INDEX OF SHEETS
SEE SHEET 2

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	STP2B24(357)HES		1
STATE	STATE DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY
1986	01	072	FM 1314
LETTING DATE:			12/03/2024

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

PROJECT NO. STP2B24(357)HES

CSJ: 1986-01-072

MONTGOMERY
FM 1314

LIMITS FROM: OLD HOUSTON ROAD
TO: LOOP 494

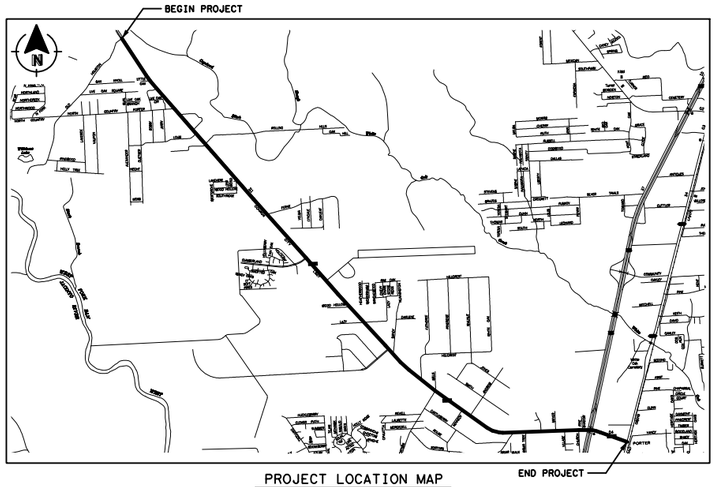
NET LENGTH OF PROJECT = 36,649.12 FT = 7.51 MI

INSTALLATION OF FIBER OPTIC CABLE FOR TRAFFIC SIGNAL INTERCONNECT

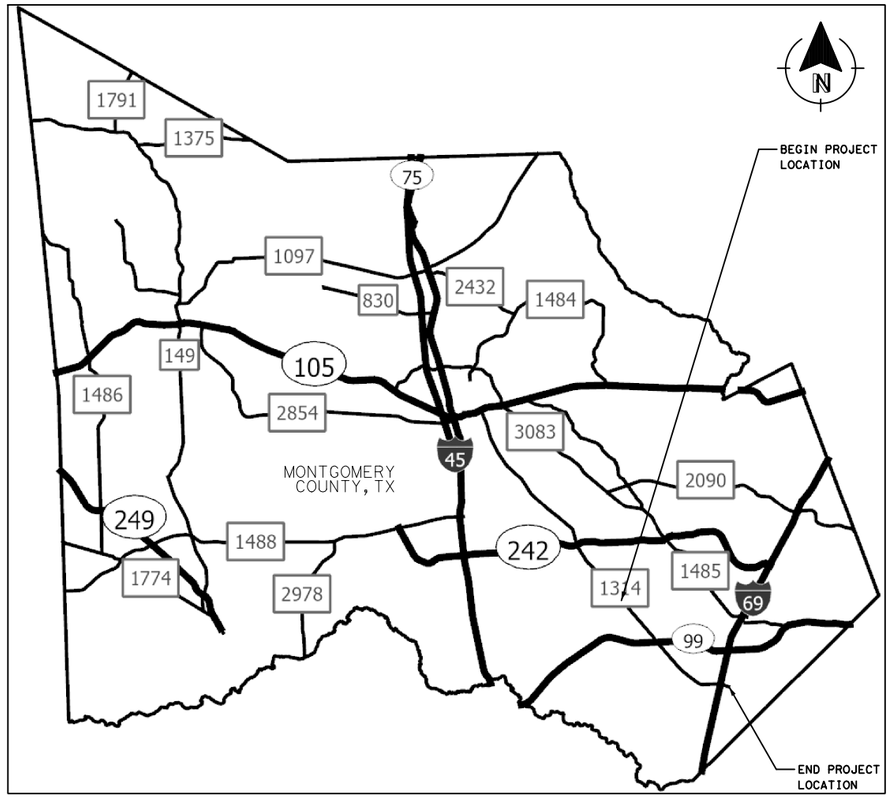
POSTED SPEED = 55 MPH (OLD HOUSTON RD - RIVERWALK DR)
= 50 MPH (RIVERWALK DR - VALLEY RANCH PKWY)
= 40 MPH (VALLEY RANCH PKWY - SL 494)

AADT 2024 = 36,322 (170H121)
= 25,692 (170H120)

FUNCTIONAL CLASSIFICATION = MINOR ARTERIAL



PROJECT LOCATION MAP
N.T.S



VICINITY MAP
N.T.S

STATE OF TEXAS
ROMA G. STEVENS
100354
LICENSED
PROFESSIONAL ENGINEER

Roma Stevens
ROMA G. STEVENS, P.E.

9/24/2024
DATE

COUNTY: MONTGOMERY
HWY. NO. FM 1314
LETTING DATE: 12/03/2024
DATE ACCEPTED: _____

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, SEPTEMBER 1, 2024, AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS. (FORM FHWA 1273, OCTOBER 23, 2023)

FOR BARRICADES AND SIGNING ALONG THE ROADWAY AND AT INDIVIDUAL INTERSECTIONS UNDER SIGNAL CONSTRUCTION REFER TO STANDARD SHEETS TCP(2-1), TCP(2-4), WZ(BTS-1)-13, AND WZ(BTS-2)-13.

EXCEPTIONS: NONE
EQUATIONS: NONE
R.R. CROSSINGS: NONE

SUBMITTED FOR LETTING 10/10/2024
P.E.
For DISTRICT TRAFFIC ENGINEER

APPROVED FOR LETTING 10/14/2024
DocuSigned by:
Brett McLeod , P.E.
For DISTRICT ENGINEER
9C2D7C24E543D...

INDEX OF SHEETS

*STANDARD SHEETS ARE APPROVED FOR USE BY THE PROJECT ENGINEER

STATE OF TEXAS
ROMA G. STEVENS
100354
LICENSED PROFESSIONAL ENGINEER

Roma Stevens
ROMA G. STEVENS , P.E.

10/9/2024
DATE

PRINT DATE	REVISION DATE
10/9/2024	10/9/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314
FROM OLD HOUSTON RD TO LOOP 494

INDEX OF SHEETS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		2
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

10/9/2024 7:36:40 AM

...\Index of Sheets.dgn

GENERAL NOTES:

General:

Area Engineer contact information for this project follows:

Montgomery County

Dock Gee, P.E. *Dock.Gee@txdot.gov*
Eugene Ampomah, P.E. *Eugene.Ampomah@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 geotechnical reports, as-built plans, and cross-sections will continue to be provided on the following FTP site:

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

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

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

Grade street intersections and median openings for surface drainage.

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

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

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.

General: Computerized Transportation Management Systems (CTMS)

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.

General: Site Management

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

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

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

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

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

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

General: Traffic Control and Construction

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

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

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

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

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

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

General: Utilities

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

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

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, https://ftp.txdot.gov/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

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

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

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

Table 2

Construction Specification Required Shop/Working Drawing Submittals - Consultant 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)
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425	Prestr Concr Beams	Y	Y	N	D	SD
425	Prestr Concr Bent	Y	Y	N	D	SD
426	Post Tension Details	Y	Y	N	D	SD

434	Elastomeric Bearing Pads (All)	Y	Y	N	D	SD
441	Bridge Protective Assembly	Y	Y	N	D	SD
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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

D – Consultant: Submit to Engineer of Record at *email@host.xxx*	
TMS – Traffic Management System	
Computerized Traffic Management Systems (CTMS)	HOU-CTMSShpDrwgs@txdot.gov

Item 6: Control of Materials

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.

No significant traffic generator events identified.

Item 8: Prosecution and Progress

Working days will be computed and charged based on a workweek in accordance with section 8.3.1.4.

No significant traffic generator events have been identified.

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.

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:

DAY	DAYTIME WORK HOURS	NIGHTTIME WORK HOURS	RESTRICTED HOURS SUBJECT TO LANE CLOSURE FEES
MONDAY	9:00 AM – 3:00 PM	N/A	5:00 AM – 9:00 AM 3:00 PM – 7:00 PM
TUESDAY	9:00 AM – 3:00 PM	N/A	5:00 AM – 9:00 AM 3:00 PM – 7:00 PM
WEDNESDAY	9:00 AM – 3:00 PM	N/A	5:00 AM – 9:00 AM 3:00 PM – 7:00 PM
THURSDAY	9:00 AM – 3:00 PM	N/A	5:00 AM – 9:00 AM 3:00 PM – 7:00 PM
FRIDAY	9:00 AM – 3:00 PM	N/A	5:00 AM – 9:00 AM 3:00 PM – 7:00 PM

DAY	DAYTIME WORK HOURS	NIGHTTIME WORK HOURS	RESTRICTED HOURS SUBJECT TO LANE CLOSURE FEES
SATURDAY	9:00 AM – 3:00 PM	N/A	5:00 AM – 9:00 AM 3:00 PM – 7:00 PM
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.

No street closures should be necessary for this work. During the construction, if street closure becomes necessary, it should be done on non-working days. The closure period for each intersection occurs only during the phase when constructing that street, unless otherwise directed. Reopen the street within the number of working days allowed; otherwise, the engineer may cease construction activities not affiliated with reopening the closed street, until it fully reopens to the traveling public. Time charges will not be suspended nor increased to compensate for this occurrence.

During construction, remove, cover, adjust, or replace overhead sign panels to correspond with each current traffic control phase. The desirable size of letters for freeways is 10 in., the minimum is 8 in. This work is subsidiary to Item 502.

Relocate a logo sign to avoid interference with construction phases as necessary. Assure that relocated signs meet clearance requirements. If clearance requirements cannot be met using the existing sign, contact the logo sign contractor to manufacture and deliver to the jobsite a smaller logo sign within 3 weeks. If there is absolutely no room to display the relocated logo sign,
2 weeks before relocating, contact the logo sign contractor to remove the sign and place it in storage. The telephone number for LoneStar Logos is (512) 462-1310 and the e-mail address for the regional manager, Tyler Starr, is tstarr@lonestarlogos.com.

When relocating a logo sign, provide wooden skid mounted sign supports for the sign that are crashworthy and in accordance with the latest edition of the "Texas Manual on Uniform Traffic Control Devices." Specific information on crash worthy skid mounted signs can be found at:
http://d2dtl5nnlpfr0r.cloudfront.net/tti.tamu.edu/documents/0-6782-2.pdf

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

Item 506: Temporary Erosion, Sedimentation and Environmental Controls

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

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

A Storm Water Pollution Prevention Plan (SWP3) is 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 and protect environmental resources.

Immediately address chemical and hydrocarbon spills caused by the Contractor. Keep a spill kit onsite.

Item 618: Conduit

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

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

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

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

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

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.

Use materials from pre-qualified producers as shown on the Department's Construction Division (CST) material producers list. Check the latest links on the Department's website for the list. The category is "Roadway Illumination and Electrical Supplies." The polymer concrete barrier box is subsidiary to Item 618, "Conduit."

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) 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 623: Intelligent Transportation Systems 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 656: Foundations for Traffic Control Devices

Excavating and disposing of surplus materials for lighting standard foundations are subsidiary to the roadway illumination assembly foundation. Dispose of surplus excavated material. Use rigid metal conduit (RMC) for stub-outs in foundation and concrete structures. These stub-outs are subsidiary to the drilled shaft foundations.

Item 6027: Fiber Optic Cable/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.

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 72 hours prior to any drilling, boring, trenching or excavating.

The contractor shall be fully responsible for any damages 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.

Data communication switch (ethernet) to be supplied by TxDOT.

Use Type 1 ground box, installed near controller, exclusively for fiber optic cable with conduit only.

Do not install other electrical cable or conduit in the Type 1 ground box. Ground metal ground box cover. Bond the ground box cover and ground conductors to the ground rod located in the ground box and the system ground.

All existing controllers should be compatible with ITS system.

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.

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 source. Ensure the tag is laminated and has minimum dimensions of 4 inches by 6 inches.

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

For Type 1 ground box construct the concrete apron in accordance with details shown on the "ground box details ITS (37)-16" standard.

Fully test the proposed fiber optic cable in accordance with the testing requirements of the specifications.

Fiber optic cables coiled in ground boxes with waterproof splice enclosures shall not exceed fifteen feet per cable unless otherwise shown in the plans or as directed by engineer in the field.

If using casing to place bored conduit, consider the casing incidental to the conduit.

If working near power lines, comply with the appropriate sections of Texas state law and federal regulations relating to the type of work involved.

Provide a single 1#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 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".

Furnish all equipment, material and labor necessary for identification and protection of the utilized fiber.

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.

Repair or replace pavement and sidewalks damaged by the contractor's forces during construction at no cost to the department.

Each fiber optic cable run in underground conduits shall have an extra length of fifteen feet coiled and left in each ground box unless otherwise shown in the plans or as directed by the engineer in the field.

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 project.

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.

Construct concrete apron, if necessary, in accordance with the latest standard sheet ED(4)-14. For ty1 ground box construct apron in accordance with details shown on the "ground box details ITS(37)-16" standard.

Install a fiber optic patch panel on the fiber drop cable in each controller cabinet. The fiber optic patch panel (12 position) shall be considered incidental to the pertinent bid items in this project.

Furnish and install all fiber optic cables and accessories for a complete and operational system.

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

Unless otherwise noted on the plans, place conduit runs behind curbs at all locations where curb exists.

Refer to TxDOT’s website for prequalified products list regarding conduits, conductors, ground boxes and electrical service. Check website periodically for current updates.

Use rigid metal conduit (RMC) for exposed conduit.

Junction boxes used to attach to bridge structures shall be incidental to Item 618,"CONDT(RM)".

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

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.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 1986-01-072 **DISTRICT** Houston **COUNTY** Montgomery
HIGHWAY FM 1314

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**1986-01-072**			
		PROJECT ID		**A00193458**			
		COUNTY		**Montgomery**			
		HIGHWAY		**FM 1314**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	500-7001	MOBILIZATION	LS	1.000		1.000	
	502-7001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	18.000		18.000	
	618-7060	CONDT (PVC) (SCH 80) (3")	LF	28,775.000		28,775.000	
	618-7061	CONDT (PVC) (SCH 80) (3") (BORE)	LF	12,555.000		12,555.000	
	618-7082	CONDT (RM) (3")	LF	455.000		455.000	
	620-7002	ELEC CONDR (NO.14) INSULATED	LF	41,355.000		41,355.000	
	623-7002	ITS GND BOX(PCAST) TY 1 (243636)W/APRN	EA	79.000		79.000	
	6027-7001	FIBER OPTIC CBL (SINGLE-MODE)(12 FIBER)	LF	615.000		615.000	
	6027-7002	FIBER OPTIC CBL (SINGLE-MODE)(36 FIBER)	LF	43,240.000		43,240.000	
	6027-7003	FO SPLICE ENCLOSURE (TYPE 2)	EA	12.000		12.000	
	6027-7004	FIBER OPTIC FUSION SPLICE	EA	144.000		144.000	
	6027-7005	FIBER OPTIC PATCH PANEL (12 POSITION)	EA	12.000		12.000	
	18	EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	
		LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	

SUMMARY OF QUANTITIES

ITEM	DESC CODE	DESCRIPTION	UNIT	QUANTITY
500	7001	MOBILIZATION	LS	1
502	7001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	18
618	7060	CONDT (PVC) (SCHD 80) (3")	LF	28,775
618	7061	CONDT (PVC) (SCHD 80) (3") (BORE)	LF	12,555
618	7082	CONDT (RM) (SCHD 80) (3")	LF	455
620	7002	ELEC CONDR (NO.14) INSULATED	LF	41,355
623	7002	ITS GND BOX (PCAST) TY1 (243636) W/ APRON	EA	79
6027	7001	FIBER OPTIC CBL (SINGLE MODE) (12 FIBER)	LF	615
6027	7002	FIBER OPTIC CBL (SINGLE MODE) (36 FIBER)	LF	43,240
6027	7003	FO SPLICE ENCLOSURE (TY 2)	EA	12
6027	7004	FIBER OPTIC FUSION SPLICE	EA	144
6027	7005	FIBER OPTIC PATCH PANEL (12 POSITION)	EA	12

PRINT DATE	REVISION DATE
9/26/2024	9/26/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

SUMMARY OF QUANTITIES

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		5
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

NOTES

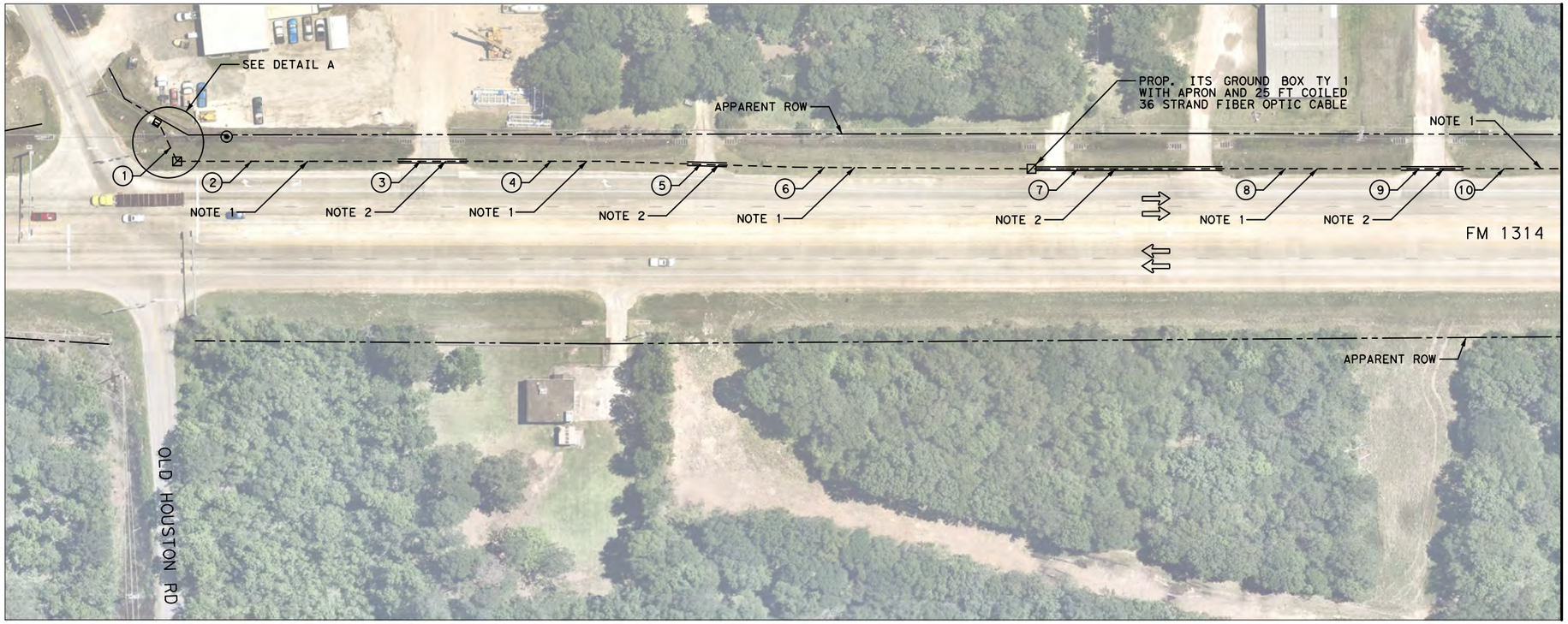
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
3. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-12 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

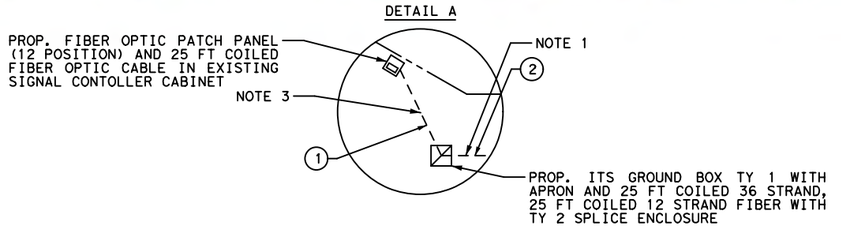
- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE

RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				FO SPLICE ENCLOSURE (TY2)	FIBER OPTIC PATCH PANEL (12 POSITION)	ITS GND BOX (PCAST) TY1 (243636) W/APRON
	3"(SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)	(6027)	(623)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)	(7005)	(7002)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY	QUANTITY	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH	EACH	EACH
1	1	35			1	35	1	35					
2	1	170			1	170			1	170			
3			1	60	1	60			1	60			
4	1	165			1	165			1	165			
5			1	40	1	40			1	40			
6	1	230			1	230			1	230			
7			1	155	1	155			1	155			
8	1	135			1	135			1	135			
9			1	55	1	55			1	55			
10	1	75			1	75			1	75			
COILED SLACK								25		50			
TOTAL		810		310		1120		60		1135	1	1	2

DETAIL A



ADDITIONAL NOTES

1. LOCATIONS OF UNDERGROUND INSTALLATIONS AND RIGHT OF WAY ARE APPROXIMATE. IT IS CONTRACTOR RESPONSIBILITY TO VERIFY ALL UNDERGROUND INSTALLATIONS AND RIGHT OF WAY LOCATIONS PRIOR TO ANY CONSTRUCTION.

2. THE CONTRACTOR MUST CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATIONS OF UNDERGROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING OR EXCAVATION.

3. THE CONTRACTOR MUST BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR FAILURE TO LOCATE AND PRESERVE THERE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND OR OVERHEAD.

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

STATE OF TEXAS
ROMA G. STEVENS
100354
LICENSED PROFESSIONAL ENGINEER

Roma Stevens
ROMA G. STEVENS , P.E.

9/25/2024
DATE

SCALE: 1" = 100'
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PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

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8131 JACKRABBIT ROAD
Houston, TX. 77095
PHONE: (713) 828-4742

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		6
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

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NOTES

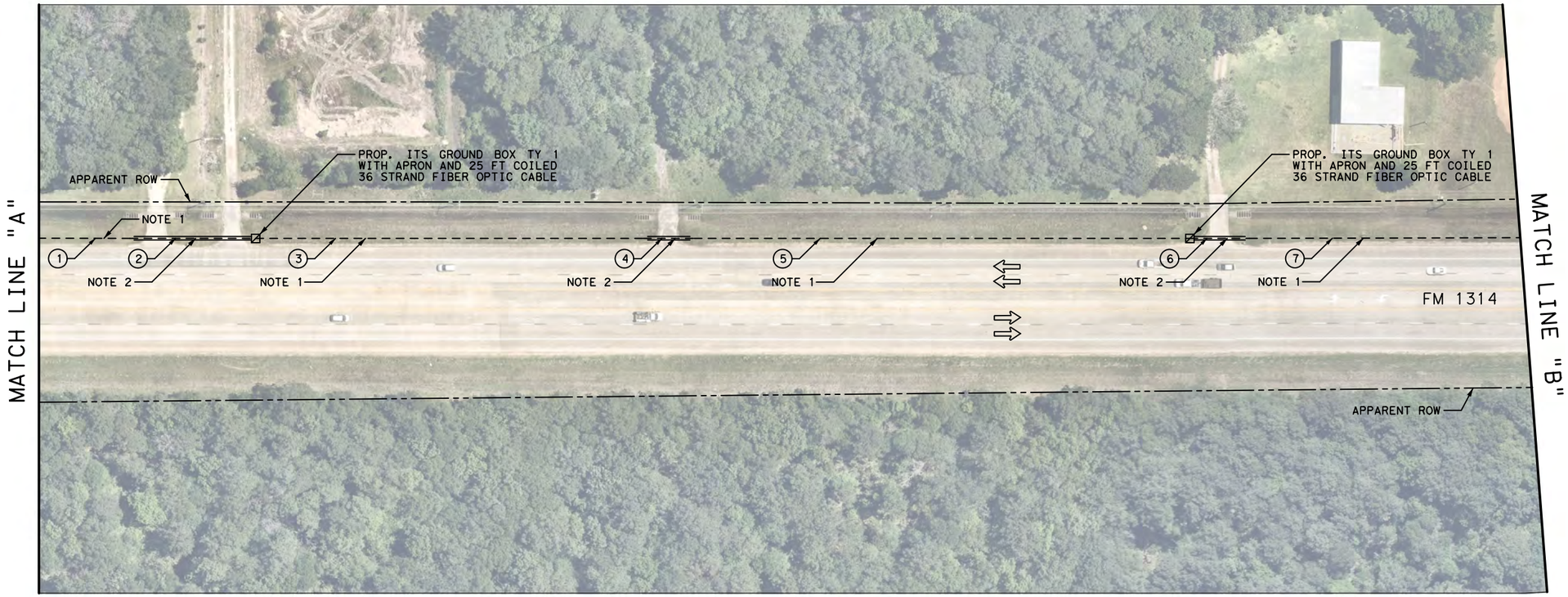
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE											ITS GND BOX (PCAST) TY1 (243636) W/APRON
RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1	1	75			1	75			1	75	
2			1	105	1	105			1	105	
3	1	315			1	315			1	315	
4			1	45	1	45			1	45	
5	1	405			1	405			1	405	
6			1	50	1	50			1	50	
7	1	220			1	220			1	220	
COILED SLACK										50	
TOTAL		1015		200		1215				1265	2

ADDITIONAL NOTES

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2. THE CONTRACTOR MUST CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATIONS OF UNDERGROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING OR EXCAVATION.

3. THE CONTRACTOR MUST BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR FAILURE TO LOCATE AND PRESERVE THERE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND OR OVERHEAD.

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

STATE OF TEXAS
ROMA G. STEVENS
100354
PROFESSIONAL LICENSED ENGINEER

Roma Stevens — 9/25/2024
ROMA G. STEVENS , P.E. — DATE

SCALE: 1" = 100'
50 0 50

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FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		7
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

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NOTES

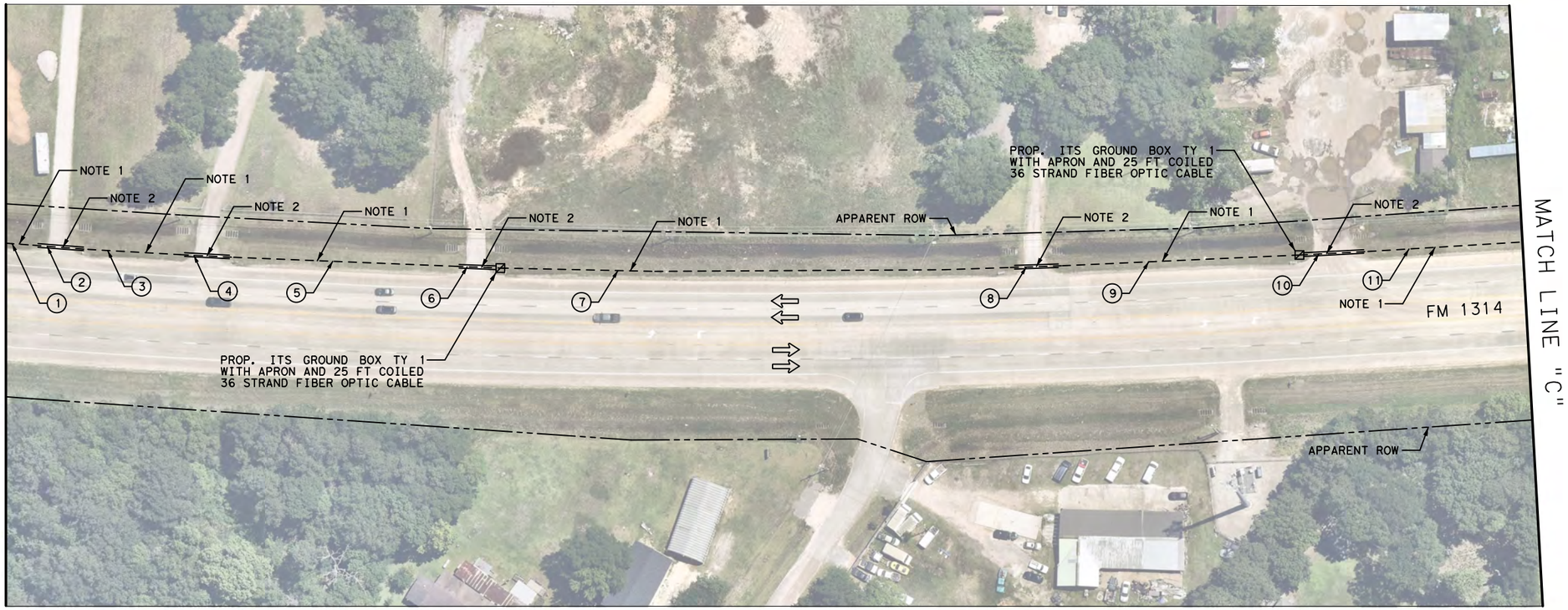
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE											ITS GND BOX (PCAST) TY1 (243636) W/APRON
RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1	1	25			1	25			1	25	
2			1	45	1	45			1	45	
3	1	75			1	75			1	75	
4			1	45	1	45			1	45	
5	1	175			1	175			1	175	
6			1	40	1	40			1	40	
7	1	405			1	405			1	405	
8			1	45	1	45			1	45	
9	1	190			1	190			1	190	
10			1	55	1	55			1	55	
11	1	125			1	125			1	125	
COILED SLACK										50	
TOTAL		995		230		1225				1275	2

ADDITIONAL NOTES

1. LOCATIONS OF UNDERGROUND INSTALLATIONS AND RIGHT OF WAY ARE APPROXIMATE. IT IS CONTRACTOR RESPONSIBILITY TO VERIFY ALL UNDERGROUND INSTALLATIONS AND RIGHT OF WAY LOCATIONS PRIOR TO ANY CONSTRUCTION.

2. THE CONTRACTOR MUST CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATIONS OF UNDERGROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING OR EXCAVATION.

3. THE CONTRACTOR MUST BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR FAILURE TO LOCATE AND PRESERVE THERE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND OR OVERHEAD.

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

STATE OF TEXAS
ROMA G. STEVENS
100354
PROFESSIONAL ENGINEER

Roma Stevens — 9/25/2024
ROMA G. STEVENS, P.E. — DATE

SCALE: 1" = 100'
50 0 50

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		8
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9/25/2024 9:27:19 AM
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NOTES

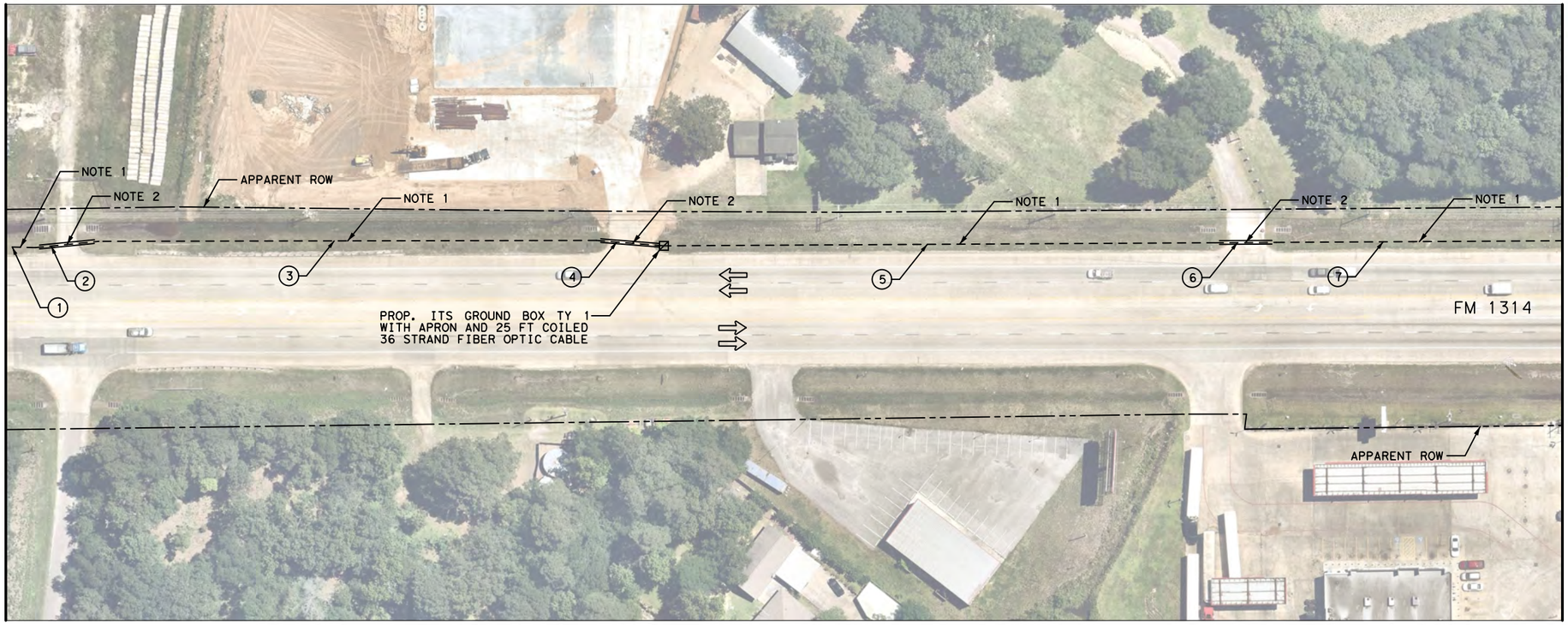
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE											ITS GND BOX (PCAST) TY1 (243636) W/APRON
RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1	1	25			1	25			1	25	
2			1	50	1	50			1	50	
3	1	385			1	385			1	385	
4			1	55	1	55			1	55	
5	1	425			1	425			1	425	
6			1	50	1	50			1	50	
7	1	225			1	225			1	225	
COILED SLACK										25	
TOTAL		1060		155		1215				1240	1

ADDITIONAL NOTES

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2. THE CONTRACTOR MUST CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATIONS OF UNDERGROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING OR EXCAVATION.

3. THE CONTRACTOR MUST BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR FAILURE TO LOCATE AND PRESERVE THERE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND OR OVERHEAD.

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

STATE OF TEXAS
ROMA G. STEVENS
100354
PROFESSIONAL LICENSED ENGINEER

Roma Stevens
ROMA G. STEVENS , P.E.

9/25/2024
DATE

SCALE: 1" = 100'
50 0 50

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD
Houston, TX. 77095
PHONE: (713) 828-4742

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		9
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9/25/2024 9:27:26 AM
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NOTES

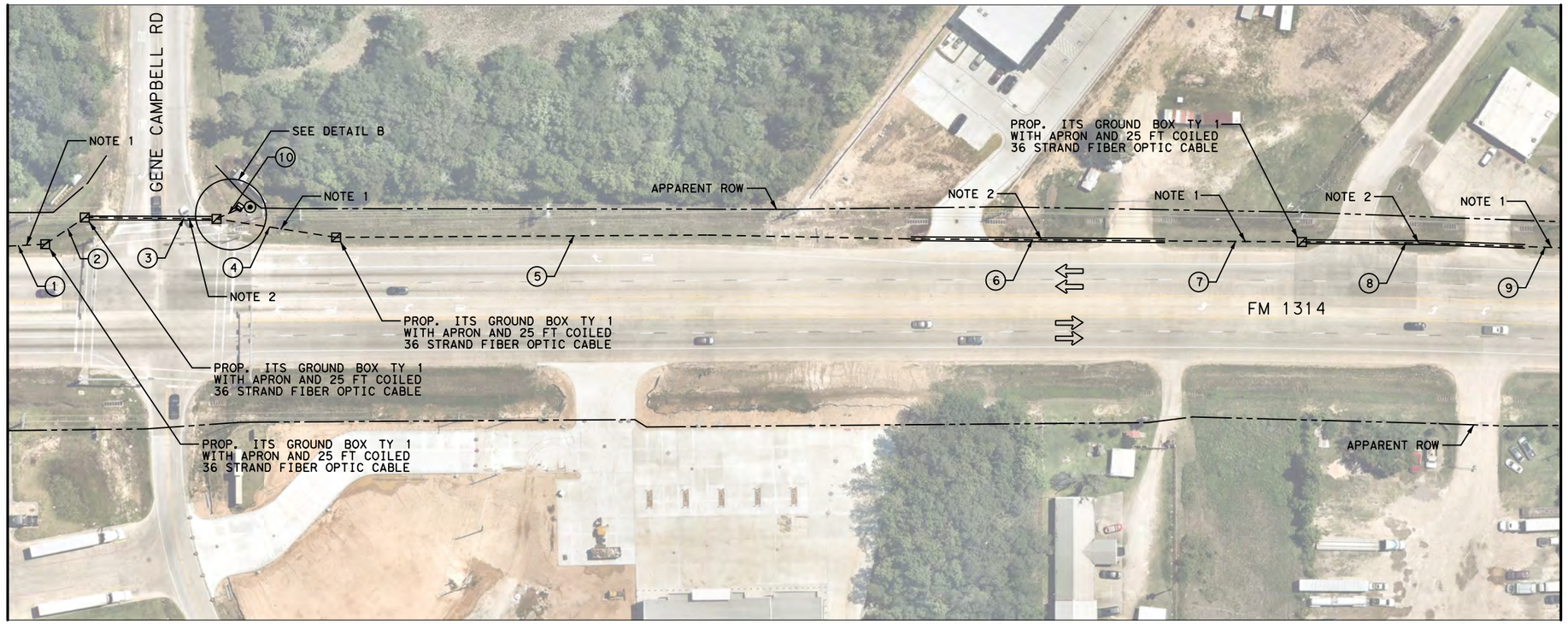
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
3. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-12 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

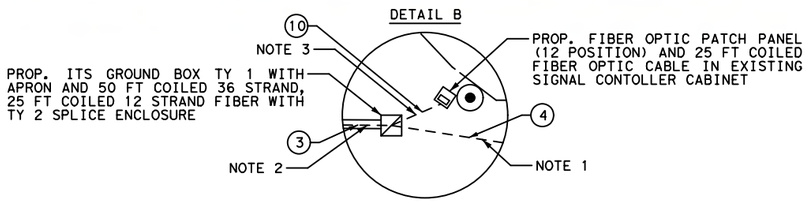
* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE											FO SPLICE ENCLOSURE (TY2)	FIBER OPTIC PATCH PANEL (12 POSITION)	ITS GND BOX (PCAST) TY1 (243636) W/APRON
RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)						
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)	(6027)	(623)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)	(7005)	(7002)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY	QUANTITY	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH	EACH	EACH
1	1	30			1	30			1	30			
2	1	40			1	40			1	40			
3			1	105	1	105			1	105			
4	1	95			1	95			1	95			
5	1	445			1	445			1	445			
6			1	205	1	205			1	205			
7	1	105			1	105			1	105			
8			1	180	1	180			1	180			
9	1	25			1	25			1	25			
10	1	20			1	20	1	20					
COILED SLACK								25		125			
TOTAL		760		490		1250		45		1355	1	1	5



ADDITIONAL NOTES

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3. THE CONTRACTOR MUST BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR FAILURE TO LOCATE AND PRESERVE THERE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND OR OVERHEAD.

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

STATE OF TEXAS
ROMA G. STEVENS
100354
PROFESSIONAL LICENSED ENGINEER

Roma Stevens — 9/25/2024
ROMA G. STEVENS, P.E. — DATE

SCALE: 1" = 100'
50 0 50

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		10
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

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NOTES

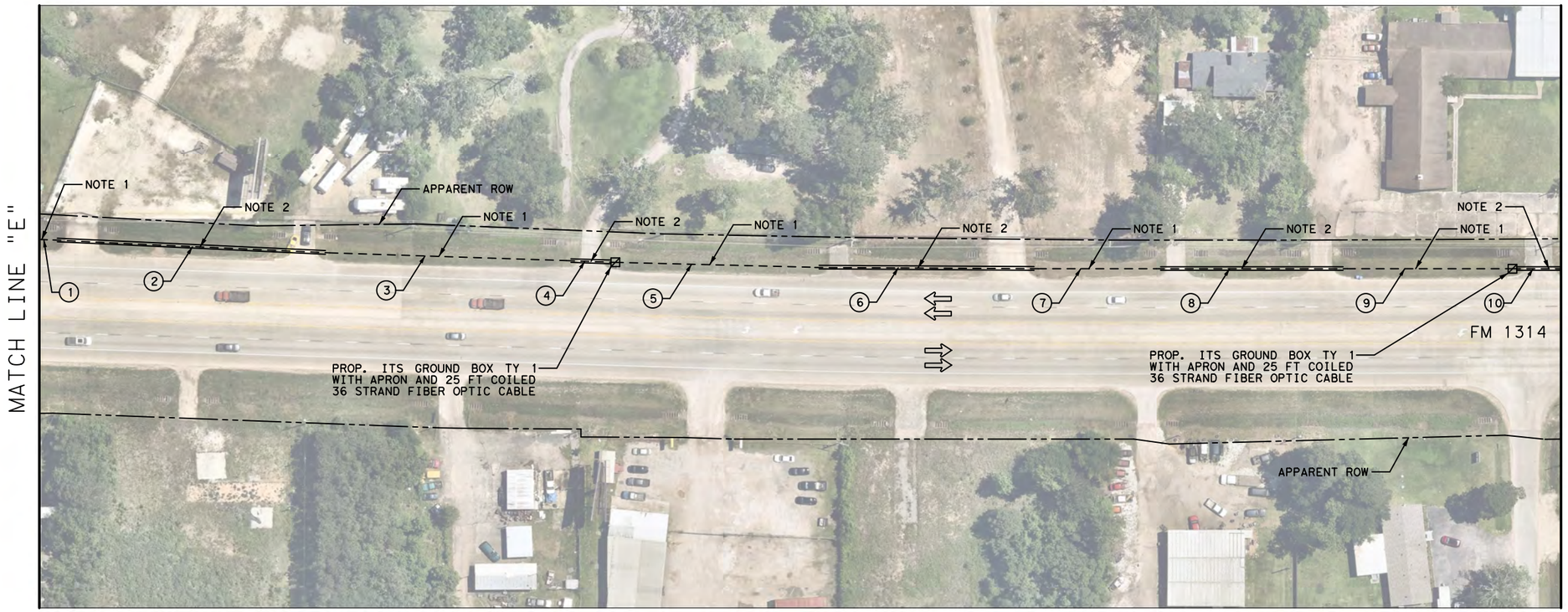
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE											ITS GND BOX (PCAST) TY1 (243636) W/APRON
RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1	1	15			1	15			1	15	
2			1	220	1	220			1	220	
3	1	190			1	190			1	190	
4			1	40	1	40			1	40	
5	1	160			1	160			1	160	
6			1	180	1	180			1	180	
7	1	95			1	95			1	95	
8			1	155	1	155			1	155	
9	1	135			1	135			1	135	
10			1	40	1	40			1	40	
COILED SLACK										50	
TOTAL		595		635		1230				1280	2

ADDITIONAL NOTES

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

STATE OF TEXAS
ROMA G. STEVENS
100354
PROFESSIONAL ENGINEER

Roma Stevens — 9/25/2024
ROMA G. STEVENS, P.E. — DATE

SCALE: 1" = 100'
50 0 50

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		11
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

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NOTES

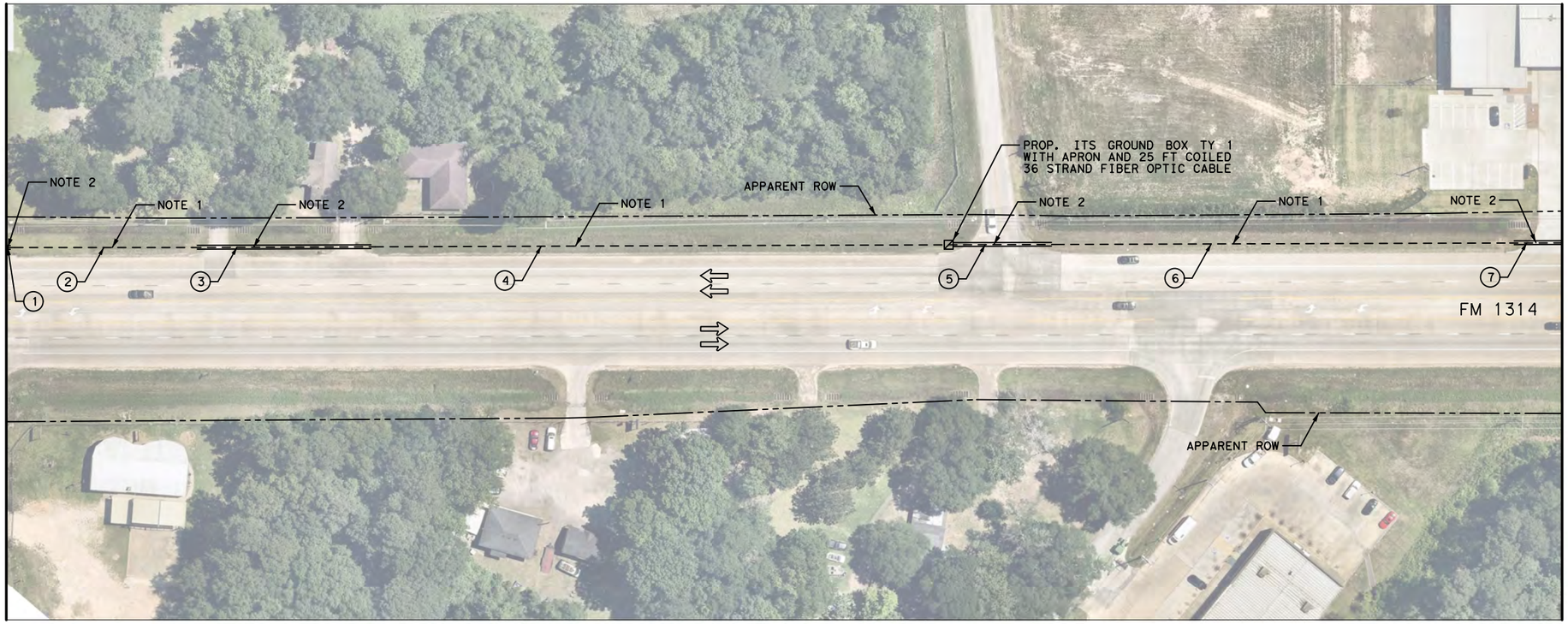
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE											ITS GND BOX (PCAST) TY1 (243636) W/APRON
RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1			1	10	1	10			1	10	
2	1	140			1	140			1	140	
3			1	145	1	145			1	145	
4	1	445			1	445			1	445	
5			1	85	1	85			1	85	
6	1	350			1	350			1	350	
7			1	40	1	40			1	40	
COILED SLACK										25	
TOTAL		935		280		1215				1240	1

ADDITIONAL NOTES

1. LOCATIONS OF UNDERGROUND INSTALLATIONS AND RIGHT OF WAY ARE APPROXIMATE. IT IS CONTRACTOR RESPONSIBILITY TO VERIFY ALL UNDERGROUND INSTALLATIONS AND RIGHT OF WAY LOCATIONS PRIOR TO ANY CONSTRUCTION.

