INDEX OF SHEETS
SEE SHEETS NO. 2

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FED.RD. DIV.NO.	STATE	FEDERAL PROJECT NO.		HIGHWAY
6	TEXAS	STP 2B23(203)HES		UA 90, ETC.
STATE DISTRICT	COUNTY	CONTROL	SECTION	JOB	SHEET NO.
HOU	FORT BEND, ETC.	0027	07	046, ETC.	1

PROJECT NO. STP 2B23(203)HES
CONTROL CSJ: 0027-07-046, ETC.

UA 90, ETC.
FORT BEND, ETC.

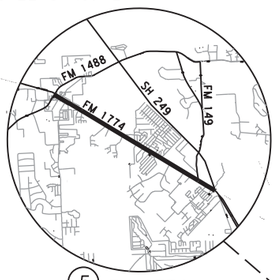
LIMITS: FROM FM 723 TO FM 762, ETC.

PROJECT DESCRIPTION:
FIBER OPTIC
INTERCONNECT SIGNALS

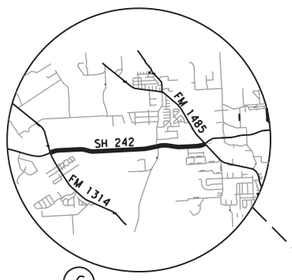
NO.	PROJECT	COUNTY	HWY	LIMITS	LENGTH
1	CSJ: 0179-02-089	BRAZORIA	SH 35	FROM BS 35E TO FM 2852	0.435
2	CSJ: 0188-07-006	BRAZORIA	SH 35	FROM SH 36 TO BS 35E	0.635
3	CCSJ: 0027-07-046	FORT BEND	UA 90	FROM FM 723 TO FM 762	3.151
4	CSJ: 0188-01-040	FORT BEND	SH 36	FROM UA 90 TO IH 69	1.822
5	CSJ: 1400-04-039	MONTGOMERY	FM 1744	FROM FM 1488 TO SH 249	5.042
6	CSJ: 3538-01-058	MONTGOMERY	SH 242	FROM FM 1314 TO FM 1485	4.709

PROJECT LENGTH: 15.794

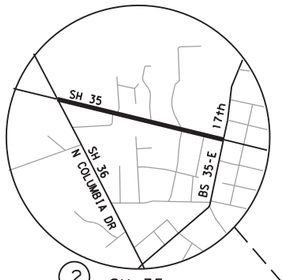
NO.	PROJECT	DESIGN SPEED	FUNCTIONAL CLASS	2023 ADT	2043 ADT
1	CSJ: 0179-02-089	N/A	MINOR ARTERIAL	19,400	27,400
2	CSJ: 0188-07-006	N/A	MINOR ARTERIAL	17,500	24,600
3	CCSJ: 0027-07-046	N/A	PRINCIPAL ARTERIAL	17,700	25,000
4	CSJ: 0188-01-040	N/A	PRINCIPAL ARTERIAL	22,900	31,200
5	CSJ: 1400-04-039	N/A	MAJOR COLLECTOR	17,000	23,900
6	CSJ: 3538-01-058	N/A	MINOR ARTERIAL	12,800	17,100



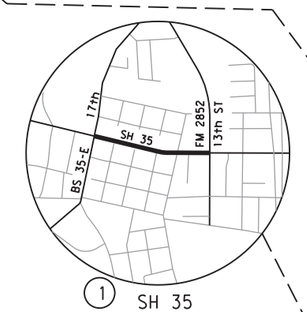
(5) FM 1774
FROM FM 1488 TO SH 249



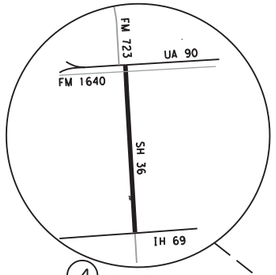
(6) SH 242
FROM FM 1314 TO FM 1485



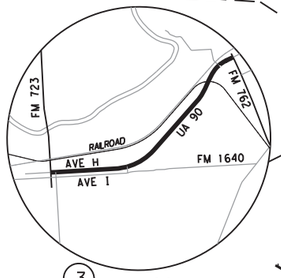
(2) SH 35
FROM SH 36 TO BS 35E



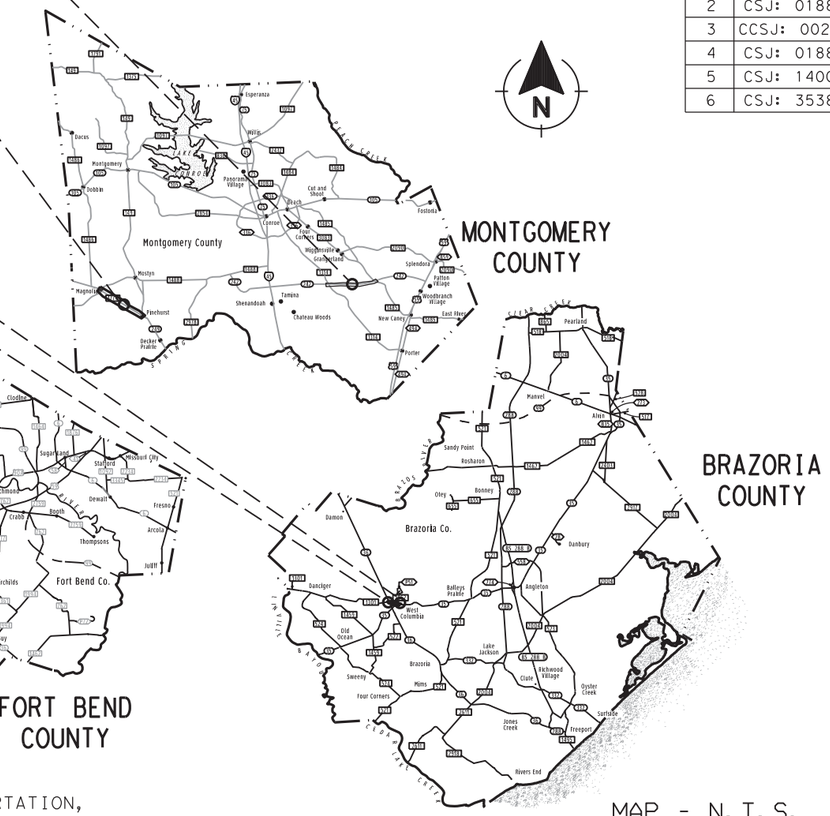
(1) SH 35
FROM BS 35E TO FM 2852



(4) SH 36
FROM UA 90 TO IH 69



(3) UA 90
FROM FM 723 TO FM 762



MAP - N. T. S.

NO EXCEPTIONS
RAILROAD CROSSINGS: BNSF
NO EQUATIONS

NOTES:
1. SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014, AND SPECFICATION ITEMS LISTED AND DATED AS FOLLOWS SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS. (FORM FHWA 1273, JULY 5, 2022)
2. FOR BARRICADES AND SIGNING AT INDIVIDUAL INTERSECTIONS UNDER SIGNAL CONSTRUCTION REFER TO STANDARD SHEETS, WZ(BTS-1)-13 & WZ(BTS-2)-13

TEXAS DEPARTMENT OF TRANSPORTATION

SUBMITTED FOR LETTING July 3, 2023

P.E.
For DISTRICT TRAFFIC ENGINEER

APPROVED FOR LETTING 7/5/2023

DocuSigned by:
Larry W. Blackburn, P.E.
B9928A69E03E42F...
For DISTRICT

GENERAL

1	TITLE SHEET
2	INDEX OF SHEETS
3, 3A-3H	GENERAL NOTES
4, 4A	ESTIMATE AND QUANTITY SHEET
5	TRAFFIC SIGNAL SUMMARY OF QUANTITIES
6	TRAFFIC CONTROL PHASING NARRATIVE

TRAFFIC CONTROL STANDARDS

7	BC (1) - 21	BARRICADE AND CONSTRUCTION - GENERAL NOTES AND REQUIREMENTS (SHEET 1 OF 12)
7A	BC (2) - 21	BARRICADE AND CONSTRUCTION - PROJECT LIMIT (SHEET 2 OF 12)
8	BC (3) - 21	BARRICADE AND CONSTRUCTION - WORK ZONE SPEED LIMIT (SHEET 3 OF 12)
9	BC (4) - 21	BARRICADE AND CONSTRUCTION - TEMPORARY SIGN NOTES (SHEET 4 OF 12)
10	BC (5) - 21	BARRICADE AND CONSTRUCTION - TYPICAL SIGN SUPPORT (SHEET 5 OF 12)
11	BC (6) - 21	BARRICADE AND CONSTRUCTION - PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) (SHEET 6 OF 12)
12	BC (7) - 21	BARRICADE AND CONSTRUCTION - ARROW PANEL, REFLECTORS, LIGHTS & ATTENUATOR (SHEET 7 OF 12)
13	BC (8) - 21	BARRICADE AND CONSTRUCTION - CHANNELIZING DEVICES (SHEET 8 OF 12)
14	BC (9) - 21	BARRICADE AND CONSTRUCTION - CHANNELIZING DEVICES (SHEET 9 OF 12)
15	BC (10) - 21	BARRICADE AND CONSTRUCTION - CHANNELIZING DEVICES (SHEET 10 OF 12)
16	BC (11) - 21	BARRICADE AND CONSTRUCTION - PAVEMENT MARKINGS (SHEET 11 OF 12)
17	BC (12) - 21	BARRICADE AND CONSTRUCTION - PAVEMENT MARKING PATTERNS (SHEET 12 OF 12)
18	WZ (BTS-1) -13	TRAFFIC SIGNAL WORK - TYPICAL DETAILS (SHEET 1 OF 2)
19	WZ (BTS-2) -13	TRAFFIC SIGNAL WORK - BARRICADES AND SIGNS (SHEET 2 OF 2)

TRAFFIC ITEMS

20	NOTES FOR FIBER OPTIC CABLE LAYOUT
	CSJ: 0179-02-089 BRAZORIA SH 35 FROM BS 35E TO FM 2852
21	SH 35 _ FROM BS 35E TO FM 2852 _ FIBER OPTIC CABLE LAYOUT
	CSJ: 0188-07-006 BRAZORIA SH 35 FROM SH 36 TO BS 35E
22-23	SH 35 _ FROM SH 36 TO BS 35E _ FIBER OPTIC CABLE LAYOUTS (2 SHEETS)
	CCSJ: 0027-07-046 FORT BEND UA 90 FROM FM 723 TO FM 762
24-32	UA 90 _ FROM FM 723 TO FM 762 _ FIBER OPTIC CABLE LAYOUTS (9 SHEETS)
	CSJ: 0188-01-040 FORT BEND SH 36 FROM UA 90 TO IH 69
33-37	SH 36 _ FROM UA 90 TO IH 69 _ FIBER OPTIC CABLE LAYOUTS (5 SHEETS)
	CSJ: 1400-04-039 MONTGOMERY FM 1774 FROM FM 1488 TO SH 249
38-48	FM 1774 _ FROM FM 1488 TO SH 249 _ FIBER OPTIC CABLE LAYOUTS (11 SHEETS)
	CSJ: 3538-01-058 MONTGOMERY SH 242 FROM FM 1314 TO FM 1485
49-59	SH 242 _ FROM FM 1314 TO FM 1485 _ FIBER OPTIC CABLE LAYOUTS (11 SHEETS)

FIBER OPTIC TERMINATION ASSIGNMENTS

60	SH 35 _ FROM BS 35E TO FM 2852 _ TERMINATION ASSIGNMENTS
61	SH 35 _ FROM SH 36 TO BS 35E _ TERMINATION ASSIGNMENTS
62	UA 90 _ FROM FM 723 TO FM 762 _ TERMINATION ASSIGNMENTS
63	SH 36 _ FROM UA 90 TO IH 69 _ TERMINATION ASSIGNMENTS
64	FM 1774 _ FROM FM 1488 TO SH 249 _ TERMINATION ASSIGNMENTS
65	SH 242 _ FROM FM 1314 TO FM 1485 _ TERMINATION ASSIGNMENTS

TRAFFIC SIGNAL STANDARDS

66	ED (1) - 14	_ ELECTRICAL DETAILS - CONDUITS AND NOTES
67	ED (2) - 14	_ ELECTRICAL DETAILS - CONDUITS SUPPORTS
68	ED (3) - 14	_ ELECTRICAL DETAILS - CONDUCTORS
69	ED (4) - 14	_ ELECTRICAL DETAILS - GROUND BOXES
70	ITS (27) - 16	_ ITS CONDUIT TRENCH DETAILS (1 OF 2)
71	ITS (28) - 16	_ ITS CONDUIT BORE AND STEEL CASING DETAILS (2 OF 2)
72	ITS (29) - 22	_ ITS CONDUIT HANGER DETAILS
73	ITS (30) - 16	_ STRUCTURE MOUNTED ITS CONDUIT
74	ITS (31) - 16	_ PARAPET MOUNTED ITS CONDUIT AND TRANSITION BOX DETAIL
75	ITS (32) - 16	_ EXPANSION / DEFLECTION JOINT
76	ITS (33) - 16	_ ITS CONDUIT TRANSITION AT ABUTMENT
77	ITS (34) - 16	_ ITS CONDUIT RISER
78	ITS (35) - 16	_ ITS CONDUIT OBSTRUCTION CROSSING
79	ITS (37) - 22	_ ITS GROUND BOX DETAILS TYPE "1" WITH STEEL COVER (SHEET 1 OF 2)
80	ITS (38) - 17	_ ITS GROUND BOX DETAILS TYPE "1" WITH STEEL COVER (SHEET 2 OF 2)
81	ITS (42) - 16	_ ITS FIBER OPTIC CABLE MISCELLANEOUS DETAILS (SHEET 1 OF 2)
82	ITS (43) - 16	_ ITS FIBER OPTIC CABLE MISCELLANEOUS DETAILS (SHEET 2 OF 2)

ENVIRONMENTAL ISSUES

83	EC (1) - 16	_ TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
84	SWP3	_ TxDOT STORM WATER POLLUTION PREVENTION PLAN
85	EPIC	_ ENVIRONMENTAL PERMITS ISSUES AND COMMITMENTS

RAILROAD SCOPE OF WORK

86	RR SCOPE OF WORK	_ RAILROAD SCOPE OF WORK PROJECT SPECIFIC DETAILS
87	NON BRIDGE PROJECTS	_ R.R. REQUIREMENTS FOR NON- BRIDGE CONSTRUCTION PROJECTS (SHEET 1 OF 2)
88	NON BRIDGE PROJECTS	_ R.R. REQUIREMENTS FOR NON- BRIDGE CONSTRUCTION PROJECTS (SHEET 2 OF 2)

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER
P.E.

08/09/2023

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

INDEX OF SHEETS

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		2

General Notes:

General:

Area Engineer contact information for this project follows:

Dock S. Gee, P.E. Dock.Gee@txdot.gov
Yannick F Dwatie, P.E. Yannick.Dwatie@txdot.gov

Submit any questions about this project via the Letting Pre-Bid Q&A web page, located at:

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

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

Large files with relevant project documentation, such as Geotech reports, As-Built plans, and cross-sections will continue to be provided on the following FTP site:

Index of /pub/txdot-info/Pre-Letting Responses/Houston District (state.tx.us) or

https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/Houston%20District/

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

Superelevate the curves to match the existing surface.

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

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

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

Grade street intersections and median openings for surface drainage.

HOUSTON DISTRICT MASTER GENERAL NOTES

County: Fort Bend, etc.

Highway: UA 90, etc. **Control:** 0027-07-046, etc.

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

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

Furnish aluminum Type A signs instead of plywood signs for signs shown on the Summary of Small Signs sheet.

Stencil the National Bridge Inventory (NBI) number on each existing bridge shown on these plans. The NBI number is shown above the title block for each bridge layout.

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

Right of way parcels or utility adjustments shown to be unclear on the plans but not listed on the special provisions will have no effect on construction.

Unless otherwise shown on the plans or otherwise directed, commence work after sunrise and ensure construction equipment is off the road by sunset.

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

General: Roadway Illumination and Electrical

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

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

General: Traffic Signals

For traffic signal items, use materials from the Pre-Qualified Producers List (located at http://www.dot.state.tx.us/GSD/purchasing/supps.htm) and the materials pre-qualified for

illumination and electrical items (located at http://ftp.dot.state.tx.us/pub/txdot-info/cmd/mpl/riaes.pdf) as shown on the Department's Material Producers List and the Roadway Illumination and Electrical Supplies List. Check the latest links on the Department's website for these lists. No substitutions will be allowed for materials found on these lists.

General: Site Management

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

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

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

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

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

Tricycle Type	**Truck Type - 4 Wheel**
Wayne Series 900	M-B Cruiser II
Elgin White Wing	Wayne Model 945
Elgin Pelican	Mobile TE-3
	Mobile TE-4
	Murphy 4042

General: Traffic Control and Construction

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

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

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

HOUSTON DISTRICT MASTER GENERAL NOTES

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

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

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

General: Utilities

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

If the Contractor damages or causes damage (breaks, leaks, nicks, dents, gouges, etc.) to the utility, contact the utility facility owner or operator immediately.

Be aware that an operational Computerized Transportation Management System (CTMS) exists within the limits of this project and that the system must remain operational throughout construction. If the Contractor damages or causes damage to this system, repair such damage within 8 hours of occurrence at no cost to the Department. In the event of system damage, notify the Director of Traffic Management Systems at 713-881-3283 within one hour of occurrence. Failure of the Contractor to repair damage to the main fiber optic cable and CCTV cable trunk lines, which convey all corridor information to TranStar, will result in the Contractor being billed for the full cost of emergency repairs.

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

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

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

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

If working near power lines, comply with the appropriate sections of Texas State Law and Federal Regulations relating to the type of work involved.

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

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

Item 5: Control of Work

Submit shop drawings electronically for the fabrication of items as documented in Table 1 or Table 2 below. Information and requirements for electronic submittals can be viewed in the "Guide to Electronic Shop Drawing Submittal" which can be accessed through the following web link, ftp://ftp.dot.state.tx.us/pub/txdot-info/library/pubs/bus/bridge/e_submit_guide.pdf. References to 11 in. x 17 in. sheets in individual specifications for structural items imply electronic CAD sheets.

Table 1

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

Spec Item No.'s	Product	Submittal Required	Approval Required (Y/N)	Contractor/ Fabricator P.E. Seal Required	Reviewing Party	Shop or Working Drawing (Note 1)
7.16.1&.2	Construction Load Analyses	Y	Y	Y	B	WD
400	Excavation and Backfill for Structures (cofferdams)	Y	N	Y	A	WD
403	Temporary Special Shoring	Y	N	Y	C	WD
420	Formwork/Falsework	Y	N	Y	A	WD
423	Retaining Walls, (calcs req'd.)	Y	Y	Y	C	SD
425	Optional Design Calculations (Prstrs Bms)	Y	Y	Y	B	SD
425	Prestr Concr Sheet Piling	Y	Y	N	B	SD
425	Prestr Concr Beams	Y	Y	N	B	SD
425	Prestr Concr Bent	Y	Y	N	B	SD
426	Post Tension Details	Y	Y	N	B	SD
434	Elastomeric Bearing Pads (All)	Y	Y	N	B	SD
441	Bridge Protective Assembly	Y	Y	N	B	SD

HOUSTON DISTRICT MASTER GENERAL NOTES

County: Fort Bend, etc.

Highway: UA 90, etc. **Control:** 0027-07-046, etc.

441	Misc Steel (various steel assemblies)	Y	Y	N	B	SD
441	Steel Pedestals (bridge raising)	Y	Y	N	B	SD
441	Steel Bearings	Y	Y	N	B	SD
441	Steel Bent	Y	Y	N	B	SD
441	Steel Diaphragms	Y	Y	N	B	SD
441	Steel Finger Joint	Y	Y	N	B	SD
441	Steel Plate Girder	Y	Y	N	B	SD
441	Steel Tub-Girders	Y	Y	N	B	SD
441	Erection Plans, including Falsework	Y	N	Y	A	WD
449	Sign Structure Anchor Bolts	Y	Y	N	T	SD
450	Railing	Y	Y	N	A	SD
462	Concrete Box Culvert	Y	Y	N	C	SD
462	Concrete Box Culvert (Alternate Designs Only,calcs reqd.)	Y	Y	Y	B	SD
464	Reinforced Concrete Pipe (Jack and Bore only; ONLY when requested)	Y	Y	Y	A	SD
465	Pre-cast Junction Boxes, Grates, and Inlets	Y	Y	N	A	SD
465	Pre-cast Junction Boxes, Grates, and Inlets (Alternate Designs Only, calcs req'd.)	Y	Y	Y	B	SD
466	Pre-cast Headwalls and Wingwalls	Y	Y	N	A	SD
467	Pre-cast Safety End Treatments	Y	Y	N	A	SD
495	Raising Existing Structure (calcs reqd.)	Y	Y	Y	B	SD
610	Roadway Illumination Supports (Non-Standard only, calcs reqd.)	Y	Y	Y	BRG	SD
613	High Mast Illumination Poles (Non-standard only, calcs reqd.)	Y	Y	Y	BRG	SD
627	Treated Timber Poles	Y	Y	N	T	SD
644	Special Non-Standard Supports (Bridge Mounts, Barrier Mounts, Etc.)	Y	Y	Y	T	SD
647	Large Roadside Sign Supports	Y	Y	Y	T	SD
650	Cantilever Sign Structure Supports - Alternate Design Calcs.	Y	Y	Y	T	SD
650	Sign Structures	Y	Y	N	T	SD
680	Installation of Highway Traffic Signals	Y	Y	N	T	SD
682	Vehicle and Pedestrian Signal Heads	Y	Y	N	T	SD
684	Traffic Signal Cables	Y	Y	N	T	SD
685	Roadside Flashing Beacon Assemblies	Y	Y	N	T	SD
686	Traffic Signal Pole Assemblies (Steel) (Non-Standard only)	Y	Y	Y	T	SD
687	Pedestal Pole Assemblies	Y	Y	N	T	SD
688	Detectors	Y	Y	N	A	SD
784	Repairing Steel Bridge Members	Y	Y	Y	B	WD
SS	Prestr Concr Crown Span	Y	Y	N	B	SD
SS	Sound Barrier Walls	Y	Y	Y	A	SD
SS	Camera Poles	Y	Y	Y	TMS	SD

SS	Pedestrian Bridge (Calcs req'd.)	Y	Y	Y	B	SD
SS	Screw-In Type Anchor Foundations	Y	Y	N	T	SD
SS	Fiber Optic/Communication Cable	Y	Y	N	TMS	SD
SS	Spread Spectrum Radios for Signals	Y	Y	N	T	SD
SS	VIVDS System for Signals	Y	Y	N	T	SD
SS	CTMS Equipment	Y	Y	N	TMS	SD

Notes:

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

Key to Reviewing Party

A - Area Office

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

B - Houston Bridge Engineer

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

BRG - Austin Bridge Division

Bridge Design (Austin TxDOT)	BRG_ShopPlanReview@txdot.gov

C - Construction Office

Construction	HOU-ConstrShpDrwgs@txdot.gov
Laboratory	HOU-LabShpDrwgs@txdot.gov

T - Traffic Engineer

Traffic Operations	HOU-TrfShpDrwgs@txdot.gov

TMS – Traffic Management System

Computerized Traffic Management Systems (CTMS)	HOU-CTMSShpDrwgs@txdot.gov

Item 6: Control of Materials

To comply with the latest provisions of the Build America, Buy America Act (BABA Act) of the Bipartisan Infrastructure Law, the Contractor must submit a notarized original of the TxDOT Construction Material Buy America Certification Form for 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.

HOUSTON DISTRICT MASTER GENERAL NOTES

County: Fort Bend, etc.

Highway: UA 90, etc. **Control:** 0027-07-046, etc.

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 for clarification on material categorization.

Item 7: Legal Relations and Responsibilities

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

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

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

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

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

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

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

If the work is on or in the vicinity of an at-grade railroad crossing, involves incidental work on railroad right of way, or involves construction of a railroad grade separation structure, notify the railroad company's Division Engineer and the Department's Project Engineer at least 30 days before performing any work on the railroad right of way and make arrangements for railroad flaggers unless otherwise shown in the contract. Obtain the required Railroad Right of Entry Permit from the railroad company. Payment of applicable permit fees is the responsibility of the Contractor. Acquiring the Railroad Right of Entry Permit is a lengthy process, allow sufficient time for this.

If this project is on a hurricane evacuation route. Provide at the pre-construction meeting a written plan outlining procedures to suspend work, secure the job site, and safely handle traffic through and across the project in the event of a hurricane evacuation.

During the hurricane season (June 1 through November 30), do not close any travel lanes except when the Contractor can demonstrate that he/she can provide labor, equipment, material, a work plan, and quality of work to satisfactorily return all lanes to an open, all-weather travel surface within 3 days of receiving written or verbal notice but no later than 3 days before the predicted hurricane landfall. Construction of temporary lanes to an all-weather surface will be paid for in accordance with Article 9.7, "Payment for Extra Work and Force Account Method."

In addition to lane closures, cease work 3 days before the predicted hurricane landfall on or near the roadway that adversely impacts the flow of traffic and reduces the capacity of the highway during an evacuation. Vehicles of the Contractor, subcontractors, or material suppliers will not

HOUSTON DISTRICT MASTER GENERAL NOTES

be allowed to enter or exit the traffic stream, including those for the purpose of material hauling and delivery, and mobilization or demobilization of equipment. When directed, this prohibition will include a reasonable time period for the evacuees to return to their point of origin.

No significant traffic generator events have been identified.

Item 8: Prosecution and Progress

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

Working days will be computed and charged based on a *standard* workweek in accordance with Section 8.3.1.*4.*

The Lane Closure Assessment Fee depends on the current A.D.T. This fee applies to the Contractor for closures or obstructions that overlap into restricted hour traffic for each hour or portion thereof, per lane, regardless of the length of lane closure or obstruction. For Restricted Hours subject to Lane Assessment Fee refer to the Item, "Barricades, Signs, and Traffic Handling." For the current A.D.T., see link to Statewide Planning Map: https://www.txdot.gov/apps/statewide_mapping/StatewidePlanningMap.html. Contractor must verify the A.D.T with the area office as work orders are being issued for each site location.

CURRENT A.D.T.	LANE ASSESSMENT AMOUNT PER LANE / PER HOUR	CURRENT A.D.T.	LANE ASSESSMENT AMOUNT PER LANE / PER HOUR
2,500 – 4,999	100.00	140,000 – 159,999	3,500.00
5,000 – 9,999	200.00	160,000 – 179,999	4,000.00
10,000 – 14,999	300.00	180,000 – 199,999	4,500.00
15,000 – 19,999	400.00	200,000 – 219,999	5,000.00
20,000 – 39,999	500.00	220,000 – 239,999	5,500.00
40,000 – 59,999	1,000.00	240,000 – 259,999	6,000.00
60,000 – 79,999	1,500.00	260,000 – 279,999	6,500.00
80,000 – 99,999	2,000.00	280,000 – 299,999	7,000.00
100,000 – 119,999	2,500.00	300,000 +	7,500.00
120,000 – 139,999	3,000.00		

Item 502: Barricades, Signs, and Traffic Handling

Use a traffic control plan for handling traffic through the various phases of construction. Follow the phasing sequence unless otherwise agreed upon by the Area Engineer and the Project Manager. Ensure this plan conforms to the latest "Texas Manual on Uniform Traffic Control Devices" and the latest Barricade and Construction (BC) Standard Sheets. The latest versions of Work Zone Standard Sheets WZ (BTS-1) and WZ (BTS-2) are the traffic control plan for the signal installations.

Submit changes to the traffic control plan to the Area Engineer. Provide a layout showing the construction phasing, signs, striping, and signalizations for changes to the original traffic control plan.

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

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

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

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

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

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

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

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

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

HOUSTON DISTRICT MASTER GENERAL NOTES

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

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

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

One Lane Closure

Day	Daytime Closure Hours	Nighttime Closure Hours	Restricted Hours Subject to Lane Assessment Fee
Monday	9:00 AM – 3:00 PM	N/A	05:00 AM – 09:00 AM 03:00 PM – 09:00 PM
Tuesday	9:00 AM – 3:00 PM	N/A	05:00 AM – 09:00 AM 03:00 PM – 09:00 PM
Wednesday	9:00 AM – 3:00 PM	N/A	05:00 AM – 09:00 AM 03:00 PM – 09:00 PM
Thursday	9:00 AM – 3:00 PM	N/A	05:00 AM – 09:00 AM 03:00 PM – 09:00 PM
Friday	9:00 AM – 3:00 PM	N/A	05:00 AM – 09:00 AM 03:00 PM – 09:00 PM
Saturday	N/A	N/A	N/A
Sunday	N/A	N/A	N/A

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

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

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

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

Engineer may choose to use existing bid items if it does not slow the implementation of enhancement.

Item 506: Temporary Erosion, Sedimentation and Environmental Controls

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

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

Before starting construction, review with the Engineer the SWP3 used for temporary erosion control as outlined on the plans. Before construction, place the temporary erosion and sedimentation control features as shown on the SWP3.

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

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

Implement temporary and permanent erosion control measures to comply with the National Pollution Discharge Elimination System (NPDES) general permit under the Clean Water Act.

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

Item 618: Conduit

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

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

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

HOUSTON DISTRICT MASTER GENERAL NOTES

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

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

Where PVC, duct cable, and HDPE conduit 1 in. and larger is allowed and installed per Department standards, provide a PVC elbow in place of the galvanized rigid metal elbow required by the Electrical Details standards. Ensure the PVC elbow is of the same schedule rating as the conduit to which it is connected. Use only a flat, high tensile strength polyester fiber pull tape to pull conductors through the PVC conduit system.

Remove conductor and conduit to be abandoned to 1 ft. below the ground level. This work is subsidiary to the various bid items.

Do not use cast iron junction boxes in concrete traffic barriers and single slope traffic barriers. Use polymer concrete junction boxes as shown on standard sheet ED(4)-14. Mount the junction boxes flush (+ 0 in., - 1/2 in.) with the concrete surface of the concrete barrier.

Locate the underground utilities within the project limits. Provide the equipment necessary for locating these utilities, locate, and mark them before starting any excavation work in the area. This work is subsidiary to the various bid items. If the Contractor damages or cause damage to any existing underground utilities, repair such damage at no cost to the Department.

Ensure the interconnection of new equipment to the existing system does not interfere with the operation of the remaining system components. Ensure the system remains completely operational between the hours of 6:00 a.m. Monday and 12:00 a.m. (midnight) Saturday.

Do not interrupt system operation without coordinating with the Department's operations personnel at Houston Transtar at (713) 881-3285.

Perform work to be done on cables during weekends only.

Provide Liquid-Tight Flexible Metal (LTFM) conduit if the plans refer to flexible metal conduit. Do not use flexible metal conduit.

Unless otherwise shown on the plans, place conduit runs behind curbs at locations where curbs exist.

Use schedule 80 PVC conduit to house conductor runs under paved riprap, roadway, or driveways, unless otherwise shown on the plans.

Use Rigid Metal Conduit (RMC) for exposed conduit.

Before backfilling conduit trenches, place a detectable underground metalized mylar marking tape above the conduit and concrete encasement. Imprint the marking tape with, "TxDOT CONDUIT AND FIBER OPTIC CABLE SYSTEM. CALL (713) 802-5909 BEFORE

PROCEEDING" every 18 in. Supplying and installing the marking tapes is subsidiary to the various bid items.

Conduit elbows and rigid metal extensions required when installing PVC conduit systems are subsidiary to the various bid items.

Install a continuous bare or green insulated copper wire No. 8 AWG or larger in every conduit throughout the electrical system in accordance with the Electrical Detail Standard Sheets, and the latest edition of the NEC.

Provide a single 1/C #14 insulated wire in conduit runs which have been identified in the plans to carry fiber optic cable. Provide UL-listed solid copper wire with orange color low density polyethylene insulation, suitable for conduit installation, rated for a temperature range of -20 C to +60 C and a voltage rating of 600V. This wire will serve as a tracer, or locate, wire for locating underground conduit containing fiber optic cabling and will be paid for under Item 620, "Electrical Conductors."

Item 620: Electrical Conductors

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

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

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

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

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

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

HOUSTON DISTRICT MASTER GENERAL NOTES

conductors, install a breakaway connector with a white colored marking and a permanently installed dummy fuse (slug).

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

Item 624: Ground Boxes

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

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

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

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

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

Item 6007: Communication Cable

Seal each end of the communications cable that is exposed to elements during storage or after installing with a waterproof sealant, or as per manufacturer recommendations.

Ensure each communication cable run is continuous without splices from controller to controller.

Assume responsibility for the signal carrying capability and performance of the cable. Install each wire with a lightning protection device unless otherwise noted. Ground the cable in accordance with the manufacturer's recommendation.

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

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

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

A total of one (1) shadow vehicle with a TMA/TA is required for the work with the exception of Pavement Marking Operations. The Contractor is responsible for determining if one or more of

these operations will be ongoing at the same time to determine the total number of TMAs/TAs needed on the project.

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

illumination and electrical items (located at http://ftp.dot.state.tx.us/pub/txdot-info/cmd/mpl/riaes.pdf) as shown on the Department's Material Producers List and the Roadway Illumination and Electrical Supplies List. Check the latest links on the Department's website for these lists. No substitutions will be allowed for materials found on these lists.

General: Site Management

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

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

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

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

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

Tricycle Type	**Truck Type - 4 Wheel**
Wayne Series 900	M-B Cruiser II
Elgin White Wing	Wayne Model 945
Elgin Pelican	Mobile TE-3
	Mobile TE-4
	Murphy 4042

General: Traffic Control and Construction

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

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

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

HOUSTON DISTRICT MASTER GENERAL NOTES

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

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

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

General: Utilities

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

If the Contractor damages or causes damage (breaks, leaks, nicks, dents, gouges, etc.) to the utility, contact the utility facility owner or operator immediately.

Be aware that an operational Computerized Transportation Management System (CTMS) exists within the limits of this project and that the system must remain operational throughout construction. If the Contractor damages or causes damage to this system, repair such damage within 8 hours of occurrence at no cost to the Department. In the event of system damage, notify the Director of Traffic Management Systems at 713-881-3283 within one hour of occurrence. Failure of the Contractor to repair damage to the main fiber optic cable and CCTV cable trunk lines, which convey all corridor information to TranStar, will result in the Contractor being billed for the full cost of emergency repairs.

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

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

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

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

If working near power lines, comply with the appropriate sections of Texas State Law and Federal Regulations relating to the type of work involved.

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

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

Item 5: Control of Work

Submit shop drawings electronically for the fabrication of items as documented in Table 1 or Table 2 below. Information and requirements for electronic submittals can be viewed in the "Guide to Electronic Shop Drawing Submittal" which can be accessed through the following web link, ftp://ftp.dot.state.tx.us/pub/txdot-info/library/pubs/bus/bridge/e_submit_guide.pdf. References to 11 in. x 17 in. sheets in individual specifications for structural items imply electronic CAD sheets.

Table 1

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

Spec Item No.'s	Product	Submittal Required	Approval Required (Y/N)	Contractor/ Fabricator P.E. Seal Required	Reviewing Party	Shop or Working Drawing (Note 1)
7.16.1&.2	Construction Load Analyses	Y	Y	Y	B	WD
400	Excavation and Backfill for Structures (cofferdams)	Y	N	Y	A	WD
403	Temporary Special Shoring	Y	N	Y	C	WD
420	Formwork/Falsework	Y	N	Y	A	WD
423	Retaining Walls, (calcs req'd.)	Y	Y	Y	C	SD
425	Optional Design Calculations (Prstrs Bms)	Y	Y	Y	B	SD
425	Prestr Concr Sheet Piling	Y	Y	N	B	SD
425	Prestr Concr Beams	Y	Y	N	B	SD
425	Prestr Concr Bent	Y	Y	N	B	SD
426	Post Tension Details	Y	Y	N	B	SD
434	Elastomeric Bearing Pads (All)	Y	Y	N	B	SD
441	Bridge Protective Assembly	Y	Y	N	B	SD

HOUSTON DISTRICT MASTER GENERAL NOTES

County: Fort Bend, etc.

Highway: UA 90, etc. **Control:** 0027-07-046, etc.

441	Misc Steel (various steel assemblies)	Y	Y	N	B	SD
441	Steel Pedestals (bridge raising)	Y	Y	N	B	SD
441	Steel Bearings	Y	Y	N	B	SD
441	Steel Bent	Y	Y	N	B	SD
441	Steel Diaphragms	Y	Y	N	B	SD
441	Steel Finger Joint	Y	Y	N	B	SD
441	Steel Plate Girder	Y	Y	N	B	SD
441	Steel Tub-Girders	Y	Y	N	B	SD
441	Erection Plans, including Falsework	Y	N	Y	A	WD
449	Sign Structure Anchor Bolts	Y	Y	N	T	SD
450	Railing	Y	Y	N	A	SD
462	Concrete Box Culvert	Y	Y	N	C	SD
462	Concrete Box Culvert (Alternate Designs Only,calcs reqd.)	Y	Y	Y	B	SD
464	Reinforced Concrete Pipe (Jack and Bore only; ONLY when requested)	Y	Y	Y	A	SD
465	Pre-cast Junction Boxes, Grates, and Inlets	Y	Y	N	A	SD
465	Pre-cast Junction Boxes, Grates, and Inlets (Alternate Designs Only, calcs req'd.)	Y	Y	Y	B	SD
466	Pre-cast Headwalls and Wingwalls	Y	Y	N	A	SD
467	Pre-cast Safety End Treatments	Y	Y	N	A	SD
495	Raising Existing Structure (calcs reqd.)	Y	Y	Y	B	SD
610	Roadway Illumination Supports (Non-Standard only, calcs reqd.)	Y	Y	Y	BRG	SD
613	High Mast Illumination Poles (Non-standard only, calcs reqd.)	Y	Y	Y	BRG	SD
627	Treated Timber Poles	Y	Y	N	T	SD
644	Special Non-Standard Supports (Bridge Mounts, Barrier Mounts, Etc.)	Y	Y	Y	T	SD
647	Large Roadside Sign Supports	Y	Y	Y	T	SD
650	Cantilever Sign Structure Supports - Alternate Design Calcs.	Y	Y	Y	T	SD
650	Sign Structures	Y	Y	N	T	SD
680	Installation of Highway Traffic Signals	Y	Y	N	T	SD
682	Vehicle and Pedestrian Signal Heads	Y	Y	N	T	SD
684	Traffic Signal Cables	Y	Y	N	T	SD
685	Roadside Flashing Beacon Assemblies	Y	Y	N	T	SD
686	Traffic Signal Pole Assemblies (Steel) (Non-Standard only)	Y	Y	Y	T	SD
687	Pedestal Pole Assemblies	Y	Y	N	T	SD
688	Detectors	Y	Y	N	A	SD
784	Repairing Steel Bridge Members	Y	Y	Y	B	WD
SS	Prestr Concr Crown Span	Y	Y	N	B	SD
SS	Sound Barrier Walls	Y	Y	Y	A	SD
SS	Camera Poles	Y	Y	Y	TMS	SD

SS	Pedestrian Bridge (Calcs req'd.)	Y	Y	Y	B	SD
SS	Screw-In Type Anchor Foundations	Y	Y	N	T	SD
SS	Fiber Optic/Communication Cable	Y	Y	N	TMS	SD
SS	Spread Spectrum Radios for Signals	Y	Y	N	T	SD
SS	VIVDS System for Signals	Y	Y	N	T	SD
SS	CTMS Equipment	Y	Y	N	TMS	SD

Notes:

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

Key to Reviewing Party

A - Area Office

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

B - Houston Bridge Engineer

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

BRG - Austin Bridge Division

Bridge Design (Austin TxDOT)	BRG_ShopPlanReview@txdot.gov

C - Construction Office

Construction	HOU-ConstrShpDrwgs@txdot.gov
Laboratory	HOU-LabShpDrwgs@txdot.gov

T - Traffic Engineer

Traffic Operations	HOU-TrfShpDrwgs@txdot.gov

TMS – Traffic Management System

Computerized Traffic Management Systems (CTMS)	HOU-CTMSShpDrwgs@txdot.gov

Item 6: Control of Materials

To comply with the latest provisions of the Build America, Buy America Act (BABA Act) of the Bipartisan Infrastructure Law, the Contractor must submit a notarized original of the TxDOT Construction Material Buy America Certification Form for 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.

HOUSTON DISTRICT MASTER GENERAL NOTES

County: Fort Bend, etc.

Highway: UA 90, etc. **Control:** 0027-07-046, etc.

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 for clarification on material categorization.

Item 7: Legal Relations and Responsibilities

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

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

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

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

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

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

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

If the work is on or in the vicinity of an at-grade railroad crossing, involves incidental work on railroad right of way, or involves construction of a railroad grade separation structure, notify the railroad company's Division Engineer and the Department's Project Engineer at least 30 days before performing any work on the railroad right of way and make arrangements for railroad flaggers unless otherwise shown in the contract. Obtain the required Railroad Right of Entry Permit from the railroad company. Payment of applicable permit fees is the responsibility of the Contractor. Acquiring the Railroad Right of Entry Permit is a lengthy process, allow sufficient time for this.

If this project is on a hurricane evacuation route. Provide at the pre-construction meeting a written plan outlining procedures to suspend work, secure the job site, and safely handle traffic through and across the project in the event of a hurricane evacuation.

During the hurricane season (June 1 through November 30), do not close any travel lanes except when the Contractor can demonstrate that he/she can provide labor, equipment, material, a work plan, and quality of work to satisfactorily return all lanes to an open, all-weather travel surface within 3 days of receiving written or verbal notice but no later than 3 days before the predicted hurricane landfall. Construction of temporary lanes to an all-weather surface will be paid for in accordance with Article 9.7, "Payment for Extra Work and Force Account Method."

In addition to lane closures, cease work 3 days before the predicted hurricane landfall on or near the roadway that adversely impacts the flow of traffic and reduces the capacity of the highway during an evacuation. Vehicles of the Contractor, subcontractors, or material suppliers will not

HOUSTON DISTRICT MASTER GENERAL NOTES

be allowed to enter or exit the traffic stream, including those for the purpose of material hauling and delivery, and mobilization or demobilization of equipment. When directed, this prohibition will include a reasonable time period for the evacuees to return to their point of origin.

No significant traffic generator events have been identified.

Item 8: Prosecution and Progress

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

Working days will be computed and charged based on a *standard* workweek in accordance with Section 8.3.1.*4.*

The Lane Closure Assessment Fee depends on the current A.D.T. This fee applies to the Contractor for closures or obstructions that overlap into restricted hour traffic for each hour or portion thereof, per lane, regardless of the length of lane closure or obstruction. For Restricted Hours subject to Lane Assessment Fee refer to the Item, "Barricades, Signs, and Traffic Handling." For the current A.D.T., see link to Statewide Planning Map: https://www.txdot.gov/apps/statewide_mapping/StatewidePlanningMap.html. Contractor must verify the A.D.T with the area office as work orders are being issued for each site location.

CURRENT A.D.T.	LANE ASSESSMENT AMOUNT PER LANE / PER HOUR	CURRENT A.D.T.	LANE ASSESSMENT AMOUNT PER LANE / PER HOUR
2,500 – 4,999	100.00	140,000 – 159,999	3,500.00
5,000 – 9,999	200.00	160,000 – 179,999	4,000.00
10,000 – 14,999	300.00	180,000 – 199,999	4,500.00
15,000 – 19,999	400.00	200,000 – 219,999	5,000.00
20,000 – 39,999	500.00	220,000 – 239,999	5,500.00
40,000 – 59,999	1,000.00	240,000 – 259,999	6,000.00
60,000 – 79,999	1,500.00	260,000 – 279,999	6,500.00
80,000 – 99,999	2,000.00	280,000 – 299,999	7,000.00
100,000 – 119,999	2,500.00	300,000 +	7,500.00
120,000 – 139,999	3,000.00		

Item 502: Barricades, Signs, and Traffic Handling

Use a traffic control plan for handling traffic through the various phases of construction. Follow the phasing sequence unless otherwise agreed upon by the Area Engineer and the Project Manager. Ensure this plan conforms to the latest "Texas Manual on Uniform Traffic Control Devices" and the latest Barricade and Construction (BC) Standard Sheets. The latest versions of Work Zone Standard Sheets WZ (BTS-1) and WZ (BTS-2) are the traffic control plan for the signal installations.

Submit changes to the traffic control plan to the Area Engineer. Provide a layout showing the construction phasing, signs, striping, and signalizations for changes to the original traffic control plan.

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

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

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

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

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

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

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

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

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

HOUSTON DISTRICT MASTER GENERAL NOTES

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

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

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

One Lane Closure

Day	Daytime Closure Hours	Nighttime Closure Hours	Restricted Hours Subject to Lane Assessment Fee
Monday	9:00 AM – 3:00 PM	N/A	05:00 AM – 09:00 AM 03:00 PM – 09:00 PM
Tuesday	9:00 AM – 3:00 PM	N/A	05:00 AM – 09:00 AM 03:00 PM – 09:00 PM
Wednesday	9:00 AM – 3:00 PM	N/A	05:00 AM – 09:00 AM 03:00 PM – 09:00 PM
Thursday	9:00 AM – 3:00 PM	N/A	05:00 AM – 09:00 AM 03:00 PM – 09:00 PM
Friday	9:00 AM – 3:00 PM	N/A	05:00 AM – 09:00 AM 03:00 PM – 09:00 PM
Saturday	N/A	N/A	N/A
Sunday	N/A	N/A	N/A

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

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

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

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

Engineer may choose to use existing bid items if it does not slow the implementation of enhancement.

Item 506: Temporary Erosion, Sedimentation and Environmental Controls

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

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

Before starting construction, review with the Engineer the SWP3 used for temporary erosion control as outlined on the plans. Before construction, place the temporary erosion and sedimentation control features as shown on the SWP3.

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

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

Implement temporary and permanent erosion control measures to comply with the National Pollution Discharge Elimination System (NPDES) general permit under the Clean Water Act.

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

Item 618: Conduit

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

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

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

HOUSTON DISTRICT MASTER GENERAL NOTES

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

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

Where PVC, duct cable, and HDPE conduit 1 in. and larger is allowed and installed per Department standards, provide a PVC elbow in place of the galvanized rigid metal elbow required by the Electrical Details standards. Ensure the PVC elbow is of the same schedule rating as the conduit to which it is connected. Use only a flat, high tensile strength polyester fiber pull tape to pull conductors through the PVC conduit system.

Remove conductor and conduit to be abandoned to 1 ft. below the ground level. This work is subsidiary to the various bid items.

Do not use cast iron junction boxes in concrete traffic barriers and single slope traffic barriers. Use polymer concrete junction boxes as shown on standard sheet ED(4)-14. Mount the junction boxes flush (+ 0 in., - 1/2 in.) with the concrete surface of the concrete barrier.

Locate the underground utilities within the project limits. Provide the equipment necessary for locating these utilities, locate, and mark them before starting any excavation work in the area. This work is subsidiary to the various bid items. If the Contractor damages or cause damage to any existing underground utilities, repair such damage at no cost to the Department.

Ensure the interconnection of new equipment to the existing system does not interfere with the operation of the remaining system components. Ensure the system remains completely operational between the hours of 6:00 a.m. Monday and 12:00 a.m. (midnight) Saturday.

Do not interrupt system operation without coordinating with the Department's operations personnel at Houston Transtar at (713) 881-3285.

Perform work to be done on cables during weekends only.

Provide Liquid-Tight Flexible Metal (LTFM) conduit if the plans refer to flexible metal conduit. Do not use flexible metal conduit.

Unless otherwise shown on the plans, place conduit runs behind curbs at locations where curbs exist.

Use schedule 80 PVC conduit to house conductor runs under paved riprap, roadway, or driveways, unless otherwise shown on the plans.

Use Rigid Metal Conduit (RMC) for exposed conduit.

Before backfilling conduit trenches, place a detectable underground metalized mylar marking tape above the conduit and concrete encasement. Imprint the marking tape with, "TxDOT CONDUIT AND FIBER OPTIC CABLE SYSTEM. CALL (713) 802-5909 BEFORE

PROCEEDING" every 18 in. Supplying and installing the marking tapes is subsidiary to the various bid items.

Conduit elbows and rigid metal extensions required when installing PVC conduit systems are subsidiary to the various bid items.

Install a continuous bare or green insulated copper wire No. 8 AWG or larger in every conduit throughout the electrical system in accordance with the Electrical Detail Standard Sheets, and the latest edition of the NEC.

Provide a single 1/C #14 insulated wire in conduit runs which have been identified in the plans to carry fiber optic cable. Provide UL-listed solid copper wire with orange color low density polyethylene insulation, suitable for conduit installation, rated for a temperature range of -20 C to +60 C and a voltage rating of 600V. This wire will serve as a tracer, or locate, wire for locating underground conduit containing fiber optic cabling and will be paid for under Item 620, "Electrical Conductors."

Item 620: Electrical Conductors

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

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

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

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

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

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

HOUSTON DISTRICT MASTER GENERAL NOTES

conductors, install a breakaway connector with a white colored marking and a permanently installed dummy fuse (slug).

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

Item 624: Ground Boxes

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

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

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

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

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

Item 6007: Communication Cable

Seal each end of the communications cable that is exposed to elements during storage or after installing with a waterproof sealant, or as per manufacturer recommendations.

Ensure each communication cable run is continuous without splices from controller to controller.

Assume responsibility for the signal carrying capability and performance of the cable. Install each wire with a lightning protection device unless otherwise noted. Ground the cable in accordance with the manufacturer's recommendation.

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

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

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

A total of one (1) shadow vehicle with a TMA/TA is required for the work with the exception of Pavement Marking Operations. The Contractor is responsible for determining if one or more of

these operations will be ongoing at the same time to determine the total number of TMAs/TAs needed on the project.

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

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0027-07-046, ETC.

DISTRICT Houston
HIGHWAY UA 90, ETC.

COUNTY Fort Bend, ETC.

			CONTROL SECTION JOB	**0027-07-046**		**0179-02-089**		**0188-01-040**		**0188-07-006**		**1400-04-039**		**3538-01-058**	
			PROJECT ID	**A00180620**		**A00180600**		**A00180606**		**A00180601**		**A00180578**		**A00180607**	
			COUNTY	**Fort Bend**		**Brazoria**		**Fort Bend**		**Brazoria**		**Montgomery**		**Montgomery**	
			HIGHWAY	**UA 90**		**SH 35**		**SH 36**		**SH 35**		**FM 1774**		**SH 242**	
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL
	500-6001	MOBILIZATION	LS	1.000											
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	15.000											
	618-6046	CONDT (PVC) (SCH 80) (2")	LF	9,515.000		495.000		4,905.000		2,060.000		25,005.000		24,315.000	
	618-6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	9,265.000		2,050.000		5,210.000		1,505.000		1,105.000		1,455.000	
	618-6070	CONDT (RM) (2")	LF					140.000				1,670.000		465.000	
	620-6002	ELEC CONDR (NO.14) INSULATED	LF	18,575.000		2,545.000		10,240.000		3,535.000		27,655.000		26,215.000	
	6007-6011	FIBER OPTIC CBL (SNGLE-MODE)(12 FIBER)	LF	1,855.000		2,780.000		720.000		3,775.000		880.000		465.000	
	6007-6013	FIBER OPTIC CBL (SNGLE-MODE)(36 FIBER)	LF	18,740.000				10,475.000				28,620.000		26,815.000	
	6007-6089	FO SPLICE ENCLOSURE (TYPE 2)	EA	14.000		4.000		7.000		2.000		8.000		3.000	
	6007-6094	FIBER OPTIC FUSION SPLICE	EA	156.000		36.000		72.000		12.000		84.000		24.000	
	6007-6096	FIBER OPTIC PATCH PANEL (12 POSITION)	EA	14.000		4.000		7.000		2.000		8.000		3.000	
	6186-6002	ITS GND BOX(PCAST) TY 1 (243636)W/APRN	EA	41.000		5.000		22.000		7.000		53.000		34.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000											
		LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000											
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000											

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0027-07-046, ETC.

DISTRICT Houston
HIGHWAY UA 90, ETC.

COUNTY Fort Bend, ETC.

ALT	BID CODE	DESCRIPTION	UNIT	TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB			
		PROJECT ID			
		COUNTY			
		HIGHWAY			
	500-6001	MOBILIZATION	LS	1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	15.000	
	618-6046	CONDT (PVC) (SCH 80) (2")	LF	66,295.000	
	618-6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	20,590.000	
	618-6070	CONDT (RM) (2")	LF	2,275.000	
	620-6002	ELEC CONDR (NO.14) INSULATED	LF	88,765.000	
	6007-6011	FIBER OPTIC CBL (SNGLE-MODE)(12 FIBER)	LF	10,475.000	
	6007-6013	FIBER OPTIC CBL (SNGLE-MODE)(36 FIBER)	LF	84,650.000	
	6007-6089	FO SPLICE ENCLOSURE (TYPE 2)	EA	38.000	
	6007-6094	FIBER OPTIC FUSION SPLICE	EA	384.000	
	6007-6096	FIBER OPTIC PATCH PANEL (12 POSITION)	EA	38.000	
	6186-6002	ITS GND BOX(PCAST) TY 1 (243636)W/APRN	EA	162.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000	
		LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000	

TRAFFIC SIGNAL SUMMARY OF QUANTITIES

MATERIALS FOR HIGHWAY TRAFFIC SIGNAL				CSJ: 0179-02-089		CSJ: 0188-07-006		CCSJ: 0027-07-046		CSJ: 0188-01-040		CSJ: 1400-04-039		CSJ: 3538-01-058		TOTAL
				SH 35		SH 35		UA 90		SH 36		FM 1774		SH 242		
ITEM	DESC CODE	DESCRIPTION	UNIT	FM 2852 TO BS 35-E		BS 35-E TO SH 36		FM 723 TO FM 762		UA 90 TO IH 69		FM 1488 TO SH 249		FM 1314 TO FM 1485		
				QUANTITY		QUANTITY		QUANTITY		QUANTITY		QUANTITY		QUANTITY		QUANTITY
618	6046	CONDT (PVC) (SCH 80) (2")	LF	495		2060		9515		4905		25005		24315		66295
618	6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	2050		1505		9265		5210		1105		1455		20590
618	6070	CONDT (RM) (2")	LF							140		1670		465		2275
		*JUNCTION BOX	EA							2				2		4
620	6002	ELEC CONDR (NO.14) INSULATED	LF	2545		3535		18575		10240		27655		26215		88765
6007	6011	FIBER OPTIC CBL (SNGLE-MODE)(12 FIBER)	LF	2780		3775		1855		720		880		465		10475
6007	6013	FIBER OPTIC CBL (SNGLE-MODE)(36 FIBER)	LF					18740		10475		28620		26815		84650
6007	6089	FO SPLICE ENCLOSURE (TYPE 2)	EA	4		2		14		7		8		3		38
6007	6094	FIBER OPTIC FUSION SPLICE	EA	36		12		156		72		84		24		384
6007	6096	FIBER OPTIC PATCH PANEL (12 POSITION)	EA	4		2		14		7		8		3		38
6186	6002	ITS GND BOX(PCAST) TY 1 (243636)W/APRN	EA	5		7		41		22		53		34		162

* MATERIAL SUBSIDIARY TO PERTINENT ITEMS

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TRAFFIC SIGNAL SUMMARY OF QUANTITIES

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		05

PHASING NARRATIVE

ALL PHASES
* INSTALL CONSTRUCTION BARRICADES, WORKZONE STRIPING, AND WORKZONE SIGNING AS SHOWN ON PLANS
* INSTAL SWPPP AS NEEDED

PHASE 1 (ALL CSJs)
- INSTALL ITS GROUND BOXES TY1 AS SHOWN

PHASE 2 (ALL CSJs EXCEPT CSJ 0027-07-046)
- INSTALL CONDUIT AS SHOWN

PHASE 3 (CSJ 0027-07-046)
- INSTALL CONDUIT AS SHOWN

PHASE 4 (ALL CSJs)
- INSTALL CONDUCTORS AS SHOWN
- INSTALL FIBER OPTIC CABLES AS SHOWN
- INSTALL SPLICE ENCLOSURES AS SHOWN
- COMPLETE FIBER OPTIC FUSION SPLICES AS SHOWN
- INSTALL PATCH PANELS AND CONNECTORS AS SHOWN
- PERFORM FIBER OPTIC TESTING
- CLEAN UP

*** THE CONTRACTOR SHALL NOT WORK IN ANY AFFECTED AREAS WITH UNCLEAR CONFLICTS, UNLESS OTHERWISE APPROVED BY THE ENGINEER, AND SHALL WORK IN OTHER AVAILABLE LOCATIONS.

NOTES:

* THE CONTRACTOR SHALL WORK IN THE ORDER SHOWN ABOVE TO AVOID POTENTIAL CONFLICTS AND DELAY.

* SHOULD THE CONTRACTOR ELECT TO BEGIN PHASE 3 PRIOR TO PHASE 2 COMPLETION AND ENCOUNTER DELAY DUE TO RAILROAD OR OTHER ISSUES THAT PREVENT THE CONTRACTOR FROM COMPLETING WORK, NO ADDITIONAL COMPENSATION OR ADDITIONAL DAYS WILL BE ADDED TO THE CONTRACT BECAUSE OF ANY CONFLICTS.

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

08/11/2023

TRAFFIC CONTROL
PHASING
NARRATIVE

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		6

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

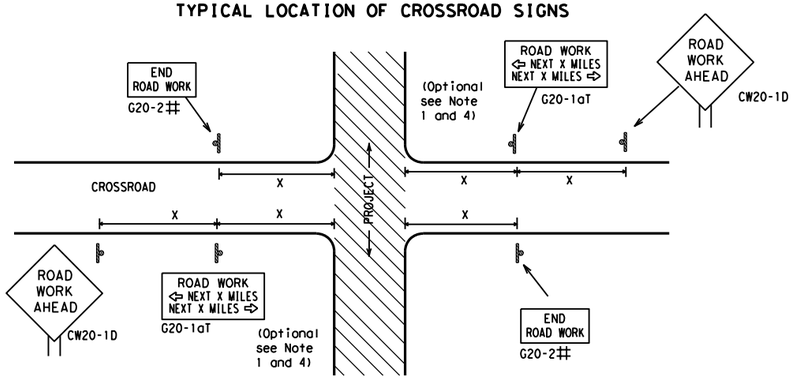
Traffic Safety Division Standard

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 4-03 7-13 9-07 8-14 5-10 5-21	0027	07	046,ETC.	UA 90,ETC.
	DIST	COUNTY		SHEET NO.
	HOU	FORT BEND,ETC.		7

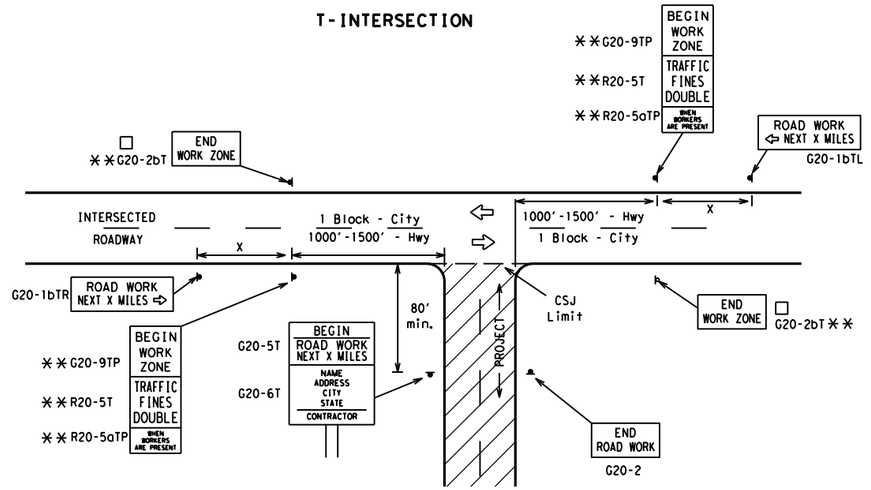
TYPICAL LOCATION OF CROSSROAD SIGNS



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]

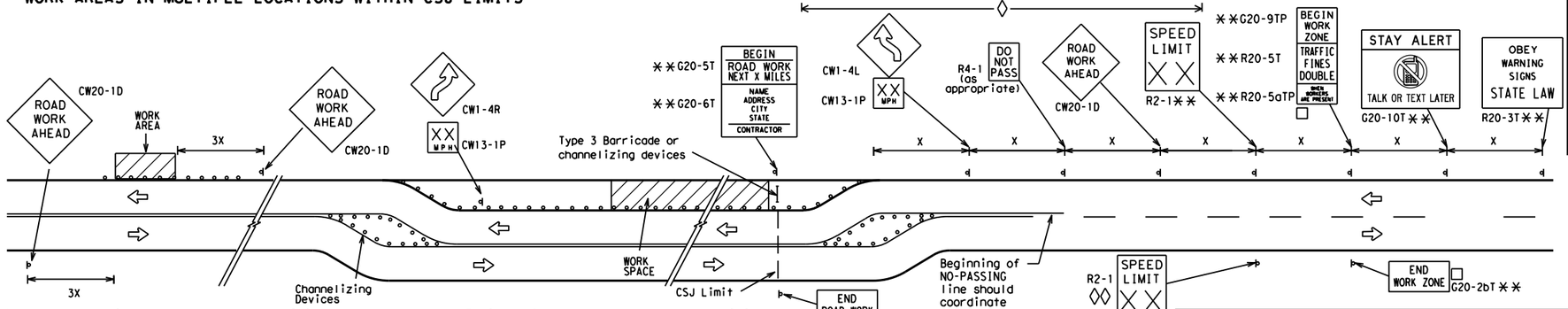
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

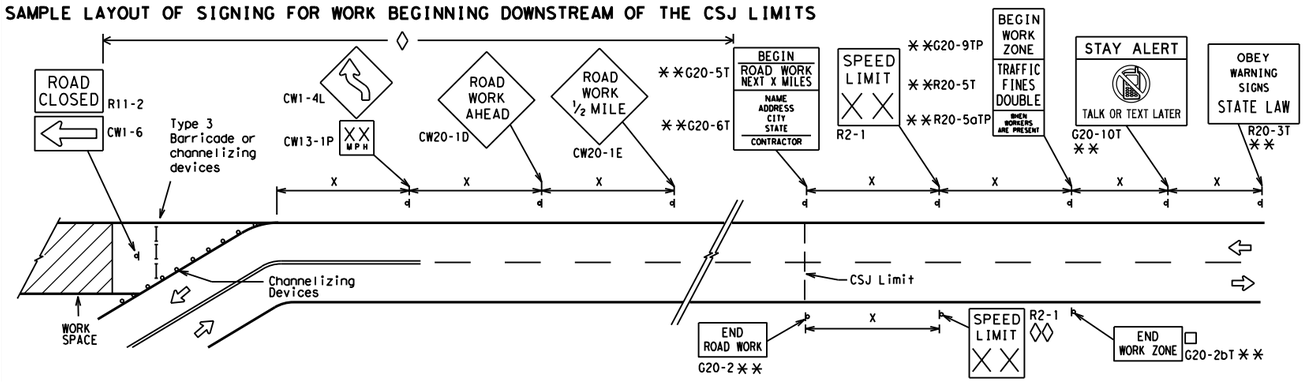
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may 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



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

NOTES

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

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

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

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

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

LEGEND

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

SHEET 2 OF 12

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
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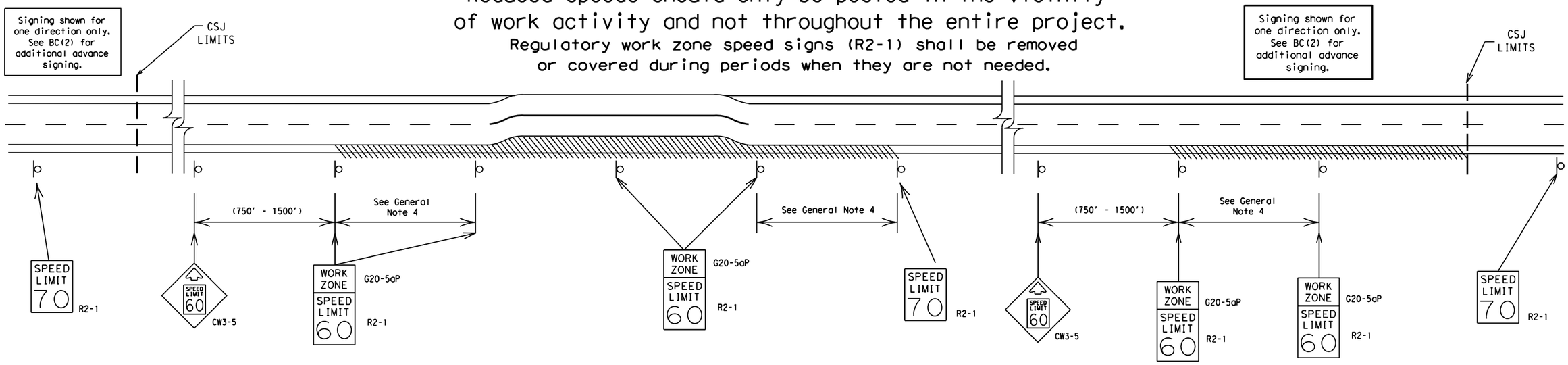
REVISIONS	0027	07	046,ETC.	UA 90,ETC.
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	FORT BEND,ETC.		7A

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
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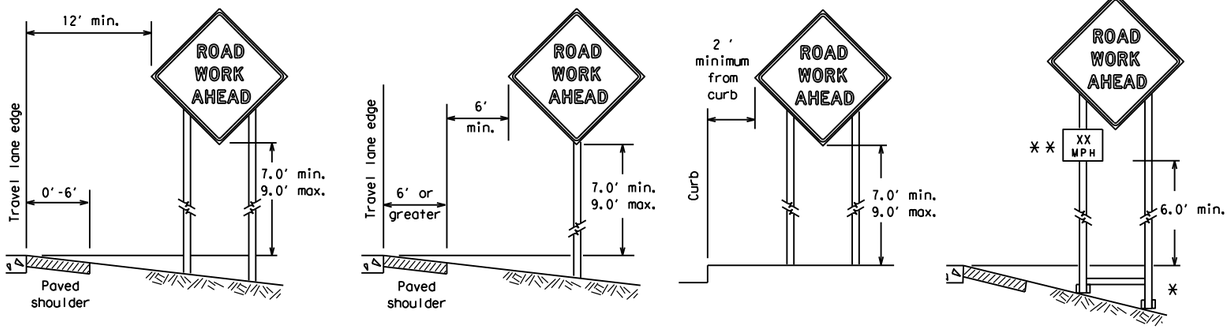
REVISIONS 9-07 8-14 7-13 5-21	0027	07	046,ETC.	UA 90,ETC.
	DIST	COUNTY		SHEET NO.
	HOU	FORT BEND,ETC.		8

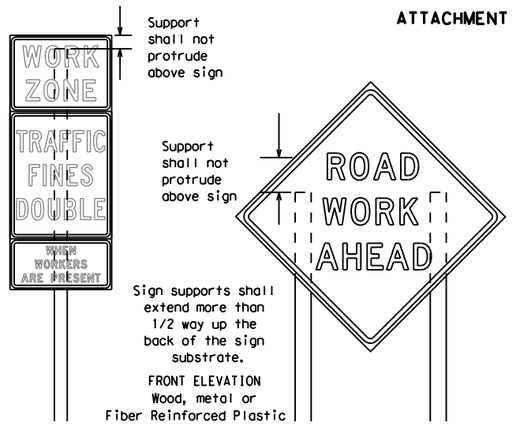
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

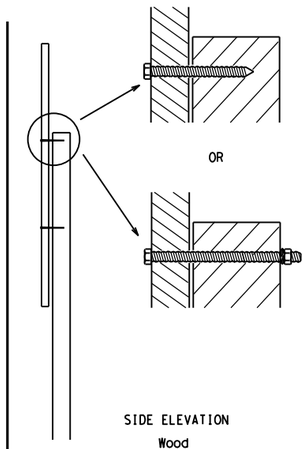


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** 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





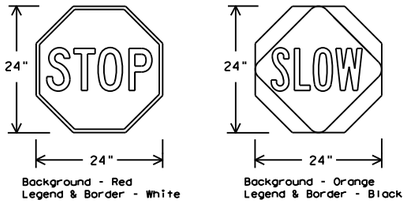
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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.

