FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	C 915-00-200		1
STATE	STATE DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
0915	00	200	VARIOUS

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

STATE PROJECT
PROJECT NO. C 915-00-200
CSJ: 0915-00-200

BEXAR COUNTY

IH-10 & IH-37

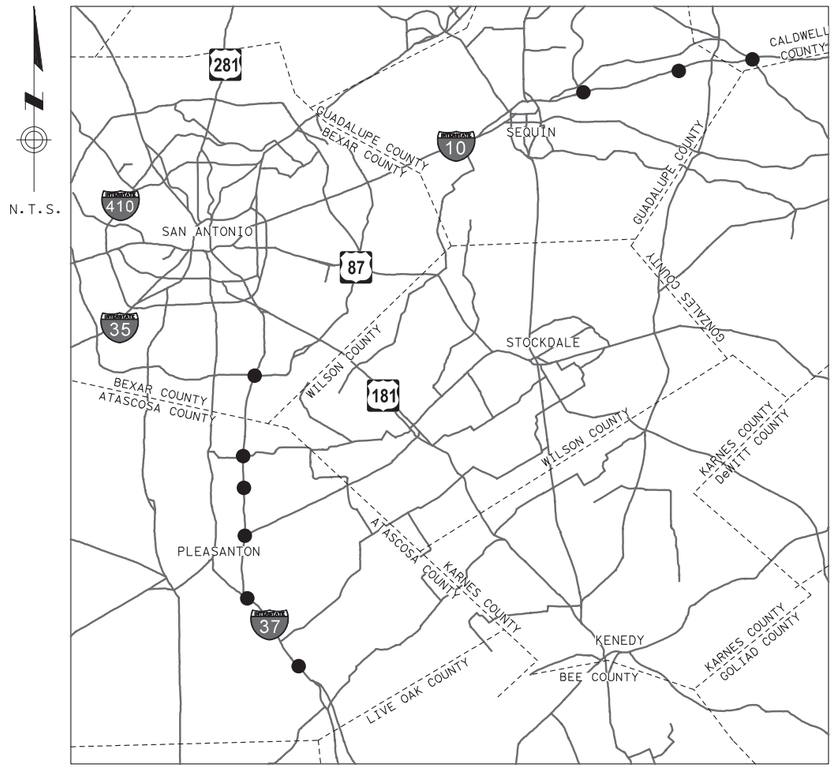
LIMITS: VARIOUS LOCATIONS ON
IH 37S: LP 1604S TO ℄ LIVE OAK &
IH 10E: LP 1604E TO ℄ GONZALES

INDEX OF SHEETS

SEE SHEET 2 FOR INDEX OF SHEETS

DESIGN SPEED = 75 MPH
AREA OF DISTURBED SOIL = 1 ACRE
ADT: >60,000

FOR WORK CONSISTING OF INSTALL ADVANCED TRAFFIC MANAGEMENT SYSTEM



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

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND THE SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT. SPECIAL LABOR PROVISIONS FOR STATE PROJECTS (000--008)

FINAL PLANS

LETTING DATE: _____

DATE CONTRACTOR BEGAN WORK: _____

DATE WORK WAS ACCEPTED: _____

FINAL CONTRACT COST: $ _____

CONTRACTOR: _____

FINAL PLANS STATEMENT:

THE CONSTRUCTION WORK WAS PERFORMED
IN ACCORDANCE WITH THE PLANS.

_____ P.E. _____
AREA ENGINEER DATE

TEXAS DEPARTMENT OF TRANSPORTATION

RECOMMENDED FOR LETTING: 3/3/2021
DocuSigned by: Lizette J. Collat, P.E.
DIRECTOR OF TRANSPORTATION PLANNING & DEVELOPMENT

RECOMMENDED FOR LETTING: 3/3/2021
DocuSigned by: Clayton Kipps
DIRECTOR OF TRANSPORTATION PLANNING & DEVELOPMENT

APPROVED FOR LETTING: 3/3/2021
DocuSigned by: Gina Gallegos
DISTRICT ENGINEER

FILE LOCATION
HTTP://WWW.TXDOT.GOV/INSIDE-TXDOT/DISTRICT/SAN-ANTONIO/SPECINFO.HTML

LEVELS DISPLAYED

COUNTY_____ PROJ. NO._____
HWY. NO._____ LETTING DATE_____
DATE ACCEPTED_____

SHEET	DESCRIPTION
1	TITLE SHEET
2	INDEX OF SHEETS
3,3A-3G	GENERAL NOTES
4	ESTIMATE & QUANTITIES
5	ITS SUMMARY
6	PROJECT LAYOUT
	ITS PLANS
7	ITS PLAN - I-10 AT SH-130
8	ITS PLAN - I-10 AT CR 217
9	ITS PLAN - I-10 AT US-183
10	ITS PLAN - I-37 AT LOOP 1604
11	ITS PLAN - I-37 AT FM 536
12	ITS PLAN - I-37 AT FM 3006
13	ITS PLAN - I-37 AT SH-97
14	ITS PLAN - I-37 AT US-281
15	ITS PLAN - I-37 AT FM 1099
16	WIRING SCHEMATIC - HARDWARE DIAGRAM
	TCP STANDARDS
17-28	BC(1-12)-14
29	TCP(5-1)-18
30	TCP(6-1)-12
31	TCP(6-3)-12
32	TCP(6-4)-12
	ELECTRICAL STANDARDS
33	ED(1)-14
34	ED(3)-14
35	ED(4)-14
36	ED(5)-14
37	ED(6)-14
38	ED(10)-14
	ITS STANDARDS
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41	ITS(4)-15
42	ITS(4A)-15
43	ITS(5)-15
44	ITS(6)-15
45	ITS(7)-15
46	ITS(14)-15
47	ITS(15)-15
48	ITS(17)-15
49	ITS(18)-15
50	ITS(19)-17
51	ITS(24)-15
52	ITS(27)-16
53	ITS(28)-16
54	ITS(36)-16
55	WV & IZ(LTS2013)-14
	EROSION STANDARDS
56	EC(1)-16
57	STORM WATER POLLUTION PREVENTION PLAN (SW3P)
58	EPIC

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

Srinivas M. Sangireni, PE 1/11/2021

SRINIVAS M. SANGINENI, PE DATE

STATE OF TEXAS
SRINIVAS M. SANGINENI
85575
LICENSED PROFESSIONAL ENGINEER

Srinivas M. Sangireni
1/11/2021

OTHON CONSULTING ENGINEERS
F-1471 · HOUSTON · DALLAS
2140 Lake Park Boulevard|Richardson, Texas 75080
P: 214.340.7344| F: 214.221.7411

Texas Department of Transportation

HURRICANE EVACUATION ROUTE - ITS

INDEX OF SHEETS

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		2
STATE	DISTRICT	COUNTY	
TEXAS	SAT	BEXAR, ETC.	
CONT	SECT	JOB	HIGHWAY NO
0915	00	200	I-10 & I-37

**********GENERAL NOTES**********
2014 Specification Book (Revised October 23, 2020)

Contact the Engineer or the City when construction operations are within 400 feet of a signalized intersection to determine/verify the location of loop detectors, conduit, ground-boxes, etc. Repair or replace any signal equipment damaged by construction operations. The method of repair or replacement shall be pre-approved and inspected. Depending on the type and extent of the damage, the Engineer reserves the right to perform the repair or replacement work and the Contractor will be billed for this work.

City of San Antonio: (210) 207-8642
City of New Braunfels: (830) 221-4049

Any materials removed and not reused and determined to be salvageable shall be stored within the project limits at an approved location or delivered undamaged to the storage yard as directed. Properly dispose unsalvageable materials in accordance with local, state, and federal regulations. Deface traffic signs so that they will not reappear in public as signs.

Notify the Engineer at least two weeks prior to a proposed traffic pattern change(s) that will require a revision to traffic signals.

Locate and reference all manholes and valves within the construction area with station and offset. Each manhole and valve shall be identified by its owner (SAWS, CPS, etc.). No roadwork will begin until this list has been submitted. All valves and manhole covers have to be accessible at all times, therefore; temp. CTB, material stock piles, etc. cannot be placed over these valves or covers.

Hurricane Evacuation

Hurricane Season is from June 1 thru November 30. As the closest metropolitan city inland from the Texas Coast, the City of San Antonio is a major shelter destination during mandatory hurricane evacuations. As such, planned work zone lane or road closures may be restricted and/or suspended during mandatory hurricane evacuation operations. The District will coordinate these restrictions at a minimum H-120 from any projected impact to the Texas Coast.

No time charges will be made if the Engineer determines that work on the project was impacted by the hurricane.

The Engineer may order changes in the Traffic Control Plan to accommodate evacuation traffic, and may suspend the work, all or in part, to ensure timely completion of this work. All work to implement changes in the Traffic Control Plan will be paid through existing bid prices or through Item 9.5, Force Account. However, the Department will not entertain any request for delay

damages, loss of efficiency that may be attributed to the restriction or suspension of road or lane closures, or to changes in the Traffic Control Plan.

The Contractor should be aware that the "City Public Service" (CPS) will be consulted by the Engineer in matters concerning the execution of the work, materials and testing related to the CPS work. As such; a CPS employee may be observing the construction and related operations as they progress.

Submit locate request for SAWS water and sewer to TXDOTlocates@saws.org.

Contractor questions on this project are to be addressed to the following individual(s):
Area Engineer, e-mail address John.Gianotti@txdot.gov
Contractor questions will be accepted through email, phone, and in person by the above individuals.

All contractor questions will be reviewed by the Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following Address:
https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/

All questions submitted that generate a response will be posted through this site. The site is organized by District, Project Type (Construction or Maintenance), Letting Date, CCSJ/Project Name.

--Item 5--
When working near aerial electrical lines or utility poles, comply with Federal, State and local regulations. A horizontal boom or equivalent equipment is required for construction in the vicinity of the CPS Energy electric lines in order to provide vertical clearance of equipment during construction. Contact CPS Energy Utility Coordination Group sixteen (16) week in anticipation of pole bracing. The estimated duration for pole bracing is 6 to 10 weeks (or longer if temporary construction easements are required) after invoice is paid. For de-energizing or sleeving of the overhead electrical lines depicted on the plans, please contact CPS Energy Utility Coordination Group sixteen (16) week in anticipation of needed de-energization. The estimated duration for de-energizing is approximately 4 to 6 weeks (after invoice is paid) but could vary on system scenario and backfeed requirements. De-energizing may not be possible in all instances or may be restricted during specific periods of time due to load demand. Contractor will be reimbursed for the invoice cost for pole bracing and/or de-energizing or sleeving through force account.

Prevention of Migratory Bird Nesting

It is anticipated that migratory birds, a protected group of species, may try to nest on bridges, culverts, vegetation, or gravel substrate, at any time of the year. The preferred nesting season for migratory birds is from February 15 through October 1. When practicable, schedule construction

operations outside of the preferred nesting season. Otherwise, nests containing migratory birds must be avoided and no work will be performed in the nesting areas until the young birds have fledged.

Structures

Bridge and culvert construction operations cannot begin until swallow nesting prevention is implemented, until after October 1 if it's determined that swallow nesting is actively occurring, or until it's determined swallow nests have been abandoned. If the State installed nesting deterrent on the bridges and culverts, maintain the existing nesting deterrent to prevent swallow nesting until October 1 or completion of the bridge and culvert work, whichever occurs earlier. If new nests are built and occupied after the beginning of the work, do not perform work that can interfere with or discourage swallows from returning to their nests. Prevention of swallow nesting can be performed by one of the following methods:

1. By February 15 begin the removal of any existing mud nests and all other mud placed by swallows for the construction of nests on any portion of the bridge and culverts. The Engineer will inspect the bridges and culverts for nest building activity. If swallows begin nest building, scrape or wash down all nest sites. Perform these activities daily unless the Engineer determines the need to do this work more frequently. Remove nests and mud through October 1 or until bridge and culvert construction operations are completed.

2. By February 15 place a nesting deterrent (which prevents access to the bridge and culvert by swallows) on the entire bridge (except deck and railing) and culverts.

No extension of time or compensation payment will be granted for a delay or suspension of work caused by nesting swallows. This work is subsidiary to the various bid items.

Provide a non-intrusive back-up alarm system on all heavy equipment used in close proximity to residential areas. This item is subsidiary to various bid items.

--Item 7--
The total disturbed areas within the project is anticipated at less than one (1) acre. Due to this type of construction, the project qualifies for exclusion under the Construction General Permit (CGP) issued by the Texas Commission on Environmental Quality (TCEQ). However; should the sum of the Engineer's anticipated disturbances and the Contractor's (On ROW and off ROW) PSL's equal or exceed the one (1) acre threshold; both TxDOT and the Contractor have project responsibilities under the CGP that reverts to non-exclusion status. Obtain approval for all non-depicted areas of disturbance that increases the initial soil and vegetation disturbed area estimates before work starts at these locations.

Notify the Engineer of the disturbed acreage within one (1) mile of the project limits. Obtain authorization from the TCEQ for Contractor PSL's for construction support activities on or off ROW.
No significant traffic generators events identified.

--Item 8--
Working days will be computed and charged in accordance with Article 8.3.1.4. "Standard Work week."

A Special Provision to Item 8 for a delayed authorized date to begin work has been included in the contract. The reason for including the Special Provision is for material processing or contractor mobilization.

Create and maintain a Bar Chart schedule.

--Item 9--
When approved, provide uniformed, off-duty law enforcement officers with marked vehicles during work that requires a lane closure. The officer in marked vehicles shall be located as approved to monitor or direct traffic during the closure. The method used to direct traffic at signalized intersections shall be as approved. Additional officers and vehicles may be provided when approved or directed.

Complete the daily 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.

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

All law enforcement personnel used in Work Zone Traffic Control shall be trained for performing duties in work zones and are required to take "Safe and Effective Use of Law Enforcement Personnel in Work Zones" (Course #133119) which can be found online at the following site: www.nhi.fhwa.dot.gov

Certificates of completion should be available to all who finish the course. These should be kept by the officers in order to substantiate completion when reporting to the work site.

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

--Item 421--
Use an automated ticket that contains the same information as TxDOT's ticket. Submit the ticket for approval prior to use. The concrete producer will contact the District Laboratory or the Engineer's Office (outside the San Antonio area) to inform TxDOT of scheduled structural concrete batching. Structural concrete includes bridge drill shafts, columns, caps, abutments,

deck or top slabs of direct traffic culverts. The curing facilities and strength testing equipment is not required for this project.
Finish all TMS concrete structures with Grade I Class B, Type 1 finish or as approved by the Engineer.

--Item 427--
Finish all TMS concrete structures with Grade I Class B, Type 1 finish or as approved by the Engineer.

--Item 432--
In areas where guard fence posts are to be placed in riprap, the riprap shall have an 18 inch +/- blocked out area (round or square). After the posts are installed, the blocked-out area shall be topped off with 4 inches of low strength grout/mortar consisting of about 1 sack of cement per cubic yard of mix.

Match the slope of the Riprap (Mow Strip) to the slope of the adjacent roadway.

--Item 500--
"Materials on Hand" payments will not be considered in determining percentages for mobilization payments.

--Item 502--
When advanced warning flashing arrow panels and/or changeable message sign is specified, have one standby unit in good condition at the job site. Standby time shall be considered subsidiary to the bid item.

After written notification, the time frame is provided on the Form 599 to provide properly maintained signs and barricades before considered in non-compliance. Failure to make corrections as noted may result in payment for this item being withheld.

Notify the Engineer in writing 10 business days in advance of any temporary or permanent lane, ramp, connector, etc. closures/detours, restrictions to lane widths, alterations to vertical clearances, or modifications to radii. Any other modifications to the roadway that may adversely affect the mobility of oversized/overweight trucks also require 10 business days advance written notice to the Engineer. Unless shown in the TCP, no lane, ramp, connector, etc. closures are allowed during special events. At least one lane has to remain open at all times. Lane closures will not be allowed if this reporting requirement is not met.

For closures not listed in the TCP; the lane closures are limited to between the hours of 9 pm to 5 am (for main lanes), 9 am to 4 pm (for frontage roads), and at least one lane has to remain open at all times

Avoid placing stockpiles within the roadway's horizontal clear zone. If a stockpile is placed within the clear zone, address in accordance with the TMUTCD.

Do not place barricades, signs, or any other traffic control devices where they interfere with sight distance at driveways or side streets.

In addition to providing a Contractor's Responsible Person and a phone number for emergency contact, have an employee available to respond on the project for emergencies and for taking corrective measures within 2 hours or within a reasonable time frame as specified by the Engineer.

If Nighttime work is required and work is not behind positive barrier then full TY 3 reflective gear is required to be worn by all workers, hard hat halos are required to be worn by the flaggers at flagging stations, TY III barricades are required to be spaced at 500 ft, and a mandatory night work meeting is required.

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.

Moving or adjustment of traffic signal heads, VIVDS, and radar detection for the purpose of alignment with the shifting of lanes in conjunction with the traffic control plan will be subsidiary to various bid items.

--Item 506--
It is not anticipated that erosion control devices will be needed. However; in the event devices are needed, the SW3P shall consist of the control measures approved. Depending on the type and amount of work, payment will be handled with the Force Account Procedure, or by individual pay items.

Failure to address items noted on the SW3P inspection report within two report cycles may result in the Department stopping all construction operations, exclusive of time charges, or withholding that month's estimate until the SW3P deficiencies are corrected unless the Engineer determines that the area is too wet to correct SW3P deficiencies.

Failure to correctly maintain daily monitoring reports and submitting to TxDOT on a daily/weekly basis may result in the monthly estimate being withheld.

--Item 540--
MBGF posts shall be round with domed tops, and not painted. If 10 or less timber posts are needed, they may be purchased locally and will be accepted by visual inspection.

Guard fence posts placed in proposed and/or existing areas of riprap, sidewalks or other concrete shall have an 18 inch +/- (square or round) block out in the concrete. After the posts are installed, the blocked-out area shall be topped off with 4 inches of low strength grout/mortar consisting of about 1 sack of cement per cubic yard of mix.

When connecting a Thrie-Beam to a concrete wingwall, bridge rail, CTB, etc., drill the holes for bolt placement using rotary or core type equipment. Use a core type drill when reinforcing steel is encountered. Do not use percussion or impact drilling. Repair damage to the concrete and spalls exceeding ½" from the edge of the hole.

Protect all TMS equipment with metal beam guard fence, downstream anchor terminal and guard rail end treatment. Install metal beam guard fence with downstream anchor terminal (DAT) and guard rail end treatment (GET) immediately after the creation of the TMS obstruction. Failure to do so will result in stoppage of all other work on the project until the installation of guard fence is complete.

Do not install metal beam guard fence for TMS equipment until the exact location of the TMS equipment to be protected has been determined. Obtain prior approval from the engineer before the metal beam guard fence is installed and prior to ordering materials. Due to field conditions, the quantity of guard fence may be reduced or increased from the amount shown in the plans. The engineer's approval does not relieve the contractor of his/her responsibility for correctness. Any adjustments to TMS equipment or metal beam guard fence with DAT and GET will be at no cost to the department

--Item 618--
It might be necessary to cut concrete for placement of conduit. Saw cut existing concrete, remove the concrete from the steel reinforcement (bars or fabric) and bend the steel to install the conduit. After the conduit has been placed, bend the steel back to its original position and back-fill the trench with an approved concrete. This work is subsidiary to this Item.

