SEE SHEET 2 FOR
INDEX OF SHEETS

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

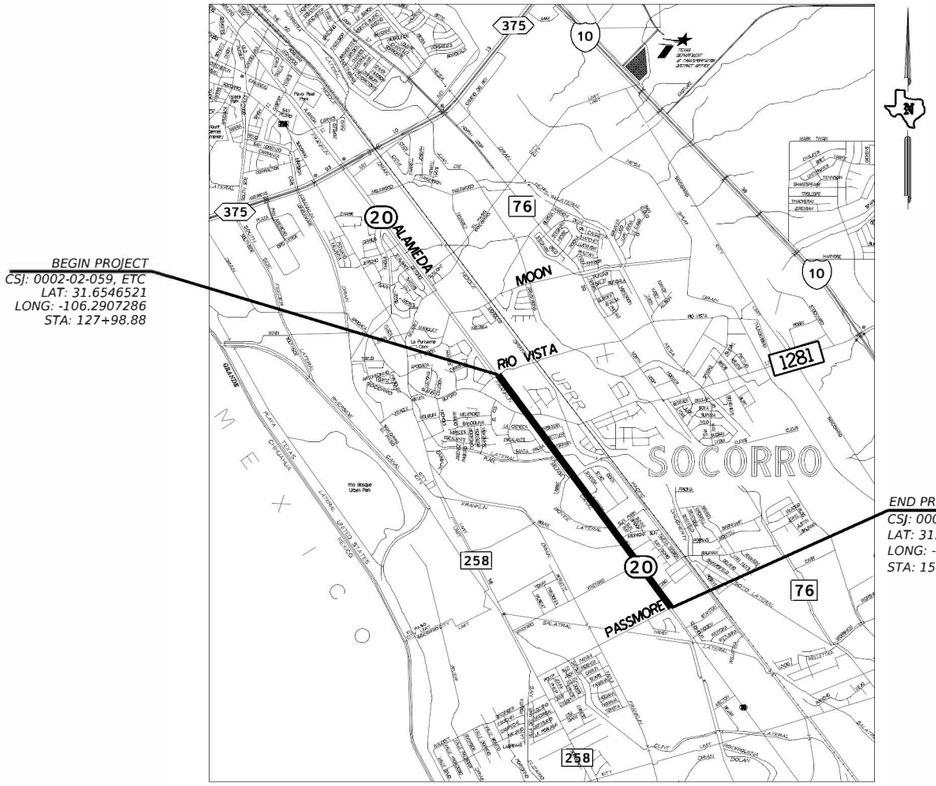
FEDERAL AID PROJECT NO. STP 2024(606)HES
CSJ: 0002-02-059, ETC.

SH 20 (ALAMEDA AVE)
EL PASO COUNTY

NET LENGTH OF ROADWAY = 12,735.36 FT.= 2.412 MI.
NET LENGTH OF BRIDGE = 0.00 FT.= 0.00 MI.
NET LENGTH OF PROJECT = 12,735.36 FT.= 2.412 MI.

LIMITS FROM RIO VISTA RD TO PASSMORE RD

FOR THE CONSTRUCTION OF SAFETY IMPROVEMENTS OF EXISTING ROADWAY CONSISTING OF INSTALLATION OF RAISED MEDIANS, CONTINUOUS ILLUMINATION, SIGNING AND PAVEMENT MARKINGS



N.T.S.

EXCEPTIONS: NONE
EQUATIONS: NONE
RAILROAD CROSSINGS: NONE
TDLR INSPECTION NOT REQUIRED

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

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, OCTOBER 23, 2023)

FEDERAL AID PROJECT NO.			
STP 2024(606)HES			
CONT	SECT	JOB	HIGHWAY
0002	02	059, ETC.	SH 20
DIST.	COUNTY		SHEET NO.
ELP	EL PASO		1

POSTED SPEED = 45 MPH
A.D.T. (2021)= 21,482
A.D.T. (2041)= 30,504

FINAL PLANS

CONTRACTOR:_____

LETTING DATE:_____

TIME CHARGES BEGAN:_____

DATE CONTRACTOR BEGAN WORK:_____

DATE WORK WAS ACCEPTED:_____

DATE WORK WAS COMPLETED:_____

TOTAL DAYS CHARGED:_____

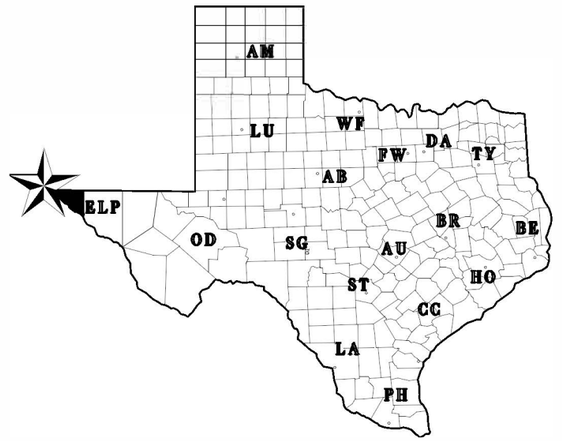
ORIGINAL CONTRACT AMOUNT: $_____

AMOUNT OF CONTRACT AMENDMENTS: $_____

FINAL CONTRACT COST: $_____

DATE: _____ 20_____

_____
AREA ENGINEER



KEY TO COUNTIES

Texas Department of Transportation

RECOMMENDED FOR LETTING: DocuSigned by: Eduardo Perales, P.E. 2778C60AB5F7426... 11/2/2023
SAFETY REVIEW COMMITTEE CHAIRMAN

RECOMMENDED FOR LETTING: DocuSigned by: L. Raul Ortega Jr., P.E. 0FA750B9875047... 11/3/2023
DISTRICT DIRECTOR OF TRANSPORTATION PLANNING AND DEVELOPMENT

APPROVED FOR LETTING: DocuSigned by: 7A68C5EA0D94498... 11/3/2023
DISTRICT ENGINEER

DATE: 10/27/2023 2:05:29 PM
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STATE OF TEXAS
KARLA Y. RIOS
140855
LICENSED
PROFESSIONAL ENGINEER

Karla Rios, P.E.

10/27/2023

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

STATE OF TEXAS
EDUARDO I. ADAME
126153
LICENSED
PROFESSIONAL ENGINEER

Eduardo Adame P.E.

10/30/2023

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

Texas Department of Transportation

SH 20

INDEX OF SHEETS

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CONT	SECT	JOB	HIGHWAY
0002	02	059 , ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		2

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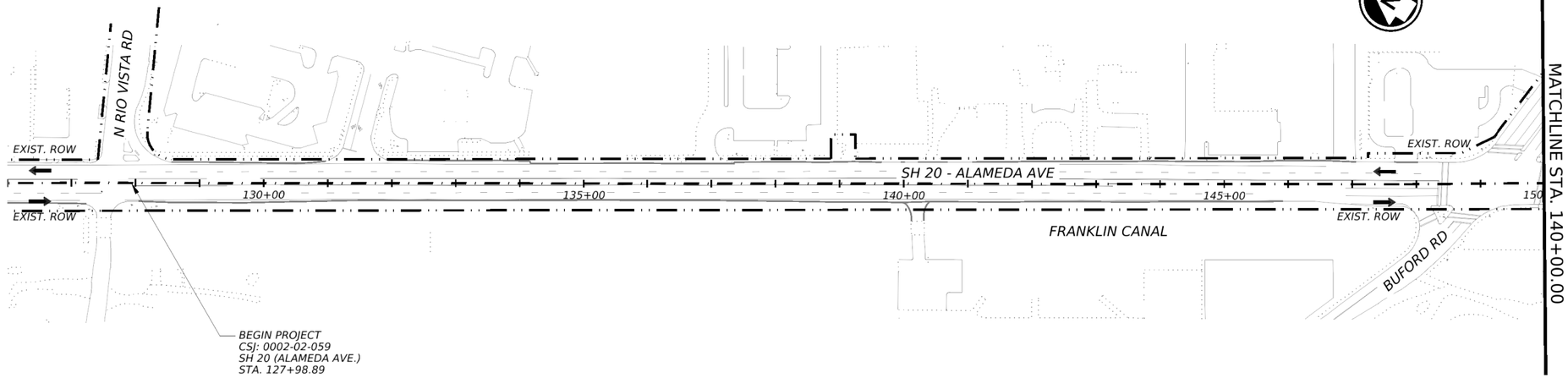

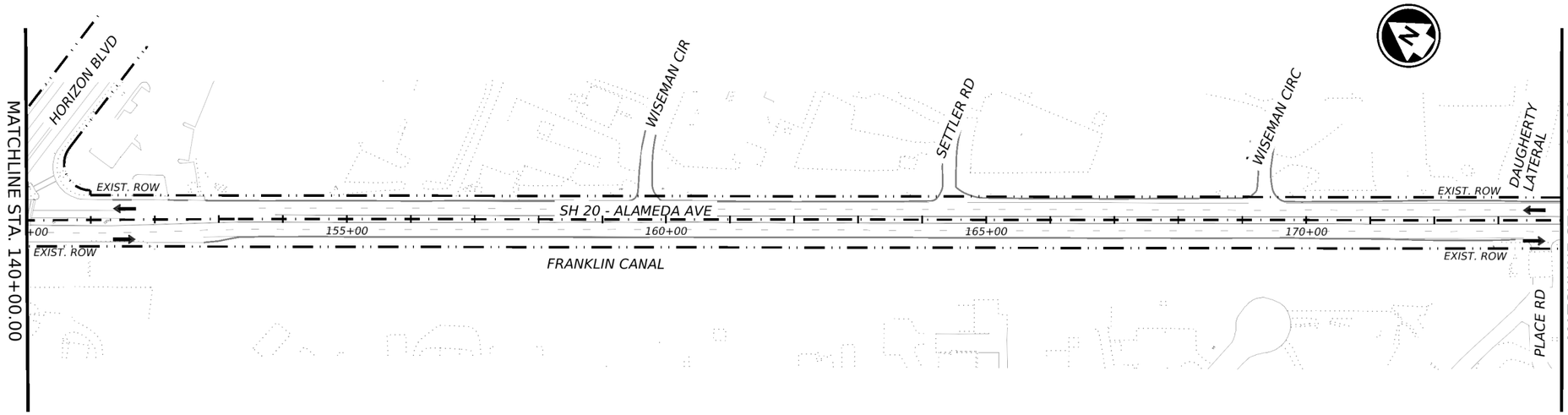

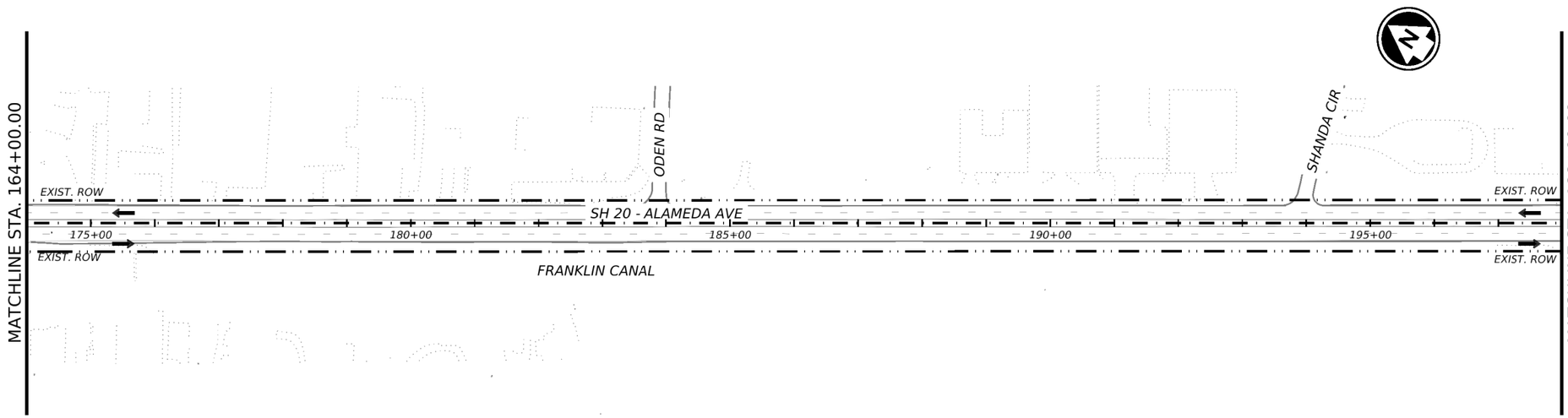

STATE OF TEXAS
KARLA Y. RIOS
140855
LICENSED
PROFESSIONAL ENGINEER
Karla Rios, P.E.
10/30/2023

0 100 200
SCALE IN FEET

SH 20

PROJECT LAYOUT
BEGIN TO STA. 188+00

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		3

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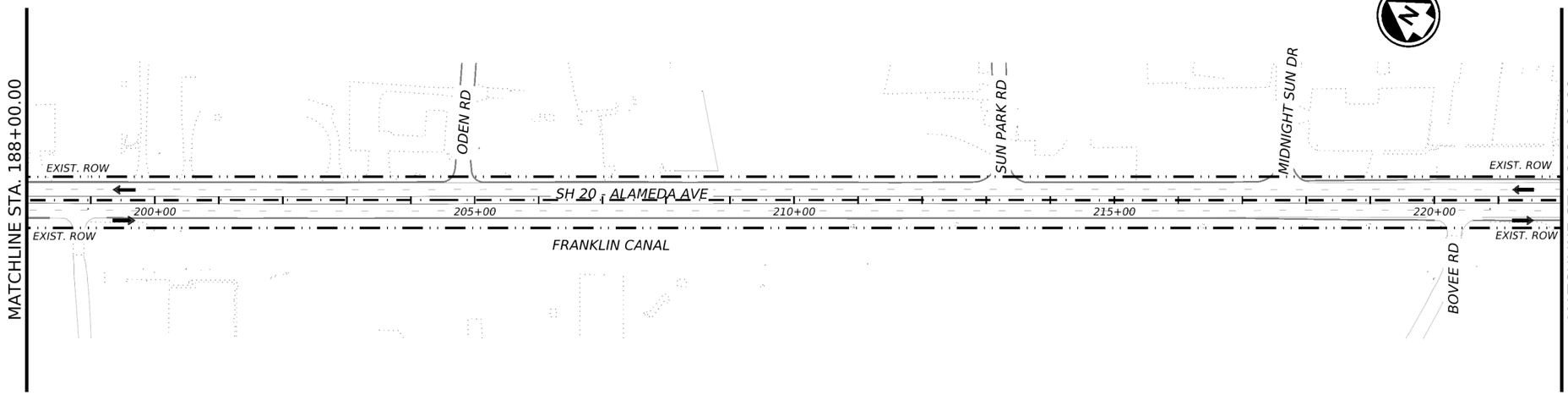

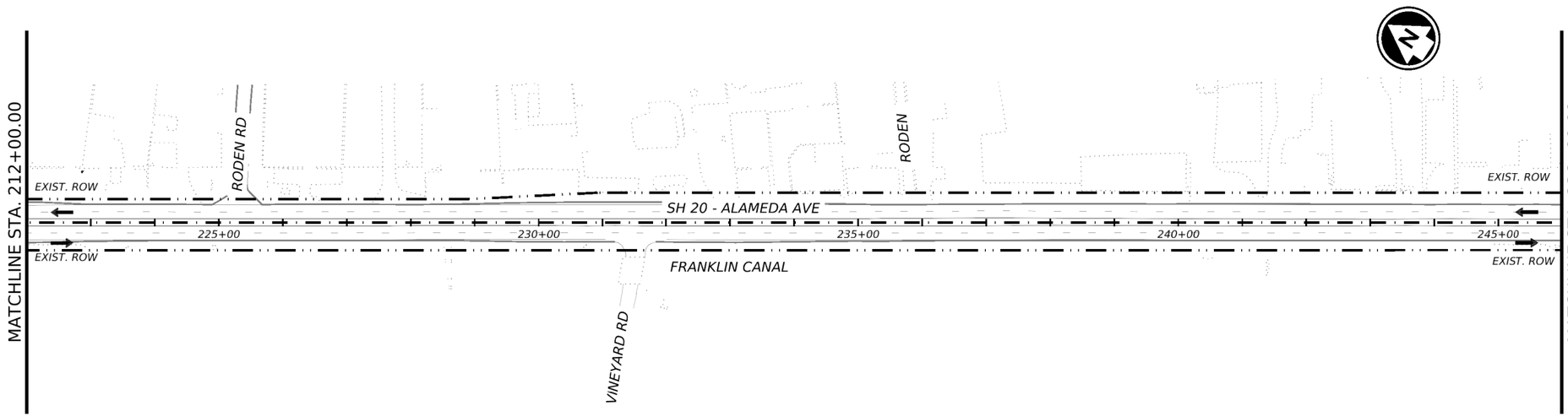

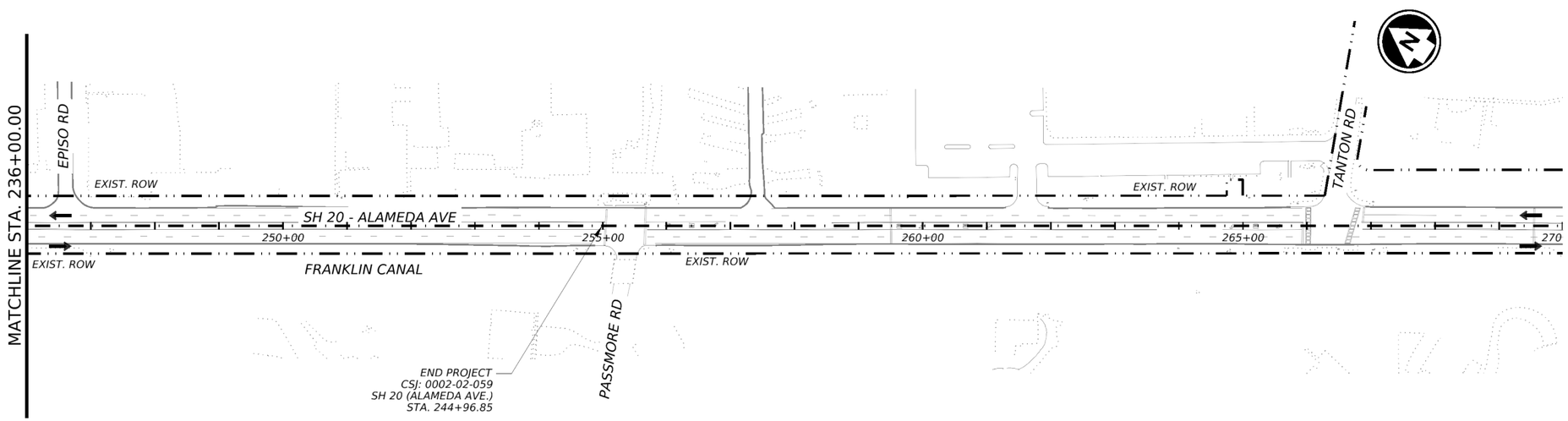

STATE OF TEXAS
KARLA Y. RIOS
140855
LICENSED
PROFESSIONAL ENGINEER

Karla Rios, P.E.

10/30/2023

0 100 200
SCALE IN FEET

Texas Department of Transportation

SH 20

PROJECT LAYOUT
STA. 188+00 TO END

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		4

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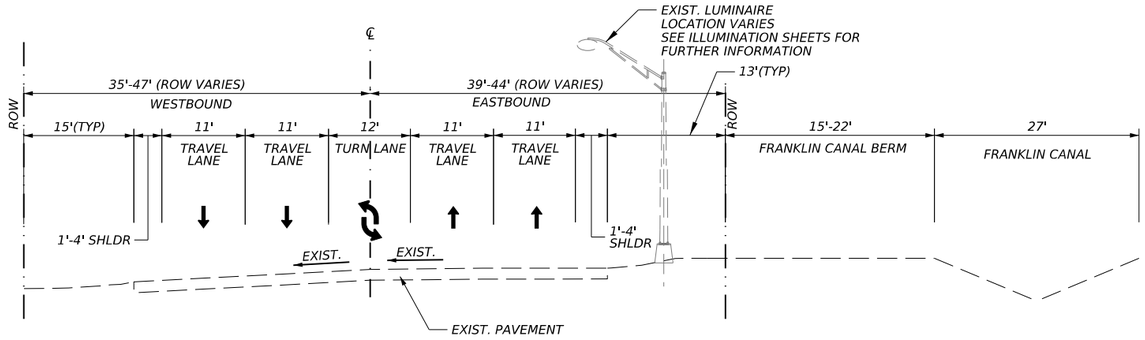
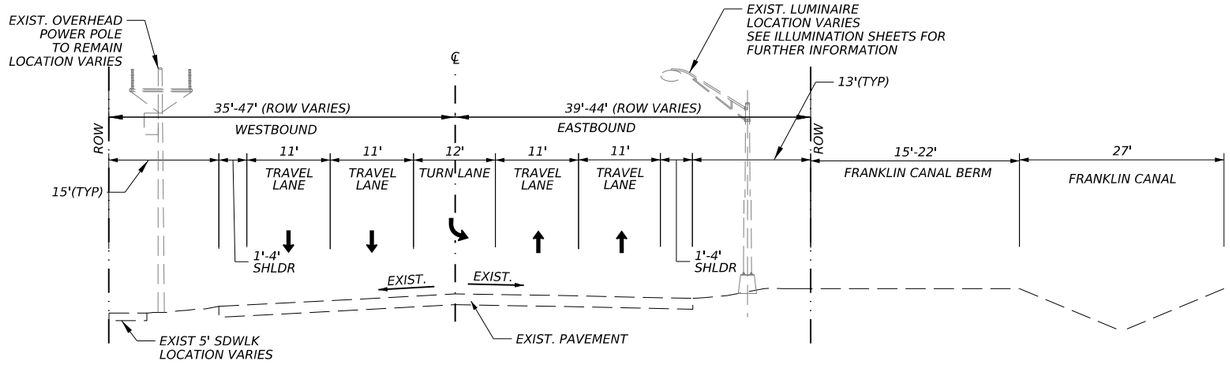
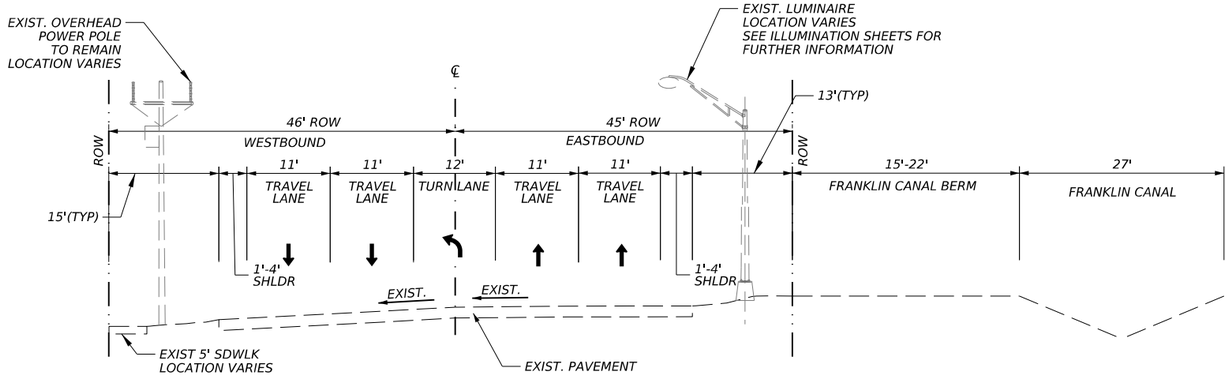


EXISTING TYPICAL SECTION
STA:131+74.32 TO STA:143+26.22
STA:152+55.65 TO STA:255+04.21



EXISTING TYPICAL SECTION
STA:127+86.40 TO STA:129+68.74
STA:149+95.79 TO STA:152+10.54



EXISTING TYPICAL SECTION
STA:129+68.74 TO STA:131+00.00
STA:143+26.22 TO STA:148+35.88

Karla Rios, P.E.

10/31/2023

N.T.S.

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Texas Department of Transportation

SH 20

EXISTING TYPICAL SECTIONS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		5

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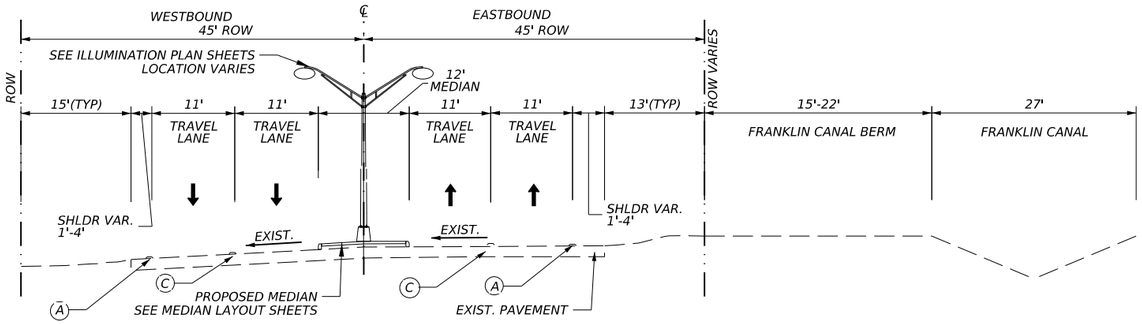
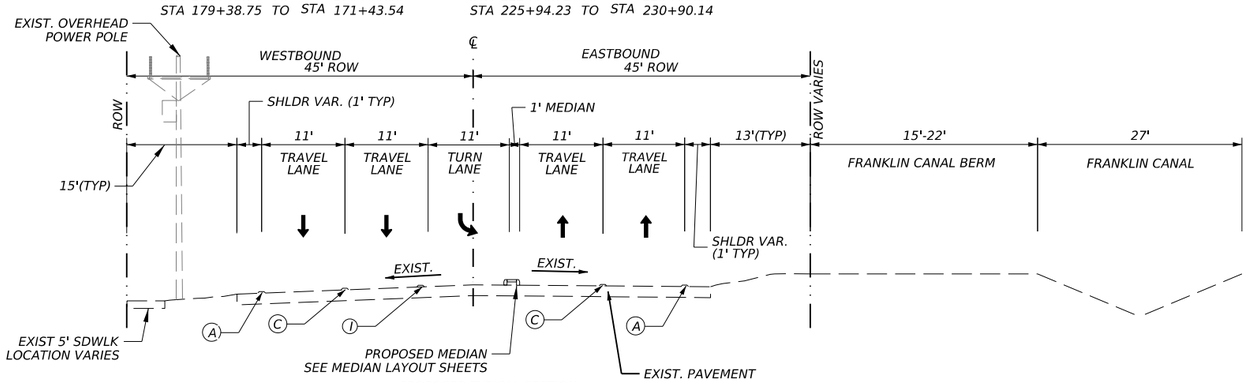


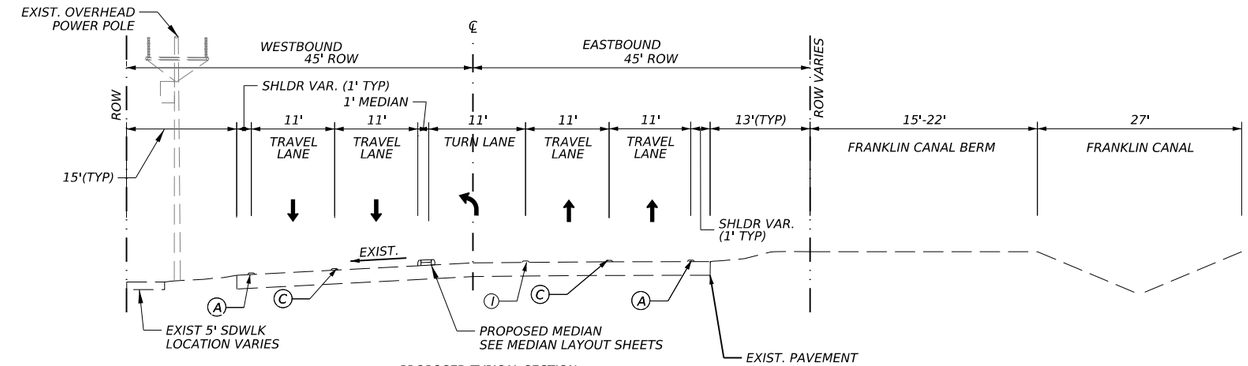
PROPOSED TYPICAL SECTION
SH 20

STA	131+85.1	TO STA	133+87.0	STA	184+46.3	TO STA	198+08.5	STA 234+04.9 TO STA 244+00.0
STA	139+20.51	TO STA	142+56.96	STA	201+68.25	TO STA	201+88.97	STA 247+24.59 TO STA 254+84.95
STA	154+40.23	TO STA	161+00.00	STA	205+43.23	TO STA	210+48.51	
STA	165+07.01	TO STA	173+21.64	STA	214+00.00	TO STA	219+61.92	
STA	175+48.64	TO STA	176+00.00	STA	222+76.72	TO STA	223+00.00	
STA	179+38.75	TO STA	171+43.54	STA	225+94.23	TO STA	230+90.14	



PROPOSED TYPICAL SECTION
SH 20

STA	133+87.01	TO STA	136+40.06	STA	201+88.97	TO STA	204+31.33
STA	142+56.96	TO STA	144+01.35	STA	210+00.00	TO STA	212+82.90
STA	161+00.00	TO STA	164+88.09	STA	223+00.00	TO STA	224+78.01
STA	176+00.00	TO STA	178+51.61	STA	244+00.00	TO STA	246+11.41
STA	181+43.54	TO STA	183+32.93				



PROPOSED TYPICAL SECTION
SH 20

STA	137+36.11	TO STA	139+20.51	STA	220+77.33	TO STA	222+76.72
STA	150+01.30	TO STA	154+40.23	STA	230+90.14	TO STA	231+21.38
STA	174+19.82	TO STA	175+92.34				
STA	199+14.86	TO STA	201+68.25				

LEGEND

A	REFL PAV MRK (W) 6" (SLD)
B	REFL PAV MRK (W) 8" (*DOT*)
C	REFL PAV MRK (W) 6" (BRK)
D	REFL PAV MRK (W) 24" (SLD)
E	REFL PAV MRK (Y) 6" (SLD)
F	REFL PAV MRK (W) (WORD)
G	REFL PAV MRK (W) (ARROW)
H	REFL PAV MRK (Y) (MED NOSE)
I	REFL PAV MRK (W) 8" (SLD)
J	REFL PAV MRK (Y) 6" (BRK)
K	REFL PAV MRK (Y) (CURB)

NOTES:

1. REFER TO PM STANDARDS FOR STRIPING AND RAISED PAVEMENT MARKER PLACEMENT

STATE OF TEXAS
KARLA Y. RIOS
140855
LICENSED
PROFESSIONAL ENGINEER

Karla Rios, P.E.
10/30/2023

N.T.S

Texas Department of Transportation

SH 20

PROPOSED
TYPICAL SECTIONS

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		6

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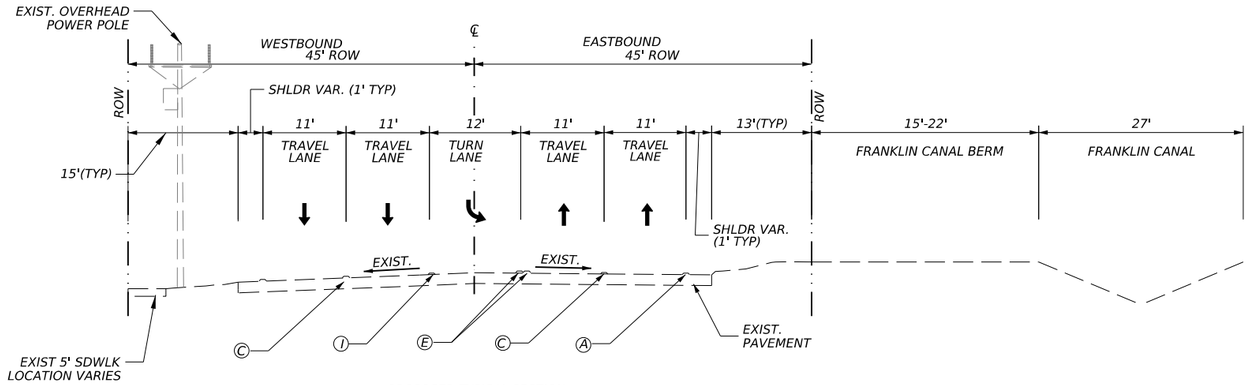
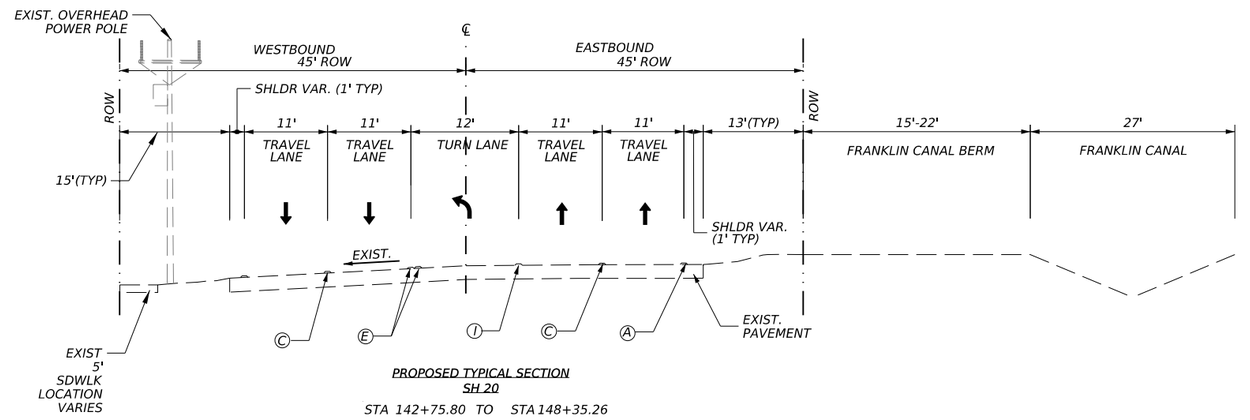
DW
CK
DW



PROPOSED TYPICAL SECTION
SH 20

STA 128+11.77 TO STA 131+91.12



PROPOSED TYPICAL SECTION
SH 20

STA 142+75.80 TO STA 148+35.26

LEGEND

A	REFL PAV MRK (W) 6" (SLD)
B	REFL PAV MRK (W) 8" (*DOT*)
C	REFL PAV MRK (W) 6" (BRK)
D	REFL PAV MRK (W) 24" (SLD)
E	REFL PAV MRK (Y) 6" (SLD)
F	REFL PAV MRK (W) (WORD)
G	REFL PAV MRK (W) (ARROW)
H	REFL PAV MRK (Y) (MED NOSE)
I	REFL PAV MRK (W) 8" (SLD)
J	REFL PAV MRK (Y) 6" (BRK)
K	REFL PAV MRK (Y) (CURB)

NOTES:

1. REFER TO PM STANDARDS FOR STRIPING AND RAISED PAVEMENT MARKER PLACEMENT

STATE OF TEXAS
KARLA Y. RIOS
140855
LICENSED
PROFESSIONAL ENGINEER

Karla Rios, P.E.
10/30/2023

N.T.S

Texas Department of Transportation

SH 20

PROPOSED
TYPICAL SECTIONS

2022 SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		7

DATE: 10/30/2023 9:08:40 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT5/Documents/24 - ELP/Design Projects/000202059/4 - Design/Plan Set/1. General/SH20_TYPSEC.dgn

CK DW CK DW

General Requirements

Maintain the entire project area in a neat and orderly manner throughout the duration of the work. Remove all construction litter and undesirable vegetation within the right of way inside the project limits. This work will be subsidiary to the various bid items.

General Project Description – This project consists of the installation of raised medians, illumination, and pavement markings along SH 20 (Alameda Ave) from Rios Vista to Passmore in El Paso County Texas.

Traffic

Contact the Engineer or the City of Socorro when construction operations are within 400 feet of a signalized intersection to determine/verify the location of loop detectors, conduit, ground-boxes, etc. Repair or replace any signal equipment damaged by construction operations. The method of repair or replacement shall be pre-approved and inspected. This work shall be completed at the Contractor's expense.

Inform the Engineer and the respective utility companies, when it becomes apparent that the utility lines will interfere with the work in progress.

The following Standard Detail sheets have been modified:

- **CCCG-22 (MOD)**

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

East Area Office:

Rene Romero, P.E.	**Aldo Madrid, P.E.**	**Monica Ruiz, P.E.**
East El Paso Area Engineer	**Director of Construction**	**District Construction Engineer**
Rene.Romero@txdot.gov	Aldo.Madrid@txdot.gov	Monica.Ruiz@txdot.gov

Questions may be submitted via the Letting Pre-Bid Q&A web page. This webpage can be accessed from the Notice to Contractors dashboard located at the following Address:

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

All contractor questions will be reviewed by the Engineer. All questions and any corresponding responses that are generated will be posted through the same Letting Pre-Bid Q&A web page.

The Letting Pre-Bid Q&A web page for each project can be accessed by using the dashboard to navigate to the project you are interested in by scrolling or filtering the dashboard using the controls on the left. Hover over the blue hyperlink for the project you want to view the Q&A for and click on the link in the window that pops up.

Traffic

Contact the Department's El Paso District Signal Shop at txdotelplocates@txdot.gov to request all Department utility line locates within the project limits. The Signal Shop will locate one time only. Record locates for the purpose of refreshing and maintaining all markings throughout the duration of the project.

Item 4 – Scope of Work

Schedule and perform all work to ensure proper drainage during the course of construction or maintenance operations. All labor, tools, equipment, and supervision required, to ensure drainage, removal, and handling of water shall be considered incidental work.

Item 5 – Control of Work

The Department will furnish horizontal and vertical reference points. Contractor must verify horizontal and vertical reference points with conventional survey methods before proceeding with construction activities. Verification must be submitted for review and approval to the Department's R.P.L.S. prior to start of construction. Any discrepancies not reported will be at no additional cost to the Department.

Plan datum for this project is NAD 83 for horizontal and NAVD 88 for elevation based.

Keep traveled surfaces used in hauling operations clear and free of dirt or other material.

Existing pavement, utilities, structures, etc. damaged as a result of construction operations will be repaired at no additional cost to the Department.

Protect from damage and destruction all areas of the right of way, which are not included in the actual limits of the proposed construction areas. Exercise care to prevent damage to trees, vegetation, irrigation system and other natural features. Protect trees, shrubs, and other landscape features from abuse, marring, or damage within the actual construction and/or fenced protection areas designated for preservation.

Restore any area disturbed or damaged to a condition "as good as" or "better than" prior to start of construction operation. This work will be at the Contractor's expense.

Item 6 – Control of Materials

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

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

The Buy America Material Classification Sheet is located at the below link. https://www.txdot.gov/business/resources/materials/buy-america-material-classification-sheet.html.

Item 7 – Legal Relations and Responsibilities

Comply with all requirements of the Environmental Permits Issues and Commitments (EPIC) Sheet.

Do not discharge any liquid pollutant from vehicles onto the roadside. Immediately clean spills and dispose in compliance with local, state, and federal regulations to the satisfaction of the Engineer at no additional cost to the Department.

Occupational Safety & Health Administration (OSHA) regulations prohibit operations that bring people or equipment within 10 ft. of an energized electrical line. Where workers and/or equipment may be close to an energized electrical line, notify the electrical power company and make all necessary adjustments to ensure the safety of workers near the energized line.

No significant traffic generator events identified.

Law Enforcement Personnel

Coordinate with TxDOT Engineer for off-duty Law enforcement assistance when needed to direct traffic during significant closures and detours, as approved unless otherwise directed by the engineer. The officer shall monitor or direct traffic during the closure as directed by the Engineer. Patrol vehicles must be clearly marked to correspond with the officer's agency and equipped with appropriate lights to identify them as law enforcement. For patrol vehicles not owned by a law enforcement agency, markings will be retroreflective and legible from 100 ft. from both sides and the rear of the vehicle. Lights will be high intensity and visible from all angles.

Contractor to submit a written request at least 48 hrs prior to the need for law enforcement to the Engineer. The Engineer will make arrangements with the respective entity to formally request the services.

Fees resulting from contractor-initiated cancellations shall be the Contractor's responsibility.

The method used to direct traffic at signalized intersections shall be as approved. Additional officers and vehicles may be provided when approved or directed.

Show proof of certification by the Texas Commission on Law Enforcement Standards.

Complete the daily tracking form provided by the department and submit proof of payment such as cancelled checks for the approved invoices that have been billed to the project no later than 30 days from the invoice date.

No payment will be made for law enforcement personnel needed for moving equipment or payment for drive time to/from the event site.

Minimums, scheduling fees, etc. will not be paid; TxDOT will consider paying cancellation fees on a case-by-case basis.

Item 8 – Prosecution and Progress

Working days will be calculated in accordance with Section 8.3.1., "**Standard** Workweek."

Create and maintain a Bar Chart schedule.
Submit baseline schedule and obtain approval prior to beginning construction. The monthly progress payment will be held if the monthly update is not submitted.

Contractor work activities will be limited to the allowed lane closure times defined as daytime hours of 9 A.M. to 4 P.M. Monday through Friday or nighttime hours of 9 P.M. to 6 A.M. Sunday through Thursday, unless otherwise directed by the Engineer.

Prior to beginning operations, schedule and attend a preconstruction conference with the Engineer. Provide the Department a written outline of the proposed sequence of work (Bar Chart Schedule) and an estimated progress schedule.

Item 9 – Measurement and Payment

Monthly progress payments will be made for items of work completed by the 27th day of each month. Any work completed after the 27th will be included for payment in the subsequent monthly progress payment.

Submit Material on Hand (MOH) payment requests at least **two (2)** working days prior to the 27th of the month for payment consideration on that month's estimate.

Item 110 – Excavation

The contractor shall use this pay item to pothole and identify possible utility conflicts along proposed conduit installation and proposed drill shaft foundations.

The contractor shall pothole as directed to the proposed ground boxes, foundations, and conduit locations. This work shall be accomplished prior to commencement of the installation/construction of the above-mentioned facilities.

The intent is to determine if any conflicts with other buried utilities or structures exist. When a conflict exists, the engineer shall be notified to determine if additional exposure of the conflict is required.

The contractor shall fill the potholes up to the bottom of the pavement surface after excavating with material from the hole and compact to 95% density. The holes shall then be patched with a suitable hot mix asphalt concrete material or earthen material as directed by the engineer. The contractor shall then maintain these patches in good repair until the completion of work. All equipment, labor, and materials associated with this work shall be considered subsidiary to the various bid items.

The contractor shall inform the engineer and the respective utility companies when it becomes apparent that utility lines shall interfere with work in progress.

Item 416 – Drilled Shaft Foundations

Stake all foundations and locations prior to commencement of drilling operations for verification to ensure no conflicts with utility lines. Approval by Engineer will be required for all non-bridge foundations.

Cover drilled shafts with plywood and delineate with pedestrian fence, to the satisfaction of the Engineer, when no work is being performed and after working hours. This work shall be considered subsidiary to this item.

Remove spoils, daily, out of the drainage areas or as directed.

Survey verify and provide the Engineer finished drilled shaft elevations.

Item 502 – Barricades, Signs, and Traffic Handling

Prior to beginning construction, the Engineer will approve the routing of traffic and sequence of work.

Additional signs and barricades, placed as directed, will be considered subsidiary to this Item

In accordance with Section 7.2.6.1, designate, in writing, a Contractor Responsible Person (CRP) and a CRP alternate to take full responsibility for the set-up, maintenance, and necessary corrective measures of the traffic control plan. The CRP or CRP alternate must be present at site and implement the initial set up of every traffic control phase/stage, at each location, and/or each call out, for the entire duration of the project.

At the written request of the Engineer, immediately remove the CRP or CRP alternate from the project if, in the opinion of the Engineer, is not competent, not present at initial TCP set-ups, or does not perform in a proper, skillful, or safe manner. These individuals shall not be reinstated without written consent of the Engineer.

CRP and CRP alternate must be trained using Department approved training. Provide a copy of the certificate of completion to the Engineer for project records. Refer to Table 1 for Department approved Training.

Table 1

Contractor Responsible Person and Alternate

Provider	Course Number	Course Title	Duration	Notes
American Traffic Safety Services Association	TCS	Traffic Control Supervisor	2 days	
National Highway Institute	133112 133113	Design and Operation of Work Zone Traffic Control Work Zone Traffic Control for Maintenance Operations	1 day 1 day	Both courses are required to meet minimum required training.
Texas Engineering Extension Services	133112A	Design and Operation of Work Zone Traffic Control	3 days	
University of Texas Arlington Division for Enterprise Development	WKZ421	Traffic Control Supervisor	16 hours	Contact UTA for training needs.

All contractor workers involved with the traffic control implementation and maintenance must participate and complete a Department approved training course. Provide a copy of the certificate of completion to the Engineer for project records. Refer to Table 2 for Department approved training.

Table 2

Other Work Zone Personnel

Provider	Course Number	Course Title	Duration	Notes
American Traffic Safety Services Association	TCT	Traffic Control Technician	1 day	
Texas Engineering Extension Services	HWS002	Work Zone Traffic Control	16 hours	Identical to HWS-410. Counts for 3 years CRP requirement.
National Highway Institute	133116	Maintenance of Traffic for Technicians	5 hours	Web based
National Highway Institute	134109-I	Maintenance Training Series: Basics of Work Zone Traffic Control	1 hour	Free, Web based
University of Texas at Arlington, Division for Enterprise Development	WKZ100	Work Zone Safety: Temporary Traffic Control	4 hours	Note name change. Free, Web based
TxDOT/AGC Joint Development	N/A	Safe Workers Awareness Highway Construction Work Zone Hazards	16 minutes 18 minutes	Videos available through AGC of Texas offices. English & Spanish
AGC America	N/A	Highway Work Zone Safety Training	1 day	
Texas Engineering Extension Service	HWS400	Temporary Traffic Control Worker	4 hours	Contact TEEX, if interested in course
TxDOT/AGC Joint Development	N/A	Work Zone Fundamentals	10 minutes	Videos available through ACT of Texas offices. English & Spanish

Contractor may choose to train workers involved with the traffic control implementation and maintenance with a contractor developed training in lieu of Department approved training. Contractor developed training must be equivalent to the Department approved training shown in Table 2. Provide the Engineer a copy of the course curriculum for pre-approval, prior to conducting the contractor developed training. Provide the Engineer a copy of the log of attendees after training completion for project records.

Existing regulatory signs, route marker auxiliaries, guide signs, and warning signs that must be removed due to widening shall be relocated temporarily and erected on approved supports at locations shown in the plans, or as directed. This work will not be paid for directly but is considered subsidiary to this Item.

Notify the Department officials when major traffic changes are to be made, such as detours. Coordinate with the Department on all traffic changes. Advance notification for the following week's work must be made by 5 P.M. on Wednesdays.

If Law Enforcement Personnel is required by the Engineer, coordinate with local law enforcement as directed or agreed. Complete the weekly tracking form provided by the Department and submit invoices with 5% allowance for Law Enforcement payments by Contractor that agree with the tracking form for payment at the end of each month where approved services were provided.

Provide access to intersecting side roads and driveways at all times, unless otherwise directed.

Any approved change to the sequence of work or TCP, must be signed and sealed by a Contractor's Licensed Professional Engineer assuming full responsibility for any additional barricade signs and devices needed.

Use striping operations to channelize traffic into the newly completed roadway, as directed. Maintain shoulders and median areas in a condition capable of serving as emergency paths, as approved. This work will be subsidiary to this Item.

Use portable changeable message signs (PCMS) to alert public of construction two weeks prior to construction.

Use flaggers when directed. Provide two-way radio communication for all flaggers.

Place and maintain sufficient additional warning signs, beacons, delineators, and barricades to warn and guide the public of all hazards in the construction zone limits at all times, and as directed.

Use flashing arrow boards on all tapers for each lane closure.

Some signs, barricades, and channelization devices may not be shown at the precise or measured position. Place the barricades, devices, or signs, with approval, in positions to meet field conditions.

Use Type A flashing warning lights or delineators to mark open excavation, footings, foundations, or other obstructions near lanes that may be open to traffic, as directed.

Remove or cover signs that do not apply to current conditions at the end of each day's work.

Repair or replace all signs damaged by the public or due to weather events.

All project signs shall be maintained free of litter, debris, or sediment build up at the base supports. This work is subsidiary to this item of work.

All project limits signs shown on BC (2) or on the project line diagram shall be installed using ground mounted supports unless otherwise approved by the engineer. Fill any holes left by barricade or sign supports and restore the area to its original condition.

Safety Contingency

The contractor Force Account "Safety Contingency" that has been established for this project is intended to be utilized for work zone enhancement, to improve the effectiveness of the TCP 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 529 – Concrete Curb, Gutter and Combined Curb and Gutter

Use Class A concrete for these Items, unless otherwise shown on the plans. Wire mesh and fibers for concrete will not be allowed. Reinforce all concrete using reinforcement conforming to Item 440, "Reinforcement for concrete," as shown on the plans or as directed.

Construct the curb opening with metal plate configuration detailed in the plans, or as directed, to ensure roadway drainage to the earthen ditch. No direct payment will be made for these features. Payment will be made under this Item. All required manipulations or incidentals required to complete the work will be considered subsidiary to these items.

Perform all requiring grading for proposed concrete curb, gutter, and combined curb and gutter construction as shown on the plans. All grading, including excavation and fill/embankment will be subsidiary to this Item.

After construction, restore the adjacent surface to a condition approved by the Engineer. Consider this work subsidiary to this Item.

Item 530 – Intersections, Driveways, and Turnouts

The existing roadway and driveways are to be saw-cut to a straight and neat line when proposed sidewalks are being constructed across them. The area then will be cleaned out prior to concrete placement. This work is subsidiary to this Item.

Use Class A or P concrete for all concrete driveways, unless otherwise shown on the plans.

High early strength concrete for proposed driveways to be available as deemed necessary and as directed.

Item 610 – Roadway Illumination Assemblies

Conductor runs in Illumination Layouts contain 5 ft. of slack.

Limitations on Use of the RIP-19 Standard

The Roadway Illumination Pole (RIP-19) Standard Details were developed for installations in locations where the 3-second gust basic maximum wind speed is 110 mph, and where the elevation of the base of the pole is less than (i.e. not more than) 25 ft. above the elevation of surrounding terrain, in accordance with the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, 6th Edition (2013) (AASHTO Design Specifications). For poles to be installed in regions where the maximum basic wind speed exceeds 110 mph or to be mounted more than 25-ft. above the surrounding terrain, provide poles meeting the following requirements:

Submittals. Submit fabrication drawings and calculations sealed by a licensed professional engineer. Follow the electronic shop drawing submittal process (see Guide Electronic Shop Drawing Submittal), to submit fabrication drawings and calculations for approval.

Luminaire Structural Support Requirements. Lighting poles, arms, and anchor bolt assemblies shall have a 25-year design life to resist dead loads, ice loads, and the required basic wind speeds safely at the location of installation in accordance with the current edition of the AASHTO Design Specifications. For transformer base poles, the fabricator shall include transformer base and connecting hardware in calculations and shop drawing submittals. All transformer bases shall have been structurally tested to resist the theoretical plastic moment capacity of the pole. Certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished shall be submitted with the shop drawings. Shop drawings shall show breakaway base model number, and manufacturer's name and logo. Manufacturer's shop drawings shall include the ASTM designations for all materials to be used.

Fabricate steel roadway illumination poles in accordance with Department standards RIP-2019 (Roadway Illumination Poles – RIP (1)-19). Poles fabricated according to RIP-2019 require no

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

For instructions on submitting shop drawings electronically go to the Texas Department of Transportation (TxDOT) home page, http://txdot.gov, Business with TxDOT, Bridge information, Shop drawings. File is titled: Guide to Electronic Shop Drawing Submittal.

Item 618 – Conduit

The location of conduit is diagrammatic and may be varied to meet local conditions upon approval of the Engineer.

When shown on the plans, use underground warning tape in the trench installation of conduit (PVC).

For conduit placement in pavement, an earth-saw may be used provided the cut does not exceed 6 in. Backfill as shown on the trench details in the plans.

For all underground conduit bends of 45°, provide rigid metal conduit. Where the rigid metal conduit is exposed at any point and where rigid metal extends into ground boxes, bond the metal conduit to the grounding conductor with grounding type bushings or by other UL-listed grounding connectors, approved by the Engineer. Rigid metal bends will not be paid for directly but will be considered incidental to the PVC conduit system.

Backfill roadway and driveway trench with cement-stabilized backfill at the end of each working day. Place an ACP patch at the end of the week or as directed by the Engineer.

All conduit elbows and rigid metal extensions required to be installed on PVC conduit systems will not be paid for separately but will be considered subsidiary to the various bid items.

All bore items shall be directional and shall be paid for under this item. Bore quantities include the distance beneath the roadway plus an additional 2 ft. on either side of the curb, sidewalk, or edge of pavement.

For conduits install by open trench method, backfill the trench as shown on the plans.

Place all other conduit at a minimum depth of 18 in. below the pavement surface. Place conduit prior to the new pavement construction.

Fit both ends of each raceway with a temporary cap to prevent dirt and debris from entering during construction.

Install a continuous green insulated copper wire, as shown in the plans, in every conduit throughout the electrical system in accordance with the electrical detail sheets, and the latest edition of the National Electrical Code.

When conduit is to be installed where riprap presently exists, take care in breaking the existing riprap for placement of the conduit. Do not break out a greater area that is required for placement of the conduit. Replace broken riprap with Class “C” concrete to the exact slope, pattern, color and thickness of the existing riprap. Replacement of riprap will be subsidiary to this Item.

Item 620 – Electrical Conductors

Use NEC type XHHW for all conductors.

Insulate grounding conductors with a green jacket and neutral conductors with a white jacket.

At every accessible point, bond together the grounding conductors which share the same conduit, junction box, ground box or structure in accordance with the electrical detail sheets and the latest edition of the National Electrical Code.

For both transformer and shoe-base type illumination poles, provide double-pole breakaway fuse holder as shown on the Department’s Materials Producers List under “Roadway Illumination and Electrical Supplies.” category. Fuse holder is shown on the list under Item 610, “Roadway Illumination Assemblies,” and Item 620, “Electrical Conductors.” Provide 10 amp time delay fuses.

Include extra cable length in each ground box or foundation for each run, to provide adequate slack, as provided in the plans or as directed.

Ensure a properly bonded electrical system by running wire, as shown in the plans, between foundations and grounding it at each foundation ground-rod.

Refer to Article 7.18, “Electrical Requirements,” for electrical certification and electrical licensing requirements

The required electrical certifications course is available and is scheduled periodically by Texas Engineering Extension Service (TEEX). Alternatively, Contractors may purchase an entire course for their personnel to be held at a time and location of their choice as negotiated through TEEX. For more information contact:

Texas Engineering Extension Service (TEEX)
TxDOT Electrical System Course
(979) 845-6563

Item 624 – Ground Boxes

Remove all conductors in ground boxes as shown on the plans to be abandoned. Payment for removal of conductors will be subsidiary to this Item.

Item 628 – Electrical Services

Meet at the service locations with representatives of the Department, electrical utility company, at least twelve weeks before electric power is needed to finalize exact service pole placement and resolve any issues.

Any electrical costs for connection, test, and operation will be the responsibility of the government agency that will have the final operational control of the items built.

Remove the existing service enclosure and conduit on service poles that are to be reused or abandoned. Payment for removal will be considered subsidiary to this Item.

Item 644 – Small Roadside Sign Assemblies

Stake all sign locations and receive approval prior to sign placement.

The 2-1/2 inch, Schedule 10 post will meet the following requirements:

- 0.120 in. nominal wall thickness
- Seamless or electric-resistance welded steel tubing or pipe
- Steel will be HSLAS Grade 55 per ASTM A1011 or ASTM A1008

Other steel may be used, if it meets the following:

- 55,000 psi minimum yield strength
- 70,000 psi minimum tensile strength
- 20% minimum elongation in 2 in.
- Wall thickness (uncoated) to be within the range of 0.108 in. to 0.132 in. galvanization per ASTM A123 or ASTM A653 G90

For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metalizing with zinc wire per ASTM B833.

Verify all post lengths to ensure the proper sign height. Remove and replace any sign installed incorrectly. This work will be done at no expense to the Department.

Provide Texas Universal Triangular Slip Base Bolt clamp type for all signs as shown on SMD (Slip-1)-08.

As directed, some regulatory and guide signs will be relocated before construction begins. Mark and locate each reference marker perpendicular to the road and along the right of way, or as directed, prior to removal. Re-erect reference markers at their original location upon completion of construction.

Item 666 –Retroreflectorized Pavement Markings

Use a pilot line for final striping and remove pilot line after all striping is complete. Removal will be in accordance with the methods specified in Item 677, “Eliminating Existing Pavement Markings and Markers,” and will be subsidiary to this Item.

Air blasting is required as pavement surface preparation.

In those areas where existing pavement markings are to be covered or removed, field locate and record the existing pavement markings by survey or other approved method by the Engineer as directed. Place final striping on these locations.

Item 677 – Eliminating Existing Pavement Marking and Markers

Use water blasting as the method for removal of existing pavement markings, unless otherwise approved by the engineer.

Item 1005 – Loose Aggregate for Ground Cover

Protect newly graded areas from traffic and erosion.

Secure locally quarried aggregate rock that is clean, free from foreign materials and debris prior to placement and approved by the Engineer.

For aggregate Type I use crushed limestone rock, graded to range from ¾ inch to 1-1/2 inch placed in a uniform 3 inch layer. Provide a color: Padre Canyon Red (Franklin Red) rock color as approved prior to placement. Place rock where shown on the plans or as directed.

The aggregate shall fill in the eroded areas, gaps, improve and satisfy the layer thickness and to the satisfaction of the engineer.

Provide a sample of each aggregate color to project Engineer for approval.

Keep aggregate 1 in below top of concrete or concrete curb.

Provide a sample of each aggregate color to project Engineer for approval. Keep aggregate 1 inch below top of concrete or concrete curb.

Item 6001 – Portable Changeable Message Sign

Provide messages as directed.

Provide two Portable Changeable Message Signs (PCMS) as advanced notification for two weeks prior to beginning project and throughout duration of project as directed.

Item 6027 – Preparation of Existing Conduits, Ground Boxes or Manholes

Install cable rack assemblies in existing ground boxes as identified in the plans.

Secure fiber optic cable slack and splice enclosures to cable rack assemblies.

Damages done by the Contractor to existing cables during the preparation of existing conduit will be repaired or replaced at the Contractor's expense, and to the satisfaction of the Engineer.

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

All TMA Operators must participate in a TMA workshop to be conducted by the El Paso District Safety Office, on the proper use of TMAs, prior to working on Department Right of Way (ROW). A certificate of completion will be issued to TMA Operators that successfully complete the TMA workshop. The certificate of completion must be carried by TMA Operators at all times while working on Department right of way.

Acquire the TCP and TMA Operator's certificates of completion prior to the authorization to begin work. No time suspension will be granted, and no traffic control work will be allowed without certificates of completion.

In addition to the shadow vehicles with Truck Mounted Attenuator (TMA) that are specified as being required on the traffic control plan for this project, provide 1 additional shadow vehicle(s) with TMA for TCP (2-4) -(3-1)- (3-4) as detailed on General Note of this standard sheet.

Therefore, 3 total shadow vehicles with TMA will be required for this type of work. The contractor will be responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs needed for the project.

The supporting vehicle for the TMA shall have a minimum gross (i.e., ballasted) vehicular weight of 19,000 pounds.

Basis of Estimate for Stationary TMAs				
		TMA(Stationary)		
Phase	Standard	Required	Additional	TOTAL
Phase 1	TCP(2-4) & TCP (2-4)	2	1	3

Basis of Estimate for Mobile TMAs			
	TMA(Mobile)		
Standard	Required	Additional	TOTAL
TCP (3-1) THRU TCP (3-4)	2	1	3

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0002-02-059 **DISTRICT** El Paso **COUNTY** El Paso
HIGHWAY SH 20

				CONTROL SECTION JOB	0002-02-059		0002-02-062		TOTAL EST.	TOTAL FINAL
				PROJECT ID	A00177494		A00193272			
				COUNTY	El Paso		El Paso			
				HIGHWAY	SH 20		SH 20			
ALT	BID CODE	DESCRIPTION	UNIT		EST.	FINAL	EST.	FINAL		
	110-6003	EXCAVATION (SPECIAL)	CY				0.900		0.900	
	416-6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF				512.000		512.000	
	500-6001	MOBILIZATION	LS		1.000				1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO		7.000				7.000	
	529-6005	CONC CURB (MONO) (TY II)	LF		20,106.000				20,106.000	
	530-6004	DRIVEWAYS (CONC)	SY		195.000				195.000	
	536-6002	CONC MEDIAN	SY		3,794.000				3,794.000	
	610-6009	REMOVE RD IL ASM (TRANS-BASE)	EA				16.000		16.000	
	610-6161	IN RD IL (TY SA) 30T-4-4 (250W EQ) LED	EA				55.000		55.000	
	610-6216	IN RD IL (TY SA) 40T-10 (250W EQ) LED	EA				9.000		9.000	
	618-6023	CONDT (PVC) (SCH 40) (2")	LF				2,900.000		2,900.000	
	618-6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF				9,545.000		9,545.000	
	620-6008	ELEC CONDR (NO.8) INSULATED	LF				17,020.000		17,020.000	
	620-6010	ELEC CONDR (NO.6) INSULATED	LF				26,095.000		26,095.000	
	624-6002	GROUND BOX TY A (122311)W/APRON	EA				27.000		27.000	
	624-6028	REMOVE GROUND BOX	EA				12.000		12.000	
	628-6002	REMOVE ELECTRICAL SERVICES	EA				3.000		3.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA		8.000				8.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA		1.000				1.000	
	666-6029	REFL PAV MRK TY I (W)8"(DOT)(090MIL)	LF		380.000				380.000	
	666-6035	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	LF		2,392.000				2,392.000	
	666-6047	REFL PAV MRK TY I (W)24"(SLD)(090MIL)	LF		40.000				40.000	
	666-6053	REFL PAV MRK TY I (W)(ARROW)(090MIL)	EA		18.000				18.000	
	666-6077	REFL PAV MRK TY I (W)(WORD)(090MIL)	EA		18.000				18.000	
	666-6155	REFL PAV MRK TY I(Y)(MED NOSE)(090MIL)	EA		28.000				28.000	
	666-6171	REFL PAV MRK TY II (W) 6" (BRK)	LF		6,267.000				6,267.000	
	666-6174	REFL PAV MRK TY II (W) 6" (SLD)	LF		21,721.000				21,721.000	
	666-6176	REFL PAV MRK TY II (W) 8" (DOT)	LF		380.000				380.000	
	666-6178	REFL PAV MRK TY II (W) 8" (SLD)	LF		2,392.000				2,392.000	
	666-6182	REFL PAV MRK TY II (W) 24" (SLD)	LF		40.000				40.000	
	666-6184	REFL PAV MRK TY II (W) (ARROW)	EA		18.000				18.000	
	666-6192	REFL PAV MRK TY II (W) (WORD)	EA		18.000				18.000	
	666-6208	REFL PAV MRK TY II (Y) 6" (BRK)	LF		135.000				135.000	
	666-6210	REFL PAV MRK TY II (Y) 6" (SLD)	LF		1,648.000				1,648.000	
	666-6217	REFL PAV MRK TY II (Y) (MED NOSE)	EA		28.000				28.000	
	666-6285	REF PROF PAV MRK TY I(W)6"(SLD)(090MIL)	LF		21,721.000				21,721.000	
	666-6305	RE PM W/RET REQ TY I (W)6"(BRK)(090MIL)	LF		6,267.000				6,267.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0002-02-059 **DISTRICT** El Paso **COUNTY** El Paso
HIGHWAY SH 20

				CONTROL SECTION JOB	0002-02-059		0002-02-062		TOTAL EST.	TOTAL FINAL
				PROJECT ID	A00177494		A00193272			
				COUNTY	El Paso		El Paso			
				HIGHWAY	SH 20		SH 20			
ALT	BID CODE	DESCRIPTION	UNIT		EST.	FINAL	EST.	FINAL		
	666-6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF		135.000				135.000	
	666-6320	RE PM W/RET REQ TY I (Y)6"(SLD)(090MIL)	LF		1,648.000				1,648.000	
	666-6440	REFL PAV MRK TY II (Y)(CURB)	LF		965.000				965.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA		56.000				56.000	
	672-6010	REFL PAV MRKR TY II-C-R	EA		630.000				630.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF		58,449.000				58,449.000	
	677-6003	ELIM EXT PAV MRK & MRKS (8")	LF		576.000				576.000	
	677-6007	ELIM EXT PAV MRK & MRKS (24")	LF		35.000				35.000	
	677-6008	ELIM EXT PAV MRK & MRKS (ARROW)	EA		5.000				5.000	
	677-6012	ELIM EXT PAV MRK & MRKS (WORD)	EA		4.000				4.000	
	678-6002	PAV SURF PREP FOR MRK (6")	LF		30,061.000				30,061.000	
	678-6004	PAV SURF PREP FOR MRK (8")	LF		2,772.000				2,772.000	
	678-6008	PAV SURF PREP FOR MRK (24")	LF		40.000				40.000	
	678-6009	PAV SURF PREP FOR MRK (ARROW)	EA		19.000				19.000	
	678-6016	PAV SURF PREP FOR MRK (WORD)	EA		19.000				19.000	
	678-6024	PAV SURF PREP FOR MRK (MED NOSE)	EA		31.000				31.000	
	1005-6001	LOOSE AGGR FOR GROUNDCOVER (TYPE I)	CY		633.000				633.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY		292.000				292.000	
	6027-6003	CONDUIT (PREPARE)	LF				1,256.000		1,256.000	
	6027-6008	GROUND BOX (PREPARE)	EA				5.000		5.000	
	6084-6001	MODIFY EXISTING ELECTRICAL SERVICE	EA				3.000		3.000	
	6163-6002	REMOVE EXISTING CABLES (POWER)	LF				5,966.000		5,966.000	
	6185-6002	TMA (STATIONARY)	DAY		262.000				262.000	
	6185-6005	TMA (MOBILE OPERATION)	DAY		6.000				6.000	
	14	PUBLIC UTILITY FORCE ACCT WORK (PARTICIPATING)	LS		1.000				1.000	
	18	LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS		1.000				1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS		1.000				1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS		1.000				1.000	

SUMMARY OF MOBILIZATION ITEMS		
	500	502
	6001	6001
LOCATION	MOBILIZATION	BARRICADES, SIGNS AND TRAFFIC HANDLING
	LS	MO
0002-02-059	1	7
0002-02-062		
PROJECT TOTALS	1	7

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS			
	6001	6185	6185
	6001	6002	6005
LOCATION	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	DAY	DAY	DAY
0002-02-059	292	262	6
0002-02-062			
PROJECT TOTALS	292	262	6

SUMMARY OF ROADWAY ITEMS CSJ 0002-02-059				
	529	530	536	1005
	6005	6004	6002	6001
LOCATION	CONC CURB (MONO) (TY II)	DRIVEWAYS (CONC)	CONC MEDIAN	LOOSE AGGR FOR GROUNDCOVER (TYPE I)
	LF	SY	SY	CY
SHEET 1 OF 11	1,226	98	145	17
SHEET 2 OF 11	1,157		184	33
SHEET 3 OF 11	1,990		362	61
SHEET 4 OF 11	1,964		370	69
SHEET 5 OF 11	2,072		331	55
SHEET 6 OF 11	2,143		476	93
SHEET 7 OF 11	2,122	97	323	55
SHEET 8 OF 11	1,843		283	49
SHEET 9 OF 11	1,982		345	59
SHEET 10 OF 11	2,203		430	80
SHEET 11 OF 11	1,404		321	62
PROJECT TOTALS	20,106	195	3,570	633

SUMMARY OF DRAINAGE ITEMS CSJ 0002-02-059	
	536
	6002
LOCATION	CONC MEDIAN
	SY
SHEET 1 OF 6	29
SHEET 2 OF 6	49
SHEET 3 OF 6	39
SHEET 4 OF 6	39
SHEET 5 OF 6	29
SHEET 6 OF 6	39
PROJECT TOTALS	224

SUMMARY OF ILLUMINATION ITEMS CSJ 0002-02-062																
	110	416	610	610	610	618	618	620	620	624	624	628	6027	6027	6084	6163
	6003	6029	6009	6161	6216	6023	6024	6008	6010	6002	6028	6002	6003	6008	6001	6002
LOCATION	EXCAVATION (SPECIAL)	DRILL SHAFT (RDWY ILL POLE) (30 IN)	REMOVE RD IL ASM (TRANS-BASE)	IN RD IL (TY SA) 30T-4-4 (250W EQ) LED	IN RD IL (TY SA) 40T-10 (250W EQ) LED	CONDT (PVC) (SCH 40) (2")	CONDT (PVC) (SCH 40) (2") (BORE)	ELEC CONDR (NO.8) INSULATED	ELEC CONDR (NO.6) INSULATED	GROUND BOX TY A (122311)W/A PRON	REMOVE GROUND BOX	REMOVE ELECTRICAL SERVICES	CONDUIT (PREPARE)	GROUND BOX (PREPARE)	MODIFY EXISTING ELECTRICAL SERVICE	REMOVE EXISTING CABLES (POWER)
	CY	LF	EA	EA	EA	LF	LF	LF	LF	EA	EA	EA	LF	EA	EA	LF
SHEET 1 OF 6	0.15	72	-	5	4	1265	665	6240		3	-	-	120	3	1	0
SHEET 2 OF 6	0.15	88	6	10	1	370	1325	5440		3	2	-	10	1	1	1282
SHEET 3 OF 6	0.15	88	2	10	1	355	1780	5340	2325	6	4	1	320	-	-	1268
SHEET 4 OF 6	0.15	96	2	9	3	900	1450		7725	5	1	1	140	-	-	387
SHEET 5 OF 6	0.15	80	4	10	-	10	2360		9085	6	2	-	505	-	1	1963
SHEET 6 OF 6	0.15	88	2	11	-	-	1965		6960	4	3	1	161	1	-	1066
PROJECT TOTALS	0.9	512	16	55	9	2900	9545	17020	26095	27	12	3	1256	5	3	5966

Texas Department of Transportation

SH 20

QUANTITY SUMMARY

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		10

DATE: 10/27/2023 2:07:04 PM
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	SUMMARY OF PAVEMENT MARKING ITEMS CSJ 0002-02-059														
	666	666	666	666	666	666	666	666	666	666	666	666	666	666	666
	6029	6035	6047	6053	6077	6155	6171	6174	6176	6178	6182	6184	6192	6208	6210
LOCATION	REFL PAV MRK TY I (W)8"(DOT)(090MIL)	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	REFL PAV MRK TY I (W)24"(SLD)(090MIL)	REFL PAV MRK TY I (W)(ARROW)(090MIL)	REFL PAV MRK TY I (W)(WORD)(090MIL)	REFL PAV MRK TY I(Y)(MED NOSE)(090MIL)	REFL PAV MRK TY II (W) 6" (BRK)	REFL PAV MRK TY II (W) 6" (SLD)	REFL PAV MRK TY II (W) 8" (DOT)	REFL PAV MRK TY II (W) 8" (SLD)	REFL PAV MRK TY II (W) 24" (SLD)	REFL PAV MRK TY II (W) (ARROW)	REFL PAV MRK TY II (W) (WORD)	REFL PAV MRK TY II (Y) 6" (BRK)	REFL PAV MRK TY II (Y) 6" (SLD)
	LF	LF	LF	EA	EA	EA	LF	LF	LF	LF	LF	EA	EA	LF	LF
SHEET 1 OF 11	44	400	40	3	3	3	558	1,107	44	400	40	3	3	135	788
SHEET 2 OF 11	19	478		3	3	2	509	829	19	478		3	3		860
SHEET 3 OF 11	111	336		1	1		600	2,254	111	336		1	1		
SHEET 4 OF 11		169		2	2	4	600	2,232		169		2	2		
SHEET 5 OF 11	59	236		2	2	4	600	2,343	59	236		2	2		
SHEET 6 OF 11						1	600	2,247							
SHEET 7 OF 11	50	281		2	2	3	600	2,266	50	281		2	2		
SHEET 8 OF 11	33	206		2	2	4	600	2,246	33	206		2	2		
SHEET 9 OF 11	43	171		2	2	4	600	2,272	43	171		2	2		
SHEET 10 OF 11	21	115		1	1	1	600	2,325	21	115		1	1		
SHEET 11 OF 11						2	400	1,600							
PROJECT TOTALS	380	2,392	40	18	18	28	6,267	21,721	380	2,392	40	18	18	135	1,648

	SUMMARY OF PAVEMENT MARKING ITEMS CSJ 0002-02-059 CONT'D																		
	666	666	666	666	666	666	672	672	677	677	677	677	677	678	678	678	678	678	678
	6217	6285	6305	6318	6320	6440	6009	6010	6001	6003	6007	6008	6012	6002	6004	6008	6009	6016	6024
LOCATION	REFL PAV MRK TY II (Y) (MED NOSE)	REF PROF PAV MRK TY I(W)6"(SLD)(090MIL)	RE PM W/RET REQ TY I (W)6"(BRK)(090MIL)	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	RE PM W/RET REQ TY I (Y)6"(SLD)(090MIL)	REFL PAV MRK TY II (Y)(CURB)	REFL PAV MRKR TY II-A-A	REFL PAV MRKR TY II-C-R	ELIM EXT PAV MRK & MRKS (4")	ELIM EXT PAV MRK & MRKS (8")	ELIM EXT PAV MRK & MRKS (24")	ELIM EXT PAV MRK & MRKS (ARROW)	ELIM EXT PAV MRK & MRKS (WORD)	PAV SURF PREP FOR MRK (6")	PAV SURF PREP FOR MRK (8")	PAV SURF PREP FOR MRK (24")	PAV SURF PREP FOR MRK (ARROW)	PAV SURF PREP FOR MRK (WORD)	PAV SURF PREP FOR MRK (MED NOSE)
	EA	LF	LF	LF	LF	LF	EA	EA	LF	LF	LF	EA	EA	LF	LF	LF	EA	EA	EA
SHEET 1 OF 11	3	1,107	558	135	788	90	56	40	3151		35	2	2	2,588	444	40	3	3	3
SHEET 2 OF 11	2	829	509		860	25		50	4372	476		2	2	2,488	497		3	3	2
SHEET 3 OF 11		2,254	600			405		60	5874	100		1		2,854	447		1	1	
SHEET 4 OF 11	4	2,232	600					60	5803					2,832	169		2	2	4
SHEET 5 OF 11	4	2,343	600			120		60	5933					2,943	295		2	2	4
SHEET 6 OF 11	1	2,247	600					60	5910					2,847					1
SHEET 7 OF 11	3	2,266	600			155		60	5943					2,866	331		2	2	3
SHEET 8 OF 11	4	2,246	600			75		60	5758					2,846	239		2	2	4
SHEET 9 OF 11	4	2,272	600			45		60	5865					2,872	214		2	2	4
SHEET 10 OF 11	1	2,325	600			50		60	5875					2,925	136		2	2	4
SHEET 11 OF 11	2	1,600	400					60	3965					2,000					2
PROJECT TOTALS	28	21,721	6,267	135	1,648	965	56	630	58,449	576	35	5	4	30,061	2,772	40	19	19	31

SUMMARY OF SIGNING ITEMS		
	644	644
	6001	6076
LOCATION	IN SM RD SN SUP&AM TY10BWG(1) SA(P)	REMOVE SM RD SN SUP&AM
	EA	EA
SHEET 1 OF 11	2	1
SHEET 2 OF 11		
SHEET 3 OF 11	1	
SHEET 4 OF 11	1	
SHEET 5 OF 11	1	
SHEET 6 OF 11	1	
SHEET 7 OF 11		
SHEET 8 OF 11	1	
SHEET 9 OF 11		
SHEET 10 OF 11		
SHEET 11 OF 11	1	
PROJECT TOTALS	8	1

Texas Department of Transportation

SH 20

QUANTITY SUMMARY

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		11

DATE: 10/27/2023 2:07:16 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT5/Documents/24 - ELP/Design Projects/0002202059/4 - Design/Plan Set/1 General/SH20_QTY_SUM_02.dgn

CK DW CK DW

DATE:
FILE:

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1. CITY OF SOCORRO

2. TEXAS DEPARTMENT OF TRANSPORTATION

☐ No Action Required ☒ Required Action

Action No.

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

2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.

3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.

4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☒ No Permit Required

☐ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)

☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)

☐ Individual 404 Permit Required

☐ Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1.

2.

3.

4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
☐ Temporary Vegetation	☐ Silt Fence	☐ Vegetative Filter Strips
☐ Blankets/Matting	☐ Rock Berm	☐ Retention/Irrigation Systems
☐ Mulch	☐ Triangular Filter Dike	☐ Extended Detention Basin
☐ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost
☐ Erosion Control Compost	☐ Erosion Control Compost	☐ Mulch Filter Berm and Socks
☐ Mulch Filter Berm and Socks	☐ Mulch Filter Berm and Socks	☐ Compost Filter Berm and Socks
☐ Compost Filter Berm and Socks	☐ Compost Filter Berm and Socks	☐ Vegetation Lined Ditches
	☐ Stone Outlet Sediment Traps	☐ Sand Filter Systems
	☐ Sediment Basins	☐ Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

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

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

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

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

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

Contact the Engineer if any of the following are detected:

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

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

☐ Yes ☒ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

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

☐ Yes ☐ No

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

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

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

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

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

VII. OTHER ENVIRONMENTAL ISSUES

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

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

Texas Department of Transportation

Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR		
©TxDOT: February 2015	CONT	SECT	JOB		HIGHWAY	
REVISIONS 12-12-2011 (DS)	0002	02	059, ETC.		SH 20	
05-07-14 ADDED NOTE SECTION IV. 01-23-2015 SECTION 1 (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	DIST	COUNTY			SHEET NO.	
	ELP	EL PASO			12	

CK
DW
CK
DW

GENERAL NOTES:

1. HANDLE TRAFFIC APPROPRIATELY THROUGHOUT THE PROJECT DURING CONSTRUCTION. PROVIDE FOR THE SAFETY OF THE TRAVELING PUBLIC AT ALL TIMES. ROADWAY CLOSURES ARE NOT ALLOWED UNLESS OTHERWISE SPECIFIED IN THE PLANS OR AS APPROVED BY THE ENGINEER. PROVIDE ACCESS TO PROPERTIES AND BUSINESSES ADJACENT TO THE RIGHT-OF-WAY (ROW) AT ALL TIMES FOR THE DURATION OF THE PROJECT. THE ADEQUACY OF THE PROPERTY ACCESS WILL BE DETERMINED BY THE TXDOT ENGINEER OR REPRESENTATIVE. CONSTRUCTION EQUIPMENT AND MATERIALS SHALL NOT BE LEFT IN POSITION THAT WILL ENDANGER THE TRAVELING PUBLIC AT THE END OF EACH WORKDAY. MAINTAIN ADEQUATE SAFETY PROVISIONS THROUGHOUT THE PROJECT BY INCLUSION OF SIGNING, PAVEMENT MARKINGS, BARRIERS AND BARRICADES. CONFORM TO THE LATEST EDITION OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD) WHEN USING THESE PROVISIONS.

B. THE USE OF THE ROW IS NOT EXCLUSIVE. COOPERATE WITH THE CITY, THE VARIOUS UTILITY COMPANIES, AND THEIR CONTRACTORS AS REQUIRED TO ALLOW ADJUSTMENTS TO BE MADE BY OTHERS. IF BY VIRTUE OF THE ADJUSTMENT OF THESE UTILITIES THE CONTRACTOR IS DELAYED, AN EXTENSION OF THE WORKING TIME MAY BE GRANTED; IF THE OPINION OF THE ENGINEER IS WARRANTED.

C. THE CONTRACTOR MAY PROPOSE OR RECOMMEND MODIFICATIONS TO THE SEQUENCE OF WORK FOR THE CONSIDERATION IN WRITING TO THE ENGINEER. PROPOSED RECOMMENDATIONS ARE TO INCLUDE ANY CHANGES TO THE VARIOUS PAY ITEMS, IMPACT TO TRAFFIC, THE EFFECT OF THE OVERALL PROJECT IN TIME, AND EASE OF CONSTRUCTION. WRITTEN APPROVAL FROM THE ENGINEER IS REQUIRED PRIOR TO PROCEEDING WITH ANY CONSTRUCTION OPERATION BASED ON A REVISED PHASE/SEQUENCE OF WORK.

D. OFF-DUTY POLICE OFFICERS MAY BE HIRED TO SUPPLEMENT THE WORK FORCE TO CONTROL TRAFFIC AT INTERSECTIONS AND ALONG THE ROADWAY DURING LANE CLOSURES AND ANY OTHER CRITICAL PHASES OF TRAFFIC HANDLING AS DETERMINED BY THE ENGINEER.

E. THE ENGINEER MAY DIRECT THE CONTRACTOR TO VARY THE NUMBER AND LOCATION OF SIGNS AND BARRICADES FROM WHAT IS INDICATED ON THE PLANS.

F. CONTRACTOR WORK ACTIVITIES WILL BE LIMITED TO THE ALLOWED LANE CLOSURE TIMES DEFINED AS DAYTIME HOURS OF 9:00 AM TO 4:00 PM MONDAY THROUGH FRIDAY OR NIGHTTIME HOURS OF 9:00 PM TO 6:00 AM SUNDAY THROUGH THURSDAY, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

G. MAINTAIN POSITIVE DRAINAGE DURING CONSTRUCTION, INCLUDING OFFSITE DRAINAGE FROM ADJACENT PROPERTIES AND AVOID IMPENDING FLOW FROM PRIVATE PROPERTY.

H. PLACE CONSTRUCTIONS EXITS AS NEEDED OR AS DIRECTED BY THE ENGINEER.

I. COORDINATE WITH TXDOT SIGNAL SHOP PRIOR TO DISPOSAL OF REMOVED ILLUMINATION POLES.

J. ALL LANES WILL BE OPENED TO TRAFFIC AT THE END OF EACH WORKING DAY, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

K. CONTRACTOR SHALL ONLY CLOSE LEFT TURN LANES AND RESTRICT LEFT TURNS MOVEMENTS AT ONE INTERSECTION AT A TIME, AND ONLY WHEN WORK IS BEING DONE WITHIN THE LEFT TURN BAY. LEFT TURN LANES AND MOVEMENTS SHALL BE OPEN AND ALLOWED AT ADJACENT INTERSECTIONS, TO ALLOW TRAFFIC TO DO A LEFT TURN OR U-TURN AS A DETOUR FROM THE CLOSED LEFT TURN.

L. CONTRACTOR SHALL NOT WORK ON THE SHOULDER AND LEFT TURN LANES CONSECUTIVELY IN THE PHASE OF WORK.

M. CONTRACTOR SHALL COORDINATE WITH TXDOT FOR BUS STOP IMPACTED ALONG THE WORKZONE.

N. CONTRACTOR SHALL COORDINATE THE WORK NEAR "TEMPLO EBEN-ZER" AND AVOID WORK DURING SERVICES.

SEQUENCE OF CONSTRUCTION :

THE PROJECT IS TO BE SPLIT INTO FOUR (4) SEPARATE WORK PHASES; EACH REQUIRING SEPARATE ADVANCE WARNING SIGN SET-UPS. THE CONTRACTOR SHALL NOT WORK ON TWO (2) ADJACENT PHASES, UNLESS DIRECTED BY THE ENGINEER.
PROJECT PHASING LIST - PHASE 1 HAS 1 STEP, PHASE 2-4 HAVE 2 STEPS:

- PHASE 1: RIO VISTA RD TO HORIZON BLVD
- PHASE 2: HORIZON BLVD TO ODEN DR
- PHASE 3: ODEN DR TO BOVEE RD
- PHASE 4: BOVEE RD TO PASSMORE RD

INSTALL ALL ADVANCE WARNING SIGNS APPLICABLE TO EACH WORK SEGMENT PRIOR TO BEGINNING ANY WORK.

PHASE 1 - FROM RIO VISTA RD TO HORIZON BLVD

PHASE 1 - STEP 1

1. INSTALL LANE CLOSURE SIGNING AND DEVICES ON BOTH ENDS OF THIS PHASE FOR MEDIAN WORK.
2. REMOVE STRIPING AND RPMs OF TWLTL PRIOR TO CONSTRUCTION OF PROPOSED MEDIANS.
3. CONSTRUCT MEDIANS. THE WORK ZONE SHALL BE SET FOR TWO LANES OF TRAFFIC IN BOTH DIRECTIONS AND ONLY ONE LANE SHALL BE OPEN TO TRAFFIC DURING THE MEDIAN CONSTRUCTION WORK. ALL EQUIPMENT AND MATERIALS SHALL BE REMOVED FROM WORK ZONE AND BOTH LANES OPEN TO TRAFFIC AT THE END OF EACH WORKDAY.
4. INSTALL ILLUMINATION. REFER TO ILLUMINATION PLANS FOR POWER SOURCE LOCATION.
5. REMOVE LANE CLOSURE SIGNING AND DEVICES.
6. ELIMINATE EXISTING PAVEMENT MARKINGS. REFER TO TCP SELECTION TABLE FOR SELECTION OF STANDARDS.
7. INSTALL PERMANENT PAVEMENT MARKINGS AND SIGNING. REFER TO TCP SELECTION TABLE FOR SELECTION OF STANDARDS.
8. ACTIVATE ILLUMINATION THROUGHOUT LIMITS OF PHASE 1 - STEP 1.

PHASE 2 - FROM HORIZON BLVD TO ODEN DR

PHASE 2 - STEP 1

1. INSTALL LANE CLOSURE SIGNING AND DEVICES ON BOTH ENDS OF THIS PHASE FOR MEDIAN WORK.
2. REMOVE STRIPING AND RPMs OF TWLTL PRIOR TO CONSTRUCTION OF PROPOSED MEDIANS.
3. CONSTRUCT MEDIANS. THE WORK ZONE SHALL BE SET FOR TWO LANES OF TRAFFIC IN BOTH DIRECTIONS AND ONLY ONE LANE SHALL BE OPEN TO TRAFFIC DURING THE MEDIAN CONSTRUCTION WORK. ALL EQUIPMENT AND MATERIALS SHALL BE REMOVED FROM WORK ZONE AND BOTH LANES OPEN TO TRAFFIC AT THE END OF EACH WORKDAY.
4. INSTALL PROPOSED ILLUMINATION. REFER TO ILLUMINATION PLANS FOR POWER SOURCE LOCATION.
5. REMOVE LANE CLOSURE SIGNING AND DEVICES.
6. ELIMINATE EXISTING PAVEMENT MARKINGS. REFER TO TCP SELECTION TABLE FOR SELECTION OF STANDARDS.
7. INSTALL PERMANENT PAVEMENT MARKINGS AND SIGNING. REFER TO TCP SELECTION TABLE FOR SELECTION OF STANDARDS.
8. ACTIVATE ILLUMINATION THROUGHOUT LIMITS OF PHASE 2 - STEP 1.

PHASE 2 - STEP 2

1. REMOVE ANY CONFLICTING SIGNING.
2. MAKE REPAIRS TO EXISTING DRIVEWAYS OR ANY MISCELLANEOUS AREAS DAMAGED DURING THE ILLUMINATION POLE REMOVAL. SUBSIDIARY TO REMOVAL ITEMS.

PHASE 3 - FROM ODEN DR TO BOVEE RD

PHASE 3 - STEP 1

1. INSTALL LANE CLOSURE SIGNING AND DEVICES ON BOTH ENDS OF THIS PHASE FOR MEDIAN WORK.
2. REMOVE STRIPING AND RPMs OF TWLTL PRIOR TO CONSTRUCTION OF PROPOSED MEDIANS.
3. CONSTRUCT MEDIANS. THE WORK ZONE SHALL BE SET FOR TWO LANES OF TRAFFIC IN BOTH DIRECTIONS AND ONLY ONE LANE SHALL BE OPEN TO TRAFFIC DURING THE MEDIAN CONSTRUCTION WORK. ALL EQUIPMENT AND MATERIALS SHALL BE REMOVED FROM WORK ZONE AND BOTH LANES OPEN TO TRAFFIC AT THE END OF EACH WORKDAY.
4. INSTALL ILLUMINATION. REFER TO ILLUMINATION PLANS FOR POWER SOURCE LOCATION.
5. REMOVE LANE CLOSURE SIGNING AND DEVICES.
6. ELIMINATE EXISTING PAVEMENT MARKINGS. REFER TO TCP SELECTION TABLE FOR SELECTION OF STANDARDS.
7. INSTALL PERMANENT PAVEMENT MARKINGS AND SIGNING. REFER TO TCP SELECTION TABLE FOR SELECTION OF STANDARDS.

PHASE 3 - STEP 2

1. REMOVE ANY CONFLICTING SIGNING.

PHASE 4 - FROM BOVEE DR TO PASSMORE RD

PHASE 4 - STEP 1

1. INSTALL LANE CLOSURE SIGNING AND DEVICES ON BOTH ENDS OF THIS PHASE FOR MEDIAN WORK.
2. REMOVE STRIPING AND RPMs OF TWLTL PRIOR TO CONSTRUCTION OF PROPOSED MEDIANS.
3. CONSTRUCT MEDIANS. THE WORK ZONE SHALL BE SET FOR TWO LANES OF TRAFFIC IN BOTH DIRECTIONS AND ONLY ONE LANE SHALL BE OPEN TO TRAFFIC DURING THE MEDIAN CONSTRUCTION WORK. ALL EQUIPMENT AND MATERIALS SHALL BE REMOVED FROM WORK ZONE AND BOTH LANES OPEN TO TRAFFIC AT THE END OF EACH WORKDAY.
4. INSTALL ILLUMINATION. REFER TO ILLUMINATION PLANS FOR POWER SOURCE LOCATION.
5. REMOVE LANE CLOSURE SIGNING AND DEVICES.
6. ELIMINATE EXISTING PAVEMENT MARKINGS. REFER TO TCP SELECTION TABLE FOR SELECTION OF STANDARDS.
7. INSTALL PERMANENT PAVEMENT MARKINGS AND SIGNING. REFER TO TCP SELECTION TABLE FOR SELECTION OF STANDARDS.
8. ACTIVATE ILLUMINATION THROUGHOUT LIMITS OF PHASE 3 - STEP 1 AND PHASE 4 - STEP 1.