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BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0027	07	046,ETC.	UA 90,ETC.
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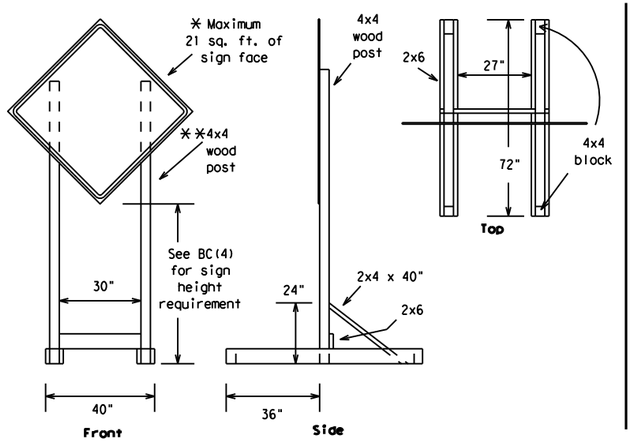
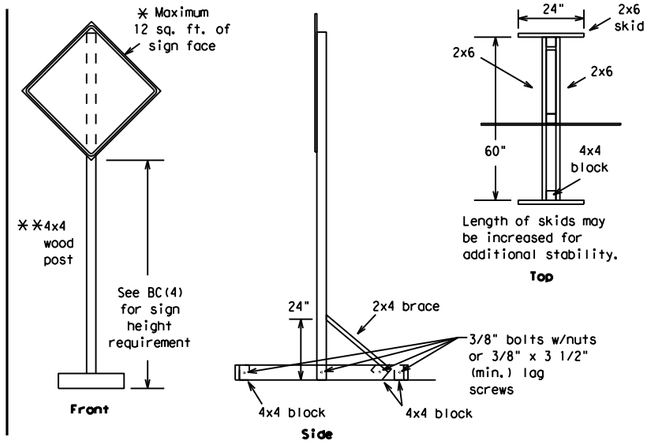
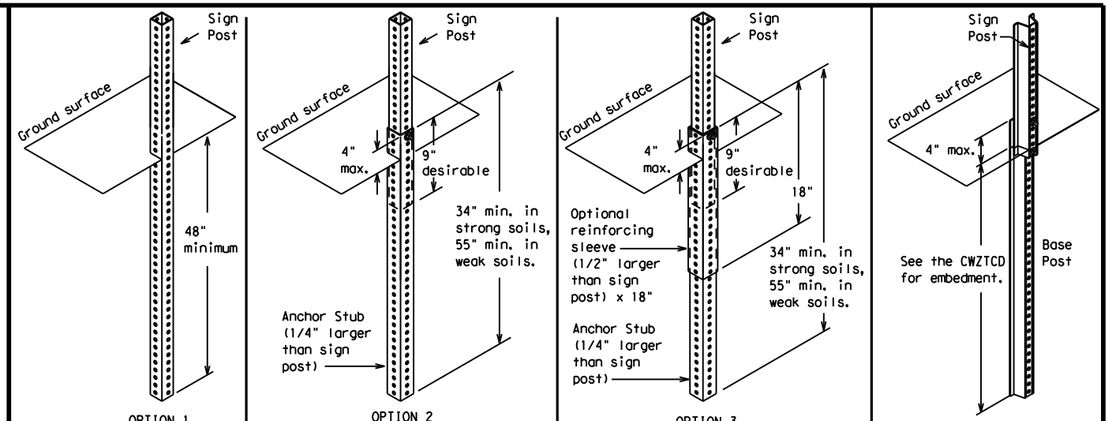




SKID MOUNTED WOOD SIGN SUPPORTS

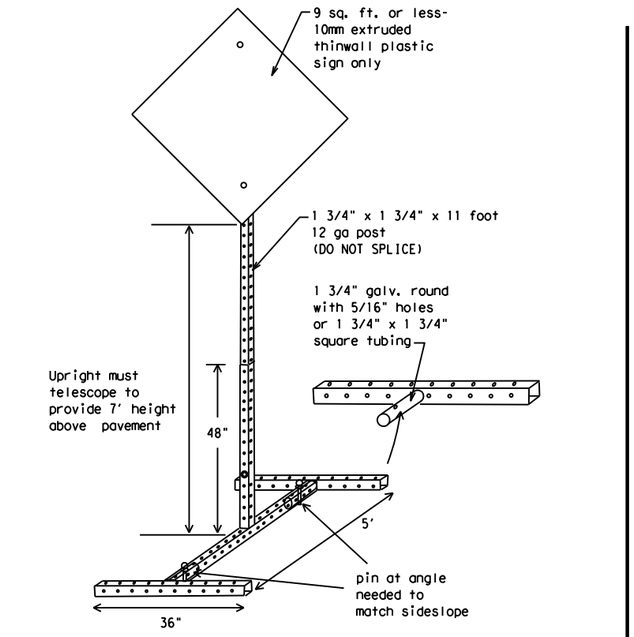
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

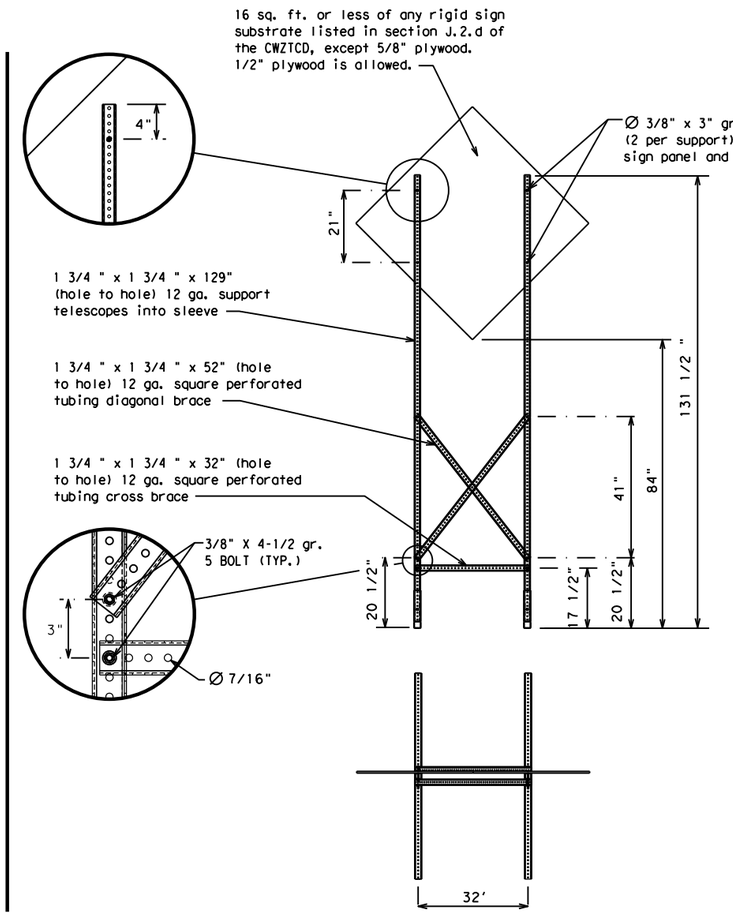


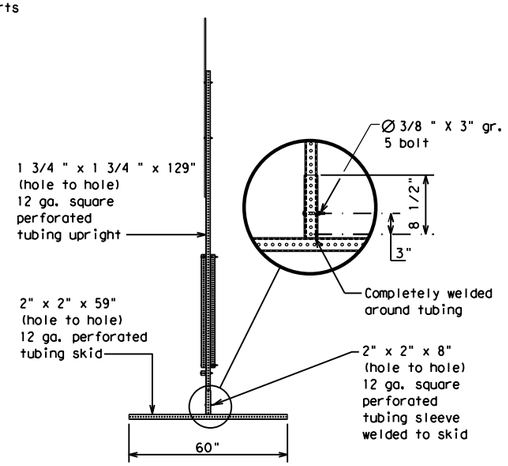
PERFORATED SQUARE METAL TUBING

GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

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BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0027	07	046,ETC.	UA 90,ETC.
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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

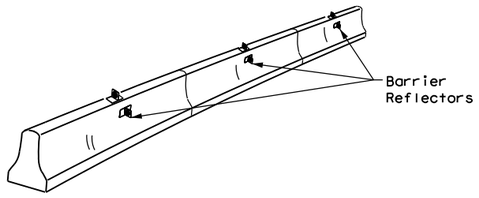
BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE:	bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS		0027	07	046,ETC.	UA 90,ETC.
9-07 8-14		DIST	COUNTY		SHEET NO.
7-13 5-21		HOU	FORT BEND,ETC.		11

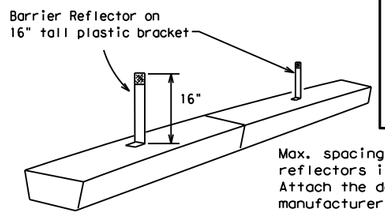
100

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



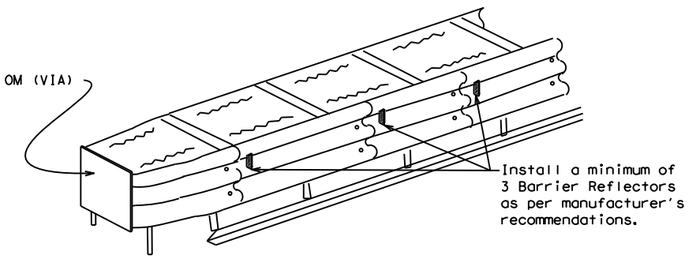
CONCRETE TRAFFIC BARRIER (CTB)

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



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

LOW PROFILE CONCRETE BARRIER (LPCB)



DELINEATION OF END TREATMENTS

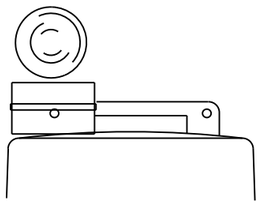
LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

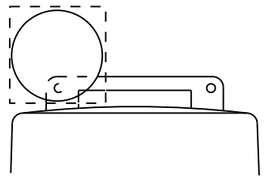
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

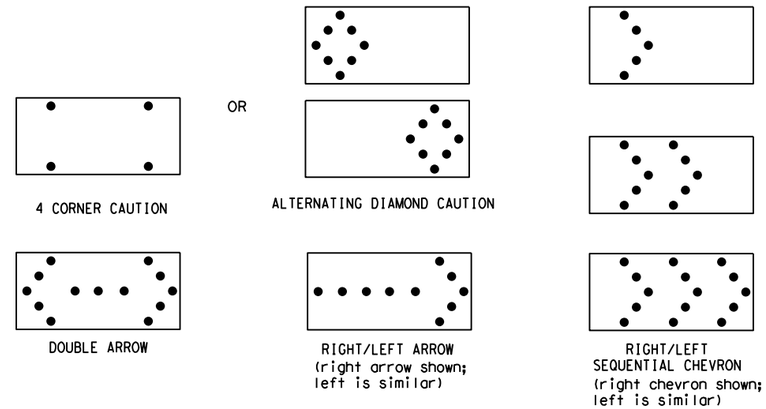
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

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Traffic Safety Division Standard

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

BC(7)-21

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REVISIONS	0027	07	046,ETC.	UA 90,ETC.
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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:

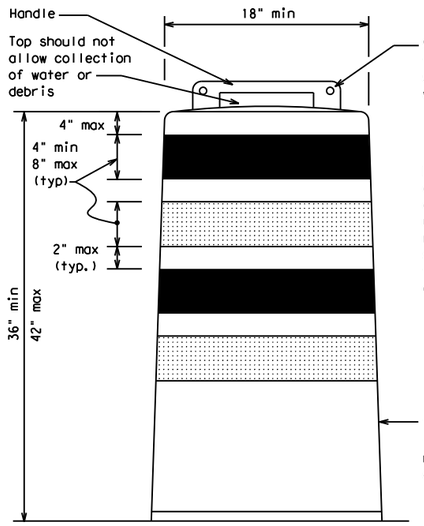
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

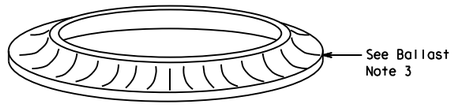
RETROREFLECTIVE SHEETING

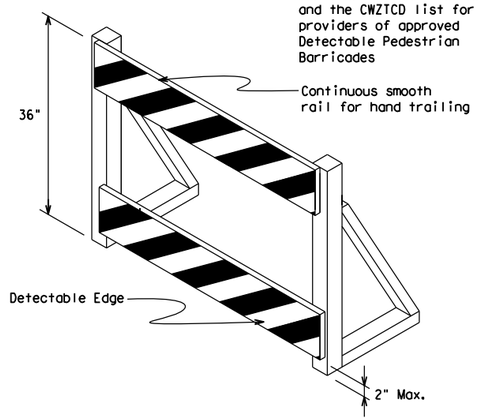
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

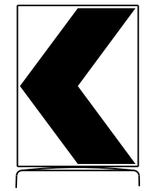




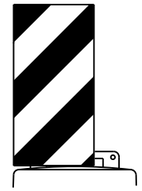


DETECTABLE PEDESTRIAN BARRICADES

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

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4-03 8-14	DIST	COUNTY		SHEET NO.
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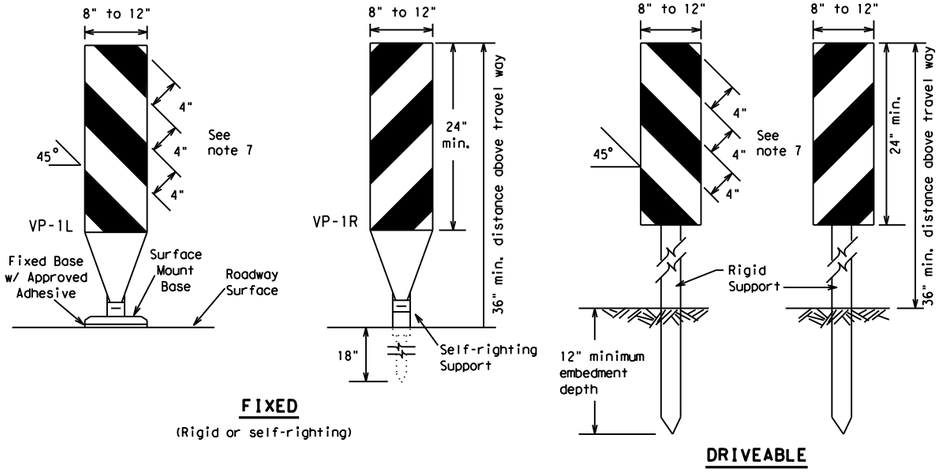
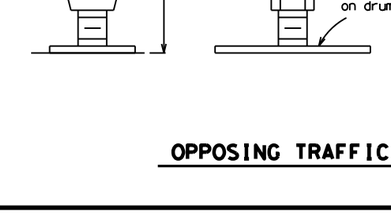


FIXED
(Rigid or self-righting)

DRIVEABLE

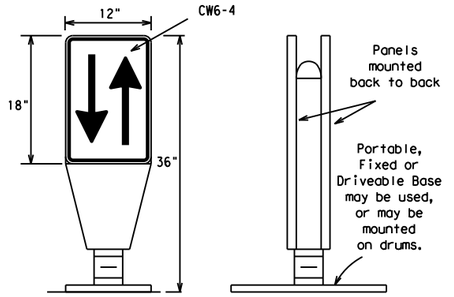


(Rigid or self-righting)

PORTABLE

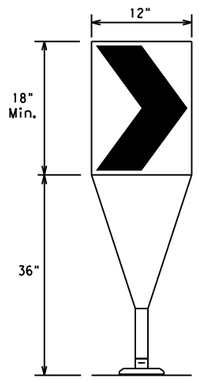
VERTICAL PANELS (VPs)

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



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



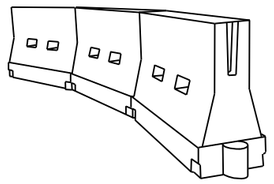
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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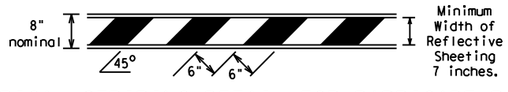
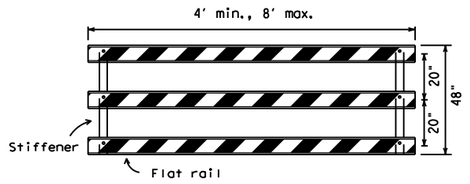
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



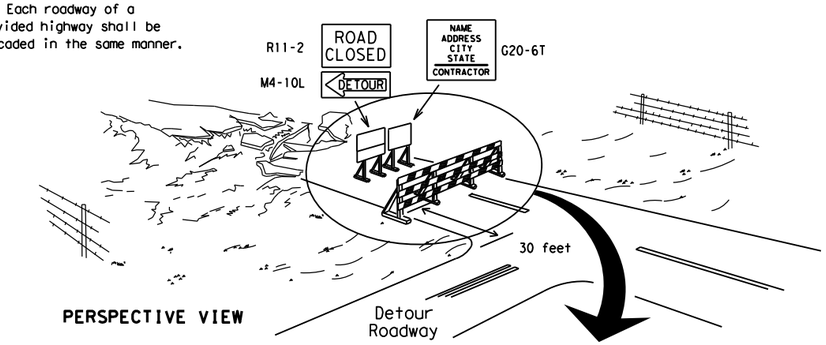
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

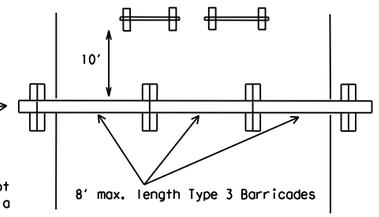
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

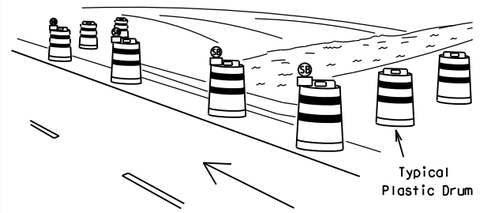
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

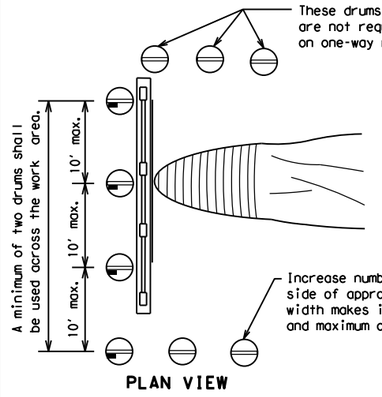
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

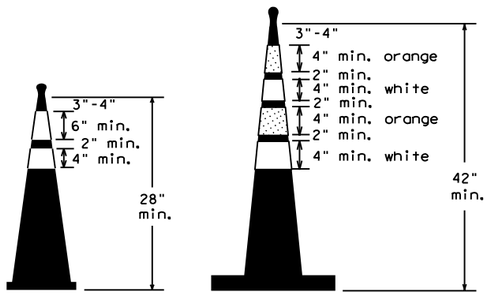
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



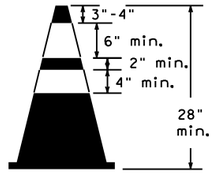
LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
SB	Steady burn warning light or yellow warning reflector

PLAN VIEW

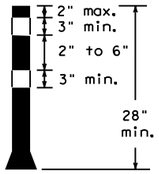
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

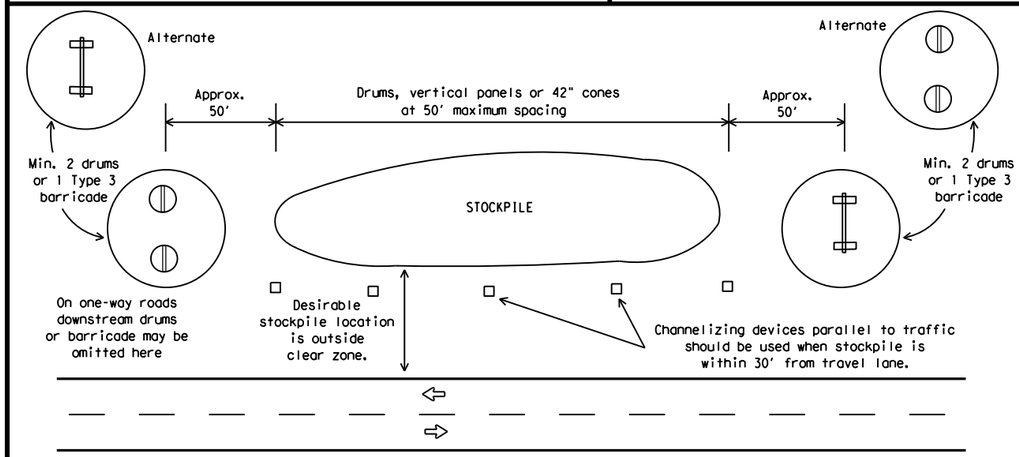


Tubular Marker

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13 5-21	0027	07	046,ETC.	UA 90,ETC.
	DIST	COUNTY		SHEET NO.
	HOU	FORT BEND,ETC.		15

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

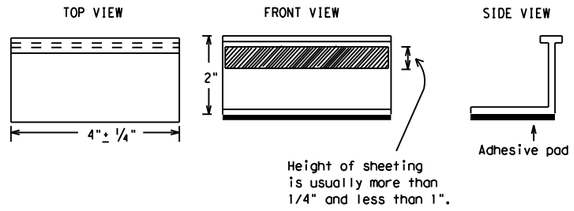
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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	DIST	COUNTY		SHEET NO.
	HOU	FORT BEND,ETC.		16

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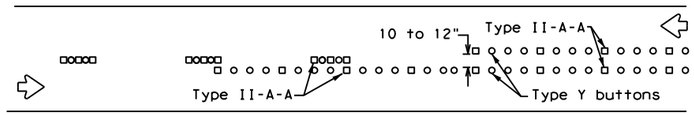
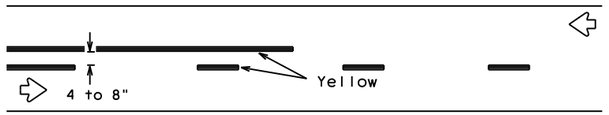
PAVEMENT MARKING PATTERNS

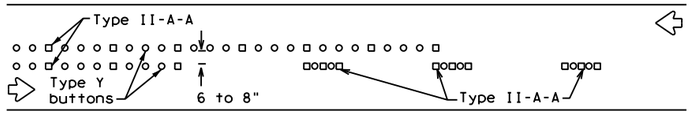
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



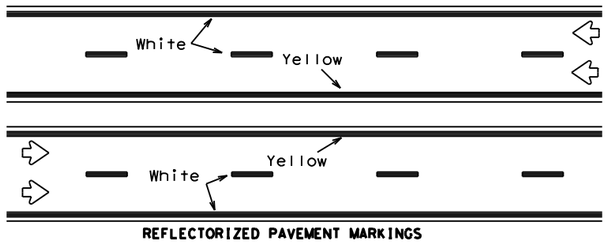
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



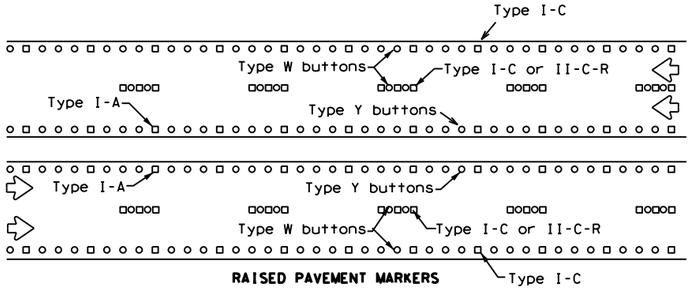
RAISED PAVEMENT MARKERS - PATTERN B

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



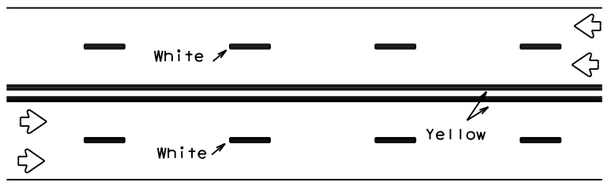
REFLECTORIZED PAVEMENT MARKINGS



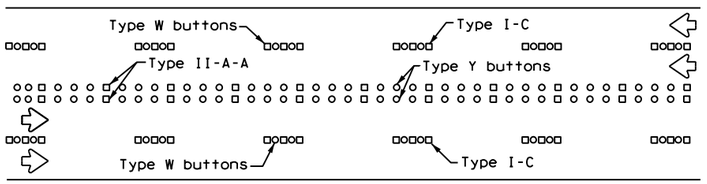
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



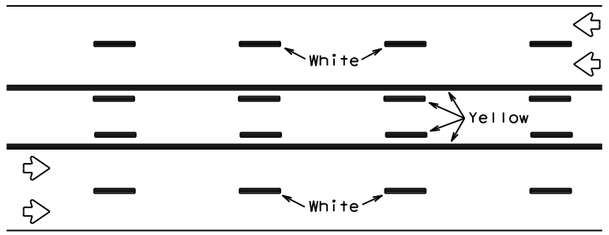
REFLECTORIZED PAVEMENT MARKINGS



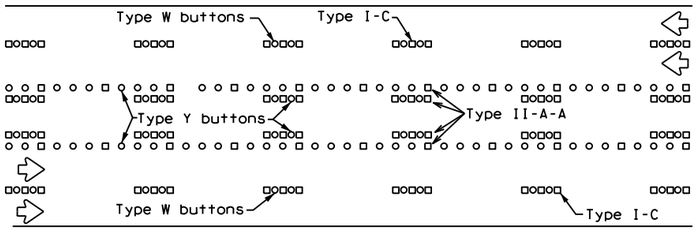
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

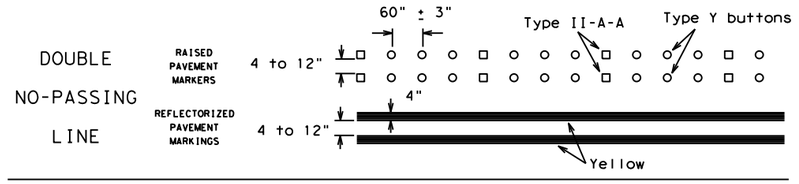
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

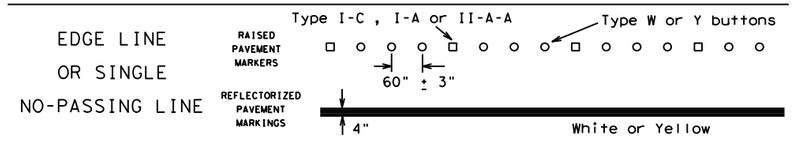
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

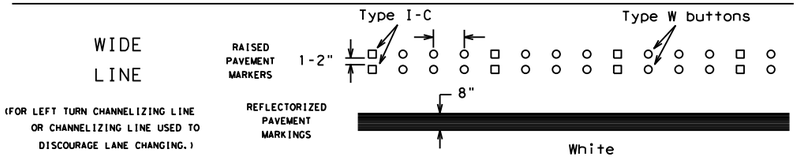


EDGE LINE OR SINGLE NO-PASSING LINE



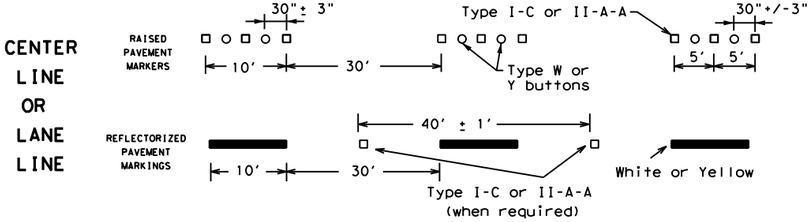
WIDE LINE

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

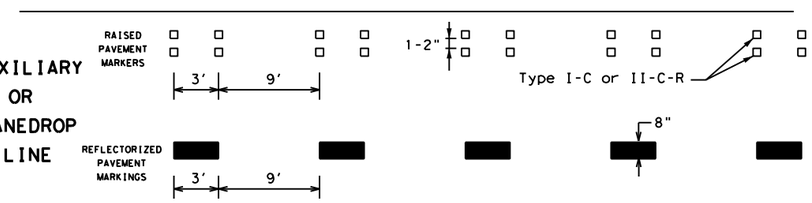


BROKEN LINES

CENTER LINE OR LANE LINE

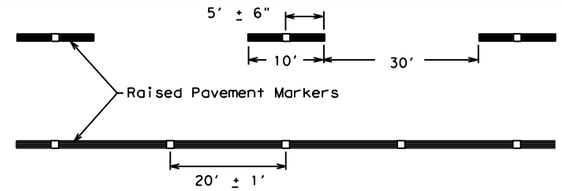


AUXILIARY OR LANEDROP LINE



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
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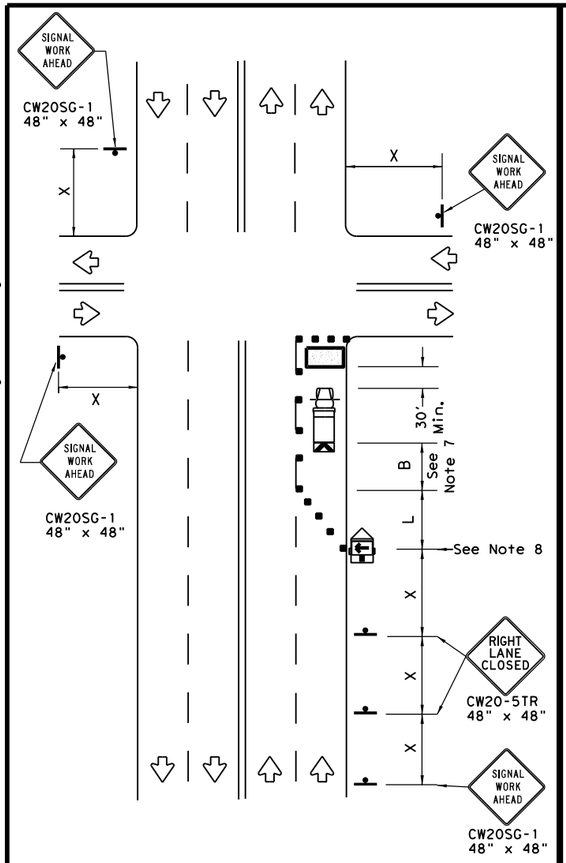
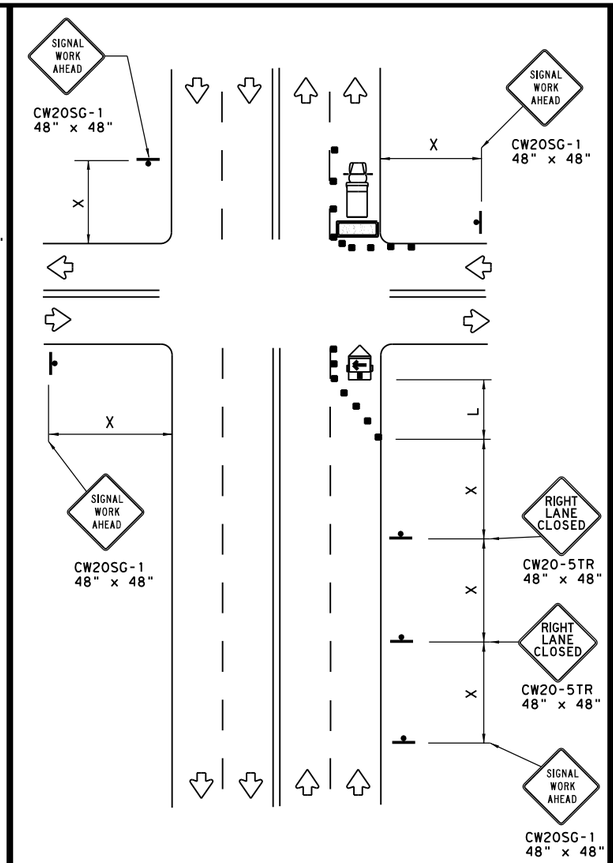
	DIST	COUNTY		SHEET NO.
	HOU	FORT BEND,ETC.		17



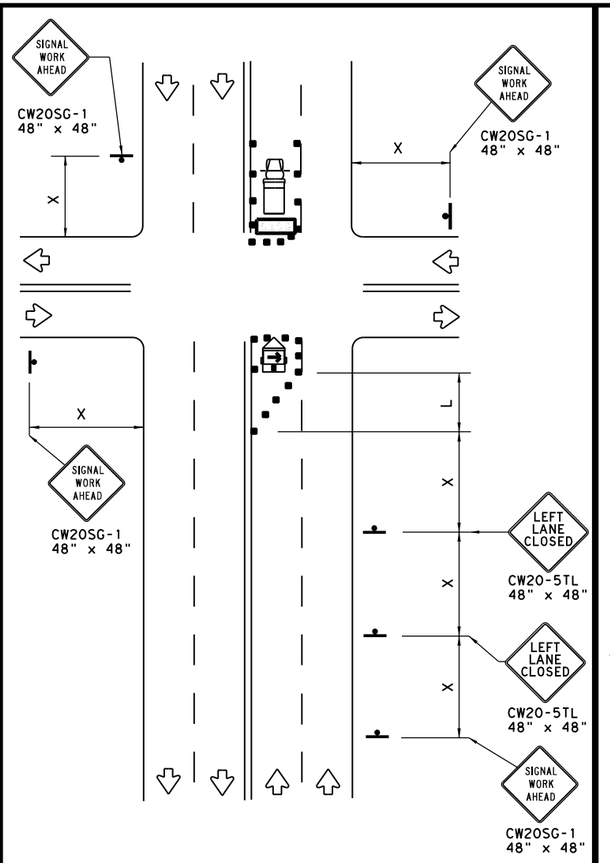
NEAR SIDE LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



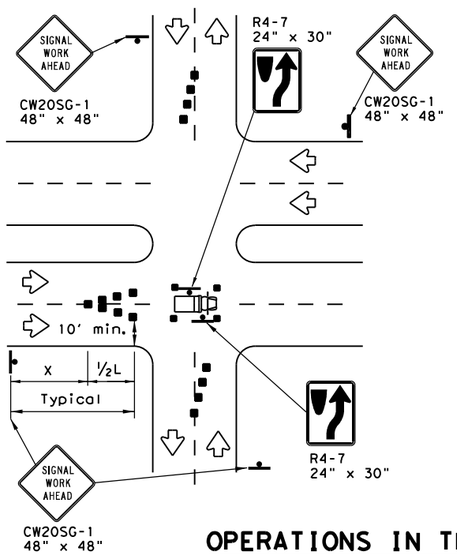
FAR SIDE RIGHT LANE CLOSURE

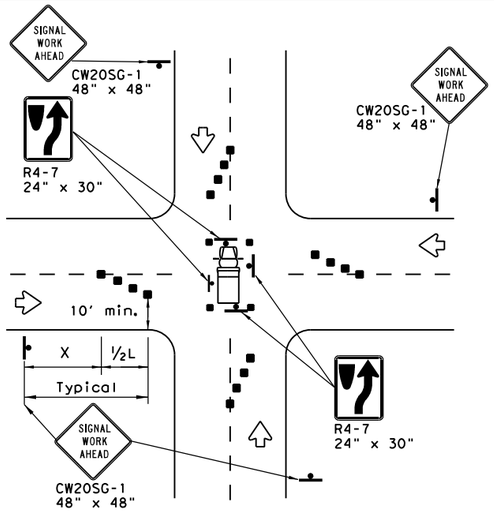
SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE LEFT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY





OPERATIONS IN THE INTERSECTION

SHORT DURATION

GENERAL NOTES

1. The minimum size channelizing device is the 28" cone. 42" Two-piece cones, drums, vertical panels or barricades will be required when the device must be left unattended at night.
2. Obstructions or hazards at the work area shall be clearly marked and delineated at all times.
3. Flaggers and Flagger Symbol (CW20-7) signs may be required according to field conditions.
4. Vehicles parked in roadway shall be equipped with at least two high intensity rotating, flashing, oscillating or strobe type lights.
5. High level warning devices (flag trees) may be used at corners of the vehicle.
6. When work operations are performed on existing signals, the signals may be placed in flashing red mode when approved by the engineer. If existing signals do not have power, All-Way Stop (R1-1 and R1-3P) signs may be implemented when approved by the engineer.
7. For Short-Term Stationary work the buffer space "B" from the above table should be used if field conditions permit. For Short Duration (less than 1 hour) any buffer space provided will enhance the safety of the setup.
8. The arrow board at this location may be omitted for Short Duration work if the work vehicle has an arrow board in operation. As an option, the arrow board may be placed at the end of the taper in the closed lane if space is not available at the beginning of the taper.
9. Signs and devices for the NEAR SIDE LANE CLOSURE may be altered for a left lane closure by using a LEFT LANE CLOSED (CW20-5TL) and adding channelizing devices on the centerline to protect the work space from opposing traffic.

LEGEND

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

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

* Conventional Roads Only

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

WORKERS IN BUCKET TRUCKS SHALL NOT WORK ABOVE OPEN LANES OF TRAFFIC.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ(BTS-1)-13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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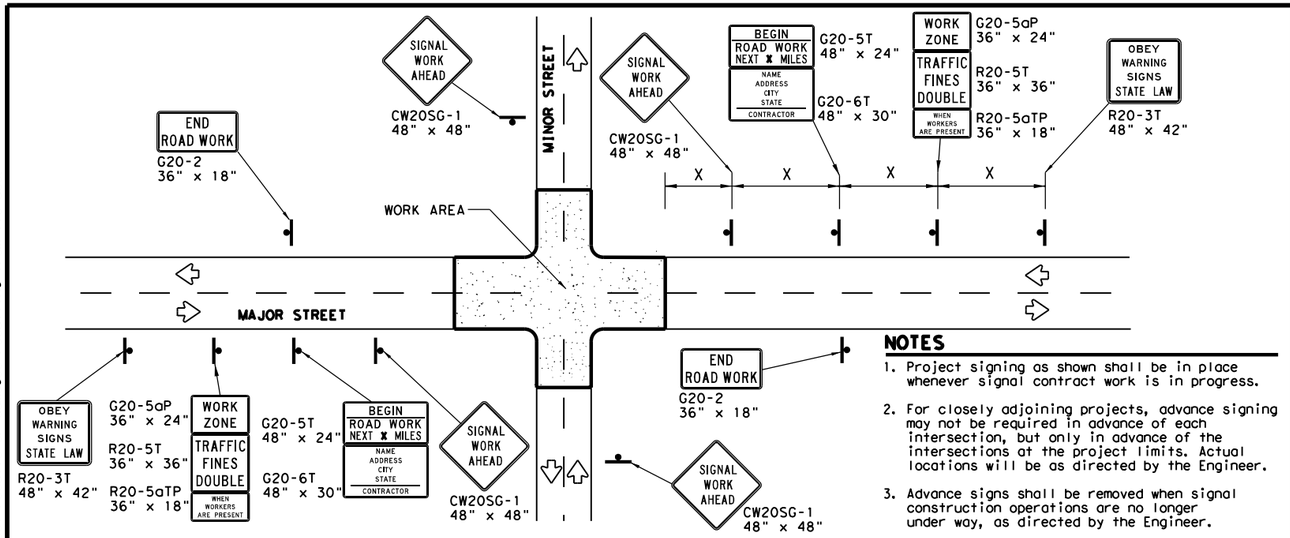
REVISIONS	0027	07	046,ETC.	UA 90,ETC.
2-98 10-99 7-13 4-98 3-03	DIST	COUNTY		SHEET NO.
	HOU	FORT BEND,ETC.		18



TYPICAL ADVANCE SIGNAL PROJECT SIGNING

FOR LONG TERM and INTERMEDIATE-TERM STATIONARY WORK OPERATIONS

NOTES

1. Project signing as shown shall be in place whenever signal contract work is in progress.
2. For closely adjoining projects, advance signing may not be required in advance of each intersection, but only in advance of the intersections at the project limits. Actual locations will be as directed by the Engineer.
3. Advance signs shall be removed when signal construction operations are no longer under way, as directed by the Engineer.
4. Warning sign spacing shown is typical for both directions.
5. See the Table on sheet 1 of 2 for Typical warning sign spacing.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Signs shall be installed and maintained in a straight and plumb condition.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. Nails shall NOT be used to attach signs to any support.
5. All signs shall be installed in accordance with the plans or as directed by the Engineer.
6. The Contractor shall furnish the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD).
7. The Contractor shall furnish sign supports and substrates listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD), installed as per the manufacturer's recommendations.
8. Temporary signs that have damaged or cracked substrates and/or damaged or marred reflective sheeting shall be replaced as directed by the Engineer.
9. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1".
10. Damaged wood posts shall be replaced. Splicing wood posts will not be allowed.

DURATION OF WORK

1. Work zone durations are defined in Part 6, Section 6G.02 of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

SIGN MOUNTING HEIGHT

1. Sign height of Long-term/Intermediate-term warning signs shall be as shown on Figure 6F-1 of the TMUTCD.
2. Sign height of Short-term/Short Duration warning signs shall be as shown on Figure 6F-2 of the TMUTCD.
3. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered, unless otherwise approved by the Engineer.
2. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night without damaging the sign sheeting. Burlap, or heavy materials such as plywood or aluminum shall not be used to cover signs.
3. Duct tape or other adhesive material shall NOT be affixed to a sign face.
4. Signs and anchor stubs shall be removed and holes back filled upon completion of the work.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the requirements of the DMS and color usage table shown on this sheet.

SIGN SUPPORT WEIGHTS

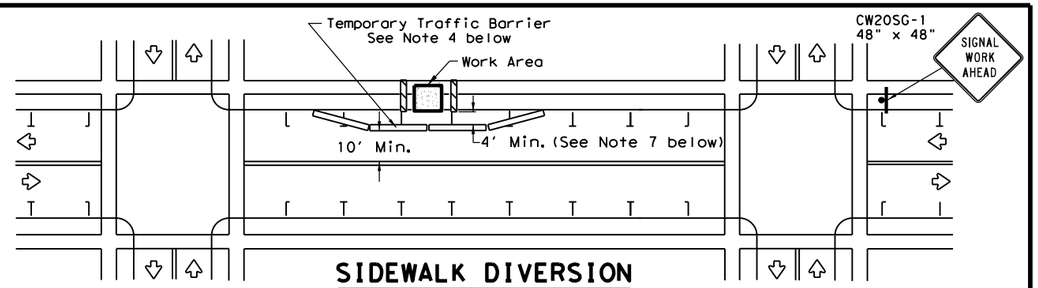
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support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

LEGEND	
	Sign
	Channelizing Devices
	Type 3 Barricade

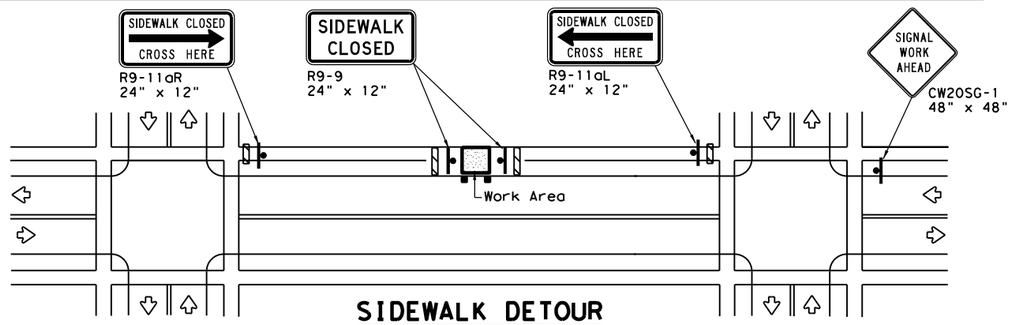
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

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

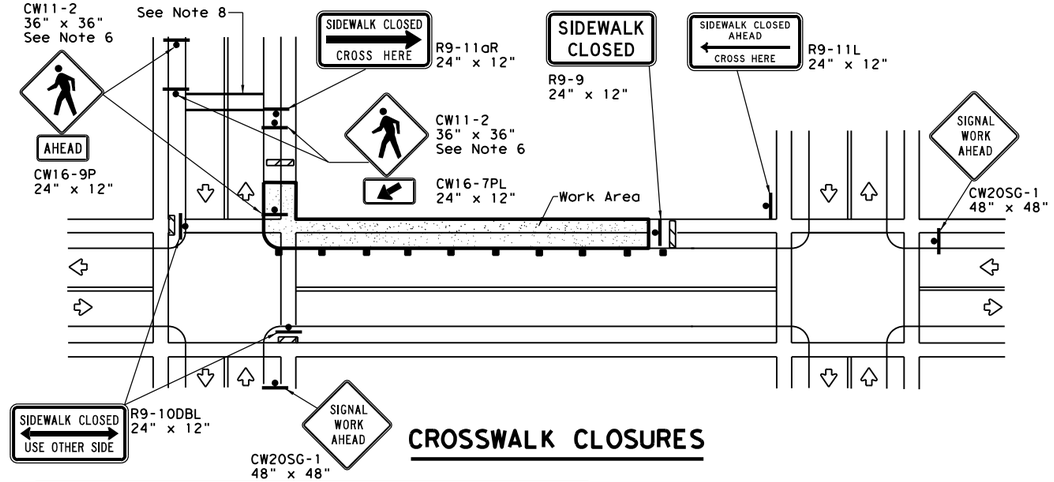
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



SIDEWALK DIVERSION



SIDEWALK DETOUR



CROSSWALK CLOSURES

PEDESTRIAN CONTROL

1. Holes, trenches or other hazards shall be adequately protected by covering, delineating or surrounding the hazard with orange plastic pedestrian fencing or longitudinal channelizing devices, or as directed by the Engineer.
2. "CROSSWALK CLOSURES" as detailed above will require the Engineer's approval prior to installation.
3. R9 series signs shown may be placed on supports detailed on the BC standards or CWZTCD list, or when fabricated from approved lightweight plastic substrates, they may be mounted on top of a plastic drum at or near the location shown.
4. For speeds less than 45 mph longitudinal channelizing devices may be used instead of traffic barriers when approved by the Engineer. Attenuation of blunt ends and installation of water filled devices shall be as per BC(9) and manufacturer's recommendations.
5. Location of devices are for general guidance. Actual device spacing and location must be field adjusted to meet actual conditions.
6. Where pedestrians with visual disabilities normally use the closed sidewalk Detectable Pedestrian Barricades should be used instead of the Type 3 Barricades shown.
7. The width of existing sidewalk should be maintained if practical.
8. Pavement markings for mid-block crosswalks shall be paid for under the appropriate bid items.
9. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ(BTS-2)-13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0027	07	046, ETC.	UA 90, ETC.
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03	HOU	FORT BEND, ETC.		19

NOTES FOR FIBER OPTICS CABLE LAYOUT:

1. USE TYPE 1 GROUND BOX, INSTALLED NEAR CONTROLLER, EXCLUSIVELY FOR FIBER OPTIC CABLE WITH CONDUIT ONLY.

2. DO NOT INSTALL ANY OTHER ELECTRICAL CABLE OR CONDUIT IN THE TYPE 1 GROUND BOX. GROUND METAL GROUND BOX COVERS. BOND THE GROUND BOX COVER AND GROUND CONDUCTORS TO THE GROUND ROD LOCATED IN THE GROUND BOX AND THE SYSTEM GROUND.

3. ALL EXISTING CONTROLLERS SHOULD BE COMPATABLE WITH ITS SYSTEM.

4. DURING CONSTRUCTION AND UNTIL PROJECT COMPLETION, PROVIDE PERSONNEL AND EQUIPMENT NECESSARY TO REMOVE GROUND BOX LIDS FOR INSPECTION. PROVIDE THIS ASSISTANCE WITHIN 24 HOURS OF NOTIFICATION.

5. FOR EACH GROUND BOX ON THIS PROJECT IN WHICH CABLE IS ADDED OR REMOVED, AFFIX A TAG TO THE CABLING REMAINING IN THE BOX CLEARLY STATING THAT THE BOX CONTAINS CABLING WHICH IS SUPPLIED BY MORE THAN ONE POWER SOURCE. ENSURE THE TAG IS LAMINATED AND HAS MINIMUM DIMENSTIONS OF 4 INCHES BY 6 INCHES.

6. THE GROUND BOX LOCATIONS ARE APPROXIMATE. ALTERNATE GROUND BOX LOCATIONS MAY BE USED AS DIRECTED, TO AVOID PLACING IN SIDEWALKS OR DRIVEWAYS.

7. FULLY TEST THE PROPOSED FIBER OPTIC CABLE IN ACCORDANCE WITH THE TESTING REQUIREMENTS OF THE SPECIFICATIONS.

8. FIBER OPTIC CABLES COILED IN GROUND BOXES WITH WATER PROOF SPLICE ENCLOSURES SHALL NOT EXCEED FIFTEEN FEET PER CABLE UNLESS OTHERWISE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER IN THE FIELD. SEE STANDARDS (ITS 42-16 AND ITS 43-16)

9. IF USING CASING TO PLACE BORED CONDUIT, CONSIDER THE CASING INCIDENTAL TO THE CONDUIT.

10. IF WORKING NEAR POWER LINES, COMPLY WITH THE APPROPRIATE SECTIONS OF TEXAS STATE LAW AND FEDERAL REGULATIONS RELATING TO THE TYPE OF WORK INVOLVED.

11. PROVIDE A SINGLE 1#14 INSULATED WIRE IN CONDUIT RUNS WHICH HAVE BEEN INDENTIFIED IN THE PLANS TO CARRY FIBER OPTIC CABLE. PROVIDE UL LISTED SOLID COPPER WIRE WITH ORANGE COLOR TYPE XHHW POLYETHYLENE INSULATION. THIS WIRE WILL SERVE AS A TRACER, OR LOCATE WIRE FOR LOCATING UNDERGROUND CONDUIT CONTAINING FIBER OPTIC CABLING AND WILL BE PAID FOR UNDER ITEM 620, "ELECTRICAL CONDUCTORS."

12. PROVIDE THE FIBER OPTIC CABLE SYSTEM COMPLETE WITH INCIDENTAL WORK, MATERIAL, AND SERVICES NOT EXPRESSLY CALLED FOR IN THE SPECIFICATIONS, OR NOT SHOWN ON THE PLANS, BUT WHICH MAY BE NECESSARY FOR A COMPLETE AND PROPERLY FUNCTIONING SYSTEM. CONSIDER THIS AS PART OF THIS BID ITEM.

13. FURNISH ALL EQUIPMENT, MATERIAL, AND LABOR NECESSARY FOR IDENTIFICATION AND PROTECTION OF THE UTILIZED FIBERS.

14. CONSTRUCT BORE PITS A MINIMUM OF FIVE FEET FROM THE EDGE OF THE BASE OR PAVEMENT. CLOSE THE BORE PIT HOLES OVERNIGHT. CONSIDER PAYMENT FOR BORED CONDUIT AS THE WIDTH OF THE ROADWAY PLUS FIVE FEET ON EACH SIDE OF ROADWAY.

15. REPAIR OR REPLACE PAVEMENT AND SIDEWALKS DAMAGED BY THE CONTRACTOR'S FORCES DURING CONSTRUCTION AT NO COST TO THE DEPARTMENT.

16. CLEAR AND TEST THE EXISTING CONDUITS DESTINED FOR USE ON THIS PROJECT.

17. GROUND ALL EXISTING METAL GROUND BOX COVERS AS OUTLINED ON LATEST STANDARD SHEET ED(4)-14. REPLACEMENTS FOR THESE GROUND BOXES MUST BE MADE OF POLYMER CONCRETE AS DETAILED ON THE LATEST STANDARD SHEET ED(4)-14. THE MATERIALS AND LABOR ASSOCIATED WITH THIS WORK IS SUBSIDIARY TO VARIOUS BID ITEMS IN THE PROJECT.

18. LIMITS OF PAY FOR BORED CONDUITS SHALL NOT EXTEND MORE THAN FIVE FEET IN FRONT OF AND BEYOND THE ROADWAY OR DRIVEWAY THAT IS BEING BORED UNDER. WHEN MULTIPLE DRIVEWAYS EXIST, THE CONTRACTOR MAY BE ALLOWED TO BORE UNDER THE ENTIRE GROUP OF DRIVEWAYS PROVIDED THE DRIVEWAYS DO NOT EXCEED FORTY FOOT SPACING AS APPROVED BY THE ENGINEER IN THE FIELD. NO INCREASE FOR BORED CONDUITS WILL BE INCURRED FOR THIS WORK. CONDUIT BORED BETWEEN MULTIPLE DRIVEWAYS TO BE PAID FOR AS TRENCHED CONDUIT.

19. CONSTRUCT CONCRETE APRON, IF NECESSARY, IN ACCORDANCE WITH THE LATEST STANDARD SHEET ED(4)-14. FOR TY 1 GROUND BOX CONSTRUCT THE CONCRETE APRON IN ACCORDANCE WITH DETAILS SHOWN ON THE "GROUND BOX DETAILS ITS(37)-16" STANDARD.

20. INSTALL A FIBER OPTIC FAN OUT KIT ON THE FIBER DROP CABLE IN EACH CONTROLLER CABINET. THE FAN OUT KIT SHALL BE CONSIDERED INCIDENTAL TO THE PERTINENT BID ITEMS IN THIS PROJECT.

21. FURNISH AND INSTALL ALL FIBER OPTIC CABLES AND ACCESSORIES FOR A COMPLETE AND OPERATIONAL SYSTEM.

22. USE SCHEDULE 80 PVC CONDUIT TO HOUSE ALL CONDUCTOR RUNS UNDER PAVED RIPRAP, ROADWAY, OR DRIVEWAYS UNLESS OTHERWISE SHOWN IN THE PLANS.

23. UNLESS OTHERWISE NOTED ON THE PLANS, PLACE CONDUIT RUNS BEHIND CURBS AT ALL LOCATIONS WHERE CURB EXISTS.

24. REFER TO TXDOT'S WEBSITE FOR PREQUALIFIED PRODUCTS LIST REGARDING CONDUITS, CONDUCTORS, GROUND BOXES, AND ELECTRICAL SERVICE. CHECK WEBSITE PERIODICALLY FOR CURRENT UPDATES.

25. USE RIGID METAL CONDUIT (RMC) FOR EXPOSED CONDUIT.

26. JUNCTION BOXES USED TO ATTACH TO BRIDGE STRUCTURES SHALL BE CONSIDERED INCIDENTAL TO THE PERTINENT BID ITEMS IN THIS PROJECT.

27. WHEN PULLING CABLES OR CONDUCTORS THROUGH THE CONDUIT, DO NOT EXCEED THE MANUFACTURER'S RECOMMENDED PULLING TENSIONS. LUBRICATE THE CABLES OR CONDUCTORS WITH LUBRICANT RECOMMENDED BY THE CABLE MANUFACTURER.

28. FURNISH ALL MATERIAL AND SERVICES NECESSARY FOR CONNECTION OF NEW EQUIPMENT AND CABLE TO THE EXISTING FIBER OPTIC CABLE.

29. DURING CONSTRUCTION OF THE PROPOSED SIGNAL WORK, IF THE EXISTING TRAFFIC SIGNAL EQUIPMENT REQUIRES REPLACEMENT DUE TO WEAR, DETERIORATION, OR ANY CIRCUMSTANCE OVER WHICH THE CONTRACTOR HAS NO CONTROL, THE EQUIPMENT WILL BE FURNISHED BY THE DEPARTMENT AT NO COST TO THE CONTRACTOR. INSTALL THIS EQUIPMENT AT NO COST TO THE DEPARTMENT. SUCH MATERIALS WILL BE PROVIDED AT THE DEPARTMENT5#32S SIGNAL SHOP LOCATED AT 6810 KATY ROAD, HOUSTON, TEXAS. CONTACT MR. MICHAEL AWA, P.E., AT TELEPHONE NUMBER (713) 802-5661.

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

07/03/2023

NOTES FOR FIBER OPTIC CABLE LAYOUT

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046,ETC.	UA 90,ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND,ETC.		20

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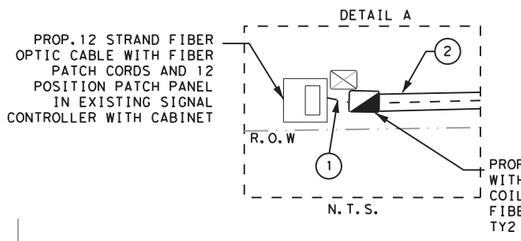
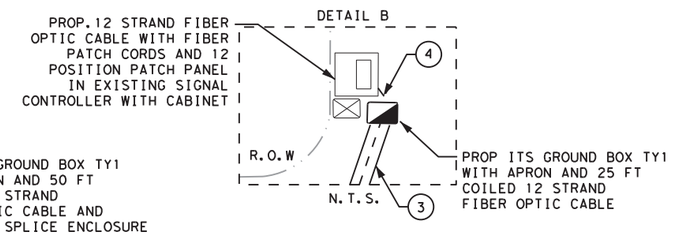
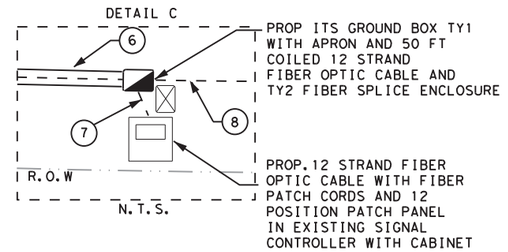
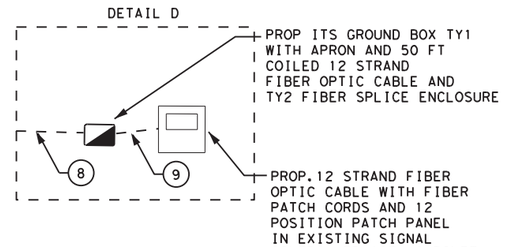
LEGEND

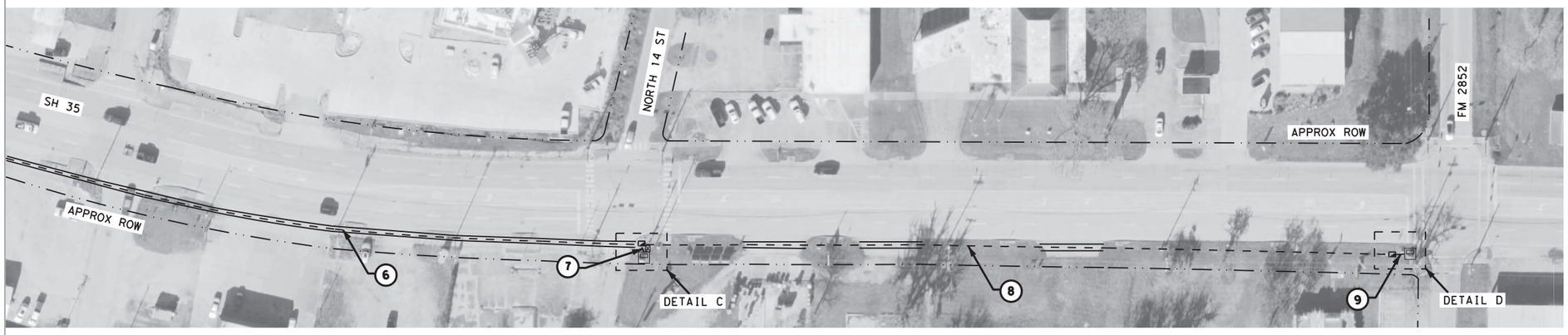
- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- PROPOSED ITS GROUND BOX TY1
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT(BORE)











CSJ: 0179-02-089

CONDUIT AND CONDUCTOR RUNS								
RUN NO.	CONDUIT (618)				TRACER (620)		FIBER (6007)	
	PVC				WIRE		SINGLE	
	2" (SCHD 80)				#14		12 STRAND	
	(6046)		(6047)		(6002)		(6011)	
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGT
	EA	LF	EA	LF	EA	LF	EA	LF
1	1	5			1	5	1	5
2			1	850	1	850	1	850
3			1	100	1	100	1	100
4	1	5			1	5	1	5
5			1	340	1	340	1	340
6			1	510	1	510	1	510
7	1	5			1	5	1	5
8	1	445	1	150	1	595	1	595
9	1	10			1	10	1	10
25' COILED FOC							1	25
50' COILED FOC							4	50
TOTAL (LF)		470		1950		2420		2645
EST. TOTAL		495		2050		2545		2780

NOTE:

LOCATIONS OF UNDERGROUND INSTALLATIONS ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL UTILITY LOCATIONS PRIOR TO ANY CONSTRUCTION.

THE CONTRACTOR SHALL CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATION OF UNDER-GROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING, OR EXCAVATING.

THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD.

ALL WORK MUST BE PERFORMED WITHIN TXDOT RIGHT OF WAY.

