DESIGN	FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
GRAPHICS	6	C 50-6-89		1
CHECKED	STATE	STATE DIST.	COUNTY	
	TEXAS	HOU	HARRIS	
CHECKED	CONT.	SECT.	JOB	HIGHWAY NO.
	0050	06	089,ETC.	US 290

SEE SHEET 2
FOR INDEX OF SHEETS

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

DESIGN SPEED = N/A
ADT = 56,700 (2022)
ADT = 103,200 (2042)

FUNCTIONAL CLASSIFICATION: PRINCIPAL ARTERIAL

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

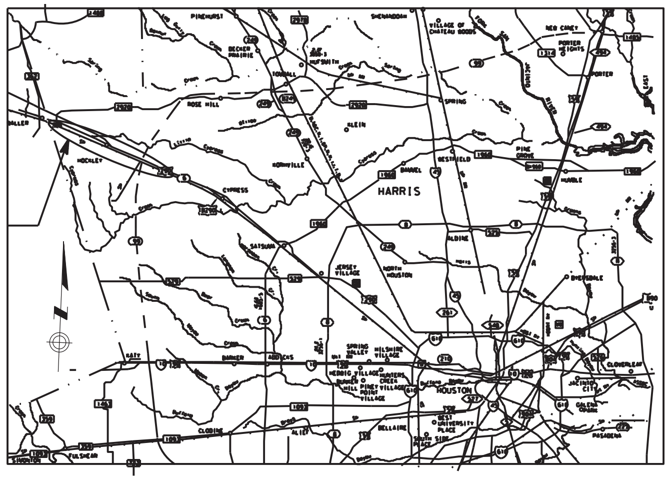
PROJECT NO.: C 50-6-89
CSJ 0050-06-089,ETC.
HARRIS COUNTY
US 290

LIMITS: FROM WEST OF BADTKE TO MUESCHKE

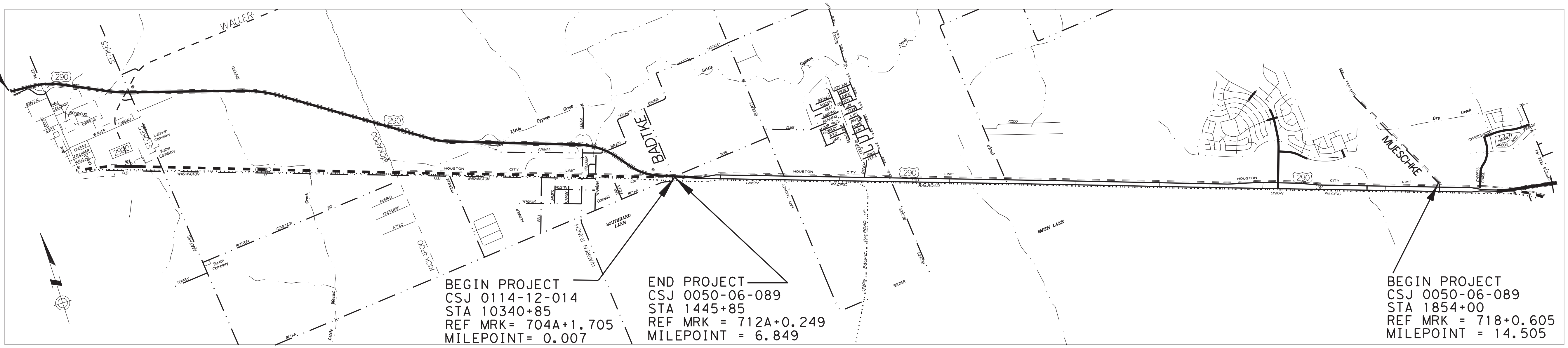
CSJ 0050-06-089 NET LENGTH OF PROJECT = 40,423.68 FT = 7.656 MI.
CSJ 0114-12-014 NET LENGTH OF PROJECT = 34,235.52 FT = 6.484 MI.
TOTAL NET LENGTH OF PROJECT = 74,659.92 FT = 14.14 MI.

FOR THE CONSTRUCTION OF CORRIDOR TRAFFIC MANAGEMENT CONSISTING OF INSTALLATION OF ITS EQUIPMENT AND INFRASTRUCTURE

PROJECT LOCATION



VICINITY MAP
N.T.S



PROJECT LOCATION MAP
N.T.S

COUNTY HARRIS PROJ. NO. C 50-06-89
HWY. NO. US 290 LETTING DATE: AUGUST 2022
DATE ACCEPTED

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

EQUATIONS:
US 290 STA.10340+85 =
US 290 @ W.OF BADTKE STA.1445+85

EXCEPTIONS: NONE

RAILROAD CROSSINGS: NONE

TEXAS DEPARTMENT OF TRANSPORTATION

SUBMITTED FOR LETTING: 5/23/2022

Kenneth Paradowski, P.E.
DESIGN SUPERVISOR

5/27/2022
APPROVED FOR LETTING:
DocuSigned by:
Larry W. Blackburn, P.E.
B5... DISTRICT ENGINEER

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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

Kenneth Paradowski, P.E. — KENNETH PARADOWSKI

5/23/2022 — DATE

TEXAS DEPARTMENT OF TRANSPORTATION

INDEX OF SHEETS

FED. ROAD DIV. NO.	COUNTY	STATE CONTROL NO.	HIGHWAY NO.
6	HARRIS	0050-06-089	US 290
STATE DIST. NO.	STATE	PROJECT NO.	SHEET NO.
HOUSTON	TEXAS		2

County: Harris **Control:** 0050-06-089, ETC.

Highway: US 290

General Notes:

General:

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

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

Contractor questions will be accepted through email, phone, and in person by the above individuals. Contractor questions will be reviewed by the Area Engineer or Assistant Area Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following address:

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

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.

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

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

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

County: Harris **Control:** 0050-06-089, ETC.

Highway: US 290

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.

General: Utilities

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

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

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

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

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.

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

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

Test each wire of each cable or conductor after installation. Any incomplete circuit or any damage to any wire or any cable will be cause for immediate rejection of the entire cable being tested. Remove and replace the entire cable at no expense to the Department and test the replacement cable after installation.

Consistently color-code and permanently label all power conductors, twisted wire pair cables, shielded cables, signal cables, control cables and fiber optic cables between all connections and splices to ensure immediate identification. Submit a chart or list identifying all cables and conductors in a logical and sequential manner.

All circuits must test clear of faults, grounds and open circuits.

Perform all staking subject to the approval of the Engineer in the field.

Ensure that all conductors are continuous without splices from terminal point to terminal point or as otherwise directed by the Engineer. Do not splice cables in ground boxes.

Pull conductors in PVC conduit using nonmetallic pull rope.

The use of ready mix concrete will be permitted. Equipment and construction methods, satisfactory to the Engineer, which will produce the desired results, may be used in lieu of those specified. Hand finishing will be permitted.

Employ, at no expense to the department, an approved commercial testing laboratory to pour and break concrete beams in lieu of all other tests for determining concrete strength. Submit certified reports of each break to the Engineer.
The Contractor may use membrane curing on concrete work as specified by Item 420, "Concrete Structures".

The location of CTMS equipment shown in the plans is approximate and is subject to change at time of installation. Prior to installing drill shafts, building foundations or cabinet foundations, contact the Engineer for field verification and approval of the exact location of each installation. Field verify each location for construction access and utility clearance prior to staking. Stake each foundation prior to the Engineer's field verification. Provide a minimum of 2 weeks notice for Engineer to perform field verification.

Provide each cabinet and building with complete documentation for all conductors contained within the cabinet/building. Completely detail the routing, termination point(s), and color code of each conductor in this documentation. Also identify the origin, destination and function of the signal for each conductor of each cable.

Submit equipment layouts for each type of cabinet and equipment floor plans for each type of building to the Engineer for approval prior to fabrication.

Construct all cabinet foundations in accordance with the details shown in the plans.

Do not use ground fault circuit interrupter (GFCI) outlets to supply power to electronic equipment.

Where new equipment is to be installed in existing cabinets, install all necessary shelves, racks, terminal panels, wiring, cabling, harnesses, etc. Review the layout of each cabinet/building and submit, for approval of the Engineer, a revised layout showing all new equipment and cabling. Include all costs associated with these modifications in the price bid for the equipment; no separate payment will be made.

In cases where conduit is to be mounted on existing structures, review the structure and submit the mounting details to the Engineer for approval.

Verify existing anchor bolt pattern dimensions prior to the fabrication of structures.

The plans show the conduits numbered and specific cables in specific conduits. The purpose of these notes is to instruct the Contractor on how to group the cables in the conduits and not to specify the exact conduit that is to carry the cables i.e., the numbering system is arbitrary and may be set by the Contractor.

Between intersections, restore all areas disturbed due to trenching, boring, drill shaft installation, conduit and ground box installation...etc. to a condition equivalent to the original condition within 14 working days from the time work begins in the area. Include all necessary planting, mulching, seeding, sodding, sidewalk, curb and riprap replacement.

At intersections, restore all areas disturbed due to trenching, boring, drill shaft installation, conduit and ground box installation, etc. to a condition equivalent to the original condition within

45 working days from the time work begins in the area. Include in this work all necessary planting, mulching, seeding, sodding, sidewalk, curb and riprap replacement.

In locations where conductors with greater than 50 VAC are routed through ground boxes with other cables, install a section of 2 inch flexible PVC conduit in the ground boxes and route the conductors through this conduit to keep it separate from other cables. The furnishing and installing of this flexible PVC conduit will not be paid for directly, but will be incidental to the various pay items.

At locations where fiber optic cable is to be installed in the same conduit with other cables, enclose the fiber optic cable in an Engineer-approved innerduct. The innerduct will not be paid for directly but is considered incidental to the various bid items.

Maintain the median of the freeway in a serviceable condition, free of obstructions, and acceptable to the Engineer. Eliminate all hazards to the traveling public.

The Contractor may make the electrical grounding connections and permissible splices using the thermal fusion process, Cadweld, Thermaweld or equal, instead of bolted connections and splices.

After satisfactory completion of all tests, place all electronic equipment in operation. Final acceptance will not be made until the electronic equipment has operated satisfactorily for a period of not less than 90 days and in is full compliance with the requirements of the plans and specifications.

Assume full responsibility for the electronic equipment during the test period. Make any adjustments or repairs, which may be required and remedy any defects or damages that may occur at no expense to the Department.

Deliver all equipment removed, as shown in the plans, to a location specified by the Engineer.

Item 5: Control of Work

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

Table 1

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

Spec Item No.'s	Product	Submittal Required	Approval Required (Y/N)	Contractor/ Fabricator P.E. Seal Required	Reviewing Party	Shop or Working Drawing (Note 1)
7.16.1&.2	Construction Load Analyses	Y	Y	Y	B	WD
400	Excavation and Backfill for Structures (cofferdams)	Y	N	Y	A	WD
403	Temporary Special Shoring	Y	N	Y	C	WD
420	Formwork/Falsework	Y	N	Y	A	WD
423	Retaining Walls, (calcs req'd.)	Y	Y	Y	C	SD
425	Optional Design Calculations (Prstrs Bms)	Y	Y	Y	B	SD
425	Prestr Concr Sheet Piling	Y	Y	N	B	SD
425	Prestr Concr Beams	Y	Y	N	B	SD
425	Prestr Concr Bent	Y	Y	N	B	SD
426	Post Tension Details	Y	Y	N	B	SD
434	Elastomeric Bearing Pads (All)	Y	Y	N	B	SD
441	Bridge Protective Assembly	Y	Y	N	B	SD
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,	Y	Y	Y	T	SD

	Etc.)					
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

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 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.

No significant traffic generator events have been identified.

Item 8: Prosecution and Progress

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

The Lane Closure Assessment Fee is $ *1,000*. This fee applies to the Contractor for closures or obstructions that overlap into restricted hour traffic for each hour or portion thereof, per lane, regardless of the length of lane closure or obstruction. For Restricted Hours subject to Lane Assessment Fee refer to the Item, “Barricades, Signs, and Traffic Handling.” The time increment for the Lane Closure Assessment fee for this project is one hour.

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.

Due to the nature of the work involved, a Storm Water Pollution Prevention Plan (SWP3) is not required. However, if a SWP3 becomes necessary, it will be paid as extra work.

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

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

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

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

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

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

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

Item 540: Metal Beam Guard Fence

Painting the timber posts is not required.

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

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

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

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

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

At locations requiring attachment of Metal Beam Guard Fence (MBGF) to concrete railing or concrete traffic barrier, repair and fill any existing holes in the railing or barrier that are not in the correct location for attaching the new MBGF. Perform this work in accordance with the Item, "Concrete Structure Repair." Existing anchor bolt holes that cannot be utilized must be filled with an epoxy grout before drilling new holes. Then core-drill new holes in the correct locations and repair any resulting spalls at no expense to the Department. This work is considered subsidiary to the MBGF transition section (Item 540).

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.

Item 416: Drilled Shaft Foundations

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

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

Item 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."

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

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

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

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

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

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

One Lane Closure

Day	Daytime work	Nighttime work	Restricted Hours Subject to Lane Assessment Fee
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
Saturday	N/A	N/A	N/A
Sunday	N/A	N/A	N/A

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

Law enforcement assistance will be required for this project and is expected to be required for major traffic control changes and lane closures. Coordinate with local law enforcement and arrange for law enforcement as directed or agreed by the Engineer. Before payment will be made, complete the "Daily Report on Law Enforcement Force Account Work" (Form 318), provided by the Department and submit daily invoices that agree with this form for any day during the month in which approved services were provided.

Provide full-time, off-duty, uniformed, certified peace officers, as part of traffic control operations. The peace officers must be able to show proof of certification by the Texas Commission on Law Enforcement Officers Standards. The cost of the officers is paid for on a force account basis.

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

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 in place of the cast iron junction boxes shown on standard sheets CTBI (3), CTBI (4), and SSCB (4). Mount the junction boxes flush (+ 0 in., - 1/2 in.) with the concrete surface of the concrete barrier.

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

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.

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

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

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

Item 624: Ground Boxes

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

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

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

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

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

Record Global Positioning System (GPS) location data for each ground box installed on this project and provide the data to the Engineer. Consider the work to be part of this item.

Item 628: Electrical Services

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

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

Any and all cost associated with the installation and connection of service to the electrical utility company will be considered incidental to the item, “Electrical Services”. This includes conduit, conduit fittings and electrical conductors.

Furnish a UL-listed meter can for all electrical service poles. Furnish a size and style of meter can in accordance with the requirements of the local electrical service provider. Consider this work incidental to the Item, “Electrical Services”.

Primary line extensions, connection charges, meter charges, and other charges by the utility company providing power to the location shown, when required, are paid for by force account work. Obtain the Engineer’s approval for the costs associated with these charges before engaging the utility company to perform the work.

Provide service enclosures which are lockable and equip each enclosure with a Master # 2195 padlock. Supply each enclosure with two keys.

Equip all CTMS service pole load centers with a 100 amp (minimum) main circuit breaker and equip each service pole with a minimum of twelve single pole circuit breakers.

Provide a concrete drill shaft foundation with a minimum outside diameter of 15 inches for mounting of each service pole. Include the cost of the foundation in the cost for the service pole.

Utilize threaded hubs for all conduit entries into service enclosures.

Item 650: Overhead Sign Supports

Stencil the structure numbers on the new structures for permanent identification.

If sign panels mounted on an overhead sign support face the same direction of traffic, keep the bottoms of the sign panels in the same horizontal plane, unless otherwise shown in the plans.

There is no additional reimbursement for blocking or shims for fits of alignment.

Mill test reports are not required for the walkway, grating, miscellaneous secondary structural items, or hardware.

Use the existing panel supports if removing existing guide signs and if placing new panels of different sizes at the same location. Extend the supports, if needed. If the supports extend over the top of the panel, cut off the supports at the top of the panel or the top of the truss, whichever is higher.

Before fabricating, field check the sign structure elevations, details, and dimensions shown on the plans.

If sign lighting and walkways are not used, trim the sign support brackets flush with the bottoms of the signs.

Assume ownership of removed existing overhead sign supports and other removed materials.

Item 6007: Fiber Optic Cable

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

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.

Fully test all fiber optic cable installed on the project in accordance with the testing requirements of the specification.

Fully splice the temporary fiber optic cable at all locations.

Furnish all material and services necessary for connection of new equipment to the existing fiber optic cable.

Repair any damage to the existing fiber optic cable or patch panels during the connection of new equipment at no expense to the Department.

Document all changes in the fiber optic cable utilization and provide detailed fiber optic cable utilization diagrams to the Engineer upon completion of all changes.
Provide fiber optic splice enclosures which are designed and fully equipped to accommodate 144 strand fiber optic cables, splices and connectors unless shown otherwise on the plans.

Where fiber optic cable is to be terminated in a CCTV cabinet, traffic signal cabinet or DMS cabinet as shown on the plans, terminate the cable with the use of a fiber optic fan out kit unless shown otherwise on the plans. Consider the fan out kits to be incidental to this item.

Test all fiber optic cable on this project bi-directionally.

Supply all test equipment, cabling and connectors necessary for performing the tests by the Contractor.

Item 6010: CCTV Field Equipment

Supply CCTV equipment on this project which is fully compatible with the existing CCTV control system operated from Houston Transtar. In order to prove compatibility and operability of CCTV systems submitted for use on this project, deliver one complete set of CCTV equipment to Houston Transtar for testing by Houston TranStar Information Technology Personnel as part of the equipment submittal and approval process. Allow a minimum of 30 days for testing by Houston TranStar IT personnel. Submit the CCTV equipment for testing no later than 60 days after completion of TxDOT submittal review. The equipment submitted for testing must be fully assembled and in a fully operational condition. Configure all equipment submitted for testing as is intended for use on the project. Prototype equipment will not be allowed. The equipment will be interconnected to the existing CCTV control system and must be fully operational using that system. No modifications to the existing CCTV control system will be made to accommodate the submitted CCTV equipment. To be considered fully operational, as a minimum, the equipment must correctly respond to the following commands:

pan left	focus far
pan right	iris override
tilt up	iris open
tilt down	iris close
Zoom in	Camera power (latching)
Zoom out	pan tilt position preset
Focus near	

The equipment must be fully operational using the existing control system from Transtar. Equipment which in any manner is not fully operational with the control system will be considered as not passing the test. Equipment which does not pass the test will be allowed one chance to be retested. The retest must occur within 30 days after the initial test. All issues of non-compliance and all discrepancies must be resolved for the second test. Equipment which is not able to be retested within 30 days or which does not pass the second test will be rejected and cannot be used on the project. No additional time or compensation will be granted for the testing of the CCTV equipment. Successful testing of the CCTV equipment must be completed prior to any construction activities at the CCTV locations. No camera poles, cabinets or any other CCTV related equipment shall be installed until successful CCTV equipment testing has occurred.

Upon completion of installation, test the communications link installed between the communications hub and the CCTV field equipment locations. Perform the test at all CCTV locations on the project.

Use a test signal generator and a video monitor to demonstrate the ability of the video signal link to transmit a NTSC compliant video signal from the CCTV cabinet to the communications hub. After completion of testing with the signal generator, connect the CCTV camera to the link and use a video monitor at the communications hub to verify the presence of an NTSC compliant video signal. Degradation of the video signal must not be discernible using the video monitor.

Connect a laptop computer containing TxDOT-supplied CCTV control software on the link and use it to control the CCTV movement and control functions from the communications hub utilizing the data link. Demonstrate the ability to control all CCTV functions outlined in the specifications.

Supply all test equipment, cabling and connectors necessary for performing the tests.

Record Global Positioning System (GPS) location data for each CCTV installed on this project and provide the data to the Engineer. Consider the work to be part of this item.

Item 6017: Communication Hub Building

Provide surge protection devices (SPDs) to protect electronics from lightning, transient voltage surges, and induced current. Install SPDs on all power, data, video, and any other conductive circuit.

Install an SPD at the closet termination or disconnection point where the supply circuit enters the building. Location the SPD on the load site of the power distribution panel breakers and ahead of any and all electronic devices. Connect the SPD ground lead directly to the ground bus. Use of wire nuts is prohibited. Install in accordance with manufacturers recommendations.

Provide UL Listed Type 1 or Type 2 SPD and labeled to UL1449 Third Edition, posted at UL.com, under Certifications UL Category Code VZCA, and have a 20kA I-nominal rating. Provide SPD rated as NEMA 4. SPD with integral EMI/RFI line filtering may be required if shown on the plans.

Do not exceed 700 V on the Voltage Protection Rating (VPR) on any mode (L-N, L-G, and N-G).
Do not exceed 150 V on the Maximum Continuous Operating Voltage (MCOV). Equal or exceed 40kA the SPD surge current rating per mode (L-N), (L-G), (N-G).
Equal or exceed 50 kA or the available short circuit current, whichever is higher for the SPD Short Circuit Current Rating (SCCR).

Provide SPD with directly connected Metal Oxide Varistors (MOV) exceeding 32 mm in diameter with thermal safety disconnectors. Gas tube and spark gap SPD are not permitted. Ensure each MOV's operational status can be monitored via visual indicator, including N-G mode.

Provide SPD with one set of Normally Open (NO), Normally Closed (NC) Form C contacts for remote monitoring.

Ensure the SPD utilized for AC power does not dissipate any energy and does not provide any series impedance during standby operation. Return the unit to its non-shunting mode after the passage of any surge and do not allow the shunting of AC power.

Install an SPD inside of the building on the power distribution to the equipment. Keep leads as short as possible with all conductor bends formed to the maximum possible radius. Connect the SPD ground lead directly to the ground bus. Use of wire nuts is prohibited. Install in accordance with manufacturers recommendations.

Provide UL Listed Type 1 or Type 2 SPD labeled to UL1449 Third Edition, posted at UL.com, under Certifications UL Category Code VZCA, and have a 20kA I-nominal rating. Provide SPD rated as NEMA 4.

Do not exceed 700 V on the Voltage Protection Rating (VPR) on any mode (L-N and N-G).

Do not exceed 150 V on the Maximum Continuous Operating Voltage (MCOV).

Equal or exceed 40 kA the SPD surge current rating per mode (L-N) and (N-G).

Equal or exceed 50 kA or the available short circuit current, whichever is higher for the SPD Short Circuit Current Rating (SCCR).

Provide SPD with directly connected Metal Oxide Varistors (MOV) exceeding 32 mm in diameter with thermal safety disconnectors. Gas tube and spark gap SPD are not be permitted. Ensure each MOV's operational status can be monitored via visual indicator, including N-G mode.

Provide SPD with one set of Normally Open (NO), Normally Closed (NC) Form C contacts for remote monitoring.

Install a specialized SPD on all conductive circuits including, but not limited to, data communication cables, coaxial video cables, and low-voltage power cables. Ensure that these devices comply with the functional requirements shown in Table 2 for all available modes (i.e., power L-N, N-G; data and signal center pin-to-shield, L-L, L-G, and shield-G where appropriate).

These specialized SPD must have an operating voltage matching the characteristics of the circuit. Ensure that these specialized SPD are UL 497B or UL 497C Listed, as applicable.

Provide the SPD with 3 stages of surge suppression in a Pi (π) configuration. The first stage (primary side) consists of parallel-connected Gas Discharge Tubes (GDTs). The

second stage consists of a series connected resistor or inductor. The third stage (secondary side) consists of parallel-connected transorbs or silicone avalanche diodes (SADs).

Ground the SPD to the DIN rail and a wire terminal connection point. (Grounding solely through the DIN rail connection is not adequate and does not meet the performance or intent of this specification.)

Install coaxial SPDs in a manner that prevents ground loops and resulting signal deterioration. This is usually caused where the cable has different references to ground at either end and connecting SPDs at both ends that have only Pin to Shield protection completes a ground loop circuit through the Shield. SPDs having Pin to Shield protection, and separate Shield to Ground protection are acceptable to eliminate ground loops.

Circuit Description	Maximum Continuous Operating Voltage (MCOV)	Frequency/Bandwidth/Data Rate	Surge Capacity	Maximum Let Through Voltage
12 VDC	15-20 V	N/A	5k A per mode (8x20 µs)	<150 Vpk
24 VAC	30-55 V	N/A	5k A per mode (8x20 µs)	<175 Vpk
48 VDC	60-85 V	N/A	5k A per mode (8x20 µs)	<200 Vpk
Coaxial Composite Video	4-8 V	Up to 1.5 GHz	10k A per mode (8x20 µs)	<100 Vpk
RS422/RS485	8-15 V	Up to 10 Mbps	10k A per mode (8x20 µs)	<30 Vpk
T1	13-30 V	Up to 10 Mbps	10k A per mode (8x20 µs)	<30 Vpk
Ethernet Data	7-12 V	Up to 100 Mbps	3k A per mode (10x1000 µs)	<30 Vpk

Provide Square D QO series, GE THQ series, or equivalent distribution panel.

Equip all communication hub buildings supplied on this project with #2 Corbin locks.

Record Global Positioning System (GPS) location data for each hub building installed on this project and provide the data to the Engineer. Consider the work to be part of this item.

Item 6028: Installation of Dynamic Message System

Record Global Positioning System (GPS) location data for each Dynamic Message Sign (DMS) installed on this project and provide the data to the Engineer. Consider the work to be part of this item.

Item 6029: Radar Vehicle Sensing Device

Record Global Positioning System (GPS) location data for each sensing device installed on this project and provide the data to the Engineer. Consider the work to be part of this item.

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

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

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

A total of one (1) shadow vehicle with a TMA/TA is required for the work with the exception of Pavement Marking Operations. The Contractor is responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs/TAs needed on the project.

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

Item 6186: Intelligent Transportation System (ITS) Ground Box

The ground box locations are approximate. Alternate ground box locations may be used as directed. 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 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.

Record Global Positioning System (GPS) location data for each ground box installed on this project and provide the data to the Engineer. Consider the work to be a part of this item.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0050-06-089 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY US 290

			CONTROL SECTION JOB		**0050-06-089**		**0114-12-014**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00123436**		**A00140449**			
			COUNTY		**Harris**		**Harris**			
			HIGHWAY		**US 290**		**US 290**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	416-6005	DRILL SHAFT (42 IN)		LF	255.000		135.000		390.000	
	416-6023	DRILL SHAFT (SIGN MTS) (54 IN)		LF	74.000				74.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)		CY	13.000		11.250		24.250	
	500-6001	MOBILIZATION		LS	1.000				1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING		MO	18.000				18.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)		LF	1,000.000				1,000.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)		LF	1,000.000				1,000.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)		LF	175.000				175.000	
	540-6016	DOWNSTREAM ANCHOR TERMINAL SECTION		EA	1.000				1.000	
	544-6006	GDRAIL END TRT(INST)(WOOD POST)(TY III)		EA	1.000				1.000	
	618-6031	CONDT (PVC) (SCH 40) (3") (CONC ENCSE)		LF	40.000		50.000		90.000	
	618-6046	CONDT (PVC) (SCH 80) (2")		LF	2,555.000		2,315.000		4,870.000	
	618-6047	CONDT (PVC) (SCH 80) (2") (BORE)		LF	1,760.000		1,650.000		3,410.000	
	618-6053	CONDT (PVC) (SCH 80) (3")		LF	445.000		625.000		1,070.000	
	618-6054	CONDT (PVC) (SCH 80) (3") (BORE)		LF	60.000		630.000		690.000	
	618-6058	CONDT (PVC) (SCH 80) (4")		LF	120.000		400.000		520.000	
	620-6002	ELEC CONDR (NO.14) INSULATED		LF	41,365.000		32,925.000		74,290.000	
	620-6007	ELEC CONDR (NO.8) BARE		LF	930.000		1,490.000		2,420.000	
	620-6008	ELEC CONDR (NO.8) INSULATED		LF	1,920.000		2,690.000		4,610.000	
	620-6009	ELEC CONDR (NO.6) BARE		LF	100.000				100.000	
	620-6010	ELEC CONDR (NO.6) INSULATED		LF	300.000				300.000	
	620-6011	ELEC CONDR (NO.4) BARE		LF	210.000		800.000		1,010.000	
	620-6012	ELEC CONDR (NO.4) INSULATED		LF	420.000		1,900.000		2,320.000	
	620-6015	ELEC CONDR (NO.2) BARE		LF	80.000				80.000	
	620-6016	ELEC CONDR (NO.2) INSULATED		LF	240.000				240.000	
	624-6002	GROUND BOX TY A (122311)W/APRON		EA	26.000		18.000		44.000	
	628-6250	ELC SRV TY D 120/240 100(NS)SS(N)SP(O)		EA	12.000		9.000		21.000	
	650-6035	INS OH SN SUP(35 FT BAL TEE)		EA	2.000				2.000	
	654-6004	SIGN WALKWAY (36 IN) WITH HNDRL		LF	62.000				62.000	
	6007-6010	FIBER OPTIC CBL (SNGLE-MODE)(6 FIBER)		LF	41,755.000		33,630.000		75,385.000	
	6007-6011	FIBER OPTIC CBL (SNGLE-MODE)(12 FIBER)		LF	23,950.000		5,975.000		29,925.000	
	6007-6017	FIBER OPTIC CBL (SNGLE-MODE)(144 FIBER)		LF	41,265.000		34,905.000		76,170.000	
	6007-6023	FIBER OPTIC PATCH PANEL (12 POSITION)		EA	8.000		3.000		11.000	
	6007-6027	FIBER OPTIC PATCH PANEL (144 POSITION)		EA	3.000		3.000		6.000	
	6007-6094	FIBER OPTIC FUSION SPLICE		EA	384.000		540.000		924.000	
	6010-6001	CCTV FIELD EQUIPMENT (ANALOG)		EA	11.000		9.000		20.000	
	6016-6008	ITS MULTI-DUCT CND (PVC-40)(CONC ENCSE)		LF			250.000		250.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0050-06-089 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY US 290

			CONTROL SECTION JOB		**0050-06-089**		**0114-12-014**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00123436**		**A00140449**			
			COUNTY		**Harris**		**Harris**			
			HIGHWAY		**US 290**		**US 290**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	6016-6011	ITS MULTI-DUCT CND (PVC-80)(BORE)		LF			400.000		400.000	
	6017-6001	COMMUNICATION HUB BUILDING		EA	1.000		3.000		4.000	
	6027-6003	CONDUIT (PREPARE)		LF	160,140.000		98,369.000		258,509.000	
	6028-6002	INSTALL DMS (FOUNDATION MTD CABINET)		EA	2.000				2.000	
	6035-6001	FIBER OPTIC VIDEO DATA TRANSMITTER		EA	11.000		9.000		20.000	
	6035-6002	FIBER OPTIC VIDEO DATA RECEIVER		EA	11.000		9.000		20.000	
	6064-6047	ITS POLE (55 FT)(110 MPH)		EA	11.000		9.000		20.000	
	6064-6080	ITS POLE MNT CAB (TY 2)(CONF 1)		EA	11.000		9.000		20.000	
	6185-6002	TMA (STATIONARY)		DAY	270.000				270.000	
	6186-6002	ITS GND BOX(PCAST) TY 1 (243636)W/APRN		EA	8.000		2.000		10.000	
	6304-6001	ITS RVSD (DATA COLLECT ONLY) SYS		EA	5.000		2.000		7.000	
	11	STATE FORCE ACCOUNT WORK (PARTICIPATING)		LS	1.000				1.000	
	14	PUBLIC UTILITY FORCE ACCT WORK (PARTICIPATING)		LS	1.000				1.000	
	16	MATERIAL FURNISHED BY THE STATE (PARTICIPATING)		LS	1.000				1.000	
	18	CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)		LS	1.000				1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)		LS	1.000				1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)		LS	1.000				1.000	
		LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)		LS	1.000				1.000	

DATE:
FILE:

BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

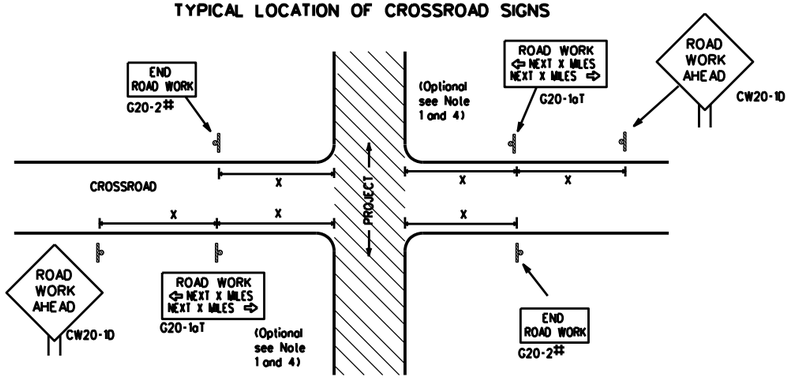
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

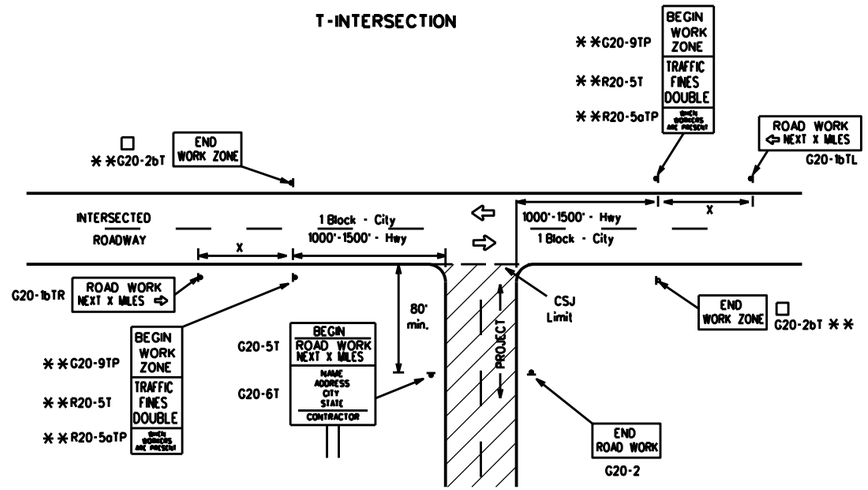
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US 290
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	HOU	HARRIS		16
5-10 5-21				

DATE:
FILE:

TYPICAL LOCATION OF CROSSROAD SIGNS



T-INTERSECTION



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.

Notes

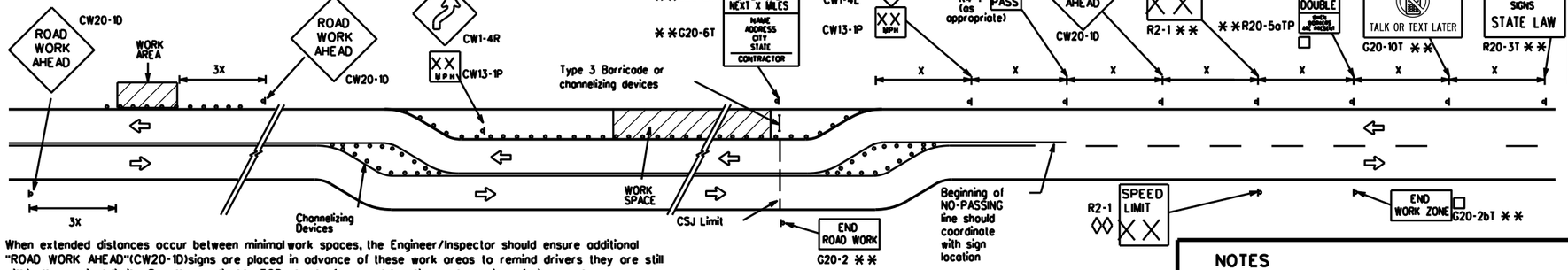
1. The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D)sign and a (G20-2) "END ROAD WORK" sign, unless noted otherwise in plans.
2. The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "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.

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

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.

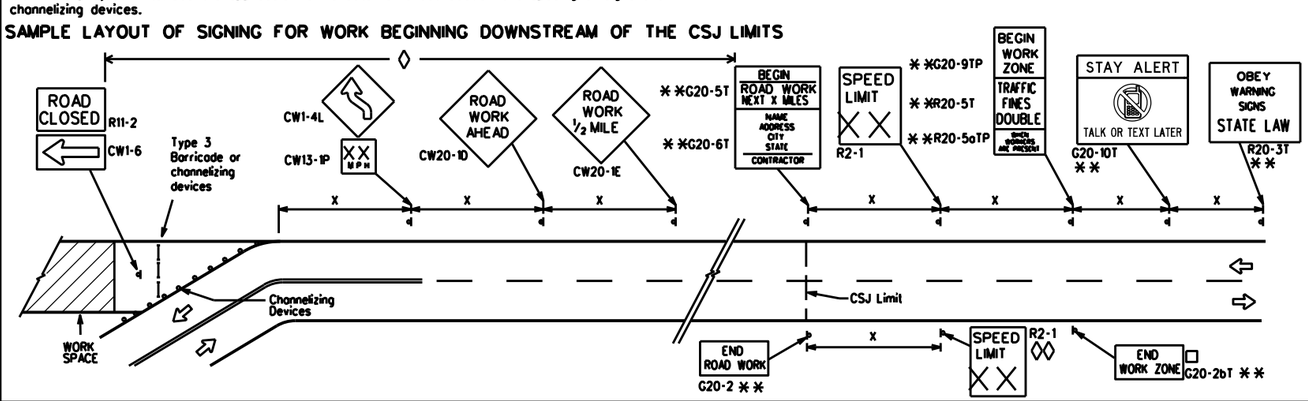
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US 290
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	HARRIS		17

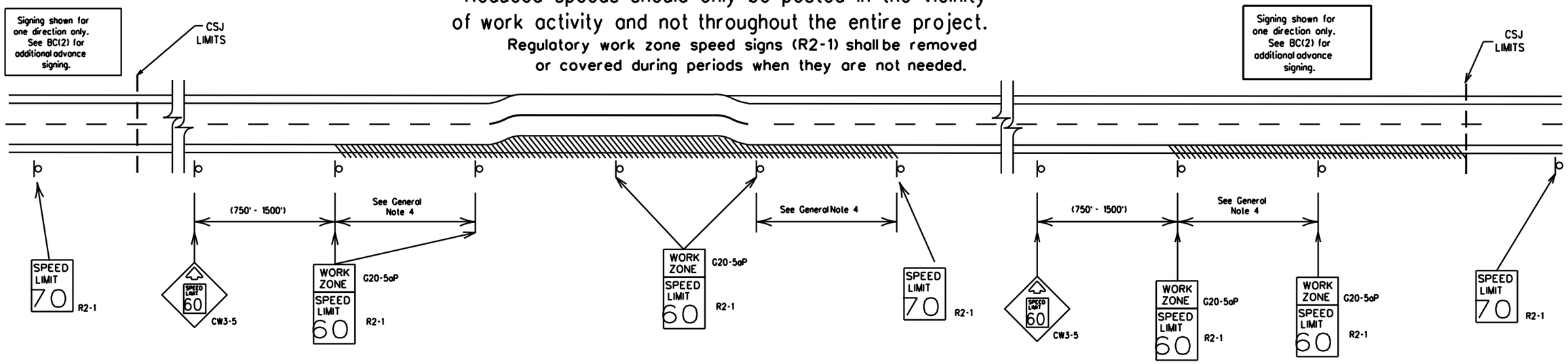
DATE:
FILE:

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13 5-21	0050	06	089	US 290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		18

DATE:
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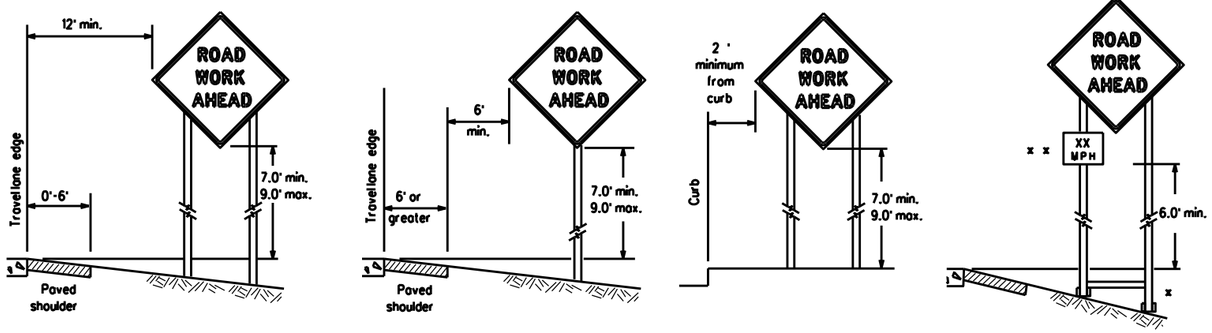
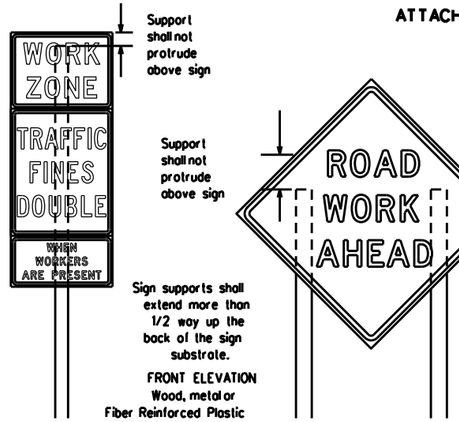
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



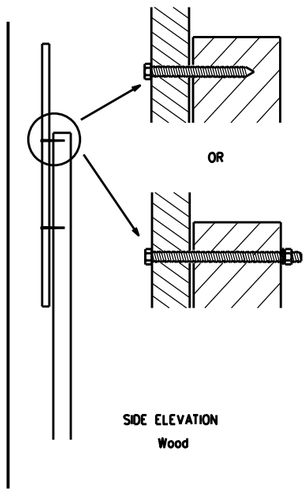
x When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS



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.

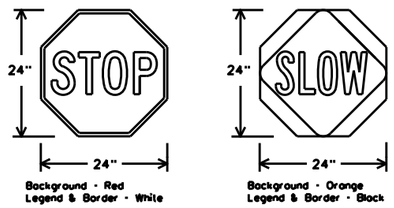


Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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.

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 lightness 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 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

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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7-13 5-21	HOU	HARRIS		19

DATE:
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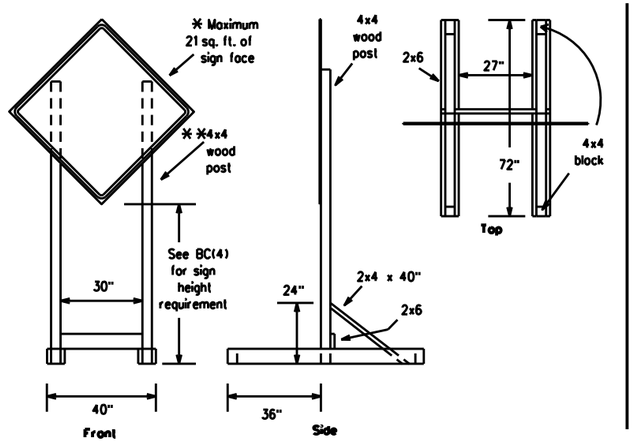
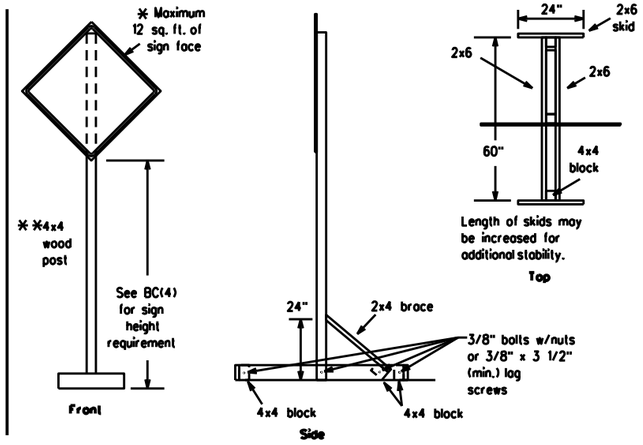
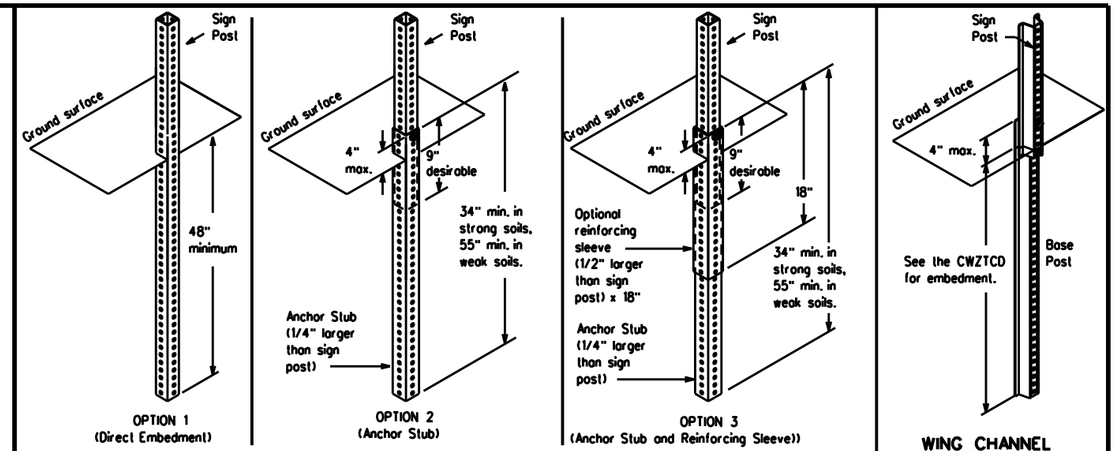




SKID MOUNTED WOOD SIGN SUPPORTS

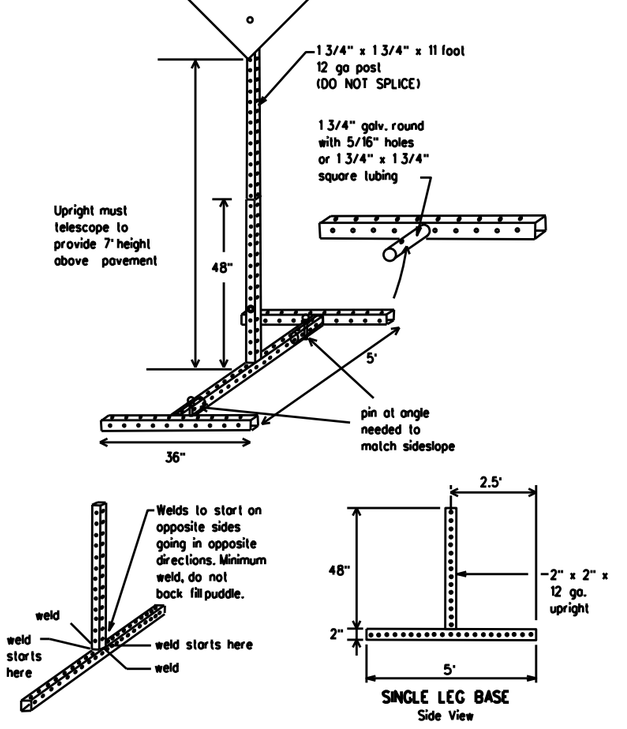
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

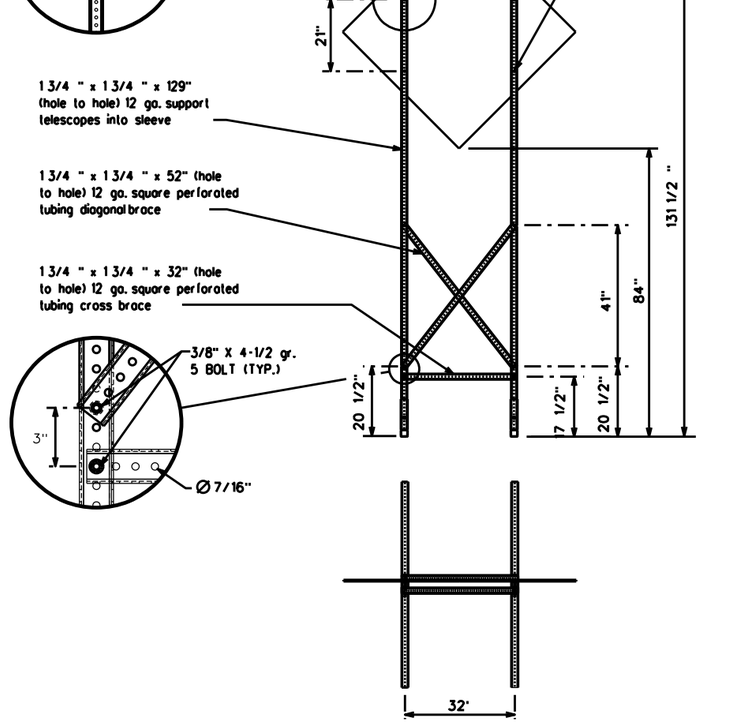


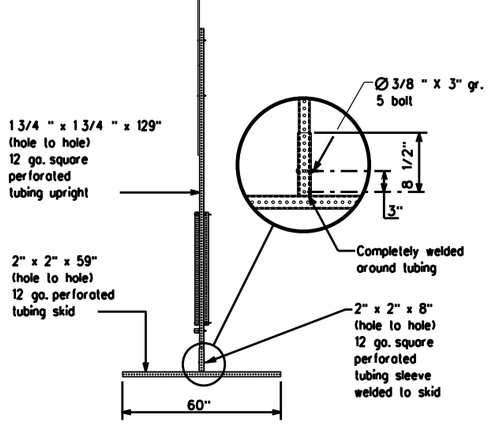
PERFORATED SQUARE METAL TUBING

GROUND MOUNTED SIGN SUPPORTS

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







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.

SHEET 5 OF 12

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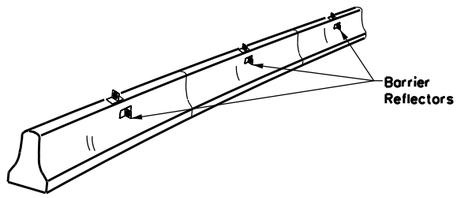
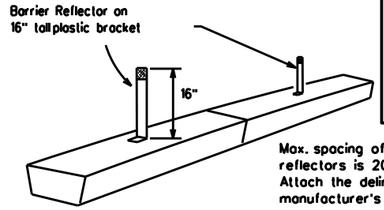
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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

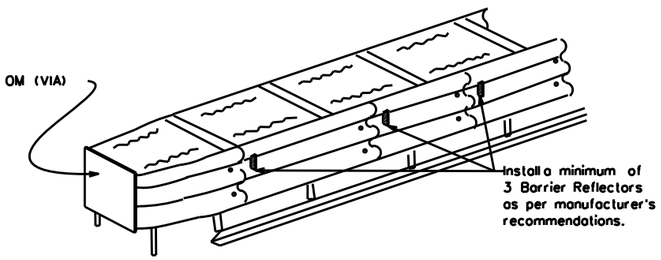


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

LOW PROFILE CONCRETE BARRIER (LPCB)

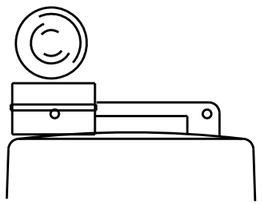


DELINEATION OF END TREATMENTS

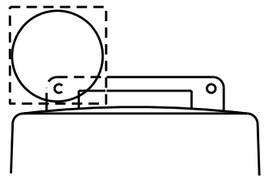
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

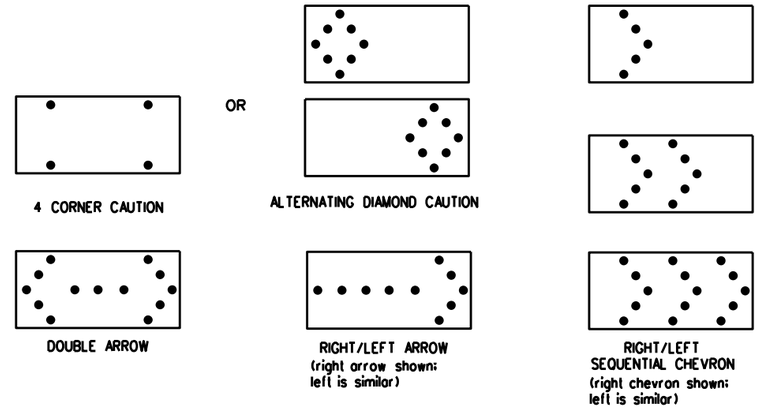
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

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

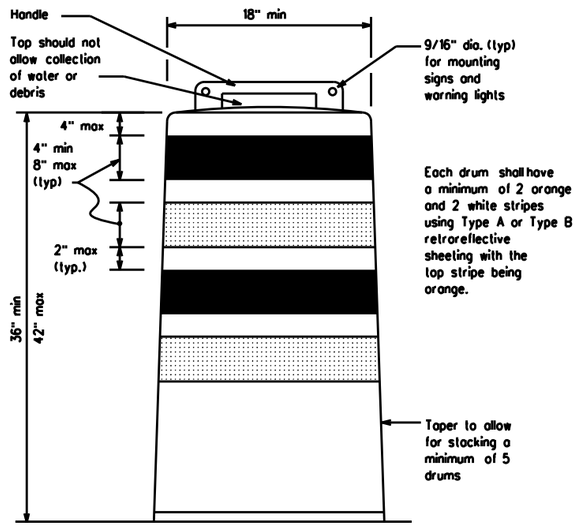
1. Plastic drums shall be a two-piece design: the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

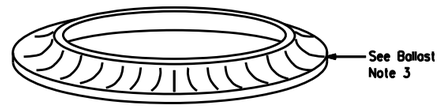
RETROREFLECTIVE SHEETING

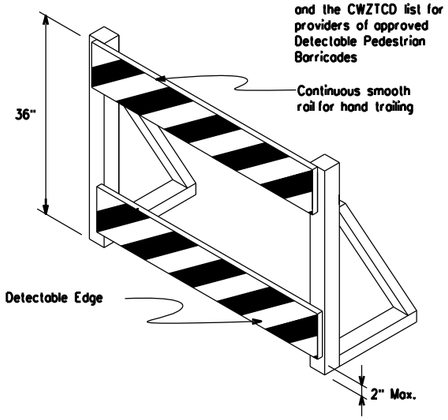
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

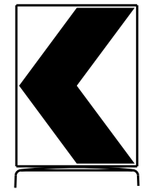




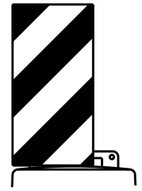


DETECTABLE PEDESTRIAN BARRICADES

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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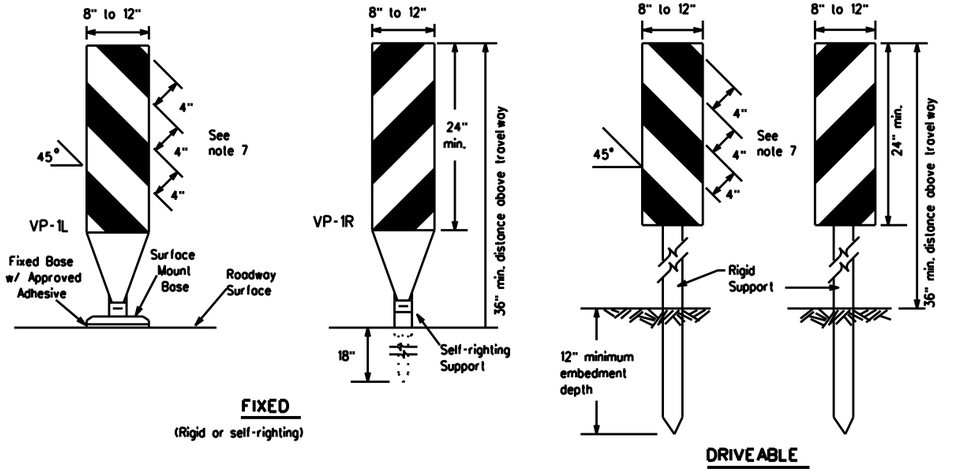
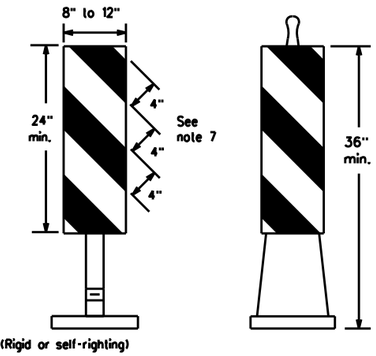


FIXED

(Rigid or self-righting)

DRIVEABLE

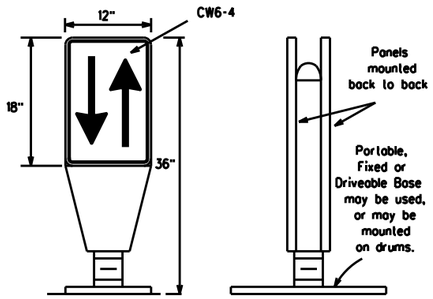


(Rigid or self-righting)

PORTABLE

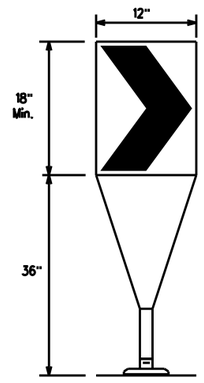
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual 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 or Type C conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



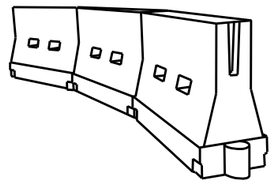
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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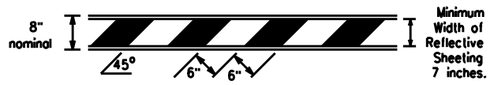
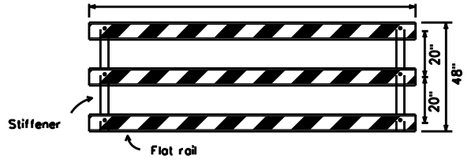
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



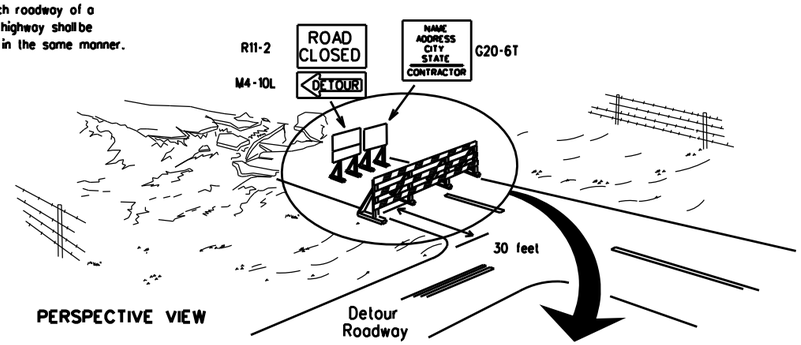
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

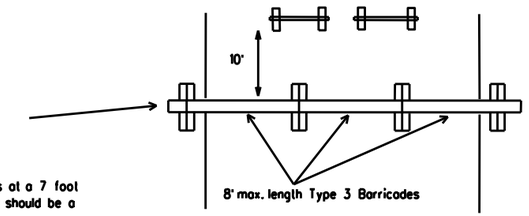
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

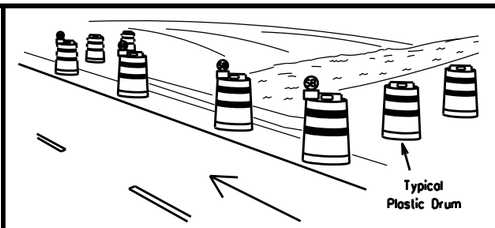
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

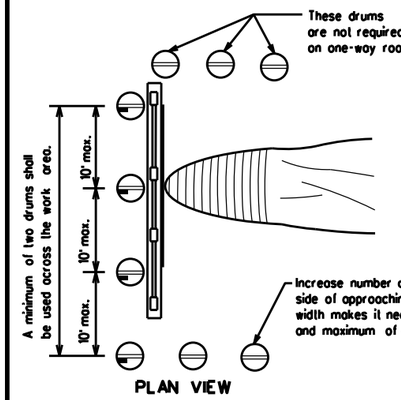
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

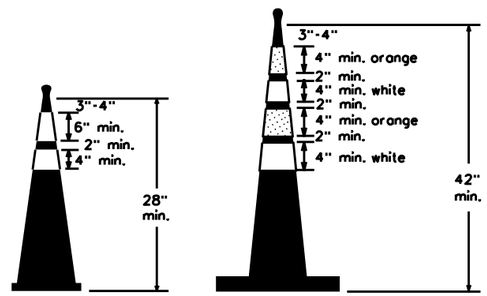
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



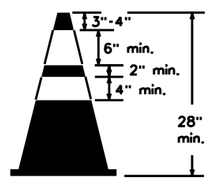
PLAN VIEW

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

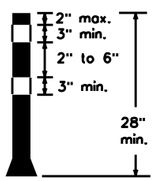
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

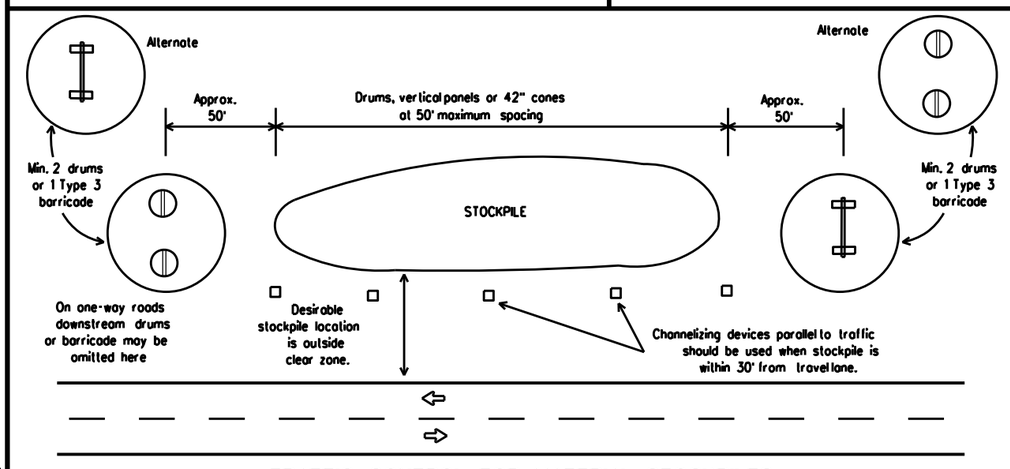


Tubular Marker

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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DATE:
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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

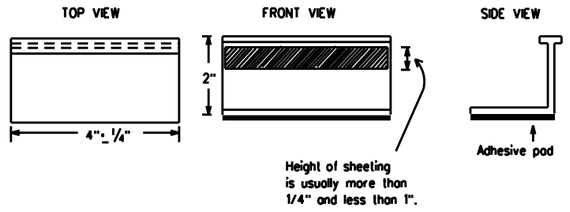
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

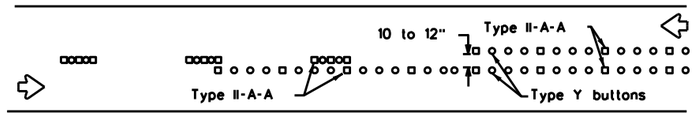
BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US 290
2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	HOU	HARRIS		26
11-02 8-14				

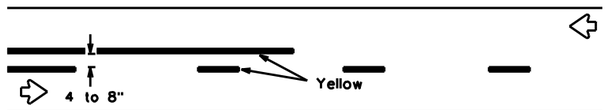
DATE:
FILE:

PAVEMENT MARKING PATTERNS

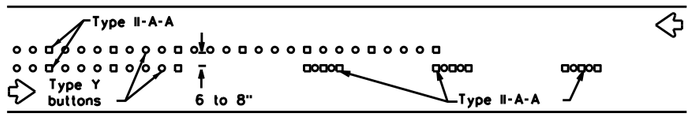
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



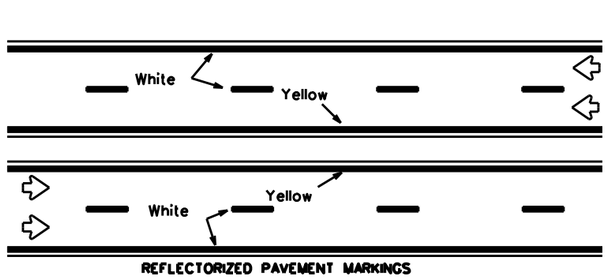
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



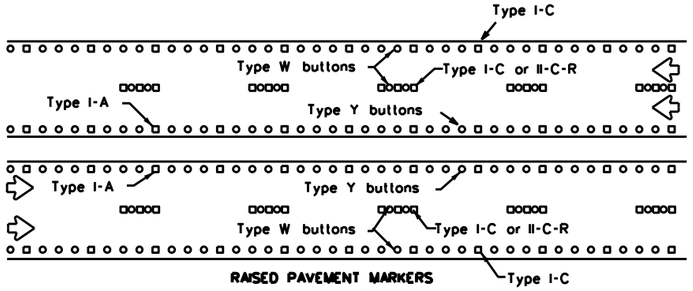
RAISED PAVEMENT MARKERS - PATTERN B

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



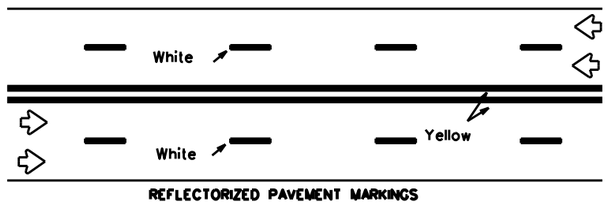
REFLECTORIZED PAVEMENT MARKINGS



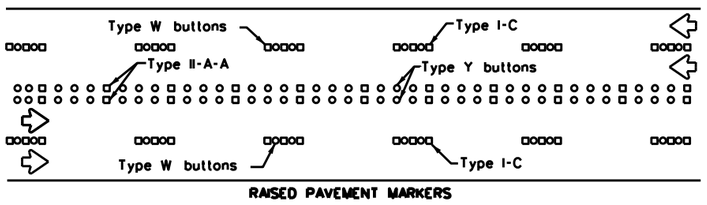
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



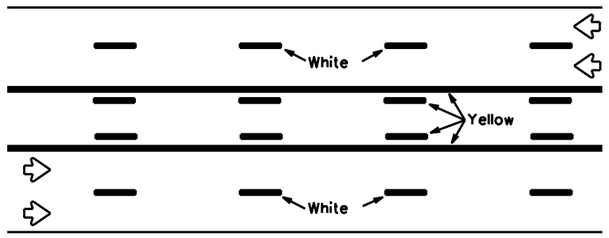
REFLECTORIZED PAVEMENT MARKINGS



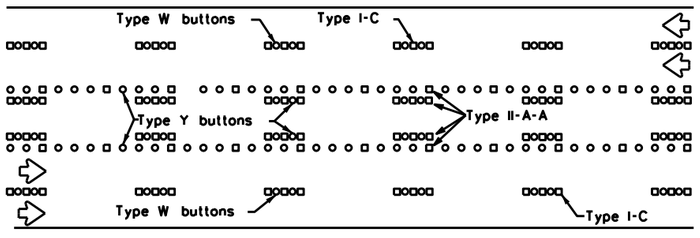
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

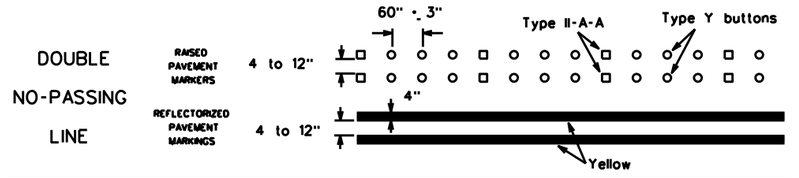
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

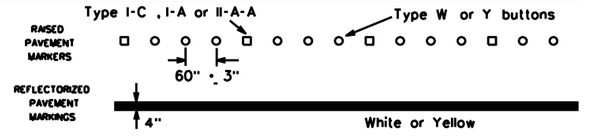
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

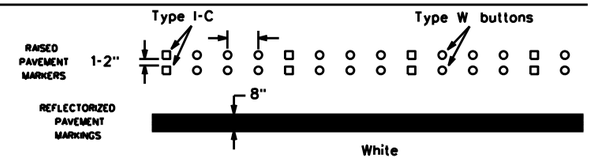


EDGE LINE OR SINGLE NO-PASSING LINE



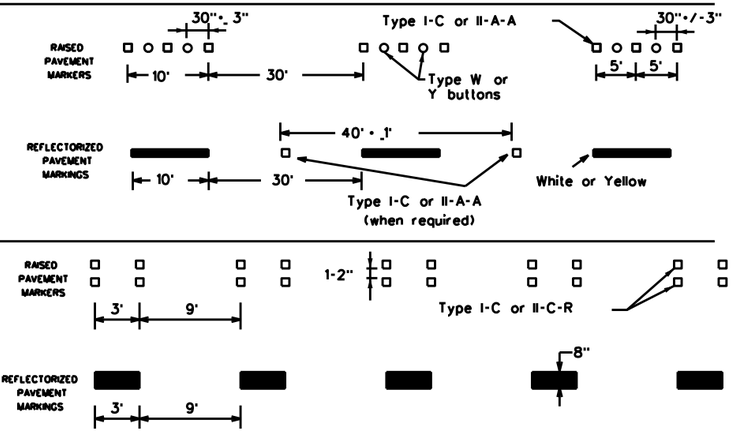
WIDE LINE

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



BROKEN LINES

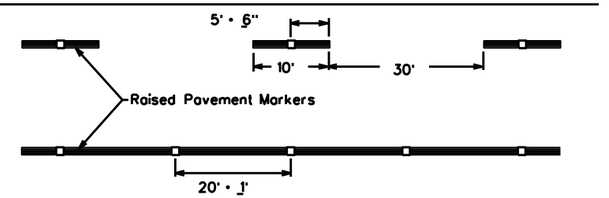
CENTER LINE OR LANE LINE



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."

SHEET 12 OF 12

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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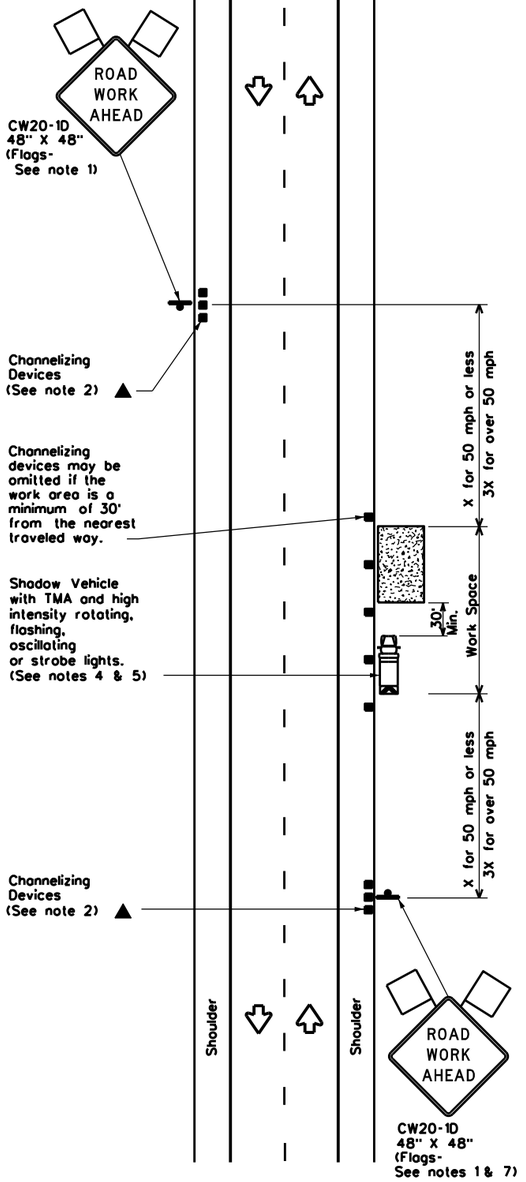
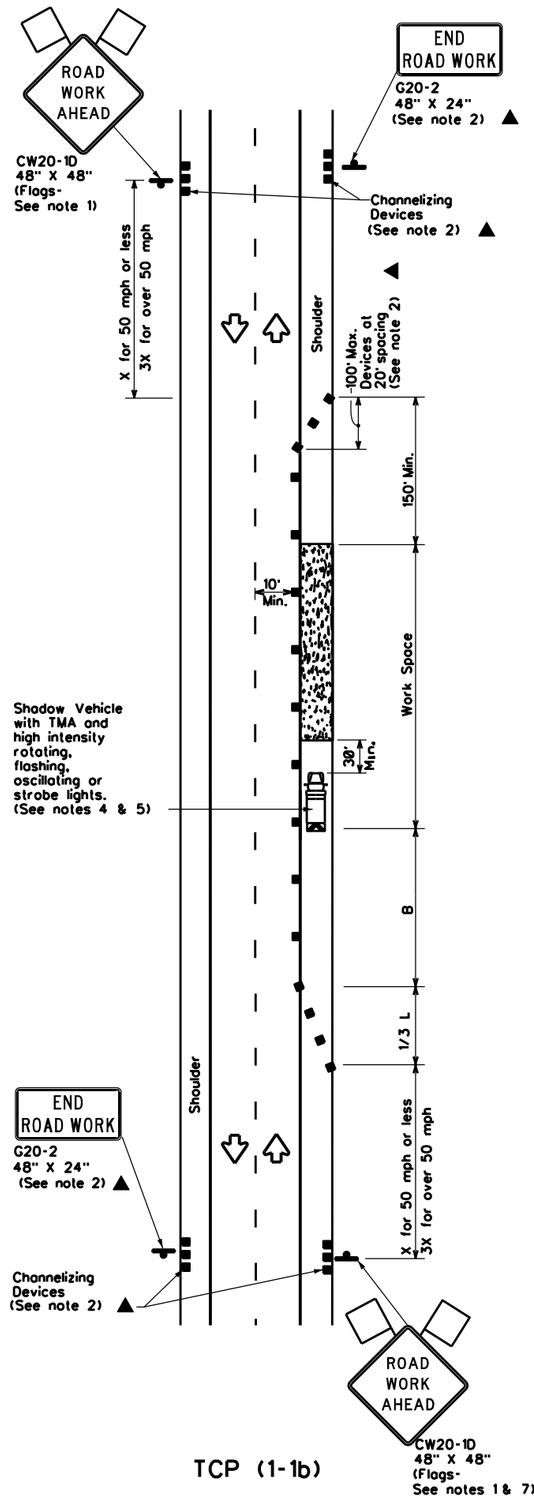
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	0050	06	089	US 290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		27

DATE:
FILE:



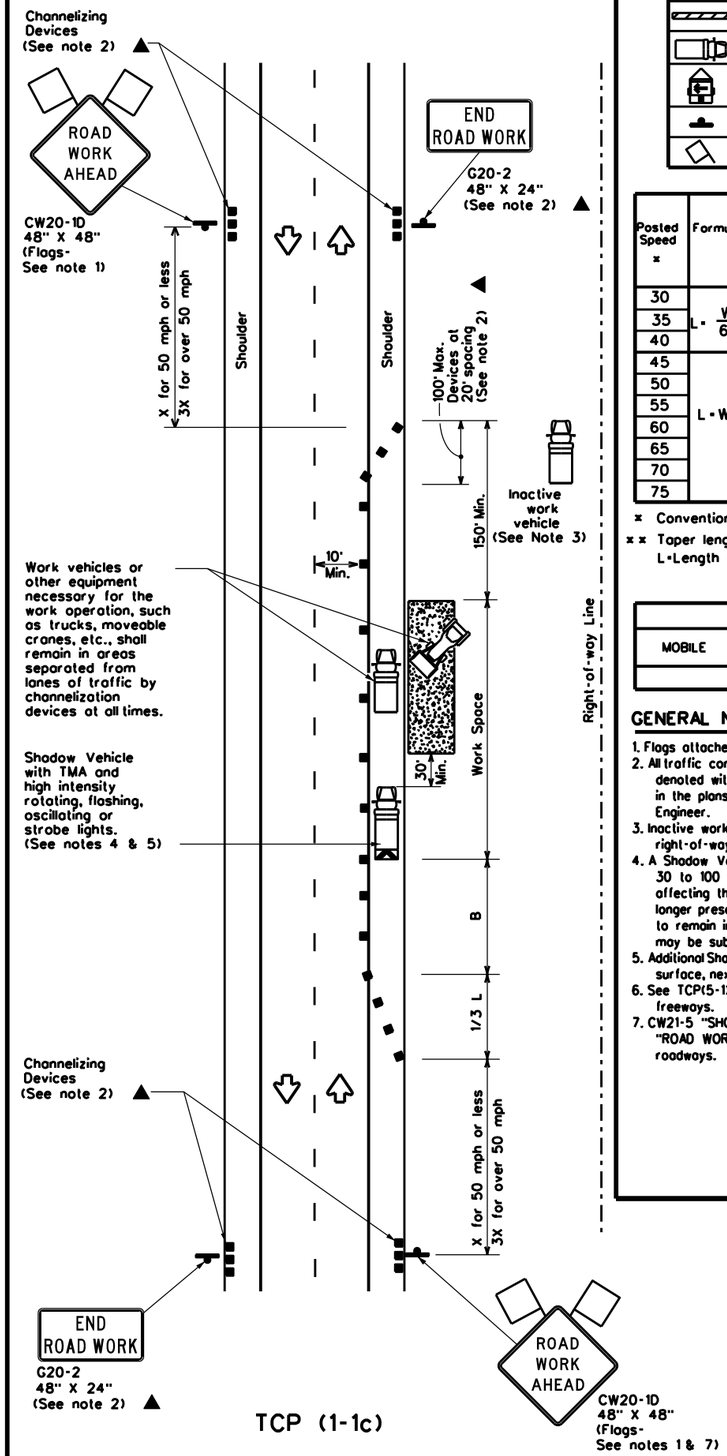
TCP (1-1a)

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	0050	06	089	US290
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	HOU	HARRIS		28
1-97 2-18				

DATE:
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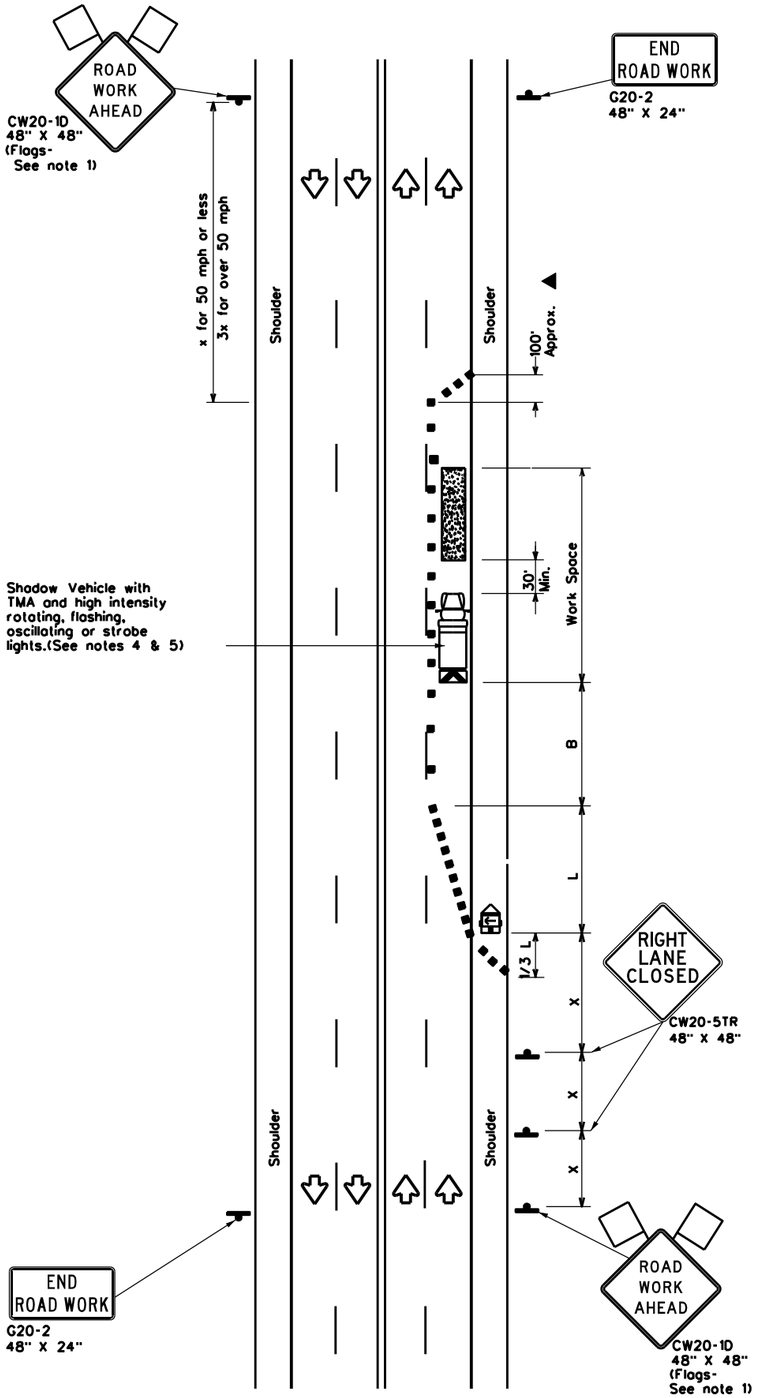
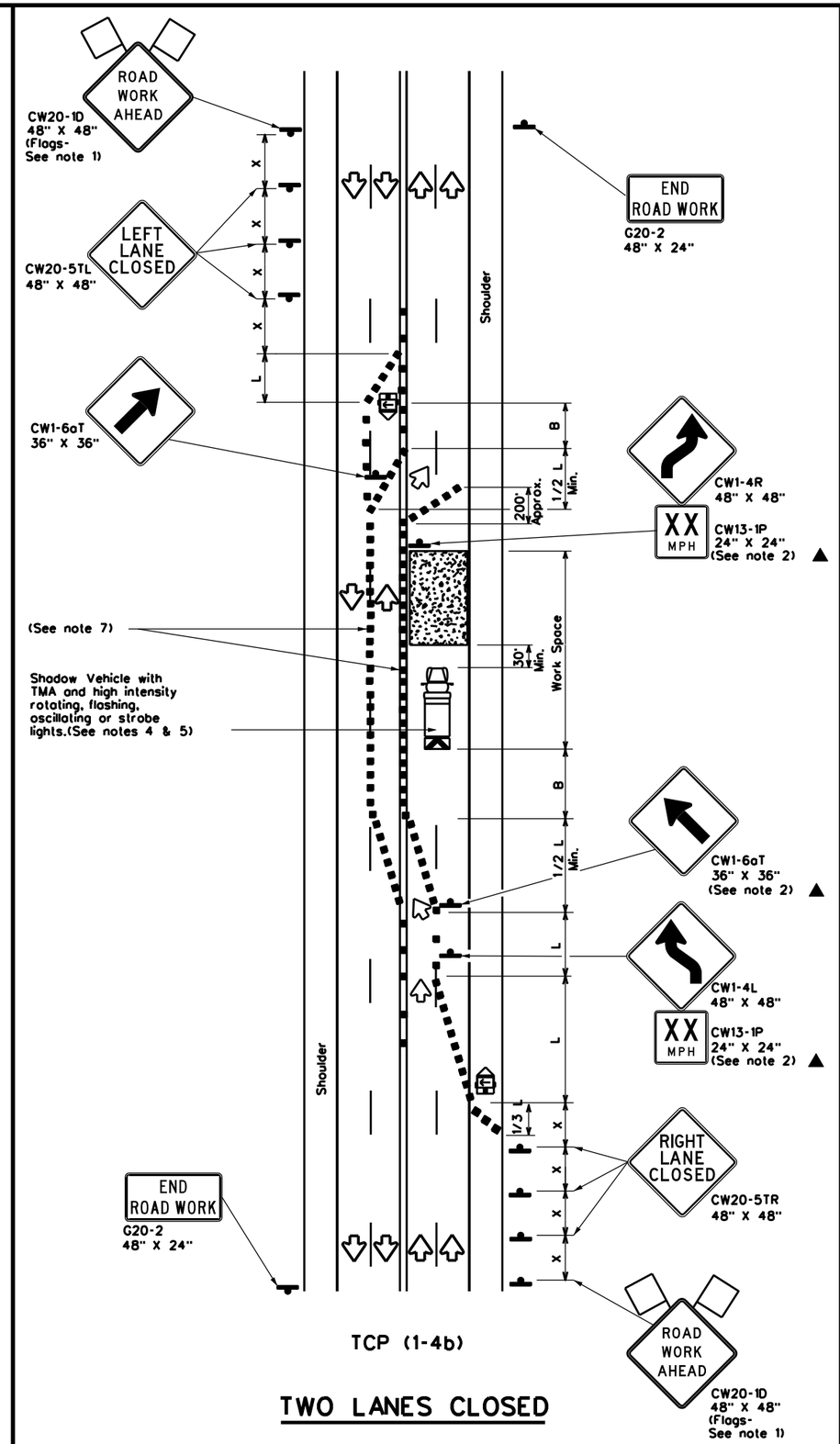


TCP (1-4a)

ONE LANE CLOSED



TCP (1-4b)

TWO LANES CLOSED

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

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

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

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

GENERAL NOTES

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

TCP (1-4a)

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

TCP (1-4b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(1-4)-18

FILE: tcp1-4-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US290
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	HOU	HARRIS		29
1-97 2-18				

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DATE:
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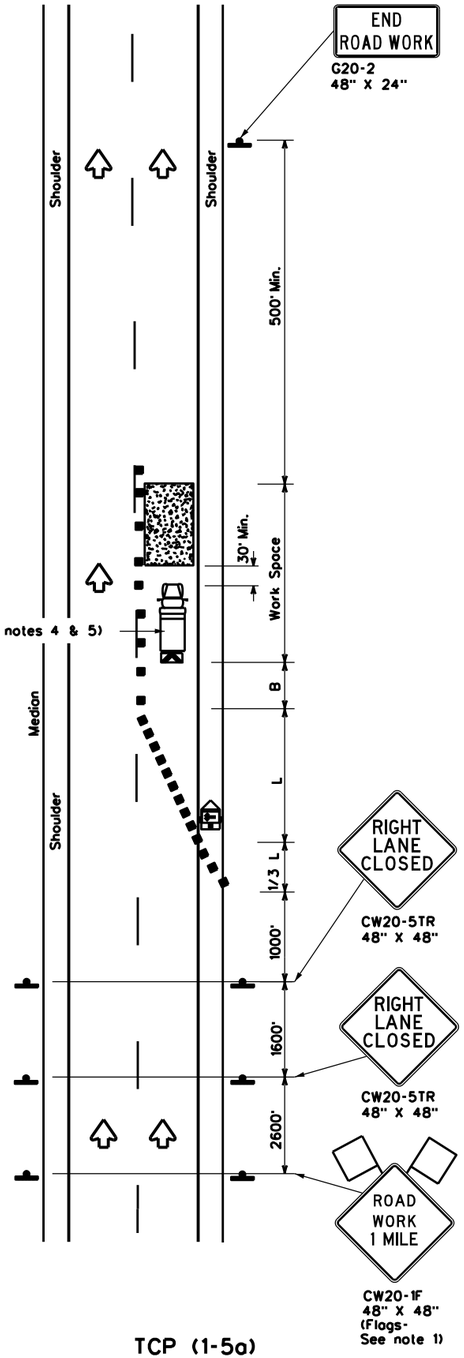
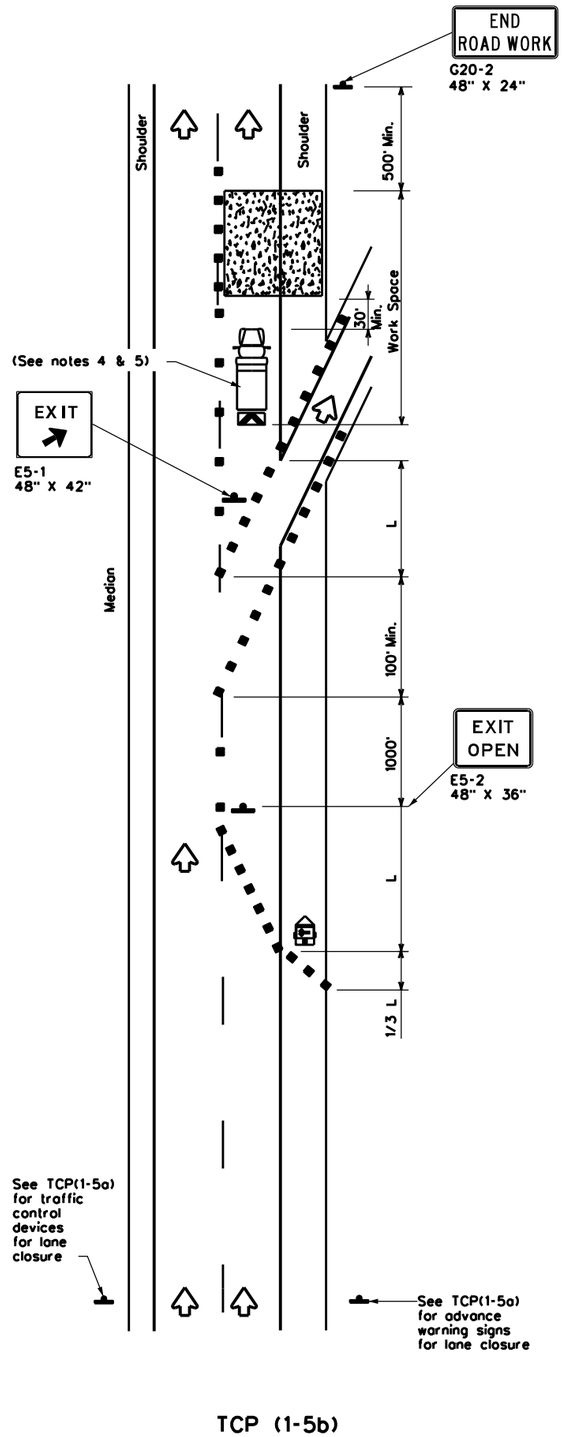


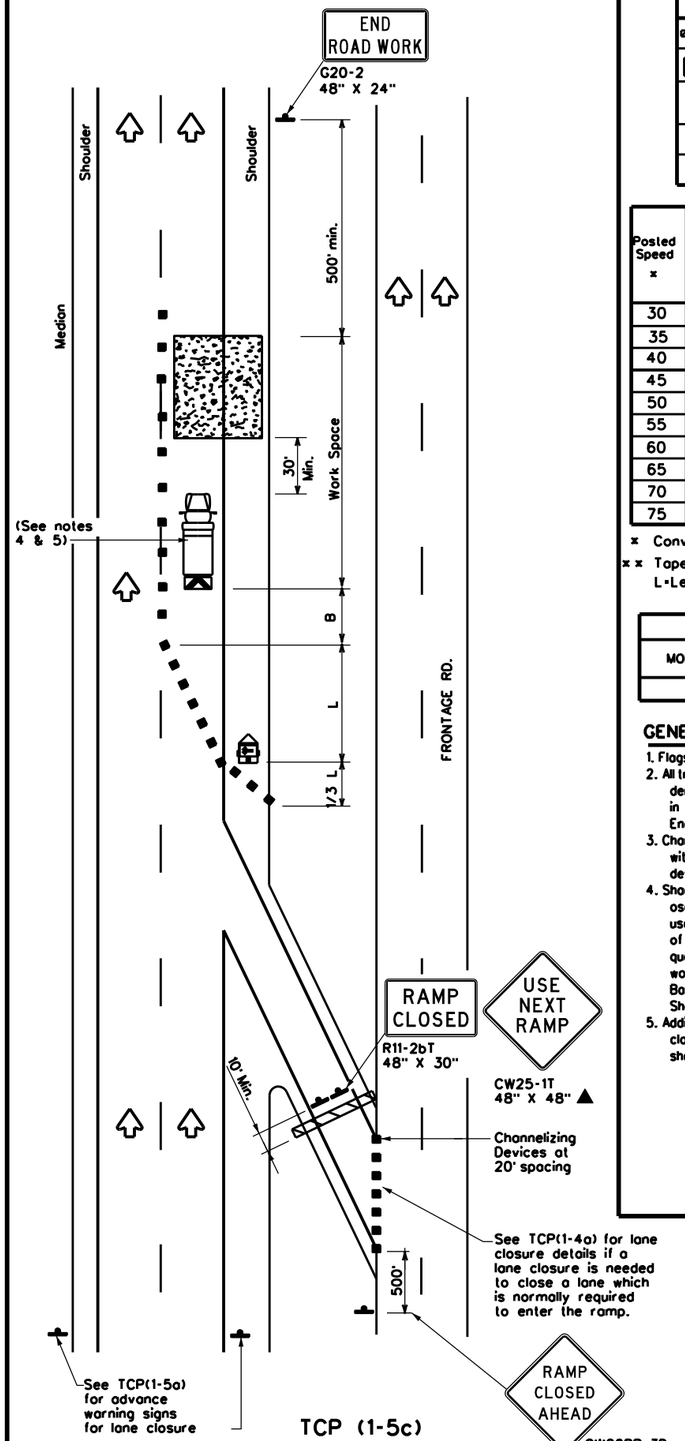
TCP (1-5a)

ONE LANE CLOSURE



TCP (1-5b)

LANE CLOSURE NEAR EXIT RAMPS



TCP (1-5c)

LANE CLOSURE NEAR ENTRANCE RAMPS

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. Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
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 in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES FOR DIVIDED HIGHWAYS

TCP(1-5)-18

FILE: tcp1-5-18.dgn	DN:	CK:	DW:	CK:
©TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-18	0050	06	089	US 290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		30

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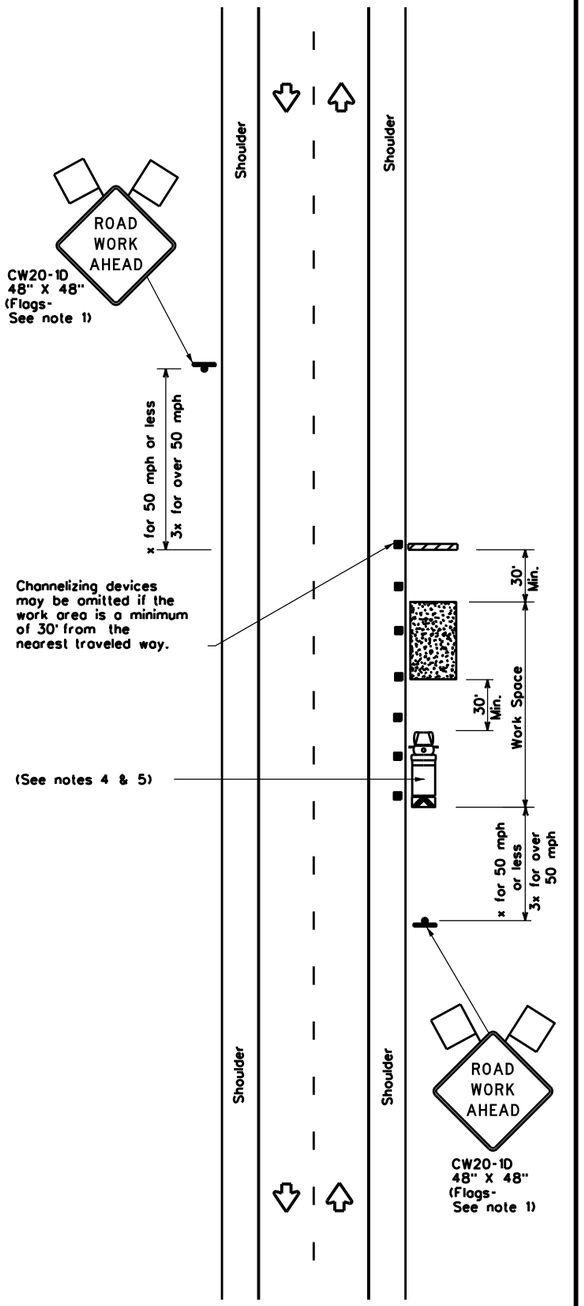
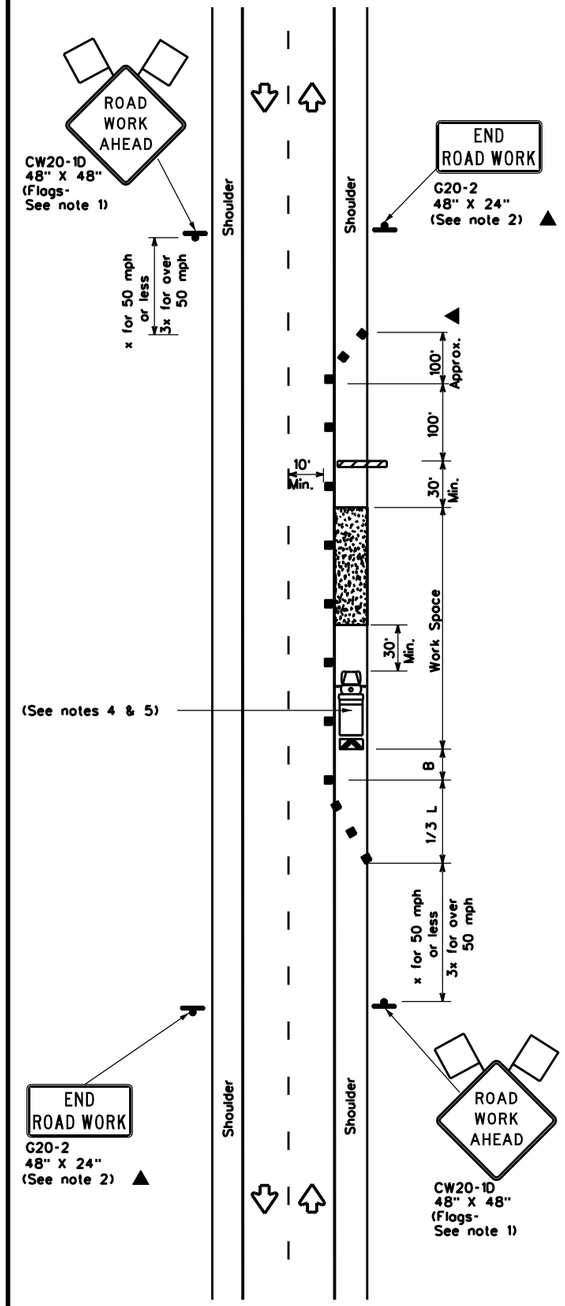


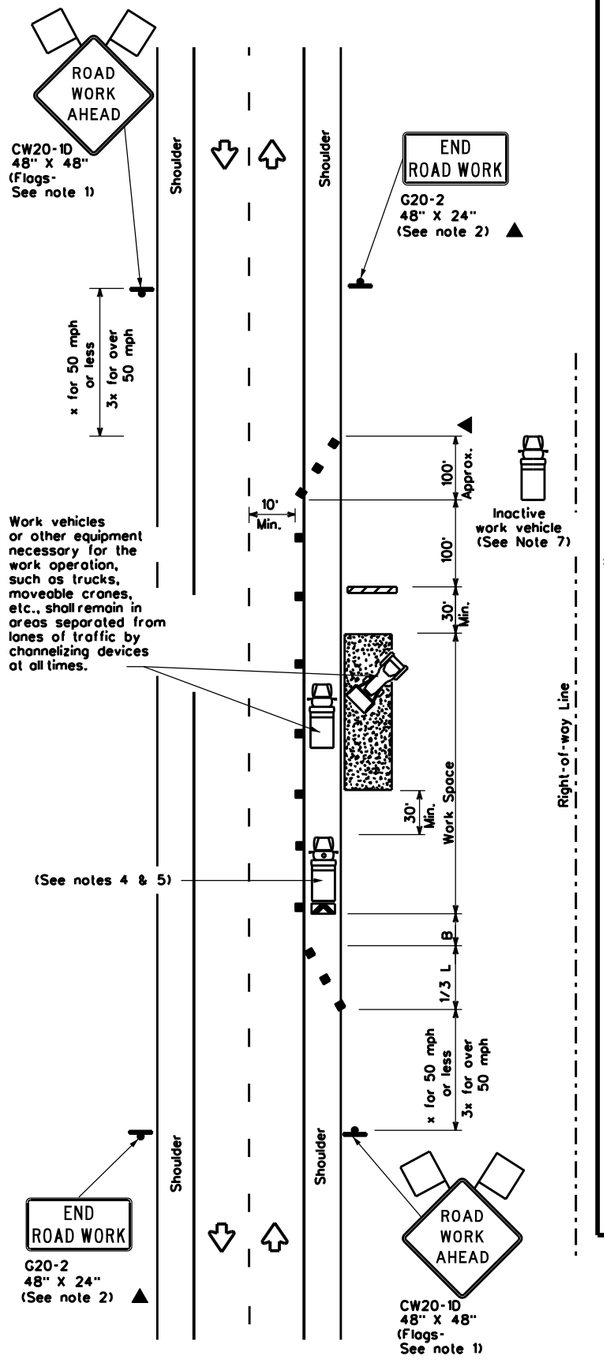
TCP (2-1a)

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	0050	06	089	US290
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	HOU	HARRIS		31
1-97 2-18				

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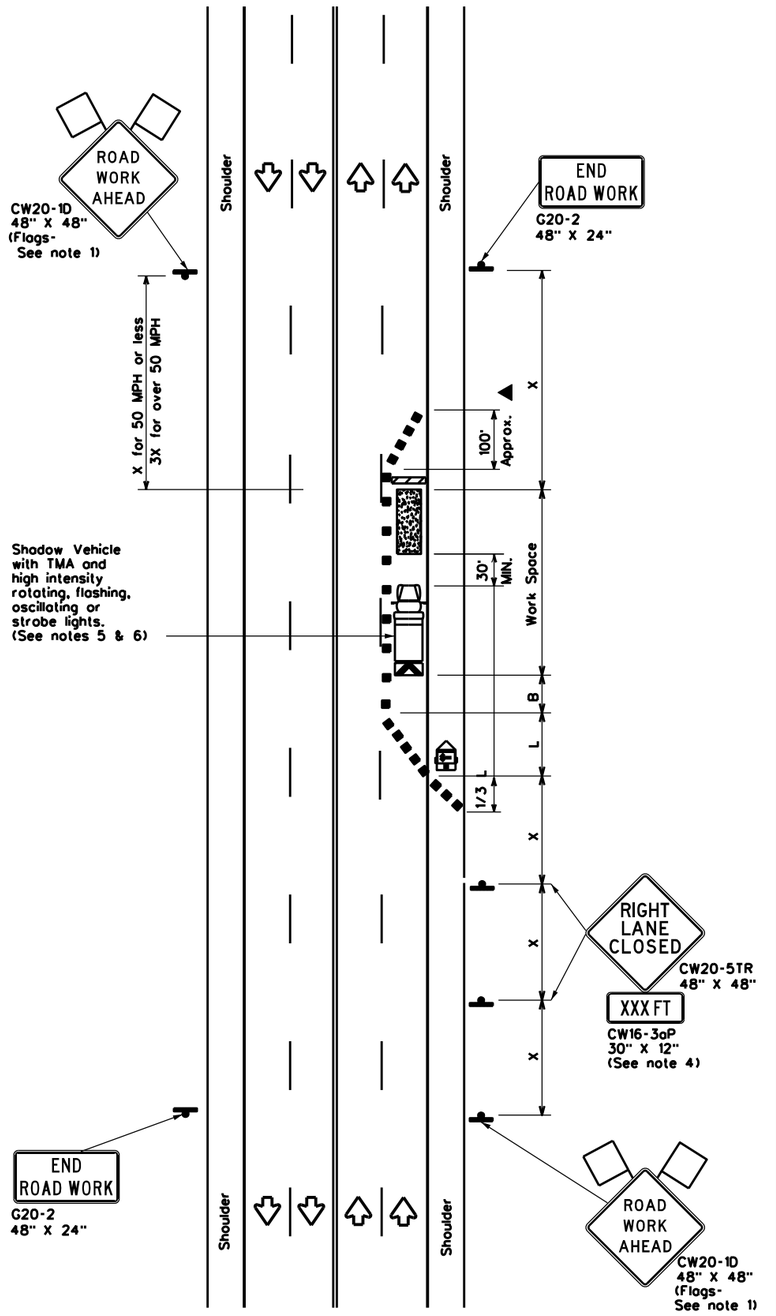
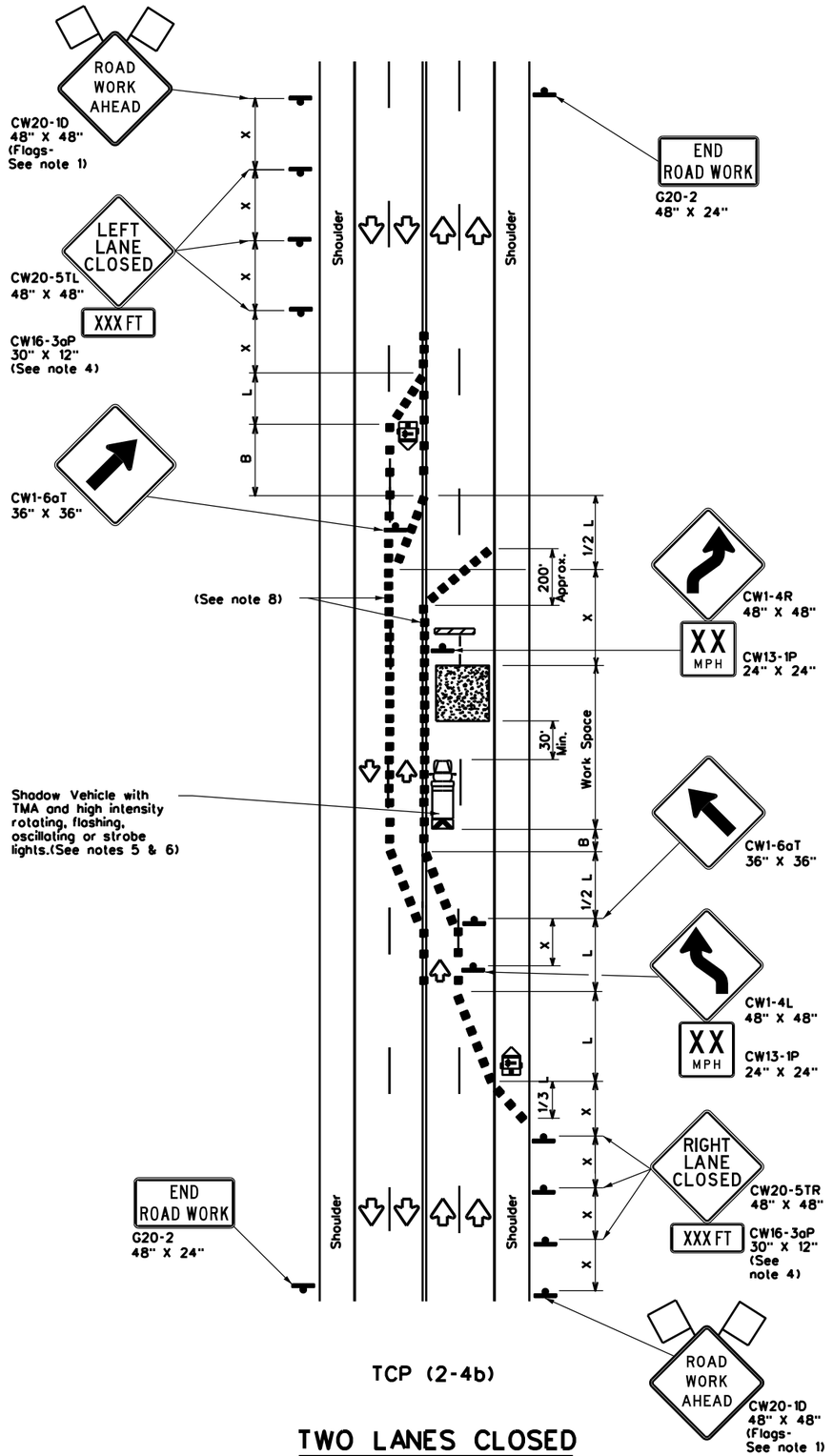
DATE:
FILE:



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 lighter devices spacing is intended for the area of conflicting markings, not the entire work zone.

Texas Department of Transportation

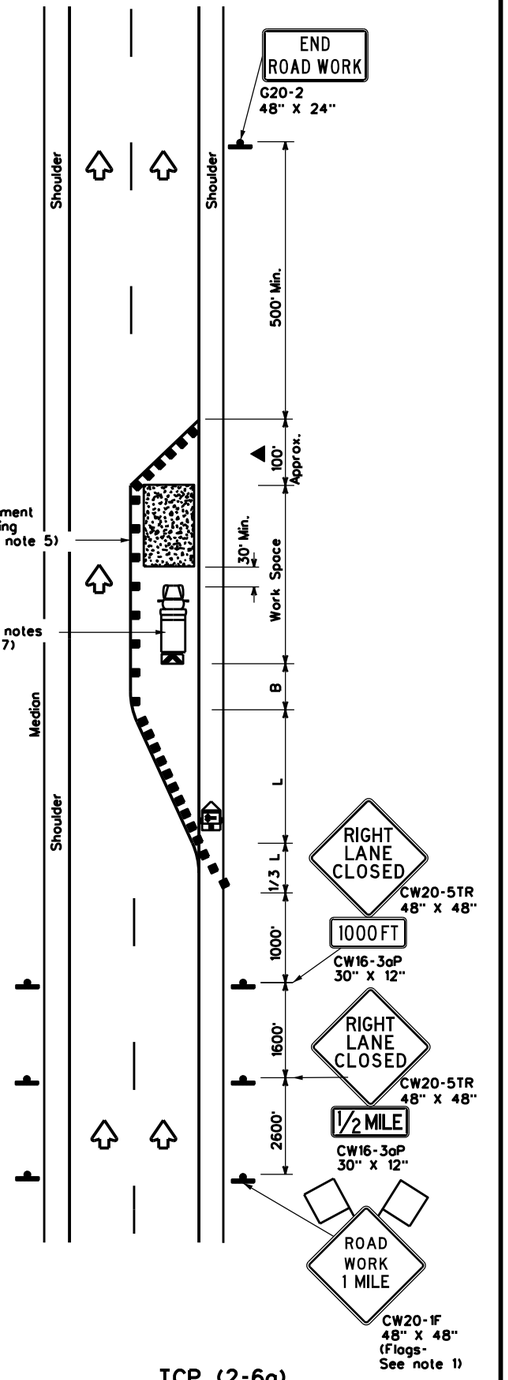
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(2-4)-18

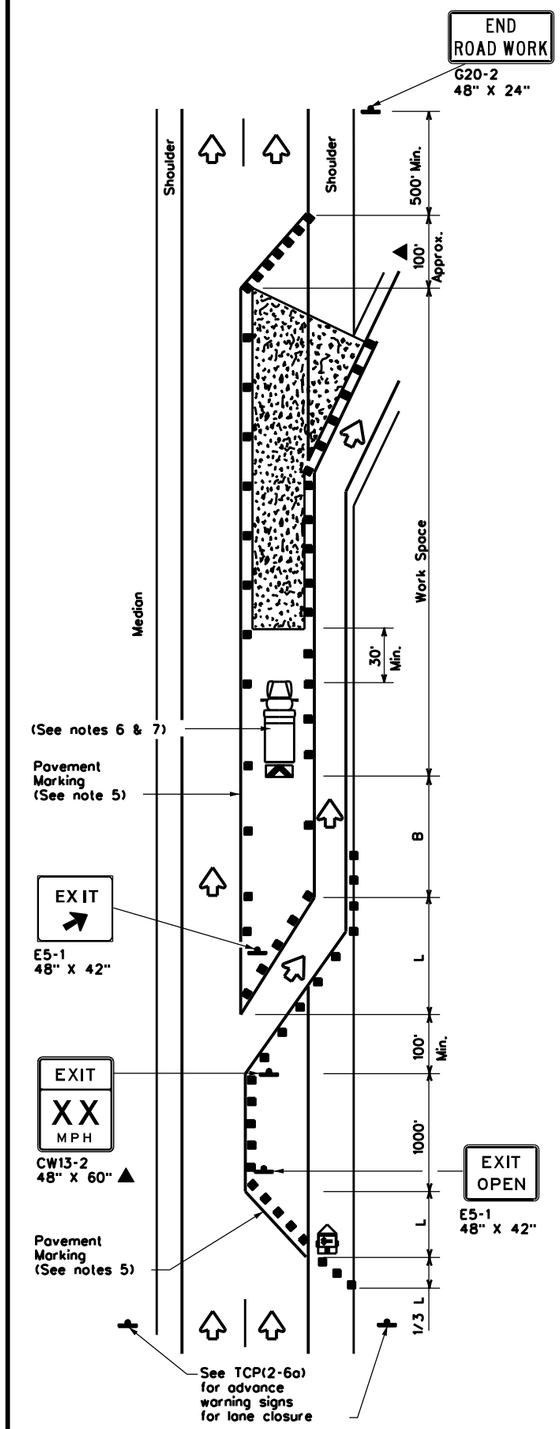
FILE: tcp2-4-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	0050	06	089	US290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		32

DATE:
FILE:



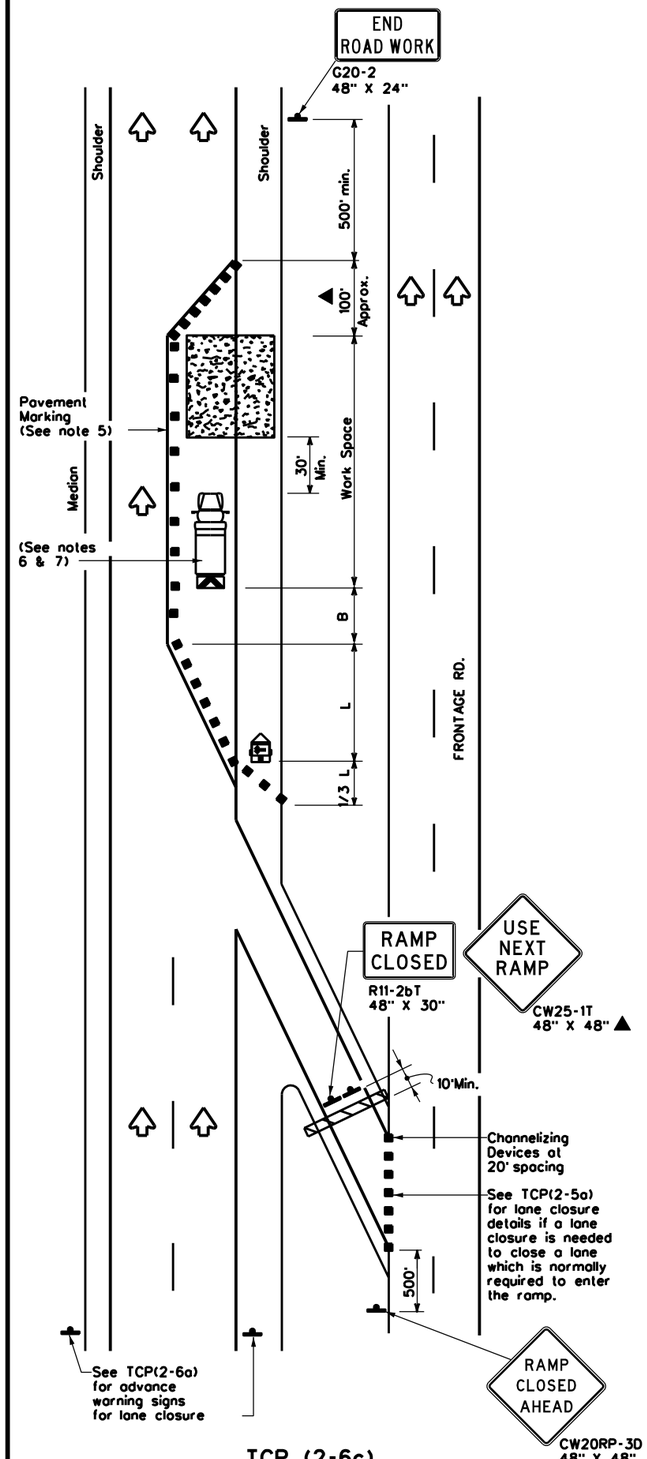
TCP (2-6a)

ONE LANE CLOSURE



TCP (2-6b)

LANE CLOSURE NEAR EXIT RAMPS



TCP (2-6c)

LANE CLOSURE NEAR ENTRANCE RAMPS

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. Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
4. Channelizing devices used along the work space or along tangent sections may be supplemented with vertical panels (VP) placed on everyother channelizing device. If night time conditions make it difficult to see at least two VPs, the VPs may be placed on each channelizing device.
5. The placement of pavement markings may be omitted on intermediate-term stationary work zones with the approval of the Engineer.
6. Shadow Vehicle with TMA and high intensity rotating, flashing,oscillating or strobe lights. 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.
7. 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.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON DIVIDED HIGHWAYS

TCP(2-6)-18

FILE: tcp2-6-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US290
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	HOU	HARRIS		33
1-97 2-18				

DATE:
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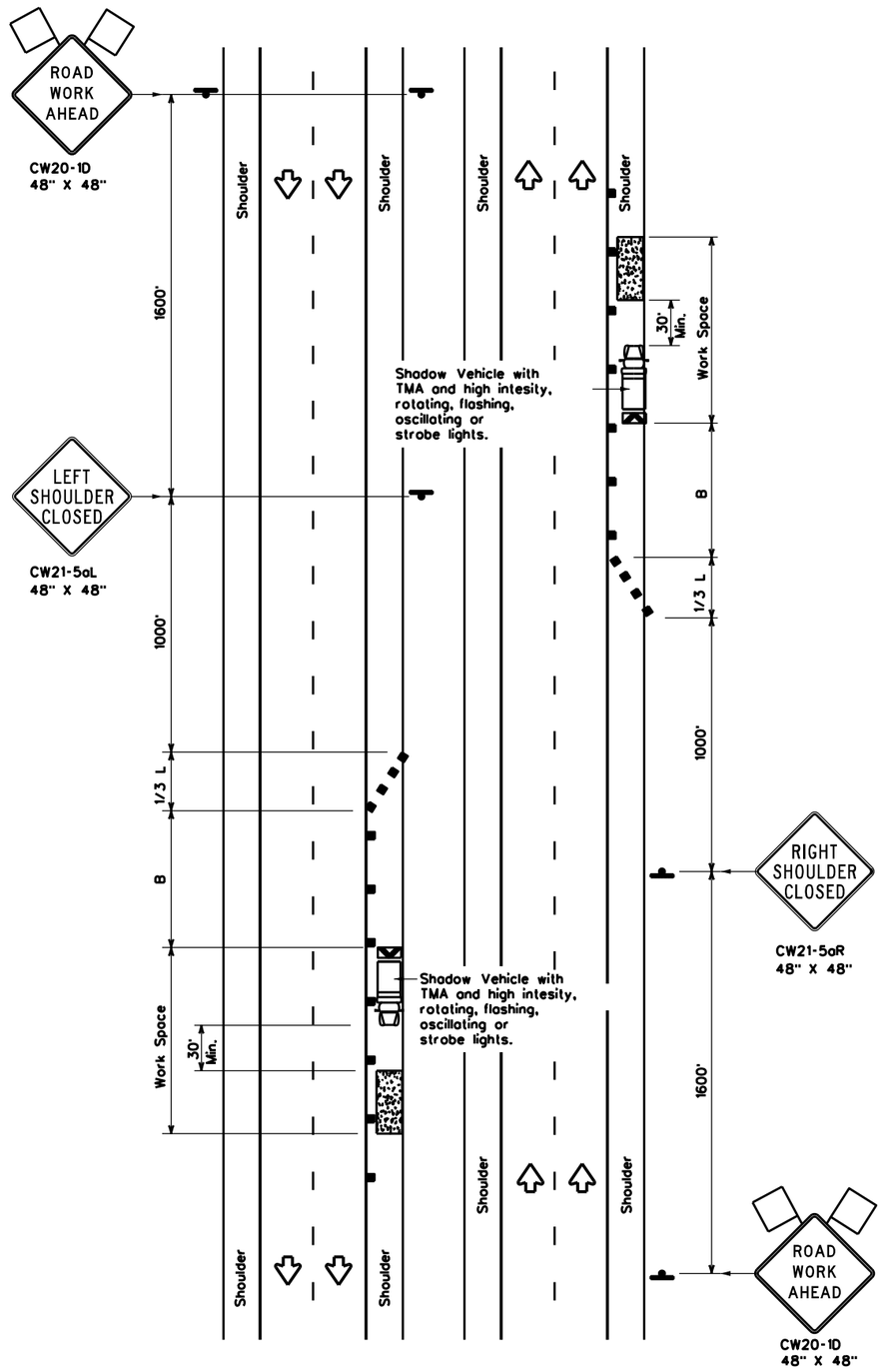
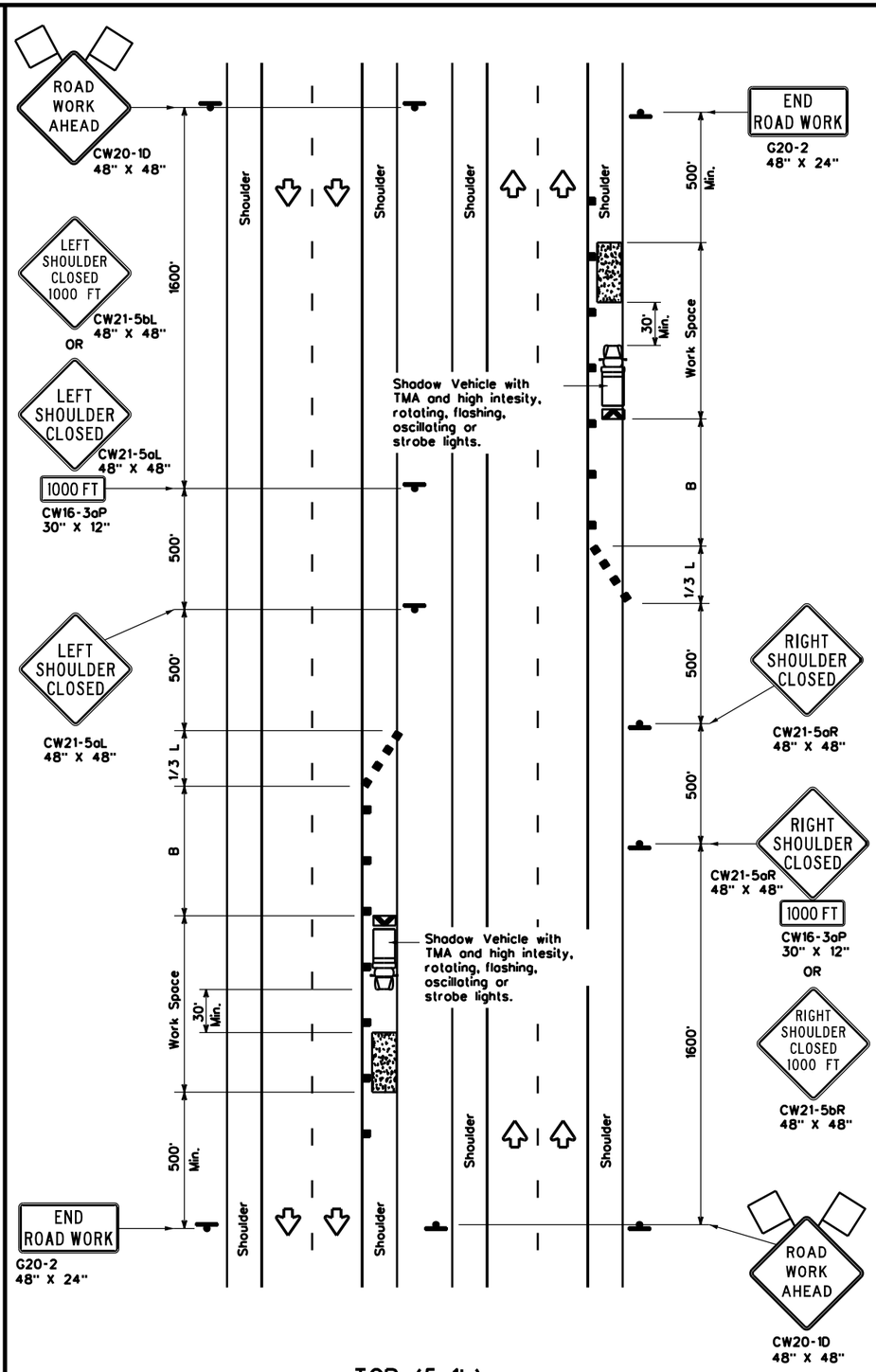


TCP (5-1a)

WORK AREA ON SHOULDER



TCP (5-1b)

WORK AREA ON SHOULDER

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	Suggested Longitudinal Buffer Space "B"
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	90'
35		205'	225'	245'	35'	70'	120'
40		265'	295'	320'	40'	80'	155'
45	L = WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

* 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
	TCP(5-1a)	TCP(5-1b)	TCP(5-1b)	

GENERAL NOTES

1. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30' to 100' in advance of the area of crew exposure without adversely effecting the performance or quality of the work. Type 3 barricades or drums may be substituted when workers on foot are no longer present when approved by the Engineer.
2. 28" tall or taller one-piece cones will be allowed only for Short Duration or Short Term stationary operations when workers are present to maintain the devices upright and in proper location. Intermediate Term stationary work areas should use Drums, Vertical Panels or 42" tall two-piece cones.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN SHOULDER WORK FOR FREEWAYS / EXPRESSWAYS

TCP(5-1)-18

FILE: tcp5-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US290
2-18	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		34

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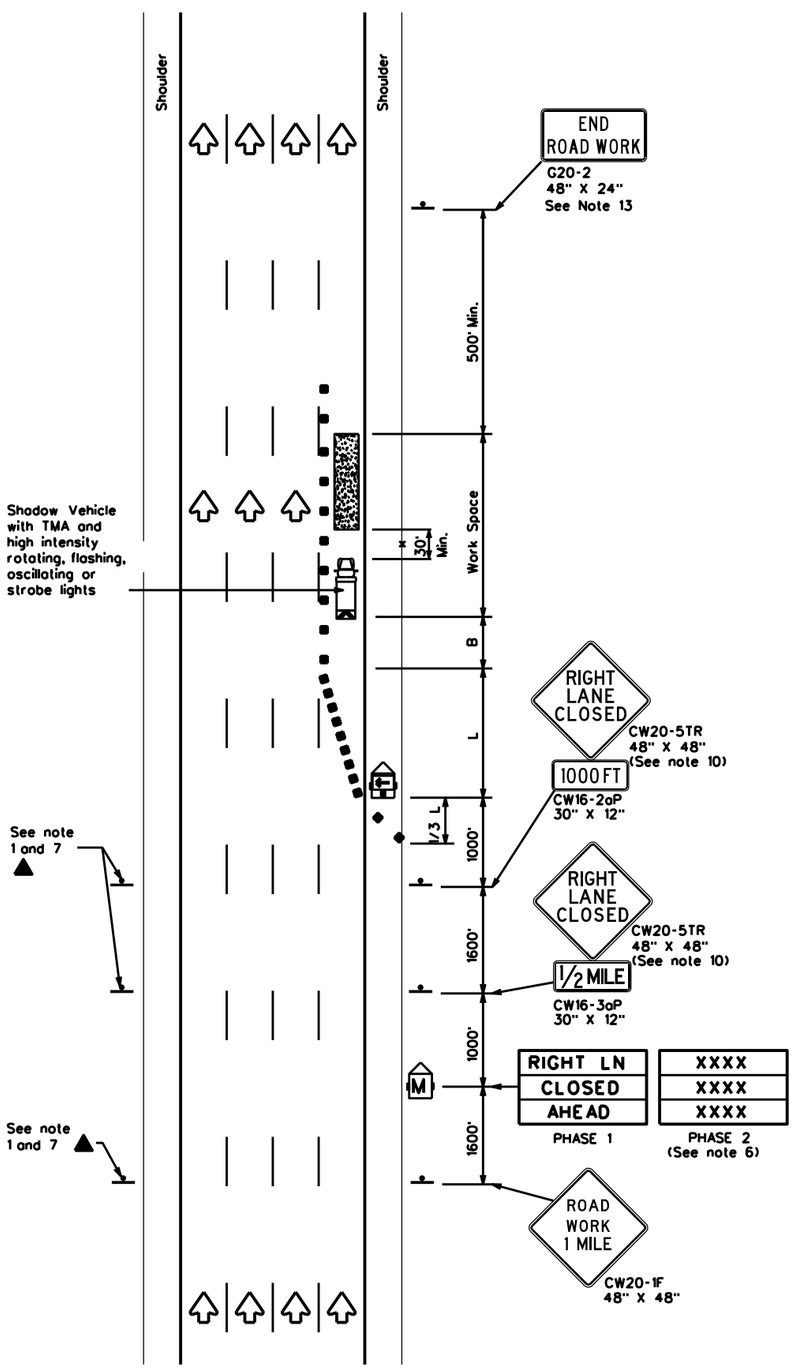
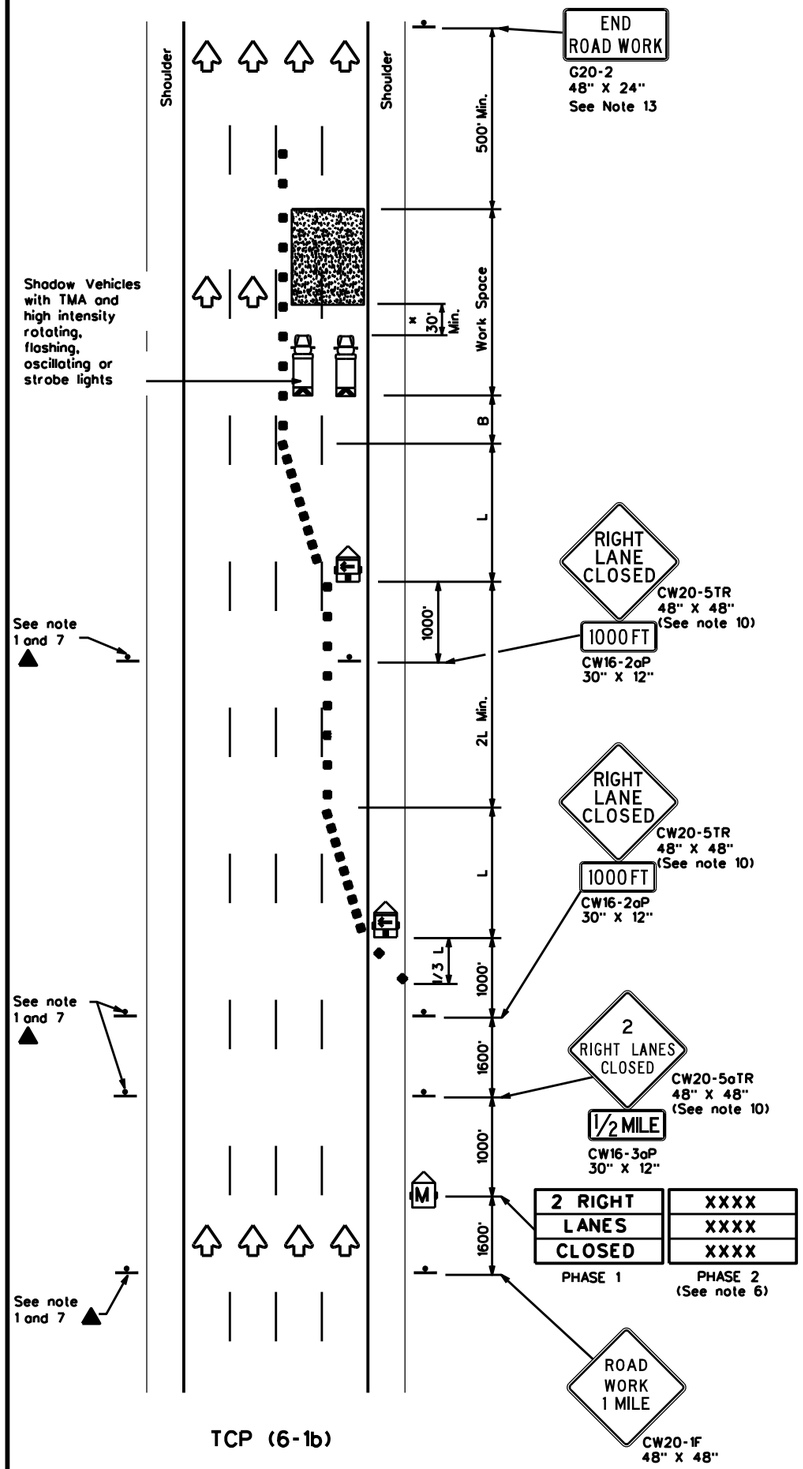
DATE:
FILE:



TCP (6-1a)

TYPICAL FREEWAY ONE LANE CLOSURE



TCP (6-1b)

TYPICAL FREEWAY TWO LANE CLOSURE

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

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

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

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

GENERAL NOTES

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

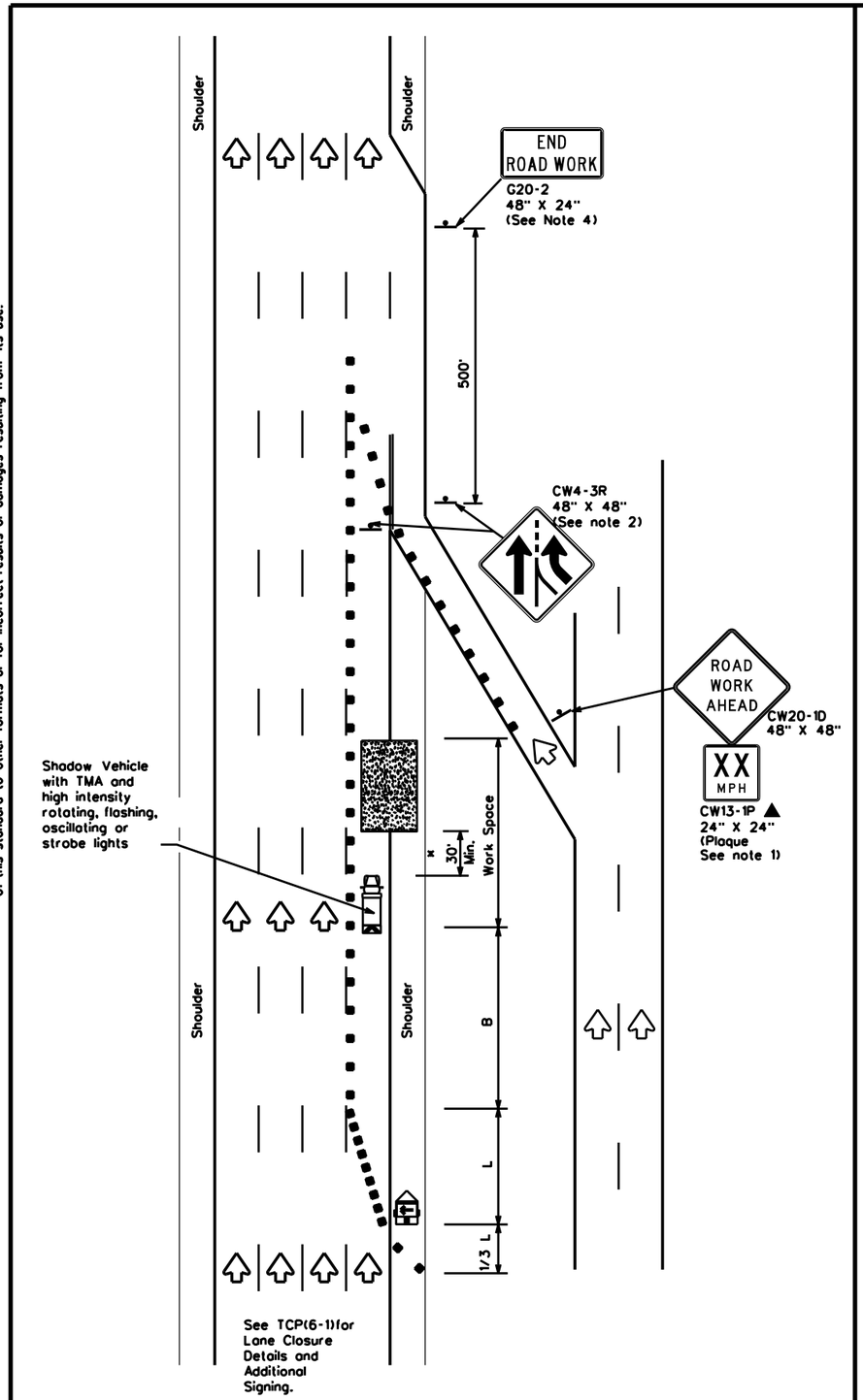
* A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN FREEWAY LANE CLOSURES

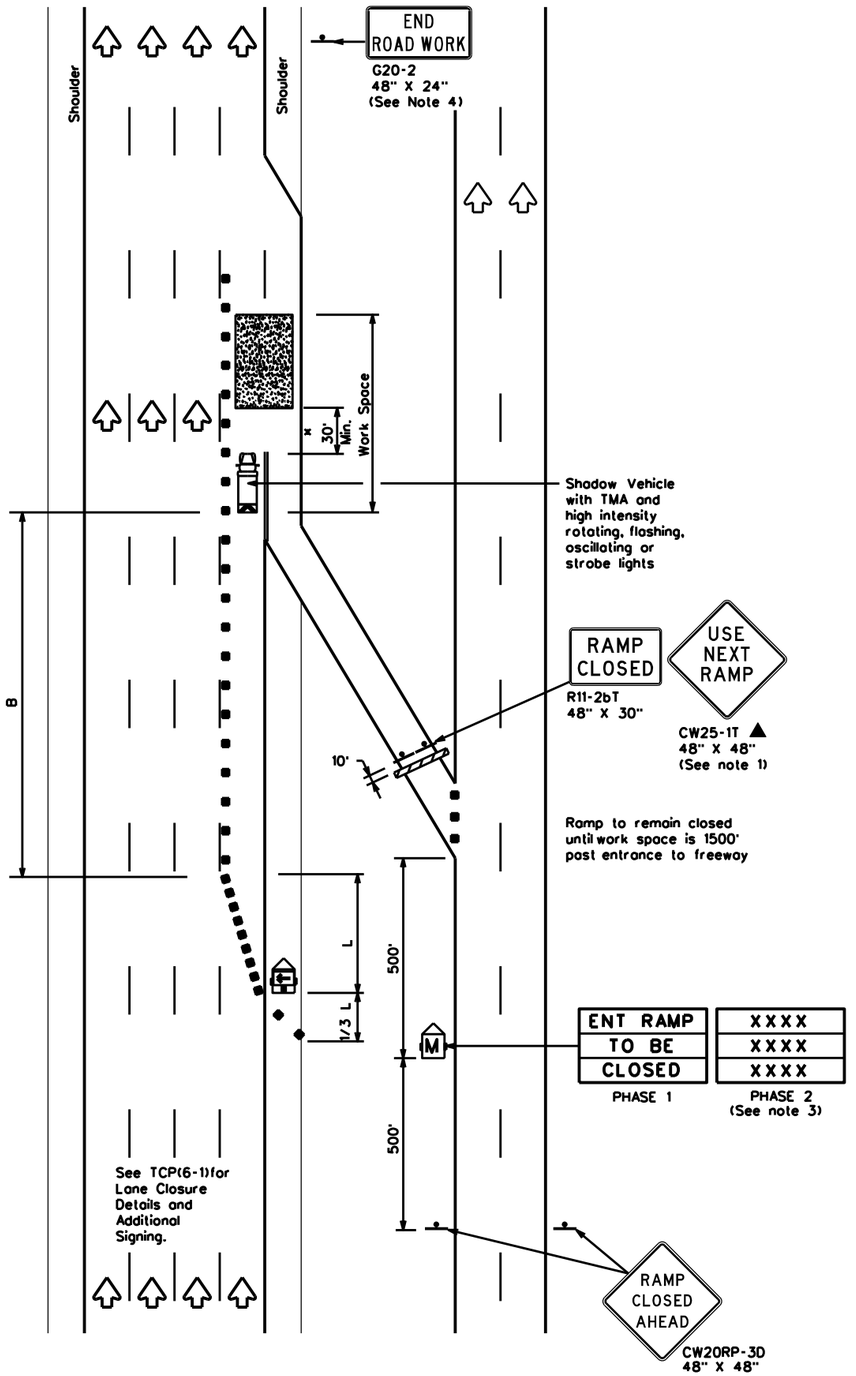
TCP(6-1)-12

FILE: tcp6-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-12	0050	06	089	US 290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		35



TCP (6-2a)

ENTRANCE RAMP OPEN
WORK WITHIN 500' OF RAMP



TCP (6-2b)

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

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

TYPICAL USAGE

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

GENERAL NOTES

1. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
2. ADDED LANE Symbol (CW4-3) sign may be omitted when sign between ramp and mainlane can be seen from both roadways.
3. See "Advance Notice List" on BC(6) for recommended date and time formatting options for PCMS Phase 2 message.
4. The END ROAD WORK (G20-2) sign may be omitted when it conflicts with G20-2 signs already in place on the project.