PHASE 4 - STEP 2

1. REMOVE EXISTING ILLUMINATION ON BOTH SIDES OR ROADWAY ONCE PROPOSED ILLUMINATION HAS BEEN ACTIVATED ON ALL PHASES. USE STANDARD (2-1c)-18.
2. REMOVE ANY CONFLICTING SIGNING.
3. MAKE REPAIRS TO EXISTING DRIVEWAYS OR ANY MISCELLANEOUS AREAS DAMAGED DURING THE ILLUMINATION POLE REMOVAL. SUBSIDIARY TO REMOVAL ITEMS.

TCP SELECTION TABLE

PHASES	ROADWAY	LIMITS	TYPE OF WORK	SHEET
1	SH 20	FROM RIO VISTA RD TO HORIZON BLVD	INSTALLATION OF RAISED MEDIANS	TCP (2-4a)-18
			INSTALLATION OF ILLUMINATION	TCP (2-4a)-18
			EDGELINE, BROKEN, AND CENTERLINE STRIPING	TCP(3-1)-13 THRU TCP(3-4)-13
			RAISED PAVEMENT MARKER INSTALLATION/REMOVAL	TCP(3-3)-14
2	SH 20	FROM HORIZON BLVD TO ODEN DR	INSTALLATION OF RAISED MEDIANS	TCP (2-4a)-18
			INSTALLATION/REMOVAL OF ILLUMINATION	TCP (2-1c)-18 AND TCP (2-4a)-18
			EDGELINE, BROKEN, AND CENTERLINE STRIPING	TCP(3-1)-13 THRU TCP(3-4)-13
			RAISED PAVEMENT MARKER INSTALLATION/REMOVAL	TCP(3-3)-14
3	SH 20	FROM ODEN DR TO BOVEE RD	INSTALLATION OF RAISED MEDIANS	TCP (2-4a)-18
			INSTALLATION/REMOVAL OF ILLUMINATION	TCP (2-1c)-18 AND TCP (2-4a)-18
			EDGELINE, BROKEN, AND CENTERLINE STRIPING	TCP(3-1)-13 THRU TCP(3-4)-13
			RAISED PAVEMENT MARKER INSTALLATION/REMOVAL	TCP(3-3)-14
4	SH 20	FROM BOVEE RD TO PASSMORE RD	INSTALLATION OF RAISED MEDIANS	TCP (2-4a)-18
			INSTALLATION/REMOVAL OF ILLUMINATION	TCP (2-1c)-18 AND TCP (2-4a)-18
			EDGELINE, BROKEN, AND CENTERLINE STRIPING	TCP(3-1)-13 THRU TCP(3-4)-13
			RAISED PAVEMENT MARKER INSTALLATION/REMOVAL	TCP(3-3)-14

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SH 20

TCP NARRATIVE

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		13

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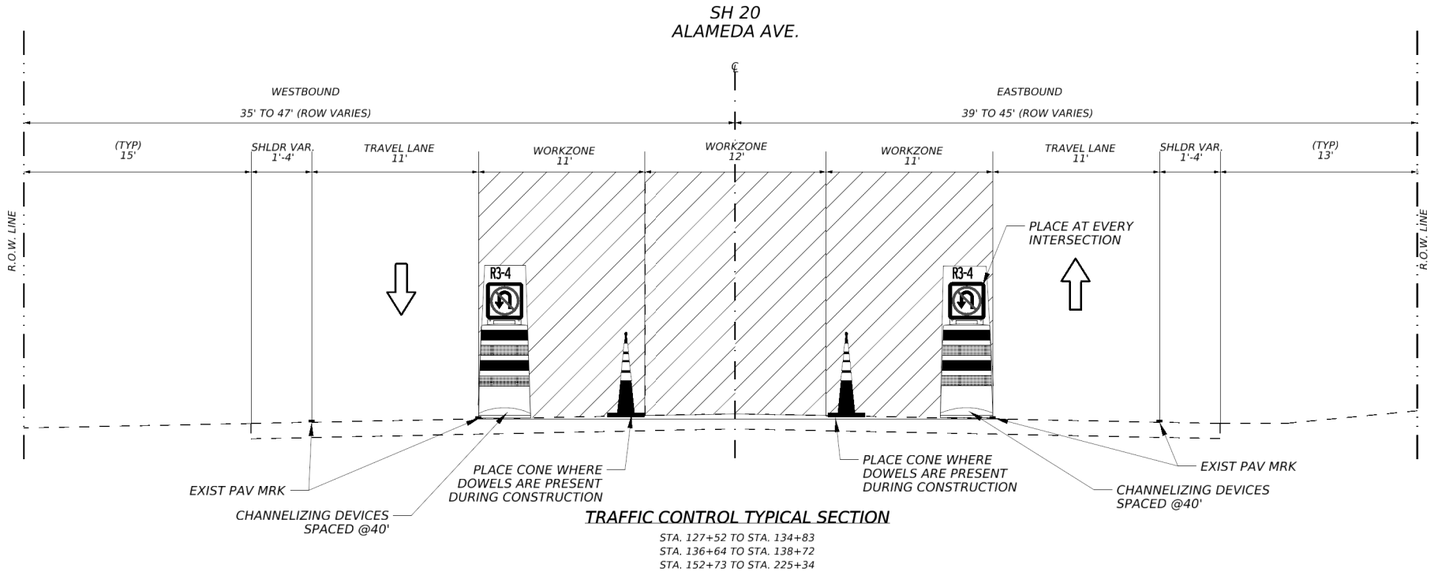
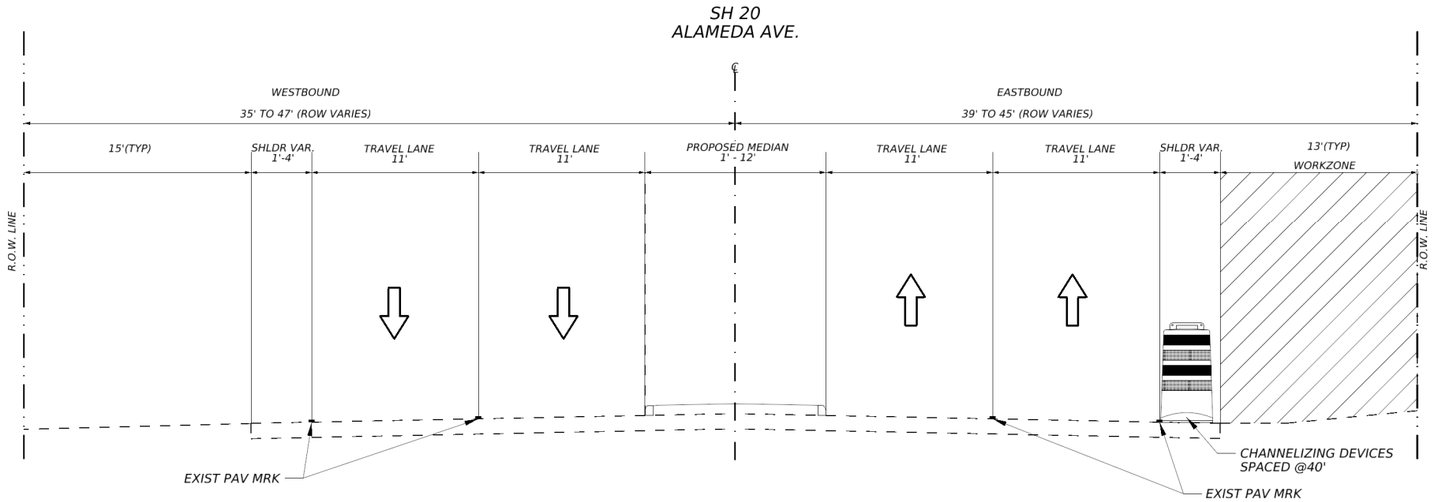


TRAFFIC CONTROL TYPICAL SECTION

STA. 127+52 TO STA. 134+83
STA. 136+64 TO STA. 138+72
STA. 152+73 TO STA. 225+34

LEGEND

- TRAFFIC FLOW DURING CONSTRUCTION HOURS
- WORKZONE
- CHANNELIZING DEVICE
- ROW
- CONES



TRAFFIC CONTROL TYPICAL SECTION

STA. 136+64 TO STA. 138+72
STA. 159+59 TO STA. 165+60
STA. 175+66 TO STA. 181+86
STA. 196+45 TO STA. 206+31
STA. 215+18 TO STA. 231+50
STA. 233+81 TO STA. 235+35
STA. 243+02 TO STA. 244+72
STA. 245+60 TO STA. 248+00
STA. 253+65 TO STA. 255+23

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SH 20

TCP TYPICAL SECTIONS

SHEET 1 OF 3

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		14

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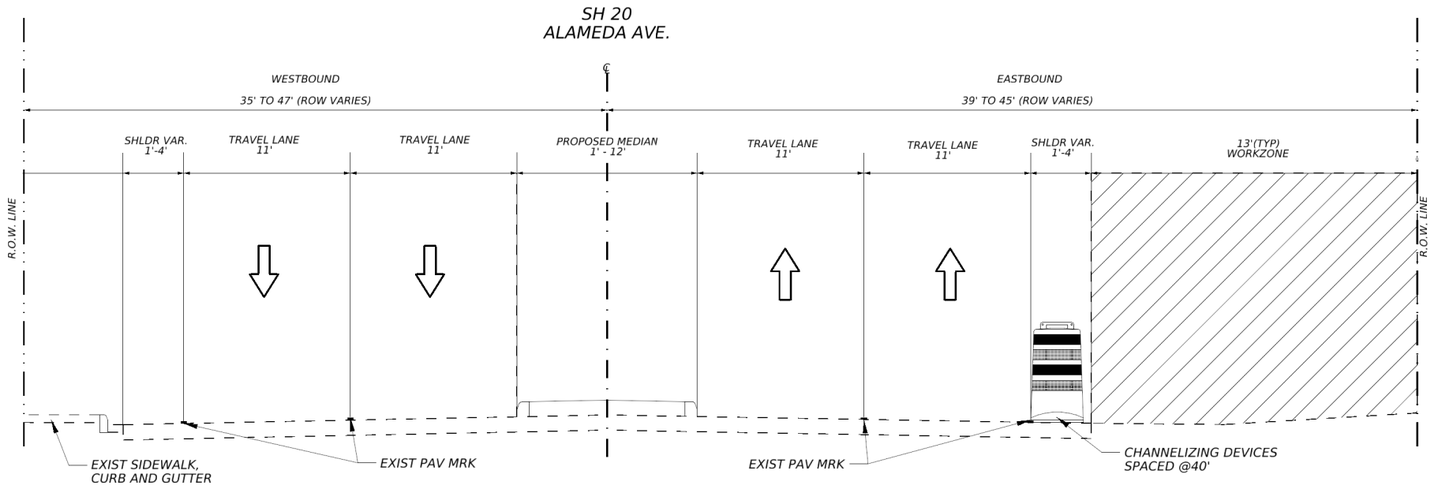
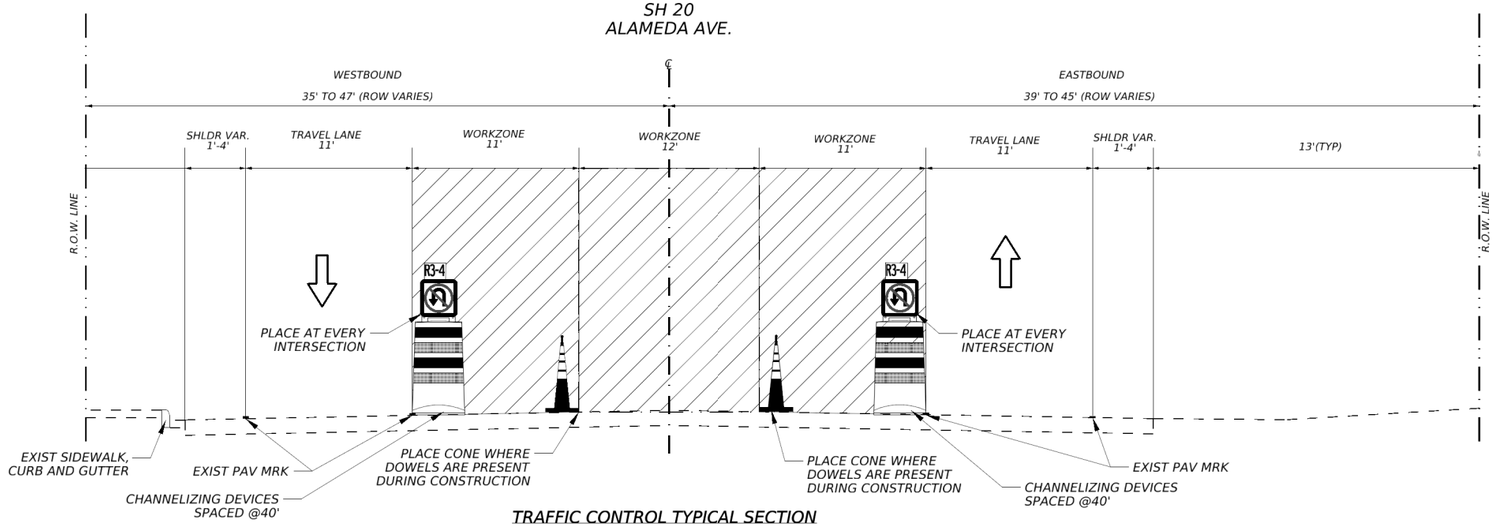


TRAFFIC CONTROL TYPICAL SECTION

STA. 134+10 TO STA. 136+64
STA. 138+72 TO STA. 152+73



TRAFFIC CONTROL TYPICAL SECTION

STA. 134+10 TO STA. 136+64
STA. 138.72 TO STA. 152+73

LEGEND

- TRAFFIC FLOW DURING CONSTRUCTION HOURS
- WORKZONE
- CHANNELIZING DEVICE
- ROW
- CONES

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SH 20

TCP TYPICAL SECTIONS

SHEET 2 OF 3

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		15

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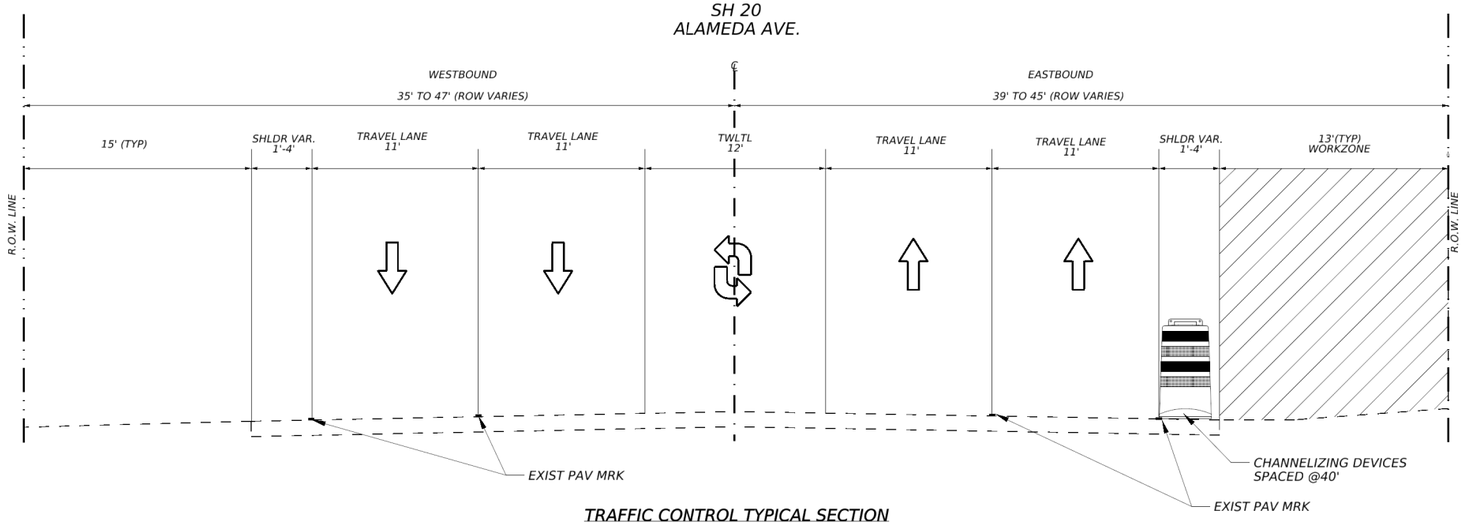
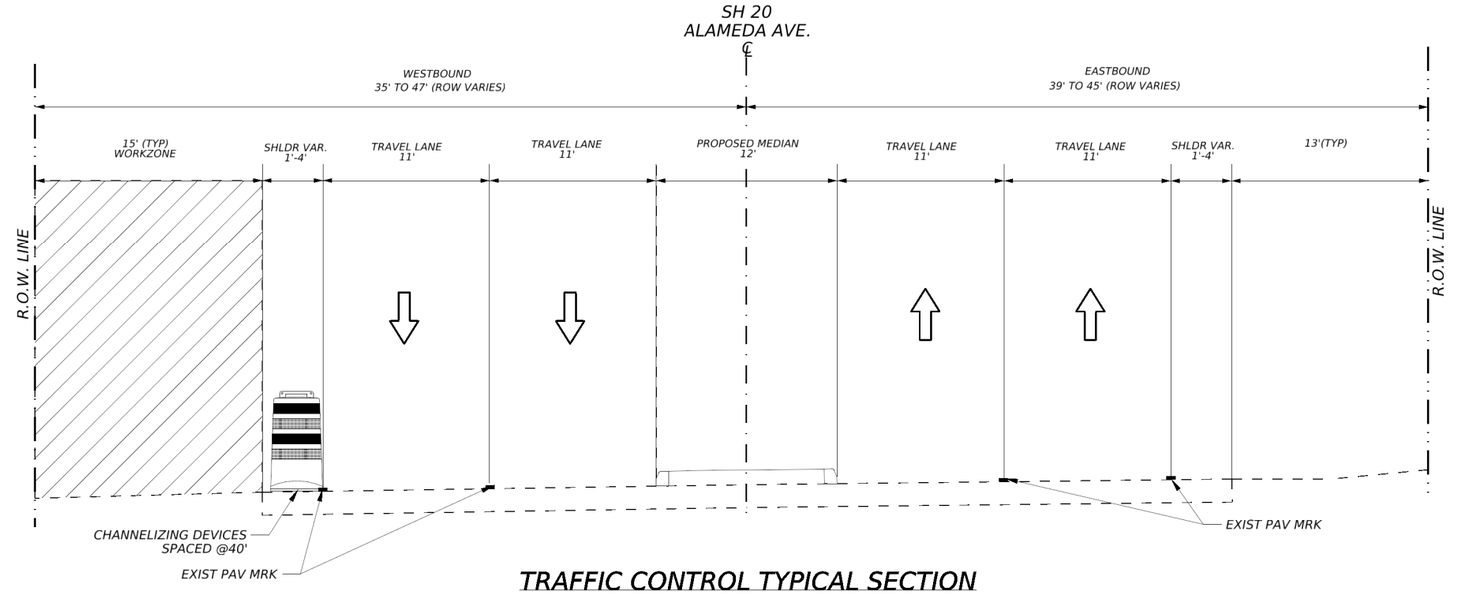


TRAFFIC CONTROL TYPICAL SECTION

STA. 127+52 TO STA. 131+83

LEGEND

- TRAFFIC FLOW DURING CONSTRUCTION HOURS
- WORKZONE
- CHANNELIZING DEVICE
- ROW
- CONES



TRAFFIC CONTROL TYPICAL SECTION

STA. 156+62 TO STA. 173+52
STA. 183+87 TO STA. 185+55
STA. 225+32 TO STA. 226+95

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SH 20

TCP TYPICAL SECTIONS

SHEET 3 OF 3

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		16

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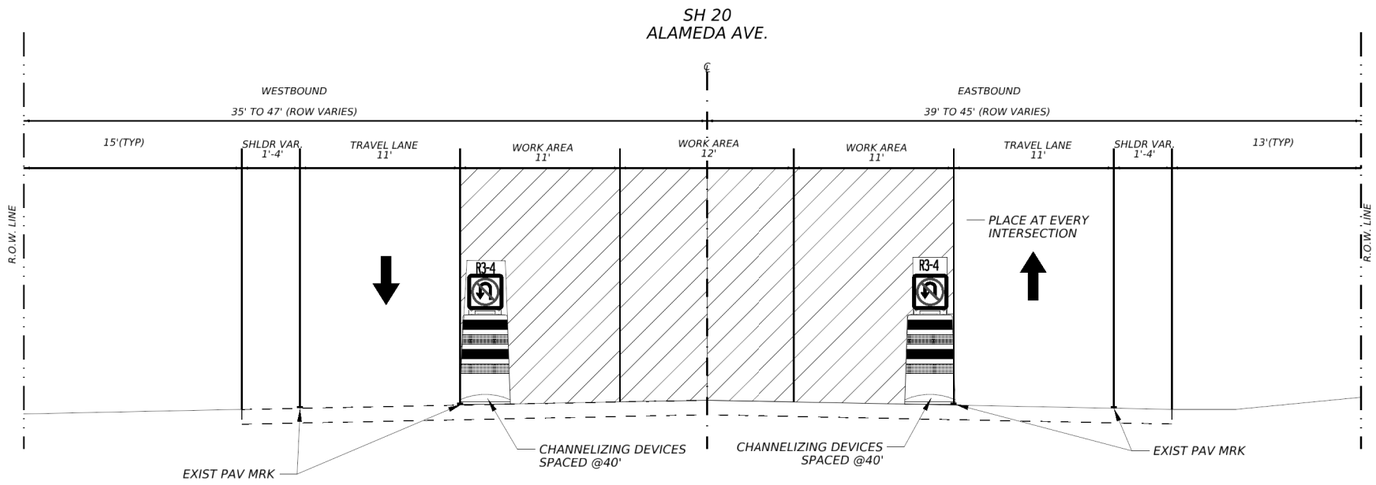
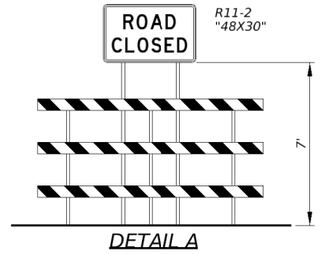
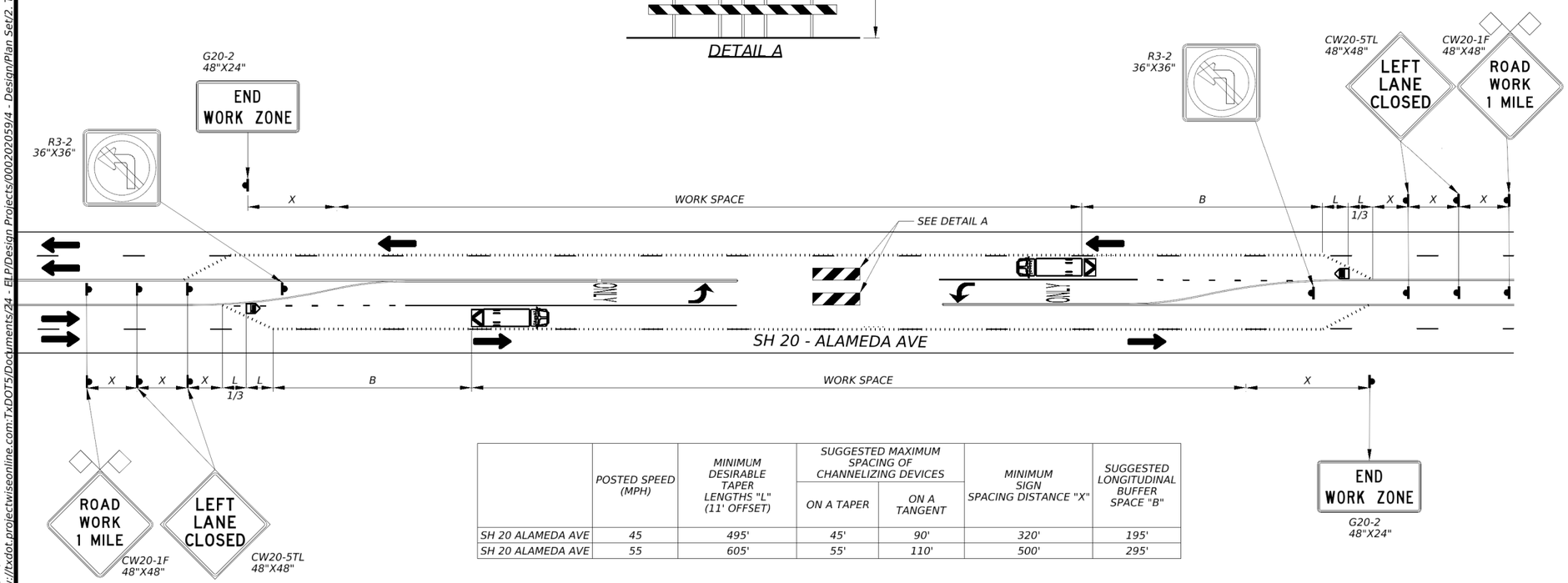


PROPOSED WORK ZONE TYPICAL SECTION

NOT TO SCALE



DETAIL A



	POSTED SPEED (MPH)	MINIMUM DESIRABLE TAPER LENGTHS "L" (11' OFFSET)	SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES		MINIMUM SIGN SPACING DISTANCE "X"	SUGGESTED LONGITUDINAL BUFFER SPACE "B"
			ON A TAPER	ON A TANGENT		
SH 20 ALAMEDA AVE	45	495'	45'	90'	320'	195'
SH 20 ALAMEDA AVE	55	605'	55'	110'	500'	295'

NOTES:

1. APPLY TRAFFIC CONTROL PLAN AS DESCRIBED IN THE TCP SELECTION TABLE FOR SH20(ALAMEDA), UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
2. COORDINATE ONGOING CONSTRUCTION PROJECTS PRIOR TO SETTING UP LANE CLOSURES AND BEGINNING WORK ON ANY ROADWAY.
3. LIMIT WORK ZONE PHASING ACCORDING TO THE TCP NARRATIVE UNDER "SEQUENCE OF CONSTRUCTION," UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
4. PERFORM WORK WITHIN TOWN OF SOCORRO LIMITS DURING NON-PEAK OR NIGHT TIME HOURS. NON-PEAK HOURS ARE DEFINED AS MONDAY-FRIDAY FROM 9 A.M.TO 4 P.M. NIGHT TIME HOURS ARE DEFINED AS SUNDAY-THURSDAY FROM 9 P.M. TO 6 A.M., UNLESS OTHERWISE DIRECTED.
5. CONTRACTOR SHALL NOT STORE ANY EQUIPMENT OR STOCKPILE ANY MATERIAL ON THE OPPOSITE DIRECTION OF THE WORK OR ON THE LANE CLOSURE.
6. NO CONSECUTIVE MEDIAN CLOSURES SHALL TAKE PLACE. CONTRACTOR SHALL CLOSE ONE MEDIAN AT A TIME.
7. TCP DETAIL SHOWN TO BE APPLIED ON MEDIAN OPENINGS ON SH20 (ALAMEDA).

LEGEND			
	TYPE 3 BARRICADE		CHANELIZING DEVICES
	HEAVY WORK VEHICLE ATTENUATER (TMA)		TRUCK MOUNTED
	TRAILER MOUNTED FLASHING ARROW BOARD		FLAG
	SIGN		TRAFFIC FLOW

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SH 20

TRAFFIC CONTROL PLAN
MEDIAN OPENING

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		17

DATE: 10/27/2023 2:08:32 PM
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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

11. Traffic control devices should be in place only while work is actually in progress or a definite need exists.

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

Texas Department of Transportation — Traffic Safety Division Standard

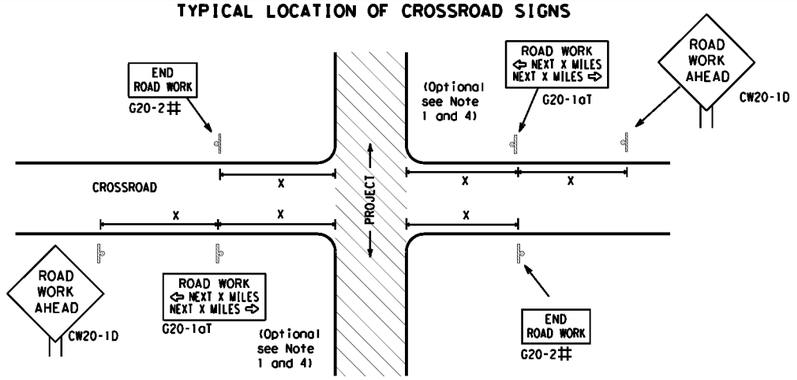
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0002	02	059,ETC.	SH 20
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	ELP	EL PASO		18
5-10 5-21				

DATE: 10/27/2023 2:08:44 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT5/Documents/24 - ELP/Design Projects/000202/5924 - Design/Plan Set/2. TCP/Standards/bc-21.dgn

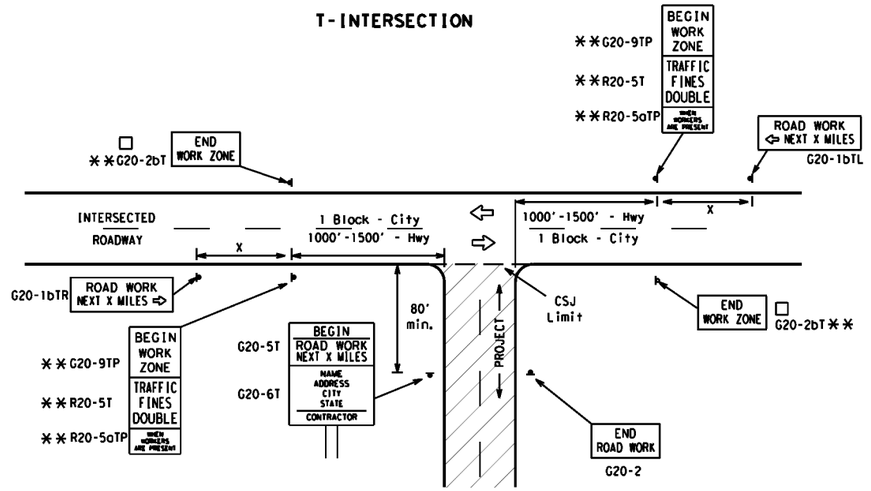
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

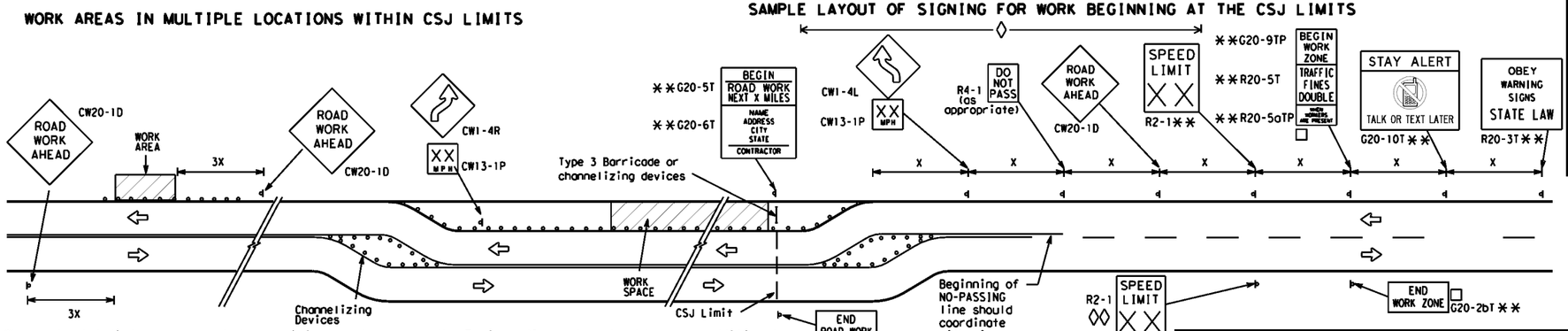
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

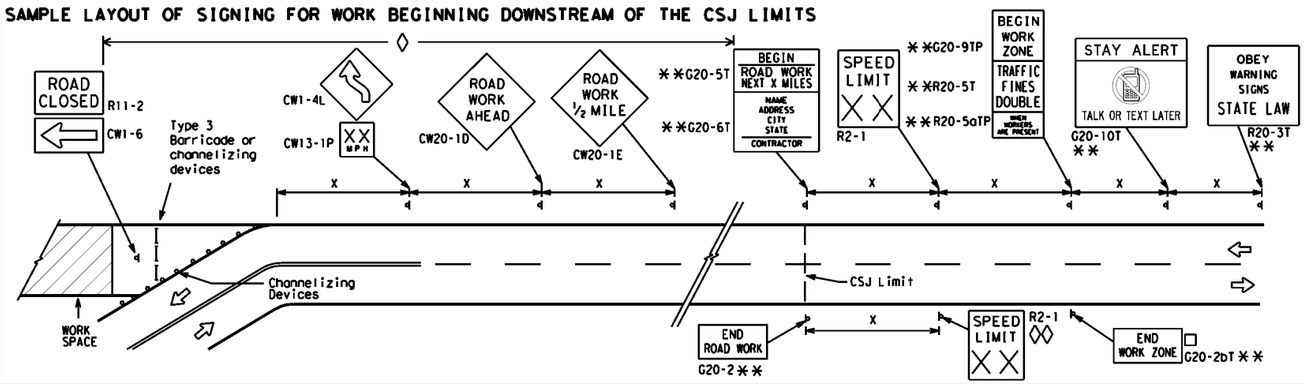
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

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



NOTES

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

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0002	02	059,ETC.	SH 20
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ELP	EL PASO		19

DATE: 10/27/2023 2:08:47 PM
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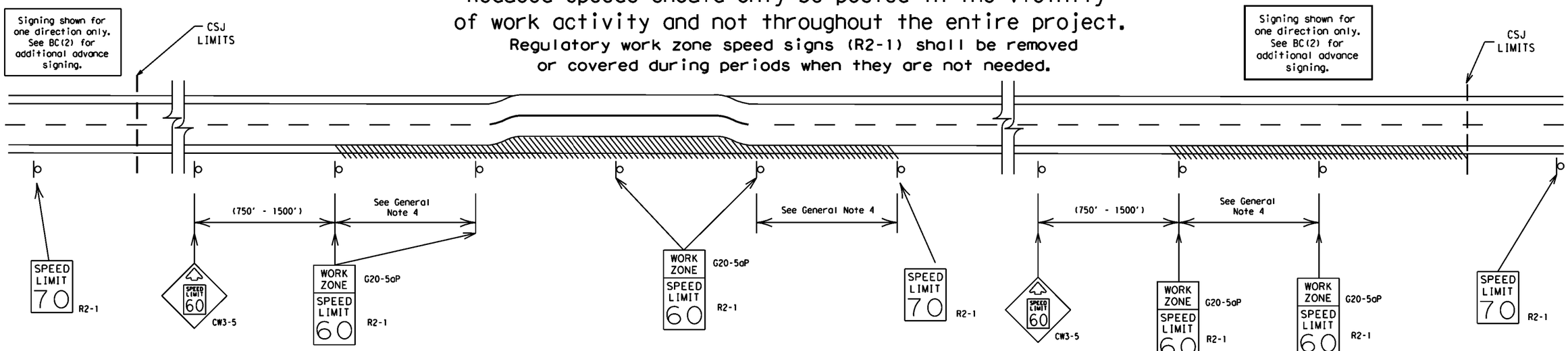
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Safety Division Standard

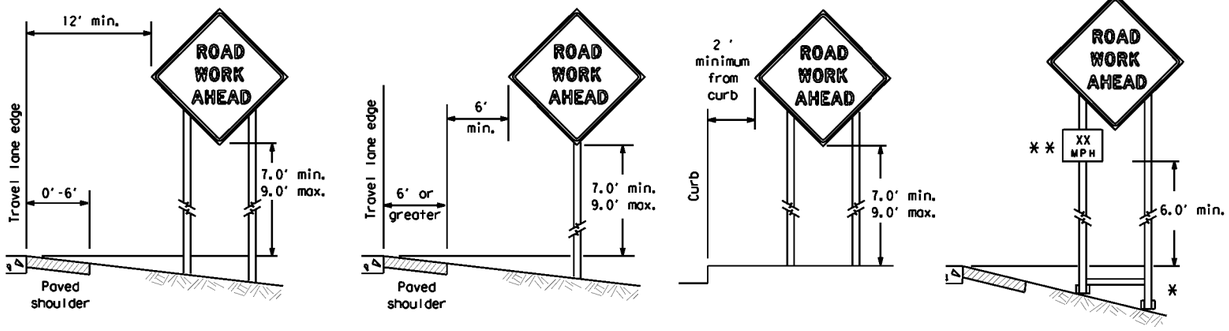
BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0002	02	059,ETC.	SH 20
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ELP	EL PASO		20

DATE: 10/27/2023 2:08:49 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT5/Documents/24 - ELP/Design Projects/000202059/4 - Design/Plan Set/2. TCP/Standards/bc-21.dgn

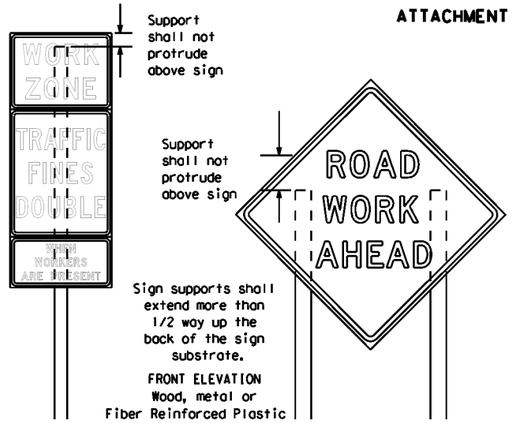
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

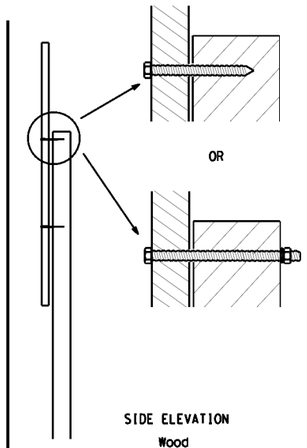


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





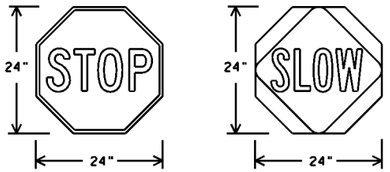
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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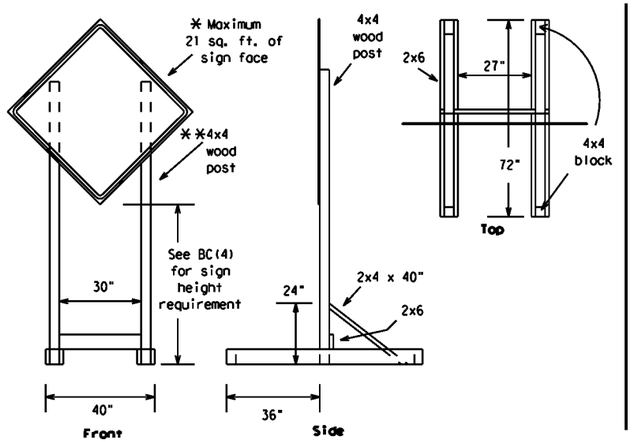
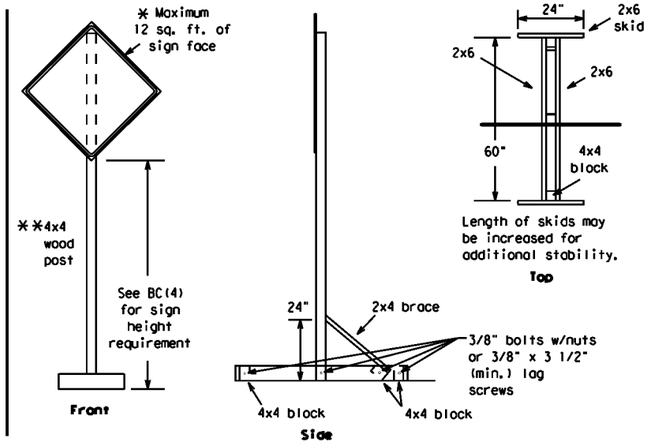
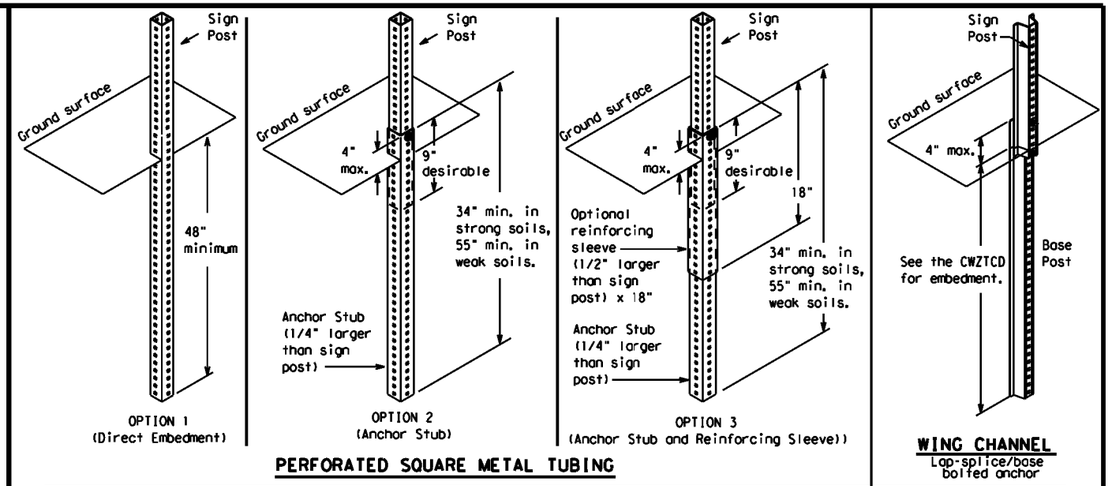




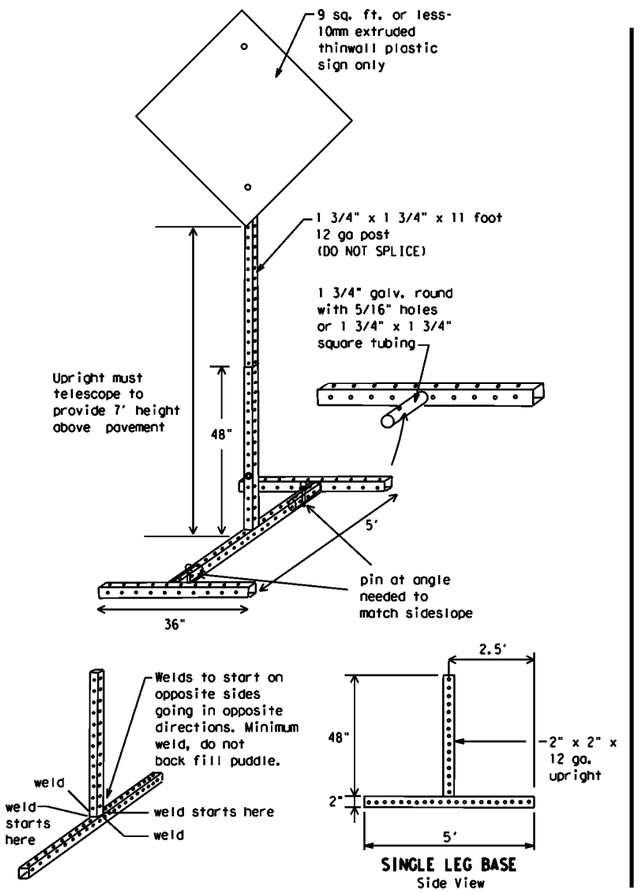
SKID MOUNTED WOOD SIGN SUPPORTS

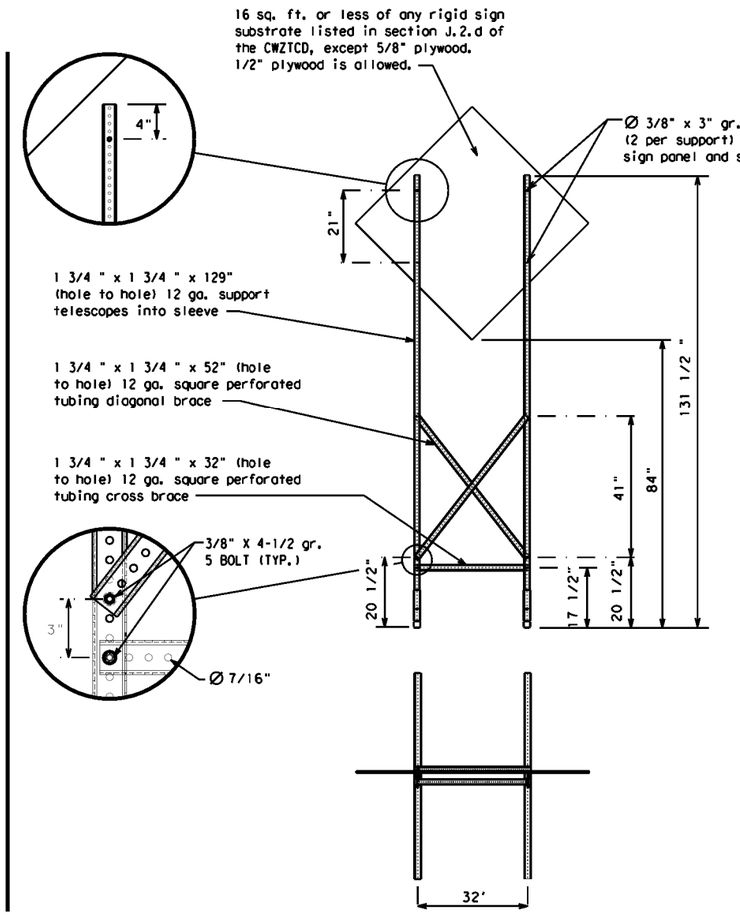
*** LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS**

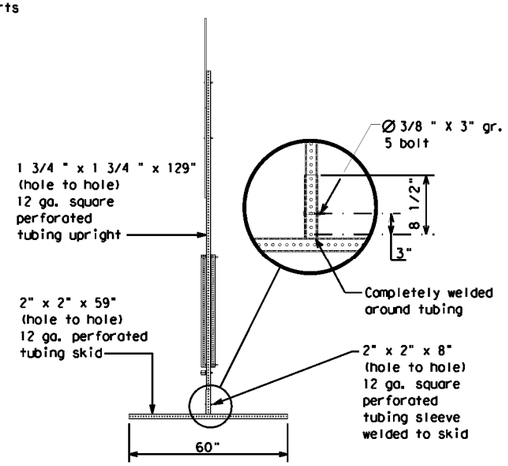


GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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9-07 8-14	DIST	COUNTY		SHEET NO.
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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

* See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0002	02	059,ETC.	SH 20
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ELP	EL PASO		23

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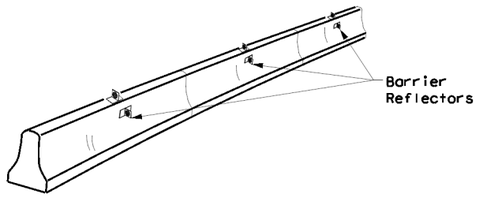
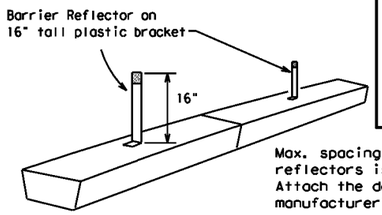
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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

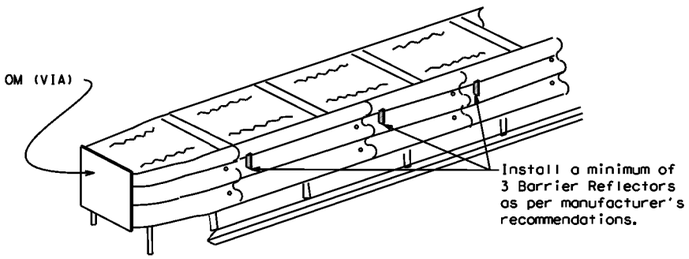


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

LOW PROFILE CONCRETE BARRIER (LPCB)

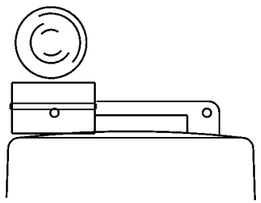


DELINEATION OF END TREATMENTS

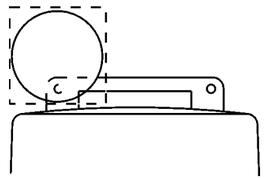
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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

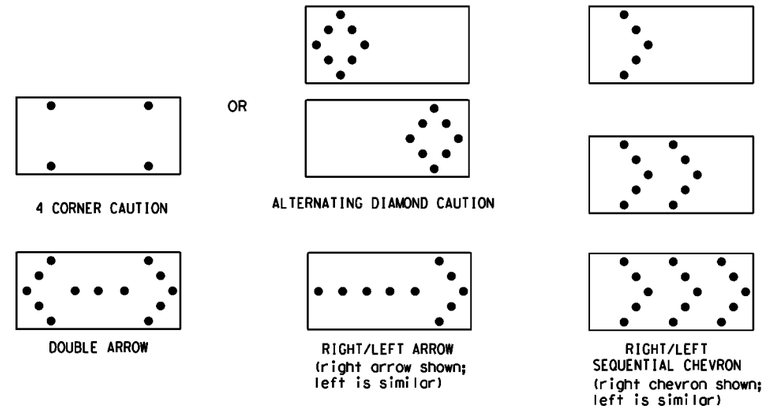
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

Texas Department of Transportation — Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0002	02	059, ETC.	SH 20
9-07 8-14	DIST	COUNTY		SHEET NO.
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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

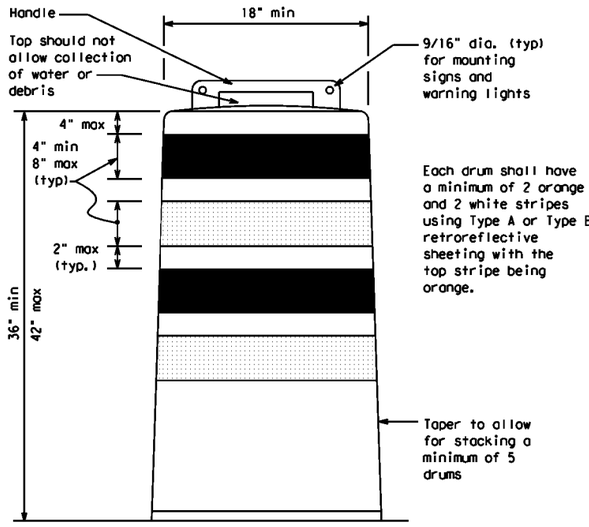
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

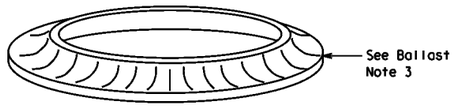
RETROREFLECTIVE SHEETING

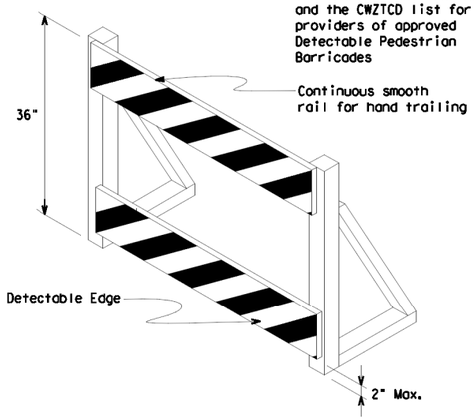
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

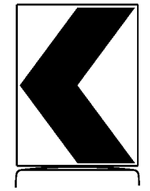




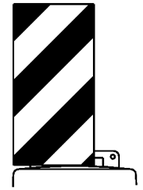


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	ELP	EL PASO		25
7-13				

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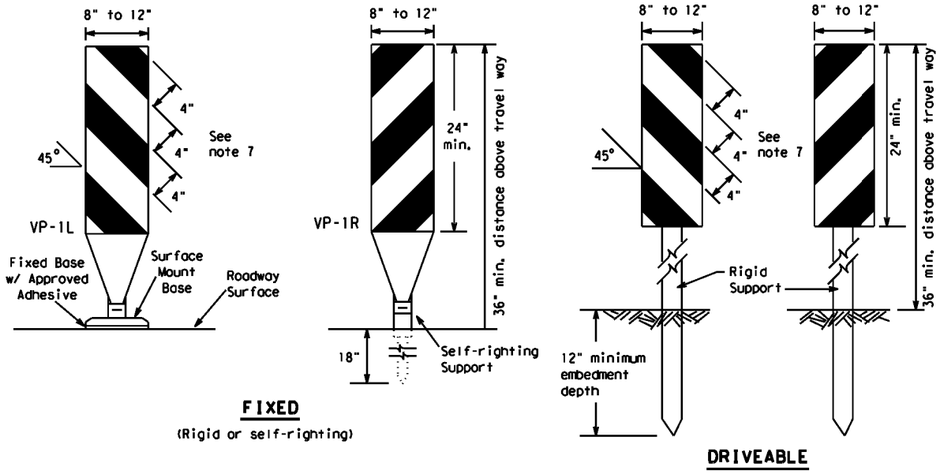
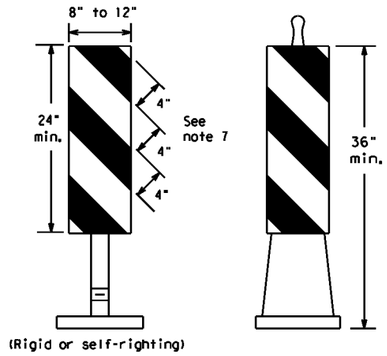


FIXED
(Rigid or self-righting)

DRIVEABLE

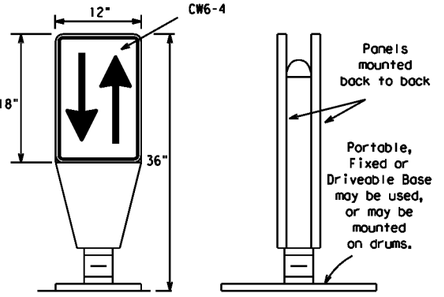


(Rigid or self-righting)

PORTABLE

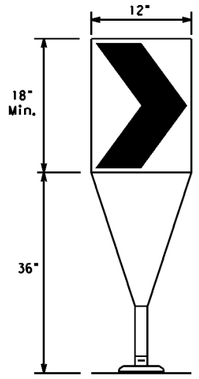
VERTICAL PANELS (VPs)

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



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



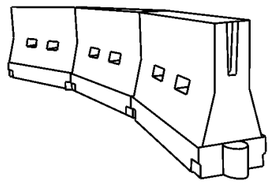
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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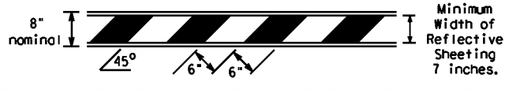
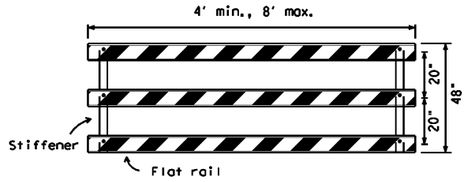
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



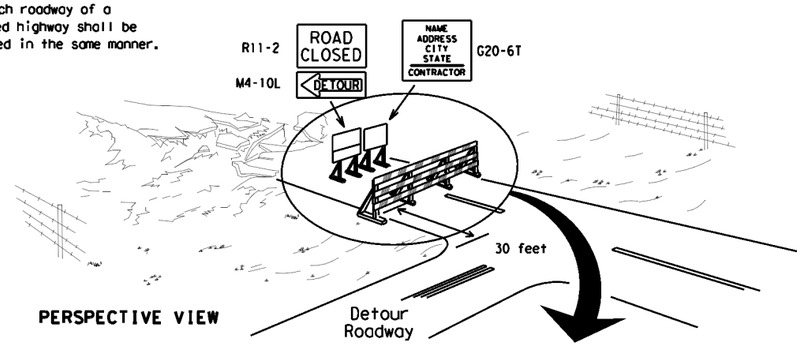
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

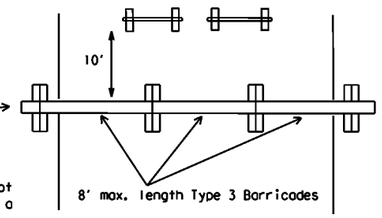
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

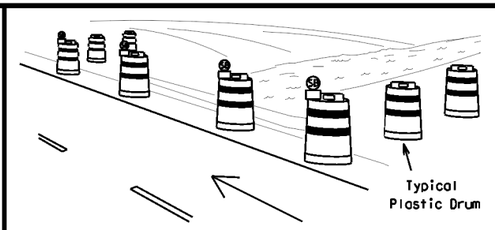
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

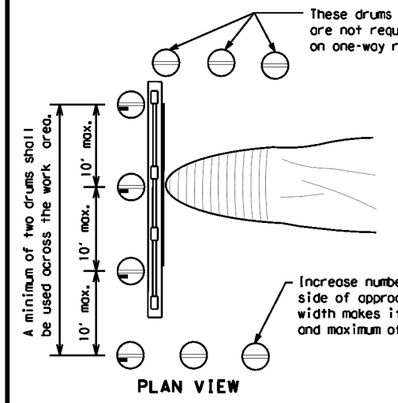
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

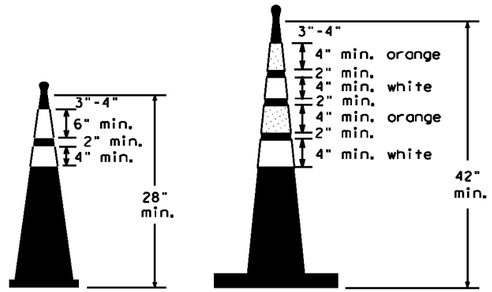
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



PLAN VIEW

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

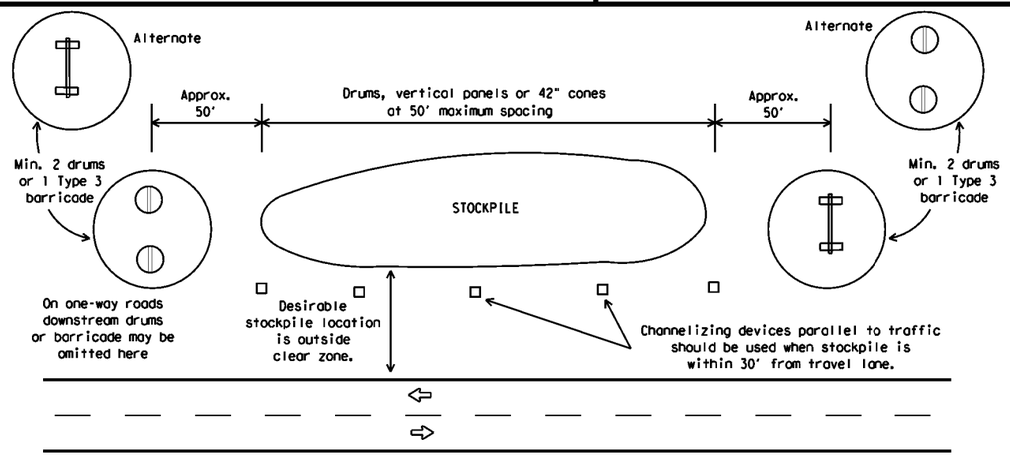
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

SHEET 10 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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	ELP	EL PASO		27

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

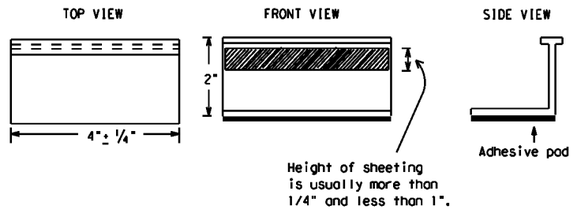
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

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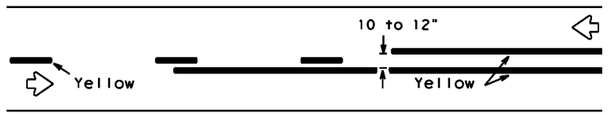
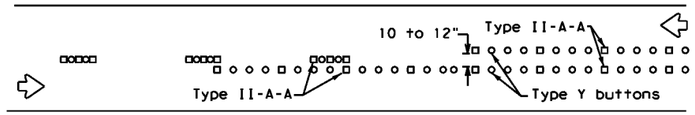
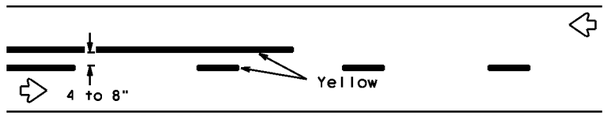
PAVEMENT MARKING PATTERNS



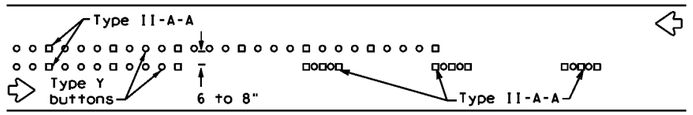
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



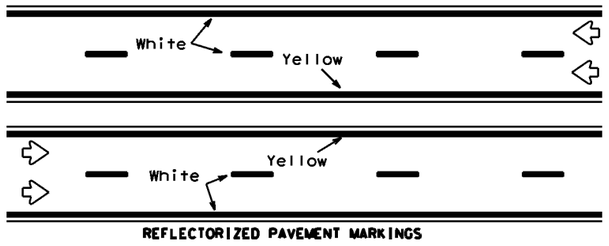
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



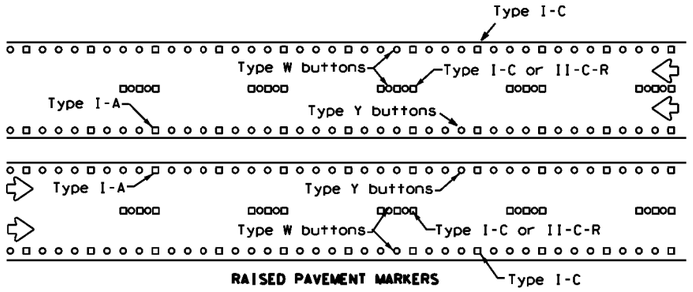
RAISED PAVEMENT MARKERS - PATTERN B

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

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



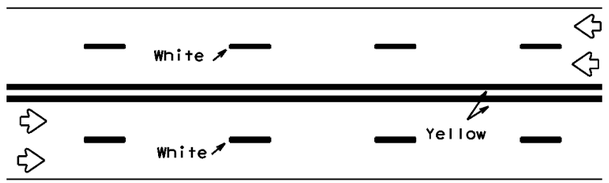
REFLECTORIZED PAVEMENT MARKINGS



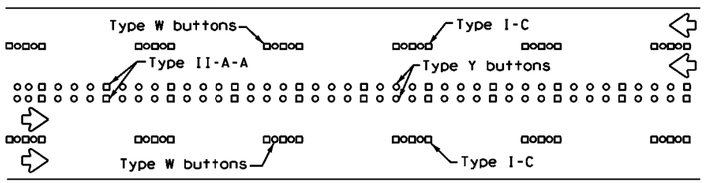
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



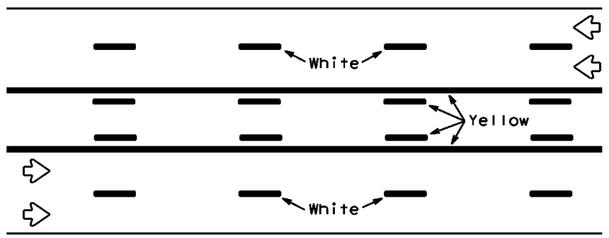
REFLECTORIZED PAVEMENT MARKINGS



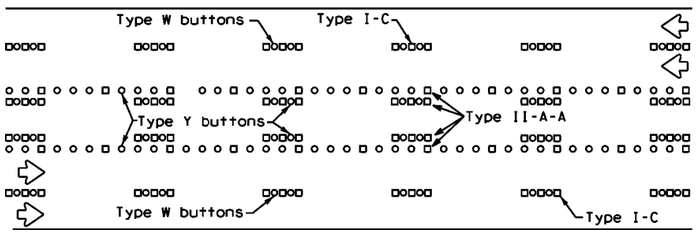
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

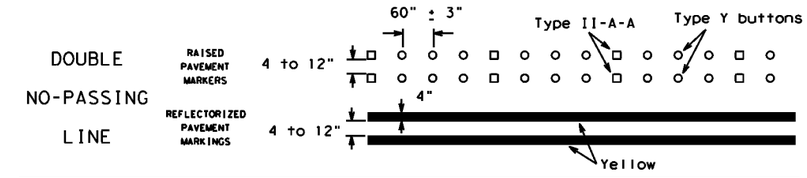
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

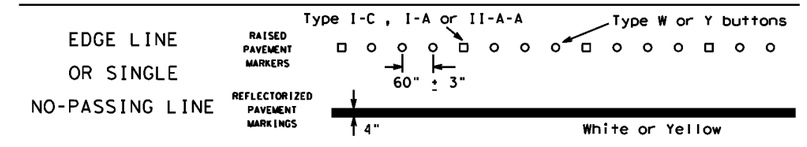
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

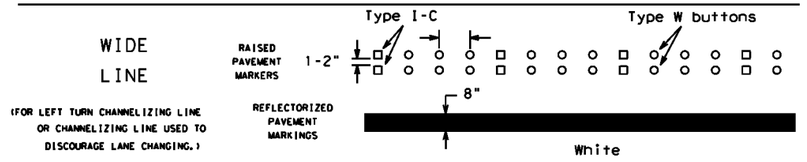


EDGE LINE OR SINGLE NO-PASSING LINE



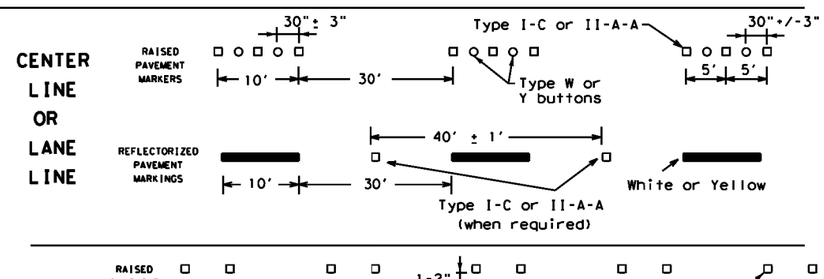
WIDE LINE

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

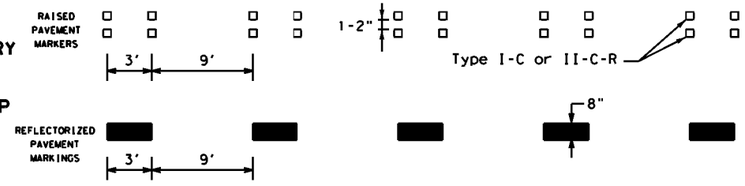


BROKEN LINES

CENTER LINE OR LANE LINE

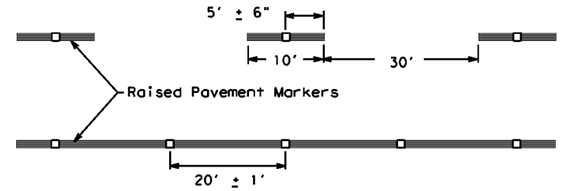


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

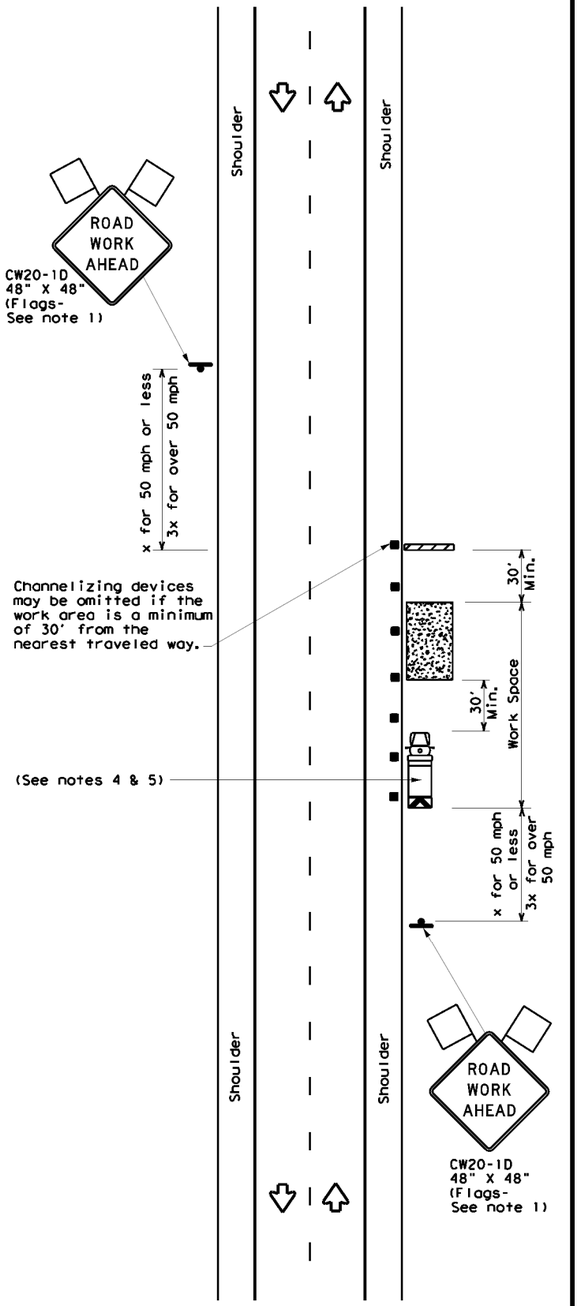
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

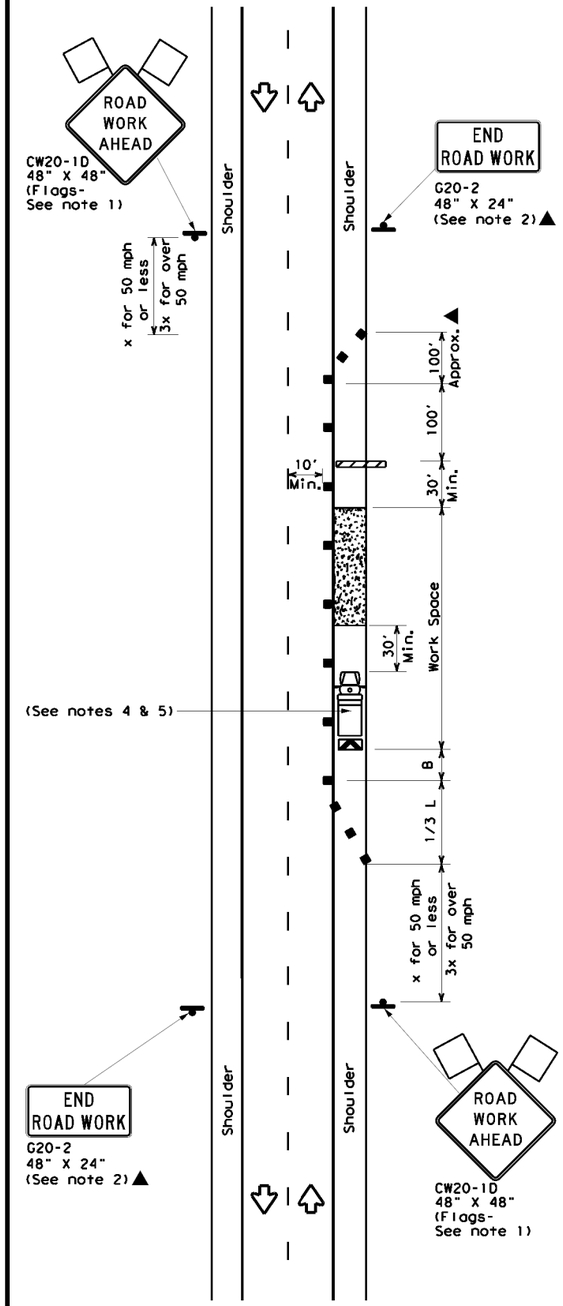
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21	0002	02	059,ETC.	SH 20
2-98 7-13	DIST	COUNTY		SHEET NO.
11-02 8-14	ELP	EL PASO		29

DATE: 10/27/2023
FILE: **pw://txdot.projectwiseonline.com:TxDOT/Documents/24 - ELP/Design Projects/000202059/4 - Design/Plan Set/2. TCP/Standards/tcp2-1-18.dgn**



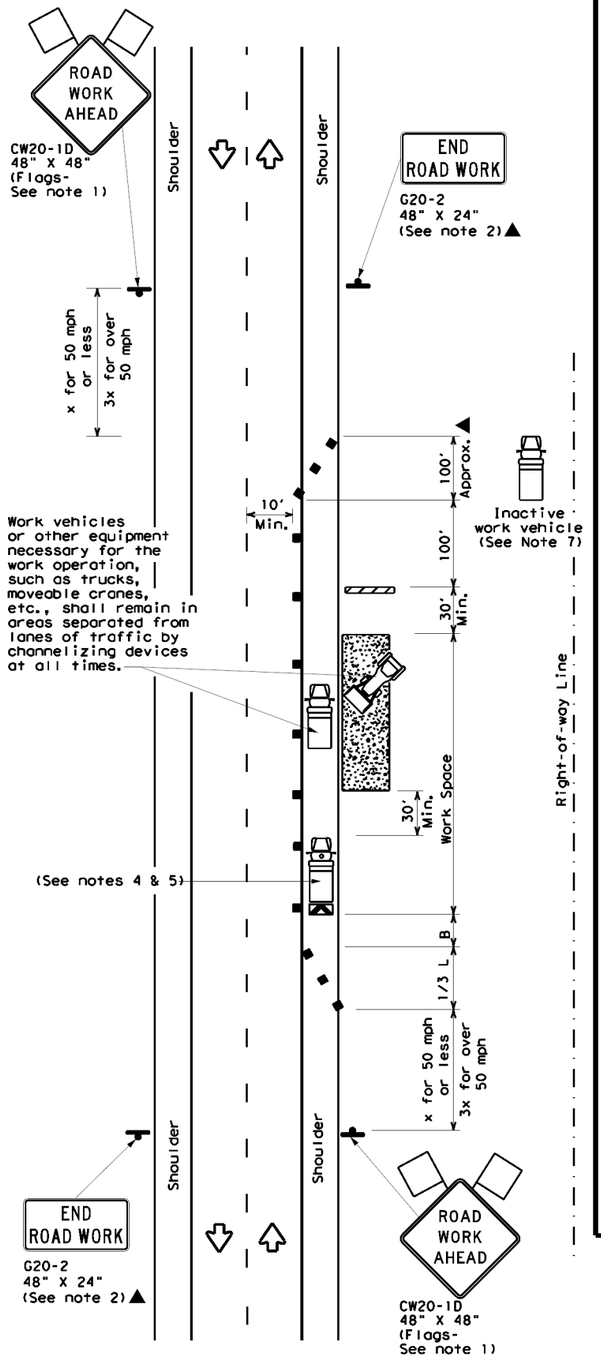
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0002	02	059,ETC.	SH 20
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	ELP	EL PASO		30
1-97 2-18				

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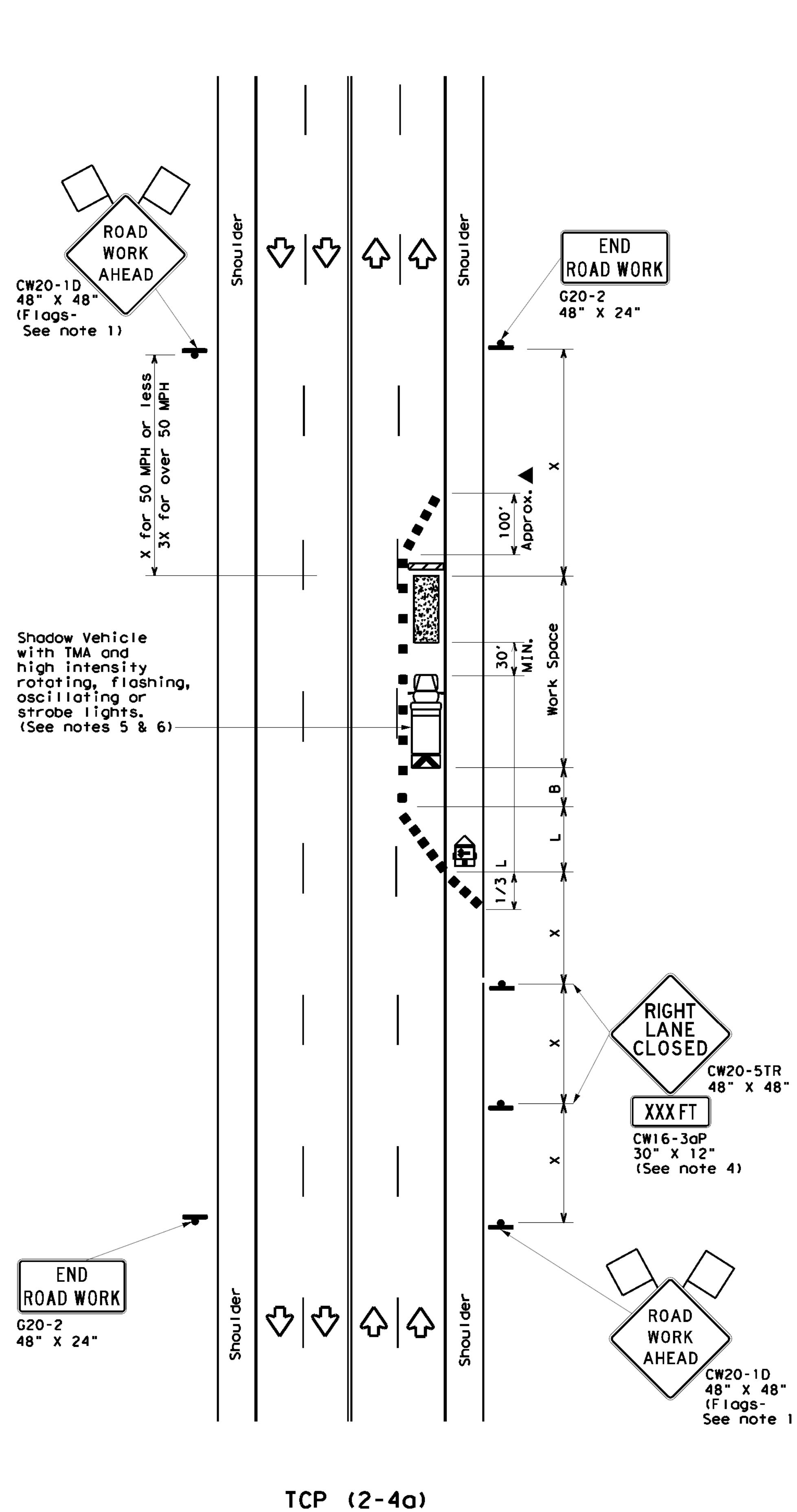
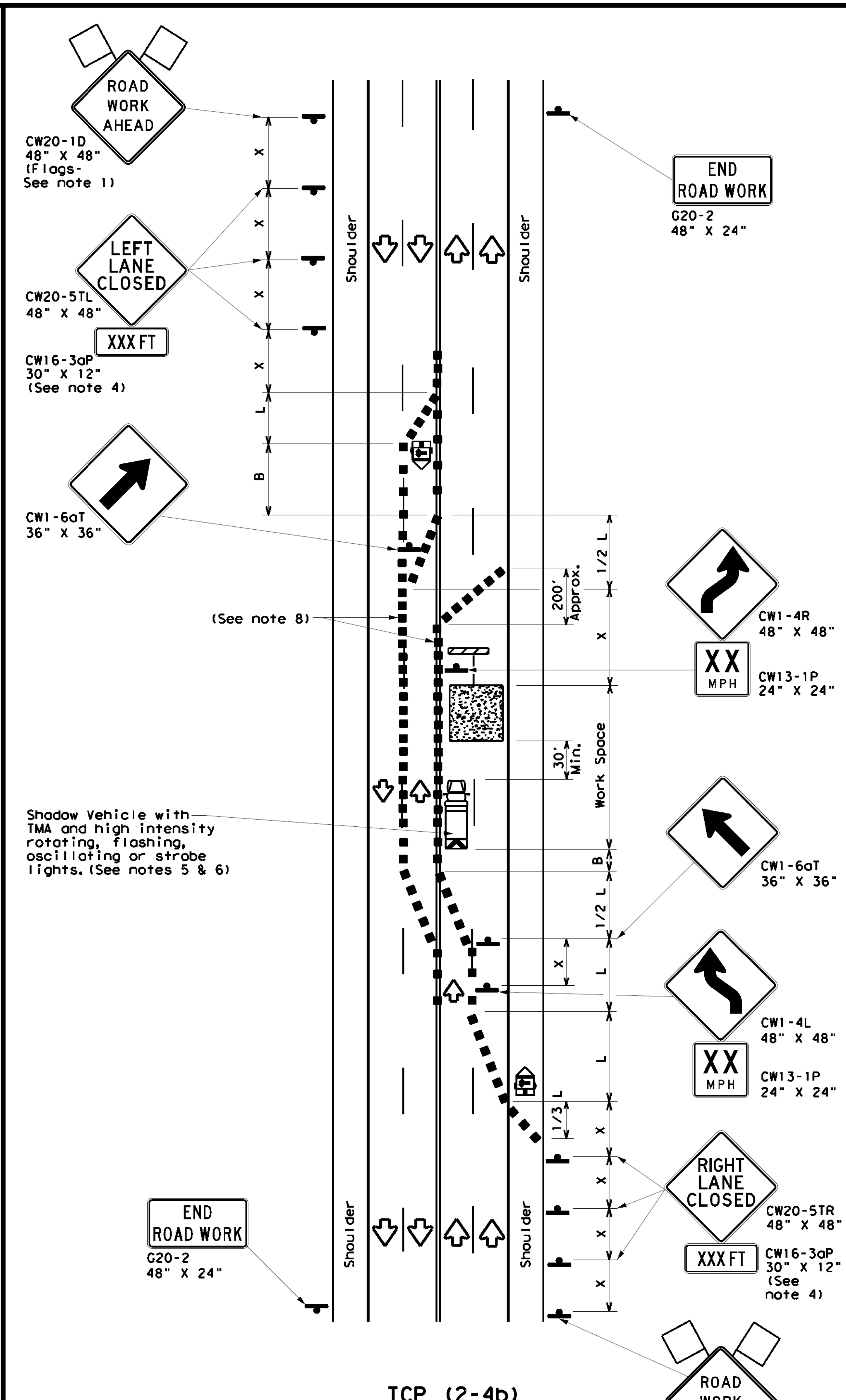


ONE LANE CLOSED



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

* Conventional Roads Only

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

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

GENERAL NOTES

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	0002	02	059,ETC.		SH 20	
1-97 2-12	DIST	COUNTY			SHEET NO.	
4-98 2-18	ELP	EL PASO			31	

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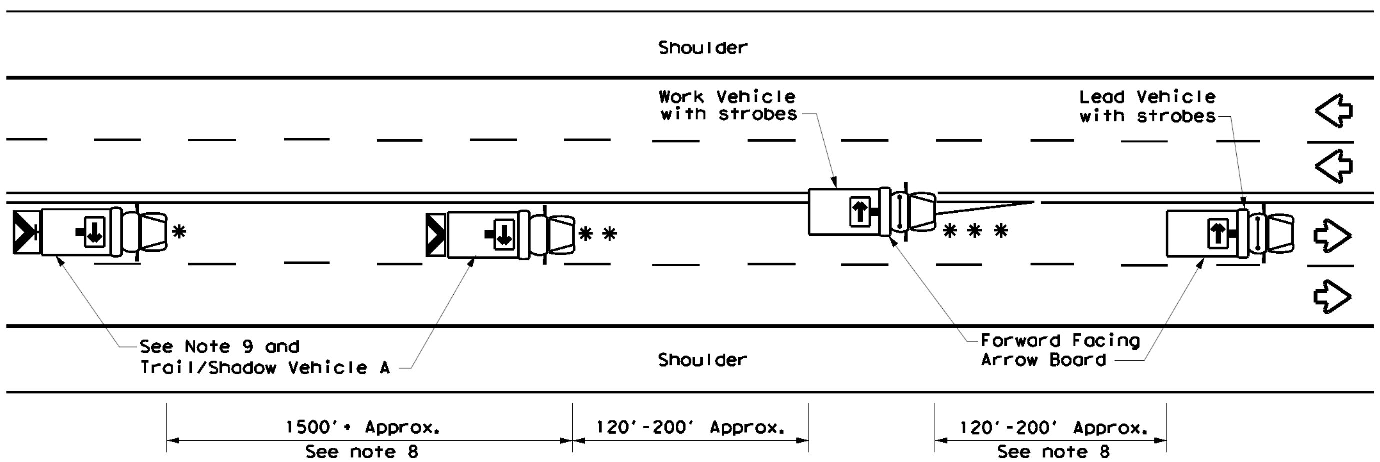
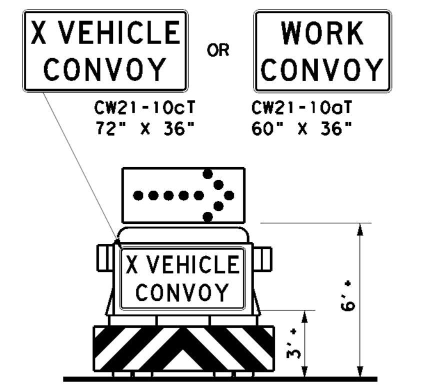


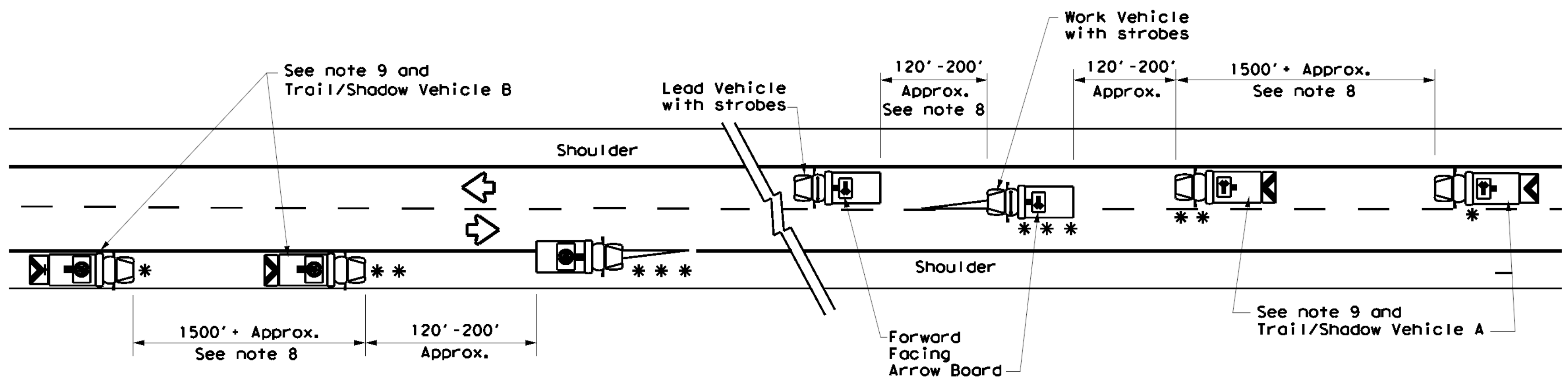
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

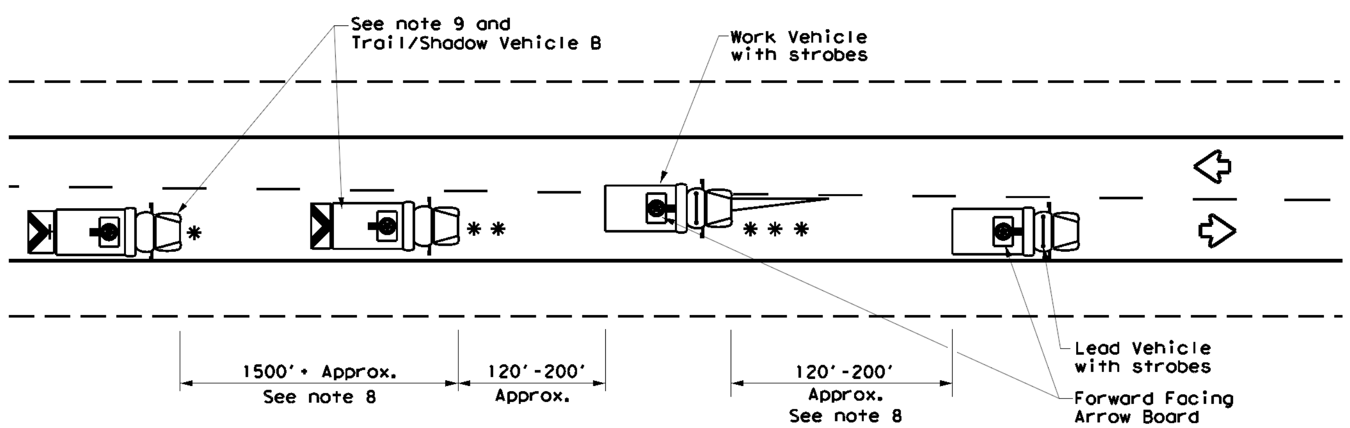


WORK ON SHOULDER

WORK ON TRAVEL LANE

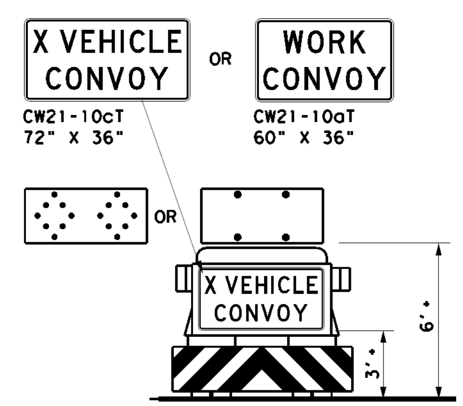
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in CAUTION display

LEGEND

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

TYPICAL USAGE

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

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used the WORK vehicle must be equipped with an arrow board. The Engineer will determine if the LEAD VEHICLE and/or TRAIL VEHICLE are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.