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

07/03/2023

SH 35
FROM BS 35 E TO FM 2852
FIBER OPTIC CABLE LAYOUTS

0 50 100 FT
SCALE: 1" = 100'

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		21

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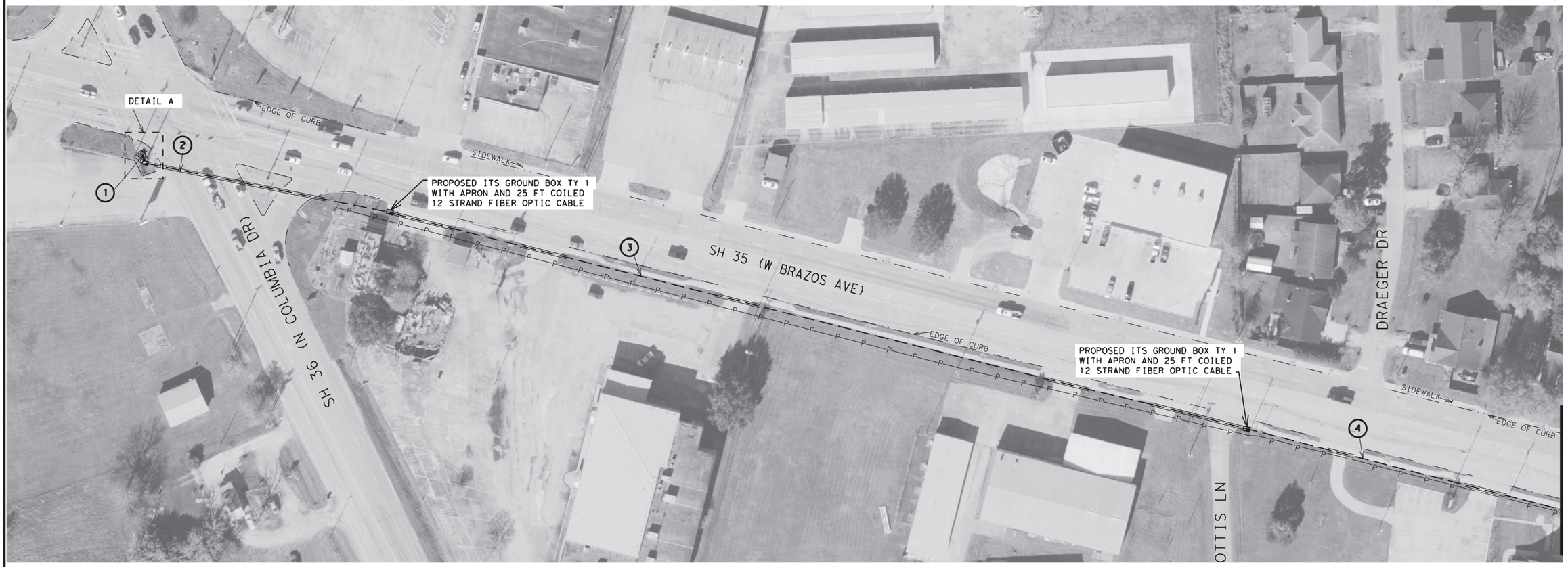
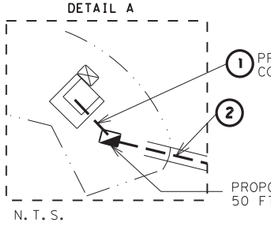


CSJ: 0188-07-006 BRAZORIA

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618) 2" PVC (SCH 80) (TRENCH) (6046) NO. EA	(TRENCH) (6046) LENGTH LF	(BORE) (6047) NO. EA	(BORE) (6047) LENGTH LF	TRACER (620) WIRE #14 INSULATED (6002) NO. EA	(6002) LENGTH LF	FIBER (6007) SINGLE MODE 12 STRAND (6011) NO. EA	(6011) LENGTH LF
1	2	10			1	10	1	10
2	1	80	1	180	1	260	1	260
3	1	565	1	300	1	865	1	865
4	1	250	1	80	1	330	1	330
25' COILED							2	25
50' COILED							1	50
TOTAL (LF)		915		560		1465		1565
EST. TOTAL		965		590		1540		1645

DETAIL A



1 PROP 12 STRAND FIBER OPTIC CONNECTED TO CONTROLLER WITH FIBER OPTIC FAN OUT KIT

2 PROPOSED ITS GROUND BOX TY 1 WITH APRON AND 50 FT COILED CABLE AND TY2 FIBER SPLICE ENCLOSURE

N. T. S.

LEGEND

—P——P— EXISTING OVERHEAD POWER LINE
EXISTING TRAFFIC SIGNAL CONTROLER
EXISTING GROUND BOX
PROPOSED ITS GROUND BOX TY 1
PROPOSED CONDUIT (TRENCH)
PROPOSED CONDUIT (BORE)

NOTE:

LOCATIONS OF UNDERGROUND INSTALLATIONS ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL UTILITY LOCATIONS PRIOR TO ANY CONSTRUCTION.

THE CONTRACTOR SHALL CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATION OF UNDERGROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING, OR EXCAVATING.

THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD. ALL WORK MUST BE PERFORMED WITHIN TXDOT RIGHT OF WAY,

DATE:
FILE: H:\Traffic Signals\LienNguyen\SH 35 0188-07-006 fiber optic\0188-07-006 SH 35 From BS 35E to SH 3\0188-07-006 SH 35 FROM SH 36 TO BS 35E -sheet 1 OF 2.dgn

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

07/03/2023

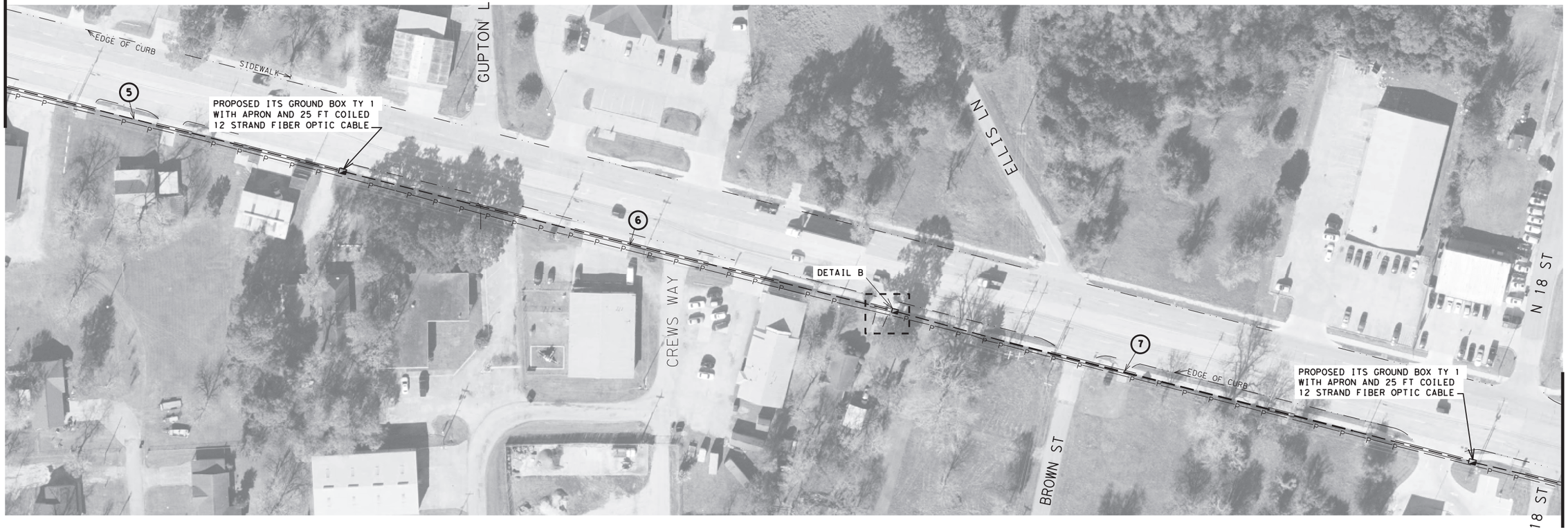
SH 35 FROM SH 36 TO BS 35E FIBER OPTIC CABLE LAYOUTS

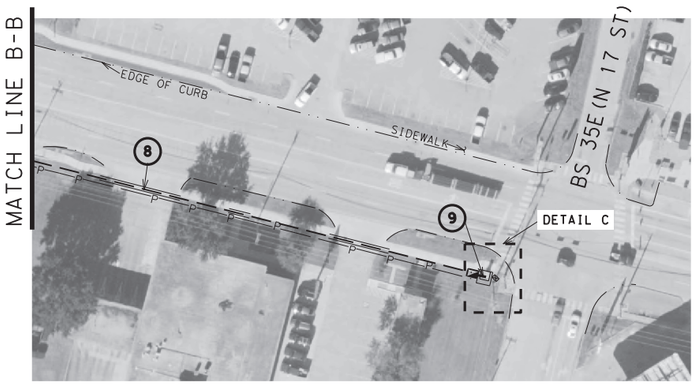
0 50 100
SCALE IN FEET
1" = 100'

SHEET 1 OF 2

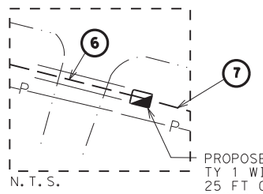
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		22





DETAIL B



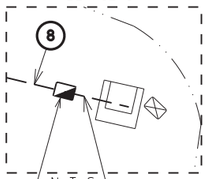
N.T.S.

PROPOSED ITS GROUND BOX TY 1 WITH APRON AND 25 FT COILED 12 STRAND FIBER OPTIC CABLE

CSJ: 0188-07-006 BRAZORIA

CONDUIT AND CONDUCTOR RUNS								
RUN NO.	CONDUIT (618)				TRACER (620)		FIBER (6007)	
	2" PVC (SCH 80)				WIRE		SINGLE MODE	
	(TRENCH) (6046)		(BORE) (6047)		#14 INSULATED (6002)		12 STRAND (6011)	
	NO. EA	LENGTH LF	NO. EA	LENGTH LF	NO. EA	LENGTH LF	NO. EA	LENGTH LF
5	1	100	1	240	1	340	1	340
6	1	260	1	300	1	560	1	560
7	1	400	1	190	1	590	1	590
8	1	260	1	140	1	400	1	400
9	2	10			1	10	1	10
25' COILED							3	25
50' COILED							1	50
TOTAL (LF)		1040		870		1900		2025
EST. TOTAL		1095		915		1995		2130

DETAIL C



N.T.S.

9 PROP 12 STRAND FIBER OPTIC CONNECTED TO CONTROLLER WITH FIBER OPTIC FAN OUT KIT

PROPOSED ITS GROUND BOX TY 1 WITH APRON AND 50 FT COILED CABLE AND TY2 FIBER SPLICE ENCLOSURE

LEGEND

- —P—P— EXISTING OVERHEAD POWER LINE
- EXISTING TRAFFIC SIGNAL CONTROLER
- EXISTING GROUND BOX
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED CONDUIT (TRENCH)
- PROPOSED CONDUIT (BORE)

NOTE:

LOCATIONS OF UNDERGROUND INSTALLATIONS ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL UTILITY LOCATIONS PRIOR TO ANY CONSTRUCTION.

THE CONTRACTOR SHALL CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATION OF UNDERGROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING, OR EXCAVATING.

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STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

07/03/2023

SH 35 FROM SH 36 TO BS 35E FIBER OPTIC CABLE LAYOUTS

0 50 100
SCALE IN FEET
1" = 100'

SHEET 2 OF 2

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		23

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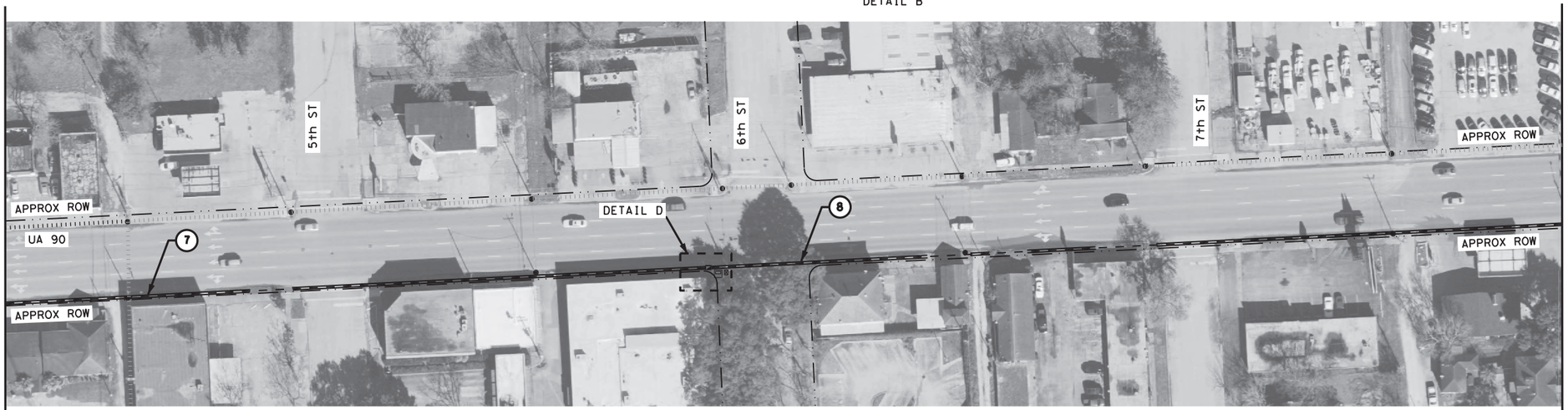
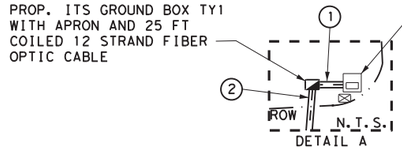
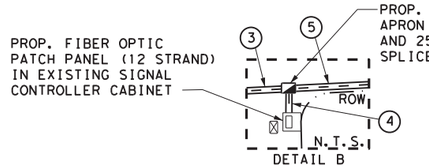
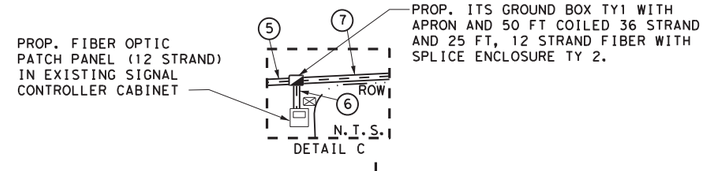


LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING CONDUIT
- EXISTING AERIAL INTERCONNECT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT (BORE)
- PROPOSED CONDUIT (RIGID METAL)







NOTE:

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THE CONTRACTOR SHALL CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATION OF UNDER-GROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING, OR EXCAVATING.

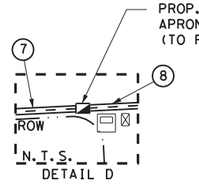
THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD.

ALL WORK MUST BE PERFORMED WITHIN TXDOT RIGHT OF WAY.

CCSJ: 0027-07-046

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618) 2" PVC (SCH 80) (TRENCH) (6046)		CONDUIT (618) 2" PVC (SCH 80) (BORE) (6047)		TRACER (620) WIRE #14 INSULATED (6002)		FIBER (6007) SINGLE MODE 12 STRAND (6011)		FIBER (6007) SINGLE MODE 36 STRAND (6013)	
	NO EA	LENGTH LF	NO EA	LENGTH LF	NO EA	LENGTH LF	NO EA	LENGTH LF	NO EA	LENGTH LF
1			1	15	1	15	1	15		
2			1	75	1	75	1	75		
3	1	130	1	650	1	780			1	780
4			1	15	1	15	1	15		
5			1	335	1	335			1	335
6			1	20	1	20	1	20		
7	1	35	1	575	1	610			1	610
8	1	110	1	365	1	475			1	475
25' COILED FOC							4	25		
50' COILED FOC									4	50
TOTAL (LF)		275		2050		2325		225		2400
EST. TOTAL		290		2155		2445		240		2520



07/03/2023

UA 90 FROM FM 723 TO FM 762 FIBER OPTIC CABLE LAYOUTS

SCALE: 1" = 100'

SHEET 1 OF 9

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		24

DATE: 6/30/2023
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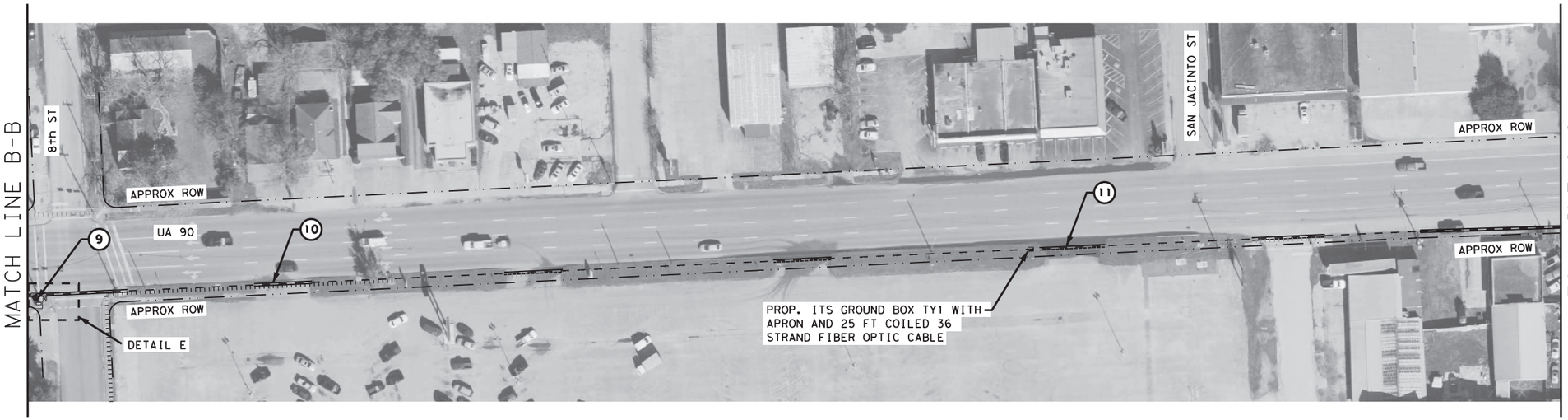
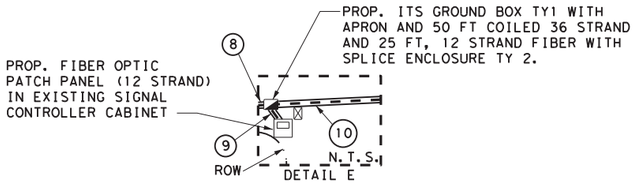


LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING CONDUIT
- EXISTING AERIAL INTERCONNECT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT (BORE)



CCSJ: 0027-07-046

CONDUIT AND CONDUCTOR RUNS										
RUN NO.	CONDUIT (618)				TRACER (620)		FIBER (6007)			
	2" PVC (SCH 80)				WIRE		SINGLE MODE		SINGLE MODE	
	(TRENCH) (6046)		(BORE) (6047)		#14 INSULATED (6002)		12 STRAND (6011)		36 STRAND (6013)	
	NO EA	LENGTH LF	NO EA	LENGTH LF	NO EA	LENGTH LF	NO EA	LENGTH LF	NO EA	LENGTH LF
8			1	5	1	5			1	5
9			1	15	1	15	1	15		
10	1	590	1	210	1	800			1	800
11	1	200	1	225	1	425			1	425
25' COILED FOC							1	25	1	25
50' COILED FOC									1	50
TOTAL (LF)		790		455		1245		40		1305
EST. TOTAL		830		480		1310		45		1375

NOTE:

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ALL WORK MUST BE PERFORMED WITHIN TXDOT RIGHT OF WAY.

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER
P.E.

07/03/2023

UA 90 FROM FM 723 TO FM 762 FIBER OPTIC CABLE LAYOUTS

0 50 100
SCALE: 1" = 100'

SHEET 2 OF 9

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		25

DATE: 6/29/2023 2:16:07 PM
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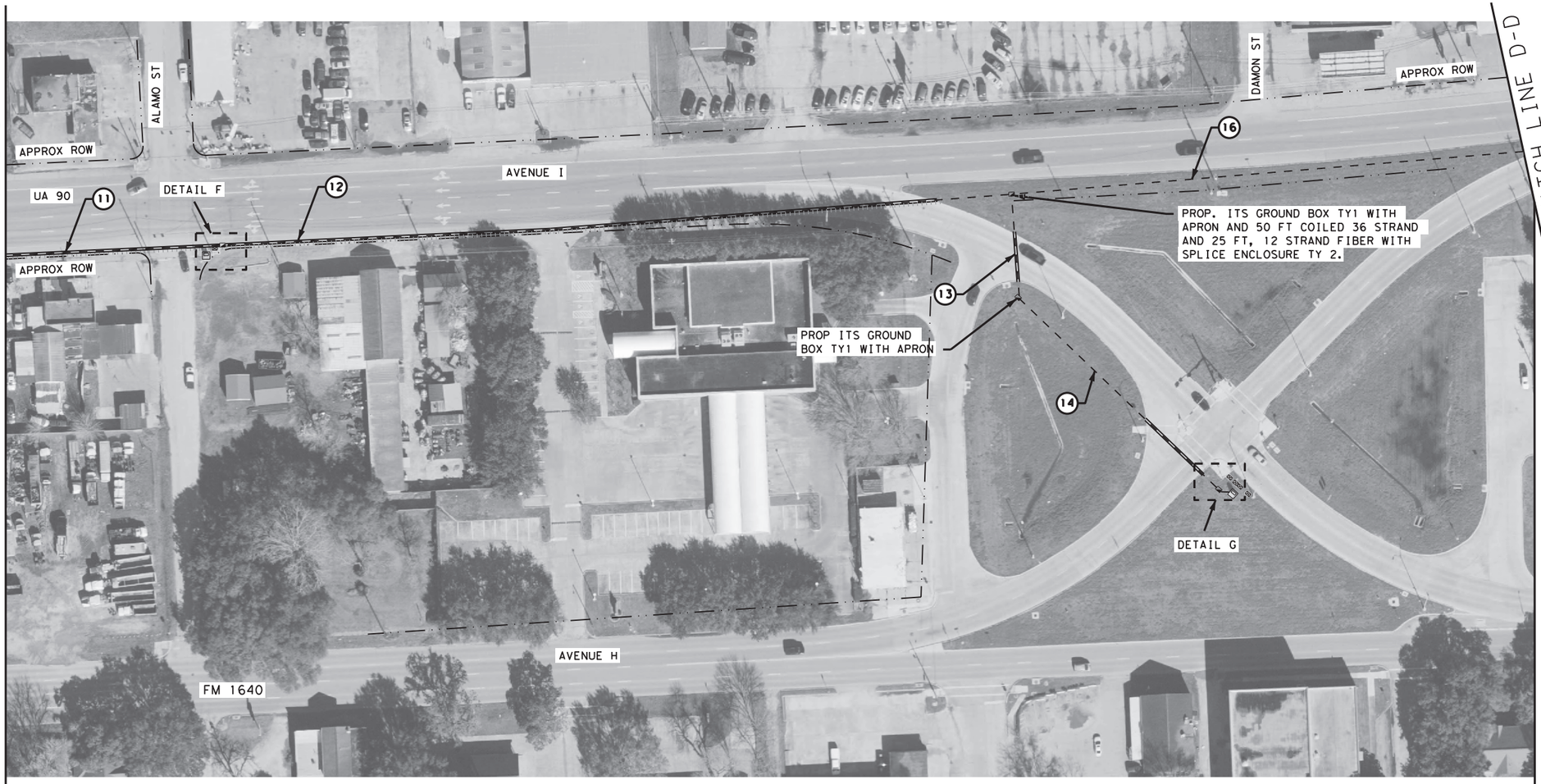
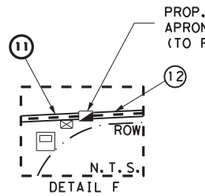


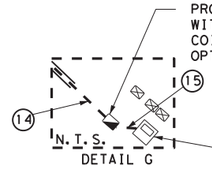
LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING CONDUIT
- EXISTING AERIAL INTERCONNECT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT (BORE)



PROP. ITS GROUND BOX TY1 WITH APRON AND 50 FT COILED 36 STRAND. (TO REMAIN FOR FUTURE USE)

DETAIL F



PROP. ITS GROUND BOX TY1 WITH APRON AND 25 FT COILED 12 STRAND FIBER OPTIC CABLE

PROP. FIBER OPTIC PATCH PANEL (12 STRAND) IN EXISTING SIGNAL CONTROLLER CABINET

DETAIL G

NOTE:

LOCATIONS OF UNDERGROUND INSTALLATIONS ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL UTILITY LOCATIONS PRIOR TO ANY CONSTRUCTION.

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CCSJ: 0027-07-046

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618) 2" PVC (SCH 80) (TRENCH) (6046)		CONDUIT (618) 2" PVC (SCH 80) (BORE) (6047)		TRACER (620) WIRE #14 INSULATED (6002)		FIBER (6007) SINGLE MODE 12 STRAND (6011)		FIBER (6007) SINGLE MODE 36 STRAND (6013)	
	NO EA	LENGTH LF	NO EA	LENGTH LF	NO EA	LENGTH LF	NO EA	LENGTH LF	NO EA	LENGTH LF
11			1	175		175			1	175
12	1	60	1	580	1	640			1	640
13	1	40	1	45	1	85	1	85		
14	1	160	1	65	1	225	1	225		
15	1	15			1	15	1	15		
16	1	415			1	415			1	415
25' COILED FOC							2	25		
50' COILED FOC									2	50
TOTAL (LF)		690		865		1380		375		1330
EST. TOTAL		725		910		1450		395		1400

MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
P.E.

07/03/2023

UA 90 FROM FM 723 TO FM 762 FIBER OPTIC CABLE LAYOUTS

0 50 100
SCALE: 1" = 100'

SHEET 3 OF 9

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		26

DATE: 6/29/2023 2:14:22 PM
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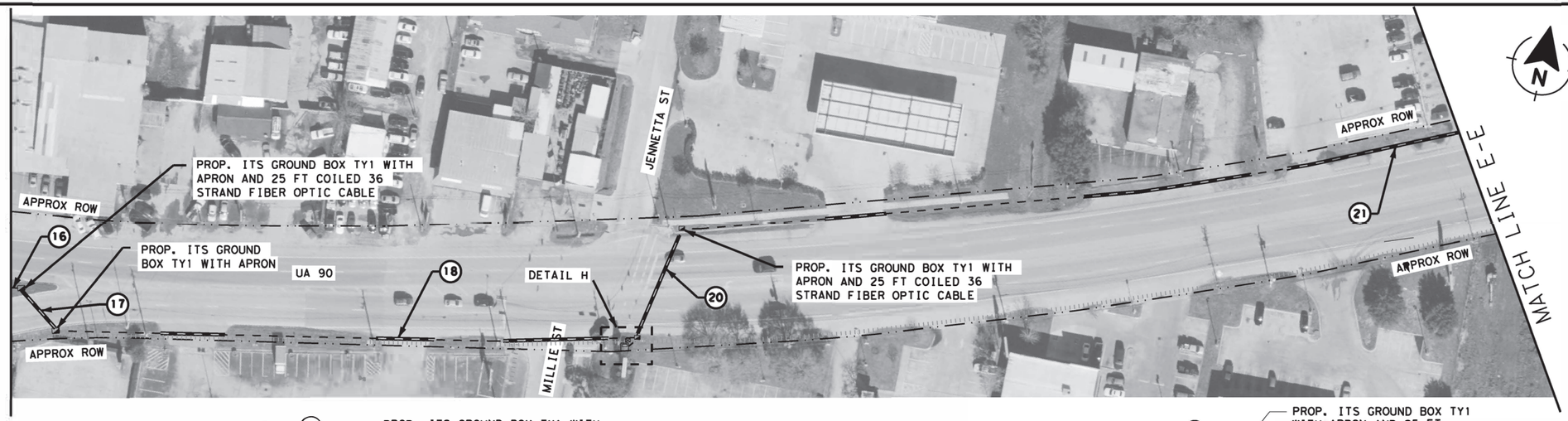

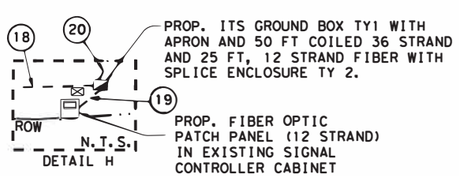

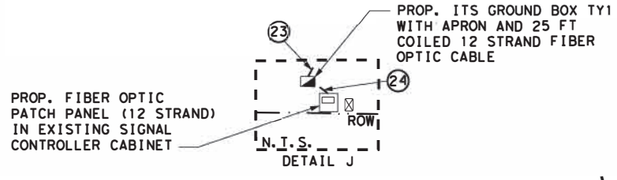

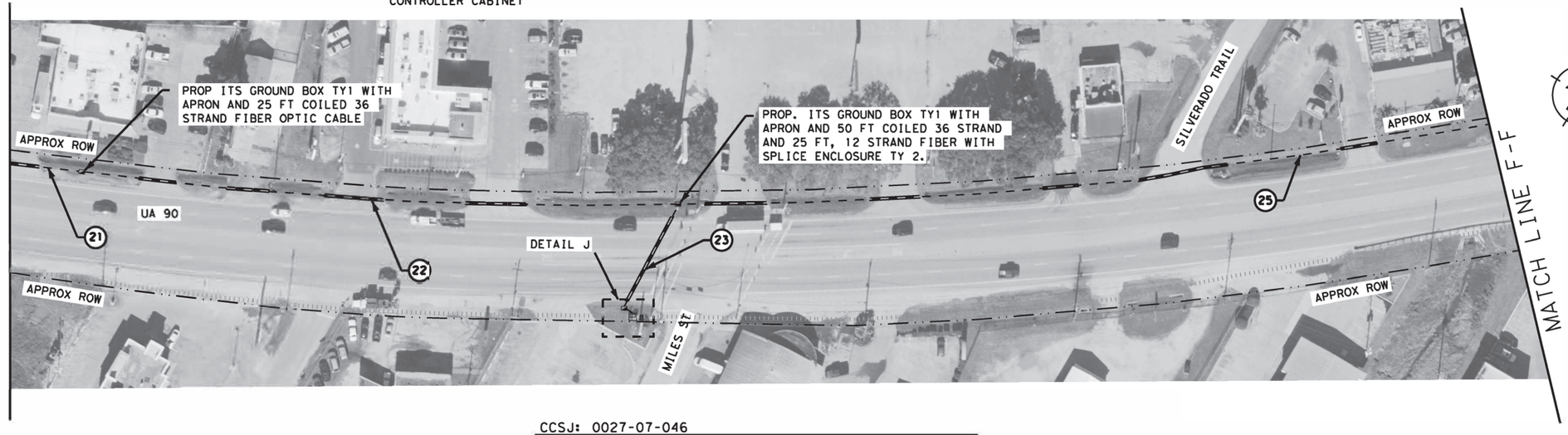

LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING CONDUIT
- EXISTING AERIAL INTERCONNECT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT (BORE)

NOTE:

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CCSJ: 0027-07-046

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618) 2" PVC (SCH 80) (TRENCH) (6046)		CONDUIT (618) 2" PVC (SCH 80) (BORE) (6047)		TRACER (620) WIRE #14 INSULATED (6002)		FIBER (6007) SINGLE MODE 12 STRAND (6011)		FIBER (6007) SINGLE MODE 36 STRAND (6013)	
	NO EA	LENGTH LF	NO EA	LENGTH LF	NO EA	LENGTH LF	NO EA	LENGTH LF	NO EA	LENGTH LF
16	1	10			1	10			1	10
17			1	45	1	45			1	45
18	1	280	1	185	1	465			1	465
19	1	15			1	15	1	15		
20			1	95	1	95			1	95
21	1	335	1	350	1	685			1	685
22	1	310	1	165	1	475			1	475
23	1	10	1	85	1	95	1	95		
24	1	10			1	10	1	10		
25	1	425	1	225	1	650			1	650
25' COILED FOC							3	25	3	25
50' COILED FOC									2	50
TOTAL (LF)		1395		1150		2545		195		2600
EST. TOTAL		1465		1210		2675		205		2730

07/03/2023

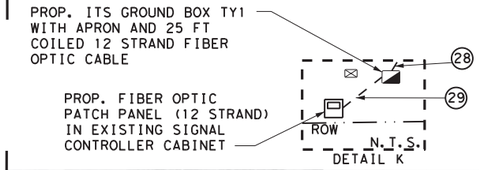
UA 90 FROM FM 723 TO FM 762 FIBER OPTIC CABLE LAYOUTS

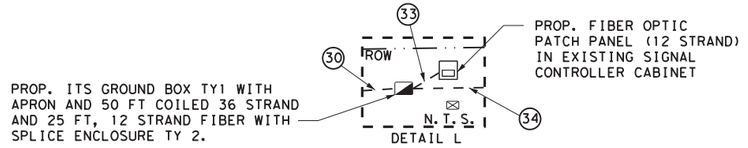
0 50 100
SCALE: 1" = 100'

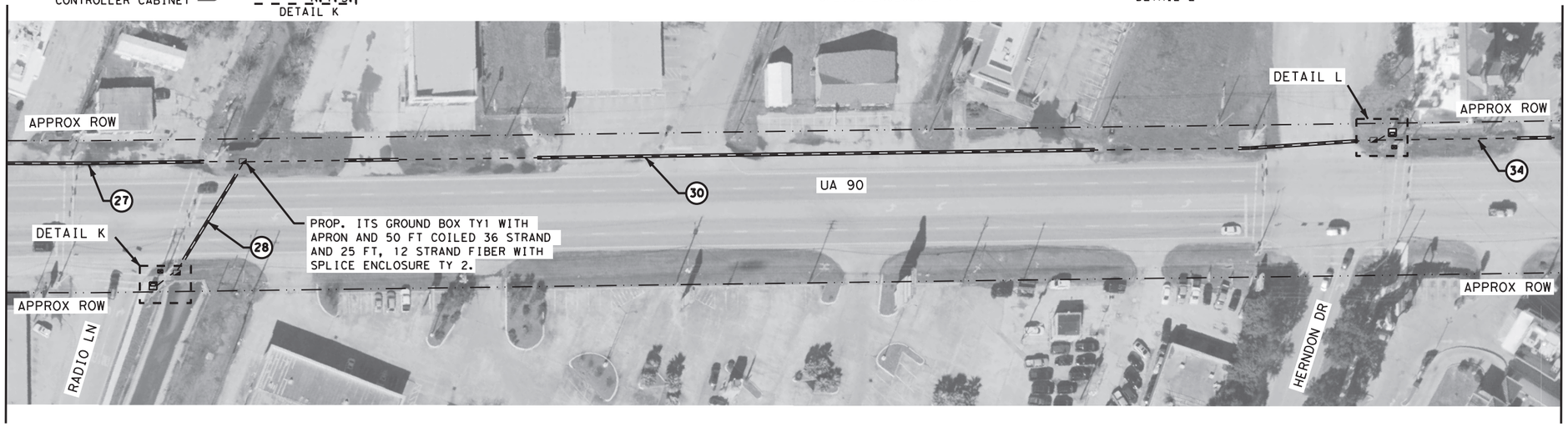
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		27

DATE: 6/30/2023
FILE: H:\Traffic Signals\Hoang Tran\Projects 2023\NEW 0027-07-046 UA 90 from FM 723 to FM 762\0027-07-046 UA 90 FOC Sheet 4.dgn







LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING CONDUIT
- EXISTING AERIAL INTERCONNECT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT (BORE)

NOTE:

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CCSJ: 0027-07-046

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618) 2" PVC (SCH 80) (TRENCH) (6046)		CONDUIT (618) 2" PVC (SCH 80) (BORE) (6047)		TRACER (620) WIRE #14 INSULATED (6002)		FIBER (6007) SINGLE MODE 12 STRAND (6011)		FIBER (6007) SINGLE MODE 36 STRAND (6013)	
	NO EA	LENGTH LF	NO EA	LENGTH LF	NO EA	LENGTH LF	NO EA	LENGTH LF	NO EA	LENGTH LF
25	1	70	1	30	1	100			1	100
26	1	265	1	535	1	800			1	800
27	1	100	1	415	1	515			1	515
28	1	15	1	90	1	105			1	105
29	1	25			1	25	1	25		
30	1	320	1	580	1	900			1	900
33	1	15			1	15	1	15		
34	1	120	1	30	1	150			1	150
25' COILED FOC							3	25	2	25
50' COILED FOC									2	50
TOTAL (LF)		930		1680		2610		115		2720
EST. TOTAL		980		1765		2745		125		2860

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

07/03/2023

UA 90 FROM FM 723 TO FM 762 FIBER OPTIC CABLE LAYOUTS

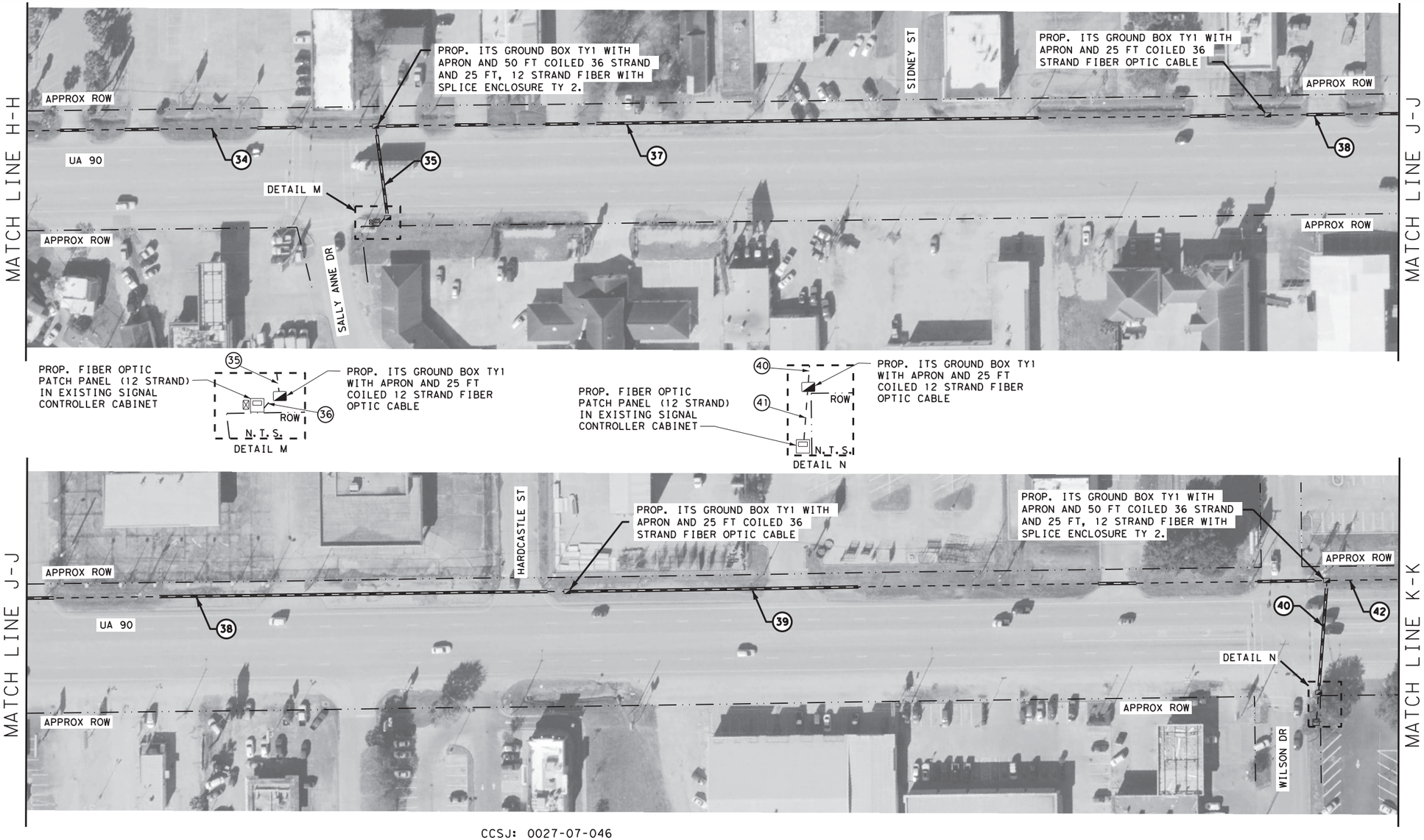
0 50 100
SCALE: 1" = 100'

SHEET 5 OF 9

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		28

DATE: 6/29/2023
FILE: H:\Trf\Signals\Hoang Tran\Projects 2023\NEW 0027-07-046 UA 90 from FM 723 to FM 762\0027-07-07-046 UA 90 FOC Sheet 5.dgn



LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING CONDUIT
- EXISTING AERIAL INTERCONNECT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT (BORE)

NOTE:

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CCSJ: 0027-07-046

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618) 2" PVC (SCH 80) (TRENCH) (6046)		CONDUIT (618) 2" PVC (SCH 80) (BORE) (6047)		TRACER (620) WIRE #14 INSULATED (6002)		FIBER (6007) SINGLE MODE 12 STRAND (6011)		FIBER (6007) SINGLE MODE 36 STRAND (6013)	
	NO EA	LENGTH LF	NO EA	LENGTH LF	NO EA	LENGTH LF	NO EA	LENGTH LF	NO EA	LENGTH LF
34	1	225	1	90	1	315			1	315
35	1	10	1	75	1	85	1	85		
36	1	10			1	10	1	10		
37	1	290	1	510	1	800			1	800
38	1	180	1	430	1	610			1	610
39	1	340	1	345	1	685			1	685
40	1	10	1	90	1	100	1	100		
41	1	30			1	30	1	30		
42	1	65			1	65			1	65
25' COILED FOC							4	25	2	25
50' COILED FOC									2	50
TOTAL (LF)		1160		1540		2700		325		2625
EST. TOTAL		1220		1620		2835		345		2760

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER
P.E.

07/03/2023

UA 90 FROM FM 723 TO FM 762 FIBER OPTIC CABLE LAYOUTS

0 50 100
SCALE: 1" = 100'

SHEET 6 OF 9

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		29

DATE: 6/29/2023
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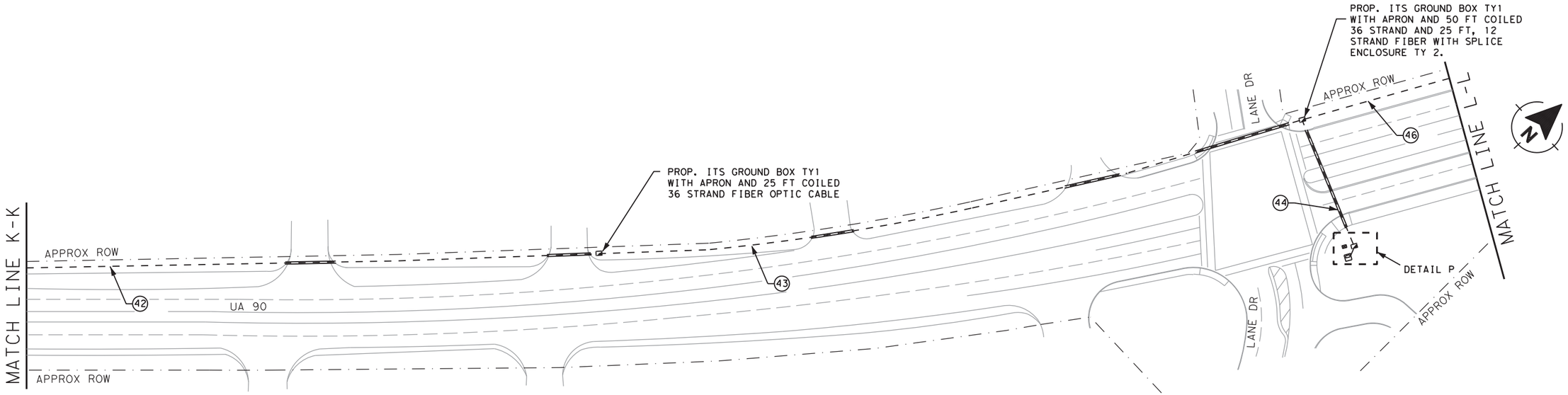
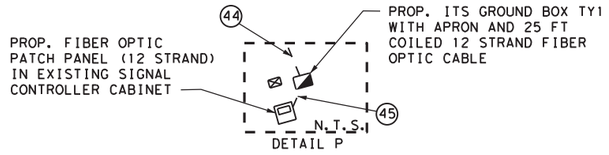


LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING CONDUIT
- EXISTING AERIAL INTERCONNECT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT (BORE)



DETAIL P

CCSJ: 0027-07-046

CONDUIT AND CONDUCTOR RUNS										
RUN NO.	CONDUIT (618)				TRACER (620)		FIBER (6007)			
	2" PVC (SCH 80)				WIRE		SINGLE MODE		SINGLE MODE	
	(TRENCH)		(BORE)		#14 INSULATED		12 STRAND		36 STRAND	
	(6046)		(6047)		(6002)		(6011)		(6013)	
	NO	LENGTH	NO	LENGTH	NO	LENGTH	NO	LENGTH	NO	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
42	1	440	1	95	1	535			1	535
43	1	475	1	95	1	570			1	570
44	1	30	1	100	1	130	1	130		
45	1	15			1	15	1	15		
46	1	145			1	145			1	145
25' COILED FOC							2	25	1	25
50' COILED FOC									1	50
TOTAL (LF)		1105		290		1395		195		1325
EST. TOTAL		1165		305		1465		205		1395

NOTE:

LOCATIONS OF UNDERGROUND INSTALLATIONS ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL UTILITY LOCATIONS PRIOR TO ANY CONSTRUCTION.

THE CONTRACTOR SHALL CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATION OF UNDER-GROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING, OR EXCAVATING.

THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD.

ALL WORK MUST BE PERFORMED WITHIN TXDOT RIGHT OF WAY.

FIBER ETHERNET SWITCH TO BE SUPPLIED BY TXDOT

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

07/03/2023

UA 90
FROM FM 723
TO FM 762
FIBER OPTIC
CABLE LAYOUTS

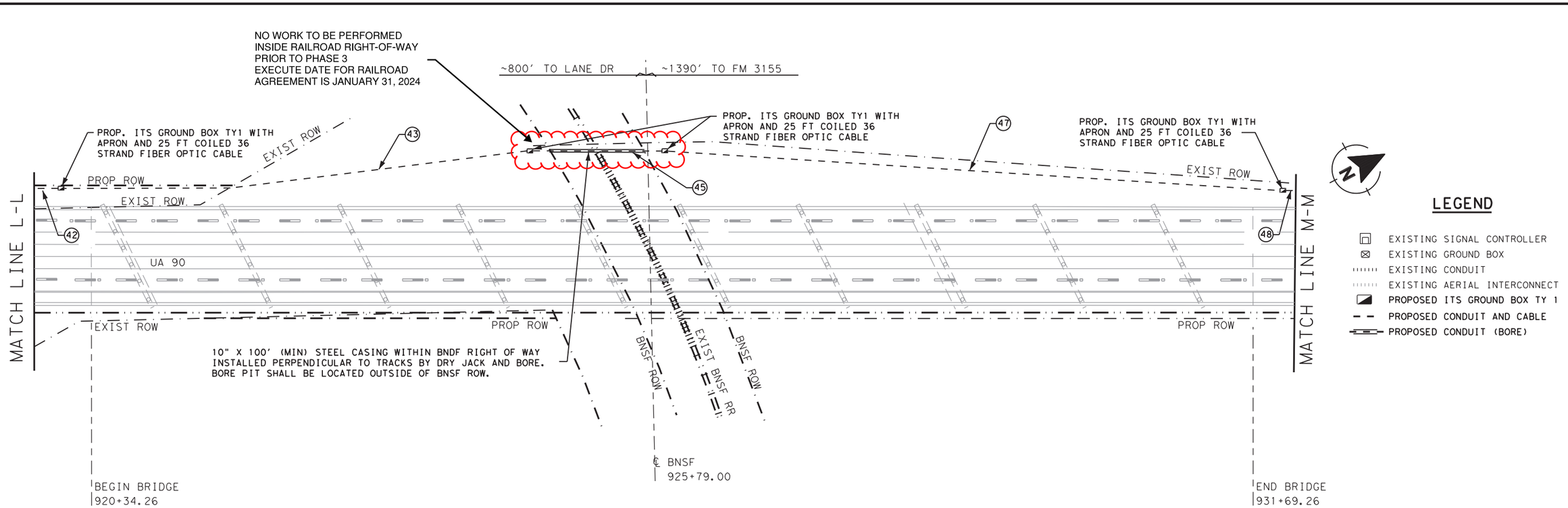
0 50 100
SCALE: 1" = 100'

SHEET 7 OF 9

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		30

DATE: 6/29/2023
FILE: H:\Traffic Signals\Hoang Tran\Projects 2023\NEW 0027-07-046 UA 90 from FM 723 to FM 762\0027-07-046 UA 90 FOC Sheet 7.dgn



DATE: 6/30/2023
FILE: H:\Trf\Signals\Hoang Tran\Projects 2023\NEW 0027-07-046 UA 90 from FM 723 to FM 762\0027-07-07-046 UA 90 FOC Sheet 8.dgn

NOTE:

LOCATIONS OF UNDERGROUND INSTALLATIONS ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL UTILITY LOCATIONS PRIOR TO ANY CONSTRUCTION.

THE CONTRACTOR SHALL CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATION OF UNDER-GROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING, OR EXCAVATING.

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ALL WORK MUST BE PERFORMED WITHIN TXDOT RIGHT OF WAY.

FIBER ETHERNET SWITCH TO BE SUPPLIED BY TXDOT

FOR BRIDGE DETAILS SEE 0027-07-032, PAGE 193

CCSJ: 0027-07-046

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618)						TRACER(620)		FIBER (6007)			
	2" PVC (SCH 80)				RM		WIRE		SINGLE MODE		SINGLE MODE	
	(TRENCH)		(BORE)		2"		#14 INSULATED		12 STRAND		36 STRAND	
	(6046)		(6047)		(6070)		(6002)		(6011)		(6013)	
	NO	LENGTH	NO	LENGTH	NO	LENGTH	NO	LENGTH	NO	LENGTH	NO	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
42	1	25					1	25			1	25
43	1	500					1	500			1	500
44	1	20					1	20			1	20
45			1	150			1	150			1	150
46 OMIT												
47	1	590					1	590			1	590
48	1	15					1	15			1	15
25' COILED FOC											4	25
50' COILED FOC												
TOTAL (LF)		1150		150		0		1300		0		1400
EST. TOTAL		1210		160		0		1365		0		1470

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

07/03/2023

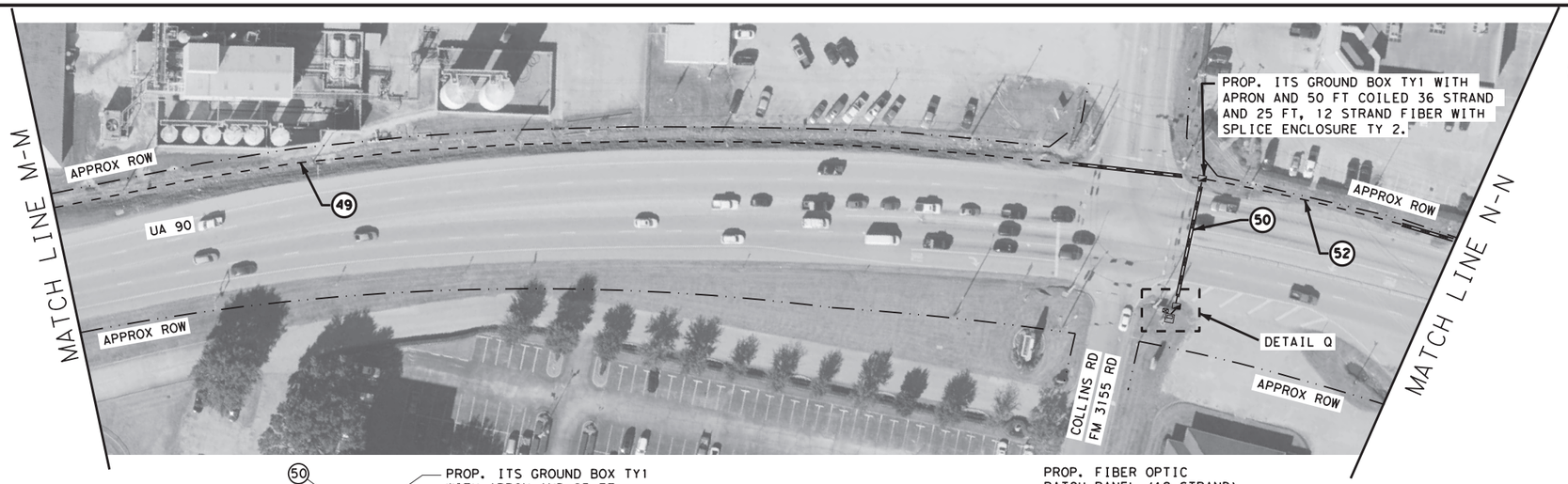
UA 90 FROM FM 723 TO FM 762 FIBER OPTIC CABLE LAYOUTS

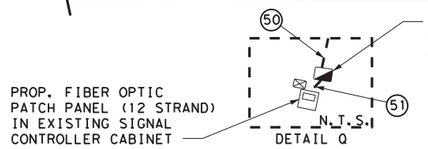
0 50 100
SCALE: 1" = 100'

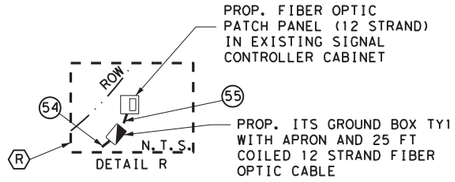
SHEET 8 OF 9

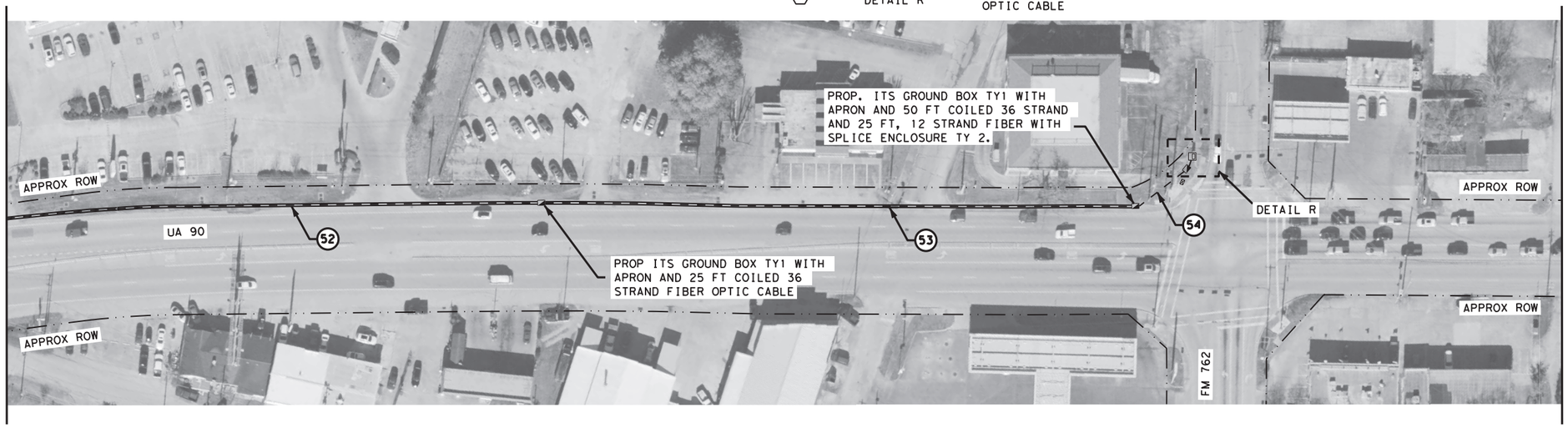
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		31









LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING CONDUIT
- EXISTING AERIAL INTERCONNECT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT (BORE)

NOTE:

LOCATIONS OF UNDERGROUND INSTALLATIONS ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL UTILITY LOCATIONS PRIOR TO ANY CONSTRUCTION.

THE CONTRACTOR SHALL CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATION OF UNDER-GROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING, OR EXCAVATING.

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ALL WORK MUST BE PERFORMED WITHIN TXDOT RIGHT OF WAY.

CCSJ: 0027-07-046

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618) 2" PVC (SCH 80) (TRENCH) (6046)		CONDUIT (618) 2" PVC (SCH 80) (BORE) (6047)		TRACER (620) WIRE #14 INSULATED (6002)		FIBER (6007) SINGLE MODE 12 STRAND (6011)		FIBER (6007) SINGLE MODE 36 STRAND (6013)	
	NO	LENGTH	NO	LENGTH	NO	LENGTH	NO	LENGTH	NO	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
49	1	700	1	75	1	775			1	775
50	1	15	1	85	1	100	1	100		
51	1	15			1	15	1	15		
52	1	85	1	465	1	550			1	550
53	1	670			1	670			1	670
54	1	50			1	50	1	50		
55	1	15			1	15	1	15		
25' COILED FOC							4	25	1	25
50' COILED FOC									2	50
TOTAL (LF)		1550		625		2175		280		2120
EST. TOTAL		1630		660		2285		295		2230

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER
P.E.

07/03/2023

UA 90 FROM FM 723 TO FM 762 FIBER OPTIC CABLE LAYOUTS

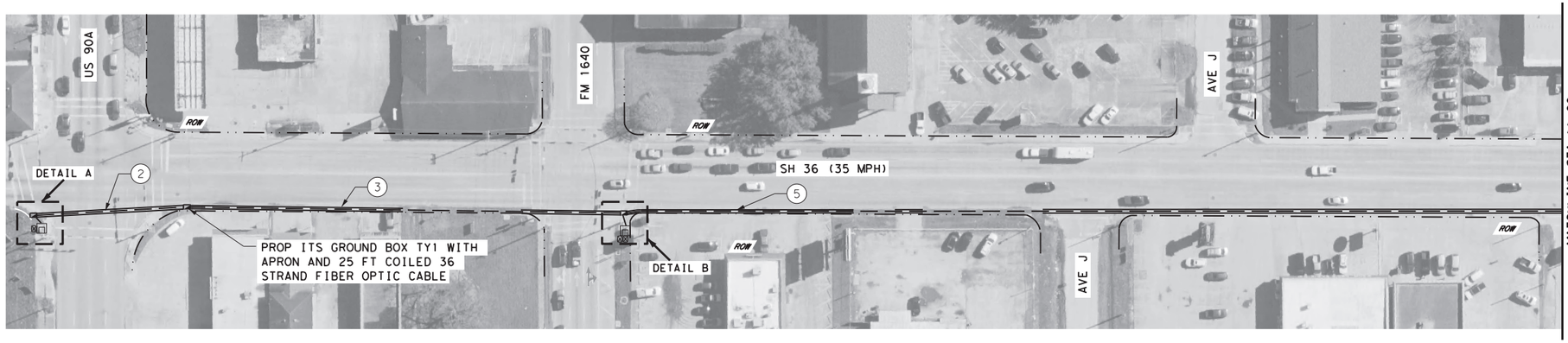
0 50 100
SCALE: 1" = 100'

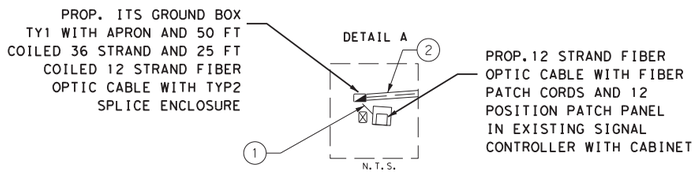
SHEET 9 OF 9

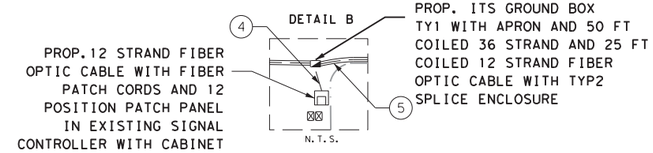
Texas Department of Transportation

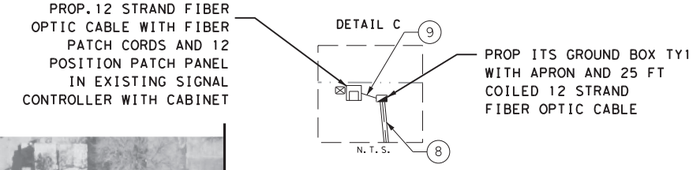
CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		32

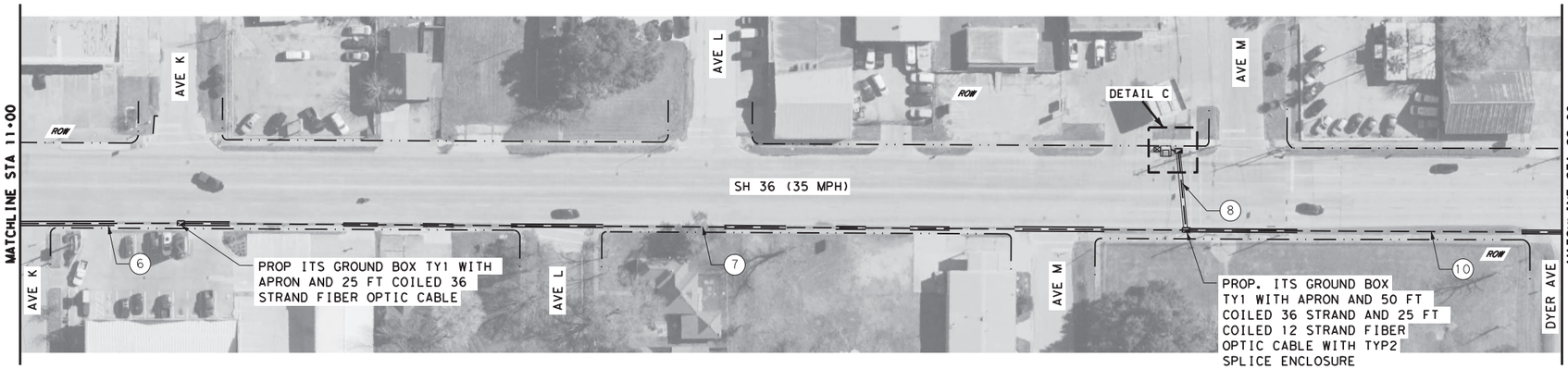
DATE: 6/29/2023
FILE: H:\Tr\Signals\Hoang Tran\Projects 2023\NEW 0027-07-046 UA 90 from FM 723 to FM 762\0027-07-046 UA 90 FOC Sheet 9.dgn











LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT (BORE)
- PROPOSED CONDUIT (RIGID METAL)

CSJ: 0188-01-040

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618) PVC 2" (SCHD 80) (6046) NO. EA	(6046) TRENCH LF	(6047) NO. EA	(6047) BORE LF	TRACER (620) WIRE #14 INSULATED (6002) NO. EA	(6002) LENGTH LF	FIBER (6007) SINGLE MODE 12 STRAND (6011) NO. EA	(6011) LENGTH LF	SINGLE MODE 36 STRAND (6013) NO. EA	(6013) LENGTH LF
1	1	10			1	10	1	10		
2			1	115	1	115			1	115
3	1	90	1	240	1	330			1	330
4	1	10			1	10	1	10		
5	1	123	1	592	1	715			1	715
6	1	45	1	70	1	115			1	115
7	1	409	1	306	1	715			1	715
8			1	55	1	55	1	55		
9	1	10			1	10	1	10		
10	1	160	1	106	1	270			1	270
25' COILED FOC							4	25	2	25
50' COILED FOC									3	50
TOTAL (LF)		857		1484		2345		185		2460
EST. TOTAL		900		1560		2465		195		2585

NOTE:

LOCATIONS OF UNDERGROUND INSTALLATIONS ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL UTILITY LOCATIONS PRIOR TO ANY CONSTRUCTION.

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ALL WORK MUST BE PERFORMED WITHIN TXDOT RIGHT OF WAY.