The conduit depth for illumination under the City of San Antonio streets is 36 inches.

Use materials from Material Producers list as shown on the Construction Division's (CST) web site. Category is "Roadway Illumination and Electrical Supplies."

Make all TMS underground conduit bends of 45 degrees or more in PVC systems, including bends into ground boxes, with rigid metal conduit, subsidiary to the various bid items with no direct payment. Ensure that grounding is in accordance with ED sheets.

Steel case all TMS PVC bores whenever shown on plans, subsidiary to the item "conduit" with no direct payment for labor or materials.

Install a permanent pull cord in all new TMS conduit and inner ducts which do not contain cables. Provide pull cords that have a minimum tensile strength of 1250 lbs. min. and are flat with footage markings for determining length installed. Provide pull cords that are water-resistant and resistant to environmental conditions within conduit. Pull cords installed shall be considered incidental to the various bid items with no direct payment made for labor and materials.

Install a single 1/C #14 AWG insulated wire (tracer wire) in TMS conduit that does not contain copper cables or contains fiber optic cable only and no copper cables (or as shown on plans), for the purpose of locating that conduit after installation.

TMS layout sheets may show multiple TMS cabinets at a particular location, however the conduit & cable which interconnects the equipment is not shown and is not included in the quantities unless stated otherwise on plan sheets.

When installing TMS conduit in areas where riprap presently exists, use care and do not break out more riprap than is necessary for placement of conduit. Replace riprap with concrete to the exact slope, pattern and thickness of existing riprap, subsidiary to the various bid items with no direct payment.

Install TMS concrete encased conduit (except for Multi-duct conduit system) with a minimum of 2 inches of encasement. Provide a template (conduit spacer) at 5 foot intervals to ensure that the conduit remains in its original position as approved by the engineer. Templates are considered subsidiary to the item "conduit" with no direct payment.

TMS bore lengths shown on plan sheets are approximate. Length of bore is measured starting 3 foot min. from each edge of pavement, curb and gutter, or any unforeseen existing utility, and balance of conduit run is measured as trenched conduit.

Conduit required in the temporary TMS phase will be considered as subsidiary unless shown otherwise on Temporary layouts. Due to unknown factors when determining best line of sight for the Wireless network, lengths of conduit will be determined in the field.

Accessories required for conduit mounted to bridge will be subsidiary to item 618 and work will be done as specified in the ITS CONDUIT details and ED standard sheets or as directed by the engineer. Conduit installed in sidewalks or bridge deck will be installed as specified in plans or as directed by the engineer.

--Item 620--
Wire nuts for TMS installation are not permitted.

In locations where TMS service conductors are routed through ground boxes with other cables, install a section of flexible PVC conduit in the ground box. Route the service conductors through this conduit to keep it separated from other cables. Isolate all other cables in the ground box in the same manner. Furnishing and installing the flexible PVC conduit is subsidiary to the various bid items with no direct payment.

To ensure immediate identification, consistently color code and permanently identify all TMS power conductors, twisted wire pair cables, shielded cables, control cables, and fiber optic cables in all manholes, ground boxes, and at all termination points and splices. Submit a chart or list identifying all cables and conductors in a logical and sequential manner.

Install all TMS conductors and cables continuous and without splices from terminal point to terminal point unless otherwise shown on the plans.

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

Provide an electrical conductor insulated ground in accordance with the National Electrical Code for any TMS conduit containing electrical conductors (insulated).

Test all TMS circuits to be clear of faults, grounds or open circuits.

--Item 624--
Place concrete aprons around all TMS ground boxes installed in sodded areas or as directed/approved by the Engineer.

Complete construction of TMS ground boxes within 48 hours after beginning construction for that ground box.

Provide TMS ground boxes as shown as state standard ED sheets. Construct the cover of polymer concrete. Legibly imprint the cover with the letters “TMS” – “Danger High Voltage” in minimum 1 inch letters.

--Item 628—
Make all arrangements for electrical service, and compliance with local standards and practices for proper installations.

Construct the TMS electrical services as shown on the TMS Electrical Service Data sheets

--Item 6005—
TESTING, TRAINING, DOCUMENTATION, FINAL ACCEPTANCE PLAN, AND WARRANTY
The 90-day Final Acceptance Test will begin only when all TMS equipment installation, cabling, wiring, testing, field work, TRANSGUIDE operations center work, etc. for the entire project is completed and acceptable to TxDOT. Partial testing is not allowed.

--Item 6007--
This project requires the placement of fiber optic cable. Splicing fiber optic cable of different manufacturers may result in signal degradation as measured through splice loss and DB loss per mile. The contractor must supply documentation of the compatibility of the fiber types with the fiber optic cable submittals. If testing of the new fiber optic cable after installation shows evidence of signal degradation outside of tolerable specifications due to the use of different fiber types, the contractor is responsible for replacing the newly installed fiber optic cable with material that results in signal quality with specifications. A TxDOT representative will be present while the contractor is splicing fibers from two different manufacturers.
The contractor is responsible for testing any existing Fiber Optic Cable strands that will be used for the communication links back to TransGuide or to an Aggregation Point (any existing fiber back to TransGuide or to an Aggregation Point to which new fiber will be spliced) for new or relocated TMS Equipment, identifying which fibers can be used and ensuring that the Fiber Optic Cable meets requirements stated in Fiber Optic Cable specification for dB loss.
If any TMS fiber optic cable is damaged during construction, it will be repaired within 48 hours after detection of damage. The Contractor will be required to test the fiber and provide such tests to the Engineer for determining suitability for splicing. If no splice is permitted, the Contractor will replace the entire run (approx. 15,000 ft. or actual length) at no direct cost to the Department. All fiber provided, tested and spliced will be in accordance with special specification 6007 “Intelligent Transportation System (ITS) Fiber Optic Cable” of the type specified.

Install 50 feet of slack of “trunkline” fiber optic cable in each ITS ground box that fiber passes through, racked to side of ground box using support hooks. Rack and hooks are subsidiary to the item ITS Ground Box with no direct payment.

Install 10 feet of slack of fiber optic cable (or as shown on plans) in each TY-D ground box that fiber passes through.

Use ST connectors where fiber optic cables terminate in TMS equipment.

--Item 6010--
CCTV Field Equipment standard manufacturer’s Warranty will not begin until the Final Acceptance Test begins. Any CCTV Field Equipment not having 100% of the standard manufacturer’s warranty remaining when Final Acceptance testing begins will be rejected by TxDOT. Ensure that all underground coaxial cable is RG-11 (double shielded) or as

recommended by the manufacturer of the CCTV Field Equipment. Furnish and install CCTV communication/power cables recommend or supplied by the manufacturer of CCTV Field Equipment. If no recommendation for communication/power cables is made by manufacturer of CCTV Field Equipment, the following cable to conduit assignment will be followed:

Conduit #1: Install coaxial drop cable and CCTV control cable.
Conduit #2: Install CCTV power cable

If the CCTV Field Equipment power cable carries 24 VDC, then the power cable may be installed in the same conduit with the coaxial drop cable. If the CCTV control cables carry 115 VAC, then the control cables must be installed with the 115 VAC power cable in conduit #2. In cases where the CCTV Field Equipment and conduit are to be mounted on an existing or proposed structure, review the structure and submit the mounting details to the engineer for approval.

Grounding for all CCTV Field Equipment shall comply with details shown on ITS Standard sheet ITS (19)-17, ITS Pole Grounding Details.

-- Item 6142--
Conduit and coax cable will be subsidiary to the various bid items. Traffic control, when applicable, shall follow appropriate standards and is subsidiary to various bid items

--Item 6185--
The TMA's will be measured and paid for by the DAY for each TMA/TA set up and operational on the worksite. 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 TMA's needed for the project. See TMA and TA Summary sheet in the plans.

--TMS General Notes--
All work will be performed in accordance to the standards and specifications found in these plans or as directed by the Engineer.

"TMS" is abbreviation for Traffic Management System.

All references to the TRANSGUIDE mainframe are references to the TRANSGUIDE Lonestar computer network.

Coordinate the installation of permanent TMS/ITS equipment, conduit, manholes, ground boxes, etc. with any roadway construction phasing to prohibit any open cuts across new construction.

Provide as submittal compliance matrix with all TMS/ITS submittals.

Perform all TMS/ITS Prototype approval, Design approval, and Demonstration tests within the state of Texas.

Not previously used TMS/ITS equipment:
Test any TMS/ITS equipment which has not previously been proven to be fully operational and fully compatible with the existing TRANSGUIDE software and hardware in the following manner:

Conduct tests for each type of TMS/ITS equipment, as directed by the Engineer, to determine compatibility of the equipment with the existing TransGuide Lonestar software and hardware. Prior to field installation, test one complete unit with all components to ensure that it is fully compatible with the existing TransGuide system. Mount the equipment to a trailer and connect in the field to an existing network cabinet. Make all hardware connections and configuration (in the operations center and in the field) and provide all incidentals (cable, connectors, etc.) to make the unit operational. Test all aspects of the system to show full functionality of the equipment and to show full compatibility with the TransGuide software and hardware. Failure to perform to the requirements of any test will be considered as a defect, and the equipment will be subject to rejection by the Engineer. Rejected equipment may be offered again for retest provided all noncompliance's have been corrected and retested by the Contractor and evidence thereof submitted to the Engineer. Testing is considered subsidiary to the particular bid item, with no payment made.

Partial payments:
The contractor will receive partial payments for the following TMS items unless otherwise approved by the Engineer.

Item 6010: CCTV Field Equipment (Analog)
Item 6304: ITS RVSD System

Partial payments consist of the following:

Materials on Hand: The Contractor's paid amount is based on the invoices for the material received and stored in his/her yard.

Field Installation for Field Camera Equipment: When the Contractor has completed the support structure and installed the Field Camera; the department will pay up to 80% of the bid item.

Stand-Alone Test: when the Field Camera Equipment has passed the stand-alone test, the department will pay the final 95% of the bid item.

When the Field Camera Equipment has passed the test portion of the final acceptance test the department will pay the final 5% of the bid item.

Field Installation: When the Contractor has completed the installation of the Radar Vehicle Sensing Device (RVSD) and Bluetooth Devices, the department will pay up to 80% of the bid item.

Stand-Alone Test: When the Radar Vehicle Sensing Device (RVSD) and/or Bluetooth Device has passed the stand-alone test, the department will pay up to 95% of the bid item.

When the Radar Vehicle Sensing Device (RVSD) and/or Bluetooth Device has passed the test portion of the Final Acceptance Test, the Department will pay the final 5% of the bid item.

The above percentages do not include the deduction of standard Retainage.

TMS Submittals:
All required shop drawing submittal for ITS equipment shall be submitted to the following e-address – SAT_ITS_SUBMITTALS@txdot.gov

Include in all TMS submittals the respective bid item (specification number and descriptive code). Indicate compliance on a paragraph by paragraph basis. Ensure that the statements claiming compliance reference the appropriate documentation and the referenced documentation supporting this claim is included with the submittal. Provide referenced documentation that contains the same numbering system as referenced in the submittal. For example, submittal item XXXX-XXXX, article 2.3, Paragraph 3, Meets Requirements (See Attachment "B"). The supporting documentation for Item XXXX-XXXX, article 2.3, Paragraph 3, would be titled as Attachment "B". Provide submittals with the same numbering system as stated in the specification. Failure to submit accordingly will result in rejection by the Engineer.

A TMS/ITS submittal will be considered as incomplete and therefore rejected, if it contains items listed as "being furnished by others". It is the responsibility of the Contractor to make sure the submittal addresses all items of the specification.

Provide the following TMS/ITS submittals (to be received by TxDOT San Antonio Traffic Management office) within the designated time. The time frame is in calendar days.

Item Description	Submitted By Contractor W/I Days After Authorization To Begin Work	Returned By State W/I Days
Equipment & Interconnect Wiring Schematic	30	30
*CCTV Field Equipment	30	30
*CCTV Equipment Cabinet	30	30
*Camera Pole Structure	30	30
Final Acceptance Plan	90	30

Submit those items designated with the (*), if any, together as a Package.
Submit the Final Acceptance Plan in electronic form.

The Contractor may submit items sooner if needed for construction, but no later than the dates stated above.

Submit a layout of equipment and interconnect wiring schematic for the TRANSGUIDE Control Center and field network equipment for approval by the Engineer prior to ordering materials. Consider all interconnect wiring within the TRANSGUIDE Control Center and all interconnect wiring for all equipment in the plans and described within the specifications as subsidiary to the various Bid Items with no direct payment.

Provide, to the Engineer, as-built plans in MicroStation format (.dgn files) of the TMS portion of this project when the project is complete. TxDOT will provide the .dgn files of the TMS plan sheets. Update these files with all TMS items as ACTUALLY CONSTRUCTED in the field. Cost to provide as-built plans as described above is subsidiary to the various bid items with no direct payment

Customize all training specifically for the TRANSGUIDE system; generic training will not be accepted on this project. Training materials and labor are subsidiary to the various Bid Items with no direct payment.

TMS equipment and conduit locations are approximate; the precise location is to be determined in the field, therefore the Contractor should not scale equipment off of plan sheets. Plan sheets are to be used for visual location (vicinity). Equipment locations may have to be adjusted due to conflicts with utilities or other structures, as approved by the Engineer. Do not obstruct the natural flow of water with Traffic Management System equipment. In low water areas, place Traffic Management equipment on high side of ditch. Replace all pavements, sidewalk, curb, rip-rap or any item damaged during construction, subsidiary to the various bid items with no direct payment.

Stencil structure numbers on all new TMS structures for permanent identification as directed by the Engineer. Ensure that all TMS equipment furnished and installed is completely compatible with existing hardware and software located within the TRANSGUIDE operations center (i.e. Lonestar). The Contractor should contact the Traffic Management Engineer for details on the system network architecture.

All new TMS equipment and any existing TMS equipment that is relocated will be incorporated into the existing Network Management System, subsidiary to the various bid items.

Security against theft and vandalism of all Traffic Management System equipment is the full responsibility of the Contractor until the date of final acceptance of the project by the Engineer.

Maintenance of all Traffic Management System equipment furnished and installed on this project is the full responsibility of the Contractor unit date of final acceptance of the project by the

Engineer. All required documentation must be turned in before TxDOT will accept project for maintenance.

Perform all TMS electrical work and provide all TMS electrical materials in accordance with the National Electrical Code.

The location of utilities (including TMS), either underground or overhead, if shown within the right of way are approximate and must be verified by the Contractor before beginning construction operations.

In accordance with the Underground Facility Damage Prevention Act (One Call Bill) the phone number for a utility locator is 1-800-545-6005. It is the Contractor's responsibility to make arrangements for unity locators as needed.

The contractor is responsible for contacting all electrical and telephone companies to have services installed for each Field Camera and/or DMS location. The electrical and telephone service will be installed under the contractor's name. Once the project is completed the contractor will transfer ownership of the electrical and telephone services to TxDOT.

In preparing auger holes or excavation for TMS posts and/or foundations, use care so as not to rupture existing drainage structures, sprinkler systems, electrical conduits and public utilities.

The contractor is fully responsible for all necessary cross connects, provisioning and cabling in the TRANSGUIDE computer room and fiber network cabinets, subsidiary to the various bid items.

The Contractor shall use materials from pre-qualified producers as indicated on the material producers list maintained by the Construction Division (CST) of the Texas Department of Transportation (TXDOT).

The following items shown on the "Summary of Quantities" sheets in the plans are provided by TxDOT.
Hardened Ethernet Switch (TELESTE)
Field Terminal Server (DIGI)
MPEG 4 Encoder (TELESTE)
CIP 3 Module (Camera Interface Panel)
Cellular Modem (Cisco)
CCTV 935563 (Axis comm. 01146-001)
RVSD (Wavetronix HD)

Installation of the above items are subsidiary to the various bid items except for the RVSD system.

QUANTITY SHEET

CONTROLLING PROJECT ID 0915-00-200 **DISTRICT** San Antonio **COUNTY** Bexar
HIGHWAY Various

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0915-00-200**			
		PROJECT ID		**A00060132**			
		COUNTY		**Bexar**			
		HIGHWAY		**Various**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	416-6006	DRILL SHAFT (48 IN)	LF	225.000		225.000	
	432-6001	RIPRAP (CONC)(4 IN)	CY	11.250		11.250	
	500-6001	MOBILIZATION	LS	100.00%		100.00%	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	9.000		9.000	
	506-6040	BIODEG EROSN CONT LOGS (INSTL) (8")	LF	270.000		270.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	270.000		270.000	
	618-6023	CONDT (PVC) (SCH 40) (2")	LF	3,230.000		3,230.000	
	618-6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	930.000		930.000	
	620-6010	ELEC CONDR (NO.6) INSULATED	LF	570.000		570.000	
	620-6012	ELEC CONDR (NO.4) INSULATED	LF	11,310.000		11,310.000	
	624-6002	GROUND BOX TY A (122311)W/APRON	EA	21.000		21.000	
	624-6010	GROUND BOX TY D (162922)W/APRON	EA	9.000		9.000	
	628-6149	ELC SRV TY D 120/240 060(NS)SS(N)GC(O)	EA	7.000		7.000	
	6010-6002	CCTV FIELD EQUIPMENT (DIGITAL)	EA	9.000		9.000	
	6010-6004	CCTV MOUNT (POLE)	EA	9.000		9.000	
	6062-6026	ITS RADIO (DUAL)(2.4 GHZ/5 GHZ)-I-U	EA	2.000		2.000	
	6063-6040	SPS-INS (20W) 288W (150AH) 1X50A(2)	EA	2.000		2.000	
	6064-6056	ITS POLE (60 FT)(110 MPH)	EA	9.000		9.000	
	6064-6080	ITS POLE MNT CAB (TY 2)(CONF 1)	EA	9.000		9.000	
	6304-6004	ITS RVSD (DC & WWA) (INSTALL ONLY)	EA	9.000		9.000	
	18	ITS: CONTRACTOR FORCE ACCOUNT WORK PARTICIPATING	LS	1.000		1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	