2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.

3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE and TRAIL VEHICLE are required.

4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.

5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.

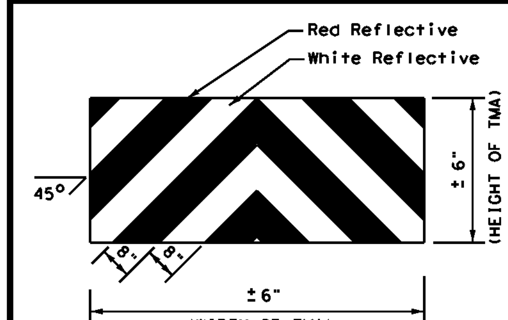
6. Each vehicle shall have two-way radio communication capability.

7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.

8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.

9. "X VEHICLE CONVOY" (CW21-10cT) or "WORK CONVOY" (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" X 48" diamond shaped "WORK CONVOY"(CW21-10T) or "X VEHICLE CONVOY" (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The "X VEHICLE CONVOY" sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.

10. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a "DO NOT PASS" (R4-1) sign should be placed on the back of the rearmost protection vehicle.



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

FILE: tcp3-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	0002	02	059,ETC.	SH 20
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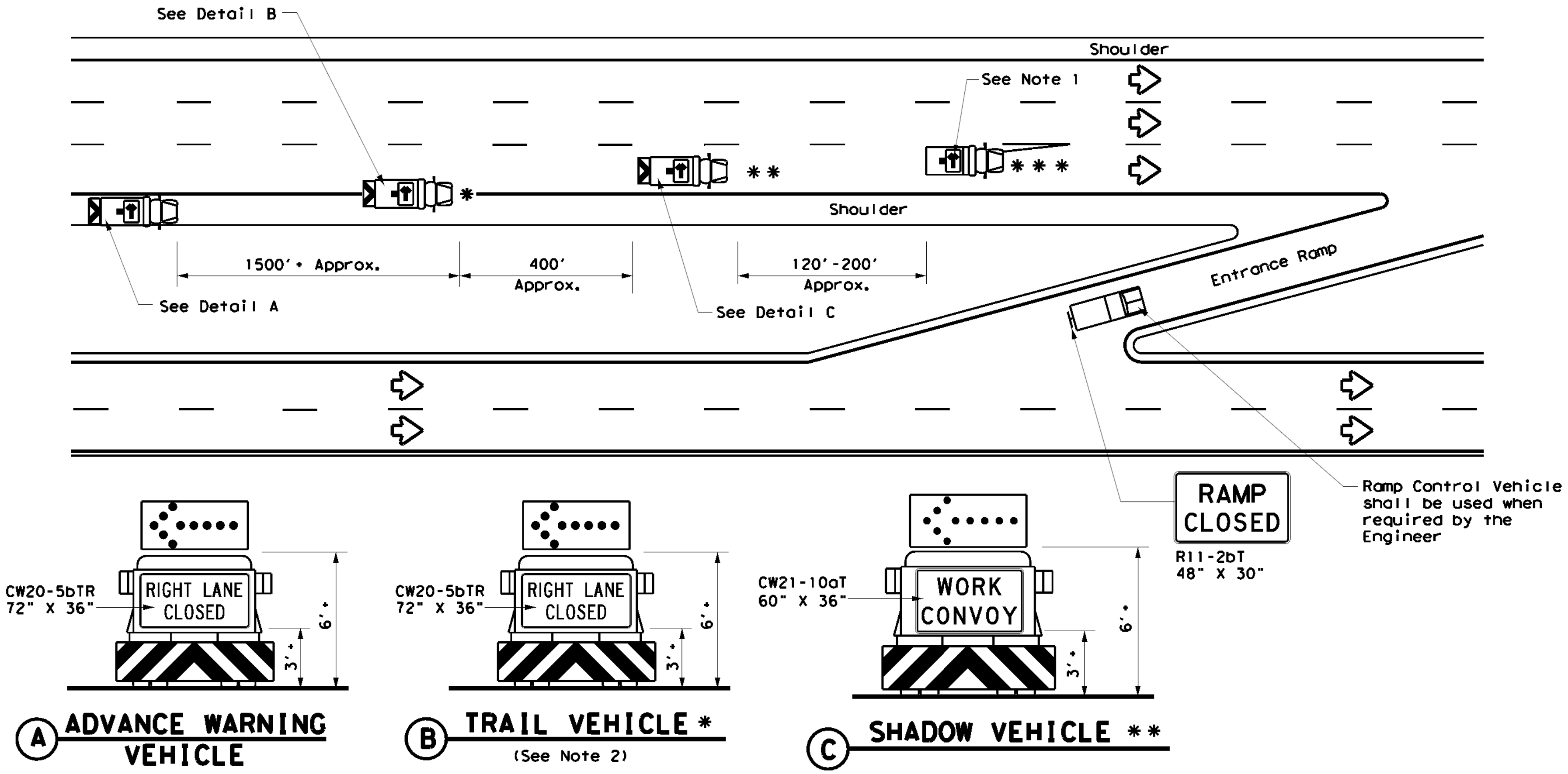
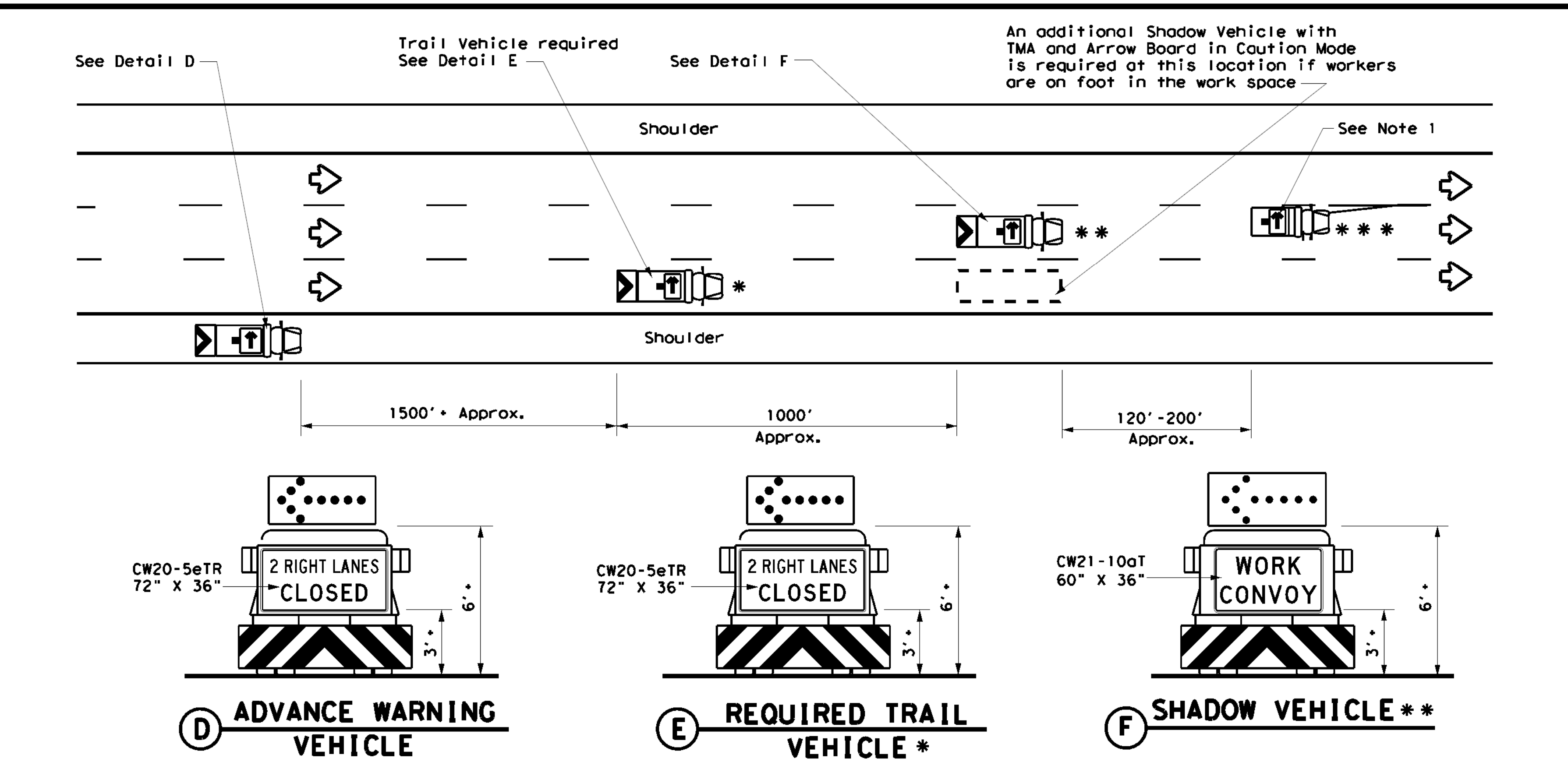


RIGHT LANE CLOSURE ON DIVIDED HIGHWAY - TCP(3-2a)



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

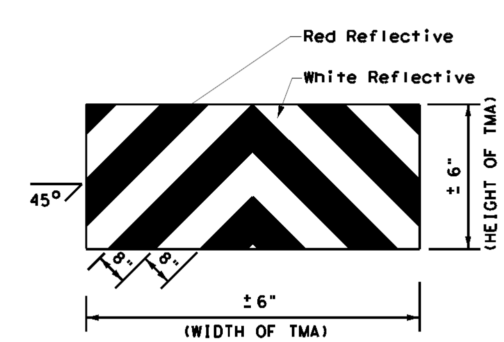
LEGEND

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

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

GENERAL NOTES

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



STRIPING FOR TMA

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS DIVIDED HIGHWAYS

TCP(3-2)-13

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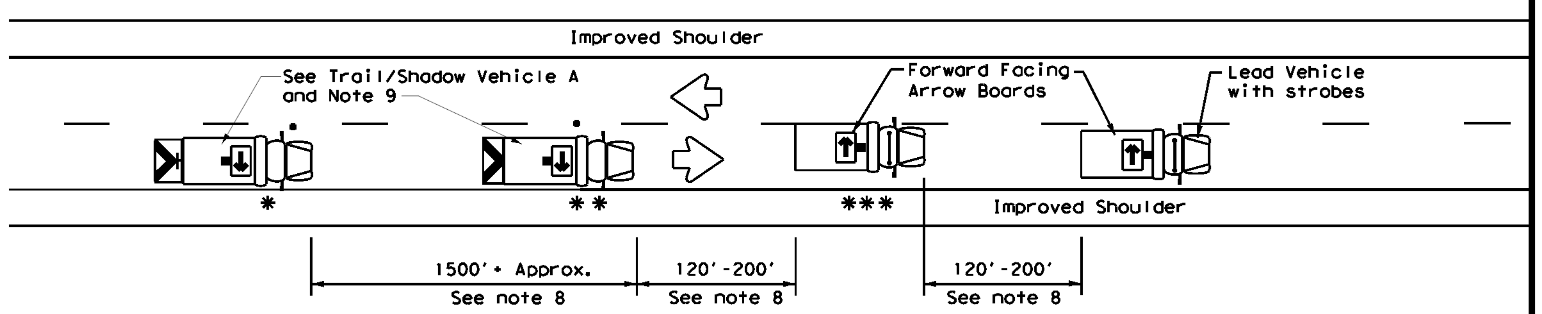
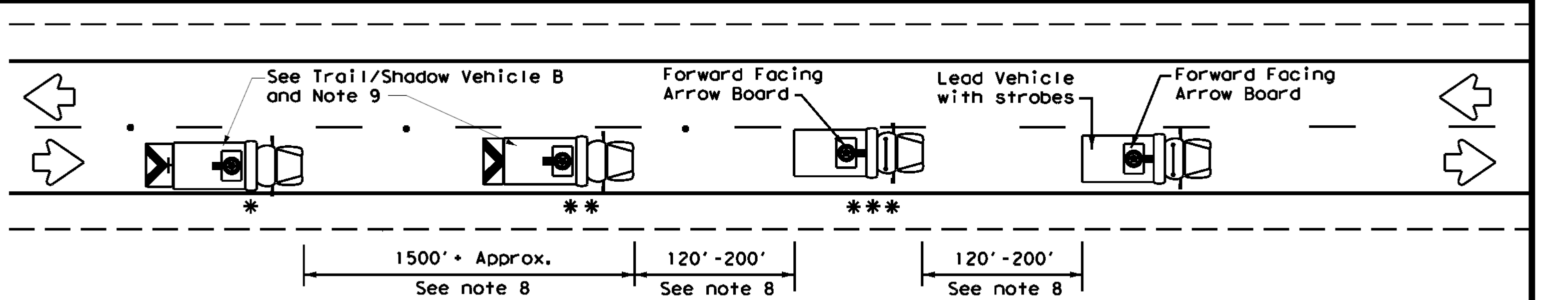
© TxDOT December 1985	CONT 0002	SECT 02	JOB 059,ETC.	HIGHWAY SH 20
REVISIONS 2-94 4-98 8-95 7-13 1-97	DIST ELP		COUNTY EL PASO	SHEET NO. 33



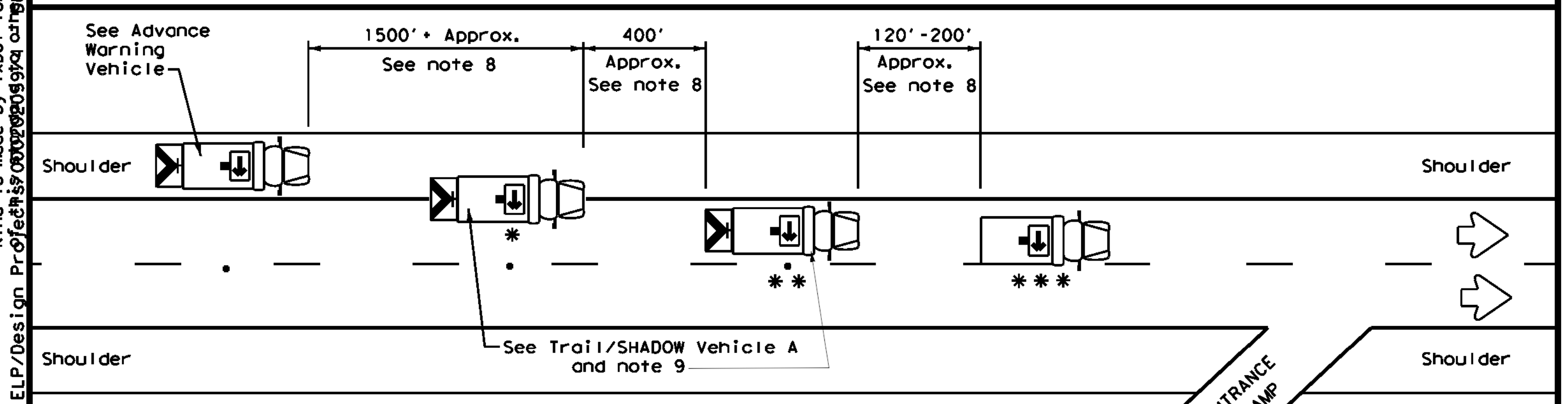
TCP (3-3a)

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



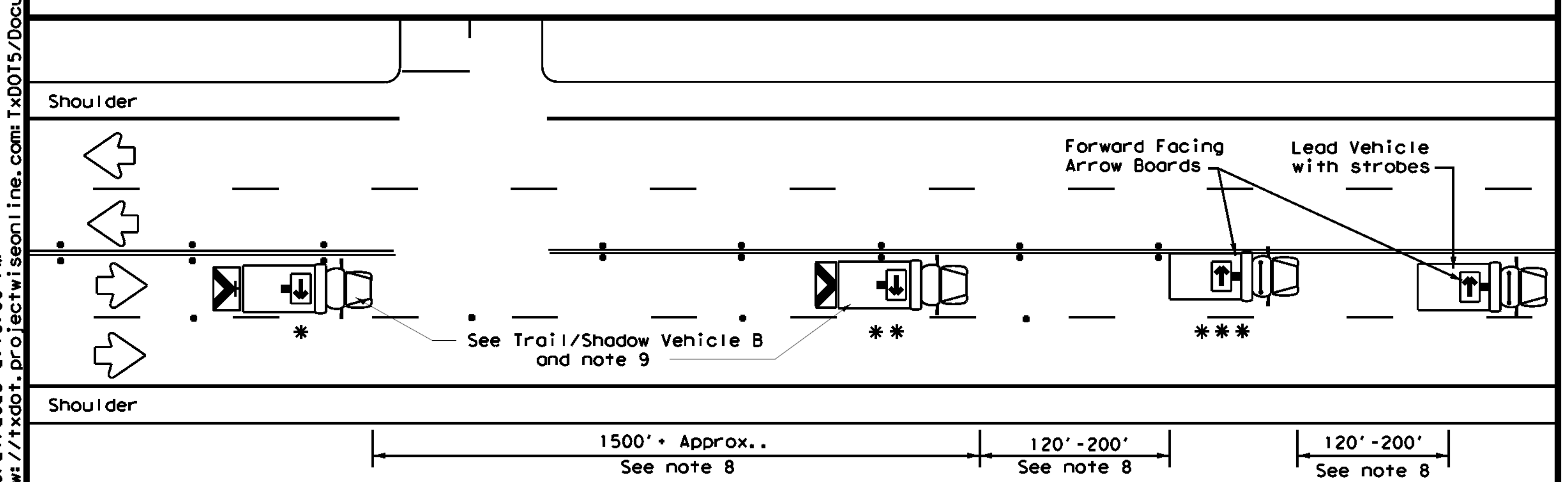
TCP (3-3b)

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



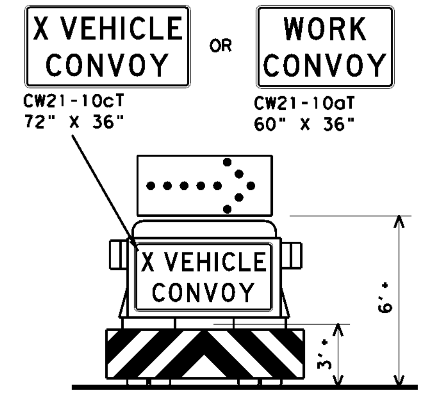
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



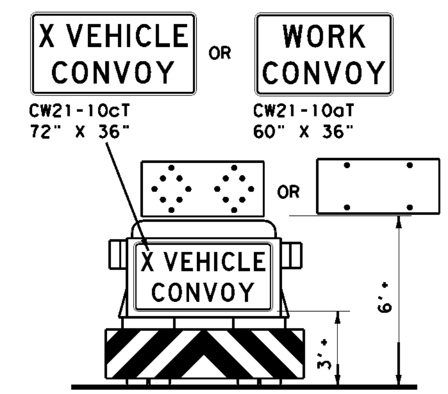
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



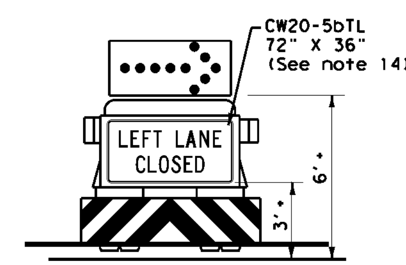
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

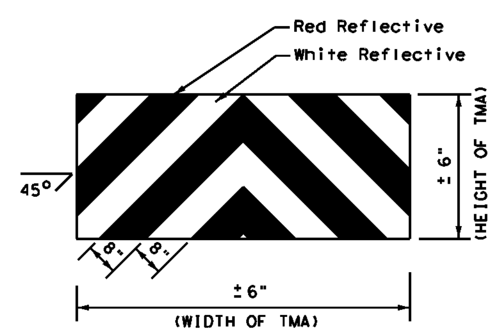


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
MOBILE OPERATIONS
RAISED PAVEMENT
MARKER INSTALLATION/
REMOVAL
TCP(3-3)-14

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97 7-14	0002	02	059,ETC.	SH 20
	DIST		COUNTY	SHEET NO.
	ELP		EL PASO	34

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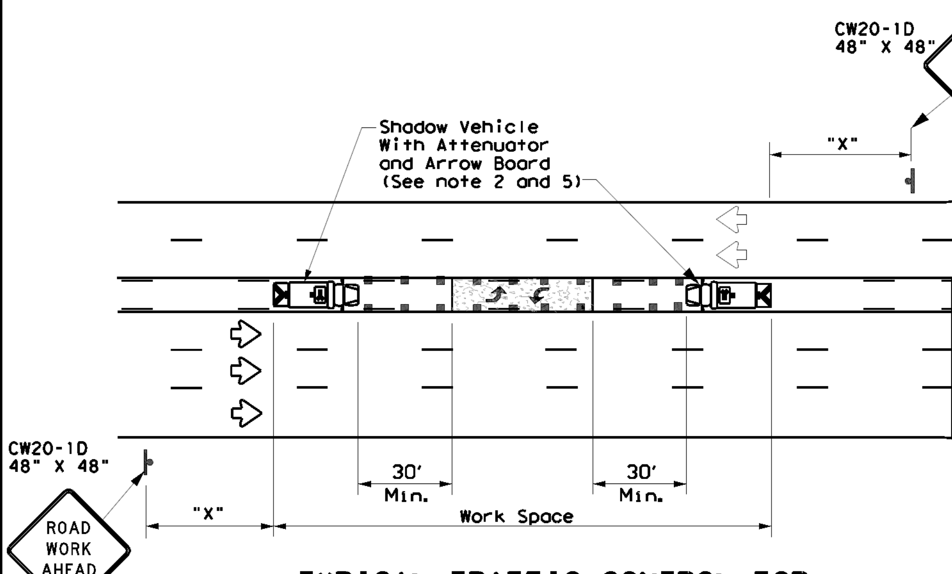
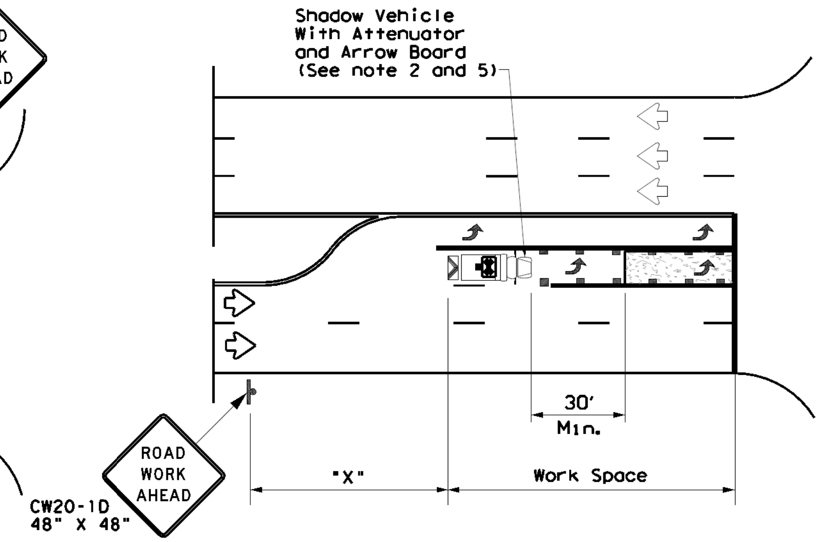
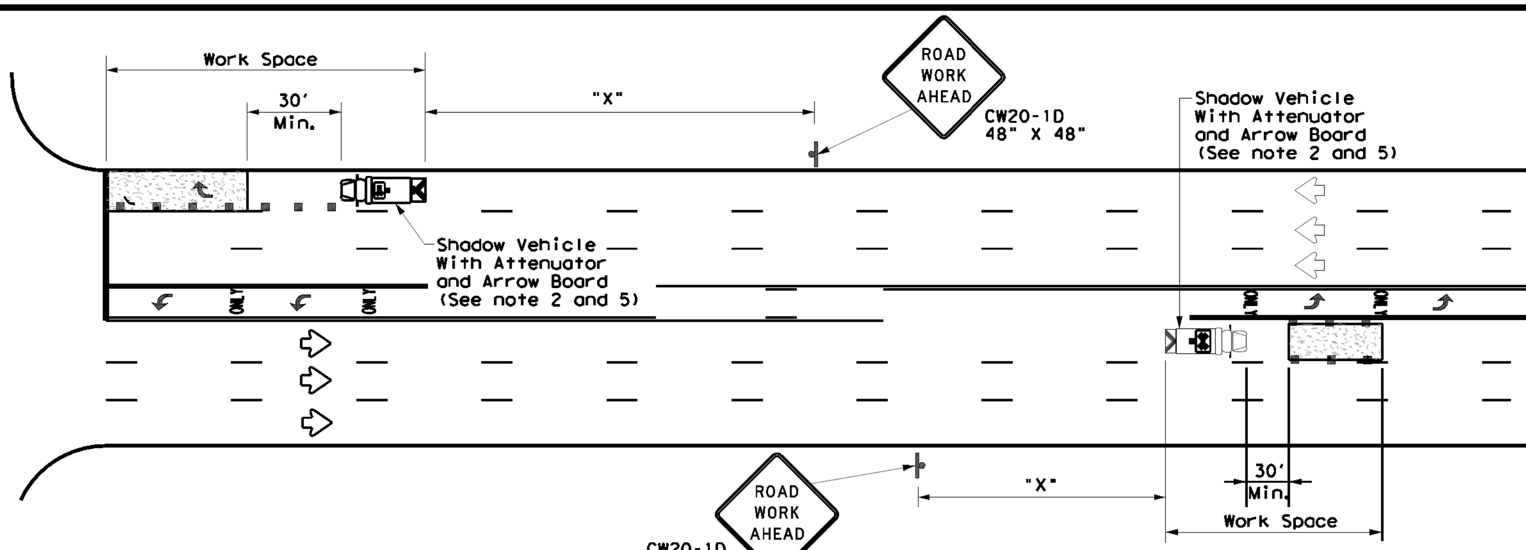


TYPICAL TRAFFIC CONTROL FOR
CONTINUOUS LEFT TURN LANE SYMBOL MARKINGS

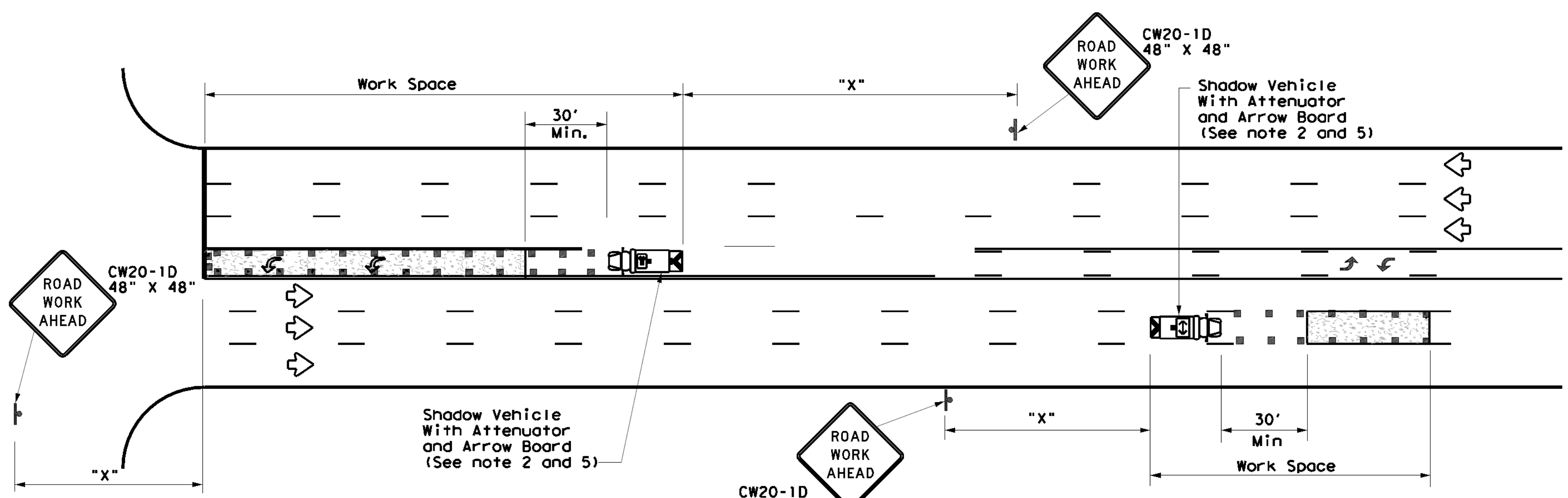


TYPICAL TRAFFIC CONTROL FOR
OUTSIDE DUAL LEFT TURN LANE SYMBOL MARKINGS



TYPICAL TRAFFIC CONTROL FOR
OUTSIDE LANE MARKINGS

TYPICAL TRAFFIC CONTROL FOR
INSIDE LANE MARKINGS



TYPICAL TRAFFIC CONTROL FOR
LEFT TURN LANE MARKINGS

TYPICAL TRAFFIC CONTROL FOR
CENTER LANE MARKINGS

LEGEND

Symbol	Description	Symbol	Description
*	Trail Vehicle		ARROW BOARD DISPLAY
**	Shadow Vehicle		
***	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow	■ ■ ■	Channelizing Devices

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

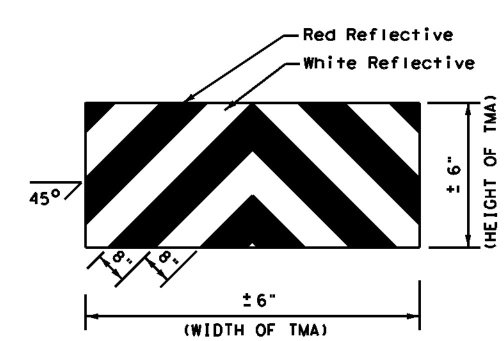
* Conventional Roads Only

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

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

GENERAL NOTES

1. This traffic control plan is for use on conventional roads posted at 45 mph or less and is intended for mobile operations that move continuously or intermittently (stopping up to approximately 15 minutes) such as short-line striping and in-lane rumble strips. When activities are anticipated to take longer amounts of time or traffic conditions warrant, a short duration or short-term stationary traffic control plan should be used.
2. A Truck Mounted Attenuator shall be used on Shadow Vehicle. Striping on the back panel of all truck mounted attenuators shall be 8" red and white reflective sheeting placed in an inverted "V" design. Reflective sheeting shall meet or exceed the reflectivity and color requirements of departmental material specification DMS-8300, Type A.
3. All traffic control devices shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD), latest edition.
4. The use of yellow rotating beacons or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the drivers side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
5. Flashing arrow board shall be used on Shadow Vehicle. Flashing arrow board shall be Type B or Type C as per BC Standards. The arrow board operation shall be controlled from inside the truck.



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS FOR ISOLATED WORK AREAS UNDIVIDED HIGHWAYS

TCP(3-4)-13

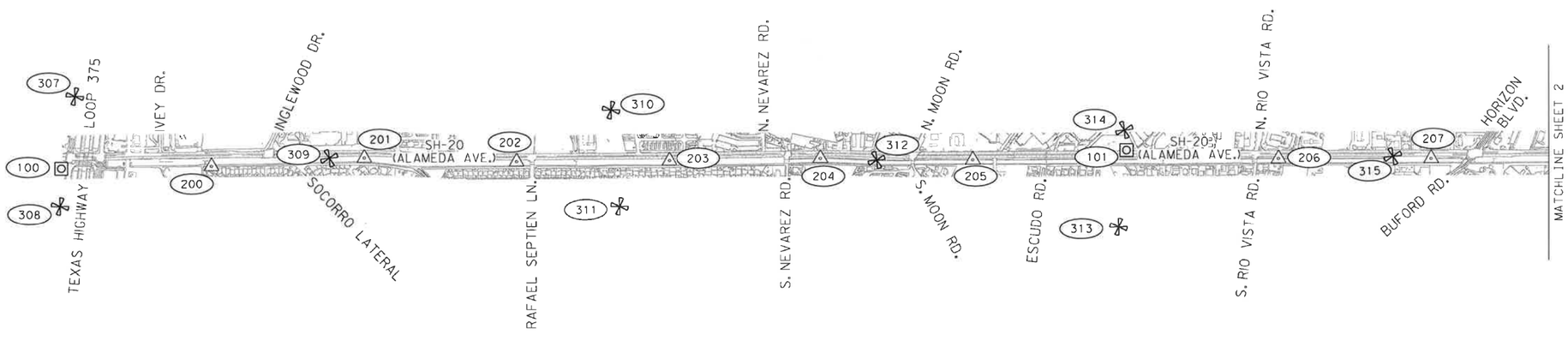
FILE: tcp3-4.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT July, 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	0002	02	059,ETC.	SH 20
	DIST		COUNTY	SHEET NO.
	ELP		EL PASO	35

178

NOTE:
SURVEY IS PROVIDED FROM AN EXISITING AS-BUILT CSJ: 0001-03-057

PRIMARY CONTROL POINT SURFACE COORDINATES				
POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
100	10627424.21	437324.61	3671.44	CONCRETE MON. W/ALUMINUM DISK
101	10618729.35	443223.67	3663.58	CONCRETE MON. W/ALUMINUM DISK

SECONDARY CONTROL POINT SURFACE COORDINATES				
POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
200	10626198.40	438155.86	3670.76	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
201	10624986.20	439047.68	3670.84	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
202	10623710.91	439838.40	3670.87	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
203	10622454.14	440671.39	3667.51	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
204	10621212.49	441508.61	3666.17	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
205	10619947.02	442317.00	3666.18	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
206	10617427.14	443976.10	3663.66	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
207	10616168.67	444800.35	3662.70	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"



AERIAL TARGET SURFACE COORDINATES				
POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
307	10627704.03	437990.07	3668.71	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
308	10627231.14	437007.48	3664.27	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
309	10625275.62	438855.53	3670.65	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
310	10623206.82	440771.88	3664.48	PK NAIL
311	10622616.90	440027.80	3661.78	PK NAIL
312	10620739.65	441796.51	3666.36	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
313	10618379.09	442548.91	3659.10	PK NAIL
314	10618856.18	443377.08	3660.06	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
315	10616497.27	444610.20	3661.91	PK NAIL

LEGEND

- ⊡ ALUMINUM DISC STAMPED "TEXAS DEPT OF TRANSPORTATION CONTROL MARK" IN CONCRETE
- △ 1/2IN-IRON ROD W/ CAP STAMPED "HALFF TRAV"
- ✻ AERIAL TARGET

NOTES

1. ALL BEARINGS SHOWN ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, TEXAS CENTRAL ZONE 4203, NAD 83/2011, GEOID 12. ALL COORDINATES SHOWN ARE SURFACE AND MAY BE CONVERTED TO GRID BY DIVIDING BY A SURFACE ADJUSTMENT FACTOR OF 1.00023100.
UNITS: U.S. SURVEY FEET.

2. HORIZONTAL AND VERTICAL CONTROL WAS ESTABLISHED USING THE TXDOT RTK NETWORK.

3. FIELD COLLECTION WAS PERFORMED 04-17.

DAN H. CLARK
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS REGISTRATION NO. 6011

2/9/2018
DATE

STATE OF TEXAS
REGISTERED
DAN H. CLARK
6011
PROFESSIONAL
LAND SURVEYOR

0 500 1000 150 2000
SCALE: 1"=1000'

Texas Department of Transportation

HALFF
9500 AMBERGLEN BLVD.
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TEL (512) 777-4600
FAX (512) 252-8141
TBPLS FIRM NO. 10029607

2018	CONT	SECT	JOB	HIGHWAY
	0001	03	057	SH 20
	DIST	COUNTY		SHEET NO.
	24	EL PASO		1 OF 10

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Texas Department of Transportation

SH 20

CONTROL SHEETS

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		36

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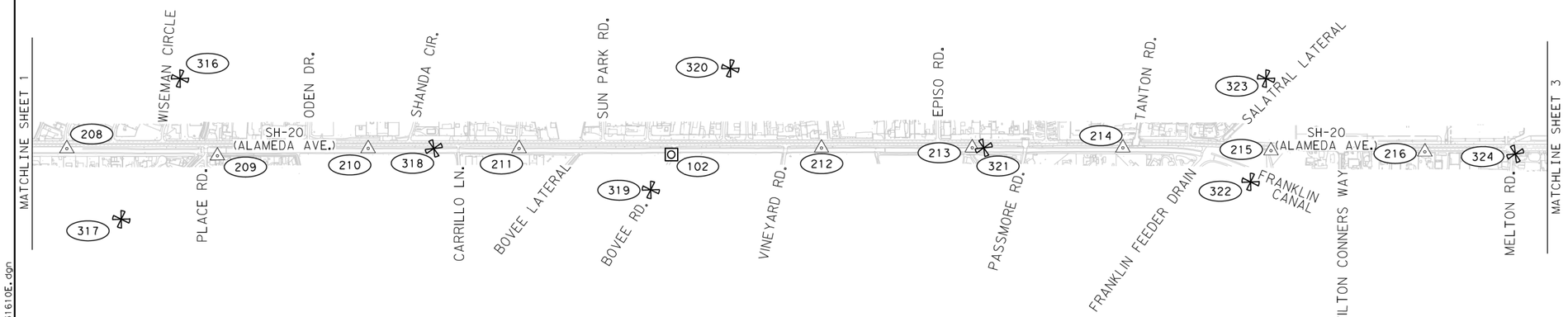
NOTE:
SURVEY IS PROVIDED FROM AN EXISTING AS-BUILT CSJ: 0001-03-057

PRIMARY CONTROL POINT SURFACE COORDINATES				
POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
102	10609850.30	448888.48	3653.39	CONCRETE MON. W/ALUMINUM DISK

SECONDARY CONTROL POINT SURFACE COORDINATES				
POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
208	10614915.19	445629.65	3661.91	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
209	10613622.59	446393.35	3656.66	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
210	10612407.51	447279.53	3657.15	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
211	10611150.85	448104.54	3656.16	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
212	10608631.06	449765.88	3654.31	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
213	10607378.40	450592.58	3652.06	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
214	10606124.63	451415.35	3652.28	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
215	10604876.70	452201.45	3647.01	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
216	10603590.50	453032.34	3644.04	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"



LEGEND

- ⊙ ALUMINUM DISC STAMPED "TEXAS DEPT OF TRANSPORTATION CONTROL MARK" IN CONCRETE
- △ 1/2IN-IRON ROD W/ CAP STAMPED "HALFF TRAV"
- ✱ AERIAL TARGET

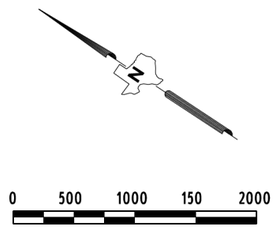
NOTES

1. ALL BEARINGS SHOWN ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, TEXAS CENTRAL ZONE 4203, NAD 83/2011, GEOID 12. ALL COORDINATES SHOWN ARE SURFACE AND MAY BE CONVERTED TO GRID BY DIVIDING BY A SURFACE ADJUSTMENT FACTOR OF 1.00023100.
UNITS: U.S. SURVEY FEET.

2. HORIZONTAL AND VERTICAL CONTROL WAS ESTABLISHED USING THE TXDOT RTK NETWORK.

3. FIELD COLLECTION WAS PERFORMED 04-17.

AERIAL TARGET SURFACE COORDINATES				
POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
316	10614356.21	446831.82	3655.82	PK NAIL
317	10614073.40	445335.08	3656.51	PK NAIL
318	10611860.86	447638.12	3656.12	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
319	10609827.90	448480.17	3650.26	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
320	10609824.36	449930.31	3649.52	PK NAIL
321	10607281.99	450654.72	3651.84	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
322	10604875.83	451829.35	3645.81	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
323	10605312.47	452774.68	3645.64	1/2" IRON ROD W/CAP STAMPED "HALFF TRAV"
324	10602826.98	453510.35	3642.72	PK NAIL



Texas Department of Transportation

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TBPLS FIRM NO. 10029607

2018	CONT	SECT	JOB	HIGHWAY
	0001	03	057	SH 20
	DIST	COUNTY		SHEET NO.
	24	EL PASO		2 OF 10

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SH 20

CONTROL SHEETS

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		37

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DW: CK: DW: CK:

HORIZONTAL ALIGNMENT REPORT

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Alignment description:
Report Created: Wednesday, June 28, 2023
Time: 4:21:10 PM

X	Y	STATION
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437437.93	10627458.29	
	PI	29+25.06 R1
438515.77	10625863.26	
Tangential Direction:		S34°02'55.85"E
Tangential Length:		1925.06
	PI	29+25.06 R1
438515.77	10625863.26	
	PC	38+64.28 R1
439040.00	10625083.96	
Tangential Direction:		S33°55'42.97"E
Tangential Length:		939.22
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439040.00	10625083.96	
	PI	40+55.35 R1
439146.65	10624925.43	
	CC	
434173.61	10621810.35	
	PT	42+46.28 R1
439242.75	10624760.29	
Radius:		5865.00
Delta:		03°43'54.27"
Right		
Degree of Curvature(Arc):		00°58'36.88"
Length:		381.99
Tangent:		191.06
Chord:		381.93
Middle Ordinate:		3.11
External:		3.11
Tangent Back Direction:		S33°55'42.97"E
Radial Direction:		S56°04'17.03"W
Chord Direction:		S32°03'45.84"E
Radial Direction:		S59°48'11.29"W
Tangent Ahead Direction:		S30°11'48.71"E
	PT	42+46.28 R1
439242.75	10624760.29	
	PC	46+66.77 R1
439454.24	10624396.86	
Tangential Direction:		S30°11'48.71"E
Tangential Length:		420.49
	PC	46+66.77 R1
439454.24	10624396.86	
	PI	48+56.90 R1
439549.88	10624232.52	
	CC	
445124.07	10627696.36	
	PT	50+46.93 R1
439654.87	10624074.00	
Radius:		6560.00
Delta:		03°19'13.54"
Left		
Degree of Curvature(Arc):		00°52'24.28"
Length:		380.17
Tangent:		190.14
Chord:		380.11
Middle Ordinate:		2.75
External:		2.75
Tangent Back Direction:		S30°11'48.71"E
Radial Direction:		S59°48'11.29"W
Chord Direction:		S31°51'25.47"E
Radial Direction:		S56°28'57.76"W
Tangent Ahead Direction:		S33°31'02.24"E
	PT	50+46.93 R1
439654.87	10624074.00	
	PI	70+85.57 R1
440780.58	10622374.35	
Tangential Direction:		S33°31'02.24"E
Tangential Length:		2038.63
	PIBL CL-3	70+85.57 R1
440780.58	10622374.35	
	PC	83+39.90 R1
441481.89	10621334.39	
Tangential Direction:		S33°59'39.41"E
Tangential Length:		1254.34
	PCBL CL-5	83+39.90 R1
441481.89	10621334.39	
	PI	86+71.15 R1
441666.92	10621059.65	
	CC	
431145.15	10614372.88	
	PRC	90+02.24 R1
441837.10	10620775.46	
Radius:		12462.38
Delta:		03°02'42.27"
Right		
Degree of Curvature(Arc):		00°27'35.10"
Length:		662.33
Tangent:		331.24
Chord:		662.25
Middle Ordinate:		4.40
External:		4.40
Tangent Back Direction:		S33°57'33.16"E
Radial Direction:		S56°02'26.84"W
Chord Direction:		S32°26'12.03"E
Radial Direction:		S59°05'09.11"W
Tangent Ahead Direction:		S30°54'50.89"E
	PRC	90+02.24 R1
441837.10	10620775.46	
	PI	91+96.44 R1
441936.87	10620608.84	
	CC	
449558.54	10625399.24	
	PTBL CL-6	93+90.58 R1
442043.74	10620446.69	
Radius:		9000.00
Delta:		02°28'20.27"
Left		
Degree of Curvature(Arc):		00°38'11.83"
Length:		388.35
Tangent:		194.20
Chord:		388.32
Middle Ordinate:		2.09
External:		2.10
Tangent Back Direction:		S30°54'50.89"E
Radial Direction:		S59°05'09.11"W
Chord Direction:		S32°09'01.03"E
Radial Direction:		S56°36'48.84"W
Tangent Ahead Direction:		S33°23'11.16"E
	PT	93+90.58 R1
442043.74	10620446.69	
	PI	127+20.28 R1
443876.02	10617666.46	
Tangential Direction:		S33°23'11.16"E
Tangential Length:		3329.70
	PIBL CL-6	127+20.28 R1
443876.02	10617666.46	
	PI	147+80.28 R1
445004.53	10615943.07	
Tangential Direction:		S33°13'03.15"E
Tangential Length:		2060.00
	PIBL CL-7	147+80.28 R1
445004.53	10615943.07	
	PI	153+30.28 R1
445310.42	10615485.98	
Tangential Direction:		S33°47'28.31"E
Tangential Length:		550.00
	PIBL CL-8	153+30.28 R1
445310.42	10615485.98	
	PI	204+50.28 R1
448126.65	10611210.09	
Tangential Direction:		S33°22'12.22"E
Tangential Length:		5120.00
	PIBL CL-9	204+50.28 R1
448126.65	10611210.09	
	PI	270+10.28 R1
451734.42	10605731.26	
Tangential Direction:		S33°21'52.59"E
Tangential Length:		6560.00
	PIBL CL-10	270+10.28 R1
451734.42	10605731.26	
	PI	283+40.28 R1
452425.32	10604594.80	
Tangential Direction:		S31°17'50.35"E
Tangential Length:		1330.00
	PI	283+40.28 R1
452425.32	10604594.80	
	PC	688+62.85 R1
474695.68	10570740.55	
Tangential Direction:		S33°20'17.30"E
Tangential Length:		40522.57
	PC	688+62.85 R1
474695.68	10570740.55	
	PI	690+72.63 R1
474810.97	10570565.30	
	CC	
482498.71	10575873.62	
	PT	692+82.33 R1
474934.01	10570395.40	
Radius:		9340.00
Delta:		02°34'23.73"
Left		
Degree of Curvature(Arc):		00°36'48.40"
Length:		419.48
Tangent:		209.77
Chord:		419.44
Middle Ordinate:		2.35
External:		2.36
Tangent Back Direction:		S33°20'17.30"E
Radial Direction:		S56°39'42.70"W
Chord Direction:		S34°37'29.17"E
Radial Direction:		S54°05'18.97"W
Tangent Ahead Direction:		S35°54'41.03"E
	PT	692+82.33 R1
474934.01	10570395.40	
	PC	697+39.08 R1
475201.91	10570025.46	
Tangential Direction:		S35°54'41.03"E
Tangential Length:		456.75
	PC	697+39.08 R1
475201.91	10570025.46	
	PI	700+06.28 R1
475358.63	10569809.05	
	CC	
465316.77	10562866.82	
	PT	702+73.40 R1
475505.73	10569585.98	
Radius:		12205.00
Delta:		02°30'30.04"
Right		
Degree of Curvature(Arc):		00°28'10.00"
Length:		534.32
Tangent:		267.20
Chord:		534.28
Middle Ordinate:		2.92
External:		2.92
Tangent Back Direction:		S35°54'41.03"E
Radial Direction:		S54°05'18.97"W
Chord Direction:		S34°39'26.01"E
Radial Direction:		S56°35'49.01"W
Tangent Ahead Direction:		S33°24'10.99"E
	PT	702+73.40 R1
475505.73	10569585.98	
	PI	751+21.66 R1
478174.82	10565538.56	
Tangential Direction:		S33°24'10.99"E
Tangential Length:		4848.26
	PI	751+21.66 R1
478174.82	10565538.56	
	PC	792+08.66 R1
480610.20	10562256.41	
Tangential Direction:		S36°34'32.31"E
Tangential Length:		4087.00
	PC	792+08.66 R1
480610.20	10562256.41	
	PI	793+19.82 R1
480676.43	10562167.15	
	CC	
478281.29	10560528.35	
	PT	794+30.87 R1
480735.64	10562073.07	
Radius:		2900.00
Delta:		04°23'24.22"
Right		
Degree of Curvature(Arc):		01°58'32.58"
Length:		222.20
Tangent:		111.15
Chord:		222.15
Middle Ordinate:		2.13
External:		2.13
Tangent Back Direction:		S36°34'32.31"E
Radial Direction:		S53°25'27.69"W
Chord Direction:		S34°22'50.20"E
Radial Direction:		S57°48'51.91"W
Tangent Ahead Direction:		S32°11'08.09"E
	PT	794+30.87 R1
480735.64	10562073.07	
	PC	797+15.87 R1
480887.45	10561831.87	
Tangential Direction:		S32°11'08.09"E
Tangential Length:		285.00
	PC	797+15.87 R1
480887.45	10561831.87	
	PI	798+27.50 R1
480946.92	10561737.39	
	CC	
483341.80	10563376.59	
	PT	799+39.03 R1
481013.47	10561647.76	
Radius:		2900.00
Delta:		04°24'32.77"
Left		
Degree of Curvature(Arc):		01°58'32.58"
Length:		223.16
Tangent:		111.64
Chord:		223.11
Middle Ordinate:		2.15
External:		2.15
Tangent Back Direction:		S32°11'08.09"E
Radial Direction:		S57°48'51.91"W
Chord Direction:		S34°23'24.47"E
Radial Direction:		S53°24'19.15"W
Tangent Ahead Direction:		S36°35'40.85"E
	PT	799+39.03 R1
481013.47	10561647.76	
	PC	829+07.23 R1
482782.96	10559264.67	
Tangential Direction:		S36°35'40.85"E
Tangential Length:		2968.20
	PC	829+07.23 R1
482782.96	10559264.67	
	PI	829+76.87 R1
482824.48	10559208.76	
	CC	
483818.67	10560033.71	
	PT	830+46.38 R1
482871.78	10559157.63	
Radius:		1290.00
Delta:		06°10'50.29"
Left		
Degree of Curvature(Arc):		04°26'29.52"
Length:		139.16
Tangent:		69.65
Chord:		139.09
Middle Ordinate:		1.88
External:		1.88
Tangent Back Direction:		S36°35'40.85"E
Radial Direction:		S53°24'19.15"W
Chord Direction:		S39°41'06.00"E
Radial Direction:		S47°13'28.86"W
Tangent Ahead Direction:		S42°46'31.14"E
	PT	830+46.38 R1
482871.78	10559157.63	
	PC	868+68.59 R1
485467.53	10556352.05	
Tangential Direction:		S42°46'31.14"E
Tangential Length:		3822.21
	PC	868+68.59 R1
485467.53	10556352.05	
	PI	870+36.08 R1
485581.28	10556229.11	
	CC	
482395.65	10553509.91	
	PT	872+03.39 R1
485684.84	10556097.47	
Radius:		4185.00
Delta:		04°35'01.22"
Right		
Degree of Curvature(Arc):		01°22'08.67"
Length:		334.80
Tangent:		167.49
Chord:		334.71
Middle Ordinate:		3.35
External:		3.35
Tangent Back Direction:		S42°46'31.14"E
Radial Direction:		S47°13'28.86"W
Chord Direction:		S40°29'00.54"E
Radial Direction:		S51°48'30.07"W
Tangent Ahead Direction:		S38°11'29.93"E
	PT	872+03.39 R1
485684.84	10556097.47	
	PC	880+38.05 R1
486200.90	10555441.47	
Tangential Direction:		S38°11'29.93"E
Tangential Length:		834.66
	PC	880+38.05 R1
486200.90	10555441.47	
	PI	882+91.84 R1
486357.82	10555242.01	
	CC	
490291.76	10558659.69	
	PT	885+45.22 R1
486533.40	10555058.76	
Radius:		5205.00
Delta:		05°34'58.54"
Left		
Degree of Curvature(Arc):		01°06'02.82"
Length:		507.18
Tangent:		253.79
Chord:		506.98
Middle Ordinate:		6.18
External:		6.18
Tangent Back Direction:		S38°11'29.93"E
Radial Direction:		S51°48'30.07"W
Chord Direction:		S40°58'59.20"E
Radial Direction:		S46°13'31.54"W
Tangent Ahead Direction:		S43°46'28.46"E
	PT	885+45.22 R1
486533.40	10555058.76	
	PC	1097+85.51 R1
501227.91	10539721.84	
Tangential Direction:		S43°46'28.46"E
Tangential Length:		21240.28
	PC	1097+85.51 R1
501227.91	10539721.84	
	PI	1098+58.51 R1
501278.42	10539669.13	
	CC	
503043.91	10541461.78	
	PT	1099+31.48 R1
501331.90	10539619.43	
Radius:		2515.00
Delta:		03°19'31.76"
Left		
Degree of Curvature(Arc):		02°16'41.38"
Length:		145.97
Tangent:		73.01
Chord:		145.95
Middle Ordinate:		1.06
External:		1.06
Tangent Back Direction:		S43°46'28.46"E
Radial Direction:		S46°13'31.54"W
Chord Direction:		S45°26'14.35"E
Radial Direction:		S42°53'59.77"W
Tangent Ahead Direction:		S47°06'00.23"E
	PT	1099+31.48 R1
501331.90	10539619.43	
	POT	1151+69.27 R1
505168.81	10536053.96	
Tangential Direction:		S47°06'00.23"E
Tangential Length:		5237.79

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140855
LICENSED
PROFESSIONAL ENGINEER

Karla Rios, P.E.

10/30/2023

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SH 20

ROADWAY
ALIGNMENT DATA

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		38

DATE: 10/27/2023 2:10:50 PM
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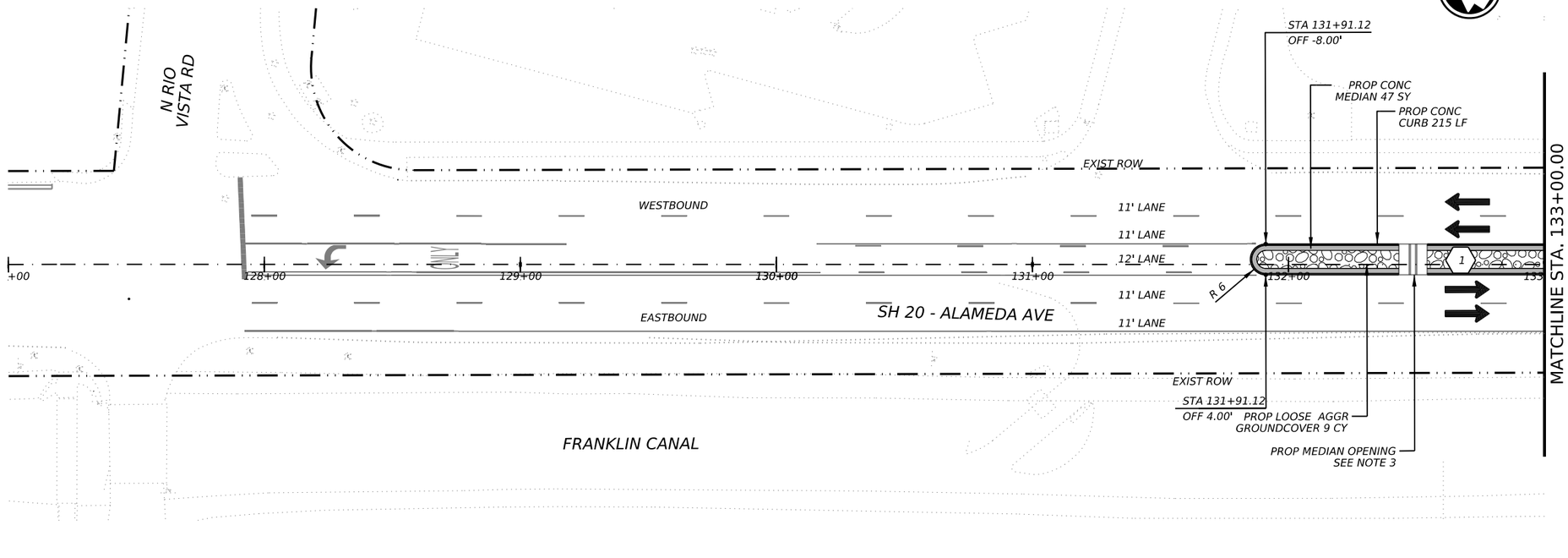


LEGEND

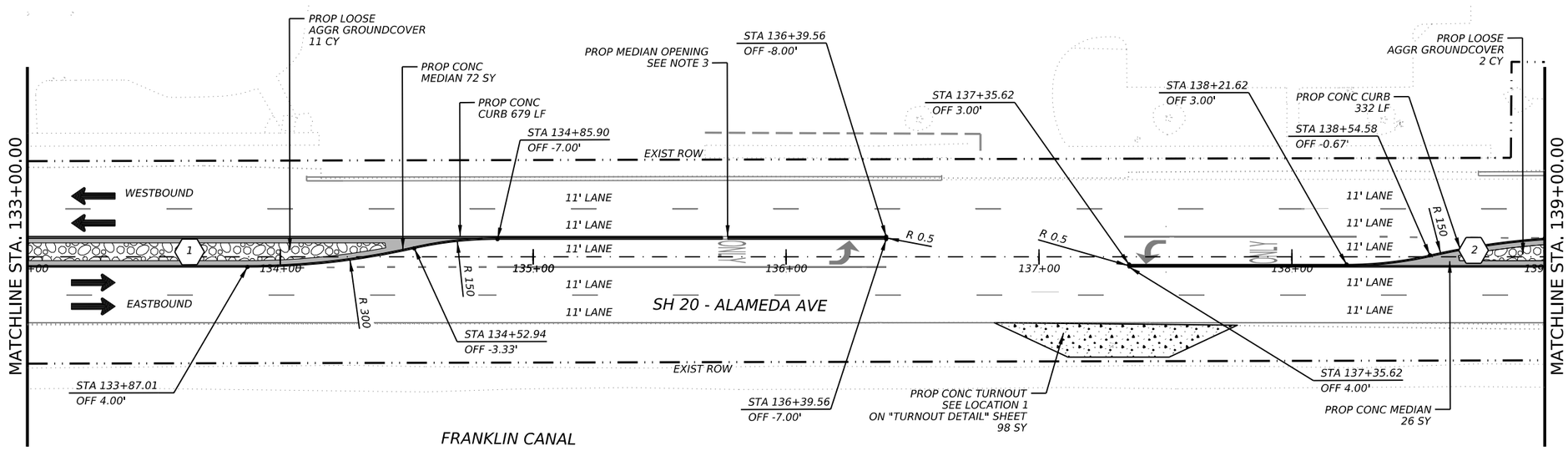
- EXISTING TRAVEL LANE DIRECTION
- PROPOSED CONC CURB
- PROPOSED CONC MEDIAN
- PROPOSED LOOSE AGGREGATE GROUND COVER
- # MEDIAN NUMBER
- ROW LINE

NOTES:

1. SEE "SIGNING AND PAVEMENT MARKINGS LAYOUT " FOR ADDITIONAL INFORMATION ON PROPOSED SIGNS AND PAVEMENT MARKINGS.
2. SEE "TURNOUT DETAIL" SHEET FOR ADDITIONAL INFORMATION.
3. SEE "DRAINAGE AREA LAYOUT" SHEETS FOR MEDIAN OPENING LOCATIONS.

MEDIAN LAYOUT ESTIMATE SHEET 1 OF 11

ITEM	CODE	DESCRIPTION	UNIT	QTY
529	6005	CONC CURB (MONO) (TY II)	LF	1226
530	6004	DRIVEWAYS (CONC)	SY	98
536	6002	CONC MEDIAN	SY	145
1005	6001	LOOSE AGGR FOR GROUNDCOVER (TYPE I)	CY	17



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SH 20

MEDIAN LAYOUT
BEGIN TO STA. 139+00

SHEET 1 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		39

DATE: 10/30/2023 8:56:57 AM
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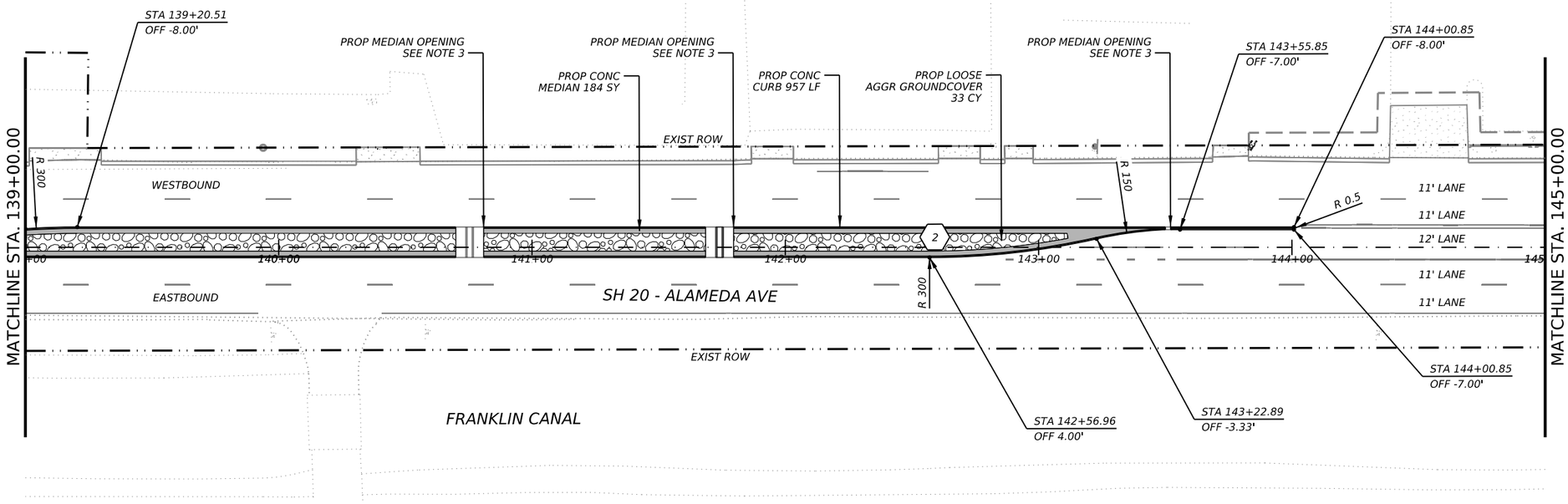


LEGEND

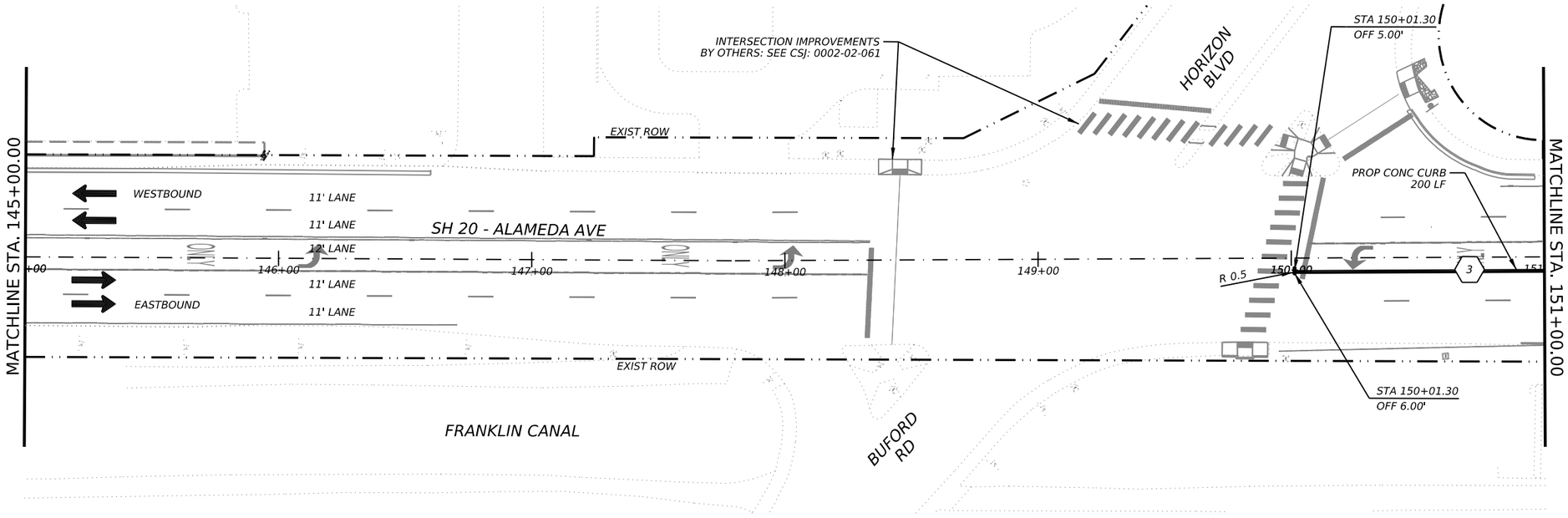
- EXISTING TRAVEL LANE DIRECTION
- PROPOSED CONC CURB
- PROPOSED CONC MEDIAN
- PROPOSED LOOSE AGGREGATE GROUND COVER
- # MEDIAN NUMBER
- ROW LINE

NOTES:

1. SEE "SIGNING AND PAVEMENT MARKINGS LAYOUT " FOR ADDITIONAL INFORMATION ON PROPOSED SIGNS AND PAVEMENT MARKINGS.
2. SEE "TURNOUT DETAIL" SHEET FOR ADDITIONAL INFORMATION.
3. SEE "DRAINAGE AREA LAYOUT" SHEETS FOR MEDIAN OPENING LOCATIONS.

MEDIAN LAYOUT ESTIMATE SHEET 2 OF 11

ITEM	CODE	DESCRIPTION	UNIT	QTY
529	6005	CONC CURB (MONO) (TY II)	LF	1157
536	6002	CONC MEDIAN	SY	184
1005	6001	LOOSE AGGR FOR GROUNDCOVER (TYPE I)	CY	33



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MEDIAN LAYOUT
STA. 139+00 TO STA. 151+00

SHEET 2 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		40

DATE: 10/30/2023 9:46:00 AM
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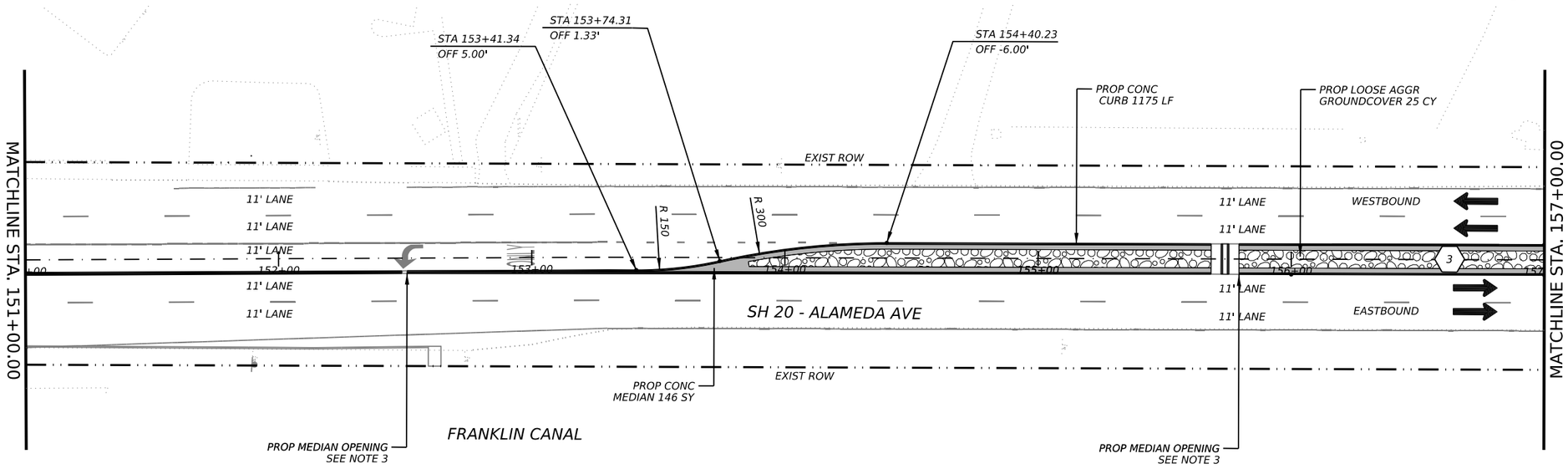


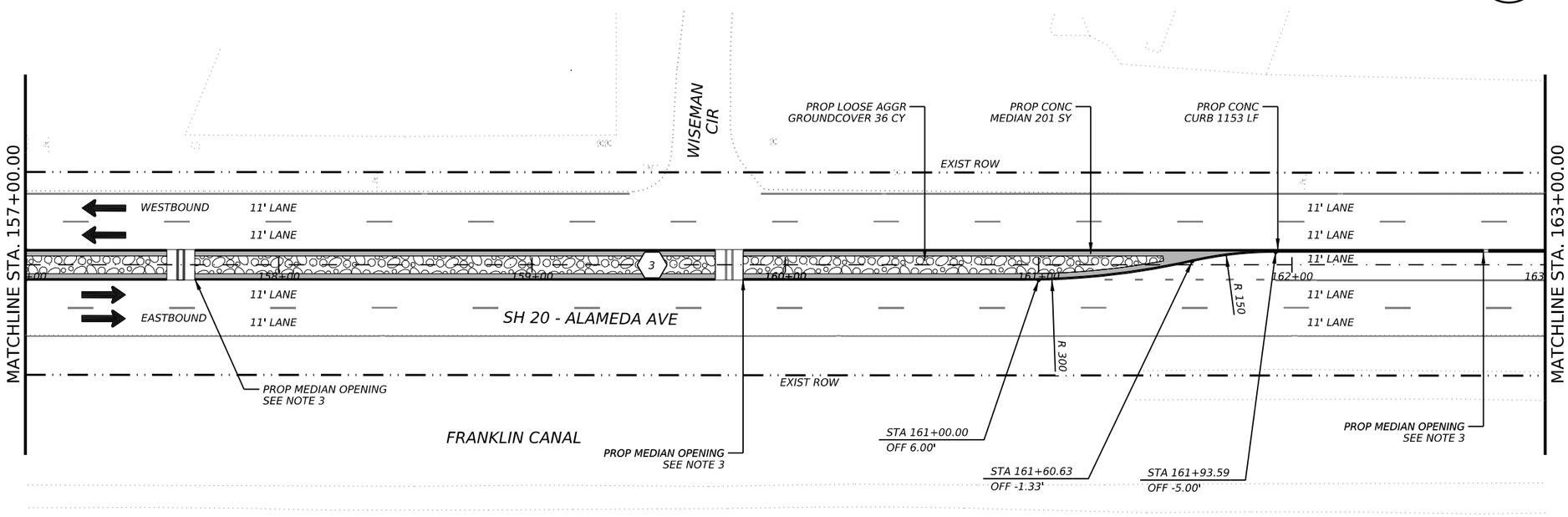
LEGEND

- EXISTING TRAVEL LANE DIRECTION
- PROPOSED CONC CURB
- PROPOSED CONC MEDIAN
- PROPOSED LOOSE AGGREGATE GROUND COVER
- # MEDIAN NUMBER
- ROW LINE

NOTES:

1. SEE "SIGNING AND PAVEMENT MARKINGS LAYOUT " FOR ADDITIONAL INFORMATION ON PROPOSED SIGNS AND PAVEMENT MARKINGS.
2. SEE "TURNOUT DETAIL" SHEET FOR ADDITIONAL INFORMATION.
3. SEE "DRAINAGE AREA LAYOUT" SHEETS FOR MEDIAN OPENING LOCATIONS.

MEDIAN LAYOUT ESTIMATE SHEET 3 OF 11				
ITEM	CODE	DESCRIPTION	UNIT	QTY
529	6005	CONC CURB (MONO) (TY II)	LF	1990
536	6002	CONC MEDIAN	SY	362
1005	6001	LOOSE AGGR FOR GROUNDCOVER (TYPE I)	CY	61



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SH 20

MEDIAN LAYOUT
STA. 151+00 TO STA. 163+00

SHEET 3 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		41

DATE: 10/30/2023 9:48:11 AM
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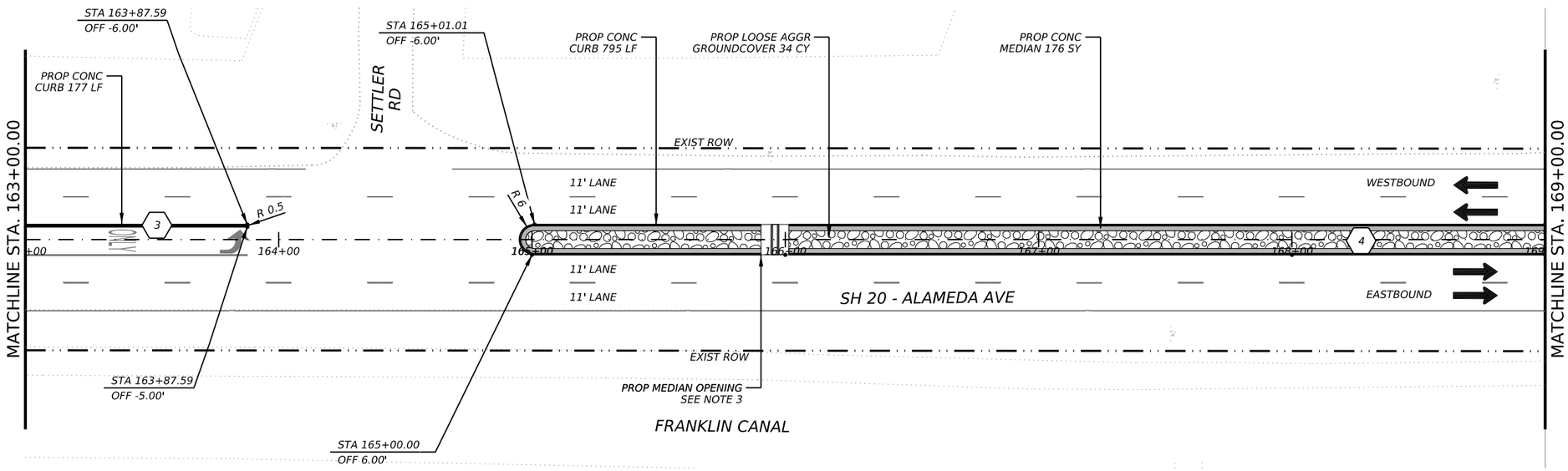


LEGEND

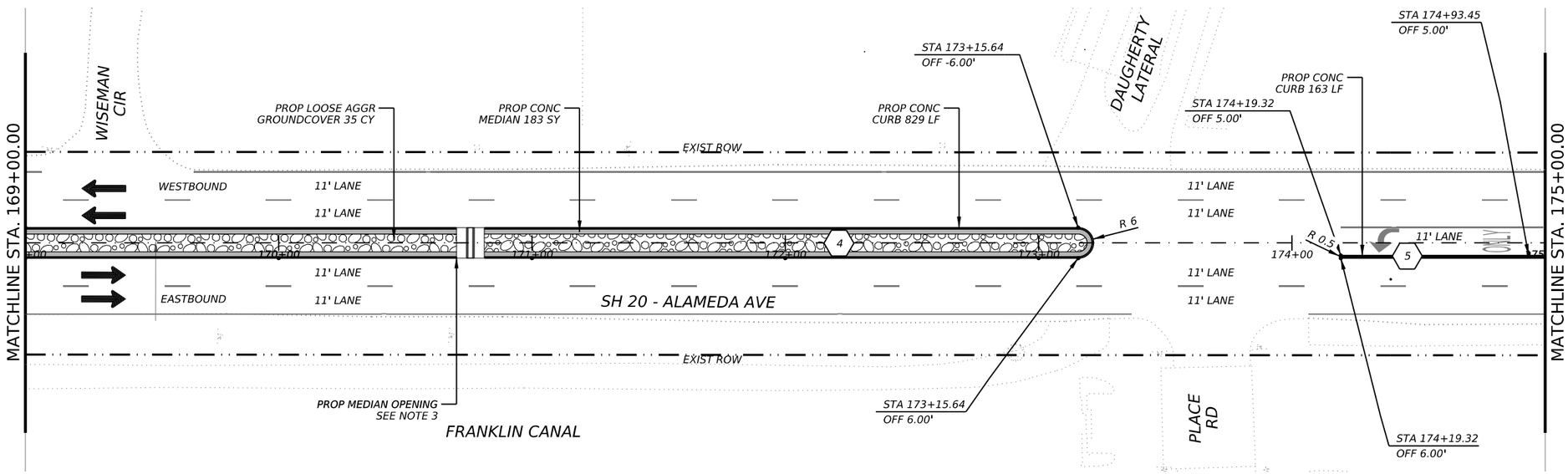
- EXISTING TRAVEL LANE DIRECTION
- PROPOSED CONC CURB
- PROPOSED CONC MEDIAN
- PROPOSED LOOSE AGGREGATE GROUND COVER
- # MEDIAN NUMBER
- ROW LINE

NOTES:

1. SEE "SIGNING AND PAVEMENT MARKINGS LAYOUT " FOR ADDITIONAL INFORMATION ON PROPOSED SIGNS AND PAVEMENT MARKINGS.
2. SEE "TURNOUT DETAIL" SHEET FOR ADDITIONAL INFORMATION.
3. SEE "DRAINAGE AREA LAYOUT" SHEETS FOR MEDIAN OPENING LOCATIONS.

MEDIAN LAYOUT ESTIMATE SHEET 4 OF 11

ITEM	CODE	DESCRIPTION	UNIT	QTY
529	6005	CONC CURB (MONO) (TY II)	LF	1964
536	6002	CONC MEDIAN	SY	370
1005	6001	LOOSE AGGR FOR GROUNDCOVER (TYPE I)	CY	69



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SH 20

MEDIAN LAYOUT
STA. 163+00 TO STA. 175+00

SHEET 4 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		42

DATE: 10/30/2023 8:57:58 AM
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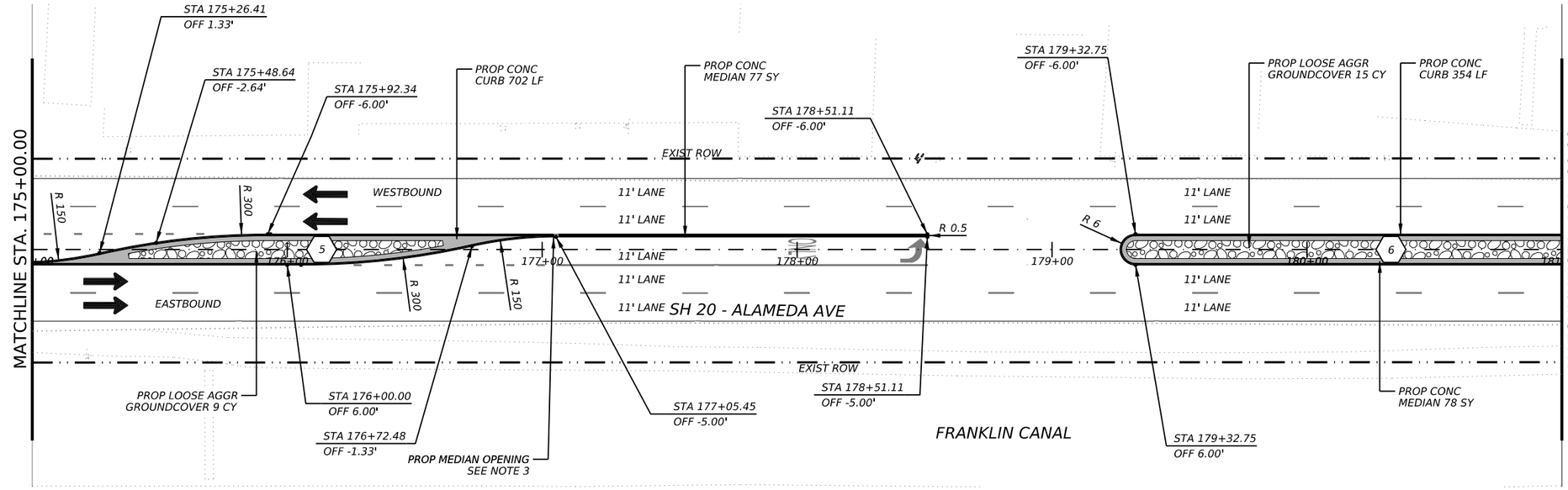


LEGEND

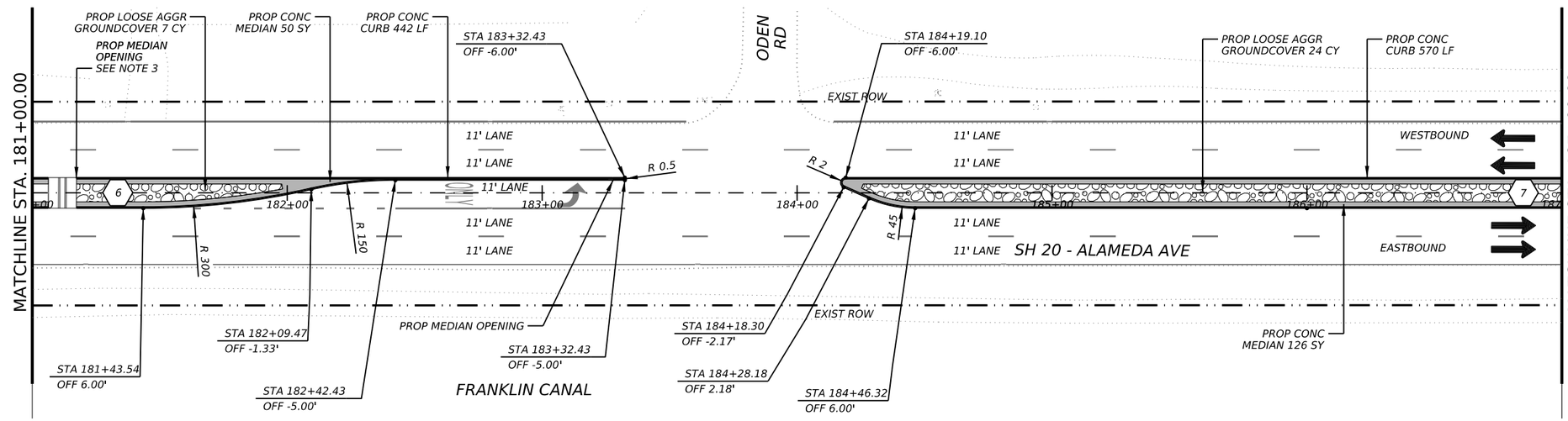
- EXISTING TRAVEL LANE DIRECTION
- PROPOSED CONC CURB
- PROPOSED CONC MEDIAN
- PROPOSED LOOSE AGGREGATE GROUND COVER
- # MEDIAN NUMBER
- ROW LINE

NOTES:

1. SEE "SIGNING AND PAVEMENT MARKINGS LAYOUT " FOR ADDITIONAL INFORMATION ON PROPOSED SIGNS AND PAVEMENT MARKINGS.
2. SEE "TURNOUT DETAIL" SHEET FOR ADDITIONAL INFORMATION.
3. SEE "DRAINAGE AREA LAYOUT" SHEETS FOR MEDIAN OPENING LOCATIONS.

MEDIAN LAYOUT ESTIMATE SHEET 5 OF 11

ITEM	CODE	DESCRIPTION	UNIT	QTY
529	6005	CONC CURB (MONO) (TY II)	LF	2072
536	6002	CONC MEDIAN	SY	331
1005	6001	LOOSE AGGR FOR GROUNDCOVER (TYPE I)	CY	55



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SH 20

MEDIAN LAYOUT
STA. 175+00 TO STA. 187+00

SHEET 5 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		43

DATE: 10/30/2023 8:58:25 AM
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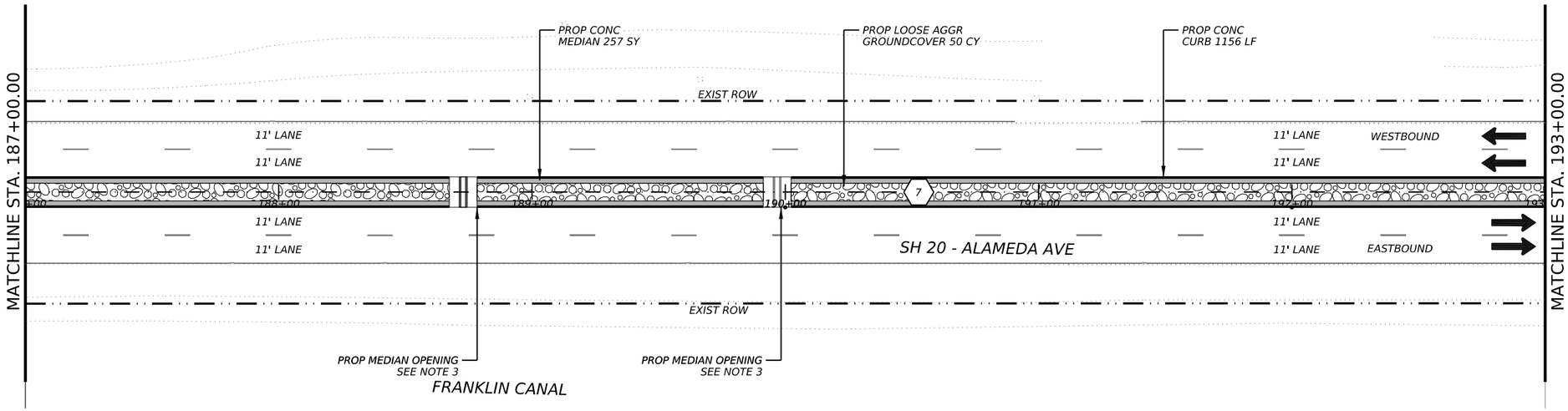


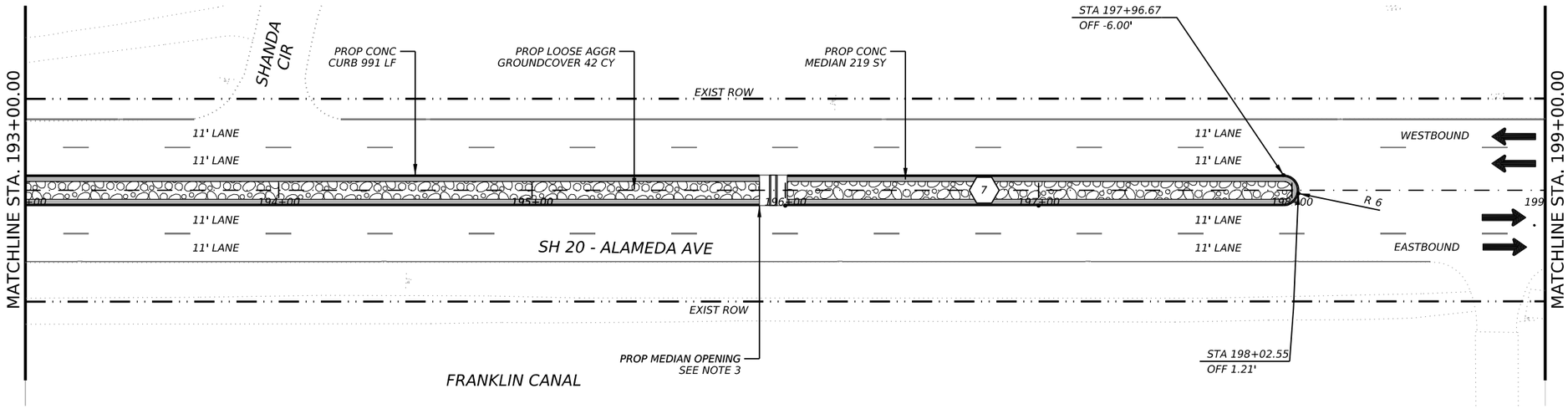
LEGEND

- EXISTING TRAVEL LANE DIRECTION
- PROPOSED CONC CURB
- PROPOSED CONC MEDIAN
- PROPOSED LOOSE AGGREGATE GROUND COVER
- # MEDIAN NUMBER
- ROW LINE

NOTES:

1. SEE "SIGNING AND PAVEMENT MARKINGS LAYOUT " FOR ADDITIONAL INFORMATION ON PROPOSED SIGNS AND PAVEMENT MARKINGS.
2. SEE "TURNOUT DETAIL" SHEET FOR ADDITIONAL INFORMATION.
3. SEE "DRAINAGE AREA LAYOUT" SHEETS FOR MEDIAN OPENING LOCATIONS.