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

07/03/2023

SH 36 FROM UA 90 TO IH 69 FIBER OPTIC CABLE LAYOUT

0 50 100
SCALE: 1" = 100'

SHEET 1 OF 5

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		33

DATE: 6/29/2023
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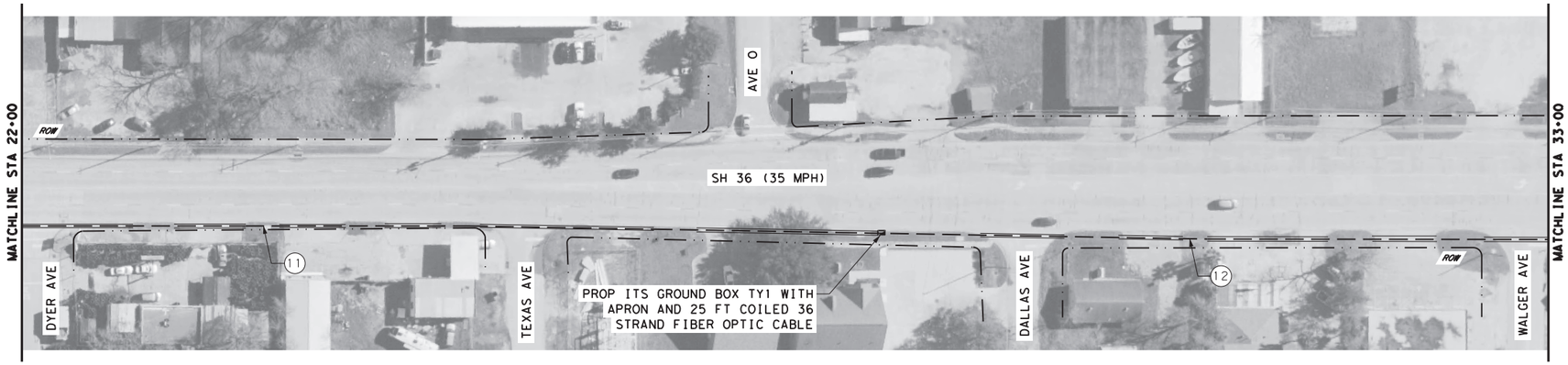

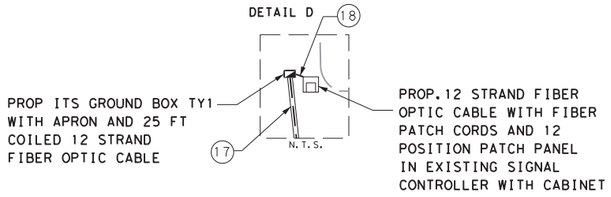

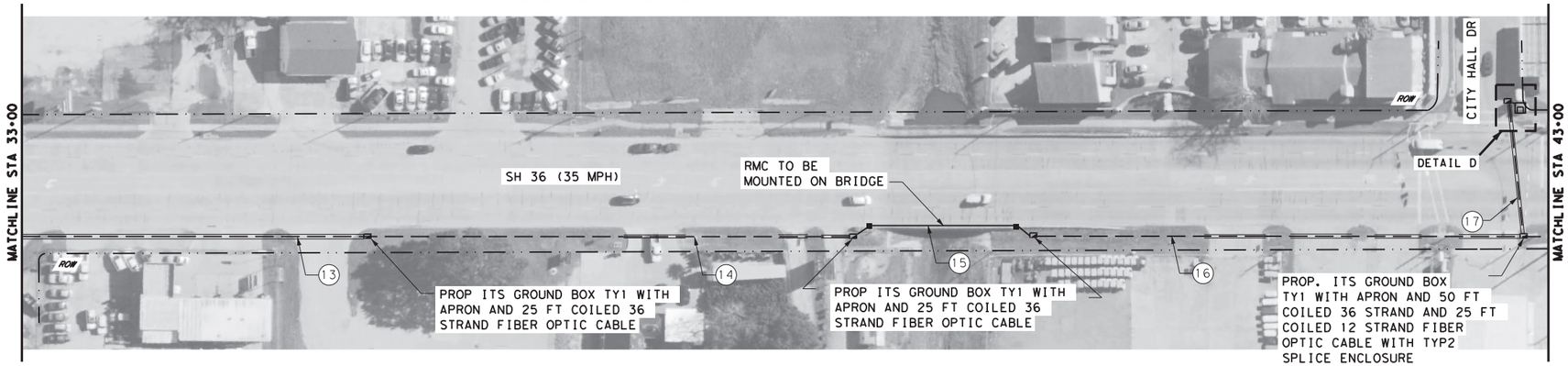

LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT (BORE)
- PROPOSED CONDUIT (RIGID METAL)

CSJ: 0188-01-040

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618)						TRACER (620)		FIBER (6007)			
	PVC				RM		WIRE		SINGLE MODE		SINGLE MODE	
	2" (SCHD 80)				2"		#14 INSULATED		12 STRAND		36 STRAND	
	(6046)		(6047)		(6070)		(6002)		(6011)		(6013)	
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
11	1	141	1	479			1	620			1	620
12	1	190	1	290			1	480			1	480
13			1	250			1	250			1	250
14	1	259	1	86			1	345			1	345
15					1	130	1	130			1	130
16	1	183	1	167			1	350			1	350
17			1	100			1	100	1	100		
18	1	10					1	10	1	10		
25' COILED FOC									2	25	4	25
50' COILED FOC											1	50
TOTAL (LF)		783		1372		130		2285		160		2325
EST. TOTAL		825		1445		140		2400		170		2445

NOTE:

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DATE: 6/29/2023
FILE: U:\HOU\Projects\0188-01-040*FOC\CSJ 0188-01-040*SH 36*06.23.2023.dgn

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

07/03/2023

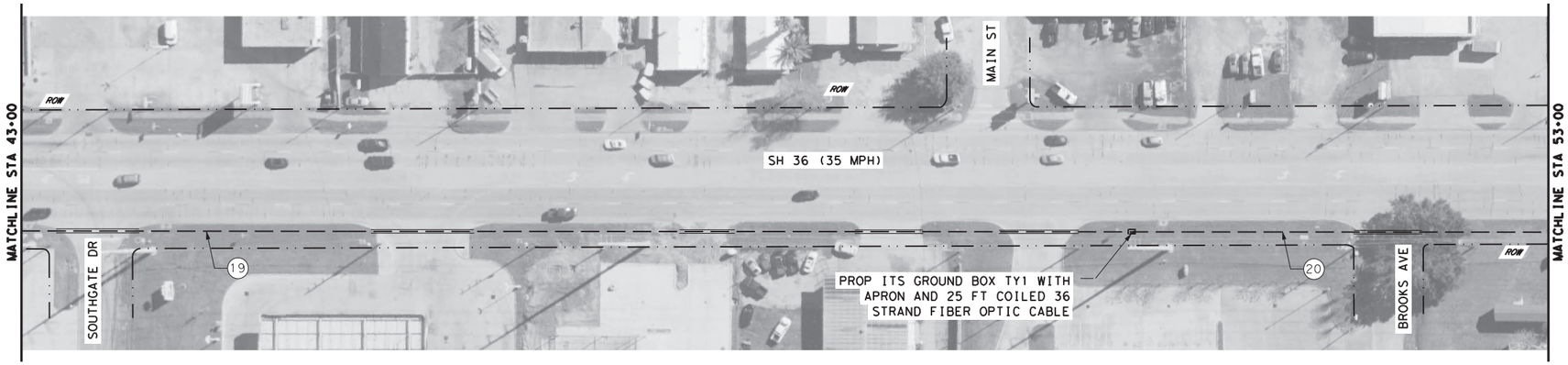
SH 36 FROM UA 90 TO IH 69 FIBER OPTIC CABLE LAYOUT

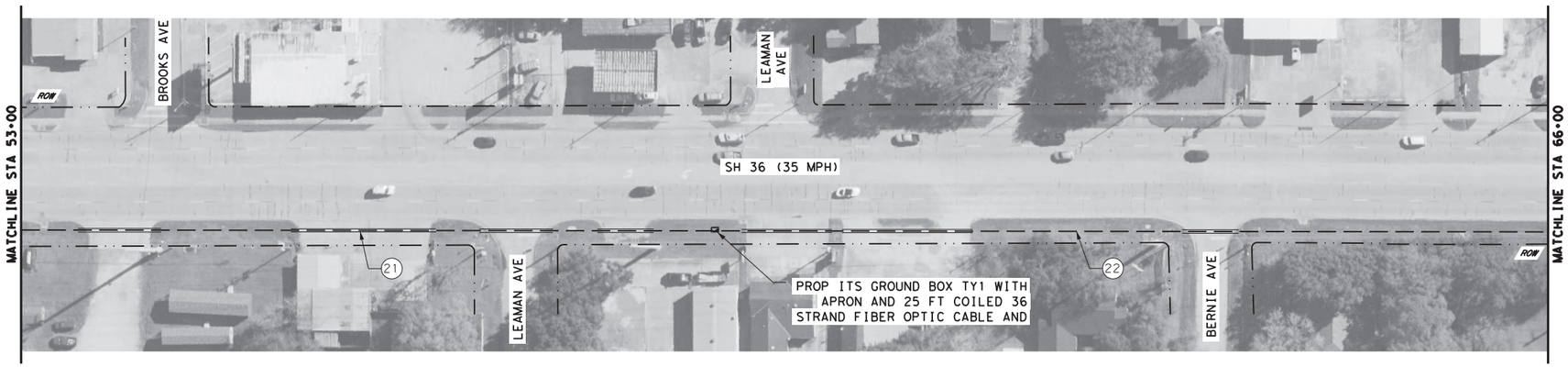
0 50 100
SCALE: 1" = 100'

SHEET 2 OF 5

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		34





LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT (BORE)
- PROPOSED CONDUIT (RIGID METAL)

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CSJ: 0188-01-040

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618) PVC 2" (SCHD 80) (6046) NO.	(6046) TRENCH	(6047) NO.	(6047) BORE	TRACER (620) WIRE #14 INSULATED (6002) NO.	(6002) LENGTH	FIBER (6007) SINGLE MODE 12 STRAND (6011) NO.	(6011) LENGTH	FIBER (6007) SINGLE MODE 36 STRAND (6013) NO.	(6013) LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
19	1	520	1	280	1	800			1	800
20	1	250	1	50	1	300			1	300
21	1	242	1	258	1	500			1	500
22	1	400	1	200	1	600			1	600
25' COILED FOC									2	25
TOTAL (LF)		1412		788		2200		0		2250
EST. TOTAL		**1485**		**830**		**2310**		**0**		**2365**

SH 36
FROM UA 90
TO IH 69
FIBER OPTIC
CABLE LAYOUT

0 50 100
SCALE: 1" = 100'

SHEET 3 OF 5

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

07/03/2023

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		35

DATE: 6/29/2023
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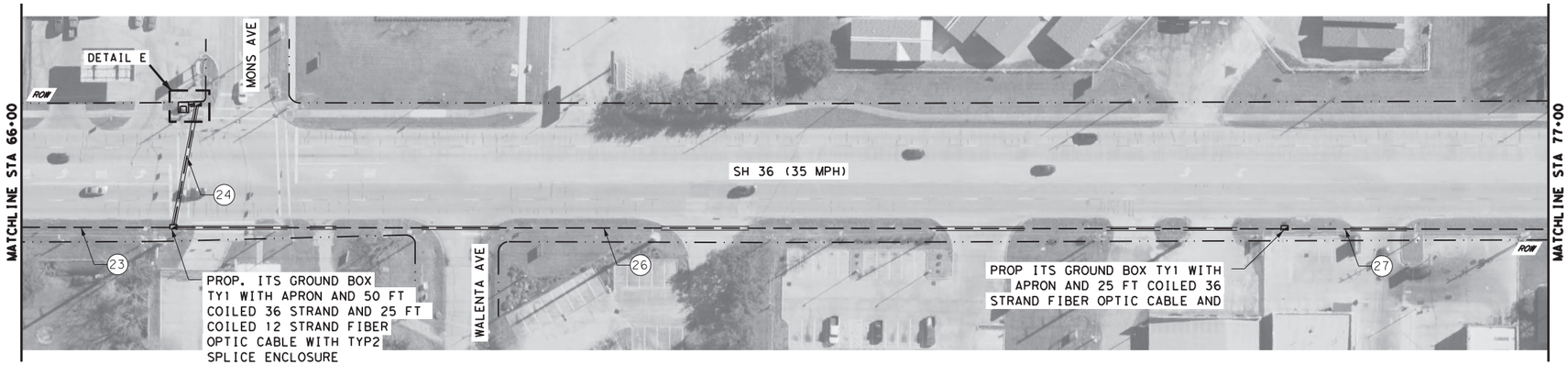

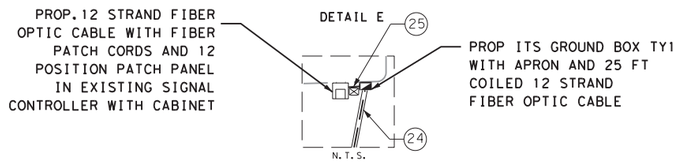

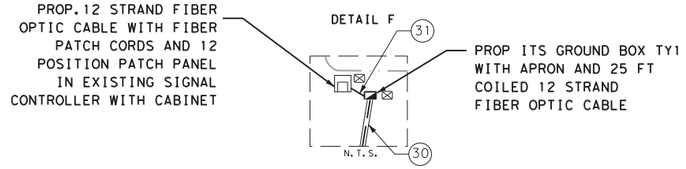

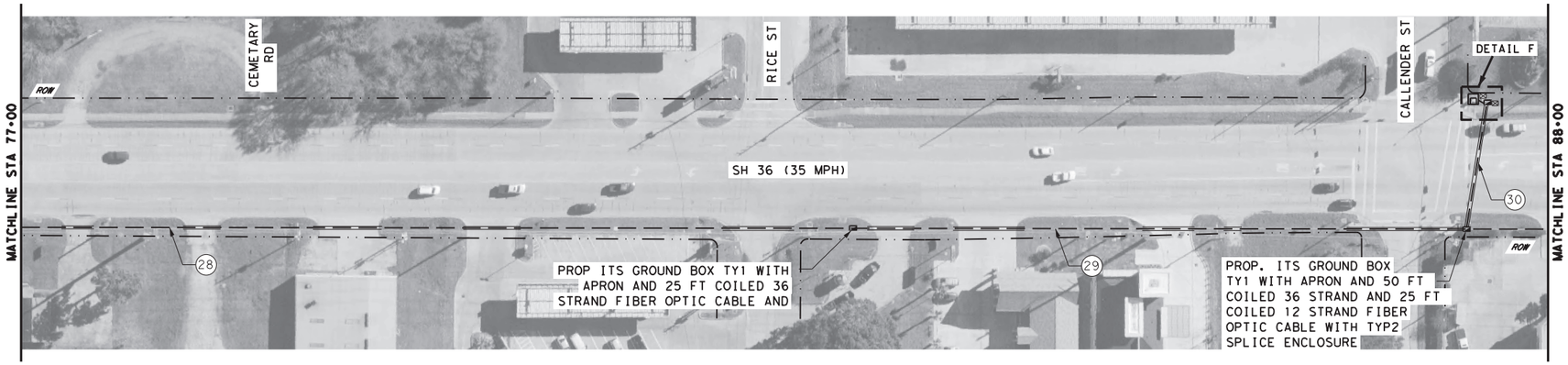

LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT (BORE)
- PROPOSED CONDUIT (RIGID METAL)

NOTE:

LOCATIONS OF UNDERGROUND INSTALLATIONS ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL UTILITY LOCATIONS PRIOR TO ANY CONSTRUCTION.

THE CONTRACTOR SHALL CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATION OF UNDER-GROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING, OR EXCAVATING.

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ALL WORK MUST BE PERFORMED WITHIN TXDOT RIGHT OF WAY.

CSJ: 0188-01-040

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618)				TRACER (620)		FIBER (6007)		FIBER (6007)	
	PVC				WIRE		SINGLE MODE		SINGLE MODE	
	2" (SCHD 80)				#14		12 STRAND		36 STRAND	
	(6046)		(6047)		(6002)		(6011)		(6013)	
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
23	1	110			1	110			1	110
24			1	90	1	90	1	90		
25	1	10			1	10	1	10		
26	1	433	1	367	1	800			1	800
27	1	149	1	41	1	190			1	190
28	1	407	1	193	1	600			1	600
29	1	216	1	219	1	435			1	435
30			1	90	1	90	1	90		
31	1	10			1	10	1	10		
25' COILED FOC							4	25	2	25
50' COILED FOC									2	50
TOTAL (LF)		1335		1000		2335		300		2285
EST. TOTAL		1405		1050		2455		315		2400

SH 36
FROM UA 90
TO IH 69
FIBER OPTIC
CABLE LAYOUT

SCALE: 1" = 100'

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

07/03/2023

SHEET 4 OF 5

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		36

DATE: 6/29/2023
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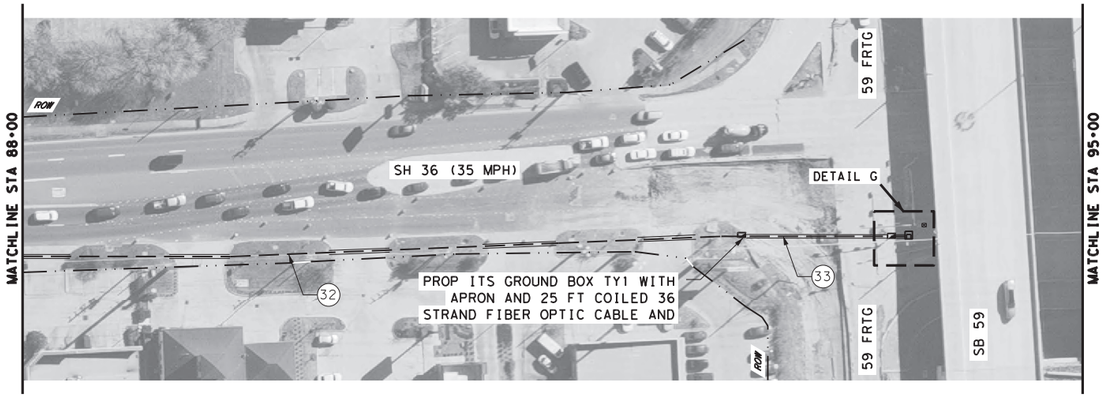

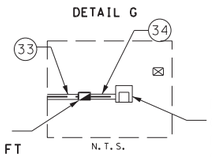

PROP. ITS GROUND BOX TY1 WITH APRON AND 50 FT COILED 36 STRAND AND 25 FT COILED 12 STRAND FIBER OPTIC CABLE WITH TYP2 SPLICE ENCLOSURE

PROP. 12 STRAND FIBER OPTIC CABLE WITH FIBER PATCH CORDS AND 12 POSITION PATCH PANEL IN EXISTING SIGNAL CONTROLLER WITH CABINET

LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT (BORE)
- PROPOSED CONDUIT (RIGID METAL)

CSJ: 0188-01-040

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618)				TRACER (620)		FIBER (6007)		FIBER (6007)	
	PVC				WIRE		SINGLE MODE		SINGLE MODE	
	2" (SCHD 80)				#14 INSULATED		12 STRAND		36 STRAND	
	(6046)		(6047)		(6002)		(6011)		(6013)	
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
32	1	275	1	200	1	475			1	475
33			1	95	1	95			1	95
34			1	10	1	10	1	10		
25' COILED FOC							1	25	1	25
50' COILED FOC									1	50
TOTAL (LF)		275		305		580		35		645
EST. TOTAL		290		325		610		40		680

NOTE:

LOCATIONS OF UNDERGROUND INSTALLATIONS ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL UTILITY LOCATIONS PRIOR TO ANY CONSTRUCTION.

THE CONTRACTOR SHALL CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATION OF UNDER-GROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING, OR EXCAVATING.

THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD.

ALL WORK MUST BE PERFORMED WITHIN TXDOT RIGHT OF WAY.

DATE: 6/29/2023
FILE: U:\HOU\Projects\0188-01-040*FOC\CSJ 0188-01-040*SH 36*06.23.2023.dgn

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07/03/2023

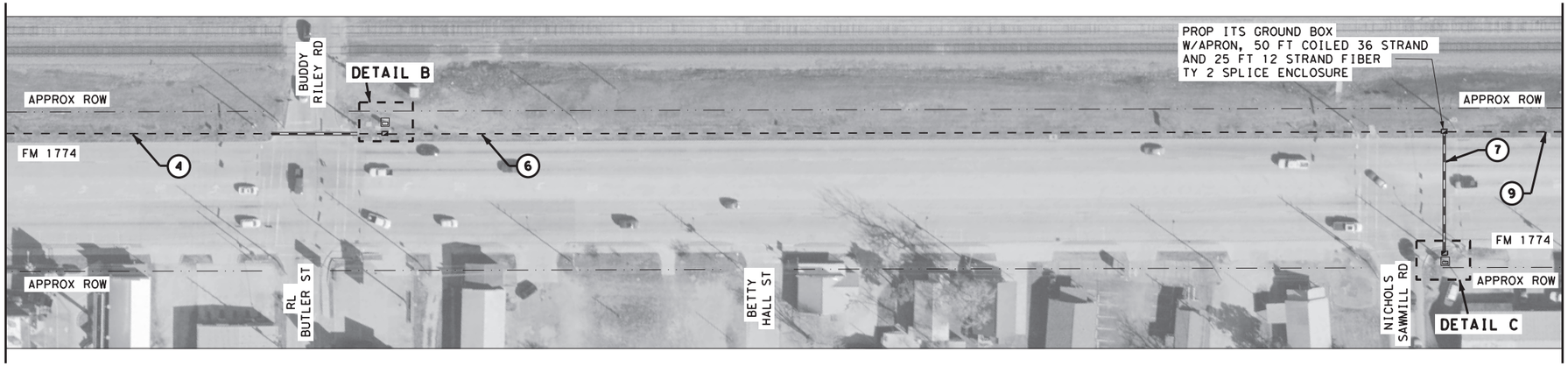
SH 36 FROM UA 90 TO IH 69 FIBER OPTIC CABLE LAYOUT

0 50 100
SCALE: 1" = 100'

SHEET 5 OF 5

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		37



LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING MULTIDUCT CONDUIT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT (BORE)
- PROPOSED CONDUIT (RIGID METAL)

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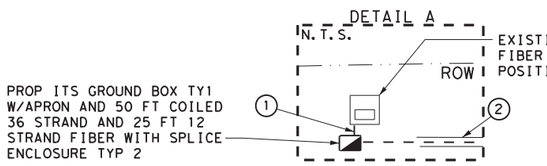
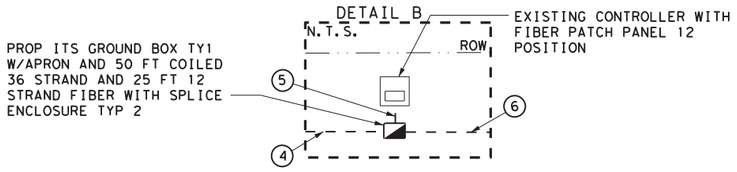
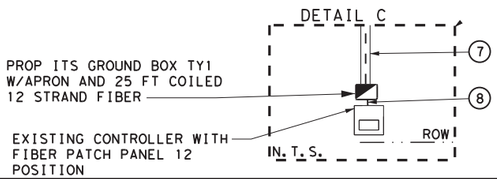






CSJ: 1400-04-039 CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618) PVC 2" (SCHD 80) (6046) NO.	(6046) TRENCH	(6047) NO.	(6047) BORE	TRACER (620) WIRE #14 INSULATED (6002) NO.	(6002) LENGTH	FIBER (6007) SINGLE MODE 12 STRAND (6011) NO.	(6011) LENGTH	SINGLE MODE 36 STRAND (6013) NO.	(6013) LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
1	1	5			1	5	1	5		
2	1	10	1	130	1	140			1	140
3	1	680			1	680			1	680
4	1	525	1	65	1	590			1	590
5	1	5			1	5	1	5		
6	1	795			1	795			1	795
7			1	90	1	90	1	90		
8	1	5			1	5	1	5		
9	1	525			1	525			1	525
25' COILED							4	25	2	25
50' COILED									3	50
TOTAL (LF)		2550		285		2835		205		2930
EST. TOTAL		2680		300		2980		220		3080

FM 1774 FROM FM 1488 TO SH 249 FIBER OPTIC CABLE LAYOUTS

SCALE: 1" = 100'

SHEET 1 OF 11

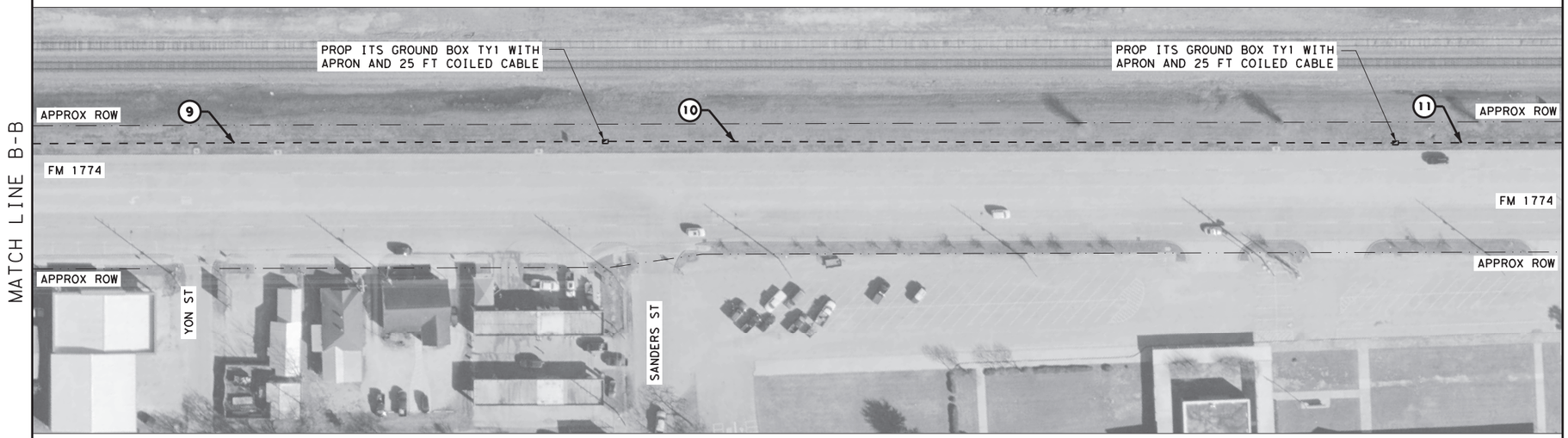
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		38

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER

07/03/2023

DATE: 6/30/2023
FILE: H:\Trf\Signals\Greg Sosa\2022 Projects\1400-04-039 FM 1774 FIBER OPTIC\Fiber Optic NO MULTI.dgn



LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING MULTIDUCT CONDUIT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT (BORE)
- PROPOSED CONDUIT (RIGID METAL)

NOTE:

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CSJ: 1400-04-039

CONDUIT AND CONDUCTOR RUNS						
RUN NO.	CONDUIT(618)		TRACER (620)		FIBER(6007)	
	PVC		WIRE		SINGLE MODE	
	2" (SCHD 80)		#14 INSULATED		36 STRAND	
	(6046)		(6002)		(6013)	
	NO.	TRENCH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF
10	1	600	1	600	1	600
11	1	160	1	160	1	160
12	1	700	1	700	1	700
13	1	565	1	565	1	565
25' COILED					4	25
TOTAL (LF)		2025		2025		2125
EST. TOTAL		2130		2130		2235

FM 1774 FROM FM 1488 TO SH 249 FIBER OPTIC CABLE LAYOUTS

STATE OF TEXAS
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P.E.

07/03/2023

SCALE: 1" = 100'

SHEET 2 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046,ETC.	UA 90,ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND,ETC.		39

DATE: 6/30/2023
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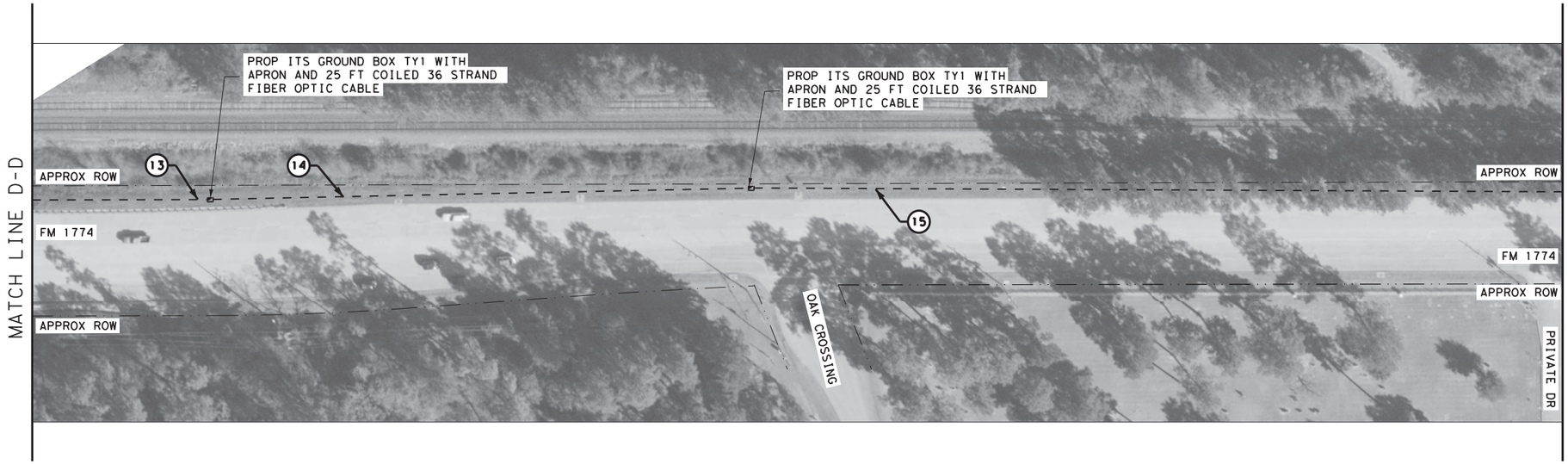

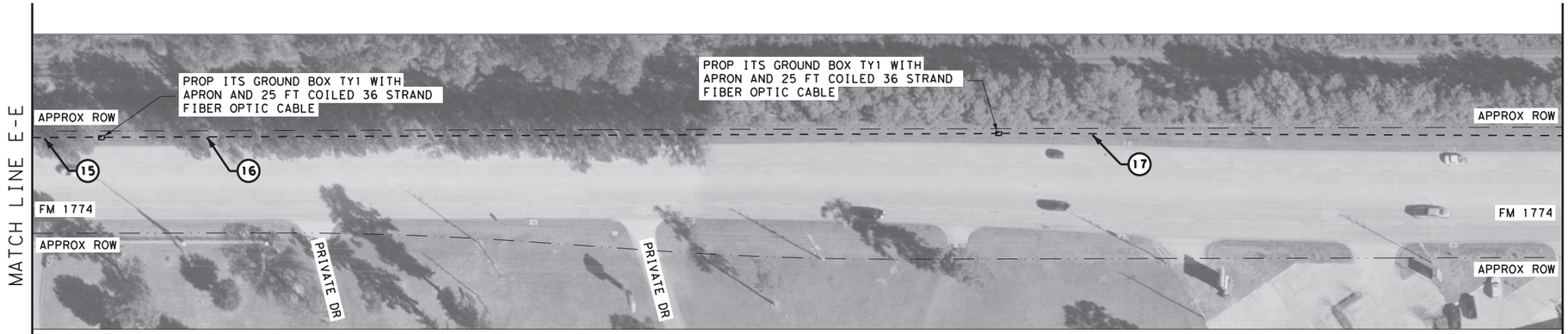

LEGEND

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- EXISTING GROUND BOX
- EXISTING MULTIDUCT CONDUIT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
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CSJ: 1400-04-039

CONDUIT AND CONDUCTOR RUNS						
RUN NO.	CONDUIT(618)		TRACER (620)		FIBER (6007)	
	PVC		WIRE		SINGLE MODE	
	2" (SCHD 80)		#14 INSULATED		36 STRAND	
	(6046)		(6002)		(6013)	
	NO.	TRENCH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF
14	1	410	1	410	1	410
15	1	670	1	670	1	670
16	1	685	1	685	1	685
17	1	670	1	670	1	670
25' COILED					4	25
TOTAL (LF)		2435		2435		2535
EST. TOTAL		2560		2560		2665

FM 1774 FROM FM 1488 TO SH 249 FIBER OPTIC CABLE LAYOUTS

STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER
P.E.

07/03/2023

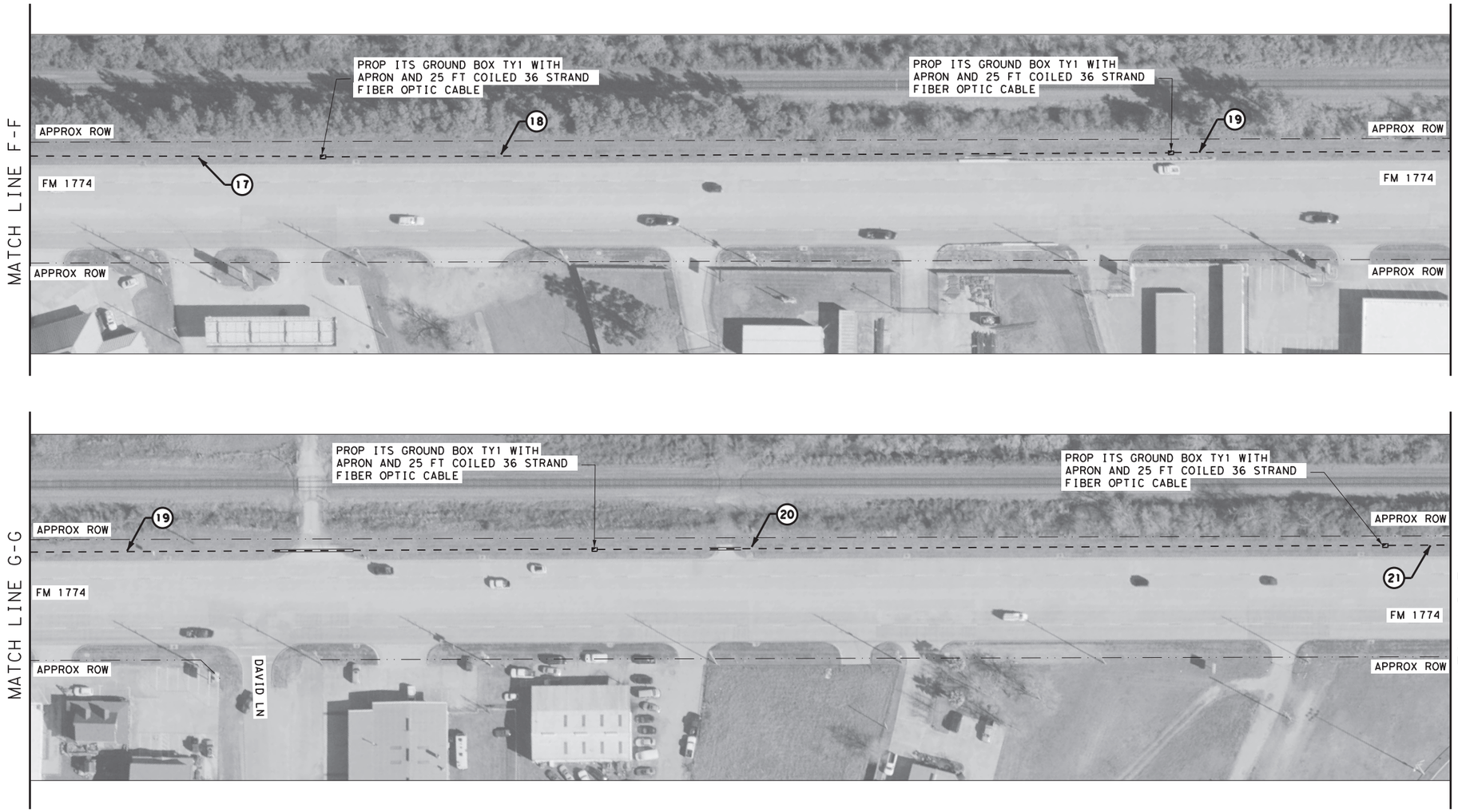
0 50 100
SCALE: 1" = 100'

SHEET 3 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046,ETC.	UA 90,ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND,ETC.		40

DATE: 6/30/2023
FILE: H:\Trf\Signals\Greg Sosa\2022 Projects\1400-04-039 FM 1774 FIBER OPTIC\Fiber Optic NO MULTI.dgn



LEGEND

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- EXISTING GROUND BOX
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- PROPOSED ITS GROUND BOX TY 1
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CSJ: 1400-04-039 CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT(618) PVC 2" (SCHD 80) (6046) NO. EA	(6046) TRENCH LF	(6047) NO. EA	(6047) BORE LF	TRACER (620) WIRE #14 INSULATED (6002) NO. EA	(6002) LENGTH LF	FIBER(6007) SINGLE MODE 36 STRAND (6013) NO. EA	(6013) LENGTH LF
18	1	695			1	695	1	695
19	1	630	1	65	1	695	1	695
20	1	625	1	25	1	650	1	650
21	1	385			1	385	1	385
25' COILED							4	25
TOTAL (LF)		2335		90		2425		2525
EST. TOTAL		2455		95		2550		2655

FM 1774
FROM FM 1488
TO SH 249
FIBER OPTIC
CABLE LAYOUTS

SCALE: 1" = 100'

SHEET 4 OF 11

STATE OF TEXAS
MICHAEL A. OLIVO
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P.E.

07/03/2023

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		41

DATE: 6/30/2023
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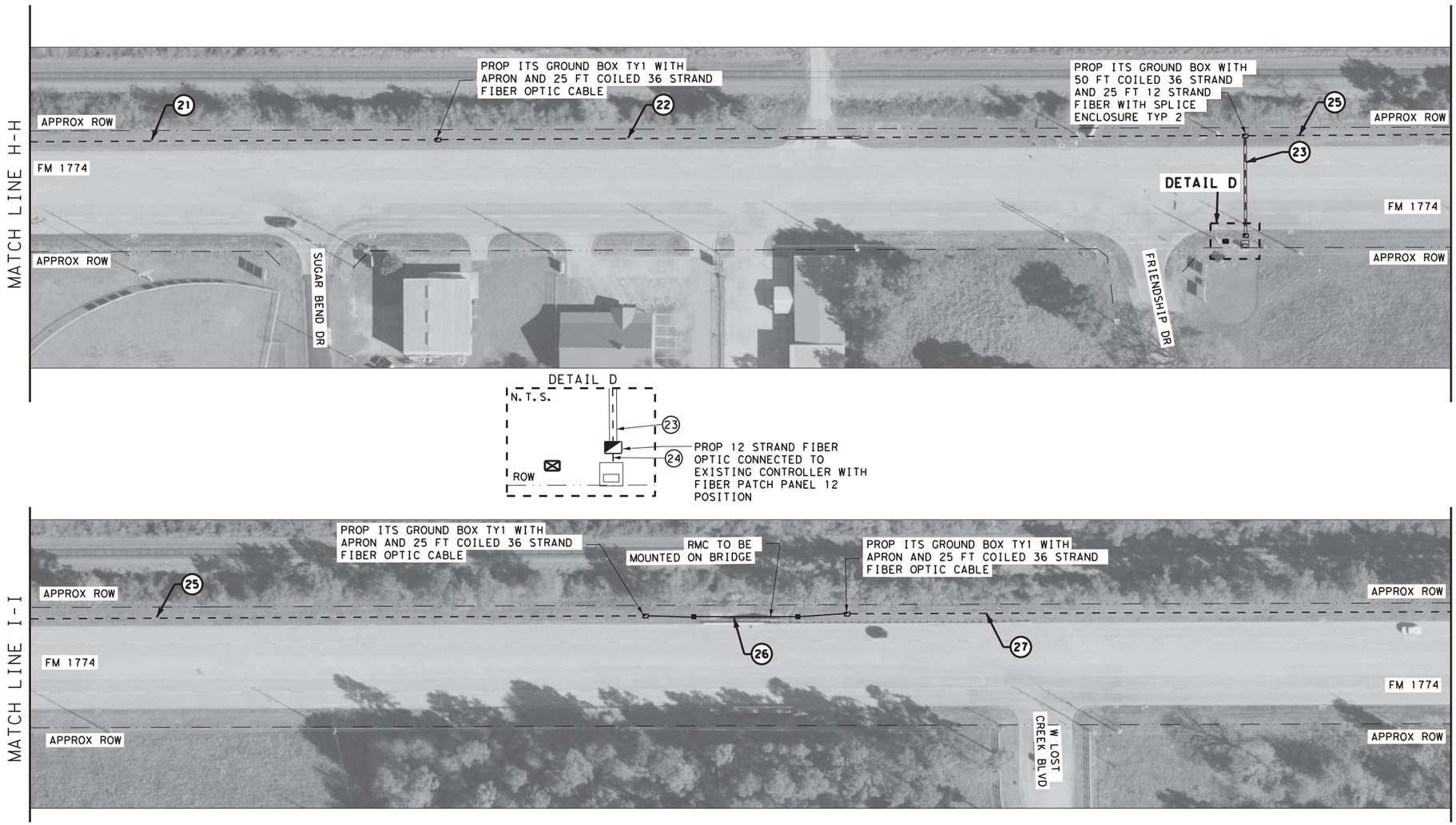

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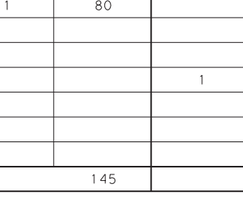

PROP 12 STRAND FIBER OPTIC CONNECTED TO EXISTING CONTROLLER WITH FIBER PATCH PANEL 12 POSITION

LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING MULTIDUCT CONDUIT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
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CSJ: 1400-04-039 — CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT(618)						TRACER (620)		FIBER (6007)			
	PVC				RM		WIRE		SINGLE MODE		SINGLE MODE	
	2" (SCHD 80)				2"		#14 INSULATED		12 STRAND		36 STRAND	
	(6046)		(6047)		(6070)		(6002)		(6011)		(6013)	
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
22	1	595	1	65			1	660			1	660
23			1	80			1	80	1	80		
24	1	10					1	10	1	10		
25	1	675					1	675			1	675
26	1	70			1	80	1	155			1	155
27	1	525					1	525			1	525
25' COILED									1	25	3	25
50' COILED											1	50
TOTAL (LF)		1875		145		80		2105		115		2140
EST. TOTAL		1970		155		85		2215		125		2250

FM 1774
FROM FM 1488
TO SH 249
FIBER OPTIC
CABLE LAYOUTS

STATE OF TEXAS
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07/03/2023

0 50 100
SCALE: 1" = 100'

SHEET 5 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		42

DATE: 6/30/2023
FILE: H:\Traffic Signals\Greg Sosa\2022 Projects\1400-04-039 FM 1774 FIBER OPTIC\Fiber Optic NO MULTI.dgn

LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING MULTIDUCT CONDUIT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT (BORE)
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CSJ: 1400-04-039 CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT(618) PVC 2" (SCHD 80) (6046)		TRACER (620) WIRE #14 INSULATED (6002)		FIBER(6007) SINGLE MODE 36 STRAND (6013)	
	NO.	TRENCH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF
28	1	685	1	685	1	685
29	1	640	1	640	1	640
30	1	680	1	680	1	680
31	1	665	1	665	1	665
25' COILED					4	25
TOTAL (LF)		2670		2670		2770
EST. TOTAL		2805		2805		2910

FM 1774 FROM FM 1488 TO SH 249 FIBER OPTIC CABLE LAYOUTS

STATE OF TEXAS
MICHAEL A. OLIVO
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LICENSED PROFESSIONAL ENGINEER
P.E.

07/03/2023

0 50 100
SCALE: 1" = 100'

SHEET 6 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		43

DATE: 6/30/2023
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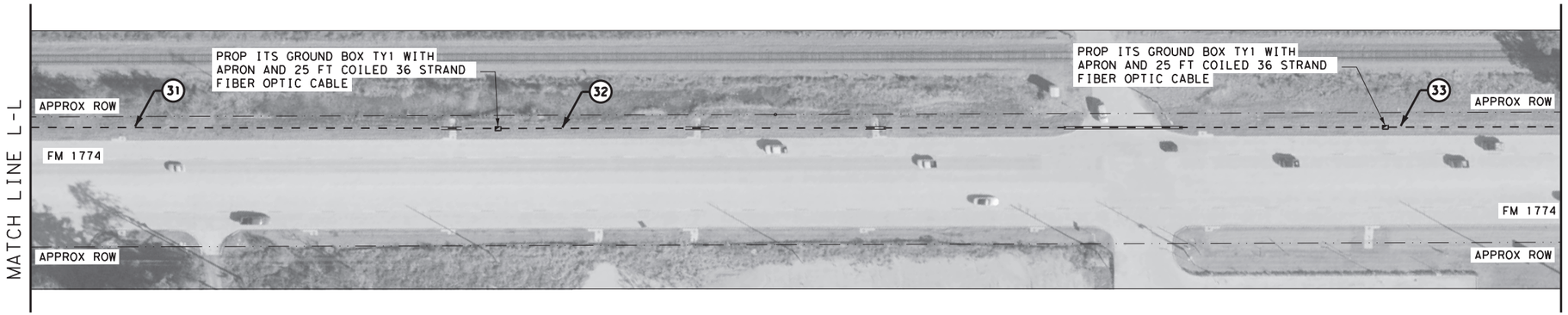

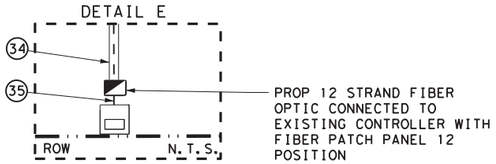

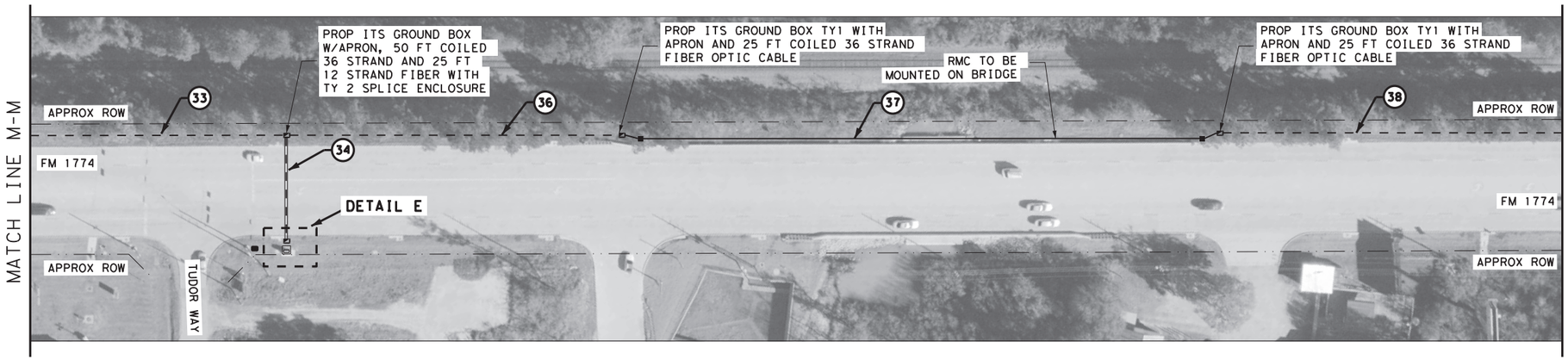

LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING MULTIDUCT CONDUIT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
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4. ALL WORK MUST BE PERFORMED WITHIN TXDOT RIGHT OF WAY.

CSJ: 1400-04-039

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT(618)						TRACER (620)		FIBER (6007)			
	PVC				RM		WIRE		SINGLE MODE		SINGLE MODE	
	2" (SCHD 80)				2"		#14 INSULATED		12 STRAND		36 STRAND	
	(6046)		(6047)		(6070)		(6002)		(6011)		(6013)	
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
32	1	550	1	125	1		1	675			1	675
33	1	325					1	325			1	325
34	1	75					1	75	1	75		
35	1	10					1	10	7	10		
36	1	255					1	255			1	255
37					1	455	1	455			1	455
38	1	325					1	325			1	325
39	1	625					1	625			1	625
25' COILED									1	25	4	25
50' COILED											1	50
TOTAL (LF)		2165		125		455		2745		170		2810
EST. TOTAL		2275		135		480		2885		180		2955

MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
P.E.

07/03/2023

FM 1774
FROM FM 1488
TO SH 249
FIBER OPTIC
CABLE LAYOUTS

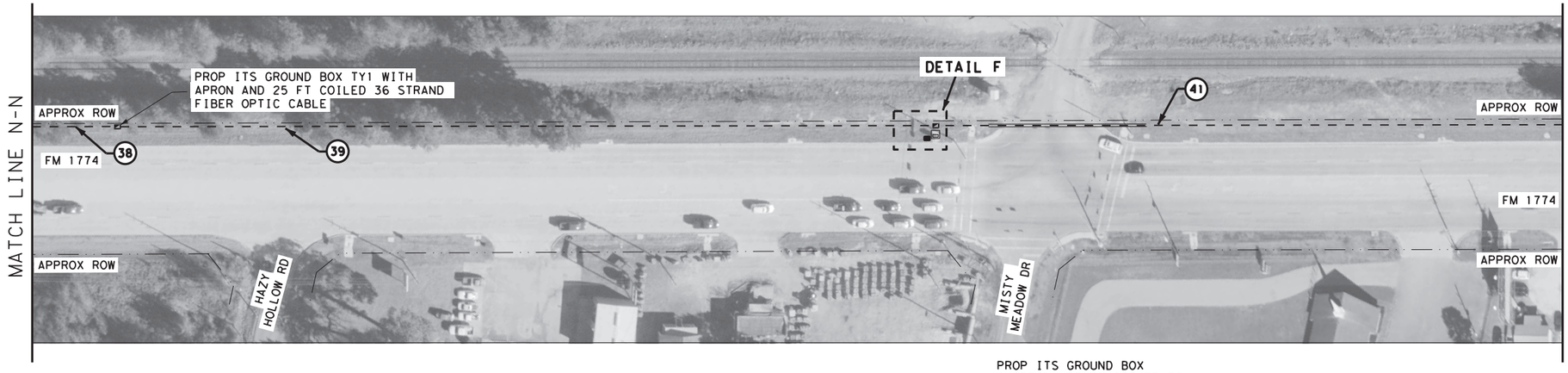
0 50 100
SCALE: 1" = 100'

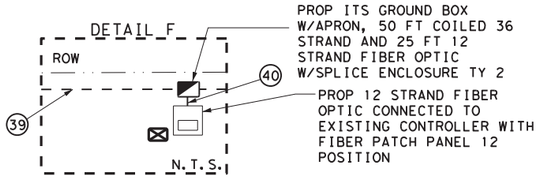
SHEET 7 OF 11

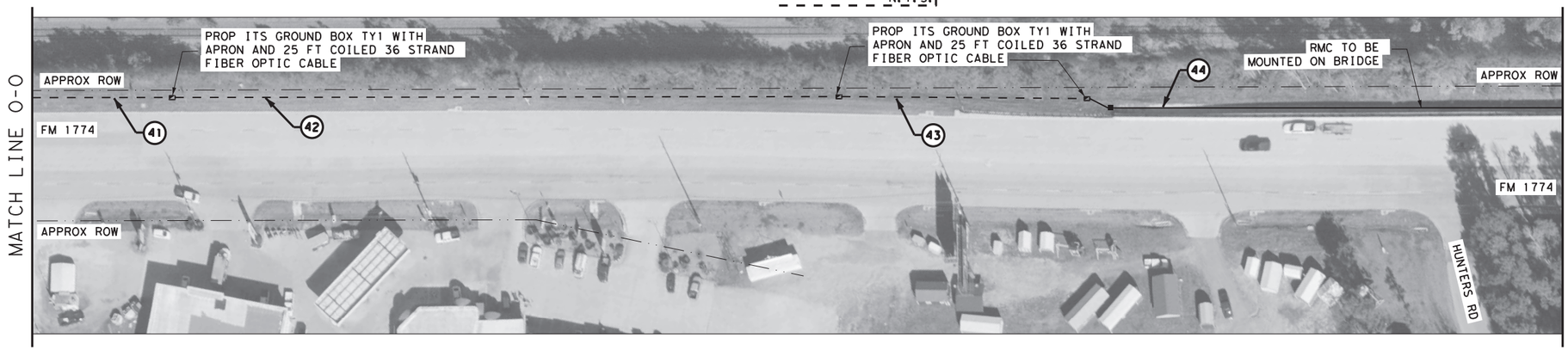
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		44

DATE: 6/30/2023
FILE: H:\Traffic Signals\Greg Sosa\2022 Projects\1400-04-039 FM 1774 FIBER OPTIC\Fiber Optic NO MULTI - Copy.dgn







LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING MULTIDUCT CONDUIT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT (BORE)
- PROPOSED CONDUIT (RIGID METAL)

NOTE:

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4. ALL WORK MUST BE PERFORMED WITHIN TXDOT RIGHT OF WAY.

CSJ: 1400-04-039

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT(618)						TRACER (620)		FIBER (6007)			
	PVC				RM		WIRE		SINGLE MODE		SINGLE MODE	
	2" (SCHD 80)				2"		#14 INSULATED		12 STRAND		36 STRAND	
	(6046)		(6047)		(6070)		(6002)		(6011)		(6013)	
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
39	1	625					1	625			1	625
40	1	10					1	10	1	10		
41	1	465	1	120			1	585			1	585
42	1	505					1	505			1	505
43	1	185					1	185			1	185
44					1	735	1	735			1	735
25' COILED									1	25	4	25
50' COILED											1	50
TOTAL (LF)		1790		120		735		2645		35		2785
EST. TOTAL		1880		130		775		2780		40		2925

FM 1774
FROM FM 1488
TO SH 249
FIBER OPTIC
CABLE LAYOUTS

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

07/03/2023

0 50 100
SCALE: 1" = 100'

SHEET 8 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046,ETC.	UA 90,ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND,ETC.		45

DATE: 6/30/2023
FILE: H:\Traffic Signals\Greg Sosa\2022 Projects\1400-04-039 FM 1774 FIBER OPTIC\Fiber Optic NO MULTI - Copy.dgn

LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING MULTIDUCT CONDUIT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT (BORE)
- PROPOSED CONDUIT (RIGID METAL)

NOTE:

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4. ALL WORK MUST BE PERFORMED WITHIN TXDOT RIGHT OF WAY.

CSJ: 1400-04-039 CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618) PVC 2" (SCHD 80) (6046)		TRACER (620) WIRE #14 INSULATED (6002)		FIBER (6007) SINGLE MODE 36 STRAND (6013)	
	NO.	TRENCH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF
45	1	705	1	705	1	705
46	1	665	1	665	1	665
47	1	600	1	600	1	600
25' COILED					3	25
TOTAL (LF)		1970		1970		2045
EST. TOTAL		2070		2070		2150

FM 1774 FROM FM 1488 TO SH 249 FIBER OPTIC CABLE LAYOUTS

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER
P.E.

07/03/2023

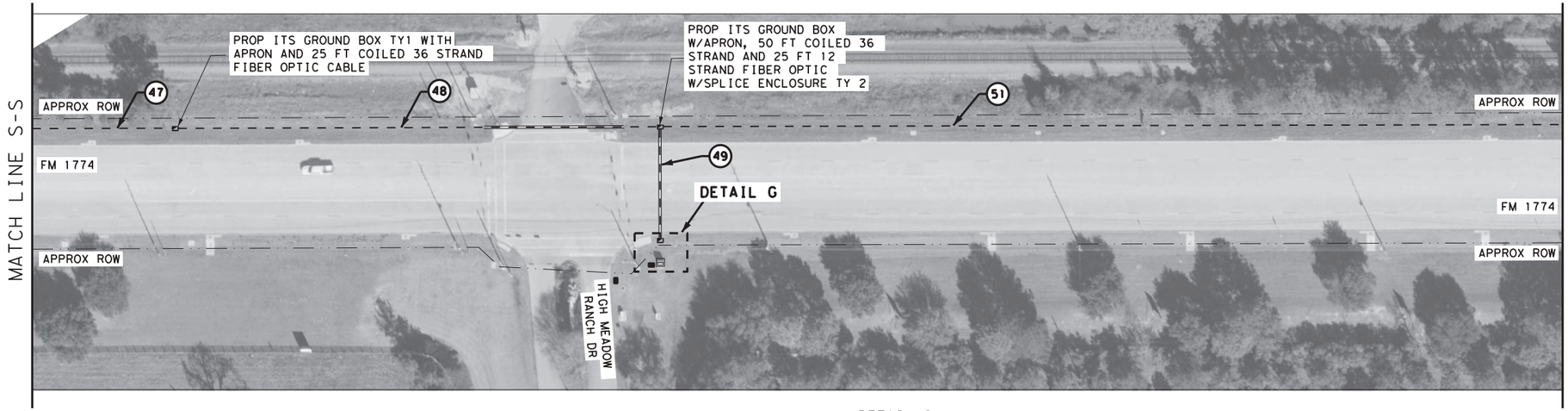
0 50 100
SCALE: 1" = 100'

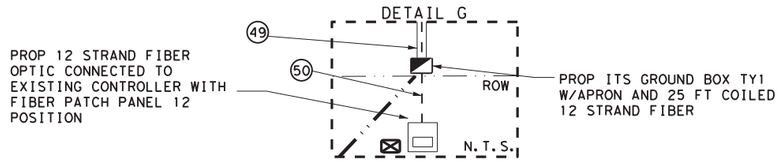
SHEET 9 OF 11

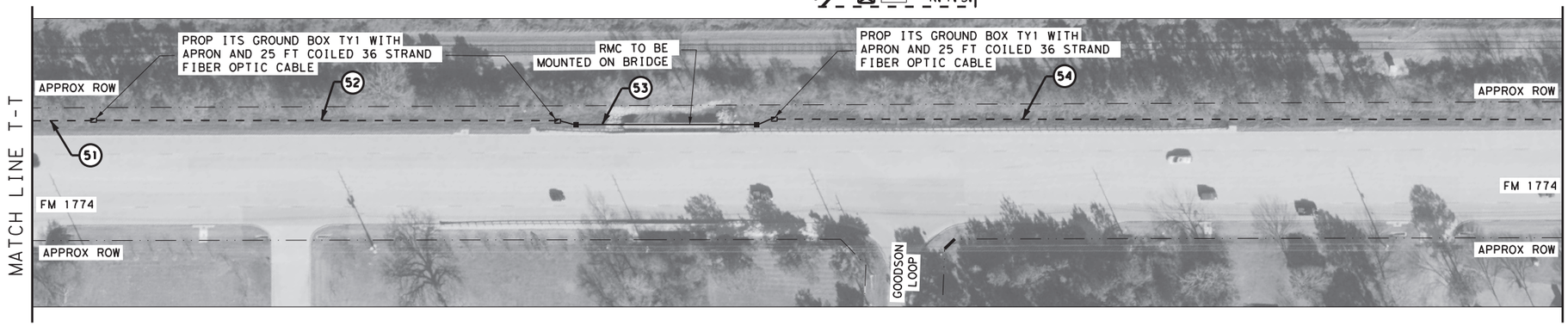
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		46

DATE: 6/30/2023
FILE: H:\Trfsignals\Greg Sosa\2022 Projects\1400-04-039 FM 1774 FIBER OPTIC\Fiber Optic NO MULTI - Copy.dgn







LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING MULTIDUCT CONDUIT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT (BORE)
- PROPOSED CONDUIT (RIGID METAL)

NOTE:

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CSJ: 1400-04-039

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618)						TRACER (620)		FIBER (6007)			
	PVC				RM		WIRE		SINGLE MODE		SINGLE MODE	
	2" (SCHD 80)				2"		#14 INSULATED		12 STRAND		36 STRAND	
	(6046)		(6047)		(6070)		(6002)		(6011)		(6013)	
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
48	1	365	1	105			1	365			1	365
49			1	85			1	85	1	85		
50	1	15					1	15	1	15		
51	1	735					1	735			1	735
52	1	350					1	350			1	350
53					1	155	1	155			1	155
54	1	755					1	755			1	755
25' COILED									2	25	4	25
50' COILED											1	50
TOTAL (LF)		2220		190		155		2460		150		2510
EST. TOTAL		2335		200		165		2585		160		2640

FM 1774
FROM FM 1488
TO SH 249
FIBER OPTIC
CABLE LAYOUTS

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

07/03/2023

0 50 100
SCALE: 1" = 100'

SHEET 10 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		47

DATE: 6/30/2023
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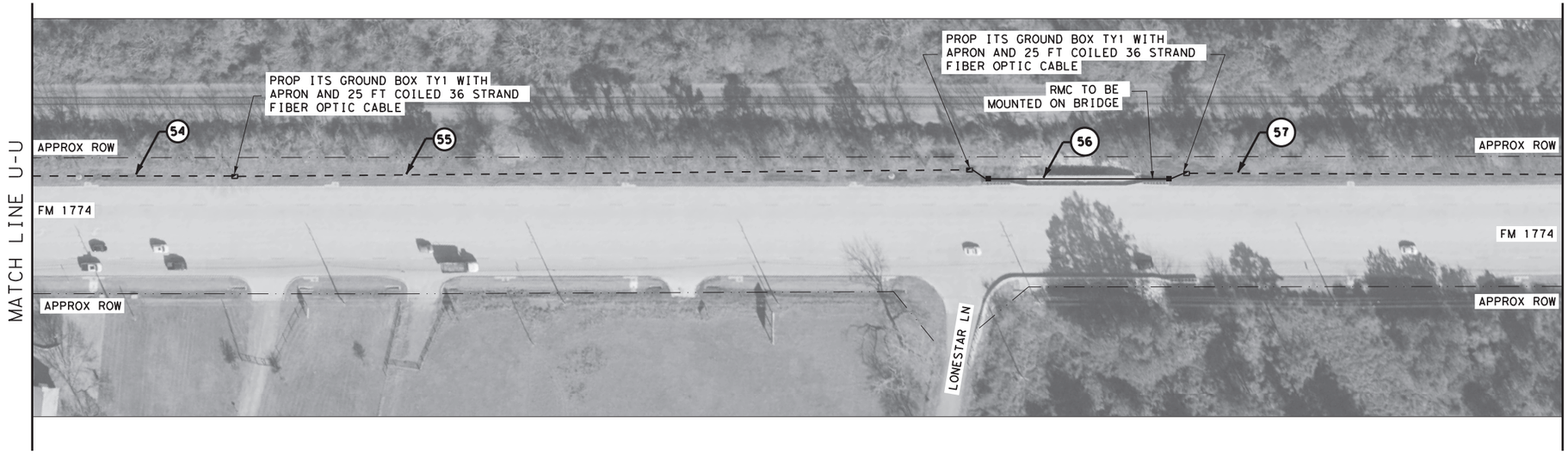

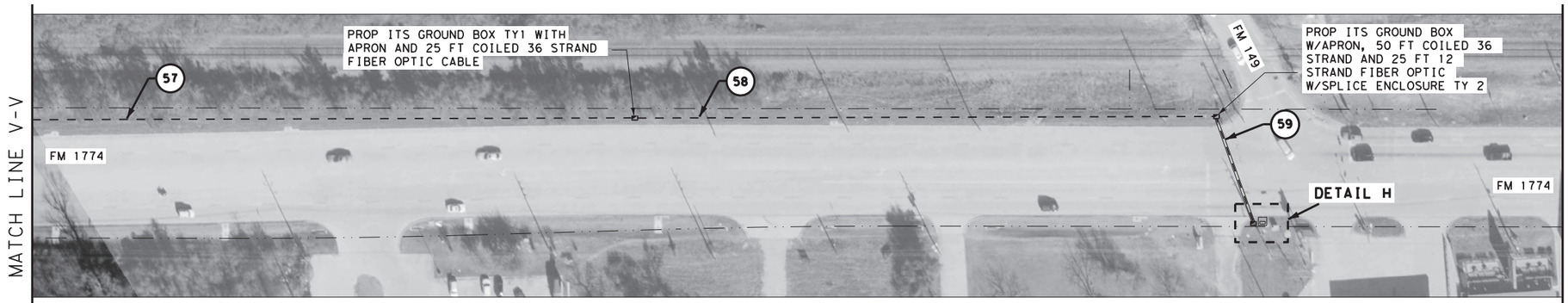

LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING MULTIDUCT CONDUIT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT (BORE)
- PROPOSED CONDUIT (RIGID METAL)

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CSJ: 1400-04-039

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618)						TRACER (620)		FIBER (6007)			
	PVC				RM		WIRE		SINGLE MODE		SINGLE MODE	
	2" (SCHD 80)				2"		#14 INSULATED		12 STRAND		36 STRAND	
	(6046)		(6047)		(6070)		(6002)		(6011)		(6013)	
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
55	1	560					1	560			1	560
56					1	155	1	155			1	155
57	1	745					1	745			1	745
58	1	440					1	440			1	440
59			1	85			1	85	1	85		
60	1	10					1	10	1	10		
25' COILED									2	25	4	25
50' COILED											1	50
TOTAL (LF)		1755		85		155		1995		145		2050
EST. TOTAL		1845		90		165		2095		155		2155

FM 1774
FROM FM 1488
TO SH 249
FIBER OPTIC
CABLE LAYOUTS

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

07/03/2023

0 50 100
SCALE: 1" = 100'

SHEET 11 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		48

DATE: 6/30/2023
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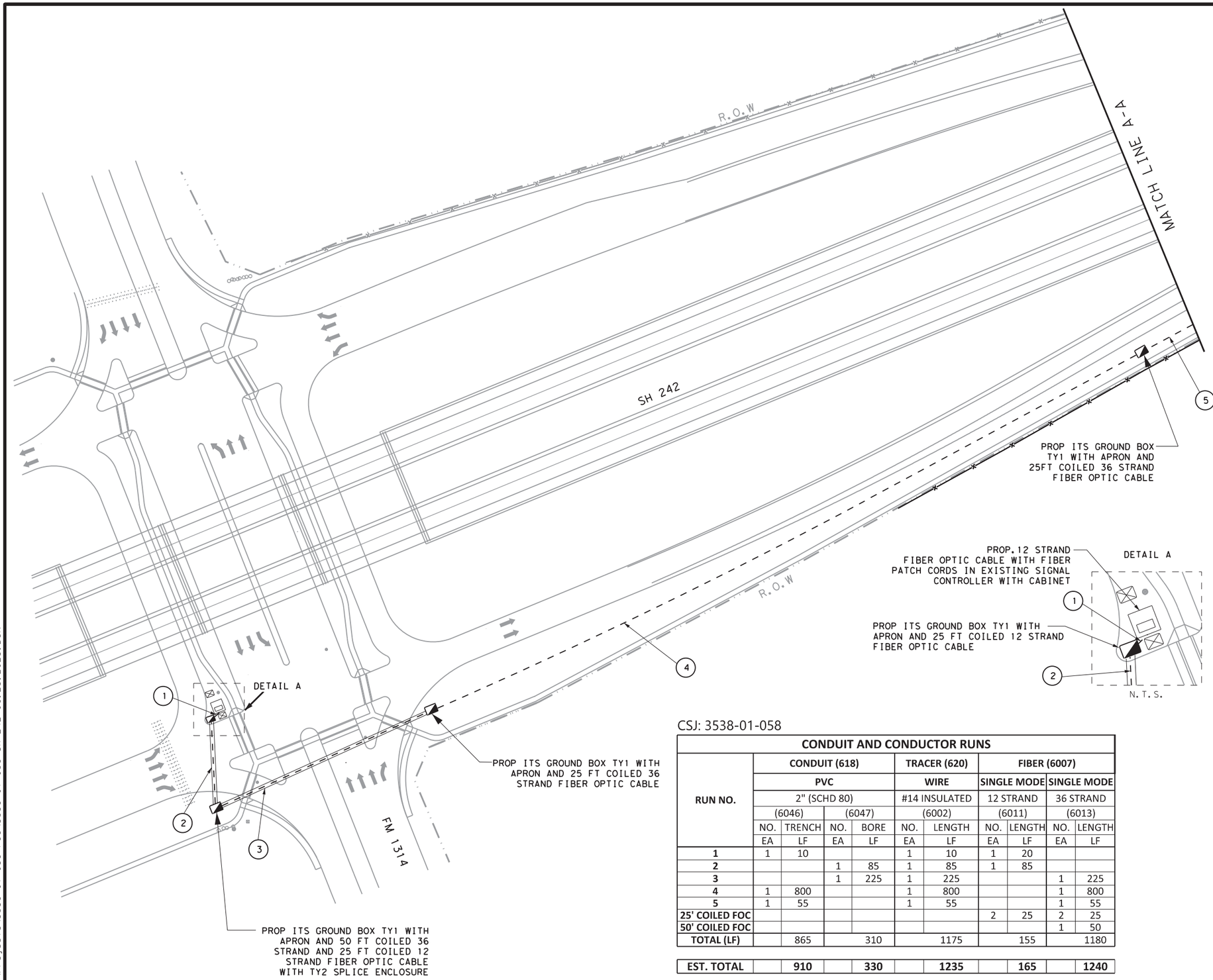

LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING MULTIDUCT CONDUIT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT(BORE)
- PROPOSED CONDUIT(RIGID METAL)

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CSJ: 3538-01-058

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618) PVC 2" (SCHD 80) (6046) NO. EA	(6046) TRENCH LF	(6047) NO. EA	(6047) BORE LF	TRACER (620) WIRE #14 INSULATED (6002) NO. EA	(6002) LENGTH LF	FIBER (6007) SINGLE MODE 12 STRAND (6011) NO. EA	(6011) LENGTH LF	SINGLE MODE 36 STRAND (6013) NO. EA	(6013) LENGTH LF
1	1	10			1	10	1	20		
2			1	85	1	85	1	85		
3			1	225	1	225			1	225
4	1	800			1	800			1	800
5	1	55			1	55			1	55
25' COILED FOC							2	25	2	25
50' COILED FOC									1	50
TOTAL (LF)		865		310		1175		155		1180
EST. TOTAL		910		330		1235		165		1240

SH 242 FROM FM 1314 TO FM 1485 FIBER OPTIC CABLE LAYOUT

0 50 100 FT
SCALE: 1" = 100'

SHEET 1 OF 11

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER
P.E.