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

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation
Traffic Operations Division Standard

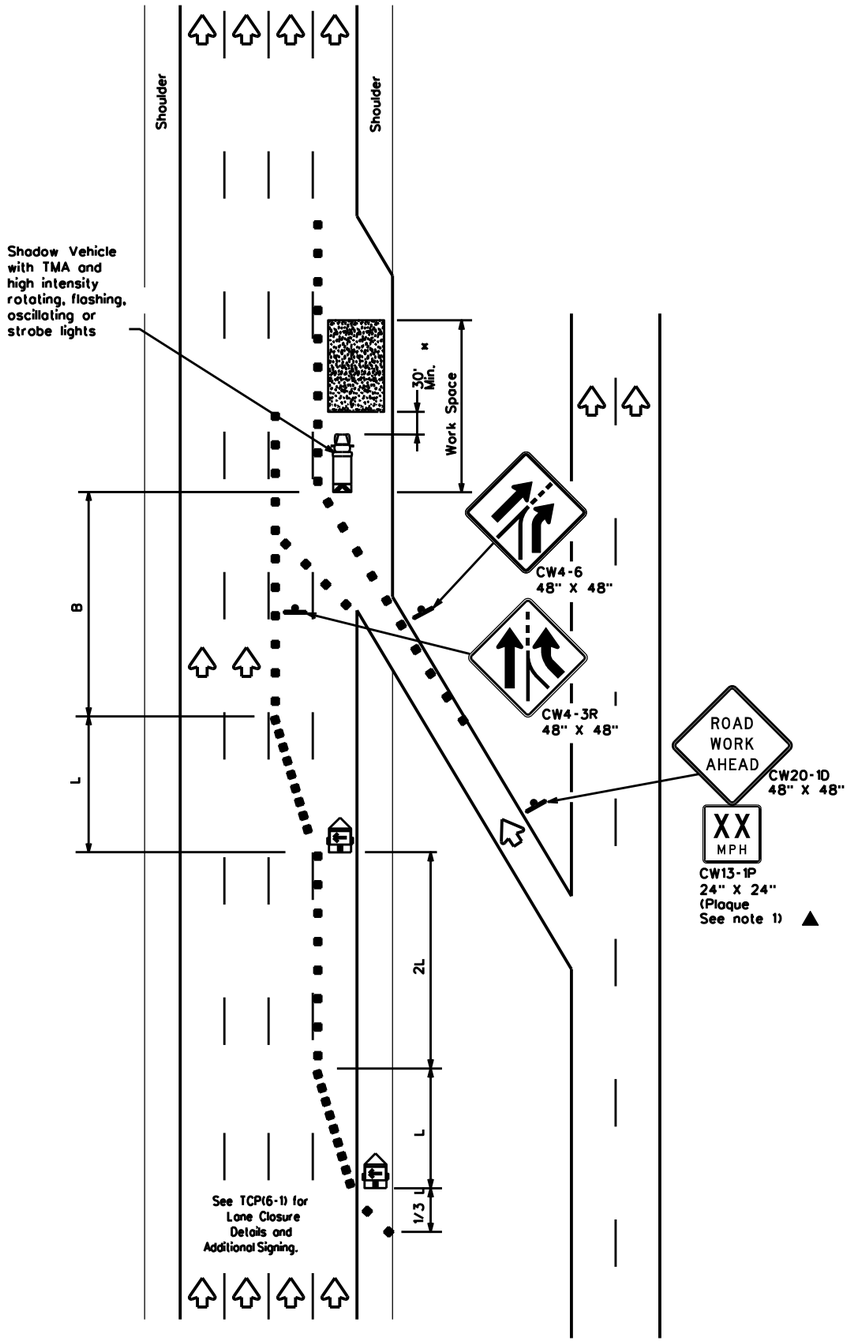
TRAFFIC CONTROL PLAN
WORK AREA NEAR RAMP

TCP(6-2)-12

FILE: tcp6-2.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US290
1-97 8-98	DIST	COUNTY		SHEET NO.
4-98 8-12	HOU	HARRIS		36

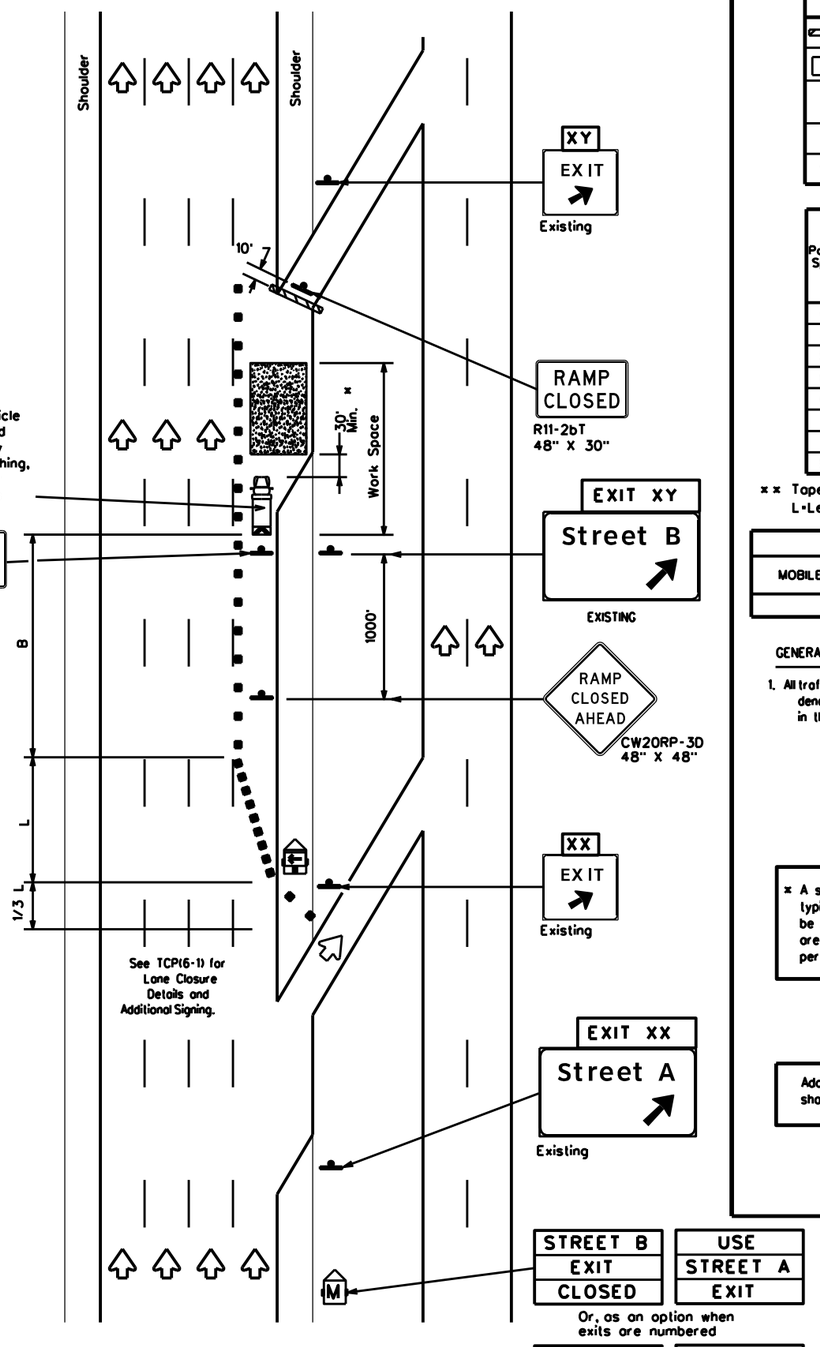
DATE:
FILE:

DATE:
FILE:



TCP (6-3a)

ENTRANCE RAMP OPEN



TCP (6-3b)

EXIT RAMP CLOSED
TRAFFIC EXITS PRIOR TO CLOSED RAMP

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

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

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

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

GENERAL NOTES:

1. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.

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

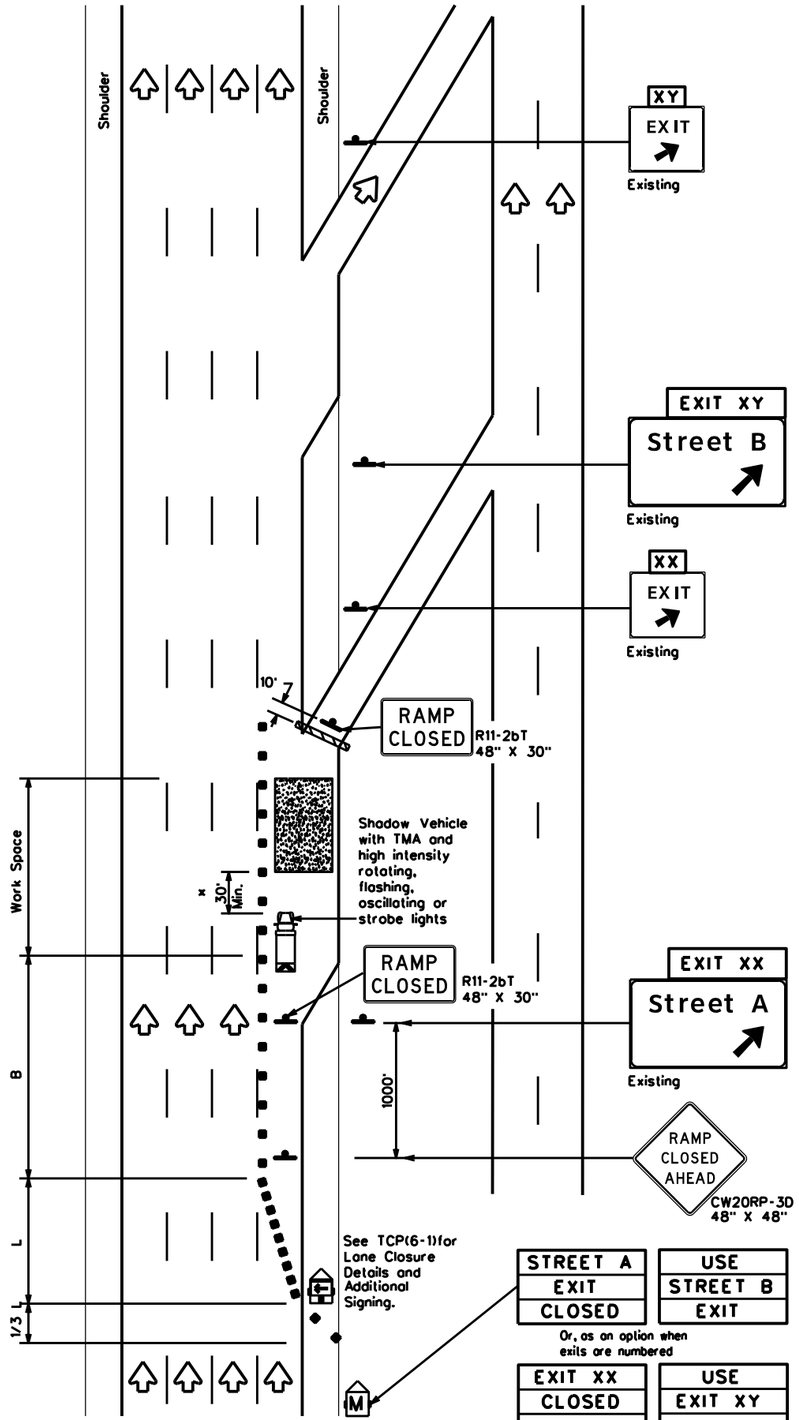
Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
WORK AREA BEYOND RAMP

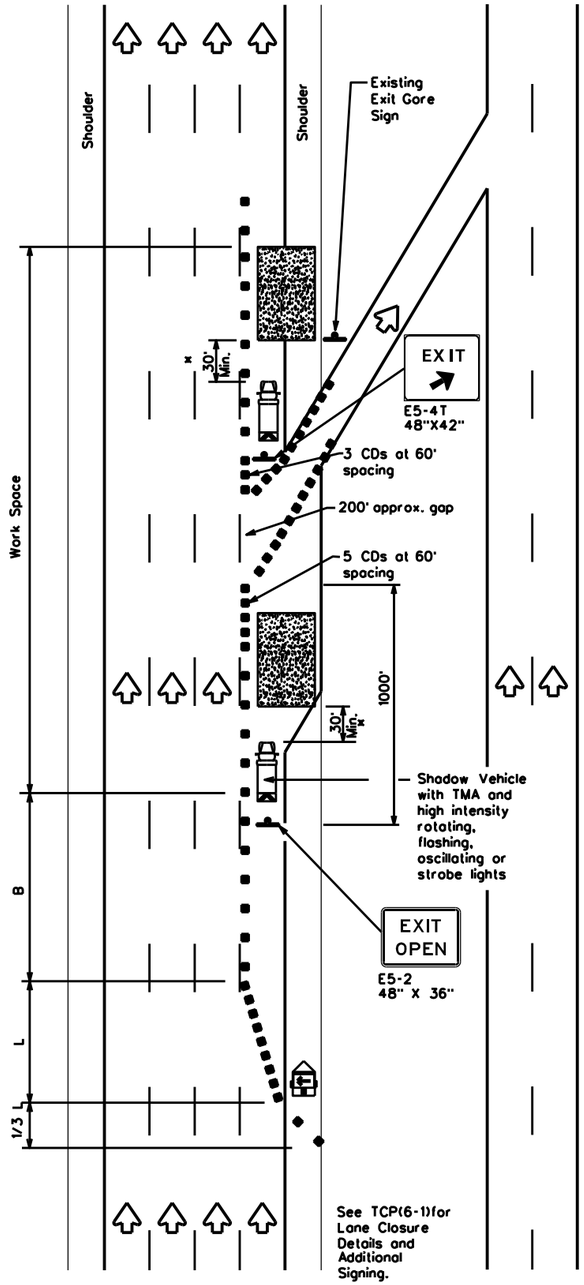
TCP(6-3)-12

FILE: tcp6-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1994 REVISIONS	CONT	SECT	JOB	HIGHWAY
1-97 8-98 4-98 8-12	0050	06	089	US290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		37



TCP (6-4a)

EXIT RAMP CLOSED
TRAFFIC EXITS PAST CLOSED RAMP



TCP (6-4b)

EXIT RAMP OPEN

LEGEND

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

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

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

TYPICAL USAGE

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

GENERAL NOTES

1. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
2. See BC Standards for sign details.

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

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation
Traffic Operations Division Standard

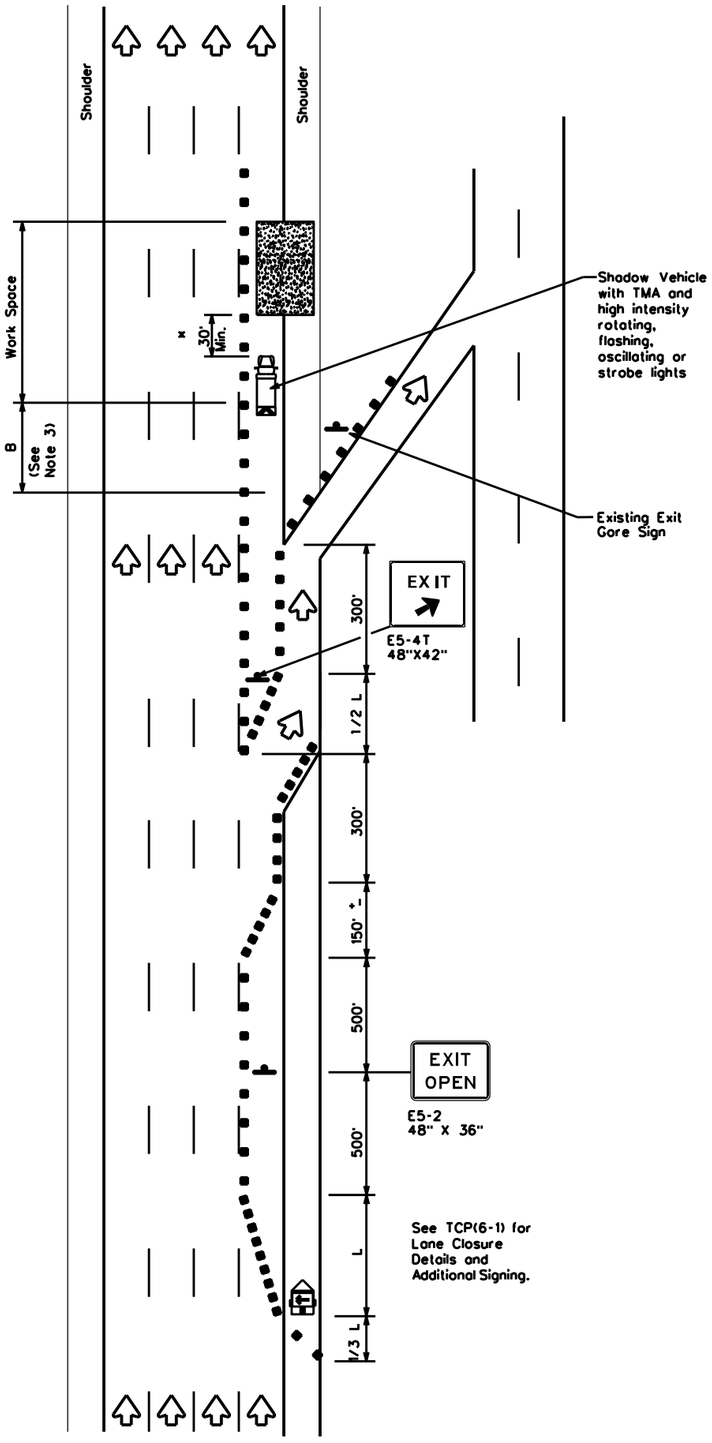
TRAFFIC CONTROL PLAN
WORK AREA AT EXIT RAMP

TCP(6-4)-12

FILE: tcp6-4.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT Feburary 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US290
1-97 8-98	DIST	COUNTY		SHEET NO.
4-98 8-12	HOU	HARRIS		38

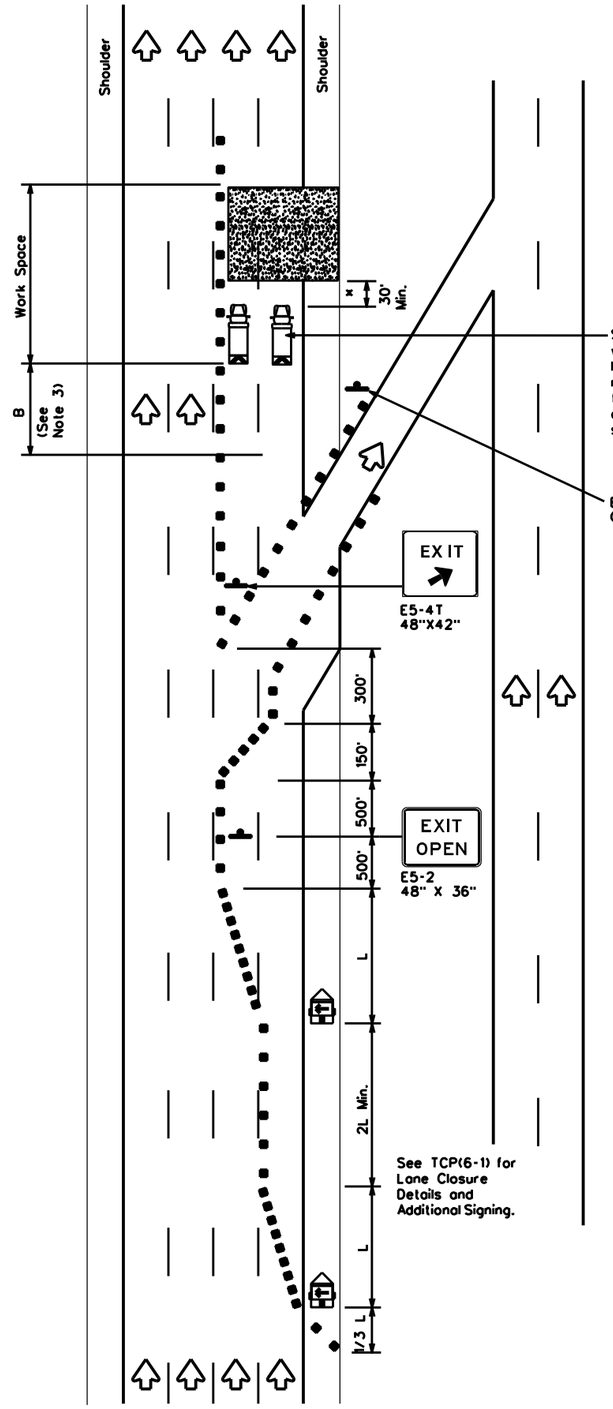
DATE:
FILE:

DATE:
FILE:



TCP (6-5a)

EXIT RAMP OPEN



TCP (6-5b)

EXIT RAMP OPEN
TWO LANE CLOSURE WITHIN 1500' PAST EXIT RAMP

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

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

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

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

GENERAL NOTES

1. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
2. See BC standards for sign details.
3. If adequate longitudinal buffer length "B" does not exist between the work space and the exit ramp, consideration should be given to closing the ramp.

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

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
WORK AREA BEYOND EXIT RAMP

TCP(6-5)-12

FILE: tcp6-5.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT Feburary 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US290
1-97 8-98	DIST	COUNTY		SHEET NO.
4-98 8-12	HOU	HARRIS		39

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

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

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

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

GENERAL NOTES

1. Place channelizing devices in the gore at 20' spacing.
2. See the Standard Highway Sign Design for Texas (SHSD) for sign details.
3. The PCMS may be omitted when a permanent DMS sign is available in an appropriate location to display a similar message as called for on the PCMS.
4. When it is determined that a through lane should be closed in addition to the exit ramp, refer to TCP(6-4) for traffic control details.
5. Truck mounted attenuator is required.
6. The PCMS may be omitted if replaced with a "RAMP CLOSED" AHEAD (CW20RP-3D) Sign.
7. Roadway ADT should be greater than 10,000.

Texas Department of Transportation

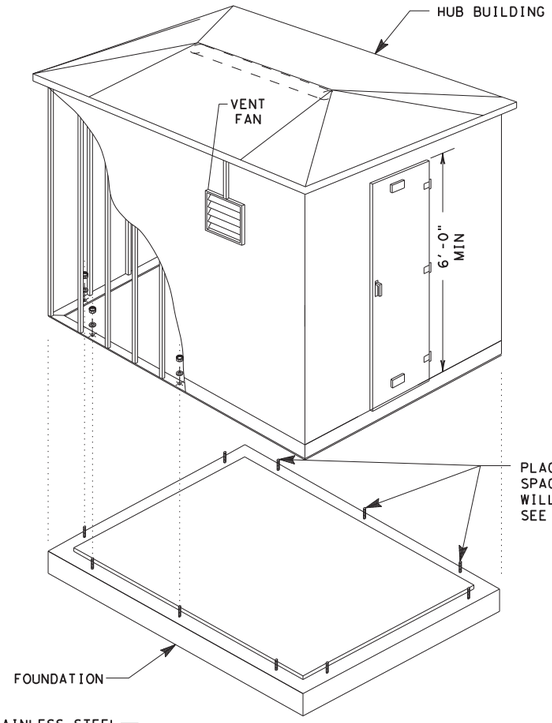
Traffic Operations Division Standard

WORK IN EXIT GORE FOR ADT GREATER THAN 10,000

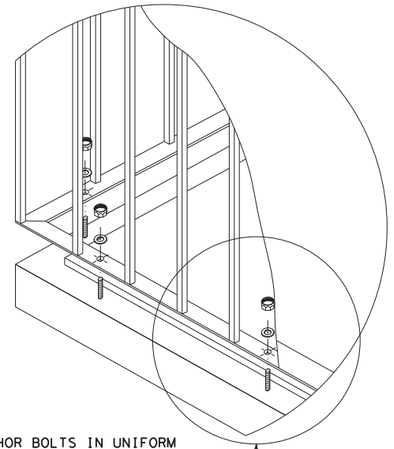
TCP(6-8)-14

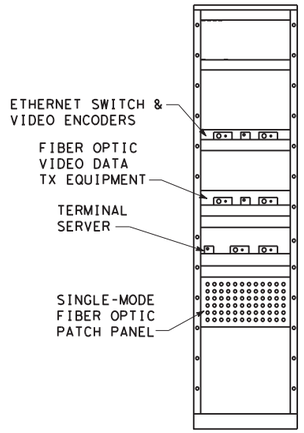
FILE: tcp6-8.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		40

DATE:
FILE:

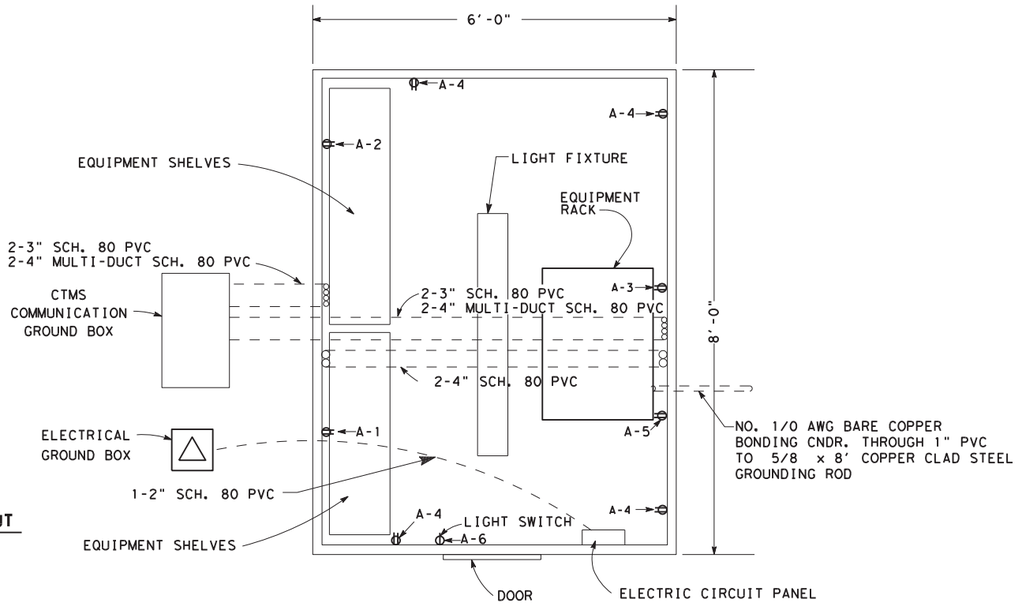


HUB BUILDING ISOMETRIC VIEW





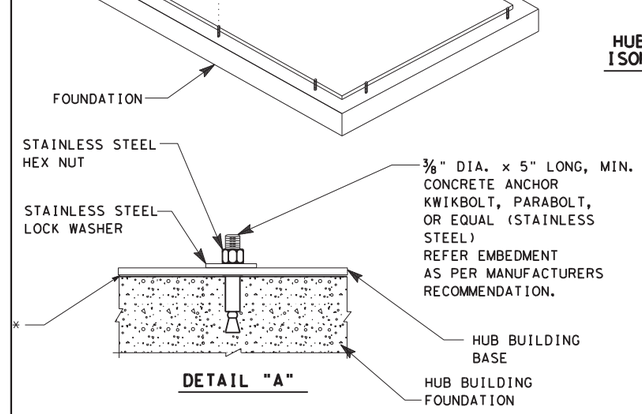
RACK MOUNTED EQUIPMENT LAYOUT



HUB BUILDING EQUIPMENT

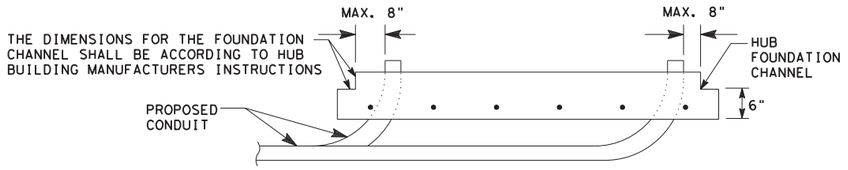
NOT TO SCALE

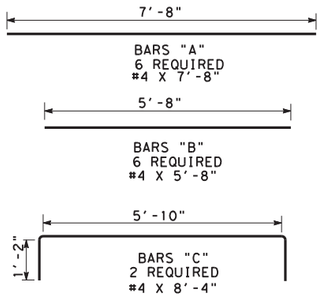
BRANCH BREAKERS:
A-1 20 AMP ONE POLE
A-2 20 AMP ONE POLE
A-3 20 AMP ONE POLE
A-4 20 AMP ONE POLE GFCI
A-5 20 AMP ONE POLE
A-6 15 AMP ONE POLE



DETAIL "A"

*BUILDING/PAD JOINT SHALL BE COMPLETELY CAULKED TO PREVENT THE ENTRY OF WATER.

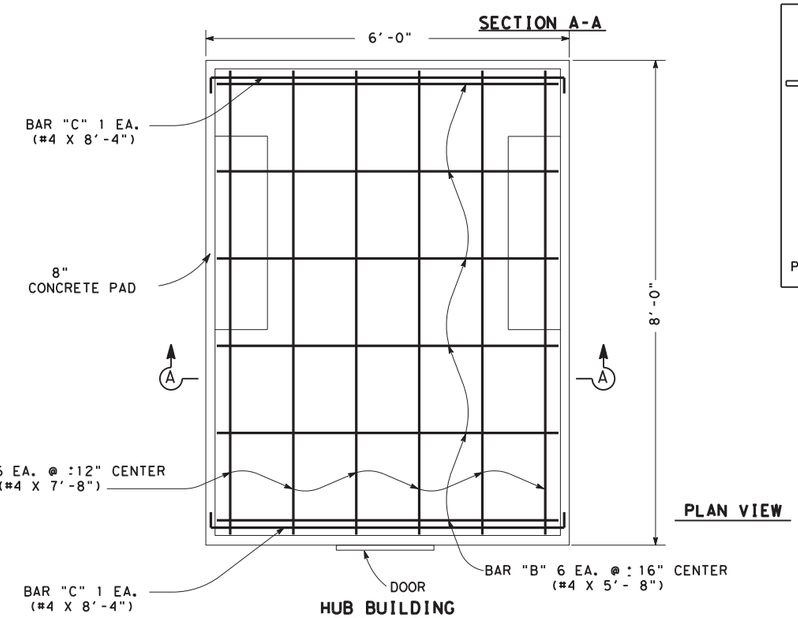




REBAR DETAIL

NOT TO SCALE

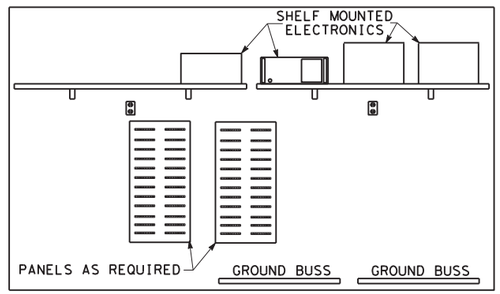
SECTION A-A



HUB BUILDING FOUNDATION

NOT TO SCALE

PLAN VIEW



SHELF MOUNTED EQUIPMENT LAYOUT

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May 23 , 2022

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COMMUNICATIONS HUB BUILDING

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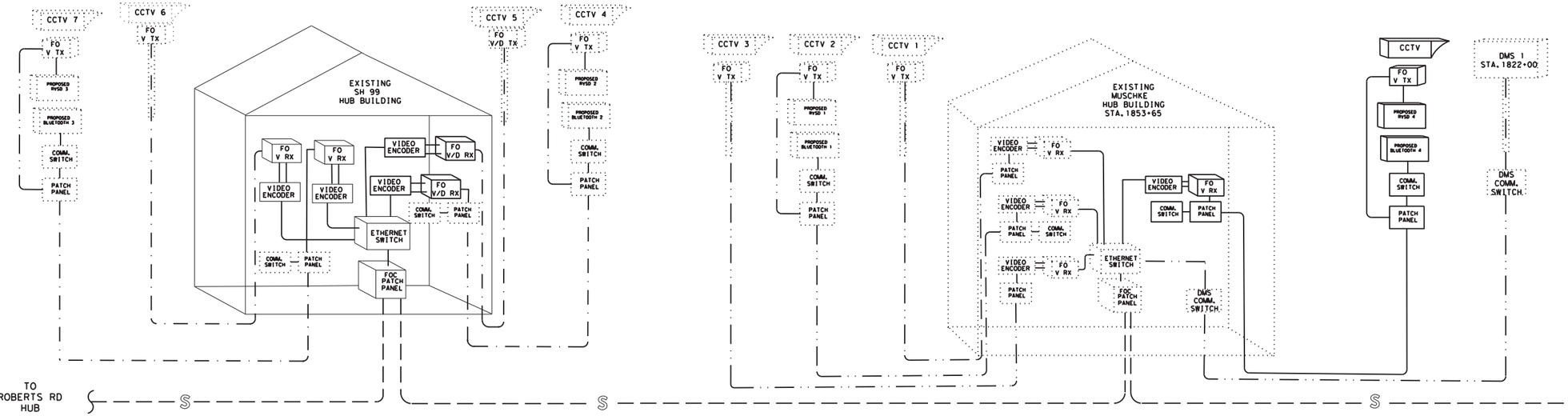
SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0050	06	089	US 290
DIST	COUNTY		SHEET NO.
HOU	HARRIS		041

CK1 DR1 CK2 DN1

DATE: $DATE$ $TIME$
FILE: $FILE$



LEGEND

- S — EXISTING 144 STRAND SINGLE MODE FIBER OPTIC CABLE
- S — NEW 144 STRAND SINGLE MODE FIBER OPTIC CABLE
- EXISTING EQUIPMENT
- NEW EQUIPMENT
- NEW SINGLE MODE FIBER OPTIC CABLE
- EXISTING COMMUNICATIONS HUB BUILDING
- NEW COMMUNICATIONS HUB BUILDING

NOTE:

AT EACH HUB BUILDING, TERMINATE THE STRANDS OF THE TRUNKLINE 144 STRAND FIBER OPTIC CABLE AS SHOWN ON THE PLANS AND AS NECESSARY FOR INTERCONNECTION OF EQUIPMENT. FULLY SPLICE ALL REMAINING STRANDS SO AS TO FORM A CONTINUOUS CONNECTION ON EACH STRAND THROUGHOUT THE PROJECT LIMITS. AT THE HUB BUILDINGS ON THE END OF THE PROJECT, FULLY SPLICE THE CABLE FROM THIS PROJECT TO THE FIBER OPTIC CABLE FROM ADJACENT PROJECTS. PROVIDE ALL SPLICE ENCLOSURES AND OTHER INCIDENTALS NEEDED TO PERFORM THE SPLICING.

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23 , 2022

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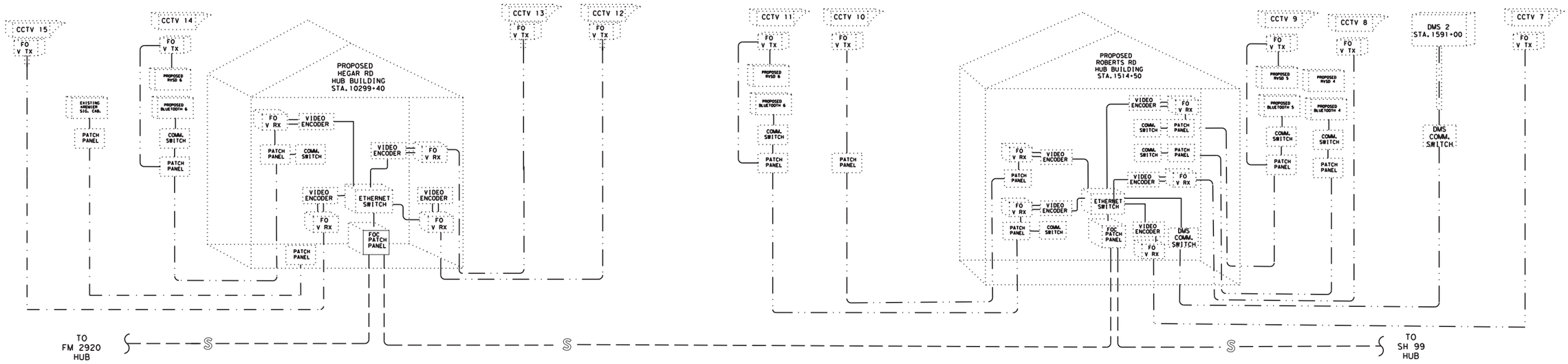
SHEET 1 OF 3

DATE: $DATE$ $TIME$
FILE: $FILE$

TEXAS DEPARTMENT OF TRANSPORTATION
US 290

FIBER OPTIC CABLING SCHEMATIC

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL		6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOU	HARRIS		0050	06	089	42
TR:									
CK TR:									



LEGEND

- EXISTING 144 STRAND SINGLE MODE FIBER OPTIC CABLE
- NEW 144 STRAND SINGLE MODE FIBER OPTIC CABLE
- EXISTING EQUIPMENT
- NEW EQUIPMENT
- NEW SINGLE MODE FIBER OPTIC CABLE
- EXISTING COMMUNICATIONS HUB BUILDING
- NEW COMMUNICATIONS HUB BUILDING

NOTE:

AT EACH HUB BUILDING, TERMINATE THE STRANDS OF THE TRUNKLINE 144 STRAND FIBER OPTIC CABLE AS SHOWN ON THE PLANS AND AS NECESSARY FOR INTERCONNECTION OF EQUIPMENT. FULLY SPLICE ALL REMAINING STRANDS SO AS TO FORM A CONTINUOUS CONNECTION ON EACH STRAND THROUGHOUT THE PROJECT LIMITS. AT THE HUB BUILDINGS ON THE END OF THE PROJECT, FULLY SPLICE THE CABLE FROM THIS PROJECT TO THE FIBER OPTIC CABLE FROM ADJACENT PROJECTS. PROVIDE ALL SPLICE ENCLOSURES AND OTHER INCIDENTALS NEEDED TO PERFORM THE SPLICING.

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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SHEET 2 OF 3

TEXAS DEPARTMENT OF TRANSPORTATION
US 290

FIBER OPTIC CABLING SCHEMATIC

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL		6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
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CK TR:									

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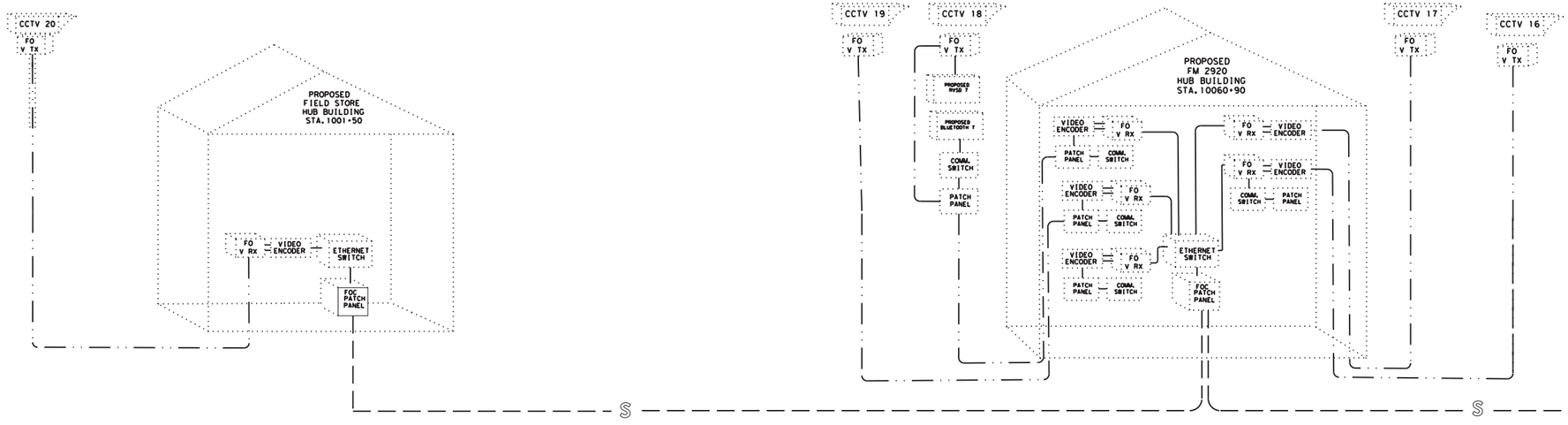

LEGEND

- EXISTING 144 STRAND SINGLE MODE FIBER OPTIC CABLE
- NEW 144 STRAND SINGLE MODE FIBER OPTIC CABLE
- EXISTING EQUIPMENT
- NEW EQUIPMENT
- NEW SINGLE MODE FIBER OPTIC CABLE
- EXISTING COMMUNICATIONS HUB BUILDING
- NEW COMMUNICATIONS HUB BUILDING

NOTE:

AT EACH HUB BUILDING, TERMINATE THE STRANDS OF THE TRUNKLINE 144 STRAND FIBER OPTIC CABLE AS SHOWN ON THE PLANS AND AS NECESSARY FOR INTERCONNECTION OF EQUIPMENT. FULLY SPLICE ALL REMAINING STRANDS SO AS TO FORM A CONTINUOUS CONNECTION ON EACH STRAND THROUGHOUT THE PROJECT LIMITS. AT THE HUB BUILDINGS ON THE END OF THE PROJECT, FULLY SPLICE THE CABLE FROM THIS PROJECT TO THE FIBER OPTIC CABLE FROM ADJACENT PROJECTS. PROVIDE ALL SPLICE ENCLOSURES AND OTHER INCIDENTALS NEEDED TO PERFORM THE SPLICING.

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SHEET 3 OF 3

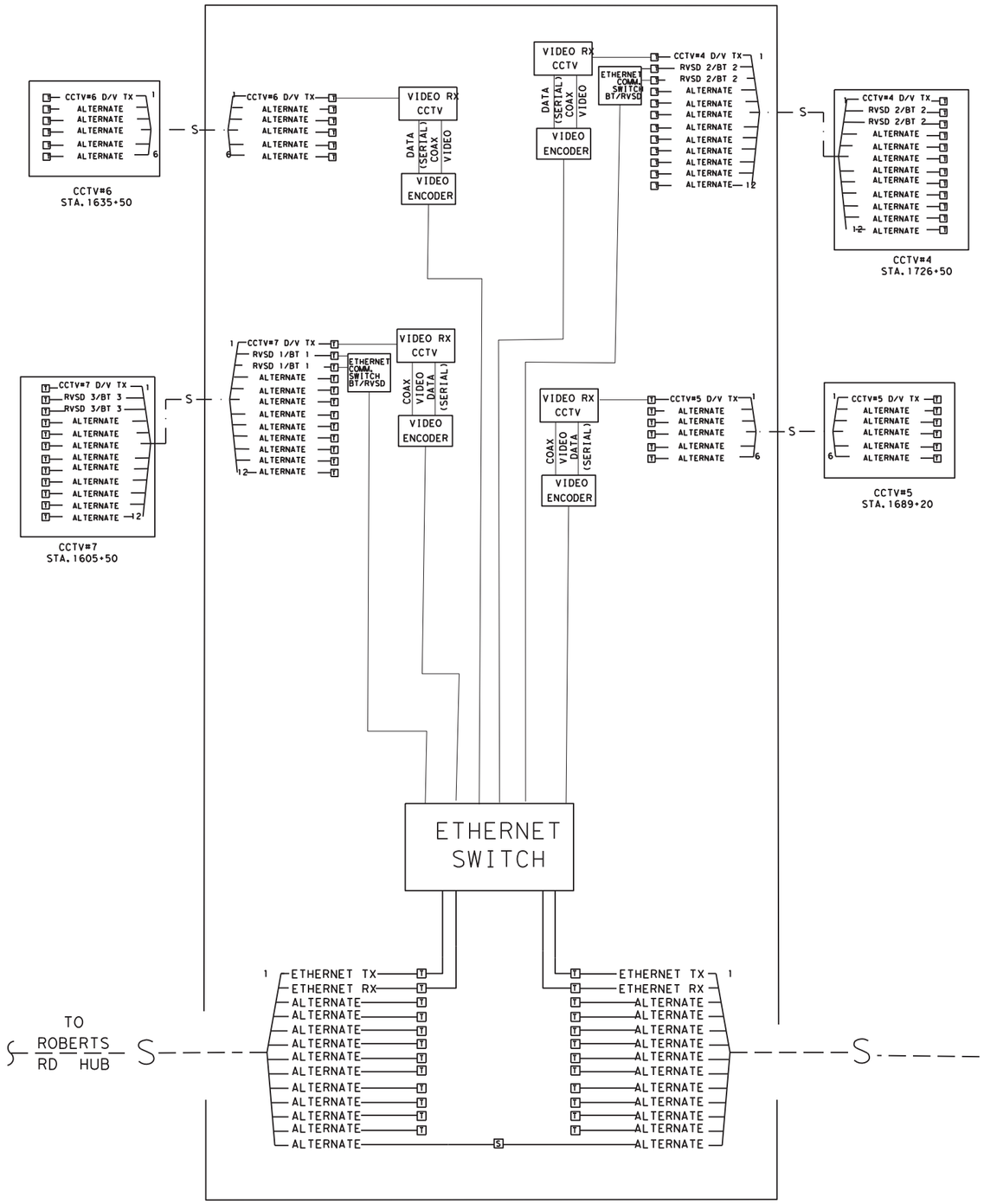
TEXAS DEPARTMENT OF TRANSPORTATION
US 290

FIBER OPTIC CABLING SCHEMATIC

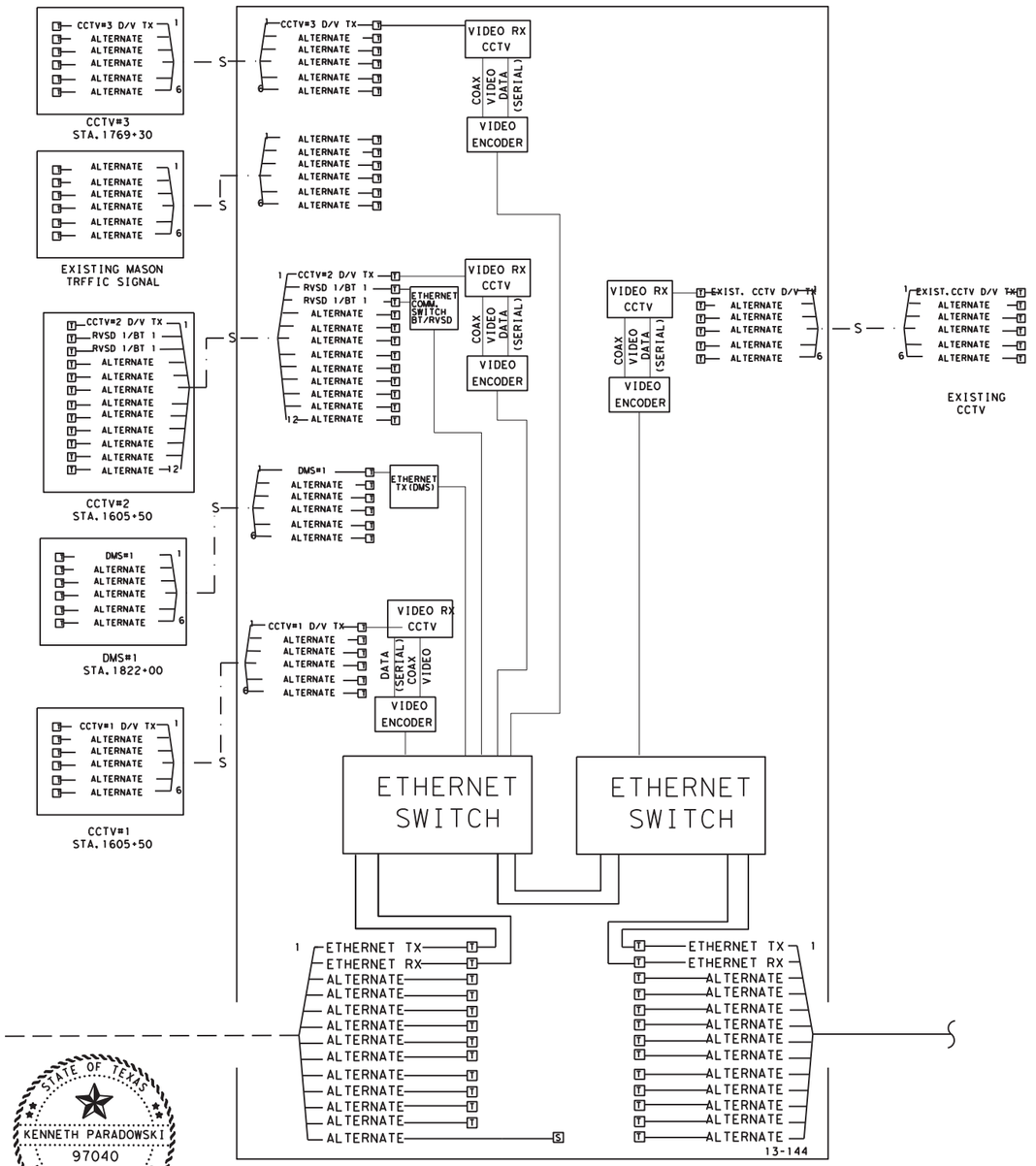
DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL		6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
CK DW:			HOU	HARRIS	0050	06	089	44	
TR:									
CK TR:									

DATE: $DATE$ $TIME$
FILE: $FILE$

EXISTING SH99 HUB BUILDING



EXISTING MUESCHKE HUB



SHEET 1 OF 3

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STATE OF TEXAS

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TEXAS DEPARTMENT OF TRANSPORTATION
US 290 NORTH

FIBER CABLE HUB TERMINATION ASSIGNMENTS
(SINGLE MODE)

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK. DN:	ORIGINAL		6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
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CK. TR:									

DATE:
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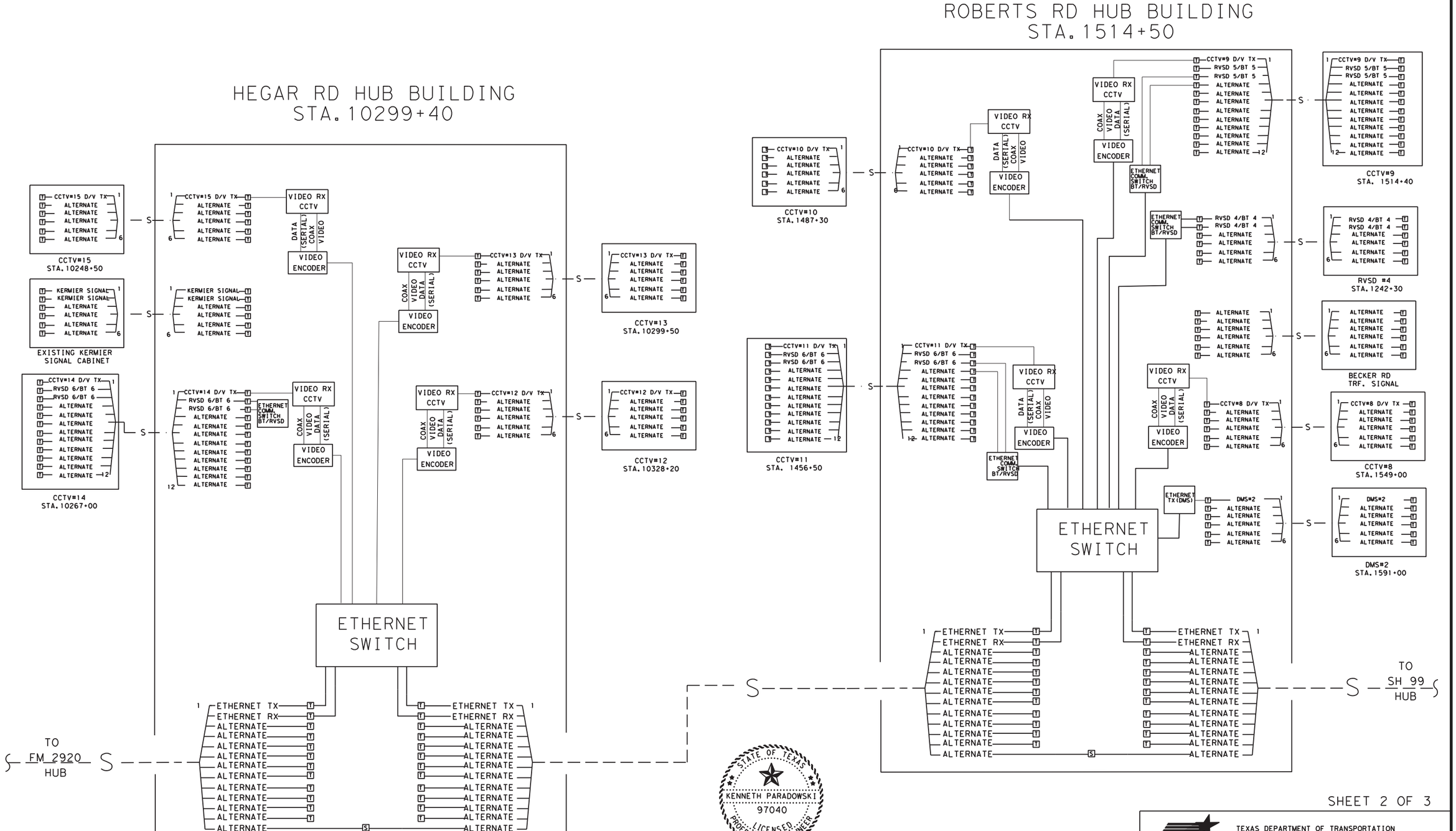

STATE OF TEXAS
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SHEET 2 OF 3

TEXAS DEPARTMENT OF TRANSPORTATION
US 290 NORTH

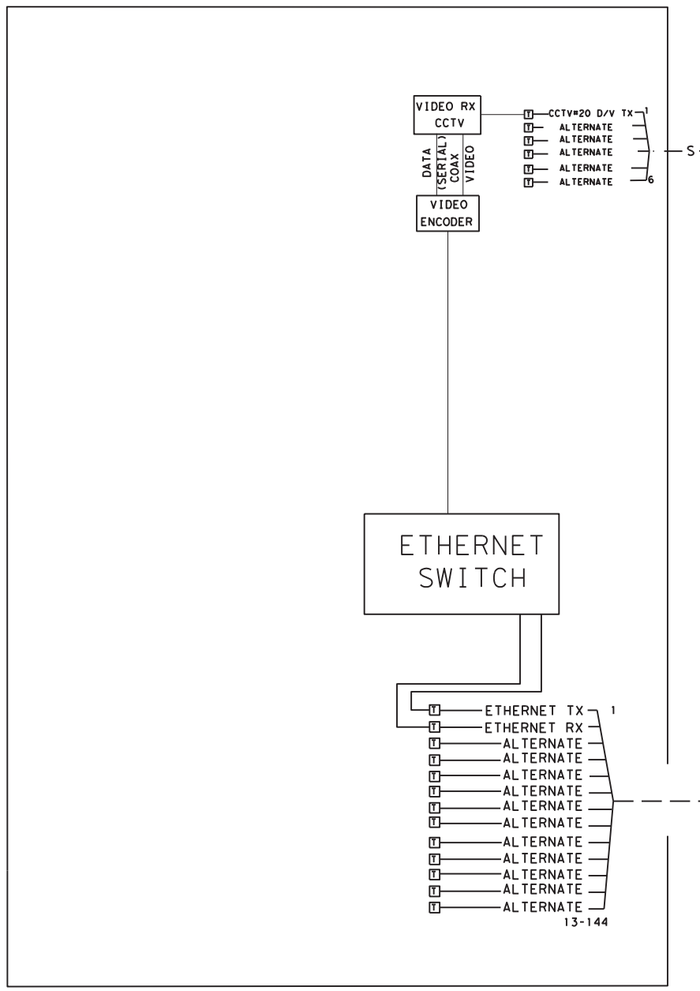
FIBER CABLE HUB TERMINATION ASSIGNMENTS
(SINGLE MODE)

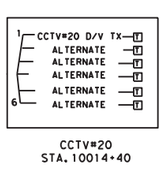
DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL		6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOU	HARRIS		0050	06	089	046
TR:									
CK TR:									

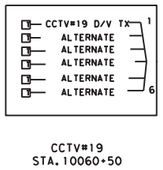
FILE NAME: fchtsm1.dgn

DATE:
FILE:

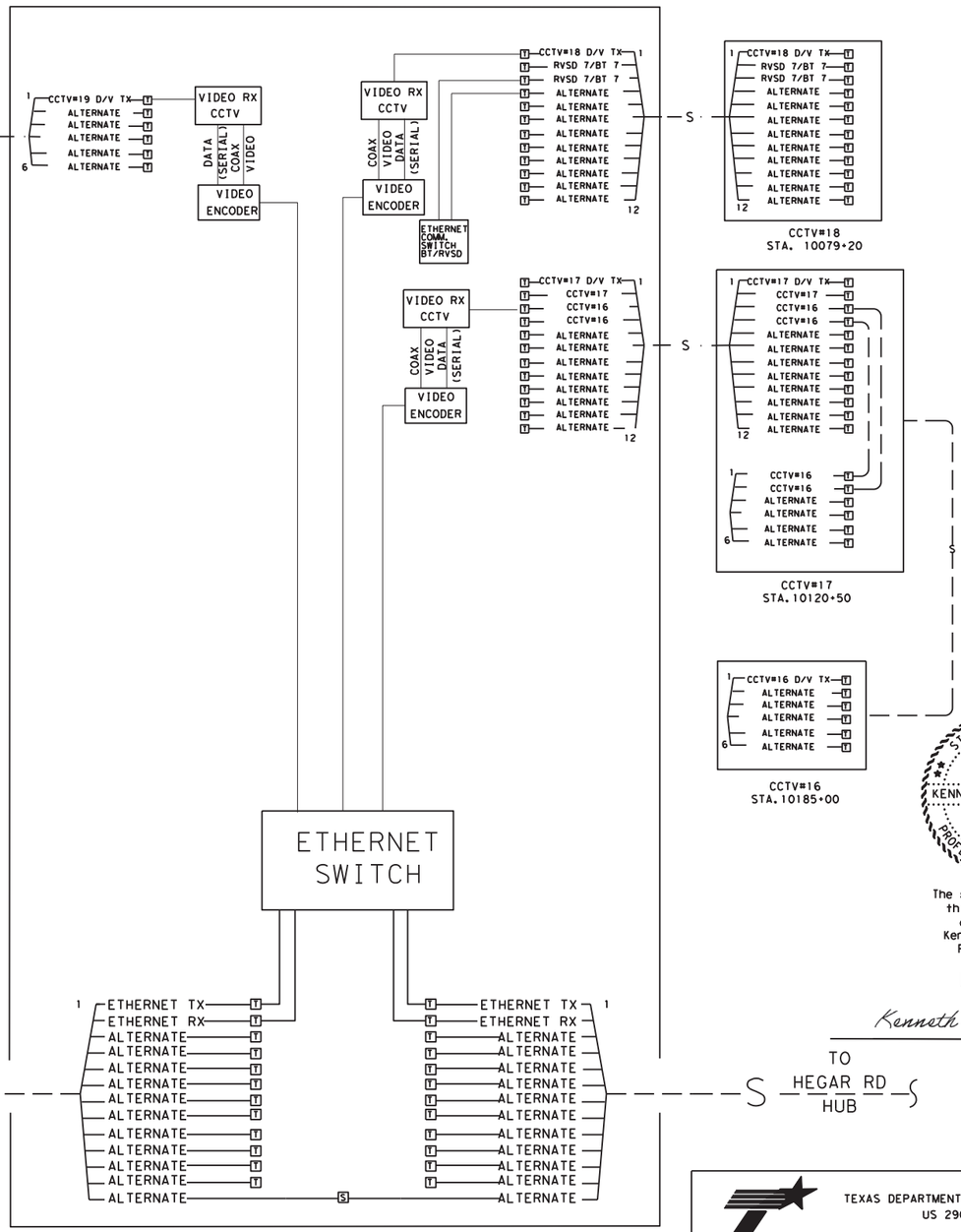
FIELD STORE HUB BUILDING
STA. 10015+50







FM 2920 HUB BUILDING
STA. 10060+80



LEGEND

- EXISTING SINGLE MODE FIBER OPTIC CABLE
- NEW SINGLE MODE FIBER OPTIC CABLE
- [T] FC CONNECTOR
- [S] FUSION SPLICE
- [C] COIL FIBER FOR FUTURE USE

TO HEGAR RD HUB

KENNETH PARADOWSKI 97040 LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

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May 23 , 2022

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SHEET 3 OF 3

TEXAS DEPARTMENT OF TRANSPORTATION
US 290 NORTH

FIBER CABLE HUB TERMINATION ASSIGNMENTS
(SINGLE MODE)

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL								
DW:			6	TEXAS					US290
CK DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
TR:			HOU	HARRIS		0050	06	089	047
CK TR:									

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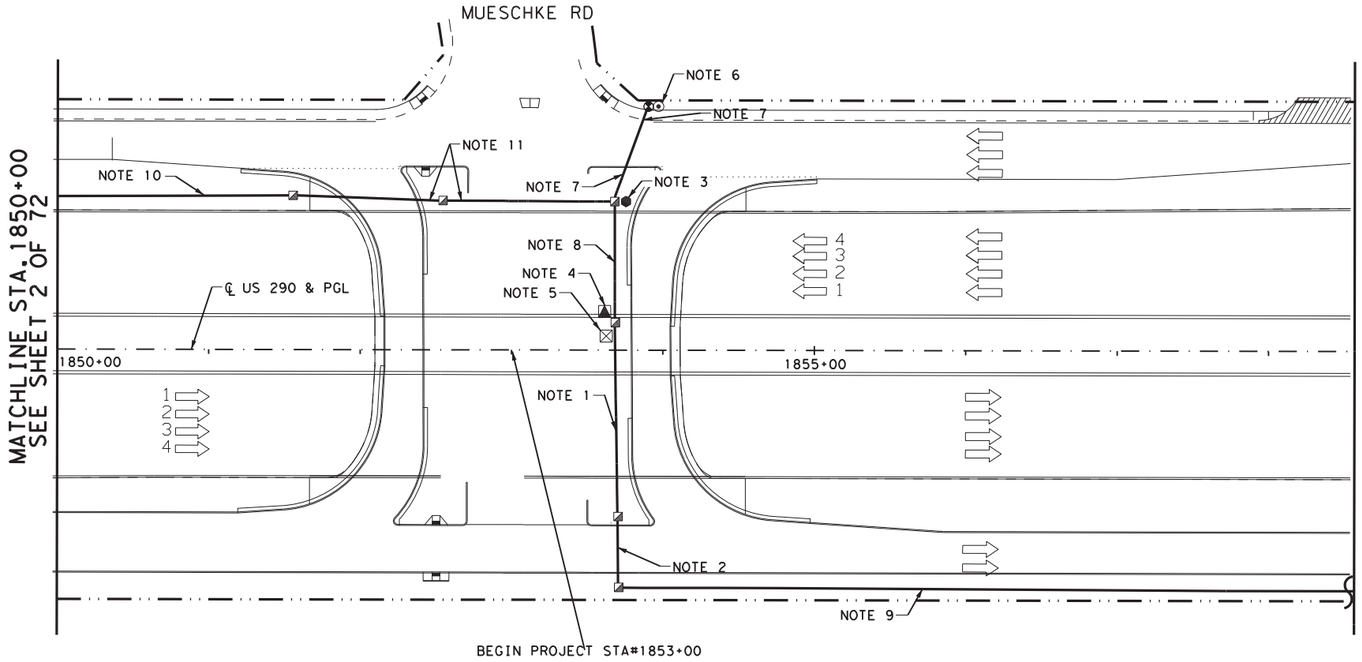

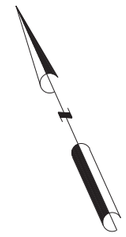

LEGEND

- RIGHT OF WAY
- NEW CONDUIT
- EXISTING CONDUIT
- NEW GROUND BOX-TYPE 1
- EXISTING GROUND BOX-TYPE 1
- NEW ELECTRICAL GROUND BOX-TYPE A
- EXISTING ELECTRICAL GROUND BOX-TYPE A
- EXISTING CABINET
- NEW CABINET (DOOR ON DARKENED SIDE)
- NEW COMMUNICATIONS HUB BUILDING
- EXISTING COMMUNICATIONS HUB BUILDING
- NEW CCTV CAMERA
- EXISTING CCTV CAMERA
- NEW SERVICE POLE
- EXISTING SERVICE POLE
- EXISTING JUNCTION BOX (UNLESS OTHERWISE NOTED)
- R RADAR VEHICLE SENSING DEVICE
- B BLUETOOTH DEVICE
- EXISTING DYNAMIC MESSAGE SIGN
- NEW DYNAMIC MESSAGE SIGN
- METAL BEAM GUARD FENCE
- **RADAR VEHICLE SENSING DEVICE POLE**

1. EXISTING
   4-3" CONDUITS
   2-4" MULTI-DUCT CONDUITS
   IN COND.#1(4" INNERDUCT"A") - 1-144 STRAND SINGLE MODE FIBER OPTIC CABLE
   IN COND.#2(4" INNERDUCT"A") - 2-6 STRAND SINGLE MODE FIBER OPTIC CABLE (RVSD, CCTV)

2. EXISTING
   2-3" CONDUITS
   2-4" SCH 80 MULTI-DUCT CONDUITS
   IN COND.#1(4"INNERDUCT"A")- 1-144 STRAND SINGLE MODE FIBER OPTIC CABLE
   IN COND.#2(4"INNERDUCT"A")- 2-6 STRAND SINGLE MODE FIBER OPTIC CABLE (RVSD,CCTV)

3. EXISTING
   CCTV CAMERA
   CCTV CAMERA SUPPORT POLE & CABINET
   CCTV FOUNDATION
   CCTV FIELD EQUIPMENT
   FIBER OPTIC VIDEO/DATA TX (S/M)
   3-2" CONDUITS TO GRD. BOX
   IN COND. #1- 1-6 STRAND SINGLE MODE FIBER OPTIC CABLE (CCTV)
   IN COND. #2- 2#8XHHW, 1#8 BARE (CCTV POWER)

4. EXISTING STA.1853+65
   COMMUNICATIONS HUB BUILDING
   1 SERIAL SERVER
   1 VIDEO ENCODER
   1 ETHERNET SWITCH
   1 BLUETOOTH RECEIVER
   1 FIBER OPTIC RS-232 DATA MODEM (RVSD)
   FIBER OPTIC SPLICE ENCLOSURE (S/M)
   1 FIBER OPTIC RS-232 DATA MODEM (TRAFFIC SIGNAL)
   1 FIBER OPTIC VIDEO/DATA RX (S/M)
   4-4" MULTI-DUCT CONDUITS TO GRD. BOX
   4-3" CONDUITS TO GRD. BOX
   2-2" CONDUITS TO GRD. BOX
   IN COND. #1(4" INNERDUCT "A") - 1-144 STRAND SINGLE MODE FIBER OPTIC CABLE
   IN COND. #2(4" INNERDUCT "B") - 1-6 STRAND SINGLE MODE FIBER OPTIC CABLES (CCTV)
   (4" INNERDUCT "C") - 1-6 STRAND SINGLE MODE FIBER OPTIC CABLES (RVSD)
   (4" INNERDUCT "D") - 1-6 STRAND SINGLE MODE FIBER OPTIC CABLE (TRAFFIC SIGNAL)
   IN COND. #3(2") - 3#4XHHW, 1#4 BARE (HUB POWER)
   INSTALL
   3 VIDEO ENCODER (SUPPLIED BY TXDOT)
   3 FIBER OPTIC VIDEO/DATA RX (S/M) (SUPPLIED BY TXDOT)
   1 ETHERNET TX (SUPPLIED BY TXDOT)
   IN COND. #3 (4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-2-6 STR.SM FOC,CCTV#3,
   MASON RD TRAFFIC SIGNAL)
   (4"INNERDUCT D)-1-12 STR.SM FOC CCTV#2,RVSD#1,BT#1
   IN COND. #4 (4"INNERDUCT A)-2-6 STR.SM FOC DMS#1,CCTV#1

5. EXISTING
   TRAFFIC SIGNAL CABINET
   1 FAN OUT KIT
   1 FIBER OPTIC RS-232 DATA MODEM (TRAFFIC SIGNAL)
   1-2" CONDUIT TO GRD. BOX
   1-6 STRAND SINGLE MODE FIBER OPTIC CABLE (TRAFFIC SIGNAL)

6. EXISTING
   SERVICE POLE
   2-2" SCH 80 PVC TO GRD. BOX
   IN CONDUIT #1 - 2#8XHHW, 1#8 BARE (CCTV POWER)
   3#4XHHW, 1#4 BARE (HUB POWER)

7. EXISTING
   2-3" CONDUITS
   IN COND. #1- 2#8XHHW, 1#8 BARE (CCTV POWER)
   3#4XHHW, 1#4 BARE (HUB POWER)

8. EXISTING
   2-3" CONDUITS
   2-4" MULTI-DUCT CONDUITS
   IN COND. #1(4" INNERDUCT "A")- 1-6 STRAND SINGLE MODE FIBER OPTIC CABLE (CCTV)
   IN COND. #2(3")- 3#4XHHW, 1#4 BARE (HUB POWER)
   INSTALL
   IN COND.#1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-2-6 STR.SM FOC,CCTV#3,
   MASON RD TRAFFIC SIGNAL)
   (4"INNERDUCT D)-1-12 STR.SM FOC CCTV#2,RVSD#1,BT#1
   IN COND. #2 (4"INNERDUCT A)-2-6 STR.SM FOC DMS#1,CCTV#1

9. EXISTING
   2-3" CONDUITS
   2-4" MULTI-DUCT CONDUITS
   IN COND.#1(4" INNERDUCT"A") - 1-144 STRAND SINGLE MODE FIBER OPTIC CABLE
   IN COND.#2(4" INNERDUCT"B") - 2-6 STRAND SINGLE MODE FIBER OPTIC CABLE (RVSD, CCTV)

10. EXISTING
    2-3" CONDUIT
    2-4" MULTIDUCT CONDUIT
    IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
    INSTALL
    IN COND.#1(4"INNERDUCT A)-1-144 STR. SM FOC
    (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
    (4"INNERDUCT C)-2-6 STR.SM FOC,CCTV#3,
    MASON RD TRAFFIC SIGNAL)
    (4"INNERDUCT D)-1-12 STR.SM FOC CCTV#2,RVSD#1,BT#1
    IN COND.#2(4"INNERDUCT A)-2-6 STR.SM FOC DMS#1,CCTV#1

11. EXISTING
    2-3" SCH. 80 PVC (BORED)
    2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
    IN SCH. 40 STEEL CASING
    IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
    INSTALL
    IN COND.#1(4"INNERDUCT A)-1-144 STR. SM FOC
    (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
    (4"INNERDUCT C)-2-6 STR.SM FOC,CCTV#3,
    MASON RD TRAFFIC SIGNAL)
    (4"INNERDUCT D)-1-12 STR.SM FOC CCTV#2,RVSD#1,BT#1
    IN COND.#2(4"INNERDUCT A)-2-6 STR.SM FOC DMS#1,CCTV#1

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May 23 , 2022

Kenneth Paradowski, P.E.

SCALE: 1" = 100'

TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 1 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK. DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
CK. DW:			HOU	HARRIS	0050	06	089	48	
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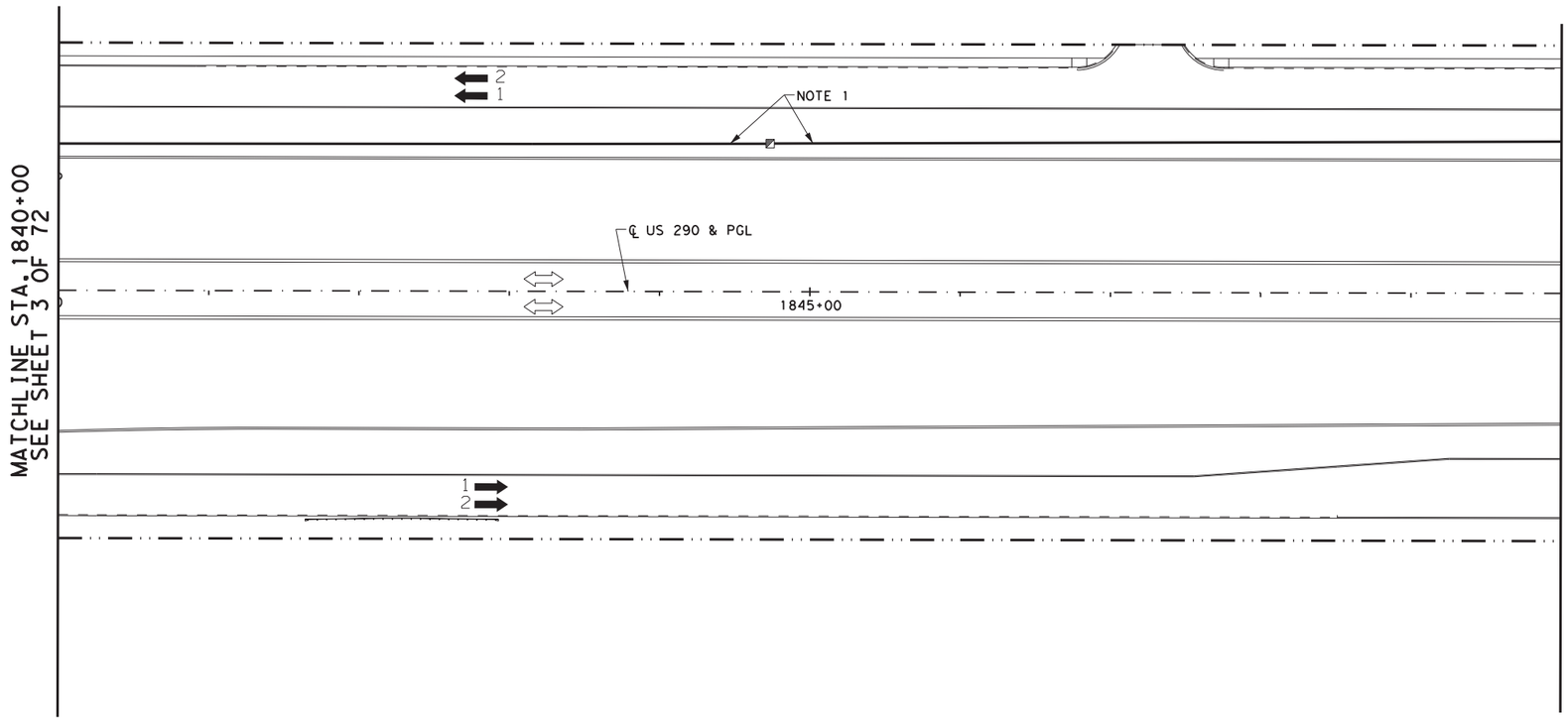

1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-2-6 STR.SM FOC,CCTV#3,
   MASON RD TRAFFIC SIGNAL)
   (4"INNERDUCT D)-1-12 STR.SM FOC CCTV#2,RVSD#1,BT#1
   IN COND. #2(4"INNERDUCT A)-2-6 STR.SM FOC DMS#1,CCTV#1

SEE SHEET 1 OF 72
FOR LEGEND

SCALE: 1" = 100'

FILE NAME: US290_89_39.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED
PROFESSIONAL ENGINEER

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Kenneth Paradowski, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 2 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
CK DW:			HOU	HARRIS	0050	06	089		49
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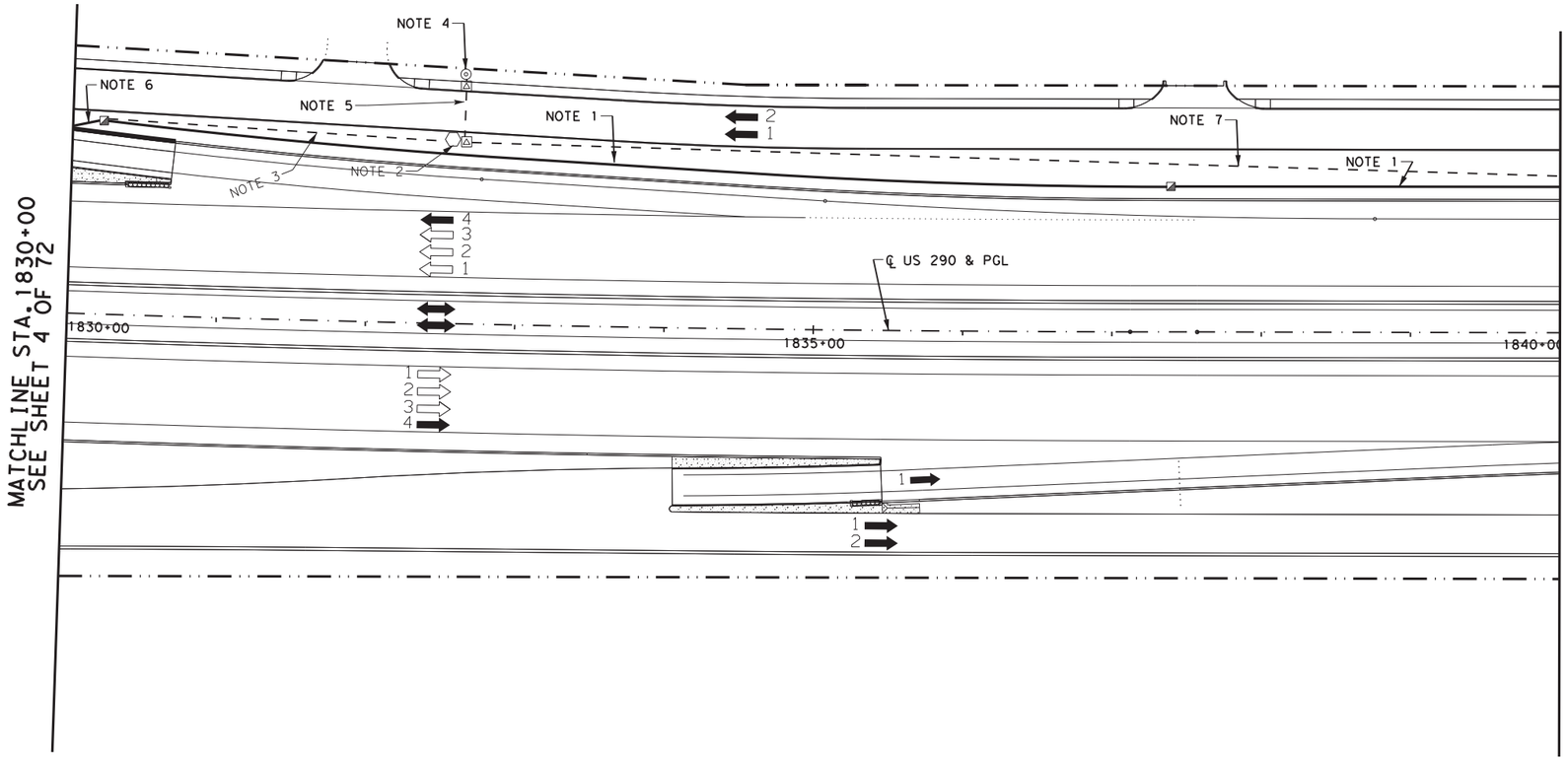

1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-2-6 STR.SM FOC,CCTV#3,
   MASON RD TRAFFIC SIGNAL)
   (4"INNERDUCT D)-1-12 STR.SM FOC CCTV#2,RVSD#1,BT#1
   IN COND.#2(4"INNERDUCT A)-2-6 STR.SM FOC DMS#1,CCTV#1

2. INSTALL (STA 1832+10).
   CCTV CAMERA #1
   CCTV CAMERA SUPPORT POLE & FOUNDATION (55')
   POLE MOUNTED CABINET (TY.2)(CONF.1)
   CCTV FIELD EQUIPMENT
   FIBER OPTIC VIDEO/DATA TX (S/M)
   2-2" SCH. 80 PVC TO TY 1 GRD BOX
   1-2" SCH. 80 PVC TO TY A GRD BOX
   IN COND.#1
   - 1-6 STR SM FOC (CCTV#1 TO TY 1 GRD BOX)
   - 1#14 INSULATED CONDUCTOR
   IN COND.#2-2#8XHHW, 1#8 BARE (CCTV#1 POWER - TY A GRD BOX)

3. INSTALL
   2-2" SCH. 80 PVC 80 TO TYPE 1 GRD. BOX
   IN COND.#1 1-6-STR. SM FOC, CCTV#1)

4. INSTALL
   SERVICE POLE D-1
   2-2" SCH 80 PVC TO GRD. BOX
   IN CONDUIT #1 - 2#8XHHW, 1#8 BARE (CCTV# 1 POWER)
   IN CONDUIT #1 - 3#2XHHW, 1#2 BARE (DMS# 1 POWER)

5. INSTALL
   2-2" SCH 80 PVC (BORED)
   IN NEW SCH. 40 STEEL CASING
   IN COND. #1- 2#8XHHW, 1#8 BARE (CCTV# 1 POWER)

6 . EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-2-6 STR.SM FOC,CCTV#3,
   MASON RD TRAFFIC SIGNAL)
   (4"INNERDUCT D)-1-12 STR.SM FOC CCTV#2,RVSD#1,BT#1
   IN COND.#2 (4"INNERDUCT A)-1-6 STR.SM FOC DMS#1

7 . INSTALL
   2-2" SCH. 80 PVC TO TY A GRD. BOX
   IN CONDUIT #1-3#2XHHW,1#2 BARE(DMS#1 POWER)

SEE SHEET 1 OF 72
FOR LEGEND

SCALE: 1" = 100'

FILE NAME: U.S.290_005006080_08.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
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PROFESSIONAL ENGINEER

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Kenneth Paradowski, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 3 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21							
DW:			6	TEXAS					US290
CK DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
TR:			HOU	HARRIS		0050	06	089	50
CK TR:									

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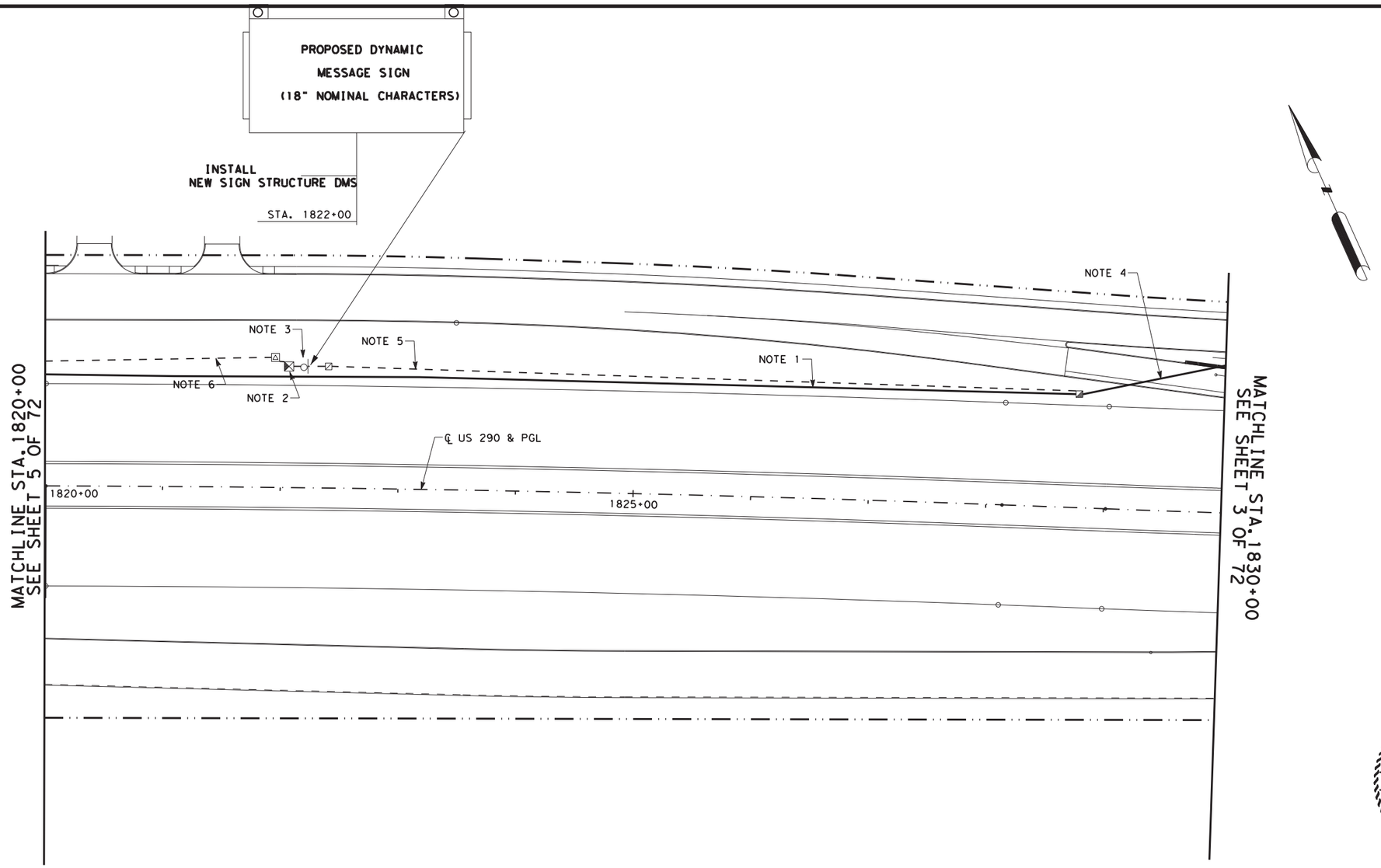

1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-2-6 STR.SM FOC,CCTV#3,
   MASON RD TRAFFIC SIGNAL
   (4"INNERDUCT D)-1-12 STR.SM FOC CCTV#2,RVSD#1,BT#1
   IN COND.#2(4"INNERDUCT A)-2-6 STR.SM FOC DMS#1,CCTV#1

2. INSTALL DMS#1 (STA.1822+00)
   DMS CABINET & FOUNDATION
   DMS CONTROLLER CABINET(SUPPLIED BY TxDOT)
   1 FIELD EQUIPMENT(DMS#1)(SUPPLIED BY TxDOT)
   1 ETHERNET TX(DMS#1)
   2-3" SCH.80 PVC TO TY1 GR.BOX
   1-2" SCH.80 PVC TO TYA GR.BOX.
   IN COND#1 (3") 1-6 STR SM FOC (DMS#1)
   IN COND#2 (2") 3#2XHHW 1#2 BARE TO TYPE A GB (DMS #1 POWER)

3. INSTALL (STA.1822+00)
   DMS#1
   SIGN STRUCTURE DMS#1
   LED DYNAMIC MESSAGE SIGN (18") (SUPPLIED BY TxDOT)
   2-4" SCH.80 TO DMS CONTROLLER CABINET
   IN COND #1 - DMS CONTROL CABLES
   IN COND #2 - DMS CONTROL CABLES

4. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-2-6 STR.SM FOC,CCTV#3,
   MASON RD TRAFFIC SIGNAL)
   (4"INNERDUCT D)-1-12 STR.SM FOC CCTV#2,RVSD#1,BT#1
   IN COND.#2(4"INNERDUCT A)-1-6 STR.SM FOC DMS#1

5 INSTALL
   2-2" SCH. 80 PVC TO TY 1 GRD. BOX
   IN CONDUIT #1#14 INSULATED CONDUCTOR
   IN CONDUIT #2 1-6 STR SM FOC (DMS#1)

6 INSTALL
   2-2" SCH. 80 PVC TO TY A GRD. BOX
   IN CONDUIT #1-3#2XHHW,1#2 BARE(DMS#1 POWER)

STATE OF TEXAS
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TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 4 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOU	HARRIS		0050	06	089	51
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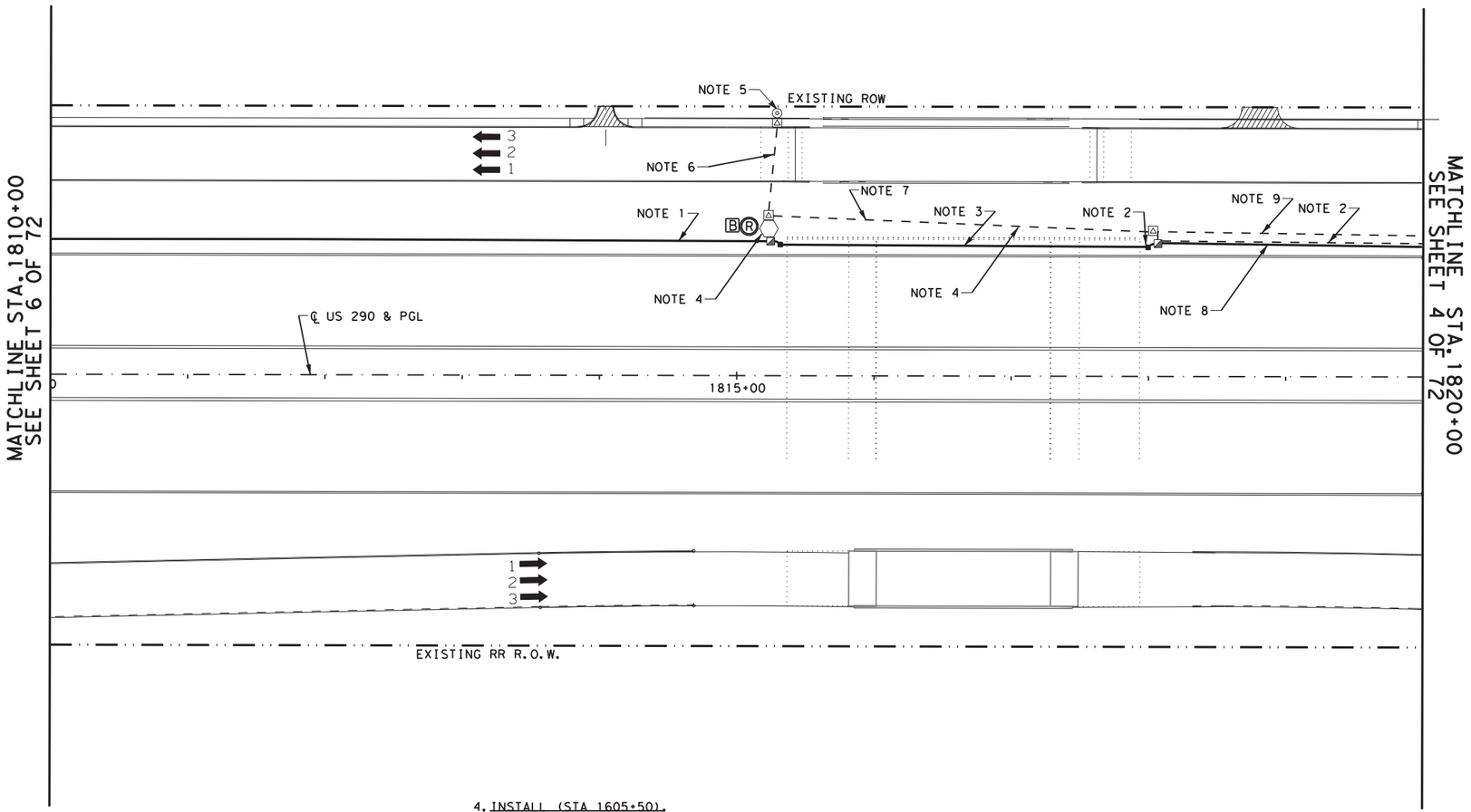

1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-2-6 STR.SM FOC CCTV#3,
   MASON RD TRAFFIC SIGNAL)

2. INSTALL
   2-2" SCH. 80 PVC TO TY 1 GRD. BOX
   IN CONDUIT #1#14 INSULATED CONDUCTOR
   IN CONDUIT #2 1-6 STR SM FOC (DMS#1)

3. EXISTING
   2-3" RMC (SUSPENDED BENEATH THE BRIDGE)
   2-4" MULTI-DUCT RMC (SUSPENDED BENEATH THE BRIDGE)
   INSTALL
   IN COND.#1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-2-6 STR.SM FOC,CCTV#3,
   MASON RD TRAFFIC SIGNAL)
   (4"INNERDUCT D)-1-12 STR.SM FOC CCTV#2,RVSD#1,BT#1

4. INSTALL (STA 1605+50).
   CCTV CAMERA #2
   CCTV CAMERA SUPPORT POLE & FOUNDATION (55')
   POLE MOUNTED CABINET (TY.2)(CONF.1)
   CCTV FIELD EQUIPMENT
   1 RVSD FIELD EQUIPMENT (RVSD#1)
   2 ETHERNET TX(SUPPLIED BY TXDOT)
   1 BLUETOOTH FIELD EQUIPMENT (BT#1) (SUPPLIED BY TXDOT)
   FIBER OPTIC VIDEO/DATA TX (S/M)
   1 FIBER OPTIC PATCH PANEL (12 POSITION)
   2-2" SCH. 80 PVC TO TY 1 GRD BOX
   1-2" SCH. 80 PVC TO TY A GRD BOX
   IN COND.#1
   - 1-12 STR SM FOC (CCTV#2,RVSD#1,BT#1- TY 1 GRD BOX)
   - 1#14 INSULATED CONDUCTOR
   IN COND.#2-2#8XHHW, 1#8 BARE (CCTV#2 POWER - TY A GRD BOX

5. INSTALL
   SERVICE POLE D-2
   2-2" SCH 80 PVC TO GRD. BOX
   IN CONDUIT #1 - 2#8XHHW, 1#8 BARE (CCTV#2 POWER)
   IN CONDUIT #2 - 3#2XHHW, 1#2 BARE (DMS#2 POWER)

6. INSTALL
   2-2" SCH 80 PVC (BORED)
   IN NEW SCH. 40 STEEL CASING
   IN COND. #1- 2#8XHHW, 1#8 BARE (CCTV#1 POWER)
   IN COND #1-3#2XHHW,1#2 BARE(DMS#1 POWER)

7. INSTALL
   2-2" RMC TO TY A GRD BOX
   IN CONDUIT #1-3#2XHHW,1#2 BARE(DMS#1 POWER)

8. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-2-6 STR.SM FOC,CCTV#3,
   MASON RD TRAFFIC SIGNAL)
   (4"INNERDUCT D)-1-12 STR.SM FOC CCTV#2,RVSD#1,BT#1
   IN COND.#2(4"INNERDUCT A)-1-6 STR.SM FOC DMS#1

9 INSTALL
   2-2" SCH. 80 PVC TO TY A GRD. BOX
   IN CONDUIT #1-3#2XHHW,1#2 BARE(DMS#1 POWER)

SEE SHEET 6 OF 72
FOR LEGEND

SCALE: 1" = 100'

FILE NAME: U.S.290_005006080_06.dgn

NAME:ENTER DATA

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED
PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 5 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21							
DW:			6	TEXAS					US290
CK DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
TR:			HOU	HARRIS		0050	06	089	52
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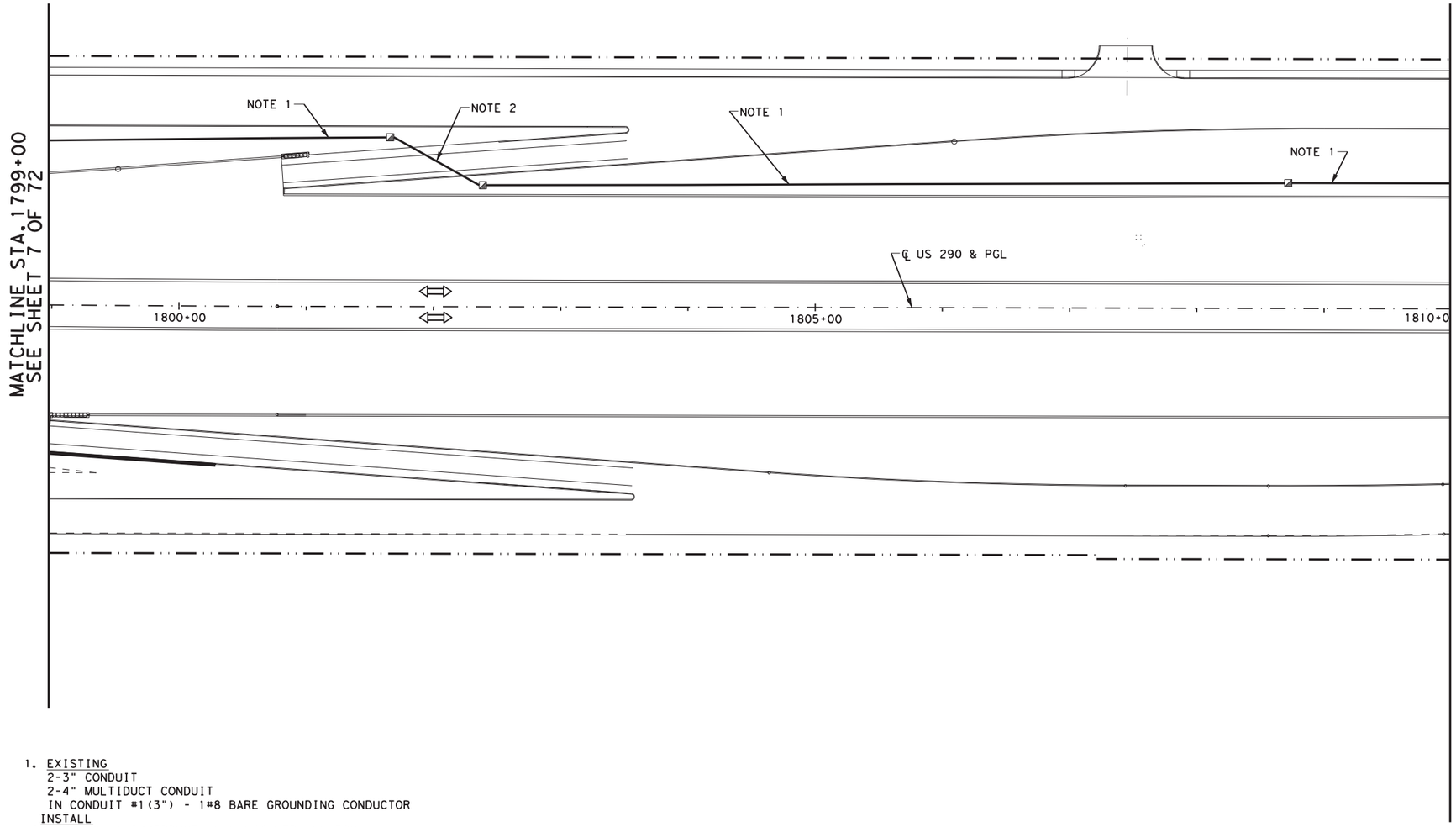


1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-2-6 STR.SM FOC,CCTV#3,
   MASON RD TRAFFIC SIGNAL)

2. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR

   INSTALL
   IN COND.#1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-2-6 STR.SM FOC,CCTV#3,
   MASON RD TRAFFIC SIGNAL)

LEGEND

- RIGHT OF WAY
- NEW CONDUIT
- EXISTING CONDUIT
- NEW GROUND BOX: TYPE 1
- EXISTING GROUND BOX: TYPE 1
- NEW GROUND BOX: TYPE 2
- EXISTING GROUND BOX: TYPE 2
- EXISTING CABINET
- EXISTING COMMUNICATIONS HUB BUILDING
- EXISTING POWER POLE
- EXISTING SERVICE POLE
- EXISTING CCTV CAMERA
- JUNCTION BOX (UNLESS OTHERWISE NOTED)
- (R) RADAR VEHICLE SENSING DEVICE POLE
- [R] RADAR VEHICLE SENSING DEVICE
- METAL BEAM GRUARD FENCE

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by Kenneth Paradowski P.E. 97040, on

May 23 , 2022

Kenneth Paradowski, P.E.

SCALE: 1" = 100'

FILE NAME: U.S.290_005006080_05.dgn

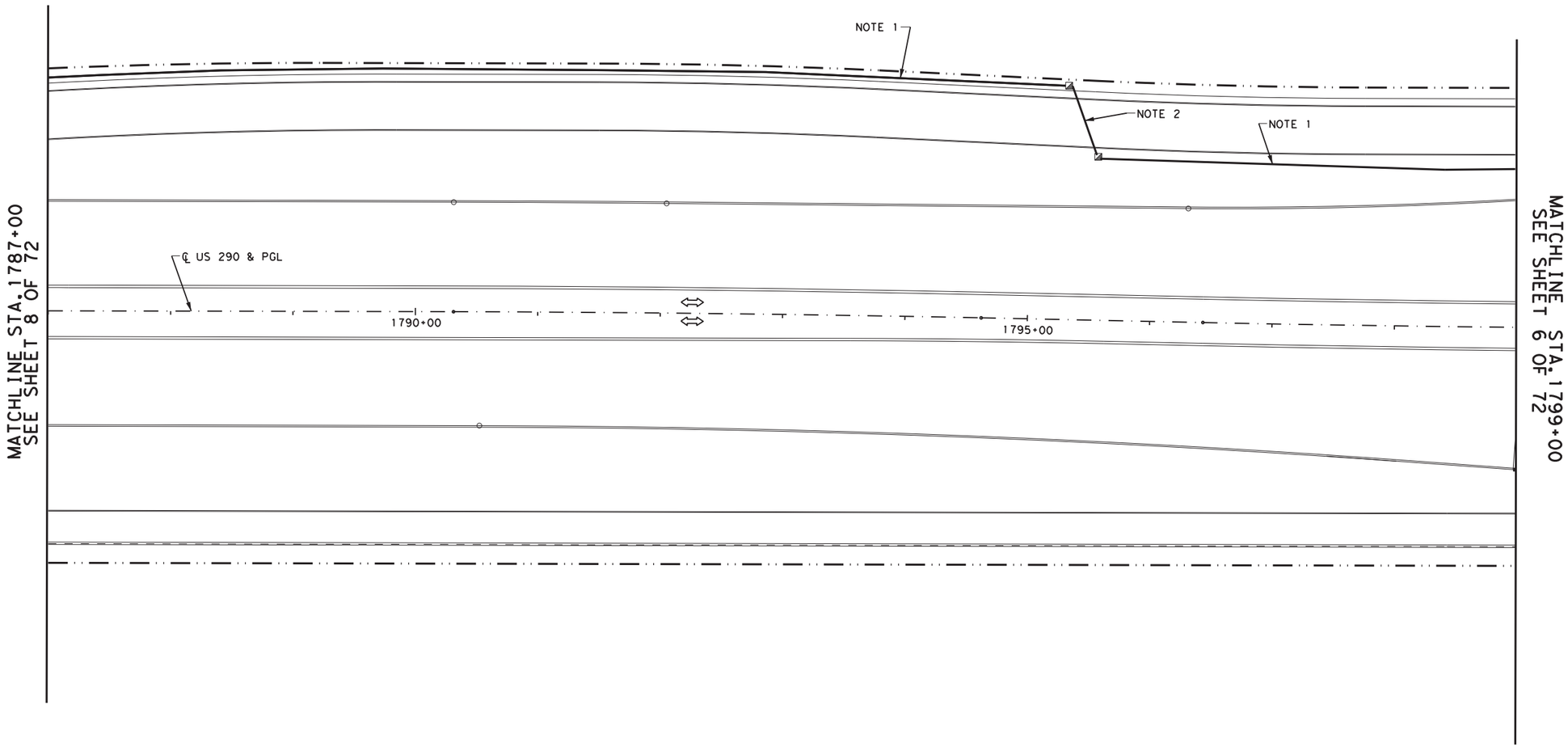
TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 6 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
CK DW:			HOU	HARRIS	0050	06	089		53
TR:									
CK TR:									

NAME:ENTER DATA



1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-2-6 STR.SM FOC,CCTV#3,
   MASON RD TRAFFIC SIGNAL)

2. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR

   INSTALL
   IN COND.#1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-2-6 STR.SM FOC,CCTV#3,
   MASON RD TRAFFIC SIGNAL)

SEE SHEET 10 OF 72
FOR LEGEND

SCALE: 1" = 100'

FILE NAME: U.S.290_005006080_04.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
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PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 7 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:									
CK DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
TR:			HOU	HARRIS	0050	06	089	54	
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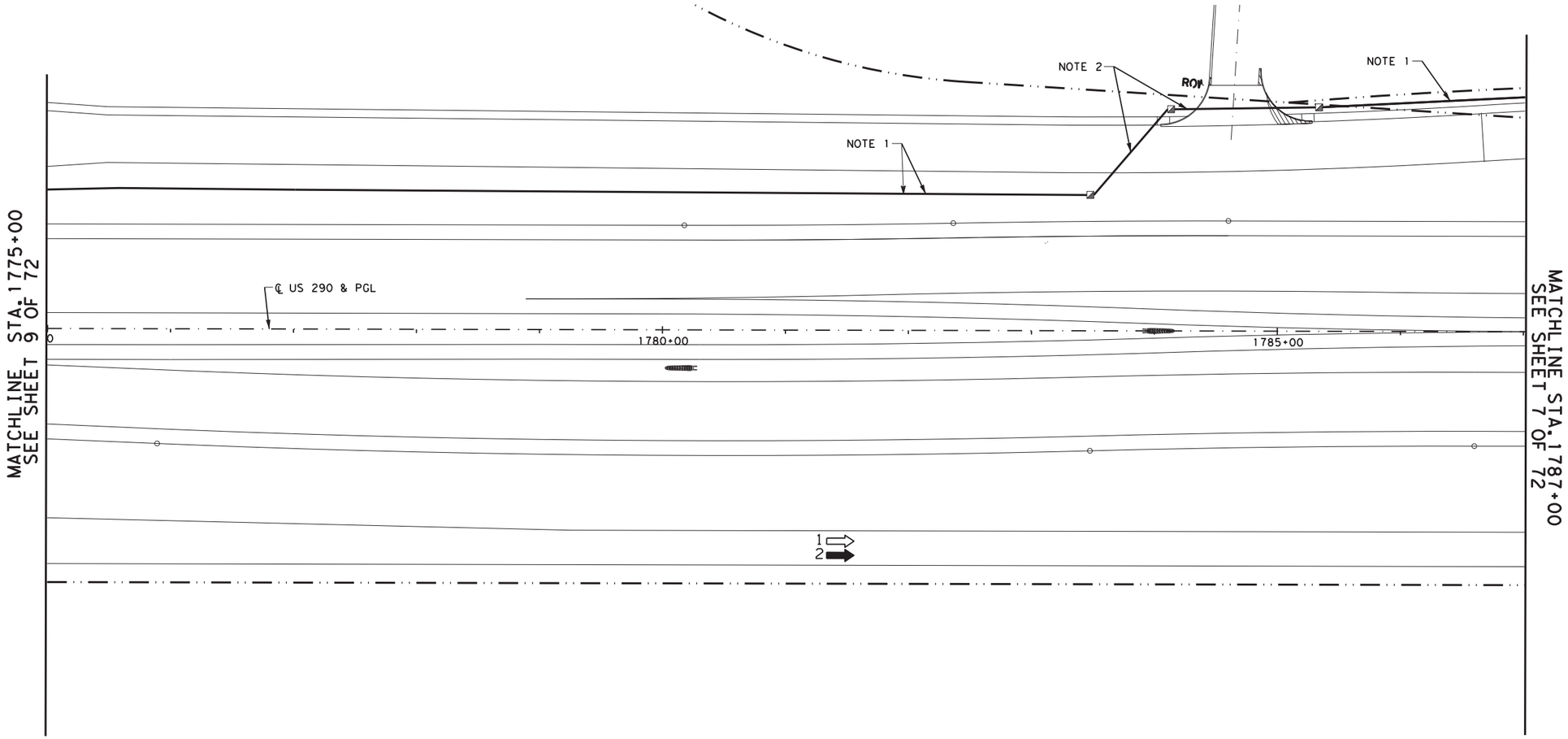
NAME:ENTER DATA



1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-2-6 STR.SM FOC CCTV#3,
   MASON RD TRAFFIC SIGNAL)

2. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR

   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-2-6 STR.SM FOC,CCTV#3)
   MASON RD TRAFFIC SIGNAL)

SEE SHEET 10 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: U.S.290_005006080_03.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23, 2022

Kenneth Paradowski, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 8 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS				US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOU	HARRIS	0050	06	089	55
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CK TR:								

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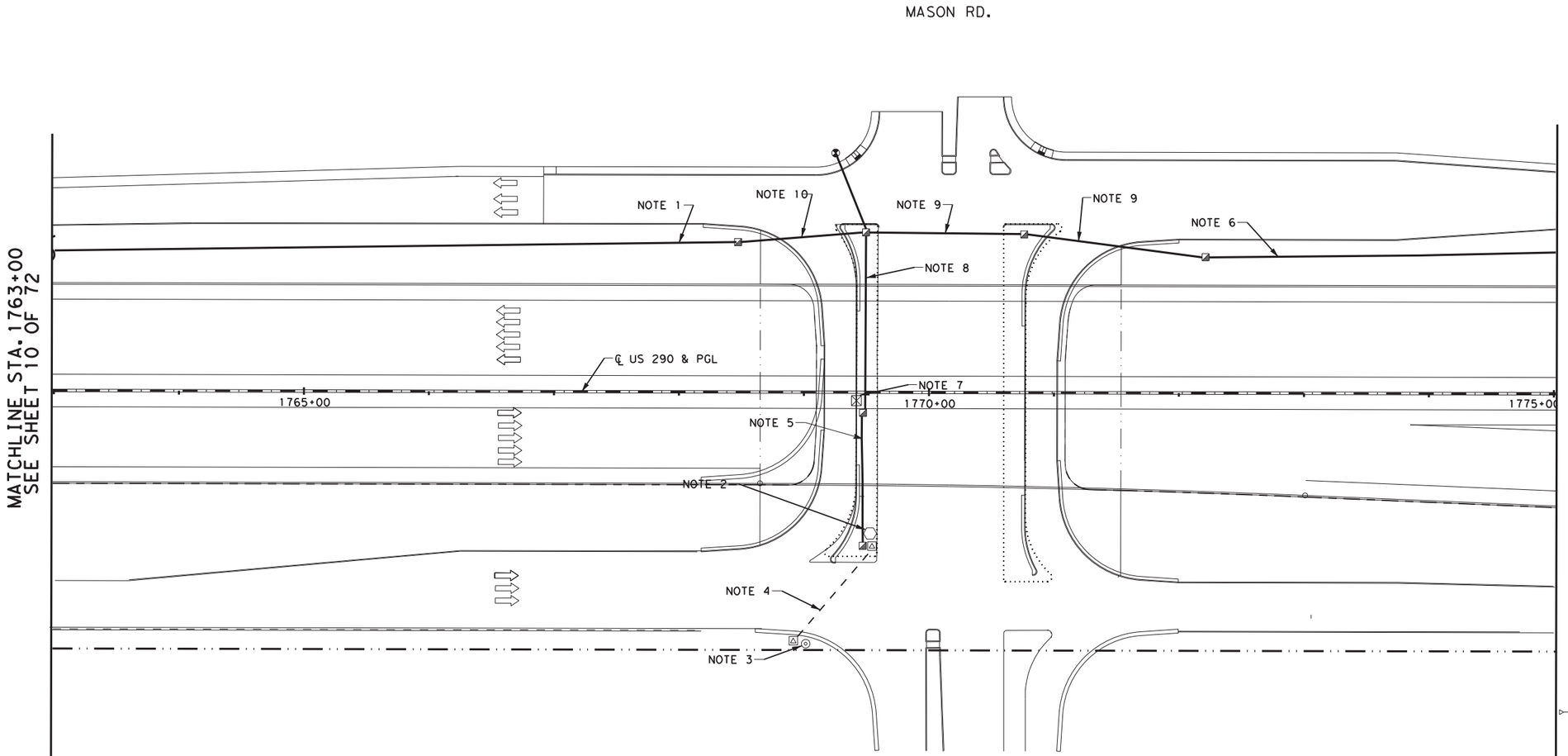

LEGEND

- RIGHT OF WAY
- NEW CONDUIT
- EXISTING CONDUIT
- NEW GROUND BOX: TYPE 1
- EXISTING GROUND BOX: TYPE 1
- NEW GROUND BOX: TYPE 2
- EXISTING GROUND BOX: TYPE 2
- EXISTING CABINET
- EXISTING COMMUNICATIONS HUB BUILDING
- EXISTING POWER POLE
- EXISTING SERVICE POLE
- EXISTING CCTV CAMERA
- JUNCTION BOX (UNLESS OTHERWISE NOTED)
- RADAR VEHICLE SENSING DEVICE POLE
- RADAR VEHICLE SENSING DEVICE
- METAL BEAM GRUARD FENCE

1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR

2. INSTALL (STA 1769+30).
   CCTV CAMERA #3
   CCTV CAMERA SUPPORT POLE & FOUNDATION (55')
   POLE MOUNTED CABINET (TY.2)(CONF.1)
   CCTV FIELD EQUIPMENT
   FIBER OPTIC VIDEO/DATA TX (S/M)
   2-2" SCH. 80 PVC TO TY 1 GRD BOX
   1-2" SCH. 80 PVC TO TY A GRD BOX
   IN COND.#1
   - 1-6 STR SM FOC (CCTV#2- TY 1 GRD BOX)
   - 1#14 INSULATED CONDUCTOR
   IN COND.#2-2#8XHHW, 1#8 BARE (CCTV#3 POWER - TY A GRD BOX)

3. INSTALL
   SERVICE POLE D-3
   2-2" SCH 80 PVC TO GRD. BOX
   IN CONDUIT #1 - 2#8XHHW, 1#8 BARE (CCTV#3 POWER)

4. INSTALL
   2-2" SCH 80 PVC (BORED)
   IN NEW SCH. 40 STEEL CASING
   IN COND. #1- 2#8XHHW, 1#8 BARE (CCTV#3 POWER)

5. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT B)-1-6 STR.SM FOC,CCTV#3)

6. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-2-6 STR.SM FOC,CCTV#3,
   MASON RD TRAFFIC SIGNAL)

7. EXISTING
   TRAFFIC SIGNAL CABINET
   INSTALL
   2-2" SCH.80 PVC TO TY.1 GRD.BOX
   IN COND.#1(4"INNERDUCT A)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT B)-1-6 STR.SM FOC
   MASON RD TRAFFIC SIGNAL)

8. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT B)-2-6 STR.SM FOC,CCTV#3,
   MASON RD TRAFFIC SIGNAL)

9. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-2-6 STR.SM FOC,CCTV#3)
   MASON RD TRAFFIC SIGNAL)

10. EXISTING
    2-3" SCH. 80 PVC (BORED)
    2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
    IN SCH. 40 STEEL CASING
    IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
    INSTALL
    IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
    (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR

SEE SHEET 10 OF 72 FOR LEGEND
SCALE: 1" = 100'

FILE NAME: U.S.290_005006080_02.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23, 2022

Kenneth Paradowski, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 9 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
CK DW:			HOU	HARRIS	0050	06	089		56
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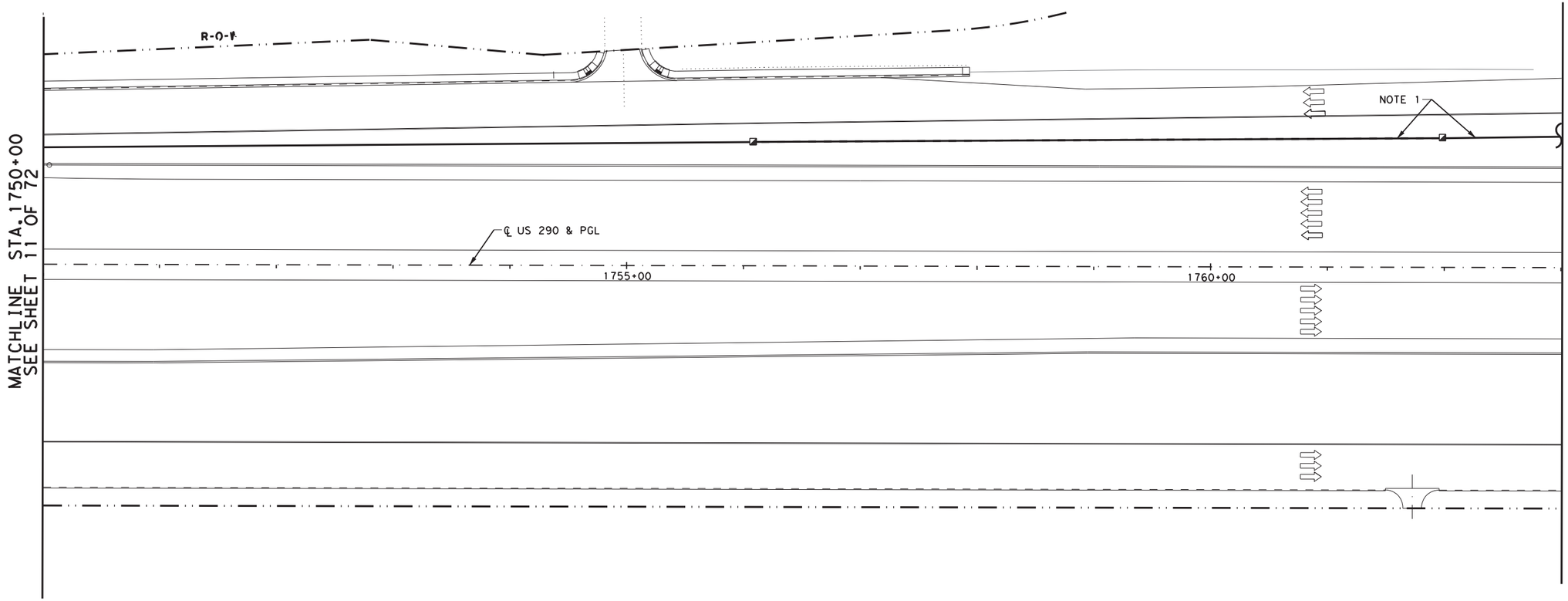
CK TR:									

NAME:ENTER DATA



1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR

LEGEND

- RIGHT OF WAY
- NEW CONDUIT
- EXISTING CONDUIT
- NEW GROUND BOX: TYPE 1
- EXISTING GROUND BOX: TYPE 1
- NEW GROUND BOX: TYPE 2
- EXISTING GROUND BOX: TYPE 2
- EXISTING CABINET
- EXISTING COMMUNICATIONS HUB BUILDING
- EXISTING POWER POLE
- EXISTING SERVICE POLE
- EXISTING CCTV CAMERA
- JUNCTION BOX (UNLESS OTHERWISE NOTED)
- RADAR VEHICLE SENSING DEVICE POLE
- RADAR VEHICLE SENSING DEVICE
- METAL BEAM GRUARD FENCE

SCALE: 1" = 100'

FILE NAME: U.S.290_005006080_01.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED
PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 10 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOU	HARRIS		0050	06	089	57
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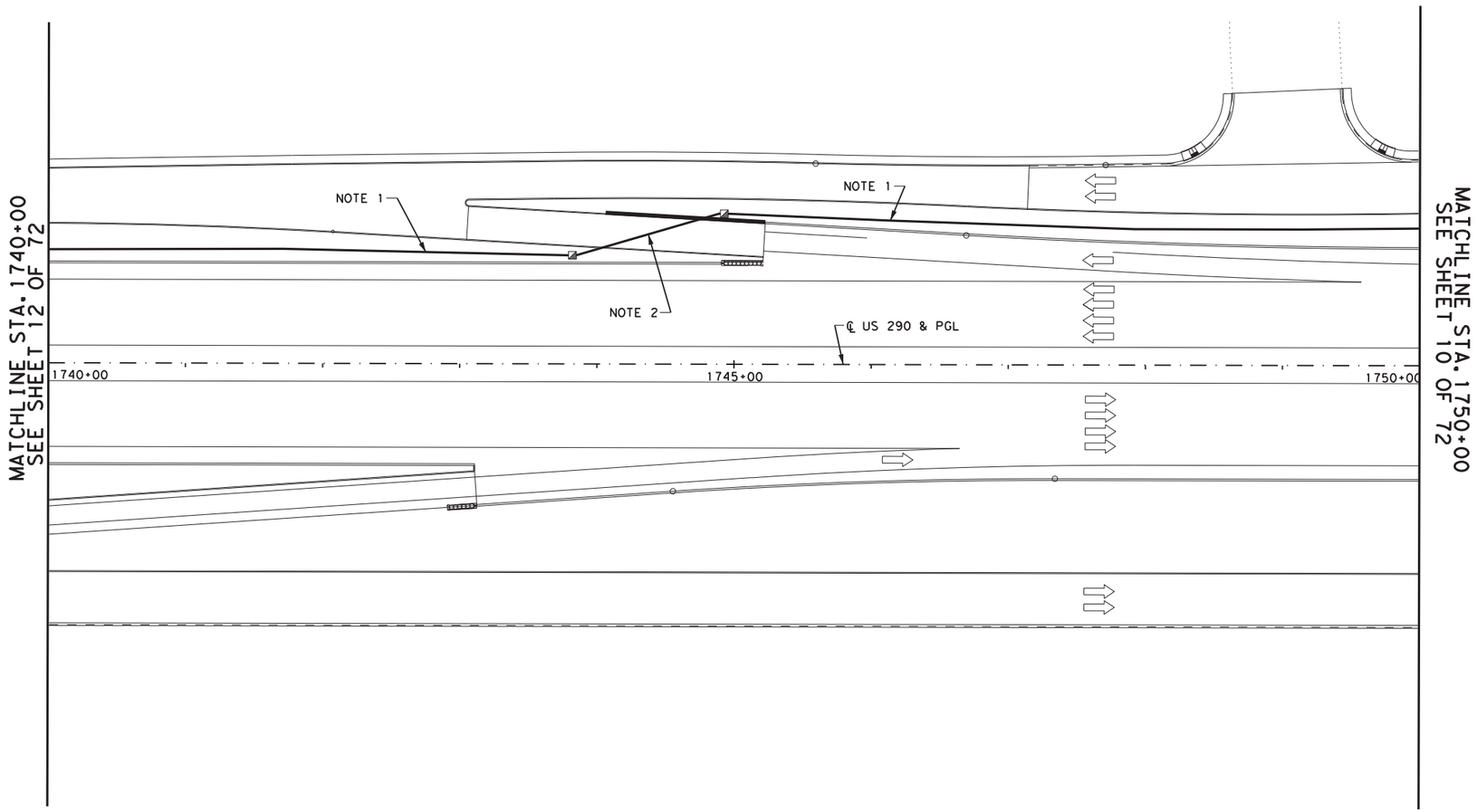

LEGEND

- RIGHT OF WAY
- NEW CONDUIT
- EXISTING CONDUIT
- NEW GROUND BOX: TYPE 1
- EXISTING GROUND BOX: TYPE 1
- NEW GROUND BOX: TYPE 2
- EXISTING GROUND BOX: TYPE 2
- EXISTING CABINET
- EXISTING COMMUNICATIONS HUB BUILDING
- EXISTING POWER POLE
- EXISTING SERVICE POLE
- EXISTING CCTV CAMERA
- JUNCTION BOX (UNLESS OTHERWISE NOTED)
- (R) RADAR VEHICLE SENSING DEVICE POLE
- [R] RADAR VEHICLE SENSING DEVICE
- METAL BEAM GRUARD FENCE