2. THE CONTRACTOR MUST CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATIONS OF UNDERGROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING OR EXCAVATION.

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

STATE OF TEXAS
ROMA G. STEVENS
100354
LICENSED PROFESSIONAL ENGINEER

Roma Stevens — 9/25/2024
ROMA G. STEVENS , P.E. — DATE

SCALE: 1" = 100'
50 0 50

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		12
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

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NOTES

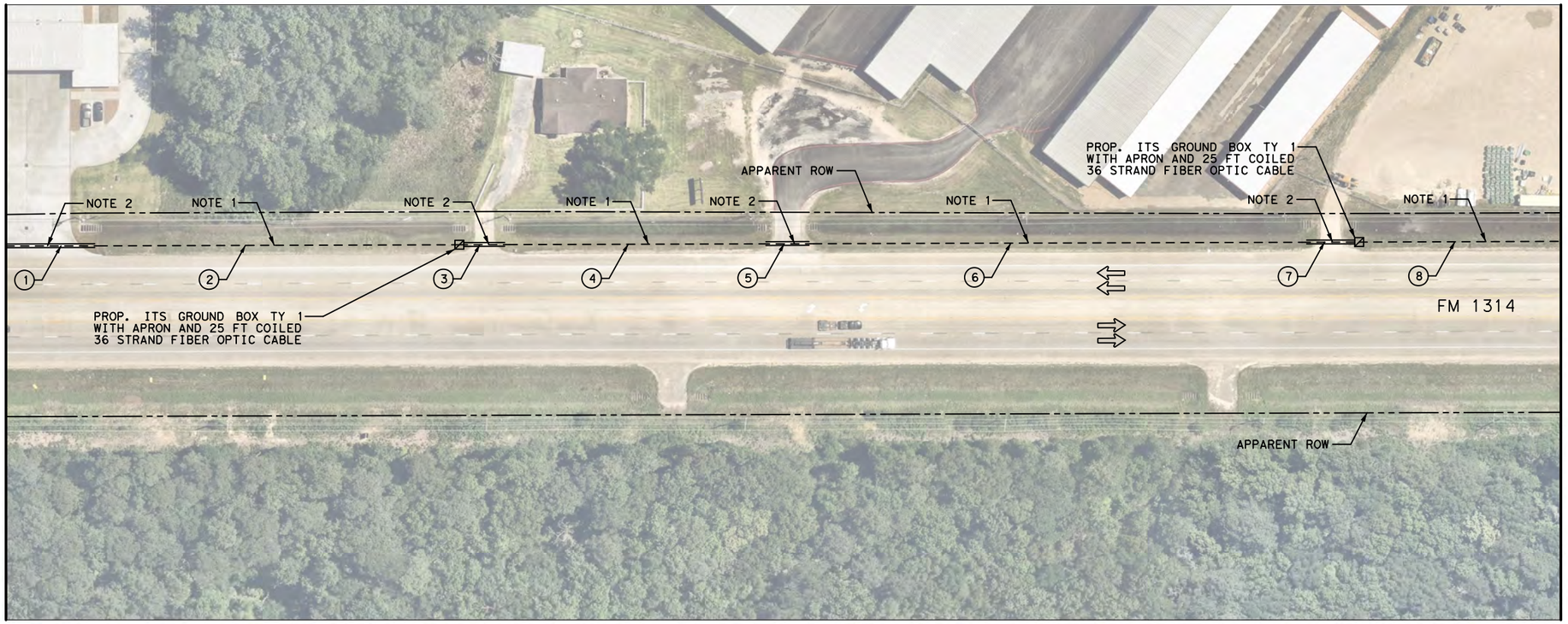
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE											ITS GND BOX (PCAST) TY1 (243636) W/APRON
RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1			1	70	1	70			1	70	
2	1	285			1	285			1	285	
3			1	35	1	35			1	35	
4	1	205			1	205			1	205	
5			1	35	1	35			1	35	
6	1	385			1	385			1	385	
7			1	40	1	40			1	40	
8	1	155			1	155			1	155	
COILED SLACK										50	
TOTAL		1130		180		1310				1360	2

ADDITIONAL NOTES

1. LOCATIONS OF UNDERGROUND INSTALLATIONS AND RIGHT OF WAY ARE APPROXIMATE. IT IS CONTRACTOR RESPONSIBILITY TO VERIFY ALL UNDERGROUND INSTALLATIONS AND RIGHT OF WAY LOCATIONS PRIOR TO ANY CONSTRUCTION.

2. THE CONTRACTOR MUST CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATIONS OF UNDERGROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING OR EXCAVATION.

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

STATE OF TEXAS
ROMA G. STEVENS
100354
PROFESSIONAL LICENSED ENGINEER

Roma Stevens — 9/25/2024
ROMA G. STEVENS , P.E. — DATE

SCALE: 1" = 100'
50 0 50

PRINT DATE	REVISION DATE
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8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		13
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9/25/2024 9:27:54 AM
...\CTMS*LAYOUT*FM1314-8.dgn

NOTES

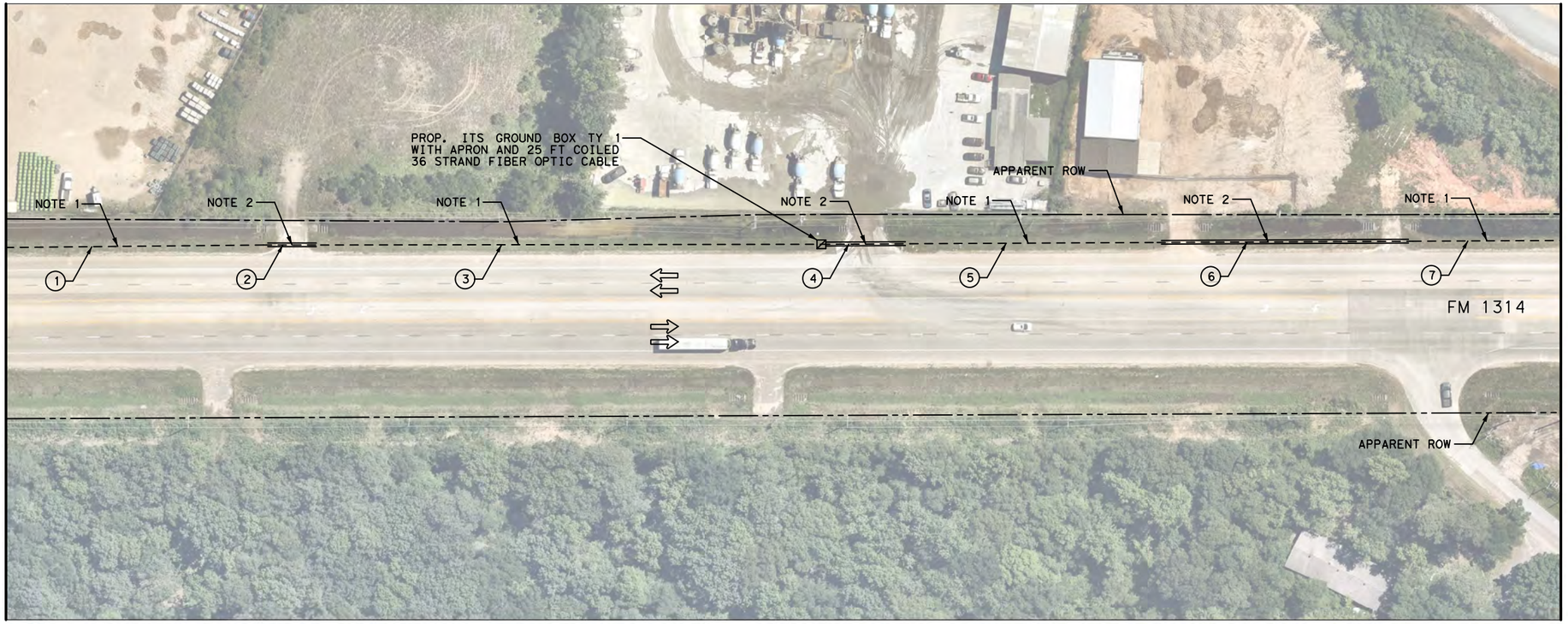
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED) IN STEEL CASING
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE

RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				ITS GND BOX (PCAST) TY1 (243636) W/APRON
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1	1	15			1	15			1	15	
2			1	220	1	220			1	220	
3	1	190			1	190			1	190	
4			1	40	1	40			1	40	
5	1	160			1	160			1	160	
6			1	180	1	180			1	180	
7	1	95			1	95			1	95	
8			1	155	1	155			1	155	
9	1	135			1	135			1	135	
10			1	40	1	40			1	40	
COILED SLACK										50	
TOTAL		595		635		1230				1280	2

ADDITIONAL NOTES

1. LOCATIONS OF UNDERGROUND INSTALLATIONS AND RIGHT OF WAY ARE APPROXIMATE. IT IS CONTRACTOR RESPONSIBILITY TO VERIFY ALL UNDERGROUND INSTALLATIONS AND RIGHT OF WAY LOCATIONS PRIOR TO ANY CONSTRUCTION.

2. THE CONTRACTOR MUST CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATIONS OF UNDERGROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING OR EXCAVATION.

3. THE CONTRACTOR MUST BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR FAILURE TO LOCATE AND PRESERVE THERE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND OR OVERHEAD.

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

STATE OF TEXAS
ROMA G. STEVENS
100354
PROFESSIONAL LICENSED ENGINEER

Roma Stevens — 9/25/2024
ROMA G. STEVENS, P.E. — DATE

SCALE: 1" = 100'
50 0 50

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD
Houston, TX. 77095
PHONE: (713) 828-4742

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		14
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

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NOTES

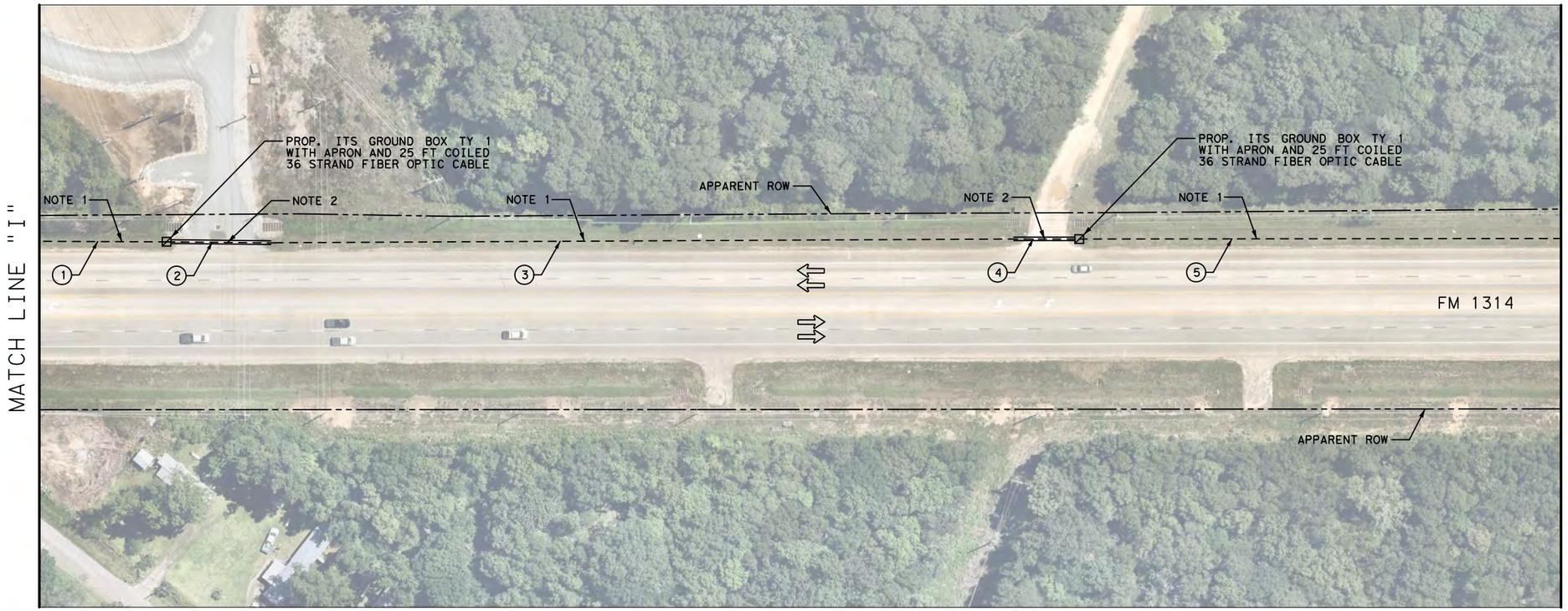
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE

RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				ITS GND BOX (PCAST) TY1 (243636) W/APRON
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1	1	105			1	105			1	105	
2			1	90	1	90			1	90	
3	1	580			1	580			1	580	
4			1	55	1	55			1	55	
5	1	385			1	385			1	385	
COILED SLACK										50	
TOTAL		1070		145		1215				1265	2

ADDITIONAL NOTES

1. LOCATIONS OF UNDERGROUND INSTALLATIONS AND RIGHT OF WAY ARE APPROXIMATE. IT IS CONTRACTOR RESPONSIBILITY TO VERIFY ALL UNDERGROUND INSTALLATIONS AND RIGHT OF WAY LOCATIONS PRIOR TO ANY CONSTRUCTION.

2. THE CONTRACTOR MUST CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATIONS OF UNDERGROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING OR EXCAVATION.

3. THE CONTRACTOR MUST BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR FAILURE TO LOCATE AND PRESERVE THERE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND OR OVERHEAD.

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

STATE OF TEXAS
ROMA G. STEVENS
100354
PROFESSIONAL ENGINEER

Roma Stevens — 9/25/2024
ROMA G. STEVENS , P.E. — DATE

SCALE: 1" = 100'
50 0 50

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		15
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9/25/2024 9:28:07 AM
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NOTES

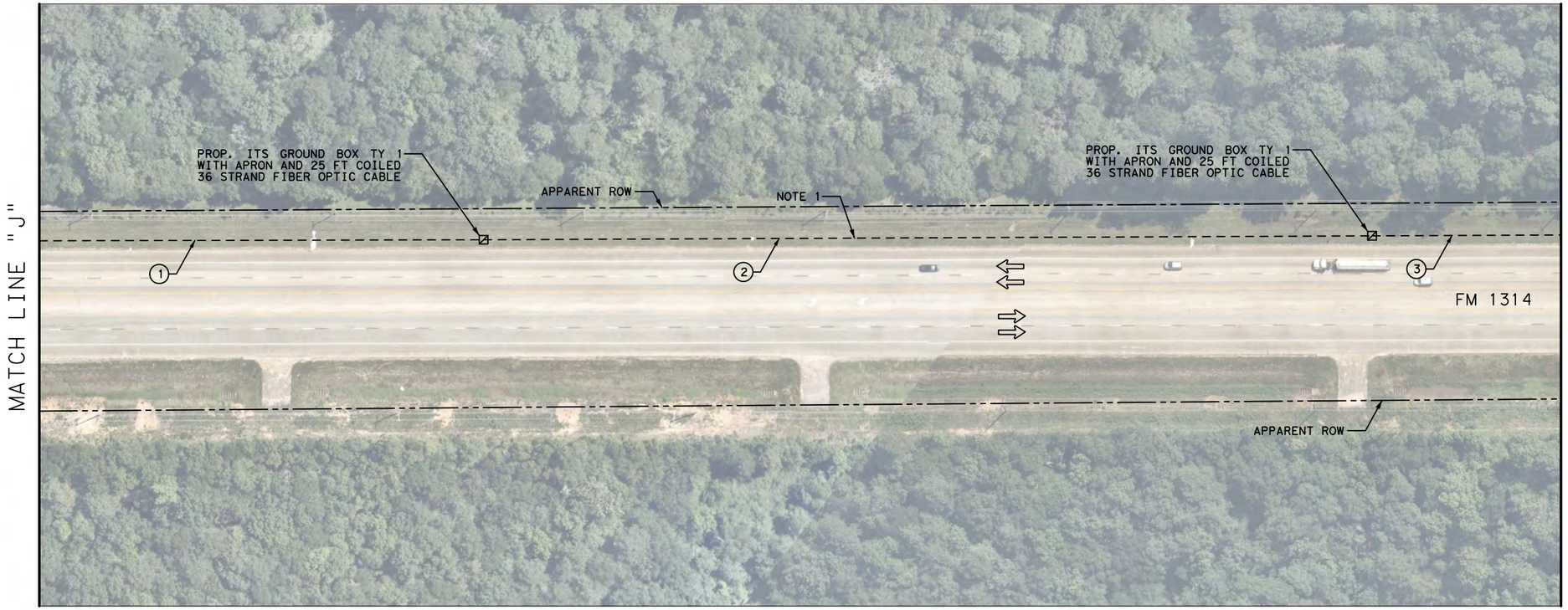
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE											ITS GND BOX (PCAST) TY1 (243636) W/APRON
RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1	1	355			1	355			1	355	
2	1	705			1	705			1	705	
3	1	150			1	150			1	150	
COILED SLACK										50	
TOTAL		1210				1210				1210	2

ADDITIONAL NOTES

1. LOCATIONS OF UNDERGROUND INSTALLATIONS AND RIGHT OF WAY ARE APPROXIMATE. IT IS CONTRACTOR RESPONSIBILITY TO VERIFY ALL UNDERGROUND INSTALLATIONS AND RIGHT OF WAY LOCATIONS PRIOR TO ANY CONSTRUCTION.

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

STATE OF TEXAS
ROMA G. STEVENS
100354
PROFESSIONAL ENGINEER
LICENSED

Roma Stevens
ROMA G. STEVENS , P.E.

9/25/2024
DATE

SCALE: 1" = 100'
50 0 50

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD Houston, TX. 77095 PHONE: (713) 828-4742

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		16
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

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NOTES

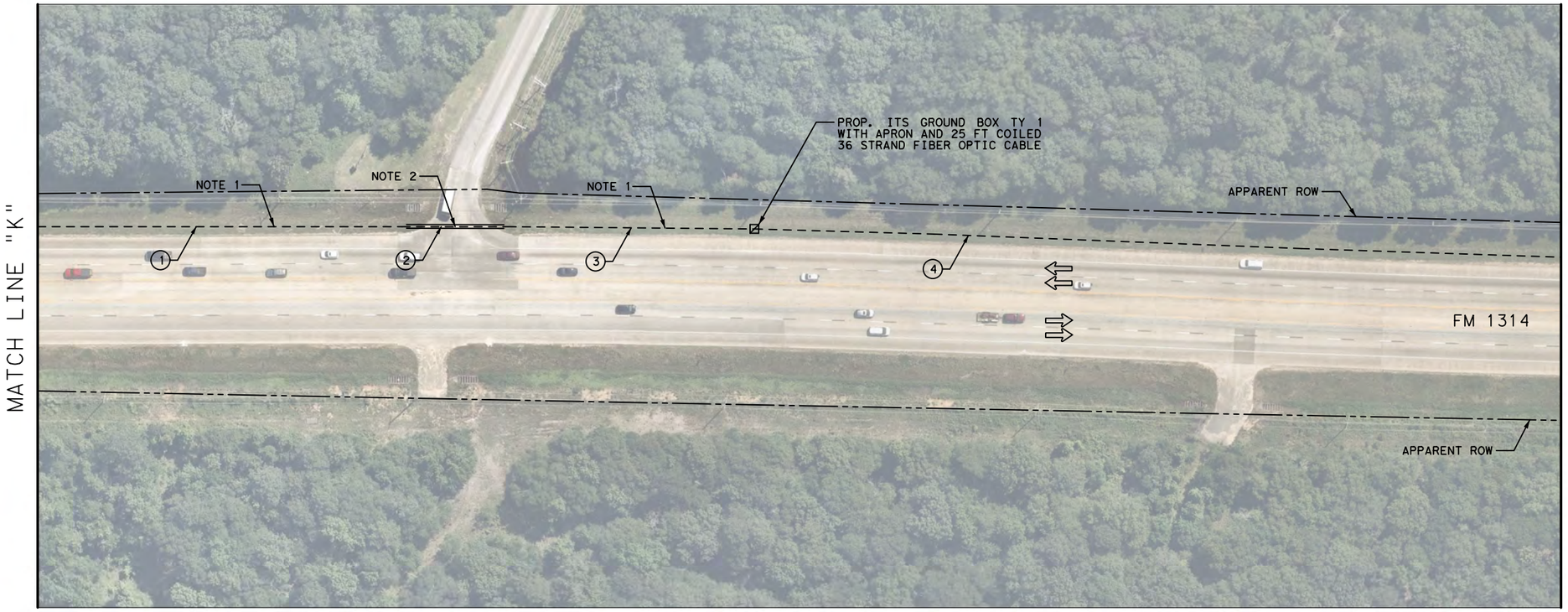
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE											ITS GND BOX (PCAST) TY1 (243636) W/APRON
RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1	1	290			1	290			1	290	
2			1	85	1	85			1	85	
3	1	195			1	195			1	195	
4	1	640			1	640			1	640	
COILED SLACK										50	
TOTAL		1125		85		1210				1260	1

ADDITIONAL NOTES

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

STATE OF TEXAS
ROMA G. STEVENS
100354
LICENSED PROFESSIONAL ENGINEER

Roma Stevens — 9/25/2024
ROMA G. STEVENS , P.E. — DATE

SCALE: 1" = 100'
50 0 50

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

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STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD Houston, TX. 77095 PHONE: (713) 828-4742

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		17
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

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NOTES

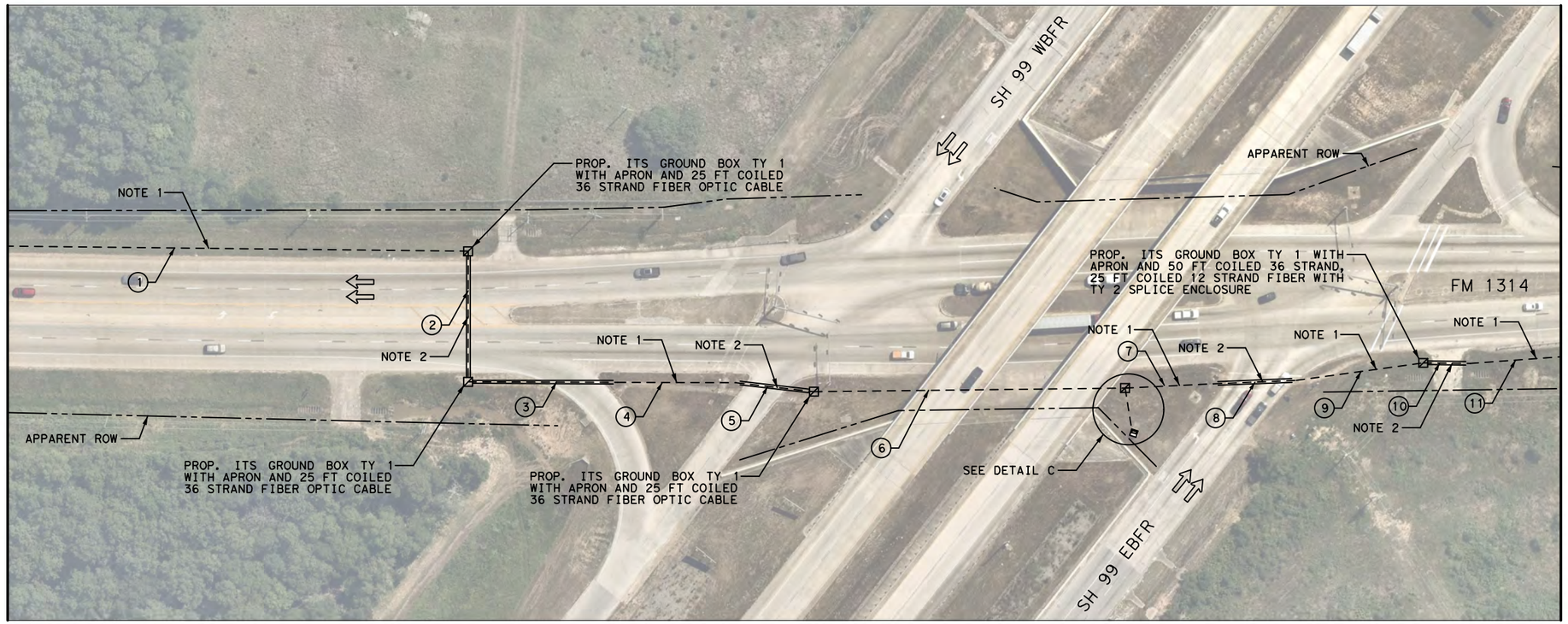
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
3. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-12 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



SCALE: 1" = 100'
50 0 50

STATE OF TEXAS
ROMA G. STEVENS
100354
LICENSED PROFESSIONAL ENGINEER

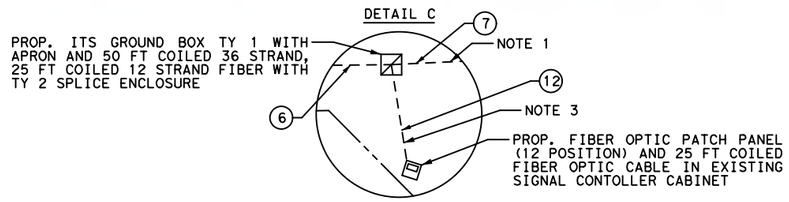
Roma Stevens
ROMA G. STEVENS, P.E.

9/25/2024
DATE

CONDUIT AND CONDUCTOR SCHEDULE

RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				FO SPLICE ENCLOSURE (TY2)	FIBER OPTIC PATCH PANEL (12 POSITION)	ITS GND BOX (PCAST) TY1 (243636) W/APRON
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)	(6027)	(623)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)	(7005)	(7002)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY	QUANTITY	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH	EACH	EACH
1	1	360			1	360			1	360			
2			1	110	1	110			1	110			
3			1	115	1	115			1	115			
4	1	95			1	95			1	95			
5			1	60	1	60			1	60			
6	1	240			1	240			1	240			
7	1	70			1	70			1	70			
8			1	65	1	65			1	65			
9	1	100			1	100			1	100			
10			1	40	1	40			1	40			
11	1	75			1	75			1	75			
12	1	35			1	35	1	35					
COILED SLACK								25		150			
TOTAL		975		390		1365		60		1480	1	1	5

DETAIL C



ADDITIONAL NOTES

1. LOCATIONS OF UNDERGROUND INSTALLATIONS AND RIGHT OF WAY ARE APPROXIMATE. IT IS CONTRACTOR RESPONSIBILITY TO VERIFY ALL UNDERGROUND INSTALLATIONS AND RIGHT OF WAY LOCATIONS PRIOR TO ANY CONSTRUCTION.

2. THE CONTRACTOR MUST CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATIONS OF UNDERGROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING OR EXCAVATION.

3. THE CONTRACTOR MUST BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR FAILURE TO LOCATE AND PRESERVE THERE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND OR OVERHEAD.

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

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		18
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9/25/2024 9:28:26 AM
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NOTES

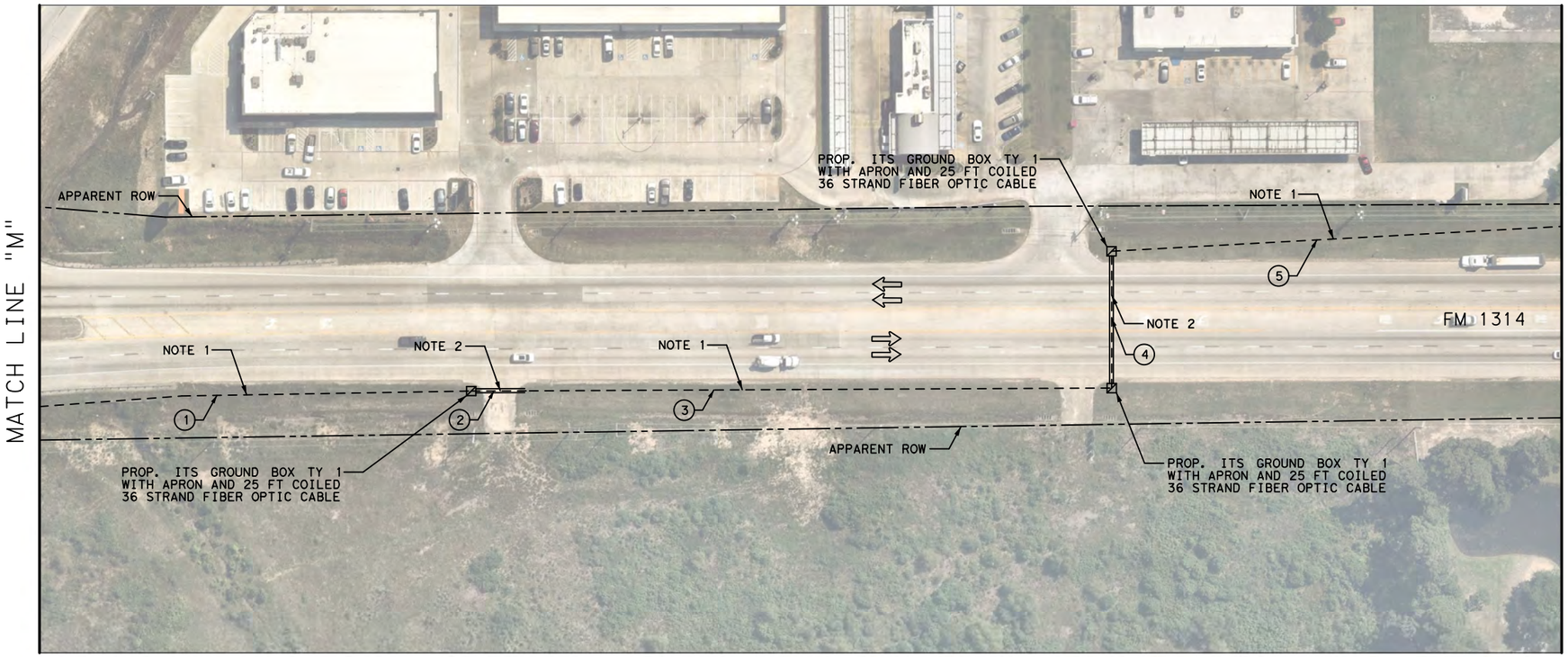
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



SCALE: 1" = 100'
50 0 50

CONDUIT AND CONDUCTOR SCHEDULE											ITS GND BOX (PCAST) TY1 (243636) W/APRON
RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1	1	320			1	320			1	320	
2			1	45	1	45			1	45	
3	1	430			1	430			1	430	
4			1	110	1	110			1	110	
5	1	335			1	335			1	335	
COILED SLACK										75	
TOTAL		1085		155		1240				1315	3

ADDITIONAL NOTES

1. LOCATIONS OF UNDERGROUND INSTALLATIONS AND RIGHT OF WAY ARE APPROXIMATE. IT IS CONTRACTOR RESPONSIBILITY TO VERIFY ALL UNDERGROUND INSTALLATIONS AND RIGHT OF WAY LOCATIONS PRIOR TO ANY CONSTRUCTION.

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STATE OF TEXAS
ROMA G. STEVENS
100354
LICENSED PROFESSIONAL ENGINEER

Roma Stevens — 9/25/2024
ROMA G. STEVENS, P.E. — DATE

PRINT DATE	REVISION DATE
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Texas Department of Transportation®

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TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		19
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9:28:33 AM 9/25/2024
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NOTES

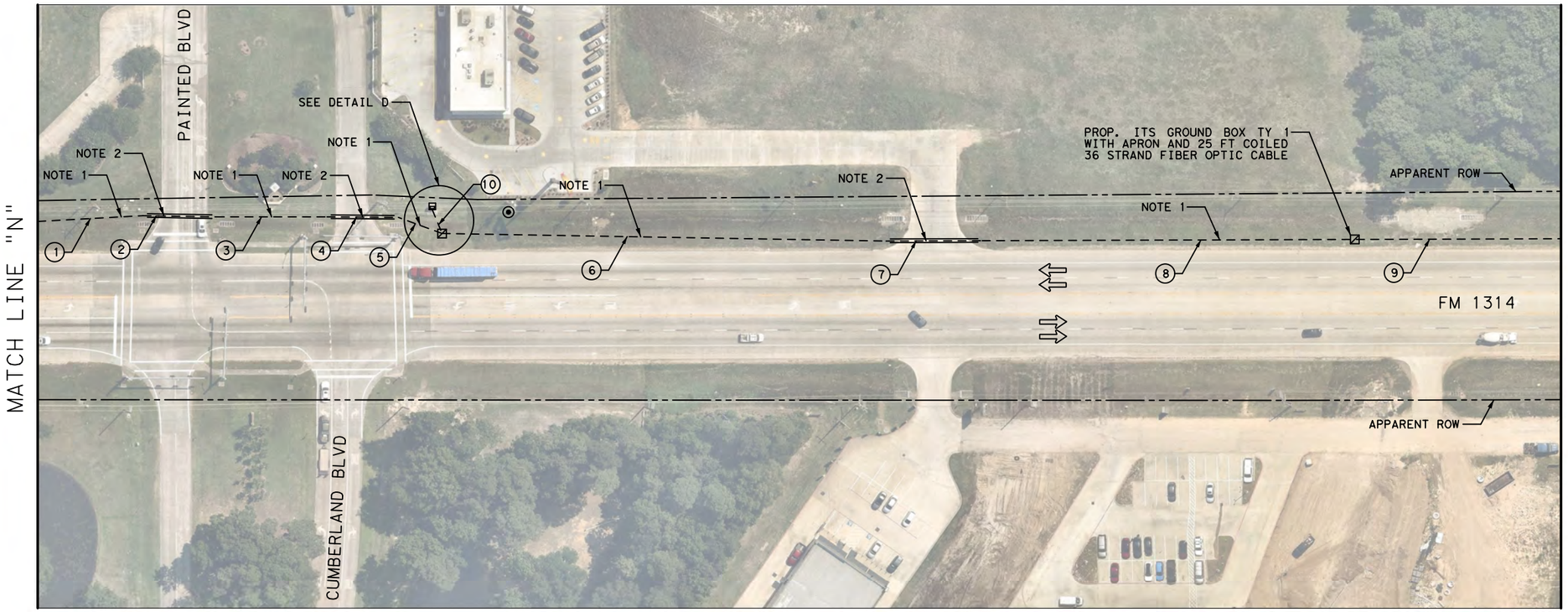
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
3. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-12 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

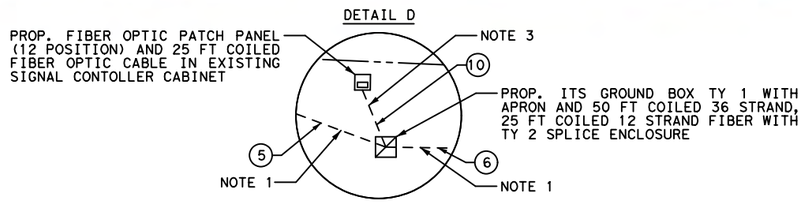
- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE

RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				FO SPLICE ENCLOSURE (TY2)	FIBER OPTIC PATCH PANEL (12 POSITION)	ITS GND BOX (PCAST) TY1 (243636) W/APRON
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)	(6027)	(623)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)	(7005)	(7002)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY	QUANTITY	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH	EACH	EACH
1	1	85			1	85			1	85			
2			1	60	1	60			1	60			
3	1	90			1	90			1	90			
4			1	60	1	60			1	60			
5	1	40			1	40			1	40			
6	1	350			1	350			1	350			
7			1	80	1	80			1	80			
8	1	295			1	295			1	295			
9	1	165			1	165			1	165			
10	1	25			1	25	1	25					
COILED SLACK								25		75			
TOTAL		1050		200		1250		50		1300	1	1	2

DETAIL D



ADDITIONAL NOTES

1. LOCATIONS OF UNDERGROUND INSTALLATIONS AND RIGHT OF WAY ARE APPROXIMATE. IT IS CONTRACTOR RESPONSIBILITY TO VERIFY ALL UNDERGROUND INSTALLATIONS AND RIGHT OF WAY LOCATIONS PRIOR TO ANY CONSTRUCTION.

2. THE CONTRACTOR MUST CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATIONS OF UNDERGROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING OR EXCAVATION.

3. THE CONTRACTOR MUST BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR FAILURE TO LOCATE AND PRESERVE THERE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND OR OVERHEAD.

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

STATE OF TEXAS
ROMA G. STEVENS
100354
PROFESSIONAL ENGINEER
LICENSED

Roma Stevens — 9/25/2024
ROMA G. STEVENS, P.E. — DATE

SCALE: 1" = 100'
50 0 50

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		20
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9/25/2024 9:28:40 AM
...\CTMS*LAYOUT*FM1314-15.dgn

NOTES

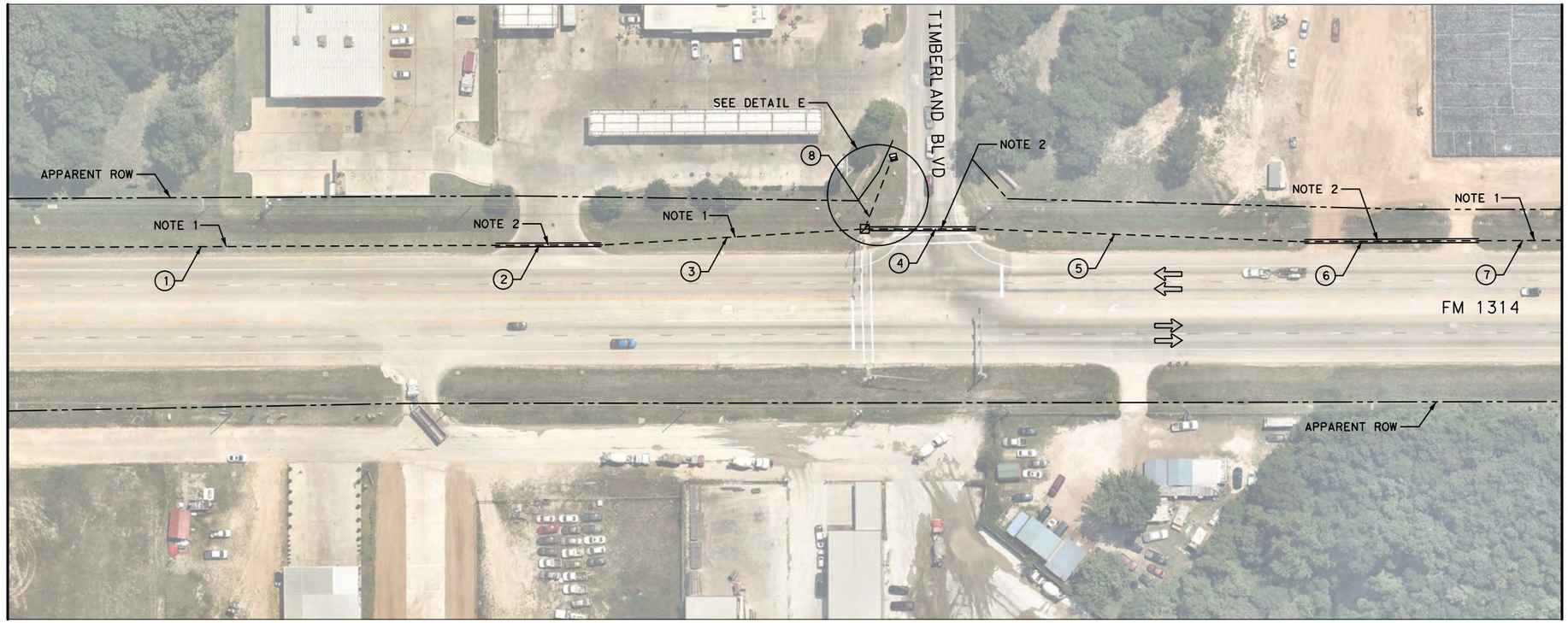
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
3. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-12 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

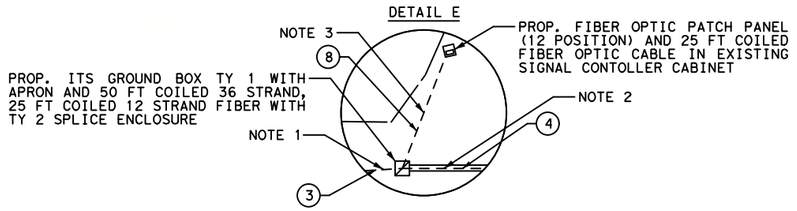
- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE

RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				FO SPLICE ENCLOSURE (TY2)	FIBER OPTIC PATCH PANEL (12 POSITION)	ITS GND BOX (PCAST) TY1 (243636) W/APRON
	3"(SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)	(6027)	(623)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)	(7005)	(7002)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY	QUANTITY	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH	EACH	EACH
1	1	375			1	375			1	375			
2			1	90	1	90			1	90			
3	1	205			1	205			1	205			
4			1	90	1	90			1	90			
5	1	250			1	250			1	250			
6			1	145	1	145			1	145			
7	1	65			1	65			1	65			
8	1	60			1	60	1	60					
COILED SLACK								25		50			
TOTAL		955		325		1280		85		1270	1	1	1

DETAIL E



ADDITIONAL NOTES

1. LOCATIONS OF UNDERGROUND INSTALLATIONS AND RIGHT OF WAY ARE APPROXIMATE. IT IS CONTRACTOR RESPONSIBILITY TO VERIFY ALL UNDERGROUND INSTALLATIONS AND RIGHT OF WAY LOCATIONS PRIOR TO ANY CONSTRUCTION.

