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FED.RD. DIV.NO.	STATE PROJECT NO.		SHEET NO.
6	F 2B24(014)		1
STATE	STATE DIST.	COUNTY	
TEXAS	18	COLLIN, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
0387	05	028, ETC.	FM 982, ETC.

FINAL PLANS

NAME OF CONTRACTOR: _____

DATE OF LETTING: _____

DATE WORK BEGAN: _____

DATE WORK COMPLETED: _____

DATE WORK ACCEPTED: _____

SUMMARY OF CHANGE ORDERS:

STATE OF TEXAS
TEXAS DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT
F 2B24(014)
CCSJ: 0387-05-028

COLLIN AND DENTON COUNTIES

NOTE:

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

REGISTERED ACCESSIBILITY SPECIALIST (RAS) INSPECTION REQUIRED. TDLR NO: TABS2024012469

CSJ: 0387-05-028
F 2B24(014)
FM 982 AT FM 546
IN THE CITY OF PRINCETON
COLLIN COUNTY

CSJ: 0718-01-076
F 2B24(014)
FM 156 AT DOUBLE EAGLE BLVD
IN THE CITY OF JUSTIN
DENTON COUNTY

CSJ: 1567-01-044
F 2B24(014)
FM 720 AT MARTINGALE TRAIL
IN THE CITY OF OAK POINT
DENTON COUNTY

CSJ: 1785-01-042
F 2B24(014)
FM 407 AT IT NEELY ROAD
IN THE TOWN OF BARTONVILLE
DENTON COUNTY

CSJ: 1785-01-042
F 2B24(014)
FM 407 AT RAYZOR RD
IN THE TOWN OF BARTONVILLE
DENTON COUNTY

CSJ: 1950-01-041
F 2B24(014)
FM 407 AT VICKERY BLVD
IN THE TOWN OF COPPER CANYON
DENTON COUNTY

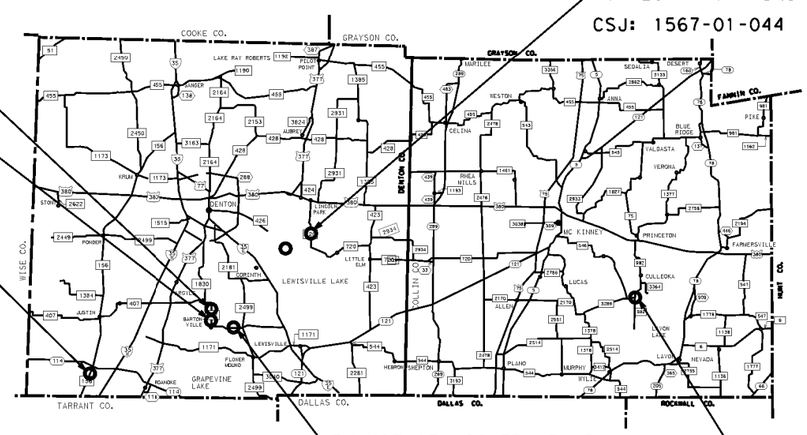
TYPE: FOR THE CONSTRUCTION OF TRAFFIC CONTROL DEVICES CONSISTING OF INSTALLATION OF TRAFFIC SIGNALS

FM 407 AT IT NEELY RD
CSJ: 1785-01-042

FM 407 AT RAYZOR RD
CSJ: 1785-01-042

FM 156 AT DOUBLE EAGLE BLVD
CSJ: 0718-01-076

FM 720 AT MARTINGALE TRAIL
CSJ: 1567-01-044



FM 407 AT VICKERY BLVD
CSJ: 1950-01-041

FM 982 AT FM 546
CSJ: 0387-05-028

SCALE 0 5 10 15 MILES

DALLAS DISTRICT

NO RAILROAD
NO EXCEPTIONS
NO EQUATIONS

Texas Department of Transportation

SUBMITTED FOR LETTING 2/29/2024
Docusigned by:
Eyad Fanous , P.E.
TRAFFIC DESIGN SUPERVISOR
7C074158193648D...

APPROVED FOR LETTING 2/29/2024
Docusigned by:
JEFFREY BUSH , P.E.
DIRECTOR OF TRAFFIC OPERATIONS
345B765EB03F406...

WORK WAS COMPLETED ACCORDING TO THE PLANS AND CONTRACT.

_____, P.E.
Signature of Registrant & Date

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INDEX OF SHEETS

STATE OF TEXAS
CODY R. YEAROUT
139576
LICENSED PROFESSIONAL ENGINEER

Cody R. Yearout 3/1/2024
Digitally signed by CODY R. YEAROUT, P.E. Date

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

Texas Department of Transportation
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INDEX OF SHEETS

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CY	6	SEE TITLE SHEET		FM 982,ETC.
GRAPHICS CY	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK CY	TEXAS	18	COLLIN,ETC.	2
CHECK EF	CONTROL	SECTION	JOB	
	0387	05	028,ETC.	

GENERAL

The construction, operation and maintenance of the proposed project will be consistent with the state implementation plan as prepared by the Texas Commission on Environmental Quality.

The disturbed area for this project, as shown on the plans is 0.0429 acres (FM 982 at Fm 546), 0.0429 acres (FM 156 at Double Eagle Blvd), 0.0429 acres (FM 720 at Martingale Trail), 0.0429 acres (FM 407 at IT Neely Drive), 0.0429 acres (FM 407 at Rayzor Road), 0.0429 acres (FM 407 ay Vickery Blvd). However, **the Total Disturbed Area** (TDA) will establish the required authorization for storm water discharges. The TDA of this project will be determined by the sum of the disturbed area in all project locations in the contract, and all disturbed area on all Project-Specific Locations (PSL) located in the project limits and/or within 1 mile of the project limits. The department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction site as shown on the plans, according to the TDA of the project. The contractor will obtain any required authorization from the TCEQ for the discharge of storm water from any PSL for construction support activities on or off of the project row according to the TDA of the project. When the TDA for the project exceeds 1 acre, provide a copy of the appropriate application of permit (NOI, or Construction Site Notice) to the engineer, for any PSL located in the project limits or within 1 mile of the project limits. Follow the directives and adhere to all requirements set forth in the TCEQ, Texas Pollution Discharge Elimination System, Construction General Permit (TPDES, CGP).

Leave all right of way areas undisturbed until actual construction is to be performed in said areas.

Provide the Engineer with a copy of all DBE subcontractor agreements prior to commencing work.

Questions may be submitted via the Letting Pre-Bid Q&A web page. This webpage can be accessed from the Notice to Contractors dashboard located at the following Address:
https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors
or Contractor questions on this project are to be addressed to the following individual(s):

Engineer's Email: Christopher.Blain@txdot.gov
Construction Manager's Email: Eric.Herman@txdot.gov
Construction Record-Keeper's Email: Anthony.Block@txdot.gov

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

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

Item 5:

Underground utilities owned by the Texas Department of Transportation may be present within the Right-Of-Way on this project. For signal, illumination, surveillance, and communications & control maintained by TxDOT, call the TxDOT Traffic Signal Office (214-320-6682) for locates a minimum of 48 hours in advance of excavation. For irrigation systems, call TxDOT Maintenance Landscape Office (214-320-6636) for locates a minimum of 48 hours in advance of excavation. If city or town owned irrigation facilities are present, call the appropriate department of the local city or town a minimum of 48 hours in advance of excavation. The Contractor is liable for all damages incurred to the above mentioned utilities when working without having the utilities located prior to excavation.

For the project to be deemed complete, permanently stabilize all unpaved disturbed areas of the project with a vegetative cover at a minimum of 70% density for the control of erosion.

Ensure a representative of the Prime Contractor is available on the project site at all times when work is being performed by the Prime Contractor or sub-contractor(s) to receive instructions from the Engineer or authorized Department representative.

Submit all shop drawings, working drawings, or other documents which require review sufficiently in advance of scheduled construction to allow no less than thirty (30) calendar days for review and response.

Locate all utilities, both underground and above ground, in the project area prior to beginning work so that conflicts are avoided.

Provide to the Engineer, in addition to any submittals required by the specifications and elsewhere in the general notes, a list of pre-qualified material to be used on this project.

Item 6:

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

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

The Buy America Material Classification Sheet is located at the below link.

https://www.txdot.gov/business/resources/materials/buy-america-material-classification-sheet.html for clarification on material categorization.

Item 7:

Repair or replace any structures and utilities that might have been damaged by negligence or a failure to have utility locates performed.

Perform all electrical work in accordance with the National Electrical Code and Texas Department of Transportation Specifications.

Consult with appropriate electric company representatives according to their respective area to coordinate electrical services installations.

Contractor will be responsible for all costs associated with locating and/or exposing existing utilities. This includes existing utilities that may have been mismarked by the locator and/or utilities that are in the near vicinity of proposed construction. In addition, this includes all costs associated with pot-holing, mechanical vacuuming, hand-digging, etc. as needed to properly locate and protect all existing utilities.

Holiday restrictions – The Engineer may decide that no lane closures or construction operations shall be allowed during the restricted periods listed in the following holiday schedule. TxDOT has the right to lengthen, shorten, or otherwise modify these restricted periods as actual, or expected, traffic conditions may warrant. Working days will not be charged for these restricted periods. No additional compensation will be allowed for these closures (i.e., overhead, delays, stand-by, barricades or any other associated cost impacts).

- New Year's Eve & Day (5 am on December 31 thru 10:00 pm January 1)
- Easter Holiday weekend (5 am on Friday thru 10:00 pm Sunday)
- Memorial Day weekend (5 am on Friday thru 10:00 pm Monday)
- Independence Day (5 am on July 3 thru 10:00 pm on July 5)
- Labor Day weekend (5 am on Friday thru 10:00 pm Monday)
- Thanksgiving Holiday (5 am on Wednesday thru 10:00 pm Sunday)
- Christmas Holiday (5 am on December 23 thru 10:00 pm December 26)

No significant traffic generator events identified.

Item 8:

This project will be a Standard Workweek in accordance with Article 8.3.1.4.

Meet daily with the Engineer to notify him or her of planned work for the day and to provide 24 hour notice of lane closures for planned work for the next day. Do not close lanes for which this requirement is not met. No work is to be performed without prior coordination with the Engineer.

A 90 day construction delay is included in this contract through Special Provision 008-056. This delay is included for material acquisition.

Item 162:

Install block sod as directed by the Engineer.

Item 168:

Water once a day where sod is installed. Include cost for this work in the unit bid price for this item.

Item 360:

Use of multiple piece tiebars will be required. Provide chairs for multiple piece tiebars, threaded connectors or other adequate devices, used in concrete paving, or tie them to the pavement reinforcing steel. If approved by the engineer for specific areas, in lieu of multiple piece tiebars, drill holes into the pavement and grout straight tiebars in place with epoxy. Use a non-impact, rotary core drill to prevent damage to the pavement unless otherwise directed. Clean the drill holes and then completely fill with epoxy before inserting the tiebar. Do not bend the tiebars or insert them into plastic concrete without the approval of the engineer.

Place construction, sawed and contraction joints in accordance with the pavement detail sheet and as directed. Joint locations, other than as shown on the plans, are subject to approval.

Item 361:

Provide Class HES concrete designed to attain a minimum average flexural strength of 255 psi or a minimum average compressive strength of 1,800 psi within the allowed lane closure times.

All permanent pavement markings which are removed during the removal of the existing concrete pavement are to be replaced as directed by the Engineer. These pavement markings will not be paid for directly, but will be considered subsidiary to this bid item.

Tining will be required as described in Item 360.4.8.3 unless otherwise directed by the Engineer. Surface Test Type A utilizing a 10' straight edge as described under Item 585 will be required unless otherwise directed by the Engineer.

Item 416:

Drilled shafts shall be drilled and poured on the same day unless directed by the engineer.

Provide a formed smooth finish for all portions of drill shafts extending above proposed ground. Include cost for this work in the unit bid price for this item.

Traffic signal pole foundations will be paid for once regardless of extra work caused by obstructions.

Concrete removal required for installation of drilled shafts will be subsidiary to Item 416.

Item 421:

Furnish mix designs to the Engineer in a format compatible to the latest version of the Department's Construction Management System (SiteManager). Mix Design templates will be provided by the Engineer.

Provide sulfate resistant concrete for all drilled shafts.

Provide all freshly mixed concrete testing equipment as required by subsection 3.3, except as noted here. Curing facilities, maturity meters, and strength-testing equipment will not be required. Air content testing is waived for this project. All testing equipment shall be clean and in like-new condition. Test molds shall be 4" diameter x 8" tall.

Item 440:

Fiber Reinforced Concrete (FRC) can be used as a substitute for Non-Structural Class Reinforced Concrete in Mow-Strip and Rip Rap Items as approved. FRC may also be used for other Non-Structural Class Reinforced Concrete Items as approved.

Item 449:

Use Thomas & Betts Kopr-Shield, MG Chemicals #846, MG Chemicals #8463, NYOGEL #756G, Pro-Shield #7308, Cho-Lube #4220, or other approved electrically conducting lubricant compound.

Item 500:

Material On Hand (MOH) will not be used in calculating partial payments for Mobilization.

Item 502:

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.

Access will be provided to all business and residences at all times. Where turning radii are limited during phased construction at intersections, provide all weather surfaces such as RAP or base in turning movements to accommodate and to protect the traffic from edge drop-offs. Materials, labor, maintenance and removal for these temporary accesses and radii will not be paid for directly but will be considered subsidiary to the various bid items.

Place barricades and signs in locations that do not obstruct the sight distance of drivers entering the highway from driveways or side streets.

Do not commence work on the road before sunrise. Do not operate or park any equipment/machinery closer than 30 feet from the traveled roadway after sunset unless authorized by the engineer.

When moving unlicensed equipment on or across any pavement or public highways, protect the pavement from all damage using an acceptable method.

As approved by the Engineer, provide uniformed off duty police officers and squad cars during lane or ramp closures, night time work or other situations that indicate a need for additional traffic control to protect the traveling public or the construction workforce. Provide documentation such as payroll, log sheets with signatures and badge number, or invoices from the government entity providing the officers for reimbursement. Complete the weekly tracking form provided by the department and submit invoices that agree with the tracking form for payment at the end of each month approved services were provided. Reimbursement will not be made for coordination fees charged by the police department.

Limit lane closures to the hours between 9:00 am and 3:30 pm. Work in other areas of the project is not restricted to this time frame.

Item 506:

Install Biodegradable Erosion Control Logs as directed by the Engineer.

Item 529:

Provide grooved joints at 10-foot intervals and ¾ inch expansion joint material for doweled curb at the same locations as on the existing pavement.

For Curb and Gutter sections, provide grooved joints at 10-foot intervals and ¾ inch expansion joint material at a maximum of 50-foot centers and at all radius points and inlets.

Curb and Gutter transitions will be paid for by the foot at the unit price for the corresponding curb or curb and gutter section.

Saw joints at the same location as on the existing pavement.

Item 531:

Joint Sealing is subsidiary to Item 531.

Item 618:

The location of conduits and ground boxes are diagrammatic only and may be shifted to accommodate field conditions as directed.

Secure permission and approval from the proper authority prior to cutting into or removing any sidewalks or curbs for installation of this Item.

When holes are drilled through concrete structures, use a coring device. Do not use masonry or concrete drills.

Place conduit under existing pavement by an approved boring method. Do not place boring pits closer than 2 feet from the edge of the pavement unless otherwise directed. Do not use water jetting. When conduits are bored, do not exceed 18 inches in the vertical and horizontal tolerances as measured from the intended target point.

Do not use a pneumatically driven device for punching holes beneath the pavement (commonly known as a "missile").

Furnish and install a flat, high tensile strength polyester fiber pull tape in conduit runs in excess of 50 feet or for future use and protected with standard weather-tight conduit caps, as approved. Acceptable products include Garvin # PT-1250-3K, ComStar PUL 1250P3K, Ideal Part No. 31-315 or equal as approved by the Engineer. This work will not be paid for directly, but is subsidiary to this Item.

Use a colored cleaner-primer on all PVC to PVC joints before application of PVC cement.

Seal all conduit ends with a permanently soft, non-toxic duct seal. Use a duct seal that does not adversely affect other plastic materials or corrode metals.

Where sidewalk is removed to install trenched conduit, replace sidewalk to match existing material. This work will be subsidiary to Item 618 except where shown otherwise in the plans.

2" Schedule 80 PVC will be used at the power pole to supply electricity to underground services.

Item 620:

The equipment grounding conductor smaller than 4 AWG shall be identified by a continuous green colored jacket insulation or bare wire. Grounded conductors (Neutral) smaller than 4 AWG shall be identified by a continuous white colored jacket. Ungrounded conductors (Hot) in a 120/240v system shall be identified by each pole or leg. For 240-volt branch circuit fed from 120/240 source, ensure one leg is identified by a continuous black colored jacket and the other leg by a continuous red colored jacket.

Item 624:

Slack conductors required by Standard Sheet ED(3)-14 will be subsidiary to Item 624.

Concrete removal required for installation of ground boxes will be subsidiary to Item 624.

Item 628:

Contact the appropriate utility company during the first three weeks of the project lead-time period to allow adequate time for any necessary utility adjustments, transformer installation, etc.

Contractor shall submit an online request at ONCOR.com by following the steps below:
Select Construction and Development tab at top of screen.
Scroll down to New Construction and select Learn More.
Select the Start Request icon under the Commercial and Industrial project type.
Select the One Single Building Facility tab and fill in all required information.
Submit the request. An ONCOR representative will contact you within a few days.

Granite concrete service pole embedment depth shall be 10' and shall be a minimum of 25' above grade.

Backfill Granite Concrete service poles with a Class A concrete in accordance with Item 421, "Hydraulic Cement Concrete", except consider the concrete subsidiary to Item 628 for payment purposes.

The Meter Base shall be mounted facing the roadway and the service enclosure shall be mounted on the opposite side of the service pole or pedestal.

The Contractor shall obtain the street address of the new electrical service directly from the applicable City.

Label the service enclosures indicating service address as well as all required information as shown on the Electrical Detail (ED) standard sheets. Labeling shall be silk screening or other acceptable method. This work will not be paid for directly, but is subsidiary to this Item.

A Licensed Master Electrician shall oversee the installation of all electrical services.

Bill the electrical service power usage to the Texas Department of Transportation.

On the outside lower front of each electrical service meter base cover, install a 12 gauge minimum thickness stainless steel, aluminum or brass placard. The placard shall be engraved or stamped with the numeric portion of the street address and permanently affixed to the cover with exterior rated adhesive so as not to interfere with the operation of the latch. This work will not be paid for directly, but is subsidiary to this Item.

Item 644:

Prior to taking elevations to determine lengths for fabrication of sign posts, obtain verification of all proposed locations.

All sign mounts shall have a clamp base system for all small roadside sign assemblies.

A 3 inch strip of red reflective sheeting shall be placed on all Do Not Enter sign assemblies. This sheeting shall be placed directly below the Do Not Enter sign for the entire length of the sign post facing wrong way traffic. This work will be considered subsidiary to Item 644.

Item 656:

Before placing the concrete for the controller foundations at the signals on FM 407, coordinate with the Town of Flower Mound to ensure that the anchor bolt spacing will match the anchor bolts and cabinet supplied by the city.

Form a 3/4-inch chamfer on the top edge of each pedestal pole foundation.

Probe for utilities and underground structures prior to drilling foundations. Foundations shall be paid for once regardless of extra work caused by obstructions.

Item 662 and 672:

Black adhesive will be used on asphalt pavements and white adhesive will be used on concrete pavements.

Item 677:

A water blasting method approved by the Engineer will be the only method allowed for the removal of permanent and temporary pavement markings except on a sealcoat surface. A 2 foot wide sealcoat will be required on sealcoat surfaces to eliminate permanent and temporary pavement markings.

Item 680:

Requirements for this Item include the following work, all of which are subsidiary to this Item:

1. Notify the Traffic Projects Office at DAL_TPO@txdot.gov and the town of Flower Mound for the signals on FM 407 one week before beginning any work involving traffic signals.
   Supplement email correspondence with the District Signal Maintenance Office at (214)320-6682 and Construction Office at
   (214)319-6406.
2. Provide submittal literature for all traffic signal equipment before installation.
3. Furnish and install a new controller (eight phase NEMA TS 2 Type 1) and cabinet (NEMA TS 2 Size 6, 16 position load bay), meeting the requirements of Departmental Materials Specifications DMS-11170. Provide detector panel toggle switches that additionally permit the user to disconnect the detector. Provide new MMU with Ethernet port.
   Install the town supplied traffic signal controller and cabinet at the signals on FM 407.
4. Deliver the cabinet, controller, and accessories (with all cabinet components completely connected and securely strapped down) to the District Signal Shop, 4777 E Hwy 80, Mesquite, for testing. Notify the District Signal Shop two working days before delivery at

(214)320-6682. For the signals on FM 407, coordinate delivery and testing of the cabinet, controller, and accessories with the town of Flower Mound.

5. Install the controller cabinet in an orientation as directed.
6. Connect all field wiring to the controller assembly, including SSR coaxial cable termination into the polyphaser. The District or the town of Flower Mound for the signals at FM 407 will assist in determining how the detection cables are to be connected, and will also program the controller for operation, hook up the malfunction management unit (MMU) or conflict monitor, detector units, and other equipment, and turn on the controller. Pick up the signal cabinet from the District Signal Shop or the Town of Flower Mound for the Signals on FM 407. Have a qualified technician and a representative from the controller supplier on the project site to place the traffic signals in operation.
7. Furnish and install all sign panels for mounting on signal poles, mast arms, and span wires. Fabricate the sign panels in accordance with Item 636, and mount with Astro-Sign Brac, Signfix aluminum channel, or equal as approved by the Engineer. Submit five (5) sets of shop drawings for street name signs.
   Install the sign panels supplied for mounting on signal poles, mast arms, and span wires. Furnish and install all other signs in accordance to Item 636. Furnish all mounting hardware for all signs. Mount signs with Astro-Sign Brac, Signfix aluminum channel, or equal as approved by the Engineer.
8. Provide 250W Equivalent LED Fixtures with 120 – 277 volt electronic LED drivers as shown on the Material Producers List.
9. Remove the existing stop sign panels or assemblies after the traffic signals are in operation.
10. Install the emergency vehicle preemption equipment supplied by the Towns of Bartonville and Copper Canyon.
11. Install all the Signal Equipment provided by the town of Flower Mound for the signals on FM 407.
12. Have a qualified technician on the project site to place the traffic signal in operation.
13. Use qualified personnel to respond to and diagnose all trouble calls during the thirty-day test period. Repair any malfunction to Contractor-supplied signal equipment. Provide to the Engineer a local telephone number, not subject to frequent changes and available on a 24-hour basis, for reporting trouble calls. Response time to reported calls must be less than 2 hours. Make appropriate repairs within 24 hours. Place a logbook in the controller cabinet and keep a record of each trouble call reported. Notify the Engineer of each trouble call. Do not clear the error log in the conflict monitor or MMU during the thirty-day test period without approval.
14. Furnish a spare controller (eight-phase NEMA TS 2 Type 1) and base-mount cabinet (NEMA TS 2 Size 6, 16 position load bay), meeting the requirements of Departmental Materials Specifications DMS-11170. Provide detector panel toggle switches that additionally permit the user to disconnect the detector. Provide new MMU with Ethernet port.
15. When the work required by this contract has been satisfactorily completed on any individual or inter-connected system of signalized intersections, final clean-up has been performed, and the traffic signal equipment supplied has operated continuously and satisfactorily for at least 30 days, release from further maintenance on that particular intersection is authorized. This partial acceptance, made in writing, does not void or alter any of the terms of the contract.

16. Prevent any damage to property owner's poles, fences, shrubs, mailboxes, etc. Protect all underground and overhead utilities and repair any damage. Provide access to all driveways during construction.
17. Integrate the proposed traffic signal(s) into the existing closed loop system as shown on the plans. CENTRACS closed loop software, which utilizes Econolite Cobalt controllers, is currently in use in the Dallas District. Provide controllers on this project that fully communicate with the existing closed loop system.
18. The concrete foundation for the controller as shown on standard TS-CF is diagrammatic and the dimensions will be adjusted in the field to fit existing conditions.

Item 682:

Install signal head attachments so that the wiring to each signal head passes from the mast arm through the attachment hardware to the signal head. Do not leave cable or wiring exposed.

Provide signal head attachments that allow for adjustment about the horizontal and vertical axis.

Provide aluminum pedestrian and vehicle signal heads in the following color: Federal Yellow #13538 of Federal Standard 595. Provide non-painted aluminum tubing. Provide back plates, louvers, and the inside of visors with a flat black finish. Provide aluminum vented back plates for all traffic signal heads.

Turn down signal heads or cover with burlap or other material, as approved, until traffic signal is placed in operation.

Mount signal heads level and plumb and aim as directed.

Item 684:

Provide 18 AWG Type C signal cables for loop detector lead-ins.

Provide stranded 14 AWG Type A signal cables for LED signal heads and stranded 12 AWG Type C cables for APS units.

Provide a separate multi-conductor signal cable (14 AWG) inside pedestal poles and signal poles from the terminal strip to each signal head as shown on the plans.

Identify each cable as shown on the plans (cable 1, etc.) with permanent marking labels (Panduit Type PLM standard single marker tie, Thomas&Betts Type 548M, or equal) at each ground box, pole base, and controller.

Item 686:

Provide 12 circuit Buchanan Type 112SN, Kulka Type 985-GP-12 CU, or equal terminal strips in the signal pole access compartment. Provide additional terminal strips of 8 circuits each when more than 12 circuits are required. The conductors for the line and load side of the terminal strip

shall be identified with a plastic label with two straps per tag. The load side shall have each signal head and ped head identified on the tag.

Mark pole shafts and mast arms with the identification numbers from the plans to facilitate field-assembly. Identify pole shafts and mast arms by intersection for projects with multiple intersections.

Provide nuts on top and bottom (double nuts) of the base plate as shown on the plans.

Set anchor bolts for mast arm signal poles and strain poles so that two are in tension and two are in compression. Obtain approval of anchor bolt placement before placing concrete.

Provide vertical clearance of 17 to 19 feet from the roadway to the lowest point of the signal head or mast arm. Except for supplemental nearside signal heads, all signal heads must be installed at least 40' from the stop line. If field adjustments result in the nearest signal head being more than 180' from the stop line, install a supplemental nearside signal head as directed by the engineer. Determine the field measurements and elevations from the actual field location of the poles, considering all above and below ground utilities and existing roadway elevations.

Provide vibration dampers for mast arms 28 feet to 48 feet in length. Install as shown on MA-DPD.

For mast arm poles designated with an ILSN bid code, the ILSN arm, clamps, bolts, and washers will be considered part of the complete pole assembly. The ILSN signs and mounting hardware will be furnished by the applicable City.

Provide 3 pipe plugs for wiring access on strain poles.

Provide a three piece bracket assembly on strain poles or drill the pole and use thimble eye bolts to attach the strain vise for the span wire.

Item 687:

Provide 12 circuit Buchanan Type 112SN, Kulka Type 985-GP-10 CU, or equal terminal strip in the pedestal pole base. The conductors for the line and load side of the terminal strip shall be identified with a plastic label with two straps per tag. The load side shall have each signal head and ped head identified on the tag.

Item 688:

Verify the location of the APS units and the direction of the arrows on the signs prior to installation.

Contractor shall provide a digital copy of the APS messages to TxDOT for all new APS Units on the project. Coordinate with the town of Flower Mound for the new APS units on FM 407.

APS Units shall operate with hardwired connections for the communications path between the APS Units and the APS controller.

Item 6058:

The BBU will be installed with the controller on the concrete pad paid for under Item 680. If a larger pad is needed to accommodate the BBU, the additional labor and material will be subsidiary to this item.

Item 6185:

The total number of truck mounted attenuators (TMA) required when utilizing the traffic control standards are shown in the tables below.

TCP 1 Series	Scenario		Required TMA	
(1-1)-18 / (1-2)-18			1	
(1-3)-18	A	B	1	2
(1-4)-18 / (1-5)-18 / (1-6)-18			1	

WZ (BTS) Series	Scenario	Required TMA
(BTS-1)-13	Near Side Lane Closure	1

Shadow vehicles equipped for truck mounted attenuators (TMA) for stationary operations will be paid for by the day and must be available for use at any time as determined by the Engineer.

Therefore, 1 total shadow vehicle with TMA will be required for this type of work. The contractor will be responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs needed for the project for those times per plan requirements. Additional TMAs used that are not specified in the plans in which the contractor expects compensation will require prior approval from the Engineer.

Item 6292:

All additional items such as poles, conduit, cable, etc. required to achieve the detection specified in the plans will not be paid for separately, but will be considered subsidiary to this item.

Item 6306:

Install the Video Processor System so that it interfaces with the traffic controller unit (CU) via the detector rack. If the manufacturer does not have a product to interface via the detector rack, interface via SDLC.

If the camera locations shown in the plans do not allow for proper sight of the proposed detection zones, relocate the cameras as needed and as directed. This labor and material cost will not be paid separately, but is subsidiary to this item.

The list of material below is for the Contractor's information only.
It is the responsibility of the Contractor to verify
all items and quantities listed below.

LIST OF MATERIAL/LABOR
SUBSIDIARY TO ITEM 680

FM 982 AT FM 546

DESCRIPTION	UNIT	QUANTITY
250W EQ LED LUMINAIRE	EA	4
8 PHASE NEMA CONTROLLER COMPLETE W/ CABINET AND ACCESSORIES	EA	1
TRAFFIC SIGNAL CONTROLLER BASE	EA	1
REGULATORY SIGN PANEL (R10-12,ETC)	EA	2
SINGLE STREET NAME SIGN PANEL	EA	4
REMOVE EXISTING STOP SIGN PANEL	EA	2
CONCRETE FOUNDATION (8' X 9' X 6", CLASS B)	CY	1.33

FM 720 AT MARTINGALE TRAIL

DESCRIPTION	UNIT	QUANTITY
250W EQ LED LUMINAIRE	EA	4
8 PHASE NEMA CONTROLLER COMPLETE W/ CABINET AND ACCESSORIES	EA	1
TRAFFIC SIGNAL CONTROLLER BASE	EA	1
REGULATORY SIGN PANEL (R10-12,ETC)	EA	4

INSTALL CITY SUPPLIED ILSN SIGNS	EA	4
REMOVE EXISTING STOP SIGN PANEL	EA	2
CONCRETE FOUNDATION (8’ X 9’ X 6”, CLASS B)	CY	1.33

FM 407 AT IT NEELY RD

DESCRIPTION	UNIT	QUANTITY
250W EQ LED LUMINAIRE	EA	3
INSTALL CITY SUPPLIED TRAFFIC CONTROLLER W/ CABINET, BASE AND ACCESSORIES	EA	1
INSTALL CITY SUPPLIED BBU W/ CABINET	EA	1
INSTALL CITY SUPLIED OPTICOM EQUIPMENT	LS	1
REGULATORY SIGN PANEL (R10-12,ETC)	EA	2
INSTALL CITY SUPPLIED STREET NAME SIGN PANEL	EA	3
REMOVE EXISTING STOP SIGN PANEL	EA	2
CONCRETE FOUNDATION (8’ X 9’ X 6”, CLASS B)	CY	1.33

FM 407 AT RAYZOR RD

DESCRIPTION	UNIT	QUANTITY
250W EQ LED LUMINAIRE	EA	3
INSTALL CITY SUPPLIED TRAFFIC CONTROLLER W/ CABINET, BASE AND ACCESSORIES	EA	1
INSTALL CITY SUPPLIED APS BUTTONS	EA	2
INSTALL CITY SUPPLIED BBU W/ CABINET	EA	1
INSTALL CITY SUPLIED OPTICOM EQUIPMENT	LS	1

REGULATORY SIGN PANEL (R10-12,ETC)	EA	7
SINGLE STREET NAME SIGN PANEL	EA	3
REMOVE EXISTING STOP SIGN PANEL	EA	1
CONCRETE FOUNDATION (8’ X 9’ X 6”, CLASS B)	CY	1.33

FM 407 AT VICKERY BLVD

DESCRIPTION	UNIT	QUANTITY
250W EQ LED LUMINAIRE	EA	4
INSTALL CITY SUPPLIED TRAFFIC CONTROLLER W/ CABINET, BASE AND ACCESSORIES	EA	1
INSTALL CITY SUPPLIED APS BUTTONS	EA	6
INSTALL CITY SUPPLIED BBU W/ CABINET	EA	1
INSTALL CITY SUPLIED OPTICOM EQUIPMENT	LS	1
REGULATORY SIGN PANEL (R10-12,ETC)	EA	6
INSTALL CITY SUPPLIED STREET NAME SIGN PANEL	EA	4
REMOVE EXISTING STOP SIGN PANEL	EA	1
CONCRETE FOUNDATION (8’ X 9’ X 6”, CLASS B)	CY	1.33

FM 156 AT DOUBLE EAGLE BLVD

DESCRIPTION	UNIT	QUANTITY
250W EQ LED LUMINAIRE	EA	4
8 PHASE NEMA CONTROLLER COMPLETE W/ CABINET AND ACCESSORIES	EA	1
TRAFFIC SIGNAL CONTROLLER BASE	EA	1

REGULATORY SIGN PANEL (R10-12,ETC)	EA	6
SINGLE STREET NAME SIGN PANEL	EA	4
REMOVE EXISTING STOP SIGN PANEL	EA	1
CONCRETE FOUNDATION (8’ X 9’ X 6”, CLASS B)	CY	1.33

LIST OF MATERIAL
FURNISHED BY THE CITY OF OAK POINT

DESCRIPTION	UNIT	QUANTITY
ILSN SIGNS	EA	4

LIST OF MATERIAL
FURNISHED BY THE TOWN OF BARTONVILLE

DESCRIPTION	UNIT	QUANTITY
OPTICOM CABLE	LF	786
OPTICOM DETECTOR W/MOUNTING BRACKET	EA	6
OPTICOM MODULES (2-CHANNEL)	EA	4
OPTICOM CARD RACK AND HARNESS	EA	2
OPTICOM CONTROLLER ASSEMBLY COMPLETE WITH CABINET AND ACCESSORIES	EA	2
STREET NAME SIGN PANELS	EA	3

LIST OF MATERIAL
FURNISHED BY THE TOWN OF COPPER CANYON

DESCRIPTION	UNIT	QUANTITY
OPTICOM CABLE	LF	697
OPTICOM DETECTOR W/MOUNTING BRACKET	EA	4

OPTICOM MODULES (2-CHANNEL)	EA	2
OPTICOM CARD RACK AND HARNESS	EA	1
OPTICOM CONTROLLER ASSEMBLY COMPLETE WITH CABINET AND ACCESSORIES	EA	1
STREET NAME SIGN PANELS	EA	4

LIST OF MATERIAL
FURNISHED BY THE TOWN OF FLOWER MOUND

DESCRIPTION	UNIT	QUANTITY
TRAFFIC SIGNAL CONTROLLER/CABINET W/ BASE AND ACCESSORIES	EA	3
POLARA APS PUSH BUTTONS	EA	8
BBU W/ CABINET	EA	3
PED CENTRAL UNIT	EA	2
VIVDS CABLE	LF	272
VEHICLE DETECTION SYSTEM	EA	3
VIVDS CAMERA ASSEMBLY	EA	3

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0387-05-028 **DISTRICT** Dallas **COUNTY** Collin, Denton
HIGHWAY FM 156, FM 407, FM 720, FM 982

				0387-05-028		0718-01-076		1567-01-044		1785-01-042		1950-01-041		TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB													
		PROJECT ID		**A00207219**		**A00207213**		**A00207209**		**A00207205**		**A00207221**			
		COUNTY		**Collin**		**Denton**		**Denton**		**Denton**		**Denton**			
		HIGHWAY		**FM 982**		**FM 156**		**FM 720**		**FM 407**		**FM 407**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	104-6011	REMOVING CONC (MEDIANS)	SY					10.000						10.000	
	104-6015	REMOVING CONC (SIDEWALKS)	SY					46.700		23.000				69.700	
	104-6029	REMOVING CONC (CURB OR CURB & GUTTER)	LF							75.000				75.000	
	162-6002	BLOCK SODDING	SY					46.700		34.100				80.800	
	168-6001	VEGETATIVE WATERING	MG					1.000		1.000				2.000	
	251-6034	REWORK BS MTL (TY C) (8") (ORD COMP)	SY					10.000						10.000	
	251-6073	REWRKING BS MATL (TY C)(10")(ORD COMP)	SY							48.600				48.600	
	361-6054	FULL-DEPTH REPAIR CRCP (VAR DEPTH)	CY					3.330		10.800				14.130	
	416-6031	DRILL SHAFT (TRF SIG POLE) (30 IN)	LF					22.000				22.000		44.000	
	416-6032	DRILL SHAFT (TRF SIG POLE) (36 IN)	LF	60.000		13.000				80.000		13.000		166.000	
	416-6034	DRILL SHAFT (TRF SIG POLE) (48 IN)	LF			66.000		44.000				22.000		132.000	
	432-6001	RIPRAP (CONC)(4 IN)	CY			2.000								2.000	
	500-6001	MOBILIZATION	LS	0.200		0.200		0.200		0.200		0.200		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	1.500		1.500		1.500		3.000		1.500		9.000	
	506-6042	BIODEG EROSN CONT LOGS (INSTL) (18")	LF	100.000		50.000		50.000		100.000		50.000		350.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	100.000		50.000		50.000		100.000		50.000		350.000	
	529-6002	CONC CURB (TY II)	LF					120.500		55.000				175.500	
	531-6001	CONC SIDEWALKS (4")	SY					63.930		23.000		9.100		96.030	
	531-6003	CONC SIDEWALKS (6")	SY			39.000								39.000	
	531-6004	CURB RAMPS (TY 1)	EA					1.000						1.000	
	531-6010	CURB RAMPS (TY 7)	EA			3.000		3.000		2.000		2.000		10.000	
	531-6017	CURB RAMPS (TY 22)	EA					1.000						1.000	
	536-6005	CONCRETE MEDIAN (NOSE)	SY					1.200						1.200	
	610-6009	REMOVE RD IL ASM (TRANS-BASE)	EA			1.000								1.000	
	618-6023	CONDT (PVC) (SCH 40) (2")	LF	16.000		81.000		31.000		42.000		334.000		504.000	
	618-6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF							90.000				90.000	
	618-6029	CONDT (PVC) (SCH 40) (3")	LF			91.000		136.000						227.000	
	618-6030	CONDT (PVC) (SCH 40) (3") (BORE)	LF			479.000		393.000						872.000	
	618-6033	CONDT (PVC) (SCH 40) (4")	LF			12.000		12.000		436.000		129.000		589.000	
	618-6034	CONDT (PVC) (SCH 40) (4") (BORE)	LF							281.000		375.000		656.000	
	618-6046	CONDT (PVC) (SCH 80) (2")	LF	10.000		20.000				120.000		29.000		179.000	
	620-6004	ELEC CONDR (NO.12) INSULATED	LF			320.000		320.000		480.000		320.000		1,440.000	
	620-6008	ELEC CONDR (NO.8) INSULATED	LF	788.000		1,156.000		748.000		1,000.000		1,899.000		5,591.000	
	620-6009	ELEC CONDR (NO.6) BARE	LF	21.000		524.000		435.000		824.000		820.000		2,624.000	
	620-6010	ELEC CONDR (NO.6) INSULATED	LF	42.000		150.000		62.000		264.000		668.000		1,186.000	
	620-6012	ELEC CONDR (NO.4) INSULATED	LF	30.000										30.000	
	621-6002	TRAY CABLE (3 CONDR) (12 AWG)	LF					693.000						693.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0387-05-028 **DISTRICT** Dallas **COUNTY** Collin, Denton
HIGHWAY FM 156, FM 407, FM 720, FM 982

				0387-05-028		0718-01-076		1567-01-044		1785-01-042		1950-01-041		TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB													
		PROJECT ID		**A00207219**		**A00207213**		**A00207209**		**A00207205**		**A00207221**			
		COUNTY		**Collin**		**Denton**		**Denton**		**Denton**		**Denton**			
		HIGHWAY		**FM 982**		**FM 156**		**FM 720**		**FM 407**		**FM 407**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	624-6008	GROUND BOX TY C (162911)W/APRON	EA	1.000		3.000		3.000						7.000	
	624-6010	GROUND BOX TY D (162922)W/APRON	EA			2.000		2.000		10.000		6.000		20.000	
	625-6002	ZINC-COAT STL WIRE STRAND (3/16")	LF	782.000										782.000	
	625-6004	ZINC-COAT STL WIRE STRAND (5/16")	LF	1,009.000										1,009.000	
	628-6185	ELC SRV TY D 120/240 070(NS)SS(E)GC(O)	EA					1.000						1.000	
	628-6187	ELC SRV TY D 120/240 070(NS)SS(E)PS(U)	EA	1.000		1.000				2.000		1.000		5.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA			3.000								3.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	2.000		1.000		2.000		2.000		1.000		8.000	
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF			480.000		172.000		1,049.000		816.000		2,517.000	
	666-6225	PAVEMENT SEALER 6"	LF			1,122.000		1,094.000		6,817.000		2,700.000		11,733.000	
	666-6226	PAVEMENT SEALER 8"	LF			480.000		172.000		1,049.000		816.000		2,517.000	
	666-6230	PAVEMENT SEALER 24"	LF	76.000		309.000		300.000		271.000		241.000		1,197.000	
	666-6231	PAVEMENT SEALER (ARROW)	EA			2.000				10.000		7.000		19.000	
	666-6232	PAVEMENT SEALER (WORD)	EA			1.000				10.000		7.000		18.000	
	666-6306	RE PM W/RET REQ TY I (W)6"(BRK)(100MIL)	LF					180.000		760.000		280.000		1,220.000	
	666-6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF			562.000		335.000		3,037.000		1,200.000		5,134.000	
	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF			560.000		579.000		3,020.000		1,220.000		5,379.000	
	668-6076	PREFAB PAV MRK TY C (W) (24") (SLD)	LF	76.000		309.000		300.000		271.000		241.000		1,197.000	
	668-6077	PREFAB PAV MRK TY C (W) (ARROW)	EA			2.000				10.000		7.000		19.000	
	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA			1.000				10.000		7.000		18.000	
	672-6007	REFL PAV MRKR TY I-C	EA							37.000				37.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA			28.000								28.000	
	672-6010	REFL PAV MRKR TY II-C-R	EA			24.000		8.000		87.000		46.000		165.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF			20.000		982.000		99.000		40.000		1,141.000	
	677-6003	ELIM EXT PAV MRK & MRKS (8")	LF			10.000		182.000		26.000		8.000		226.000	
	677-6005	ELIM EXT PAV MRK & MRKS (12")	LF			146.000								146.000	
	677-6007	ELIM EXT PAV MRK & MRKS (24")	LF			29.000		45.000						74.000	
	678-6002	PAV SURF PREP FOR MRK (6")	LF			1,122.000		1,094.000		6,817.000		2,700.000		11,733.000	
	678-6004	PAV SURF PREP FOR MRK (8")	LF			480.000		172.000		1,049.000		816.000		2,517.000	
	678-6008	PAV SURF PREP FOR MRK (24")	LF	76.000		309.000		300.000		271.000		241.000		1,197.000	
	678-6009	PAV SURF PREP FOR MRK (ARROW)	EA			2.000				10.000		7.000		19.000	
	678-6016	PAV SURF PREP FOR MRK (WORD)	EA			1.000				10.000		7.000		18.000	
	680-6002	INSTALL HWY TRF SIG (ISOLATED)	EA	1.000		1.000		1.000						3.000	
	680-6005	INS HY TRF SIG (DPT SUP CNT & CAB)(ISO)	EA							2.000		1.000		3.000	
	682-6001	VEH SIG SEC (12")LED(GRN)	EA	8.000		8.000		8.000		14.000		7.000		45.000	
	682-6002	VEH SIG SEC (12")LED(GRN ARW)	EA	4.000		2.000		4.000		4.000		4.000		18.000	
	682-6003	VEH SIG SEC (12")LED(YEL)	EA	8.000		8.000		8.000		14.000		7.000		45.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0387-05-028 **DISTRICT** Dallas **COUNTY** Collin, Denton
HIGHWAY FM 156, FM 407, FM 720, FM 982

				0387-05-028		0718-01-076		1567-01-044		1785-01-042		1950-01-041		TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB													
		PROJECT ID		**A00207219**		**A00207213**		**A00207209**		**A00207205**		**A00207221**			
		COUNTY		**Collin**		**Denton**		**Denton**		**Denton**		**Denton**			
		HIGHWAY		**FM 982**		**FM 156**		**FM 720**		**FM 407**		**FM 407**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	682-6004	VEH SIG SEC (12")LED(YEL ARW)	EA	4.000		8.000		4.000		4.000		8.000		28.000	
	682-6005	VEH SIG SEC (12")LED(RED)	EA	8.000		8.000		8.000		14.000		7.000		45.000	
	682-6006	VEH SIG SEC (12")LED(RED ARW)	EA	4.000		8.000		4.000		4.000		6.000		26.000	
	682-6018	PED SIG SEC (LED)(COUNTDOWN)	EA			4.000		6.000		2.000		6.000		18.000	
	682-6054	BACKPLATE W/REF BRDR(3 SEC)(VENT)ALUM	EA	6.000		8.000		6.000		12.000		7.000		39.000	
	682-6055	BACKPLATE W/REF BRDR(4 SEC)(VENT)ALUM	EA	2.000		2.000		2.000		2.000		2.000		10.000	
	682-6056	BACKPLATE W/REF BRDR(5 SEC)(VENT)ALUM	EA	2.000		2.000		2.000		2.000		2.000		10.000	
	684-6031	TRF SIG CBL (TY A)(14 AWG)(5 CONDR)	LF			439.000		467.000		472.000		351.000		1,729.000	
	684-6033	TRF SIG CBL (TY A)(14 AWG)(7 CONDR)	LF	737.000		534.000		140.000		447.000		555.000		2,413.000	
	684-6042	TRF SIG CBL (TY A)(14 AWG)(16 CONDR)	LF			551.000				437.000				988.000	
	684-6046	TRF SIG CBL (TY A)(14 AWG)(20 CONDR)	LF					485.000		110.000		486.000		1,081.000	
	684-6079	TRF SIG CBL (TY C)(12 AWG)(2 CONDR)	LF			789.000		849.000		354.000		850.000		2,842.000	
	686-6020	INS TRF SIG PL AM (S)STR(TY D)LUM	EA	4.000										4.000	
	686-6028	INS TRF SIG PL AM(S)1 ARM(24')LUM&ILSN	EA					2.000						2.000	
	686-6035	INS TRF SIG PL AM(S)1 ARM(32')LUM	EA									2.000		2.000	
	686-6043	INS TRF SIG PL AM(S)1 ARM(40')LUM	EA			1.000				4.000				5.000	
	686-6047	INS TRF SIG PL AM(S)1 ARM(44')LUM	EA							1.000		1.000		2.000	
	686-6051	INS TRF SIG PL AM(S)1 ARM(48')LUM	EA							1.000				1.000	
	686-6056	INS TRF SIG PL AM(S)1 ARM(50')LUM&ILSN	EA					1.000						1.000	
	686-6059	INS TRF SIG PL AM(S)1 ARM(55')LUM	EA			2.000						1.000		3.000	
	686-6060	INS TRF SIG PL AM(S)1 ARM(55')LUM&ILSN	EA					1.000						1.000	
	686-6063	INS TRF SIG PL AM(S)1 ARM(60')LUM	EA			1.000								1.000	
	687-6001	PED POLE ASSEMBLY	EA			1.000		2.000		1.000		2.000		6.000	
	688-6001	PED DETECT PUSH BUTTON (APS)	EA			4.000		6.000						10.000	
	688-6003	PED DETECTOR CONTROLLER UNIT	EA			1.000		1.000						2.000	
	6058-6001	BBU SYSTEM (EXTERNAL BATT CABINET)	EA	1.000		1.000		1.000						3.000	
	6185-6002	TMA (STATIONARY)	DAY	30.000		30.000		30.000		60.000		30.000		180.000	
	6292-6001	RVDS(PRESENCE DETECTION ONLY)	EA	1.000		2.000		2.000						5.000	
	6292-6003	RVDS(PRESENCE AND ADVANCE DET)	EA	3.000		2.000		2.000						7.000	
	6306-6009	VIVDS PROSR SYS (INSTALL ONLY)	EA							2.000		1.000		3.000	
	6306-6010	VIVDS CAM ASSY (INSTALL ONLY)	EA							2.000		1.000		3.000	
	6306-6012	VIVDS CABLING (INSTALL ONLY)	LF							191.000		81.000		272.000	
	14	PUBLIC UTILITY FORCE ACCT WORK (PARTICIPATING)	LS	1.000		1.000		1.000		2.000		1.000		6.000	
	18	EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000		1.000		1.000		1.000		5.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000		1.000		1.000		1.000		5.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0387-05-028 **DISTRICT** Dallas **COUNTY** Collin, Denton
HIGHWAY FM 156, FM 407, FM 720, FM 982

				0387-05-028		0718-01-076		1567-01-044		1785-01-042		1950-01-041		TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB													
		PROJECT ID		A00207219		A00207213		A00207209		A00207205		A00207221			
		COUNTY		Collin		Denton		Denton		Denton		Denton			
		HIGHWAY		FM 982		FM 156		FM 720		FM 407		FM 407			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	31	MATERIALS FURNISHED BY CITY (PARTICIPATING)	LS							1.000		1.000		2.000	

ITEM	NO.	DESCRIPTION	UNIT	FM 982/FM 546 0387-05-028 QUANTITY	FM 720/MARTINGALE 1567-01-044 QUANTITY	FM 407/IT NEELY 1785-01-042 QUANTITY	FM 407/RAYZOR 1785-01-042 QUANTITY	FM 407/VICKERY 1950-01-041 QUANTITY	FM 156/DOUBLE EAGLE 0718-01-076 QUANTITY	TOTAL PROJECT QUANTITY
0104	6011	REMOVING CONC (MEDIANS)	SY		10					10
0104	6015	REMOVING CONC (SIDEWALKS)	SY		46.7		23			69.7
0104	6029	REMOVING CONC (CURB OR CURB & GUTTER)	LF				75			75
0162	6002	BLOCK SODDING	SY		46.7		34.1			80.8
0168	6001	VEGETATIVE WATERING	MG		1		1			2
0251	6034	REWORK BS MTL (TY C)(8")(ORD COMP)	SY		10					10
0251	6073	REWORK BS MTL (TY C)(10")(ORD COMP)	SY				48.6			48.6
0361	6054	FULL-DEPTH REPAIR CRCP (VAR DEPTH)	CY		3.33		10.8			14.13
0416	6031	DRILL SHAFT (TRF SIG POLE) (30 IN)	LF		22			22		44
0416	6032	DRILL SHAFT (TRF SIG POLE) (36 IN)	LF	60		41	39	13	13	166
0416	6034	DRILL SHAFT (TRF SIG POLE) (48 IN)	LF		44			22	66	132
0432	6001	RIPRAP (CONC)(4 IN)	CY						2	2
0500	6001	MOBILIZATION	LS	0.2	0.2	0.1	0.1	0.2	0.2	1
0502	6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	1.5	1.5	1.5	1.5	1.5	1.5	9
0506	6042	BIODEG EROSN CONT LOGS (INSTL)(18")	LF	100	50	50	50	50	50	350
0506	6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	100	50	50	50	50	50	350
0529	6002	CONC CURB (TY II)	LF		120.5		55			175.5
0531	6001	CONC SIDEWALKS (4")	SY		63.93		23	9.1		96.03
0531	6003	CONC SIDEWALKS (6")	SY						39	39
0531	6004	CURB RAMPS (TY 1)	EA		1					1
0531	6010	CURB RAMPS (TY 7)	EA		3		2	2	3	10
0532	6017	CURB RAMPS (TY 22)	EA		1					1
0536	6005	CONC MEDIAN (NOSE)	SY		1.2					1.2
0610	6009	REMOVE RD IL ASM (TRANS-BASE)	EA						1	1
0618	6023	CONDUIT (PVC)(SCHD 40)(2 ")	LF	16	31	15	27	334	81	504
0618	6024	CONDUIT (PVC)(SCHD 40)(2 ")(BORE)	LF				90			90
0618	6029	CONDUIT (PVC)(SCHD 40)(3 ")	LF		136				91	227
0618	6030	CONDUIT (PVC)(SCHD 40)(3 ")(BORE)	LF		393				479	872
0618	6033	CONDUIT (PVC)(SCHD 40)(4 ")	LF		12	133	303	129	12	589
0618	6034	CONDUIT (PVC)(SCHD 40)(4 ")(BORE)	LF			94	187	375		656
0618	6046	CONDUIT (PVC)(SCHD 80)(2 ")	LF	10		40	80	29	20	179
0620	6004	ELEC CONDUCTOR (NO. 12) INSULATED	LF		320	240	240	320	320	1440
0620	6008	ELEC CONDUCTOR (NO. 8) INSULATED	LF	788	748	426	574	1899	1156	5591
0620	6009	ELEC CONDUCTOR (NO. 6) BARE	LF	21	435	228	596	820	536	2636
0620	6010	ELEC CONDR (NO.6) INSULATED	LF	42	62	30	234	668	162	1198
0620	6012	ELEC CONDR (NO.4) INSULATED	LF	30						30
0621	6002	TRAY CABLE (3 CONDR)(12 AWG)	LF		693					693
0624	6008	GROUND BOX TY C (162911) W/APRON	EA	1	3				3	7
0624	6010	GROUND BOX TY D (162922) W/APRON	EA		2	4	6	6	2	20
0625	6002	ZINC-COAT STL WIRE STRAND (3/16")	LF	782						782
0626	6004	ZINC-COAT STL WIRE STRAND (5/16")	LF	1009						1009
0628	6185	ELC SRV TY D 120 / 240 070 (NS) SS (E) GC (O)	EA		1					1
0628	6187	ELC SRV TY D 120 / 240 070 (NS) SS (E) PS (U)	EA	1		1	1	1	1	5
0644	6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA						3	3
0644	6076	REMOVE SM RD SN SUP&AM	EA	2	2	1	1	1	1	8
0666	6036	REFL PAV MRK TY I (W) 8" (SLD)(100MIL)	LF		172	549	500	816	480	2517
0666	6225	PAVEMENT SEALER 6"	LF		1094	3505	3312	2700	1122	11733
0666	6226	PAVEMENT SEALER 8"	LF		172	549	500	816	480	2517
0666	6230	PAVEMENT SEALER 24"	LF	76	300	89	182	241	309	1197
0666	6231	PAVEMENT SEALER (ARROW)	EA			4	6	7	2	19
0666	6232	PAVEMENT SEALER (WORD)	EA			4	6	7	1	18
0666	6306	RE PM W/RET REQ TY I (W) 6" (BRK)(100 MIL)	LF		180	400	360	280		1220
0666	6309	RE PM W/RET REQ TY I (W) 6" (SLD)(100 MIL)	LF		335	1545	1492	1200	562	5134
0666	6321	RE PM W/RET REQ TY I (Y) 6" (SLD)(100 MIL)	LF		579	1560	1460	1220	560	5379

ITEM	NO.	DESCRIPTION	UNIT	FM 982/FM 546 0387-05-028 QUANTITY	FM 720/MARTINGALE 1567-01-044 QUANTITY	FM 407/IT NEELY 1785-01-042 QUANTITY	FM 407/RAYZOR 1785-01-042 QUANTITY	FM 407/VICKERY 1950-01-041 QUANTITY	FM 156/DOUBLE EAGLE 0718-01-076 QUANTITY	TOTAL PROJECT QUANTITY
0668	6076	PREFAB PAV MRK TY C (W)(24")(SLD)	LF	76	300	89	182	241	309	1197
0668	6077	PREFAB PAV MRK TY C (W)(ARROW)	EA			4	6	7	2	19
0668	6085	PREFAB PAV MRK TY C (W)(WORD)	EA			4	6	7	1	18
0672	6007	REFL PAV MRKR TY I-C	EA			37				37
0671	6009	REFL PAV MRKR TY II-A-A	EA						28	28
0672	6010	REFL PAV MRKR TY II-C-R	EA		8	46	41	46	24	165
0677	6001	ELIM EXT PAV MRK & MRKS (4")	LF		982	49	50	40	20	1141
0677	6003	ELIM EXT PAV MRK & MRKS (8")	LF		182	26		8	10	226
0678	6005	ELIM EXT PAV MRK & MRKS (12")	LF						146	146
0677	6007	ELIM EXT PAV MRK & MRKS (24")	LF		45				29	74
0678	6002	PAV SURF PREP FOR MRK (6")	LF		1094	3505	3312	2700	1122	11733
0678	6004	PAV SURF PREP FOR MRK (8")	LF		172	549	500	816	480	2517
0678	6008	PAV SURF PREP FOR MRK (24")	LF	76	300	89	182	241	309	1197
0678	6009	PAV SURF PREP FOR MRK (ARROW)	EA			4	6	7	2	19
0678	6016	PAV SURF PREP FOR MRK (WORD)	EA			4	6	7	1	18
0680	6002	INSTALL HWY TRAF SIG (ISOLATED)	EA	1	1				1	3
0680	6005	INSTALL HWY TRAF SIG (DPT SUP CNT & CAB)(ISO)	EA			1	1	1		3
0682	6001	VEH SIG SEC (12 IN) LED (GRN)	EA	8	8	7	7	7	8	45
0682	6002	VEH SIG SEC (12 IN) LED (GRN ARW)	EA	4	4	2	2	4	2	18
0682	6003	VEH SIG SEC (12 IN) LED (YEL)	EA	8	8	7	7	7	8	45
0682	6004	VEH SIG SEC (12 IN) LED (YEL ARW)	EA	4	4	2	2	8	8	28
0682	6005	VEH SIG SEC (12 IN) LED (RED)	EA	8	8	7	7	7	8	45
0682	6006	VEH SIG SEC (12 IN) LED (RED ARW)	EA	4	4	2	2	6	8	26
0682	6018	PED SIG SEC (LED) (COUNTDOWN)	EA		6		2	6	4	18
0682	6054	BACKPLATE W/REF BRDR(3 SEC)(VENT)ALUM	EA	6	6	6	6	7	8	39
0682	6055	BACKPLATE W/REF BRDR (4 SEC)(VENT) ALUM	EA	2	2	1	1	2	2	10
0682	6056	BACKPLATE W/REF BRDR(5 SEC)(VENT)ALUM	EA	2	2	1	1	2	2	10
0684	6031	TRAF SIG CBL (TY A)(14 AWG)(5 CONDR)	LF		467	212	260	351	439	1729
0684	6033	TRAF SIG CBL (TY A)(14 AWG)(7 CONDR)	LF	737	140	109	338	555	534	2413
0684	6042	TRAF SIG CBL (TY A)(14 AWG)(16 CONDR)	LF			273	164		563	1000
0684	6046	TRAF SIG CBL (TY A)(14 AWG)(20 CONDR)	LF		485		110	486		1081
0684	6079	TRAF SIG CBL (TY A)(12 AWG)(2 CONDR)	LF		849		354	850	807	2860
0686	6020	INS TRF SIG PL AM (S) STR (TY D) LUM	EA	4						4
0686	6028	INS TRF SIG PL AM (S) 1 ARM (24') LUM&ILSN	EA		2					2
0686	6035	INS TRF SIG PL AM (S) 1 ARM (32') LUM	EA					2		2
0686	6043	INS TRF SIG PL AM (S) 1 ARM (40') LUM	EA			3	1		1	5
0686	6047	INS TRF SIG PL AM (S) 1 ARM (44') LUM	EA				1	1		2
0686	6051	INS TRF SIG PL AM (S) 1 ARM (48') LUM	EA				1			1
0686	6056	INS TRF SIG PL AM (S) 1 ARM (50') LUM&ILSN	EA		1					1
0686	6059	INS TRF SIG PL AM (S) 1 ARM (55') LUM	EA					1	2	3
0686	6060	INS TRF SIG PL AM (S) 1 ARM (55') LUM&ILSN	EA		1					1
0687	6063	INS TRF SIG PL AM (S) 1 ARM (60') LUM	EA						1	1
0687	6001	PED POLE ASSEMBLY	EA		2		1	2	1	6
0688	6001	PED DETECT PUSH BUTTON (APS)	EA		6				4	10
0688	6003	PED DETECTOR CONTROLLER UNIT	EA		1				1	2
6058	6001	BBU SYSTEM (EXTERNAL BATT CABINET)	EA	1	1				1	3
6185	6002	TMA (STATIONARY)	DAY	30	30	30	30	30	30	180
6292	6001	RVDS(PRESENCE DETECTION ONLY)	EA	1	2				2	5
6292	6003	RVDS(PRESENCE AND ADVANCE DET)	EA	3	2				2	7
6306	6009	VIVDS PROSR SYS (INSTALL ONLY)	EA			1	1	1		3
6306	6010	VIVDS CAM ASSY (INSTALL ONLY)	EA			1	1	1		3
6306	6012	VIVDS CABLING (INSTALL ONLY)	LF			125	66	81		272

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PROJECT SUMMARIES

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
CY	6	(SEE TITLE SHEET)		FM 982, ETC.
GRAPHICS CY	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK CY	TEXAS	18	COLLIN, ETC.	5
CHECK EF	CONTROL	SECTION	JOB	
	0387	05	028, ETC.	

FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/0387050028/4 - Design/Plan Set/8. Traffic/PROJECT SUMMARY.dgn

SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION		BRIDGE MOUNT CLEARANCE SIGNS (See Note 2)
			FM 982 AT FM 546				FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	TY = TYPE TY N TY S
	A 1 EA		7700 FM 546	78"X18"	X				MOUNT ON SPAN P1-P2			
	B 1 EA		FM 546 7700	78"X18"	X				MOUNT ON SPAN P3-P4			
	C 2 EA		5200 FM 982 5200	96"X18"	X				MOUNT ON SPANS P2-P3 AND P4-P1			
	D 2 EA	R10-17T	LEFT TURN YIELD ON FLASHING YELLOW ARROW	36"X42"	X				MOUNT ON SPANS P1-P2 AND P3-P4			

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

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Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS SOSS

FM 982 at FM 546

SHEET 1 OF 1

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REVISIONS		0387	05	028, ETC	FM 982, ETC
4-16		DIST	COUNTY		SHEET NO.
8-16		18	COLLIN, ETC		6

SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN FM 720 AT MARTINGALE TRAIL	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP • Fiberglass TWT • Thin-Wall 10BWG • 10 BWG S80 • Sch 80	POSTS 1 or 2	ANCHOR TYPE UA•Universal Conc UB•Universal Bolt SA•Slipbase-Conc SB•Slipbase-Bolt WS•Wedge Steel WP•Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P • "Plain" T • "T" U • "U"	1EXT or 2EXT • # of Ext BM • Extruded Wind Beam WC • 1.12 #/ft Wing Channel EXAL• Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY • TYPE TY N TY S
	A *		ILLUMINATED STREET NAME SIGNS									
	B *		WILL BE PROVIDED							MOUNT ON P1, P2, P3, AND P4 MAST ARM		
	C *		BY THE CITY OF OAK POINT									
	D *		INSTALLATION SUBSIDIARY TO ITEM 680									
	E *	R10-17T 2 EA		36"X42"	X					MOUNT ON P1 MAST ARM MOUNT ON P3 MAST ARM		
	F *	R9-3 2 EA		24"X24"	X					MOUNT ON P3 AND P6		
	G **	R10-3eL 2 EA		9"X15"	X					MOUNT ON P1 AND P3		
	H **	R10-3eR 4 EA		9"X15"	X					MOUNT ON P1, P2, P5 AND P6		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

NOTE:

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2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

• SUBSIDIARY TO ITEM 680

•• SUBSIDIARY TO ITEM 688

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS SOSS

FM 982 at Martingale Trail

SHEET 1 OF 1

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REVISIONS	0387	05	028, ETC	FM 982, ETC
4-16	DIST	COUNTY		SHEET NO.
8-16	18	COLLIN, ETC		6A

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SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN FM 407 AT IT NEELY ROAD	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U" 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
7	B*		STREET NAME SIGNS SUPPLIED BY THE TOWN OF BARTONVILLE INSTALLATION SUBSIDIARY TO ITEM 680						MOUNT ON MAST ARM P1		
7	C*								MOUNT ON MAST ARM P2		
7	D*								MOUNT ON MAST ARM P3		
7	A*	R10-17T		36" X 42"	X				MOUNT ON MAST ARM P1		
7	E*	R3-4		36" X 36"	X				MOUNT ON MAST ARM P3		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

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3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

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SUMMARY OF SMALL SIGNS

FM 407 AT IT NEELY ROAD

SOSS

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REVISIONS		0387	05	028,ETC.	FM 982,ETC.
4-16		DIST	COUNTY		SHEET NO.
8-16		18	COLLIN,ETC.		6B

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SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN FM 407 AT RAYZOR RD	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U" 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
7	B*	D3-1G	Rayzor Rd	66" X 18"	X				MOUNT ON MAST ARM P1		
7	E*	D3-1G		66" X 18"	X				MOUNT ON MAST ARM P3		
7	F*	R10-17T	LEFT TURN YIELD ON FLASHING YELLOW ARROW	36" X 42"	X				MOUNT ON MAST ARM P3		
7	D*	R3-8LR	ONLY ONLY	36" X 36"	X				MOUNT ON MAST ARM P2		
7	C*	D3-1G	FM 407	54" X 18"	X				MOUNT ON MAST ARM P2		
7	A**	R10-3eL		9" X 15"	X				MOUNT ON POLE P1		
7	G**	R10-3eL		9" X 15"	X				MOUNT ON POLE P4		
7	H*	R3-4		36" X 36"	X				MOUNT ON MAST ARM P1		
7	I*	R9-3		24" X 24"	X				MOUNT ON POLE P1		
7	J*	R9-3		24" X 24"	X				MOUNT ON POLE P2		
7	K*	R9-3		24" X 24"	X				MOUNT ON POLE P3		
7	L*	R9-3		24" X 24"	X				MOUNT ON POLE P4		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

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2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

FM 407 AT RAYZOR RD

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0387	05	028,ETC.	FM 982,ETC.
4-16 8-16	DIST	COUNTY		SHEET NO.
	18	COLLIN,ETC.		6C

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SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN FM 407 AT VICKERY BLVD	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U" 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
7	B*		STREET NAME SIGNS SUIPPLIED BY THE TOWN OF COPPER CANYON INSTALLATION SUBSIDIARY TO ITEM 680.						MOUNT ON MAST ARM P1		
7	D*								MOUNT ON MAST ARM P2		
7	H*								MOUNT ON MAST ARM P3		
7	L*								MOUNT ON MAST ARM P4		
7	A*	R10-17T		36" X 42"					MOUNT ON MAST ARM P1		
7	G*	R10-17T		36" X 42"					MOUNT ON MAST ARM P3		
7	K*	R10-17T		36" X 42"					MOUNT ON MAST ARM P4		
7	N*	R10-17T		36" X 42"					MOUNT ON MAST ARM P2		
7	C**	R10-3eL		9" X 15"	X				MOUNT ON P1		
7	E**	R10-3eL		9" X 15"	X				MOUNT ON P2		
7	I**	R10-3eL		9" X 15"	X				MOUNT ON P3		
7	F**	R10-3eL		9" X 15"	X				MOUNT ON P5		
7	J**	R10-3eL		9" X 15"	X				MOUNT ON P6		
7	M**	R10-3eL		9" X 15"	X				MOUNT ON P4		
7	O**	R9-3		24" X 24"	X				MOUNT ON P1		
7	P**	R9-3		24" X 24"	X				MOUNT ON P4		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

* SUBSIDIARY TO ITEM 680
** SUBSIDIARY TO ITEM 688

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

FM 407 AT VICKERY BLVD

SOSS

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8-16		18	COLLIN,ETC.		6D

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SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION: PREFABRICATED	MOUNTING DESIGNATION: 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE
			FM 156 at Double Eagle Blvd				FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"		TY N TY S
	A*			24" X 24"	X						MOUNT ON POLE P1.	
	E*			24" X 24"	X						MOUNT ON POLE P2.	
	B*		Double Eagle Blvd	138" X 18"	X						MOUNT ON POLE P1 MAST ARM.	
	K*			138" X 18"	X						MOUNT ON POLE P3 MAST ARM.	
	C*	R10-17T		36" X 42"	X						MOUNT ON POLE P1 MAST ARM.	
	H*	R10-17T		36" X 42"	X						MOUNT ON POLE P2 MAST ARM.	
	L*	R10-17T		36" X 42"	X						MOUNT ON POLE P3 MAST ARM.	
	O*											
	D	R3-7R		36" X 36"	X		10BWG	1	SA	P		
	F*	R10-3EL		9" X 15"	X						MOUNT ON POLE P2.	
	J*	R10-3EL		9" X 15"	X						MOUNT ON POLE P3.	
	G*		FM 156	60" X 18"	X						MOUNT ON POLE P2 MAST ARM.	
	N*			60" X 18"	X						MOUNT ON POLE P4 MAST ARM.	
	I*	R10-3ER		9" X 15"	X						MOUNT ON POLE P5.	
	M*	R10-3ER		9" X 15"	X						MOUNT ON POLE P4.	

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

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NOTE:

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2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

* SUBSIDIARY TO ITEM 680

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

FM 156 at Double Eagle Blvd

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

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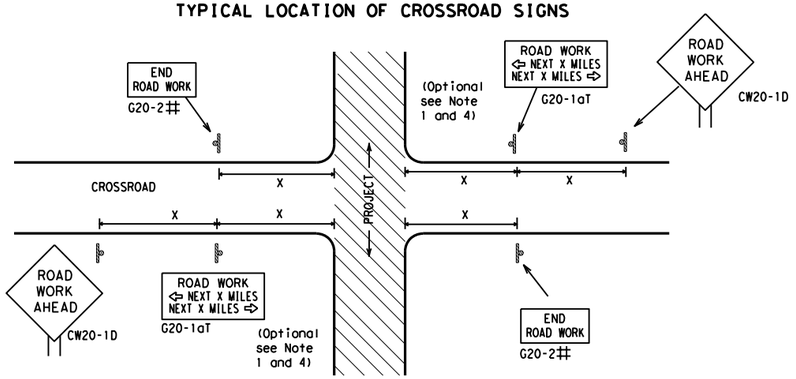
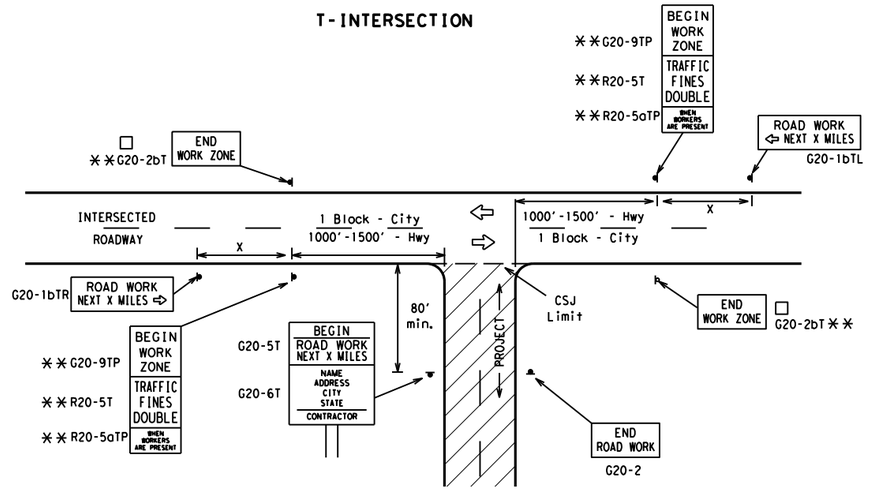
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

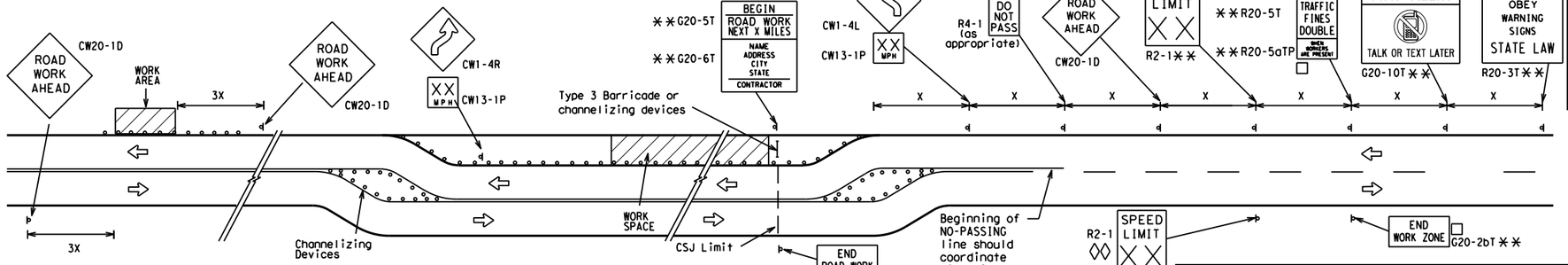
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

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

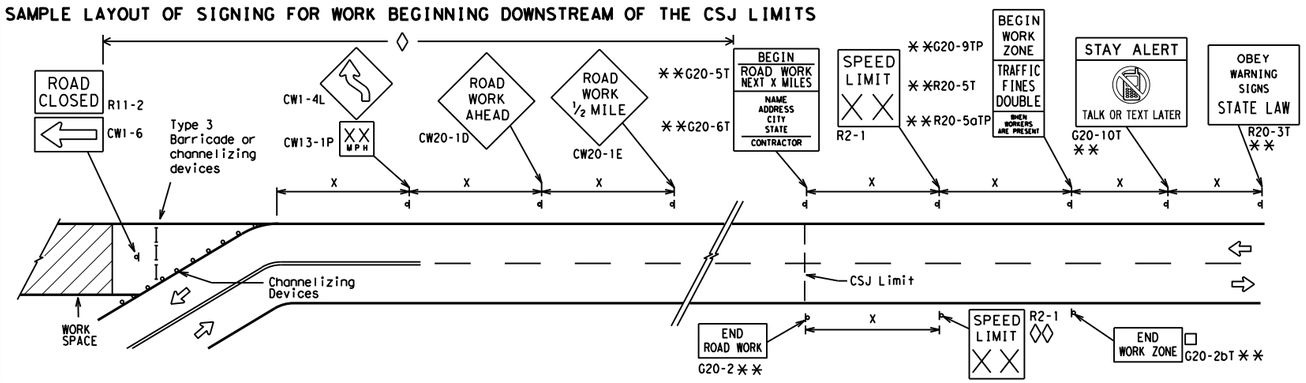
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

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

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

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

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

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

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

SHEET 2 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

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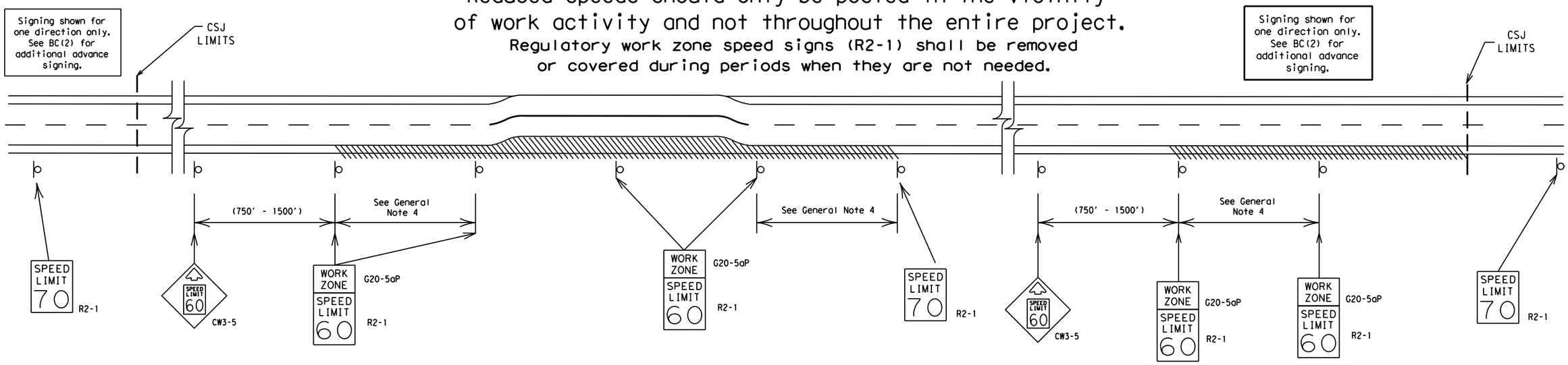
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

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BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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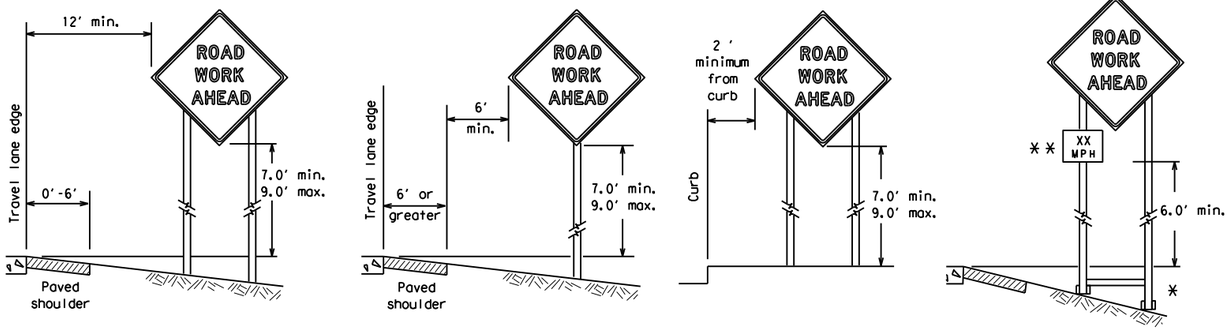
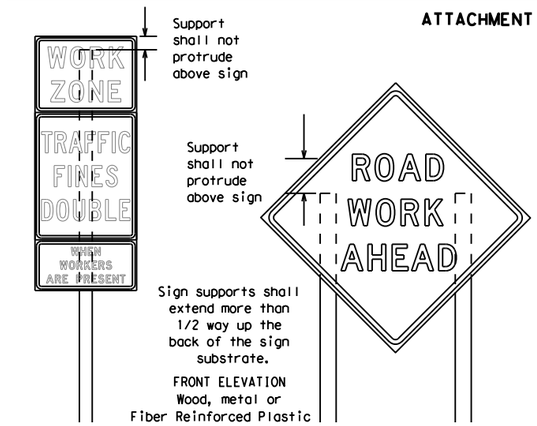
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

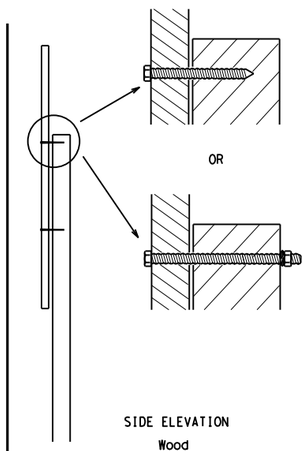


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





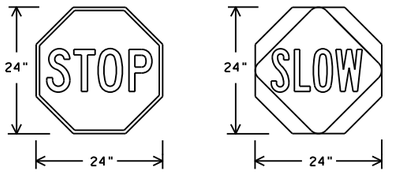
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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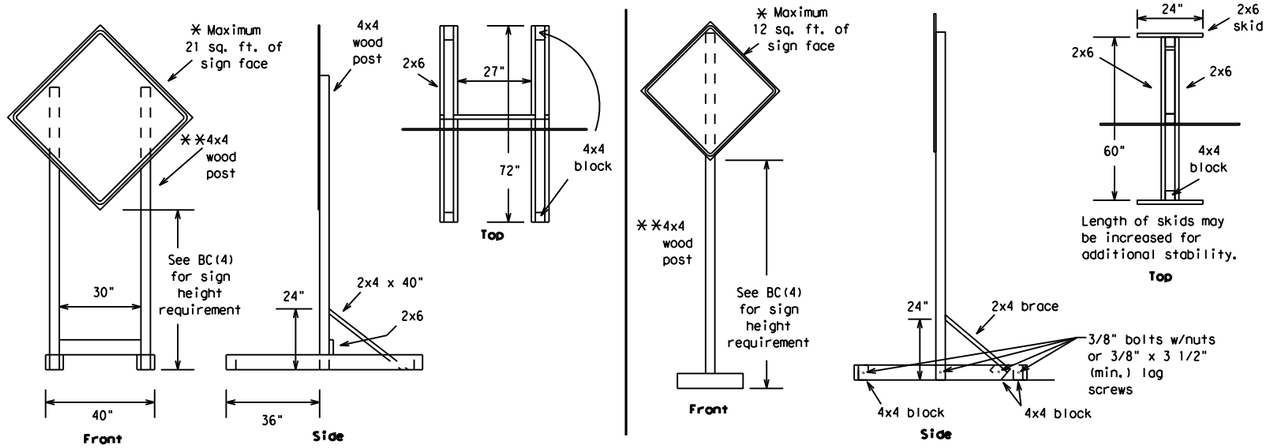
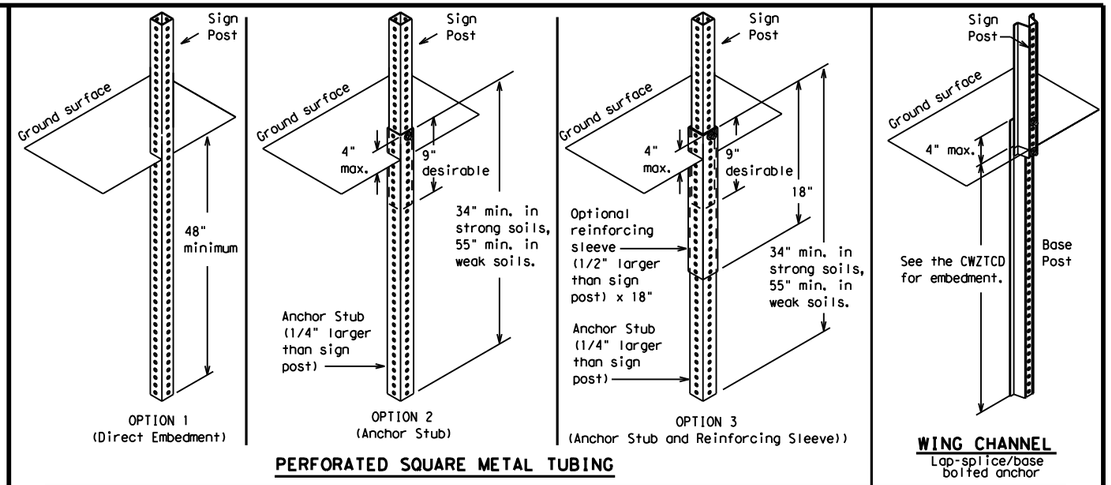