1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR

2. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR

   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR

SEE SHEET 10 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: US290_086_15.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 11 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOU	HARRIS		0050	06	089	58
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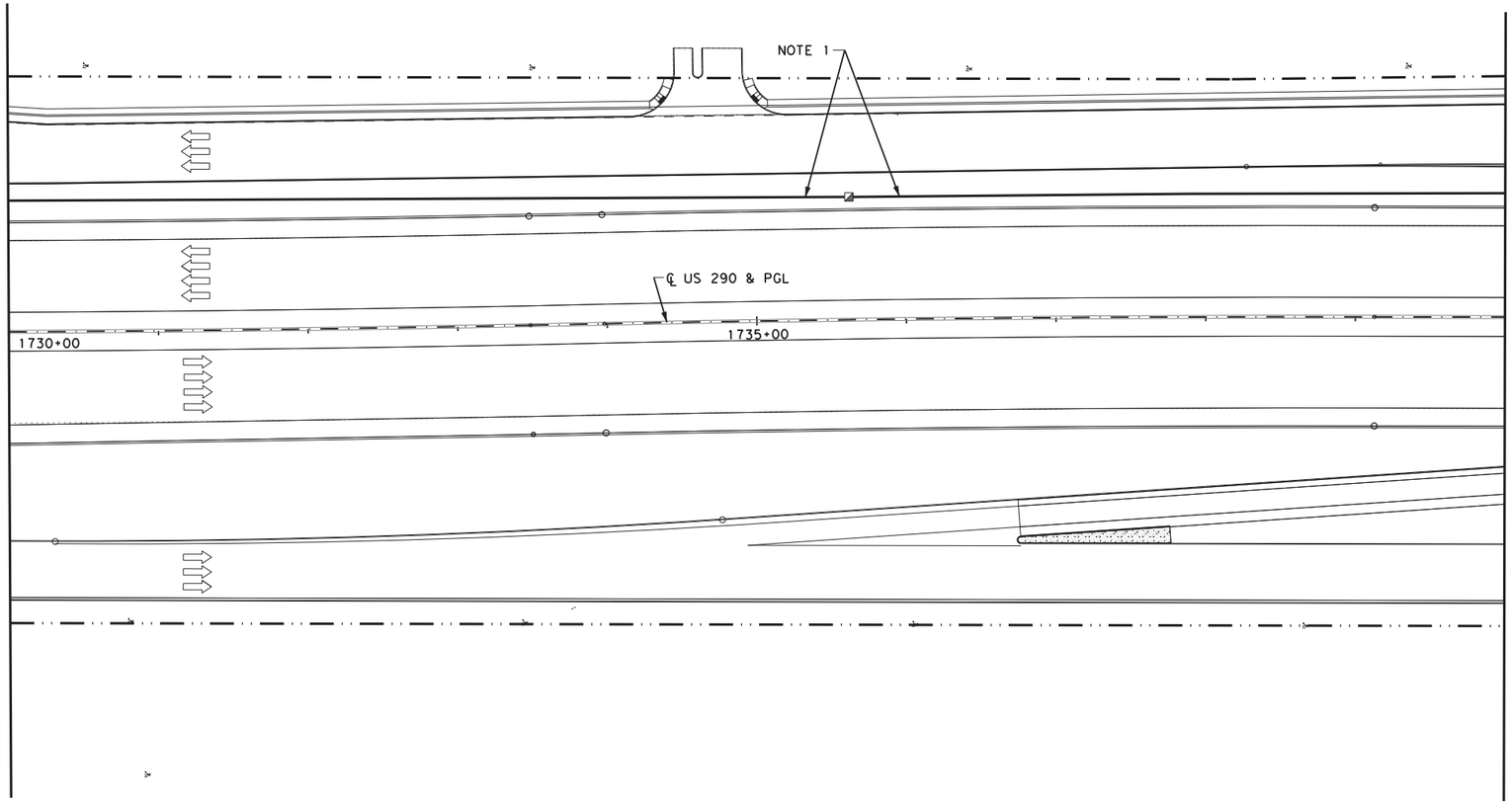
CK TR:									

NAME:ENTER DATA



1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR

SEE SHEET 10 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: US290_086_14.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23, 2022

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TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 12 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOU	HARRIS		0050	06	089	59
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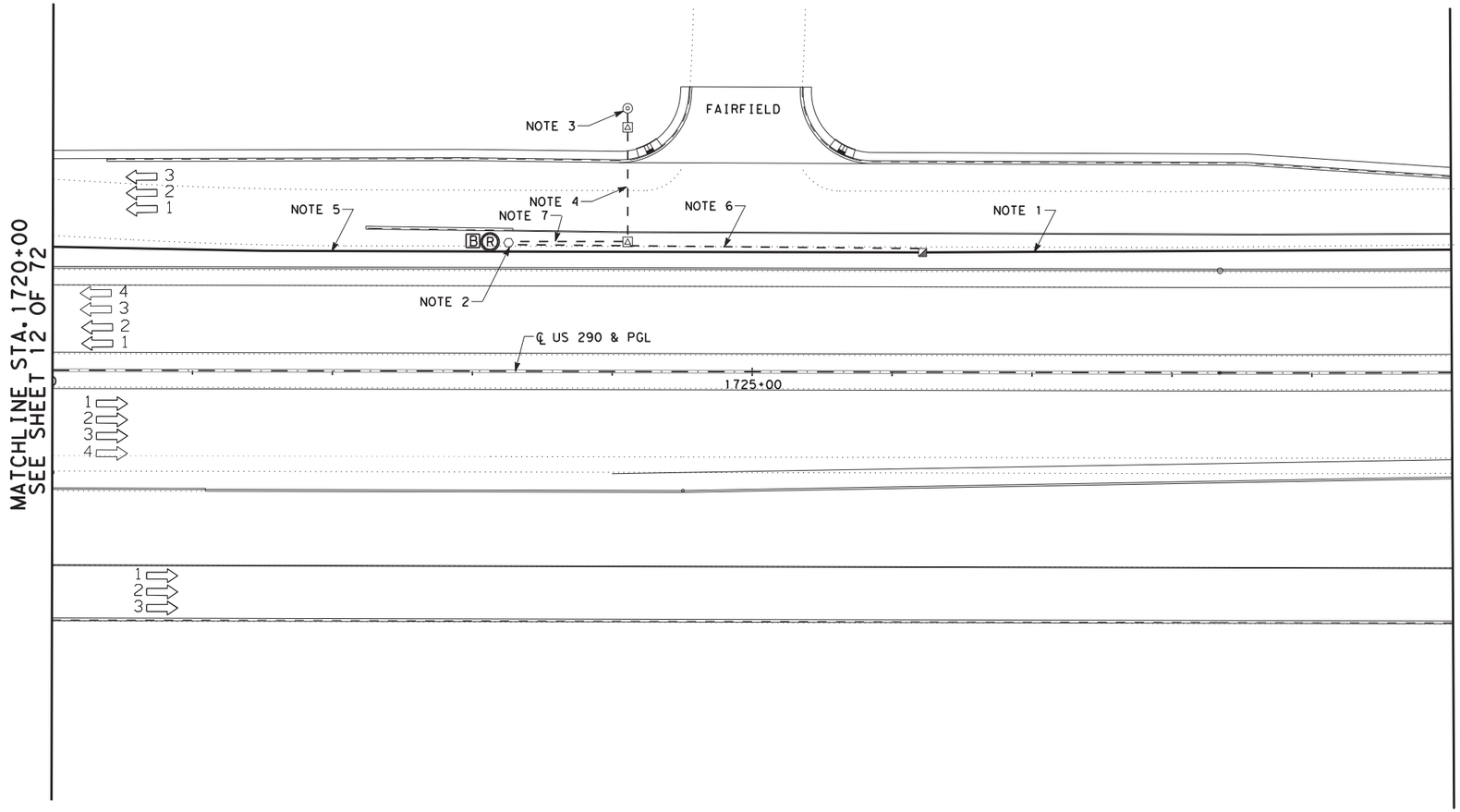

1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR

2. INSTALL (STA 1726+50).
   CCTV CAMERA #4
   CCTV CAMERA SUPPORT POLE & FOUNDATION (55')
   POLE MOUNTED CABINET (TY.2)(CONF.1)
   CCTV FIELD EQUIPMENT
   1 RVSD FIELD EQUIPMENT (RVSD#2)
   2 ETHERNET TX (SUPPLIED BY TXDOT)
   1 BLUETOOTH FIELD EQUIPMENT (BT#2) (SUPPLIED BY TXDOT)
   FIBER OPTIC VIDEO/DATA TX (S/M)
   1 FIBER OPTIC PATCH PANEL (12 POSITION)
   2-2" SCH. 80 PVC TO TY 1 GRD BOX
   1-2" SCH. 80 PVC TO TY A GRD BOX
   IN COND.#1
   - 1-12 STR SM FOC (CCTV#4,RVSD#2,BT#2- TY 1 GRD BOX)
   - 1#14 INSULATED CONDUCTOR
   IN COND.#2-2#8XHHW, 1#8 BARE (CCTV#4 POWER - TY A GRD BOX)

3. INSTALL
   SERVICE POLE D-4
   2-2" SCH 80 PVC TO GRD. BOX
   IN CONDUIT #1 - 2#8XHHW, 1#8 BARE (CCTV#4 POWER)

4. INSTALL
   2-2" SCH 80 PVC (BORED)
   IN NEW SCH. 40 STEEL CASING
   IN COND. #1- 2#8XHHW, 1#8 BARE (CCTV#4 POWER)

5. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)IN COND#1-12 STR.SM FOC(CCTV#4,
   (RVSD#2-BT#2)

6. INSTALL
   2-2" SCH. 80 PVC 80 TO TYPE 1 GRD. BOX
   IN COND.#1 -1#14 INSULATED CONDUCTOR
   #2-1-12 STR.SM FOC(CCTV#4(RVSD#2-BT#2)

7 INSTALL
   2-2" SCH. 80 PVC to TYPE A GRD. BOX
   IN COND.#1-2#8XHHW, 1#8 BARE (CCTV#4 POWER)

SEE SHEET 10 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: US290_086_13.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

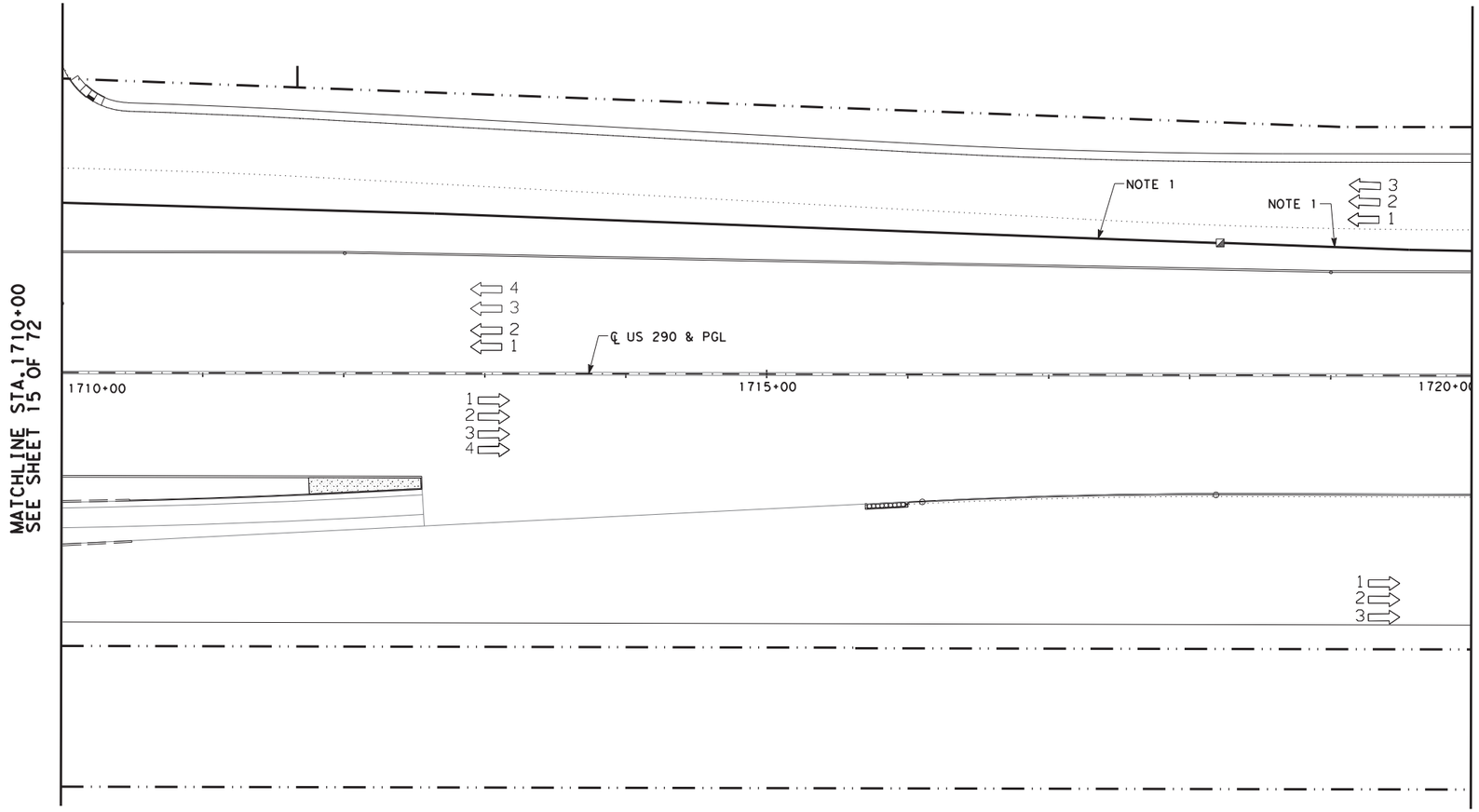
TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

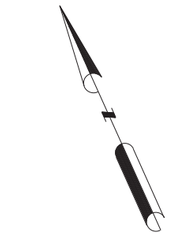
COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 13 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21							
DW:			6	TEXAS					US290
CK DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
TR:			HOU	HARRIS		0050	06	089	60
CK TR:									

NAME:ENTER DATA





LEGEND

- RIGHT OF WAY
- NEW CONDUIT
- EXISTING CONDUIT
- NEW GROUND BOX: TYPE 1
- EXISTING GROUND BOX: TYPE 1
- NEW GROUND BOX: TYPE 2
- EXISTING GROUND BOX: TYPE 2
- EXISTING CABINET
- EXISTING COMMUNICATIONS HUB BUILDING
- EXISTING POWER POLE
- EXISTING SERVICE POLE
- EXISTING CCTV CAMERA
- JUNCTION BOX (UNLESS OTHERWISE NOTED)
- (R) RADAR VEHICLE SENSING DEVICE POLE
- [R] RADAR VEHICLE SENSING DEVICE
- METAL BEAM GRUARD FENCE

1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-IN COND#1-12 STR.SM FOC(CCTV#4)
   (RVSD#2-BT#2)

SEE SHEET 10 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: US290_086_12.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED
PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

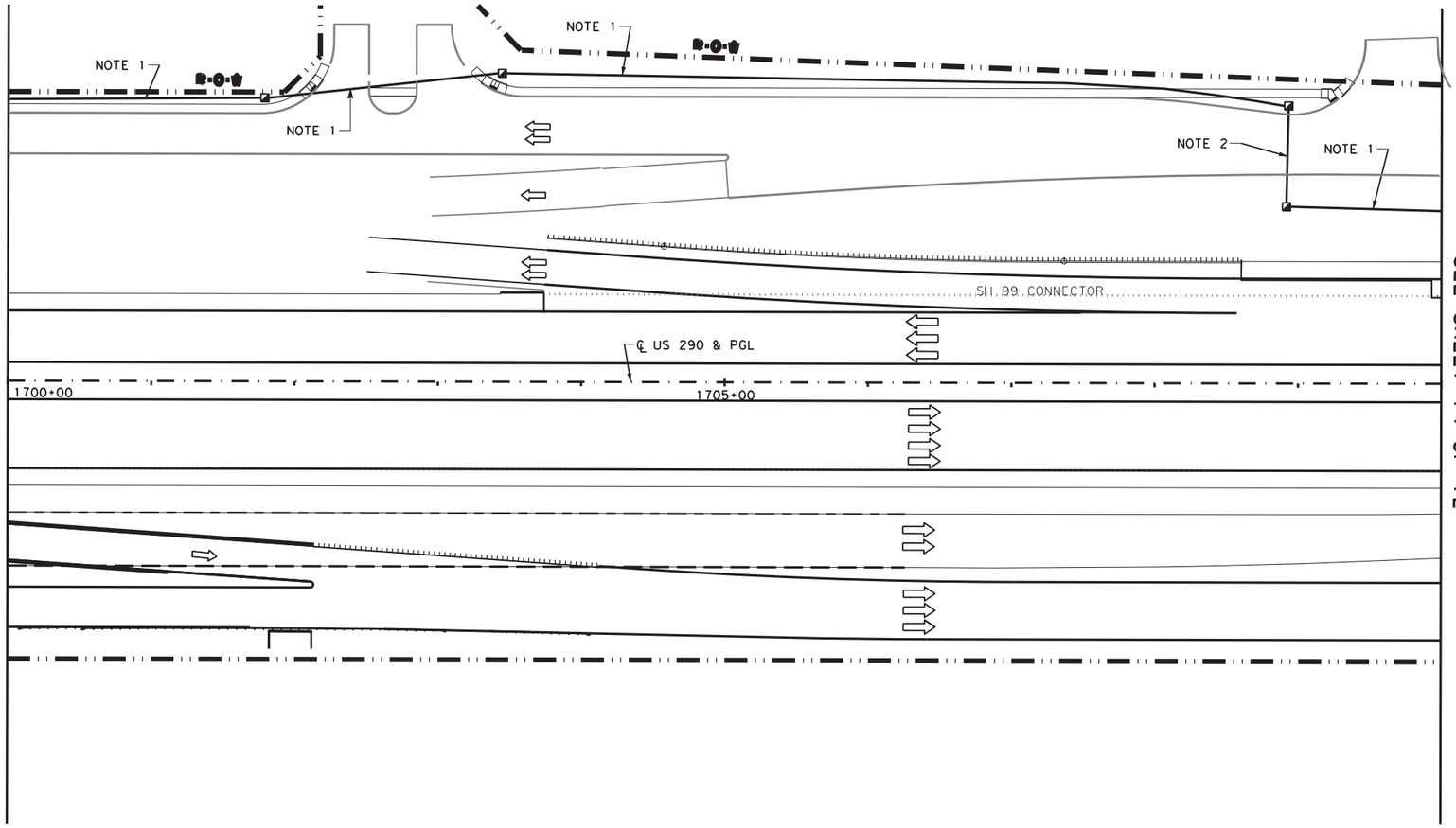
TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 14 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21							
DW:			6	TEXAS					US290
CK DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
TR:									
CK TR:			HOU	HARRIS		0050	06	089	61

NAME:ENTER DATA



1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
  INSTALL
 IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
           (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
           (4"INNERDUCT C)-IN COND#1-12 STR.SM FOC(CCTV#4)
           (RVSD#2-BT#2)

2. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN COND. #1(4" INNERDUCT "A")-1#8 BARE GROUNDING CONDUCTOR
 INSTALL
 IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
           (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
           (4"INNERDUCT C)IN COND#1-12 STR.SM FOC(CCTV#4)
           (RVSD#2-BT#2)

SEE SHEET 20 OF 39 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: US290_086_11.dgn

NAME:ENTER DATA

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by Kenneth Paradowski P.E. 97040, on

May 23 , 2022

Kenneth Paradowski, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 15 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
CK DW:			HOU	HARRIS	0050	06	089		62
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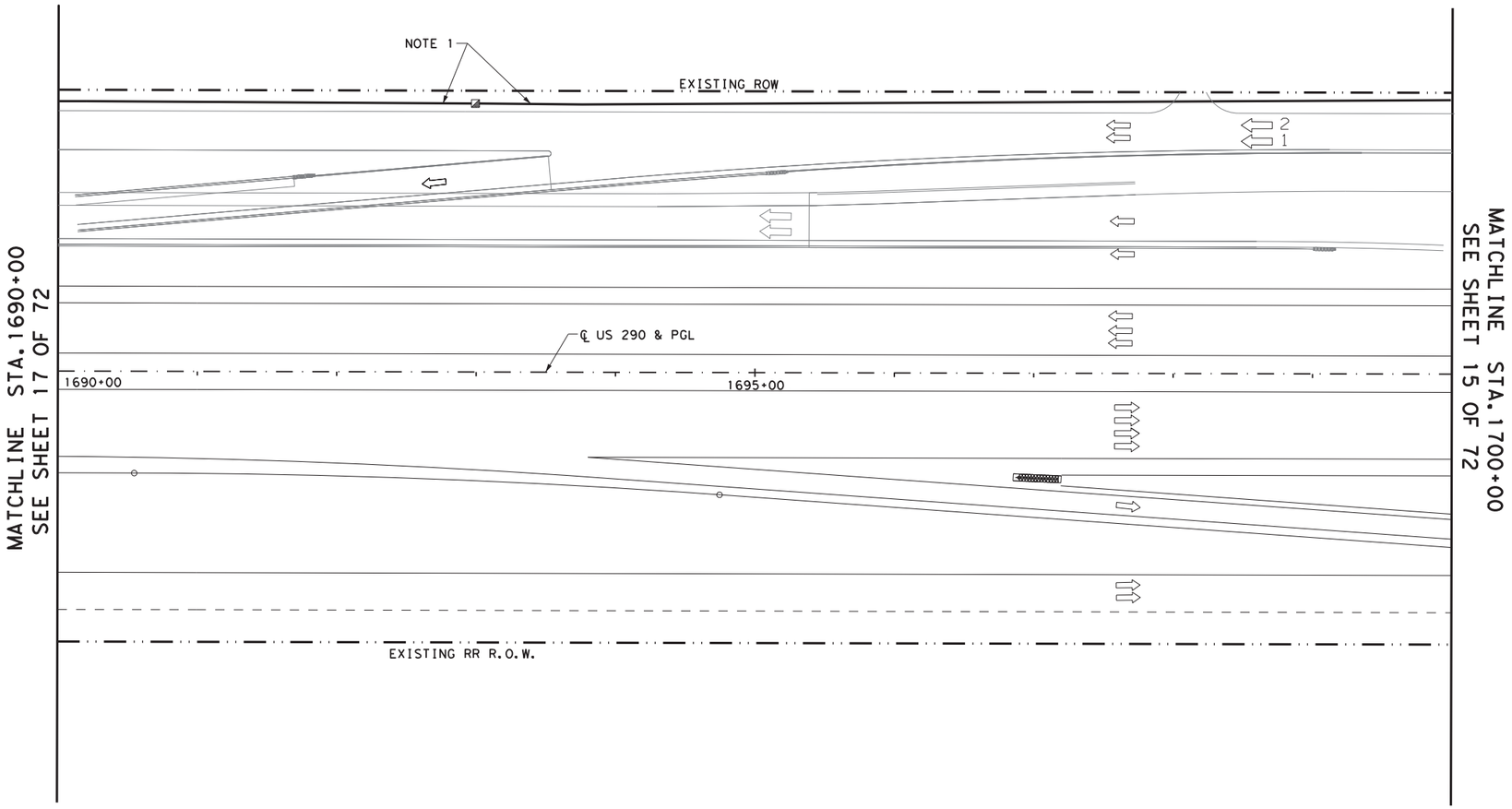
CK TR:									



1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN COND. #1(4" INNERDUCT "A")-1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-IN COND#1-12 STR.SM FOC CCTV#4,
   RVSD#2-BT#2

SEE SHEET 10 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: US290_086_10.dgn

STATE OF TEXAS
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97040
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Kenneth Paradowski, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 16 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21							
DW:			6	TEXAS					US290
CK DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
TR:			HOU	HARRIS		0050	06	089	63
CK TR:									

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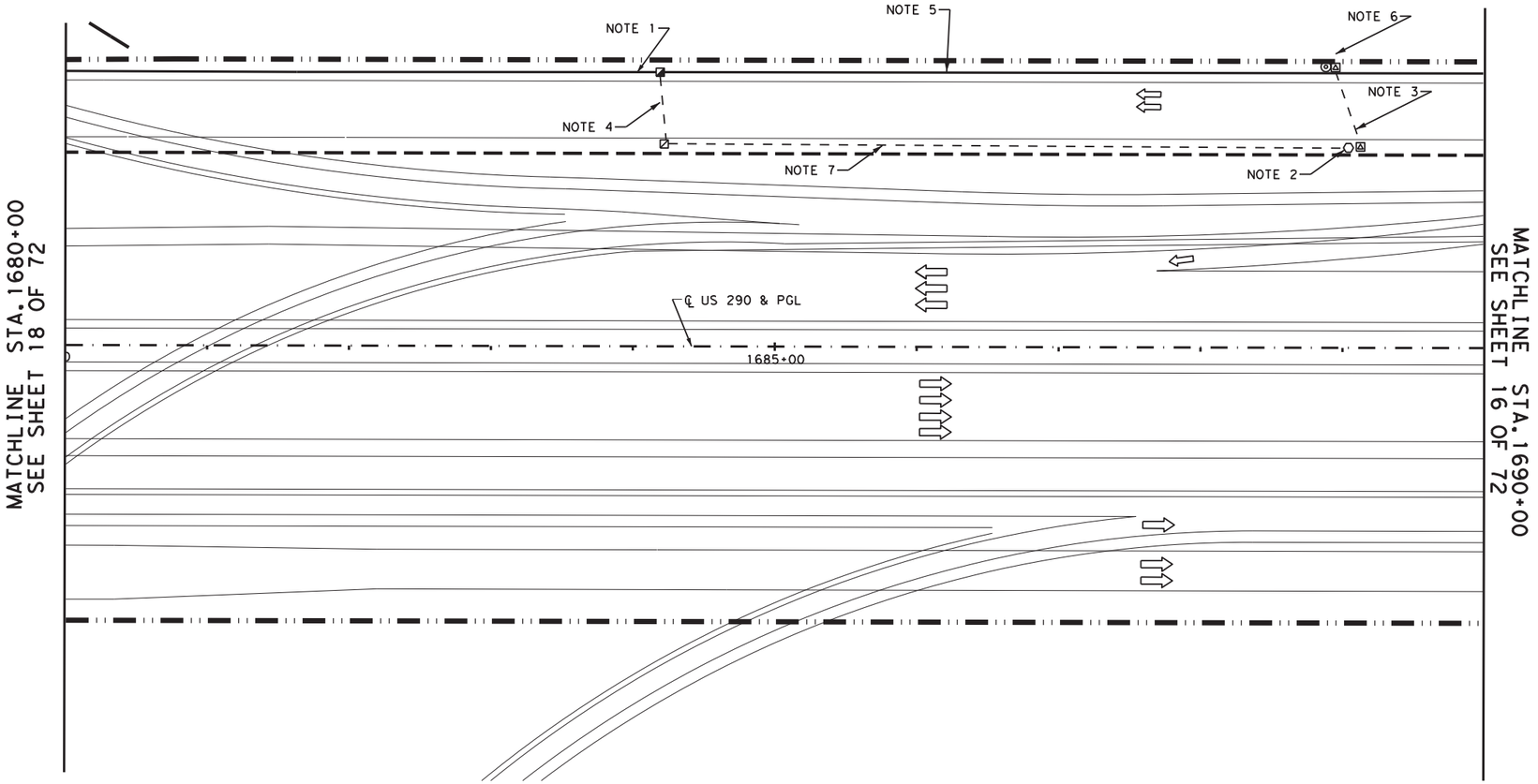

1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-1-12 STR.SM FOC CCTV#4,
   RVSD#2-BT#2
   (4"INNERDUCT D)-1-6-STR.SM FOC CCTV#5

2. INSTALL (STA 1689+20).
   CCTV CAMERA #5
   CCTV CAMERA SUPPORT POLE & FOUNDATION (55')
   POLE MOUNTED CABINET (TY.2)(CONF.1)
   CCTV FIELD EQUIPMENT
   1 ETHERNET TX(SUPPLIED BY TXDOT)
   FIBER OPTIC VIDEO/DATA TX (S/M)
   2-2" SCH. 80 PVC TO TY 1 GRD BOX
   1-2" SCH. 80 PVC TO TY A GRD BOX
   IN COND.#1
   - 1-6 STR SM FOC (CCTV#5 TO TY 1 GRD BOX)
   - 1#14 INSULATED CONDUCTOR
   IN COND.#2-2#8XHHW, 1#8 BARE (CCTV#5 POWER - TY A GRD BOX)

3 .INSTALL
   2-2" SCH 80 PVC (BORED)
   IN NEW SCH. 40 STEEL CASING
   IN COND. #1- 2#8XHHW, 1#8 BARE (CCTV# 5 POWER)

4. INSTALL
   2-2" SCH. 80 PVC (BORED) TO TYPE 1 GRD. BOX
   IN COND#1-1-6 STR FOC(CCTV#5)

5. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-IN COND#1-12 STR.SM FOC(CCTV#4)
   (RVSD#2-BT#2)

6. INSTALL
   SERVICE POLE D-5
   2-2" SCH 80 PVC TO GRD. BOX
   IN CONDUIT #1 - 2#8XHHW, 1#8 BARE (CCTV#5 POWER)

7. INSTALL
   2-2" SCH. 80 PVC
   IN COND#1-1-6 STR FOC(CCTV#5)

SEE SHEET 10 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: US290_086_9.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED
PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 17 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
CK DW:			HOU	HARRIS	0050	06	089	64	
TR:									
CK TR:									

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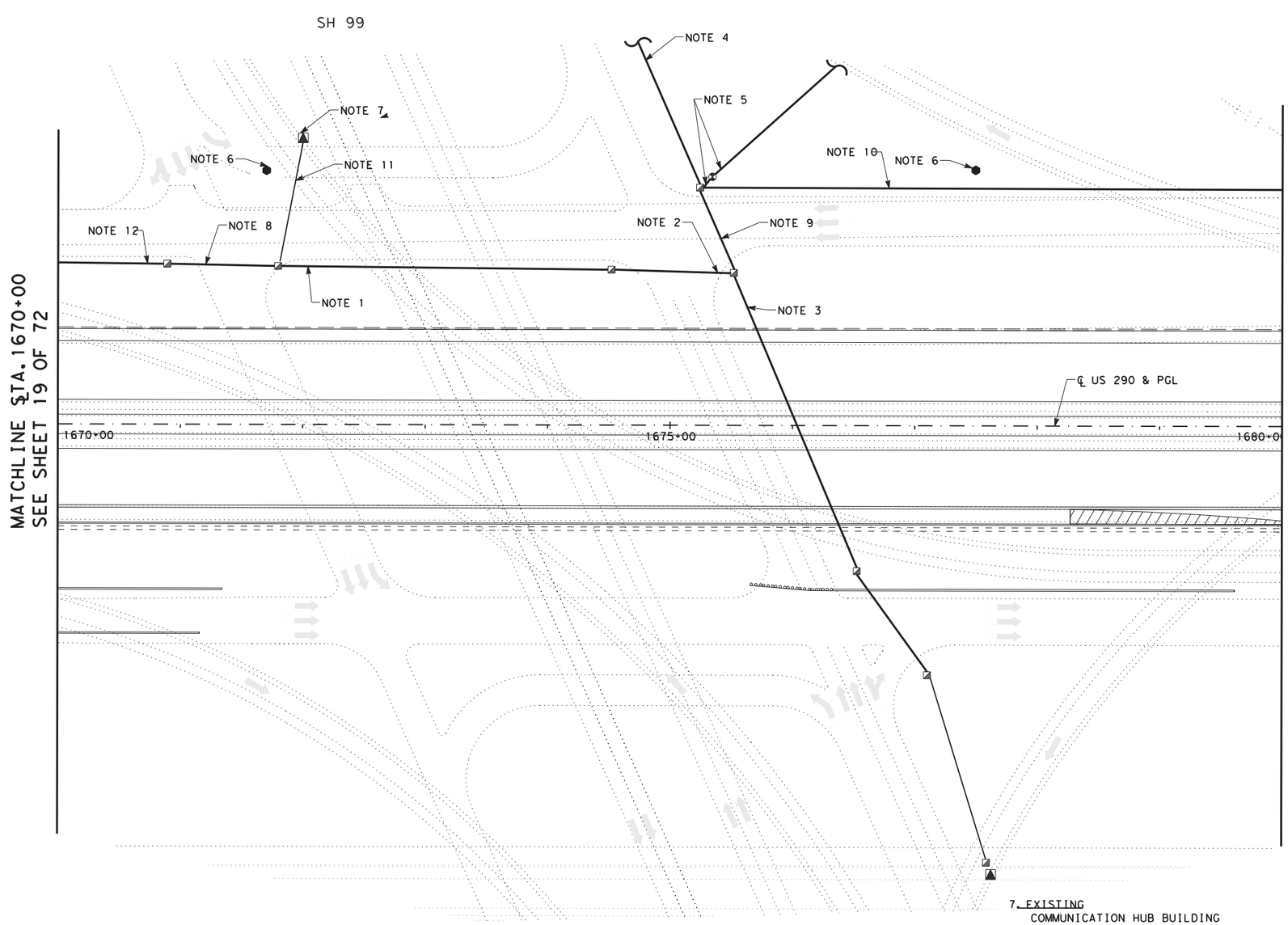

1. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN COND. #1(4" INNERDUCT "A")-1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-1-12 STR.SM FOC CCTV#4,
   RVSD#2-BT#2
   (4"INNERDUCT D)-1-6-STR.SM FOC CCTV#5

2. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN COND. #1(4" INNERDUCT "A")-1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-1-12 STR.SM FOC CCTV#4,
   RVSD#2-BT#2
   (4"INNERDUCT D)-1-6-STR.SM FOC CCTV#5

3. EXISTING
   4-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN COND. #1(4" INNERDUCT "A")-1#8 BARE GROUNDING CONDUCTOR

4. EXISTING
   2-1" CONDUITS
   IN COND. #1(1") - 1-12 STRAND S/M FIBER
   IN COND. #2(1") - 1-6 STRAND S/M FIBER (TOLL)

5. EXISTING
   1-1" CONDUITS

6. EXISTING
   CCTV
   CCTV CAMERA SUPPORT POLE & FOUNDATION(55')

7. EXISTING
   COMMUNICATION HUB BUILDING
   4-3" PVC TO TYPE 1 G.B.
   4-4" MULTI-DUCT CONDUITS TO TYPE 1 G.B.
   INSTALL
   4 FIBER OPTIC VIDEO DATA RX'S (S/M) (SUPPLIED BY TXDOT)
   4 VIDEO ENCODERS (SUPPLIED BY TXDOT)
   1 ETHERNET FIELD SWITCH (SUPPLIED BY TXDOT)
   1 FIBER OPTIC PATCH PANEL (144 POSITION)
   2 FIBER OPTIC PATCH PANEL (12 POSITION)
   IN COND.#1 (4"INNERDUCT A),2-144 STR SM FOC
   (4"INNERDUCT B),1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-2-12 STR.SM FOC CCTV#4,
   RVSD#2-BT#2, CCTV#7,RVSD#3-BT#3
   (4"INNERDUCT D)-2-6-STR.SM FOC CCTV#5,CCTV#6

8. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN COND. #1(4" INNERDUCT "A")-1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-IN COND#1-6 STR.SM FOC(CCTV#6
   (4"INNERDUCT D)-IN COND#1-12 STR.SM FOC CCTV#7,RVSD#3-BT#3

9. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN COND. #1(4" INNERDUCT "A")-1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)1-12 STR.SM FOC CCTV#4,
   RVSD#2-BT#2
   (4"INNERDUCTD)-1-6-STR.SM FOC CCTV#5

10. EXISTING
    2-3" SCH. 40 PVC/CCE
    2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
    IN COND. #1(4" INNERDUCT "A")-1#8 BARE GROUNDING CONDUCTOR
    INSTALL
    IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
    (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
    (4"INNERDUCT C)-1-12 STR.SM FOC CCTV#4,
    RVSD#2-BT#2
    (4"INNERDUCT D)-1-6-STR.SM FOC CCTV#5

11. EXISTING
    2-3" SCH. 80 PVC (BORED)
    2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
    IN SCH. 40 STEEL CASING
    IN COND. #1(4" INNERDUCT "A")-1#8 BARE GROUNDING CONDUCTOR
    INSTALL
    IN COND. #1(4"INNERDUCT A)-2-144 STR. SM FOC
    (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
    (4"INNERDUCT C)-2-12 STR.SM FOC CCTV#4,
    RVSD#2-BT#2, CCTV#7,RVSD#3-BT#3
    (4"INNERDUCT D)-2-6-STR.SM FOC CCTV#5,CCTV#6

12. EXISTING
    2-3" SCH. 40 PVC/CCE
    2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
    IN COND. #1(4" INNERDUCT "A")-1#8 BARE GROUNDING CONDUCTOR
    INSTALL
    IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
    (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
    (4"INNERDUCT C)-IN COND#1-6 STR.SM FOC(CCTV#6
    (4"INNERDUCT D)-IN COND#1-12 STR.SM FOC CCTV#7,RVSD#3-BT#3

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 18 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOU	HARRIS		0050	06	089	65
TR:									
CK TR:									

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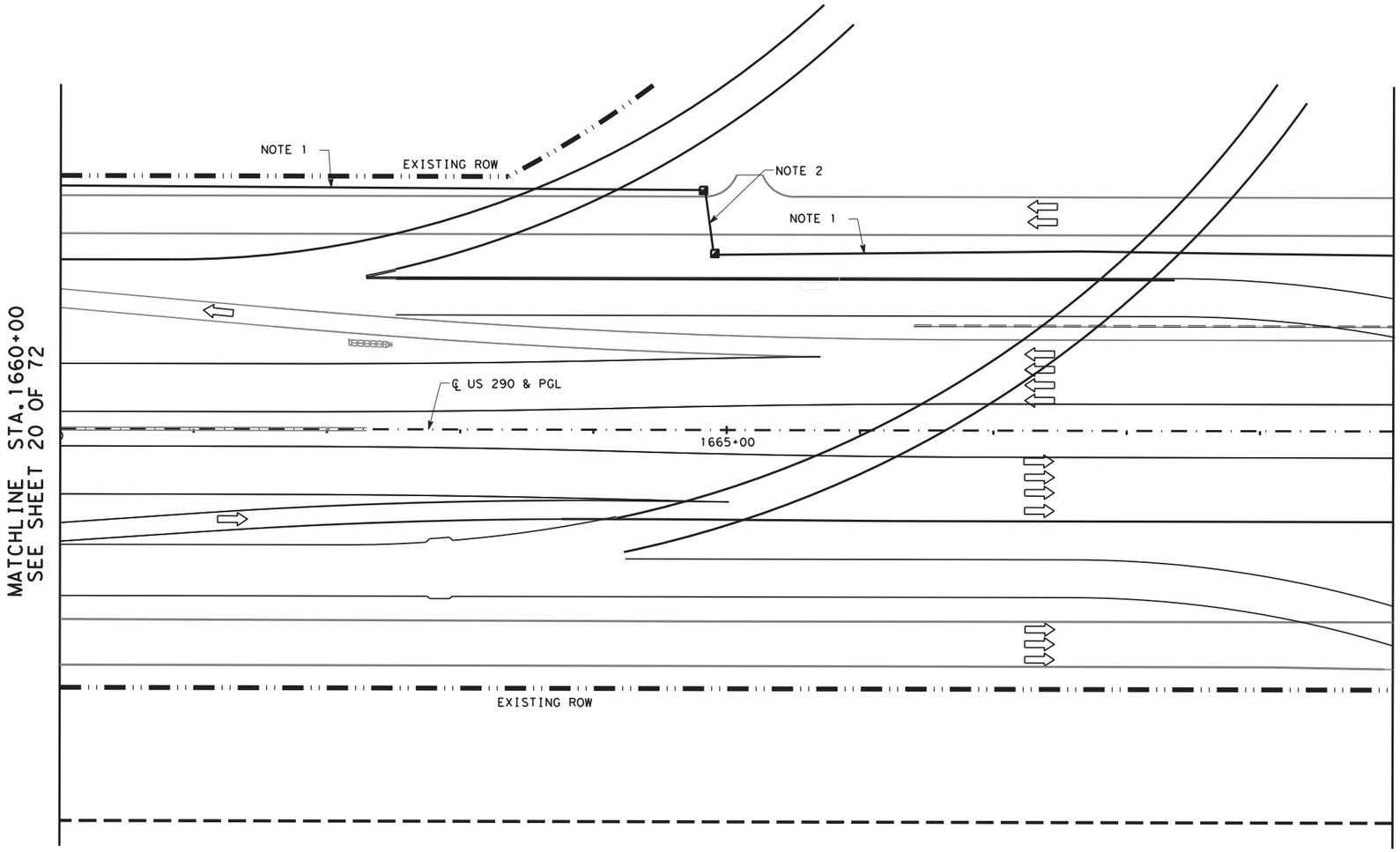

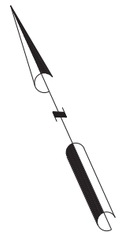

LEGEND

- RIGHT OF WAY
- NEW CONDUIT
- EXISTING CONDUIT
- NEW GROUND BOX: TYPE 1
- EXISTING GROUND BOX: TYPE 1
- NEW GROUND BOX: TYPE 2
- EXISTING GROUND BOX: TYPE 2
- EXISTING CABINET
- EXISTING COMMUNICATIONS HUB BUILDING
- EXISTING POWER POLE
- EXISTING SERVICE POLE
- EXISTING CCTV CAMERA
- JUNCTION BOX (UNLESS OTHERWISE NOTED)
- (R) RADAR VEHICLE SENSING DEVICE POLE
- [R] RADAR VEHICLE SENSING DEVICE
- METAL BEAM GRUARD FENCE

1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-IN COND#1-6 STR.SM FOC(CCTV#6
   (4"INNERDUCT D)-IN COND#1-12 STR.SM FOC CCTV#7,RVSD#3-BT#3

2. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR

   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-IN COND#1-6 STR.SM FOC(CCTV#6
   (4"INNERDUCT D)-IN COND#1-12 STR.SM FOC CCTV#7,RVSD#3-BT#3

SCALE: 1" = 100'

FILE NAME: US290_086_07.dgn

NAME:ENTER DATA

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23 , 2022

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TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 19 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
CK DW:			HOU	HARRIS	0050	06	089	66	
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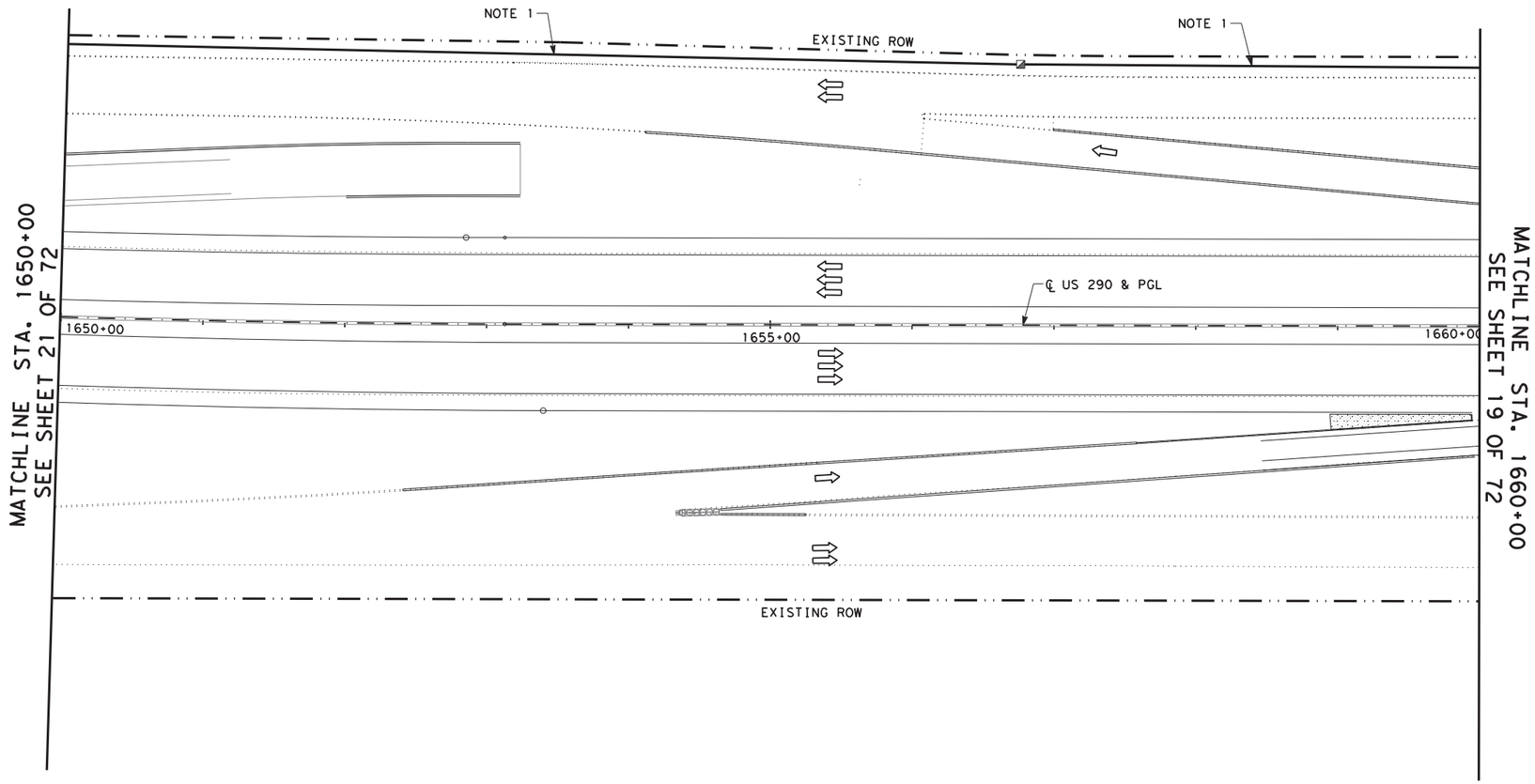

1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-IN COND#1-6 STR.SM FOC CCTV#6
   (4"INNERDUCT D)-IN COND#1-12 STR.SM FOC CCTV#7,RVSD#3-BT#3

SEE SHEET 21 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: US290_086_06.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
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TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 20 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21							
DW:			6	TEXAS					US290
CK DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
TR:									
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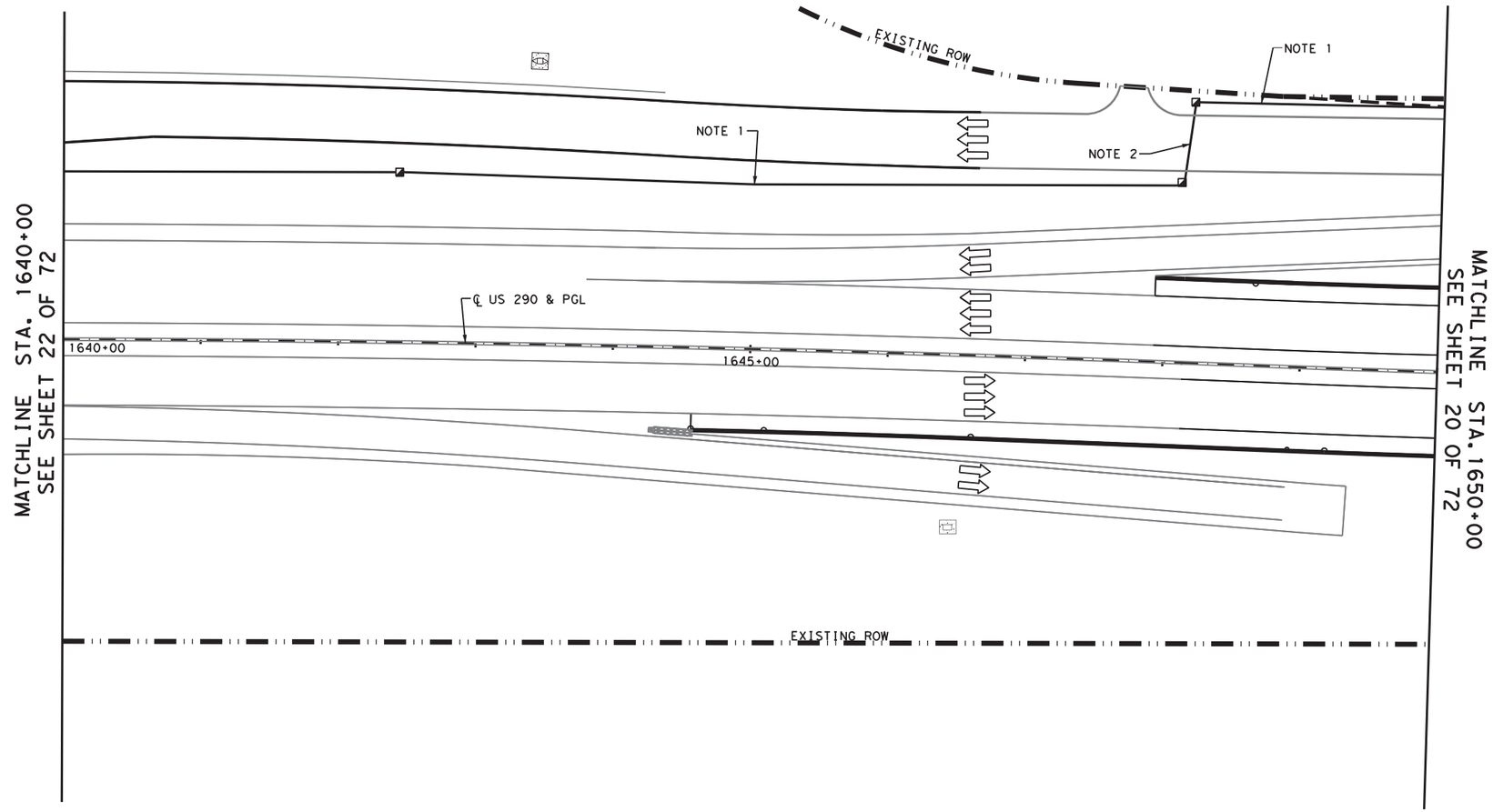

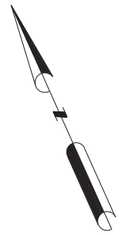

LEGEND

- RIGHT OF WAY
- NEW CONDUIT
- EXISTING CONDUIT
- NEW GROUND BOX: TYPE 1
- EXISTING GROUND BOX: TYPE 1
- NEW GROUND BOX: TYPE 2
- EXISTING GROUND BOX: TYPE 2
- EXISTING CABINET
- EXISTING COMMUNICATIONS HUB BUILDING
- EXISTING POWER POLE
- EXISTING SERVICE POLE
- EXISTING CCTV CAMERA
- JUNCTION BOX (UNLESS OTHERWISE NOTED)
- RADAR VEHICLE SENSING DEVICE POLE
- RADAR VEHICLE SENSING DEVICE
- METAL BEAM GUARD FENCE

1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-IN COND#1-6 STR.SM FOC CCTV#6
   (4"INNERDUCT D)-IN COND#1-12 STR.SM FOC CCTV#7,RVSD#3-BT#3

2. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR

   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-IN COND#1-6 STR.SM FOC CCTV#6
   (4"INNERDUCT D)-IN COND#1-12 STR.SM FOC CCTV#7,RVSD#3-BT#3

SCALE: 1" = 100'

FILE NAME: US290_086_05.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 21 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21							
DW:			6	TEXAS					US290
CK DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
TR:									
CK TR:			HOU	HARRIS		0050	06	089	68

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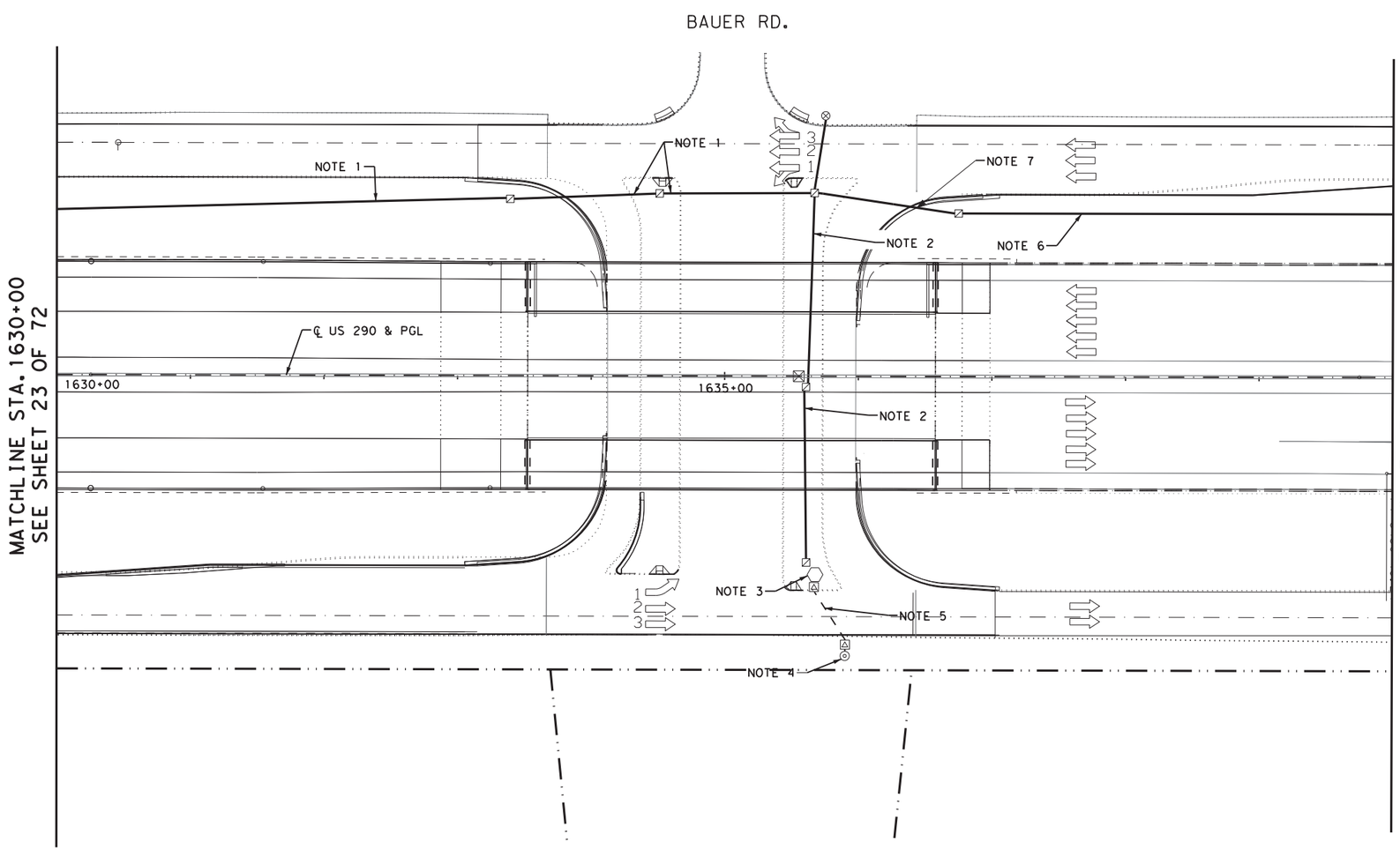


1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-IN COND#1-12 STR.SM FOC(CCTV#7)(RVSD#3-BT#3)

2. EXISTING
   4-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT B)-IN COND#1-6 STR.SM FOC(CCTV#6)

3. INSTALL (STA 1635+50).
   CCTV CAMERA #6
   CCTV CAMERA SUPPORT POLE & FOUNDATION (55')
   POLE MOUNTED CABINET (TY.2)(CONF.1)
   CCTV FIELD EQUIPMENT
   FIBER OPTIC VIDEO/DATA TX (S/M)
   2-2" SCH. 80 PVC TO TY 1 GRD BOX
   1-2" SCH. 80 PVC TO TY A GRD BOX
   IN COND.#1
   - 1-6 STR SM FOC (CCTV#6- TY 1 GRD BOX)
   - 1#14 INSULATED CONDUCTOR
   IN COND.#2-2#8XHHW, 1#8 BARE (CCTV#6 POWER - TY A GRD BOX)

4. INSTALL
   SERVICE POLE D-6
   2-2" SCH 80 PVC TO GRD. BOX
   IN CONDUIT #1 - 2#8XHHW, 1#8 BARE (CCTV#6 POWER)

5. INSTALL
   2-2" SCH 80 PVC (BORED)
   IN NEW SCH. 40 STEEL CASING
   IN COND. #1- 2#8XHHW, 1#8 BARE (CCTV# 6 POWER)

6. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-IN COND#1-6 STR.SM FOC(CCTV#6
   (4"INNERDUCT D)-IN COND#1-12 STR.SM FOC CCTV#7,RVSD#3-BT#3

7. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR

   INSTALL
   IN COND. #1 (4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-IN COND#1-6 STR.SM FOC CCTV#6
   (4"INNERDUCT D)-IN COND#1-12 STR.SM FOC CCTV#7,RVSD#3-BT#3

SEE SHEET 19 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: US290_086_04.dgn

NAME: ENTER DATA

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by Kenneth Paradowski P.E. 97040, on

May 23, 2022

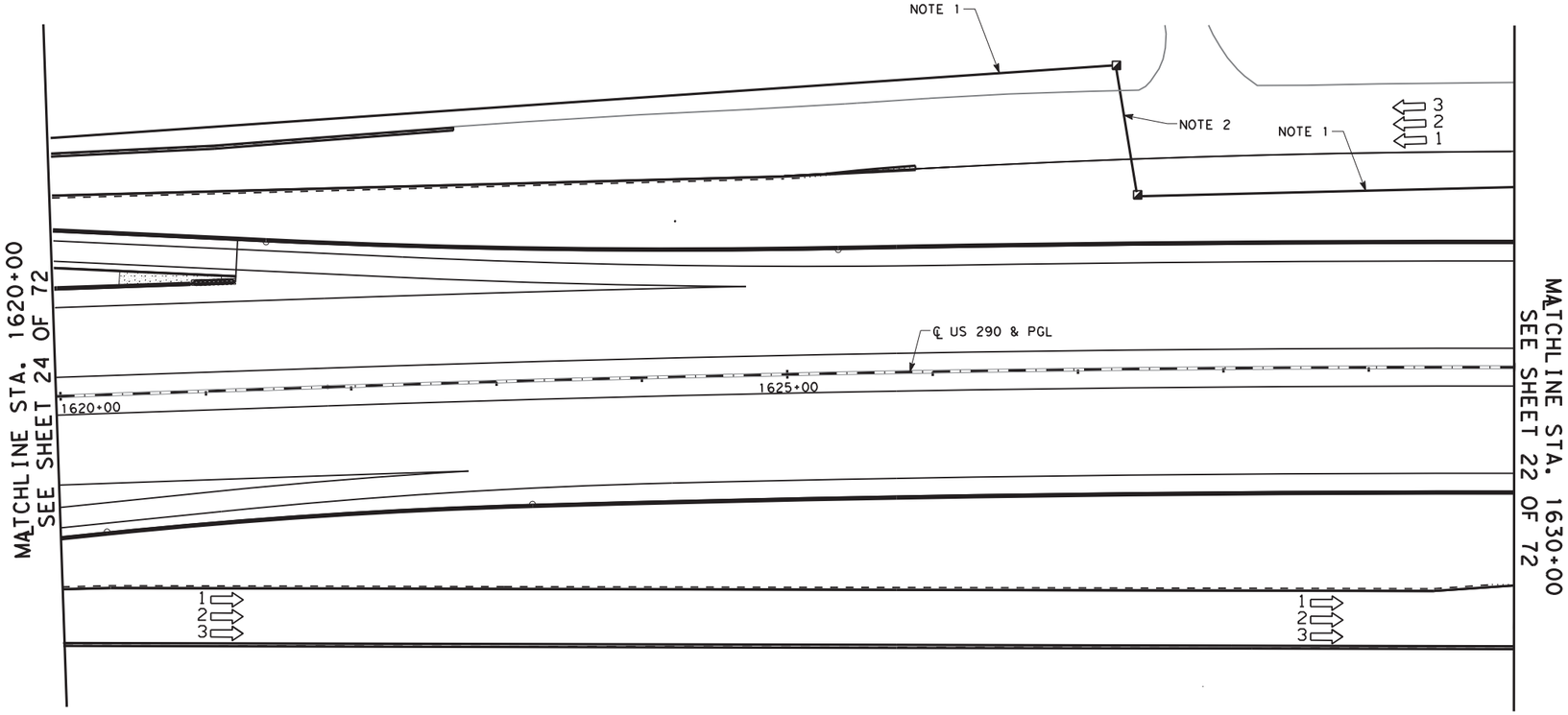
Kenneth Paradowski, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 22 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:									
CK DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
TR:			HOU	HARRIS	0050	06	089	69	
CK TR:									



1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-IN COND#1-12 STR.SM FOC(CCTV#7)(RVSD#3-BT#3)

2. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR

   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-IN COND#1-12 STR.SM FOC(CCTV#7)(RVSD#3-BT#3)

STATE OF TEXAS
KENNETH PARADOWSKI
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May 23 , 2022

Kenneth Paradowski, P.E.

SEE SHEET 21 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: US290_086_03.dgn

TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 23 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21							
DW:			6	TEXAS					US290
CK DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
TR:			HOU	HARRIS		0050	06	089	70
CK TR:									

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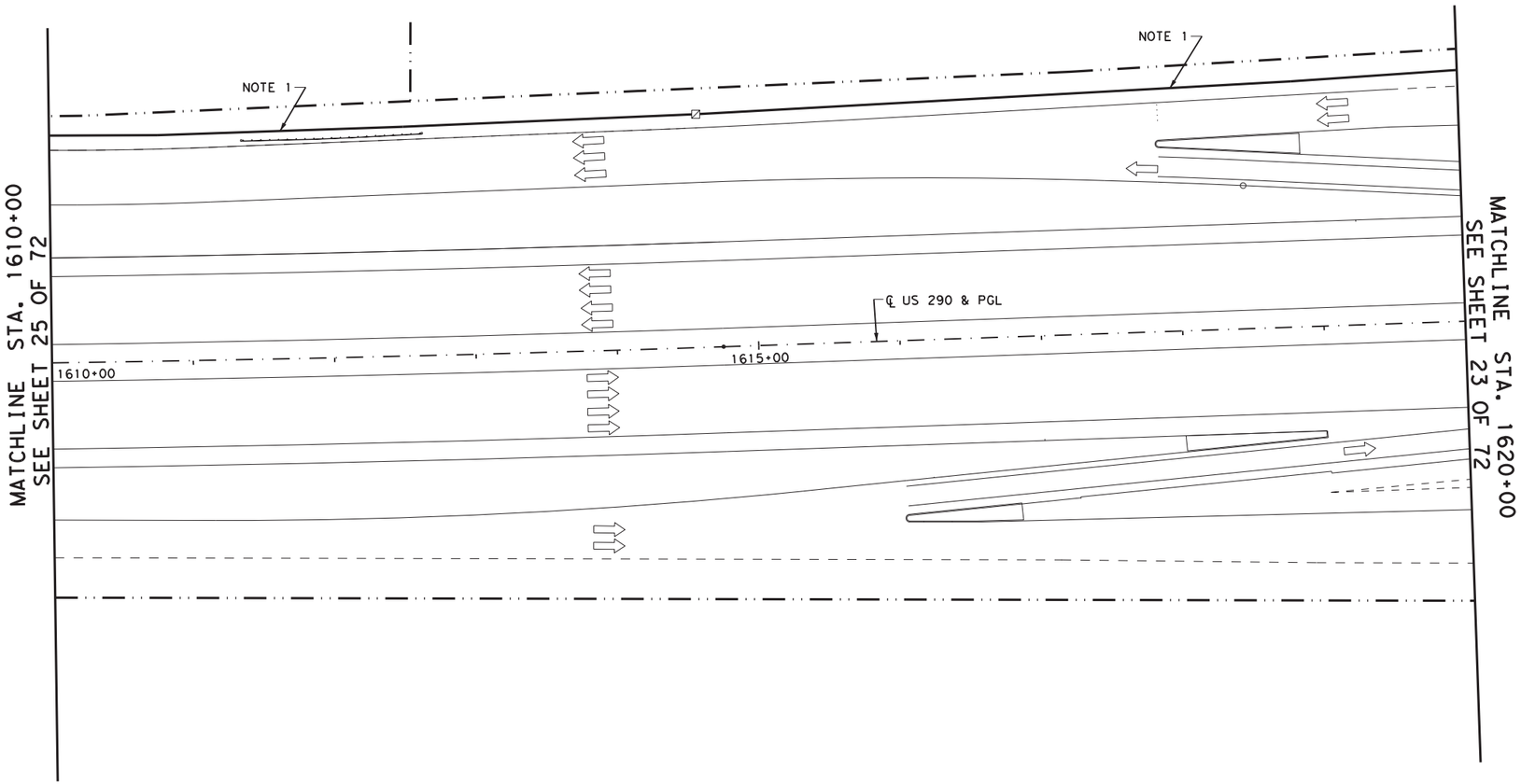

1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
  INSTALL
  IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
           (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
           (4"INNERDUCT C)-IN COND.#1-12 STR.SM FOC(CCTV#7)(RVSD#3,BT#3)

SEE SHEET 25 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: US290_086_02.dgn

STATE OF TEXAS
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97040
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PROFESSIONAL ENGINEER

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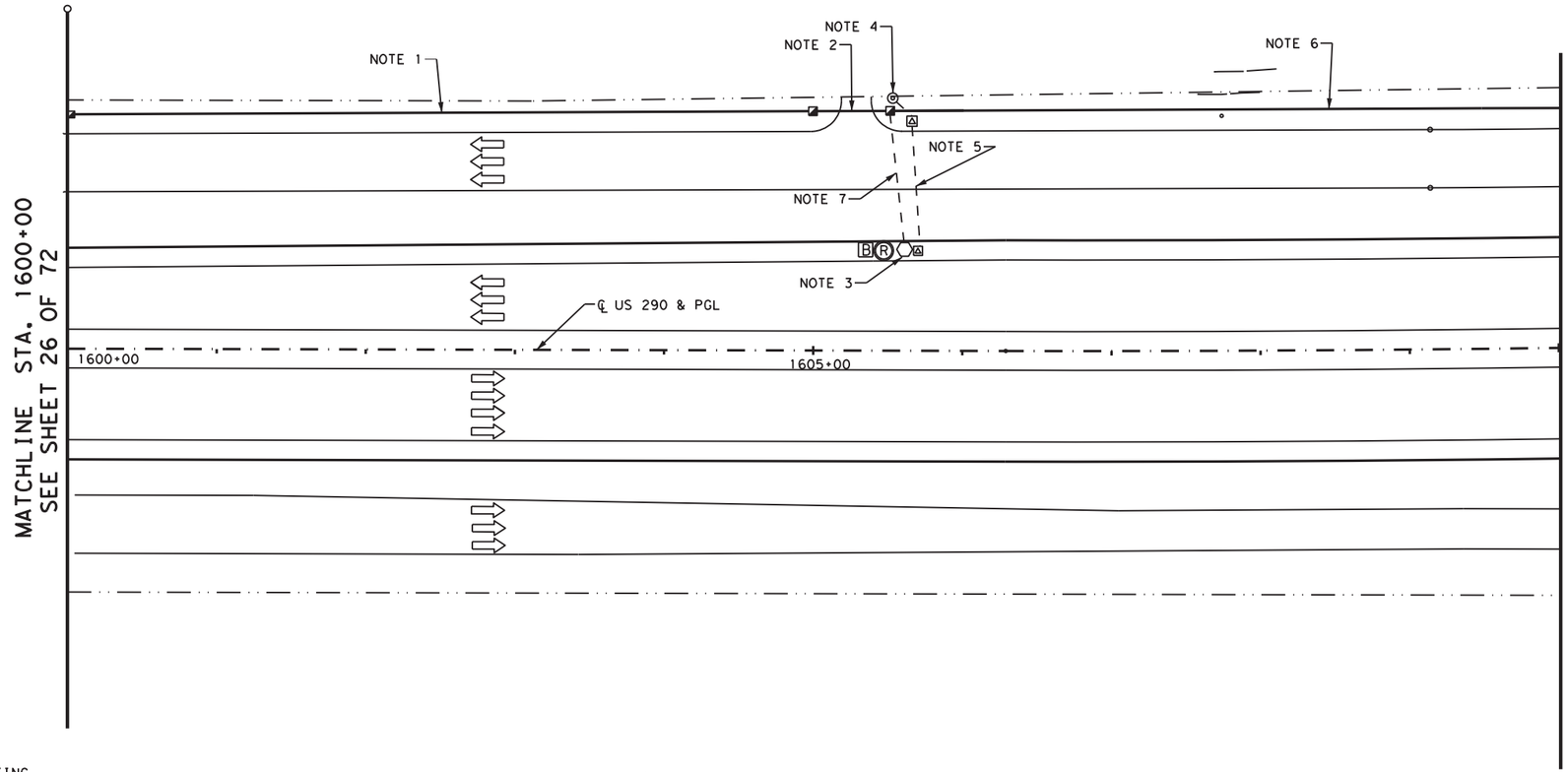
TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 24 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
CK DW:			HOU	HARRIS	0050	06	089		71
TR:									
CK TR:									

NAME:ENTER DATA



LEGEND

- RIGHT OF WAY
- NEW CONDUIT
- EXISTING CONDUIT
- NEW GROUND BOX: TYPE 1
- EXISTING GROUND BOX: TYPE 1
- NEW GROUND BOX: TYPE 2
- EXISTING GROUND BOX: TYPE 2
- EXISTING CABINET
- EXISTING COMMUNICATIONS HUB BUILDING
- EXISTING POWER POLE
- EXISTING SERVICE POLE
- EXISTING CCTV CAMERA
- JUNCTION BOX (UNLESS OTHERWISE NOTED)
- (D) RADAR VEHICLE SENSING DEVICE POLE
- [R] RADAR VEHICLE SENSING DEVICE
- METAL BEAM GRUARD FENCE

1. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4" INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR

2. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR

3. INSTALL (STA 1605+50).
   CCTV CAMERA #7
   CCTV CAMERA SUPPORT POLE & FOUNDATION (55')
   POLE MOUNTED CABINET (TY.2)(CONF.1)
   CCTV FIELD EQUIPMENT
   1 RVSD FIELD EQUIPMENT (RVSD#3)
   1 ETHERNET TX(SUPPLIED BY TXDOT)
   1 BLUETOOTH FIELD EQUIPMENT (BT#3) (SUPPLIED BY TXDOT)
   FIBER OPTIC VIDEO/DATA TX (S/M)
   1 FIBER OPTIC PATCH PANEL (12 POSITION)
   2-2" SCH. 80 PVC TO TY 1 GRD BOX
   1-2" SCH. 80 PVC TO TY A GRD BOX
   IN COND.#1
   - 1-12 STR SM FOC (CCTV#7,RVSD#3,BT#3- TY 1 GRD BOX)
   - 1#14 INSULATED CONDUCTOR
   IN COND.#2-2#8XHHW, 1#8 BARE (CCTV#7 POWER - TY A GRD BOX)

4. INSTALL
   SERVICE POLE D-7
   2-2" SCH 80 PVC TO GRD. BOX
   IN CONDUIT #1 - 2#8XHHW, 1#8 BARE (CCTV# 7 POWER)

5. INSTALL
   2-2" SCH 80 PVC (BORED)
   IN NEW SCH. 40 STEEL CASING
   IN COND. #1- 2#8XHHW, 1#8 BARE (CCTV# 7 POWER)

6. EXISTING
   2-3" CONDUIT
   2-4" MULTIDUCT CONDUIT
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR. SM FOC
   (4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C)-IN COND#1-12 STR.SM FOC(CCTV#7)(RVSD#3-BT#3)

7. INSTALL
   2-2" SCH. 80 PVC(BORED) TO TYPE 1 GRD. BOX
   IN COND#1-12 STR.SM FOC(CCTV#7)(RVSD#3-BT#3)

SCALE: 1" = 100'

FILE NAME: US290_086_01_REVISED.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23, 2022

Kenneth Paradowski, P.E.

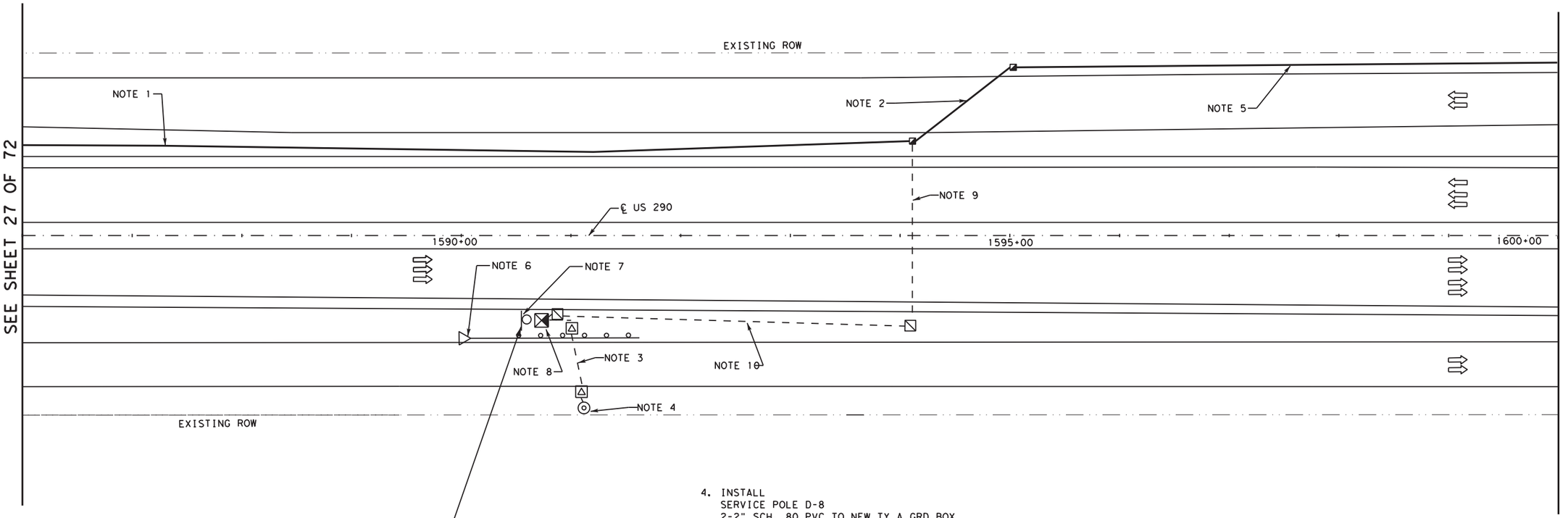
TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 25 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
CK DW:			HOU	HARRIS	0050	06	089	72	
TR:									
CK TR:									

NAME:ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC /CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS /CCE
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A) 1-144 STR.SM .FOC
   (4" INNERDUCT B) 1#14 INSULATED CONDUCTOR
   (4" INNERDUCT C) 1-6 STR SM FOC (DMS#2)

2. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A) 1-144 STR.SM.FOC
   IN COND #1 (4" INNERDUCT B) 1#14 INSULATED CONDUCTOR

3. INSTALL
   2-2" SCH.80 PVC (BORED)
   3#6XHHW,1#6 BARE (DMS#2 POWER)

PROPOSED DYNAMIC
MESSAGE SIGN
(18" NOMINAL CHARACTERS)

INSTALL
NEW SIGN STRUCTURE DMS-US290-02
STA#1591+00

4. INSTALL
   SERVICE POLE D-8
   2-2" SCH. 80 PVC TO NEW TY A GRD BOX
   IN COND.1# 3#6XHHW, 1#6 BARE (DMS# 2 POWER)

5. EXISTING
   2-3" SCH. 40 PVC /CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS /CCE
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A) 1-144 STR.SM .FOC
   IN COND #1 (4" INNERDUCT B) 1#14 INSULATED CONDUCTOR

6. INSTALL
   175' M.B.G.F WITH G.E.T. AND DOWNSTREAM
   ANCHOR TERMINAL

7. INSTALL DMS #2 (STA# 1591+00)
   SIGN STRUCTURE DMS#2
   LED DYNAMIC MESSAGE SIGN (18")(SUPPLIED BY TXDOT)
   2-4" SCH.80 TO DMS CONTROLER CABINET
   IN COND#1 DMS CONTROL CABLES
   IN COND#2 DMS CONTROL CABLES

8. INSTALL DMS#2 (STA.1543+20)
   DMS CABINET & FOUNDATION
   DMS CONTROLLER CABINET(SUPPLIED BY TXDOT)
   1 DMS FIELD EQUIPMENT(DMS#2)(SUPPLIED BY TXDOT)
   1 ETHERNET TX(DMS#2)(SUPPLIED BY TXDOT)
   2-3" SCH.80 PVC TO TY1 GR.BOX
   1-2" SCH.80 PVC TO TYA GR.BOX.
   IN COND#1 (3") 1-6 STR SM FOC (DMS#2)
   IN COND#2 (2") 3#6XHHW 1#6 BARE (DMS #2 POWER)

9. INSTALL
   2-3" SCH. 80 PVC (BORED) TO TYPE 1 GRD BOX
   IN COND.#1-6 STR SM FOC (DMS#2)

10. INSTALL
    2-3" SCH. 80 PVC TO TYPE 1 GRD BOX
    IN COND.#1-6 STR SM FOC (DMS#2)

SEE SHEET 10 OF 39 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: U.S.290_005006079_14_REVISED.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

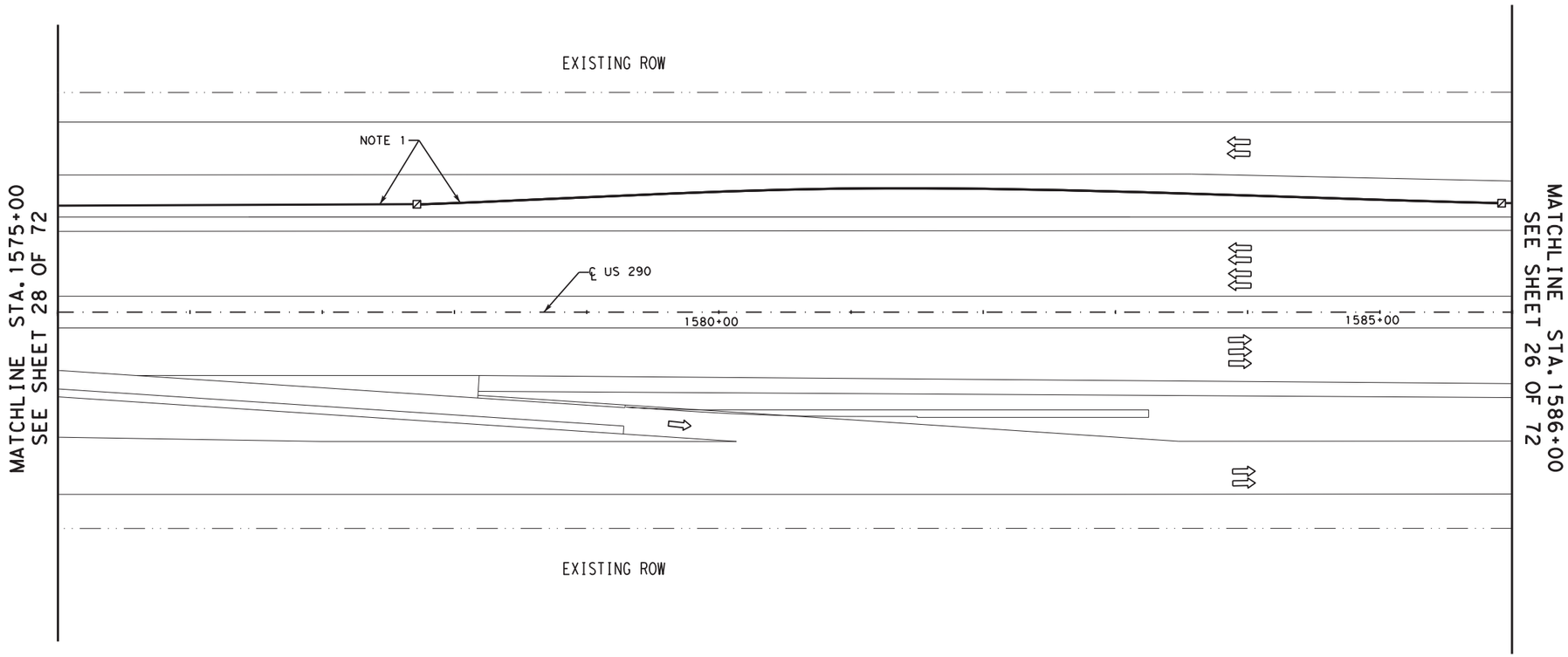
TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 26 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
CK DW:			HOU	HARRIS	0050	06	079		73
TR:									
CK TR:									

NAME: ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC /CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS /CCE
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4" INNERDUCTA) 1-144 STR.SM .FOC
   (4" INNERDUCT B) 14 INSULATED CONDUCTOR
   (4" INNERDUCT C) 1-6 STR SM FOC (DMS#2)

SEE SHEET 30 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: U.S.290_005006079_13.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
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May 23, 2022

Kenneth Paradowski, P.E.

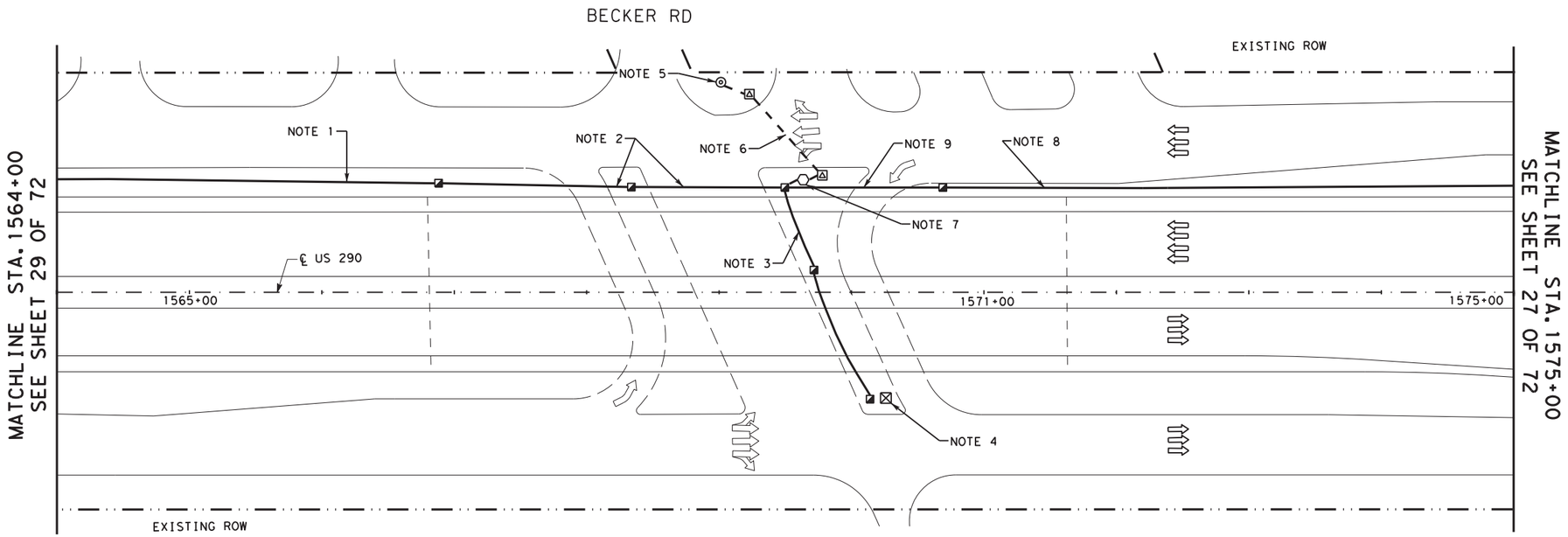
TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 27 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK. DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
CK. DW:			HOU	HARRIS	0050	06	089	74	
TR:									
CK. TR:									

NAME:ENTER DATA



1.EXISTING
2-3" SCH. 40 PVC /CCE
2-4" SCH. 40 MULTI-DUCT CONDUITS /CCE
IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND.#1 (4" INNERDUCT A) 1-144 STR.SM .FOC
(4" INNERDUCT B)1#14 INSULATED CONDUCTOR
(4" INNERDUCT C) 2-6 STR SM FOC CCTV#8,DMS#2.
(4" INNERDUCT D)-6 STR SM FOC BECKER RD TRAFFIC SIGNAL

2.EXISTING
2-3" SCH. 80 PVC (BORED)
2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
IN SCH. 40 STEEL CASING
IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND.#1 (4" INNERDUCT A) 1-144 STR.SM.FOC
(4" INNERDUCT B) 1#14 INSULATED CONDUCTOR
(4" INNERDUCT C) 2-6 STR SM FOC CCTV#8,DMS#2.
(4" INNERDUCT D)-6 STR SM FOC BECKER RD TRAFFIC SIGNAL

3.EXISTING
4-3" SCH. 40 PVC /CCE
2-4" SCH. 40 MULTI-DUCT CONDUITS /CCE
IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
IN CONDUIT #21-6 STR SM FOC BECKER RD TRAFFIC SIGNAL)

4.EXISTING
TRAFFIC SIGNAL CABINET
TRAFFIC SIGNAL CONTROLLER EQUIPMENT
INSTALL
1-2" SCH.80 PVC TO TY.1 GRD.BOX
1-6 STR SM FOC (BECKER TRAFFIC SIGNAL)

5. INSTALL
SERVICE POLE D-8
2-2" SCH.80 PVC TO NEW TY A GRD BOX
IN COND.1# 2#8XHHW,1#8 BARE (CCTV#8 POWER)

6. INSTALL
2-2" SCH.80 PVC (BORED)
2#8XHHW,1#8 BARE (CCTV#8 POWER)

7. INSTALL (STA.1549+00)
CCTV CAMERA#8
CCTV CAMERA SUPPORT POLE & FOUNDATION (55')
POLE MOUNTED CABINET (TY.2)(CONF.1)
CCTV FIELD EQUIPMENT
FIBER OPTIC VIDEO/DATA TX (S/M)
2-2" SCH. 80 PVC TO TY 1 GRD BOX
1-2" SCH. 80 PVC TO TY A GRD BOX
IN COND.#1
- 1-6 STR SM FOC (CCTV#7- TY 1 GRD BOX)
- 1#14 INSULATED CONDUCTOR
IN COND.#2-2#8XHHW, 1#8 BARE (CCTV#7 POWER - TY A GRD BOX)

8.EXISTING
2-3" SCH. 40 PVC /CCE
2-4" SCH. 40 MULTI-DUCT CONDUITS /CCE
IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND.#1 (4" INNERDUCT A) 1-144 STR.SM .FOC
(4" INNERDUCT B) 1#14 INSULATED CONDUCTOR
(4" INNERDUCT C) 1-6 STR SM FOC (DMS#2)

9.EXISTING
2-3" SCH. 80 PVC (BORED)
2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
IN SCH. 40 STEEL CASING
IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND.#1 (4" INNERDUCT A) 1-144 STR.SM.FOC
(4" INNERDUCT B) 1#14 INSULATED CONDUCTOR
(4" INNERDUCT C) 1-6 STR SM FOC (DMS#2)

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED
PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

SEE SHEET 30 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: U.S.290_005006079_12.dgn

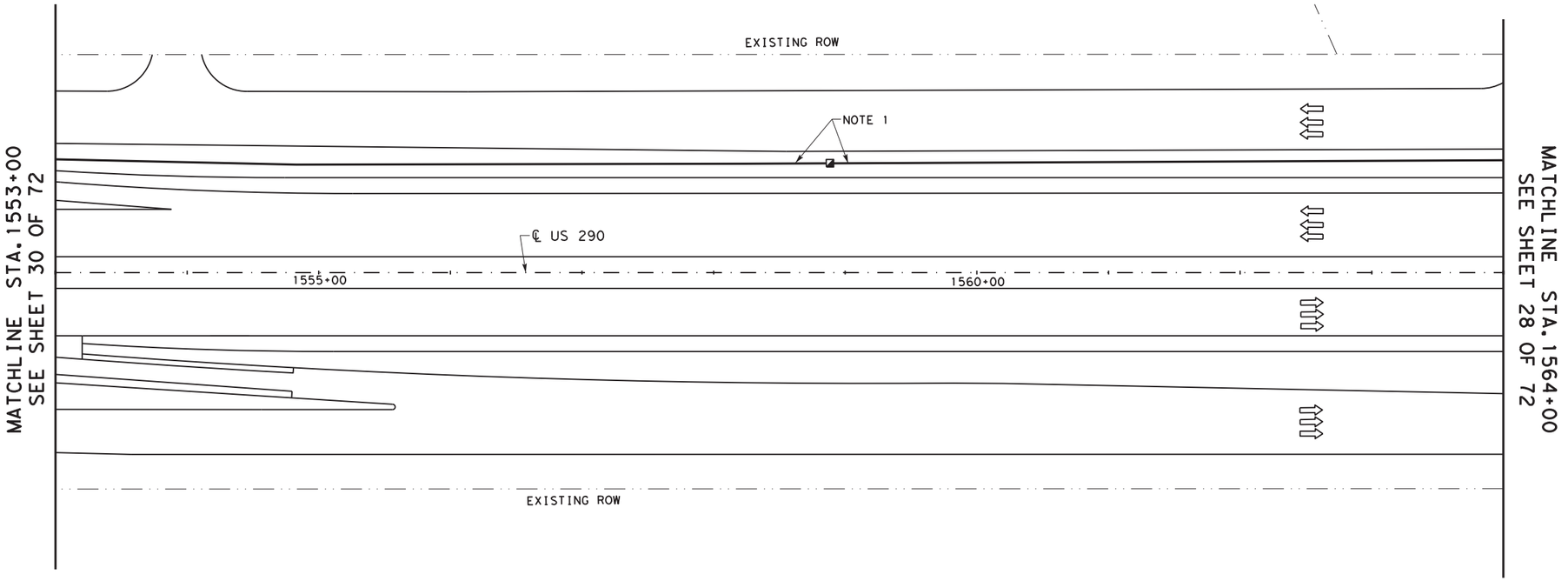
TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 28 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21							
DW:			6	TEXAS					US290
CK DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
TR:			HOU	HARRIS		0050	06	089	75
CK TR:									

NAME:ENTER DATA



1. EXISTING
   4-3" SCH. 40 PVC /CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS /CCE
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A) 1-144 STR.SM .FOC
   (4" INNERDUCT B) 1#14 INSULATED CONDUCTOR
   (4" INNERDUCT C) 2-6 STR SM FOC CCTV#8,DMS#2.
   (4" INNERDUCT D)-6 STR SM FOC BECKER RD TRAFFIC SIGNAL)

SEE SHEET 30 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: U.S.290_005006079_13.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

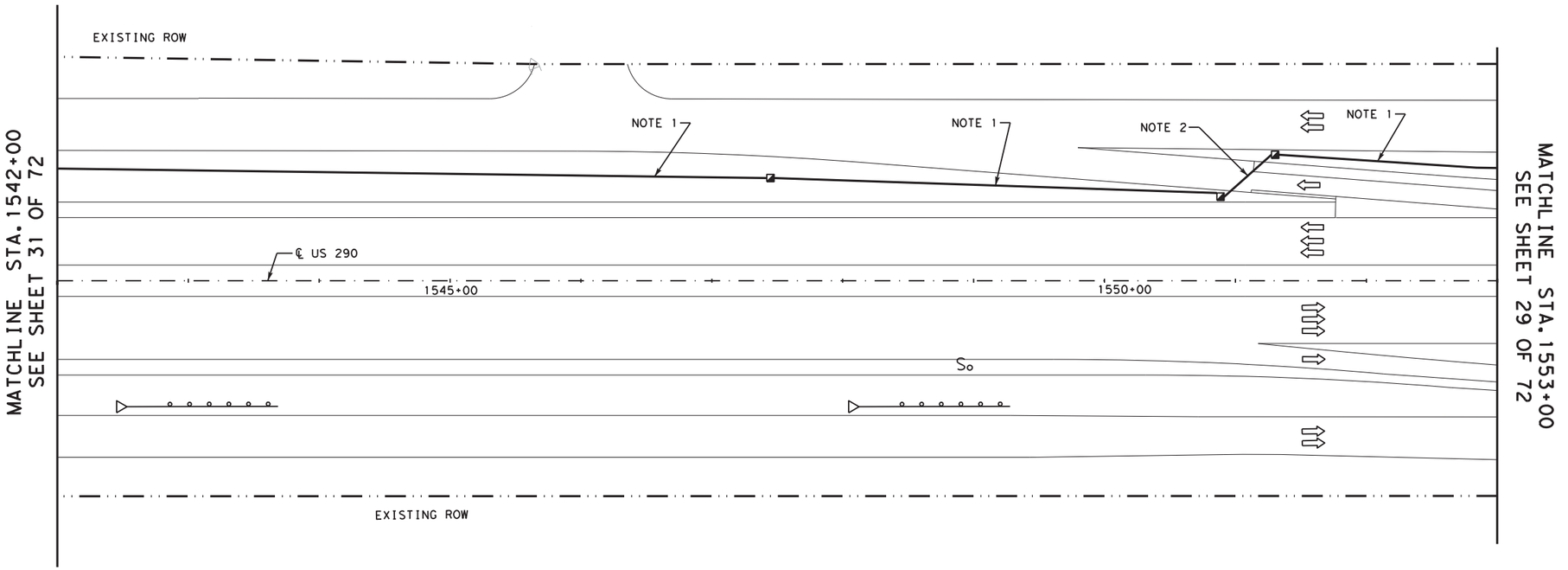
TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 29 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21							
DW:			6	TEXAS					US290
CK DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
TR:									
CK TR:			HOU	HARRIS		0050	06	089	76

NAME:ENTER DATA



LEGEND

- RIGHT OF WAY
- NEW CONDUIT
- EXISTING CONDUIT
- NEW GROUND BOX-TYPE 1
- EXISTING GROUND BOX-TYPE 1
- NEW ELECTRICAL GROUND BOX-TYPE A
- EXISTING ELECTRICAL GROUND BOX-TYPE A
- EXISTING CABINET
- NEW CABINET (DOOR ON DARKENED SIDE)
- NEW COMMUNICATIONS HUB BUILDING
- EXISTING COMMUNICATIONS HUB BUILDING
- NEW CCTV CAMERA
- EXISTING CCTV CAMERA
- NEW SERVICE POLE
- EXISTING SERVICE POLE
- EXISTING JUNCTION BOX (UNLESS OTHERWISE NOTED)
- [R] RADAR VEHICLE SENSING DEVICE
- [B] BLUETOOTH DEVICE
- EXISTING DYNAMIC MESSAGE SIGN
- NEW DYNAMIC MESSAGE SIGN
- METAL BEAM GUARD FENCE
- Ⓡ RADAR VEHICLE SENSING DEVICE POLE

1. EXISTING
   4-3" SCH. 40 PVC /CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS /CCE
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4"INNERDUCT A) 1-144 STR.SM .FOC
   (4"INNERDUCT B) 1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C) 2-6 STR SM FOC (CCTV#8,DMS#2)
   (4"INNERDUCT D) 1-6 STR SM FOC BECKER RD TRAFFIC SIGNAL)

2. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4"INNERDUCT A) 1-144 STR.. SM .FOC
   (4"INNERDUCT B) 1#14INSULATED CONDUCTOR
   (4"INNERDUCT C) 2-6 STR SM FOC (CCTV#8,DMS#2.
   (4"INNERDUCT D) 1-6 STR SM FOC BECKER RD TRAFFIC SIGNAL)

NOTE:
① SUPPLIED BY STATE SCALE: 1" = 100'

FILE NAME: U.S.290_005006079_10.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

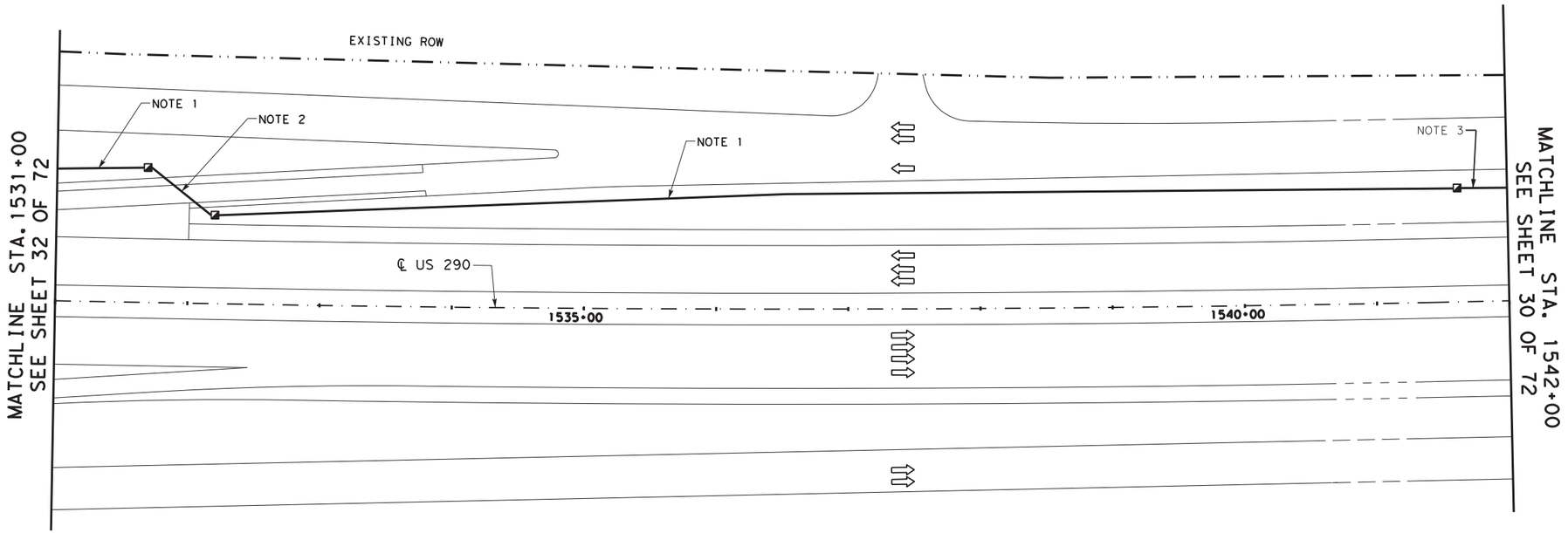
TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 30 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOU	HARRIS		0050	06	089	77
TR:									
CK TR:									

NAME: ENTER DATA



1. EXISTING
   4-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4"INNERDUCT A) 1-144 STR.SM.FOC
   (4"INNERDUCT B)1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C) 2-6 STR SM FOC CCTV#8,DMS#2.
   (4"INNERDUCT D) 1-6 STR SM FOC BECKER RD TRAFFIC SIGNAL

2. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR

   INSTALL
   IN COND.#1 (4"INNERDUCT A) 1-144 STR.SM.FOC
   (4"INNERDUCT B) 1#14INSULATED CONDUCTOR
   (4"INNERDUCT C) 2-6 STR SM FOC CCTV#8,DMS#2.
   (4"INNERDUCT D) 1-6 STR SM FOC BECKER RD TRAFFIC SIGNAL

3. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4"INNERDUCT A) 1-144 STR SM .FOC
   (4"INNERDUCT B) INSULATED CONDUCTOR
   (4"INNERDUCT C) 2-6 STR SM FOC CCTV#8,DMS#2.
   (4"INNERDUCT D) 1-6 STR SM FOC BECKER RD TRAFFIC SIGNAL

SEE SHEET 30 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: U.S.290_005006079_09.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED
PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

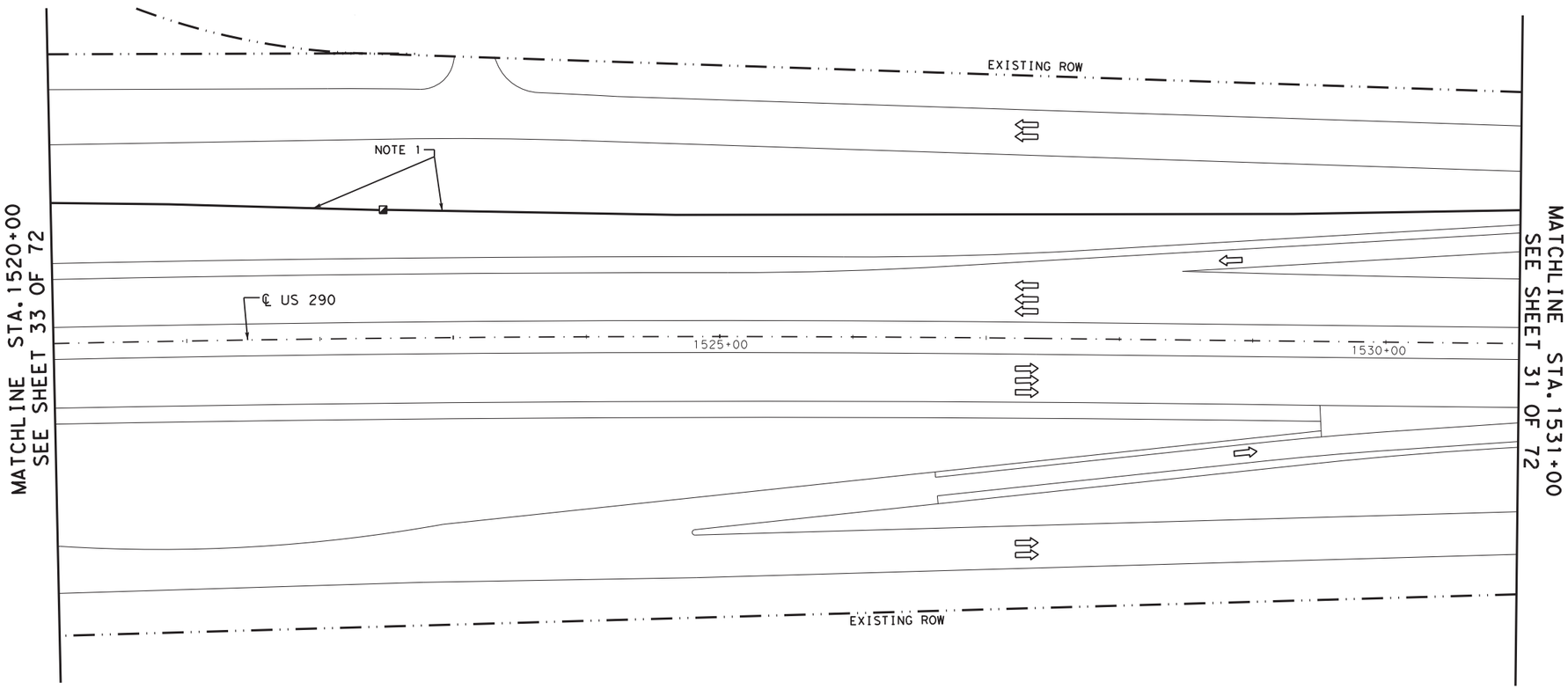
TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 31 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOU	HARRIS		0050	06	089	78
TR:									
CK TR:									

NAME: ENTER DATA



1. EXISTING
   4-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4"INNERDUCT A) 1-144 STR.SM.FOC
   (4"INNERDUCT B) 1#14INSULATED CONDUCTOR
   (4"INNERDUCT C) 2-6 STR SM FOC CCTV#8,DMS#2.
   (4"INNERDUCT D) 1-6 STR SM FOC BECKER RD TRAFFIC SIGNAL

SEE SHEET 30 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: U.S.290_005006079_08.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23, 2022

Kenneth Paradowski, P.E.

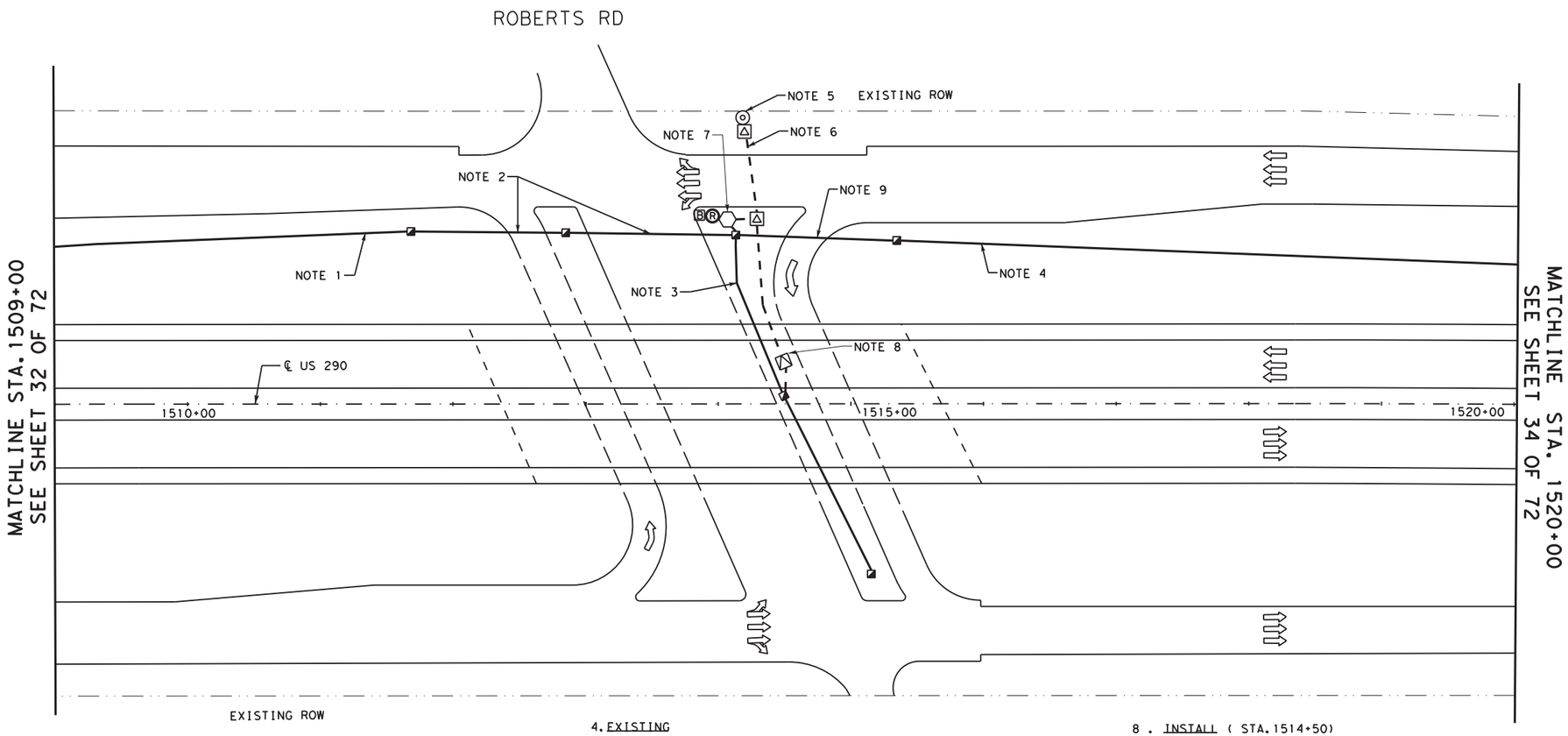
TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 32 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21							
DW:			6	TEXAS					US290
CK DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
TR:									
CK TR:			HOU	HARRIS		0050	06	089	79

NAME:ENTER DATA



1.EXISTING
2-3" SCH. 40 PVC/CCE
2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND.#1 (4" INNERDUCT A) 1-144 STR.SM.FOC
(4" INNERDUCT B)1#14 INSULATED CONDUCTOR
(4" INNERDUCT C) 1-12 STR SM FOC CCTV#11,RVSD#5,BT#5
(4" INNERDUCT D) 1-6 STR SM FOC CCTV#10

2. EXISTING
2-3" SCH. 80 PVC (BORED)
2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
IN SCH. 40 STEEL CASING
IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUIT CONDUCTORS

INSTALL
IN COND.#1(4"INNERDUCT A) 1-144 STR.SM.FOC
(4" INNERDUCT B)1#14 INSULATED CONDUCTOR
(4" INNERDUCT C) 1-12 STR SM FOC CCTV#11,RVSD#5,BT#5
(4" INNERDUCT D) 1-6 STR SM FOC CCTV#10

3. EXISTING
4-3" SCH. 40 PVC/CCE
2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND.#1 (4"INNERDUCT A) 2-144 STR.SM.FOC
(4"INNERDUCT B) 1#14 INSULATED CONDUCTOR
(4"INNERDUCT C) 2-6 STR SM FOC CCTV#8,DMS#2.
(4"INNERDUCT D) 2-6 STR SM FOC BECKER RD TRAFFIC SIGNAL,CCTV# 10
IN COND.#2 (4" INNERDUCT A) 2-12 STR SM FOC CCTV#11,RVSD#5,BT#5,
CCTV#9,RVSD#4,BT#4

4. EXISTING
2-3" SCH. 40 PVC /CCE
2-4" SCH. 40 MULTI-DUCT CONDUITS /CCE
IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND.#1 (4"INNERDUCT A) 1-144 STR.SM.FOC
(4"INNERDUCT B) 1#14INSULATED CONDUCTOR
(4"INNERDUCT C) 2-6 STR SM FOC CCTV#8,DMS#2.
(4"INNERDUCT D)1-6 STR SM FOC
BECKER RD TRAFFIC SIGNAL

5. INSTALL
SERVICE POLE D-11
2-2" SCH. 80 PVC TO NEW TY A GROUND BOX
IN COND.#1 2#8XHHW,1#8 BARE(CCTV#9 POWER)
IN COND.#2 3#4XHHW,1#4 BARE(HUB BUILDING POWER)

6.INSTALL
2-2" SCH.80 PVC (BORED)
IN COND.#1,2#8XHHW, 1#8 BARE (CCTV#9 POWER)
IN COND.#2,3#4XHHW, 1#4 BARE (HUB BUILDING POWER)

7. INSTALL (STA 1514+40).
CCTV CAMERA #9
CCTV CAMERA SUPPORT POLE & FOUNDATION (55')
POLE MOUNTED CABINET (TY.2)(CONF.1)
CCTV FIELD EQUIPMENT
1 RVSD FIELD EQUIPMENT (RVSD#4)
2 ETHERNET TX(SUPPLIED BY TXDOT)
1 BLUETOOTH FIELD EQUIPMENT (BT#4) (SUPPLIED BY TXDOT)
FIBER OPTIC VIDEO/DATA TX (S/M)
1 FIBER OPTIC PATCH PANEL (12 POSITION)
2-2" SCH. 80 PVC TO TY 1 GRD BOX
1-2" SCH. 80 PVC TO TY A GRD BOX
IN COND.#1
- 1-12 STR SM FOC (CCTV#11,RVSD#4,BT#4- TY 1 GRD BOX)
- 1#14 INSULATED CONDUCTOR
IN COND.#2-2#8XHHW, 1#8 BARE (CCTV#9 POWER - TY A GRD BOX)

8 . INSTALL (STA.1514+50)
COMMUNICATION HUB BUILDING
4 FIBER OPTIC VIDEO DATA RX'S (S/M)
4 VIDEO ENCODERS (SUPPLIED BY TXDOT)
1 ETHERNET FIELD SWITCH (SUPPLIED BY TXDOT)
4 ETHERNET TX (SUPPLIED BY TXDOT)
1 FIBER OPTIC PATCH PANEL (144 POSITION)
4 FIBER OPTIC PATCH PANEL (12 POSITION)
4-3" SCH.80 PVC TO TYPE 1 G.B.
4-4" SCH.80 MULTI-DUCT CONDUITS TO TYPE 1 G.B.
1-2" SCH.80 PVC TO NEW TY A GRD BOX

IN COND.#1(4"INNERDUCT A) 2-144 STR.SM.FOC
(4"INNERDUCT B) 1#14 INSULATED CONDUCTOR
(4"INNERDUCT C) 2-6 STR SM FOC CCTV#8,DMS#2.
(4"INNERDUCT D) 2-6 STR SM FOC BECKER RD TRAFFIC SIGNAL,CCTV#10
IN COND.#2 (4" INNERDUCT A) 2-12 STR SM FOC CCTV#11,RVSD#5,BT#5
CCTV#9,RVSD#4,BT#4
IN COND.#3(2",3#4XHHW, 1#4 BARE
(HUB BUILDING POWER - TY A GRD BOX)

9. EXISTING
2-3" SCH. 80 PVC (BORED)
2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
IN SCH. 40 STEEL CASING
IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR

INSTALL
IN COND.#1(4"INNERDUCT A) 1-144 STR.SM.FOC
(4"INNERDUCT B) 1#14INSULATED CONDUCTOR
(4"INNERDUCT C) 2-6 STR SM FOC CCTV#8,DMS#2.
(4"INNERDUCT D) 1-6 STR SM FOC
BECKER RD TRAFFIC SIGNAL

SCALE: 1" = 100'

FILE NAME: U.S.290_005006079_07.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23, 2022

Kenneth Paradowski, P.E.

SEE SHEET 30 OF 72 FOR LEGEND

TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 33 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOU	HARRIS		0050	06	089	80
TR:									
CK TR:									

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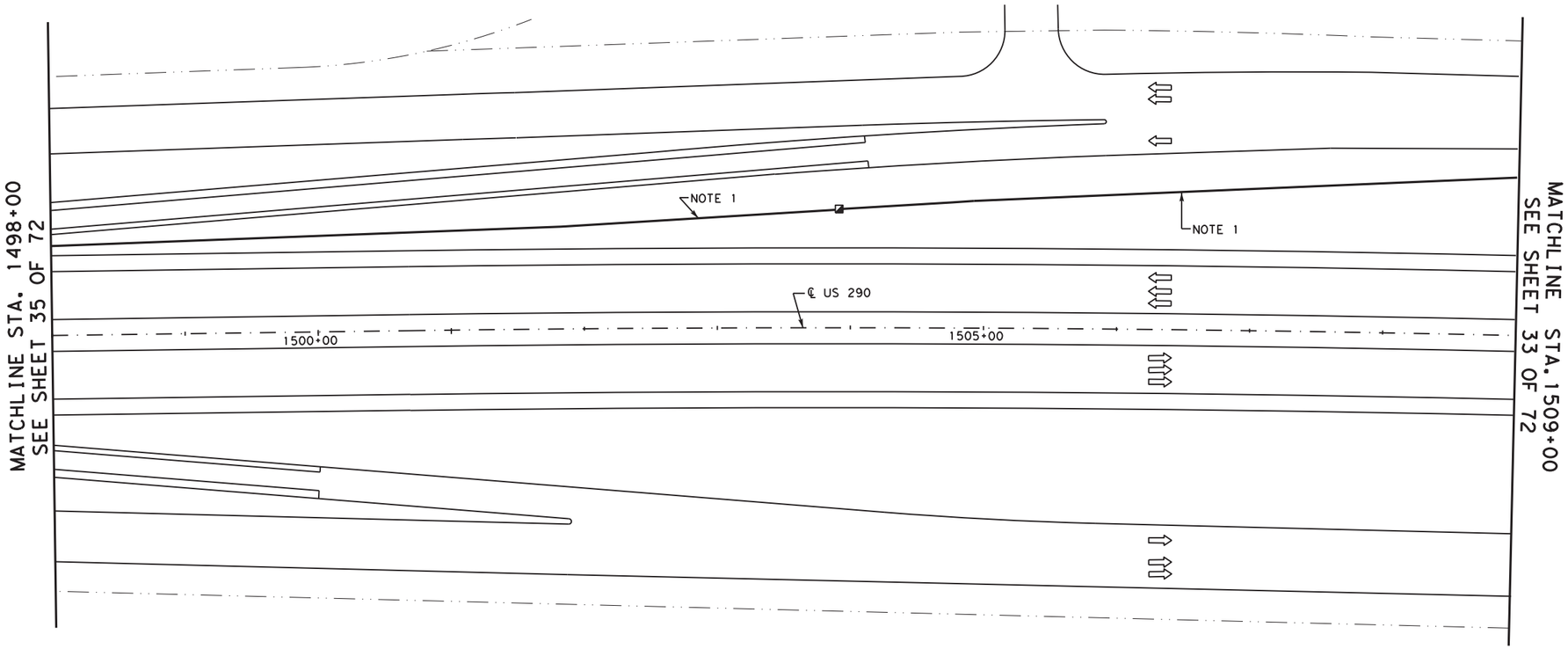

1. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4"INNERDUCT A) 1-144 STR.SM.FOC
   (4"INNERDUCT B) 1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C) 1-12 STR SM FOC CCTV#11,RVSD#5,BT#5
   (4"INNERDUCT D) 1-6 STR SM FOC CCTV#10

SEE SHEET 30 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: U.S.290_005006079_06.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 34 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
CK DW:			HOU	HARRIS	0050	06	089	81	
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CK TR:									

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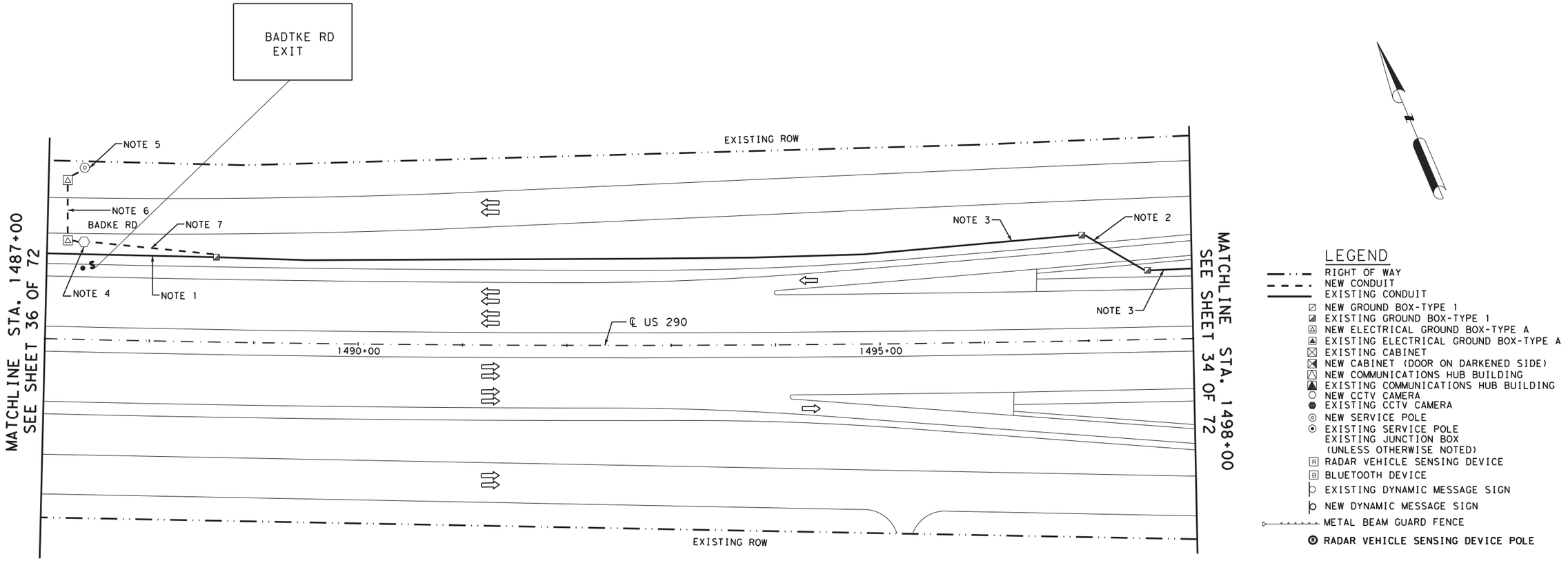

LEGEND

- RIGHT OF WAY
- NEW CONDUIT
- EXISTING CONDUIT
- NEW GROUND BOX-TYPE 1
- EXISTING GROUND BOX-TYPE 1
- NEW ELECTRICAL GROUND BOX-TYPE A
- EXISTING ELECTRICAL GROUND BOX-TYPE A
- EXISTING CABINET
- NEW CABINET (DOOR ON DARKENED SIDE)
- NEW COMMUNICATIONS HUB BUILDING
- EXISTING COMMUNICATIONS HUB BUILDING
- NEW CCTV CAMERA
- EXISTING CCTV CAMERA
- NEW SERVICE POLE
- EXISTING SERVICE POLE
- EXISTING JUNCTION BOX (UNLESS OTHERWISE NOTED)
- R RADAR VEHICLE SENSING DEVICE
- B BLUETOOTH DEVICE
- EXISTING DYNAMIC MESSAGE SIGN
- NEW DYNAMIC MESSAGE SIGN
- METAL BEAM GUARD FENCE
- R RADAR VEHICLE SENSING DEVICE POLE

1. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT #1(3") INNERDUCT A- 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4" INNERDUCT A) 1-144 STR.SM.FOC
   (4" INNERDUCT B) 1#14 INSULATED CONDUCTOR
   (4" INNERDUCT C) 1-12 STR SM FOC CCTV#11,RVSD#5,BT#5

2. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUIT CONDUCTOR

   INSTALL
   IN COND.#1(4"INNERDUCT A) 1-144 STR.SM.FOC
   (4" INNERDUCT B)1#14 INSULATED CONDUCTOR
   (4" INNERDUCT C) 1-12 STR SM FOC CCTV#11,RVSD#5,BT#5
   (4" INNERDUCT D) 1-6 STR SM FOC CCTV#10

3. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT #1(3")INNERDUCT A 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4"INNERDUCT A) 1-144 STR.SM.FOC
   (4"INNERDUCT B)1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C) 1-12 STR SM FOC CCTV#11,RVSD#5,BT#5
   (4"INNERDUCT D) 1-6 STR SM FOC CCTV#10)

4. INSTALL (STA. 1487+30)
   CCTV CAMERA#10
   CCTV CAMERA SUPPORT POLE & FOUNDATION (55')
   POLE MOUNTED CABINET (TY.2)(CONF.1)
   CCTV FIELD EQUIPMENT
   FIBER OPTIC VIDEO/DATA TX (S/M)
   2-2" SCH. 80 PVC TO TY 1 GRD BOX
   1-2" SCH. 80 PVC TO TY A GRD BOX
   IN COND. #1
   - 1-6 STR SM FOC (CCTV#10)
   - 1#14 INSULATED CONDUCTOR
   IN COND. #2 , 2#8XHHW, 1#8 BARE
   (CCTV#10 POWER-TY.A GRD BOX)

5. INSTALL
   SERVICE POLE D-12
   2-2" SCH.80 PVC TO NEW TY A GRD BOX
   IN COND.#1,2#8XHHW,1#8 BARE (CCTV#10 POWER)

6. INSTALL
   2-2" SCH 80 PVC (BORED)
   IN NEW SCH.40 STEEL CASING
   IN COND.#1, 2#8XHHW, 1#8 BARE (CCTV#10 POWER)

7. INSTALL
   1-2" SCH 80 PVC
   IN COND.#1,1-6 STR SM FOC (CCTV#10)

SCALE: 1" = 100'

FILE NAME: U.S.290_005006079_05.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

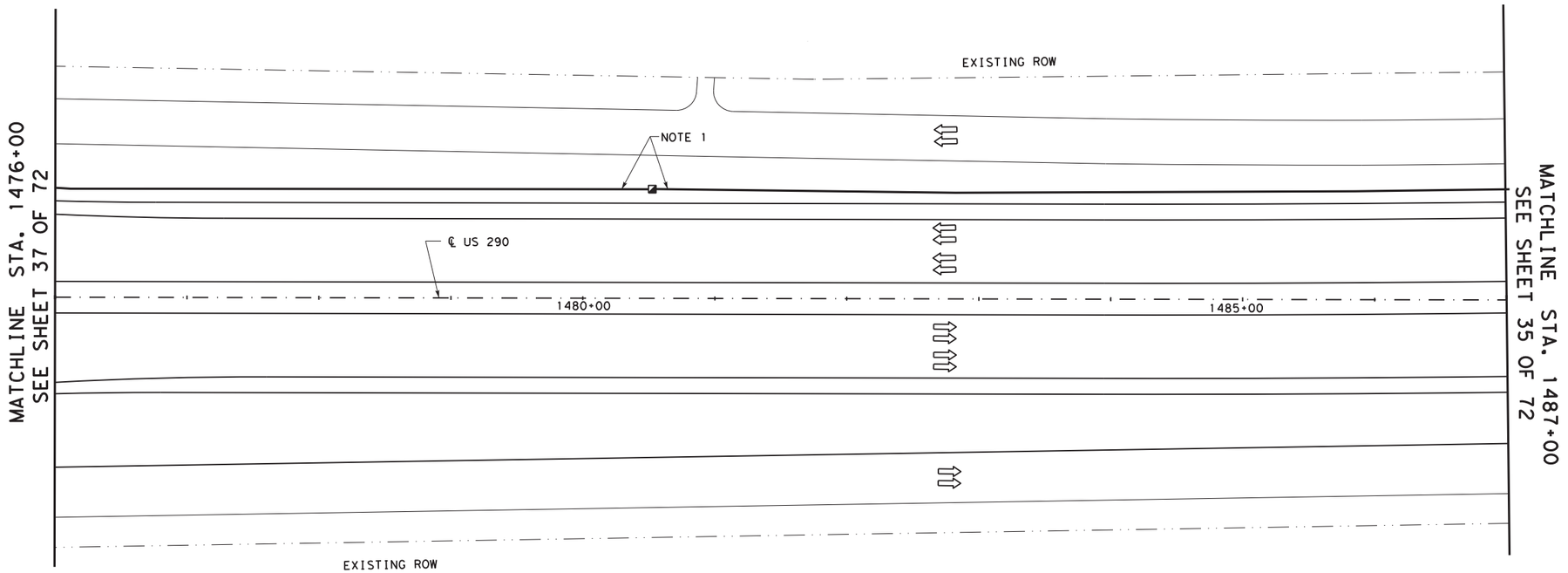
TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 35 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.	HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS		US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO. / SECTION NO. / JOB NO.	SHEET NO.
CK DW:			HOU	HARRIS	0050 / 06 / 089	82
TR:						
CK TR:						

NAME: ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4"INNERDUCT A) 1-144 STR.SM.FOC
   (4"INNERDUCT B) 1#14 INSULATED CONDUCTOR
   (4"INNERDUCT C) 1-12 STR SM FOC CCTV#11,RVSD#5,BT#5

SEE SHEET 35 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: U.S.290_005006079_04.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

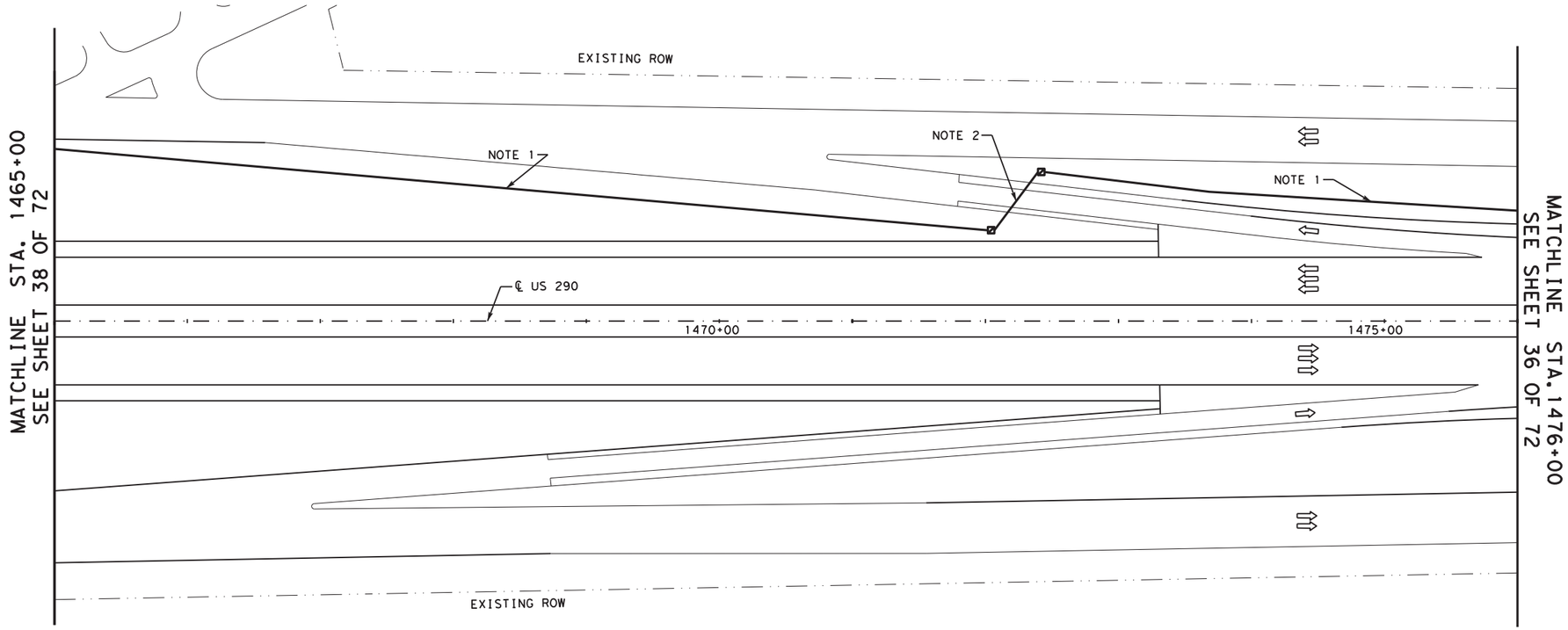
TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 36 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21							
DW:			6	TEXAS					US290
CK DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
TR:									
CK TR:			HOU	HARRIS		0050	06	089	83

NAME:ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4" INNERDUCT A) 1-144 STR. SM. FOC
   (4" INNERDUCT B) 1#14 INSULATED CONDUCTOR
   (4" INNERDUCT C) 1-12 STR SM FOC CCTV#11, RVSD#5, BT#5

2. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR

   INSTALL
   IN COND. #1(4" INNERDUCT A) 1-144 STR. SM. FOC
   (4" INNERDUCT B) 1#14 INSULATED CONDUCTOR
   (4" INNERDUCT C) 1-12 STR SM FOC CCTV#11, RVSD#5, BT#5

SEE SHEET 35 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: U.S.290_005006079_03.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

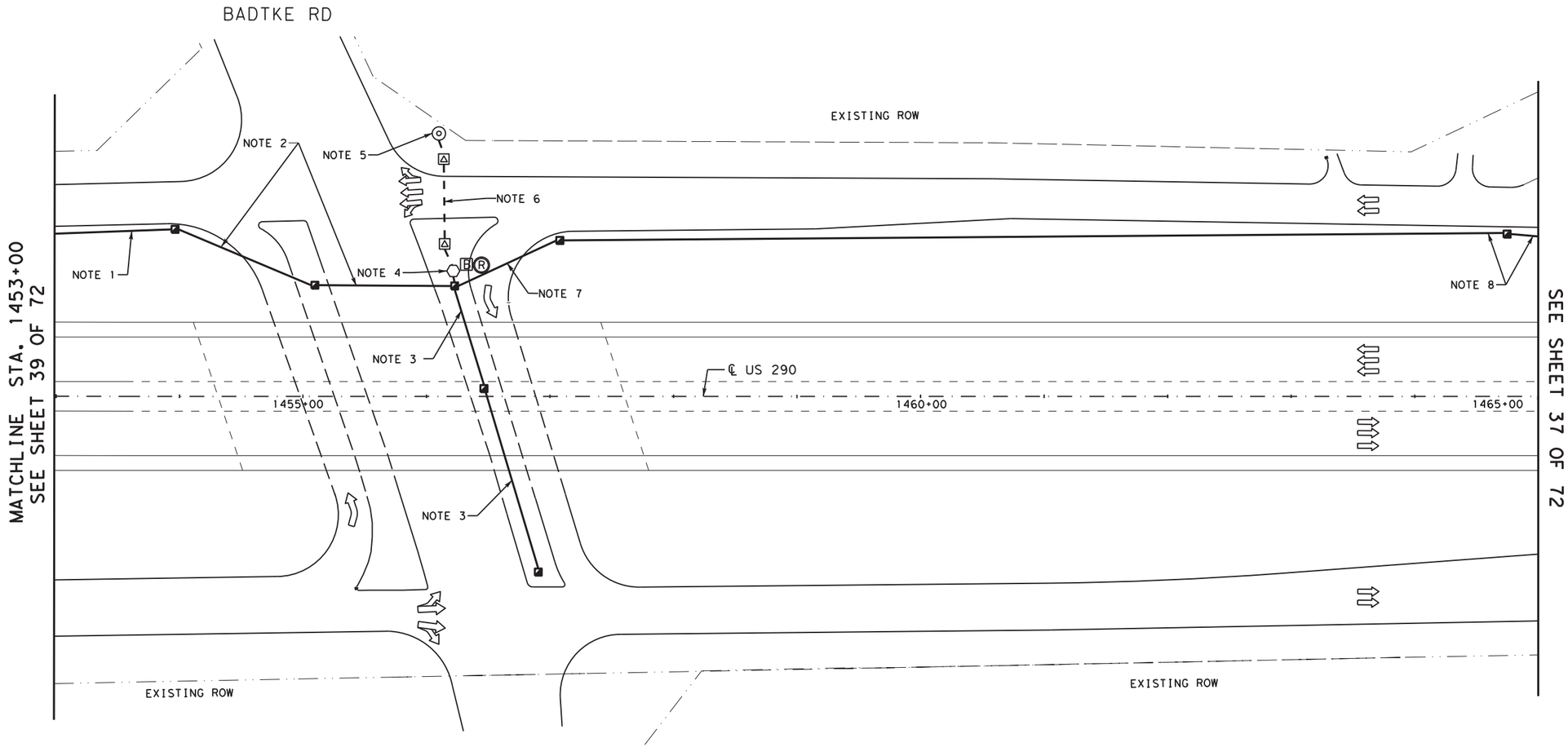
TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 37 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21							
DW:			6	TEXAS					US290
CK DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
TR:									
CK TR:			HOU	HARRIS		0050	06	089	84

NAME: ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A) 1-144 STR.SM.FOC
   (4" INNERDUCT B) 1#14 INSULATED CONDUCTOR

2. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR

   INSTALL
   IN COND.#1 (4" INNERDUCT A) 1-144 STR.SM.FOC
   (4" INNERDUCT B) 1#14 INSULATED CONDUCTOR

3. EXISTING
   4-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR

4. INSTALL (STA 1456+50).
   CCTV CAMERA #11
   CCTV CAMERA SUPPORT POLE & FOUNDATION (55')
   POLE MOUNTED CABINET (TY.2)(CONF.1)
   CCTV FIELD EQUIPMENT
   1 RVSD FIELD EQUIPMENT (RVSD#5)
   2 ETHERNET TX(SUPPLIED BY TXDOT)
   1 BLUETOOTH FIELD EQUIPMENT (BT#5) (SUPPLIED BY TXDOT)
   FIBER OPTIC VIDEO/DATA TX (S/M)
   1 FIBER OPTIC PATCH PANEL (12 POSITION)
   2-2" SCH. 80 PVC TO TY 1 GRD BOX
   1-2" SCH. 80 PVC TO TY A GRD BOX
   IN COND.#1
   - 1-12 STR SM FOC (CCTV#11,RVSD#5,BT#5- TY 1 GRD BOX)
   - 1#14 INSULATED CONDUCTOR
   IN COND.#2-2#8XHHW, 1#8 BARE (CCTV#11 POWER - TY A GRD BOX)

5. INSTALL
   SERVICE POLE D-13
   2-2" SCH.80 PVC TO NEW TY A GRD BOX
   IN COND.#1,2#8XHHW,1#8 BARE (CCTV#11 POWER)

6. INSTALL
   2-2" SCH 80 PVC (BORED)
   IN COND.#1, 2#8XHHW, 1#8 BARE (CCTV#11 POWER)

7. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN SCH. 40 STEEL CASING
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUIT CONDUCTOR

   INSTALL
   IN COND.#1 (4" INNERDUCT A) 1-144 STR.SM.FOC
   (4" INNERDUCT B) 1#14 INSULATED CONDUCTOR
   (4" INNERDUCT C) 1-12 STR SM FOC (CCTV#11,RVSD#5,BT#5)

8. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A) 1-144 STR.SM.FOC
   B) 1#14 INSULATED CONDUCTOR
   C) 1-12 STR SM FOC (CCTV#11,RVSD#5,BT#5)

SEE SHEET 35 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: U.S.290_005006079_02.dgn

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED
PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

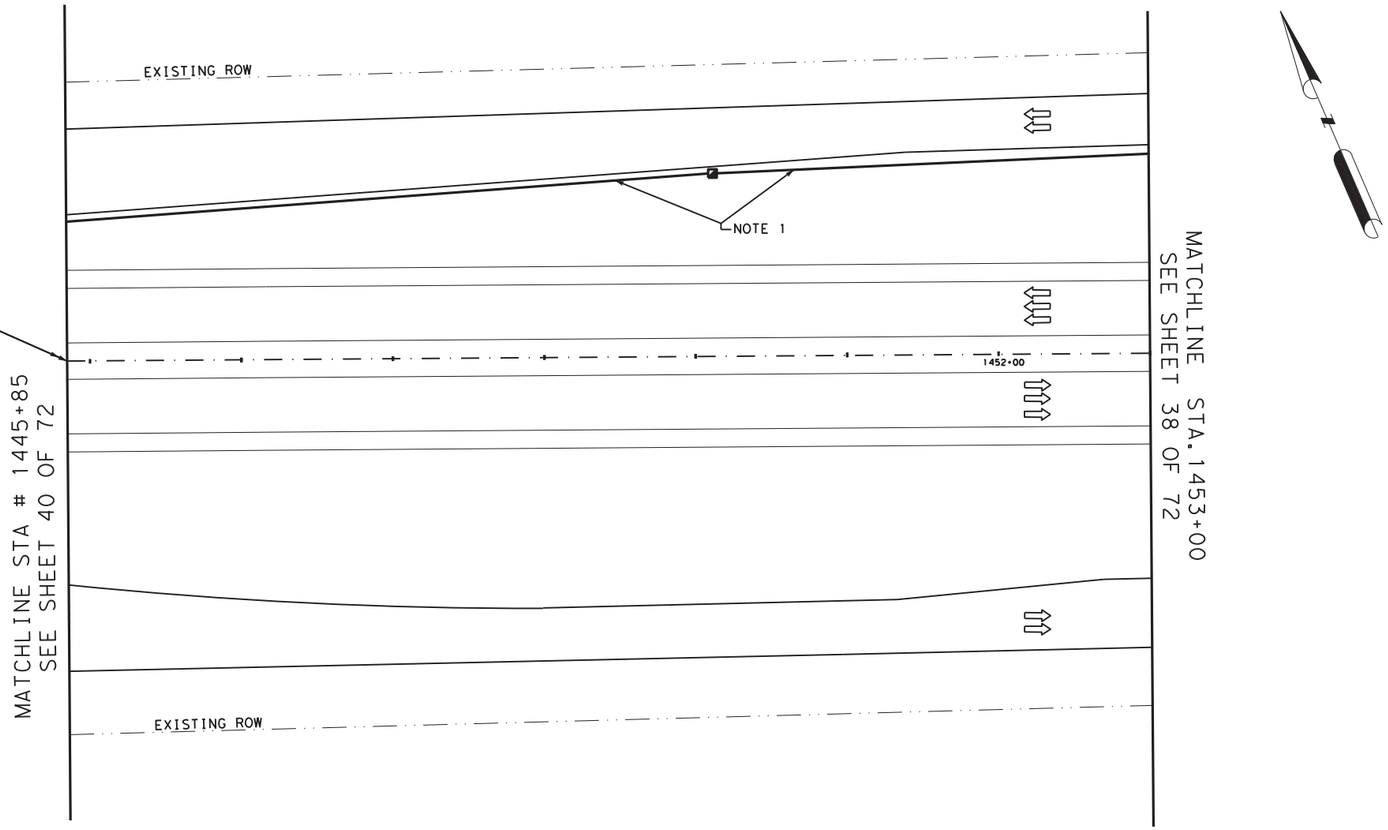
SHEET 38 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21							
DW:			6	TEXAS					US290
CK DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
TR:			HOU	HARRIS		0050	06	089	85
CK TR:									

NAME:ENTER DATA

START PROJECT
0114-12-014
STA 10340+85.15(ML)

END PROJECT
0050-06-089
STA 1445+85.15(ML)



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT PVC/CCE
   IN CONDUIT #1(3") - 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1 (4" INNERDUCT A)1-144 STR SM FOC
   IN COND. #1 (4" INNERDUCT B)1#14 INSULATED CONDUCTOR

SEE SHEET 35 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: U.S.290_005006079_01.dgn

NAME:ENTER DATA

STATE OF TEXAS
KENNETH PARADOWSKI
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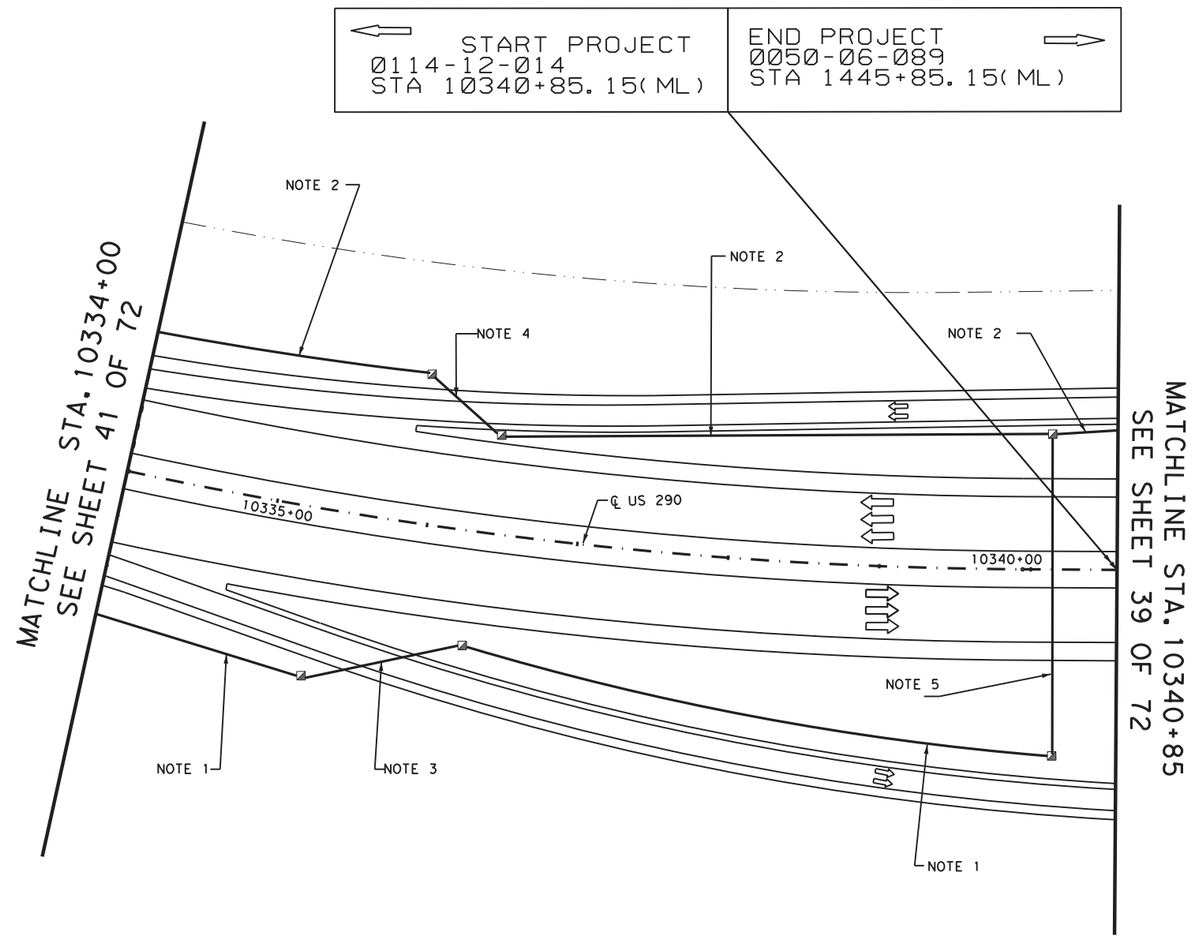
TEXAS DEPARTMENT OF TRANSPORTATION
US-290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 39 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:									
CK DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
TR:									
CK TR:			HOU	HARRIS	0050	06	089	86	



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH. 40 PVC/CCE (BORE)
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE (BORE)
   IN CONDUIT #1 (3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4"INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1(4"INNERDUCT B)-1#14 INSULATED CONDUCTOR

3. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING

4. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   2-4" SCH. 80 MULTI-DUCT CONDUITS/CCE (BORE)
   IN CONDUIT #1 (3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING
   INSTALL
   IN COND.#1(4"INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1(4"INNERDUCT B)-1#14 INSULATED CONDUCTOR

5. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   2-4" SCH. 80 MULTI-DUCT CONDUITS/CCE (BORE)
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING

SEE SHEET 41 OF 72
FOR LEGEND

FILE NAME: US290_007_33.DGN

STATE OF TEXAS
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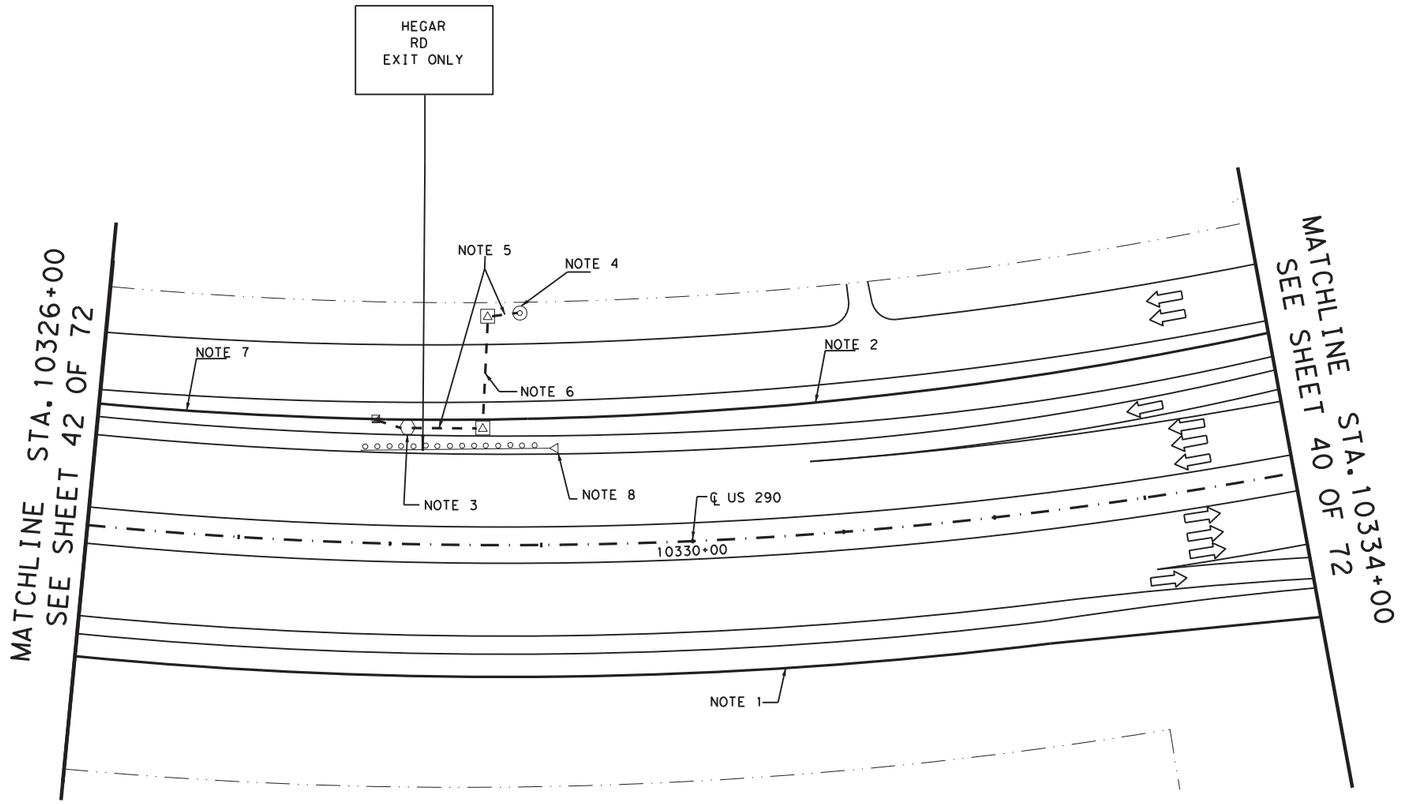
TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

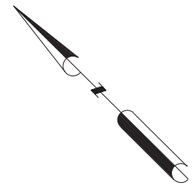
COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 40 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
CK DW:			HOUSTON	HARRIS	0050	06	089		087
TR:									
CK TR:									

NAME:ENTER DATA





LEGEND

- RIGHT OF WAY
- NEW CONDUIT
- EXISTING CONDUIT
- NEW GROUND BOX-TYPE 1
- EXISTING GROUND BOX-TYPE 1
- NEW ELECTRICAL GROUND BOX-TYPE A
- EXISTING ELECTRICAL GROUND BOX-TYPE A
- EXISTING CABINET
- NEW CABINET (DOOR ON DARKENED SIDE)
- NEW COMMUNICATIONS HUB BUILDING
- EXISTING COMMUNICATIONS HUB BUILDING
- NEW CCTV CAMERA
- EXISTING CCTV CAMERA
- NEW SERVICE POLE
- EXISTING SERVICE POLE
- EXISTING JUNCTION BOX (UNLESS OTHERWISE NOTED)
- [R] RADAR VEHICLE SENSING DEVICE
- [B] BLUETOOTH DEVICE
- EXISTING DYNAMIC MESSAGE SIGN
- NEW DYNAMIC MESSAGE SIGN
- METAL BEAM GUARD FENCE
- RADAR VEHICLE SENSING DEVICE POLE

1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4"INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1(4"INNERDUCT B)-1#14 INSULATED CONDUCTOR

3. INSTALL (STA.10328+20)
   CCTV CAMERA#12-LOCATE BEHIND HEGAR ROAD SIGN
   CCTV CAMERA SUPPORT POLE & FOUNDATION (55')
   POLE MOUNTED CABINET (TY.A)(CONF.1)
   CCTV FIELD EQUIPMENT
   FIBER OPTIC VIDEO/DATA TX (S/M)
   2-2" SCH. 80 PVC TO TY 1 GRD BOX
   1-2" SCH. 80 PVC TO TY A GRD BOX
   IN COND.#1
   - 1-6 STR SM FOC (CCTV#12- TY 1 GRD BOX)
   - 1#14 INSULATED CONDUCTOR
   IN COND.#2-2#8XHHW, 1#8 BARE (CCTV#12 POWER - TY A GRD BOX)

4. INSTALL
   SERVICE POLE D-14
   2-2" SCH. 80 PVC TO NEW TY A GRD BOX
   IN COND.#1,2#8XHHW,1#8 BARE (CCTV#12 POWER)

5. INSTALL
   2-2" SCH. 80 PVC
   IN COND.#1,2#8XHHW,1#8 BARE (CCTV#12 POWER)

6. INSTALL
   2-2" SCH. 80 PVC (BORED)
   IN NEW SCH. 40 STEEL CASING
   IN COND.#1,2#8XHHW,1#8 BARE (CCTV#12 POWER)

7. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4"INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1(4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   IN COND.#1(4"INNERDUCT C)-1-6 STR SM FOC (CCTV#12)

8. EXISTING
   M.B.G.F WITH G.E.T AND DOWNSTREAM ANCHOR TERMINAL

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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Kenneth Paradowski, P.E.