2. THE CONTRACTOR MUST CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATIONS OF UNDERGROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING OR EXCAVATION.

3. THE CONTRACTOR MUST BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR FAILURE TO LOCATE AND PRESERVE THERE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND OR OVERHEAD.

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

STATE OF TEXAS
ROMA G. STEVENS
100354
LICENSED PROFESSIONAL ENGINEER

Roma Stevens
ROMA G. STEVENS , P.E.

9/25/2024
DATE

SCALE: 1" = 100'
50 0 50

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314
FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		21
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9/25/2024 9:28:45 AM

...\CTMS*LAYOUT*FM1314-16.dgn

NOTES

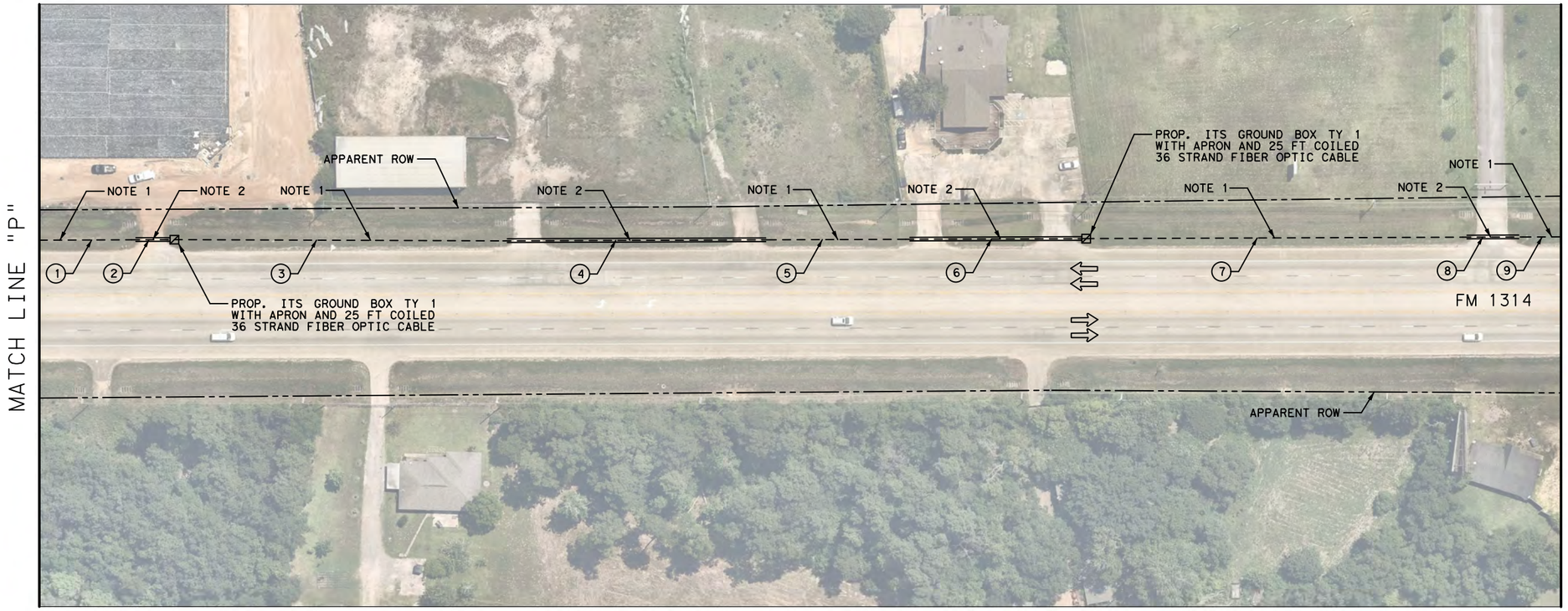
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



SCALE: 1" = 100'
50 0 50

CONDUIT AND CONDUCTOR SCHEDULE											ITS GND BOX (PCAST) TY1 (243636) W/APRON
RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1	1	75			1	75			1	75	
2			1	35	1	35			1	35	
3	1	260			1	260			1	260	
4			1	250	1	250			1	250	
5	1	110			1	110			1	110	
6			1	145	1	145			1	145	
7	1	300			1	300			1	300	
8			1	50	1	50			1	50	
9	1	35			1	35			1	35	
COILED SLACK										50	
TOTAL		780		480		1260				1310	2

ADDITIONAL NOTES

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

STATE OF TEXAS
ROMA G. STEVENS
100354
LICENSED PROFESSIONAL ENGINEER

Roma Stevens
ROMA G. STEVENS, P.E.

9/25/2024
DATE

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		22
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9/25/2024 9:28:52 AM

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NOTES

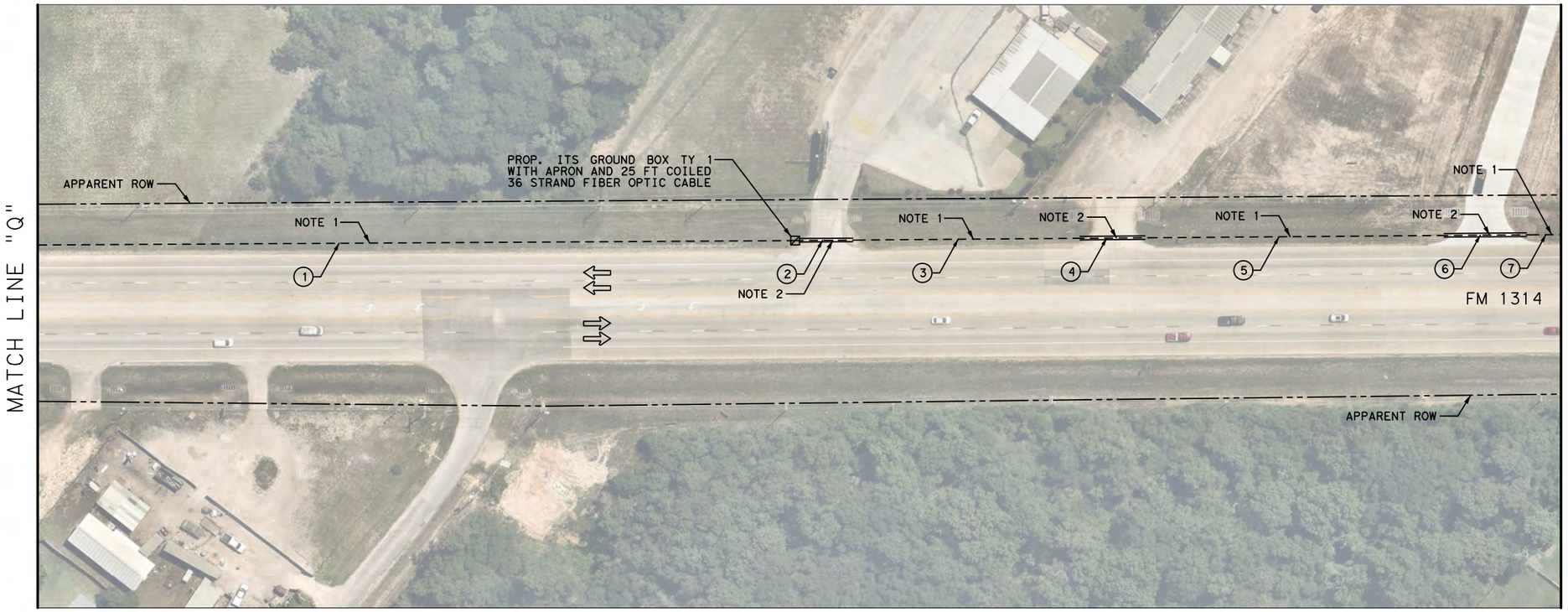
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE											ITS GND BOX (PCAST) TY1 (243636) W/APRON
RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1	1	600			1	600			1	600	
2			1	50	1	50			1	50	
3	1	175			1	175			1	175	
4			1	60	1	60			1	60	
5	1	230			1	230			1	230	
6			1	75	1	75			1	75	
7	1	25			1	25			1	25	
COILED SLACK										25	
TOTAL		1030		185		1215				1240	1

ADDITIONAL NOTES

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STATE OF TEXAS
ROMA G. STEVENS
100354
PROFESSIONAL ENGINEER

Roma Stevens
ROMA G. STEVENS , P.E.

9/25/2024
DATE

SCALE: 1" = 100'
50 0 50

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		23
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9:28:59 AM
9/25/2024
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NOTES

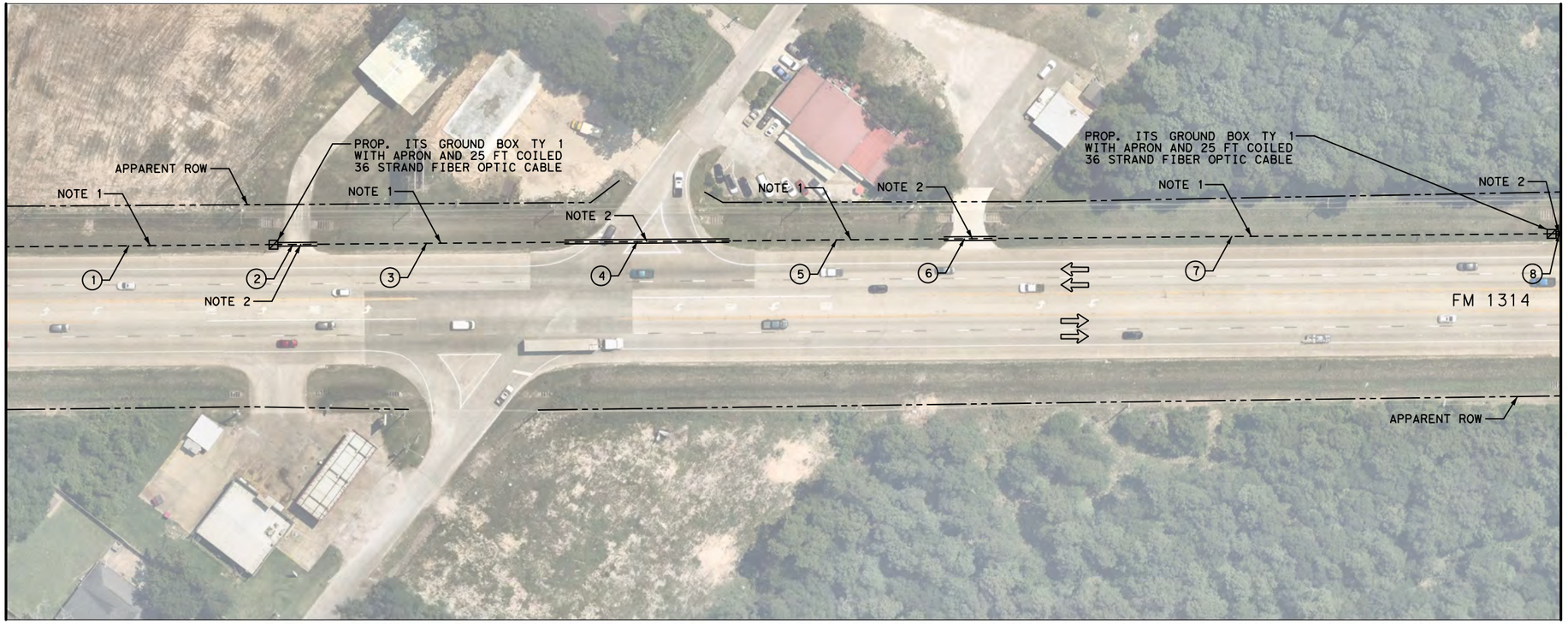
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE											ITS GND BOX (PCAST) TY1 (243636) W/APRON
RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1	1	210			1	210			1	210	
2			1	40	1	40			1	40	
3	1	185			1	185			1	185	
4			1	135	1	135			1	135	
5	1	160			1	160			1	160	
6			1	50	1	50			1	50	
7	1	430			1	430			1	430	
8			1	5	1	5			1	5	
COILED SLACK										50	
TOTAL		985		230		1215				1265	2

ADDITIONAL NOTES

1. LOCATIONS OF UNDERGROUND INSTALLATIONS AND RIGHT OF WAY ARE APPROXIMATE. IT IS CONTRACTOR RESPONSIBILITY TO VERIFY ALL UNDERGROUND INSTALLATIONS AND RIGHT OF WAY LOCATIONS PRIOR TO ANY CONSTRUCTION.

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STATE OF TEXAS
ROMA G. STEVENS
100354
LICENSED PROFESSIONAL ENGINEER

Roma Stevens — 9/25/2024
ROMA G. STEVENS, P.E. — DATE

SCALE: 1" = 100'
50 0 50

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD Houston, TX. 77095 PHONE: (713) 828-4742

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		24
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

NOTES

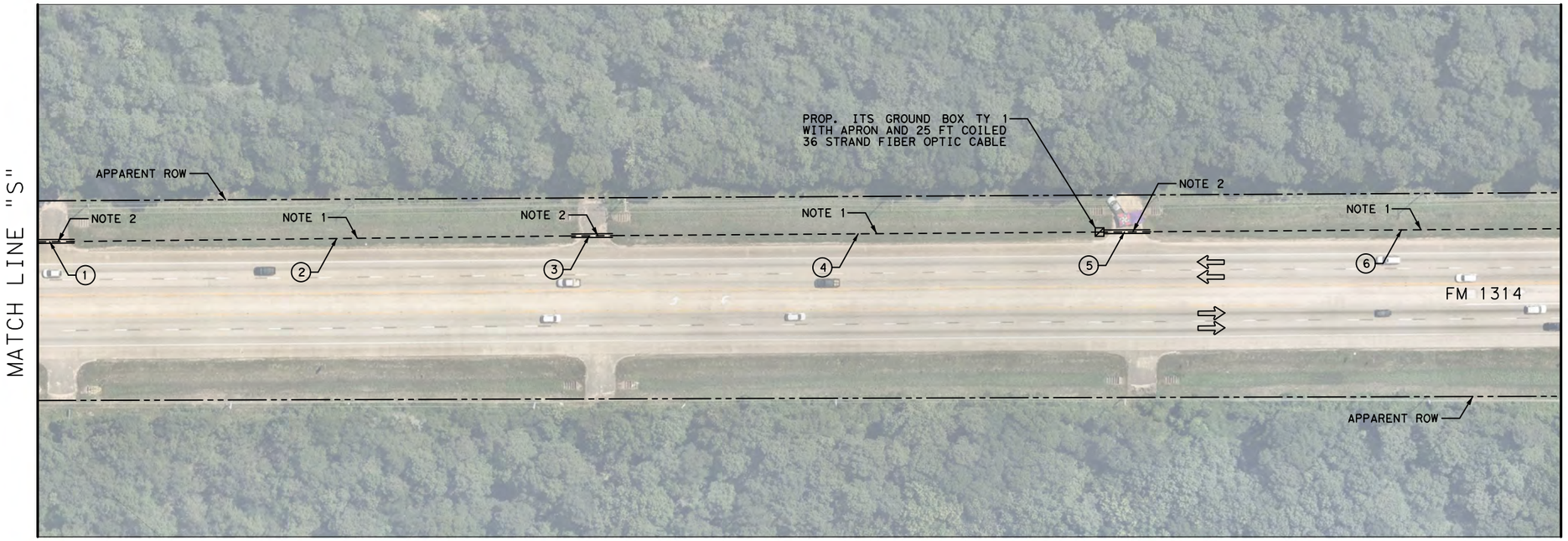
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE											ITS GND BOX (PCAST) TY1 (243636) W/APRON
RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1			1	35	1	35			1	35	
2	1	390			1	390			1	390	
3			1	40	1	40			1	40	
4	1	385			1	385			1	385	
5			1	45	1	45			1	45	
6	1	325			1	325			1	325	
COILED SLACK										25	
TOTAL		1100		120		1220				1245	1

ADDITIONAL NOTES

1. LOCATIONS OF UNDERGROUND INSTALLATIONS AND RIGHT OF WAY ARE APPROXIMATE. IT IS CONTRACTOR RESPONSIBILITY TO VERIFY ALL UNDERGROUND INSTALLATIONS AND RIGHT OF WAY LOCATIONS PRIOR TO ANY CONSTRUCTION.

2. THE CONTRACTOR MUST CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATIONS OF UNDERGROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING OR EXCAVATION.

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STATE OF TEXAS
ROMA G. STEVENS
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Roma Stevens — 9/25/2024
ROMA G. STEVENS, P.E. — DATE

SCALE: 1" = 100'
50 0 50

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

Texas Department of Transportation®

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TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD
Houston, TX. 77095
PHONE: (713) 828-4742

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		25
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9/25/2024 9:29:11 AM
...\CTMS*LAYOUT*FM1314-20.dgn

NOTES

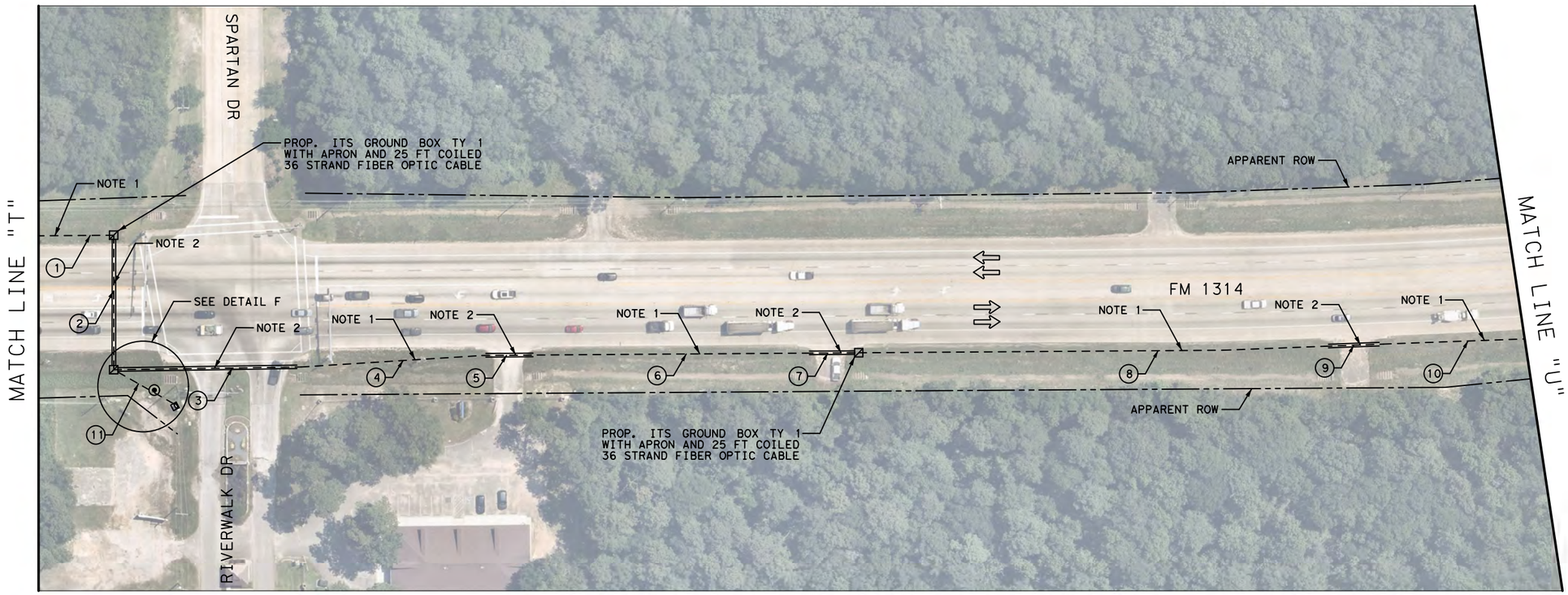
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
3. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-12 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

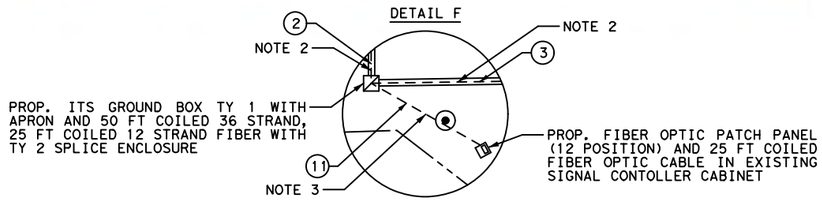
LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE

RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				FO SPLICE ENCLOSURE (TY2)	FIBER OPTIC PATCH PANEL (12 POSITION)	ITS GND BOX (PCAST) TY1 (243636) W/APRON
	3"(SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)	(6027)	(623)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)	(7005)	(7002)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY	QUANTITY	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH	EACH	EACH
1	1	65			1	65			1	65			
2			1	115	1	115			1	115			
3			1	155	1	155			1	155			
4	1	150			1	150			1	150			
5			1	50	1	50			1	50			
6	1	220			1	220			1	220			
7			1	45	1	45			1	45			
8	1	385			1	385			1	385			
9			1	50	1	50			1	50			
10	1	115			1	115			1	115			
11	1	60			1	60	1	60					
COILED SLACK								25		100			
TOTAL		995		415		1410		85		1450	1	1	3



ADDITIONAL NOTES

1. LOCATIONS OF UNDERGROUND INSTALLATIONS AND RIGHT OF WAY ARE APPROXIMATE. IT IS CONTRACTOR RESPONSIBILITY TO VERIFY ALL UNDERGROUND INSTALLATIONS AND RIGHT OF WAY LOCATIONS PRIOR TO ANY CONSTRUCTION.

2. THE CONTRACTOR MUST CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATIONS OF UNDERGROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING OR EXCAVATION.

3. THE CONTRACTOR MUST BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR FAILURE TO LOCATE AND PRESERVE THERE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND OR OVERHEAD.

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

STATE OF TEXAS
ROMA G. STEVENS
100354
LICENSED PROFESSIONAL ENGINEER

Roma Stevens — 9/25/2024
ROMA G. STEVENS , P.E. — DATE

SCALE: 1" = 100'
50 0 50

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		26
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9/25/2024 9:29:17 AM
...\CTMS*LAYOUT*FM1314-21.dgn

NOTES

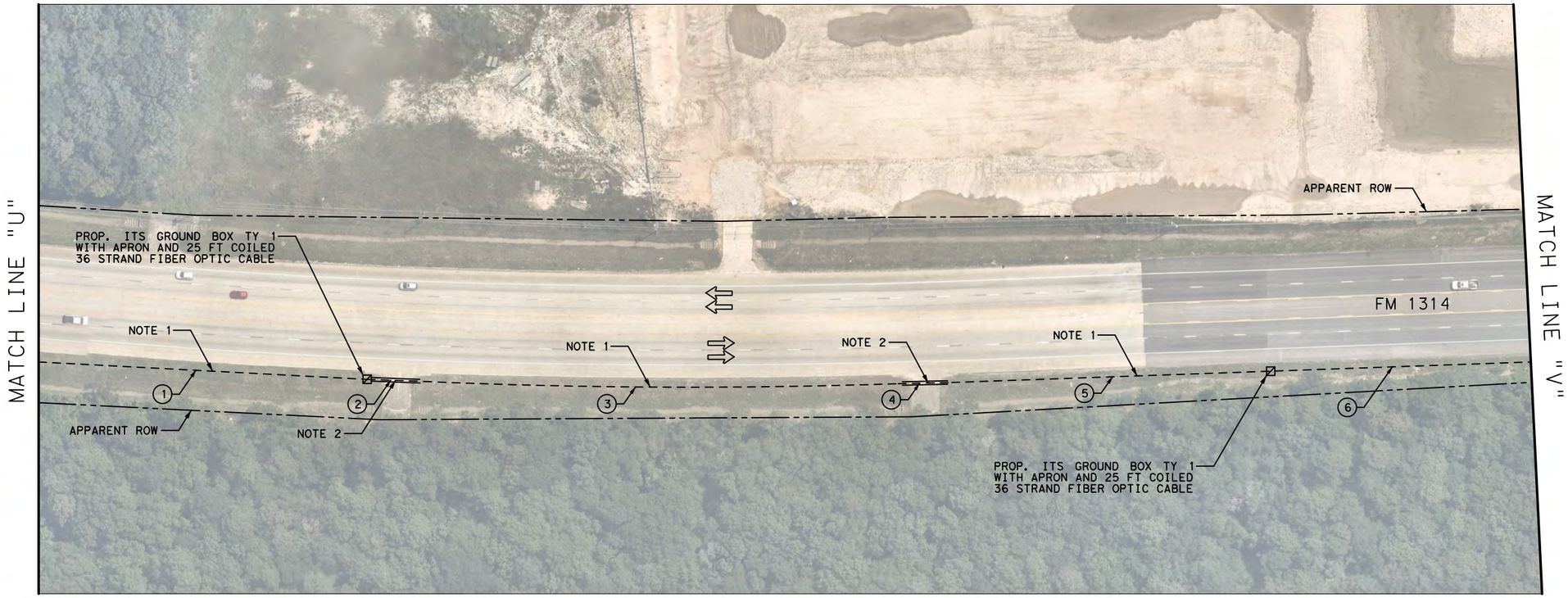
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE											ITS GND BOX (PCAST) TY1 (243636) W/APRON
RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1	1	270			1	270			1	270	
2			1	50	1	50			1	50	
3	1	385			1	385			1	385	
4			1	45	1	45			1	45	
5	1	260			1	260			1	260	
6	1	210			1	210			1	210	
COILED SLACK										50	
TOTAL		1125		95		1220				1270	2

ADDITIONAL NOTES

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3. THE CONTRACTOR MUST BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR FAILURE TO LOCATE AND PRESERVE THERE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND OR OVERHEAD.

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STATE OF TEXAS
ROMA G. STEVENS
100354
LICENSED PROFESSIONAL ENGINEER

Roma Stevens — 9/25/2024
ROMA G. STEVENS , P.E. — DATE

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Texas Department of Transportation®

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TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		27
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

NOTES

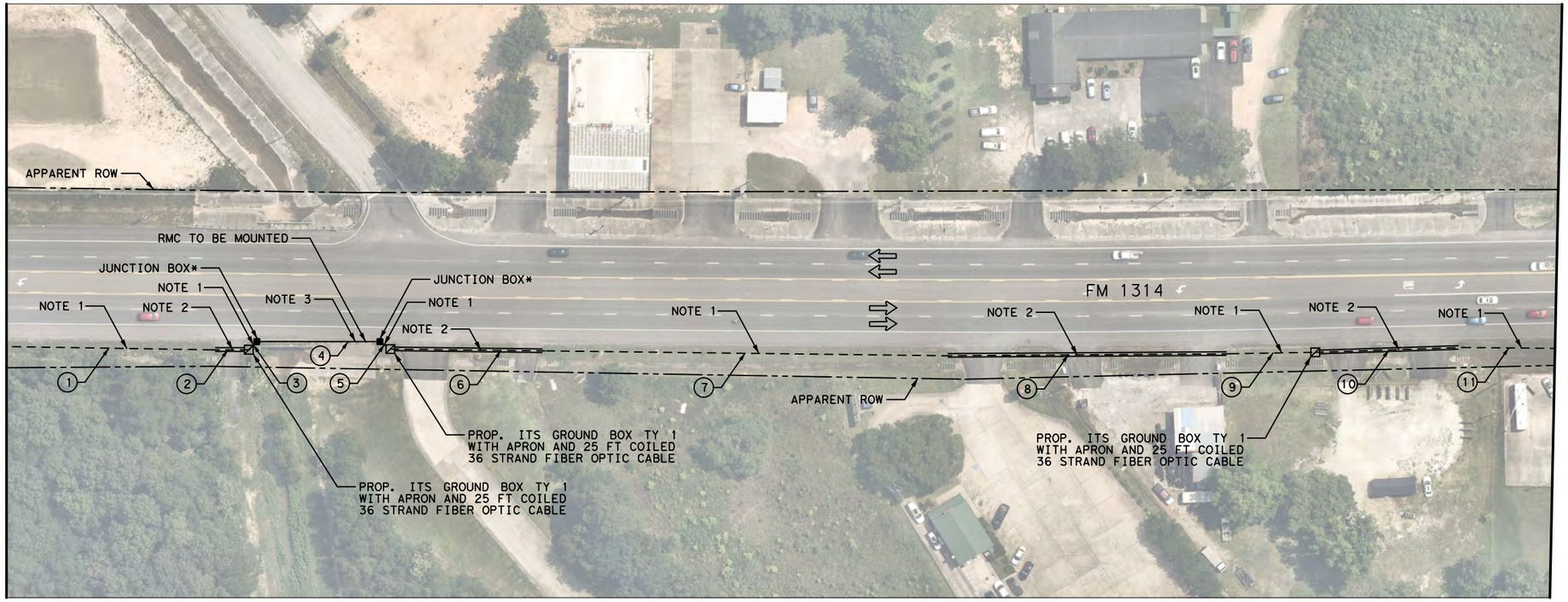
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
3. INSTALL
   1-3" SCH. 80 RMC (PARAPET MOUNTED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW
- JUNCTION BOX*



CONDUIT AND CONDUCTOR SCHEDULE													ITS GND BOX (PCAST) TY1 (243636) W/APRON
RUN NO.	CONDUIT (618)						CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				
	3" (SCHD 80)						#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7082)		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	RMC	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1	1	160					1	160			1	160	
2			1	30			1	30			1	30	
3	1	10					1	10			1	10	
4					1	100	1	100			1	100	
5	1	10					1	10			1	10	
6			1	125			1	125			1	125	
7	1	310					1	310			1	310	
8			1	225			1	225			1	225	
9	1	70					1	70			1	70	
10			1	115			1	115			1	115	
11	1	75					1	75			1	75	
COILED SLACK												75	
TOTAL		635		495		100		1230				1305	3

*JUNCTION BOX IS INCIDENTAL TO BID ITEM 618-7082

ADDITIONAL NOTES

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STATE OF TEXAS
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100354
LICENSED PROFESSIONAL ENGINEER

Roma Stevens — 9/25/2024
ROMA G. STEVENS, P.E. — DATE

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TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		28
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9/25/2024 9:29:29 AM
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NOTES

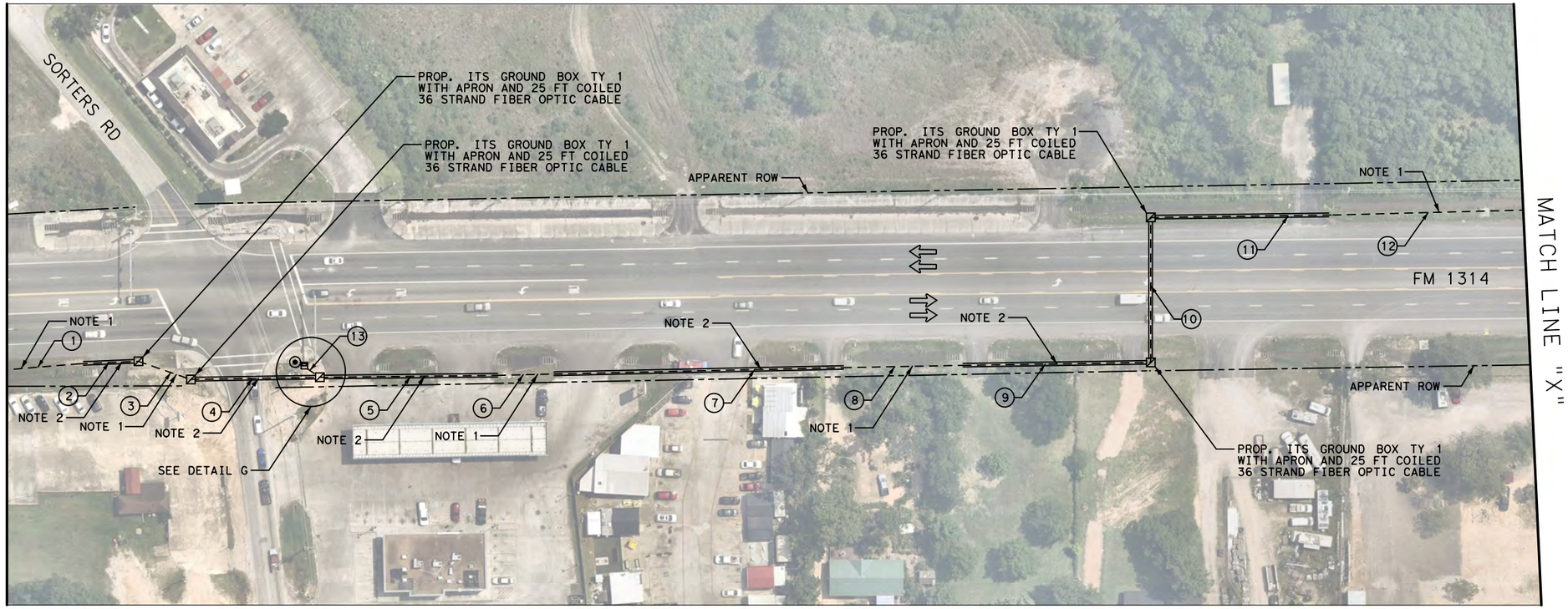
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
3. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-12 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

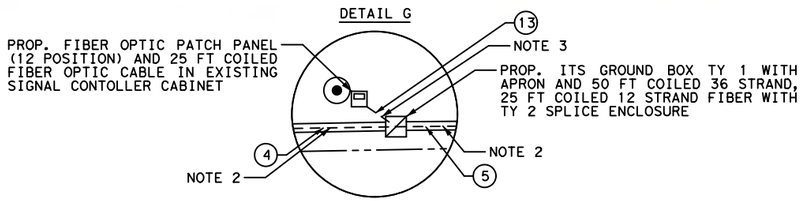
LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE

RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				FO SPLICE ENCLOSURE (TY2)	FIBER OPTIC PATCH PANEL (12 POSITION)	ITS GND BOX (PCAST) TY1 (243636) W/APRON
	3"(SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)	(6027)	(623)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)	(7005)	(7002)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY	QUANTITY	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH	EACH	EACH
1	1	60			1	60			1	60			
2			1	50	1	50			1	50			
3	1	45			1	45			1	45			
4			1	105	1	105			1	105			
5			1	145	1	145			1	145			
6	1	45			1	45			1	45			
7			1	230	1	230			1	230			
8	1	95			1	95			1	95			
9			1	150	1	150			1	150			
10			1	115	1	115			1	115			
11			1	145	1	145			1	145			
12	1	155			1	155			1	155			
13	1	15			1	15	1	15					
COILED SLACK								25		150			
TOTAL		415		940		1355		40		1490	1	1	5



ADDITIONAL NOTES

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STATE OF TEXAS
ROMA G. STEVENS
100354
PROFESSIONAL ENGINEER
LICENSED

Roma Stevens — 9/25/2024

ROMA G. STEVENS , P.E. — DATE

SCALE: 1" = 100'
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PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		29
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9/25/2024 9:29:35 AM

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NOTES

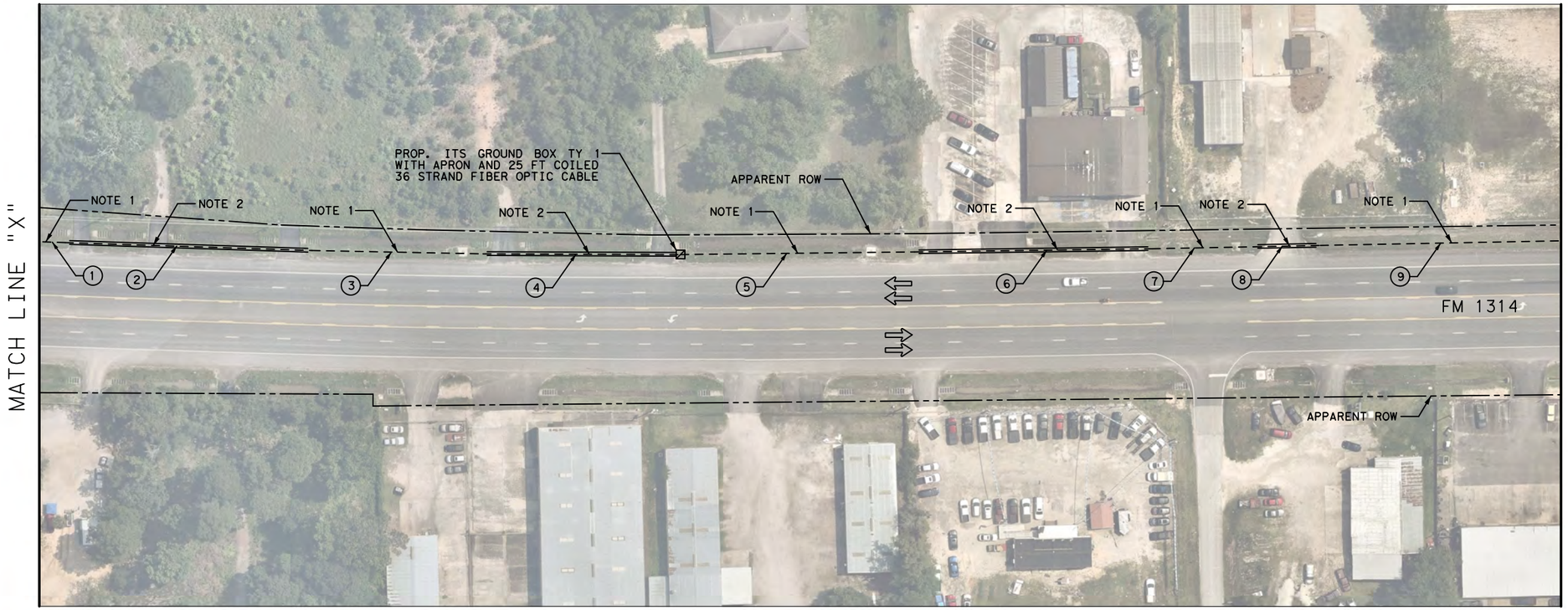
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE											ITS GND BOX (PCAST) TY1 (243636) W/APRON
RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1	1	25			1	25			1	25	
2			1	195	1	195			1	195	
3	1	135			1	135			1	135	
4			1	160	1	160			1	160	
5	1	185			1	185			1	185	
6			1	190	1	190			1	190	
7	1	80			1	80			1	80	
8			1	55	1	55			1	55	
9	1	190			1	190			1	190	
COILED SLACK										25	
TOTAL		615		600		1215				1240	1

ADDITIONAL NOTES

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STATE OF TEXAS
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DATE

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FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		30
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9/25/2024 9:29:41 AM
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NOTES

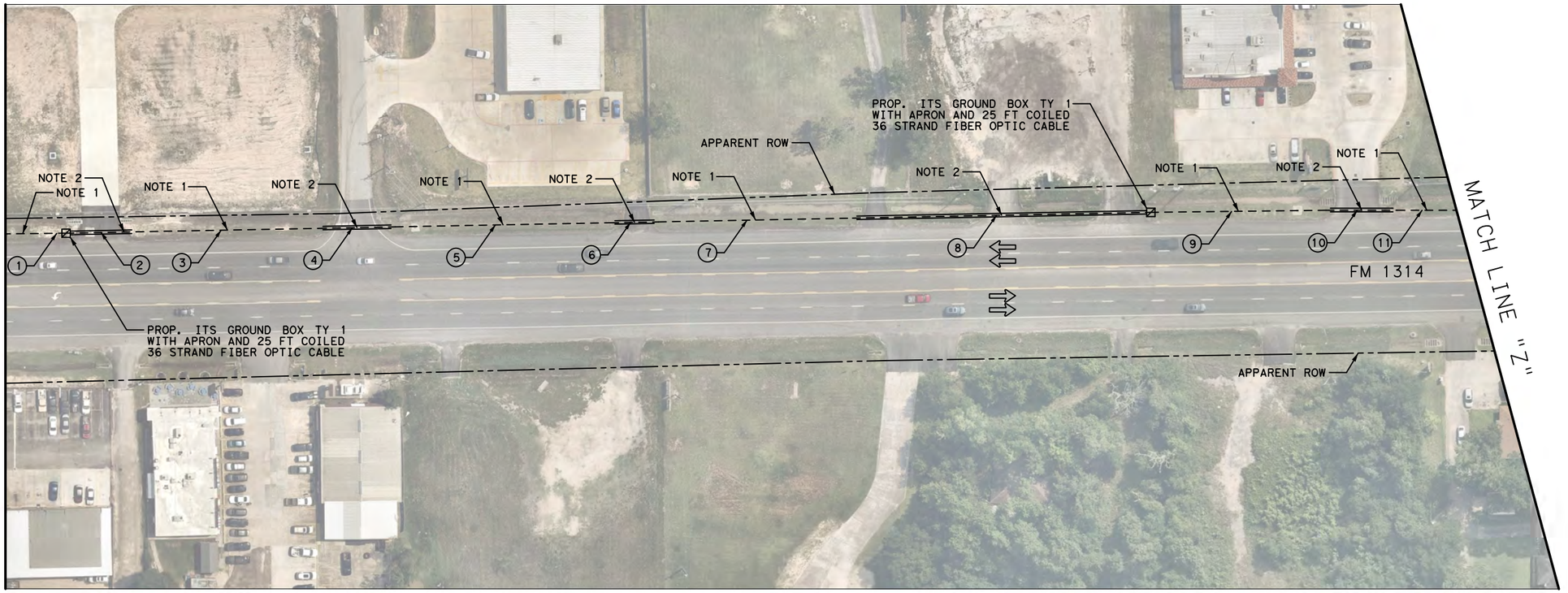
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE

RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				ITS GND BOX (PCAST) TY1 (243636) W/APRON
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1	1	50			1	50			1	50	
2			1	60	1	60			1	60	
3	1	150			1	150			1	150	
4			1	65	1	65			1	65	
5	1	180			1	180			1	180	
6			1	40	1	40			1	40	
7	1	160			1	160			1	160	
8			1	245	1	245			1	245	
9	1	145			1	145			1	145	
10			1	60	1	60			1	60	
11	1	50			1	50			1	50	
COILED SLACK										50	
TOTAL		735		470		1205				1255	2

ADDITIONAL NOTES

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STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		31
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9/25/2024 9:29:48 AM
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NOTES

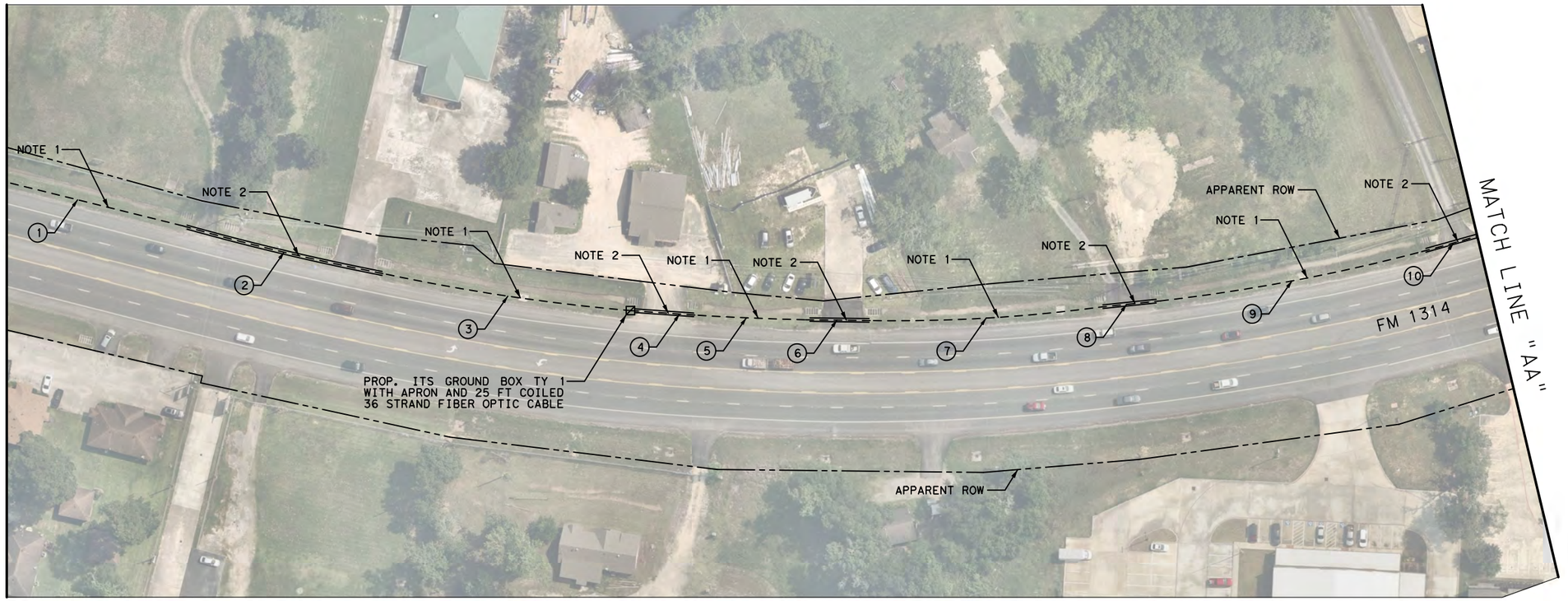
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE											ITS GND BOX (PCAST) TY1 (243636) W/APRON
RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1	1	150			1	150			1	150	
2			1	170	1	170			1	170	
3	1	205			1	205			1	205	
4			1	55	1	55			1	55	
5	1	90			1	90			1	90	
6			1	55	1	55			1	55	
7	1	185			1	185			1	185	
8			1	50	1	50			1	50	
9	1	215			1	215			1	215	
10			1	50	1	50			1	50	
COILED SLACK										25	
TOTAL		845		380		1225				1250	1

ADDITIONAL NOTES

1. LOCATIONS OF UNDERGROUND INSTALLATIONS AND RIGHT OF WAY ARE APPROXIMATE. IT IS CONTRACTOR RESPONSIBILITY TO VERIFY ALL UNDERGROUND INSTALLATIONS AND RIGHT OF WAY LOCATIONS PRIOR TO ANY CONSTRUCTION.