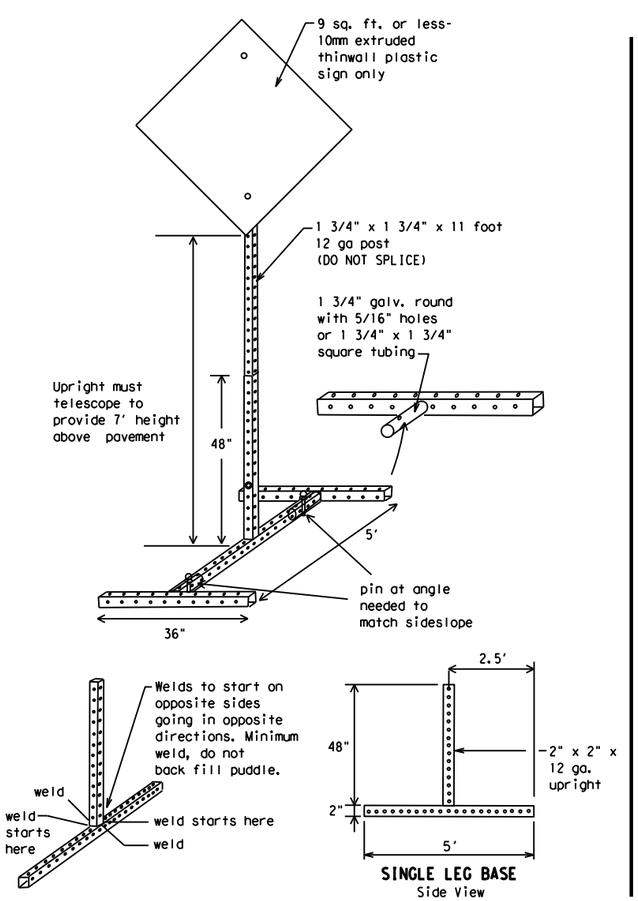
SKID MOUNTED WOOD SIGN SUPPORTS

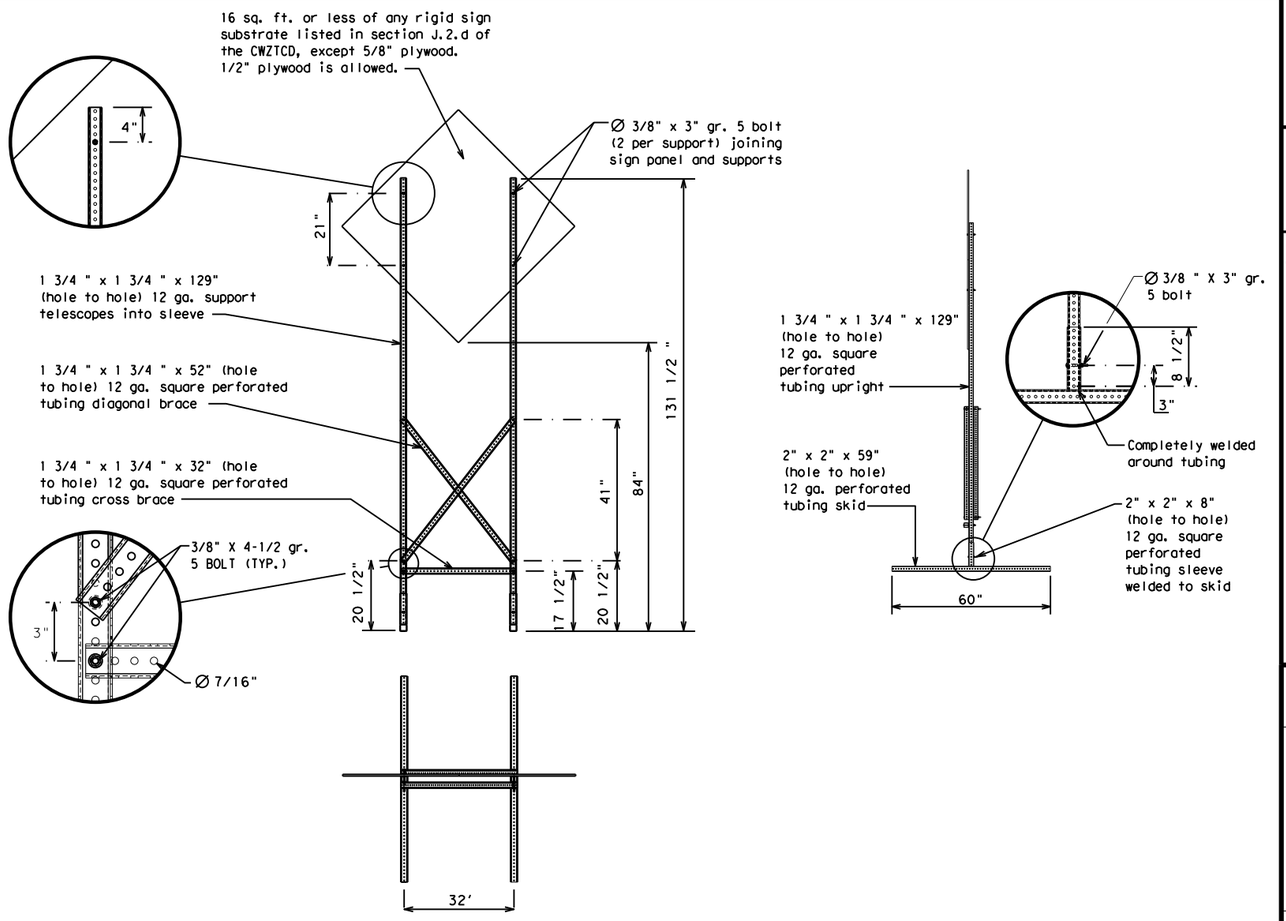
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS



GROUND MOUNTED SIGN SUPPORTS

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





SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List		Other Condition List	
FREEWAY CLOSED X MILE	FRONTAGE ROAD CLOSED	ROADWORK XXX FT	ROAD REPAIRS XXXX FT
ROAD CLOSED AT SH XXX	SHOULDER CLOSED XXX FT	FLAGGER XXXX FT	LANE NARROWS XXXX FT
ROAD CLSD AT FM XXXX	RIGHT LN CLOSED XXX FT	RIGHT LN NARROWS XXXX FT	TWO-WAY TRAFFIC XX MILE
RIGHT X LANES CLOSED	RIGHT X LANES OPEN	MERGING TRAFFIC XXXX FT	CONST TRAFFIC XXX FT
CENTER LANE CLOSED	DAYTIME LANE CLOSURES	LOOSE GRAVEL XXXX FT	UNEVEN LANES XXXX FT
NIGHT LANE CLOSURES	I-XX SOUTH EXIT CLOSED	DETOUR X MILE	ROUGH ROAD XXXX FT
VARIOUS LANES CLOSED	EXIT XXX CLOSED X MILE	ROADWORK PAST SH XXXX	ROADWORK NEXT FRI-SUN
EXIT CLOSED	RIGHT LN TO BE CLOSED	BUMP XXXX FT	US XXX EXIT X MILES
MALL DRIVEWAY CLOSED	X LANES CLOSED TUE - FRI	TRAFFIC SIGNAL XXXX FT	LANES SHIFT *
XXXXXXXX BLVD CLOSED			

* 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		Location List	Warning List	** Advance Notice List
MERGE RIGHT	FORM X LINES RIGHT	AT FM XXXX	SPEED LIMIT XX MPH	TUE-FRI XX AM- X PM
DETOUR NEXT X EXITS	USE XXXXX RD EXIT	BEFORE RAILROAD CROSSING	MAXIMUM SPEED XX MPH	APR XX-XX X PM-X AM
USE EXIT XXX	USE EXIT I-XX NORTH	NEXT X MILES	MINIMUM SPEED XX MPH	BEGINS MONDAY
STAY ON US XXX SOUTH	USE I-XX E TO I-XX N	PAST US XXX EXIT	ADVISORY SPEED XX MPH	BEGINS MAY XX
TRUCKS USE US XXX N	WATCH FOR TRUCKS	XXXXXXX TO XXXXXXX	RIGHT LANE EXIT	MAY X-X XX PM - XX AM
WATCH FOR TRUCKS	EXPECT DELAYS	US XXX TO FM XXXX	USE CAUTION	NEXT FRI-SUN
EXPECT DELAYS	PREPARE TO STOP		DRIVE SAFELY	XX AM TO XX PM
REDUCE SPEED XXX FT	END SHOULDER USE		DRIVE WITH CARE	NEXT TUE AUG XX
USE OTHER ROUTES	WATCH FOR WORKERS			TONIGHT XX PM- XX AM
STAY IN LANE *				

* 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

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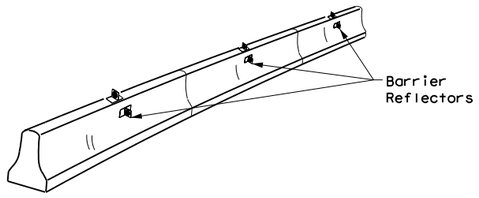
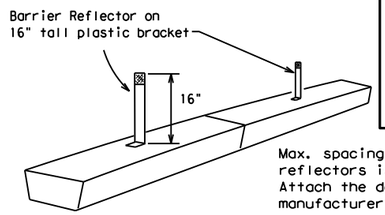
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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

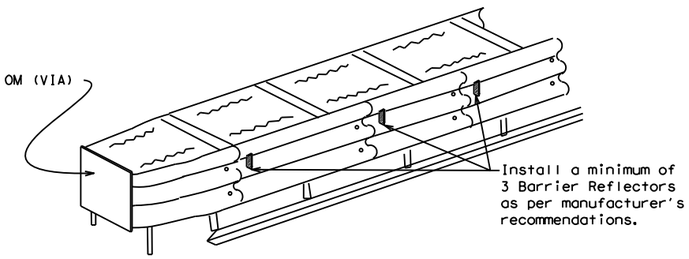


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

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)

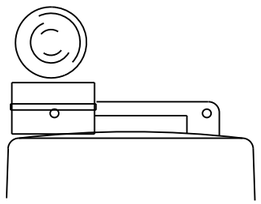


DELINEATION OF END TREATMENTS

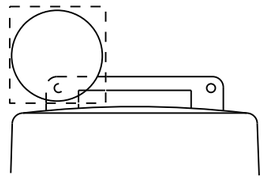
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

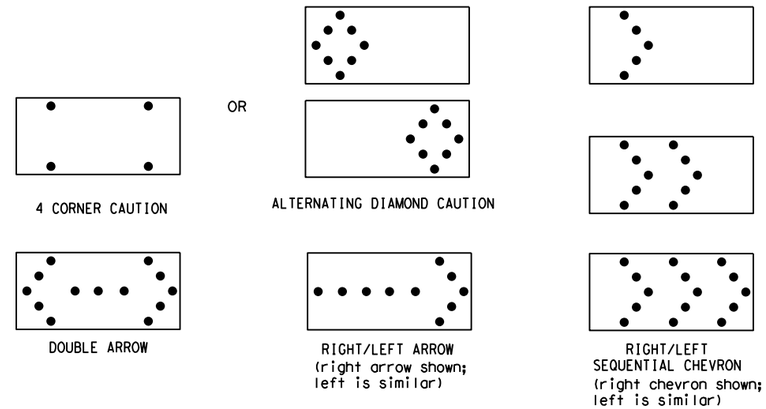
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0387	05	028,ETC.	FM 982,ETC.
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	18	COLLIN,ETC.		13

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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:

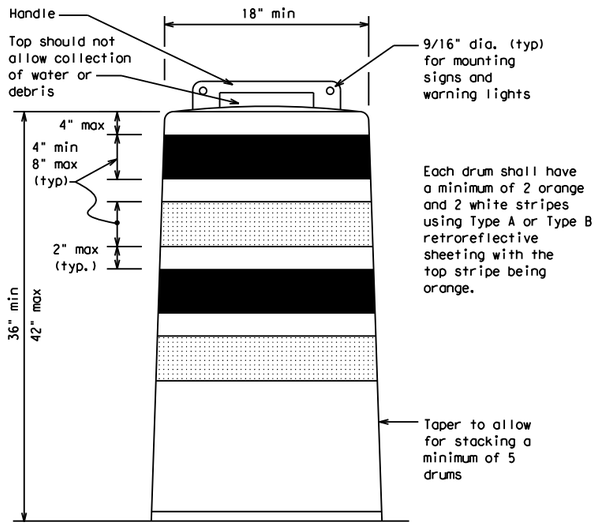
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

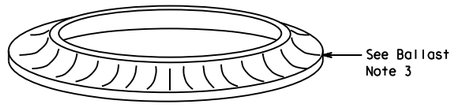
RETROREFLECTIVE SHEETING

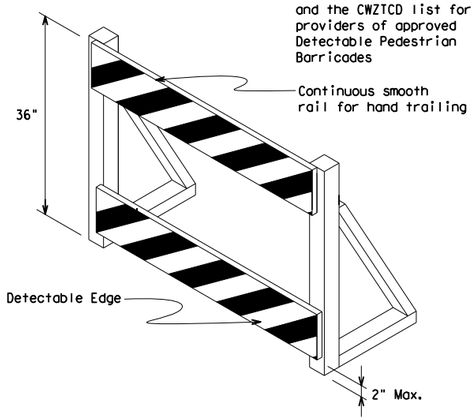
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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



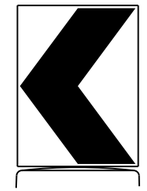




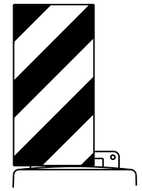
This detail is not intended for fabrication. See note 3 and the CWZTCD list for providers of approved Detectable Pedestrian Barricades

DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0387	05	028,ETC.	FM 982,ETC.
4-03 8-14	DIST	COUNTY		SHEET NO.
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7-13				

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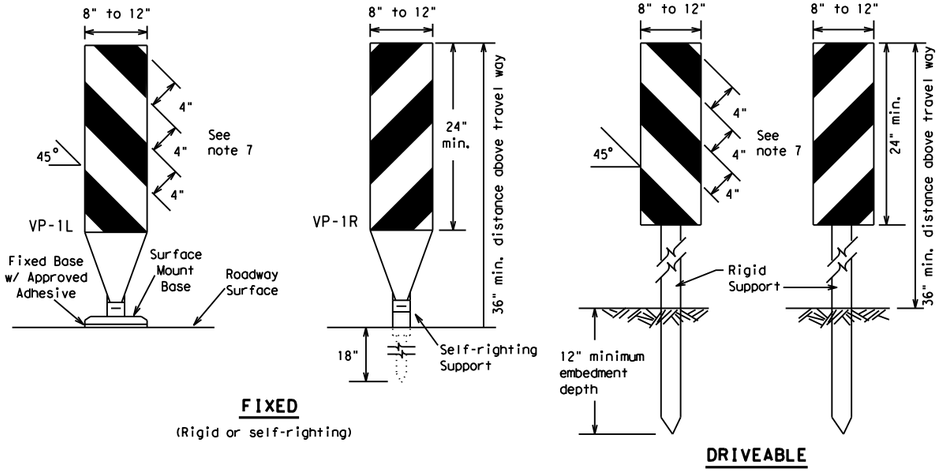
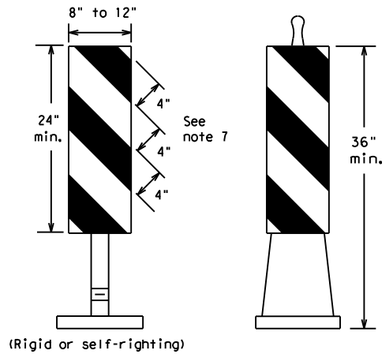


FIXED
(Rigid or self-righting)

DRIVEABLE

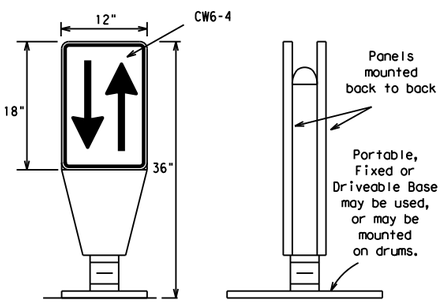


(Rigid or self-righting)

PORTABLE

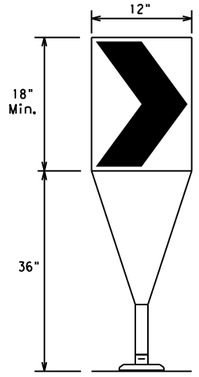
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



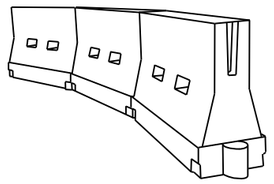
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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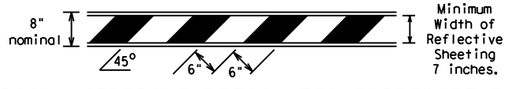
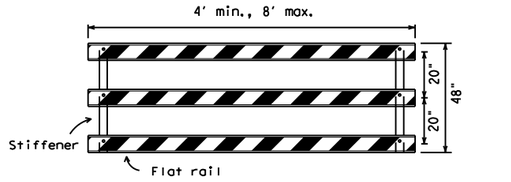
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



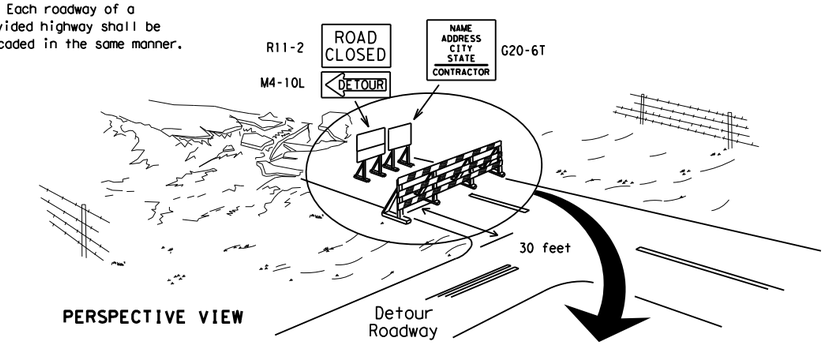
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

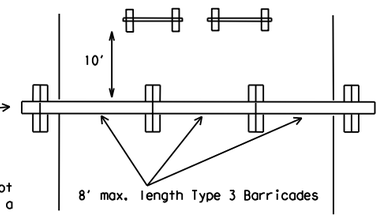
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

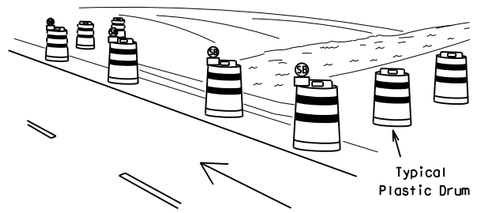
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

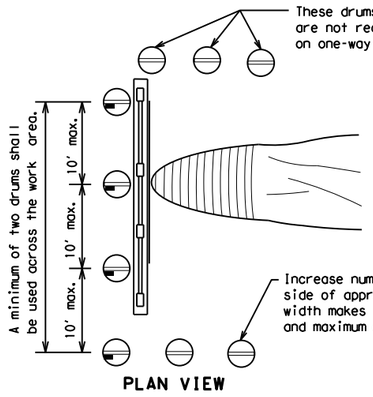
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

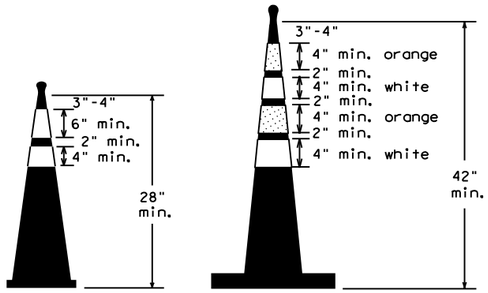
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



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

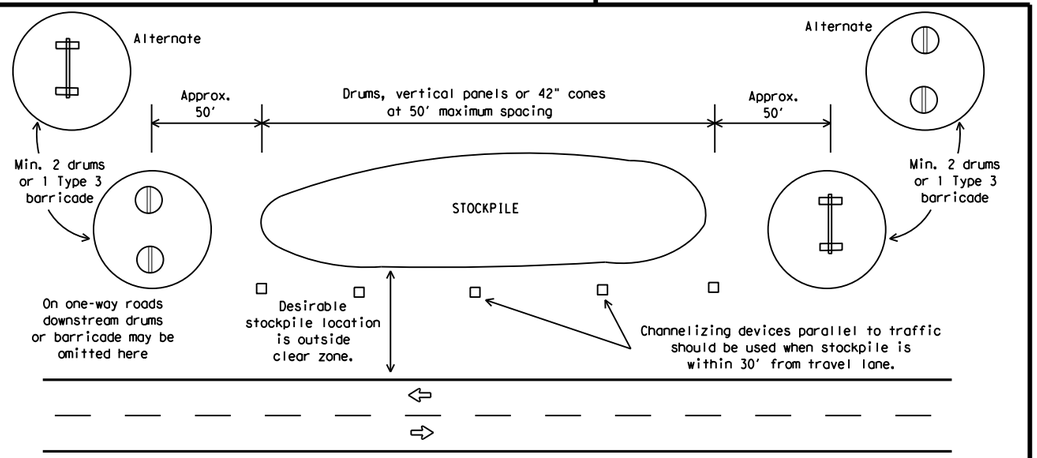
PLAN VIEW

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



28" Cones shall have a minimum weight of 9 1/2 lbs.
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

SHEET 10 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

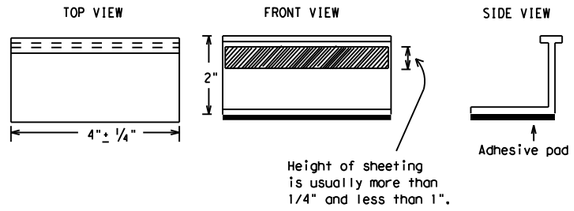
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

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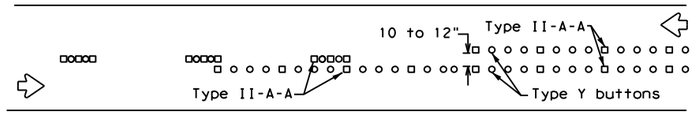
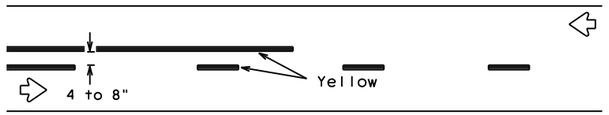
PAVEMENT MARKING PATTERNS

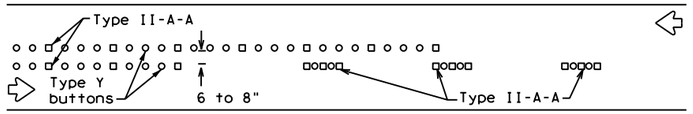
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



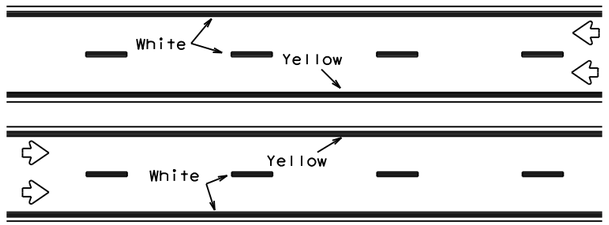
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



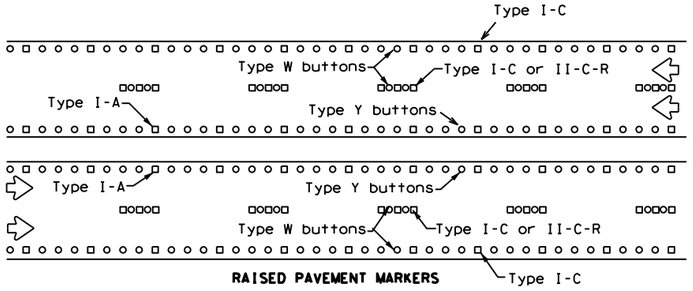
RAISED PAVEMENT MARKERS - PATTERN B

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

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



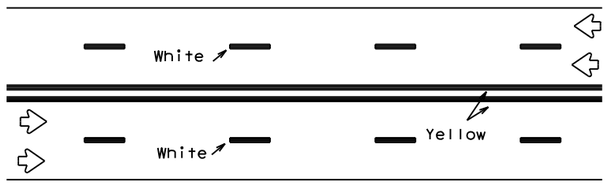
REFLECTORIZED PAVEMENT MARKINGS



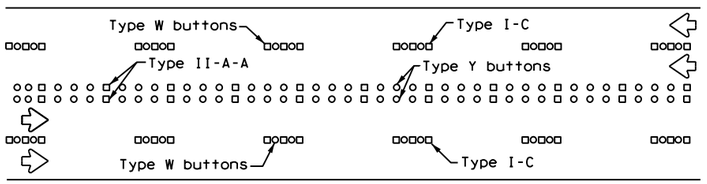
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



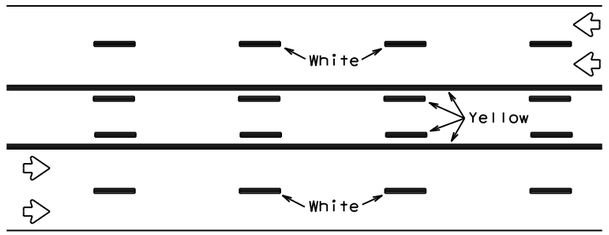
REFLECTORIZED PAVEMENT MARKINGS



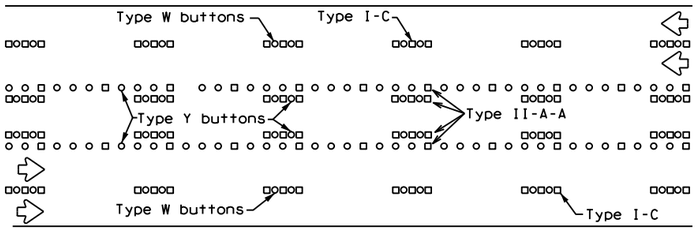
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

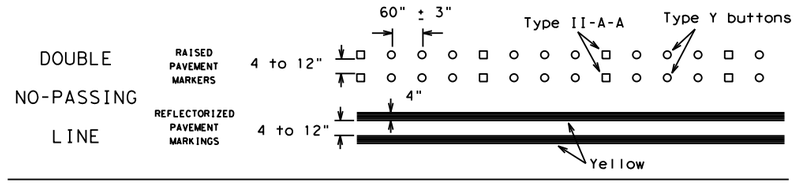
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

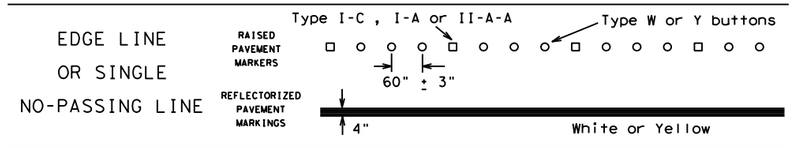
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

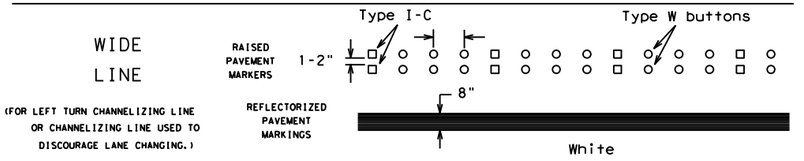


EDGE LINE OR SINGLE NO-PASSING LINE



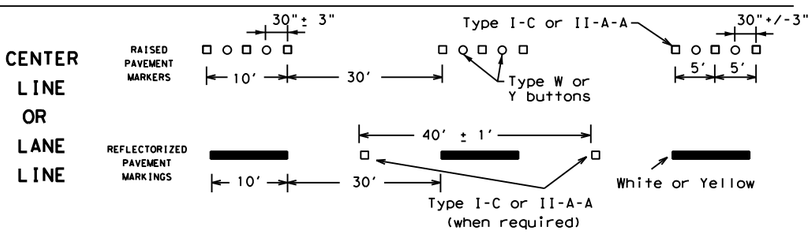
WIDE LINE

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

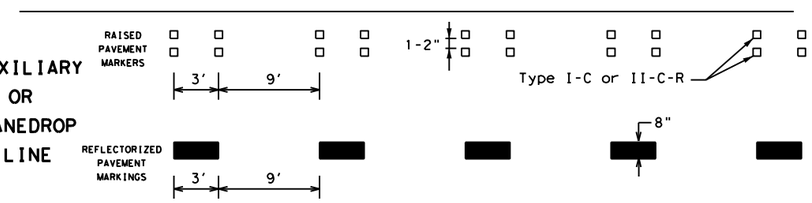


BROKEN LINES

CENTER LINE OR LANE LINE

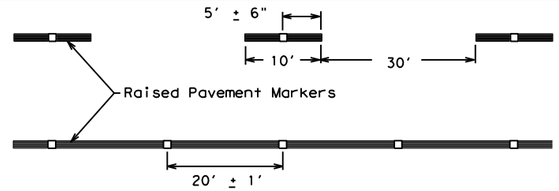


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

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REVISIONS 1-97 9-07 5-21	0387	05	028,ETC.	FM 982,ETC.
2-98 7-13	DIST	COUNTY		SHEET NO.
11-02 8-14	18	COLLIN,ETC.		18

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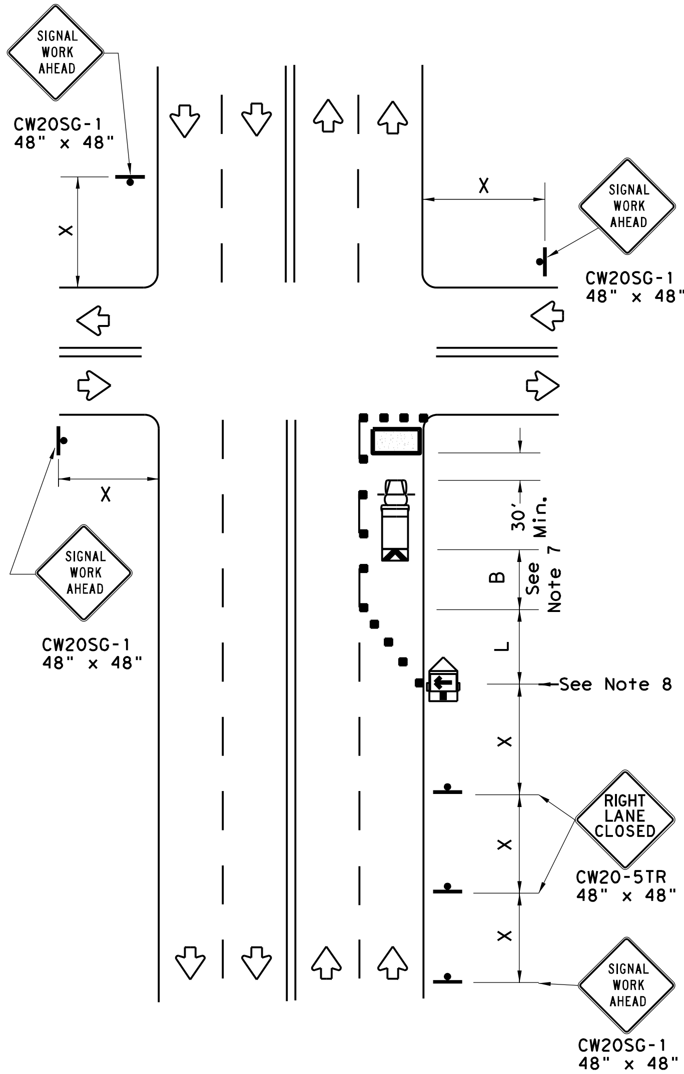
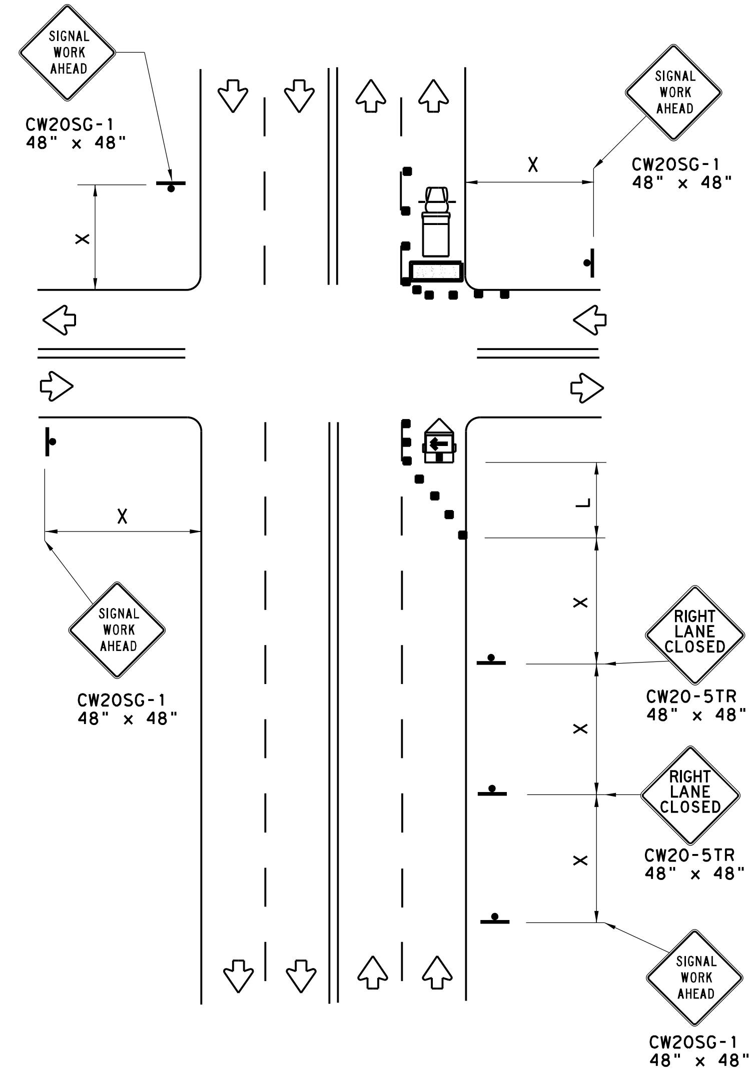


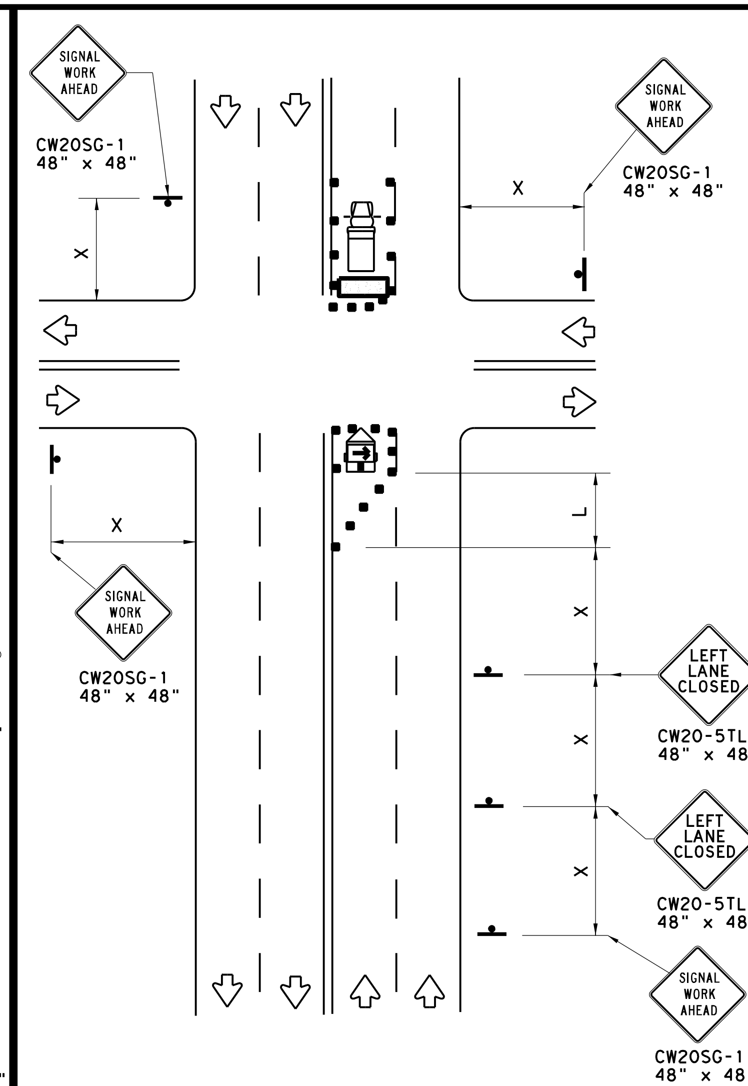
NEAR SIDE LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE RIGHT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE LEFT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY

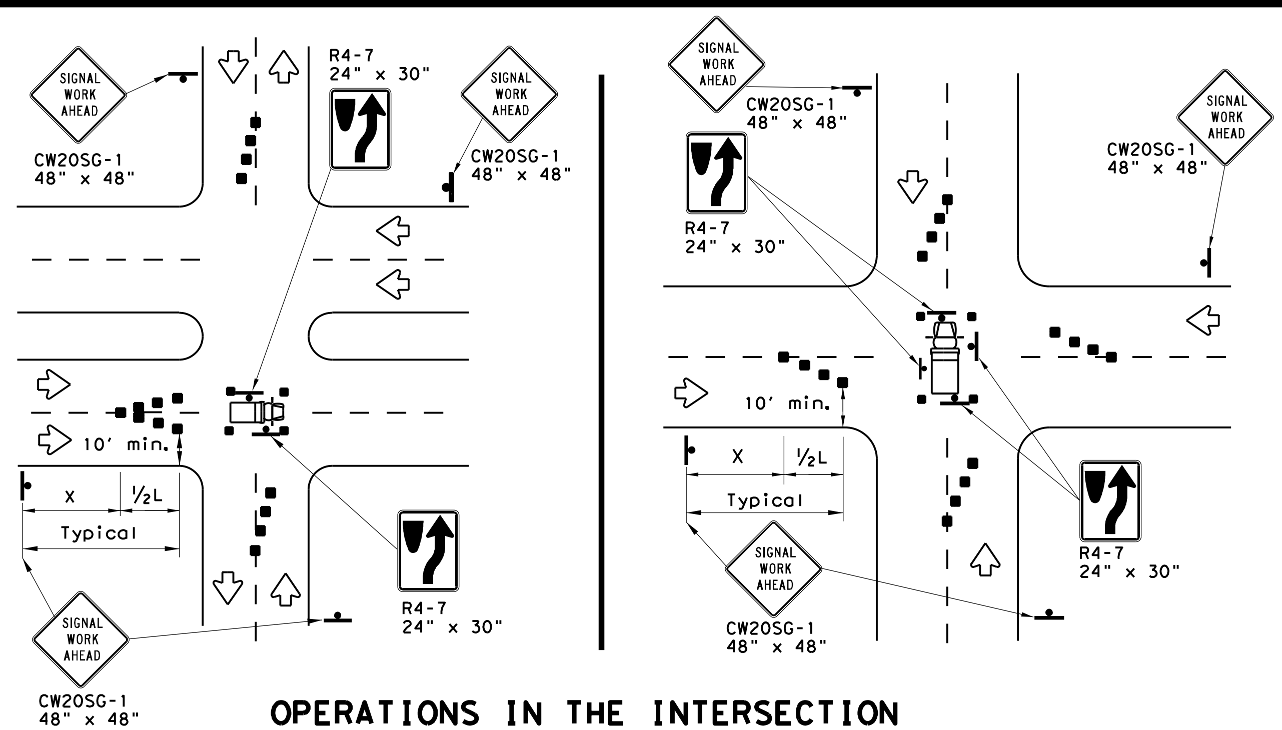
LEGEND			
▨	Type 3 Barricade	■ ■	Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

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

* Conventional Roads Only

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

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



OPERATIONS IN THE INTERSECTION

SHORT DURATION

GENERAL NOTES

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

SHEET 1 OF 2

Texas Department of Transportation — *Traffic Operations Division Standard*

TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ(BTS-1)-13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0387	05	028,ETC.	FM 982,ETC.
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03	18	COLLIN,ETC.		19

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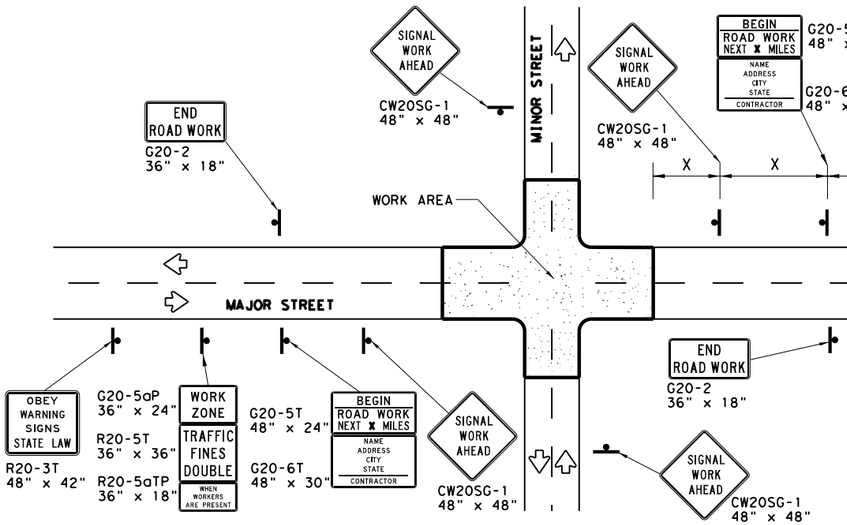
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/0902824 arrest/Roadway/Standards/WZBTS-2-13.dgn



TYPICAL ADVANCE SIGNAL PROJECT SIGNING

FOR LONG TERM and INTERMEDIATE-TERM STATIONARY WORK OPERATIONS

NOTES

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

DURATION OF WORK

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

SIGN MOUNTING HEIGHT

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

REMOVING OR COVERING

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

REFLECTIVE SHEETING

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

SIGN SUPPORT WEIGHTS

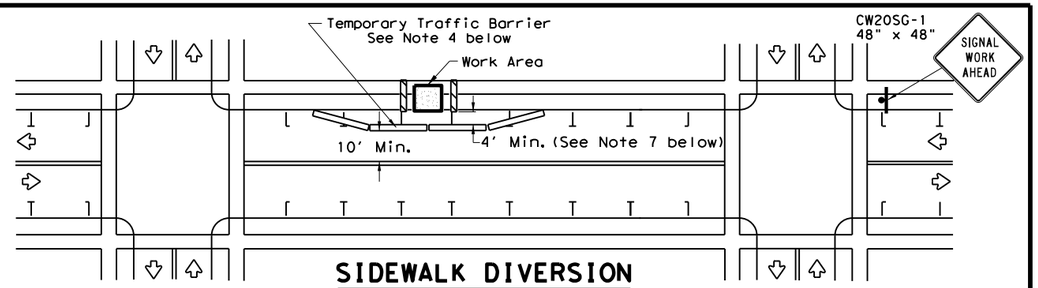
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support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

LEGEND	
	Sign
	Channelizing Devices
	Type 3 Barricade

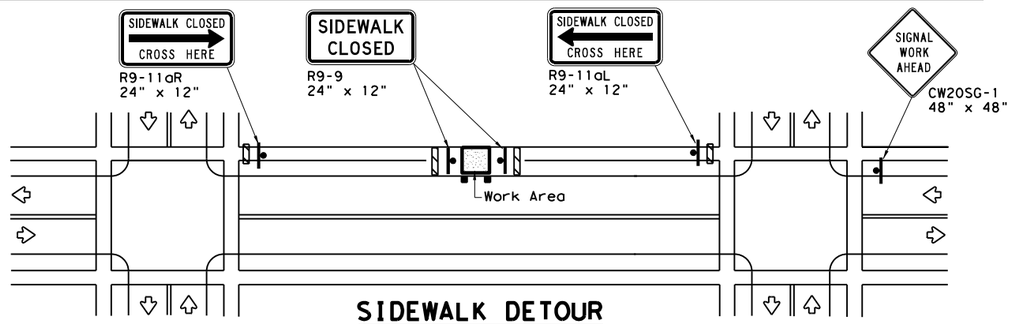
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

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

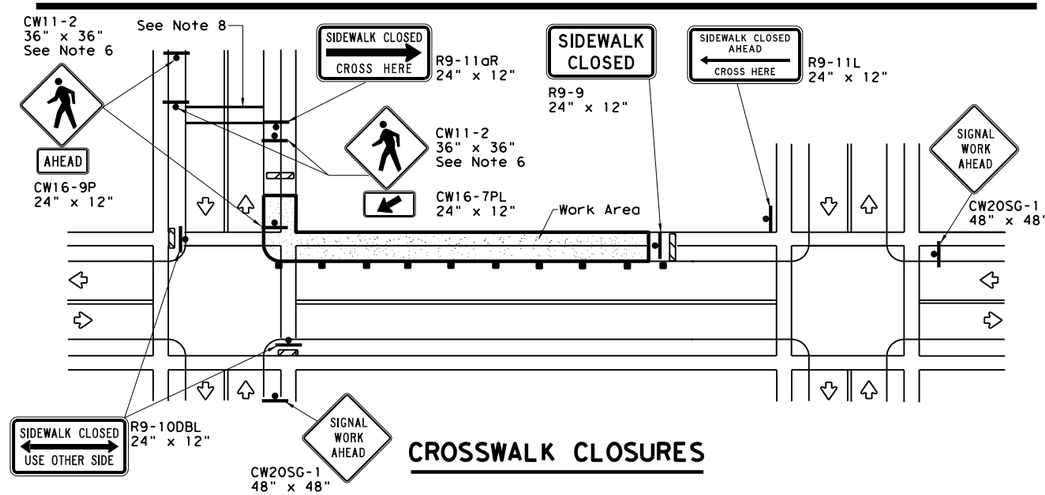
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



SIDEWALK DIVERSION



SIDEWALK DETOUR



CROSSWALK CLOSURES

PEDESTRIAN CONTROL

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

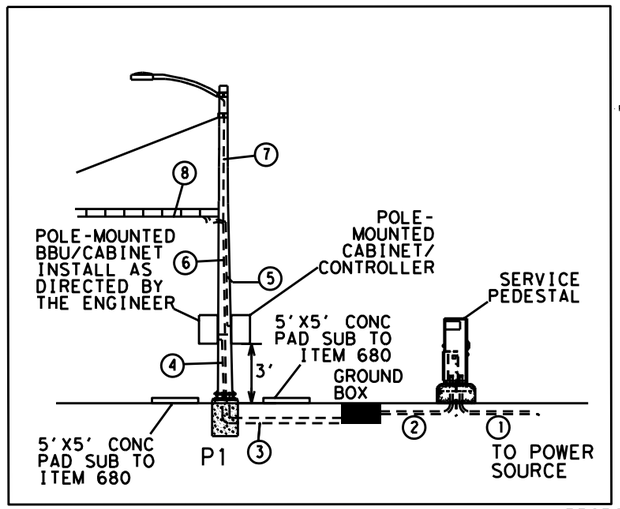
Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ(BTS-2)-13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0387	05	028,ETC.	FM 982,ETC.
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03	18	COLLIN,ETC.		20



DETAILS AT POLE P1

LEGEND

- PROPOSED STRAIN POLE SIGNAL WITH SIGNAL HEADS, 250 WATT EQ LED LUMINAIRE AND SIGNS
- POLE MOUNTED CONTROLLER
- BBU CABINET
- SERVICE POLE
- TYPE C GROUND BOX WITH APRON
- SS1 – STORM SEWER
- FOL – FIBER OPTICS
- OH – OVERHEAD ELECTRIC
- CULVERT

0 20 40 60 80 100

SCALE (FT.)

PROPOSED POWER SOURCE
CONTACT JACOB BOWHAY
WITH ONCOR ELECTRIC
AT 214-548-2788

INSTALL ELECTRICAL SERVICE
TY D(120/240)070(NS)SS(E)PS(U)
SERVICE ADDRESS:
5250 FM 982, PRINCETON, TX 75407

TELEPHONE

EXISTING DRIVEWAY

POSSIBLE FUTURE DRIVEWAY

PROPOSED DEVELOPER DRIVEWAY

PROPOSED DEVELOPER DRIVEWAY

POSSIBLE FUTURE DRIVEWAY

TELEPHONE

FM 546 (50MPH)

FM 982 (55MPH)

ROW

ONLY

Ø1 Ø2 Ø4 Ø5 Ø6 Ø8

P1 P2 P3 P4

NOTE: SIGNAL HEAD PLACEMENT AND PHASING SHOWN ARE FOR FUTURE STRIPING. ENGINEER SHALL ADJUST TO MEET CURRENT FIELD CONDITIONS IF NEEDED.

FILE: FM 982 @ FM 546 signal layout.dgn

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STATE OF TEXAS
LISA D. LAWSON
65131
REGISTERED PROFESSIONAL ENGINEER

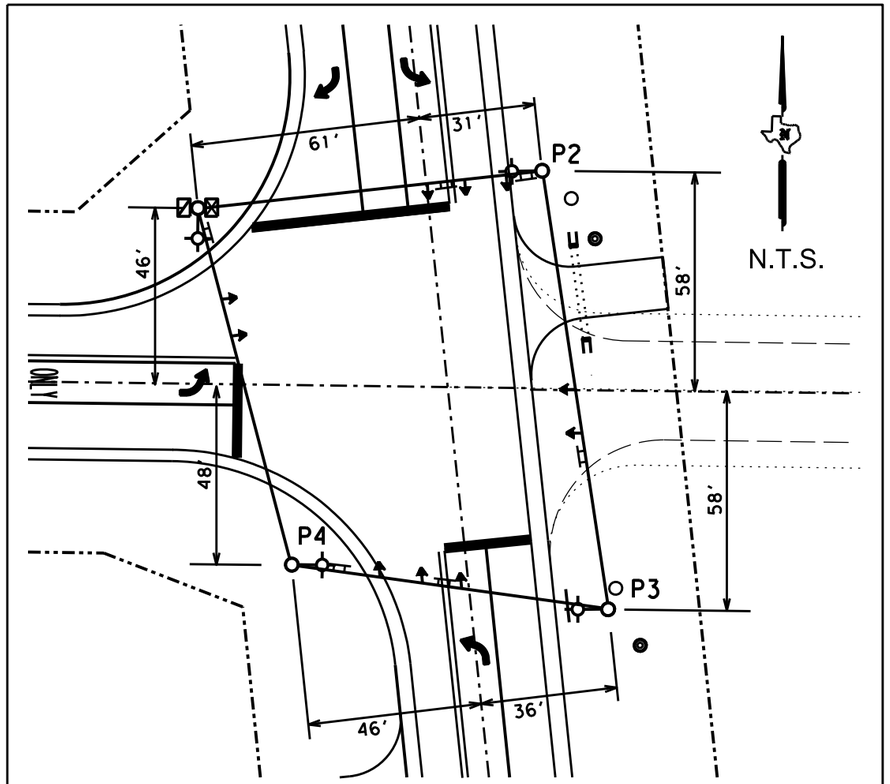
Lisa D Lawson, P.E. 2/12/2024

TRAFFIC SIGNAL LAYOUT
FM 982 AT FM 546

SCALE: 1"=40'

SHEET 1 OF 4

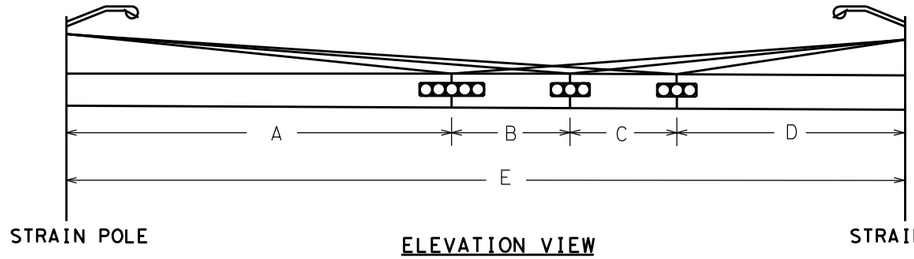
DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MJ	6	(SEE TITLE SHEET)		FM 982,ETC
GRAPHICS JDC	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK BS	TEXAS	18	COLLIN, ETC	21
CHECK	CONTROL	SECTION	JOB	
	0387	05	028, ETC	



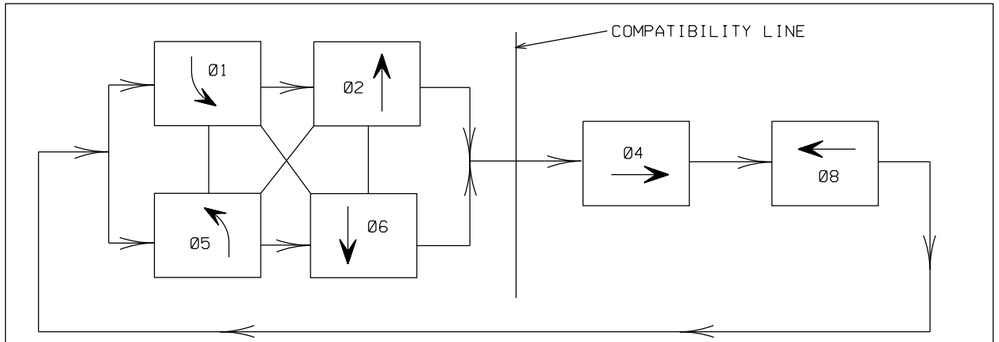
POLE PLACEMENT DIAGRAM

SIGNAL POLE FOUNDATIONS					
POLE NUMBER	POLE HEIGHT	POLE TYPE	FND. TYPE WIND ZONE 80 MPH	DRILLED SHAFT LENGTH 36" DIA TYPE A ITEM 416 (LF)	LUM ARM (EA)
P1	34'	D	36-B	15	1
P2	34'	D	36-B	15	1
P3	34'	D	36-B	15	1
P4	34'	D	36-B	15	1
		TOTAL		60	4

STEEL CABLE SUMMARY (ITEM 625)			
ITEM NO.	DESCRIPTION	UNIT	QTY.
0625 6002	ZINC-COAT STL WIRE STRAND (3/16")	LF	782
0625 6004	ZINC-COAT STL WIRE STRAND (5/16")	LF	1009



ELEVATION VIEW



PHASE SEQUENCE

Ø1 AND Ø5 ARE PROTECTED/PERMITTED LEFT TURN PHASES

OL A = Ø1 (RA, YA, FYA)
OL C = Ø5 (RA, YA, FYA)

SIGNAL HEAD & POLE PLACEMENT (FT)						
SPAN	A	B	C	D	E	NO. OF HEADS
P1 TO P2*	62	10	11	10	93	3
P2 TO P3*	58	-	12	47	117	2
P3 TO P4*	39	10	11	24	84	3
P4 TO P1*	62	-	10	25	97	2

*USE AN 8'-0" SAG WHEN INSTALLING SIGNAL HEADS

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STATE OF TEXAS
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Lisa D Lawson, P.E. 2/12/2024

TRAFFIC SIGNAL LAYOUT
FM 982 AT FM 546

SHEET 2 OF 4

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MJ	6	(SEE TITLE SHEET)		FM 982,ETC
GRAPHICS JDC	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK BS	TEXAS	18	COLLIN, ETC	22
CHECK	CONTROL	SECTION	JOB	
	0387	05	028, ETC	

SIGNAL HEADS (ITEM 682)											
SIGNAL HEAD NUMBER	12" LED SIGNAL INDICATION										
	SIGNAL HEAD TYPE	STATUS	BACKPLATE			LED SIGNAL LAMPS					
			3 SEC	4 SEC	5 SEC	R	Y	G	~~R~~	~~Y~~	~~G~~
			EA	EA	EA	EA	EA	EA	EA	EA	EA
1	H5FLT	I			1				2	2	1
2	H3	I	1			1	1	1			
3	H3	I	1			1	1	1			
4	H4LT	I		1		1	1	1			1
5	H3	I	1			1	1	1			
6	H5FLT	I			1				2	2	1
7	H3	I	1			1	1	1			
8	H3	I	1			1	1	1			
9	H4LT	I		1		1	1	1			1
10	H3	I	1			1	1	1			
		TOTAL	6	2	2	8	8	8	4	4	4

STATUS: I=INSTALL

H3

H4LT

H5FLT

DETECTION ZONE DETAILS		
PHASE OF DETECTION	TYPE OF LOCATION	ADVANCE DETECTION ZONE LOCATIONS
Ø1 & Ø6	PRESENCE AND ADVANCE	445' AND 325' FROM THE STOP BAR
Ø2 & Ø5	PRESENCE AND ADVANCE	445' AND 325' FROM THE STOP BAR
Ø4	PRESENCE AND ADVANCE	405' AND 300' FROM THE STOP BAR
Ø8	PRESENCE ONLY	N/A

CABLE TERMINATION CHART						
CNDR. COLOR	CABLE 1 SPAN P1-P2 TO CNTRL. 7 CNDR.	CABLE 2 SPAN P1-P2 TO CNTRL. 7 CNDR.	CABLE 3 SPAN P2-P3 TO CNTRL. 7 CNDR.	CABLE 4 SPAN P3-P4 TO CNTRL. 7 CNDR.	CABLE 5 SPAN P3-P4 TO CNTRL. 7 CNDR.	CABLE 6 SPAN P4-P1 TO CNTRL. 7 CNDR.
BLACK	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE
WHITE	S. COMMON	S. COMMON	S. COMMON	S. COMMON	S. COMMON	S. COMMON
RED	SH 1 OL C ~~R~~	SH 2,3 Ø2 R	SH 4,5 Ø4 R	SH 6 OL A ~~R~~	SH 7,8 Ø6 R	SH 9,10 Ø8 R
GREEN	SH 1 OL C ~~SY~~	SH 2,3 Ø2 G	SH 4,5 Ø4 ~~G~~/G	SH 6 OL A ~~SY~~	SH 7,8 Ø6 G	SH 9,10 Ø8 ~~G~~/G
ORANGE	SH 1 OL C ~~FY~~	SH 2,3 Ø2 Y	SH 4,5 Ø4 Y	SH 6 OL A ~~FY~~	SH 7,8 Ø6 Y	SH 9,10 Ø8 Y
BLUE	SH 1 Ø5 ~~G~~	SPARE	SPARE	SH 6 Ø1 ~~G~~	SPARE	SPARE
WHITE/ BLACK	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE
RED/ BLACK						
GRN/ BLACK						
ORANGE/ BLACK						
BLUE/ BLACK						
BLACK/ WHITE						
RED/ WHITE						
GRN/ WHITE						
BLUE/ WHITE						
BLACK/ RED						
RED/ WHITE						
GRN/ WHITE						
BLUE/ WHITE						
BLACK/ RED						

ELECTRICAL SERVICE DATA									
ELECTRICAL SERVICE DESCRIPTION (SEE ED(5))	SERVICE CONDUIT SIZE (RM) (SCH 80)	SERVICE CONDUCTORS NO. / SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE / AMPS	FIVE-POLE CONTACTOR AMPS	PANEL BD. / LOADCENTER AMP RATING (MIN.)	CIRCUIT NO.	BRANCH CKT. BRK. POLE / AMPS	KVA LOAD
ELEC SRV TY D (120/240) 070 (NS) SS (E) PS (U)	2"	3/#4	N/A	2P/70	30	100	SIGNAL LIGHTING LIGHTING	1P/50 2P/20 2P/20	<7.1

GROUND BOX SUMMARY			
ITEM NO.	DESCRIPTION	UNIT	QTY.
0624 6008	GROUND BOX TYPE C (162911) W/APRON	EA	1

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STATE OF TEXAS
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Lisa D Lawson, P.E. 2/12/2024

TRAFFIC SIGNAL LAYOUT
FM 982 AT FM 546

SHEET 3 OF 4

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MJ	6	(SEE TITLE SHEET)		FM 982,ETC
GRAPHICS JDC	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK BS	TEXAS	18	COLLIN, ETC	23
CHECK	CONTROL	SECTION	JOB	
	0387	05	028, ETC	

FILE: FM 982 @ FM 546 signal layout.dgn

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT SIZE / TYPE							ELECTRICAL CONDUCTORS								RADAR PRESENCE DETECTION CABLE *		RADAR ADVANCE DETECTION CABLE *		TRAFFIC SIGNAL CABLES		RUN NO.
	INSIDE POLE	OVERHEAD SPAN	2" (SCHD 80)		2" (SCHD 40)		STATUS	POWER #4 INSULATED		POWER #6 INSULATED		GROUND #6 BARE		LUMINAIRE #8 INSULATED						#14 /7C		
	LENGTH	LENGTH	NO.	LENGTH	NO.	LENGTH		NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	
	LF	LF	EA	LF	EA	LF		EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	
1			1	10			I	3	30													1
2					1	8	I			2	16	1	8	4	32							2
3					1	8	I			2	16	1	8	4	32							3
4	5						I			2	10	1	5									4
5	15						I													6	90	5
6	20						I							4	80							6
7	8						I							4	32							7
8		62					I							2	124					3	186	8
9		10					I							2	20					2	20	9
10		11					I							2	22					2	22	10
11		10					I							2	20					1	10	11
12	8						I							2	16							12
13		58					I													1	58	13
14		12					I													1	12	14
15	8						I							2	16							15
16		39					I							2	78							16
17		10					I							2	20					1	10	17
18		11					I							2	22					2	22	18
19		24					I							2	48					2	48	19
20	8						I							4	32							20
21		62					I							2	124					2	124	21
22		10					I							2	20					3	30	22
23		25					I							2	50					3	75	23
SLACK 4-1							I														30	SLACK 4-1
TOTAL			10		16		-	30		42		21		788						737		

NOTE: 1. STATUS IS "I" INSTALL OR "E" EXISTING
2. SLACK 4-1 QUANTITY INCLUDED FOR SHIFT OF HEADS ON SPAN P4-P1 DUE TO FUTURE DRIVEWAY INSTALLATION. COIL ON POLE P1 FOR FUTURE USE.
*ALL RADAR CABLE IS SUBSIDIARY TO ITEM 6292. COLUMN IS TO BE FILLED IN AT TIME OF INSTALLATION.

FILE: FM 982 @ FM 546 signal layout.dgn

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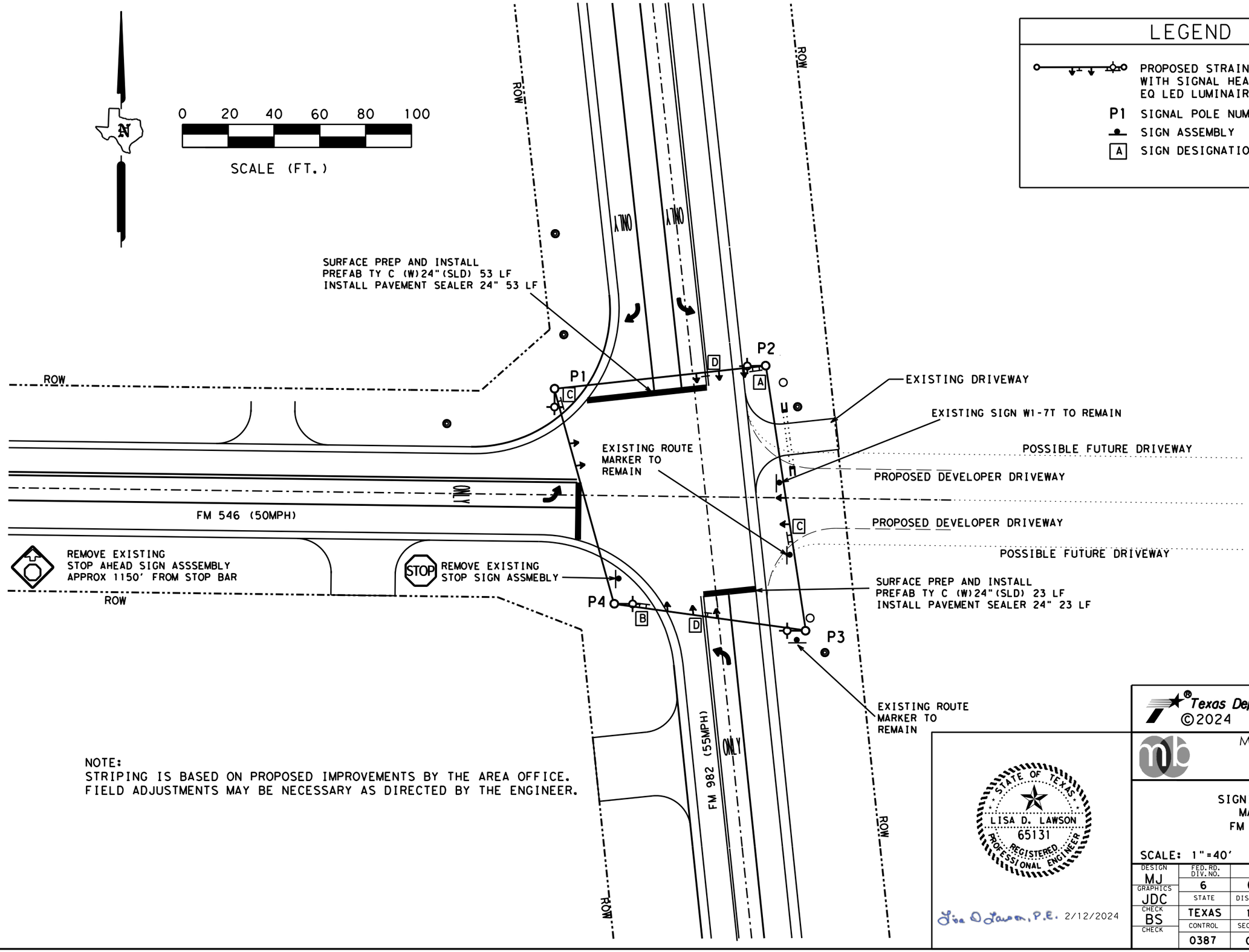
STATE OF TEXAS
LISA D. LAWSON
65131
REGISTERED PROFESSIONAL ENGINEER

Lisa D Lawson, P.E. 2/12/2024

TRAFFIC SIGNAL LAYOUT
FM 982 AT FM 546

SHEET 4 OF 4

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MJ	6	(SEE TITLE SHEET)		FM 982,ETC
GRAPHICS JDC	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK BS	TEXAS	18	COLLIN, ETC	24
CHECK	CONTROL	SECTION	JOB	
	0387	05	028, ETC	



NOTE:
STRIPING IS BASED ON PROPOSED IMPROVEMENTS BY THE AREA OFFICE.
FIELD ADJUSTMENTS MAY BE NECESSARY AS DIRECTED BY THE ENGINEER.

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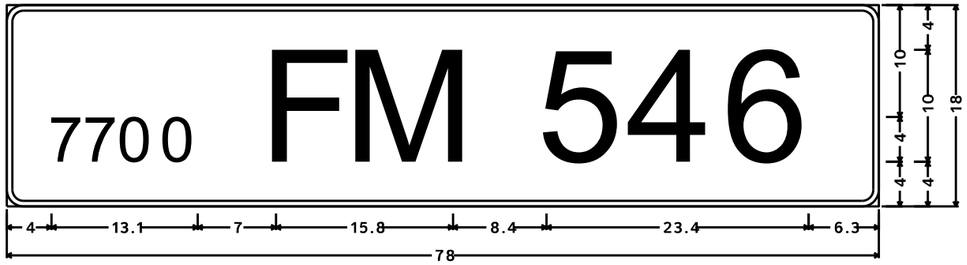
SIGNING AND PAVEMENT MARKING LAYOUT
FM 982 AT FM 546

SCALE: 1"=40' SHEET 1 OF 2

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MJ	6	(SEE TITLE SHEET)		FM 982,ETC
GRAPHICS JDC	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK BS	TEXAS	18	COLLIN, ETC	25
CHECK	CONTROL	SECTION	JOB	
	0387	05	028, ETC	

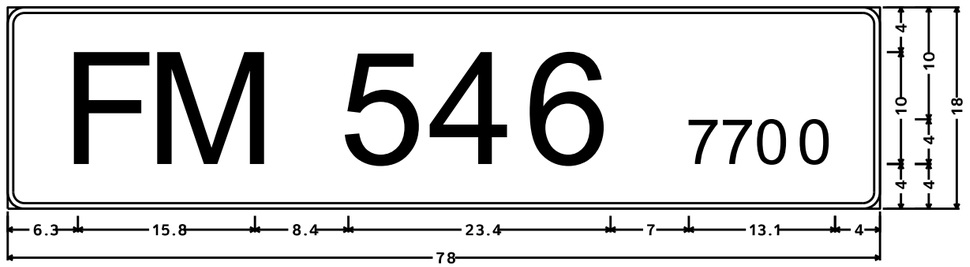
FILE: FM 982atFM546*Sign*PaveMark layout.dgn

SIGNING AND PAVEMENT MARKING ITEMS			
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0644-6076	REMOVE SM RD SN SUP&AM	EA	2
0666-6230	PAVEMENT SEALER 24"	LF	69
0668-6076	PREFAB PAV MRK TY C (W) (24") (SLD)	LF	69
0678-6008	PAV SURF PREP FOR MRK (24")	LF	69



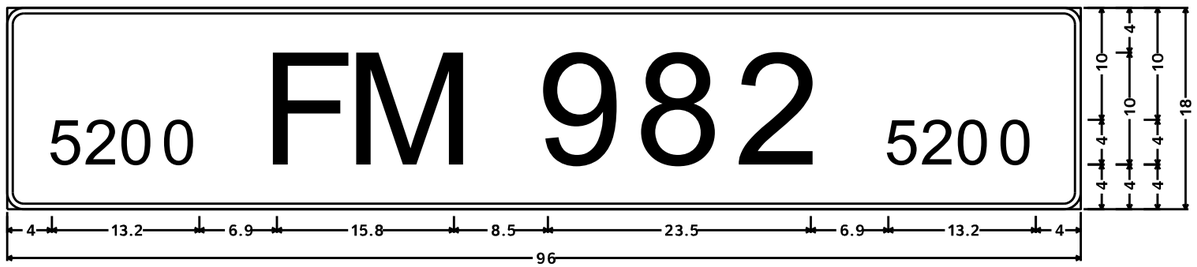
A

D3-1G(6) 10in;
1.5" Radius, 0.5" Border, White on Green;
"7700", ClearviewHwy-3-W; "FM 546", ClearviewHwy-3-W;



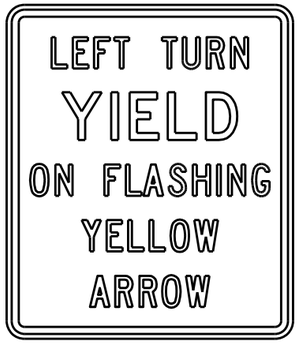
B

D3-1G(6) 10in;
1.5" Radius, 0.5" Border, White on Green;
"FM 546", ClearviewHwy-3-W; "7700", ClearviewHwy-3-W;



C
2 EA

D3-1G(6) 10in;
1.5" Radius, 0.5" Border, White on Green;
"5200", ClearviewHwy-3-W; "FM 982", ClearviewHwy-3-W; "5200", ClearviewHwy-3-W;



D
R10-17T
36X42
2 EA

FILE: FM 982atFM546+Sign+PaveMark layout.dgn

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SIGNING AND PAVEMENT MARKING LAYOUT
FM 982 AT FM 546

SHEET 2 OF 2

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MJ	6	(SEE TITLE SHEET)		FM 982,ETC
GRAPHICS JDC	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK BS	TEXAS	18	COLLIN, ETC	26
CHECK	CONTROL	SECTION	JOB	
	0387	05	028, ETC	

FILE: P:\4.0 Eng Ops\4.2 Projects\651.4 - TxDOT DAL On Call\TO 5 - Signal Designs\FM 720 at Martingale Trail\cad\sheets\FM720 SignalLayout.dgn

LEGEND

- TRAFFIC SIGNAL POLE W/MAST ARM, SIGNAL HEADS W/ NUMBERS, SIGN AND 250W EQ LED LUMINAIRE
- PROPOSED PEDESTAL POLE WITH APS UNIT
- CONTROLLER
- TYPE C GROUND BOX WITH APRON
- TYPE D GROUND BOX WITH APRON
- ELECTRICAL SERVICE
- UTILITY POLE W/LUMINAIRE
- CONDUIT RUN W/NUMBER
- P1 POLE NUMBER
- SS1 – STORM SEWER
- FOL – FIBER OPTICS
- OH – OVERHEAD ELECTRIC
- G – GAS PIPELINE
- ROW

PROPOSED POWER SOURCE
CONTACT MATT WALKER WITH
COSERV ELECTRIC
AT 940-321-7800

INSTALL ELECTRICAL SERVICE
TY D(120/240)070(NS)SS(E)GC(O)
SERVICE ADDRESS:
2905 FM 720 W, OAK POINT,
TX 75068

SEE DETAIL A

INSTALL CONTROLLER, CABINET,
BBU, BASE, AND FOUNDATION

MANHOLE

TELEPHONE

INLET

CITY ROW

MARTINGALE TRAIL

EXISTING
DECORATIVE
LIGHT

SEE DETAIL B

FM 720 (OAK GROVE PKWY)

(50 MPH)

10" SS FORCE MAIN

12" WATER MAIN

P1 P2 P3 P4 P5 P6

Ø1 Ø2 Ø3 Ø4 Ø5 Ø6 Ø7 Ø8

DETAIL A

DETAIL B

0 20 40 60 80 100
SCALE (FT.)

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TRAFFIC SIGNAL LAYOUT
FM 720 AT MARTINGALE TRAIL

SCALE: 1"=40' SHEET 1 OF 4

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MJ	6	(SEE TITLE SHEET)		FM 982,ETC
GRAPHICS JDC	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK LDL	TEXAS	18	COLLIN, ETC	27
CHECK BS	CONTROL	SECTION	JOB	
	0387	05	028, ETC	

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT SIZE/TYPE								STATUS	ELECTRICAL CONDUCTORS								TRAY CABLE		RADAR PRESENCE DETECTION CABLE *		RADAR ADVANCE DETECTION CABLE *		TRAFFIC SIGNAL CABLES								RUN NO.
	2" (SCHD 40)		3" (SCHD 40)		4" (SCHD 40)					POWER		GROUND		LUMINAIRE		LUMINAIRES		ILSN						SIGNAL						PEDESTRIAN		
										#6 INSULATED		#6 BARE		#8 INSULATED		#12 INSULATED		12 AWG 3 CNDR						#14 /20C		#14 /7C		#14 /5C		#12 /2C		
	NO.	TRENCH	NO.	TRENCH	NO.	BORE	NO.	TRENCH		NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	
	EA	LF	EA	LF	EA	LF	EA	LF		EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	
1	1	25							I	2	50	1	25	4	100			4	100													1
2	1	6							I	2	12	1	6																			2
2**			1	6					I			1	6																			2**
2							1	6	I			1	6											2	12					3	18	2
3**			1	6					I			1	6																			3**
3							1	6	I			1	6											2	12					3	18	3
4			1	6					I			1	6	2	12			2	12													4
5			1	11					I			1	11	2	22			1	11					1	11					1	11	5
6					1	75			I			1	75	2	150			1	75					1	75					2	150	6
7			1	13					I			1	13	2	26			1	13					1	13			1	13	1	13	7
8			1	33					I			1	33															1	33	1	33	8
9					1	143			I			1	143	2	286			2	286					2	286					3	429	9
10			1	23					I			1	23															1	23	1	23	10
11			1	14					I			1	14	2	28			1	14					1	14			1	14			11
12					1	38			I			1	38	2	76			1	38					1	38					2	76	12
13			1	24					I			1	24	2	48			1	24					1	24					2	48	13
14***					1	137																									14***
INSIDE POLES																															INSIDE POLES
P1									I								80		30						69		90				P1
P1 PED																											20		10		P1 PED
P2									I								80		30								68				P2
P2 PED																											10		5		P2 PED
P3									I								80		30						71		98				P3
P3 PED																											10		5		P3 PED
P4									I								80		30								68				P4
P5									I																		10		5		P5
P6									I																		10		5		P6
TOTAL	31		136		393		12		-	62		435		748		320		693						485		140		467		849	

STATUS: I=INSTALL
*ALL RADAR CABLE IS SUBSIDIARY TO ITEM 6292. COLUMN IS TO BE FILLED IN AT TIME OF INSTALLATION.
**SPARE CONDUIT AS REQUIRED ON TS-CF-21
*** CONDUIT INSTALLED FOR FUTURE USE

FILE: P:\4.0 Eng Ops\4.2 Projects\651.4 - TxDOT DAL On Call\TO 5 - SignalDesigns\FM 720 at Martingale Trail\cad\sheets\FM720_SignalLayout.dgn

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TRAFFIC SIGNAL LAYOUT
FM 720 AT MARTINGALE TRAIL

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MJ	6	(SEE TITLE SHEET)		FM 982,ETC
GRAPHICS JDC	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK LDL	TEXAS	18	COLLIN, ETC	28
CHECK BS	CONTROL	SECTION	JOB	
	0387	05	028, ETC	

SIGNAL HEAD AND POLE PLACEMENT																	
POLE NUMBER	STATUS	A (FT)	B (FT)	C (FT)	D (FT)	E (FT)	F (FT)	G (FT)	H (FT)	NO. OF HEADS (EA)*	RADAR DET.(EA)		LUM	DRILLED SHAFT LENGTH (LF)			FDN. TYPE WIND ZONE 80 MPH
											ADVANCE	PRESENCE		24" DIA SUB TO ITEM 687	30" DIA TYPE A	48" DIA TYPE A	
P1	I	7	20	12	18	50	10	19	30	3	1	1	1			22	48-A
P2	I	12	10	10		24	10	19	30	2		1	1		11		30-A
P3	I	10	24	12	16	55	10	19	30	3	1	1	1			22	48-A
P4	I	7	10	10		24	10	19	30	2		1	1		11		30-A
P5	I	9	PEDESTAL POLE						10					6			24-A
P6	I	7	PEDESTAL POLE						10					6			24-A
										TOTAL	2	4	4	12	22	44	

STATUS: I=INSTALL; E= EXISTING; REM=EXISTING TO BE REMOVED; REL=EXISTING TO BE RELOCATED

* DOES NOT INCLUDE VERTICAL SIGNAL HEADS OR PEDESTRIAN SIGNAL HEADS

SIGNAL HEADS (ITEM 682)													
SIGNAL HEAD NUMBER	12" LED SIGNAL INDICATION												PED SIG SEC (LED) (COUNTDOWN)
	SIGNAL HEAD TYPE	STATUS	BACKPLATE			LED SIGNAL LAMPS							
			3 SEC	4 SEC	5 SEC	R	Y	G	←R	←Y	←G		
			EA	EA	EA	EA	EA	EA	EA	EA	EA		
1	H3	I	1			1	1	1					
2	H3	I	1			1	1	1					
3	H5FLT	I			1				2	2	1		
4	H3	I	1			1	1	1					
5	H4LT	I		1		1	1	1			1		
6	H3	I	1			1	1	1					
7	H3	I	1			1	1	1					
8	H5FLT	I			1				2	2	1		
9	H3	I	1			1	1	1					
10	H4LT	I		1		1	1	1			1		
11-16	PED	I											6
		TOTAL	6	2	2	8	8	8	4	4	4		6

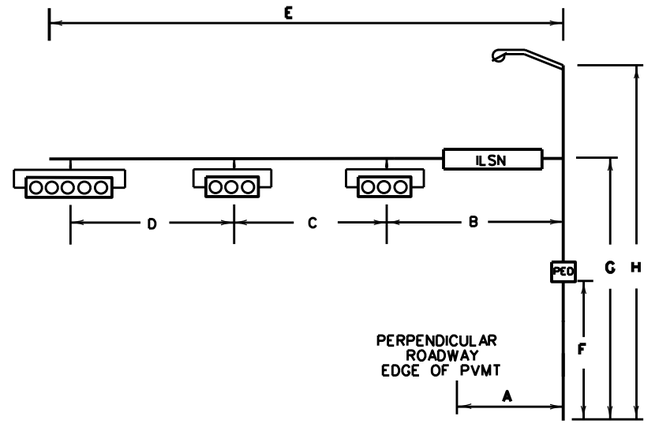
STATUS: I=INSTALL; E=EXISTING; REM=EXISTING TO BE REMOVED; REL=RELOCATE

PED SIGNAL

H3

H4LT

H5FLT



ELECTRICAL SERVICE DATA									
ELECTRICAL SERVICE DESCRIPTION (SEE ED(5))	SERVICE CONDUIT SIZE (RM)	SERVICE CONDUCTORS NO. / SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE / AMPS	FIVE-POLE CONTACTOR AMPS	PANEL BD. / LOADCENTER AMP RATING (MIN.)	CIRCUIT NO.	BRANCH CKT. BRK. POLE / AMPS	KVA LOAD
ELEC SRV TY D (120/240) 070 (NS) SS (E) GC (O)	1 1/4"	3/#4	N/A	2P/70	30	100	SIGNAL LIGHTING LIGHTING ILSN	1P/50 2P/20 2P/20 1P/20	<7.1

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TRAFFIC SIGNAL LAYOUT
FM 720 AT MARTINGALE TRAIL

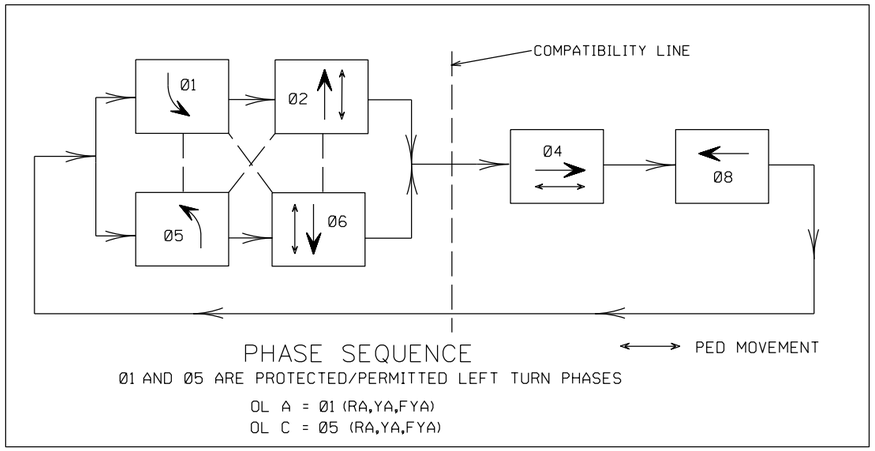
SHEET 3 OF 4

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MJ	6	(SEE TITLE SHEET)		FM 982,ETC
GRAPHICS JDC	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK LDL	TEXAS	18	COLLIN, ETC	29
CHECK BS	CONTROL	SECTION	JOB	
	0387	05	028, ETC	

FILE: P:\4.0 Eng Ops\4.2 Projects\651.4 - TxDOT DAL On Call\TO 5 - SignalDesigns\FM 720 at Martingale Trail\cad\sheets\FM720 SignalLayout.dgn

APS MESSAGE CHART			
POLE LOCATION	PEDESTRIAN MOVEMENT	FUNCTIONS	SPEECH MESSAGE/SOUND DETAILS
P1	PHASE 4	BUTTON PUSH ON DW	WAIT TO CROSS OAK GROVE PKWY AT MARTINGALE TR
		EXTENDED BUTTON PUSH	WAIT TO CROSS OAK GROVE PKWY AT MARTINGALE TR
		LOCATOR TONE	SLOW TICK
		WALK INDICATION*	OAK GROVE PKWY, WALK SIGN IS ON TO CROSS OAK GROVE PKWY
P1	PHASE 6	BUTTON PUSH ON DW	WAIT TO CROSS MARTINGALE TR AT OAK GROVE PKWY
		EXTENDED BUTTON PUSH	WAIT TO CROSS MARTINGALE TR AT OAK GROVE PKWY
		LOCATOR TONE	SLOW TICK
		WALK INDICATION*	MARTINGALE TR, WALK SIGN IS ON TO CROSS MARTINGALE TR
P2	PHASE 2	BUTTON PUSH ON DW	WAIT TO CROSS MARTINGALE TR AT OAK GROVE PKWY
		EXTENDED BUTTON PUSH	WAIT TO CROSS MARTINGALE TR AT OAK GROVE PKWY
		LOCATOR TONE	SLOW TICK
		WALK INDICATION*	MARTINGALE TR, WALK SIGN IS ON TO CROSS MARTINGALE TR
P3	PHASE 2	BUTTON PUSH ON DW	WAIT TO CROSS MARTINGALE TR AT OAK GROVE PKWY
		EXTENDED BUTTON PUSH	WAIT TO CROSS MARTINGALE TR AT OAK GROVE PKWY
		LOCATOR TONE	SLOW TICK
		WALK INDICATION*	MARTINGALE TR, WALK SIGN IS ON TO CROSS MARTINGALE TR
P5	PHASE 4	BUTTON PUSH ON DW	WAIT TO CROSS OAK GROVE PKWY AT MARTINGALE TR
		EXTENDED BUTTON PUSH	WAIT TO CROSS OAK GROVE PKWY AT MARTINGALE TR
		LOCATOR TONE	SLOW TICK
		WALK INDICATION*	OAK GROVE PKWY, WALK SIGN IS ON TO CROSS OAK GROVE PKWY
P6	PHASE 6	BUTTON PUSH ON DW	WAIT TO CROSS MARTINGALE TR AT OAK GROVE PKWY
		EXTENDED BUTTON PUSH	WAIT TO CROSS MARTINGALE TR AT OAK GROVE PKWY
		LOCATOR TONE	SLOW TICK
		WALK INDICATION*	MARTINGALE TR, WALK SIGN IS ON TO CROSS MARTINGALE TR

* COUNTDOWN SPEECH MESSAGE - "OFF" FOR ALL UNITS



DETECTION ZONE DETAILS		
PHASE OF DETECTION	TYPE OF LOCATION	ADVANCE DETECTION ZONE LOCATIONS
Ø1 & Ø6	PRESENCE AND ADVANCE	405' AND 300' FROM THE STOP BAR
Ø2 & Ø5	PRESENCE AND ADVANCE	405' AND 300' FROM THE STOP BAR
Ø4	PRESENCE ONLY	N/A
Ø8	PRESENCE ONLY	N/A

GROUND BOX SUMMARY			
ITEM NO.	DESCRIPTION	UNIT	QTY.
0624 6008	GROUND BOX TYPE C (162911) W/APRON	EA	3
0624 6010	GROUND BOX TYPE D (162922) W/APRON	EA	2

CABLE TERMINATION CHART						
CNDR. COLOR	CABLE 1 FROM P1 TO CNTRL. 20 CNDR.	CABLE 2 FROM P2 TO CNTRL. 20 CNDR.	CABLE 3 FROM P3 TO CNTRL. 20 CNDR.	CABLE 4 FROM P4 TO CNTRL. 20 CNDR.	CABLE 5 FROM P2 TO P5 5 CNDR.	CABLE 6 FROM P4 TO P6 5 CNDR.
BLACK	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE
WHITE	S. COMMON	S. COMMON	S. COMMON	S. COMMON	S. COMMON	S. COMMON
RED	SH 1,2 Ø6 R	SH 4,5 Ø4 R	SH 6,7 Ø2 R	SH 9,10 Ø8 R	SH 13 Ø4 DW	SH 16 Ø6 DW
GREEN	SH 1,2 Ø6 G	SH 4,5 Ø4 G	SH 6,7 Ø2 G	SH 9,10 Ø8 G	SH 13 Ø4 W	SH 16 Ø6 W
ORANGE	SH 1,2 Ø6 Y	SH 4,5 Ø4 Y	SH 6,7 Ø2 Y	SH 9,10 Ø8 Y	SPARE	SPARE
BLUE	SH 3 OL A R	SPARE	SH 8 OL C R	SPARE		
WHITE/ BLACK	SH 3 OL A Y	SPARE	SH 8 OL C Y	SPARE		
RED/ BLACK	SH 3 OL A FY	SPARE	SH 8 OL C FY	SPARE		
GRN/ BLACK	SH 3 Ø1 G	SPARE	SH 8 Ø5 G	SPARE		
ORANGE/ BLACK	SPARE	SPARE	SPARE	SPARE		
BLUE/ BLACK	SPARE	SPARE	SPARE	SPARE		
BLACK/ WHITE	SPARE	SPARE	SPARE	SPARE		
RED/ WHITE	SH 11 Ø6 DW	SH 14 Ø2 DW	SH 15 Ø2 DW	SH 16 Ø6 DW		
GRN/ WHITE	SH 11 Ø6 W	SH 14 Ø2 W	SH 15 Ø2 W	SH 16 Ø6 W		
BLUE/ WHITE	SPARE	SPARE	SPARE	SPARE		
BLACK/ RED	SPARE	SPARE	SPARE	SPARE		
RED/ WHITE	SH 12 Ø4 DW	SH 13 Ø4 DW	SPARE	SPARE		
GRN/ WHITE	SH 12 Ø4 W	SH 13 Ø4 W	SPARE	SPARE		
BLUE/ WHITE	SPARE	SPARE	SPARE	SPARE		
BLACK/ RED	SPARE	SPARE	SPARE	SPARE		

STATE OF TEXAS
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TRAFFIC SIGNAL LAYOUT
FM 720 AT MARTINGALE TRAIL

SHEET 4 OF 4

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MJ	6	(SEE TITLE SHEET)		FM 982,ETC
GRAPHICS JDC	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK LDL	TEXAS	18	COLLIN, ETC	30
CHECK BS	CONTROL 0387	SECTION 05	JOB 028, ETC	

FILE: P:\4.0 Eng Ops\4.2 Projects\651.4 - TxDOT DAL On Call\TO 5 - Signal Designs\FM 720 at Martingale Trail\cad\sheets\FM720_SignalLayout.dgn

ELIMINATE EXISTING PVMT MARK (4") 80 LF
ELIMINATE EXISTING RPMS 4 EA
THIS WORK IS SUBSIDAIRY TO ITEM 677
SURFACE PREP AND INSTALL
RE PM W/RET REQ TY I(W) 6" (BRK) 80 LF
INSTALL PAVEMENT SEALER 6" 80 LF
INSTALL REFL MRKS TY II-C-R 4 EA

ELIMINATE EXISTING PVMT MARK (4)" 199 LF
SURFACE PREP AND INSTALL
RE PM W/RET REQ TY I(Y) 6" (SLD) 199 LF
INSTALL PAVEMENT SEALER 6" 180 LF

SURFACE PREP AND INSTALL
PREFAB TY C (W)24"(SLD) 48 LF
INSTALL PAVEMENT SEALER 24" 48 LF

ELIMINATE EXISTING PVMT MARK (4") 100 LF
ELIMINATE EXISTING RPMS 4 EA
THIS WORK IS SUBSIDAIRY TO ITEM 677

SURFACE PREP AND INSTALL DOUBLE YELLOW
RE PM W/RET REQ TY I(Y)(6")(SLD) - 200 LF
INSTALL PAVEMENT SEALER 6" 200 LF

MARTINGALE TRAIL

SURFACE PREP AND INSTALL
PREFAB TY C (W)24"(SLD) 12 LF
INSTALL PAVEMENT SEALER 24" 12 LF

ELIMINATE EXISTING
PAVEMENT MARKING
(STOP BAR)(24") 15 LF

SURFACE PREP AND INSTALL
PREFAB TY C (W)24"(SLD) 6 AT 6 LF EA - 36 LF TOTAL
INSTALL PAVEMENT SEALER 24" 6 AT 6 LF EA- 36 LF TOTAL

MARTINGALE TR
2800 OAK GROVE PKWY 2700

STOP

REMOVE STOP SIGN
ASSEMBLY AFTER
SIGNAL IS OPERATIONAL

ELIMINATE EXISTING PVMT MARK (4)" 168 LF
SURFACE PREP AND INSTALL
RE PM W/RET REQ TY I(Y) 6" (SLD) 180 LF
INSTALL PAVEMENT SEALER 6" 180 LF

ELIMINATE EXISTING PVMT MARK (4") 100 LF
ELIMINATE EXISTING RPMS 4 EA
THIS WORK IS SUBSIDAIRY TO ITEM 677
SURFACE PREP AND INSTALL
RE PM W/RET REQ TY I(W) 6" (BRK) 100 LF
INSTALL PAVEMENT SEALER 6" 100 LF
INSTALL REFL MRKS TY II-C-R 4 EA

ROW
ROW
ROW
ROW
CITY ROW
CITY ROW
CITY ROW
CITY ROW
FM 720 (OAK GROVE PKWY)

ELIMINATE EXISTING
PAVEMENT MARKING
(8") 93 LF
SURFACE PREP AND
INSTALL PM W/RET REQ
TY I(W)8"(SOLID) 93 LF
INSTALL PAVEMENT SEALER
8" 93 LF

ELIMINATE EXISTING PVMT MARK (4)" 168 LF
SURFACE PREP AND INSTALL
RE PM W/RET REQ TY I(W) 6" (SLD) 168 LF
INSTALL PAVEMENT SEALER 6" 168 LF

FM 720
MARTINGALE TR

REMOVE STOP SIGN
ASSEMBLY AFTER
SIGNAL IS OPERATIONAL

STOP

SURFACE PREP AND INSTALL
PREFAB TY C (W)24"(SLD) 8 AT 6 LF EA - 48 LF TOTAL
INSTALL PAVEMENT SEALER 24" 8 AT 6 LF EA - 48 LF TOTAL

SURFACE PREP AND INSTALL
PREFAB TY C (W)24"(SLD) 24 LF
INSTALL PAVEMENT SEALER 24" 24 LF

ELIMINATE EXISTING
PAVEMENT MARKING
(STOP BAR)(24") 30 LF

SURFACE PREP AND INSTALL
PREFAB TY C (W)24"(SLD) 48 LF
INSTALL PAVEMENT SEALER 24" 48 LF

SURFACE PREP AND INSTALL
PREFAB TY C (W)24"(SLD) 14 AT 6 LF EA - 84 LF TOTAL
INSTALL PAVEMENT SEALER 24" 14 AT 6 LF EA - 84 LF TOTAL

ELIMINATE EXISTING PVMT MARK
(4)" 167 LF
SURFACE PREP AND INSTALL
RE PM W/RET REQ TY I(W)
(6" (SLD) 167 LF
INSTALL PAVEMENT SEALER
6" 167 LF

ELIMINATE EXISTING
PAVEMENT MARKING
(8") 89 LF
ELIMINATE EXISTING
RPMS 2 EA
THIS WORK IS
SUBSIDIARY TO ITEM 677
SURFACE PREP AND
INSTALL PM W/RET REQ
TY I(W)8"(SOLID) 79 LF
INSTALL PAVEMENT SEALER
8" 79 LF

P1 P2 P3 P4 P5 P6

LEGEND

- TRAFFIC SIGNAL POLE W/MAST ARM, SIGNAL HEADS, SIGN AND 250W EQ LED LUMINAIRE
- PROPOSED PEDESTAL POLE WITH APS UNIT
- P1 SIGNAL POLE NUMBER
- [A] SIGN DESIGNATION
- SIGN ASSEMBLY
- ROW

N

0 20 40 60 80 100
SCALE (FT.)