MEDIAN LAYOUT ESTIMATE SHEET 6 OF 11				
ITEM	CODE	DESCRIPTION	UNIT	QTY
529	6005	CONC CURB (MONO) (TY II)	LF	2143
536	6002	CONC MEDIAN	SY	476
1005	6001	LOOSE AGGR FOR GROUNDCOVER (TYPE I)	CY	93



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Texas Department of Transportation

SH 20

MEDIAN LAYOUT
STA. 187+00 TO STA. 199+00

SHEET 6 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		44

DATE: 10/30/2023 8:58:51 AM
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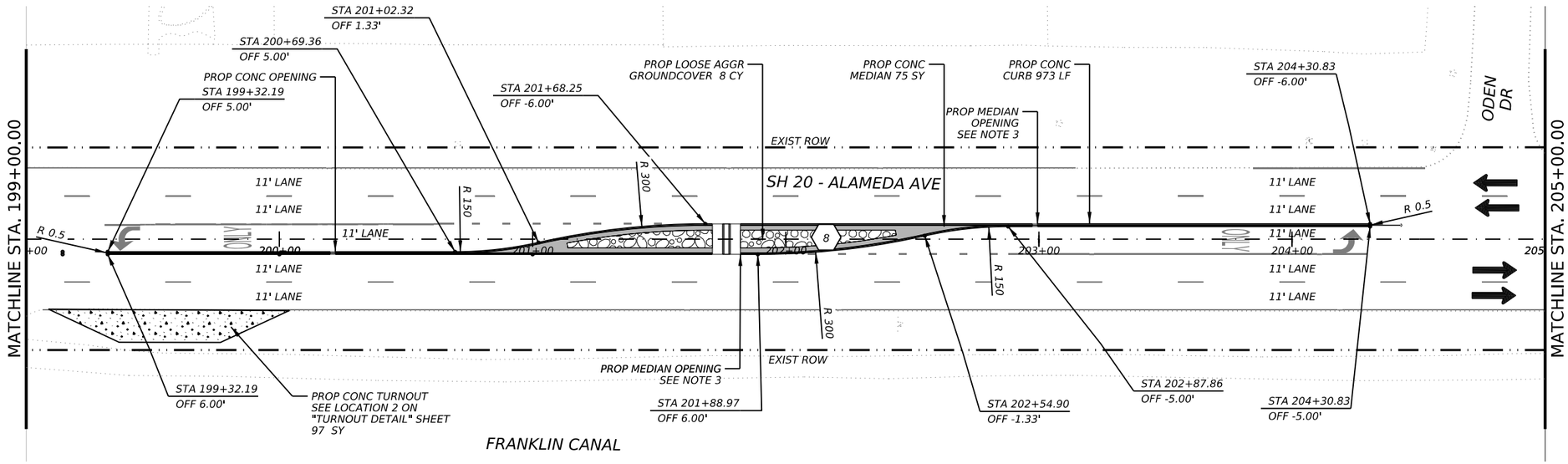
DW:
CK:
DW:



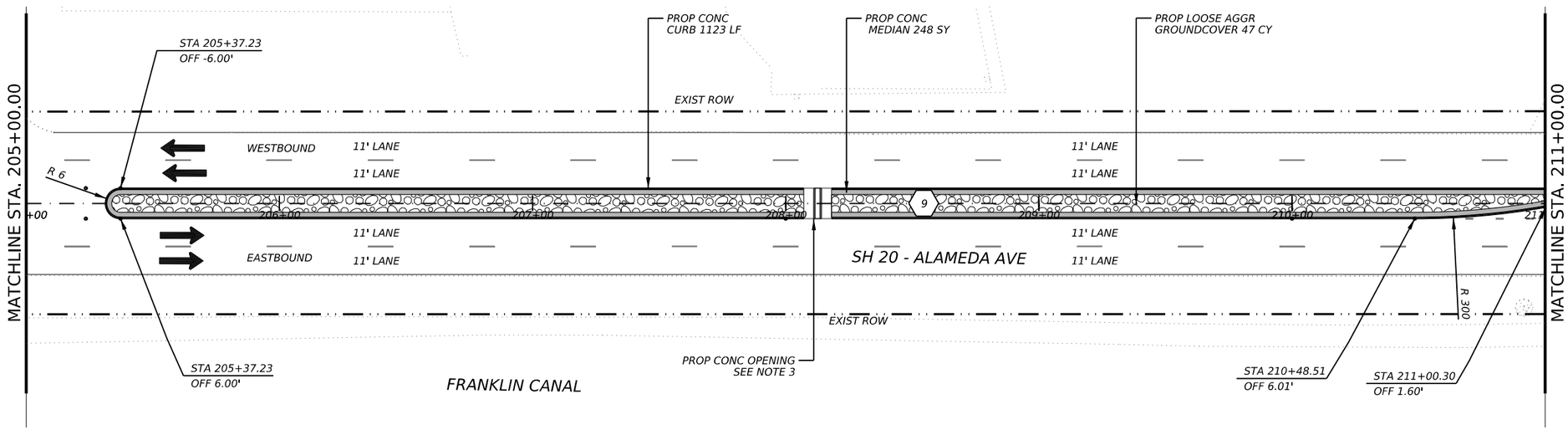
LEGEND

- EXISTING TRAVEL LANE DIRECTION
- PROPOSED CONC CURB
- PROPOSED CONC MEDIAN
- PROPOSED LOOSE AGGREGATE GROUND COVER
- # MEDIAN NUMBER
- ROW LINE

NOTES:

1. SEE "SIGNING AND PAVEMENT MARKINGS LAYOUT " FOR ADDITIONAL INFORMATION ON PROPOSED SIGNS AND PAVEMENT MARKINGS.
2. SEE "TURNOUT DETAIL" SHEET FOR ADDITIONAL INFORMATION.
3. SEE "DRAINAGE AREA LAYOUT" SHEETS FOR MEDIAN OPENING LOCATIONS.

MEDIAN LAYOUT ESTIMATE SHEET 7 OF 11				
ITEM	CODE	DESCRIPTION	UNIT	QTY
529	6005	CONC CURB (MONO) (TY II)	LF	2122
530	6004	DRIVEWAYS (CONC)	SY	97
536	6002	CONC MEDIAN	SY	323
1005	6001	LOOSE AGGR FOR GROUNDCOVER (TYPE I)	CY	55



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MEDIAN LAYOUT
STA. 199+00 TO STA. 211+00

SHEET 7 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		45

DATE: 10/30/2023 8:59:15 AM
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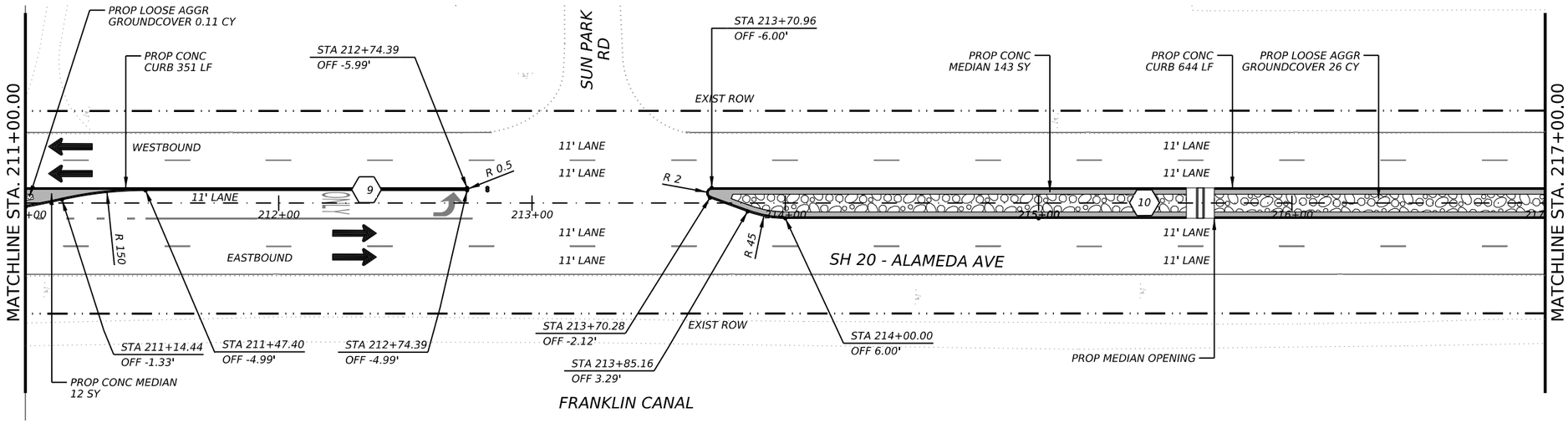


LEGEND

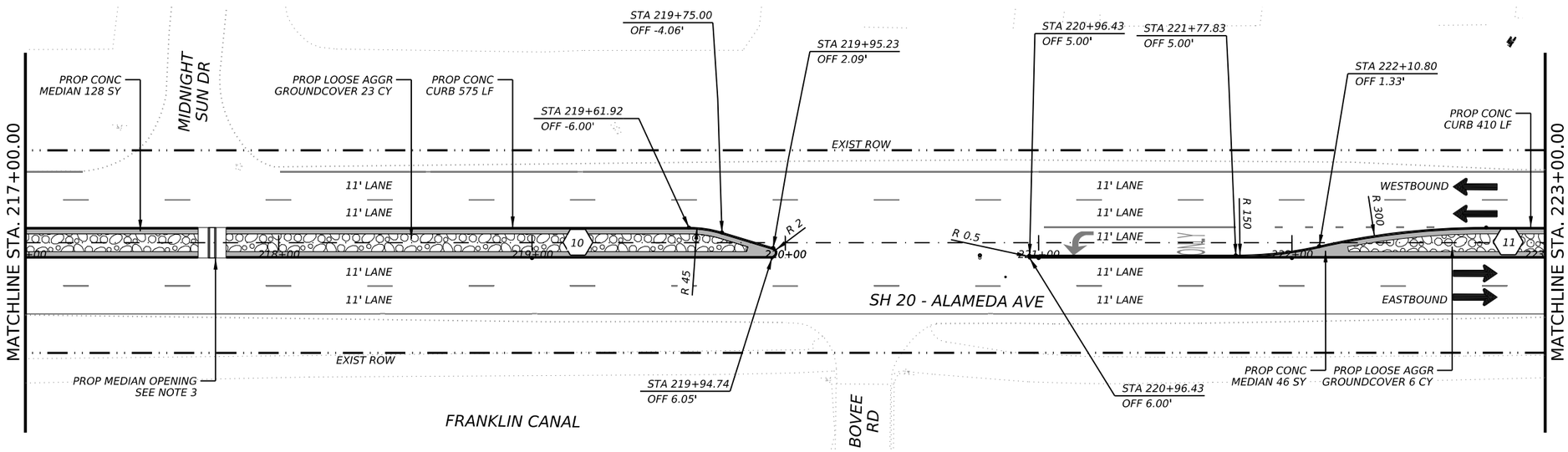
- EXISTING TRAVEL LANE DIRECTION
- PROPOSED CONC CURB
- PROPOSED CONC MEDIAN
- PROPOSED LOOSE AGGREGATE GROUND COVER
- # MEDIAN NUMBER
- ROW LINE

NOTES:

1. SEE "SIGNING AND PAVEMENT MARKINGS LAYOUT " FOR ADDITIONAL INFORMATION ON PROPOSED SIGNS AND PAVEMENT MARKINGS.
2. SEE "TURNOUT DETAIL" SHEET FOR ADDITIONAL INFORMATION.
3. SEE "DRAINAGE AREA LAYOUT" SHEETS FOR MEDIAN OPENING LOCATIONS.

MEDIAN LAYOUT ESTIMATE SHEET 8 OF 11

ITEM	CODE	DESCRIPTION	UNIT	QTY
529	6005	CONC CURB (MONO) (TY II)	LF	1843
536	6002	CONC MEDIAN	SY	283
1005	6001	LOOSE AGGR FOR GROUNDCOVER (TYPE I)	CY	49



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MEDIAN LAYOUT
STA. 211+00 TO STA. 223+00

SHEET 8 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		46

DATE: 10/30/2023 8:59:42 AM
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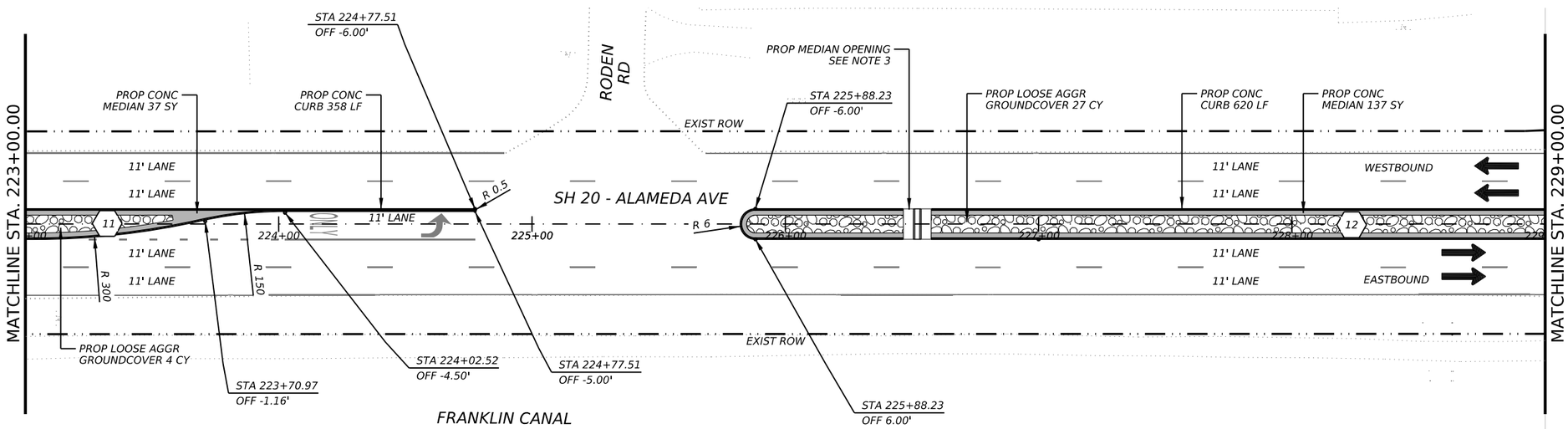


LEGEND

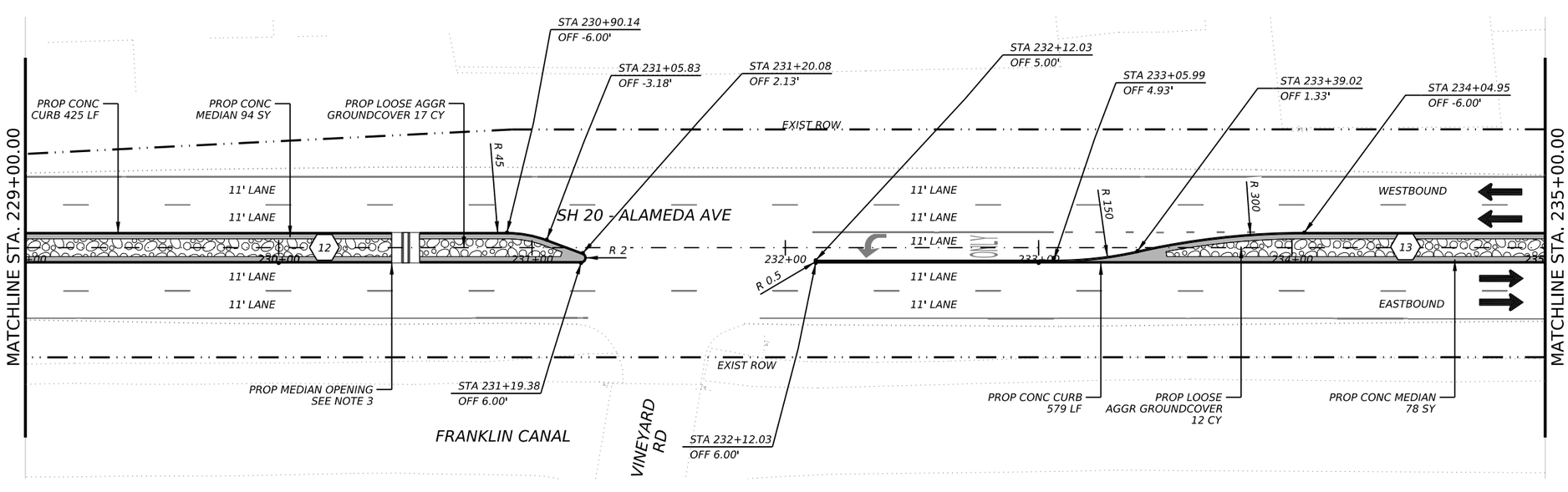
- EXISTING TRAVEL LANE DIRECTION
- PROPOSED CONC CURB
- PROPOSED CONC MEDIAN
- PROPOSED LOOSE AGGREGATE GROUND COVER
- # MEDIAN NUMBER
- ROW LINE

NOTES:

1. SEE "SIGNING AND PAVEMENT MARKINGS LAYOUT " FOR ADDITIONAL INFORMATION ON PROPOSED SIGNS AND PAVEMENT MARKINGS.
2. SEE "TURNOUT DETAIL" SHEET FOR ADDITIONAL INFORMATION.
3. SEE "DRAINAGE AREA LAYOUT" SHEETS FOR MEDIAN OPENING LOCATIONS.

MEDIAN LAYOUT ESTIMATE SHEET 9 OF 11

ITEM	CODE	DESCRIPTION	UNIT	QTY
529	6005	CONC CURB (MONO) (TY II)	LF	1982
536	6002	CONC MEDIAN	SY	345
1005	6001	LOOSE AGGR FOR GROUNDCOVER (TYPE I)	CY	59



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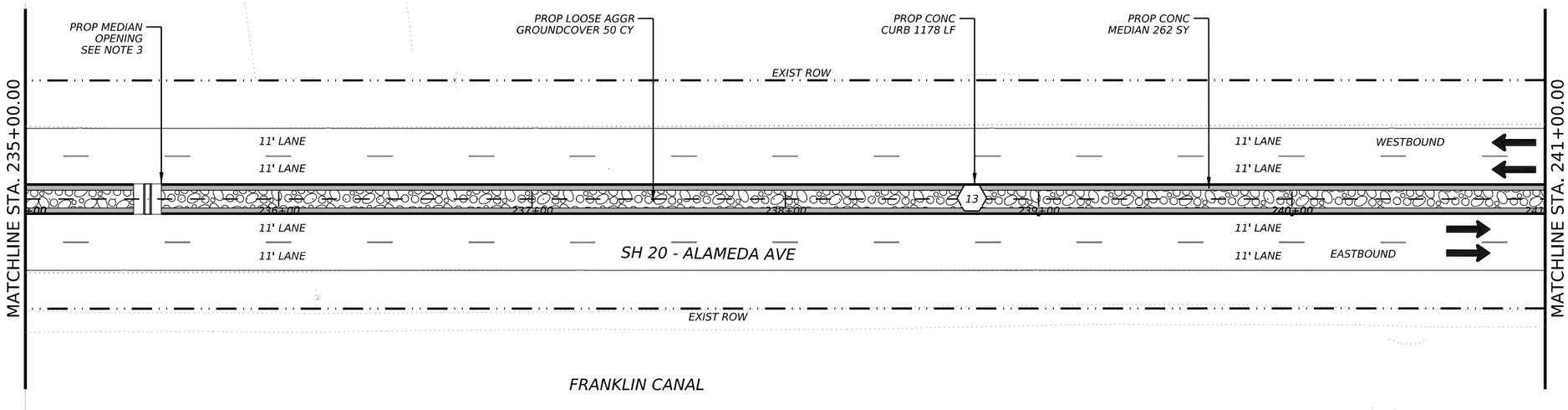
SH 20

MEDIAN LAYOUT
STA. 223+00 TO STA. 235+00

SHEET 9 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		47

DATE: 10/30/2023 9:00:07 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT5/Documents/24 - ELP/Design Projects/000220059/4 - Design/Plan Set/3. Roadway/SH20_RDWY09.dgn



LEGEND

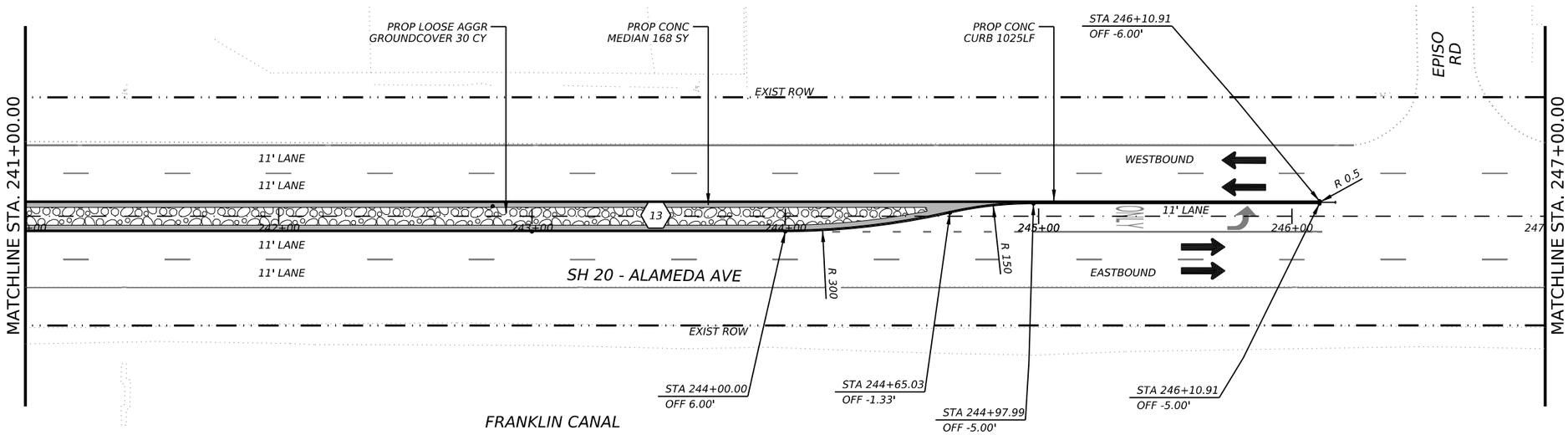
- EXISTING TRAVEL LANE DIRECTION
- PROPOSED CONC CURB
- PROPOSED CONC MEDIAN
- PROPOSED LOOSE AGGREGATE GROUND COVER
- # MEDIAN NUMBER
- ROW LINE

NOTES:

1. SEE "SIGNING AND PAVEMENT MARKINGS LAYOUT " FOR ADDITIONAL INFORMATION ON PROPOSED SIGNS AND PAVEMENT MARKINGS.
2. SEE "TURNOUT DETAIL" SHEET FOR ADDITIONAL INFORMATION.
3. SEE "DRAINAGE AREA LAYOUT" SHEETS FOR MEDIAN OPENING LOCATIONS.

MEDIAN LAYOUT ESTIMATE SHEET 10 OF 11

ITEM	CODE	DESCRIPTION	UNIT	QTY
529	6005	CONC CURB (MONO) (TY II)	LF	2203
536	6002	CONC MEDIAN	SY	430
1005	6001	LOOSE AGGR FOR GROUNDCOVER (TYPE I)	CY	80



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MEDIAN LAYOUT
STA. 235+00 TO STA. 247+00

SHEET10 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		48

DATE: 10/30/2023 9:00:31 AM
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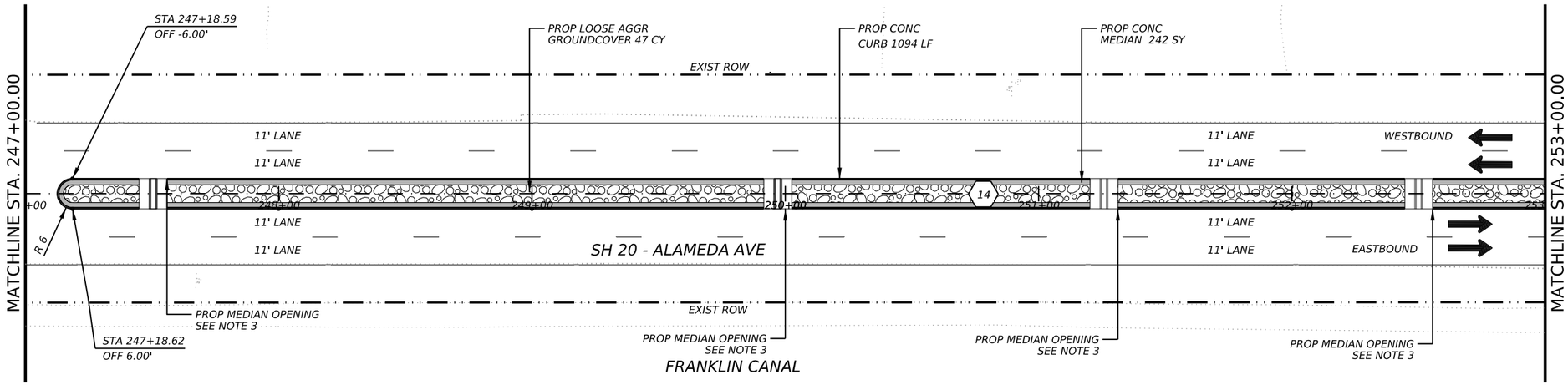


LEGEND

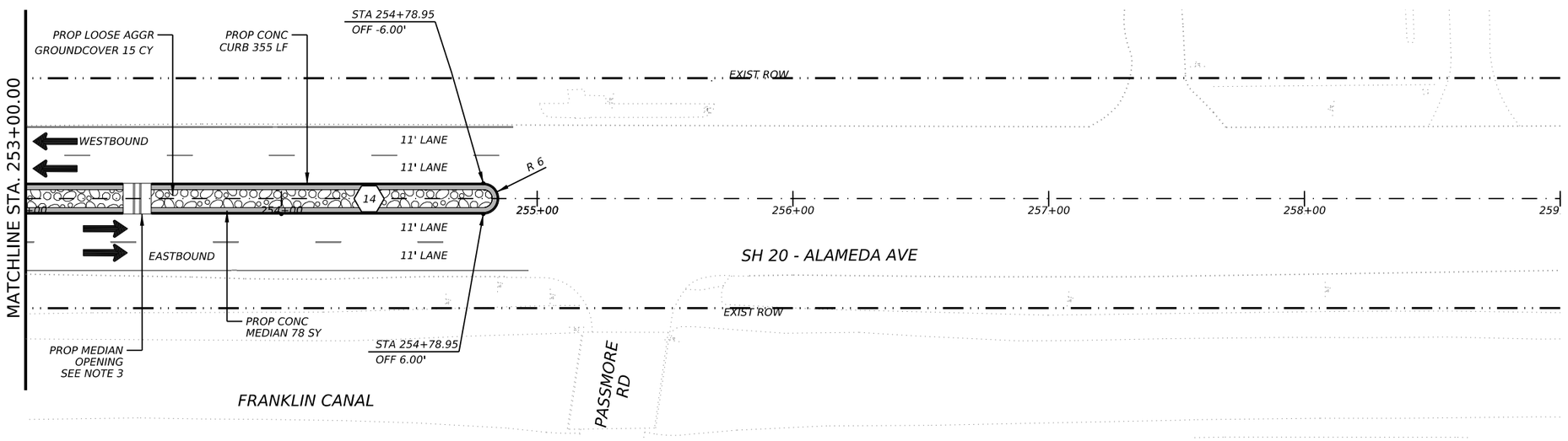
- EXISTING TRAVEL LANE DIRECTION
- PROPOSED CONC CURB
- PROPOSED CONC MEDIAN
- PROPOSED LOOSE AGGREGATE GROUND COVER
- # MEDIAN NUMBER
- ROW LINE

NOTES:

1. SEE "SIGNING AND PAVEMENT MARKINGS LAYOUT " FOR ADDITIONAL INFORMATION ON PROPOSED SIGNS AND PAVEMENT MARKINGS.
2. SEE "TURNOUT DETAIL" SHEET FOR ADDITIONAL INFORMATION.
3. SEE "DRAINAGE AREA LAYOUT" SHEETS FOR MEDIAN OPENING LOCATIONS.

MEDIAN LAYOUT ESTIMATE SHEET 11 OF 11

ITEM	CODE	DESCRIPTION	UNIT	QTY
529	6005	CONC CURB (MONO) (TY II)	LF	1404
536	6002	CONC MEDIAN	SY	321
1005	6001	LOOSE AGGR FOR GROUNDCOVER (TYPE I)	CY	62



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SH 20

MEDIAN LAYOUT
STA. 247+00 TO END

SHEET 11 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		49

DATE: 10/30/2023 9:01:00 AM
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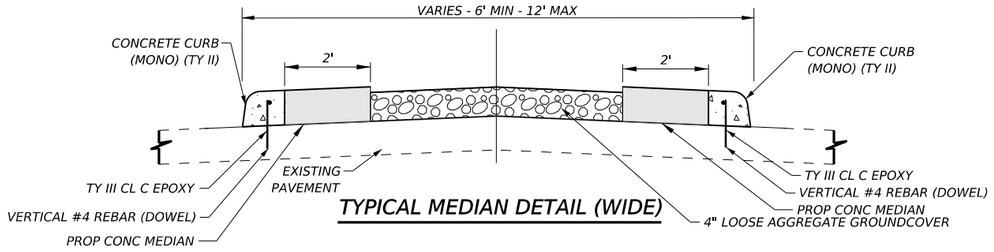
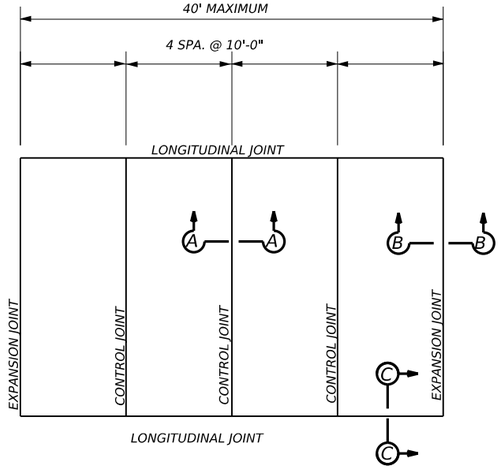


TYPICAL MEDIAN DETAIL (WIDE)



CONCRETE JOINT DIAGRAM

NOTES:

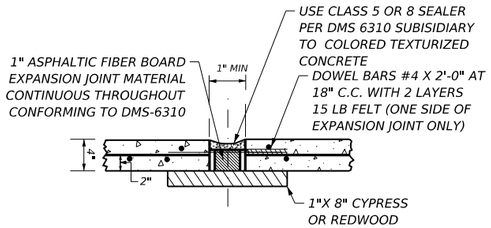
1. REFER TO CCCG-22 (MOD) FOR GENERAL NOTES ON CURB INSTALLATION.
2. ONE- HALF INCH EXPANSION JOINT MATERIAL SHALL BE PROVIDED WHERE CURB OR CURB AND GUTTER IS ADJACENT TO SIDEWALK OR CONCRETE.

CONCRETE MEDIAN NOTES:

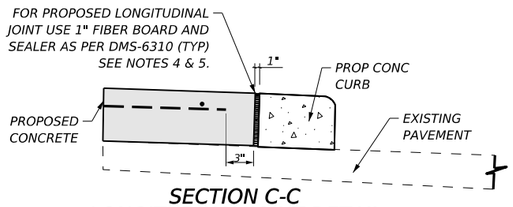
1. PLACE CONTROL, LONGITUDINAL AND EXPANSION JOINTS AS SHOWN OR DIRECTED. MATERIALS AND LABOR ARE SUBSIDIARY TO ITEM 536.
2. REFER TO "MEDIAN LAYOUT SHEETS" SHEETS FOR CONCRETE MEDIAN LOCATION, QUANTITY, AND PAY ITEMS.
3. EXISTING STRIPING AND RPMs UNDER PROPOSED MEDIAN SHALL BE REMOVED PRIOR TO MEDIAN INSTALLATION. STRIPING AND RPMs REMOVAL WILL BE PAID FOR UNDER ITEM 677 "ELIMINATE EXISTING PAVEMENT MARKINGS AND MARKERS".

CURB DETAIL (MEDIAN WIDTH 2' - 5')

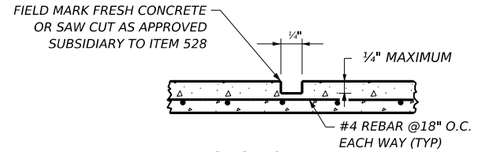
CURB DETAIL (MEDIAN WIDTH 1')



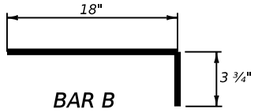
SECTION B-B EXPANSION JOINT



SECTION C-C LONGITUDINAL JOINT DETAIL



SECTION A-A CONTROL JOINT



BAR B

BAR B WILL BE LAPPED ON MEDIANS WITH WIDTH BETWEEN 2' TO 5'

BAR C

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SH 20

MISCELLANEOUS DETAILS

SHEET 1 OF 1

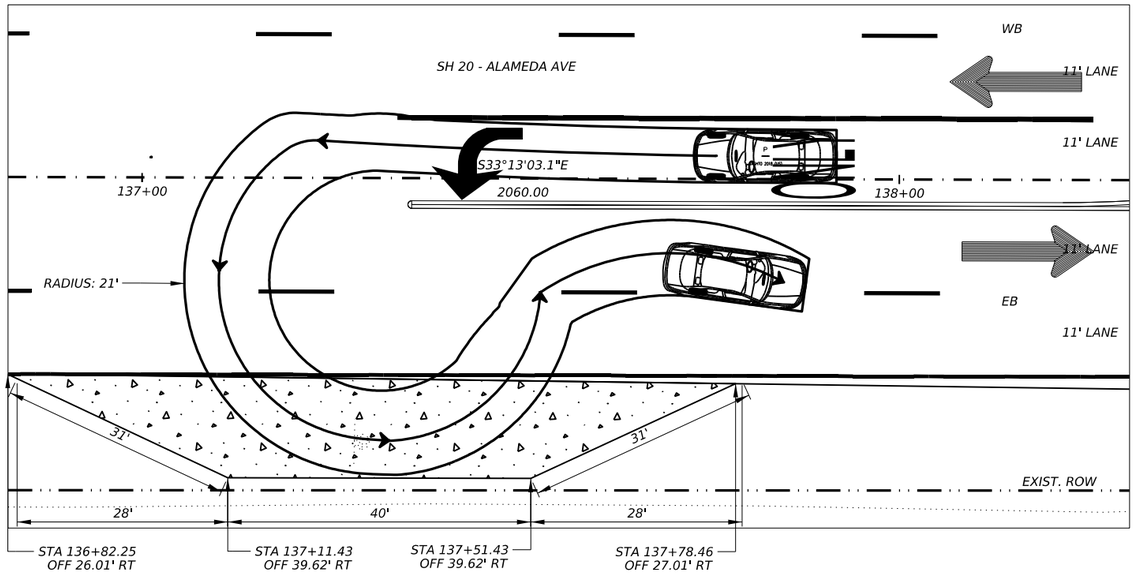
CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		50

DATE: 10/27/2023 2:13:03 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT5/Documents/24 - ELP/Design Projects/0002020059/4 - Design/Plan Set/3. Roadway/SH20 MISC DETS

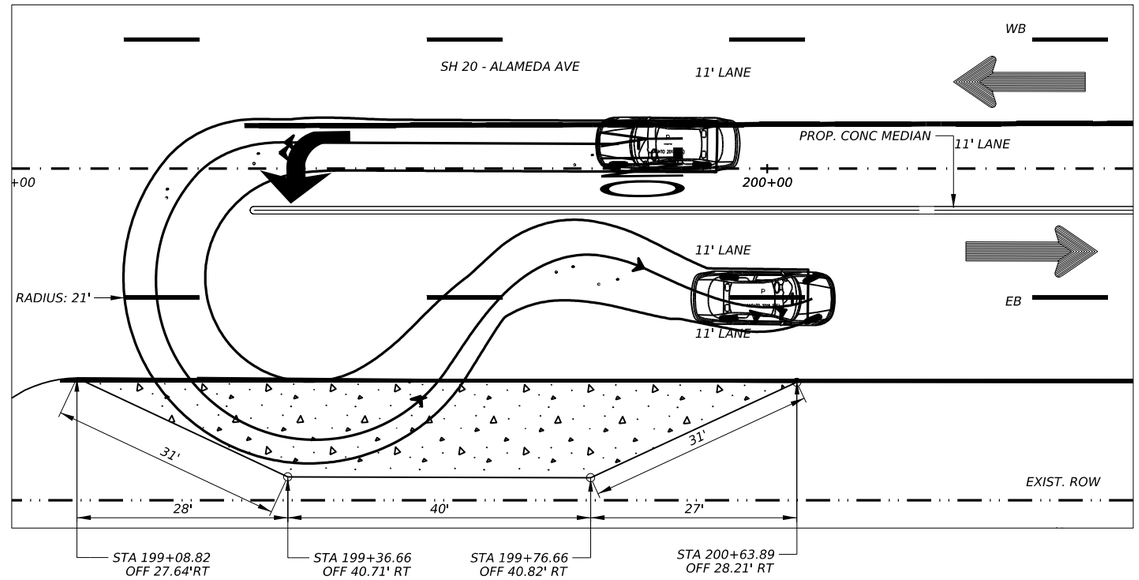
DN: CK: DW: CK:

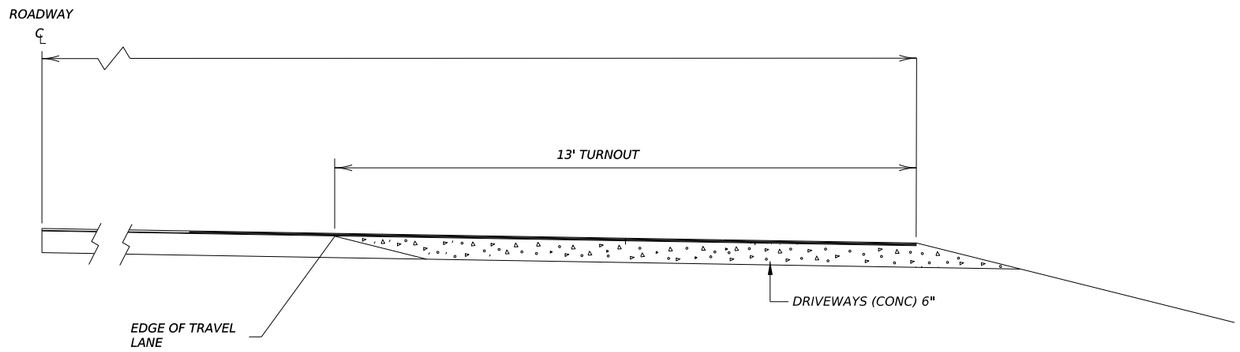
CK
DW
CK
DW

TURNOUT DETAIL LOCATION 1



TURNOUT DETAIL LOCATION 2





TYPICAL SECTION

NOTES:
1. REFFER TO "MEDIAN LAYOUT SHEETS FOR QUANTITIES AND ADDITIONAL INFOTMATION.

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SH 20

TURNOUT DETAIL

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		51

DATE: 10/27/2023 2:13:41 PM
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DATE:
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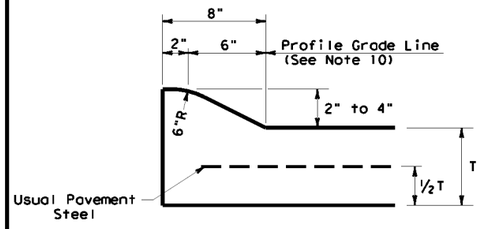
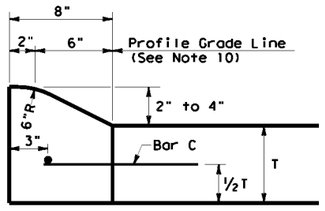
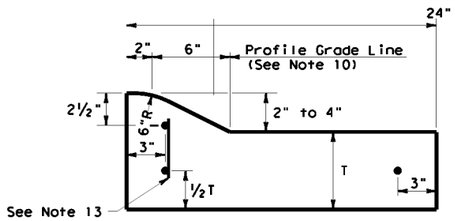


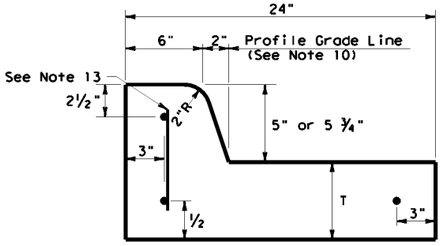
TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



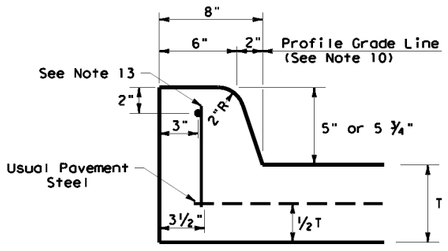
TYPE I CURB
2" - 4" HEIGHT



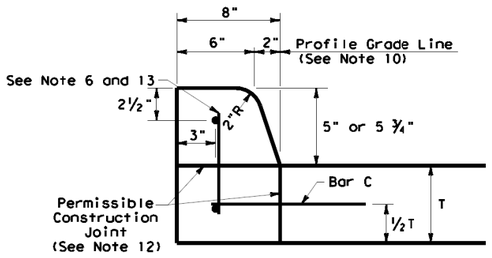
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



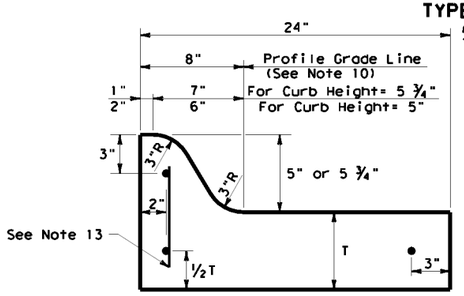
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



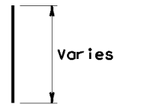
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



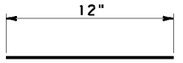
TYPE II CURB
5" - 5 ¾" HEIGHT



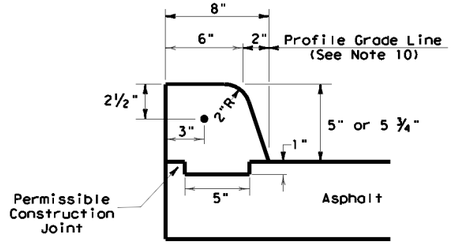
TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT



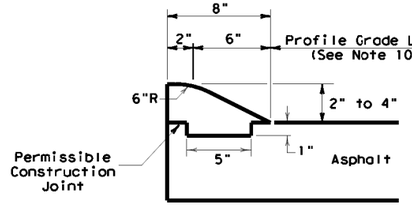
BAR B



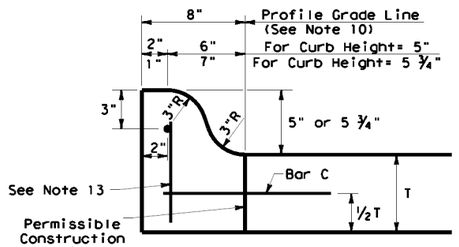
BAR C



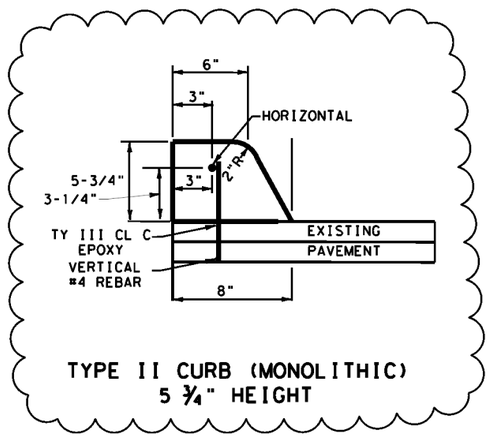
TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



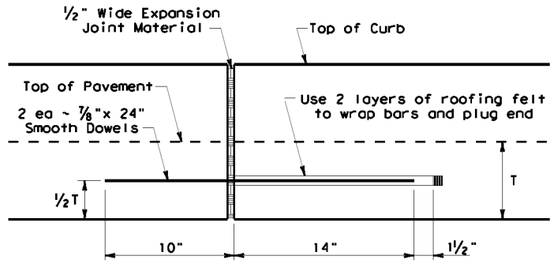
TYPE III CURB (KEYED)
2" - 4" HEIGHT



TYPE IIa CURB
5" - 5 ¾" HEIGHT

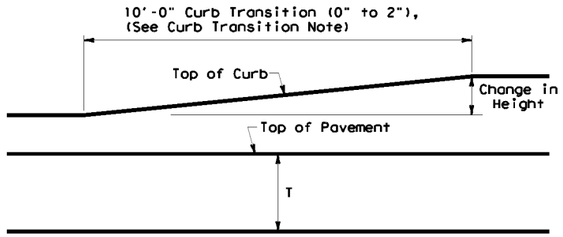


TYPE II CURB (MONOLITHIC)
5 ¾" HEIGHT



EXPANSION JOINT DETAIL

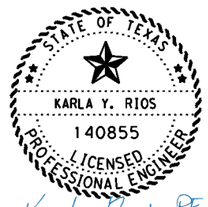
CURB TRANSITION NOTE:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



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 fiber reinforced concrete in lieu of reinforcing steel is acceptable. Use fibers meeting the requirements of DMS 4550, "Fibers for Concrete," and dose fibers in accordance with Material Producers List (MPL) "Fibers for Class A and B Concrete Applications."
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 to be placed on existing concrete pavement, Bar B may be drilled and grouted in place, or may be inserted into fresh concrete.
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 horizontal permissible construction joints are used, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans. Reinforcing steel for curb section shall then conform to that required for concrete curb.
13. Bar B placement as needed (typically at four ft. C-C) to support curb reinforcing steel during concrete placement.



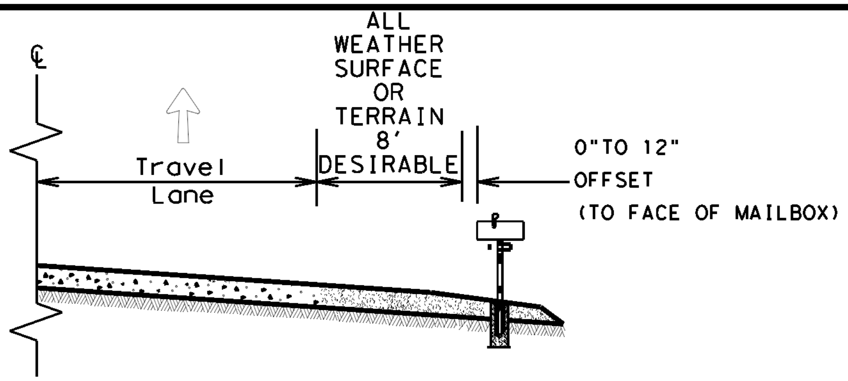
Texas Department of Transportation

Design Division Standard

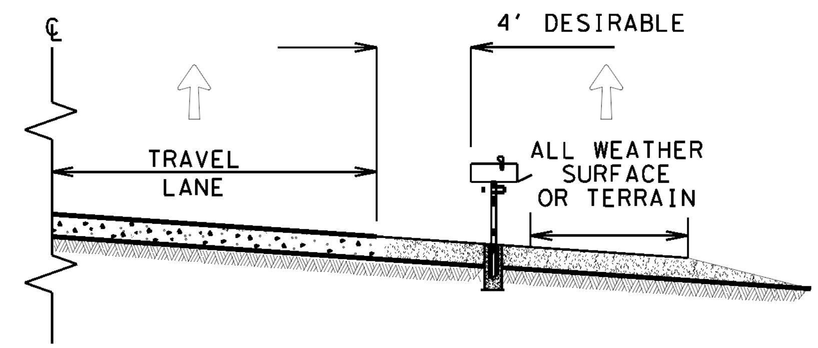
CONCRETE CURB AND CURB AND GUTTER

CCCG-22 (MOD)

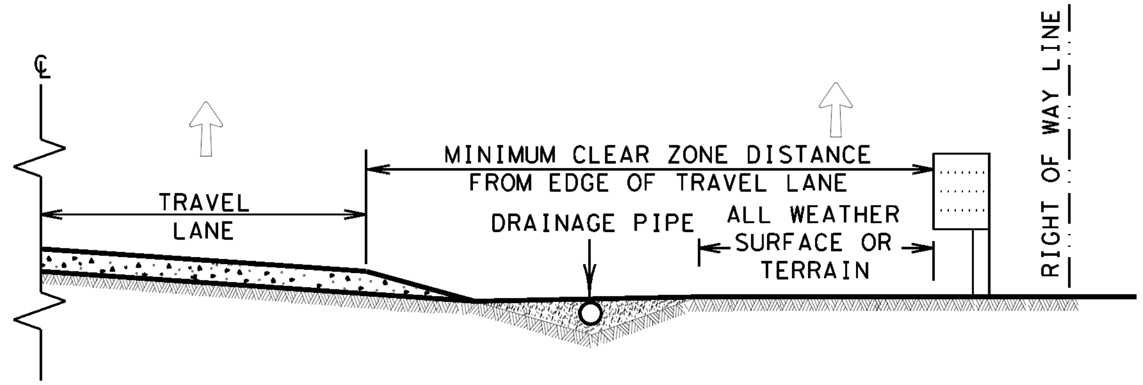
FILE: cccg21.dgn	DN: TXDOT	CK: AN	DW: CS	CK: KM
©TxDOT: JUNE 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0002	02	059, ETC.	SH 20
	DIST	COUNTY		SHEET NO.
	ELP	EL PASO		52



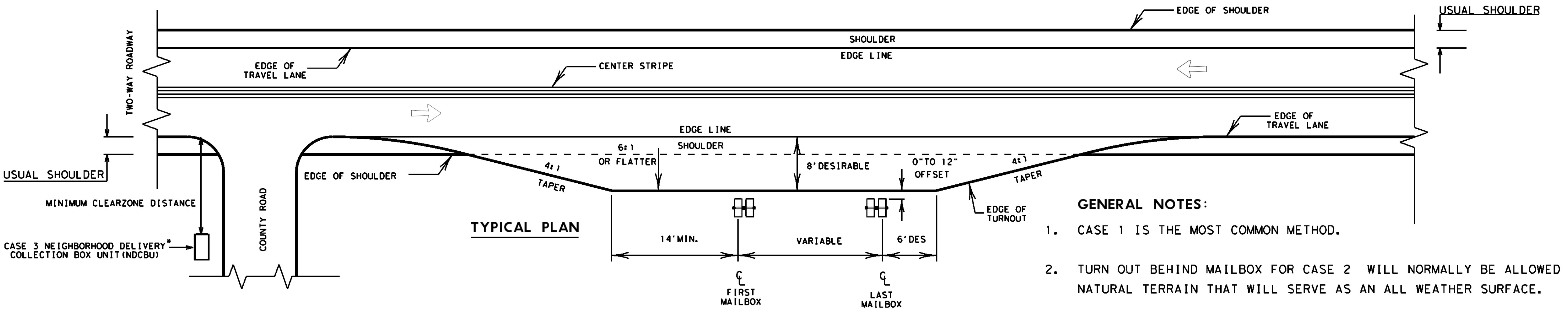
CASE 1. OFF TRAVEL WAY DELIVERY



CASE 2. BACK SIDE DELIVERY



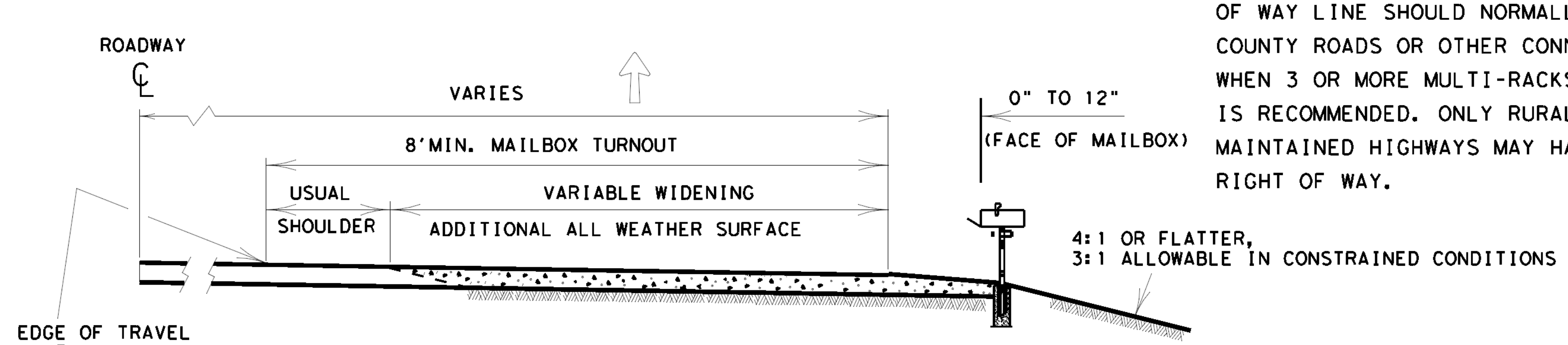
CASE 3. DELIVERY NEAR RIGHT OF WAY LINE



TYPICAL PLAN

GENERAL NOTES:

1. CASE 1 IS THE MOST COMMON METHOD.
2. TURN OUT BEHIND MAILBOX FOR CASE 2 WILL NORMALLY BE ALLOWED FOR NATURAL TERRAIN THAT WILL SERVE AS AN ALL WEATHER SURFACE.
3. ALL WEATHER DRIVEWAYS FOR CASE 3 MAILBOXES LOCATED AT THE RIGHT OF WAY LINE SHOULD NORMALLY BE PLACED IN CONJUNCTION WITH COUNTY ROADS OR OTHER CONNECTING COMMUNITY ROADS OR STREETS. WHEN 3 OR MORE MULTI-RACKS ARE ANTICIPATED, THE USE OF AN NDCBU IS RECOMMENDED. ONLY RURAL PATRONS LOCATED ON STATE MAINTAINED HIGHWAYS MAY HAVE A MAILBOX OR NDCBU SLOT ON TXDOT RIGHT OF WAY.



TYPICAL SECTION CASE 1

* NDCBU MAY BE INSTALLED ON COUNTY ROAD ROW WITH APPROVAL OF COUNTY.

⇧ MAIL DELIVERY VEHICLE TRAVEL DIRECTION

SHEET 1 OF 2

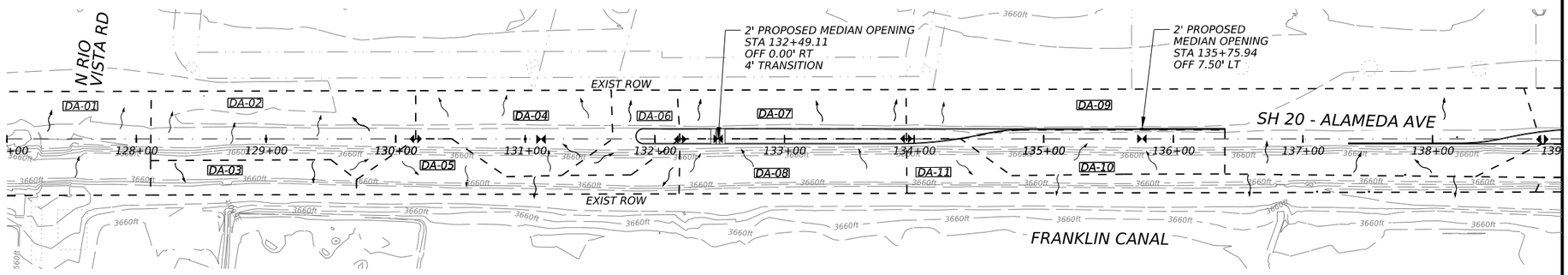
Texas Department of Transportation | Maintenance Division Standard

Guideline

MAILBOX SIDE ROAD PLACEMENT AND TURNOUTS

MBP(1)-22

FILE: MBP-22.DGN	DN: VS	CK:	DW: VS	CK:
©TxDOT OCTOBER 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 12/2012 5/2014	0002	02	059, ETC.	SH 20
	DIST		COUNTY	SHEET NO.
	ELP		EL PASO	53



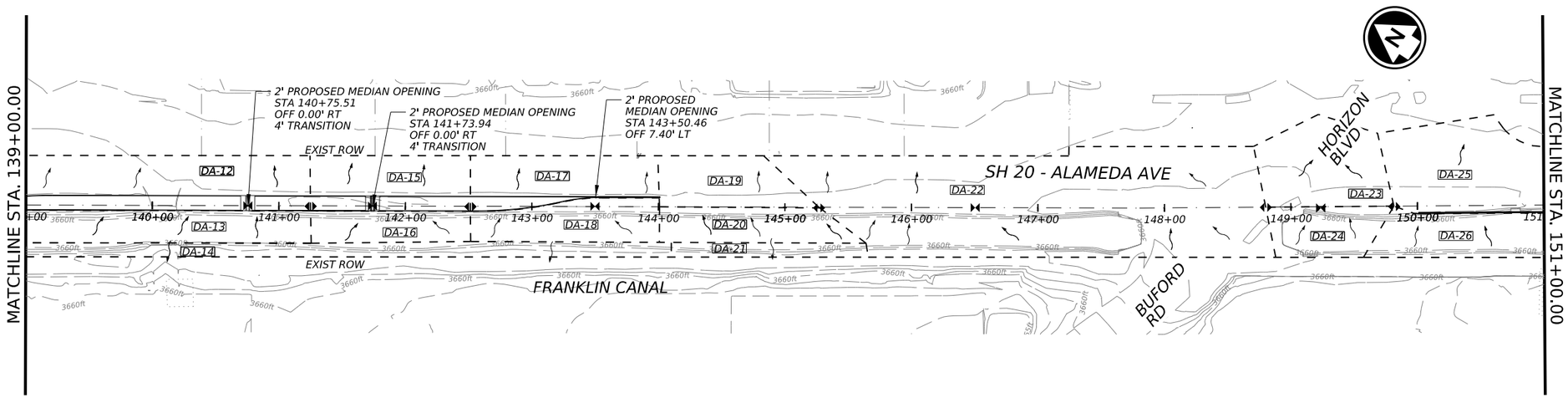
LEGEND

- DA-XX — DRAINAGE AREA ID
- DRAINAGE AREA
- DIRECTION OF FLOW
- EXISTING ROW
- XXXX — MAJOR CONTOUR
- MINOR CONTOUR
- HIGH POINT
- LOW POINT

NOTES:

1. SEE MISCELLANEOUS DRAINAGE DETAILS FOR FURTHER INFORMATION ON FLUMES
2. MEDIAN CURB OPENINGS SHALL BE SUBSIDIARY TO ITEM 529-6005

DRAINAGE ESTIMATE SHEET 1 OF 6				
ITEM	CODE	DESCRIPTION	UNIT	QTY
536	6002	CONC MEDIAN	SY	29



STATE OF TEXAS
KARLA Y. RIOS
140855
LICENSED
PROFESSIONAL ENGINEER

Karla Rios, P.E.
10/31/2023

0 50 100
SCALE IN FEET

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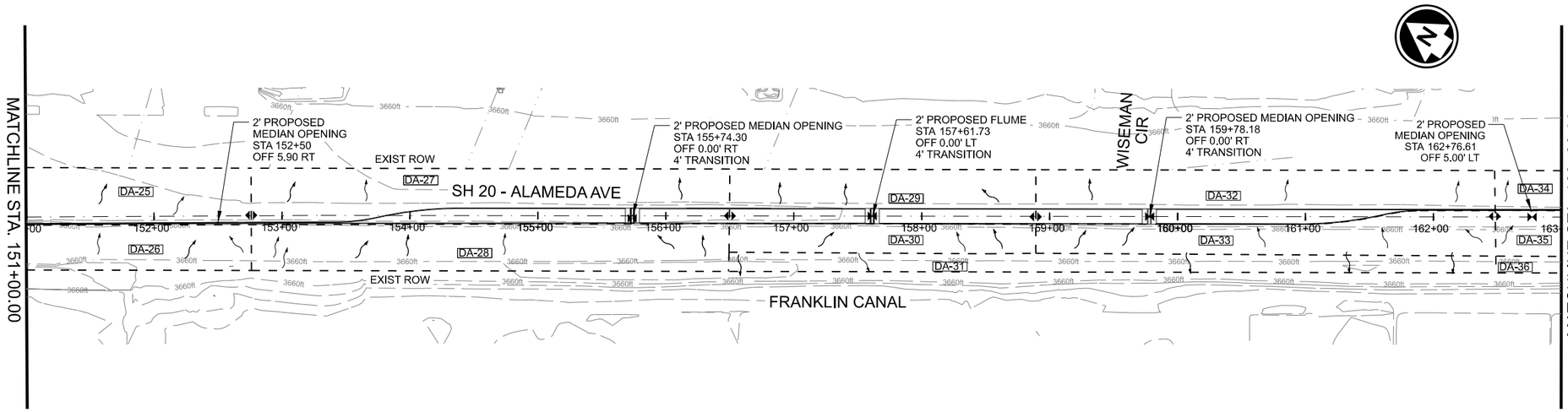
SH 20

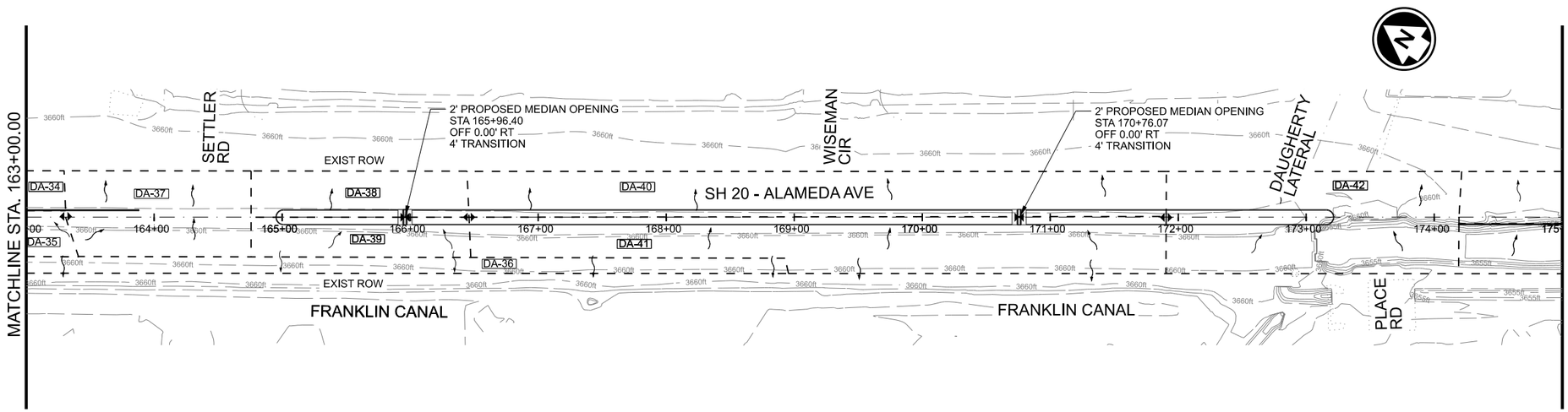
DRAINAGE AREA LAYOUT BEGIN TO STA. 151+00

SHEET 1 OF 6

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		54

DATE: 10/31/2023 8:36:15 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT5/Documents/24 - ELP/Design Projects/000202059/4 - Design/Plan Set/5. Drainage/SH20_DRNG_01.dgn





ITEM	CODE	DESCRIPTION	UNIT	QTY
536	6002	CONC MEDIAN	SY	49

LEGEND

- DA-XX — DRAINAGE AREA ID
- DRAINAGE AREA
- DIRECTION OF FLOW
- EXISTING ROW
- XXXX — MAJOR CONTOUR
- MINOR CONTOUR
- HIGH POINT
- LOW POINT

NOTES:

1. SEE MISCELLANEOUS DRAINAGE DETAILS FOR FURTHER INFORMATION ON FLUMES
2. MEDIAN CURB OPENINGS SHALL BE SUBSIDIARY TO ITEM 529-6005

STATE OF TEXAS
KARLA Y. RIOS
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LICENSED
PROFESSIONAL ENGINEER

Karla Rios, P.E.

10/31/2023

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SCALE IN FEET

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SH 20

DRAINAGE AREA LAYOUT
STA. 151+00 TO STA. 175+00

SHEET 2 OF 6

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		55

DATE: 10/31/2023 8:36:35 AM
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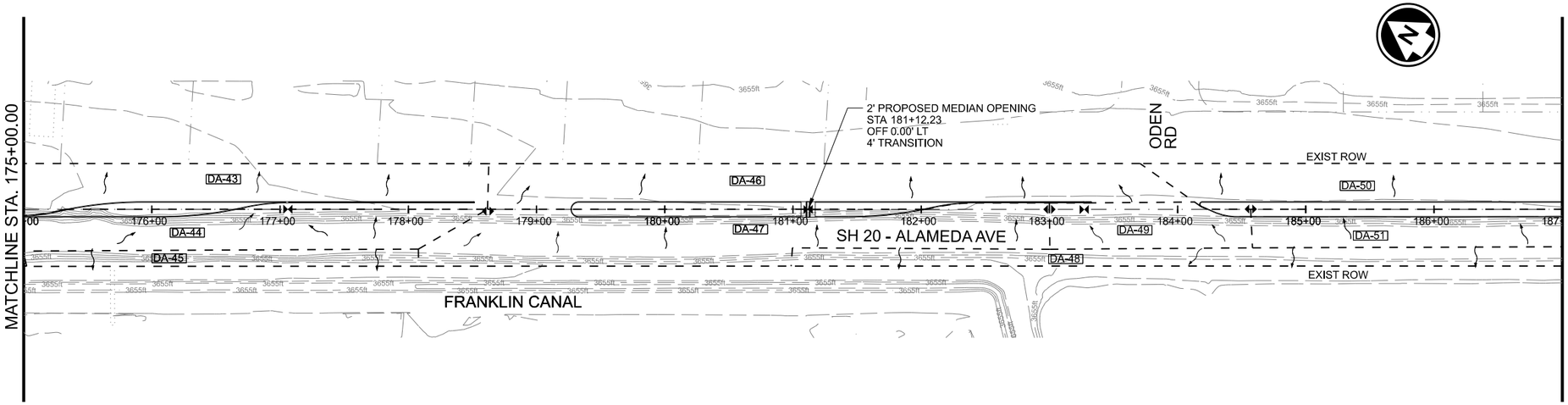

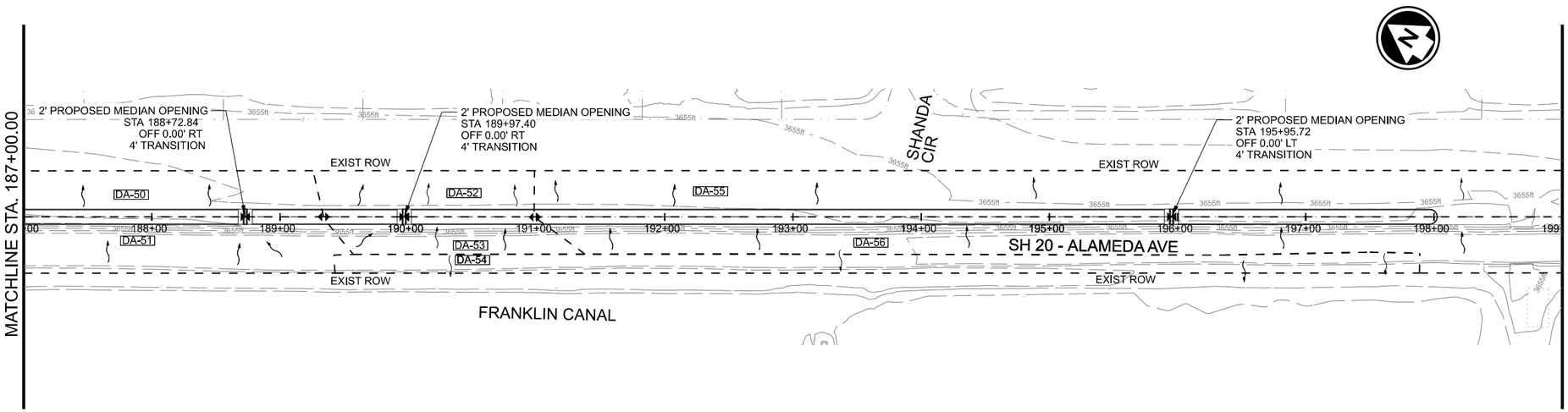

LEGEND

- DA-XX — DRAINAGE AREA ID
- DRAINAGE AREA
- DIRECTION OF FLOW
- EXISTING ROW
- XXXX — MAJOR CONTOUR
- MINOR CONTOUR
- HIGH POINT
- LOW POINT

NOTES:

1. SEE MISCELLANEOUS DRAINAGE DETAILS FOR FURTHER INFORMATION ON FLUMES
2. MEDIAN CURB OPENINGS SHALL BE SUBSIDIARY TO ITEM 529-6005

DRAINAGE ESTIMATE SHEET 3 OF 6

ITEM	CODE	DESCRIPTION	UNIT	QTY
536	6002	CONC MEDIAN	SY	39

STATE OF TEXAS
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140855
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Karla Rios, P.E.
10/30/2023

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SCALE IN FEET

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SH 20

DRAINAGE AREA LAYOUT
STA. 175+000 TO STA. 199+00

SHEET 3 OF 6

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		56

DATE: 10/27/2023 2:54:59 PM
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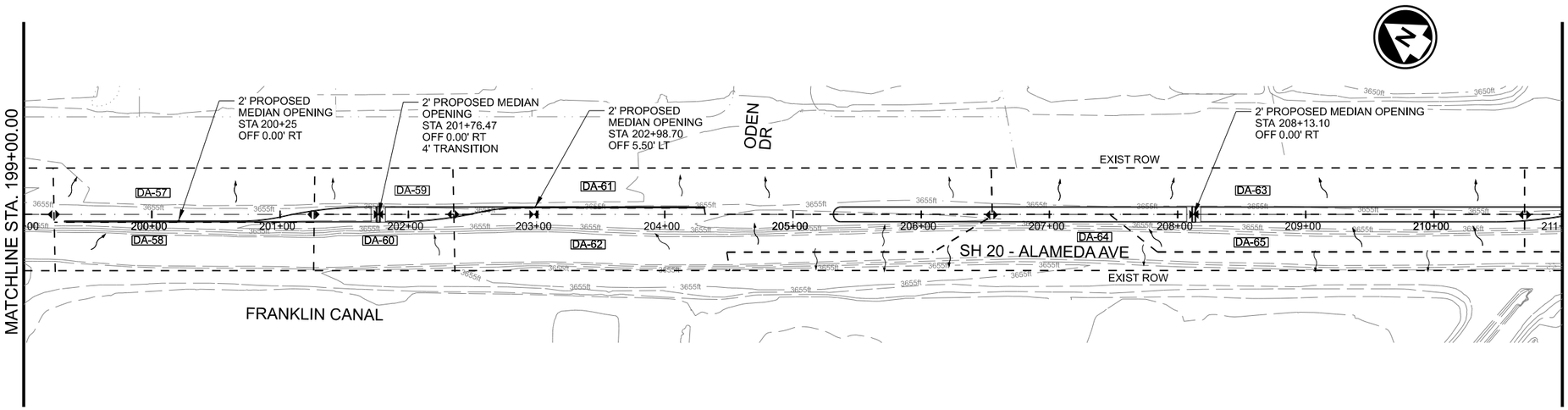


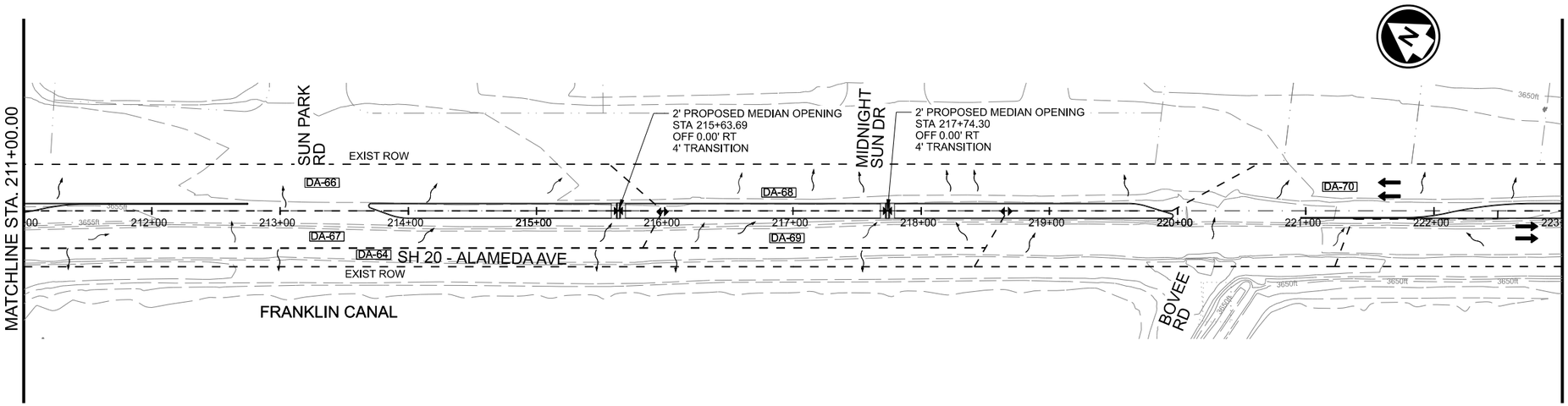
LEGEND

- DA-XX — DRAINAGE AREA ID
- DRAINAGE AREA
- DIRECTION OF FLOW
- EXISTING ROW
- XXXX — MAJOR CONTOUR
- MINOR CONTOUR
- HIGH POINT
- LOW POINT

NOTES:

1. SEE MISCELLANEOUS DRAINAGE DETAILS FOR FURTHER INFORMATION ON FLUMES
2. MEDIAN CURB OPENINGS SHALL BE SUBSIDIARY TO ITEM 529-6005

DRAINAGE ESTIMATE SHEET 4 OF 6				
ITEM	CODE	DESCRIPTION	UNIT	QTY
536	6002	CONC MEDIAN	SY	39



KARLA Y. RIOS
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Karla Rios, P.E.
10/30/2023

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SCALE IN FEET

Texas Department of Transportation

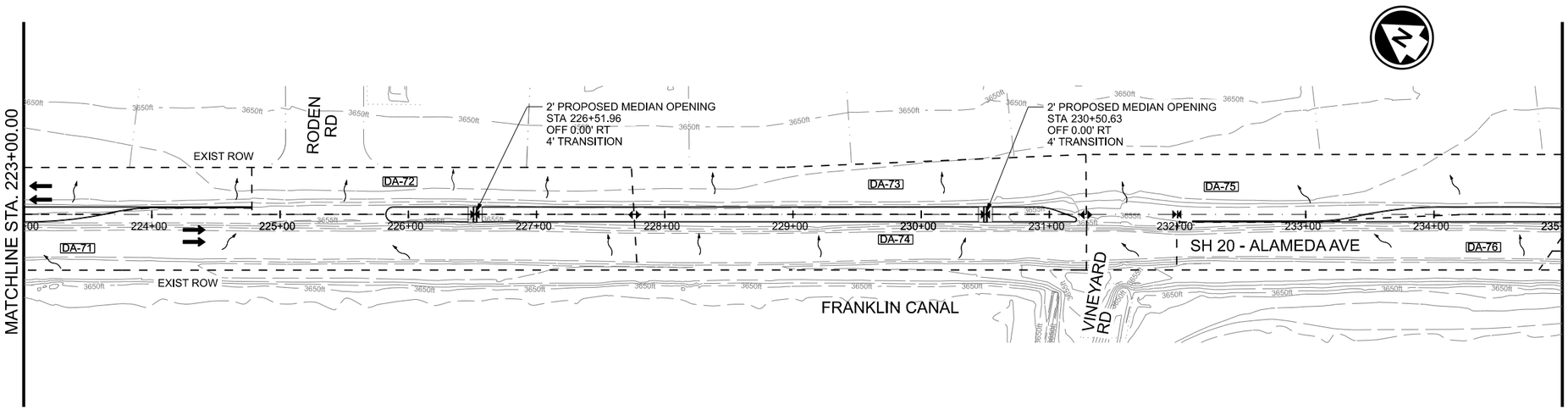
SH 20

DRAINAGE AREA LAYOUT
STA. 199+000 TO STA. 223+00

SHEET 4 OF 6

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		57

DATE: 10/27/2023 2:55:03 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT5/Documents/24 - ELP/Design Projects/000202059/4 - Design/Plan Set/5. Drainage/SH20_DRNG_04.dgn



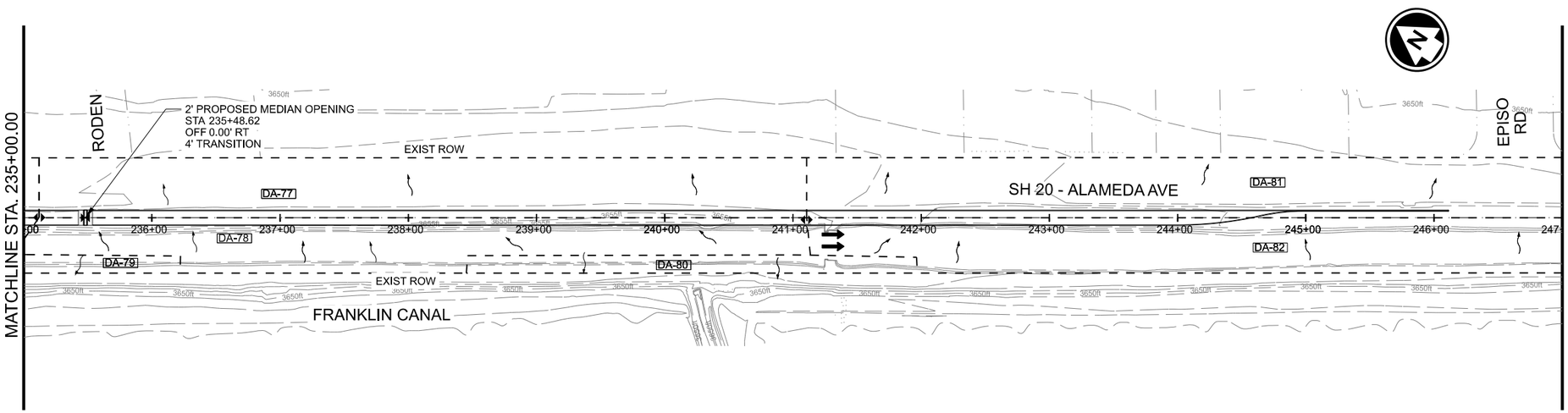
LEGEND

- DA-XX — DRAINAGE AREA ID
- DRAINAGE AREA
- DIRECTION OF FLOW
- EXISTING ROW
- MAJOR CONTOUR
- MINOR CONTOUR
- HIGH POINT
- LOW POINT

NOTES:

1. SEE MISCELLANEOUS DRAINAGE DETAILS FOR FURTHER INFORMATION ON FLUMES
2. MEDIAN CURB OPENINGS SHALL BE SUBSIDIARY TO ITEM 529-6005

DRAINAGE ESTIMATE SHEET 5 OF 6				
ITEM	CODE	DESCRIPTION	UNIT	QTY
536	6002	CONC MEDIAN	SY	29



STATE OF TEXAS
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SH 20

DRAINAGE
AREA LAYOUT
STA. 223+00 TO STA 247+00

SHEET 5 OF 6

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		58

DATE: 10/27/2023 2:55:06 PM
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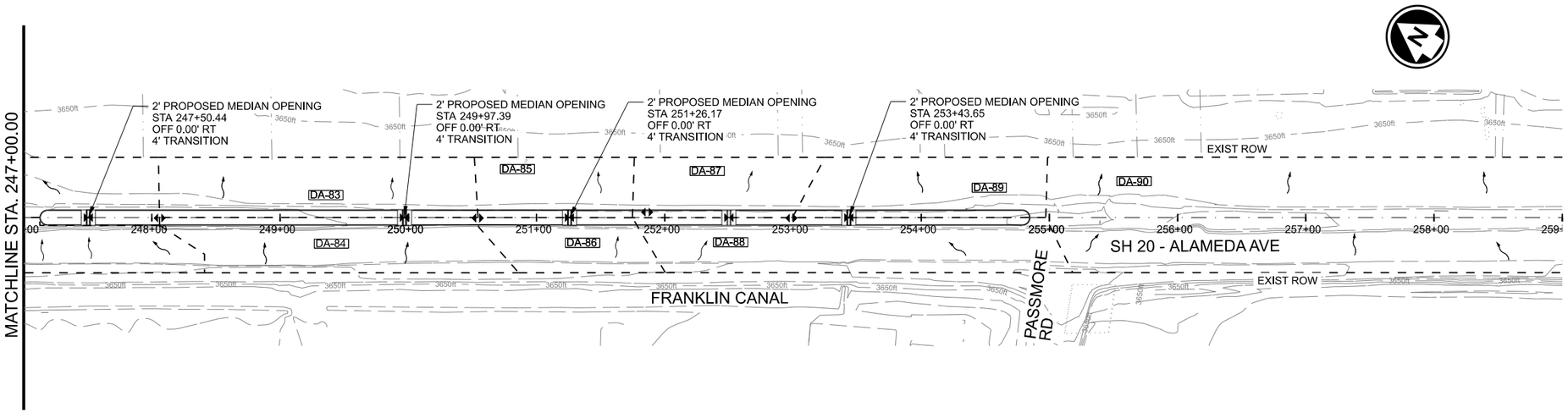

LEGEND

- DA-XX — DRAINAGE AREA ID
- DRAINAGE AREA
- DIRECTION OF FLOW
- EXISTING ROW
- XXXX — MAJOR CONTOUR
- MINOR CONTOUR
- HIGH POINT
- LOW POINT

NOTES:

1. SEE MISCELLANEOUS DRAINAGE DETAILS FOR FURTHER INFORMATION ON FLUMES
2. MEDIAN CURB OPENINGS SHALL BE SUBSIDIARY TO ITEM 529-6005

DRAINAGE ESTIMATE SHEET 6 OF 6

ITEM	CODE	DESCRIPTION	UNIT	QTY
536	6002	CONC MEDIAN	SY	39

STATE OF TEXAS
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10/30/2023

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SCALE IN FEET

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SH 20

DRAINAGE
AREA LAYOUT
STA. 247+00 TO END

SHEET 6 OF 6

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		59

DATE: 10/27/2023 2:55:09 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT5/Documents/24 - ELP/Design Projects/000202059/4 - Design/Plan Set/5. Drainage/SH20_DRNG_06.dgn

DRAINAGE AREA ID	AREA (AC)	C VALUE	I(100 YR) IN/H	I(5 YR) IN/H	Q (100 YR) CFS	Q (5 YR) CFS
1	0.20	0.9	7.49	4.24	1.38	0.78
2	0.25	0.9	7.49	4.24	1.71	0.97
3	0.09	0.9	7.49	4.24	0.63	0.36
4	0.18	0.9	7.49	4.24	1.23	0.69
5	0.14	0.9	7.49	4.24	0.96	0.54
6	0.08	0.9	7.49	4.24	0.52	0.29
7	0.15	0.9	7.49	4.24	1.02	0.58
8	0.17	0.9	7.49	4.24	1.16	0.65
9	0.54	0.9	7.49	4.24	3.64	2.06
10	0.14	0.9	7.49	4.24	0.96	0.55
11	0.18	0.9	7.49	4.24	1.24	0.70
12	0.24	0.9	7.49	4.24	1.59	0.90
13	0.15	0.9	7.49	4.24	1.01	0.57
14	0.14	0.9	7.49	4.24	0.93	0.53
15	0.13	0.9	7.49	4.24	0.86	0.49
16	0.07	0.9	7.49	4.24	0.48	0.27
17	0.13	0.9	7.49	4.24	0.90	0.51
18	0.10	0.9	7.49	4.24	0.70	0.40
19	0.10	0.9	7.49	4.24	0.66	0.37
20	0.09	0.9	7.49	4.24	0.63	0.36
21	0.04	0.9	7.49	4.24	0.29	0.17
22	0.68	0.9	7.49	4.24	4.56	2.58
23	0.15	0.9	7.49	4.24	0.98	0.55
24	0.08	0.9	7.49	4.24	0.53	0.30
25	0.37	0.9	7.49	4.24	2.53	1.43
26	0.27	0.9	7.49	4.24	1.82	1.03
27	0.30	0.9	7.49	4.24	2.01	1.14
28	0.32	0.9	7.49	4.24	2.17	1.23
29	0.17	0.9	7.49	4.24	1.16	0.66
30	0.13	0.9	7.49	4.24	0.85	0.48
31	0.19	0.9	7.49	4.24	1.31	0.74
32	0.25	0.9	7.49	4.24	1.71	0.97
33	0.22	0.9	7.49	4.24	1.45	0.82
34	0.06	0.9	7.49	4.24	0.39	0.22
35	0.07	0.9	7.49	4.24	0.48	0.27
36	0.19	0.9	7.49	4.24	1.30	0.74
37	0.21	0.9	7.49	4.24	1.44	0.81
38	0.14	0.9	7.49	4.24	0.95	0.54
39	0.12	0.9	7.49	4.24	0.78	0.44
40	0.45	0.9	7.49	4.24	3.03	1.71
41	0.39	0.9	7.49	4.24	2.61	1.48
42	0.42	0.9	7.49	4.24	2.84	1.61
43	0.38	0.9	7.49	4.24	2.53	1.43
44	0.30	0.9	7.49	4.24	2.01	1.14
45	0.09	0.9	7.49	4.24	0.60	0.34

DRAINAGE AREA ID	AREA (AC)	C VALUE	I(100 YR) IN/H	I(5 YR) IN/H	Q (100 YR) CFS	Q (5 YR) CFS
46	0.41	0.9	7.49	4.24	2.73	1.55
47	0.44	0.9	7.49	4.24	2.96	1.68
48	0.21	0.9	7.49	4.24	1.44	0.81
49	0.12	0.9	7.49	4.24	0.82	0.46
50	0.44	0.9	7.49	4.24	2.96	1.68
51	0.41	0.9	7.49	4.24	2.74	1.55
52	0.14	0.9	7.49	4.24	0.94	0.53
53	0.12	0.9	7.49	4.24	0.78	0.44
54	0.30	0.9	7.49	4.24	2.05	1.16
55	0.68	0.9	7.49	4.24	4.61	2.61
56	0.57	0.9	7.49	4.24	3.82	2.16
57	0.20	0.9	7.49	4.24	1.33	0.75
58	0.18	0.9	7.49	4.24	1.19	0.67
59	0.09	0.9	7.49	4.24	0.61	0.34
60	0.11	0.9	7.49	4.24	0.74	0.42
61	0.35	0.9	7.49	4.24	2.37	1.34
62	0.34	0.9	7.49	4.24	2.29	1.29
63	0.35	0.9	7.49	4.24	2.33	1.32
64	0.30	0.9	7.49	4.24	2.06	1.16
65	0.20	0.9	7.49	4.24	1.33	0.75
66	0.43	0.9	7.49	4.24	2.89	1.63
67	0.34	0.9	7.49	4.24	2.30	1.30
68	0.38	0.9	7.49	4.24	2.54	1.44
69	0.18	0.9	7.49	4.24	1.18	0.67
70	0.20	0.9	7.49	4.24	1.33	0.75
71	0.38	0.9	7.49	4.24	2.56	1.45
72	0.25	0.9	7.49	4.24	1.69	0.96
73	0.33	0.9	7.49	4.24	2.23	1.26
74	0.35	0.9	7.49	4.24	2.36	1.34
75	0.50	0.9	7.49	4.24	3.34	1.89
76	0.28	0.9	7.49	4.24	1.88	1.06
77	0.64	0.9	7.49	4.24	4.33	2.45
78	0.48	0.9	7.49	4.24	3.26	1.85
79	0.04	0.9	7.49	4.24	0.29	0.17
80	0.10	0.9	7.49	4.24	0.70	0.40
81	0.77	0.9	7.49	4.24	5.21	2.95
82	0.64	0.9	7.49	4.24	4.34	2.46
83	0.27	0.9	7.49	4.24	1.80	1.02
84	0.24	0.9	7.49	4.24	1.60	0.91
85	0.13	0.9	7.49	4.24	0.89	0.51
86	0.12	0.9	7.49	4.24	0.80	0.45
87	0.15	0.9	7.49	4.24	1.00	0.56
88	0.32	0.9	7.49	4.24	2.13	1.20
89	0.20	0.9	7.49	4.24	1.35	0.77
90	0.82	0.9	7.49	4.24	5.52	3.13

HYDROLOGIC METHODOLOGY

TIME OF CONCENTRATION

KERBY-KIRPICH METHOD
Tc = TOV + TCH

EQUATION 4-13. CHAPTER 4 SECTION 11 TXDOT HDM 2019
WHERE:
Tov = OVERLAND FLOW TIME
Tch = CHANNEL FLOW TIME

Tov = K (LXN)^0.467 S^-0.235

EQUATION 4-14. CHAPTER 4 SECTION 11 TXDOT HDM 2019 WHERE:

Tov = OVERLAND FLOW TIME OF CONCENTRATION. IN MINUTES
K = A UNITS CONVERSION COEFFICIENT. IN WHICH K =0. 828 FOR
TRADITIONAL UNITS AND K = 1. 44 FOR SI UNITS
L = THE OVERLAND-FLOW LENGTH. IN FEET OR METERS AS DICTATED BY K
N = A DIMENSIONLESS RETARDANCE COEFFICIENT
S = THE DIMENSIONLESS SLOPE OF TERRAIN CONVEYING THE OVERLAND FLOW

Tch = K(L^0.770)(S^-0.385)

EQUATION 4-15. CHAPTER 4 SECTION 11 TXDOT HDM 2019 WHERE:
Tch = THE TIME OF CONCENTRATION. IN MINUTES
K = A UNITS CONVERSION COEFFICIENT. IN WHICH K = 0.0078 FOR
TRADITIONAL UNITS AND K = 0.0195 FOR SI UNITS
L = THE CHANNEL FLOW LENGTH. IN FEET OR METERS AS DICTATED BY K
S = THE DIMENSIONLESS MAIN- CHANNEL SLOPE

RATIONAL METHOD
Q = CIA/Z

EQUATION 4-20. CHAPTER 4 SECTION 12 TXDOT HDM 2019 WHERE:

O = MAXIMUM RATE OF RUNOFF (CFS OR M'/SEC.)
C = RUNOFF COEFFICIENT
I= AVERAGE RAINFALL INTENSITY (IN./HR. OR MM/HR.)
A= DRAINAGE AREA (AC OR HA)
Z = CONVERSION FACTOR, 1 FOR ENGLISH, 360 FOR METRIC.

STATE OF TEXAS
KARLA Y. RIOS
140855
LICENSED
PROFESSIONAL ENGINEER

Karla Rios, P.E.
10/30/2023

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SH 20

DRAINAGE AREA CALCULATIONS

2022 SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		60

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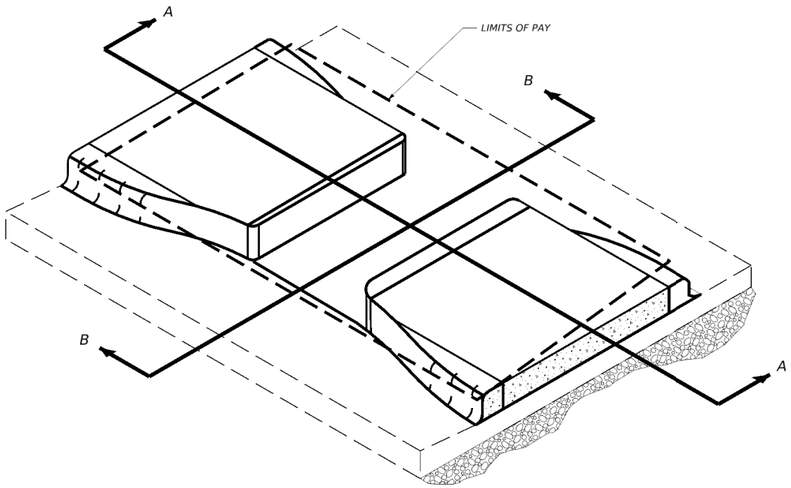
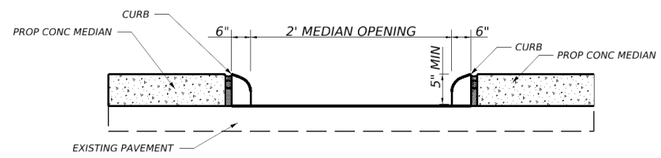


ISOMETRIC VIEW
SHOWING SINGLE MEDIAN OPENING
REFER TO "DRAINAGE AREA LAYOUT" SHEETS
FOR DETAIL OF INDIVIDUAL SECTIONS

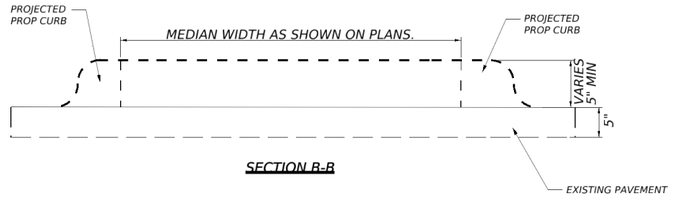
GENERAL NOTES

1. EXISTING CONDITIONS MAY VARY FROM DIMENSIONS SHOWN. FIELD VERIFY ALL DIMENSIONS, AND ADJUST DIMENSIONS OF PROPOSED WORK AS DIRECTED.