2. THE CONTRACTOR MUST CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATIONS OF UNDERGROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING OR EXCAVATION.

3. THE CONTRACTOR MUST BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR FAILURE TO LOCATE AND PRESERVE THERE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND OR OVERHEAD.

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

STATE OF TEXAS
ROMA G. STEVENS
100354
PROFESSIONAL LICENSED ENGINEER

Roma Stevens — 9/25/2024
ROMA G. STEVENS, P.E. — DATE

SCALE: 1" = 100'
50 0 50

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD
Houston, TX. 77095
PHONE: (713) 828-4742

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		32
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9/25/2024 9:29:53 AM ...\CTMS\LAYOUT\FM1314-27.dgn

NOTES

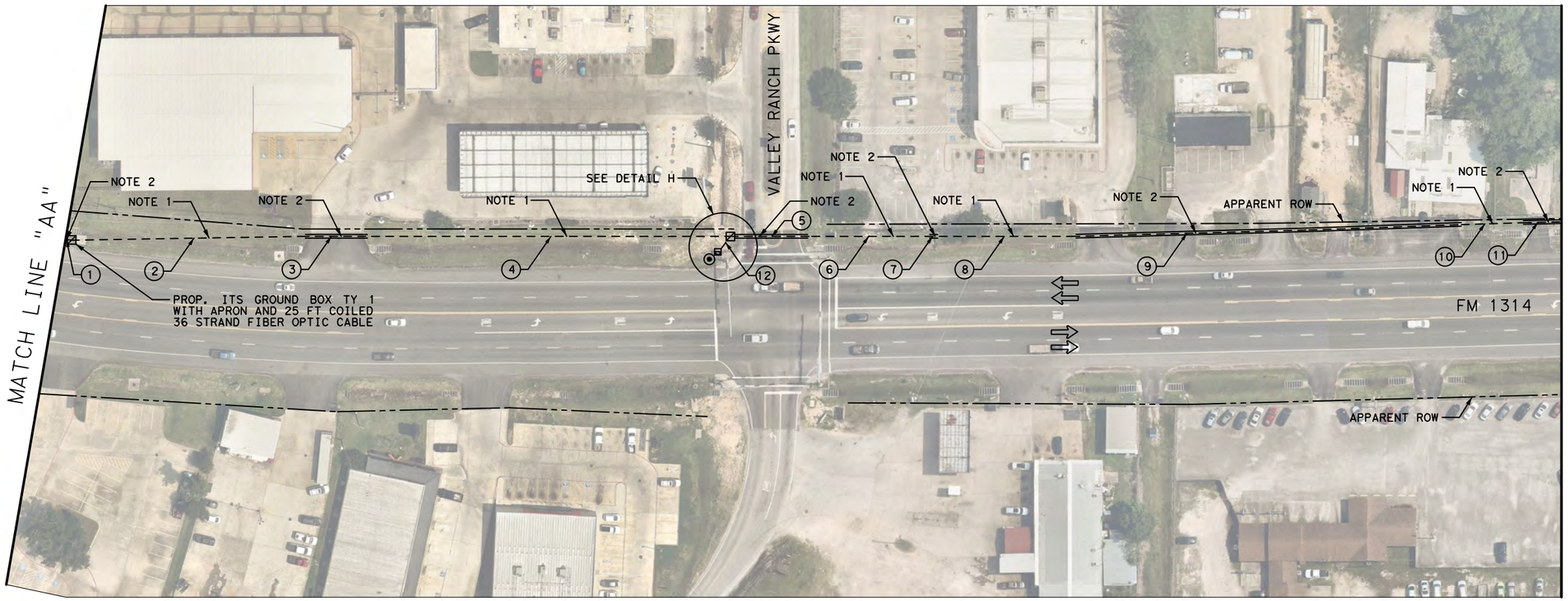
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
3. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-12 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW

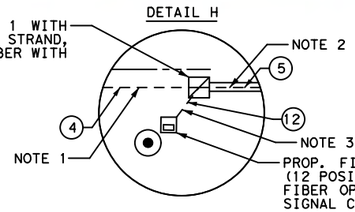


CONDUIT AND CONDUCTOR SCHEDULE

RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				FO SPLICE ENCLOSURE (TY2)	FIBER OPTIC PATCH PANEL (12 POSITION)	ITS GND BOX (PCAST) TY1 (243636) W/APRON
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)	(6027)	(623)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)	(7005)	(7002)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY	QUANTITY	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH	EACH	EACH
1			1	5	1	5			1	5			
2	1	185			1	185			1	185			
3			1	60	1	60			1	60			
4	1	290			1	290			1	290			
5			1	70	1	70			1	70			
6	1	95			1	95			1	95			
7			1	10	1	10			1	10			
8	1	110			1	110			1	110			
9			1	315	1	315			1	315			
10	1	50			1	50			1	50			
11			1	35	1	35			1	35			
12	1	15			1	15	1	15					
COILED SLACK								25		75			
TOTAL		745		495		1240		40		1300	1	1	2

PROP. ITS GROUND BOX TY 1 WITH APRON AND 50 FT COILED 36 STRAND, 25 FT COILED 12 STRAND FIBER WITH TY 2 SPLICE ENCLOSURE

DETAIL H



ADDITIONAL NOTES

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

STATE OF TEXAS
ROMA G. STEVENS
100354
LICENSED PROFESSIONAL ENGINEER

Roma Stevens
ROMA G. STEVENS, P.E.

9/25/2024
DATE

SCALE: 1" = 100'
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TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		33
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9/25/2024 9:29:58 AM

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NOTES

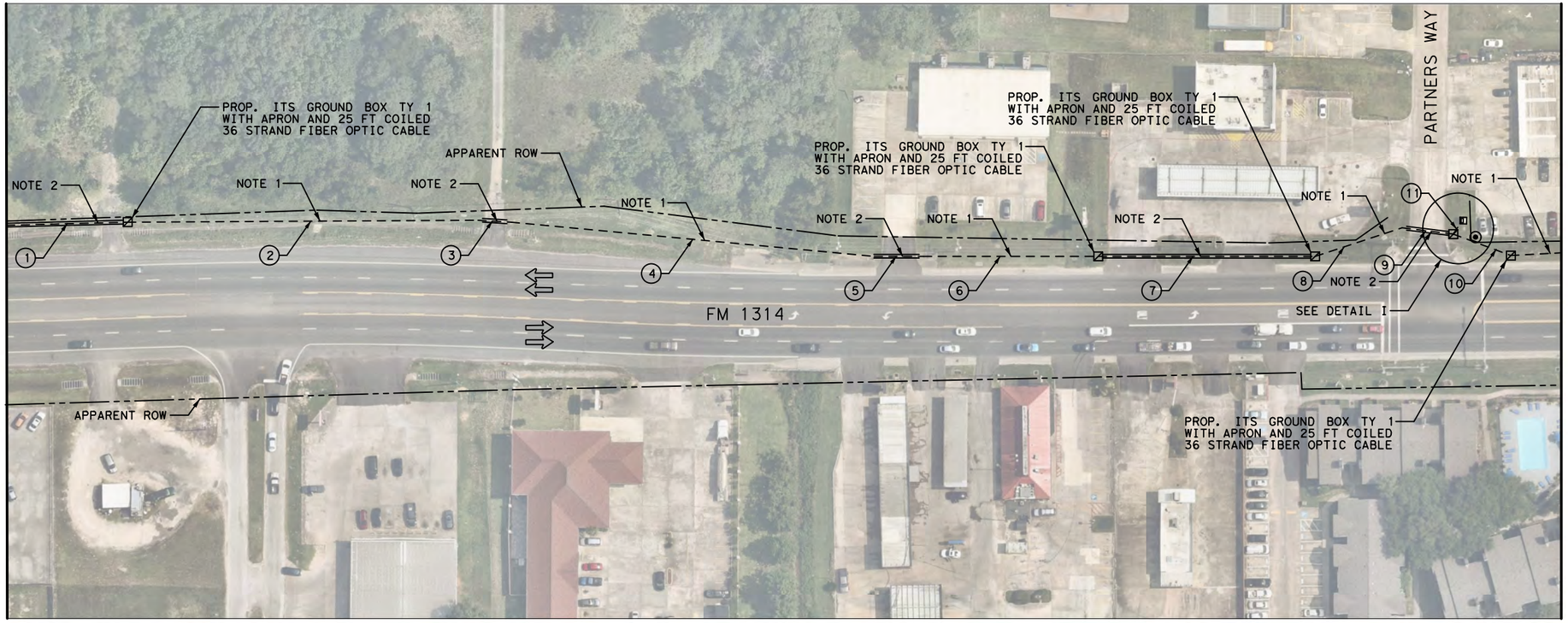
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
3. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-12 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

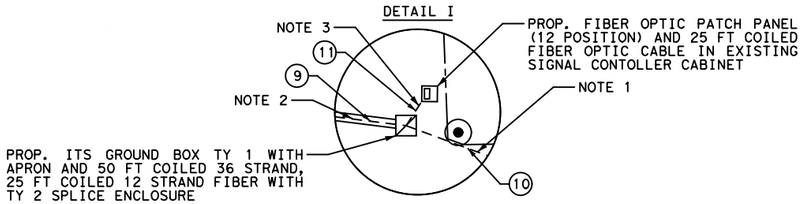
* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE											FO SPLICE ENCLOSURE (TY2)	FIBER OPTIC PATCH PANEL (12 POSITION)	ITS GND BOX (PCAST) TY1 (243636) W/APRON
RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)						
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)	(6027)	(623)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)	(7005)	(7002)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY	QUANTITY	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH	EACH	EACH
1			1	95	1	95			1	95			
2	1	275			1	275			1	275			
3			1	30	1	30			1	30			
4	1	285			1	285			1	285			
5			1	40	1	40			1	40			
6	1	135			1	135			1	135			
7			1	170	1	170			1	170			
8	1	100			1	100			1	100			
9			1	40	1	40			1	40			
10	1	90			1	90			1	90			
11	1	10			1	10	1	10					
COILED SLACK								25		150			
TOTAL		895		375		1270		35		1410	1	1	5



ADDITIONAL NOTES

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

STATE OF TEXAS
ROMA G. STEVENS
100354
PROFESSIONAL ENGINEER

Roma Stevens — 9/25/2024
ROMA G. STEVENS , P.E. — DATE

SCALE: 1" = 100'
50 0 50

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD
Houston, TX. 77095
PHONE: (713) 828-4742

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		34
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9/25/2024 9:30:02 AM
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NOTES

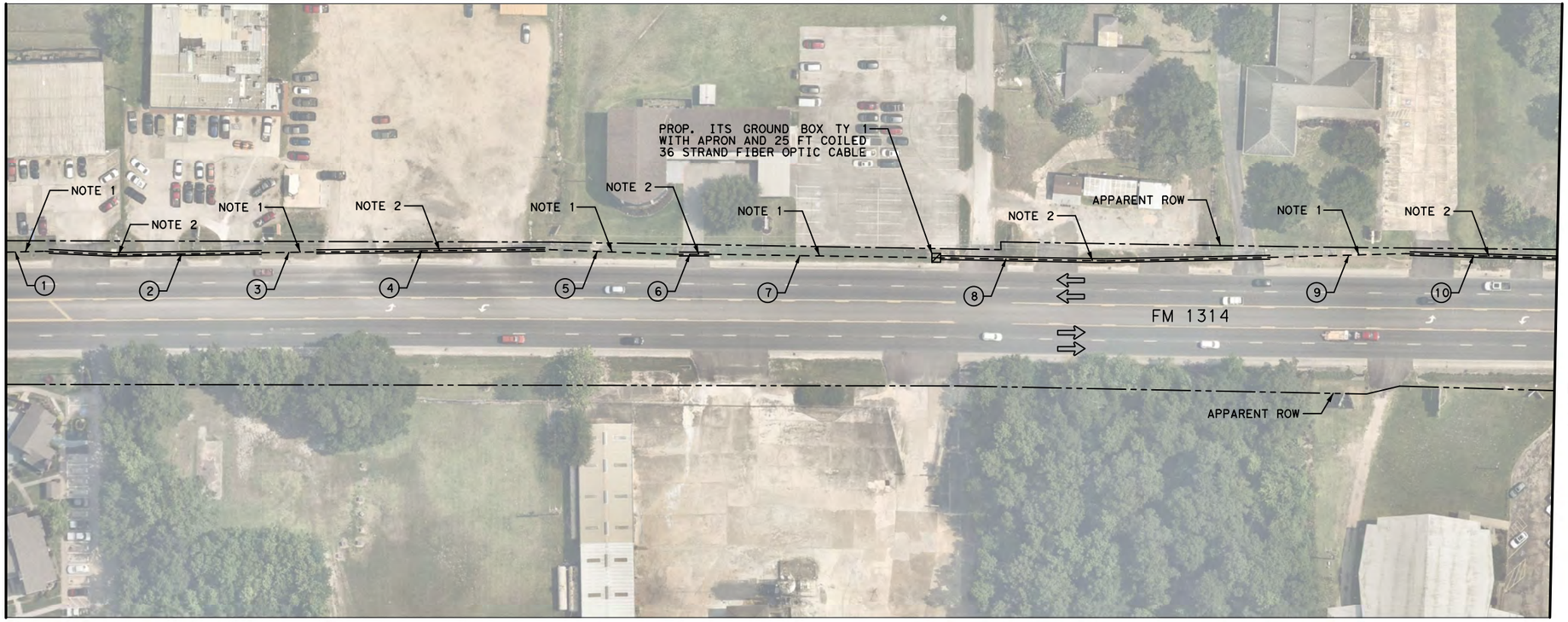
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE											ITS GND BOX (PCAST) TY1 (243636) W/APRON
RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1	1	35			1	35			1	35	
2			1	175	1	175			1	175	
3	1	45			1	45			1	45	
4			1	180	1	180			1	180	
5	1	100			1	100			1	100	
6			1	30	1	30			1	30	
7	1	175			1	175			1	175	
8			1	265	1	265			1	265	
9	1	110			1	110			1	110	
10			1	120	1	120			1	120	
COILED SLACK										25	
TOTAL		465		770		1235				1260	1

ADDITIONAL NOTES

1. LOCATIONS OF UNDERGROUND INSTALLATIONS AND RIGHT OF WAY ARE APPROXIMATE. IT IS CONTRACTOR RESPONSIBILITY TO VERIFY ALL UNDERGROUND INSTALLATIONS AND RIGHT OF WAY LOCATIONS PRIOR TO ANY CONSTRUCTION.

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

STATE OF TEXAS
ROMA G. STEVENS
100354
LICENSED PROFESSIONAL ENGINEER

Roma Stevens
ROMA G. STEVENS , P.E.

9/25/2024
DATE

SCALE: 1" = 100'
50 0 50

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

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TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		35
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9/25/2024 9:30:07 AM
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NOTES

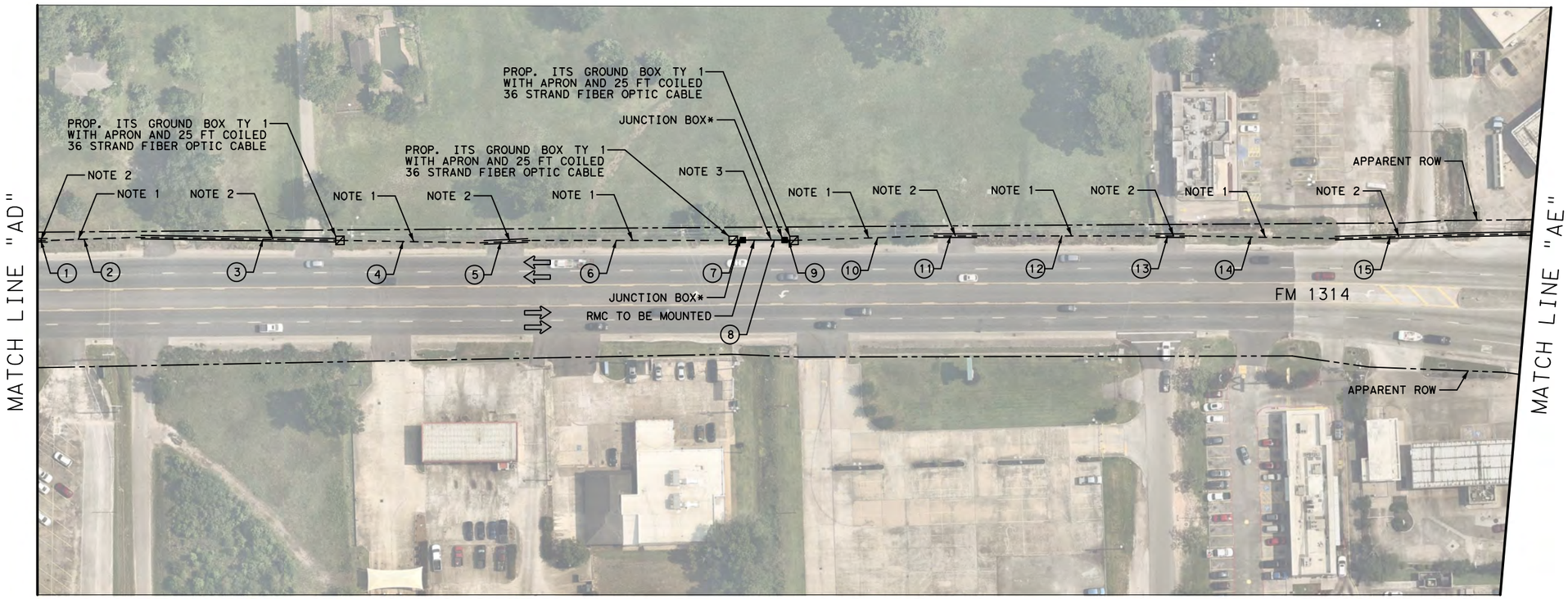
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
3. INSTALL
   1-3" SCH. 80 RMC (PARAPET MOUNTED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW
- JUNCTION BOX*



CONDUIT AND CONDUCTOR SCHEDULE

RUN NO.	CONDUIT (618)						CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				ITS GND BOX (PCAST) TY1 (243636) W/APRON
	3"(SCHD 80)						#14 INSUL		12 FIBER		36 FIBER		(6027)
	(7060)		(7061)		(7082)*		(7002)		(7001)		(7002)		(7003)
	NO.	TRENCH	NO.	BORE	NO.	RMC	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH
1			1	10			1	10			1	10	
2	1	70					1	70			1	70	
3			1	165			1	165			1	165	
4	1	115					1	115			1	115	
5			1	45			1	45			1	45	
6	1	165					1	165			1	165	
7	1	10					1	10			1	10	
8					1	35	1	35			1	35	
9	1	10					1	10			1	10	
10	1	110					1	110			1	110	
11			1	45			1	45			1	45	
12	1	140					1	140			1	140	
13			1	30			1	30			1	30	
14	1	120					1	120			1	120	
15			1	165			1	165			1	165	
COILED SLACK												75	
TOTAL		740		460		35		1235				1310	3

*JUNCTION BOX IS INCIDENTAL TO BID ITEM 618-7082

ADDITIONAL NOTES

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Roma Stevens — 9/25/2024
ROMA G. STEVENS, P.E. — DATE

SCALE: 1" = 100'
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PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

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PHONE: (713) 828-4742

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		36
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9:30:12 AM 9/25/2024
...\CTMS*LAYOUT*FM1314-31.dgn

NOTES

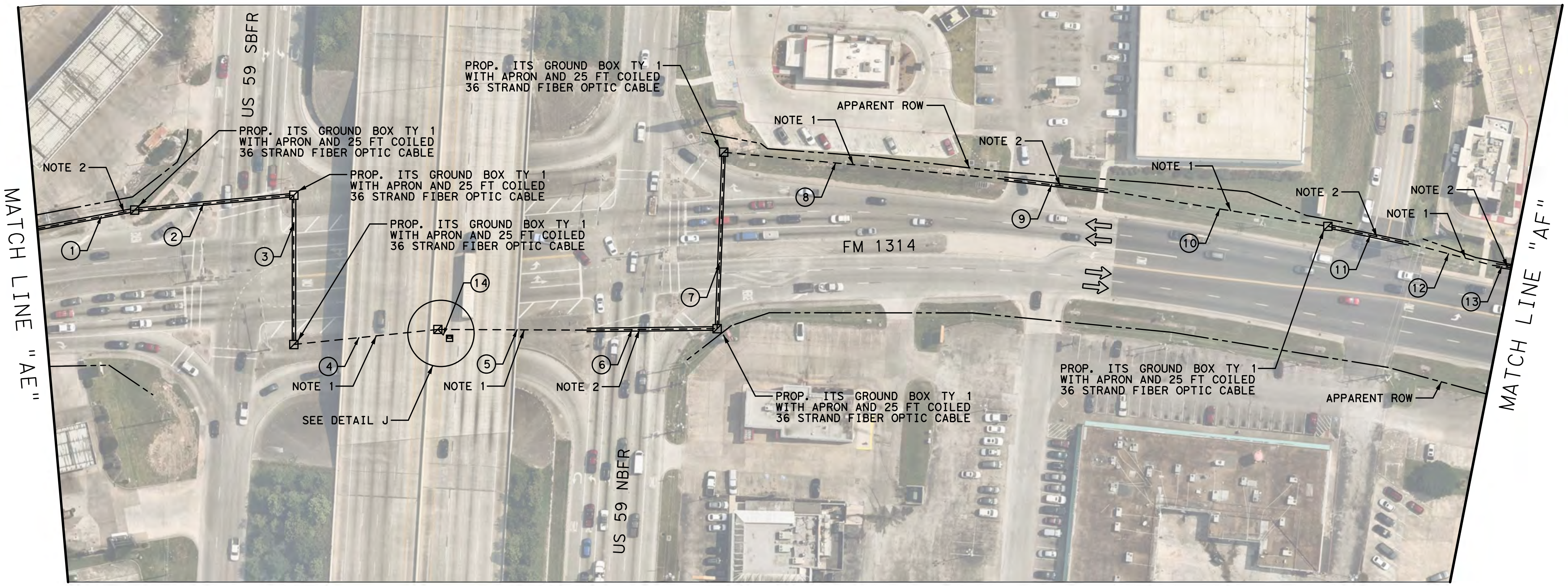
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
3. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-12 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

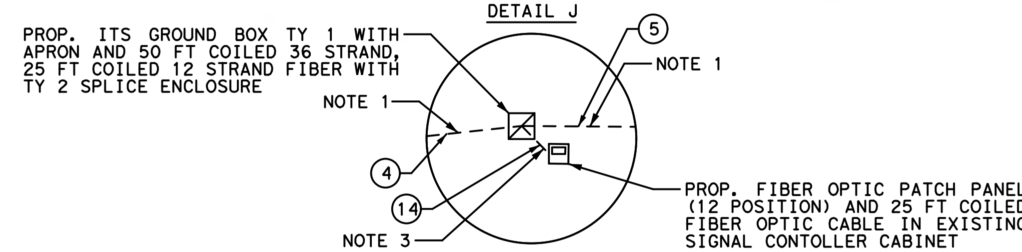
LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				FO SPLICE ENCLOSURE (TY2)	FIBER OPTIC PATCH PANEL (12 POSITION)	ITS GND BOX (PCAST) TY1 (243636) W/APRON
	3"(SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)	(6027)	(623)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)	(7005)	(7002)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY	QUANTITY	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH	EACH	EACH
1			1	85	1	85			1	85			
2			1	130	1	130			1	130			
3			1	125	1	125			1	125			
4	1	120			1	120			1	120			
5	1	120			1	120			1	120			
6			1	115	1	115			1	115			
7			1	150	1	150			1	150			
8	1	230			1	100			1	100			
9			1	100	1	185			1	185			
10	1	185			1	75			1	75			
11			1	75	1	70			1	70			
12	1	70			1	20			1	20			
13			1	20	1	120			1	120			
14	1	10			1	10	1	10					
COILED SLACK								25		200			
TOTAL		735		800		1425		35		1615	1	1	7

DETAIL J



ADDITIONAL NOTES

1. LOCATIONS OF UNDERGROUND INSTALLATIONS AND RIGHT OF WAY ARE APPROXIMATE. IT IS CONTRACTOR RESPONSIBILITY TO VERIFY ALL UNDERGROUND INSTALLATIONS AND RIGHT OF WAY LOCATIONS PRIOR TO ANY CONSTRUCTION.

2. THE CONTRACTOR MUST CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATIONS OF UNDERGROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING OR EXCAVATION.

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

STATE OF TEXAS
ROMA G. STEVENS
100354
LICENSED PROFESSIONAL ENGINEER

Roma Stevens

ROMA G. STEVENS, P.E. — DATE 9/25/2024

SCALE: 1" = 100'
50 0 50

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD, Houston, TX. 77095
PHONE: (713) 828-4742

FM 1314
FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		37
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9:30:15 AM
9/25/2024
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NOTES

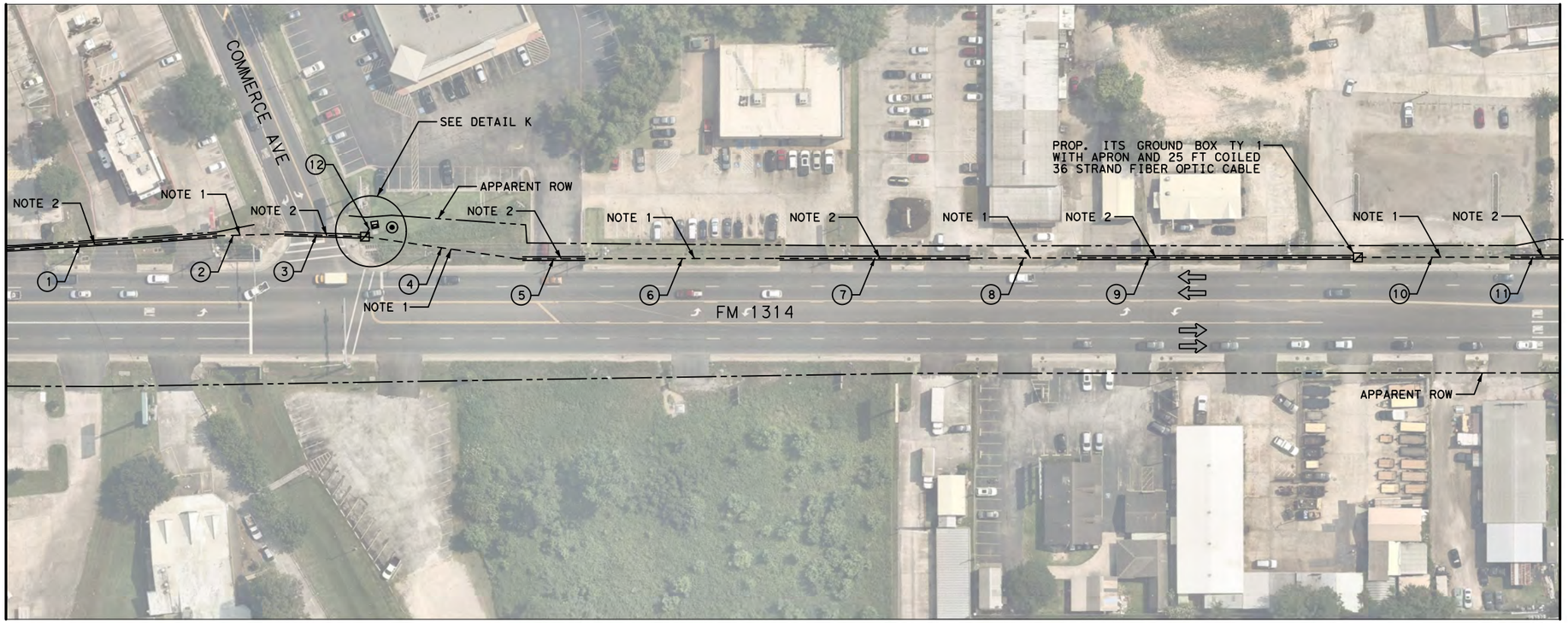
1. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
2. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
3. INSTALL
   1-3" SCH. 80 PVC
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-12 STRAND S/M FIBER OPTIC CABLE

SPECIAL NOTES

* COIL 25 FT OF 36 STRAND FIBER OPTIC CABLE IN EACH GROUND BOX, UNLESS SHOWN OTHERWISE. (REF: ITS(43)-16)

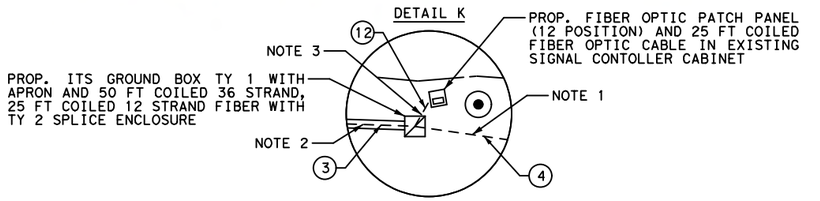
LEGEND

- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)
- APPARENT RIGHT OF WAY
- PROP. GROUND BOX: TY 1 (ITS(37)-16)
- EXISTING SERVICE POLE
- EXISTING TRAFFIC SIGNAL CONTROLLER
- DIRECTION OF TRAFFIC FLOW



CONDUIT AND CONDUCTOR SCHEDULE

RUN NO.	CONDUIT (618)				CONDUCTORS (620)		FIBER OPTIC CBL (6027) (SINGLE MODE)				FO SPLICE ENCLOSURE (TY2)	FIBER OPTIC PATCH PANEL (12 POSITION)	ITS GND BOX (PCAST) TY1 (243636) W/APRON
	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)	(6027)	(623)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)	(7005)	(7002)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY	QUANTITY	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH	EACH	EACH
1			1	165	1	165			1	165			
2	1	55			1	55			1	55			
3			1	65	1	65			1	65			
4	1	120			1	120			1	120			
5			1	55	1	55			1	55			
6	1	145			1	145			1	145			
7			1	155	1	155			1	155			
8	1	80			1	80			1	80			
9			1	220	1	220			1	220			
10	1	115			1	115			1	115			
11			1	45	1	45			1	45			
12	1	15			1	15	1	15					
COILED SLACK								25		75			
TOTAL		530		705		1235		40		1295	1	1	2



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STATE OF TEXAS
ROMA G. STEVENS
100354
PROFESSIONAL ENGINEER

Roma Stevens — 9/25/2024
ROMA G. STEVENS , P.E. — DATE

SCALE: 1" = 100'
50 0 50

PRINT DATE	REVISION DATE
9/25/2024	9/25/2024

Texas Department of Transportation®

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT ROAD PHONE: (713) 828-4742
Houston, TX. 77095

FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		38
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

9/25/2024 9:30:20 AM
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NOTES

1. INSTALL
   1-3" SCH. 80 PVC (BORED)
   IN CONDT. 1#14XHHW ELECT. CONDUCTOR (ORANGE TRACER WIRE)
   1-36 STRAND S/M FIBER OPTIC CABLE
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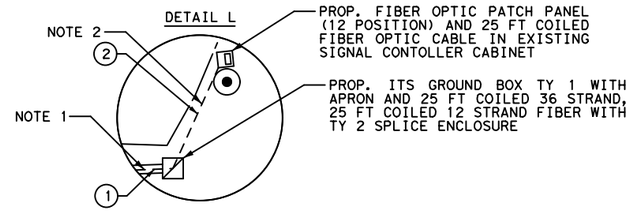

STATE OF TEXAS
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	3" (SCHD 80)				#14 INSUL		12 FIBER		36 FIBER		(6027)	(6027)	(623)
	(7060)		(7061)		(7002)		(7001)		(7002)		(7003)	(7005)	(7002)
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	QUANTITY	QUANTITY	QUANTITY
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EACH	EACH	EACH
1			1	125	1	125			1	125			
2	1	40			1	40	1	40					
COILED SLACK								25		25			
TOTAL		40		125		165		65		150	1	1	1

ADDITIONAL NOTES

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Houston, TX. 77095
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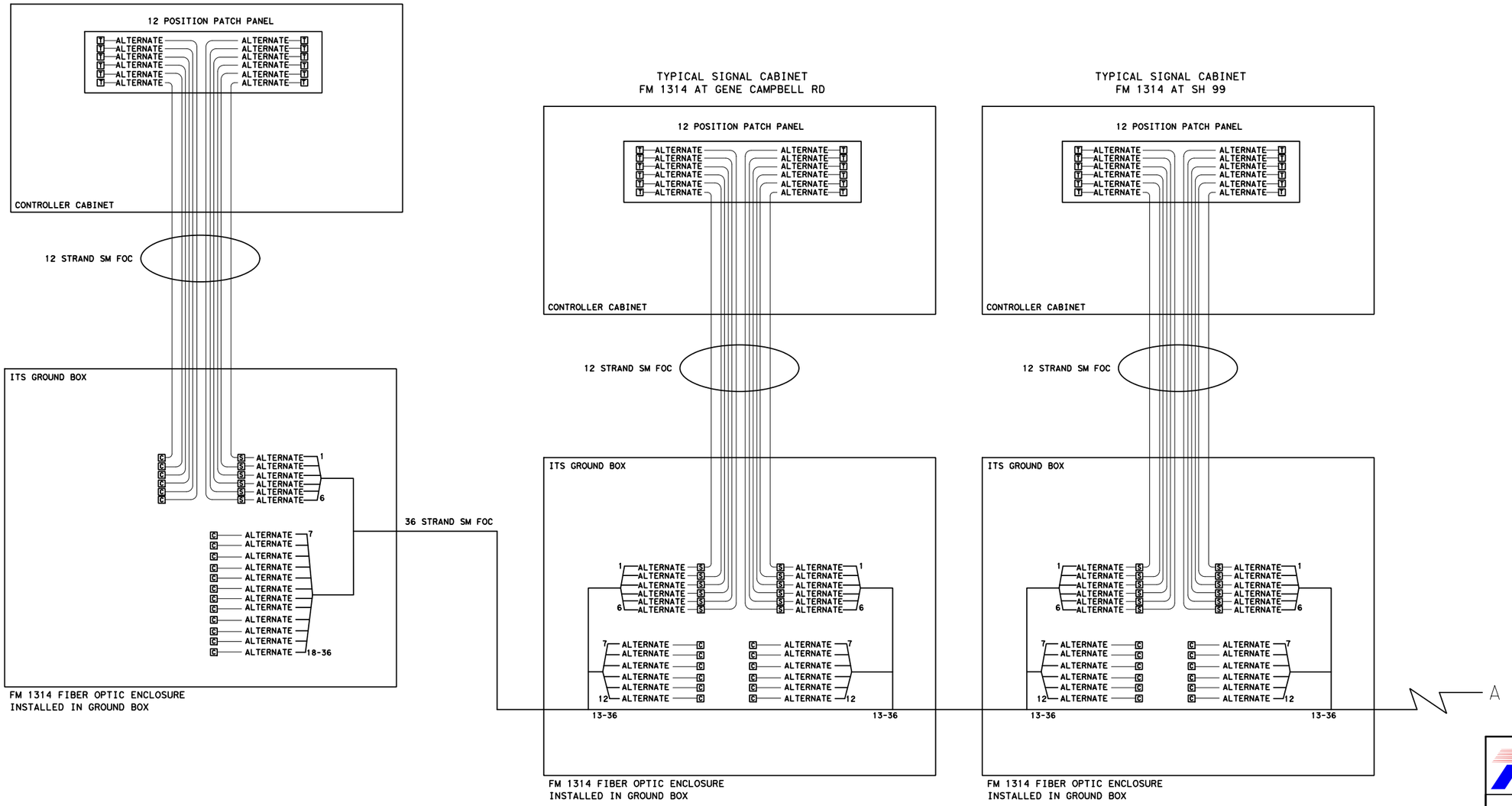
FM 1314 FROM OLD HOUSTON RD TO LOOP 494

FIBER OPTIC CABLE LAYOUTS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		39
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

TYPICAL SIGNAL CABINET
FM 1314 AT OLD HOUSTON RD



TYPICAL SIGNAL CABINET
FM 1314 AT GENE CAMPBELL RD

TYPICAL SIGNAL CABINET
FM 1314 AT SH 99

A

LEGEND

- [T] FC CONNECTOR
- [S] FUSION SPLICE
- [C] COIL FIBER FOR FUTURE USE

Roma Stevens — 9/25/2024
ROMA G. STEVENS , P.E. — DATE

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Houston, TX. 77095

FM 1314
FROM OLD HOUSTON RD TO LOOP 494

FIBER CABLE TERMINATION ASSIGNMENTS S/M

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		40
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

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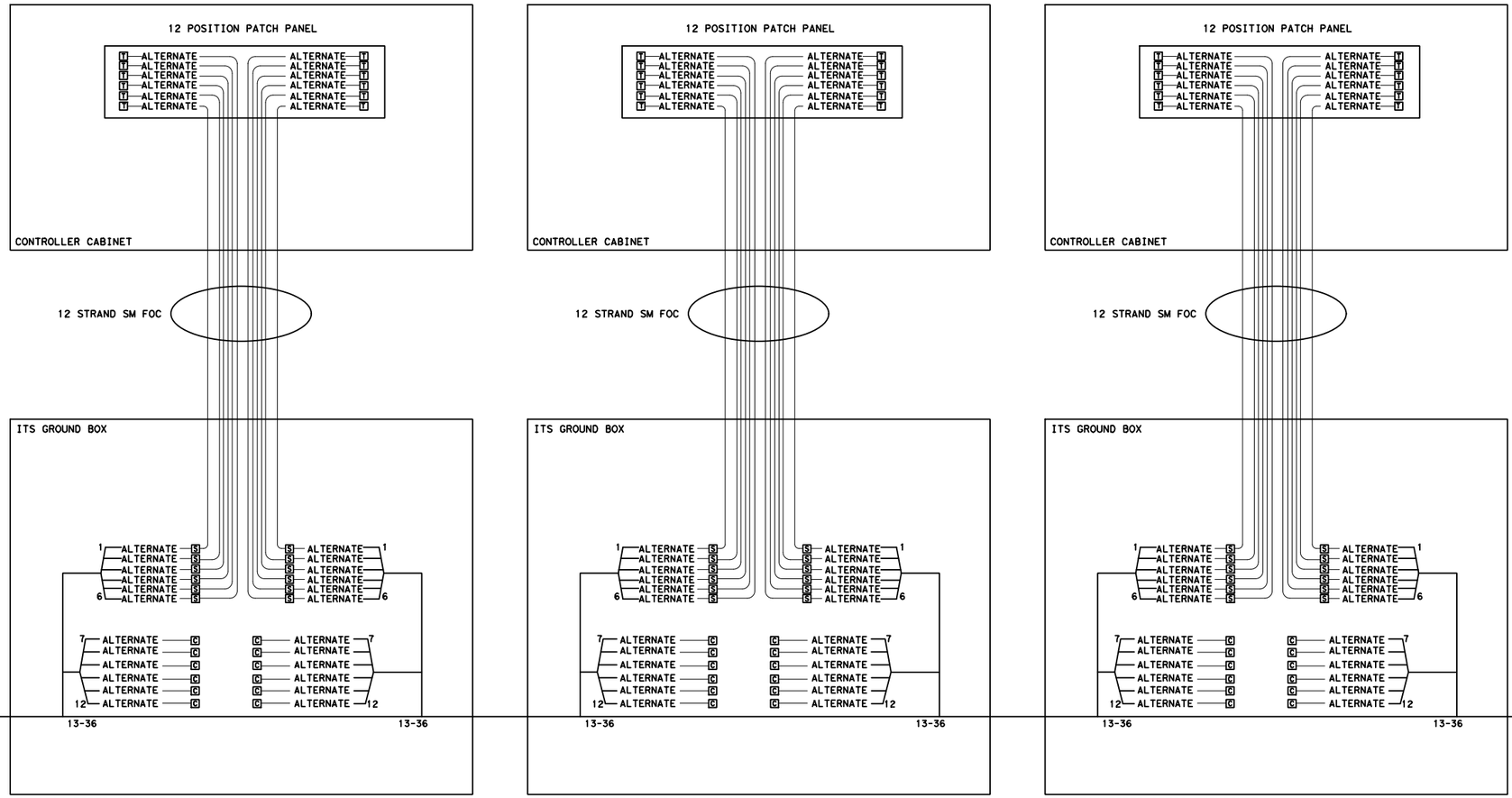
TYPICAL SIGNAL CABINET
FM 1314 AT PAINTED BLVD/
CUMBERLAND BLVD

TYPICAL SIGNAL CABINET
FM 1314 AT TIMBERLAND BLVD

TYPICAL SIGNAL CABINET
FM 1314 AT RIVERWALK DR/
SPARTAN DR



LEGEND

- T — FC CONNECTOR
- S — FUSION SPLICE
- C — COIL FIBER FOR FUTURE USE

STATE OF TEXAS
ROMA G. STEVENS
100354
LICENSED
PROFESSIONAL ENGINEER

Roma Stevens — 9/25/2024
ROMA G. STEVENS , P.E. — DATE

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Houston, TX. 77095
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FM 1314
FROM OLD HOUSTON RD TO LOOP 494

FIBER CABLE TERMINATION ASSIGNMENTS S/M

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		41
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