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MALDONADO - BURKETT
Engineers | Contractors
TBPE # 10258
www.maldonado-burkett.com

STATE OF TEXAS
LISA D. LAWSON
65131
REGISTERED PROFESSIONAL ENGINEER

Lisa D Lawson, P.E.
2/13/2024

SIGNING AND PAVEMENT MARKING LAYOUT FM 720 AT MARTINGALE TRAIL

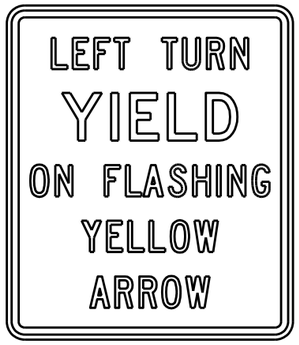
SCALE: 1"=40' SHEET 1 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MJ	6	(SEE TITLE SHEET)		FM 982,ETC
GRAPHICS JDC	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK LDL	TEXAS	18	COLLIN, ETC	31
CHECK BS	CONTROL 0387	SECTION 05	JOB 028, ETC	

FILE: P:\4.0 Eng Ops\4.2 Projects\651.4 - TxDOT DAL On Call\TO 5 - SignalDesigns\FM 720 at Martingale Trail\cad\sheets\FM720 PaveMarkLayout.dgn

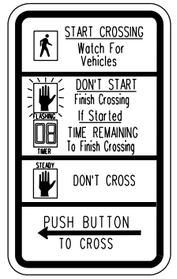
A B C D

ILSN SIGNS TO BE SUPPLIED BY THE CITY OF OAK POINT

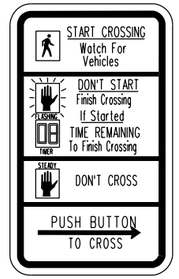


E
R10-17T
36X42
2 EA

F
R9-3
24X24
2 EA



G
R10-3eL
9X15
2 EA



H
R10-3eR
9X15
4 EA

SIGNING AND PAVEMENT MARKING ITEMS			
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0644-6076	REMOVE SM RD SN SUP&AM	EA	2
0666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	172
0666-6225	PAVEMENT SEALER 6"	LF	1094
0666-6226	PAVEMENT SEALER 8"	LF	172
0666-6230	PAVEMENT SEALER 24"	LF	300
0666-6306	RE PM W/RET REQ TY I (W)6"(BRK)(100MIL)	LF	180
0666-6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	335
0666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	579
0668-6076	PREFAB PAV MRK TY C (W) (24") (SLD)	LF	300
0672-6010	REFL PAV MRKR TY II-C-R	EA	8
0677-6001	ELIM EXT PAV MRK & MRKS (4")	LF	982
0677-6003	ELIM EXT PAV MRK & MRKS (8")	LF	182
0677-6007	ELIM EXT PAV MRK & MRKR (24")	LF	45
0678-6002	PAV SURF PREP FOR MRK (6")	LF	1094
0678-6004	PAV SURF PREP FOR MRK (8")	LF	172
0678-6008	PAV SURF PREP FOR MRK (24")	LF	300

NOTE: REMOVAL OF RPMS IS SUBSIDIARY TO ITEM 677

FILE: P:\4.0 Eng Ops\4.2 Projects\651.4 - TxDOT DAL On Call\TO 5 - Signal Designs\FM 720 at Martingale Trail\cad\sheets\FM720 PaveMarkLayout.dgn

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STATE OF TEXAS
LISA D. LAWSON
65131
REGISTERED
PROFESSIONAL ENGINEER

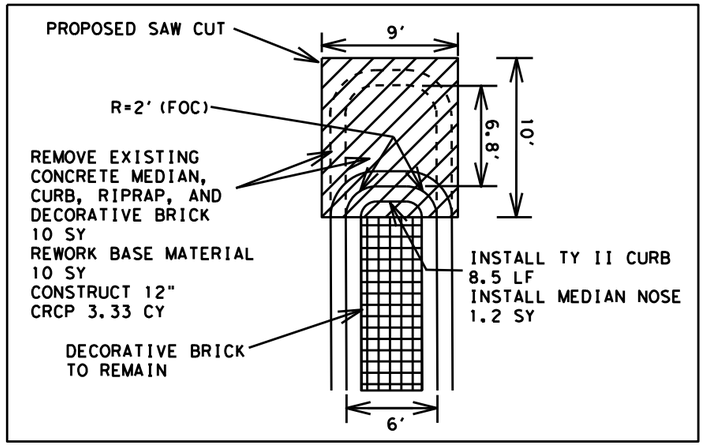
Lisa D Lawson, P.E.

2/13/2024

SIGNING AND PAVEMENT MARKING LAYOUT
FM 720 AT MARTINGALE TRAIL

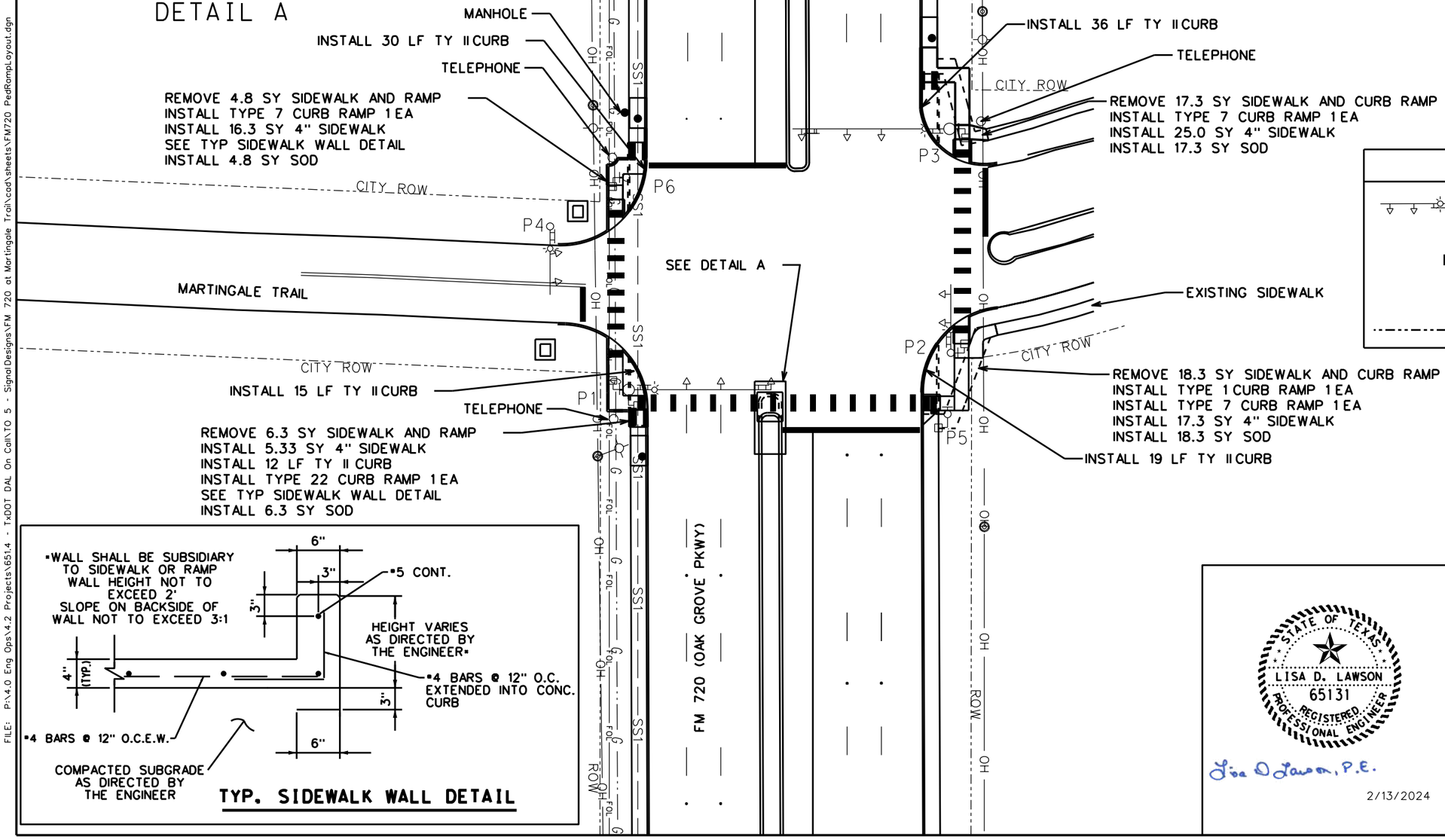
SHEET 2 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MJ	6	(SEE TITLE SHEET)		FM 982,ETC
GRAPHICS JDC	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK LDL	TEXAS	18	COLLIN, ETC	32
CHECK BS	CONTROL	SECTION	JOB	
	0387	05	028, ETC	



DETAIL A

MEDIAN, CUB AND CURB RAMP QUANTITIES			
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
104-6015	REMOVING CONC (SIDEWALKS)	SY	46.7
104-6011	REMOVING CONC (MEDIANS)	SY	10
162-6002	BLOCK SODDING	SY	46.7
251-6034	REWORK BS MTL (TY C)(8")(ORD COMP)	SY	10
361-6054	FULL-DEPTH REPAIR CRCP (VAR DEPTH)	CY	3.33
529-6002	CONC CURB (TY II)	LF	120.5
531-6001	CONC SIDEWALKS (4")	SY	63.93
531-6004	CURB RAMPS (TY 1)	EA	1
531-6010	CURB RAMPS (TY 7)	EA	3
531-6017	CURB RAMPS (TY 22)	EA	1
536-6005	CONCRETE MEDIAN (NOSE)	SY	1.2



TYP. SIDEWALK WALL DETAIL

LEGEND

- TRAFFIC SIGNAL POLE W/MAST ARM, SIGNAL HEADS, SIGN AND 250W EQ LED LUMINAIRE
- PROPOSED PEDESTAL POLE WITH APS UNIT
- P1 SIGNAL POLE NUMBER
- ROW

0 20 40 60 80 100

SCALE (FT.)

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STATE OF TEXAS
LISA D. LAWSON
65131
REGISTERED PROFESSIONAL ENGINEER

Lisa D Lawson, P.E.

2/13/2024

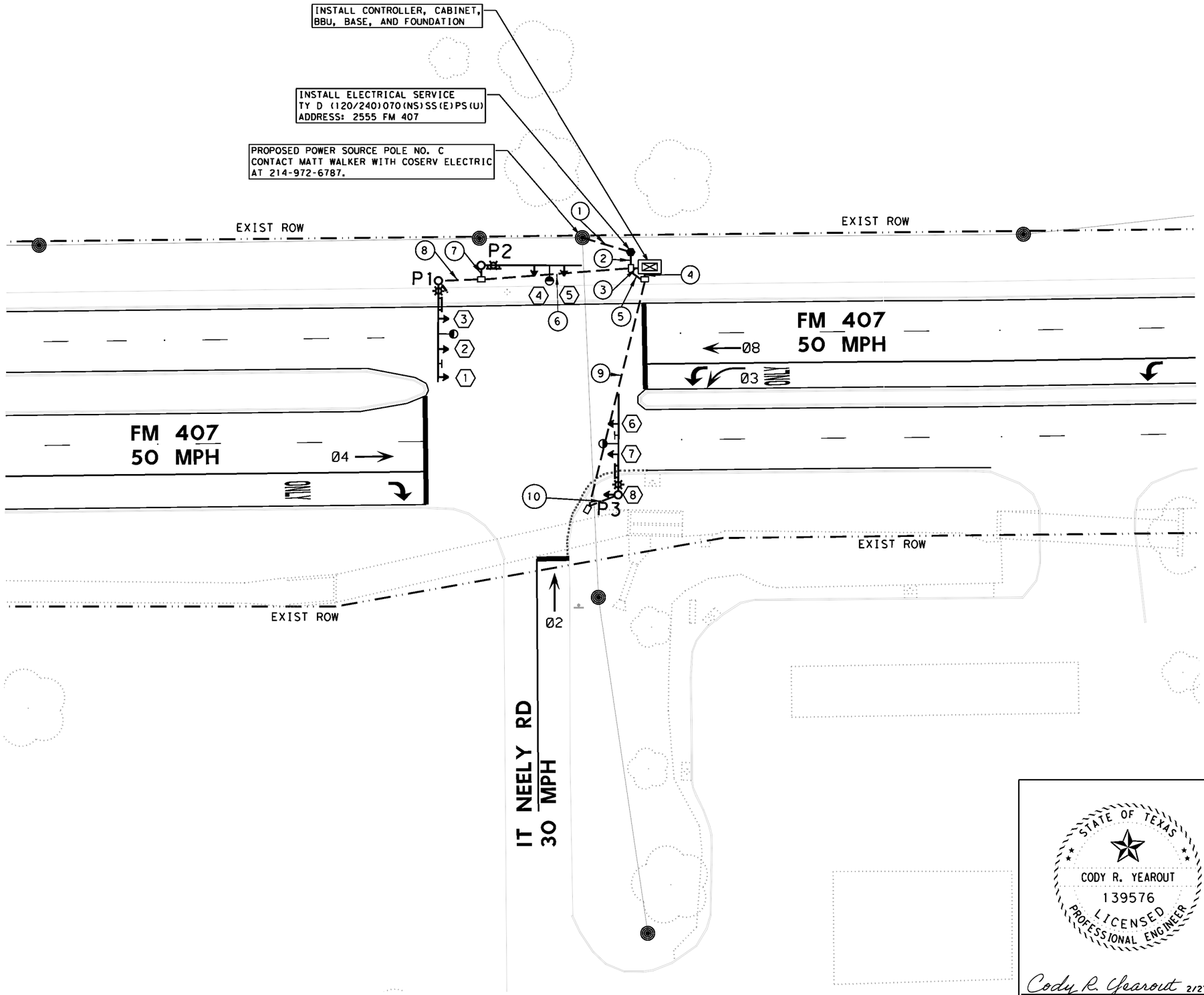
MEDIAN, CURB AND CURB RAMP LAYOUT FM 720 AT MARTINGALE TRAIL

SCALE: 1"=40' SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MJ	6	(SEE TITLE SHEET)		FM 982,ETC
GRAPHICS JDC	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK LDL	TEXAS	18	COLLIN, ETC	33
CHECK BS	CONTROL	SECTION	JOB	
	0387	05	028, ETC	

FILE: P:\4.0 Eng Ops\4.2 Projects\651.4 - TxDOT DAL On Call\TO 5 - SignalDesigns\FM 720 at Martingale Trail\cad\sheets\FM720 PedRampLayout.dgn

FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/091800380/4 - Design/Plan Set/8. Traffic/FM 407 at IT Neely Drive in Bartonville/Base Files/FM 407 at IT Neely Dri



0 10 20 30 40
SCALE (FT.)

LEGEND

- PROPOSED MAST ARM SIGNAL WITH HEAD NUMBERS AND 250 WATT HPS EQ LED LUMINAIRE
- PROPOSED CONDUIT WITH RUN NUMBER
- P# — SIGNAL POLE NUMBER
- ELECTRICAL SERVICE
- PROPOSED TYPE C GROUND BOX
- EXIST ROW — RIGHT OF WAY
- OE — OVERHEAD POWER LINE
- UTILITY POWER POLE
- PROPOSED OPTICOM SENSOR
- PROPOSED VIDEO DETECTION (VIVDS)

NOTE:

1. THE TOWN OF FLOWER MOUND WILL FURNISH THE CONTROLLER EQUIPMENT, CONTROLLER CABINET, BBU, VIVDS DETECTORS AND CABLES, AND COMMUNICATION EQUIPMENT. CONTACT MATTHEW HOTELLING, P.E. WITH THE TOWN OF FLOWER MOUND AT 972-874-6303 FOR FURTHER INFORMATION.
2. BBU IS TO BE INSTALLED BY THE TOWN OF FLOWER MOUND AFTER THE CONTRACTOR INSTALLS THE CONTROLLER CABINET.
3. CONTRACTOR IS NOT TO INSTALL VIVDS DETECTORS BEFORE FIELD VERIFYING LOCATIONS WITH TOWN OF FLOWER MOUND STAFF. CONTACT THE TOWN OF FLOWER MOUND FOR ASSISTANCE WITH INSTALLATION, DETERMINING THE DETECTION ZONE, AND PROGRAMMING OF VIVDS.

STATE OF TEXAS
CODY R. YEAROUT
139576
LICENSED PROFESSIONAL ENGINEER

Cody R. Yearout 2/21/2024
Digitally signed by CODY R. YEAROUT, P.E. Date

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FM 407 AT IT NEELY RD
TRAFFIC SIGNAL LAYOUT

SCALE: 1"=40' SHEET 1 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
CY	6	(SEE TITLE SHEET)		FM 982, ETC.
GRAPHICS CY	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK CY	TEXAS	18	COLLIN, ETC.	34
CHECK ETS	CONTROL	SECTION	JOB	
	0387	05	028, ETC.	

FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/091800380/4 - Design/Plan Set/8. Traffic/FM 407 at IT Neely Drive in Bartonville/Base Files/FM 407 at IT Neely Dri

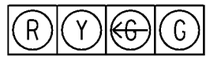
ELECTRICAL SERVICE DATA

ELECTRICAL SERVICE DESCRIPTION (SEE ED(5))	SERVICE CONDUIT SIZE (PVC) (SCH 80)	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE/AMP	FOUR-POLE CONTACTOR AMPS	PANEL BD./ LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE/AMPS	KVA LOAD
TY D (120/240)070(NS)SS(E)PS(U)	2"	3/#4	N/A	2P/70	30	100	T.S.	1P/50	<7.1
							LIGHTING	2P/20	
							LIGHTING	2P/20	

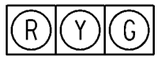
SIGNAL HEADS (ITEM 682)

SIGNAL HEADS NUMBER	SIGNAL HEAD TYPE	BACK PLATE			12" INDICATION VEH SIG SECT WITH LED LAMP					
		3 SEC	4 SEC	5 SEC	~~G~~	G	~~Y~~	Y	~~R~~	R
		EA.	EA.	EA.	EA.	EA.	EA.	EA.	EA.	EA.
1	H5FLT			1	1		2		2	
2	H3	1				1		1		1
3	H3	1				1		1		1
4	H4LT		1		1	1		1		1
5	H3	1				1		1		1
6	H3	1				1		1		1
7	H3	1				1		1		1
8	V3	1				1		1		1
TOTALS		6	1	1	2	7	2	7	2	7

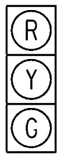
H5FLT



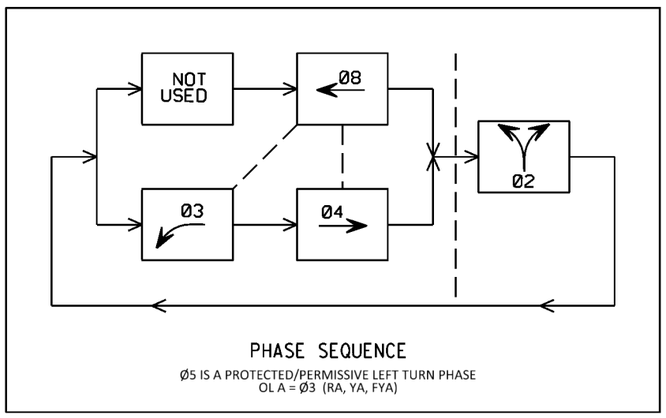
H4LT



H3



V3



PHASE SEQUENCE

Ø5 IS A PROTECTED/PERMISSIVE LEFT TURN PHASE
OL A = Ø3 (RA, YA, FYA)

CABLE TERMINATION CHART

CNDR. COLOR	CABLE 1 FROM P1 TO CNTRL. 16 CNDR.	CABLE 2 FROM P2 TO CNTRL. 16 CNDR.	CABLE 3 FROM P3 TO CNTRL. 16 CNDR.
BLACK	SPARE	SPARE	SPARE
WHITE	S.COMMON	S.COMMON	S.COMMON
RED	SH 2,3 Ø8 R	SH 4,5 Ø2 R	SH 6,7,8 Ø4 R
GREEN	SH 2,3 Ø8 G	SH 4,5 Ø2 ~~G~~	SH 6,7,8 Ø4 G
ORANGE	SH 2,3 Ø8 Y	SH 4,5 Ø2 Y	SH 6,7,8 Ø4 Y
BLUE	SH 1 OL A~~R~~	SPARE	SPARE
WHITE/ BLACK	SH 1 OL A~~SY~~	SPARE	SPARE
RED/ BLACK	SH 1 OL A~~FY~~	SPARE	SPARE
GRN/ BLACK	SH 1 Ø3~~G~~	SPARE	SPARE
ORANGE/ BLACK	SPARE	SPARE	SPARE
BLUE/ BLACK	SPARE	SPARE	SPARE
BLACK/ WHITE	SPARE	SPARE	SPARE
RED/ WHITE	SPARE	SPARE	SPARE
GRN/ WHITE	SPARE	SPARE	SPARE
BLUE/ WHITE	SPARE	SPARE	SPARE
BLACK/ RED	SPARE	SPARE	SPARE

GROUND BOX SUMMARY

ITEM NO.	DESCRIPTION	UNIT	QTY.
624	TYPE D (162922) W/ APRON	EA	4

STATE OF TEXAS
CODY R. YEAROUT
139576
LICENSED PROFESSIONAL ENGINEER

Cody R. Yearout 2/27/2024
Digitally signed by CODY R. YEAROUT, P.E. Date

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FM 407 AT IT NEELY RD

TRAFFIC SIGNAL LAYOUT

SHEET 2 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
CY	6	(SEE TITLE SHEET)		FM 982,ETC.
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CY	TEXAS	18	COLLIN,ETC.	35
CHECK	CONTROL	SECTION	JOB	
CY	0387	05	028,ETC.	
CHECK				
ETS				

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CONDUIT RUNS

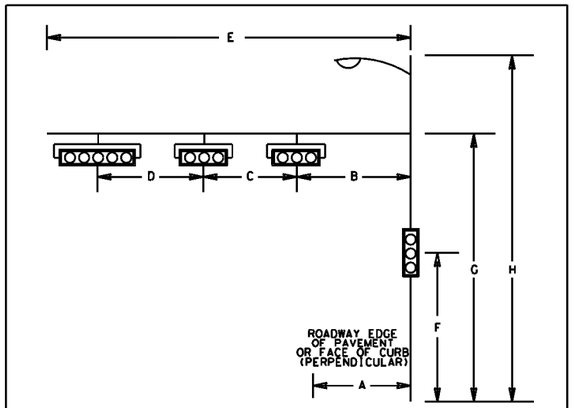
RUN #	CONDUIT TYPE (LF)				WIRE SIZE AND TYPE (EA)							RUN LENGTH (LF)	RUN #
					CONDUCTOR (ITEM 620)								
	*2" PVC SCH 80	2" PVC SCH 40	4" PVC SCH 40	4" PVC SCH 40 (BORE)	NO.4 XHHW $	NO.6 XHHW	NO.6 BARE	NO.8 XHHW	16 CNDR TY-A 14 AWG ITEM 684	VIVDS CABLE ITEM 6306 **	OPTICOM CABLE ****		
1	40				3							40	1
2		7				2	1	4				7	2
3***		8				2	1					8	3
			2 @ 8				1		2	1	2		
4***			2 @ 6				1		1		1	6	4
5			8				1	2				8	5
6			60				1	2	2	1	2	60	6
7			6				1	2	1		1	6	7
8			17				1	2	1	1	1	17	8
9				94			1	2	1		1	94	9
10			14				1	2	1		1	14	10
TOTALS	40	15	133	94	120	30	228	426	273	85	273	TOTAL	

* NOTE 2" PVC SCH 80 INCLUDES 20' RISER ON COSERV POLE
** ALL RADAR CABLE IS SUPPLIED BY THE TOWN OF FLOWER MOUND.
*** RUNS 3 AND 4 SHALL CONTAIN AN EMPTY 3" CONDUIT TO SATISFY THE REQUIREMENT OF TS-CF-21.
**** TO BE PROVIDED BY TOWN OF BARTONVILLE. CONTACT THAD CHAMBERS AT 817-693-5280.
$ FURNISHED AND INSTALLED BY COSERV.

SIGNAL HEAD & POLE PLACEMENT (LF)

POLE NUMBER	FND. TYPE WIND ZONE 80 MPH	36" DIA TYPE A (LF)	WIRE INSIDE POLE (LF)							DIMENSIONS (LF)								POLE NUMBER
			(ITEM 684) SIGNAL CABLE		(ITEM 620)	(ITEM 6306)	*OPTICOM CABLE	LUM	** NO. OF HEADS									
			SIGNAL HEADS		LUMINAIRE	VIVDS CABLE ***												
			5 CNDR TY A 14 AWG	7 CNDR TY A 14 AWG	NO. 12 XHHW					A	B	C	D	E	F	G	H	
P1	36-A	13	80	57	80	40	40	1	3	9	15	12	11	40	--	19	30	P1
P2	36-A	13	40	52	80		38	1	2	15	21	12	--	40	--	19	30	P2
P3	36-A	15$	92		80		41	1	3	8	16	12	--	40	10	19	30	P3
TOTAL		41	212	109	240	40	119	3	8									

* TO BE PROVIDED BY THE TOWN OF BARTONVILLE. CONTACT THAD CHAMBERS AT (817)-693-5280
** DOES NOT INCLUDE PED HEADS
*** ALL RADAR CABLE IS SUPPLIED BY THE TOWN OF FLOWER MOUND.
$ EXTRA 2' TO LEVEL THE FOUNDATION WITH THE CROWN OF THE ROADWAY



TYPICAL TRAFFIC POLE & SIGNAL HEAD CONFIGURATION

MEASURED TO THE CENTER OF THE POLE (LF)

STATE OF TEXAS
CODY R. YEAROUT
139576
LICENSED PROFESSIONAL ENGINEER

Cody R. Yearout 2/27/2024
Digitally signed by CODY R. YEAROUT, P.E. Date

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FM 407 AT IT NEELY RD

TRAFFIC SIGNAL LAYOUT

SHEET 3 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	HIGHWAY NO.
CY	6	(SEE TITLE SHEET)	FM 982,ETC.
GRAPHICS CY	STATE	DISTRICT	COUNTY
CHECK CY	TEXAS	18	COLLIN,ETC.
CHECK ETS	CONTROL	SECTION	JOB
	0387	05	028,ETC.

SHEET NO. 36

FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/091800380/4 - Design/Plan Set-8, Traffic/FM 407 at IT Neely Drive in Bartonville/Base Files/FM 407 at IT Neely Dri

ELIM EXT PAV MRK
& MRKS (4"), 40 LF
REMOVE EXISTING RPM
(SUBSIDARY TO ITEM 672)

SURFACE PREP AND INSTALL
RE PM W/REQ TY I (W)6"(SLD)(100 MIL),380 LF
INSTALL PAVEMENT SEALER(6"),380 LF

SURFACE PREP AND INSTALL
REFL PAV MRK TY I(W)(8")(SLD), 293 LF
INSTALL PAV SEALER (8"), 293 LF
INSTALL REFL PAV MRKR TY II-C-R, 14 EA

SURFACE PREP AND INSTALL
RE PM W/REQ TY I (W)6"(BRK)(100 MIL),100 LF
INSTALL PAVEMENT SEALER (6"),100 LF
INSTALL REFL PAV MRKR TY II-C-R, 5 EA

SURFACE PREP AND INSTALL
RE PM W/REQ TY I (W)6"(SLD)(100 MIL),870 LF
INSTALL PAVEMENT SEALER(6"),870 LF

SURFACE PREP AND INSTALL
RE PM W/REQ TY I (W)6"(BRK)(100 MIL),100 LF
INSTALL PAVEMENT SEALER (6"),100 LF
INSTALL REFL PAV MRKR TY II-C-R, 5 EA

SURFACE PREP AND INSTALL
RE PM W/REQ TY I (Y)6"(SLD)(100 MIL),380 LF
INSTALL PAVEMENT SEALER (6"),380 LF

EXIST ROW

SURFACE PREP AND INSTALL
RE PM W/REQ TY I (Y)6"(SLD)(100 MIL),380 LF
INSTALL PAVEMENT SEALER (6"),380 LF

P1 P2

B C A E D

FM 407
50 MPH

SURFACE PREP AND INSTALL
PREFAB TY C (W)(WORD) 2 EA &
PREFAB TY C (W)(ARROW) 2 EA
INSTALL PAV SEALER (WORD) 2 EA
INSTALL PAV SEALER (ARROW) 2 EA

SURFACE PREP AND INSTALL
PREFAB TY C (W)(24")(SLD) 42 LF
INSTALL PAVEMENT SEALER(24") 42 LF

EXIST ROW

ELIM EXT PAV MRK
& MRKS (4"), 9 LF

ELIM EXT PAV MRK
& MRKS (8"), 26 LF
REMOVE EXISTING RPM
(SUBSIDARY TO ITEM 672)

SURFACE PREP AND INSTALL
PREFAB TY C (W)(24")(SLD) 13 LF
INSTALL PAVEMENT SEALER(24") 13 LF

SURFACE PREP AND INSTALL
REFL PAV MRK TY I(W)(8")(SLD) 100 LF
INSTALL PAV SEALER (8") 100 LF

REMOVE EXISTING STOP SIGN,
STREET NAME SIGNS, AND
ASSEMBLY. SALVAGE AND RETURN
STREET NAME SIGNS TO THE
TOWN OF BARTONVILLE
CONTACT THAD CHAMBERS
AT 817-693-5280

STOP

IT NEELY RD
30 MPH

P3

SURFACE PREP AND INSTALL
RE PM W/REQ TY I (Y)6"(SLD)(100 MIL),420 LF
INSTALL PAVEMENT SEALER (6"),420 LF

SURFACE PREP AND INSTALL
RE PM W/REQ TY I (W)6"(BRK)(100 MIL),100 LF
INSTALL PAVEMENT SEALER (6"),100 LF
INSTALL REFL PAV MRKR TY II-C-R, 5 EA

SURFACE PREP AND INSTALL
REFL PAV MRK TY I(W)(8")(SLD), 256 LF
INSTALL PAV SEALER (8"), 256 LF
INSTALL REFL PAV MRKR TY II-C-R, 12 EA

SURFACE PREP AND INSTALL
PREFAB TY C (W)(WORD) 2 EA &
PREFAB TY C (W)(ARROW) 2 EA
INSTALL PAV SEALER (WORD) 2 EA
INSTALL PAV SEALER (ARROW) 2 EA
EXIST ROW

FM 407
50 MPH

SURFACE PREP AND INSTALL
RE PM W/REQ TY I (Y)6"(SLD)(100 MIL),380 LF
INSTALL PAVEMENT SEALER (6"),380 LF

SURFACE PREP AND INSTALL
RE PM W/REQ TY I (W)6"(BRK)(100 MIL),100 LF
INSTALL PAVEMENT SEALER (6"),100 LF
INSTALL REFL PAV MRKR TY II-C-R, 5 EA

EXIST ROW

SURFACE PREP AND INSTALL
RE PM W/REQ TY I (W)6"(SLD)(100 MIL),295 LF
INSTALL PAVEMENT SEALER(6"),295 LF

SURFACE PREP AND INSTALL
PREFAB TY C (W)(24")(SLD) 34 LF
INSTALL PAVEMENT SEALER(24") 34 LF

INSTALL REFL PAV MRKR TY I-C, 37 EA

LEGEND

- PROPOSED MAST ARM SIGNAL WITH HEAD NUMBERS AND 250 WATT HPS EQ LED LUMINAIRE
- P# SIGNAL POLE NUMBER
- [A] SIGN LABEL
- EXIST ROW RIGHT OF WAY
- PROPOSED OPTICOM SENSOR

0 10 20 30 40
SCALE (FT.)

STATE OF TEXAS
CODY R. YEAROUT
139576
LICENSED
PROFESSIONAL ENGINEER

Cody R. Yearout 2/27/2024
Digitally signed by CODY R. YEAROUT, P.E. Date

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FM 407 AT IT NEELY RD
SIGNING AND PVMT MARKING LAYOUT

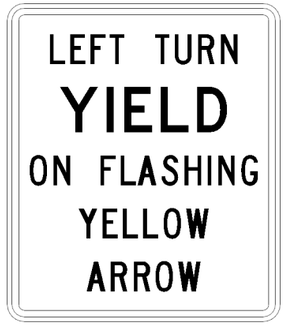
SCALE: 1"=40' SHEET 1 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
CY	6	(SEE TITLE SHEET)		FM 982,ETC.
GRAPHICS CY	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK CY	TEXAS	18	COLLIN,ETC.	37
CHECK ETS	CONTROL	SECTION	JOB	
	0387	05	028,ETC.	

FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/0918003804 - Design/Plan Set/8. Traffic/FM 407 at IT Neely Drive in Bartonville/Base Files/FM 407 at IT Neely Dri

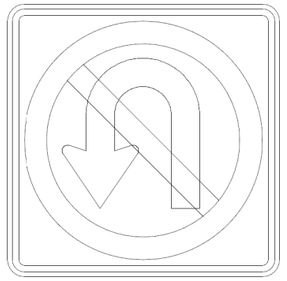
STREET NAME SIGNS
TO BE SUPPLIED BY THE TOWN OF BARTONVILLE
CONTACT THAD CHAMBERS AT 817-693-5280

B C D



R10-17T
36"X42"

A



R3-4
36"X36"

E

SIGNING AND PAVEMENT MARKING ITEMS			
BID ITEM	DESCRIPTION	UNIT	QUANTITY
0644 6076	REMOVE SM RD SN SUP&AM	EA	1
0666 6036	REFL PAV MRK TY I (W) 8" (SLD)(100MIL)	LF	549
0666 6225	PAVEMENT SEALER 6"	LF	3505
0666 6226	PAVEMENT SEALER 8"	LF	549
0666 6230	PAVEMENT SEALER 24"	LF	89
0666 6231	PAVEMENT SEALER (ARROW)	EA	4
0666 6232	PAVEMENT SEALER (WORD)	EA	4
0666 6306	RE PM W/RET REQ TY I (W) 6" (BRK)(100 MIL)	LF	400
0666 6309	RE PM W/RET REQ TY I (W) 6" (SLD)(100 MIL)	LF	1545
0666 6321	RE PM W/RET REQ TY I (Y) 6" (SLD)(100 MIL)	LF	1560
0668 6076	PREFAB PAV MRK TY C (W)(24")(SLD)	LF	89
0668 6077	PREFAB PAV MRK TY C (W)(ARROW)	EA	4
0668 6085	PREFAB PAV MRK TY C (W)(WORD)	EA	4
0672 6007	REFL PAV MRKR TY I-C	EA	37
0672 6010	REFL PAV MRKR TY II-C-R	EA	46
0677 6001	ELIM EXT PAV MRK & MRKS (4")	LF	49
0677 6003	ELIM EXT PAV MRK & MRKS (8")	LF	26
0678 6002	PAV SURF PREP FOR MRK (6")	LF	3505
0678 6004	PAV SURF PREP FOR MRK (8")	LF	549
0678 6008	PAV SURF PREP FOR MRK (24")	LF	89
0678 6009	PAV SURF PREP FOR MRK (ARROW)	EA	4
0678 6016	PAV SURF PREP FOR MRK (WORD)	EA	4

NOTE:

1. SIGNS SHALL CONFORM TO SPECIFICATIONS DETAILED ON STANDARD TSR(4).

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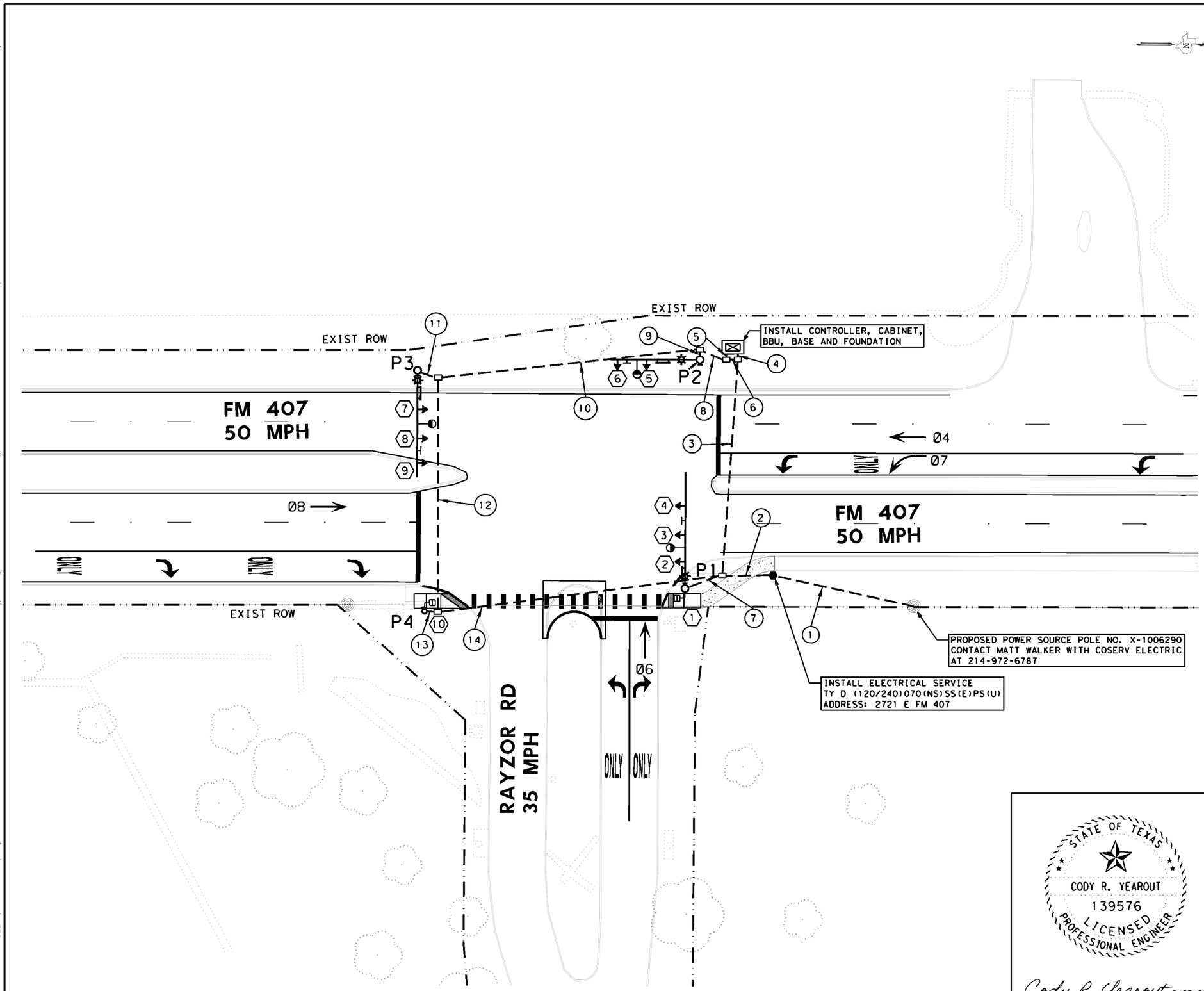
FM 407 AT IT NEELY RD
SIGNING AND PVMT
MARKING LAYOUT

SCALE: NTS SHEET 2 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
CY	6	(SEE TITLE SHEET)		FM 982,ETC.
GRAPHICS CY	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK CY	TEXAS	18	COLLIN,ETC.	38
CHECK ETS	CONTROL	SECTION	JOB	
	0387	05	028,ETC.	



0 10 20 30 40
SCALE (FT.)

LEGEND

- PROPOSED MAST ARM SIGNAL WITH HEAD NUMBERS AND 250 WATT HPS EQ LED LUMINAIRE
- PROPOSED CONDUIT WITH RUN NUMBER
- P# SIGNAL POLE NUMBER
- ELECTRICAL SERVICE
- PROPOSED TYPE D GROUND BOX
- EXIST ROW RIGHT OF WAY
- OE OVERHEAD POWER LINE
- UTILITY POWER POLE
- PROPOSED OPTICOM SENSOR
- PEDESTRIAN SIGNAL HEAD WITH APS BUTTON
- INSTALL CONC SIDEWALK (4")
- PROPOSED VIDEO DETECTION (VIVDS)

NOTE:

1. THE TOWN OF FLOWER MOUND WILL FURNISH THE CONTROLLER EQUIPMENT, CONTROLLER CABINET, BBU, VIVDS DETECTORS AND CABLES, APS PUSH BUTTIONS, PED DETECTOR CONTROLLER UNIT AND COMMUNICATION EQUIPMENT. CONTACT MATTHEW HOTELLING, P.E. WITH THE TOWN OF FLOWER MOUND AT 972-874-6303 FOR FURTHER INFORMATION.
2. BBU IS TO BE INSTALLED BY THE TOWN OF FLOWER MOUND AFTER THE CONTRACTOR INSTALLS THE CONTROLLER CABINET.
3. CONTRACTOR IS NOT TO INSTALL VIVDS DETECTORS BEFORE FIELD VERIFYING LOCATIONS WITH TOWN OF FLOWER MOUND STAFF. CONTACT THE TOWN OF FLOWER MOUND FOR ASSISTANCE WITH INSTALLATION, DETERMINING THE DETECTION ZONE, AND PROGRAMMING OF VIVDS.
4. ALL APS PUSH BUTTONS SHALL HAVE A 30" BY 48" CLEAR FLOOR SPACE CENTERED ON THE BUTTON.

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FM 407 AT RAYZOR RD

TRAFFIC SIGNAL LAYOUT

SCALE: 1"=40' SHEET 1 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 982,ETC.
GRAPHICS JP	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK CY	TEXAS	18	COLLIN,ETC.	39
CHECK SW	CONTROL	SECTION	JOB	
	0387	05	028,ETC.	

FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/091800380/4 - Design/Plan Set/8. Traffic/FM 407 at Rayzor Road in Bartonville/Base Files/FM 407 at Rayzor Rd Sheet

FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/091800380/4 - Design/Plan Set/8. Traffic/FM 407 at Rayzor Road in Bartonville/Base Files/FM 407 at Rayzor Rd Sheet

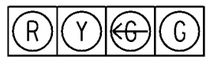
ELECTRICAL SERVICE DATA

ELECTRICAL SERVICE DESCRIPTION (SEE ED(5))	SERVICE CONDUIT SIZE (PVC) (SCH 80)	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE/AMP	FOUR-POLE CONTACTOR AMPS	PANEL BD./ LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE/AMPS	KVA LOAD
TY D (120/240)070(NS)SS(E)PS(U)	2"	3/#4	N/A	2P/70	30	100	T.S.	1P/50	<7.1
							LIGHTING	2P/20	
							LIGHTING	2P/20	

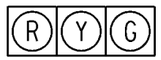
SIGNAL HEADS (ITEM 682)

SIGNAL HEADS NUMBER	SIGNAL HEAD TYPE	BACK PLATE			12" INDICATION VEH SIG SECT WITH LED LAMP						LED COUNTDOWN PED SIGNAL
		3 SEC	4 SEC	5 SEC	~~G~~	G	~~Y~~	Y	~~R~~	R	
		EA.	EA.	EA.	EA.	EA.	EA.	EA.	EA.	EA.	EA.
1	PED										1
2	H3	1				1		1		1	
3	H3	1				1		1		1	
4	H3	1				1		1		1	
5	H3	1				1		1		1	
6	H4LT		1		1	1		1		1	
7	H3	1				1		1		1	
8	H3	1				1		1		1	
9	H5FLT			1	1		2		2		
10	PED										1
TOTALS		6	1	1	2	7	2	7	2	7	2

H5FLT

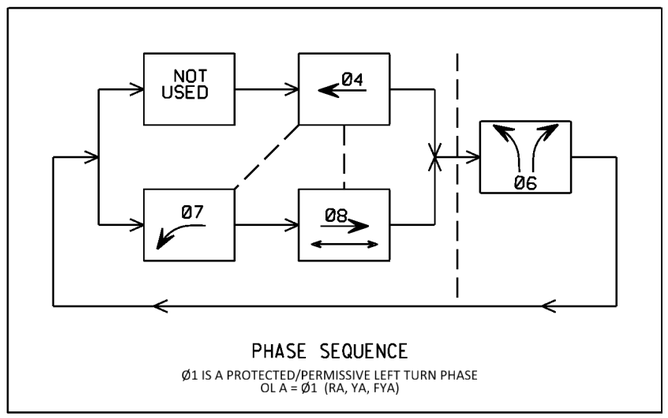


H4LT



H3

PED SIGNAL



PHASE SEQUENCE
Ø1 IS A PROTECTED/PERMISSIVE LEFT TURN PHASE
OL A = Ø1 (RA, YA, FYA)

CABLE TERMINATION CHART

CNDR. COLOR	CABLE 1 FROM P1 TO CNTRL. 20 CNDR.	CABLE 2 FROM P2 TO CNTRL. 16 CNDR.	CABLE 3 FROM P3 TO CNTRL. 16 CNDR.	CABLE 4 FROM P4 TO CNTRL. 7 CNDR.
BLACK	SPARE	SPARE	SPARE	SPARE
WHITE	S.COMMON	S.COMMON	S.COMMON	S.COMMON
RED	SH 2,3,4 Ø8 R	SH 5,6 Ø6 R	SH 7,8 Ø4 R	SH 10 Ø8 DW
GREEN	SH 2,3,4 Ø8 G	SH 5,6 Ø6 ~~G~~	SH 7,8 Ø4 G	SH 10 Ø8 W
ORANGE	SH 2,3,4 Ø8 Y	SH 5,6 Ø6 Y	SH 7,8 Ø4 Y	SPARE
BLUE	SH 1 Ø8 DW	SPARE	SH 9 OLA~~R~~	SPARE
WHITE/ BLACK	SH 1 Ø8 W	SPARE	SH 9 OLA~~SY~~	SPARE
RED/ BLACK	SPARE	SPARE	SH 9 OLA~~FY~~	
GRN/ BLACK	SPARE	SPARE	SH 9 Ø7~~G~~	
ORANGE/ BLACK	SPARE	SPARE	SPARE	
BLUE/ BLACK	SPARE	SPARE	SPARE	
BLACK/ WHITE	SPARE	SPARE	SPARE	
RED/ WHITE	SPARE	SPARE	SPARE	
GRN/ WHITE	SPARE	SPARE	SPARE	
BLUE/ WHITE	SPARE	SPARE	SPARE	
BLACK/ RED	SPARE	SPARE	SPARE	
WHITE/ RED	SPARE			
ORANGE/ RED	SPARE			
BLUE/ RED	SPARE			
RED/ GREEN	SPARE			

APS MESSAGE CHART

POLE LOCATION	PEDESTRIAN MOVEMENT	FUNCTIONS	SPEECH MESSAGE/SOUND DETAILS
P1	Ø8	BUTTON PUSH ON DW	WAIT TO CROSS RAYZOR RD AT FM 407
		EXTENDED BUTTON PUSH	WAIT TO CROSS RAYZOR RD AT FM 407
		LOCATOR TONE	SLOW TICK
		WALK INDICATION*	RAYZOR RD. WALK SIGN IS ON TO CROSS RAYZOR RD
P4	Ø8	BUTTON PUSH ON DW	WAIT TO CROSS RAYZOR RD AT FM 407
		EXTENDED BUTTON PUSH	WAIT TO CROSS RAYZOR RD AT FM 407
		LOCATOR TONE	SLOW TICK
		WALK INDICATION*	RAYZOR RD. WALK SIGN IS ON TO CROSS RAYZOR RD

* COUNTDOWN SPEECH MESSAGE = "OFF" FOR ALL UNITS

GROUND BOX SUMMARY

ITEM NO.	DESCRIPTION	UNIT	QTY.
624	TYPE D (162922) W/ APRON	EA	6

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FM 407 AT RAYZOR RD

TRAFFIC SIGNAL LAYOUT

SHEET 2 OF 3

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 982,ETC.
GRAPHICS JP	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK CY	TEXAS	18	COLLIN, ETC.	40
CHECK SW	CONTROL	SECTION	JOB	
	0387	05	028,ETC.	

FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/091800380/4 - Design/Plan Set/8. Traffic/FM 407 at Rayzor Road in Bartonville/Base Files/FM 407 at Rayzor Rd Sheet

CONDUIT RUNS

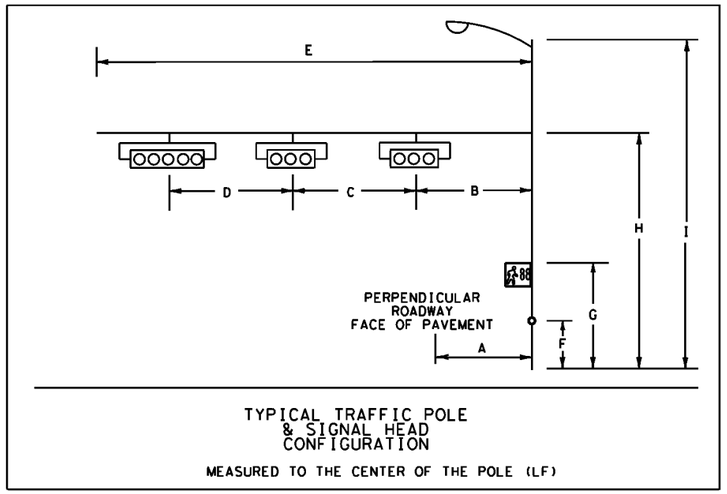
RUN #	CONDUIT TYPE (LF)					WIRE SIZE AND TYPE (EA)										RUN LENGTH (LF)	RUN #
						CONDUCTOR (ITEM 620)				SIGNAL CABLE (ITEM 684)				VIVDS CABLE ITEM 6306 **	OPTICOM CABLE ****		
	*2" PVC SCH 80	2" PVC SCH 40	2" PVC SCH 40 (BORE)	4" PVC SCH 40	4" PVC SCH 40 (BORE)	NO.4 XHHW $	NO.6 XHHW	NO.6 BARE	NO.8 XHHW	2 CNDR TY-A 12 AWG APS UNITS	7 CNDR TY-A 14 AWG	16 CNDR TY-A 14 AWG	20 CNDR TY-A 14 AWG				
1	80					3										80	1
2		21					2	1	4							21	2
3			90				2	1	2							90	3
					90			1		1			1		1		
4***		6					2	1								6	4***
				2@6				1		1			1		1		
5***				2@6				1		1	1	2		1	2	6	5***
6				5				1	2							5	6
7				12				1	2	1			1		1	12	7
8				14				1	2	1	1	2		1	2	14	8
9				6				1	2			1		1	1	6	9
10				109				1	2	1	1	1			1	109	10
11				9				1	2			1			1	9	11
12					97			1		1	1					97	12
13				6				1		1	1					6	13
14				119				1								119	14
TOTALS	80	27	90	303	187	240	234	596	574	340	232	164	108	26	272	TOTAL	

* NOTE 2" PVC SCH 80 INCLUDES 20' RISER ON COSERV POLE.
** ALL RADAR CABLE IS SUPPLIED BY THE TOWN OF FLOWER MOUND.
*** RUNS 4 AND 5 SHALL CONTAIN A SPARE 3" CONDUIT TO SATISFY THE REQUIREMENT OF TS-CF-21.
**** TO BE PROVIDED BY THE TOWN OF BARTONVILLE. CONTACT THAD CHAMBERS AT 817-693-5280.
$ FURNISHED AND INSTALLED BY COSERV.

SIGNAL HEAD & POLE PLACEMENT (LF)

POLE NUMBER	FND. TYPE WIND ZONE 80 MPH	DRILLED SHAFT LENGTH		WIRE INSIDE POLE (LF)									DIMENSIONS (LF)									POLE NUMBER
				(ITEM 684) SIGNAL CABLE				(ITEM 620)	(ITEM 6306)													
				SIGNAL HEADS		PED HEADS	APS UNITS	LUMINAIRE														
		24" DIA SUB. TO ITEM 687	36" DIA TYPE A (LF)	5 CNDR TY A 14 AWG	7 CNDR TY A 14 AWG	5 CNDR TY A 14 AWG	2 CNDR TY A 12 AWG	NO. 12 XHHW	VIVDS CABLE ***	*OPTICOM CABLE	LUM	NO. OF HEADS **	NO. OF APS UNITS	A	B	C	D	E	F	G	H	I	
P1	36-A		13	124		10	5	80		36	1	3	1	5	11	11	12	48	5	10	19	30	P1
P2	36-A		13	41	53			80	40	45	1	2		13	22	12	-	40	-	-	19	30	P2
P3	36-A		13	82	57			80		41	1	3		8	16	12	10	44	-	-	19	30	P3
P4	24-A	6				10	5						1	11	-	-	-	-	5	10	-	-	P4
TOTAL		6	39	247	110	20	10	240	40	122	3	8	2										

* TO BE PROVIDED BY THE TOWN OF BARTONVILLE. CONTACT THAD CHAMBERS AT 817-693-5280.
** DOES NOT INCLUDE PED HEADS AND VERTICAL HEADS.
*** ALL RADAR CABLE IS SUPPLIED BY THE TOWN OF FLOWER MOUND. INSTALLATION IS SUBSIDIARY TO ITEM 6292. COLUMN TO BE FILLED IN AT TIME OF INSTALLATION



TYPICAL TRAFFIC POLE & SIGNAL HEAD CONFIGURATION

MEASURED TO THE CENTER OF THE POLE (LF)

STATE OF TEXAS
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FM 407 AT RAYZOR RD

TRAFFIC SIGNAL LAYOUT

SHEET 3 OF 3

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 982, ETC.
GRAPHICS JP	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK CY	TEXAS	18	COLLIN, ETC.	41
CHECK SW	CONTROL	SECTION	JOB	
	0387	05	028, ETC.	

SURFACE PREP AND INSTALL
RE PM W/REQ TY I (W)6"(SLD)(100 MIL),591 LF
INSTALL PAVEMENT SEALER(6"),591 LF

SURFACE PREP AND INSTALL
RE PM W/RET REQ TY I (W)6"(BRK)(100 MIL),90 LF
INSTALL PAVEMENT SEALER(6"),90 LF
INSTALL REFL PAV MRKR TY II-C-R, 5 EA

SURFACE PREP AND INSTALL
RE PM W/REQ TY I (Y)6"(SLD)(100 MIL),370LF
INSTALL PAVEMENT SEALER (6"),370 LF

SURFACE PREP AND INSTALL
REFL PAV MRK TY I(W)(8")(SLD) 157 LF
INSTALL PAV SEALER (8") 157 LF
INSTALL REFL PAV MRKR TY II-C-R, 8 EA

ELIM EXT PAV MRK
& MRKS (4"), 50 LF
REMOVE EXISTING RPM
(SUBSIDARY TO ITEM 672)

SURFACE PREP AND INSTALL
RE PM W/REQ TY I (W)6"(SLD)(100 MIL),171 LF
INSTALL PAVEMENT SEALER(6"),171 LF

SURFACE PREP AND INSTALL
PREFAB TY C (W) (24") (SLD) 33 LF
INSTALL PAVEMENT SEALER (24") 33 LF

SURFACE PREP AND INSTALL
REFL PAV MRK TY I(W)(8")(SLD), 260 LF
INSTALL PAV SEALER (8"), 260 LF
INSTALL REFL PAV MRKR TY II-C-R, 13 EA

SURFACE PREP AND INSTALL
RE PM W/REQ TY I (Y)6"(SLD)(100 MIL),360 LF
INSTALL PAVEMENT SEALER (6"),360 LF

SURFACE PREP AND INSTALL
PREFAB TY C (W)(WORD) 2 EA &
PREFAB TY C (W)(ARROW) 2 EA
INSTALL PAV SEALER (WORD) 2 EA
INSTALL PAV SEALER (ARROW) 2 EA

EXIST ROW

EXIST ROW

P3

P2

P1

P4

K E F D C J H G L B I A

FM 407
50 MPH

FM 407
50 MPH

RAYZOR RD
35 MPH

ONLY

ONLY

ONLY

ONLY

SURFACE PREP AND INSTALL
RE PM W/REQ TY I (W)6"(SLD)(100 MIL),360 LF
INSTALL PAVEMENT SEALER(6"),360 LF

EXIST ROW

SURFACE PREP AND INSTALL
RE PM W/REQ TY I (Y)6"(SLD)(100 MIL),360 LF
INSTALL PAVEMENT SEALER (6"),360 LF

SURFACE PREP AND INSTALL
RE PM W/RET REQ TY I (W)6"(BRK)(100 MIL),90 LF
INSTALL PAVEMENT SEALER(6"),90 LF
INSTALL REFL PAV MRKR TY II-C-R, 5 EA

REMOVE EXISTING STOP SIGN, STREET NAME SIGNS,
AND MOUNT. SALVAGE STREET NAME SIGNS
AND RETURN TO THE TOWN OF BARTONVILLE.
CONTACT THAD CHAMBERS AT 817-693-5280.

STOP

SURFACE PREP AND INSTALL
RE PM W/RET REQ TY I (W)6"(BRK)(100 MIL),90 LF
INSTALL PAVEMENT SEALER(6"),90 LF
INSTALL REFL PAV MRKR TY II-C-R, 5 EA

SURFACE PREP AND INSTALL
PREFAB TY C (W)(24")(SLD) 27 LF
INSTALL PAVEMENT SEALER(24") 27 LF

SURFACE PREP AND INSTALL
PREFAB TY C (W)(ARROW) 2 EA
INSTALL PAV SEALER (ARROW)2 EA

SURFACE PREP AND INSTALL
PREFAB TY C (W)(WORD) 2 EA
INSTALL PAV SEALER (WORD) 2 EA

SURFACE PREP AND INSTALL
REFL PAV MRK TY I(W)(8")(SLD) 83 LF
INSTALL PAV SEALER (8") 83 LF

SURFACE PREP AND INSTALL
PREFAB TY C (W)(WORD) 2 EA &
PREFAB TY C (W)(ARROW) 2 EA
INSTALL PAV SEALER (WORD) 2 EA
INSTALL PAV SEALER (ARROW) 2 EA

SURFACE PREP AND INSTALL
RE PM W/REQ TY I (Y)6"(SLD)(100 MIL),370LF
INSTALL PAVEMENT SEALER (6"),370 LF

SURFACE PREP AND INSTALL
RE PM W/REQ TY I (W)6"(SLD)(100 MIL),370 LF
INSTALL PAVEMENT SEALER(6"),370 LF

SURFACE PREP AND INSTALL
PREFAB TY C (W) (24") (SLD) 38 LF
INSTALL PAVEMENT SEALER (24") 38 LF

SURFACE PREP AND INSTALL
RE PM W/RET REQ TY I (W)6"(BRK)(100 MIL),90 LF
INSTALL PAVEMENT SEALER(6"),90 LF
INSTALL REFL PAV MRKR TY II-C-R, 5 EA

SURFACE PREP AND INSTALL
PREFAB TY C (W) (24") (SLD) 84 LF
INSTALL PAVEMENT SEALER (24") 84 LF

0 10 20 30 40
SCALE (FT.)

LEGEND

- PROPOSED MAST ARM SIGNAL WITH HEAD NUMBERS AND 250 WATT HPS EQ LED LUMINAIRE
- P# SIGNAL POLE NUMBER
- [A] SIGN LABEL
- EXIST ROW — RIGHT OF WAY
- PROPOSED OPTICOM SENSOR

STATE OF TEXAS
CODY R. YEAROUT
139576
LICENSED
PROFESSIONAL ENGINEER

Cody R. Yearout 2/27/2024
Digitally signed by CODY R. YEAROUT, P.E. Date

Texas Department of Transportation
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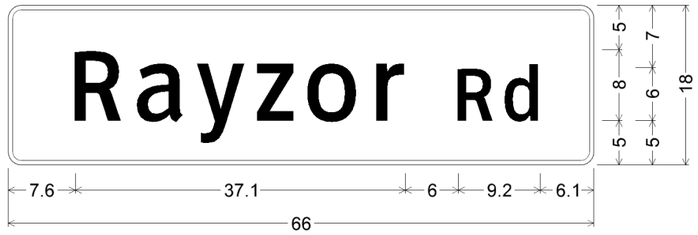
FM 407 AT RAYZOR RD
SIGNING AND PVMT MARKING LAYOUT

SCALE: 1"=40' SHEET 1 OF 2

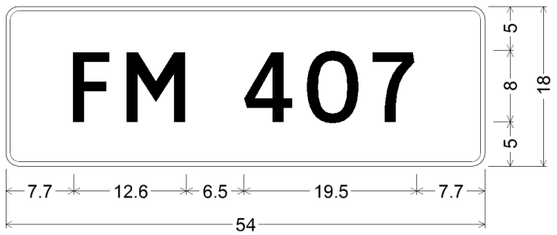
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 982,ETC.
GRAPHICS JP	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK CY	TEXAS	18	COLLIN,ETC.	42
CHECK SW	CONTROL	SECTION	JOB	
	0387	05	028,ETC.	

FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/091800380/4 - Design/Plan Set/8. Traffic/FM 407 at Rayzor Road in Bartonville/Base Files/FM 407 at Rayzor Rd Sheet



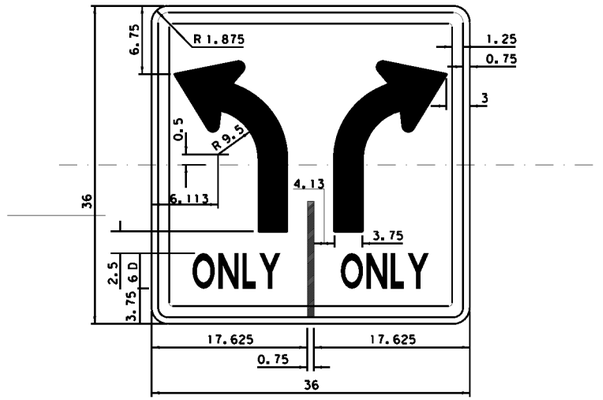
D3-1G(1) 8in;
1.5" Radius, 0.5" Border, White on, Green;
"Rayzor", ClearviewHwy-3-W; "Rd", ClearviewHwy-3-W;

B E



D3-1G(1) 8in;
1.5" Radius, 0.5" Border, White on, Green;
"FM 407", ClearviewHwy-3-W;

C

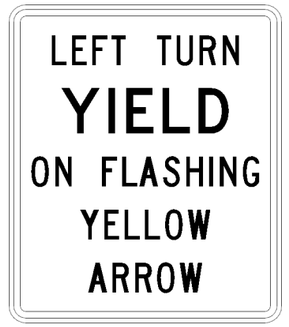


R3-8LR
36"X36"

D

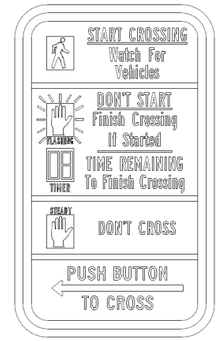
R9-3
24"X24"

I J K L



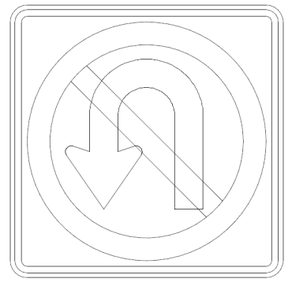
R10-17T
36"X42"

F



R10-3eL
9"x15"

A G



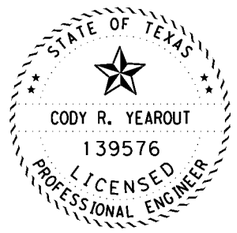
R3-4
36"X36"

H

NOTE:

1. SIGNS SHALL CONFORM TO SPECIFICATIONS DETAILED ON STANDARD TSR(4).
2. ALL SIGN DIMENSIONS IN INCHES UNLESS OTHERWISE SHOWN.

SIGNING AND PAVEMENT MARKING ITEMS			
BID ITEM	DESCRIPTION	UNIT	QUANTITY
0644 6076	REMOVE SM RD SN SUP&AM	EA	1
0666 6036	REFL PAV MRK TY I (W) 8" (SLD)(100MIL)	LF	500
0666 6225	PAVEMENT SEALER 6"	LF	3312
0666 6226	PAVEMENT SEALER 8"	LF	500
0666 6230	PAVEMENT SEALER 24"	LF	182
0666 6231	PAVEMENT SEALER (ARROW)	EA	6
0666 6232	PAVEMENT SEALER (WORD)	EA	6
0666 6306	RE PM W/RET REQ TY I (W) 6" (BRK)(100 MIL)	LF	360
0666 6309	RE PM W/RET REQ TY I (W) 6" (SLD)(100 MIL)	LF	1492
0666 6321	RE PM W/RET REQ TY I (Y) 6" (SLD)(100 MIL)	LF	1460
0668 6076	PREFAB PAV MRK TY C (W)(24")(SLD)	LF	182
0668 6077	PREFAB PAV MRK TY C (W)(ARROW)	EA	6
0668 6085	PREFAB PAV MRK TY C (W)(WORD)	EA	6
0672 6010	REFL PAV MRKR TY II-C-R	EA	41
0677 6001	ELIM EXT PAV MRK & MRKS (4")	LF	50
0678 6002	PAV SURF PREP FOR MRK (6")	LF	3312
0678 6004	PAV SURF PREP FOR MRK (8")	LF	500
0678 6008	PAV SURF PREP FOR MRK (24")	LF	182
0678 6009	PAV SURF PREP FOR MRK (ARROW)	EA	6
0678 6016	PAV SURF PREP FOR MRK (WORD)	EA	6



Cody R. Yearout 2/27/2024
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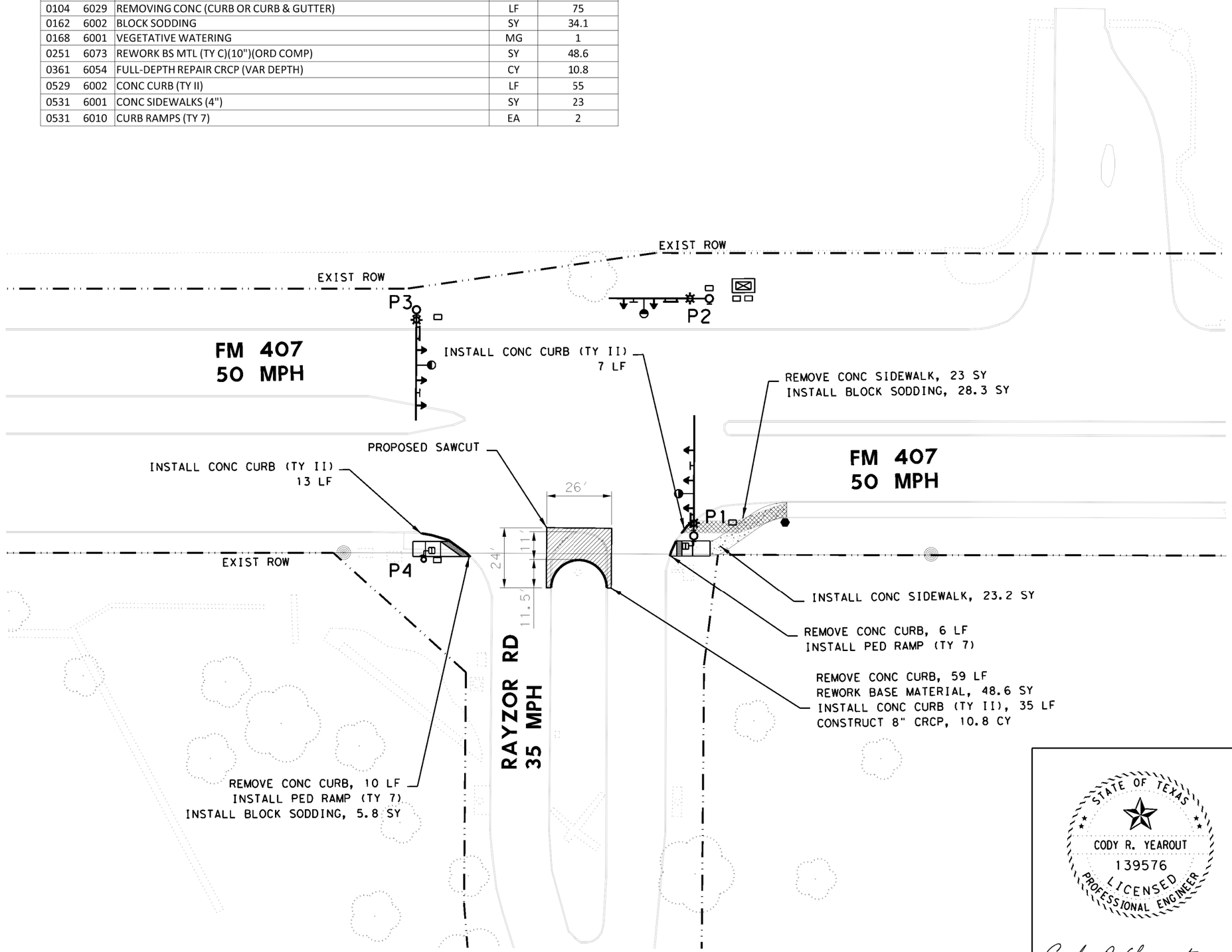
FM 407 AT RAYZOR RD
SIGNING AND PVMT MARKING LAYOUT

SCALE: NTS SHEET 2 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 982,ETC.
GRAPHICS JP	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK CY	TEXAS	18	COLLIN, ETC.	43
CHECK SW	CONTROL	SECTION	JOB	
	0387	05	028, ETC.	

FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/0918003804 - Design/Plan Set-8. Traffic/FM 407 at Rayzor Road in Bartonville/Base Files/FM 407 at Rayzor Rd Sheet

BID ITEM		DESCRIPTION	UNIT	QUANTITY
0104	6015	REMOVING CONC (SIDEWALKS)	SY	23
0104	6029	REMOVING CONC (CURB OR CURB & GUTTER)	LF	75
0162	6002	BLOCK SODDING	SY	34.1
0168	6001	VEGETATIVE WATERING	MG	1
0251	6073	REWORK BS MTL (TY C)(10")(ORD COMP)	SY	48.6
0361	6054	FULL-DEPTH REPAIR CRCP (VAR DEPTH)	CY	10.8
0529	6002	CONC CURB (TY II)	LF	55
0531	6001	CONC SIDEWALKS (4")	SY	23
0531	6010	CURB RAMPS (TY 7)	EA	2



0 10 20 30 40
SCALE (FT.)

LEGEND

- PROPOSED MAST ARM SIGNAL WITH HEAD NUMBERS AND 250 WATT HPS EQ LED LUMINAIRE
- P# — SIGNAL POLE NUMBER
- ELECTRICAL SERVICE
- PROPOSED TYPE D GROUND BOX
- EXIST ROW — RIGHT OF WAY
- OE — OVERHEAD POWER LINE
- UTILITY POWER POLE
- PROPOSED OPTICOM SENSOR
- PEDESTRIAN SIGNAL HEAD WITH APS BUTTON
- REMOVING CONC SIDEWALK
- INSTALL CONC SIDEWALK (4")
- INSTALL CRCP (8")

STATE OF TEXAS
CODY R. YEAROUT
139576
LICENSED PROFESSIONAL ENGINEER

Cody R. Yearout 2/27/2024
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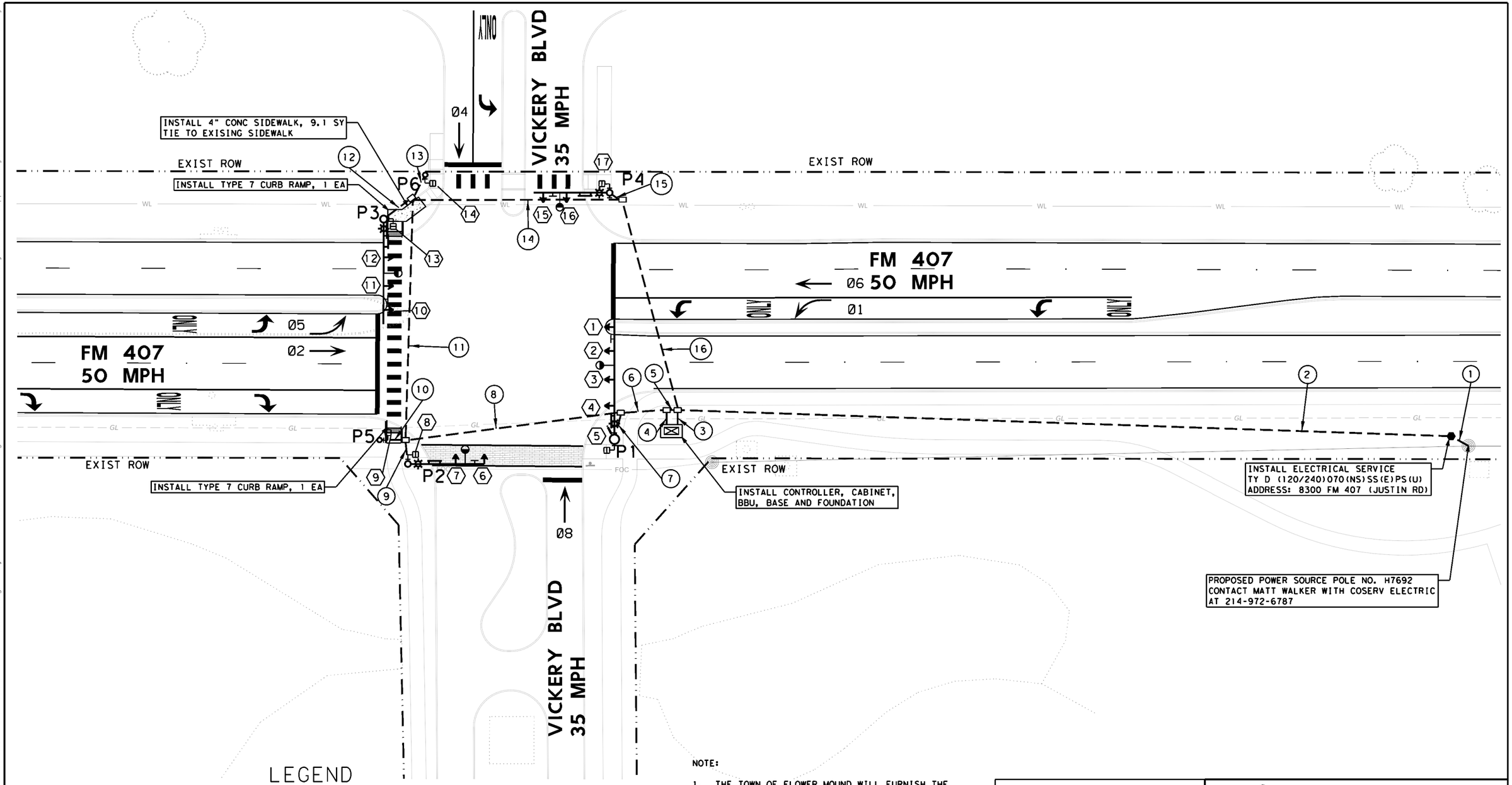
FM 407 AT RAYZOR RD PAVEMENT, CURB, AND CURB RAMP LAYOUT

SCALE: 1"=40' SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 982,ETC.
GRAPHICS JP	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK CY	TEXAS	18	COLLIN,ETC.	44
CHECK SW	CONTROL 0387	SECTION 05	JOB 028,ETC.	

FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/0918003804 - Design/Plan Set/8. Traffic/FM 407 at Rayzor Road in Bartonville/Base Files/FM 407 at Rayzor Rd Sheet

FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/0918003804 - Design/Plan Set-8. Traffic/FM 407 at Vickery Blvd in Copper Canyon/Base Files/FM 407 at Vickery Blvd



LEGEND

- PROPOSED MAST ARM SIGNAL WITH HEAD NUMBERS AND 250 WATT HPS EQ LED LUMINAIRE
- PROPOSED CONDUIT WITH RUN NUMBER
- P# SIGNAL POLE NUMBER
- ELECTRICAL SERVICE
- PEDESTRIAN SIGNAL HEAD WITH APS BUTTON
- PROPOSED TYPE D GROUND BOX
- PROPOSED VIDEO DETECTION (VIVDS)
- EXIST ROW — RIGHT OF WAY
- OE — OVERHEAD POWER LINE
- UTILITY POWER POLE
- PROPOSED OPTICOM SENSOR
- GL — EXIST GAS LINE
- WL — EXIST WATER LINE
- FOC — EXIST FIBER OPTIC LINE
- PROPOSED 4" CONC SIDEWALK

SCALE (FT.) 0 10 20 30 40

NOTE:

1. THE TOWN OF FLOWER MOUND WILL FURNISH THE CONTROLLER EQUIPMENT, CONTROLLER CABINET, BBU, VIVDS DETECTORS AND CABLES, APS PUSH BUTTIONS, PED DETECTOR CONTROLLER UNIT AND COMMUNICATION EQUIPMENT. CONTACT MATTHEW HOTELLING, P.E. WITH THE TOWN OF FLOWER MOUND AT 972-874-6303 FOR FURTHER INFORMATION.
2. BBU IS TO BE INSTALLED BY THE TOWN OF FLOWER MOUND AFTER THE CONTRACTOR INSTALLS THE CONTROLLER CABINET.
3. CONTRACTOR IS NOT TO INSTALL VIVDS DETECTORS BEFORE FIELD VERIFYING LOCATIONS WITH TOWN OF FLOWER MOUND STAFF. CONTACT THE TOWN OF FLOWER MOUND FOR ASSISTANCE WITH INSTALLATION, DETERMINING THE DETECTION ZONE, AND PROGRAMMING OF VIVDS.
4. ALL APS PUSH BUTTONS SHALL HAVE A 30" BY 48" CLEAR FLOOR SPACE CENTERED ON THE BUTTON.