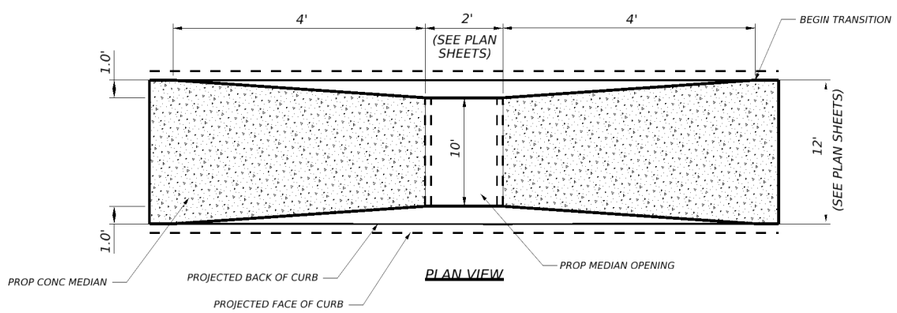
2. REFER TO "MEDIAN LAYOUT" SHEETS FOR MORE INFORMATION ON MEDIAN WIDTHS.



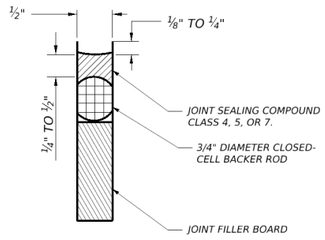
SECTION A-A



SECTION B-B



PLAN VIEW



SEALED EXPANSION JOINT

STATE OF TEXAS
KARLA Y. RIOS
140855
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PROFESSIONAL ENGINEER

Karla Rios, P.E.

10/30/2023

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SH 20

MISCELLANEOUS
DRAINAGE
DETAILS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		61

DATE: 10/27/2023 2:55:45 PM
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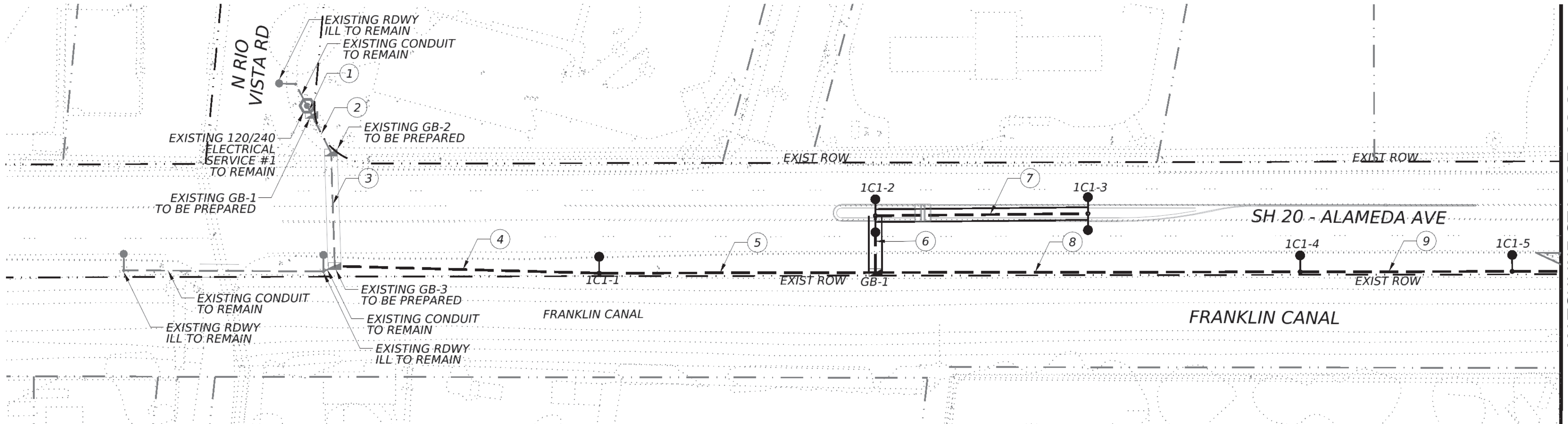


LEGEND

- EXISTING RDWY ILL TO REMAIN
- EXISTING RDWY ILL TO BE REMOVED
- IN RD IL (TY SA) 30T-4-4 (250W EQ) LED
- IN RD IL (TY SA) 40T-10 (250W EQ) LED
- EXISTING ELECTRICAL SERVICE
- EXISTING GROUND BOX TY A (W/APRON)
- PROPOSED GROUND BOX TY A (W/APRON)
- EXISTING CONDUIT (TRENCHED) ABANDONED & CAPPED
- EXISTING CONDUIT (TRENCHED) RE-USE
- PROPOSED CONDUIT (TRENCHED)
- EXISTING CONDUIT (BORE)
- PROPOSED CONDUIT (BORE)
- # CONDUIT RUN

POLE DESIGNATION

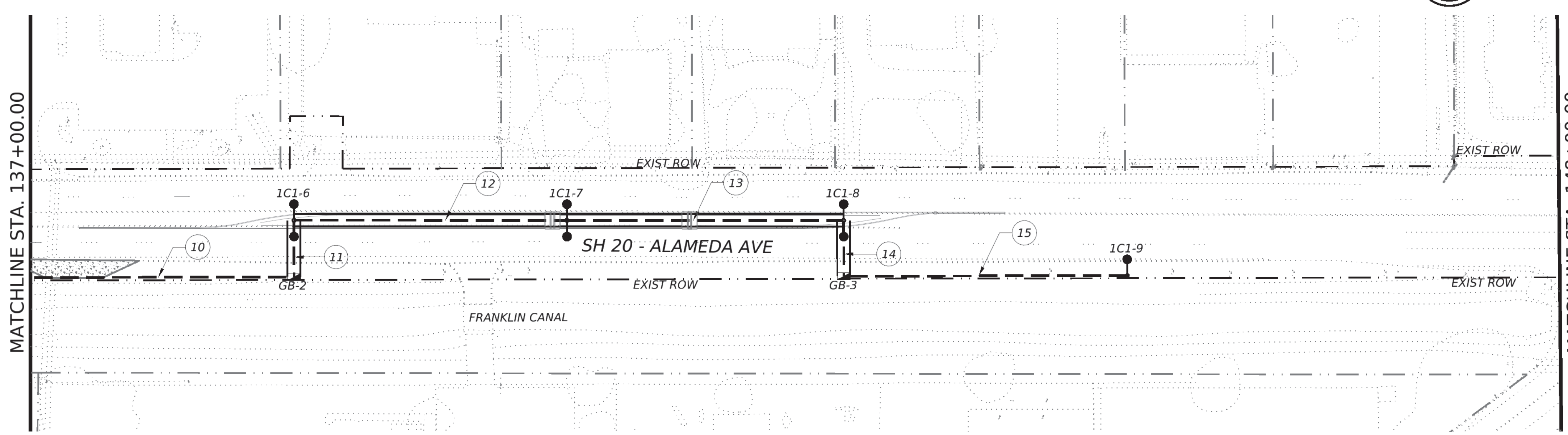
1I-#: POLE OR LUMINAIRE NO.; CIRCUIT NO.; SERVICE NO.

NOTE:
1. CONTRACTOR TO INSTALL PROPOSED CIRCUIT BREAKER 2P/15 AT EXISTING ELECTRICAL SERVICE#1. THIS ITEM WILL BE PAID FOR UNDER ITEM 6084-6001.

CONDUIT AND CONDUCTOR RUNS												
RUN NO.	LENGTH OF RUN (FT)	EXISTING/INSTALL (E/I)	CONDUIT (FT) SCHED 40PVC (2")						ELECTRICAL CONDUCTOR ELEC CONDR (NO.8) INSUL			
			EA	PREPARE	EA	TRENCH	EA	BORE	GROUND		POWER	
1	10	E	1	10					0	0	2	30
2	30	E	1	30					0	0	2	70
3	80	E	1	80					0	0	2	170
4	190	I			1	190			1	195	2	390
5	195	I			1	195			1	200	2	400
6	40	I					1	40	1	45	2	90
7	150	I					1	150	1	155	2	310
8	300	I			1	300			1	305	2	610
9	150	I			1	150			1	155	2	310
10	225	I			1	225			1	230	2	460
11	40	I					1	40	1	45	2	90
12	195	I					1	195	1	200	2	400
13	200	I					1	200	1	205	2	410
14	40	I					1	40	1	45	2	90
15	205	I			1	205			1	210	2	420
TOTAL	2050			120		1265		665		1990		4250

NOTE: ALL CONDUIT WILL INCLUDE 5 FT SLACK PER CABLE

ILLUMINATION QUANTITIES (CSJ 0002-02-062)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
110	6003	EXCAVATION (SPECIAL)	CY	0.15
416	6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF	72
610	6161	IN RD IL (TY SA) 30T-4-4 (250W EQ) LED	EA	5
610	6216	IN RD IL (TY SA) 40T-10 (250W EQ) LED	EA	4
618	6023	CONDT (PVC) (SCH 40) (2")	LF	1265
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF	665
620	6008	ELEC CONDR (NO.8) INSULATED	LF	6240
624	6002	GROUND BOX TY A (122311)W/APRON	EA	3
6027	6003	CONDUIT (PREPARE)	LF	120
6027	6008	GROUND BOX (PREPARE)	EA	3
6084	6001	MODIFY EXISTING ELECTRICAL SERVICE	EA	1



STATE OF TEXAS
EDUARDO I. ADAME
126153
LICENSED
PROFESSIONAL ENGINEER

Eduardo Adame P.E.
10/26/2023

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SH 20

ILLUMINATION LAYOUT BEGIN PROJECT TO 148+00

SHEET 1 OF 6

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		62

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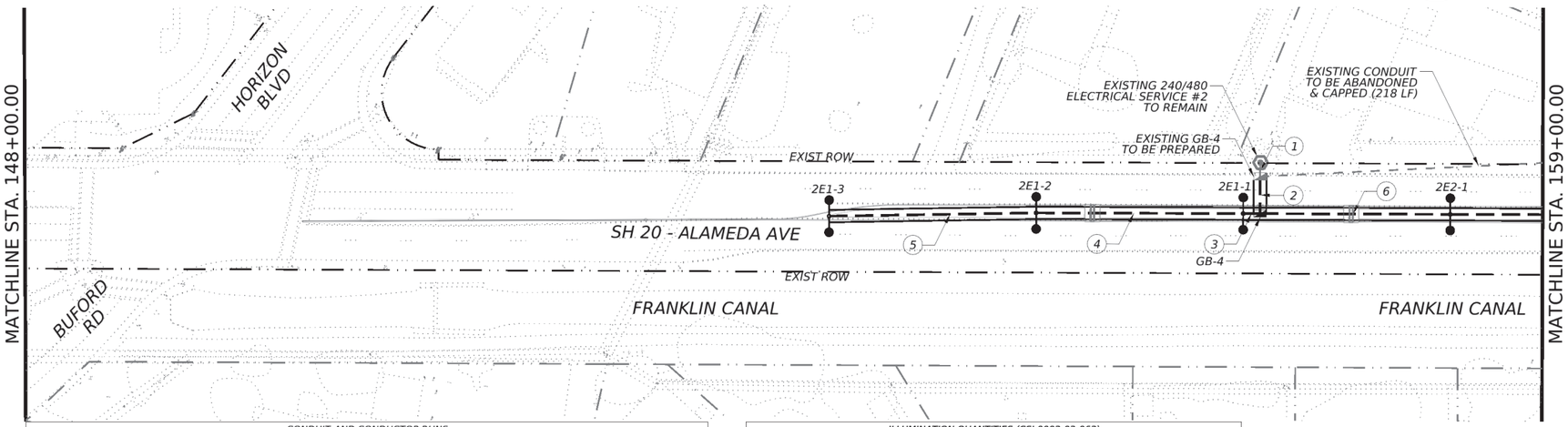


LEGEND

- EXISTING RDWY ILL TO REMAIN
- EXISTING RDWY ILL TO BE REMOVED
- IN RD IL (TY SA) 30T-4-4 (250W EQ) LED
- IN RD IL (TY SA) 40T-10 (250W EQ) LED
- EXISTING ELECTRICAL SERVICE
- EXISTING GROUND BOX TY A (W/APRON)
- PROPOSED GROUND BOX TY A (W/APRON)
- EXISTING CONDUIT (TRENCHED) ABANDONED & CAPPED
- EXISTING CONDUIT (TRENCHED) RE-USE
- PROPOSED CONDUIT (TRENCHED)
- EXISTING CONDUIT (BORE)
- PROPOSED CONDUIT (BORE)
- # CONDUIT RUN

POLE DESIGNATION

1I-#

- POLE OR LUMINAIRE NO.
- CIRCUIT NO.
- SERVICE NO.

NOTE:

1. CONTRACTOR TO DISCONNECT EXISTING CIRCUIT BREAKER AND INSTALL 2 PROPOSED CIRCUIT BREAKERS 2P/20 AT EXISTING ELECTRICAL SERVICE #2. THIS ITEM WILL BE PAID FOR UNDER ITEM 6084-6001.
2. CONTRACTOR TO REMOVE EXISTING CABLES FOR ALL EXISTING CONDUIT TO BE ABANDONED AND CAPPED. THIS ITEM WILL BE FOR UNDER ITEM 6163-6002.

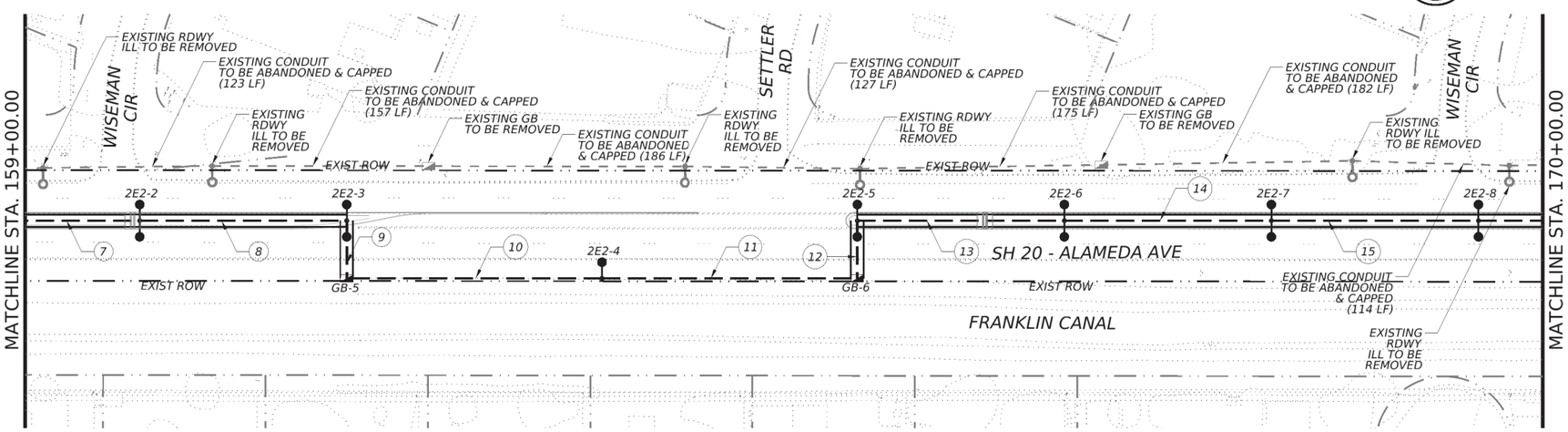
CONDUIT AND CONDUCTOR RUNS

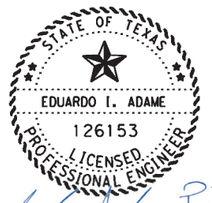
RUN NO.	LENGTH OF RUN (FT)	EXISTING/INSTALL (E/I)	CONDUIT (FT) SCHED 40 PVC (2")						ELECTRICAL CONDUCTOR ELEC CONDR (NO. 8) INSUL			
			EA	PREPARE	EA	TRENCH	EA	BORE	GROUND		POWER	
1	10	E	1	10					1	15	4	60
2	30	I					1	30	1	35	4	140
3	15	I					1	15	1	20	2	40
4	150	I					1	150	1	155	2	310
5	150	I					1	150	1	155	2	310
6	140	I					1	140	1	145	2	290
7	150	I					1	150	1	155	2	310
8	150	I					1	150	1	155	2	310
9	45	I					1	45	1	50	2	100
10	185	I			1	185			1	190	2	380
11	185	I			1	185			1	190	2	380
12	45	I					1	45	1	50	2	100
13	150	I					1	150	1	155	2	310
14	150	I					1	150	1	155	2	310
15	150	I					1	150	1	155	2	310
TOTAL	1705			10		370		1325		1780		3660

NOTE: ALL CONDUIT WILL INCLUDE 5 FT SLACK PER CABLE

ILLUMINATION QUANTITIES (CSJ 0002-02-062)

ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
110	6003	EXCAVATION (SPECIAL)	CY	0.15
416	6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF	88
610	6009	REMOVE RD IL ASM (TRANS-BASE)	EA	6
610	6161	IN RD IL (TY SA) 30T-4-4 (250W EQ) LED	EA	10
610	6216	IN RD IL (TY SA) 40T-10 (250W EQ) LED	EA	1
618	6023	CONDT (PVC) (SCH 40) (2")	LF	370
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF	1325
620	6008	ELEC CONDR (NO.8) INSULATED	LF	5440
624	6002	GROUND BOX TY A (122311)W/APRON	EA	3
624	6028	REMOVE GROUND BOX	EA	2
6027	6003	CONDUIT (PREPARE)	LF	10
6027	6008	GROUND BOX (PREPARE)	EA	1
6084	6001	MODIFY EXISTING ELECTRICAL SERVICE	EA	1
6163	6002	REMOVE EXISTING CABLES (POWER)	LF	1282





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SH 20

ILLUMINATION LAYOUT
STA 148+00 TO 170+00

2022 SHEET 2 OF 6

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		63

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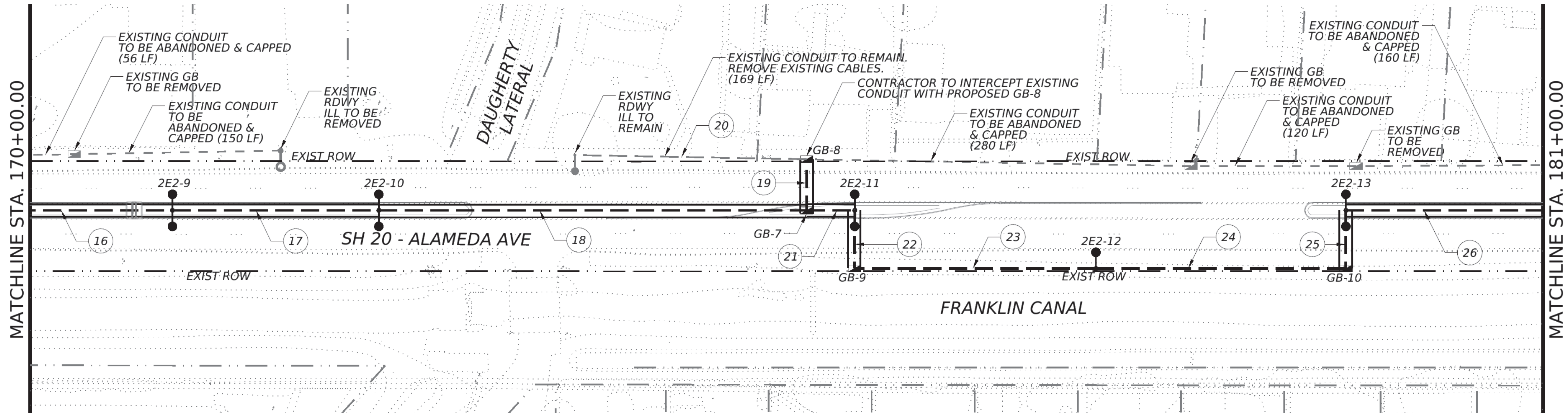


CONDUIT AND CONDUCTOR RUNS												
RUN NO.	LENGTH OF RUN (FT)	EXISTING/INSTALL (E/I)	CONDUIT (FT) SCHED 40 PVC (2")						ELECTRICAL CONDUCTOR ELEC CONDR (NO.8) INSUL			
			EA	PREPARE	EA	TRENCH	EA	BORE	GROUND		POWER	
16	150	I					1	150	1	155	2	310
17	150	I					1	150	1	155	2	310
18	315	I					1	315	1	320	2	640
19	40	I					1	40	1	45	2	90
20	170	E	1	170					1	175	2	350
21	35	I					1	35	1	40	2	80
22	45	I					1	40	1	50	2	100
23	175	I			1	175			1	180	2	360
24	180	I			1	180			1	185	2	370
25	45	I					1	45	1	50	2	100
26	180	I					1	180	1	185	2	370
27	35	I					1	35	1	40	2	80
28	40	I					1	40	1	45	2	90
29	150	E	1	150					1	155	2	310
TOTAL	1710			320		355		1030		1780		3560

NOTE: ALL CONDUIT WILL INCLUDE 5 FT SLACK PER CABLE

CONDUIT AND CONDUCTOR RUNS												
RUN NO.	LENGTH OF RUN (FT)	EXISTING/INSTALL (E/I)	CONDUIT (FT) SCHED 40 PVC (2")						ELECTRICAL CONDUCTOR ELEC CONDR (NO.6) INSUL			
			EA	PREPARE	EA	TRENCH	EA	BORE	GROUND		POWER	
30	150	I					1	150	1	155	2	310
31	150	I					1	150	1	155	2	310
32	150	I					1	150	1	155	2	310
33	150	I					1	150	1	155	2	310
34	150	I					1	150	1	155	2	310
TOTAL	750							750		775		1550

NOTE: ALL CONDUIT WILL INCLUDE 5 FT SLACK PER CABLE

LEGEND

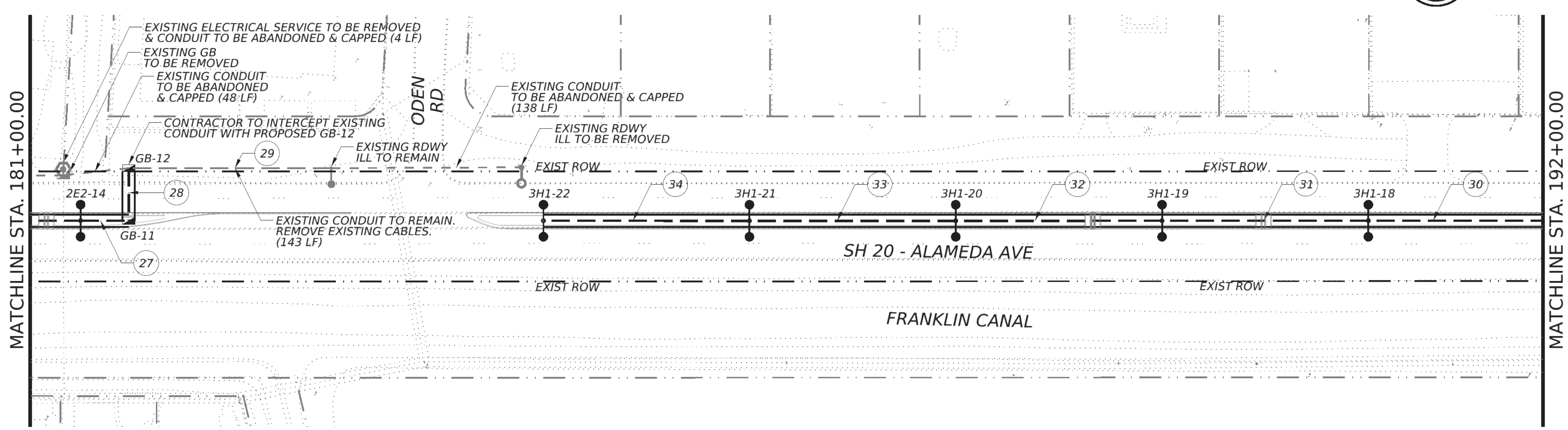
- EXISTING RDWY ILL TO REMAIN
- EXISTING RDWY ILL TO BE REMOVED
- IN RD IL (TY SA) 30T-4-4 (250W EQ) LED
- IN RD IL (TY SA) 40T-10 (250W EQ) LED
- EXISTING ELECTRICAL SERVICE
- EXISTING GROUND BOX TY A (W/APRON)
- PROPOSED GROUND BOX TY A (W/APRON)
- EXISTING CONDUIT (TRENCHED) ABANDONED & CAPPED
- EXISTING CONDUIT (TRENCHED) RE-USE
- PROPOSED CONDUIT (TRENCHED)
- EXISTING CONDUIT (BORE)
- PROPOSED CONDUIT (BORE)
- # CONDUIT RUN

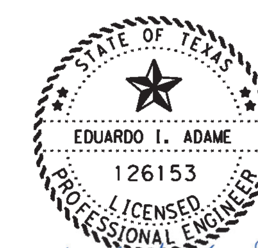
POLE DESIGNATION

1I-#
- POLE OR LUMINAIRE NO.
- CIRCUIT NO.
- SERVICE NO.

NOTE:
1. CONTRACTOR TO REMOVE EXISTING CABLES FOR ALL EXISTING CONDUIT TO BE ABANDONED AND CAPPED. THIS ITEM WILL BE FOR UNDER ITEM 6163-6002.

ILLUMINATION QUANTITIES (CSJ0002-02-062)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
110	6003	EXCAVATION (SPECIAL)	CY	0.15
416	6029	DRILL SHAFT (RDWY ILL POLE) (30IN)	LF	88
610	6009	REMOVE RD IL ASM (TRANS-BASE)	EA	2
610	6161	IN RD IL (TY SA) 30T-4-4(250WEQ) LED	EA	10
610	6216	IN RD IL (TY SA) 40T-10(250WEQ) LED	EA	1
618	6023	CONDT (PVC) (SCH 40)(2")	LF	355
618	6024	CONDT (PVC) (SCH 40)(2")(BORE)	LF	1780
620	6008	ELEC CONDR (NO.8)INSULATED	LF	5340
620	6010	ELEC CONDR (NO.6)INSULATED	LF	2325
624	6002	GROUND BOX TY A (122311)W/APRON	EA	6
624	6028	REMOVE GROUND BOX	EA	4
628	6002	REMOVE ELECTRICAL SERVICES	EA	1
6027	6003	CONDUIT (PREPARE)	LF	320
6163	6002	REMOVE EXISTING CABLES (POWER)	LF	1268





Eduardo Adame P.E.
10/26/2023

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SH 20

ILLUMINATION LAYOUT
STA 170+00 TO 192+00

SHEET 3 OF 6

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		64

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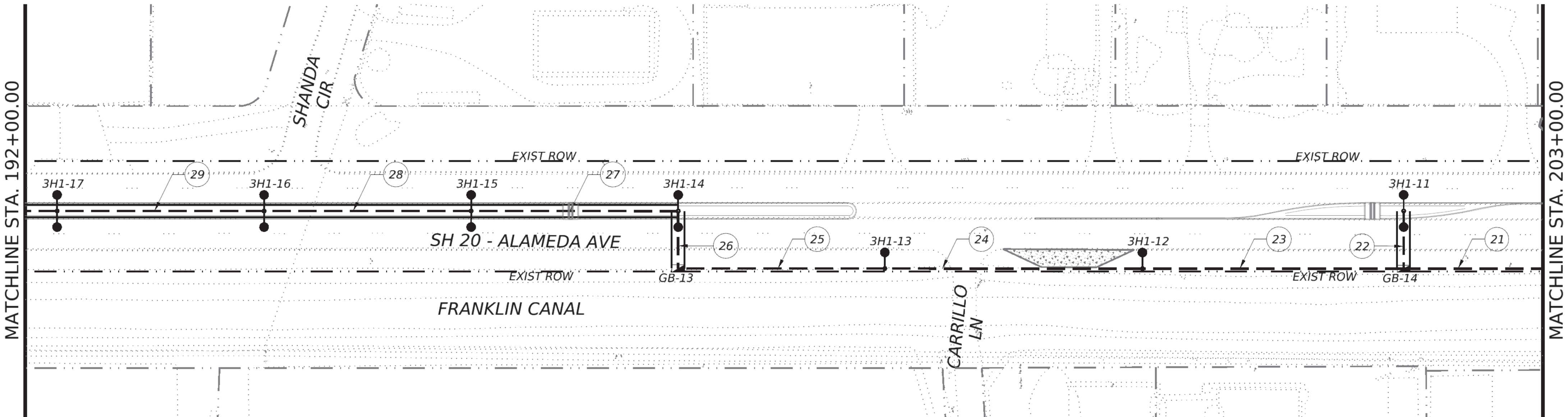
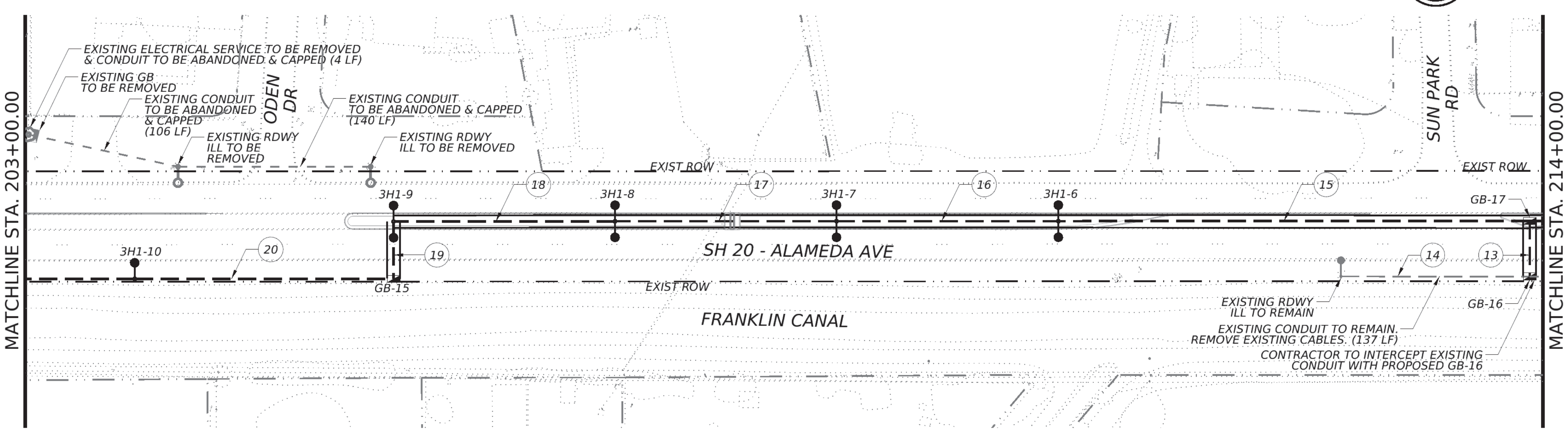


CONDUIT AND CONDUCTOR RUNS												
RUN NO.	LENGTH OF RUN (FT)	EXISTING/INSTALL (E/I)	CONDUIT (FT) SCHED 40 PVC (2")						ELECTRICAL CONDUCTOR ELEC CONDR (NO. 6) INSUL			
			EA	PREPARE	EA	TRENCH	EA	BORE	GROUND		POWER	
13	40	I					1	40	1	45	2	90
14	140	E	1	140					1	145	2	290
15	345	I					1	345	1	350	2	700
16	160	I					1	160	1	165	2	330
17	160	I					1	160	1	165	2	330
18	160	I					1	160	1	165	2	330
19	45	I					1	45	1	50	2	100
20	190	I			1	190			1	195	2	390
21	180	I			1	180			1	185	2	370
22	45	I					1	45	1	50	2	100
23	190	I			1	190			1	195	2	390
24	190	I			1	190			1	195	2	390
25	150	I			1	150			1	155	2	310
26	45	I					1	45	1	50	2	100
27	150	I					1	150	1	155	2	310
28	150	I					1	150	1	155	2	310
29	150	I					1	150	1	155	2	310
TOTAL	2490			140		900		1450		2575		5150

NOTE: ALL CONDUIT WILL INCLUDE 5 FT SLACK PER CABLE

ILLUMINATION QUANTITIES (CSJ 0002-02-062)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
110	6003	EXCAVATION (SPECIAL)	CY	0.15
416	6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF	96
610	6009	REMOVE RD IL ASM (TRANS-BASE)	EA	2
610	6161	IN RD IL (TY SA) 30T-4-4 (250W EQ) LED	EA	9
610	6216	IN RD IL (TY SA) 40T-10 (250W EQ) LED	EA	3
618	6023	CONDT (PVC) (SCH 40) (2")	LF	900
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF	1450
620	6010	ELEC CONDR (NO.6) INSULATED	LF	7725
624	6002	GROUND BOX TY A (122311)W/APRON	EA	5
624	6028	REMOVE GROUND BOX	EA	1
628	6002	REMOVE ELECTRICAL SERVICES	EA	1
6027	6003	CONDUIT (PREPARE)	LF	140
6163	6002	REMOVE EXISTING CABLES (POWER)	LF	387



LEGEND

- EXISTING RDWY ILL TO REMAIN
- EXISTING RDWY ILL TO BE REMOVED
- IN RD IL (TY SA) 30T-4-4 (250W EQ) LED
- IN RD IL (TY SA) 40T-10 (250W EQ) LED
- EXISTING ELECTRICAL SERVICE
- EXISTING GROUND BOX TY A (W/APRON)
- PROPOSED GROUND BOX TY A (W/APRON)
- EXISTING CONDUIT (TRENCHED) ABANDONED & CAPPED
- EXISTING CONDUIT (TRENCHED) RE-USE
- PROPOSED CONDUIT (TRENCHED)
- EXISTING CONDUIT (BORE)
- PROPOSED CONDUIT (BORE)
- # CONDUIT RUN

POLE DESIGNATION

1I-#
POLE OR LUMINAIRE NO.
CIRCUIT NO.
SERVICE NO.

NOTE:
1. CONTRACTOR TO REMOVE EXISTING CABLES FOR ALL EXISTING CONDUIT TO BE ABANDONED AND CAPPED. THIS ITEM WILL BE FOR UNDER ITEM 6163-6002.

STATE OF TEXAS
EDUARDO I. ADAME
126153
LICENSED PROFESSIONAL ENGINEER
Eduardo Adame P.E.
10/26/2023

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SH 20

ILLUMINATION LAYOUT
STA 192+00 TO 214+00

SHEET 4 OF 6

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		65

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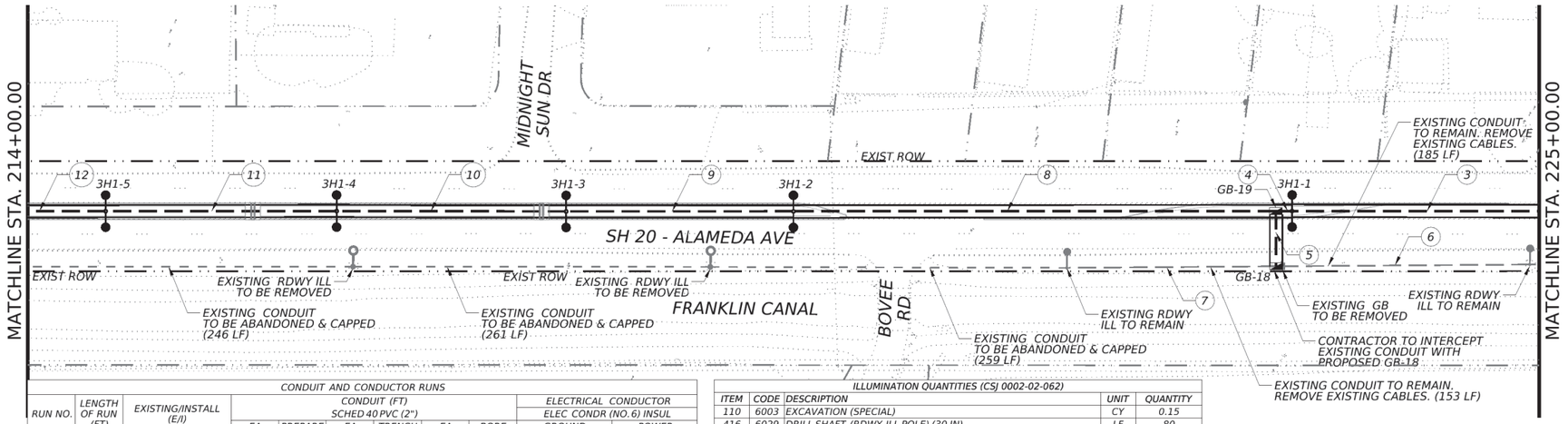


LEGEND

- EXISTING RDWY ILL TO REMAIN
- EXISTING RDWY ILL TO BE REMOVED
- IN RD IL (TY SA) 30T-4-4 (250W EQ) LED
- IN RD IL (TY SA) 40T-10 (250W EQ) LED
- EXISTING ELECTRICAL SERVICE
- EXISTING GROUND BOX TY A (W/APRON)
- PROPOSED GROUND BOX TY A (W/APRON)
- EXISTING CONDUIT (TRENCHED) ABANDONED & CAPPED
- EXISTING CONDUIT (TRENCHED) RE-USE
- PROPOSED CONDUIT (TRENCHED)
- EXISTING CONDUIT (BORE)
- PROPOSED CONDUIT (BORE)
- # CONDUIT RUN

POLE DESIGNATION

1I-#
- POLE OR LUMINAIRE NO.
- CIRCUIT NO.
- SERVICE NO.

NOTE:
1. CONTRACTOR TO DISCONNECT EXISTING CIRCUIT BREAKER AND INSTALL 2 PROPOSED CIRCUIT BREAKERS 2P/20 AT EXISTING ELECTRICAL SERVICE #3. THIS ITEM WILL BE PAID FOR UNDER ITEM 6084-6001.
2. CONTRACTOR TO REMOVE EXISTING CABLES FOR ALL EXISTING CONDUIT TO BE ABANDONED AND CAPPED. THIS ITEM WILL BE FOR UNDER ITEM 6163-6002.

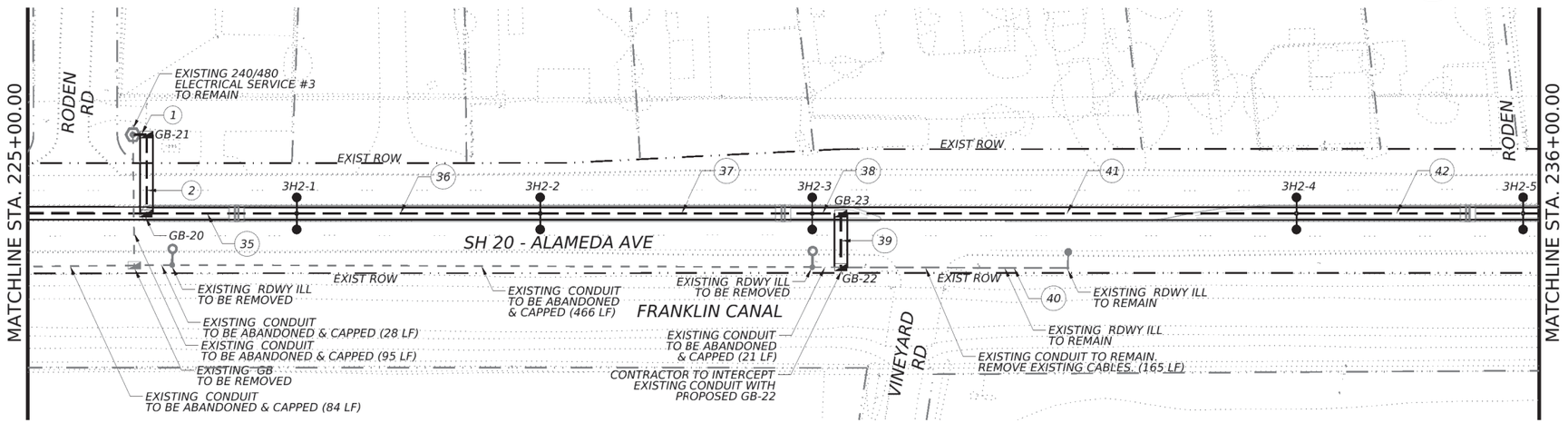
CONDUIT AND CONDUCTOR RUNS

RUN NO.	LENGTH OF RUN (FT)	EXISTING/INSTALL (E/I)	CONDUIT (FT) SCHED 40 PVC (2")						ELECTRICAL CONDUCTOR ELEC CONDR (NO.6) INSUL			
			EA	PREPARE	EA	TRENCH	EA	BORE	GROUND		POWER	
1	10	I			1	10			1	15	4	60
2	60	I					1	60	1	65	4	260
3	270	I					1	270	1	275	2	550
4	15	I					1	15	1	20	2	40
5	40	I					1	40	1	45	2	90
6	185	E	1	185					1	190	2	380
7	155	E	1	155					1	160	2	320
8	350	I					1	350	1	355	2	710
9	165	I					1	165	1	170	2	340
10	170	I					1	170	1	175	2	350
11	170	I					1	170	1	175	2	350
12	70	I					1	70	1	75	2	150
35	110	I					1	110	1	115	2	230
36	180	I					1	180	1	185	2	370
37	200	I					1	200	1	205	2	410
38	20	I					1	20	1	25	2	50
39	40	I					1	40	1	45	2	90
40	165	E	1	165					1	170	2	340
41	335	I					1	335	1	340	2	680
42	165	I					1	165	1	170	2	340
TOTAL	2875			505		10		2360		2975		6110

NOTE: ALL CONDUIT WILL INCLUDE 5 FT SLACK PER CABLE

ILLUMINATION QUANTITIES (CSJ 0002-02-062)

ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
110	6003	EXCAVATION (SPECIAL)	CY	0.15
416	6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF	80
610	6009	REMOVE RD IL ASM (TRANS-BASE)	EA	4
610	6161	IN RD IL (TY SA) 30T-4-4 (250W EQ) LED	EA	10
618	6023	CONDT (PVC) (SCH 40) (2")	LF	10
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF	2360
620	6010	ELEC CONDR (NO.6) INSULATED	LF	9085
624	6002	GROUND BOX TY A (122311)W/APRON	EA	6
624	6028	REMOVE GROUND BOX	EA	2
6027	6003	CONDUIT (PREPARE)	LF	505
6084	6001	MODIFY EXISTING ELECTRICAL SERVICE	EA	1
6163	6002	REMOVE EXISTING CABLES (POWER)	LF	1963



STATE OF TEXAS
EDUARDO I. ADAME
126153
LICENSED PROFESSIONAL ENGINEER
10/26/2023

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Texas Department of Transportation

SH 20

ILLUMINATION LAYOUT
STA 214+00 TO 236+00

SHEET 5 OF 6

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		66

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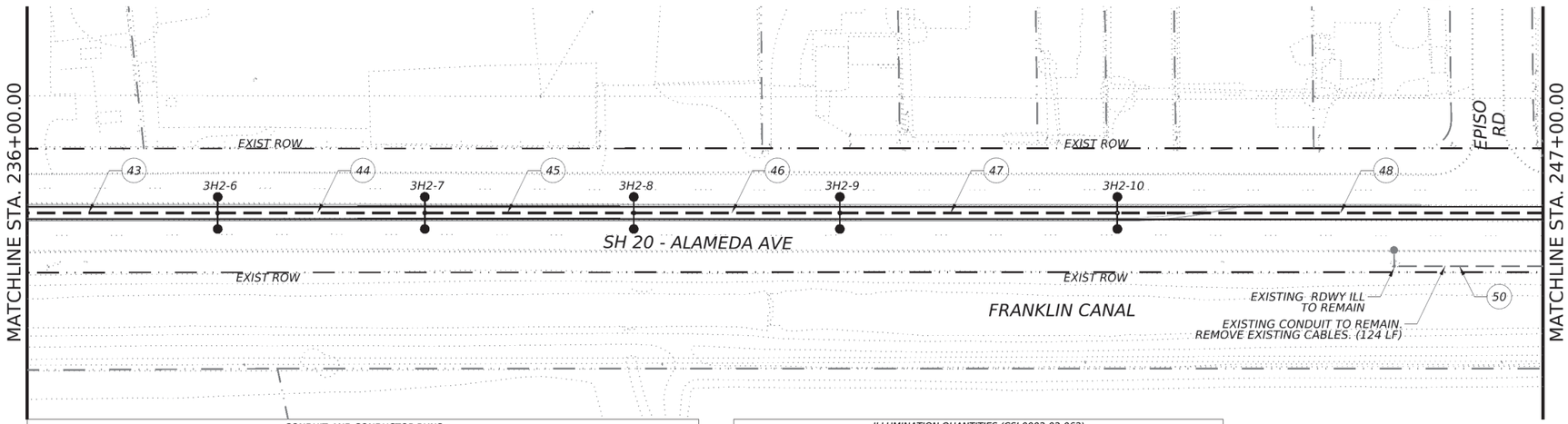
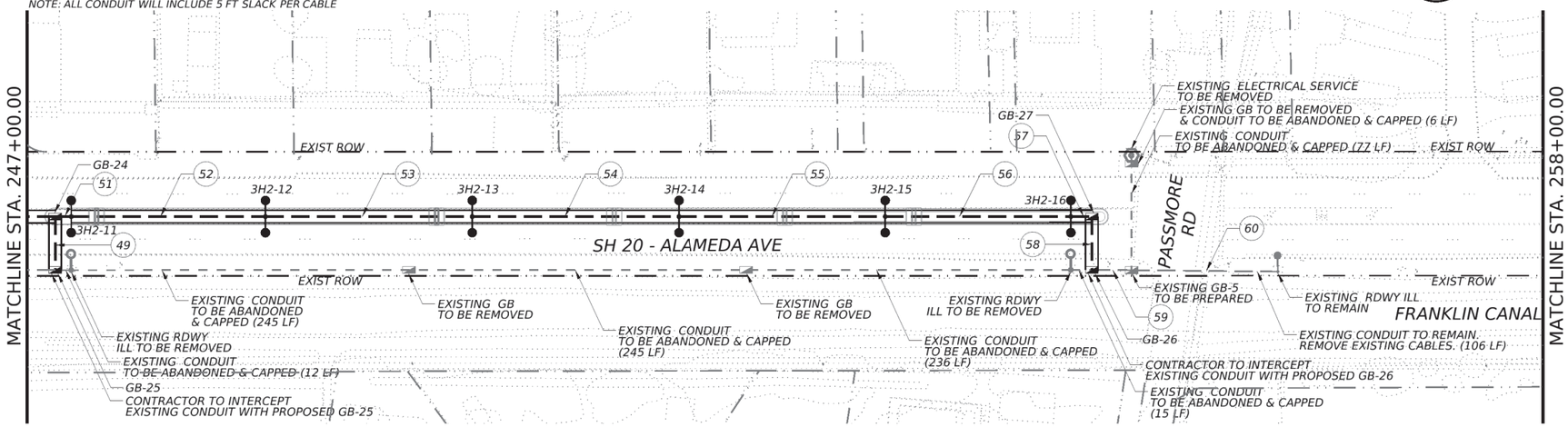


CONDUIT AND CONDUCTOR RUNS												
RUN NO.	LENGTH OF RUN (FT)	EXISTING/INSTALL (E/I)	CONDUIT (FT) SCHED 40 PVC (2")						ELECTRICAL CONDUCTOR ELEC CONDR (NO. 6) INSUL			
			EA	PREPARE	EA	TRENCH	EA	BORE	GROUND		POWER	
43	150	I					1	150	1	155	2	310
44	150	I					1	150	1	155	2	310
45	150	I					1	150	1	155	2	310
46	150	I					1	150	1	155	2	310
47	200	I					1	200	1	205	2	410
48	330	I					1	330	1	335	2	670
49	40	I					1	40	1	45	2	90
50	130	E	1	130					1	135	2	270
51	15	I					1	15	1	20	2	40
52	140	I					1	140	1	145	2	290
53	150	I					1	150	1	155	2	310
54	150	I					1	150	1	155	2	310
55	150	I					1	150	1	155	2	310
56	135	I					1	135	1	140	2	280
57	15	I					1	15	1	20	2	40
58	40	I					1	40	1	45	2	90
59	30	E	1	30					1	35	2	70
60	105	E	1	1					1	110	2	220
TOTAL	2230			161				1965		2320		4640

NOTE: ALL CONDUIT WILL INCLUDE 5 FT SLACK PER CABLE

ILLUMINATION QUANTITIES (CSJ 0002-02-062)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
110	6003	EXCAVATION (SPECIAL)	CY	0.15
416	6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF	88
610	6009	REMOVE RD IL ASM (TRANS-BASE)	EA	2
610	6161	IN RD IL (TY SA) 30T-4-4 (250W EQ) LED	EA	11
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF	1965
620	6010	ELEC CONDR (NO.6) INSULATED	LF	6960
624	6002	GROUND BOX TY A (122311)W/APRON	EA	4
624	6028	REMOVE GROUND BOX	EA	3
628	6002	REMOVE ELECTRICAL SERVICES	EA	1
6027	6003	CONDUIT (PREPARE)	LF	161
6027	6008	GROUND BOX (PREPARE)	EA	1
6163	6002	REMOVE EXISTING CABLES (POWER)	LF	1066



LEGEND

- EXISTING RDWY ILL TO REMAIN
- EXISTING RDWY ILL TO BE REMOVED
- IN RD IL (TY SA) 30T-4-4 (250W EQ) LED
- IN RD IL (TY SA) 40T-10 (250W EQ) LED
- EXISTING ELECTRICAL SERVICE
- EXISTING GROUND BOX TY A (W/APRON)
- PROPOSED GROUND BOX TY A (W/APRON)
- EXISTING CONDUIT (TRENCHED) ABANDONED & CAPPED
- EXISTING CONDUIT (TRENCHED) RE-USE
- PROPOSED CONDUIT (TRENCHED)
- EXISTING CONDUIT (BORE)
- PROPOSED CONDUIT (BORE)
- # CONDUIT RUN

POLE DESIGNATION

1I-#

POLE OR LUMINAIRE NO.
CIRCUIT NO.
SERVICE NO.

NOTE:

1. CONTRACTOR TO REMOVE EXISTING CABLES FOR ALL EXISTING CONDUIT TO BE ABANDONED AND CAPPED. THIS ITEM WILL BE FOR UNDER ITEM 6163-6002.

EDUARDO I. ADAME
126153

P.E.
10/26/2023

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SH 20

ILLUMINATION LAYOUT
STA 236+00 TO
END OF PROJECT

SHEET 6 OF 6

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST		COUNTY	SHEET NO.
ELP		EL PASO	67

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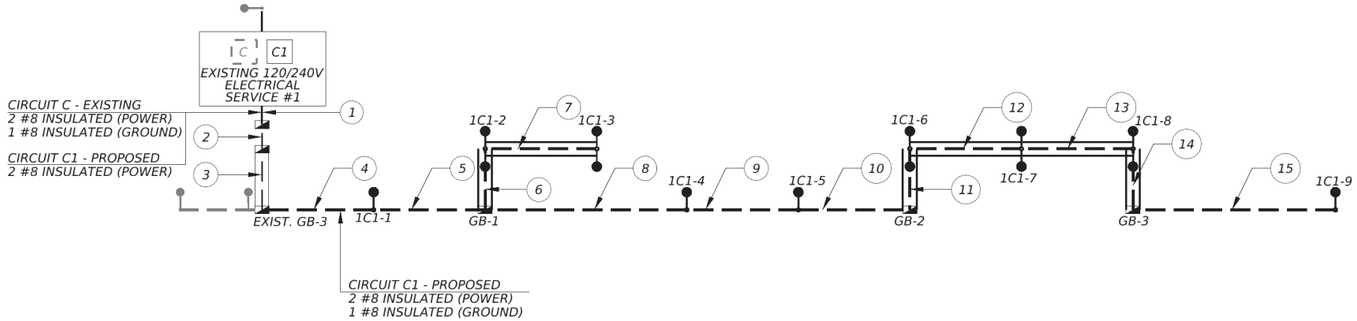
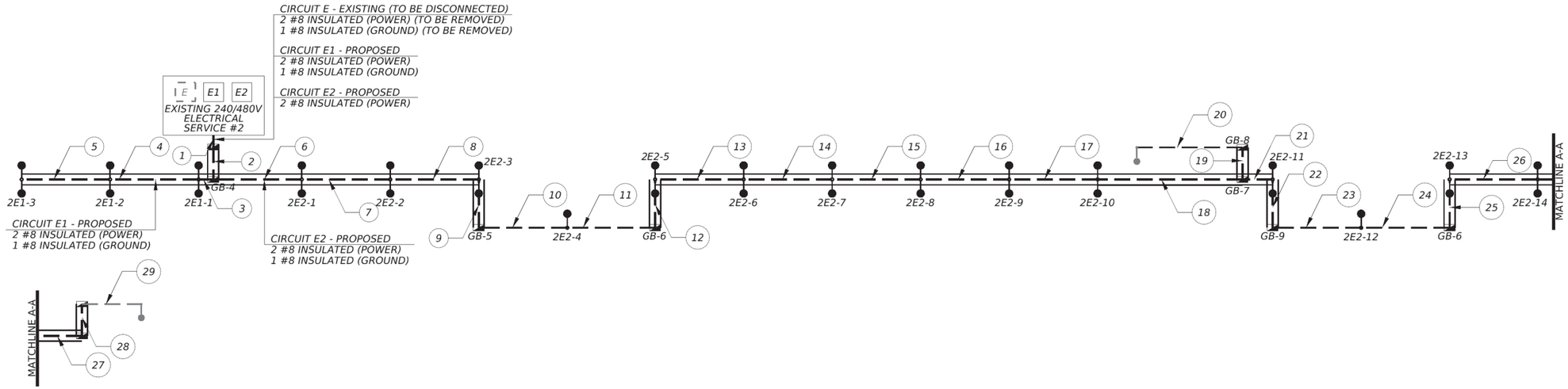
LEGEND

- EXISTING RDWY ILL TO REMAIN
- EXISTING RDWY ILL TO BE REMOVED
- IN RD IL (TY SA) 30T-4-4 (250W EQ) LED
- IN RD IL (TY SA) 40T-10 (250W EQ) LED
- EXISTING ELECTRICAL SERVICE
- EXISTING GROUND BOX TY A (W/APRON)
- PROPOSED GROUND BOX TY A (W/APRON)
- EXISTING CONDUIT (TRENCHED) ABANDONED & CAPPED
- EXISTING CONDUIT (TRENCHED) RE-USE
- PROPOSED CONDUIT (TRENCHED)
- EXISTING CONDUIT (BORE)
- PROPOSED CONDUIT (BORE)
- # CONDUIT RUN

POLE DESIGNATION

1I-#
- POLE OR LUMINAIRE NO.
- CIRCUIT NO.
- SERVICE NO.





Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service *Conduit Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Lighting Contactor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
STA 4+59 84' LT ELECTRICAL SERVICE #1	45	ELC SRV TY A 120/240 060 (NS)AL(T)GC(O)	1 1/4"	3/#4	N/A	2P/60	2P/ 60	N/A	Existing C Proposed C1	2P/15 2P/15	3 10.65	3.3
STA 7+32 45' LT ELECTRICAL SERVICE #2	47	ELC SRV TY A 240/480 060 (NS)AL(T)GC(O)	1 1/4"	3/#4	N/A	2P/60	2P/ 60	N/A	Existing E Proposed E1 Proposed E2	2P/20 2P/20 2P/20	5 2.1 9.1	7.8

STATE OF TEXAS
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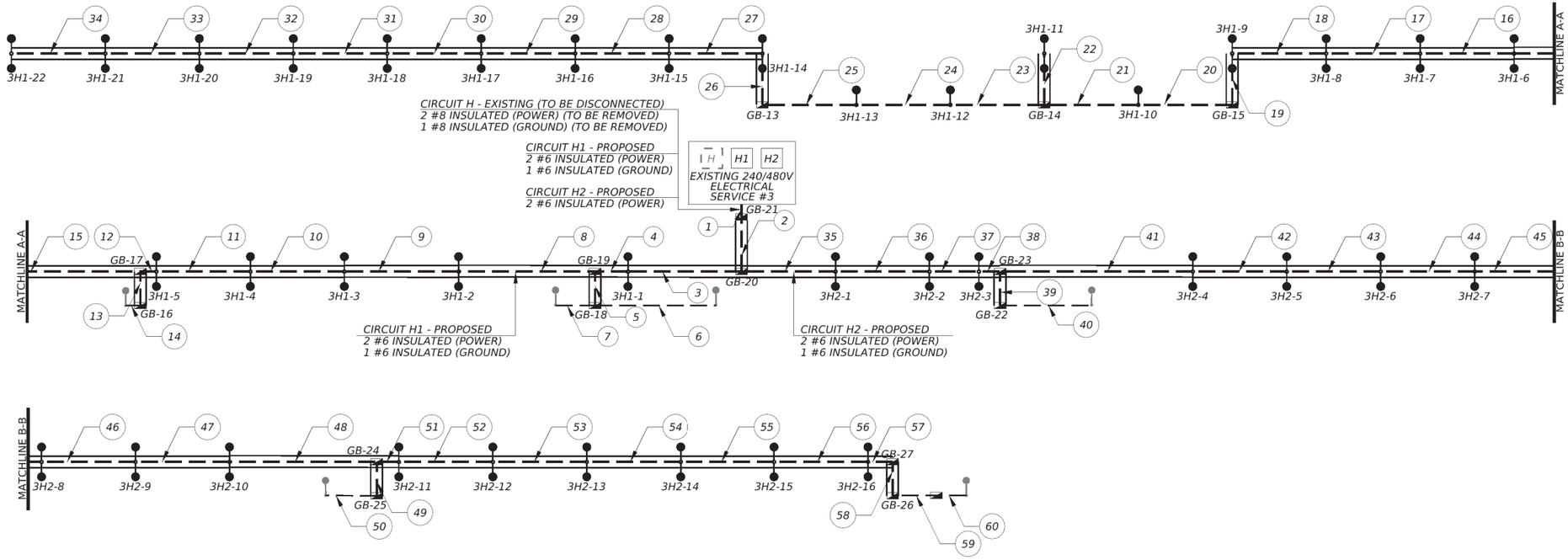
SH 20

CIRCUIT DIAGRAM

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		68



Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service *Conduit Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Lighting Contactor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
STA 14+86 86' LT ELECTRICAL SERVICE #3	53	ELC SRV TY A 240/480 060 (NS)AL(T)GC(O)	1 1/4"	3/#4	N/A	2P/60	2P/ 60	N/A	Existing H Proposed H1 Proposed H2	2P/20 2P/20 2P/20	6 15.4 11.9	15.9

LEGEND

- EXISTING RDWY ILL TO REMAIN
- EXISTING RDWY ILL TO BE REMOVED
- IN RD IL (TY SA) 30T-4-4 (250W EQ) LED
- IN RD IL (TY SA) 40T-10 (250W EQ) LED
- EXISTING ELECTRICAL SERVICE
- EXISTING GROUND BOX TY A (W/APRON)
- PROPOSED GROUND BOX TY A (W/APRON)
- EXISTING CONDUIT (TRENCHED) ABANDONED & CAPPED
- EXISTING CONDUIT (TRENCHED) RE-USE
- PROPOSED CONDUIT (TRENCHED)
- EXISTING CONDUIT (BORE)
- PROPOSED CONDUIT (BORE)
- (#) CONDUIT RUN

POLE DESIGNATION

1I-#
- POLE OR LUMINAIRE NO.
- CIRCUIT NO.
- SERVICE NO.

STATE OF TEXAS
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126153
LICENSED
PROFESSIONAL ENGINEER

Edward Adame P.E.

10/26/2023

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Texas Department of Transportation

SH 20

CIRCUIT DIAGRAM

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		69

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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 $\frac{1}{2}$ 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 point 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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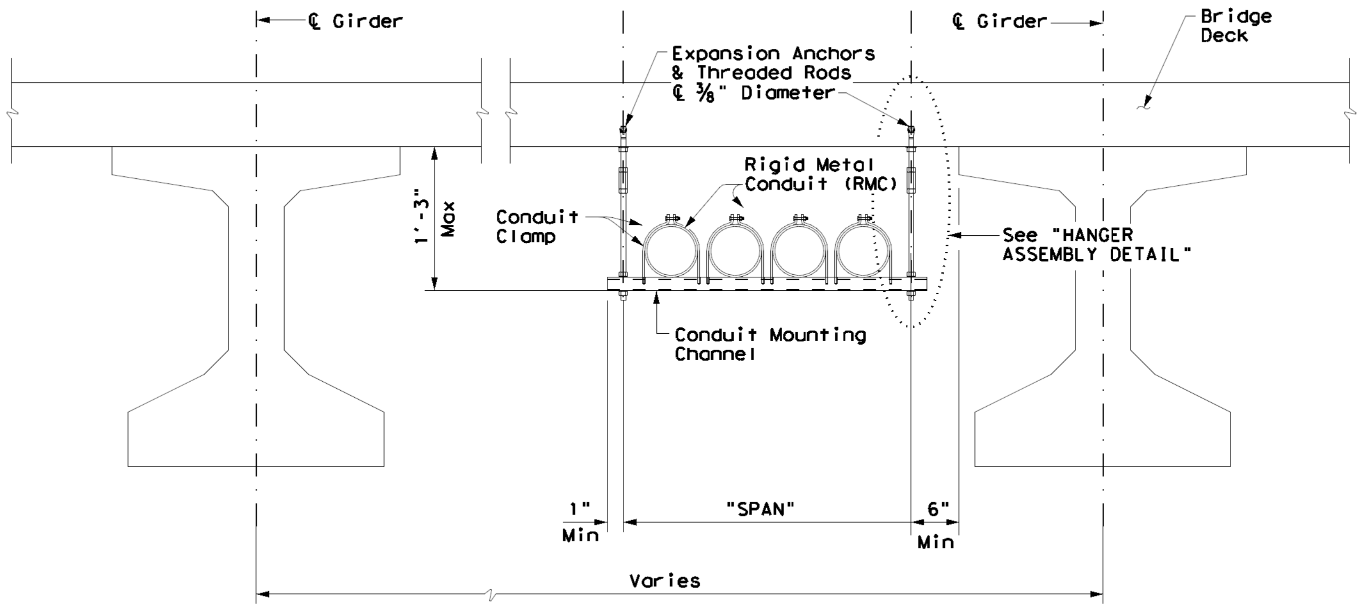
REVISIONS	DIST ELP	COUNTY EL PASO		SHEET NO. 70

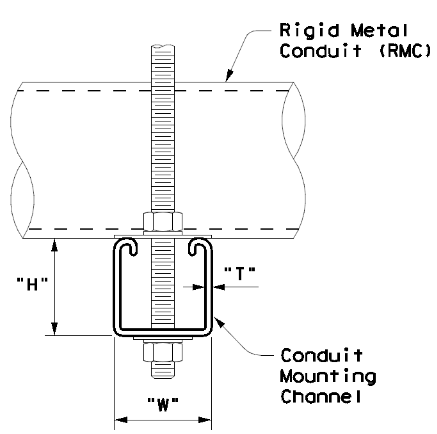
71A

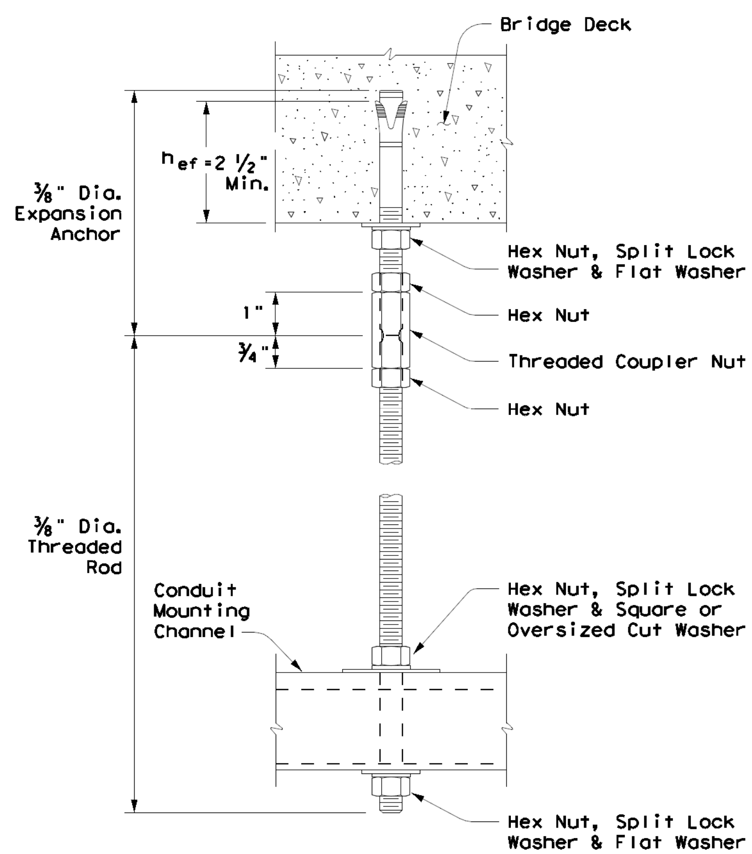


CONDUIT HANGING DETAIL

CONDUIT MOUNTING CHANNEL		
"SPAN"	"W" x "H"	"T"
less than 2'	1 5/8" x 1 3/8"	12 Ga.
2'-0" to 2'-6"	1 5/8" x 1 5/8"	12 Ga.
>2'-6" to 3'-0"	1 5/8" x 2 7/16"	12 Ga.

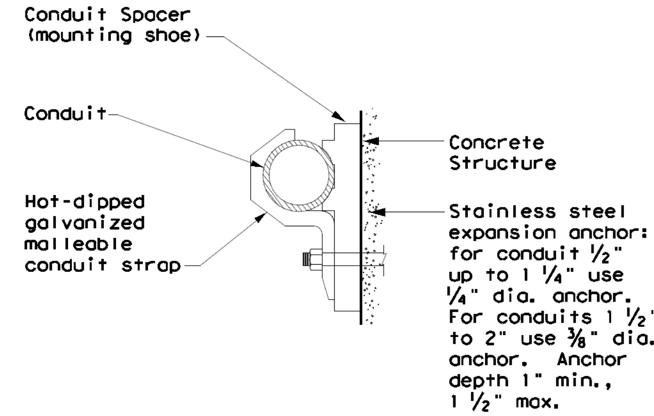
Channels with round or short slotted hole patterns are allowed, if the load carrying capacity is not reduced by more than 15%.

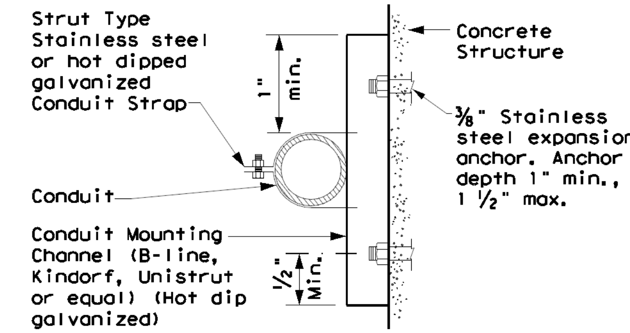




HANGER ASSEMBLY DETAIL

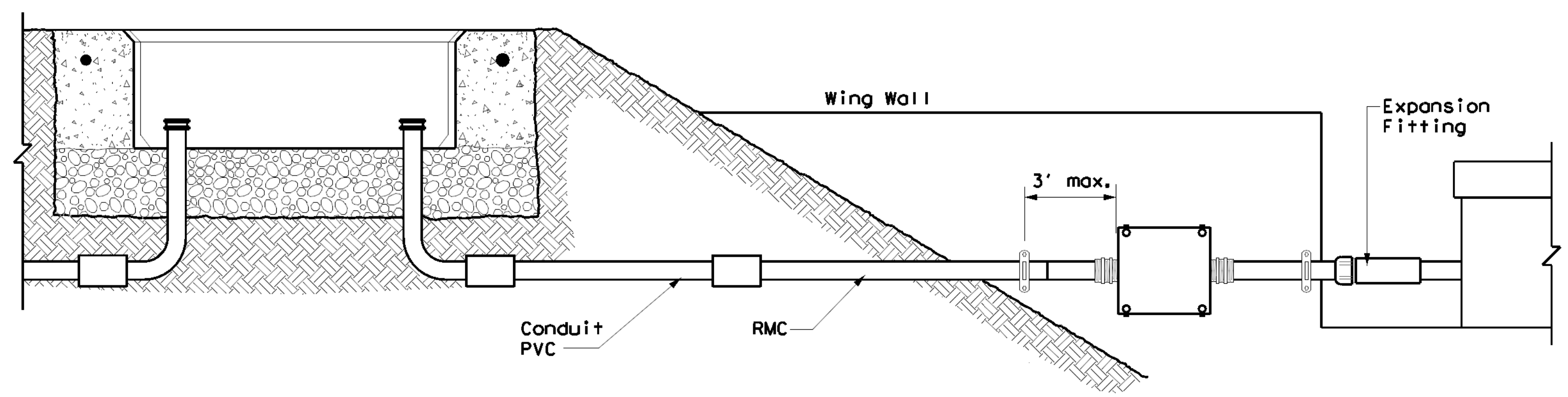
ELECTRIC CONDUIT TO BRIDGE DECK ATTACHMENT





CONDUIT MOUNTING OPTIONS

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



TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL

EXPANSION ANCHOR NOTES FOR BRIDGE DECK ATTACHMENT

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

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUIT SUPPORTS

ED(2)-14

FILE:	ed2-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT		
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REVISIONS		0002	02	059, ETC.		SH 20	
		DIST	COUNTY			SHEET NO.	
		ELP	EL PASO			71	

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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.

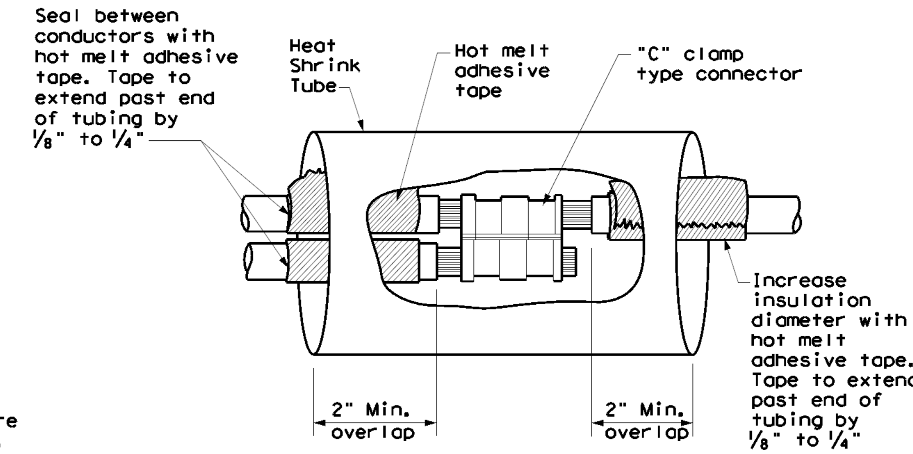
3. Install ground rods so the imprinted part number is at the upper end of the rod.

4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.

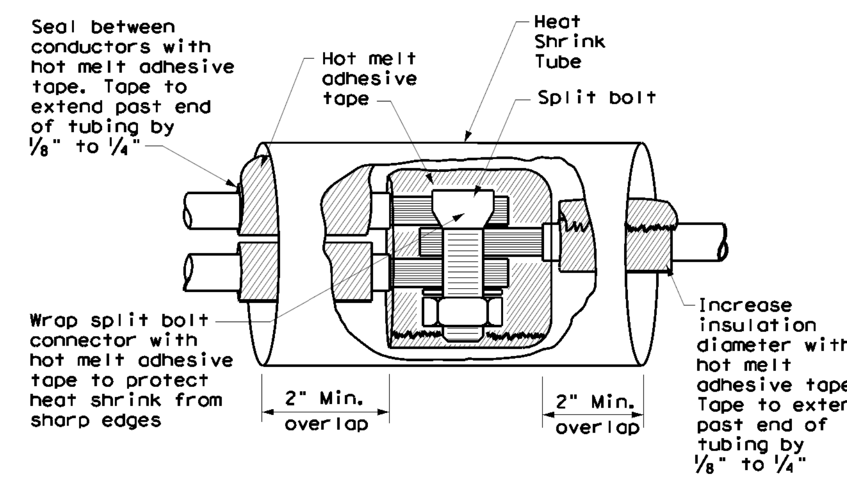
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.

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.

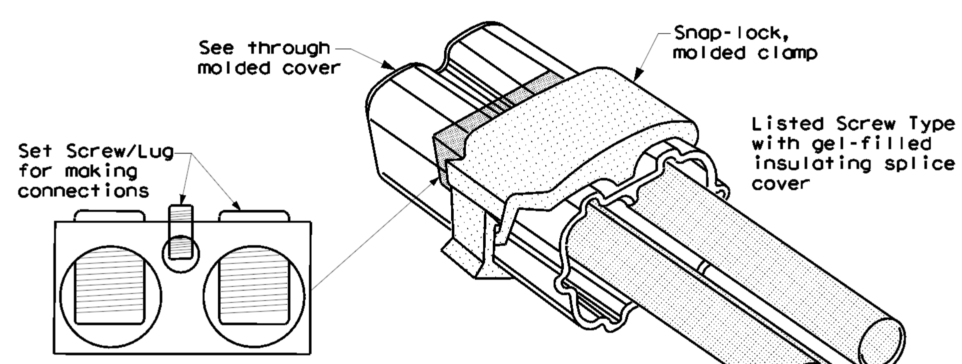
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

Texas Department of Transportation			Traffic Operations Division Standard
ELECTRICAL DETAILS CONDUCTORS			
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REVISIONS	DIST ELP	COUNTY EL PASO	SHEET NO. 72

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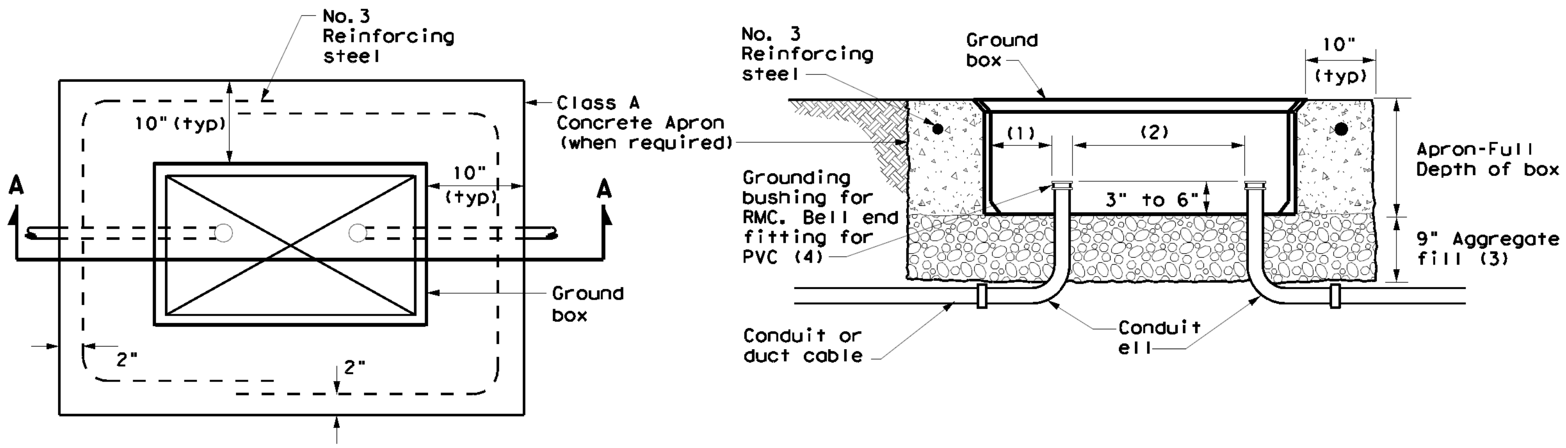


PLAN VIEW

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 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.

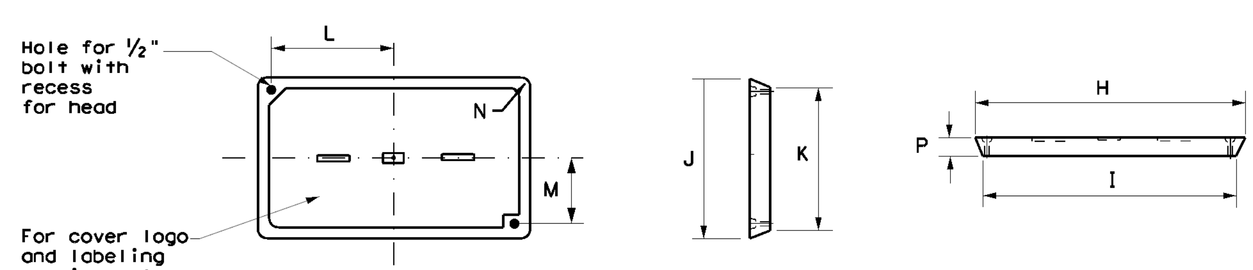
11. Bond metal ground box covers to the grounding conductor with a tank ground type lug.

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

END

SIDE

GROUND BOX COVER

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS GROUND BOXES

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	DIST		COUNTY	SHEET NO.
	ELP		EL PASO	73

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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	

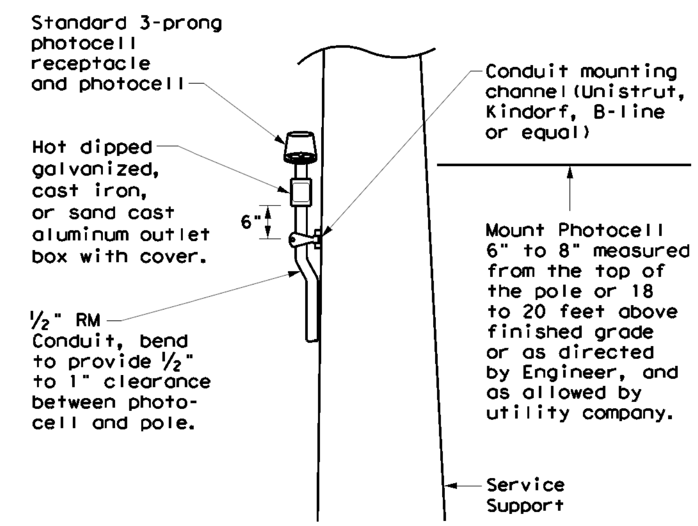
* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.

** 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

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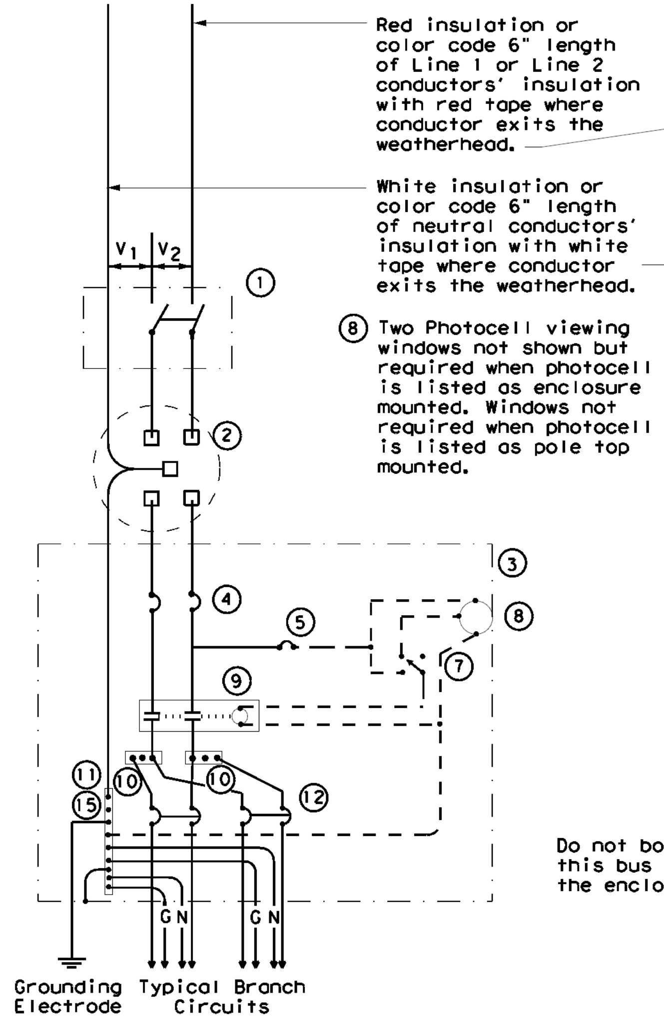
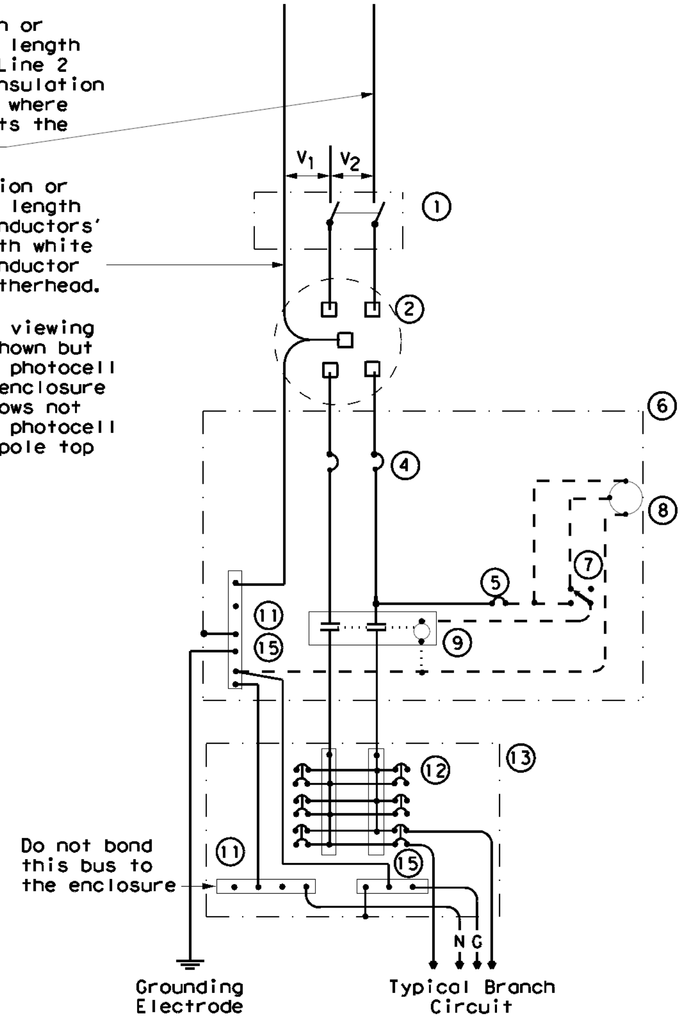
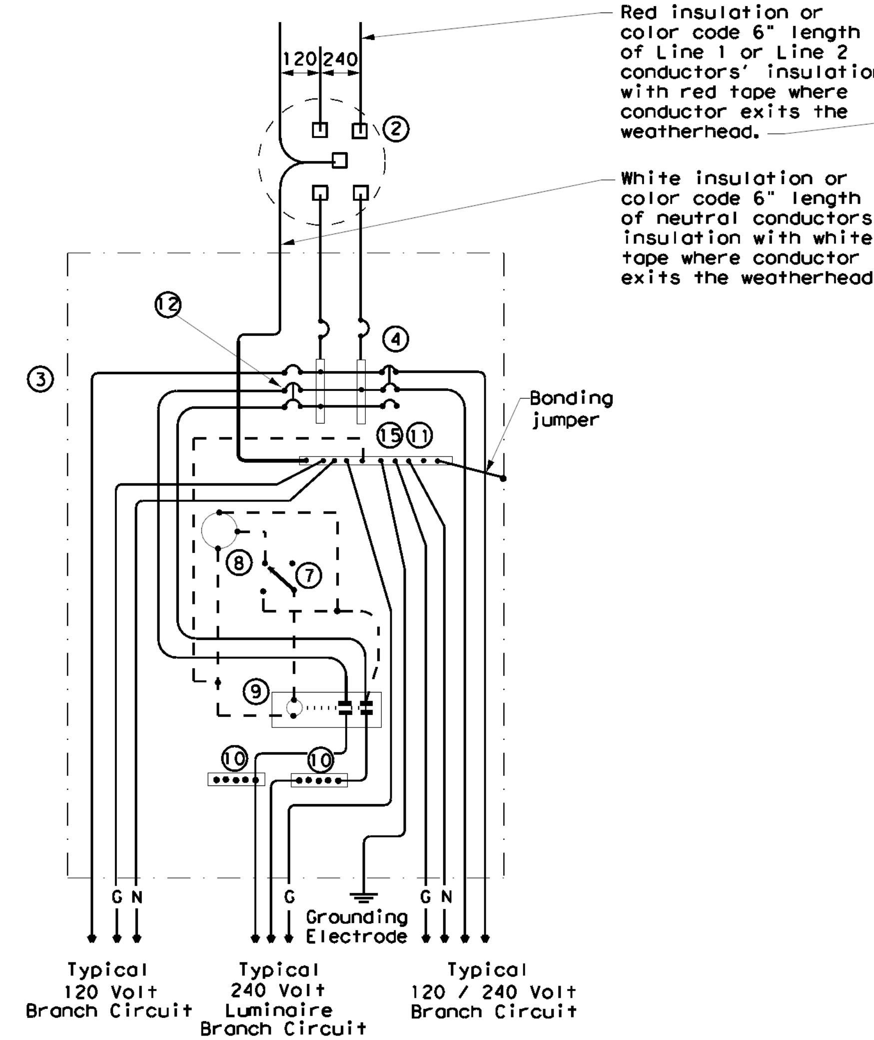


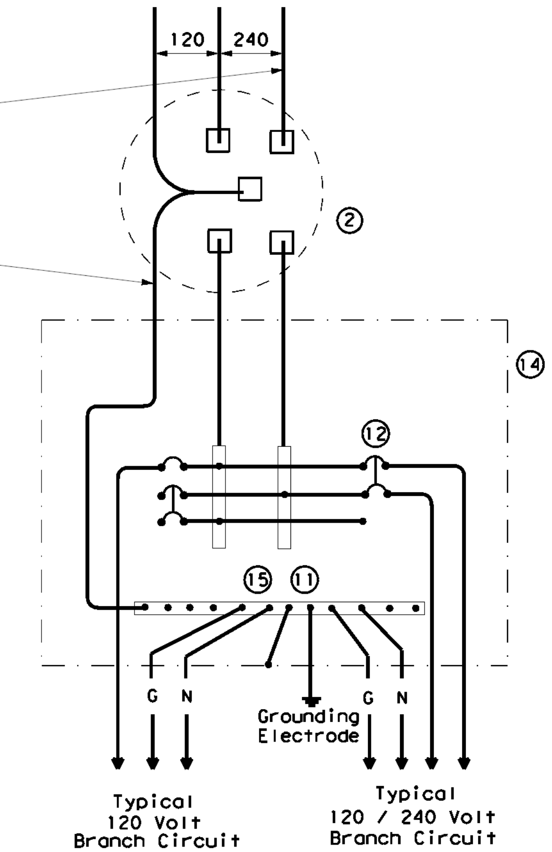
SCHEMATIC TYPE A
THREE WIRE



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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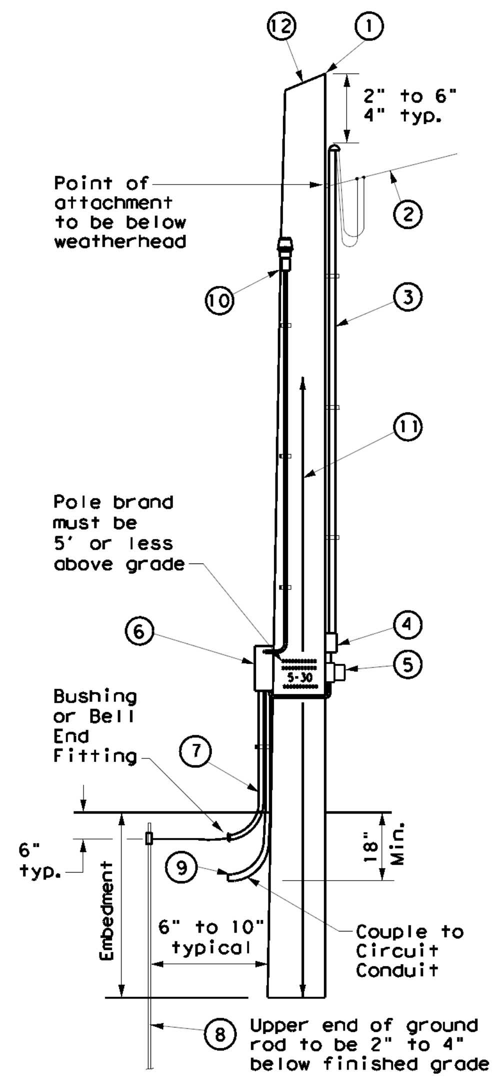
TIMBER POLE (TP) SERVICE SUPPORT NOTES

1. Ensure electrical service support is a class 5 treated timber pole as per Item 627 "Treated Timber Poles." Embed timber pole to depth required in Item 627.
2. Conduit and electrical conductors attached to the electrical service pole and underground within 12 in. of service pole are not paid for directly but are subsidiary to the electrical service.
3. Install pole-top mounted photocell (T) on north side of pole, or in service enclosure (E) as required. See Electrical Service Data chart in plan set.
4. Gain pole as required to provide flat surface for each channel. Gain timber pole to ⅝ in. max. depth and 1 ⅞ in. max. height. Gain pole in a neat and workmanlike manner.
5. Mount meter and service equipment on stainless steel or galvanized channel (Unistrut, Kindorf, or equal). Provide channel sized 1 in. to 3 ¾ in. maximum depth, and 1½ in. to 1⅝ in. maximum width. File smooth the cut ends of galvanized channel and paint with zinc rich paint before installing on pole. Secure each channel section to timber pole with two galvanized or SS lag bolts, ¼ in. minimum diameter by 1½ in. minimum length. Use a galvanized or SS flat washer on each lag bolt. Do not stack channel.
6. When excess length must be trimmed from poles, trim from the top end only.