07/03/2023

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		49

DATE: 6/29/2023
FILE: U:\HOU\Projects\3538-01-058*FOC\3538-01-058*SH 242*06.23.2023.DGN

NOTE:

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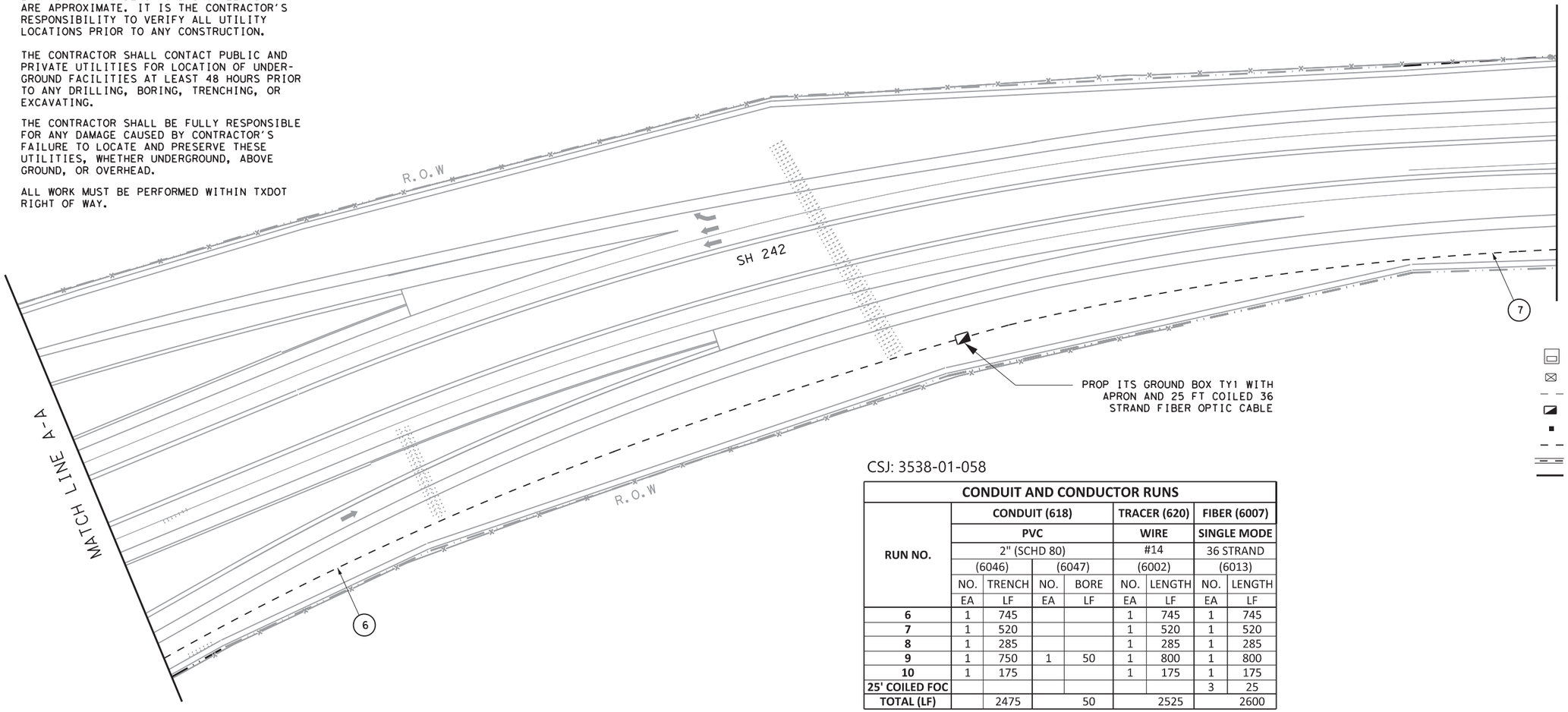
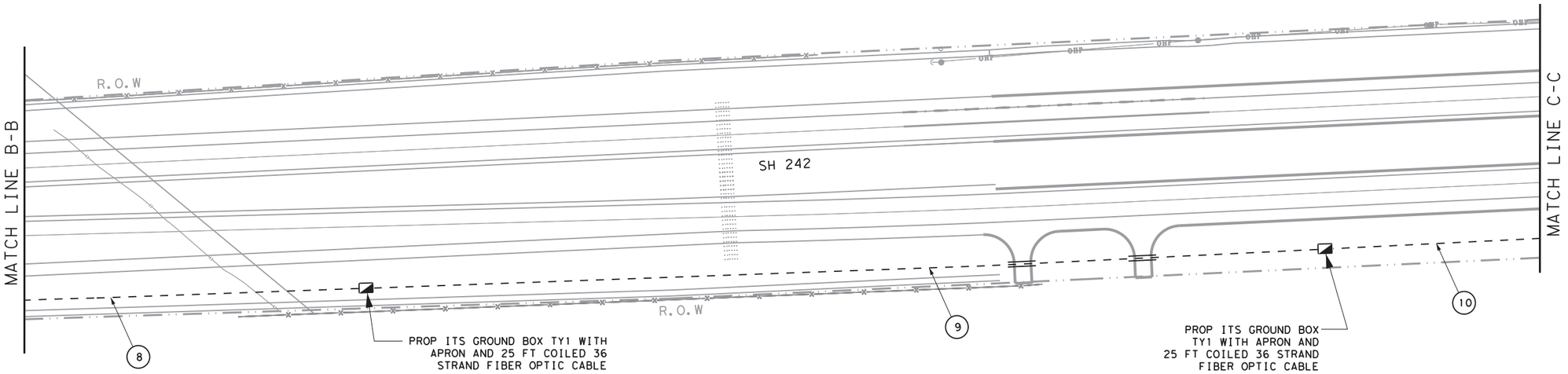


CSJ: 3538-01-058

CONDUIT AND CONDUCTOR RUNS								
RUN NO.	CONDUIT (618)				TRACER (620)		FIBER (6007)	
	PVC				WIRE		SINGLE MODE	
	2" (SCHD 80)				#14		36 STRAND	
	(6046)		(6047)		(6002)		(6013)	
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF
6	1	745			1	745	1	745
7	1	520			1	520	1	520
8	1	285			1	285	1	285
9	1	750	1	50	1	800	1	800
10	1	175			1	175	1	175
25' COILED FOC							3	25
TOTAL (LF)		2475		50		2525		2600
EST. TOTAL		2600		55		2655		2730



LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING MULTIDUCT CONDUIT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT(BORE)
- PROPOSED CONDUIT(RIGID METAL)

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

07/03/2023

SH 242
FROM FM 1314 TO FM 1485 FIBER OPTIC CABLE LAYOUT

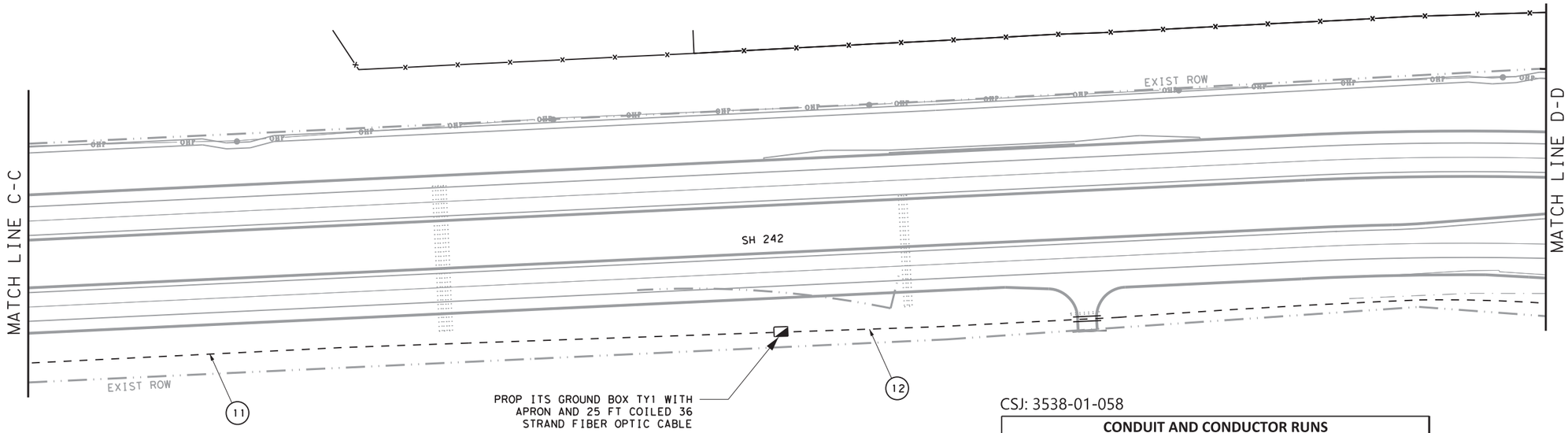
0 50 100 FT
SCALE: 1" = 100'

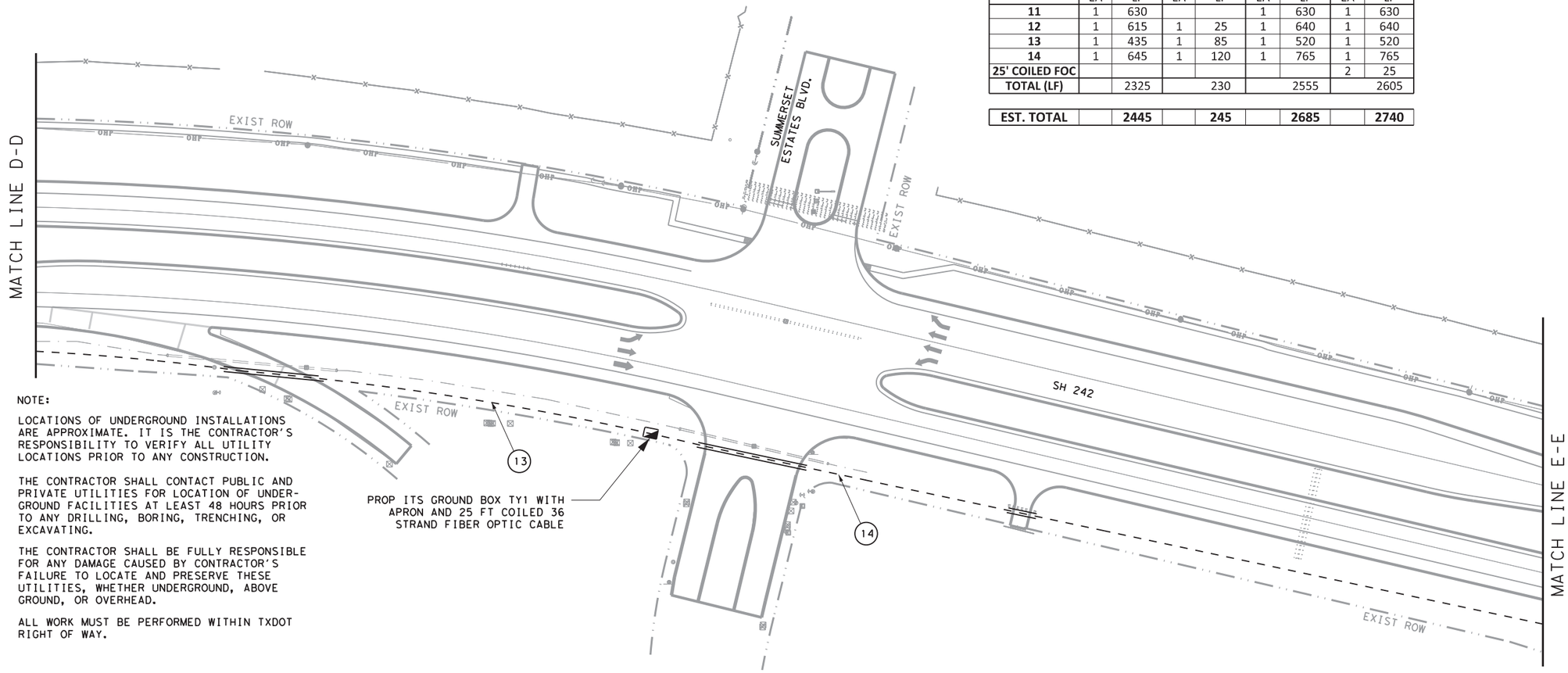
SHEET 2 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046,ETC.	UA 90,ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND,ETC.		50

DATE: 6/29/2023
FILE: U:\HOU\Projects\3538-01-058*FOC\3538-01-058*SH 242*06.23.2023.DGN





LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING MULTIDUCT CONDUIT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT(BORE)
- PROPOSED CONDUIT(RIGID METAL)

CSJ: 3538-01-058

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618) PVC 2" (SCHD 80) (6046) NO. EA	(6046) TRENCH LF	(6047) NO. EA	(6047) BORE LF	TRACER (620) WIRE #14 (6002) NO. EA	(6002) LENGTH LF	FIBER (6007) SINGLE MODE 36 STRAND (6013) NO. EA	(6013) LENGTH LF
11	1	630			1	630	1	630
12	1	615	1	25	1	640	1	640
13	1	435	1	85	1	520	1	520
14	1	645	1	120	1	765	1	765
25' COILED FOC							2	25
TOTAL (LF)		2325		230		2555		2605
EST. TOTAL		**2445**		**245**		**2685**		**2740**

NOTE:

LOCATIONS OF UNDERGROUND INSTALLATIONS ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL UTILITY LOCATIONS PRIOR TO ANY CONSTRUCTION.

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THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD.

ALL WORK MUST BE PERFORMED WITHIN TXDOT RIGHT OF WAY.

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER
P.E.

07/03/2023

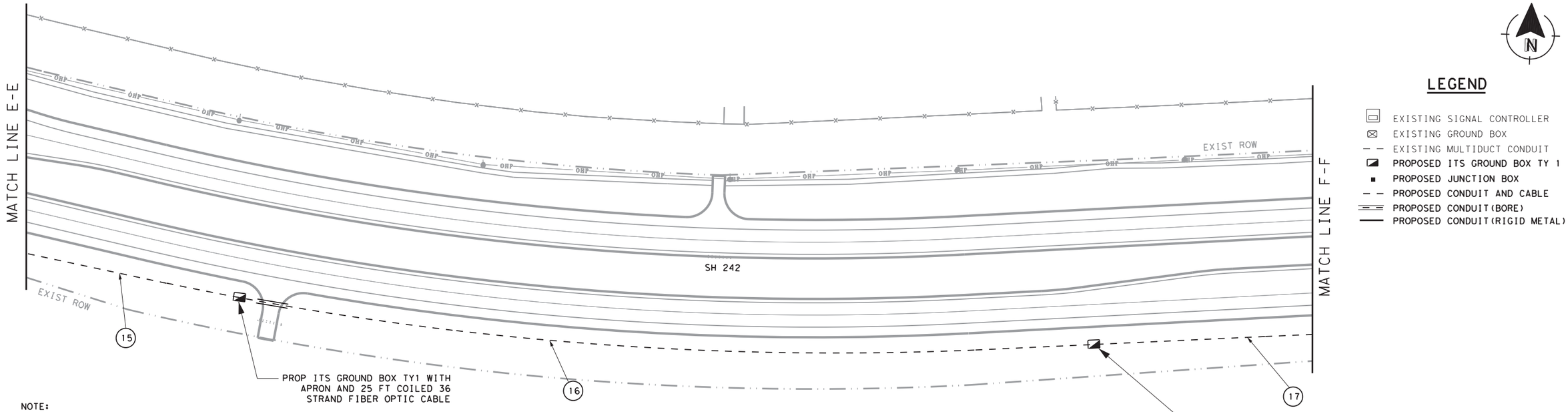
SH 242
FROM FM 1314 TO FM 1485 FIBER OPTIC CABLE LAYOUT

0 50 100 FT
SCALE: 1" = 100'

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046,ETC.	UA 90,ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND,ETC.		51

DATE: 6/29/2023
FILE: U:\HOU\Projects\3538-01-058*FOC\3538-01-058*SH 242*06.23.2023.DGN



LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING MULTIDUCT CONDUIT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT(BORE)
- PROPOSED CONDUIT(RIGID METAL)

NOTE:

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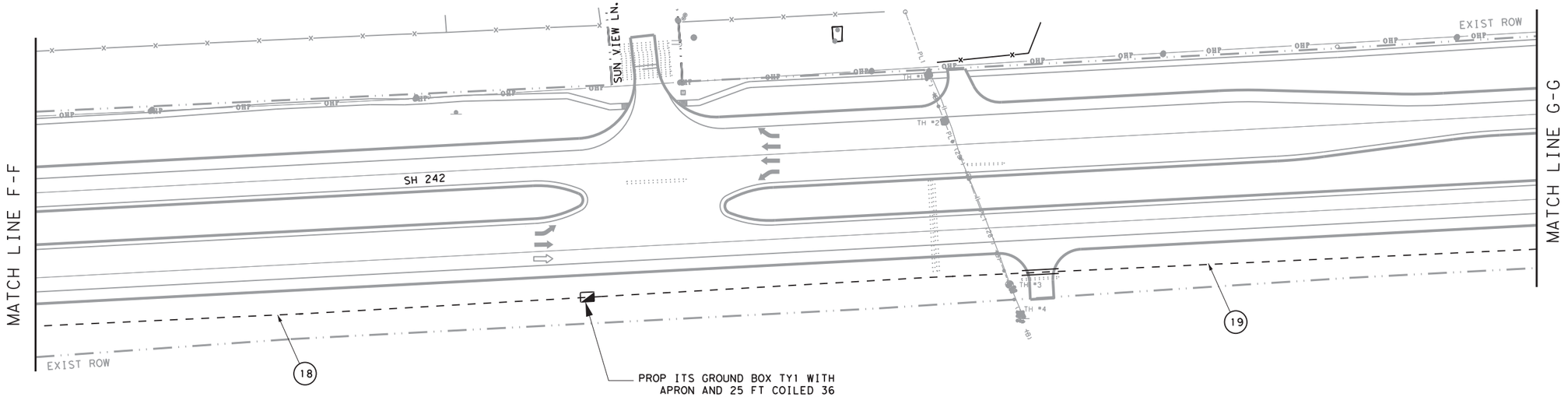
ALL WORK MUST BE PERFORMED WITHIN TXDOT RIGHT OF WAY.

CSJ: 3538-01-058

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618)				TRACER (620)		FIBER (6007)	
	PVC				WIRE		SINGLE MODE	
	2" (SCHD 80)				#14		36 STRAND	
	(6046)		(6047)		(6002)		(6013)	
	NO. EA	TRENCH LF	NO. EA	BORE LF	NO. EA	LENGTH LF	NO. EA	LENGTH LF
15	1	210			1	210	1	210
16	1	805	1	35	1	840	1	840
17	1	210			1	210	1	210
18	1	465			1	465	1	465
19	1	770	1	35	1	805	1	805
25' COILED FOC							3	25
TOTAL (LF)		2460		70		2530		2605
EST. TOTAL		2585		75		2660		2740



STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER
P.E.

07/03/2023

SH 242 FROM FM 1314 TO FM 1485 FIBER OPTIC CABLE LAYOUT

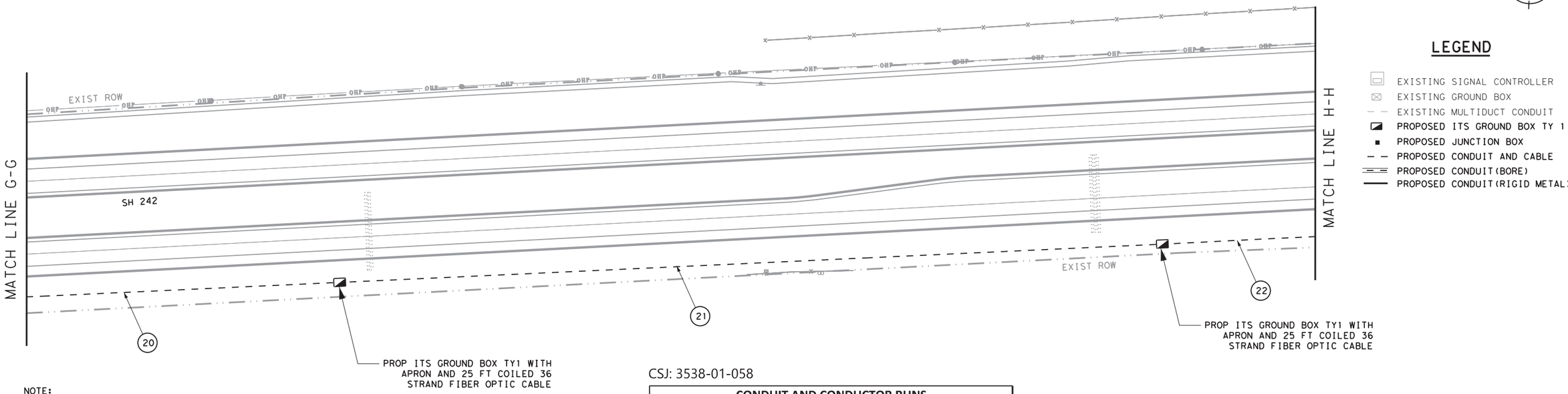
0 50 100 FT
SCALE: 1" = 100'

SHEET 4 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		52

DATE: 6/29/2023
FILE: U:\HOU\Projects\3538-01-058*FOC\3538-01-058*SH 242*06.23.2023.DGN



LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING MULTIDUCT CONDUIT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT(BORE)
- PROPOSED CONDUIT(RIGID METAL)

NOTE:

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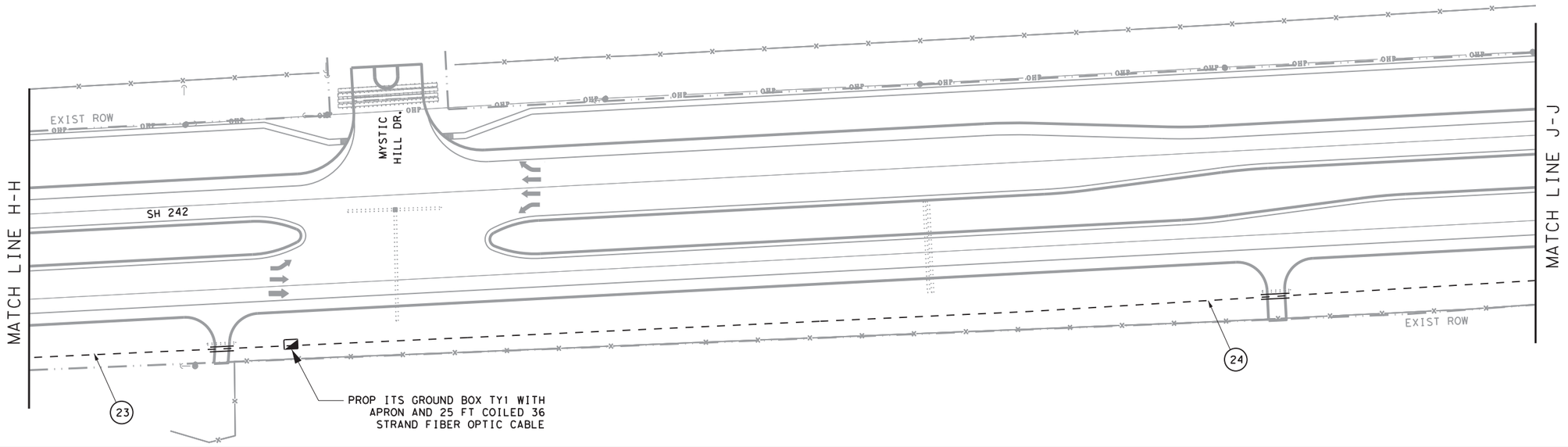
ALL WORK MUST BE PERFORMED WITHIN TXDOT RIGHT OF WAY.

CSJ: 3538-01-058

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618) PVC 2" (SCHD 80) (6046) NO. EA	(6046) TRENCH LF	(6047) NO. EA	(6047) BORE LF	TRACER (620) WIRE #14 (6002) NO. EA	(6002) LENGTH LF	FIBER (6007) SINGLE MODE 36 STRAND (6013) NO. EA	(6013) LENGTH LF
20	1	305			1	305	1	305
21	1	800			1	800	1	800
22	1	145			1	145	1	145
23	1	195	1	25	1	220	1	220
24	1	1025	1	25	1	1050	1	1050
25' COILED FOC							3	25
TOTAL (LF)		2470		50		2520		2595
EST. TOTAL		2595		55		2650		2725



STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER
P.E.

07/03/2023

SH 242
FROM FM 1314 TO FM 1485 FIBER OPTIC CABLE LAYOUT

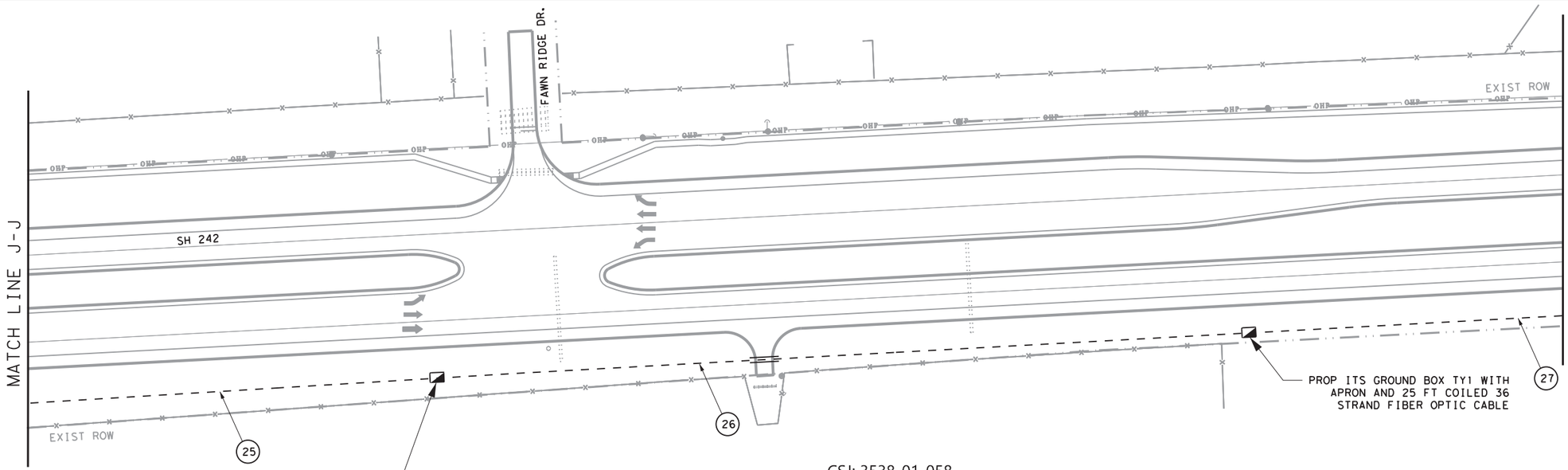
0 50 100 FT
SCALE: 1" = 100'

SHEET 5 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046,ETC.	UA 90,ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND,ETC.		53

DATE: 6/29/2023
FILE: U:\HOU\Projects\3538-01-058*FOC\3538-01-058*SH 242*06.23.2023.DGN



LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING MULTIDUCT CONDUIT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT(BORE)
- PROPOSED CONDUIT(RIGID METAL)

NOTE:

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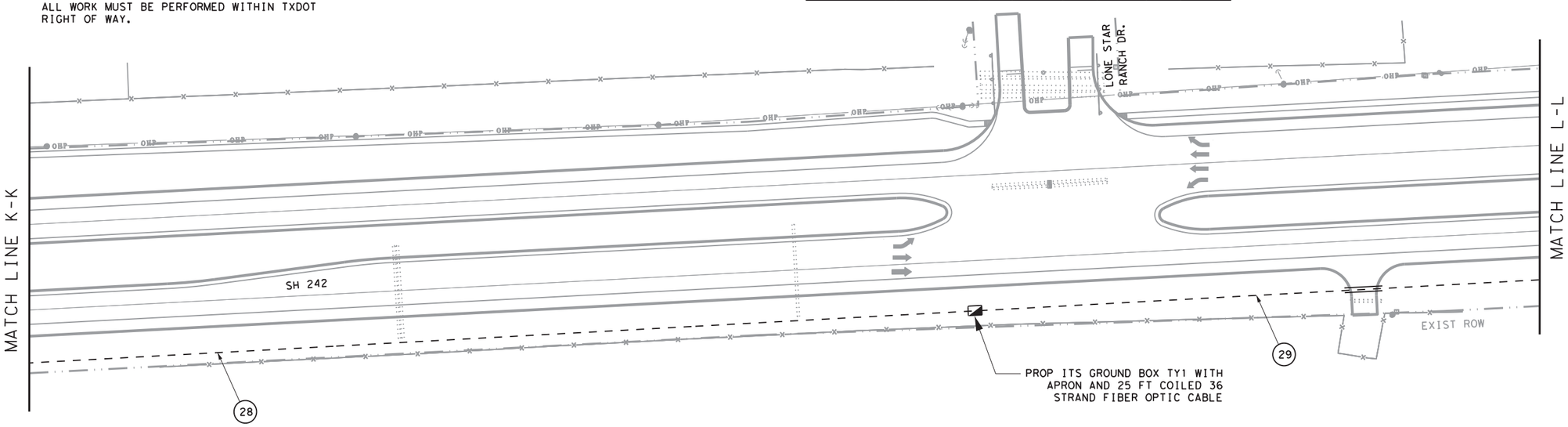
ALL WORK MUST BE PERFORMED WITHIN TXDOT RIGHT OF WAY.

CSJ: 3538-01-058

CONDUIT AND CONDUCTOR RUNS								
RUN NO.	CONDUIT (618)				TRACER (620)		FIBER (6007)	
	PVC				WIRE		SINGLE MODE	
	2" (SCHD 80)				#14		36 STRAND	
	(6046)		(6047)		(6002)		(6013)	
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF
25	1	335			1	335	1	335
26	1	640	1	25	1	665	1	665
27	1	255			1	255	1	255
28	1	795			1	795	1	795
29	1	440	1	35	1	475	1	475
25' COILED FOC							3	25
TOTAL (LF)		2465		60		2525		2600
EST. TOTAL		**2590**		**65**		**2655**		**2730**



STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER
P.E.

07/03/2023

SH 242 FROM FM 1314 TO FM 1485 FIBER OPTIC CABLE LAYOUT

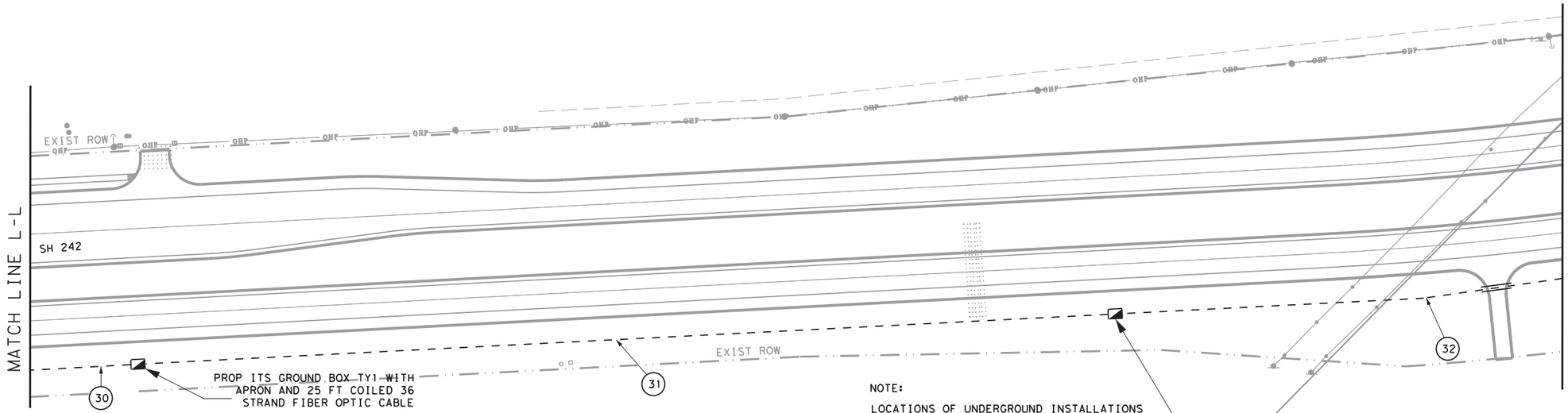
0 50 100 FT
SCALE: 1" = 100'

SHEET 6 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		54

DATE: 6/29/2023
FILE: U:\HOU\Projects\3538-01-058*FOC\3538-01-058*SH 242*06.23.2023.DGN



LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING MULTIDUCT CONDUIT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT(BORE)
- PROPOSED CONDUIT(RIGID METAL)

CSJ: 3538-01-058

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618)						TRACER (620)		FIBER (6007)	
	PVC				RM		WIRE		SINGLE MODE	
	2" (SCHD 80)				2"		#14		36 STRAND	
	(6046)		(6047)		(6070)		(6002)		(6013)	
	NO.	TRENCH	NO.	BORE	NO.	LENGT	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
30	1	85					1	85	1	85
31	1	800					1	800	1	800
32	1	345	1	25			1	370	1	370
33	1	405					1	405	1	405
34					1	440	1	440	1	440
35	1	450					1	450	1	450
25' COILED FOC									4	25
TOTAL (LF)		2085		25		440		2550		2650
EST. TOTAL		**2190**		**30**		**465**		**2680**		**2785**

NOTE:

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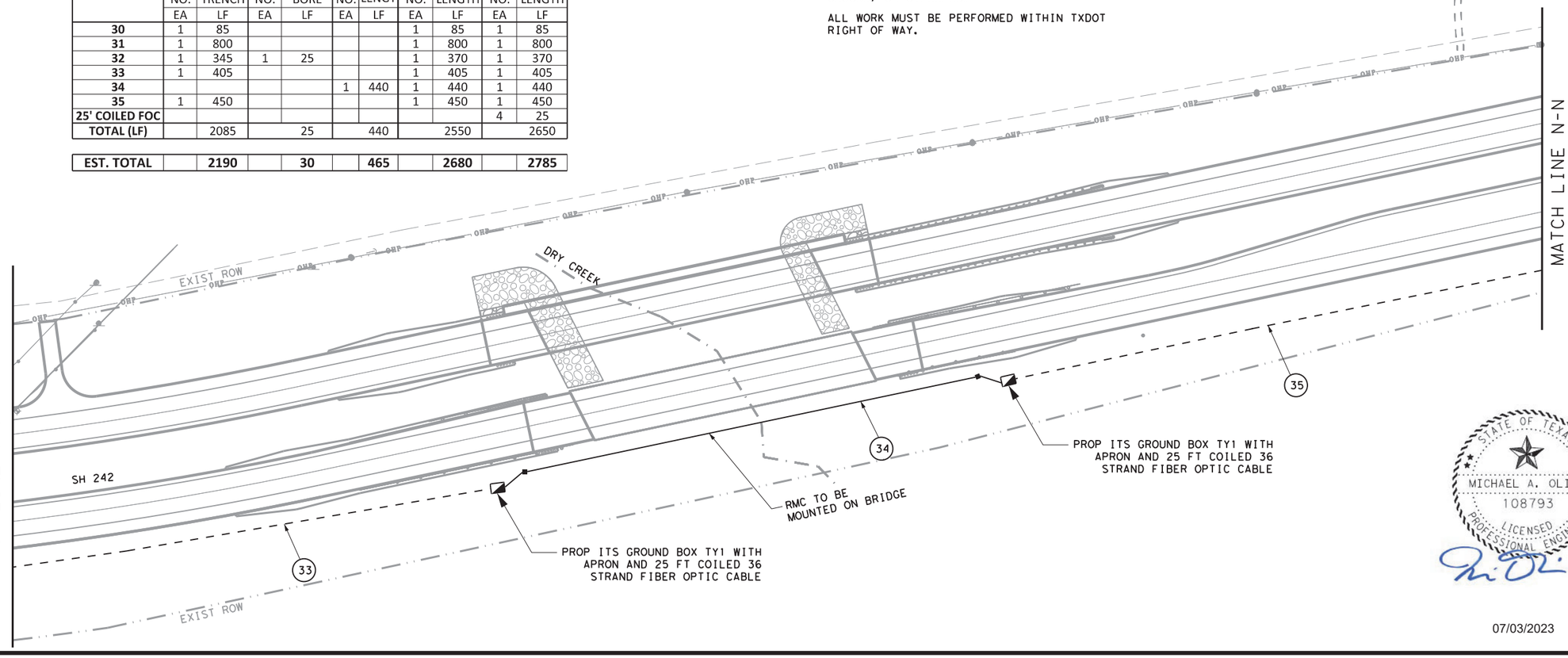
ALL WORK MUST BE PERFORMED WITHIN TXDOT RIGHT OF WAY.

PROP ITS GROUND BOX TY1 WITH APRON AND 25 FT COILED 36 STRAND FIBER OPTIC CABLE



SH 242 FROM FM 1314 TO FM 1485 FIBER OPTIC CABLE LAYOUT

0 50 100 FT

SCALE: 1" = 100'

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER
P.E.

07/03/2023

SHEET 7 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		55

DATE: 6/29/2023
FILE: U:\HOU\Projects\3538-01-058*FOC\3538-01-058*SH 242*06. 23. 2023. DGN

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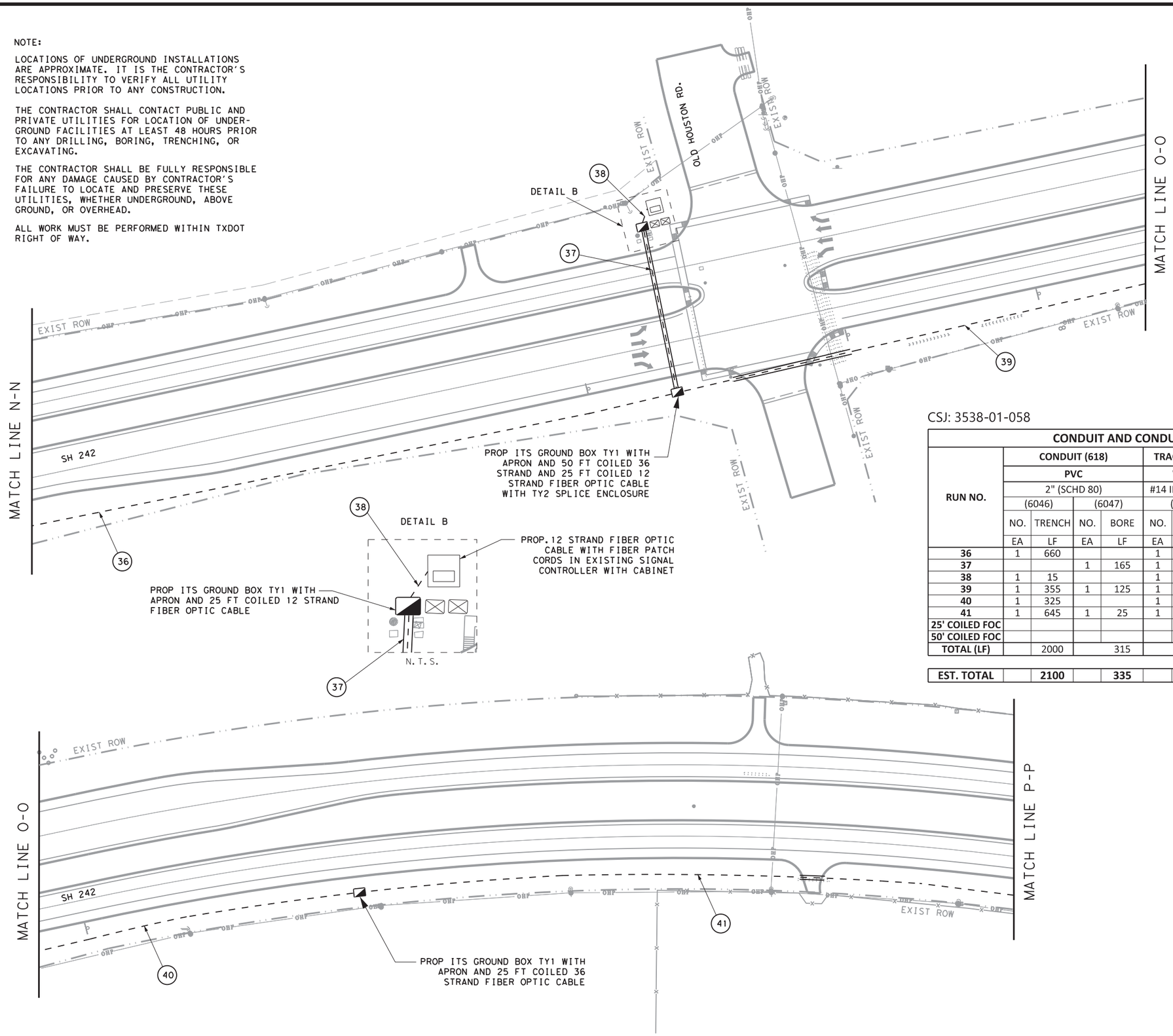


LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING MULTIDUCT CONDUIT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT(BORE)
- PROPOSED CONDUIT(RIGID METAL)

CSJ: 3538-01-058

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618)				TRACER (620)		FIBER (6007)			
	PVC				WIRE		SINGLE MODE		SINGLE MODE	
	2" (SCHD 80)				#14 INSULATED		12 STRAND		36 STRAND	
	(6046)		(6047)		(6002)		(6011)		(6013)	
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
36	1	660			1	660			1	660
37			1	165	1	165	1	165		
38	1	15			1	15	1	15		
39	1	355	1	125	1	480			1	480
40	1	325			1	325			1	325
41	1	645	1	25	1	670			1	670
25' COILED FOC							2	25	1	25
50' COILED FOC									1	50
TOTAL (LF)		2000		315		2315		230		2210
EST. TOTAL		**2100**		**335**		**2435**		**245**		**2325**

SH 242
FROM FM 1314 TO FM 1485 FIBER OPTIC CABLE LAYOUT

0 50 100 FT
SCALE: 1" = 100'

SHEET 8 OF 11

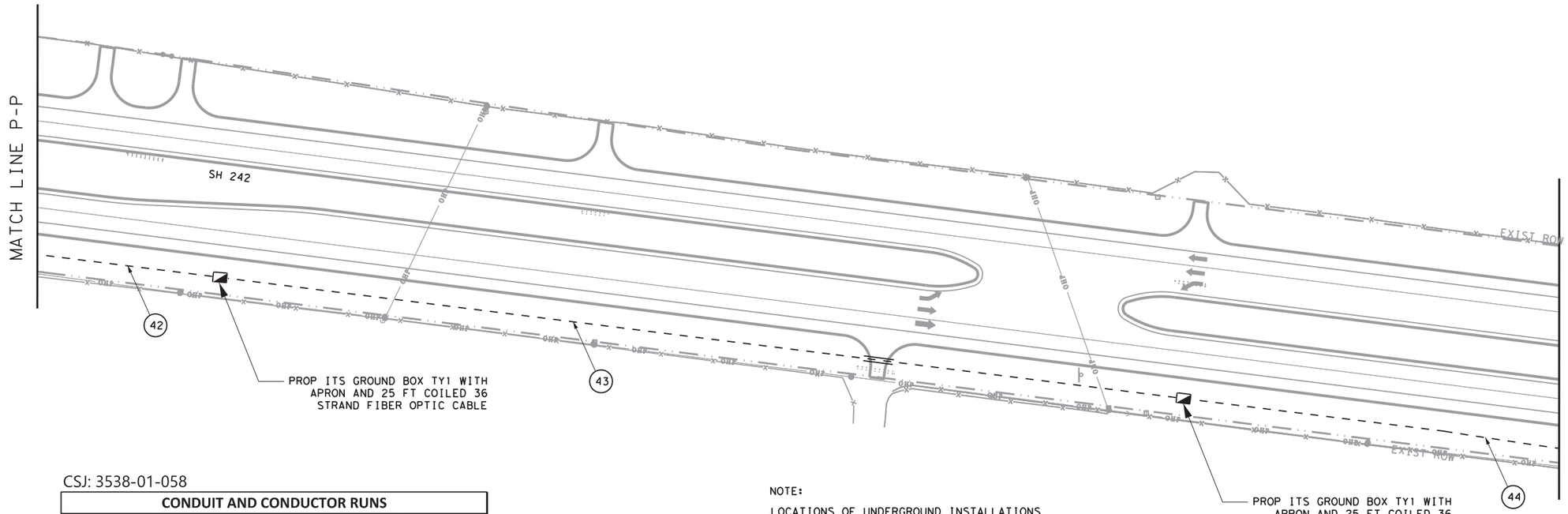
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		56

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

07/03/2023

DATE: 6/29/2023
FILE: U:\HOU\Projects\3538-01-058*FOC\3538-01-058*SH 242*06.23.2023.DGN



LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING MULTIDUCT CONDUIT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT(BORE)
- PROPOSED CONDUIT(RIGID METAL)

CSJ: 3538-01-058

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618)				TRACER (620)		FIBER (6007)	
	PVC				WIRE		SINGLE MODE	
	2" (SCHD 80)				#14		36 STRAND	
	(6046)		(6047)		(6002)		(6013)	
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF
42	1	150			1	150	1	150
43	1	775	1	25	1	800	1	800
44	1	315			1	315	1	315
45	1	495			1	495	1	495
46	1	750	1	25	1	775	1	775
25' COILED FOC							3	25
TOTAL (LF)		2485		50		2535		2610
EST. TOTAL		**2610**		**55**		**2665**		**2745**

NOTE:

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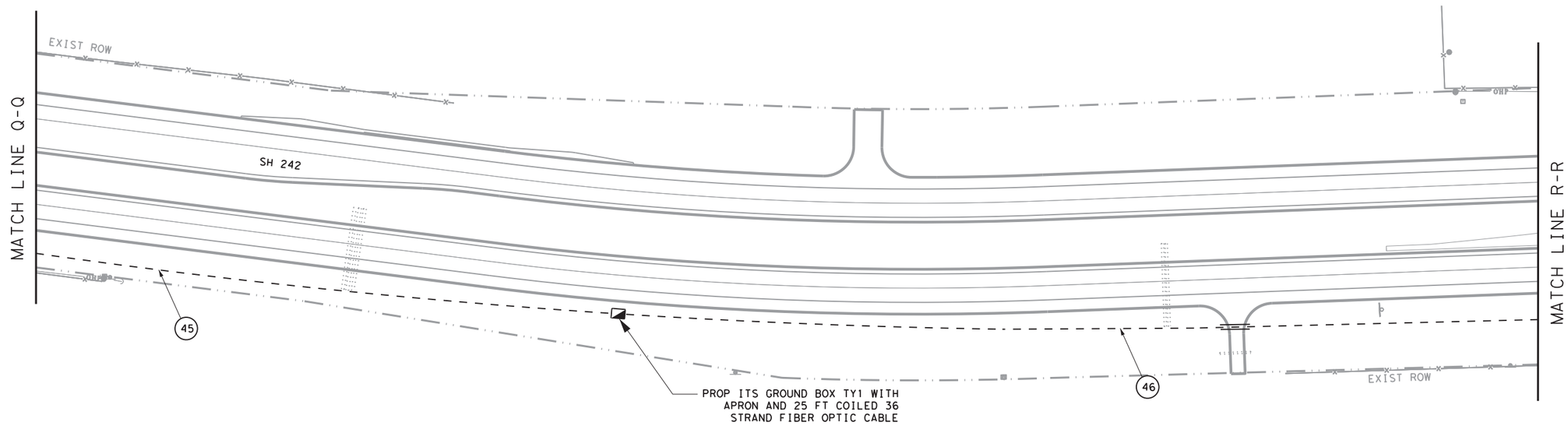


STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER
P.E.

07/03/2023

SH 242
FROM FM 1314 TO FM 1485 FIBER OPTIC CABLE LAYOUT

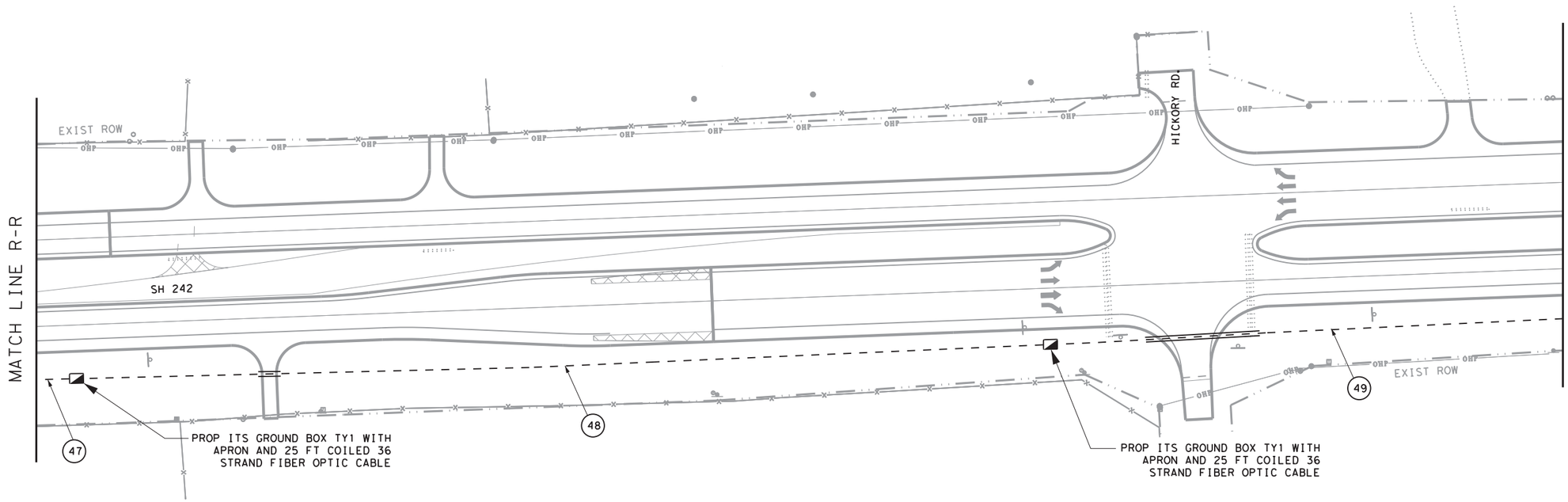
0 50 100 FT
SCALE: 1" = 100'

SHEET 9 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		57

DATE: 6/29/2023
FILE: U:\HOU\Projects\3538-01-058*FOC\3538-01-058*SH 242*06.23.2023.DGN



LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING MULTIDUCT CONDUIT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT(BORE)
- PROPOSED CONDUIT(RIGID METAL)

CSJ: 3538-01-058

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618) PVC 2" (SCHD 80) (6046) TRENCH	CONDUIT (618) PVC 2" (SCHD 80) (6047) BORE	TRACER (620) WIRE #14 INSULATED (6002)	FIBER (6007) SINGLE MODE 36 STRAND (6013)
	NO. EA / LF	NO. EA / LF	NO. EA / LENGTH LF	NO. EA / LENGTH LF
47	1 / 30		1 / 30	1 / 30
48	1 / 780	1 / 20	1 / 800	1 / 800
49	1 / 330	1 / 95	1 / 425	1 / 425
50	1 / 375	1 / 25	1 / 400	1 / 400
51	1 / 770	1 / 30	1 / 800	1 / 800
52	1 / 85		1 / 85	1 / 85
25' COILED FOC				4 / 25
TOTAL (LF)	2370	170	2540	2640
EST. TOTAL	**2490**	**180**	**2670**	**2775**

NOTE:

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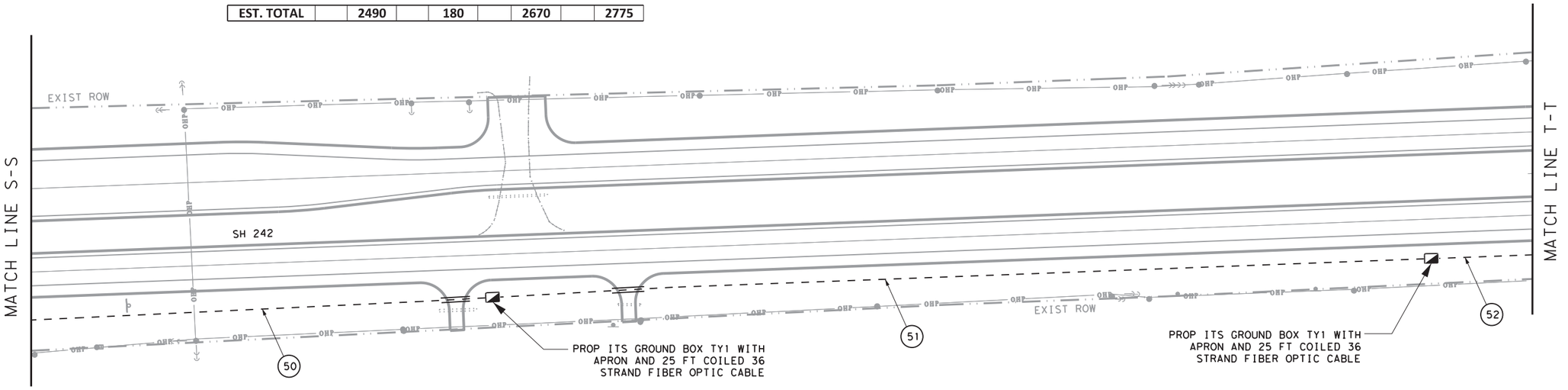


STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER
P.E.

07/03/2023

SH 242
FROM FM 1314 TO FM 1485
FIBER OPTIC CABLE LAYOUT

0 50 100 FT
SCALE: 1" = 100'

SHEET 10 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		58

DATE: 6/29/2023
FILE: U:\HOU\Projects\3538-01-058*FOC\3538-01-058*SH 242*06.23.2023.DGN

CSJ: 3538-01-058

CONDUIT AND CONDUCTOR RUNS										
RUN NO.	CONDUIT (618)				TRACER (620)		FIBER (6007)			
	PVC				WIRE		SINGLE		SINGLE	
	2" (SCHD 80)				#14 INSULATED		12 STRAND		36 STRAND	
	(6046)		(6047)		(6002)		(6011)		(6013)	
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
53	1	550			1	550			1	550
54	1	565	1	25	1	590			1	590
55	1	25			1	25	1	25		
25' COILED FOC							1	25	1	25
50' COILED FOC									1	50
TOTAL (LF)		1140		25		1165		50		1215
EST. TOTAL		1200		30		1225		55		1280

NOTE:

LOCATIONS OF UNDERGROUND INSTALLATIONS ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL UTILITY LOCATIONS PRIOR TO ANY CONSTRUCTION.

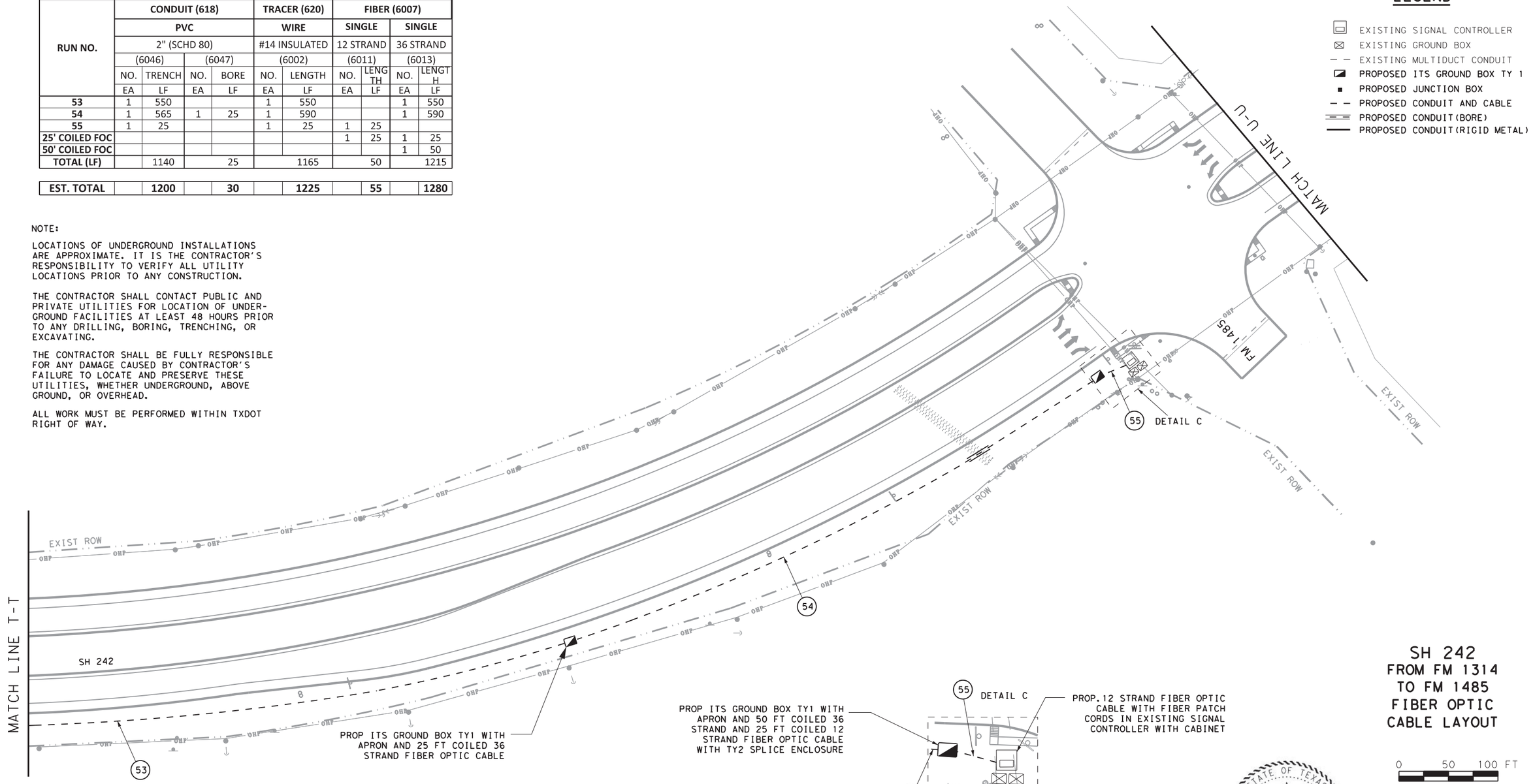
THE CONTRACTOR SHALL CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATION OF UNDER-GROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING, OR EXCAVATING.

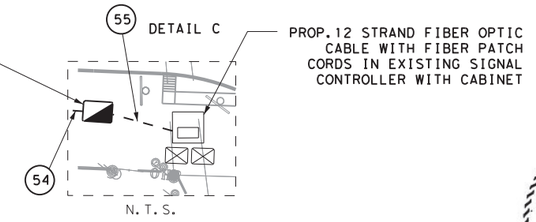
THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD.

ALL WORK MUST BE PERFORMED WITHIN TXDOT RIGHT OF WAY.

LEGEND

- EXISTING SIGNAL CONTROLLER
- EXISTING GROUND BOX
- EXISTING MULTIDUCT CONDUIT
- PROPOSED ITS GROUND BOX TY 1
- PROPOSED JUNCTION BOX
- PROPOSED CONDUIT AND CABLE
- PROPOSED CONDUIT(BORE)
- PROPOSED CONDUIT(RIGID METAL)





SH 242 FROM FM 1314 TO FM 1485 FIBER OPTIC CABLE LAYOUT

0 50 100 FT

SCALE: 1" = 100'

SHEET 11 OF 11

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER
P.E.

07/03/2023

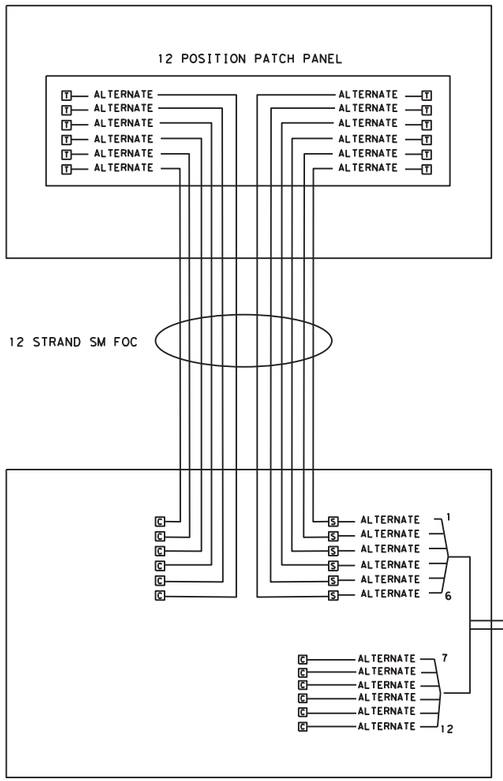
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		59

DATE: 6/29/2023
FILE: U:\HOU\Projects\3538-01-058*FOC\3538-01-058*SH 242*06_23_2023.DGN

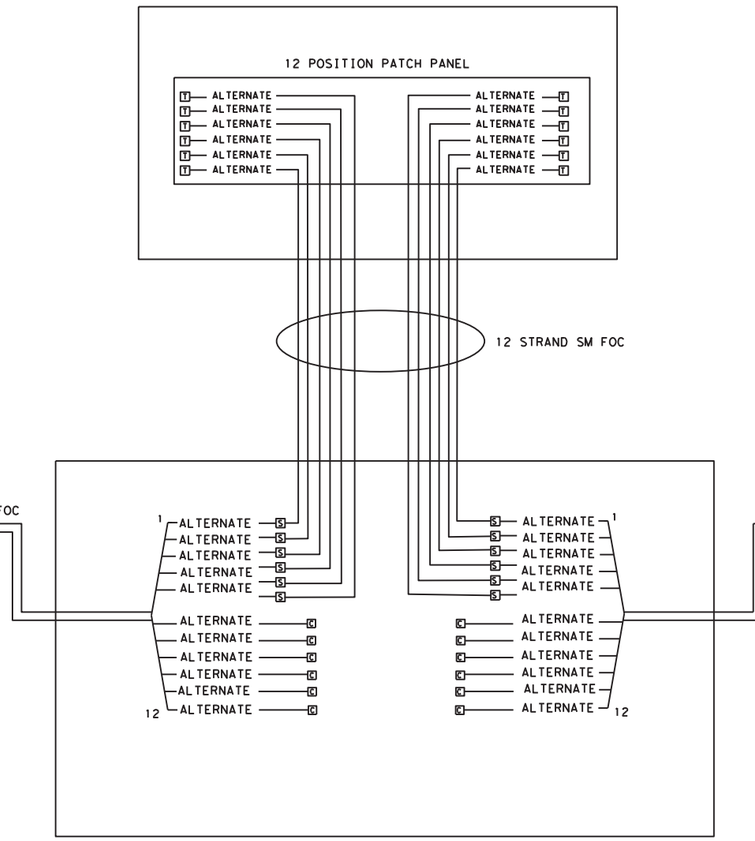
CSJ: 0179-02-089

SIGNAL CABINET AT BS 35 E



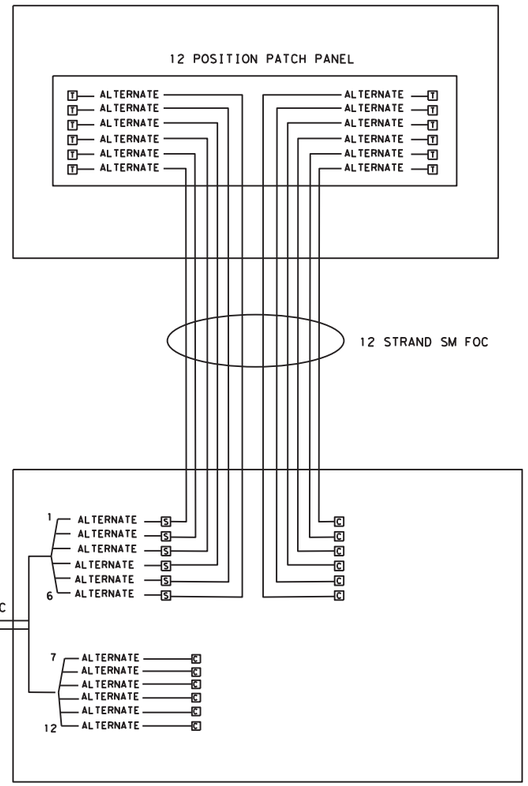
BS 35 E FIBER OPTIC ENCLOSURE
INSTALLED IN GROUND BOX
(FINAL INTERSECTION)

TYPICAL SIGNAL CABINETS ALONG SH 35
(N BROAD ST. AND NORTH 14 ST.)