STATE OF TEXAS
CODY R. YEAROUT
139576
LICENSED PROFESSIONAL ENGINEER

Cody R. Yearout 2/27/2024
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FM 407 AT VICKERY BLVD

TRAFFIC SIGNAL LAYOUT

SCALE: 1"=40' SHEET 1 OF 3

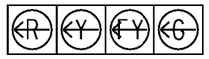
DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
CY	6	(SEE TITLE SHEET)		FM 982, ETC.
GRAPHICS CY	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK CY	TEXAS	18	COLLIN, ETC.	45
CHECK AB	CONTROL	SECTION	JOB	
	0387	05	028, ETC.	

FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/091800380/4 - Design/Plan Set/8. Traffic/FM 407 at Vickery Blvd in Copper Canyon/Base Files/FM 407 at Vickery Blvd

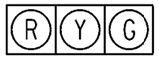
SIGNAL HEADS (ITEM 682)

SIGNAL HEADS NUMBER	SIGNAL HEAD TYPE	BACK PLATE			12" INDICATION VEH SIG SECT WITH LED LAMP						LED COUNTDOWN PED SIGNAL
		3 SEC	4 SEC	5 SEC	~~G~~	G	~~Y~~	Y	~~R~~	R	
		EA.	EA.	EA.	EA.	EA.	EA.	EA.	EA.	EA.	EA.
1	H5FLT			1	1		2		2		
2	H3	1				1		1		1	
3	H3	1				1		1		1	
4	H3	1				1		1		1	
5	PED										1
6	H4LT(MOD)		1		1		2		1		
7	H3	1				1		1		1	
8	PED										1
9	PED										1
10	H5FLT			1	1		2		2		
11	H3	1				1		1		1	
12	H3	1				1		1		1	
13	PED										1
14	PED										1

H5FLT



H4FLT(MOD)

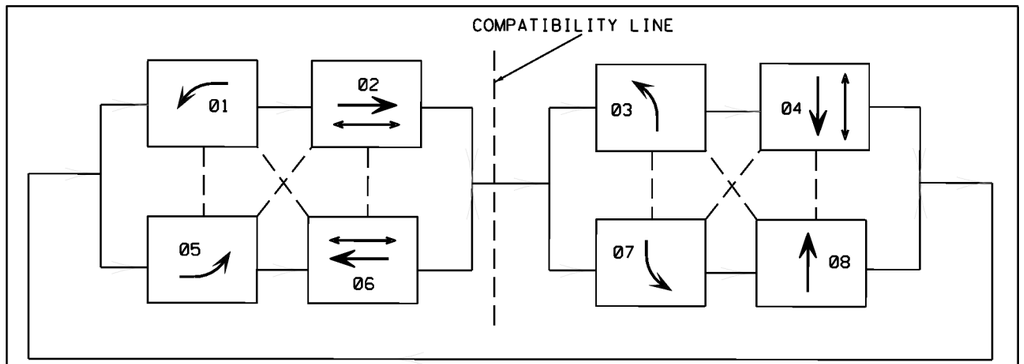


H3


PED SIGNAL

GROUND BOX SUMMARY

ITEM NO.	DESCRIPTION	UNIT	QTY.
624	TYPE D (162922) W/ APRON	EA	6



PHASE SEQUENCE

01, 05, 07, AND 03 ARE PROTECTED/PERMISSIVE LEFT TURN PHASES
OL A = 01 (RA, YA, FYA) OL C = 05 (RA, YA, FYA)
OL B = 03 (RA, YA, FYA) OL D = 07 (RA, YA, FYA)

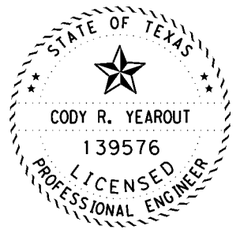
APS MESSAGE CHART

POLE LOCATION	PEDESTRIAN MOVEMENT	FUNCTIONS	SPEECH MESSAGE/SOUND DETAILS
P1	Ø2	BUTTON PUSH ON DW	WAIT TO CROSS VICKERY BLVD AT FM 407
		EXTENDED BUTTON PUSH	WAIT TO CROSS VICKERY BLVD AT FM 407
		LOCATOR TONE	SLOW TICK
		WALK INDICATION*	VICKERY BLVD, WALK SIGN IS ON TO CROSS VICKERY BLVD
P2	Ø2	BUTTON PUSH ON DW	WAIT TO CROSS VICKERY BLVD AT FM 407
		EXTENDED BUTTON PUSH	WAIT TO CROSS VICKERY BLVD AT FM 407
		LOCATOR TONE	SLOW TICK
		WALK INDICATION*	VICKERY BLVD, WALK SIGN IS ON TO CROSS VICKERY BLVD
P5	Ø4	BUTTON PUSH ON DW	WAIT TO CROSS FM 407 AT VICKERY BLVD
		EXTENDED BUTTON PUSH	WAIT TO CROSS FM 407 AT VICKERY BLVD
		LOCATOR TONE	SLOW TICK
		WALK INDICATION*	FM 407, WALK SIGN IS ON TO CROSS FM 407
P3	Ø4	BUTTON PUSH ON DW	WAIT TO CROSS FM 407 AT VICKERY BLVD
		EXTENDED BUTTON PUSH	WAIT TO CROSS FM 407 AT VICKERY BLVD
		LOCATOR TONE	SLOW TICK
		WALK INDICATION*	FM 407, WALK SIGN IS ON TO CROSS FM 407
P6	Ø6	BUTTON PUSH ON DW	WAIT TO CROSS VICKERY BLVD AT FM 407
		EXTENDED BUTTON PUSH	WAIT TO CROSS VICKERY BLVD AT FM 407
		LOCATOR TONE	SLOW TICK
		WALK INDICATION*	VICKERY BLVD, WALK SIGN IS ON TO CROSS VICKERY BLVD
P4	Ø6	BUTTON PUSH ON DW	WAIT TO CROSS VICKERY BLVD AT FM 407
		EXTENDED BUTTON PUSH	WAIT TO CROSS VICKERY BLVD AT FM 407
		LOCATOR TONE	SLOW TICK
		WALK INDICATION*	VICKERY BLVD, WALK SIGN IS ON TO CROSS VICKERY BLVD

* COUNTDOWN SPEECH MESSAGE = "OFF" FOR ALL UNITS

CABLE TERMINATION CHART

CNDR. COLOR	CABLE 1 FROM P1 TO CNTRL. 20 CNDR.	CABLE 2 FROM P2 TO CNTRL. 20 CNDR.	CABLE 3 FROM P3 TO CNTRL. 20 CNDR.	CABLE 4 FROM P4 TO CNTRL. 20 CNDR.	CABLE 5 FROM P4 TO CNTRL. 7 CNDR.	CABLE 6 FROM P4 TO CNTRL. 7 CNDR.
BLACK	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE
WHITE	S.COMMON	S.COMMON	S.COMMON	S.COMMON	S.COMMON	S.COMMON
RED	SH 2,3,4 Ø2 R	SH 7 Ø4 R	SH 11,12 Ø6 R	SH 16 Ø8 R	SH 9 Ø4 DW	SH 14 Ø6 DW
GREEN	SH 2,3,4 Ø2 G	SH 7 Ø4 G	SH 11,12 Ø6 G	SH 16 Ø8 G	SH 9 Ø4 W	SH 14 Ø6 W
ORANGE	SH 2,3,4 Ø2 Y	SH 7 Ø4 Y	SH 11,12 Ø6 Y	SH 16 Ø8 Y	SPARE	SPARE
BLUE	SH 1 OL C~~R~~	SH 6 OL D~~R~~	SH 10 OL A~~R~~	SH 15 OL B~~R~~	SPARE	SPARE
WHITE/ BLACK	SH 1 OL C~~Y~~	SH 6 OL D~~Y~~	SH 10 OL A~~Y~~	SH 15 OL B~~Y~~	SPARE	SPARE
RED/ BLACK	SH 1 OL C~~FY~~	SH 6 OL D~~FY~~	SH 10 OL A~~FY~~	SH 15 OL B~~FY~~		
GRN/ BLACK	SH 1 Ø5~~G~~	SH 6 Ø7~~G~~	SH 10 Ø1~~G~~	SH 15 Ø3~~G~~		
ORANGE/ BLACK	SH 5 Ø2 DW	SH 8 Ø2 DW	SH 13 Ø4 DW	SH 17 Ø6 DW		
BLUE/ BLACK	SH 5 Ø2 W	SH 8 Ø2 W	SH 13 Ø4 W	SH 17 Ø6 W		
BLACK/ WHITE	SPARE	SPARE	SPARE	SPARE		
RED/ WHITE	SPARE	SPARE	SPARE	SPARE		
GRN/ WHITE	SPARE	SPARE	SPARE	SPARE		
BLUE/ WHITE	SPARE	SPARE	SPARE	SPARE		
BLACK/ RED	SPARE	SPARE	SPARE	SPARE		
WHITE/ RED	SPARE	SPARE	SPARE	SPARE		
ORANGE/ RED	SPARE	SPARE	SPARE	SPARE		
BLUE/ RED	SPARE	SPARE	SPARE	SPARE		
RED/ GREEN	SPARE	SPARE	SPARE	SPARE		



Cody R. Yearout 2/27/2024
Digitally signed by Date
CODY R. YEAROUT, P.E.

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FM 407 AT VICKERY BLVD

TRAFFIC SIGNAL LAYOUT

SHEET 2 OF 3

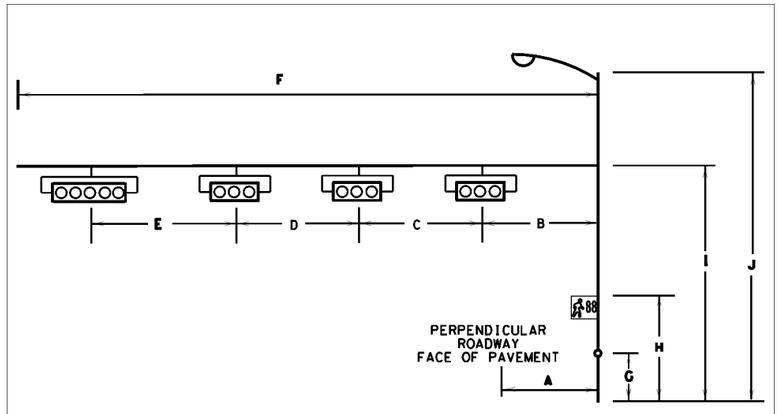
DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
CY	6	(SEE TITLE SHEET)		FM 982, ETC.
GRAPHICS CY	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK CY	TEXAS	18	COLLIN, ETC.	46
CHECK AB	CONTROL	SECTION	JOB	
	0387	05	028, ETC.	

FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/0918003804 - Design/Plan Set/8. Traffic/FM 407 at Vickery Blvd in Copper Canyon/Base Files/FM 407 at Vickery Blvd

CONDUIT RUNS

RUN #	CONDUIT TYPE (LF)				WIRE SIZE AND TYPE (EA)									RUN LENGTH (LF)	RUN #
					CONDUCTOR (ITEM 620)				ITEM 684						
	*2" PVC SCH 80	2" PVC SCH 40	4" PVC SCH 40	4" PVC SCH 40 (BORE)	NO.4 XHHW $$	NO.6 XHHW	NO.6 BARE	NO.8 XHHW	2 CNDR 12AWG FOR APS UNITS	7 CNDR TY-A 14 AWG	20 CNDR TY-A 14 AWG	VIVDS CABLE **	OPTICOM CABLE $		
1	29				3									29	1
2		325				2	1	4						325	2
3***		9				2	1							9	3
			2@9				1		3	1	2		1		
4***			2@9				1		3	1	2	1	3	9	4
5			5				1	2						5	5
6			20				1	2	3	1	2	1	3	20	6
7			12				1	2	1		1	1	1	12	7
8				92			1	2	2	1	1		2	92	8
9			11				1	2	1		1		1	11	9
10			11				1		1	1				11	10
11				102			1						1	102	11
12			15				1	2	1		1		1	15	12
13			12				1		1	1				12	13
14				89			1	2	2	1	1			89	14
15			7				1	2	1		1		1	7	15
16				92			1	2	3	1	2		1	92	16
TOTALS	29	334	129	375	87	668	820	1899	820	334	486	41	519	TOTAL	

* NOTE 2" PVC SCH 80 INCLUDES 20' RISER ON COSERV POLE
** ALL RADAR CABLE IS SUPPLIED BY THE TOWN OF FLOWER MOUND.
*** RUNS 3 AND 4 SHALL CONTAIN AN EMPTY 3" CONDUIT TO SATISFY THE REQUIREMENT OF TS-CF-21.
$ TO BE PROVIDED BY TOWN OF COPPER CANYON. CONTACT TROY MEYER AT 817-829-6974.
$$ FURNISHED AND INSTALLED BY COSERV.



TYPICAL TRAFFIC POLE
& SIGNAL HEAD
CONFIGURATION

MEASURED TO THE CENTER OF THE POLE (LF)

SIGNAL HEAD & POLE PLACEMENT (LF)

POLE NUMBER	FND. TYPE WIND ZONE 80 MPH					WIRE INSIDE POLE (LF)										DIMENSIONS (LF)									
						(ITEM 684) SIGNAL CABLE				(ITEM 620)	(ITEM 6306)														
						SIGNAL HEADS		PED HEADS	APS UNITS	LUMINAIRE															
		24" DIA TYPE A (LF)	30" DIA TYPE A (LF)	36" DIA TYPE A (LF)	48" DIA TYPE A (LF)	5 CNDR TY A 14 AWG	7 CNDR TY A 14 AWG	5 CNDR TY A 14 AWG	2 CNDR TY A 12 AWG	NO. 12 XHHW	VIVDS CABLE ***	*OPTICOM CABLE	LUM	NO. OF HEADS **	NO. OF APS UNITS	A	B	C	D	E	F	G	H	I	J
P1	48-A				22	133	66	10	5	80	40	50	1	4	1	11	14	11	12	10	55	5	10	19	30
P2	30-A		11			39	51	10	5	80		45	1	2	1	10	20	12			32	5	10	19	30
P3	36-A			13		82	57	10	5	80		41	1	3	1	9	16	12	10		44	5	10	19	30
P4	30-A		11			37	47	10	5	80		42	1	2	1	11	18	10			32	5	10	19	30
P5	24-A	6						10	5						1	9						5	10		
P6	24-A	6						10	5						1	8						5	10		
TOTAL		12	22	26	22	291	221	60	30	320	40	178	4	11	6										

* TO BE PROVIDED BY THE TOWN OF COPPER CANYON. CONTACT TROY MEYER AT (817)-829-6974.
** DOES NOT INCLUDE VERTICAL AND PED HEADS
*** ALL RADAR CABLE IS SUPPLIED BY THE TOWN OF FLOWER MOUND.

ELECTRICAL SERVICE DATA

ELECTRICAL SERVICE DESCRIPTION (SEE ED(5))	SERVICE CONDUIT SIZE (PVC) (SCH 80)	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE/AMP	FOUR-POLE CONTACTOR AMPS	PANEL BD./ LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE/AMPS	KVA LOAD
TY D (120/240)070(NS)SS(E)PS(U)	2"	3/#4	N/A	2P/70	30	100	T.S.	1P/50	<7.1
							LIGHTING	2P/20	
							LIGHTING	2P/20	

STATE OF TEXAS
CODY R. YEAROUT
139576
LICENSED
PROFESSIONAL ENGINEER

Cody R. Yearout 2/27/2024
Digitally signed by CODY R. YEAROUT, P.E. Date

Texas Department of Transportation
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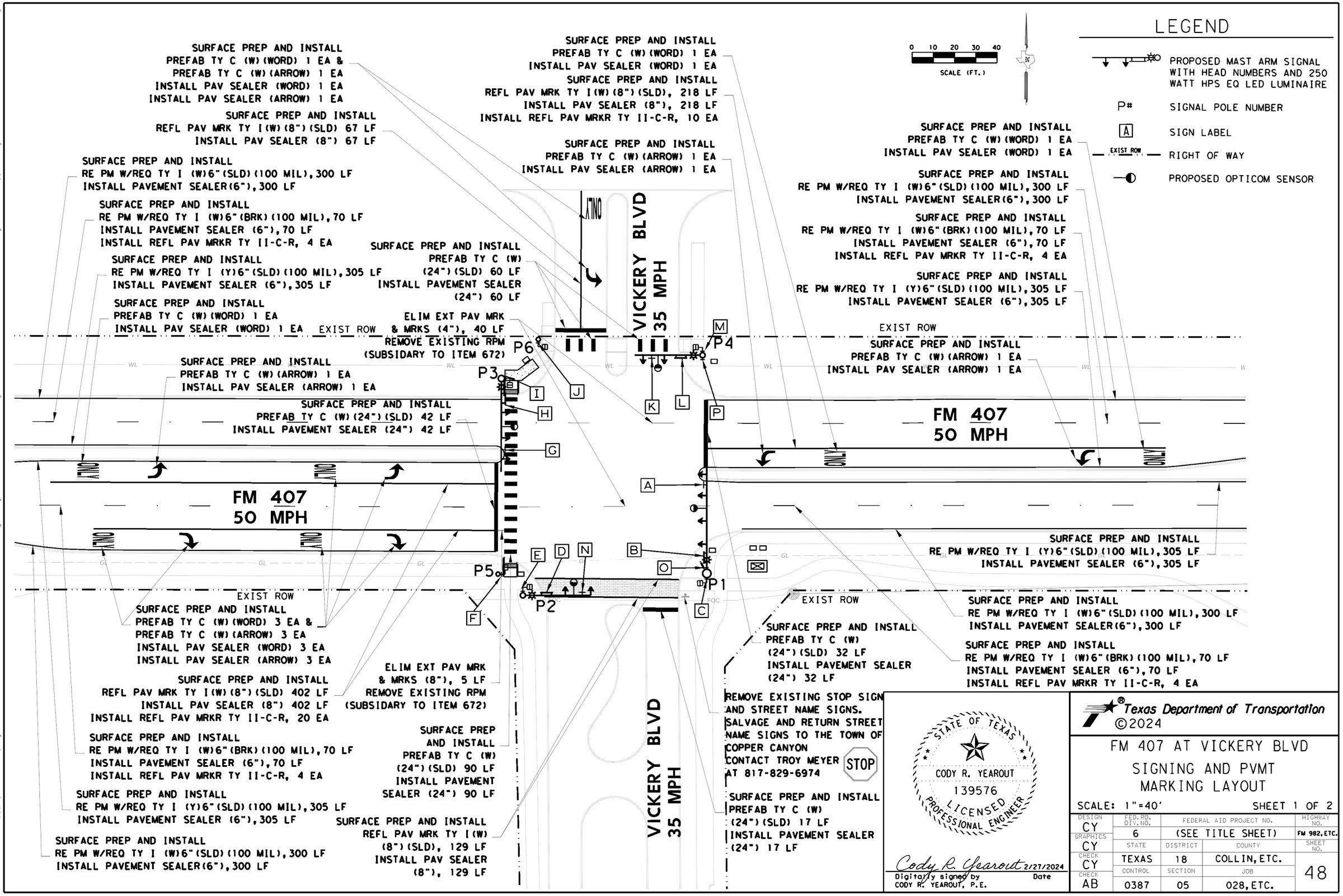
FM 407 AT VICKERY BLVD

TRAFFIC SIGNAL LAYOUT

SHEET 3 OF 3

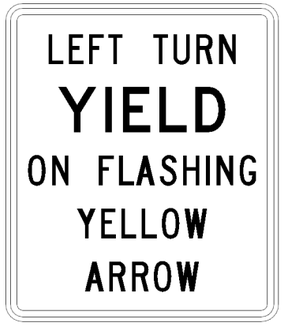
DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
CY	6	(SEE TITLE SHEET)		FM 982, ETC.
GRAPHICS CY	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK CY	TEXAS	18	COLLIN, ETC.	47
CHECK AB	CONTROL	SECTION	JOB	
	0387	05	028, ETC.	



FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/091800380/4 - Design/Plan Set/8. Traffic/FM 407 at Vickery Blvd in Copper Canyon/Base Files/FM 407 at Vickery Blvd

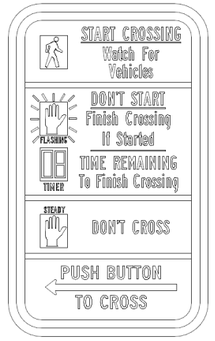
STREET NAME SIGNS
SUPPLIED BY THE TOWN OF COPPER CANYON
CONTACT TROY MEYER AT 817-829-6974

B D H L



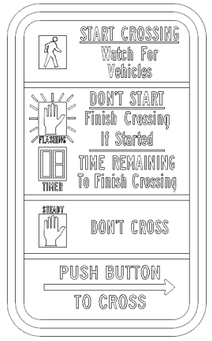
R10-17T
36"X42"

A G
K N



R10-3eL
9"x15"

C E
I



R10-3eR
9"x15"

F J
M

R9-3
24"X24"

O P

SIGNING AND PAVEMENT MARKING ITEMS			
BID ITEM	DESCRIPTION	UNIT	QUANTITY
0644 6076	REMOVE SM RD SN SUP&AM	EA	1
0666 6036	REFL PAV MRK TY I (W) 8" (SLD)(100MIL)	LF	816
0666 6225	PAVEMENT SEALER 6"	LF	2700
0666 6226	PAVEMENT SEALER 8"	LF	816
0666 6230	PAVEMENT SEALER 24"	LF	241
0666 6231	PAVEMENT SEALER (ARROW)	EA	7
0666 6232	PAVEMENT SEALER (WORD)	EA	7
0665 6306	RE PM W/RET REQ TY I (W) 6" (BRK)(100 MIL)	LF	280
0666 6309	RE PM W/RET REQ TY I (W) 6" (SLD)(100 MIL)	LF	1200
0666 6321	RE PM W/RET REQ TY I (Y) 6" (SLD)(100 MIL)	LF	1220
0668 6076	PREFAB PAV MRK TY C (W)(24")(SLD)	LF	241
0668 6077	PREFAB PAV MRK TY C (W)(ARROW)	EA	7
0668 6085	PREFAB PAV MRK TY C (W)(WORD)	EA	7
0672 6007	REFL PAV MRKR TY II-C-R	EA	46
0677 6001	ELIM EXT PAV MRK & MRKS (4")	LF	40
0677 6003	ELIM EXT PAV MRK & MRKS (8")	LF	8
0678 6002	PAV SURF PREP FOR MRK (6")	LF	2700
0678 6004	PAV SURF PREP FOR MRK (8")	LF	816
0678 6008	PAV SURF PREP FOR MRK (24")	LF	241
0678 6009	PAV SURF PREP FOR MRK (ARROW)	EA	7
0678 6016	PAV SURF PREP FOR MRK (WORD)	EA	7

NOTE:

1. SIGNS SHALL CONFORM TO SPECIFICATIONS DETAILED ON STANDARD TSR(4).

STATE OF TEXAS
CODY R. YEAROUT
139576
LICENSED
PROFESSIONAL ENGINEER

Cody R. Yearout 2/27/2024
Digitally signed by CODY R. YEAROUT, P.E. Date

Texas Department of Transportation
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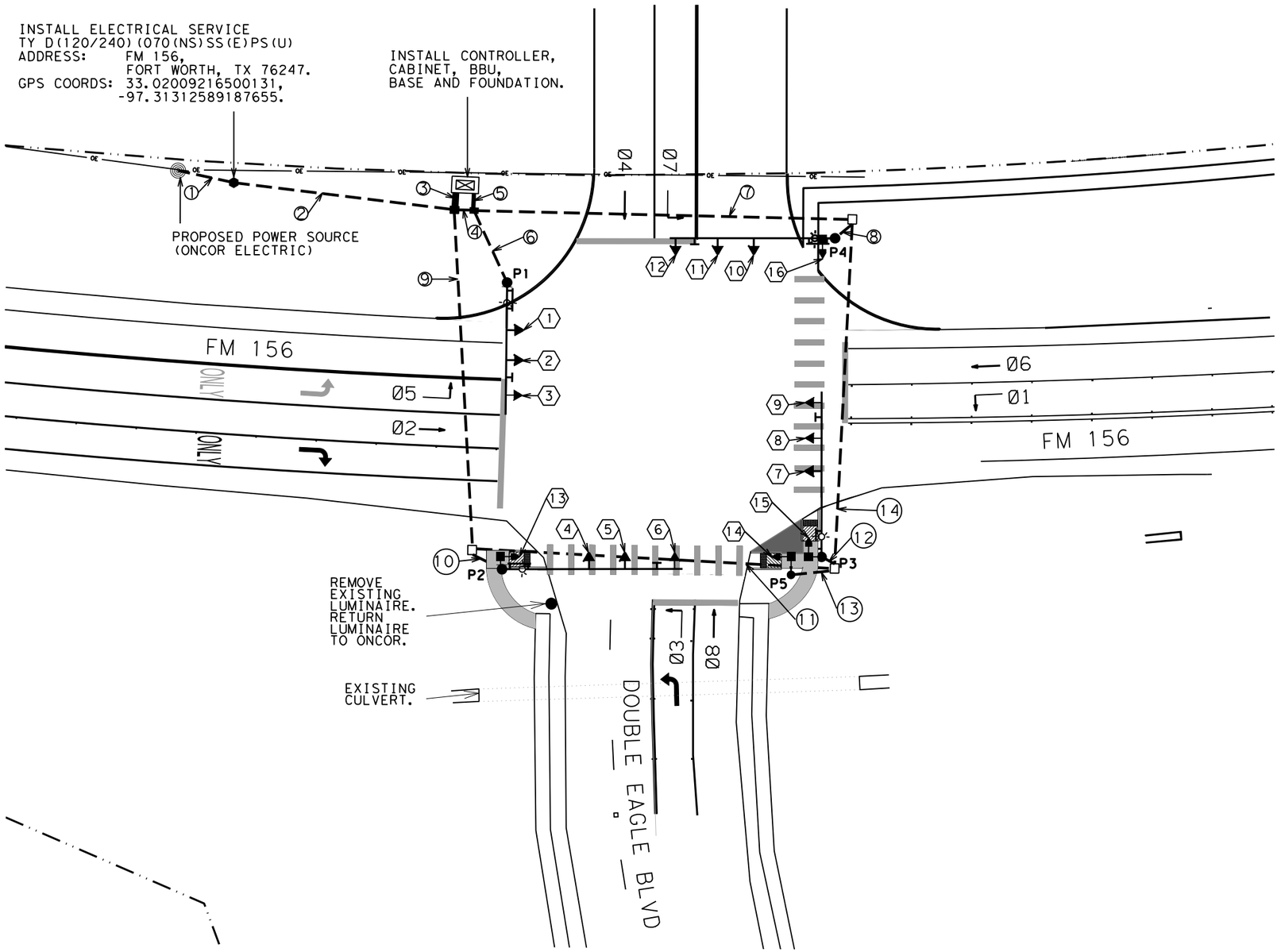
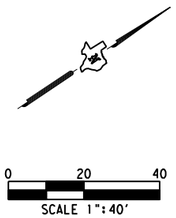
FM 407 AT VICKERY BLVD
SIGNING AND PVMT
MARKING LAYOUT

SCALE: NTS SHEET 2 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
CY	6	(SEE TITLE SHEET)		FM 982,ETC.
GRAPHICS CY	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK CY	TEXAS	18	COLLIN,ETC.	49
CHECK AB	CONTROL	SECTION	JOB	
	0387	05	028,ETC.	

FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/091800380/4 - Design/Plan Set/8. Traffic/FM 407 at Vickery Blvd in Copper Canyon/Base Files/FM 407 at Vickery Blvd





LEGEND

1 2	PROPOSED MAST ARM SIGNAL AND 250 WATT EQ LED LUMINAIRE
P1	SIGNAL POLE NUMBER
■	PROPOSED TYPE D GROUND BOX
□	PROPOSED TYPE C GROUND BOX
1	PROPOSED CONDUIT WITH RUN NUMBER
	RIGHT OF WAY
OE	OVERHEAD ELECTRIC LINE
	PEDESTRIAN HEAD

STATE OF TEXAS
MARK A. ABOSO
112638
LICENSED PROFESSIONAL ENGINEER

Signature of Registrant , P.E. 03/22/2024 Date

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SIGNAL LAYOUT

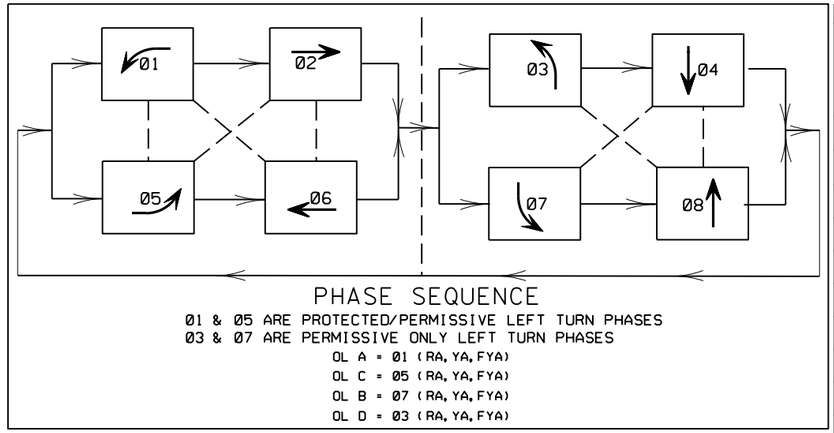
FM 156 AT DOUBLE EAGLE BLVD

SCALE: 1"=40' SHEET 1 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MAA	6	(SEE TITLE SHEET)		FM 982,ETC
GRAPHICS MAA	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK SW	TEXAS	18	COLLIN, ETC	50
CHECK CC	CONTROL	SECTION	JOB	
	0387	05	028, ETC	

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

SIGNAL HEADS (ITEM 682)											
	12" SIGNAL INDICATION										
	SIGNAL	BACK PLATE			VEH SIG SEC WITH LED LAMP						PED SIGNAL SEC (LED)
SIGNAL HEAD NUMBER	HEAD TYPE	3 SEC	4 SEC	5 SEC	G	GA	Y	YA	R	RA	(COUNT DOWN)
		EA.	EA.	EA.	EA.	EA.	EA.	EA.	EA.	EA.	EA.
1	H3	1			1		1		1		
2	H3	1			1		1		1		
3	H5FLT			1		1		2		2	
4	H3	1			1		1		1		
5	H3	1			1		1		1		
6	H4FLT		1					2		2	
7	H3	1			1		1		1		
8	H3	1			1		1		1		
9	H5FLT			1		1		2		2	
10	H3	1			1		1		1		
11	H3	1			1		1		1		
12	H4FLT		1					2		2	
13	PED										1
14	PED										1
15	PED										1
16	PED										1
TOTALS		8	2	2	8	2	8	8	8	8	4



PHASE SEQUENCE

Ø1 & Ø5 ARE PROTECTED/PERMISSIVE LEFT TURN PHASES
Ø3 & Ø7 ARE PERMISSIVE ONLY LEFT TURN PHASES
OL A = Ø1 (RA, YA, FYA)
OL C = Ø5 (RA, YA, FYA)
OL B = Ø7 (RA, YA, FYA)
OL D = Ø3 (RA, YA, FYA)

CABLE TERMINATION CHART					
CNDR. COLOR	CABLE 1 FROM POLE P1 TO CONTROL 16 CNDR.	CABLE 2 FROM POLE P2 TO CONTROL 16 CNDR.	CABLE 3 FROM POLE P3 TO CONTROL 16 CNDR.	CABLE 4 FROM POLE P4 TO CONTROL 16 CNDR.	CABLE 5 FROM POLE P5 TO CONTROL 7 CNDR.
BLACK	SPARE	SPARE	SPARE	SPARE	SPARE
WHITE	S. COMMON	S. COMMON	S. COMMON	S. COMMON	S. COMMON
RED	SH 1, 2 Ø6 R	SH 4, 5 Ø4 R	SH 7, 8 Ø2 R	SH 10, 11 Ø8 R	SH 14 Ø2 DW
GREEN	SH 1, 2 Ø6 G	SH 4, 5 Ø4 G, GA	SH 7, 8 Ø2 G	SH 10, 11 Ø8 G	SH 14 Ø2 DW
ORANGE	SH 1, 2 Ø6 Y	SH 4, 5 Ø4 Y	SH 7, 8 Ø2 Y	SH 10, 11 Ø8 Y	SPARE
BLUE	SH 3 OLA RA	SH 6 OLB RA	SH 9 OLC RA	SH 12 OLD RA	SPARE
WHITE/ BLACK	SH 3 OLA SYA	SH 6 OLB SYA	SH 9 OLC SYA	SH 12 OLD SYA	SPARE
RED/ BLACK	SH 3 OLA FYA	SH 6 OLB FYA	SH 9 OLC FYA	SH 12 OLD FYA	
GREEN/ BLACK	SH 3 Ø1 GA	SPARE	SH 9 Ø5 GA	SPARE	
ORANGE/ BLACK	SPARE	SH 13 Ø2 DW	SH 15 Ø8 DW	SH 16 Ø DW	
BLUE/ BLACK	SPARE	SH 13 Ø2 W	SH 15 Ø8 DW	SH 16 Ø8 DW	
BLACK/ WHITE	SPARE	SPARE	SPARE	SPARE	
RED/ WHITE	SPARE	SPARE	SPARE	SPARE	
GREEN/ WHITE	SPARE	SPARE	SPARE	SPARE	
BLUE/ WHITE	SPARE	SPARE	SPARE	SPARE	
BLACK/ RED	SPARE	SPARE	SPARE	SPARE	

H3 H4FLT H5FLT

LED COUNT DOWN PEDESTRIAN SIGNAL.

SIGNAL HEAD & POLE PLACEMENT (LF)																				
		DRILLED SHAFT LENGTH	DRILLED SHAFT LENGTH	DRILLED SHAFT LENGTH	WIRE INSIDE POLE (LF)															
					(ITEM 684) SIGNAL CABLE				(ITEM 620)	(ITEM 6292)										
POLE NUMBER	FND. TYPE WIND ZONE 80 MPH	24"DIA SUBSIDIARY TO ITEM 687(LF)	36" DIA TYPE A (LF)	48" DIA TYPE A (LF)	SIGNAL HEADS		APS UNITS	LUMINAIRE	RADAR CABLE *	NO. OF HEADS **	LUM.	DIMENSION (LF)								POLE NUMBER
					5 CNDR TY A 14 AWG	7 CNDR TY A 14 AWG	TY C 2 CNDR NO. 12	NO.12 XHHW				A	B	C	D	E	F	G	H	
P1	36-A		13		80	57		80		3	1	6	16	10	12	40	19	30		P1
P2	48-A			22	118	76	5	80		3	1	11	29	12	16	60	19	30	10	P2
P3	48-A			22	117	71	5	80		3	1	12	29	11	12	55	19	30	10	P3
P4	48-A			22	114	72	5	80		3	1	8	27	12	14	55	19	30	10	P4
P5	24-A	6			10		5			-	-	13	-	-	-	-	-	-	10	P5
TOTAL		6	13	66	439	276	20	320		12	4									

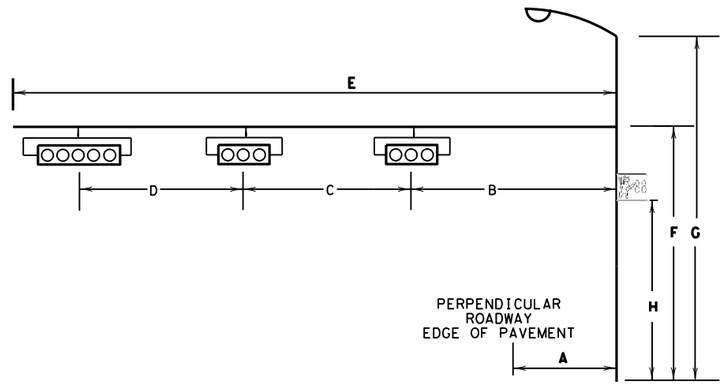
DETECTION ZONE DETAILS		
PHASE OF DETECTION	TYPE OF DETECTION	ADVANCE DETECTION ZONE LOCATIONS
02 & 05	PRESENCE AND ADVANCE	380' AND 245' FROM THE STOPBAR
01 & 06	PRESENCE AND ADVANCE	380' AND 245' FROM THE STOPBAR
03 & 08	PRESENCE	N/A
04 & 07	PRESENCE	N/A

GROUND BOX SUMMARY (ITEM 624)		
DESCRIPTION	UNIT	QTY.
TYPE D (122311) W/ APRON	EA	2
TYPE C (162911) W/ APRON	EA	3

* ALL RADAR CABLE IS SUBSIDIARY TO ITEM 6292. COLUMN TO BE FILLED IN AT TIME OF INSTALLATION.
** DOES NOT INCLUDE VERTICAL HEADS OR PED HEADS.

CONDUIT RUNS (LF)															
	CONDUIT TYPE (ITEM 618)(LF)					(ITEM 620) CONDUCTORS				SIGNAL CABLE		TY C 2 CNDR NO.12.	(ITEM 6292) RADAR CABLE *	LENGTH OF RUN	RUN NO.
RUN NO.	2" PVC SCH 80	2" PVC SCH 40	3" PVC SCH 40	3" PVC SCH 40 BORED	4" PVC SCH 40	NO. 4 XXHW	NO. 6 BARE	NO. 6 XHHW	NO. 8 XHHW	16-CNDR TY A 14 AWG	7-CNDR TY A 14 AWG				
1**	20					$$								20	1
2		75					1	2	4					75	2
3					6***									6	3
		6					1	2			1				
			6				1			2		3			
4			4				1		2					4	4
5					6***									6	5
			6				1			2		1			
6			28				1		2	1				28	6
7				127			1		2	1		1		127	7
8			11				1		2	1		1		11	8
9				115			1		2	2	1	3		115	9
10			12				1		2	1		1		12	10
11				122			1		2	1	1	2		122	11
12			9				1		2	1		1		9	12
13			15				1				1	1		15	13
14				115										115	14
TOTALS	20	81	91	479	12		536	162	1156	563	258	787			

* ALL RADAR CABLE IS SUBSIDIARY TO ITEM 6292. COLUMN IS TO BE FILLED IN AT TIME OF INSTALLATION.
** INCLUDES 10' RISER ON UTILITY POLE
*** SPARE CONDUIT TO SATISFY THE REQUIREMENTS OF TS-CF-21
$$ TO BE INSTALLED BY OTHERS.



ELECTRICAL SERVICE DATA									
ELECTRICAL SERVICE DESCRIPTION (SEE ED(5)-14)	SERVICE CONDUIT SIZE (PVC)	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE/AMP	FOUR-POLE CONTACTOR AMPS	PANELBD./ LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE/AMPS	KVA LOAD
TY D (120/240) 070 (NS) SS (E) PS (U)	2	3/#4	N/A	2P/70	30	100	SIGNALS	1P/50	<7.1
							LIGHTING	2P/20	
							LIGTHING	2P/20	

Signature of Registrant , P.E. 03/22/2024 Date

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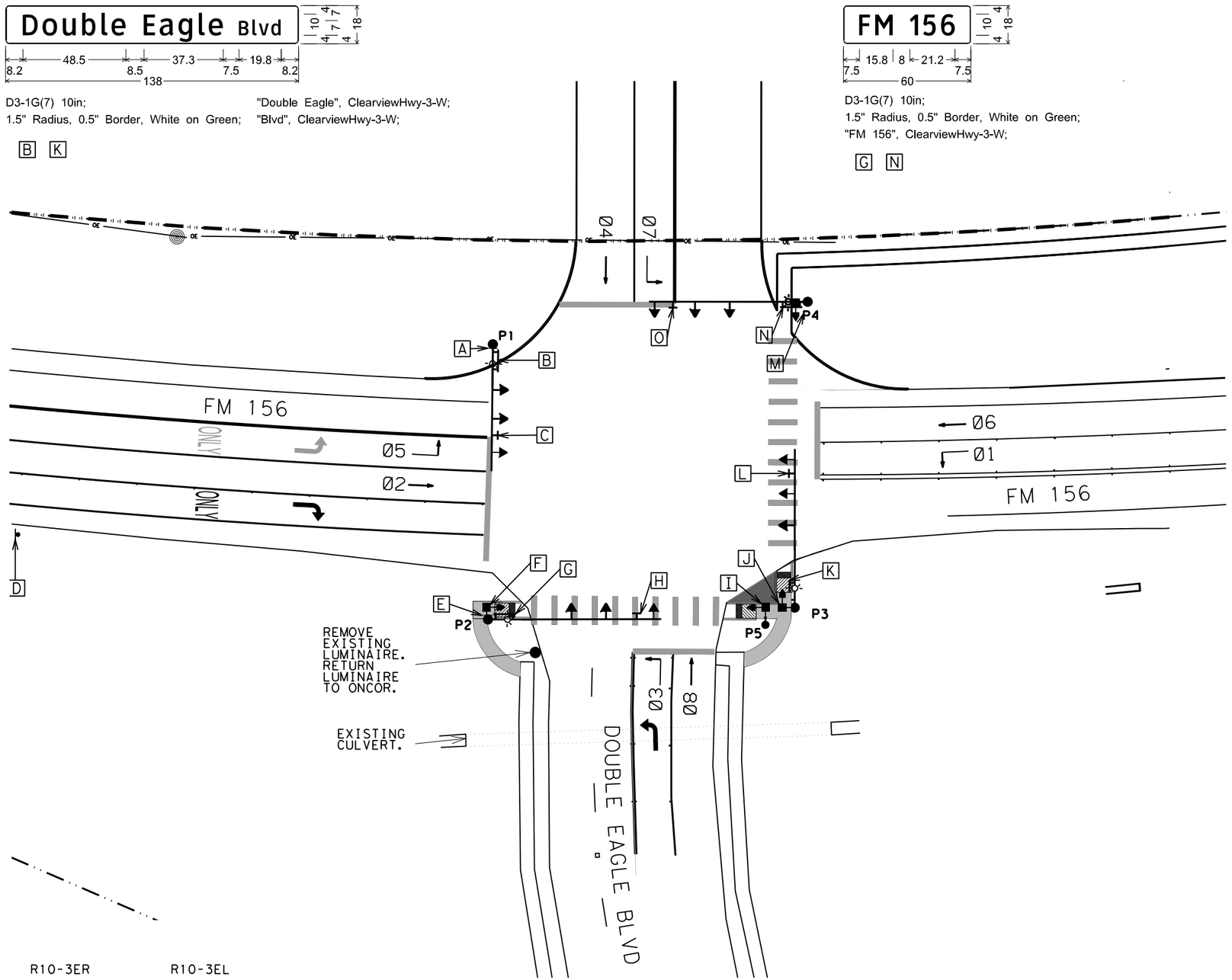
SIGNAL LAYOUT

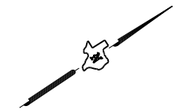
FM 156 AT DOUBLE EAGLE BLVD

SCALE: 1"=40' SHEET 2 OF 2

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MAA	6	(SEE TITLE SHEET)		FM 982,ETC
GRAPHICS MAA	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK SW	TEXAS	18	COLLIN, ETC	51
CHECK CC	CONTROL 0387	SECTION 05	JOB 028, ETC	

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





LEGEND

	PROPOSED MAST ARM SIGNAL
P1	SIGNAL POLE NUMBER
A	PROPOSED SIGN DESIGNATION
	RIGHT OF WAY
	PROPOSED SIGN ON MAST ARM
	PROPOSED GROUND MOUNTED SIGN

STATE OF TEXAS
MARK A. ABOSO
112638
LICENSED PROFESSIONAL ENGINEER

Signature of Registrant , P.E. 03/22/2024 Date

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SIGNING LAYOUT

FM 156 AT DOUBLE EAGLE BLVD

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MAA	6	(SEE TITLE SHEET)		FM 982,ETC
GRAPHICS MAA	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK SW	TEXAS	18	COLLIN, ETC	52
CHECK CC	CONTROL 0387	SECTION 05	JOB 028, ETC	

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

APS MESSAGE CHART			
POLE LOCATION	PEDESTRIAN MOVEMENT	FUNCTIONS	SPEECH MESSAGE/SOUND DETAILS
P2	PHASE 2	BUTTON PUSH ON DW	WAIT TO CROSS DOUBLE EAGLE BLVD AT FM 156.
		EXTENDED BUTTON PUSH	WAIT
		LOCATOR TONE	SLOW TICK
		WALK INDICATION*	RAPID TICK
P5	PHASE 2	BUTTON PUSH ON DW	WAIT TO CROSS DOUBLE EAGLE BLVD AT FM 156.
		EXTENDED BUTTON PUSH	WAIT
		LOCATOR TONE	SLOW TICK
		WALK INDICATION*	RAPID TICK
P4	PHASE 8	BUTTON PUSH ON DW	WAIT TO CROSS FM 156 AT DOUBLE EAGLE BLVD.
		EXTENDED BUTTON PUSH	WAIT
		LOCATOR TONE	SLOW TICK
		WALK INDICATION*	RAPID TICK
P3	PHASE 8	BUTTON PUSH ON DW	WAIT TO CROSS FM 156 AT DOU.BLE EAGLE BLVD.
		EXTENDED BUTTON PUSH	WAIT
		LOCATOR TONE	SLOW TICK
		WALK INDICATION*	RAPID TICK

* COUNT DOWN SPEECH MESSAGE = "OFF" FOR ALL UNITS.

0 20 40
SCALE 1": 40'

EXISTING RAMP TO REMAIN.

P1

P4

FM 156

ONLY

ONLY

FM 156

P2

P5

P3

DOUBLE EAGLE BLVD

INSTALL TYPE 7
CURB RAMP.

INSTALL
2 CY RIPRAP.

INSTALL TYPE 7
CURB RAMP.

0 10 20
SCALE 1":20'

P2

INSTALL 18.4 SY
6" SIDEWALK.
TIE PROPOSED SIDEWALK
FLUSH TO EXISTING
SIDEWALK.

INSTALL TYPE 7
CURB RAMP.

EXISTING SIDE WALK.

EXISTING
SIDEWALK.

0 10 20
SCALE 1":20'

P5

P3

EXISTING SIDEWALK.

INSTALL 20.6 SY
6" SIDEWALK.
TIE PROPOSED SIDEWALK
FLUSH TO EXISTING
SIDEWALK.

LEGEND

PEDESTRIAN RAMPS

- PROPOSED 4 INCH CONCRETE RIPRAP.
- PROPOSED 6 INCH SIDEWALK.
- PEDESTRIAN HEAD

STATE OF TEXAS
MARK A. ABOSO
112638
LICENSED
PROFESSIONAL ENGINEER

Signature of Registrant , P.E. 03/22/2024
Date

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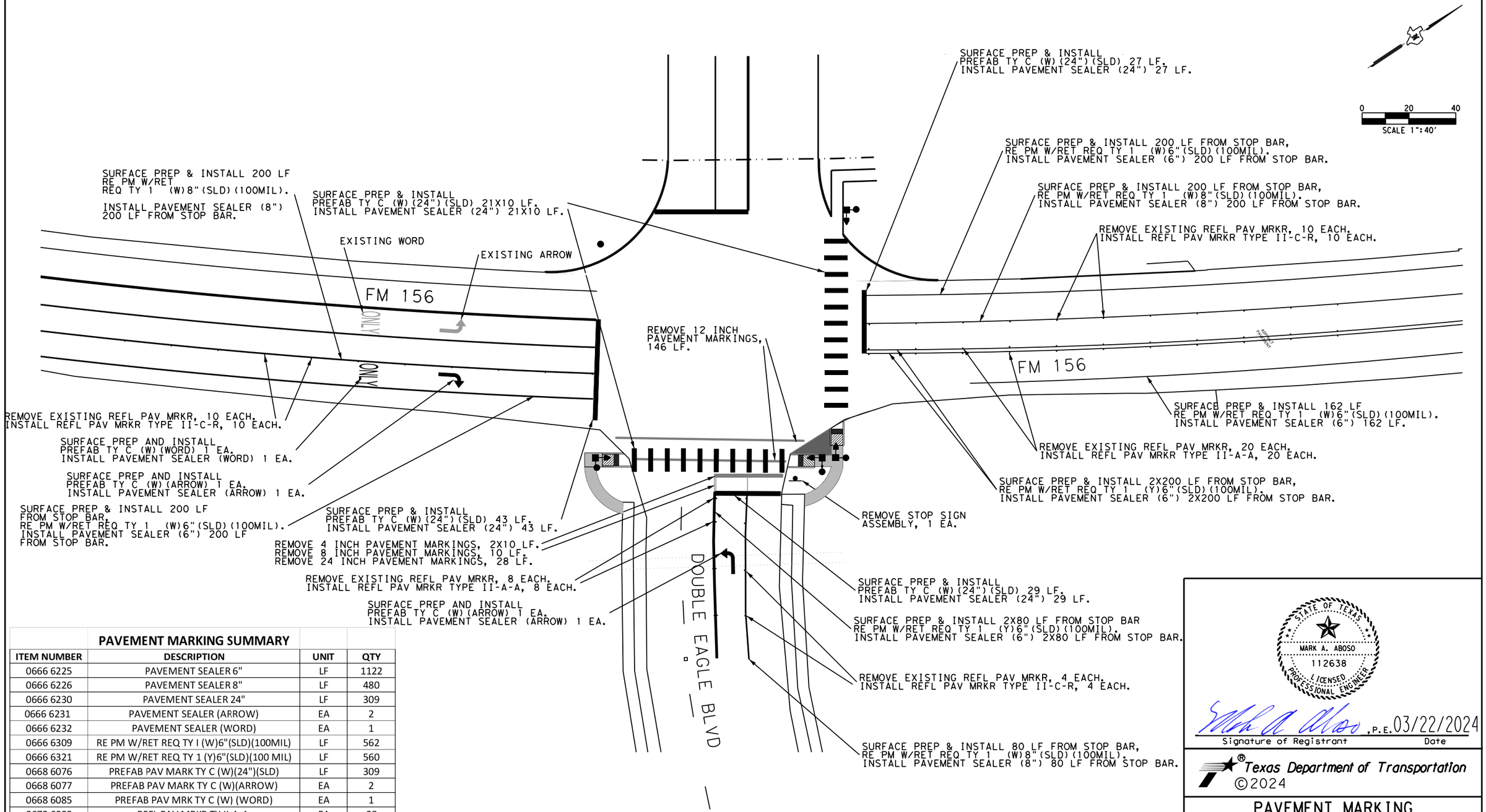
SIDEWALK, RAMP, & APS MESSAGE DETAILS.

FM 156 AT DOUBLE EAGLE BLVD

SCALE: 1"=40' SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MAA	6	(SEE TITLE SHEET)		FM 982,ETC
GRAPHICS MAA	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK SW	TEXAS	18	COLLIN, ETC	53
CHECK CC	CONTROL	SECTION	JOB	
	0387	05	028, ETC	

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



PAVEMENT MARKING SUMMARY

ITEM NUMBER	DESCRIPTION	UNIT	QTY
0666 6225	PAVEMENT SEALER 6"	LF	1122
0666 6226	PAVEMENT SEALER 8"	LF	480
0666 6230	PAVEMENT SEALER 24"	LF	309
0666 6231	PAVEMENT SEALER (ARROW)	EA	2
0666 6232	PAVEMENT SEALER (WORD)	EA	1
0666 6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	562
0666 6321	RE PM W/RET REQ TY 1 (Y)6"(SLD)(100 MIL)	LF	560
0668 6076	PREFAB PAV MARK TY C (W)(24")(SLD)	LF	309
0668 6077	PREFAB PAV MARK TY C (W)(ARROW)	EA	2
0668 6085	PREFAB PAV MRK TY C (W) (WORD)	EA	1
0672 6009	REFL PAV MRKR TY II-A-A	EA	28
0672 6010	REFL PAV MRKR TY II-C-R	EA	24
0677 6001	ELIM EXT PAV MRK & MRKS (4")	LF	20
0677 6003	ELIM EXT PAV MRK & MRKS (8")	LF	10
0677 6005	ELIM EXT PAV MRK & MRKS (12")	LF	146
0677 6007	ELIM EXT PAV MRK & MRKS (24")	LF	29
0678 6002	PAV SURF PREP FOR MRK (6")	LF	1122
0678 6004	PAV SURF PREP FOR MRK (8")	LF	480
0678 6008	PAV SURF PREP FOR MRK (24")	LF	309
0678 6009	PAV SURF PREP FOR MRK (ARROW)	EA	2
0678 6016	PAV SURF PREP FOR MRK (WORD)	EA	1

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

STATE OF TEXAS
MARK A. ABOSO
112638
LICENSED
PROFESSIONAL ENGINEER

Signature of Registrant ,P.E. 03/22/2024 Date

Texas Department of Transportation
©2024

PAVEMENT MARKING LAYOUT

FM 156 AT DOUBLE EAGLE BLVD

SCALE: 1"=40' SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MAA	6	(SEE TITLE SHEET)		FM 982,ETC
GRAPHICS MAA	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK SW	TEXAS	18	COLLIN, ETC	54
CHECK CC	CONTROL 0387	SECTION 05	JOB 028, ETC	

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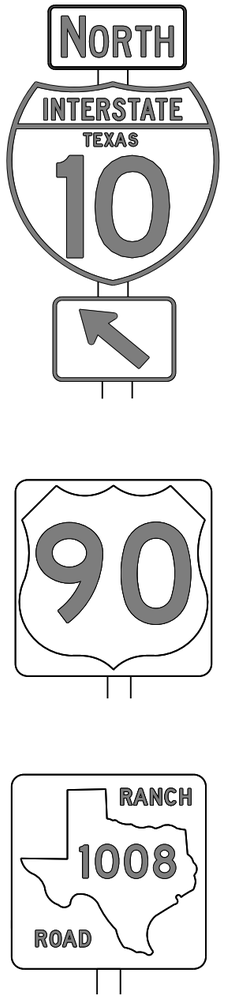
DATE: 2/28/2024 6:27:01 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/09028094 other/Design/09028094 Sign Standards.dgn

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

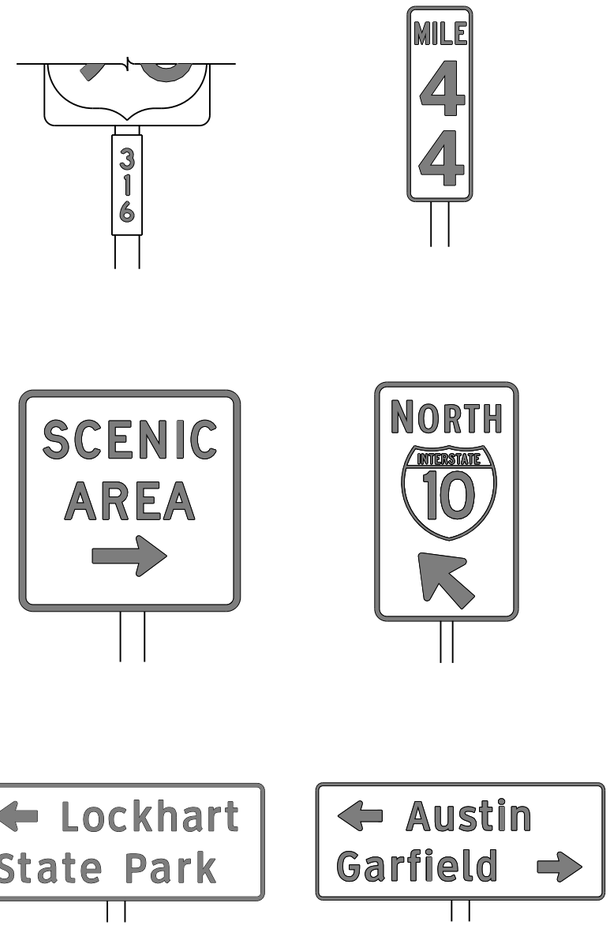
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING



TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).

2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

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

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0387	05	028,ETC.	FM 982,ETC.
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	18	COLLIN,ETC.		55

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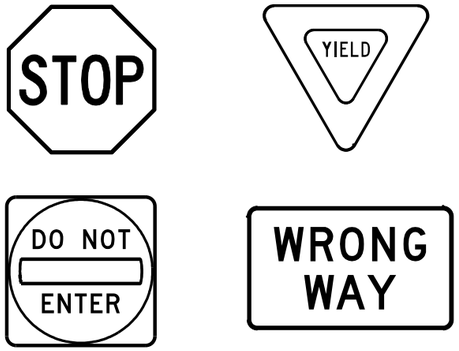
DATE: 2/28/2024 6:27:08 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/0902894 atyes\tsr4-13.dgn

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

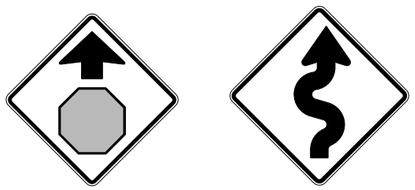
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

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

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0387	05	028,ETC.	FM 982,ETC.
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	18	COLLIN,ETC.		56

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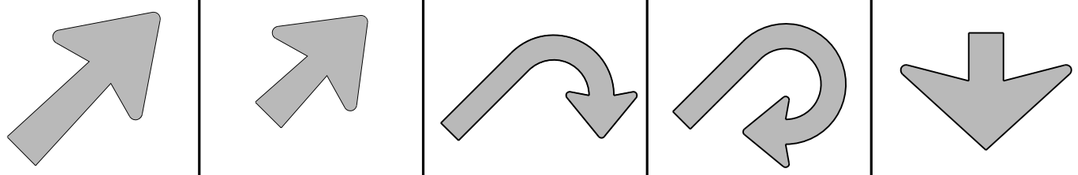
DATE: 2/28/2024 6:27:15 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Profiles/09028/09028794 arrows for sign standard.dgn

ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

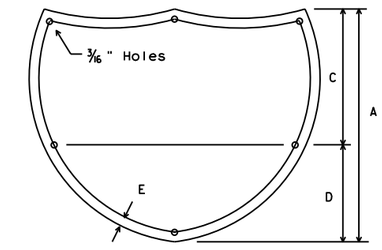
NOTE

Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

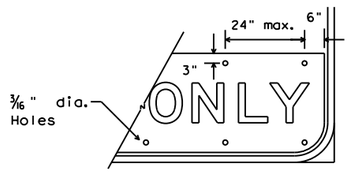
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

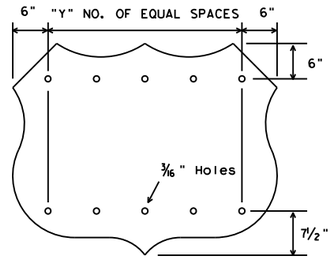


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

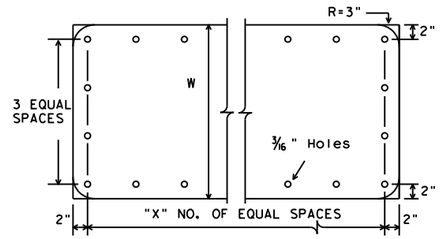


EXIT ONLY PANEL



U.S. ROUTE MARKERS

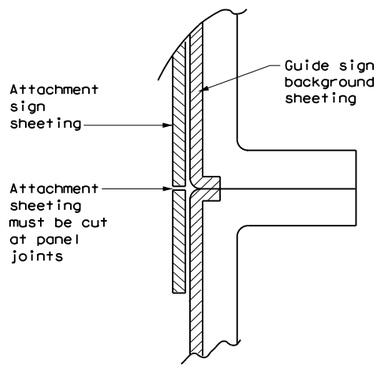
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

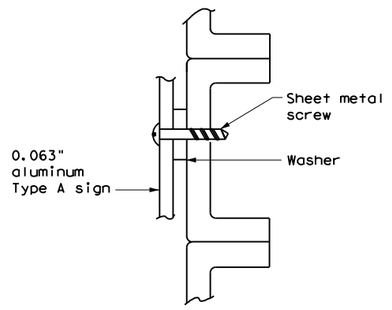
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



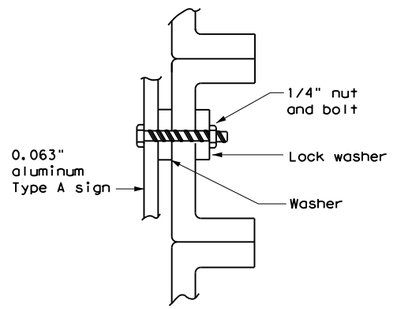
DIRECT APPLIED ATTACHMENT

NOTE:

1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".



SCREW ATTACHMENT



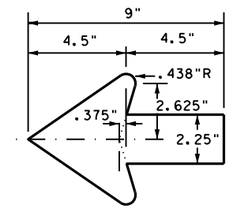
NUT/BOLT ATTACHMENT

NOTE:

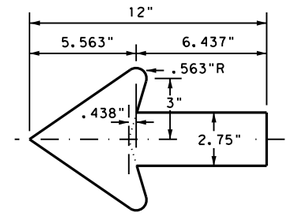
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

ARROW DETAILS

for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.



Standard arrow to be used with 8 inch letters.

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(5)-13

FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0387	05	028, ETC.	FM 982, ETC.
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	18	COLLIN, ETC.		57

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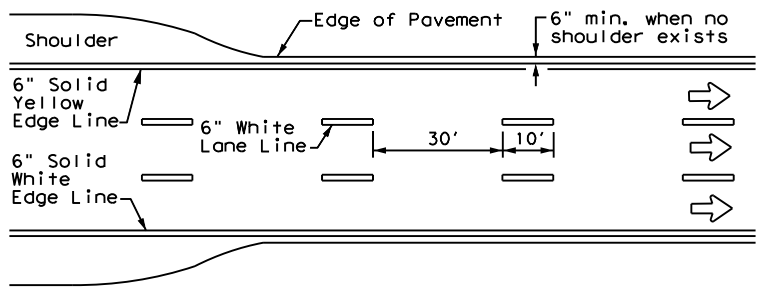
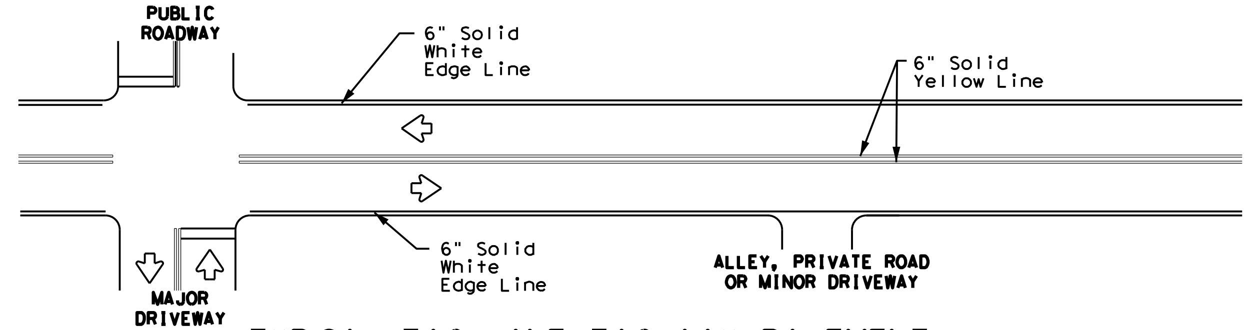


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS

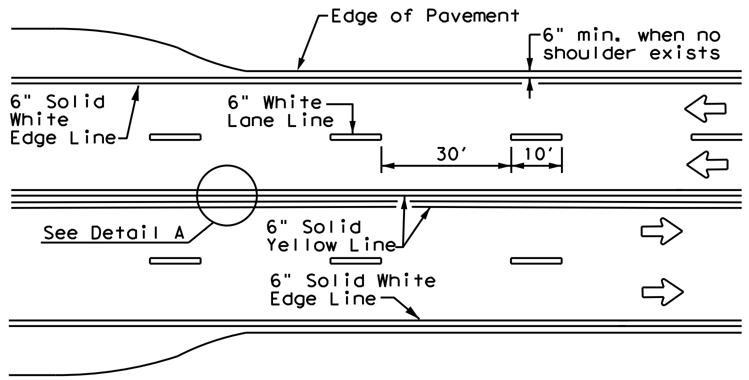
GENERAL NOTES

1. Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edge lines are not required in curb and gutter sections of roadways.

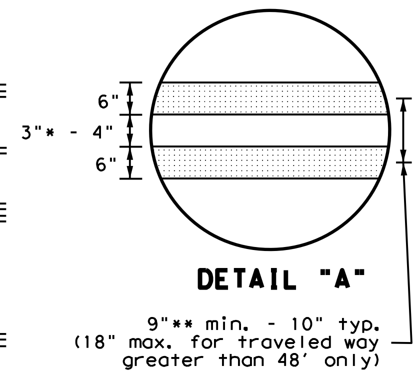
2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the center of edge line to the center of edge line of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



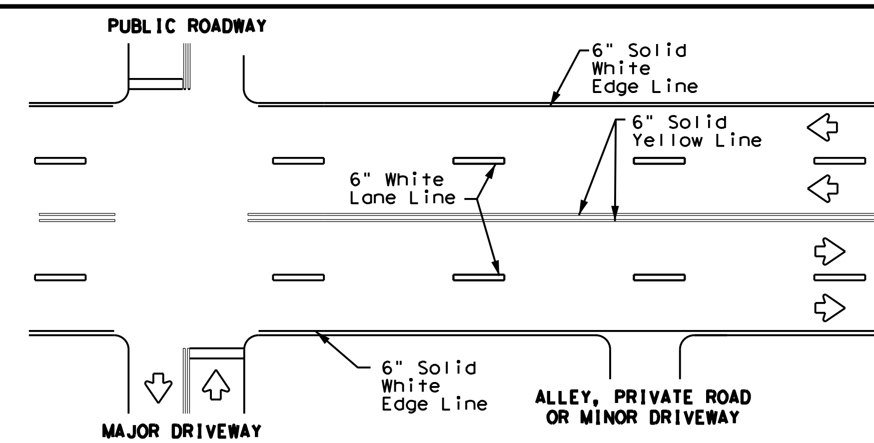
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



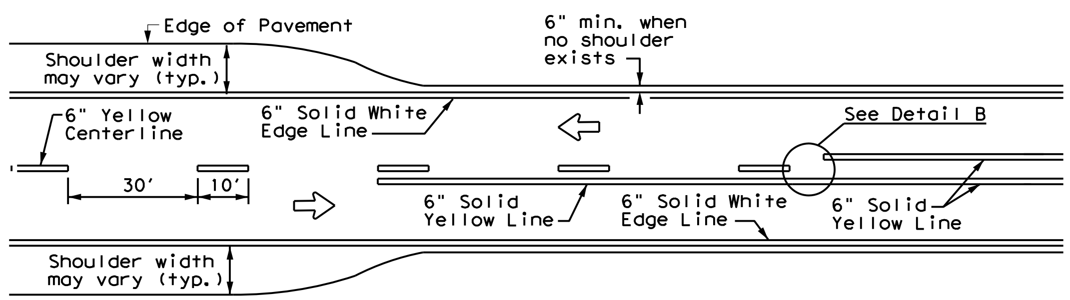
DETAIL "A"

* 2" minimum for restripe projects when approved by the Engineer.

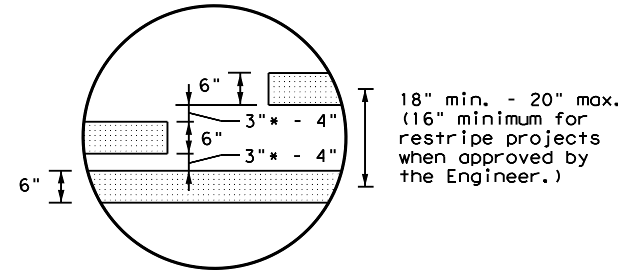
** 8" minimum for restripe projects when approved by the Engineer.



TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS

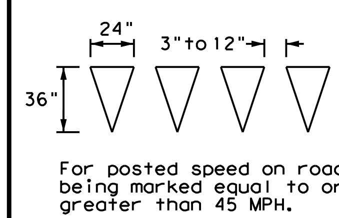


TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



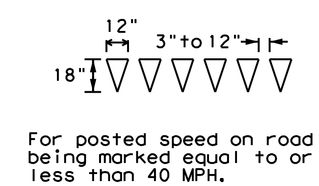
DETAIL "B"

* 2" minimum for restripe projects when approved by the Engineer.

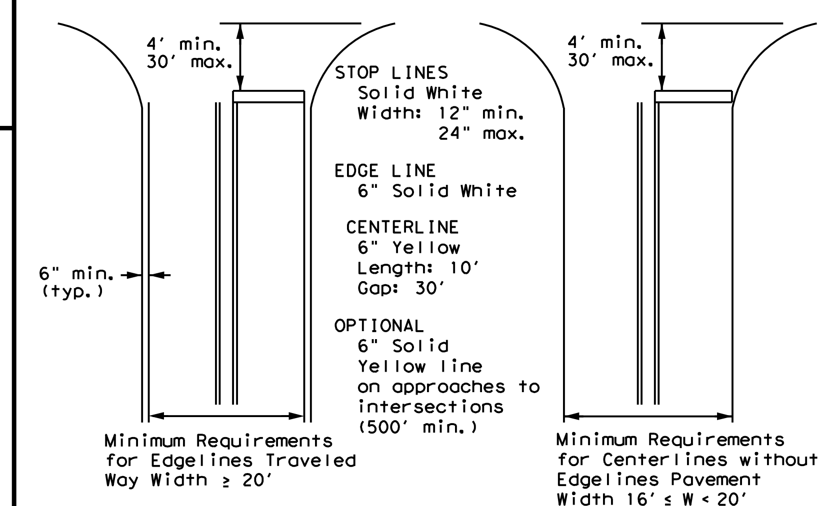


For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



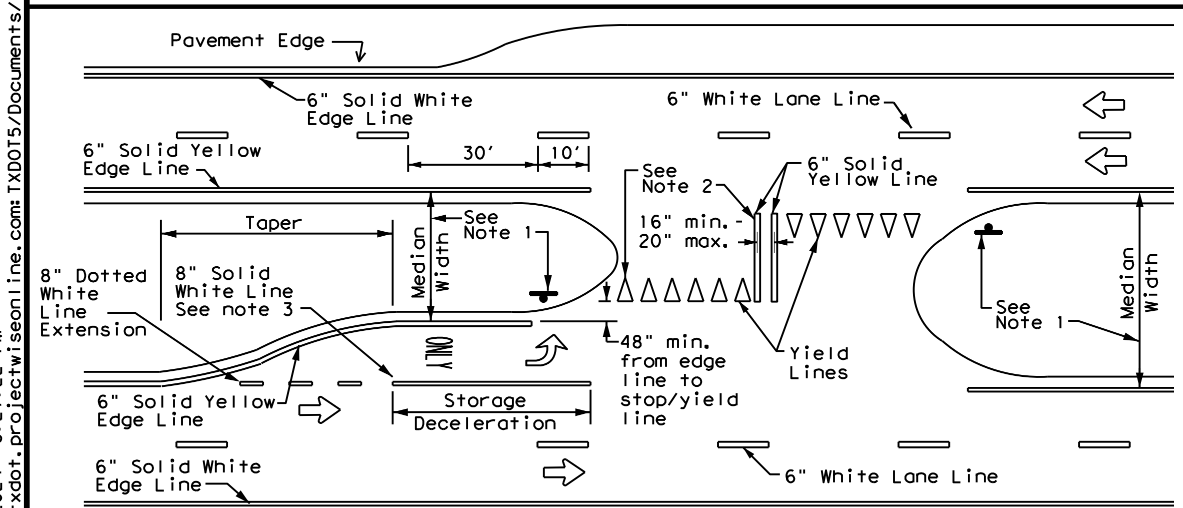
For posted speed on road being marked equal to or less than 40 MPH.



NOTE: Traveled way is exclusive of shoulder widths. Refer to General Note 2 for additional details.

GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Roadways



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections.
   Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs and stop bars are optional as determined by the Engineer.

2. Install median striping (double yellow centerlines and stop lines/yield lines) when a 50' or greater median centerline can be placed. Stop lines shall only be used with stop signs. Yield lines shall only be used with yield signs.

3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

Texas Department of Transportation — Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

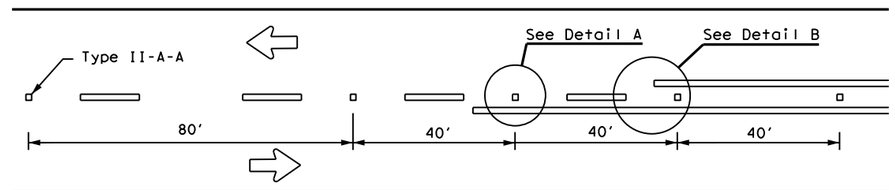
PM(1)-22

FILE: pm1-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 11-78 8-00 6-20 8-95 3-03 12-22 5-00 2-12	0387	05	028, ETC.	FM 982, ETC.
	DIST	COUNTY		SHEET NO.
	18	COLLIN, ETC.		58

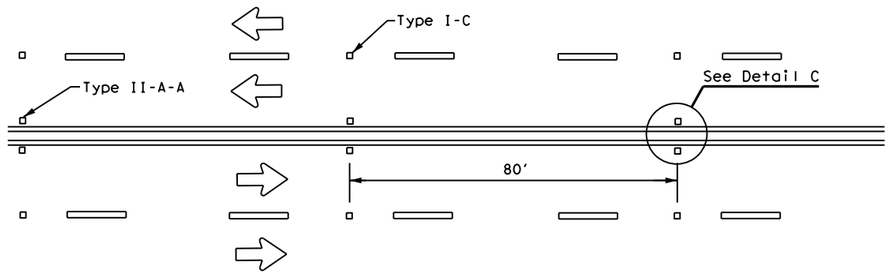
22A

DATE: 2/28/2024 6:27:22 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/0387050281 ... pm1-22.dgn

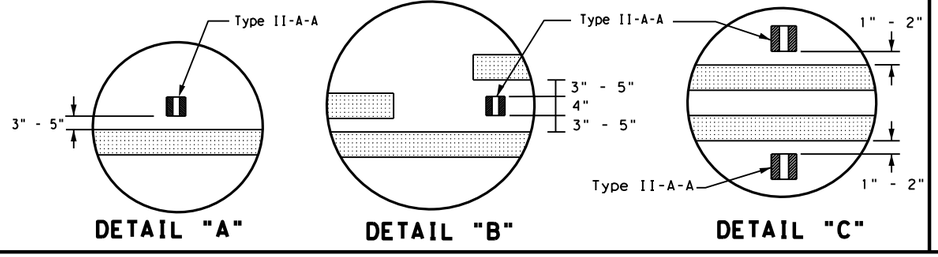
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

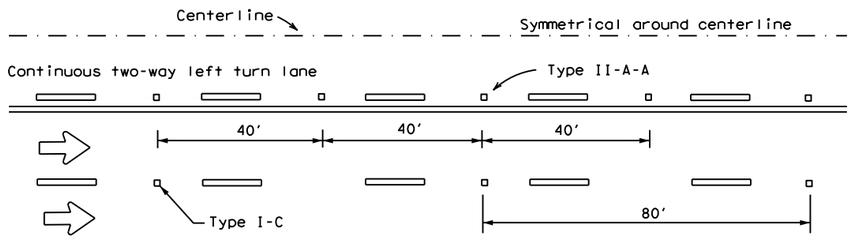


CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS

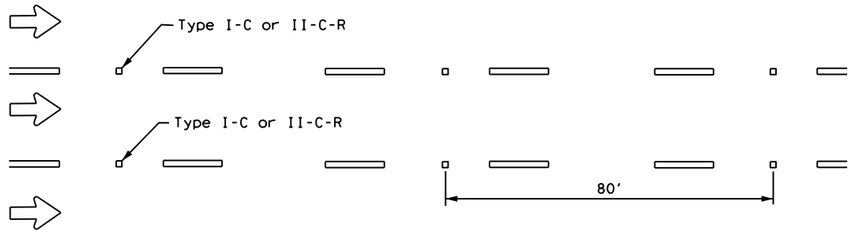


CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS





CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



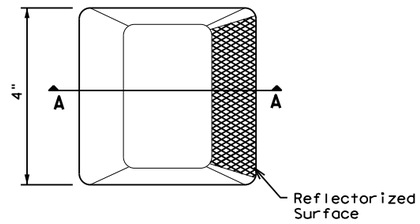
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

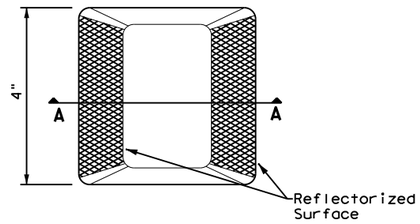
See Note 3.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

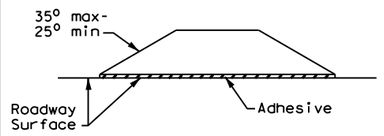
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

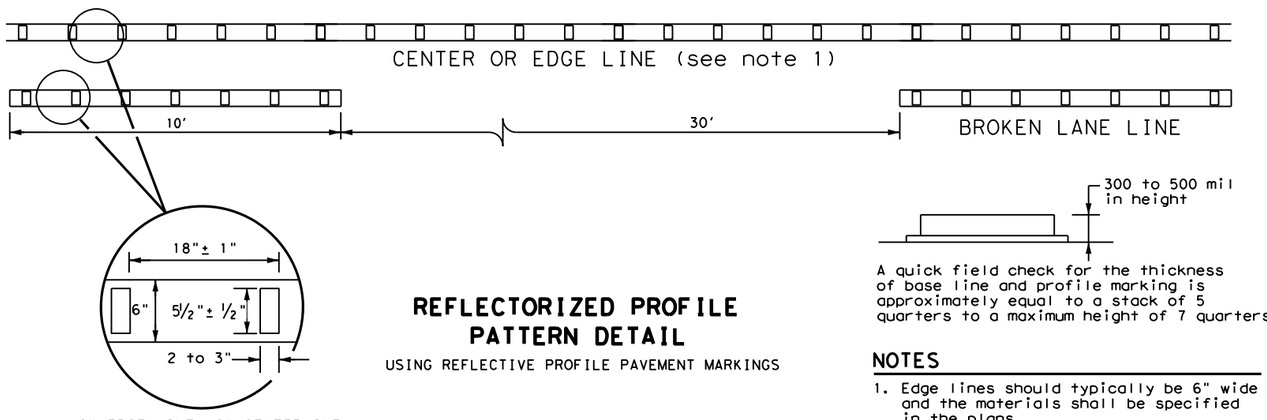


Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS



6" EDGE LINE, 6" CENTERLINE OR 6" LANE LINE

REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTES

1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

1. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements, the raised pavement markers should be placed to one side of the longitudinal joints.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians, and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS REFLECTORIZED PROFILE MARKINGS PM(2)-22

FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
©TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-77 8-00 6-20 4-92 2-10 12-22 5-00 2-12	0387	05	028,ETC.	FM 982,ETC.
	DIST	COUNTY		SHEET NO.
	18	COLLIN,ETC.		59

22B

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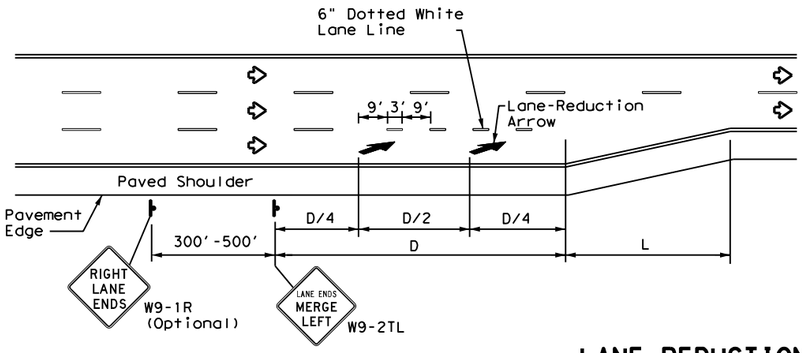
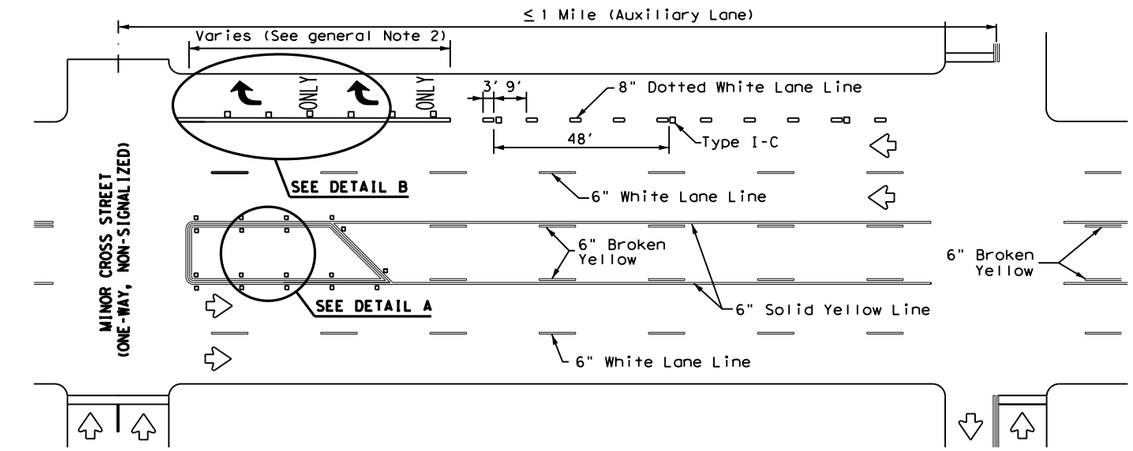


LANE REDUCTION

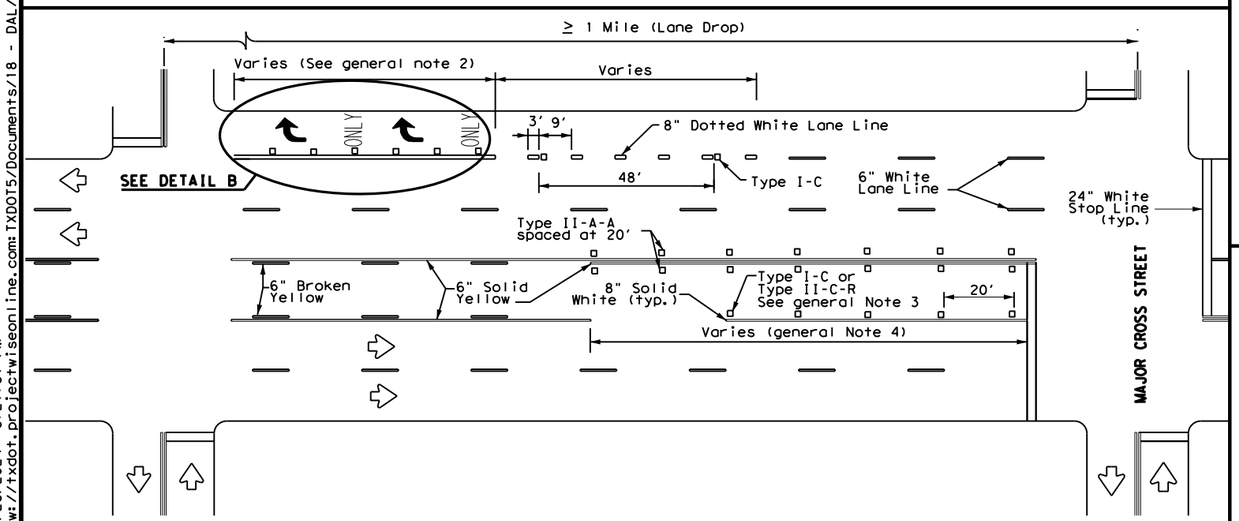
NOTES

1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional RIGHT LANE ENDS (W9-1R) sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.