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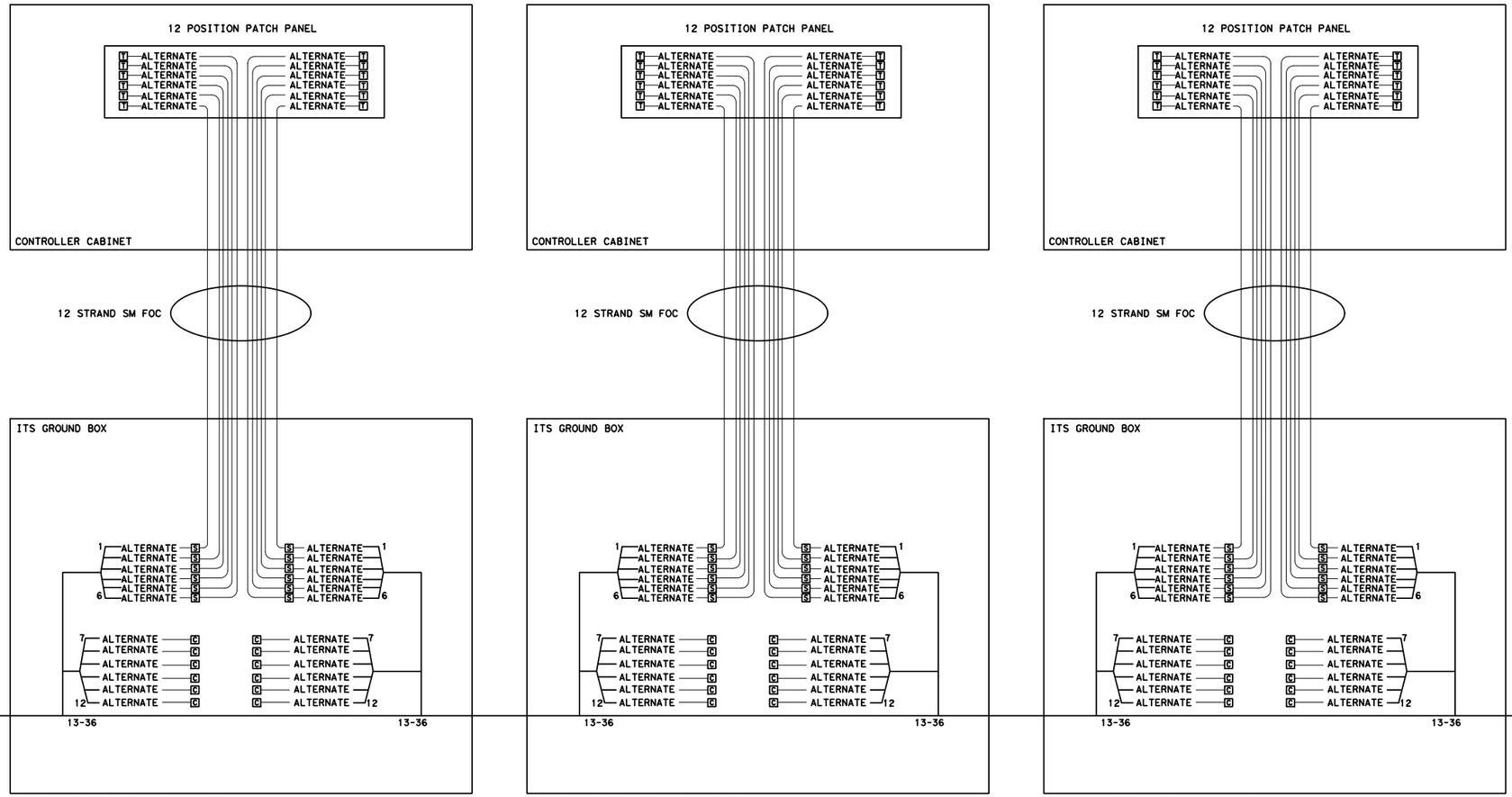
TYPICAL SIGNAL CABINET
FM 1314 AT SORTERS RD

TYPICAL SIGNAL CABINET
FM 1314 AT VALLEY RANCH PKWY

TYPICAL SIGNAL CABINET
FM 1314 AT PARTNERS WAY



LEGEND

- [T] FC CONNECTOR
- [S] FUSION SPLICE
- [C] COIL FIBER FOR FUTURE USE

STATE OF TEXAS
ROMA G. STEVENS
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FM 1314
FROM OLD HOUSTON RD TO LOOP 494

FIBER CABLE TERMINATION ASSIGNMENTS S/M

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		42
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

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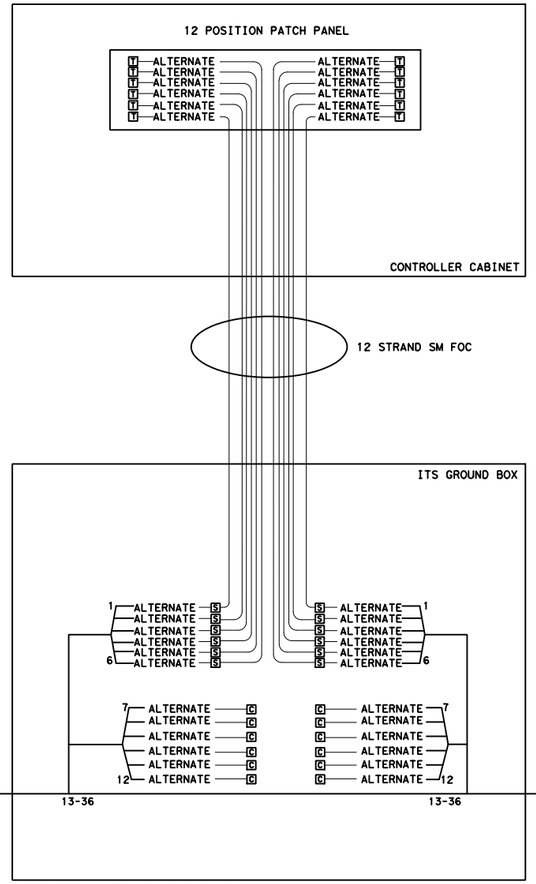
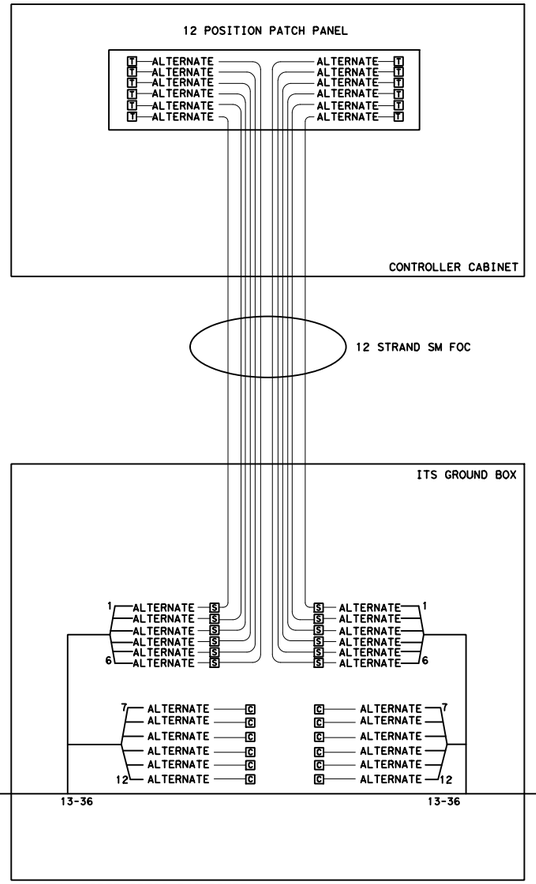
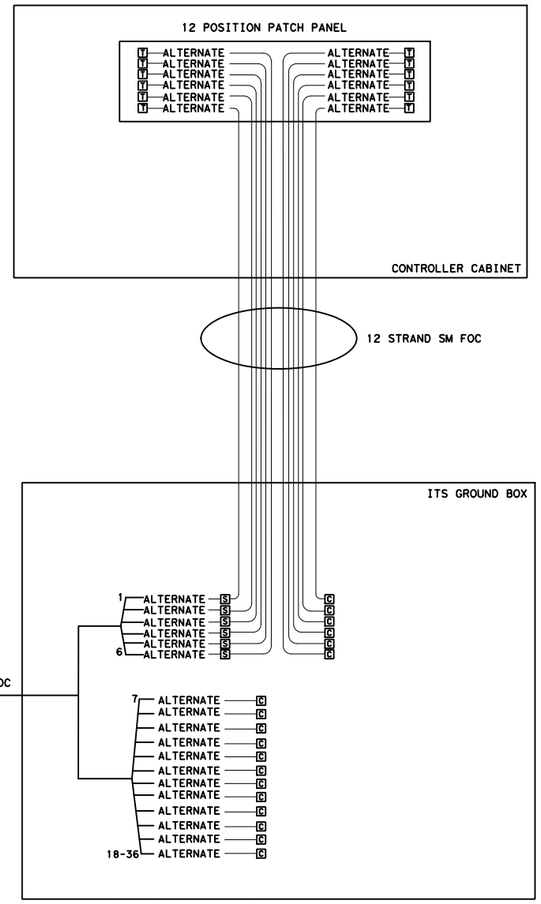
TYPICAL SIGNAL CABINET
FM 1314 AT IH 69/US 59



TYPICAL SIGNAL CABINET
FM 1314 AT COMMERCE AVE



TYPICAL SIGNAL CABINET
FM 1314 AT SH 494



LEGEND

- T FC CONNECTOR
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STATE OF TEXAS
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FIBER CABLE TERMINATION ASSIGNMENTS S/M

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		43
STATE	DIST	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT	SECT	JOB	HIGHWAY
1986	01	072	FM 1314

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DATE:
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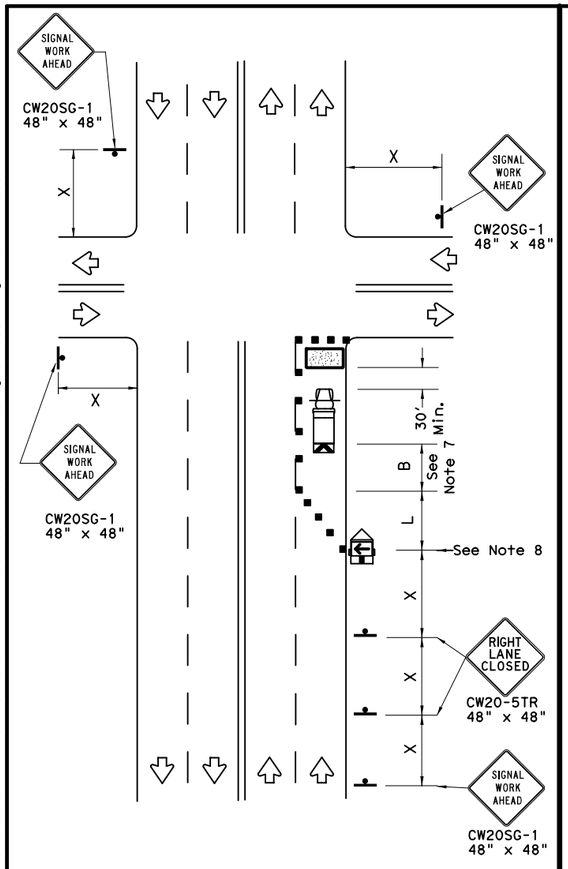
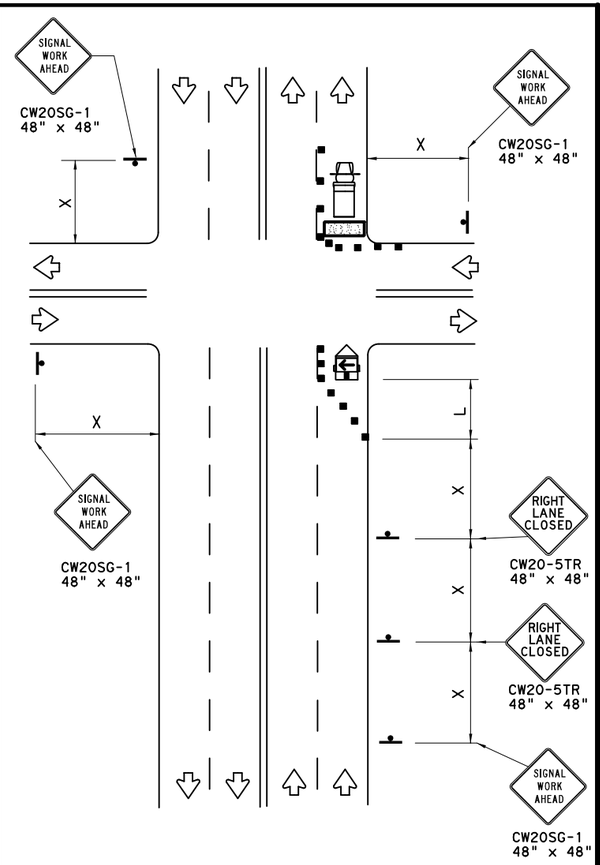


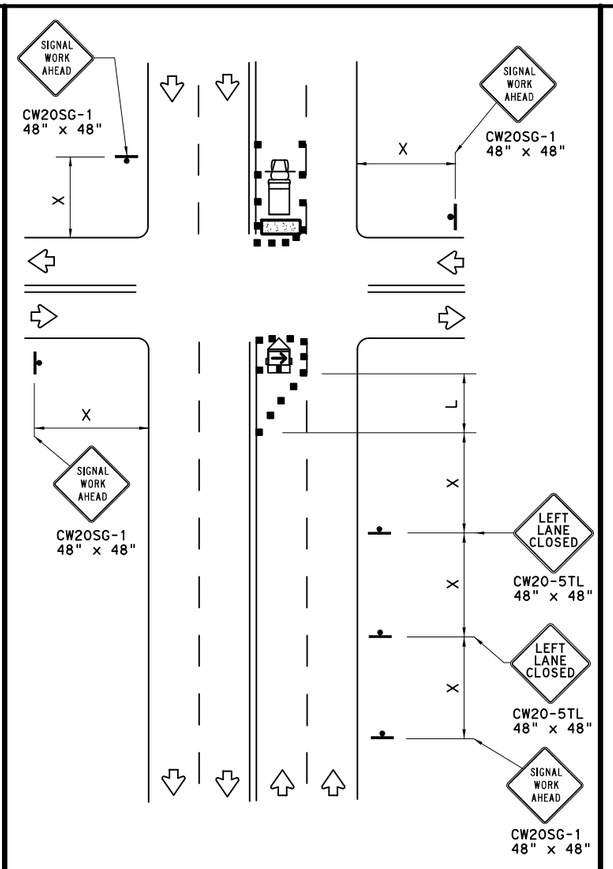
NEAR SIDE LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



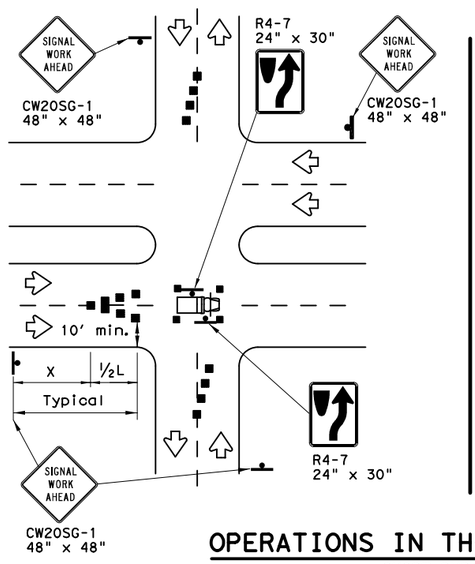
FAR SIDE RIGHT LANE CLOSURE

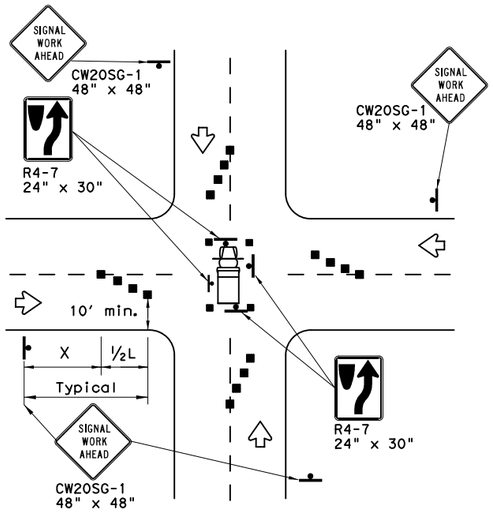
SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE LEFT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY





OPERATIONS IN THE INTERSECTION

SHORT DURATION

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.

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.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ(BTS-1)-13

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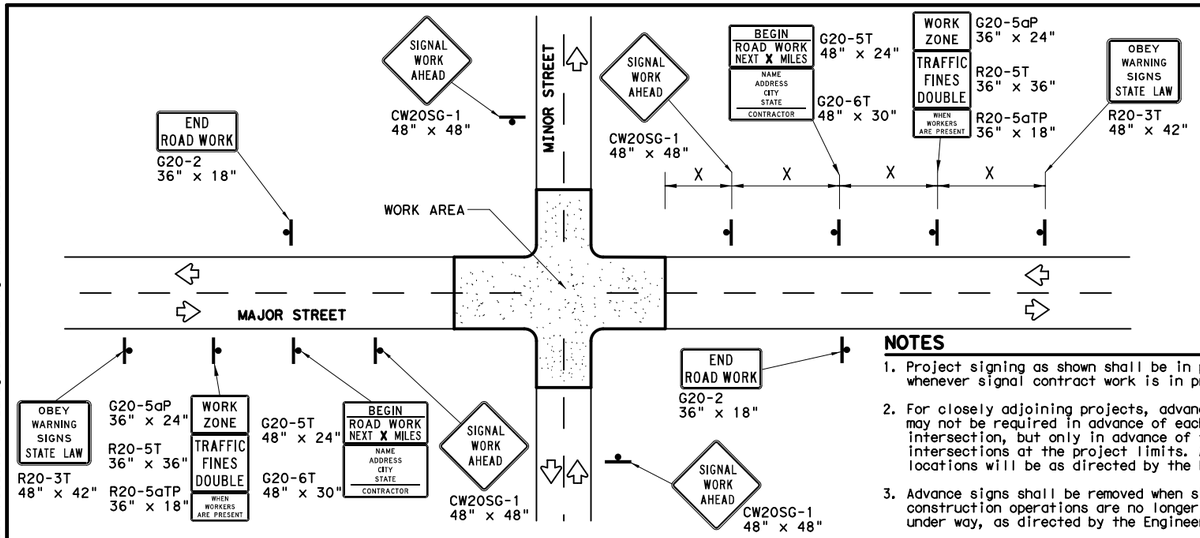


TYPICAL ADVANCE SIGNAL PROJECT SIGNING

FOR LONG TERM and INTERMEDIATE-TERM STATIONARY WORK OPERATIONS

NOTES

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

DURATION OF WORK

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

SIGN MOUNTING HEIGHT

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

REMOVING OR COVERING

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

REFLECTIVE SHEETING

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

SIGN SUPPORT WEIGHTS

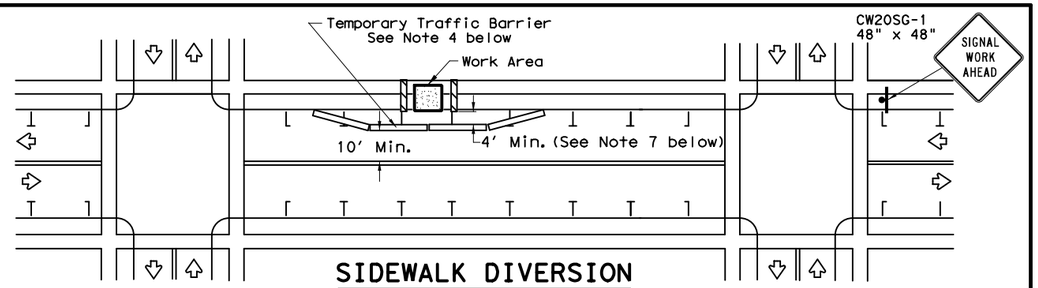
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support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

LEGEND	
	Sign
	Channelizing Devices
	Type 3 Barricade

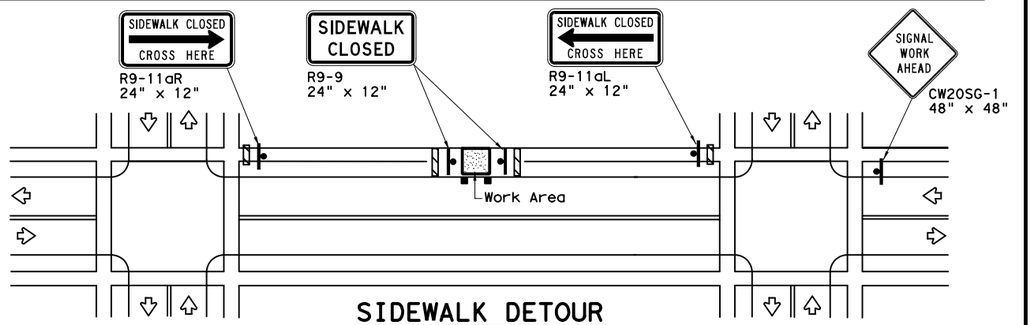
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

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

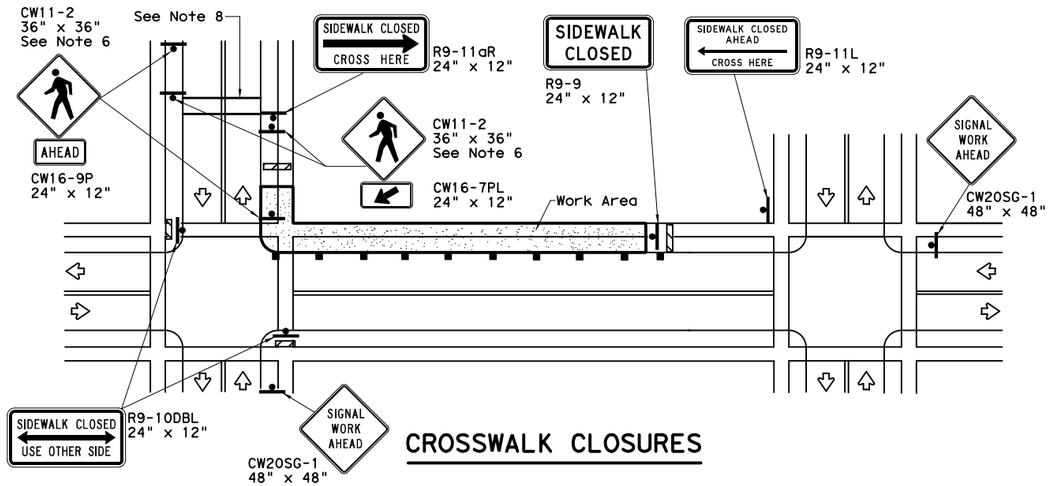
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



SIDEWALK DIVERSION



SIDEWALK DETOUR



CROSSWALK CLOSURES

PEDESTRIAN CONTROL

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

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GENERAL NOTES FOR ALL ELECTRICAL WORK

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

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

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

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

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

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

CONDUIT

A. MATERIALS

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

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

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

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

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

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

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

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

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

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

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

B. CONSTRUCTION METHODS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

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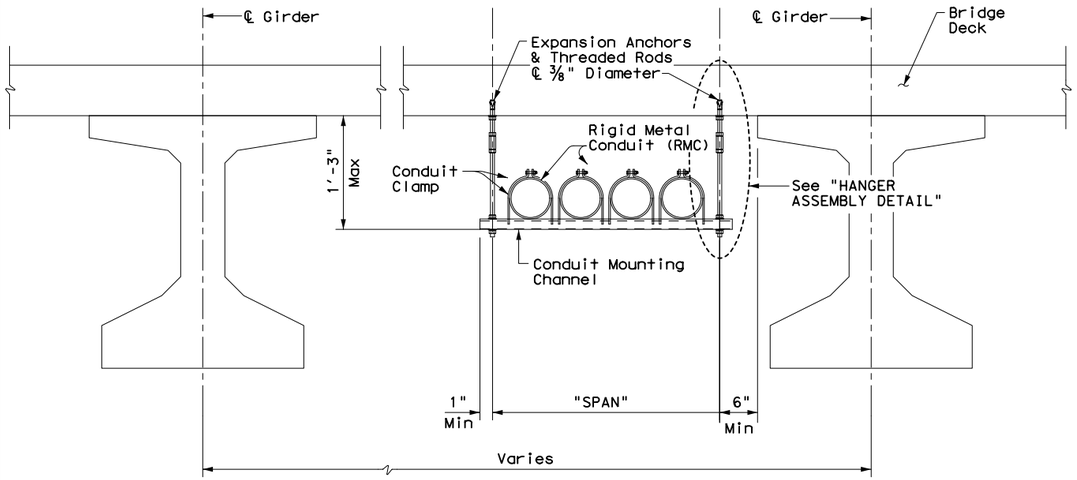
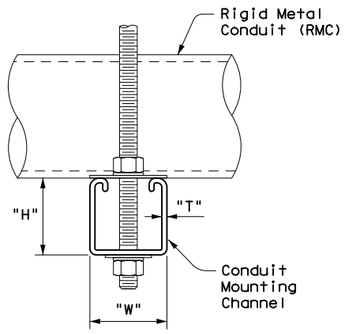
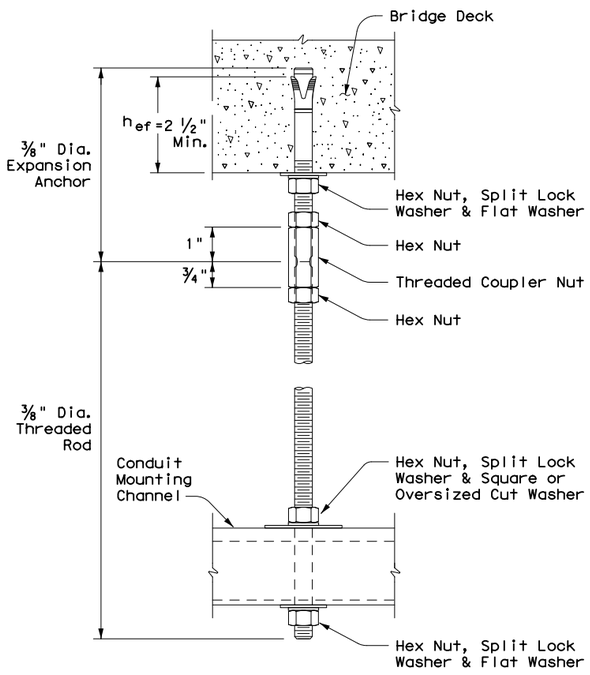


CONDUIT HANGING DETAIL

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

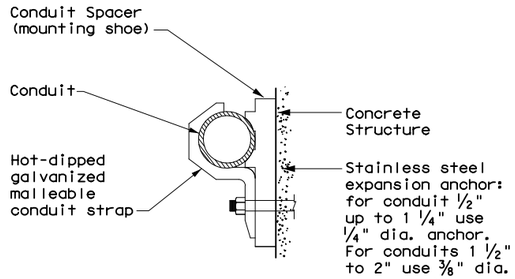
Channels with round or short slotted hole patterns are allowed, if the load carrying capacity is not reduced by more than 15%.

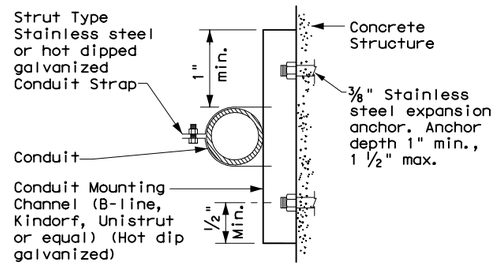




HANGER ASSEMBLY DETAIL

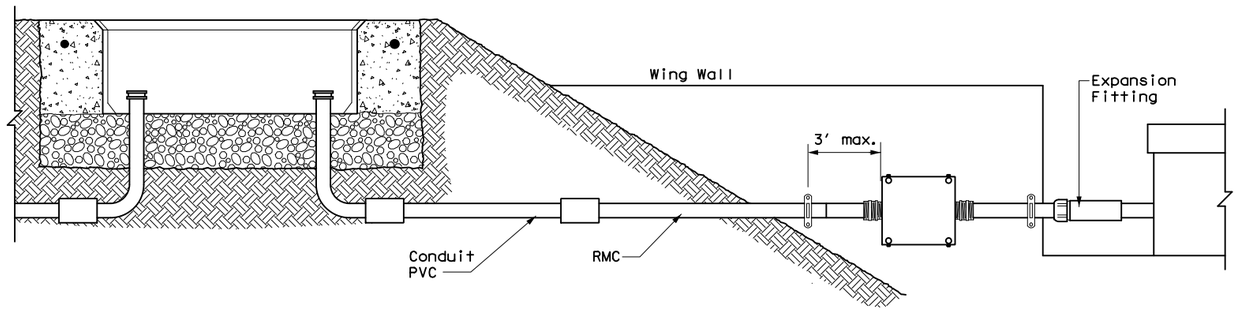
ELECTRIC CONDUIT TO BRIDGE DECK ATTACHMENT





CONDUIT MOUNTING OPTIONS

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



TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL

EXPANSION ANCHOR NOTES FOR BRIDGE DECK ATTACHMENT

1. Use torque controlled mechanical expansion anchors that are approved for use in cracked concrete by the International Code Council, Evaluation Service (ICC-ES). The chosen anchor product shall have a designated ICC-ES Evaluation Report number, and its approval status shall be maintained on the ICC-ES website under Division 031600 for Concrete Anchors.

2. Unless otherwise approved by the Engineer: do not use adhesive anchors; do not use expansion anchors that are not included in the ICC-ES approval list; and do not use expansion anchors that are only approved for use in uncracked concrete.

3. Use anchors manufactured with stainless steel expansion wedges. Anchors manufactured with carbon steel expansion wedges are not allowed. Anchor bodies can be either zinc-plated carbon steel or stainless steel. For application in marine environment, both the anchor body and expansion wedge shall be stainless steel.

4. Install anchors as shown on the plans and in accordance with the anchor manufacturer's published installation instructions. Arrange a field demonstration test to evaluate the procedures and tools. The test shall be witnessed and approved by the Engineer prior to furnishing anchors on the structure.

5. Prior to hole drilling, use rebar locator to ensure clearing of existing deck strands or reinforcement. Install anchors to ensure a minimum effective embedment depth, (h_{ef}), as shown. Increase (h_{ef})as needed to ensure sufficient thread length for proper torqueing and tightening of anchors.

6. Use anchors of minimum 1600 Lbs tensile capacity (minimum of steel, concrete breakout, and concrete pullout strengths as determined by ACI 318 Appendix D) at the required minimum embedment depth (h_{ef}). No lateral loads shall be introduced after conduit installation.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
CONDUIT SUPPORTS

ED(2)-14

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ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

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

B. CONSTRUCTION METHODS

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

C. TEMPORARY WIRING

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

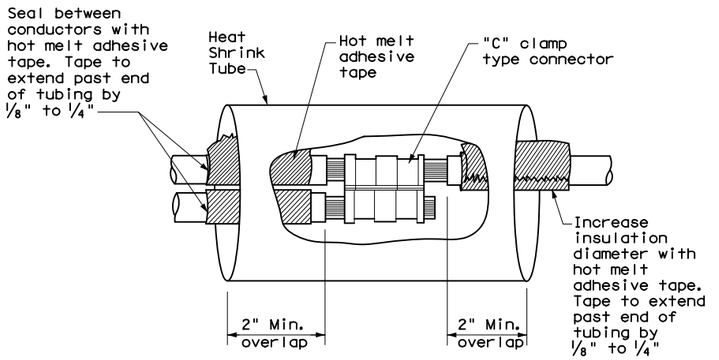
GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

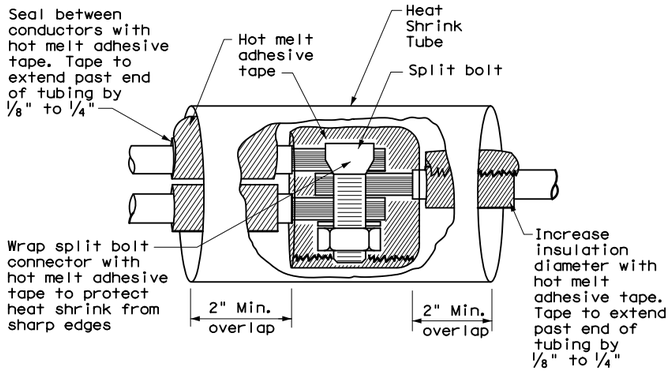
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in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

B. CONSTRUCTION METHODS

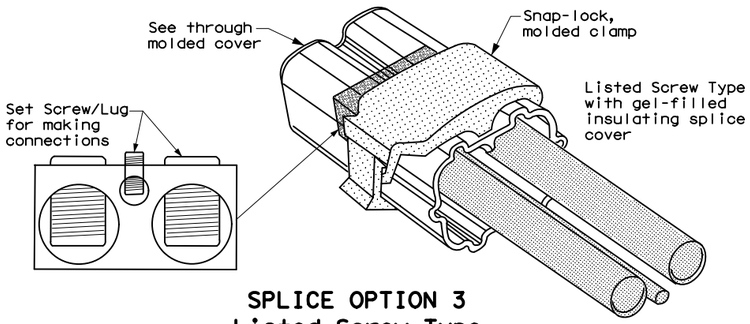
1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil,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



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

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ELECTRICAL DETAILS CONDUCTORS

ED(3)-14

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		HOU	MONTGOMERY			48	

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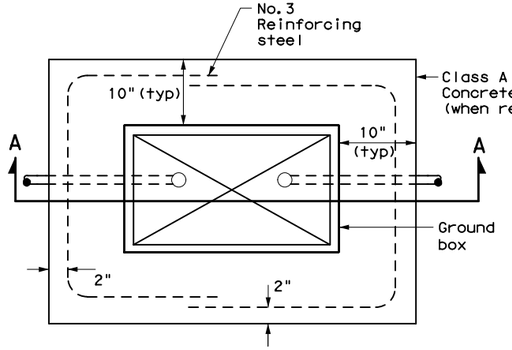
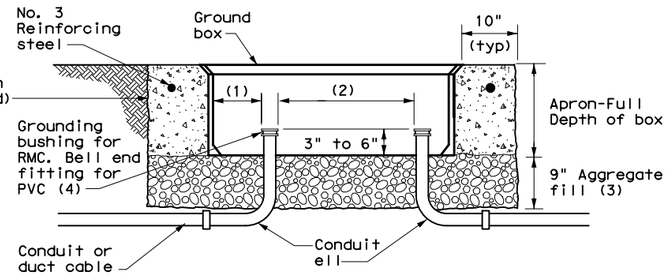


PLAN VIEW



SECTION A - A

APRON FOR GROUND BOX

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

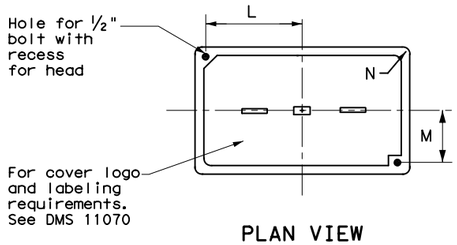
(2) Maintain sufficient space between conduits to allow for proper installation of bushing.

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

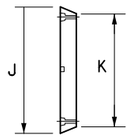
(4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

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

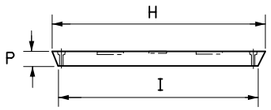
GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



PLAN VIEW



END



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

ED(4)-14

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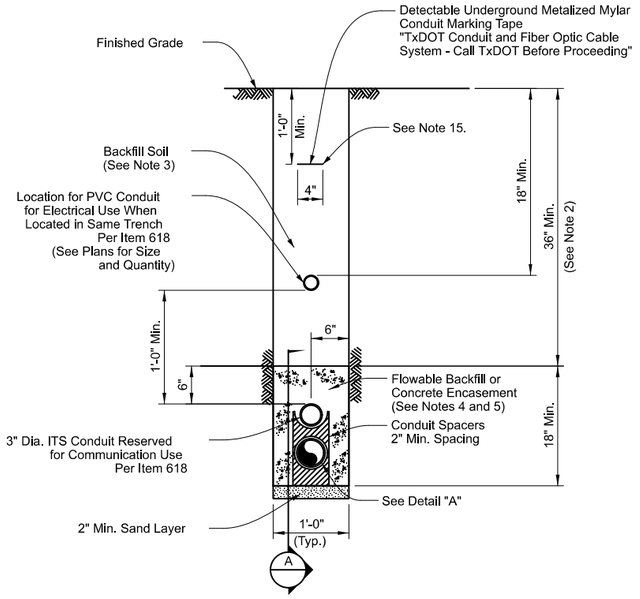
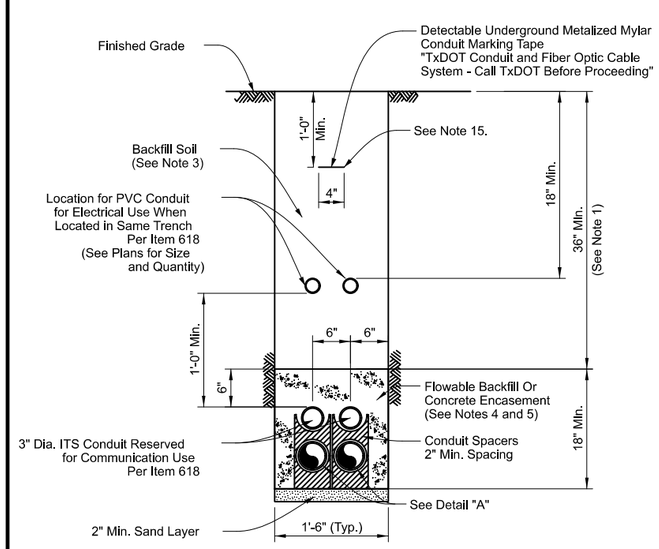


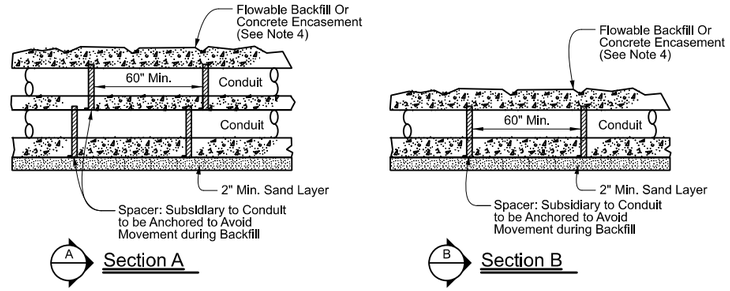
ITS Conduit Backbone Trench Vertical Spacing

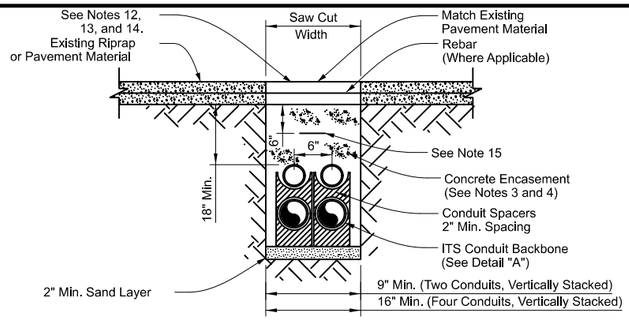
Two Conduit System



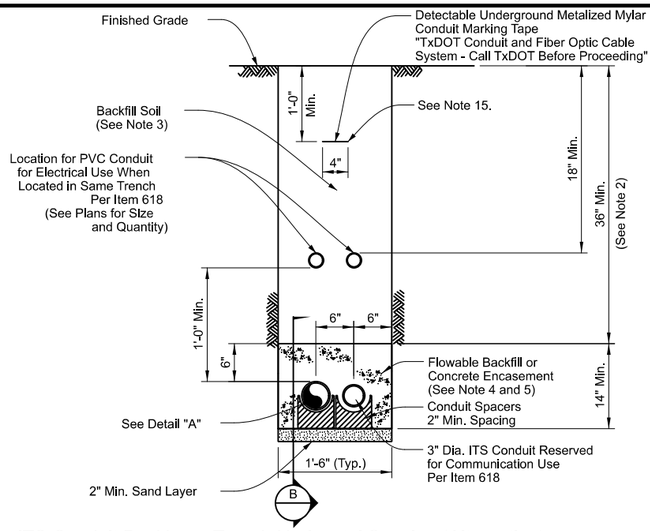
ITS Conduit Backbone Trench Vertical Spacing

Four Conduit System



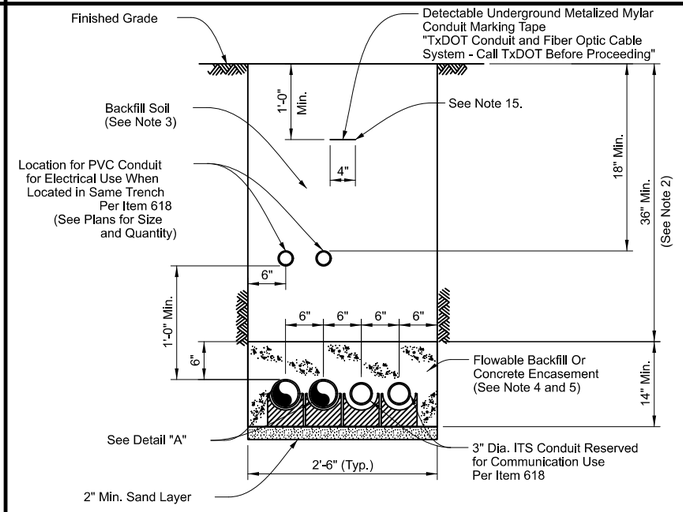


Open Cut Trenching Details



ITS Conduit Backbone Trench Horizontal Spacing (Alternative)

Two Conduit System

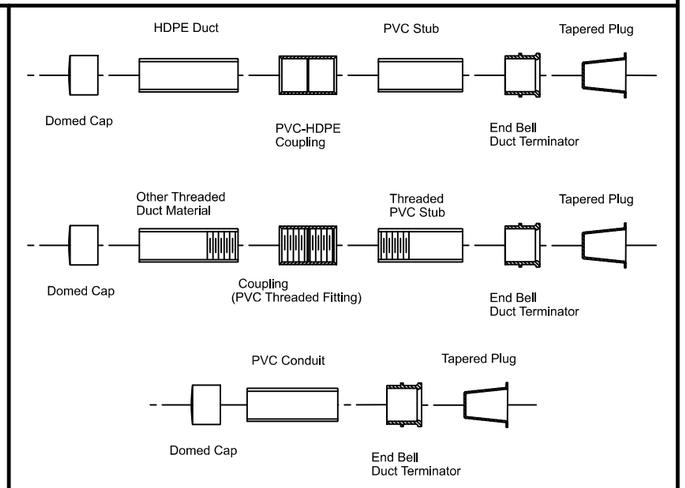


ITS Conduit Backbone Trench Horizontal Spacing (Alternative)

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

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Traffic Operations Division Standard

ITS CONDUIT TRENCH DETAILS

ITS(27)-16

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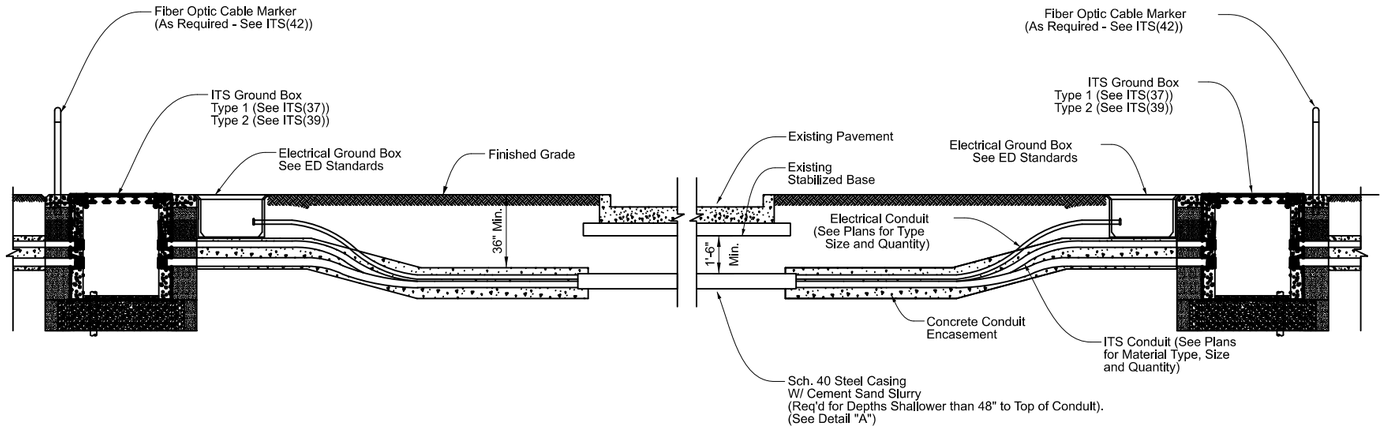
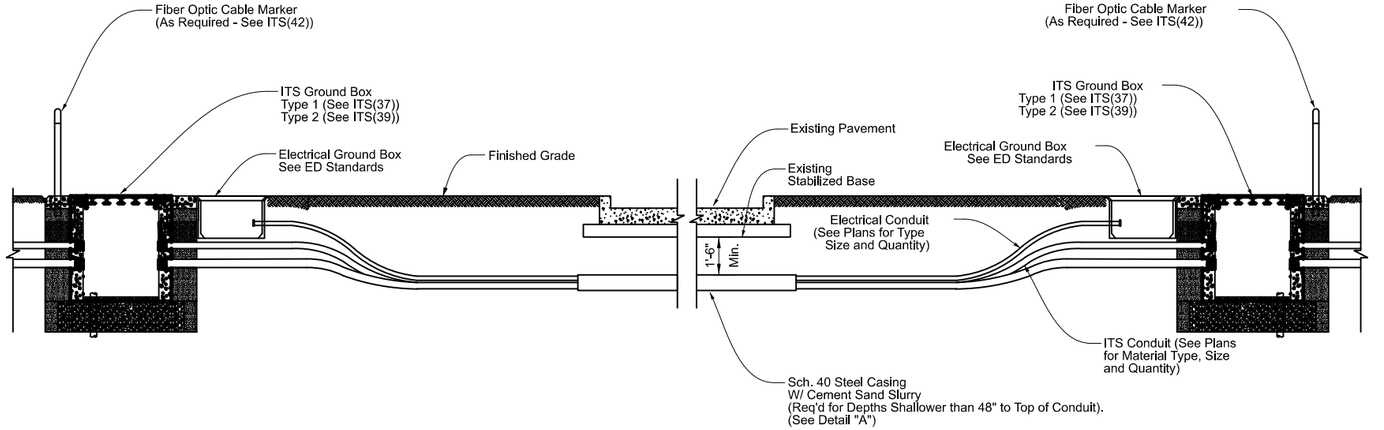
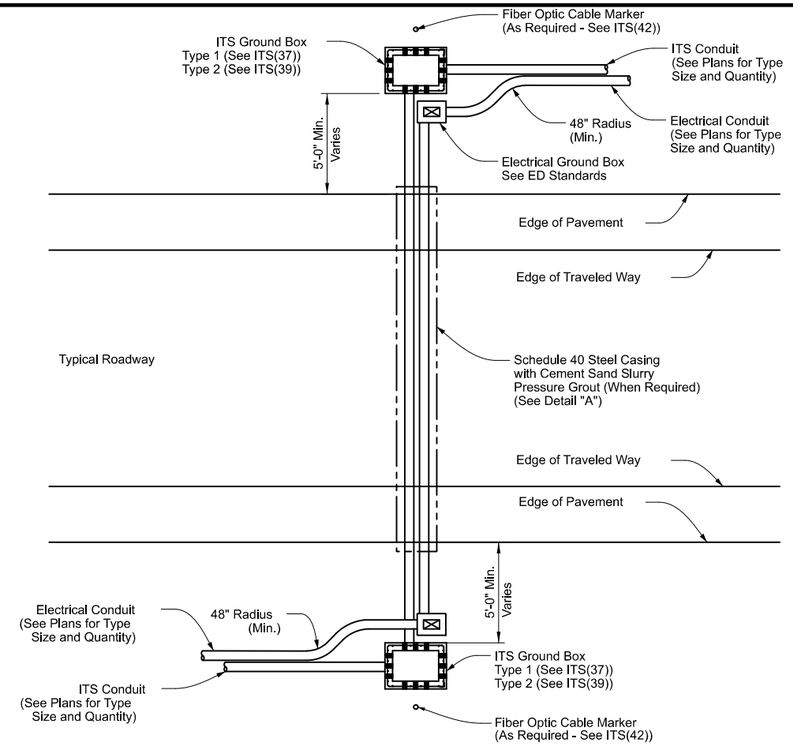


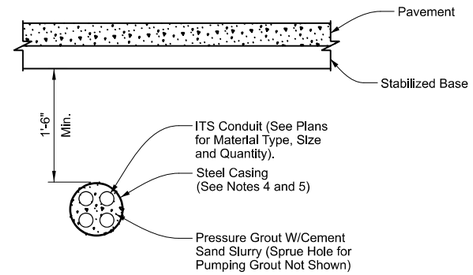
Typical Conduit Installation Jacking
or Boring Beneath Existing Roadway



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



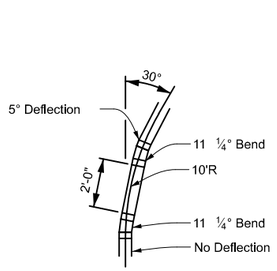
Bore Under Pavement



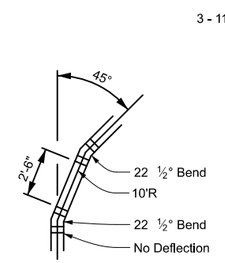
Steel Casing Detail "A"

General Notes:

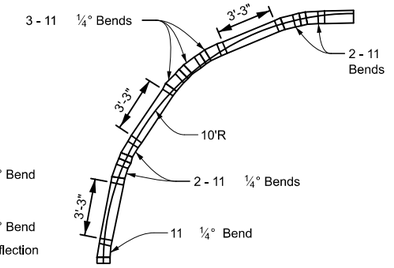
1. Typical conduit installation details for jacking or boring beneath existing roadway is diagrammatic in nature. Roadway cross-slopes may vary for each crossing.
2. Jack or bore in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box" except for measurement and payment.
3. Furnishing 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

Provide this arrangement of conduit and fittings or approved equal at all 30°, 45°, and 90° bends, horizontal and vertical, to achieve a nominal 10' conduit radius for pre-assembled multi-duct conduit. See Note 7.