SUMMARY OF ITS ITEMS

LOCATION	416 6006	432 6001	500 6001	502 6001	506 6040	506 6043	618 6023	618 6047	620 6010	620 6012	624 6002	624 6010	628 6149	6010 6002	6010 6004	6062 6026	6063 6040	6064 6056	6064 6080	6304 6004
	DRILL SHAFT (48 IN)	RIPRAP (CONC)(4 IN)	MOBILIZATION	BARRICADES, SIGNS AND TRAFFIC HANDLING	BIODEG EROSN CONT LOGS (INSTL) (8")	BIODEG EROSN CONT LOGS (REMOVE)	CONDT (PVC) (SCH 40) (2")	CONDT (PVC) (SCH 80) (2") (BORE)	ELEC CONDR (NO.6) INSULATED	ELEC CONDR (NO.4) INSULATED	GROUND BOX TY A (122311)W/APRON	GROUND BOX TY D (162922)W/APRON	ELC SRV TY D 120/240 060(NS)SS(N)GC(O)	CCTV FIELD EQUIPMENT (DIGITAL)	CCTV MOUNT (POLE)	ITS RADIO (DUAL)(2.4 GHZ/5 GHZ)-IU	SPS-INS (20W) 288W (150AH) 1X50A(2)	ITS POLE (60 FT)(110 MPH)	ITS POLE MNT CAB (TY 2)(CONF 1)	ITS RVSD (DC & WWA) (INSTALL ONLY)
	LF	CY	LS	MO	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
I-10 AT SH-130	25	1.25	0.11	1	30	30	30					1		1	1	2	1	1	1	1
I-10 AT CR 217	25	1.25	0.11	1	30	30	310	45		1005	2	1	1	1	1			1	1	1
I-10 AT US-183	25	1.25	0.11	1	30	30	630	215		2475	4	1	1	1	1			1	1	1
I-37 AT LOOP 1604	25	1.25	0.11	1	30	30	100	110	570		2	1	1	1	1			1	1	1
I-37 AT FM 536	25	1.25	0.11	1	30	30	445	295		2160	4	1	1	1	1			1	1	1
I-37 AT FM 3006	25	1.25	0.11	1	30	30	735	50		2295	3	1	1	1	1			1	1	1
I-37 AT SH-97	25	1.25	0.11	1	30	30	565	55		1800	3	1	1	1	1			1	1	1
I-37 AT US-281	25	1.25	0.11	1	30	30	385	160		1575	3	1	1	1	1			1	1	1
I-37 AT FM 1099	25	1.25	0.12	1	30	30	30					1		1	1		1	1	1	1
PROJECT TOTALS	**225**	**11.25**	**1**	**9**	**270**	**270**	**3230**	**930**	**570**	**11310**	**21**	**9**	**7**	**9**	**9**	**2**	**2**	**9**	**9**	**9**

SUMMARY OF TxDOT FORCE ACCOUNT ITEMS

LOCATION	FORCE	FORCE	FORCE	FORCE	FORCE	FORCE	FORCE
	FIELD ETHERNET SWITCH (MES 110)	MPEG 4 Encoder (Teleste)	CIP 3 Module (Camera Interface Panel)	CELLULAR MODEM (Cisco)	CCTV 935563 (AXIS COMM 01146-001)	FIELD TERMINAL SERVER (DIGI)	RVSD (WAVETRONIX HD)
	EA	EA	EA	EA	EA	EA	EA
I-10 AT SH-130	1	1	1		1	1	1
I-10 AT CR 217	1	1	1	1		1	1
I-10 AT US-183	1	1	1	1		1	1
I-37 AT LOOP 1604	1	1	1	1		1	1
I-37 AT FM 536	1	1	1	1		1	1
I-37 AT FM 3006	1	1	1	1		1	1
I-37 AT SH-97	1	1	1	1		1	1
I-37 AT US-281	1	1	1	1		1	1
I-37 AT FM 1099	1	1	1	1	1	1	1
PROJECT TOTALS	**9**	**9**	**9**	**8**	**2**	**9**	**9**

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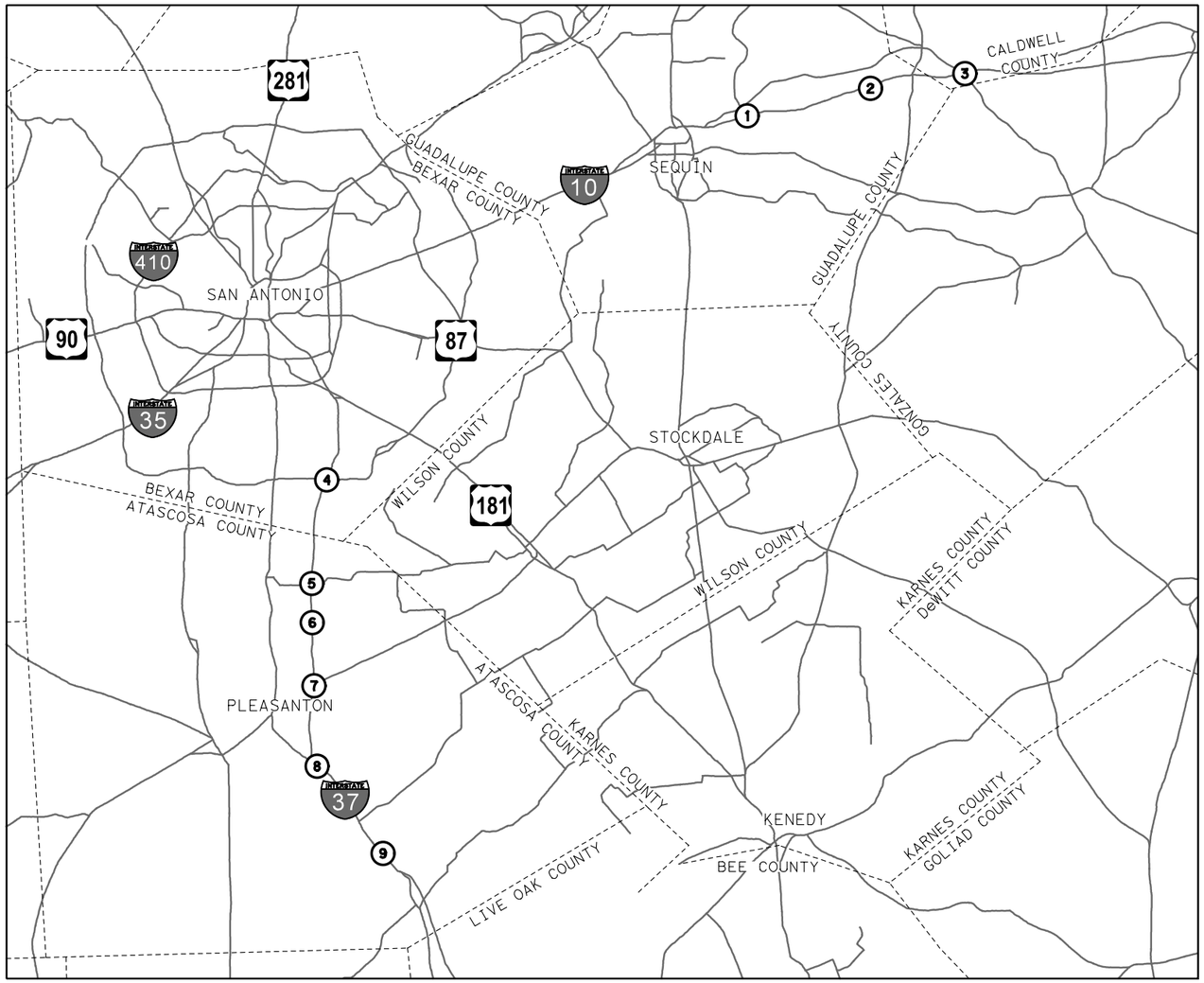
Texas Department of Transportation

HURRICANE EVACUATION ROUTE - ITS

ITS SUMMARY

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		5
STATE	DISTRICT	COUNTY	
TEXAS	SAT	BEXAR	
CONT	SECT	JOB	HIGHWAY NO
0915	00	200	VARIOUS



SITE	LOCATION	SHEET NUMBER	MILE MARKER	GPS LOCATION
1	IH-10 AT SH-130	6	614	29°36′35.52"N, 97°52′11.03"W
2	IH-10 AT CR 217	7	625	29°38′43.27"N, 97°41′52.05"W
3	IH-10 AT US-183	8	632	29°39′08.43"N, 97°35′30.06"W
4	IH-37 AT LOOP 1604	9	125	29°13′06.71"N, 98°24′45.56"W
5	IH-37 AT FM 536	10	117	29°06′21.84"N, 98°25′54.78"W
6	IH-37 AT FM 3006	11	113	29°03′07.02"N, 98°25′53.70"W
7	IH-37 AT SH-97	12	109	28°59′37.28"N, 98°25′50.74"W
8	IH-37 AT US-281	13	104	28°54′35.65"N, 98°26′03.77"W
9	IH-37 AT FM 1099	14	88	28°44′02.22"N, 98°17′22.69"W

STATE OF TEXAS
SRINIVAS M. SANGINENI
85575
LICENSED
PROFESSIONAL ENGINEER
Srinivas M. Sangineni
2/17/2021

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Texas Department of Transportation

HURRICANE EVACUATION ROUTE - ITS

PROJECT LAYOUT

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		6
STATE	DISTRICT	COUNTY	
TEXAS	SAT	BEXAR	
CONT	SECT	JOB	HIGHWAY NO
0915	00	200	VARIOUS

N

50 0 50 100

SCALE: 1" = 100'

LEGEND

- TRENCHED CONDUIT
- BORED CONDUIT
- ITS POLE w/ RIPRAP
- ELECTRICAL SERVICE
- TYPE A GROUND BOX W/ APRON
- TYPE D GROUND BOX W/ APRON
- RVSD DETECTION DIRECTION

NOTES:

1. THE LOCATION OF THE PROPOSED CONDUITS AND GROUND BOXES ARE DIAGRAMMATIC ONLY AND MAY BE ADJUSTED BY THE ENGINEER TO ACCOMMODATE FIELD CONDITIONS.
2. CONTRACTOR SHALL INSTALL ITS RADIO AND EQUIPMENT ON ITS POLE AT IH-10 AT CR 212A AND PROVIDE CONNECTION TO EXISTING FIBER NETWORK.
3. FORCE ACCOUNT ITEMS TO BE PROVIDED BY TxDOT AND INSTALLED BY CONTRACTOR. INSTALLATION OF FORCE ACCOUNT ITEMS WILL BE PAID SUBSIDIARY TO THE BID ITEM INDICATED IN THE FORCE ACCOUNT SUMMARY TABLE.

STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER
Srinivas M. Sangineni
2/17/2021

QUANTITY SUMMARY

BID ITEM	DESCRIPTION	UNIT	QTY.
0416 6006	DRILL SHAFT (48 IN)	LF	25
0432 6001	RIPRAP (CONC)(4 IN)	CY	1.25
0618 6023	CONDT (PVC) (SCH 40) (2")	LF	30
0624 6010	GROUND BOX TY D (162922)W/APRON	EA	1
6010 6002	CCTV FIELD EQUIPMENT (DIGITAL)	EA	1
6010 6004	CCTV MOUNT (POLE)	EA	1
6062 6026	ITS RADIO (DUAL)(2.4 GHZ/5 GHZ)-I-U	EA	2
6063 6040	SPS-INS (20W) 288W (150AH) 1X50A(2)	EA	1
6064 6056	ITS POLE (60 FT)(110 MPH)	EA	1
6064 6080	ITS POLE MNT CAB (TY 2)(CONF 1)	EA	1
6304 6004	ITS RVSD (DC & WWA) (INSTALL ONLY)	EA	1

FORCE ACCOUNT SUMMARY

DESCRIPTION	UNIT	QTY.	INSTALLATION*	
FIELD ETHERNET SWITCH (MES 110)	EA	1	6064	6080
CELLULAR MODEM (CISCO)	EA	1		
MPEG 4 ENCORDER (TELESTE)	EA	1	6010	6002
CCTV 935563 (AXIS COMM 01146-001)	EA	1		
CIP 3 MODULE (CAMERA INTERFACE PANEL)	EA	1		
FIELD TERMINAL SERVER (DIGI)	EA	1	6304	6004
RVSD (WAVETRONIX HD)	EA	1		

* INSTALLATION OF FORCE ACCOUNT EQUIPMENT SHALL BE PAID SUBSIDIARY TO THE BID ITEM INDICATED

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Texas Department of Transportation

HURRICANE EVACUATION ROUTE - ITS

ITS PLAN

I-10 AT SH-130

SCALE: 1" = 100' SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		7
STATE	DISTRICT	COUNTY	
TEXAS	SAT	BEXAR	
CONT	SECT	JOB	HIGHWAY NO
0915	00	200	VARIOUS

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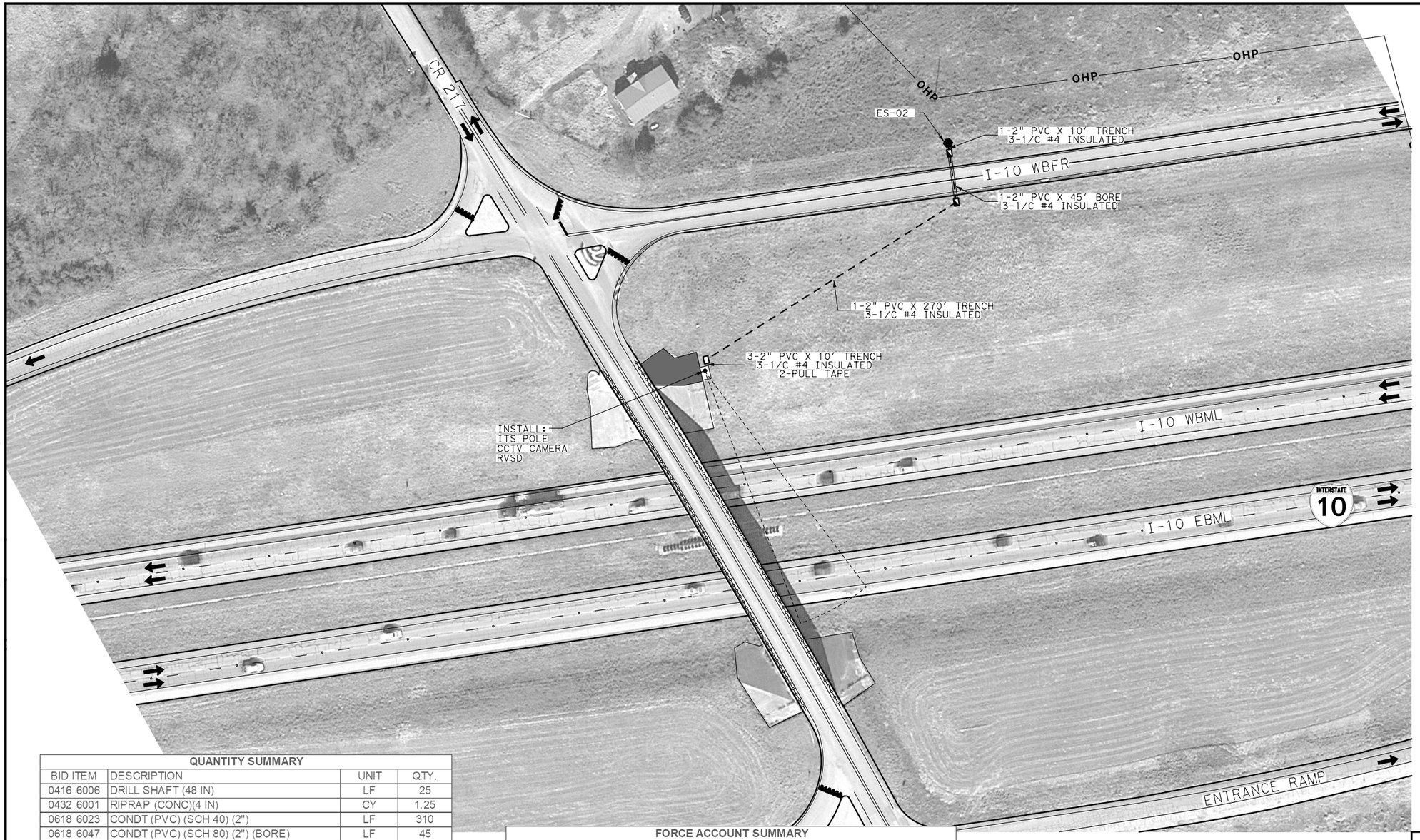

N

50 0 50 100

SCALE: 1" = 100'

LEGEND

- TRENCHED CONDUIT
- BORED CONDUIT
- ITS POLE w/ RIPRAP
- ELECTRICAL SERVICE
- TYPE A GROUND BOX W/ APRON
- TYPE D GROUND BOX W/ APRON
- RVSD DETECTION DIRECTION

NOTES:

1. THE LOCATION OF THE PROPOSED CONDUITS AND GROUND BOXES ARE DIAGRAMMATIC ONLY AND MAY BE ADJUSTED BY THE ENGINEER TO ACCOMMODATE FIELD CONDITIONS.
2. DESIGN ALLOWS FOR A MAXIMUM WIRE DISTANCE OF 495 FEET WITH AN ALLOWABLE DROP OF 3%.
3. CONTRACTOR SHALL TIE CCTV POLE RIPRAP TO EXISTING RIPRAP.
4. FORCE ACCOUNT ITEMS TO BE PROVIDED BY TxDOT AND INSTALLED BY CONTRACTOR. INSTALLATION OF FORCE ACCOUNT ITEMS WILL BE PAID SUBSIDIARY TO THE BID ITEM INDICATED IN THE FORCE ACCOUNT SUMMARY TABLE.

STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER
Srinivas M. Sangineni
2/17/2021

QUANTITY SUMMARY

BID ITEM	DESCRIPTION	UNIT	QTY.
0416 6006	DRILL SHAFT (48 IN)	LF	25
0432 6001	RIPRAP (CONC)(4 IN)	CY	1.25
0618 6023	CONDT (PVC) (SCH 40) (2")	LF	310
0618 6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	45
0620 6012	ELEC CONDR (NO.4) INSULATED	LF	1005
0624 6002	GROUND BOX TY A (122311)W/APRON	EA	2
0624 6010	GROUND BOX TY D (162922)W/APRON	EA	1
0628 6149	ELC SRV TY D 120/240 060(NS)SS(N)GC(O)	EA	1
6010 6002	CCTV FIELD EQUIPMENT (DIGITAL)	EA	1
6010 6004	CCTV MOUNT (POLE)	EA	1
6064 6056	ITS POLE (60 FT)(110 MPH)	EA	1
6064 6080	ITS POLE MNT CAB (TY 2)(CONF 1)	EA	1
6304 6004	ITS RVSD (DC & WWA) (INSTALL ONLY)	EA	1

FORCE ACCOUNT SUMMARY

DESCRIPTION	UNIT	QTY.	INSTALLATION*	
FIELD ETHERNET SWITCH (MES 110)	EA	1	6064	6080
CELLULAR MODEM (CISCO)	EA	1		
MPEG 4 ENCORDER (TELESTE)	EA	1	6010	6002
CIP 3 MODULE (CAMERA INTERFACE PANEL)	EA	1		
FIELD TERMINAL SERVER (DIGI)	EA	1	6304	6004
RVSD (WAVETRONIX HD)	EA	1		

* INSTALLATION OF FORCE ACCOUNT EQUIPMENT SHALL BE PAID SUBSIDIARY TO THE BID ITEM INDICATED

ELECTRICAL SERVICE DATA

Elec. Service ID	BID ITEM	Electrical Service Description	Service *Conduit Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contactor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Ckt Conductors No./Size	Branch Circuit Amps	KVA Load
ES-02	0628-6149	ELC SRV TY D 120/240 060 (NS)SS(N)GC(O)	2"	N/A	2P/60	N/A	100	1	1P/15	3/#4	12	1.4

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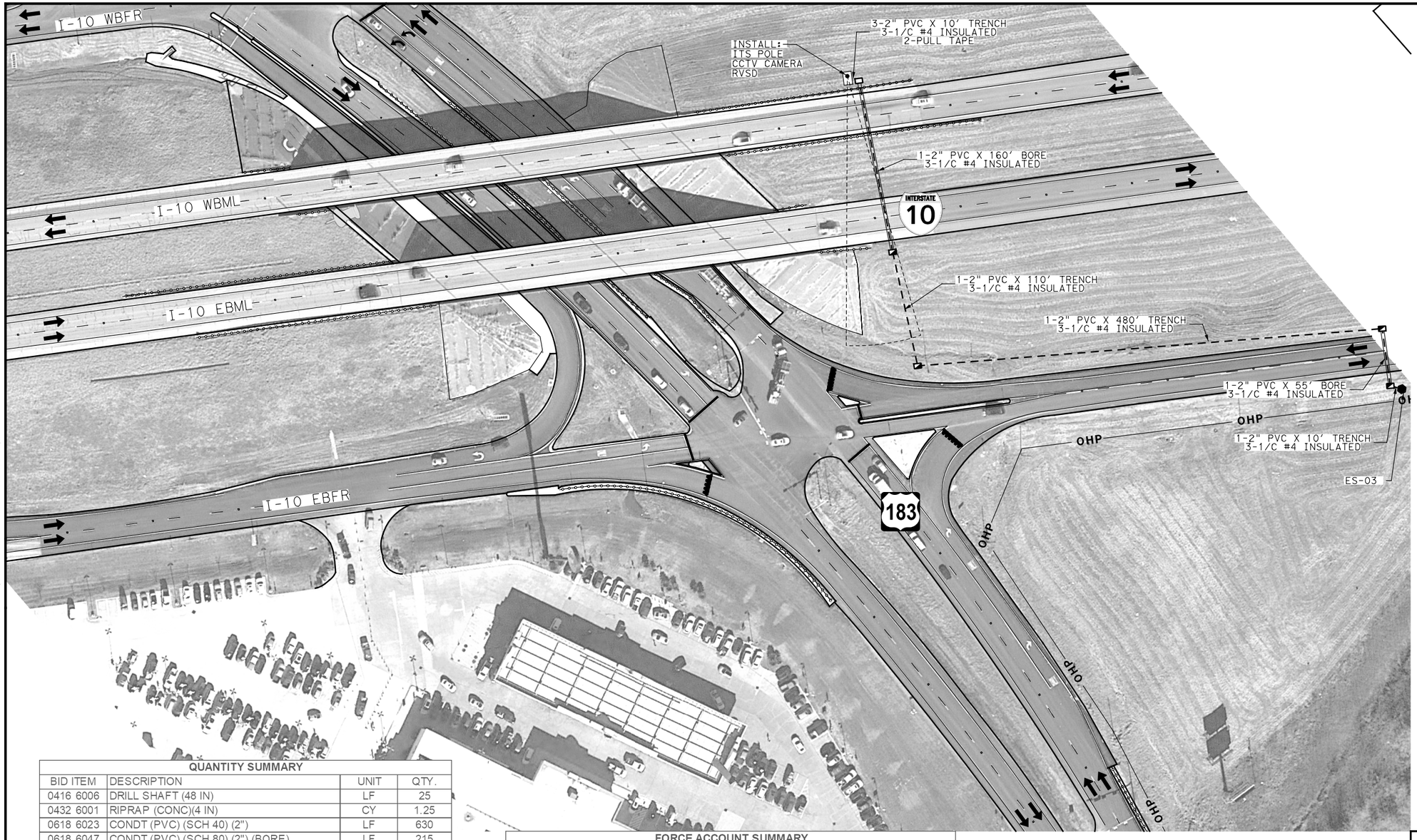
HURRICANE EVACUATION ROUTE - ITS

ITS PLAN

I-10 AT CR 217

SCALE: 1" = 100' SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		8
STATE	DISTRICT	COUNTY	
TEXAS	SAT	BEXAR	
CONT	SECT	JOB	HIGHWAY NO
0915	00	200	VARIOUS



N

50 0 50 100

SCALE: 1" = 100'

LEGEND

- TRENCHED CONDUIT
- BORED CONDUIT
- ITS POLE w/ RIPRAP
- ELECTRICAL SERVICE
- TYPE A GROUND BOX W/ APRON
- TYPE D GROUND BOX W/ APRON
- RVSD DETECTION DIRECTION

NOTES:

1. THE LOCATION OF THE PROPOSED CONDUITS AND GROUND BOXES ARE DIAGRAMMATIC ONLY AND MAY BE ADJUSTED BY THE ENGINEER TO ACCOMMODATE FIELD CONDITIONS.
2. DESIGN ALLOWS FOR A MAXIMUM WIRE DISTANCE OF 825 FEET WITH AN ALLOWABLE VOLTAGE DROP OF 5%.
3. FORCE ACCOUNT ITEMS TO BE PROVIDED BY TxDOT AND INSTALLED BY CONTRACTOR. INSTALLATION OF FORCE ACCOUNT ITEMS WILL BE PAID SUBSIDIARY TO THE BID ITEM INDICATED IN THE FORCE ACCOUNT SUMMARY TABLE.

QUANTITY SUMMARY

BID ITEM	DESCRIPTION	UNIT	QTY.
0416 6006	DRILL SHAFT (48 IN)	LF	25
0432 6001	RIPRAP (CONC)(4 IN)	CY	1.25
0618 6023	CONDT (PVC) (SCH 40) (2")	LF	630
0618 6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	215
0620 6012	ELEC CONDR (NO.4) INSULATED	LF	2475
0625 6002	GROUND BOX TY A (122311)W/APRON	EA	4
0624 6010	GROUND BOX TY D (162922)W/APRON	EA	1
0628 6149	ELC SRV TY D 120/240 060(NS)SS(N)GC(O)	EA	1
6010 6002	CCTV FIELD EQUIPMENT (DIGITAL)	EA	1
6010 6004	CCTV MOUNT (POLE)	EA	1
6064 6056	ITS POLE (60 FT)(110 MPH)	EA	1
6064 6080	ITS POLE MNT CAB (TY 2)(CONF 1)	EA	1
6304 6004	ITS RVSD (DC & WWA) (INSTALL ONLY)	EA	1

FORCE ACCOUNT SUMMARY

DESCRIPTION	UNIT	QTY.	INSTALLATION*	
FIELD ETHERNET SWITCH (MES 110)	EA	1	6064	6080
CELLULAR MODEM (CISCO)	EA	1		
MPEG 4 ENCORDER (TELESTE)	EA	1	6010	6002
CIP 3 MODULE (CAMERA INTERFACE PANEL)	EA	1		
FIELD TERMINAL SERVER (DIGI)	EA	1	6304	6004
RVSD (WAVETRONIX HD)	EA	1		

* INSTALLATION OF FORCE ACCOUNT EQUIPMENT SHALL BE PAID SUBSIDIARY TO THE BID ITEM INDICATED

ELECTRICAL SERVICE DATA

Elec. Service ID	BID ITEM	Electrical Service Description	Service *Conduit Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contactor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Ckt. Conductors No./Size	Branch Circuit Amps	KVA Load
ES-03	0628-6149	ELC SRV TY D 120/240 060 (NS)SS(N)GC(O)	2"	N/A	2P/60	N/A	100	1	1P/15	3/#4	12	1.4

STATE OF TEXAS
SRINIVAS M. SANGINENI
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LICENSED PROFESSIONAL ENGINEER
Srinivas M. Sangineni
2/17/2021

OTHON CONSULTING ENGINEERS
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P: 214.340.7344| F: 214.221.7411

HURRICANE EVACUATION ROUTE - ITS

ITS PLAN

I-10 AT US-183

SCALE: 1" = 100' SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
6	(SEE TITLE SHEET)	9

STATE	DISTRICT	COUNTY	
TEXAS	SAT	BEXAR	
CONT	SECT	JOB	HIGHWAY NO
0915	00	200	VARIOUS

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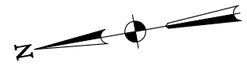

50 0 50 100
SCALE: 1" = 100'

LEGEND

- TRENCHED CONDUIT
- BORED CONDUIT
- ITS POLE w/ RIPRAP
- ELECTRICAL SERVICE
- TYPE A GROUND BOX W/ APRON
- TYPE D GROUND BOX W/ APRON
- RVSD DETECTION DIRECTION

NOTES:

1. THE LOCATION OF THE PROPOSED CONDUITS AND GROUND BOXES ARE DIAGRAMMATIC ONLY AND MAY BE ADJUSTED BY THE ENGINEER TO ACCOMMODATE FIELD CONDITIONS.
2. DESIGN ALLOWS FOR A MAXIMUM WIRE DISTANCE OF 310 FEET WITH AN ALLOWABLE DROP OF 3%.
3. CONTRACTOR SHALL TIE CCTV POLE RIPRAP TO EXISTING RIPRAP.
4. FORCE ACCOUNT ITEMS TO BE PROVIDED BY TxDOT AND INSTALLED BY CONTRACTOR. INSTALLATION OF FORCE ACCOUNT ITEMS WILL BE PAID SUBSIDIARY TO THE BID ITEM INDICATED IN THE FORCE ACCOUNT SUMMARY TABLE.

STATE OF TEXAS
SRINIVAS M. SANGINENI
85575
LICENSED
PROFESSIONAL ENGINEER
Srinivas M. Sangineni
2/17/2021

QUANTITY SUMMARY

BID ITEM	DESCRIPTION	UNIT	QTY.
0416 6006	DRILL SHAFT (48 IN)	LF	25
0432 6001	RIPRAP (CONC)(4 IN)	CY	1.25
0618 6023	CONDT (PVC) (SCH 40) (2")	LF	100
0618 6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	110
0620 6010	ELEC CONDR (NO.6) INSULATED	LF	570
0624 6002	GROUND BOX TY A (122311)W/APRON	EA	2
0624 6010	GROUND BOX TY D (162922)W/APRON	EA	1
0628 6149	ELC SRV TY D 120/240 060(NS)SS(N)GC(O)	EA	1
6010 6002	CCTV FIELD EQUIPMENT (DIGITAL)	EA	1
6010 6004	CCTV MOUNT (POLE)	EA	1
6064 6056	ITS POLE (60 FT)(110 MPH)	EA	1
6064 6080	ITS POLE MNT CAB (TY 2)(CONF 1)	EA	1
6304 6004	ITS RVSD (DC & WWA) (INSTALL ONLY)	EA	1

FORCE ACCOUNT SUMMARY

DESCRIPTION	UNIT	QTY.	INSTALLATION*	
FIELD ETHERNET SWITCH (MES 110)	EA	1	6064	6080
CELLULAR MODEM (CISCO)	EA	1		
MPEG 4 ENCORDER (TELESTE)	EA	1	6010	6002
CIP 3 MODULE (CAMERA INTERFACE PANEL)	EA	1		
FIELD TERMINAL SERVER (DIGI)	EA	1	6304	6004
RVSD (WAVETRONIX HD)	EA	1		

* INSTALLATION OF FORCE ACCOUNT EQUIPMENT SHALL BE PAID SUBSIDIARY TO THE BID ITEM INDICATED

ELECTRICAL SERVICE DATA

Elec. Service ID	BID ITEM	Electrical Service Description	Service *Conduit Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contactor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Ckt. Conductors No./Size	Branch Circuit Amps	KVA Load
ES-09	0628-6149	ELC SRV TY D 120/240 060 (NS)SS(N)GC(O)	2"	N/A	2P/60	N/A	100	1	1P/15	3/#6	12	1.4

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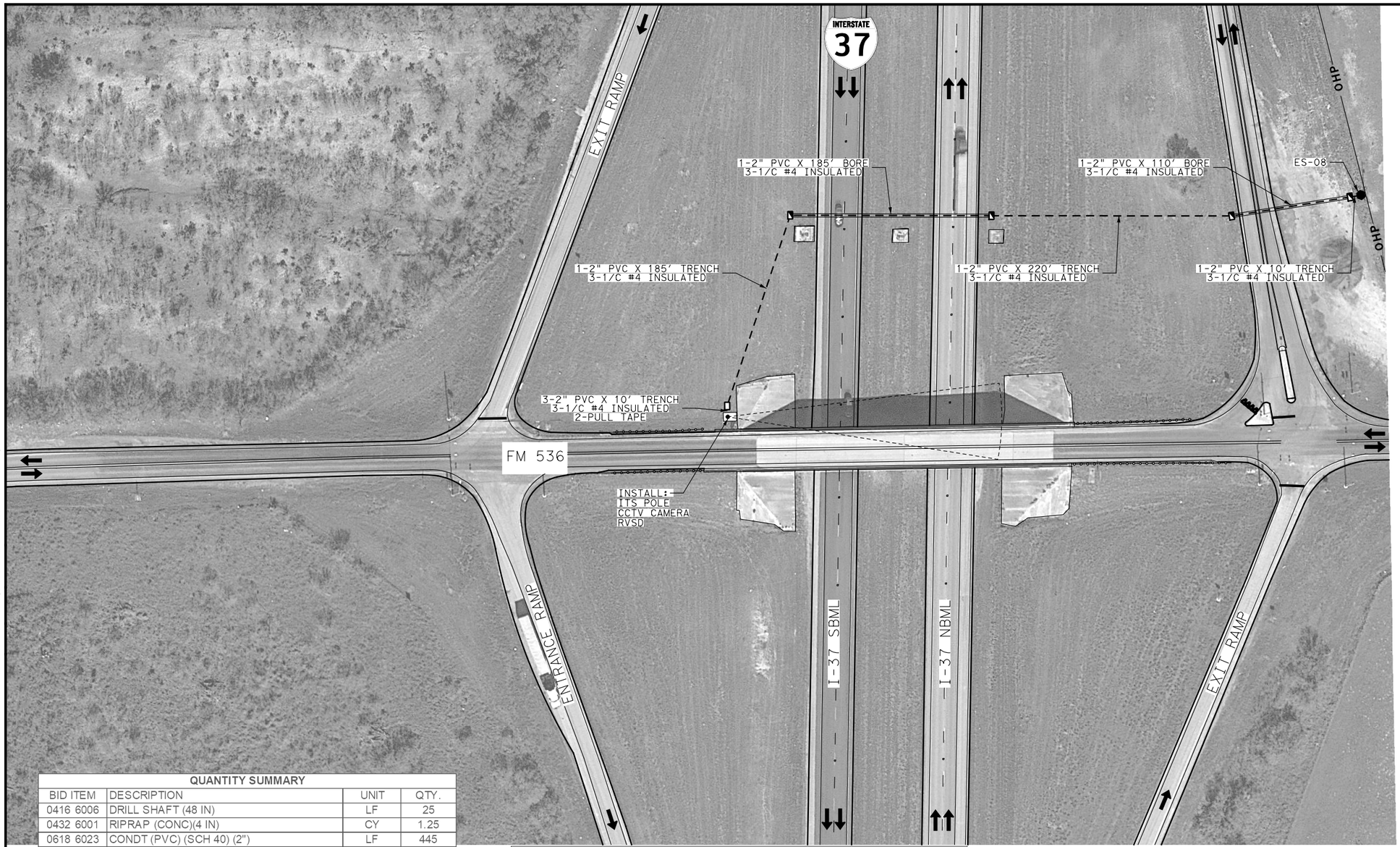
HURRICANE EVACUATION ROUTE - ITS

ITS PLAN

I-37 AT LOOP 1604

SCALE: 1" = 100' SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		10
STATE	DISTRICT	COUNTY	
TEXAS	SAT	BEXAR	
CONT	SECT	JOB	HIGHWAY NO
0915	00	200	VARIOUS



N

50 0 50 100
SCALE: 1" = 100'

LEGEND

- TRENCHED CONDUIT
- BORED CONDUIT
- ITS POLE w/ RIPRAP
- ELECTRICAL SERVICE
- TYPE A GROUND BOX W/ APRON
- TYPE D GROUND BOX W/ APRON
- RVSD DETECTION DIRECTION

NOTES:

1. THE LOCATION OF THE PROPOSED CONDUITS AND GROUND BOXES ARE DIAGRAMMATIC ONLY AND MAY BE ADJUSTED BY THE ENGINEER TO ACCOMMODATE FIELD CONDITIONS.
2. DESIGN ALLOWS FOR A MAXIMUM WIRE DISTANCE OF 825 FEET WITH AN ALLOWABLE DROP OF 5%.
3. CONTRACTOR SHALL TIE CCTV POLE RIPRAP TO EXISTING RIPRAP.
4. FORCE ACCOUNT ITEMS TO BE PROVIDED BY TxDOT AND INSTALLED BY CONTRACTOR. INSTALLATION OF FORCE ACCOUNT ITEMS WILL BE PAID SUBSIDIARY TO THE BID ITEM INDICATED IN THE FORCE ACCOUNT SUMMARY TABLE.

STATE OF TEXAS
SRINIVAS M. SANGINENI
85575
LICENSED PROFESSIONAL ENGINEER
Srinivas M. Sangineni
2/17/2021

QUANTITY SUMMARY

BID ITEM	DESCRIPTION	UNIT	QTY.
0416 6006	DRILL SHAFT (48 IN)	LF	25
0432 6001	RIPRAP (CONC)(4 IN)	CY	1.25
0618 6023	CONDT (PVC) (SCH 40) (2")	LF	445
0618 6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	295
0620 6012	ELEC CONDR (NO.4) INSULATED	LF	2160
0624 6002	GROUND BOX TY A (122311)W/APRON	EA	4
0624 6010	GROUND BOX TY D (162922)W/APRON	EA	1
0628 6149	ELC SRV TY D 120/240 060(NS)SS(N)GC(O)	EA	1
6010 6002	CCTV FIELD EQUIPMENT (DIGITAL)	EA	1
6010 6004	CCTV MOUNT (POLE)	EA	1
6064 6056	ITS POLE (60 FT)(110 MPH)	EA	1
6064 6080	ITS POLE MNT CAB (TY 2)(CONF 1)	EA	1
6304 6004	ITS RVSD (DC & WWA) (INSTALL ONLY)	EA	1

FORCE ACCOUNT SUMMARY

DESCRIPTION	UNIT	QTY.	INSTALLATION*	
FIELD ETHERNET SWITCH (MES 110)	EA	1	6064	6080
CELLULAR MODEM (CISCO)	EA	1		
MPEG 4 ENCORDER (TELESTE)	EA	1	6010	6002
CIP 3 MODULE (CAMERA INTERFACE PANEL)	EA	1		
FIELD TERMINAL SERVER (DIGI)	EA	1	6304	6004
RVSD (WAVETRONIX HD)	EA	1		

* INSTALLATION OF FORCE ACCOUNT EQUIPMENT SHALL BE PAID SUBSIDIARY TO THE BID ITEM INDICATED

ELECTRICAL SERVICE DATA

Elec. Service ID	BID ITEM	Electrical Service Description	Service *Conduit Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contactor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Ckt. Conductors No./Size	Branch Circuit Amps	KVA Load
ES-08	0628-6149	ELC SRV TY D 120/240 060 (NS)SS(N)GC(O)	2"	N/A	2P/60	N/A	100	1	1P/15	3/#4	12	1.4

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Texas Department of Transportation

HURRICANE EVACUATION ROUTE - ITS

ITS PLAN

I-37 AT FM 536

SCALE: 1" = 100' SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		11
STATE	DISTRICT	COUNTY	
TEXAS	SAT	BEXAR	
CONT	SECT	JOB	HIGHWAY NO
0915	00	200	VARIOUS