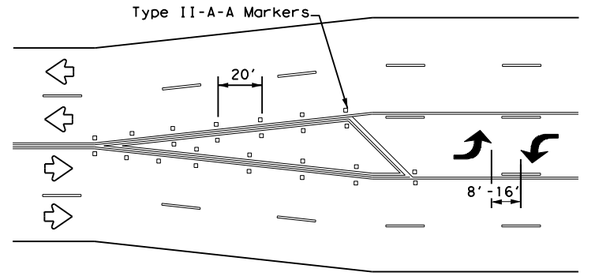
ADVANCED WARNING SIGN DISTANCE (D)		
Posted Speed	D (ft)	L (ft)
30 MPH	460	$L=\frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	



TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

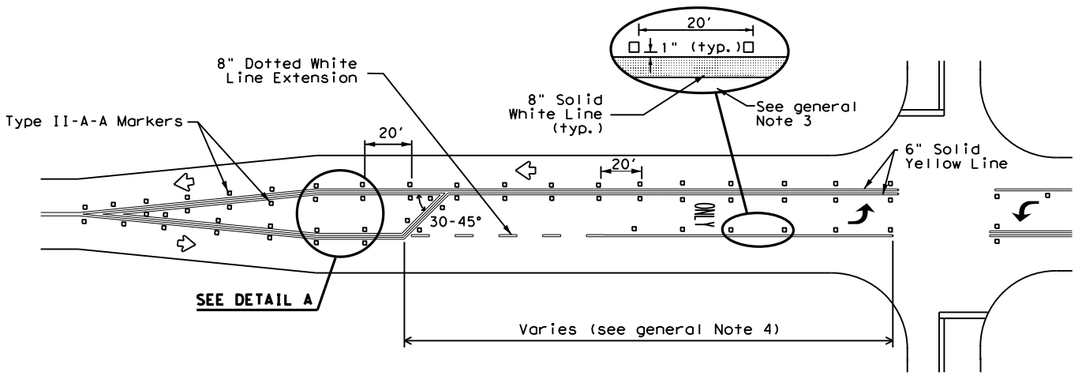
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

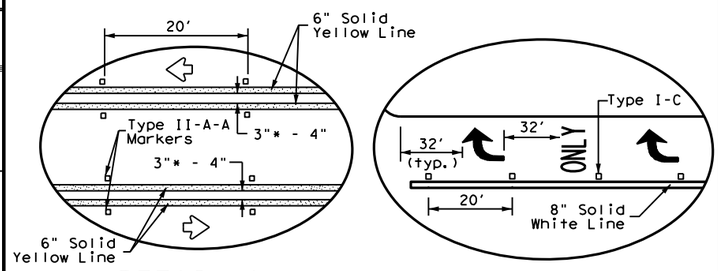
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
2. When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
3. Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
4. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer. See Chapter 3 of the Roadway Design Manual for additional information on turning lanes or storage lengths.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



TYPICAL TWO-LANE ROADWAY INTERSECTION WITH LEFT TURN BAYS



* 2" minimum allowed for restripe projects when approved by the Engineer.

Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS

PM(3)-22

FILE: pm3-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-98 3-03 6-20 5-00 2-10 12-22 8-00 2-12	0387	05	028,ETC.	FM 982,ETC.
	DIST	COUNTY		SHEET NO.
	18	COLLIN,ETC.		60

22C

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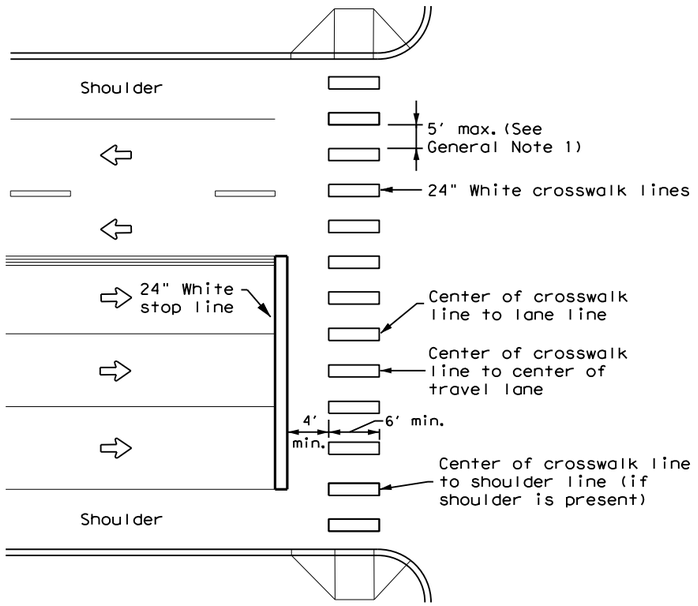


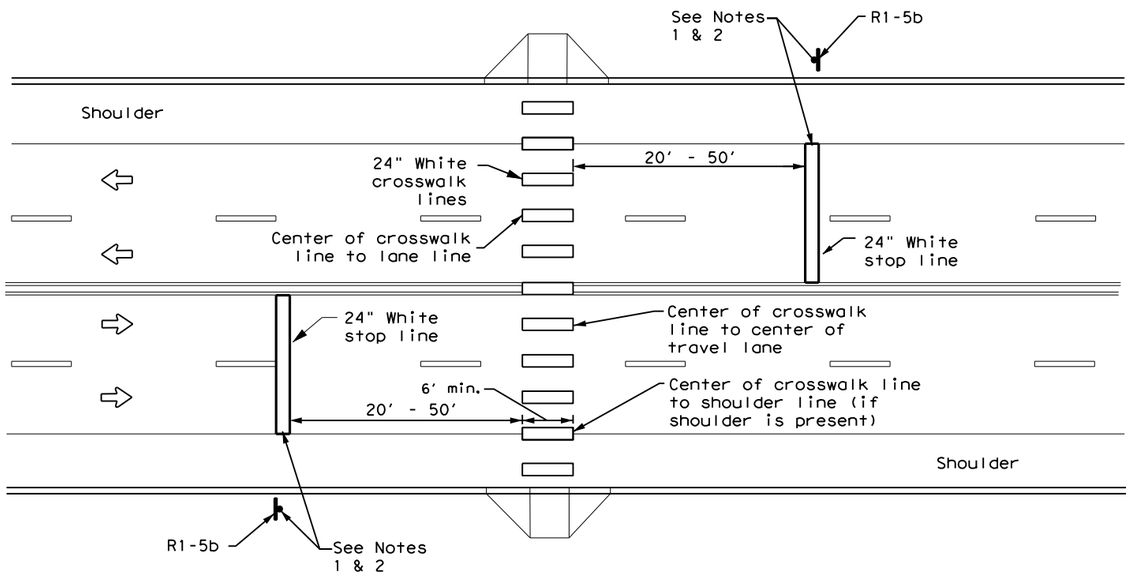
HIGH-VISIBILITY LONGITUDINAL CROSSWALK AT CONTROLLED APPROACH

GENERAL NOTES

1. Longitudinal crosswalk lines should not be placed in the wheel path of vehicles. Center the crosswalk lines on travel lanes, lane lines, and shoulder lines (if present).
2. A minimum 6" clear distance shall be provided to the curb face. If the last crosswalk line falls into this distance it must be omitted.
3. For divided roadways, adjustments in spacing of the crosswalk lines should be made in the median so that the crosswalk lines are maintained in their proper location across the travel portion of the roadway.
4. At skewed crosswalks, the crosswalk lines are to remain parallel to the lane lines.
5. Each crosswalk shall be a minimum of 6' wide.
6. The High-Visibility Longitudinal Crosswalk is the preferred crosswalk pattern on State Highways. Other crosswalk patterns as shown in the "Texas Manual on Uniform Traffic Control Devices" may be used. All crosswalk designs and dimension shall comply with the "Texas Manual on Uniform Traffic Control Devices."
7. Final placement of Stop Bar and Crosswalk shall be approved by the Engineer in the field.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



UNSIGNALIZED MIDBLOCK HIGH-VISIBILITY LONGITUDINAL CROSSWALK

NOTES:

1. Use stop bars with Stop Here For Pedestrians (R1-5b) signs at unsignalized midblock cross walks.
2. Use stop bars with STOP HERE ON RED (R10-6 or R10-6a) signs at mid block crosswalks controlled by traffic signals or pedestrian hybrid beacons.

Texas Department of Transportation

Traffic Safety Division Standard

CROSSWALK PAVEMENT MARKINGS

PM(4)-22A

FILE: pm4-22a.dgn	DN:	CK:	DW:	CK:
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REVISIONS	0387	05	028,ETC.	FM 982,ETC.
6-20	DIST	COUNTY		SHEET NO.
6-22	18	COLLIN,ETC.		61
12-22				

22D

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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:	CK:	DW:	CK:
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REVISIONS		0387	05	028,ETC.	FM 982,ETC.
		DIST	COUNTY		SHEET NO.
		18	COLLIN,ETC.		62

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ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS)11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.

2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.

3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.

4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.

2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.

3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.

4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.

5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.

6. Support conductors in illumination poles with a J-hook at the top of the pole.

7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.

8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.

9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.

10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.

11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.

12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.

2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.

3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.

4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.

5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

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

B. CONSTRUCTION METHODS

1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.

2. Do not place ground rods in the same drilled hole as a timber pole.

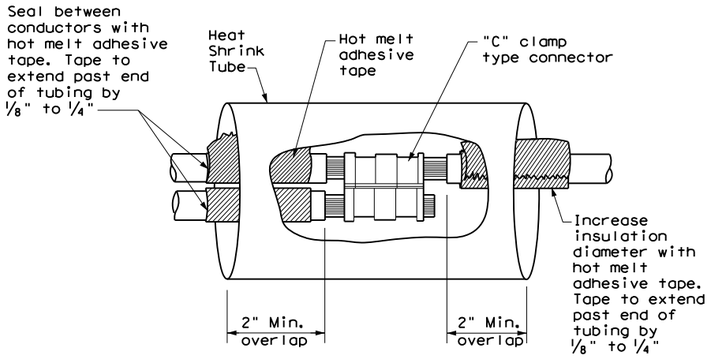
3. Install ground rods so the imprinted part number is at the upper end of the rod.

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

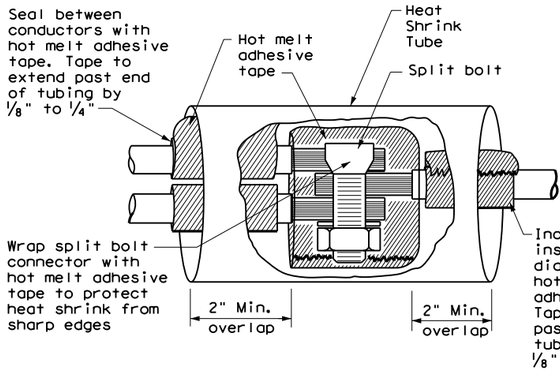
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.

6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.

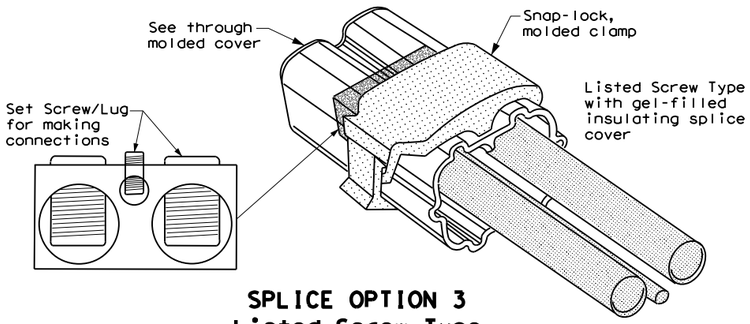
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUCTORS

ED(3)-14

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71C

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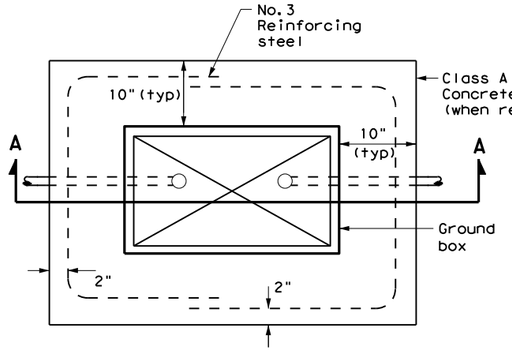
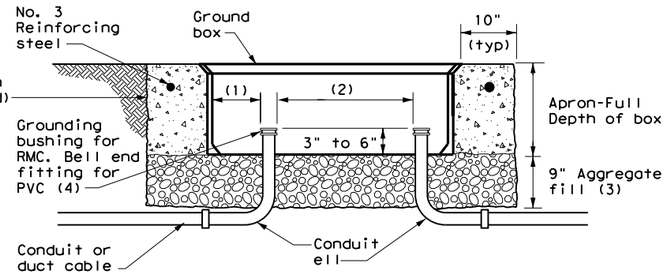


PLAN VIEW



SECTION A - A

APRON FOR GROUND BOX

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

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

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

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

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

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

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.

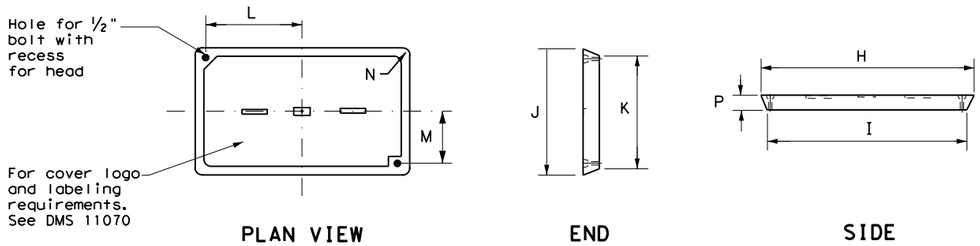
7. When a ground rod is present in a ground box, bond all equipment grounding conductors together and to the ground rod with listed connectors.

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.



PLAN VIEW | END | SIDE

GROUND BOX COVER

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS GROUND BOXES

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ELECTRICAL SERVICES NOTES

1. Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.

2. Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services,"DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.

3. Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.

4. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.

5. The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.

6. Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.

7. When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.

8. Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.

9. All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.

10. Provide rigid metal conduit (RMC) for all conduits on service, except for the ½ in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.

11. Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.

12. Ensure all mounting hardware and installation details of services conform to utility company specifications.

13. For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.

14. When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.

15. Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

SERVICE ASSEMBLY ENCLOSURE

1. Provide threaded hub for all conduit entries into the top of enclosure.

2. Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.

3. Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.

4. Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

1. Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.

2. When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

PHOTOELECTRIC CONTROL

1. Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

*ELECTRICAL SERVICE DATA

Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit **Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 ¼"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 ¼"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

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

** Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National ELectrical Code.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE

ELEC SERV TY X XXX/XXX XXX (XX) XX (X) XX (X)

Schematic Type

Service Voltage V / V

Disconnect Amp Rating
000 indicates main lug only/
Typically Type T

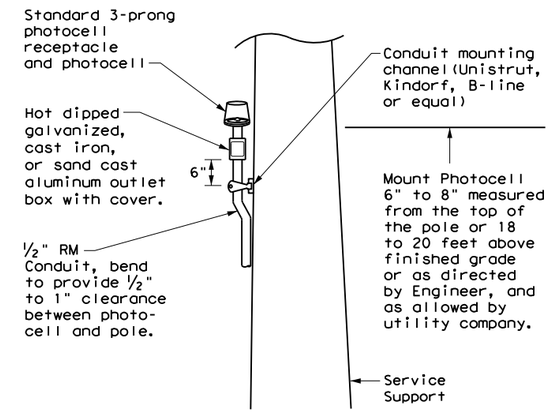
(SS)= Safety Switch Ahead of Meter-Check with Utility
(NS)= No safety Switch Ahead of Meter-Check with Utility

Enclosure Type
GS= Galvanized steel("off the shelf")
SS= Stainless steel(Custom Enclosure)See MPL
AL= Aluminum (Custom Enclosure)See MPL

Photocell Mounting Location
(E)= Inside Service/Enclosure Mounted
(T)= Top of pole
(L)= Luminaire mounted
(N)= None/No Photocell or Lighting Contactor Required

Service Support Type
GC= Granite concrete
OC= Other concrete
TP= Timber pole
SP= Steel pole
SF= Steel frame
OT= Pole by others or paid for separately
EX= Existing pole
TS= Service on traffic signal pole
PS= Pedestal Service

O= Overhead Service Feed from Utility
U= Underground Service Feed from Utility



TOP MOUNTED PHOTOCELL

Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.

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Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

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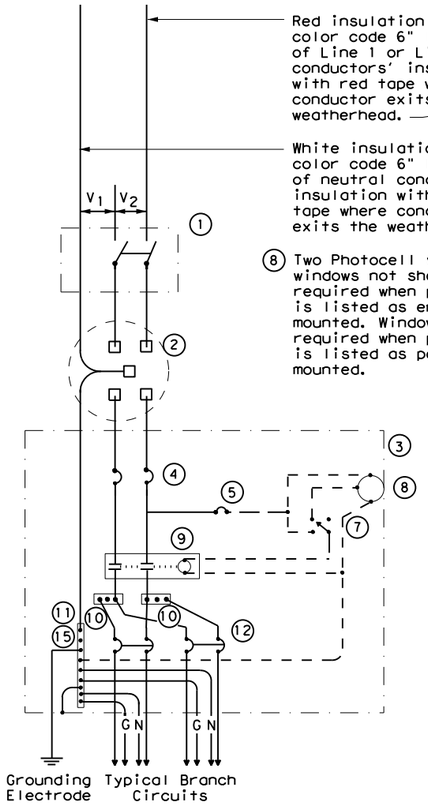
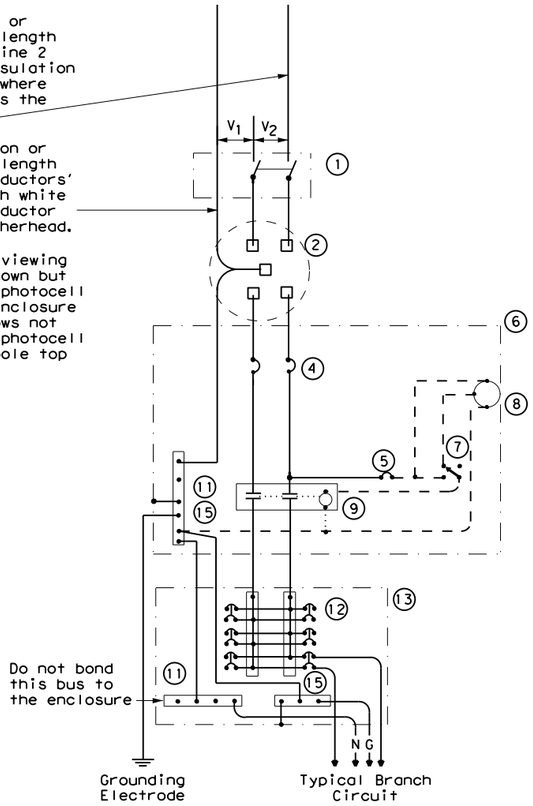
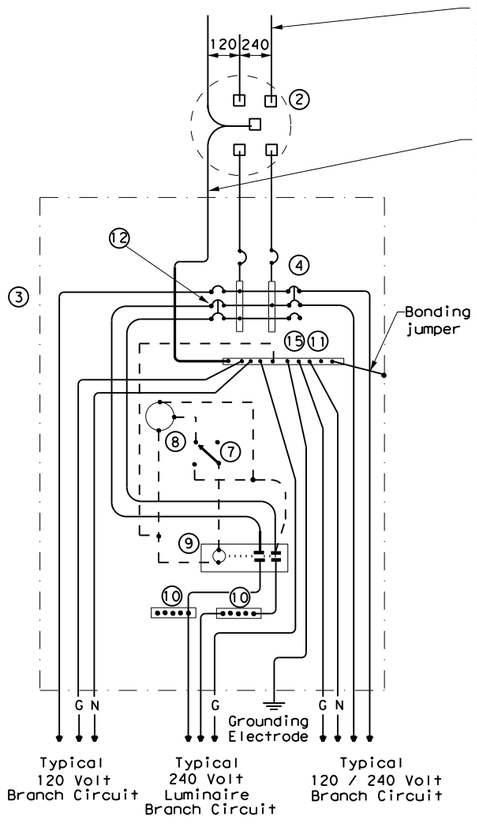


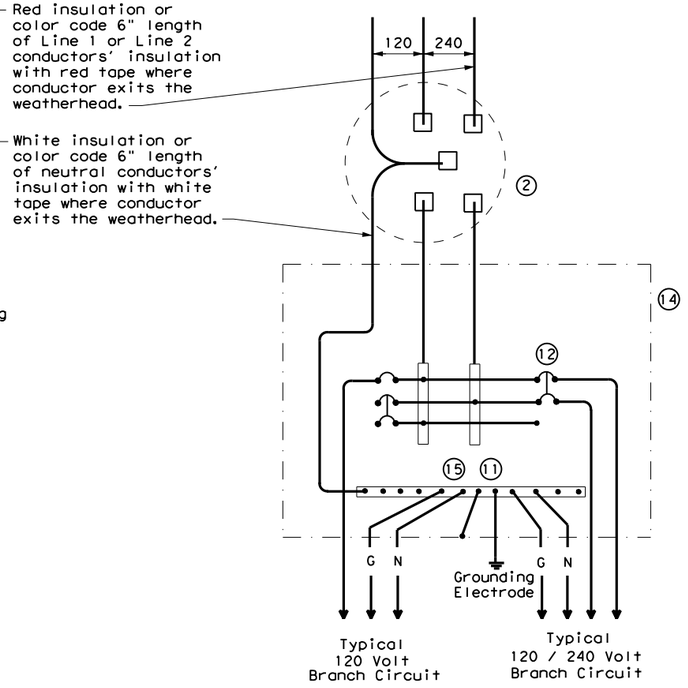
SCHEMATIC TYPE A
THREE WIRE



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

FILE: ed6-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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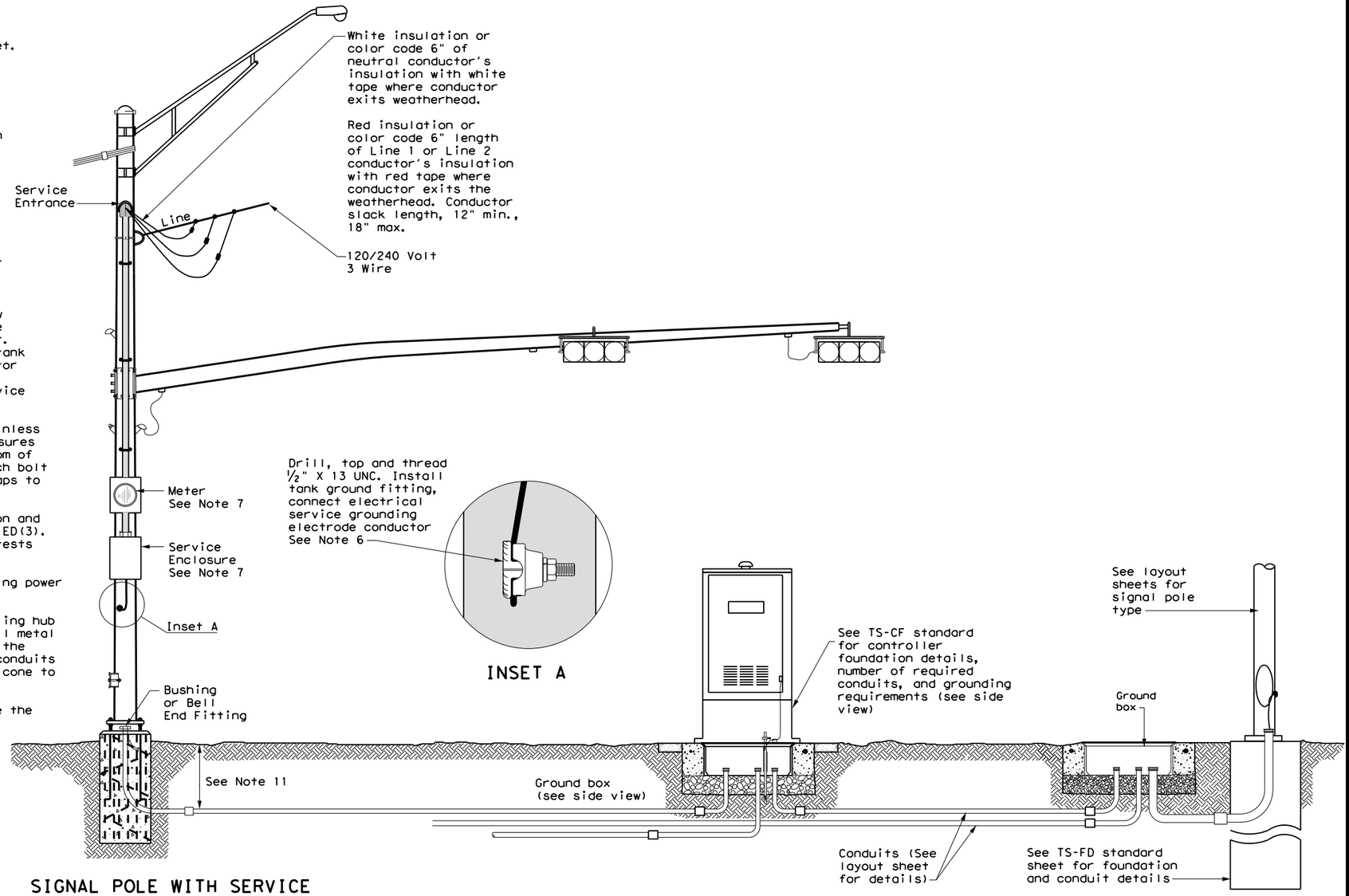
TRAFFIC SIGNAL NOTES

1. Do not pass luminaire conductors through the signal controller cabinet.
2. Include an equipment grounding conductor in all conduits throughout the electrical system. Bond all exposed metal parts to the grounding conductor.
3. Provide roadway luminaires, when required, in accordance with the material and construction sections of Item 610, "Roadway Illumination Assemblies," except for performance testing of luminaires. Test installed roadway luminaires for proper operation as a part of the associated traffic signal system test.
4. If internally illuminated street name signs are approved for use, ground the fixture to the pole with a 12 AWG green XHHW conductor.
5. Bond anchor bolts to rebar cage in two locations using #3 bars or 6 AWG stranded copper conductors. Use listed mechanical connectors rated for embedment in concrete. See TXDOT standard TS-FD for further details.
6. Drill and tap signal poles for ½ in. X 13 UNC tank ground fitting. Provide and install tank ground fitting 4 in. to 6 in. directly below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Connect the electrical service grounding electrode conductor to the tank ground fitting. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. See Inset A detail for further information. Size service entrance conduit and branch circuit conduit as shown in the plans.
7. Mount electrical service enclosure and meter to signal pole with stainless steel bands. Ensure bands are a minimum width of ¾ in. Secure enclosures to bands using two-bolt brackets. Install brackets near top and bottom of each enclosure. Install properly sized stainless steel washers on each bolt in the enclosure. Band or drill and tap properly sized stand-off straps to signal pole for attaching conduit.
8. Conduct pull tests and insulation resistance tests on all illumination and power conductors as required in Item 620 "Electrical Conductors" and ED(3). To prevent electronics damage, do not conduct insulation resistance tests on traffic signal cables after termination.
9. Lock all enclosures and bolt down all ground box covers before applying power to the signal installation.
10. Terminate conduits entering the top of enclosures with a conduit-sealing hub or threaded boss such as meter hub. Install a grounding bushing on all metal conduits not connected to conduit-sealing hub or threaded boss. Bond the grounding bushing to the ground bus with a bonding jumper. Seal all conduits entering enclosures with duct seal or expanding foam. Do not use silicone to seal conduit ends.
11. For all conduits, ensure the burial depth is a minimum of 18". Ensure the minimum burial depth for conduit placed under a roadway is 24".



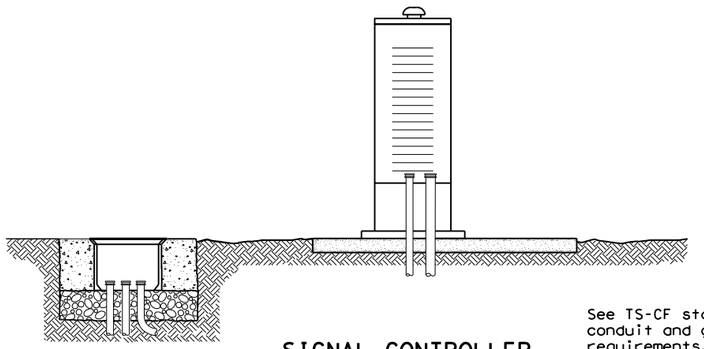
INSET A

SIGNAL POLE WITH SERVICE

Type T electrical service mounted on signal pole shown as an example. See electrical details, layout sheets, and electrical service data chart for additional details.

SIGNAL CONTROLLER FRONT VIEW

SIGNAL POLE



SIGNAL CONTROLLER SIDE VIEW

See TS-CF standard for conduit and grounding requirements. See layout sheets for ground box locations and any additional conduits that are required.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS TYPICAL TRAFFIC SIGNAL SYSTEM DETAILS

ED(8)-14

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PEDESTAL SERVICE NOTES

1. Manufacture pedestal electrical services in accordance with Departmental Material Specifications (DMS)11080 "Electrical Services", 11085 "Electrical Services-Pedestal (PS)" and Item 628 "Electrical Services. "Provide pedestal electrical services as listed on the Material Producers list (MPL) on the Department's web site under "Roadway Illumination and Electrical Supplies," Item 628. Ensure all mounting hardware and installation details of services meet utility company specifications. Contact the local utility company for approval of pedestal details prior to installing the electrical pedestal service. Submit any changes required by the utility company prior to manufacturing the pedestal enclosure.

2. When a meter socket is required, provide a socket with a minimum 100 amp rating that complies with local utility requirements.

3. Provide Class A or C concrete for pedestal service foundations in accordance with Item 420, "Concrete Substructures," except that concrete will not be paid for directly but is considered subsidiary to Item 628.

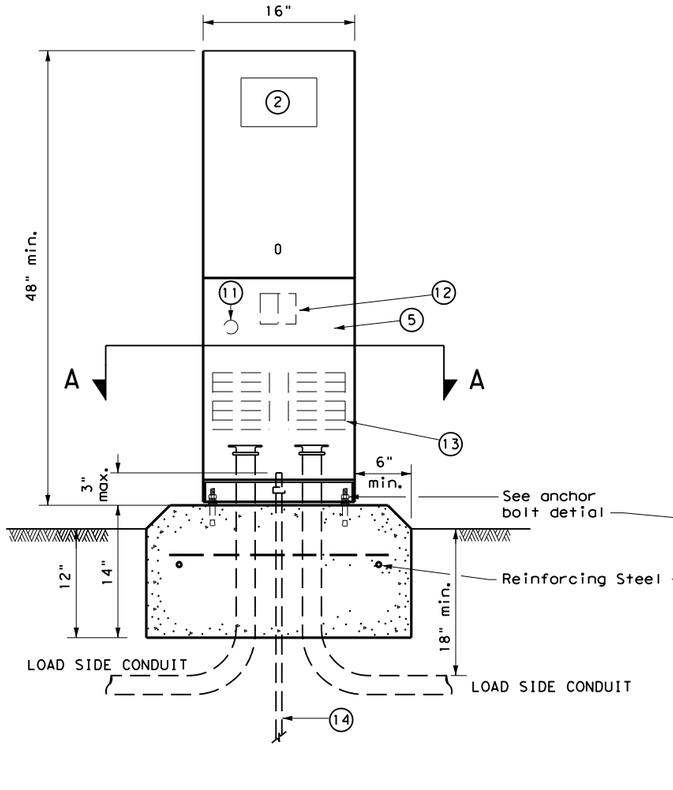
4. Provide #4 reinforcing steel for foundations in accordance with Item 440, "Reinforcement for Concrete."

5. Install ½ in. X 2 ⅛ in. minimum length concrete single expansion type anchors for mounting pedestal enclosure to foundation. Anchor location to match mounting holes in each corner of enclosure. Secure each of the four corners of the pedestal enclosure to the anchors in the foundation with a ½ in. galvanized or stainless steel machine thread bolt, a properly sized locknut and a flat washer.

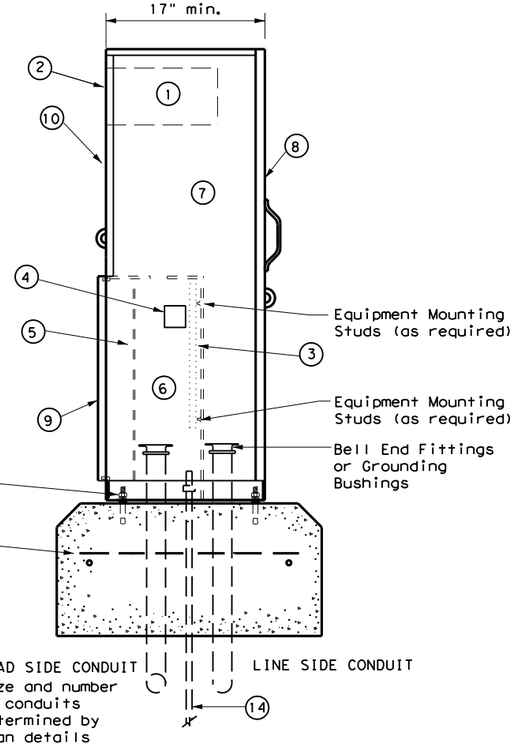
6. Finish top of concrete foundation in a neat and workmanlike manner. If leveling washers are used, ensure no more than ⅛ in. gap at any corner. Do not exceed a maximum dip or rise in the foundation of ⅛ in. per foot. When properly installed, ensure the top of the service enclosure is level front to back and side to side within ¼ in. Repair rocking or movement of the service enclosure at no additional cost to the department.

7. Do not use liquidtight flexible metal conduit (LFMC) on pedestal type services.

8. Ensure all elbows in the foundation are sized as per utility provider's conduit requirements for underground conduit and feeders. PVC extensions may be installed provided the ends of the rigid metal conduits are more than 2 in. below the top of the concrete foundation. Where extension conduits are metal, grounding bushings must be installed with a bonding jumper properly terminated.

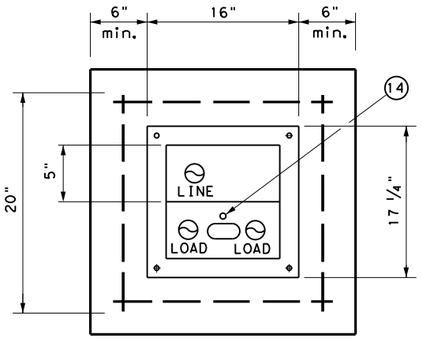


FRONT VIEW

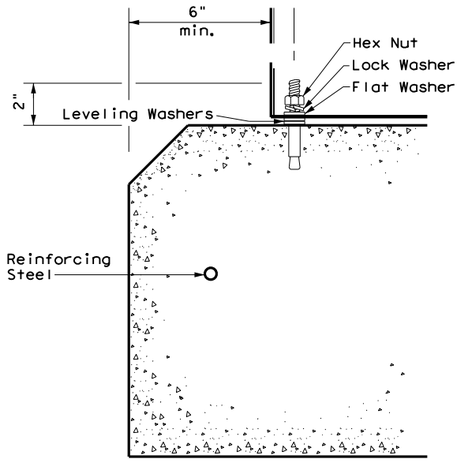


SIDE VIEW

TYPE C shown, TYPE A similar except that TYPE A shall have individual circuit breakers (CB) mounted on an equipment mounting panel. CB Handles shall protrude through hinged deadfront trim.



SECTION A-A



ANCHOR BOLT DETAIL

LEGEND	
1	Meter Socket, (when required)
2	Meter Socket Window, (when required)
3	Equipment Mounting Panel
4	Photo Electric Control Window, (When required)
5	Hinged Deadfront Trim
6	Load Side Conduit Trim
7	Line Side Conduit Area
8	Utility Access Door, with handle
9	Pedestal Door
10	Hinged Meter Access
11	Control Station (H-O-A Switch)
12	Main Disconnect
13	Branch Circuit Breakers
14	Copper Clad Ground Rod - 5/8" X 10'

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
ELECTRICAL SERVICE SUPPORT
PEDESTAL SERVICE TYPE PS

ED(9)-14

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TIMBER POLE (TP) SERVICE SUPPORT NOTES

1. Ensure electrical service support is a class 5 treated timber pole as per Item 627 "Treated Timber Poles." Embed timber pole to depth required in Item 627.
2. Conduit and electrical conductors attached to the electrical service pole and underground within 12 in. of service pole are not paid for directly but are subsidiary to the electrial service.
3. Install pole-top mounted photocell (T) on north side of pole, or in service enclosure (E) as required. See Electrical Service Data chart in plan set.
4. Gain pole as required to provide flat surface for each channel. Gain timber pole to 5/8 in. max. depth and 1 7/8 in. max. height. Gain pole in a neat and workmanlike manner.
5. Mount meter and service equipment on stainless steel or galvanized channel (Unistrut, Kindorf, or equal). Provide channel sized 1 in. to 3 3/4 in. maximum depth, and 1 1/2 in. to 1 5/8 in. maximum width. File smooth the cut ends of galvanized channel and paint with zinc rich paint before installing on pole. Secure each channel section to timber pole with two galvanized or SS lag bolts, 1/4 in. minimum diameter by 1 1/2 in. minimum length. Use a galvanized or SS flat washer on each lag bolt. Do not stack channel.
6. When excess length must be trimmed from poles, trim from the top end only.

(1) Class 5 pole, height as required

(2) Service drop from utility company (attached below weatherhead)

(3) Service conduit (RMC) and service entrance conductors - One Red, One Black, One White (See Electrical Service Data)

(4) Safety switch (when required)

(5) Meter (when required)

(6) Service enclosure

(7) 6 AWG bare grounding electrode conductor in 1/2 in. PVC to ground rod - extend 1/2 in. PVC 6 in. underground.

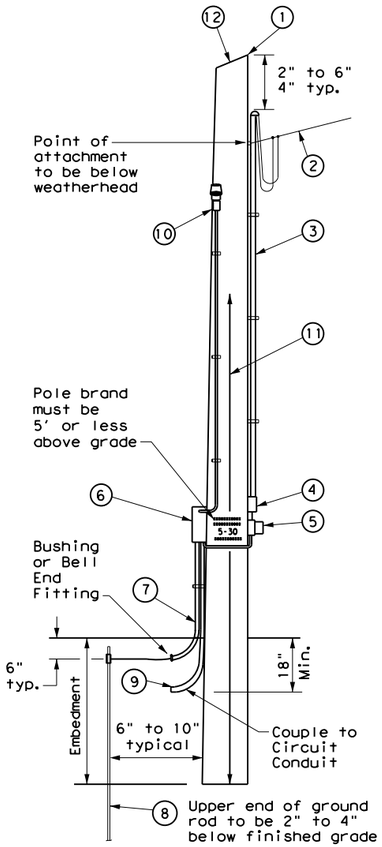
(8) 5/8 in. x 8 ft. Copper clad ground rod - drive ground rod to a depth of 2 in. to 4 in. below grade.

(9) RMC same size as branch circuit conduit.

(10) See pole-top mounted photocell detail on ED(5).

(11) When required by the serving utility provide bare 6 AWG copper conductor. Run wire from pole top to butt wrap or copper butt plate. Protect conductor with non-conductive material to a height of 8 ft. above finished grade.

(12) When required by utility, cut top of pole at an angle to enhance rain run off.

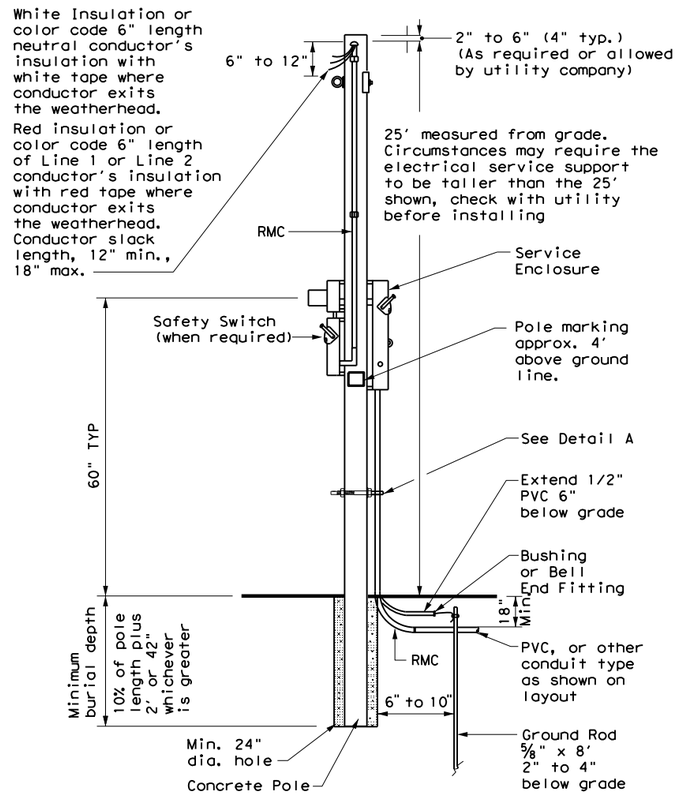


SERVICE SUPPORT TYPE TP (O)

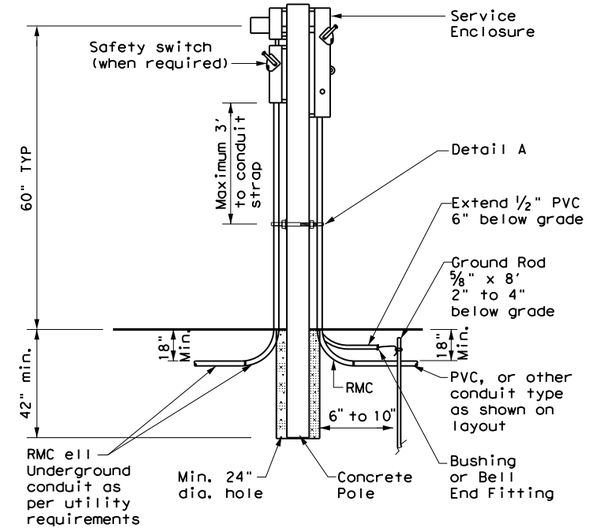
GRANITE CONCRETE (GC) & OTHER CONCRETE (OC) NOTES

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

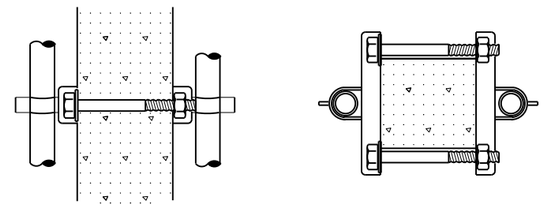
1. Provide GC and OC poles that meet the requirements of DMS 11080 "Electrical Services."
2. Provide prestressed concrete poles suitable for direct embedment into the ground without special foundations.
3. Verify poles are marked as required on DMS 11080. Location of marking should be approximately 4'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



CONCRETE SERVICE SUPPORT
Overhead (O)



CONCRETE SERVICE SUPPORT
Underground (U)



DETAIL A

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

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES GC, OC, & TP

ED(10)-14

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ROADWAY ILLUMINATION ASSEMBLY NOTES

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

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

3. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC),TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA),and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association, Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection.

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

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

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

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

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

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

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

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

8. Install T-Base with following procedure:

   a. Anchor Bolt Tightening.

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

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

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

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

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

   b. Top Bolt Procedure

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

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

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

   c. Level and Plumb

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

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

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

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

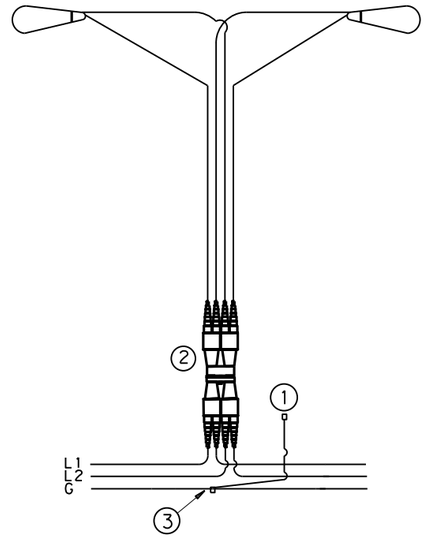
12. Orient luminaires perpendicular to the roadway intended to be lit unless otherwise shown on the plans.

Wiring Diagram Notes:

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

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

(3) Split Bolt or other connector.



L1,L2 = Hot Conductors
G = Grounding Conductor

TYPICAL WIRING DIAGRAM

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

Decorative LED Lighting Notes:

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

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

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

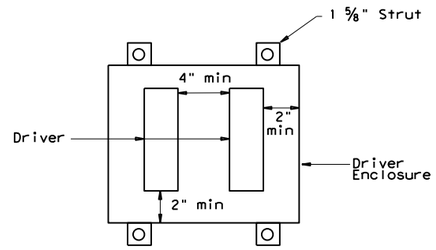
   c. Install drivers with at least 2 inches of space from enclosure walls.

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

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

   f. Provide remote drivers with a maximum of 100 watts

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



Driver Spacing In Remote Enclosure

Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION DETAILS

RID(1)-20

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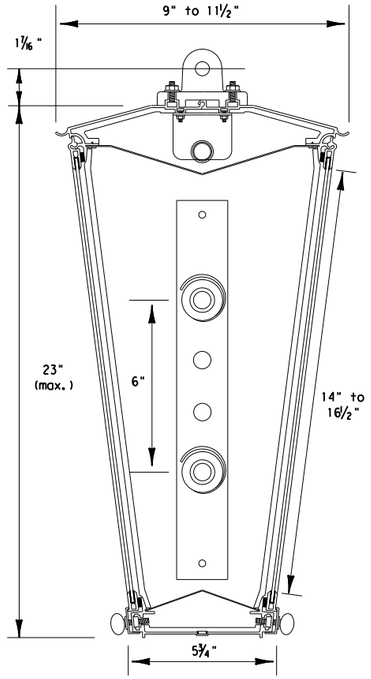
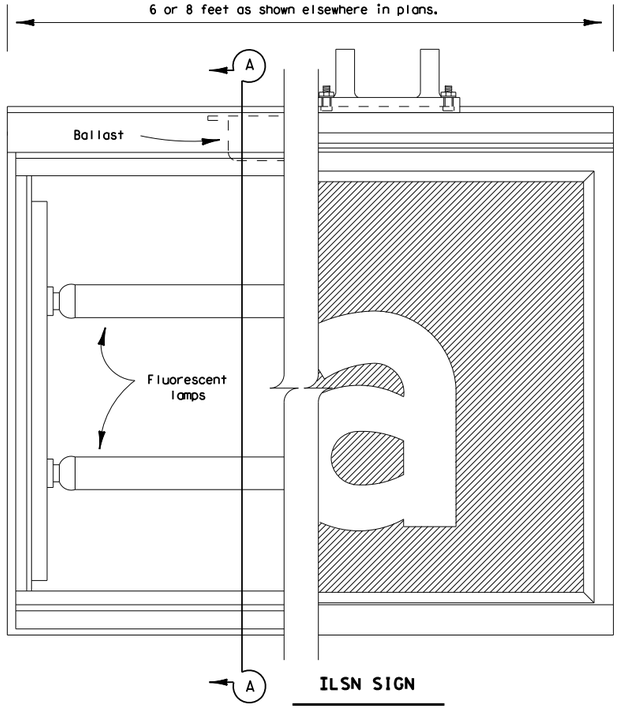
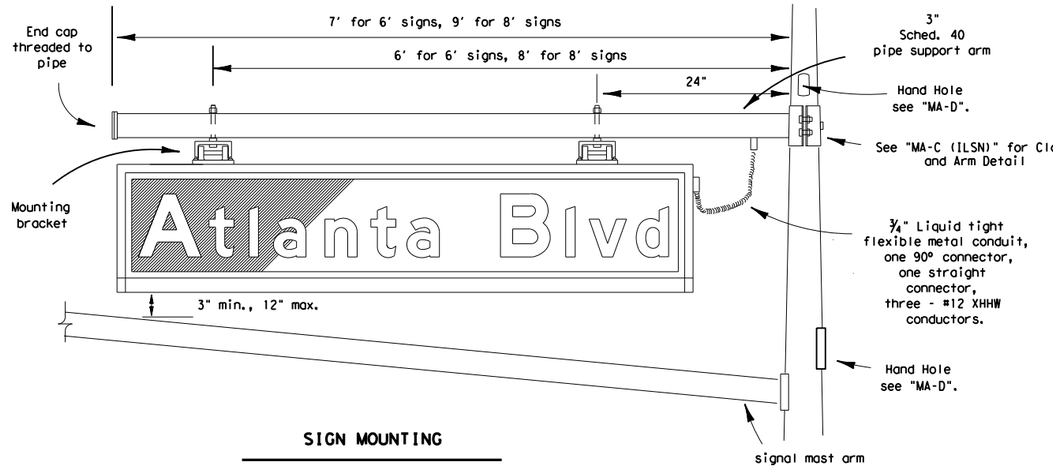
INTERNALLY LIGHTED STREET NAME SIGN DETAILS



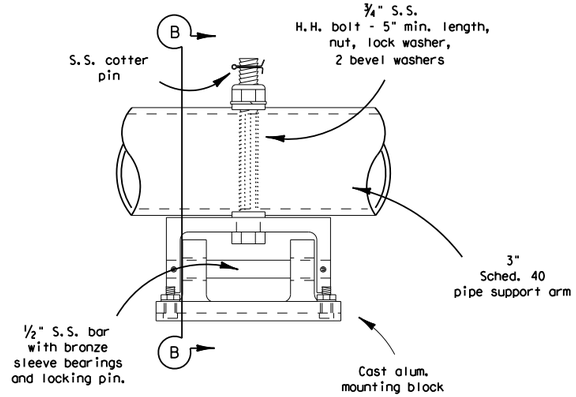
Section A-A



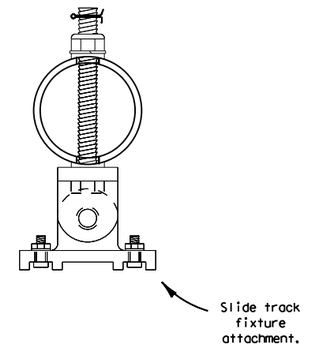
ILSN SIGN



SIGN MOUNTING



MOUNTING BRACKET



Section B-B

ILSN SIGN NOTES:

1. Eight foot ILSN sign shall not exceed 11.5 sq.ft. effective projected area (EPA) and shall not exceed a weight of 85 lbs.
   Six foot ILSN sign shall not exceed 8.7 sq.ft. EPA and shall not exceed a weight of 70 lbs.
2. Sign message shall be as shown elsewhere in the plans.
3. See Special Specification, "Internally Lighted Street Name Signs" for additional details.

EXPLANATION OF DESCRIPTION

ILSN Sign 6 S

- ILSN Sign: Internally lighted street name sign
- 6: Sign length; 6 or 8 ft.
- S: Single or double face

Texas Department of Transportation
Traffic Operations Division

STREET NAME SIGN DETAILS (ILLUMINATED)

SNS-95

© TxDOT August 1995

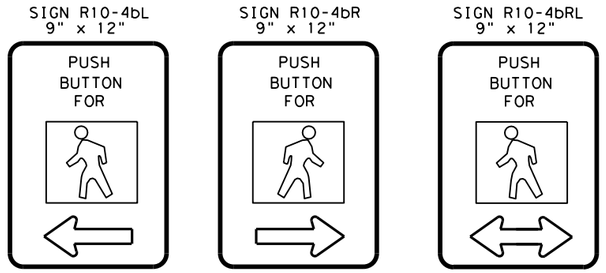
REVISIONS

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

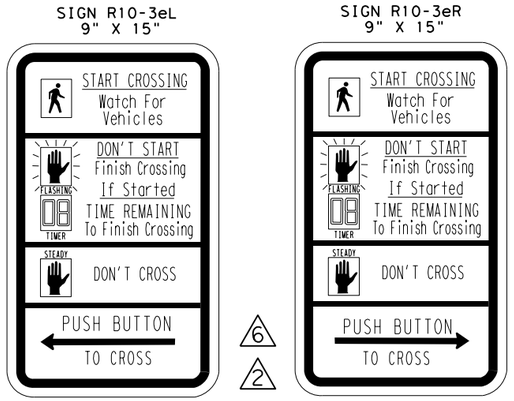
CONT	SECT	JOB	HIGHWAY
0387	05	028, ETC.	FM 982, ETC.

DIST	COUNTY	SHEET NO.
18	COLLIN, ETC.	71

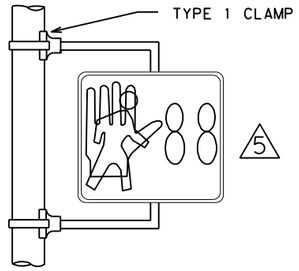
DATE:
FILE:



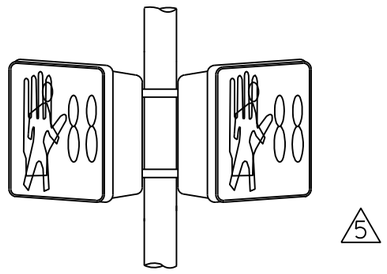
PEDESTRIAN PUSHBUTTON
SIGN DETAILS



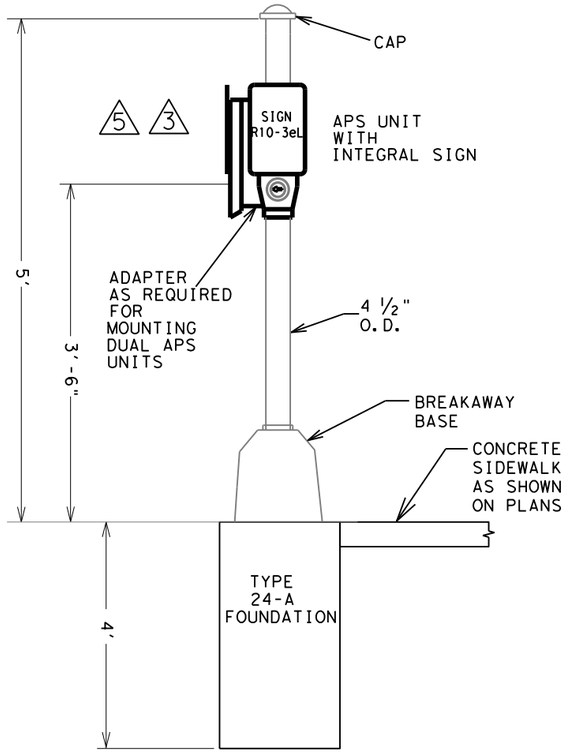
COUNTDOWN PEDESTRIAN PUSHBUTTON
SIGN DETAILS



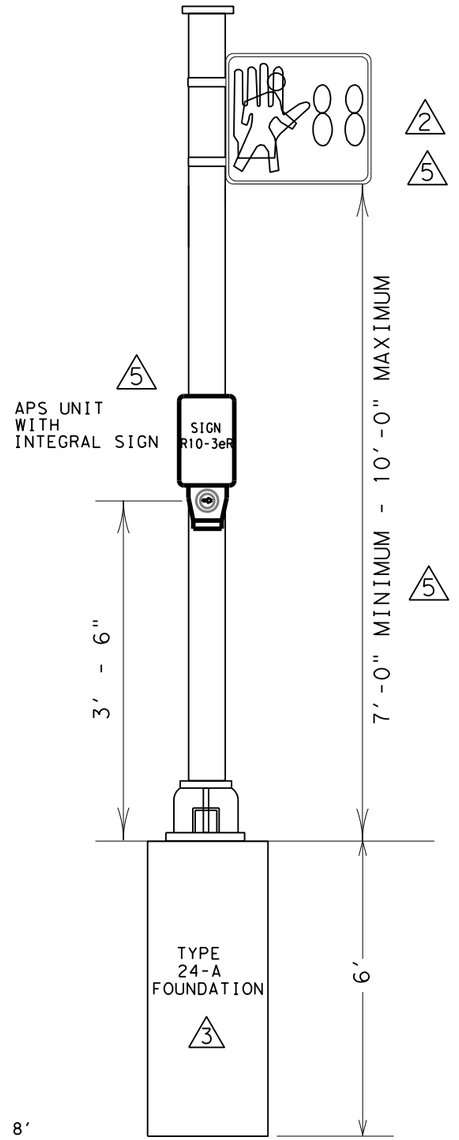
PEDESTRIAN SIGNAL HEAD MOUNTING
FOR ONE PEDESTRIAN SIGNAL HEAD
152A



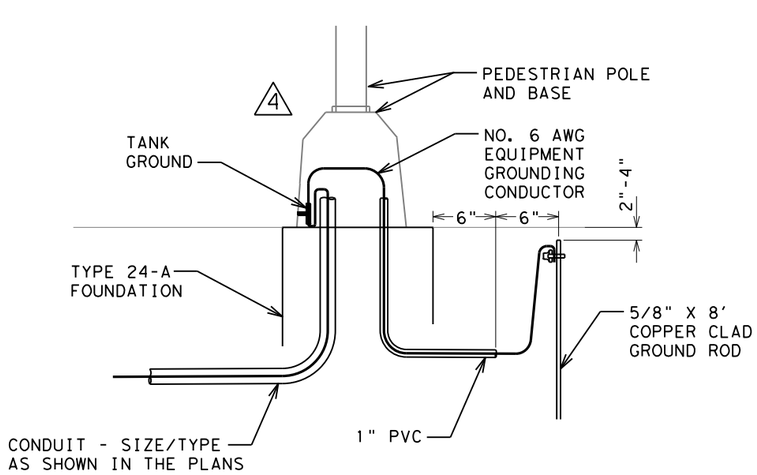
PEDESTRIAN SIGNAL HEAD MOUNTING
FOR TWO PEDESTRIAN SIGNAL HEADS
143C



PEDESTRIAN PUSH BUTTON POLE



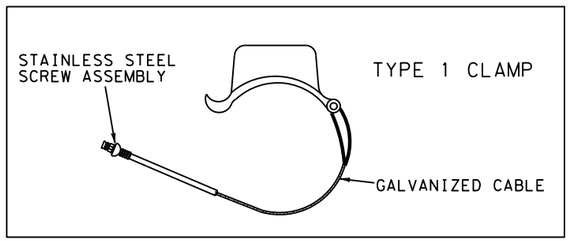
PEDESTAL POLE



PEDESTRIAN PUSH BUTTON POLE
GROUNDING DETAILS

NOTE:
THE POLES ON THIS DRAWING ARE SHOWN AS AN EXAMPLE ONLY. POLES OF SIMILAR DESIGN FOR ANY CROSS SECTION WHICH MEET THE SPECIFICATIONS AND REQUIREMENTS SHOWN ON THESE DRAWINGS AND ARE APPROVED BY THE ENGINEER WILL BE DEEMED ACCEPTABLE.

1 5 NOTE: EITHER TYPE 1 CLAMPS OR CLAM SHELL MOUNTING HARDWARE MAY BE USED AS APPROVED BY THE ENGINEER. FOR CLAM SHELLS, USE ICC P/N 4805 OR McCAIN QUICKMOUNT OR APPROVED EQUAL.



1 ALTERNATIVE MOUNTING METHOD
revised 12-92

2 ALTERNATIVE PEDESTRIAN SIGNAL HEAD AND SIGNING
revised 10-08

3 PEDESTRIAN PUSH BUTTON POLE
revised 01-11

4 PEDESTRIAN PUSH BUTTON POLE GROUNDING DETAILS
revised 09-15

5 APS UNIT ADDED
"SYMBOLS ONLY" PEDESTRIAN SIGNAL HEAD REMOVED
MOUNTING HARDWARE NOTES REVISED
MOUNTING HEIGHT REVISED
revised 06-17

6 APS SIGN REVISED
revised 11-20

NOTES:

5
1. ALL PEDESTRIAN SIGNAL HEADS SHALL BE INSTALLED ON THE AWAY-FROM-TRAFFIC SIDE OF THE PEDESTAL OR MAST ARM POLE.
2. ALL WIRING FOR PEDESTRIAN SIGNALS SHALL BE TOTALLY ENCLOSED WITHIN THE SIGNAL MOUNTING HARDWARE.
3. ALL PEDESTRIAN SIGNAL HEADS AND PUSH BUTTON SIGNS SHALL DISPLAY THE SYMBOLIZED MESSAGES SHOWN ABOVE.

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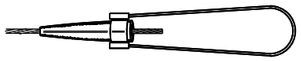
DALLAS DISTRICT STANDARD

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		72
STATE	STATE DIST.	COUNTY	
TEXAS	18	COLLIN, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
0387	05	028, ETC.	FM 928, ETC.

PEDESTRIAN SIGNAL HEAD DETAILS (DAL)

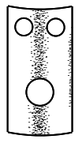


COMPRESSION FITTING

SOURCES:
RELIABLE ELECTRIC NO. 5264
FARGO NO. OR EQUAL

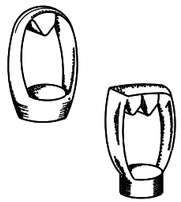
THIMBLEYE BOLT (Angle Type)

SOURCES:
HUBBELL POWER SYS. NO. 5016
MCLEAN POWER SYS. NO. J8154
OR EQUAL



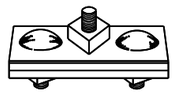
LIFT PLATE

SOURCES:
HUBBELL POWER SYS. NO. 7898
MCLEAN POWER SYS. NO. J7890
OR EQUAL



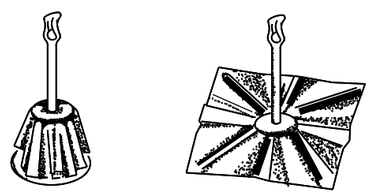
EYE NUTS (Twineye & tripleye)

SOURCES:
HUBBELL POWER SYS. NO. 6560 (TWIN), 6510 (SINGLE)
MCLEAN POWER SYS. NO. J6515 (TWIN), J6510 (SINGLE)
OR EQUAL



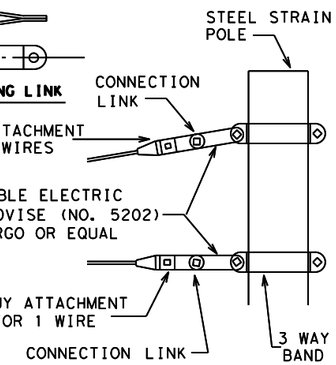
GUY CLAMP (3-Bolt)

6" HEAVY GUY CLAMP WITH 3-5/8" BOLTS OR RELIABLE ELECTRIC STRANDVISE WITH FLEXIBLE BAIL (NO. 5264), FARGO STRANDVISE, HUBBELL POWER SYS. NO. 6460, OR EQUAL



8-WAY ANCHOR

SOURCES:
HUBBELL POWER SYS. NO. 1283
MCLEAN POWER SYS. NO. J0283
OR EQUAL



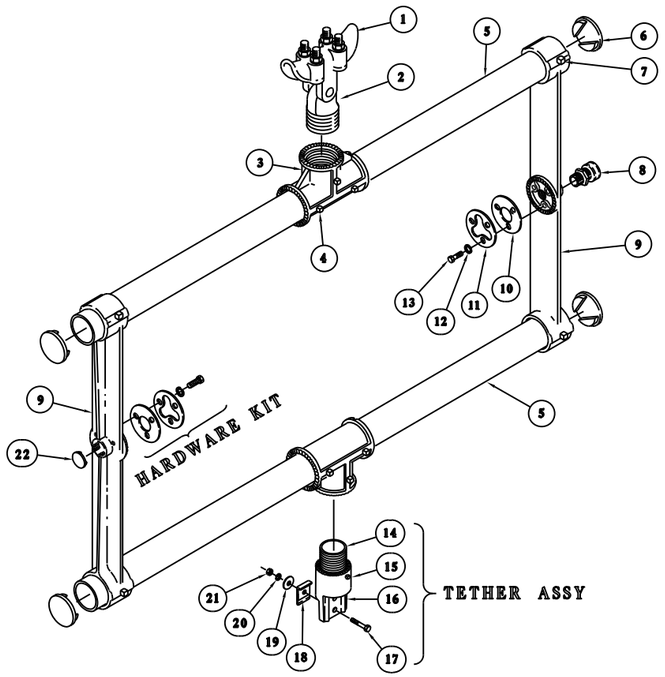
SPAN CABLE ATTACHMENT DETAILS FOR STEEL STRAIN POLES

* ANCHORS SHOULD BE LOCATED SO THAT THE DISTANCE BETWEEN THE ANCHOR AND THE POLE BUTT IS EQUAL TO THE DISTANCE FROM THE GROUND TO THE POINT OF GUY ATTACHMENT. IN NO CASE SHOULD THE DISTANCE FROM THE ANCHOR TO THE POLE BUTT BE LESS THAN 1/3 OF THE DISTANCE FROM THE GROUND TO THE POINT OF GUY ATTACHMENT.

CONSTRUCTION DETAILS FOR SPAN WIRE MOUNTED TRAFFIC SIGNALS

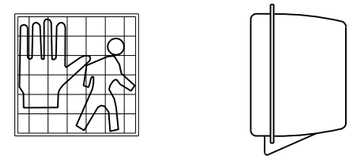
SHEET 1 OF 3
DALLAS DISTRICT STANDARD

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		73
STATE	STATE DIST. NO.	COUNTY	
TEXAS	18	COLLIN, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
0387	05	028, ETC.	FM 982, ETC.

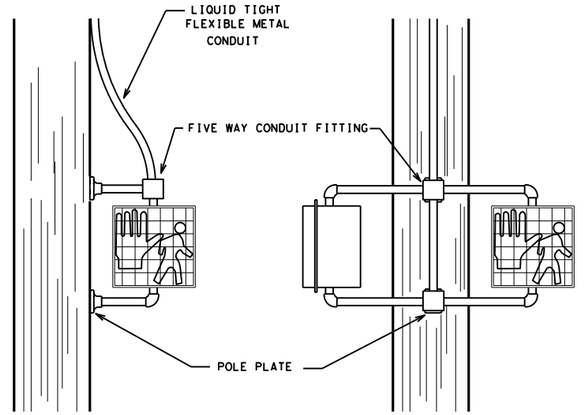


BOTTOM TETHERED, SPAN WIRE SIGNAL HEAD HARDWARE ASSEMBLY (BACKPLATE NOT SHOWN)

ITEM	DESCRIPTION	QTY
1	SPAN WIRE CLAMP, IRON, W/ U-BOLTS	1
2	SPAN WIRE ADAPTER, ALUM W/ STAINLESS BUSHING	1
3	TEE HORIZONTAL SLIP, DIE CAST ALUM	2
4	SCREW, SET SQ HD, 1/4"-20 X 1/2", STAINLESS	6
5	TUBE, 1 1/2" X LENGTH, ALUM	2
6	TUBE CAP, 1 1/2", PLASTIC	4
7	SCREW, SET SQ HD, 5/16"-18 X 5/8", STAINLESS	8
8	CGB, 3/4" .55-.65, ZINC 1	1
9	CAST ARM, FOR HORIZONTAL MOUNTED SIGNAL, ALUM	2
10	GASKET, TRI-BOLT, 1/16" X 70 DURO NEOPRENE	2
11	WASHER, SLOTTED, ZINC 2	2
12	WASHER, LOCK SPLIT, 1/4", STAINLESS	6
13	BOLT, HEX HD, 1/4"-20 X 1 1/2", GRADE 5, STAINLESS	6
14	NIPPLE, ALLTHREAD, 1 1/2" NPS X 2.13", ALUM	1
15	SCREW, SET SQ HD, 1/4"-20 X 5/8", STAINLESS	1
16	BODY, 1 1/2", HANGER, ALUM	1
17	BOLT, HEX HD, 5/16"-18 X 1 1/2", STAINLESS	1
18	PLATE, TETHER, 1-HOLE, ALUM	1
19	WASHER, FENDER, 5/16", STAINLESS	1
20	WASHER, SPLIT LOCK, 5/16", STAINLESS	1
21	NUT, HEX HD, 5/16"-18, STAINLESS	1
22	CAP, EN-3/4, BLUE (FOR CGB)	1

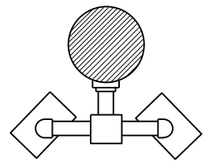


"EGGCRATE" VISOR PEDESTRIAN SIGNAL
WITH ONE-PIECE REFLECTOR



152A
ONE-WAY
ADJUSTABLE FACE SIGNAL FOR
WOOD POLE MOUNTING

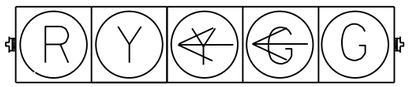
143C
TWO-WAY
ADJUSTABLE FACE SIGNAL FOR
WOOD POLE MOUNTING



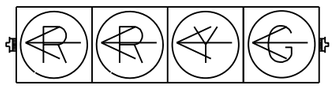
143C
PLAN VIEW

SIGN R10-4bR
SIGN R10-4bL
9"X12"

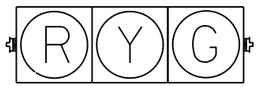
PEDESTRIAN PUSHBUTTON
SIGN DETAILS



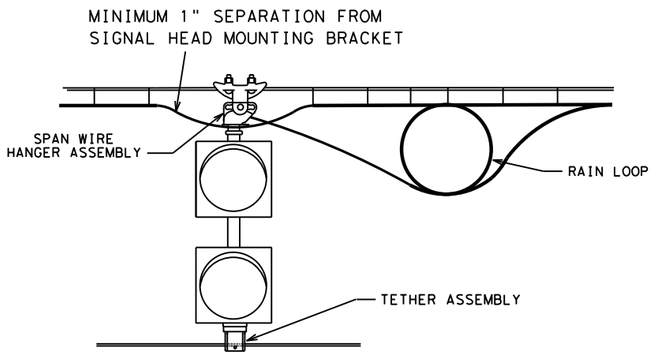
H5LT
TYPICAL SPAN WIRE
HORIZONTAL MOUNT
INSTALLATION



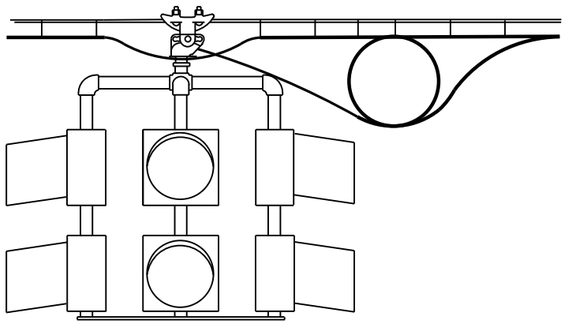
H4LT
TYPICAL SPAN WIRE
HORIZONTAL MOUNT
INSTALLATION



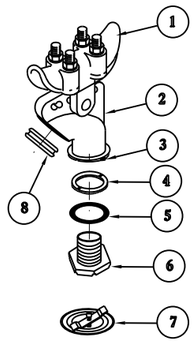
H3
TYPICAL SPAN WIRE
HORIZONTAL MOUNT
INSTALLATION



TYPICAL
ONE-WAY FLASHING BEACON
INSTALLATION



TYPICAL
FOUR-WAY FLASHING BEACON
INSTALLATION



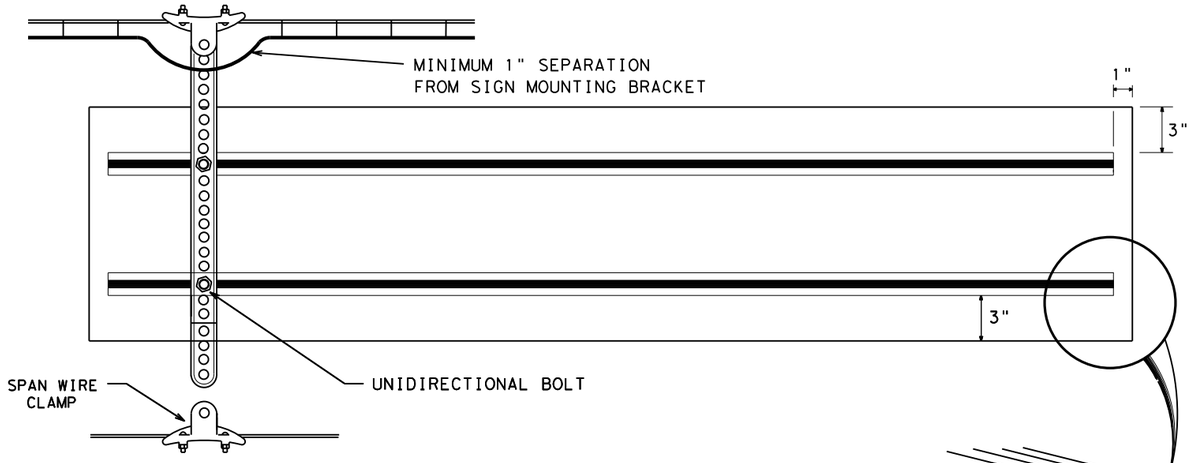
SPAN WIRE FLASHING BEACON
SIGNAL HEAD HANGER ASSEMBLY

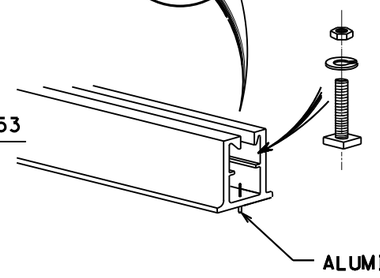
SPAN WIRE FLASHING BEACON SIGNAL HEAD HANGER ASSEMBLY

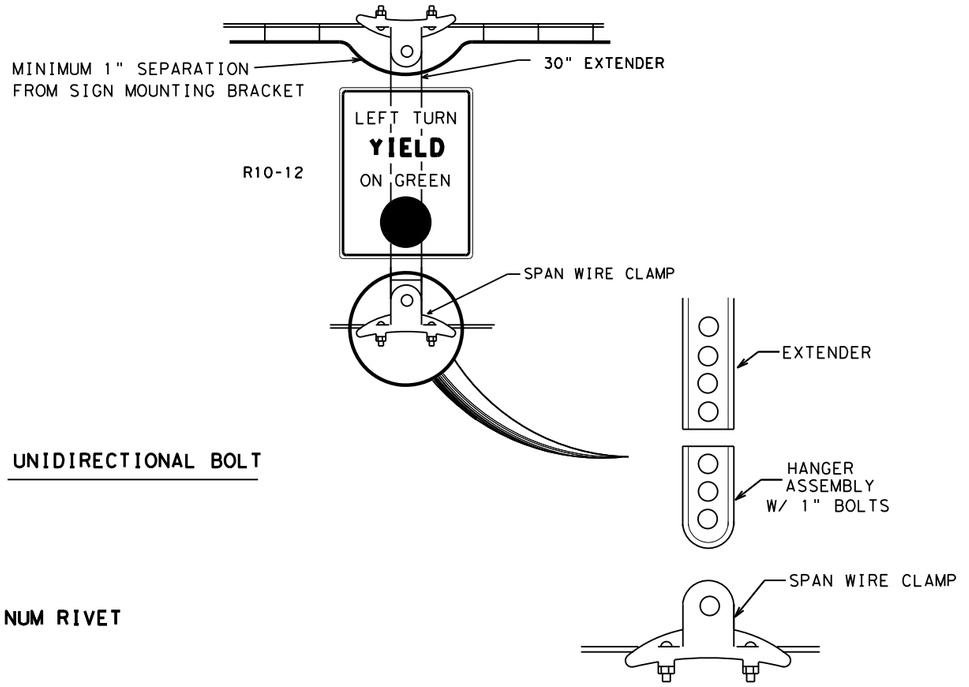
ITEM	DESCRIPTION	QTY
1	SPAN WIRE CLAMP, IRON, W/ U-BOLTS	1
2	WIRE OUTLET BODY, 3/4", ALUM	1
3	SET SCREW, SQUARE HD, CUP POINT, 1/4"-20X5/8", TYPE 304 STAINLESS	1
4	LOCKRING, SERRATED, 380 DIE CAST ALUM	1
5	GASKET, 70 DURO NEOPRENE	1
6	NIPPLE, HEX, 1-1/2" NPS, ALUM	1
7	KIT, SIGNAL CLOSURE	1
8	GROMMET, 1-1/2", W/ DIAPHRAGM	1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		74
STATE	STATE DIST. NO.	COUNTY	
TEXAS	18	COLLIN, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
0387	05	028, ETC.	FM 982, ETC.

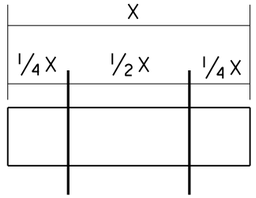
CONSTRUCTION DETAILS FOR SPAN WIRE MOUNTED TRAFFIC SIGNALS

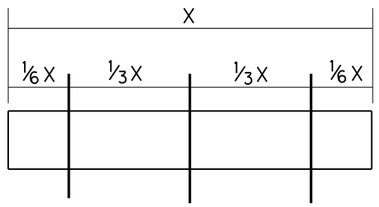






UNIDIRECTIONAL BOLT

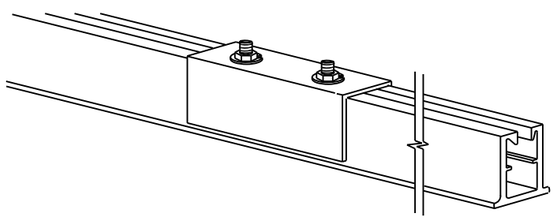




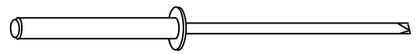
HANGER ASSEMBLY DETAILS

NOTES: 1. BASED ON SIGN WIDTH, THE NUMBER OF VERTICAL SUPPORTS REQUIRED ARE AS FOLLOWS:
3'-0" OR LESS - 1 SUPPORT REQUIRED
>3'-0" UP TO 8'-0" - 2 SUPPORTS REQUIRED
>8'-0" - 3 SUPPORTS REQUIRED
SEE DIAGRAMS FOR SIGN SUPPORT SPACING

2. FOR STREET NAME SIGNS, EXTRUDED ALUMINUM SHALL BE MOUNTED FOR HORIZONTAL SUPPORT AS SHOWN.



5" ALUMINUM COUPLING
6061-T6



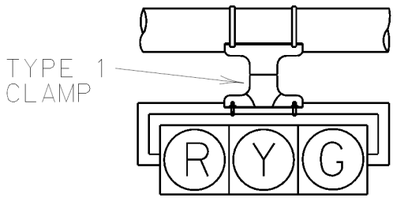
ALUMINUM RIVET

NOTE: ALUMINUM RIVETS SHALL BE USED TO ATTACH THE SIGN TO THE EXTRUDED ALUMINUM. SPACINGS OF RIVETS SHALL BE 6" O.C.

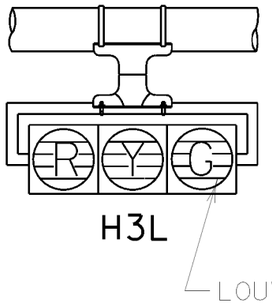
SHEET 3 OF 3
DALLAS DISTRICT STANDARD

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		75
STATE	STATE DIST.NO.	COUNTY	
TEXAS	18	COLLIN, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
0387	05	028,ETC.	FM 982,ETC.

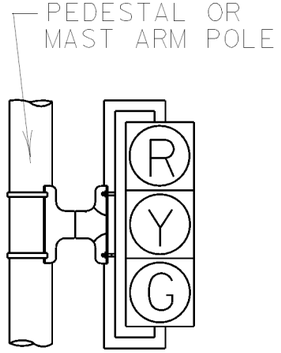
CONSTRUCTION DETAILS FOR SPAN WIRE MOUNTED TRAFFIC SIGNALS



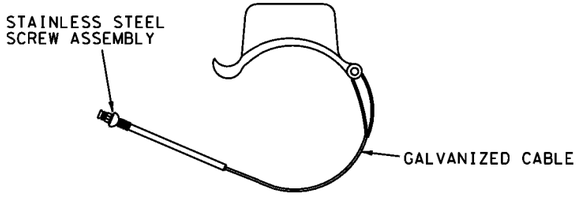
H3



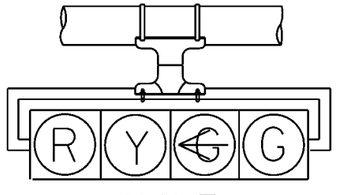
H3L



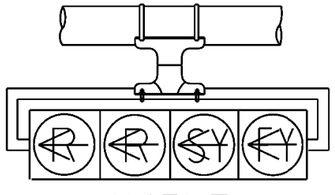
V3



TYPE 1 AND 2 CLAMPS



H4LT



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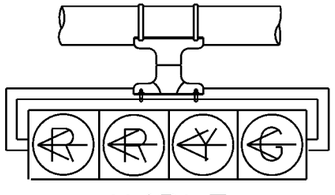
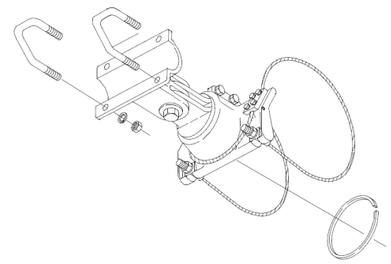


H4PLT

H5LT

H5FLT

V5RT



TYPE 2 CLAMP KIT

SHALL BE INSTALLED WHEN ROTATION ABOUT
THE HORIZONTAL AND VERTICAL AXES ARE NEEDED.

NOTES:

1. VEHICLE SIGNAL HEADS SHALL BE MOUNTED WITH TYPE 1 CLAMP AND APPROPRIATE TUBING.
2. ALL POLE MOUNTED VEHICLE HEADS SHALL BE INSTALLED ON THE AWAY-FROM-TRAFFIC SIDE OF THE PEDESTAL OR MAST ARM POLE.
3. THE SIGNAL HEADS SHOWN ARE NOT MEANT TO REFLECT ALL POSSIBLE SIGNAL HEADS, BUT ARE REPRESENTATIVE OF SIGNAL HEADS COMMONLY IN USE. SEE THE TRAFFIC SIGNAL LAYOUT FOR REQUIRED SIGNAL HEADS, AND THE NUMBER AND ORIENTATION OF LOUVERS.

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DALLAS DISTRICT STANDARD

TRAFFIC SIGNAL HEAD DETAILS (DAL)

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		76
STATE	STATE DIST.	COUNTY	
TEXAS	18	COLLIN, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
0387	05	028, ETC.	FM 998, ETC.

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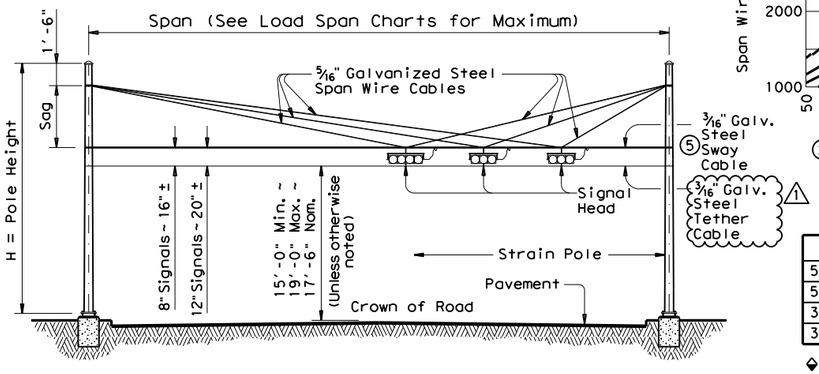
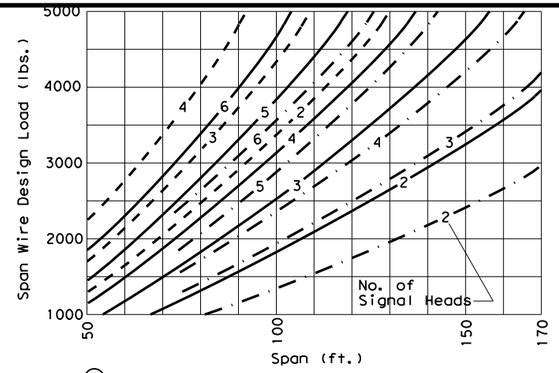
STRAIN POLE DESCRIPTION	Pole Type	Found-ation Type	Maximum Permissible Span Wire Load (lbs.)
26′ Pole	A	36-A	5200
30′ Pole	B	36-A	4600
30′ Pole with Lum.	B	36-A	4400
30′ Pole with 20′ Mast Arm	C	36-B	5600
30′ Pole with 24′ Mast Arm	C	36-B	5500
30′ Pole with 28′ Mast Arm	C	36-B	5300
30′ Pole with 32′ Mast Arm	C	36-B	5100
30′ Pole with 36′ Mast Arm	C	36-B	4900
30′ Pole with 20′ Mast Arm & Lum.	C	36-B	5300
30′ Pole with 24′ Mast Arm & Lum.	C	36-B	5200
30′ Pole with 28′ Mast Arm & Lum.	C	36-B	5000
30′ Pole with 32′ Mast Arm & Lum.	C	36-B	4800
30′ Pole with 36′ Mast Arm & Lum.	C	36-B	4500
34′ Pole	D	36-B	5600
34′ Pole with Lum.	D	36-B	5400

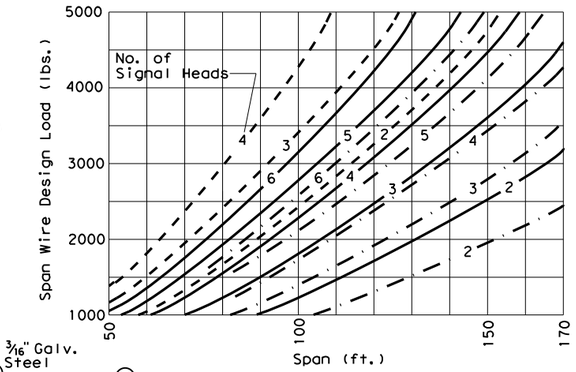
② Numbers on Load Span Charts indicate the number of signal heads on the span. The total span wire design load is based on one 5-section head and one or more additional 3-section head(s). Design wind pressures on cables are assumed as 1.0 lb/ft. Weight of span wire cables (one per signal head) is assumed as 0.65 lb/ft which includes an allowance for conductor cables and miscellaneous hardware. The effect of the sway cable on load distribution is ignored as it is assumed to break at design wind conditions. When a pole supports 2 spans, the span wire design loads for both spans should be added vectorially to determine the design load for that pole.