TYPICAL FIBER OPTIC ENCLOSURE
INSTALLED IN GROUND BOX

SIGNAL CABINET AT FM 2852



FM 2852 FIBER OPTIC ENCLOSURE
INSTALLED IN GROUND BOX
(FINAL INTERSECTION)

LEGEND

- T FC CONNECTOR
- S FUSION SPLICE
- C COILED

STATE OF TEXAS
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07/03/2023

SH 35
FROM BS 35 E
TO FM 2852
TERMINATION
ASSIGNMENTS

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046,ETC.	UA 90,ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND,ETC.		60

DATE: 6/30/2023 7:30:33 AM
FILE: U:\HOU\Projects\0179-02-089_FOC\0179_02_089_SH0035_12.13.2022.dgn

CSJ: 0188-07-006 BRAZORIA
TERMINATION DIAGRAM

EXISTING SIGNAL CABINET SH 35 AT SH 36

FAN OUT KIT

T — ALTERNATE
T — ALTERNATE
T — ALTERNATE
T — ALTERNATE
T — ALTERNATE
T — ALTERNATE

ALTERNATE — T
ALTERNATE — T
ALTERNATE — T
ALTERNATE — T
ALTERNATE — T
ALTERNATE — T

12 STRAND SM FOC

C — S — ALTERNATE — 1
C — S — ALTERNATE
C — S — ALTERNATE
C — S — ALTERNATE
C — S — ALTERNATE
C — S — ALTERNATE — 6

C — ALTERNATE — 7
C — ALTERNATE
C — ALTERNATE
C — ALTERNATE
C — ALTERNATE
C — ALTERNATE — 12

SH 35
AT SH 36

12 STRAND (SM)
FIBER OPTIC CABLE

SH 35 FIBER OPTIC ENCLOSURE
INSTALLED IN GROUND BOX

EXISTING SIGNAL CABINET SH 35 AT BS 35E

FAN OUT KIT

T — ALTERNATE
T — ALTERNATE
T — ALTERNATE
T — ALTERNATE
T — ALTERNATE
T — ALTERNATE

ALTERNATE — T
ALTERNATE — T
ALTERNATE — T
ALTERNATE — T
ALTERNATE — T
ALTERNATE — T

12 STRAND SM FOC

SH 35
AT BS 35E

12 STRAND (SM)
FIBER OPTIC CABLE

1 — ALTERNATE — S — C
ALTERNATE — S — C
ALTERNATE — S — C
ALTERNATE — S — C
ALTERNATE — S — C
6 — ALTERNATE — S — C

7 — ALTERNATE — C
ALTERNATE — C
ALTERNATE — C
ALTERNATE — C
ALTERNATE — C
12 — ALTERNATE — C

SH 35 FIBER OPTIC ENCLOSURE
INSTALLED IN GROUND BOX

LEGEND

T	FC CONNECTOR
S	FUSION SPLICE
C	COILED

SH 35
FROM SH 36
TO BS 35E
TERMINATION
ASSIGMENTS

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

07/03/2023

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		61

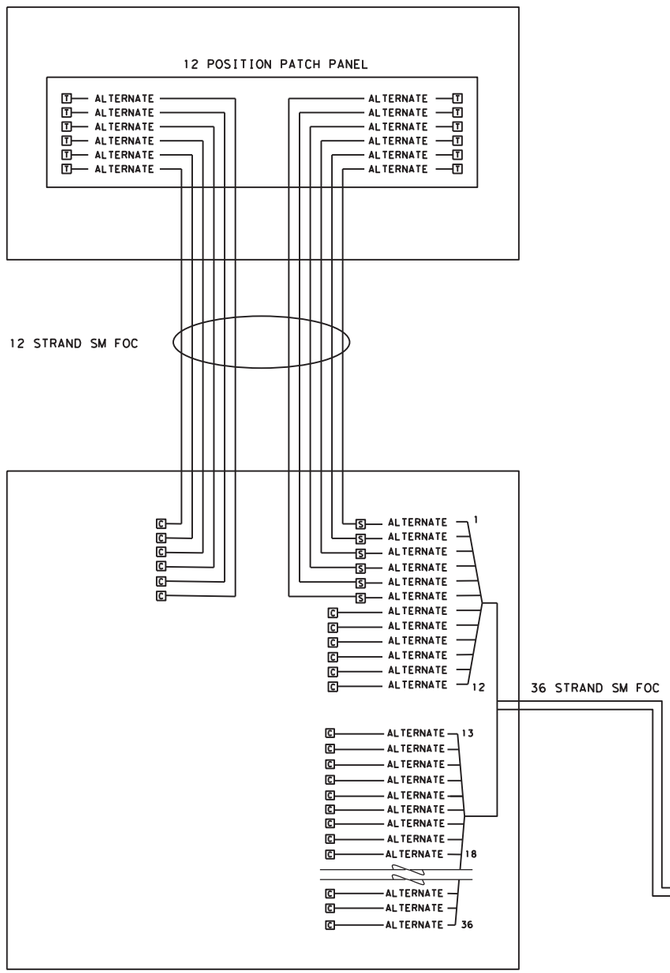
H:\Traffic Signals\LienNguyen\SH 35 0188-07-006 fiber optic\0188-07-006 SH 35 From BS 35E to SH 36\0188-07-006 SH 35 FROM SH 36 TO BS 35E -sheet 2,3 OF 3.dgn

CCSJ: 0027-07-046

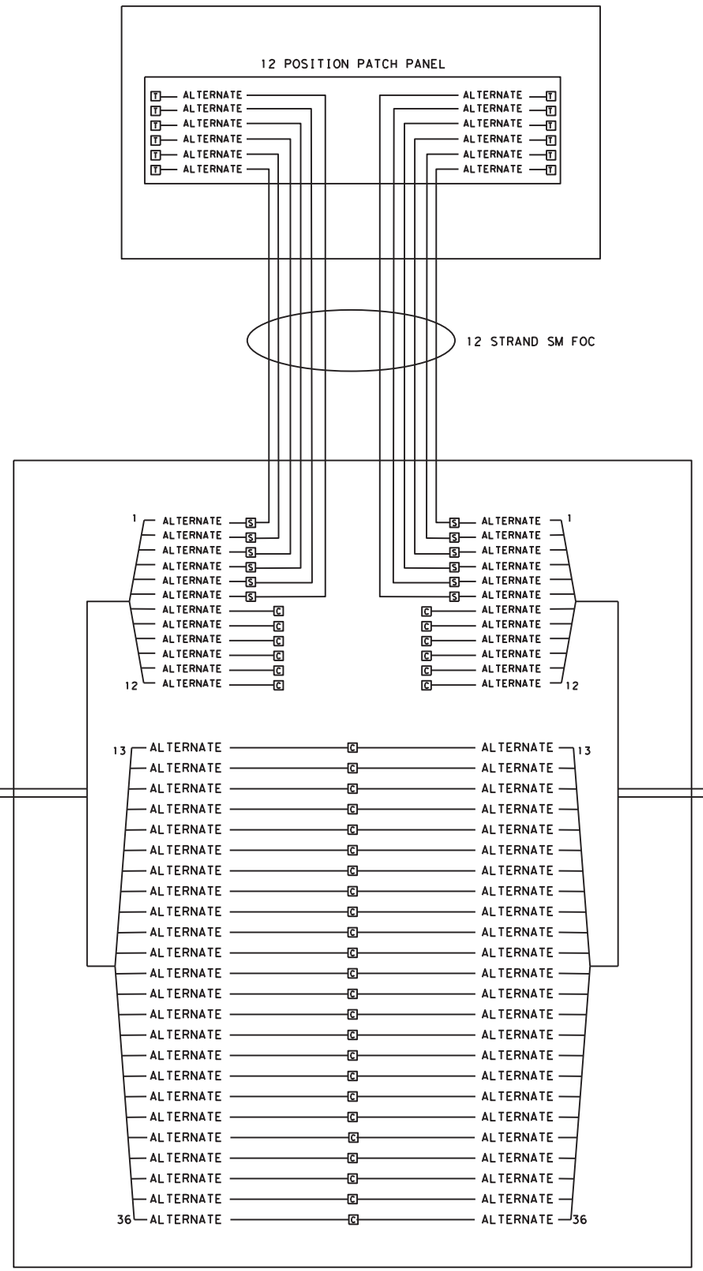
TYPICAL SIGNAL CABINETS ALONG UA 90

3rd ST, 4th ST, 8th ST, AVE H AND I CROSS, MILLIE ST (JENNETTA ST), MILES ST, RADIO LN, HERNDON DR, SALLY ANNE DR, WILSON DR, LANE DR, COLLINS DR (FM 3155)

SIGNAL CABINET AT FM 723

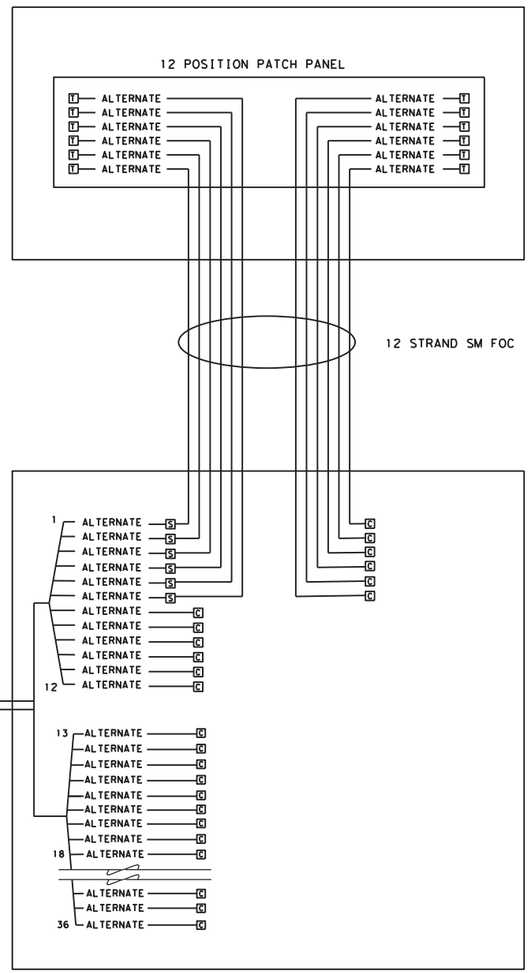


FM 723 FIBER OPTIC ENCLOSURE
INSTALLED IN GROUND BOX
(FINAL INTERSECTION)



TYPICAL FIBER OPTIC ENCLOSURE
INSTALLED IN GROUND BOX

SIGNAL CABINET AT FM 762



FM 762 FIBER OPTIC ENCLOSURE
INSTALLED IN GROUND BOX
(FINAL INTERSECTION)

LEGEND

- [T] LC CONNECTOR
- [S] FUSION SPLICE
- [C] COILED

UA 90
FROM FM 723
TO FM 762
TERMINATION
ASSIGNMENTS

STATE OF TEXAS
MICHAEL A. OLIVO
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07/03/2023

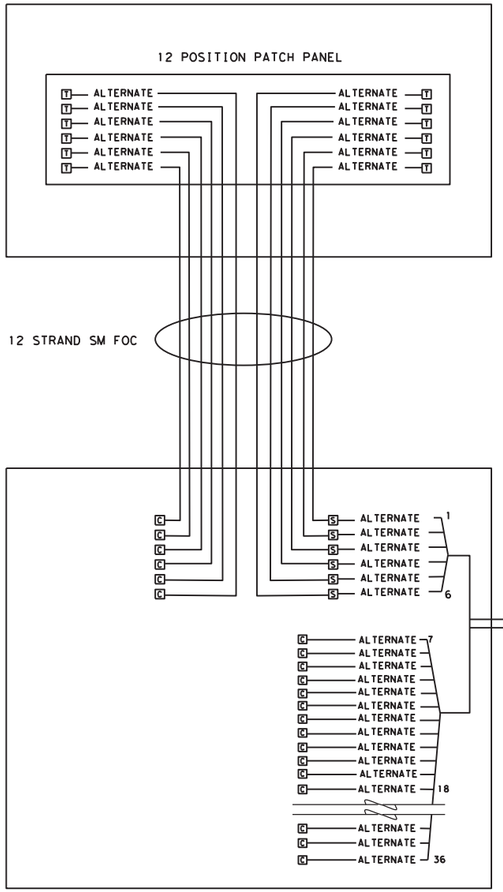
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		62

DATE: 6/15/2023
FILE: H:\Trf\Signals\Hoang Tran\Projects 2023\0027-07-046 UA 90 from FM 723 to FM 762\0027-07-046 UA 90 FOC Termination Assy.dgn

CSJ: 0188-01-040

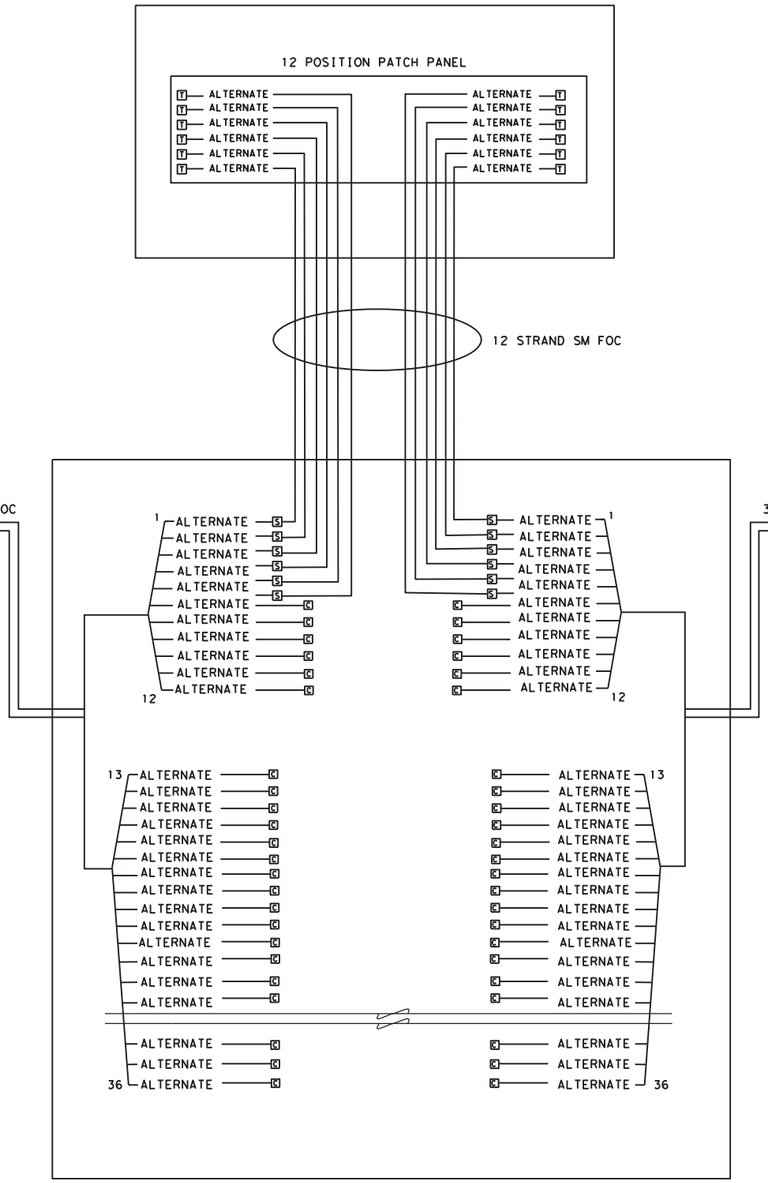
SIGNAL CABINET AT US 90A



FM 1314 FIBER OPTIC ENCLOSURE
INSTALLED IN GROUND BOX
(FINAL INTERSECTION)

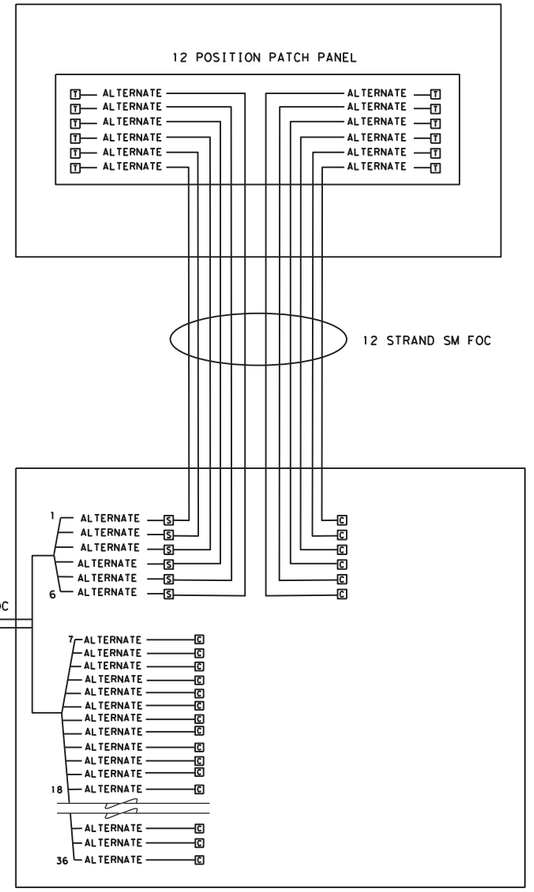
TYPICAL SIGNAL CABINETS ALONG SH 36

(FM 1640, AVE M, CITY HALL DR., MONS AVE. AND CALLENDAR ST.)



TYPICAL FIBER OPTIC ENCLOSURE
INSTALLED IN GROUND BOX

SIGNAL CABINET AT 59 FRTG RD.



FM 1485 FIBER OPTIC ENCLOSURE
INSTALLED IN GROUND BOX
(FINAL INTERSECTION)

LEGEND

- T — FC CONNECTOR
- S — FUSION SPLICE
- C — COILED

DATE: 6/15/2023
FILE: U:\HOU\Projects\0188-01-040*FOC\CSJ 0188-01-040*SH 36*02.16.2023.dgn

STATE OF TEXAS
MICHAEL A. OLIVO
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P.E.

07/03/2023

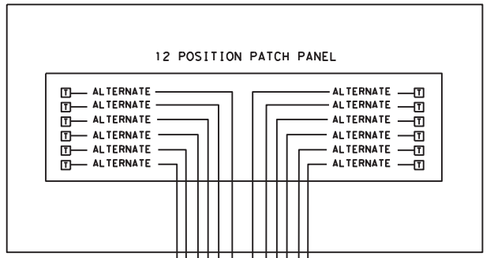
SH 36 FROM UA 90 TO IH 69 TERMINATION ASSIGNMENTS

Texas Department of Transportation

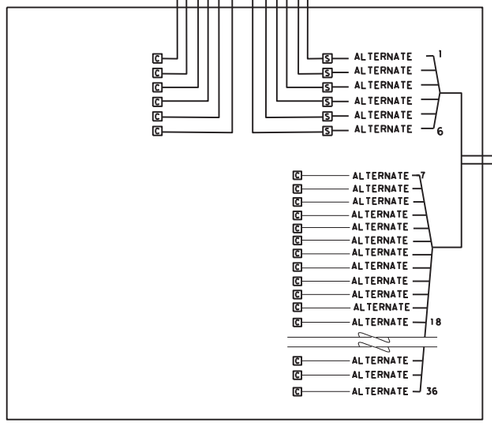
CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		63

CSJ: 1400-04-039

SIGNAL CABINET AT FM 1488



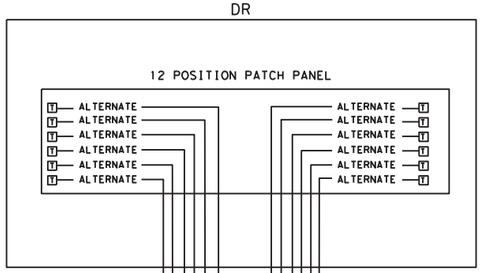
12 STRAND SM FOC



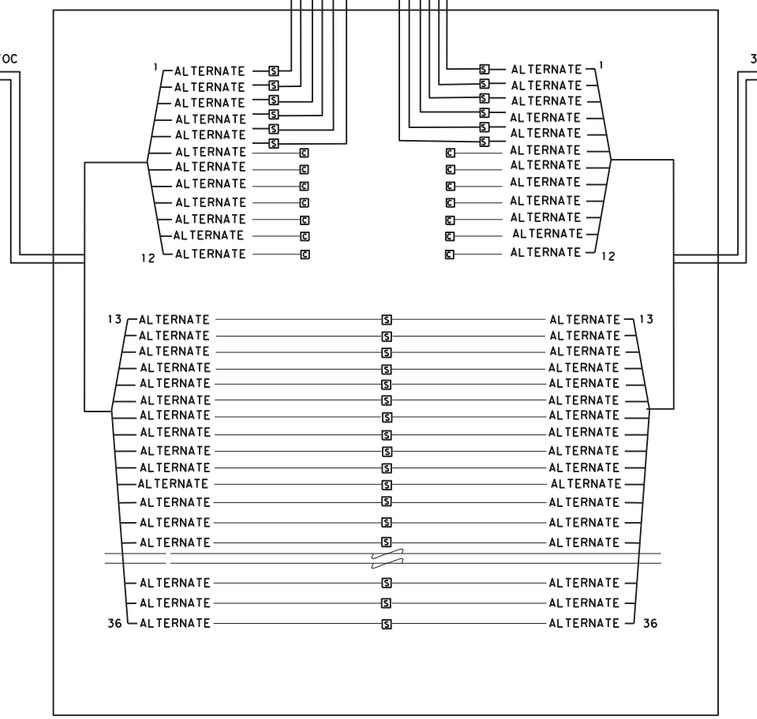
FM 1774 FIBER OPTIC ENCLOSURE
INSTALLED IN GROUND BOX
(FINAL INTERSECTION)

36 STRAND SM FOC

TYPICAL SIGNAL CABINETS ALONG FM 1774
(BUDDY RILEY RD, NICHOLS SAWMILL RD,
FRIENDHSIP DR, TUDOR WAY, MISTY MEADOW
DR



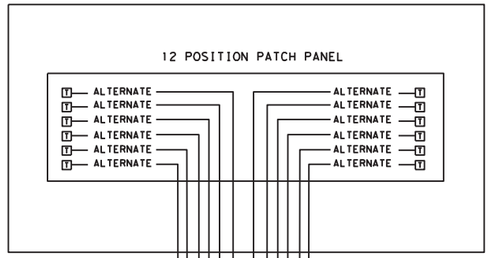
12 STRAND SM FOC



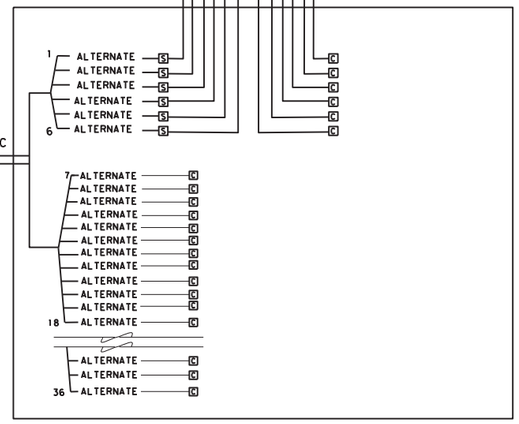
TYPICAL FIBER OPTIC ENCLOSURE
INSTALLED IN GROUND BOX

36 STRAND SM FOC

SIGNAL CABINET AT FM 149



12 STRAND SM FOC



FM 1774 FIBER OPTIC ENCLOSURE
INSTALLED IN GROUND BOX
(FINAL INTERSECTION)

LEGEND

- [T] FC CONNECTOR
- [S] FUSION SPLICE
- [C] COILED

FM 1774
FROM FM 1488
TO SH 249
TERMINATION
ASIGNMENTS

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

07/03/2023

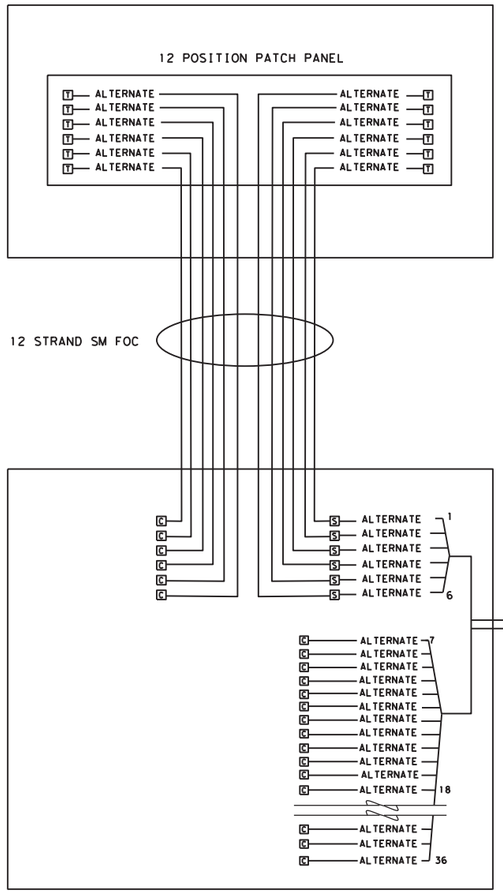
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046,ETC.	UA90,ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND,ETC.		64

DATE: 6/30/2023 9:40:23 AM
FILE: H:\Irf\Signals\Greg Sosa\2022 Projects\1400-04-039 FM 1774 FIBER OPTIC\Fiber Optic NO MULTI - Copy.dgn

CSJ: 3538-01-058

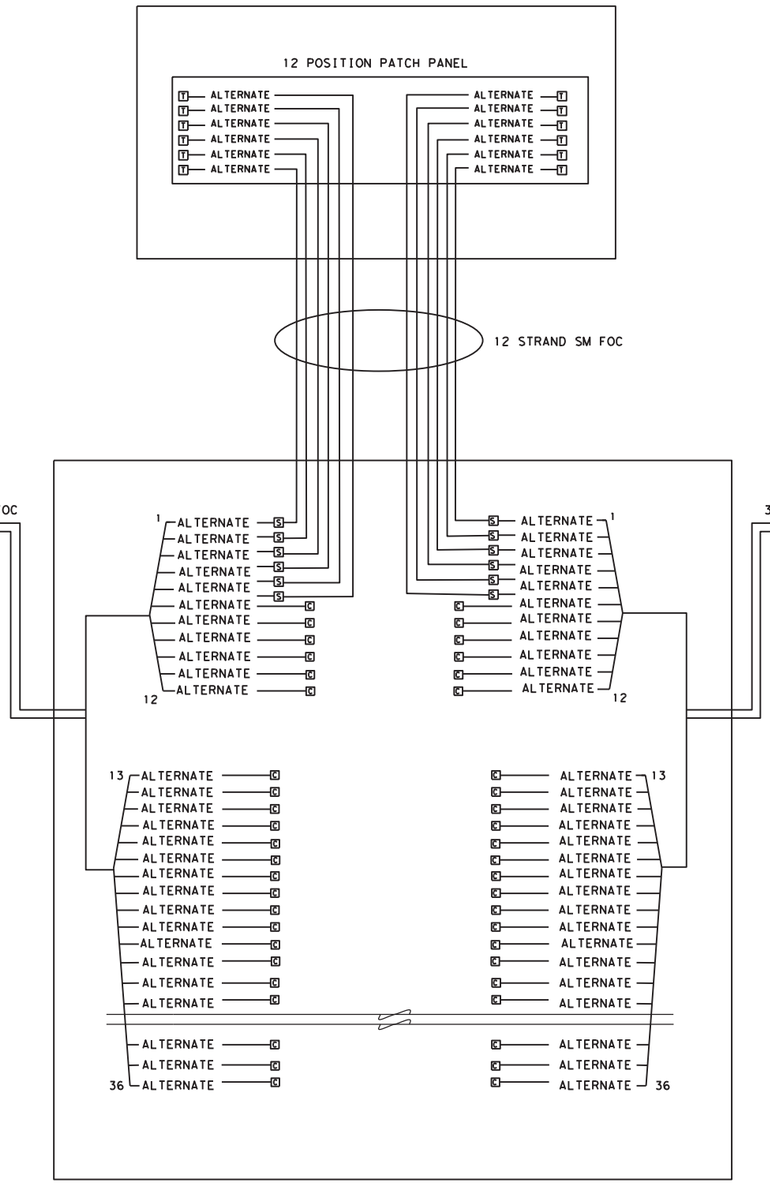
SIGNAL CABINET AT FM 1314



FM 1314 FIBER OPTIC ENCLOSURE
INSTALLED IN GROUND BOX
(FINAL INTERSECTION)

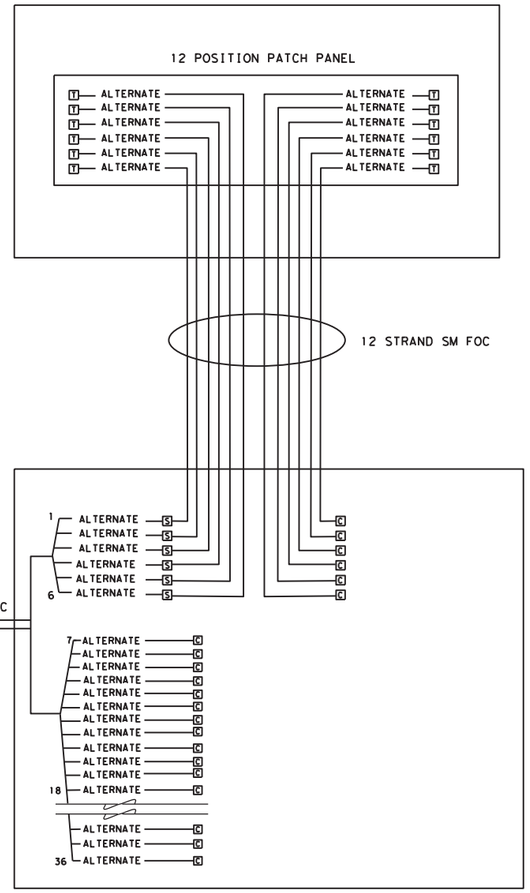
TYPICAL SIGNAL CABINETS ALONG SH 242

(OLD HOUSTON RD.)



TYPICAL FIBER OPTIC ENCLOSURE
INSTALLED IN GROUND BOX

SIGNAL CABINET AT FM 1485



FM 1485 FIBER OPTIC ENCLOSURE
INSTALLED IN GROUND BOX
(FINAL INTERSECTION)

LEGEND

- [T] FC CONNECTOR
- [S] FUSION SPLICE
- [C] COILED

DATE: 6/16/2023
FILE: U:\HOU\Projects\3538-01-058*FOC\3538-01-058*SH 242*02.16.2023.DGN

STATE OF TEXAS
MICHAEL A. OLIVO
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07/03/2023

SH 242
FROM FM 1314
TO FM 1485
TERMINATION
ASSIGNMENTS

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0027	07	046, ETC.	UA 90, ETC.
DIST	COUNTY		SHEET NO.
HOU	FORT BEND, ETC.		65

GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.

2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.

3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is ½ in. or less in diameter.

4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.

5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.

6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.

2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.

3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

4. Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.

5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.

6. Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.

7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.

9. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.

10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.

2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.

3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.

4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.

5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."

6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.

7. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.

8. Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.

9. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.

10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.

11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.

12. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).

13. Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.

14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

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Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

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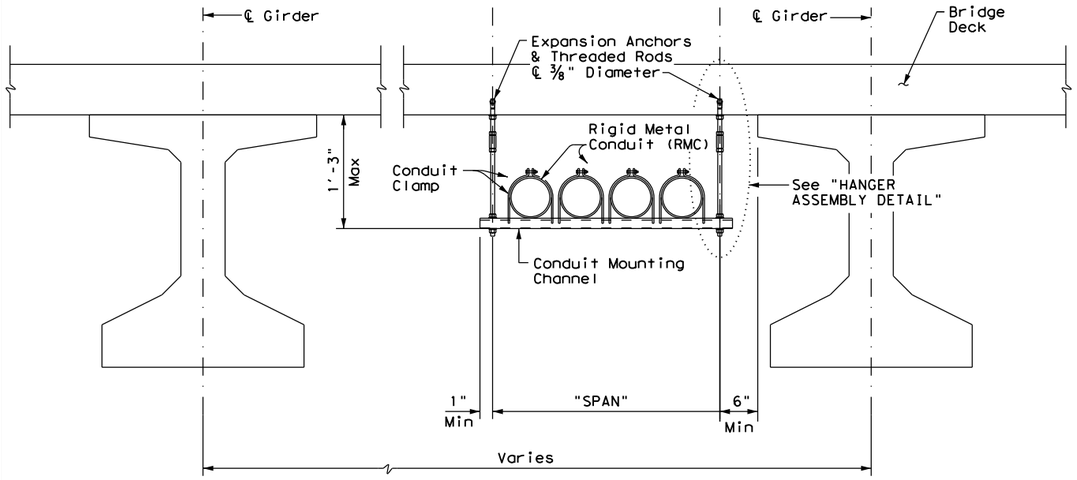
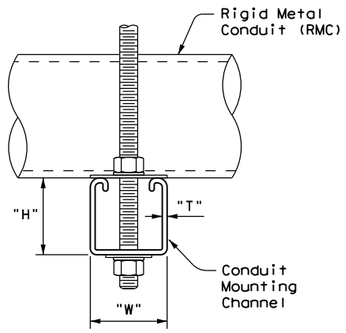
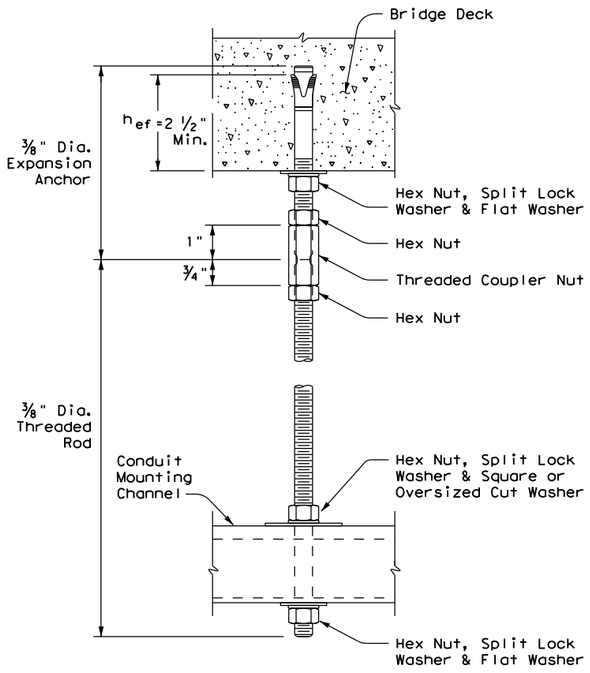


CONDUIT HANGING DETAIL

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.

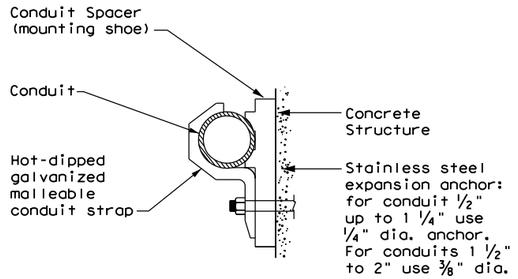
Channels with round or short slotted hole patterns are allowed, if the load carrying capacity is not reduced by more than 15%.

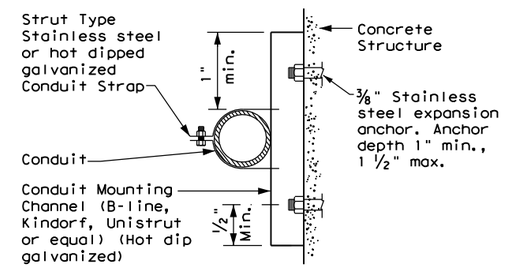




HANGER ASSEMBLY DETAIL

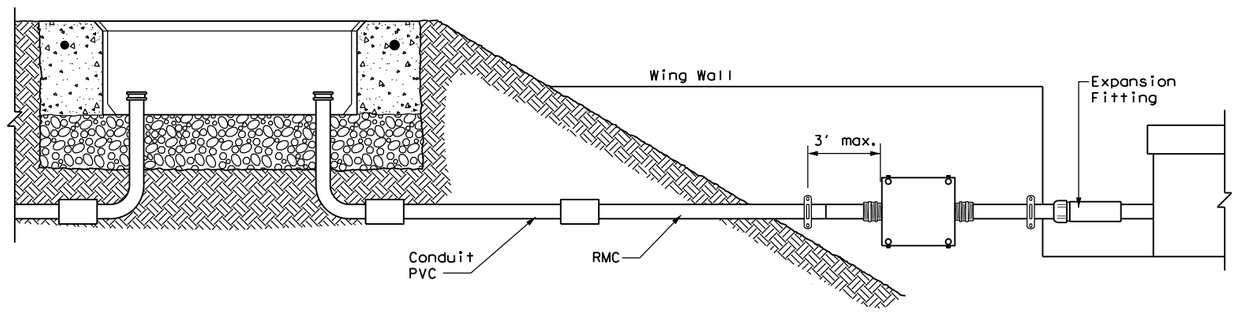
ELECTRIC CONDUIT TO BRIDGE DECK ATTACHMENT





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.

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Traffic Operations Division Standard

ELECTRICAL DETAILS
CONDUIT SUPPORTS

ED(2)-14

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ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS)11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.
2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.
3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.
4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.
2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.
3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.
4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.
5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.
6. Support conductors in illumination poles with a J-hook at the top of the pole.
7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.
8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.
9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.
10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.
11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.
12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.
2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.
3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.
4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.
5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

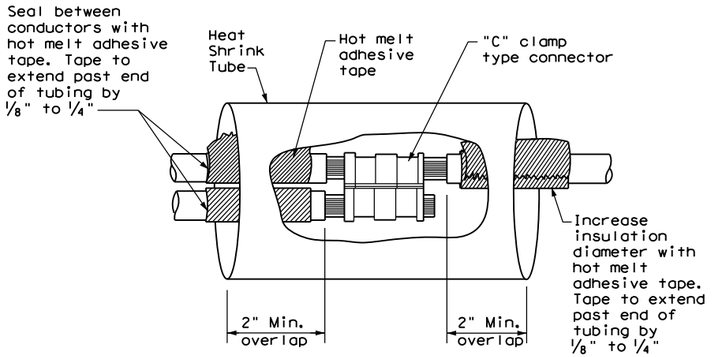
GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.
2. Do not place ground rods in the same drilled hole as a timber pole.
3. Install ground rods so the imprinted part number is at the upper end of the rod.
4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.
6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
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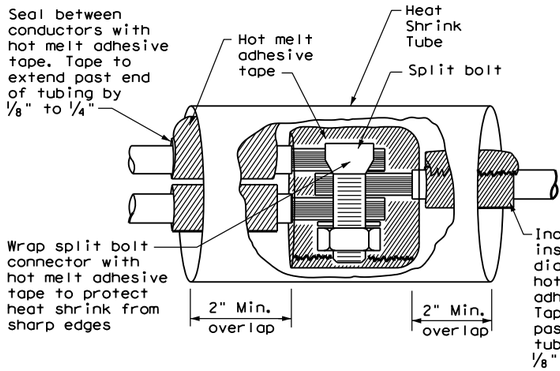
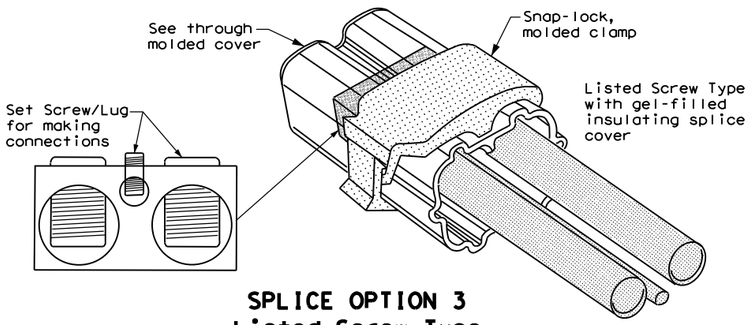


SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

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ELECTRICAL DETAILS CONDUCTORS

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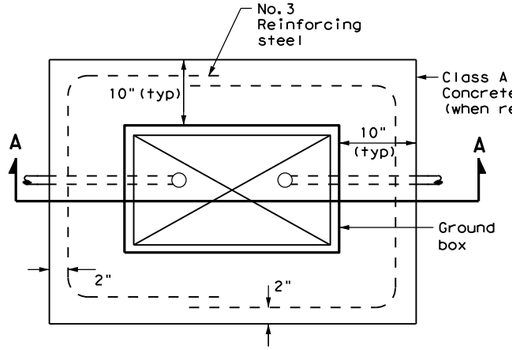
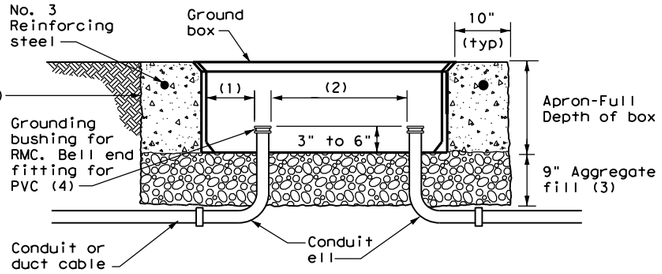


PLAN VIEW



SECTION A - A

APRON FOR GROUND BOX

(1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.

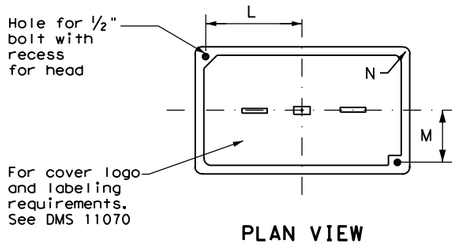
(2) Maintain sufficient space between conduits to allow for proper installation of bushing.

(3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.

(4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

GROUND BOX DIMENSIONS	
TYPE	OUTSIDE DIMENSIONS (INCHES) (Width x Length X Depth)
A	12 X 23 X 11
B	12 X 23 X 22
C	16 X 29 X 11
D	16 X 29 X 22
E	12 X 23 X 17

GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



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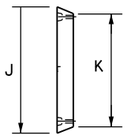

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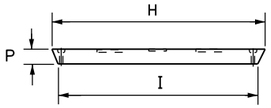

SIDE

GROUND BOX COVER

GROUND BOXES

A. MATERIALS

1. Provide polymer concrete ground boxes measuring 16x30x24 in. (WxLxD) or smaller in accordance with Departmental Material Specification (DMS) 11070 "Ground Boxes" and Item 624 "Ground Boxes."

2. Provide Type A, B, C, D, and E ground boxes as shown in the plans, and as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 624.

3. Ensure ground box cover is correctly labeled in accordance with DMS 11070.

4. Provide larger ground boxes in accordance with Item 624 and as shown in the plans.

B. CONSTRUCTION METHODS

1. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure aggregate bed is in place and at least 9 inches deep, prior to setting the ground box. Install ground box on top of aggregate.

2. Cast ground box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Ground box aprons, including concrete and reinforcing steel, are subsidiary to ground boxes when called for by descriptive code.

3. Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.

4. Install all conduits and ells in a neat and workmanlike manner. Uniformly space conduits so grounding bushings and bell end fittings can easily be installed.

5. Temporarily seal all conduits in the ground box until conductors are installed.

6. Permanently seal conduits immediately after the completion of conductor installation and pull tests. Permanently seal the ends of all conduits with duct seal, expandable foam, or other method as approved. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a sealant.

7. When a ground rod is present in a ground box, bond all equipment grounding conductors together and to the ground rod with listed connectors.

8. When a type B or D ground box is stacked to meet volume requirements, it is allowable to cut an appropriately sized hole for conduit entry in the side wall at least 18 inches below grade.

9. If an existing ground box in the contract has a metal cover, bond the cover to the equipment grounding conductor with a 3 ft. long stranded bonding jumper the same size as the grounding conductor. The bonding jumper is subsidiary to various bid items. Verify existing ground boxes with metal covers are shown on the plans, with notes fully describing the work required.

10. If other ground boxes with metal covers are within the project limits but are not part of the contract, the Engineer may direct the Contractor to bond the metal covers, identifying the specific boxes in writing. This work will be paid for separately.

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

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ELECTRICAL DETAILS
GROUND BOXES

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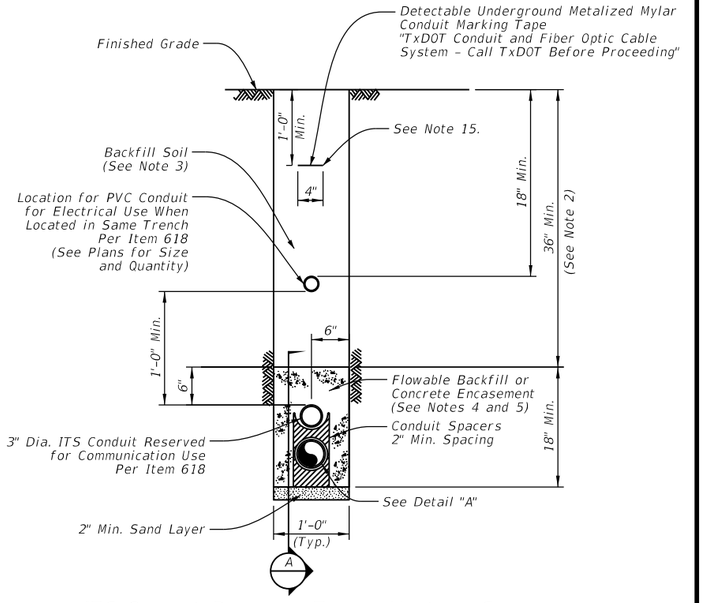
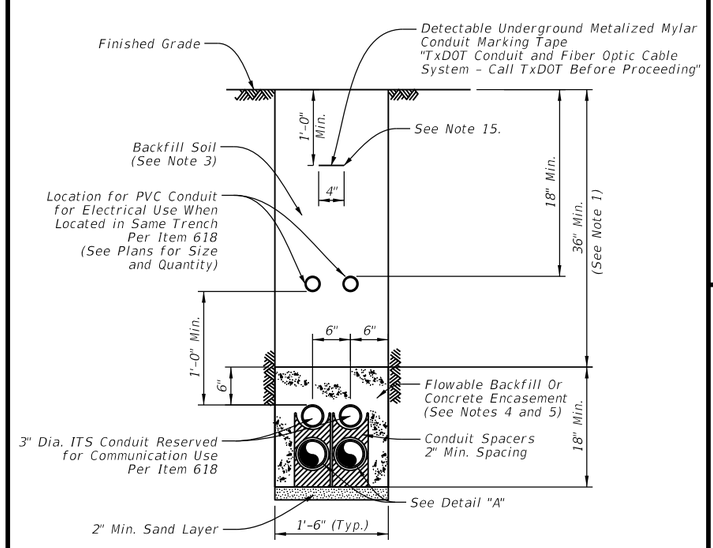


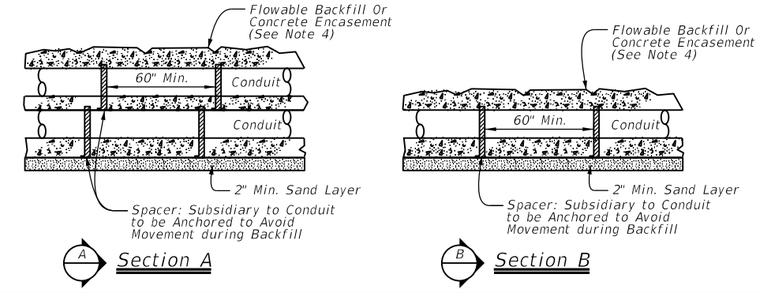
ITS Conduit Backbone Trench Vertical Spacing

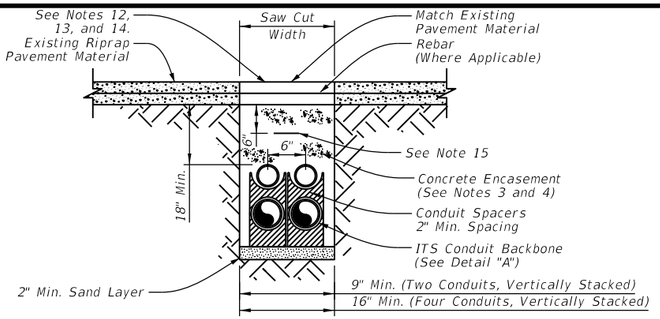
Two Conduit System



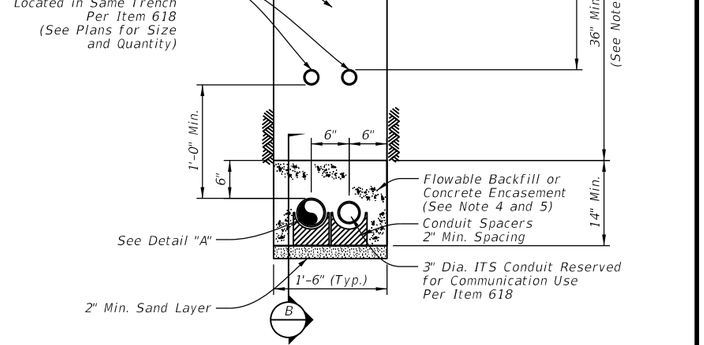
ITS Conduit Backbone Trench Vertical Spacing

Four Conduit System



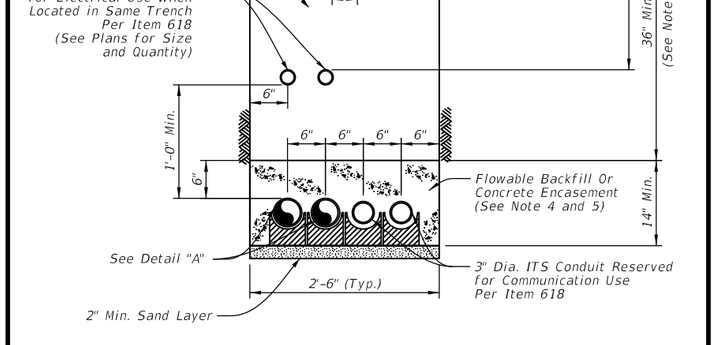


Open Cut Trenching Details



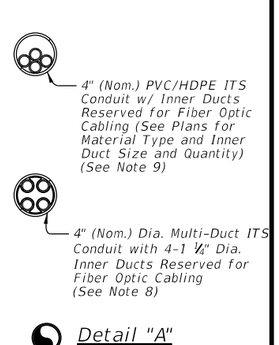
ITS Conduit Backbone Trench Horizontal Spacing (Alternative)

Two Conduit System



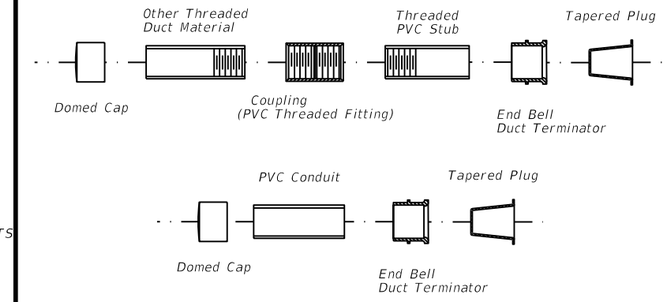
ITS Conduit Backbone Trench Horizontal Spacing (Alternative)

Four Conduit System



Detail "A"

Conduit Types
(See Plans for Type and Quantity)



Typical Conduit Fitting Combinations

2 Conduit and Single Conduit Configuration

SHEET 1 OF 2

General Notes:

1. Construct the ITS conduit backbone system by vertically spacing conduit, unless field constraints, obstructions, or utility conflicts require horizontal spacing of conduits. Both vertical and horizontal spacing configurations have been detailed for contractor information for construction.
2. Install ITS conduit backbone system a minimum of 42 inches from finished grade to the top of the conduit unless otherwise directed or to avoid conflicts or field conditions such as utilities or obstructions. Vary depth of the trench in order to pass over/under any existing utilities. Refer to ITS Conduit Obstruction Crossing Standard ITS(35) for further detail.
3. Perform trench excavation and backfilling in accordance with Item 400, "Excavation and Backfill for Structures."
4. When a trench depth greater than 24 inches can be achieved from the finished grade to the top of ITS conduit, encase the conduits with flowable backfill in accordance with Item 401, "Flowable Backfill." Use Class B concrete as a substitute in accordance with Item 421, "Hydraulic Cement Concrete" at the discretion of the Engineer.
5. When a trench depth of less than 24 inches is required due to field conditions, encase the conduits in Class B concrete in accordance with Item 421, "Hydraulic Cement Concrete."
6. Concrete encasement will be paid for under Special Specification "ITS Multi-Duct Conduit" or as shown on the plans.
7. Provide ITS PVC conduit identified for electrical and communication use in accordance with Item 618, "Conduit."
8. Provide ITS multi-duct conduit identified for fiber optic communication use in accordance with Special Specification "ITS Multi-Duct Conduit."
9. Conduit per Item 618, "Conduit" (See Plans for Material Type and Quantity).
10. Provide a single 1/C #14 insulated wire in conduit runs which have been identified in the plans to carry fiber optic cable. Provide UL listed solid copper wire with orange color low density polyethylene insulation suitable for conduit installation rated for temperature range -20 C to 60 C and a voltage rating of 600V. This wire will serve as a tracer, or locate, wire for locating underground conduit containing fiber optic cabling and will be paid for under Item 620, "Electrical Conductors."
11. Provide a flat pull cord in all empty conduits and innerducts. Provide a pull cord with a tensile strength of 1,250 Lbs. minimum and have foot markings to determine length installed. Pull cord and installation to be subsidiary to various bid items.
12. Remove saw cut width to accommodate conduit installation.
13. Replace rebar as necessary, lapped and tied a minimum of 3 inches to existing rebar.
14. Replace broken pavement materials with similar materials to exact shape, and thickness of existing.
15. Place marking tape a minimum of 1 foot – 0 inches below grade when no other electrical marking tape required, or 8 inches below electrical marking tape when provisioned under Item 618.
16. Provide a 1/C #8 insulated grounding conductor within one inner duct of a pre-assembled multi-duct when no other grounding conductor is provisioned for in the plans.

Sheet Details
Not to Scale

Texas Department of Transportation

Traffic Operations Division Standard

ITS CONDUIT TRENCH DETAILS

ITS(27)-16

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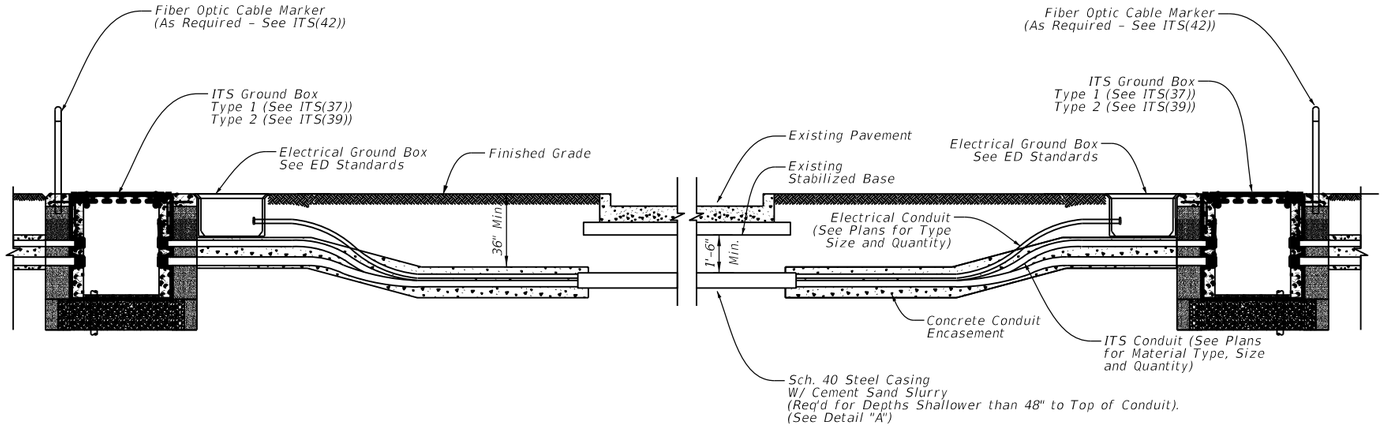
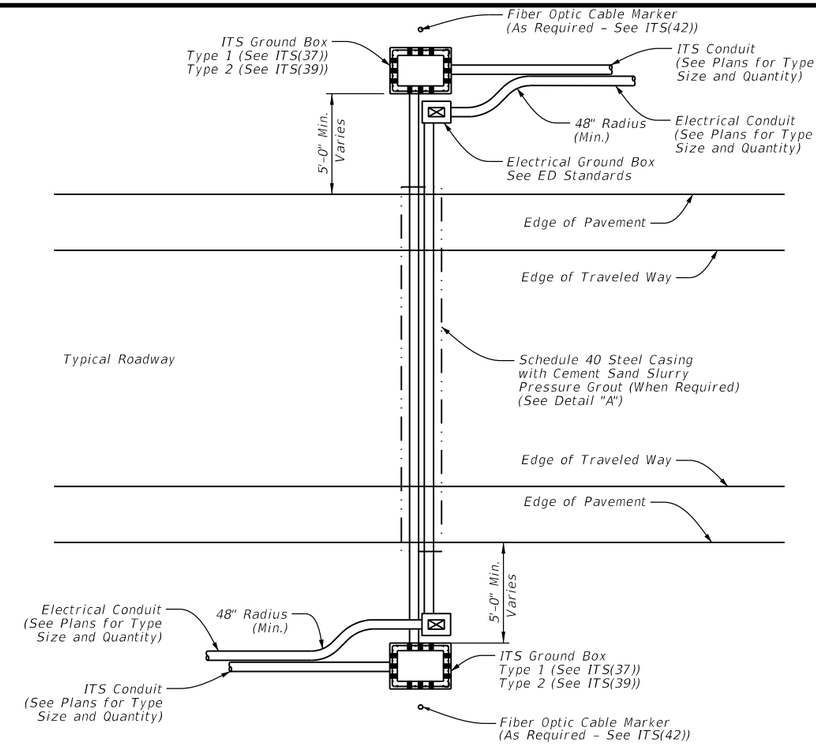
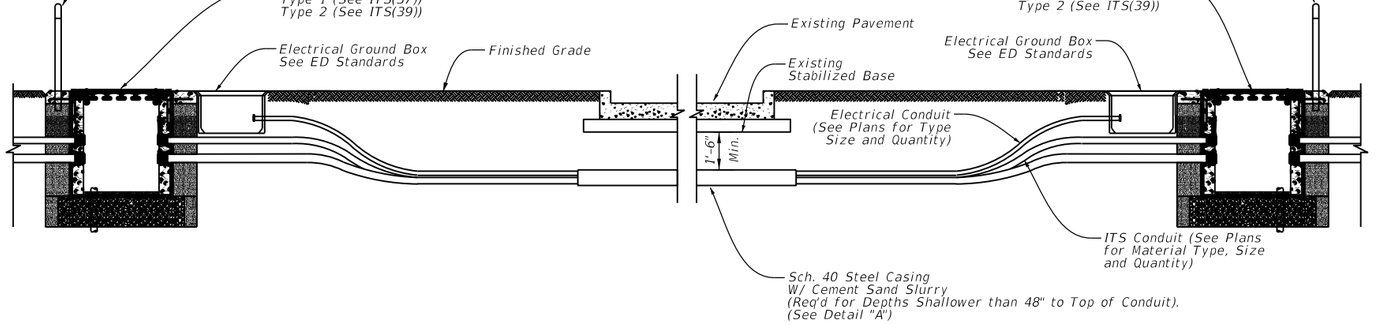


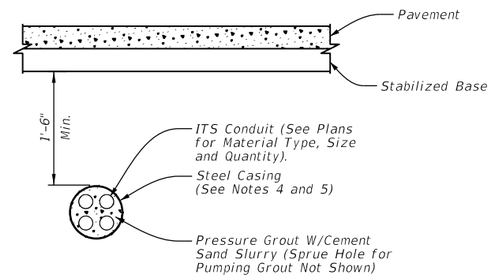
Typical Conduit Installation Jacking
or Boring Beneath Existing Roadway



Bore Under Pavement



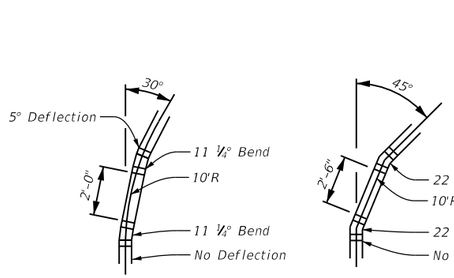
Typical Conduit Installation Jacking
or Boring Beneath Existing Roadway
(Where Concrete Encasement Not Required)



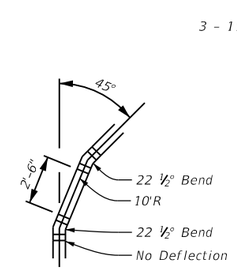
Steel Casing Detail "A"

General Notes:

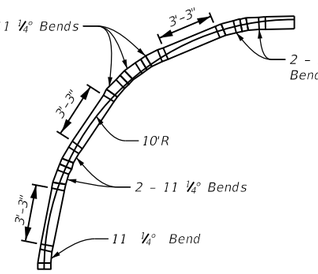
1. Typical conduit installation details for jacking or boring beneath existing roadway is diagrammatic in nature. Roadway cross-slopes may vary for each crossing.
2. Jack or bore in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box" except for measurement and payment.
3. Furnishing and installation of pressure grouting will not be paid for directly but considered incidental to Special Specification "ITS Multi-Duct Conduit" or Item 618, "Conduit."
4. When boring under pavement shallower than 48 inches from finished grade to top of conduit, provide Schedule 40 steel casing under pavement to encase the conduit system. Provide steel casing of a size to accommodate ITS conduit and electrical conduit as shown in the plans. Provide a minimum 20 percent void space around all conduits. Steel casing will not be paid for directly but considered incidental to Special Specification, "ITS Multi-Duct Conduit" or Item 618, "Conduit."
5. When a depth greater than 48 inches can be achieved from finished grade to top of conduit, provide Schedule 80 PVC. No steel casing required unless otherwise directed.
6. Ensure all conduit bends are in conformance with the latest edition of the National Electrical Code.
7. Provide GPS coordinate points to the District for all ground boxes installed, and shifts or deviations of the conduit alignment from the plans required to avoid obstructions or utilities. Take GPS coordinate points at the start of the transition, at the point of curvature, and at the end of the transition at the point of tangency. Document the turnout radius and installed depth. Provide GPS coordinate points in NAD83 coordinate system and be accurate to 5 feet.