1. Class 5 pole, height as required
2. Service drop from utility company (attached below weatherhead)
3. Service conduit (RMC) and service entrance conductors - One Red, One Black, One White (See Electrical Service Data)
4. Safety switch (when required)
5. Meter (when required)
6. Service enclosure
7. 6 AWG bare grounding electrode conductor in ½ in. PVC to ground rod - extend ½ in. PVC 6 in. underground.
8. ⅝ in. x 8 ft. Copper clad ground rod - drive ground rod to a depth of 2 in. to 4 in. below grade.
9. RMC same size as branch circuit conduit.
10. See pole-top mounted photocell detail on ED(5).
11. When required by the serving utility provide bare 6 AWG copper conductor. Run wire from pole top to butt wrap or copper butt plate. Protect conductor with non-conductive material to a height of 8 ft. above finished grade.
12. When required by utility, cut top of pole at an angle to enhance rain run off.

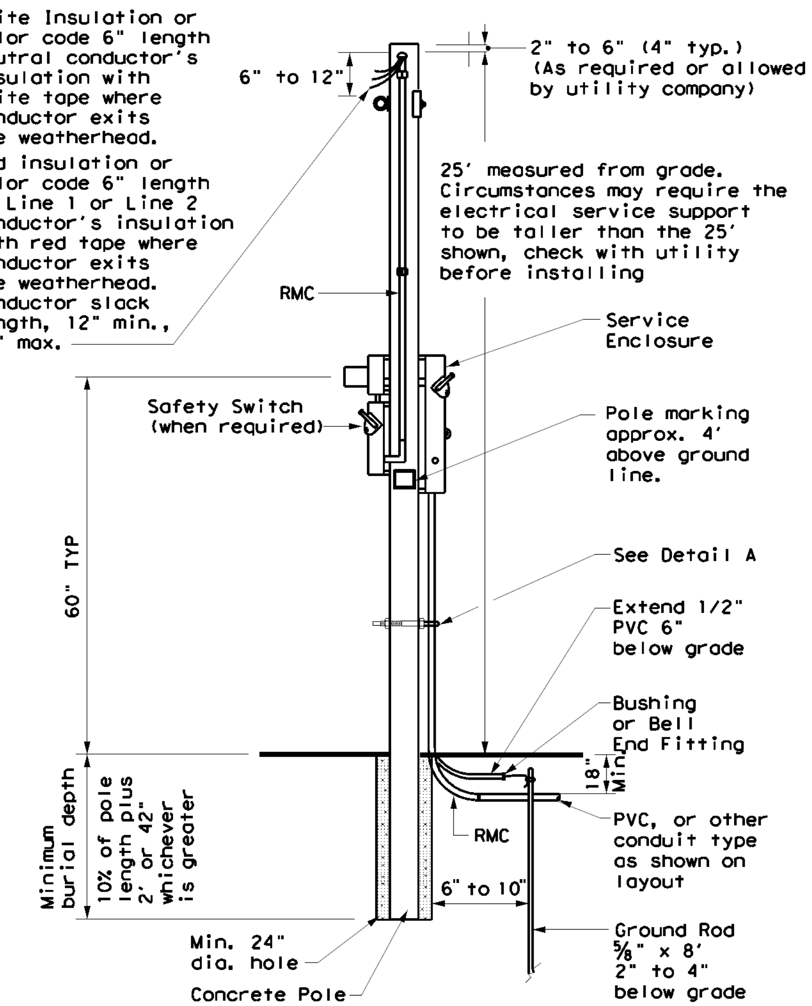


SERVICE SUPPORT TYPE TP (O)

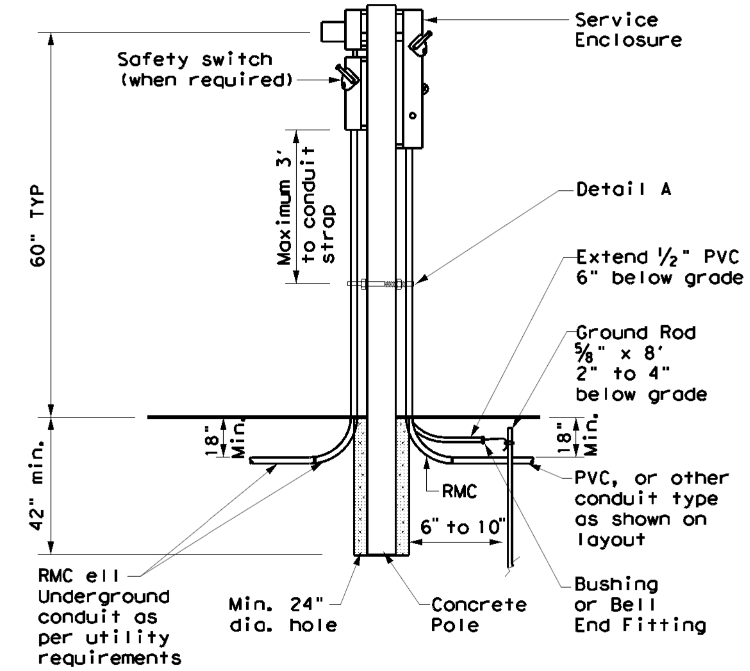
GRANITE CONCRETE (GC) & OTHER CONCRETE (OC) NOTES

Ensure electrical service support structures bid as type Granite Concrete (GC) or Other Concrete (OC) meet the following requirements.

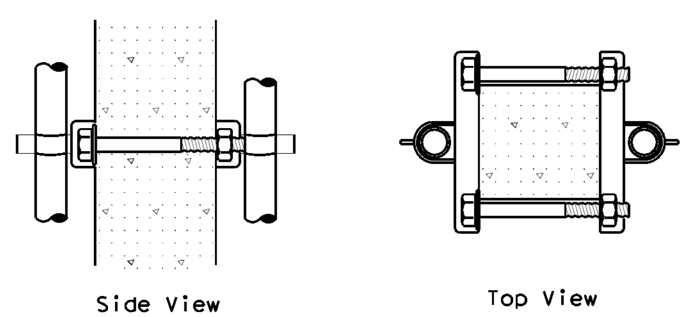
1. Provide GC and OC poles that meet the requirements of DMS 11080 "Electrical Services."
2. Provide prestressed concrete poles suitable for direct embedment into the ground without special foundations.
3. Verify poles are marked as required on DMS 11080. Location of marking should be approximately 4' above final grade. Use the two-point pickup locations when handling pole in horizontal position, and one-point pickup location for use in raising the pole to a vertical position. These marks are small but conspicuous.
4. Embed poles 42 in. or 10% of the length plus 2 ft., whichever is greater.
5. Ensure all installation details of services are in accordance with utility company specifications.
6. Install a one point rack or eye bolt bracket 6 inches to 12 inches below the weatherhead as an overhead service drop anchoring point for the electric utility.
7. Furnish and install galvanized 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). Attach channel strut with stainless steel concrete anchors (max. 1" depth), square U-bolts or back to back channel strut with long bolts, or other secure mounting as approved by the Engineer. Ensure bolts are galvanized in accordance with ASTM A153. Do not stack channel struts.
8. Backfill the holes thoroughly by tamping in 6 in. lifts. After tamping to grade, place additional backfill material in a 6 inch high cone around the pole to allow for settling. Use material equal in composition and density to the surrounding area. Backfilling will not be paid for directly but is subsidiary to various bid items.



CONCRETE SERVICE SUPPORT
Overhead (O)



CONCRETE SERVICE SUPPORT
Underground (U)



DETAIL A

See Note 7. Before installing channel that has been cut, file sharp edges and paint with zinc-rich paint. Ensure there is no paint splatter on the pole.

Texas Department of Transportation — Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES GC, OC, & TP

ED(10)-14

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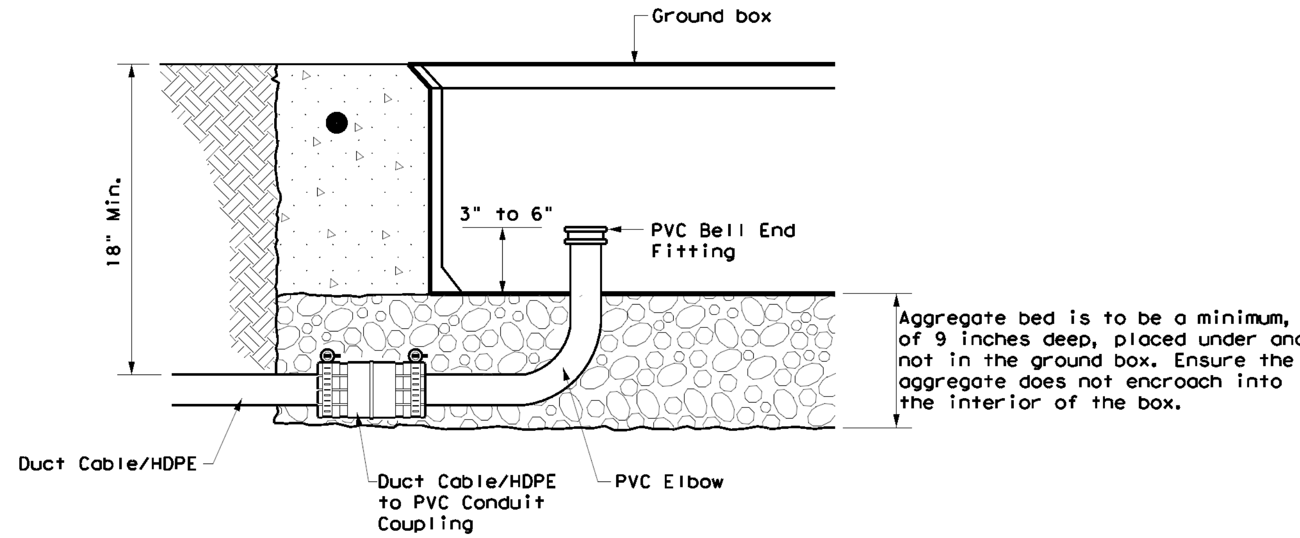
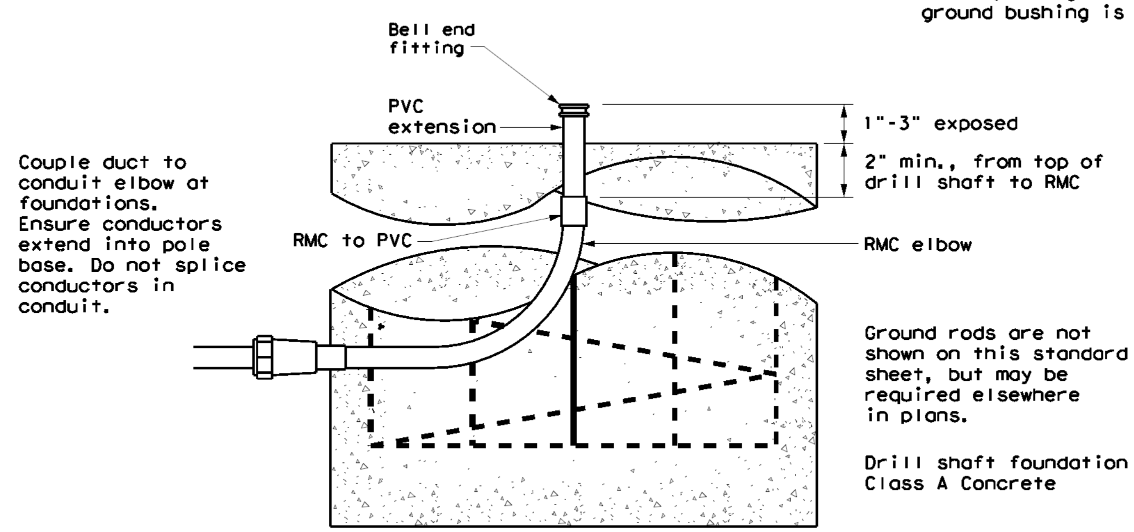
DUCT CABLE & HDPE CONDUIT NOTES

1. Provide duct cable in accordance with Departmental Material Specification (DMS) 11060 "Duct Cable" and Item 622 "Duct Cable." Provide duct cable as listed on the Material Producer List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 622.
2. Provide High-Density Polyethylene (HDPE) conduit in accordance with DMS 11060 and Item 618, "Conduit." Provide HDPE as listed on the MPL on the Department web site under "Roadway Illumination and Electrical Supplies," Item 618.
3. Supply duct cable with a minimum 2 in. diameter, unless otherwise shown in the plans. Provide duct cable and HDPE conduit as shown by descriptive code or on the plans. Bend duct cable and HDPE conduit as recommended by the manufacturer, with a minimum bending radius of 26 in. for 2 in. duct. Follow manufacturers' recommendations when handling duct cable and HDPE conduit reels and during installation of duct cable and HDPE conduit.
4. Do not splice conductors within duct cable or HDPE conduit. Couple duct cable and HDPE entering a ground box or foundation to a PVC elbow. When galvanized steel RMC elbows are called for in the plans and any portion of the RMC elbow is buried less than 18" from possible contact, ground the RMC elbow.
5. Furnish and install duct cable with factory installed conductors, sized as shown in the plans and as required by the National Electrical Code (NEC). The NEC contains specific requirements for duct cable in Article, "Nonmetallic Underground Conduit with Conductors: Type NUCC."
6. When conduit casing is called for in the plans, extend duct cable or HDPE conduit through the conduit casing in one continuous length without connection to the casing.
7. Seal the ends of duct cable or HDPE conduit with duct seal, expandable foam, or other approved method after completing the pull tests required by Item 622.
8. Provide minimum cover of 24 in. under roadways, 18 in. in other locations, or as shown on the plans.
9. Furnish and install listed fittings to couple duct cable or HDPE conduit to other types of conduit. Duct cable and HDPE conduit may be field-threaded and spliced with PVC or RMC threaded couplings; connected with listed tie-wrap fittings; connected using listed coupling made of HDPE with stainless steel external banding clamps and locking rings; connected with approved electrofusion conduit couplings; or connected using an approved chemical fusion method using an epoxy or adhesive specifically designed for HDPE couplings and connectors all installed in accordance with their manufacturer's instructions. Do not use PVC glue on HDPE. Do not use water pipe fittings, or connect conduit with heat shrink tubing.

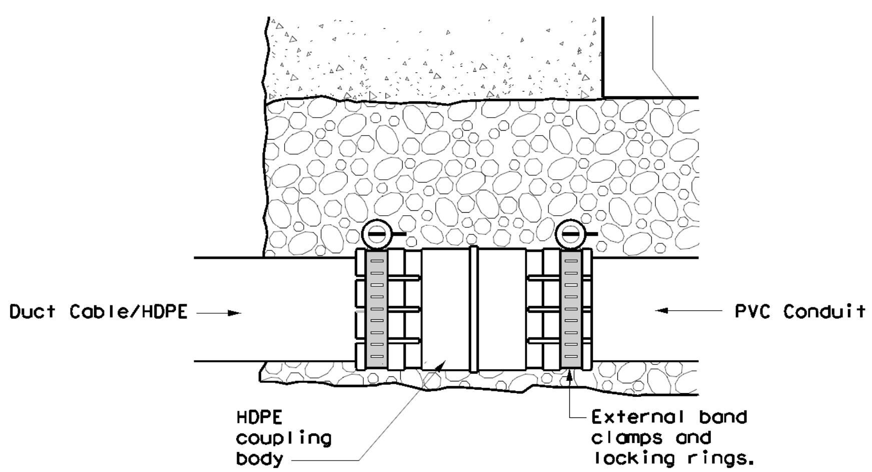


DUCT CABLE/HDPE AT GROUND BOX

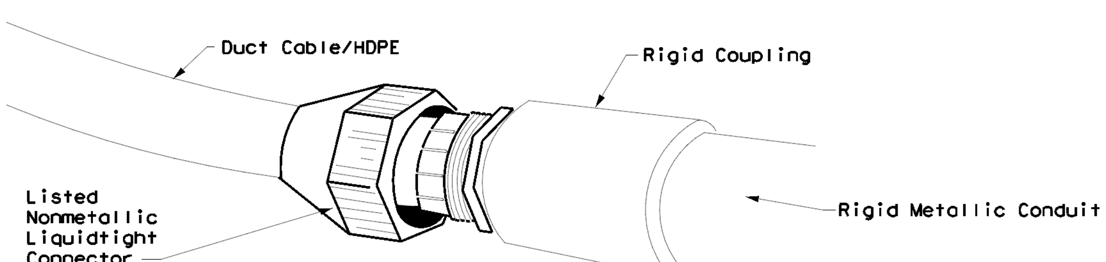
When the upper end of an RMC Ell does not enter the ground box, it may be extended with a SCH-40 PVC conduit nipple and bell end, provided there is a minimum of 18" of cover over all parts of the elbow. If not, a rigid extension and ground bushing is required.



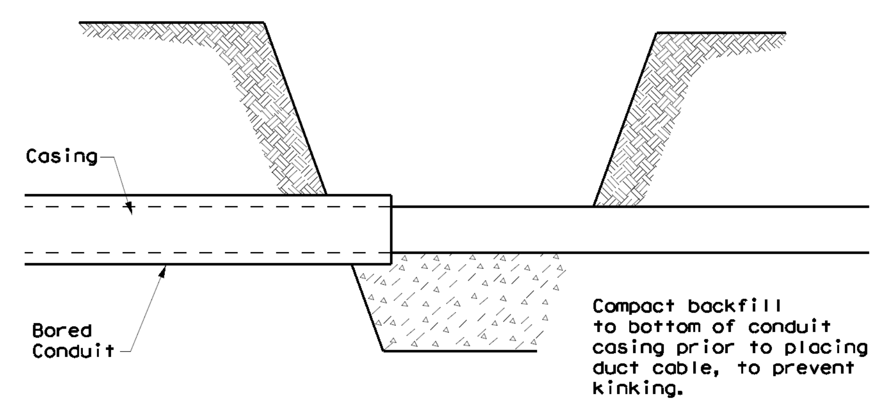
DUCT CABLE / HDPE AT FOUNDATION



DUCT CABLE/HDPE TO PVC



DUCT CABLE/HDPE TO RMC



BORE PIT DETAIL

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS DUCT CABLE/ HDPE CONDUIT

ED(11)-14

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ROADWAY ILLUMINATION ASSEMBLY NOTES

1. Details apply to roadway lighting installations bid or referenced under Item 610, "Roadway Illumination Assemblies." Provide, furnish, and install all other materials not shown on the plans which may be necessary for complete and proper construction. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the State such warranties or guarantees.

2. The locations of poles and fixtures may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.

3. 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, Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection.

4. Provide Roadway Illumination Light Fixtures as per TxDOT Departmental Material Specification (DMS) 11010, Item 610, and as shown on the Material Producers List (MPL) for Roadway Illumination and Electrical Supplies.

5. Fabricate steel roadway illumination poles in accordance with Roadway Illumination Poles (RIP) standards and Item 610. Poles fabricated according to RIP standards do not require shop drawing submittals.

   a. Alternate designs to RIP standards or the use of aluminum to fabricate poles will require the submission of shop drawings electronically. For instructions on submitting shop drawings electronically see "Guide to Electronic Shop Drawing Submittal" on the TxDOT web site.

   b. Limitations on use of the RIP standard: The RIP standard details were developed for installations in locations where the 3-second gust basic maximum wind speed is 110 mph, and where the elevation of the base of the pole is less than (i.e. not more than) 25' above the elevation of the surrounding terrain, in accordance with the "AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals," 6th Edition (2013) of the AASHTO Design Specifications. For poles to be installed in regions where the maximum basic wind speed exceeds 110 mph or to be mounted more than 25' above the surrounding terrain, provide poles meeting the following requirements:

      i. Submittals. Following the electronic shop drawing submittal process (see Guide to Electronic Shop Drawing Submittal on the TxDOT web site), submit to the Engineer for approval fabrication drawings and calculations for the poles, sealed by a Texas licensed professional engineer (P.E.).

      ii. Luminaire Structural Support Requirements. Provide light poles, arms, and anchor bolt assemblies with a 25 year design life to safely resist dead loads, ice loads and the required basic wind speeds at the location of installation in accordance with the 6th edition (2013) of the AASHTO Design Specifications. For transformer base poles, include transformer base and connecting hardware in calculations and shop drawing submittals. Structurally test all transformer bases to resist the theoretical plastic moment capacity of the pole. Submit certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished with the shop drawings. Show breakaway base model number, manufacturer's name, and logo on shop drawings. Include on manufacturer's shop drawings the ASTM designations for all materials to be used.

6. For both transformer and shoe-base type illumination poles, provide and install double-pole breakaway fuse holders as specified by DMS-11040. Breakaway fuse holders are listed on the MPL for Roadway Illumination and Electrical Supplies under Items 610 & 620. Provide 10 amp time delay fuses for breakaway connectors in light poles, or inside the light fixture for underpass luminaires. In each pole, connect luminaires to the breakaway connector with continuous stranded 12 AWG copper conductors as listed on the MPL. Bond all equipment grounding conductors together and to the ground lug in the transformer base or hand hole.

7. Tighten anchor bolts for shoe base, concrete traffic barrier base, and bridge mount roadway illumination poles, in accordance with Item 449.

8. Install T-Base with following procedure:

   a. Anchor Bolt Tightening.

      i. Coat the threads of the anchor bolts with electrically conductive lubricant.

      ii. Place the T-base over the anchor bolts. Foundation must be level and flat. The maximum permissible gap under any one corner of the t-base is 1/8" before nuts are tightened.

      iii. Coat the bearing surfaces of the nuts and washers with electrically conductive lubricant. Install (1) 1/2" hold down washer, (1) lock washer, and (1) nut on each anchor bolt. Turn the nuts onto the bolts so that each is hand-tight against the washer.

      iv. Using a torque wrench, tighten each nut to 150 ft-lb. Uniform contact is required between the foundation and the T-base in the corner regions of the T-base, and all corner gaps must be closed after applying torque. If a gap still exists after torquing to 150 ft-lbs, continue torquing each bolt incrementally until gap is closed or maximum allowable torque of 250 ft. pound is reached, whichever comes first. If 250 ft-lbs is not enough to close the gap the foundation must be leveled. Gaps along the straight sides of the T-bases and the foundation are permissible. Ensure that no high point of contact occurs between the straight sides of the T-base and the foundation.

      v. Check top of T-base for level. If not level then foundation must be leveled.

   b. Top Bolt Procedure

      i. Erect pole over T-base with crane. Coat bolts, nuts, washers, and lock washers with electrically conductive lubricant.

      ii. Install bolts and 1/2" connecting washers from the inside of the T-base, thread up through the pole base. Install flat washers, lock washers and nuts snug tight according to Item 447, "Structural Bolting."

      iii. Tighten each nut to 150 ft-lb. using a torque wrench.

   c. Level and Plumb

      i. Ensure pole is plumb and mast arm is perpendicular to the roadway according to plans to within 5 degrees.

9. Construct luminaire pole foundations in accordance with Item 416, "Drilled Shaft Foundations," and TxDOT standard sheet RID(2).

10. Provide and install underpass luminaires in accordance with Item 610, DMS-11010, and TxDOT standard sheet RID(3). Typical luminaire size for underpass luminaires is 150W HPS or 150W EQ LED.

11. Mount luminaires on arms level as shown by the luminaire level indicator.

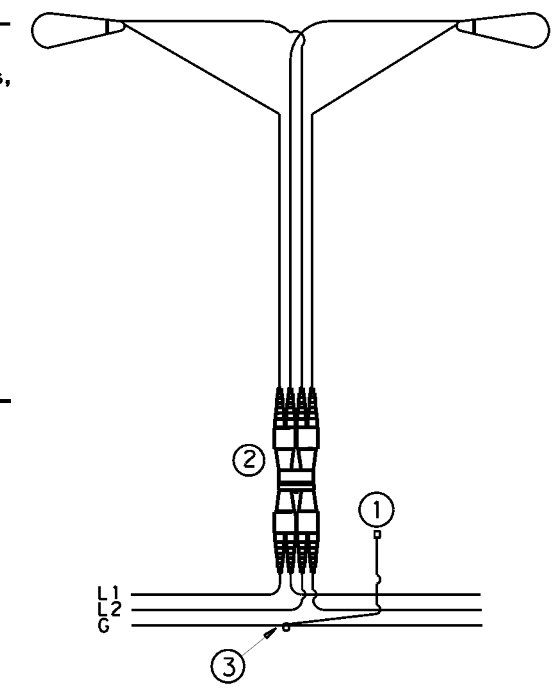
12. Orient luminaires perpendicular to the roadway intended to be lit unless otherwise shown on the plans.

Wiring Diagram Notes:

(1) Use 1/2 in.-13 UNC threaded, copper or tin-plated copper, pole bonding connector, sized appropriately for conductors, bonded to T-base, or use ground lug in handhole as available.

(2) Use pre-qualified two-pole breakaway connectors for all luminaire pole installations. For luminaires fed by a circuit with a neutral conductor, use double pole breakaway connectors with the neutral side unfused and marked white.

(3) Split Bolt or other connector.



L1,L2 = Hot Conductors
G = Grounding Conductor

TYPICAL WIRING DIAGRAM

LUMINAIRES SERVED AT 480V ON 240/480 VOLT SERVICE OR LUMINAIRES SERVED AT 240V FOR 120/240 VOLT SERVICE.

Decorative LED Lighting Notes:

1. LED Drivers in Remote Outdoor enclosures (for drivers that do not include an enclosure as part of a factory assembly):

   a. Provide NEMA 3R outdoor enclosure or as approved.

   b. Install enclosure at least 12" above ground or other horizontal surface. Mount vertically or on ceiling, and avoid direct sun where possible.

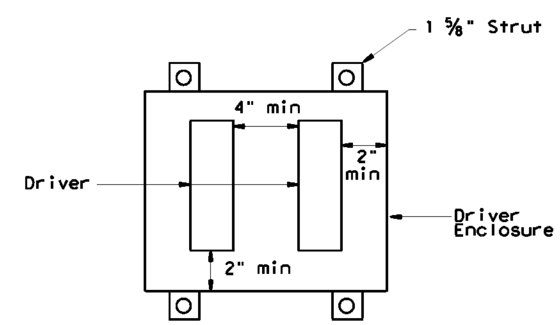
   c. Install drivers with at least 2 inches of space from enclosure walls.

   d. For multiple drivers in an enclosure, provide at least 4 inches side to side and 1 inch end to end from other drivers or electronic equipment

   e. For drivers mounted on back wall of enclosure, mount enclosure on 1 5/8" strut or other standoff to dissipate heat, or mount driver to side of the enclosure or to the metal cover.

   f. Provide remote drivers with a maximum of 100 watts

   g. Provide drivers with documentation of 100,000 hr lifetime at Tcase of 65C or higher.



Driver Spacing In Remote Enclosure

Texas Department of Transportation — Traffic Safety Division Standard

ROADWAY ILLUMINATION DETAILS

RID(1)-20

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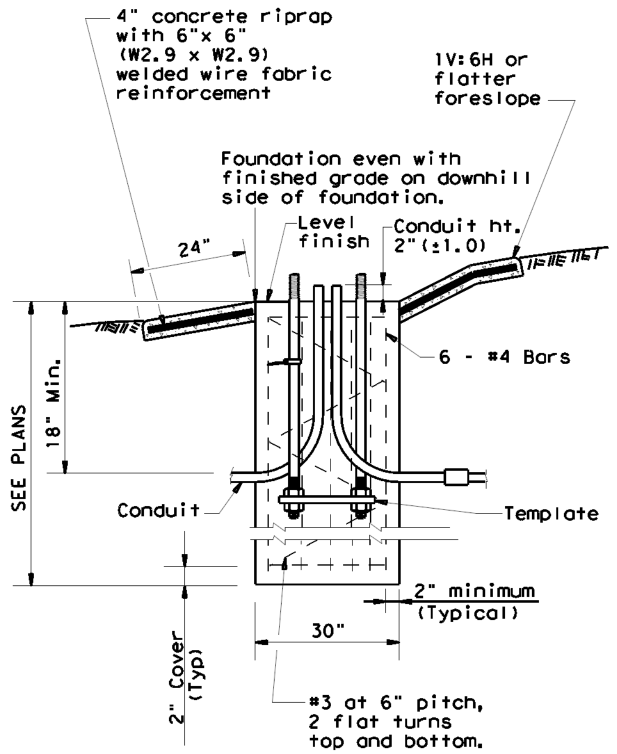
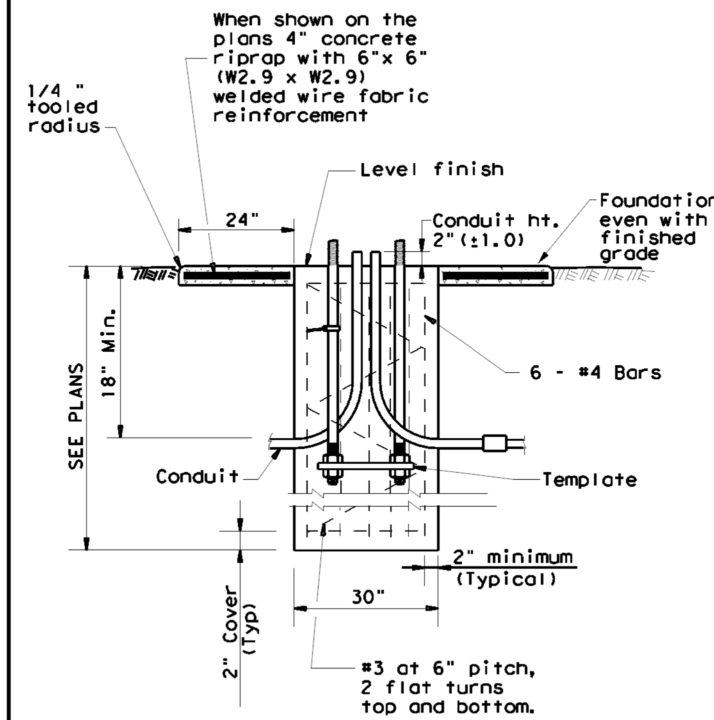


SECTION A-A
SHOWING SLOPED GRADE



SECTION A-A
SHOWING CONSTANT GRADE

TABLE 1

ANCHOR BOLTS			
POLE MOUNTING HEIGHT	BOLT CIRCLE		ANCHOR BOLT SIZE
	Shoe Base	T-Base	
<40 ft.	13 in.	14 in.	1in.x 30in.
40-50 ft.	15 in.	17 1/4 in.	1 1/4 in. x 30in.

TABLE 2

RECOMMENDED FOUNDATION LENGTHS (See note 1)			
MOUNTING HEIGHT	TEXAS CONE PENETROMETER N Blows/ft		
	10	15	40
≤20 ft.	6'	6'	6'
>20 ft. to 30 ft.	8'	6'	6'
>30 ft. to 40 ft.	8'	8'	6'
>40 ft. to 50 ft.	10'	8'	6'

TABLE 3

PAY QUANTITY OF RIPRAP PER FOUNDATION (Install only when shown on the plans)		
Foundation Diameter	RIPRAP DIAMETER	RIPRAP (CONC) (CL B)
30 in.	78 in.	0.35 CY

GENERAL NOTES:

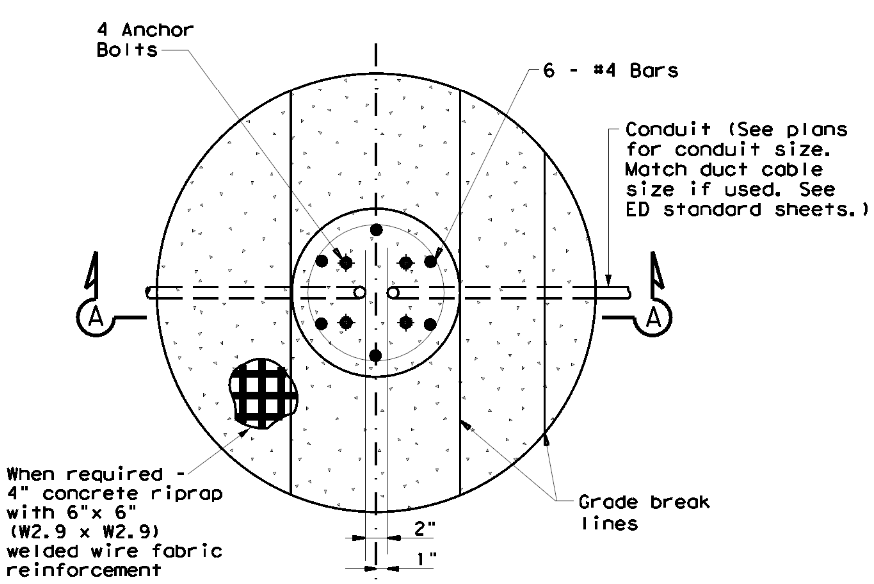
1. "Recommended Foundation Lengths" table is for information purposes only. Foundation lengths shall be as shown on the plans, or as directed by the Engineer. Foundations will be paid for under Item 416, "Drilled Shaft Foundations," unless otherwise shown on the plans.
2. Erect roadway illumination assembly poles plumb and true. Form and level the top 6" of the foundation so the pole will be plumb. Use leveling nuts to plumb shoe base poles. Do not use shims or leveling nuts under transformer bases. Do not grout between baseplate and the foundation.
3. Ensure Class 2A and 2B fit for anchor bolts and nuts. Tap and chase nuts after galvanizing. Anchor bolt body with rolled threads need not be full size.
4. Use appropriate class of concrete as specified in Items 416 and 432. Concrete for riprap may be upgraded to Class C at no extra cost to the Department.
5. Place riprap around the foundation when called for elsewhere in the plans. Riprap will be paid for under Item 432.
6. Locate breakaway roadway illumination assemblies as shown in the placement table, unless otherwise dimensioned on the plans. Protect non-breakaway illumination assemblies from vehicular impact (i.e. 2.5 ft. behind guard rail or mounted on traffic barrier), or located outside the clear zone, except that 2.5 ft. from curb face is minimum desired for light poles on city streets, 45 mph or less. See Roadway Design Manual for further information.
7. Use 4 hold down and 4 connecting washers on transformer base poles as recommended by the manufacturer and supplied with base.
8. Install a minimum of 2 conduits in each foundation. See lighting layout sheets for locations of foundations with more than 2 conduits. Cap unused conduits in foundations on both ends.
9. Conduit location in foundations is critical for breakaway devices. Place conduits 2 in. apart on centerline as shown.
10. Bond anchor bolt to rebar cage with #6 bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. The bonded steel in the foundation creates a concrete encased grounding electrode which replaces the ground rod.
11. Grade earthwork around T-base foundations even with the finished grade as shown in Section A-A to ensure proper function of the breakaway device. Use riprap on T-base foundations that are located on sloped grades, and as shown on the plans for level grades.

TABLE 4

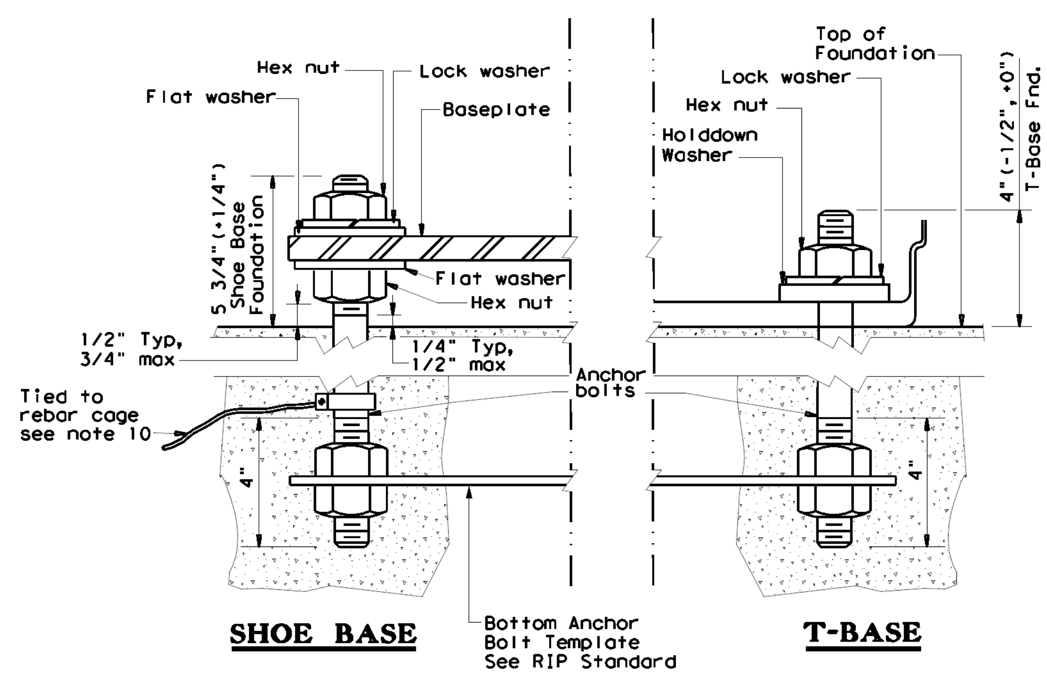
BREAKAWAY POLE PLACEMENT (See note 6)	
ROADWAY FUNCTIONAL CLASSIFICATION	** POLE OFFSET (DISTANCE TO FACE OF TRANSFORMER BASE)
Freeway Mainlanes (roadway with full control of access)	15 ft. (minimum and typical) from lane edge
All curbed, 45 mph or less design speed	2.5 ft. minimum (15 ft. desirable) from curb face
All others	10 ft. minimum*(15 ft. desirable) from lane edge

* or as close to ROW line as is practical

** provide 2/5 of the luminaire mounting height behind the pole for "falling area" to prevent encroachment on the other travel lanes. See design guidelines.



FOUNDATION DETAIL



SHOE BASE **T-BASE**

ANCHOR BOLT DETAIL

Texas Department of Transportation — Traffic Safety Division Standard

ROADWAY ILLUMINATION DETAILS (RDWY ILLUM FOUNDATIONS)

RID(2)-20

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	ELP		EL PASO	79

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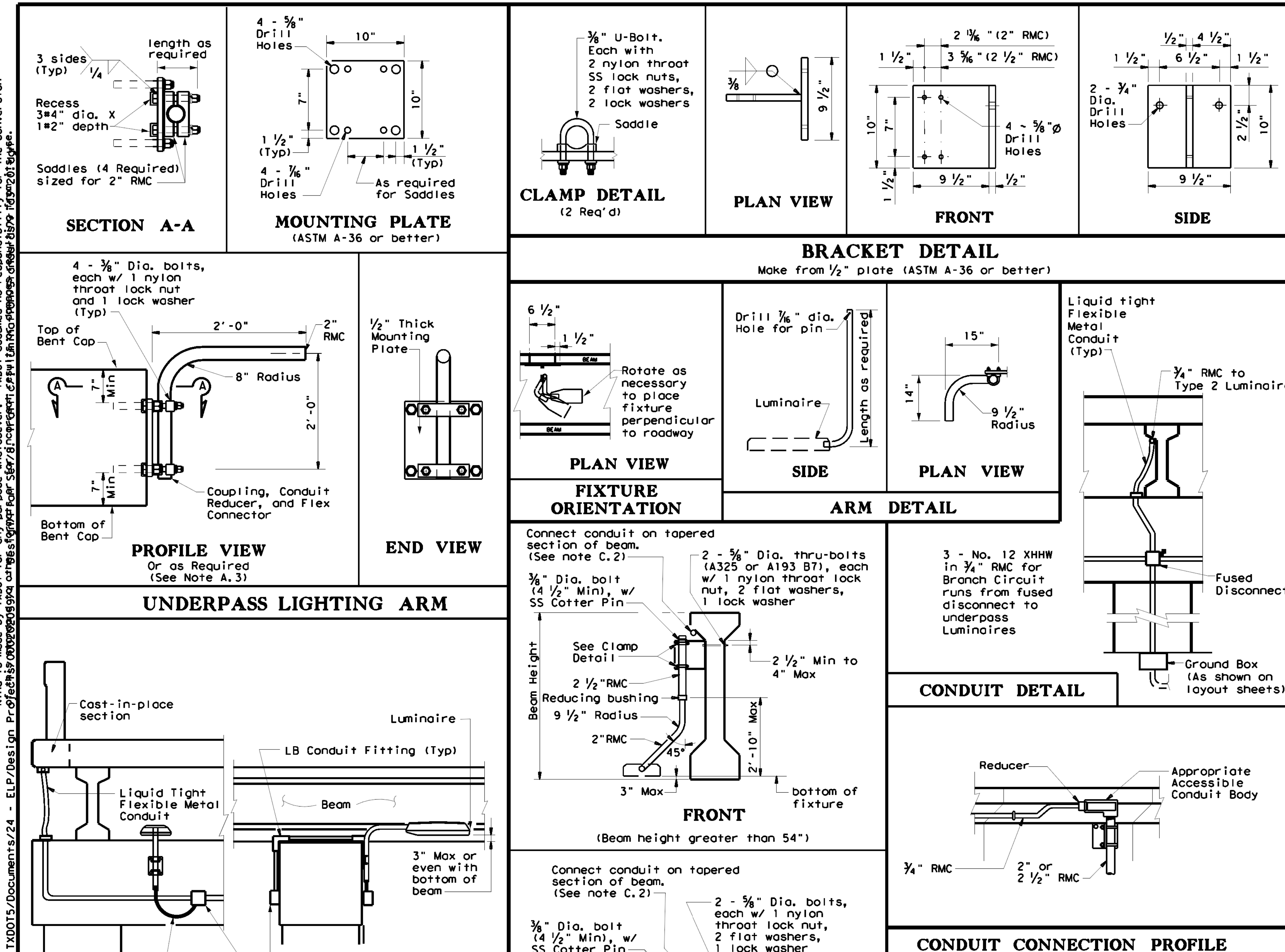

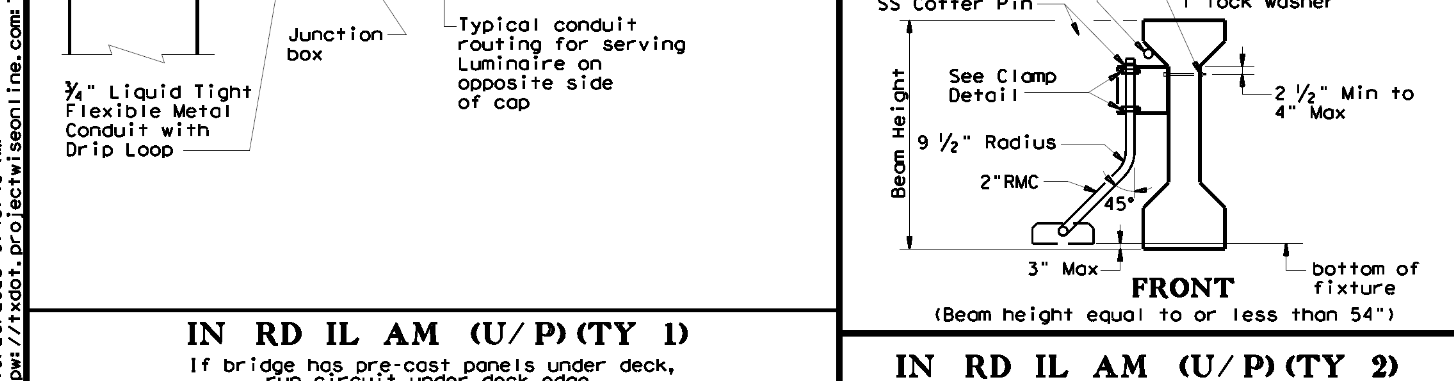

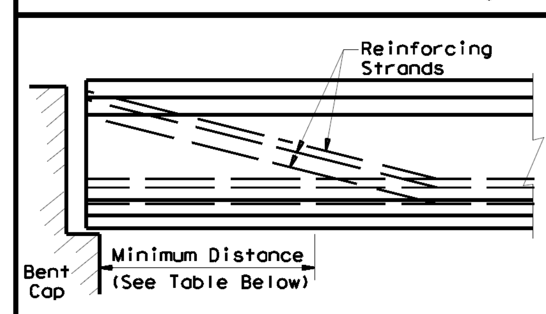

LOCATION OF UNDERPASS LIGHT MOUNTING BRACKET

UNDERPASS LIGHTING TYPE 1

UNDERPASS LIGHTING TYPE 2

TABLE 5

LOCATION OF UNDERPASS LIGHT MOUNTING BRACKET TABLE

SPAN LENGTH	MINIMUM DISTANCE
≤ 50'	10'-0"
50' - 70'	15'-0"
70' - 90'	20'-0"
> 90'	25'-0"

GENERAL NOTES:

A. ALL 150 watt HPS and 150 watt equivalent LED Luminaires

1. Luminaire locations, conduit and conductor sizes and routing are typical and diagrammatic only. See project layout sheets for specific details.
2. Conduit will be paid for under Item 618, "Conduit" and conductors will be paid for under Item 620, "Electrical Conductors," unless otherwise shown on the plans.
3. Adjust conduit in saddles to place fixture height and orientation as required. See fixture orientation detail and plans. Where practicable, place luminaires so the bottom of luminaire is above the bottom of the beam, maximum of 3 in. (See detail UNDERPASS LIGHTING ARM TYPE 2)
4. Except as noted, galvanize all structural steel and exposed bolts, nuts, and washers in accordance with Item 445 "Galvanizing".
5. Fabrication of brackets and support arms will not be paid for directly but is subsidiary to Item 610, "Roadway Illumination Assemblies."
6. Install a heavy duty NEMA 3R fused disconnect or breaker enclosure rated at 30 amps and 480 volts to switch underpass luminaires as shown on plans, with at least one per bridge circuit. Install 20 amp time-delay fuses or inverse-time circuit breakers. Mount disconnect or breaker enclosure 10 ft. (min) above grade on columns or bent caps as approved by the Department. Modify disconnect to allow padlocking in the "ON" and "OFF" positions. Padlocks and disconnect switches or circuit breakers for underpass fixtures will not be paid for directly but are subsidiary to the various bid items of the contract.
7. Conduit on columns, caps, and slab is shown surface mounted. For new columns and caps, embed PVC conduit in concrete. Bond and ground metal junction boxes and conduit.

B. TYPE 1

1. Provide 2 in. rigid metal conduit (2.375" O.D., 0.146" wall) for Type 1 arm shaft.
2. Use 3/8 in. stainless steel bolt or stud non-epoxy type expansion anchors for concrete for Type 1 mounting. Except as noted, provide an allowable 2650 lbs minimum pull-out force (after consideration of adjustment factors for edge distance and bolt spacing) for each anchor. Install each anchor to the embedment depth recommended by the manufacturer.
3. Attach conduit to plate with 4 saddles, four - 3/8 in. diameter bolts, nylon throat lock nuts, and lock washers.

C. TYPE 2

1. Provide 2 in. rigid metal conduit (2.375" O.D., 0.146" wall) or provide a combination of 2 1/2 in. (2.875" O.D., 0.193" wall) and 2 in. (2.375" O.D., 0.146" wall) rigid metal conduits with a reducing bushing as beam height stipulated for Type 2 arm shaft. Field cutting and threading will be permitted. Paint cut and threaded areas with zinc rich paint after conduit is connected to adjacent fitting.
2. Connecting conduit may be strapped to tapered section only of precast beams as shown. Anchor as approved by the Engineer. Maximum anchor depth is 1 in.
3. Indiscriminate drilling into precast concrete beams may result in reduced beam strength. Use drilling location and method as directed by the Engineer. See Location of Underpass Lighting Mounting Bracket detail. The locations shown in the table are such that reinforcing strands will not be damaged.

Texas Department of Transportation — Traffic Safety Division Standard

ROADWAY ILLUMINATION DETAILS

(UNDERPASS LIGHT FIXTURES)

RID(3)-20

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REVISIONS 2-14 7-17 12-20	DIST ELP	COUNTY EL PASO		SHEET NO. 80

SHIPPING PARTS LIST - POLES AND LUMINAIRE ARMS

Nominal Mounting Ht. (ft)	Shoe Base Designation: Pole / A1 / A2	Shoe Base Luminaire	Shoe Base Quantity	T-Base Designation: Pole / A1 / A2	T-Base Luminaire	T-Base Quantity	CSB/SSCB Mounted Designation: Pole / A1 / A2	CSB/SSCB Luminaire	CSB/SSCB Quantity
20	(Type SA 20 S - 4)	(150W EQ) LED		(Type SA 20 T - 4)	(150W EQ) LED				
	(Type SA 20 S - 4 - 4)	(150W EQ) LED		(Type SA 20 T - 4 - 4)	(150W EQ) LED				
30	(Type SA 30 S - 4)	(250W EQ) LED		(Type SA 30 T - 4)	(250W EQ) LED		(Type SP 28 S - 4)	(250W EQ) LED	
	(Type SA 30 S - 4 - 4)	(250W EQ) LED		(Type SA 30 T - 4 - 4)	(250W EQ) LED	55	(Type SP 28 S - 4 - 4)	(250W EQ) LED	
	(Type SA 30 S - 8)	(250W EQ) LED		(Type SA 30 T - 8)	(250W EQ) LED		(Type SP 28 S - 8)	(250W EQ) LED	
	(Type SA 30 S - 8 - 8)	(250W EQ) LED		(Type SA 30 T - 8 - 8)	(250W EQ) LED		(Type SP 28 S - 8 - 8)	(250W EQ) LED	
40	(Type SA 40 S - 4)	(250W EQ) LED		(Type SA 40 T - 4)	(250W EQ) LED		(Type SP 38 S - 4)	(250W EQ) LED	
	(Type SA 40 S - 4 - 4)	(250W EQ) LED		(Type SA 40 T - 4 - 4)	(250W EQ) LED		(Type SP 38 S - 4 - 4)	(250W EQ) LED	
	(Type SA 40 S - 8)	(250W EQ) LED		(Type SA 40 T - 8)	(250W EQ) LED		(Type SP 38 S - 8)	(250W EQ) LED	
	(Type SA 40 S - 8 - 8)	(250W EQ) LED		(Type SA 40 T - 8 - 8)	(250W EQ) LED		(Type SP 38 S - 8 - 8)	(250W EQ) LED	
	(Type SA 40 S - 10)	(250W EQ) LED		(Type SA 40 T - 10)	(250W EQ) LED	9	(Type SP 38 S - 10)	(250W EQ) LED	
	(Type SA 40 S - 10 - 10)	(250W EQ) LED		(Type SA 40 T - 10 - 10)	(250W EQ) LED		(Type SP 38 S - 10 - 10)	(250W EQ) LED	
	(Type SA 40 S - 12)	(250W EQ) LED		(Type SA 40 T - 12)	(250W EQ) LED		(Type SP 38 S - 12)	(250W EQ) LED	
	(Type SA 40 S - 12 - 12)	(250W EQ) LED		(Type SA 40 T - 12 - 12)	(250W EQ) LED		(Type SP 38 S - 12 - 12)	(250W EQ) LED	
50	(Type SA 50 S - 4)	(400W EQ) LED		(Type SA 50 T - 4)	(400W EQ) LED		(Type SP 48 S - 4)	(400W EQ) LED	
	(Type SA 50 S - 4 - 4)	(400W EQ) LED		(Type SA 50 T - 4 - 4)	(400W EQ) LED		(Type SP 48 S - 4 - 4)	(400W EQ) LED	
	(Type SA 50 S - 8)	(400W EQ) LED		(Type SA 50 T - 8)	(400W EQ) LED		(Type SP 48 S - 8)	(400W EQ) LED	
	(Type SA 50 S - 8 - 8)	(400W EQ) LED		(Type SA 50 T - 8 - 8)	(400W EQ) LED		(Type SP 48 S - 8 - 8)	(400W EQ) LED	
	(Type SA 50 S - 10)	(400W EQ) LED		(Type SA 50 T - 10)	(400W EQ) LED		(Type SP 48 S - 10)	(400W EQ) LED	
	(Type SA 50 S - 10 - 10)	(400W EQ) LED		(Type SA 50 T - 10 - 10)	(400W EQ) LED		(Type SP 48 S - 10 - 10)	(400W EQ) LED	
	(Type SA 50 S - 12)	(400W EQ) LED		(Type SA 50 T - 12)	(400W EQ) LED		(Type SP 48 S - 12)	(400W EQ) LED	
	(Type SA 50 S - 12 - 12)	(400W EQ) LED		(Type SA 50 T - 12 - 12)	(400W EQ) LED		(Type SP 48 S - 12 - 12)	(400W EQ) LED	

OTHER Designation: Pole	A1	A2	Luminaire	Quantity

GENERAL NOTES:

1. All work, materials and services not shown on the plans which may be necessary for complete and proper construction shall be performed, furnished and installed by the Contractor. Faulty fabrication or poor workmanship in any material, equipment or installation will be considered justification for rejection. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the Department such warranties or guarantees.

2. The location of poles and fixtures are diagrammatic only and may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.

3. Standard Steel Pole Designs. Steel poles fabricated in accordance with the details and dimensions shown herein, shall be considered standard designs. Submission of shop drawings and design calculations for standard designs is not required.

4. Optional Steel Pole Designs. Multi-sided steel poles may be allowed as optional designs, if steel poles are permitted or required, pending approval by the Department as outlined below.

   a. Shop Drawings. Optional designs require submission of shop drawings and design calculations bearing the seal of an engineer licensed in the State of Texas, in accordance with Item 441, "Steel Structures." The Department may elect to pre-approve some shop drawings for optionally designed poles. Submission of shop drawings and design calculations is not required for structures fabricated in accordance with the details of shop drawings on the pre-approved list maintained by the TxDOT Traffic Operations Division. Any deviation from the pre-approved shop drawings will require submission of shop drawings of the complete assembly and design calculations as described above.
   b. Structural Support Design for Luminaires. Lighting support structures shall be designed for a 25 year design life in accordance with the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto. All poles shall be designed for 110 mph 3-second gust wind speeds. The Gust Factor, G, and Wind Importance Factor, Ir, shall be applied as per the AASHTO Specifications assuming a 25-year design life. The design wind pressure for hurricane wind velocities greater than 100 mph shall not be less than the design wind pressure using 100 mph with the non-hurricane Wind Importance Factor, Ir, value. For transformer base poles, fabricator shall include transformer base and connecting hardware in design calculations and shop drawing submittals. All transformer bases shall have been structurally tested to resist the theoretical plastic moment capacity of the pole. Certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished shall be submitted with the shop drawings. Shop drawings shall show breakaway base model number, and manufacturer's name and logo. Manufacturer's shop drawings shall include the ASTM designations for all materials to be used.
   c. Mast Arm Attachments. All poles and attachments shall be structurally designed to support two 12-foot mast arms and luminaires. Poles shall be supplied with mast arm combinations as shown in the plans. All mast arms shall be designed for a 60-pound luminaire having an effective projected area of 1.6 square feet.
   d. Anchor Bolt Assembly. Anchor bolt assemblies for optionally designed poles shall be the same as those shown herein.

5. Aluminum Pole Designs. Aluminum pole designs may be allowed, if aluminum poles are permitted or required, pending approval by the Department as outlined below.

   a. Meet all of the requirements stated above for optional steel pole designs and the following:
      1. Aluminum poles shall be fabricated in accordance with "Structural Welding Code-Aluminum" AWS D1.2.
      2. Aluminum pole designs shall use the same anchor bolt assembly and be subject to the same geometric restraints and other requirements for steel poles specified herein.
      3. Aluminum poles shall be equipped with vibration mitigation devices, as approved by the engineer.
      4. Pole components shall be constructed using the following material:
         Shaft: ASTM B221 or B241 Alloy 6063-T6, ASTM B209 Alloy 5086-H34, ASTM B221 Alloy 6005-T5.
         Base Flange: ASTM B26 Alloy 356.0-T6 or ASTM B108 Alloy 356.0-T6 (Yield strength test required).
         Mast Arm Fitting: ASTM B209 Alloy 6061-T6 or ASTM B221 Alloy 6005-T5.
         Mast Arms: ASTM B241 Alloy 6061-T6 or Alloy 6063-T6.
         Pole Cap: ASTM B209 Alloy 5086-H32 or ASTM B108 or B26 Alloy 356.0-T6.
         Bolts: Stainless Steel AISI 300 series. Bolts threading into aluminum threads shall be treated with anti-seize compound, Never-Seez Compound, Permatex 133K or equal.

6. Special Designs. Poles with architectural treatments shall meet the requirements shown elsewhere in the plans.

7. Luminaire Mounting Height. Actual luminaire mounting height shall be the nominal mounting height given on RIP(2) for all pole-arm combinations except for poles with 4 ft. luminaire arms, which shall be 3'-0" lower than the nominal height, unless otherwise shown or directed.

EXPLANATION OF ROADWAY ILLUMINATION ASSEMBLY DESIGNATIONS

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

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

Two numerical digits denote nominal mounting height in feet.

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

First number denotes length of mast arm in feet.

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

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

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

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Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(1)-19

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7-17 12-19	DIST	COUNTY		SHEET NO.
	ELP	EL PASO		81

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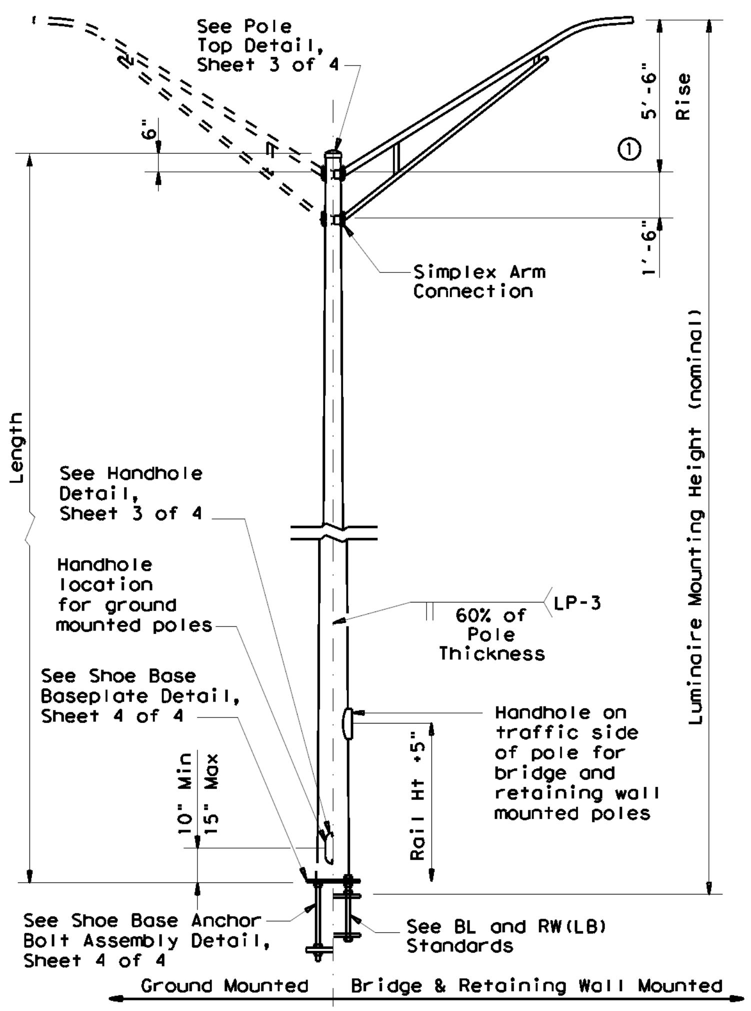
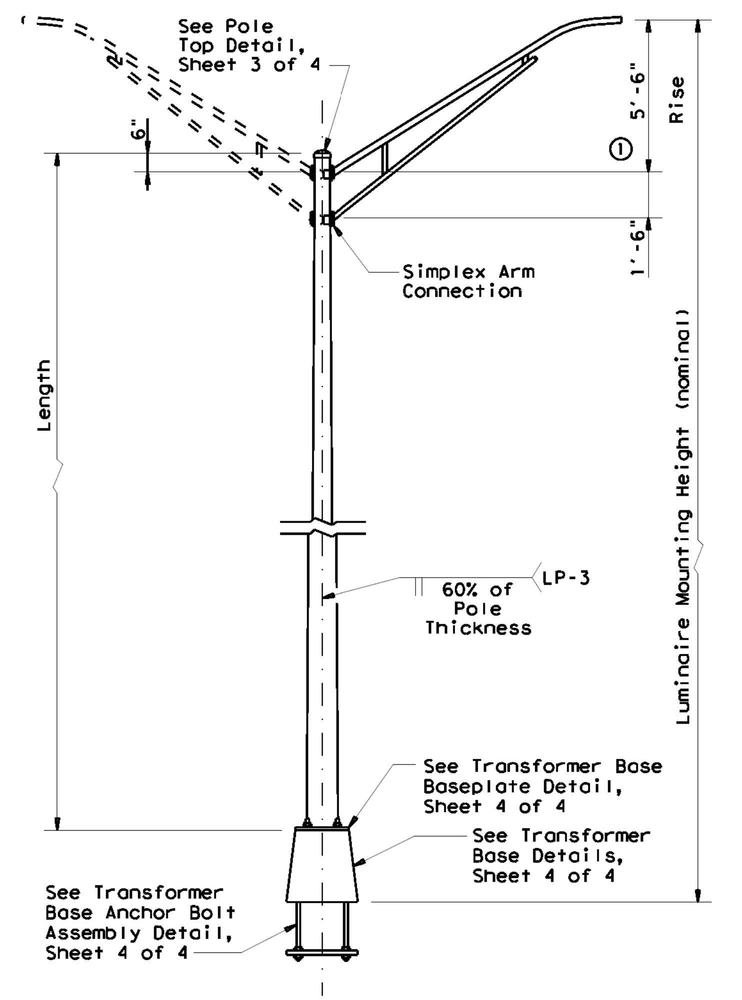
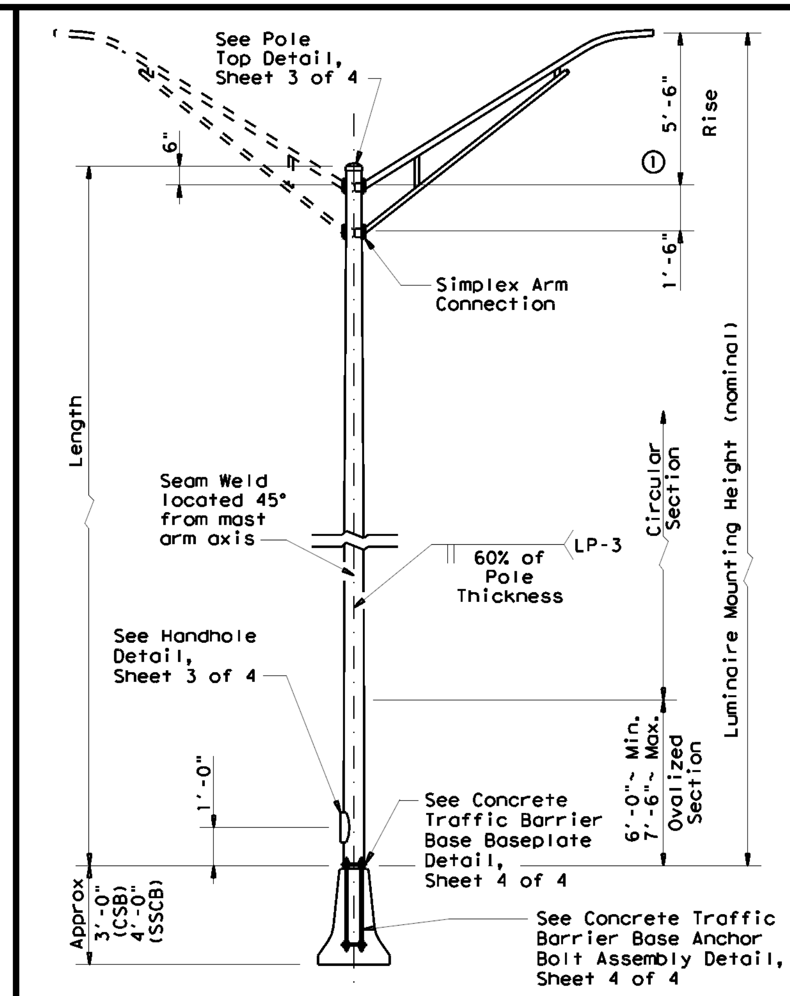


SHOE BASE POLE



TRANSFORMER BASE POLE



CONCRETE TRAFFIC BARRIER BASE POLE

SHOE BASE POLE

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

TRANSFORMER BASE POLE

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

CONCRETE TRAFFIC BARRIER BASE POLE (CSB/SSCB)

Luminaire Mounting Height (Nominal) (ft)	Base ② Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)	
					About ℄ of Rail	Perp. to Rail
28.00	9.00	5.78	23.00	0.1196	10.3	13.2
38.00	9.00	4.38	33.00	0.1196	16.6	20.8
48.00	10.50	4.48	43.00	0.1345	25.1	30.5

MATERIAL DATA

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

NOTES:

① 2'-6" rise for 4 ft. luminaire arms.

② Before ovalized as shown on Concrete Traffic Barrier Base Baseplate details, Sheet 4 of 4.

③ A1011 SS Gr 50 may be used instead of HSLAS, provided the material meets the elongation requirements for HSLAS.

POLE ASSEMBLY FABRICATION TOLERANCES TABLE

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

GENERAL NOTES:

1. Designs conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto. Design 3-Second Gust Wind Speed equals 110 mph with a 1.14 gust factor. A wind importance factor of 0.80 is applied to adjust the wind speed to a 25 year recurrence interval. Design moments listed in tables assume base of pole is 25' above natural ground level.

2. Structures are designed to support two 12' luminaire mast arms and luminaires. Mast arms are designed to support a 60-pound luminaire having an effective projected area of 1.6 square feet.

3. Fabrication shall be in accordance with the Specifications and with the details, dimensions, and weld procedures shown herein. Do not submit shop drawings for roadway illumination pole assemblies fabricated in accordance with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of these sheets and the Specifications. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.

4. For mounting heights between values shown in the tables, use base diameter and thickness values for the larger height.

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

6. Steel poles shall be fabricated in accordance with Item 441, "Steel Structures." Longitudinal seam welds for pole sections shall have 60% minimum penetration. All welding shall be in accordance with AWS D1.1, Structural Welding Code-Steel.

7. Two-section poles joined by circumferential welds will not be permitted, unless otherwise shown on the plans. Poles may be fabricated in two sections and field-assembled by the lap-joint method. The two sections shall telescope together with a lap length of not less than 1-1/2 times the shaft diameter at the lap joint.

8. Alternate material equal to or better than material specified may be substituted with the approval of the Engineer.

9. Lubricate and tighten anchor bolts, when erecting shoe base poles and concrete traffic barrier base poles, in accordance with Item 449, "Anchor Bolts."

10. All poles, except Transformer Base Poles, shall have hand holes with reinforcing frames and covers. For ground mounted shoe base poles, hand holes shall be placed 90 degrees to mast arm unless otherwise noted on the plans. For poles mounted on a concrete traffic barrier with one luminaire arm, hand holes shall be located 180 degrees from luminaire arm. For poles mounted on a concrete traffic barrier with two luminaire arms, all hand holes shall be on the same side of the barrier. For poles mounted on a bridge lighting bracket or a retaining wall lighting bracket, hand hole shall be on traffic side of the pole, at a height that will clear the barrier.

11. The finished pole shall have a smooth, uniform finish free of pits, blisters, or other defects. Scratched, chipped, and other damaged galvanized areas on poles and mast arms shall be repaired in accordance with Item 445, "Galvanizing."

12. Pole length is based on a 5'-6" luminaire arm rise. 4 ft. luminaire arms have a 2'-6" rise. A pole with 4 ft. luminaire arms will have an actual mounting height 3'-0" less than the nominal mounting height. Increasing the pole length to meet the nominal mounting height is allowed, but unnecessary unless otherwise directed by the engineer.

13. Erect transformer base poles in accordance with sheet RID(1).

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ROADWAY ILLUMINATION POLES

RIP(2)-19

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7-17 12-19	DIST		COUNTY	SHEET NO.
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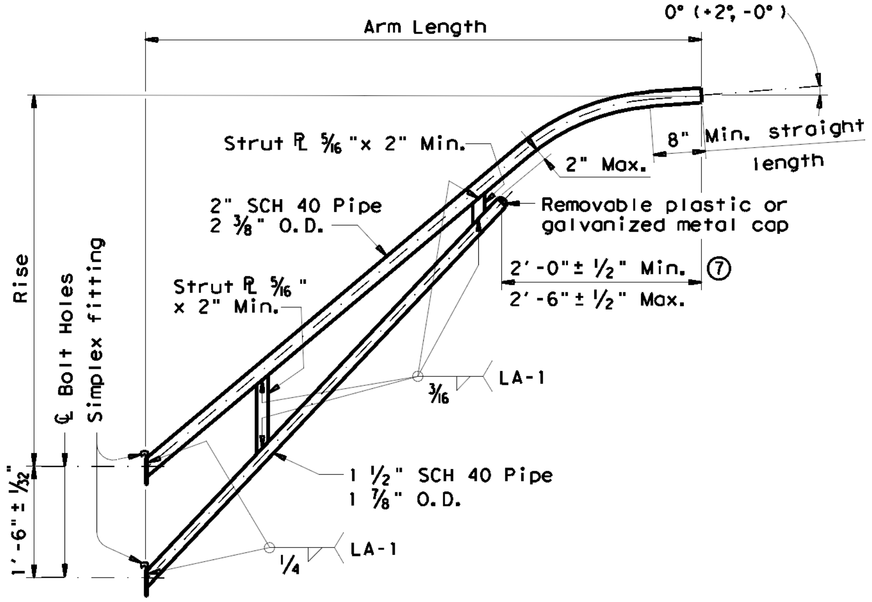
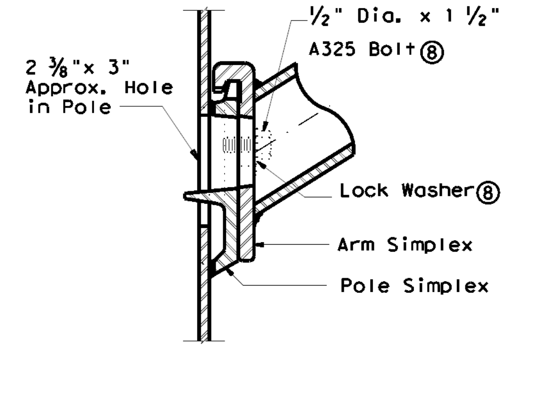
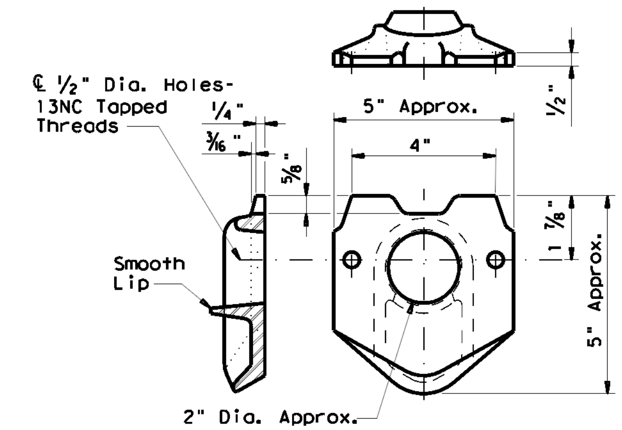


LUMINAIRE ARM

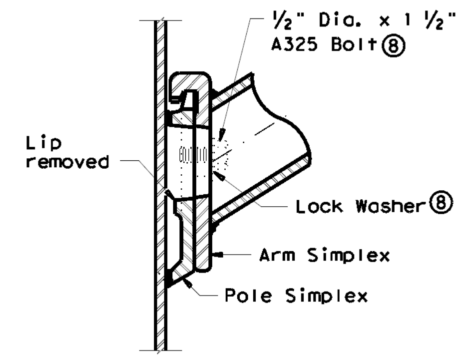


UPPER SIMPLEX FITTING

(Gusset not shown for clarity)



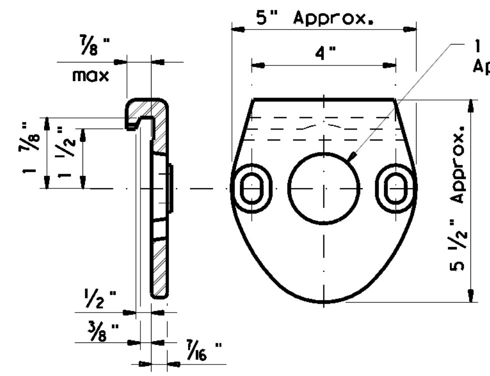
POLE SIMPLEX DETAIL ⑨



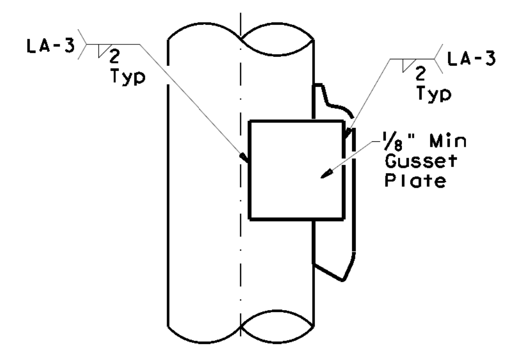
LOWER SIMPLEX FITTING

(Gusset not shown for clarity)

SECTION B-B



ARM SIMPLEX DETAIL ⑨



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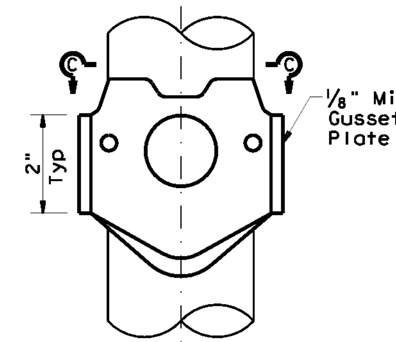

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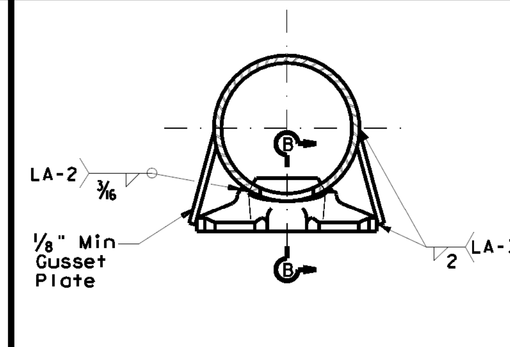
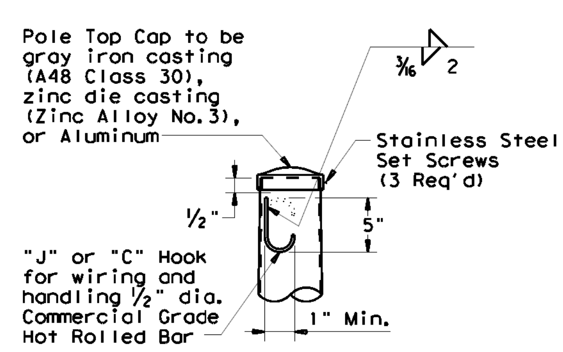
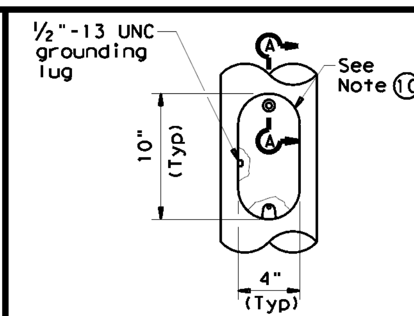


SECTION C-C

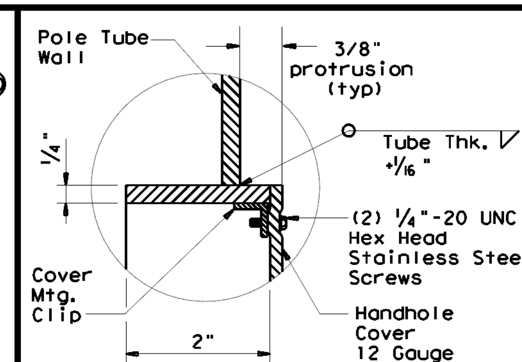
SIMPLEX ATTACHMENT DETAIL



POLE TOP



ELEVATION



SECTION A-A

HANDHOLE

LUMINAIRE ARM DIMENSIONS

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

ARM ASSEMBLY FABRICATION TOLERANCES TABLE

DIMENSION	TOLERANCE
Arm Length	±1"
Arm Rise	±1"
Deviation from flat	1/8" in 12"
Spacing between holes	±1/32"

NOTES:

④ Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.

⑤ A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.

⑥ A572, A1008 HSLAS-F, and A1011 HSLAS-F materials may have higher yield strengths but shall not have less elongation than the grade indicated.

⑦ Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.

⑧ Each pole simplex fitting shall be supplied with 2 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans.

⑨ Proposed deviations in arm simplex dimensions or materials must be submitted to the Department for approval.

⑩ A welded handhole frame is permissible. Maximum of two (2) CJP weld splices is allowed.

MATERIALS

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

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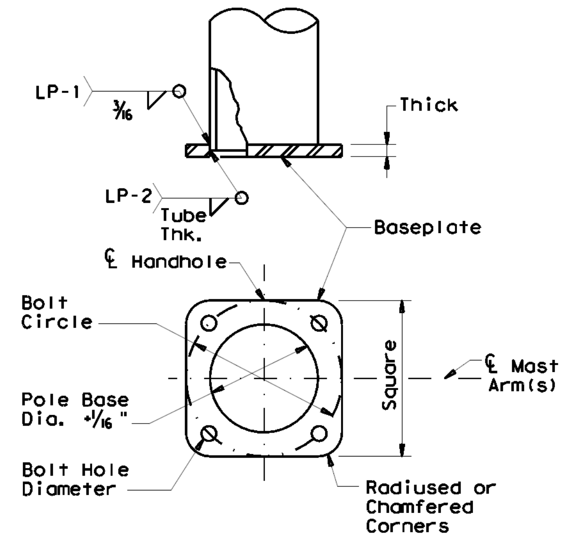
Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

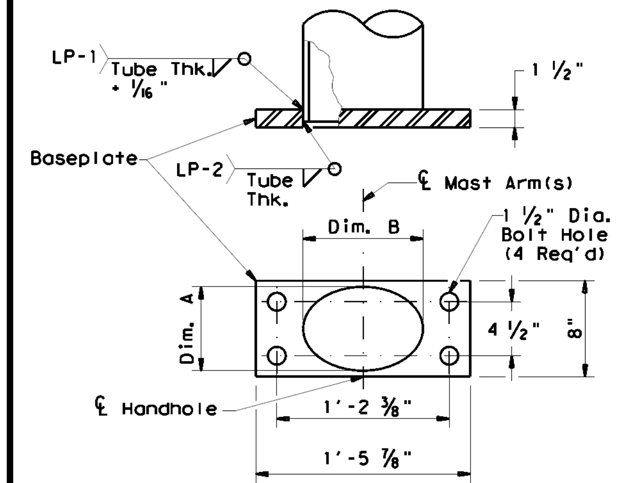
RIP(3)-19

FILE: rip-19.dgn | DN: | CK: | DW: | CK:
© TxDOT January 2007 | CONT 0002 | SECT 02 | JOB 059, ETC. | HIGHWAY SH 20
REVISIONS 7-17 12-19 | DIST ELP | COUNTY EL PASO | SHEET NO. 83
73C



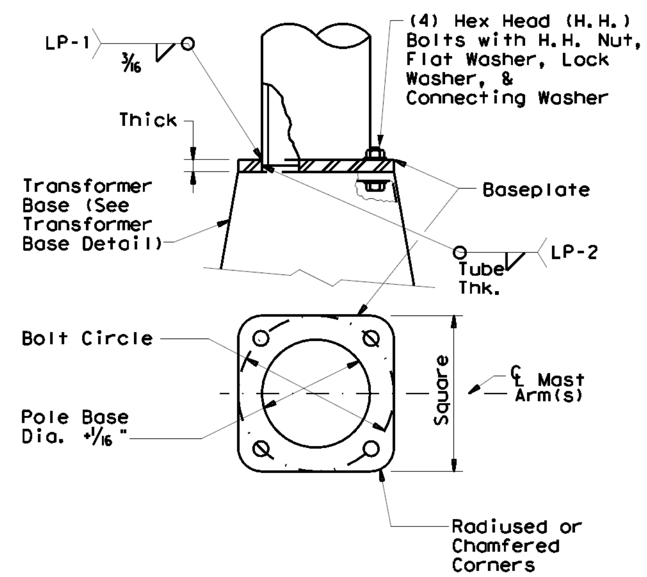
SHOE BASE BASEPLATE

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



CONCRETE TRAFFIC BARRIER BASE BASEPLATE

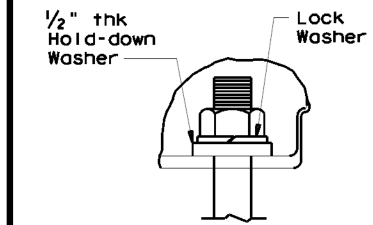
CONCRETE TRAFFIC BARRIER BASE BASEPLATE TABLE			
MOUNTING HEIGHTS (nominal)	POLE DIA. (12)	DIM. A	DIM. B
28'- 38'	9"	7"± 1⁄4"	10"± 1⁄4"
48'	10 1⁄2"	7"± 1⁄4"	13"± 1⁄4"



TRANSFORMER BASE BASEPLATE

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

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



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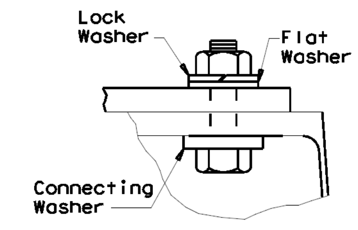
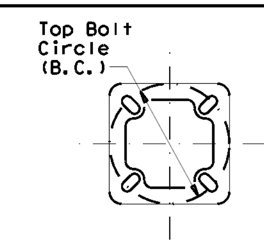
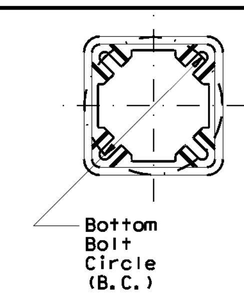


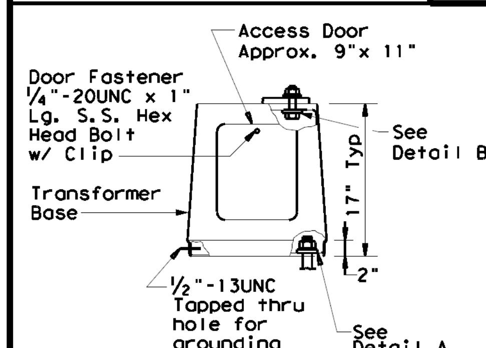
DETAIL B



TOP PLAN

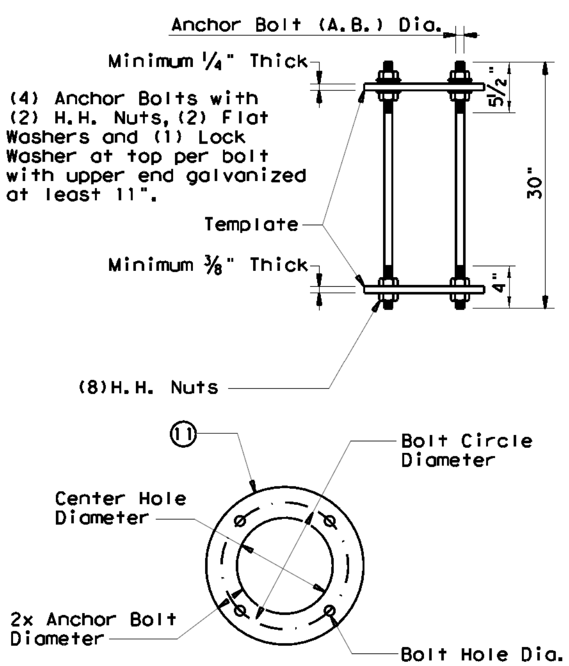


BOTTOM PLAN



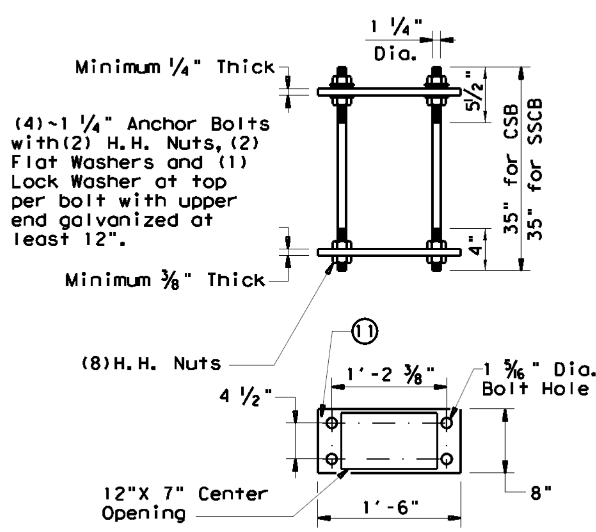
ELEVATION

TRANSFORMER BASE DETAILS



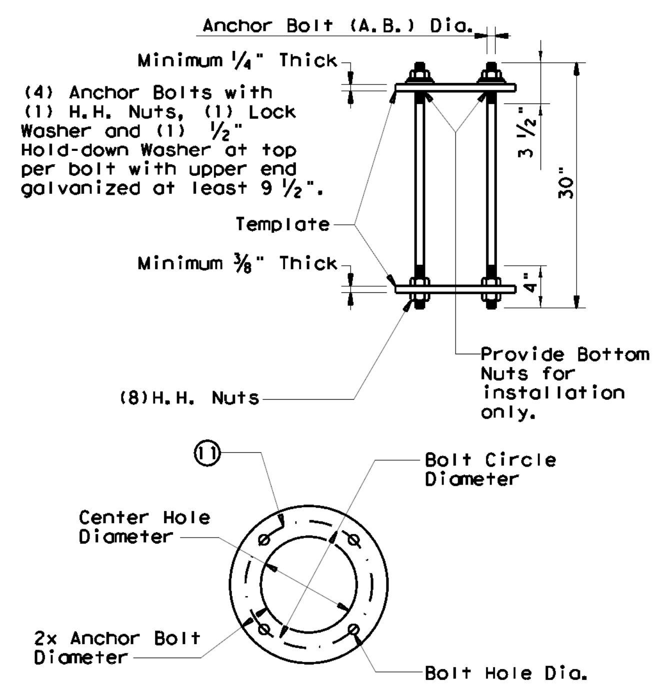
SHOE BASE ANCHOR BOLT ASSEMBLY

SHOE BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20'-39'	1"	13"	11"	1 1⁄16"
40'-50'	1 1⁄4"	15"	12 1⁄2"	1 5⁄16"



CONCRETE TRAFFIC BARRIER BASE ANCHOR BOLT ASSEMBLY

TRANSFORMER BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20'- 39'	1"	14"	12"	1 1⁄16"
40'- 50'	1 1⁄4"	17 1⁄4"	14 3⁄4"	1 5⁄16"



TRANSFORMER BASE ANCHOR BOLT ASSEMBLY

GENERAL NOTES:

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

NOTES:

(11) Anchor Bolt Templates do not need to be galvanized.

(12) Pole diameter before ovalized.