STRAIN POLE ELEVATIONS HORIZONTAL SIGNALS



② SIGNALS WITH 12-INCH LENS

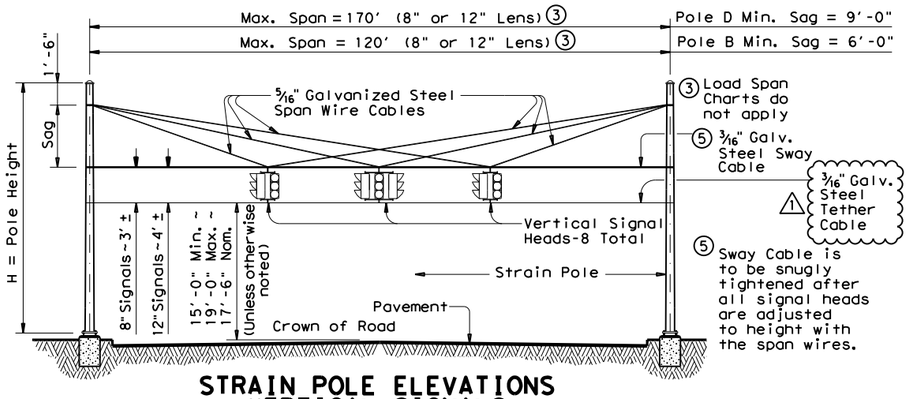


② SIGNALS WITH 8-INCH LENS

Signal Head Type	Wt. Per Head	Wind Area ◆
5-Section, 12" Lens	125 lbs	9.6 sq. ft.
5-Section, 8" Lens	70 lbs	4.8 sq. ft.
3-Section, 12" Lens	75 lbs	5.64 sq. ft.
3-Section, 8" Lens	45 lbs	3.0 sq. ft.

◆ Effective projected design wind area (actual area times drag coefficient)

– – – – – – Sag = 4′-6" (26′ or 30′ Pole)
——— Sag = 8′-0" (30′ or 34′ Pole)
— · — · — Sag = 11′-6" (34′ Pole)



STRAIN POLE ELEVATIONS VERTICAL SIGNALS

(Mast arms are not used with vertical signals)

SHIPPING PARTS LIST

Poles (Without Traffic Signal Arm)

Pole Type	Strain poles with Luminaire: Ship each pole with the following hardware attached: handhole at base, pole cap, 2 clamp-on simplex and 1 pipe plug.			Strain poles without Luminaire: Ship each pole with the following hardware attached: handhole at base, pole cap and 1 pipe plug.		
	Description	Designation	Quantity	Description	Designation	Quantity
A				26′ Strain Pole	SP 26 A-80	
B	30′ Strain Pole	SPL 30 B-80		30′ Strain Pole	SP 30 B-80	
D	34′ Strain Pole	SPL 34 D-80	4	34′ Strain Pole	SP 34 D-80	

Poles (With Traffic Signal Arm)

Pole Type	Strain poles with Luminaire: Ship each pole with the following hardware attached: handhole at base, pole cap, clamp-on simplex and 3 pipe plugs.			Strain poles without Luminaire: Ship each pole with the following hardware attached: handhole at base, pole cap and 3 pipe plugs.		
	Description	Designation	Quantity	Description	Designation	Quantity
C	30′ SPw/TS Arm	SPL 30 C-80		30′ SPw/TS Arm	SP 30 C-80	

Traffic Signal Arms (For Type C poles)

Nominal Arm Length	Type I Arm (1 Signal): Ship each Type I Arm with the following hardware attached: 2 CGB Connectors, 1 clamp with bolts and washers		Type II Arm (2 Signals): Ship each Type II Arm with the following hardware attached: 1 Bracket Assembly ①, 3 CGB Connectors and 1 clamp with bolts and washers		Type III Arm (3 Signals): Ship each Type III Arm with the following hardware attached: 2 Bracket Assemblies ①, 4 CGB Connectors and 1 clamp with bolts and washers	
ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-80					
24	24I-80		24 II -80			
28	28I-80		28 II -80			
32			32 II -80		32 III -80	
36			36 II -80		36 III -80	

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Templates may be removed for shipment. Quantity
1 ¾"	3′-10"	
2"	4′-3"	4

Each Anchor Bolt Assembly consists of the following: Top and Bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers, and 4 nut anchor devices (Type 2) per Standard Drawing "TS-FD".

Luminaire Arms

Nominal Arm Length	Quantity
8′ Arm	4

① See Sheet "DMA-80"

Pole Type	ROUND POLES D_B in.	D_T in.	(4)thk in.	H ft.	POLYGONAL POLES D_B in.	D_T in.	(4)thk in.	H ft.
A	12.5	8.9	.239	26	13.0	9.0	.239	26
B	13.5	9.3	.239	30	14.0	9.0	.239	30
C	15.5	11.3	.239	30	16.0	11.0	.239	30
D	15.5	10.7	.239	34	16.0	11.0	.239	34

④ Thickness shown are minimum, thicker materials may be used.

D_B = Pole Base O.D. D_T = Pole Top O.D. H = Pole Height

MODIFICATIONS:

⚠1 ADDED BOTTOM STEEL TETHER CABLE. (2/12)

SHEET 1 OF 2

Texas Department of Transportation
DALLAS DISTRICT STANDARD

TRAFFIC SIGNAL SUPPORT STRUCTURES STRAIN POLE ASSEMBLIES

(80 MPH WIND ZONE)

SP-80(1)-12(DAL)

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DN: MS	CK: JSY	DW: BR	CK: JSY

REVISIONS
6-96
1-12

CONT	SECT	JOB	HIGHWAY
0387	05	028,ETC.	FM 982,ETC.
DIST	COUNTY		SHEET NO.
DAL	COLLIN,ETC.		77

120A

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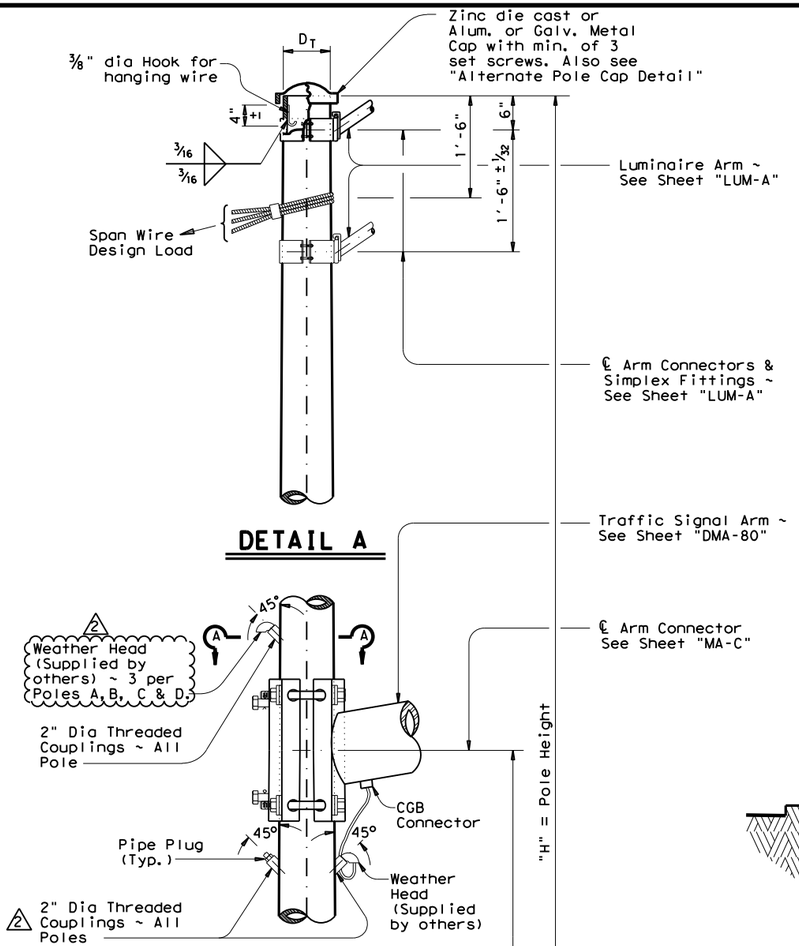
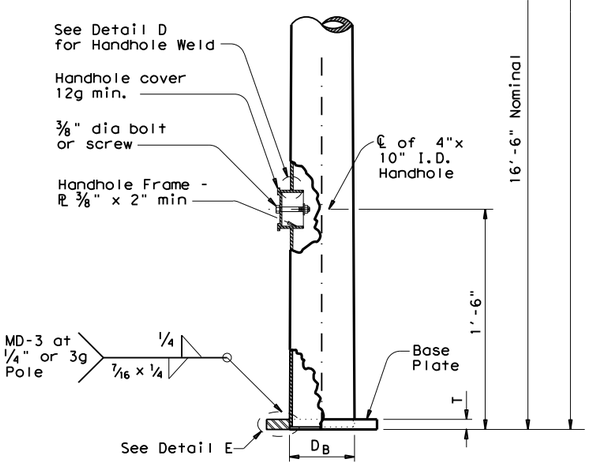


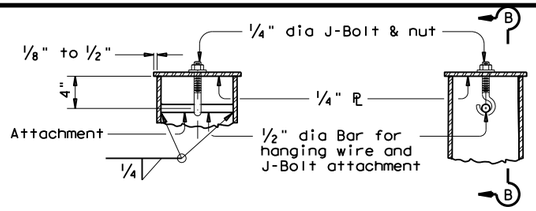
DETAIL A

DETAIL B



DETAIL C

POLE ELEVATION



SECTION B-B

ALTERNATE POLE CAP DETAIL

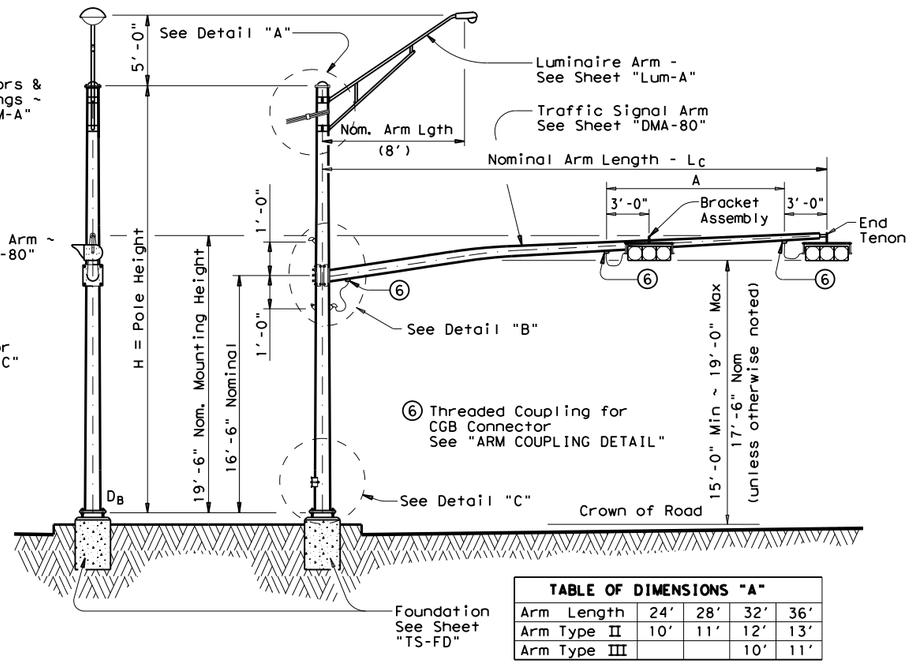
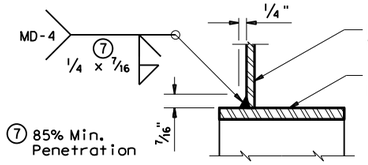
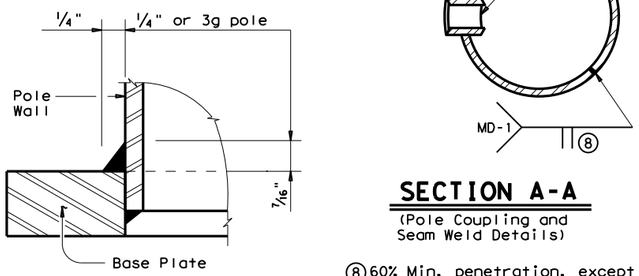


TABLE OF DIMENSIONS "A"				
Arm Length	24'	28'	32'	36'
Arm Type II	10'	11'	12'	13'
Arm Type III			10'	11'

STRUCTURE ASSEMBLY



DETAIL D

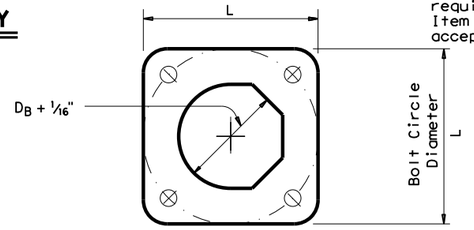


DETAIL E

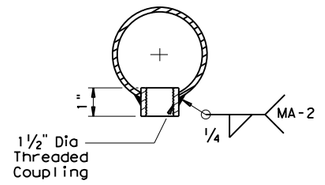
SECTION A-A

(Pole Coupling and Seam Weld Details)

8 60% Min. penetration, except 100% penetration within 6" of circumferential base welds.



BASE PLATE PLAN



ARM COUPLING DETAIL

2 CHANGED TO 3 WEATHERHEAD ACCESS POINTS FOR POLES A, B, C AND D(3/12).

MATERIALS	
Round Shafts or Polygonal Shafts 9	ASTM A595 Gr.A, A588, A1008 HSLAS Gr.50 Class 2, A1011 HSLAS Gr.50 Class 2, A572 Gr.50 or A1011 SS Gr.50 10
Plates 9	ASTM A36, A588, or A572 Gr.50
Connection Bolts	ASTM A325 except where noted
Pin Bolts	ASTM A325
Pipe 9	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50, A1011 HSLAS-F Gr.50
Steel Cable	ASTM A475, 7 Wire Utilities Grade
Misc. Hardware	Galvanized steel or stainless steel or as noted

9 ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F, or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.

10 ASTM A1011 SS Gr.50 shall also have a minimum elongation of 18 percent in 8 inches or 23 percent in 2 inches. Material thickness in excess of those stipulated under A1011 SS will be acceptable providing the material meets all other A1011 SS requirements and the requirements of this item.

GENERAL NOTES

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor. The maximum permissible span wire design loads tabulated are calculated at a stress load of 1.4 times the basic allowable stress. A simultaneous wind on the pole, mast arm, and luminaire is also included.

See standard sheet "DMA-80" for details of clamp-on traffic signal arms, sheet "MA-C" for traffic signal arm connection details, sheet "LUM-A" for luminaire arm and connection details, and sheet "TS-FD" for anchor bolt and foundation details.

Fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of this sheet and Item 686, "Traffic Signal Pole Assemblies (Steel)".

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

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

Foundation Type	Anchor Bolt Diameter	Bolt Hole Diameter	Bolt Circle Diameter	Base PL Dim. L x T
36-A	1 3/4"	2"	19"	19" x 1 3/4"
36-B	2"	2 1/4"	21"	21" x 2"

Texas Department of Transportation
DALLAS DISTRICT STANDARD

TRAFFIC SIGNAL SUPPORT STRUCTURES STRAIN POLE ASSEMBLIES

(80 MPH WIND ZONE)

SP-80(2)-12(DAL)

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REVISIONS	CONT	SECT	JOB	HIGHWAY
6-96 1-12	0387	05	028,ETC.	FM 982,ETC.
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN,ETC.		78

120B

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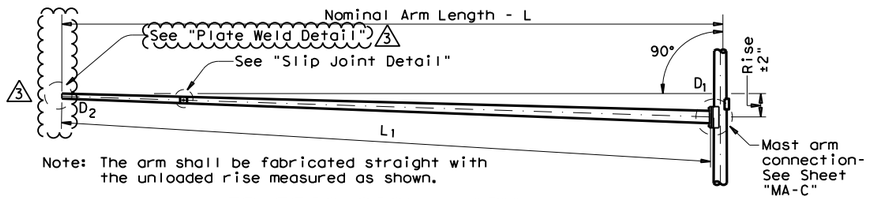
Arm Length	ROUND POLES					POLYGONAL POLES					Foundation Type
	D_B	D_{19}	D_{24}	D_{30}	① thk	D_B	D_{19}	D_{24}	D_{30}	① thk	
ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
20	10.5	7.8	7.1	6.3	.179	11.5	8.5	7.7	6.8	.179	30-A
24	11.0	8.3	7.6	6.8	.179	12.0	9.0	8.2	7.3	.179	30-A
28	11.5	8.8	8.1	7.3	.179	12.5	9.5	8.7	7.8	.179	30-A
32	12.5	9.8	9.1	8.3	.179	12.0	9.0	8.2	7.3	.239	30-A
36	12.0	9.3	8.6	7.8	.239	12.5	9.5	8.7	7.8	.239	36-A
40	12.0	9.3	8.6	7.8	.239	13.5	10.5	9.7	8.8	.239	36-A
44	12.5	9.8	9.1	8.3	.239	14.0	11.0	10.2	9.3	.239	36-A
48	13.0	10.3	9.6	8.8	.239	15.0	12.0	11.2	10.3	.239	36-A

Arm Length	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	① thk	Rise	L_1	D_1	② D_2	① thk	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	6.5	3.8	.179	1'-9"	19.1	7.0	3.5	.179	1'-8"
24	23.1	7.5	4.3	.179	1'-10"	23.1	7.5	3.5	.179	1'-9"
28	27.1	8.0	4.2	.179	1'-11"	27.1	8.0	3.5	.179	1'-10"
32	31.0	9.0	4.7	.179	2'-1"	31.0	9.0	3.5	.179	2'-0"
36	35.0	9.5	4.6	.179	2'-4"	35.0	10.0	3.5	.179	2'-1"
40	39.0	9.5	4.1	.239	2'-8"	39.0	9.5	3.5	.239	2'-3"
44	43.0	10.0	4.1	.239	2'-11"	43.0	10.0	3.5	.239	2'-6"
48	47.0	10.5	4.1	.239	3'-4"	47.0	11.0	3.5	.239	2'-9"

D_B = Pole Base O.D.
D_{19} = Pole Top O.D. with no Luminaire and no ILSN
D_{24} = Pole Top O.D. with ILSN w/out Luminaire
D_{30} = Pole Top O.D. with Luminaire
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
L = Nominal Arm Length

① Thickness shown are minimums, thicker materials may be used.

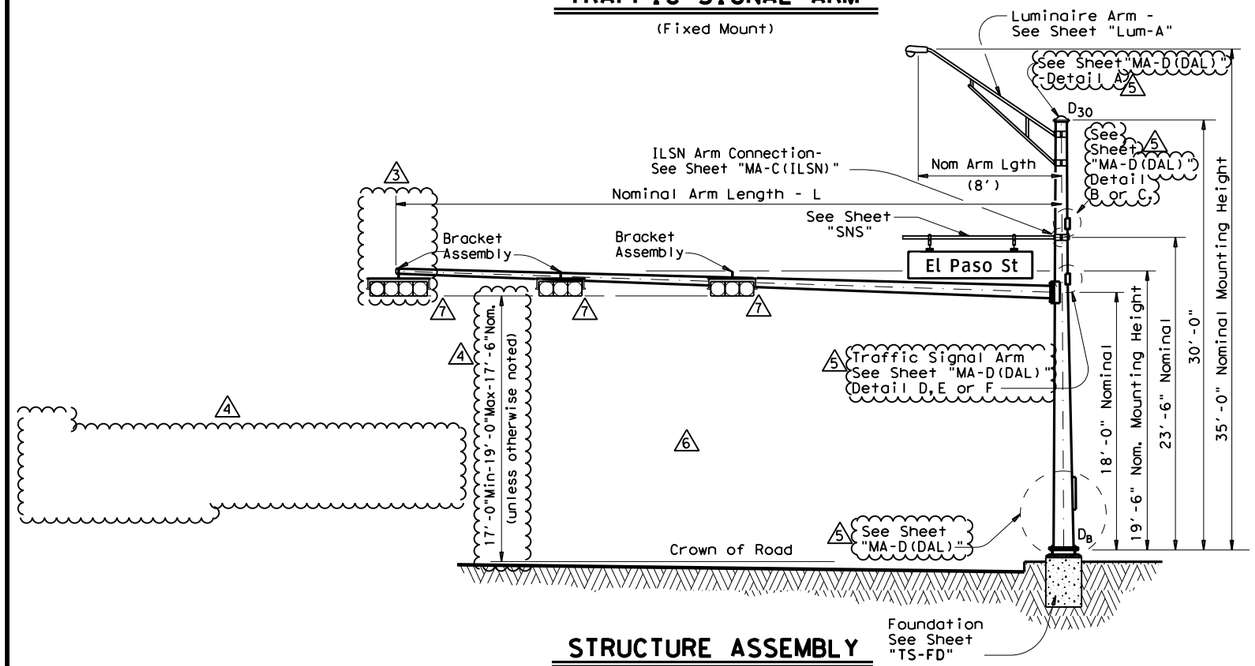
② D_2 may be increased by up to 1" for polygonal arms.



Note: The arm shall be fabricated straight with the unloaded rise measured as shown.

TRAFFIC SIGNAL ARM

(Fixed Mount)



STRUCTURE ASSEMBLY

SHIPPING PARTS LIST

Ship each pole with the following attached: enlarged hand hole, pole cap, fixed-arm connection bolts and washers and any additional hardware listed in the table.

Nominal Arm Length	30' Poles With Luminaire		24' Poles With ILSN		19' Poles With No Luminaire and No ILSN	
	Above hardware plus: One (or two if ILSN attached) small hand hole, clamp-on simplex		Above hardware plus one small hand hole		See note above	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20L-80		20S-80		20-80	
24	24L-80	2	24S-80		24-80	
28	28L-80		28S-80		28-80	
32	32L-80	2	32S-80		32-80	
36	36L-80		36S-80		36-80	
40	40L-80	5	40S-80		40-80	
44	44L-80	2	44S-80		44-80	
48	48L-80	1	48S-80		48-80	

Traffic Signal Arms (1 per Pole) Ship each arm with the listed equipment attached

Nominal Arm Length	Type I Arm (1 Signal)		Type II Arm (2 Signals)		Type III Arm (3 Signals)	
	⚠1 1 Bracket Assembly		2 Bracket Assemblies		3 Bracket Assemblies	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-80					
24	24I-80		24II-80	2		
28	28I-80		28II-80			
32			32II-80	2	32III-80	
36			36II-80		36III-80	
40			⚠2 40II-80	2	40III-80	3
44			44II-80		44III-80	2
48					48III-80	1

Luminaire Arms (1 per 30' pole)

Nominal Arm Length	Quantity
8' Arm	12

ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers

Nominal Arm Length	Quantity
7' Arm	
9' Arm	2

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
1 ½"	3'-4"	4
1 ¾"	3'-10"	8

Each anchor bolt assembly consists of the following: Top and Bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers, and 4 nut anchor devices (Type 2) per Standard Drawing "TS-FD".

Templates may be removed for shipment.

MODIFICATIONS:

⚠1 REPLACED CGB CONNECTOR WITH BRACKET ASSEMBLY. (2/12)

⚠2 ADDITIONAL OPTION. (3/12)

⚠3 REPLACED TENON DETAIL WITH PLATE WELD DETAIL. (2/12)

⚠4 REVISED MINIMUM SIGNAL HEIGHT. (3/12)

⚠5 REPLACED "MA-D" WITH "MA-D(DAL)". (2/12)

⚠6 REMOVED TABLE OF DIMENSIONS "A". (2/12)

⚠7 REMOVED CGB CONNECTORS. (2/12)

Texas Department of Transportation
DALLAS DISTRICT STANDARD

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(80 MPH WIND ZONE)

SMA-80(1)-12(DAL)

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1-12

CONT	SECT	JOB	HIGHWAY
0387	05	028,ETC.	FM 982,ETC.
DIST	COUNTY		SHEET NO.
18	COLLIN,ETC.		79

122A

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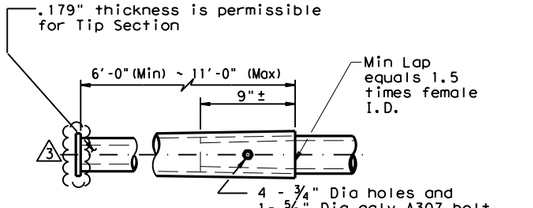


Note: A slip joint is permissible for arms 40' and greater in length. The slip joint shall be made in the shop, but may be match marked and shipped disassembled.

SLIP JOINT DETAIL

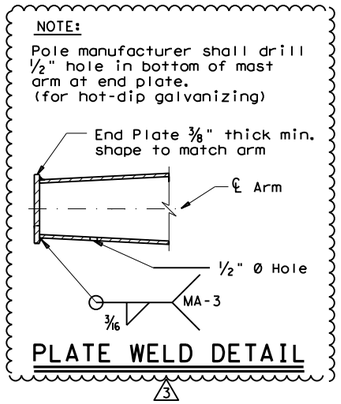


PLATE WELD DETAIL

VIBRATION WARNING

Mast Arms of SMA and DMA structures and clamp-on Arms of LMA structures of approximately 40 ft or longer are subject to harmonic vertical vibrations in light wind conditions due to the aeroelastic characteristics of a few of the myriads of possible combinations of the following: signal numbers, weights and positions; existence/solidity of backplates; presence of additional attachments to the arm, such as signs and cameras; arm-wind orientation; and arm-pole stiffness.

Such vibrations may cause fatigue damage to the structure and may lead to galloping in moderate wind conditions which may further damage the structure and alarm the public. Tests have indicated that when wind is blowing toward the back side of signal heads having un-vented backplates attached the probability of unacceptable harmonic vibration and/or galloping is rather high.

If backplates are not required for improved visibility they should not be applied to the signal heads or, if they must be applied, they should be vented as a first and inexpensive measure to mitigate vibrations.

The traffic signal mast arms shall be visually inspected in 5 to 20 mph wind conditions after installation of signal heads and any attachments, including any required backpates. If vertical movements with a total excursion (maximum upward excursion to maximum downward excursion) of more than approximately 8" are observed at the arm tip, a damping plate shall be fitted to the arm. See "Damping Plate Mounting Details" on standard sheet, MA-DPD-10.

This visual inspection shall be repeated after each modification of the structure that could affect its aeroelastic response. Excessive vibrations shall not be allowed to continue for more than two days.

Stainless steel bands (or Cables) and cast bracket as in "Astro-Brac", "Sky Bracket" or "Easy Bracket" with 1 ½" Dia Threaded Coupling.

BRACKET ASSEMBLY

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor.

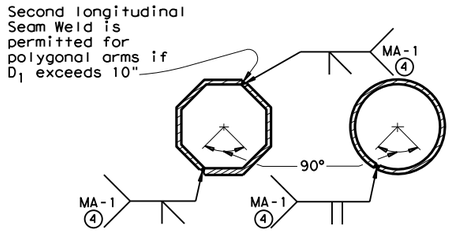
Poles are designed to support one 8'-0" luminaire arm, one 9'-0" internally lighted street name sign and one traffic signal arm with a length as tabulated. The specified luminaire load applied at the end of the luminaire arm equals 60 lbs vertical dead load plus the horizontal wind load on an effective projected area of 1.6 sq ft. The specified internally lighted street name sign load applied 4.5 ft from the centerline of the pole equals 85 lbs vertical dead load plus horizontal wind load on an effective projected area of 11.5 sq ft. The specified signal load applied at the end of the traffic signal arm equals 180 lbs vertical dead load plus the horizontal wind load on an effective projected area of 32.4 sq ft (actual area times drag coefficient).

5 See Standard Sheet "MA-D(DAL)" for pole details, "MA-C" for traffic signal arm connection details, "MA-C (ILSN)" for internally lighted street name sign arm connection details, "LUM-A" for luminaire arm and connection details, "SNS" for internally lighted street name sign details, and "TS-FD" for anchor bolt and foundation details. See "MA-C" for material specifications.

Fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of this sheet and Item 686, "Traffic Signal Pole Assemblies (Steel)".

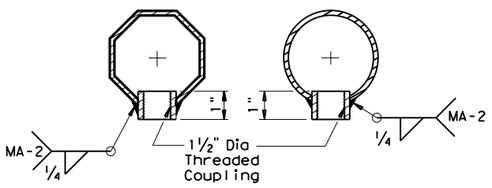
Unless otherwise noted, all parts shall be galvanized in accordance with Item 445, "Galvanizing", after fabrication.

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.



ARM WELD DETAIL

4 60% Min. penetration 100% pemetration within 6" of circumferential base welds.



ARM COUPLING DETAILS

3 REPLACED TENON DETAIL WITH PLATE WELD DETAIL(2/12).

5 REPLACED "MA-D" WITH "MA-D(DAL)"(2/12).

Texas Department of Transportation
DALLAS DISTRICT STANDARD

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(80 MPH WIND ZONE)

SMA-80(2)-12(DAL)

© TxDOT August 1995

DN: MS	CK: JSY	DW: MMF	CK: JSY

REVISIONS
5-96
1-12

CONT	SECT	JOB	HIGHWAY
0387	05	028,ETC.	FM 982,ETC.

DIST	COUNTY	SHEET NO.
18	COLLIN,ETC.	80

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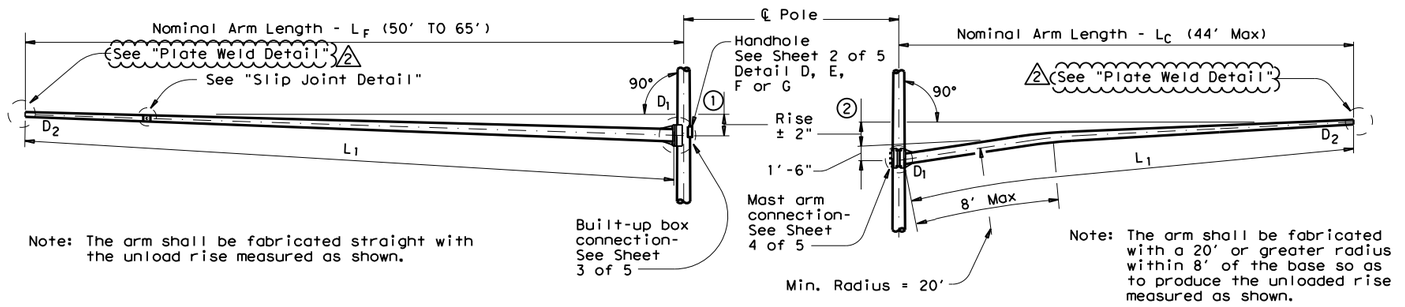


Note: The arm shall be fabricated straight with the unload rise measured as shown.

Note: The arm shall be fabricated with a 20' or greater radius within 8' of the base so as to produce the unloaded rise measured as shown.

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed can be either 100 mph or 80 mph plus a 1.3 gust factor. If clamp-on traffic signal is required, designs are based on an arm included angle of 90 degrees or more. Angles of less than approximately 75 degrees will require a special design.

Poles are designed to support one 8'-0" luminaire arm, two 9'-0" internally lighted street name (ILSN) signs and two traffic signal arms with limited length combinations.

Each arm with its related attachment is shown below

Arm	Equivalent DL ⑤	WL EPA ⑤⑥
8' Luminaire Arm	Luminaire 60 lbs	1.6 sq ft
9' ILSN Arm	Sign 85 lbs	11.5 sq ft
50' to 65' Fixed Mount Arm	Signal Loads 310 lbs	52 sq ft
Up to 44' Clamp-on Arm	Signal Loads 180 lbs	32.4 sq ft

⑤ Equivalent dead load plus horizontal wind load applied at the end of arm except ILSN arm, which applied 4.5' from the centerline of the pole.

⑥ Effective projected area (actual area times drag coefficient) for the application of horizontal wind load.

4 Except as noted in Sheet 1 thru 5 of 5, other details not covered shall refer to Standard Sheet "LUM-A" for luminaire arm and connection details, "SNS" for internally lighted street name sign details, and "TS-FD" for anchor bolt and foundation details.

Fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Material, fabrication tolerances, and shipping practices shall also meet the requirements of this sheet and Item 686, "Traffic Signal Pole Assemblies (Steel)".

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

Deviations from the details and dimensions shown herein require submission of shop drawings in accordance with the Item 441, "Steel Structures". Alternate designs are not acceptable.

Installation of damping plate for the long mast arm is not recommended.

Provision of the bracket assembly used to support the traffic signal heads shall be under the direction of the Engineer for approval.

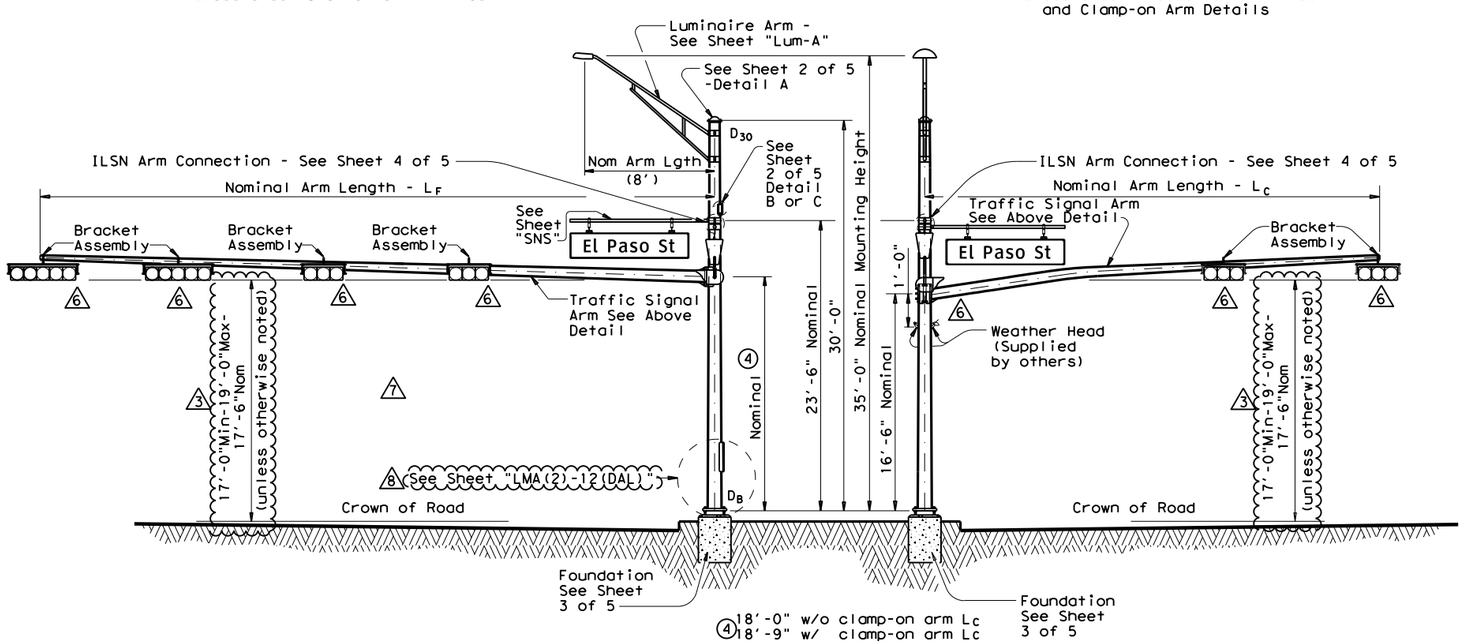
Design also conforms to NCHRP Report 412 for fatigue resistance except that there are no stiffeners at the base plate. TxDOT is conducting tests to determine if stiffeners at the base plate will or will not result in optimal performance; depending upon the results of the tests, poles may need a retrofit to ensure optimal fatigue performance.

FIXED MOUNT TRAFFIC SIGNAL ARM

① See Sheet 3 of 5 for Arm Rise

CLAMP-ON TRAFFIC SIGNAL ARM (IF REQUIRED)

② See Sheet 4 of 5 for Arm Rise and Clamp-on Arm Details



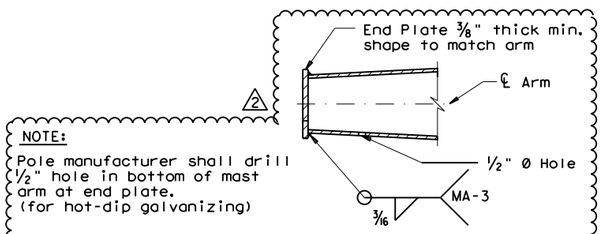
ELEVATION
(Showing fixed mount arm)

STRUCTURE ASSEMBLY

ELEVATION
(Showing clamp-on arm)

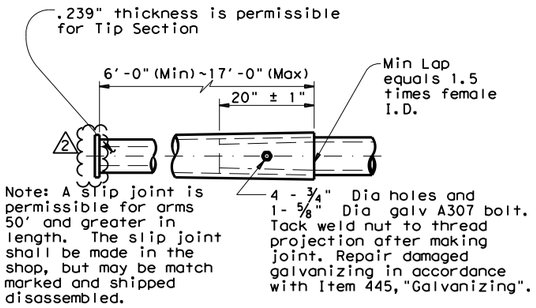
MODIFICATIONS:

1. NOT USED
2. REPLACED TENON DETAIL WITH PLATE WELD DETAIL. (2/12)
3. REVISED MINIMUM SIGNAL HEIGHT. (3/12)
4. REMOVED "MA-D" REFERENCE. (2/12)
5. REMOVED TABLE OF DIMENSIONS "A". (2/12)
6. REMOVED CGB CONNECTORS. (2/12)
7. REMOVED THREADED COUPLING FOR CGB CONNECTOR. (2/12)
8. REVISED THE ELEVATION OF ACCESS COMPARTMENT. (3/12)



NOTE:
Pole manufacturer shall drill ½" hole in bottom of mast arm at end plate. (for hot-dip galvanizing)

PLATE WELD DETAIL



Note: A slip joint is permissible for arms 50' and greater in length. The slip joint shall be made in the shop, but may be match marked and shipped disassembled.

SLIP JOINT DETAIL (FIXED MOUNT ARM)

Texas Department of Transportation
DALLAS DISTRICT STANDARD

TRAFFIC SIGNAL SUPPORT STRUCTURES
LONG MAST ARM ASSEMBLY (50 TO 65 FT) (80 AND 100 MPH WIND ZONE) LMA(1)-12(DAL)

Sheet 1 of 5

© TxDOT July 2000

DN: JK	CK: GRB	DW: FDN	CK: CAL

REVISIONS
4-20-01
1-12

CONT	SECT	JOB	HIGHWAY
0387	05	028, ETC.	FM 982, ETC.
DIST	COUNTY		SHEET NO.
18	COLLIN, ETC.		81

131A

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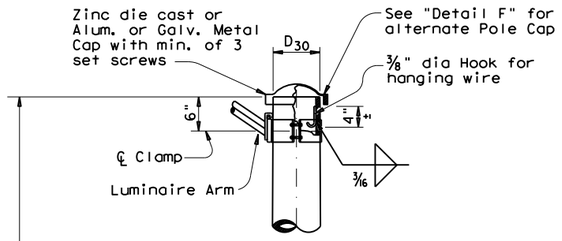
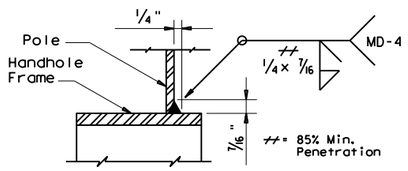
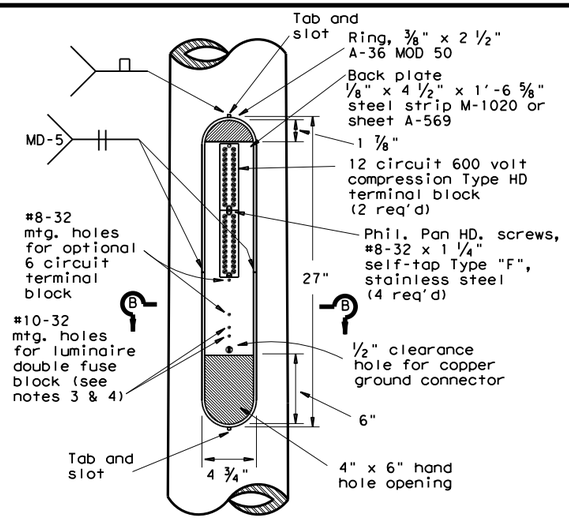


DETAIL A

(for pole with luminaire)



DETAIL H

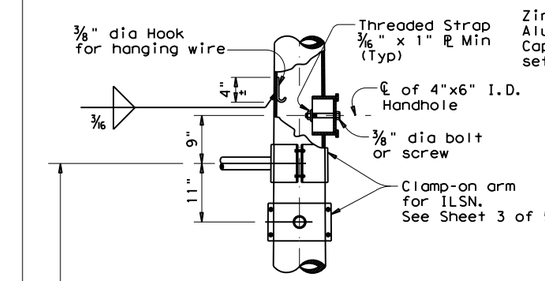


ACCESS COMPARTMENT

MATERIALS	
Round Shafts or Polygonal Shafts (7)	ASTM A595 Gr.A, A588, A1008 HSLAS Gr.50 Class 2, A1011 HSLAS Gr.50 Class 2, A572 Gr.50 or A1011 SS Gr.50 (8)
Plates (7)	ASTM A36, A588, or A572 Gr.50
Connection Bolts	ASTM A325, or A449 except where noted
Pin Bolts	ASTM A325
Pipe (7)	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50, A1011 HSLAS-F Gr.50
Misc. Hardware	Galvanized steel or stainless steel or as noted

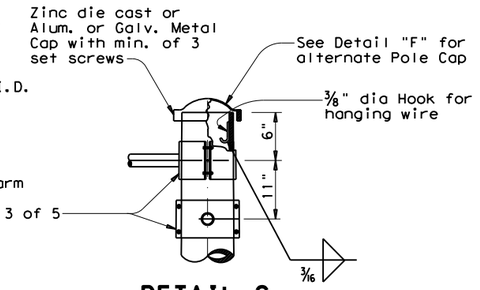
(7) ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F, or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.

(8) ASTM A1011 SS Gr.50 shall also have a minimum elongation of 18 percent in 8 inches or 23 percent in 2 inches. Material thickness in excess of those stipulated under A1011 SS will be acceptable providing the material meets all other A1011 SS requirements and the requirements of this item.

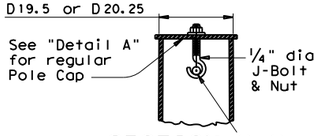


DETAIL B

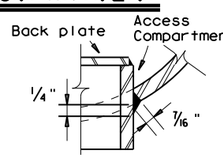
(If ILSN applied)



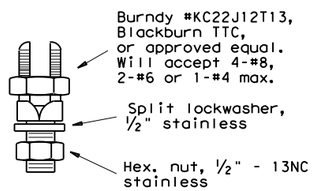
DETAIL C



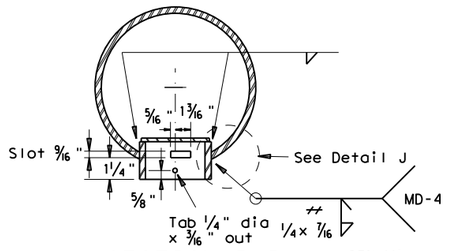
SECTION Y-Y



DETAIL J

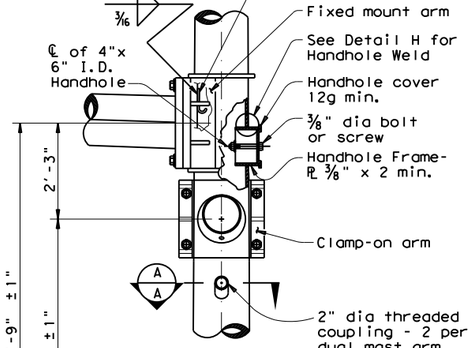


COPPER GROUND CONNECTOR



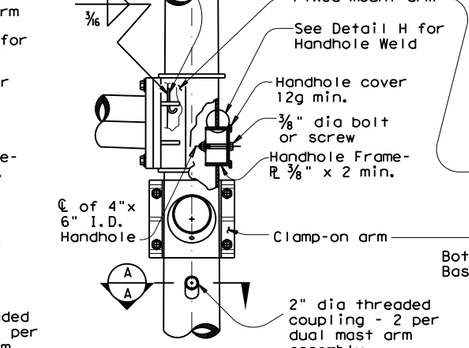
SECTION B-B

Opening for access compartment shall be no more than 1/16 inch wider than the access compartment itself.



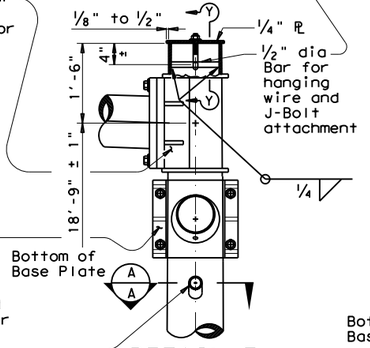
DETAIL D

(for 30' pole with luminaire and ILSN sign)



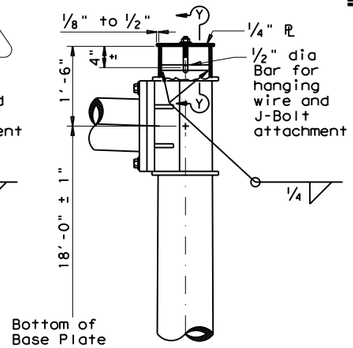
DETAIL E

(for 24' pole with ILSN sign and no luminaire, single or dual mast arm)



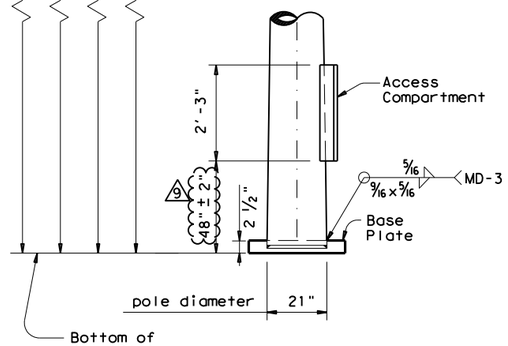
DETAIL F

(for 20.25' pole with no ILSN sign and no luminaire, dual mast arm)

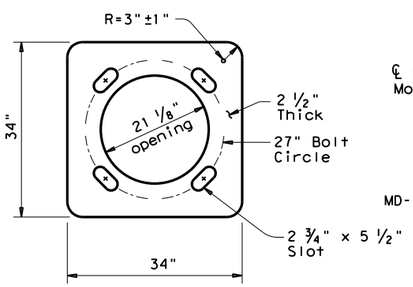


DETAIL G

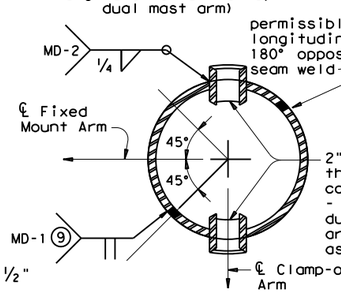
(for 19.5' pole with no ILSN sign and no luminaire, single mast arm)



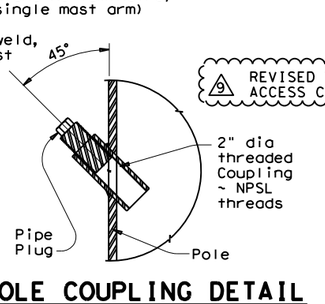
POLE ELEVATION



BASE PLATE



SECTION A-A



POLE COUPLING DETAIL

(9) Longitudinal seam weld must be oriented within 90° (45° rotation each side) along the fixed mount arm. 60% min penetration required, 100% penetration within 6" of circumferential base weld.

(9) REVISED THE ELEVATION OF ACCESS COMPARTMENT (2/12).

ACCESS COMPARTMENT NOTES:

1. The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4-20 stainless flat socket head screws with tamper proof feature.
2. The pole manufacturer shall provide with each pole a separate kit consisting of: one cover with two latching assemblies, two terminal strips (Marathon #985GP12CU or approved equal), four #8-32 x 1 1/4" self tapping type "F" stainless steel pan head screws, and one ground connector (Blackburn TTC, Burndy KC22J12T13, or Ilsco SSS-5). The traffic signal contractor shall install the kit items in the field.
3. The screw hole spacing on the enclosure back plate shall be for two Marathon #985GP12 terminal strips, one Marathon #985GP06CU terminal strip, and one Bussmann #BM6032B fuse block.
4. Install one Bussmann #BM6032B, Littelfuse #L60030M-2C, or Ferraz-Shawmut #30352 fuse block for poles where luminaires are to be installed.

Texas Department of Transportation
DALLAS DISTRICT STANDARD

TRAFFIC SIGNAL SUPPORT STRUCTURES
LONG MAST ARM ASSEMBLY (50 TO 65 FT) (80 AND 100 MPH WIND ZONE)

Sheet 2 of 5 — LMA(2)-12(DAL)

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DN: JK	CK: GRB	DW: FDN	CK: CAL

REVISIONS
4-20-01
1-12

CONT	SECT	JOB	HIGHWAY
0387	05	028,ETC.	FM 982,ETC.
DIST	COUNTY		SHEET NO.
18	COLLIN,ETC.		82

131B

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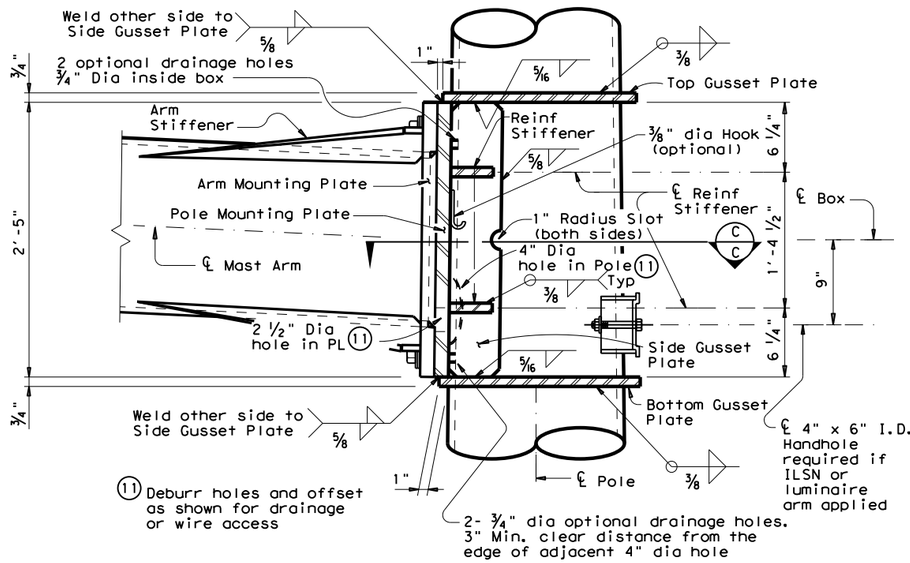
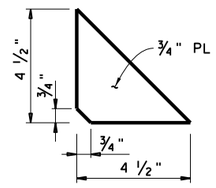
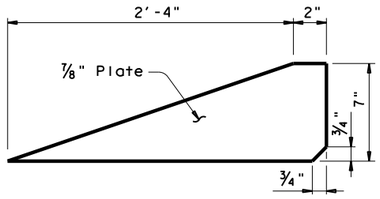


BUILT-UP BOX CONNECTION



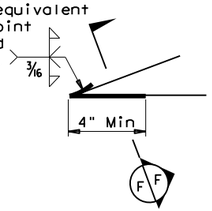
REINFORCING STIFFENER



ARM STIFFENER

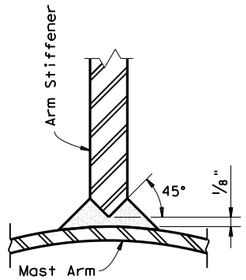
(Cut to match arm inclination and taper)

Provide Detail shown in SECTION F-F or equivalent 100% complete joint penetration weld from both sides.



Only 4" length at tip of Arm Stiffener requires a complete joint penetration weld. Smooth weld radius to connect Stiffener. Only a fillet weld is required for the remaining weld length.

DETAIL "K"



SECTION F-F

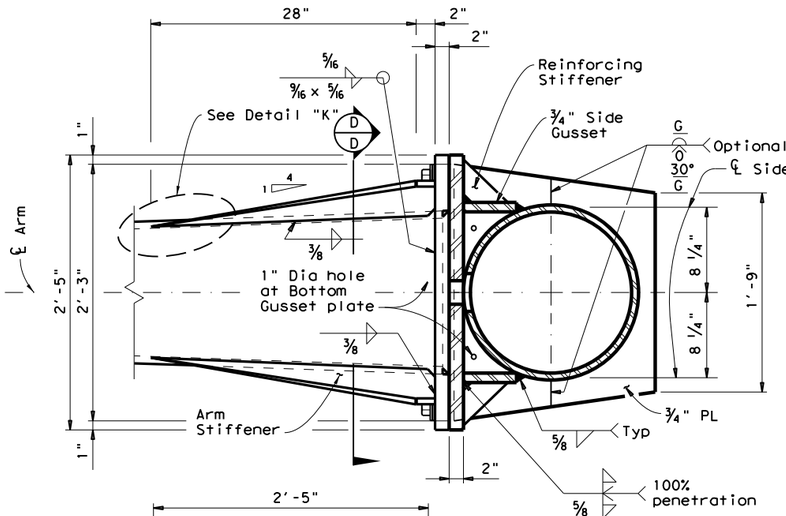
Fixed Mount Arm L_F	ROUND POLES (13)					Foundation Type
	D_B	$D_{19.5}$ or $D_{20.25}$	D_{24}	D_{30}	(12) thk	
ft.	in.	in.	in.	in.	in.	
50', 55' 60', 65'	21.0	18.2	17.6	16.8	.3125	48-A

Fixed Mount Arm L_F	ROUND ARMS (13)				
	L_1	D_1	D_2	(12) thk	Rise
ft.	ft.	in.	in.	in.	
50	49	18.5	11.7	.3125	3'- 3"
55	54	18.5	11.0	.3125	3'- 7"
60	59	18.5	10.3	.3125	3'-11"
65	64	18.5	9.6	.3125	4'- 4"

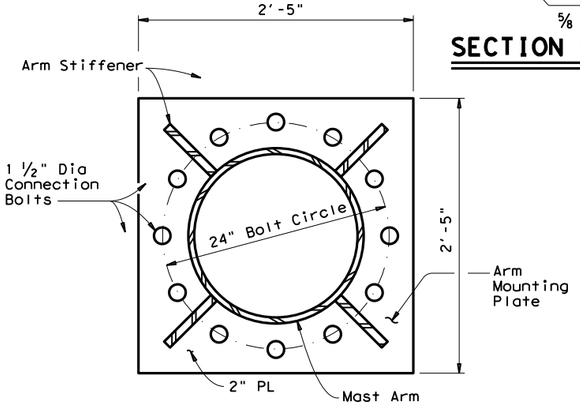
D_B = Pole Base O.D.
$D_{19.5}$ = Pole Top O.D. with no Luminaire and no ILSN (single mast arm)
$D_{20.25}$ = Pole Top O.D. with no Luminaire and no ILSN (dual mast arm)
D_{24} = Pole Top O.D. with ILSN w/out Luminaire
D_{30} = Pole Top O.D. with Luminaire
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
L_F = Fixed Arm Length

(12) Thickness shown is minimum, thicker materials may be used.

(13) Shaft profile 16-sided or 18-sided is considered to be equivalent to round section.



SECTION C-C



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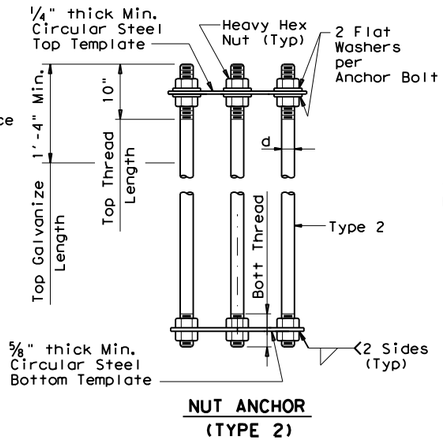
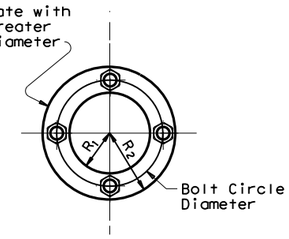


NUT ANCHOR (TYPE 2)

ANCHOR BOLT ASSEMBLY

Steel Template with holes 1/16" greater than bolt diameter



TEMPLATE DETAIL

ANCHOR BOLT & TEMPLATE SIZE						
Bolt Dia in.	Length ‡	Top Thread	Bottom Thread	Bolt Circle	R_2	R_1
2 1/2"	5'-2"	10"	6 1/2"	27"	16"	11"

‡ Min dimension given, longer bolts are acceptable.

FOUNDATION DESIGN TABLE													
FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		DRILLED SHAFT LENGTH-ft (16), (17), (18)			ANCHOR BOLT DESIGN (14)				FOUNDATION DESIGN LOAD (15)		TYPICAL APPLICATION
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft	SHEAR Kips	
				10	15	40							
48-A	48"	20 #9	#4 at 6"	21.9	19.5	14.7	2 1/2"	55	27"	2	490	10	50' to 65' Mast arm assembly.

SEE SHEET "TS-FD" FOR ADDITIONAL DETAILS.

(14) Anchor bolt design develops the foundation capacity given under Foundation Design Loads.

(15) Foundation Design Loads are the allowable moments and shears at the base of the structure.

(16) Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.

(17) If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.

(18) Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

GENERAL NOTES:

Built-up Box Connection: For the welded arm-to-pole connection as a build-up box configuration illustrated here is an example only, fabricators are required to submit a shop drawing of box connection for approval. The drawing shall specify the details of each box element, welds of arm-to-pole connection, arm-to-plate socket connection, and arm rise creation. Specify the proper location of drain holes along the pole. 2 1/2" dia hole in the pole mounting plate and 4" dia hole in the pole need to be aligned for wiring access or drainage. Arm stiffeners cut to match arm inclination and taper shall also be included.

The deviation from flat for either arm or pole mounting plate shall not exceed 1/32 in., which is measured along the center of mounting plate to a radial distance of 13.5 in. The deformed-from-flat connection between arm and pole mounting plates shall not be allowed if the center of both mounting plates cannot contact directly.

Fixed mount details are used for single mast arm assemblies and for the first arm on dual mast arm assemblies.

Texas Department of Transportation

TRAFFIC SIGNAL SUPPORT STRUCTURES
LONG MAST ARM ASSEMBLY (50 TO 65 FT) (80 AND 100 MPH WIND ZONE)

Sheet 3 of 5 LMA(3)-12

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REVISIONS	DN: JK	CK: GRB	DW: FDN	CK: CAL
4-20-01 1-12	CONT	SECT	JOB	HIGHWAY
	0387	05	028, ETC.	FM 982, ETC.
	DIST	COUNTY		SHEET NO.
	18	COLLIN, ETC.		83

131C

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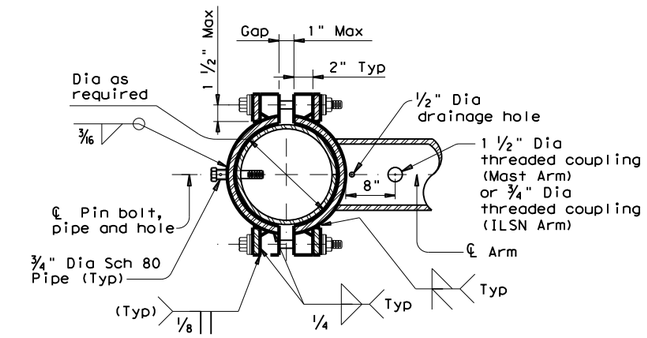

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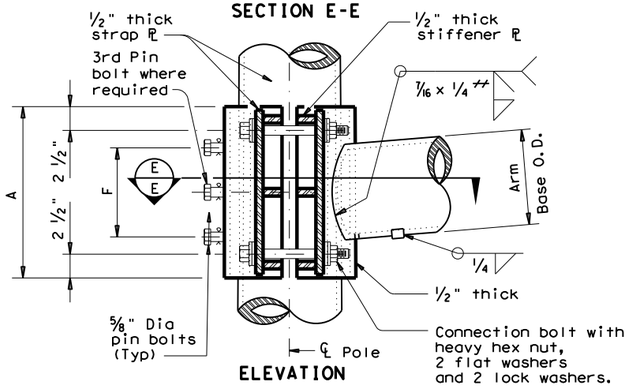


ELEVATION
(Mast Arm or ILSN Arm to pole)

= 85% Min. Penetration

CLAMP-ON CONNECTION

80 MPH WIND

Clamp-on Arm Lc	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	thk (12)	Rise	L_1	D_1	D_2	thk (12)	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	6.5	3.8	.179	1'-9"	19.1	7.0	3.5	.179	1'-8"
24	23.1	7.5	4.3	.179	1'-10"	23.1	7.5	3.5	.179	1'-9"
28	27.1	8.0	4.2	.179	1'-11"	27.1	8.0	3.5	.179	1'-10"
32	31.0	9.0	4.7	.179	2'-1"	31.0	9.0	3.5	.179	2'-0"
36	35.0	9.5	4.6	.179	2'-4"	35.0	10.0	3.5	.179	2'-1"
40	39.0	9.5	4.1	.239	2'-8"	39.0	9.5	3.5	.239	2'-3"
44	43.0	10.0	4.1	.239	2'-11"	43.0	10.0	3.5	.239	2'-6"

100 MPH WIND

Clamp-on Arm Lc	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	thk (12)	Rise	L_1	D_1	D_2	thk (12)	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	8.0	5.3	.179	1'-8"	19.1	8.0	3.5	.179	1'-7"
24	23.1	9.0	5.8	.179	1'-9"	23.1	9.0	3.5	.179	1'-8"
28	27.1	9.5	5.7	.179	1'-10"	27.1	10.0	3.5	.179	1'-9"
32	31.0	9.5	5.2	.239	1'-11"	31.0	9.5	3.5	.239	1'-10"
36	35.0	10.0	5.1	.239	2'-0"	35.0	10.0	3.5	.239	1'-11"
40	39.0	10.5	5.1	.239	2'-3"	39.0	11.0	3.5	.239	2'-1"
44	43.0	11.0	5.1	.239	2'-8"	43.0	11.5	4.0	.239	2'-3"

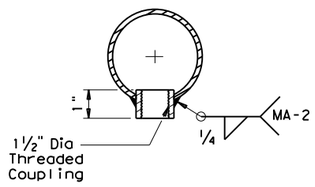
D1 = Arm Base O.D.
D2 = Arm End O.D.
L1 = Shaft Length
Lc = Clamp-on Arm Length

(12) Thickness shown is minimum, thicker materials may be used.

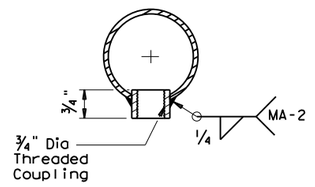
CLAMP-ON ARM CONNECTION

ILSN Arm Size		A	F	4 Conn. Bolts	⅝" Dia. Pin Bolts
Sch 40 pipe Dia	Thick			Dia	No.
in.	in.	in.	in.	in.	ea
3	.216	10	4	¾	2

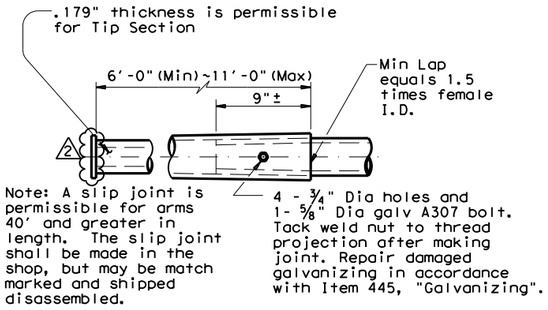
Mast Arm Size		A	F	4 Conn. Bolts	⅝" Dia. Pin Bolts
Base Dia	Thick			Dia	No.
in.	in.	in.	in.	in.	ea
6.5	.179	12	6	1	2
7.5	.179	14	8	1	2
8.0	.179	14	8	1	2
9.0	.179	16	10	1	2
9.5	.179	18	12	1 ¼	3
9.5	.239	18	12	1 ¼	3
10.0	.239	18	12	1 ¼	3
10.5	.239	18	12	1 ¼	3
11.0	.239	18	12	1 ¼	3
11.5	.239	18	12	1 ¼	3



ARM COUPLING DETAIL



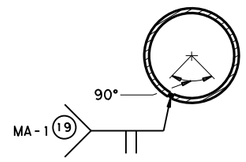
ILSN ARM COUPLING DETAIL



SLIP JOINT DETAIL (CLAMP-ON ARM)

Stainless steel bands (or Cables) and cast bracket as in "Astro-Brac", "Sky Bracket" or "Easy Bracket" with 1 ½" Dia Threaded Coupling.

BRACKET ASSEMBLY



ARM WELD DETAIL

(19) Longitudinal Seam Weld must be oriented within the lower 90° of the signal arm.
60% Min penetration
100% penetration within 6" of circumferential base welds.

GENERAL NOTES:

Clamp-on details are used for the second arm on dual mast arm assemblies or ILSN arm support. For a clamp-on mast arm, a maximum 1 ½" wide vertical slotted hole may be cut in the front clamp plate to facilitate drainage during galvanizing. The slot shall be centered behind the arm and shall be no longer than the arm diameter minus 1". For an ILSN arm, a 1 ½" diameter hole shall be cut in the front clamp plate for wire access. A matched hole shall be field drilled through the pole to provide wire access after arm is oriented. Deburr both holes.

Where duplicate parts occur on a detail, welds shown for part shall apply to all similar parts on the detail.

Pin bolts are required to prevent rotation of clamp-on arms under design wind forces. Pin bolts shall be ASTM A325 with threads excluded from the shear plane. Pin bolt and ¾" diameter pipe shall have 3/16" diameter holes for a ⅛" diameter galvanized cotter pin. Back clamp plate shall be furnished with a ¾" diameter hole for each pin bolt. An 11/16" diameter hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.

2 REPLACED TENON DETAIL WITH PLATE WELD DETAIL (2/12).

Texas Department of Transportation
DALLAS DISTRICT STANDARD

TRAFFIC SIGNAL SUPPORT STRUCTURES
LONG MAST ARM ASSEMBLY (50 TO 65 FT) (80 AND 100 MPH WIND ZONE)

Sheet 4 of 5 LMA(4)-12(DAL)

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REVISIONS
4-20-01 1-12

CONT	SECT	JOB	HIGHWAY
0387	05	028,ETC.	FM 982,ETC.

DIST	COUNTY	SHEET NO.
18	COLLIN,ETC.	84

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Shipping Parts List

Ship each pole with the following attached: enlarged hand hole, pole cap, fixed arm connection bolts and washers, and any additional hardware listed in the table.

Nominal Arm Length	30' Poles with Luminaire: See note above plus: one (or two if ILSN attached) small hand hole, clamp-on simplex		24' Poles with ILSN: See note above plus one small hand hole		19.50' (Single Mast Arm) 20.25' (Dual Mast Arm) Poles with no Luminaire and no ILSN: See note above	
Single Mast Arm						
Lf ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
50	50L	1	50S		50	
55	55L	4	55S		55	
60	60L	1	60S		60	
65	65L		65S		65	
Dual Mast Arm						
Lf ft. / Lc ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
50 / 20	5020L		5020S		5020	
24	5024L		5024S		5024	
28	5028L		5028S		5028	
32	5032L		5032S		5032	
36	5036L		5036S		5036	
40	5040L		5040S		5040	
44	5044L		5044S		5044	
55 / 20	5520L		5520S		5520	
24	5524L		5524S		5524	
28	5528L		5528S		5528	
32	5532L		5532S		5532	
36	5536L		5536S		5536	
40	5540L		5540S		5540	
44	5544L		5544S		5544	
60 / 20	6020L		6020S		6020	
24	6024L		6024S		6024	
28	6028L		6028S		6028	
32	6032L		6032S		6032	
36	6036L		6036S		6036	
40	6040L		6040S		6040	
44	6044L		6044S		6044	
65 / 20	6520L		6520S		6520	
24	6524L		6524S		6524	
28	6528L		6528S		6528	
32	6532L		6532S		6532	
36	6536L		6536S		6536	
40	6540L		6540S		6540	
44	6544L		6544S		6544	

Foundation Summary Table **

Location Ident.	Avg. N Blow/ft.	No. Each	Drill Shaft *** Length (feet)
			48-A
FM 720 AT MARTINGALE TRAIL, P1	10	1	22
FM 720 AT MARTINGALE TRAIL, P3	10	1	22
FM 156 AT DOUBLE EAGLE, P2	10	1	22
FM 156 AT DOUBLE EAGLE, P3	10	1	22
FM 156 AT DOUBLE EAGLE, P4	10	1	22
FM 407 AT VICKERY BLVD, P1	10	1	22
Total Drill Shaft Length			132

Notes

** Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.

*** Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

Shipping Parts List

Traffic Signal Arms (Fixed Mount) (1 per pole)
Ship each arm with listed equipment attached

Nominal Arm Length	Type IV Arm (4 Signals) 1 4 Bracket Assemblies	
ft.	Designation	Quantity
50	50IV	1 $
55	55III	4 $$
60	60IV	1 $
65	65IV	

$ ARM W/ 3 SIGNAL HEADS

$$ 3 OF THE 4 ARMS W/ 3 SIGNAL HEADS

Luminaire Arms (1 per 30' pole)

Nominal Arm Length	Quantity
8' Arm	6

ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers

Nominal Arm Length	Quantity
7' Arm	
9' Arm	

Traffic Signal Arms (80 MPH Clamp-On Mount) (1 per pole) Ship each arm with listed equipment attached

Nominal Arm Length 1	Type I Arm (1 Signal) 1 Bracket Assembly and 1 clamp w/bolts and washers		Type II Arm (2 Signals) 2 Bracket Assemblies and 1 clamp w/bolts and washers		Type III Arm (3 Signals) 3 Bracket Assemblies and 1 clamp w/bolts and washers	
ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-80					
24	24I-80		24II-80			
28	28I-80		28II-80			
32			32II-80		32III-80	
36			36II-80		36III-80	
40					40III-80	
44					44III-80	

Traffic Signal Arms (100 MPH Clamp-On Mount) (1 per pole) Ship each arm with listed equipment attached

Nominal Arm 1	Type I Arm (1 Signal) 1 Bracket Assembly and 1 clamp w/bolts and washers		Type II Arm (2 Signals) 2 Bracket Assemblies and 1 clamp w/bolts and washers		Type III Arm (3 Signals) 3 Bracket Assemblies and 1 clamp w/bolts and washers	
ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-100					
24	24I-100		24II-100			
28	28I-100		28II-100			
32			32II-100		32III-100	
36			36II-100		36III-100	
40					40III-100	
44					44III-100	

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
2 1/2 "	5' - 3"	

Each anchor bolt assembly consists of the following: Top and bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers and 4 nut anchor devices (type 2) per Standard Drawing "TS-FD". Templates may be removed for shipment.

Abbreviations
Lf= Fixed Arm Length
Lc= Clamp-on Arm Length (44' Max.)

1 REPLACED CGB CONNECTOR WITH BRACKET ASSEMBLY(2/12).

Texas Department of Transportation
DALLAS DISTRICT STANDARD

LONG MAST ARM ASSEMBLY PARTS LIST LMA(5)-12(DAL)

Sheet 5 of 5

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REVISIONS	CONT	SECT	JOB	HIGHWAY
4-20-01 1-12	0387	05	028,ETC.	FM 982,ETC.
	DIST	COUNTY		SHEET NO.
	18	COLLIN,ETC.		85

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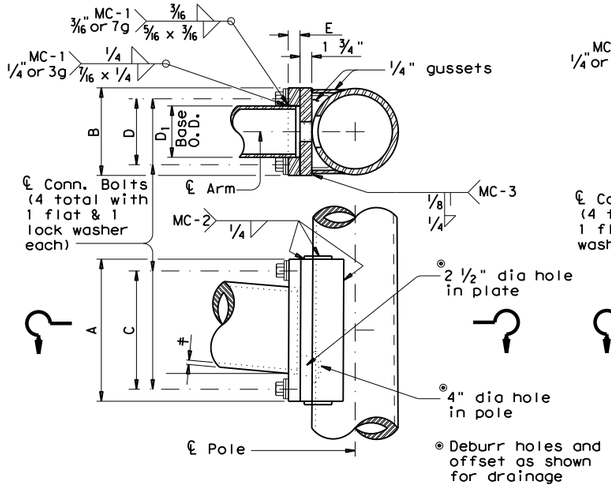
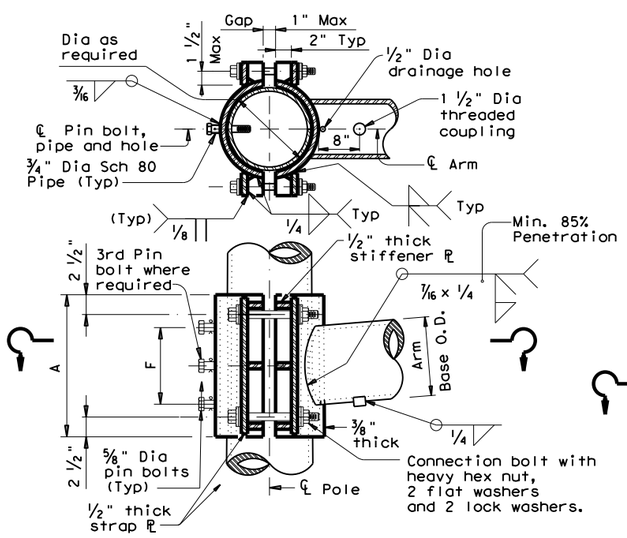
DATE:
FILE:

ARM SIZE D_1	ARM SIZE ℄	A	B	C	D	E	CONN BOLT DIA
in.	in.	in.	in.	in.	in.	in.	in.
6.5	.179	12	9	9	6	1 ¾	1
7.5	.179	13	9	10	6	1 ¾	1
8.0	.179	14	10	11	7	2	1 ¼
9.0	.179	16	11	13	8	2	1 ¼
9.5	.179	17	12	14	9	2	1 ¼
9.5	.239	18	12	15	9	2	1 ¼
10.0	.239	18	12	15	9	2	1 ¼
10.5	.239	18	13	15	10	3	1 ½
11.0	.239	18	13	15	10	3	1 ½



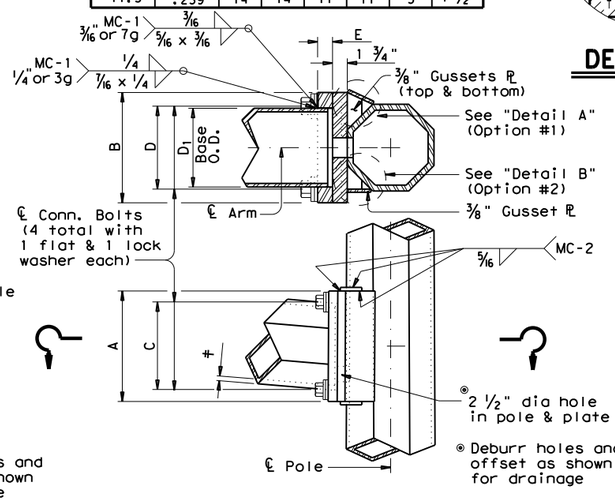
FIXED MOUNT DETAIL 1

ARM SIZE D_1	ARM SIZE ℄	A	F	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	ea.	in.	ea.	in.
6.5	.179	12	6	4	1	2	⅝
7.5	.179	14	8	4	1	2	⅝
8.0	.179	14	8	4	1	2	⅝
9.0	.179	16	10	4	1	2	⅝
9.5	.179	18	12	4	1 ¼	3	⅝
9.5	.239	18	12	4	1 ¼	3	⅝
10.0	.239	18	12	4	1 ¼	3	⅝

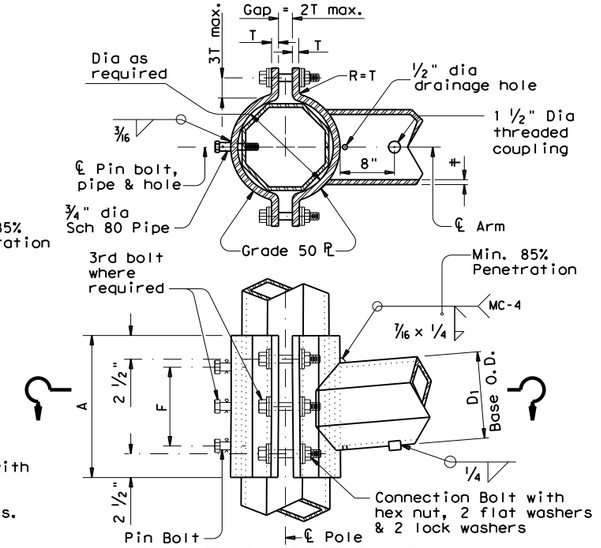


CLAMP-ON DETAIL 1

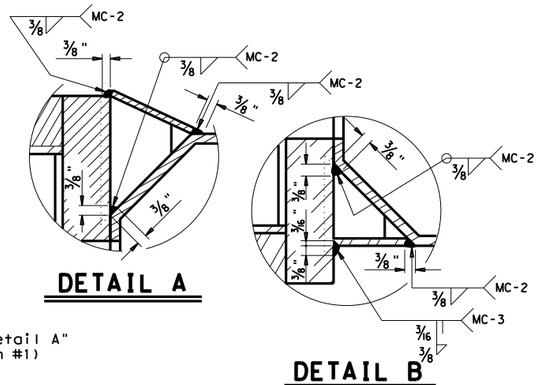
ARM SIZE D_1	ARM SIZE ℄	A	F	T	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	in.	ea.	in.	ea.	in.
7.0	.179	12	6	¾	4	¾	2	⅝
7.5	.179	14	8	¾	4	¾	2	⅝
8.0	.179	14	8	¾	4	¾	2	⅝
9.0	.179	16	10	⅞	4	1	2	⅝
10.0	.179	18	10	⅞	4	1	2	⅝
9.5	.239	18	10	1	6	1	3	⅝
10.0	.239	18	10	1	6	1	3	⅝

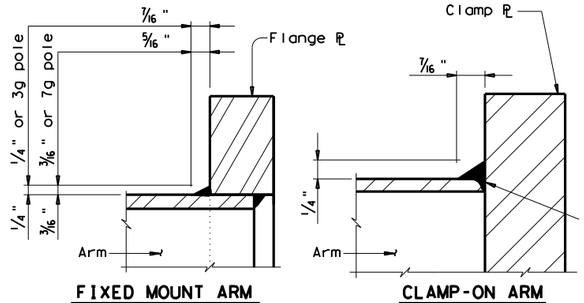


FIXED MOUNT DETAIL 2



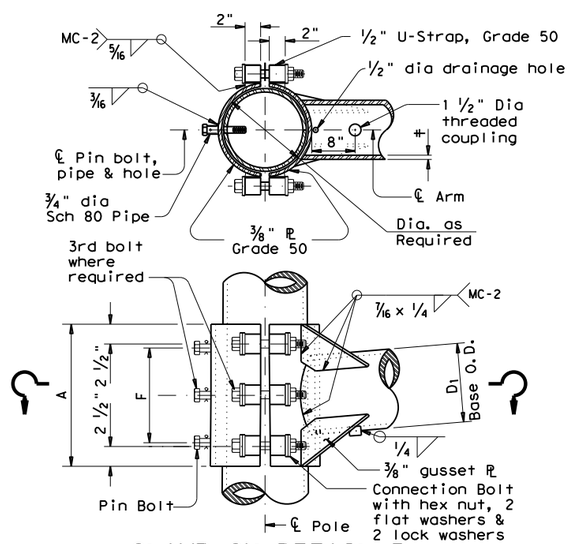
CLAMP-ON DETAIL 2





ARM BASE WELD DETAILS

ARM SIZE D_1	ARM SIZE ℄	A	F	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	ea.	in.	ea.	in.
6.5	.179	12	6	4	1	2	⅝
7.5	.179	14	8	4	1	2	⅝
8.0	.179	14	8	4	1	2	⅝
9.0	.179	16	10	4	1	2	⅝
9.5	.179	18	12	6	1	3	⅝
9.5	.239	18	12	6	1	3	⅝
10.0	.239	18	12	6	1	3	⅝



CLAMP-ON DETAIL 3

MATERIALS	
Round Shafts or Polygonal Shafts ①	ASTM A595 Gr.A, A588, A1008 HSLAS Gr.50 Class 2, A1011 HSLAS Gr.50 Class 2, A572 Gr.50 or A1011 SS Gr.50 ②
Plates ①	ASTM A36, A588, or A572 Gr.50
Connection Bolts	ASTM A325 or A449, except where noted
Pin Bolts	ASTM A325
Pipe ①	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50, A1011 HSLAS-F Gr.50
Misc. Hardware	Galvanized steel or stainless steel or as noted

① ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.

② ASTM A1011 SS Gr.50 material shall also have a minimum elongation of 18 percent in 8 inches or 23 percent in 2 inches. Material thickness in excess of those stipulated under A1011 SS will be acceptable providing the material meets all other A1011 SS requirements and the requirements of this item.

GENERAL NOTES:

Clamp-on details are used for the second arm on dual mast arm assemblies. A Maximum 1 ½" wide vertical slotted hole shall be cut in the front clamp plate to facilitate drainage during galvanizing. The slot shall be centered behind the arm and shall be no longer than the arm diameter minus 1"

Fixed mount details are used for single mast arm assemblies and for the first arm on dual mast arm assemblies.

Where duplicate parts occur on a detail, welds shown for one part shall apply to all similar parts on the detail.

Pin bolts are required to prevent rotation of clamp-on arms under design wind forces.