FILE NAME: US290_007_32.DGN

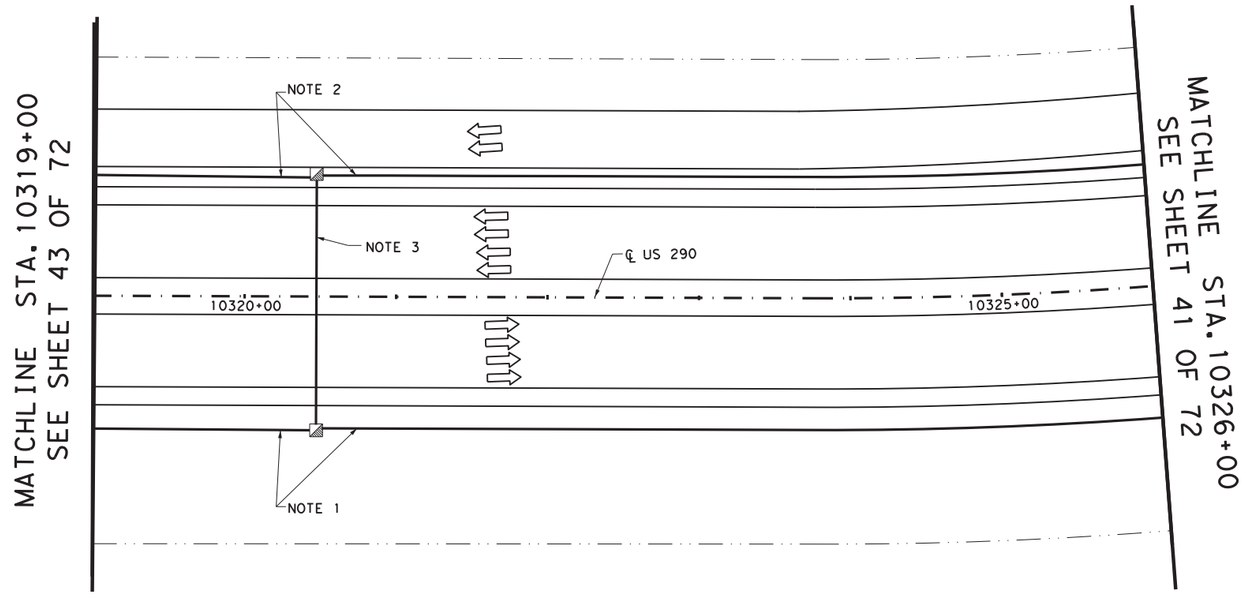
NAME: ENTER DATA

TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 41 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS				US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOUSTON	HARRIS	0050	06	089	088
TR:								
CK TR:								



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4"INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1(4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   IN COND.#1(4"INNERDUCT C)-1-6 STR SM FOC (CCTV#12)

3. EXISTING
   2-3" SCH. 80 PVC/CCE ((BORE)
   2-4" SCH. 80 MULTI-DUCT CONDUITS/CCE (BORE)
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING

SEE SHEET 35 OF 72
FOR LEGEND

FILE NAME: US290_007_31.DGN

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED
PROFESSIONAL ENGINEER

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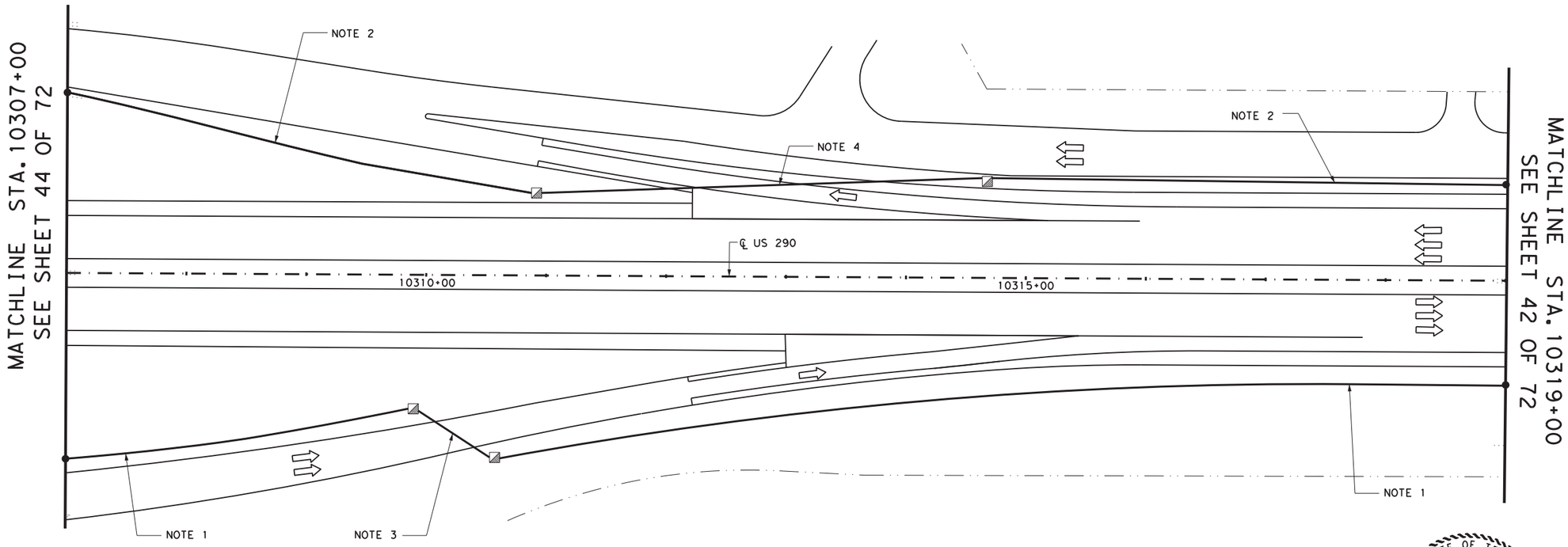
TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 42 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.					HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS						US290
DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
CK DW:			HOUSTON	HARRIS		0050	06	089	089	
TR:										
CK TR:										

NAME:ENTER DATA



1. EXISTING
   2-3" SCH.40 PVC/CCE (BORE)
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4"INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1(4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   IN COND.#1(4"INNERDUCT C)-1-6 STR SM FOC (CCTV#12)

3. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
   IN SCH.40 STEEL CASING

4. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   2-4" SCH. 80 MULTI-DUCT CONDUITS/CCE(BORE)
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
   IN SCH.40 STEEL CASING
   INSTALL
   IN COND.#1(4"INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1(4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
   IN COND.#1(4"INNERDUCT C)-1-6 STR SM FOC (CCTV#12)

SCALE: 1" = 100'

FILE NAME: US290_007_30.DGN

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23 , 2022

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TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 43 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS				089	US290
DW:									
CK DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
TR:									
CK TR:			HOUSTON	HARRIS		0050	06		090

NAME: ENTER DATA

1. EXISTING
2-3" SCH. 40 PVC/CCE
IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
2-3" SCH. 40 PVC/CCE
2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
IN COND.#1 (4" INNERDUCT C)-1-6 STR SM FOC(CCTV#12)

3. EXISTING
JUNCTION BOX
2-3" RMC (DOWN COLUMN)
2-4" MULTI-DUCT RMC (DOWN COLUMN)
INSTALL
IN COND.#1(4" INNERDUCT A)-1-144 STR SM FOC
IN COND.#1(4" INNERDUCT B)-1-6 STR SM FOC(CCTV#12)

4. EXISTING
JUNCTION BOX
2-3" RMC
2-4" RMC MULTI-DUCT
INSTALL
IN COND.#1(4" INNERDUCT A)-1-144 STR SM FOC
IN COND.#1(4" INNERDUCT B)-1-12 STR SM FOC (CCTV#14,BT#6,RVSD#6)
IN COND.#2(4" INNERDUCT A)-1-6 STR SM FOC (KERMIER TRAFFIC SIGNAL)
IN COND.#2(4" INNERDUCT B)-1-6 STR SM FOC (CCTV#15)

5. EXISTING
2-3" RMC (SUSPENDED BENEATH THE BRIDGE)
2-4" MULTI-DUCT RMC (SUSPENDED BENEATH THE BRIDGE)
IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND.#1(4"INNERDUCT A)-1-144 STR SM FOC
IN COND.#1(4"INNERDUCT C)-1-6 STR SM FOC(CCTV#12)

6. EXISTING
2-3" SCH 80 PVC (BORED)
2-4" MULTI-DUCT CONDUITS (BORED)
IN CONDUIT #1(3")- 1#8 BARE GROUNDING CONDUCTOR
IN SCH.40 STEEL CASING

7. EXISTING
2-3" SCH. 40 PVC/CCE
2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
IN COND.#1 (4" INNERDUCT C)-1-12 STR SM FOC (CCTV#14,BT#6,RVSD#6)
IN COND.#2 (4" INNERDUCT A)-1-6 STR SM FOC (KERMIER TRAFFIC SIGNAL)
IN COND.#2 (4" INNERDUCT B)-1-6 STR SM FOC (CCTV#15)

8. EXISTING
2-3" SCH. 40 PVC/CCE
2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
IN COND.#1 (4" INNERDUCT C)-1-12 STR SM FOC (CCTV#14,BT#6,RVSD#6)
IN COND.#2 (4" INNERDUCT A)-1-6 STR SM FOC (KERMIER TRAFFIC SIGNAL)
IN COND.#2 (4" INNERDUCT B)-1-6 STR SM FOC (CCTV#15)

9. EXISTING
2-3" SCH 80 PVC (BORED)
IN CONDUIT #1(3"),1# 8 BARE GROUNDING CONDUCTOR
IN SCH. 40 STEEL CASING

10. EXISTING
2-3" SCH. 40 PVC/CCE
IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR

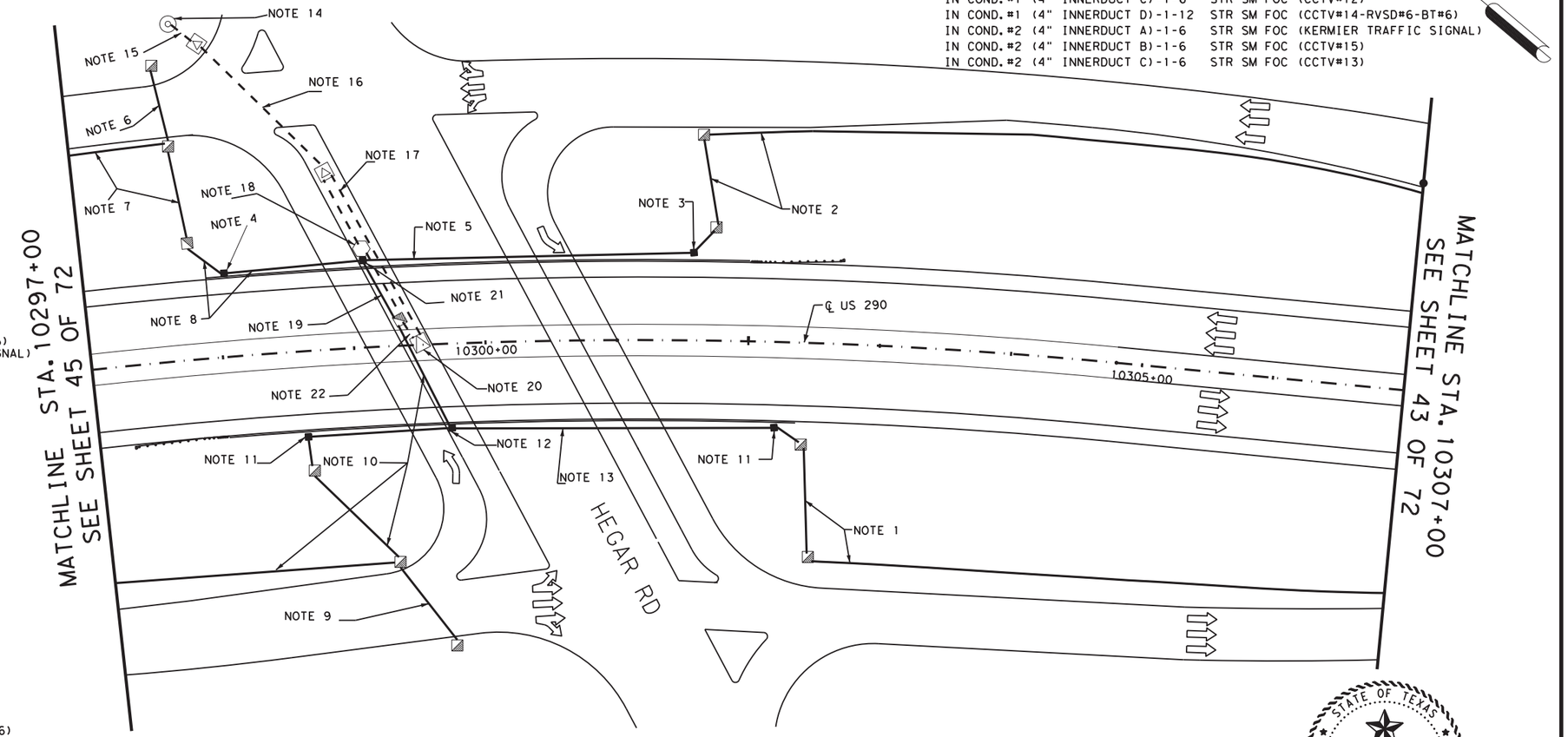
11. EXISTING
JUNCTION BOX
2-3" RMC

12. EXISTING
JUNCTION BOX
2-3" RMC (DOWN COLUMN)

13. EXISTING
2-3" RMC (SUSPENDED BENEATH THE BRIDGE)
IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR

14. INSTALL
SERVICE POLE D-15
2-2" SCH. 80 PVC TO NEW TY A GROUND BOX
IN COND.#1, 2#8XHHW, 1#8 BARE(CCTV#13 POWER)
IN COND.#2, 3#4XHHW, 1#4 BARE(HUB BUILDING POWER)

22. INSTALL
2-3" SCH. 40 PVC/CCE
2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
IN COND.#1 (4" INNERDUCT A)-2-144 STR SM FOC
IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
IN COND.#1 (4" INNERDUCT C)-1-6 STR SM FOC (CCTV#12)
IN COND.#1 (4" INNERDUCT D)-1-12 STR SM FOC (CCTV#14-RVSD#6-BT#6)
IN COND.#2 (4" INNERDUCT A)-1-6 STR SM FOC (KERMIER TRAFFIC SIGNAL)
IN COND.#2 (4" INNERDUCT B)-1-6 STR SM FOC (CCTV#15)
IN COND.#2 (4" INNERDUCT C)-1-6 STR SM FOC (CCTV#13)



16. INSTALL
2-2" SCH.80 PVC (BORED)
IN COND.#1,2#8XHHW, 1#8 BARE (CCTV#13 POWER)
IN COND.#2,3#4XHHW, 1#4 BARE (HUB BUILDING POWER)

17. INSTALL
1-2" SCH.80 PVC
IN COND.#1,3#4XHHW 1#4 BARE (HUB BUILDING POWER)

18. INSTALL (STA. 10299+50)
CCTV CAMERA#13
CCTV CAMERA SUPPORT POLE & FOUNDATION (55')
POLE MOUNTED CABINET (TY.2) (CONF.1)
CCTV FIELD EQUIPMENT
FIBER OPTIC VIDEO/DATA TX (S/M)
2-2" SCH. 80 PVC TO TY 1 GRD BOX
1-2" SCH. 80 PVC TO TY A GRD BOX
IN COND. #1
- 1-6 STR SM FOC (CCTV#13- TY 1 GRD BOX)
- 1#14 INSULATED CONDUCTOR
IN COND. #2 - 2#8XHHW, 1#8 BARE
(CCTV#13 POWER - TY A GRD BOX)

19. EXISTING
2-3" SCH. 40 PVC/CCE
2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND.#1 (4" INNERDUCT A)-2-144 STR SM FOC
IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
IN COND.#1 (4" INNERDUCT C)-1-6 STR SM FOC(CCTV#12)
IN COND.#1 (4" INNERDUCT D)-1-12 STR SM FOC(CCTV#14,BT#6,RVSD#6)
IN COND.#2 (4" INNERDUCT A)-1-6 STR SM FOC(KERMIER TRAFFIC SIGNAL)
IN COND.#2 (4" INNERDUCT B)-1-6 STR SM FOC(CCTV#15)

20. INSTALL (STA.10299+40)
COMMUNICATION HUB BUILDING
4 FIBER OPTIC VIDEO DATA RX'S (S/M)
4 VIDEO ENCODERS (SUPPLIED BY TXDOT)
1 ETHERNET FIELD SWITCH (SUPPLIED BY TXDOT)
2 ETHERNET TX (RVSD#6,BT#6)
1 FIBER OPTIC PATCH PANEL (144 POSITION)
1 FIBER OPTIC PATCH PANEL (12 POSITION)
4-3" SCH.80 PVC TO TYPE 1 G.B.
4-4" SCH.80 MULTI-DUCT CONDUITS TO TYPE 1 G.B.
1-2" SCH.80 PVC TO NEW TY A GRD BOX
IN COND.#1 (4" INNERDUCT A)-2-144 STR SM FOC
(4" INNERDUCT B)-1#14 INSULATED CONDUCTOR)
(4" INNERDUCT C)-1-6 STR SM FOC (CCTV#12)
(4" INNERDUCT D)-1-12 STR SM FOC (CCTV#14-RVSD#6-BT#6)
IN COND.#2 (4" INNERDUCT A)-1-6 STR SM FOC (KERMIER TRAFFIC SIGNAL)
(4" INNERDUCT B)-1-6 STR SM FOC (CCTV#15)
(4" INNERDUCT C)-1-6 STR SM FOC (CCTV#13)
IN COND.#2 (2",3#4XHHW, 1#4 BARE
(HUB BUILDING POWER - TY A GRD BOX)

15. INSTALL
2-2" SCH. 80 PVC
IN COND.#1, 2#8XHHW,1#8 BARE(CCTV#13 POWER)
IN COND.#2, 3#4XHHW,1#4 BARE(HUB BUILDING POWER)

21. EXISTING
JUNCTION BOX
2-3" RMC (DOWN COLUMN)
2-4" MULTI-DUCT RMC (DOWN COLUMN)
INSTALL
IN COND.#1 (4" INNERDUCT A)-2-144 STR SM FOC
IN COND.#1 (4" INNERDUCT B)-1-6 STR SM FOC (CCTV#12)
IN COND.#1 (4" INNERDUCT C)-1-12 STR SM FOC (CCTV#14,BT#6,RVSD#6)
IN COND.#2 (4" INNERDUCT A)-1-6 STR SM FOC (KERMIER TRAFFIC SIGNAL)
IN COND.#2 (4" INNERDUCT B)-1-6 STR SM FOC (CCTV#15)

SEE SHEET 35 OF 72
FOR LEGEND

FILE NAME: US290*007*29.DGN

NAME:ENTER DATA

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23 , 2022

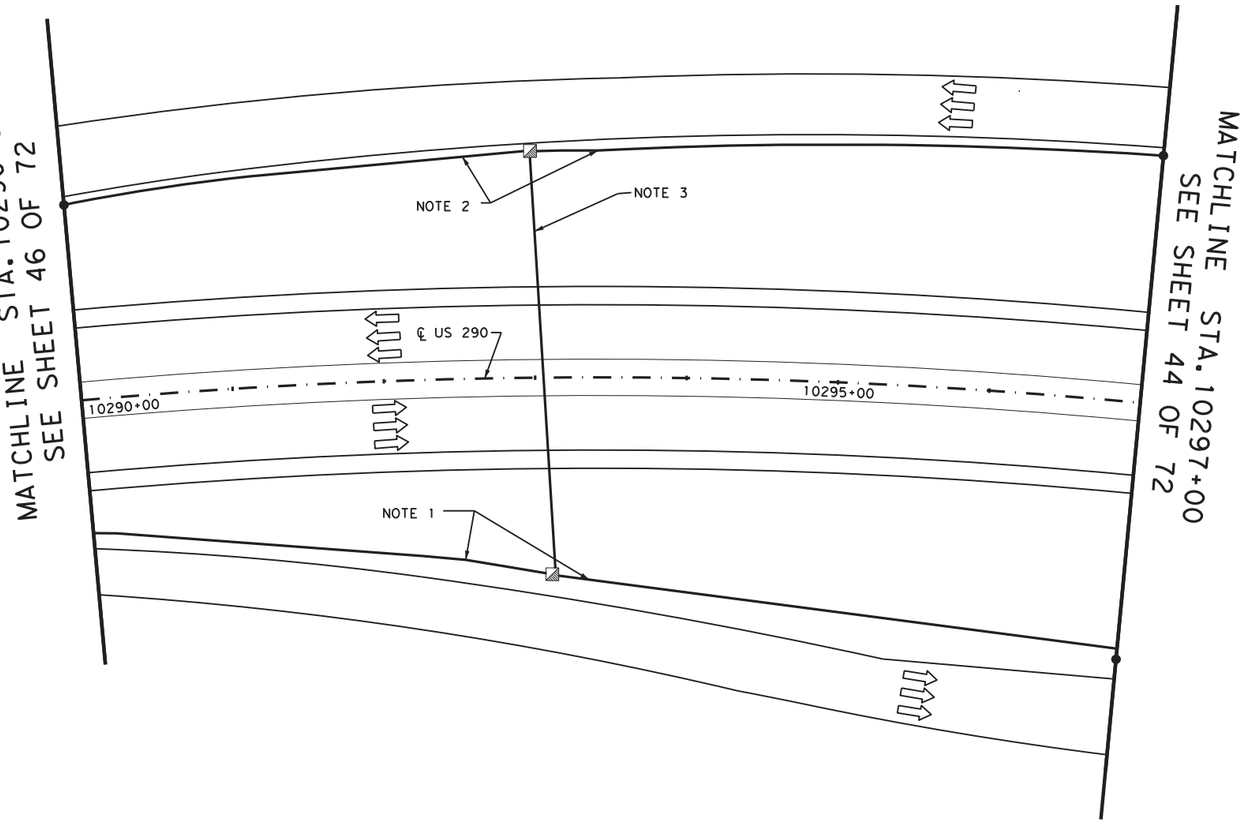
Kenneth Paradowski, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 44 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS				US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOUSTON	HARRIS	0050	06	089	091
TR:								
CK TR:								



LEGEND

- RIGHT OF WAY
- NEW CONDUIT
- EXISTING CONDUIT
- NEW GROUND BOX-TYPE 1
- EXISTING GROUND BOX-TYPE 1
- NEW ELECTRICAL GROUND BOX-TYPE A
- EXISTING ELECTRICAL GROUND BOX-TYPE A
- EXISTING CABINET
- NEW CABINET (DOOR ON DARKENED SIDE)
- NEW COMMUNICATIONS HUB BUILDING
- EXISTING COMMUNICATIONS HUB BUILDING
- NEW CCTV CAMERA
- EXISTING CCTV CAMERA
- NEW SERVICE POLE
- EXISTING SERVICE POLE
- EXISTING JUNCTION BOX (UNLESS OTHERWISE NOTED)
- [R] RADAR VEHICLE SENSING DEVICE
- [B] BLUETOOTH DEVICE
- EXISTING DYNAMIC MESSAGE SIGN
- NEW DYNAMIC MESSAGE SIGN
- METAL BEAM GUARD FENCE
- Ⓡ RADAR VEHICLE SENSING DEVICE POLE

1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1(4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
   IN COND.#1(4" INNERDUCT C)-1-12 STR SM FOC(CCTV#14,BT#6,RVSD#6)
   IN COND.#2(4" INNERDUCT A)-1-6 STR SM FOC(KERMIER TRAFFIC SIGNAL)
   IN COND.#2(4" INNERDUCT B)-1-6 STR SM FOC(CCTV#15)

3. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   2-4" SCH. 80 MULTI-DUCT CONDUITS/CCE(BORE)
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING

SEE SHEET 45 OF 72
FOR LEGEND

FILE NAME: US290_007_28.DGN

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

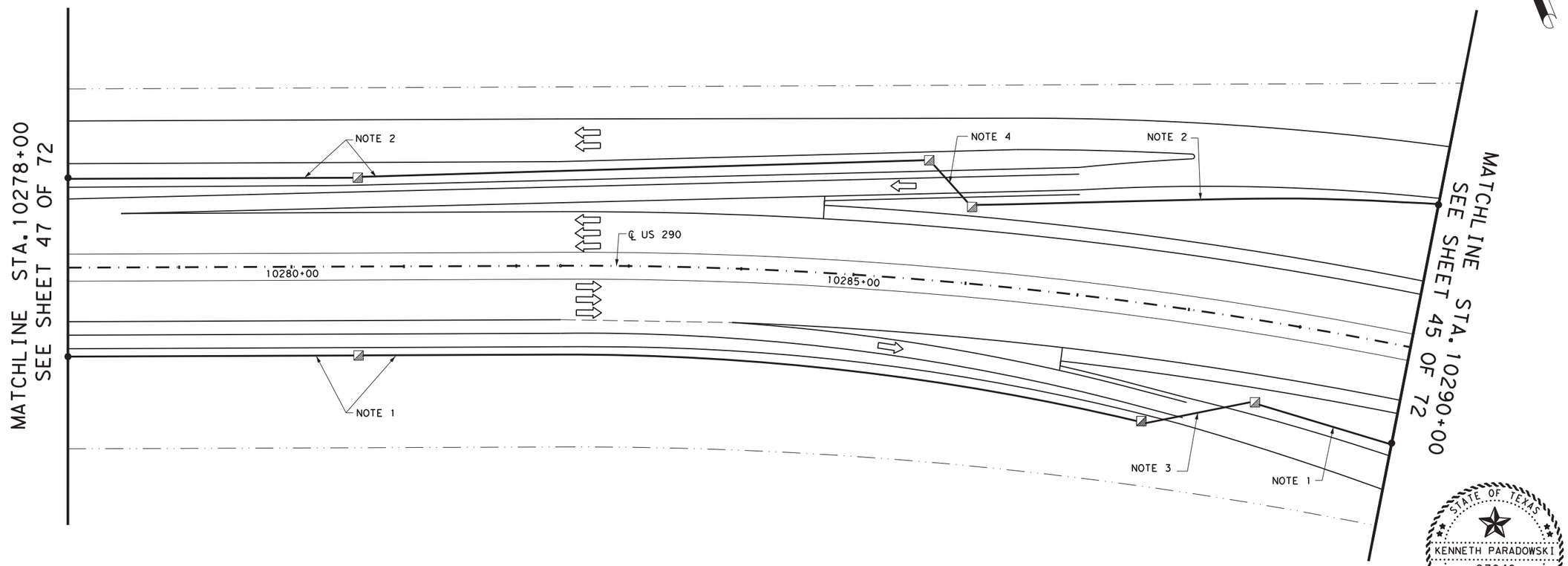
TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 45 OF 72

DN: SDS	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN: KBP	ORIGINAL	JUNE 21	6	TEXAS					US290
DW: RFB									
CK DW: ELP			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
TR:			HOUSTON	HARRIS	0050	06	089	092	
CK TR:									

NAME: ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1(4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
   IN COND.#1(4" INNERDUCT C)-1-12 STR SM FOC(CCTV#14-RVSD#6-BT#6)
   IN COND.#2(4" INNERDUCT A)-1-6 STR SM FOC(KERMIER TRAFFIC SIGNAL)
   IN COND.#2(4" INNERDUCT B)-1-6 STR SM FOC(CCTV#15)

3. EXISTING
   2-3" SCH.80 PVC/CCE (BORE)
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH.40 STEEL CASING

4. EXISTING
   2-3" SCH.80 PVC/CCE (BORE)
   2-4" SCH.80 MULTI-DUCT CONDUITS/CCE(BORE)
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH.40 STEEL CASING
   INSTALL
   IN COND.#1(4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1(4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
   IN COND.#1(4" INNERDUCT C)-1-12 STR SM FOC(CCTV#14-RVSD#6-BT#6)
   IN COND.#2(4" INNERDUCT A)-1-6 STR SM FOC(KERMIER TRAFFIC SIGNAL)
   IN COND.#2(4" INNERDUCT B)-1-6 STR SM FOC(CCTV#15)

SEE SHEET 45 OF 72
FOR LEGEND

FILE NAME: US290_007_27.DGN

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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Kenneth Paradowski, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 46 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
CK DW:			HOUSTON	HARRIS	0050	06	089		093
TR:									
CK TR:									

NAME:ENTER DATA

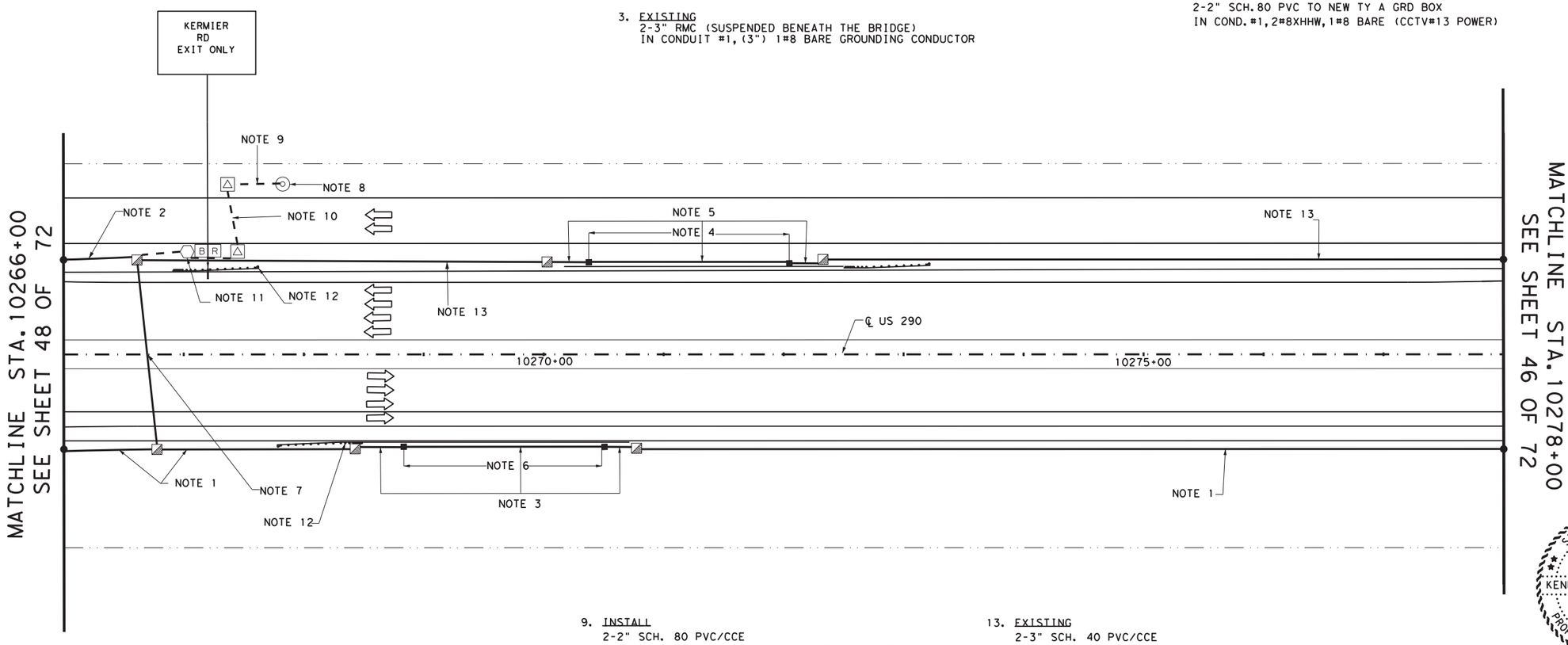
1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT.#1,(3") 1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH.40 PVC/CCE
   2-4" SCH.40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT #1(3")1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1(4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
   IN COND.#2(4" INNERDUCT A)-1-6 STR SM FOC(KERMIER TRAFFIC SIGNAL)
   IN COND.#2(4" INNERDUCT B)-1-6 STR SM FOC(CCTV#15)

3. EXISTING
   2-3" RMC (SUSPENDED BENEATH THE BRIDGE)
   IN CONDUIT #1,(3") 1#8 BARE GROUNDING CONDUCTOR

7. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   2-4" SCH. 80 MULTI-DUCT CONDUITS/CCE (BORE)
   IN CONDUIT #1 (3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH.40 STEEL CASING

8. INSTALL
   SERVICE POLE D-16
   2-2" SCH.80 PVC TO NEW TY A GRD BOX
   IN COND.#1,2#8XHHW,1#8 BARE (CCTV#13 POWER)



4. EXISTING
   JUNCTION BOX
   2-3" RMC
   2-4" RMC MULTI-DUCT
   INSTALL
   IN COND.#1 (4"INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1 (4"INNERDUCT B)-1-12 STR SM FOC(CCTV#14-RVSD#6-BT#6)
   IN COND.#2 (4"INNERDUCT A)-1-6 STR SM FOC(KERMIER TRAFFIC SIGNAL)
   IN COND.#2 (4"INNERDUCT B)-1-6 STR SM FOC(CCTV#15)

5. EXISTING
   2-3" RMC (SUSPENDED BENEATH THE BRIDGE)
   2-4" MULTI-DUCT RMC (SUSPENDED BENEATH THE BRIDGE)
   IN CONDUIT #1,(3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1(4" INNERDUCT B)-1-12 STR SM FOC(CCTV#14-RVSD#6-BT#6)
   IN COND.#2(4" INNERDUCT A)-1-6 STR SM FOC(KREMIER TRAFFIC SIGNAL)
   IN COND.#2(4" INNERDUCT B)-1-6 STR SM FOC(CCTV#15)

6. EXISTING
   JUNCTION BOX
   2-3" RMC

9. INSTALL
   2-2" SCH. 80 PVC/CCE
   IN COND.#1,2#8XHHW,1#8 BARE (CCTV#14 POWER)

10. INSTALL
    2-2" SCH. 80 PVC (BORED)
    IN NEW SCH. 40 STEEL CASING
    IN COND.#1,2#8XHHW,1#8 BARE (CCTV#14 POWER)

11. INSTALL (STA. 10267+00)
    CCTV CAMERA #14 / BEHIND THE KERMIER ROADWAY SIGN
    CCTV CAMERA SUPPORT POLE & FOUNDATION (55')
    POLE MOUNTED CABINET (TY.2)(CONF.1)
    CCTV FIELD EQUIPMENT
    1 RVSD FIELD EQUIPMENT(RVSD#6)
    1 BLUETOOTH FIELD EQUIPMENT(BT#6) ①
    2 ETHERNET TX (RVSD#6,BT#6) ①
    FIBER OPTIC VIDEO/DATA TX (S/M)
    1 FIBER OPTIC PATCH PANEL (12 POSITION)
    2-2" SCH.80 PVC TO TY 1 GRD BOX
    1-2" SCH.80 PVC TO TY A GRD BOX
    IN COND.#1
    - 1-12 STR SM FOC (CCTV#14- TY 1 GRD BOX)
    - 1#14 INSULATED CONDUCTOR
    IN COND.#2,2#8XHHW,1#8 BARE
    (CCTV#14 POWER - TY A GRD BOX)

12. EXISTING
    M.B.G.F WITH G.E.T AND DOWNSTREAM ANCHOR TERMINAL

13. EXISTING
    2-3" SCH. 40 PVC/CCE
    2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
    IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
    INSTALL
    IN COND.#1(4"INNERDUCT A)-1-144 STR SM FOC
    IN COND.#1(4"INNERDUCT B)-1#14 INSULATED CONDUCTOR
    IN COND.#1(4"INNERDUCT C)-1-12 STR SM FOC (CCTV#14-RVSD#6-BT#6)
    IN COND.#2(4"INNERDUCT A)-1-6 STR SM FOC (KERMIER TRAFFIC SIGNAL)
    IN COND.#2(4"INNERDUCT B)-1-6 STR SM FOC (CCTV#15)

SEE SHEET 40 OF 72
FOR LEGEND
① SUPPLIED BY TXDOT

FILE NAME: US290_007_26.DGN

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

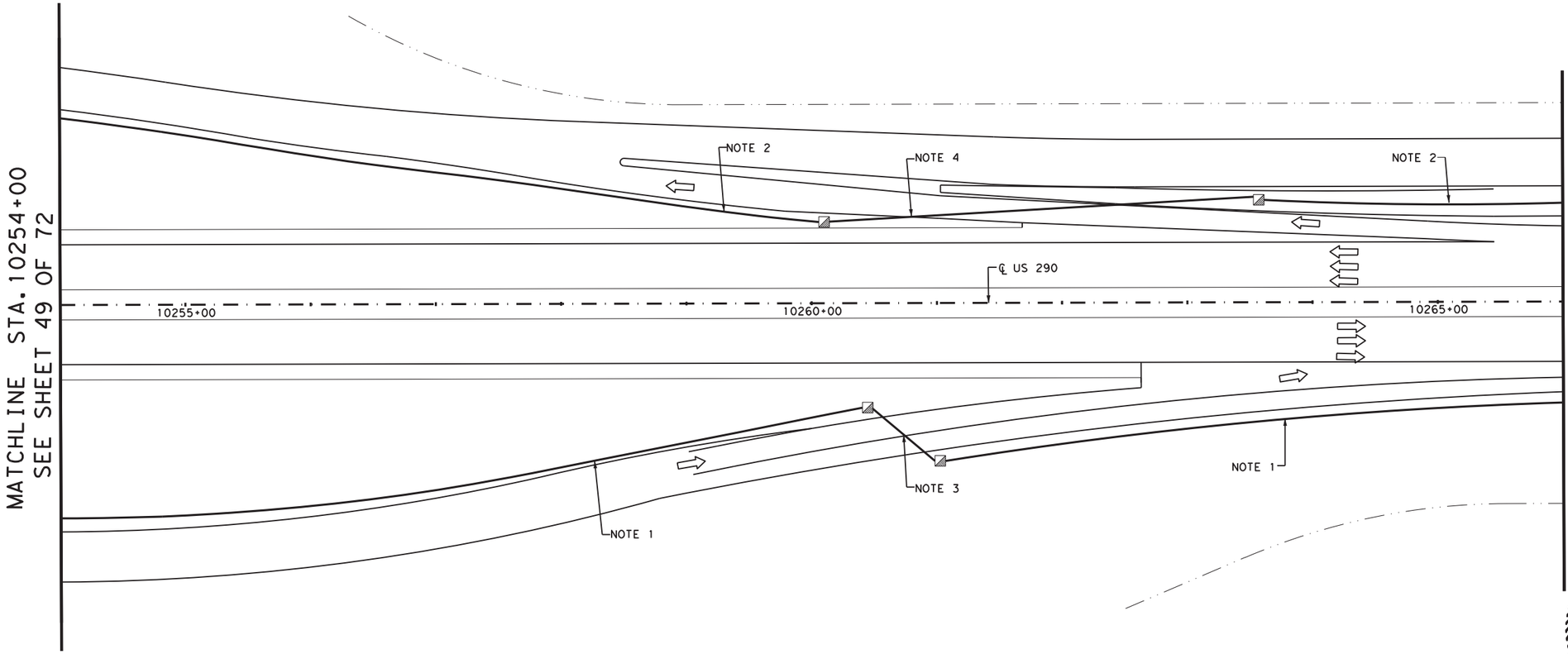
TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 47 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.	HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS		US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO. / SECTION NO. / JOB NO.	SHEET NO.
CK DW:			HOUSTON	HARRIS	0050 / 06 / 089	094
TR:						
CK TR:						

NAME:ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT#1 (3"),1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH.40 PVC/CCE
   2-4" SCH.40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT#1 (3")1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
   IN COND.#2 (4" INNERDUCT A)-1-6 STR SM FOC(KERMIER TRAFFIC SIGNAL)
   IN COND.#2 (4" INNERDUCT B)-1-6 STR SM FOC (CCTV#15)

3. EXISTING
   2-3" SCH.80 PVC/CCE (BORE)
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH.40 STEEL CASING

4. EXISTING
   2-3" SCH.80 PVC/CCE (BORE)
   2-4" SCH.80 MULTI-DUCT CONDUITS/CCE (BORE)
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH.40 STEEL CASING
   INSTALL
   IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
   IN COND.#2 (4" INNERDUCT A)-1-6 STR SM FOC(KERMIER TRAFFIC SIGNAL)
   IN COND.#2 (4" INNERDUCT B)-1-6 STR SM FOC (CCTV#15)

LEGEND

- RIGHT OF WAY
- NEW CONDUIT
- EXISTING CONDUIT
- NEW GROUND BOX-TYPE 1
- EXISTING GROUND BOX-TYPE 1
- NEW ELECTRICAL GROUND BOX-TYPE A
- EXISTING ELECTRICAL GROUND BOX-TYPE A
- EXISTING CABINET
- NEW CABINET (DOOR ON DARKENED SIDE)
- NEW COMMUNICATIONS HUB BUILDING
- EXISTING COMMUNICATIONS HUB BUILDING
- NEW CCTV CAMERA
- EXISTING CCTV CAMERA
- NEW SERVICE POLE
- EXISTING SERVICE POLE
- EXISTING JUNCTION BOX (UNLESS OTHERWISE NOTED)
- [R] RADAR VEHICLE SENSING DEVICE
- [B] BLUETOOTH DEVICE
- EXISTING DYNAMIC MESSAGE SIGN
- NEW DYNAMIC MESSAGE SIGN
- METAL BEAM GUARD FENCE
- (R) RADAR VEHICLE SENSING DEVICE POLE

SCALE: 1" = 100'

FILE NAME: US290_007_25.DGN

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 48 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21							
DW:			6	TEXAS					US290
CK DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
TR:			HOUSTON	HARRIS	0050	06	089	095	
CK TR:									

NAME:ENTER DATA

1. EXISTING
2-3" SCH. 40 PVC/CCE
IN CONDUIT#1 (3"), 1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
2-3" SCH. 40 PVC/CCE
2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
IN CONDUIT#1 (3"), 1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR

3. EXISTING
JUNCTION BOX
2-3" RMC
2-4" RMC MULTI-DUCT
INSTALL
IN COND.#1(4" INNERDUCT A)-1-144 STR SM FOC

4. EXISTING
2-3" RMC (SUSPENDED BENEATH THE BRIDGE)
2-4" MULTI-DUCT RMC (SUSPENDED BENEATH THE BRIDGE)
IN CONDUIT#1 (3"),1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
IN COND.#1 (4" INNERDUCT B)-1-6 STR SM FOC (CCTV#15)

5. EXISTING
JUNCTION BOX
2-3" RMC (DOWN COLUMN)
2-4" MULTI-DUCT RMC (DOWN COLUMN)
INSTALL
IN COND.#1,(4" INNERDUCT A)-1-6 STR SM FOC (CCTV#15)

6. EXISTING
2-3" SCH 80 PVC (BORED)
2-4" MULTI-DUCT CONDUITS (BORED)
IN CONDUIT #1 (3"),1#8 BARE GROUNDING CONDUCTOR
IN SCH. 40 STEEL CASING

7. EXISTING
JUNCTION BOX
2-3" RMC

8. EXISTING
JUNCTION BOX
2-3" RMC (DOWN COLUMN)

9. EXISTING
2-3" RMC (SUSPENDED BENEATH THE BRIDGE)
IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR

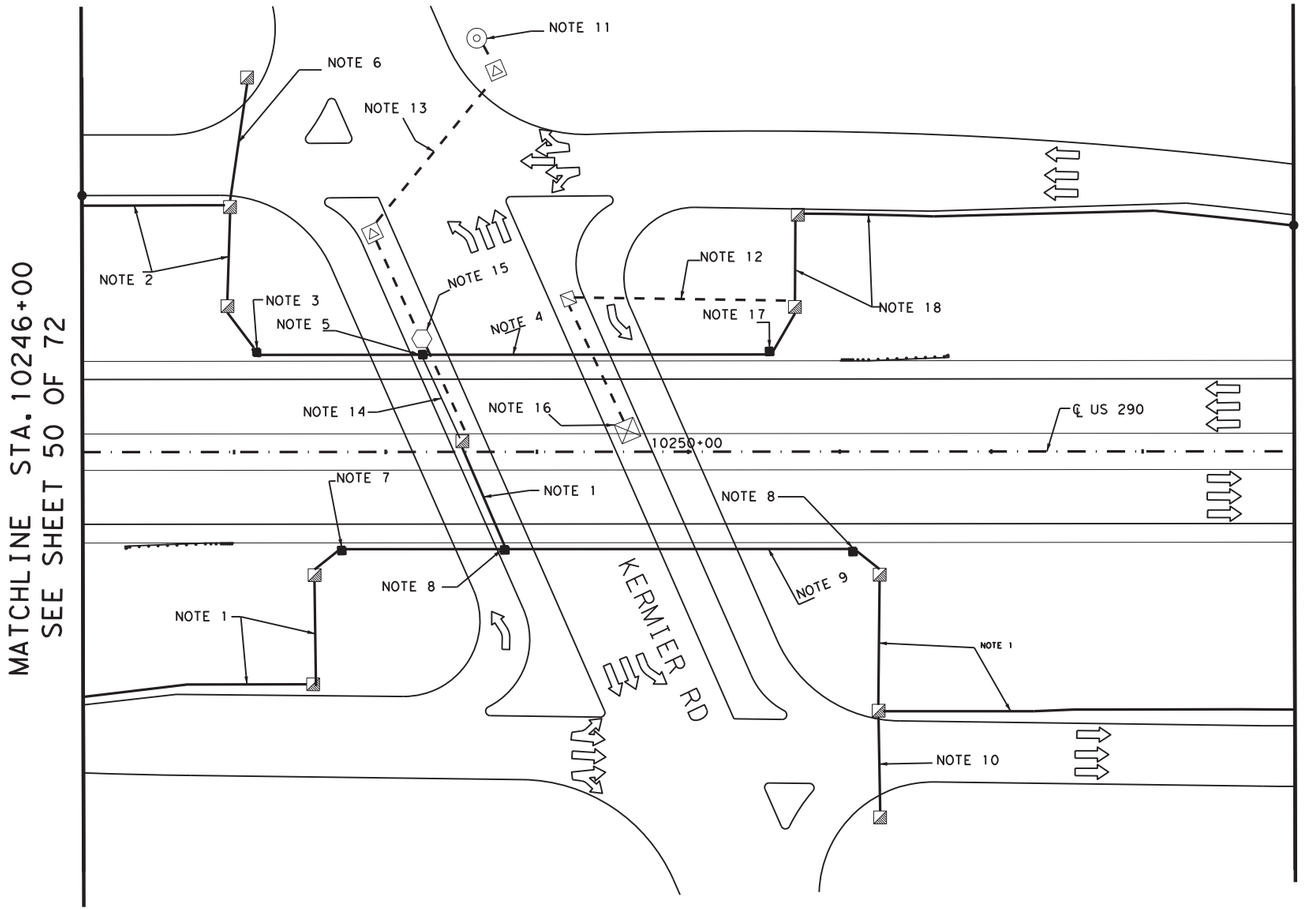
10. EXISTING
2-3" SCH 80 PVC (BORED)
IN CONDUIT#1 (3"), 1# 8 BARE GROUNDING CONDUCTOR
IN SCH. 40 STEEL CASING

11. INSTALL
SERVICE POLE D-17
2-2" SCH.80 PVC TO NEW TY A GRD BOX
IN COND.#1,2#8XHHW,1#8 BARE (CCTV#15 POWER)

12. INSTALL
2-3" SCH. 80 PVC (BORED)
IN COND.#1,(3")-1#14 INSULATED CONDUCTOR
IN COND.#2,(3")-1-6 STR SM FOC (KERMIER TRAFFIC SIGNAL)

13. INSTALL
2-2" SCH 80 PVC (BORED)
IN NEW SCH.40 STEEL CASING
IN COND.#1, 2#8XHHW, 1#8 BARE (CCTV#15 POWER)

14. EXISTING
2-3" SCH. 40 PVC/CCE
2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
IN COND.#1(3").1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND.#2(4" INNERDUCT A)-1-6 STR SM FOC (CCTV#15)



15. INSTALL (STA. 10248+50)
CCTV CAMERA#15
CCTV CAMERA SUPPORT POLE & FOUNDATION (55')
POLE MOUNTED CABINET (TY.2)(CONF.1)
CCTV FIELD EQUIPMENT
FIBER OPTIC VIDEO/DATA TX (S/M)
2-2" SCH. 80 PVC TO TY 1 GRD BOX
1-2" SCH. 80 PVC TO TY A GRD BOX
IN COND. #1
- 1-6 STR SM FOC (CCTV#15-TY.1 GRD BOX)
- 1#14 INSULATED CONDUCTOR
IN COND. #2 , 2#8XHHW, 1#8 BARE
(CCTV#15 POWER-TY.A GRD BOX)

16. EXISTING
TRAFIC SIGNAL CONTROLLER CABINET & EQUIPMENT
INSTALL
1-2" SCH.80 PVC TO TY.1 GRD.BOX
1-6 STR SM FOC (KERMIER TRAFFIC SIGNAL)

17. EXISTING
JUNCTION BOX
2-3" RMC
2-4" RMC MULTI-DUCT
INSTALL
IN COND.#1(4" INNERDUCT A)-1-144 STR SM FOC
IN COND.#1(4" INNERDUCT B)-1-6 STR SM FOC (CCTV#15)

18. EXISTING
2-3" SCH. 40 PVC/CCE
2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
IN CONDUIT#1 (3"), 1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
IN COND.#2 (4" INNERDUCT A)-1-6 STR SM FOC(KERMIER TRAFFIC SIGNAL)
IN COND.#2 (4" INNERDUCT B)-1-6 STR SM FOC(CCTV#15)

SEE SHEET 45 OF 72
FOR LEGEND

FILE NAME: US290_007_24.DGN

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED
PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

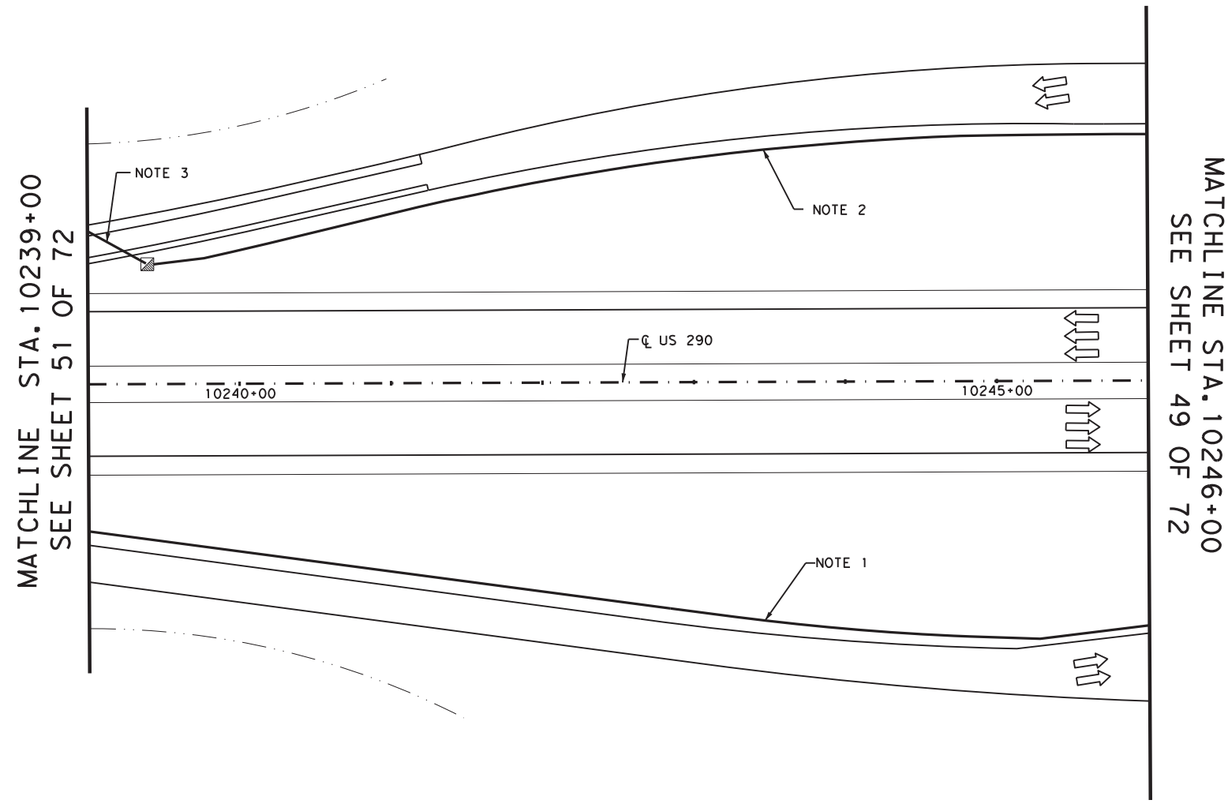
TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 49 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:									
CK DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
TR:			HOUSTON	HARRIS	0050	06	089	096	
CK TR:									

NAME:ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1(4" INNERDUCT B)-1#14 INSULATED CONDUCTOR

3. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   2-4" SCH. 80 MULTI-DUCT CONDUITS/CCE (BORE)
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING
   INSTALL
   IN COND.#1(4"INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1(4"INNERDUCT B)-1#14 INSULATED CONDUCTOR

SEE SHEET 55 OF 72
FOR LEGEND

FILE NAME: US290_007_23.DGN

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TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 50 OF 72

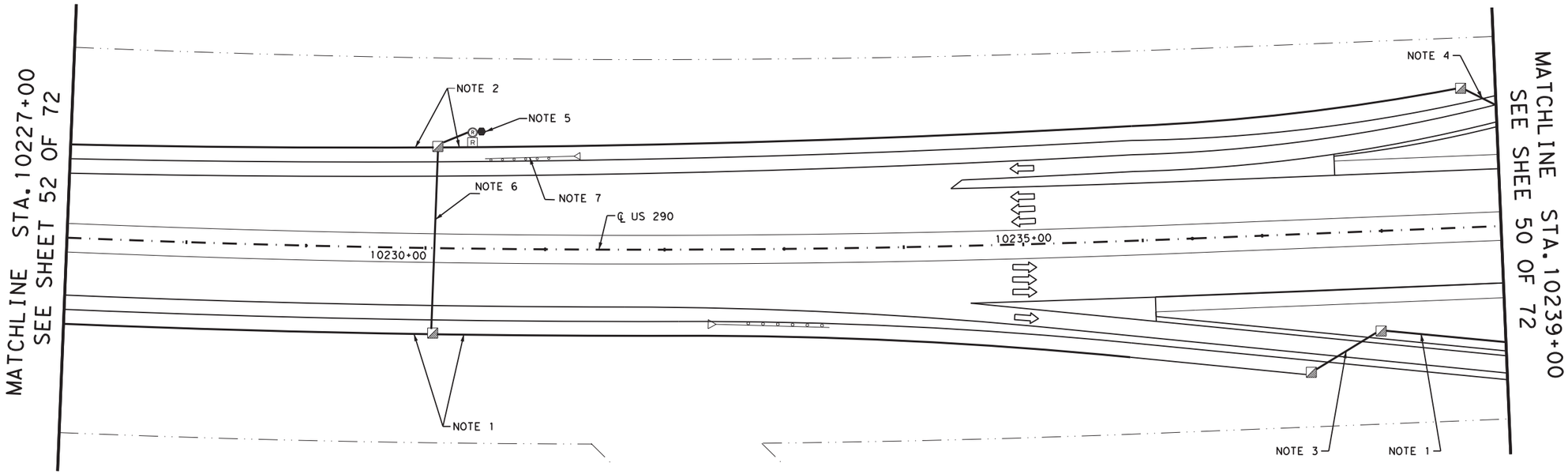
DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS				US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOUSTON	HARRIS	0050	06	089	097
TR:								
CK TR:								

NAME:ENTER DATA

1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR

3. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING



4. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   2-4" SCH. 80 MULTI-DUCT CONDUITS/CCE (BORE)
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING
   INSTALL
   IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR

5. EXISTING RVSD AT (RELOCATED FROM STA.10226+75) STA. 10059+63
   2-2" SCH. 80 PVC TO GRD
   BLUETOOTH / ANTENNA EQUIPMENT
   RADAR VEHICLE SENSING DEVICE (RVSD)
   RVSD CABINET
   RS-232 DATA MODEM (RVSD)
   SOLAR PANELS
   RADAR VEHICLE SENSING DEVICE SUPPORT POLE & FOUNDATION (25')
   RADAR VEHICLE SENSING DEVICE MOUNTED ON THE POLE
   HURRICANE EVACUATION CAMERA (MOUNT ON DEVICE SUPPORT POLE) ①
   HURRICANE EVACUATION CAMERA CONTROL CABLES ①

6. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   2-4" SCH. 80 MULTI-DUCT CONDUITS/CCE (BORE)
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING

7. EXISTING
   M.B.G.F WITH G.E.T AND DOWNSTREAM ANCHOR TERMINAL

NOTES:
① ALL EQUIPMENT AT THIS LOCATION TO BE REMOVED AND SALVAGED AFTER PERMANENT SYSTEM IS INSTALLED

SPECIAL NOTE:
REMOVE AND RELOCATE ALL EQUIPMENT SHOWN IN THE PLANS TO A LOCATION SPECIFIED BY THE ENGINEER. REPLACE ANY MATERIAL DAMAGED AT NO COST TO THE DEPARTMENT. REMOVAL OF ALL EQUIPMENT TO BE SALVAGED TO A LOCATION WITHIN THE PROJECT LIMITS WILL NOT BE PAID FOR DIRECTLY BUT CONSIDERED INCIDENTAL TO THE VARIOUS BID ITEMS.

SEE SHEET 55 OF 72
FOR LEGEND

FILE NAME: US290_007_22.DGN

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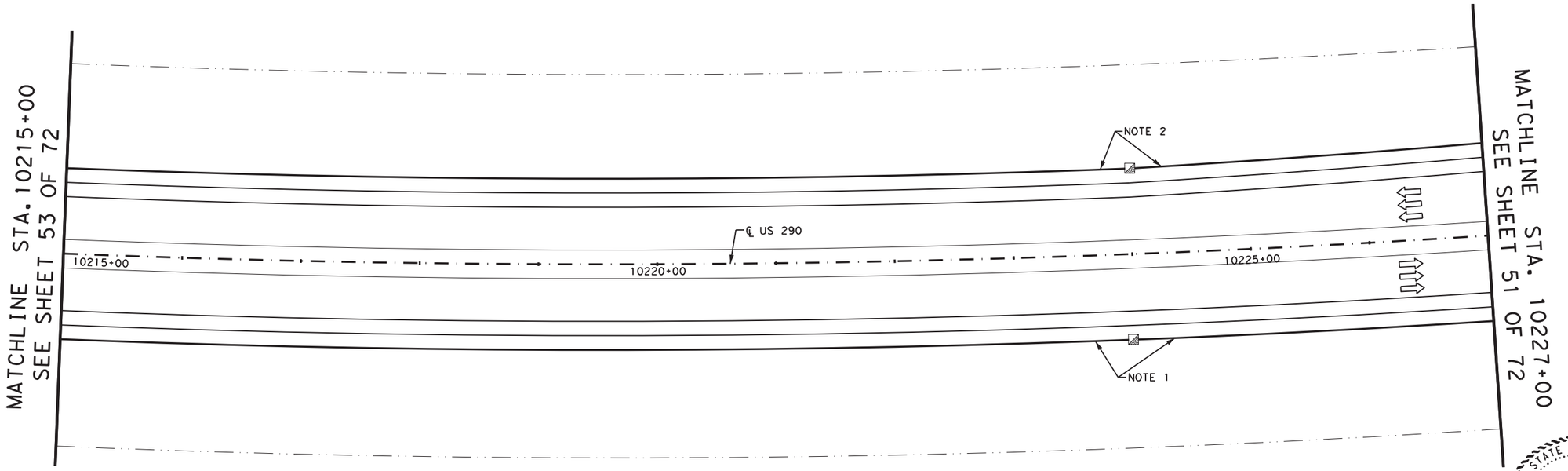
TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 51 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
CK DW:			HOUSTON	HARRIS	0050	06	089	098	
TR:									
CK TR:									

NAME: ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT #1 (3") 1#8 BARE GROUNDING CONDUCTOR

2 EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT #1 (3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR

SEE SHEET 55 OF 72
FOR LEGEND

FILE NAME: US290_014_21.DGN

STATE OF TEXAS
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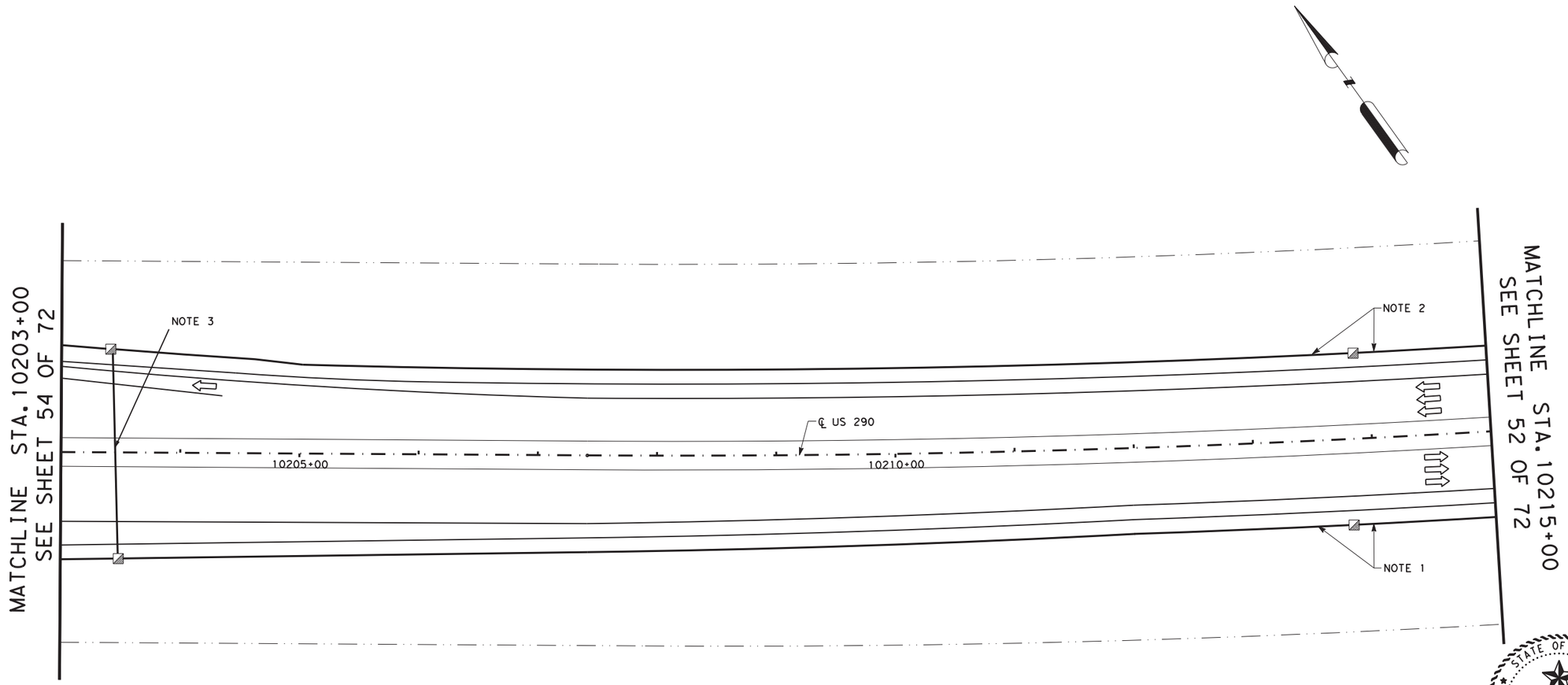
TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 52 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
CK DW:			HOUSTON	HARRIS	0050	06	089	099	
TR:									
CK TR:									

NAME:ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT #1 (3") 1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT #1 (3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR

3. EXISTING
   2-3" SCH.80 PVC/CCE (BORE)
   2-4" SCH.80 MULTI-DUCT CONDUITS/CCE (BORE
   IN CONDUIT#1 (3")1#8 BARE GROUNDING CONDUCTOR
   IN SCH.40 STEEL CASING

STATE OF TEXAS
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SCALE: 1" = 100'

FILE NAME: US290_007_20.DGN

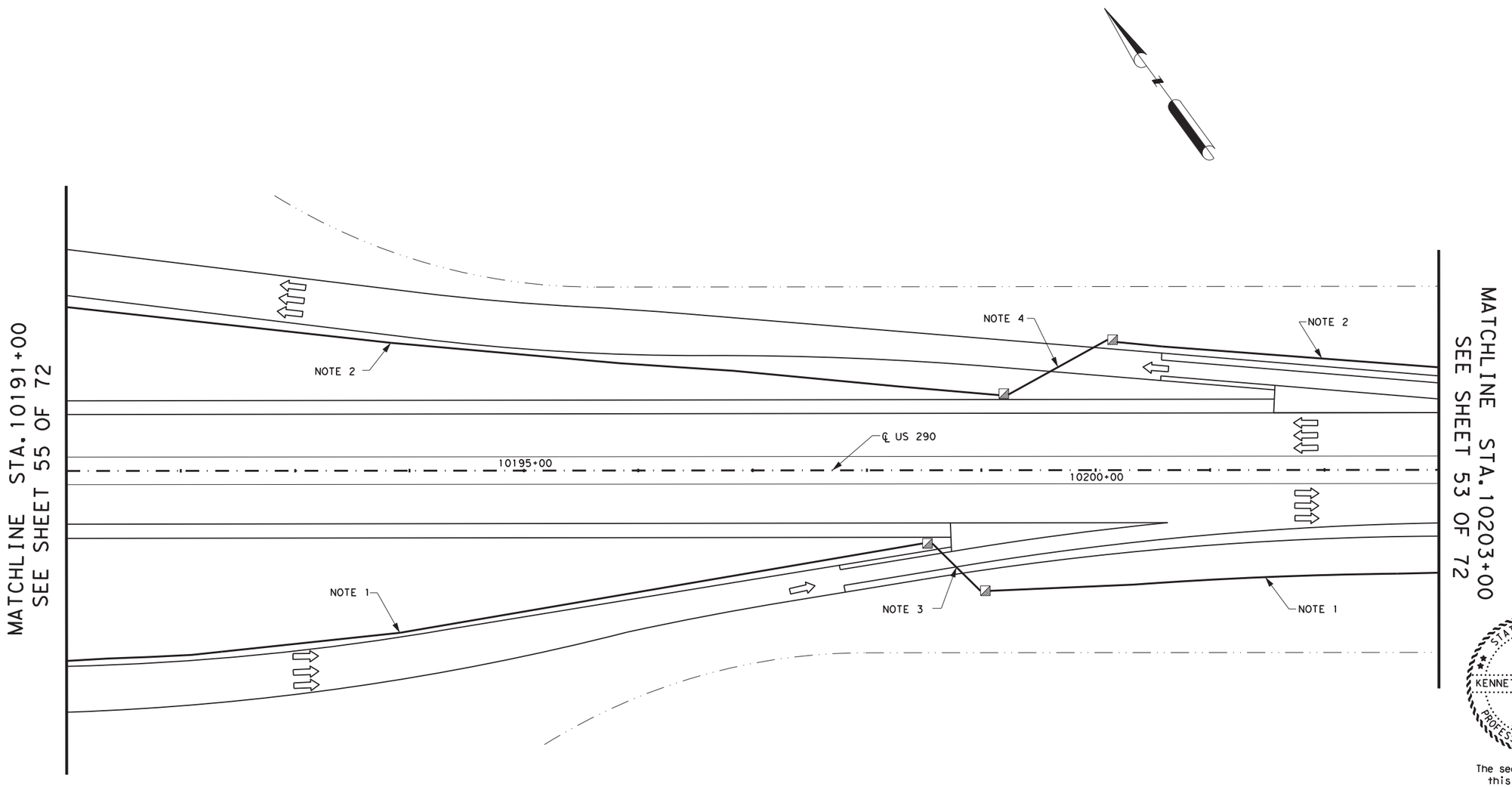
TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 53 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
CK DW:			HOUSTON	HARRIS	0050	06	089		100
TR:									
CK TR:									

NAME: ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1(4"INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1(4"INNERDUCT B)-1#14 INSULATED CONDUCTOR

3. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
   IN SCH.40 STEEL CASING

4. EXISTING
   2-3" SCH.80 PVC/CCE (BORE)
   2-4" SCH.80 MULTI-DUCT CONDUITS/CCE (BORE)
   IN CONDUIT#1(3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH.40 STEEL CASING
   INSTALL
   IN COND.#1(4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1(4" INNERDUCT B)-1#14 INSULATED CONDUCTOR

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SEE SHEET 55 OF 72
FOR LEGEND

FILE NAME: US290_007_19.DGN

TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 54 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21							
DW:			6	TEXAS					US290
CK DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
TR:									
CK TR:			HOUSTON	HARRIS		0050	06	089	101

NAME: ENTER DATA

1. EXISTING
2-3" SCH. 40 PVC/CCE
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
2-3" SCH.40 PVC/CCE
2-4" SCH.40 MULTI-DUCT CONDUITS/CCE
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND.#1(4"INNERDUCT A)-1-144 STR SM FOC
IN COND.#1(4"INNERDUCT B)-1#14 INSULATED CONDUCTOR

3. EXISTING
JUNCTION BOX
2-3" RMC
2-4" RMC MULTI-DUCT
INSTALL
IN COND.#1(4"INNERDUCT A)-1-144 STR SM FOC

4. EXISTING
2-3" RMC (SUSPENDED BENEATH THE BRIDGE)
2-4" MULTI-DUCT RMC (SUSPENDED BENEATH THE BRIDGE)
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND.#1(4" INNERDUCT A)-1-144 STR SM FOC

5. EXISTING
JUNCTION BOX
2-3" RMC (DOWN COLUMN)
2-4" MULTI-DUCT RMC (DOWN COLUMN)

6. EXISTING
2-3" SCH 80 PVC (BORED)
2-4" MULTI-DUCT CONDUITS (BORED)
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
IN SCH.40 STEEL CASING

7. EXISTING
JUNCTION BOX
2-3" RMC

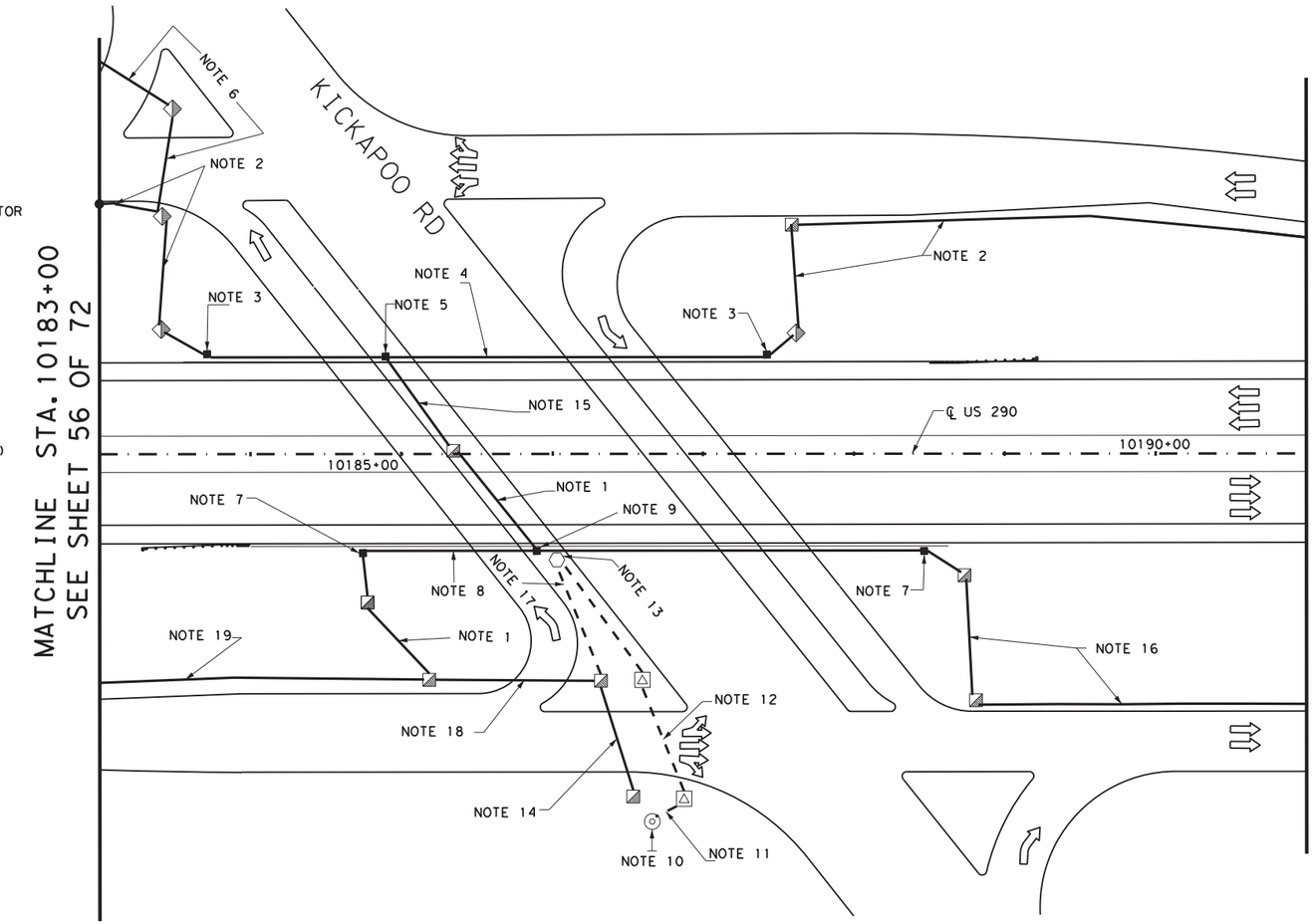
8. EXISTING
2-3" RMC (SUSPENDED BENEATH THE BRIDGE)
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR

9. EXISTING
JUNCTION BOX
2-3" RMC (DOWN COLUMN)

10. INSTALL
SERVICE POLE D-18
2-2" SCH.80 PVC TO NEW TY A GRD BOX
IN COND.#1,2#8XHHW,1#8 BARE (CCTV#16 POWER)

11. INSTALL
2-2" SCH.80 PVC/CCE
IN COND.#1,2#8XHHW,1#8 BARE (CCTV#16 POWER)

12. INSTALL
2-2" SCH 80 PVC (BORED)
IN COND.#1,2#8XHHW,1#8 BARE (CCTV#16 POWER)



13. INSTALL (STA.10185+50)
CCTV CAMERA #16
CCTV CAMERA SUPPORT POLE & FOUNDATION (55')
POLE MOUNTED CABINET (TY.2)(CONF.1)
CCTV FIELD EQUIPMENT
FIBER OPTIC VIDEO/DATA TX (S/M)
2-2" SCH. 80 PVC TO TY 1 GRD BOX
1-2" SCH. 80 PVC TO TY A GRD BOX
IN COND.#1
- 1-6 STR SM FOC (CCTV#16-TY.1 GRD BOX)
- 1#14 INSULATED CONDUCTOR
IN COND.#2,2#8XHHW, 1#8 BARE
(CCTV#16 POWER-TY.A GRD BOX)

14. EXISTING
2-3" SCH 80 PVC (BORED)
IN CONDUIT#1(3")1# 8 BARE GROUNDING CONDUCTOR
IN SCH.40 STEEL CASING

15. EXISTING
2-3" SCH.40 PVC/CCE
2-4" SCH.40 MULTI-DUCT CONDUITS/CCE
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR

16. EXISTING
2-3" SCH. 40 PVC/CCE
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR

17. INSTALL
2-2" SCH.80 PVC/CCE
IN COND.#1,1-6 STR FOC SM (CCTV#16)

18. EXISTING
2-3" SCH. 80 PVC (BORED)
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND.#2,1-6 STR SM FOC (CCTV#16)

19. EXISTING
2-3" SCH. 40 PVC/CCE
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND.#2,1-6 STR SM FOC (CCTV#16)

FILE NAME: US290_007_18.DGN

LEGEND

- RIGHT OF WAY
- NEW CONDUIT
- EXISTING CONDUIT
- NEW GROUND BOX-TYPE 1
- EXISTING GROUND BOX-TYPE 1
- NEW ELECTRICAL GROUND BOX-TYPE A
- EXISTING ELECTRICAL GROUND BOX-TYPE A
- EXISTING CABINET
- NEW CABINET (DOOR ON DARKENED SIDE)
- NEW COMMUNICATIONS HUB BUILDING
- EXISTING COMMUNICATIONS HUB BUILDING
- NEW CCTV CAMERA
- EXISTING CCTV CAMERA
- NEW SERVICE POLE
- EXISTING SERVICE POLE
- EXISTING JUNCTION BOX (UNLESS OTHERWISE NOTED)
- [R] RADAR VEHICLE SENSING DEVICE
- [B] BLUETOOTH DEVICE
- EXISTING DYNAMIC MESSAGE SIGN
- NEW DYNAMIC MESSAGE SIGN
- METAL BEAM GUARD FENCE
- (R) RADAR VEHICLE SENSING DEVICE POLE

STATE OF TEXAS
KENNETH PARADOWSKI
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PROFESSIONAL ENGINEER

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TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 55 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS				US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOUSTON	HARRIS	0050	06	089	102
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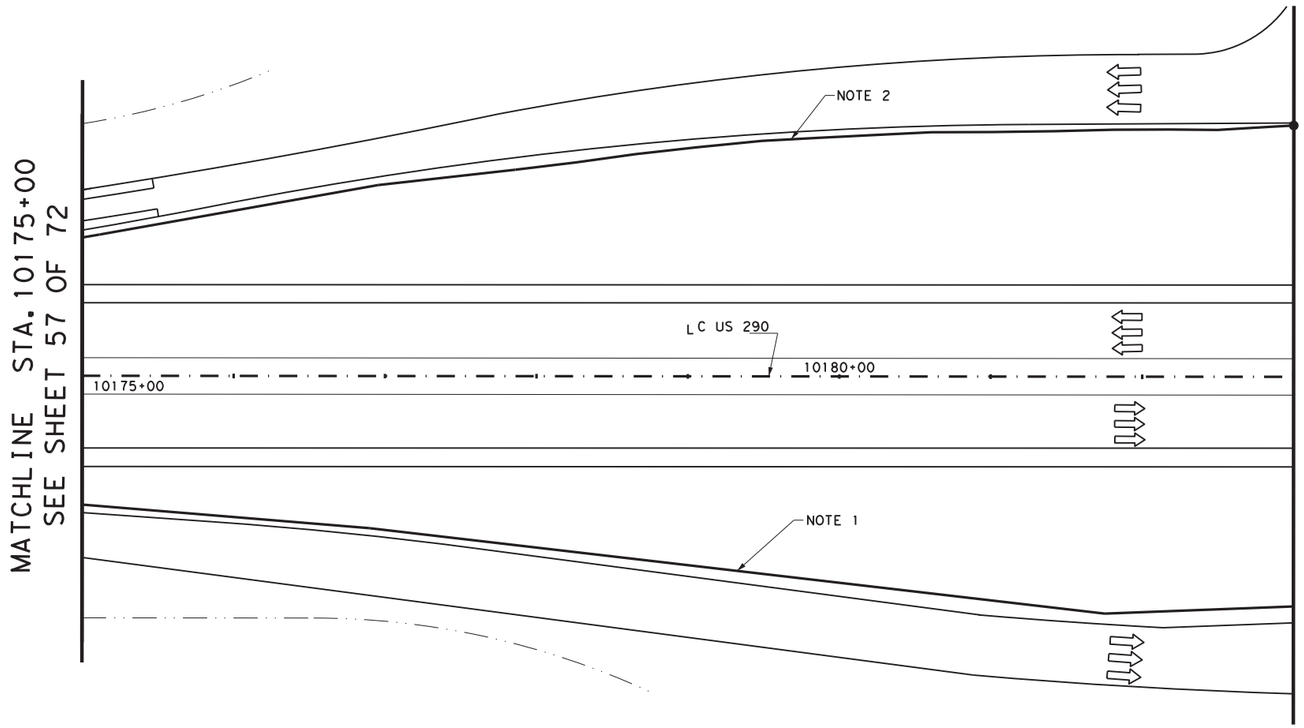
NAME:ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #2, 1-6 STR SM FOC(CCTV#16)

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4" INNERDUCT A)-1-144 STR SM FOC
   IN COND. #1(4" INNERDUCT B)-1#14 INSULATED CONDUCTOR

SEE SHEET 55 OF 72
FOR LEGEND

FILE NAME: US290_007_17.DGN

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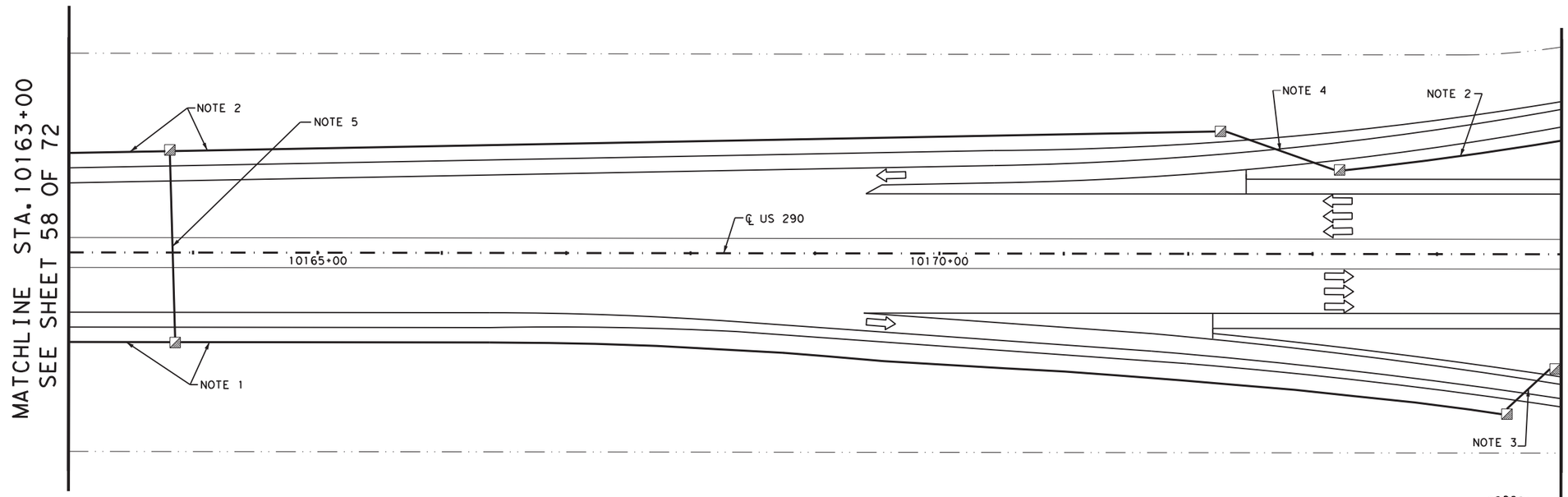
TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 56 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS				US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOUSTON	HARRIS	0050	06	089	103
TR:								
CK TR:								

NAME: ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN CONDUIT. #2, 1-6 STR SM FOC (CCTV#16)

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR SM FOC
   IN COND. #1(4 INNERDUCT B)-1#14 INSULATED CONDUCTOR

3. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING
   INSTALL
   IN CONDUIT. #2, 1-6 STR SM FOC (CCTV#16)

4. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   2-4" SCH. 80 MULTI-DUCT CONDUITS/CCE (BORE)
   IN CONDUIT #1(3")1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING
   INSTALL
   IN COND. #1(4" INNERDUCT A)-1-144 STR SM FOC
   IN COND. #1(4" INNERDUCT B)-1#14 INSULATED CONDUCTOR

5. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   2-4" SCH. 80 MULTI-DUCT CONDUITS/CCE (BORE)
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING

SEE SHEET 55 OF 72
FOR LEGEND

FILE NAME: US290_007_16.DGN

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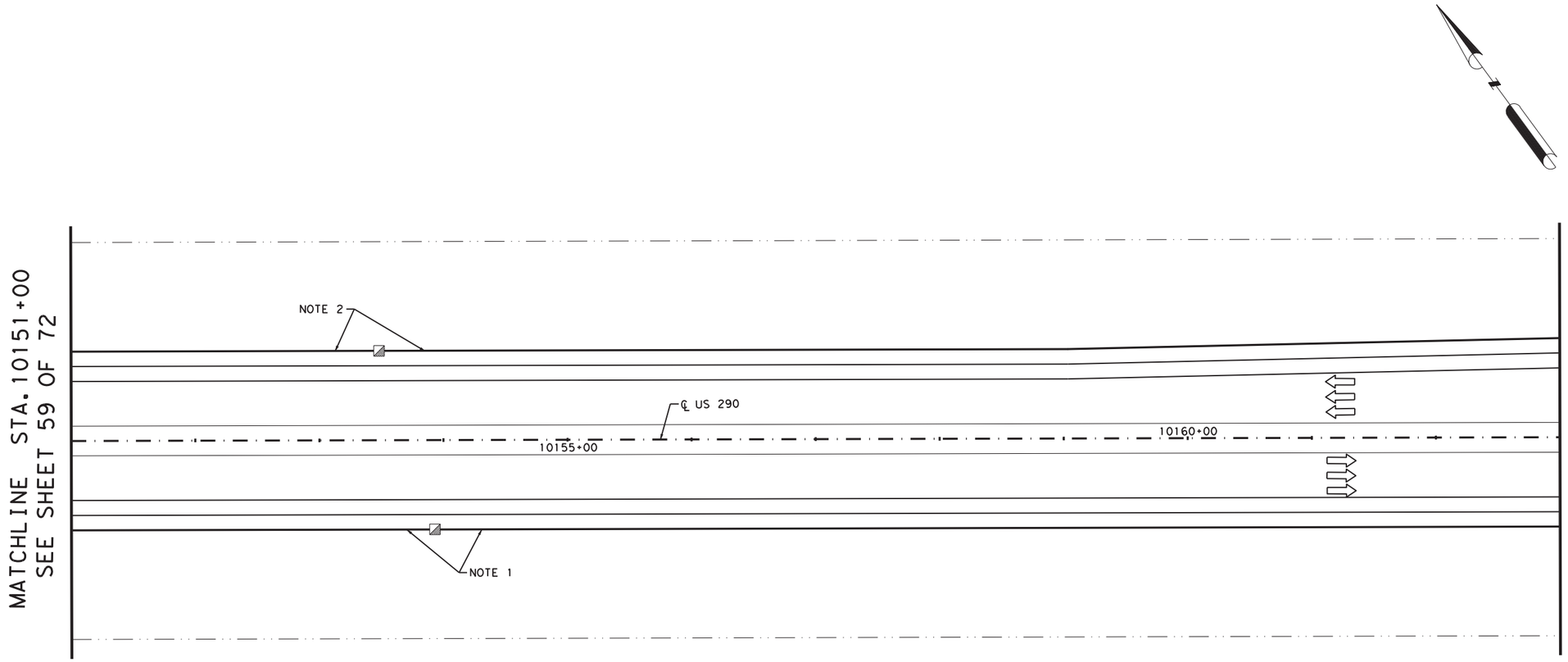
TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 57 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOUSTON	HARRIS		0050	06	089	104
TR:									
CK TR:									

NAME: ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#2,1-6 STR SM FOC (CCTV#16)

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by Kenneth Paradowski P.E. 97040, on

May 23 , 2022

Kenneth Paradowski, P.E.

SEE SHEET 55 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: US290_007_15.DGN

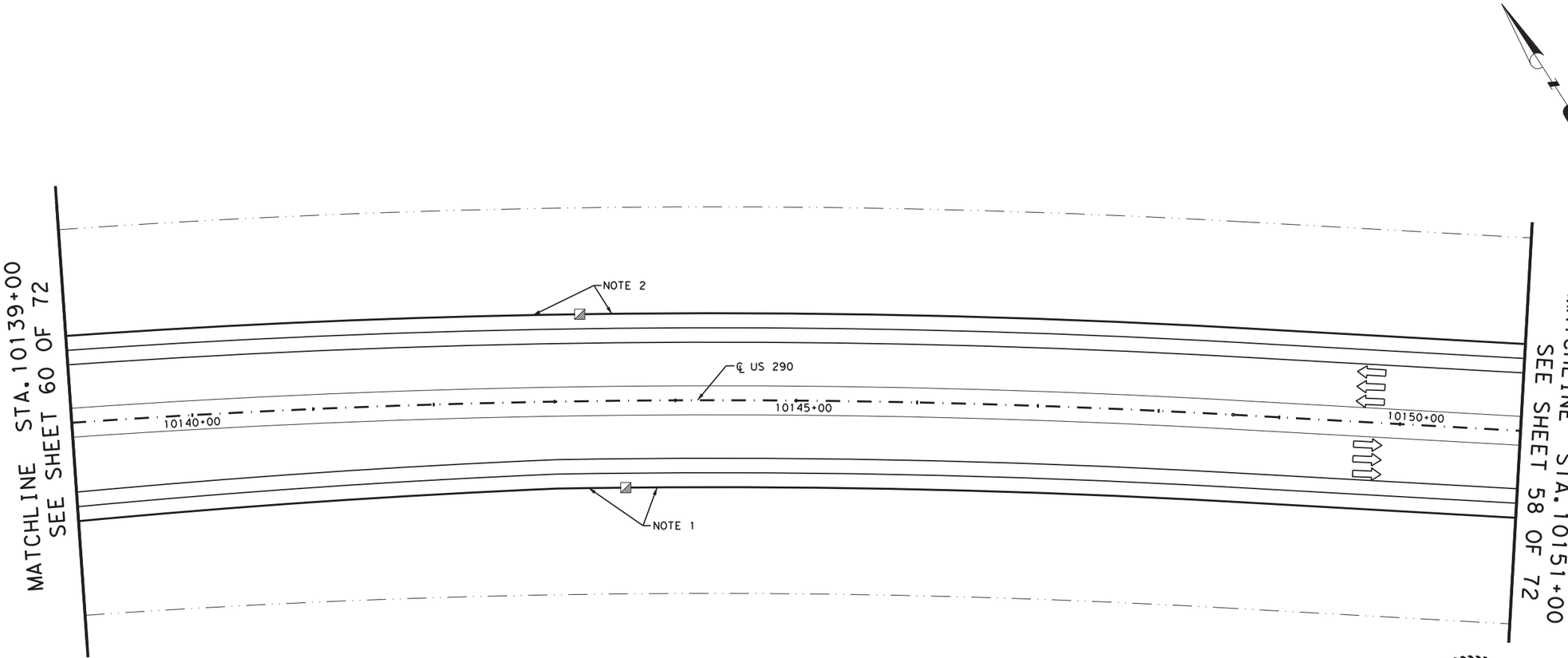
TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 58 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:									
CK DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
TR:									
CK TR:			HOUSTON	HARRIS	0050	06	089	105	

NAME: ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT#1(3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#2,1-6 STR SM FOC(CCTV#16)

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR

SEE SHEET 55 OF 72
FOR LEGEND

FILE NAME: US290_007_14.DGN

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LICENSED PROFESSIONAL ENGINEER

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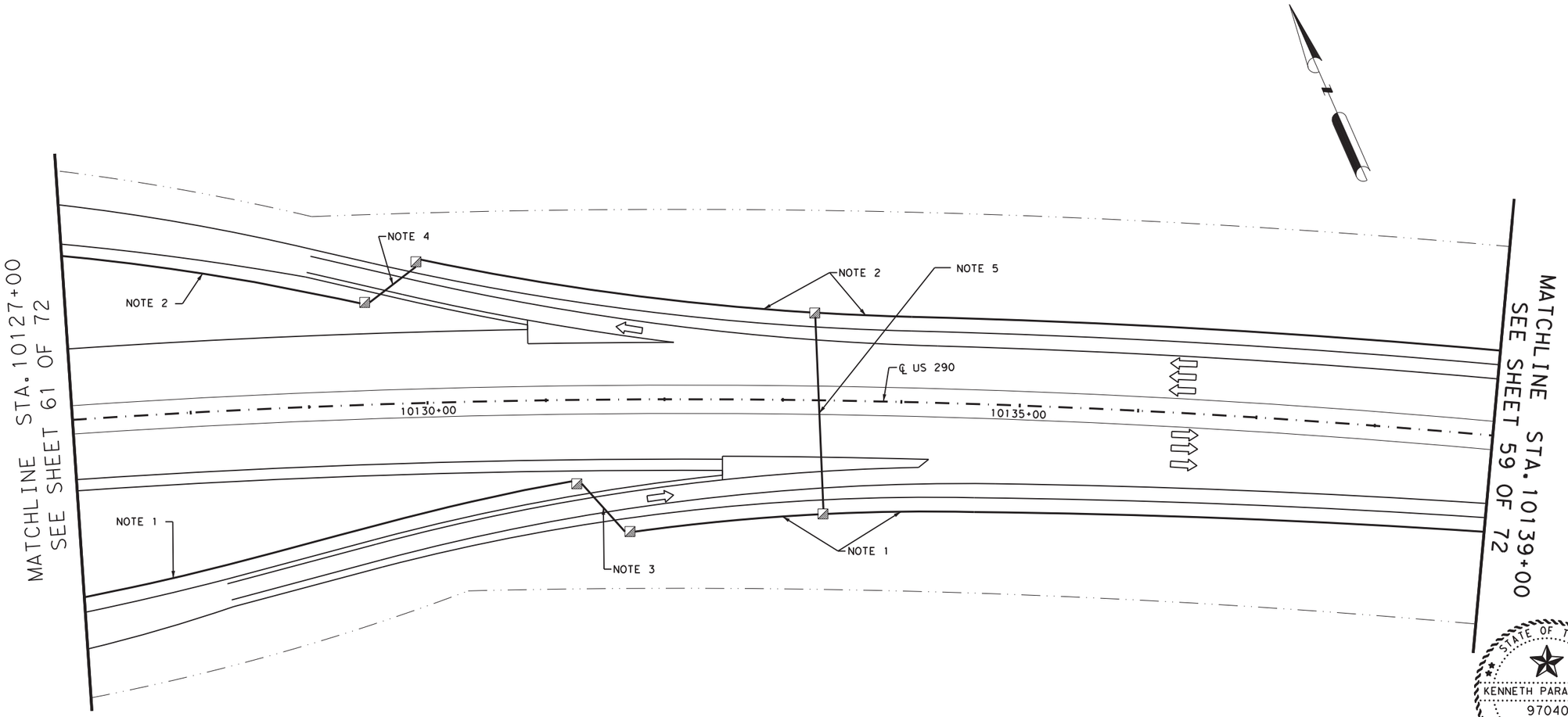
TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 59 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOUSTON	HARRIS		0050	06	089	106
TR:									
CK TR:									

NAME:ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT#1(3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#2,1-6 STR SM FOC (CCTV#16)

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR

3. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING
   INSTALL
   IN COND.#2,1-6 STR SM FOC (CCTV#16)

4. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   2-4" SCH. 80 MULTI-DUCT CONDUITS/CCE (BORE)
   IN CONDUIT #1(3")1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING
   INSTALL
   IN COND.#1(4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1(4" INNERDUCT B)-1#14 INSULATED CONDUCTOR

5. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   2-4" SCH. 80 MULTI-DUCT CONDUITS/CCE (BORE)
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING

SEE SHEET 65 OF 72
FOR LEGEND

FILE NAME: US290_007_13.DGN

STATE OF TEXAS
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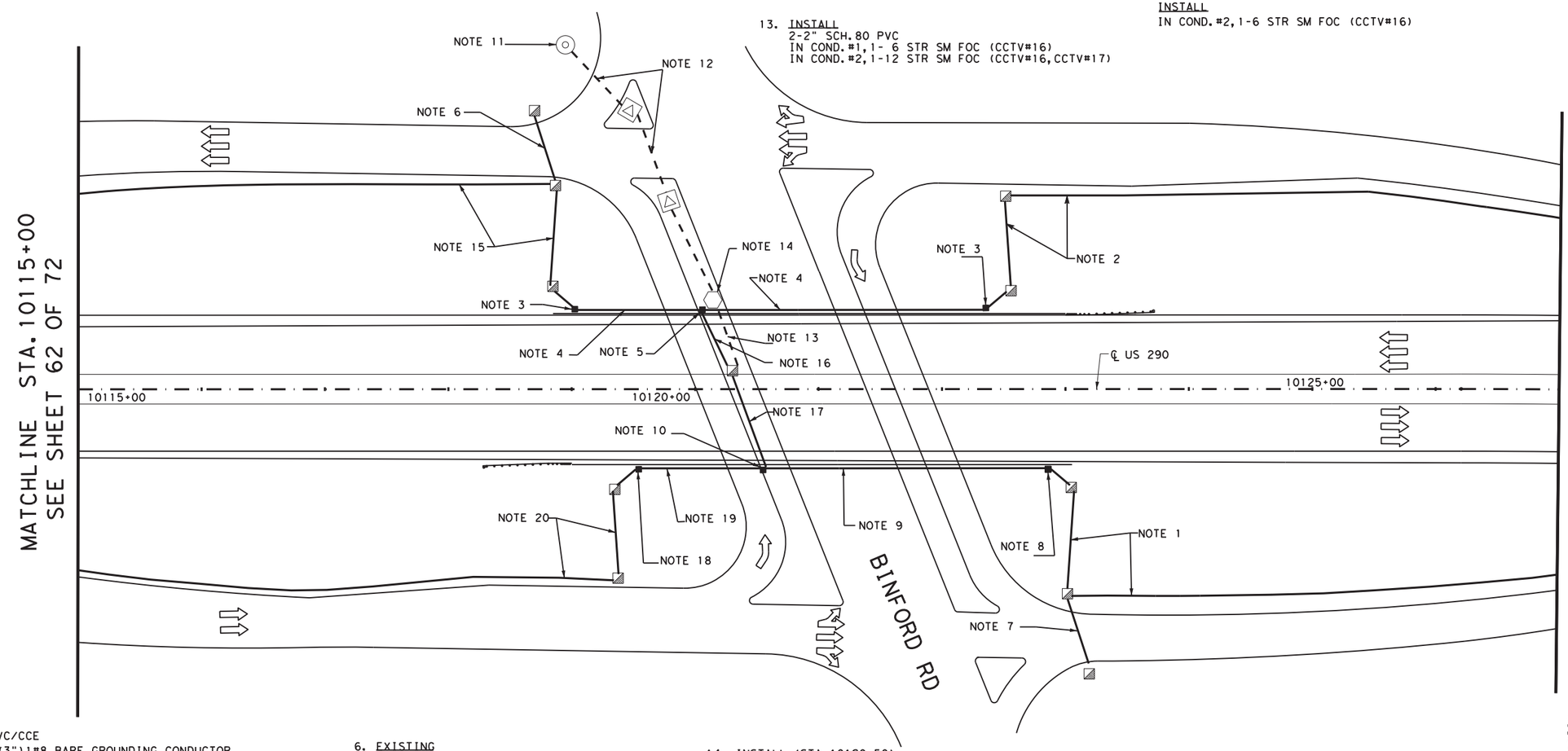
TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 60 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JULY 03	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOUSTON	HARRIS		0050	06	089	107
TR:									
CK TR:									

NAME:ENTER DATA



12. INSTALL
2-2" SCH. 80 PVC (BORED)
IN COND. #1, 2#8XHHW, 1#8 BARE (CCTV#17 POWER)

13. INSTALL
2-2" SCH. 80 PVC
IN COND. #1, 1- 6 STR SM FOC (CCTV#16)
IN COND. #2, 1-12 STR SM FOC (CCTV#16, CCTV#17)

17. EXISTING
2-3" SCH. 40 PVC/CCE
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND. #2, 1-6 STR SM FOC (CCTV#16)

1. EXISTING
2-3" SCH. 40 PVC/CCE
IN CONDUIT #1(3")1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND. #2, 1-6 STR SM FOC (CCTV#16)

2. EXISTING
2-3" SCH. 40 PVC/CCE
2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND. #1(4"INNERDUCT A)-1-144 STR SM FOC
IN COND. #1(4"INNERDUCT B)-1#14 INSULATED CONDUCTOR

3. EXISTING
JUNCTION BOX
2-3" RMC
2-4" RMC MULTI-DUCT
INSTALL
IN COND. #1 (4" INNERDUCT A)-1-144 STR SM FOC
IN COND. #1 (4" INNERDUCT B)-1-12 STR SM FOC (CCTV#16, CCTV#17)

4. EXISTING
2-3" RMC (SUSPENDED BENEATH THE BRIDGE)
2-4" MULTI-DUCT RMC (SUSPENDED BENEATH THE BRIDGE)
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND. #1 (4" INNERDUCT A)-1-144 STR SM FOC
IN COND. #1 (4" INNERDUCT B)-1-12 STR SM FOC (CCTV#16, CCTV#17)

5. EXISTING
JUNCTION BOX
2-3" RMC (DOWN COLUMN)
2-4" MULTI-DUCT RMC (DOWN COLUMN)
INSTALL
IN COND. #1(4" INNERDUCT A)-1-12 STR SM FOC (CCTV#16, CCTV#17)

6. EXISTING
2-3" SCH. 80 PVC (BORED)
2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
IN SCH. 40 STEEL CASING

7. EXISTING
2-3" SCH. 40 PVC (BORED)
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
IN SCH. 40 STEEL CASING

8. EXISTING
JUNCTION BOX
2-3" RMC
INSTALL
IN COND. #1, 1-6 STR SM FOC (CCTV#16)

9. EXISTING
2-3" RMC (SUSPENDED BENEATH THE BRIDGE)
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND. #2, 1-6 STR SM FOC (CCTV#16)

10. EXISTING
JUNCTION BOX
2-3" RMC (DOWN COLUMN)
INSTALL
IN COND. #2, 1-6 STR SM FOC (CCTV#16)

11. INSTALL
SERVICE POLE D-19
2-2" SCH. 80 PVC TO NEW TY A GROUND BOX
IN COND. #1, 2#8XHHW, 1#8 BARE (CCTV#17 POWER)

14. INSTALL (STA. 10120+50)
CCTV CAMERA#17
CCTV CAMERA SUPPORT POLE & FOUNDATION (55')
POLE MOUNTED CABINET (TY. 2) (CONF. 1)
CCTV FIELD EQUIPMENT
FIBER OPTIC VIDEO/DATA TX (S/M)
1 FIBER OPTIC PATCH PANEL (12 POSITION)
2-2" SCH. 80 PVC TO TY 1 GRD BOX
1-2" SCH. 80 PVC TO TY A GRD BOX
IN COND. #1
- 1-12 STR SM FOC (CCTV#16, (CCTV#16-CCTV#17))
- 1#14 INSULATED CONDUCTOR
IN COND. #2 - 2#8XHHW, 1#8 BARE
(CCTV#17 POWER - TY A GRD BOX)

15. EXISTING
2-3" SCH. 40 PVC/CCE
2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND. #1(4" INNERDUCT A)-1-144 STR SM FOC
IN COND. #1(4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
IN COND. #1(4" INNERDUCT C)-1-12 STR SM FOC (CCTV#16, CCTV#17)

16. EXISTING
2-3" SCH. 40 PVC/CCE
2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND. #2, 1-12 STR SM FOC (CCTV#16, CCTV#17)

18. EXISTING
JUNCTION BOX
2-3" RMC

19. EXISTING
2-3" RMC (SUSPENDED BENEATH THE BRIDGE)
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR

20. EXISTING
2-3" SCH. 40 PVC/CCE
IN CONDUIT #1(3")1#8 BARE GROUNDING CONDUCTOR

SEE SHEET 65 OF 72 FOR LEGEND

FILE NAME: US290_007_12.DGN

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23, 2022

Kenneth Paradowski, P.E.

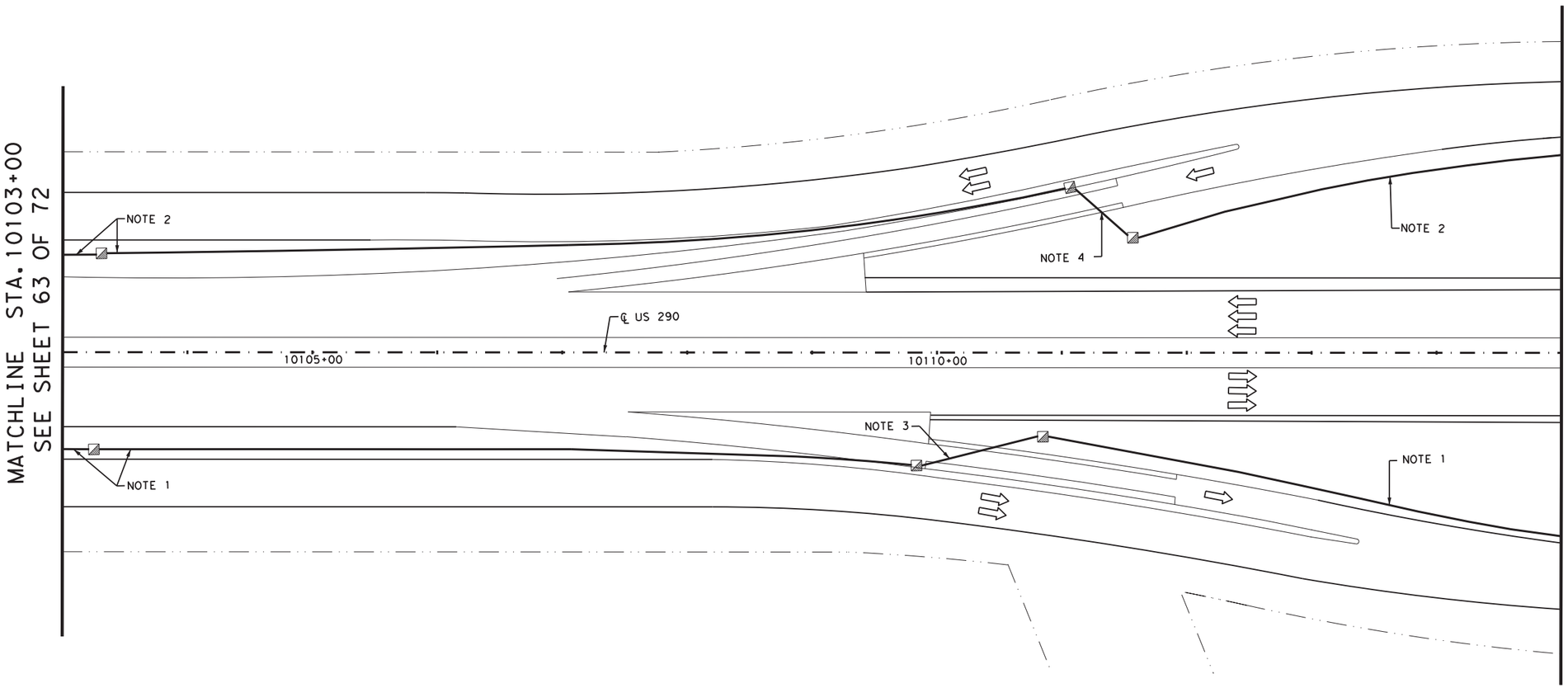
TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 61 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.	HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS		US290
DW:						
CK DW:			STATE DIST. NO.	COUNTY	CONTROL NO. / SECTION NO. / JOB NO.	SHEET NO.
TR:			HOUSTON	HARRIS	0050 / 06 / 089	108
CK TR:						

NAME: ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
   IN COND.#1 (4" INNERDUCT C)-1-12 STR SM FOC(CCTV#16,CCTV#17)

3. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING

4. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   2-4" SCH. 80 MULTI-DUCT CONDUITS/CCE (BORE)
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING
   INSTALL
   IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
   IN COND.#1 (4" INNERDUCT C)-1-12 STR SM FOC(CCTV#16,CCTV#17)

SEE SHEET 65 OF 72
FOR LEGEND

FILE NAME: US290_007_11.DGN

STATE OF TEXAS
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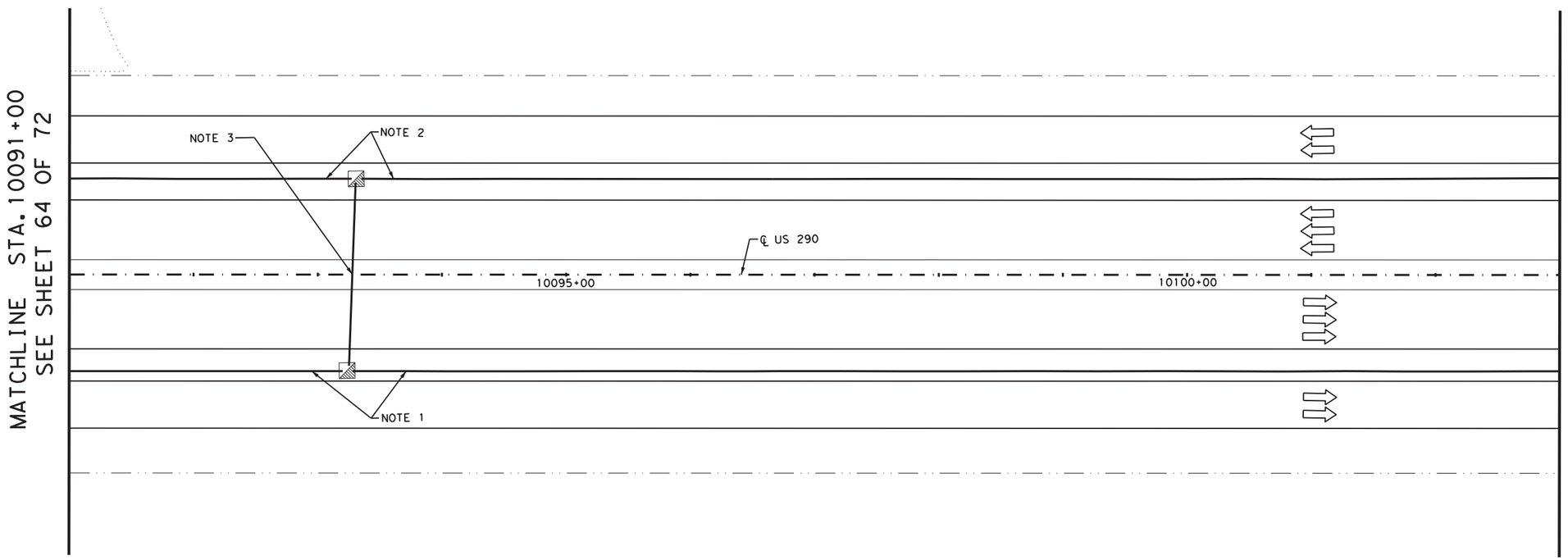
TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 62 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
CK DW:			HOUSTON	HARRIS	0050	06	089		109
TR:									
CK TR:									

NAME: ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
   IN COND.#1 (4" INNERDUCT C)-1-12 STR SM FOC(CCTV#16,CCTV#17)

3. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   2-4" SCH. 80 MULTI-DUCT CONDUITS/CCE (BORE)
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING

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May 23 , 2022

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SEE SHEET 65 OF 72 FOR LEGEND

SCALE: 1" = 100'

FILE NAME: US290_007_10.DGN

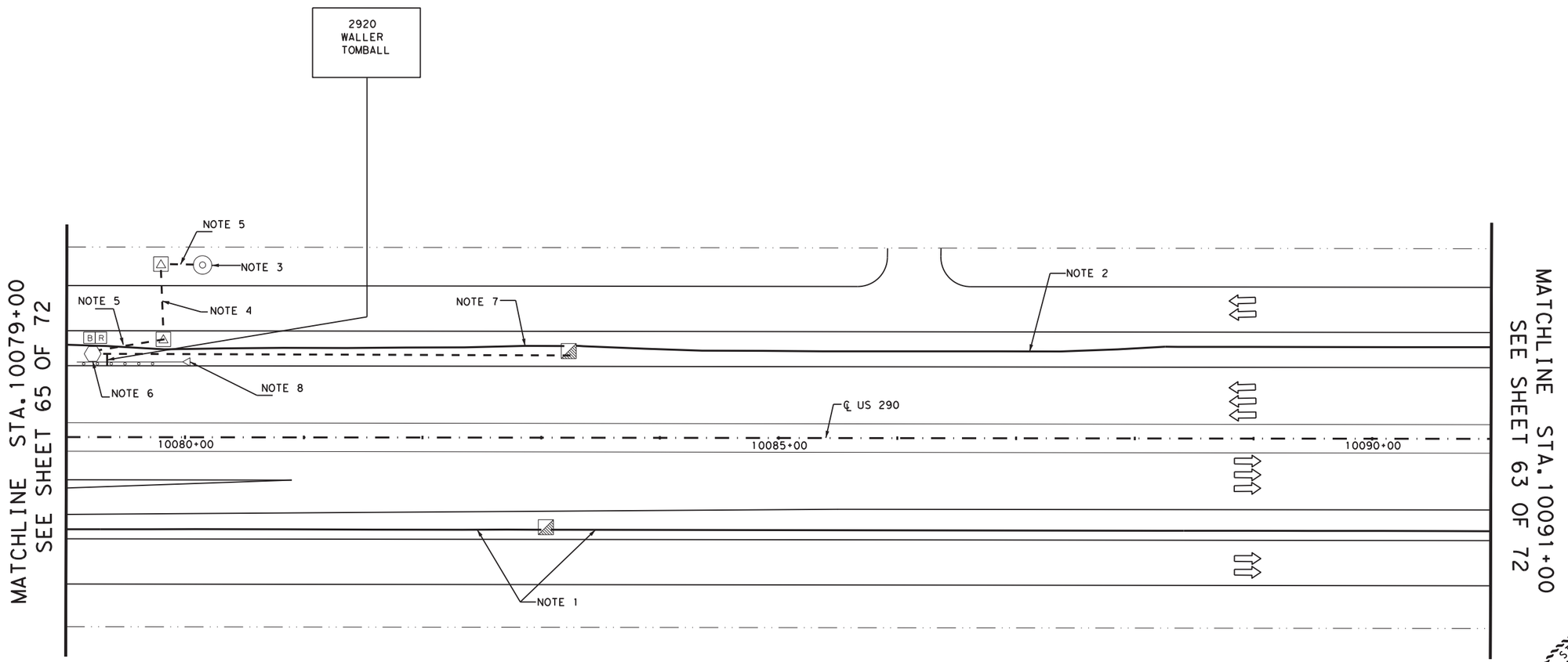
TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 63 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL		6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
CK DW:			HOUSTON	HARRIS	0050	06	089	110	
TR:									
CK TR:									

NAME: ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
   IN COND.#1 (4" INNERDUCT C)-1-12 STR SM FOC(CCTV#16,CCTV#17)

3. INSTALL
   SERVICE POLE D-20
   2-2" SCH. 80 PVC TO NEW TY A GRD BOX
   IN COND.#1,2#8XHHW,1#8 BARE (CCTV#18 POWER)

4. INSTALL
   2-2" SCH. 80 PVC (BORED)
   IN NEW SCH. 40 STEEL CASING
   IN COND.#1,2#8XHHW,1#8 BARE (CCTV#18 POWER)

5. INSTALL
   2-2" SCH. 80 PVC
   IN COND.#1,2#8XHHW,1#8 BARE (CCTV#18 POWER)

6. INSTALL (STA.10079+20)
   CCTV CAMERA #18 (BEHIND THE " WALLER TOMBALL" ROAD SIGN)
   CCTV CAMERA SUPPORT POLE & FOUNDATION (55')
   POLE MOUNTED CABINET (TY.2)(CONF.1)
   CCTV FIELD EQUIPMENT
   1 RVSD FIELD EQUIPMENT(RVSD#7) ①
   1 BLUETOOTH FIELD EQUIPMENT(BT#7) ①
   2 ETHERNET TX (RVSD#7,BT#7)
   FIBER OPTIC VIDEO/DATA TX (S/M)
   1 FIBER OPTIC PATCH PANEL (12 POSITION)
   2-2" SCH. 80 PVC TO TY 1 GRD BOX
   1-2" SCH. 80 PVC TO TY A GRD BOX
   IN COND.#1
   - 1-12 STR SM FOC (CCTV#18, RVSD#7, BT#7)
   - 1#14 INSULATED CONDUCTOR
   IN COND.#2-2#8XHHW, 1#8 BARE (CCTV#18 POWER - TY A GRD BOX)

7. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
   IN COND.#1 (4" INNERDUCT C)-1-12 STR SM FOC (CCTV#18, RVSD#7,BT#7)
   IN COND.#1 (4" INNERDUCT D)-1-12 STR SM FOC (CCTV#16,CCTV#17)

8. EXISTING
   M.B.G.F WITH G.E.T AND DOWNSTREAM ANCHOR TERMINAL

① SUPPLIED BY TXDOT

SEE SHEET 65 OF 72
FOR LEGEND

FILE NAME: US290_007_09.DGN

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED
PROFESSIONAL ENGINEER

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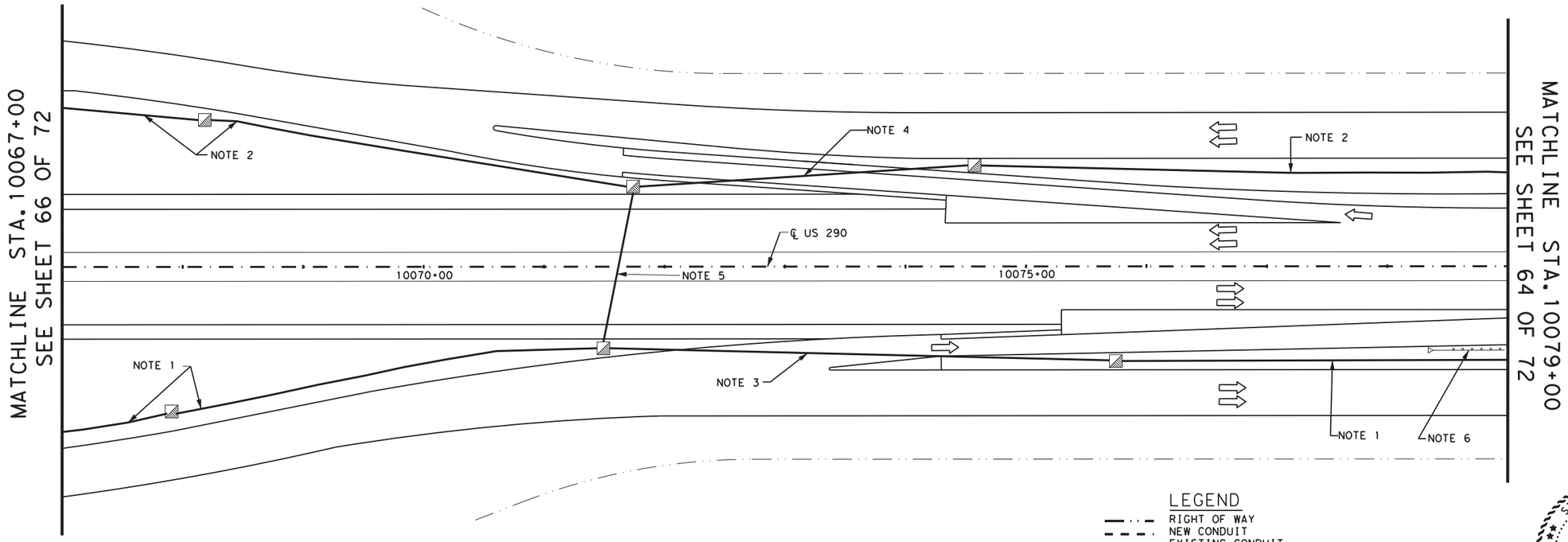
TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 64 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS				US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOUSTON	HARRIS	0050	06	089	111
TR:								
CK TR:								

NAME:ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
   IN COND.#1 (4" INNERDUCT C)-1-12 STR SM FOC(CCTV#18,BT#7,RVSD#7)
   IN COND.#1 (4" INNERDUCT D)-1-12 STR SM FOC(CCTV#16,CCTV#17)

3. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING

4. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   2-4" SCH. 80 MULTI-DUCT CONDUITS/CCE (BORE)
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING
   INSTALL
   IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
   IN COND.#1 (4" INNERDUCT C)-1-12 STR SM FOC(CCTV#18,BT#7,RVSD#7)
   IN COND.#1 (4" INNERDUCT C)-1-12 STR SM FOC(CCTV#16,CCTV#7)

5. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   2-4" SCH. 80 MULTI-DUCT CONDUITS/CCE (BORE)
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING

6. EXISTING
   M.B.G.F WITH G.E.T AND DOWNSTREAM ANCHOR TERMINAL

LEGEND

- RIGHT OF WAY
- NEW CONDUIT
- EXISTING CONDUIT
- NEW GROUND BOX-TYPE 1
- EXISTING GROUND BOX-TYPE 1
- NEW ELECTRICAL GROUND BOX-TYPE A
- EXISTING ELECTRICAL GROUND BOX-TYPE A
- EXISTING CABINET
- NEW CABINET (DOOR ON DARKENED SIDE)
- NEW COMMUNICATIONS HUB BUILDING
- EXISTING COMMUNICATIONS HUB BUILDING
- NEW CCTV CAMERA
- EXISTING CCTV CAMERA
- NEW SERVICE POLE
- EXISTING SERVICE POLE
- EXISTING JUNCTION BOX (UNLESS OTHERWISE NOTED)
- R RADAR VEHICLE SENSING DEVICE
- B BLUETOOTH DEVICE
- EXISTING DYNAMIC MESSAGE SIGN
- NEW DYNAMIC MESSAGE SIGN
- METAL BEAM GUARD FENCE
- Ⓡ **RADAR VEHICLE SENSING DEVICE POLE**

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by Kenneth Paradowski P.E. 97040, on

May 23 , 2022

Kenneth Paradowski, P.E.