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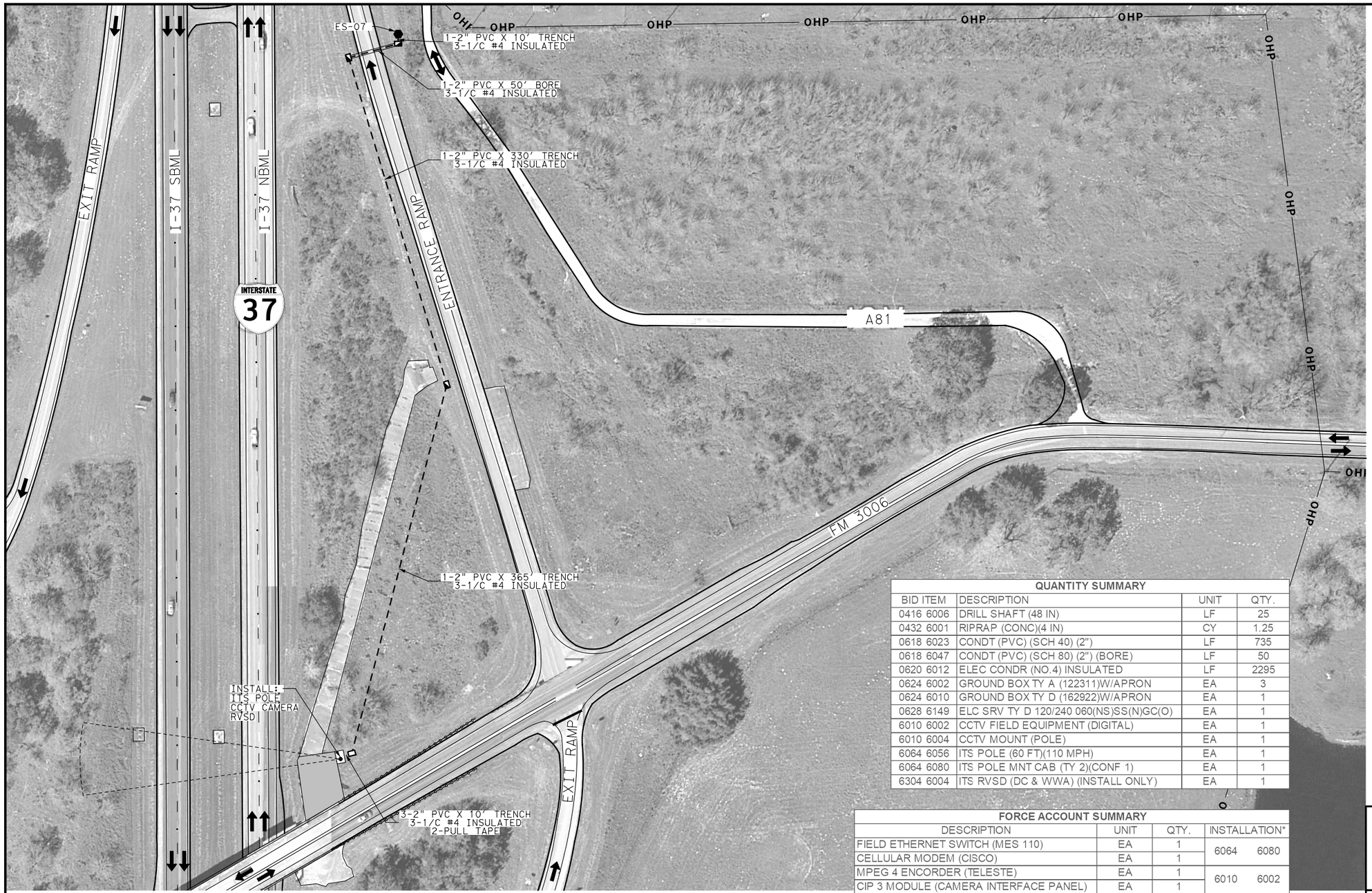

N

50 0 50 100
SCALE: 1" = 100'

LEGEND

- TRENCHED CONDUIT
- BORED CONDUIT
- ITS POLE w/ RIPRAP
- ELECTRICAL SERVICE
- TYPE A GROUND BOX W/ APRON
- TYPE D GROUND BOX W/ APRON
- RVSD DETECTION DIRECTION

NOTES:

1. THE LOCATION OF THE PROPOSED CONDUITS AND GROUND BOXES ARE DIAGRAMMATIC ONLY AND MAY BE ADJUSTED BY THE ENGINEER TO ACCOMMODATE FIELD CONDITIONS.
2. DESIGN ALLOWS FOR A MAXIMUM WIRE DISTANCE OF 820 FEET WITH AN ALLOWABLE VOLTAGE DROP OF 5%.
3. CONTRACTOR SHALL TIE CCTV POLE RIPRAP TO EXISTING RIPRAP.
4. FORCE ACCOUNT ITEMS TO BE PROVIDED BY TxDOT AND INSTALLED BY CONTRACTOR. INSTALLATION OF FORCE ACCOUNT ITEMS WILL BE PAID SUBSIDIARY TO THE BID ITEM INDICATED IN THE FORCE ACCOUNT SUMMARY TABLE.

QUANTITY SUMMARY

BID ITEM	DESCRIPTION	UNIT	QTY.
0416 6006	DRILL SHAFT (48 IN)	LF	25
0432 6001	RIPRAP (CONC)(4 IN)	CY	1.25
0618 6023	CONDT (PVC) (SCH 40) (2")	LF	735
0618 6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	50
0620 6012	ELEC CONDR (NO.4) INSULATED	LF	2295
0624 6002	GROUND BOX TY A (122311)W/APRON	EA	3
0624 6010	GROUND BOX TY D (162922)W/APRON	EA	1
0628 6149	ELC SRV TY D 120/240 060(NS)SS(N)GC(O)	EA	1
6010 6002	CCTV FIELD EQUIPMENT (DIGITAL)	EA	1
6010 6004	CCTV MOUNT (POLE)	EA	1
6064 6056	ITS POLE (60 FT)(110 MPH)	EA	1
6064 6080	ITS POLE MNT CAB (TY 2)(CONF 1)	EA	1
6304 6004	ITS RVSD (DC & WWA) (INSTALL ONLY)	EA	1

FORCE ACCOUNT SUMMARY

DESCRIPTION	UNIT	QTY.	INSTALLATION*	
FIELD ETHERNET SWITCH (MES 110)	EA	1	6064	6080
CELLULAR MODEM (CISCO)	EA	1		
MPEG 4 ENCORDER (TELESTE)	EA	1	6010	6002
CIP 3 MODULE (CAMERA INTERFACE PANEL)	EA	1		
FIELD TERMINAL SERVER (DIGI)	EA	1	6304	6004
RVSD (WAVETRONIX HD)	EA	1		

* INSTALLATION OF FORCE ACCOUNT EQUIPMENT SHALL BE PAID SUBSIDIARY TO THE BID ITEM INDICATED

ELECTRICAL SERVICE DATA

Elec. Service ID	BID ITEM	Electrical Service Description	Service *Conduit Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contactor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Ckt. Conductors No./Size	Branch Circuit Amps	KVA Load
ES-07	0628-6149	ELC SRV TY D 120/240 060 (NS)SS(N)GC(O)	2"	N/A	2P/60	N/A	100	1	1P/15	3/#4	12	1.4

SRINIVAS M. SANGINENI
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STATE OF TEXAS
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Texas Department of Transportation

HURRICANE EVACUATION ROUTE - ITS

ITS PLAN

I-37 AT FM 3006

SCALE: 1" = 100' SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		12
STATE	DISTRICT	COUNTY	
TEXAS	SAT	BEXAR	
CONT	SECT	JOB	HIGHWAY NO
0915	00	200	VARIOUS

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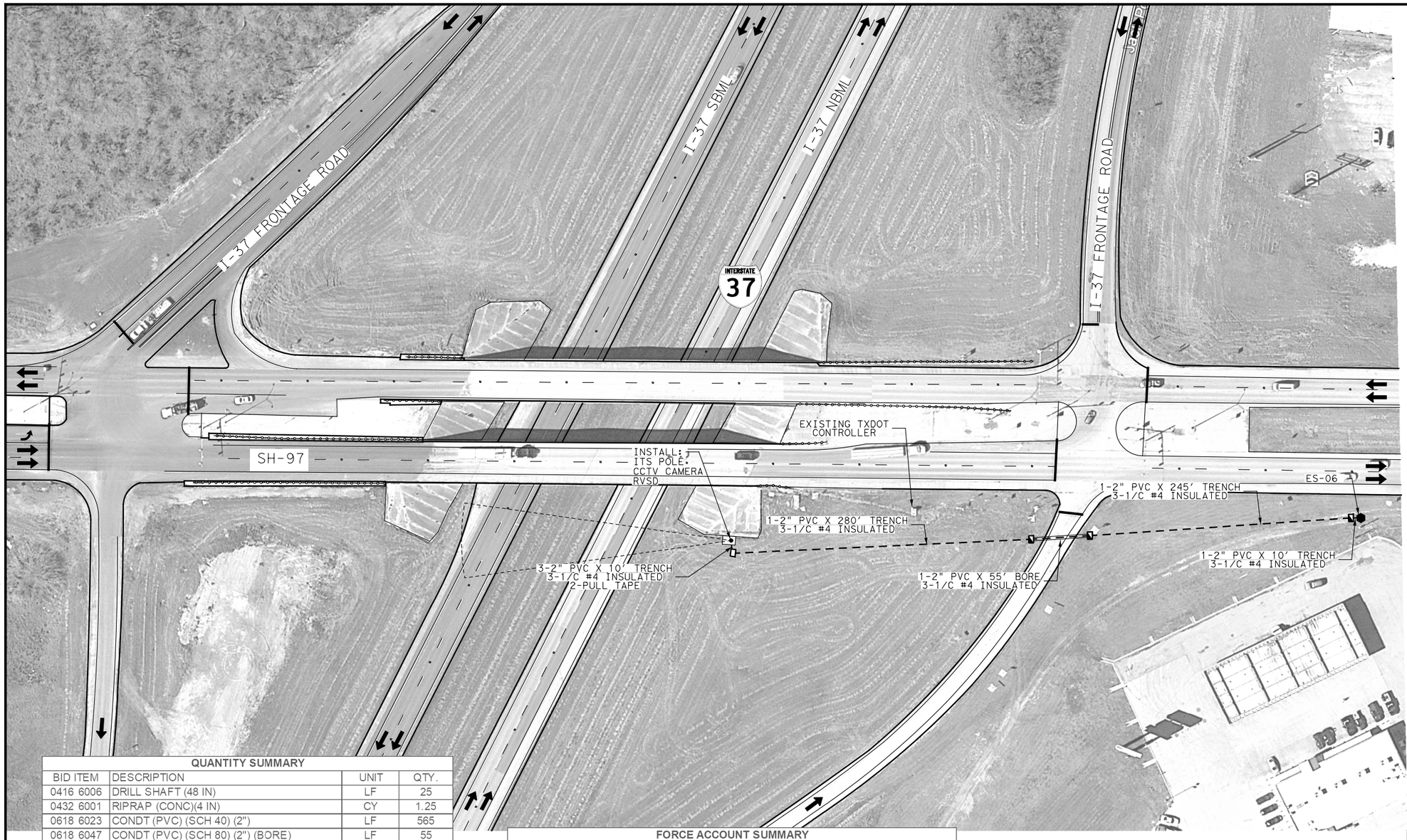

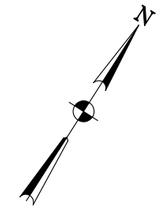

50 0 50 100

SCALE: 1" = 100'

LEGEND

- TRENCHED CONDUIT
- BORED CONDUIT
- ITS POLE w/ RIPRAP
- ELECTRICAL SERVICE
- TYPE A GROUND BOX W/ APRON
- TYPE D GROUND BOX W/ APRON
- RVSD DETECTION DIRECTION

NOTES:

1. THE LOCATION OF THE PROPOSED CONDUITS AND GROUND BOXES ARE DIAGRAMMATIC ONLY AND MAY BE ADJUSTED BY THE ENGINEER TO ACCOMMODATE FIELD CONDITIONS.
2. DESIGN ALLOWS FOR A MAXIMUM WIRE DISTANCE OF 660 FEET WITH AN ALLOWABLE VOLTAGE DROP OF 4%.
3. CONTRACTOR SHALL TIE CCTV POLE RIPRAP TO EXISTING RIPRAP.
4. FORCE ACCOUNT ITEMS TO BE PROVIDED BY TxDOT AND INSTALLED BY CONTRACTOR. INSTALLATION OF FORCE ACCOUNT ITEMS WILL BE PAID SUBSIDIARY TO THE BID ITEM INDICATED IN THE FORCE ACCOUNT SUMMARY TABLE.

QUANTITY SUMMARY

BID ITEM	DESCRIPTION	UNIT	QTY.
0416 6006	DRILL SHAFT (48 IN)	LF	25
0432 6001	RIPRAP (CONC)(4 IN)	CY	1.25
0618 6023	CONDT (PVC) (SCH 40) (2")	LF	565
0618 6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	55
0620 6012	ELEC CONDR (NO.4) INSULATED	LF	1800
0624 6002	GROUND BOX TY A (122311)W/APRON	EA	3
0624 6010	GROUND BOX TY D (162922)W/APRON	EA	1
0628 6149	ELC SRV TY D 120/240 060(NS)SS(N)GC(O)	EA	1
6010 6002	CCTV FIELD EQUIPMENT (DIGITAL)	EA	1
6010 6004	CCTV MOUNT (POLE)	EA	1
6064 6056	ITS POLE (60 FT)(110 MPH)	EA	1
6064 6080	ITS POLE MNT CAB (TY 2)(CONF 1)	EA	1
6304 6004	ITS RVSD (DC & WWA) (INSTALL ONLY)	EA	1

FORCE ACCOUNT SUMMARY

DESCRIPTION	UNIT	QTY.	INSTALLATION*	
FIELD ETHERNET SWITCH (MES 110)	EA	1	6064	6080
CELLULAR MODEM (CISCO)	EA	1		
MPEG 4 ENCORDER (TELESTE)	EA	1	6010	6002
CIP 3 MODULE (CAMERA INTERFACE PANEL)	EA	1		
FIELD TERMINAL SERVER (DIGI)	EA	1	6304	6004
RVSD (WAVETRONIX HD)	EA	1		

* INSTALLATION OF FORCE ACCOUNT EQUIPMENT SHALL BE PAID SUBSIDIARY TO THE BID ITEM INDICATED

ELECTRICAL SERVICE DATA

Elec. Service ID	BID ITEM	Electrical Service Description	Service *Conduit Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contactor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Ckt. Conductors No./Size	Branch Circuit Amps	KVA Load
ES-06	0628-6149	ELC SRV TY D 120/240 060 (NS)SS(N)GC(O)	2"	N/A	2P/60	N/A	100	1	1P/15	3/#4	12	1.4

Srinivas M. Sangineni

2/17/2021

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HURRICANE EVACUATION ROUTE - ITS

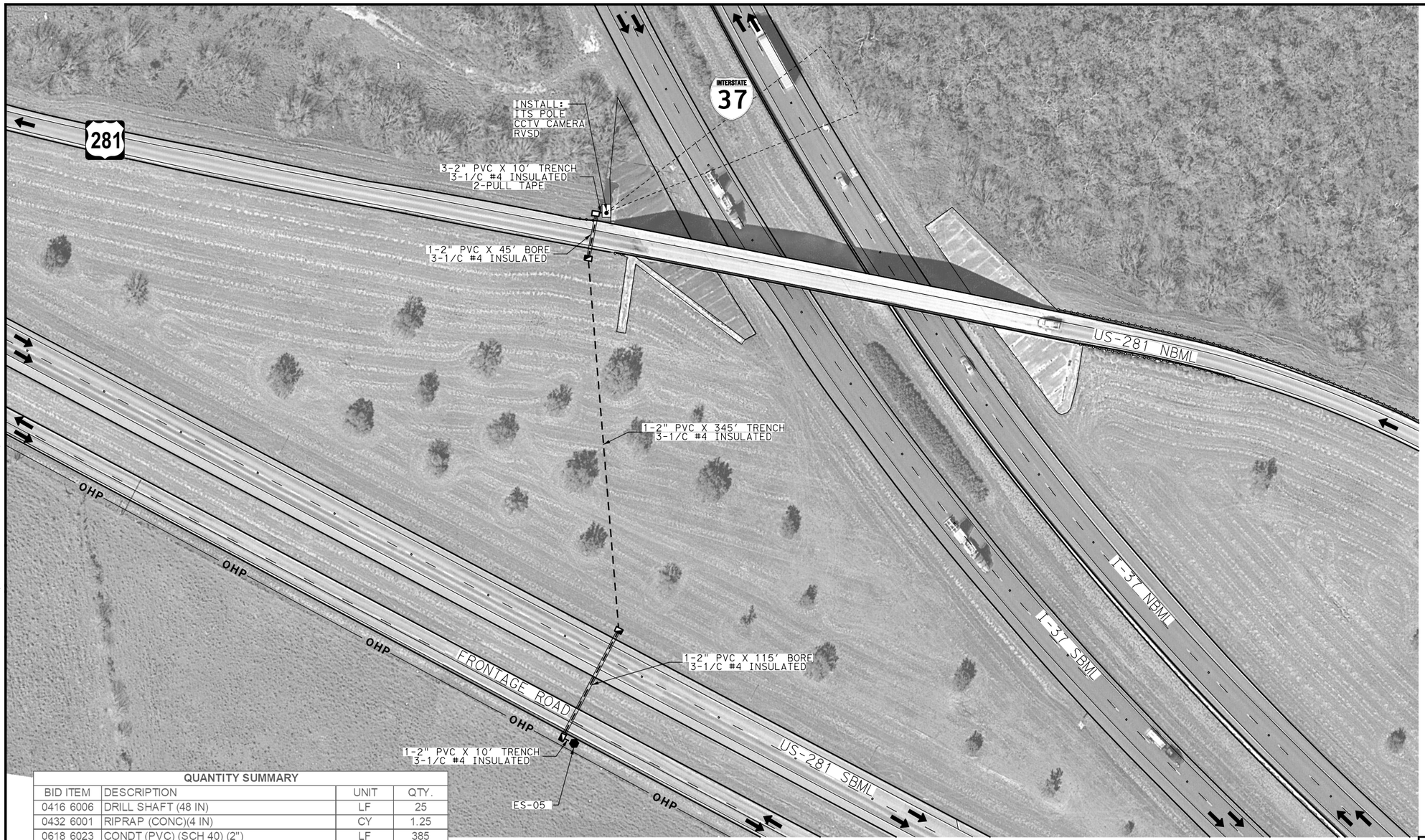
ITS PLAN

I-37 AT SH-97

SCALE: 1" = 100' SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
6	(SEE TITLE SHEET)	13

STATE	DISTRICT	COUNTY	
TEXAS	SAT	BEXAR	
CONT	SECT	JOB	HIGHWAY NO
0915	00	200	VARIOUS



N

50 0 50 100

SCALE: 1" = 100'

LEGEND

- TRENCHED CONDUIT
- BORED CONDUIT
- ITS POLE w/ RIPRAP
- ELECTRICAL SERVICE
- TYPE A GROUND BOX W/ APRON
- TYPE D GROUND BOX W/ APRON
- RVSD DETECTION DIRECTION

NOTES:

1. THE LOCATION OF THE PROPOSED CONDUITS AND GROUND BOXES ARE DIAGRAMMATIC ONLY AND MAY BE ADJUSTED BY THE ENGINEER TO ACCOMMODATE FIELD CONDITIONS.
2. DESIGN ALLOWS FOR A MAXIMUM WIRE DISTANCE OF 660 FEET WITH AN ALLOWABLE VOLTAGE DROP OF 4%.
3. CONTRACTOR SHALL TIE CCTV POLE RIPRAP TO EXISTING RIPRAP.
4. FORCE ACCOUNT ITEMS TO BE PROVIDED BY TxDOT AND INSTALLED BY CONTRACTOR. INSTALLATION OF FORCE ACCOUNT ITEMS WILL BE PAID SUBSIDIARY TO THE BID ITEM INDICATED IN THE FORCE ACCOUNT SUMMARY TABLE.