NOTE:

Pin bolts shall be A325 with threads excluded from the shear plane. Pin bolt and ¾" dia pipe shall have 3/16" dia holes for a ⅛" dia galvanized cotter pin. Back clamp plate shall be furnished with a ¾" dia hole for each pin bolt. An 11/16" dia hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY FOR TRAFFIC SIGNAL SUPPORT STRUCTURES

MAST ARM CONNECTIONS

MA-C-12

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REVISIONS
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5-09
1-12

CONT	SECT	JOB	HIGHWAY
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DIST	COUNTY		SHEET NO.
18	COLLIN,ETC.		86

126A

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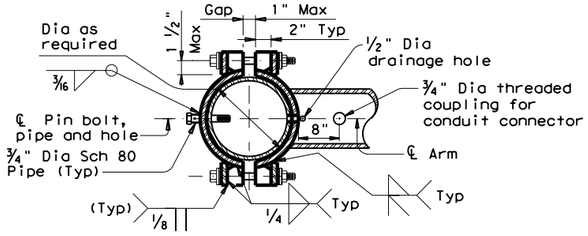
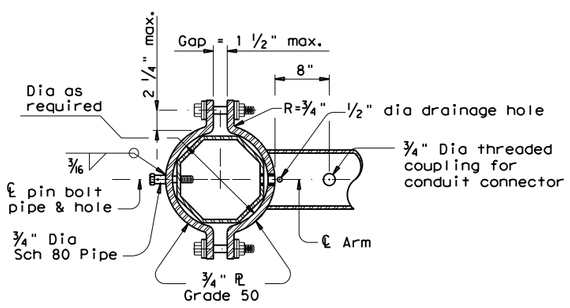
DATE:
FILE:

TABLE OF DIMENSIONS
for ILSN Support Arm Clamp-on
Details 1, 2 and 3

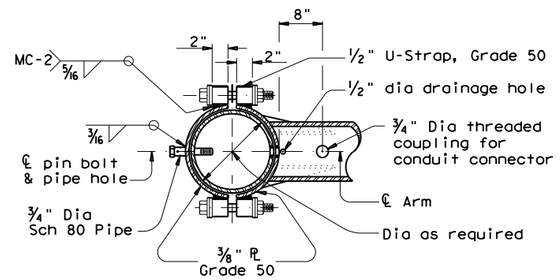
ILSN ARM SIZE	A	F	CONN. BOLTS		PIN BOLTS	
			No.	Dia	No.	Dia
	in.	in.	ea.	in.	ea.	in.
3 in. dia Schedule 40 Pipe	10	4	4	¾	2	⅝



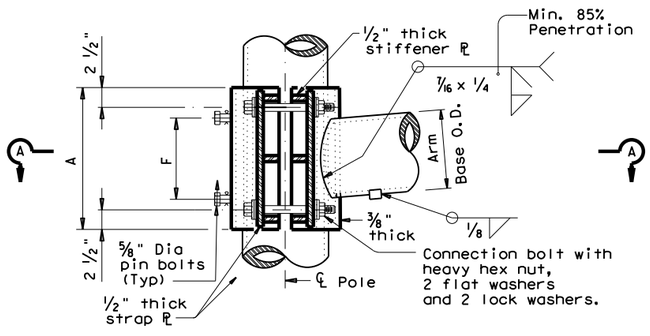
SECTION A-A



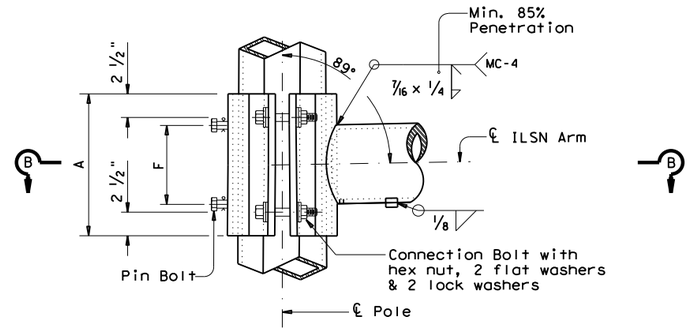
SECTION B-B



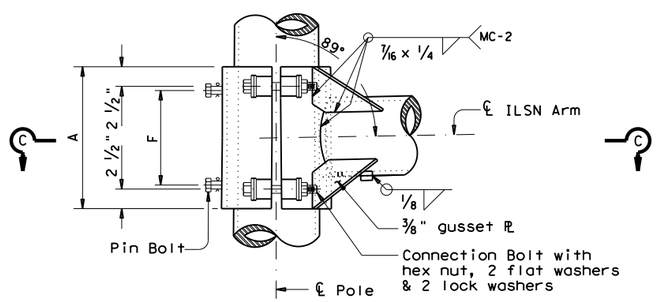
SECTION C-C



ILSN CLAMP-ON DETAIL 1



ILSN CLAMP-ON DETAIL 2



ILSN CLAMP-ON DETAIL 3

GENERAL NOTES:

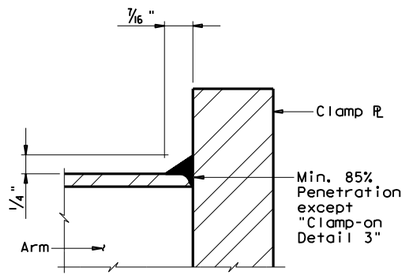
Clamp-on details shall be used for ILSN support arm assemblies. A 1 ½" inch diameter hole shall be cut in the front clamp plate for wiring access. A matched hole shall be field drilled through the pole to provide wire access after arm is oriented. Deburr both holes.

Where duplicate parts occur on a detail, welds shown for one part shall apply to all similar parts on the details.

Pin bolts are required to prevent rotation of clamp-on arms under design wind forces.

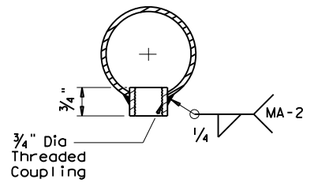
NOTE:

Pin bolts shall be A325 with threads excluded from the shear plane. Pin bolt and ¾" dia pipe shall have 7/16" dia holes for a ⅛" dia galvanized cotter pin. Back clamp plate shall be furnished with a ¾" dia hole for each pin bolt. An 11/16" dia hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.



CLAMP-ON ARM

ARM BASE WELD DETAILS



ILSN ARM COUPLING DETAIL

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY FOR TRAFFIC SIGNAL SUPPORT STRUCTURES

MAST-ARM CONNECTIONS

MA-C(ILSN)-12

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CONT	SECT	JOB	HIGHWAY
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DIST	COUNTY	SHEET NO.
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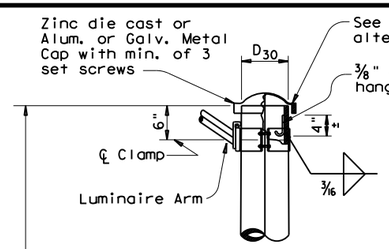
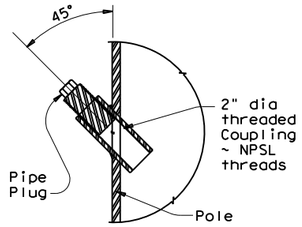
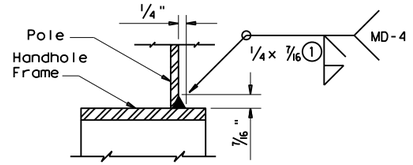


DETAIL A

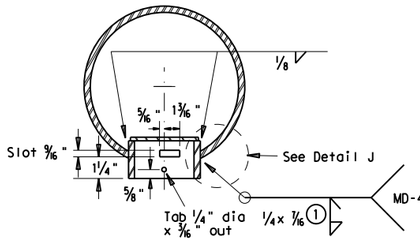
(for pole with luminaire)



POLE COUPLING DETAIL

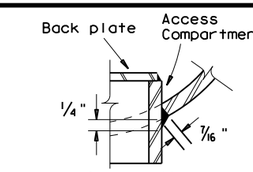


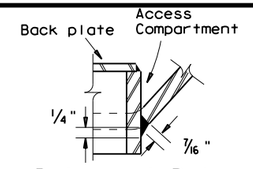
DETAIL G



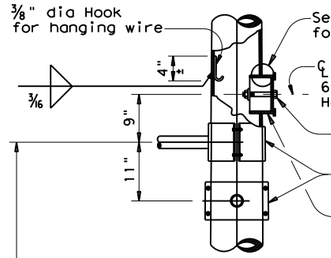
SECTION X-X

Opening for access compartment shall be no more than 1/16 inch wider than the access compartment itself.



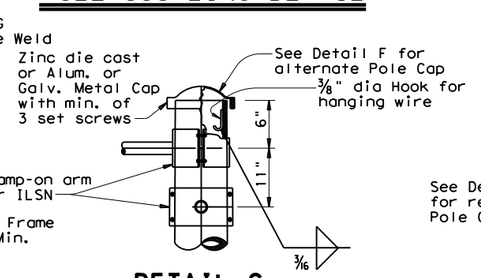


DETAIL J

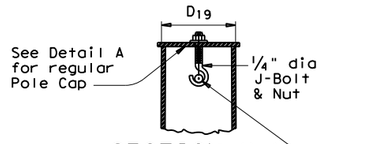


DETAIL B

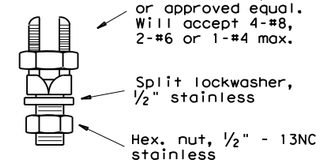
(If ILSN applied)



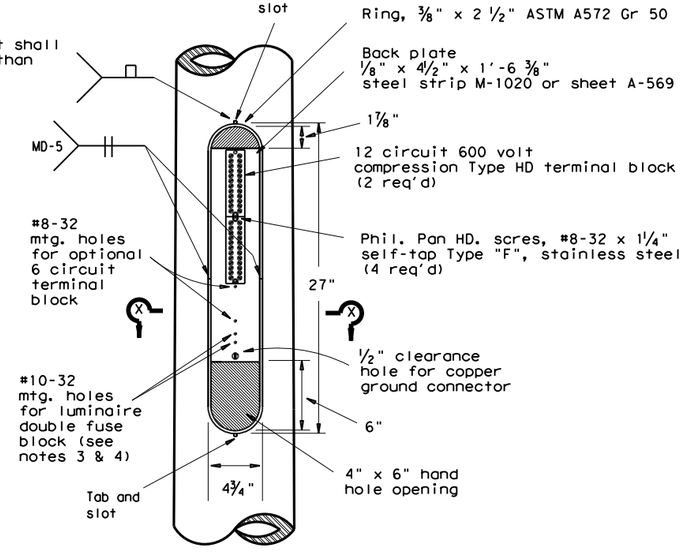
DETAIL C



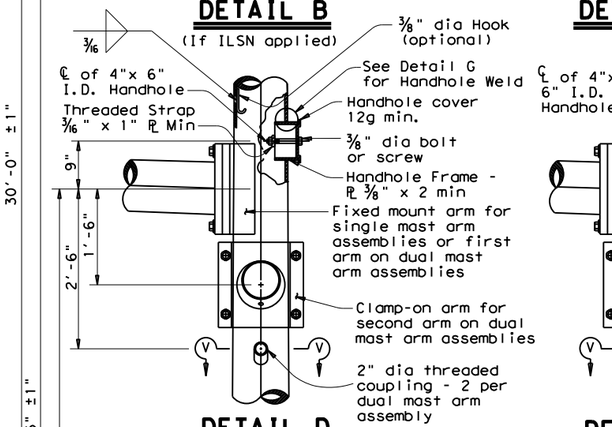
SECTION Y-Y



COPPER GROUND CONNECTOR

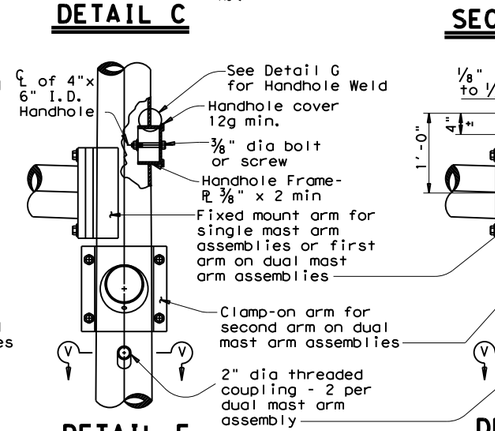


ACCESS COMPARTMENT



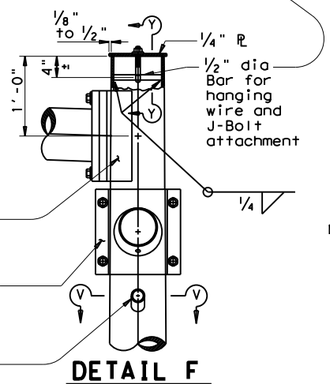
DETAIL D

(for 30' pole with luminaire and ILSN sign)



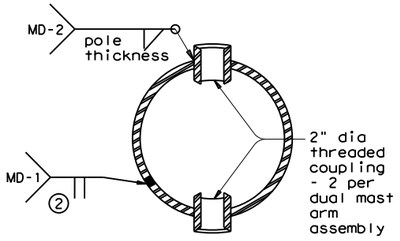
DETAIL E

(for 24' pole with ILSN sign and no luminaire)



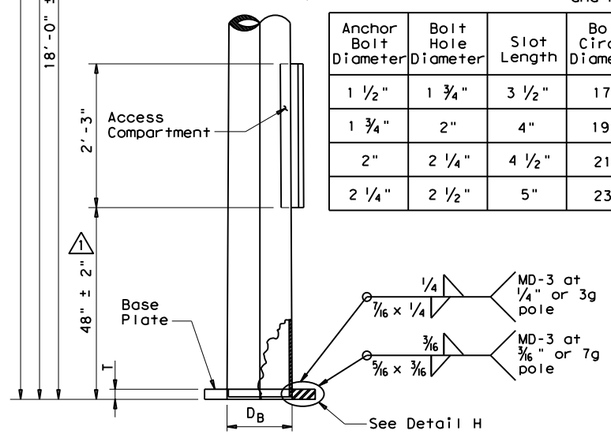
DETAIL F

(for 19' pole with no ILSN sign and no luminaire)

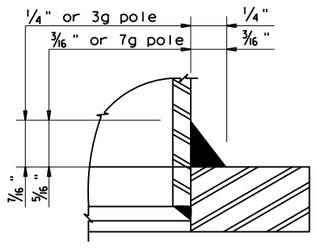


SECTION V-V

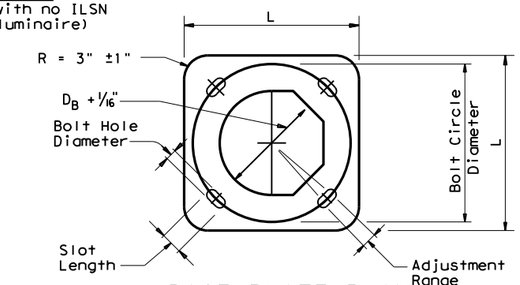
Anchor Bolt Diameter	Bolt Hole Diameter	Slot Length	Bolt Circle Diameter	Base PL Dim. L x T	Adjust. Range
1 1/2"	1 3/4"	3 1/2"	17"	18" x 1 1/2"	13.4°
1 3/4"	2"	4"	19"	20" x 1 3/4"	13.5°
2"	2 1/4"	4 1/2"	21"	22" x 2"	13.6°
2 1/4"	2 1/2"	5"	23"	24" x 2 1/4"	13.7°



POLE ELEVATION



DETAIL H



BASE PLATE PLAN

(1) 85% Min. penetration

(2) 60% Min. penetration 100% pemetration within 6" of circumferential base welds.

(1) REVISED THE ELEVATION OF ACCESS COMPARTMENT (2/12).

NOTES:

1. The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4-20 stainless flat socket head screws with tamper proof feature.
2. The pole manufacturer shall provide with each pole a separate kit consisting of: one cover with two latching assemblies, two terminal strips (Marathon #985GP12CU or approved equal), four #8-32 x 1 1/4" self tapping type "F" stainless steel pan head screws, and one ground connector (Blackburn TTC, Burndy KC22J12T13, or Ilsco SSS-5). The traffic signal contractor shall install the kit items in the field.
3. The screw hole spacing on the enclosure back plate shall be for two Marathon #985GP12 terminal strips, one Marathon #985GP06CU terminal strip, and one Bussmann #BM6032B fuse block.
4. Install one Bussmann #BM6032B, Littelfuse #L60030M-2C, or Ferraz-Shawmut #30352 fuse block for poles where luminaires are to be installed.

Texas Department of Transportation
DALLAS DISTRICT STANDARD

TRAFFIC SIGNAL SUPPORT STRUCTURES MAST ARM POLE DETAILS

MA-D-12(DAL)

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1-12

CONT	SECT	JOB	HIGHWAY
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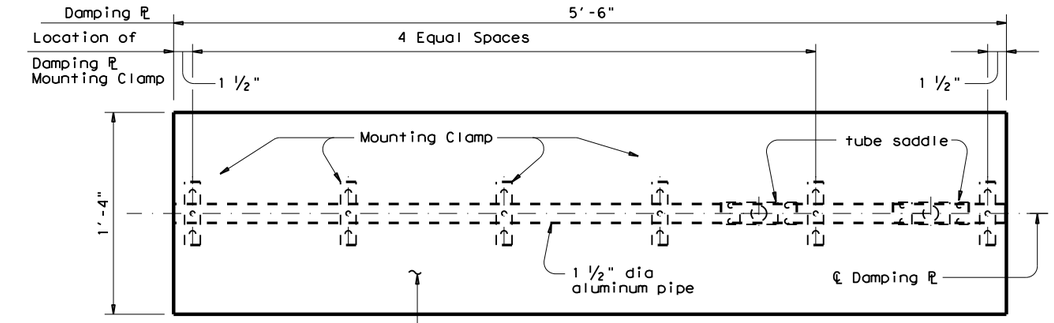
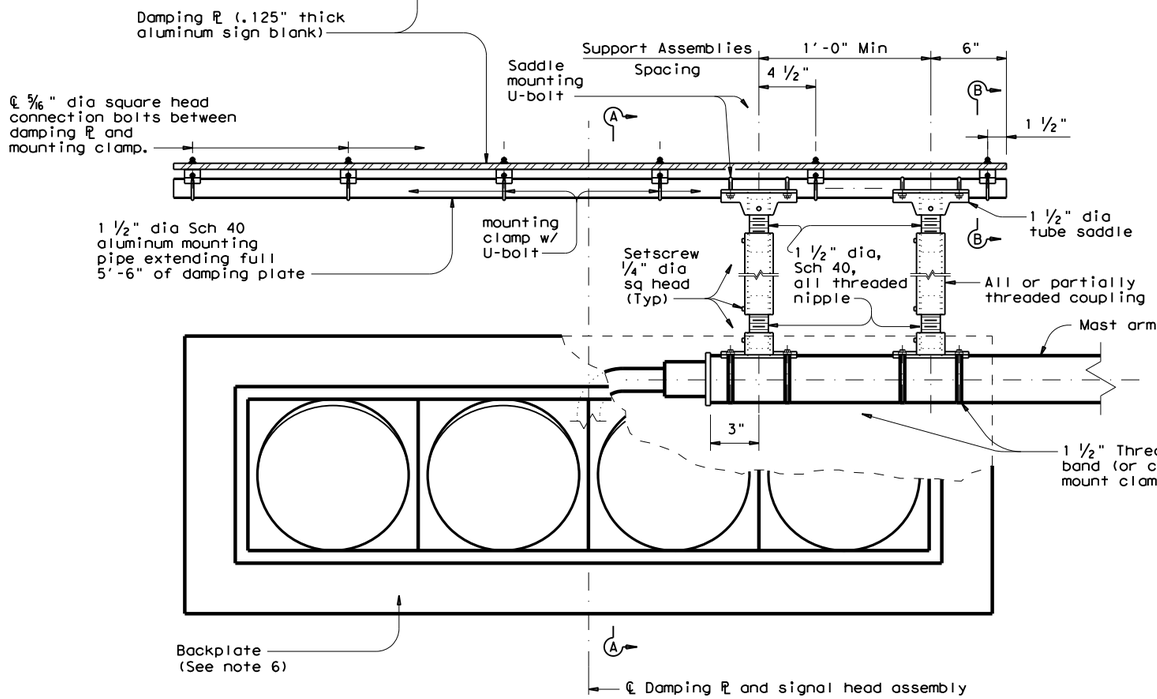


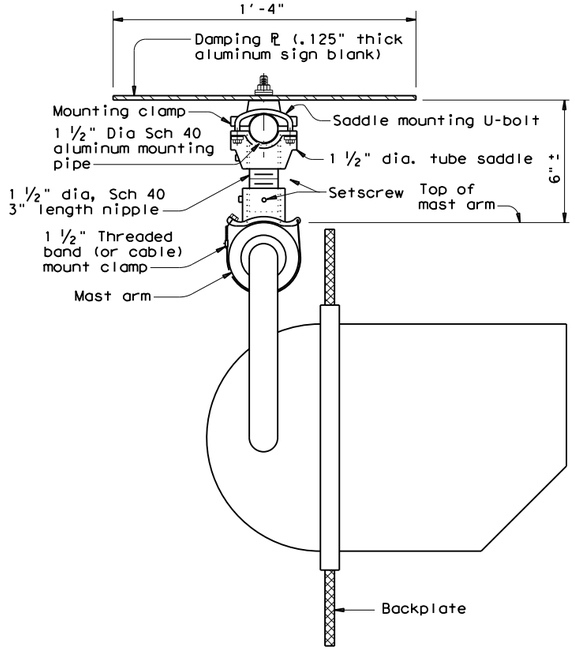
PLAN



ELEVATION

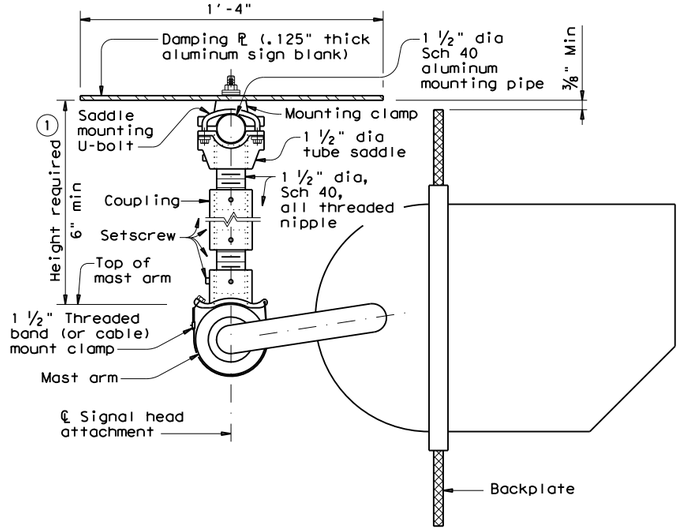
DAMPING PLATE MOUNTING DETAILS

(Showing alternate placement of signal head)



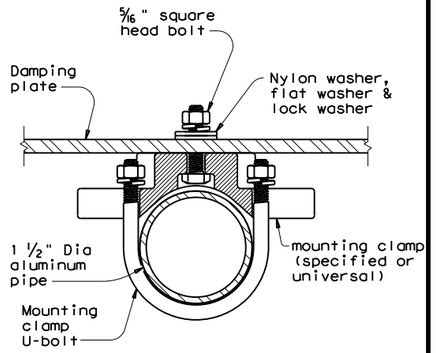
SECTION A-A

(Showing standard placement of signal head)
(Mounting clamp U-bolt is not shown for clarity)



SECTION A-A

(Showing alternate placement of signal head)
(Mounting clamp U-bolt is not shown for clarity)



SECTION B-B

(Showing damping plate attachment)

① Recommended supporting assemblies to achieve required height for horizontal section heads

Height required	One nipple each length	Two nipples each length plus	One coupling each length
6"-6 ¾"	3"	-	-
7"-8 ½"	4"	-	-
9"-10 ½"	6"	-	-
11"-15 ½"	-	4"	5"
16"-24"	-	6"	10"

GENERAL NOTES:

1. In accordance with the findings of TxDOT sponsored research, the installation of a damping plate in accordance with the details shown here at the end of signal mast arms of SMA and DMA standard structures reduces excessive harmonic vertical vibration, and thus fatigue damage. Any deviation from these details may reduce the effectiveness of this damping device.
2. Aluminum sign blank for damping plate will conform to Departmental Material Specifications DMS-7110. Materials for mast arm mounting clamp and tube saddle will be aluminum castings or aluminum alloys as in accordance with manufacturers' stipulations. Mounting pipe, pipe nipple and coupling will be aluminum alloy 6061-T6 or 6063-T6. Damping plate mounting clamp and u-bolt assemblies will conform to Standard sheet SMD(GEN). U-bolts for saddle mounting will have a minimum yield strength of 36 ksi.
3. Damping plate will be mounted horizontally. Position centerline of damping plate to align with centerline of mast arm or horizontal signal head assembly. Vertical clearance between signal head (with or without backing plate) and bottom of damping plate will be maintained as shown. The attachments shown here are examples only, other supporting details which meet both alignment and vertical clearance requirements are also acceptable.
4. Unless stipulated by the manufacturers, all steel parts will be galvanized finish in accordance with Standard Specification Item 445, "Galvanizing".
5. Contractor will verify applicable field dimensions before the installation.
6. Backplates are optional for traffic signals. When backplates are used, Backplates will have a 2-inch fluorescent yellow AASHTO Type B_{FL} or C_{FL} retroreflective border conforming to TxDOT DMS-8300 "Sign Face Materials." See Sheet TS-BP-20 for backplate details.

Texas Department of Transportation

Traffic Safety Division Standard

MAST ARM DAMPING PLATE DETAILS

MA-DPD-20

FILE: ma-dpd-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0387	05	028, ETC.	FM 982, ETC.
6-20	DIST	COUNTY		SHEET NO.
	18	COLLIN, ETC.		89

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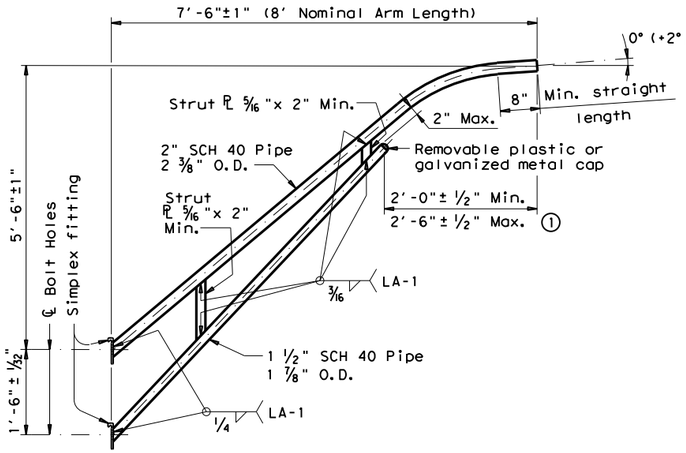
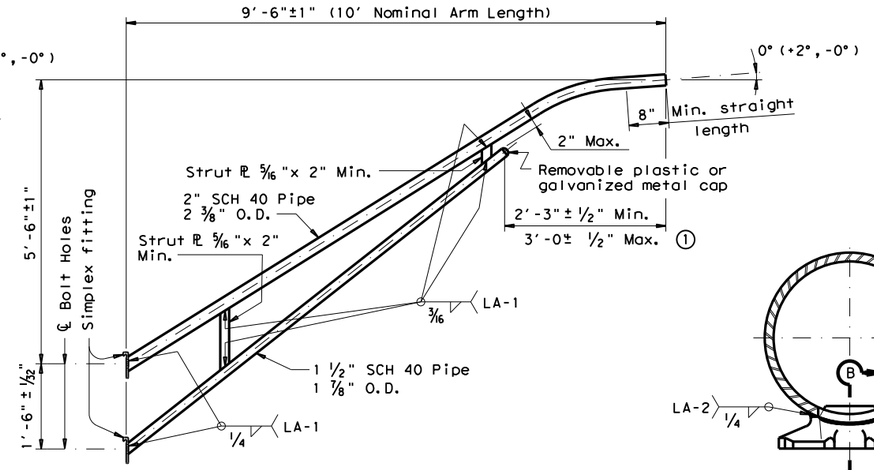


8-FOOT LUMINAIRE ARM



10-FOOT LUMINAIRE ARM

DIRECT ATTACHMENT DETAIL

MATERIALS	
Pole or Arm Simplex	ASTM A27 Gr.65-35 or A148 Gr.80-50, A576 Gr.1021 (3), or A36 (Arm only)
Arm Pipes	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50 (4), or A1011 HSLAS-F Gr.50 (4)
Arm Strut Plates (2)	ASTM A36, A572 Gr.50 (4), or A588
Misc.	ASTM designations as noted

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

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

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

(4) ASTM A572, A1008 HSLAS-F, and A1011 HSLAS-F may have higher yield strengths but shall not have less elongation than the grade indicated.

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions thereto. Design Wind Speed equals 90 mph plus a 1.3 gust factor. Arms are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq. ft.

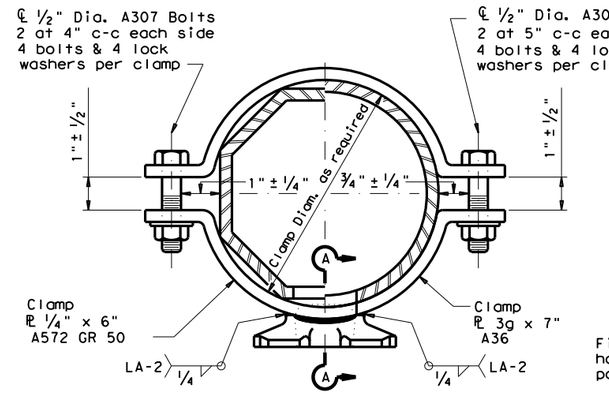
Materials and fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absense of specified Fabricaton tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.

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

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

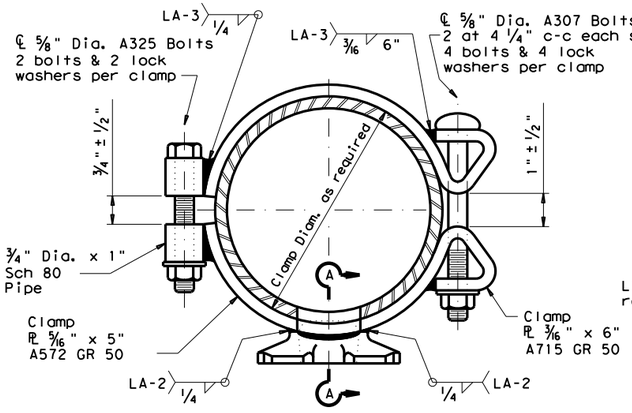
Each pole simplex fitting shall be supplied with 2 ASTM A325 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans. When clamp attachment is specified, the Fabricator shall ship the clamp assembly securely attached to the pole at the location shown on the plans.

If clamp assemblies are ordered without poles, the Fabricator shall ship one upper and one lower clamp assembly together in a single package, including all nuts and washers required for the clamps and simplex fittings.



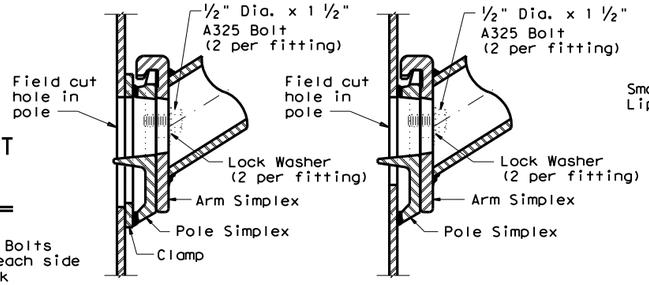
CLAMP ATTACHMENT DETAIL NO. 1 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 2 (HALF SECTION)



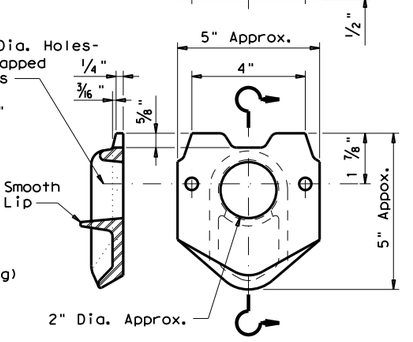
CLAMP ATTACHMENT DETAIL NO. 3 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 4 (HALF SECTION)

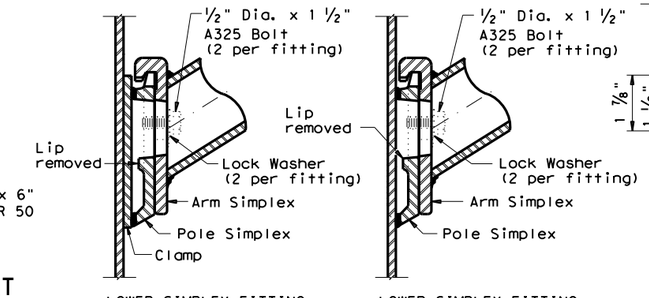


UPPER SIMPLEX FITTING

UPPER SIMPLEX FITTING



POLE SIMPLEX DETAIL

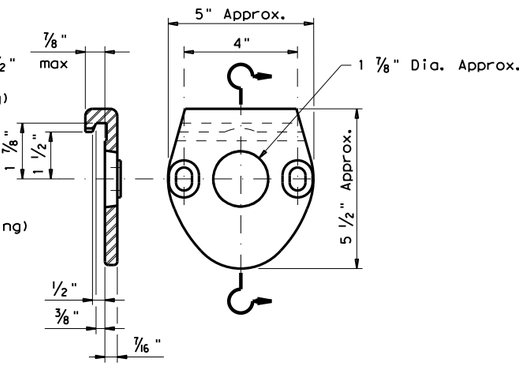


LOWER SIMPLEX FITTING

LOWER SIMPLEX FITTING

SECTON A-A

SECTON B-B



ARM SIMPLEX DETAIL

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY DRAWINGS FOR LUMINAIRE SUPPORT STRUCTURES

ARM DETAILS

LUM-A-12

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DN: LEH	CK: JSY	DW: LTT	CK: TEB

REVISIONS
5-96
1-99
1-12

CONT	SECT	JOB	HIGHWAY
0387	05	028,ETC.	FM 982,ETC.

DIST	COUNTY	SHEET NO.
18	COLLIN,ETC.	90

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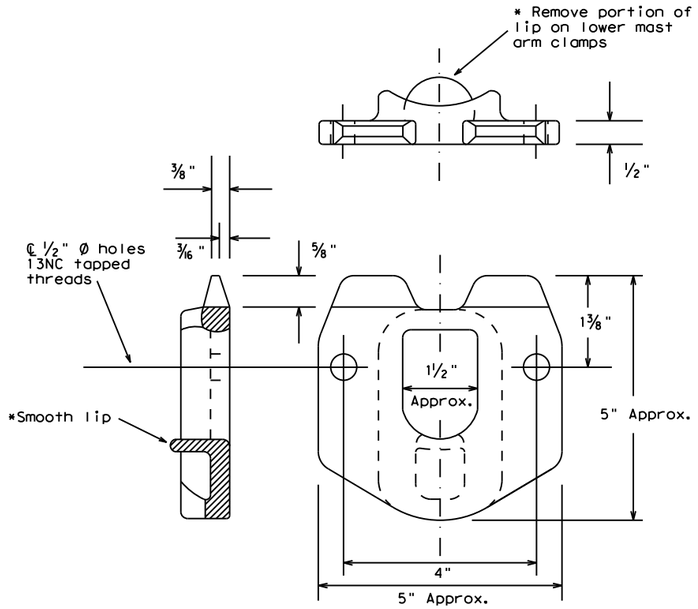
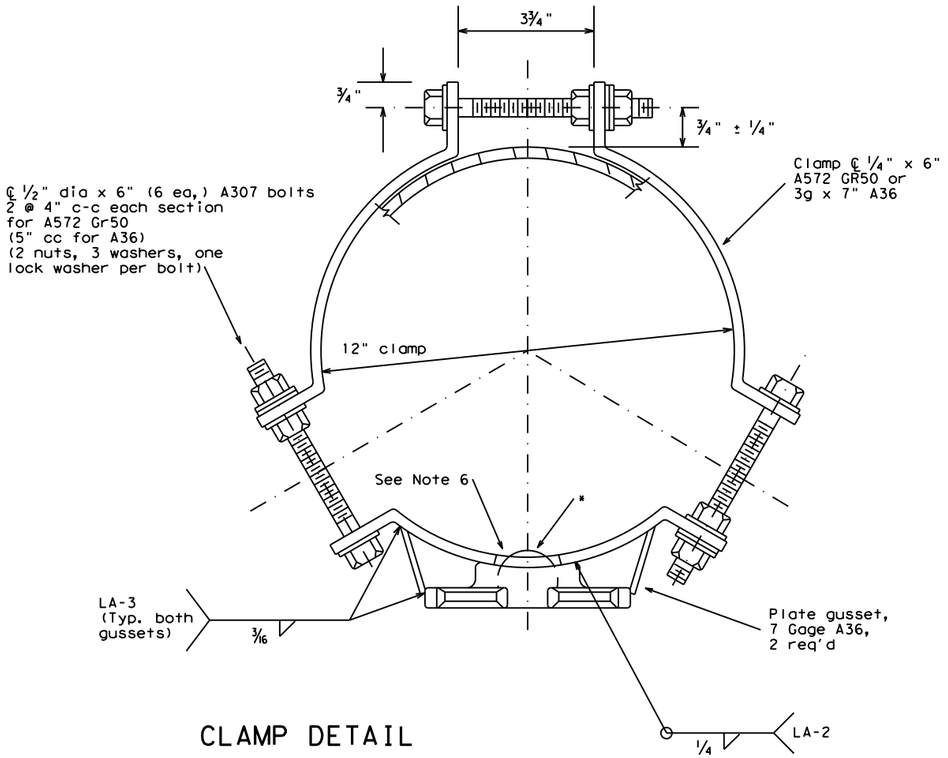


POLE SIMPLEX DETAILS



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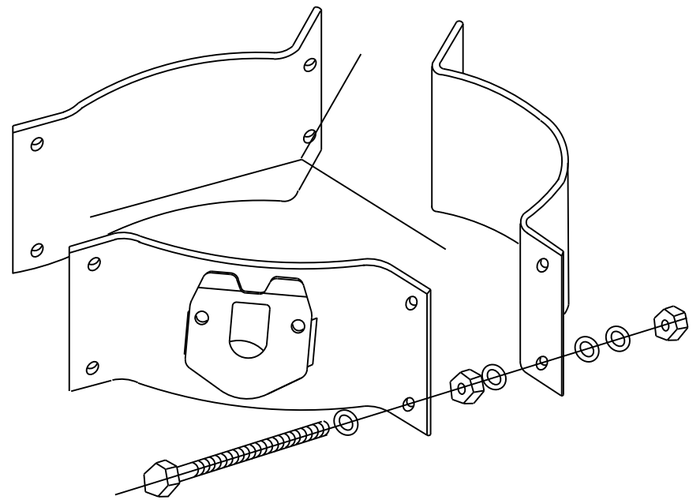

PROJECTION

OTHER MATERIALS:

1. Pole simplex shall be ASTM A27 GR65-35 or A148 GR80-50 or A576 GR1021. ASTM A576 must be suitable for forging and also meet minimum tensile of 65ksi, minimum yield of 35ksi, and a minimum elongation of 22 percent in 2 inches.
2. Welded tabs and backplates shall be ASTM A-36 steel or better.
3. Nylon insert locknuts shall conform to ASTM A563.

GENERAL NOTES:

1. Materials and fabrication shall be in accordance with Standard Sheet "MA-C" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.
2. All parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing". The throat of the Simplex shall be made free of all rough or sharp edges resulting from the galvanizing process.
3. Each simplex fitting shall be supplied with 2 ASTM A325 bolts, ½in. X 1½in. and 2 lock washers. The bolts and lock washers shall be secured to the clamp with the other hardware items. The Fabricator shall ship clamp assembly together in a single package, including all bolts, nuts, and washers required for the clamp and simplex fitting.
4. Design conforms to 1994 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals" and interim revisions thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor. Clamps are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq.ft.,12 ft. maximum arm length.
5. Each assembly shall consist of one upper piece simplex fitting having a smooth lip and one lower piece simplex fitting with the lip removed.
6. Approximately 2 in. diameter hole in upper mast arm clamp.

For 8.9 - 12 inch diameter Signal Poles
(Two req'd for each mast arm)

Texas Department of Transportation
Traffic Operations Division

CLAMP ON FITTING ASSEMBLY FOR LUMINAIRE MAST ARM

CFA-12

© TxDOT	DN: KAB	CK: RES	DW: FDN	CK: CAL
REVISIONS	CONT	SECT	JOB	HIGHWAY
11-99	0387	05	028,ETC.	FM 982,ETC.
1-12	DIST	COUNTY		SHEET NO.
	18	COLLIN,ETC.		91

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FOUNDATION DESIGN TABLE

FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		EMBEDDED DRILLED SHAFT LENGTH-ft ④, ⑤, ⑥			ANCHOR BOLT DESIGN ①				FOUNDATION DESIGN LOAD ②		TYPICAL APPLICATION
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft	SHEAR Kips	
				10	15	40							
24-A	24"	4- #5	#2 at 12"	5.7	5.3	4.5	¾"	36	12 ¾"	1	10	1	Pedestal pole, pedestal mounted controller.
30-A	30"	8- #9	#3 at 6"	11.3	10.3	8.0	1 ½"	55	17"	2	87	3	Mast arm assembly. (see Selection Table)
36-A	36"	10- #9	#3 at 6"	13.2	12.0	9.4	1 ¾"	55	19"	2	131	5	Mast arm assembly. (see Selection Table) 30' strain pole with or without luminaire.
36-B	36"	12- #9	#3 at 6"	15.2	13.6	10.4	2"	55	21"	2	190	7	Mast arm assembly. (see Selection Table) Strain pole taller than 30' & strain pole with mast arm
42-A	42"	14- #9	#3 at 6"	17.4	15.6	11.9	2 ¼"	55	23"	2	271	9	Mast arm assembly. (see Selection Table)

NOTES:

① Anchor bolt design develops the foundation capacity given under Foundation Design Loads.

② Foundation Design Loads are the allowable moments and shears at the base of the structure.

③ Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.

④ Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.

⑤ If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.

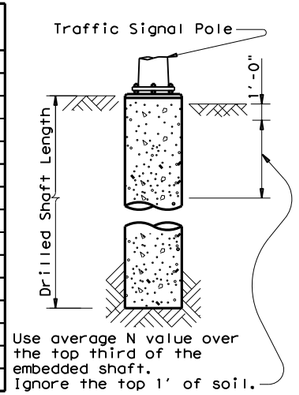
⑥ Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

FOUNDATION SUMMARY TABLE ③

LOCATION IDENTIFICATION	AVG. N BLOW /ft.	FDN TYPE	NO. EA	DRILLED SHAFT LENGTH ⑥ (FEET)				
				24-A	30-A	36-A	36-B	42-A
FM 928 AT FM 546	10	36-B	1				15	
	10	36-B	1				15	
	10	36-B	1				15	
	10	36-B	1				15	
FM 720 AT MARTINGALE TRAIL	10	30-A	1		11			
	10	30-A	1		11			
	10	24-A	1	6				
	10	24-A	1	6				
FM 407 AT IT NEELY RD	10	36-A	1			13		
	10	36-A	1			13		
	10	36-A	1			15		
FM 407 AT RAYZOR RD	10	36-A	1			13		
	10	36-A	1			13		
	10	36-A	1			13		
	10	24-A	1	6				
FM 407 AT VICKERY BLVD	10	30-A	1		11			
	10	36-A	1			13		
	10	30-A	1		11			
	10	24-A	1	6				
	10	24-A	1	6				
FM 156 AT DOUBLE EAGLE	10	36-A	1			13		
	10	24-A	1	6				
TOTAL DRILLED SHAFT LENGTHS				60	44	106	60	

FOUNDATION SELECTION TABLE FOR STANDARD MAST ARM PLUS ILSN SUPPORT ASSEMBLIES (ft)

		FDN 30-A	FDN 36-A	FDN 36-B	FDN 42-A
80 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH	32'	48'		
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	24' X 24'			
		28' X 28'			
		32' X 28'	32' X 32'		
			36' X 36'		
			40' X 36'		
			44' X 28'	44' X 36'	
100 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH		36'	44'	
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS		24' X 24'		
			28' X 28'		
			32' X 24'	32' X 32'	
				36' X 36'	
				40' x24'	40' X 36'
					44' x 36'

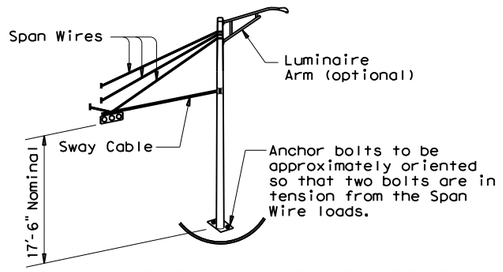


ANCHOR BOLT & TEMPLATE SIZES

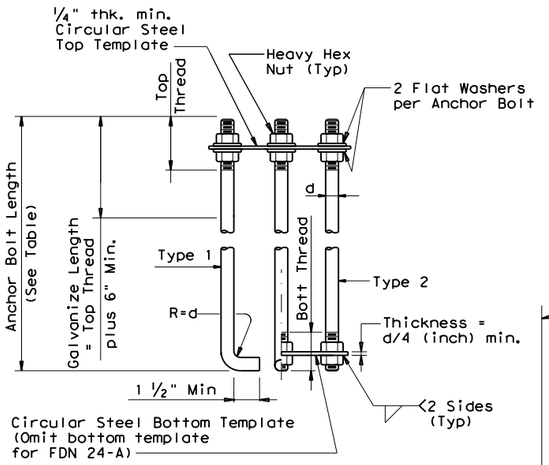
BOLT DIA IN.	⑦ BOLT LENGTH	TOP THREAD	BOTTOM THREAD	BOLT CIRCLE	R2	R1
¾"	1'-6"	3"	—	12 ¾"	7 ⅛"	5 ⅝"
1 ½"	3'-4"	6"	4"	17"	10"	7"
1 ¾"	3'-10"	7"	4 ½"	19"	11 ¼"	7 ¾"
2"	4'-3"	8"	5"	21"	12 ½"	8 ½"
2 ¼"	4'-9"	9"	5 ½"	23"	13 ¾"	9 ¼"

⑦ Min dimensions given, longer bolts are acceptable.

EXAMPLE:
1. For 80mph design wind speed, foundation 30-A can support up to a 32' arm with another arm up to 28'
2. For 100mph design wind speed, foundation 36-A can support a single 36' mast arm.



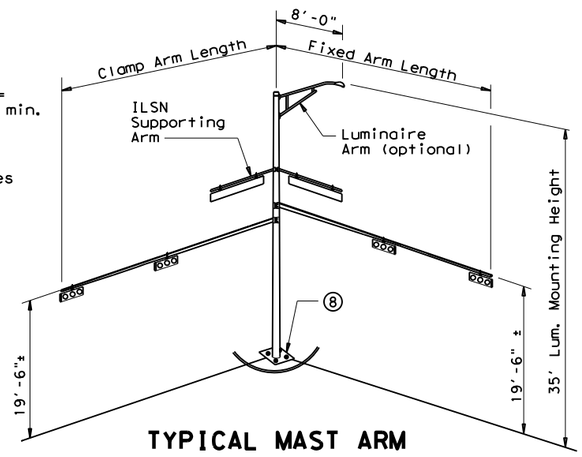
TYPICAL STRAIN POLE ASSEMBLY



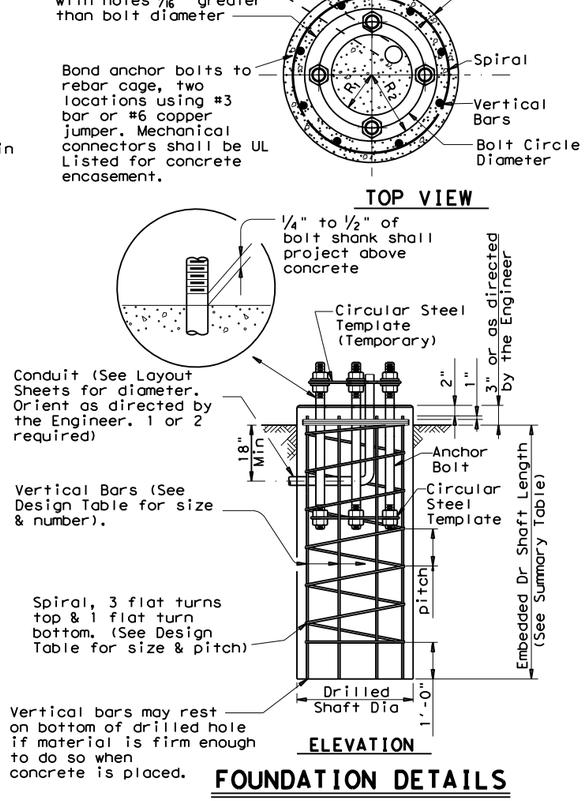
HOOKED ANCHOR (TYPE 1) NUT ANCHOR (TYPE 2)

ANCHOR BOLT ASSEMBLY

⑧ Orient anchor bolts orthogonal with the fixed arm direction to ensure that two bolts are in tension under dead load.



TYPICAL MAST ARM ASSEMBLY



FOUNDATION DETAILS

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and interim revisions thereto.

Reinforcing steel shall conform to Item 440, "Reinforcing Steel".

Concrete shall be Class "C".

Threads for anchor bolts and nuts shall be rolled or cut threads of 8UN series up to 2" in diameter or UNC series for all sizes. Bolts and nuts shall have Class 2A and 2B fit tolerances. Galvanized nuts shall be tapped after galvanizing.

Anchor bolts that are larger than 1" in diameter shall conform to "alloy steel" or "medium-strength mild steel" per Item 449, "Anchor Bolts". Anchor bolts that are 1" in diameter or less shall conform to ASTM A36. Galvanize a minimum of the top end thread length plus 6" for all anchor bolts unless otherwise noted. Exposed washers and exposed nuts shall be galvanized. All galvanizing shall be in accordance with Item 445, "Galvanizing".

Templates and embedded nuts need not be galvanized. Lubricate and tighten anchor bolts when erecting the structure in accordance with Item 449, "Anchor Bolts".

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL POLE FOUNDATION

TS-FD-12

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REVISIONS	DN: MS	CK: JSY	DW: MAO/MMF	CK: JSY/TEB
5-96 11-99 1-12	CONT	SECT	JOB	HIGHWAY
	0387	05	028,ETC.	FM 982,ETC.
	DIST	COUNTY		SHEET NO.
	18	COLLIN,ETC.		92

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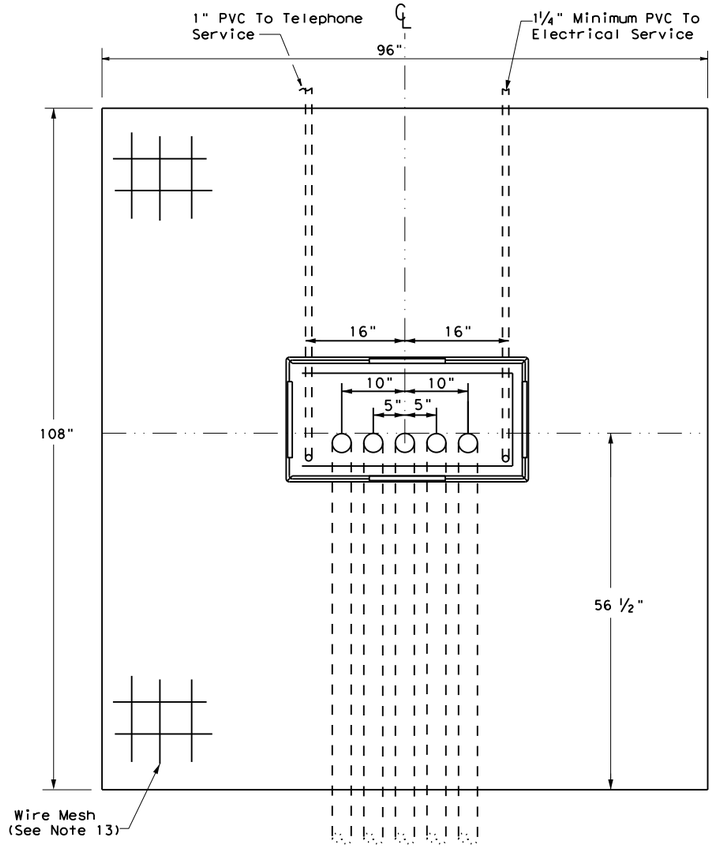
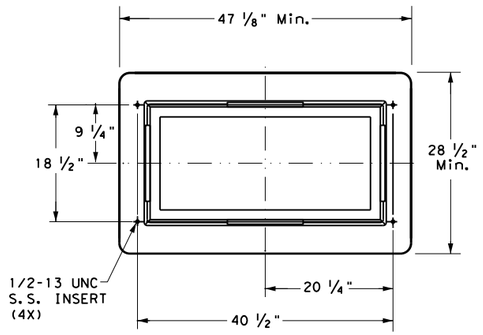
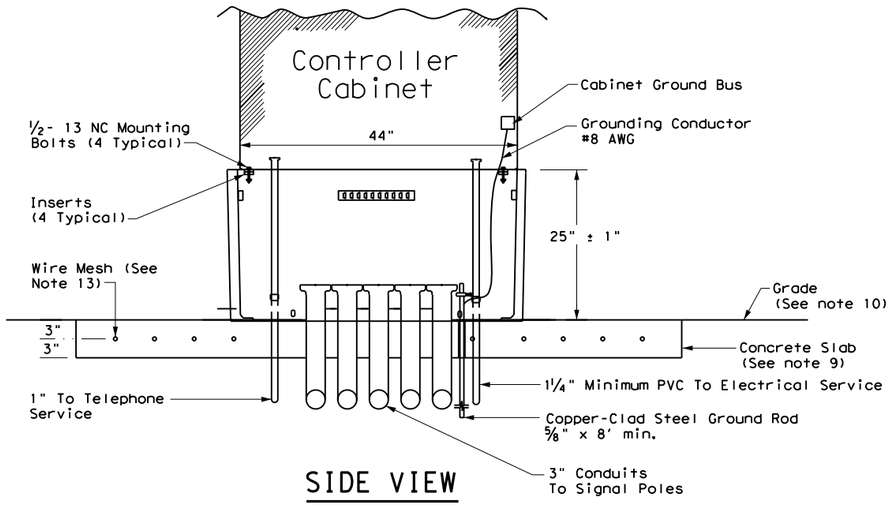


TOP VIEW



CABINET BASE



SIDE VIEW

TRAFFIC SIGNAL CONTROLLER BASE:

1. Provide a traffic signal controller base (cabinet base) manufactured of polymer concrete material consisting of calcareous and siliceous stone; glass fibers and thermoset polyester resin. The polymer concrete cabinet base must be reinforced on the inside of the cabinet base with fiberglass matting. Provide one of the following bases: Armorcast Part # A6001848X24, Quazite Model # PG3048Z709, or other as approved by TxDOT Traffic Safety Division.
2. The polymer concrete material must have a minimum compressive strength of 10,300 pounds per square inch (psi), minimum flexural strength of 3600 psi, and minimum shear strength of 3600 psi.
3. The polymer concrete cabinet base must conform to the dimensions shown and must accommodate a standard TxDOT basemount cabinet.
4. Supply the cabinet base with four 1#2"-13 UNC stainless steel inserts for attachment of the cabinet to the base. Inserts must withstand a minimum torque of 50 ft-lb and a minimum straight pull out strength of 750 lbs.
5. Provide the cabinet base with 4 cable racks mounted one on each side of the base 2" to 7 " from the top edge of the base. Unless approved otherwise, cable racks must be 1-1/2 x 9#16x 3#16inch steel channel with eight T-slots spaced at 1-1/2 inches. The cable racks must easily accommodate the insertion of tie wraps to attach field wiring to the racks to serve as strain relief. Secure cable racks to the base using 1#2"-13 UNC stainless steel screws and inserts.
6. The cabinet base, when secured to the concrete slab with controller cabinet attached, must withstand a minimum wind load of 125 mph or a 850 lb force applied at 49" above the bottom of the base without causing the base or cabinet to come out of their anchored position or cause any permanent deformation. The manufacturer must supply certification by an independent testing laboratory or sealed by a Texas Licensed Professional Engineer. Provide the cabinet base with hardware for attachment to a concrete slab.
7. The traffic signal base must be permanently marked either by impress or by permanent ink with the manufacturer's model number and name or logo.
8. Seal the base to the concrete with a silicone caulk bead and fastened to the slab per manufacturer's instructions.

CONCRETE SLAB:

9. Traffic signal controller pad must be a portland cement concrete slab poured in place, must conform to the dimensions shown, and must be level.
10. Grade earthwork such that it is flush with the concrete pad on all four sides, unless otherwise shown on the plans. Subsidiary to ITEM 680, four inch rip rap may be used in lieu of earthwork. Slopes shall gradually contour to match plans.
11. Bond a #8 AWG copper ground wire and an 8 ft ground rod bonded to the reinforcing mesh by a suitable UL Listed clamp and terminated to the cabinet grounding bus for the purpose of providing a local ground for the electrical grounding conductor. The electrical grounding conductor specified in Item 680-3.A.4 is required and must be terminated to the cabinet ground bus.
12. Install a PVC sleeve to prevent the ground rod from direct embedment in the slab.
13. Provide welded wire mesh 6X6-W2.9 X W2.9 for reinforcement. Provide joints and splices in the mesh with a minimum 6-inch overlap. Center the mesh between top and bottom and provide a minimum 3 inch cover on the edges.
14. Provide Class B concrete minimum for the slab in accordance with Item 421. Construct the slab in accordance with Item 531.

CONDUITS:

15. Stub up and run 3-inch conduits through the slab to the various traffic signal poles and ground boxes as shown on the layouts. Install the number of conduits as shown on layouts plus two additional 3 inch conduits for future use. Terminate the conduits with a bushing between 2 and 4-inches above the slab.
16. Extend conduits for future use at least 18-inches from the edge of the slab, terminate underground with a coupling, and cap and seal so that the seal can be removed without damaging the coupling. This must also apply to unused telephone conduit.
17. Stub up two separate conduits through the slab from the electrical and telephone services. Run the conduit for the electrical feed directly to the electrical service enclosure. Run the conduit for the telephone line directly to the telephone service, usually located on the same pole as the electrical service. Telephone must not under any circumstance share a conduit with any other function.
18. Terminate electric and telephone conduits above the slab with a coupling. After the base is installed, extend the conduits above the top of the base and secure to the base using a steel one-hole strap or similar suitable substitute.

CONTROLLER CABINET:

19. Anchor the controller cabinet to the base using four stainless steel 1/2-13 NC bolts.
20. The silicone caulk bead specified in Item 680.3.B must be RTV 133.

PAYMENT:

21. Bid TS-CF as subsidiary to Item 680.

Texas Department of Transportation

Traffic Safety Division Standard

TRAFFIC SIGNAL CONTROLLER CABINET BASE AND PAD
TS-CF-21

FILE: ts-cf-21.dgn	DN:	CK:	DW:	CK:
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REVISIONS 12-04 2-21	0387	05	028,ETC.	FM 982,ETC.
	DIST	COUNTY		SHEET NO.
	18	COLLIN,ETC.		93

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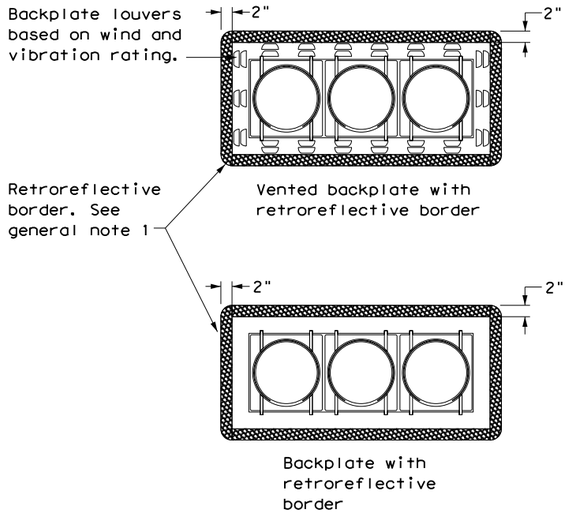
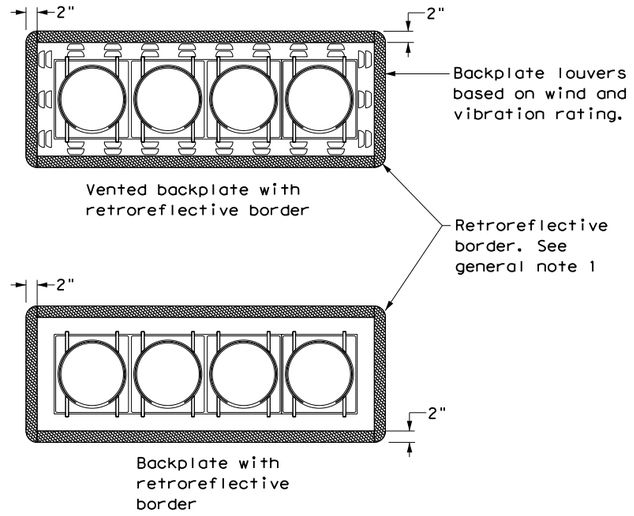
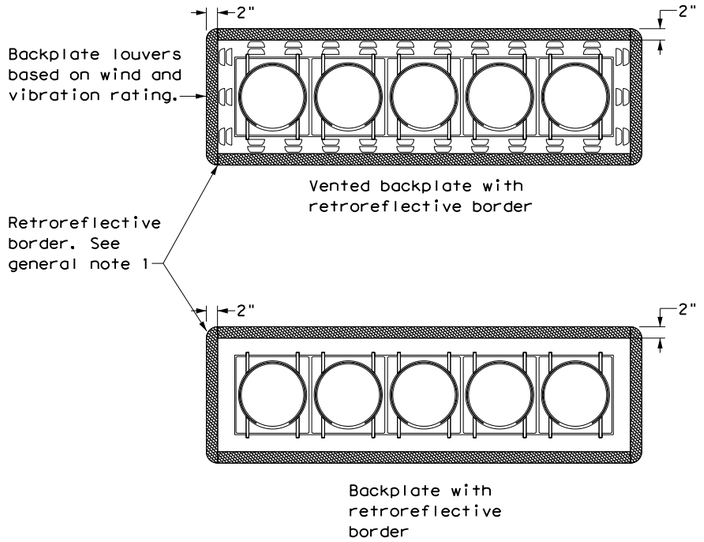


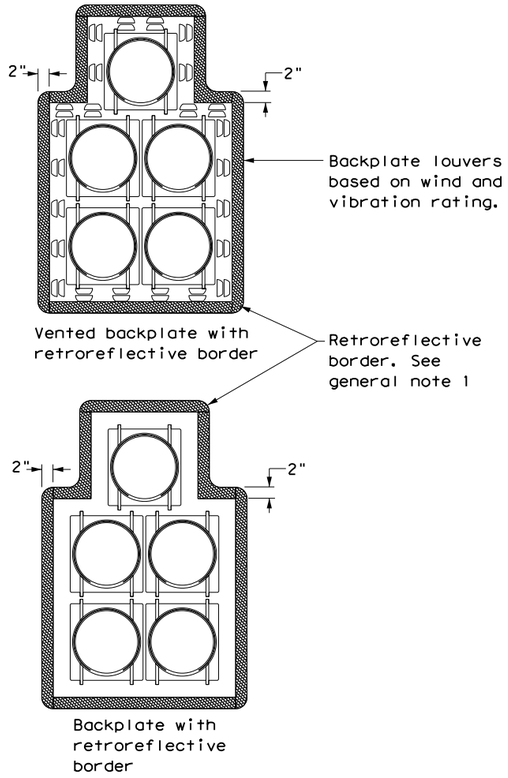
THREE-SECTION HEAD
HORIZONTAL OR VERTICAL



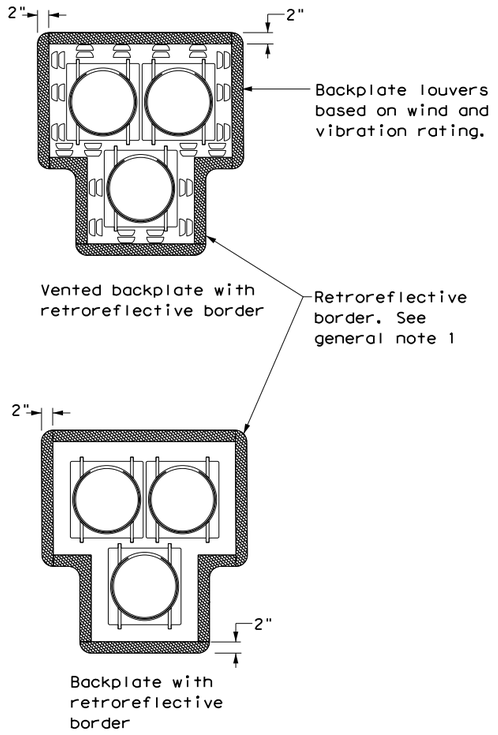
FOUR-SECTION HEAD
HORIZONTAL OR VERTICAL



FIVE-SECTION HEAD
HORIZONTAL OR VERTICAL



FIVE-SECTION HEAD
CLUSTER



PEDESTRIAN HYBRID
BEACON

GENERAL NOTES:

1. Backplates are optional for traffic signals and pedestrian hybrid beacons. When backplates are used, a 2-inch wide fluorescent yellow AASHTO Type B_{FL} or C_{FL} retroreflective border conforming to TxDOT DMS-8300 is required. Place on all approaches when used.
2. Signal head and backplate compatability must be verified by the contractor prior to installation.
3. When using backplates on signal heads, venting is preferred to reduce cyclic vibration stress.
4. When a vented backplate is used, the retroreflective border must not be placed over the louvers.
5. This standard sheet applies to all signal heads with backplates, including but not limited to:
   - Pole mounted
   - Overhead mounted
   - Span wire mounted
   - Mast arm mounted
   - Vertical signal heads
   - Horizontal signal heads
   - Clustered signal heads
   - Pedestrian hybrid beacons

Texas Department of Transportation

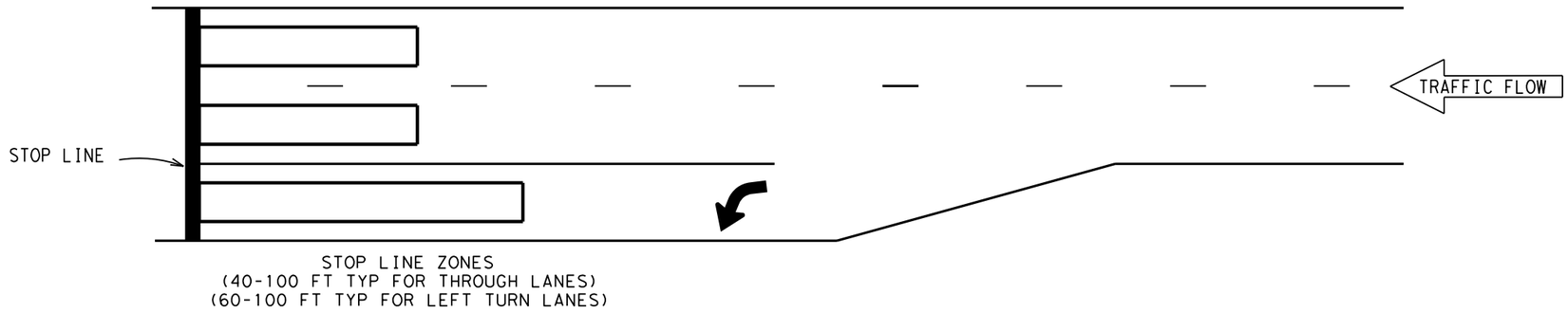
Traffic Safety Division Standard

TRAFFIC SIGNAL HEAD WITH BACKPLATE

TS-BP-20

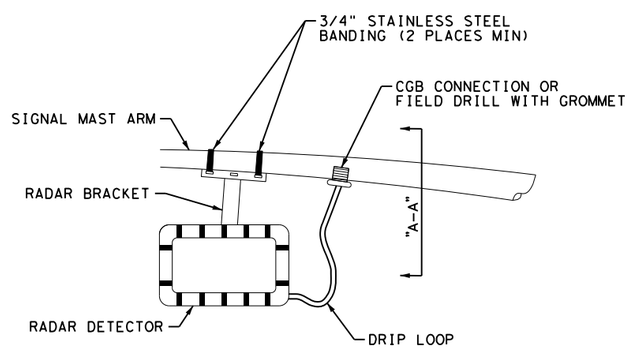
FILE: ts-bp-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT June 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0387	05	028,ETC.	FM 982,ETC.
	DIST	COUNTY		SHEET NO.
	18	COLLIN,ETC.		94

RADAR DETECTION ZONE LOCATIONS

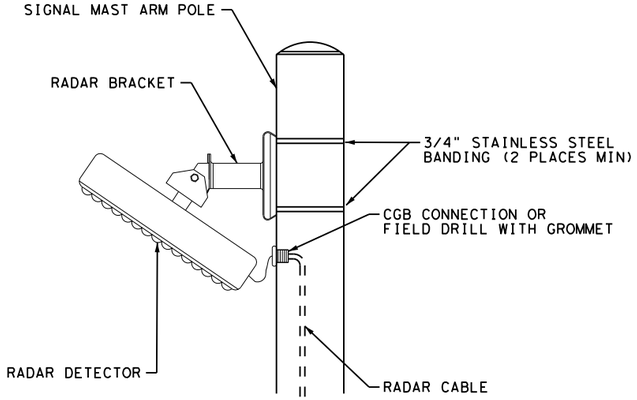


APPROACH SPEED LIMIT (MPH)	MINIMUM RANGE OF ADVANCE DETECTION (LF)
40	355
45	400
50	440
55	490
60	530
65	575
70	620

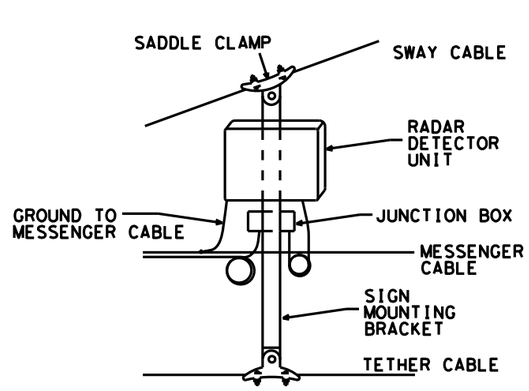
RADAR DETECTION INSTALLATION DETAILS



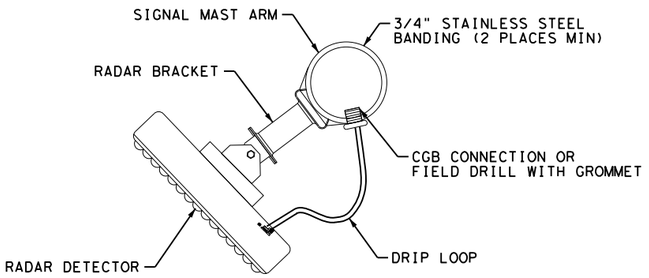
MAST ARM MOUNT



POLE MOUNT



SPAN WIRE MOUNT FOR ADVANCE RADAR



SECTION "A-A"

NOTES:

1. THE RADAR SENSOR MOUNTING BRACKET MUST BE ADJUSTABLE TO TILT UP, DOWN, LEFT, RIGHT, AND TO ROTATE.

2. THE RADAR DETECTOR UNITS SHOWN ARE NOT INTENDED TO REPRESENT ANY SPECIFIC BRAND OR PRODUCT, AND ALTERNATE MOUNTING METHODS MAY BE SUBMITTED FOR APPROVAL.

DALLAS DISTRICT STANDARD

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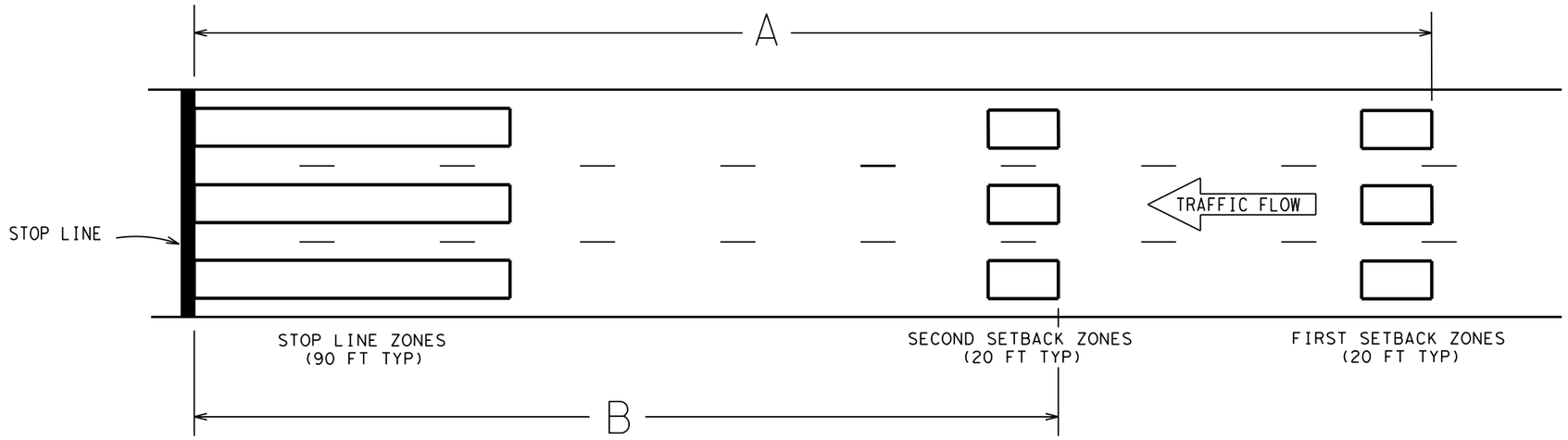
RADAR VEHICLE DETECTION SYSTEM
RVDS-23 (DAL)

©TxDOT May 2018	DN: EF	CK: ---	DW: EF	CK: TRF-Aus.
REVISIONS	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
	6	(SEE TITLE SHEET)		FM 982,ETC.
	STATE	DISTRICT	COUNTY	SHEET NO.
	TEXAS	18	COLLIN ETC.	95
	CONTROL	SECTION	JOB	
	0387	05	028,ETC.	



APPROACH SPEED LIMIT (MPH)	DISTANCE [2] BETWEEN CAMERA AND STOP LINE (FT)	DISTANCE [1] A (FT)	CAMERA HEIGHT (FT)									
			24	28	32	36	40	24	28	32	36	40
			DISTANCE B (FT)					EXTENSION ON 2ND DET. ZONE (SEC.)				
60	80	470	280	295	305	310	315	0.0	0.0	0.0	0.5	0.5
	150	470	270	285	295	300	310	0.0	0.0	0.0	0.0	0.5
55	80	430	255	265	275	280	285	0.0	0.0	0.0	0.5	0.5
	150	430	245	255	265	275	280	0.0	0.0	0.0	0.0	0.5
50	80	390	235	245	250	255	260	0.0	0.0	0.5	0.5	0.5
	150	390	220	230	240	245	250	0.0	0.0	0.0	0.0	0.5
45	80	350	210	215	220	225	230	0.0	0.0	0.5	0.5	0.5
	150	350	190	200	210	215	220	0.0	0.0	0.0	0.0	0.5

1. Distances shown are based on a 20' detection zone and a 1.0 second passage time setting.
2. Distance between the camera and the stop line, as measured parallel to the direction of travel.

DALLAS DISTRICT STANDARD

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VIDEO DETECTION ZONE PLACEMENT

VDZ-04 (DAL)

© TxDOT September 2004 DN: THW CK: CDB DW: BES CK: TRF-Aus.

REVISIONS	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	HIGHWAY NO.
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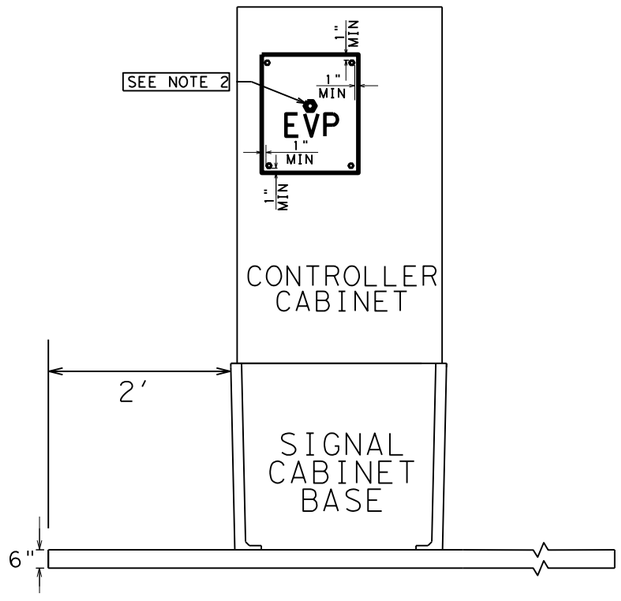
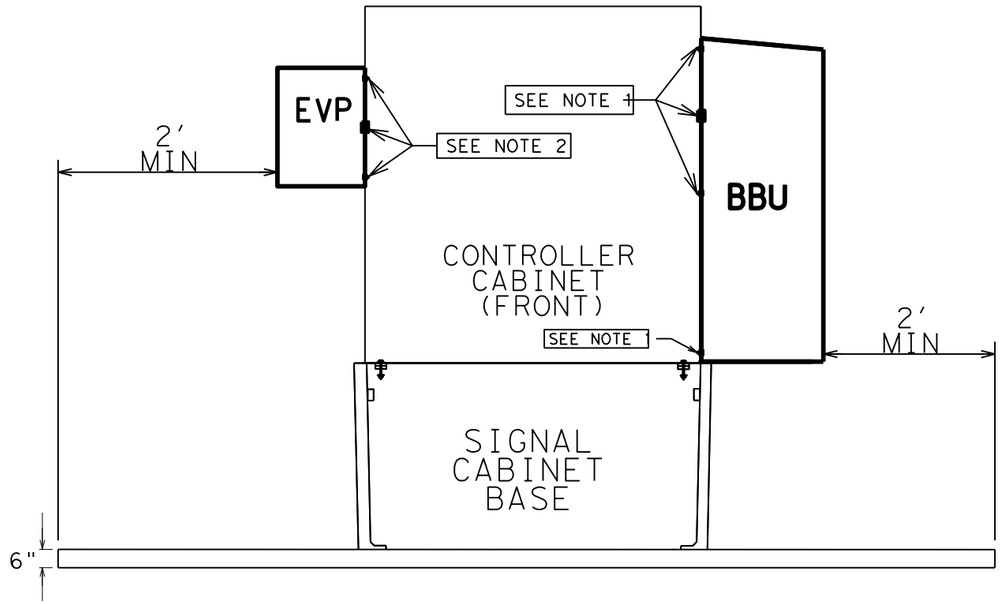
	STATE	DISTRICT / COUNTY	SHEET NO.
	TEXAS	18 / COLLIN, ETC.	96
	CONTROL	SECTION / JOB	
	0387	05 / 028, ETC.	

NOTES:

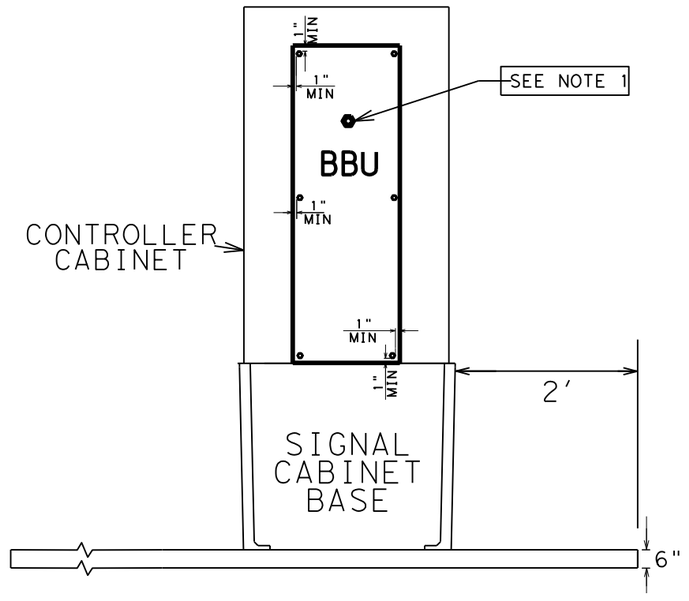
1. INSTALL 1½" ALL THREAD NIPPLE WITH BONDING BUSHINGS ON BOTH ENDS AND 6 EA OF ½" X 1½" 13 UNC MOUNTING BOLTS BETWEEN THE TWO CABINETS (SIGNAL AND BBU).
2. INSTALL 2 " FITTING FOR EVP CABLES/WIRES AND 4 EA OF ½" X 1½" 13 UNC MOUNTING BOLTS BETWEEN THE TWO CABINETS (SIGNAL AND EVP).
3. USE SILICON SEALANT TO SEAL BETWEEN THE CABINETS OF THE CONTROLLER, EVP AND BBU UNIT.
4. THE ABOVE WORK PERFORMED AND MATERIALS FURNISHED WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE SUBSIDIARY TO PERTINENT ITEMS.



SIDE VIEW (EVP)



ELEVATION VIEW

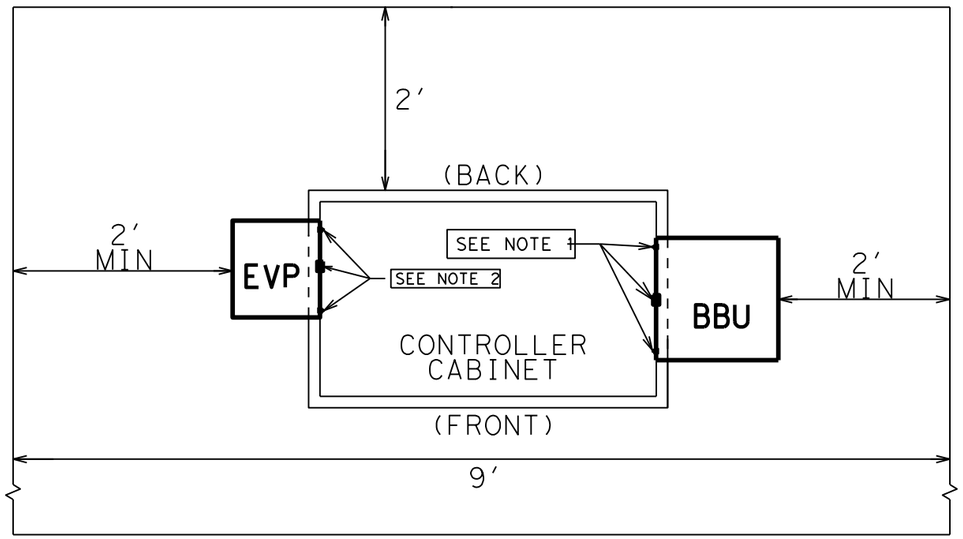


SIDE VIEW (BBU)

REQUIRED CABLE/CONDUCTORS FOR EVP			
QUANTITY EACH	WIRE SIZE	COLOR	FUNCTION
1	#14	BLACK	120 VAC FOR EVP
1	#14	RED	120 VAC FOR FAN & CABINET LIGHT
1	#14	WHITE	AC NEUTRAL
1	#14	GREEN	CHASIS GROUND
1	#18	GRAY	LOGIC GROUND
4	#18	BLUE	PREEMPT COMMANDS
4	-	-	CABLE FROM DETECTOR UNIT

REQUIRED CONDUCTORS FOR BBU			
QUANTITY EACH	WIRE SIZE	COLOR	FUNCTION
1	-	BLACK	120 VAC FROM SERVICE
1	-	WHITE	AC NEUTRAL FROM SERVICE
1	#6	BLACK	120 VAC TO CONTROLLER
1	#6	WHITE	AC NEUTRAL TO CONTROLLER
1	#6	GREEN	GROUND

LEGEND:
EVP-EMERGENCY VEHICLE PREEMPTION CABINET.
BBU-BATTERY BACKUP UNIT.



PLAN VIEW

Texas Department of Transportation
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INSTALLATION OF BBU/EVP

EXTERNAL SIDE MOUNT CABINET INSTALLATION DETAILS

DALLAS DISTRICT STANDARD

N. T. S.

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
6	(SEE TITLE SHEET)		FM 982, ETC.
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	18	COLLIN, ETC.	97
CONTROL	SECTION	JOB	
0387	05	028, ETC.	