FILE NAME: US290_007_08.DGN

TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 65 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS				US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOUSTON	HARRIS	0050	06	089	112
TR:								
CK TR:								

NAME:ENTER DATA

1. EXISTING
2-3" SCH. 40 PVC/CCE
IN COND, #1(3"), 1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
2-3" SCH. 40 PVC/CCE
2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND. #1 (4" INNERDUCT A)-1-144 STR SM FOC
IN COND. #1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
IN COND. #1 (4" INNERDUCT C)-1-12 STR SM FOC(CCTV#18, RVSD#7, BT#7)
IN COND. #1 (4" INNERDUCT D)-1-12 STR SM FOC(CCTV#16, CCTV#17)

3. EXISTING
2-3" SCH. 80 PVC (BORED)
2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR

4. EXISTING
JUNCTION BOX
2-3" RMC
2-4" RMC MULTI-DUCT
INSTALL
IN COND. #1 (4" INNERDUCT A)-1-144 STR SM FOC
IN COND. #1 (4" INNERDUCT B)-1-12 STR SM FOC(CCTV#18, RVSD#9, BT#9)
IN COND. #1 (4 INNERDUCT C)-1-12 STR SM FOC(CCTV#16, CCTV#17)

5. EXISING
2-3" RMC (SUSPENDED BENEATH THE BRIDGE)
2-4" MULTI-DUCT RMC (SUSPENDED BENEATH THE BRIDGE)
IN CONDUIT #1 (3") 1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND. #1(4" INNERDUCT A)-1-144 STR SM FOC
IN COND. #1(4" INNERDUCT B)-1-12 STR SM FOC(CCTV#18, RVSD#7, BT#7)
IN COND. #1(4" INNERDUCT C)-1-12 STR SM FOC(CCTV#16, CCTV#17)

6. EXISTING
JUNCTION BOX
2-3" RMC (DOWN COLUMN)
2-4" MULTI-DUCT RMC (DOWN COLUMN)
INSTALL
IN COND. #1 (4" INNERDUCT A)-1-144 STR SM FOC
IN COND. #1 (4" INNERDUCT B)-1-12 STR SM FOC (CCTV#18, RVSD#7, BT#7)
IN COND. #1 (4" INNERDUCT C)-1-12 STR SM FOC (CCTV#16, CCTV#17)

7. EXISING
2-3" RMC (SUSPENDED BENEATH THE BRIDGE)
2-4" MULTI-DUCT RMC (SUSPENDED BENEATH THE BRIDGE)
IN CONDUIT #1 (3") 1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND. #1 (4" INNERDUCT A)-1-144 STR SM FOC

8. EXISTING
JUNCTION BOX
2-3" RMC
2-4" RMC MULTI-DUCT
INSTALL
IN COND. #1 (4" INNERDUCT A)-1-144 STR SM FOC
IN COND. #1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR

9. EXISTING
2-3" SCH. 40 PVC/CCE
2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND. #1 (4" INNERDUCT A)-1-144 STR SM FOC
IN COND. #1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR

10. EXISTING
JUNCTION BOX
2-3" RMC
INSTALL
IN COND. #1, (3")1-6 STR SM FOC (FM 2920 TRAFFIC SIGNAL)

11. EXISTING
2-3" RMC (SUSPENDED BENEATH THE BRIDGE)
IN COND. #1, (3")1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND. #2, (3")1-6 STR SM FOC (FM 2920 TRAFFIC SIGNAL)

12. EXISTING
2-3" RMC (SUSPENDED BENEATH THE BRIDGE)
IN COND. #1, (3")1#8 BARE GROUNDING CONDUCTOR

13. EXISTING
JUNCTION BOX
2-3" RMC (DOWN COLUMN)
INSTALL
IN COND. #1, (3")1-6 STR SM FOC (FM 2920 TRAFFIC SIGNAL)

14. EXISTING
2-3" SCH. 40 PVC/CCE
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR

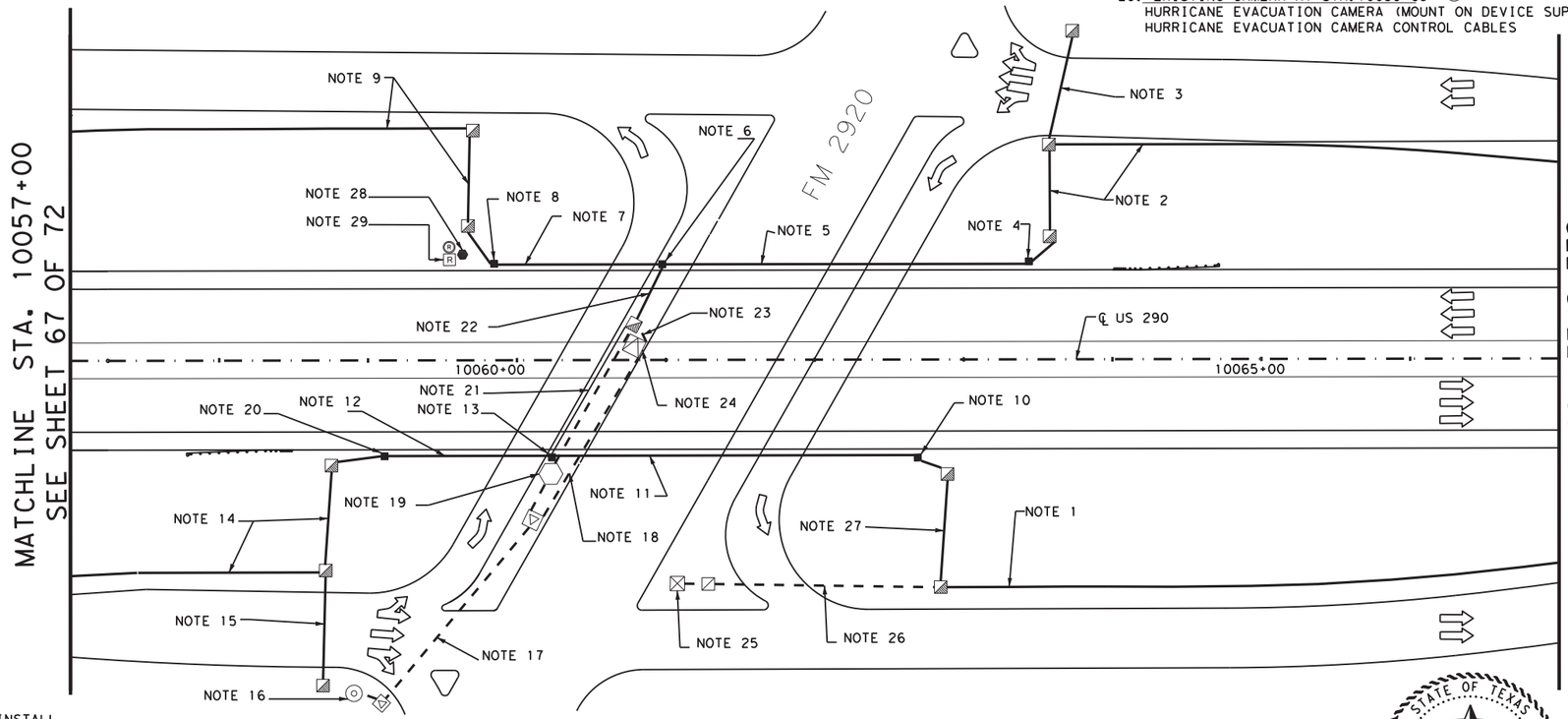
15. EXISTING
2-3" SCH. 40 PVC (BORED)
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR

16. INSTALL
SERVICE POLE D-21
2-2" SCH. 80 PVC TO NEW TY A GROUND BOX
IN COND. #1, 3#4XHHW, 1#4 BARE (HUB BUILDING POWER)
IN COND. #2, 2#8XHHW, 1#8 BARE (CCTV#19 POWER)

23. INSTALL
2-3" SCH. 40 PVC/CCE
2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
IN COND. #1 (4" INNERDUCT A)-1-144 STR SM FOC
IN COND. #1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
IN COND. #1 (4" INNERDUCT C)-1-12 STR SM FOC (CCTV#18, RVSD#7, BT#7)
IN COND. #2 (3" INNERDUCT A)-1-12 STR SM FOC (CCTV#16, CCTV#17)
IN COND. #2 (3" INNERDUCT B)-1-6 STR SM FOC (FM 2920 TRAFFIC SIGNAL)

28. EXISTING RVSD AT STA. 10059+63 ①
2-2" SCH. 80 PVC TO GRD
BLUETOOTH / ANTENNA EQUIPMENT
RADAR VEHICLE SENSING DEVICE (RVSD)
RVSD CABINET
RS-232 DATA MODEM (RVSD)
SOLAR PANELS
RADAR VEHICLE SENSING DEVICE SUPPORT POLE & FOUNDATION (25')
RADAR VEHICLE SENSING DEVICE MOUNTED ON THE POLE

29. EXISTING CAMERA AT STA. 10059+63 ①
HURRICANE EVACUATION CAMERA (MOUNT ON DEVICE SUPPORT POLE)
HURRICANE EVACUATION CAMERA CONTROL CABLES



17. INSTALL
2-2" SCH. 80 PVC (BORED)
IN COND. #1, 3#4XHHW, 1#4 BARE (HUB BUILDING POWER)
IN COND. #2, 2#8XHHW, 1#8 BARE (CCTV#19 POWER)

18. INSTALL
1-2" SCH. 80 PVC
IN COND. #1, 3#4XHHW, 1#4 BARE (HUB BUILDING POWER)

19. INSTALL (STA. 10060+50)
CCTV CAMERA#19
CCTV CAMERA SUPPORT POLE & FOUNDATION (55')
POLE MOUNTED CABINET (TY.2) (CONF.1)
CCTV FIELD EQUIPMENT
FIBER OPTIC VIDEO/DATA TX (S/M)
2-2" SCH. 80 PVC TO TY 1 GRD BOX
1-2" SCH. 80 PVC TO TY A GRD BOX
IN COND. #1
- 1-6 STR SM FOC (CCTV#19- TY 1 GRD BOX)
- 1#14 INSULATED CONDUCTOR
IN COND. #2 - 2#8XHHW, 1#8 BARE (CCTV#19 POWER - TY A GRD BOX)

20. EXISTING
JUNCTION BOX
2-3" RMC

21. EXISTING
2-3" SCH. 40 PVC/CCE
IN COND. #1(3") 1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND. #1(3") 1-6 STR SM FOC(FM 2920 TRAFFIC SIGNAL)

22. EXISTING
2-3" SCH. 40 PVC/CCE
2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND. #1 (4" INNERDUCT A)-1-144 STR SM FOC
IN COND. #1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
IN COND. #1 (4" INNERDUCT C)-1-12 STR SM FOC(CCTV#16-CCTV#17)

24. INSTALL (STA. 10060+80)
COMMUNICATION HUB BUILDING
4 FIBER OPTIC VIDEO DATA RX'S (S/M)
4 VIDEO ENCODERS (SUPPLIED BY TXDOT)
1 ETHERNET FIELD SWITCH (SUPPLIED BY TXDOT)
2 ETHERNET TX (RVSD#7, BT#7)
1 FIBER OPTIC PATCH PANEL (144 POSITION)
2 FIBER OPTIC PATCH PANEL (12 POSITION)
4-3" SCH. 80 PVC TO TYPE 1 G.B.
4-4" SCH. 80 MULTI-DUCT CONDUITS TO TYPE 1 G.B.
1-2" SCH. 80 PVC TO NEW TY A GRD BOX
IN COND. #1 (4" INNERDUCT A)-1-144 STR SM FOC
IN COND. #1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
IN COND. #1 (4" INNERDUCT C)-1-12 STR SM FOC (CCTV#18, RVSD#9, BT#9)

IN COND. #2 (3" INNERDUCT A)-1-12 STR SM FOC (CCTV#16, CCTV#17)
IN COND. #2 (3" INNERDUCT B)-1-6 STR SM FOC (FM 2920 TRAFFIC SIGNAL)

IN COND. #3 (2")3#4XHHW, 1#4 BARE (HUB BUILDING POWER - TY A GRD BOX)

25. EXISTING
TRAFFIC SIGNAL CONTROLLER CABINET & EQUIPMENT
INSTALL
1-2" SCH. 80 PVC TO TY. 1 GRD. BOX
1-3" 1-6 STR SM FOC (FM 2920 TRAFFIC SIGNAL)

26. INSTALL
1-2" SCH. 80 PVC (BORED)
1-6 STR SM FOC (FM 2920 TRAFFIC SIGNAL)

27. EXISTING
2-3" SCH. 40 PVC/CCE
IN COND. #1(3"), 1#8 BARE GROUNDING CONDUCTOR
INSTALL
IN COND. #2, 1-6 STR SM FOC (FM 2920 TRAFFIC SIGNAL)

FILE NAME: US290_007_07.DGN

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by Kenneth Paradowski P.E. 97040, on

May 23 , 2022

Kenneth Paradowski, P.E.

SEE SHEET 65 OF 72 FOR LEGEND

NOTES:
① TO BE REMOVED AFTER INSTALLATION OF PERMANENT SYSTEM

TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS				US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOUSTON	HARRIS	0050	06		113
TR:								
CK TR:								

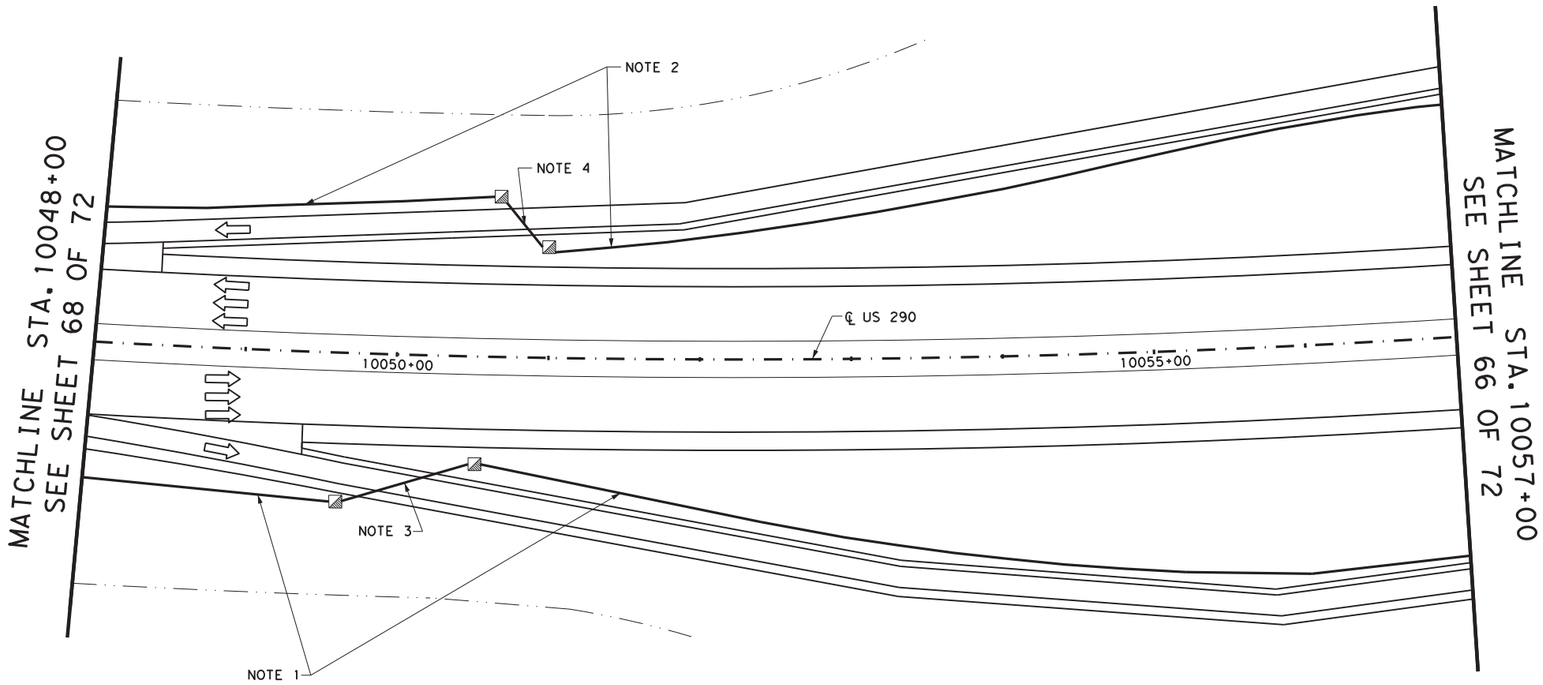
NAME: ENTER DATA

1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR

3. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR

4. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   2-4" SCH. 80 MULTI-DUCT CONDUITS/CCE (BORE)
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR



STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

SEE SHEET 65 OF 72 FOR LEGEND

FILE NAME: US290_007_06.DGN

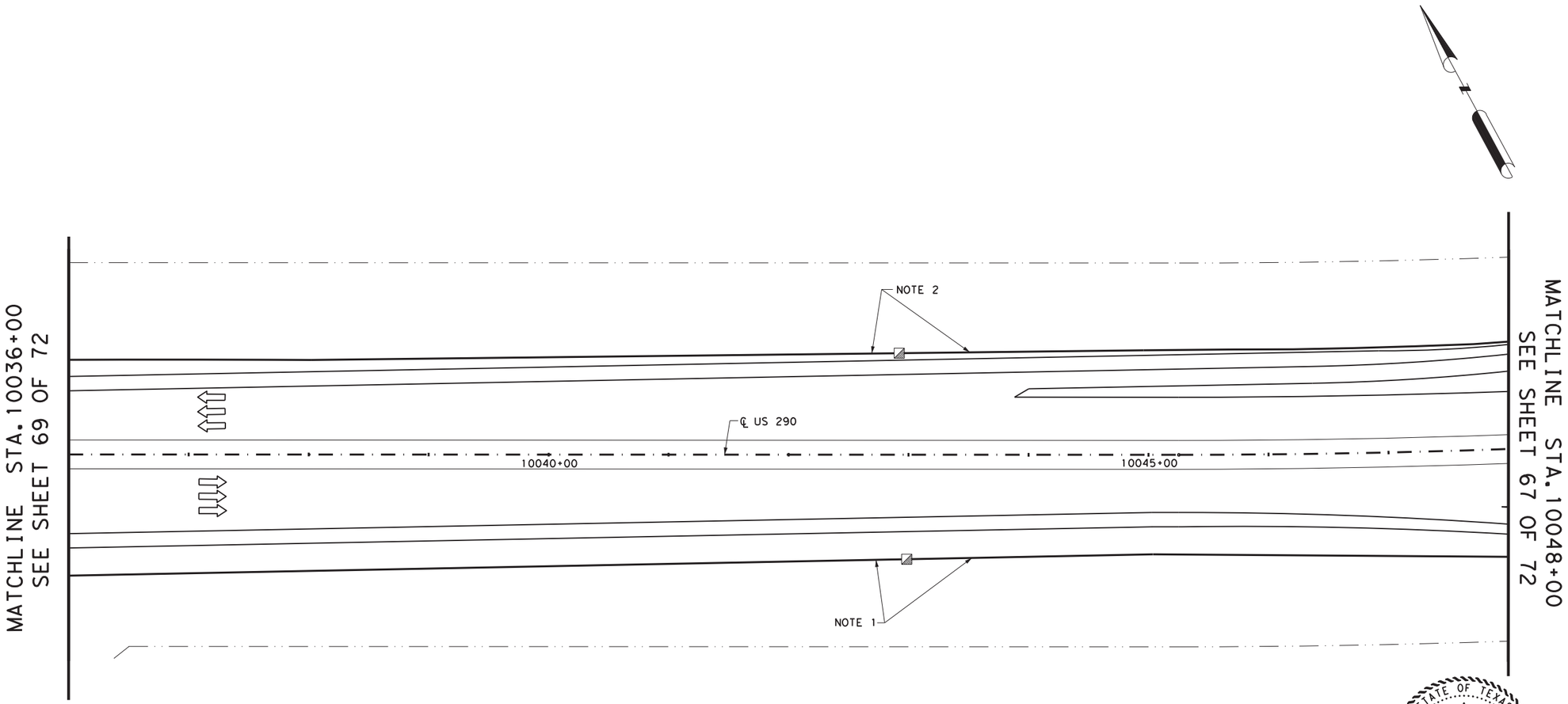
TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 67 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
CK DW:			HOUSTON	HARRIS	0050	06	089		114
TR:									
CK TR:									

NAME:ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

SCALE: 1" = 100'

FILE NAME: US290_007_05.DGN

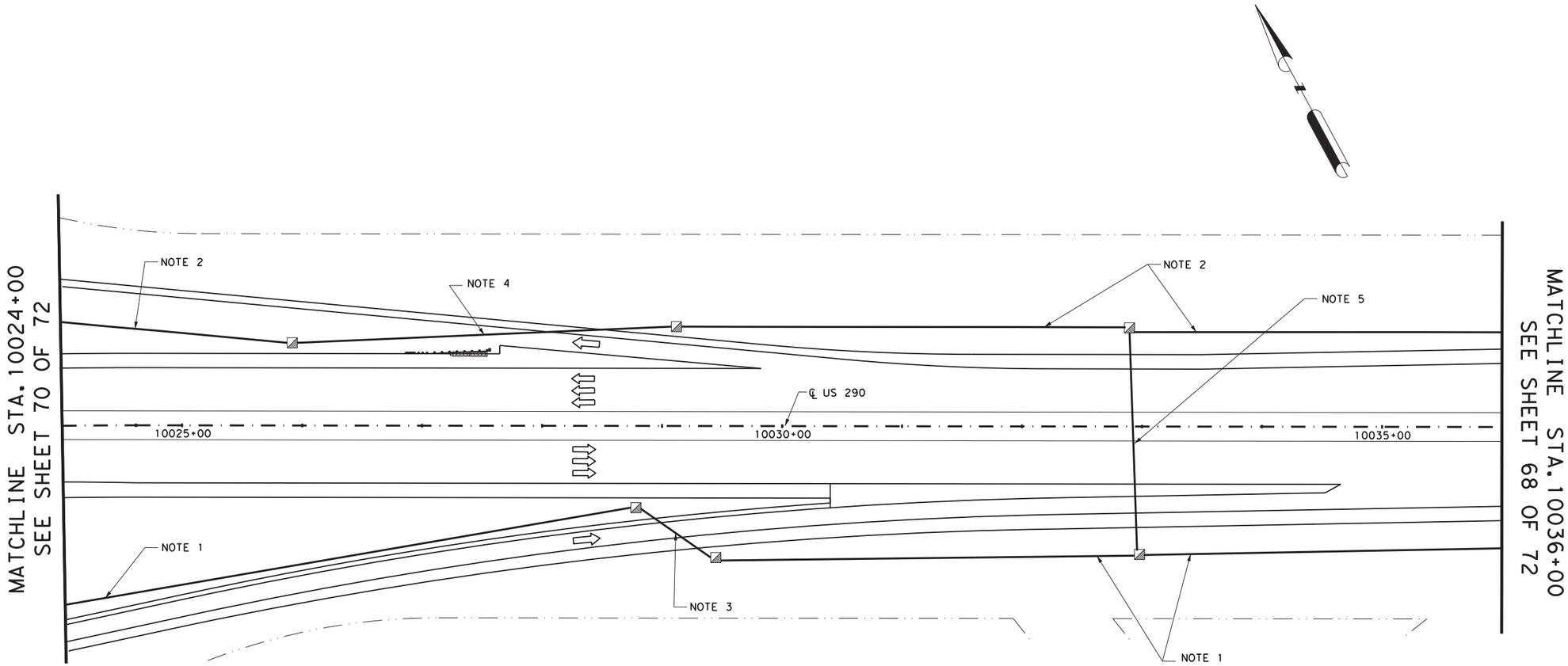
TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 68 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21							
DW:			6	TEXAS					US290
CK DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
TR:									
CK TR:			HOUSTON	HARRIS		0050	06	089	115

NAME:ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR SM FOC
   IN COND. #1(4"INNERDUCT B)-1#14 INSULATED CONDUCTOR

3. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   IN CONDUIT #1(3")1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING

4. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   2-4" SCH. 80 MULTI-DUCT CONDUITS/CCE(BORE)
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING
   INSTALL
   IN COND. #1(4"INNERDUCT A)-1-144 STR SM FOC
   IN COND. #1(4"INNERDUCT B)-1#14 INSULATED CONDUCTOR

5. EXISTING
   2-3" SCH. 80 PVC/CCE (BORE)
   2-4" SCH. 80 MULTI-DUCT CONDUITS/CCE(BORE)
   IN CONDUIT#1(3")1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING

SEE SHEET 65 OF 72
FOR LEGEND

FILE NAME: US290_007_04.DGN

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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May 23 , 2022

Kenneth Paradowski, P.E.

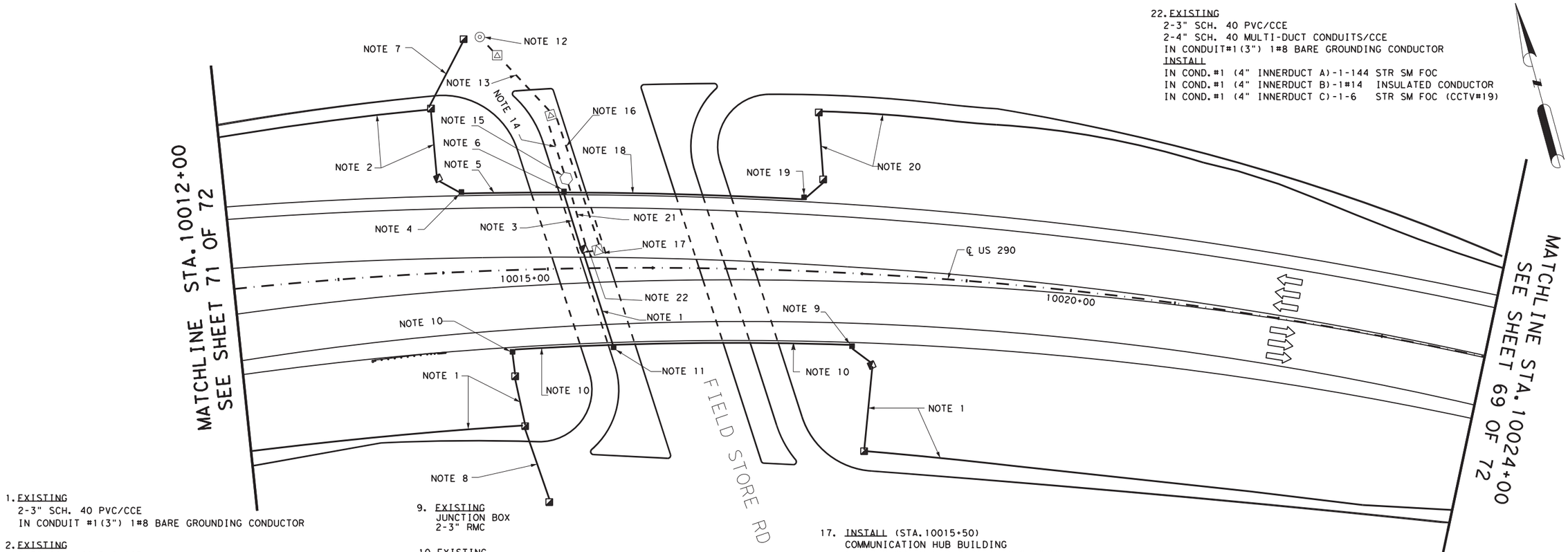
TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 69 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
CK DW:			HOUSTON	HARRIS	0050	06	089		116
TR:									
CK TR:									

NAME:ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT#1(3") 1#8 BARE GROUNDING CONDUCTOR

3. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT#1(3") 1#8 BARE GROUNDING CONDUCTOR
   INSTALL
   IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
   IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR

4. EXISTING
   JUNCTION BOX
   2-3" RMC
   2-4" RMC MULTI-DUCT

5. EXISTING
   2-3" RMC (SUSPENDED BENEATH THE BRIDGE)
   2-4" MULTI-DUCT RMC (SUSPENDED BENEATH THE BRIDGE)
   IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR

6. EXISTING
   JUNCTION BOX
   2-3" RMC (DOWN COLUMN)
   2-4" MULTI-DUCT RMC (DOWN COLUMN)
   INSTALL
   IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC

7. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 40 MULTI-DUCT CONDUITS (BORED)
   IN CONDUIT#1(3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING

8. EXISTING
   2-3" SCH. 80 PVC (BORED)
   CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING

9. EXISTING
   JUNCTION BOX
   2-3" RMC

10. EXISTING
    2-3" RMC (SUSPENDED BENEATH THE BRIDGE)
    IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR

11. EXISTING
    JUNCTION BOX
    2-3" RMC (DOWN COLUMN)

12. INSTALL
    SERVICE POLE D-22
    2-2" SCH. 80 PVC TO NEW TY A GRD BOX
    IN COND.#1,2#8XHHW,1#8 BARE (CCTV#20 POWER)
    IN COND.#1,3#4XHHW,1#4 BARE (HUB BULDING POWER)

13. INSTALL
    2-2" SCH. 80 PVC (BORED)
    IN NEW SCH. 40 STEEL CASING
    IN COND.#1, 2#8XHHW,1#8 BARE (CCTV#20 POWER)
    IN COND.#2,3#4XHHW,1#4 BARE (HUB BUILDING POWER)

14. INSTALL
    1-2" SCH. 80 PVC
    IN COND.#1,2#8XHHW,1#8 BARE (CCTV#20 POWER)

15. INSTALL (STA.10015+40)
    CCTV CAMERA #20
    CCTV CAMERA SUPPORT POLE & FOUNDATION (55')
    POLE MOUNTED CABINET (TY.2)(CONF.1)
    CCTV FIELD EQUIPMENT
    FIBER OPTIC VIDEO/DATA TX (S/M)
    2-2" SCH. 80 PVC TO TY 1 GRD BOX
    1-2" SCH. 80 PVC TO TY A GRD BOX
    IN COND.#1
    - 1-6 STR SM FOC (CCTV#20- TY 1 GRD BOX)
    - 1#14 INSULATED CONDUCTOR
    IN COND.#2-2#8XHHW, 1#8 BARE (CCTV#20 POWER - TY A GRD BOX)

16. INSTALL
    1-2" SCH. 80 PVC
    IN COND.#1,3#4XHHW,1#4 BARE (HUB BULDING POWER)

17. INSTALL (STA.10015+50)
    COMMUNICATION HUB BUILDING
    1 FIBER OPTIC VIDEO DATA RX'S (S/M)
    1 VIDEO ENCODERS (SUPPLIED BY TXDOT)
    1 ETHERNET FIELD SWITCH (SUPPLIED BY TXDOT)
    1 FIBER OPTIC PATCH PANEL (144 POSITION)
    4-3" SCH.80 PVC TO TYPE 1 G.B.
    4-4" SCH.80 MULTI-DUCT CONDUITS TO TYPE 1 G.B.
    1-2" SCH.80 PVC TO NEW TY A GRD BOX
    IN COND.#1(4" INNERDUCT A),1-144 STR SM FOC
    (4" INNERDUCT B),1#14 INSULATED CONDUCTOR
    (4" INNERDUCT C),1-6 STR SM FOC (CCTV#20)
    IN COND.#2(2" 3#4XHHW, 1#4 BARE
    (HUB BUILDING POWER - TY A GRD BOX)

18. EXISTING
    2-3" RMC (SUSPENDED BENEATH THE BRIDGE)
    2-4" MULTI-DUCT RMC (SUSPENDED BENEATH THE BRIDGE)
    IN CONDUIT #1(3") 1#8 BARE GROUNDING CONDUCTOR
    INSTALL
    IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC

19. EXISTING
    JUNCTION BOX
    2-3" RMC
    2-4" RMC MULTI-DUCT
    INSTALL
    IN COND.#1(4" INNERDUCT A)-1-144 STR SM FOC

20. EXISTING
    2-3" SCH. 40 PVC/CCE
    2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
    IN CONDUIT#1(3") 1#8 BARE GROUNDING CONDUCTOR
    INSTALL
    IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
    IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR

21. INSTALL
    1-2" SCH. 80 PVC
    IN COND.#1,1-6 STR SM FOC (CCTV#19)

22. EXISTING
    2-3" SCH. 40 PVC/CCE
    2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
    IN CONDUIT#1(3") 1#8 BARE GROUNDING CONDUCTOR
    INSTALL
    IN COND.#1 (4" INNERDUCT A)-1-144 STR SM FOC
    IN COND.#1 (4" INNERDUCT B)-1#14 INSULATED CONDUCTOR
    IN COND.#1 (4" INNERDUCT C)-1-6 STR SM FOC (CCTV#19)

SEE SHEET 65 OF 72
FOR LEGEND

FILE NAME: US290_007_03.DGN

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KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

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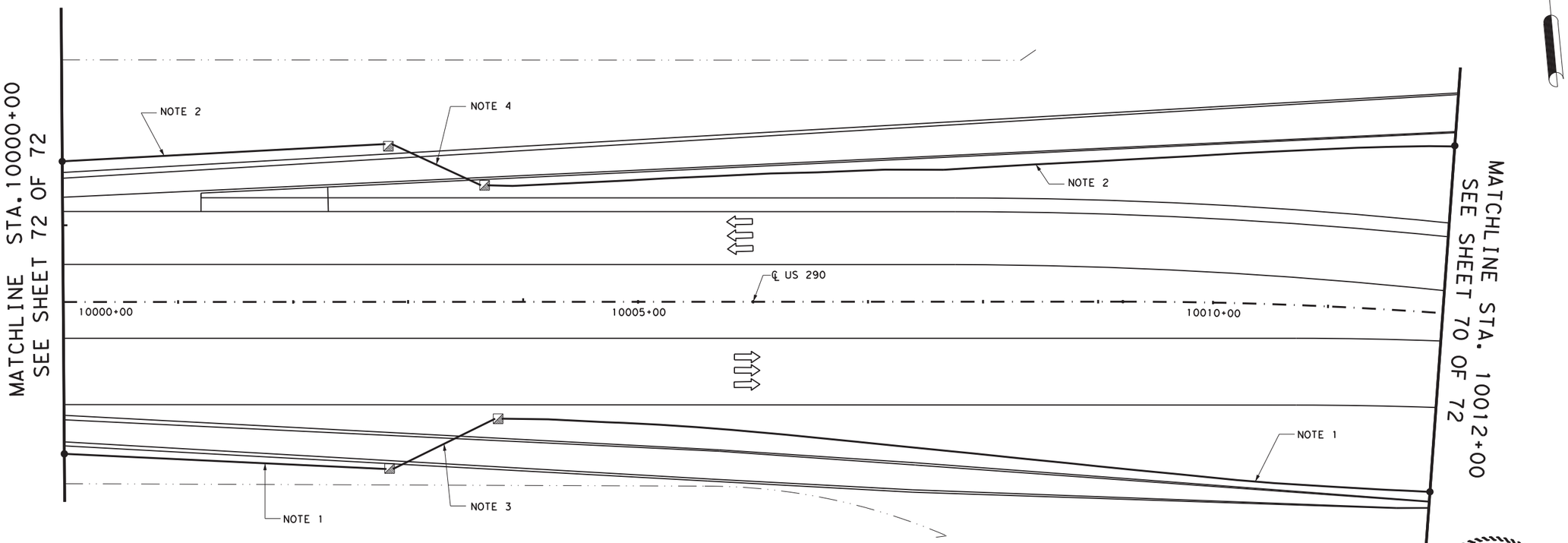
TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 70 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.	HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS		US290
DW:			STATE DIST. NO.	COUNTY	CONTROL NO. / SECTION NO. / JOB NO.	SHEET NO.
CK DW:			HOUSTON	HARRIS	0050 06 089	117
TR:						
CK TR:						

NAME: ENTER DATA



1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT#1(3") 1#8 BARE GROUNDING CONDUCTOR

3. EXISTING
   2-3" SCH. 80 PVC (BORED)
   IN CONDUIT #1 (3") 1#8 BARE GROUNDING CONDUCTOR

4. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING

SEE SHEET 65 OF 72
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TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 71 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL	JUNE 21	6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:			HOUSTON	HARRIS		0050	06	089	118
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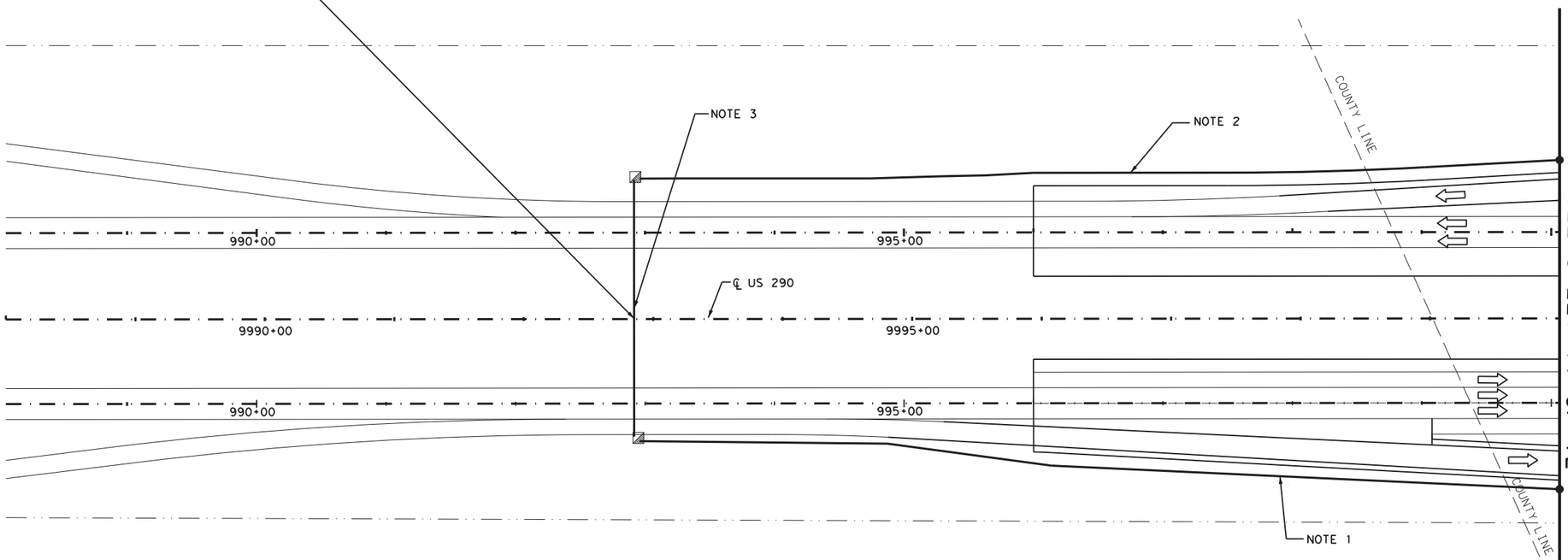
STA 997+20(ML)



MATCHLINE STA. 10000+00
SEE SHEET 71 OF 72

1. EXISTING
   2-3" SCH. 40 PVC/CCE
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR

2. EXISTING
   2-3" SCH. 40 PVC/CCE
   2-4" SCH. 40 MULTI-DUCT CONDUITS/CCE
   IN CONDUIT#1(3") 1#8 BARE GROUNDING CONDUCTOR

3. EXISTING
   2-3" SCH. 80 PVC (BORED)
   2-4" SCH. 80 MULTI-DUCT CONDUITS (BORED)
   IN CONDUIT#1 (3") 1#8 BARE GROUNDING CONDUCTOR
   IN SCH. 40 STEEL CASING

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SCALE: 1" = 100'

FILE NAME: US290_007_01.DGN

TEXAS DEPARTMENT OF TRANSPORTATION
US 290 (NORTHWEST FREEWAY)

COMPUTERIZED TRANSPORTATION MANAGEMENT SYSTEM LAYOUT

SHEET 72 OF 72

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	ORIGINAL		6	TEXAS					US290
DW:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
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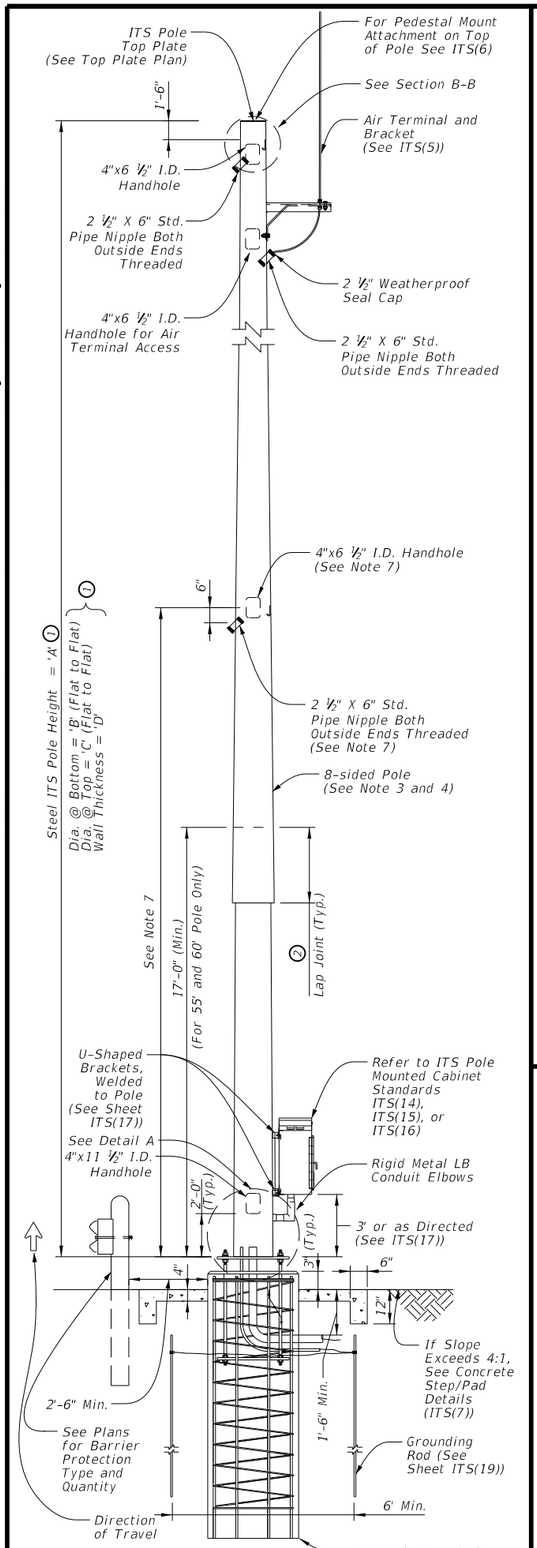
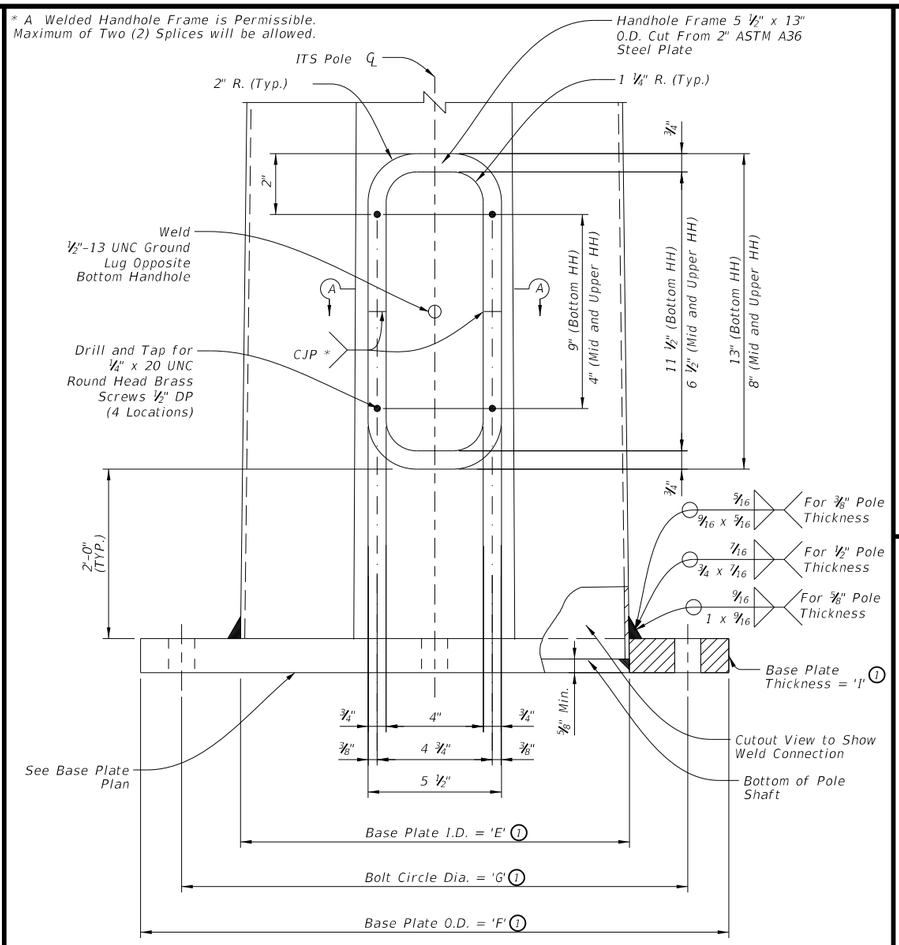
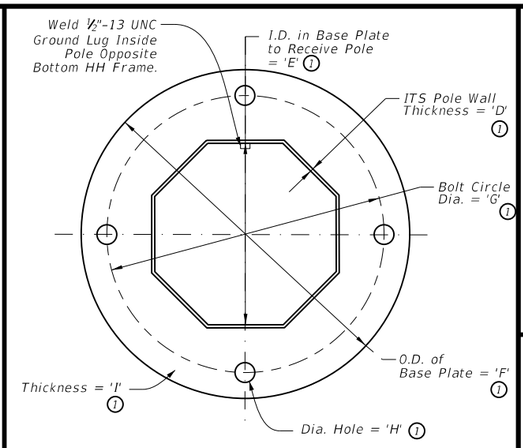


ITS Pole with Cabinet

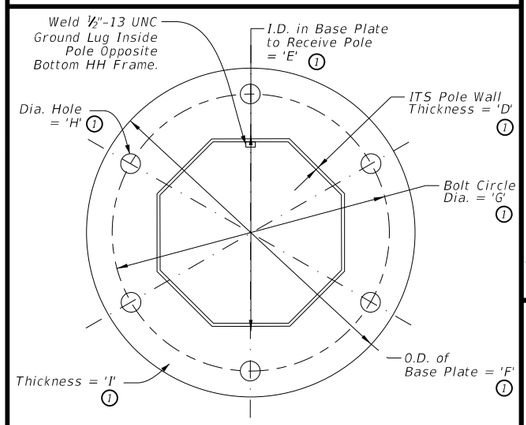


Detail A



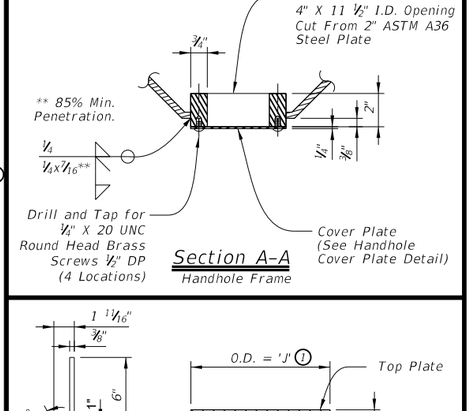
Base Plate Plan

4 Bolt Base Plate (ASTM A36)



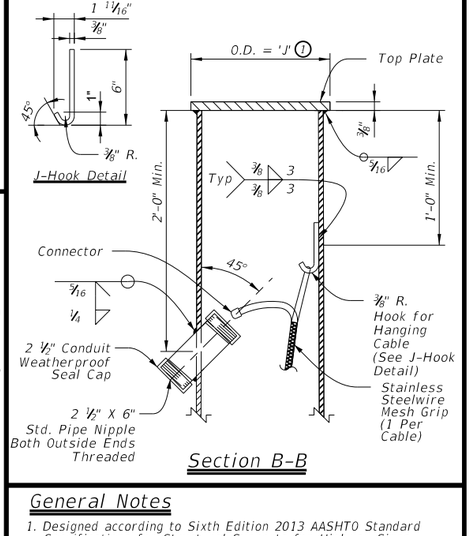
Base Plate Plan

6 Bolt Base Plate (ASTM A36)



Section A-A

Handhole Frame



Section B-B

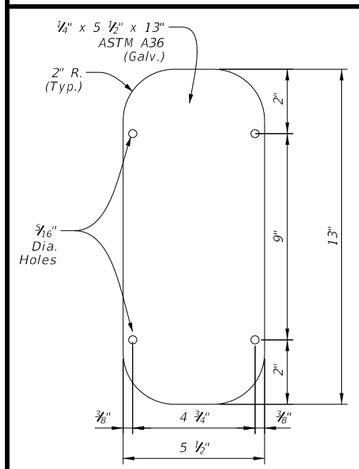
General Notes

1. Designed according to Sixth Edition 2013 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications.
2. Unless otherwise noted, all parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
3. Deviation from the design criteria, values, and dimensions shown herein and on ITS(4), constitutes an alternative design and will require submission of shop drawings and calculations for approval, sealed by a Texas Professional Engineer.
4. Direct substitution of twelve sided or round poles, matching the design criteria, values, and dimensions shown herein, require submission of shop drawings for approval to confirm design criteria and values on ITS(4) is met.
5. Locate handholes opposite of the direction of travel.
6. Appropriate number of anchor bolts for base plate determined by height of pole. See 'L' on sheet ITS(4).
7. Location for ITS equipment mount may vary by device. Locate mid span handhole and pipe nipple to accommodate location for ITS equipment as identified in the plans or per manufacturer recommendations. Identify location for mid span handhole and pipe nipple on shop drawings for approval.

Reference Notes:

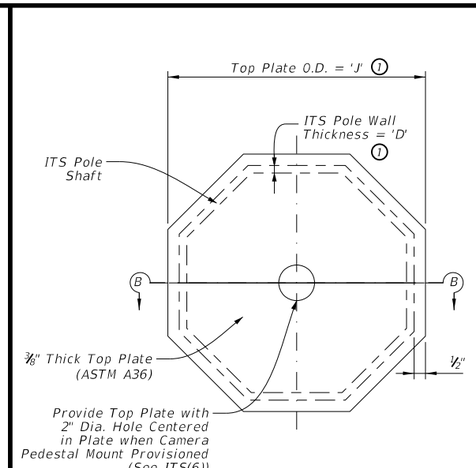
(1) See tables on Sheet ITS(4) for values of dimension variables.

(2) See lap joint note for 55' and 60' pole heights on ITS(4) at the bottom of each table.

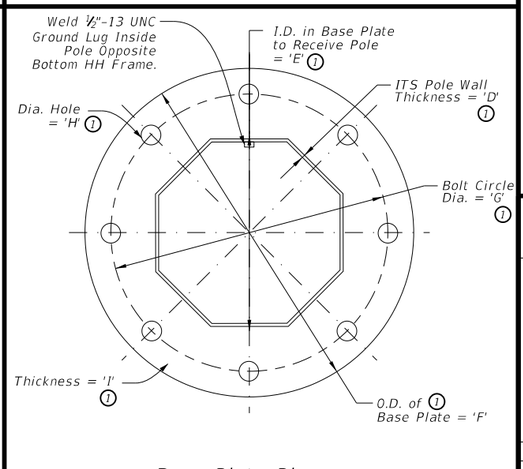


Handhole Cover Plate Detail

(Bottom Handhole)



Top Plate Plan



Base Plate Plan

8 Bolt Base Plate (ASTM A36)

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE DETAILS OCTAGONAL POLE (EIGHT SIDED POLE)

ITS(1)-15

FILE: its(1)-15.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT June 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US290
	DIST	COUNTY		SHEET NO.
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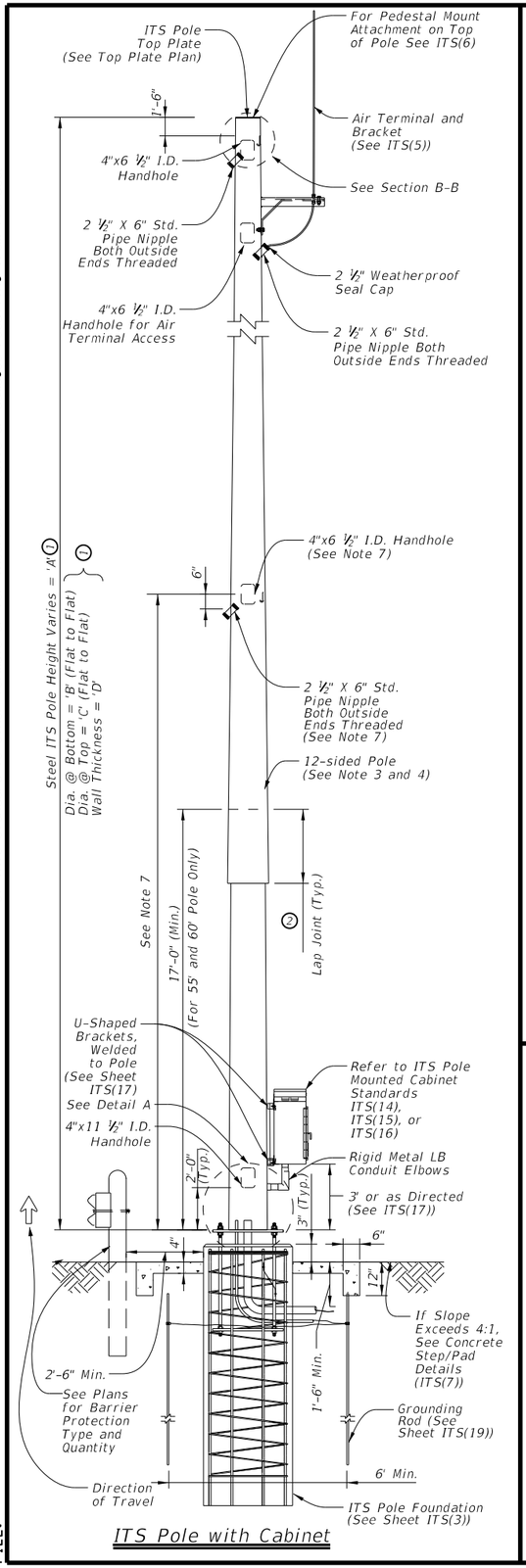
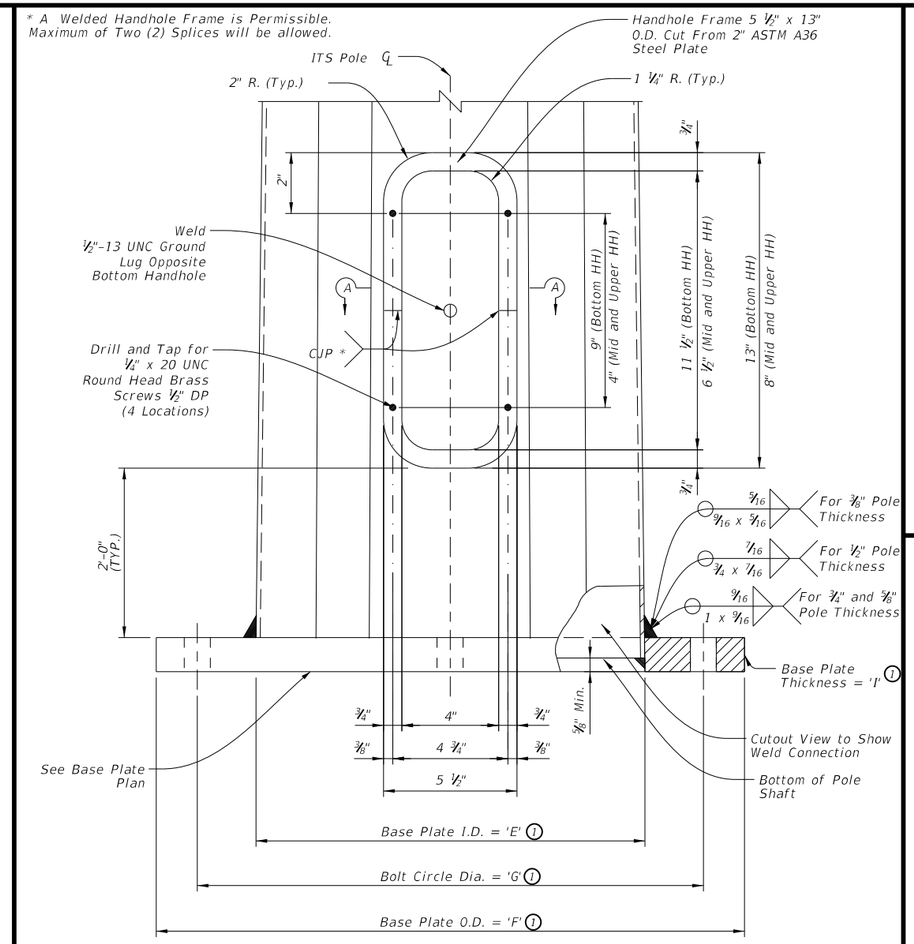
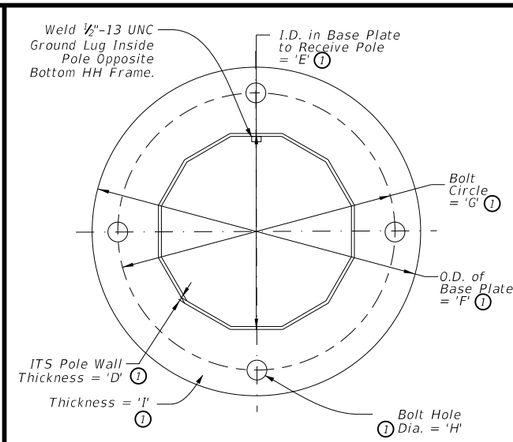


ITS Pole with Cabinet

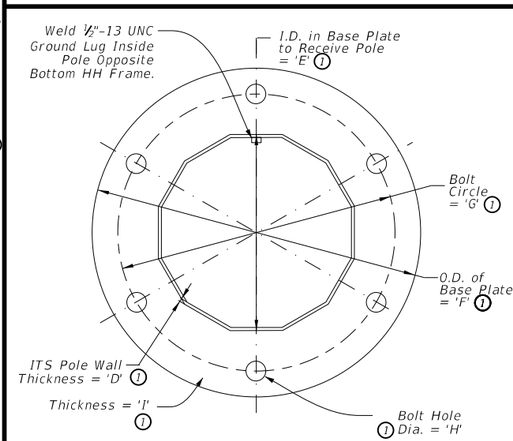


Detail A



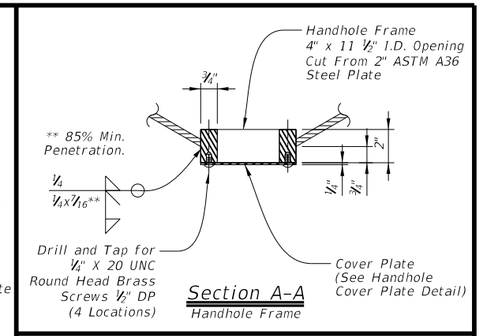
Base Plate Plan

4 Bolt Base Plate (ASTM A36)



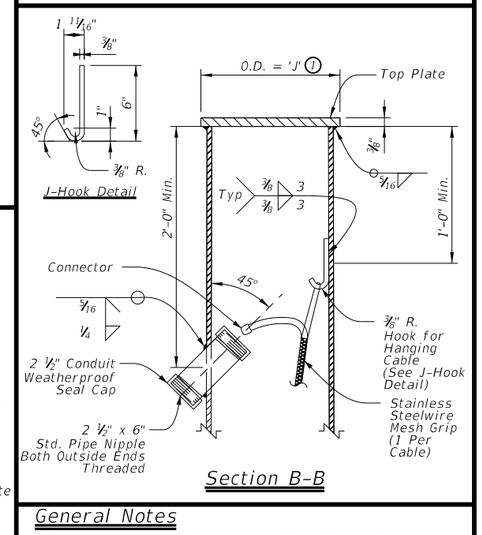
Base Plate Plan

6 Bolt Base Plate (ASTM A36)



Section A-A

Handhole Frame



Section B-B

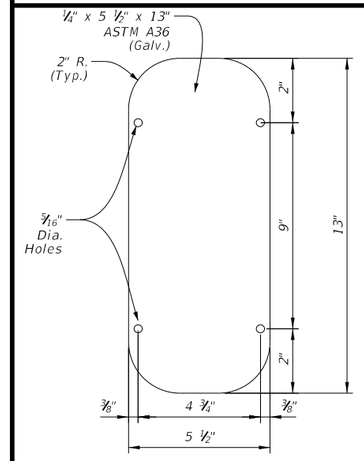
General Notes

1. Designed according to Sixth Edition 2013 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications.
2. Unless otherwise noted, all parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
3. Deviation from the design criteria, values, and dimensions shown herein and on ITS(4), constitutes an alternative design and will require submission of shop drawings and calculations for approval, sealed by a Texas Professional Engineer.
4. Direct substitution of round poles, matching the design criteria, values, and dimensions shown herein, require submission of shop drawings for approval to confirm design criteria and values on ITS(4) is met.
5. Locate handholes opposite of the direction of travel.
6. Appropriate number of anchor bolts for base plate determined by height of pole. See 'L' on sheet ITS(4).
7. Location for ITS equipment mount may vary by device. Locate mid span handhole and pipe nipple to accommodate location for ITS equipment as identified in the plans or per manufacturer recommendations. Identify location for mid span handhole and pipe nipple on shop drawings for approval.

Reference Notes:

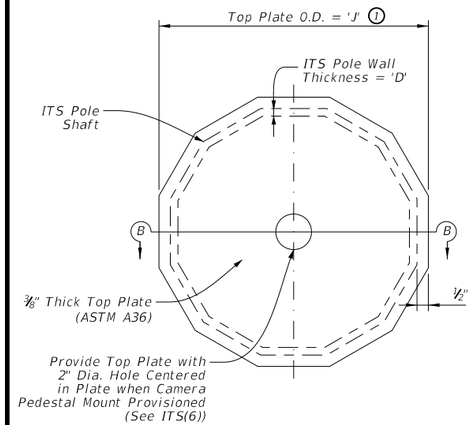
(1) See tables on Sheet ITS(4) for values of dimension variables.

(2) See lap joint note for 55' and 60' pole heights on ITS(4) at the bottom of each table.

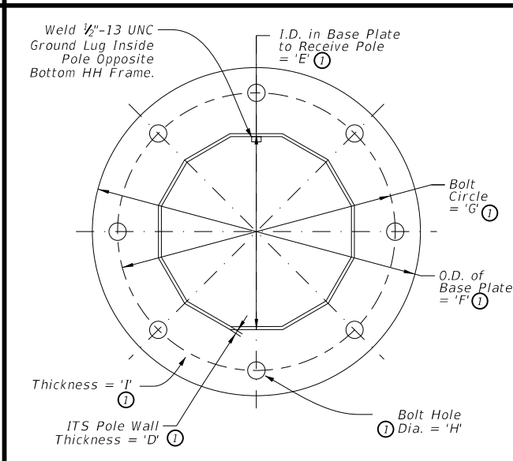


Handhole Cover Plate Detail

(Bottom Handhole)



Top Plate Plan



Base Plate Plan

8 Bolt Base Plate (ASTM A36)

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE DETAILS DODECAHEDRAL POLE (TWELVE SIDED POLE) (ALTERNATIVE) ITS(2)-15

FILE: its(2)-15.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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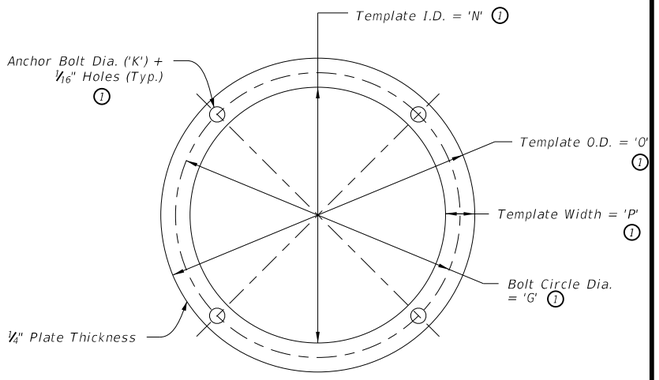
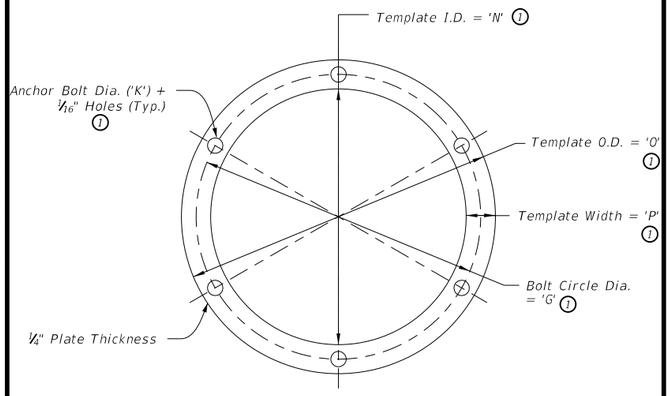
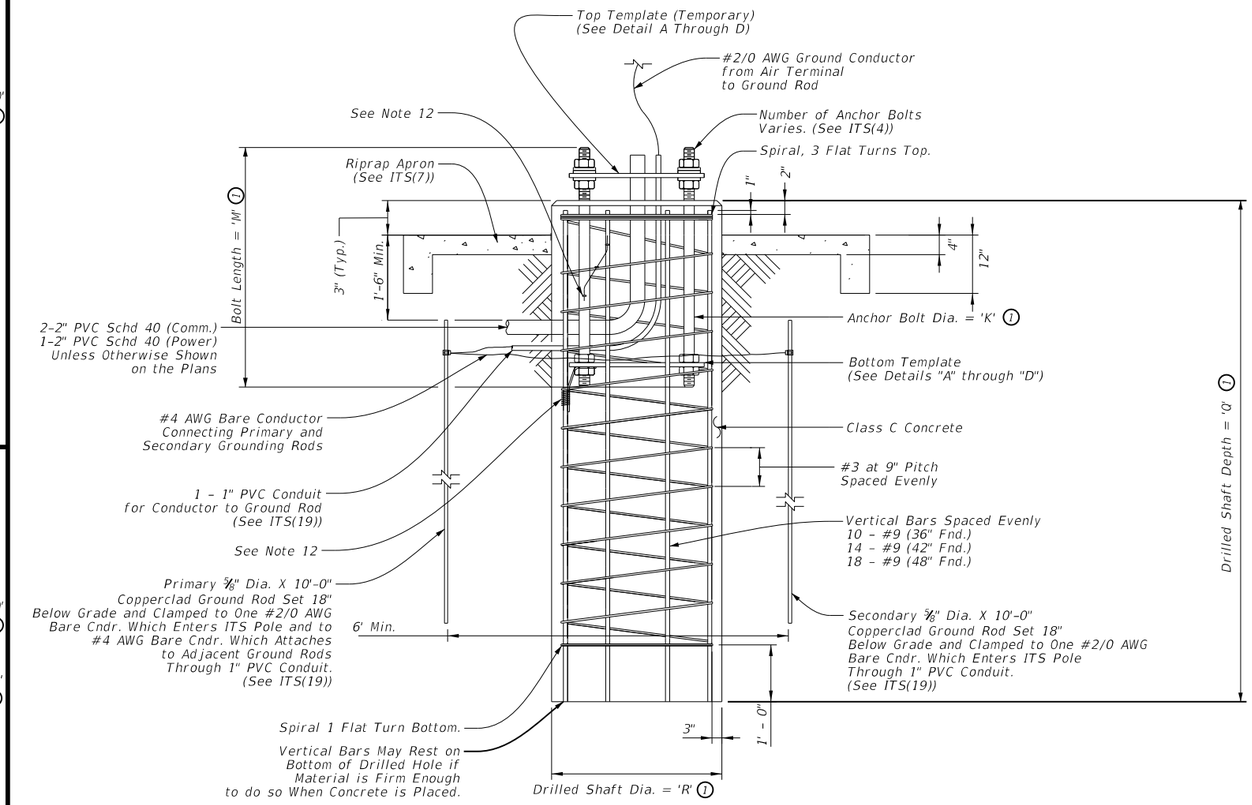


Top and Bottom Template (Four Bolt)
Detail A



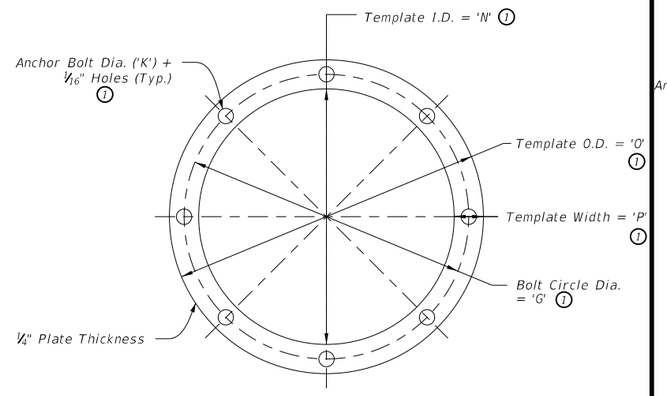
Top and Bottom Template (Six Bolt)
Detail B



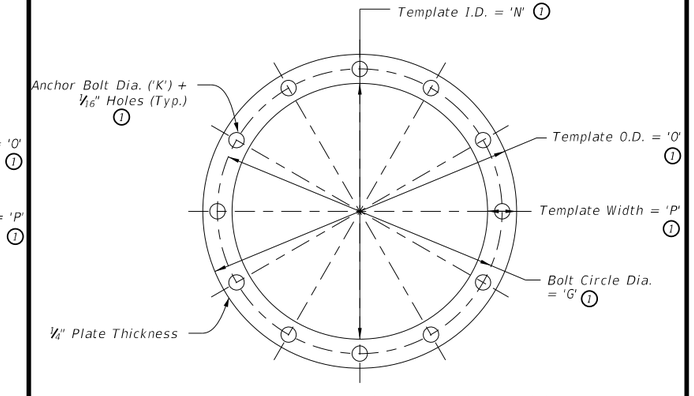
Foundation Details (Typical)
Elevation
Not to Scale

General Notes:

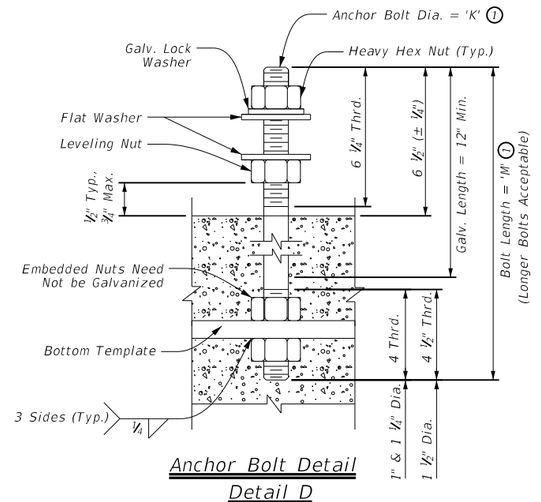
1. Drilled shaft concrete shall be Class "C" (f'c = 3,600 PSI) in accordance with Item 416, "Drilled Shaft Foundations."
2. Reinforcing bars shall be Grade 60 (Fy = 60 KSI) and conform to ASTM A-615. All reinforcing shall conform to Item 440, "Reinforcing Steel."
3. Provide ASTM A-36 steel for templates. Top and bottom templates need not be galvanized.
4. Anchor bolts shall be rigidly held in position during concrete placement using steel templates at the top and bottom. Top templates shall remain in place until the concrete has cured in place beyond initial set time.
5. Lubricate and tighten anchor bolts, when erecting pole, in accordance with Item 449, "Anchor Bolts."
6. Anchor bolts shall conform to ASTM F1554 Grade 55, or ASTM A193 B7 with ASTM A194 Grade 2H or A563 heavy hex nuts with F436 washers. Galvanize a minimum of the top end thread length plus 6 inches for all anchor bolts unless otherwise noted. Exposed washers and exposed nuts shall be galvanized. All galvanizing shall be in accordance with Item 445, "Galvanizing."
7. All vertical reinforcement shall be carried to the bottom of the drilled shaft.
8. Place three flat turns of the spiral bar at the top and one flat turn at the bottom of the drilled shaft.
9. Drilled shaft shall be measured by the linear foot and paid under Item 416, "Drill Shaft Foundations."
10. If rock is encountered, the drilled shaft to extend a minimum of two diameters into solid rock.
11. Location for conduit entering foundation may vary. Orient conduit entering foundation to coincide with location of ground boxes and primary ground rod.
12. Bond anchor bolts to rebar with #2/0 AWG jumper and two mechanical connectors or by bending No. 3 bar on bottom template as shown and wire tightly with ten turns of No. 10 wire or one mechanical connector. Mechanical connectors shall be UL Listed for concrete encasement.



Top and Bottom Template (Eight Bolt)
Detail C



Top and Bottom Template (Twelve Bolt)
Detail D



Anchor Bolt Detail
Detail D

Reference Notes:

(1) See tables on Sheet ITS(4) for values of dimension variables.

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE FOUNDATION DETAILS

ITS(3)-16

FILE: its(3)-16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS April 2016	0050	06	089	US290
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TABLE 1: ITS POLE – 90 MPH (W/ 2 SOLAR PANELS) (4)

POLE TYPE (1)	POLE HEIGHT (FT)	POLE SHAFT (1)(10)			BASE PLATE (1)					TOP PLATE (2)	ANCHOR BOLT (3)						FOUNDATION (3)			
		BOTTOM OUTSIDE DIA. (IN)	TOP OUTSIDE DIA. (IN)	WALL THICKNESS (IN)	INSIDE DIA. (IN)	OUTSIDE DIA. (IN)	BOLT CIRCLE DIA. (IN)	BOLT HOLE DIA. (IN)	THICKNESS (IN)	OUTSIDE DIA. (IN)	DIA. (IN)	NO. OF BOLTS	LENGTH OF BOLT MIN. (IN)	TEMPLATE INSIDE DIA. (IN)	TEMPLATE OUTSIDE DIA. (IN)	TEMPLATE WIDTH (IN)	DRILL SHAFT DEPTH – TEXAS CONE PENETROMETER (N – BLOWS/FT.) (SEE NOTE 5)			DRILLED SHAFT DIA. (IN)
																	N = 10	N = 15	N = 40	
		'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'I'	'J'	'K'	'L'	'M'	'N'	'O'	'P'	'Q'			'R'
8 SIDED	20	10	8	1/2	10-1/16	21	16	1-1/4	1-1/2	9	1	4	29	14	18	2	12	11	10	36
	30	13	9	1/2	13-1/16	24	19	1-9/16	1-1/2	10	1-1/4	4	35	16-1/2	21-1/2	2-1/2	15	13	10	36
	40	15	9	1/2	15-1/16	26	21	1-9/16	1-1/2	10	1-1/4	6	35	18-1/2	23-1/2	2-1/2	17	14	11	42
	45	16	10	1/2	16-1/16	27	22	1-9/16	1-1/2	11	1-1/4	6	35	19-1/2	24-1/2	2-1/2	18	16	12	42
	50	17	10	1/2	17-1/16	28	23	1-9/16	1-1/2	11	1-1/4	6	35	20-1/2	25-1/2	2-1/2	19	16	12	42
	55 (6)(7)	19	11	5/8	19-1/16	30	25	1-13/16	2	12	1-1/2	6	40	22	28	3	21	18	13	42
	60 (6)(7)	20	11	5/8	20-1/16	31	26	1-13/16	2	12	1-1/2	6	40	23	29	3	21	19	14	48

TABLE 2: ITS POLE – 110 MPH (W/ 2 SOLAR PANELS) (4)

POLE TYPE (1)	POLE HEIGHT (FT)	POLE SHAFT (1)(10)			BASE PLATE (1)					TOP PLATE (2)	ANCHOR BOLT (3)						FOUNDATION (3)			
		BOTTOM OUTSIDE DIA. (IN)	TOP OUTSIDE DIA. (IN)	WALL THICKNESS (IN)	INSIDE DIA. (IN)	OUTSIDE DIA. (IN)	BOLT CIRCLE DIA. (IN)	BOLT HOLE DIA. (IN)	THICKNESS (IN)	OUTSIDE DIA. (IN)	DIA. (IN)	NO. OF BOLTS	LENGTH OF BOLT MIN. (IN)	TEMPLATE INSIDE DIA. (IN)	TEMPLATE OUTSIDE DIA. (IN)	TEMPLATE WIDTH (IN)	DRILL SHAFT DEPTH – TEXAS CONE PENETROMETER (N – BLOWS/FT.) (SEE NOTE 5)			DRILLED SHAFT DIA. (IN)
																	N = 10	N = 15	N = 40	
		'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'I'	'J'	'K'	'L'	'M'	'N'	'O'	'P'	'Q'			'R'
8 SIDED	20	10	8	1/2	10-1/16	21	16	1-1/4	1-1/2	9	1	4	29	14	18	2	14	12	10	36
	30	13	9	1/2	13-1/16	24	19	1-9/16	1-3/4	10	1-1/4	6	35	16-1/2	21-1/2	2-1/2	18	15	11	36
	40	15	9	1/2	15-1/16	25	21	1-9/16	1-3/4	10	1-1/4	6	35	18-1/2	23-1/2	2-1/2	20	17	12	42
	45	16	10	1/2	17-1/16	27	22	1-9/16	1-3/4	11	1-1/4	8	35	19-1/2	24-1/2	2-1/2	21	18	13	42
	50	17	10	1/2	18-1/16	28	23	1-9/16	1-3/4	11	1-1/4	8	35	20-1/2	25-1/2	2-1/2	22	19	14	42
	55 (7)	19	11	5/8	19-1/16	30	25	1-9/16	2	12	1-1/4	8	35	22-1/2	27-1/2	2-1/2	24	20	14	42
	60 (7)	20	11	5/8	20-1/16	31	26	1-13/16	2	12	1-1/2	6	40	23	29	3	25	21	15	48

TABLE 3: ITS POLE – 130 MPH (W/ 1 SOLAR PANEL) (5)

POLE TYPE (1)	POLE HEIGHT (FT)	POLE SHAFT (1)(10)			BASE PLATE (1)					TOP PLATE (2)	ANCHOR BOLT (3)						FOUNDATION (3)			
		BOTTOM OUTSIDE DIA. (IN)	TOP OUTSIDE DIA. (IN)	WALL THICKNESS (IN)	INSIDE DIA. (IN)	OUTSIDE DIA. (IN)	BOLT CIRCLE DIA. (IN)	BOLT HOLE DIA. (IN)	THICKNESS (IN)	OUTSIDE DIA. (IN)	DIA. (IN)	NO. OF BOLTS	LENGTH OF BOLT MIN. (IN)	TEMPLATE INSIDE DIA. (IN)	TEMPLATE OUTSIDE DIA. (IN)	TEMPLATE WIDTH (IN)	DRILL SHAFT DEPTH – TEXAS CONE PENETROMETER (N – BLOWS/FT.) (SEE NOTE 5)			DRILLED SHAFT DIA. (IN)
																	N = 10	N = 15	N = 40	
		'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'I'	'J'	'K'	'L'	'M'	'N'	'O'	'P'	'Q'			'R'
8 SIDED	20	10	8	1/2	10-1/16	21	16	1-9/16	1-3/4	9	1-1/4	4	35	13-1/2	18-1/2	2-1/2	16	14	10	36
	30	13	9	1/2	15-1/16	24	19	1-9/16	1-3/4	10	1-1/4	6	35	16-1/2	21-1/2	2-1/2	18	16	11	36
	40	15	9	1/2	15-1/16	26	21	1-9/16	1-3/4	10	1-1/4	6	35	18-1/2	23-1/2	2-1/2	21	18	13	42
	45	16	10	1/2	16-1/16	27	22	1-9/16	1-3/4	11	1-1/4	8	35	19-1/2	24-1/2	2-1/2	23	19	14	42
	50	17	10	1/2	17-1/16	28	23	1-9/16	2	11	1-1/2	8	40	20	26	3	24	20	14	42
	55 (7)	19	11	5/8	19-1/16	30	25	1-13/16	2	12	1-1/2	8	40	22	28	3	27	22	15	42
	60 (7)	20	11	5/8	20-1/16	31	26	1-13/16	2	12	1-1/2	8	40	23	29	3	28	23	16	48

TABLE 4: ITS POLE WITH STIFFENERS – 90 MPH (W/ 4 SOLAR PANELS) (8)

POLE TYPE (1)	POLE HEIGHT (FT)	POLE SHAFT (1)			BASE PLATE (1)					TOP PLATE (2)	ANCHOR BOLT (3)						FOUNDATION (3)			
		BOTTOM OUTSIDE DIA. (IN)	TOP OUTSIDE DIA. (IN)	WALL THICKNESS (IN)	INSIDE DIA. (IN)	OUTSIDE DIA. (IN)	BOLT CIRCLE DIA. (IN)	BOLT HOLE DIA. (IN)	THICKNESS (IN)	OUTSIDE DIA. (IN)	DIA. (IN)	NO. OF BOLTS	LENGTH OF BOLT MIN. (IN)	TEMPLATE INSIDE DIA. (IN)	TEMPLATE OUTSIDE DIA. (IN)	TEMPLATE WIDTH (IN)	DRILL SHAFT DEPTH – TEXAS CONE PENETROMETER (N – BLOWS/FT.) (SEE NOTE 5)			DRILLED SHAFT DIA. (IN)
																	N = 10	N = 15	N = 40	
		'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'I'	'J'	'K'	'L'	'M'	'N'	'O'	'P'	'Q'			'R'
8 SIDED	30	13	9	3/8	13-1/16	28	22	1-1/4	1-3/4	10	1	8	29	20	24	2	17	15	11	42
	40	15	9	1/2	15-1/16	30	24	1-1/4	2	10	1	8	29	22	26	2	20	17	12	42
	45	16	10	1/2	16-1/16	31	25	1-9/16	2	11	1-1/4	8	35	22-1/2	27-1/2	2-1/2	21	18	13	42
	50	17	10	1/2	17-1/16	32	26	1-9/16	2	11	1-1/4	8	35	23-1/2	28-1/2	2-1/2	21	18	13	42
12 sided	55 (7)	19	11	5/8	19-1/16	34	27	1-9/16	2	12	1-1/4	12	35	24-1/2	29-1/2	2-1/2	21	18	13	48
	60 (7)	20	12	5/8	20-1/16	35	28	1-9/16	2	13	1-1/4	12	35	25-1/2	30-1/2	2-1/2	22	19	14	48

TABLE 5: ITS POLE WITH STIFFENERS – 110 MPH (W/ 4 SOLAR PANELS) (8)

POLE TYPE (1)	POLE HEIGHT (FT)	POLE SHAFT (1)			BASE PLATE (1)					TOP PLATE (2)	ANCHOR BOLT (3)						FOUNDATION (3)			
		BOTTOM OUTSIDE DIA. (IN)	TOP OUTSIDE DIA. (IN)	WALL THICKNESS (IN)	INSIDE DIA. (IN)	OUTSIDE DIA. (IN)	BOLT CIRCLE DIA. (IN)	BOLT HOLE DIA. (IN)	THICKNESS (IN)	OUTSIDE DIA. (IN)	DIA. (IN)	NO. OF BOLTS	LENGTH OF BOLT MIN. (IN)	TEMPLATE INSIDE DIA. (IN)	TEMPLATE OUTSIDE DIA. (IN)	TEMPLATE WIDTH (IN)	DRILL SHAFT DEPTH – TEXAS CONE PENETROMETER (N – BLOWS/FT.) (SEE NOTE 5)			DRILLED SHAFT DIA. (IN)
																	N = 10	N = 15	N = 40	
		'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'I'	'J'	'K'	'L'	'M'	'N'	'O'	'P'	'Q'			'R'
8 SIDED	30	13	9	1/2	13-1/16	28	22	1-9/16	2-1/4	10	1-1/4	8	35	19-1/2	24-1/2	2-1/2	20	17	12	42
	40	16	10	1/2	16-1/16	31	25	1-9/16	2-1/4	11	1-1/4	8	35	22-1/2	27-1/2	2-1/2	24	20	14	42
	45	17	11	1/2	17-1/16	32	26	1-9/16	2-1/4	12	1-1/4	8	35	23-1/2	28-1/2	2-1/2	25	21	15	42
	50	18	11	1/2	18-1/16	32	26	1-13/16	2-1/2	12	1-1/2	8	40	23	29	3	25	21	15	48
12 SIDED	55 (7)	19	11	5/8	19-1/16	34	27	1-9/16	2-1/4	12	1-1/4	12	35	24-1/2	29-1/2	2-1/2	24	21	15	48
	60 (7)	20	12	5/8	20-1/16	35	28	1-9/16	2-1/4	13	1-1/4	12	35	25-1/2	30-1/2	2-1/2	25	22	15	48

TABLE 6: ITS POLE WITH STIFFENERS – 130 MPH (W/ 3 SOLAR PANELS) (9)

POLE TYPE (1)	POLE HEIGHT (FT)	POLE SHAFT (1)			BASE PLATE (1)					TOP PLATE (2)	ANCHOR BOLT (3)						FOUNDATION (3)			
		BOTTOM OUTSIDE DIA. (IN)	TOP OUTSIDE DIA. (IN)	WALL THICKNESS (IN)	INSIDE DIA. (IN)	OUTSIDE DIA. (IN)	BOLT CIRCLE DIA. (IN)	BOLT HOLE DIA. (IN)	THICKNESS (IN)	OUTSIDE DIA. (IN)	DIA. (IN)	NO. OF BOLTS	LENGTH OF BOLT MIN. (IN)	TEMPLATE INSIDE DIA. (IN)	TEMPLATE OUTSIDE DIA. (IN)	TEMPLATE WIDTH (IN)	DRILL SHAFT DEPTH – TEXAS CONE PENETROMETER (N – BLOWS/FT.) (SEE NOTE 5)			DRILLED SHAFT DIA. (IN)
																	N = 10	N = 15	N = 40	
		'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'I'	'J'	'K'	'L'	'M'	'N'	'O'	'P'	'Q'			'R'
8 SIDED	30	13	9	1/2	13-1/16	28	22	1-9/16	2-1/2	10	1-1/4	8	35	19-1/2	24-1/2	2-1/2	23	19	14	42
	40	16	10	1/2	16-1/16	31	25	1-9/16	2-1/2	11	1-1/2	8	40	22	28	3	25	21	14	42
	45	17	11	1/2	17-1/16	32	26	1-13/16	2-1/2	12	1-1/2	8	40	23	29	3	26	22	16	48
	50	18	11	1/2	18-1/16	33	27	1-13/16	2-1/2	12	1-1/2	8	40	24	30	3	27	23	16	48
12 SIDED	55 (7)	19	11	5/8	19-1/16	34	27	1-9/16	2-1/4	12	1-1/4	12	35	24-1/2	29-1/2	2-1/2	26	22	16	48
	60 (7)	20	12	5/8	20-1/16	35	28	1-9/16	2-1/4	13	1-1/4	12	35	25 1/2	30 1/2	2-1/2	27	23	16	48

General Notes:

1. Designed according to Sixth Edition 2013 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto.
2. Table 1 and Table 4 design wind speed equals 90 MPH (3-Second Wind Gusts) with a 1.14 gust factor. A wind importance factor of 1.00 is applied to adjust the wind speed to a 50 year recurrence interval at 33 FT above the ground for Exposure C category in accordance with TxDOT WV&IZ(LTS2013). Design values listed in the table allow the base of the pole to be elevated above the surrounding ground level no more than 20 FT.
3. Table 2 and Table 5 design wind speed equals 110 MPH (3-Second Wind Gusts) with a 1.14 gust factor. A wind importance factor of 1.00 is applied to adjust the wind speed to a 50 year recurrence interval at 33 FT above the ground for Exposure C category in accordance with TxDOT WV&IZ(LTS2013). Design values listed in the table allow the base of the pole to be elevated above the surrounding ground level no more than 20 FT.
4. Table 3 and Table 6 design wind speed equals 130 MPH (3-Second Wind Gusts) with a 1.14 gust factor. A wind importance factor of 1.00 is applied to adjust the wind speed to a 50 year recurrence interval at 33 FT above the ground for Exposure C category in accordance with TxDOT WV&IZ(LTS2013). Design values listed in the table allow the base of the pole to be elevated above the surrounding ground level no more than 20 FT.
5. Recommended embedment lengths are for information purposes only. Foundation embedment depth is based off Texas Cone Penetrometer Value N = 10 blows/ft. for soft soils and up to 40 blows/ft. for hard soils. Foundation lengths shall be as shown on the plans, or as directed by the Engineer. Foundations will be paid for under Item 416, "Drilled Shaft Foundations" unless otherwise shown on the plans.
6. Deviation from the design criteria and values contained in the tables above constitute and alternative design and will require submission of shop drawings and calculations for approval, sealed by a Texas Professional Engineer.
7. 12-sided or round poles as a direct substitution for 8-sided and round poles as a direct substitution for 12-sided poles, meeting the design criteria and values contained in the tables above, require submission of shop drawings for approval.

Reference Notes

(1) See the following ITS Pole Standard sheets:
- 8-sided Pole – ITS(1)
- 12-sided Pole – ITS(2)

(2) Provision for 2" Dia. opening in top plate for poles requiring cameras mounted on top.
- See ITS Pole Mounting Details – ITS(6)

(3) See ITS Pole Foundation Details – ITS(3)

(4) Designed to support the following:
- Two Type 3 ITS pole mounted cabinets (280 LBS/EA and EPA = 14.50 sq. ft. per cabinet). See ITS(16).
- Two 250 W (50 LBS/EA and EPA = 30.70 sq. ft. per panel) solar panels (see ITS(24) "Solar Panel Matrix Table")
- Combined ITS equipment dead load of 170 LBS with an EPA = 6 sq. ft.

(5) Designed to support the following:
- Two Type 3 ITS pole mounted cabinets (280 LBS/EA and EPA = 14.50 sq. ft. per cabinet). See ITS(16).
- One 250 W (50 LBS/EA and EPA = 30.70 sq. ft. per panel) solar panels (see ITS(24) "Solar Panel Matrix Table")
- Combined ITS equipment dead load of 170 LBS with an EPA = 6 sq. ft.

(6) Pole heights at 55 Ft. and 60 Ft. located in the AMA, CHS, and LBB Districts, will require special design and design values shown shall not be used. Submit shop drawings for pole design and supporting calculations for 55 Ft. and 60 Ft. pole heights signed and sealed by a Texas Professional Engineer for approval.

(7) Ensure minimum nominal splice length is 1.5 times the average pole diameter at the splice to the nearest inch. Ensure longitudinal seam welds that will be in contact at a slip joint splice are ground smooth for the length of splice plus a minimum of six inches. Ensure a 100% longitudinal seam weld for a length of 1.5 pole diameter plus a minimum of 6 inches in outer sections at splices and at base plate. Provide 85% penetration in longitudinal seam welds at other pole sections.

(8) Designed to support the following:
- Two Type 3 ITS pole mounted cabinets (280 LBS/EA and EPA = 14.50 sq. ft. per cabinet). See ITS(16).
- Four 250 W (50 LBS/EA and EPA = 30.70 sq. ft. per panel) solar panels (see ITS(24) "Solar Panel Matrix Table")
- Combined ITS equipment dead load of 170 LBS with an EPA = 6 sq. ft.

Refer to ITS(4A) for stiffening plate details at the pole to base plate connection.

(9) Designed to support the following:
- Two Type 3 ITS pole mounted cabinets (280 LBS/EA and EPA = 14.50 sq. ft. per cabinet). See ITS(16).
- Three 250 W (50 LBS/EA and EPA = 30.70 sq. ft. per panel) solar panels (see ITS(24) "Solar Panel Matrix Table")
- Combined ITS equipment dead load of 170 LBS with an EPA = 6 sq. ft.

Refer to ITS(4A) for stiffening plate details at the pole to base plate connection.

(10) When solar panels are not provisioned in the plans, ITS pole wall thickness may be reduced by 1/2".

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE DESIGN DETAILS DATA LOOKUP TABLE

ITS(4)-15

FILE: its(4)-15.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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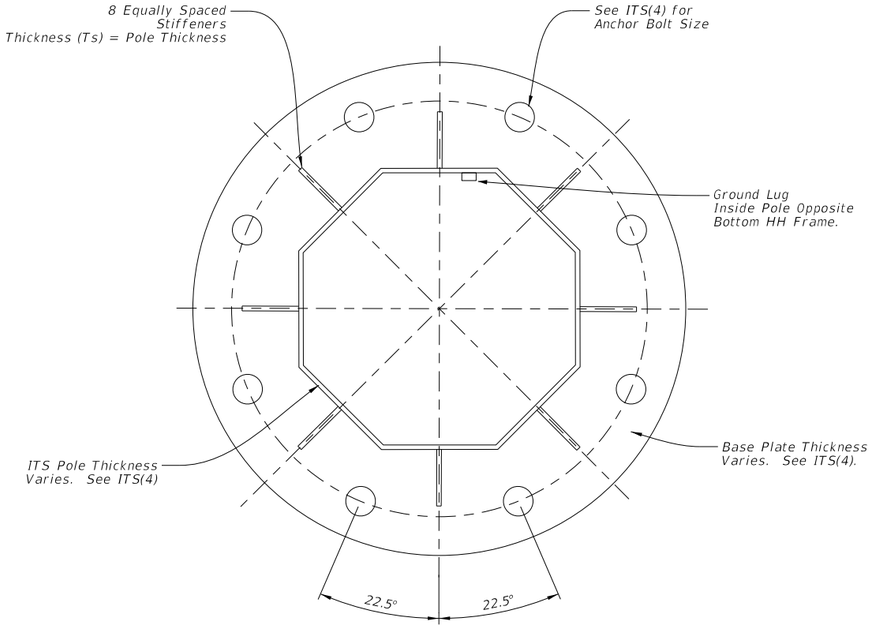
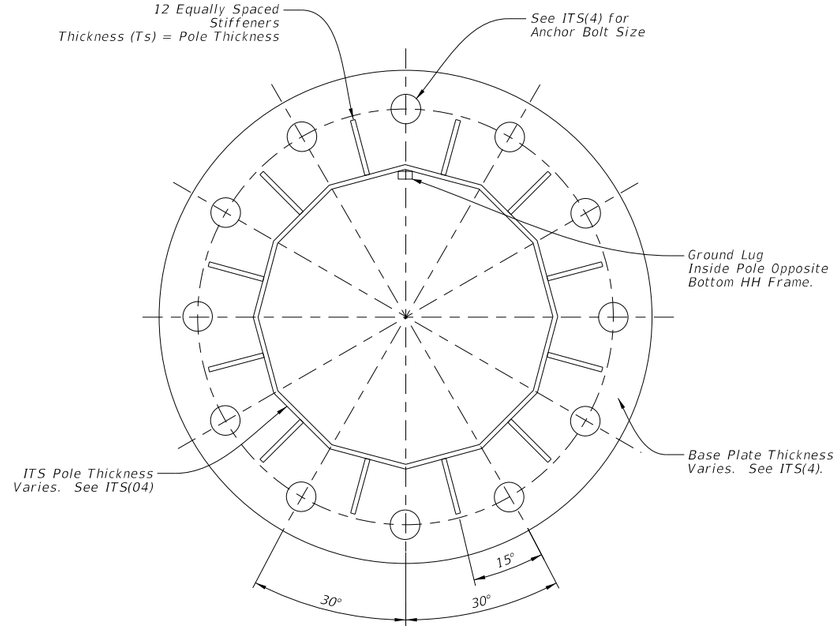
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		123

DATE:
FILE:



8-sided Pole Base Plate Detail



12-sided Pole Base Plate Detail

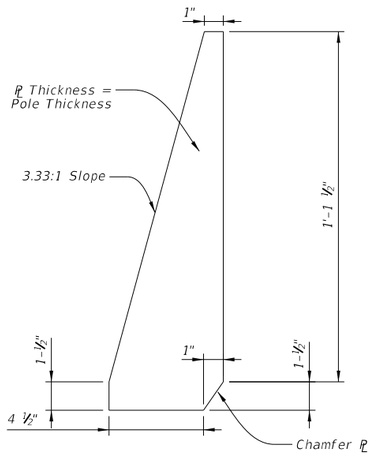
General Notes:

1. Steel stiffening plates shall conform to ASTM A36.
2. Make all welds conform to Item 441, "Steel Structures."
3. Galvanize in accordance with Item 445, "Galvanizing" unless otherwise noted.
4. Submit shop drawings detailing stiffening plate orientation along with ITS equipment intended for mounting for review and approval prior to fabrication.
5. HH = Handhole
6. T_s = Thickness

Reference Notes:

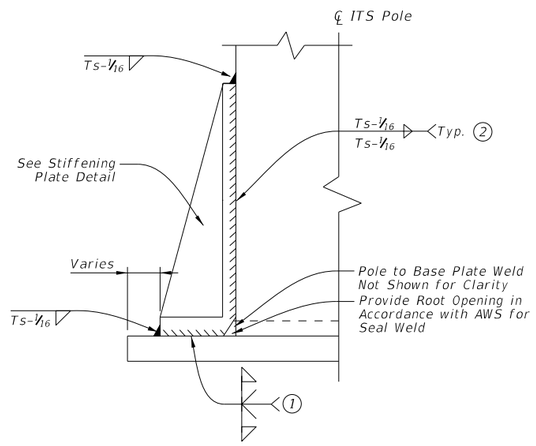
(1) Complete Joint Penetration Weld per AWS

(2) Wrap Fillet Weld Around Tip of Stiffener



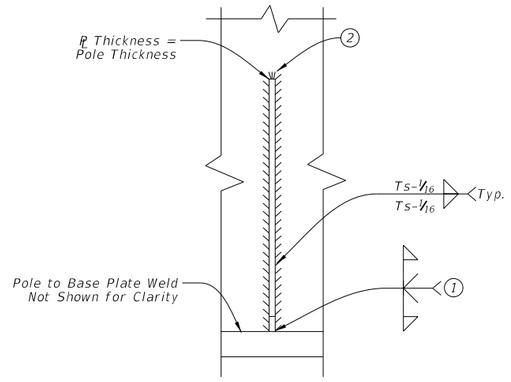
Stiffening Plate Detail

Not to Scale



Stiffening Detail - Elevation View

Not to Scale



Stiffening Detail - Front View

Not to Scale

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE STIFFENER PLATE DETAILS

ITS(4A)-15

FILE: its(4A)-15.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0050	06	089	US290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		124

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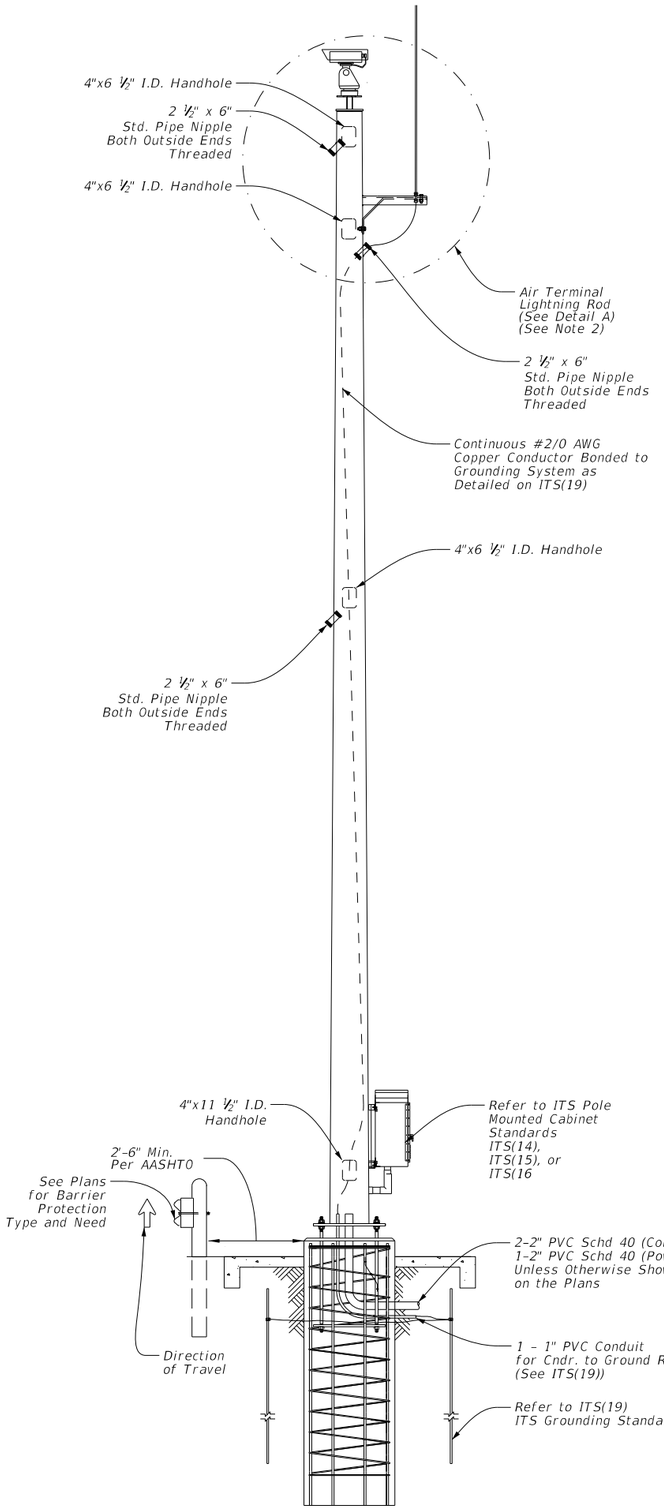
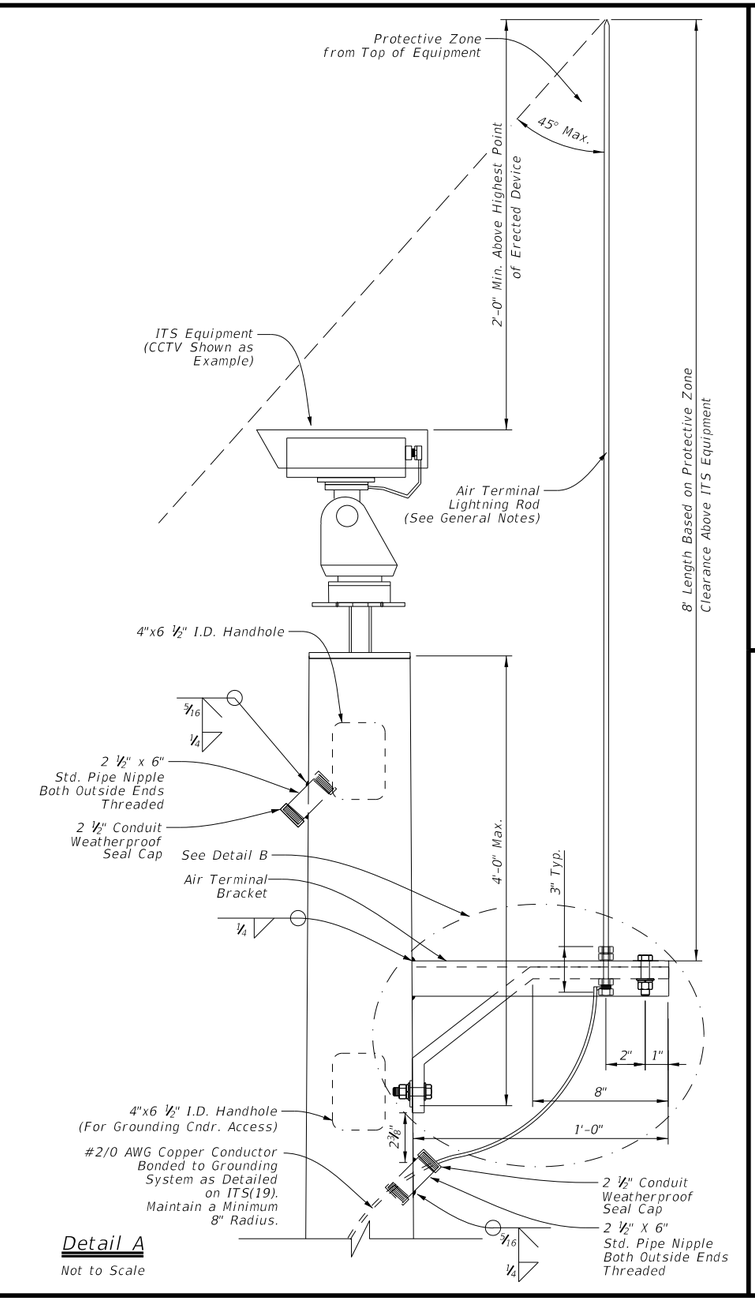


ITS Pole with Cabinet



Detail A

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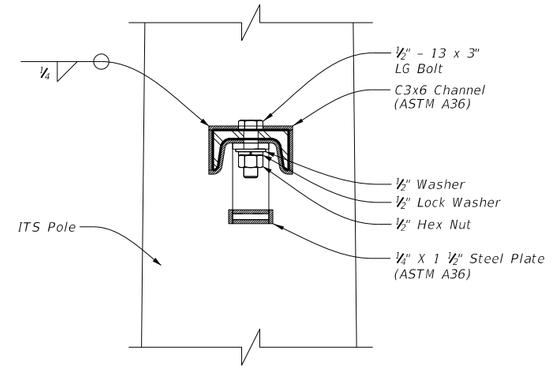

Section A-A

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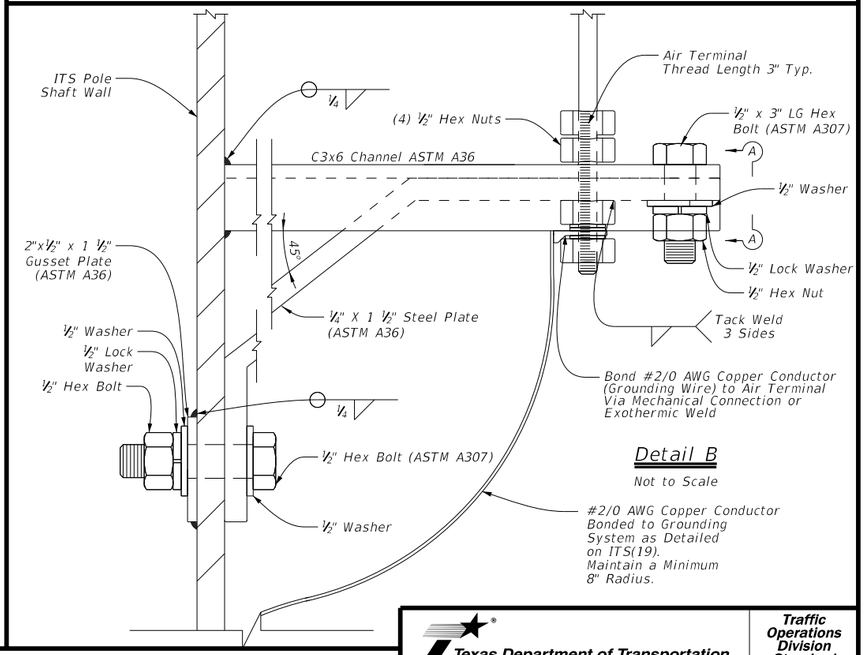

Detail B

Not to Scale

General Notes:

1. Provide lightning protection using air terminals on structures utilizing the rolling sphere method. Provide lightning protection system consisting of air terminals, down conductor, and grounding system installed in accordance with NFPA 780 and tested in accordance with IEEE 142. Meet the following requirements:
   A. Position - in center of least utilized field of view.
   B. Height - camera equipment to be within 45 degree protective zone of air terminal.
   C. Material - ½" ETP alloy 110 copper air terminal (Class II)
   D. Clearance - 24" minimum height above highest point of ITS equipment.
   E. Bonding - attach air terminal to bracket by exothermic weld or with approved clamping.
   F. Structure wind rating in accordance with TxDOT WV & IZ (LTS2013).
   G. Galvanize air terminal bracket in accordance with Item 445, "Galvanizing."
2. Alternative orientation for air terminal and pole mounted cabinet due to project specific needs to be indicated on the plans and detailed in shop drawing submittal for approval.
3. Weld air terminal bracket to ITS pole in accordance with Item 448 "Structural Field Welding." Bracket may be welded by the fabricator in the shop prior to delivery. A bolted connection for the air terminal bracket is acceptable in lieu of a welded connection with approval by the Engineer and detailed in the shop drawings.

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE AIR TERMINAL DETAILS

ITS(5)-15

FILE: its(5)-15.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0050	06	089	US290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		125

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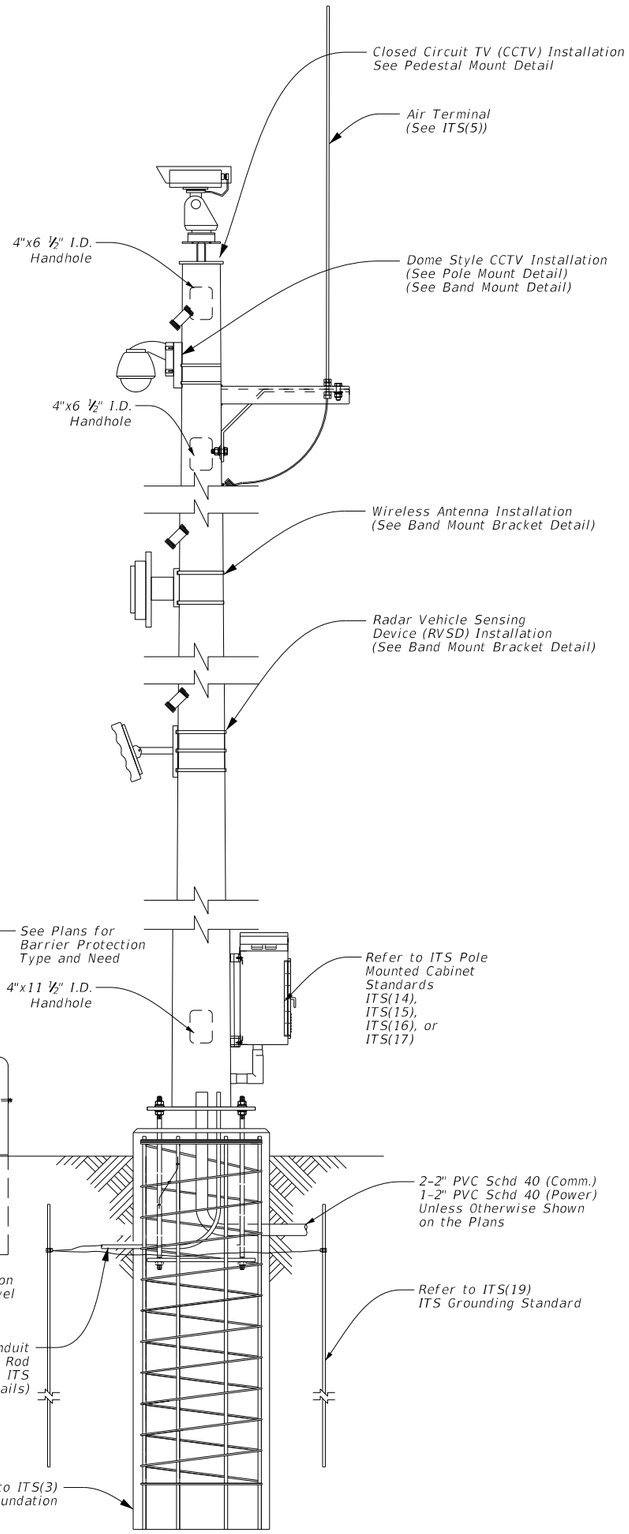
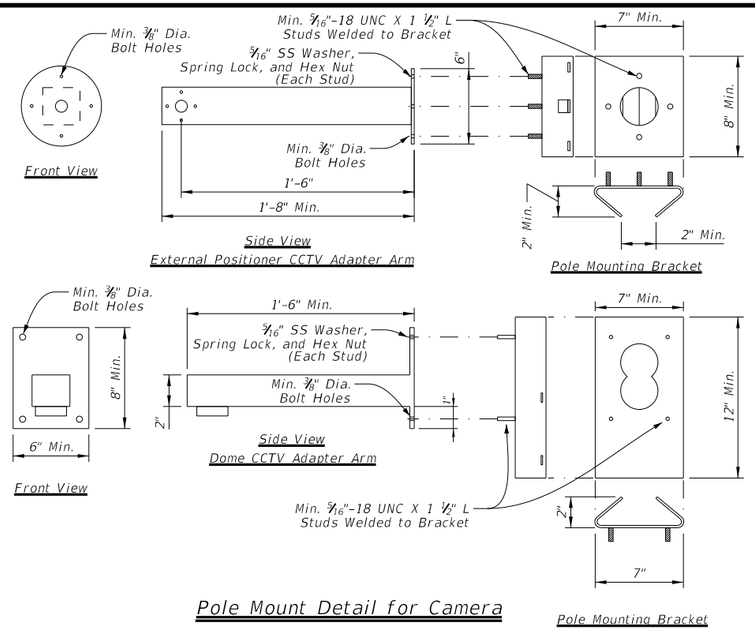
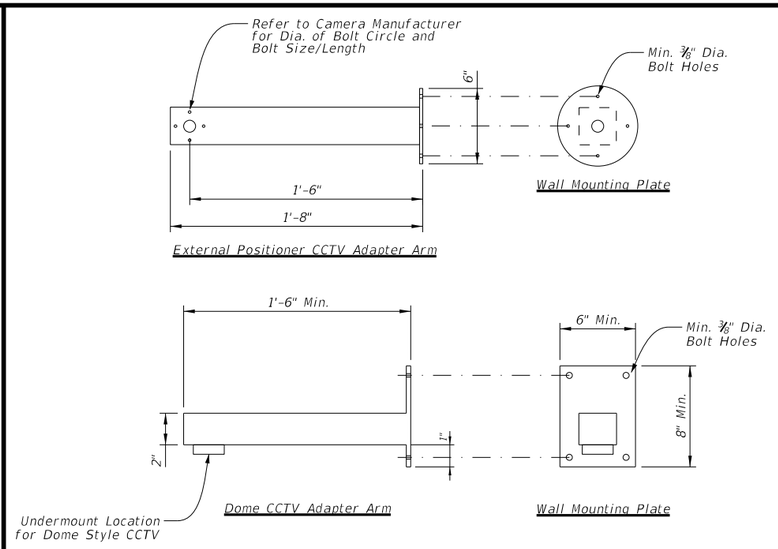


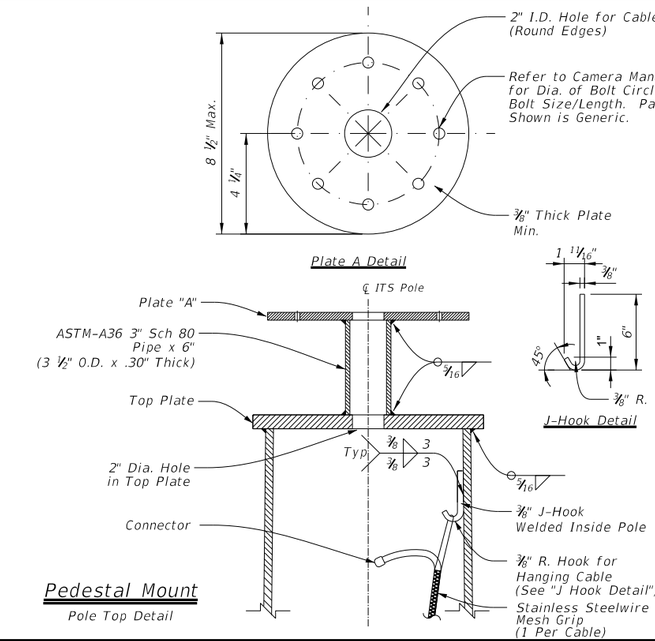
ITS Pole with Cabinet



Pole Mount Detail for Camera

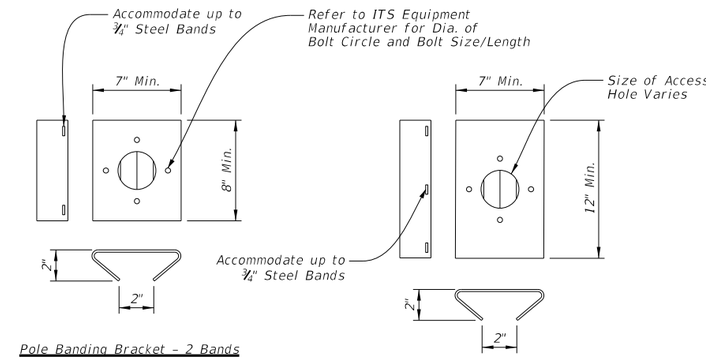


Wall Mount Detail



Pedestal Mount

Pole Top Detail



Band Mount Bracket Details

General Notes:

1. Designed according to Sixth Edition AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications.
2. Hang all cabling inside ITS pole structure with stainless steel wire mesh grips.
3. Bolt positioning in the pedestal top plate (Plate "A") for the pan/tilt base must be determined in the field per camera manufacturers recommendations. This will allow positioning of the camera to maximize coverage area. The Engineer will determine the camera's blind zone at each location.
4. Provide pedestal top plate and Plate "A" that conform to ASTM A36.
5. Make all welds conform to Item 441 and AWSD 1.1 (Structural Welding). Repair damaged galvanized coating per Item 445, "Galvanizing."
6. Galvanize parts in accordance with Item 445, "Galvanizing" unless otherwise noted.
7. The type of ITS equipment shown to be mounted to the ITS pole is intended to represent the most common ITS equipment applications and should not be treated as all inclusive. Other ITS equipment applications may exist that are project specific.
8. Mounting brackets are intended to be diagrammatic and for information only, and are not all inclusive. Contractor responsible for submitting mounting bracket design for approval by the Engineer prior to fabrication. Mounting bracket designed to support a maximum 35 Lbs. Off-the-shelf mounting brackets are acceptable and shall be submitted by shop drawing for approval.
9. Mounting heights to be determined in the field based on manufacturer recommendations.

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE EQUIPMENT MOUNTING DETAILS

ITS(6)-15

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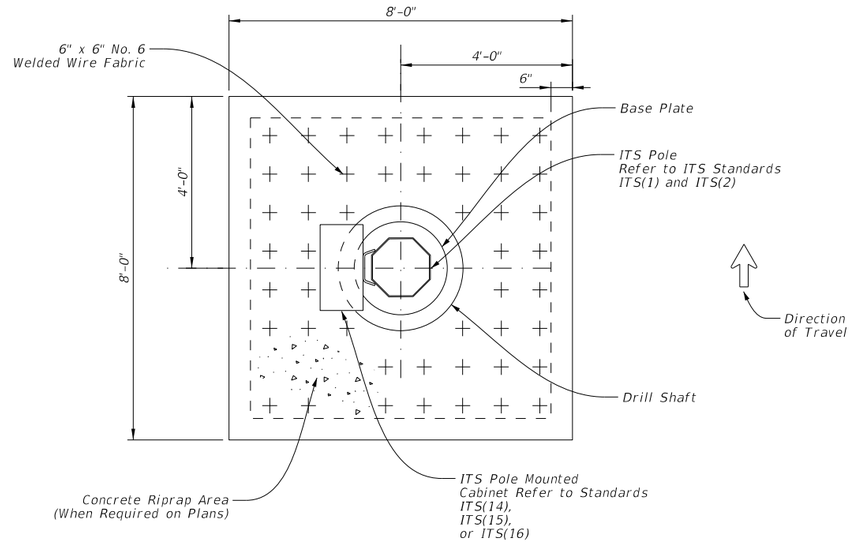
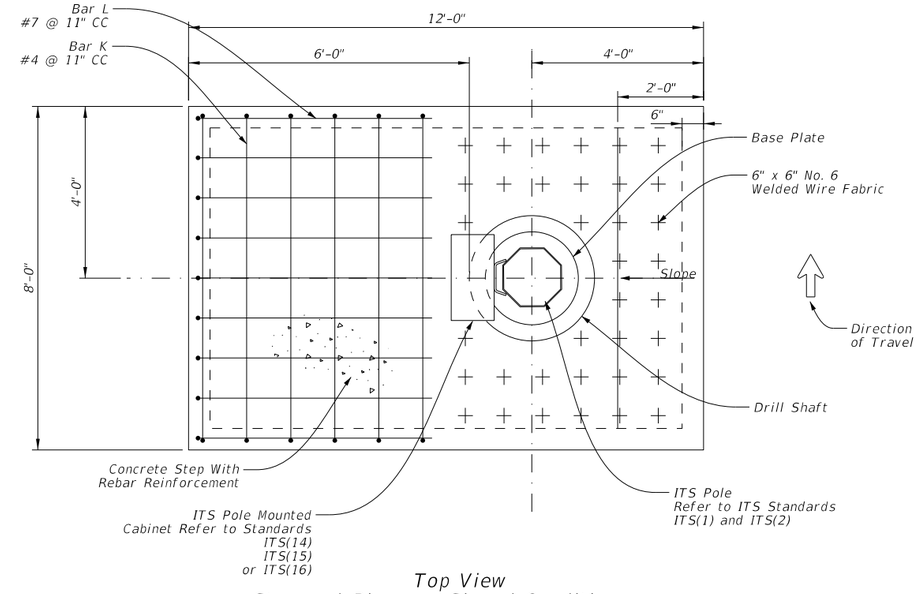
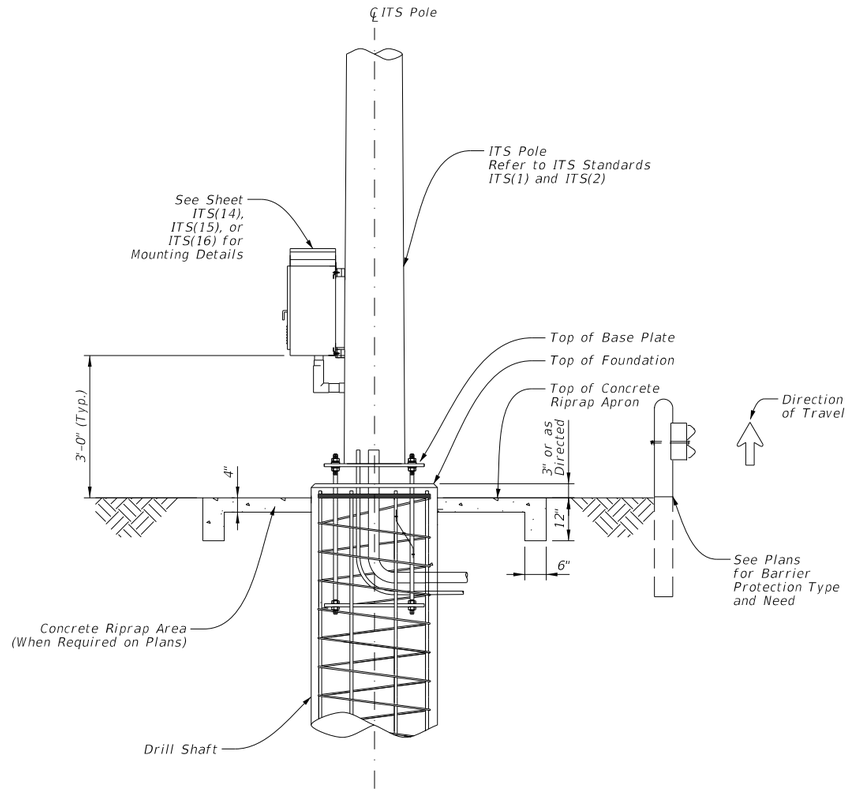


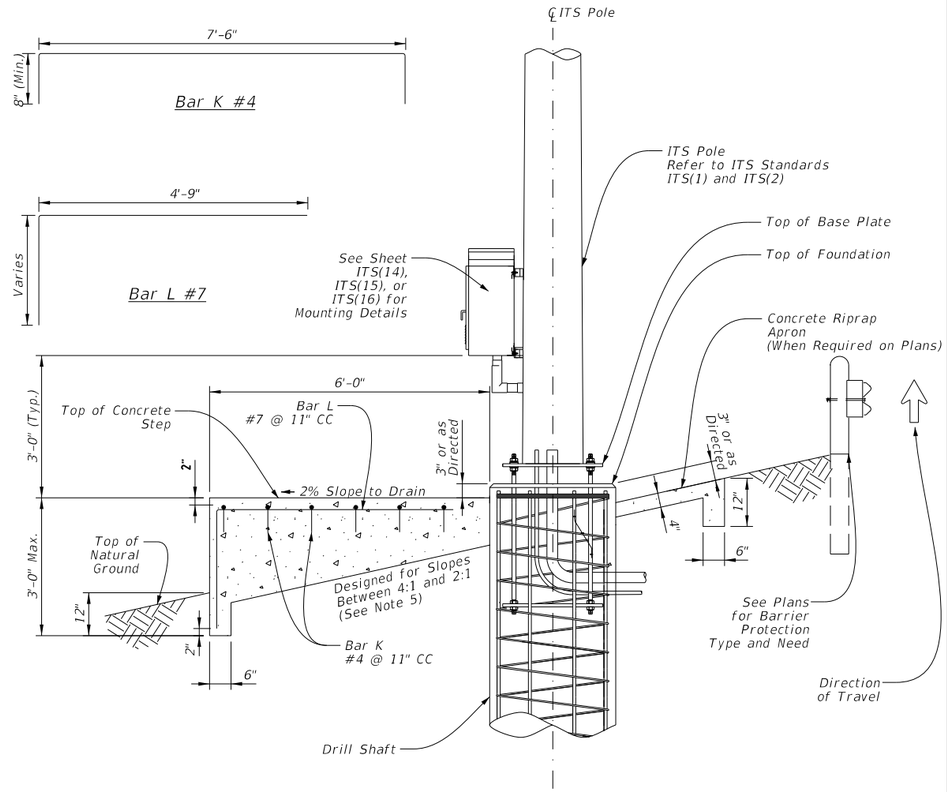
Top View
Riprap – Non-Sloped Conditions



Top View
Step and Riprap – Sloped Conditions



Elevation View
Riprap Apron Detail – Non-Sloped Conditions



Elevation View
Riprap Apron/Step Detail – Sloped Conditions
(Slopes Exceeding 4:1)

General Notes:

1. For non-sloped grassy areas, an 8' x 8' concrete riprap apron shall be poured around ITS pole foundations (see detail on this sheet), estimated at 1.25 CY per site, paid for under Item 432 "Riprap."
2. For sloped grassy areas, a concrete "step" (for maintenance personnel to access cabinet) shall be poured as part of the riprap apron. The step shall vary in height depending on slope, but shall extend 6' horizontally from ITS pole drilled shaft foundation and be the same width as riprap apron (8'). Step shall be poured at same time as riprap apron (see detail on this sheet). Any additional concrete necessary to fabricate step (over and above the 1.25 CY) shall be considered subsidiary to the various bid items and no direct payment shall be made.
3. For sloped areas where riprap exists, a 6' (horizontal from drilled shaft foundation) x 4' wide step shall be installed (see detail this sheet). Concrete for step shall be considered subsidiary to the various bid items and no direct payment shall be made.
4. Cabinet orientation may vary depending on field conditions or project constraints. Accommodate configuration of platform according to cabinet orientation.
5. Slopes greater than a 2:1 or when 3'-0" Max. step wall height is exceeded, an alternative design with safety railing is required and shall be detailed in the shop drawings for approval.