Sheet Details
Not to Scale

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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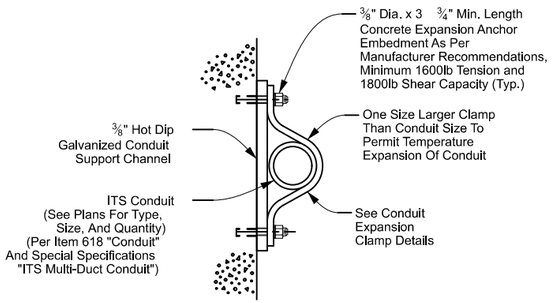
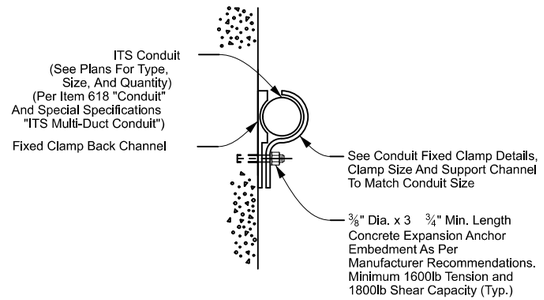
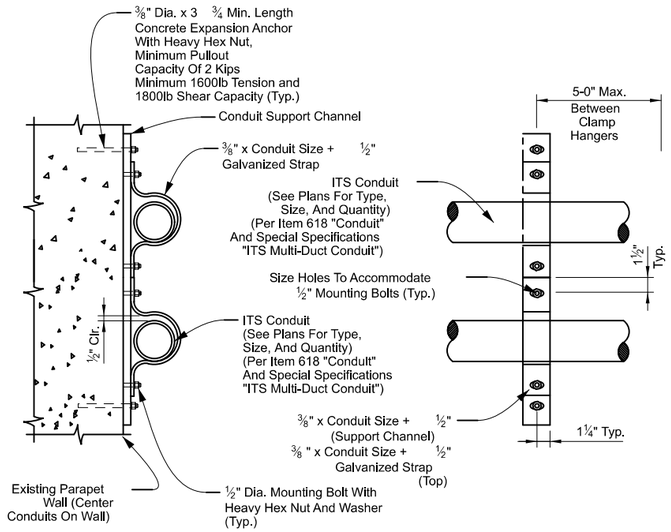


Conduit Expansion Clamp



Conduit Fixed Clamp

Conduit Clamp Details (Typ.)

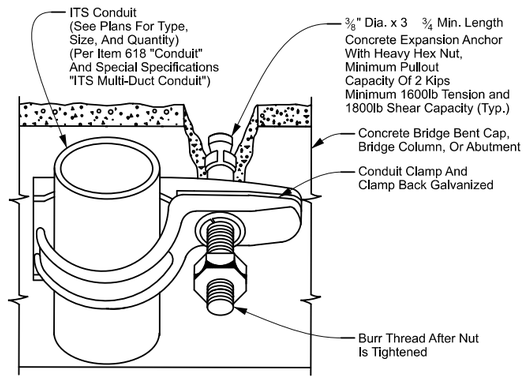


Side View

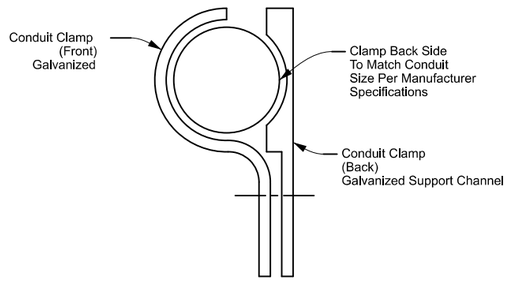
Top View

Elevation View

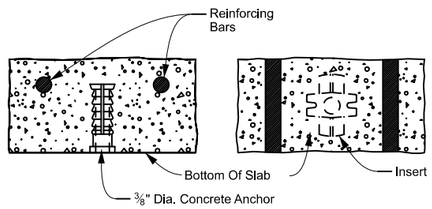
Conduit Expansion Clamp Details



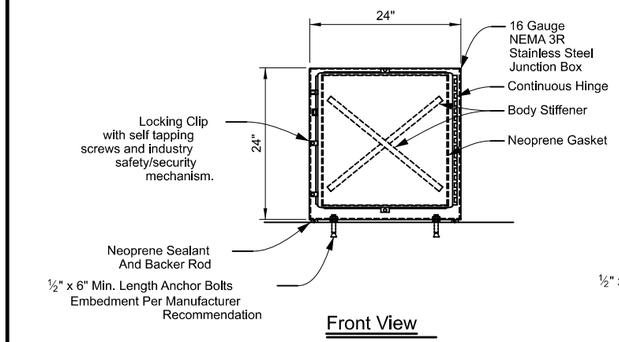
Conduit Fixed Clamp Back Channel



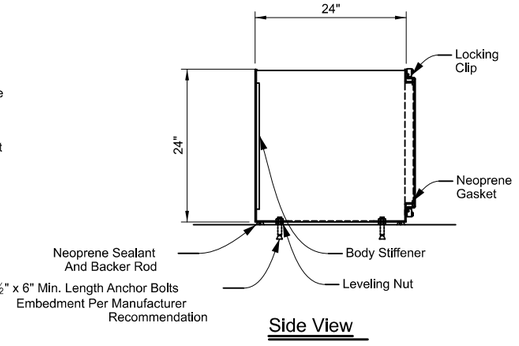
Conduit Fixed Clamp Details
Side View



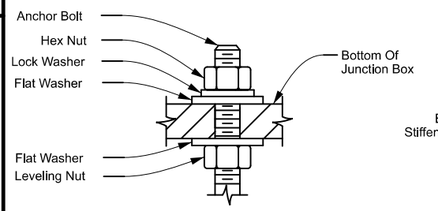
Conduit Fixed Clamp Concrete Insert Detail



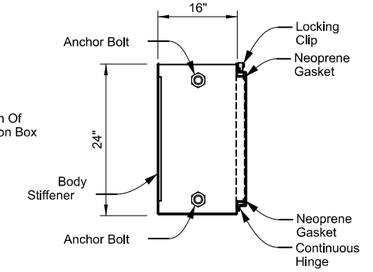
Front View



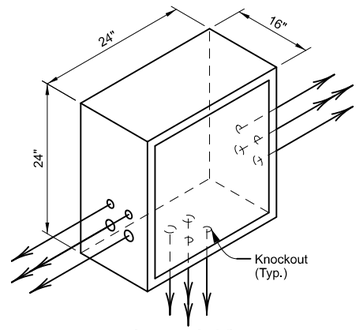
Side View



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.

Texas Department of Transportation

Traffic Operations Division Standard

PARAPET MOUNTED ITS CONDUIT AND TRANSITION BOX DETAIL

ITS(31)-16

FILE: its(31)-16.dgn		DN: TxDOT	CK: TxDOT	DW: TxDOT		CK: TxDOT	
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		HOU	MONTGOMERY			52	

Sheet Details
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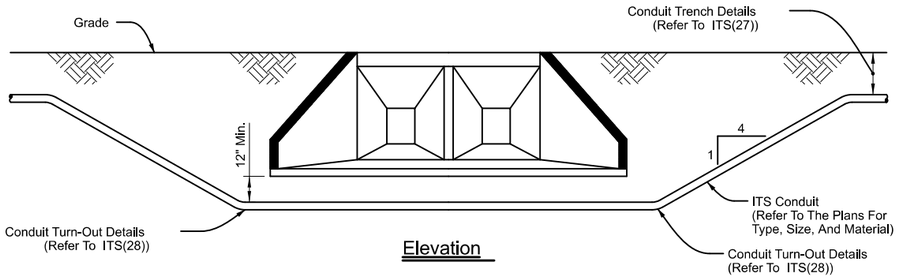
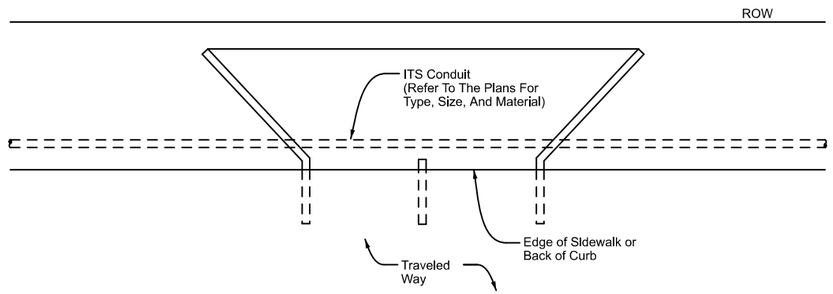
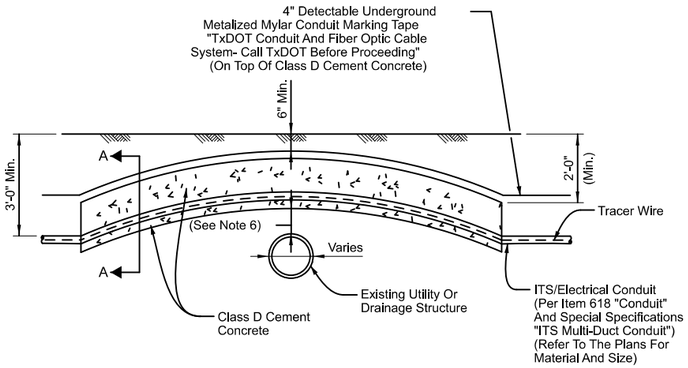


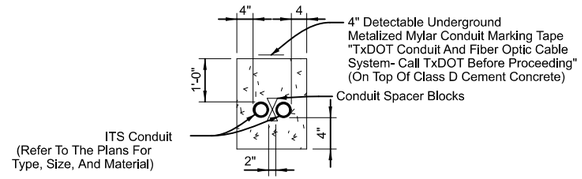
Elevation



Plan View

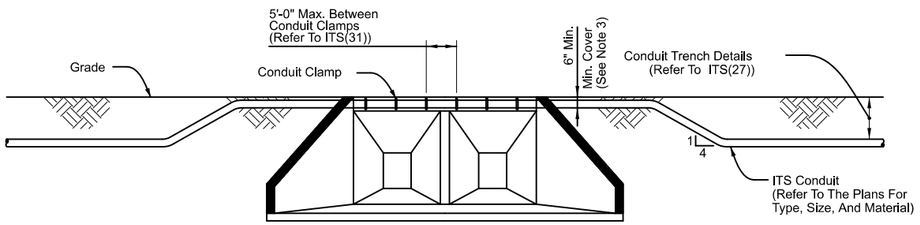
Conduit Bored Under Culvert



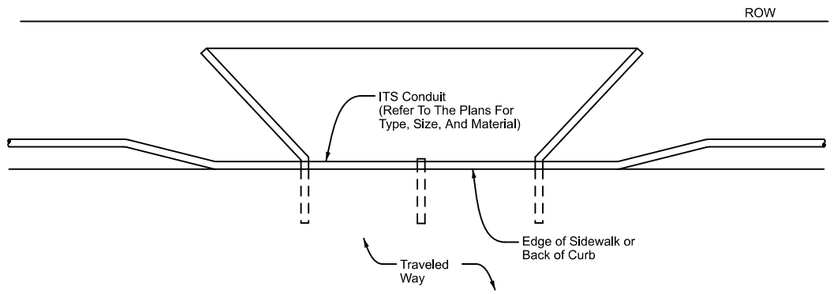


Section A-A

Conduit Installation Detail Above
Existing Drain Pipes Or Utilities

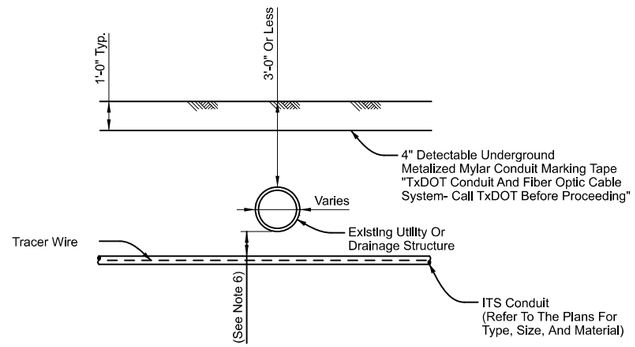


Elevation



Plan View

Conduit Attached To Culvert Headwall



Conduit Installation Detail Below
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.

Sheet Details
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Texas Department of Transportation

Traffic Operations Division Standard

ITS CONDUIT OBSTRUCTION CROSSING

ITS(35)-16

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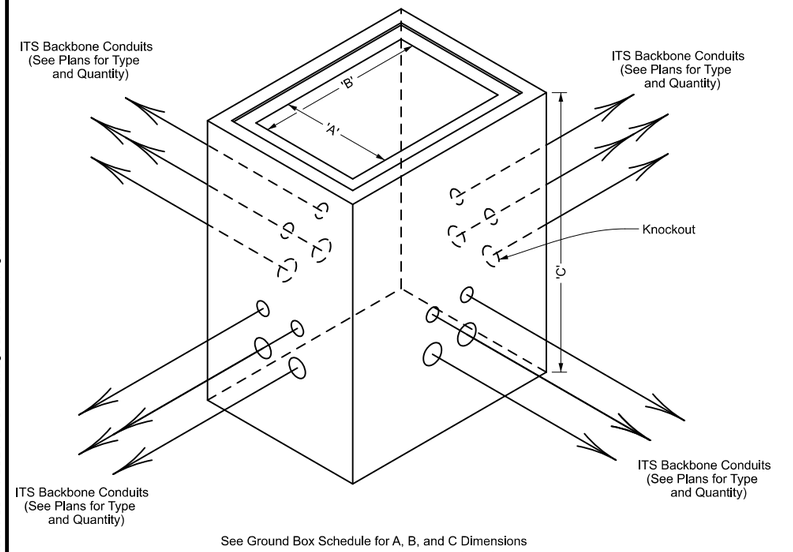
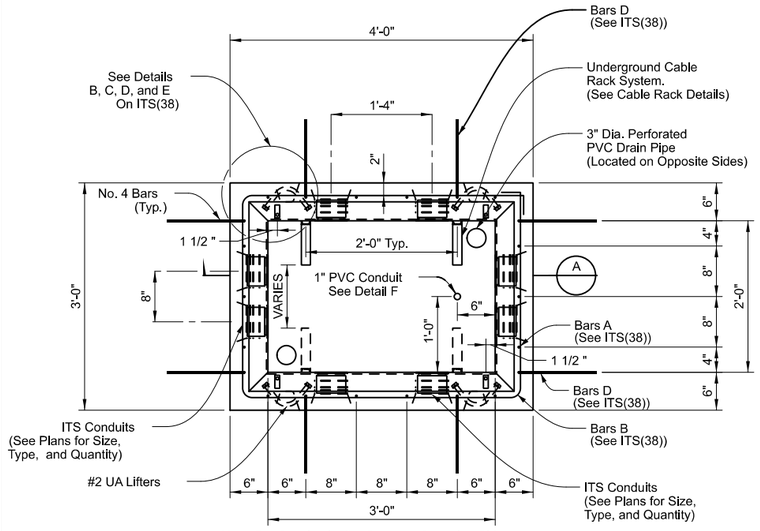


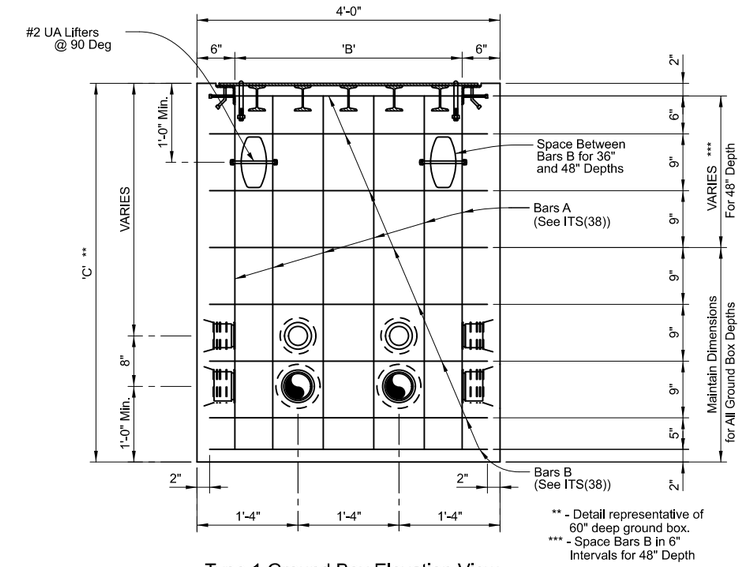
See Ground Box Schedule for A, B, and C Dimensions

Type 1 Ground Box Isometric View



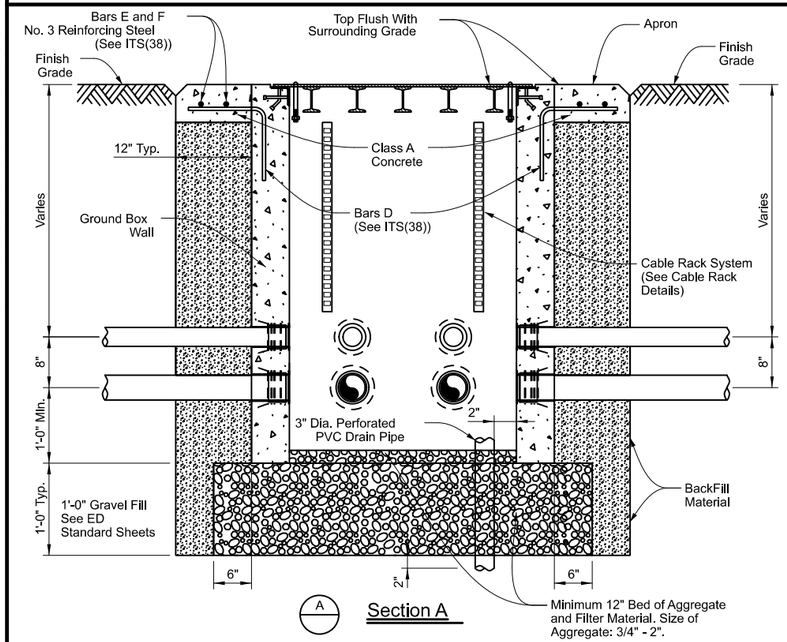
Note: Bar Spacing is The Same on Opposing Sides.

Type 1 Ground Box Plan View

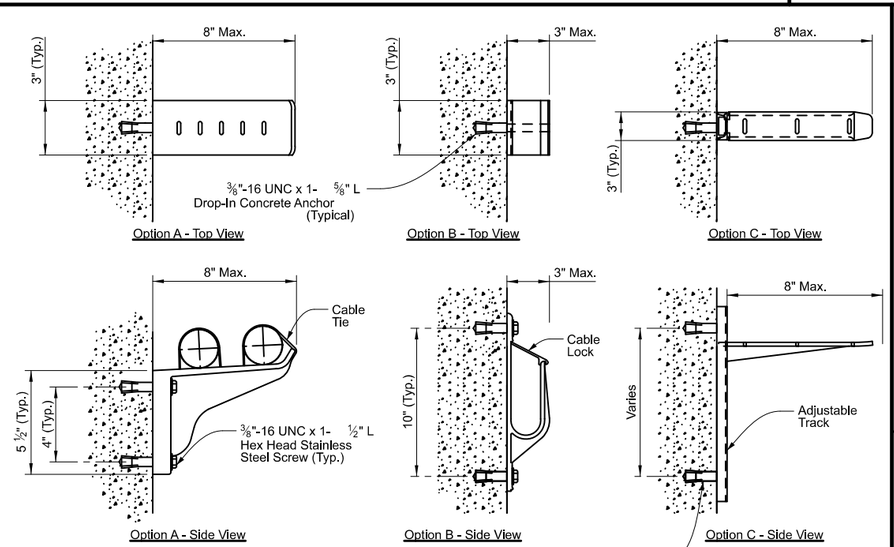


** - Detail representative of 60" deep ground box.
*** - Space Bars B in 6" Intervals for 48" Depth

Type 1 Ground Box Elevation View

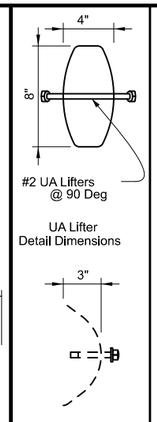


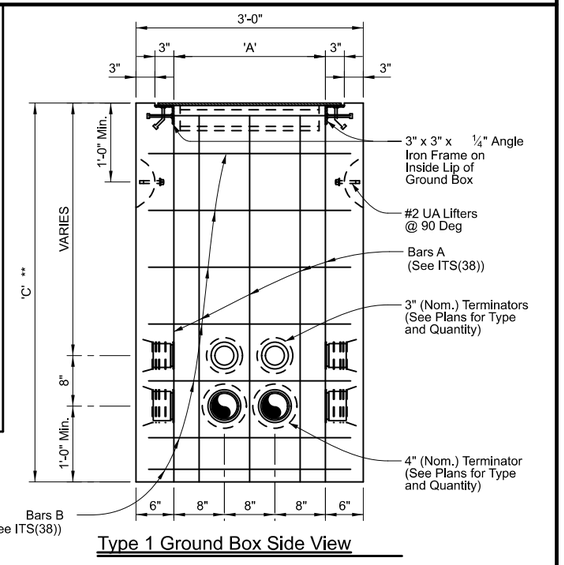
A Section A



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
Not to Scale

Texas Department of Transportation

Traffic Safety Division Standard

ITS GROUND BOX DETAILS TYPE "1" WITH STEEL COVER

ITS(37)-22

FILE: its(37)-22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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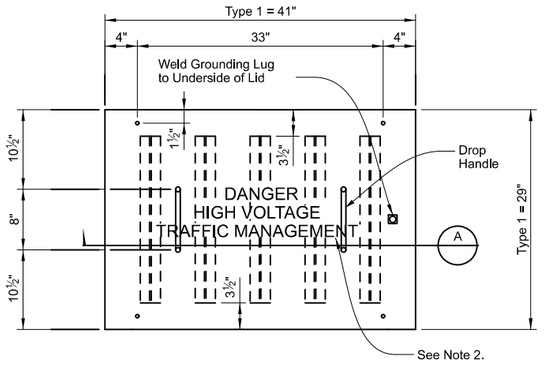
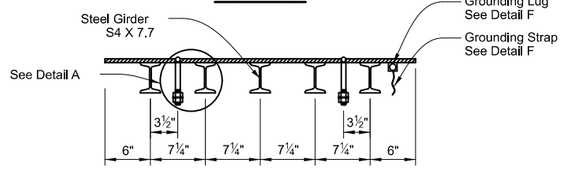
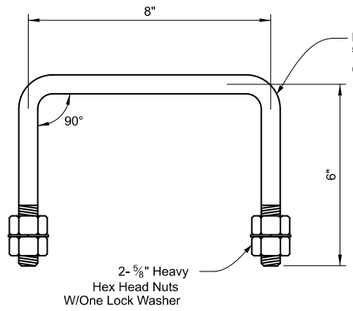


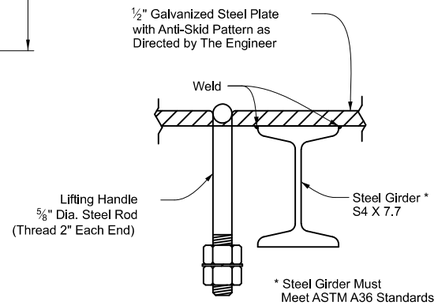
Type 1 Steel Cover Details
Top View



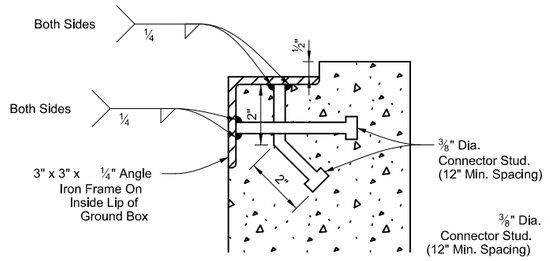
A Section A



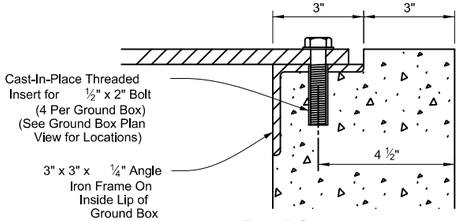
Drop Handle Detail



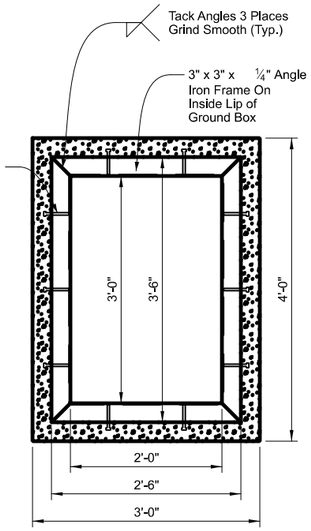
Detail A



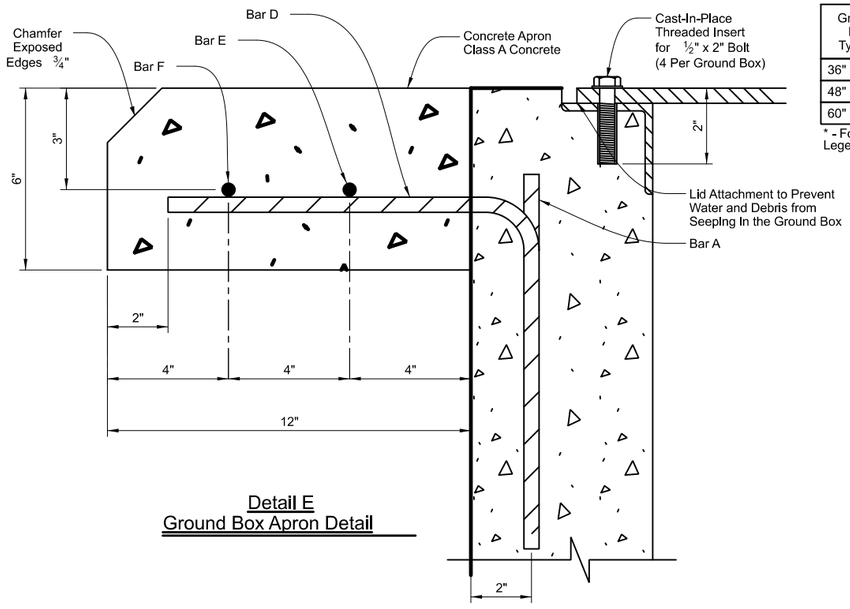
Detail B



Detail C
Lid Attachment Detail



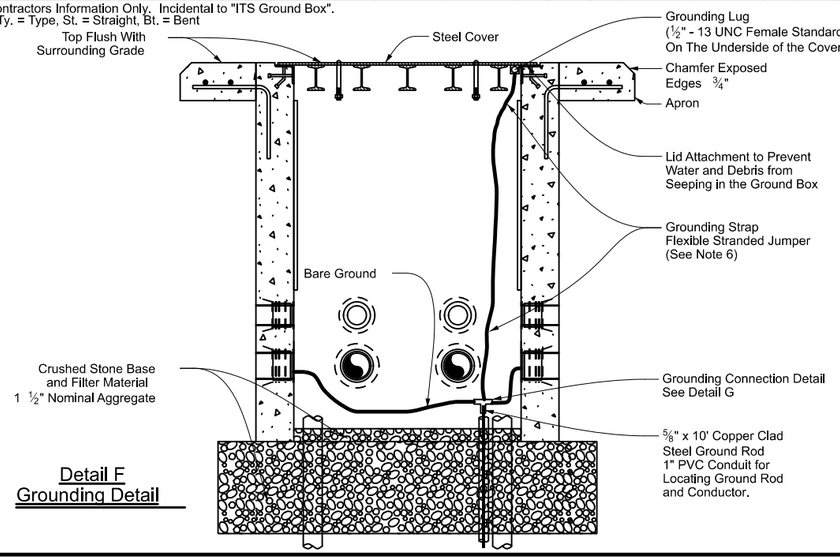
Detail D



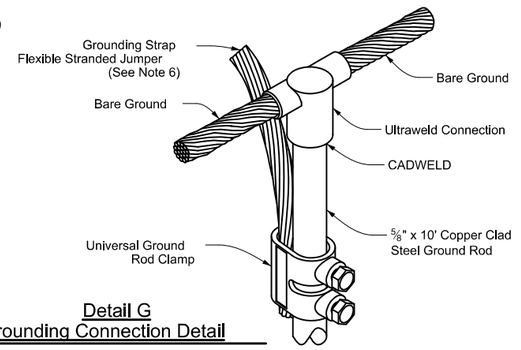
Detail E
Ground Box Apron Detail

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.

DATE:
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Sheet Details
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SHEET 2 OF 2

Texas Department of Transportation

Traffic Operations Division Standard

ITS GROUND BOX DETAILS TYPE "1" WITH STEEL COVER

ITS(38)-17

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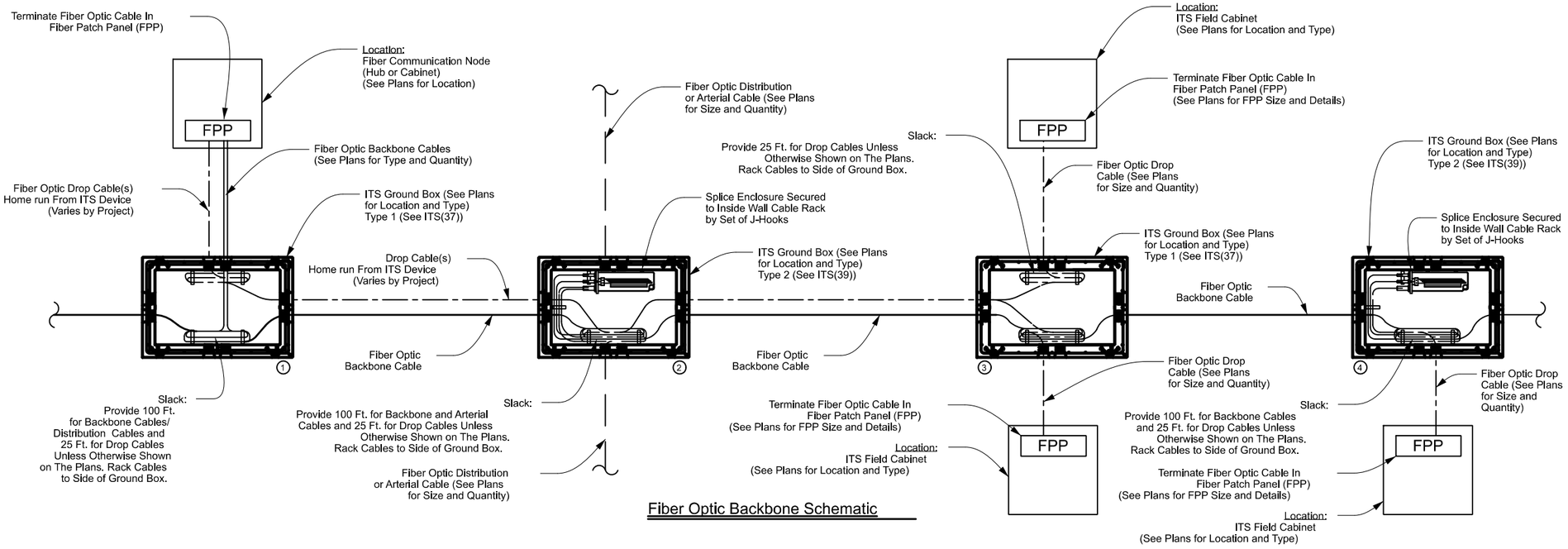
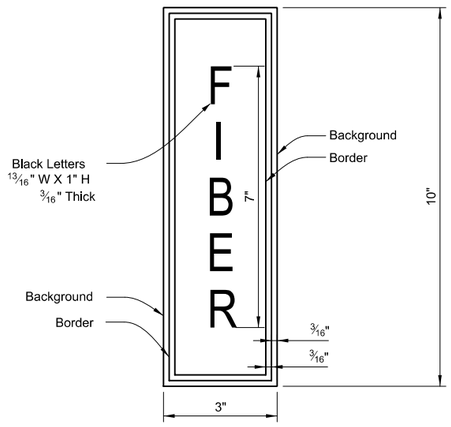
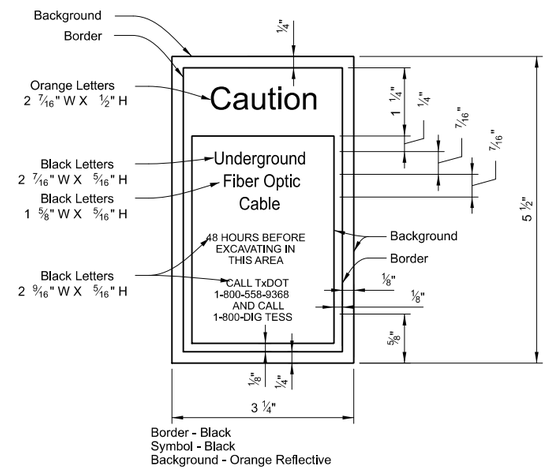


Fiber Optic Backbone Schematic



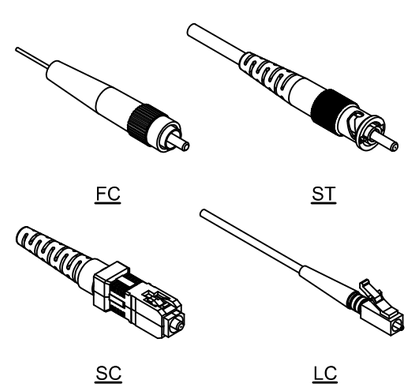
Border - Black
Background - Orange Reflective

Fiber Decal Details



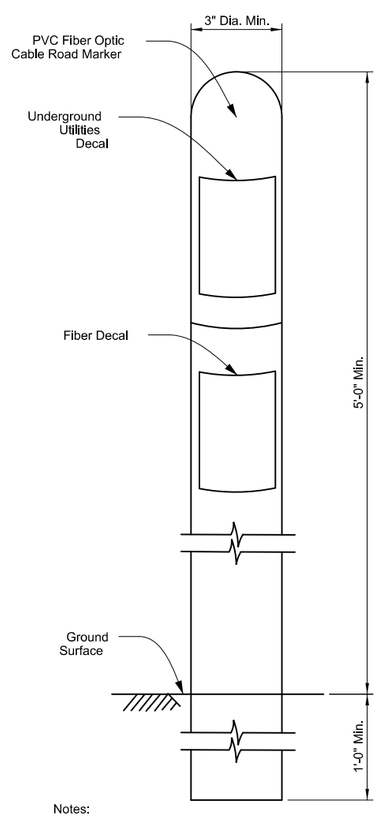
Border - Black
Symbol - Black
Background - Orange Reflective

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
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SHEET 1 OF 2

Texas Department of Transportation

Traffic Operations Division Standard

ITS FIBER OPTIC CABLE MISCELLANEOUS DETAILS

ITS(42)-16

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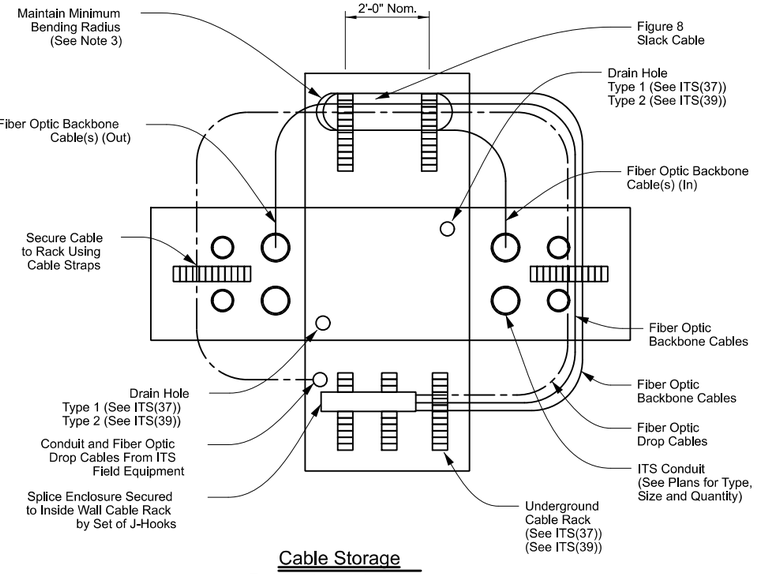
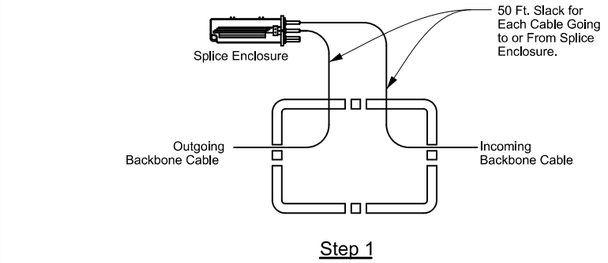
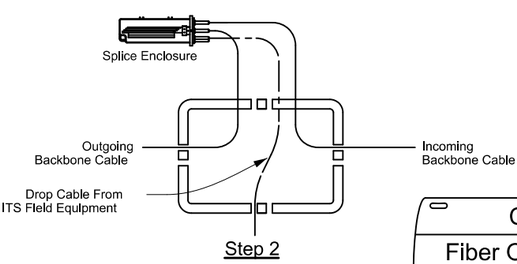


Cable Storage

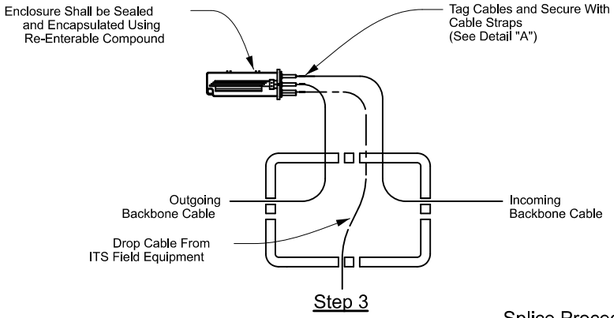
Top View - Ground Box Walls Folded Down for Clarity