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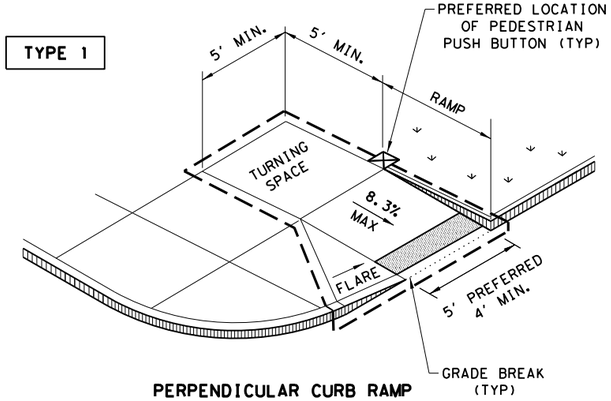
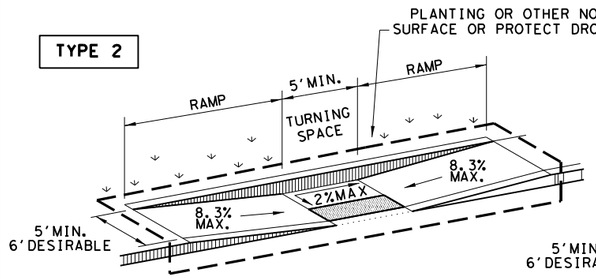
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/038705028/4 - Design/Plan Set/8. Traffic/STANDARDS/098-101 PED-18.dgn

TYPE 1

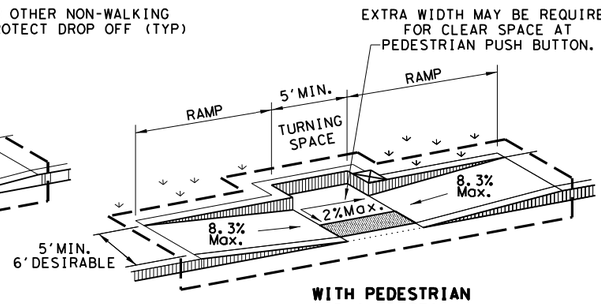


PERPENDICULAR CURB RAMP

TYPE 2



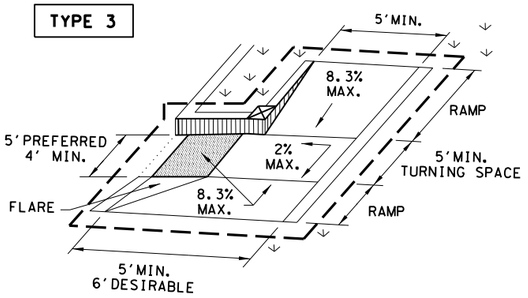
WITHOUT PEDESTRIAN PUSH BUTTON



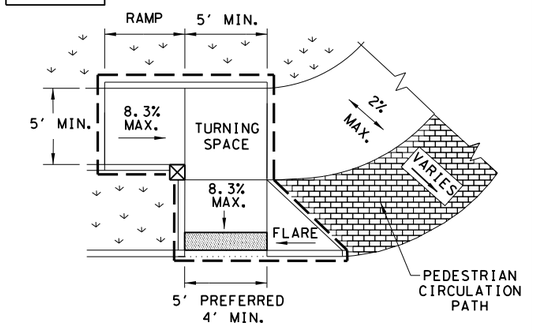
WITH PEDESTRIAN PUSH BUTTON

PARALLEL CURB RAMP

TYPE 3

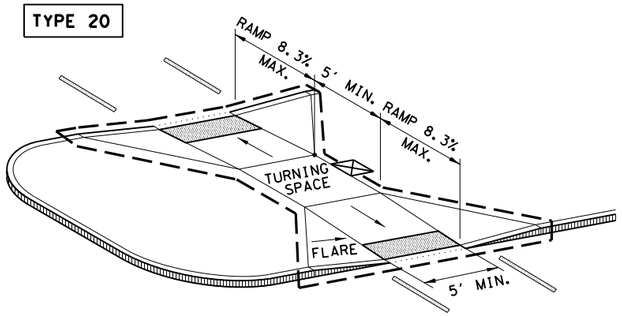


TYPE 6



COMBINATION CURB RAMPS

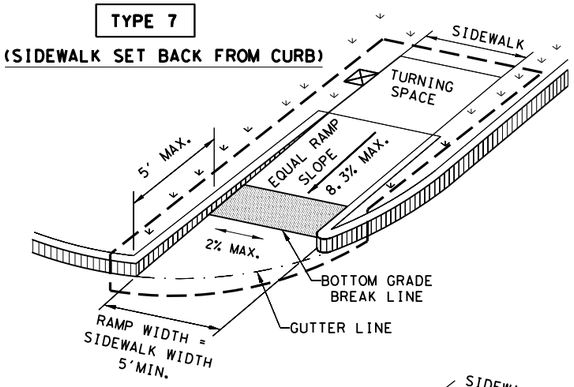
TYPE 20



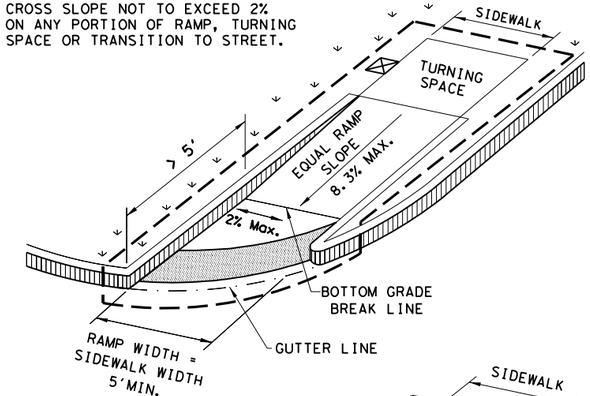
CURB RAMPS AT MEDIAN ISLANDS

TYPE 7

(SIDEWALK SET BACK FROM CURB)

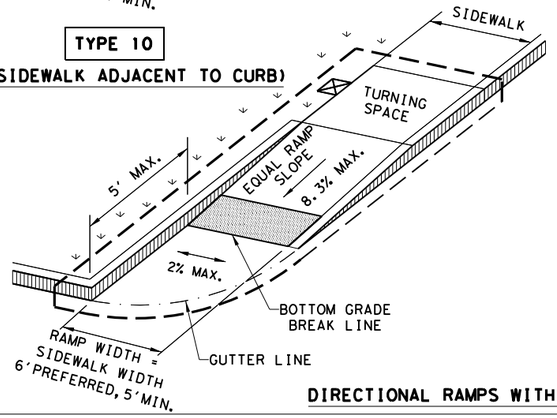


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.

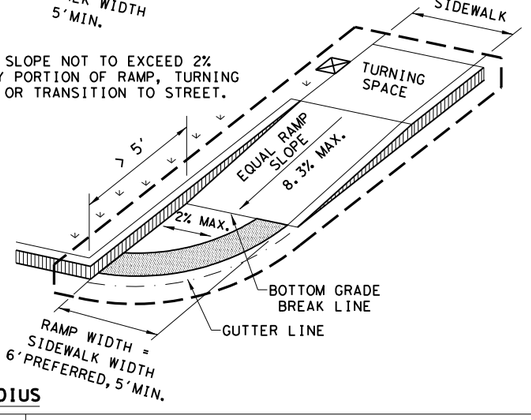


TYPE 10

(SIDEWALK ADJACENT TO CURB)

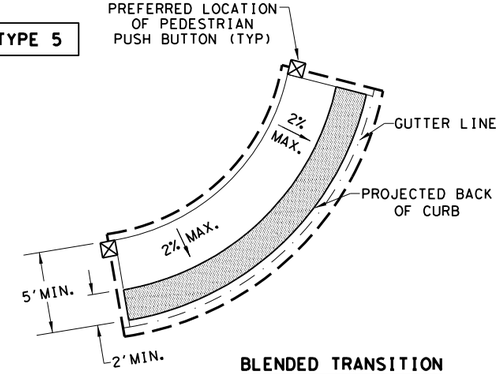


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.



DIRECTIONAL RAMPS WITHIN RADIUS

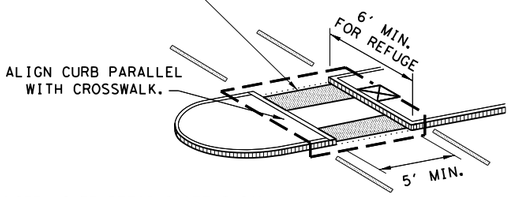
TYPE 5



BLENDED TRANSITION
(FLUSH LANDING)

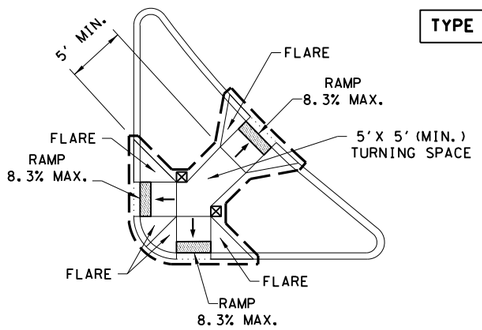
TYPE 21

INSTALL DETECTABLE WARNING SURFACE AT EACH END OF THE CUT-THROUGH RAMP WITH A MINIMUM 2' USUAL SIDEWALK SURFACE BETWEEN. IF MEDIAN IS LESS THAN 6' WIDE, ELIMINATE DETECTABLE WARNING SURFACES.



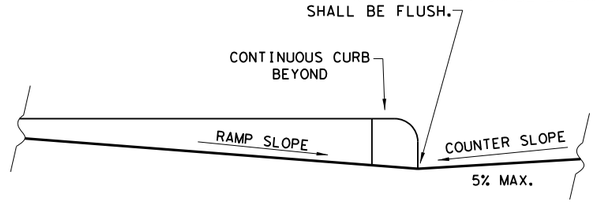
NOTE: CURB DETAILS ARE SHOWN ELSEWHERE IN THE PLANS.

TYPE 22



COMBINATION ISLAND RAMPS

BOTTOM GRADE BREAK OF CURB RAMP WILL NORMALLY BE AT GUTTER LINE. SURFACE SLOPES AT GRADE BREAKS SHALL BE FLUSH.



TYPICAL SECTION OF PERPENDICULAR CURB RAMP AT CONNECTION TO ROADWAY

NOTES / LEGEND:

SEE GENERAL NOTES ON SHEET 2 OF 4 FOR MORE INFORMATION.

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

DETECTABLE WARNING SURFACE

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON IF APPLICABLE.

GUTTER LINE

GRADE BREAK

RAMP LIMITS OF PAYMENT

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0387	05	028, ETC.	FM 982, ETC.
REVISED 08, 2005	DIST	COUNTY		SHEET NO.
REVISED 06, 2012	18	COLLIN, ETC.		98
REVISED 01, 2018				

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GENERAL NOTES

CURB RAMPS

1. Install a curb ramp or blended transition at each pedestrian street crossing.
2. All slopes shown are maximum allowable. Cross slopes of 1.5% and lesser running should be used. Adjust curb ramp length or grade of approach sidewalks as directed.
3. Maximum allowable cross slope on sidewalk and curb ramp surfaces is 2%.
4. The minimum sidewalk width is 5'. Where the sidewalk is adjacent to the back of curb, a 6' sidewalk width is desirable. Where a 5' sidewalk cannot be provided due to site constraints, sidewalk width may be reduced to 4' for short distances. 5'x 5' passing areas at intervals not to exceed 200' are required.
5. Turning Spaces shall be 5'x 5' minimum. Cross slope shall be maximum 2%.
6. Clear space at the bottom of curb ramps shall be a minimum of 4'x 4' wholly contained within the crosswalk and wholly outside the parallel vehicular travel path.
7. Provide flared sides where the pedestrian circulation path crosses the curb ramp. Flared sides shall be sloped at 10% maximum, measured parallel to the curb. Returned curbs may be used only where pedestrians would not normally walk across the ramp, either because the adjacent surface is planted, substantially obstructed, or otherwise protected.
8. Additional information on curb ramp location, design, light reflective value and texture may be found in the latest draft of the Proposed Guidelines for Pedestrian Facilities in the Public Right of Way (PROWAG) as published by the U.S. Architectural and Transportation Barriers Compliance Board (Access Board).
9. To serve as a pedestrian refuge area, the median should be a minimum of 6' wide, measured from back of curbs. Medians should be designed to provide accessible passage over or through them.
10. Small channelization islands, which do not provide a minimum 5'x 5' landing at the top of curb ramps, shall be cut through level with the surface of the street.
11. Crosswalk dimensions, crosswalk markings and stop bar locations shall be as shown elsewhere in the plans. At intersections where crosswalk markings are not required, curb ramps shall align with theoretical crosswalks unless otherwise directed.
12. Provide curb ramps to connect the pedestrian access route at each pedestrian street crossing. Handrails are not required on curb ramps.
13. Curb ramps and landings shall be constructed and paid for in accordance with Item 531 "Sidewalks".
14. Place concrete at a minimum depth of 5" for ramps, flares and landings, unless otherwise directed.
15. Furnish and install No. 3 reinforcing steel bars at 18" o.c. both ways, unless otherwise directed.
16. Provide a smooth transition where the curb ramps connect to the street.
17. Curbs shown on sheet 1 within the limits of payment are considered part of the curb ramp for payment, whether it is concrete curb, gutter, or combined curb and gutter.
18. Existing features that comply with applicable standards may remain in place unless otherwise shown on the plans.

DETECTABLE WARNING MATERIAL

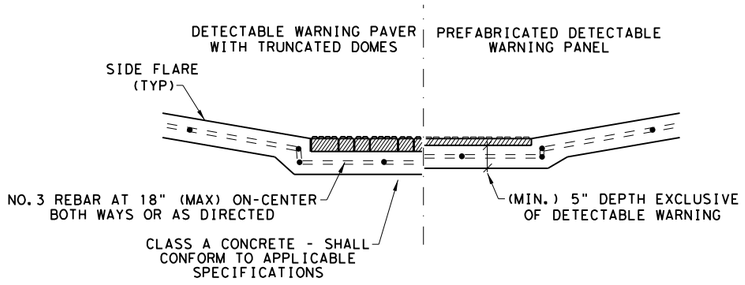
19. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with PROWAG. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material adjacent to uncolored concrete, unless specified elsewhere in the plans.
20. Detectable Warning Materials must meet TxDOT Departmental Materials Specification DMS 4350 and be listed on the Material Producer List. Install products in accordance with manufacturer's specifications.
21. Detectable warning surfaces must be firm, stable and slip resistant.
22. Detectable warning surfaces shall be a minimum of 24 inches in depth in the direction of pedestrian travel, and extend the full width of the curb ramp or landing where the pedestrian access route enters the street.
23. Detectable warning surfaces shall be located so that the edge nearest the curb line is at the back of curb and neither end of that edge is greater than 5 feet from the back of curb. Detectable warning surfaces may be curved along the corner radius.
24. Shaded areas on Sheet 1 of 4 indicate the approximate location for the detectable warning surface for each curb ramp type.

DETECTABLE WARNING PAVERS (IF USED)

25. Furnish detectable warning paver units meeting all requirements of ASTM C-936, C-33. Lay in a two by two unit basket weave pattern or as directed.
26. Lay full-size units first followed by closure units consisting of at least 25 percent (25%) of a full unit. Cut detectable warning paver units using a power saw.

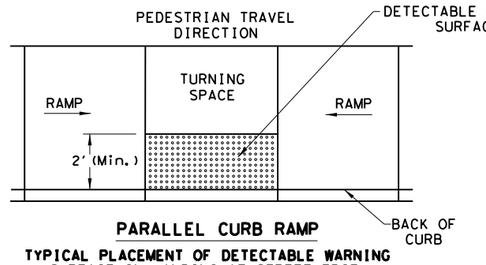
SIDEWALKS

27. Provide clear ground space at operable parts, including pedestrian push buttons. Operable parts shall be placed within unobstructed reach range specified in PROWAG section R406.
28. Place traffic signal or illumination poles, ground boxes, controller boxes, signs, drainage facilities and other items so as not to obstruct the pedestrian access route or clear ground space.
29. Street grades and cross slopes shall be as shown elsewhere in the plans.
30. Changes in level greater than 1/4 inch are not permitted.
31. The least possible grade should be used to maximize accessibility. The running slope of sidewalks and crosswalks within the public right of way may follow the grade of the parallel roadway. Where a continuous grade greater than five percent (5%) must be provided, handrails may be desirable to improve accessibility. Handrails may also be needed to protect pedestrians from potentially hazardous conditions. If provided, handrails shall comply with PROWAG R409.
32. Handrail extensions shall not protrude into the usable landing area or into intersecting pedestrian routes.
33. Driveways and turnouts shall be constructed and paid for in accordance with Item "Intersections, Driveways and Turnouts". Sidewalks shall be constructed and paid for in accordance with Item, "Sidewalks".
34. Sidewalk details are shown elsewhere in the plans.



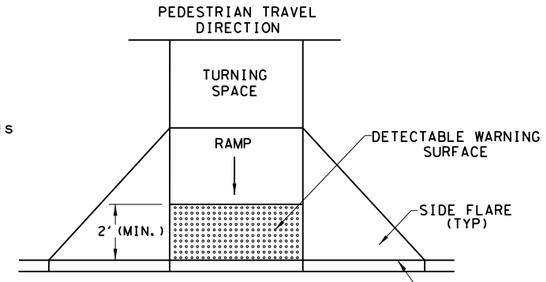
SECTION VIEW DETAIL
CURB RAMP AT DETECTIBLE WARNINGS

DETECTABLE WARNING SURFACE DETAILS



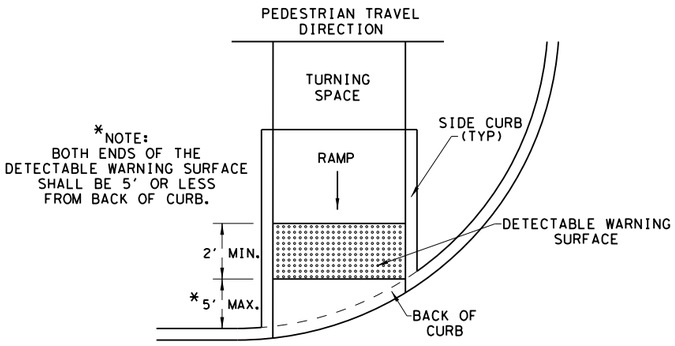
PARALLEL CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON LANDING AT STREET EDGE.



PERPENDICULAR CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.



DIRECTIONAL CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.

Texas Department of Transportation | Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0387	05	028, ETC.	FM 982, ETC.
REVISED 08, 2005 REVISED 06, 2012 REVISED 01, 2018	DIST	COUNTY		SHEET NO.
	18	COLLIN, ETC.		99

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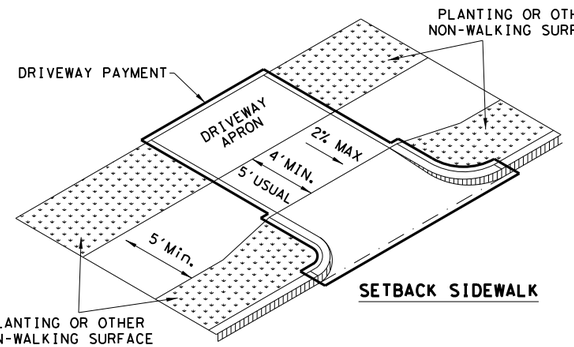
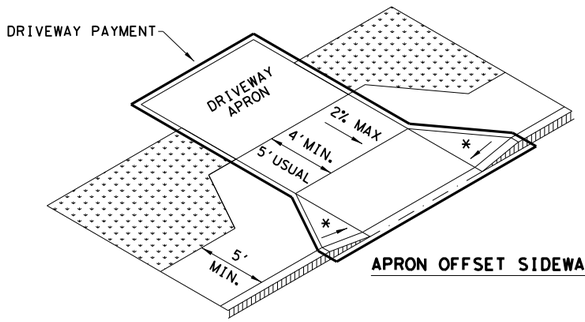
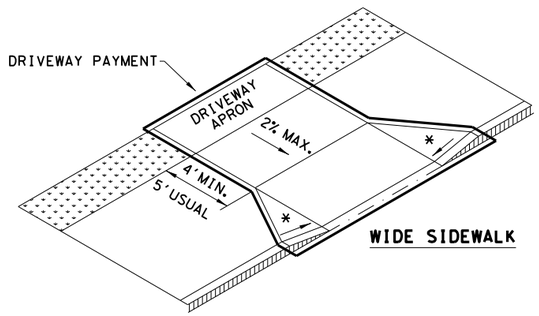
SIDEWALK TREATMENT AT DRIVEWAYS



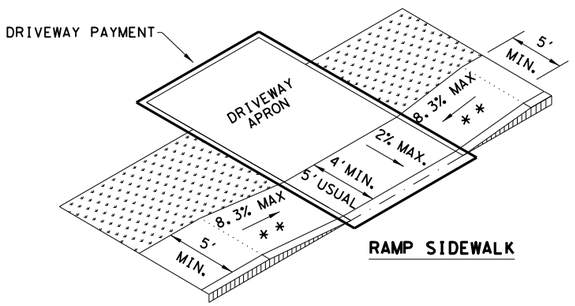
SETBACK SIDEWALK



APRON OFFSET SIDEWALK



WIDE SIDEWALK

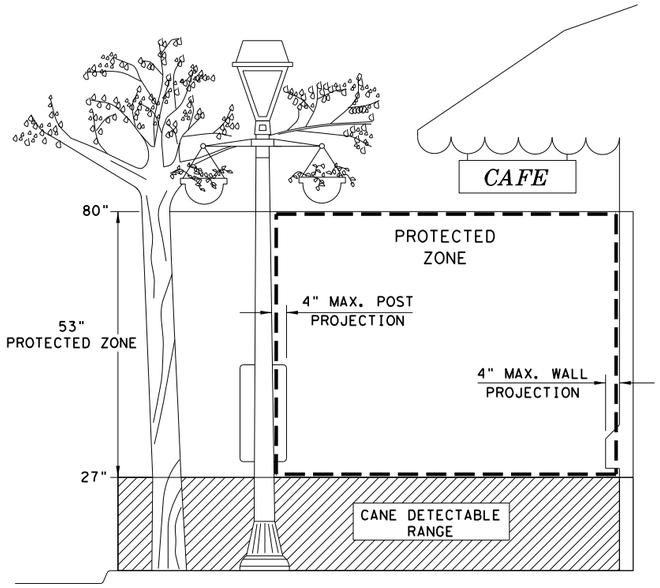


RAMP SIDEWALK

NOTES:

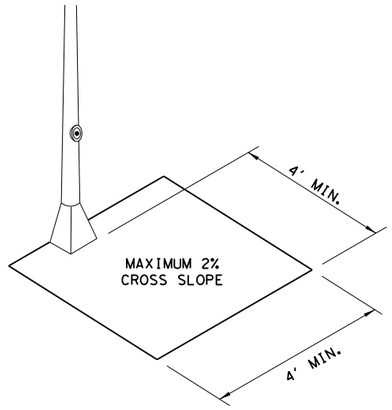
* WHERE DRIVEWAYS CROSS THE PEDESTRIAN ROUTE, SIDES SHALL BE FLARED AT 10% MAX SLOPE.

* * IF CURB HEIGHT IS GREATER THAN 6 INCHES, USE GRADE LESS THAN OR EQUAL TO 5%. HANDRAIL AND DETECTABLE WARNING ARE NOT REQUIRED.

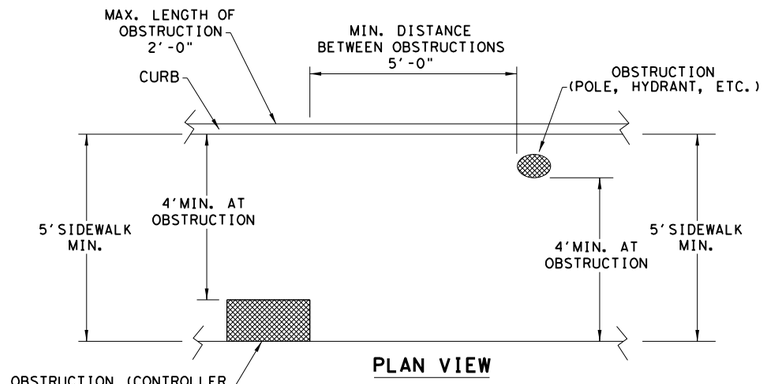


PROTECTED ZONE

NOTE: IN PEDESTRIAN CIRCULATION AREA, MAXIMUM 4" PROJECTION FOR POST OR WALL MOUNTED OBJECTS BETWEEN 27" AND 80" ABOVE THE SURFACE.



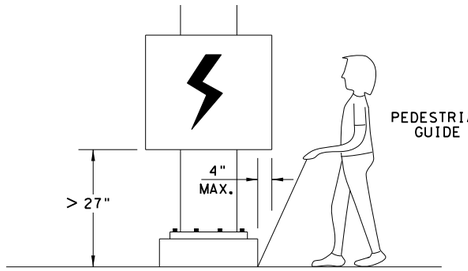
CLEAR SPACE ADJACENT TO PEDESTRIAN PUSH BUTTON



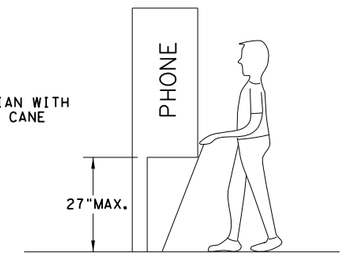
PLAN VIEW

PLACEMENT OF STREET FIXTURES

NOTE: ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' X 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.



WHEN AN OBSTRUCTION OF A HEIGHT GREATER THAN 27" FROM THE SURFACE WOULD CREATE A PROTRUSION OF MORE THAN 4" INTO THE PEDESTRIAN CIRCULATION AREA, CONSTRUCT ADDITIONAL CURB OR FOUNDATION AT THE BOTTOM TO PROVIDE A MAXIMUM 4" OVERHANG.



PROTRUDING OBJECTS OF A HEIGHT ≤ 27" ARE DETECTABLE BY CANE AND DO NOT REQUIRE ADDITIONAL TREATMENT.

DETECTION BARRIER FOR VERTICAL CLEARANCE < 80"

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
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REVISIONS	0387	05	028, ETC.	FM 982, ETC.
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY		SHEET NO.
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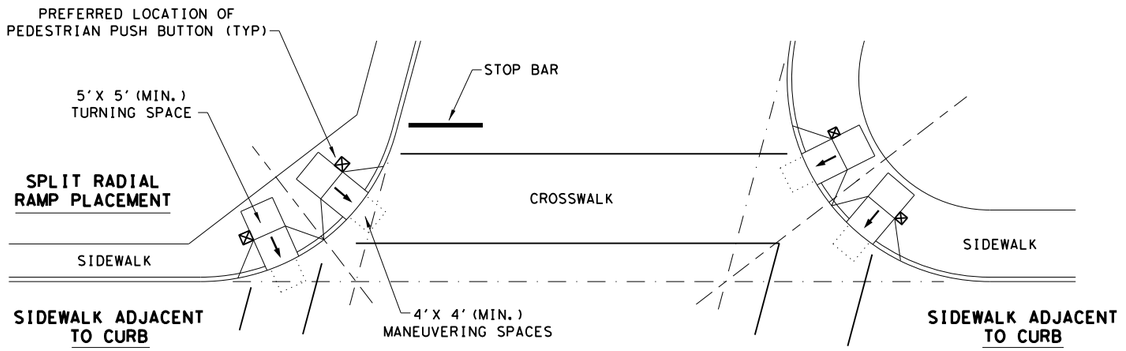
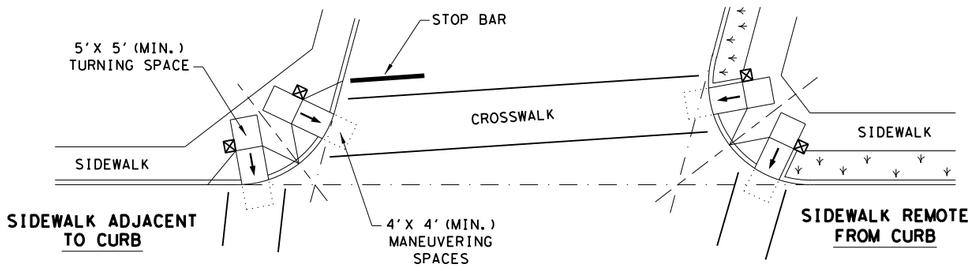
TYPICAL CROSSING LAYOUTS

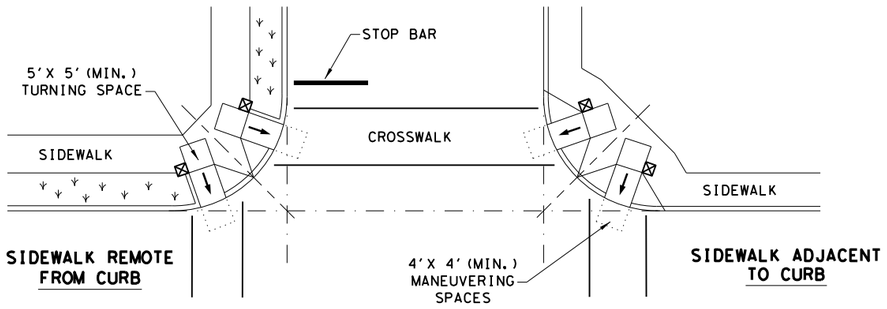
SEE SHEET 1 OF 4 FOR DETAILS AND DIMENSIONS



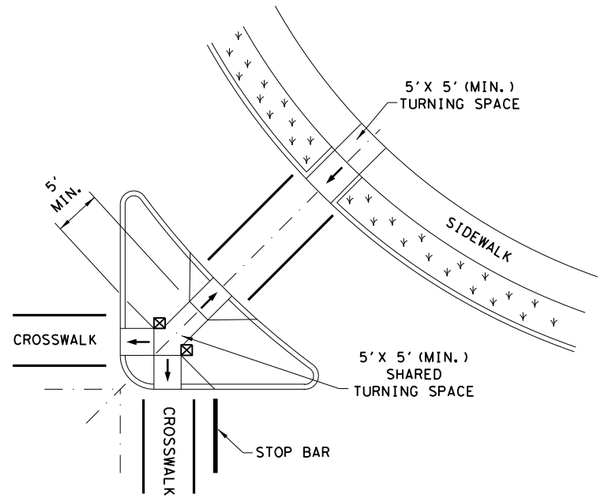
SKEWED INTERSECTION WITH "LARGE" RADIUS



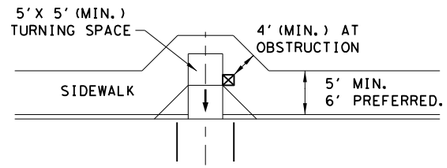
SKEWED INTERSECTION WITH "SMALL" RADIUS

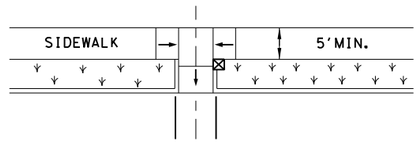


NORMAL INTERSECTION WITH "SMALL" RADIUS



AT INTERSECTION
W/FREE RIGHT TURN & ISLAND





MID-BLOCK PLACEMENT
PERPENDICULAR RAMPS

LEGEND:

SHOWS DOWNWARD SLOPE. →

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON (IF APPLICABLE). ⊠

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

Texas Department of Transportation | Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
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REVISIONS	0387	05	028, ETC.	FM 982, ETC.
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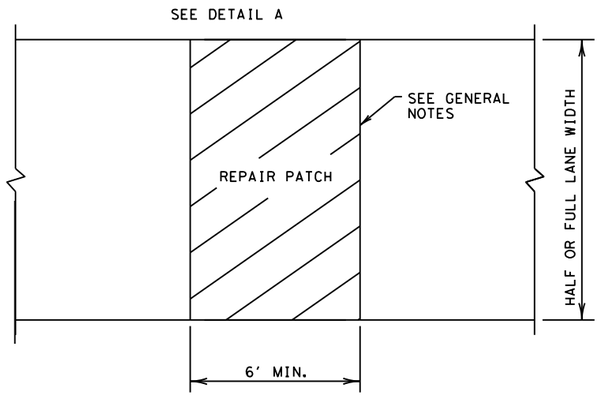
TABLE NO.1 STEEL BAR SIZE AND SPACING						
TYPE PAVEMENT	SLAB THICKNESS AND BAR SIZE		LONGITUDINAL*		TRANSVERSE*	
			REGULAR BARS	TIEBARS	BARS	TIEBARS
	T (IN.)	BAR SIZE	SPACING (IN.)	SPACING (IN.)	SPACING (IN.)	SPACING (IN.)
CRCP	6.0	#5	7.5	7.5	24	24
	6.5		7.0	7.0		
	7.0		6.5	6.5		
	7.5		6.0	6.0		
	8.0	#6	9.0	9.0	24	24
	8.5		8.5	8.5		
	9.0		8.0	8.0		
	9.5		7.5	7.5		
	10.0		7.0	7.0		
	10.5		6.75	6.75		
	11.0		6.5	6.5		
	11.5		6.25	6.25		
	≥12.0		6.0	6.0		
JRCP	<8.0	#5	24.0	12.0	24	24
	≥8.0	#6	24.0	12.0	24	24
CPCD	<8.0	#5	NONE	12.0	NONE	24
	≥8.0	#6	NONE	12.0	NONE	24

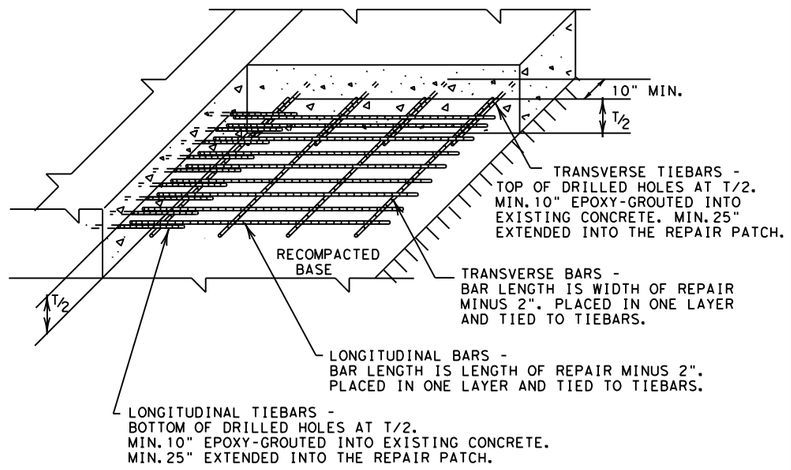
* USE 12" SPACING AS FIRST AND LAST SPACING AT END OR SIDE FOR ALL BARS.

GENERAL NOTES

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



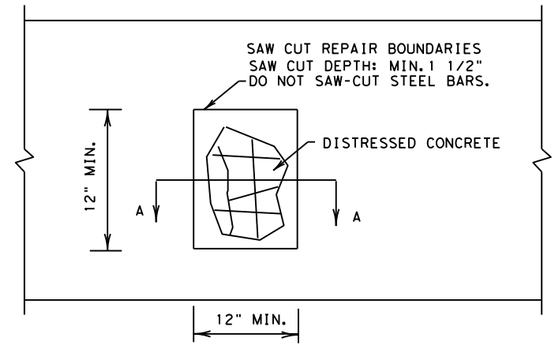
PLAN VIEW



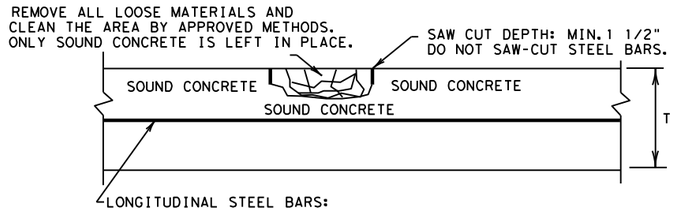
DETAIL A
GROUTED TIEBARS & REINFORCEMENT

GENERAL NOTES

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



PLAN VIEW



LONGITUDINAL STEEL BARS:

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

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

SECTION A-A

HALF-DEPTH REPAIR

FULL-DEPTH REPAIR OF CRCP, JRCP, AND CPCD

Texas Department of Transportation

Design Division Standard

REPAIR OF CONCRETE PAVEMENT

REPCP-14

FILE: repcp14.dgn	DN: TxDOT	DN: HC	DW: HC	CK: AN
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REVISIONS	0387	05	028,ETC.	FM 982,ETC.
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	18	COLLIN,ETC.		102

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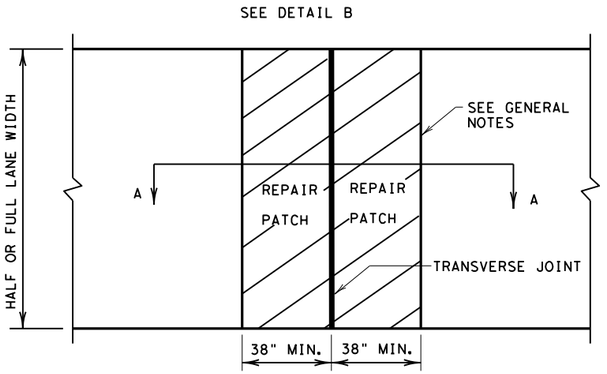
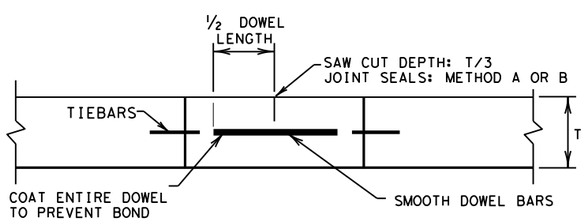
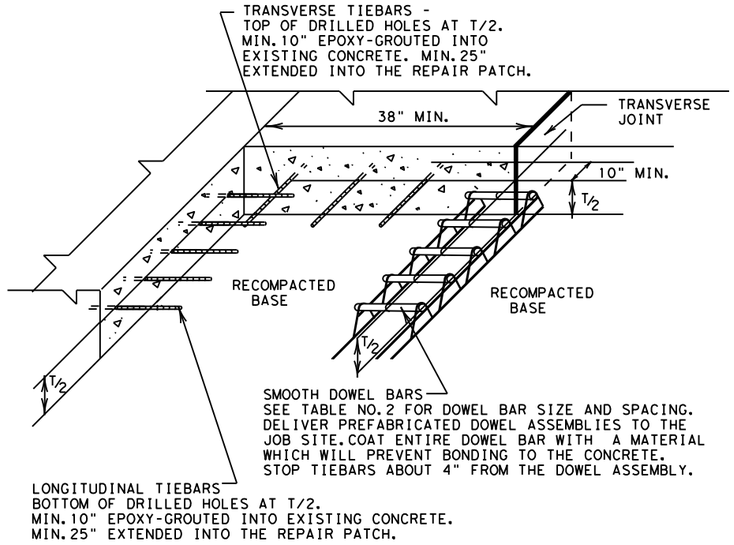


PLAN VIEW



SECTION A-A



DETAIL B
GROUTED TIEBARS & DOWELS

GENERAL NOTES

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

TABLE NO. 2 DOWELS (SMOOTH BARS)			
PAVEMENT THICKNESS (INCHES)	SIZE AND DIA.	LENGTH (IN.)	SPACING (IN.)
<10	#8 (1 IN.)	18.0	12.0
≥10	#10 (1 1/4 IN.)		

REPAIR OF TRANSVERSE JOINT OF CPCD

Texas Department of Transportation — Design Division Standard

REPAIR OF CONCRETE PAVEMENT

REPCP-14

FILE: repcp14.dgn	DN: TxDOT	DN: HC	DW: HC	CK: AN
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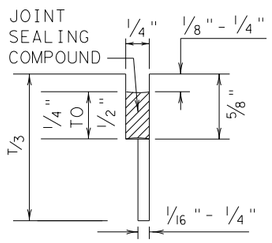
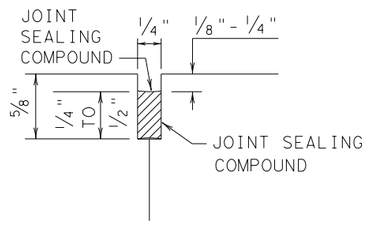
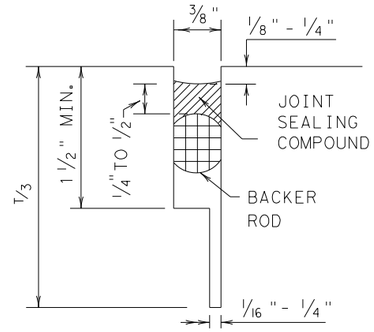
METHOD B: JOINT SEALING COMPOUND



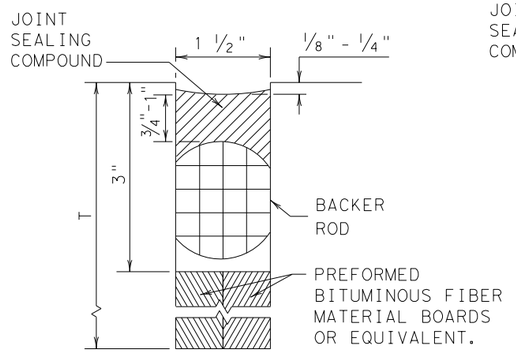
LONGITUDINAL SAWED CONTRACTION JOINT



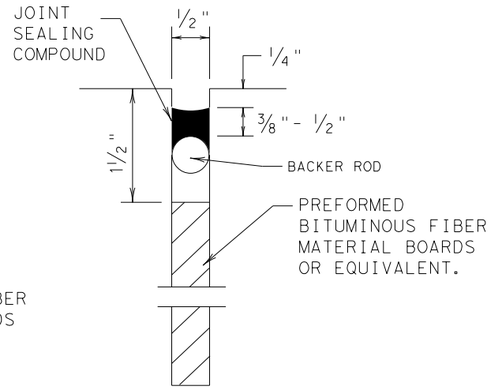
LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT

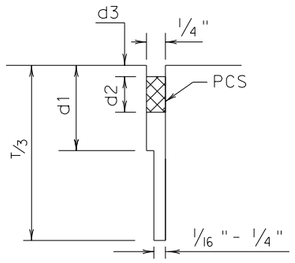


TRANSVERSE FORMED EXPANSION JOINT

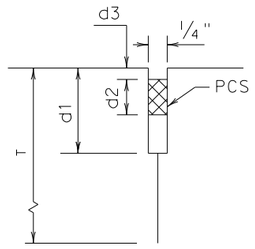


FORMED ISOLATION JOINT

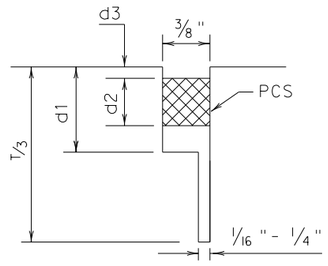
METHOD A: PREFORMED COMPRESSION SEALS (PCS)(DMS-6310 CLASS 6)



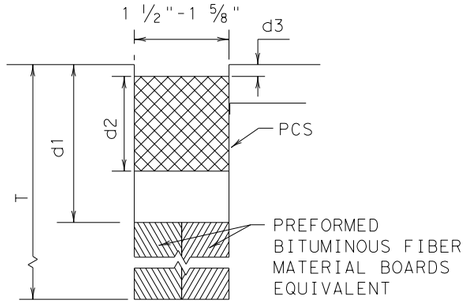
LONGITUDINAL SAWED CONTRACTION JOINT



LONGITUDINAL CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT



TRANSVERSE FORMED EXPANSION JOINT

GENERAL NOTES

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

Texas Department of Transportation

Design Division Standard

CONCRETE PAVING DETAILS

JOINT SEALS

JS-14

FILE: js14.dgn	DN: TxDOT	DN: HC	DW: HC	CK: AN
©TxDOT: DECEMBER 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0387	05	028,ETC.	FM 982,ETC.
	DIST	COUNTY		SHEET NO.
	18	COLLIN,ETC.		104

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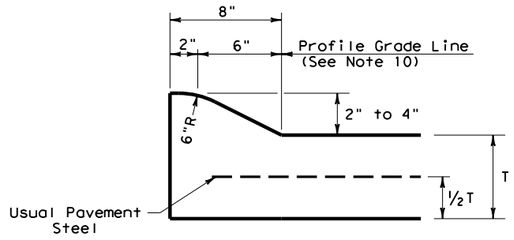
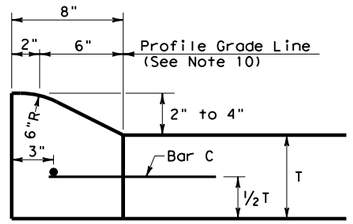
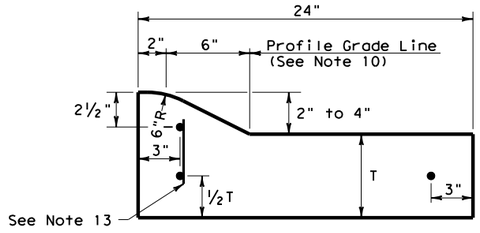
DATE: 2/28/2024
FILE: pw:/txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/0387050028/4 - Design/Plan Set/8. Traffic/STANDARDS/105 CCCG-22.dgn



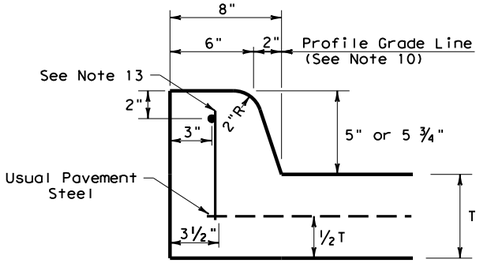
TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



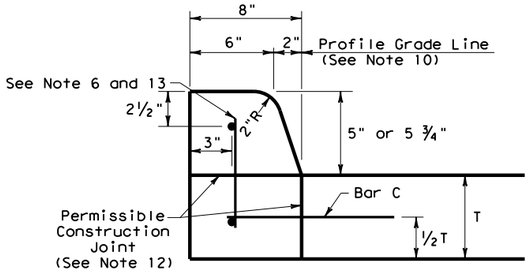
TYPE I CURB
2" - 4" HEIGHT



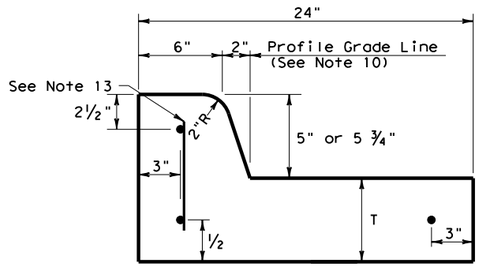
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



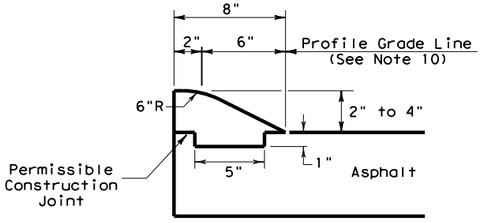
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



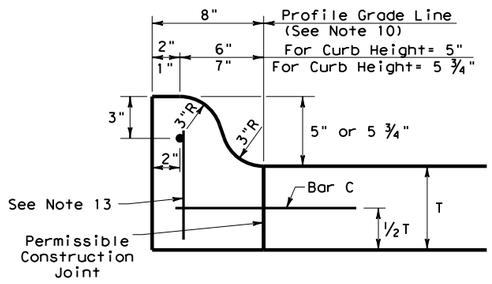
TYPE II CURB
5" - 5 ¾" HEIGHT



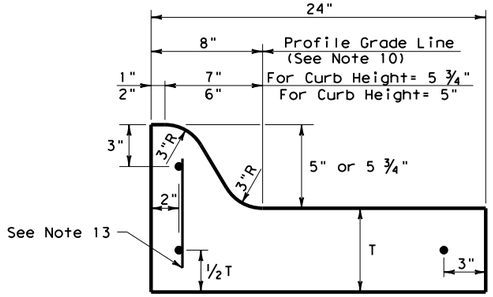
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



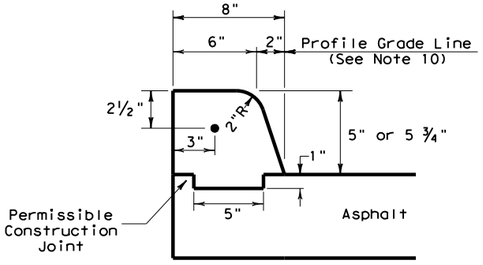
TYPE III CURB (KEYED)
2" - 4" HEIGHT



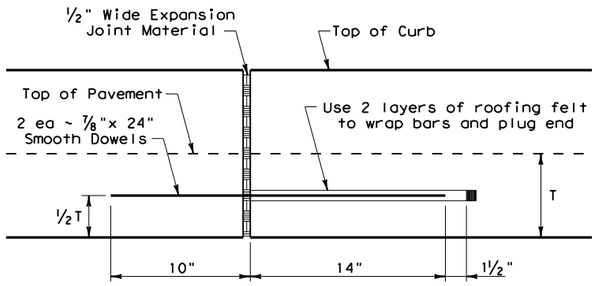
TYPE IIa CURB
5" - 5 ¾" HEIGHT



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

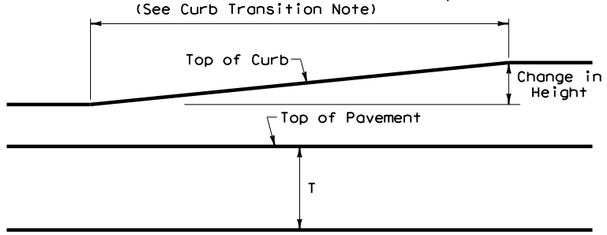


TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

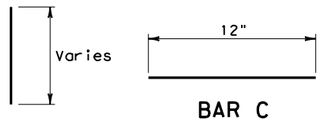
CURB TRANSITION NOTE:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



CURB TRANSITION
Note: To be paid for as Highest Curb

GENERAL NOTES

1. All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
2. Concrete shall be Class A.
3. When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of fiber reinforced concrete in lieu of reinforcing steel is acceptable. Use fibers meeting the requirements of DMS 4550, "Fibers for Concrete," and dose fibers in accordance with Material Producers List (MPL) "Fibers for Class A and B Concrete Applications."
4. Round exposed sharp edges with a rounding tool, to a minimum radius of ¼ inch.
5. All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
6. Where concrete curb is to be placed on existing concrete pavement, Bar B may be drilled and grouted in place, or may be inserted into fresh concrete.
7. Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
8. Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C~C.
9. Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
10. Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
11. One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
12. When horizontal permissible construction joints are used, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans. Reinforcing steel for curb section shall then conform to that required for concrete curb.
13. Bar B placement as needed (typically at four ft. C-C) to support curb reinforcing steel during concrete placement.



BAR B

BAR C

Texas Department of Transportation

Design Division Standard

CONCRETE CURB AND CURB AND GUTTER

CCCG-22

FILE: cccg21.dgn	DN: TXDOT	CK: AN	DW: CS	CK: KM
© TxDOT: JUNE 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0387	05	028,ETC.	FM 982,ETC.
	DIST	COUNTY		SHEET NO.
	18	COLLIN,ETC.		105

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Notes To Designer:
1. Do not alter Sheet Design or Font style, size or weight - match text attributes.
2. If additional space is needed for a numbered section, fence and adjust sections up or down as needed for proportioning and readability but do not relocate from its relative position.
3. All areas should be addressed thoroughly and verify the necessary pay items are set up to support actions needed.

Filled Out: XX/XX/XXXX
Prepared by: Name/Section

I. STORMWATER POLLUTION PREVENTION PLAN-CLEAN WATER ACT SECTION 402

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

List adjacent MS 4 Operator(s) that receive discharges from this project. They need to be notified prior to construction activities.
(Note: Leave blank only if no adjacent MS 4 Operator(s) are affected.)

1. County of Collin Phase II MS4 - Contact Tracy Homfeld
2. Town of Copper Canyon Phase II MS4 - Contact Sue Tejml
3. County of Denton Phase II MS4 - Contact Stephen Belknap
4. City of Fort Worth Phase I MS4 - Contact Cody Whittenburg
5. City of Oak Point Phase II MS4 - Contact Douglas Mousel
6. City of Princeton Phase II MS4 - Contact Tommy Mapp

☐ No Action Required ☒ Required Action

Action Number:

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000.
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

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

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas. No equipment is allowed in any sream channel below the ordinary High Water Mark except on approved temporary stream crossings or drill pads.

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

☒ No Permit Required
☐ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
☐ Individual 404 Permit Required
☐ Other Nationwide Permit Required: NWP# 3(a)

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

1.

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

Best Management Practices for applicable 401 General Conditions:
(Note: If CORP Permit not required, do not check boxes.)

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

III. CULTURAL RESOURCES

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

☒ No Action Required ☐ Required Action

Action Number:

1.

2.

3.

IV. VEGETATION RESOURCES

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

☒ No Action Required ☐ Required Action

Action Number:

1.

2.

3.

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

☐ No Action Required ☒ Required Action

Action Number:

1. Follow Special Notes.

Special Notes:

1. Avoid harming all wildlife species if encountered and allow them to safely leave the project site. Due diligence should be used to avoid killing or harming any wildlife species in the implementation of transportation projects.

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

3. The Migratory Bird Act of 1918 states that it is unlawful to kill, capture, collect, possess, buy, sell, trade or transport any migratory bird, nest, young, feather or egg in part or in whole, without a federal permit issued in accordance within the Act's policies and regulations. The contractor would remove all old migratory bird nests from any structure or trees where work would be done from October 1 to February 15. In addition, the contractor would be prepared to prevent migratory birds from building nest(s) between February 15 to October 1. In the event that migratory birds are encountered on-site during project construction, efforts to avoid adverse impacts on protected birds, active nests, eggs and/or young would be observed.

LIST OF ABBREVIATIONS

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

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

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

Obtain and keep on-site Safety Data Sheets (SDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act. Maintain an adequate supply of on-site spill response materials, as indicated in the SDS. In the event of a spill, take actions to mitigate the spill as indicated in the SDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:
* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canisters, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation(s) or replacement(s) (bridge class structures not including box culverts)?
☐ Yes ☒ No

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

Are the results of the asbestos inspection positive (is asbestos present)?
☐ Yes ☐ No

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

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

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

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

☒ No Action Required ☐ Required Action

Action Number:

1.

2.

3.

VII. OTHER ENVIRONMENTAL ISSUES

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

☒ No Action Required ☐ Required Action

Action Number:

1.

GENERAL NOTE:

Any change orders and/or deviations from the final design must be reported to the Engineer prior to commencement of construction activities, as additional environmental clearance may be required.

LAST REVISION: 1/15/15

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Dallas District

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC)

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 982, ETC.
STATE	DISTRICT	COUNTY	
TEXAS	18	COLLIN, ETC.	
CONTROL	SECTION	JOB	SHEET NO.
0387	05	028, ETC.	106

STORMWATER POLLUTION PRVENTION PLAN (SWP3):

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

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

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

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):

0387-05-028, ETC.

1.2 PROJECT LIMITS:

FM 982 AT FM 546, FM 720 AT MARTINGALE TRAIL, FM 407 AT IT NEELY RD, FM 407 AT RAYZOR RD, FM 407 AT VICKERY BLVD, AND FM 156 AT DOUBLE EAGLE BLVD

1.3 PROJECT COORDINATES:

FM 982 AT FM 546:	33.102548, -96.501404
FM 720 AT MARTINGALE:	33.182800, -96.976943
FM 407 AT IT NEELY:	33.090546, -97.131188
FM 407 AT RAYZOR:	33.085940, -97.131184
FM 407 AT VICKERY:	33.072111, -97.099533
FM 156 AT DOUBLE EAGLE:	33.020082, -97.312755

1.4 TOTAL PROJECT AREA (Acres): 13.0

1.5 TOTAL AREA TO BE DISTURBED (Acres): 0.26

1.6 NATURE OF CONSTRUCTION ACTIVITY:

INSTALLATION OF TRAFFIC SIGNALS

1.7 MAJOR SOIL TYPES:

Soil Type	Description
BURLESON CLAY, 1 TO 3% SLOPES	85% BURLESON CLAY, 15% MINOR COMPONENTS. MODERATELY WELL DRAINED. VERY HIGH RATE OF RUNOFF.
WILSON CLAY LOAM, 1 TO 3% SLOPES	85% WILSON CLAY LOAM, 15% MINOR COMPONENTS. MODERATELY WELL DRAINED. HIGH RATE OF RUNOFF.
NAVO CLAY LOAM, 3 TO 5% SLOPES.	100% NAVO CLAY LOAM AND SIMILAR SOILS. WELL DRAINED. VERY HIGH RATE OF RUNNOFF.
CALLISBURG FINE SANDY LOAM, 1 TO 3% SLOPES	100% CALLISBURG AND SIMILAR SOILS. WELL DRAINED. MEDIUM RATE OF RUNOFF.
BIROME-RAYEX-AUBREY COMPLEX, 2 TO 15% SLOPES	33% BIROME, 32% RAYEX, 29% AUBRY, 6% MINOR COMPONENTS. WELL DRAINED. HIGH RATE OF RUNOFF.
GASIL FINE SANDY LOAM, 1 TO 3% SLOPES	85% GASIL AND SIMILAR SOILS, 15% MINOR COMPNENTS. WELL DRAINED, LOW RATE OF RUNOFF.
PONDER LOAM, 1 TO 3% SLOPES	100% PONDER LOAM AND SIMILAR SOILS. MODERATELY WELL DRAINED. HIGH RATE OF RUNOFF.

1.8 PROJECT SPECIFIC LOCATIONS (PSLs):

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

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

Type	Sheet #s

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

1.9 CONSTRUCTION ACTIVITIES:

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

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

1.10 POTENTIAL POLLUTANTS AND SOURCES:

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

1.11 RECEIVING WATERS:

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

Tributaries	Classified Waterbody

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

1.12 ROLES AND RESPONSIBILITIES: TxDOT

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

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

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

STATE OF TEXAS
CODY R. YEAROUT
139576
LICENSED
PROFESSIONAL ENGINEER

Cody R. Yearout 2/29/2024
Digitally signed by CODY R. YEAROUT, P.E. Date

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

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July 2023 Sheet 1 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		107
STATE	STATE DIST.	COUNTY	
TEXAS	18	COLLIN, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
0387	05	028, ETC.	FM 982, ETC.

STORMWATER POLLUTION PRVENTION PLAN (SWP3):

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

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

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

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

2.2 SEDIMENT CONTROL BMPs:

T / P

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

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

2.3 PERMANENT CONTROLS:

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

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To

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

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

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

2.5 POLLUTION PREVENTION MEASURES:

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

2.6 VEGETATED BUFFER ZONES:

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

Type	Stationing	
	From	To

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

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

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

2.8 DEWATERING:

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

2.9 INSPECTIONS:

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

2.10 MAINTENANCE:

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

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

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July 2023 Sheet 2 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		108
STATE	STATE DIST.	COUNTY	
TEXAS	18	COLLIN, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
0387	05	028, ETC.	FM 982, ETC.

USER ID

SURFACE PREPARATION ITEM 160* TOPSOIL SY / ITEM 161* COMPOST MANUF. TOPSOIL (BOS) (4") SY

SURFACE PREPARATION

Prepare planting area surface BEFORE placing Topsoil, Compost, Fertilizer, Seed and/or Sod.
Once project area has been completed to final lines, grade and compaction, remove objectionable materials from planting area surface and cultivate existing surface to a depth of 4 inches, unless otherwise specified or directed.

Refer to Items 160 and 161 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.

TOPSOIL NOTES:
1. When Topsoil is specified under Item 160, use suitable material salvaged from the project ROW in accordance with Item 160 specifications, and/or secure additional good material from approved sources.
2. Topsoil shall include only the top 6 inches of its native surface, and be easily cultivated, fertile, erosion-resistant and free of objectionable materials.
3. Topsoil obtained from sites outside of the ROW must come from approved sources and have a pH between 5.5 and 8.5 su.
4. Place Topsoil on pre-cultivated surface, spread to a uniform loose cover at thickness specified, and shape per plans. Water and roll the finished surface with a light roller or other suitable equipment per Item 160.3; do not over-compact.

COMPOST NOTES:
1. When Compost Manufactured Topsoil (4") is specified under Item 161, use compost meeting all requirements of Item 161.2 and Table 1. Provide quality control (QC) documentation and obtain Engineer approval prior to compost delivery.
2. Contractor shall provide tickets/invoices that document material type, quantity and placement for all compost delivered.
3. Additional topsoil may be required to be imported to achieve the compost/topsoil mix ratio. Topsoil must meet Item 160 specifications.

APPLICATION OF COMPOST MANUFACTURED TOPSOIL (4")

AFTER Surface Preparation, uniformly spread a 1-inch layer of compost on-grade with 3 inches topsoil over pre-cultivated planting area. (25% compost and 75% topsoil = 1" compost and 3" topsoil.)
Then mix compost and topsoil together by cultivating the compost into the topsoil (by till or disk) to a 4-inch (4") depth.
Roll the finished surface with a light corrugated drum; do not over-compact.

FERTILIZER ITEM 166* FERTILIZER AC

SOIL ANALYSIS FOR FERTILIZER APPLICATION RATE

Unless otherwise stated in the plans, Contractor shall perform at least one soil analysis on each project before fertilization, and submit results to Engineer with recommended fertilizer rates based on soil analysis.
Engineer may direct sample location(s). Soil analysis may be waived if both compost and sod are used on entire project.

FERTILIZER NOTES:
1. Refer to Item 166 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.
2. Apply fertilizer BEFORE seeding, or AFTER placing sod.
3. Use fertilizer containing nitrogen (N), phosphoric acid (P) and potash (K) nutrients, unless otherwise specified. At least 50% of the Nitrogen component shall be a slow-release sulfur-coated urea as described in Item 166.3. Do not apply more than 60 lbs Nitrogen per acre without Engineer concurrence.
4. Deliver fertilizer in bags, clearly labeled to show contents, unless otherwise specified or approved prior to delivery. When non-bagged, loose fertilizer is approved, provide documentation for each load of material delivered, to validate authenticity of the material.
5. Apply fertilizer uniformly, as a dry, granular material, essentially dust-free, and do not mix with water for application as a slurry.
6. When both temporary and permanent seeding are specified for the same area, apply half of the required fertilizer before the temporary seeding operation and the other half before the permanent seeding operation.

SEEDING FOR EROSION CONTROL ITEM 164* DRILL SEEDING AC

RECOMMENDED PLANTING SEASON	PERMANENT RURAL SEED MIX ITEM 164 - DRILL SEEDING (PERM) (RURAL)(CLAY)	Pure Live Seed Rate**	PERMANENT URBAN SEED MIX ITEM 164 - DRILL SEEDING (PERM) (URBAN)(CLAY)	Pure Live Seed Rate**	TEMPORARY DRILL SEED MIX ITEM 164 - DRILL SEEDING (TEMP) (WARM OR COOL)	Pure Live Seed Rate**
WARM SEASON Mar.15th, April, May, June, July, August, Sept. 15th	Green Sprangletop (Van Horn)	- 1.0 lbs/AC	Green Sprangletop (Leptochloa dubia)	- 0.3 lbs/AC	Foxtail Millet (Setaria italica)	- 34 lbs/AC
	Sideoats Grama (Haskell)	- 1.0 lbs/AC	Sideoats Grama (El Reno)(Bouteloua curtipendula)	- 3.6 lbs/AC		
	Texas Grama (Atascosa)	- 1.0 lbs/AC	Buffalograss (Texoka)(Buchloe dactyloides)	- 1.6 lbs/AC		
	Hairy Grama (Chaparral)	- 0.4 lbs/AC	Bermudagrass (Cynodon dactylon)	- 2.4 lbs/AC		
	Shortspike Windmillgrass (Welder)	- 0.2 lbs/AC				
	Little Bluestem (OK Select)	- 0.8 lbs/AC				
	Purple Prairie Clover (Cuero)	- 0.6 lbs/AC				
	Engelmann Daisy (Eldorado)	- 0.75lbs/AC				
	Illinois Bundleflower	- 1.3 lbs/AC				
	Awnless Bushsunflower (Plateau)	- 0.2 lbs/AC				
COOL SEASON Sept 16th, Oct, Nov, Dec, Jan, Feb, Mar 14th					Tall Fescue (Festuca arundinaceae)	- 4.5 lbs/AC
					Western Wheatgrass (Agropyron smithii)	- 5.6 lbs/AC
					Red Winter Wheat (Triticum aestivum)	- 34 lbs/AC
					Cereal Rye	- 34 lbs/AC

SEEDING NOTES:
1. When seeding is specified under Item 164, refer to TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown. Materials and construction shall meet specifications.
2. Conduct seeding upon completion of each applicable construction stage (dependent upon planting season requirements), without compensation for additional move-ins.
3. Place seed AFTER preparing planting area surface. Refer to Surface Preparation detail this sheet, as well as Topsoil Item 160 and Compost Manufactured Topsoil Item 161 when specified. Apply fertilizer per Item 166 BEFORE seeding, per specifications and this sheet, to help drill the fertilizer into the soil.
4. When temporary grasses are well-established and more than 2 inches tall, mow planting area before seeding permanent grasses; mowing for this purpose will be subsidiary. When vegetation is not already well-established, cultivate planting area to a depth as described in Item 164.3, before temporary seeding and before permanent seeding.
5. Seed material must be appropriate to the location, soil type and season. Use the seed mix species and pure live seed rates designated in Tables 1-4 of the TxDOT 2014 Standard Specifications* for Item 164, unless otherwise specified.
6. All seed shall meet labeling, delivery, analysis, and testing requirements described in Item 164.2.1. Deliver seed in labeled, unopened bags or containers to Engineer prior to planting.
7. Uniformly plant seed over the designated planting area, along the contour of slopes, and drill seed to a depth as described in Item 164.3.4.
8. Hydroseeding may be allowed, when specified or Engineer concurs.
9. Implement and continue Vegetative Watering per the schedule, rate and volume specified under Item 168.

TXDOT REFERENCE MATERIALS:
- * "STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS, AND BRIDGES" 2014
- "A GUIDANCE TO ROADSIDE VEGETATION ESTABLISHMENT" 2004
- ONLINE TRAINING COURSE: MNT415 REVEGETATION DURING CONSTRUCTION
- DALLAS DISTRICT "VEGETATION ESTABLISHMENT GUIDELINES"

SODDING FOR EROSION CONTROL ITEM 162* BLOCK SOD (BERMUDA) SY

BLOCK OR ROLL SOD	COMMON NAME	BOTANICAL NAME
	Common Bermuda Grass	Cynodon dactylon

SODDING NOTES:
1. Refer to Item 162 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.
2. Place sod between the average date of the last freeze in the Spring and 6 weeks before the average date of the first freeze in the Fall, per the Texas Almanac for the project area.
3. Place sod only AFTER soil surface preparation is complete as detailed in this sheet. Dry soil may require pre-watering.
4. Place all sod (blocks or rolls) within 24 hours of delivery to the site, and keep moist from the time it is dug up until it is planted. Sod with dried roots will not be accepted.
5. Place sod with joints alternating on each row to prevent all joints from lining up, and place blocks firmly against adjacent blocks. Roll, tamp and trim sod per Item 162.3.
6. Place fertilizer promptly AFTER sodding operation is complete in each area.
7. Water sod immediately following placement, and continue Vegetative Watering per Item 168.

VEGETATIVE WATERING FOR ESTABLISHING SEED AND SOD ITEM 168* VEGETATIVE WATERING MG

WATERING SCHEDULE

SEASON (Usual Months)	RATE	TIME SCHEDULE	TOTAL WATER ESTIMATE
SPRING & FALL (March, April, May, October)	7,000 gallons/acre per working day	Vegetative watering for seed shall begin on the day after rainfall described below and continue for 60 consecutive working days; vegetative watering for sod shall begin on the day the sod is placed and continue for a minimum of 15 consecutive working days.	420,000 gallons/acre (60 working days)
SUMMER (June, July, August, September)	12,000 gallons/acre per working day		720,000 gallons/acre (60 working days)
WINTER (November through February)	1,000 gallons/acre per working day	Vegetative watering for seed and/or sod shall begin on the day after placement for 15 consecutive working days	15,000 gallons/acre (15 working days)

Notes: Rate and frequency may be adjusted, with the approval of the Engineer, to meet site conditions (especially with sod).
For informational purposes only: 1,000 gallons equals 1 MG

VEGETATIVE WATERING NOTES:
1. Refer to Item 168 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.
2. Use clean water free of industrial waste and other substances harmful to vegetation growth, per Item 168.2.
3. Use Vegetative Watering to keep the seed bed moist during germination; not to provide initial watering. After drill seeding, postpone watering operations until site receives at least 1/2-inch of natural rainfall in a single day. Delay watering operations for warm season grasses until soil temperature exceeds 70 degrees F.
4. For sod, water immediately.
5. All water distribution equipment shall be furnished and operated to provide water at a uniform and controllable rate. Use a metering device on all watering equipment.
6. Evenly distribute water over entire area designated for seeding and/or sodding, using even spray patterns that do not disturb seed bed and/or dislodge seed from seed bed.
7. Do not water between the hours of 12:00 p.m. and 6:00 p.m. when daytime temperatures exceed 95 degrees F.
8. After initial establishment period, continue intermittent watering of newly established seed or sod at a rate of approximately 1-inch water/week, during summer months until end of contract.
9. If 1/4-inch or more of rainfall occurs on site on any given working day, no vegetative watering will be needed on that working day. (Note: 1/4-inch rain equals 7,000 gallons of water per acre.)
10. Should the Contractor fail to apply the specified amount of water within the time allowed, any seed or sod in poor condition shall be replaced, fertilized, and watered at Contractor's expense.

**Note: The amount of Pure Live Seed (PLS) in one pound of bulk seed is based on three factors: % Purity, % Germination, and % Dormant. Use the following formula to calculate PLS in bulk seed: PLS = % Purity X (% Germination + % Dormant) Ensure that the specified amount of pure live seed is placed.

ROADSIDE MOWING ITEM 730* PROJECT MAINTENANCE AC

MOWING NOTES:
1. During project construction, once seed is established, use mowing to promote permanent grasses by mowing any remaining temporary grasses.
2. Also mow established turf and ROW grasses in designated areas of project limits as specified or directed by Engineer.
3. Remove litter and debris prior to mowing.
4. Do not mow on wet ground when soil rutting can occur.
5. Hand-trim around obstructions and stormwater control devices as needed.
6. Maintain paved surfaces free of tracked soils and clipped vegetation.

SEQUENCE OF WORK:
- CULTIVATE SURFACE SOIL.
- PREPARE / PLACE TOPSOIL, OR
- PREPARE / PLACE COMPOST MANUFACTURED TOPSOIL.
- APPLY FERTILIZER AND THEN PLACE SEEDING, OR
- PLACE SOD AND THEN APPLY FERTILIZER.
- CONDUCT VEGETATIVE WATERING.
- CONDUCT ROADSIDE MOWING, AS DIRECTED.

Texas Department of Transportation
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VEGETATION ESTABLISHMENT SHEET

(DALLAS DISTRICT)

TEMPLATE REVISION DATE: 02/21/19

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
CY	6	(See Title Sheet)		FM 982,ETC.
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CY	TEXAS	DALLAS	COLLIN,ETC.	
CHECK	CONTROL	SECTION	JOB	109
CY	0387	05	028,ETC.	
CHECK				
EF				

DATE

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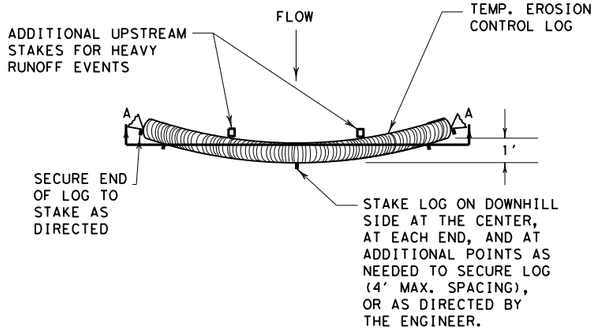
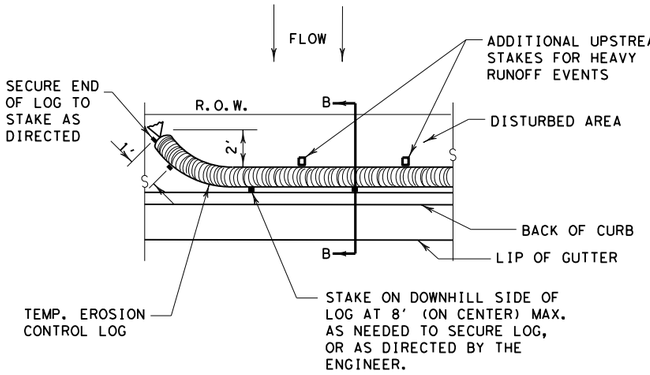
DATE: 2/28/2024
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/038705028/4 - Design/Plan Set/8. Traffic/STANDARDS/110-112 EC(9)-16.dgn



PLAN VIEW



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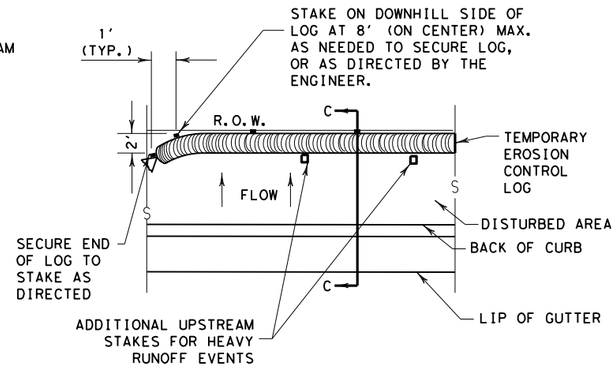
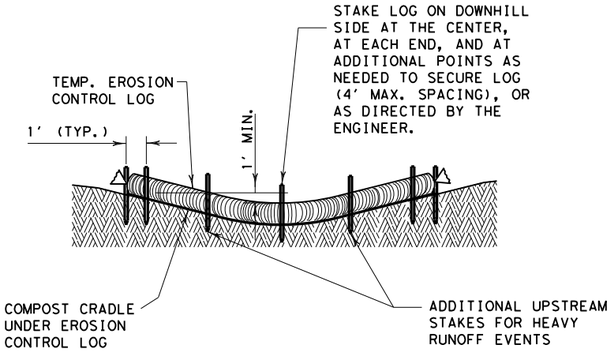


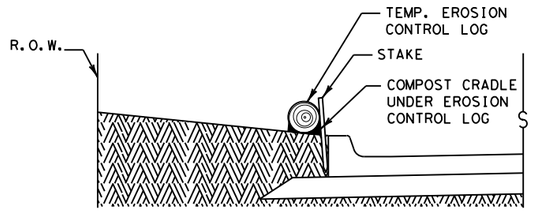
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

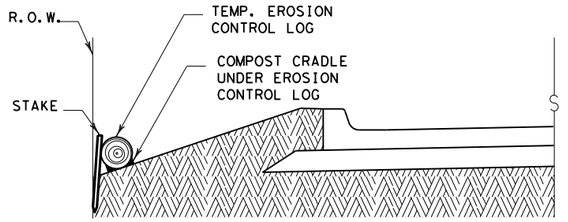
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

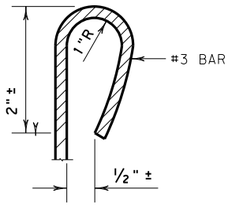
CL-BOC



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



REBAR STAKE DETAIL

LEGEND

- CL-D — EROSION CONTROL LOG DAM
- CL-BOC — EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW — EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST — EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL — EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- CL-CI — EROSION CONTROL LOG AT CURB INLET
- CL-GI — EROSION CONTROL LOG AT CURB & GRATE INLET

GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

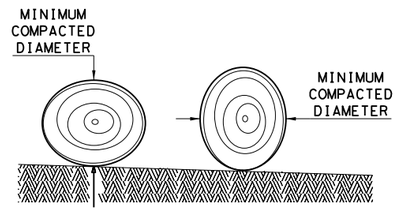
Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT		CK: KM		DW: LS/PT		CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY		
REVISIONS	0387	05	028,ETC.		FM 982,ETC.		
	DIST	COUNTY			SHEET NO.		
	18	COLLIN,ETC.			110		

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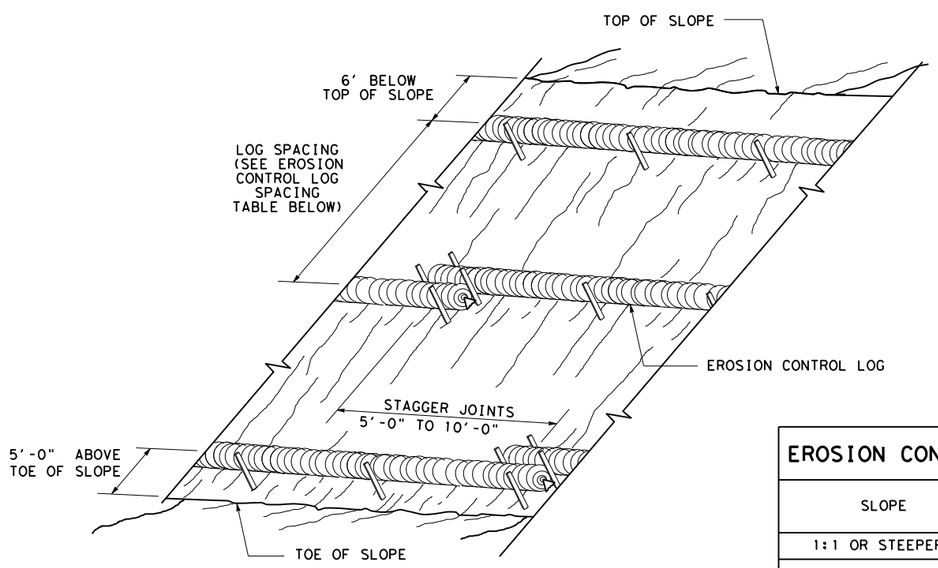
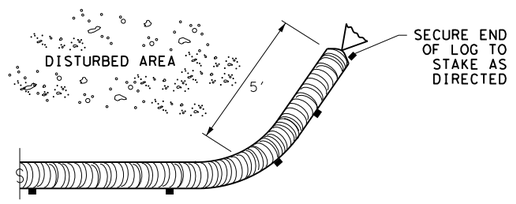


EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

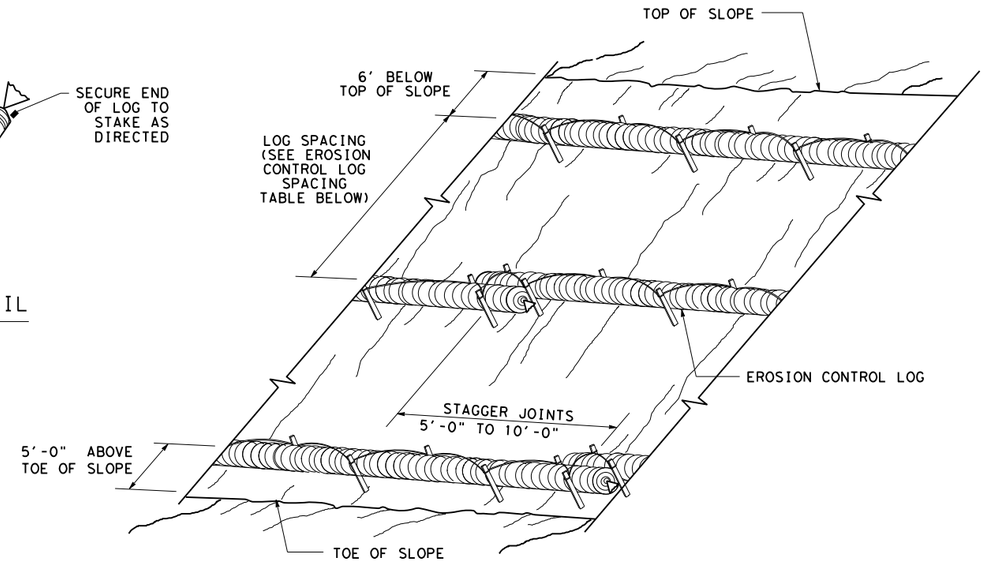
CL-SST



END SECTION RAP DETAIL

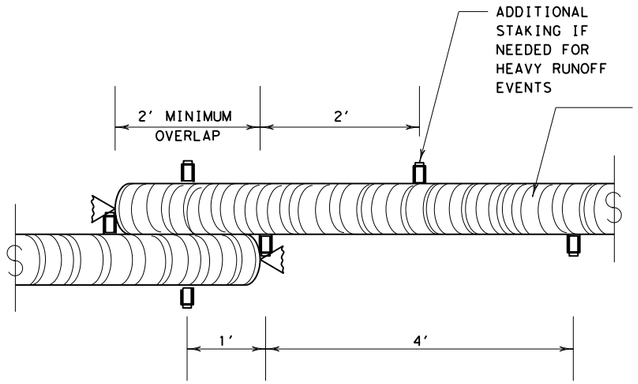
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

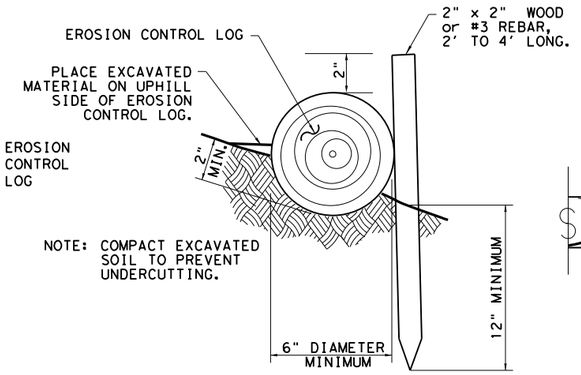
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

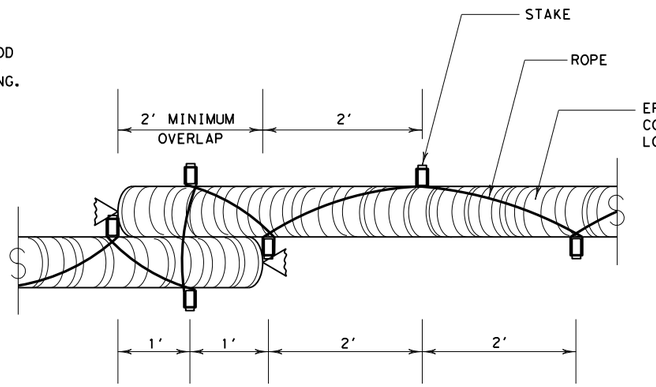


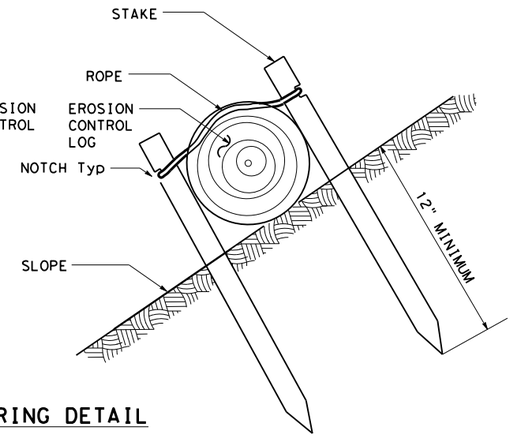


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

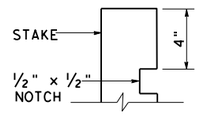
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
EROSION CONTROL LOG
EC(9)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0387	05	028, ETC.	FM 982, ETC.
	DIST	COUNTY		SHEET NO.
	18	COLLIN, ETC.		111

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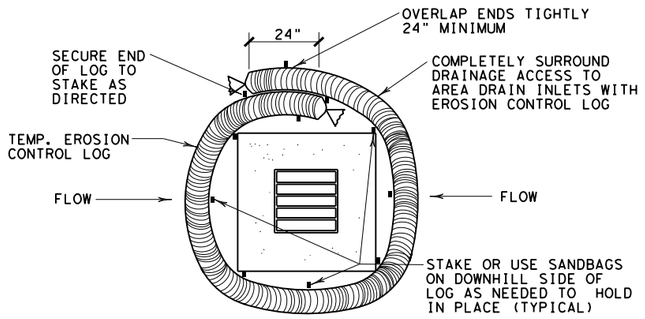
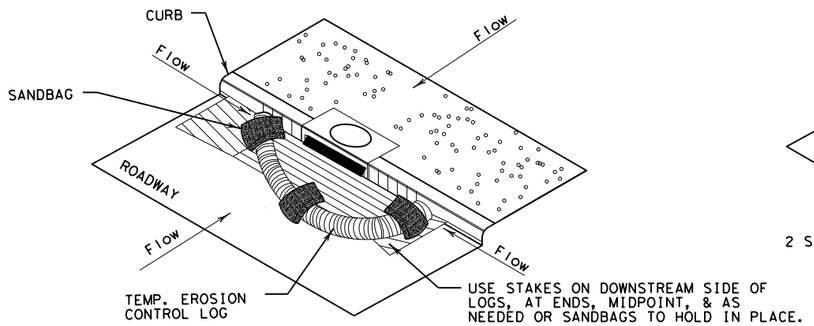
DATE: 2/28/2024
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/0387050284 - Design/Plan Set/8. Traffic/STANDARDS/110-112 EC(9)-16.dgn



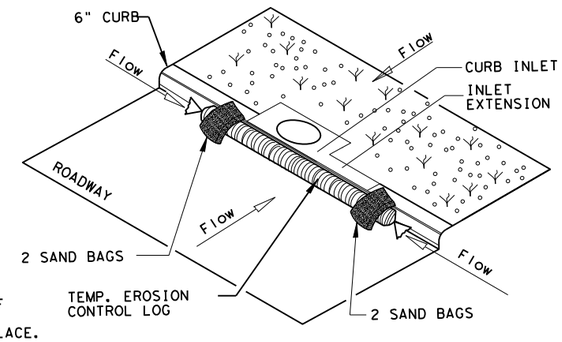
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

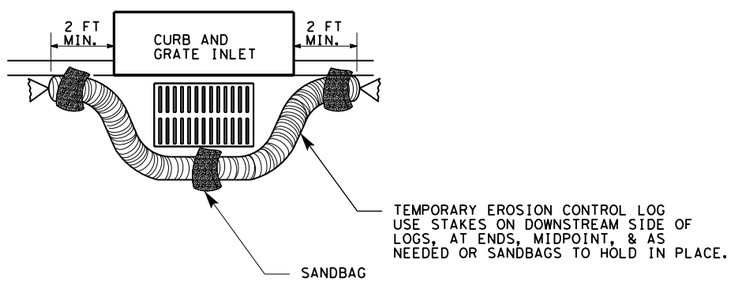
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

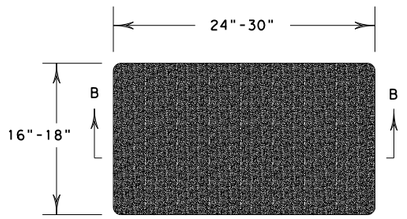
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

SECTION B-B



SANDBAG DETAIL

SHEET 3 OF 3

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
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REVISIONS	0387	05	028,ETC.	FM 982,ETC.
	DIST	COUNTY		SHEET NO.
	18	COLLIN,ETC.		112