STATE OF TEXAS
SRINIVAS M. SANGINENI
85575
LICENSED PROFESSIONAL ENGINEER
Srinivas M. Sangineni
2/17/2021

QUANTITY SUMMARY

BID ITEM	DESCRIPTION	UNIT	QTY.
0416 6006	DRILL SHAFT (48 IN)	LF	25
0432 6001	RIPRAP (CONC)(4 IN)	CY	1.25
0618 6023	CONDT (PVC) (SCH 40) (2")	LF	385
0618 6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	160
0620 6012	ELEC CONDR (NO.4) INSULATED	LF	1575
0624 6002	GROUND BOX TY A (122311)W/APRON	EA	3
0624 6010	GROUND BOX TY D (162922)W/APRON	EA	1
0628 6149	ELC SRV TY D 120/240 060(NS)SS(N)GC(O)	EA	1
6010 6002	CCTV FIELD EQUIPMENT (DIGITAL)	EA	1
6010 6004	CCTV MOUNT (POLE)	EA	1
6064 6056	ITS POLE (60 FT)(110 MPH)	EA	1
6064 6080	ITS POLE MNT CAB (TY 2)(CONF 1)	EA	1
6304 6004	ITS RVSD (DC & WWA) (INSTALL ONLY)	EA	1

FORCE ACCOUNT SUMMARY

DESCRIPTION	UNIT	QTY.	INSTALLATION*	
FIELD ETHERNET SWITCH (MES 110)	EA	1	6064	6080
CELLULAR MODEM (CISCO)	EA	1		
MPEG 4 ENCORDER (TELESTE)	EA	1	6010	6002
CIP 3 MODULE (CAMERA INTERFACE PANEL)	EA	1		
FIELD TERMINAL SERVER (DIGI)	EA	1	6304	6004
RVSD (WAVETRONIX HD)	EA	1		

* INSTALLATION OF FORCE ACCOUNT EQUIPMENT SHALL BE PAID SUBSIDIARY TO THE BID ITEM INDICATED

ELECTRICAL SERVICE DATA

Elec. Service ID	BID ITEM	Electrical Service Description	Service *Conduit Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contactor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Ckt. Conductors No./Size	Branch Circuit Amps	KVA Load
ES-05	0628-6149	ELC SRV TY D 120/240 060 (NS)SS(N)GC(O)	2"	N/A	2P/60	N/A	100	1	1P/15	3/#4	12	1.4

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HURRICANE EVACUATION ROUTE - ITS

ITS PLAN

I-37 AT US-281

SCALE: 1" = 100' SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
6	(SEE TITLE SHEET)	14

STATE	DISTRICT	COUNTY
TEXAS	SAT	BEXAR

CONT	SECT	JOB	HIGHWAY NO
0915	00	200	VARIOUS

N

50 0 50 100

SCALE: 1" = 100'

LEGEND

- TRENCHED CONDUIT
- BORED CONDUIT
- ITS POLE w/ RIPRAP
- ELECTRICAL SERVICE
- TYPE A GROUND BOX W/ APRON
- TYPE D GROUND BOX W/ APRON
- RVSD DETECTION DIRECTION

NOTES:

1. THE LOCATION OF THE PROPOSED CONDUITS AND GROUND BOXES ARE DIAGRAMMATIC ONLY AND MAY BE ADJUSTED BY THE ENGINEER TO ACCOMMODATE FIELD CONDITIONS.
2. CONTRACTOR SHALL TIE CCTV POLE RIPRAP TO EXISTING RIPRAP.
3. FORCE ACCOUNT ITEMS TO BE PROVIDED BY TxDOT AND INSTALLED BY CONTRACTOR. INSTALLATION OF FORCE ACCOUNT ITEMS WILL BE PAID SUBSIDIARY TO THE BID ITEM INDICATED IN THE FORCE ACCOUNT SUMMARY TABLE.

STATE OF TEXAS
SRINIVAS M. SANGINENI
85575
LICENSED PROFESSIONAL ENGINEER

Srinivas M. Sangineni
2/17/2021

QUANTITY SUMMARY

BID ITEM	DESCRIPTION	UNIT	QTY.
0416 6006	DRILL SHAFT (48 IN)	LF	25
0432 6001	RIPRAP (CONC)(4 IN)	CY	1.25
0618 6023	CONDT (PVC) (SCH 40) (2")	LF	30
0624 6010	GROUND BOX TY D (162922)W/APRON	EA	1
6010 6002	CCTV FIELD EQUIPMENT (DIGITAL)	EA	1
6010 6004	CCTV MOUNT (POLE)	EA	1
6063 6040	SPS-INS (20W) 288W (150AH) 1X50A(2)	EA	1
6064 6056	ITS POLE (60 FT)(110 MPH)	EA	1
6064 6080	ITS POLE MNT CAB (TY 2)(CONF 1)	EA	1
6304 6004	ITS RVSD (DC & WWA) (INSTALL ONLY)	EA	1

FORCE ACCOUNT SUMMARY

DESCRIPTION	UNIT	QTY.	INSTALLATION*
FIELD ETHERNET SWITCH (MES 110)	EA	1	6064 6080
CELLULAR MODEM (CISCO)	EA	1	
MPEG 4 ENCORDER (TELESTE)	EA	1	6010 6002
CCTV 935563 (AXIS COMM 01146-001)	EA	1	
CIP 3 MODULE (CAMERA INTERFACE PANEL)	EA	1	
FIELD TERMINAL SERVER (DIGI)	EA	1	6304 6004
RVSD (WAVETRONIX HD)	EA	1	

* INSTALLATION OF FORCE ACCOUNT EQUIPMENT SHALL BE PAID SUBSIDIARY TO THE BID ITEM INDICATED

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HURRICANE EVACUATION ROUTE - ITS

ITS PLAN

I-37 AT FM 1099

SCALE: 1" = 100' SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		15
STATE	DISTRICT	COUNTY	
TEXAS	SAT	BEXAR	
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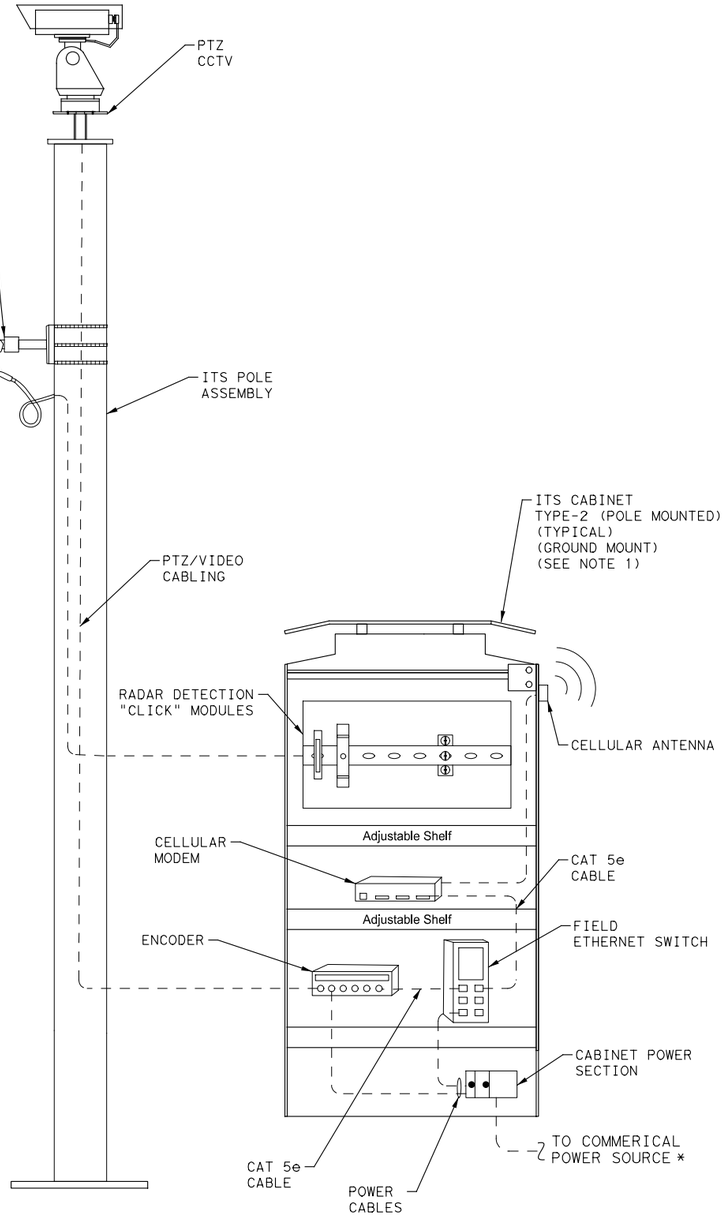
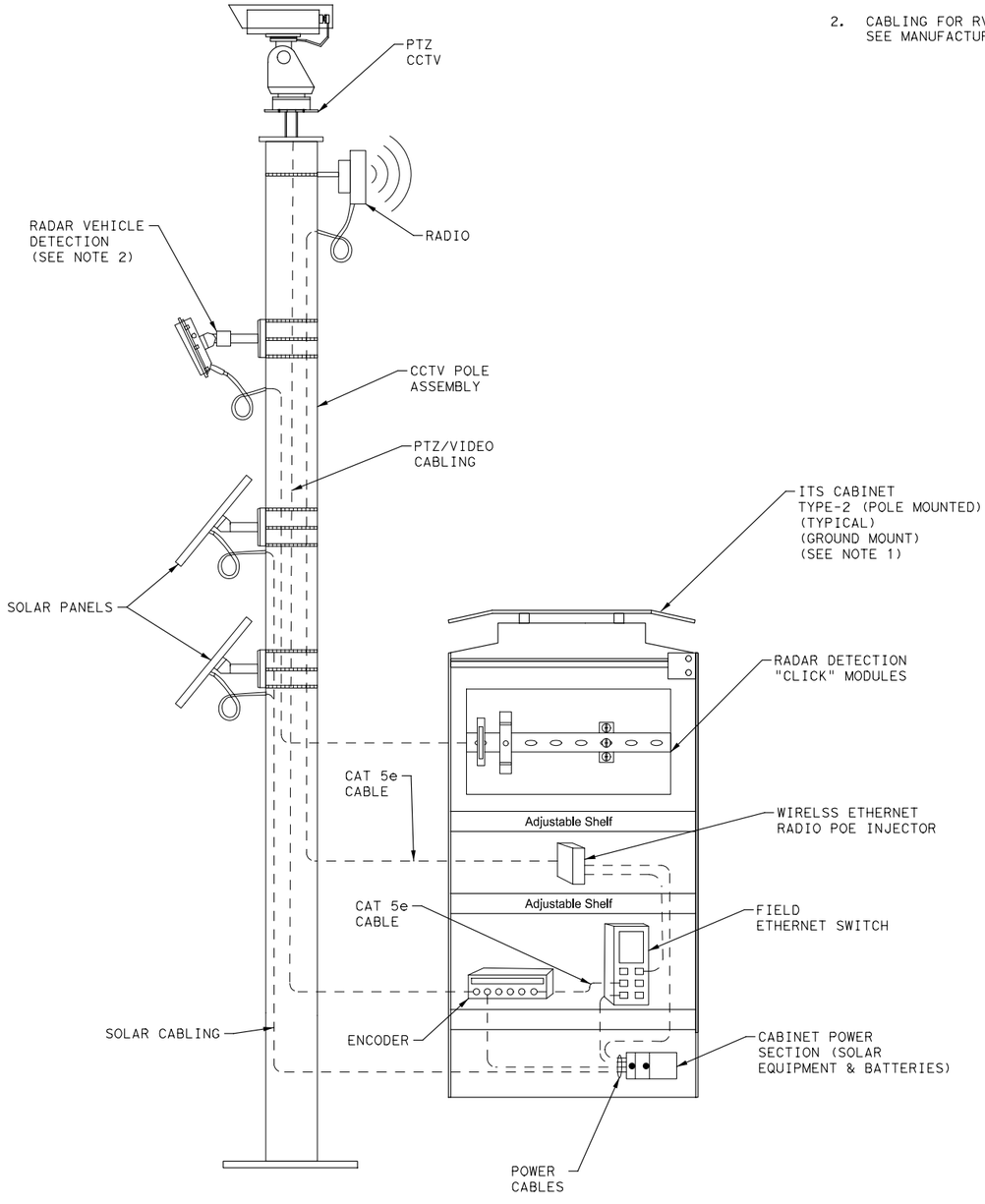
NOTES: (THIS SHEET ONLY)

1. SEE TXDOT STANDARD DETAIL ITS(15)-15 FOR DETAILED INFORMATION ON THE CABINET AND POLE MOUNTING REQUIREMENTS.
2. CABLING FOR RVD UNIT IS PROPRIETARY CONFIGURATION/TYPE. SEE MANUFACTURER DOCUMENTATION FOR DETAILS.



ITS POLE MOUNTED CABINET
WITH CELLULAR COMMUNICATION
I-10 AT CR 217
I-10 AT US-183
I-37 AT LOOP 1604
I-37 AT FM 536
I-37 AT FM 3006
I-37 AT SH-97
I-37 AT US-281
I-37 AT FM 1099



ITS POLE MOUNTED CABINET
WITH RADIO COMMUNICATION
I-10 AT SH-130

* I-37 AT FM 1099 SHALL UTILIZE SOLAR POWER.

STATE OF TEXAS
SRINIVAS M. SANGINENI
85575
LICENSED PROFESSIONAL ENGINEER
Srinivas M. Sangineni
2/17/2021

OTHON CONSULTING ENGINEERS
F-1471 · HOUSTON · DALLAS
2140 Lake Park Boulevard|Richardson, Texas 75080
P: 214.340.7344| F: 214.221.7411

Texas Department of Transportation

HURRICANE EVACUATION ROUTE - ITS

WIRING SCHEMATIC

HARDWARE DIAGRAM

SCALE: 1" = 100' SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		16
STATE	DISTRICT	COUNTY	
TEXAS	SAT	BEXAR	
CONT	SECT	JOB	HIGHWAY NO
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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. AS SHOWN ON BC(2), THE OBEY WARNING SIGNS STATE LAW SIGN, STAY ALERT TALK OR TEXT LATER (SEE SIGN DETAIL G20-10T) AND THE WORK ZONE TRAFFIC FINES DOUBLE SIGN WITH PLAQUE SHALL BE ERECTED IN ADVANCE OF THE CSJ LIMITS. HOWEVER, THE TRAFFIC FINES DOUBLE SIGN WILL NOT BE REQUIRED ON PROJECTS CONSISTING SOLELY OF MOBILE OPERATION WORK, SUCH AS STRIPING OR MILLING EDGELINE RUMBLE STRIPS. THE BEGIN ROAD WORK NEXT X MILES, CONTRACTOR AND END ROAD WORK SIGNS SHALL BE ERECTED AT OR NEAR THE CSJ LIMITS.

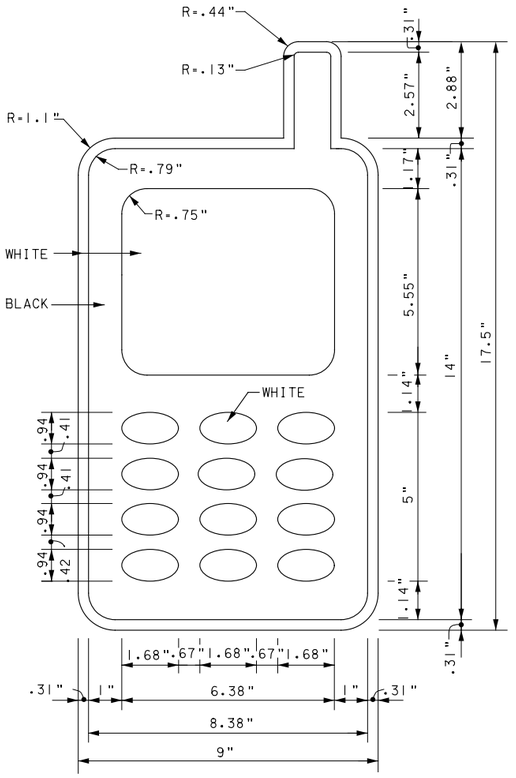
11. EXCEPT FOR DEVICES REQUIRED BY NOTE 10, TRAFFIC CONTROL DEVICES SHOULD BE IN PLACE ONLY WHILE WORK IS ACTUALLY IN PROGRESS OR A DEFINITE NEED EXISTS.

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 APPAREL 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.



3.0" RADIUS, 1.25" BORDER, 0.75" INDENT, BLACK ON YELLOW: [STAY ALERT] FONT: D
3.0" RADIUS, 1.25" BORDER, 0.75" INDENT, BLACK ON ORANGE: [TALK OR TEXT LATER] FONT: C SPECIFIED LENGTH.