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

Texas Department of Transportation — Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(4)-19

FILE: rip-19.dgn	DN:	CK:	DW:	CK:
© TxDOT January 2007	CONT 0002	SECT 02	JOB 059,ETC.	HIGHWAY SH 20
REVISIONS 7-17 12-19	DIST ELP	COUNTY EL PASO		SHEET NO. 84

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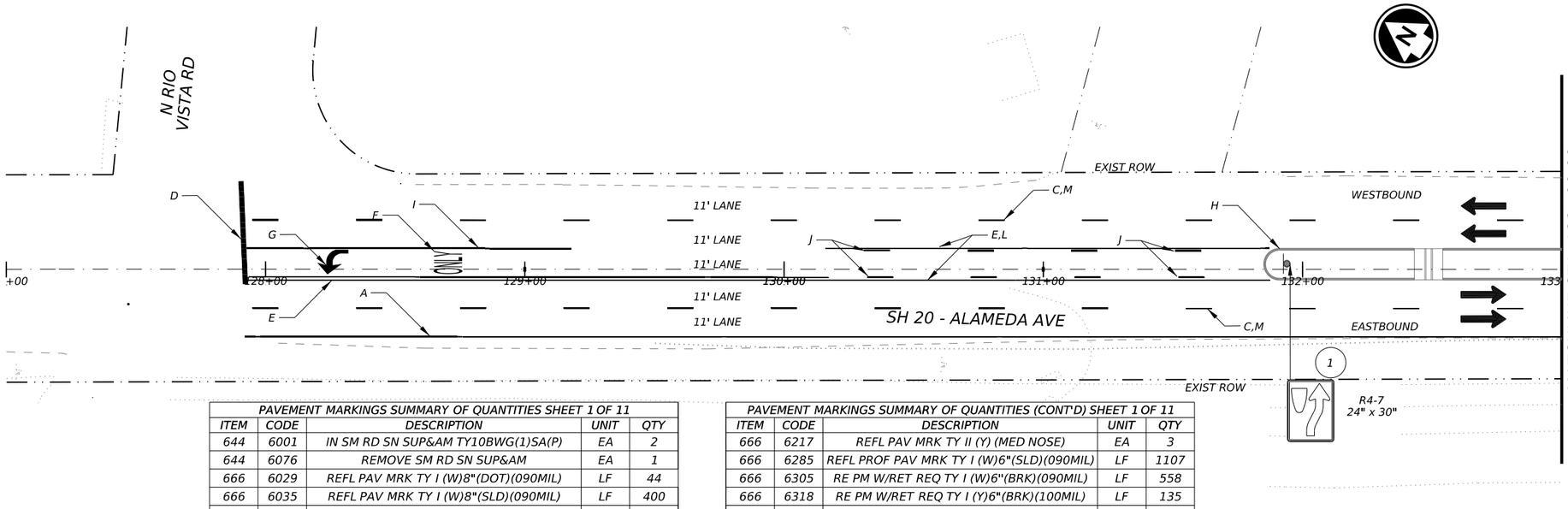


LEGEND

A	REFL PAV MRK (W) 6" (SLD)
B	REFL PAV MRK (W) 8" (*DOT*)
C	REFL PAV MRK (W) 6" (BRK)
D	REFL PAV MRK (W) 24" (SLD)
E	REFL PAV MRK (Y) 6" (SLD)
F	REFL PAV MRK (W) (WORD)
G	REFL PAV MRK (W) (ARROW)
H	REFL PAV MRK (Y) (MED NOSE)
I	REFL PAV MRK (W) 8" (SLD)
J	REFL PAV MRK (Y) 6" (BRK)
K	REFL PAV MRK (Y) (CURB)
L	REFL PAV MRKR TY II-A-A
M	REFL PAV MRKR TY II-C-R
(#)	PROP. SIGN ASSEMBLY
	TRAFFIC FLOW DIRECTION

NOTES:

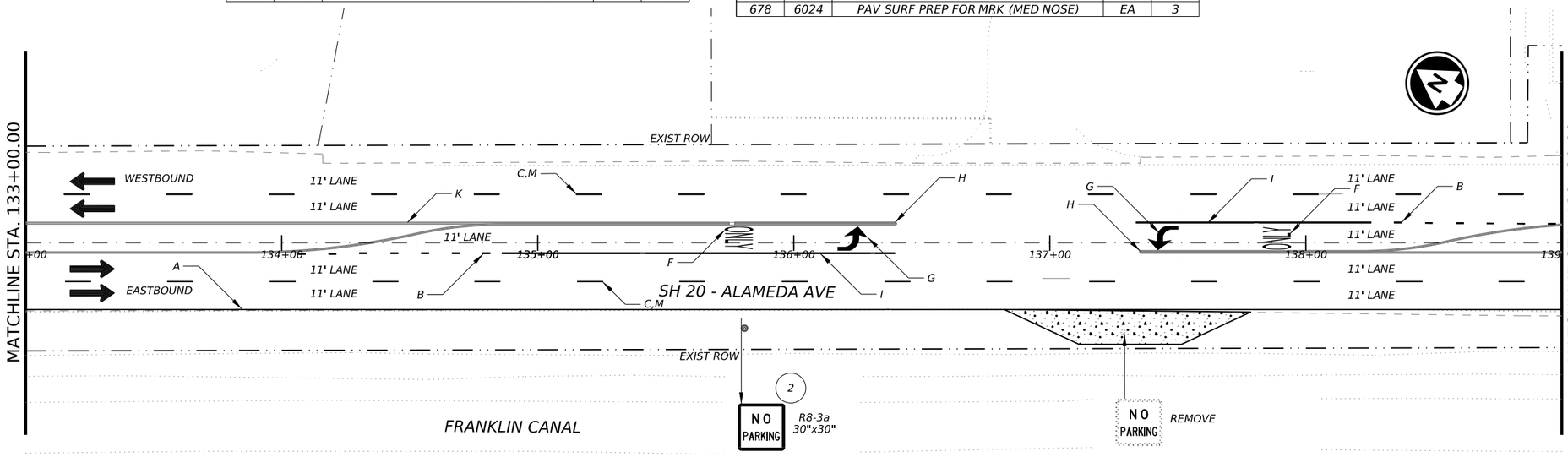
1. ALL MEDIAN NOSES SHALL BE PAINTED FOR THE FIRST 50 FEET.
2. MEDIANS THAT ARE LESS THAN 5 FEET WIDE SHALL BE PAINTED.

PAVEMENT MARKINGS SUMMARY OF QUANTITIES SHEET 1 OF 11

ITEM	CODE	DESCRIPTION	UNIT	QTY
644	6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	2
644	6076	REMOVE SM RD SN SUP&AM	EA	1
666	6029	REFL PAV MRK TY I (W)8"(DOT)(090MIL)	LF	44
666	6035	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	LF	400
666	6047	REFL PAV MRK TY I (W)24"(SLD)(090MIL)	LF	40
666	6053	REFL PAV MRK TY I (W)(ARROW)(090MIL)	EA	3
666	6077	REFL PAV MRK TY I (W)(WORD)(090MIL)	EA	3
666	6155	REFL PAV MRK TY I(Y)(MED NOSE)(090MIL)	EA	3
666	6171	REFL PAV MRK TY II (W) 6" (BRK)	LF	558
666	6174	REFL PAV MRK TY II (W) 6" (SLD)	LF	1107
666	6176	REFL PAV MRK TY II (W) 8" (DOT)	LF	44
666	6178	REFL PAV MRK TY II (W) 8" (SLD)	LF	400
666	6182	REFL PAV MRK TY II (W) 24" (SLD)	LF	40
666	6184	REFL PAV MRK TY II (W) (ARROW)	EA	3
666	6192	REFL PAV MRK TY II (W) (WORD)	EA	3
666	6208	REFL PAV MRK TY II (Y) 6" (BRK)	LF	135
666	6210	REFL PAV MRK TY II (Y) 6" (SLD)	LF	788

PAVEMENT MARKINGS SUMMARY OF QUANTITIES (CONT'D) SHEET 1 OF 11

ITEM	CODE	DESCRIPTION	UNIT	QTY
666	6217	REFL PAV MRK TY II (Y) (MED NOSE)	EA	3
666	6285	REFL PROF PAV MRK TY I (W)6"(SLD)(090MIL)	LF	1107
666	6305	RE PM W/RET REQ TY I (W)6"(BRK)(090MIL)	LF	558
666	6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	135
666	6320	RE PM W/RET REQ TY I (Y)6"(SLD)(090MIL)	LF	788
666	6440	REFL PAV MRK TY II (Y) (CURB)	LF	90
672	6009	REFL PAV MRKR TY II-A-A	EA	56
672	6010	REFL PAV MRKR TY II-C-R	EA	40
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	3151
677	6007	ELIM EXT PAV MRK & MRKS (24")	EA	35
677	6008	ELIM EXT PAV MRK & MRKS (ARROW)	EA	2
677	6012	ELIM EXT PAV MRK & MRKS (WORD)	EA	2
678	6002	PAV SURF PREP FOR MRK (6")	LF	2588
678	6004	PAV SURF PREP FOR MRK (8")	LF	444
678	6008	PAV SURF PREP FOR MRK (24")	LF	40
678	6009	PAV SURF PREP FOR MRK (ARROW)	EA	3
678	6016	PAV SURF PREP FOR MRK (WORD)	EA	3
678	6024	PAV SURF PREP FOR MRK (MED NOSE)	EA	3



STATE OF TEXAS
KARLA Y. RIOS
140855
LICENSED
PROFESSIONAL ENGINEER

Karla Rios, P.E.
10/31/2023

0 25 50
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® 2023
Texas Department of Transportation

SH 20

PAVEMENT MARKINGS
LAYOUT
BEGIN TO STA. 139+00

SHEET 1 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		85

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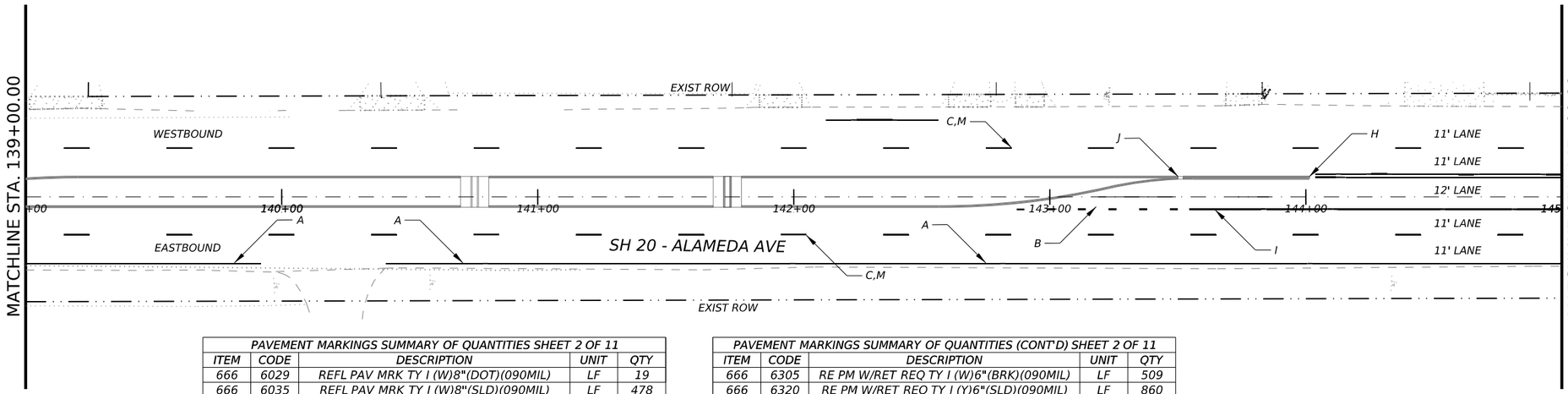


PAVEMENT MARKINGS SUMMARY OF QUANTITIES SHEET 2 OF 11				
ITEM	CODE	DESCRIPTION	UNIT	QTY
666	6029	REFL PAV MRK TY I (W)8"(DOT)(090MIL)	LF	19
666	6035	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	LF	478
666	6053	REFL PAV MRK TY I (W)(ARROW)(090MIL)	EA	3
666	6077	REFL PAV MRK TY I (W)(WORD)(090MIL)	EA	3
666	6155	REFL PAV MRK TY I(Y)(MED NOSE)(090MIL)	EA	2
666	6171	REFL PAV MRK TY II (W) 6" (BRK)	LF	509
666	6174	REFL PAV MRK TY II (W) 6'' (SLD)	LF	829
666	6176	REFL PAV MRK TY II (W) 8" (DOT)	LF	19
666	6178	REFL PAV MRK TY II (W) 8'' (SLD)	LF	478
666	6184	REFL PAV MRK TY II (W) (ARROW)	EA	3
666	6192	REFL PAV MRK TY II (W) (WORD)	EA	3
666	6210	REFL PAV MRK TY II (Y) 6" (SLD)	LF	860
666	6217	REFL PAV MRK TY II (Y) (MED NOSE)	EA	2
666	6285	REFL PROF PAV MRK TY I (W)6"(SLD)(090MIL)	LF	829

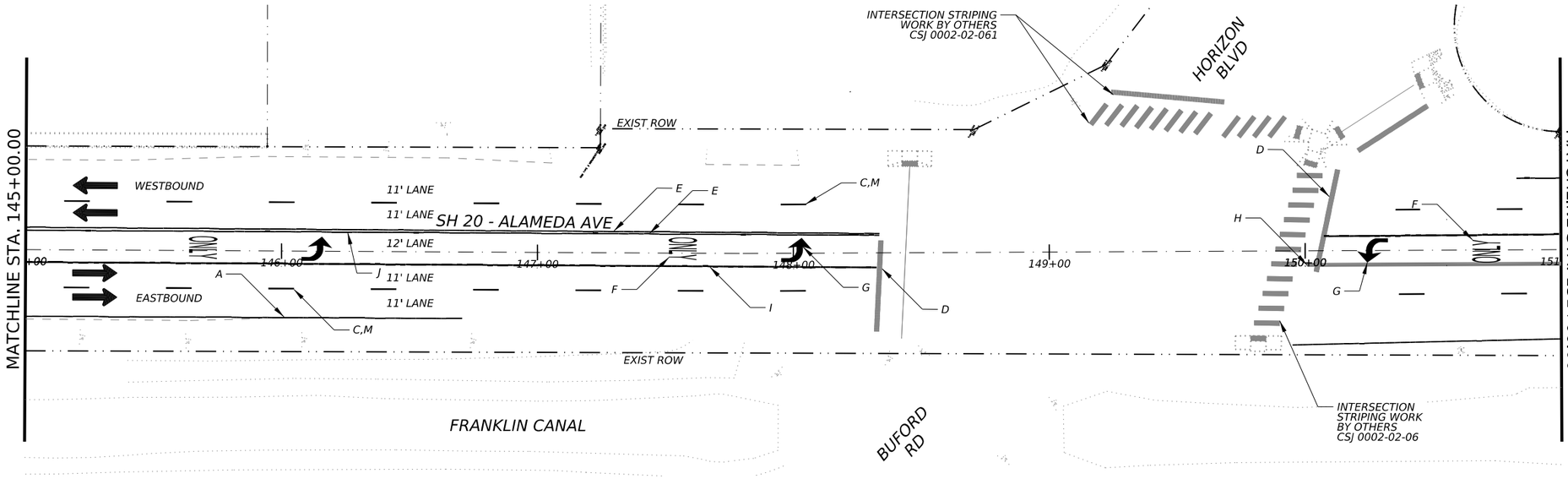
PAVEMENT MARKINGS SUMMARY OF QUANTITIES (CONT'D) SHEET 2 OF 11				
ITEM	CODE	DESCRIPTION	UNIT	QTY
666	6305	RE PM W/RET REQ TY I (W)6"(BRK)(090MIL)	LF	509
666	6320	RE PM W/RET REQ TY I (Y)6"(SLD)(090MIL)	LF	860
666	6440	REFL PAV MRK TY II (Y) (CURB)	LF	25
672	6010	REFL PAV MRKR TY II-C-R	EA	50
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	4372
677	6003	ELIM EXT PAV MRK & MRKS (8")	LF	476
677	6008	ELIM EXT PAV MRK & MRKS (ARROW)	EA	2
677	6012	ELIM EXT PAV MRK & MRKS (WORD)	EA	2
678	6002	PAV SURF PREP FOR MRK (6")	LF	2488
678	6004	PAV SURF PREP FOR MRK (8")	LF	497
678	6009	PAV SURF PREP FOR MRK (ARROW)	EA	3
678	6016	PAV SURF PREP FOR MRK (WORD)	EA	3
678	6024	PAV SURF PREP FOR MRK (MED NOSE)	EA	2

LEGEND

A	REFL PAV MRK (W) 6" (SLD)
B	REFL PAV MRK (W) 8" (*DOT*)
C	REFL PAV MRK (W) 6" (BRK)
D	REFL PAV MRK (W) 24" (SLD)
E	REFL PAV MRK (Y) 6" (SLD)
F	REFL PAV MRK (W) (WORD)
G	REFL PAV MRK (W) (ARROW)
H	REFL PAV MRK (Y) (MED NOSE)
I	REFL PAV MRK (W) 8" (SLD)
J	REFL PAV MRK (Y) 6" (BRK)
K	REFL PAV MRK (Y) (CURB)
L	REFL PAV MRKR TY II-A-A
M	REFL PAV MRKR TY II-C-R
(#)	PROP. SIGN ASSEMBLY
	TRAFFIC FLOW DIRECTION

NOTES:

1. ALL MEDIAN NOSES SHALL BE PAINTED FOR THE FIRST 50 FEET.
2. MEDIANS THAT ARE LESS THAN 5 FEET WIDE SHALL BE PAINTED.



STATE OF TEXAS
KARLA Y. RIOS
140855
LICENSED PROFESSIONAL ENGINEER

Karla Rios, P.E.
10/31/2023

0 25 50
SCALE IN FEET

® 2023 Texas Department of Transportation

SH 20

PAVEMENT MARKINGS LAYOUT
STA. 139+00 TO STA. 151+00

SHEET 2 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		86

DATE:
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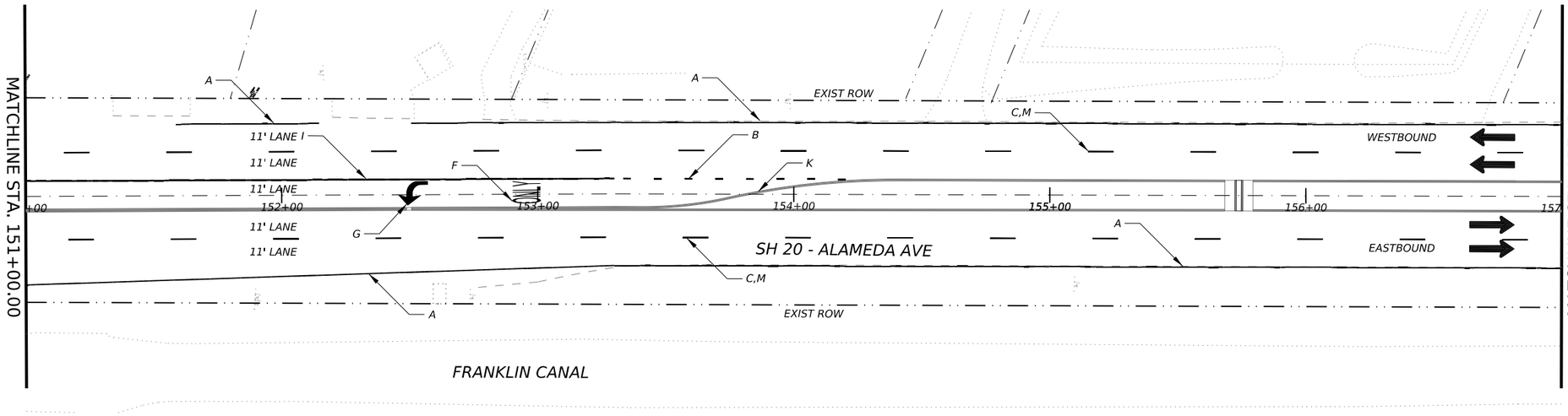


LEGEND

A	REFL PAV MRK (W) 6" (SLD)
B	REFL PAV MRK (W) 8" (*DOT*)
C	REFL PAV MRK (W) 6" (BRK)
D	REFL PAV MRK (W) 24" (SLD)
E	REFL PAV MRK (Y) 6" (SLD)
F	REFL PAV MRK (W) (WORD)
G	REFL PAV MRK (W) (ARROW)
H	REFL PAV MRK (Y) (MED NOSE)
I	REFL PAV MRK (W) 8" (SLD)
J	REFL PAV MRK (Y) 6" (BRK)
K	REFL PAV MRK (Y) (CURB)
L	REFL PAV MRKR TY II-A-A
M	REFL PAV MRKR TY II-C-R
(#)	PROP. SIGN ASSEMBLY
	TRAFFIC FLOW DIRECTION

NOTES:

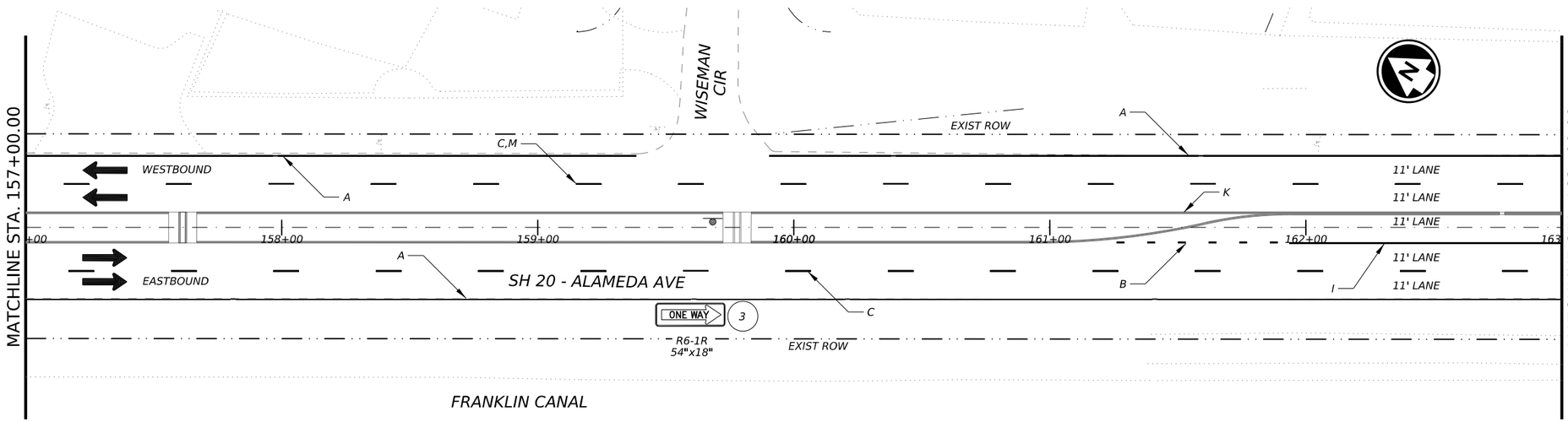
1. ALL MEDIAN NOSES SHALL BE PAINTED FOR THE FIRST 50 FEET.
2. MEDIANS THAT ARE LESS THAN 5 FEET WIDE SHALL BE PAINTED.

PAVEMENT MARKINGS SUMMARY OF QUANTITIES SHEET 3 OF 11

ITEM	CODE	DESCRIPTION	UNIT	QTY
644	6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	1
666	6029	REFL PAV MRK TY I (W)8"(DOT)(090MIL)	LF	111
666	6035	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	LF	336
666	6053	REFL PAV MRK TY I (W)(ARROW)(090MIL)	EA	1
666	6077	REFL PAV MRK TY I (W)(WORD)(090MIL)	EA	1
666	6171	REFL PAV MRK TY II (W) 6" (BRK)	LF	600
666	6174	REFL PAV MRK TY II (W) 6" (SLD)	LF	2254
666	6176	REFL PAV MRK TY II (W) 8" (DOT)	LF	111
666	6178	REFL PAV MRK TY II (W) 8" (SLD)	LF	336
666	6184	REFL PAV MRK TY II (W) (ARROW)	EA	1
666	6192	REFL PAV MRK TY II (W) (WORD)	EA	1

PAVEMENT MARKINGS SUMMARY OF QUANTITIES (CONT'D) SHEET 3 OF 11

ITEM	CODE	DESCRIPTION	UNIT	QTY
666	6285	REFL PROF PAV MRK TY I (W)6"(SLD)(090MIL)	LF	2254
666	6305	RE PM W/RET REQ TY I (W)6"(BRK)(090MIL)	LF	600
666	6440	REFL PAV MRK TY II (Y) (CURB)	LF	405
672	6010	REFL PAV MRKR TY II-C-R	EA	60
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	5874
677	6003	ELIM EXT PAV MRK & MRKS (8")	LF	100
677	6008	ELIM EXT PAV MRK & MRKS (ARROW)	EA	1
678	6002	PAV SURF PREP FOR MRK (6")	LF	2854
678	6004	PAV SURF PREP FOR MRK (8")	LF	447
678	6009	PAV SURF PREP FOR MRK (ARROW)	EA	1
678	6016	PAV SURF PREP FOR MRK (WORD)	EA	1



STATE OF TEXAS
KARLA Y. RIOS
140855
LICENSED
PROFESSIONAL ENGINEER

Karla Rios, P.E.
10/31/2023

0 25 50
SCALE IN FEET

® 2023
Texas Department of Transportation

SH 20

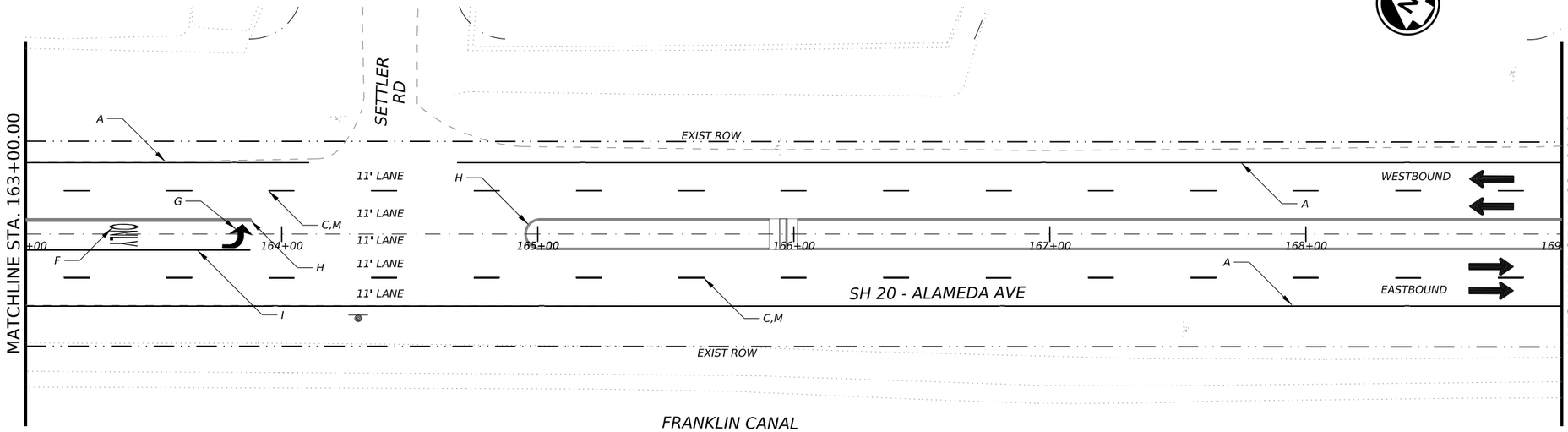
PAVEMENT MARKINGS
LAYOUT
STA. 151+00 TO STA. 163+00

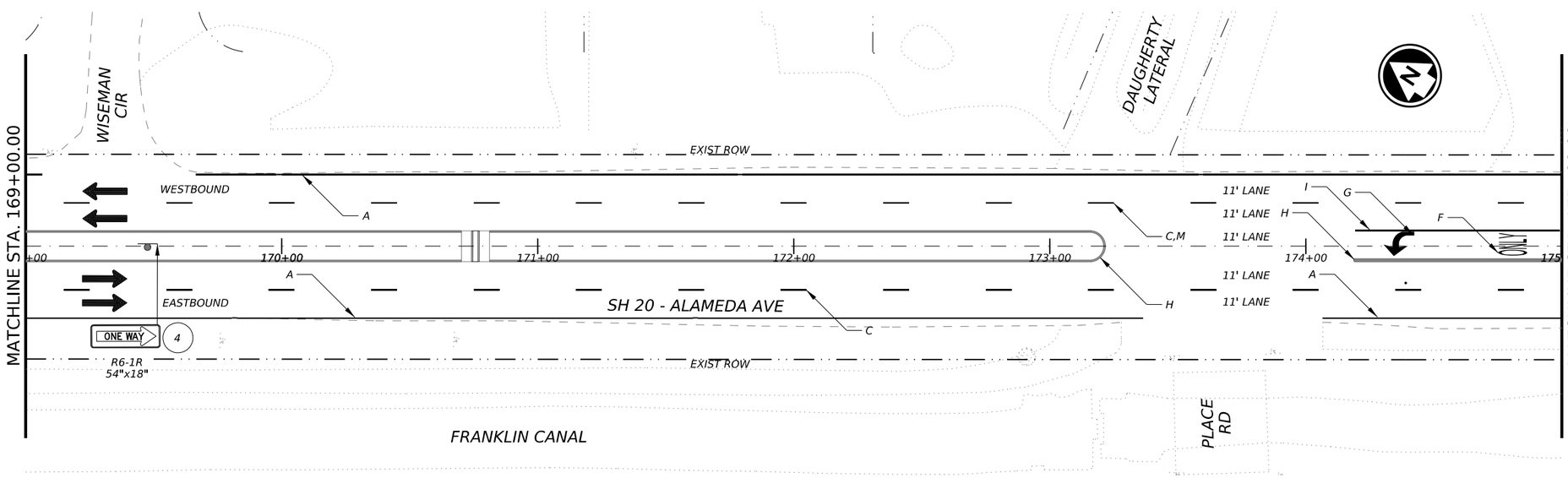
SHEET 3 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		87

CK:
DW:
CK:
DW:

DATE:
FILE:





LEGEND

A	REFL PAV MRK (W) 6" (SLD)
B	REFL PAV MRK (W) 8" (*DOT*)
C	REFL PAV MRK (W) 6" (BRK)
D	REFL PAV MRK (W) 24" (SLD)
E	REFL PAV MRK (Y) 6" (SLD)
F	REFL PAV MRK (W) (WORD)
G	REFL PAV MRK (W) (ARROW)
H	REFL PAV MRK (Y) (MED NOSE)
I	REFL PAV MRK (W) 8" (SLD)
J	REFL PAV MRK (Y) 6" (BRK)
K	REFL PAV MRK (Y) (CURB)
L	REFL PAV MRKR TY II-A-A
M	REFL PAV MRKR TY II-C-R
(#)	PROP. SIGN ASSEMBLY
	TRAFFIC FLOW DIRECTION

NOTES:

1. ALL MEDIAN NOSES SHALL BE PAINTED FOR THE FIRST 50 FEET.
2. MEDIANS THAT ARE LESS THAN 5 FEET WIDE SHALL BE PAINTED.

PAVEMENT MARKINGS SUMMARY OF QUANTITIES SHEET 4 OF 11

ITEM	CODE	DESCRIPTION	UNIT	QTY
644	6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	1
666	6035	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	LF	169
666	6053	REFL PAV MRK TY I (W)(ARROW)(090MIL)	EA	2
666	6077	REFL PAV MRK TY I (W)(WORD)(090MIL)	EA	2
666	6155	REFL PAV MRK TY I(Y)(MED NOSE)(090MIL)	EA	4
666	6171	REFL PAV MRK TY II (W) 6" (BRK)	LF	600
666	6174	REFL PAV MRK TY II (W) 6" (SLD)	LF	2232
666	6178	REFL PAV MRK TY II (W) 8" (SLD)	LF	169
666	6184	REFL PAV MRK TY II (W) (ARROW)	EA	2
666	6192	REFL PAV MRK TY II (W) (WORD)	EA	2

PAVEMENT MARKINGS SUMMARY OF QUANTITIES (CONT'D) SHEET 4 OF 11

ITEM	CODE	DESCRIPTION	UNIT	QTY
666	6217	REFL PAV MRK TY II (Y) (MED NOSE)	EA	4
666	6285	REFL PROF PAV MRK TY I (W)6"(SLD)(090MIL)	LF	2232
666	6305	RE PM W/RET REQ TY I (W)6"(BRK)(090MIL)	LF	600
672	6010	REFL PAV MRKR TY II-C-R	EA	60
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	5803
678	6002	PAV SURF PREP FOR MRK (6")	LF	2832
678	6004	PAV SURF PREP FOR MRK (8")	LF	169
678	6009	PAV SURF PREP FOR MRK (ARROW)	EA	2
678	6016	PAV SURF PREP FOR MRK (WORD)	EA	2
678	6024	PAV SURF PREP FOR MRK (MED NOSE)	EA	4

STATE OF TEXAS
KARLA Y. RIOS
140855
LICENSED
PROFESSIONAL ENGINEER

Karla Rios, P.E.
10/31/2023

0 25 50
SCALE IN FEET

® 2023
Texas Department of Transportation

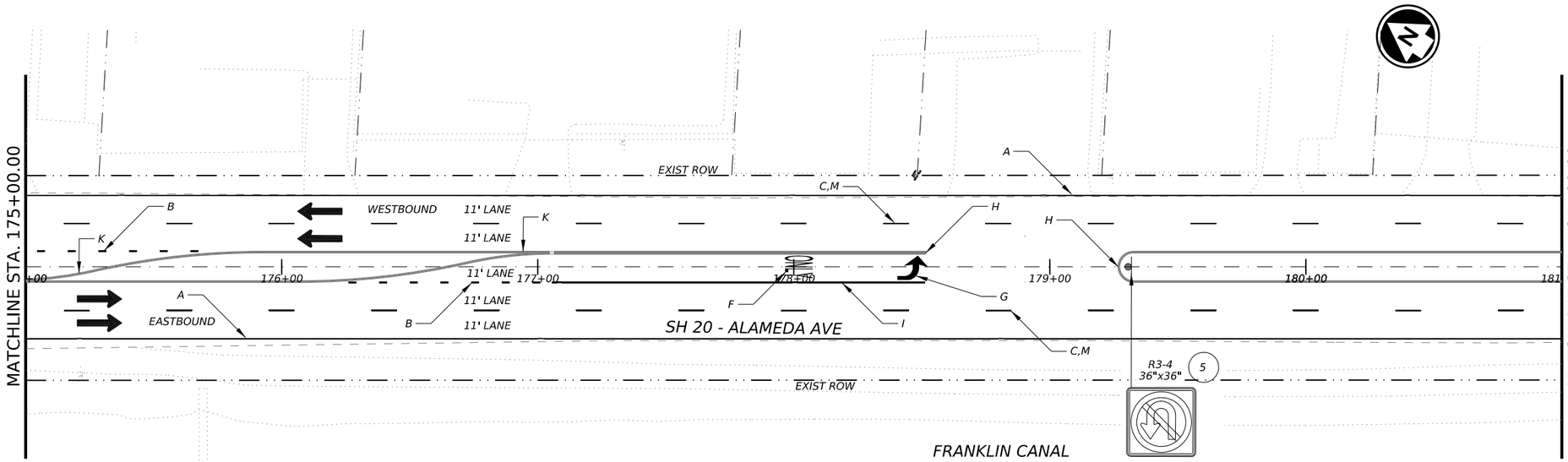
SH 20

PAVEMENT MARKINGS LAYOUT STA. 163+00 TO STA. 175+00

SHEET 4 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		88

DATE:
FILE:



LEGEND

A	REFL PAV MRK (W) 6" (SLD)
B	REFL PAV MRK (W) 8" (*DOT*)
C	REFL PAV MRK (W) 6" (BRK)
D	REFL PAV MRK (W) 24" (SLD)
E	REFL PAV MRK (Y) 6" (SLD)
F	REFL PAV MRK (W) (WORD)
G	REFL PAV MRK (W) (ARROW)
H	REFL PAV MRK (Y) (MED NOSE)
I	REFL PAV MRK (W) 8" (SLD)
J	REFL PAV MRK (Y) 6" (BRK)
K	REFL PAV MRK (Y) (CURB)
L	REFL PAV MRKR TY II-A-A
M	REFL PAV MRKR TY II-C-R
(#)	PROP. SIGN ASSEMBLY
➡	TRAFFIC FLOW DIRECTION

NOTES:

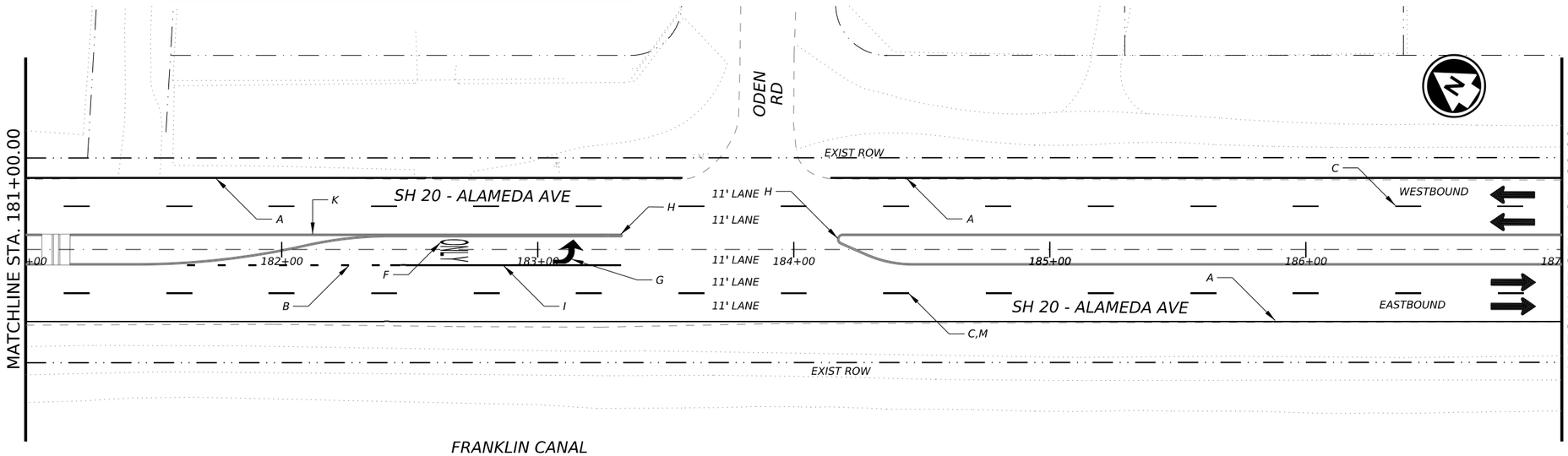
1. ALL MEDIAN NOSES SHALL BE PAINTED FOR THE FIRST 50 FEET.
2. MEDIANS THAT ARE LESS THAN 5 FEET WIDE SHALL BE PAINTED.

PAVEMENT MARKINGS SUMMARY OF QUANTITIES SHEET 5 OF 11

ITEM	CODE	DESCRIPTION	UNIT	QTY
644	6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	1
666	6029	REFL PAV MRK TY I (W)8"(DOT)(090MIL)	LF	59
666	6035	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	LF	236
666	6053	REFL PAV MRK TY I (W)(ARROW)(090MIL)	EA	2
666	6077	REFL PAV MRK TY I (W)(WORD)(090MIL)	EA	2
666	6155	REFL PAV MRK TY I(Y)(MED NOSE)(090MIL)	EA	4
666	6171	REFL PAV MRK TY II (W) 6" (BRK)	LF	600
666	6174	REFL PAV MRK TY II (W) 6" (SLD)	LF	2343
666	6176	REFL PAV MRK TY II (W) 8" (DOT)	LF	59
666	6178	REFL PAV MRK TY II (W) 8" (SLD)	LF	236
666	6184	REFL PAV MRK TY II (W) (ARROW)	EA	2
666	6192	REFL PAV MRK TY II (W) (WORD)	EA	2

PAVEMENT MARKINGS SUMMARY OF QUANTITIES (CONT'D) SHEET 5 OF 11

ITEM	CODE	DESCRIPTION	UNIT	QTY
666	6217	REFL PAV MRK TY II (Y) (MED NOSE)	EA	4
666	6285	REFL PROF PAV MRK TY I (W)6"(SLD)(090MIL)	LF	2343
666	6305	RE PM W/RET REQ TY I (W)6"(BRK)(090MIL)	LF	600
666	6440	REFL PAV MRK TY II (Y) (CURB)	LF	120
672	6010	REFL PAV MRKR TY II-C-R	EA	60
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	5933
678	6002	PAV SURF PREP FOR MRK (6")	LF	2943
678	6004	PAV SURF PREP FOR MRK (8")	LF	295
678	6009	PAV SURF PREP FOR MRK (ARROW)	EA	2
678	6016	PAV SURF PREP FOR MRK (WORD)	EA	2
678	6024	PAV SURF PREP FOR MRK (MED NOSE)	EA	4



STATE OF TEXAS
KARLA Y. RIOS
140855
LICENSED
PROFESSIONAL ENGINEER

Karla Rios, P.E.

10/31/2023

0 25 50
SCALE IN FEET

Texas Department of Transportation

SH 20

PAVEMENT MARKINGS
LAYOUT
STA. 175+00 TO STA. 187+00

SHEET 5 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		89

DATE:
FILE:

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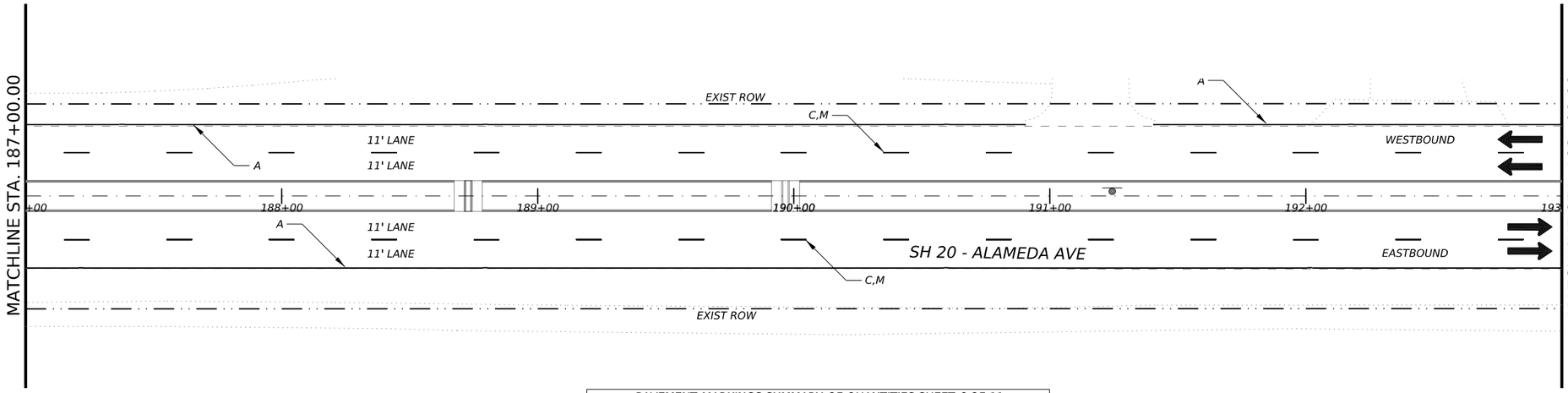
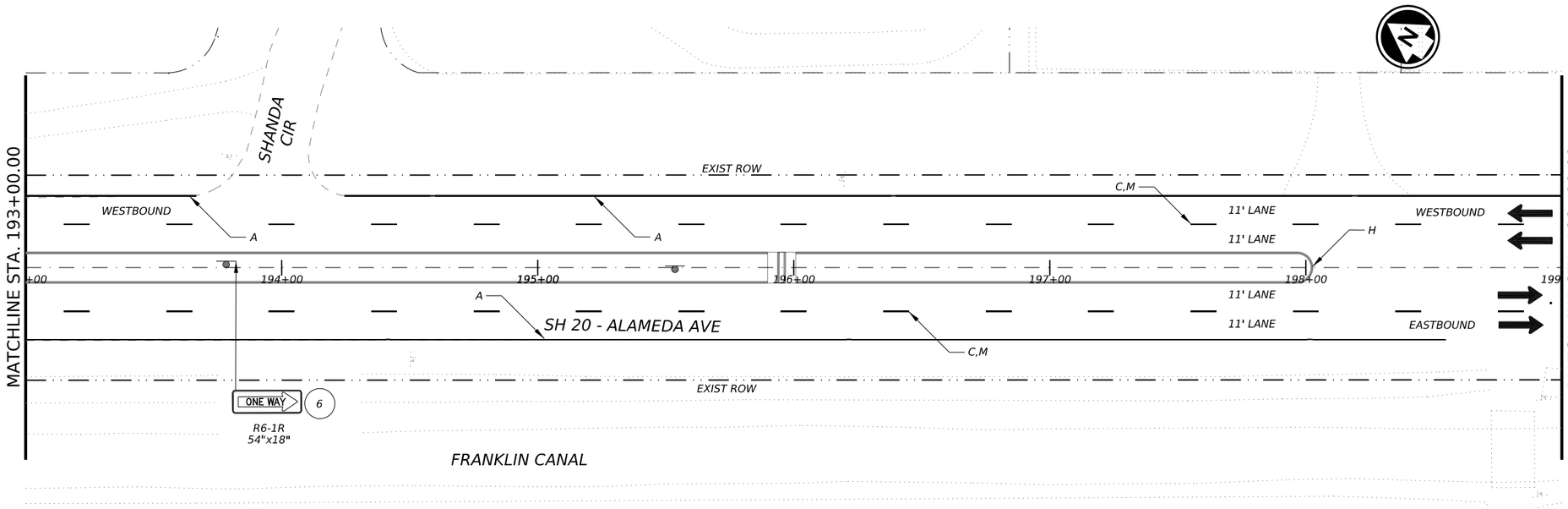
DW:
CK:
DW:



PAVEMENT MARKINGS SUMMARY OF QUANTITIES SHEET 6 OF 11				
ITEM	CODE	DESCRIPTION	UNIT	QTY
644	6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	1
666	6155	REFL PAV MRK TY I(Y)(MED NOSE)(090MIL)	EA	1
666	6171	REFL PAV MRK TY II (W) 6" (BRK)	LF	600
666	6174	REFL PAV MRK TY II (W) 6" (SLD)	LF	2247
666	6217	REFL PAV MRK TY II (Y) (MED NOSE)	EA	1
666	6285	REFL PROF PAV MRK TY I (W)6"(SLD)(090MIL)	LF	2247
666	6305	RE PM W/RET REQ TY I (W)6"(BRK)(090MIL)	LF	600
672	6010	REFL PAV MRKR TY II-C-R	EA	60
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	5910
678	6002	PAV SURF PREP FOR MRK (6")	LF	2847
678	6024	PAV SURF PREP FOR MRK (MED NOSE)	EA	1



LEGEND

A	REFL PAV MRK (W) 6" (SLD)
B	REFL PAV MRK (W) 8" (*DOT*)
C	REFL PAV MRK (W) 6" (BRK)
D	REFL PAV MRK (W) 24" (SLD)
E	REFL PAV MRK (Y) 6" (SLD)
F	REFL PAV MRK (W) (WORD)
G	REFL PAV MRK (W) (ARROW)
H	REFL PAV MRK (Y) (MED NOSE)
I	REFL PAV MRK (W) 8" (SLD)
J	REFL PAV MRK (Y) 6" (BRK)
K	REFL PAV MRK (Y) (CURB)
L	REFL PAV MRKR TY II-A-A
M	REFL PAV MRKR TY II-C-R
(#)	PROP. SIGN ASSEMBLY
➡	TRAFFIC FLOW DIRECTION

NOTES:

1. ALL MEDIAN NOSES SHALL BE PAINTED FOR THE FIRST 50 FEET.
2. MEDIANS THAT ARE LESS THAN 5 FEET WIDE SHALL BE PAINTED.

STATE OF TEXAS
KARLA Y. RIOS
140855
LICENSED
PROFESSIONAL ENGINEER

Karla Rios, P.E.
10/31/2023

0 25 50
SCALE IN FEET

® 2023
Texas Department of Transportation

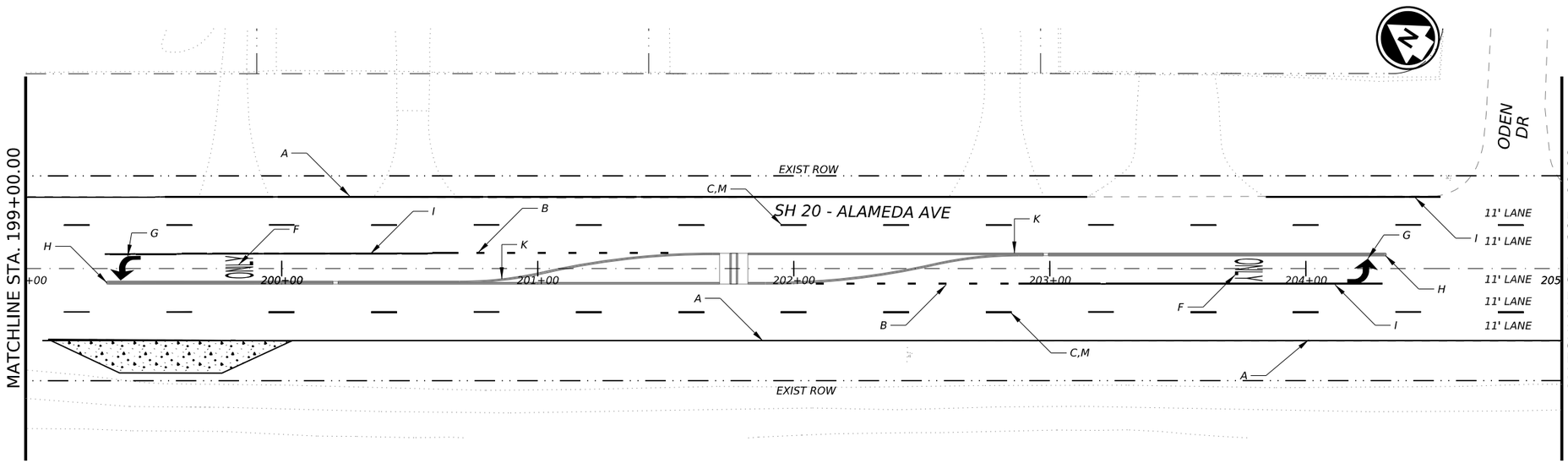
SH 20

PAVEMENT MARKINGS LAYOUT
STA. 187+00 TO STA. 199+00

SHEET 6 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		90

DATE:
FILE:



LEGEND

A	REFL PAV MRK (W) 6" (SLD)
B	REFL PAV MRK (W) 8" (*DOT*)
C	REFL PAV MRK (W) 6" (BRK)
D	REFL PAV MRK (W) 24" (SLD)
E	REFL PAV MRK (Y) 6" (SLD)
F	REFL PAV MRK (W) (WORD)
G	REFL PAV MRK (W) (ARROW)
H	REFL PAV MRK (Y) (MED NOSE)
I	REFL PAV MRK (W) 8" (SLD)
J	REFL PAV MRK (Y) 6" (BRK)
K	REFL PAV MRK (Y) (CURB)
L	REFL PAV MRKR TY II-A-A
M	REFL PAV MRKR TY II-C-R
(#)	PROP. SIGN ASSEMBLY
➡	TRAFFIC FLOW DIRECTION

NOTES:

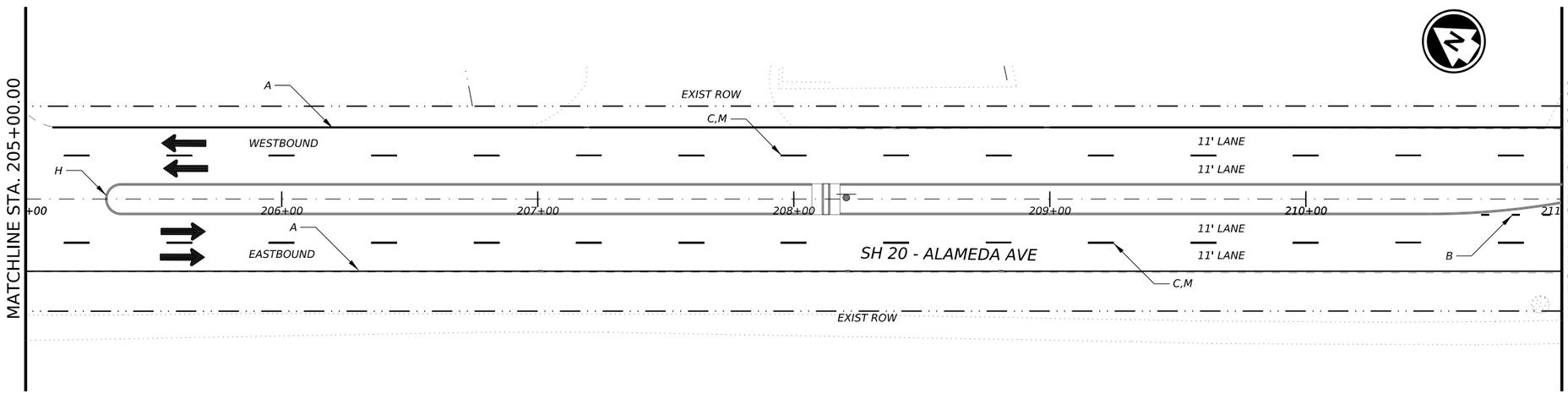
1. ALL MEDIAN NOSES SHALL BE PAINTED FOR THE FIRST 50 FEET.
2. MEDIANS THAT ARE LESS THAN 5 FEET WIDE SHALL BE PAINTED.

PAVEMENT MARKINGS SUMMARY OF QUANTITIES SHEET 7 OF 11

ITEM	CODE	DESCRIPTION	UNIT	QTY
666	6029	REFL PAV MRK TY I (W)8"(DOT)(090MIL)	LF	50
666	6035	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	LF	281
666	6053	REFL PAV MRK TY I (W)(ARROW)(090MIL)	EA	2
666	6077	REFL PAV MRK TY I (W)(WORD)(090MIL)	EA	2
666	6155	REFL PAV MRK TY I(Y)(MED NOSE)(090MIL)	EA	3
666	6171	REFL PAV MRK TY II (W) 6" (BRK)	LF	600
666	6174	REFL PAV MRK TY II (W) 6" (SLD)	LF	2266
666	6176	REFL PAV MRK TY II (W) 8" (DOT)	LF	50
666	6178	REFL PAV MRK TY II (W) 8" (SLD)	LF	281
666	6184	REFL PAV MRK TY II (W) (ARROW)	EA	2
666	6192	REFL PAV MRK TY II (W) (WORD)	EA	2

PAVEMENT MARKINGS SUMMARY OF QUANTITIES (CONT'D) SHEET 7 OF 11

ITEM	CODE	DESCRIPTION	UNIT	QTY
666	6217	REFL PAV MRK TY II (Y) (MED NOSE)	EA	3
666	6285	REFL PROF PAV MRK TY I (W)6"(SLD)(090MIL)	LF	2266
666	6305	RE PM W/RET REQ TY I (W)6"(BRK)(090MIL)	LF	600
666	6440	REFL PAV MRK TY II (Y) (CURB)	LF	155
672	6010	REFL PAV MRKR TY II-C-R	EA	60
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	5943
678	6002	PAV SURF PREP FOR MRK (6")	LF	2866
678	6004	PAV SURF PREP FOR MRK (8")	LF	331
678	6009	PAV SURF PREP FOR MRK (ARROW)	EA	2
678	6016	PAV SURF PREP FOR MRK (WORD)	EA	2
678	6024	PAV SURF PREP FOR MRK (MED NOSE)	EA	3



STATE OF TEXAS
KARLA Y. RIOS
140855
LICENSED
PROFESSIONAL ENGINEER

Karla Rios, P.E.
10/31/2023

0 25 50
SCALE IN FEET

Texas Department of Transportation

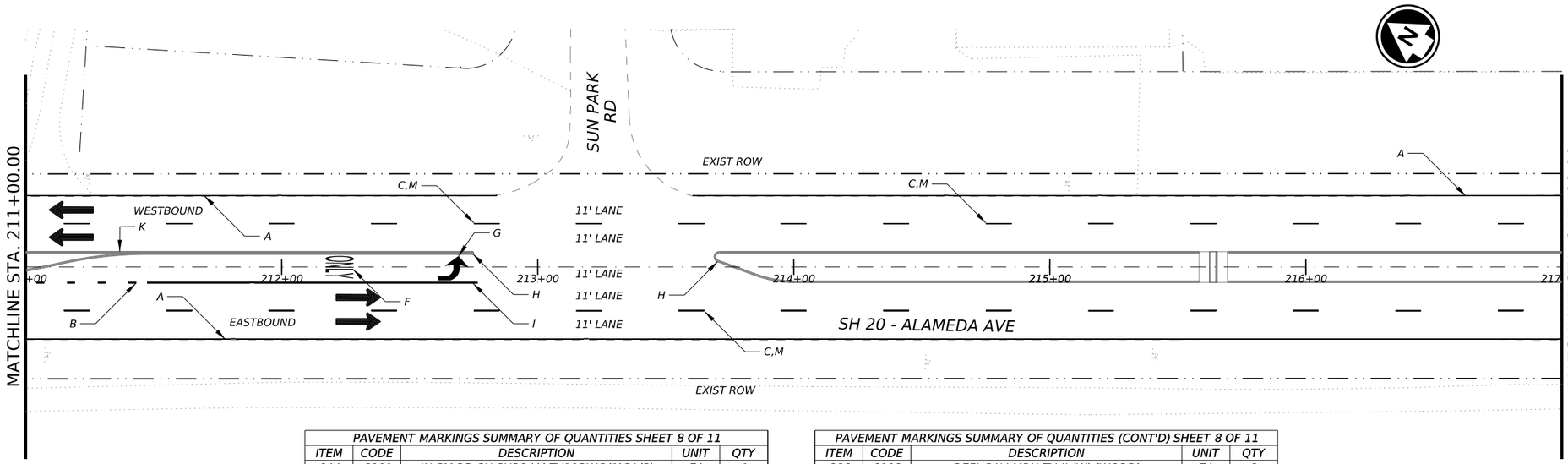
SH 20

PAVEMENT MARKINGS
LAYOUT
STA. 199+00 TO STA. 211+00

SHEET 7 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		91

DATE:
FILE:



PAVEMENT MARKINGS SUMMARY OF QUANTITIES SHEET 8 OF 11				
ITEM	CODE	DESCRIPTION	UNIT	QTY
644	6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	1
666	6029	REFL PAV MRK TY I (W)8"(DOT)(090MIL)	LF	33
666	6035	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	LF	206
666	6053	REFL PAV MRK TY I (W)(ARROW)(090MIL)	EA	2
666	6077	REFL PAV MRK TY I (W)(WORD)(090MIL)	EA	2
666	6155	REFL PAV MRK TY I(Y)(MED NOSE)(090MIL)	EA	4
666	6171	REFL PAV MRK TY II (W) 6" (BRK)	LF	600
666	6174	REFL PAV MRK TY II (W) 6" (SLD)	LF	2246
666	6176	REFL PAV MRK TY II (W) 8" (DOT)	LF	33
666	6178	REFL PAV MRK TY II (W) 8" (SLD)	LF	206
666	6184	REFL PAV MRK TY II (W) (ARROW)	EA	2

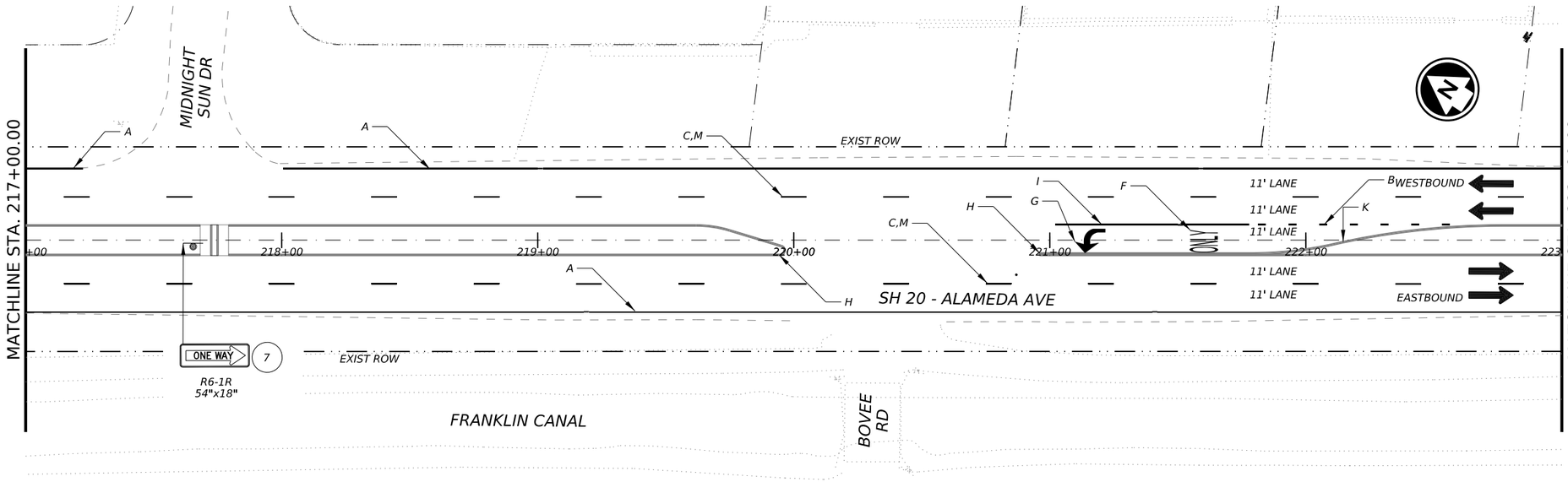
PAVEMENT MARKINGS SUMMARY OF QUANTITIES (CONT'D) SHEET 8 OF 11				
ITEM	CODE	DESCRIPTION	UNIT	QTY
666	6192	REFL PAV MRK TY II (W) (WORD)	EA	2
666	6217	REFL PAV MRK TY II (Y) (MED NOSE)	EA	4
666	6285	REFL PROF PAV MRK TY I (W)6"(SLD)(090MIL)	LF	2246
666	6305	RE PM W/RET REQ TY I (W)6"(BRK)(090MIL)	LF	600
666	6440	REFL PAV MRK TY II (Y) (CURB)	LF	75
672	6010	REFL PAV MRKR TY II-C-R	EA	60
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	5758
678	6002	PAV SURF PREP FOR MRK (6")	LF	2846
678	6004	PAV SURF PREP FOR MRK (8")	LF	239
678	6009	PAV SURF PREP FOR MRK (ARROW)	EA	2
678	6016	PAV SURF PREP FOR MRK (WORD)	EA	2
678	6024	PAV SURF PREP FOR MRK (MED NOSE)	EA	4

LEGEND

A	REFL PAV MRK (W) 6" (SLD)
B	REFL PAV MRK (W) 8" (*DOT*)
C	REFL PAV MRK (W) 6" (BRK)
D	REFL PAV MRK (W) 24" (SLD)
E	REFL PAV MRK (Y) 6" (SLD)
F	REFL PAV MRK (W) (WORD)
G	REFL PAV MRK (W) (ARROW)
H	REFL PAV MRK (Y) (MED NOSE)
I	REFL PAV MRK (W) 8" (SLD)
J	REFL PAV MRK (Y) 6" (BRK)
K	REFL PAV MRK (Y) (CURB)
L	REFL PAV MRKR TY II-A-A
M	REFL PAV MRKR TY II-C-R
(#)	PROP. SIGN ASSEMBLY
➡	TRAFFIC FLOW DIRECTION

NOTES:

1. ALL MEDIAN NOSES SHALL BE PAINTED FOR THE FIRST 50 FEET.
2. MEDIANS THAT ARE LESS THAN 5 FEET WIDE SHALL BE PAINTED.



STATE OF TEXAS
KARLA Y. RIOS
140855
LICENSED
PROFESSIONAL ENGINEER

Karla Rios, P.E.
10/31/2023

0 25 50
SCALE IN FEET

® 2023
Texas Department of Transportation

SH 20

PAVEMENT MARKINGS
LAYOUT
STA. 211+00 TO STA. 223+00

SHEET 8 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		92

CK:
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CK:
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DATE:
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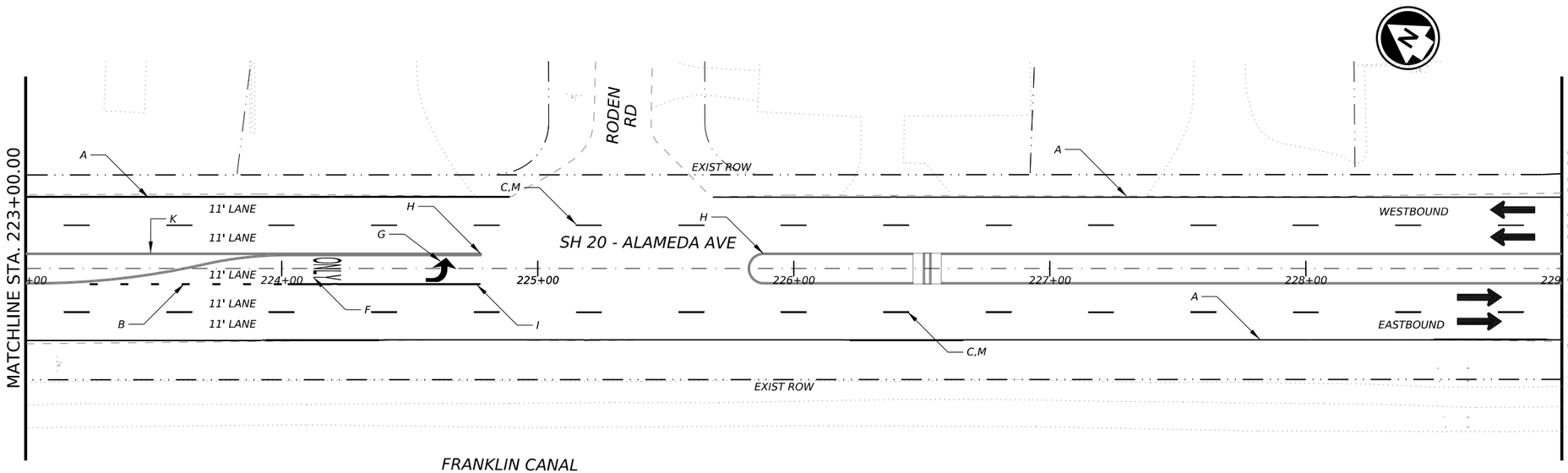


FRANKLIN CANAL

PAVEMENT MARKINGS SUMMARY OF QUANTITIES SHEET 9 OF 11				
ITEM	CODE	DESCRIPTION	UNIT	QTY
666	6029	REFL PAV MRK TY I (W)8"(DOT)(090MIL)	LF	43
666	6035	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	LF	171
666	6053	REFL PAV MRK TY I (W)(ARROW)(090MIL)	EA	2
666	6077	REFL PAV MRK TY I (W)(WORD)(090MIL)	EA	2
666	6155	REFL PAV MRK TY I(Y)(MED NOSE)(090MIL)	EA	4
666	6171	REFL PAV MRK TY II (W) 6" (BRK)	LF	600
666	6174	REFL PAV MRK TY II (W) 6" (SLD)	LF	2272
666	6176	REFL PAV MRK TY II (W) 8" (DOT)	LF	43
666	6178	REFL PAV MRK TY II (W) 8" (SLD)	LF	171
666	6184	REFL PAV MRK TY II (W) (ARROW)	EA	2
666	6192	REFL PAV MRK TY II (W) (WORD)	EA	2

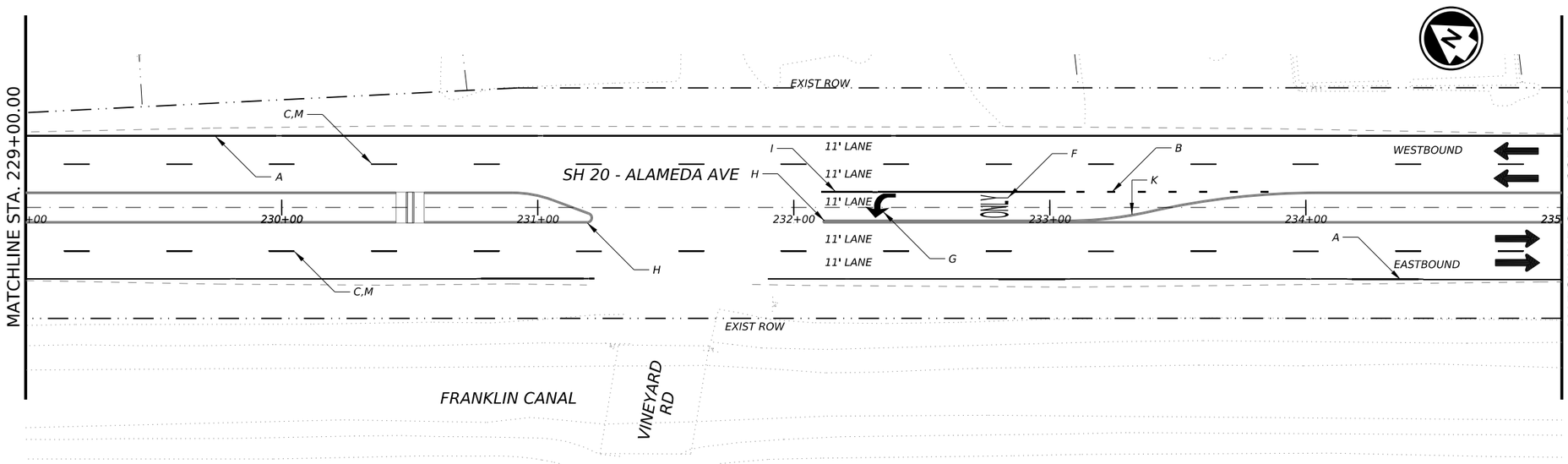
PAVEMENT MARKINGS SUMMARY OF QUANTITIES (CONT'D) SHEET 9 OF 11				
ITEM	CODE	DESCRIPTION	UNIT	QTY
666	6217	REFL PAV MRK TY II (Y) (MED NOSE)	EA	4
666	6285	REFL PROF PAV MRK TY I (W)6"(SLD)(090MIL)	LF	2272
666	6305	RE PM W/RET REQ TY I (W)6"(BRK)(090MIL)	LF	600
666	6440	REFL PAV MRK TY II (Y) (CURB)	LF	45
672	6010	REFL PAV MRKR TY II-C-R	EA	60
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	5865
678	6002	PAV SURF PREP FOR MRK (6")	LF	2872
678	6004	PAV SURF PREP FOR MRK (8")	LF	214
678	6009	PAV SURF PREP FOR MRK (ARROW)	EA	2
678	6016	PAV SURF PREP FOR MRK (WORD)	EA	2
678	6024	PAV SURF PREP FOR MRK (MED NOSE)	EA	4

LEGEND

A	REFL PAV MRK (W) 6" (SLD)
B	REFL PAV MRK (W) 8" (*DOT*)
C	REFL PAV MRK (W) 6" (BRK)
D	REFL PAV MRK (W) 24" (SLD)
E	REFL PAV MRK (Y) 6" (SLD)
F	REFL PAV MRK (W) (WORD)
G	REFL PAV MRK (W) (ARROW)
H	REFL PAV MRK (Y) (MED NOSE)
I	REFL PAV MRK (W) 8" (SLD)
J	REFL PAV MRK (Y) 6" (BRK)
K	REFL PAV MRK (Y) (CURB)
L	REFL PAV MRKR TY II-A-A
M	REFL PAV MRKR TY II-C-R
(#)	PROP. SIGN ASSEMBLY
	TRAFFIC FLOW DIRECTION

NOTES:

1. ALL MEDIAN NOSES SHALL BE PAINTED FOR THE FIRST 50 FEET.
2. MEDIANS THAT ARE LESS THAN 5 FEET WIDE SHALL BE PAINTED.



STATE OF TEXAS
KARLA Y. RIOS
140855
LICENSED PROFESSIONAL ENGINEER

Karla Rios, P.E.

10/31/2023

0 25 50
SCALE IN FEET

® 2023
Texas Department of Transportation

SH 20

PAVEMENT MARKINGS LAYOUT
STA. 223+00 TO STA. 235+00

SHEET 9 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		93

DATE:
FILE:

CK:
DW:
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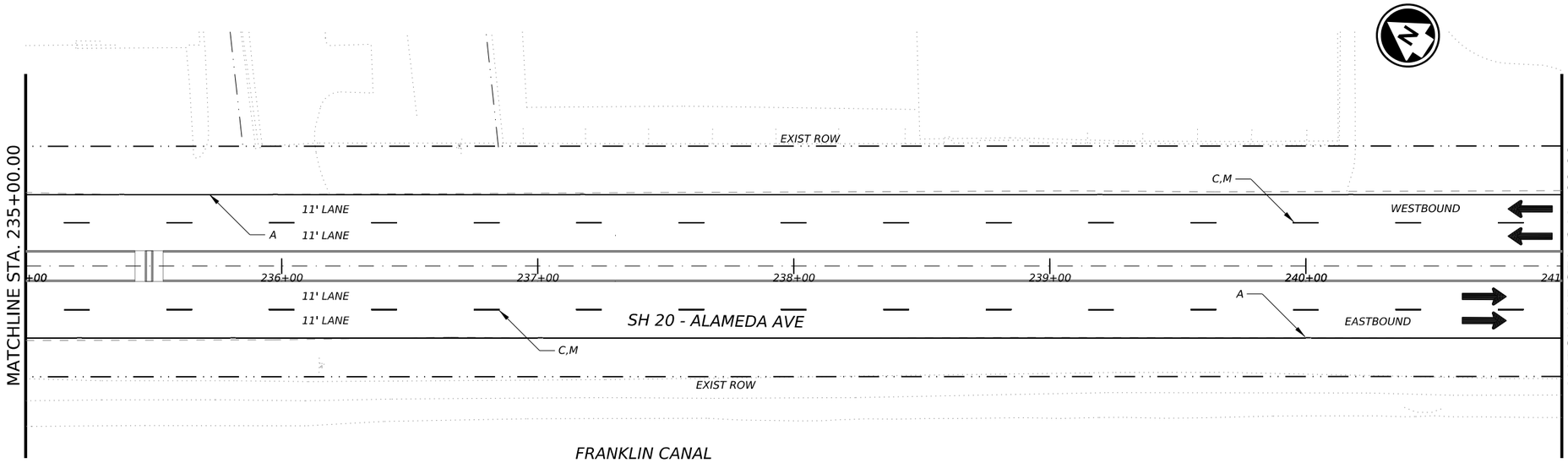


LEGEND

A	REFL PAV MRK (W) 6" (SLD)
B	REFL PAV MRK (W) 8" (*DOT*)
C	REFL PAV MRK (W) 6" (BRK)
D	REFL PAV MRK (W) 24" (SLD)
E	REFL PAV MRK (Y) 6" (SLD)
F	REFL PAV MRK (W) (WORD)
G	REFL PAV MRK (W) (ARROW)
H	REFL PAV MRK (Y) (MED NOSE)
I	REFL PAV MRK (W) 8" (SLD)
J	REFL PAV MRK (Y) 6" (BRK)
K	REFL PAV MRK (Y) (CURB)
L	REFL PAV MRKR TY II-A-A
M	REFL PAV MRKR TY II-C-R
(#)	PROP. SIGN ASSEMBLY
➡	TRAFFIC FLOW DIRECTION

NOTES:

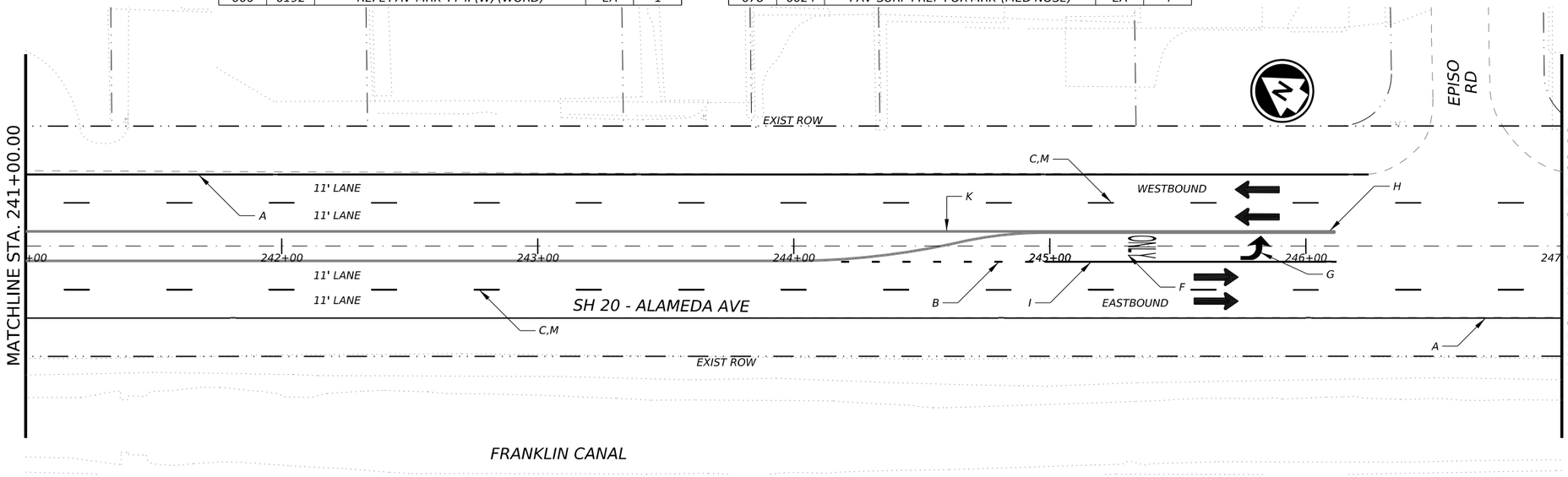
1. ALL MEDIAN NOSES SHALL BE PAINTED FOR THE FIRST 50 FEET.
2. MEDIANS THAT ARE LESS THAN 5 FEET WIDE SHALL BE PAINTED.

PAVEMENT MARKINGS SUMMARY OF QUANTITIES SHEET 10 OF 11

ITEM	CODE	DESCRIPTION	UNIT	QTY
666	6029	REFL PAV MRK TY I (W)8"(DOT)(090MIL)	LF	21
666	6035	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	LF	115
666	6053	REFL PAV MRK TY I (W)(ARROW)(090MIL)	EA	1
666	6077	REFL PAV MRK TY I (W)(WORD)(090MIL)	EA	1
666	6155	REFL PAV MRK TY I(Y)(MED NOSE)(090MIL)	EA	1
666	6171	REFL PAV MRK TY II (W) 6" (BRK)	LF	600
666	6174	REFL PAV MRK TY II (W) 6" (SLD)	LF	2325
666	6176	REFL PAV MRK TY II (W) 8" (DOT)	LF	21
666	6178	REFL PAV MRK TY II (W) 8" (SLD)	LF	115
666	6184	REFL PAV MRK TY II (W) (ARROW)	EA	1
666	6192	REFL PAV MRK TY II (W) (WORD)	EA	1

PAVEMENT MARKINGS SUMMARY OF QUANTITIES (CONT'D) SHEET 10 OF 11

ITEM	CODE	DESCRIPTION	UNIT	QTY
666	6217	REFL PAV MRK TY II (Y) (MED NOSE)	EA	1
666	6285	REFL PROF PAV MRK TY I (W)6"(SLD)(090MIL)	LF	2325
666	6305	RE PM W/RET REQ TY I (W)6"(BRK)(090MIL)	LF	600
666	6440	REFL PAV MRK TY II (Y) (CURB)	LF	50
672	6010	REFL PAV MRKR TY II-C-R	EA	60
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	5875
678	6002	PAV SURF PREP FOR MRK (6")	LF	2925
678	6004	PAV SURF PREP FOR MRK (8")	LF	136
678	6009	PAV SURF PREP FOR MRK (ARROW)	EA	2
678	6016	PAV SURF PREP FOR MRK (WORD)	EA	2
678	6024	PAV SURF PREP FOR MRK (MED NOSE)	EA	4



STATE OF TEXAS
KARLA Y. RIOS
140855
LICENSED
PROFESSIONAL ENGINEER

Karla Rios, P.E.
10/31/2023

0 25 50
SCALE IN FEET

Texas Department of Transportation

SH 20

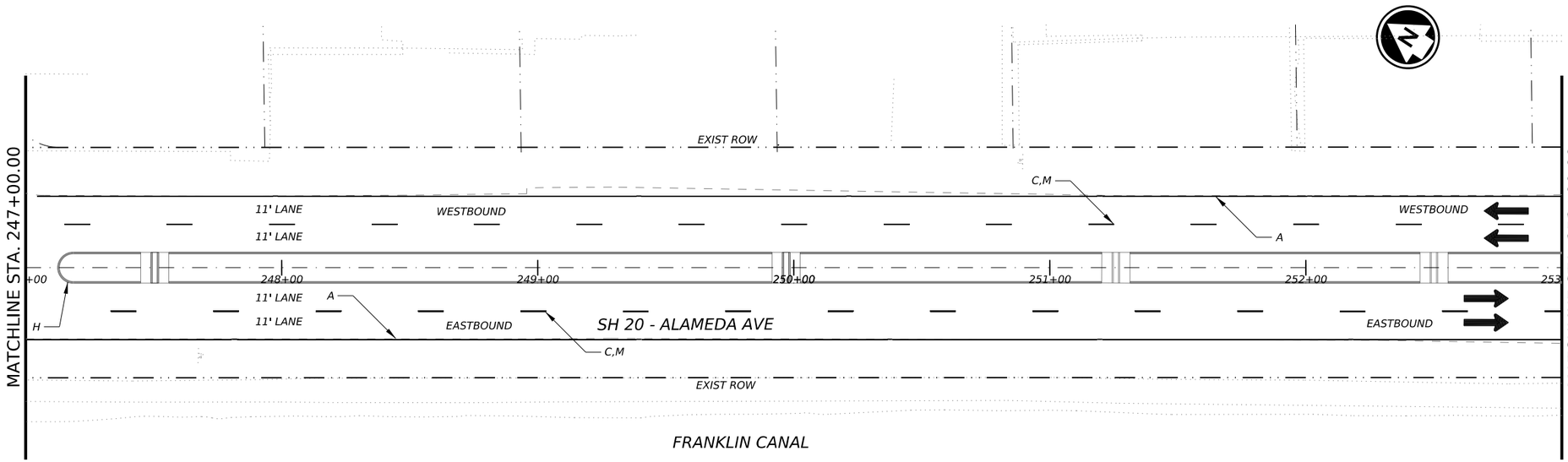
PAVEMENT MARKINGS LAYOUT
STA. 235+00 TO STA. 247+00

SHEET 10 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		94

DATE:
FILE:

CK:
DW:
CK:
DW:



LEGEND

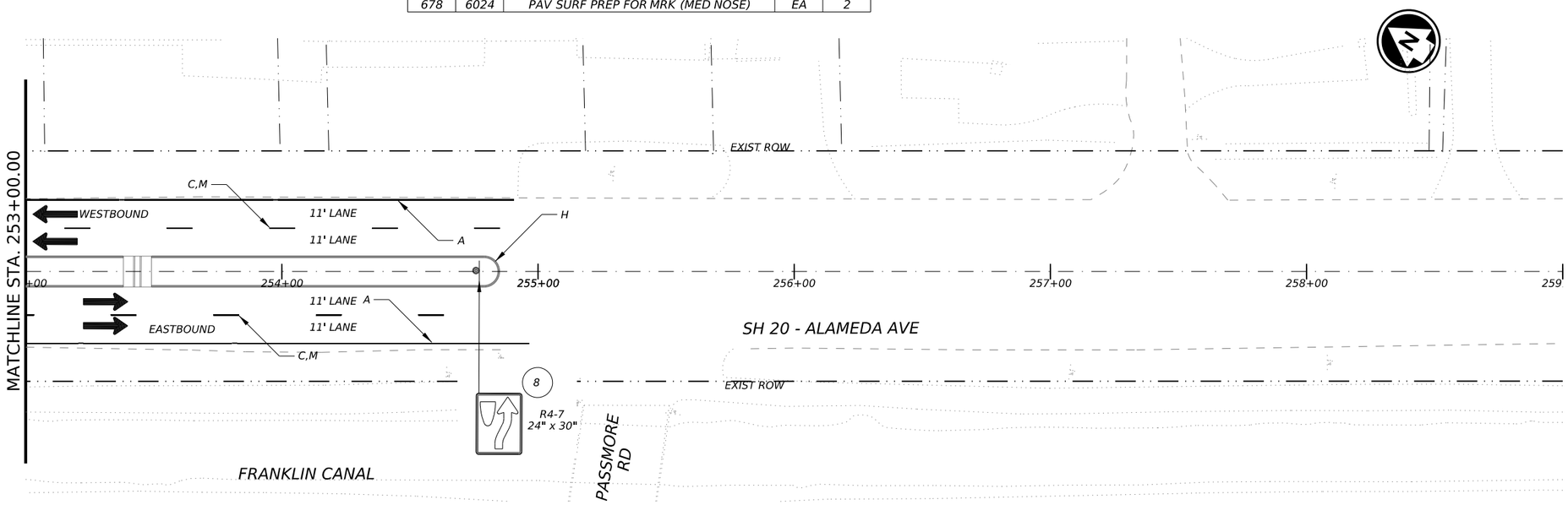
A	REFL PAV MRK (W) 6" (SLD)
B	REFL PAV MRK (W) 8" (*DOT*)
C	REFL PAV MRK (W) 6" (BRK)
D	REFL PAV MRK (W) 24" (SLD)
E	REFL PAV MRK (Y) 6" (SLD)
F	REFL PAV MRK (W) (WORD)
G	REFL PAV MRK (W) (ARROW)
H	REFL PAV MRK (Y) (MED NOSE)
I	REFL PAV MRK (W) 8" (SLD)
J	REFL PAV MRK (Y) 6" (BRK)
K	REFL PAV MRK (Y) (CURB)
L	REFL PAV MRKR TY II-A-A
M	REFL PAV MRKR TY II-C-R
(#)	PROP. SIGN ASSEMBLY
➡	TRAFFIC FLOW DIRECTION

NOTES:

1. ALL MEDIAN NOSES SHALL BE PAINTED FOR THE FIRST 50 FEET.
2. MEDIANS THAT ARE LESS THAN 5 FEET WIDE SHALL BE PAINTED.

PAVEMENT MARKINGS SUMMARY OF QUANTITIES SHEET 11 OF 11

ITEM	CODE	DESCRIPTION	UNIT	QTY
644	6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	1
666	6155	REFL PAV MRK TY I(Y)(MED NOSE)(090MIL)	EA	2
666	6171	REFL PAV MRK TY II (W) 6" (BRK)	LF	400
666	6174	REFL PAV MRK TY II (W) 6" (SLD)	LF	1600
666	6217	REFL PAV MRK TY II (Y) (MED NOSE)	EA	2
666	6285	REFL PROF PAV MRK TY I (W)6"(SLD)(090MIL)	LF	1600
666	6305	RE PM W/RET REQ TY I (W)6"(BRK)(090MIL)	LF	400
672	6010	REFL PAV MRKR TY II-C-R	EA	60
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	3965
678	6002	PAV SURF PREP FOR MRK (6")	LF	2000
678	6024	PAV SURF PREP FOR MRK (MED NOSE)	EA	2



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KARLA Y. RIOS
140855
LICENSED PROFESSIONAL ENGINEER

Karla Rios, P.E.

10/31/2023

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SCALE IN FEET

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Texas Department of Transportation

SH 20

PAVEMENT MARKINGS LAYOUT STA. 247+00 TO END

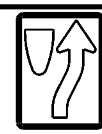
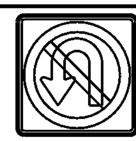
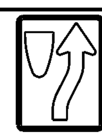
SHEET 11 OF 11

CONT	SECT	JOB	HIGHWAY
0002	02	059,ETC.	SH 20
DIST	COUNTY		SHEET NO.
ELP	EL PASO		95

DATE:
FILE:

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION: PREFABRICATED P = "Plain" T = "T" U = "U"	MOUNTING DESIGNATION 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
85	1	R4-7		24" X 30"	X		10 BWG	1	SA	P		
85	2	R8-3a		30" X 30"	X		10 BWG	1	SA	P		
87	3	R6-1R		54" X 18"	X		10 BWG	1	SA	T		
88	4	R6-1R		54" X 18"	X		10 BWG	1	SA	T		
89	5	R3-4		36" X 36"	X		10 BWG	1	SA	P		
90	6	R6-1R		54" X 18"	X		10 BWG	1	SA	T		
91	7	R6-1R		54" X 18"	X		10 BWG	1	SA	T		
95	8	R4-7		24" X 30"	X		10 BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS

Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

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

NOTE:

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

DATE: 10/27/2023 2:21:24 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT5/Documents/24 - ELP/Design Pro...