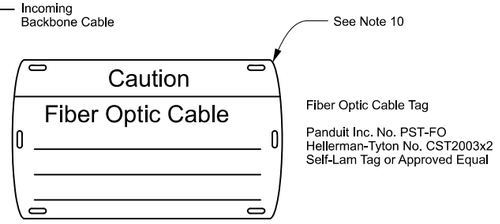
Step 1



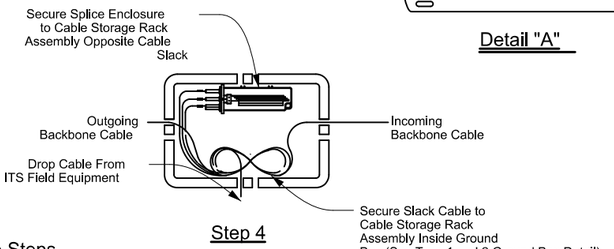
Step 2



Step 3

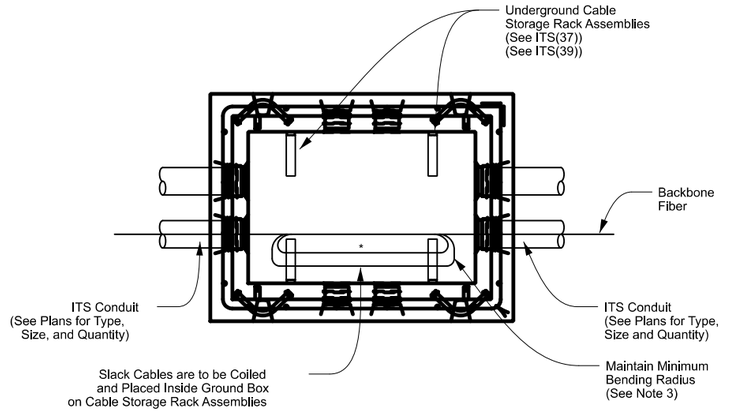


Detail "A"



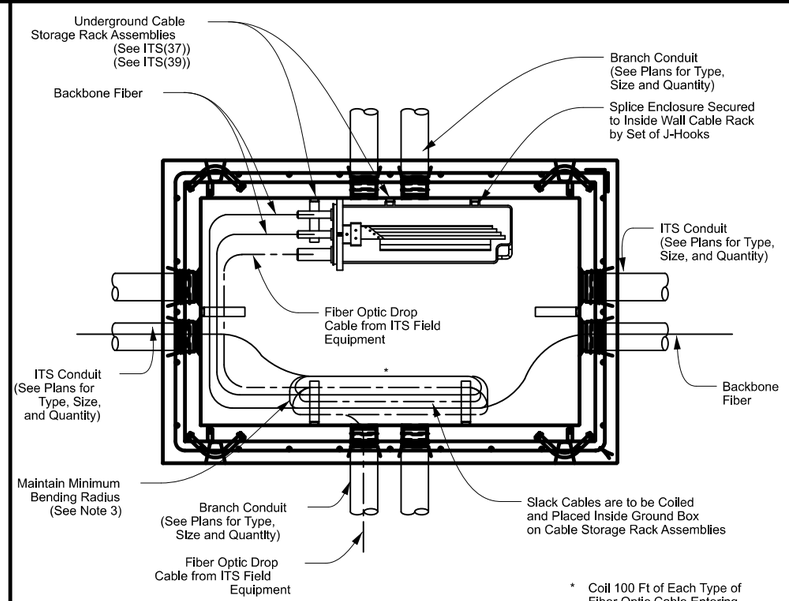
Step 4

Splice Procedure Steps



Type "1" Ground Box

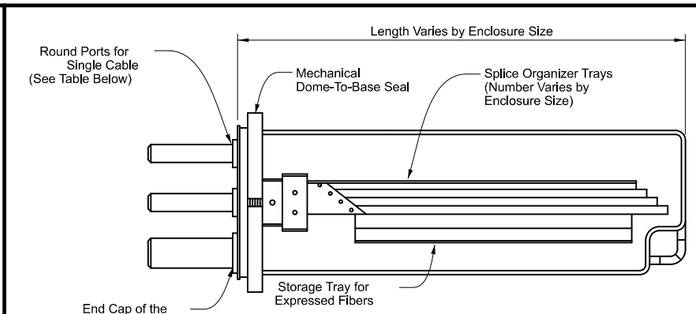
* Coil 25 Ft of Fiber Optic Cable for Slack



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
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Texas Department of Transportation

Traffic Operations Division Standard

ITS FIBER OPTIC CABLE MISCELLANEOUS DETAILS

ITS(43)-16

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

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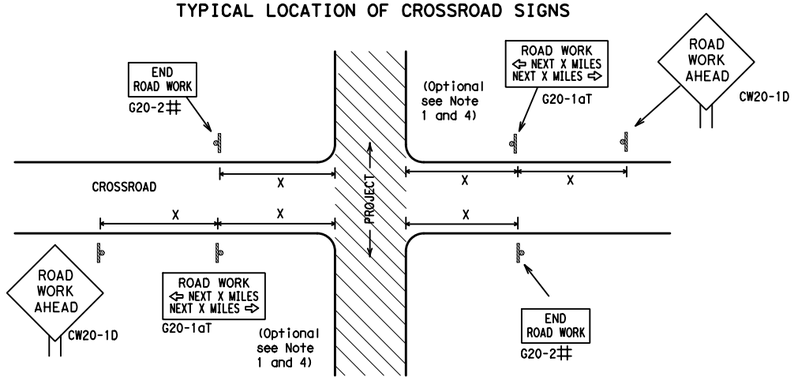
5-10 5-21				

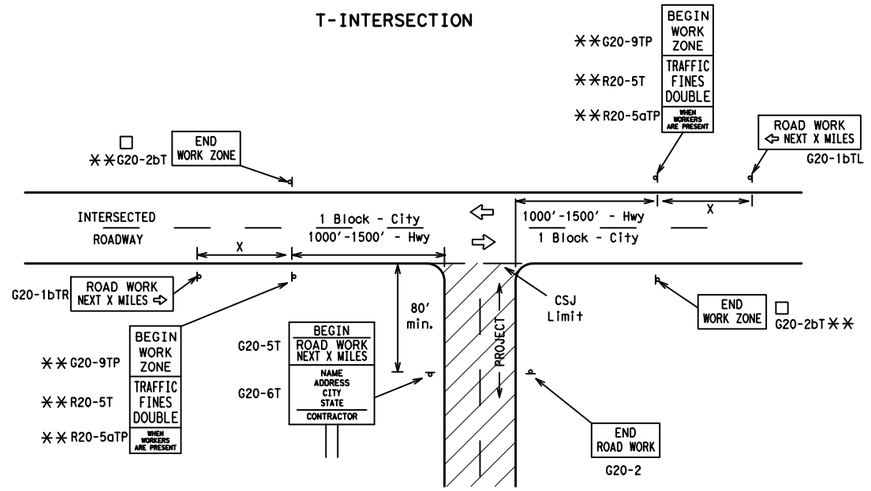
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

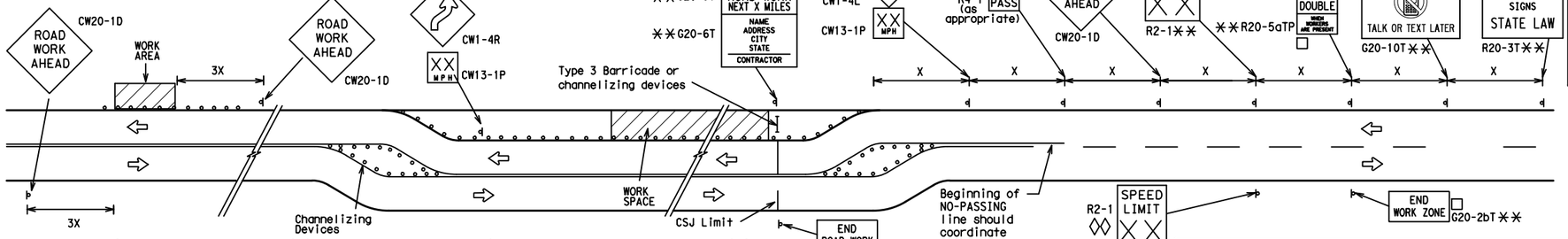
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

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

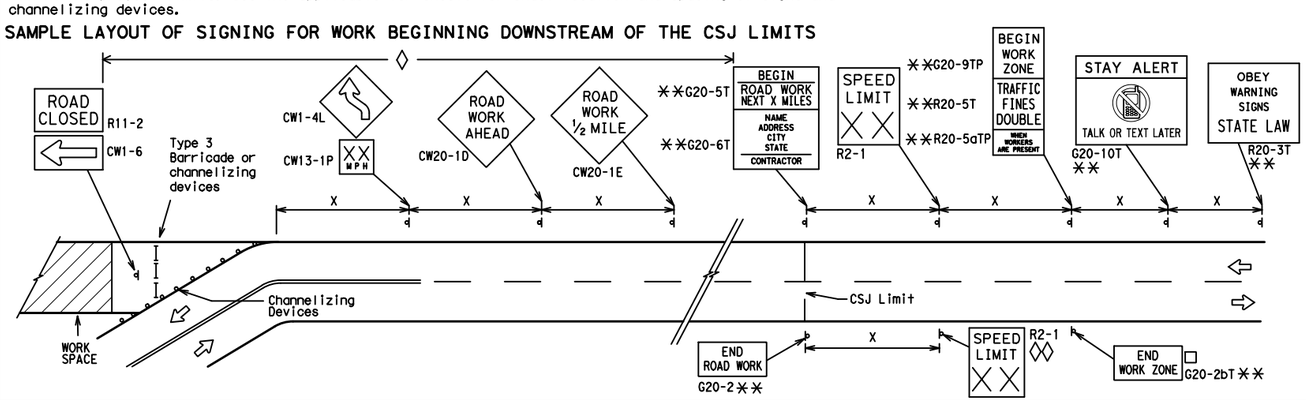
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

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

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

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

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

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

LEGEND

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

SHEET 2 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

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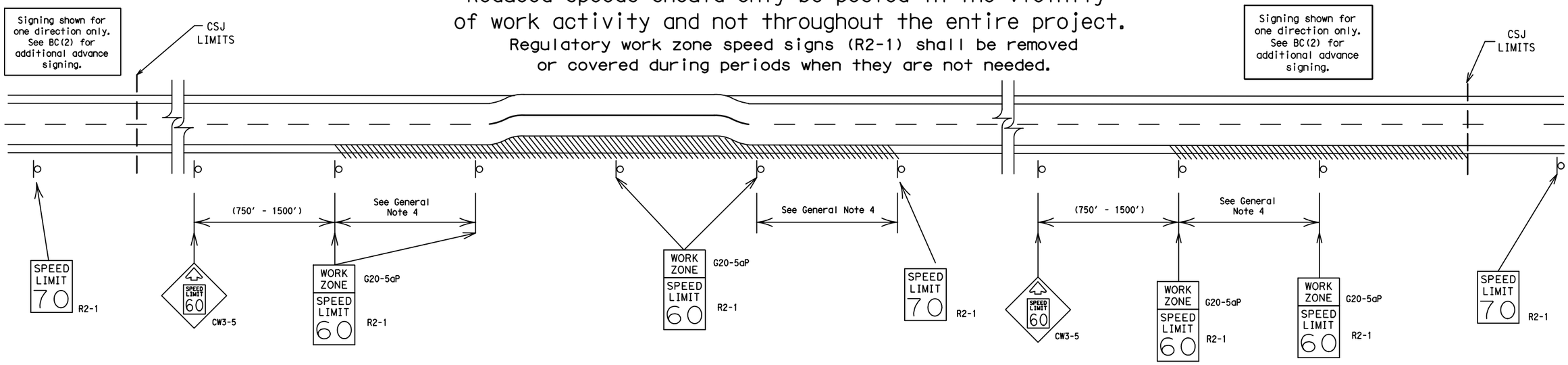
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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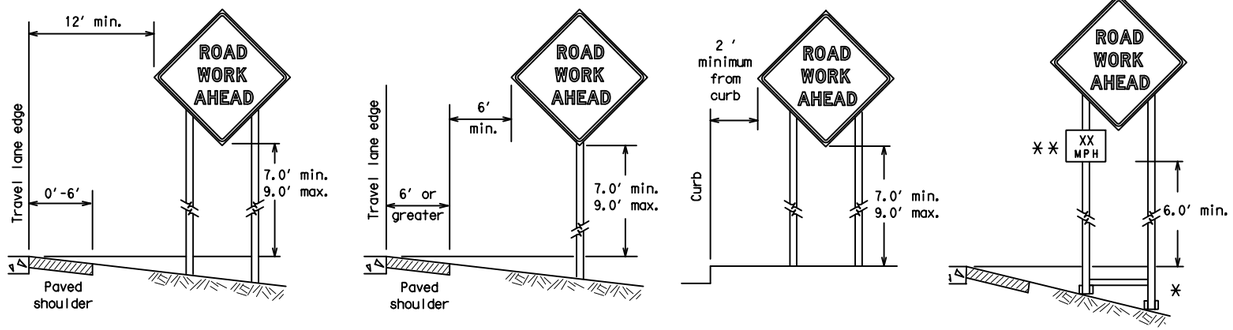
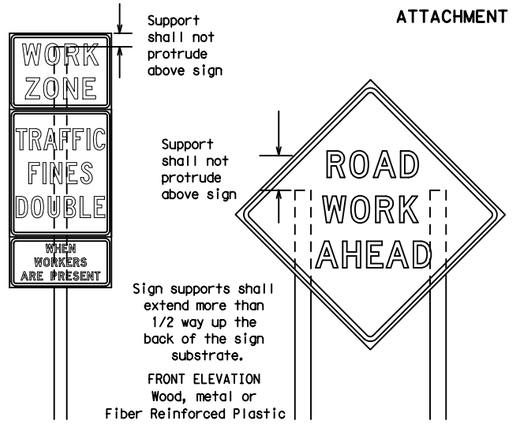
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

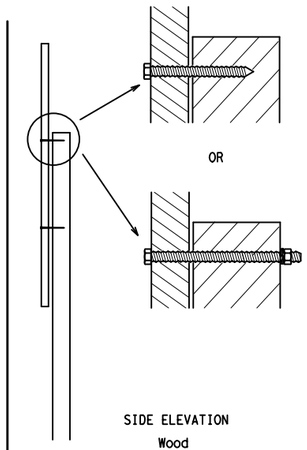


⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





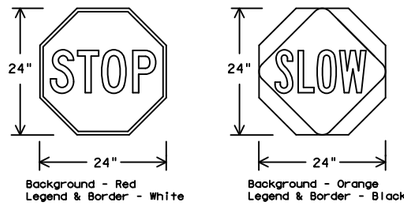
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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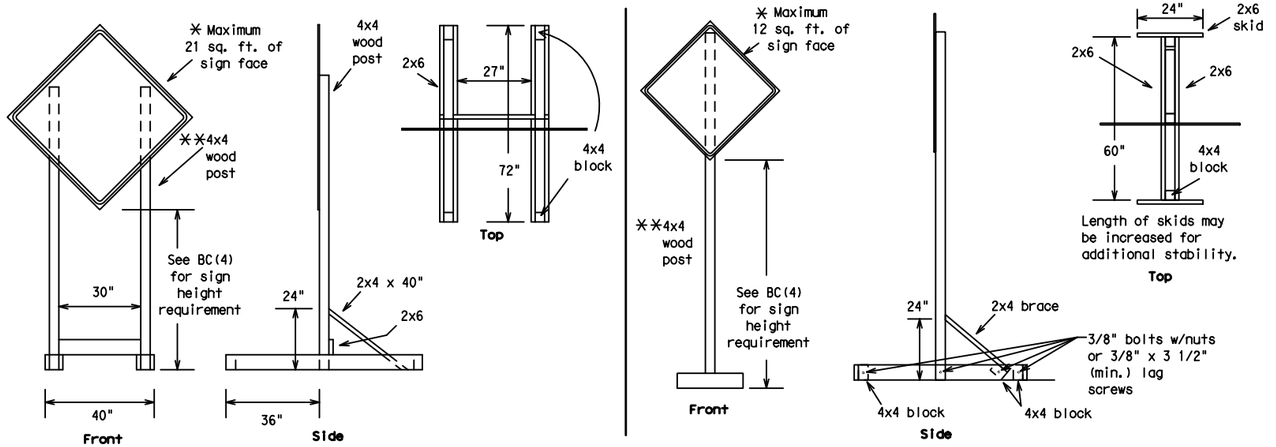
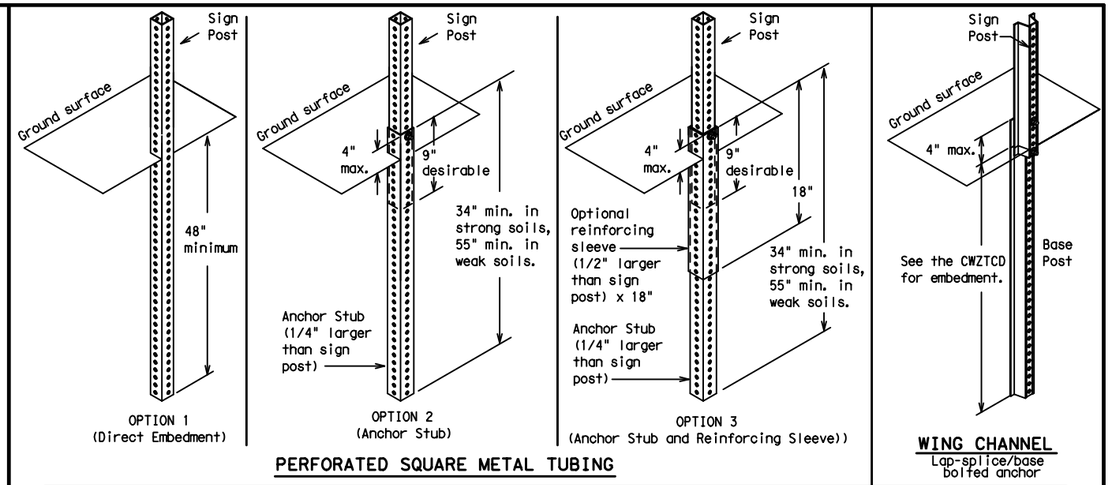


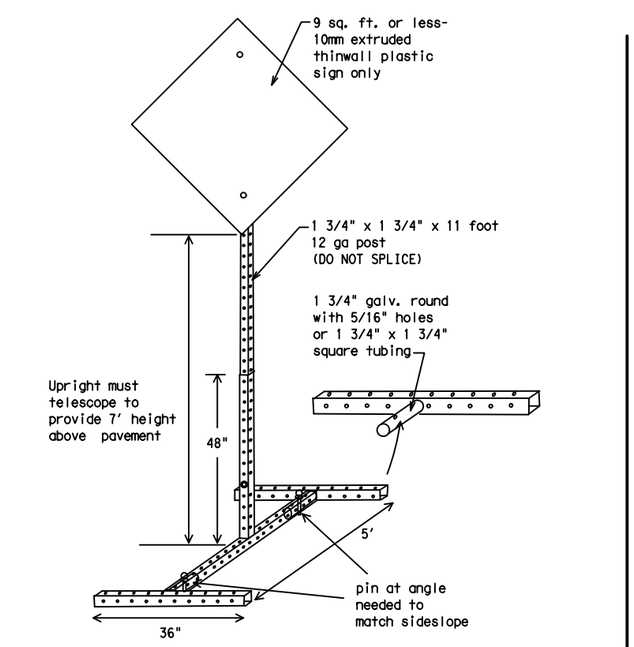
SKID MOUNTED WOOD SIGN SUPPORTS

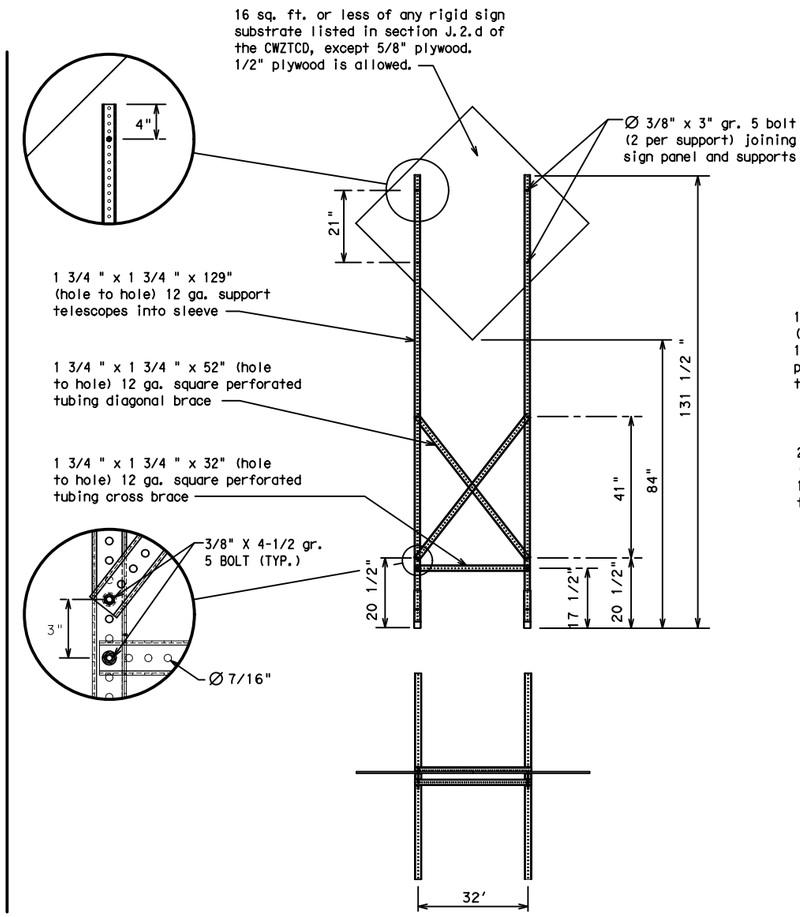
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

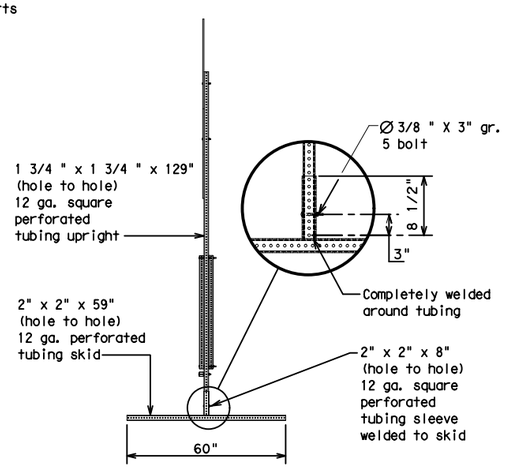


GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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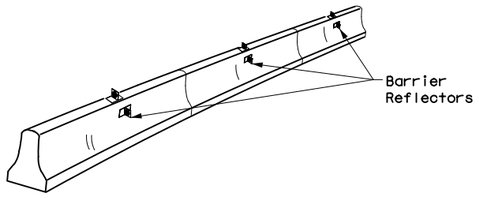
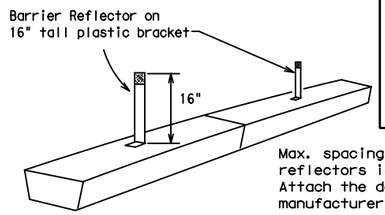
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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



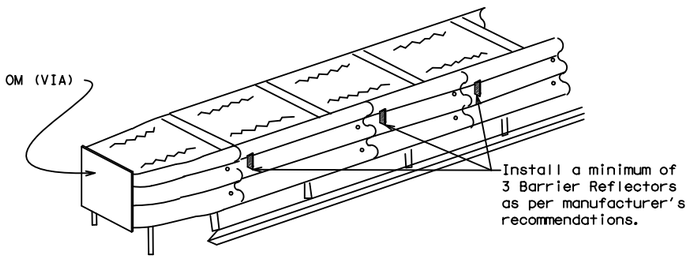
CONCRETE TRAFFIC BARRIER (CTB)

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



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

LOW PROFILE CONCRETE BARRIER (LPCB)



DELINEATION OF END TREATMENTS

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

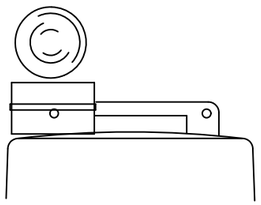
LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

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

WARNING LIGHTS

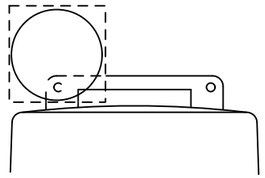


Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.

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.



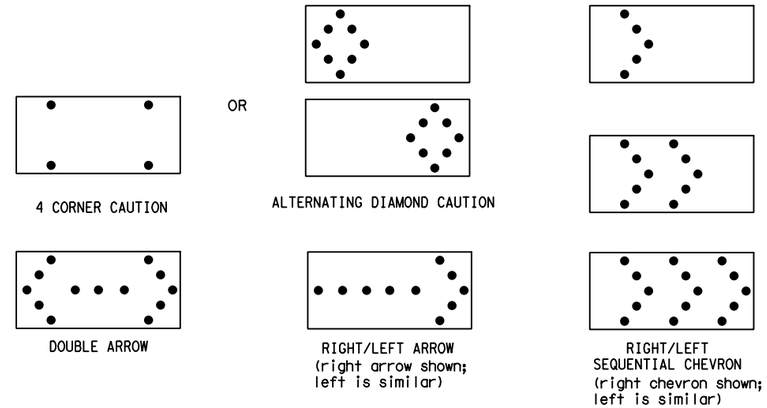
Warning reflector may be round or square. Must have a yellow reflective surface area of at least 30 square inches

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

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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Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

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REVISIONS	1986	01	072	FM 1314
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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

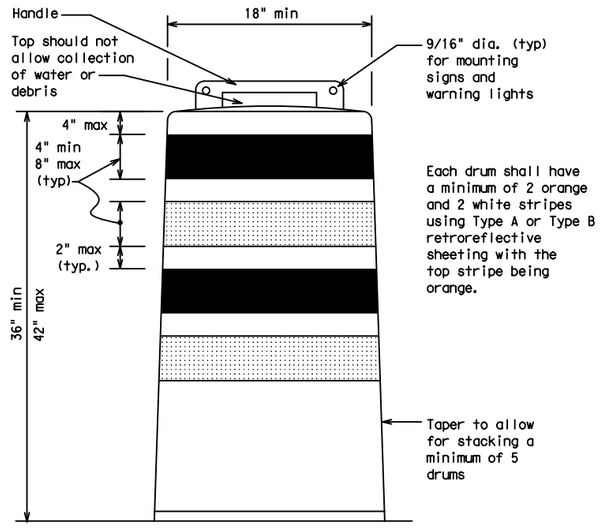
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

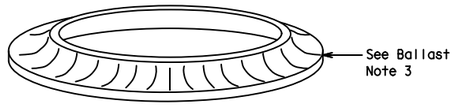
RETROREFLECTIVE SHEETING

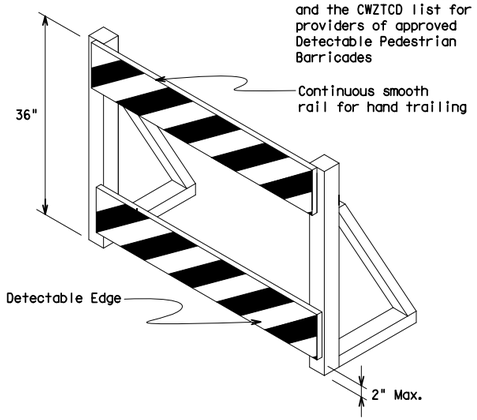
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

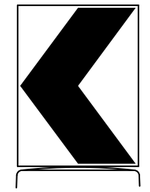




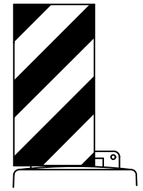


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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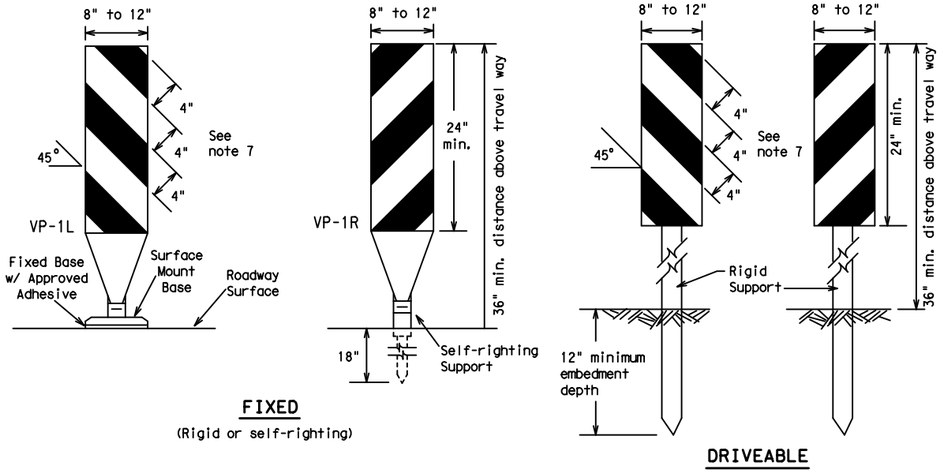
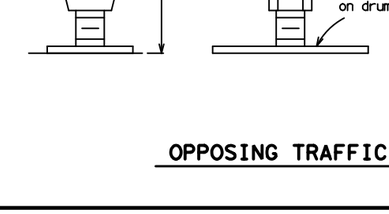


FIXED
(Rigid or self-righting)

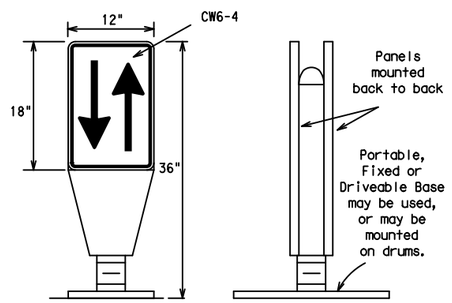
DRIVEABLE



PORTABLE

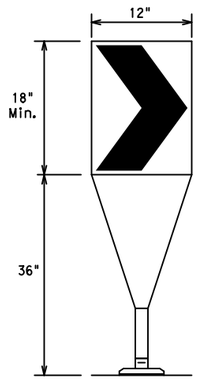
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual 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.

VERTICAL PANELS (VPs)



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



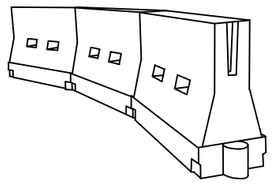
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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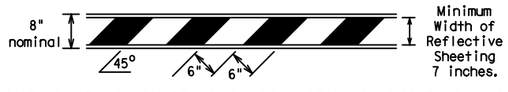
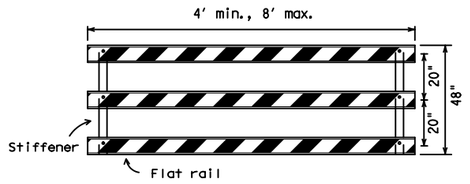
TYPE 3 BARRICADES

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.



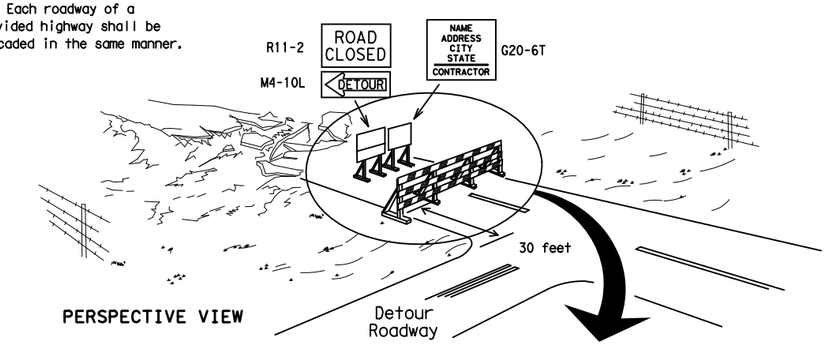
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

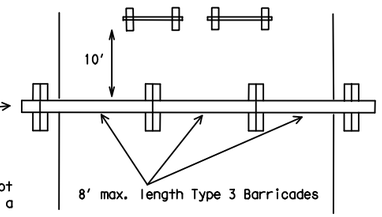
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

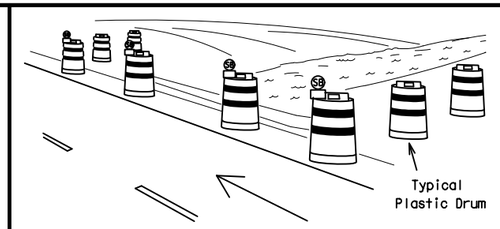
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

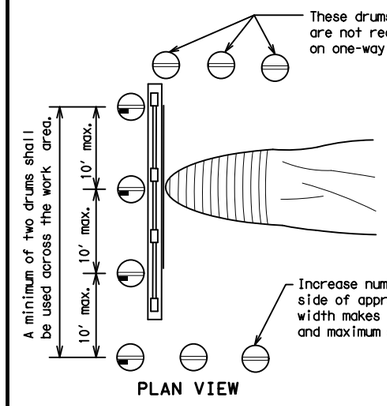
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

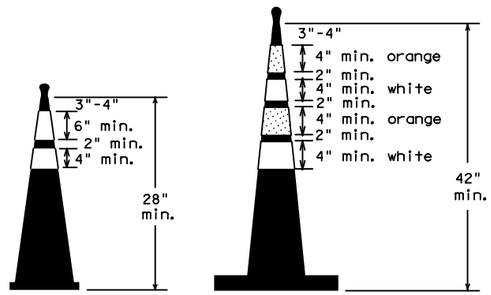
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



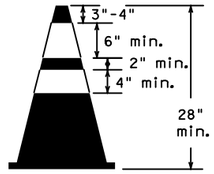
PLAN VIEW

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

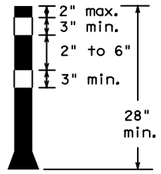
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

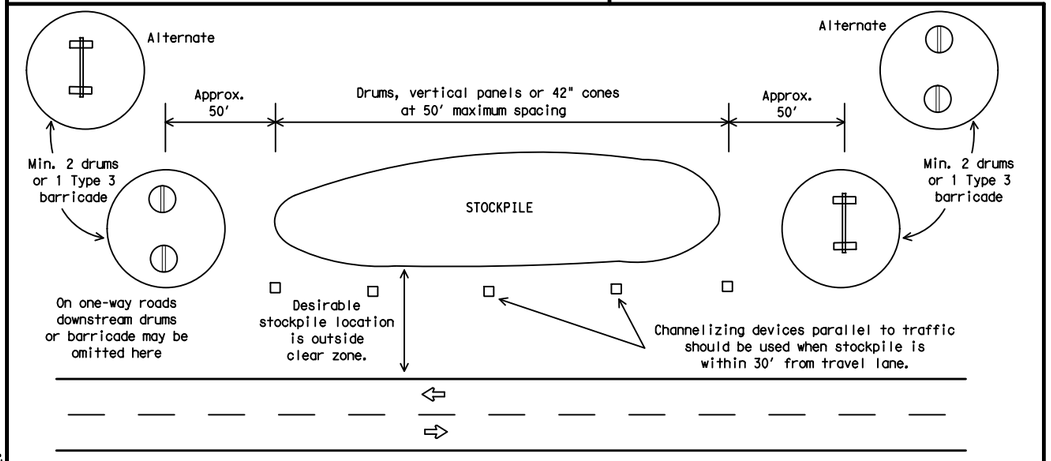


Tubular Marker

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

DATE:
FILE:

SHEET 10 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	072	FM 1314
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	MONTGOMERY		67

104

DATE:
FILE:

WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

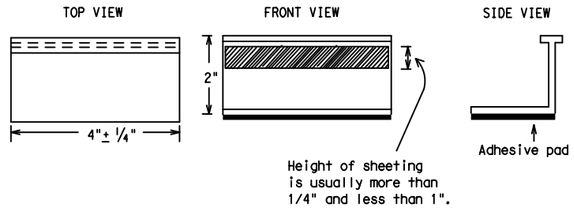
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic 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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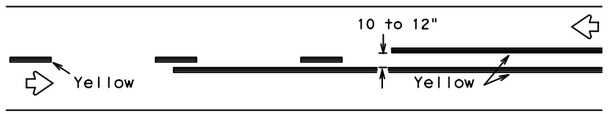
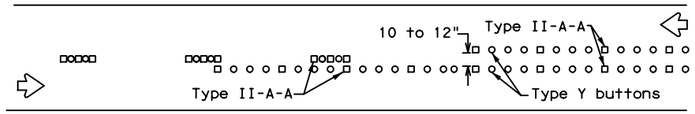
REVISIONS	1986	01	072	FM 1314
2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	HOU	MONTGOMERY		68
11-02 8-14				

DATE:
FILE:

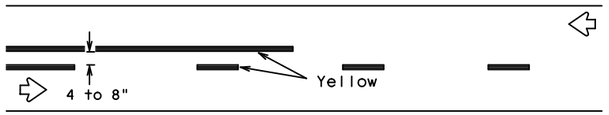
PAVEMENT MARKING PATTERNS



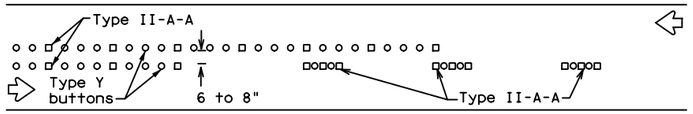
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



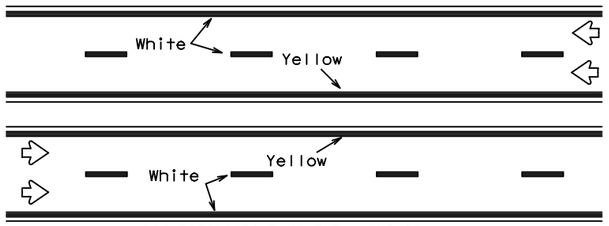
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



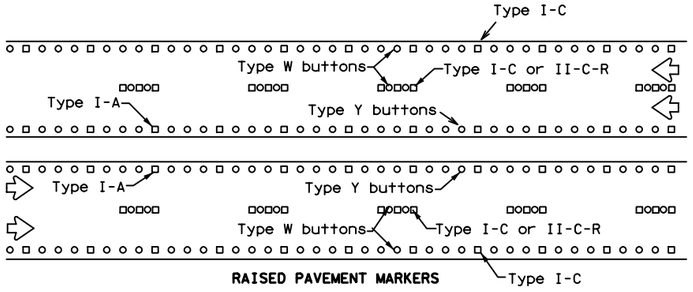
RAISED PAVEMENT MARKERS - PATTERN B

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

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



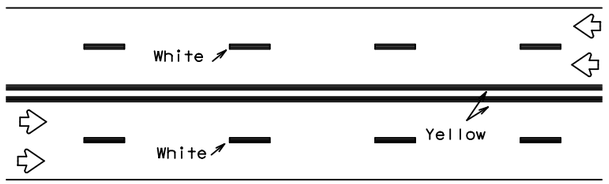
REFLECTORIZED PAVEMENT MARKINGS



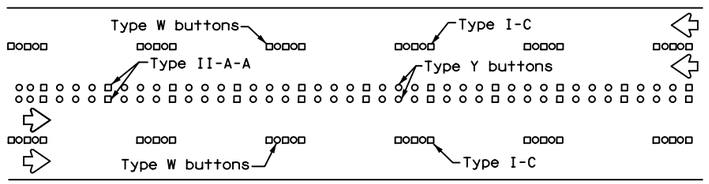
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



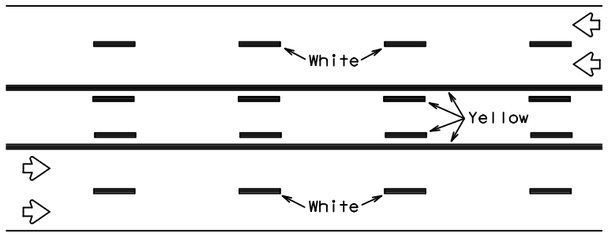
REFLECTORIZED PAVEMENT MARKINGS



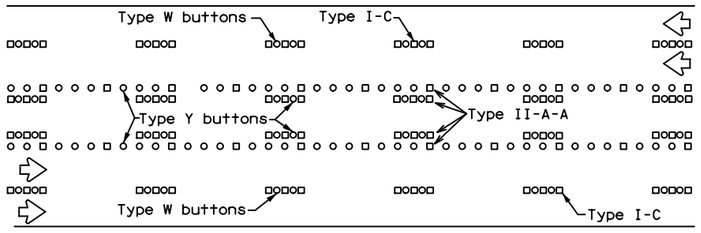
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

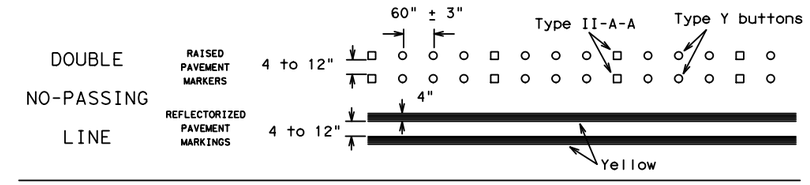
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

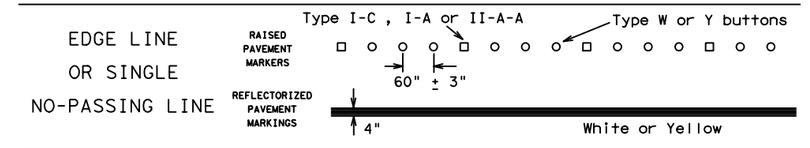
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

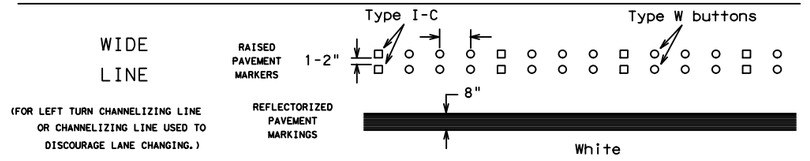


EDGE LINE OR SINGLE NO-PASSING LINE



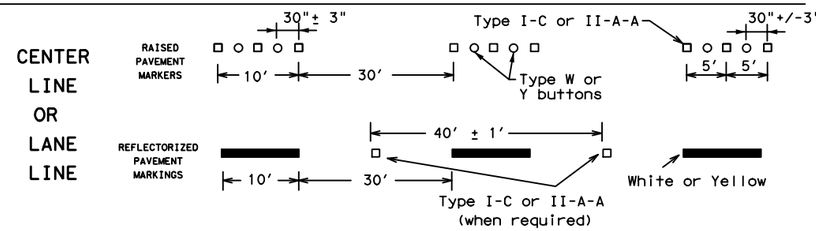
WIDE LINE

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

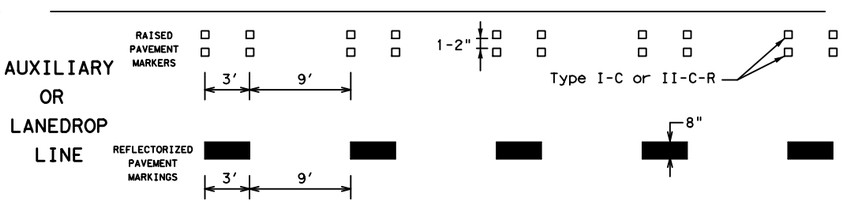


BROKEN LINES

CENTER LINE OR LANE LINE

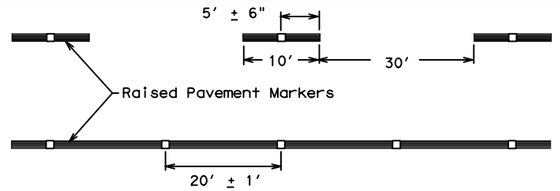


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic 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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2-98 7-13	DIST	COUNTY		SHEET NO.
11-02 8-14	HOU	MONTGOMERY		69