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE RIPRAP DETAILS

ITS(7)-15

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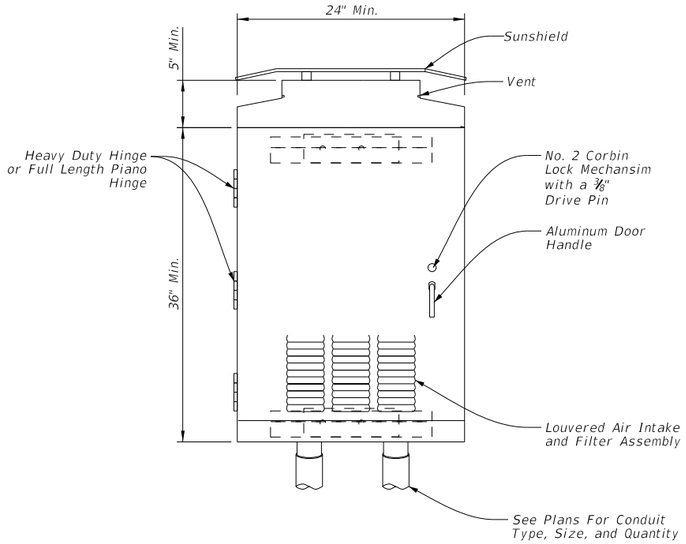
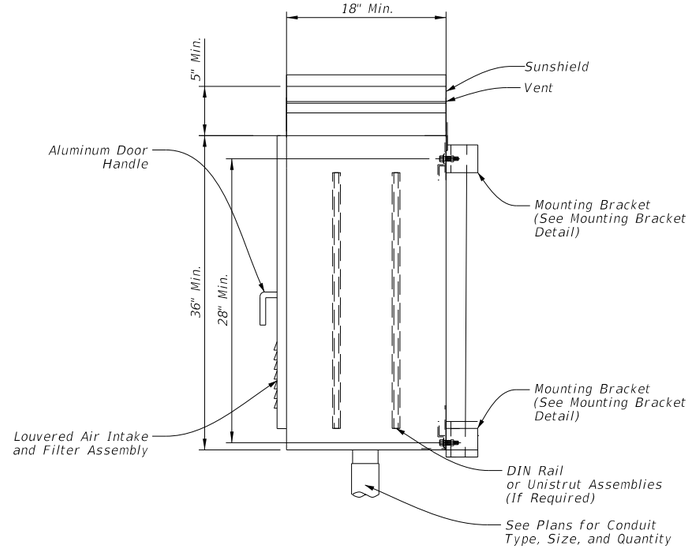


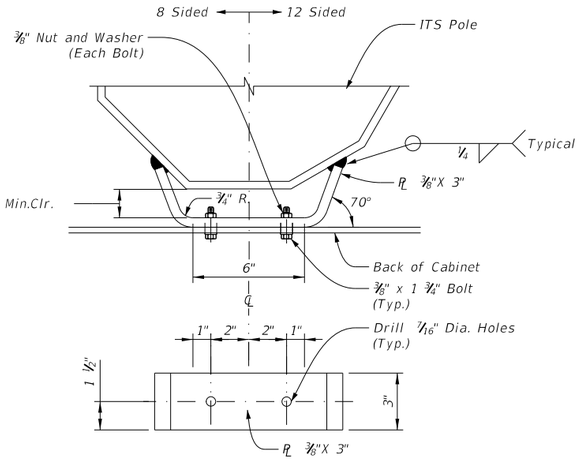
Pole Mounted Cabinet – Type 2 Front View

Not to Scale



Pole Mounted Cabinet – Type 2 Side View

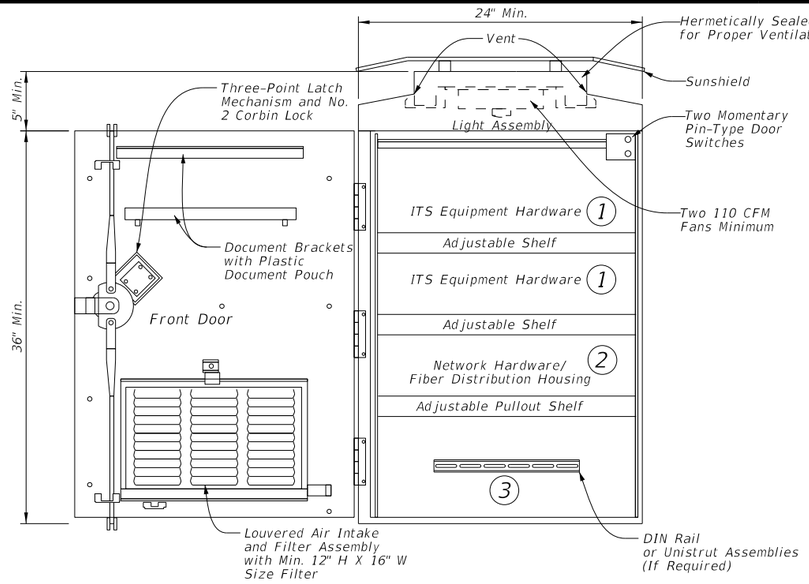
Not to Scale



Note:
ITS Pole May be Round, Octagonal (8 Sided), or Dodecahedron (12 Sided).
See ITS(1), and ITS(2) for Details.

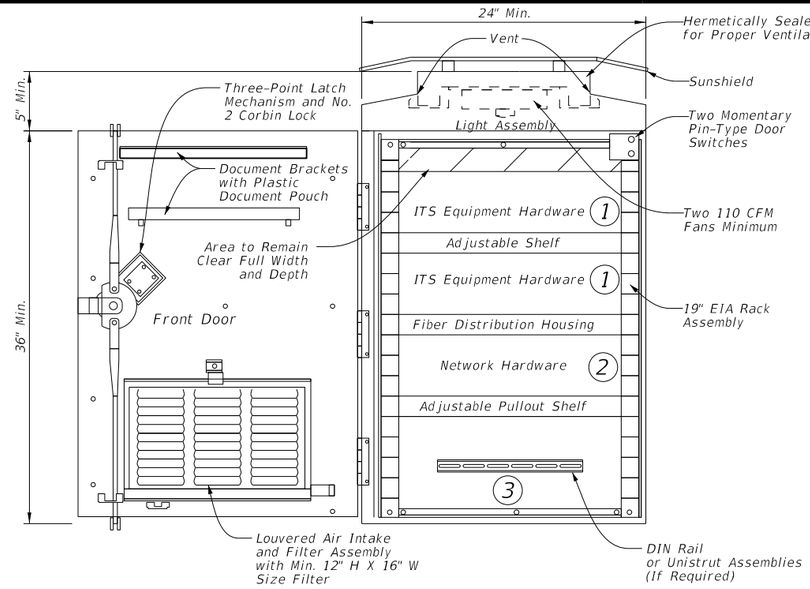
Mounting Bracket Detail

Not to Scale



Interior – Type 2 Without 19" EIA Rack – Front View

Not to Scale



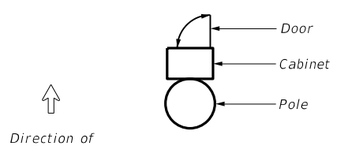
Interior – Type 2 With 19" EIA Rack – Front View

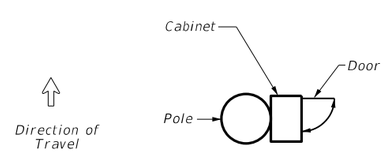
Not to Scale

Typical Equipment Layout Legend	
	Example Equipment
1	CCTV Interface Panel, Radar Vehicle Sensing Device (RVSD) Equipment, DMS/LCS Controller Environmental Sensor Station (ESS) Equipment, Bluetooth Equipment, or ITS Radio Equipment (See General Note 1)
2	Ethernet Switch, Video Encoder, Terminal Server, Fiber Optic Transceivers, or Media Conversion Equipment (See General Note 1)
3	Power Distribution Assembly, Service Entrance Breakers, Primary AC Power, Auxiliary Power Strip, Ground Bus Bar Surge Protection Equipment

General Notes:

1. Layout of hardware equipment and configuration shown is diagrammatic in nature and intended to represent a preferred Type 2 pole mounted cabinet setup. Hardware needed for each Type 2 cabinet varies and not all cabinet equipment may be shown. The contractor will be responsible for configuring cabinets with all appropriate ITS hardware and power supplies in accordance with the plans and specifications. The contractor may alter the cabinet configuration shown to maximize space and ensure easy access for maintenance.
2. Mount cabinet as detailed on ITS(15) or ITS(17). Orientation of cabinet on ITS pole may vary depending on field conditions. Mount the pole mounted cabinet to the backside of the ITS pole, to allow maintenance personnel to access the cabinet while being able to view oncoming traffic.
3. For ITS pole sites located on slopes greater than 4H:1V, mount the cabinet to the backside of the ITS pole as detailed on ITS(7). Mounting height to accommodate maintenance pad for easy access.
4. All dimensions are approximate and represent minimum cabinet dimensions.
5. Provide conduit entrances at the bottom of the cabinet.
6. Paid under Special Specification "ITS Pole with Cabinet" (Configuration 1) without 19" EIA rack. Paid under Special Specification "ITS Pole with Cabinet" (Configuration 2) with 19" EIA rack.





Orientation of Type 2 Cabinet on ITS Pole (Typical)

Not to Scale

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE MOUNTED CABINET TYPE 2 DETAILS

ITS(15)-15

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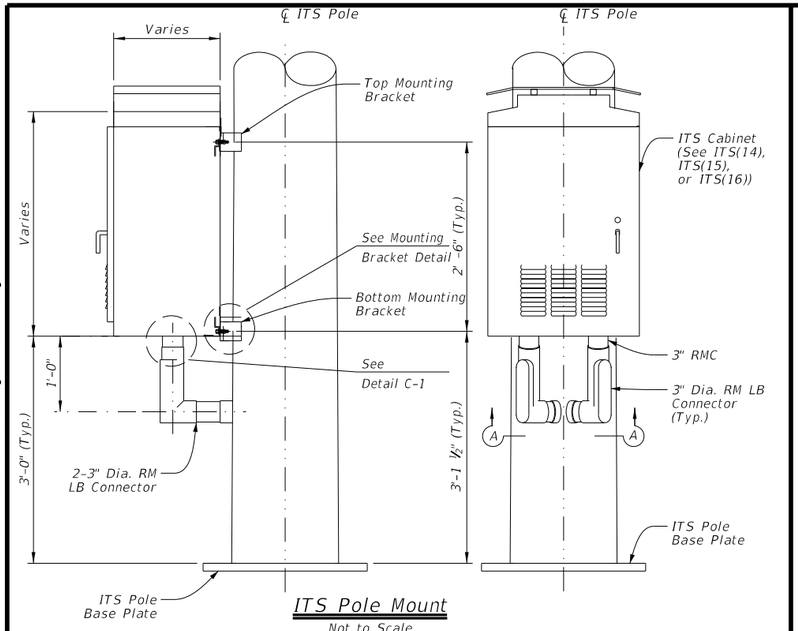
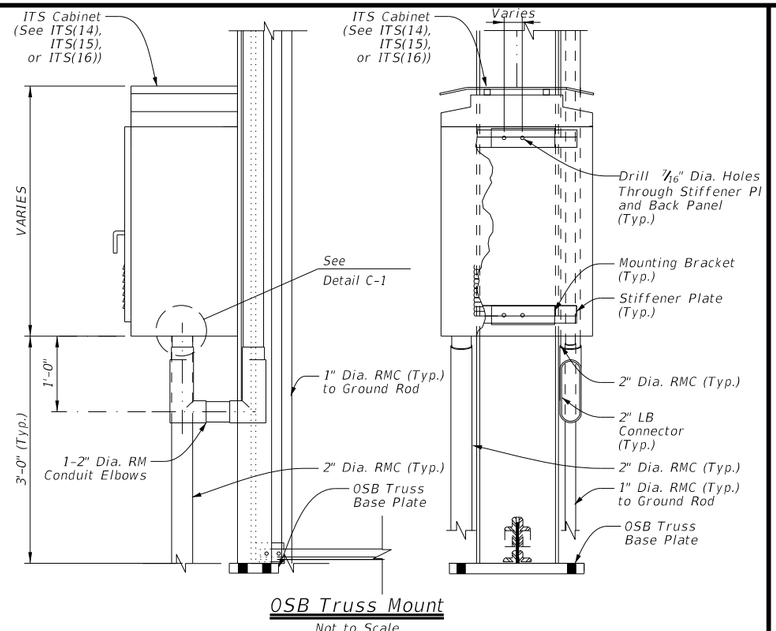


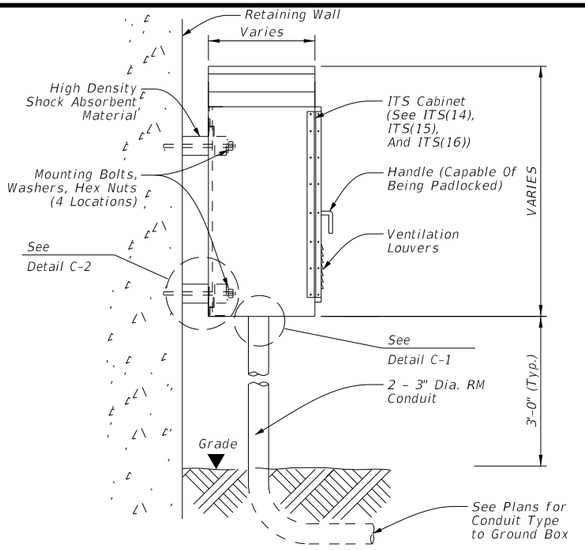
ITS Pole Mount

Not to Scale



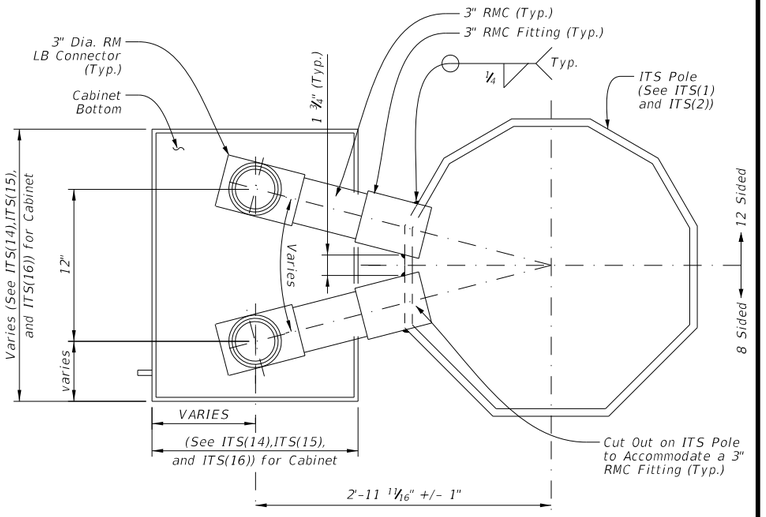
OSB Truss Mount

Not to Scale



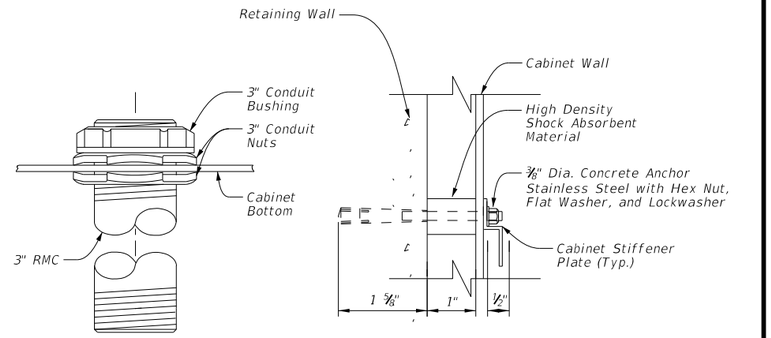
Retaining Wall Mount

Not to Scale



Section A-A

Not to Scale

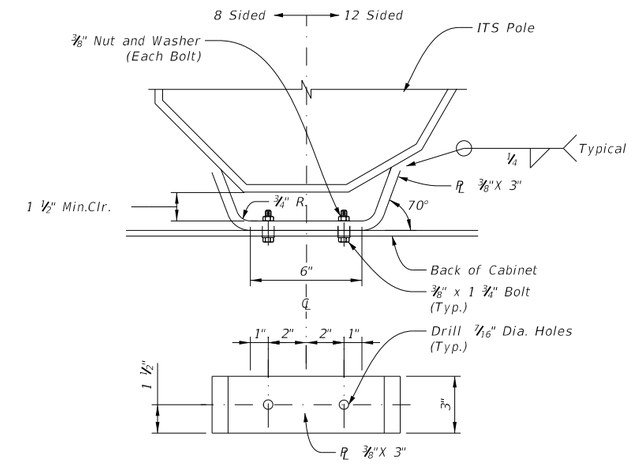


Detail C-1

Detail C-2

Detail C-1 and C-2

Not to Scale



Note:
ITS Pole May be Round, Octagonal (8 Sided), or Dodecahedron (12 Sided).
See ITS(1), and ITS(2) for Details.

Mounting Bracket Detail

Not to Scale

General Notes:

1. Mount cabinet as detailed on ITS(14), ITS(15), ITS(16), or ITS(17). Orientation of cabinet on ITS pole may vary depending on field conditions. Mount the pole mounted cabinet to the backside of the ITS pole, to allow maintenance personnel to access the cabinet while being able to view oncoming traffic.
2. For ITS pole sites located on slopes greater than 4V:1H, mount the cabinet to the backside of the ITS pole as detailed on ITS(7). Mounting height to accommodate maintenance pad for easy access.
3. All dimensions are approximate and represent minimum dimensions.
4. Provide conduit entrances at the bottom of the cabinet.

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Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE MOUNTED CABINET MISC. MOUNTING DETAILS

ITS(17)-15

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DATE:
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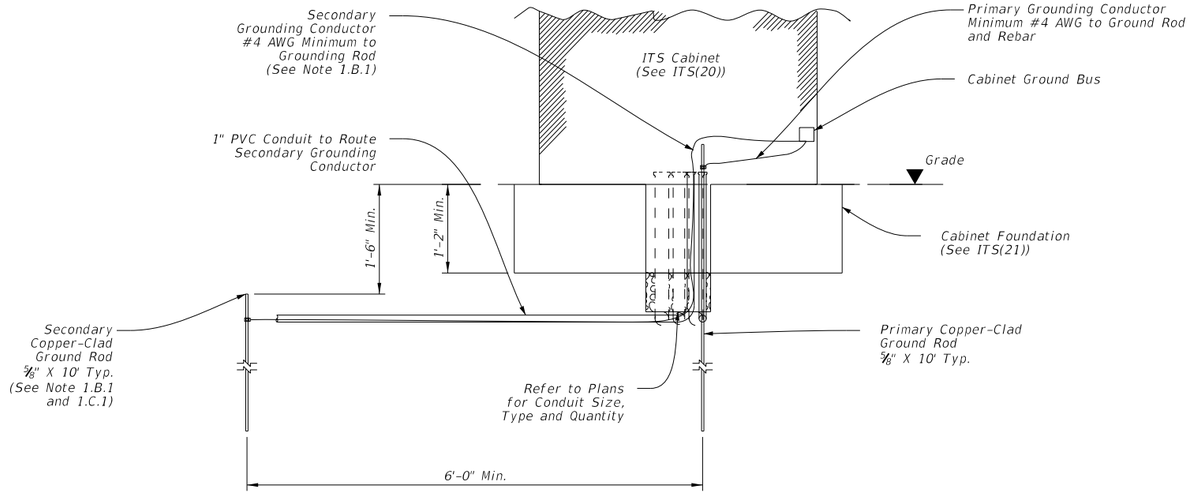
General Notes:

1. Grounding System:
   - A. Description:
     1. Provide ground system consisting of copper wires, ground rods, and concrete-encased grounding electrodes (Ufers), of the configuration shown to minimize potential gradient irregularities, drain leakage, and fault currents to earth.
   - B. Performance:
     1. Provide a grounding system, consisting of a minimum one ground rod, having a resistance not greater than 5 Ohms to ground. Additional ground rods may be added to the system to achieve less than 5 Ohms resistance.
   - C. Design Criteria:
     1. The combined ground resistance of separate systems bonded together below grade may be used to meet the specified ground resistance, but the minimum number of rods indicated shall still be provided.
     2. Measure the resistance of systems requiring separate ground resistance separately before bonding below grade.
     3. Only provide UL-approved materials listed for grounding systems.
     4. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture, unless moisture is permanently excluded from the junction of such materials.
     5. Submit product data for the materials and products used to perform the work of this section.
   - D. Materials:
     1. Conductors:
        - a. Bare Ground Conductor:
          1) For No. 8 AWG or larger bare ground wire sizes, provide soft drawn copper, Class A or Class B, stranded wire meeting the requirements of ASTM B 8.
     2. Ground Compression Connectors:
        - a. Provide molds, thermite packages, and other material for ground compression connectors that are full-rated to carry 100% of the cable rating and which meet IEEE 837.
          1) Provide the compression materials from a single manufacturer throughout the project.
        - b. Provide the items necessary for connecting cable to ground rods.
     3. Ground Rods:
        - a. Provide copper-clad steel ground rods conforming to the requirements specified in UL 467.
          1) Diameter: ⅝ in.
          2) Length: 10 Ft.

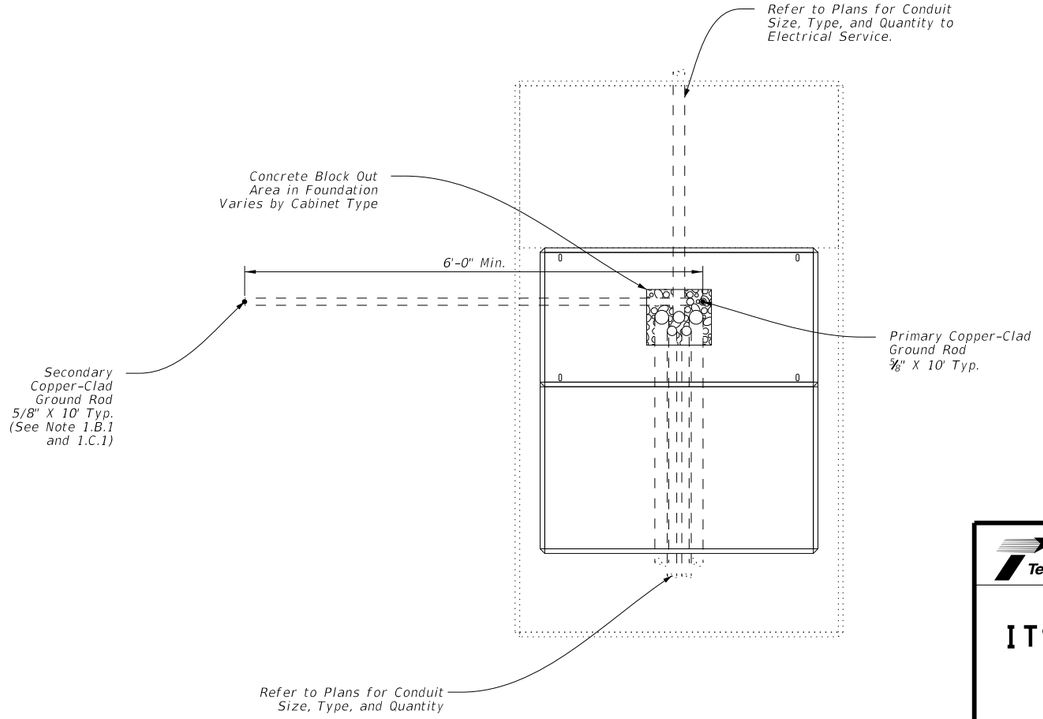
2. Installation:
   - A. Install grounding components and systems in accordance with the requirements specified in UL 467, IEEE 81, and IEEE 142.
   - B. System Grounding:
     1. Ground Rods:
        - a. Drive ground rods into the ground until the tops of the rods are approximately 18 in. below finished grade.
        - b. If multiple ground rods are needed to meet the minimum resistance of 5 Ohms, space ground rods as evenly as possible, at least 6 feet apart, and so conductors will be connected below grade.
     2. Conductors:
        - a. Provide minimum No. 4 AWG ground wire for system and equipment grounding.
        - b. Using suitable fasteners, securely attach exposed ground wires to structural supports at not more than 2 ft. intervals, where applicable.
        - c. Bends in ground wires greater than 45 degrees are unacceptable.
     3. Cable Connections:
        - a. Use approved exothermic-welded connections for conductor splices and connections between conductors and other components.

3. Testing:
   - A. Resistance Test:
     1. Test Procedure:
        - a. The ground-resistance measurements of each ground Rod shall be taken.
          1) The resistance to ground shall be measured in accordance with the fall-of-potential method specified in IEEE 81 and IEEE 142.
          2) Ground-resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds.
        - b. Test reports shall be prepared that indicate the location of the ground rod, the grounding system, and the resistance and soil conditions at the time the test was performed.
     2. Acceptance Criteria:
        - a. The grounding system must have a resistance not greater than 5 Ohms.
        - b. Do not energize any part of the electrical distribution system prior to the resistance testing of that system's ground rods and grounding system, and submission of the test results for approval.
     3. Inspections:
        - a. Prepare and submit as-built record drawings of the grounding system as installed and test reports for approval.



Ground Mounted Cabinet - Side View

(Slab & Base)
Not to Scale



Ground Mounted Cabinet - Top View

(Slab & Base)
Not to Scale

Texas Department of Transportation

Traffic Operations Division Standard

ITS CABINET GROUNDING DETAILS

ITS(18)-15

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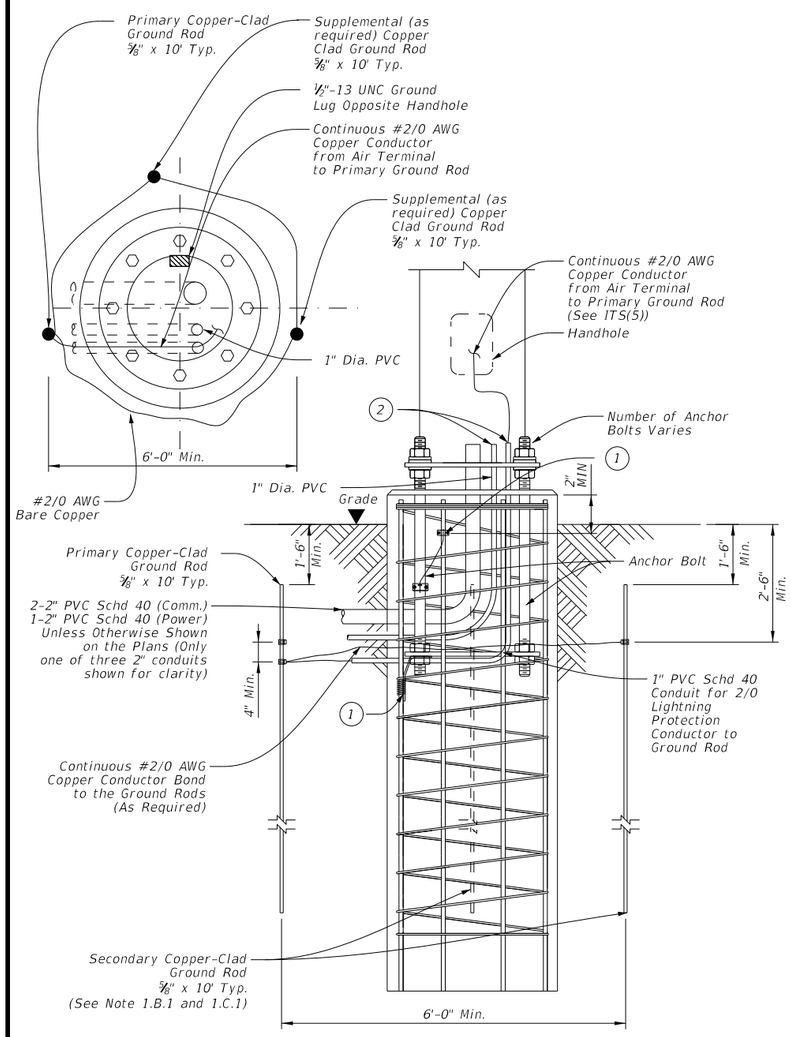
General Notes:

1. Grounding System:
   - A. Description:
     1. Provide ground system consisting of copper wires, ground rods, and concrete-encased grounding electrodes (Ufers), of the configuration shown to minimize potential gradient irregularities, drain leakage, and fault currents to earth.
   - B. Performance:
     1. Provide a grounding system, consisting of a minimum one ground rod, having a resistance not greater than 5 Ohms to ground. Provide up to 2 additional supplemental ground rods if necessary to achieve a resistance not greater than 5 Ohms to ground. If a total of 3 ground rods is needed then install as as part of a ground ring.
     2. If a ground ring is required, provide a minimum conductor length of 20 ft. placed at a minimum depth of 30 in..
   - C. Design Criteria:
     1. The grounding system of the ITS pole may be bonded below grade to the grounding systems of other nearby equipment to meet the specified grounding resistance. A minimum of one ground rod for the ITS pole is still required.
     2. Separately measure the grounding resistance of each system before bonding together below grade.
     3. Only provide UL-approved materials listed for grounding systems.
     4. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture, unless moisture is permanently excluded from the junction of such materials.
     5. Submit product data for the materials and products used to perform the work of this section.
   - D. Materials:
     1. Conductors:
        - a. Bare Ground Conductor:
          1) Provide prequalified copper conductors appearing on the Material Producers List according to Item 618.
     2. Ground Compression Connectors:
        - a. Provide molds, thermite packages, and other material for exothermic welding of grounding connections.
        - b. Provide listed compression connectors fully rated to carry 100% of the cable rating and that meet IEEE 837. Provide compression materials from a single manufacturer througout the project.
     3. Ground Rods:
        - a. Provide copper-clad steel ground rods conforming to the requirements specified in DMS 11040.
          1) Diameter: ⅝ in.
          2) Length: 10 ft.

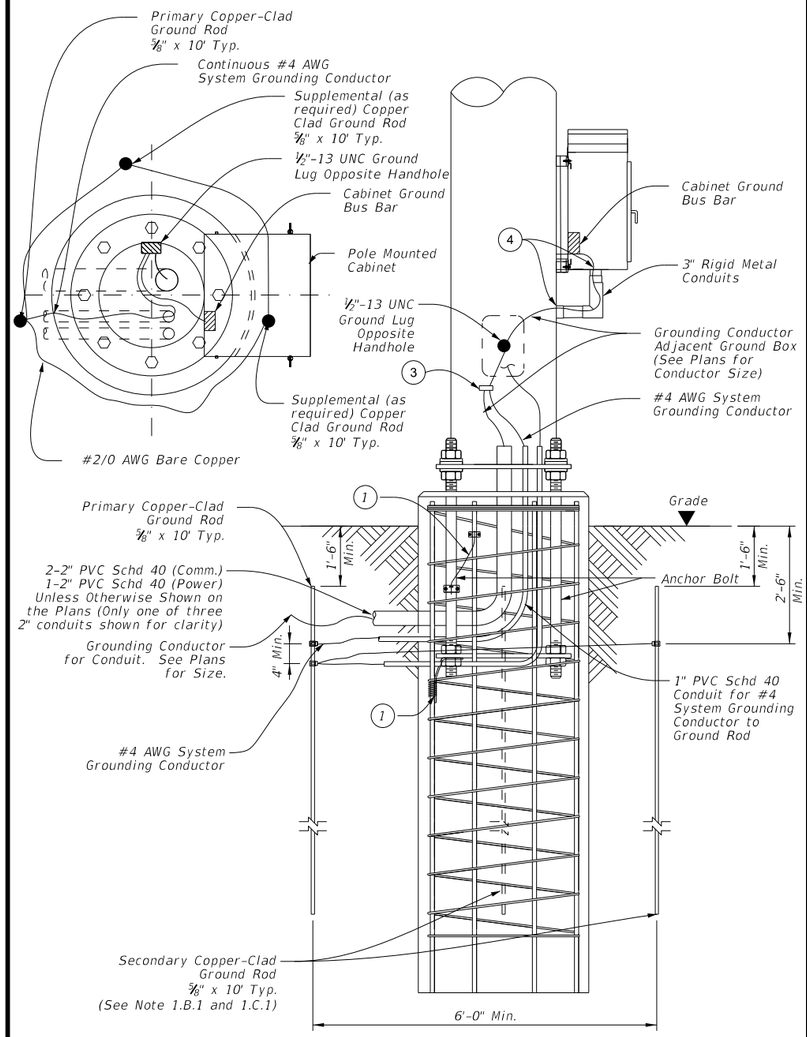
2. Installation:
   - A. Install grounding components and systems in accordance with the requirements specified in IEEE 142.
   - B. System Grounding:
     1. Ground Rods:
        - a. Drive ground rods into the ground until the tops of the rods are a minimum of 18 in. below finished grade.
        - b. If multiple ground rods are needed to meet the minimum resistance of 5 Ohms, space ground rods as evenly as possible, at least 6 feet apart, so conductors will be connected below grade.
     2. Conductors:
        - a. Provide minimum No. 2/0 AWG ground wire for lightning protection from air terminal.
        - b. Provide minimum No. 4 AWG ground wire for system and equipment grounding.
        - c. Using suitable fasteners, securely attach exposed ground wires to structural supports at not more than 2 ft. intervals, where applicable.
        - d. Bends in ground wires greater than 45 degrees are unacceptable.
     3. Cable Connections:
        - a. Use exothermic-welded connections or listed compression connectors for conductor splices and connections between conductors and other components.

3. Testing:
   - A. Resistance Test:
     1. Test Procedure:
        - a. The ground-resistance measurements of each ground Rod shall be taken.
          1) The resistance to ground shall be measured in accordance with the fall-of-potential method specified in IEEE 81 and IEEE 142.
          2) Ground-resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds.
        - b. Test reports shall be prepared that indicate the location of the ground rod, the grounding system, and the resistance and soil conditions at the time the test was performed.
     2. Acceptance Criteria:
        - a. The grounding system must have a resistance not greater than 5 Ohms.
        - b. Do not energize any part of the electrical distribution system prior to the resistance testing of that system's ground rods and grounding system, and submission of the test results for approval.
     3. Inspections:
        - a. Prepare and submit as-built record drawings of the grounding system as installed and test reports for approval.



Grounding System

Not to Scale



Grounding System with Pole Mounted Cabinet

Not to Scale

Reference Notes:

1. Bond anchor bolts to rebar with #2/0 AWG jumper and two mechanical connectors or by bending No. 3 bar on bottom template as shown and wire tightly with ten turns of No. 10 wire or one mechanical connector. Mechanical connectors shall be UL Listed for concrete encasement.
2. Cut PVC approximately 1 in. above concrete and install bell or bushing. Align conduit as close as possible to point of attachment to base plate to minimize bends in #2/0 wire.
3. Bond grounding conductors via cadweld or mechanical connector, rated for size and number of conductors.
4. Provide and install a grounding type bushing on metal conduit terminations. 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.

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Traffic Operations Division Standard

ITS POLE GROUNDING DETAILS

ITS(19)-17

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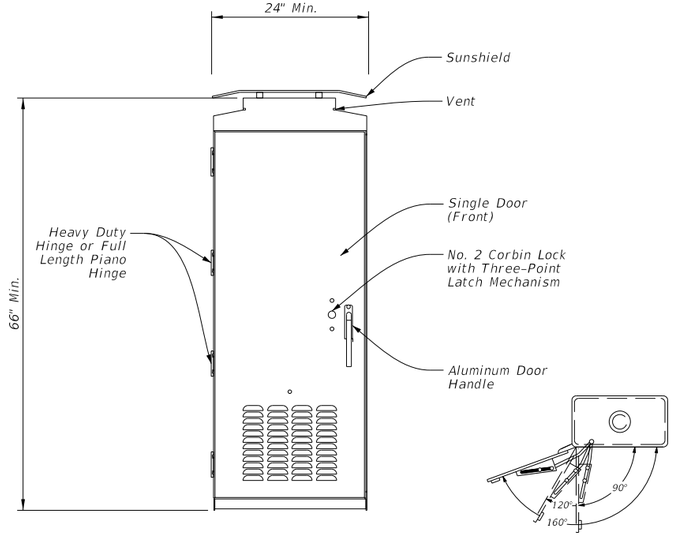
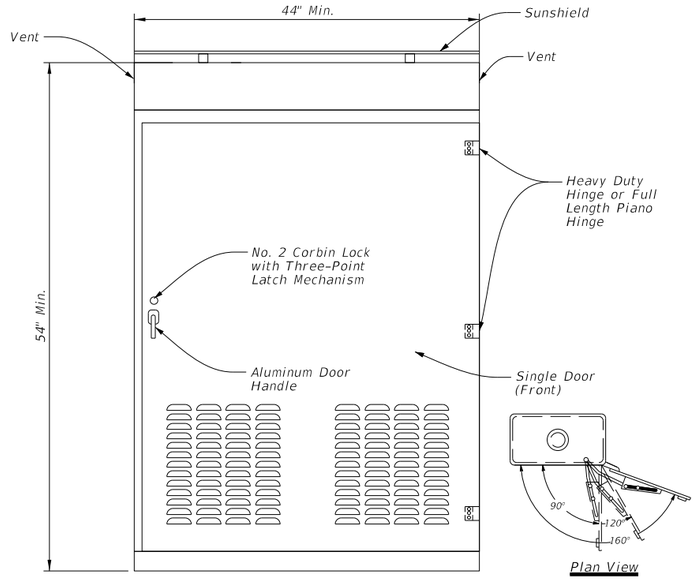


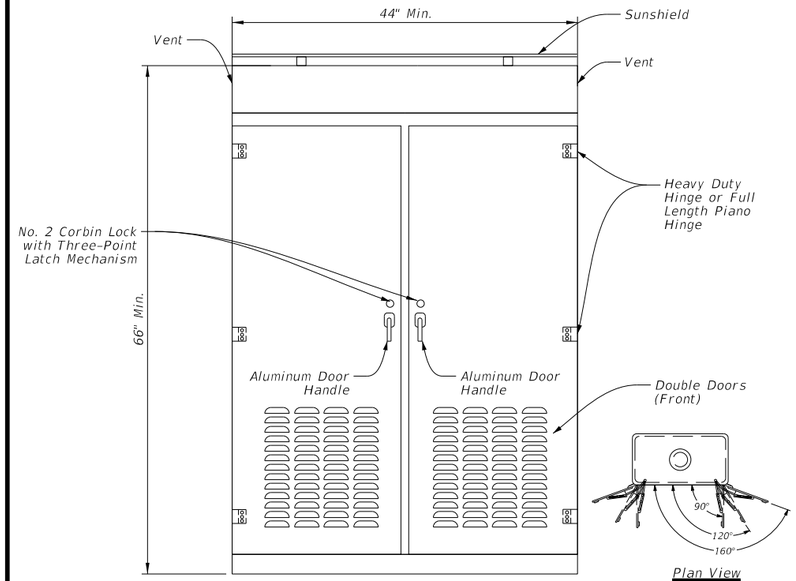
Type 4 (Small) Cabinet
Front View

Plan View
Door Stop Detail
(3 Positions)



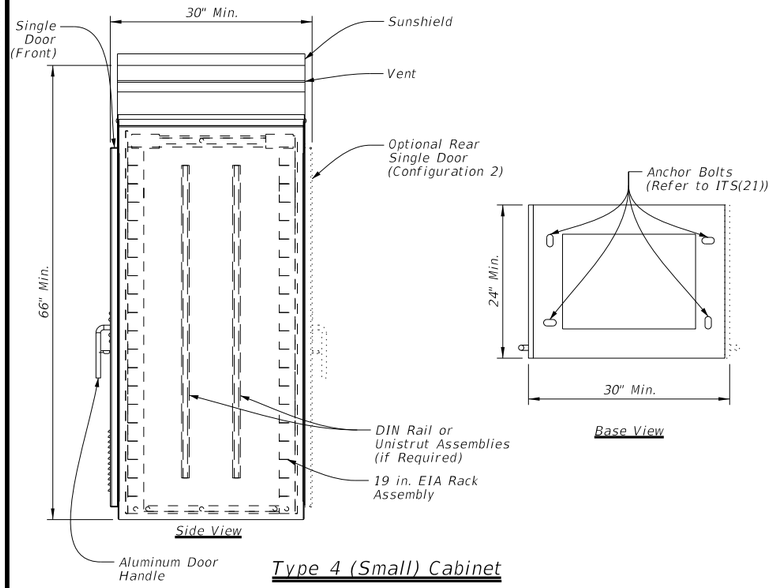
Type 5 (Medium) Cabinet
Front View

Plan View
Door Stop Detail
(3 Positions)



Type 6 (Large) Cabinet
Front View

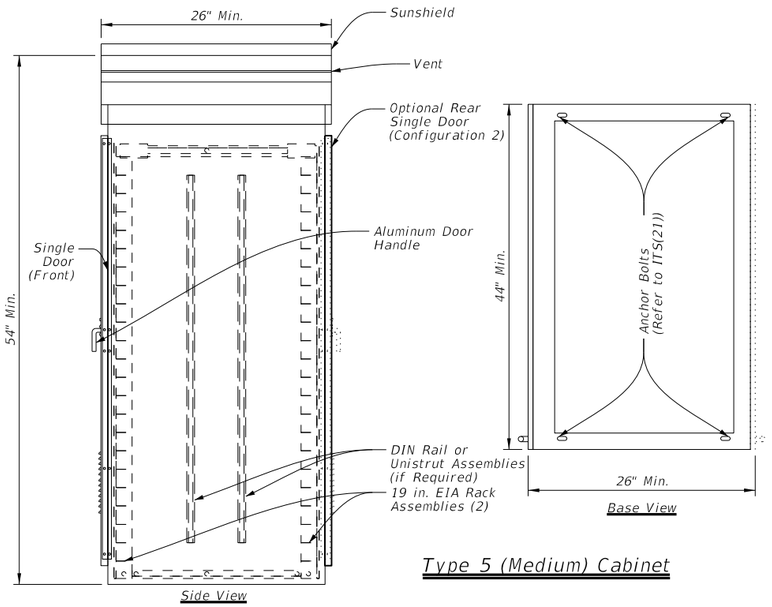
Plan View
Door Stop Detail
(3 Positions)



Side View

Base View

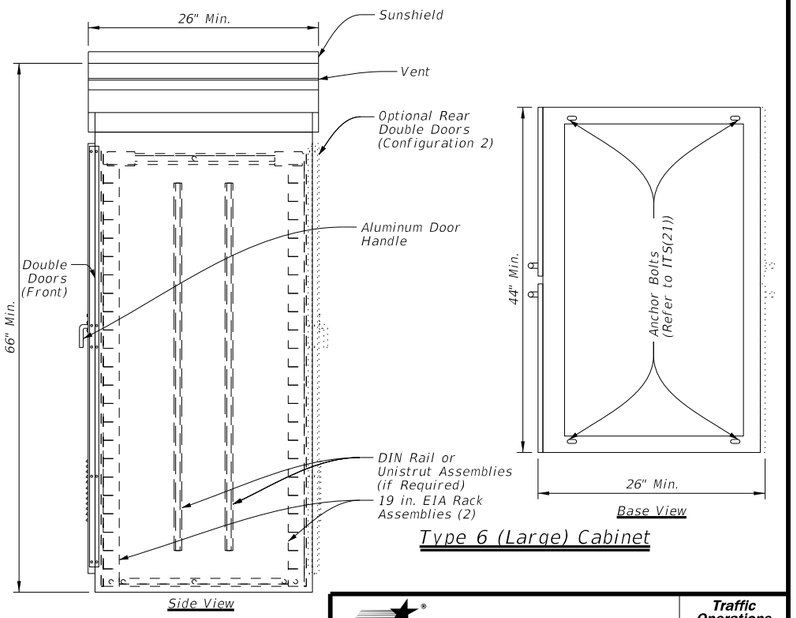
Type 4 (Small) Cabinet



Side View

Base View

Type 5 (Medium) Cabinet



Side View

Base View

Type 6 (Large) Cabinet

General Notes:

1. Cabinet hardware equipment and door configuration shown is diagrammatic in nature and intended to represent a preferred ground mounted cabinet setup. Door orientation may vary and will be noted in the plans. The contractor will be responsible for configuring cabinets with all appropriate ITS hardware and power supplies in accordance with the plans and specifications. The contractor may alter the cabinet configuration shown to maximize space and ensure easy access for maintenance.
2. All dimensions are approximate and represent minimum dimensions.
3. Provide conduit entrances at the bottom of the cabinet.
4. Paid under Special Specification "ITS Ground Mounted Cabinet" (Configuration 1) with single door. Paid under Special Specification "ITS Ground Mounted Cabinet" (Configuration 2) for rear door option.
5. Sunshield to be mounted to cabinet using nuts, bolts, and spacers. Water proof sealant to be used at cabinet surface/bolt contact points.

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Texas Department of Transportation

Traffic Operations Division Standard

ITS GROUND MOUNTED CABINET ELEVATION DETAILS

ITS(20)-15

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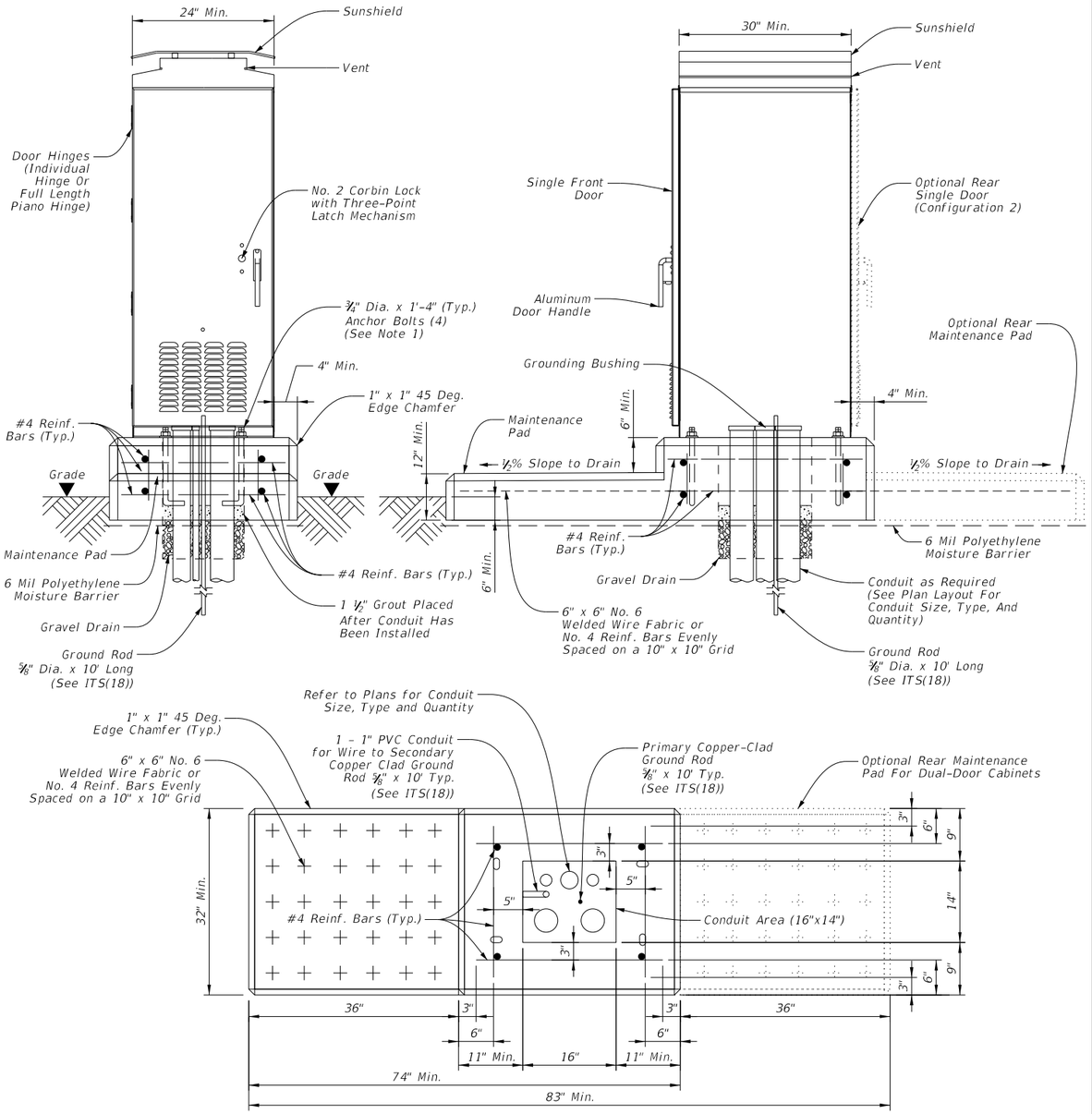
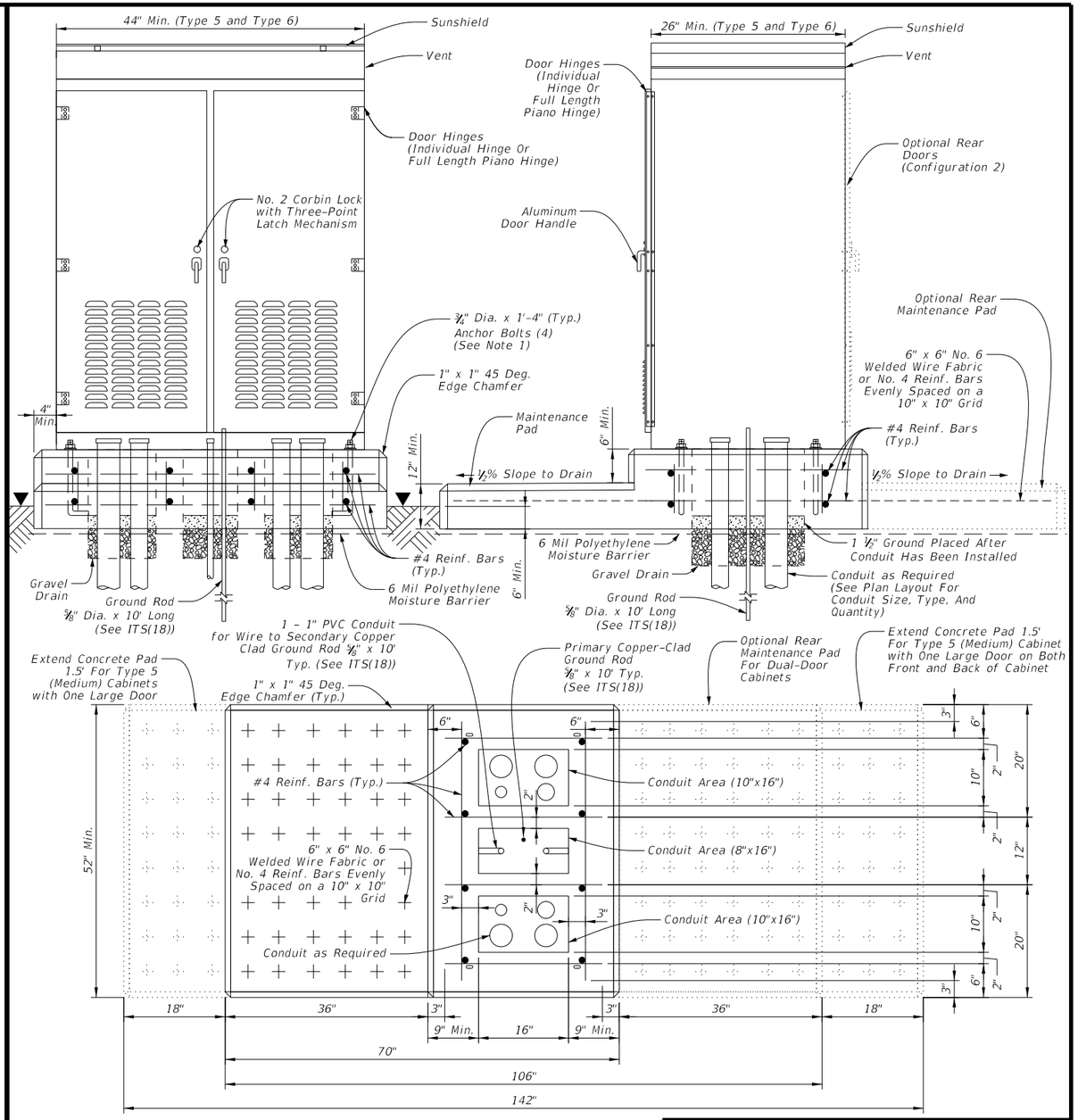


Type 4 (Small) Cabinet



Type 5 (Medium) & Type 6 (Large) Cabinet

General Notes:

1. Details of anchor bolt location to be furnished by the cabinet manufacturer. Size and length of anchor bolts shown in details may vary by manufacturer.
2. Modify concrete base dimensions to fit required cabinet type.
3. Ensure conduit area has gravel drain, 12" depth, course aggregate, grade No. 1.
4. All concrete to be Class "A" in accordance with Item 421.
5. Set the cabinet foundation level with the pavement surface, in unpaved area. The foundation shall be a minimum of 4" above surrounding grade, or as approved by the Engineer.
6. Furnish any additional concrete which may be necessary to stabilize foundation at unusual locations.
7. Foundation will be subsidiary to Special Specification "ITS Ground Mounted Cabinet.
8. Ground cabinet as required in cabinet specifications and as detailed on ITS(18) in accordance with the National Electric Code (NEC).
9. Treat cabinet foundation with moisture sealant.
10. Type 5 cabinet foundation will have a slightly larger foundation than Type 6. See foundation notes on details.
11. Drain pipe shall be screened for drainage portion below foundation in gravel.

Texas Department of Transportation

Traffic Operations Division Standard

ITS GROUND MOUNTED CABINET FOUNDATION DETAILS

ITS(21)-15

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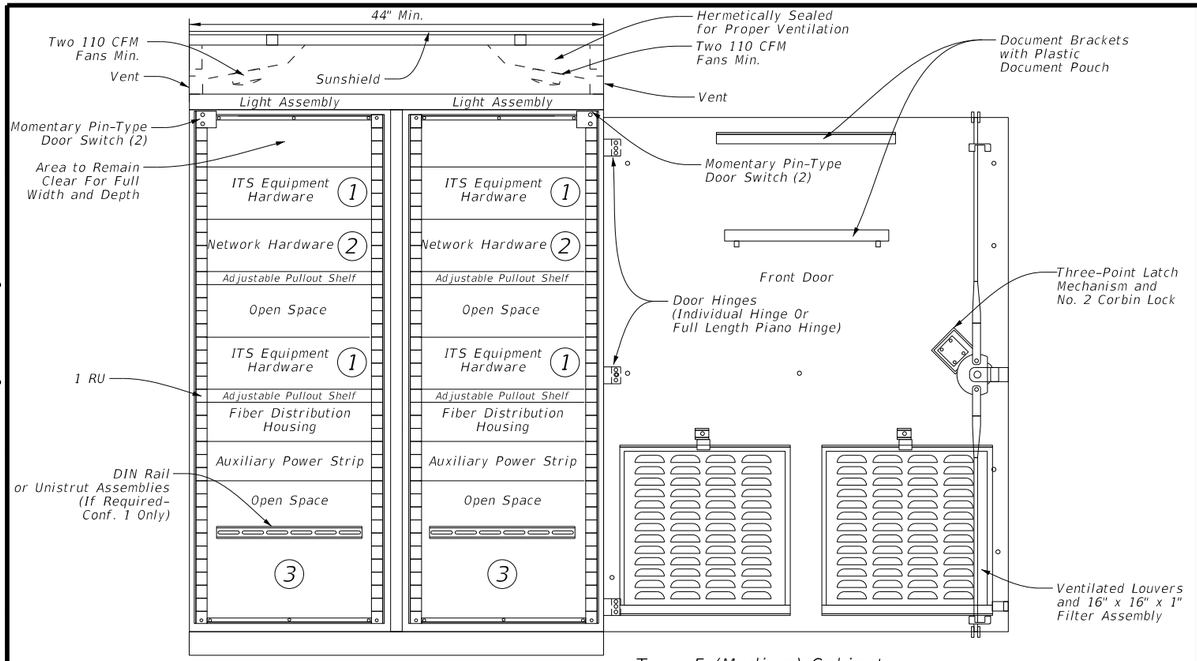
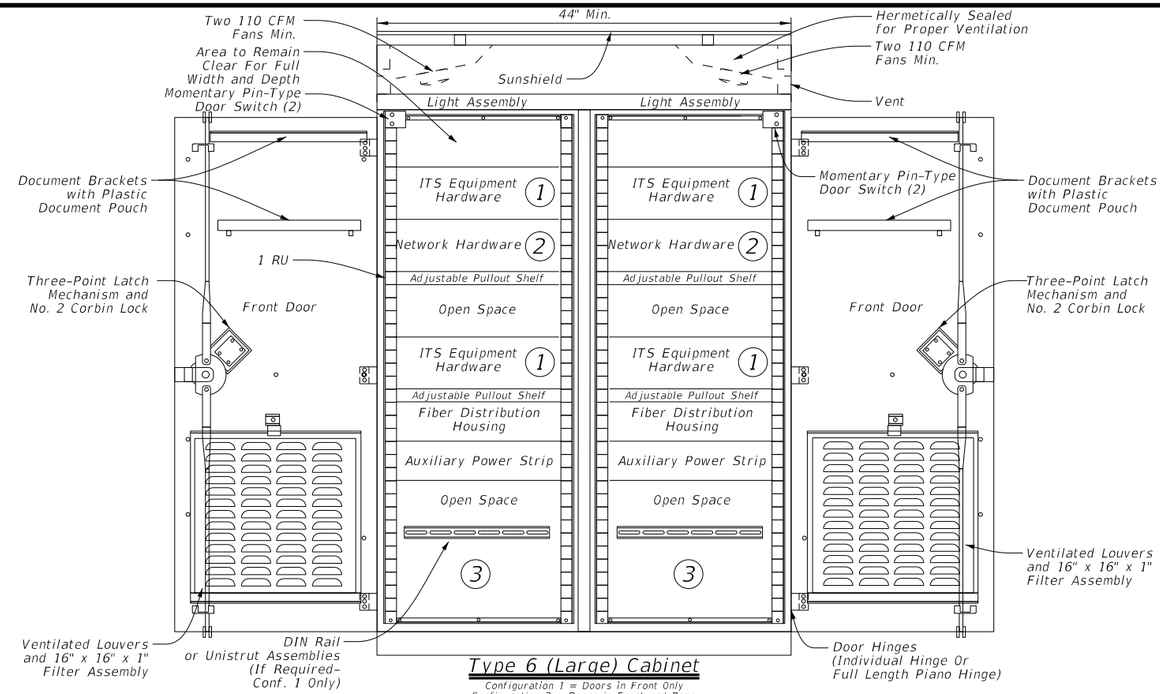


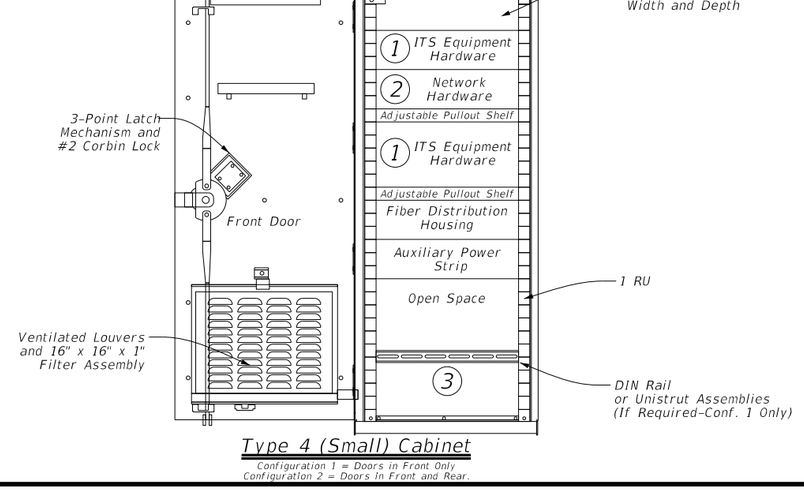
Type 5 (Medium) Cabinet

Configuration 1 = Doors in Front Only
Configuration 2 = Doors in Front and Rear.



Type 6 (Large) Cabinet

Configuration 1 = Doors in Front Only
Configuration 2 = Doors in Front and Rear.



Type 4 (Small) Cabinet

Configuration 1 = Doors in Front Only
Configuration 2 = Doors In Front and Rear.

Typical Equipment Layout Legend

	Example Equipment
1	CCTV Interface Panel, Radar Vehicle Sensing Device (RVSD) Equipment, DMS/LCS Controller Environmental Sensor Station (ESS) Equipment, Bluetooth Equipment, Highway Advisory Radio (HAR), Ramp Meter or Inductive Loop Card Rack, Automatic Vehicle Identification (AVI) Equipment, or ITS Radio Equipment (See General Note 1)
2	Ethernet Switch, Video Encoder, Terminal Server, Fiber Optic Transceivers, or Media Conversion Equipment (See General Note 1)
3	Power Distribution Assembly, Service Entrance Breakers, Primary AC Power, Auxiliary Power Strip, Ground Bus Bar Surge Protection Equipment, Solar Power System (If Required)

General Notes:

1. Layout of hardware equipment and configuration shown is diagrammatic in nature and intended to represent a preferred ground mounted cabinet setup. Hardware needed for each cabinet varies and not all cabinet equipment may be shown. The contractor will be responsible for configuring cabinets with all appropriate ITS hardware and power supplies in accordance with the plans and specifications. The contractor may alter the cabinet configuration shown to maximize space and ensure easy access for maintenance.
2. All dimensions are approximate and represent minimum dimensions.
3. Provide conduit entrances at the bottom of the cabinet.
4. Paid under Special Specification "ITS Ground Mounted Cabinet" (Configuration 1) with single door.
   Paid under Special Specification "ITS Ground Mounted Cabinet" (Configuration 2) for rear door option.
5. RU = rack unit.
6. Contractor to remove the cabinet removable center support, which ensures cabinet rigidity during shipping, during installation.

Texas Department of Transportation

Traffic Operations Division Standard

ITS GROUND MOUNTED CABINET INTERIOR DETAILS

ITS(23)-15

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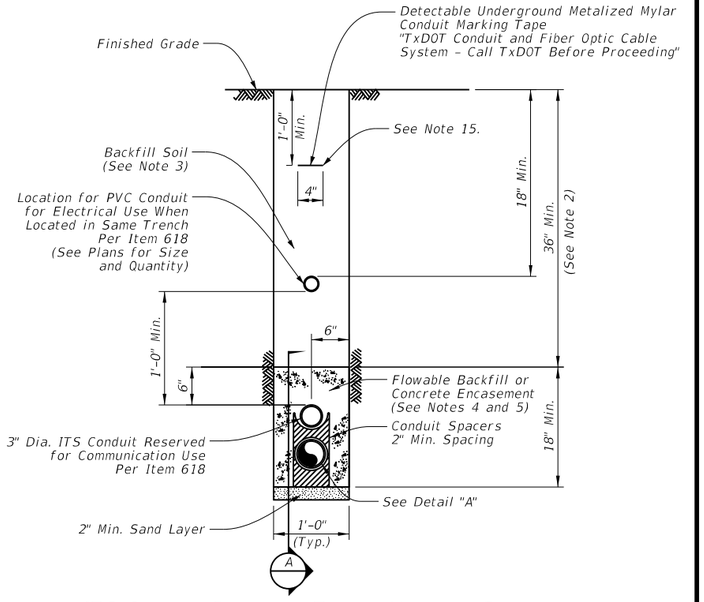
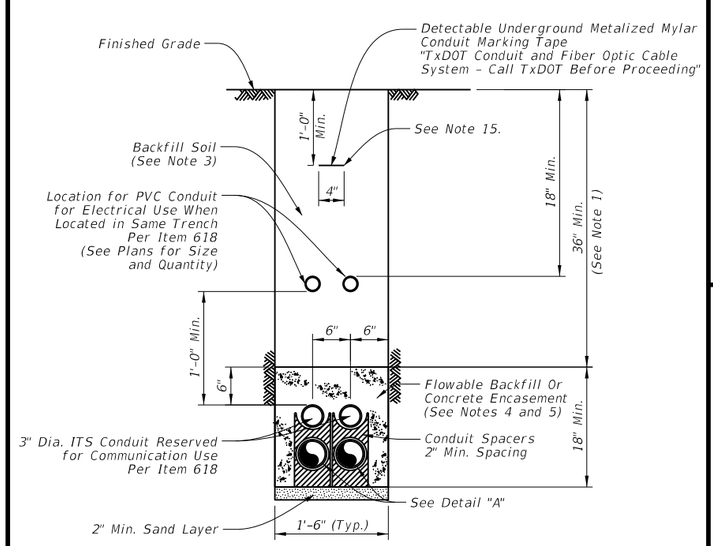


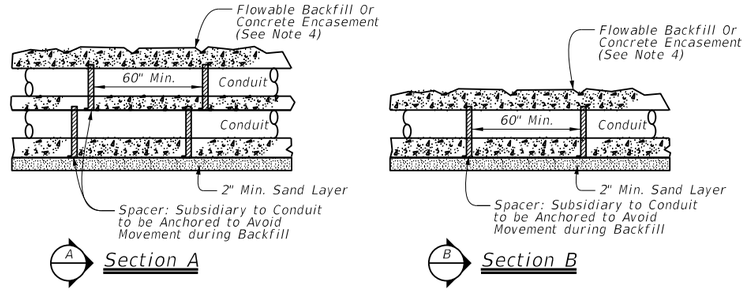
ITS Conduit Backbone Trench Vertical Spacing

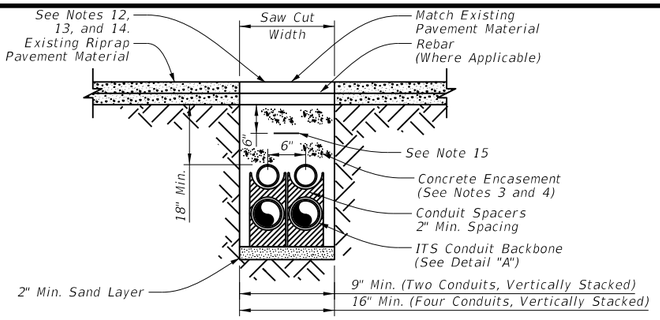
Two Conduit System



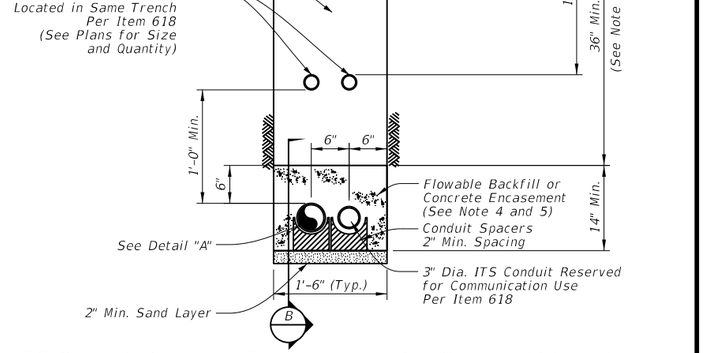
ITS Conduit Backbone Trench Vertical Spacing

Four Conduit System



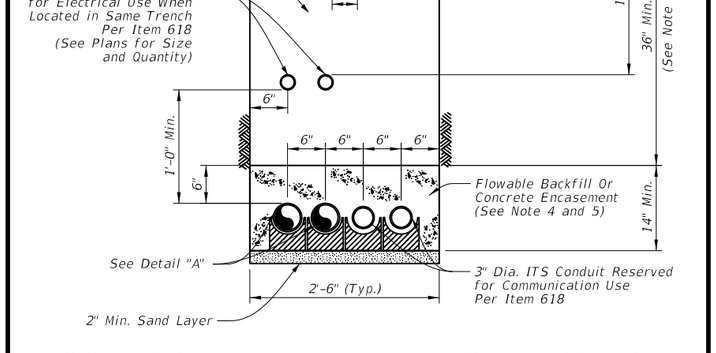


Open Cut Trenching Details



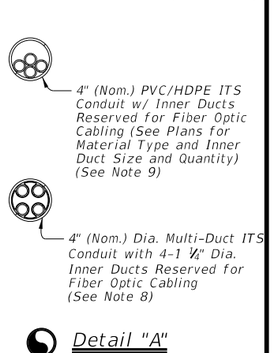
ITS Conduit Backbone Trench Horizontal Spacing (Alternative)

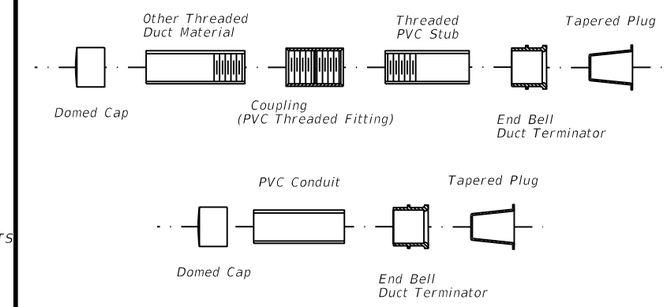
Two Conduit System



ITS Conduit Backbone Trench Horizontal Spacing (Alternative)

Four Conduit System





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
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Traffic Operations Division Standard

ITS CONDUIT TRENCH DETAILS

ITS(27)-16

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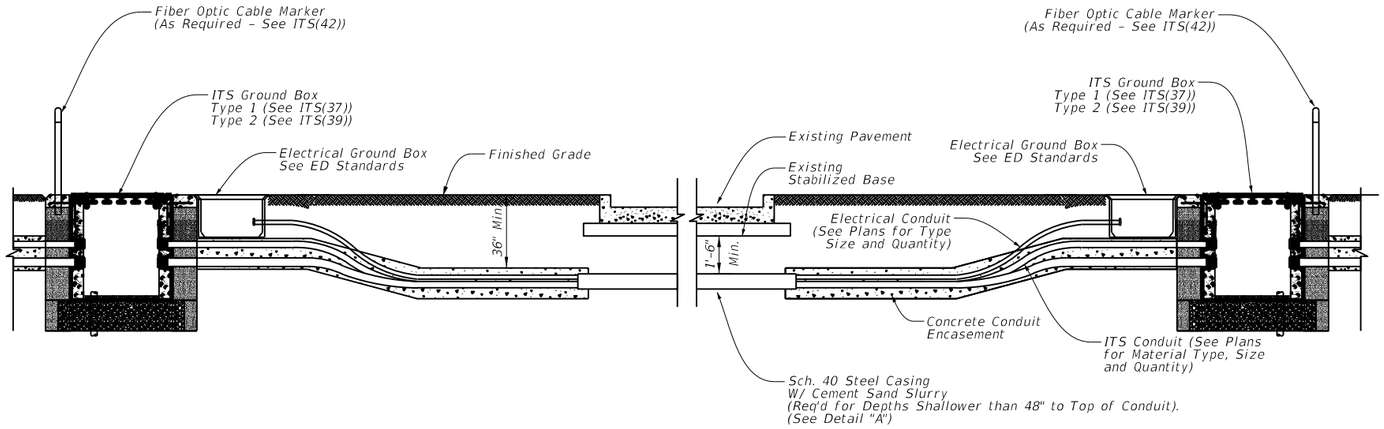
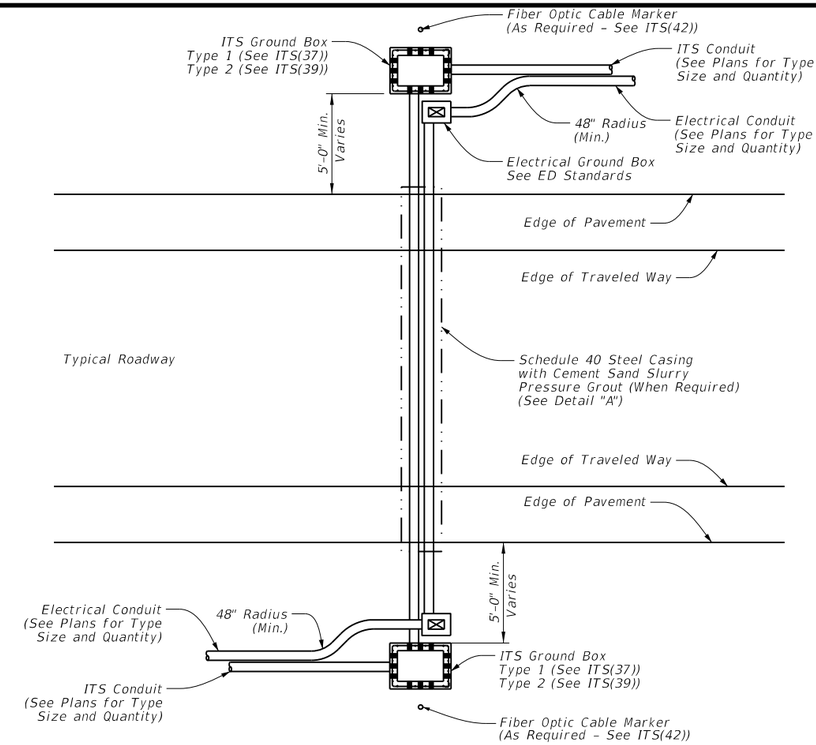
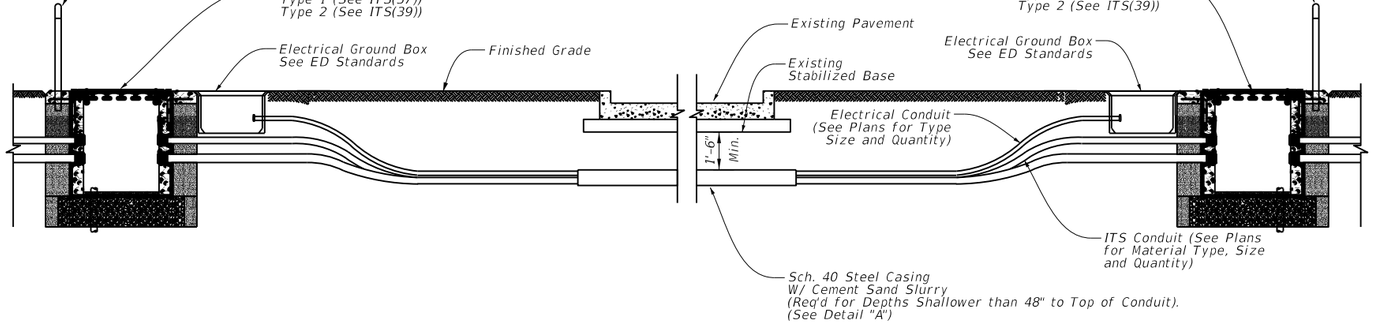


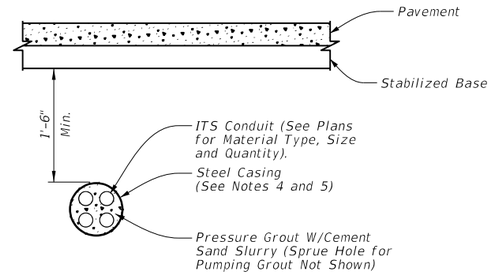
Typical Conduit Installation Jacking
or Boring Beneath Existing Roadway



Bore Under Pavement



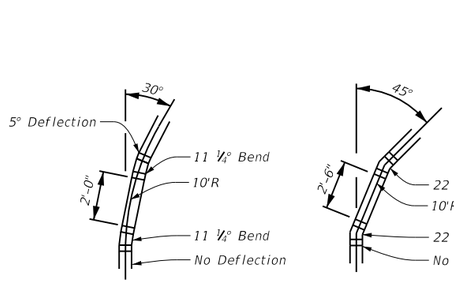
Typical Conduit Installation Jacking
or Boring Beneath Existing Roadway
(Where Concrete Encasement Not Required)



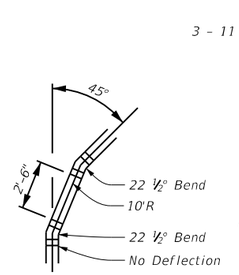
Steel Casing Detail "A"

General Notes:

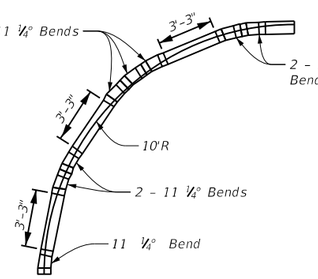
1. Typical conduit installation details for jacking or boring beneath existing roadway is diagrammatic in nature. Roadway cross-slopes may vary for each crossing.
2. Jack or bore in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box" except for measurement and payment.
3. Furnishing and installation of pressure grouting will not be paid for directly but considered incidental to Special Specification "ITS Multi-Duct Conduit" or Item 618, "Conduit."
4. When boring under pavement shallower than 48 inches from finished grade to top of conduit, provide Schedule 40 steel casing under pavement to encase the conduit system. Provide steel casing of a size to accommodate ITS conduit and electrical conduit as shown in the plans. Provide a minimum 20 percent void space around all conduits. Steel casing will not be paid for directly but considered incidental to Special Specification, "ITS Multi-Duct Conduit" or Item 618, "Conduit."
5. When a depth greater than 48 inches can be achieved from finished grade to top of conduit, provide Schedule 80 PVC. No steel casing required unless otherwise directed.
6. Ensure all conduit bends are in conformance with the latest edition of the National Electrical Code.
7. Provide GPS coordinate points to the District for all ground boxes installed, and shifts or deviations of the conduit alignment from the plans required to avoid obstructions or utilities. Take GPS coordinate points at the start of the transition, at the point of curvature, and at the end of the transition at the point of tangency. Document the turnout radius and installed depth. Provide GPS coordinate points in NAD83 coordinate system and be accurate to 5 feet.



30° Turnout Detail



45° Turnout Detail



90° Turnout Detail

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
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SHEET 2 OF 2

Texas Department of Transportation

Traffic Operations Division Standard

ITS CONDUIT BORE AND STEEL CASING DETAILS

ITS(28)-16

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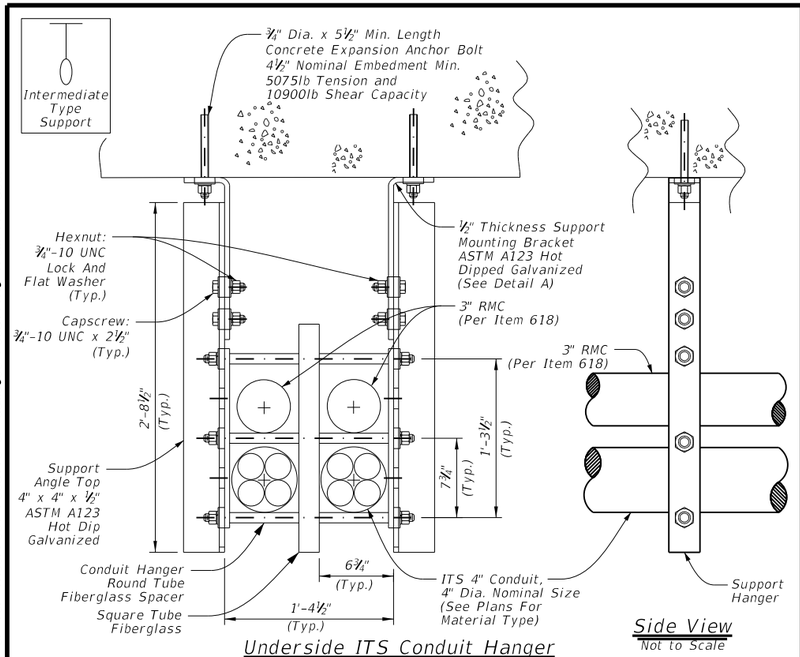
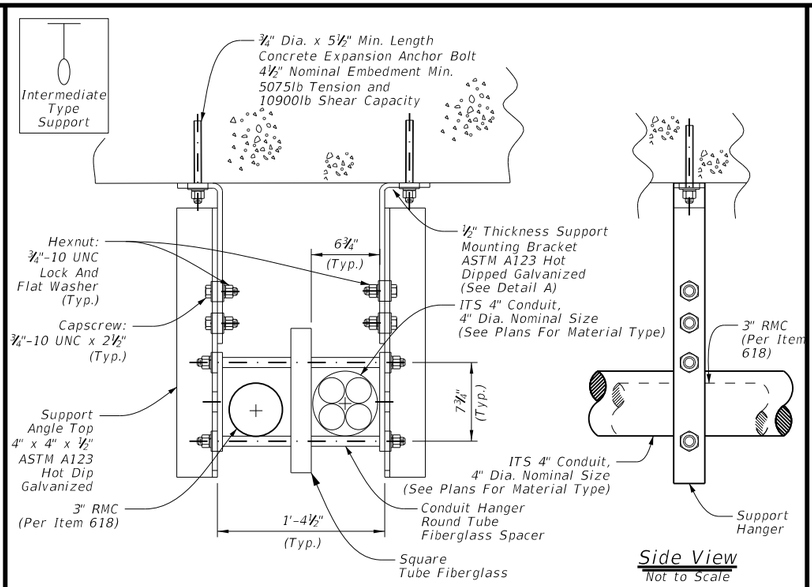
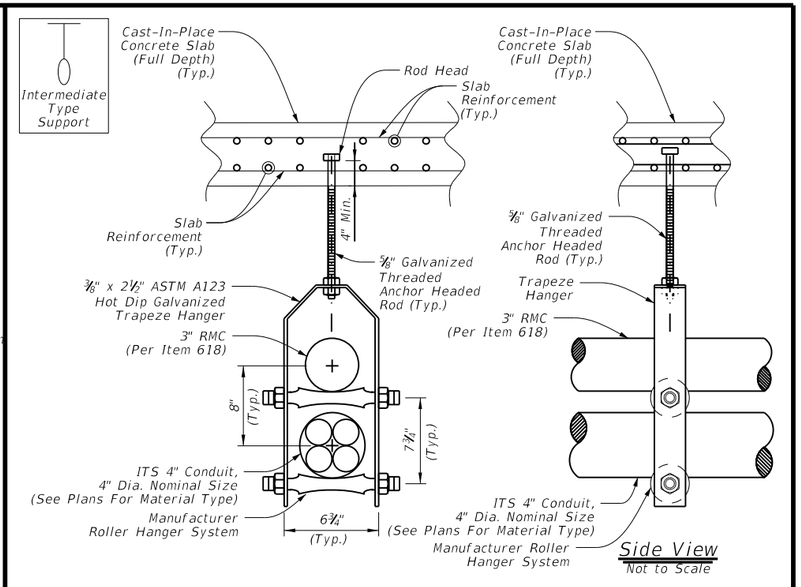


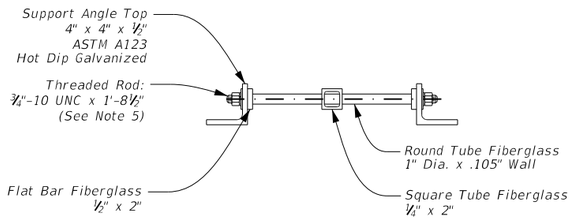
Underside ITS Conduit Hanger
(2x2 Conduit Configuration)



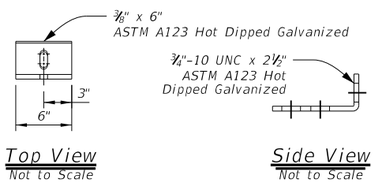
Underside ITS Conduit Hanger
(2x1 Conduit Configuration)



Underside ITS Conduit Roller Hanger
For New Construction
(1x2 Conduit Configuration)



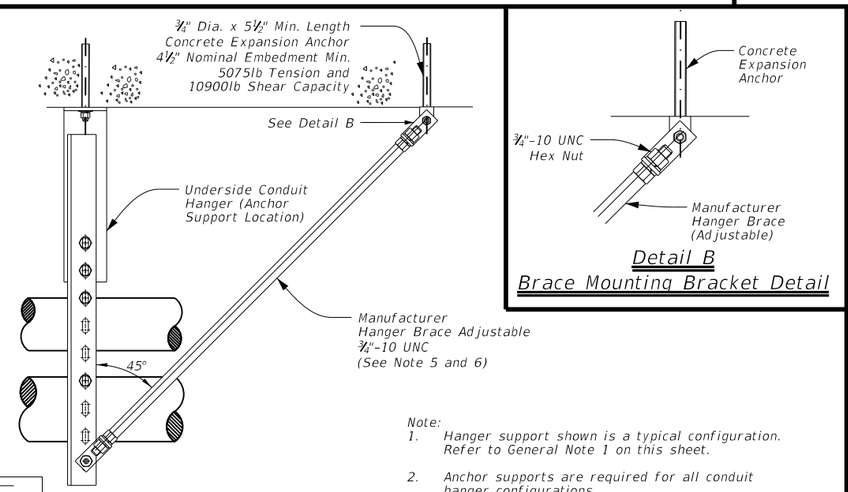
Underside ITS Conduit Hanger Spacer - Top View (Typ.)



Detail A
Support Mounting Bracket Detail

General Notes:

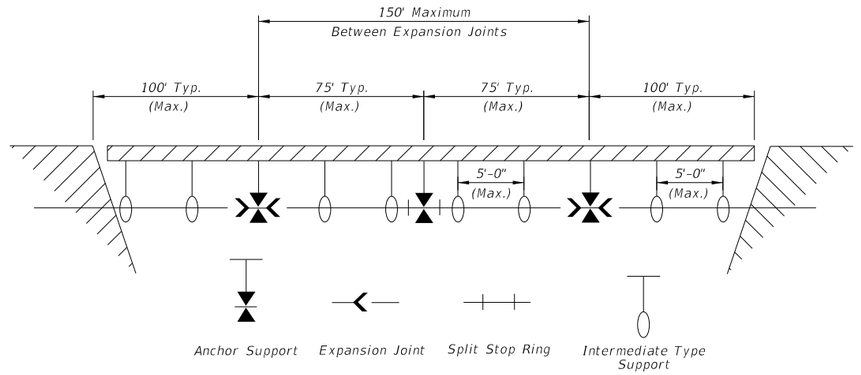
1. Use commercially designed multiple conduit support hangers as an alternative to the hanger details on this sheet, or standard sheet ED(2)-14 may be used. Verify sufficient tension and shear capacity before proposed substitution. Submit hanger details and specifications to the Engineer for approval prior to using on project.
2. Refer to the contract plans for conduit design and hanger configuration requirements. For two (2) conduit configurations, use the typical underside hanger or roller hanger system.
3. Maximum spacing of intermediate conduit hangers is 5'-0" C-C.
4. Hangers vary in length, but do not allow conduit to hang below bridge beams. Refer to ITS(30) for minimum clearance requirement below bridge deck.
5. Ensure all conduit hanger steel shapes conform to ASTM A36 and expansion anchors conform to ASTM A307 and are supplied with minimum of one nut and washer per bolt. Galvanize all steel plate, shapes, and hardware per Item 445, "Galvanizing".
6. Use angle bracing on both sides of conduit support for conduit anchor point hangers.
7. Refer to ITS(32) for expansion-deflection joint details.
8. Provide a minimum of two (2) expansion joints at all bridges. Ensure expansion joint spacing does not exceed manufacturer recommendations.
9. Select conduit lengths so that couplings do not coincide with conduit hanger locations.
10. Allowable types of outer duct material for above ground ITS conduit include rigid metallic conduit (RMC) and fiberglass.
11. Refer to ITS(30) for anchor details through pre-stressed concrete panels.
12. Bond all external structure conduit throughout entire length of run and ground at ground box locations according to ITS(38).



Note:
1. Hanger support shown is a typical configuration. Refer to General Note 1 on this sheet.
2. Anchor supports are required for all conduit hanger configurations.

Underside ITS Conduit
Anchor Hanger Support (Typ.)

Detail B
Brace Mounting Bracket Detail



Notes:
1. Install conduit supports within 3'-0" of all enclosures and conduit terminations.
2. The number of intermediate supports varies based upon the distance between anchor supports.

Underside Anchor Hanger Support Spacing (Typ.) *

* Refer To BICSI Outside Plant Design Reference Manual (OSPDRM) For Conduit Hanger Expansion Joint Placement

Sheet Details
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Traffic Safety Division Standard

ITS CONDUIT HANGER DETAILS

ITS(29)-22

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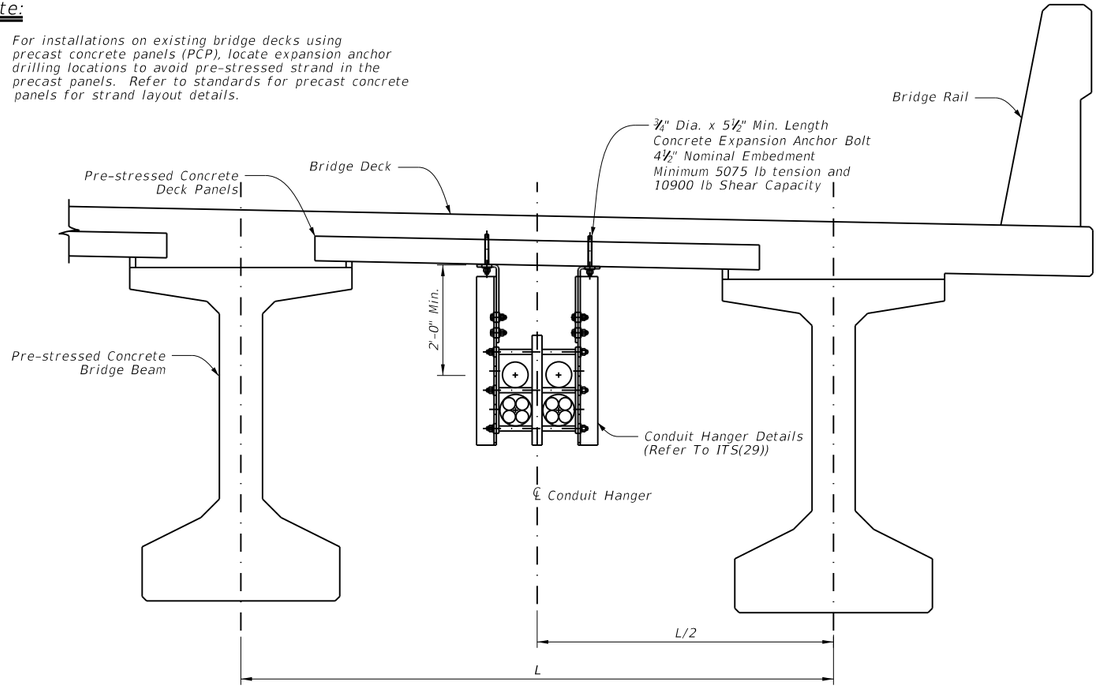
Note:

1. For installations on existing bridge decks using precast concrete panels (PCP), locate expansion anchor drilling locations to avoid pre-stressed strand in the precast panels. Refer to standards for precast concrete panels for strand layout details.

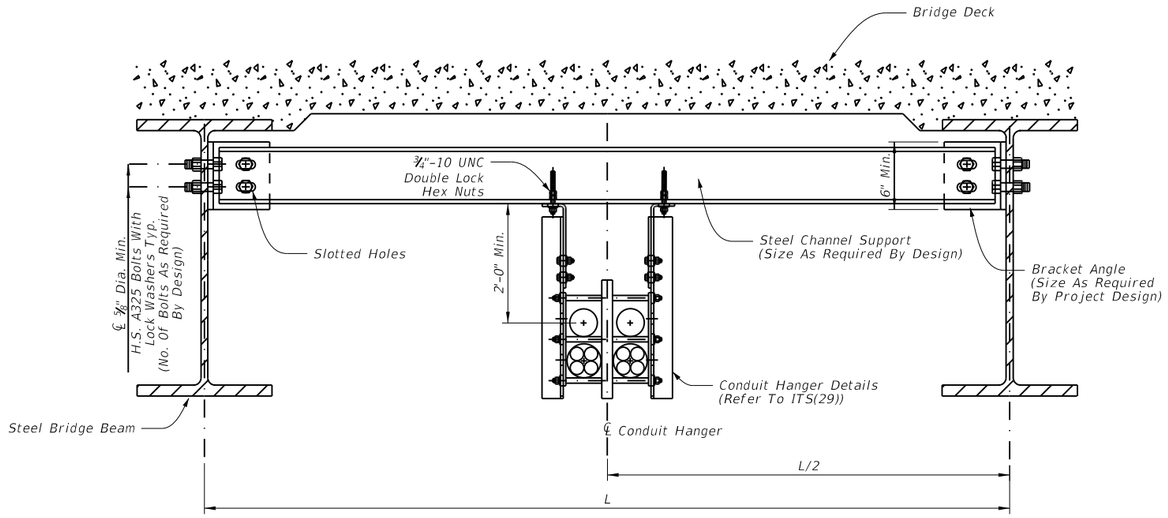


Structure Mounted ITS Conduit – Concrete Bridge Deck With Precast Panels

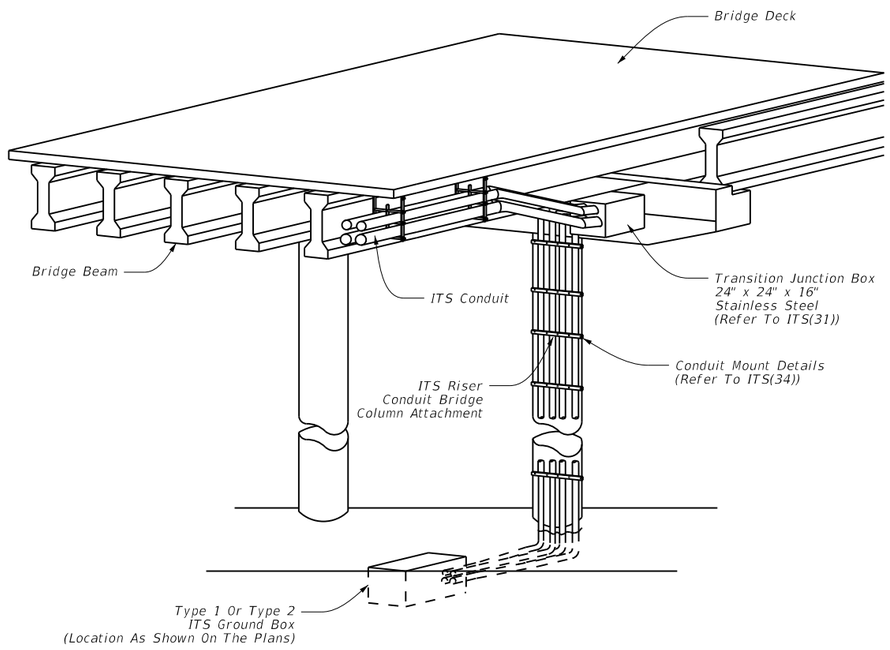
Refer To ITS(29) For General Notes

Note:

1. Position conduit hanger height to avoid conflicts with diaphragms in the conduit runs.



Typical Alternate Conduit Hanger Support (Steel I-Beam Mount)



Underside Conduit Hanger Transition Detail

General Notes:

1. The alternative mounting conduit hanger support mounting detail for steel I-Beam structures as shown is a suggested detail for steel structures. Submit details for the configuration shown on this sheet via shop drawings and include structural load analysis, support member and connection design. Seal all calculations and shop drawings by a Texas P.E.
2. Conduit hanger support mounting details for concrete bridge deck with precast panels as shown are a suggested method for pre-stressed concrete beam structures. Submit any deviation from these details via shop drawing and include structural load analysis, support member, and connection design. Seal all calculations and shop drawings by a Texas P.E.
3. Locate auxiliary conduit hanger supports for steel structures at a maximum 5'-0" spacing.
4. For conduit loads located between beams exceeding 5 lbs per ft, furnish structural load analysis calculations for adjacent beams in the shop drawing submission.
5. Submit design details for structure with cathodic protection in the shop drawing submission.
6. Do not extend conduit hangers below the bottom of the bridge beams (any exceptions at end spans are subject to approval).
7. Drilling in pre-stressed beams or field welding of steel beams is not permitted. Submit any exceptions on a case by case basis for evaluation and approval by the Engineer.
8. Ensure all conduit hanger assemblies are furnished and supplied by the conduit hanger manufacturer.
9. Galvanize all hardware and structural steel that is not stainless steel. Ensure all bolt hardware used to secure hangers to steel structures conforms to A325 for high strength. Ensure all expansion anchors conform to ASTM A307. Separate dissimilar materials for use of galvanized hardware with weathering steel girders.
10. Select conduit lengths so that couplings do no coincide with conduit hanger locations.
11. Refer to Special Specification, "ITS Multi-Duct Conduit" or Item 618 "Conduit", for details on conduit mandreling and other testing required upon conduit installation.
12. Provide a flat pull cord in each conduit and inner duct to allow for installation of future cables to match 1250 lbs-ft tension. Refer to ITS(27) for additional conduit details.
13. Provide a transition junction box for conduit access located outside the abutments for bridge spans < 800 ft. For bridge spans > 800 ft., locate an additional junction box for conduit access near the mid-span/pier.
14. Provide ITS conduit of the type and configuration shown on the plans in accordance with Special Specification, "ITS Multi-Duct Conduit" or Item 618 "Conduit". Ensure all other conduit is in accordance with Item 618 "Conduit" and as shown on the plans.
15. Bond all external structure mounted conduit throughout entire length of run and ground the run at ground box locations according to ITS(37) and ITS(39).

Texas Department of Transportation

Traffic Operations Division Standard

STRUCTURE MOUNTED ITS CONDUIT

ITS(30)-16

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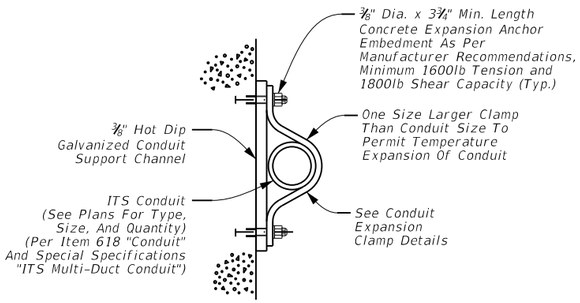
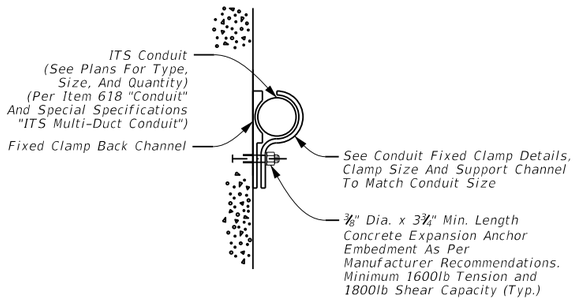
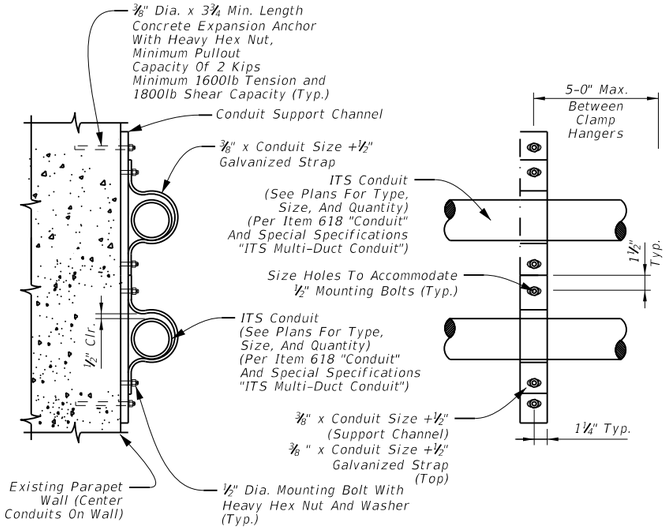


Conduit Expansion Clamp



Conduit Fixed Clamp

Conduit Clamp Details (Typ.)

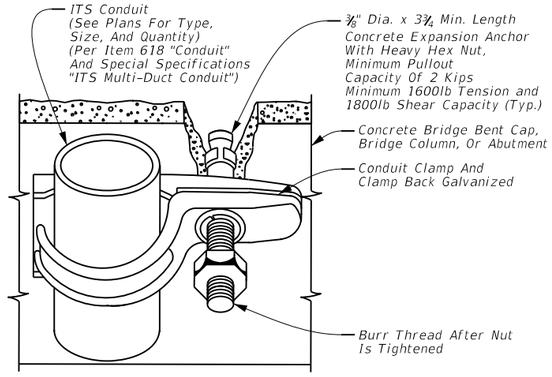


Side View

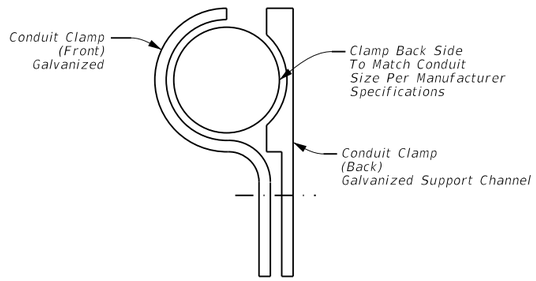
Top View

Elevation View

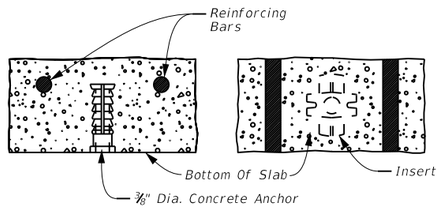
Conduit Expansion Clamp Details



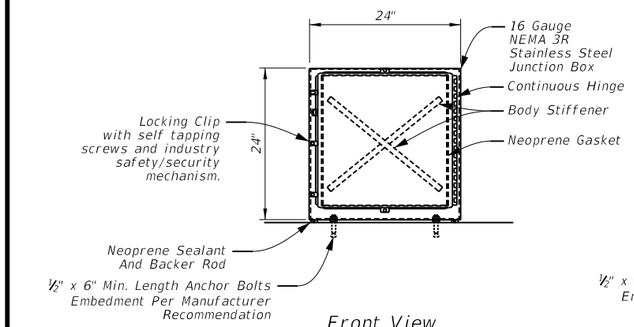
Conduit Fixed Clamp Back Channel



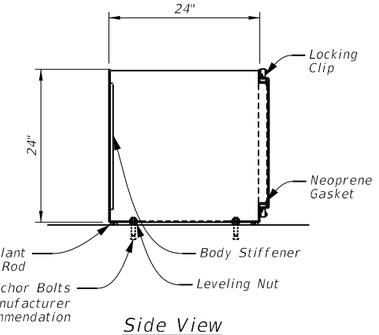
Conduit Fixed Clamp Details
Side View



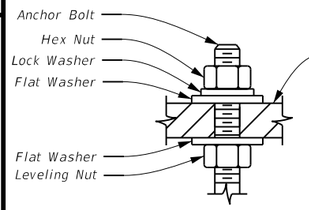
Conduit Fixed Clamp Concrete Insert Detail



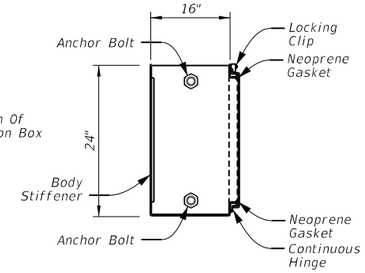
Front View



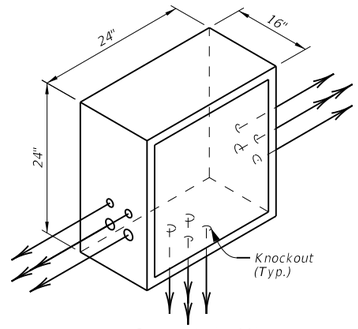
Side View



Anchor Bolt Detail
(May Vary On Mounting Scenario)



Top View



Isometric View

24" X 24" X 16" Stainless Steel Transition Junction Box Detail

Notes:
1. Transition box as depicted is top mount. Actual anchor fasteners and knockout location will vary based upon mount location and manufacturer recommendations.
2. Secure the transition box cover using self tapping screws with industry safety/security mechanism.
3. Typical knockout locations shown are for diagrammatic purposes only. The number of transition boxes required at a given location will vary depending on the number of conduits and cable storage requirements for cabling run(s).

General Notes:

1. Ensure all duct/conduit bends are in accordance with the latest version of the NFPA 70, National Electrical Code and as recommended by the manufacturer.
2. Utilize separate transition junction boxes for communications and electrical conduit runs.
3. Maintain constant slope in all duct/conduit runs.
4. Ensure maximum spacing of conduit clamps is 5'-0" C-C.
5. Galvanize all hardware, including anchor bolts, nuts, and washers per TxDOT Item 445, "Galvanizing". Ensure all expansion anchors conform to ASTM A307.
6. Provide a minimum NEMA 3R junction boxes. Construct all junction boxes in accordance with manufacturer specifications. Install junction boxes in accordance with the latest edition of NFPA 70, National Electrical Code.
7. Junction boxes and associated appurtenances are incidental to ITS conduit.
8. Install all conduit sweeps into junction boxes in accordance with allowable bend radius of the installed cable.
9. Install conduit support within 3'-0" of all enclosures and conduit terminations.
10. Refer to ED standard sheets for additional details on parapet mounted conduit.

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Traffic Operations Division Standard

PARAPET MOUNTED ITS CONDUIT AND TRANSITION BOX DETAIL

ITS(31)-16

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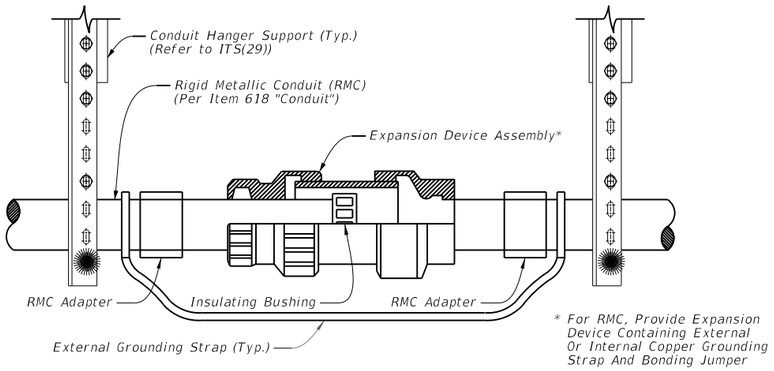
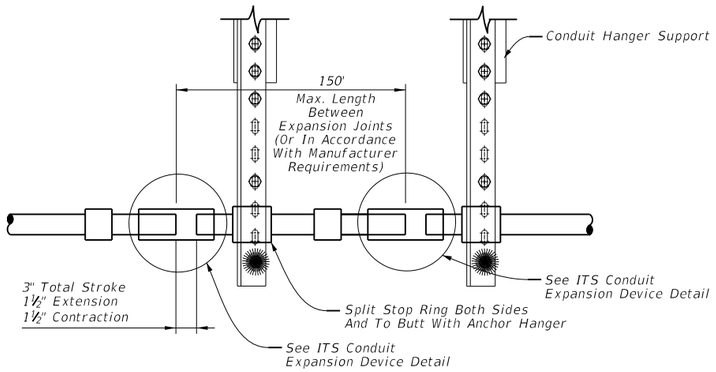
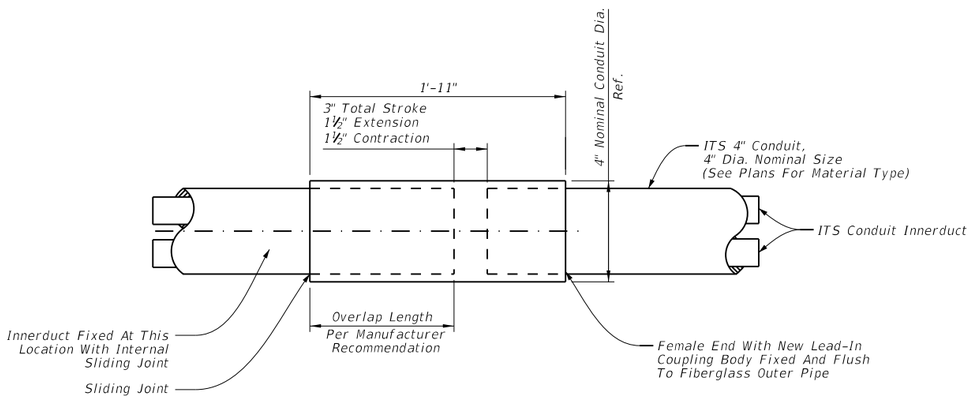


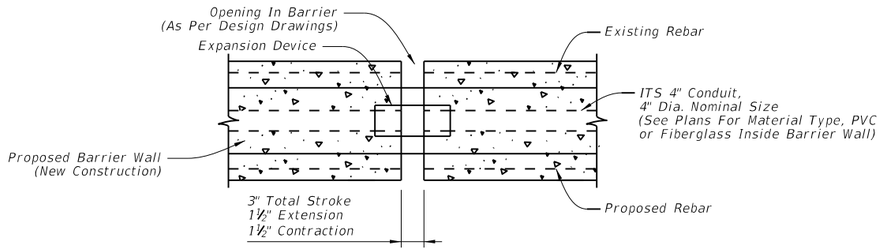
RMC Conduit Expansion Device Detail (Typ.)



ITS Conduit Expansion Device Placement (Typ.)



ITS Conduit Expansion Device Detail



ITS Conduit In New Construction Barrier Wall Expansion And Deflection Joint Fitting (Typ.)

General Notes:

1. Install expansion device at all open joints, at each end of bridge abutments and between bridge bents, allowing for 3" movement.
2. Provide a minimum of two (2) expansion joints at all bridges. Ensure expansion joint spacing does not exceed manufacturer recommendations.
3. Ensure conduit lengths are selected so that couplings do not coincide with hanger locations.
4. Ensure all rigid metallic conduit (RMC) expansion devices are constructed per manufacturer specifications.
5. Bond all external structure mounted conduit throughout entire length of run and ground the run at ground box locations according to ITS(37) and ITS(39).

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EXPANSION / DEFLECTION JOINT

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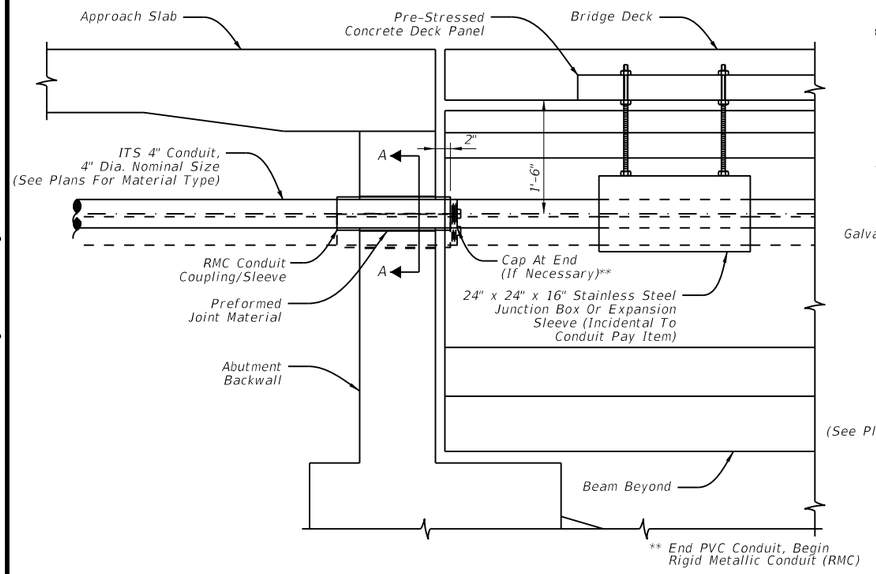
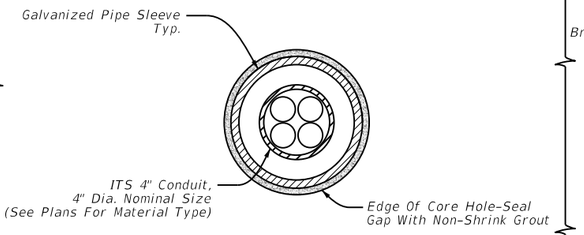


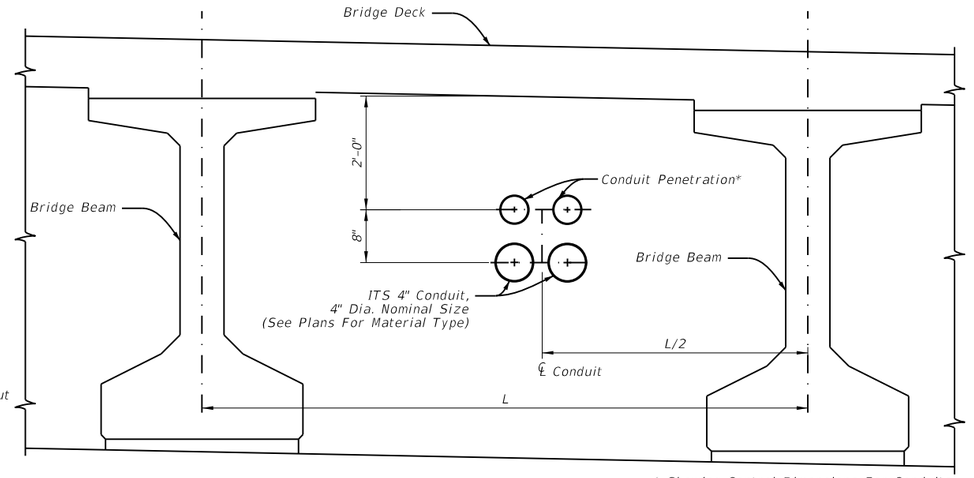
Section Through New Construction Abutment Backwall

Standard Notes:

1. If constant conduit elevation is maintained from the abutment backwall to the underside conduit hangers, provide an expansion joint sleeve (same size as conduit) with one travel overlap. If conduit elevation varies from the abutment backwall to the underside conduit hangers, provide an abutment wall mounted transition junction box (NEMA 3R rated).
2. Provide separate pipe sleeve for each conduit through abutment backwall. Size sleeve per manufacturer recommendations.



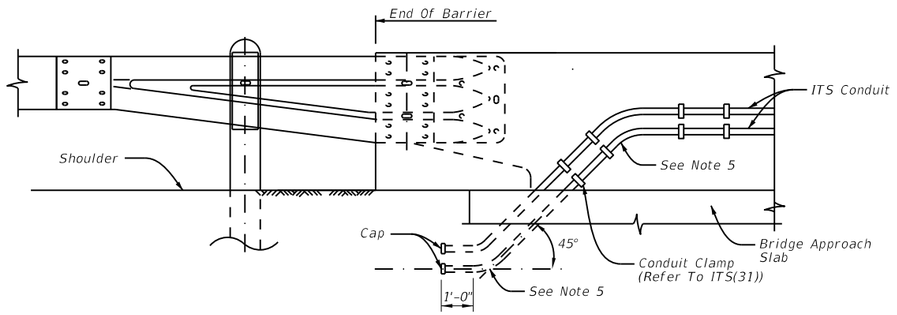
Section A-A (Typical Pipe Sleeve)



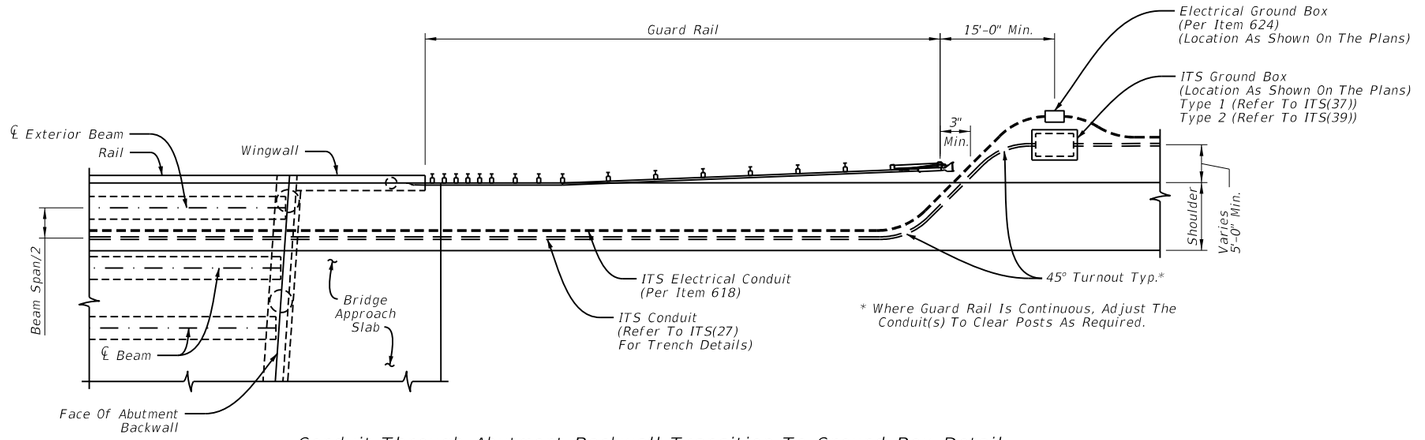
* Showing Control Dimensions For Conduits Thru Abutment Backwall. 2 x 2 Conduit Configuration Shown.

Abutment Elevation

ITS Conduit Transition At Bridge Abutment Detail



Parapet Mounted Conduit Transition To Ground Detail



* Where Guard Rail Is Continuous, Adjust The Conduit(s) To Clear Posts As Required.

Conduit Through Abutment Backwall Transition To Ground Box Detail

General Notes:

1. An alternative option to conduit mountings shown is conduit encased within parapet or bridge structure at crossings. Submit shop drawings and specifications to the engineer for approval.
2. Install expansion sleeves at bridge expansion joints and per manufacturer recommendations.
3. For conduit crossings over bridges, provide ITS communications junction boxes at 1000' maximum spacing and electrical junction boxes at 450' maximum spacing.
4. Keep all junction boxes sufficiently clear of guard rail or other obstructions to maintain clear access.
5. Install conduit sweep at an angle that accommodates cable bend radius. Do not exceed 45 degrees to the shoulder line. Refer to ITS(28) for conduit turn-out details.
6. Do not install junction boxes within paved shoulder area.
7. Ensure all work is in compliance with the latest edition of NFPA 70, National Electrical Code.
8. Junction boxes and associated appurtenances are incidental to ITS conduit.
9. For installation requiring ITS conduit transition within mechanically stabilized earth (MSE) walls with select fill, locate conduit to avoid reinforced straps. Refer to retaining wall standards for further details.
10. Bond all external structure mounted conduit throughout entire length of run and ground the run at ground box locations according to ITS(37) and ITS(39).

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Traffic Operations Division Standard

ITS CONDUIT TRANSITION AT ABUTMENT

ITS(33)-16

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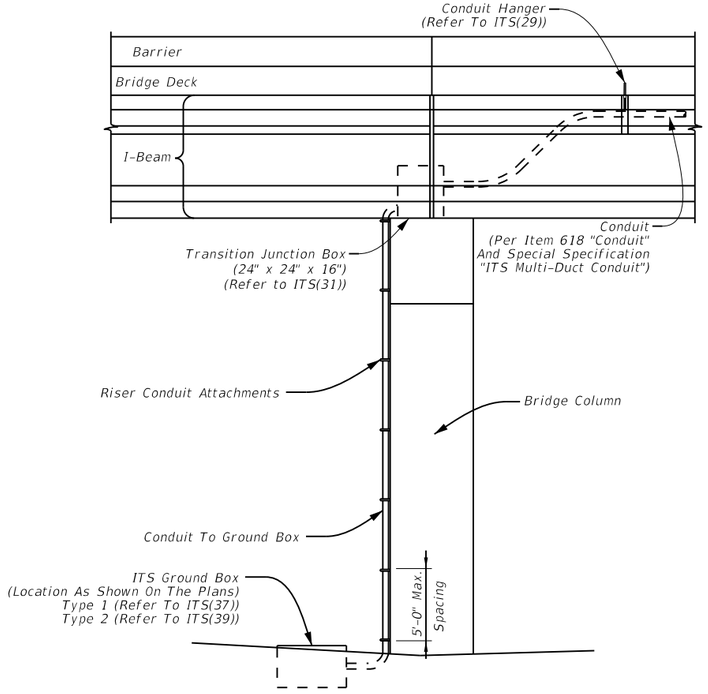
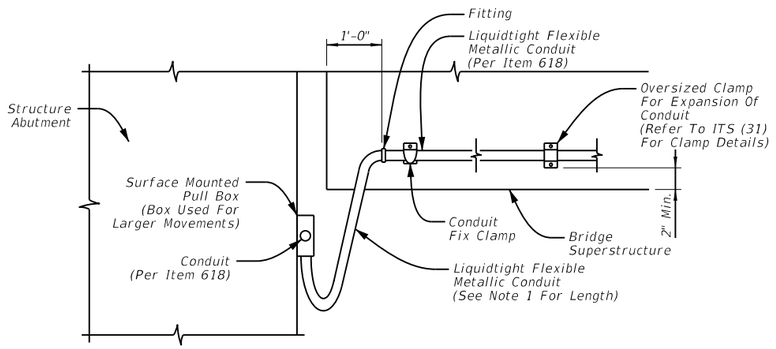


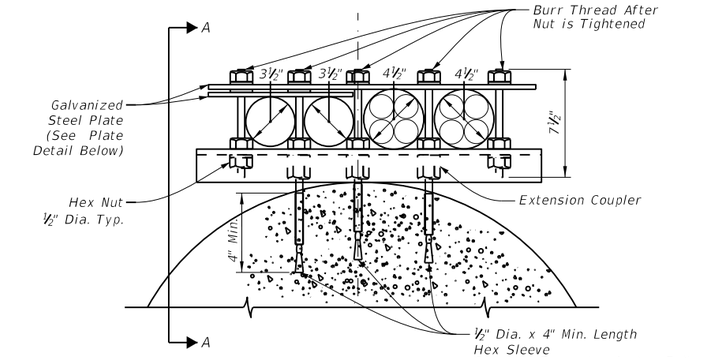
ITS Conduit Riser

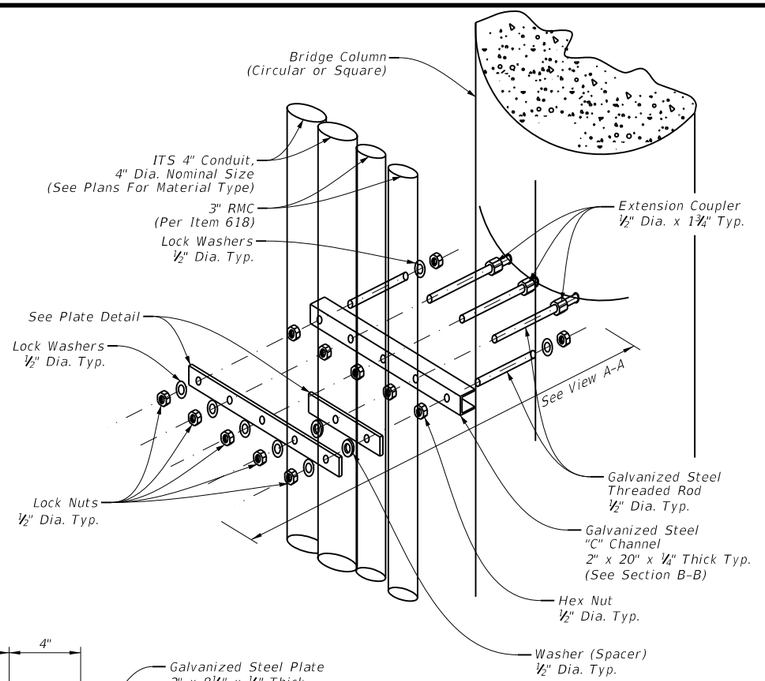


Exposed Conduit Connections At Expansion Joints

Notes:

1. Bond all external structure mounted conduit throughout entire length of run and ground the run at ground box locations according to ITS(37) and ITS(39).
2. The detail shown applies to conduit connections for conduit per Item 618 and is not intended for conduit for fiber optic cable applications.





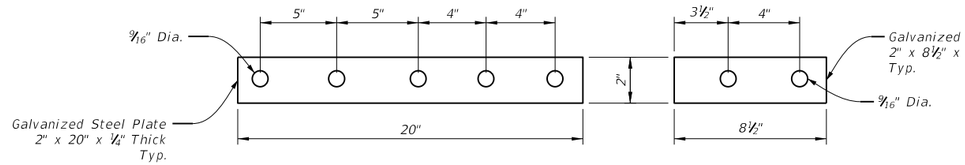
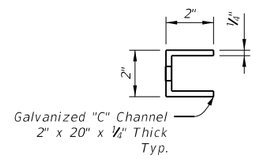
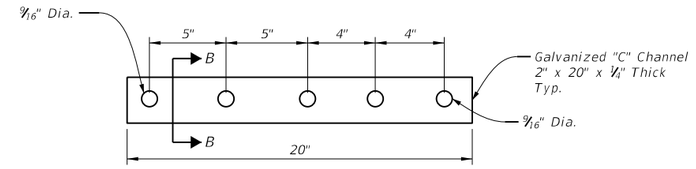


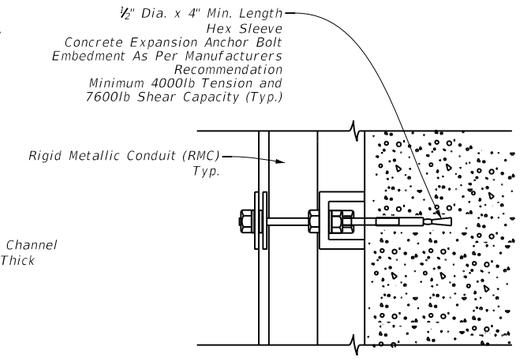
Plate Detail



Section B-B



"C" Channel Detail



View A-A

ITS Riser Conduit Bridge Column Attachment

General Notes:

1. Utilize an approximate length of flexible conduit at exposed connections of 2 times anticipated movement or 4'-0" minimum.
2. Size all transition boxes and surface mounted pull boxes per National Electrical Code Article 314 boxes and fittings.
3. For under bridge locations, ensure all junction boxes are kept inaccessible from general public and placed a minimum 10'-0" above surrounding ground.
4. Refer to ED standard sheets for additional notes and attachment details for riser conduit.
5. See plan sheets for number and size of conduit(s) to be installed.
6. Refer to ITS(33) for details involving conduit passing through the abutment.
7. Ensure maximum spacing between ITS riser conduit attachments is 5'-0" C-C.
8. Install conduit supports within 3'-0" of all enclosures and conduit terminations.
9. Ground all rigid metallic conduit (RMC) hangers per manufacturer recommendations when electrical conductors present.
10. Ensure all expansion anchors conform to ASTM A307.
11. Allowable types of outer duct material for above ground ITS conduit include rigid metallic conduit (RMC) and fiberglass.