SIGN DETAIL (G20-10T)

ONLY PRE-QUALIFIED PRODUCTS SHALL BE USED. THE "COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST" (CWZTCD) DESCRIBES PRE-QUALIFIED PRODUCTS AND THEIR SOURCES AND MAY BE FOUND ON-LINE AT THE WEB ADDRESS GIVEN BELOW OR BY CONTACTING:

TEXAS DEPARTMENT OF TRANSPORTATION
TRAFFIC OPERATIONS DIVISION - TE
PHONE (512) 416-3118

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 Operations Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

FILE: BC-14.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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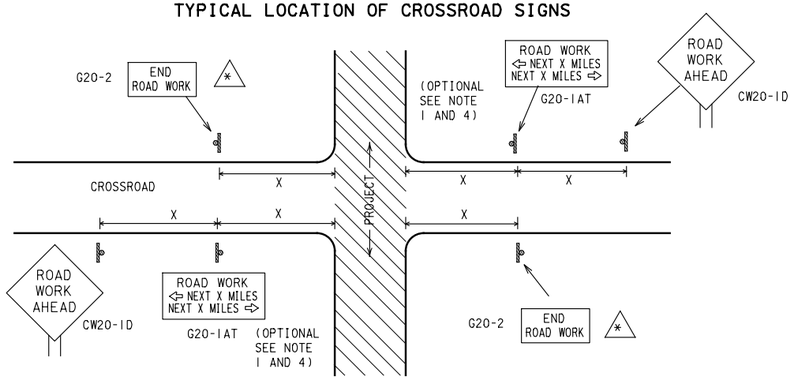
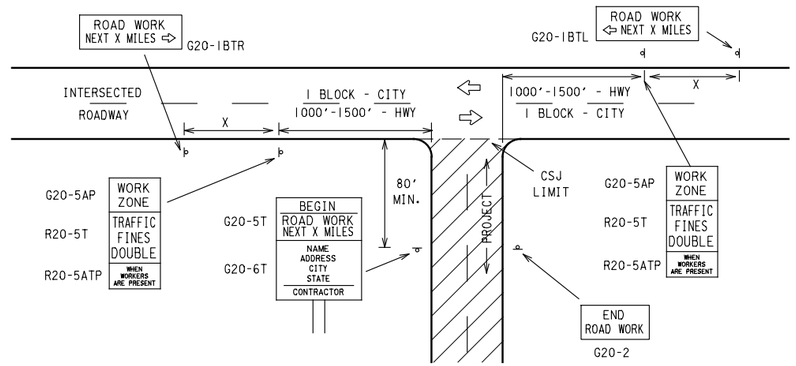
TYPICAL LOCATION OF CROSSROAD SIGNS



* 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. 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[1,2,6]

SIZE

SIGN NUMBER OR SERIES	CONVENTIONAL ROAD	EXPRESSWAY / FREEWAY
CW20*, 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 ³
60	600 ³
65	700 ³
70	800 ³
75	900 ³
80	1000 ³
*	* ³

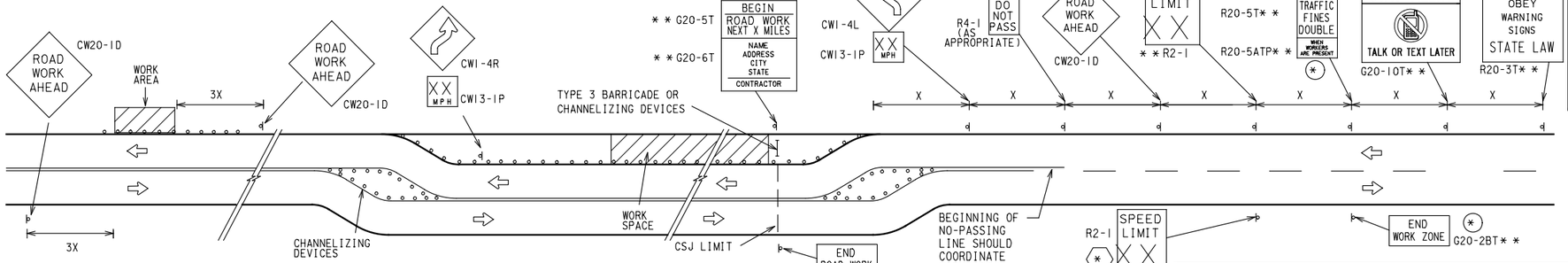
* FOR TYPICAL SIGN SPACINGS ON DIVIDED HIGHWAYS, EXPRESSWAYS AND FREEWAYS, SEE PART 6 OF THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (TMUTCD) TYPICAL APPLICATION DIAGRAMS OR TCP STANDARD SHEETS.

△ 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. 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.

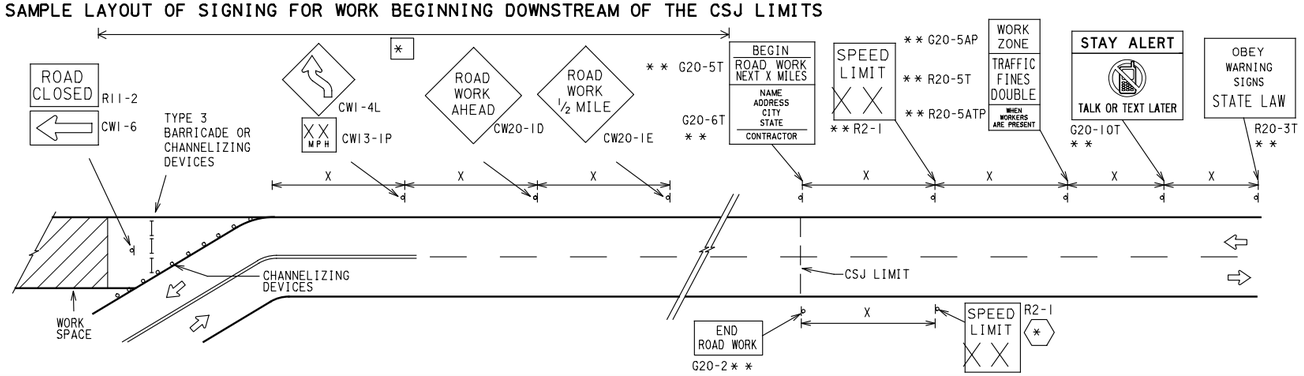
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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.

** REQUIRED CSJ LIMIT SIGNING. SEE NOTE 10 ON BC(1). TRAFFIC FINES DOUBLE SIGNS WILL NOT BE REQUIRED ON PROJECTS CONSISTING SOLELY OF MOBILE OPERATIONS WORK.

[*] 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.

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Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

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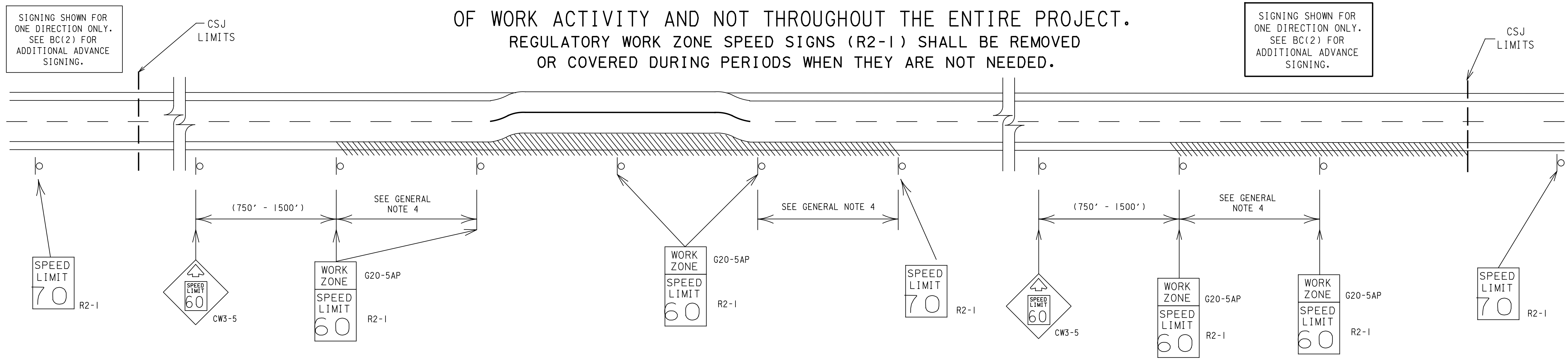
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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 TRAVELLED 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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SHEET 3 OF 12

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

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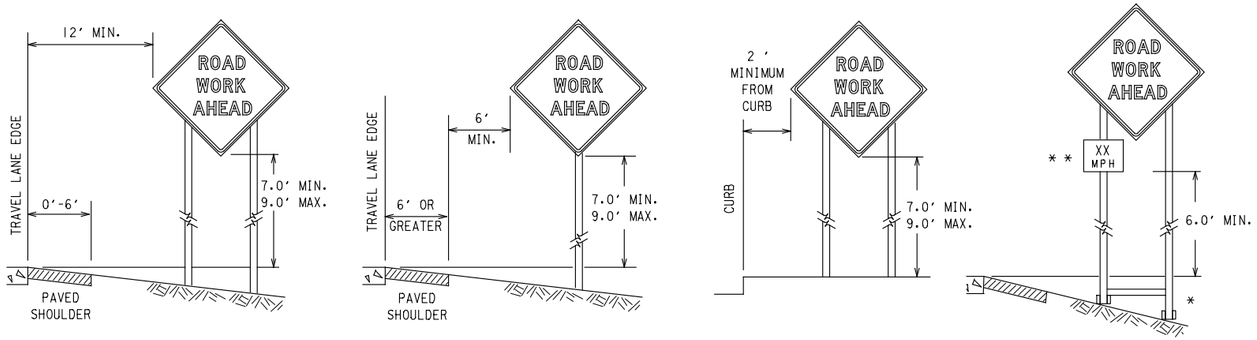
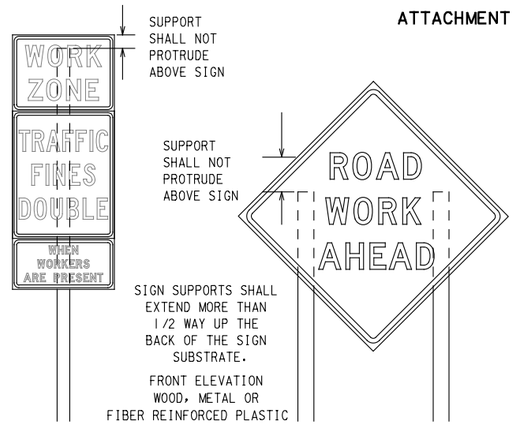
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



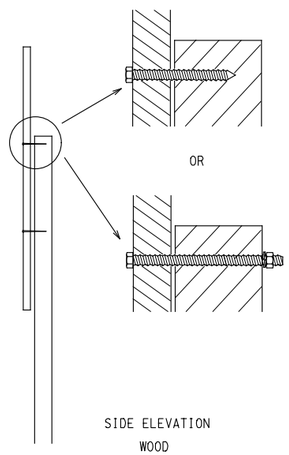
* WHEN PLACING SKID SUPPORTS ON UNLEVEL GROUND, THE LEG POST LENGTHS MUST BE ADJUSTED SO THE SIGN APPEARS STRAIGHT AND PLUMB. OBJECTS SHALL NOT BE PLACED UNDER SKIDS AS A MEANS OF LEVELING.

* * 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



SPLICING EMBEDDED PERFORATED SQUARE METAL TUBING IN ORDER TO EXTEND POST HEIGHT WILL ONLY BE ALLOWED WHEN THE SPLICE IS MADE USING FOUR BOLTS, TWO ABOVE AND TWO BELOW THE SPICE POINT. SPLICE MUST BE LOCATED ENTIRELY BEHIND THE SIGN SUBSTRATE, NOT NEAR THE BASE OF THE SUPPORT. SPLICE INSERT LENGTHS SHOULD BE AT LEAST 5 TIMES NOMINAL POST SIZE, CENTERED ON THE SPLICE AND OF AT LEAST THE SAME GAUGE MATERIAL.

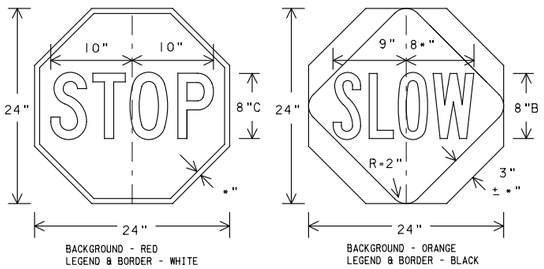


ATTACHMENT TO WOODEN SUPPORTS WILL BE BY BOLTS AND NUTS OR SCREWS. USE TXDOT'S OR MANUFACTURER'S RECOMMENDED PROCEDURES FOR ATTACHING SIGN SUBSTRATES TO OTHER TYPES OF SIGN SUPPORTS

NAILS SHALL NOT BE ALLOWED. EACH SIGN SHALL BE ATTACHED DIRECTLY TO THE SIGN SUPPORT. MULTIPLE SIGNS SHALL NOT BE JOINED OR SPLICED BY ANY MEANS. WOOD SUPPORTS SHALL NOT BE EXTENDED OR REPAIRED BY SPLICING OR OTHER MEANS.

STOP/SLOW PADDLES

1. STOP/SLOW PADDLES ARE THE PRIMARY METHOD TO CONTROL TRAFFIC BY FLAGGERS. THE STOP/SLOW PADDLE SIZE SHOULD BE 24" X 24" AS DETAILED BELOW.
2. WHEN USED AT NIGHT, THE STOP/SLOW PADDLE SHALL BE RETROREFLECTORIZED.
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.



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, 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.
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 SHEETS OR THE CWZTCD. THE SIGNS SHALL MEET THE REQUIRED MOUNTING HEIGHTS SHOWN ON THE BC SHEETS OR THE SMD STANDARDS 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). 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 Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

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©TXDOT NOVEMBER 2002	CONT	SECT	JOB	HIGHWAY
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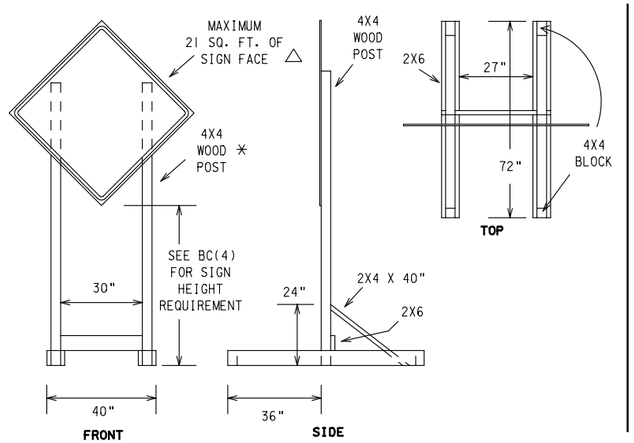
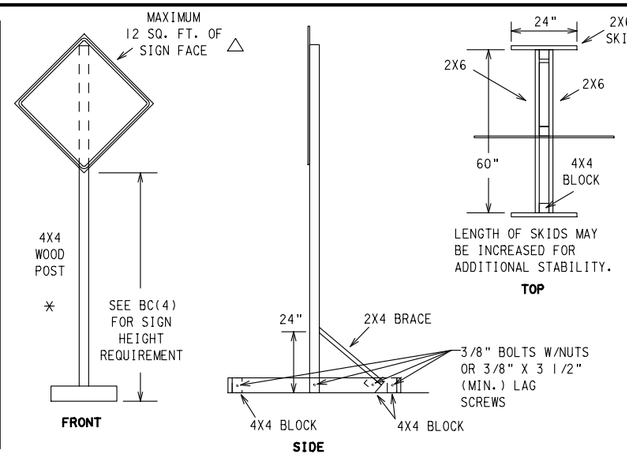
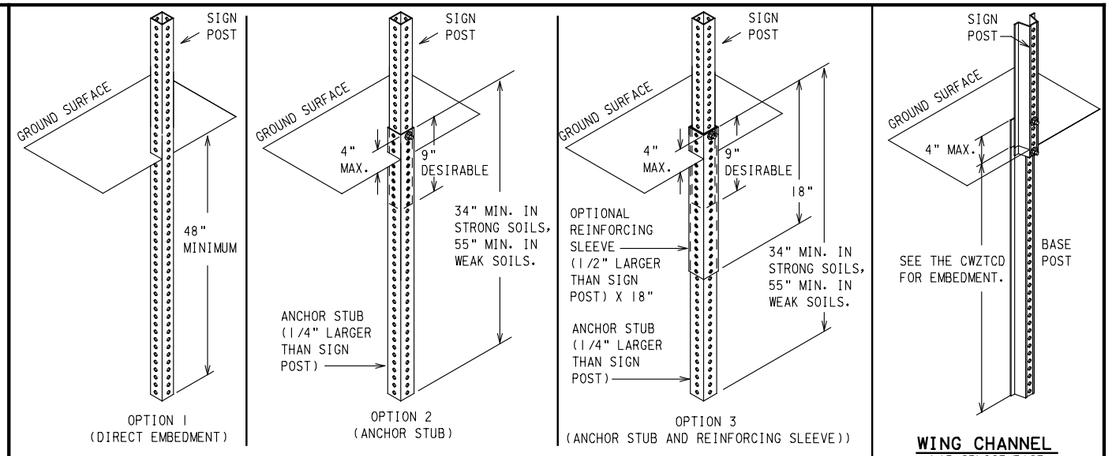




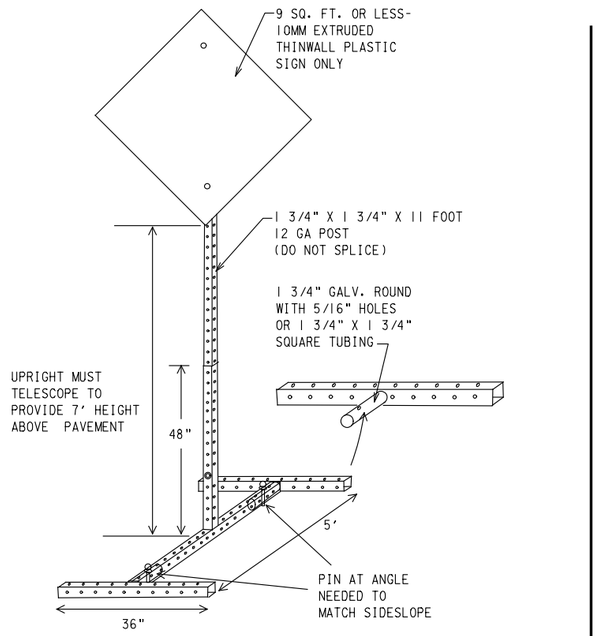
SKID MOUNTED WOOD SIGN SUPPORTS

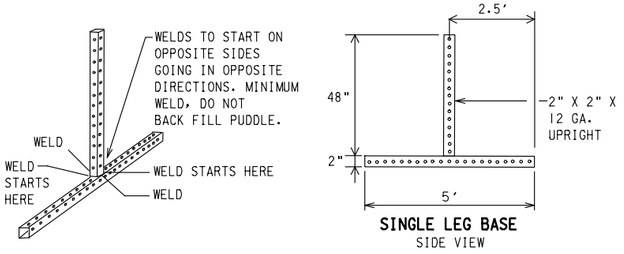
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS□

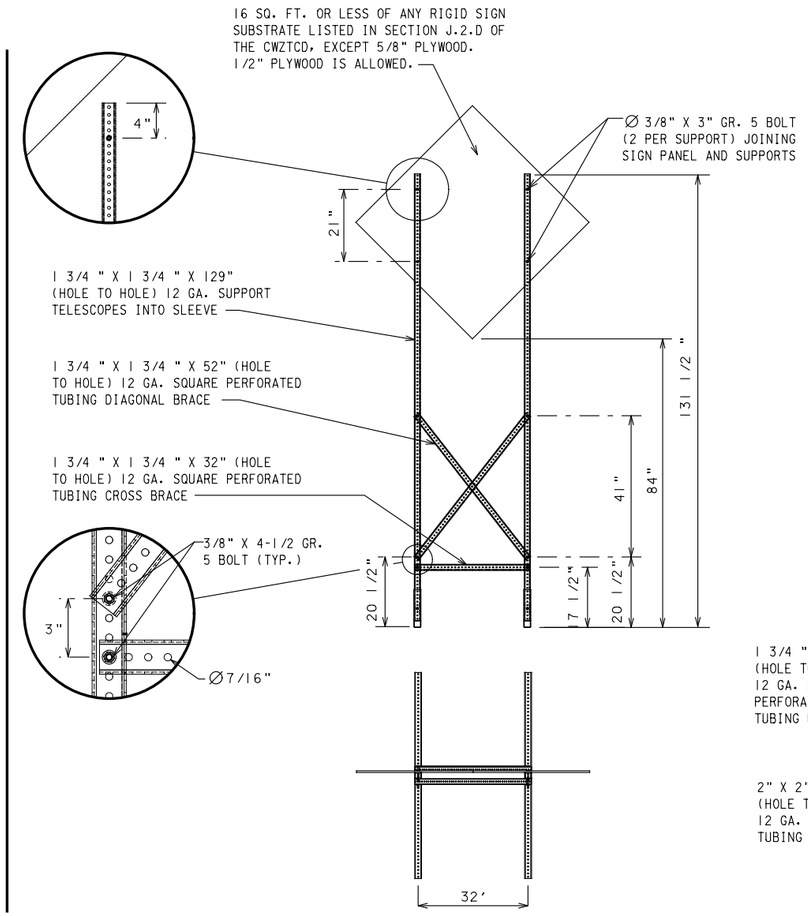


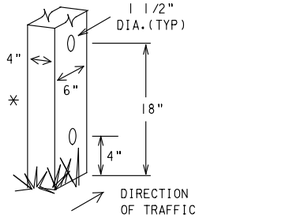
GROUND MOUNTED SIGN SUPPORTS

REFER TO THE CWZTCD AND THE MANUFACTURER'S INSTALLATION PROCEDURE FOR EACH TYPE SIGN SUPPORT.
THE MAXIMUM SIGN SQUARE FOOTAGE SHALL ADHERE TO THE MANUFACTURER'S RECOMMENDATION.
TWO POST INSTALLATIONS CAN BE USED FOR LARGER SIGNS.