DATE:
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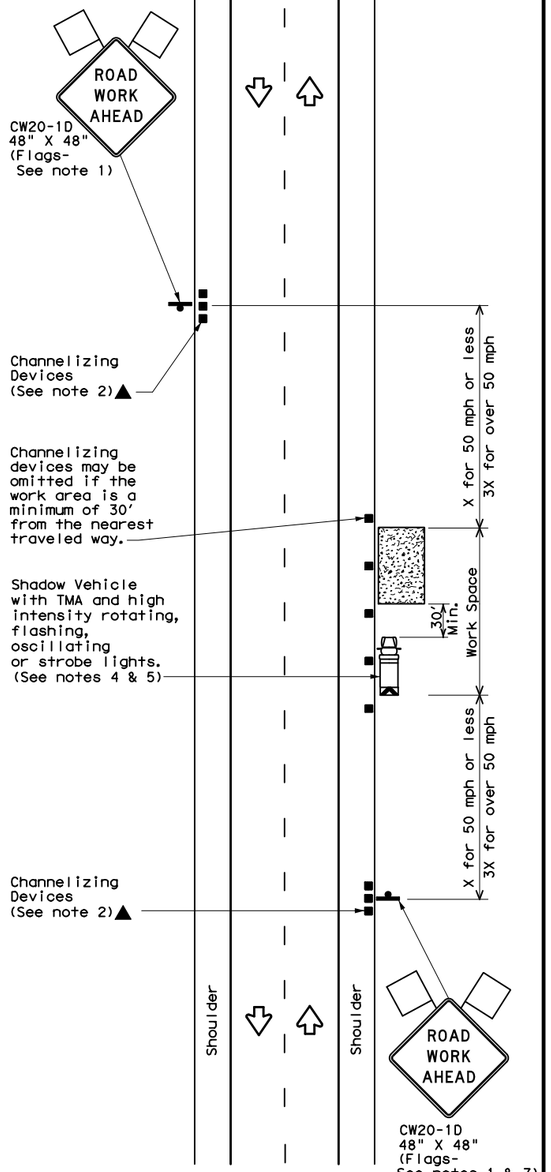
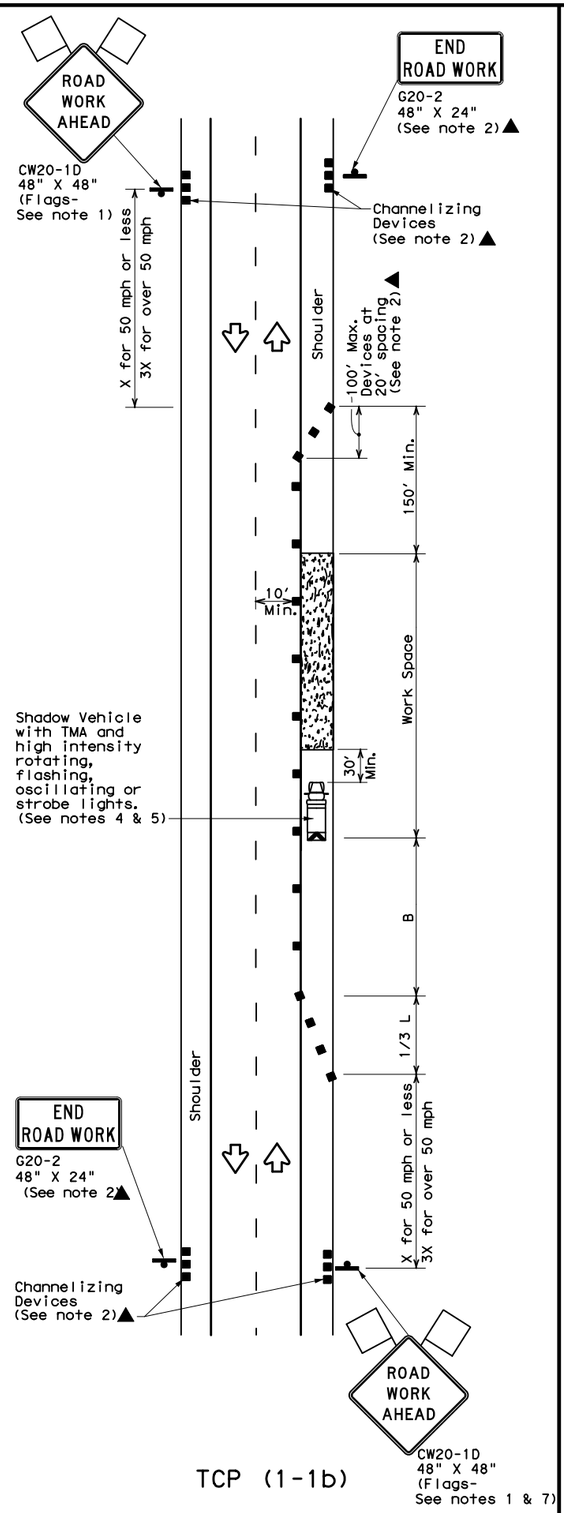


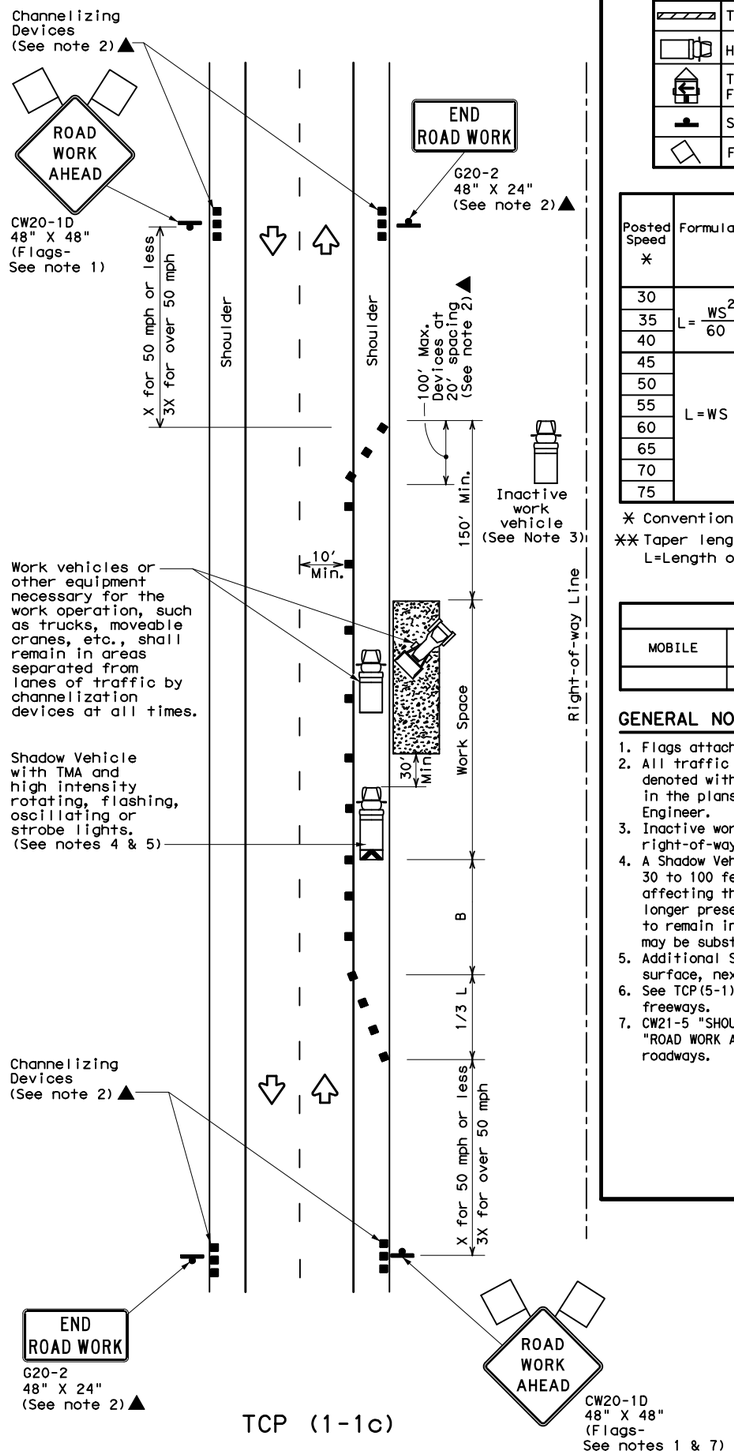
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(1-1)-18

FILE: tcp1-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	072	FM 1314
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	HOU	MONTGOMERY		70
1-97 2-18				

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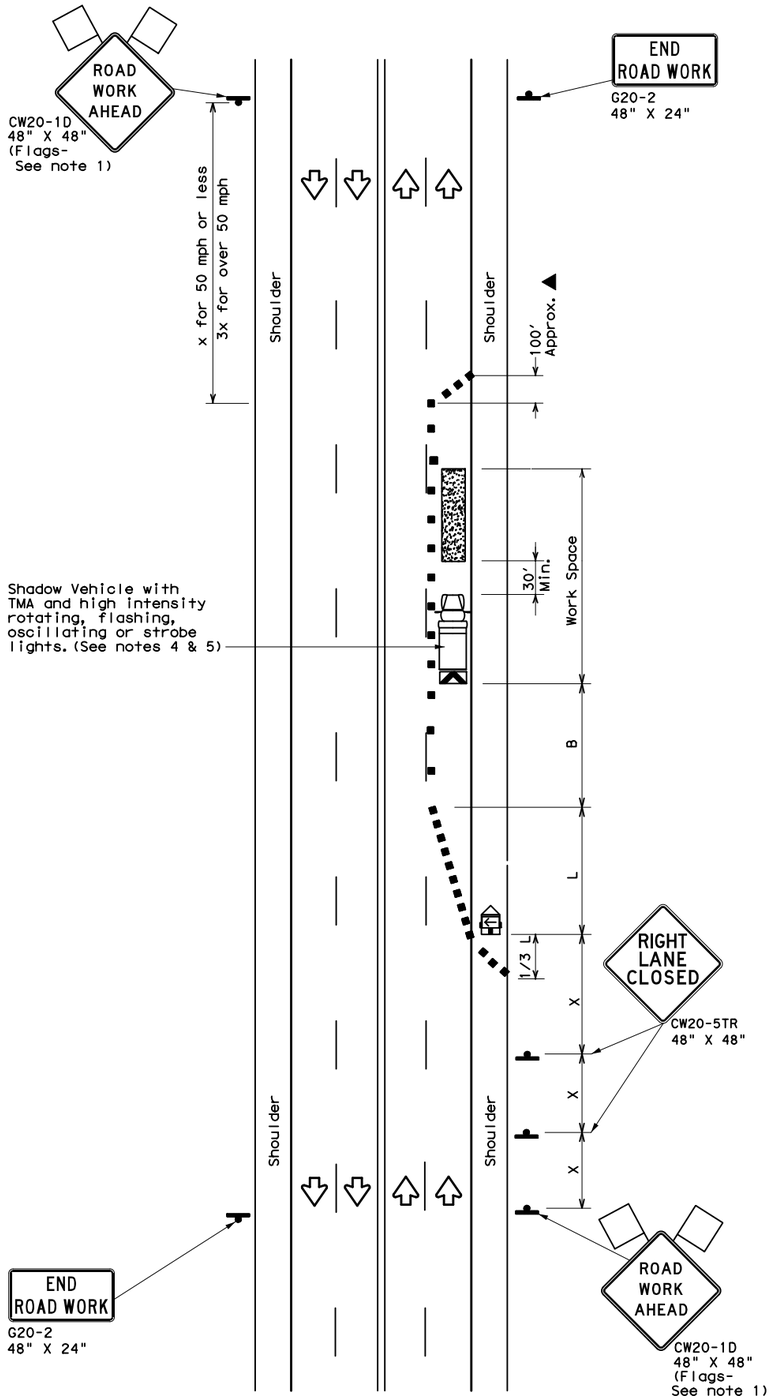
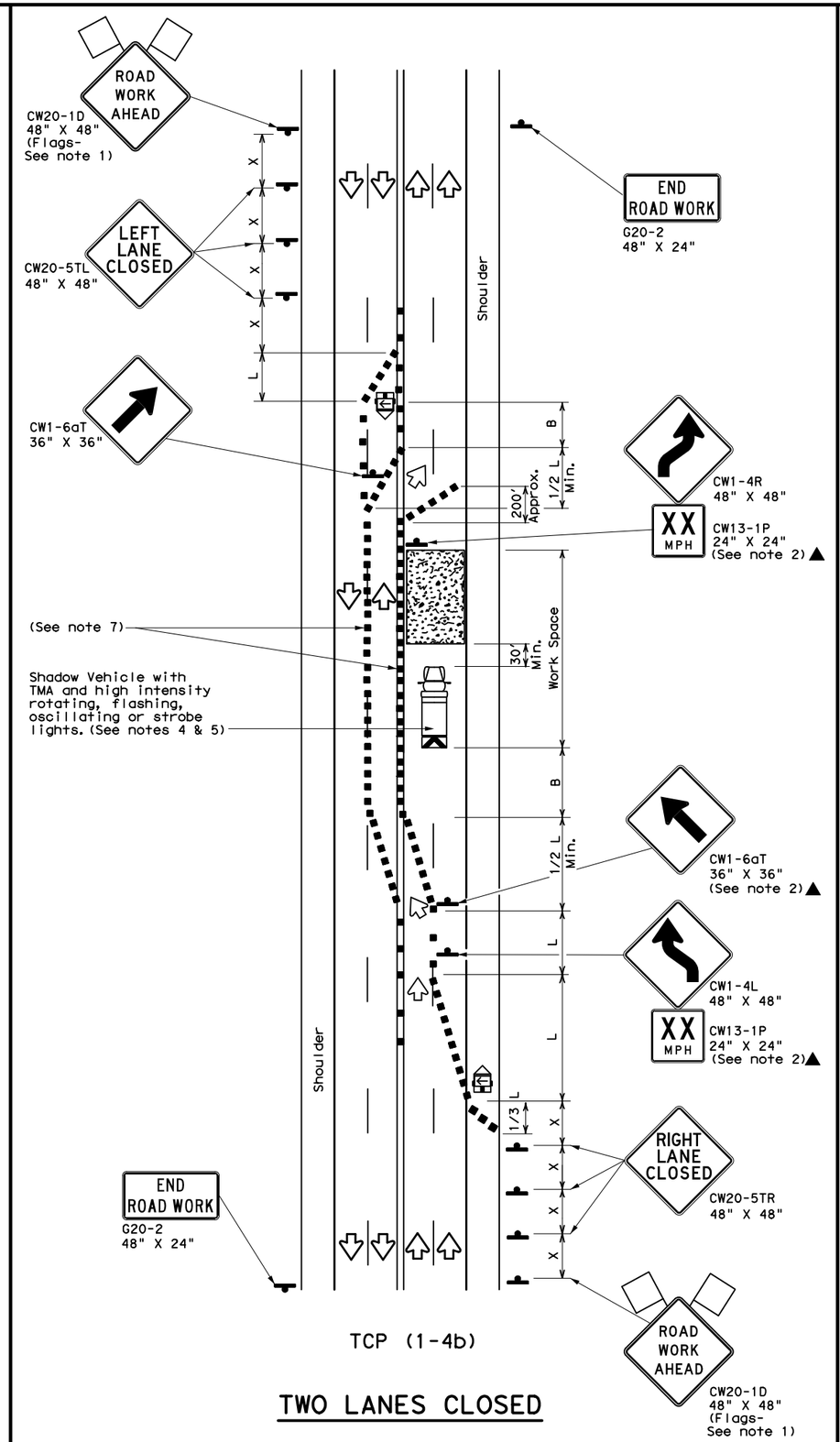
DATE:
FILE:



TCP (1-4a)

ONE LANE CLOSED



TCP (1-4b)

TWO LANES CLOSED

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

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

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

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

GENERAL NOTES

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

TCP (1-4a)

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

TCP (1-4b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(1-4)-18

FILE: tcp1-4-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	072	FM 1314
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	HOU	MONTGOMERY		71
1-97 2-18				

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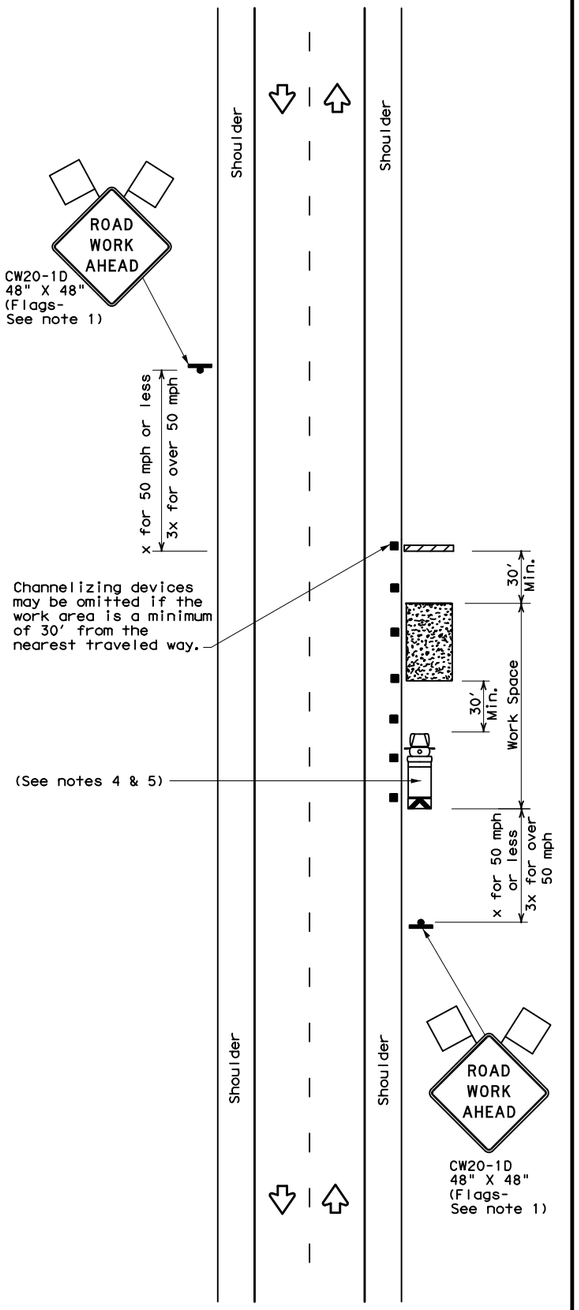
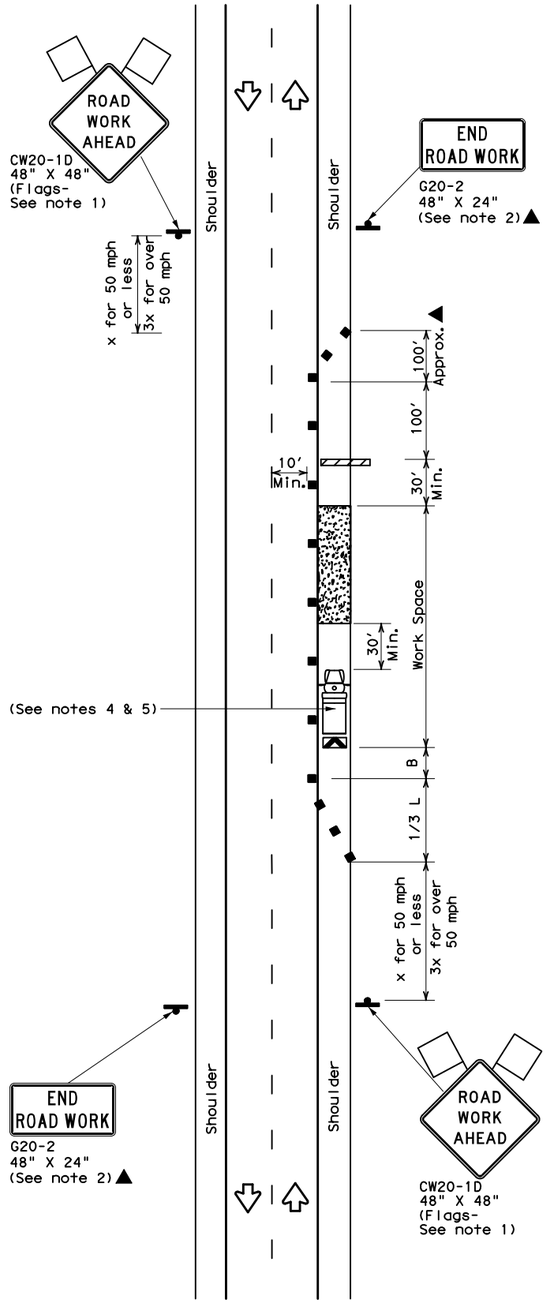
FILE:



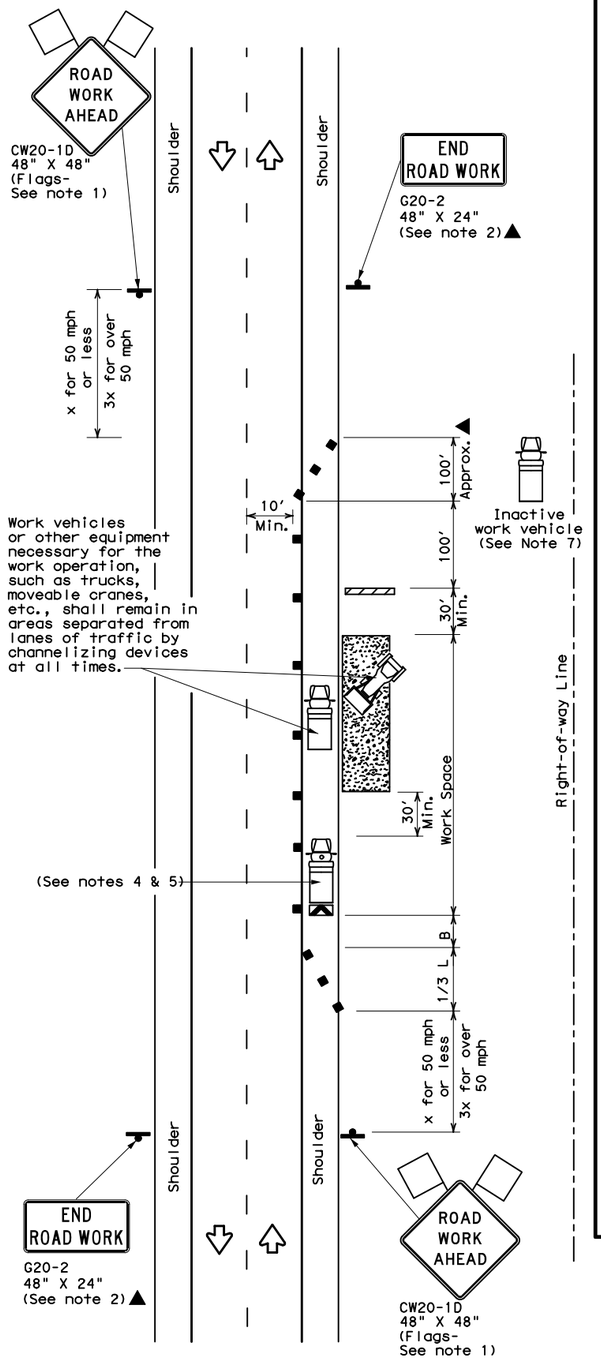
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	072	FM 1314
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	HOU	MONTGOMERY		72
1-97 2-18				

DATE:
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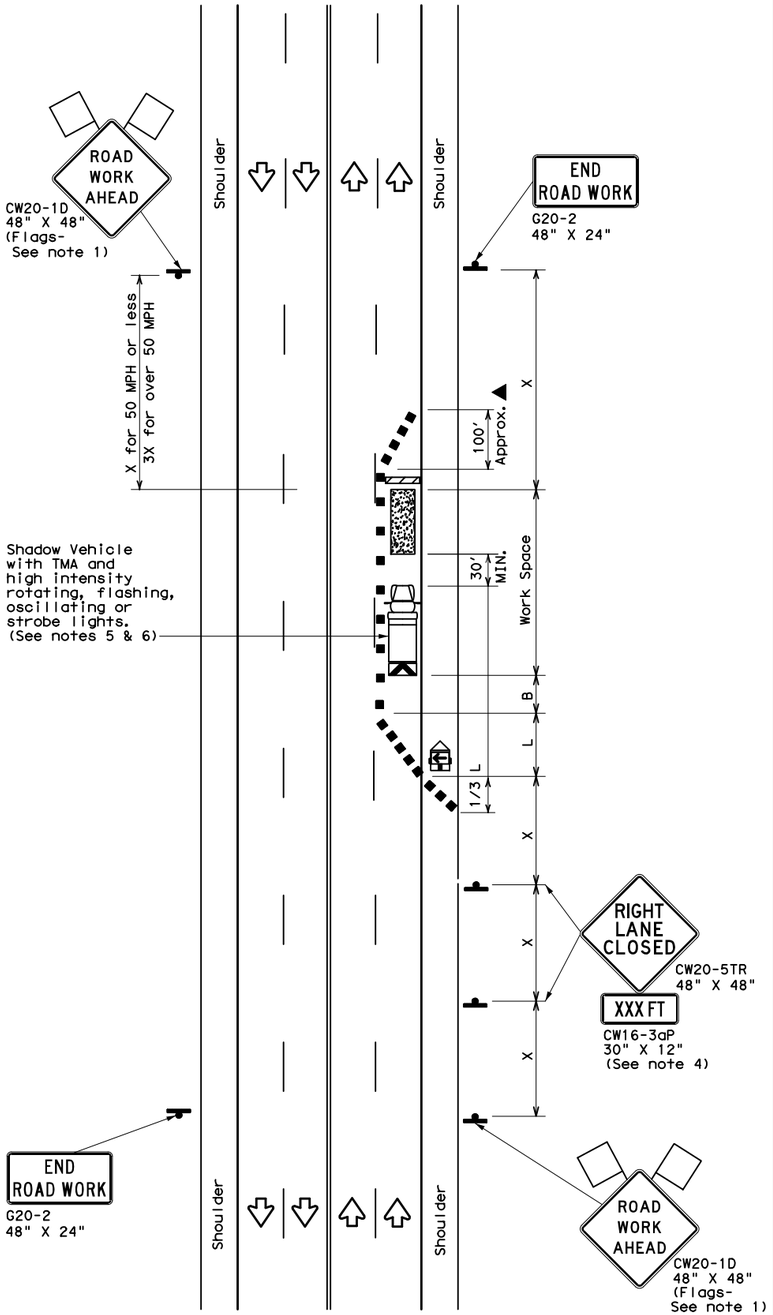
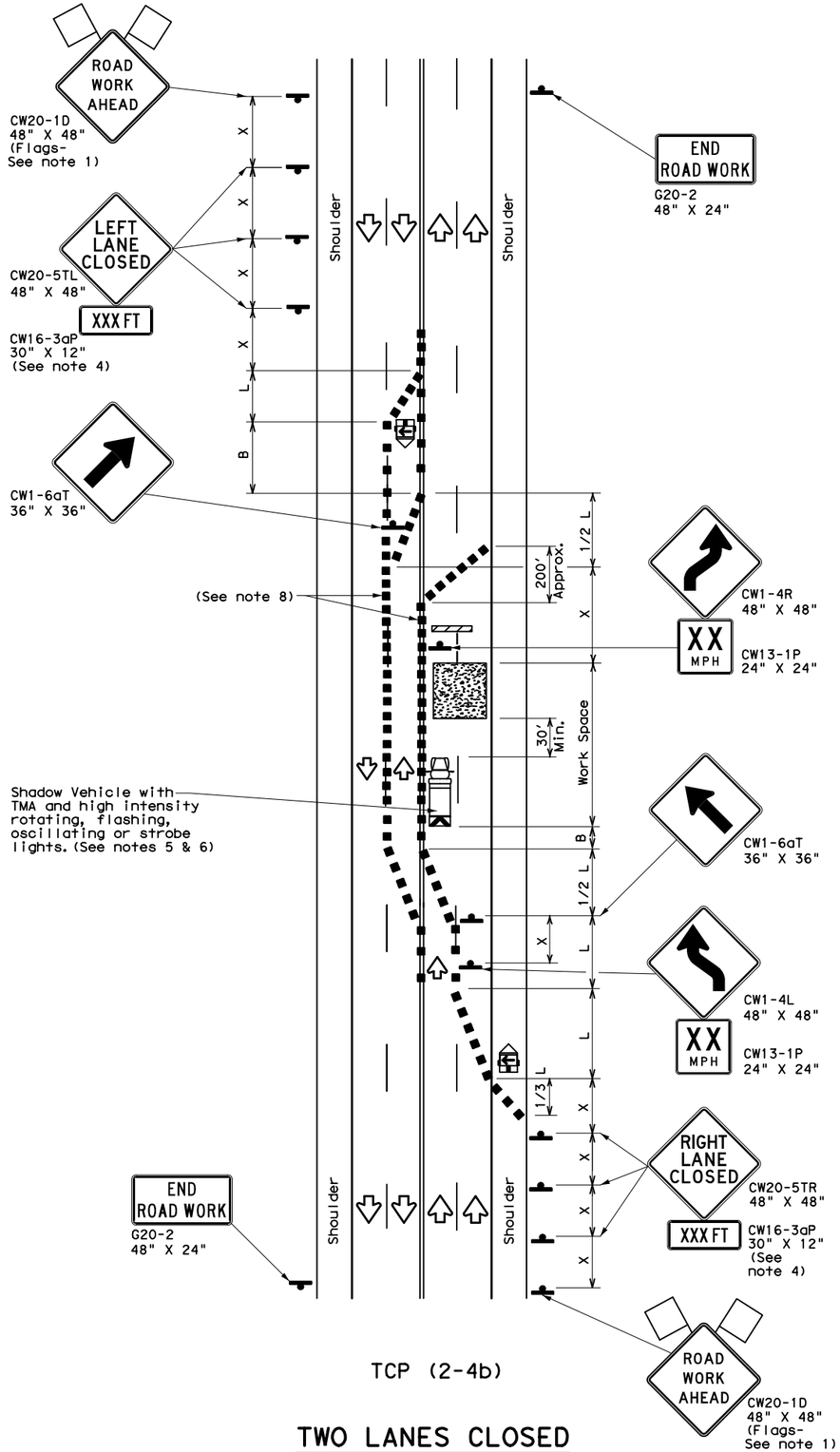


TCP (2-4a)

ONE LANE CLOSED



TCP (2-4b)

TWO LANES CLOSED

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The downstream taper is optional. When used, it should be 100 feet minimum length per lane.
4. For short term applications, when post mounted signs are not used, the distance legend may be shown on the sign face rather than on a CW16-3aP supplemental plaque.
5. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
6. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-4a)

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

TCP (2-4b)

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

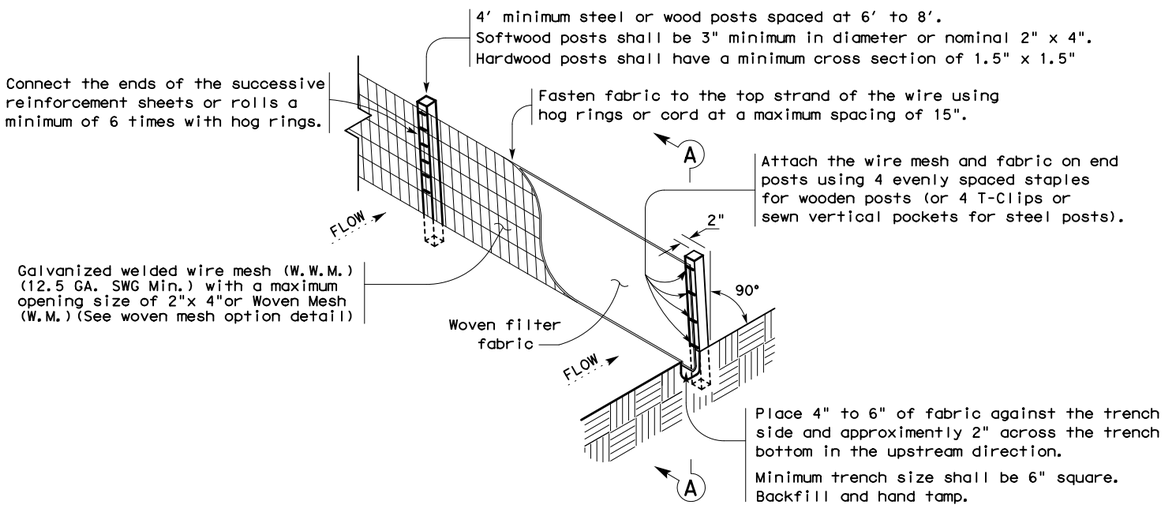
Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

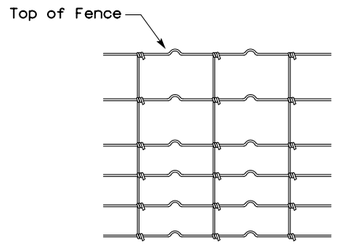
TCP(2-4)-18

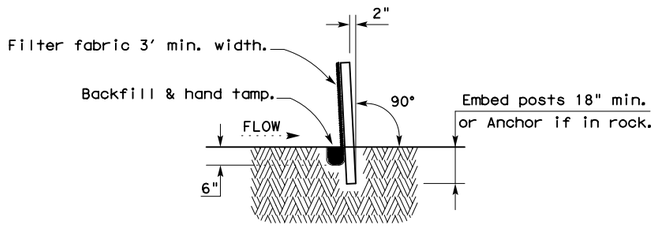
FILE: tcp2-4-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	1986	01	072	FM 1314
1-97 2-12	DIST	COUNTY		SHEET NO.
4-98 2-18	HOU	MONTGOMERY		73



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.

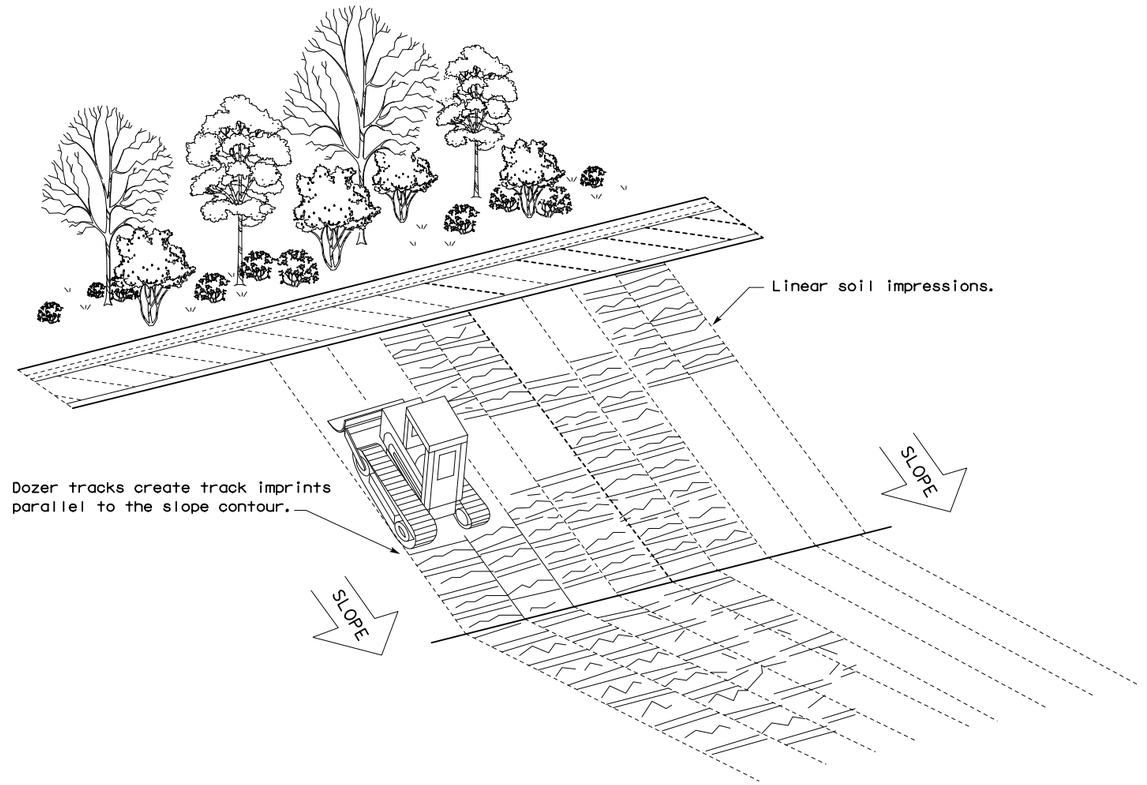
LEGEND

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	1986	01	072		FM 1314	
	DIST	COUNTY			SHEET NO.	
	HOU	MONTGOMERY			74	

DATE
FILE

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 20, 2024
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	1986	01	072	FM 1314
UPDATED section V. text and added definition (10/17) ADDED USCG and USACE notes in Section VII (04/18)	DIST	COUNTY		SHEET NO.
	12	Montgomery		75

STORMWATER POLLUTION PRVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with TxDOT policy for projects disturbing less than 1 acre of soil, and not part of a larger common plan of development.

For projects with less than one acre of soil disturbing activity and that have Environmental, Permits, Issues, and Commitments (EPICs) dependent on stormwater controls and water quality measures TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office, Area Office, or electronically.

This SWP3 is consistent with requirements specified in applicable stormwater plans, and the project's environmental permits, issues, and commitments (EPICs).

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):

1986-01-072

1.2 PROJECT LIMITS:

OLD HOUSTON RD

LP 494

1.3 PROJECT COORDINATES:

BEGIN: 30.170654,-95.319564
END: 30.102338,-95.229763

1.4 TOTAL PROJECT AREA (Acres): N/A

1.5 TOTAL AREA TO BE DISTURBED (Acres): N/A

1.6 NATURE OF CONSTRUCTION ACTIVITY:

INSTALLATION OF FIBER OPTIC CABLE FOR TRAFFIC SIGNAL INTERCONNECT

1.7 MAJOR SOIL TYPES:

Soil Type	Description
Sorter-Tarkington complex, 0 to 1% slopes	100% very fine sandy loam, poorly drained, high rate of runoff, no erosion potential-deposition
Sorter-Urban land complex, 0 to 1% slopes	100% very fine sandy loam, poorly drained, high rate of runoff, no erosion potential-deposition
Waller silt loam, 0 to 1% slopes	100% silt loam, poorly drained, high rate of runoff, no erosion potential-deposition
Waller-Urban land complex, 0 to 1% slopes	100% silt loam, poorly drained, high rate of runoff, no erosion potential-deposition
Splendora fine sandy loam, 0 to 2% slopes	50% fine sandy loam/50% loam, poorly drained, high rate of runoff, no erosion potential-deposition
Splendora-Urban land complex, 0 to 2% slopes	50% fine sandy loam/50% loam, somewhat poorly drained, high rate of runoff, slight erosion potential
Segno fine sandy loam, 1 to 3 % slopes	11% fine sandy loam, 36% very fine sandy loam, 42% sandy clay loam, 11% loam, well drained, moderate rate of runoff, slight erosion potential
Segno-Urban land complex, 1 to 3% slopes	11% fine sandy loam, 36% very fine sandy loam, 42% sandy clay loam, 11% loam, well drained, moderate rate of runoff, slight erosion potential
Urban land	100% urban, very high rate of runoff, slight erosion potential

1.8 PROJECT SPECIFIC LOCATIONS (PSLs): N/A

PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

- ☐ PSLs determined during preconstruction meeting
- ☐ PSLs determined during construction
- ☐ No PSLs planned for construction

Type	Sheet #s

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

1.9 CONSTRUCTION ACTIVITIES:

(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.3.)

- ☒ Mobilization
- ☐ Install sediment and erosion controls
- ☐ Blade existing topsoil into windrows, prep ROW, clear and grub
- ☐ Remove existing pavement
- ☐ Grading operations, excavation, and embankment
- ☐ Excavate and prepare subgrade for proposed pavement widening
- ☐ Remove existing culverts, safety end treatments (SETs)
- ☐ Remove existing metal beam guard fence (MBGF), bridge rail
- ☐ Install proposed pavement per plans
- ☐ Install culverts, culvert extensions, SETs
- ☐ Install mow strip, MBGF, bridge rail
- ☐ Place flex base
- ☐ Rework slopes, grade ditches
- ☐ Blade windrowed material back across slopes
- ☐ Revegetation of unpaved areas
- ☐ Achieve site stabilization and remove sediment and erosion control measures
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

1.10 POTENTIAL POLLUTANTS AND SOURCES: N/A

- ☐ Sediment laden stormwater from stormwater conveyance over disturbed area
- ☐ Fuels, oils, and lubricants from construction vehicles, equipment, and storage
- ☐ Solvents, paints, adhesives, etc. from various construction activities
- ☐ Transported soils from offsite vehicle tracking
- ☐ Construction debris and waste from various construction activities
- ☐ Contaminated water from excavation or dewatering pump-out water
- ☐ Sanitary waste from onsite restroom facilities
- ☐ Trash from various construction activities/receptacles
- ☐ Long-term stockpiles of material and waste
- ☐ Discharges from concrete washout activities, runoff from concrete cutting activities, and other concrete related activities
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

1.11 RECEIVING WATERS:

Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

Tributaries	Classified Waterbody
Copeland Ditch, White Oak Creek	*Caney Creek (1010); Impaired for bacteria
TMDL/I-Plan Project: Houston-Galveston Region BIG	

* Add (*) for impaired waterbodies with pollutant in ().

1.12 ROLES AND RESPONSIBILITIES: TxDOT

- ☒ Development of plans and specifications
- ☒ Perform SWP3 inspections
- ☒ Maintain SWP3 records and update to reflect daily operations
- ☐ Other: _____
- ☐ Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

- ☒ Day To Day Operational Control
- ☒ Maintain schedule of major construction activities
- ☒ Install, maintain and modify BMPs
- ☐ Other: _____
- ☐ Other: _____

STATE OF TEXAS
ROMA G. STEVENS
100354
LICENSED PROFESSIONAL ENGINEER

Roma Stevens
ROMA G. STEVENS , P.E.

9/25/2024
DATE

STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		76
STATE	STATE DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	072	FM 1314

STORMWATER POLLUTION PRVENTION PLAN (SWP3):

2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs: N/A

T / P

- ☐ ☐ Protection of Existing Vegetation
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Soil Retention Blankets
- ☐ ☐ Geotextiles
- ☐ ☐ Mulching/ Hydromulching
- ☐ ☐ Soil Surface Treatments
- ☐ ☐ Temporary Seeding
- ☐ ☐ Permanent Planting, Sodding or Seeding
- ☐ ☐ Biodegradable Erosion Control Logs
- ☐ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Vertical Tracking
- ☐ ☐ Interceptor Swale
- ☐ ☐ Riprap
- ☐ ☐ Diversion Dike
- ☐ ☐ Temporary Pipe Slope Drain
- ☐ ☐ Embankment for Erosion Control
- ☐ ☐ Paved Flumes
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

2.2 SEDIMENT CONTROL BMPs:

T / P

- ☐ ☐ Biodegradable Erosion Control Logs
- ☐ ☐ Dewatering Controls
- ☐ ☐ Inlet Protection
- ☐ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Sandbag Berms
- ☒ ☐ Sediment Control Fence
- ☐ ☐ Stabilized Construction Exit
- ☐ ☐ Floating Turbidity Barrier
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Vegetated Filter Strips
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.3 PERMANENT CONTROLS: N/A

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.4 OFFSITE VEHICLE TRACKING CONTROLS: N/A

- ☐ Excess dirt/mud on road removed daily
- ☐ Haul roads dampened for dust control
- ☐ Loaded haul trucks to be covered with tarpaulin
- ☐ Stabilized construction exit
- ☐ Daily street sweeping
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.5 POLLUTION PREVENTION MEASURES:

- ☐ Chemical Management
- ☐ Concrete and Materials Waste Management
- ☒ Debris and Trash Management
- ☐ Dust Control
- ☐ Sanitary Facilities
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.6 VEGETATED BUFFER ZONES: N/A

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

- ☒ Fire hydrant flushings
- ☒ Irrigation drainage
- ☒ Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- ☒ Potable water sources
- ☒ Springs
- ☒ Uncontaminated groundwater
- ☒ Water used to wash vehicles or control dust
- ☒ Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

2.8 DEWATERING:

Dewatering discharges of accumulated stormwater, groundwater, and surface water including discharges from dewatering of trenches, excavations, foundations, vaults, and other points of accumulation are prohibited unless managed by appropriate controls to prevent and minimize the offsite discharge of sediment and other pollutants.

2.9 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.3 of this SWP3 .

2.10 MAINTENANCE:

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.3 of this SWP3.

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CONT.	SECT.	JOB	HIGHWAY NO.
1986	Ø1	Ø72	FM 1314