Texas Department of Transportation

Traffic Operations Division Standard

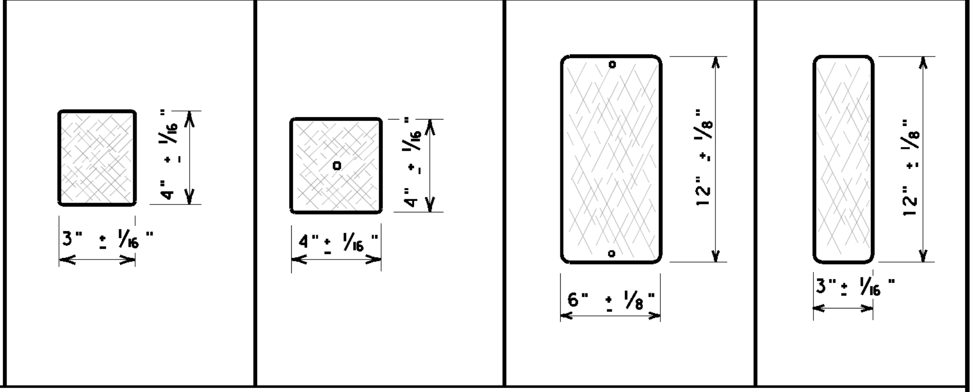
SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-16 8-16	0002	02	059,ETC.	SH 20
	DIST		COUNTY	SHEET NO.
	ELP		EL PASO	96

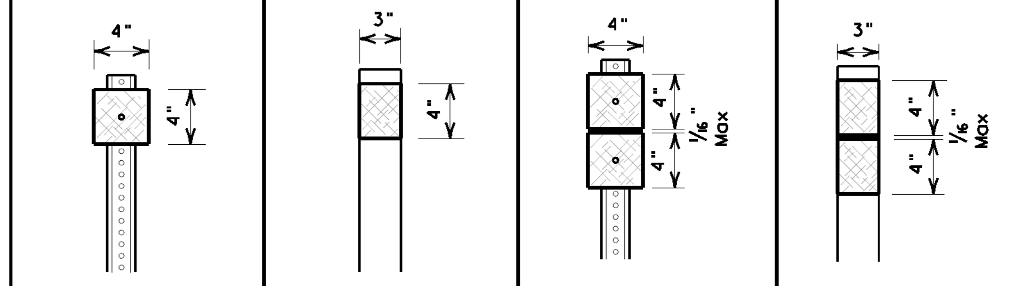
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE	3" ± 1/16" x 4" ± 1/16"	4" ± 1/16" x 4" ± 1/16"	6" ± 1/8" x 12" ± 1/8"	3" ± 1/16" x 12" ± 1/8"
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			



DELINEATORS

	SINGLE		DOUBLE	
DEVICE	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF



D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
S = Single
D = Double

COLOR OF REFLECTORS
W = White
Y = Yellow
R = Red

REFLECTOR UNIT SIZE
1 or 2

TYPE OF POST OR DELINEATOR
WC = Wing Channel Post
YFLX = Yellow Flexible Post
WFLX = White Flexible Post
BRF = Barrier Reflector

TYPE OF MOUNT
GND = Embedded (drivable or set in concrete)
CTB = Concrete Barrier Mount
GF1 or GF2 = Guard Fence Attachment
SRF = Surface Mount

DIRECTION
If Required
BI = Bi-Directional
BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
1, 2, 3, or 4

NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

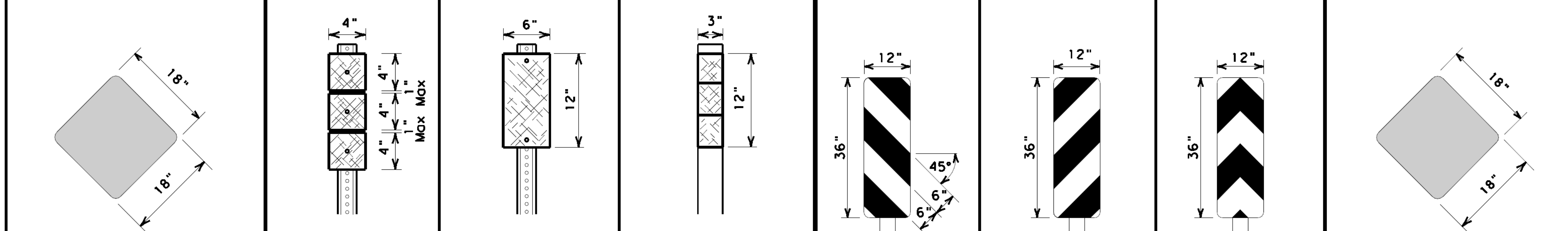
TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE	18" x 18"	3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit	12" x 36"	12" x 36"	12" x 36"	18" x 18"
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

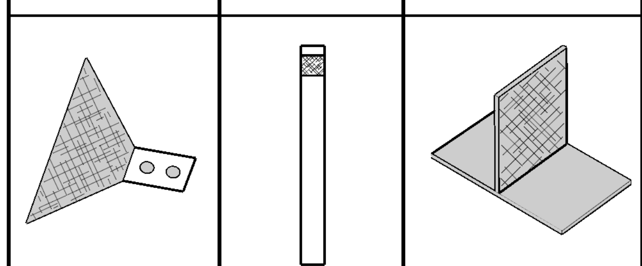


DEPARTMENTAL MATERIAL SPECIFICATIONS

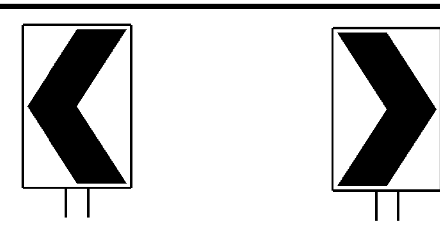
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		



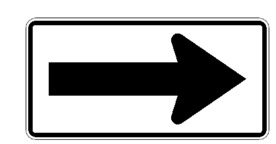
CHEVRONS



W1-8

SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

ONE DIRECTION LARGE ARROW



W1-6

SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

NOTE

1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT 0002	SECT 02	JOB 059, ETC.	HIGHWAY SH 20
REVISIONS 10-09 3-15 4-10 7-20	DIST ELP		COUNTY EL PASO	SHEET NO. 97

20A

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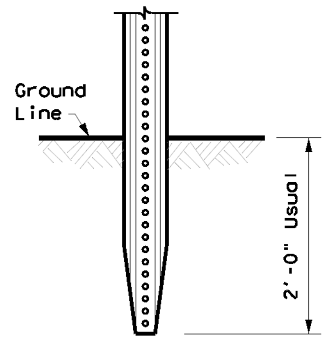
POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

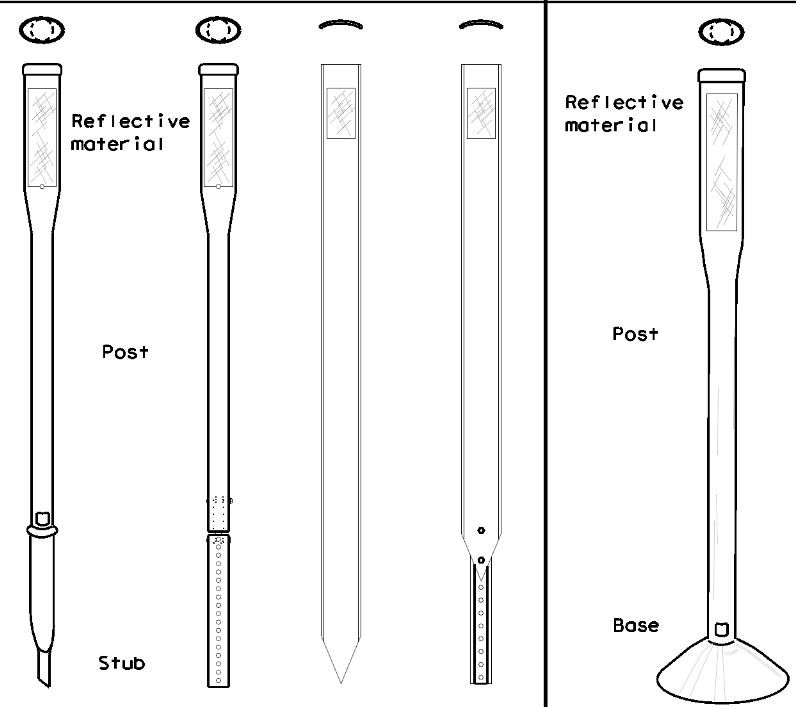


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

FLEXIBLE POSTS (YFLX, WFLX)

GND | SRF



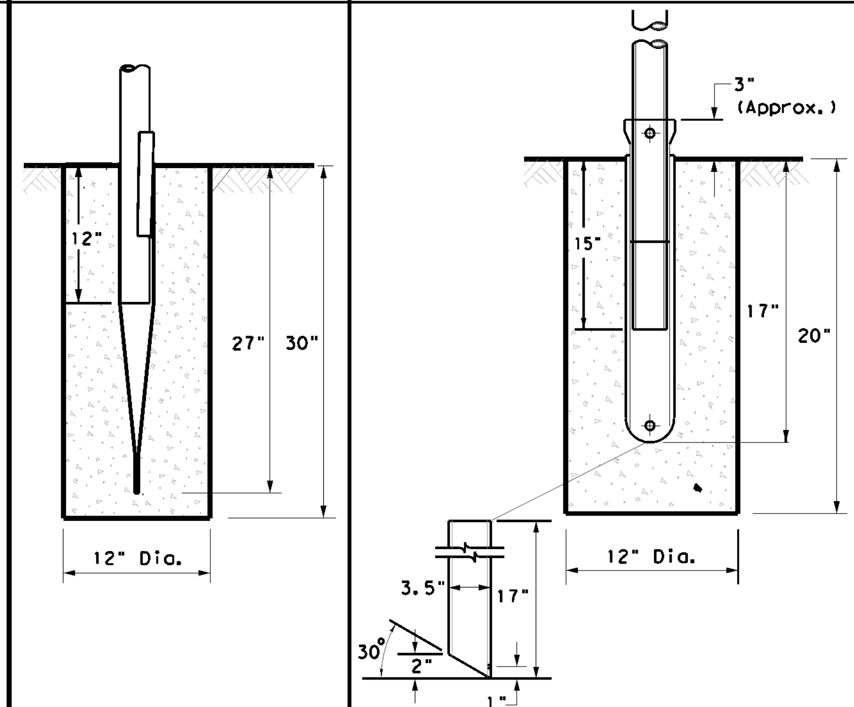
EMBEDDED | SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

WEDGE ANCHOR SYSTEMS

WAS | WAP



STEEL | PLASTIC

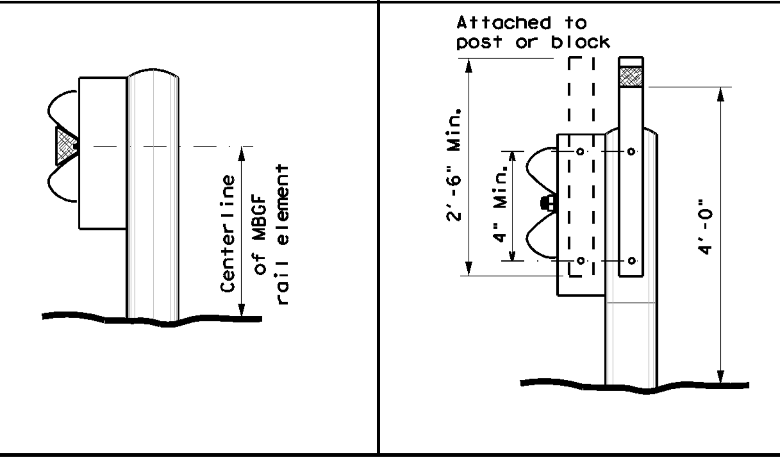
NOTE

1. Install per manufacturer's recommendations.

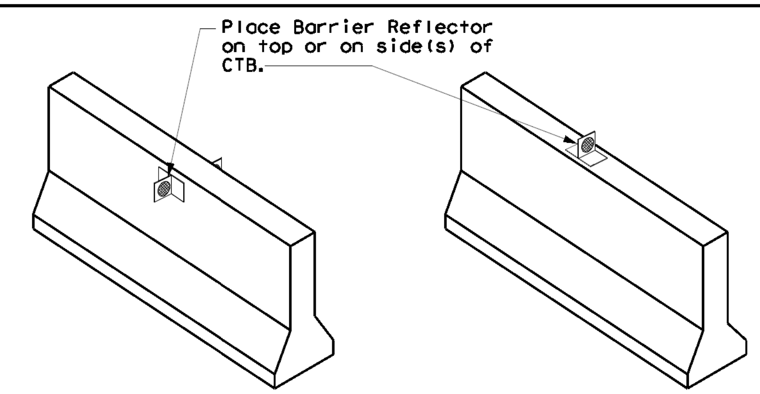
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

GF1 | GF2



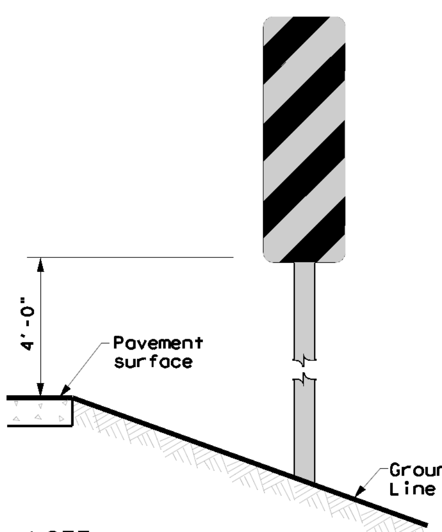
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

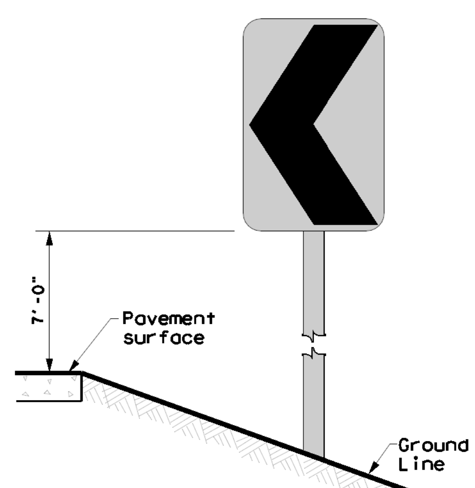
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

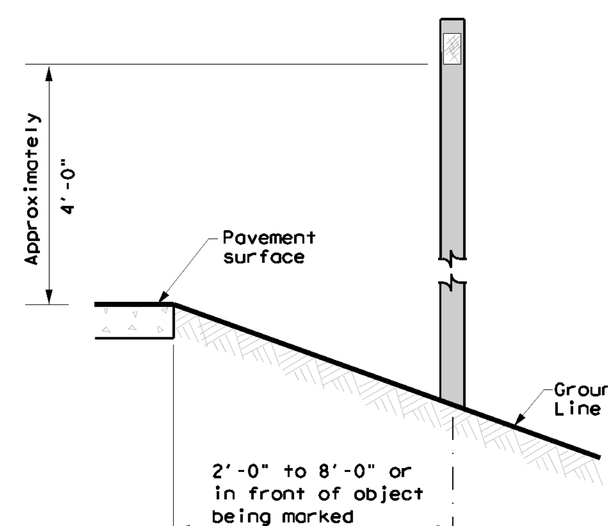
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation | Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0002	02	059, ETC.	SH 20
10-09 3-15	DIST		COUNTY	SHEET NO.
4-10 7-20	ELP		EL PASO	98

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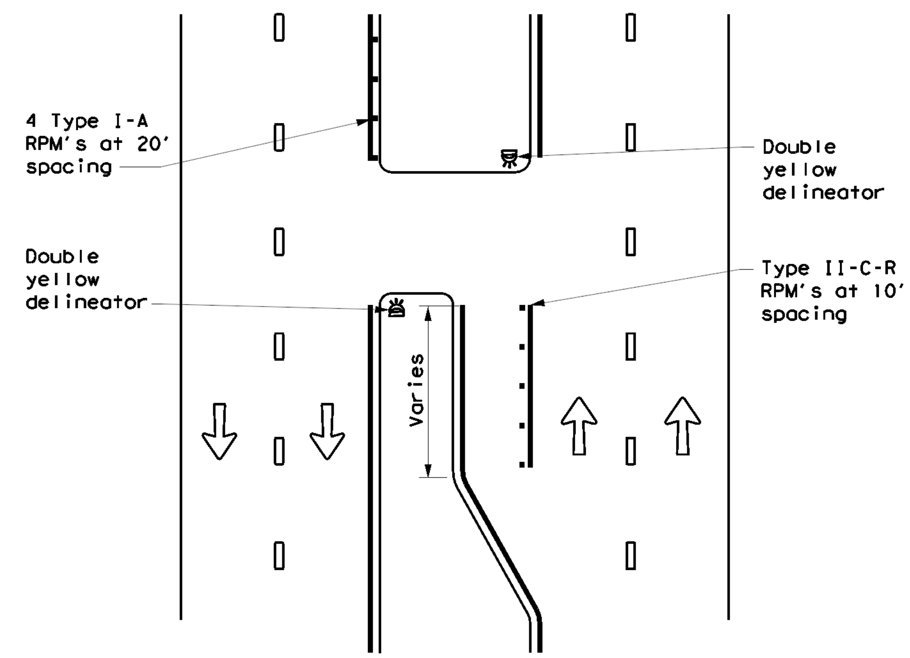
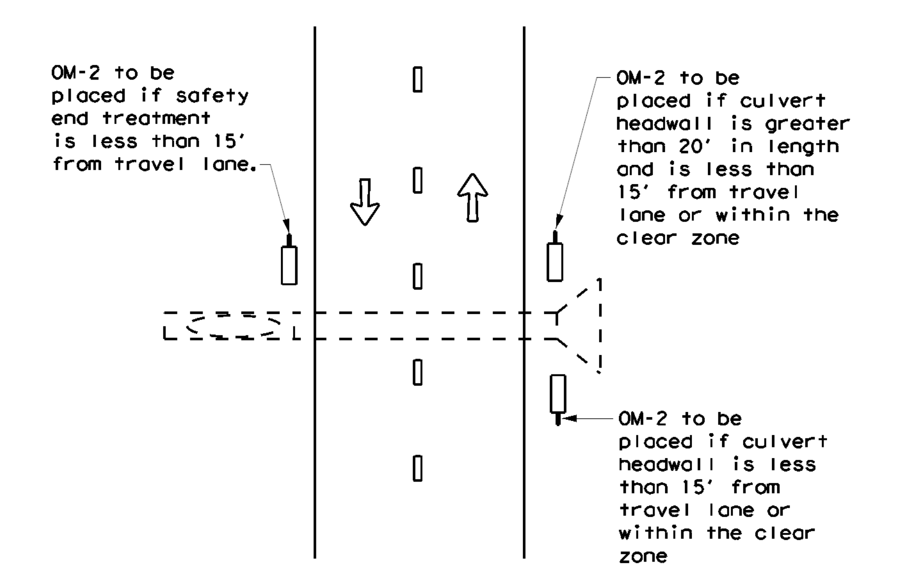
CROSSOVERS



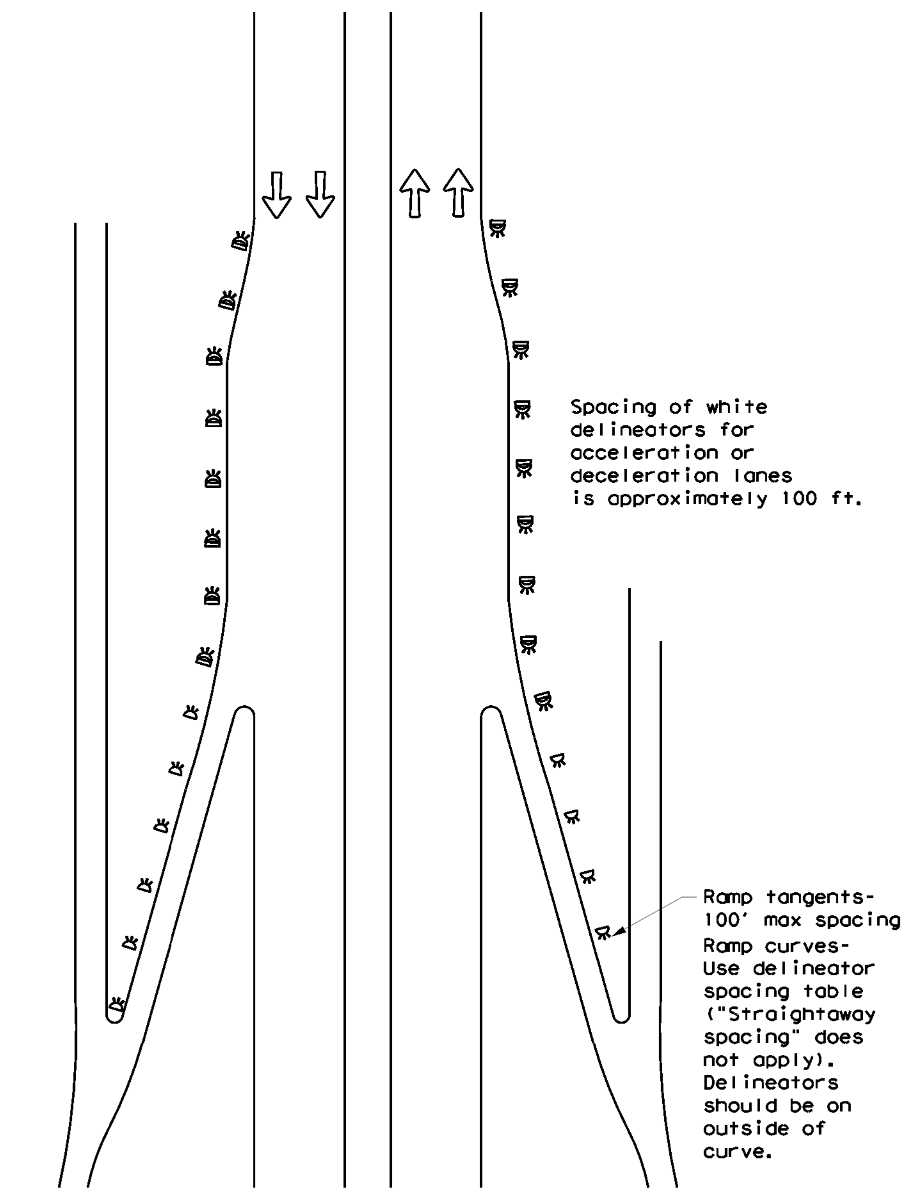
DETAIL 1

FOR CULVERTS WITHOUT MBGF



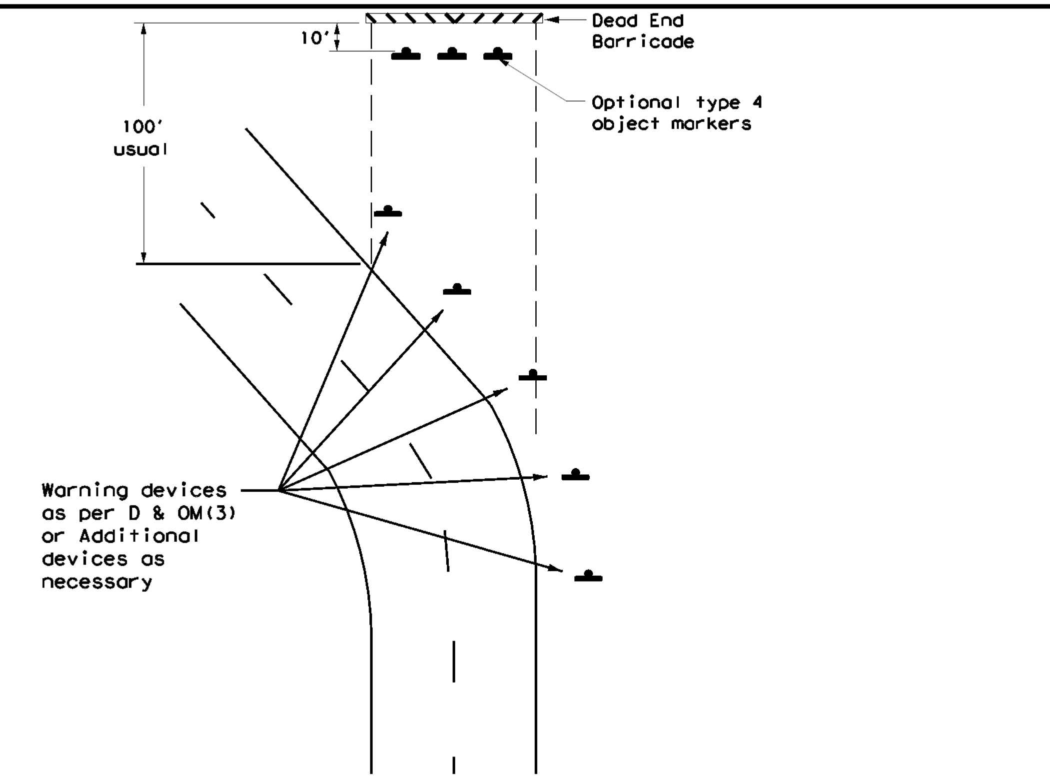
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



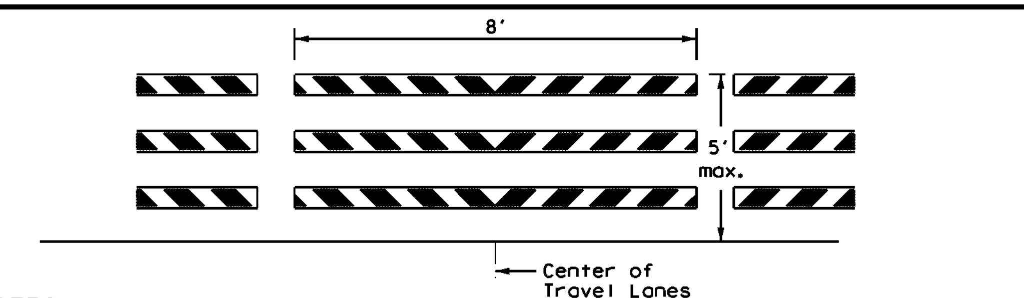
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND	
(symbol)	Bidirectional Delineator
(symbol)	Delineator
(symbol)	OM-3
(symbol)	Barricade
(symbol)	Sign
(symbol)	OM-2
(symbol)	Double Delineator

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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REVISIONS 3-15 7-20	0002	02	059, ETC.	SH 20
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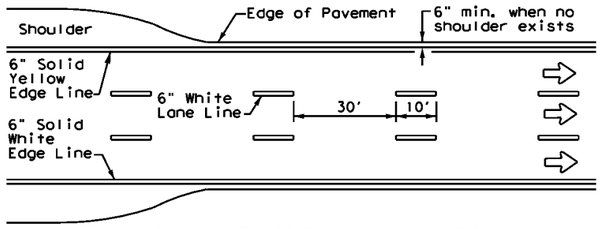
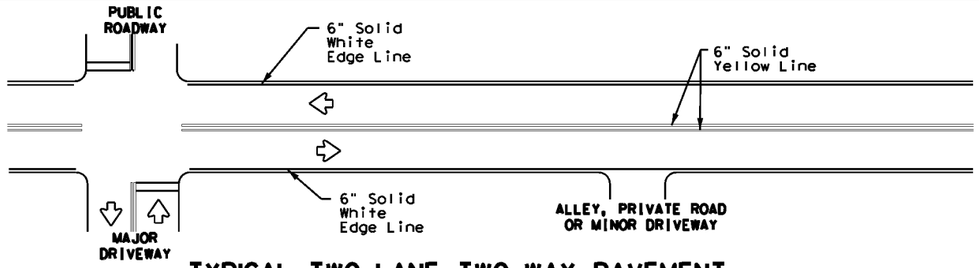
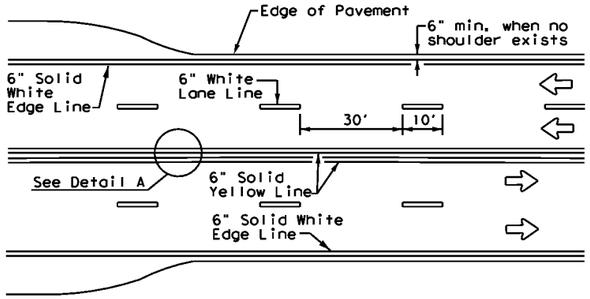
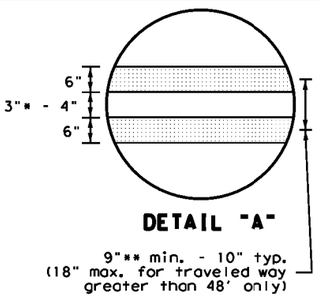


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



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

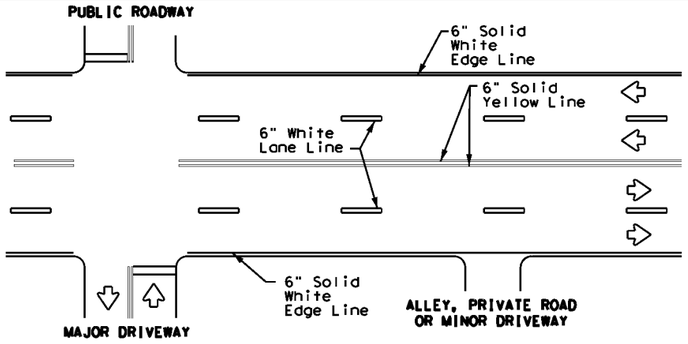




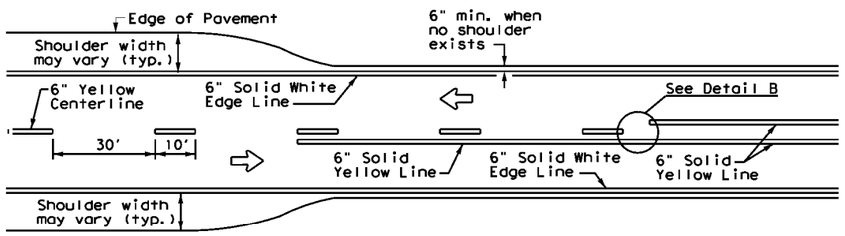
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

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

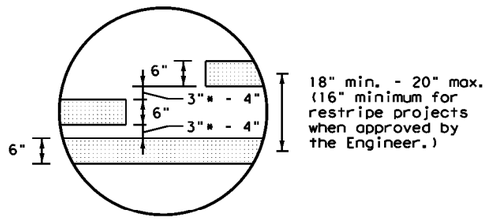
** 8" minimum for restripe projects when approved by the Engineer.



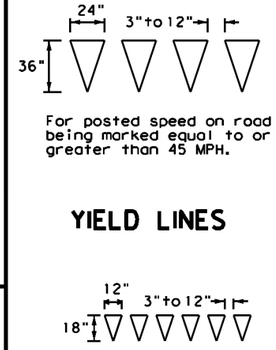
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS

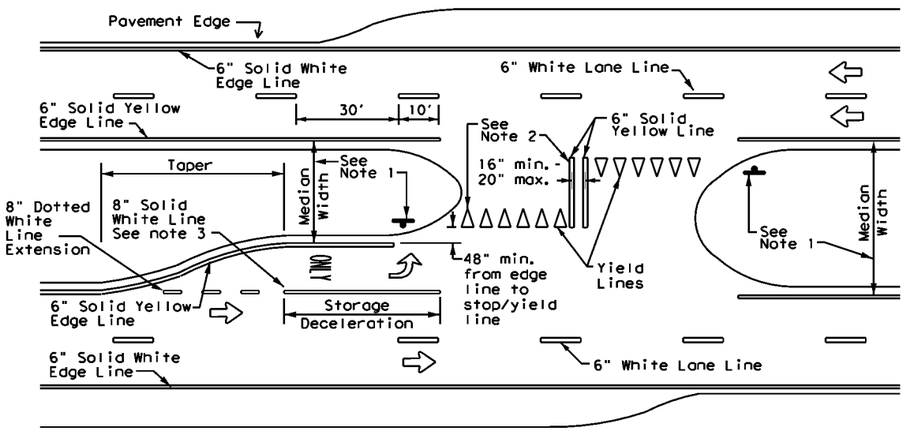


TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



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





FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

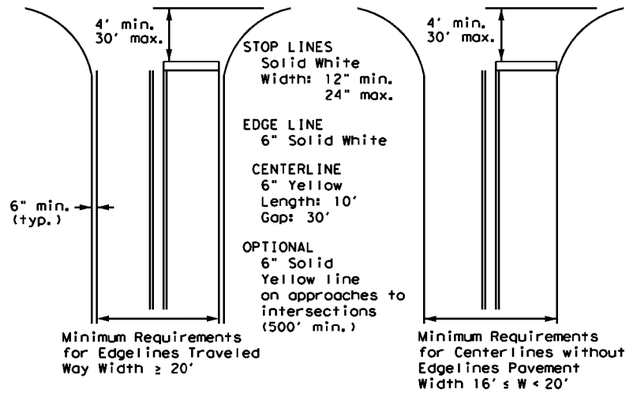
1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling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

GENERAL NOTES

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

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

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



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

GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Roadways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-22

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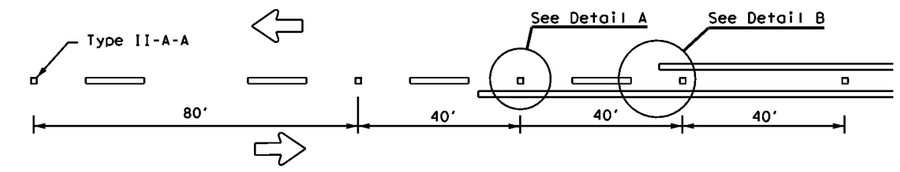
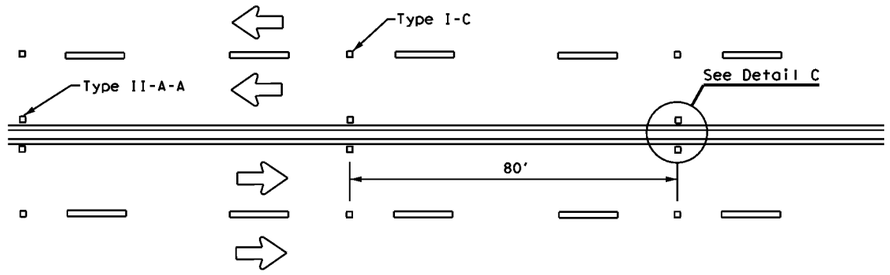
	ELP	EL PASO		100

22A

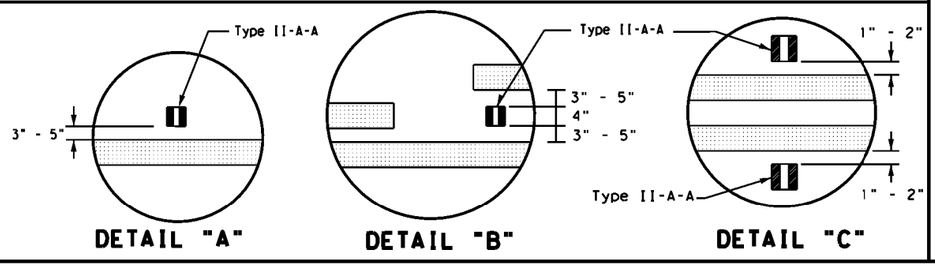
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

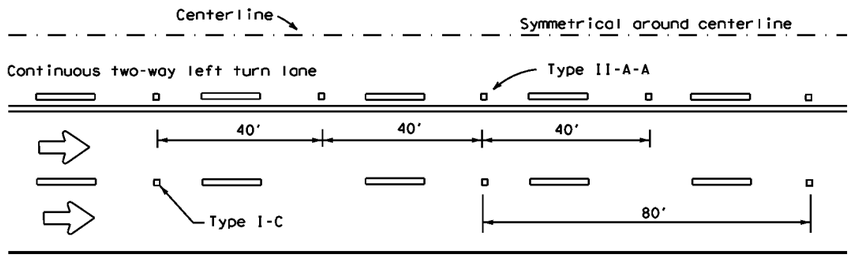


CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS

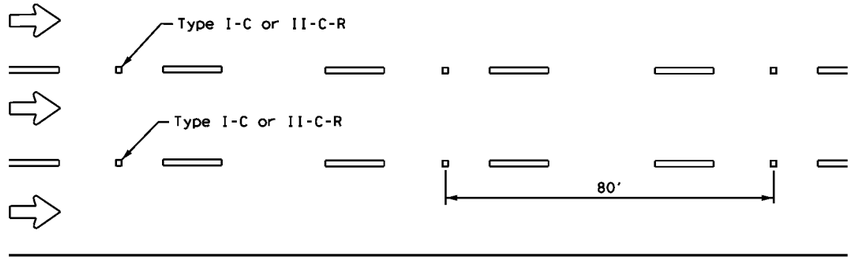


CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS





CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



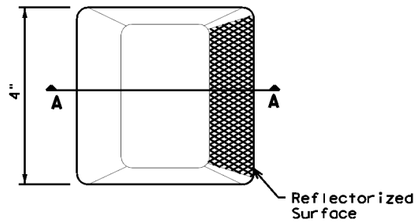
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

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

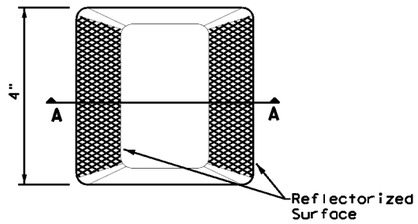
See Note 3.

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

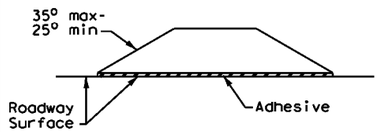
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

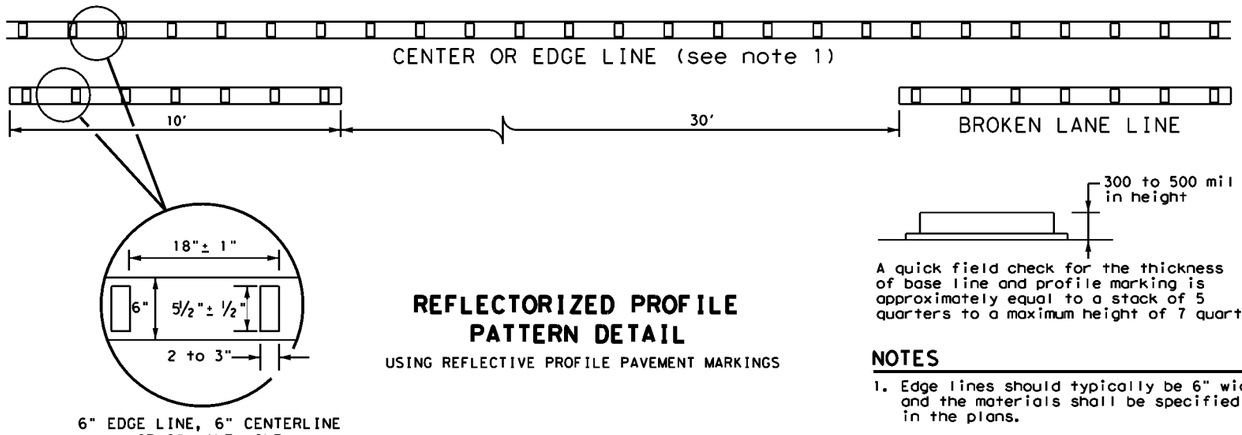


Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS



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.

NOTES

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

GENERAL NOTES

1. All raised pavement markers placed along 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.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.

Texas Department of Transportation

Traffic Safety Division Standard

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

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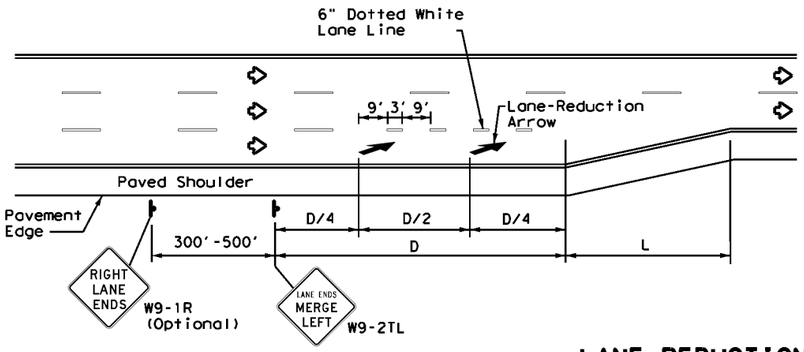


LANE REDUCTION

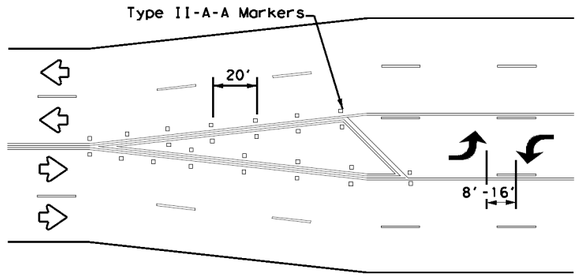
NOTES

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 RIGHT LANE ENDS (W9-1R) 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.

ADVANCED WARNING SIGN DISTANCE (D)		
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	

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. See Chapter 3 of the Roadway Design Manual for additional information on turning lanes or storage lengths.

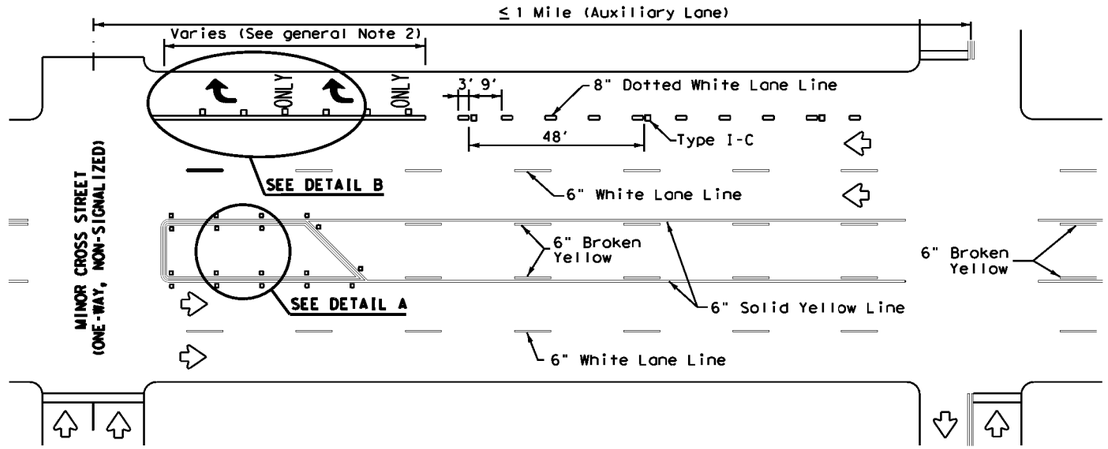


A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

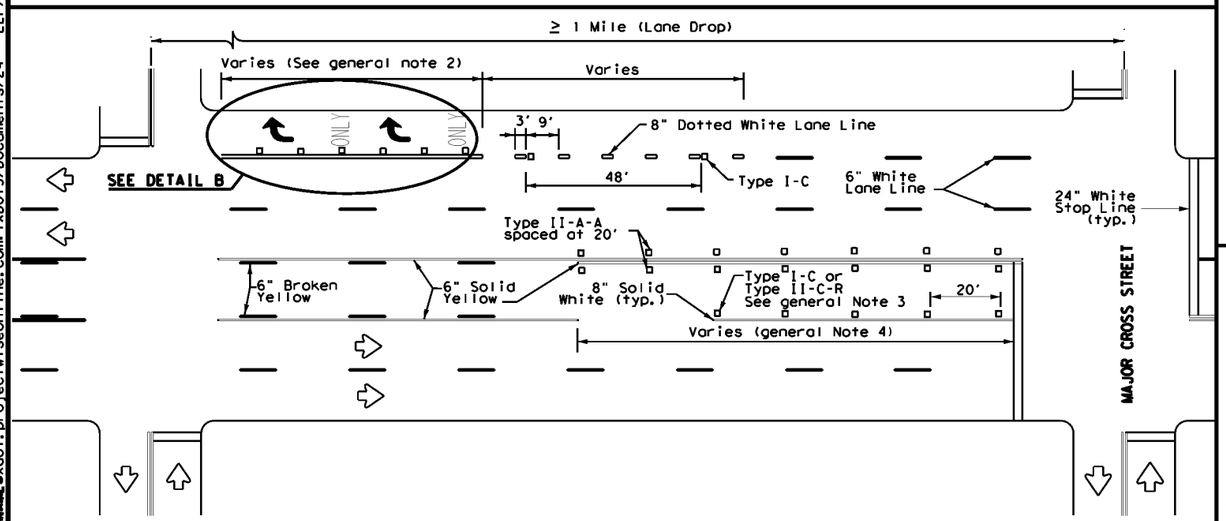
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

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

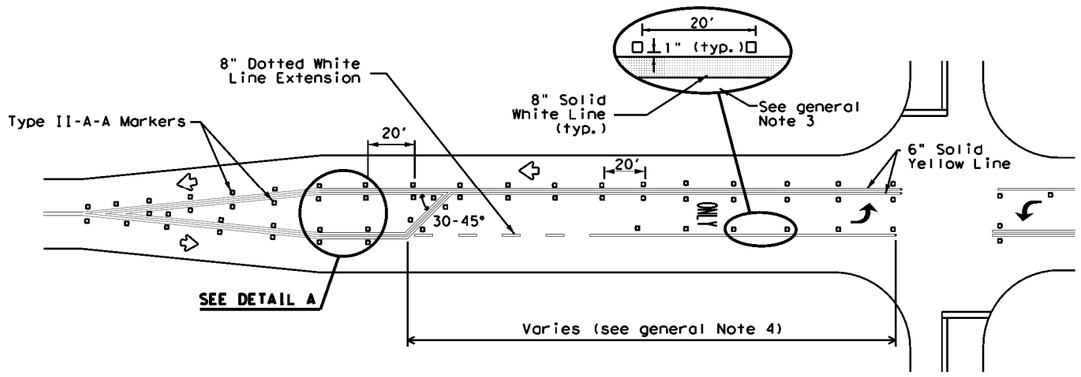
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



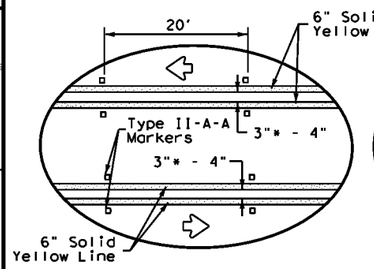
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



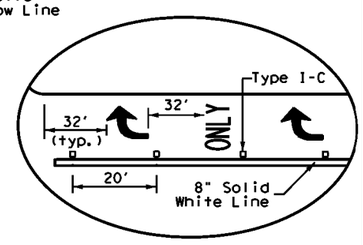
TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWO-LANE ROADWAY INTERSECTION WITH LEFT TURN BAYS



DETAIL A



DETAIL B

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

Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS PM(3)-22

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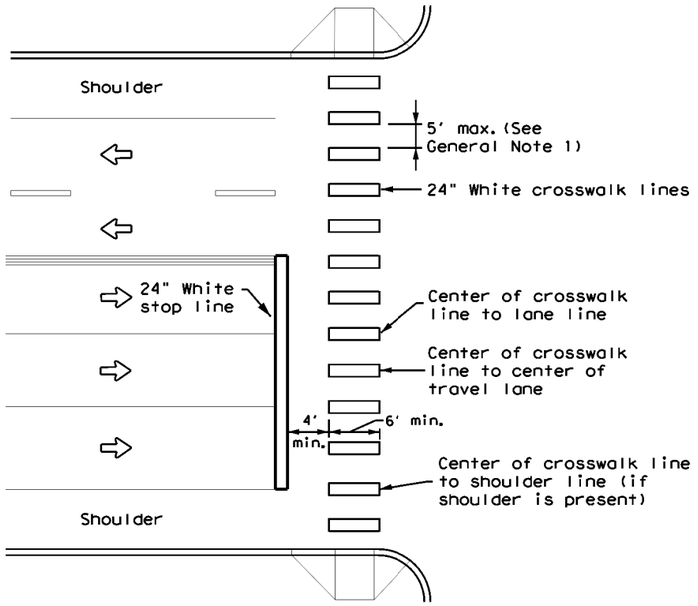


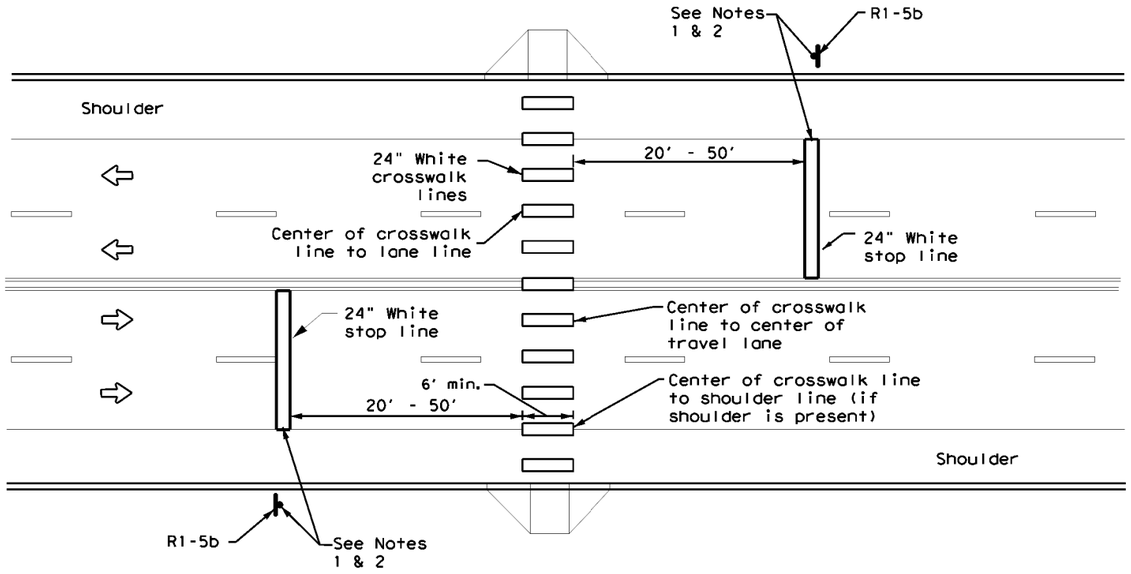
HIGH-VISIBILITY LONGITUDINAL CROSSWALK AT CONTROLLED APPROACH

GENERAL NOTES

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

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

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



UNSIGNALIZED MIDBLOCK HIGH-VISIBILITY LONGITUDINAL CROSSWALK

NOTES:

1. Use stop bars with Stop Here For Pedestrians (R1-5b) signs at unsignalized midblock cross walks.
2. Use stop bars with STOP HERE ON RED (R10-6 or R10-6a) signs at mid block crosswalks controlled by traffic signals or pedestrian hybrid beacons.

Texas Department of Transportation

Traffic Safety Division Standard

CROSSWALK PAVEMENT MARKINGS

PM(4)-22A

FILE: pm4-22a.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0002	02	059,ETC.	SH 20
6-20	DIST	COUNTY		SHEET NO.
6-22	ELP	EL PASO		103
12-22				
22D				

DATE: 10/27/2023 2:22:41 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT5/Documents/24 - ELP/Design Projects/000202059/4 - Design/Plan Set/8. Traffic/PM Standards/smdgen.dgn

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

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

Number of Posts (1 or 2)

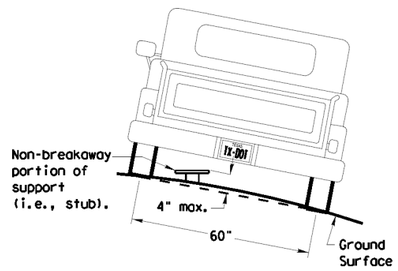
Anchor Type

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

Sign Mounting Designation

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

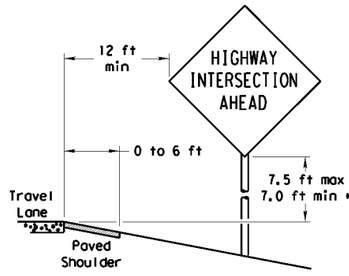
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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

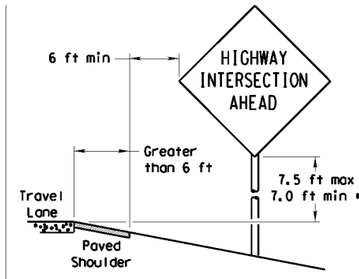
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

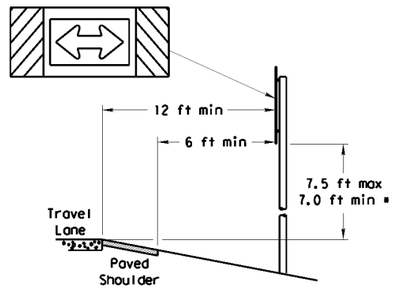
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



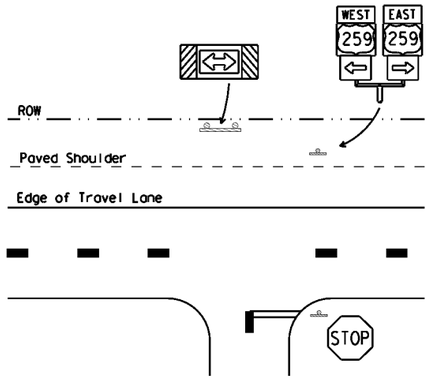
GREATER THAN 6 FT. WIDE

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

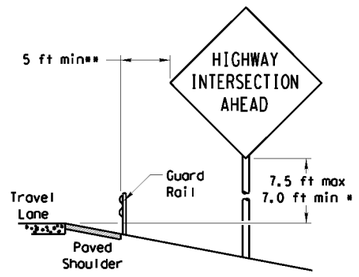
T-INTERSECTION



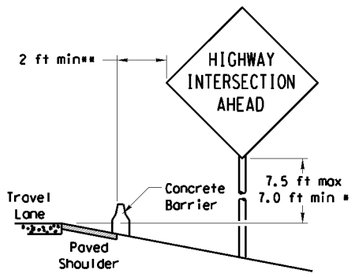
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

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

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

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

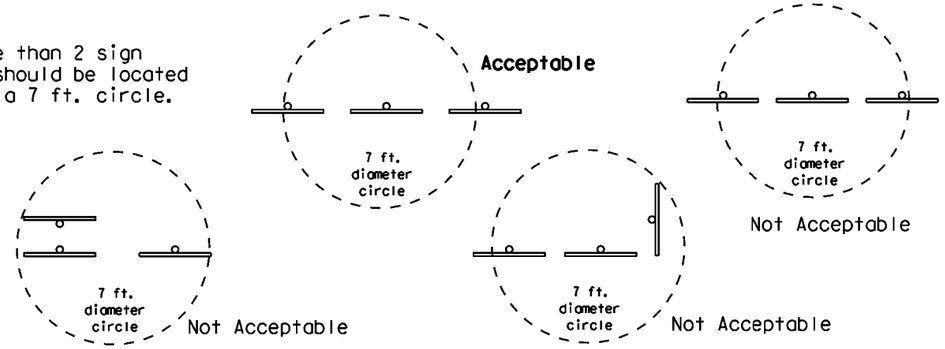
(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

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

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

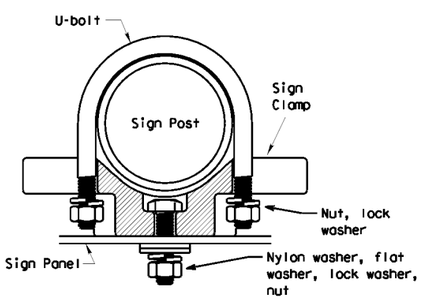
The website address is:
http://www.txdot.gov/publications/traffic.htm

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



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

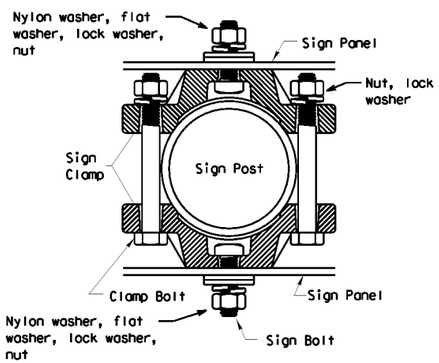


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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

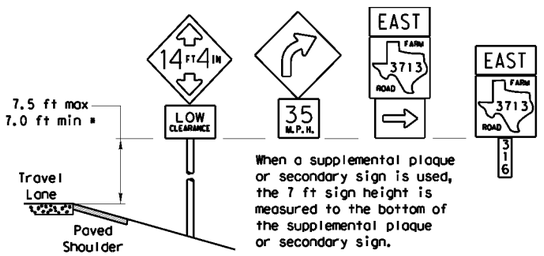
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



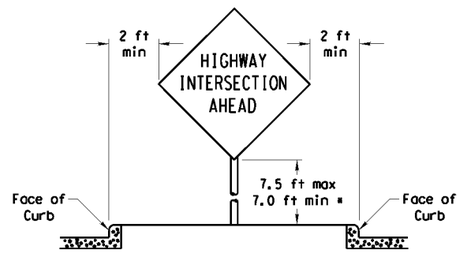
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



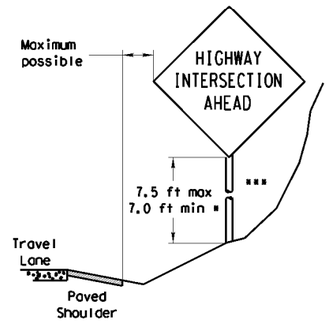
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



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

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

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

Texas Department of Transportation
Traffic Operations Division

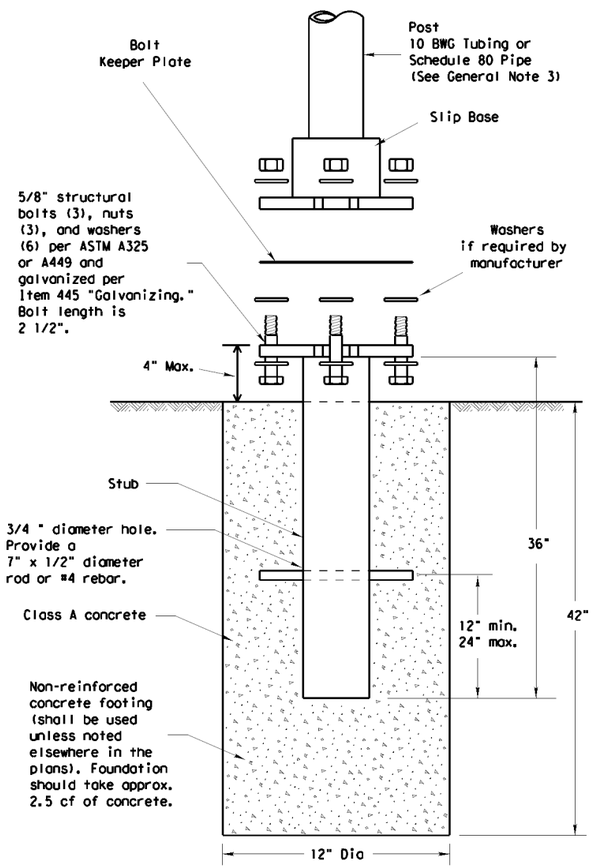
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0002	02	059,ETC.	SH 20
	DIST	COUNTY		SHEET NO.
	ELP	EL PASO		104

DATE: 10/27/2023 2:22:51 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT5/Documents/24 - ELP/Design Projects/000202059/4 - Design/Plan Set/8. Traffic/PM Standards/smdsl.dgn

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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

NOTE

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

GENERAL NOTES:

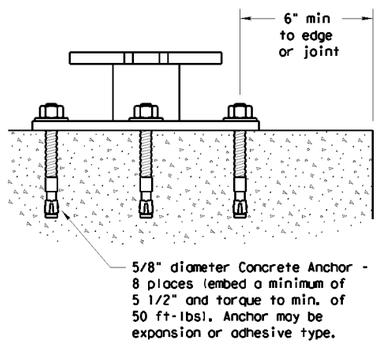
1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)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

ASSEMBLY PROCEDURE

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

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

CONCRETE ANCHOR



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

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0002	02	059,ETC.	SH 20
	DIST	COUNTY		SHEET NO.
	ELP	EL PASO		105

DATE: 10/27/2023 2:23:01 PM
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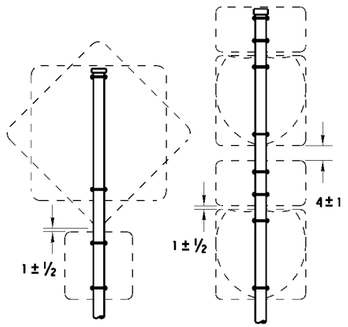
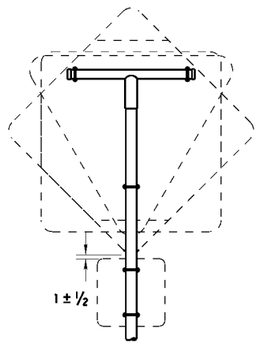


SM RD SGN ASSM TY XXXXX(1)XX(P)



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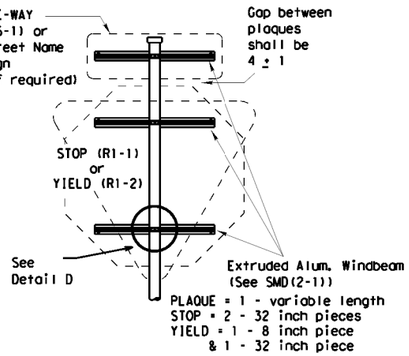

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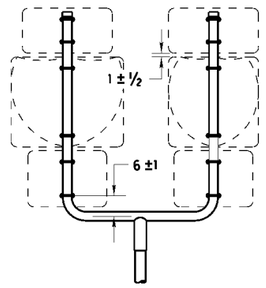

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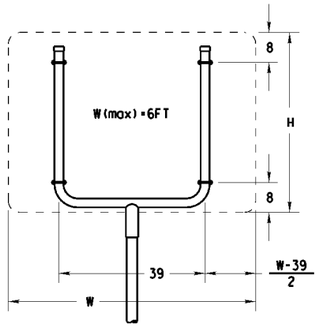
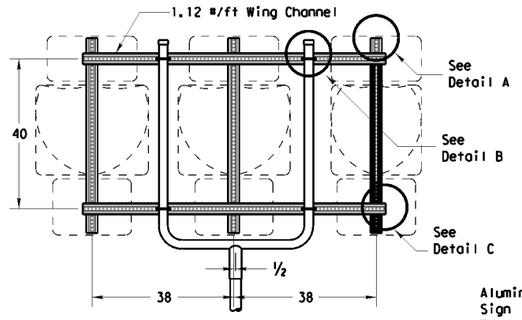
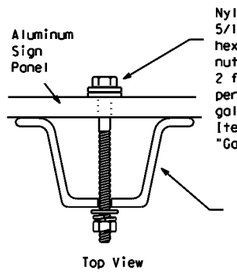


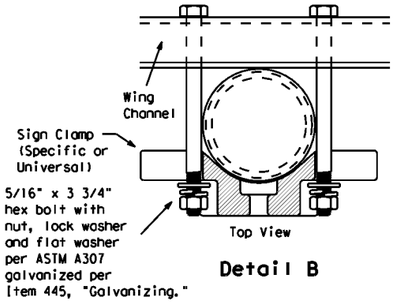
SM RD SGN ASSM TY XXXXX(1)XX(U)



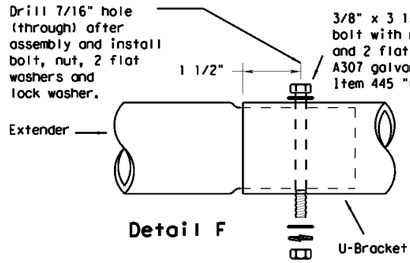
SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)



Detail A

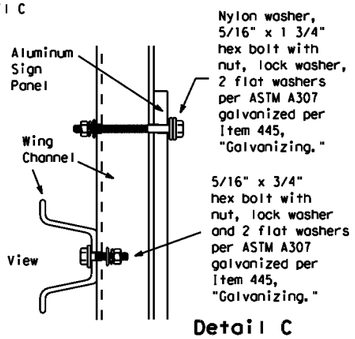


Detail B

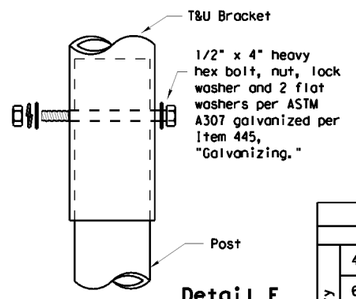


Detail F

Splices shall only be allowed behind the sign substrate.



Detail C



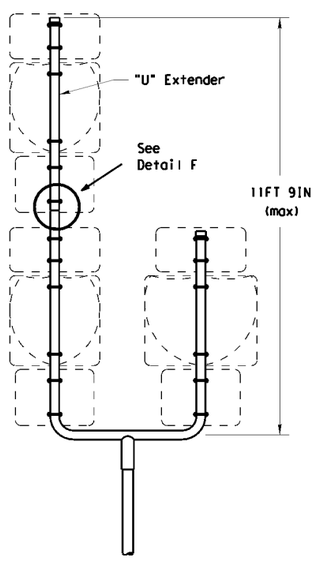
Detail E

GENERAL NOTES:

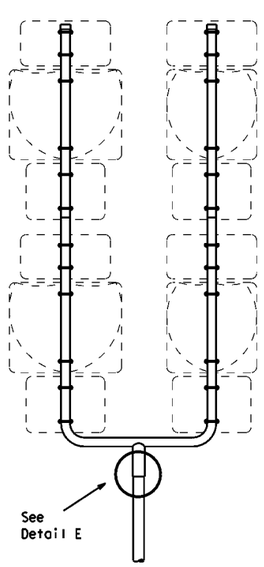
1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

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



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



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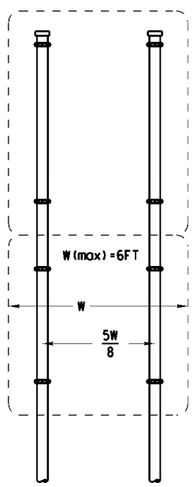
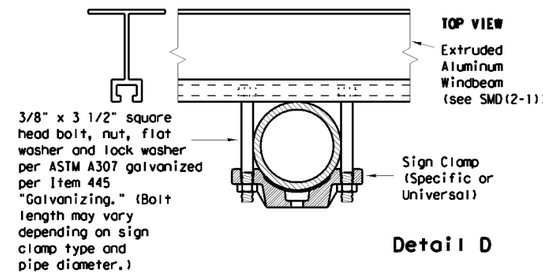
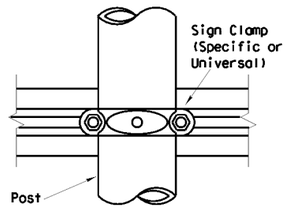


SM RD SGN ASSYM TY XXXXX(2)XX(P)

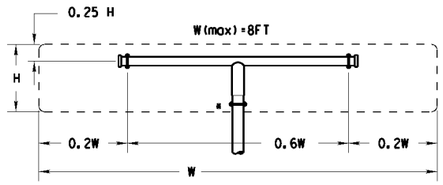
SIDE VIEW



Detail D



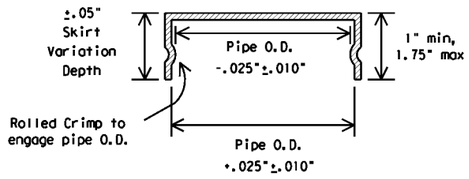
REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)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



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

All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

REVISIONS	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0002	02	059,ETC.	SH 20
	DIST	COUNTY		SHEET NO.
	ELP	EL PASO		106

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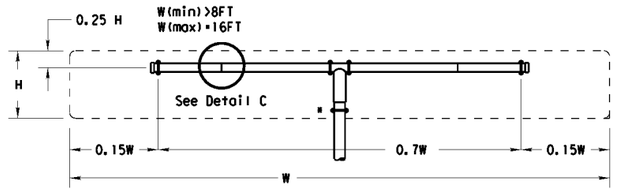
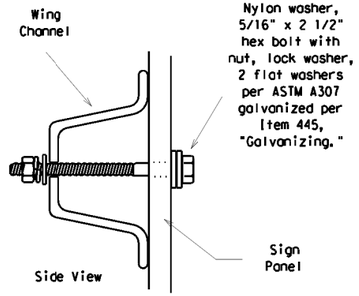
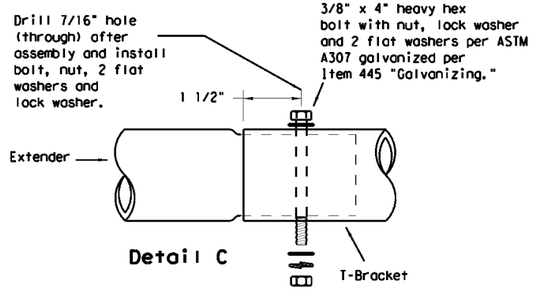


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)

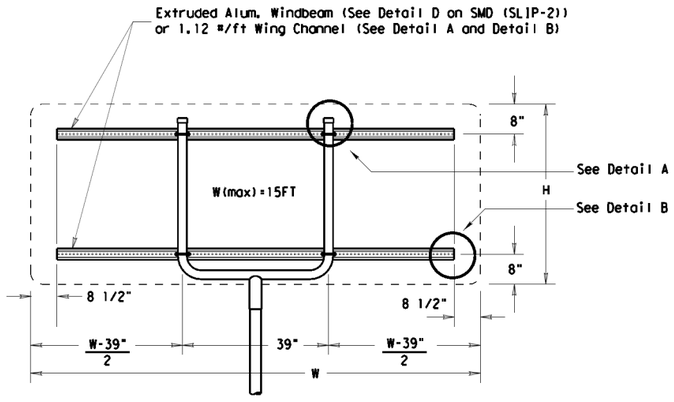


Detail B

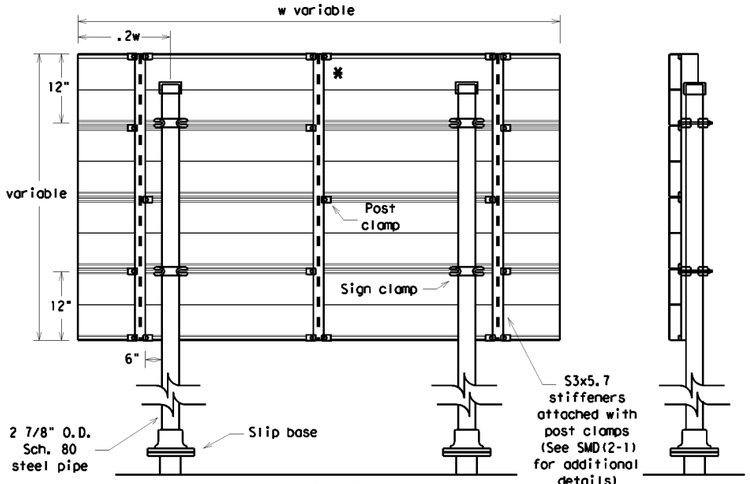


Detail C

Splices shall only be allowed behind the sign substrate.



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

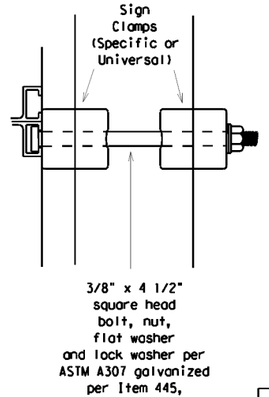


Typical Sign Mount

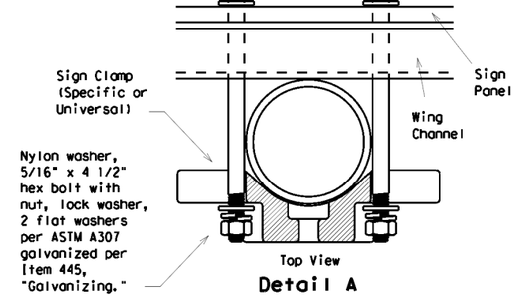
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

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

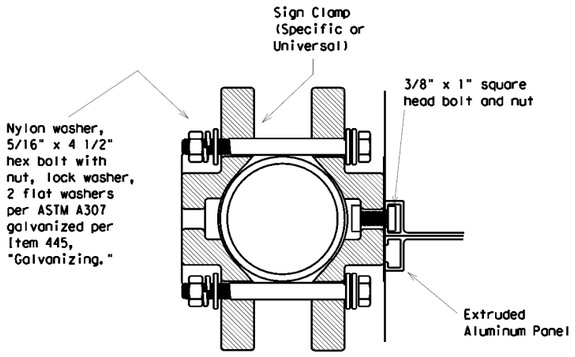
See Detail E for clamp installation



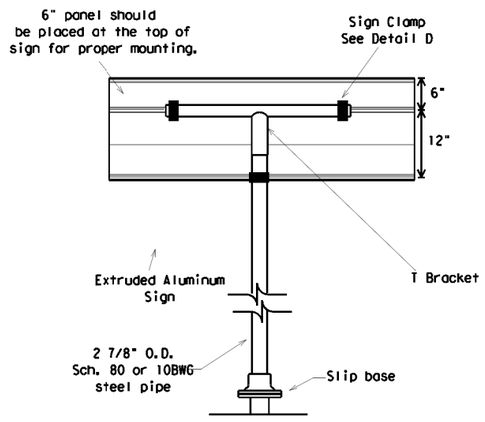
Detail E



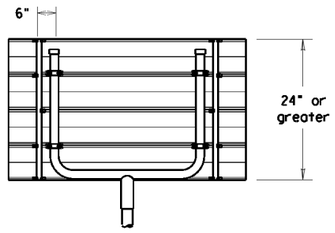
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

GENERAL NOTES:

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

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

REQUIRED SUPPORT

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0002	02	059,ETC.	SH 20
	DIST	COUNTY		SHEET NO.
	ELP	EL PASO		107

STORMWATER POLLUTION PRVENTION PLAN (SWP3):

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

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

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

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):

0002-02-059, ETC, Federal Aid Project NO. STP 2024(606)HES

1.2 PROJECT LIMITS:

From: RIO VISTA RD.

To: PASSMORE RD.

1.3 PROJECT COORDINATES:

BEGIN: (Lat) 31.6546521 ,(Long) -106.2907286

END: (Lat) 31.6264802 ,(Long) -106.2664144

1.4 TOTAL PROJECT AREA (Acres): 0.29

1.5 TOTAL AREA TO BE DISTURBED (Acres): >1

1.6 NATURE OF CONSTRUCTION ACTIVITY:

FOR THE CONSTRUCTION OF SAFETY IMPROVEMENTS OF EXISTING ROADWAY CONSISITING OF INSTALLATION OF RAISED MEDIANS, CONTINUOS ILLUMINATION, SIGNING AND PAVEMENT MARKINGS

1.7 MAJOR SOIL TYPES:

Soil Type	Description
Harkey silty clay loam, 0 to 1% slopes	silt loam with some clay, well drained, low rate of runoff
Anapra silty clay loam, 0 to 1% slopes	silt clay loam with some sand, well drained, low rate of runoff
Gila loam, 0 to 1% slopes	75% loam with some sand and silt, well drained, drainage class is negligible
Glendale silty slay, 0 to 1% slope	80% silty clay with some sand and clay loam, well drained, medium rate of runoff
Harkey Loam, 0 to 1% slope	100% Harkey-age coarse-silty alluvium, well drained, runoff rate is negligible

1.8 PROJECT SPECIFIC LOCATIONS (PSLs):

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

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

Type	Sheet #s

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

1.9 CONSTRUCTION ACTIVITIES:

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

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

1.10 POTENTIAL POLLUTANTS AND SOURCES:

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

1.11 RECEIVING WATERS:

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

Tributaries	Classified Waterbody
RIO GRANDE BELOW INTERNATIONAL DAM	RIO GRANDE BELOW INTERNATIONAL DAM (2308), IMPAIRED FOR BACTERIA
RIO GRANDE BELOW RIVERSIDE DIVERION DAM	RIO GRANDE BELOW RIVERSIDE DIVERION DAM (2307), IMPAIRED FOR BACTERIA, CHLORIDE AND TOTAL DISSOLVED SOLIDS

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

1.12 ROLES AND RESPONSIBILITIES: TxDOT

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

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

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

STATE OF TEXAS
KARLA Y. RIOS
140855
LICENSED PROFESSIONAL ENGINEER

Karla Rios, P.E.

10/31/2023

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

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
	STP 2024(606)HES		108
STATE	STATE DIST.	COUNTY	
TEXAS	ELP	EL PASO	
CONT.	SECT.	JOB	HIGHWAY NO.
0002	02	059, ETC	SH 20

STORMWATER POLLUTION PRVENTION PLAN (SWP3):

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

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

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

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

2.2 SEDIMENT CONTROL BMPs:

T / P

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

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

2.3 PERMANENT CONTROLS:

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

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To
N/A		

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

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

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

2.5 POLLUTION PREVENTION MEASURES:

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

2.6 VEGETATED BUFFER ZONES:

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

Type	Stationing	
	From	To
N/A		

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

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

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

2.8 INSPECTIONS:

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

2.9 MAINTENANCE:

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

STATE OF TEXAS
KARLA Y. RIOS
140855
LICENSED
PROFESSIONAL ENGINEER

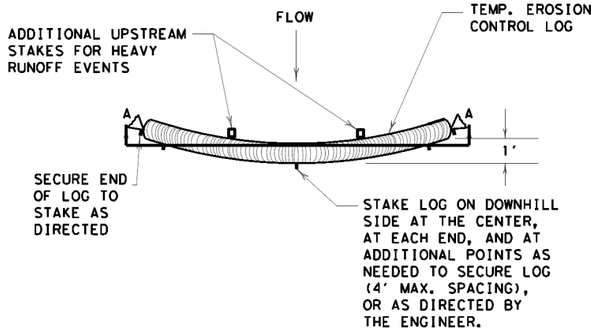
Karla Rios, P.E.
10/31/2023

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

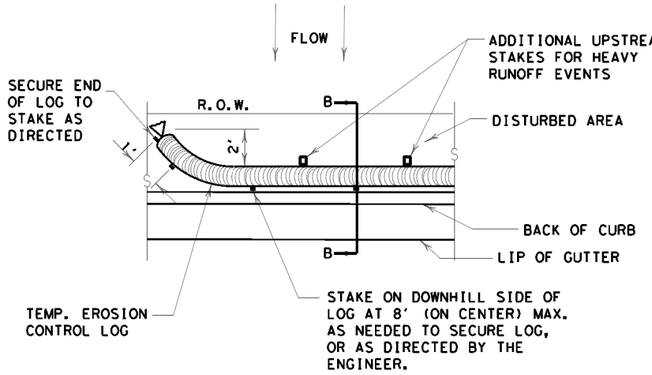
Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
	STP 2024(606)HES		109
STATE	STATE DIST.	COUNTY	
TEXAS	ELP	EL PASO	
CONT.	SECT.	JOB	HIGHWAY NO.
0002	02	059, ETC	SH 20

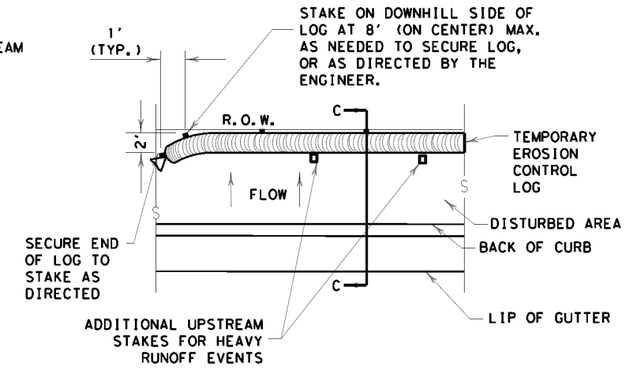
DATE: 10/27/2023
FILE: pw://txdot.projectwiseonline.com:TxDOT5/Documents/24 - ELP/Design Projects/000202059/4 - Design/Plan Set/9. Environmental/Standards/ec916.dgn



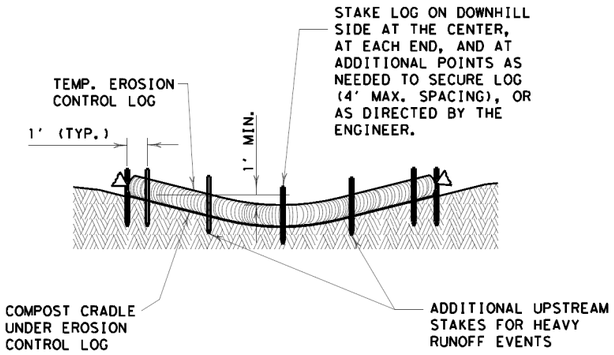
PLAN VIEW



PLAN VIEW



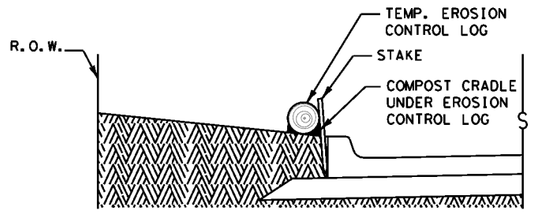
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

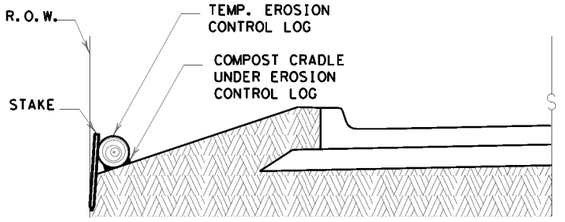
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

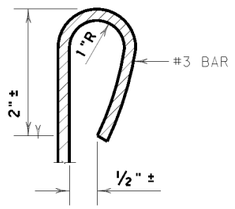
CL-BOC



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



REBAR STAKE DETAIL

LEGEND

- CL-D — EROSION CONTROL LOG DAM
- CL-BOC — EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW — EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST — EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL — EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- CL-CI — EROSION CONTROL LOG AT CURB INLET
- CL-GI — EROSION CONTROL LOG AT CURB & GRATE INLET

GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

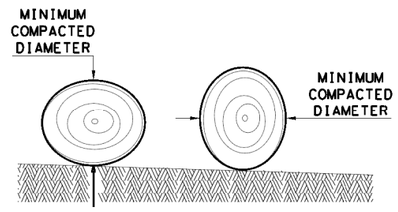
Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS			
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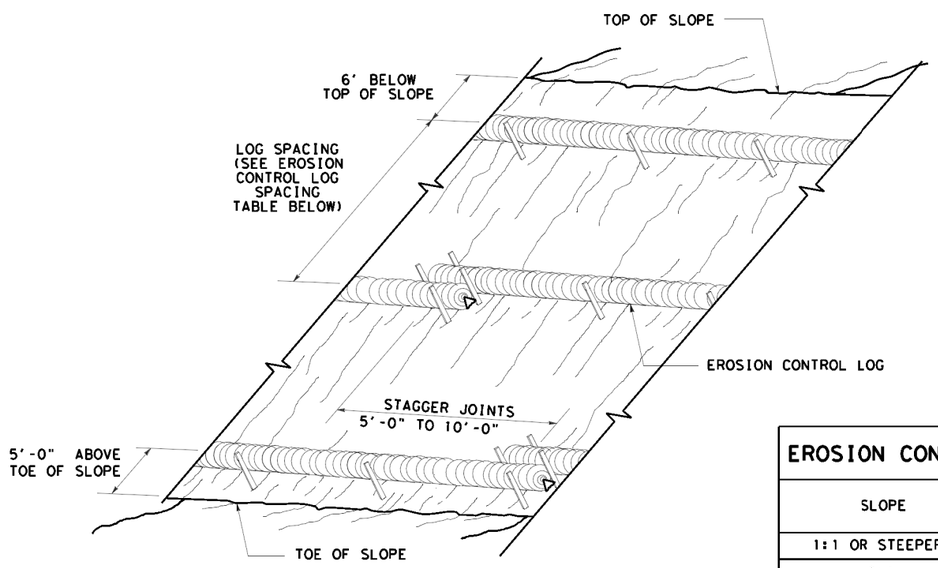
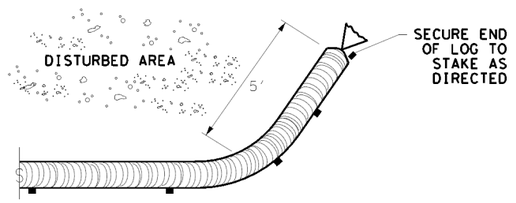


EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

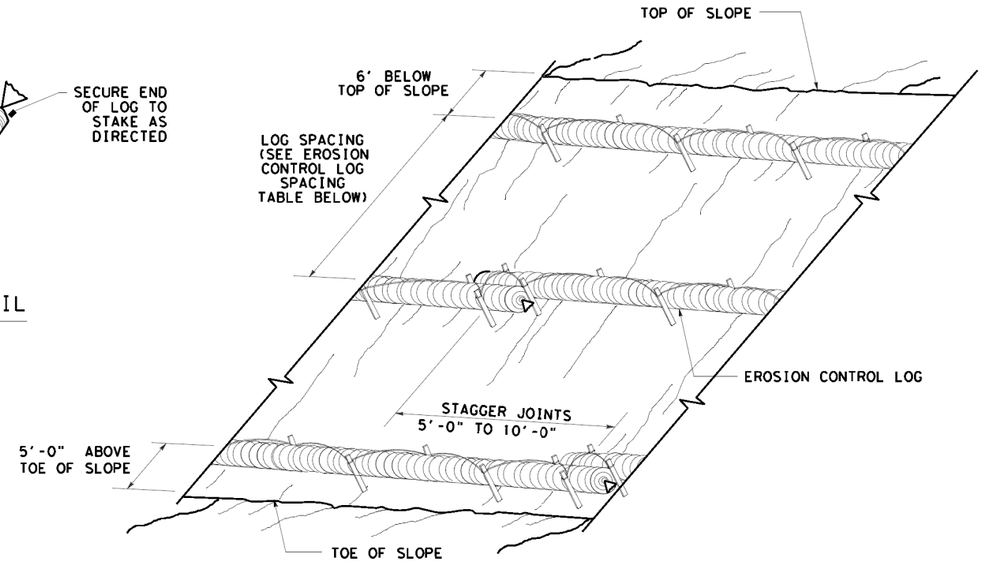
CL-SST



END SECTION RAP DETAIL

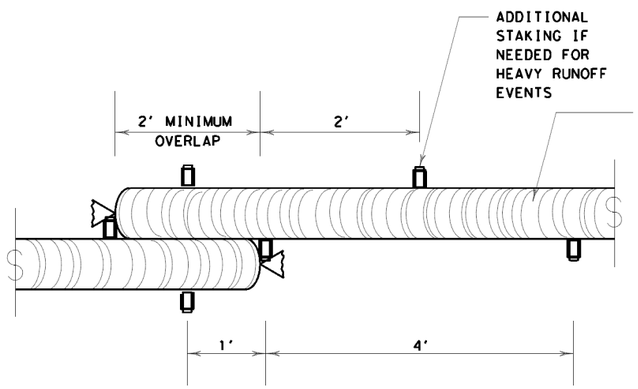
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

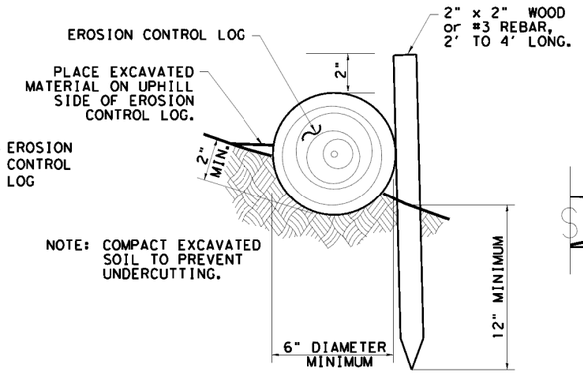
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

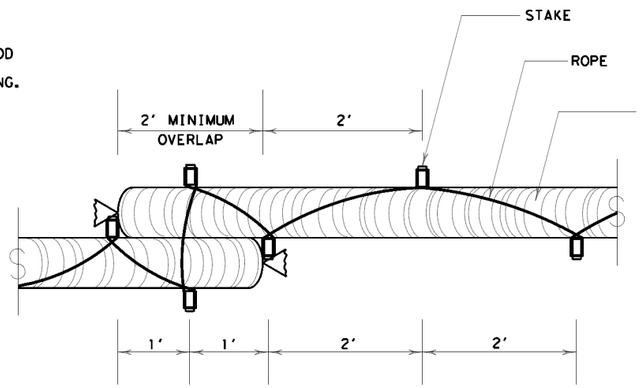


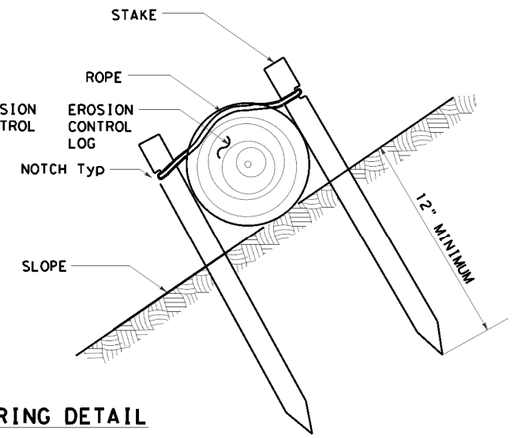


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

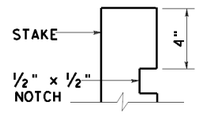
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

SHEET 2 OF 3

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
EROSION CONTROL LOG
EC(9)-16

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	DIST	COUNTY		SHEET NO.
	ELP	EL PASO		111

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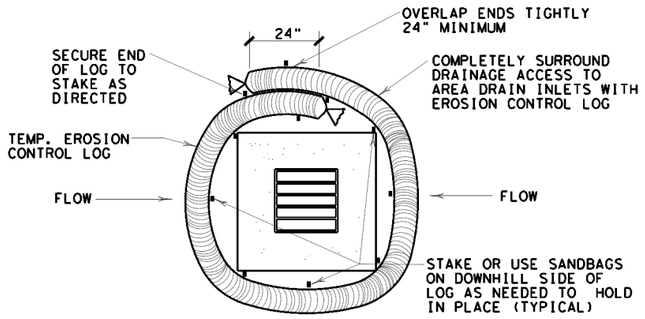
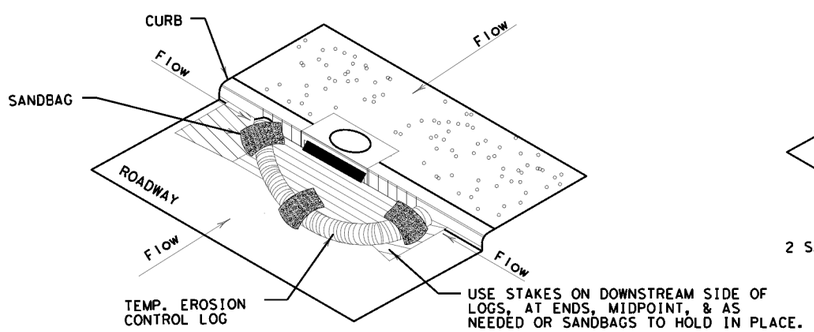


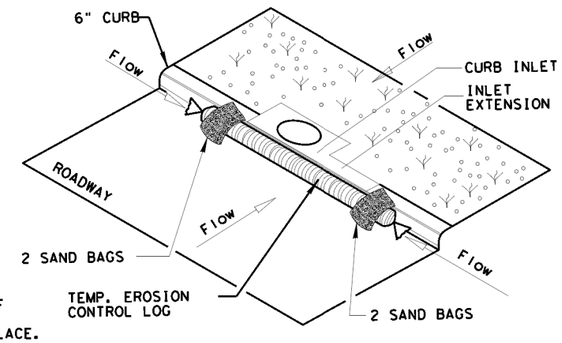
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

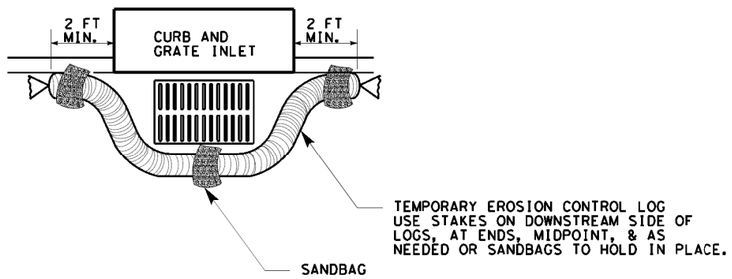
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

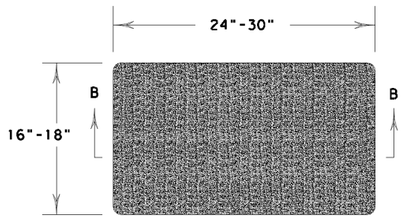
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

SECTION B-B



SANDBAG DETAIL

SHEET 3 OF 3

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

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