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Traffic Operations Division Standard

ITS CONDUIT RISER

ITS(34)-16

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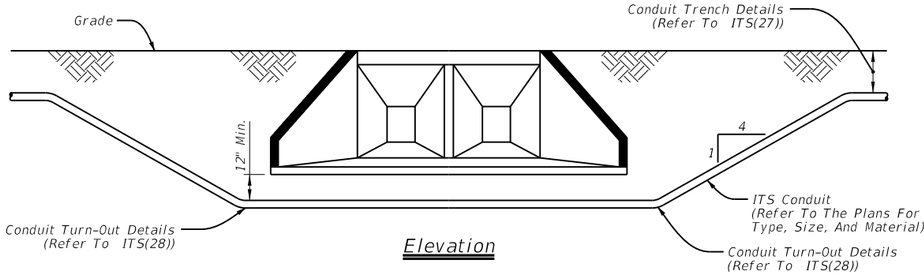
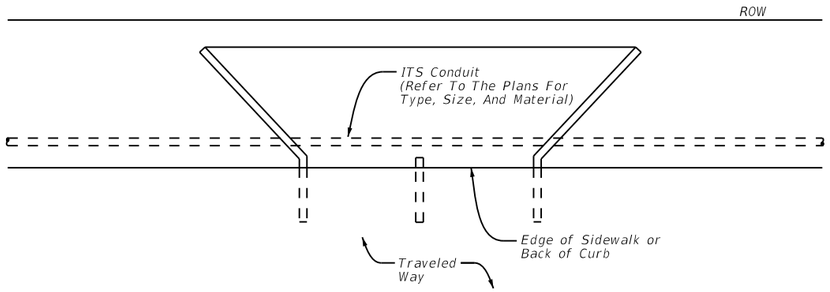
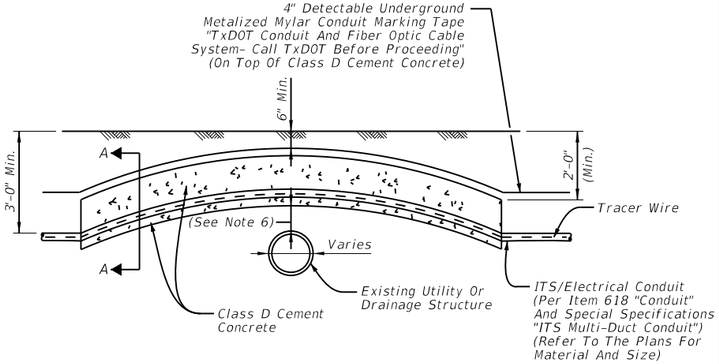


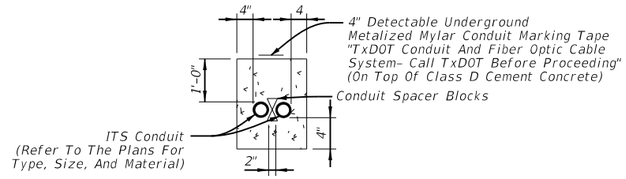
Elevation



Plan View

Conduit Bored Under Culvert



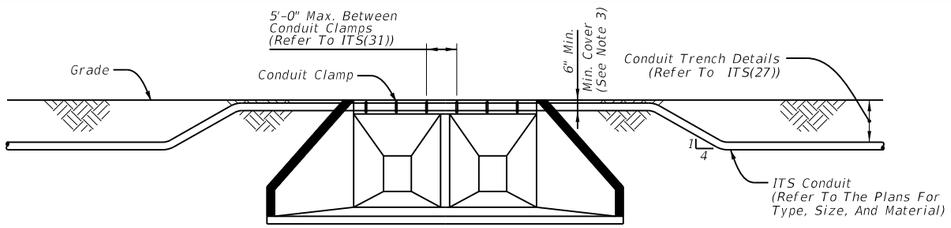


Section A-A

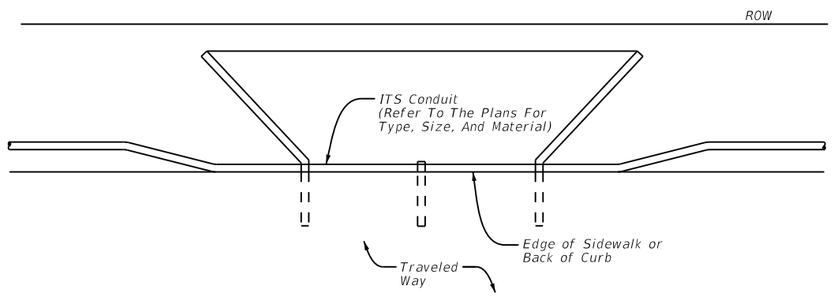
Conduit Installation Detail Above
Existing Drain Pipes Or Utilities

General Notes:

1. With approval from the field engineer adjust the final burial depth of conduit(s) in circumstances requiring traversal of non-movable object conflicts.
2. Where conduits are to be installed over existing underground infrastructure (i.e., existing utility or drainage structure) which are less than 3'-0" deep, encase conduit in Class D cement concrete in accordance with Item 421, "Hydraulic Cement Concrete", for the entire length of the conduit that is installed at a depth of less than 3'-0".
3. If depth of cover over encasement is less than 6", install the conduit to pass beneath the underground infrastructure.
4. Refer to the plans for type, size and configuration of all conduits. Refer to ITS(27) and ITS(28) for further installation details.
5. It is the responsibility of the contractor to verify all existing underground infrastructure. The contractor is responsible for any damage to any underground infrastructure during construction. Verify all utility locations at least 100' in advance of trenches, plowing or boring, and make changes in conduit placement in the event of conflict.
6. If proposed conduit is crossing or in close proximity to an existing underground utility, maintain a minimum clearance of 1'-6" vertical, 1'-6" horizontal or a clearance dictated by municipal code and or utility owner.
7. Install underground warning tape directly above all conduits per ITS(27) standard.
8. Do not install communications and electric cables in the same conduit. Separate conduits installed within the same trench based on NFPA 70, National Electrical Code. Refer to ITS(27) for additional conduit installation details.
9. Ensure all work is in compliance with the latest edition of NFPA 70, National Electrical Code.
10. Utilize PVC conduit for all underground applications as required by design. Transition with a conduit coupling to RMC conduit or other as required by design that is approved for above ground applications.
11. Do not exceed a rise:run ratio of 1:4 for conduit sloped through increases or decreases in elevation.

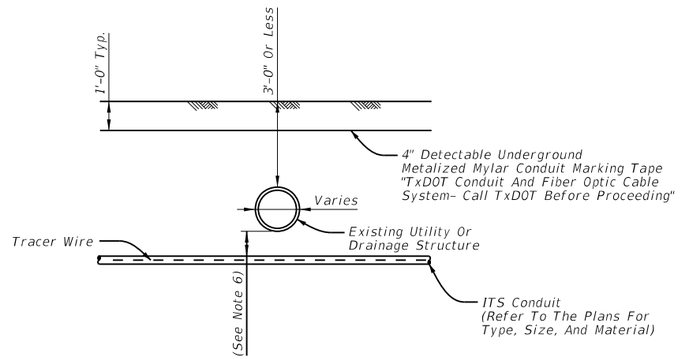


Elevation



Plan View

Conduit Attached To Culvert Headwall



Conduit Installation Detail Below
Existing Drain Pipes Or Utilities

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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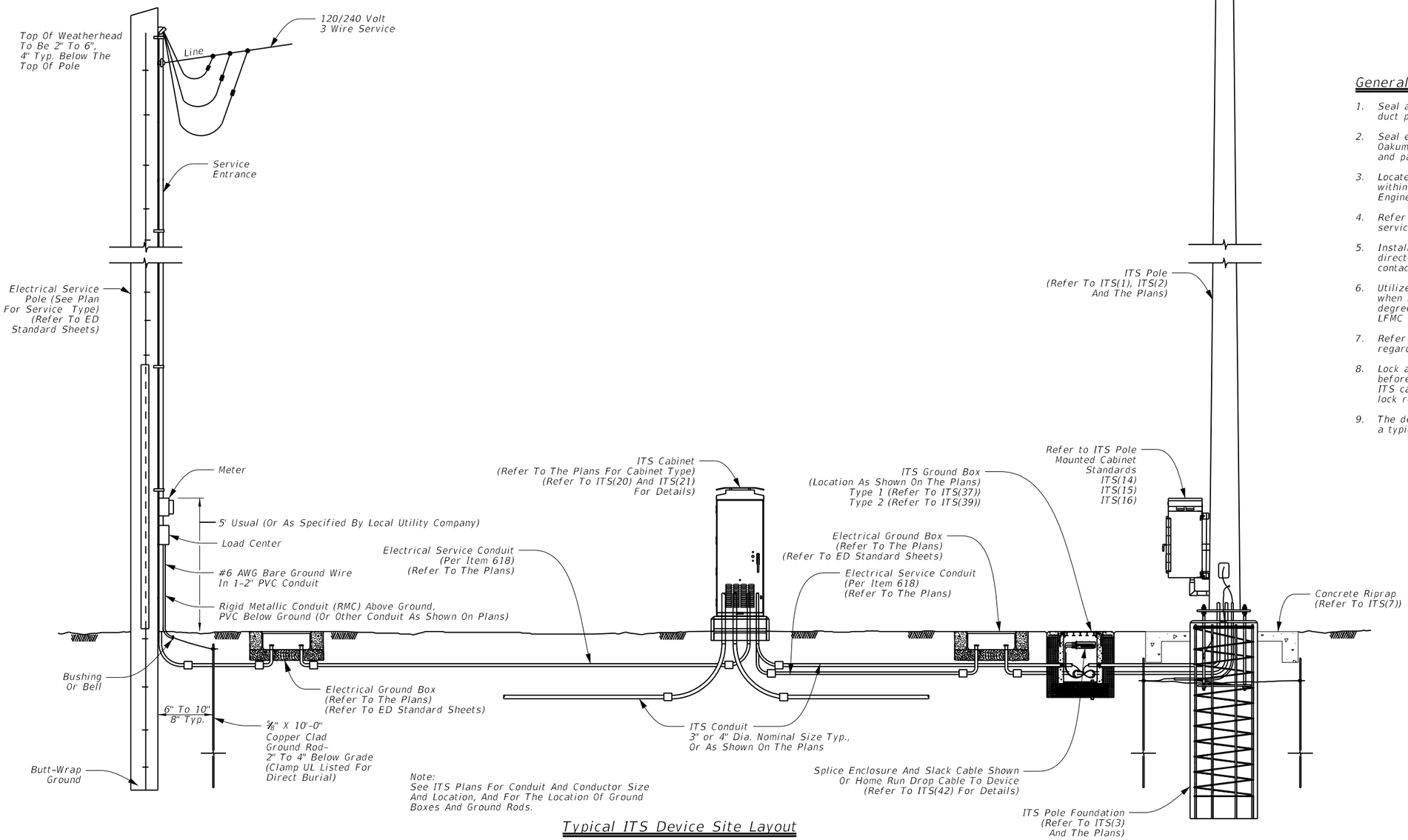

Typical ITS Device Site Layout

General Notes:

1. Seal all ITS communications conduits with waterproof duct plugs and seals.
2. Seal ends of all conduit entries into ITS cabinets with Oakum or other as approved by the District representative and pack with duct sealant.
3. Locate ground boxes for electrical and ITS communications within 5'-0" of cabinet enclosure, or as directed by the Engineer.
4. Refer to ED standard sheets for additional notes regarding electrical service.
5. Install service pole ground rod at alternate location when directed by the engineer. Maintain a minimum of 8'-0" in contact with the earth.
6. Utilize liquidtight flexible metal conduit (LFMC), as required when meter and service enclosure are mounted 90 to 180 degrees to each other. Refer to ED standard sheets for details on LFMC use.
7. Refer to ITS(21), ITS(37) and ITS(39) for details regarding conduit depth and entry into ITS ground boxes.
8. Lock all enclosures and bolt all ground box covers before power is applied to the circuit. Refer to the ITS cabinet references indicated on this sheet for cabinet lock requirements.
9. The detail shown is diagrammatic and is intended to represent a typical layout from electrical service to ITS devices.

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Traffic Operations Division Standard

TYPICAL ITS DEVICE SITE LAYOUT

ITS(36)-16

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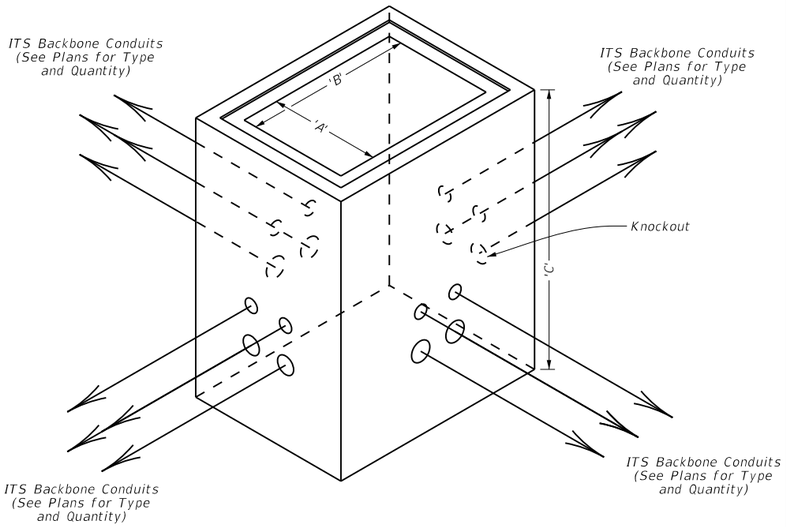
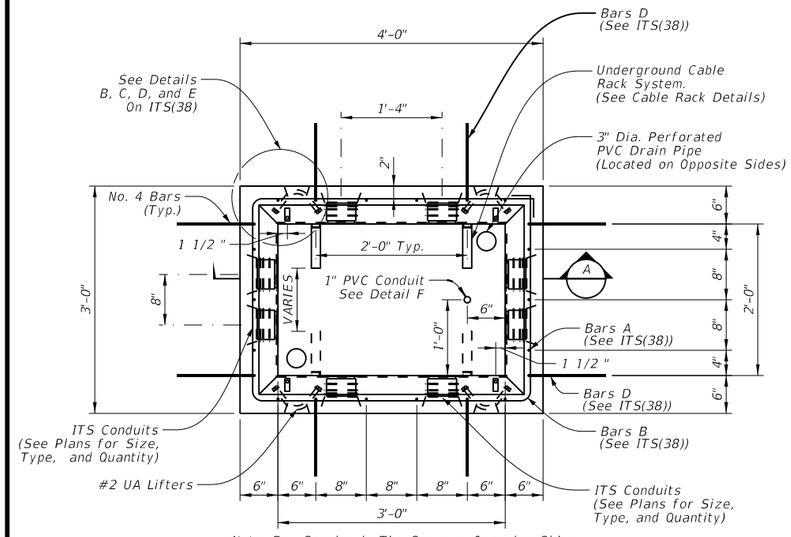


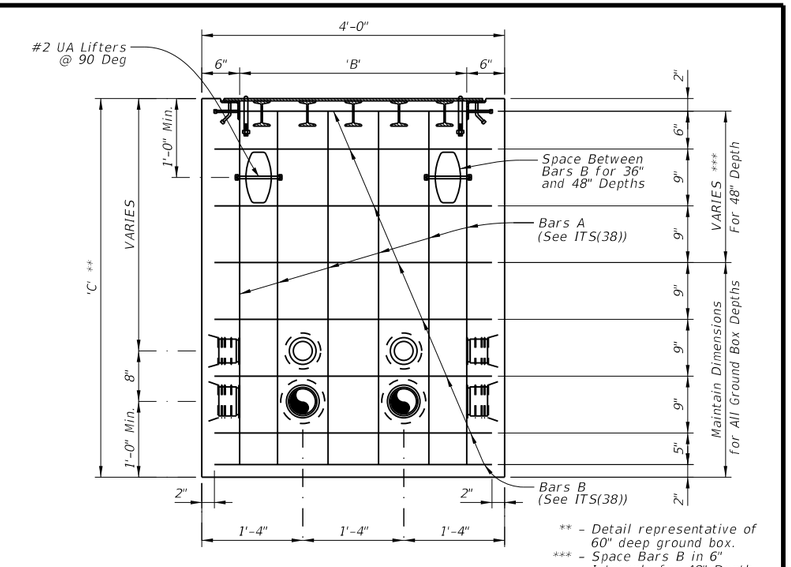
See Ground Box Schedule for A, B, and C Dimensions

Type 1 Ground Box Isometric View



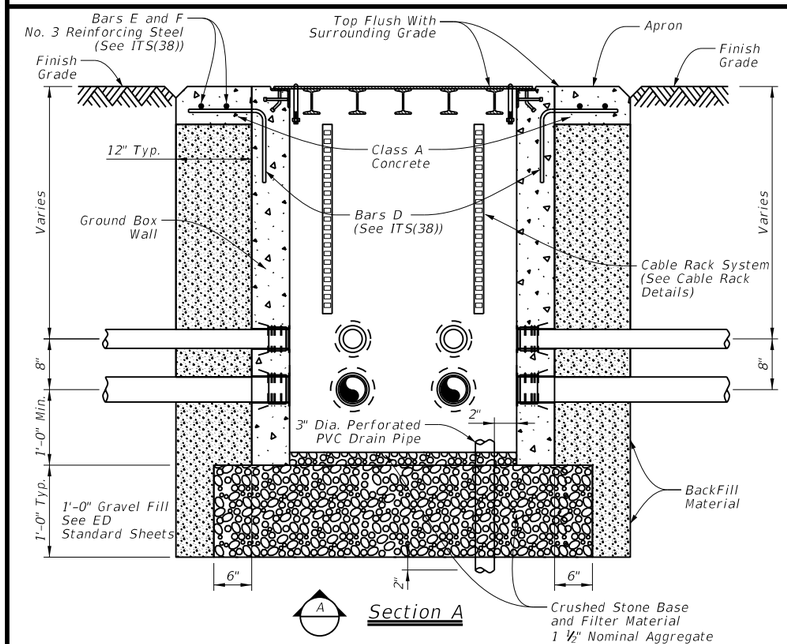
Note: Bar Spacing is The Same on Opposing Sides.

Type 1 Ground Box Plan View

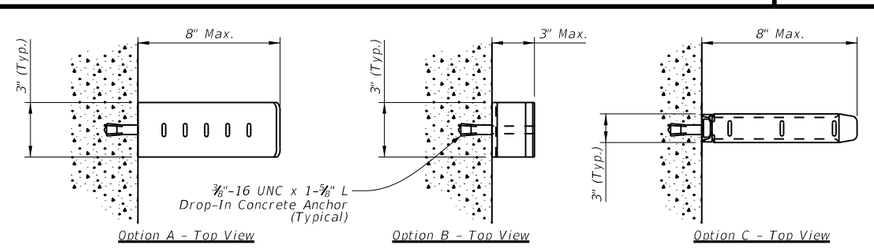


** – Detail representative of 60" deep ground box.
*** – Space Bars B in 6" Intervals for 48" Depth

Type 1 Ground Box Elevation View

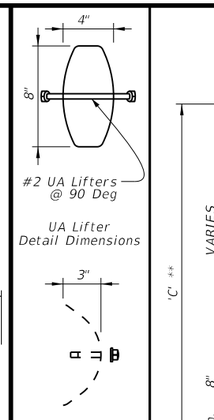


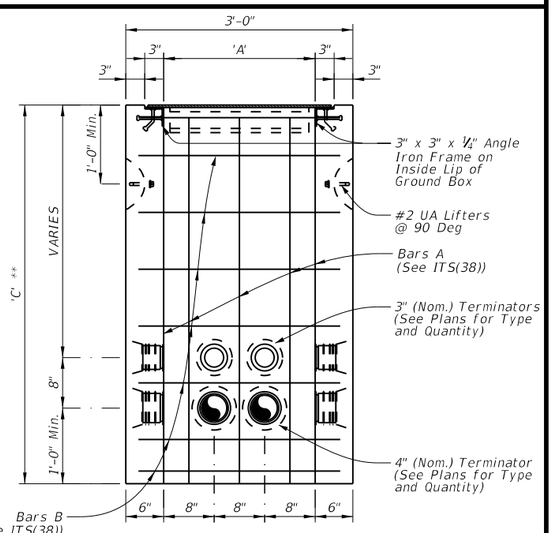
Section A



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 base of crushed stone which extends 6 inches in all directions from the perimeter of the box for closed bottom boxes. Crushed stone will be subsidiary to Special Specification, "ITS Ground Box."
6. Install all open bottom Type "1" ground boxes on a 12-inch base of crushed stone which extends 6 inches in all directions from the perimeter of the box. Crushed stone will be subsidiary to Special Specification, "ITS Ground Box."
7. Cap and seal terminators that do not have conduits attached.
8. When additional conduit entry points are needed to accommodate existing conduit, core drill conduit knockouts in the field of the appropriate number and size of conduit at each location, as directed by the Engineer.
9. Provide a bell fitting on the end of each conduit to ensure a flush fit inside the ground box.
10. Concrete grout around the knockout (inside and out) and around the conduit and bell fitting to ensure a neat watertight fit after the conduit and bell fitting have been placed in a knockout. Ensure all openings in the ground box are sealed prior to grouting operations.
11. Install a nylon string and plug all unused conduits with tug-plugs sized for the particular conduits. Provide split innerduct plugs in conduits or innerducts with cables to seal the innerduct around the cables to prevent water and dirt from entering.
12. Provide steel (ASTM A-153), glass reinforced nylon, or equivalent cable rack assemblies designed to support the amount of cable storage slack identified in the plans. Locate cable rack system on one side only (longer length side) to allow access to the inside of the ground box. Cable racks may be installed at the factory or in the field. When mounting cable racks in the field, seal all penetrations to the concrete side wall to prevent moisture penetration. Ground metallic cable rack systems to grounding system inside ground box in accordance with the National Electrical Code.

Ground Box Schedule

Ground Box Type	'A' Width Inside (Inches)	'B' Length Inside (Inches)	'C' Depth Inside (Inches)
Type 1	24	36	36, 48, 60

Sheet Details
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Texas Department of Transportation

Traffic Operations Division Standard

ITS GROUND BOX DETAILS TYPE "1" WITH STEEL COVER

ITS(37)-16

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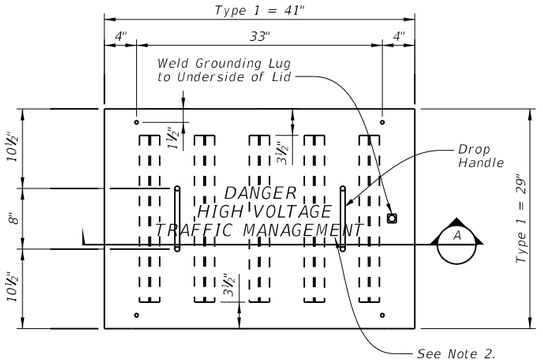
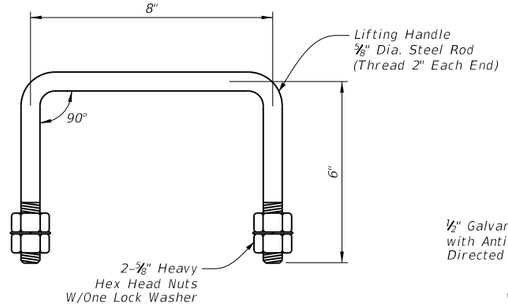
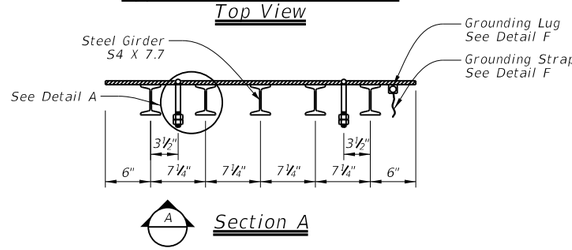


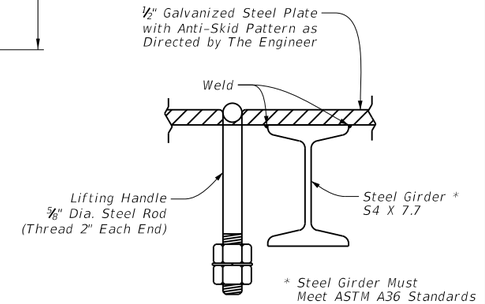
Type 1 Steel Cover Details
Top View



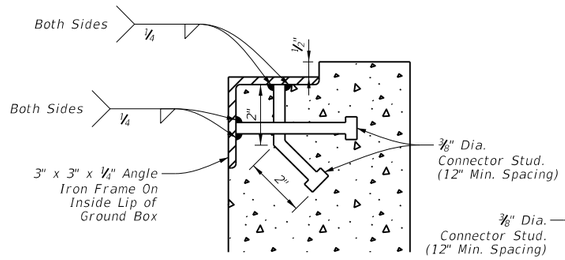
Drop Handle Detail



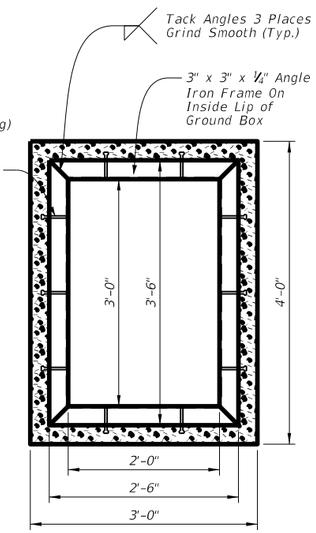
Section A



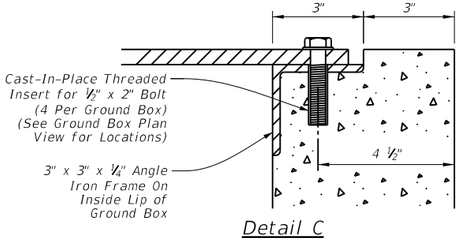
Detail A



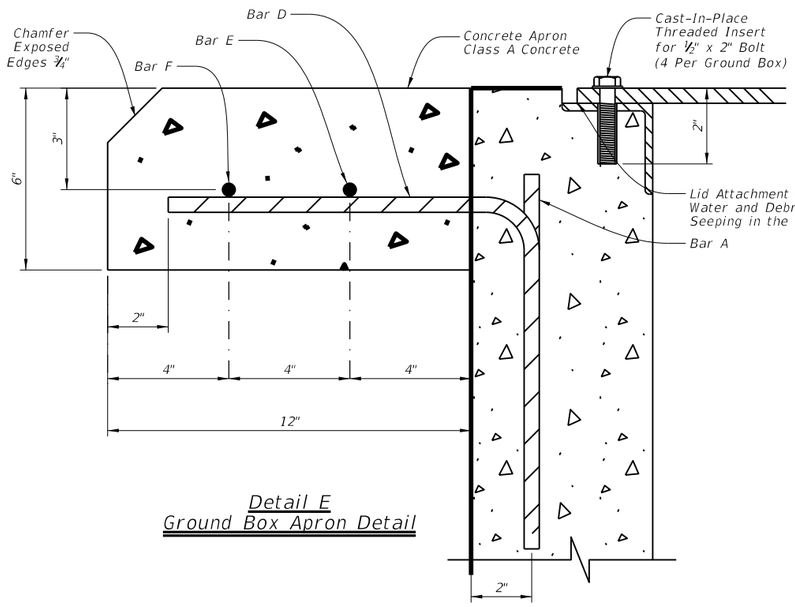
Detail B



Detail D



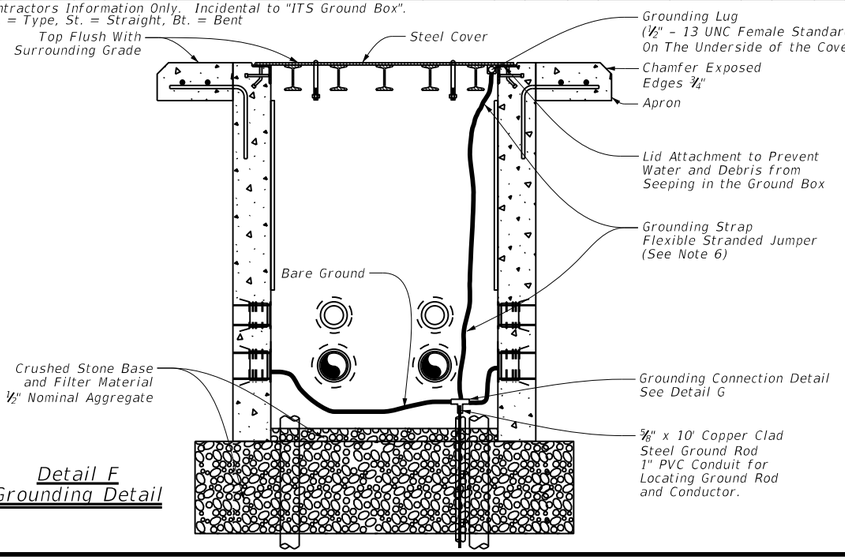
Detail C
Lid Attachment Detail



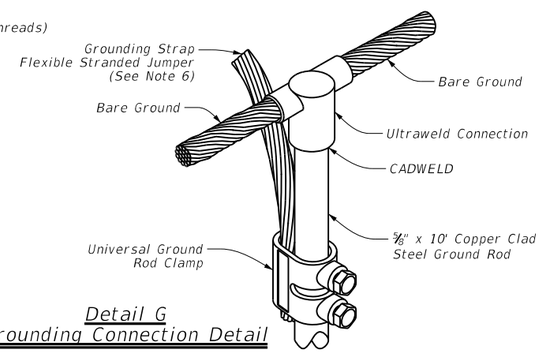
Detail E
Ground Box Apron Detail

Ground Box Type 1	BAR A					BAR B					BAR D					BAR E					BAR F					TOTALS	
	No.	Size	Ty.	Length	Weight	No.	Size	Ty.	Length	Weight	No.	Size	Ty.	Length	Weight	No.	Size	Ty.	Length	Weight	No.	Size	Ty.	Length	Weight	Steel * LBS.	Conc. * CY
36" Depth	22	#4	St.	2'-8"	39.3	5	#4	Bt.	13'-2"	44.1	8	#4	Bt.	2'-0"	10.7	1	#3	Bt.	17'-2"	6.5	1	#3	Bt.	19'-10"	7.5	108.1	.67
48" Depth	22	#4	St.	3'-8"	54.0	7	#4	Bt.	13'-2"	61.8	8	#4	Bt.	2'-0"	10.7	1	#3	Bt.	17'-2"	6.5	1	#3	Bt.	19'-10"	7.5	140.5	.89
60" Depth	22	#4	St.	4'-8"	68.8	8	#4	Bt.	13'-2"	70.6	8	#4	Bt.	2'-0"	10.7	1	#3	Bt.	17'-2"	6.5	1	#3	Bt.	19'-10"	7.5	164.1	1.11

* - For Contractors Information Only. Incidental to "ITS Ground Box".
Legend: Ty. = Type, St. = Straight, Bt. = Bent



Detail F
Grounding Detail



Detail G
Grounding Connection Detail

Note - All grounding connections to be CADWELD or approved equal. This work will not be paid for directly, but is considered incidental to ITS ground box.

General Notes:

1. See ITS(37) for additional Type "1" ground box details.
2. Hot-dip galvanized steel covers after all welds are made.
3. Label top of cover with the words "DANGER HIGH VOLTAGE TRAFFIC MANAGEMENT" using template-guided, hand-welded lettering at a height of 2 inches to ensure neatness.
4. Provide all Type "1" ground boxes with a securable, tamper-proof cover equipped with a bolting system that positively secures the cover in place.
5. Ground steel covers in accordance with the National Electrical Code.
6. Ground covers to the grounding cable using a split-bolt kearney clamp, and a minimum 8-foot long flexible stranded jumper the same size as the grounding conductor. Terminate to metal ground box cover with a tank ground type lug as approved and directed by the Engineer.
7. Provide Type "1" ground box and cover designed for heavy duty loading in accordance with AASHTO H20 loading when located where the box may experience deliberate, continuous vehicular traffic, such as near the shoulder or an auxiliary lane, or immediately adjacent to the unprotected edge of pavement.
8. Provide a Type "1" ground box and cover tested by a laboratory independent of the manufacturer certifying loading requirements are met. Provide certification of such tests to the Engineer for approval.
9. Provide a steel or cast iron cover in accordance with Item 471, Article 471.2, "Frames, Grates, Rings, and Covers." Provide covers with the number of drop handles shown. Provide Class "A" concrete for ground box construction and aprons.
10. Fabricate cover so to fits properly on the ground box, and no undue noise results when traffic contacts the cover.

Sheet Details
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Traffic Operations Division Standard

ITS GROUND BOX DETAILS TYPE "1" WITH STEEL COVER

ITS(38)-17

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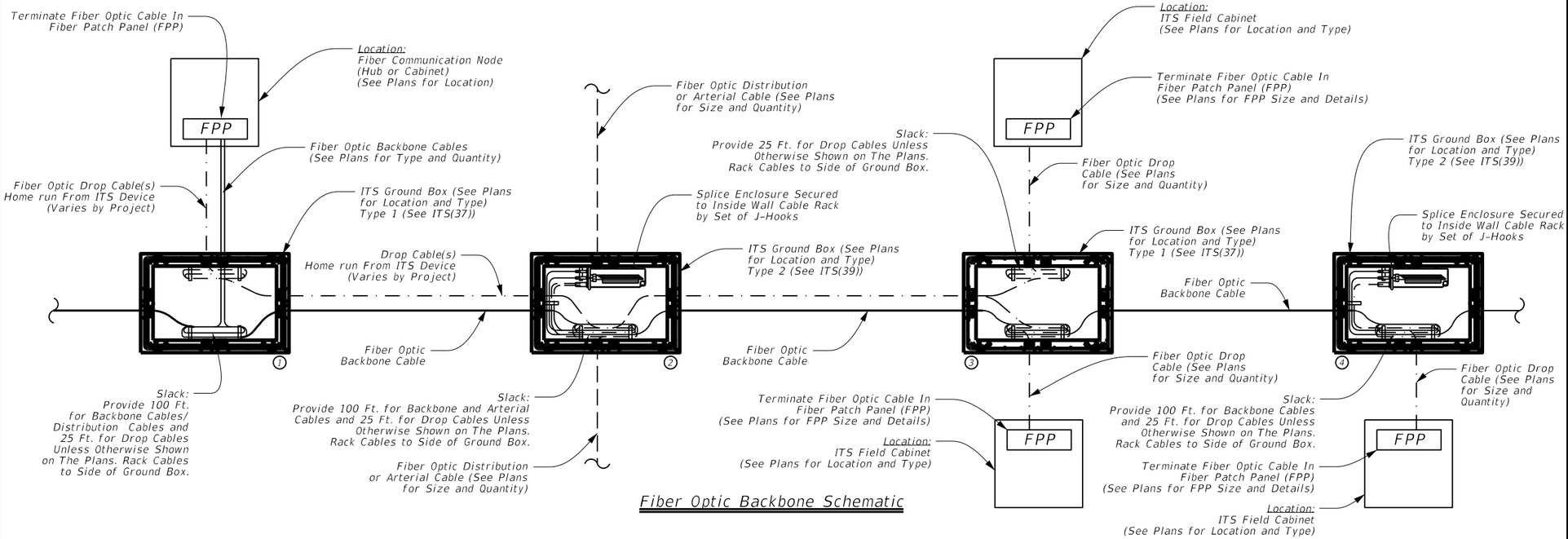
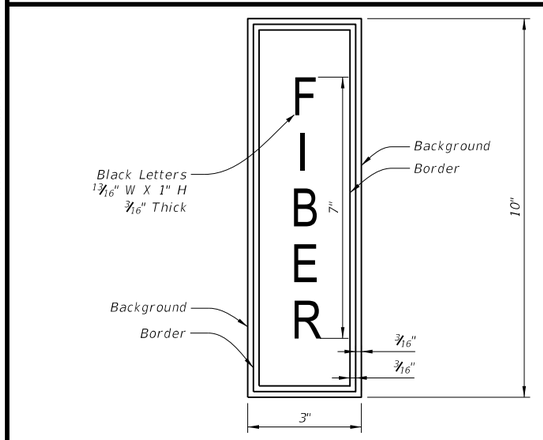
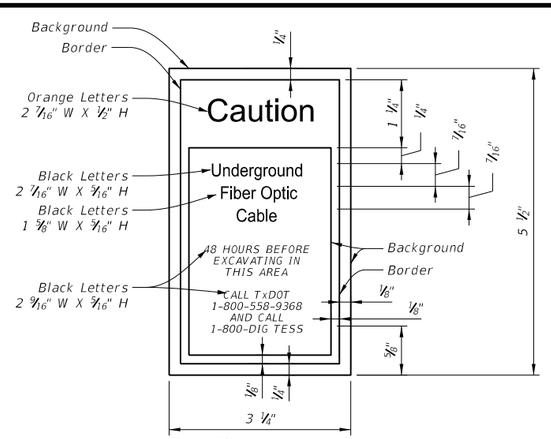


Fiber Optic Backbone Schematic



Border - Black
Background - Orange Reflective

Fiber Decal Details



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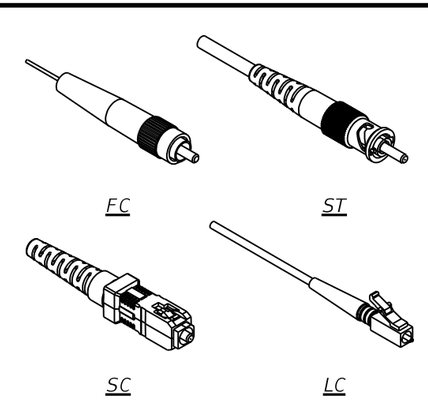
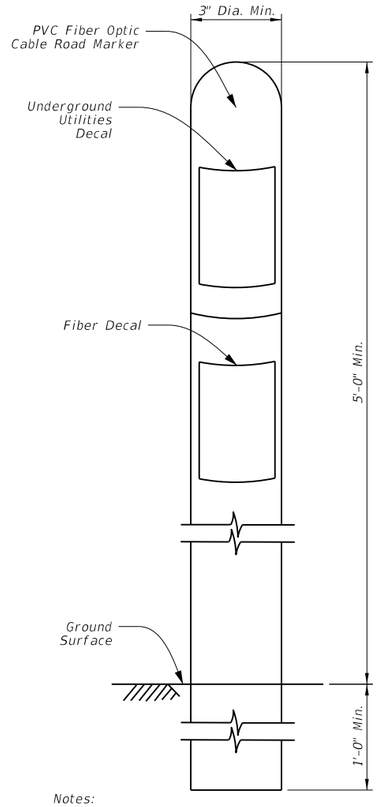
Symbol - Black
Background - Orange Reflective

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

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.

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.

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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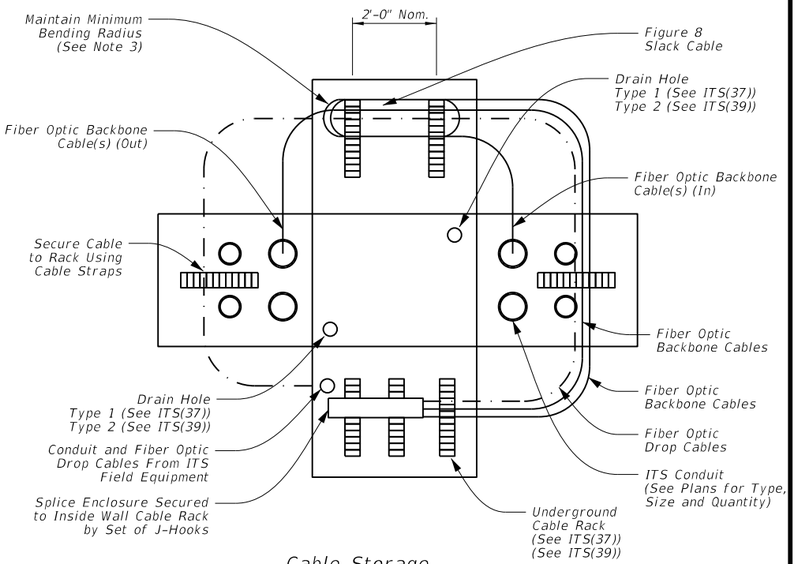
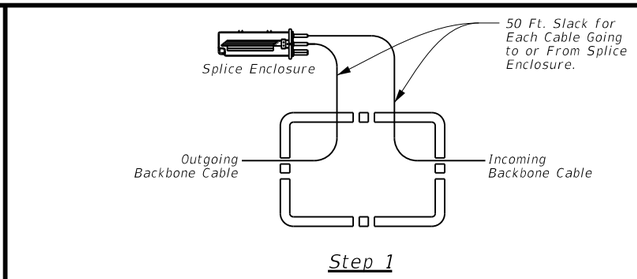
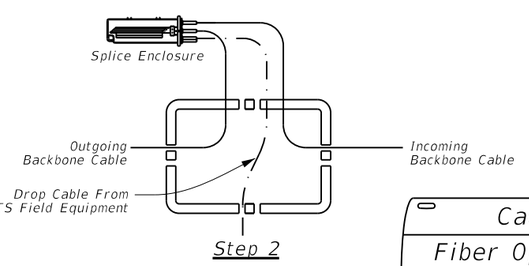


Cable Storage

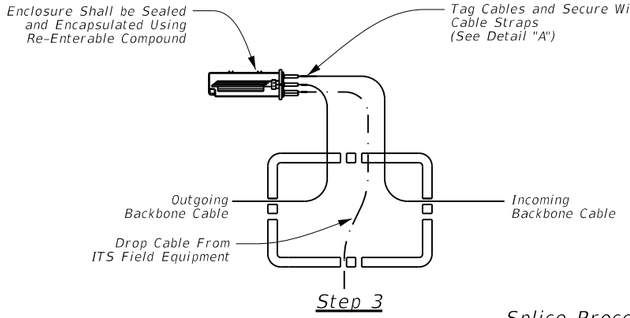
Top View - Ground Box Walls Folded Down for Clarity



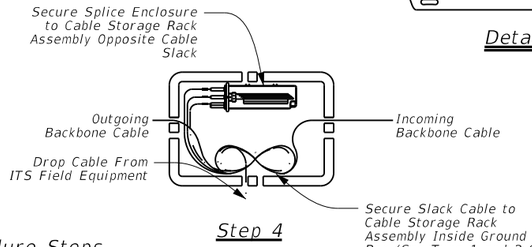
Step 1



Step 2

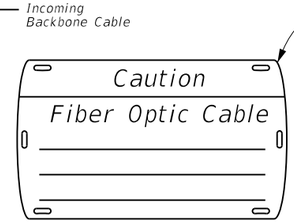


Step 3



Step 4

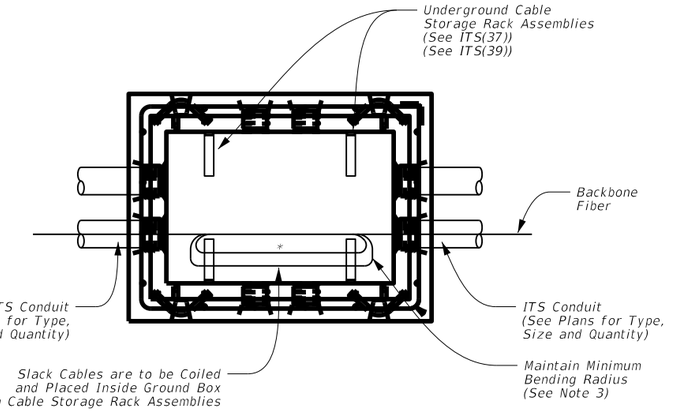
Splice Procedure Steps



Fiber Optic Cable Tag

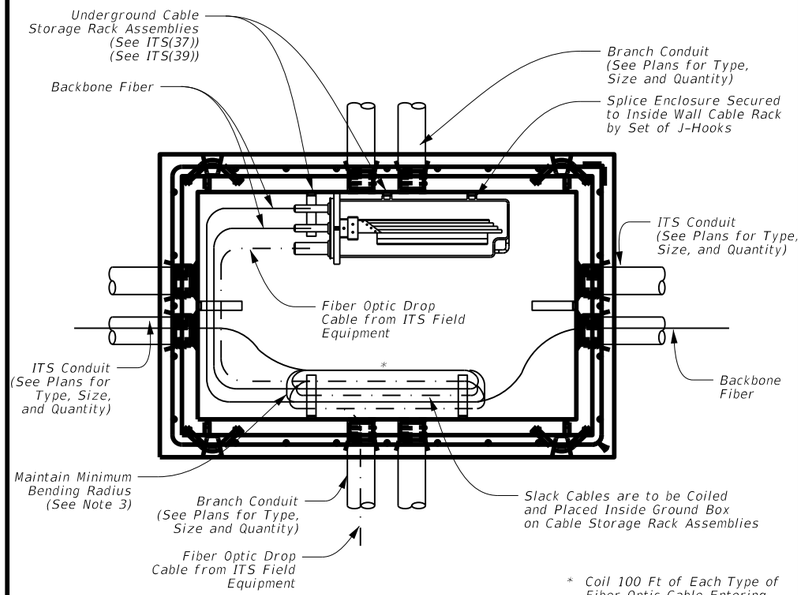
Panduit Inc. No. PST-FO
Hellerman-Tyton No. CST2003x2
Self-Lam Tag or Approved Equal

Detail "A"



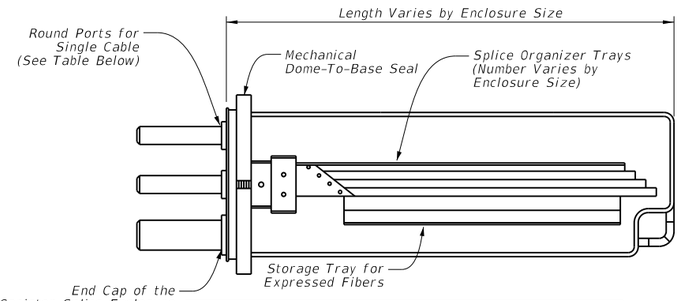
Type "1" Ground Box

* Coil 25 Ft of Fiber Optic Cable for Slack



Type "2" Ground Box with Splice

* Coil 100 Ft of Each Type of Fiber Optic Cable Entering the Ground Box



Splice Enclosure Sizes			
Type	No. of Ports	Port Capacity	Fiber Use
1	4	2 - Up to 144 Sm	Backbone
		2 - Up to 48 Sm	Drop
2	6	4 - Up to 144 Sm	Backbone/Arterial
		2 - Up to 48 Sm	Drop
3	8	4 - Up to 144 Sm	Backbone/Arterial
		4 - Up to 48 Sm	Drop

Splice Enclosure Fiber Accommodations

General Notes:

1. Conduit entry points to the Type 1 and Type 2 ground boxes are diagrammatic. Refer to ITS ground box standards, ITS(37) and ITS(39), for more information. Additional conduits may be required as shown on the plans.
2. Type 2 ground boxes are to be used, as shown on the plans, when splice enclosures are required.
3. Maintain a minimum bend radius of 20 times the fiber optic cable diameter during installation, relocation, and removal and a minimum of 10 times the fiber optic cable diameter when in operation.
4. Caulk all conduit around the top of the cable ducts with an engineer approved caulking compound to seal clearance between the cables and ducts. Place conduit plugs in all vacant conduits or inner-ducts.
5. Provide cable straps that will withstand ultra-violet exposure and do not damage cables when tightening.
6. All incidental equipment necessary for the cable installation and mounting of splice enclosure within the ground box will be incidental to Special Specification, "ITS Fiber Optic Cable."
7. Submit all splice locations to the field engineer for approval before beginning work.
8. Provide splice enclosures designed to seal, bond, anchor, and protect fiber optic cable splices. Provide splice enclosures designed to handle mechanical and fusion type splices. Provide splice enclosures with port configurations for the sizes detailed above.
9. Provide splice enclosures designed for underground placement with a sealing system preventing water penetration when submerged under 10 ft. of water.
10. Furnish, install, and secure fiber optic cable tags for each fiber optic cable entering a ground box, ITS field equipment cabinet (ground and pole), and hub building or communication node as detailed above. Provide information including fiber optic type, count, origin, and destination on the cable tag. Use UV resistant tie-wraps for securing the tag to the cable. Provide tie-wraps that do not damage fiber when securing to cable.

Sheet Details
Not to Scale

SHEET 2 OF 2

Texas Department of Transportation

Traffic Operations Division Standard

ITS FIBER OPTIC CABLE MISCELLANEOUS DETAILS

ITS(43)-16

FILE: its(43)-16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT FEBRUARY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		148

SERVICE POLE NO.	SHEET NO.	ADDRESS	SERVICE POLE DESCRIPTION (SEE ED (5)-D3	SERVICE CONDUIT SIZE	SERVICE CONDUCTORS NO./SIZE	MAIN DISCONECT		TWO-POLES CONTACTOR AMPS	PANELBD./LOAD CENTER AMP RATING (MIN)	EQUIPMENT	CIRCUIT NO.	BRANCH CKT. BKR. POLE/AMPS	KVA LOAD
						SWITCH AMP/FUSE	CKT. BRK. POLE/AMP						
D1	03 OF 72		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	CCTV	1	1P/20	2.4
D2	05 OF 72		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	CCTV	1	1P/20	2.4
										DMS		2P/30	7.2
D3	09 OF 72		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	CCTV	1	1P/20	2.4
D4	13 OF 72		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	CCTV	1	1P/20	2.4
D5	17 OF 72		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	CCTV	1	1P/20	2.4
D6	22 OF 72		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	CCTV	1	1P/20	2.4
D7	25 OF 72		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	CCTV	1	1P/20	2.4
D8	26 OF 72		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	DMS	1	2P/30	7.2
D9	28 OF 72		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	CCTV	1	1P/20	2.4
D10	31 OF 72		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	RVSD, BT	1	1P/20	2.4
D11	33 OF 72		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	CCTV	1	1P/20	2.4
										HUB BUILDING		2P/50	12
D12	35 OF 72		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	CCTV	1	1P/20	2.4
D13	38 OF 72		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	CCTV	1	1P/20	2.4

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED
PROFESSIONAL ENGINEER

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May 23, 2022

Kenneth Paradowski, P.E.

ELECTRICAL/SERVICE POLE DATA

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SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
0050	06	089	US 290
DIST	COUNTY		SHEET NO.
HOU	HARRIS		149

CK1
DN1
CK1
DN1

DATE:
FILE:

SERVICE POLE NO.	SHEET NO.	ADDRESS	SERVICE POLE DESCRIPTION (SEE ED (5)-D3	SERVICE CONDUIT SIZE	SERVICE CONDUCTORS NO./SIZE	MAIN DISCONECT		TWO-POLES CONTACTOR AMPS	PANELBD./LOAD CENTER AMP RATING (MIN)	EQUIPMENT	CIRCUIT NO.	BRANCH CKT. BKR. POLE/AMPS	KVA LOAD
						SWITCH AMP/FUSE	CKT. BRK. POLE/AMP						
D14	88 OF 119		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	CCTV	1	1P/20	2.4
D15	90 OF 119		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	CCTV	1	1P/20	2.4
										HUB BUILDING	1	2P/50	12
D16	94 OF 119		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	CCTV	1	1P/20	2.4
D17	96 OF 119		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	CCTV	1	1P/20	2.4
D18	102 OF 119		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	CCTV	1	1P/20	2.4
D19	108 OF 119		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	CCTV	2	1P/20	2.4
D20	111 OF 119		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	CCTV	1	1P/20	2.4
D21	113 OF 119		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	CCTV	1	1P/20	2.4
										HUB BUILDING	1	2P/50	12
D22	117 OF 119		TYP D (120-240) 100(NS)SS(N)SP(0)	1 1/2"	3/#2		2/100		100	CCTV	1	1P/20	2.4
										HUB BUILDING	1	2P/50	12

STATE OF TEXAS
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97040
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May 23 , 2022

Kenneth Paradowski, P.E.

ELECTRICAL/SERVICE POLE DATA

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SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
0050	06	089	US 290
DIST	COUNTY		SHEET NO.
HOU	HARRIS		150

CK1
DN1
CK1
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DATE:
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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

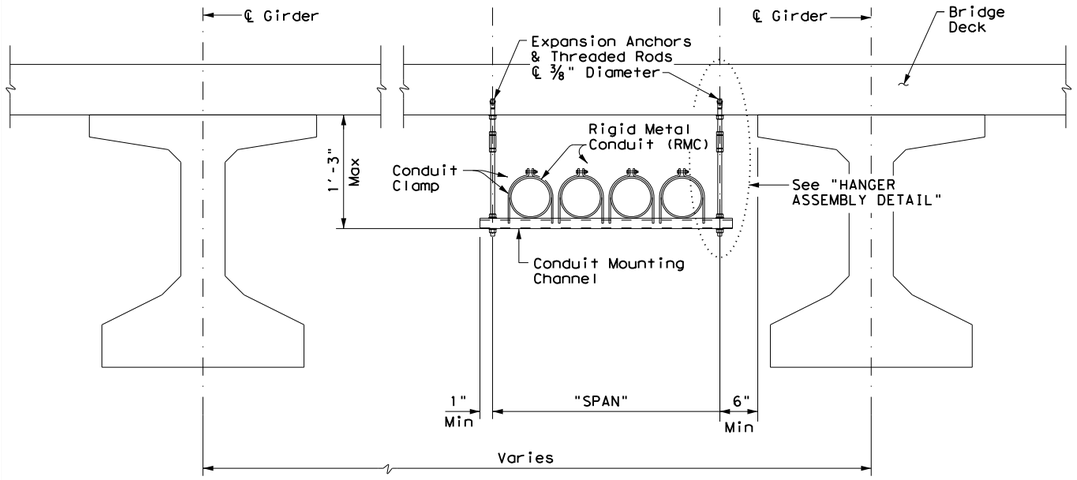
Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

FILE:	ed1-14.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
	October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS		0050	06	089	US 290
		DIST	COUNTY		SHEET NO.
		HOU	HARRIS		151

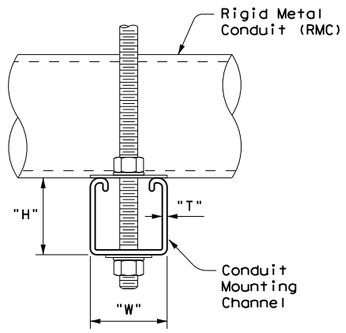
DATE:
FILE:

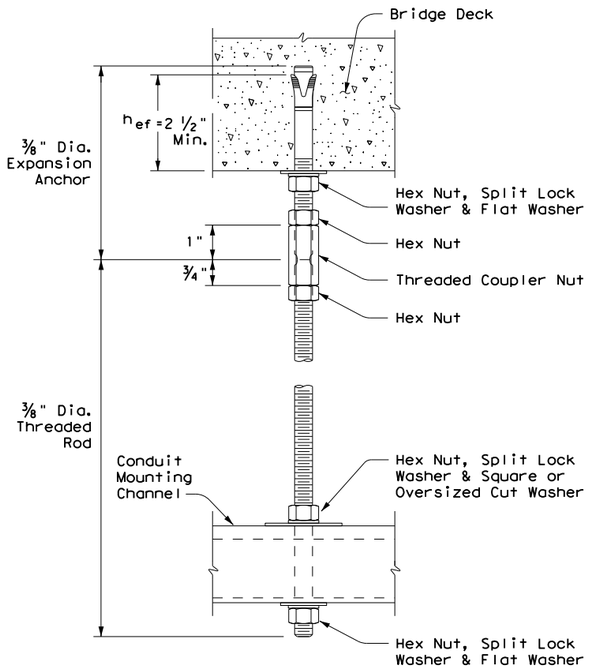


CONDUIT HANGING DETAIL

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

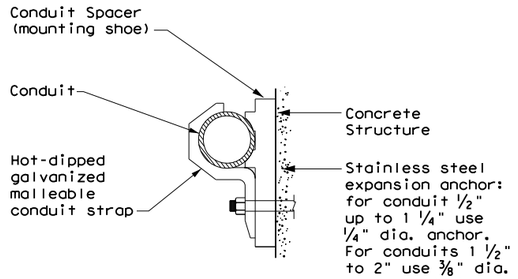
Channels with round or short slotted hole patterns are allowed, if the load carrying capacity is not reduced by more than 15%.

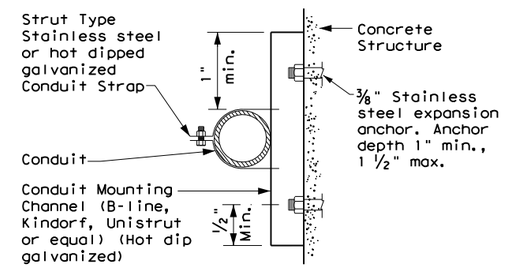




HANGER ASSEMBLY DETAIL

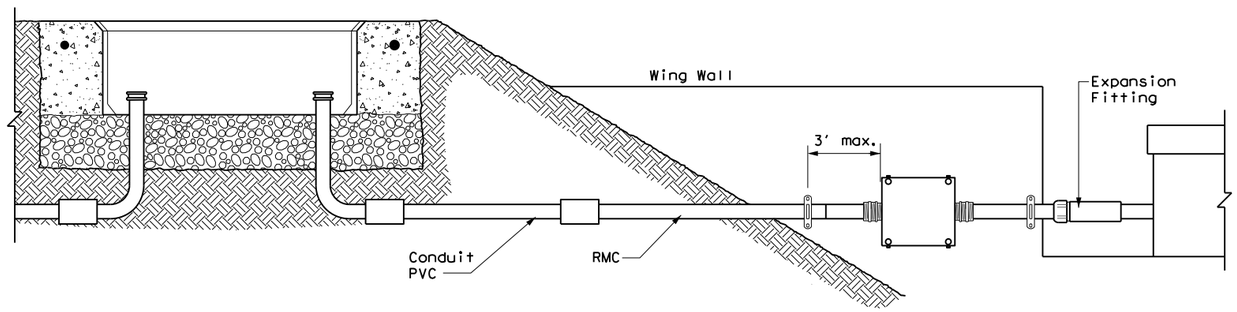
ELECTRIC CONDUIT TO BRIDGE DECK ATTACHMENT





CONDUIT MOUNTING OPTIONS

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



TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL

EXPANSION ANCHOR NOTES FOR BRIDGE DECK ATTACHMENT

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

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

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
CONDUIT SUPPORTS

ED(2)-14

FILE: ed2-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0050	06	089	US 290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		152

71B

ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS)11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.

2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.

3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.

4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.

2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.

3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.

4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.

5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.

6. Support conductors in illumination poles with a J-hook at the top of the pole.

7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.

8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.

9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.

10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.

11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.

12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.

2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.

3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.

4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.

5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

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

B. CONSTRUCTION METHODS

1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.

2. Do not place ground rods in the same drilled hole as a timber pole.

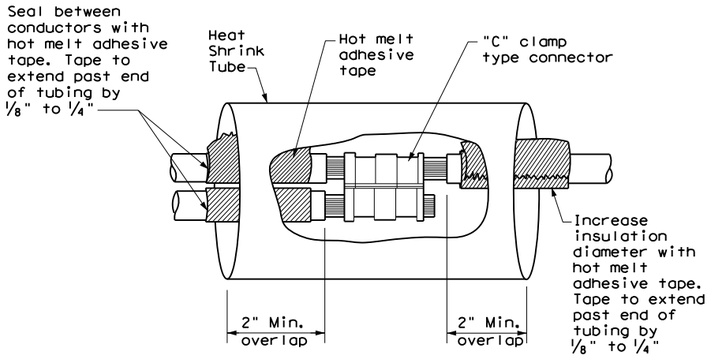
3. Install ground rods so the imprinted part number is at the upper end of the rod.

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

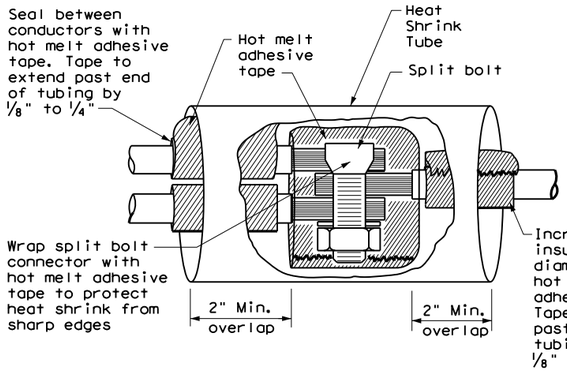
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.

6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.

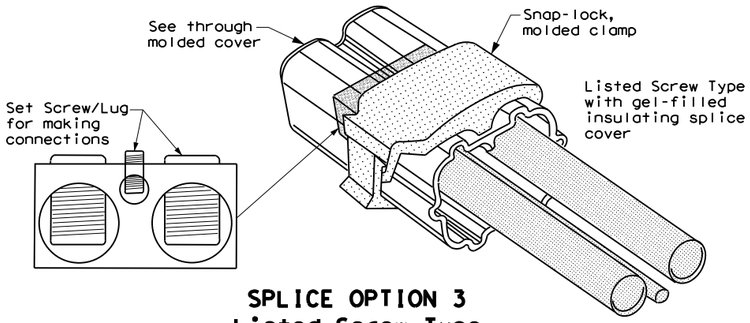
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUCTORS

ED(3)-14

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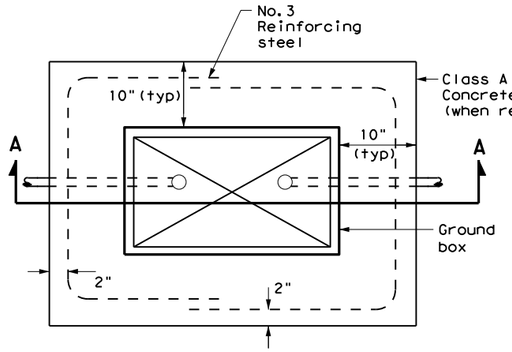
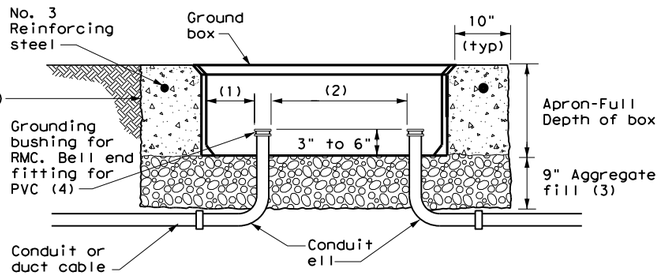


PLAN VIEW



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.

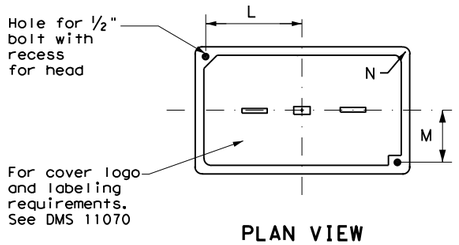
(2) Maintain sufficient space between conduits to allow for proper installation of bushings.

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

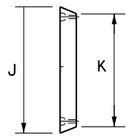
(4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

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

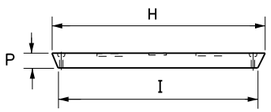
GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



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.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
GROUND BOXES

ED(4)-14

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ELECTRICAL SERVICES NOTES

1. Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.

2. Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services,"DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.

3. Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.

4. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.

5. The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.

6. Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.

7. When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.

8. Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.

9. All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.

10. Provide rigid metal conduit (RMC) for all conduits on service, except for the ½ in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.

11. Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.

12. Ensure all mounting hardware and installation details of services conform to utility company specifications.

13. For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.

14. When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.

15. Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

SERVICE ASSEMBLY ENCLOSURE

1. Provide threaded hub for all conduit entries into the top of enclosure.

2. Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.

3. Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.

4. Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

1. Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.

2. When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

PHOTOELECTRIC CONTROL

1. Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

*ELECTRICAL SERVICE DATA

Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit **Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 ¼"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 ¼"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

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

** Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National ELectrical Code.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE

ELEC SERV TY X XXX/XXX XXX (XX) XX (X) XX (X)

Schematic Type

Service Voltage V / V

Disconnect Amp Rating
000 indicates main lug only/
Typically Type T

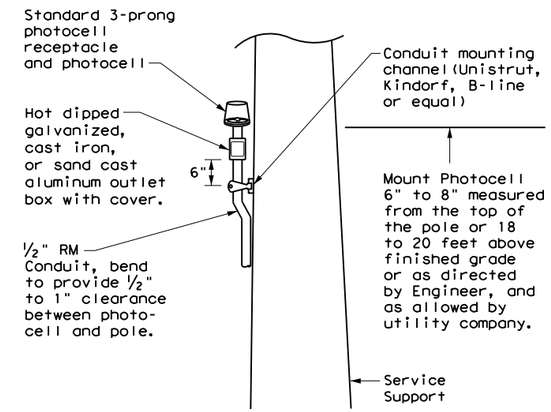
(SS)= Safety Switch Ahead of Meter-Check with Utility
(NS)= No safety Switch Ahead of Meter-Check with Utility

Enclosure Type
GS= Galvanized steel("off the shelf")
SS= Stainless steel(Custom Enclosure)See MPL
AL= Aluminum (Custom Enclosure)See MPL

Photocell Mounting Location
(E)= Inside Service/Enclosure Mounted
(T)= Top of pole
(L)= Luminaire mounted
(N)= None/No Photocell or Lighting Contactor Required

Service Support Type
GC= Granite concrete
OC= Other concrete
TP= Timber pole
SP= Steel pole
SF= Steel frame
OT= Pole by others or paid for separately
EX= Existing pole
TS= Service on traffic signal pole
PS= Pedestal Service

O= Overhead Service Feed from Utility
U= Underground Service Feed from Utility



TOP MOUNTED PHOTOCELL

Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.

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Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

ED(5)-14

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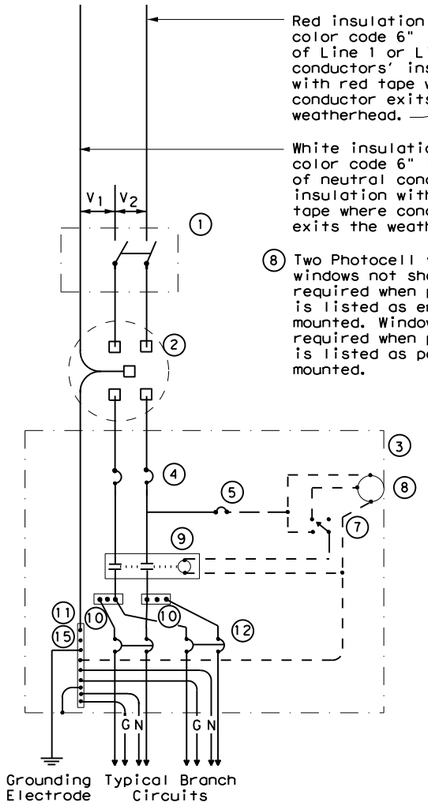
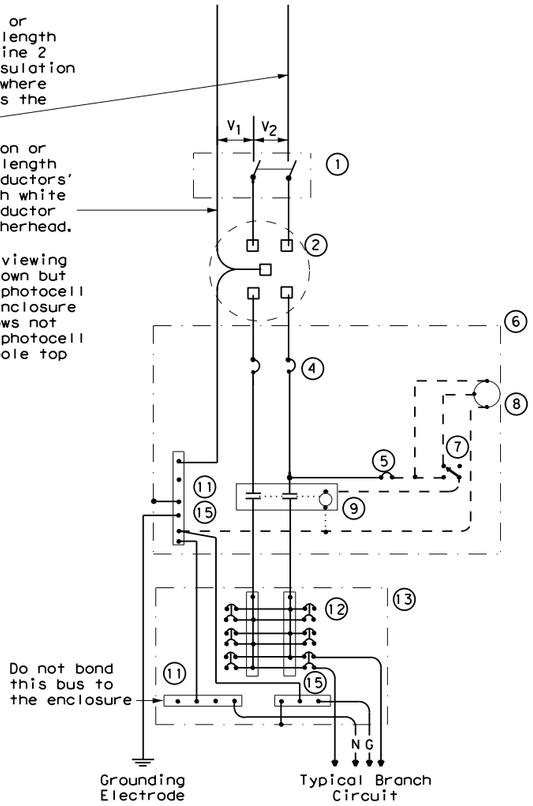
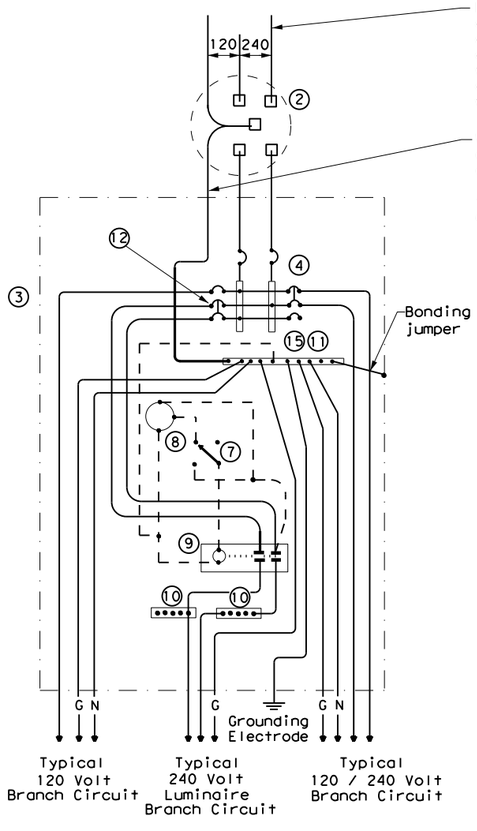


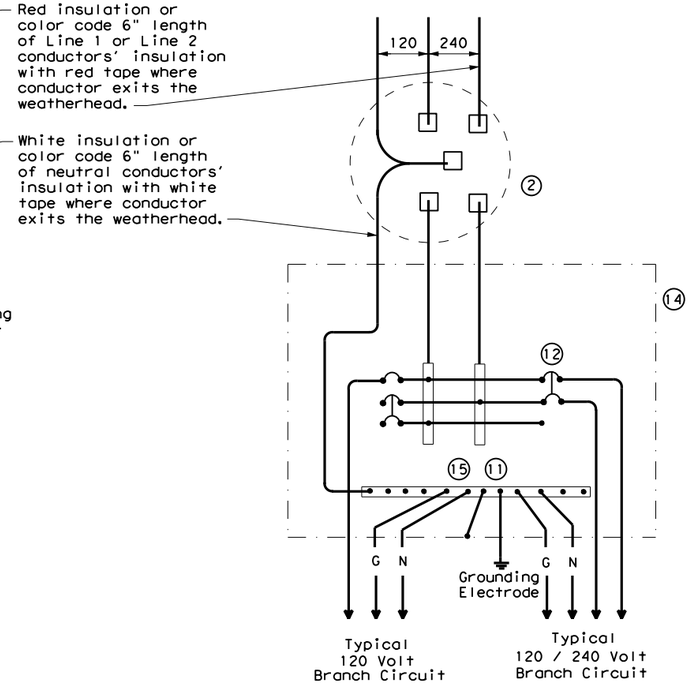
SCHEMATIC TYPE A
THREE WIRE



SCHEMATIC TYPE C
THREE WIRE



SCHEMATIC TYPE D - CUSTOM
120/240 VOLTS - THREE WIRE



SCHEMATIC TYPE T
120/240 VOLTS - THREE WIRE

Galvanized steel-"Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

WIRING LEGEND	
———	Power Wiring
- - - -	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required

SCHEMATIC LEGEND	
1	Safety Switch (when required)
2	Meter (when required-verify with electric utility provider)
3	Service Assembly Enclosure
4	Main Disconnect Breaker (See Electrical Service Data)
5	Circuit Breaker, 15 Amp (Control Circuit)
6	Auxiliary Enclosure
7	Control Station ("H-O-A" Switch)
8	Photo Electric Control (enclosure-mounted shown)
9	Lighting Contactor
10	Power Distribution Terminal Blocks
11	Neutral Bus
12	Branch Circuit Breaker (See Electrical Service Data)
13	Separate Circuit Breaker Panelboard
14	Load Center
15	Ground Bus

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES

ED(6)-14

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SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS)11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 ½ in. or 1 ⅝ in. wide by 1 in. up to 3 ¾ in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.

2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.

3. Provide and install galvanized ¾ in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized ¾ in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 ¼ in. to 3 ½ in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.

4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.

5. Furnish and install rigid metallic ells in all steel pole and steel frame foundations for all conduits entering the service from underground.

6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.

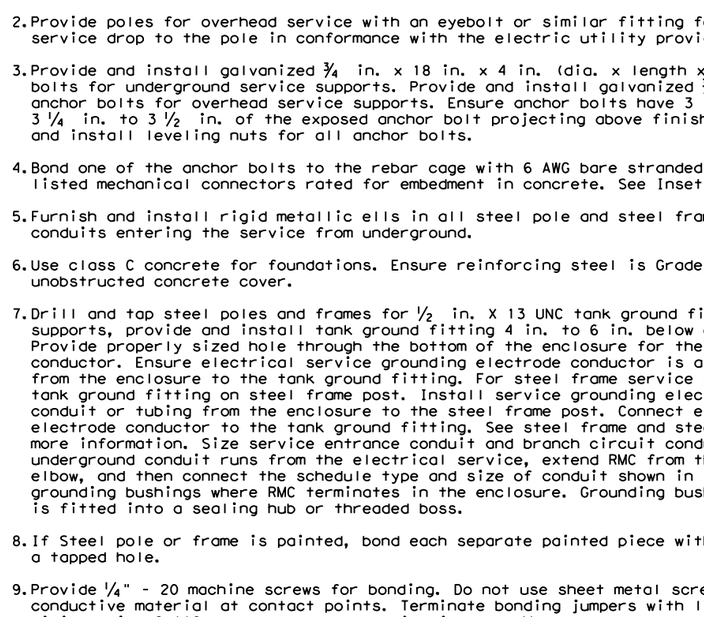
7. Drill and tap steel poles and frames for ½ in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.

8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.

9. Provide ¼" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.

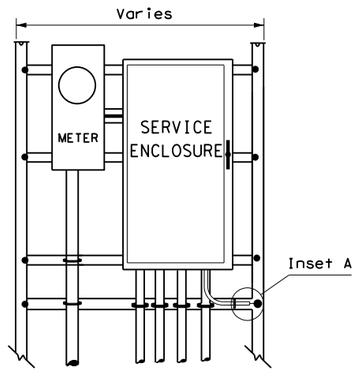
10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.

11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.



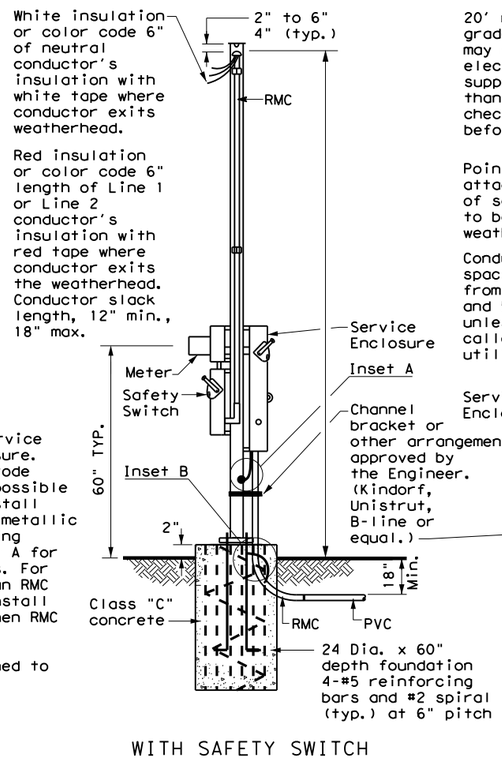
WITH SAFETY SWITCH

FRONT VIEW

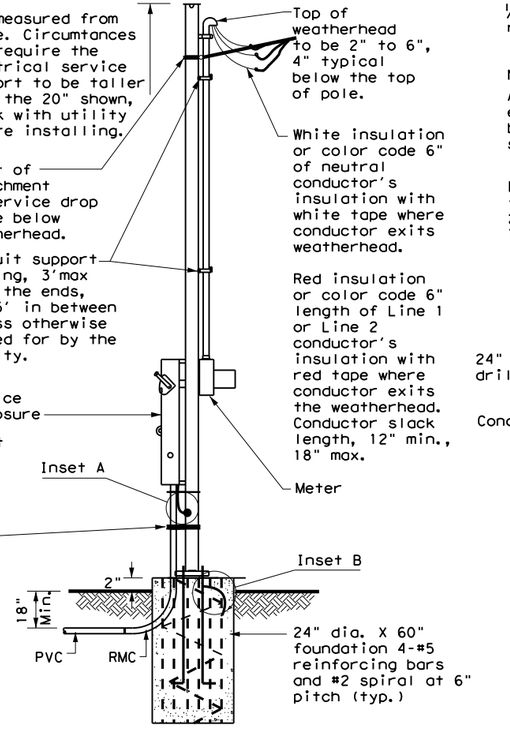


WITHOUT SAFETY SWITCH

SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE

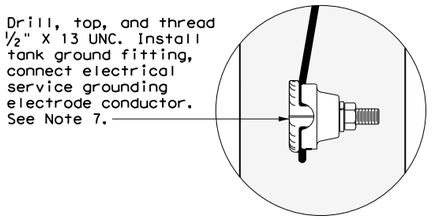


WITH SAFETY SWITCH



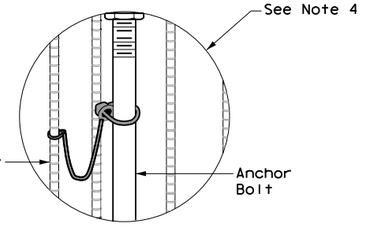
WITHOUT SAFETY SWITCH

SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE

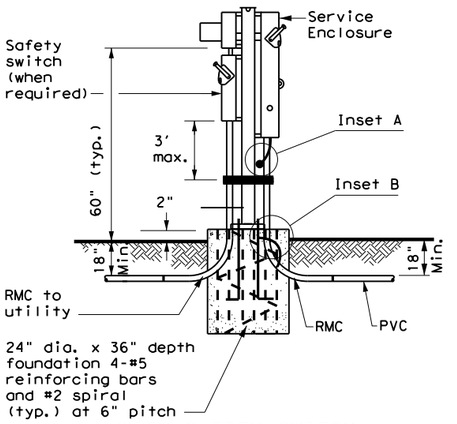


FRONT VIEW

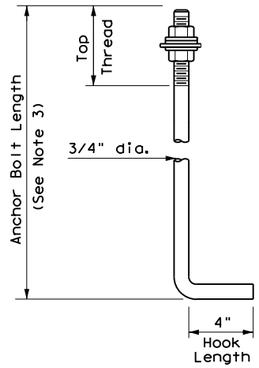
INSET A



INSET B

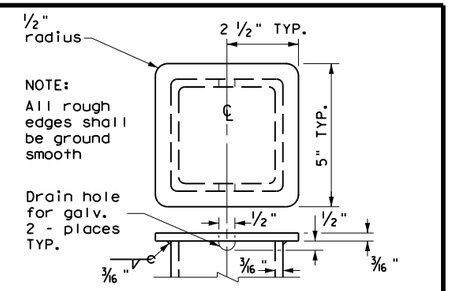


WITH SAFETY SWITCH

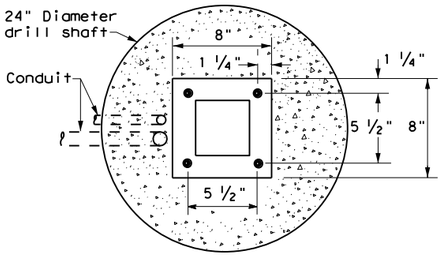


HOOKED ANCHOR DETAIL

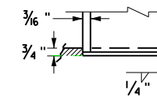
SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE



POLE TOP PLATE

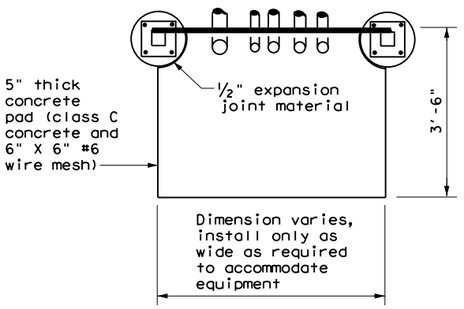


BASE PLATE DETAIL



BOTTOM OF POLE

SERVICE SUPPORT TYPE SF & SP



TOP VIEW

SERVICE SUPPORT TY SF (O) & SF (U)

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

ED(7)-14

FILE: ed7-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US 290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		157

DATE: $DATE$
FILE: $FILE$
$TIME$

SUMMARY OF DMS OVERHEAD SIGN STRUCTURES

CONTROL NO.	STRUCTURE NO.	STATION NO.	CTMS LAYOUT SHEET	ELEV. SHEET NO.	STRUCTURE TYPE															DRILL SHAFT				SPECIAL	SIGN	DMS ✳ SIGN	SIGN LGT	DYNAMIC MESSAGE SIGN ✳✳			TOWER HEIGHT @ TRUSS ℄	TOWER PIPE DIA.
						RECT TUB								BRIDGE			TEE				CANT.	30"	42"	48"	54"	CTB SECT	WALKWAYS	WALKWAYS	FIXT	(8)	(12)	(18)		
					SPAN	22′-0"	22′-0"	21′-5"	33′-3"	33′-3"	33′-6"	37′-3"	32′-6"	46′-6"	70′-0"	10′-4"	25′-2"	25′-0"	35′-0"	35′-0"														
					HEIGHT	18′-5"	21′-5"	21′-0"	19′-1"	21′-10"	19′-1"	18′-11"	49′-6"	25′-0"	53′-0"	10′-9½"	26′-11"	29′-2"	37′-3"	28′-9"		LF	LF	LF	LF	LF	LF	LF	EA				EA	EA
0050-06-089	DMS-US 290-01	1822+00	4 OF 72	1															1				37			31′-0"				1	34′-0"	30"
0050-06-089	DMS-US 290-02	1591+00	26 OF 72	1															1				37			31′-0"				1	34′-0"	30"
					TOTAL														2				74			62				2		

✳ PAYMENT FOR WALKWAY WILL BE MADE AT THE UNIT BID PRICE, PER LINEAR FOOT, FOR ITEM "WALKWAY (3′-0").

✳✳ UNIT INDICATES MINIMUM CHARACTER HEIGHT (INCHES) FOR DYNAMIC MESSAGE SIGN.

$TIME$
$DATE$
$FILE$

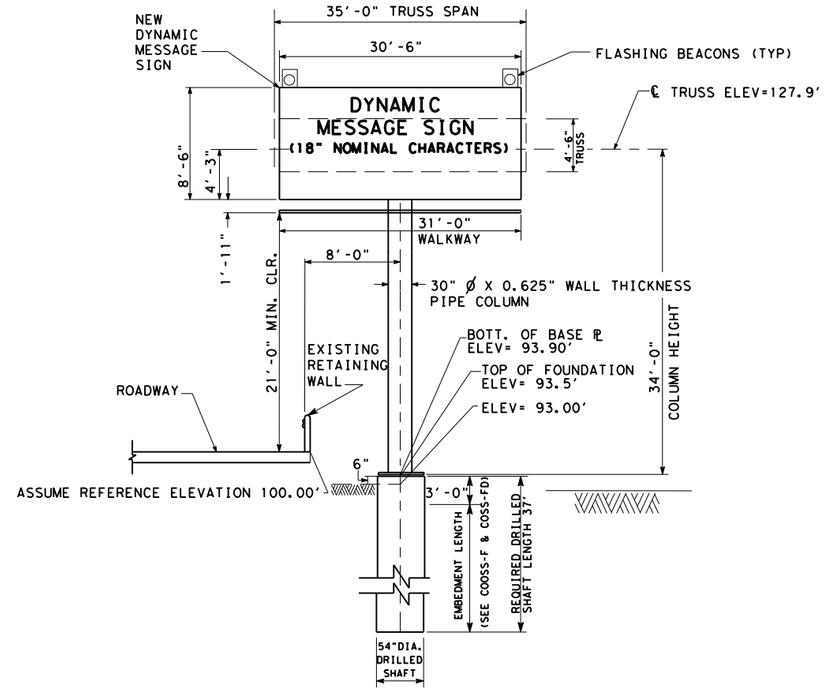
DATE:
FILE:

TEXAS DEPARTMENT OF TRANSPORTATION
US 290

SUMMARY OF DMS OVERHEAD SIGN STRUCTURES

DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:									
DW:				TEXAS					US 290
CK DW:			STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
TR:			HOU	HARRIS	0050	06	089		158
CK TR:									

AD-76-0



PROPOSED SIGN STRUCTURES
DMS-US 290-01: STA.1822+00 , CTMS LAYOUT SHEET 04 OF 72
COSS & OSB-SZ

STATE OF TEXAS
GAURANG S. PANDIT
111896
LICENSED PROFESSIONAL ENGINEER

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04/05/2022.

SIGN SUPPORT ELEVATIONS

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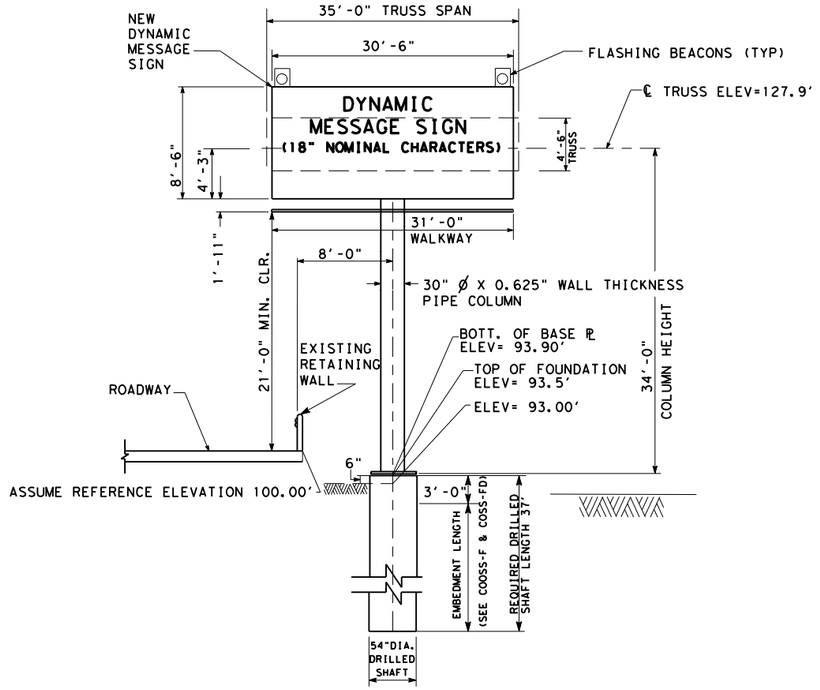
SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
0050	06	089	US 290
DIST	COUNTY		SHEET NO.
HOU	HARRIS		159

SCALE: N.T.S.

DATE:
FILE:



PROPOSED SIGN STRUCTURES

DMS-US 290-02: STA. 1591+00 , CTMS LAYOUT SHEET 26 OF 72

COSS & OSB-SZ

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SIGN SUPPORT ELEVATIONS

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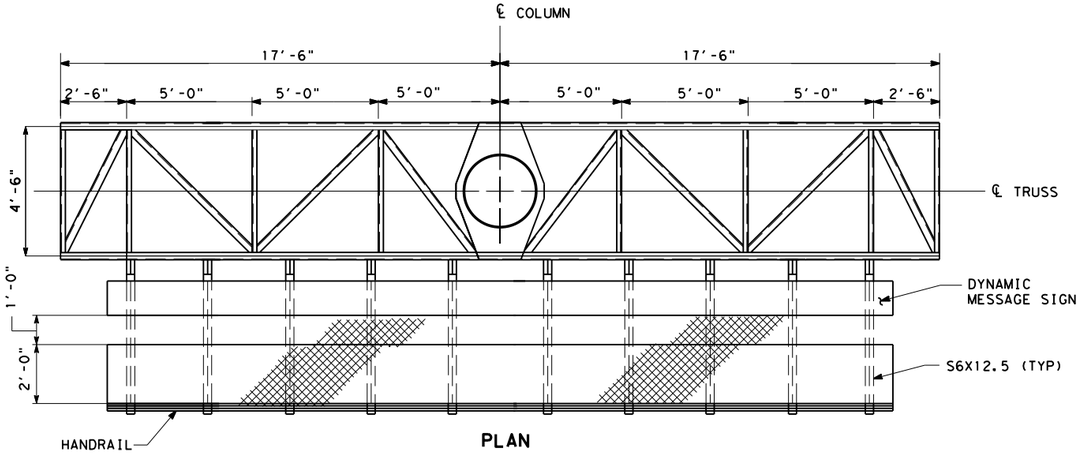
SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
0050	06	089	US 290
DIST	COUNTY		SHEET NO.
HOU	HARRIS		160

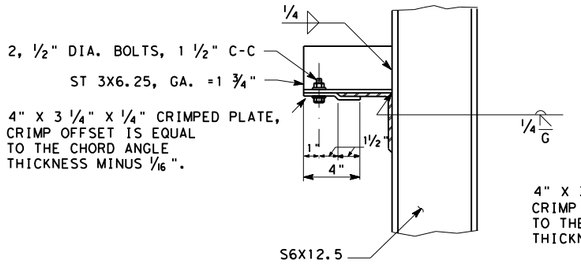
SCALE: N.T.S.

DATE:
FILE:

CK:
DW:
CK:
DN:

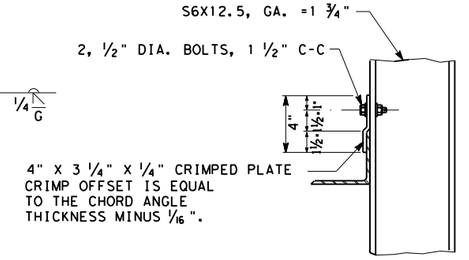


PLAN



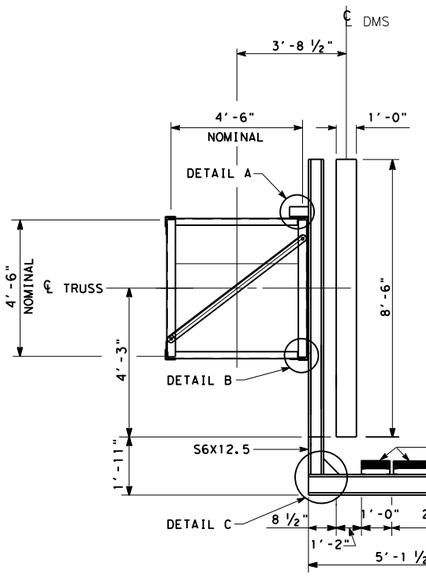
DETAIL A

TOP CHORD

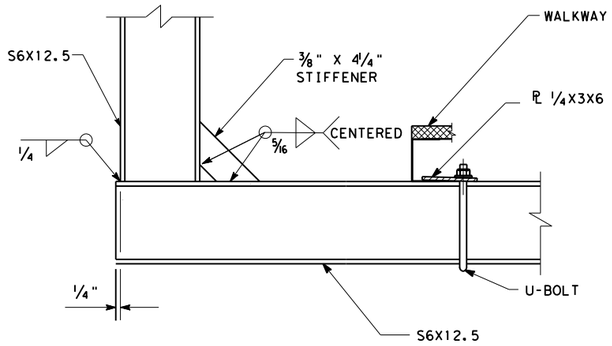


DETAIL B

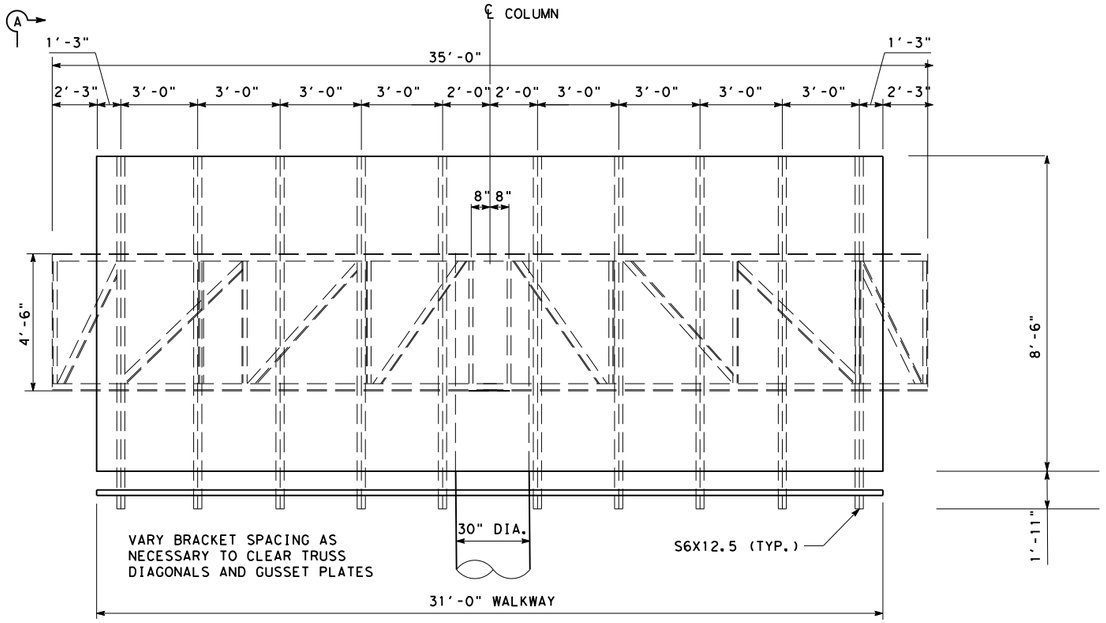
BOTTOM CHORD



SECTION A-A



DETAIL C



ELEVATION

GENERAL NOTES:

DESIGN CONFORMS TO THE AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS.

ENSURE MATERIALS, FABRICATION, CONSTRUCTION AND ERECTION CONFORM WITH THE REQUIREMENTS OF SPECIFICATIONS FOR INTERSTATE SIGNING AND DELINEATION PROJECTS AND TEXAS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION OF HIGHWAYS, STREETS AND BRIDGES. ENSURE STRUCTURAL STEEL CONFORM TO ASTM SPECIFICATION A36 UNLESS NOTED OTHERWISE.

ENSURE BOLTS HAVE HEXAGON HEADS AND NUTS AND CONFORM WITH ASTM SPECIFICATION A325.

GALVANIZE ALL PARTS AFTER FABRICATION.

SEE SHEET COSS & OSB-SZ FOR OVERHEAD SIGN BRIDGE DETAILS.
SEE SHEET COSSD FOR TRUSS DETAILS.
SEE SHEET COSSF FOR FOUNDATION DETAILS.
SEE SHEET SWW(1) FOR SIGN WALKWAY AND HANDRAIL DETAILS.

STATE OF TEXAS
GAURANG S. PANDIT
111896
LICENSED PROFESSIONAL ENGINEER

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SCALE: N.T.S.

DATE: $DATE$ $TIME$
FILE: $FILE$

TEXAS DEPARTMENT OF TRANSPORTATION

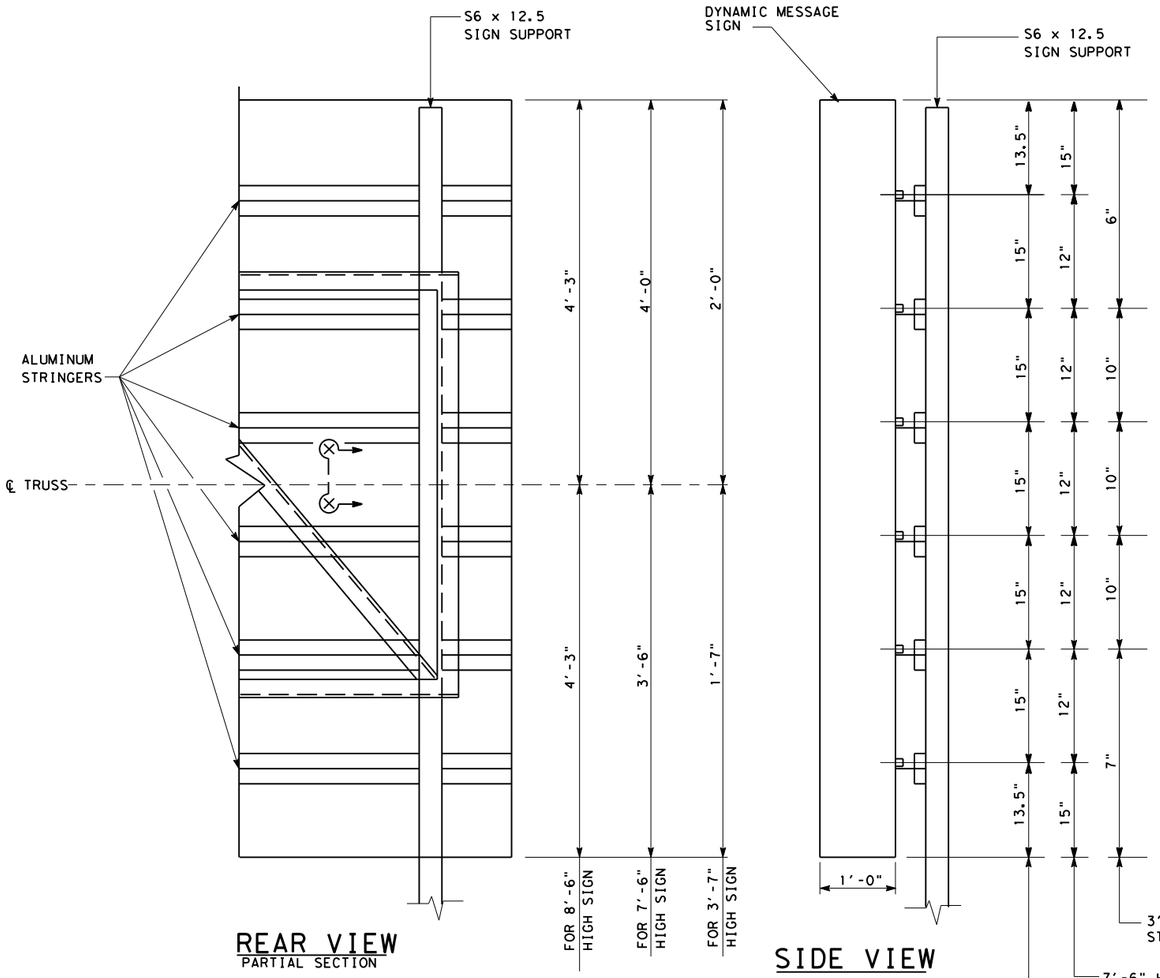
US 290

DYNAMIC MESSAGE SIGN INSTALLATION DETAILS

(SUPPORT BRACKET FOR SIGN AND WALKWAY)

SHEET 1 OF 3

DN:	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:			6	TEXAS					US290
DW:			DIST.	COUNTY		CONT.	SECT.	JOB	SHEET NO.
CK DW:			HOU	HARRIS		0050	06	089	161
TR:									
CK TR:									

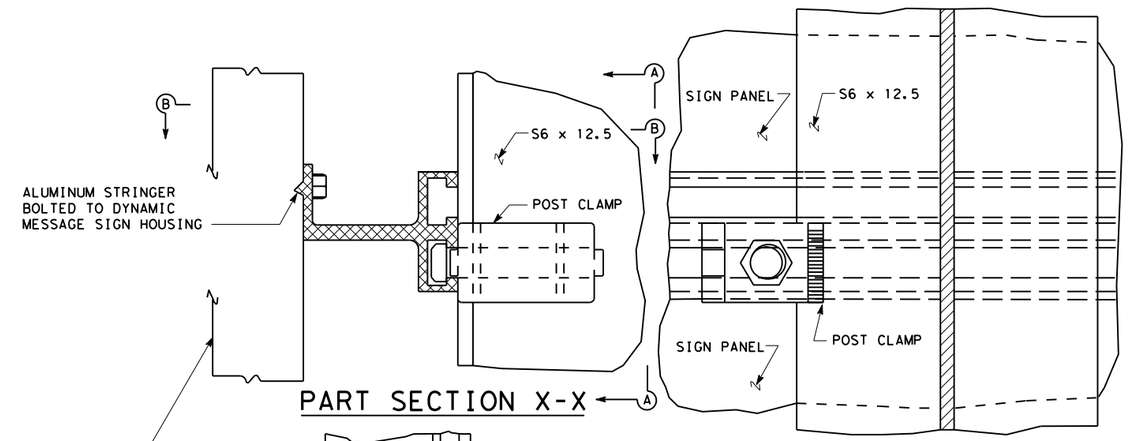


REAR VIEW
PARTIAL SECTION

SIDE VIEW

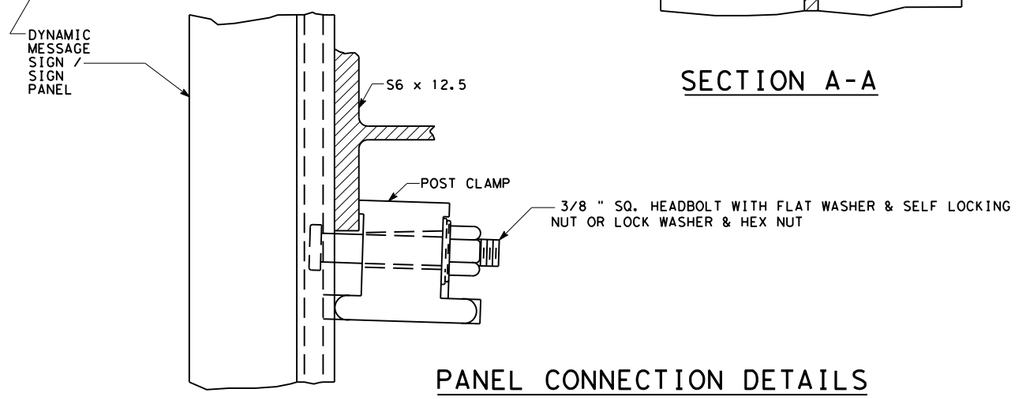
NOTE: STRINGER SPACING MAY VARY
ACCORDING TO MANUFACTURER

DYNAMIC MESSAGE SIGN



PART SECTION X-X

SECTION A-A



SECTION B-B

PANEL CONNECTION DETAILS

GENERAL NOTES:

ENSURE MATERIALS, FABRICATION, CONSTRUCTION AND ERECTION CONFORMS WITH THE REQUIREMENTS OF THE DEPARTMENT'S STANDARD SPECIFICATIONS.

ENSURE ALL STRUCTURAL STEEL, BOLTS, NUTS AND WASHERS ARE GALVANIZED AFTER FABRICATION.

ENSURE STRUCTURAL STEEL CONFORMS WITH A.S.T.M. SPECIFCATION A-36. ENSURE CLAMP BOLTS HAVE SQUARE HEADS AND HEXAGON NUTS AND CONFORMS WITH A.S.T.M. SPECIFICATION A-307. ENSURE DIMENSIONS ARE IN ACCORDANCE WITH ANSI B 18.2.1.

ENSURE ALUMINUM POST CLAMPS ARE CAST ALUMINUM ALLOY 356-T6 AND ALUMINUM BOLTS ARE ALLOY 2024-T4.

THIS STANDARD IS TO BE MODIFIED BY THE CONTRACTOR AS APPLICABLE SIGNED, SEALED AND SUBMITTED TO TXDOT FOR REVIEW AND APPROVAL.

STATE OF TEXAS
GAURANG S. PANDIT
111896
LICENSED
PROFESSIONAL ENGINEER

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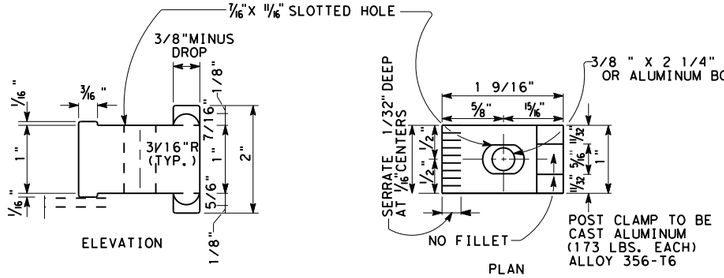
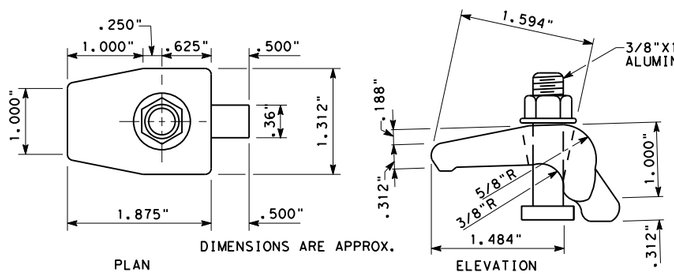
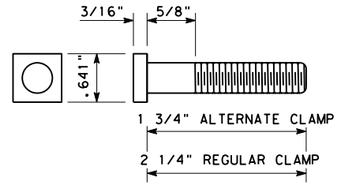


POST CLAMP DETAILS



ALTERNATE POST CLAMP DETAIL



POST CLAMP BOLT DETAIL

(ALUMINUM ALLOY 2024-T4)

SCALE: N.T.S.

TEXAS DEPARTMENT OF TRANSPORTATION

US 290

DYNAMIC MESSAGE SIGN INSTALLATION DETAILS

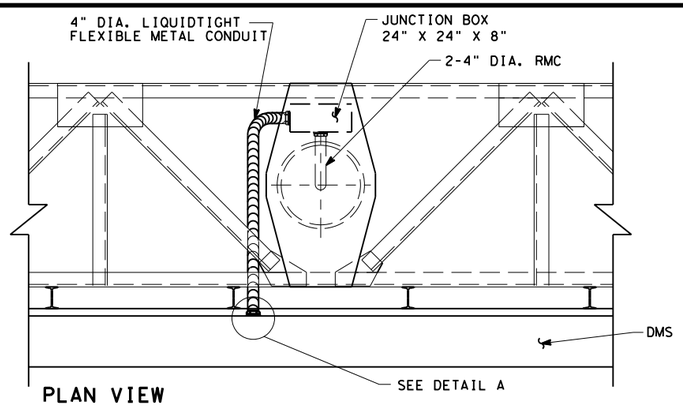
(STRUCTURAL MOUNTING DETAILS)

SHEET 2 OF 3

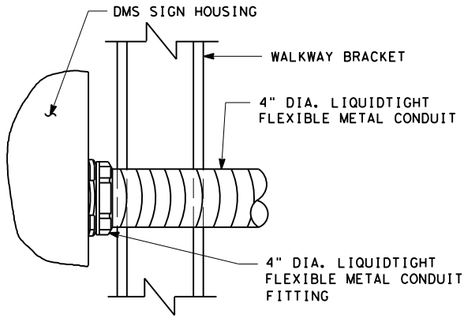
DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:									
DW:			6	TEXAS					US290
CK DW:			DIST.	COUNTY	CONT.	SECT.	JOB		SHEET NO.
TR:									
CK TR:			HOU	HARRIS	0050	06	089		162

DATE: $DATE$ $TIME$
FILE: $FILE$

AD-76-0



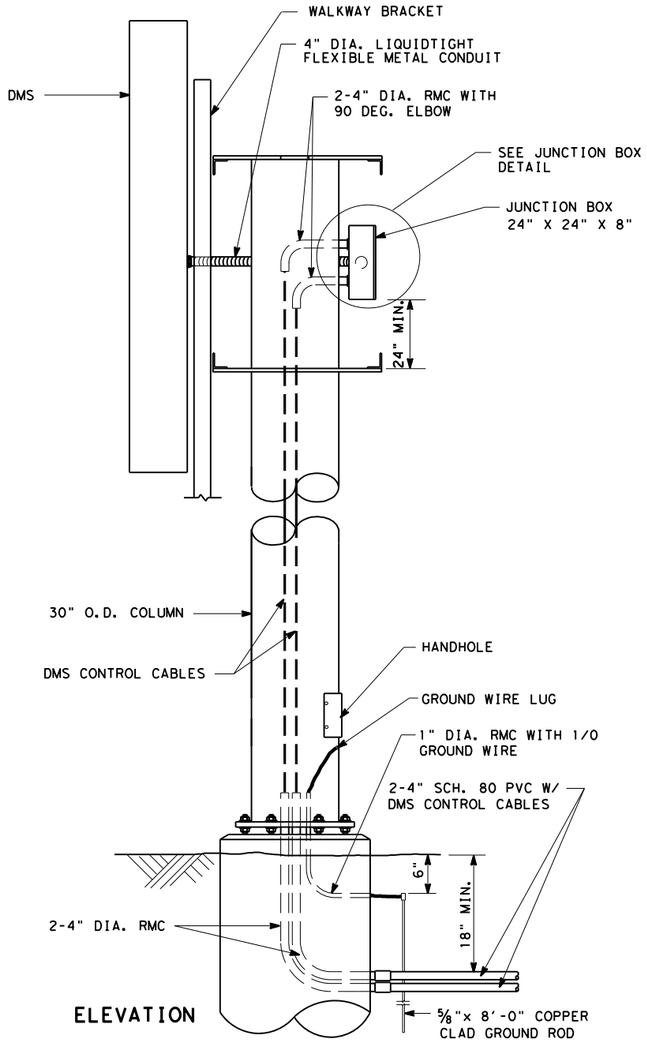
PLAN VIEW



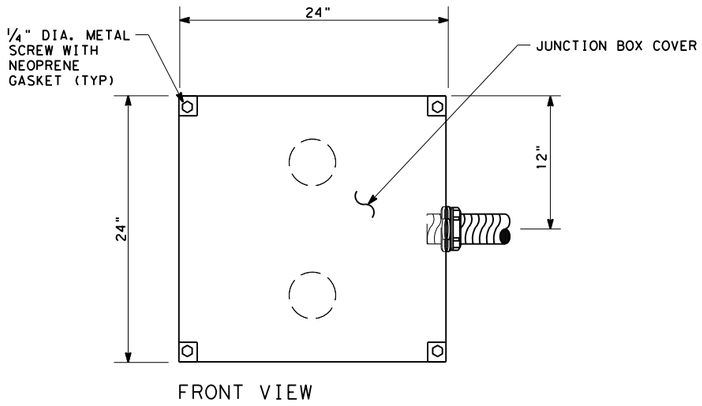
DETAIL "A"

NOTES:

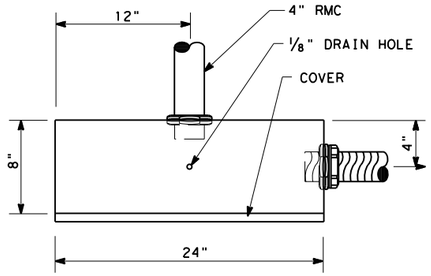
1. ROUTING OF FLEXIBLE CONDUIT WILL BE DETERMINED BY DMS MANUFACTURER.
2. BUILT THE HOV LANE CONTROL PANEL CABINET IN ACCORDANCE WITH SPECIAL SPECIFICATION ITEM "CABINETS". (HOV DMS ONLY)
3. BANDING OF HOV LANE CONTROL PANEL CABINET TO COLUMN WILL NOT BE ALLOWED.
4. ENSURE JUNCTION BOX IS WEATHERPROOF NEMA 4X ENCLOSURE. FRONT FACE OF THE JUNCTION BOX HAVE A REMOVABLE NEMA 4X GASKETED COVER HELD IN PLACE BY A MINIMUM OF 4 SCREWS.



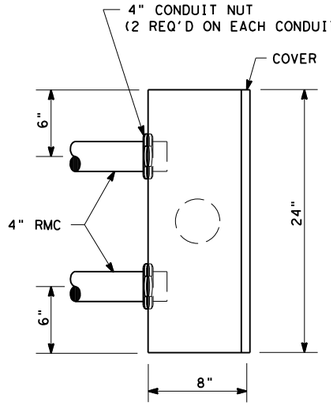
TYPICAL DMS ELECTRICAL DETAILS



FRONT VIEW



BOTTOM VIEW



SIDE VIEW

JUNCTION BOX DETAIL
24"X 24"X 8"

SCALE: N.T.S.

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LICENSED PROFESSIONAL ENGINEER

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TEXAS DEPARTMENT OF TRANSPORTATION

US 290

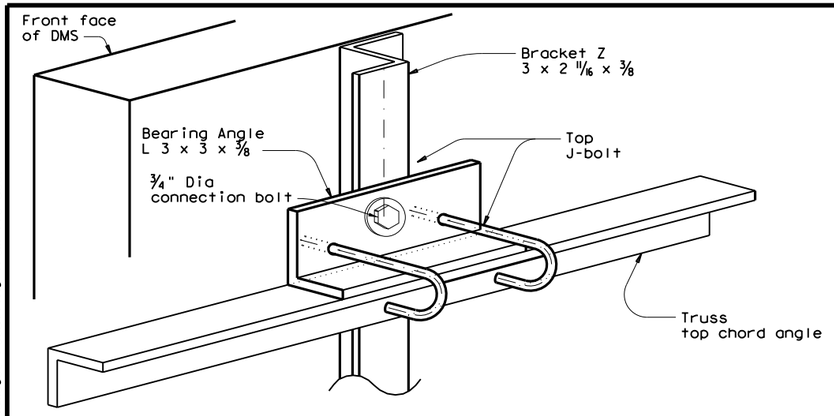
DYNAMIC MESSAGE SIGN INSTALLATION DETAILS

(ELECTRICAL DETAILS FOR T-MOUNT SIGN STRUCURE)

SHEET 3 OF 3

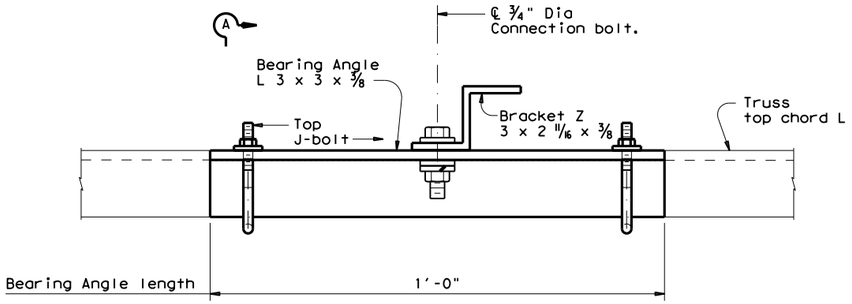
DN:	DRAWING	DATE	FED. RD. DIV. RD.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:									
DW:			6	TEXAS					US290
CK DW:			DIST.	COUNTY		CONT.	SECT.	JOB	SHEET NO.
TR:									
CK TR:			HOU	HARRIS		0050	06	089	163

DATE: $DATE$ $TIME$
FILE: $FILE$



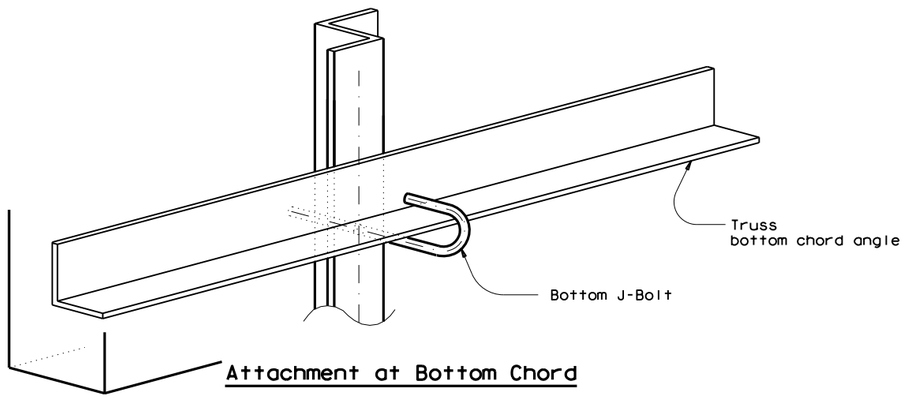
Attachment at Top Chord

(Showing Chord Angle 3")



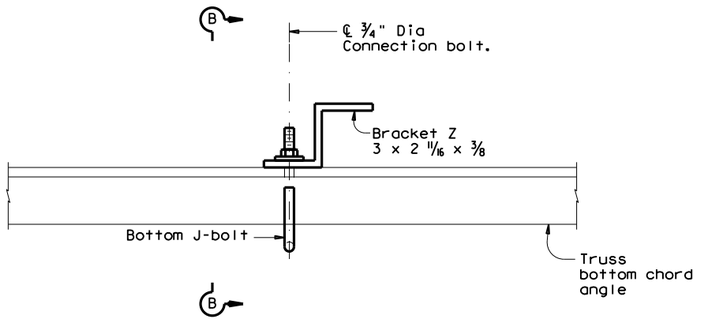
Attachment at Top Chord

(Showing Chord Angle 3")



Attachment at Bottom Chord

ISOMETRIC VIEW

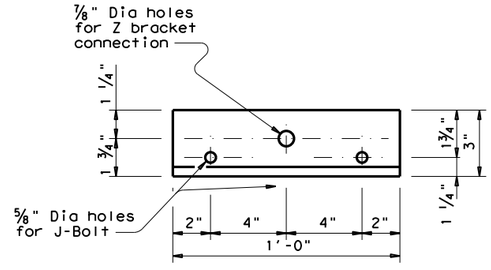


Attachment at Bottom Chord

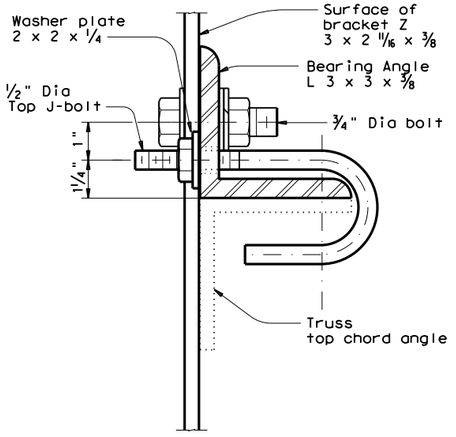
PLAN VIEW

GENERAL NOTES:

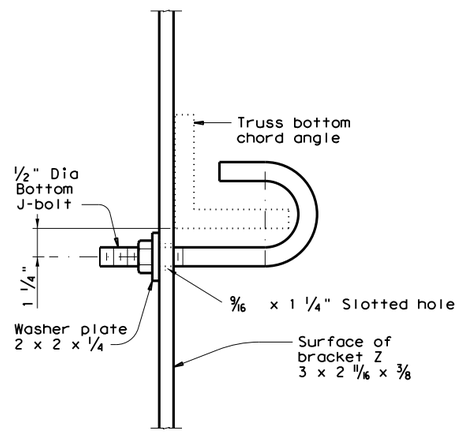
1. Application of the mounting detailed on Sheet 1 of 3 is limited to a dynamic message sign (DMS) attachment that is not in conflict with the truss connection bolts at the point(s) of attachment. The overhead sign structure must have adequate capacity to support the DMS. A determination of adequacy shall be made prior to attaching the DMS supports to the truss.
2. Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions thereto. The Design Sustained Wind Velocity is 100 mph with a gust factor of 1.3. Connections are designed for a DMS weight of 3600 lbs and a design Effective Projected Area (EPA) of 441 sq ft, with the EPA based on a DMS nominal width of 30.5 feet and nominal depth of 8.25 feet plus four top and bottom 1'-8" square flashing beacons. The EPA includes drag coefficients of 1.7 (applied to sign area) and 1.2 (applied to flashing beacon area). A horizontal eccentricity of 1.0 ft from the face of the truss to the center of gravity of the DMS for attachment of DMS is assumed. An even number of Z brackets, spaced at 5 ft max., is assumed to transfer forces through the connection.
3. All structural steel shall conform to ASTM A36, A572 Gr 50 or A588. Connection bolts shall conform to ASTM A325 or A449. Each connection bolt shall be provided with 1 heavy hex nut, 2 flat washers, and 1 lock washer. J bolts and washer plate both shall be Type 304 stainless steel, with bolt minimum yield strength of 50 ksi and an elongation of 16 percent in 2 inches. All parts except stainless steel shall be galvanized.
4. Contractor shall verify applicable field dimensions before fabrication.



BEARING ANGLE 3 x 3 x 3/8

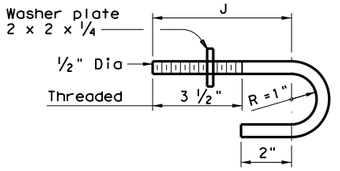


SECTION A-A



SECTION B-B

Chord Angle	J
3", 3 1/2", 4"	5 1/2"
5" and 6"	7 1/2"



TOP & BOTTOM J-BOLT

SHEET 1 OF 3

Texas Department of Transportation

Traffic Operations Division Standard

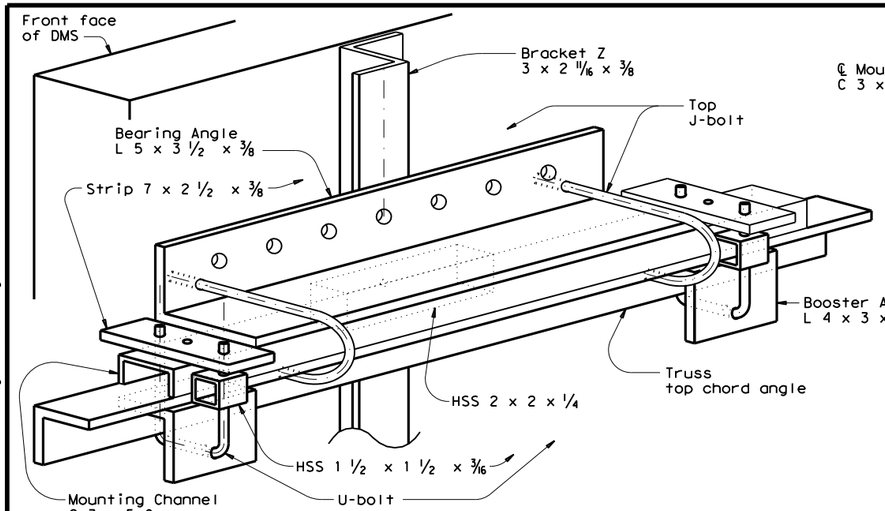
DMS-TO-TRUSS MOUNTING AT OVERHEAD SIGN SUPPORTS (NON BUILD-UP)

DMS(TM-1)-16

FILE: dms-tm-16.dgn	DN: TxDOT	CK:	DW: TxDOT	CK:
©TxDOT June 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US 290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		164

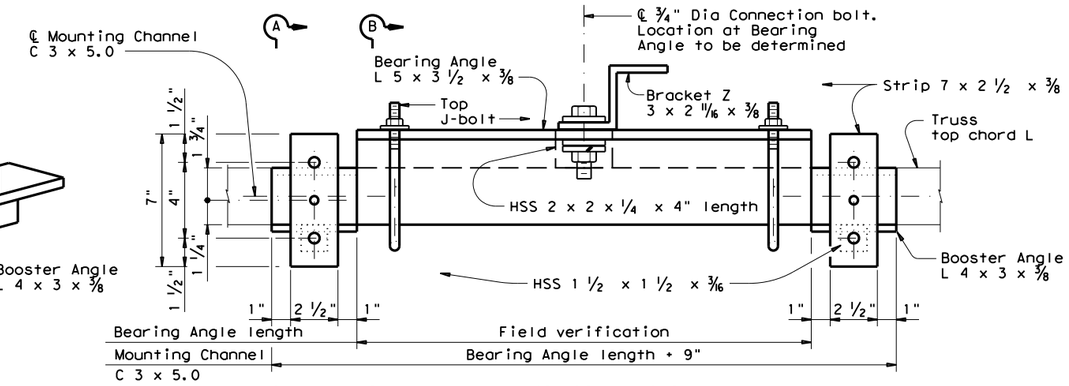
29C

DATE: $DATE$
FILE: $FILE$
$TIME$

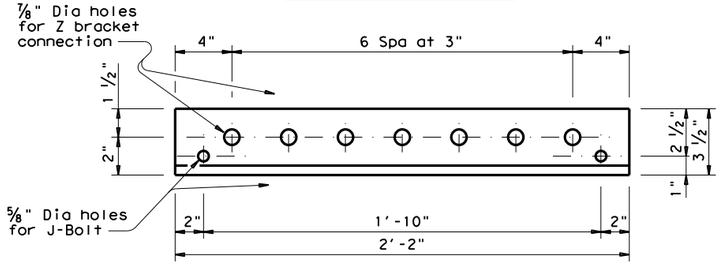


Built-up Attachment at Top Chord

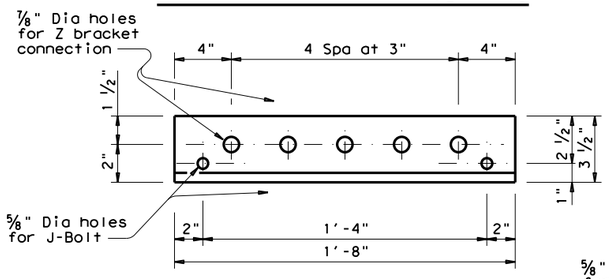
(Showing Chord Angle 3")



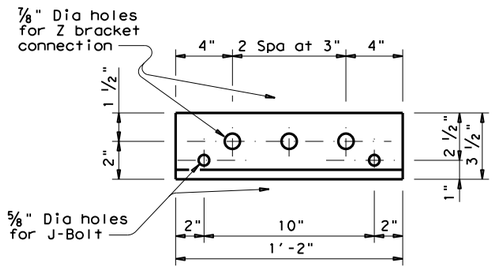
ISOMETRIC VIEW



BEARING ANGLE 5 x 3 1/2 x 3/8



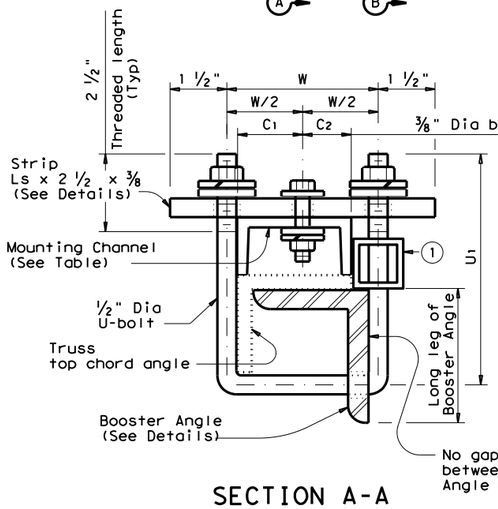
BEARING ANGLE 5 x 3 1/2 x 3/8



BEARING ANGLE 5 x 3 1/2 x 3/8

PLAN VIEW (AT TOP CHORD)

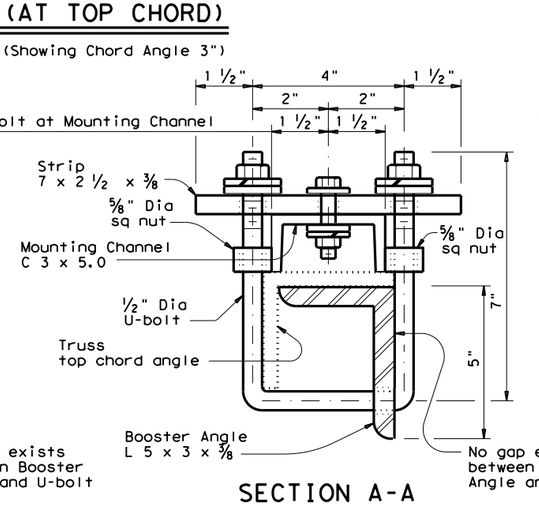
(Showing Chord Angle 3")



SECTION A-A

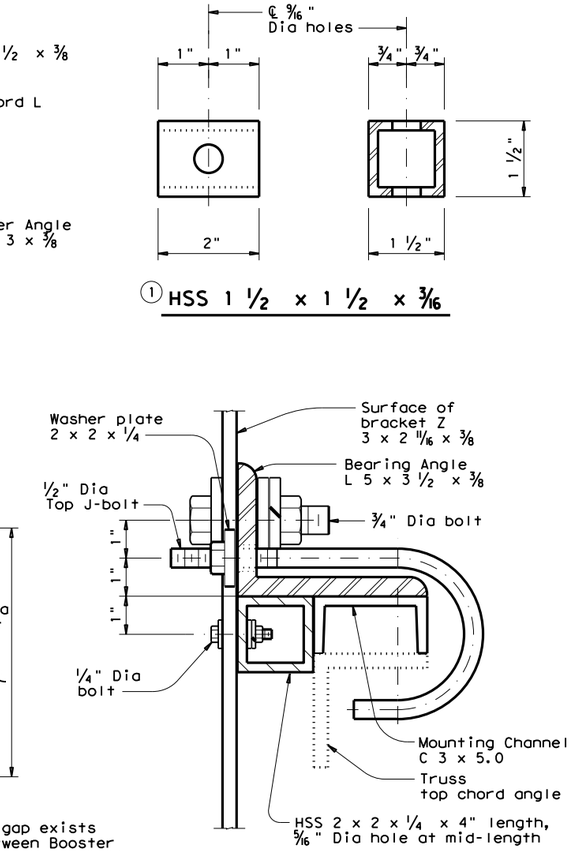
(Showing Chord Angle 3",4",5" & 6")

Chord Angle	U1	W	C1	C2	Mounting Channel
3"	7"	4"	1 3/4"	1 1/4"	C3 x 5.0
4"	8"	5"	2 1/4"	1 3/4"	C4 x 7.25
5"	9"	6"	2 3/4"	2 1/4"	C5 x 9.0
6"	10 1/2"	7"	3 1/4"	2 3/4"	C6 x 13

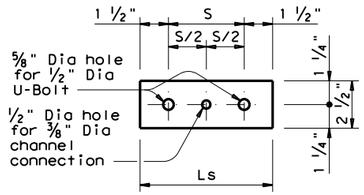


SECTION A-A

(Showing Chord Angle 3 1/2")

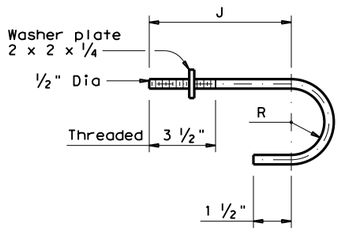


SECTION B-B



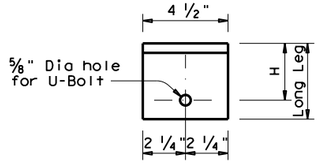
Strip Ls x 2 1/2 x 3/8

Chord Angle	S	Ls
3"	4"	7"
3 1/2"	4"	7"
4"	5"	8"
5"	6"	9"
6"	7"	10"



TOP J-BOLT

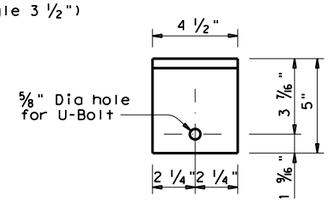
Chord Angle	J	R
3 & 3 1/2"	7"	1 3/4"
4 & 5"	8"	2"
6"	9"	2 1/4"



BOOSTER ANGLE

(For Chord Angle 3",4",5" and 6")

Chord Angle	Booster Angle	H
3"	4 x 3 x 3/8	3"
4"	5 x 3 1/2 x 3/8	3 13/16"
5"	6 x 4 x 3/8	4 13/16"
6"	7 x 4 x 3/8	5 5/8"



BOOSTER ANGLE 5 x 3 x 3/8

(For Chord Angle 3 1/2")

SHEET 2 OF 3

Texas Department of Transportation

Traffic Operations Division Standard

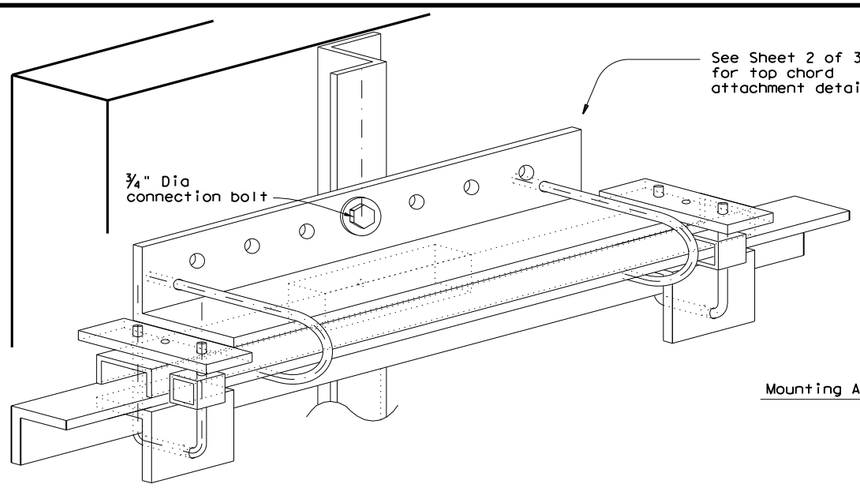
DMS-TO-TRUSS MOUNTING AT OVERHEAD SIGN SUPPORTS (WITH BUILD-UP)

DMS(TM-2)-16

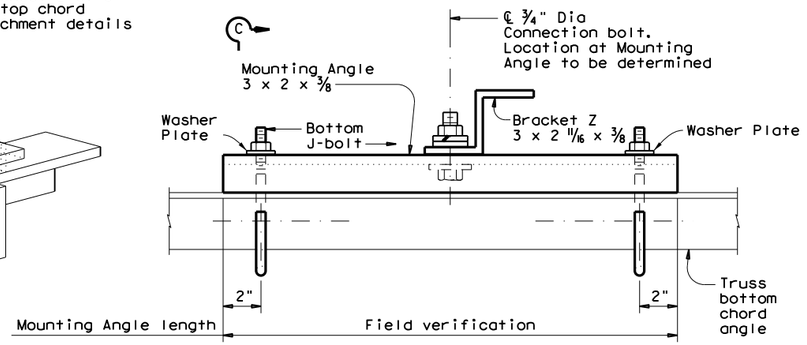
FILE: dms-tm-16.dgn	DN: TxDOT	CK:	DW: TxDOT	CK:
©TxDOT JUNE 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US 290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		165

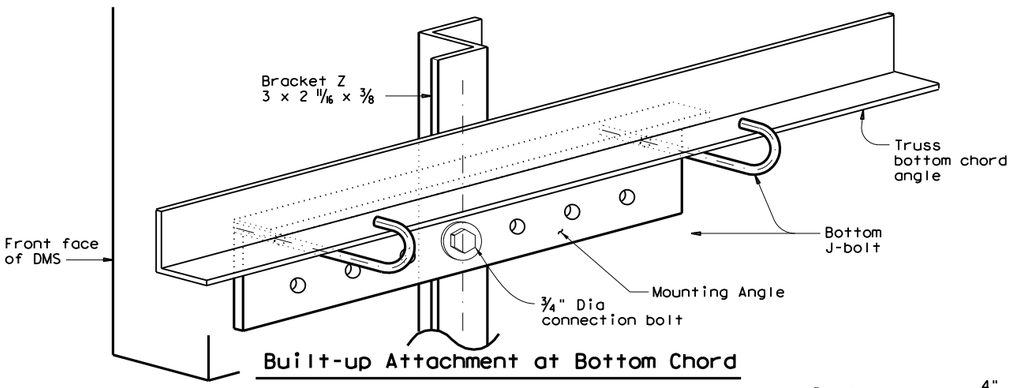
29D

DATE: $DATE$ $TIME$
FILE: $FILE$



Built-up Attachment at Top Chord

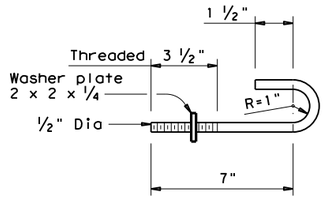




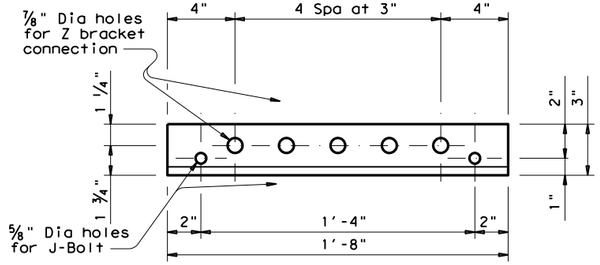
Built-up Attachment at Bottom Chord

ISOMETRIC VIEW

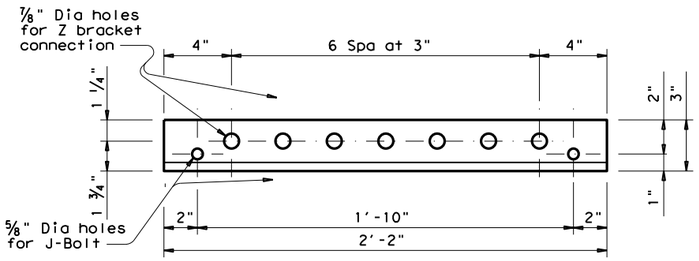
PLAN VIEW (AT BOTTOM CHORD)



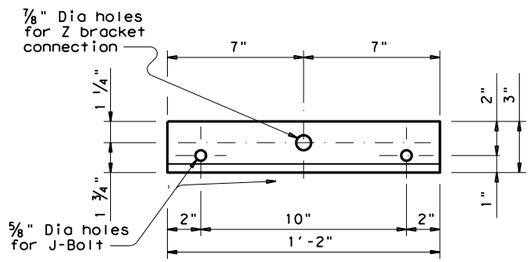
BOTTOM J-BOLT



MOUNTING ANGLE 3 x 2 x ⅜



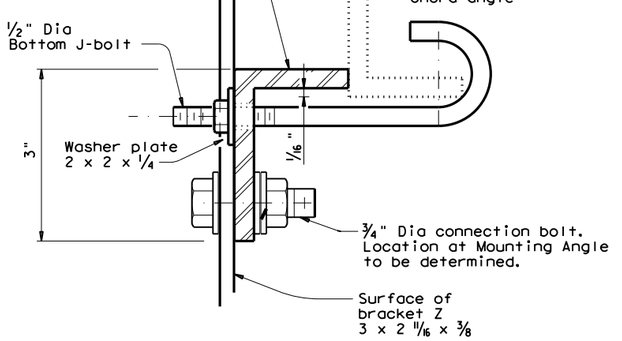
MOUNTING ANGLE 3 x 2 x ⅜



MOUNTING ANGLE 3 x 2 x ⅜

GENERAL NOTES:

1. Application of the built-up detailed on Sheet 2 and 3 of 3 is limited to the dynamic message sign (DMS) attachment which is in conflict with the truss connection bolts at the point(s) of attachment. The overhead sign structure must have adequate capacity to support the DMS. A determination of adequacy shall be made prior to attaching the DMS supports to the truss.
2. Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions thereto. The Design Sustained Wind Velocity is 100 mph with a gust factor of 1.3. Connections are designed for a DMS weight of 3600 lbs and a design Effective Projected Area (EPA) of 441 sq ft, with the EPA based on a DMS nominal width of 30.5 feet and nominal depth of 8.25 feet plus four top and bottom 1'-8" square flashing beacons. The EPA includes drag coefficients of 1.7 (applied to sign area) and 1.2 (applied to flashing beacon area). A horizontal eccentricity of 1.0 ft from the face of the truss to the center of gravity of the DMS for attachment of DMS is assumed. An even number of Z brackets, spaced at 5 ft max., is assumed to transfer forces through the connection.
3. All structural steel shall conform to ASTM A36, A572 Gr 50 or A588. Connection bolts shall conform to ASTM A325 or A449. Each connection bolt shall be provided with 1 heavy hex nut, 2 flat washers, and 1 lock washer. U bolts shall conform to ASTM A307 with 2 hex nuts, 2 flat washers and 2 lock washers. Hollow structural section (HSS) shall conform to ASTM A500, A501, or A847. J bolts and washer plate both shall be Type 304 stainless steel, with bolt minimum yield strength of 50 ksi and an elongation of 16 percent in 2 inches. All parts, except stainless steel shall be galvanized.
4. Contractor shall verify applicable field dimensions before fabrication. Various lengths of bearing and mounting angle are provided for suitable mounting. Contractor shall determine the proper bearing and mounting angle length, and the connection along the length at Z bracket to accommodate J-bolt hook. Contractor may substitute HSS for the mounting channel as long as the HSS has equal or greater thickness at the mounting channel. Limit HSS height to achieved mounting clearance.