30° Turnout Detail



45° Turnout Detail



90° Turnout Detail

Sheet Details
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SHEET 2 OF 2

Texas Department of Transportation

Traffic Operations Division Standard

ITS CONDUIT BORE AND STEEL CASING DETAILS

ITS(28)-16

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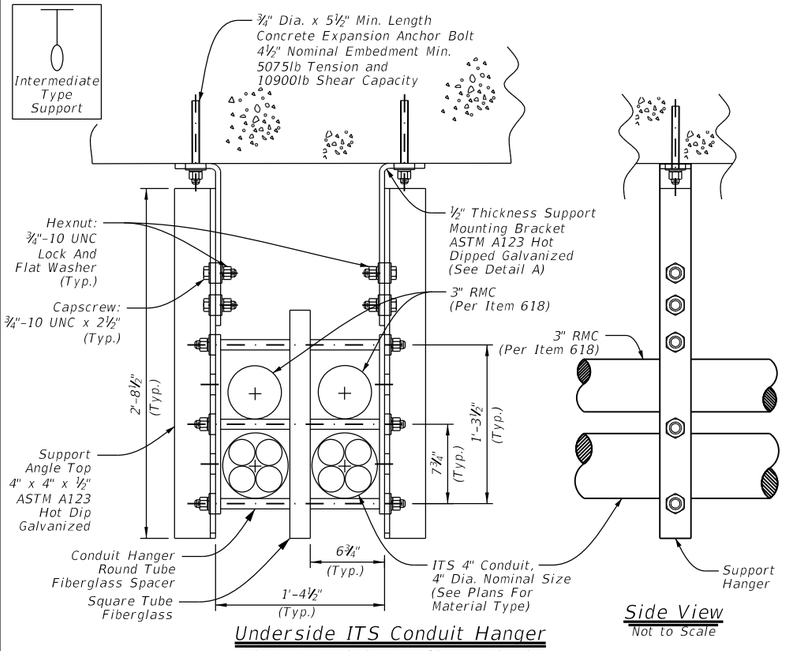
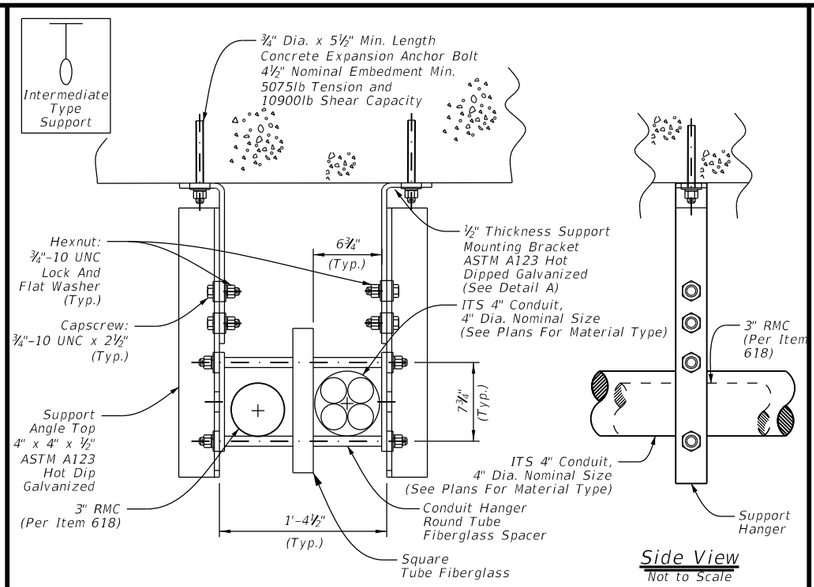
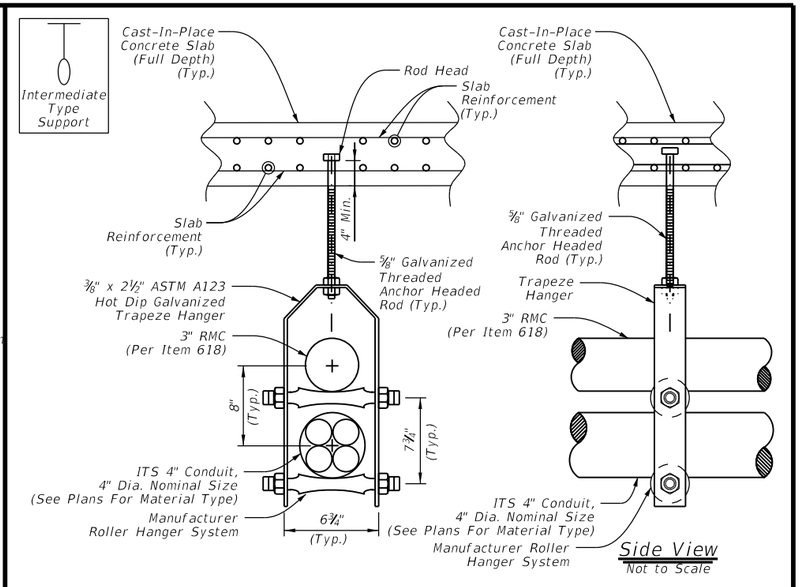


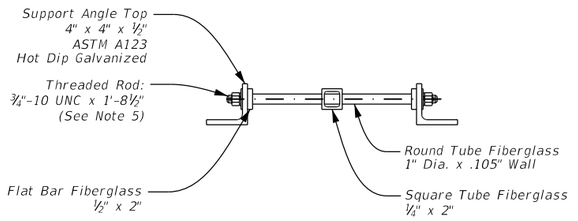
Underside ITS Conduit Hanger
(2x2 Conduit Configuration)



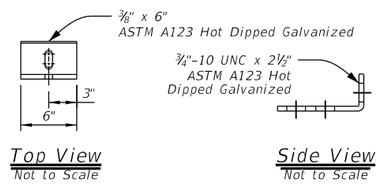
Underside ITS Conduit Hanger
(2x1 Conduit Configuration)



Underside ITS Conduit Roller Hanger
For New Construction
(1x2 Conduit Configuration)



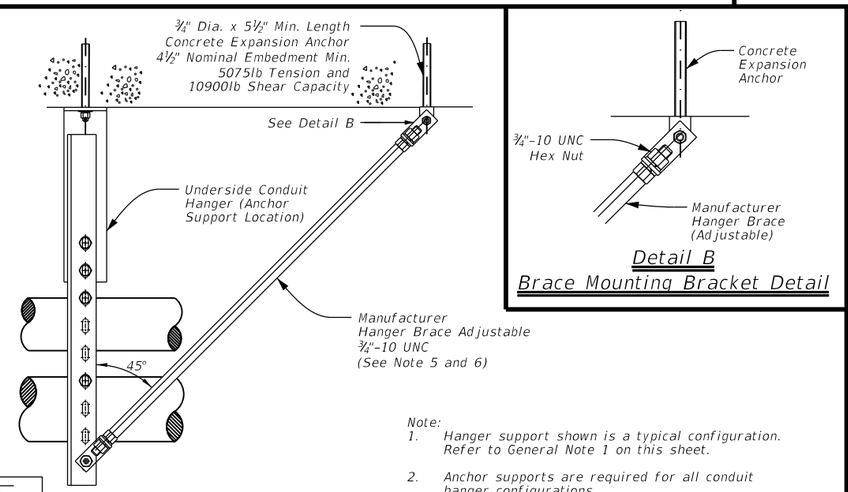
Underside ITS Conduit Hanger Spacer - Top View (Typ.)



Detail A
Support Mounting Bracket Detail

General Notes:

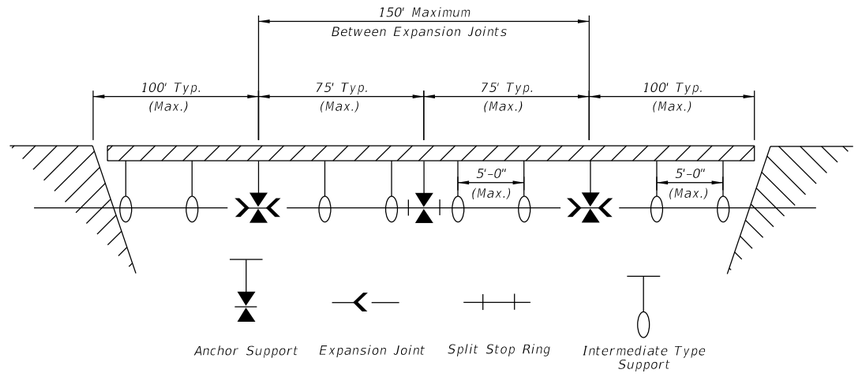
1. Use commercially designed multiple conduit support hangers as an alternative to the hanger details on this sheet, or standard sheet ED(2)-14 may be used. Verify sufficient tension and shear capacity before proposed substitution. Submit hanger details and specifications to the Engineer for approval prior to using on project.
2. Refer to the contract plans for conduit design and hanger configuration requirements. For two (2) conduit configurations, use the typical underside hanger or roller hanger system.
3. Maximum spacing of intermediate conduit hangers is 5'-0" C-C.
4. Hangers vary in length, but do not allow conduit to hang below bridge beams. Refer to ITS(30) for minimum clearance requirement below bridge deck.
5. Ensure all conduit hanger steel shapes conform to ASTM A36 and expansion anchors conform to ASTM A307 and are supplied with minimum of one nut and washer per bolt. Galvanize all steel plate, shapes, and hardware per Item 445, "Galvanizing".
6. Use angle bracing on both sides of conduit support for conduit anchor point hangers.
7. Refer to ITS(32) for expansion-deflection joint details.
8. Provide a minimum of two (2) expansion joints at all bridges. Ensure expansion joint spacing does not exceed manufacturer recommendations.
9. Select conduit lengths so that couplings do not coincide with conduit hanger locations.
10. Allowable types of outer duct material for above ground ITS conduit include rigid metallic conduit (RMC) and fiberglass.
11. Refer to ITS(30) for anchor details through pre-stressed concrete panels.
12. Bond all external structure conduit throughout entire length of run and ground at ground box locations according to ITS(38).



Note:
1. Hanger support shown is a typical configuration. Refer to General Note 1 on this sheet.
2. Anchor supports are required for all conduit hanger configurations.

Underside ITS Conduit
Anchor Hanger Support (Typ.)

Detail B
Brace Mounting Bracket Detail



Notes:
1. Install conduit supports within 3'-0" of all enclosures and conduit terminations.
2. The number of intermediate supports varies based upon the distance between anchor supports.

Underside Anchor Hanger Support Spacing (Typ.) *

* Refer To BICSI Outside Plant Design Reference Manual (OSPDRM) For Conduit Hanger Expansion Joint Placement

Sheet Details
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Texas Department of Transportation

Traffic Safety Division Standard

ITS CONDUIT HANGER DETAILS

ITS(29)-22

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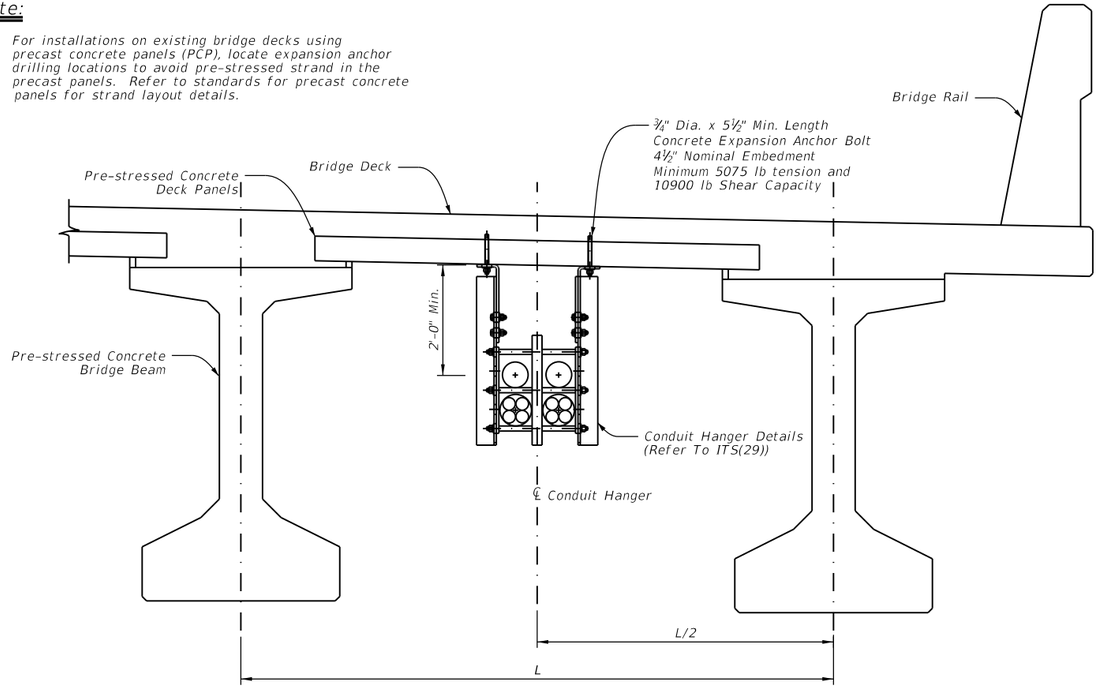
Note:

1. For installations on existing bridge decks using precast concrete panels (PCP), locate expansion anchor drilling locations to avoid pre-stressed strand in the precast panels. Refer to standards for precast concrete panels for strand layout details.

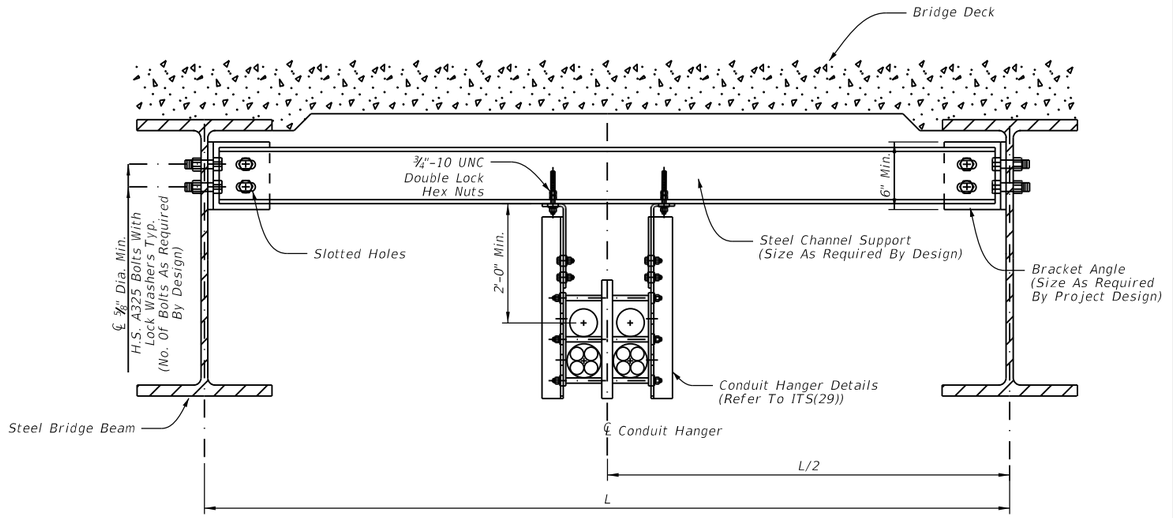


Structure Mounted ITS Conduit – Concrete Bridge Deck With Precast Panels

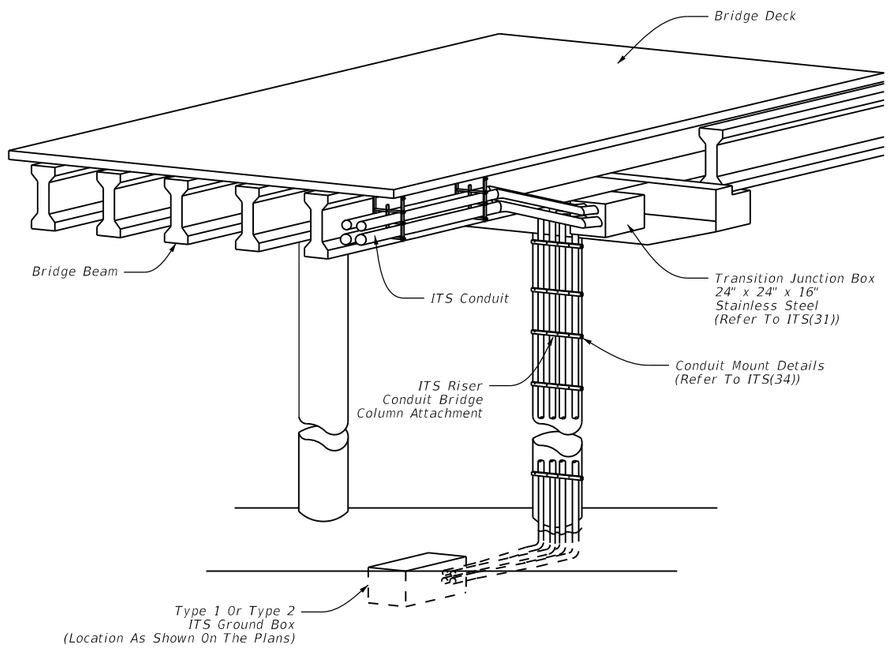
Refer To ITS(29) For General Notes

Note:

1. Position conduit hanger height to avoid conflicts with diaphragms in the conduit runs.



Typical Alternate Conduit Hanger Support (Steel I-Beam Mount)



Underside Conduit Hanger Transition Detail

General Notes:

1. The alternative mounting conduit hanger support mounting detail for steel I-Beam structures as shown is a suggested detail for steel structures. Submit details for the configuration shown on this sheet via shop drawings and include structural load analysis, support member and connection design. Seal all calculations and shop drawings by a Texas P.E.
2. Conduit hanger support mounting details for concrete bridge deck with precast panels as shown are a suggested method for pre-stressed concrete beam structures. Submit any deviation from these details via shop drawing and include structural load analysis, support member, and connection design. Seal all calculations and shop drawings by a Texas P.E.
3. Locate auxiliary conduit hanger supports for steel structures at a maximum 5'-0" spacing.
4. For conduit loads located between beams exceeding 5 lbs per ft, furnish structural load analysis calculations for adjacent beams in the shop drawing submission.
5. Submit design details for structure with cathodic protection in the shop drawing submission.
6. Do not extend conduit hangers below the bottom of the bridge beams (any exceptions at end spans are subject to approval).
7. Drilling in pre-stressed beams or field welding of steel beams is not permitted. Submit any exceptions on a case by case basis for evaluation and approval by the Engineer.
8. Ensure all conduit hanger assemblies are furnished and supplied by the conduit hanger manufacturer.
9. Galvanize all hardware and structural steel that is not stainless steel. Ensure all bolt hardware used to secure hangers to steel structures conforms to A325 for high strength. Ensure all expansion anchors conform to ASTM A307. Separate dissimilar materials for use of galvanized hardware with weathering steel girders.
10. Select conduit lengths so that couplings do no coincide with conduit hanger locations.
11. Refer to Special Specification, "ITS Multi-Duct Conduit" or Item 618 "Conduit", for details on conduit mandreling and other testing required upon conduit installation.
12. Provide a flat pull cord in each conduit and inner duct to allow for installation of future cables to match 1250 lbs-ft tension. Refer to ITS(27) for additional conduit details.
13. Provide a transition junction box for conduit access located outside the abutments for bridge spans < 800 ft. For bridge spans > 800 ft., locate an additional junction box for conduit access near the mid-span/pier.
14. Provide ITS conduit of the type and configuration shown on the plans in accordance with Special Specification, "ITS Multi-Duct Conduit" or Item 618 "Conduit". Ensure all other conduit is in accordance with Item 618 "Conduit" and as shown on the plans.
15. Bond all external structure mounted conduit throughout entire length of run and ground the run at ground box locations according to ITS(37) and ITS(39).

Sheet Details
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Texas Department of Transportation

Traffic Operations Division Standard

STRUCTURE MOUNTED ITS CONDUIT

ITS(30)-16

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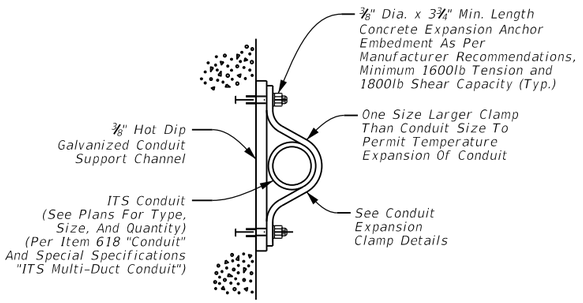
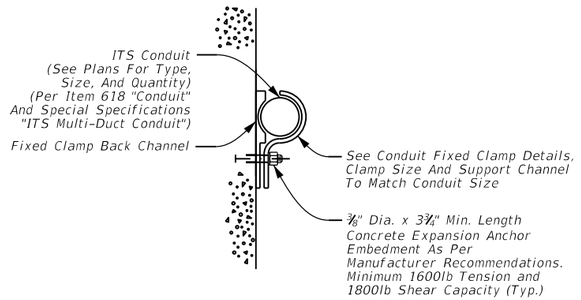
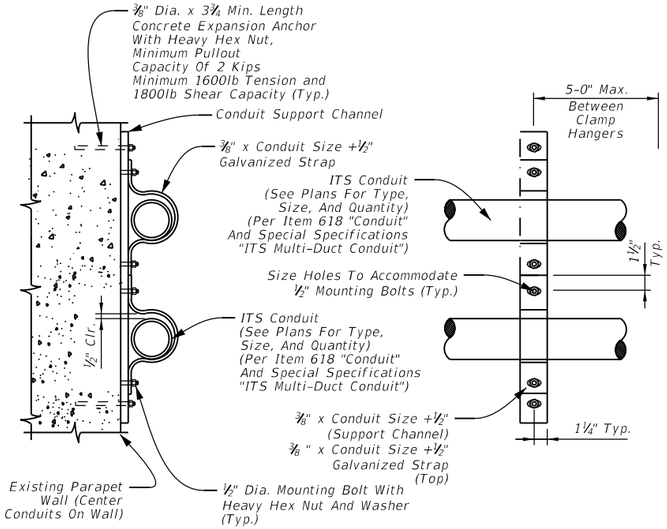


Conduit Expansion Clamp



Conduit Fixed Clamp

Conduit Clamp Details (Typ.)

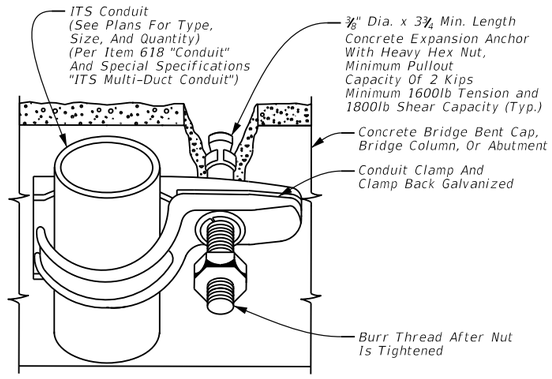


Side View

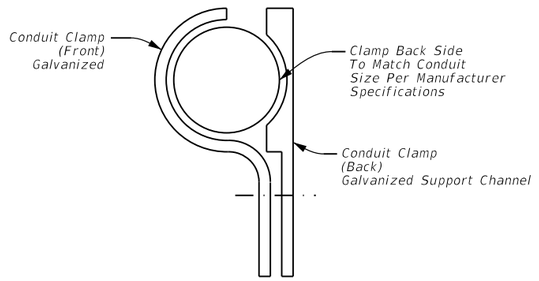
Top View

Elevation View

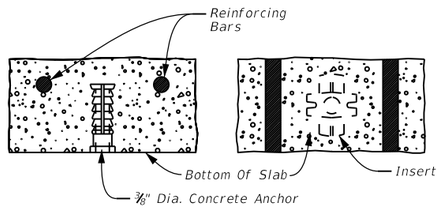
Conduit Expansion Clamp Details



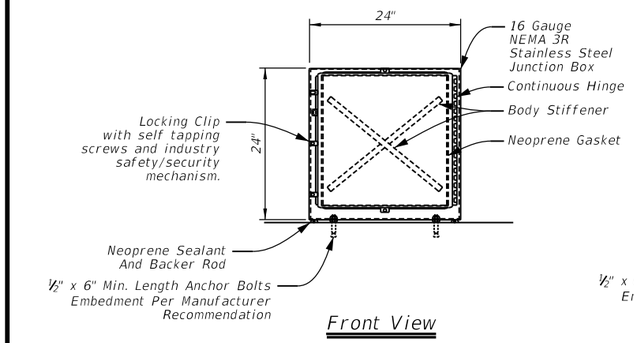
Conduit Fixed Clamp Back Channel



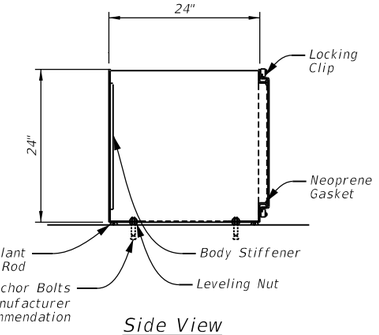
Conduit Fixed Clamp Details
Side View



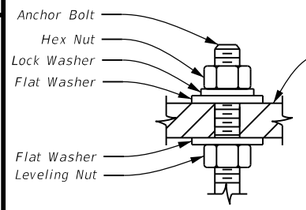
Conduit Fixed Clamp Concrete Insert Detail



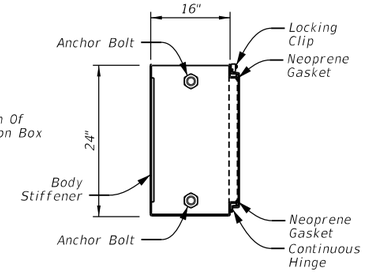
Front View



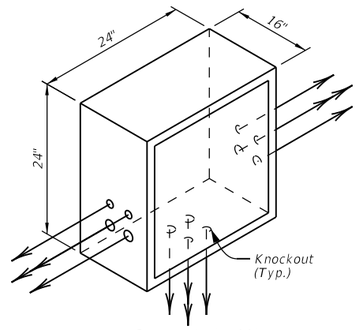
Side View



Anchor Bolt Detail
(May Vary On Mounting Scenario)



Top View



Isometric View

24" X 24" X 16" Stainless Steel Transition Junction Box Detail

Notes:
1. Transition box as depicted is top mount. Actual anchor fasteners and knockout location will vary based upon mount location and manufacturer recommendations.
2. Secure the transition box cover using self tapping screws with industry safety/security mechanism.
3. Typical knockout locations shown are for diagrammatic purposes only. The number of transition boxes required at a given location will vary depending on the number of conduits and cable storage requirements for cabling run(s).

General Notes:

1. Ensure all duct/conduit bends are in accordance with the latest version of the NFPA 70, National Electrical Code and as recommended by the manufacturer.
2. Utilize separate transition junction boxes for communications and electrical conduit runs.
3. Maintain constant slope in all duct/conduit runs.
4. Ensure maximum spacing of conduit clamps is 5'-0" C-C.
5. Galvanize all hardware, including anchor bolts, nuts, and washers per TxDOT Item 445, "Galvanizing". Ensure all expansion anchors conform to ASTM A307.
6. Provide a minimum NEMA 3R junction boxes. Construct all junction boxes in accordance with manufacturer specifications. Install junction boxes in accordance with the latest edition of NFPA 70, National Electrical Code.
7. Junction boxes and associated appurtenances are incidental to ITS conduit.
8. Install all conduit sweeps into junction boxes in accordance with allowable bend radius of the installed cable.
9. Install conduit support within 3'-0" of all enclosures and conduit terminations.
10. Refer to ED standard sheets for additional details on parapet mounted conduit.

Sheet Details
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Texas Department of Transportation

Traffic Operations Division Standard

PARAPET MOUNTED ITS CONDUIT AND TRANSITION BOX DETAIL

ITS(31)-16

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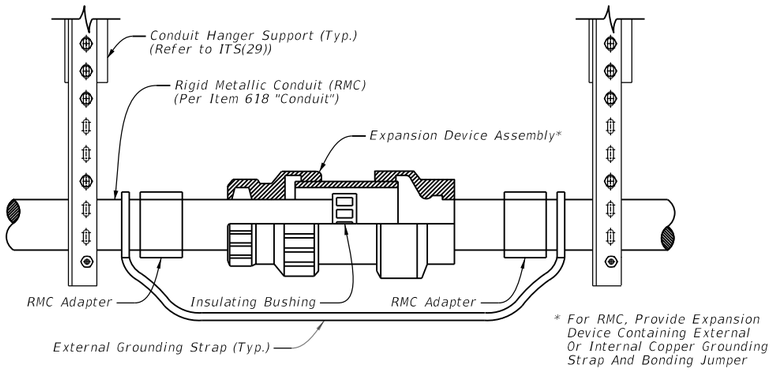
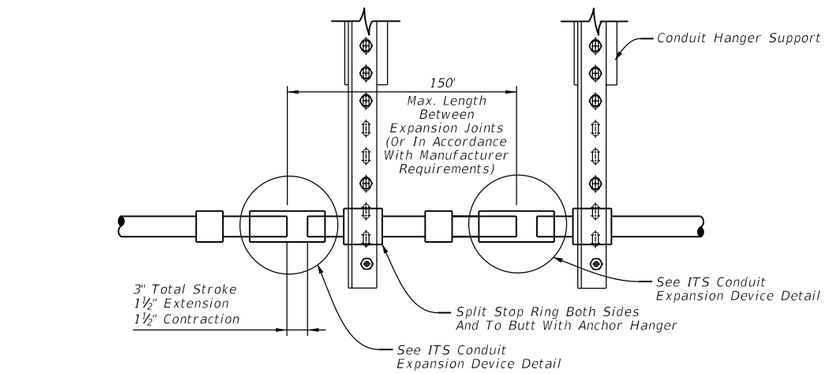
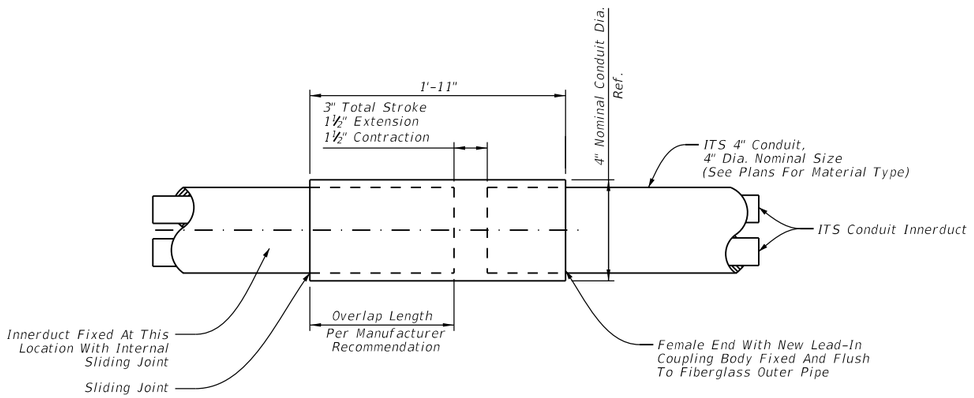


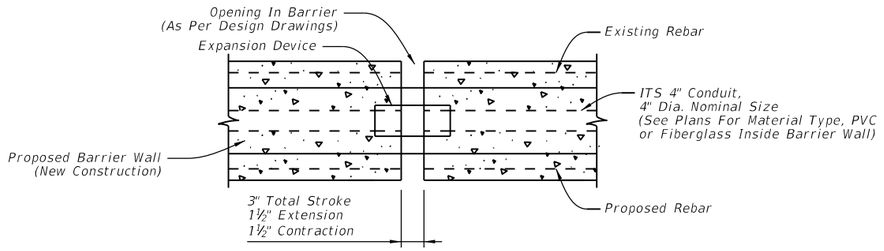
RMC Conduit Expansion Device Detail (Typ.)



ITS Conduit Expansion Device Placement (Typ.)



ITS Conduit Expansion Device Detail



ITS Conduit In New Construction Barrier Wall Expansion And Deflection Joint Fitting (Typ.)

General Notes:

1. Install expansion device at all open joints, at each end of bridge abutments and between bridge bents, allowing for 3" movement.
2. Provide a minimum of two (2) expansion joints at all bridges. Ensure expansion joint spacing does not exceed manufacturer recommendations.
3. Ensure conduit lengths are selected so that couplings do not coincide with hanger locations.
4. Ensure all rigid metallic conduit (RMC) expansion devices are constructed per manufacturer specifications.
5. Bond all external structure mounted conduit throughout entire length of run and ground the run at ground box locations according to ITS(37) and ITS(39).

Sheet Details
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Texas Department of Transportation

Traffic Operations Division Standard

EXPANSION / DEFLECTION JOINT

ITS(32)-16

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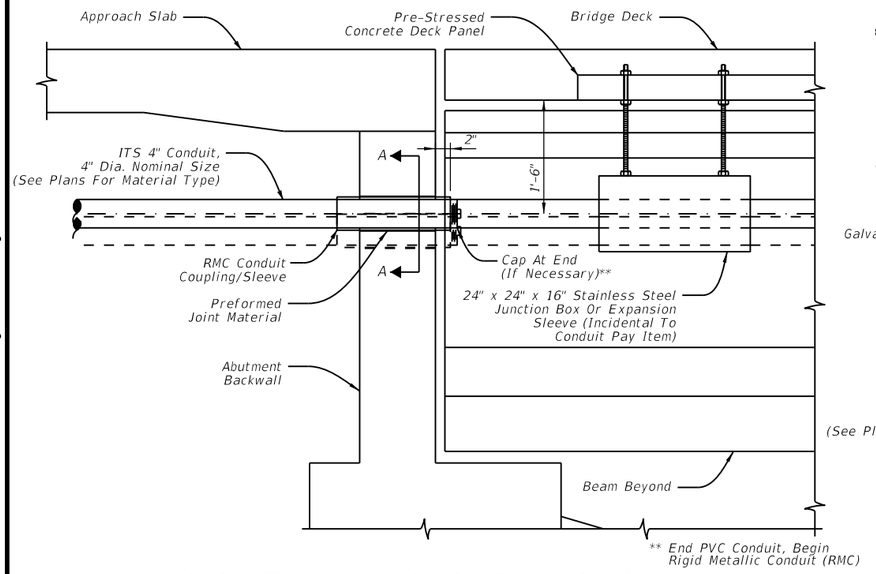
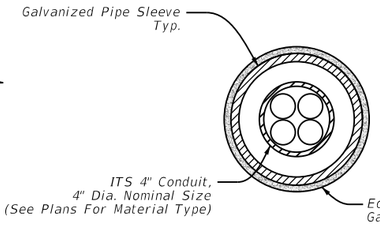


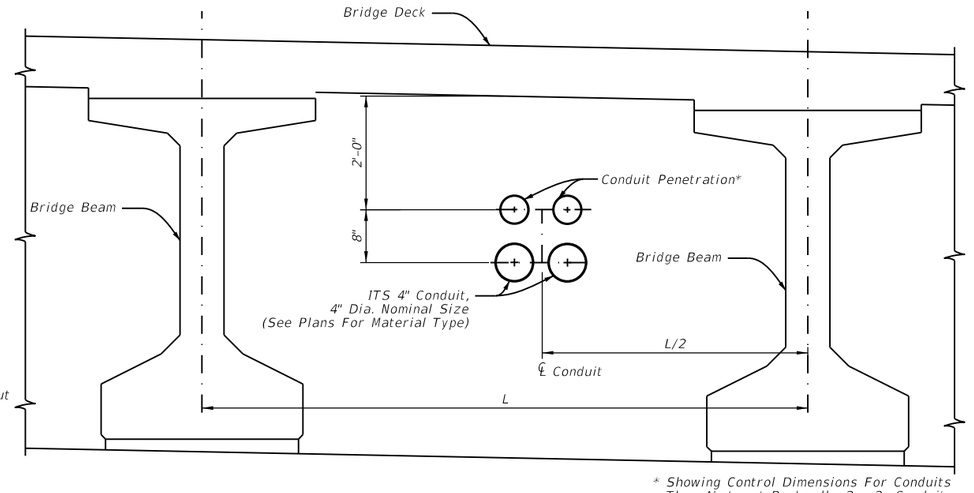
Section Through New Construction Abutment Backwall

Standard Notes:

1. If constant conduit elevation is maintained from the abutment backwall to the underside conduit hangers, provide an expansion joint sleeve (same size as conduit) with one travel overlap. If conduit elevation varies from the abutment backwall to the underside conduit hangers, provide an abutment wall mounted transition junction box (NEMA 3R rated).
2. Provide separate pipe sleeve for each conduit through abutment backwall. Size sleeve per manufacturer recommendations.



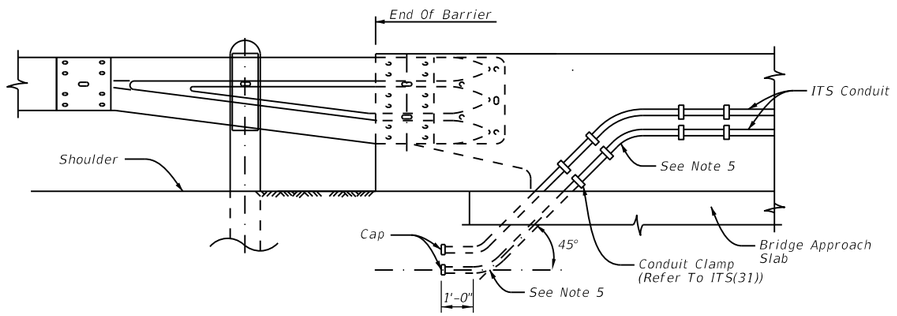
Section A-A (Typical Pipe Sleeve)



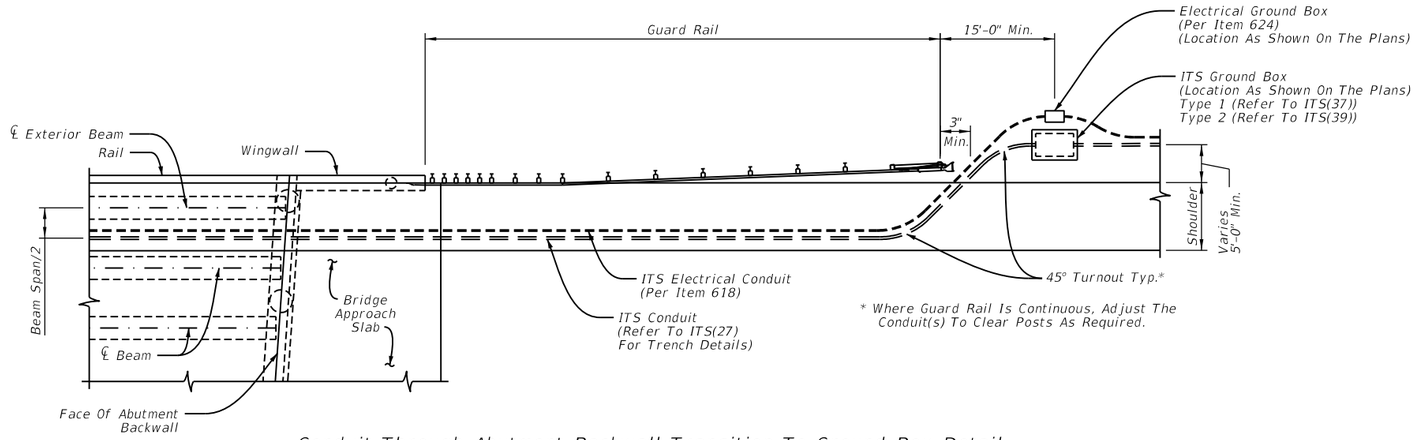
* Showing Control Dimensions For Conduits Thru Abutment Backwall. 2 x 2 Conduit Configuration Shown.

Abutment Elevation

ITS Conduit Transition At Bridge Abutment Detail



Parapet Mounted Conduit Transition To Ground Detail



* Where Guard Rail Is Continuous, Adjust The Conduit(s) To Clear Posts As Required.

Conduit Through Abutment Backwall Transition To Ground Box Detail

General Notes:

1. An alternative option to conduit mountings shown is conduit encased within parapet or bridge structure at crossings. Submit shop drawings and specifications to the engineer for approval.
2. Install expansion sleeves at bridge expansion joints and per manufacturer recommendations.
3. For conduit crossings over bridges, provide ITS communications junction boxes at 1000' maximum spacing and electrical junction boxes at 450' maximum spacing.
4. Keep all junction boxes sufficiently clear of guard rail or other obstructions to maintain clear access.
5. Install conduit sweep at an angle that accommodates cable bend radius. Do not exceed 45 degrees to the shoulder line. Refer to ITS(28) for conduit turn-out details.
6. Do not install junction boxes within paved shoulder area.
7. Ensure all work is in compliance with the latest edition of NFPA 70, National Electrical Code.
8. Junction boxes and associated appurtenances are incidental to ITS conduit.
9. For installation requiring ITS conduit transition within mechanically stabilized earth (MSE) walls with select fill, locate conduit to avoid reinforced straps. Refer to retaining wall standards for further details.
10. Bond all external structure mounted conduit throughout entire length of run and ground the run at ground box locations according to ITS(37) and ITS(39).

Sheet Details
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Traffic Operations Division Standard

ITS CONDUIT TRANSITION AT ABUTMENT

ITS(33)-16

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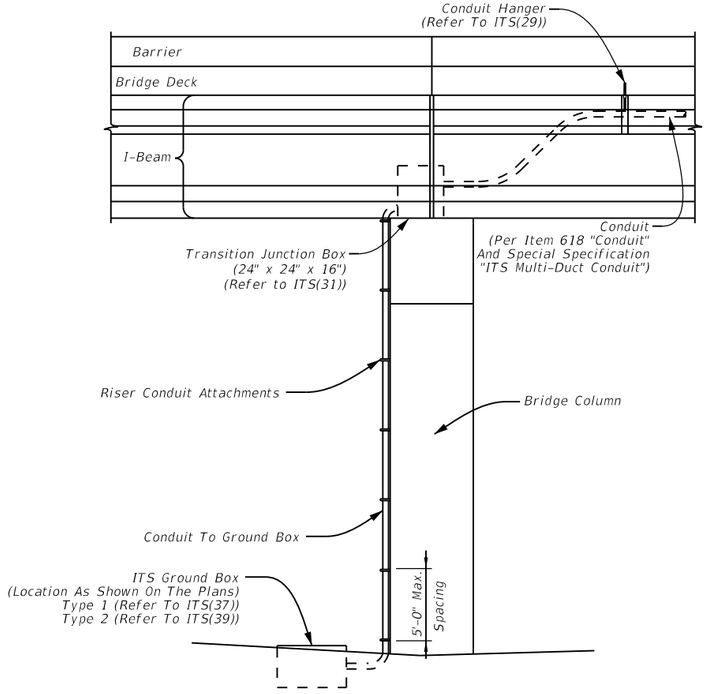
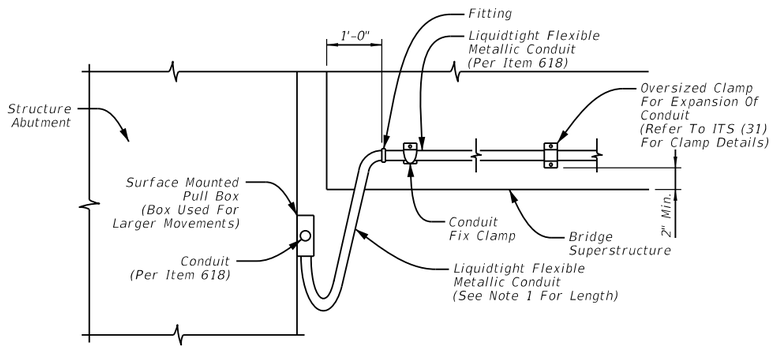


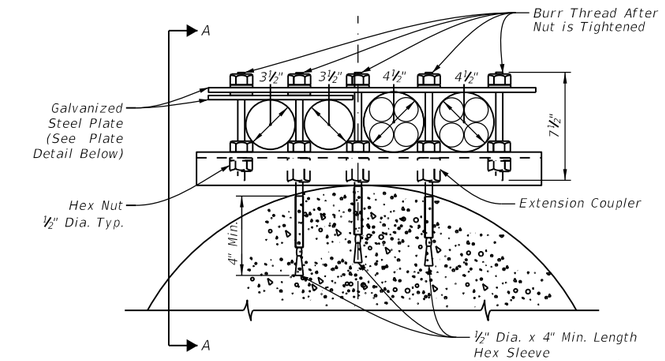
ITS Conduit Riser

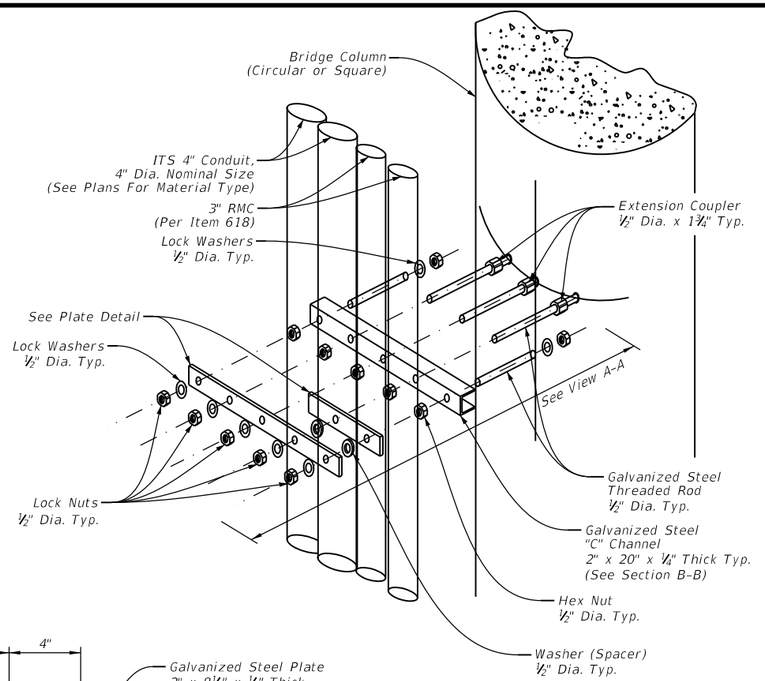


Exposed Conduit Connections At Expansion Joints

Notes:

1. Bond all external structure mounted conduit throughout entire length of run and ground the run at ground box locations according to ITS(37) and ITS(39).
2. The detail shown applies to conduit connections for conduit per Item 618 and is not intended for conduit for fiber optic cable applications.





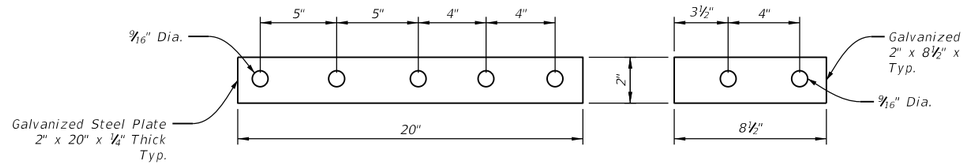
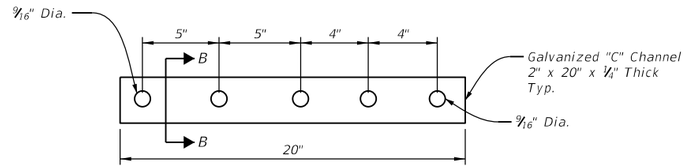
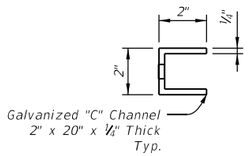


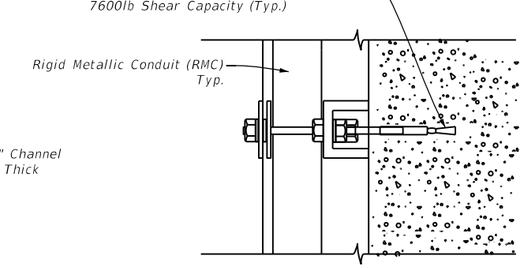
Plate Detail



"C" Channel Detail



Section B-B



View A-A

ITS Riser Conduit Bridge Column Attachment

General Notes:

1. Utilize an approximate length of flexible conduit at exposed connections of 2 times anticipated movement or 4'-0" minimum.
2. Size all transition boxes and surface mounted pull boxes per National Electrical Code Article 314 boxes and fittings.
3. For under bridge locations, ensure all junction boxes are kept inaccessible from general public and placed a minimum 10'-0" above surrounding ground.
4. Refer to ED standard sheets for additional notes and attachment details for riser conduit.
5. See plan sheets for number and size of conduit(s) to be installed.
6. Refer to ITS(33) for details involving conduit passing through the abutment.
7. Ensure maximum spacing between ITS riser conduit attachments is 5'-0" C-C.
8. Install conduit supports within 3'-0" of all enclosures and conduit terminations.
9. Ground all rigid metallic conduit (RMC) hangers per manufacturer recommendations when electrical conductors present.
10. Ensure all expansion anchors conform to ASTM A307.
11. Allowable types of outer duct material for above ground ITS conduit include rigid metallic conduit (RMC) and fiberglass.

Sheet Details
Not to Scale

Texas Department of Transportation

Traffic Operations Division Standard

ITS CONDUIT RISER

ITS(34)-16

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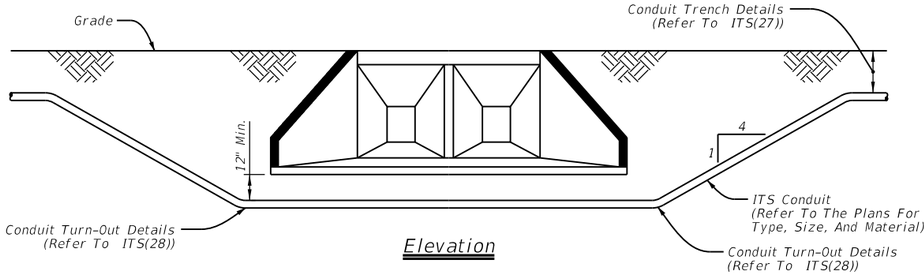
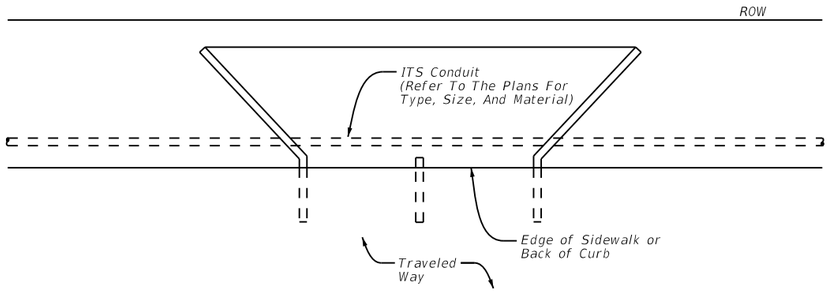
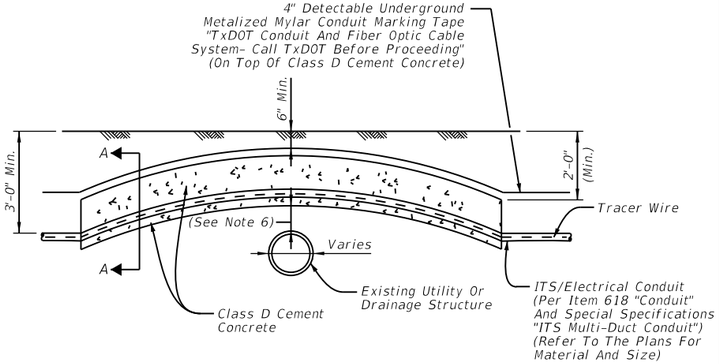


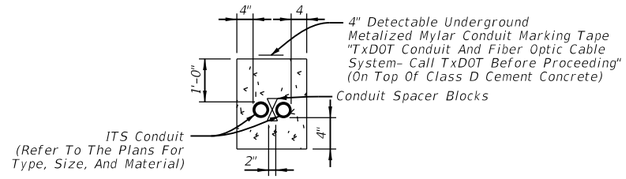
Elevation



Plan View

Conduit Bored Under Culvert



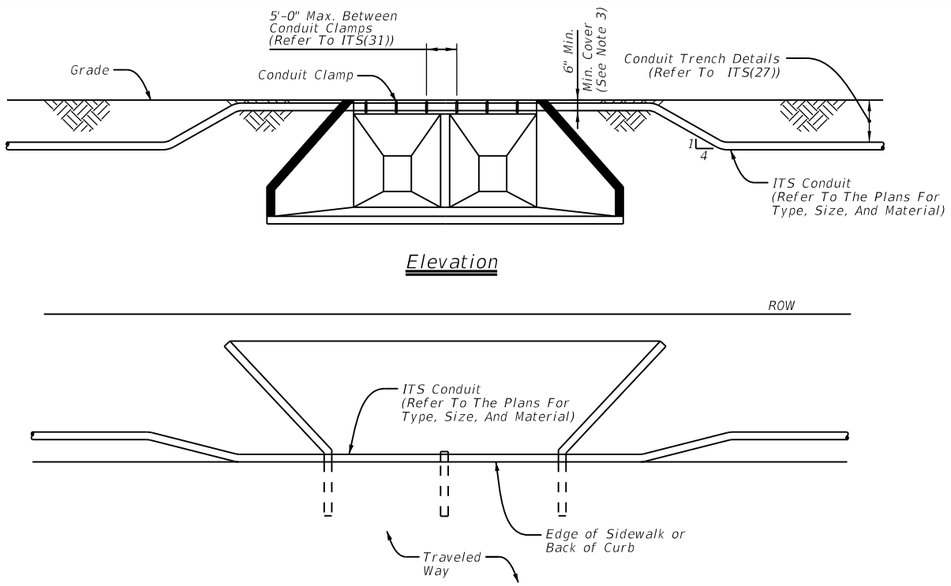


Section A-A

Conduit Installation Detail Above
Existing Drain Pipes Or Utilities

General Notes:

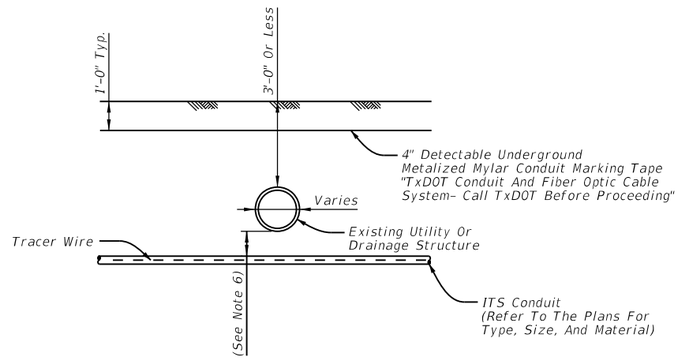
1. With approval from the field engineer adjust the final burial depth of conduit(s) in circumstances requiring traversal of non-movable object conflicts.
2. Where conduits are to be installed over existing underground infrastructure (i.e., existing utility or drainage structure) which are less than 3'-0" deep, encase conduit in Class D cement concrete in accordance with Item 421, "Hydraulic Cement Concrete", for the entire length of the conduit that is installed at a depth of less than 3'-0".
3. If depth of cover over encasement is less than 6", install the conduit to pass beneath the underground infrastructure.
4. Refer to the plans for type, size and configuration of all conduits. Refer to ITS(27) and ITS(28) for further installation details.
5. It is the responsibility of the contractor to verify all existing underground infrastructure. The contractor is responsible for any damage to any underground infrastructure during construction. Verify all utility locations at least 100' in advance of trenches, plowing or boring, and make changes in conduit placement in the event of conflict.
6. If proposed conduit is crossing or in close proximity to an existing underground utility, maintain a minimum clearance of 1'-6" vertical, 1'-6" horizontal or a clearance dictated by municipal code and or utility owner.
7. Install underground warning tape directly above all conduits per ITS(27) standard.
8. Do not install communications and electric cables in the same conduit. Separate conduits installed within the same trench based on NFPA 70, National Electrical Code. Refer to ITS(27) for additional conduit installation details.
9. Ensure all work is in compliance with the latest edition of NFPA 70, National Electrical Code.
10. Utilize PVC conduit for all underground applications as required by design. Transition with a conduit coupling to RMC conduit or other as required by design that is approved for above ground applications.
11. Do not exceed a rise:run ratio of 1:4 for conduit sloped through increases or decreases in elevation.



Elevation

Plan View

Conduit Attached To Culvert Headwall



Conduit Installation Detail Below
Existing Drain Pipes Or Utilities

Texas Department of Transportation

Traffic Operations Division Standard

ITS CONDUIT OBSTRUCTION CROSSING

ITS(35)-16

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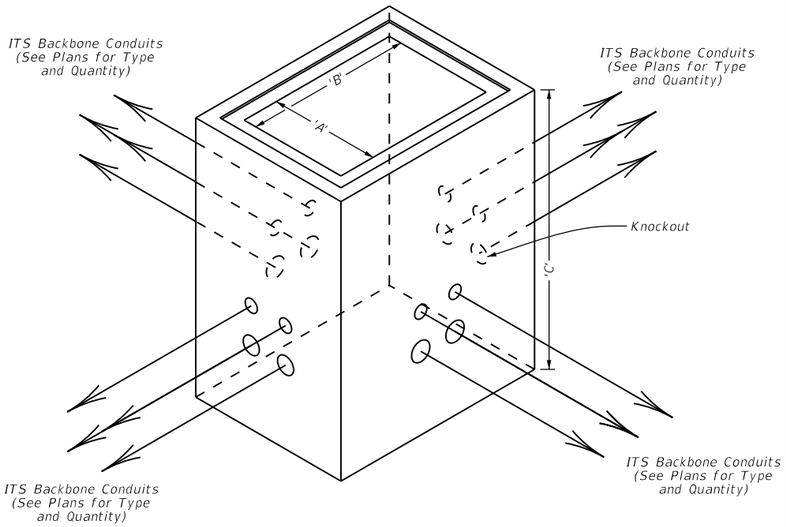
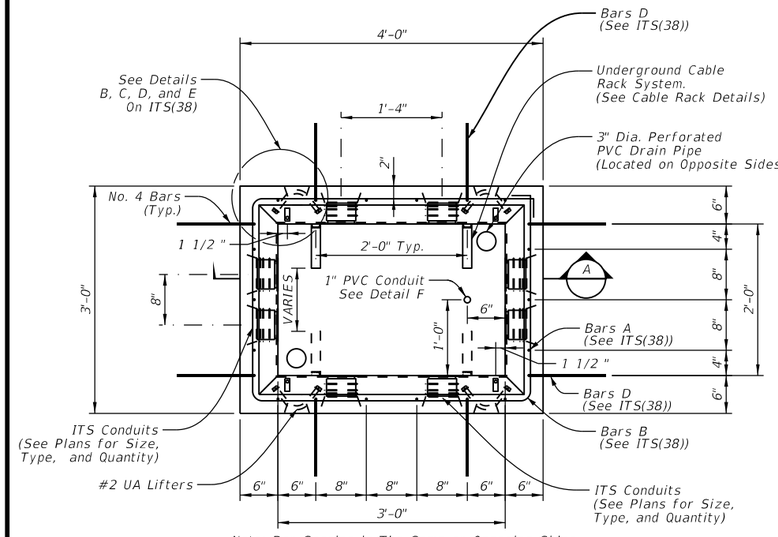


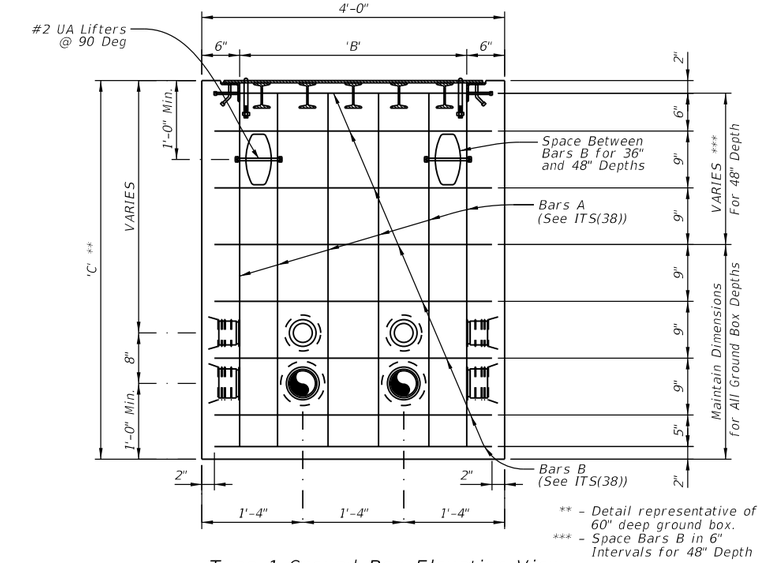
See Ground Box Schedule for A, B, and C Dimensions

Type 1 Ground Box Isometric View

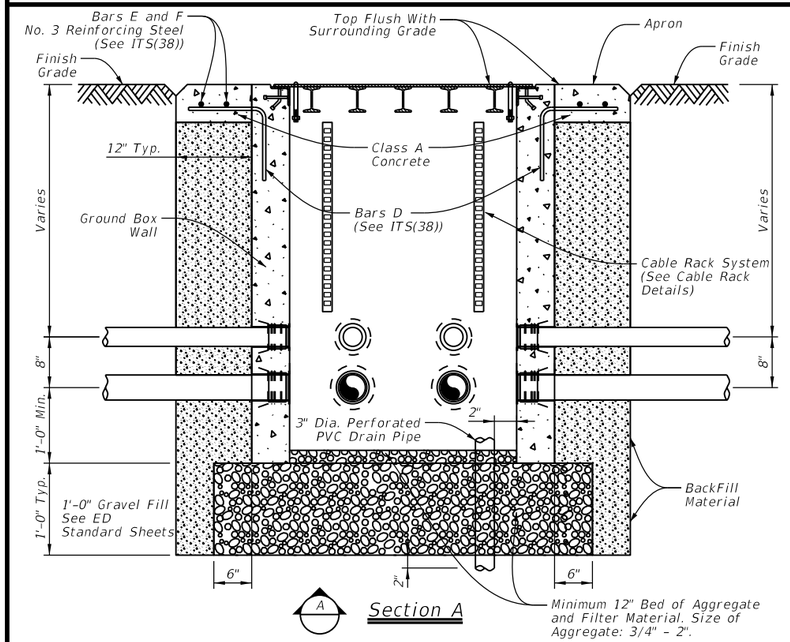


Note: Bar Spacing is The Same on Opposing Sides.

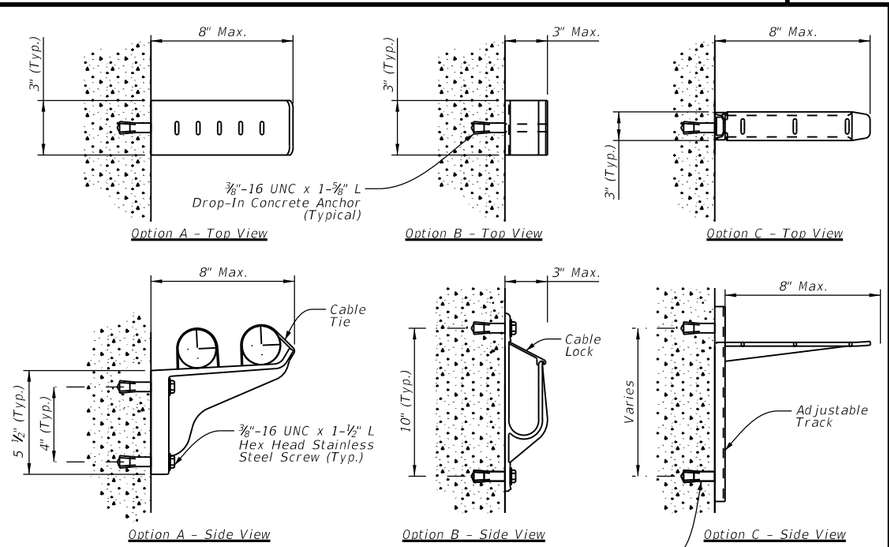
Type 1 Ground Box Plan View



Type 1 Ground Box Elevation View

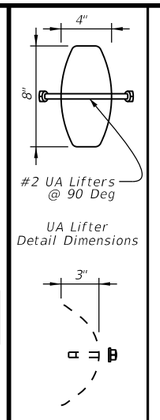


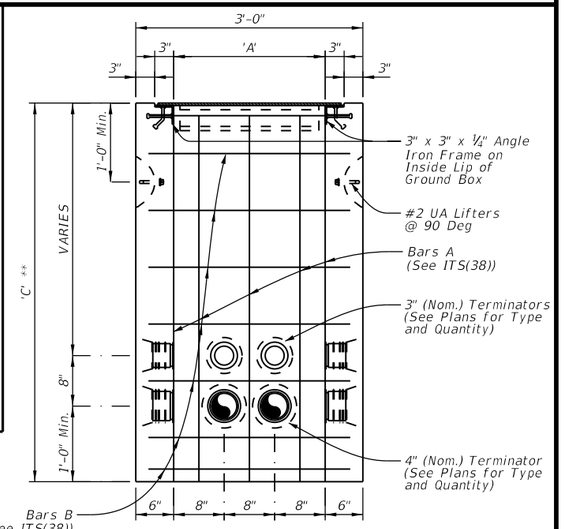
Section A



Note: Options Shown for Cable Racks and Attachment Methods. Furnish Shop Drawings of Cable Rack for Engineer Approval Prior to Installation.

Type 1 Cable Rack Details





Type 1 Ground Box Side View

** - Detail representative of 60" deep ground box.

SHEET 1 OF 2

General Notes:

1. Conduit entry points shown represent the standard configuration for backbone conduit as detailed on ITS(27). Additional conduits may be required as shown on the plans.
2. Provide Class A concrete for Type "1" ground boxes.
3. Provide terminators for the PVC conduit cast in the walls and placed symmetrically about the centerline of the box at the depths shown, unless otherwise noted, for the number of conduits identified on the plans to enter the box.
4. Provide terminators appropriately sized for the conduits indicated on the plans. Provide terminators with an air tight and water tight connection.
5. Closed bottom Type "1" ground boxes are acceptable in lieu of open bottom boxes. Provide two 3" Dia. perforated PVC drain pipes on opposite corners to optimize water drainage. Provide 12-inch bed of aggregate that extends 6 inches in all directions from the perimeter of the box for closed bottom boxes. Aggregate bed will be subsidiary to Special Specification, "ITS Ground Box."
6. Install all open bottom Type "1" ground boxes on a 12-inch bed of aggregate that extends 6 inches in all directions from the perimeter of the box. Aggregate bed will be subsidiary to Special Specification, "ITS Ground Box."
7. Cap and seal terminators that do not have conduits attached.
8. When additional conduit entry points are needed to accommodate existing conduit, core drill conduit knockouts in the field of the appropriate number and size of conduit at each location, as directed by the Engineer.
9. Provide a bell fitting on the end of each conduit to ensure a flush fit inside the ground box.
10. Concrete grout around the knockout (inside and out) and around the conduit and bell fitting to ensure a neat watertight fit after the conduit and bell fitting have been placed in a knockout. Ensure all openings in the ground box are sealed prior to grouting operations.
11. Install a nylon string and plug all unused conduits with tug-plugs sized for the particular conduits. Provide split innerduct plugs in conduits or innerducts with cables to seal the innerduct around the cables to prevent water and dirt from entering.
12. Provide steel (ASTM A-153), glass reinforced nylon, or equivalent cable rack assemblies designed to support the amount of cable storage slack identified in the plans. Locate cable rack system on one side only (longer length side) to allow access to the inside of the ground box. Cable racks may be installed at the factory or in the field. When mounting cable racks in the field, seal all penetrations to the concrete side wall to prevent moisture penetration. Ground metallic cable rack systems to grounding system inside ground box in accordance with the National Electrical Code.