SECTION C-C

SHEET 3 OF 3

Texas Department of Transportation

Traffic Operations Division Standard

DMS-TO-TRUSS MOUNTING AT OVERHEAD SIGN SUPPORTS (WITH BUILD-UP)

DMS(TM-3)-16

FILE: dms-tm-16.dgn	DN: TxDOT	CK:	DW: TxDOT	CK:
©TxDOT JUNE 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US 290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		166

29E

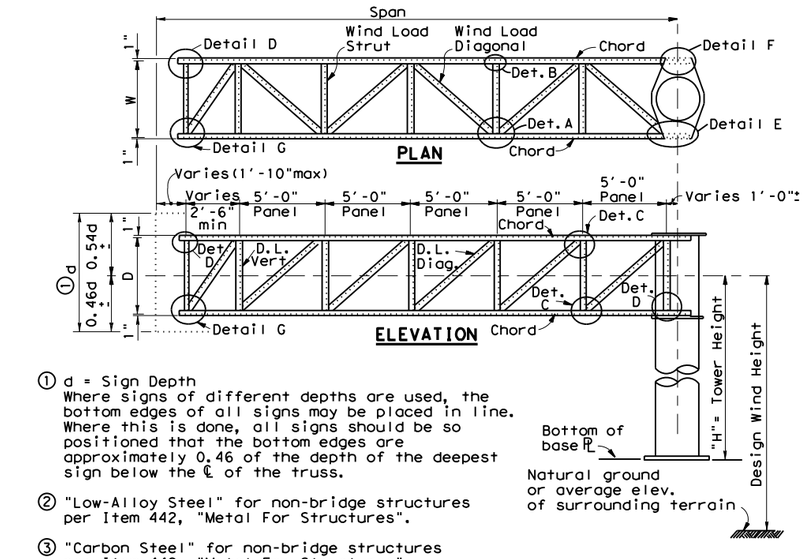
DATE: $DATE$
FILE: $FILE$
$TIME$

COSS STRUCTURES

	STRUCTURE NO. AND STATION	DMS-US290-01(STA.1822+00)	DMS-US290-02(STA.1591+00) *
	DESIGN WIND HEIGHT, Hd (feet)	37' - 0"	37' - 0"
TRUSS DETAILS	LENGTH OF SPAN (feet)	35' - 0"	35' - 0"
	W x D & SIZE HS BOLTS	4.5 x 4.5 w/8-¾ " Dia HS Bolts	
	LENGTH OF TRUSS PANELS	End = 2.5' Other = 5.0'	
	CHORD	L3½ X 3½ X ⅜ [8] ②	
	DEAD LOAD DIAGONAL	L2 X 2 X 3/16 [2] ③	
	WIND LOAD DIAGONAL	L3 X 3 X ¼ [3] ③	
	DEAD LOAD VERTICAL	L3 X 2 X 3/16 [2] ③	
	WIND LOAD STRUT	L 2½ X 2½ X 3/16 [1] ③	
	TRUSS DL & DEFL	DL= 70 lb/ft, Δ_V = 2.6"	
TOWER DETAILS	TOWER HEIGHT AT TRUSS ℄ (feet)	34' - 0"	
	TOWER PIPE DIA & WALL THICKNESS	DIA=30" Thick = 0.625"	
	TOWER PIPE Δ_H AT ℄ TRUSS	0.891	
	NO. & SIZE OF ANCHOR BOLTS	8 X 2 3/4	
	ANCHOR BOLT CIRCLE DIA	37.0"	
	BASE PL SIZE	42" X 2 3/4"	
	TRUSS TO TOWER CONNECTION	8 ~ 3/4" DIA EA	
DESIGN LOADS			
	SHEAR (Kips)	24.83	
	TORSION (Kip-ft)	133.03	
	MOMENT (Kip-ft)	895.75	
FOUNDATION		w/ "N" =	
	SOIL (Sand or Clay) & "N"	"N" = 10	
	SIZE & LENGTH OF DR SHAFT	*** DIA 54' X 37'	
	MAIN SHAFT STEEL	20 # 11(D)	
	SHAFT SPIRAL REINFORCING	#4 @ 3.5" PITCH (GRADE 60)	

OSB STRUCTURES

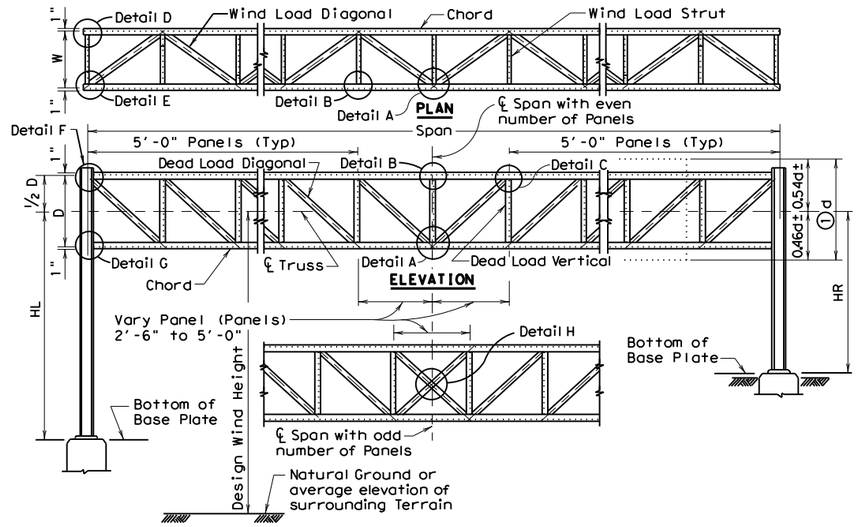
	STRUCTURE NO. AND STATION				
	DESIGN WIND HEIGHT, Hd (feet)				
TRUSS	LENGTH OF SPAN (feet)				
	W x D & SIZE HS BOLTS	x w/ " Dia HS Bolts			
	LENGTH OF TRUSS PANELS	5.0' w/ Center Panel(s) at			
	CHORD				
	DEAD LOAD DIAGONAL				
	WIND LOAD DIAGONAL				
	DEAD LOAD VERTICAL				
	WIND LOAD STRUT				
	TRUSS DL & DEFL	DL = lb/ft, Δ = "			
		LEFT TOWER	RIGHT TOWER		
TOWERS	COLUMN SPACING				
	TOWER HEIGHT (feet)	H_L =	H_R =		
	COLUMN SIZE	W x	W x		
	ANCHOR BOLTS				
	BASE PLATE				
	TOWER DIAGONALS				
	TOWER STRUTS				
	TOWER UPLIFT (Kips)				
DRILLED SHAFTS					
MAXIMUM BRACING SPACING, "S"					
SOIL N (BLOWS PER FT.)					



① d = Sign Depth
Where signs of different depths are used, the bottom edges of all signs may be placed in line. Where this is done, all signs should be so positioned that the bottom edges are approximately 0.46 of the depth of the deepest sign below the ℄ of the truss.

② "Low-Alloy Steel" for non-bridge structures per Item 442, "Metal For Structures".

③ "Carbon Steel" for non-bridge structures per Item 442, "Metal For Structures".



* USE SAME STRUCTURAL DESIGN AS STA.1822+00

GENERAL NOTES:

Use tower details, truss details, truss to tower connection, and foundation details, shown on standard drawings OSBT, OSBC, COSSD, and COSSF.

Dimensions and connections, should be determined, using member size or combination of members shown on this sheet.

Number of high strength bolts required in truss connection or splice are indicated in brackets, e.g. [3], after the member size.

Design of truss includes 12.29 pounds per square foot for sign panel, 20 pounds per foot for lights, and 50 pounds per foot for walkway, all placed as specified for the design sign panel.

STATE OF TEXAS
GAURANG S. PANDIT
111896
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by Guarang S. Pandit, P.E. 111896, on 04/05/2022.

04/05/2022.

SHEET 1 OF 1

Texas Department of Transportation
Traffic Operations Division

OVERHEAD SIGN BRIDGE DETAILS

COSS & OSB-SZ

FILE: coss-osb-sz-21	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT November 2007	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		167

DATE: $DATE$ $TIME$
FILE: $FILE$

Washers shall conform to ASTM F436.

ANCHOR BOLT DIA.	WASHER DIMENSIONS				HOLE IN BASE PLATE
	OUTSIDE DIAMETER	HOLE DIAMETER	THICKNESS		
d			MIN.	MAX.	
1 ½" or less	2d	d + ⅛"	0.136"	0.177"	d + ¼"
1 ¾"	2d - ⅛"	d + ⅛"	0.178"	0.280"	d + 5/16"
2"	2d - ¼"	d + ⅛"	0.178"	0.280"	d + 5/16"
Over 2"	2d - ½"	d + ⅛"	0.240"	0.340"	d + 5/16"

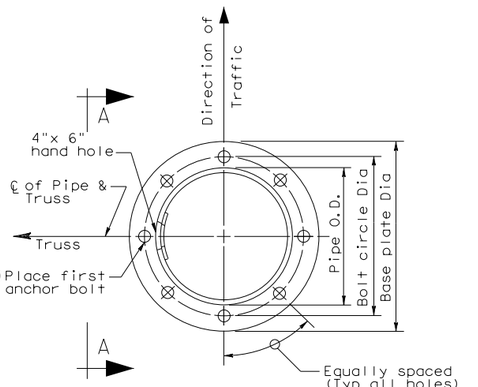
ANCHOR BOLT SIZE				
DIA	BOLT ① LENGTH	THREAD ① LENGTH	PROJECTION LENGTH	GALVAN. ① LENGTH
1 ¼"	2'-11"	5"	5 ¼"	11 ¼"
1 ⅜"	3'-1"	5 ½"	5 ¾"	11 ¾"
1 ½"	3'-4"	6"	6 ¼"	1'-0 ¼"
1 ¾"	3'-10"	7"	7 ¼"	1'-1 ¼"
2"	4'-3"	8"	8 ¼"	1'-2 ¼"
2 ¼"	4'-9"	9"	9 ¼"	1'-3 ¼"
2 ½"	5'-2"	10"	10 ¼"	1'-4 ¼"
2 ¾"	5'-8"	11"	11 ¼"	1'-5 ¼"
3"	6'-1"	1'-0"	1'-0 ¼"	1'-6 ¼"

① Anchor Bolt Fabrication Tolerances:
Bolt Length ~ ±½"
Thread Length ~ ±½"
Galvanized Length ~ -¼"

② Thread lenght applies to upper and lower threads

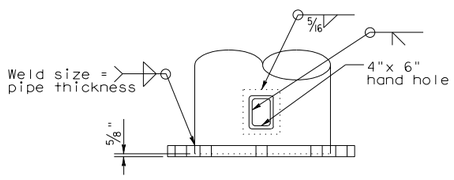
ANCHOR BOLT SIZE	PIPE OUTSIDE DIAMETER											
	16"			20"			24"			30"		
	BOLT CIRCLE DIA	DRILLED SHAFT SIZE	DRILLED SHAFT REINF	BOLT CIRCLE DIA	DRILLED SHAFT SIZE	DRILLED SHAFT REINF	BOLT CIRCLE DIA	DRILLED SHAFT SIZE	DRILLED SHAFT REINF	BOLT CIRCLE DIA	DRILLED SHAFT SIZE	DRILLED SHAFT REINF
1 ¼"Dia x 2'-11"	20 ½"	36" Dia	14-#8 (A)	24 ½"	36" Dia	14-#8 (A)						
1 ⅜"Dia x 3'-1"	20 ¾"	36" Dia	12-#9 (A)	24 ¾"	42" Dia	14-#9 (A)						
1 ½"Dia x 3'-4"	21"	36" Dia	12-#9 (A)	25"	42" Dia	14-#9 (A)	29"	42" Dia	14-#9 (C)			
1 ¾"Dia x 3'-10"	21 ½"	36" Dia	10-#10(A)	25 ⅜"	42" Dia	12-#10(B)	29 ⅜"	48" Dia	16-#10(C)	35 ⅜"	54" Dia	18-#10(C)
2"Dia x 4'-3"	22"	36" Dia	12-#10(A)	25 ¾"	42" Dia	12-#10(B)	29 ¾"	48" Dia	16-#10(C)	35 ¾"	54" Dia	18-#10(C)
2 ¼"Dia x 4'-9"	22 ½"	42" Dia	12-#11(A)	26"	42" Dia	10-#11(B)	30"	48" Dia	14-#11(C)	36"	54" Dia	14-#11(D)
2 ½"Dia x 5'-2"				26 ½"	42" Dia	12-#11(B)	30 ½"	48" Dia	16-#11(C)	36 ½"	54" Dia	16-#11(D)
2 ¾"Dia x 5'-8"							31 ½"	48" Dia	18-#11(D)	37"	54" Dia	20-#11(D)
3"Dia x 6'-1"										37 ½"	54" Dia	24-#11(D)

A = #3 Plain spiral at 6" pitch (Grade 40)
B = #4 Plain spiral at 6" pitch (Grade 40)
C = #4 Plain spiral at 6" pitch (Grade 60)
D = #4 Plain spiral at 3 ½" pitch (Grade 60)



PLAN

② See "Cantilever Overhead Sign Support" or "High Lever Cantilever Overhead Sign Support" sheets for number and size.

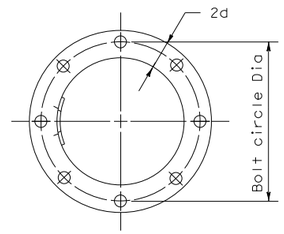


Cut 5" x 7" hole in pipe. Center 4" x 6" hand hole in ⅜" x 8" x 10" back up plate. Provide attachable cover made from section cut from pipe.

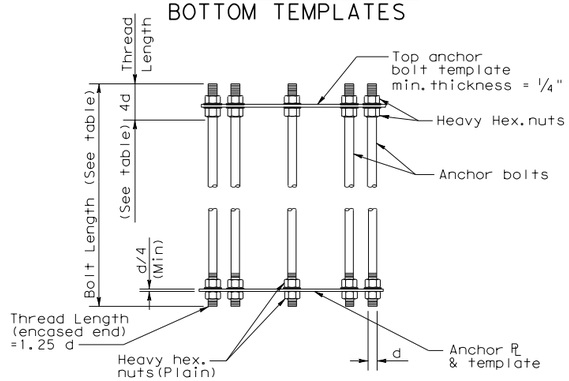
VIEW A-A

③ BASE PLATE & HANDHOLE DETAILS

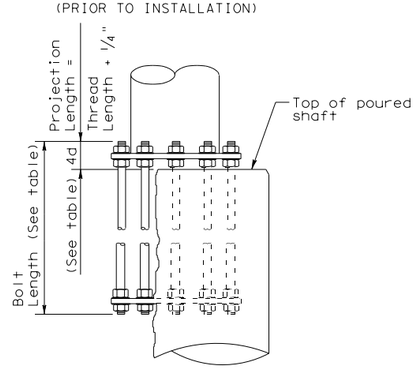
③ See "Cantilever Overhead Sign Support" or "High Level Cantilever Overhead Sign Support" sheets for Diameter and thickness of base plate.



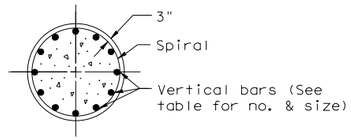
TOP VIEW OF TOP & BOTTOM TEMPLATES



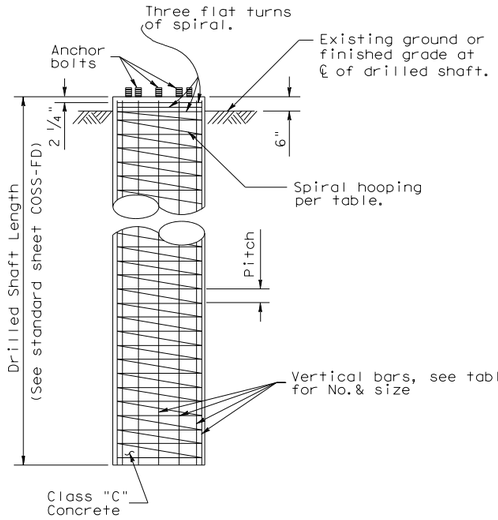
ANCHOR BOLT ASSEMBLY
(PRIOR TO INSTALLATION)



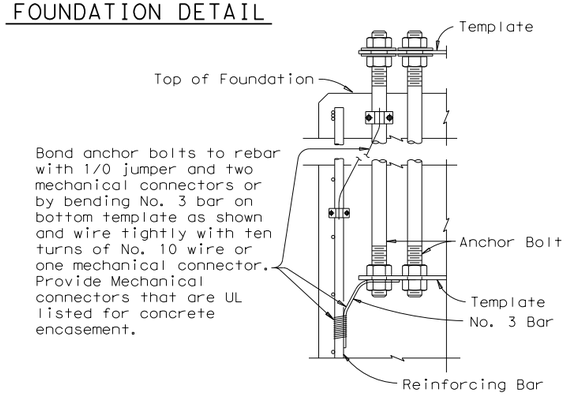
BEARING SEAT ELEVATION



SECTION



FOUNDATION DETAIL



LIGHTNING PROTECTION SYSTEM

GENERAL NOTES

1. Concrete shall be Class "C".
2. Reinforcing shall conform to Item 440, "Reinforcing Steel".
3. Anchor bolts and nuts for anchor bolts shall be "Alloy Steel" per Item 449, "Anchor Bolts".
4. Anchor bolts shall be rigidly held in position during concrete placement using steel templates at the top and bottom. The top templates shall be removed after the concrete has set.
5. Lubricate and tighten anchor bolts when erecting the structure per Item 449, "Anchor Bolts". After the structure has been aligned in its final position and the anchor bolts have been properly tightened, tack weld anchor bolt nuts to washer, and tack weld washers to base plate. Galvanizing in tack welded areas shall be repaired in accordance with Item 445, "Galvanizing".
6. All vertical reinforcing shall be carried to the bottom of the Drilled Shaft.

Texas Department of Transportation

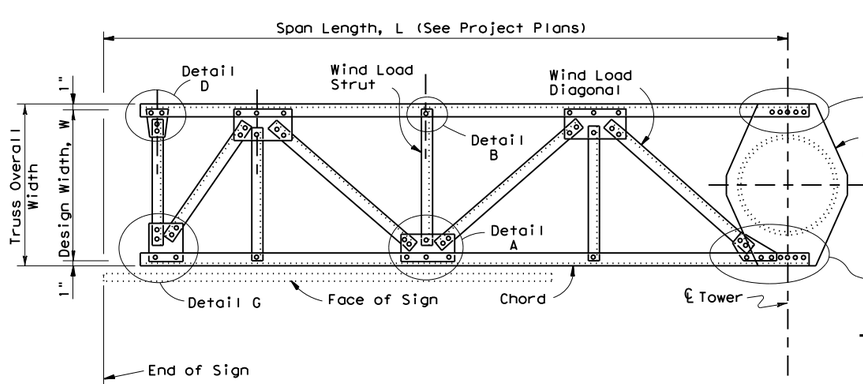
Traffic Safety Division Standard

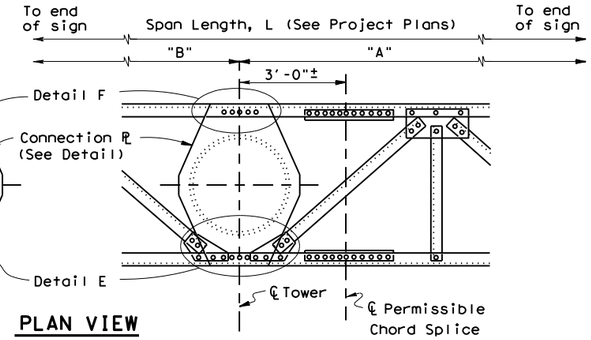
CANTILEVER OVERHEAD SIGN SUPPORT FOUNDATION

COSSF-21

FILE: cossf-21.dgn	DN:	CK:	DW:	CK:
©TxDOT November 2007	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US290
8-21	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		168

DATE:
FILE:



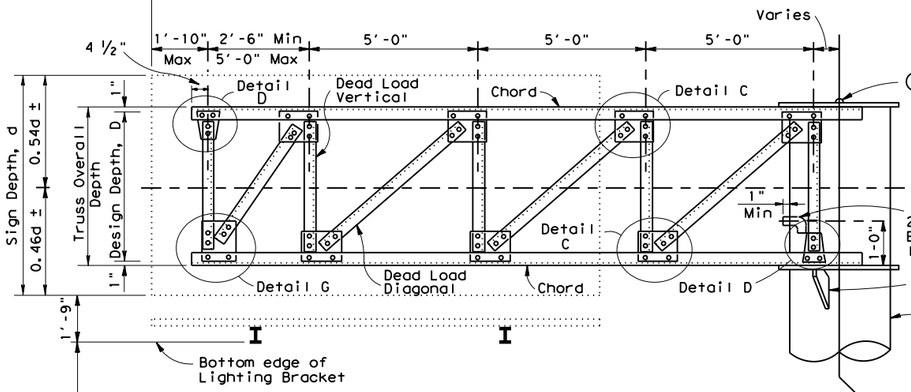


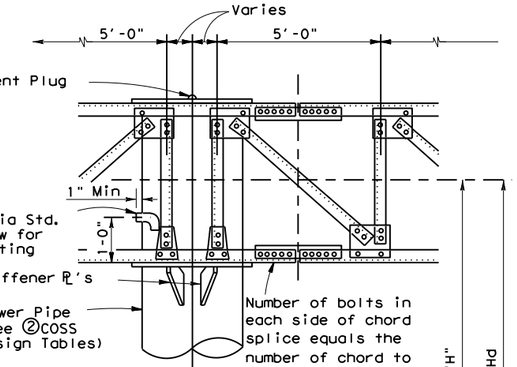
PLAN VIEW

GENERAL NOTES:

Design conforms to 1975 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and Interim revisions thereto. Connection details are typical only. Actual size of member and number of bolts will vary. The details on this sheet are intended as a guide only. See "Cantilever Overhead Sign Supports" or "High Level Cantilever Overhead Sign Supports" sheets for number of bolts and size of members.

Gusset plates to be same thickness as thickest web member in connection.

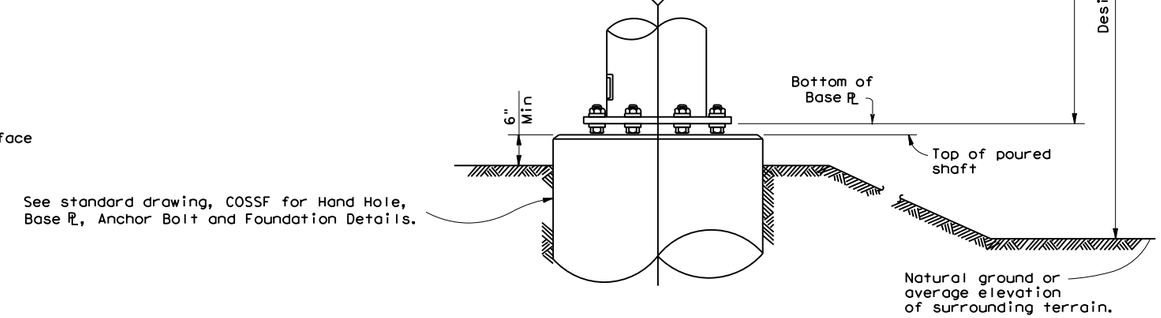




ELEVATION

SINGLE CANTILEVER

DOUBLE CANTILEVER



① Note: Cap shall be solid steel sheet ⅜" nominal thickness. Drill, tap and plug galvanizing vent. Weld plate to pipe with ⅜" weld all around.

② For COSS design tables see standard drawing, "Cantilever Overhead Sign Supports" or "High Level Cantilever Overhead Sign Supports".

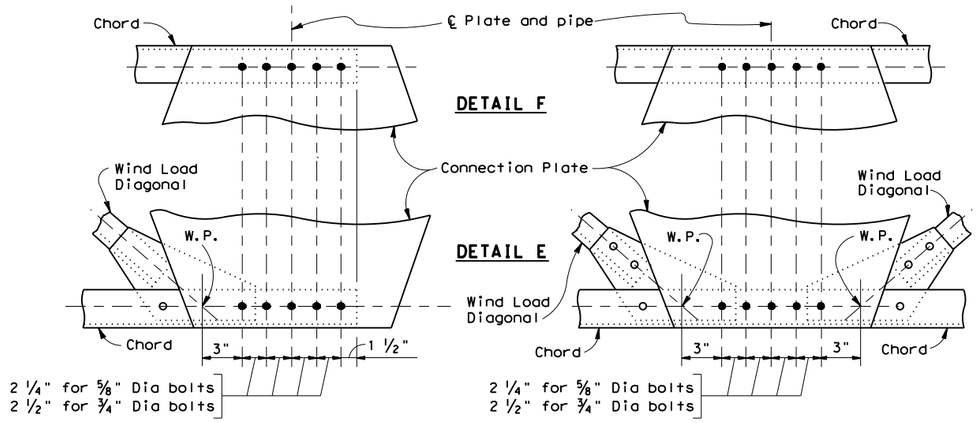
Texas Department of Transportation
Traffic Operations Division

CANTILEVER OVERHEAD SIGN SUPPORT DETAILS

COSSD

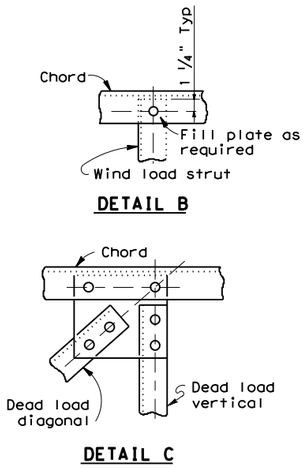
FILE: cossd.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2007	DISTRICT	PROJECT		SHEET
REVISIONS	HOU			169
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0050	06	089	US290

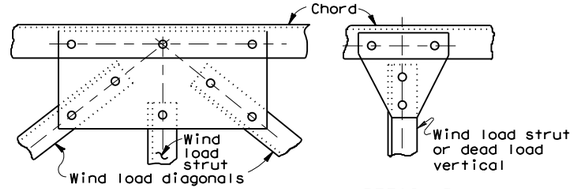
LEVELS DISPLAYED
PATH:
1

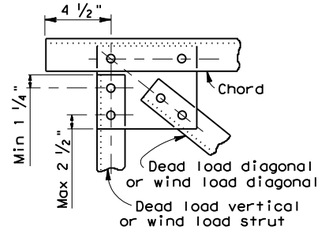


SINGLE CANTILEVER

DOUBLE CANTILEVER

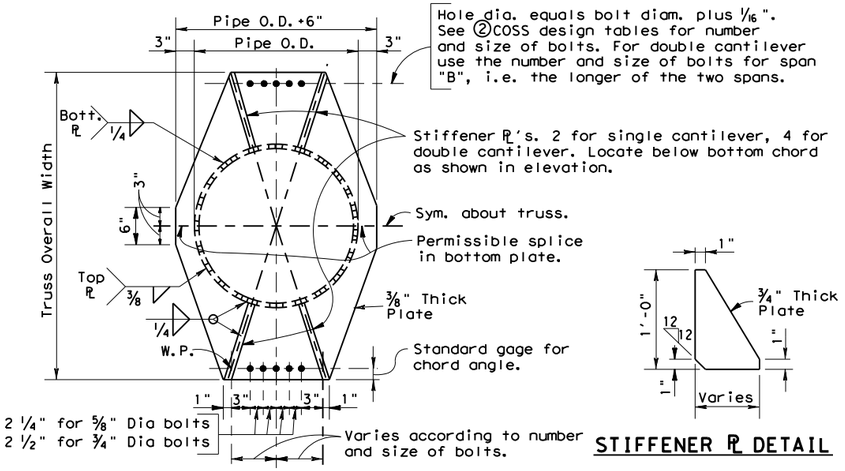






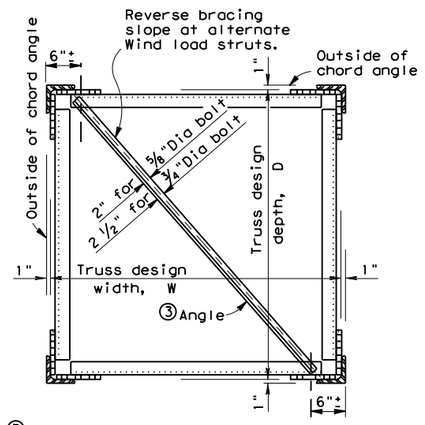
TOTAL NO. OF BOLTS IN DIAG'S. IN JOINT	NUMBER OF BOLTS REQD. IN GUSSET ℄ TO CHORD CONNECTION
0	2
2	2
3	3
4	3
5	4
6	4
8	5
10	6

CONNECTION DETAILS



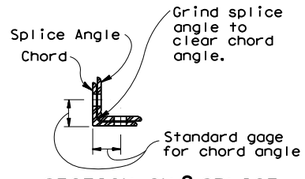
CONNECTION PLATE DETAIL

STIFFENER ℄ DETAIL

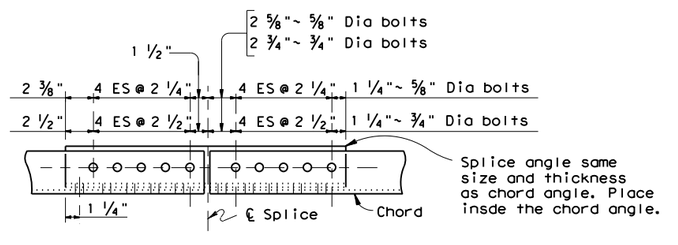


③ 2" x 2" x ⅜" angle for ⅝" Dia bolts [1]
2 ½" x 2" x ⅜" angle for ¾" Dia bolts [1]

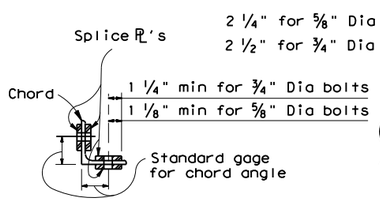
TRUSS SECTION
(DIAGONALS NOT SHOWN)



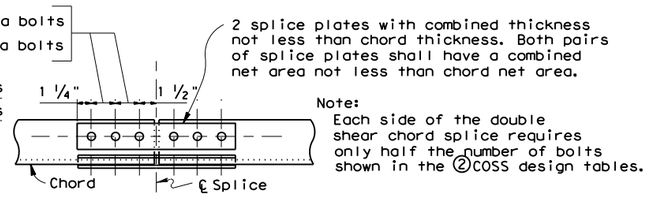
SECTION ON ℄ SPLICE



SINGLE SHEAR CHORD SPLICE



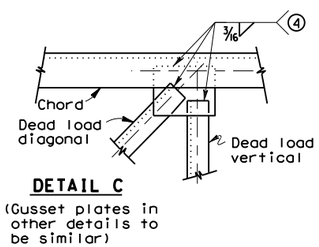
SECTION ON ℄ SPLICE



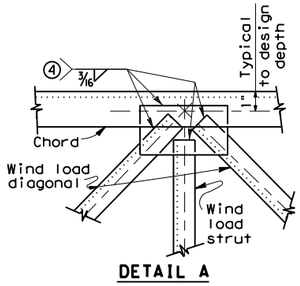
Note:
Each side of the double shear chord splice requires only half the number of bolts shown in the ②COSS design tables.

DOUBLE SHEAR CHORD SPLICE

SPLICE DETAILS



DETAIL C
(Gusset plates in other details to be similar)



DETAIL A

ALTERNATE WELDED CONNECTION DETAILS

④ MINIMUM LENGTH OF ⅜" FILLET WELD REQUIRED		
NUMBER OF BOLTS	TO REPLACE ⅝" DIA BOLTS	TO REPLACE ¾" DIA BOLTS
1	2"	3"
2	4"	6"
3	6"	9"
4	8"	11 ½"
5	10"	14 ½"
6	12"	17 ½"
7	14"	20"

SHEET 2 OF 2

Texas Department of Transportation
Traffic Operations Division

CANTILEVER OVERHEAD SIGN SUPPORT DETAILS

COSSD

FILE: cossd.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2007	DISTRICT	PROJECT		SHEET
REVISIONS	HOU			170
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0050	06	089	US290

LEVELS DISPLAYED
PATH:
1

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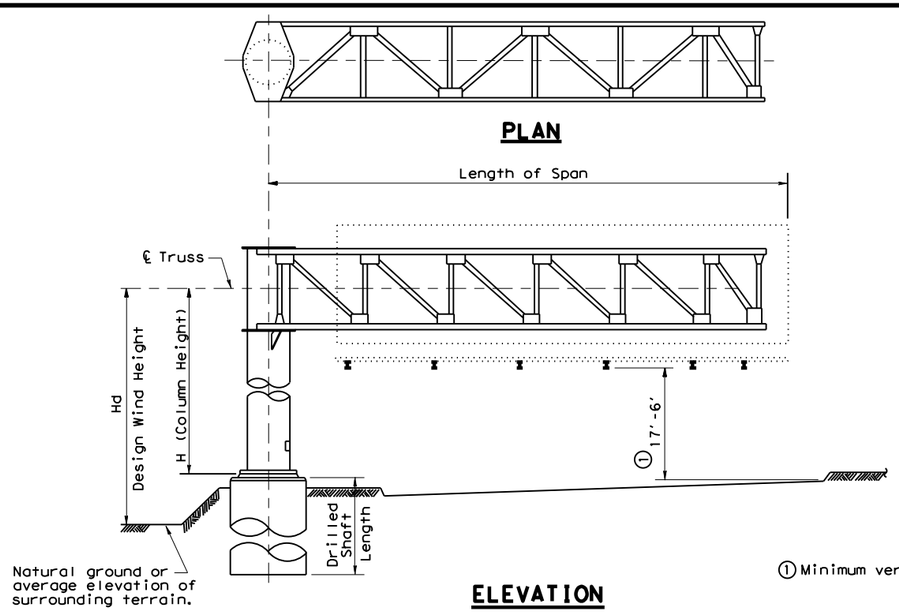
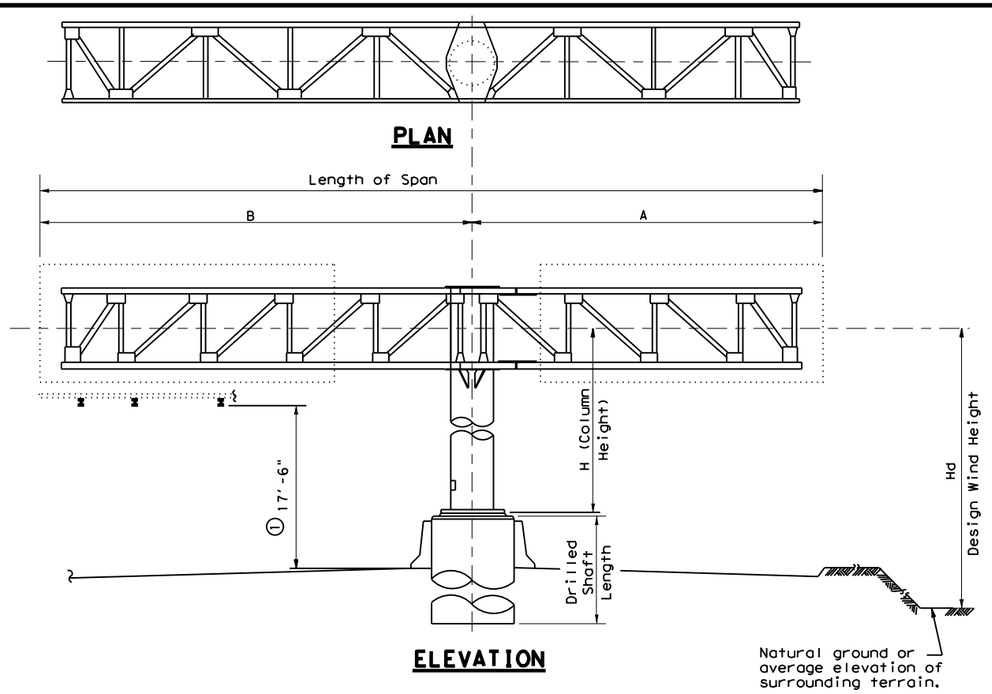


① Minimum vertical clearance



SELECTION EXAMPLE CANTILEVER SPAN

Given: Cantilever Span = 33′; Column Height, H = 23.3.′; Design Wind Height, Hd = 27′; Avg. Penetrometer Value, N = 15 (clay type soil); Hill County

Step 1: Select applicable COSS standard.
From Wind Velocity and Ice Zone sheet (WV & IZ-96) determine that Hill County is in Zone 4 (70 mph) and is above the ice line. Since Design Wind Height is less than 30′, use standard COSS-Z4 & Z4I. If Design Wind Height is more than 30′, use COSS-Z3 & Z3I. NOTE: In Zone 1 if Design Wind Height is greater than 30′ use HCOSS-Z1.

Step 2: Determine tower details from COSS-Z4 & Z4I. Use column height to nearest tabulated value' i.e., 23′. Round span length up to the nearest tabulated value, i.e., 35′.
Tower details are:
Tower pipe 24" Dia with min. wall thickness = 0.312"
Base plate 33 ¾" Dia x 1 ¾"
Anchor bolts 8~1 ¾" Dia on 29 ⅜" bolt circle
Horizontal deflection of tower at ℄ truss = 0.889". During installation, double nuts at base plate may be used to plumb tower to compensate for horizontal deflection.
Design Moment = 244 Kip-ft
Design Torsion = 162 Kip-ft

Step 3: Determine truss details from COSS-Z4 & Z4I.
Read from small table at bottom of sheet for span = 35′.
Truss design width, W and depth, D = 4.0′x 4.0′.
Chord L 3 x 3 x ⅝ (HYC) with 6 bolt connection at tower
D.L. Diag. L 2 x 2 x ⅜ (HYC) with 2 bolt connection
W. L. Diag. L 3 x 3 x ⅜ (HYC) with 2 bolt connection
D. L. Vert. L 2 x 2 x ⅜ (HYC) with 2 bolt connection
W. L. Strut. L 2 x 2 x ⅜ (HYC) with 1 bolt connection
Bolts are ⅝" Dia high strength with 5~¾" Dia bolt alternate for chord connection at tower.
D.L. of truss = 50 lb/ft
Truss deflection at free end = 3.2". The fabricator shall compensate for this deflection by offsetting bolt holes between the upper and lower chords at the truss-to-tower connection.

Step 4: Determine foundation details. Use standard COSSF.
From COSSF with 24" Dia pipe and 1 ¾" Dia anchor bolts:
Anchor Bolts 1 ¾" Dia x 3′-10"
Drilled Shaft Dia 42"
Vertical Reinforcing 12 ~ #10 bars
Spiral C = #4 at 6" pitch Grade 60.
Misc. handhole, base plate, anchor bolt, and foundation details are shown on COSSF.

Step 5: Determine drilled shaft length from COSS-FD.
Enter the appropriate graph (for 42" Dia drilled shaft in clay soil) from the bottom with N = 15. Proceed upward interpolating moment curves (solid lines) to locate 244 Kip-ft. Project to the left side of the graph to determine the required embedment length, i.e., 12′.
Repeat the procedure for torsion curves (dashed lines) to locate 162 Kip-ft. The embedment length required to satisfy torsion is 14′. Add 3′-0" to the longer length to obtain a required drilled shaft length of 17′.

SELECTION EXAMPLE DOUBLE CANTILEVER SPAN

Given: Short span, A = 9′; Long Span, B = 25′; Total Cantilever Span = 34′; Column Height, H = 24′; Design Wind Height, Hd = 26′; Avg. Penetrometer Value, N = 20 (clay type soil); Wheeler County.

Step 1: Select applicable COSS standard.
From Wind Velocity and Ice Zone sheet determine that Wheeler County is in Zone 2 (90 mph) and is above the ice line. Since Design Wind Height is less than 30′ use standard COSS-Z2I. If Design Wind Height is more than 30′, use HCOSS-Z1.

Step 2: Determine tower details from COSS-Z2I.
Use column height = 24′. Round total span length up to the next longer tabulated length span, i.e., 35′. If total span length is greater than 40′, a special design would be required.
Tower details are:
Tower pipe 30" Dia with min. wall thickness = 0.310"
Base Plate 40 ½" Dia x 1 ¾"
Anchor bolts 8 ~ 2" Dia on 35 ¾" bolt circle
Horizontal deflection of tower at ℄ truss = 0.574-0.316 = 0.26".
During installation, double nuts at base plate may be used to plumb tower and compensate for horizontal deflection.
Design Moment = 403 Kip-ft (use total span = 35′)
Design Torsion = 136 Kip-ft (use long span = 25′)

Step 3: Determine truss details from COSS-Z2I.
Read from small table at bottom of sheet 2 of 2 for Span A = 9′ (use 10′):
Chord L 3 x 3 x ⅜ (HYC) with 3 bolt connection at splice
D.L. Diag. L 2 x 2 x ⅜ (HYC) with 2 bolt connection
W.L. Diag. L 3 x 3 x ⅜ (HYC) with 2 bolt connection
D.L. Vert. L 2 x 2 x ⅜ (HYC) with 2 bolt connection
W.L. Strut. L 2 x 2 x ⅜ (HYC) with 1 bolt connection
Bolts are ⅝" Dia high strength.
D.L. of truss = 42 lb/ft.
Span B = 25′:
Chord L 3 x 3 x ¼ (HYC) with 4 bolt connection at tower
D.L. Diag. L 2 x 2 x ⅜ (HYC) with 2 bolt connection
W.L. Diag. L 3 x 3 x ⅜ (HYC) with 2 bolt connection
D.L. Vert. L 2 x 2 x ⅜ (HYC) with 2 bolt connection
W.L. Strut. L 2 x 2 x ⅜ (HYC) with 1 bolt connection
Bolts are ⅝" Dia high strength with 3 ~ ¾" Dia bolt alternate for chord connection at tower.
D.L. of truss = 47 lb/ft.
Truss defl. at free end = 0.2" for Span A, = 1.3" for Span B.
The fabricator shall compensate for deflections by offsetting bolt holes between upper and lower chords at splice and at truss-to-tower connection. Top chord shall be shortened between the tower and the splice to achieve the required offset.

Step 4: Determine foundation details. Use standard COSSF.
From COSSF with 30" Dia pipe and 2" Dia anchor bolts:
Anchor bolts 2" Dia x 4′-3"
Drilled shaft Dia 54"
Vertical Reinforcing 18 ~ #10 bars
Spiral C = #4 at 6" pitch Grade 60
Misc. handhole, base plate, anchor bolt, and foundation details are shown on COSSF.

Step 5: Determine drilled shaft length from COSS-FD.
Enter the appropriate graph (for 54" Dia drilled shaft in clay type soil) from the bottom with N = 20. Proceed upward interpolating moment curves (solid lines) to locate 403 Kip-ft. Project to the left side of graph to determine required embedment length, i.e., 13′.
Repeat the procedure for the torsion curves (dashed lines) to locate 136 Kip-ft. Embedment length required to satisfy torsion is 9′.
Add 3′ to the longer length to obtain required drilled shaft length of 16′.

Texas Department of Transportation
Traffic Operations Division

CANTILEVER OVERHEAD SIGN SUPPORTS SELECTION EXAMPLES

COSS-SE

REVISIONS

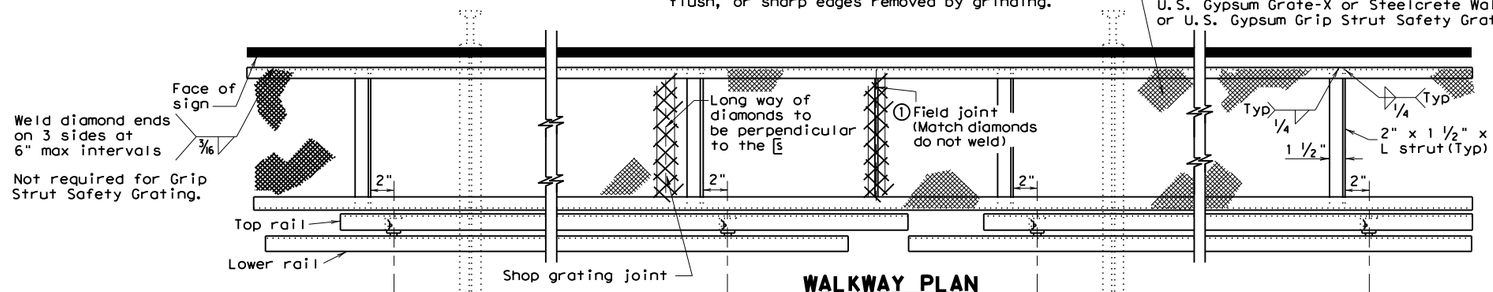
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
0050	06	089	US 290

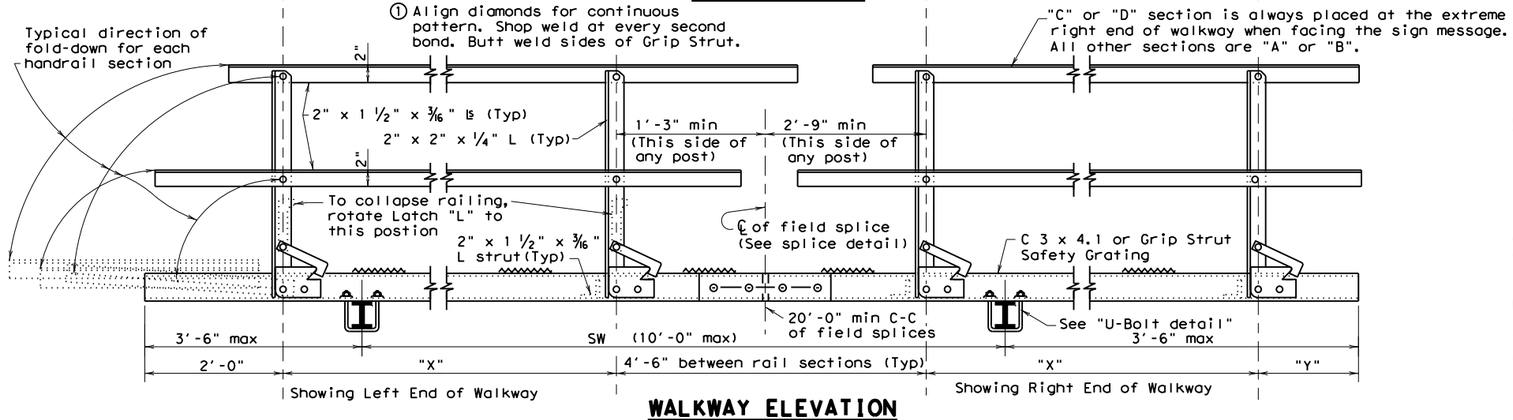
DIST	COUNTY	SHEET NO.
HOU	HARRIS	171

DATE:
FILE:

DATE:
FILE:



WALKWAY PLAN



WALKWAY ELEVATION

10'-0" Maximum spacing for Walkway, Lights and Sign Support Bracket spacing, see sheets SL(MV), and SMD(2-4)EXTRUDED ALUMINUM for other limitations to spacing.

GENERAL NOTES

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and Interim revisions thereto.

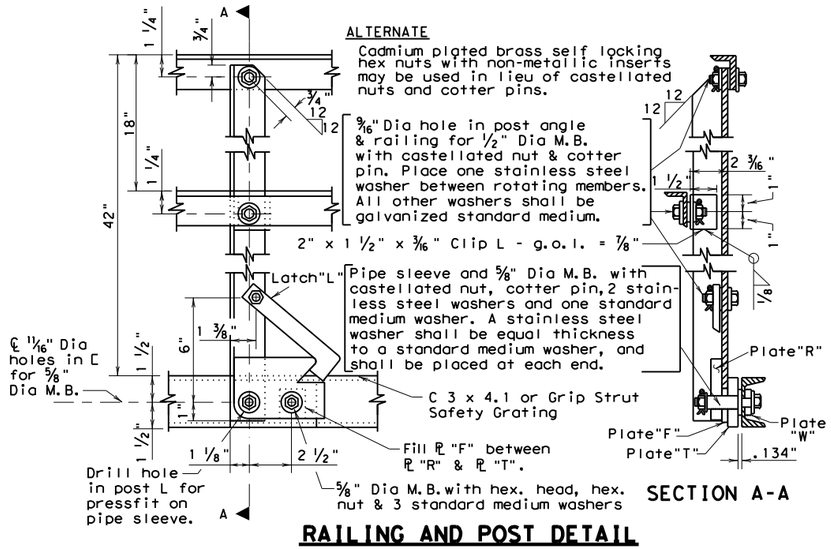
Materials, fabrication, construction and erection shall conform to Item 654, "Sign Walkways" and with details, dimensions, and weld procedures shown herein.

Structural steel shall conform with ASTM A36. Bolts shall have hexagon heads and nuts and conform with ASTM A307. Stainless steel pipe bushings shall conform with ASTM A312 Grade TP304. Stainless steel washers shall conform with ASTM A167 Type 302B. All parts, except stainless steel shall be galvanized after fabrication per Item 445, "Galvanizing".

The stainless steel bushings shall be pressed in the rail posts after posts are galvanized.

The walkway and railing shall be shop assembled to check fabrication.

Note: Eliminate C 3 x 4.1 when Grip Strut Safety Grating is used. All other details and materials apply unless otherwise noted.



RAILING AND POST DETAIL

After erection, adjust all castellated nuts to remove only excess play in rotation parts then lock in position with cotter pins. Adjust nut on latch "L" for free latch operation.

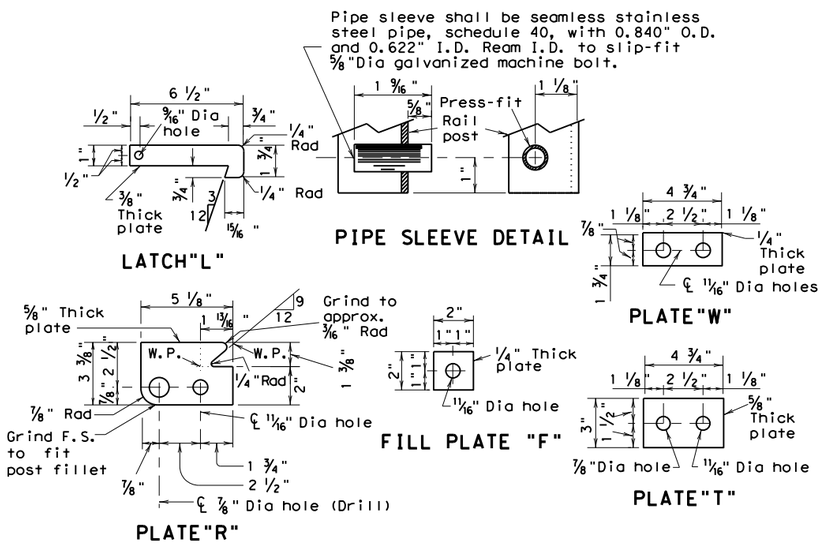


PLATE AND MISCELLANEOUS DETAILS

SHEET 1 OF 2

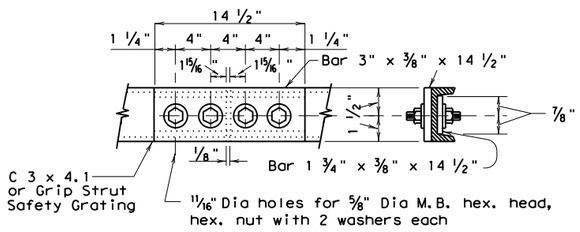
Texas Department of Transportation

Traffic Operations Division Standard

SIGN WALKWAY AND HANDRAIL

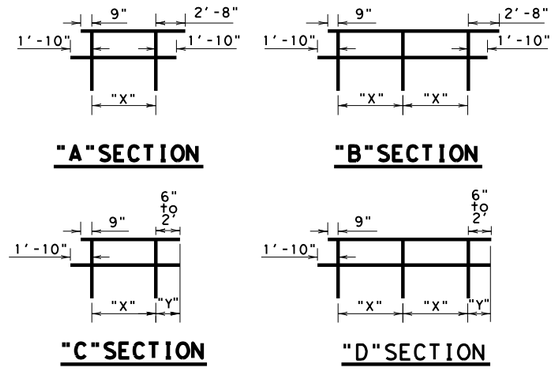
SWW(1)-14

FILE: sww1-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US 290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		172



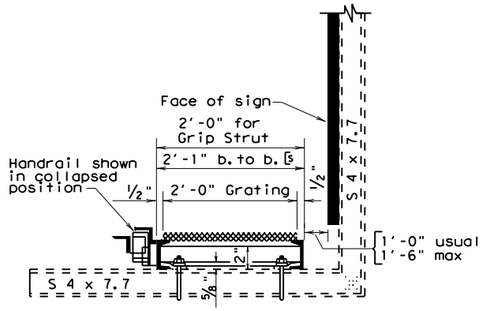
FIELD SPLICE DETAIL

(See WALKWAY ELEVATION for location; sheet 1 of 2)

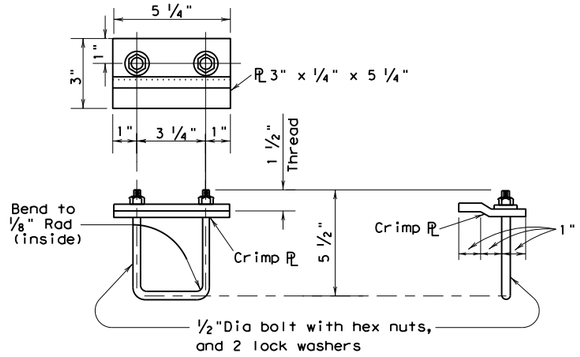


"X"dimension = 8'-0" max. See table for min dimension "X".
"X"shall be the same for all sections in any one walkway.
"Y"dimension = 6" usual,but variable between 6" and 2'-0" to obtain maximum dimension for "X" in even inches.

TYPES OF HANDRAIL SECTION



END VIEW OF WALKWAY



U-BOLT AND CLAMP DETAIL

WALKWAY LENGTH	MINIMUM "X" DIMENSION	REQUIRED NO. OF SECTIONS			
		"A"	"B"	"C"	"D"
7'-6" to 12'-0"	1 at 5'-0"	~	~	1	~
12'-6" to 20'-0"	2 at 5'-0"	~	~	~	1
20'-6" to 24'-6"	2 at 6'-9"	1	~	1	~
25'-0" to 32'-6"	3 at 6'-0"	~	1	1	~
33'-0" to 40'-6"	4 at 6'-6"	~	1	~	1
41'-0" to 45'-0"	4 at 7'-4 ½"	1	1	1	~
45'-6" to 53'-0"	5 at 6'-9"	~	2	1	~
53'-6" to 61'-0"	6 at 7'-0"	~	2	~	1
61'-6" to 73'-6"	7 at 6'-6"	~	3	1	~
74'-0" to 81'-6"	8 at 7'-3"	~	3	~	1
82'-0" to 94'-0"	9 at 6'-10"	~	4	1	~
94'-6" to 102'-0"	10 at 7'-4"	~	4	~	1
102'-6" to 114'-6"	11 at 7'-0"	~	5	1	~
115'-0" to 122'-6"	12 at 7'-6"	~	5	~	1

Texas Department of Transportation

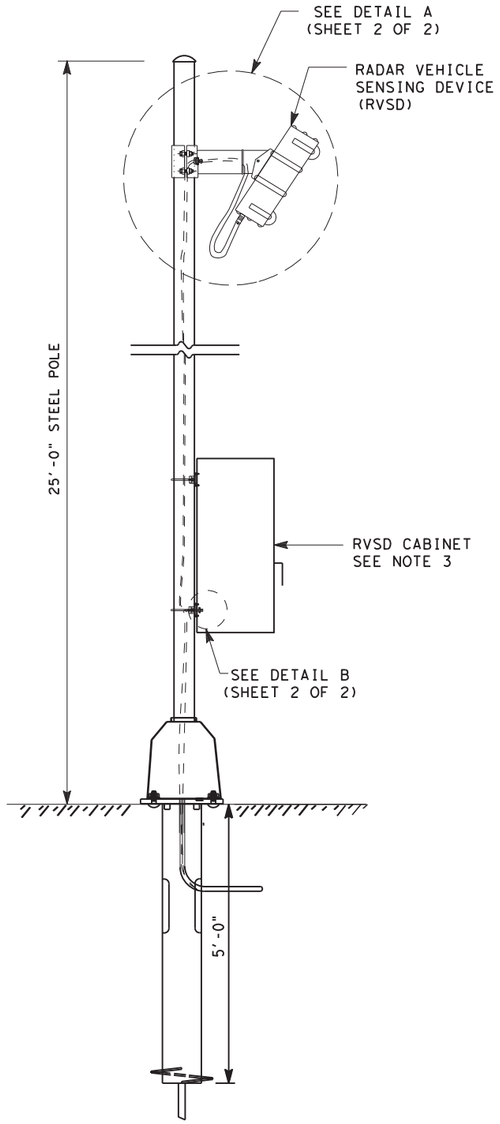
Traffic Operations Division Standard

SIGN WALKWAY AND HANDRAIL

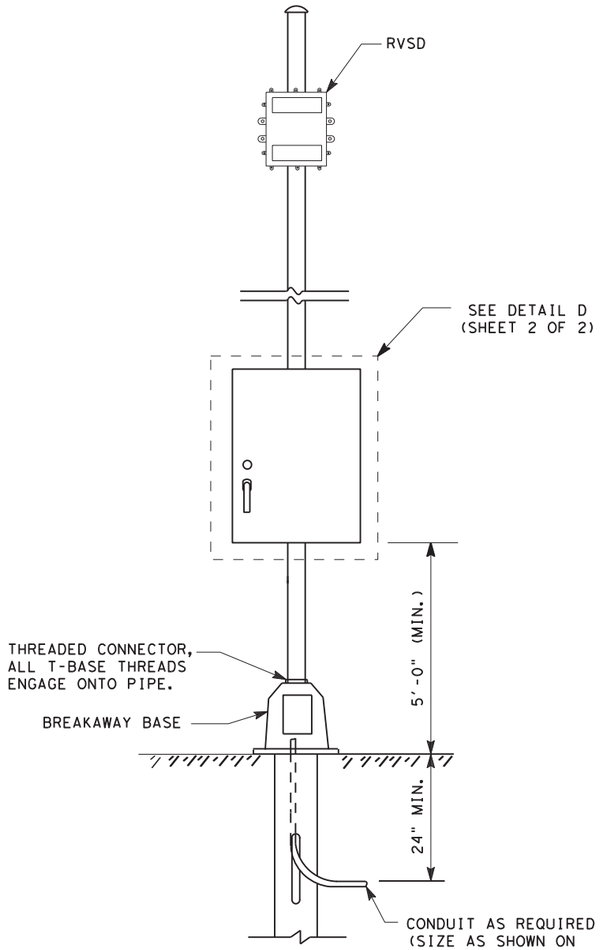
SWW(1)-14

FILE: sww1-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US 290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		173

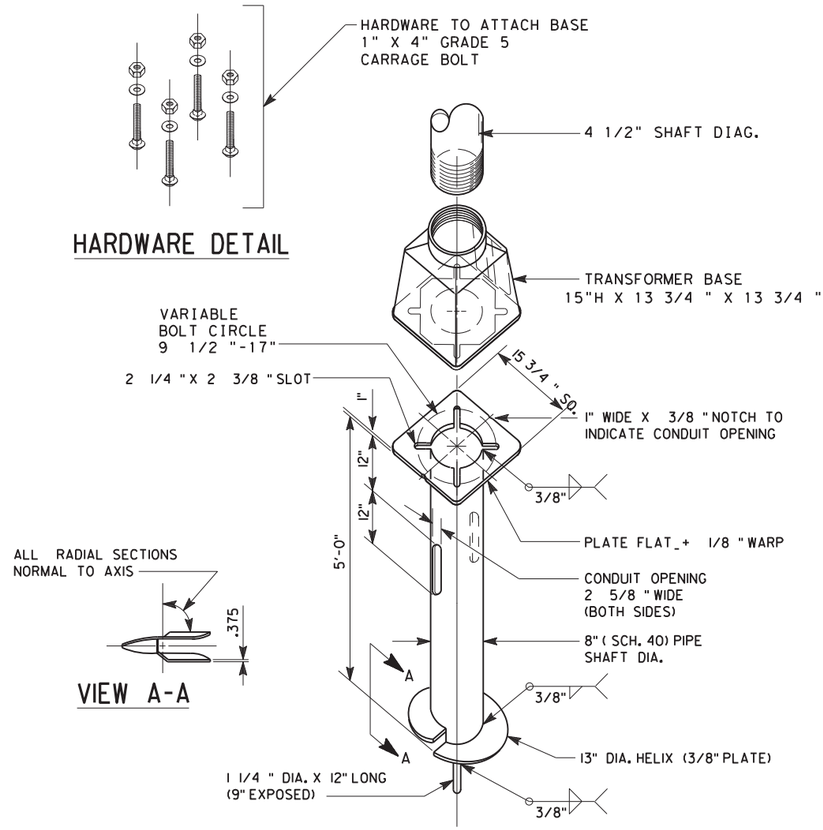
DATE:
FILE:



SIDE



FRONT



HARDWARE DETAIL

VIEW A-A

SCREW ANCHOR FOUNDATION DETAIL

NOTES:

1. DETAILS DEPICTED ON THIS SHEET SHOW A TYPICAL PEDESTAL POLE ASSEMBLY WITH A RADAR VEHICLE SENSING DEVICE AND CABINET.
2. RADAR VEHICLE SENSING DEVICE MUST BE ADJUSTED TO FACE THE FREEWAY LANES.
3. NEW RADAR VEHICLE SENSING DEVICE CABINET TO BE MOUNTED TO NEW POLE WITH NEW POWER SUPPLY. SEE "DMS-11160 FLASHER CONTROLLER ASSEMBLY" FOR THE RADAR VEHICLE SENSING DEVICE CABINET REQUIREMENTS.
4. SEE SPECIAL SPECIFICATION, "RADAR VEHICLE SENSING DEVICE (RVSD)" FOR INSTALLATION AND REQUIREMENTS.
5. SEE SPECIAL SPECIAFICATION, "SCREW-IN TYPE ANCHOR FOUNDATIIONS" FOR FURTHER REQUIREMENTS.
7. UNLESS OTHERWISE SHOWN ON THE PLANS, PROVIDE POLE SHAFT AND BREAKAWAY BASE IN ACCORDANCE WITH REQUIREMENTS LIMSTED IN STANDARD SPECIFICATION ITEM "PEDESTAL POLE ASSEMBLIES".
8. CONDUIT IN FOUNDATION AND WITHIN 6 IN. OF FOUNDATION IS SUBSIDIARY TO STANDARD SPECIFICATION ITEM, "PEDESTAL POLE ASSEMBLIES".

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED
PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by Kenneth Paradowski P.E. 97040, on

May 23 , 2022

Kenneth Paradowski, P.E.

FILE NAME: RVSD1.DGN

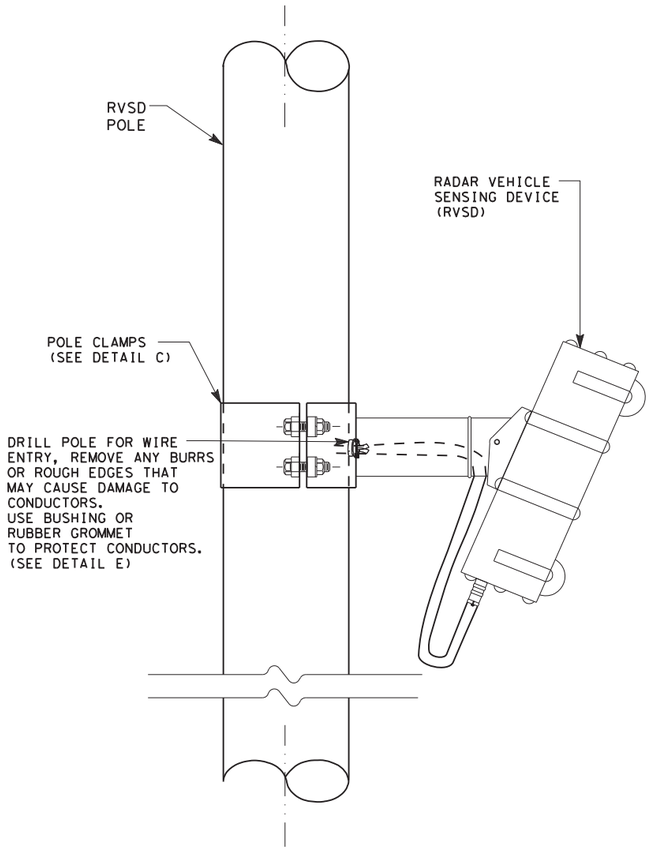
TEXAS DEPARTMENT OF TRANSPORTATION
US 90A

RADAR VEHICLE SENSING DEVICE STRUCTURE POLE DETAIL

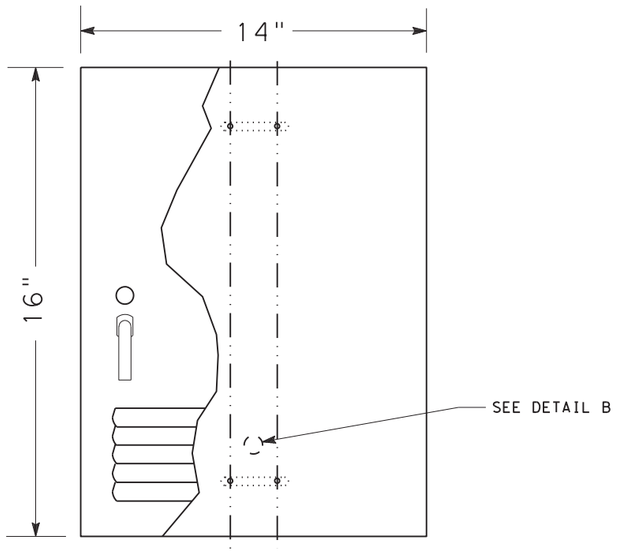
SHEET 1 OF 2

DN: RFB	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN: KBP	ORIGINAL	AUG 16	6	TEXAS					US290
DW: RFB				STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW: ELP				HOUSTON	WALLER	0050	06	089	174
TR:									
CK TR:									

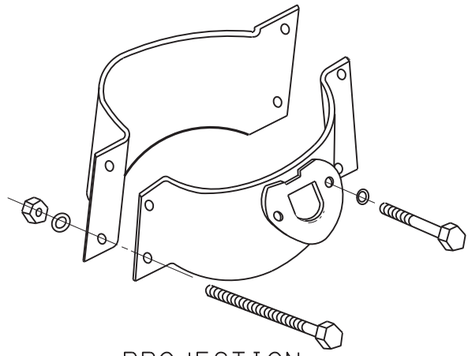
NAME: ENTER DATA



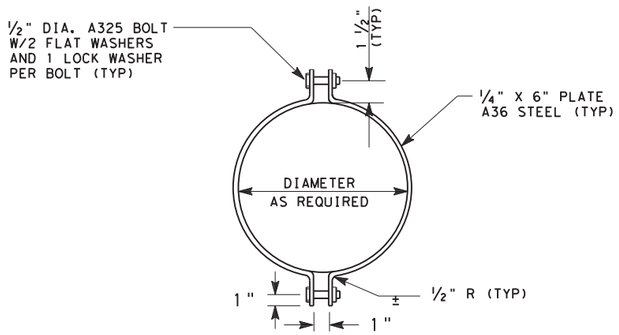
DETAIL A



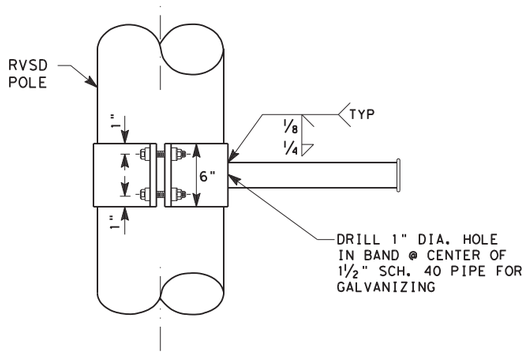
DETAIL D



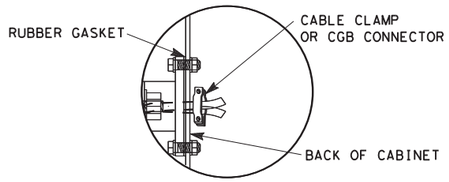
PROJECTION



CLAMP DETAIL C

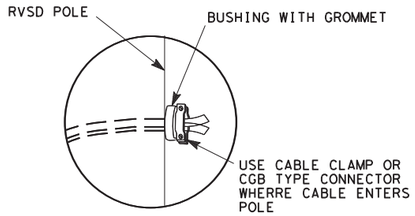


ELEVATION



DETAIL B

PULL CONDUCTORS TO REMOVE SLACK IN RUN BETWEEN CABINET AND THE RADAR VECHICLE SENSING DEVICE. CLAMP CABLE AT THE TOP OF THE RVSD POLE AND IN CABINET AT ENTRY AT SHOWN.



DETAIL E

NOTES:
PROVIDE RVSD CABINET WITH A NUMBER CORBIN LOCK.

ENSURE THE RVSD POLE AND ALL MOUNTING BRACKETS IS HOT DIP GALVANIZED. ENSURE ALL HARDWARE USED ON THE POLE IS STAINLESS STEEL.

SEE "DMS-11160 FLASHER CONTROLLER ASSEMBLY" SPECIFICATION FOR THE RVSD CABINET REQUIREMENTS.

MOUNT RVSD CABINET 5'-6" ABOVE GRADE (± 6")

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May 23 , 2022

Kenneth Paradowski, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION
US 290

RADAR VEHICLE SENSING DEVICE STRUCTURE POLE DETAIL

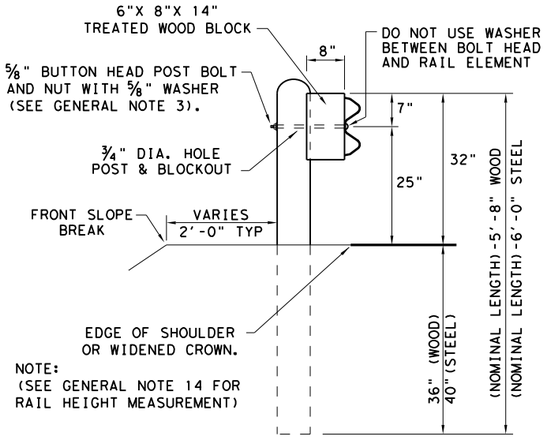
SHEET 2 OF 2

DN: RFB	DRAWING	DATE	FED. RD. DIV. NO.	STATE	PROJECT NO.					HIGHWAY NO.
CK DN: KBP	ORIGINAL	AUG 16								
DW: RFB			6	TEXAS						US290
CK DW: ELP										
TR:			STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
CK TR:			HOUSTON	HARRIS		0050	06	089	175	

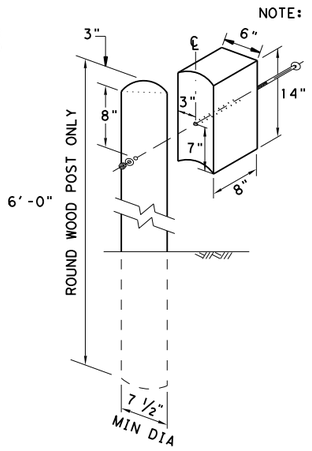
FILE NAME: RVSD2.DGN

NAME: ENTER DATA

DATE:
FILE:

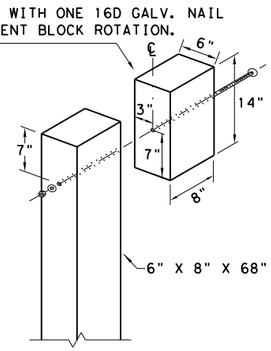


TYPICAL POST PLACEMENT

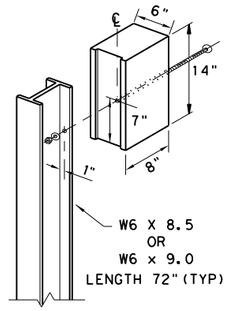


WOOD BLOCK TO ROUND WOOD POST

NOTE: TOENAIL WITH ONE 16D GALV. NAIL TO PREVENT BLOCK ROTATION.

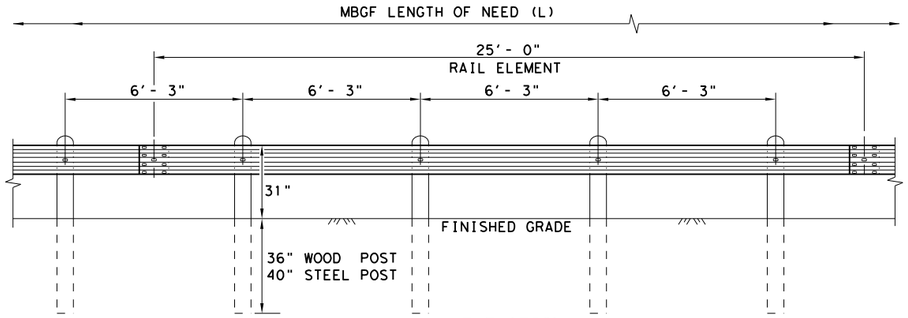


WOOD BLOCK TO RECTANGULAR WOOD POST



ROUTED WOOD BLOCK TO I-BEAM STEEL POST

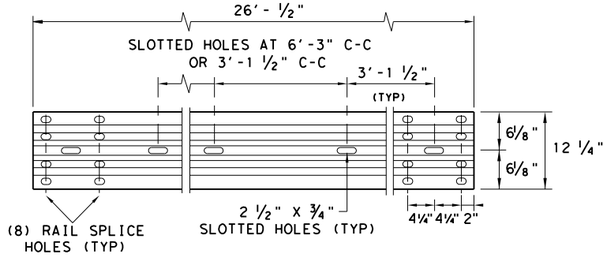
NOTE: ** "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



DIRECTION OF TRAFFIC

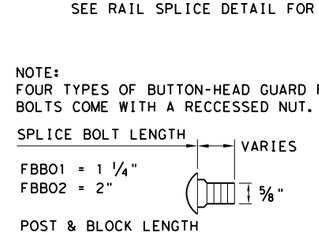
ELEVATION
MID-SPAN RAIL SPLICE

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



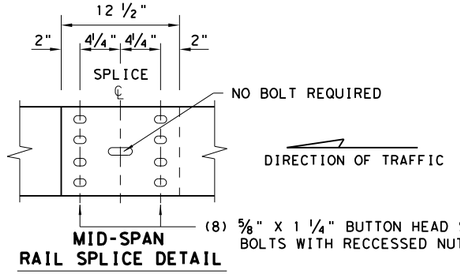
ELEVATION 25'- 0" (NOM.) W-BEAM SECTION

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



BUTTON HEAD BOLT

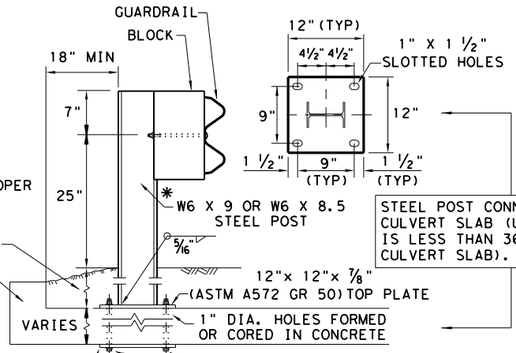
NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.



DIRECTION OF TRAFFIC

MID-SPAN RAIL SPLICE DETAIL

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



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

STEEL POST CONNECTION TO CULVERT SLAB (USE WHEN THERE IS LESS THAN 36" COVER OVER CULVERT SLAB).

LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

1. BOLT-THROUGH OPTION: REQUIRES A 6" MIN. SLAB THICKNESS. ⅞" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS.
   NOTE: BOLT LENGTH = SLAB PLUS 2 ¼" MIN.

2. EPOXY ANCHOR OPTION: THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE ⅞" DIA. ASTM A449 OR A193 GRADE B7 WITH HEAVY HEX NUT, AND ONE HARDENED WASHER EACH. EMBED ANCHOR RODS 6" WITH HILTI HIT RE 500 EPOXY ADHESIVE. OTHER TYPE III CLASS C EPOXY ADHESIVES MEETING THE REQUIREMENTS OF DMS-6100, "EPOXIES AND ADHESIVES", MAY BE USED IF IT CAN BE DEMONSTRATED THAT THEY MEET OR EXCEED THE STRENGTH OF HILTI HIT RE 500 WITH THE SAME EMBEDMENT DEPTH AND THREADED ROD DIA. FOLLOW THE MANUFACTURER'S REQUIREMENTS FOR INSTALLING EPOXIED THREADED RODS. EXTEND RODS ¼" MIN. BEYOND NUT.

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

NOTE: TRANSISTIONS TO BRIDGE RAILS OR TRAFFIC BARRIERS.
SEE GF(31)TL3 TR STANDARD FOR HIGH-SPEED TL-3 TRANSITIONS.
SEE GF(31)TL2 TR STANDARD FOR LOW-SPEED TL-2 TRANSITIONS.

GENERAL NOTES

1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25'- 0", OR 12'- 6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'-1 ½" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE DOWNSTREAM ANCHOR TERMINAL (DAT) AND THE TRANSITION SECTIONS OF GUARDRAIL.
3. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
6. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
8. UNLESS OTHERWISE SHOWN IN THE PLANS, GUARD FENCE PLACED IN THE VICINITY OF CURBS SHALL BE POSITIONED SO THAT THE FACE OF CURB IS LOCATED DIRECTLY BELOW OR BEHIND THE FACE OF THE RAIL. RAIL PLACED OVER CURBS SHALL BE INSTALLED SO THAT THE POST BOLT IS LOCATED APPROXIMATELY 25 INCHES ABOVE THE GUTTER PAN OR EDGE OF SHOULDER.
9. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. IF SOLID ROCK IS ENCOUNTERED WITHIN 0 TO 18" OF THE FINISHED GRADE, DRILL A 24" DIA. HOLE, 24" INTO THE ROCK. IF SOLID ROCK IS ENCOUNTERED BELOW 18", DRILL A 12" DIA. HOLE, 12" INTO THE ROCK OR TO THE STANDARD EMBEDMENT DEPTH, WHICHEVER MAYBE LESS. ANY EXCESS POST LENGTH, AFTER MEETING THESE DEPTHS, MAY BE FIELD CUT TO ENSURE PROPER GUARDRAIL MOUNTING HEIGHT. BACKFILL WITH COARSE AGGREGATE MATERIAL.
10. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
11. SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 150 FT. RADIUS.
12. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210 ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
13.

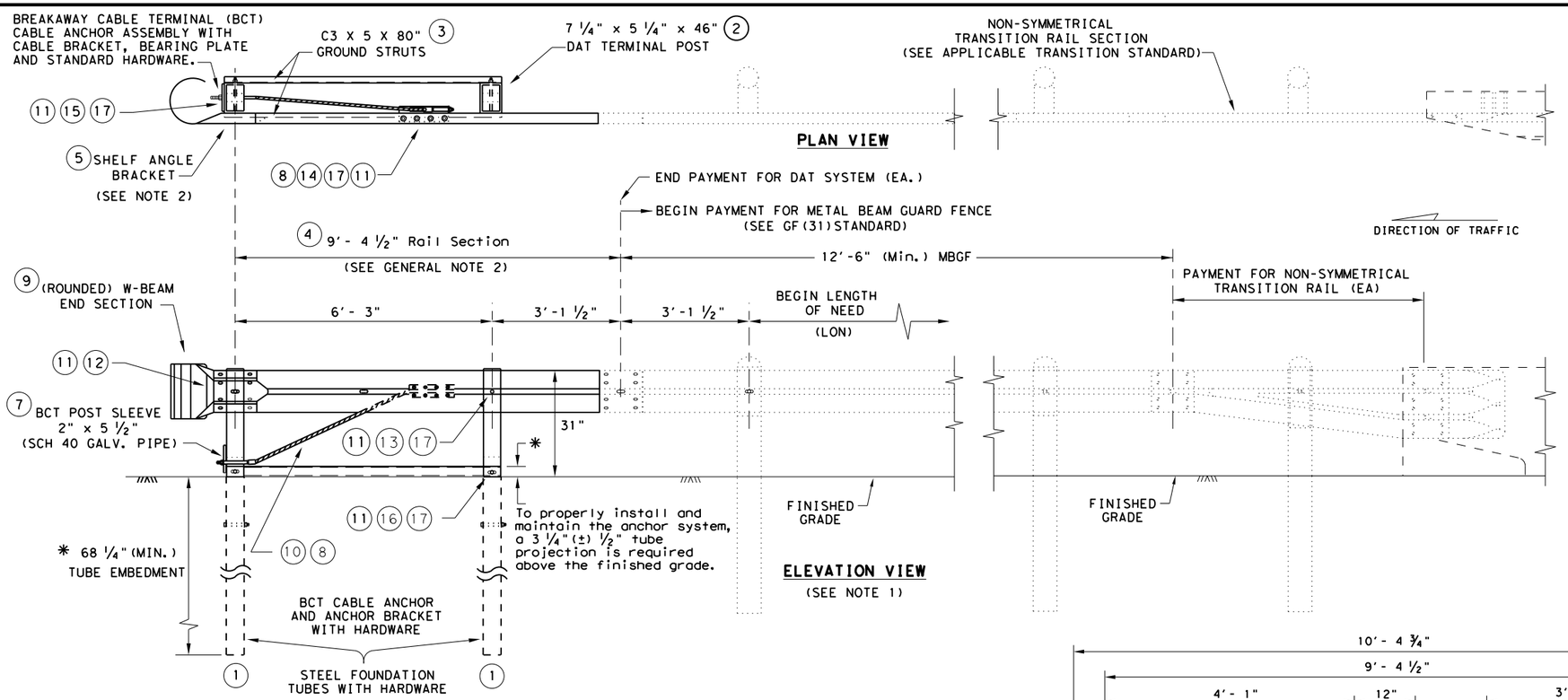
Texas Department of Transportation

Design Division Standard

METAL BEAM GUARD FENCE
TL-3 MASH COMPLIANT
GF(31)-19

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US 290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		176

DATE:
FILE:



DOWNSTREAM ANCHOR TERMINAL (DAT)

NOTE: ONLY FOR DOWNSTREAM USE, WHEN LOCATED OUTSIDE THE HORIZONTAL CLEARANCE AREA OF OPPOSING TRAFFIC.

GENERAL NOTES

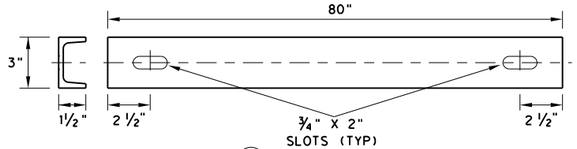
1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN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

MOW STRIP INSTALLATION

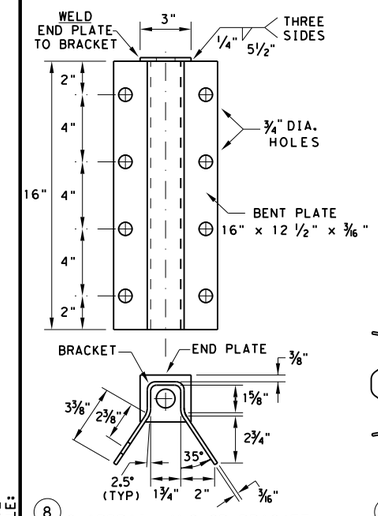
IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

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

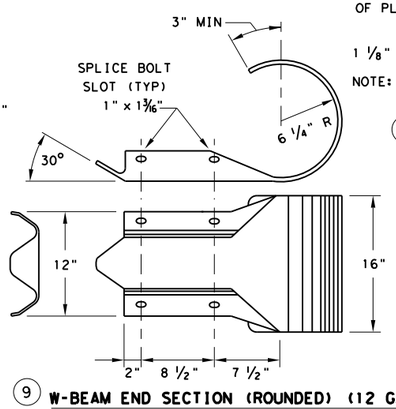
(4) TERMINAL RAIL ELEMENT FOR DAT



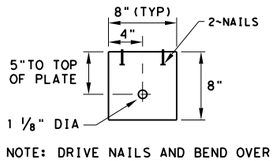
(3) CHANNEL STRUT
C3 X 5 X 80", GRADE A36



(8) GUARDRAIL ANCHOR BRACKET

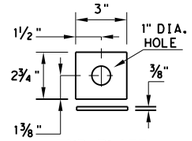


(9) W-BEAM END SECTION (ROUNDED) (12 GA.)

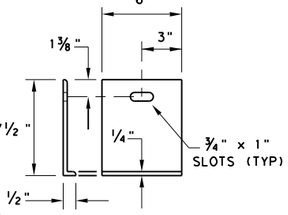


NOTE: DRIVE NAILS AND BEND OVER TO PREVENT PLATE ROTATION

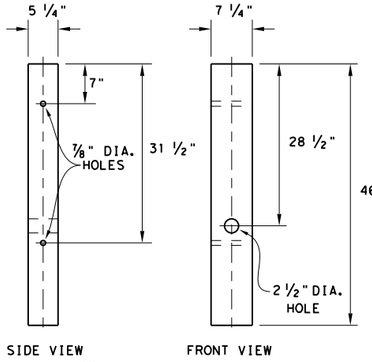
(6) BEARING PLATE
8"x 8"x 5/8" R



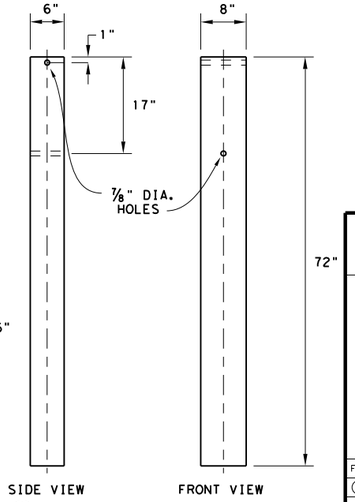
END PLATE



(5) SHELF ANGLE BRACKET



(2) TERMINAL POST
7 1/4"x 5 1/4"x 46" WOOD POST



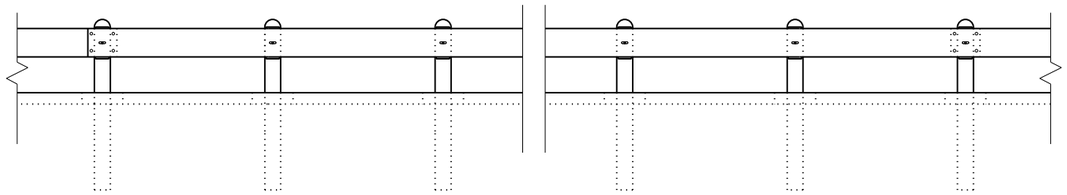
(1) STEEL FOUNDATION TUBE
6"x 8"x 1/8" x 72" STEEL TUBE

Texas Department of Transportation — Design Division Standard

METAL BEAM GUARD FENCE
(DOWNSTREAM ANCHOR TERMINAL)
TL-3 MASH COMPLIANT

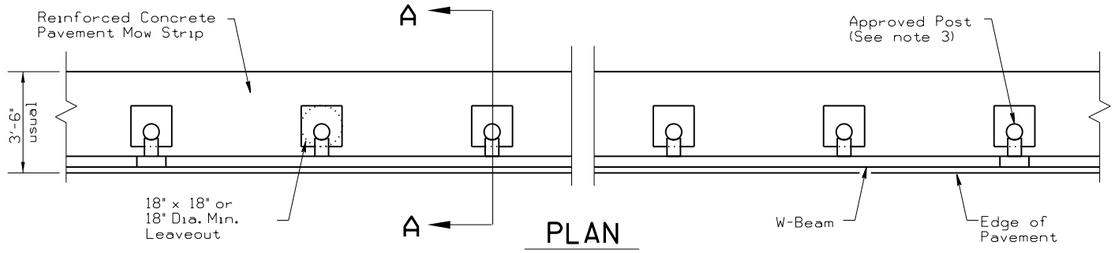
GF(31)DAT-19

FILE: gf31dat19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US 290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		177



ELEVATION

TRAFFIC



PLAN

GENERAL NOTES

1. Place concrete riprap mow strips at all Metal Beam Guard Fence locations, and in accordance with Item 432, "Riprap". Use Class B Concrete, reinforced with No. 3 bars spaced at 18 in. centers each direction and 2 in. below the surface.

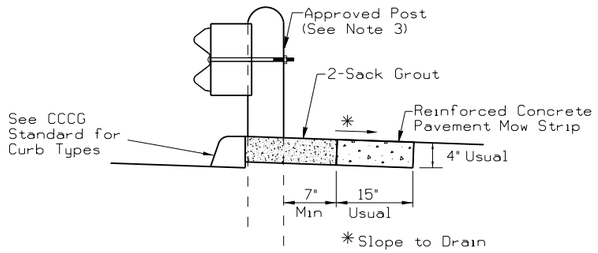
2. Provide a minimum of 7 in. leave out behind the post. Do not place concrete in the leave out.

3. The type of approved post is shown elsewhere on the plans. See the applicable standard sheets for additional details and information.

4. Other curb placement options may be used. Curbs are not considered part of the mow strip and are paid for under other pertinent bid items.

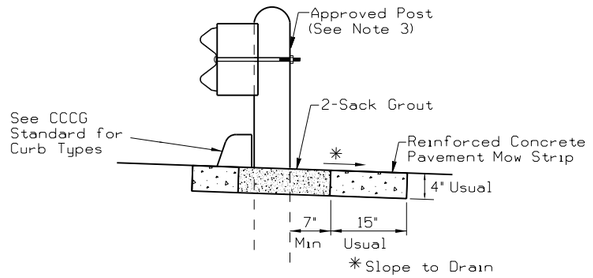
5. Fill the leave outs with no more than a 2-sack grout mixture and place in accordance with Section 421.2.7, ""Mortar and Grout." Payment for furnishing and placing the grout mixture is subsidiary to the Item 432, "RIPRAP."

6. Place the mow strip the entire length of the guard fence plus any Terminal Anchor Section (TAS) or Single Guardrail Terminal (SGT) to 2 ft. beyond the face of the object marker at the end of the SGT. Do not allow concrete to adhere to the ground line strut shown on the SGT standard sheet.



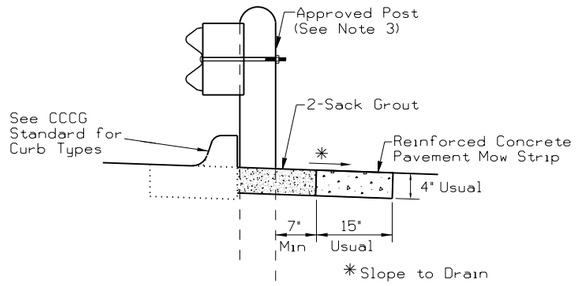
CURB OPTION (1)

Shown at Curbed Location

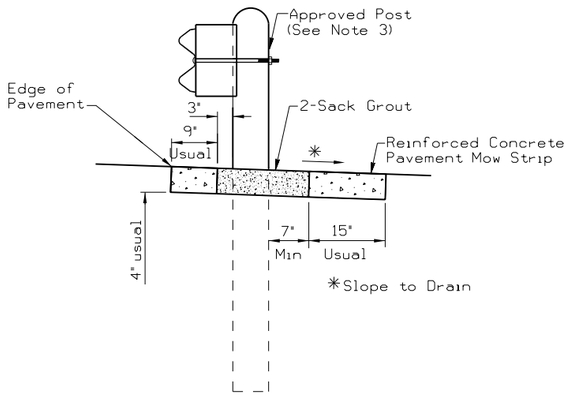


CURB OPTION (2)

Curb Shown on Top of Mow Strip

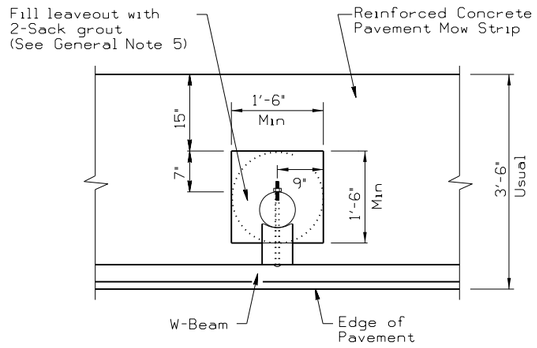


CURB OPTION (3)



SECTION A-A

Typical



MOW STRIP DETAIL

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

Texas Department of Transportation
Houston District

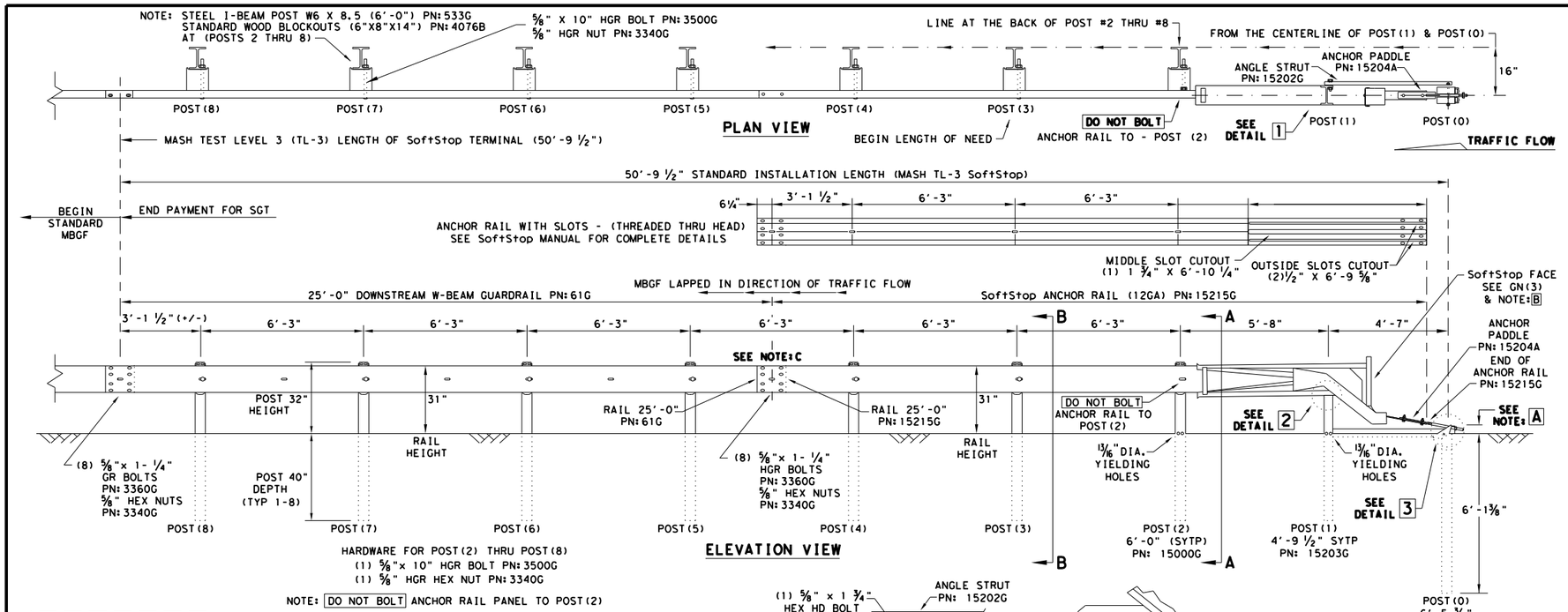
MOW STRIP

MS

FILE:	DN:	CK:	DW:	CK:	
© TxDOT 2014	DIST	FED REG	PROJECT NO.		SHEET
REVISIONS	HOU	6			178
03/15 2014 SPECS	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0050	06	089	US 290

STDE5.DGN

DATE: $DATE$ $TIME$
FILE: $FILE$



GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY AT 1(888)323-6374. 2525 N. STEMMONS FREEWAY, DALLAS, TX 75207
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE; SoftStop END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL. PN: 620237B
3. APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. A COMPOSITE MATERIAL BLOCKOUT THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS OF SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
7. IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL AND REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
8. POSTS SHALL NOT BE SET IN CONCRETE.
9. IT IS ACCEPTABLE TO INSTALL THE SoftStop IMPACT HEAD PARALLEL TO THE GRADE LINE OR WITH AN UPWARD TILT.
10. DO NOT ATTACH THE SoftStop SYSTEM DIRECTLY TO A RIGID BARRIER.
11. UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE SoftStop SYSTEM BE CURVED.
12. A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCROACHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.

NOTE: A	THE INSTALLATION HEIGHT OF FULLY ASSEMBLED ANCHOR POST WILL VARY FROM 3-3/4" MIN. TO 4" MAX. ABOVE FINISHED GRADE.
NOTE: B	PART PN: 5852B RIGHT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING) PART PN: 5851B LEFT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING)
NOTE: C	W-BEAM SPLICE LOCATED BETWEEN LINE POST(4) AND LINE POST(5) GUARDRAIL PANEL 25'-0" PN: 61G ANCHOR RAIL 25'-0" PN: 15215G LAP GUARDRAIL IN DIRECTION OF TRAFFIC FLOW.

PART	QTY	MAIN SYSTEM COMPONENTS
620237B	1	PRODUCT DESCRIPTION ASSEMBLY MANUAL (LATEST REV.)
15208A	1	SoftStop HEAD (SEE MANUAL FOR RIGHT-LEFT APPROACH)
15215G	1	SoftStop ANCHOR RAIL (12GA) WITH CUTOUT SLOTS
61G	1	SoftStop DOWNSTREAM W-BEAM RAIL (12GA) (25'- 0")
15205A	1	POST #0 - ANCHOR POST (6'- 5 3/8")
15203G	1	POST #1 - (SYTP) (4'- 9 1/2")
15000G	1	POST #2 - (SYTP) (6'- 0")
533G	6	POST #3 THRU #8 - I-BEAM (W6 x 8.5) (6'- 0")
4076B	7	BLOCKOUT - WOOD (ROUTED) (6" x 8" x 14")
6777B	7	BLOCKOUT - COMPOSITE (4" x 7 1/2" x 14")
15204A	1	ANCHOR PADDLE
15207G	1	ANCHOR KEEPER PLATE (24 GA)
15206G	1	ANCHOR PLATE WASHER (1/2" THICK)
15201G	2	ANCHOR POST ANGLE (10" LONG)
15202G	1	ANGLE STRUT
		HARDWARE
4902G	1	1" ROUND WASHER F436
3908G	1	1" HEAVY HEX NUT A563 GR.DH
3717G	2	3/4" x 2 1/2" HEX BOLT A325
3701G	4	3/4" ROUND WASHER F436
3704G	2	3/4" HEAVY HEX NUT A563 GR.DH
3360G	16	5/8" x 1 1/4" W-BEAM RAIL SPLICE BOLTS HGR
3340G	25	5/8" W-BEAM RAIL SPLICE NUTS HGR
3500G	7	5/8" x 10" HGR POST BOLT A307
3391G	1	5/8" x 1 3/4" HEX HD BOLT A325
4489G	1	5/8" x 9" HEX HD BOLT A325
4372G	4	5/8" WASHER F436
105285G	2	5/8" x 2 1/2" HEX HD BOLT GR-5
105286G	1	5/8" x 1 1/2" HEX HD BOLT GR-5
3240G	6	5/8" ROUND WASHER (WIDE)
3245G	3	5/8" HEX NUT A563 GR.DH
5852B	1	HIGH INTENSITY REFLECTIVE SHEETING - SEE NOTE:B

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

Texas Department of Transportation

Design Division Standard

TRINITY HIGHWAY
SOFTSTOP END TERMINAL
MASH - TL-3
SGT(10S)31-16

FILE: sgt10s3116	DN: TxDOT	CK: KM	DW: VP	CK: MB/VP
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089,ETC	US 290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		179

DATE: $DATE$
FILE: $FILE$

(SEE GN NOTE 15)
STANDARD 31" MBGF

ITEM (6)
INNER SIDE SLIDER
(ISS) PANEL FOR RAIL 3

FIELD-SIDE
(RAIL 3)

NOTE:
RECESSED HEX NUTS FACING
TRAFFIC-SIDE **SEE DETAIL (C)**

REFERENCE LINE USED TO INSTALL
LINE POST(9) THRU POST(2)

POST 1 OFFSET DISTANCE MEASURED
7-⅝" FROM REFERENCE LINE

POST 9 | POST 8 | POST 7 | POST 6 | POST 5 | POST 4 | POST 3 | POST 2

RAIL 4 | RAIL 3 | RAIL 2 | RAIL 1

ITEM (10)
CABLE ASSEMBLY

ITEM (2)
GROUNDSTRUT

NO BLOCKOUT
AT (POST 1)

NOTES:
1. ITEM (12) COMPOSITE BLOCKOUTS INSTALLED AT LINE POST(9) THRU LINE POST(2).
2. DO NOT INSTALL A BLOCKOUT AT LINE POST(1).

PLAN VIEW

CABLES

ITEM (5)
TRAFFIC SIDE SLIDER
(TSS) PANEL FOR RAIL 2

NOTE: SECURE THE (TSS) PANEL TO OUTSIDE OF RAIL 2 WITH THE PANEL ARROWS POINTING TOWARDS THE HEAD.

INSTALL GUARD FENCE RECESSED
HEX NUTS ON TRAFFIC-SIDE

MBGF
RAIL 2

MBGF
RAIL 1

DETAIL (C)

TRAFFIC FLOW

ITEM (25)
MAX-TENSION HEAD
SEE DETAIL (A)

END PAYMENT (SGT) BY EACH

DO NOT BOLT
RAIL TO POST 6

BEGIN LENGTH OF NEED

INSTALLATION LENGTH 55'- ½"

49'-8 ⅝"

6'-3" | 6'-3" | 6'-3" | 6'- ¾" | 6'-3" | 6'-3" | 6'-3" | 37 ½" | 5'-3 ⅜"

RAIL
HEIGHT
31"

ARROWS

RAIL
HEIGHT
31"

HEAD
HEIGHT

DETAIL (B)

32-¼"

ITEM (13) RAIL 4 | ITEM (13) RAIL 3 | ITEM (13) RAIL 2 | ITEM (13) RAIL 1

DETAIL (D)

FINISHED
GRADE

CABLES

FINISHED
GRADE

ITEM (10)
CABLE
ASSEMBLY

ITEM (2)
GROUNDSTRUT

68-⅛"

POST 9 | POST 8 | POST 7 | POST 6 | POST 5 | POST 4 | POST 3 | POST 2 | POST 1
ITEM (4)
I-BEAM
W6 X 9

NO BLOCKOUT
AT (POST 1)

(8) X-LITE LINE POST - ITEM (11)

ELEVATION VIEW

**SOIL
ANCHOR POST**
ITEM (1)

A

A

TSS PANEL
GALVANIZED
ITEM (5)

RSS PLATE
GALVANIZED
ITEM (8)

INSTALL THE TSS AND RSS
WITH THE ARROWS POINTING
TOWARDS THE MAX-HEAD

TSS PANEL AND RSS PLATE
DETAIL (D)

HEAD
HEIGHT
32-¼"

TOP OF POST

31-⅞"

FINISHED
GRADE

40-⅛"

68-⅛"
ANCHOR POST
DEPTH

ITEM (1)
ANCHOR

ITEM (11)
LINE POSTS
2 THRU 9
(NOTE: ITEM (4) POST 1 (NOT SHOWN),
TO BE INSTALLED AT SAME DEPTH
AS LINE POSTS.)

**SOIL ANCHOR, POST 1
& LINE POST 2 THRU 9**

SECTION VIEW A-A

NOTE:
USE THE MASH APPROVED
X-TENSION CABLE ASSEMBLY.

7 ⅝"

2 ⅛"

UPPER CABLE
(BACK SIDE)

LOWER CABLE
(TRAFFIC SIDE)

DETAIL (B)

CABLE
FRICTION PLATE
HEAD UNIT
ITEM (9)

NOTE:
INSTALL ⅝" RECESSED HEX
NUTS ON TRAFFIC SIDE.

ITEM (24)

ITEM (21)

ITEM (20)
8X

ITEM (17)
8X

ITEM (23)
6X
3 SCREWS
EACH SIDE

(RAIL 1)

ITEM (22)
BRACKET
SHIPPED FLAT

ITEM (3)

ITEM (16)
4X

* ITEM (25)
HIGH INTENSITY
REFLECTIVE SHEETING

NOTE: DELINEATION MARKER IN
ACCORDANCE WITH TEXAS MUTCD.

SPLICE FOR IMPACT-HEAD
TO GUARD FENCE (RAIL1)

DETAIL (A)

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800
2. FOR INSTALLATION, REPAIR, & MAINTENANCE REFER TO THE; MAX-TENSION INSTALLATION INSTRUCTION MANUAL. P/N MANMAX REV D (ECN 3516).
3. APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURE'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. ALL STEEL COMPONENTS ARE GALVANIZED PER ASTM A123 OR EQUIVALENT UNLESS OTHERWISE STATED.
6. SYSTEM SHOWN USING STEEL WIDE FLANGE POST WITH COMPOSITE BLOCKOUTS.
7. COMPOSITE MATERIAL BLOCKOUT THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST(MPL)FOR CERTIFIED PRODUCERS.
8. REFER TO INSTALLATION MANUAL FOR SPECIFIC PANEL LAPPING GUIDANCE.
9. IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL FOR INSTALLATION GUIDANCE.
10. POSTS SHALL NOT BE SET IN CONCRETE.
11. A DRIVING CAP WITH A TIMBER OR PLASTIC INSERT SHALL BE USED WHEN DRIVING POST TO PREVENT DAMAGE TO THE GALVANIZING ON TOP OF THE POST.
12. MAX-TENSION SYSTEM SHALL NEVER BE INSTALLED WITHIN A CURVED SECTION OF GUARDRAIL.
13. IF A DELINEATION MARKER IS REQUIRED, MARKER SHALL BE IN ACCORDANCE WITH TEXAS MUTCD.
14. THE SYSTEM IS SHOWN WITH 12'-6" MBGF PANELS, 25'-0" MBGF PANELS ARE ALSO ALLOWED.
15. A MINIMUM OF 12'-6" OF 12GA. MBGF IS REQUIRED IMMEDIATELY DOWNSTREAM OF THE MAX-TENSION SYSTEM.

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT.-GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	⅝" X 7" THREAD BOLT HH (GR.5)GEOMET	1
16	BSI-2001885	¾" X 3" ALL-THREAD BOLT HH (GR.5)GEOMET	4
17	4001115	⅝" X 1 ¼" GUARD FENCE BOLTS (GR.2)MGAL	48
18	2001840	⅝" X 10" GUARD FENCE BOLTS MGAL	8
19	2001636	⅝" WASHER F436 STRUCTURAL MGAL	2
20	4001116	⅝" RECESSED GUARD FENCE NUT (GR.2)MGAL	59
21	BSI-2001888	⅝" X 2" ALL THREAD BOLT (GR.5)GEOMET	1
22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
23	BSI-2001887	¼" X ¾" SCREW SD HH 410SS	7
24	4002051	GUARDRAIL WASHER RECT AASHTO FWR03	1
* 25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
** 26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
** 27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL,8-SPACE,12GA.	2
28	MANMAX Rev-(D)	MAX-TENSION INSTALLATION INSTRUCTIONS	1

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

** ALTERNATIVE ITEMS NOT SHOWN.
ITEM(26) 8" WOOD-BLOCKOUTS
ITEM(27) 25'GUARD FENCE PANELS

APPROX 5'-10"

5'-0"

50' APPROACH GRADING

STANDARD
MBGF

2'-0"

EDGE OF PAVEMENT

NOTE: ADJUST WIDTH ACCORDINGLY WHEN OFFSET IS USED. (OFFSET "OPTION" SHOWN)

2'-0" MAX.
RAIL OFFSET

APPROACH GRADING
(1V:10H OR FLATTER)
SEE PRODUCT ASSEMBLY MANUAL
FOR ADDITIONAL GUIDANCE.

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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

TRAFFIC FLOW

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

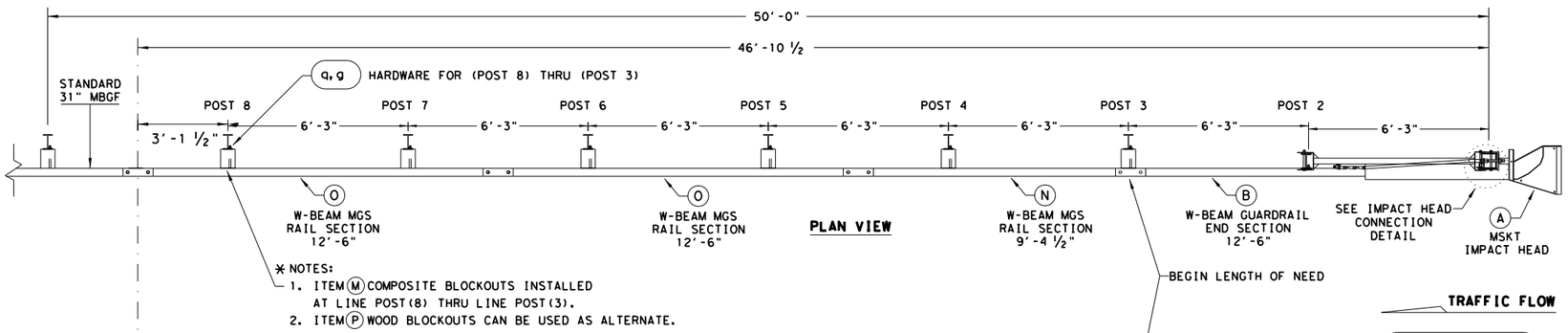
Texas Department of Transportation

Design Division Standard

MAX-TENSION END TERMINAL
MASH - TL-3
SGT(11S)31-18

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089,ETC	US 290
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		180

$TIME$
DATE: $DATE$
FILE: $FILE$



NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.

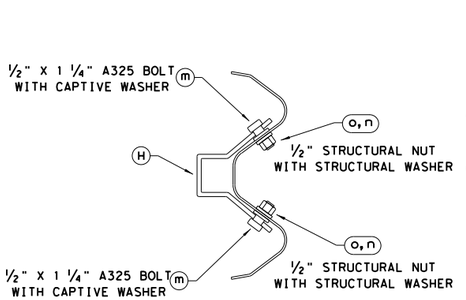
GENERAL NOTES

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

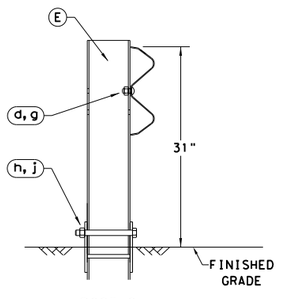
ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X ⅛" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6x9 OR W6x8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 ½")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
		SMALL HARDWARE	
a	2	⅝" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	⅝" WASHER	W0516
c	2	⅝" HEX NUT	N0516
d	25	⅝" Dia. x 1 ¼" SPLICE BOLT (POST 2)	B580122
e	2	⅝" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	⅝" WASHER	W050
g	33	⅝" Dia. H.G.R NUT	N050
h	1	¾" Dia. x 8 ½" HEX BOLT (GRD A449)	B340854A
j	1	¾" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	½" x 1 ¼" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	½" STRUCTURAL NUTS	N012A
o	8	1 1/16" O.D. x 9/16" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	⅝" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151

SEE NOTES: *

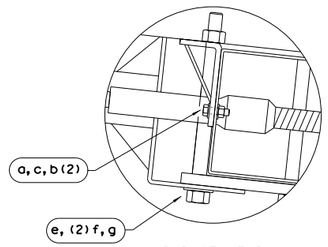
ALTERNATIVE ITEMS NOT SHOWN. **
* ITEM(P) 8" WOOD-BLOCKOUT
** ITEM(Q) 25'GUARD FENCE PANEL



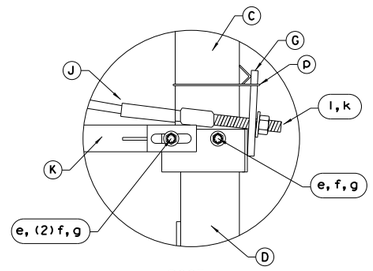
SECTION B-B
ANCHOR BRACKET



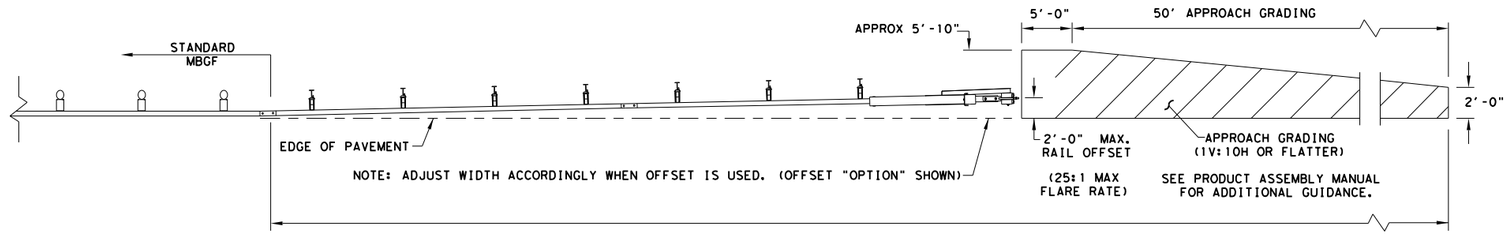
POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL



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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

Texas Department of Transportation

Design Division Standard

SINGLE GUARDRAIL TERMINAL
MSKT-MASH-TL-3
SGT(12S)31-18

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL	
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0050	06	089,ETC	US 290	
	DIST	COUNTY		SHEET NO.	
	HOU	HARRIS		181	

DATE: $DATE$ $TIME$
FILE: $FILE$

SITE DESCRIPTION

PROJECT LIMITS: US 290 FROM MUESCHKE TO WALLER COUNTY LINE

PROJECT DESCRIPTION: INSTALL NEW ITS EQUIPMENT AND INFRASTRUCTURE

MAJOR SOIL DISTURBING ACTIVITIES: TRENCHING, BORING AND DRILLING

TOTAL PROJECT AREA: NOT APPLICABLE

TOTAL AREA TO BE DISTURBED: NOT APPLICABLE

WEIGHTED RUNOFF COEFFICIENT:
(AFTER CONSTRUCTION): NOT APPLICABLE

EXISTING CONDITION OF SOIL & VEGETATIVE
COVER AND % OF EXISTING VEGETATIVE COVER: NOT APPLICABLE

NAME OF RECEIVING WATERS: NOT APPLICABLE

EROSION AND SEDIMENT CONTROLS

SOIL STABILIZATION PRACTICES:

____ TEMPORARY SEEDING
____ PERMANENT PLANTING, SODDING, OR SEEDING
____ MULCHING
____ SOIL RETENTION BLANKET
____ BUFFER ZONES
____ PRESERVATION OF NATURAL RESOURCES

OTHER: SEDIMENT CONTROL FENCE

STRUCTURAL PRACTICES:

__X__ SILT FENCES
____ HAY BALES
____ ROCK BERMS
____ DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
____ DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
____ DIVERSION DIKE AND SWALE COMBINATIONS
____ PIPE SLOPE DRAINS
____ PAVED FLUMES
____ ROCK BEDDING AT CONSTRUCTION EXIT
____ TIMBER MATTING AT CONSTRUCTION EXIT
____ CHANNEL LINERS
____ SEDIMENT TRAPS
____ SEDIMENT BASINS
____ STORM INLET SEDIMENT TRAP
____ STONE OUTLET STRUCTURES
____ CURBS AND GUTTERS
____ STORM SEWERS
____ VELOCITY CONTROL DEVICES
____ EROSION CONTROL LOGS

OTHER: ____

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES: ____

NOT APPLICABLE

STORM WATER MANAGEMENT: NOT APPLICABLE

OTHER EROSION AND SEDIMENT CONTROLS:

MAINTENANCE: All erosion and sediment controls will be maintained in good working order. If a repair is necessary it will be done at the earliest date possible, but no later than 7 calendar days after the surrounding exposed ground has dried sufficiently to prevent further damage from heavy equipment. The area adjacent to creeks and drainageways shall have priority followed by devices protecting storm sewer inlets.

INSPECTION: All inspections will be performed by a TxDOT inspector per one of the options below as directed by the Area Engineer
1. At least every 7 calendar days
2. At least every 14 days or after 0.5 inches or more of rainfall
An inspection and maintenance report should be made for each inspection. Based on the inspection results, the controls shall be revised according to the inspection report.

WASTE MATERIALS: The dumpster used to store all waste material will meet all state and local city solid waste management regulations. All trash and construction debris will be deposited in the dumpster. The dumpster will be emptied as necessary or as required by local regulation and the trash will be hauled to a local dump. No construction waste material will be buried on site.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING): In the event of a spill which may be considered hazardous, the Houston District Safety Office shall be contacted immediately at 713-802-5962.

SANITARY WASTE: ALL SANITARY WASTE WILL BE COLLECTED FROM THE PORTABLE UNITS AS NECESSARY OR AS REQUIRED BY LOCAL REGULATIONS BY A LICENSED SANITARY WASTE MANAGEMENT CONTRACTOR.

OFFSITE VEHICLE TRACKING:

____ HAUL ROADS DAMPENED FOR DUST CONTROL
____ LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
____ EXCESS DIRT ON ROAD REMOVED DAILY
____ STABILIZED CONSTRUCTION ENTRANCE

OTHER: NOT APPLICABLE

REMARKS: Disposal areas, stockpiles, and haul roads shall be constructed in a manner that will minimize and control the sediment that may enter receiving waterways. Disposal areas shall not be located in any waterway, waterbody or streambed. Construction staging areas and vehicle maintenance areas shall be constructed by the contractor in a manner which minimizes the runoff of all pollutants. All waterways shall be cleared as soon as practical of temporary embankments, temporary bridges, matting, falsework, piling, debris, and other obstructions placed during construction operations that are not part of the finished work.

STATE OF TEXAS
KENNETH PARADOWSKI
97040
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by Kenneth Paradowski P.E. 97040, on

May 23 , 2022

Kenneth Paradowski, P.E.

Texas Department of Transportation
Houston District

TxDOT STORM WATER POLLUTION PREVENTION PLAN

SWP3

FILE: STDG1.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
©TxDOT JANUARY 2007	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		182
9/2010 INSPECTION NOTE	COUNTY		CONTROL	SECT	JOB	HIGHWAY
9/2013 INSPECTION NOTE	HARRIS		0050	06	089	US 290
11/2013 SWDP TO SWP3						
05/2015 2014 SPECS						

STD G-1

I. STORMWATER POLLUTION PREVENTION

Texas Pollutant Discharge Elimination System (TPDES) TXR 150000: Stormwater Discharge Permit or Construction General Permit is required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506. Refer to Storm Water Pollution Prevention Plan (SWP3) Houston District standard plan.

No Additional Comments

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS

United States Army Corps of Engineers (USACE) Permit is required for filling, dredging, excavating or other work in water bodies, rivers, creeks, streams, wetlands or wet areas. The Contractor must adhere to all of the terms and general conditions associated with the following permit(s). If additional work not represented in the plans is required, contact the Engineer immediately.

☒ No United States Army Corps (USACE) Permit Required

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) without a Pre-Construction Notification (PCN). Project specific permit was not issued by USACE, therefore is not in the plan set. The USACE general conditions are in the “General Notes."

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) with a Pre-Construction Notification (PCN). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set. The USACE general conditions are in the “General Notes."

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Individual Permit (IP). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set.

☐ Work would be authorized by the United States Army Corps of Engineers (USACE) permit. The project specific permit issued by the USACE will be provided to the contractor.

United States Coast Guard (USCG) Permit is required for projects that involve the construction or modification (including changes to lighting) of a bridge or causeway across a water body determined to be navigable by the United States Coast Guard (USCG) under Section 9 of the Rivers and Harbors Act. If additional work not represented in the plans is required, contact the Engineer immediately.

☒ No United States Coast Guard (USCG) Coordination Required

☐ United States Coast Guard (USCG) Permit

☐ United States Coast Guard (USCG) Exemption

No Additional Comments

III. CULTURAL RESOURCES

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

No Additional Comments

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical. Refer to TxDOT Standard Specifications in order to comply with requirements for invasive species, beneficial landscaping and tree/brush removal.

No Additional Comments

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

If any of the listed species below are observed, cease work in the area, do not disturb species or habitat and contact the Engineer immediately.

The work may not remove active nests (from bridges, structures, or vegetation adjacent to the roadway, etc.) during nesting season (February 15 to 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: Feb 03, 2022
FILE:

Version 2.1

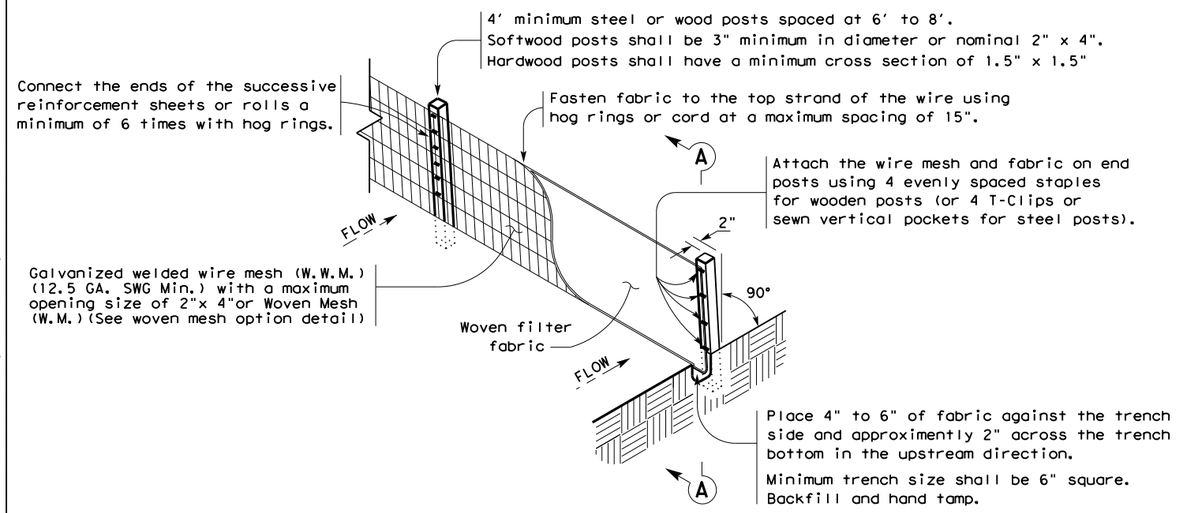
Texas Department of Transportation

TxDOT Houston District

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

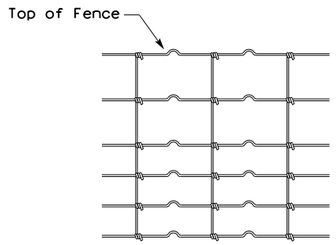
EPIC

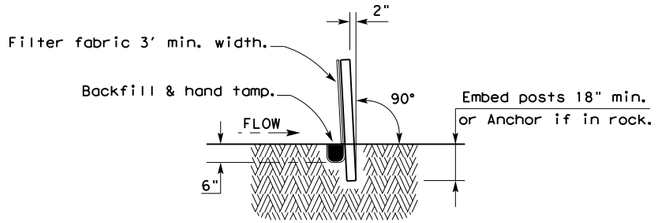
FILE: EPIC Sheet.dgn	DN:	CK:	DW:	CK:
© TxDOT: March 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0050	06	089	US 290
UPDATED section V. text and added definition (10/17) ADDED USCG and USACE notes in Section VII (04/18)	DIST	COUNTY		SHEET NO.
	Hou	Harris		183



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.

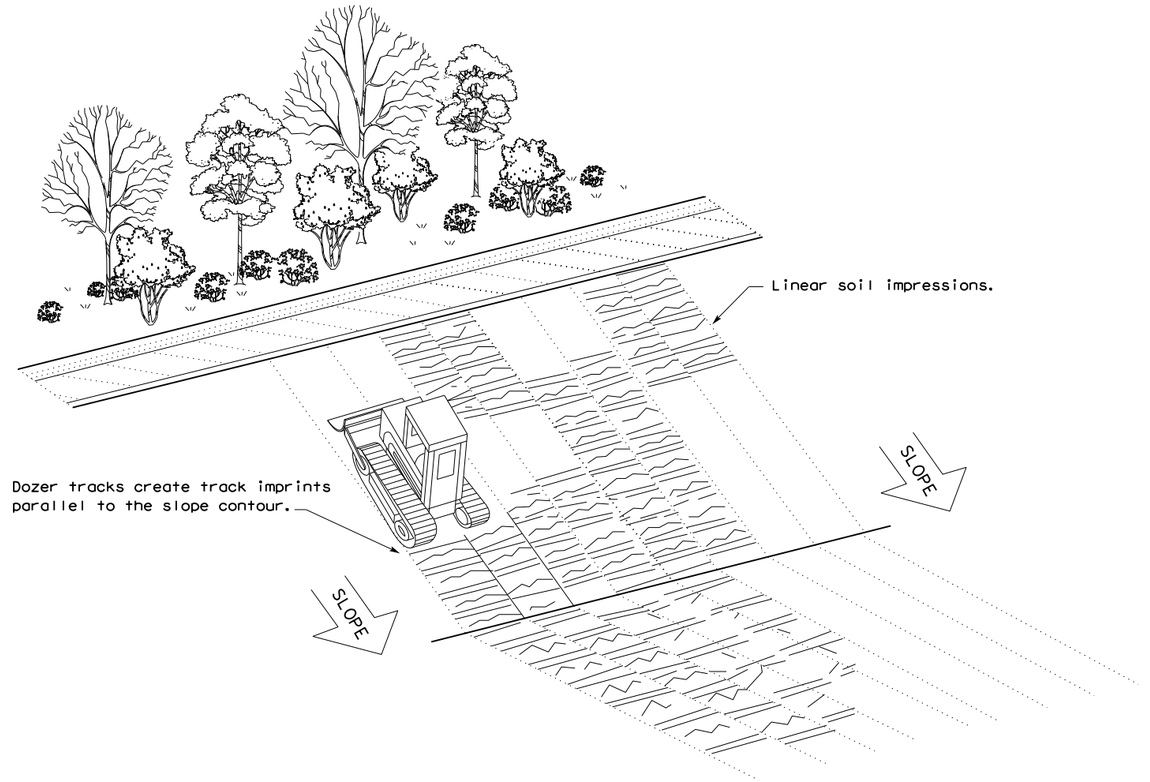
LEGEND

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	0050	06	089		US 290		
	DIST	COUNTY					SHEET NO.
	HOU	HARRIS					184