Ground Box Schedule

Ground Box Type	'A' Width Inside (Inches)	'B' Length Inside (Inches)	'C' Depth Inside (Inches)
Type 1	24	36	36, 48, 60

Sheet Details
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Texas Department of Transportation

Traffic Safety Division Standard

ITS GROUND BOX DETAILS TYPE "1" WITH STEEL COVER

ITS(37)-22

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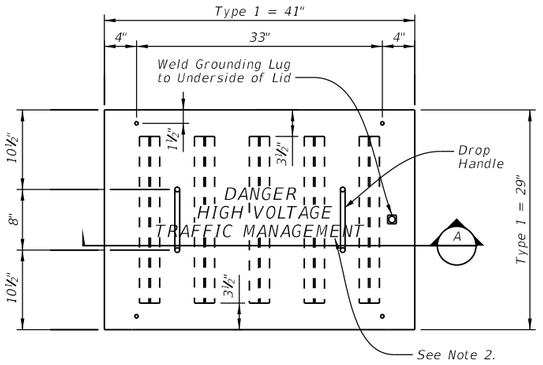
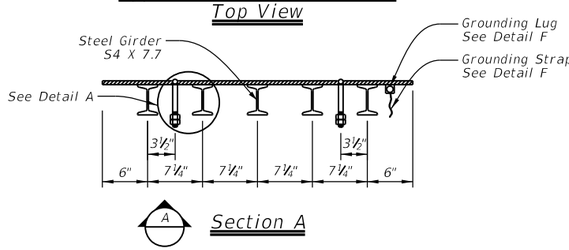
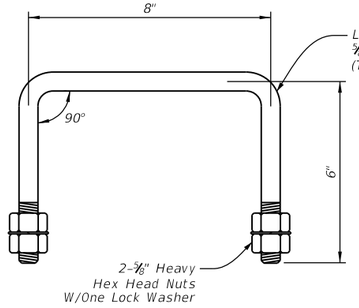


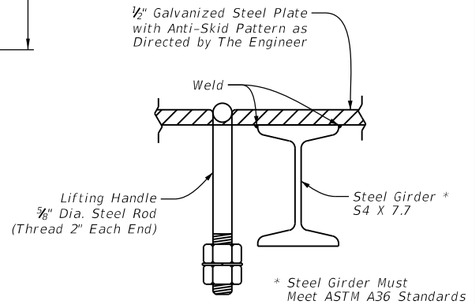
Type 1 Steel Cover Details
Top View



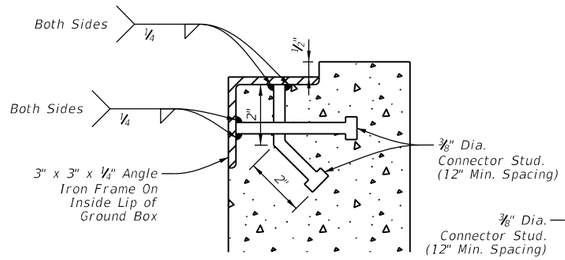
Section A



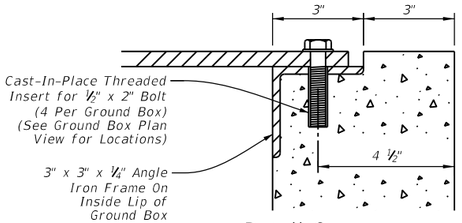
Drop Handle Detail



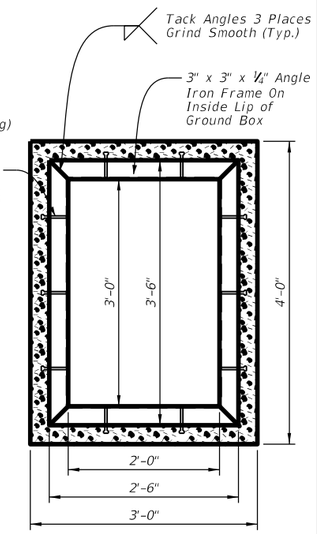
Detail A



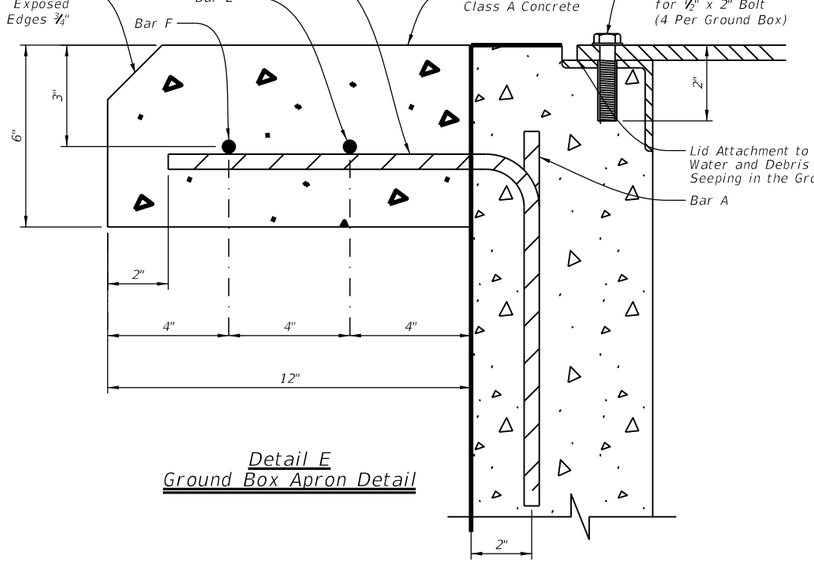
Detail B



Detail C
Lid Attachment Detail



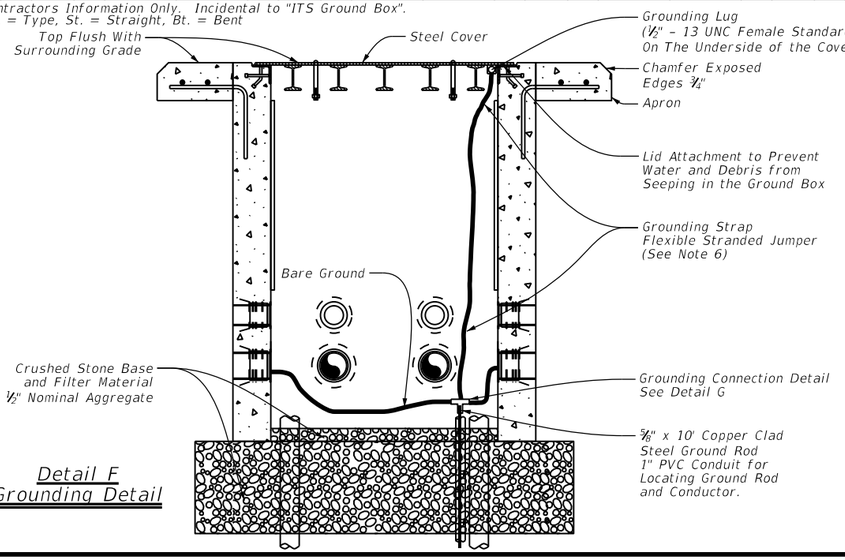
Detail D



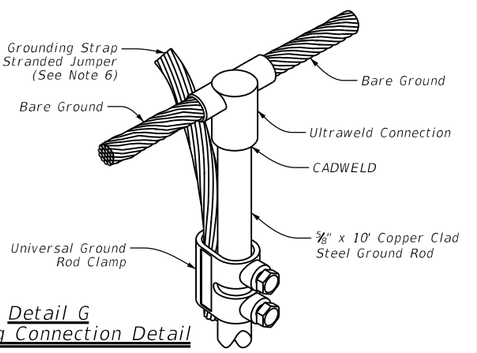
Detail E
Ground Box Apron Detail

Ground Box Type 1	BAR A					BAR B					BAR D					BAR E					BAR F					TOTALS	
	No.	Size	Ty.	Length	Weight	No.	Size	Ty.	Length	Weight	No.	Size	Ty.	Length	Weight	No.	Size	Ty.	Length	Weight	No.	Size	Ty.	Length	Weight	Steel * LBS.	Conc. * CY
36" Depth	22	#4	St.	2'-8"	39.3	5	#4	Bt.	13'-2"	44.1	8	#4	Bt.	2'-0"	10.7	1	#3	Bt.	17'-2"	6.5	1	#3	Bt.	19'-10"	7.5	108.1	.67
48" Depth	22	#4	St.	3'-8"	54.0	7	#4	Bt.	13'-2"	61.8	8	#4	Bt.	2'-0"	10.7	1	#3	Bt.	17'-2"	6.5	1	#3	Bt.	19'-10"	7.5	140.5	.89
60" Depth	22	#4	St.	4'-8"	68.8	8	#4	Bt.	13'-2"	70.6	8	#4	Bt.	2'-0"	10.7	1	#3	Bt.	17'-2"	6.5	1	#3	Bt.	19'-10"	7.5	164.1	1.11

* - For Contractors Information Only. Incidental to "ITS Ground Box".
Legend: Ty. = Type, St. = Straight, Bt. = Bent



Detail F
Grounding Detail



Detail G
Grounding Connection Detail

Note - All grounding connections to be CADWELD or approved equal. This work will not be paid for directly, but is considered incidental to ITS ground box.

General Notes:

1. See ITS(37) for additional Type "1" ground box details.
2. Hot-dip galvanized steel covers after all welds are made.
3. Label top of cover with the words "DANGER HIGH VOLTAGE TRAFFIC MANAGEMENT" using template-guided, hand-welded lettering at a height of 2 inches to ensure neatness.
4. Provide all Type "1" ground boxes with a securable, tamper-proof cover equipped with a bolting system that positively secures the cover in place.
5. Ground steel covers in accordance with the National Electrical Code.
6. Ground covers to the grounding cable using a split-bolt kearney clamp, and a minimum 8-foot long flexible stranded jumper the same size as the grounding conductor. Terminate to metal ground box cover with a tank ground type lug as approved and directed by the Engineer.
7. Provide Type "1" ground box and cover designed for heavy duty loading in accordance with AASHTO H20 loading when located where the box may experience deliberate, continuous vehicular traffic, such as near the shoulder or an auxiliary lane, or immediately adjacent to the unprotected edge of pavement.
8. Provide a Type "1" ground box and cover tested by a laboratory independent of the manufacturer certifying loading requirements are met. Provide certification of such tests to the Engineer for approval.
9. Provide a steel or cast iron cover in accordance with Item 471, Article 471.2, "Frames, Grates, Rings, and Covers." Provide covers with the number of drop handles shown. Provide Class "A" concrete for ground box construction and aprons.
10. Fabricate cover so to fits properly on the ground box, and no undue noise results when traffic contacts the cover.

Sheet Details
Not to Scale

Texas Department of Transportation

Traffic Operations Division Standard

ITS GROUND BOX DETAILS TYPE "1" WITH STEEL COVER

ITS(38)-17

FILE: its(38)-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT FEBRUARY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0027	07	046,ETC.	UA 90,ETC.
5-17	DIST	COUNTY		SHEET NO.
	HOU	FORT BEND,ETC.		80

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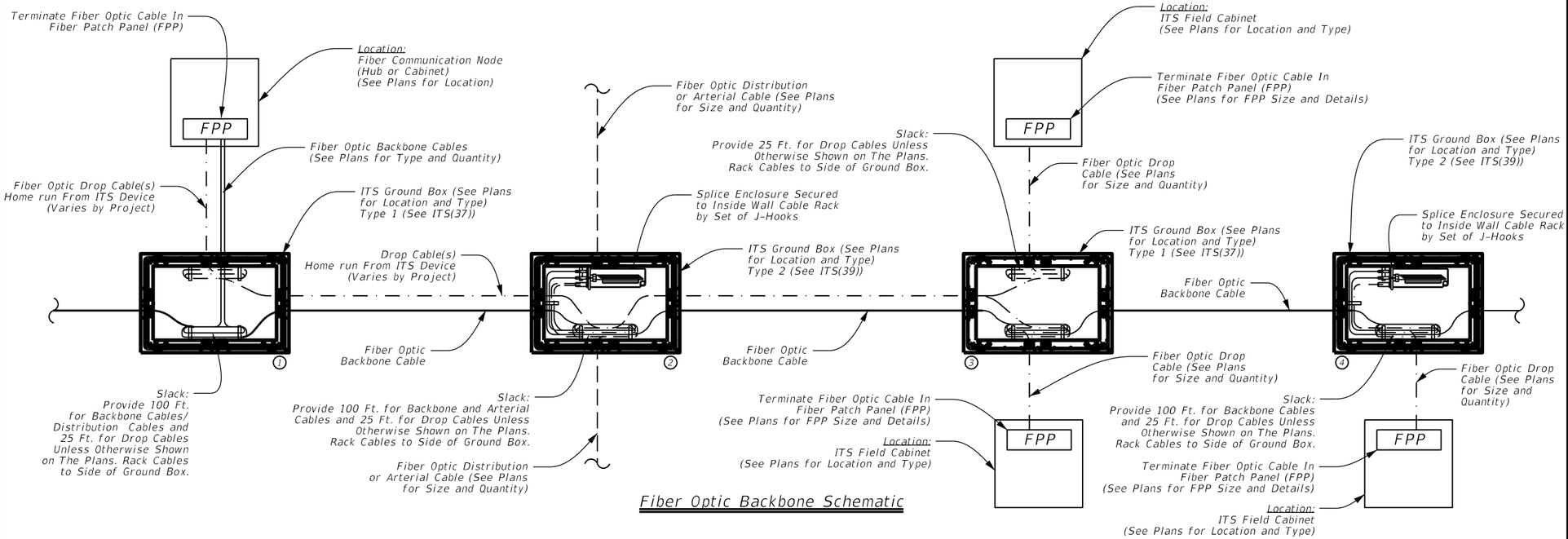
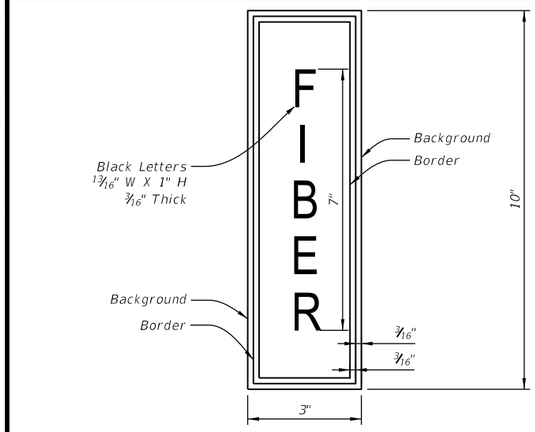
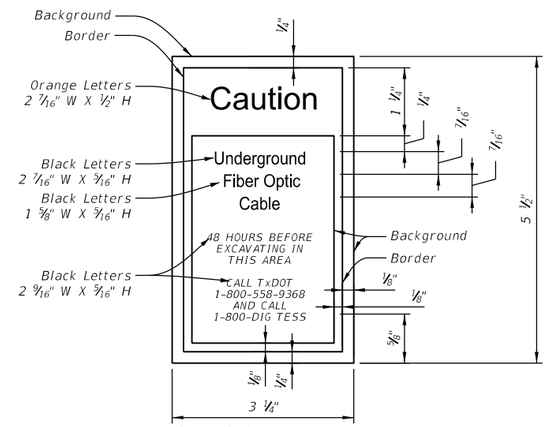


Fiber Optic Backbone Schematic



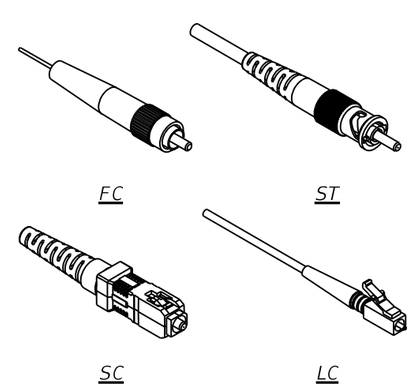
Border - Black
Background - Orange Reflective

Fiber Decal Details



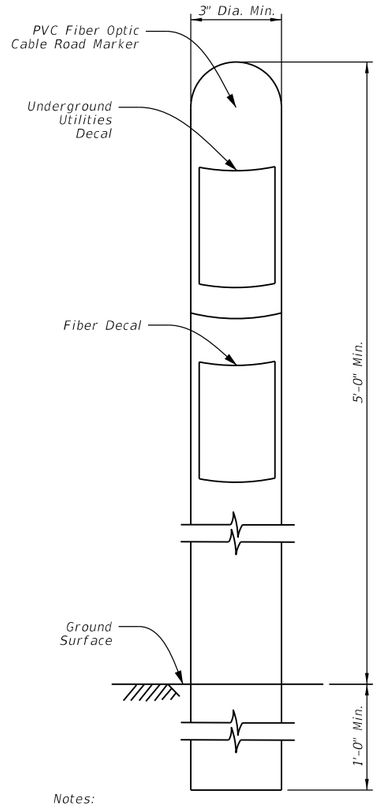
Border - Black
Symbol - Black
Background - Orange Reflective

Underground Utilities Decal Details



Fiber Optic Connectors

Note - Details are diagrammatic and may vary by manufacturer.



Notes:
1. Space fiber optic cable road markers at maximum 1000' intervals or at significant changes in direction such as a 90 degree turn.
2. Provide all orange fiber optic cable road markers for non-splice locations.
3. Provide orange fiber optic cable road markers with white dome for splice locations.
4. Locate marker within concrete apron of fiber ground box.

Fiber Optic Cable Road Markers

Reference Notes:

1. Fiber architecture at communication node.
2. Fiber architecture for splicing arterial distribution cables.
3. Fiber architecture for home run of drop cables from ITS field equipment cabinets to communication node.
4. Fiber architecture for splicing drop cable from ITS field equipment cabinet.

General Notes:

1. The fiber optic backbone schematic shown is diagrammatic only and intended to represent the various fiber optic communication architectures seen across the state and may not show all configurations seen. Connection of ITS field equipment to ITS communication nodes or hubs is achieved through home run drop cables or spliced to the backbone in a splice enclosure. Refer to fiber communication schematic details and fiber termination information shown on the plans for further information.
2. Install a flat pull cord in all empty conduits and inner-ducts identified for communication use. The pull cord must have a tensile strength of 1,250 lbs minimum and have foot markings to determine length installed. Furnish and installation of pull cord will be subsidiary to special specification "ITS Fiber Optic Cable".
3. Color code each type of fiber optic cable to identify the cable as a "backbone" (green or blue), "distribution" (red), or "drop" (orange or yellow).
4. Terminate fibers at fiber patch panel (FPP), also referred to as patch panel, with SC connectors for new installations. When connecting to existing FPP, terminate with FC or ST connectors as shown on the plans. Provide connector adaptors as required to accommodate existing equipment if information is not provided in the plans.
5. Provide a list showing cable number assignments and highway or facility that the cable services.
6. Provide a single 1/C #14 insulated wire in conduit runs which have been identified in the plans to carry fiber optic cable. Provide UL listed solid copper wire with orange color low density polyethylene insulation suitable for conduit installation rated for temperature range -20 C to 60 C and a voltage rating of 600V. This wire will serve as a tracer, or locate, wire for locating underground conduit containing fiber optic cabling and will be paid for under Item 620, "Electrical Conductors."
7. Ensure each cable is marked on the outer jacket with a label detailing the manufacturer's name, the date of manufacturer (month/year), the fiber count (Example: 48F SM or 48 SMF), and sequential length markings at maximum 3 FT increments.

Sheet Details
Not to Scale

SHEET 1 OF 2

Texas Department of Transportation

Traffic Operations Division Standard

ITS FIBER OPTIC CABLE MISCELLANEOUS DETAILS

ITS(42)-16

FILE: its(42)-16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT FEBRUARY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0027	07	046,ETC.	UA 90,ETC.
	DIST	COUNTY		SHEET NO.
	HOU	FORT BEND,ETC.		81

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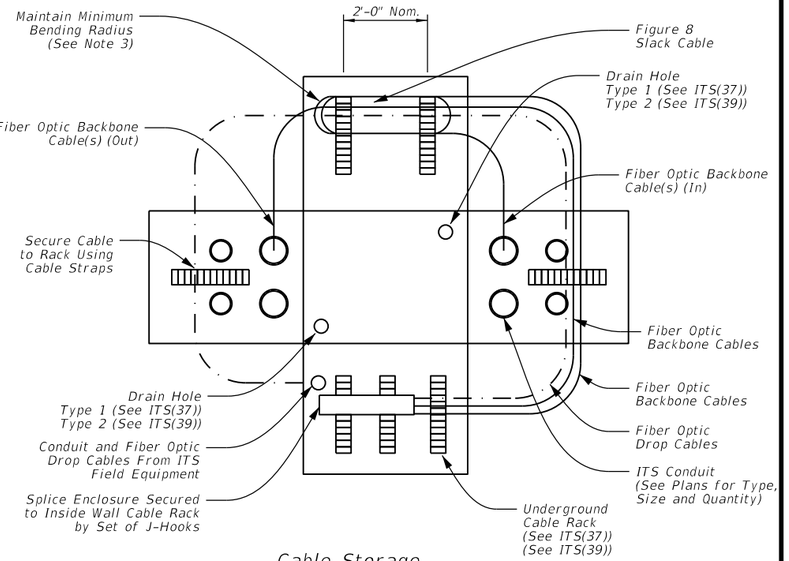
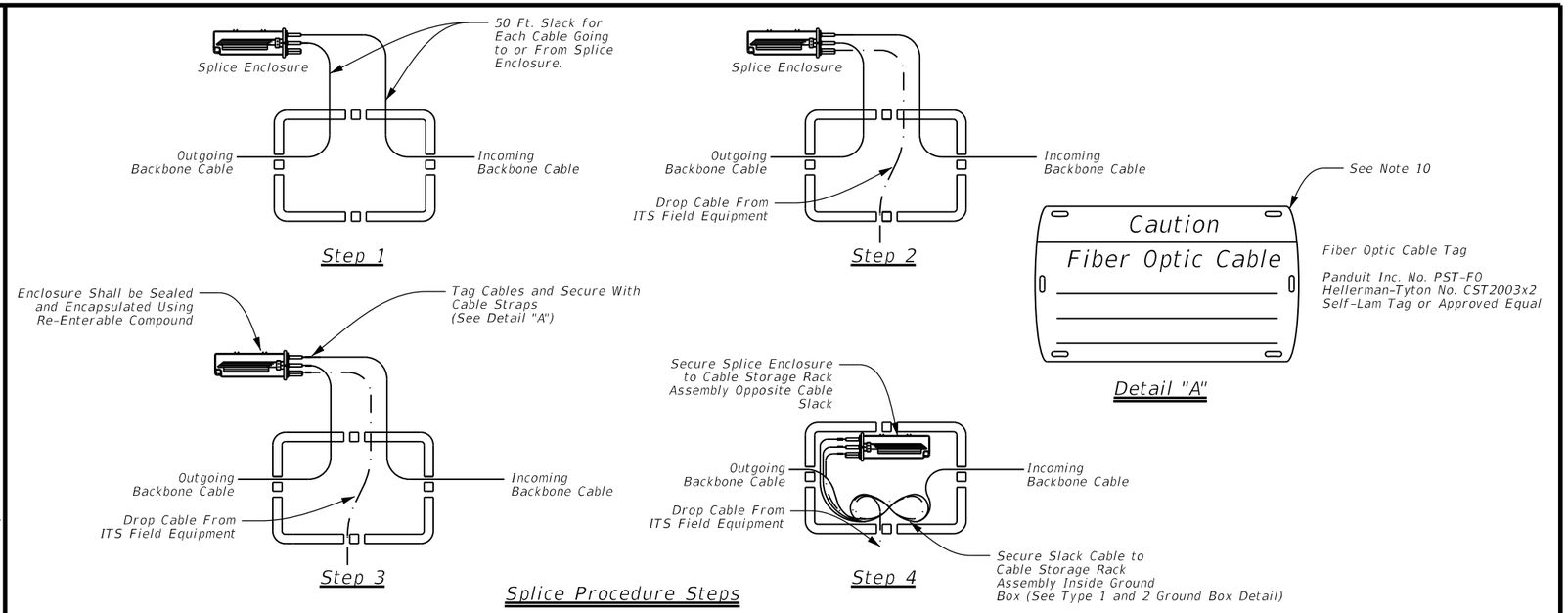
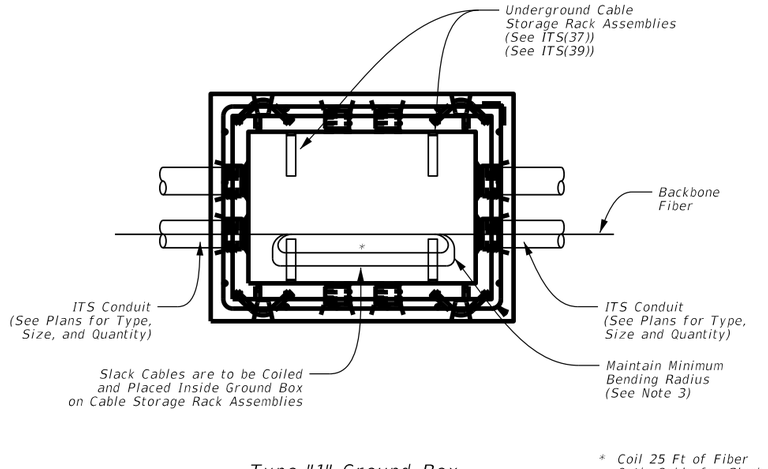


Cable Storage

Top View - Ground Box Walls Folded Down for Clarity

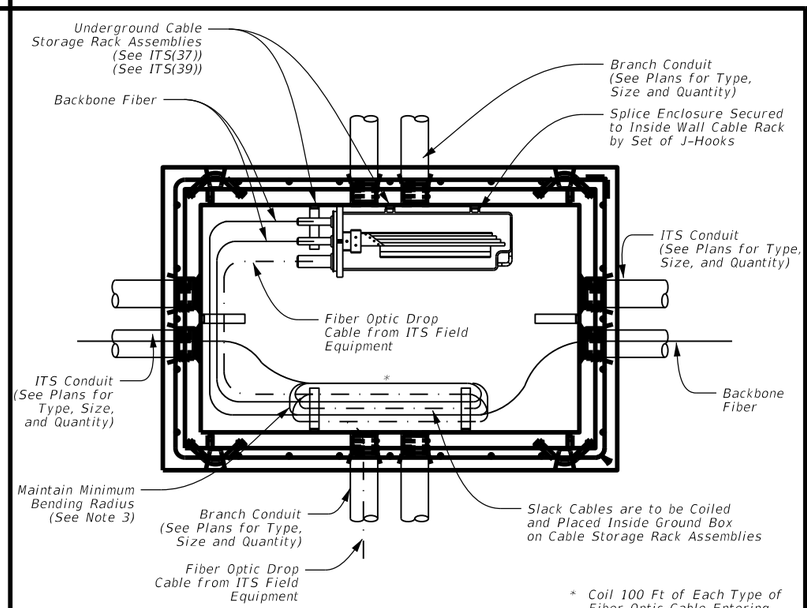


Splice Procedure Steps



Type "1" Ground Box

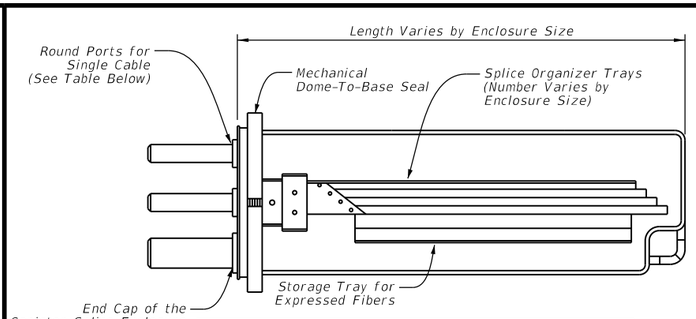
* Coil 25 Ft of Fiber Optic Cable for Slack



Type "2" Ground Box

with Splice

* Coil 100 Ft of Each Type of Fiber Optic Cable Entering the Ground Box



Splice Enclosure Sizes			
Type	No. of Ports	Port Capacity	Fiber Use
1	4	2 - Up to 144 Sm	Backbone
		2 - Up to 48 Sm	Drop
2	6	4 - Up to 144 Sm	Backbone/Arterial
		2 - Up to 48 Sm	Drop
3	8	4 - Up to 144 Sm	Backbone/Arterial
		4 - Up to 48 Sm	Drop

Splice Enclosure Fiber Accommodations

General Notes:

1. Conduit entry points to the Type 1 and Type 2 ground boxes are diagrammatic. Refer to ITS ground box standards, ITS(37) and ITS(39), for more information. Additional conduits may be required as shown on the plans.
2. Type 2 ground boxes are to be used, as shown on the plans, when splice enclosures are required.
3. Maintain a minimum bend radius of 20 times the fiber optic cable diameter during installation, relocation, and removal and a minimum of 10 times the fiber optic cable diameter when in operation.
4. Caulk all conduit around the top of the cable ducts with an engineer approved caulking compound to seal clearance between the cables and ducts. Place conduit plugs in all vacant conduits or inner-ducts.
5. Provide cable straps that will withstand ultra-violet exposure and do not damage cables when tightening.
6. All incidental equipment necessary for the cable installation and mounting of splice enclosure within the ground box will be incidental to Special Specification, "ITS Fiber Optic Cable."
7. Submit all splice locations to the field engineer for approval before beginning work.
8. Provide splice enclosures designed to seal, bond, anchor, and protect fiber optic cable splices. Provide splice enclosures designed to handle mechanical and fusion type splices. Provide splice enclosures with port configurations for the sizes detailed above.
9. Provide splice enclosures designed for underground placement with a sealing system preventing water penetration when submerged under 10 ft. of water.
10. Furnish, install, and secure fiber optic cable tags for each fiber optic cable entering a ground box, ITS field equipment cabinet (ground and pole), and hub building or communication node as detailed above. Provide information including fiber optic type, count, origin, and destination on the cable tag. Use UV resistant tie-wraps for securing the tag to the cable. Provide tie-wraps that do not damage fiber when securing to cable.

Sheet Details
Not to Scale

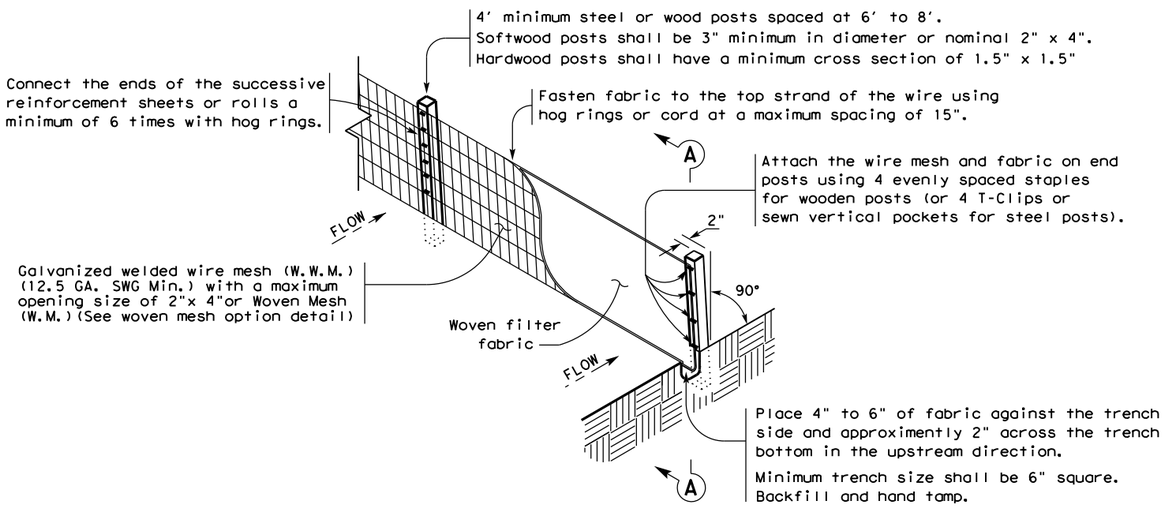
Texas Department of Transportation

Traffic Operations Division Standard

ITS FIBER OPTIC CABLE MISCELLANEOUS DETAILS

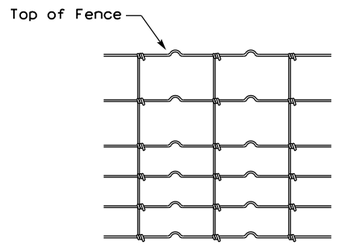
ITS(43)-16

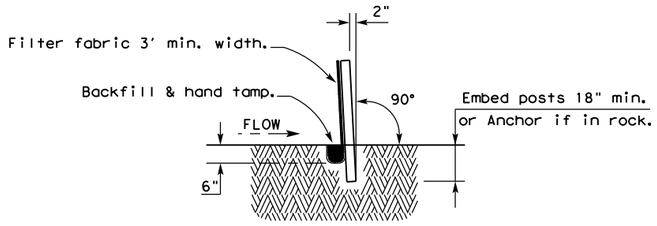
FILE: its(43)-16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT FEBRUARY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0027	07	046,ETC.	UA 90,ETC.
	DIST	COUNTY		SHEET NO.
	HOU	FORT BEND,ETC.		82



TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

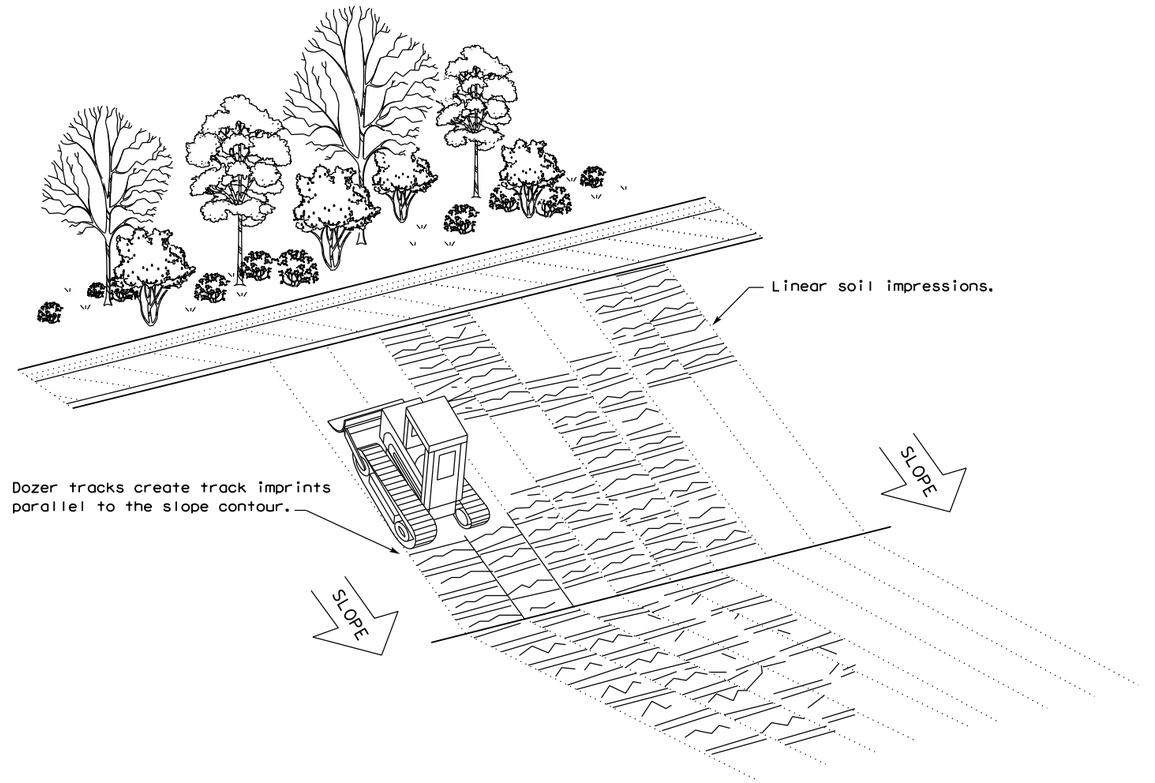
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS		
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0027	07	046,ETC.		UA 90,ETC.	
	DIST	COUNTY			SHEET NO.	
	HOU	FORT BEND,ETC.			83	

SITE DESCRIPTION

PROJECT LIMITS:
(CCSJ 0027-07-046) Fort Bend County UA 90 Highway from FM 723 to FM 762
(CSJ 0188-01-040) Fort Bend County SH 36 Highway from UA 90 to IH 69
(CSJ 0179-02-089) Brazoria County SH 35 Highway from BS 35-E to FM 2852
(CSJ 0188-07-006) Brazoria County SH 35 Highway from SH 36 to BS 35-E
(CSJ 1400-04-039) Montgomery County FM 1774 Highway from FM 1488 to SH 249
(CSJ 3538-01-058) Montgomery County SH 242 Highway from FM 1314 to FM 1485

PROJECT DESCRIPTION: For the construction of corridor traffic management consisting of advanced traffic management system.

MAJOR SOIL DISTURBING ACTIVITIES: Trenching for installation of conduits and foundations.

TOTAL PROJECT AREA: Less than 5 Acres

TOTAL AREA TO BE DISTURBED: Less than 5 Acres

WEIGHTED RUNOFF COEFFICIENT:
(AFTER CONSTRUCTION): N/A

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER: Existing ground cover occupies approximately 5% of the area to be disturbed. The proposed condition shall have ground cover on approximately 5% of the area to be disturbed.

NAME OF RECEIVING WATERS: N/A

EROSION AND SEDIMENT CONTROLS

SOIL STABILIZATION PRACTICES:

____ TEMPORARY SEEDING
__X__ PERMANENT PLANTING, SODDING, OR SEEDING
____ MULCHING
____ SOIL RETENTION BLANKET
____ BUFFER ZONES
____ PRESERVATION OF NATURAL RESOURCES

OTHER:

STRUCTURAL PRACTICES:

__X__ SILT FENCES
____ HAY BALES
____ ROCK BERMS
____ DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
____ DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
____ DIVERSION DIKE AND SWALE COMBINATIONS
____ PIPE SLOPE DRAINS
____ PAVED FLUMES
____ ROCK BEDDING AT CONSTRUCTION EXIT
____ TIMBER MATTING AT CONSTRUCTION EXIT
____ CHANNEL LINERS
____ SEDIMENT TRAPS
____ SEDIMENT BASINS
____ STORM INLET SEDIMENT TRAP
____ STONE OUTLET STRUCTURES
____ CURBS AND GUTTERS
____ STORM SEWERS
____ VELOCITY CONTROL DEVICES
____ EROSION CONTROL LOGS

OTHER:

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

N/A

STORM WATER MANAGEMENT: Storm water drainage will be provided by both existing open ditch system and curb and gutter.

OTHER EROSION AND SEDIMENT CONTROLS:

MAINTENANCE: All erosion and sediment controls will be maintained in good working order. If a repair is necessary it will be done at the earliest date possible, but no later than 7 calendar days after the surrounding exposed ground has dried sufficiently to prevent further damage from heavy equipment. The area adjacent to creeks and drainageways shall have priority followed by devices protecting storm sewer inlets.

INSPECTION: All inspections will be performed by a TxDOT inspector per one of the options below as directed by the Area Engineer
1. At least every 7 calendar days
2. At least every 14 days or after 0.5 inches or more of rainfall
An inspection and maintenance report should be made for each inspection. Based on the inspection results, the controls shall be revised according to the inspection report.

WASTE MATERIALS: The dumpster used to store all waste material will meet all state and local city solid waste management regulations. All trash and construction debris will be deposited in the dumpster. The dumpster will be emptied as necessary or as required by local regulation and the trash will be hauled to a local dump. No construction waste material will be buried on site.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING): In the event of a spill which may be considered hazardous, the Houston District Safety Office shall be contacted immediately at 713-802-5962.

SANITARY WASTE: All Sanitary Waste will be collected from the portable units as necessary or as required by local regulations by a licensed sanitary waste management contractor.

OFFSITE VEHICLE TRACKING:

____ HAUL ROADS DAMPENED FOR DUST CONTROL
____ LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
____ EXCESS DIRT ON ROAD REMOVED DAILY
____ STABILIZED CONSTRUCTION ENTRANCE

OTHER:

REMARKS: Disposal areas, stockpiles, and haul roads shall be constructed in a manner that will minimize and control the sediment that may enter receiving waterways. Disposal areas shall not be located in any waterway, waterbody or streambed. Construction staging areas and vehicle maintenance areas shall be constructed by the contractor in a manner which minimizes the runoff of all pollutants. All waterways shall be cleared as soon as practical of temporary embankments, temporary bridges, matting, falsework, piling, debris, and other obstructions placed during construction operations that are not part of the finished work.

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER
P.E.

07/03/2023

Texas Department of Transportation
Houston District

TxDOT STORM WATER POLLUTION PREVENTION PLAN

SWP3

FILE: STDG1.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
©TxDOT JANUARY 2007	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 9/2010 INSPECTION NOTE 9/2013 INSPECTION NOTE 11/2013 SW3P TO SWP3 03/2015 2014 SPECS	HOU	6	STP 2B23(203)HES	84
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	FORT BEND, ETC.	0027	07	046, ETC.	UA 90, ETC.

STD G-1

I. STORMWATER POLLUTION PREVENTION

Texas Pollutant Discharge Elimination System (TPDES) TXR 150000: Stormwater Discharge Permit or Construction General Permit is required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506. Refer to the TxDOT SWP3 Summary Sheets, SWP3 Binder Template, and Form 2118.

No Additional Comments

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS

United States Army Corps of Engineers (USACE) Permit is required for filling, dredging, excavating or other work in water bodies, rivers, creeks, streams, wetlands or wet areas. The Contractor must adhere to all of the terms and general conditions associated with the following permit(s). If additional work not represented in the plans is required, contact the Engineer immediately.

☒ No United States Army Corps (USACE) Permit Required

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) without a Pre-Construction Notification (PCN). Project specific permit was not issued by USACE, therefore is not in the plan set. The USACE general conditions are in the “General Notes."

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) with a Pre-Construction Notification (PCN). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set. The USACE general conditions are in the “General Notes."

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Individual Permit (IP). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set.

☐ Work would be authorized by the United States Army Corps of Engineers (USACE) permit. The project specific permit issued by the USACE will be provided to the contractor.

United States Coast Guard (USCG) Permit is required for projects that involve the construction or modification (including changes to lighting) of a bridge or causeway across a water body determined to be navigable by the United States Coast Guard (USCG) under Section 9 of the Rivers and Harbors Act. If additional work not represented in the plans is required, contact the Engineer immediately.

☒ No United States Coast Guard (USCG) Coordination Required

☐ United States Coast Guard (USCG) Permit

☐ United States Coast Guard (USCG) Exemption

No Additional Comments

III. CULTURAL RESOURCES

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

No Additional Comments

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical. Refer to TxDOT Standard Specifications in order to comply with requirements for invasive species, beneficial landscaping and tree/brush removal.

No Additional Comments

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

If any of the listed species below are observed, cease work in the area, do not disturb species or habitat and contact the Engineer immediately.

The work may not remove active nests (from bridges, structures, or vegetation adjacent to the roadway, etc.) during nesting season (February 15 to October 1). If removal of structures or vegetation is necessary during the nesting season, the Contractor shall conduct a bird survey no more than 3 days in advance of the clearing/demolish start date. All bird surveys shall be conducted by a Field Biologist and adhere to the guidance document “Avoiding Migratory Birds and Handling Potential Violations” found in the TxDOT Environmental Compliance Toolkits at the time of the survey. (See below for Field Biologist and Ornithologist qualifications)

No Additional Comments

Field Biologist, Ornithologist – a field biologist is defined as an individual qualified to perform field investigations, presence/absence surveys and habitat surveys for protected avian species or species of concern. A mandatory bachelor’s degree in biology or a related science is required. At a minimum, the Field Biologist, Ornithologist, shall have completed and reported a minimum of three presence/absence and habitat surveys for protected avian species in the past five years. A minimum of three projects must have been conducted in Texas. Surveys shall have been performed for documentation of species in accordance with a protocol approved by USFWS or TPWD, or following generally accepted methodologies.

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

Refer to TxDOT Standard Specifications in the event potentially contaminated materials are observed, such as dead or distressed vegetation, trash disposal areas, drums, canisters, barrels, leaching or seepage of substances, unusual smells or odors, or stained soil, cease work in the area and contact the Engineer immediately.

No Additional Comments

VII. OTHER ENVIRONMENTAL ISSUES

Comments:

DATE: May 03, 2023
FILE:

Version 2.2

Texas Department of Transportation

TxDOT Houston District

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: EPIC Sheet.dgn	DN:	CK:	DW:	CK:
© TxDOT: March 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0027	07	046,ETC.	UA 90,ETC.
UPDATED section V. text and added definition (10/17) ADDED USCG and USACE notes in Section VII (04/18)	DIST	COUNTY		SHEET NO.
	HOU	FORT BEND,ETC.		85

I. WORK AT CROSSING LOCATIONS (AT GRADE, HIGHWAY OVERPASS, HIGHWAY UNDERPASS, PEDESTRIAN, OR CLOSED/ABANDONED)

☐ This project is adjacent or parallel work, not within RR ROW:

DOT No.: 022686A

Crossing Type: UNDERPASS

RR Company Operating Track at Crossing: BNSF

RR Company Owning Track at Crossing: BNSF RAILWAY (BNSF)

RR MP: 63.43

RR Subdivision: GALVESTON

City: RICHMOND

County: FORT BEND

CSJ at this Crossing: 0027-07-046, ETC.

Scope of Work, including any TCP, to be performed by State Contractor:

INSTALLED PERPENDICULAR TO TRACK 2" CONDUIT, 4" MULTI DUCT
AND FIBER OPTIC CABLE (36 STRAND)

Scope of Work to be performed by Railroad Company:

N/A

II. FLAGGING & INSPECTION

No. of Days of Railroad Flagging Expected: 4

On this project, night or weekend flagging is:

☐ Expected

☑ Not Expected

Flagging services will be provided by:

☐ Railroad Company: TxDOT will pay flagging invoices. Flagging Agreement with Railroad will be needed

☑ Outside Party: Contractor will pay flagging invoices to be reimbursed by TxDOT

Contractor must incorporate flaggers into anticipated construction schedule. The Railroad requires a 30-day notice if their flaggers are to be utilized. If Contractor falls behind schedule due to their own negligence and is not ready for scheduled flaggers, any flagging charges will be paid by Contractor.

Contact Information for Flagging:

☐ **UPRR** UP.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
UP.request@nrssinc.net
Call Center 877-984-677

☑ **BNSF** BNSFinfo@railprosfs.com
Call Center 877-315-0513, Select #1 for flagging

☐ **KCS** KCS.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
Bottom Line On-Track Safety Services
bottomline076@aol.com, 903-767-7630

☐ OTHERS:

Contractor must incorporate Construction Inspection into anticipated construction schedule.

☑ Not Required

☐ Required. Contact Information for Construction Inspection:

III. CONSTRUCTION WORK TO BE PERFORMED BY THE RAILROAD

☐ Required. Railroad Point of Contact: _____

☑ Not Required

Coordinate with TxDOT for any work to be performed by the Railroad Company. TxDOT must issue a work order for any work done by the Railroad Company prior to the work being performed.

IV. RAILROAD INSURANCE REQUIREMENTS

The Contractor shall confirm the insurance requirements with the Railroad as the insurance limits are subject to change without notice.

Insurance policies and corresponding certificates of insurance must be issued by the contractor on behalf of the Railroad. Separate insurance policies and certificates are required when more than one Railroad Company is operating on the same right of way, or when several Railroad Companies are involved and operate on their own separate right of ways.

No direct compensation will be made to the Contractor for providing the insurance coverages shown below or any deductibles. These costs are incidental to the various bid items.

Escalated Limits

Type of Insurance	Amount of Coverage (Minimum)
Workers Compensation	$500,000 / $500,000 / $500,000
Commercial General Liability	$2,000,000 / $4,000,000
Business Automobile	$2,000,000

Railroad Protective Liability Limits

☐ Not Required	
☑ Non - Bridge/Typical Maintenance Projects. Includes repairs to overpass/underpass and culvert structures	$2,000,000 / $6,000,000
☐ Bridge Structure Projects. Includes new construction or replacement of overpass/ underpass structures	$5,000,000 / $10,000,000
☐ Other: _____	

V. CONTRACTOR'S RIGHT OF ENTRY (CROE)

☐ Not Required

☐ Required: UPRR Maintenance Consent Letter. TxDOT to assist

☐ Required: TxDOT to assist in obtaining the UPRR CROE

☑ Required: Contractor to obtain

- ☑ BNSF: _____
  https://bnsf.railpermitting.com
- ☐ KCS
  https://jllrpg.360works.com/fmi/webd/rpo_web_kcs.fmp12
- ☐ Other Railroads: _____

To view previously approved CROE templates agreed upon between the State and Railroad, see: https://www.txdot.gov/business/resources/railroad-highway-crossing/sample-right-of-entry-agreements.html

Approved CROE templates are not to be modified by the Contractor.

Contractor shall not operate within Railroad Right of Way without an executed Construction & Maintenance Agreement between the State and the Railroad and an executed CROE between the Contractor and the Railroad if required on project.

VI. RAILROAD COORDINATION MEETING

A Railroad Coordination Meeting is required. See item 5, Article 8.1, of the Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges Manual for more details.

VII. RAILROAD SAFETY ORIENTATION

A. Complete the Railroad's course "Orientation for Contractor's Safety," and maintain registration prior to working on the Railroad's property. This course is required to be completed annually by Contractor and Subcontractor personnel working on site.

UPRR, BNSF, KCS/TEXMEX will not accept on-track safety training certificates from other Railroads. Refer to each Railroad's specific contractor right of entry for training information.

Know and follow the Contractor's Right of Entry Agreement EXHIBIT D, MINIMUM SAFETY REQUIREMENTS regarding clothing, personal protective equipment, and general safety requirements.

VIII. SUBCONTRACTORS

Contractor shall not subcontract work without written consent of TxDOT. Subcontractors are subject to the same insurance requirements as the Prime Contractor.

IX. EMERGENCY NOTIFICATION

In Case of Railroad Emergency

Call: BNSF

Railroad Emergency Line at: 800-832-5452 (OPTION 1)

Location: DOT 022686A

RR Milepost: 63.43

Subdivision: GALVESTON

RRD Review Only

Initials: _____

Date: _____

Texas Department of Transportation — Rail Division

RAILROAD SCOPE OF WORK
PROJECT SPECIFIC DETAILS

FILE: rr-scope-of-work.pdf	DN: TxDOT	CK:	DW:	CK:
© TxDOT June 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0027	07	046, ETC.	UA 90
3/2023	DIST	COUNTY		SHEET NO.
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PART 1 - GENERAL

1.01 DESCRIPTION

This project includes construction work within the Right-of-Way and/or properties of the Railroad Company and adjacent to its tracks, wire lines and other facilities. These sheets describe the minimum special requirements for coordination with the Railroad when working upon, over or under Railroad Right-of-Way or when impacting current or future Railroad operations. Coordinate with the Railroad while performing the work outlined herein, and afford the same cooperation with the Railroad as with TxDOT. Complete all submittals and work in accordance with TxDOT Standard Specifications, Railroad Guidelines and AREMA recommendations as modified by these minimum special requirements or as directed in writing by the Railroad Designated Representative.

For purposes of this project, the Railroad Designated Representative is the person or persons designated by the Railroad Manager of Industry and Public Projects to handle specific tasks related to the project.

1.02 REQUEST FOR INFORMATION / CLARIFICATION

Submit Requests for Information ("RFI") involving work within any Railroad Right-Of-Way to the TxDOT Engineer. The TxDOT Engineer will submit the RFI to the Railroad Designated Representative for review and approval for RFI's corresponding to work within Railroad Right-Of-Way. Allow six (6) weeks total time for review and approval, which includes four (4) weeks for review and approval by the Railroad.

1.03 PLANS / SPECIFICATIONS

TxDOT has received writtern Railroad approval of the plans and specifications for this project. Any revisions or changes in the plans after award of the Contract must have the approval of TxDOT and the Railroad.

PART 2 - UTILITIES AND FIBER OPTIC

Construct all utility installations in accordance with current AREMA recommendations, Railroad, TxDOT and owning utility specifications and requirements. Railroad general guidelines can be found on the Railroad website or by contacting the Railroad Designated Representative.

PART 3 - CONSTRUCTION

3.01 GENERAL

A. Perform all work in compliance with all applicable Railroad, Federal Railroad Administration (FRA), and TxDOT rules and regulations. Arrange and conduct work in a manner that does not endanger or interfere with the safe operation of the tracks and property of the Railroad and the traffic moving on such tracks, or the wires, signals and other property of the Railroad, its tenants or licensees, at or in the vicinity of the Work. The safe operation of Railroad train movements takes precedence over any work to be performed by the Contractor. The Contractor is responsible for train delay cost and lost revenue claims due to any delays or interruption of train operations resulting from Contractor's construction or other activities.

B. Construction activities within 15 feet of the operational tracks will only be allowed if absolutely necessary and the Railroad's Designated Representative grants approval. Construction activities within 15 feet of the operational track(s) preferably allow the tracks to stay operational. In such cases, coordination and approval by the Railroad Track Manager is required with regard to schedule, flagging, and slow orders. See Sections 3.07 and 3.08 for additional information.

C. Provide track protection for all work equipment (including rubber tired equipment) operating within 25 feet from nearest rail. When not in use, keep Contractor machinery and materials at least 50 feet from the Railroad's nearest track.

D. Vehicular crossings of railroad track are allowed only at existing crossings, or haul road crossings developed with Railroad approval.

E. The Contractor is also advised that new railroad facilities within the project may be built by the Railroad. If applicable, these facilities are delineated in the plans. Be aware of the limits of responsibilities and coordinate efforts with the Railroad and TxDOT.

F. Railroad requirements do not allow work withing 50 feet of track centers when a train passes the work site and all personnel must clear the area within 50 feet of the track centerline and secure all equipment. Additional allowances may be pursued as outlined in 3.02 and 3.03.

G. All permanent clearances shall be verified before project closing.

3.02 RAILROAD OPERATIONS

A. Trains and/or equipment are expected on any track, at any time, in either direction. Become familiar with the train schedules in this location and structure bid assuming intermittent track windows in this period, as defined in Paragraph B that follows.

B. All railroad tracks within and adjacent to the Contract Site are active, and rail traffic over these facilities shall be maintained throughout the Project. Activities may include both through moves and switching moves to local customers. Railroad traffic and operations will occur continuously throughout the day and night on these tracks and shall be maintained at all times as defined herein. Coordinate and schedule the work so that construction activities do not interfere with railroad operations.

C. Coordinate work windows with TxDOT and the Railroad's Designated Representative. Types of work windows include Conditional Work Windows and Absolute Work Windows, as defined below:

1. Conditional Work Window: A Conditional Work Window is a period of time that railroad operations have priority over construction activities. When construction activities may occur on and/or adjacent to the railroad tracks within 25 feet of the nearest track, a Railroad flag person will be required. At the direction of the Railroad flag person, upon approach of a train, and when trains are present on the tracks, the tracks must be cleared (i.e., no construction equipment, materials or personnel within 25 feet, or as directed by the Railroad Designated Representative, from the tracks). Conditional Work Windows are available for the Project.

2. Absolute Work Window: An Absolute Work Window is a period of time that construction activities are given priority over railroad operations. During this time frame, the designated railroad track(s) will be inactive for train movements and may be fouled by the Contractor. At the end of an Absolute Work Window, the railroad tracks and/or signals must be completely operational for train operations and all Railroad, Public Utilities Commission (PUC) and FRA requirements, codes and regulations for operational tracks must be satisfied. In the situation where the operating tracks and/or signals have been affected, the Railroad will perform inspections of the work prior to placing that track back into service. Railroad flag persons will be required for construction activities requiring an Absolute Work Window. Absolute Work Windows will not generally be granted. Any request will require a detailed explanation for Railroad review.

3.03 RIGHT OF ENTRY, ADVANCE NOTICE AND WORK STOPPAGES

A. Do not perform any work within Railroad Right-of-Way without a valid executed Right of Entry Agreement if required on this project.

B. Give advance notice to the Railroad as required in the "Contractor's Right of Entry Agreement" before commencing work in connection with construction upon or over Railroad Right-of-Way and observe the Railroad's rules and regulations with respect thereto.

C. Perform all work upon Railroad Right-of-Way in a manner to avoid interference with or endanger the operations of the Railroad. Whenever work may affect the operations or safety of trains, submit the work method to the Railroad Designated Representative for approval. Approval does not relieve the Contractor from liability. Do not commence any work which requires flagging service or inspection service until the flagging protection required by the Railroad is available at the job site. See Section 3.15 for railroad flagging requirements.

D. Make requests in writing for both Absolute and Conditional Work Windows, at least 30 days in advance of any work. Include in the written request:
1. Exactly what the work entails.
2. The days and hours that work will be performed.
3. The exact location of work, and proximity to the tracks.
4. The type of window requested and the amount of time requested.
5. The designated contact person.

Provide a written confirmation notice to the Railroad at least 48 hours before commencing work in connection with approved work windows when work is within 25 feet of nearest rail. Perform all work in accordance with previously approved work plans.

E. Make provisions to protect operations and property of the Railroad should a condition arising from, or in connection with the work, require immediate and unusual action. If in the judgment of the Railroad Designated Representative such provisions are insufficient, the Railroad Designated Representative may require or provide such provisions as deemed necessary. In any event, such provisions shall be at the Contractor's expense and without cost to the Railroad or TxDOT. The Railroad or TxDOT shall have the right to order the Contractor to temporarily cease operations in the event of an emergency or, if in the opinion of the Railroad Designated Representative, the Contractor's operations could endanger railroad operations. In the event of such an order, immediately notify TxDOT of the order.

3.04 INSURANCE

Do not begin work upon or over Railroad Right-of-Way until furnishing the Railroad with the insurance policies, binders, certificates and endorsements required by the "Contractor's Right-of-Entry Agreement", and until the Railroad Designated Representative has advised TxDOT that such insurance is in accordance with the Agreement.

3.05 RAILROAD SAFETY ORIENTATION

A. Complete the Railroad course "Orientation for Contractor's Safety", and maintain current registration prior to working on Railroad property. This orientation is available at www.contractororientation.com. This course is required to be completed annually by Contractor and Subcontractor personnel working on site.

"UPRR, BNSF, KCS/TEXMEX will not accept on-track safety training certificates from other railroads. Refer to Railroad specific contractor right of entry for training information."

B. Know and follow the "Contractor's Right of Entry Agreement" EXHIBIT D, MINIMUM SAFETY REQUIREMENTS regarding closthing, personal protective equipment, and general safety requirements.

3.06 COOPERATION

The Railroad will cooperate with Contractor so that work may be conducted in an efficient manner, and will cooperate with Contractor in enabling use of Railroad Right-of-Way in performing the work.

3.07 MINIMUM CONSTRUCTION CLEARANCES FOR FALSEWORK AND OTHER TEMPORARY STRUCTURES

Abide by the following minimum temporary clearances during the course of construction:
A. 15' - 0" (BNSF)(UPRR)and 14'-0" (KCS) horizontal from centerline of track
B. 22' (KCS) and 21' - 6" (UPRR & BNSF) vertically above top of rail.

For construction clearance less than listed above, obtain local Railroad Operating Unit review and approval.

3.08 APPROVAL OF REDUCED CLEARANCES

A. Maintain minimum track clearances during construction as specified in Section 3.07.

B. Submit any proposed infringement on the specified minimum clearances to the Railroad Designated Representative through TxDOT at least 30 days in advance of the work. Do not proceed with such infringement without written approval by the Railroad Designated Representative.

C. Do not commence work involving an approved infringement without receiving written assurance from the Railroad Designated Representative that arrangements have been made for any necessary flagging service.

BNSF
UA 90 NEAR FM 3155
DOT NO.022686A RRMP 63.43
GALVESTON SUBDIVISION

SHEET 1 OF 2

Texas Department of Transportation | Rail Division

RAILROAD REQUIREMENTS FOR NON-BRIDGE CONSTRUCTION PROJECTS

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3.09 MAINTENANCE OF RAILROAD FACILITIES

A. Maintain all ditches and drainage structures free of silt or other obstructions resulting from Contractor's operations. Repair eroded areas and any other damage within Railroad Right-of Way and repair any other damage to the property of the Railroad, or its tenants.

B. Perform all such maintenance and repair of damages due to the Contractors's operations at Contractor's expense.

C. Submit a proposed method of erosion control for review by the Railroad prior to beginning any grading on the Project Site. Comply with all applicable local, state and federal regulations when developing and implementing such erosion control.

3.10 SITE INSPECTIONS BY RAILROAD's DESIGNATED REPRESENTATIVE

A. In addition to the office reviews of construction submittals, site inspections may be performed by the Railroad Designated Representative at significant points during construction, including the following if applicable:
   1. Pre-construction meetings.
   2. Pile driving/drilling of caissons or drilled shafts.
   3. Reinforcement and concrete placement for railroad bridge substructure and/or superstructure.
   4. Erection of precast concrete or steel bridge superstructure.
   5. Placement of waterproofing (prior to placing ballast on bridge deck).
   6. Completion of the bridge structure.

B. Site inspection is not limited to the milestone events listed above. Site visits to check progress of the work may be performed at any time throughout the construction as deemed necessary by the Railroad.

C. Provide a detailed construction schedule, including the proposed temporary horizontal and vertical clearances and construction sequence for all work to TxDOT for submittal to the Railroad Designated Representative for review prior to commencement of work. Include the anticipated dates when the above listed events will occur. Update this schedule for the above listed events as necessary and each month at a minimum to allow the Railroad to schedule site inspections.

3.11 RAILROAD REPRESENTATIVES

Railroad representatives, conductors, flag person or watch person will be provided by the Railroad at expense of TxDOT to protect Railroad facilities, property and movements of its trains or engines. In general, the Railroad will furnish such personnel or other protective services as follows:

A. When any part of any equipment is standing or being operated within 25 feet, measured horizontally, from nearest rail of any track on which trains may operate, or when any object is off the ground and any dimension thereof could extend inside the 25 foot limit, or when any erection or construction activities are in progress within such limits, regardless of elevation above or below track.

B. For any excavation below elevation of track subgrade if, in the opinion of the Railroad Designated Representative, track or other Railroad facilities may be subject to settlement or movement.

C. During any clearing, grubbing, excavation or grading in proximity to Railroad facilities, which, in the opinion of the Railroad Designated Representative, may endanger Railroad facilities or operations.

D. During any Contractor's operations when, in the opinion of the Railroad Designated Representative, Railroad facilities, including, but not limited to, tracks, buildings, signals, wire lines, or pipe lines, may be endangered.

E. Arrange with the Railroad Designated Representative to provide the adequate number of flag persons to accomplish the work.

3.12 COMMUNICATIONS AND SIGNAL LINES

If required, the Railroad will rearrange its communications and signal lines, its grade crossing warning devices, train signals and tracks, and facilities that are in use and maintained by the Railroad's forces in connection with its operation at expense of TxDOT. This work by the Railroad will be done by its own forces and it is not a part of the Work under this Contract.

3.13 TRAFFIC CONTROL

Coordinate any operations that control traffic across or around Railroad facilities with the Railroad Designated Representative.

3.14 CONSTRUCTION EXCAVATIONS AND BORING ACTIVITIES UNDER TRACK

A. Take special precaution and care in connection with excavating and shoring. Excavations for construction of footings, piers, columns, walls or other facilities that require shoring shall comply with requirements of TxDOT, OSHA, AREMA and Railroad "Guidelines for Temporary Shoring".

B. The project plans indicate whether there are fiber optic lines or other such telecommunications systems that require consideration. Regardless, contact the necessary call center to determine if such cable systems are present:

   UPRR 1-800-336-9193
   7:00 AM to 9:00 PM CST Monday-Friday except holidays,
   staffed 24 hrs/day for emergencies
   48 hrs notice required

   BNSF 1-800-832-5452
   24 hour number
   5 working days notice required

   KCS 1-800-344-8377
   Texas One Call, a 24 hour number
   48 hrs notice required, excluding weekends and holidays

   If a telecommunications system is buried anywhere on or near Railroad property, coordinate with TxDOT, the Railroad and the Telecommunication Company(ies) to arrange for relocation or protective measures prior to beginning work on or near Railroad property. Refer to the project General Notes for additional information.

C. Projects involving a boring or jack and bore operation under track such as drainage pipes or culverts and utilities require an installation plan reviewed and approved by the Railroad and TxDOT prior to proceeding with such construction. A railroad inspector and contractor-assisted monitoring of ground and track movement is required to maintain safe passage of rail traffic. Stop installation and do not allow passage of trains if movements in excess of 1/4" vertical or horizontal is detected in the tracks. Immediately repair the damage to the satisfaction of TxDOT and the Railroad before proceeding.

3.15 RAILROAD FLAGGING

Per the RIGHT OF ENTRY agreement for flagging, notify the Railroad Representative at least 10 working days in advance of Contractor work and at least 30 working days in advance of any Contractor work in which any person or equipment will be within 25 feet of nearest rail.

3.16 CLEANING OF RIGHT-OF-WAY

When work is complete, remove all tools, implements, and other materials brought into Railroad Right-of-Way and leave the Right-of-Way in a clean and presentable condition to the satisfaction of TxDOT and the Railroad.

BNSF
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