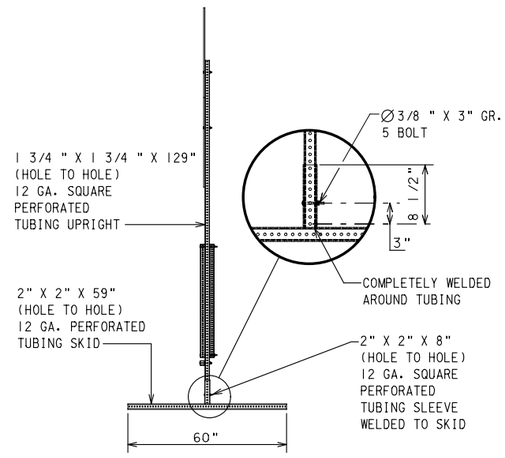






Nominal Post Size	NUMBER OF POSTS	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS



SKID MOUNTED PERFORATED SQUARE STEEL TUBING 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 Operations Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

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

PORTABLE CHANGEABLE MESSAGE SIGNS

1. THE ENGINEER/INSPECTOR SHALL APPROVE ALL MESSAGES USED ON PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS).
2. MESSAGES ON PCMS SHOULD CONTAIN NO MORE THAN 8 WORDS (ABOUT FOUR TO EIGHT CHARACTERS PER WORD), NOT INCLUDING SIMPLE WORDS SUCH AS "TO," "FOR," "AT," ETC.
3. MESSAGES SHOULD CONSIST OF A SINGLE PHASE, OR TWO PHASES THAT ALTERNATE. THREE-PHASE MESSAGES ARE NOT ALLOWED. EACH PHASE OF THE MESSAGE SHOULD CONVEY A SINGLE THOUGHT, AND MUST BE UNDERSTOOD BY ITSELF.
4. USE THE WORD "EXIT" TO REFER TO AN EXIT RAMP ON A FREEWAY, I.E., "EXIT CLOSED." DO NOT USE THE TERM "RAMP."
5. ALWAYS USE THE ROUTE OR INTERSTATE DESIGNATION (IH, US, SH, FM) ALONG WITH THE NUMBER WHEN REFERRING TO A ROADWAY.
6. WHEN IN USE THE BOTTOM OF A STATIONARY PCMS MESSAGE PANEL SHOULD BE A MINIMUM 7 FEET ABOVE THE ROADWAY, WHERE POSSIBLE.
7. THE MESSAGE TERM "WEEKEND" SHOULD BE USED ONLY IF THE WORK IS TO START ON SATURDAY MORNING AND END BY SUNDAY EVENING AT MIDNIGHT. ACTUAL DAYS AND HOURS OF WORK SHOULD BE DISPLAYED ON THE PCMS IF WORK IS TO BEGIN ON FRIDAY EVENING AND/OR CONTINUE INTO MONDAY MORNING.
8. THE ENGINEER/INSPECTOR MAY SELECT ONE OF TWO OPTIONS WHICH ARE AVAILABLE FOR DISPLAYING A TWO-PHASE MESSAGE ON A PCMS. EACH PHASE MAY BE DISPLAYED FOR EITHER FOUR SECONDS EACH OR FOR THREE SECONDS EACH.
9. DO NOT "FLASH" MESSAGES OR WORDS INCLUDED IN A MESSAGE. THE MESSAGE SHOULD BE STEADY BURN OR CONTINUOUS WHILE DISPLAYED.
10. DO NOT PRESENT REDUNDANT INFORMATION ON A TWO-PHASE MESSAGE, I.E., KEEPING TWO LINES OF THE MESSAGE THE SAME AND CHANGING THE THIRD LINE.
11. DO NOT USE THE WORD "DANGER" IN MESSAGE.
12. DO NOT DISPLAY THE MESSAGE "LANES SHIFT LEFT" OR "LANES SHIFT RIGHT" ON A PCMS. DRIVERS DO NOT UNDERSTAND THE MESSAGE.
13. DO NOT DISPLAY MESSAGES THAT SCROLL HORIZONTALLY OR VERTICALLY ACROSS THE FACE OF THE SIGN.
14. THE FOLLOWING TABLE LISTS ABBREVIATED WORDS AND TWO-WORD PHRASES THAT ARE ACCEPTABLE FOR USE ON A PCMS. BOTH WORDS IN A PHRASE MUST BE DISPLAYED TOGETHER. WORDS OR PHRASES NOT ON THIS LIST SHOULD NOT BE ABBREVIATED, UNLESS SHOWN IN THE TMUTCD.
15. PCMS CHARACTER HEIGHT SHOULD BE AT LEAST 18 INCHES FOR TRAILER MOUNTED UNITS. THEY SHOULD BE VISIBLE FROM AT LEAST 1/2 (.5) MILE AND THE TEXT SHOULD BE LEGIBLE FROM AT LEAST 600 FEET AT NIGHT AND 800 FEET IN DAYLIGHT. TRUCK MOUNTED UNITS MUST HAVE A CHARACTER HEIGHT OF 10 INCHES AND MUST BE LEGIBLE FROM AT LEAST 400 FEET.
16. EACH LINE OF TEXT SHOULD BE CENTERED ON THE MESSAGE BOARD RATHER THAN LEFT OR RIGHT JUSTIFIED.
17. IF DISABLED, THE PCMS SHOULD DEFAULT TO AN ILLEGIBLE DISPLAY THAT WILL NOT ALARM MOTORISTS AND WILL ONLY BE USED TO ALERT WORKERS THAT THE PCMS HAS MALFUNCTIONED. A PATTERN SUCH AS A SERIES OF HORIZONTAL SOLID BARS IS APPROPRIATE.

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

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

ROADWAY DESIGNATION • IH-NUMBER, US-NUMBER, SH-NUMBER, FM-NUMBER

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

(THE ENGINEER MAY APPROVE OTHER MESSAGES NOT SPECIFICALLY COVERED HERE.)

PHASE 1: CONDITION LISTS

ROAD/LANE/RAMP CLOSURE LIST

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

OTHER CONDITION LIST

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

* LANES SHIFT IN PHASE 1 MUST BE USED WITH STAY IN LANE IN PHASE 2.

PHASE 2: POSSIBLE COMPONENT LISTS

ACTION TO TAKE/EFFECT ON TRAVEL LIST

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

LOCATION LIST

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

WARNING LIST

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

** ADVANCE NOTICE LIST

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

* LANES SHIFT IN PHASE 1 MUST BE USED WITH STAY IN LANE IN PHASE 2.

* * SEE APPLICATION GUIDELINES NOTE 6.

APPLICATION GUIDELINES

1. ONLY 1 OR 2 PHASES ARE TO BE USED ON A PCMS.
2. THE 1ST PHASE (OR BOTH) SHOULD BE SELECTED FROM THE "ROAD/LANE/RAMP CLOSURE LIST" AND THE "OTHER CONDITION LIST".
3. A 2ND PHASE CAN BE SELECTED FROM THE "ACTION TO TAKE/EFFECT ON TRAVEL, LOCATION, GENERAL WARNING, OR ADVANCE NOTICE PHASE LISTS".
4. A LOCATION PHASE IS NECESSARY ONLY IF A DISTANCE OR LOCATION IS NOT INCLUDED IN THE FIRST PHASE SELECTED.
5. IF TWO PCMS ARE USED IN SEQUENCE, THEY MUST BE SEPARATED BY A MINIMUM OF 1000 FT. EACH PCMS SHALL BE LIMITED TO TWO PHASES, AND SHOULD BE UNDERSTANDABLE BY THEMSELVES.
6. FOR ADVANCE NOTICE, WHEN THE CURRENT DATE IS WITHIN SEVEN DAYS OF THE ACTUAL WORK DATE, CALENDAR DAYS SHOULD BE REPLACED WITH DAYS OF THE WEEK. ADVANCE NOTIFICATION SHOULD TYPICALLY BE FOR NO MORE THAN ONE WEEK PRIOR TO THE WORK.

WORDING ALTERNATIVES

1. THE WORDS RIGHT, LEFT AND ALL CAN BE INTERCHANGED AS APPROPRIATE.
2. ROADWAY DESIGNATIONS IH, US, SH, FM AND LP CAN BE INTERCHANGED AS APPROPRIATE.
3. EAST, WEST, NORTH AND SOUTH (OR ABBREVIATIONS E, W, N AND S) CAN BE INTERCHANGED AS APPROPRIATE.
4. HIGHWAY NAMES AND NUMBERS REPLACED AS APPROPRIATE.
5. ROAD, HIGHWAY AND FREEWAY CAN BE INTERCHANGED AS NEEDED.
6. AHEAD MAY BE USED INSTEAD OF DISTANCES IF NECESSARY.
7. FT AND MI, MILE AND MILES INTERCHANGED AS APPROPRIATE.
8. AT, BEFORE AND PAST INTERCHANGED AS NEEDED.
9. DISTANCES OR AHEAD CAN BE ELIMINATED FROM THE MESSAGE IF A LOCATION PHASE IS USED.

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

FULL MATRIX PCMS SIGNS

1. WHEN FULL MATRIX PCMS SIGNS ARE USED, THE CHARACTER HEIGHT AND LEGIBILITY/VISIBILITY REQUIREMENTS SHALL BE MAINTAINED AS LISTED IN NOTE 15 UNDER "PORTABLE CHANGEABLE MESSAGE SIGNS" ABOVE.
2. WHEN SYMBOL SIGNS, SUCH AS THE "FLAGGER SYMBOL"(CW20-7) ARE REPRESENTED GRAPHICALLY ON THE FULL MATRIX PCMS SIGN AND, WITH THE APPROVAL OF THE ENGINEER, IT SHALL MAINTAIN THE LEGIBILITY/VISIBILITY REQUIREMENT LISTED ABOVE.
3. WHEN SYMBOL SIGNS ARE REPRESENTED GRAPHICALLY ON THE FULL MATRIX PCMS, THEY SHALL ONLY SUPPLEMENT THE USE OF THE STATIC SIGN REPRESENTED, AND SHALL NOT SUBSTITUTE FOR, OR REPLACE THAT SIGN.
4. A FULL MATRIX PCMS MAY BE USED TO SIMULATE A FLASHING ARROW BOARD PROVIDED IT MEETS THE VISIBILITY, FLASH RATE AND DIMMING REQUIREMENTS ON BC(7), FOR THE SAME SIZE ARROW.

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

FILE: BC-14.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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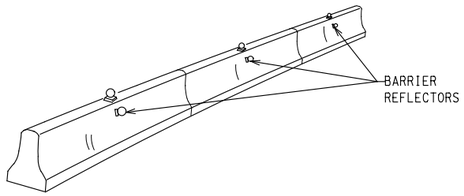
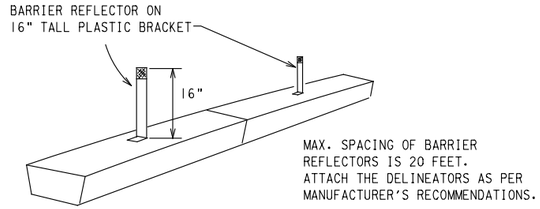
1. BARRIER REFLECTORS SHALL BE PRE-QUALIFIED, AND CONFORM TO THE COLOR AND REFLECTIVITY REQUIREMENTS OF DMS-8600. A LIST OF PREQUALIFIED BARRIER REFLECTORS CAN BE FOUND AT THE MATERIAL PRODUCER LIST WEB ADDRESS SHOWN ON BC(1).
2. COLOR OF BARRIER REFLECTORS SHALL BE AS SPECIFIED IN THE TMUTCD. THE COST OF THE REFLECTORS SHALL BE CONSIDERED SUBSIDIARY TO ITEM 512.

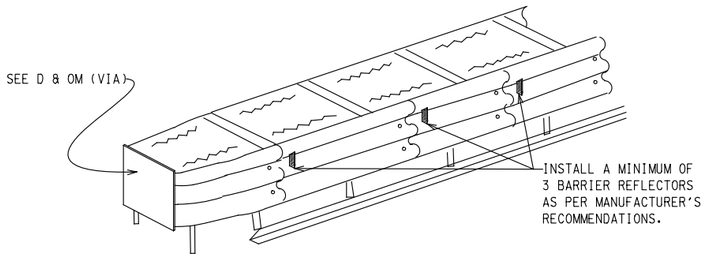


CONCRETE TRAFFIC BARRIER (CTB)

3. WHERE TRAFFIC IS ON ONE SIDE OF THE CTB, TWO (2) BARRIER REFLECTORS SHALL BE MOUNTED IN APPROXIMATELY THE MIDSECTION OF EACH SECTION OF CTB. AN ALTERNATE MOUNTING LOCATION IS UNIFORMLY SPACED AT ONE END OF EACH CTB. THIS WILL ALLOW FOR ATTACHMENT OF A BARRIER GRAPPLE WITHOUT DAMAGING THE REFLECTOR. THE BARRIER REFLECTOR MOUNTED ON THE SIDE OF THE CTB SHALL BE LOCATED DIRECTLY BELOW THE REFLECTOR MOUNTED ON TOP OF THE BARRIER, AS SHOWN IN THE DETAIL ABOVE.
4. WHERE CTB SEPARATES TWO-WAY TRAFFIC, THREE BARRIER REFLECTORS SHALL BE MOUNTED ON EACH SECTION OF CTB. THE REFLECTOR UNIT ON TOP SHALL HAVE TWO YELLOW REFLECTIVE FACES (BI-DIRECTIONAL)WHILE THE REFLECTORS ON EACH SIDE OF THE BARRIER SHALL HAVE ONE YELLOW REFLECTIVE FACE, AS SHOWN IN THE DETAIL ABOVE.
5. WHEN CTB SEPARATES TRAFFIC TRAVELING IN THE SAME DIRECTION, NO BARRIER REFLECTORS WILL BE REQUIRED ON TOP OF THE CTB.
6. BARRIER REFLECTOR UNITS SHALL BE YELLOW OR WHITE IN COLOR TO MATCH THE EDGELINE BEING SUPPLEMENTED.
7. MAXIMUM SPACING OF BARRIER REFLECTORS IS FORTY (40) FEET.
8. PAVEMENT MARKERS OR TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS SHALL NOT BE USED AS CTB DELINEATION.
9. ATTACHMENT OF BARRIER REFLECTORS TO CTB SHALL BE PER MANUFACTURER'S RECOMMENDATIONS.
10. MISSING OR DAMAGED BARRIER REFLECTORS SHALL BE REPLACED AS DIRECTED BY THE ENGINEER.
11. SINGLE SLOPE BARRIERS SHALL BE DELINEATED AS SHOWN ON THE ABOVE DETAIL.



LOW PROFILE CONCRETE BARRIER (LPCB)

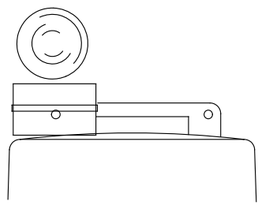


DELINEATION OF END TREATMENTS

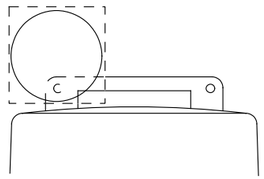
END TREATMENTS FOR CTB'S USED IN WORK ZONES

END TREATMENTS USED ON CTB'S IN WORK ZONES SHALL MEET CRASHWORTHY STANDARDS AS DEFINED IN THE NATIONAL COOPERATIVE HIGHWAY RESEARCH REPORT 350. 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

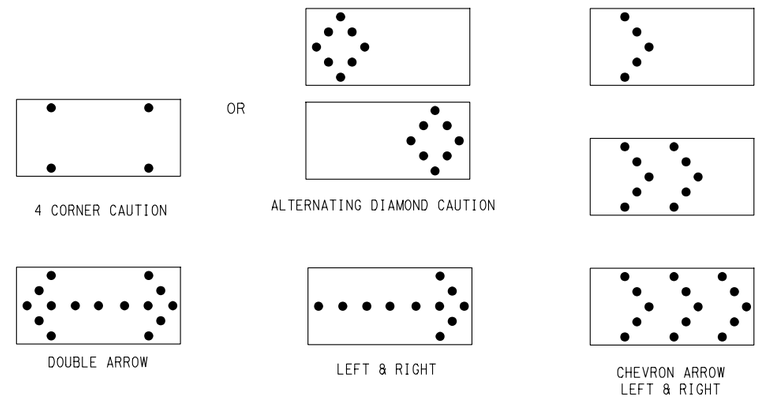
1. TYPE A FLASHING WARNING LIGHTS ARE INTENDED TO WARN DRIVERS THAT THEY ARE APPROACHING OR ARE IN A POTENTIALLY HAZARDOUS AREA.
2. TYPE A RANDOM FLASHING WARNING LIGHTS ARE NOT INTENDED FOR DELINEATION AND SHALL NOT BE USED IN A SERIES.
3. A SERIES OF SEQUENTIAL FLASHING WARNING LIGHTS PLACED ON CHANNELIZING 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 NATIONAL COOPERATIVE HIGHWAY RESEARCH REPORT NO. 350 (NCHRP 350) OR 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 Operations Division Standard

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

BC(7)-14

FILE: BC-14.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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GENERAL NOTES

1. FOR LONG TERM STATIONARY WORK ZONES ON FREEWAYS, DRUMS SHALL BE USED AS THE PRIMARY CHANNELIZING DEVICE.
2. FOR INTERMEDIATE TERM STATIONARY WORK ZONES ON FREEWAYS, DRUMS SHOULD BE USED AS THE PRIMARY CHANNELIZING DEVICE BUT MAY BE REPLACED IN TANGENT SECTIONS BY VERTICAL PANELS, OR 42" TWO-PIECE CONES. IN TANGENT SECTIONS ONE-PIECE CONES MAY BE USED WITH THE APPROVAL OF THE ENGINEER BUT ONLY IF PERSONNEL ARE PRESENT ON THE PROJECT AT ALL TIMES TO MAINTAIN THE CONES IN PROPER POSITION AND LOCATION.
3. FOR SHORT TERM STATIONARY WORK ZONES ON FREEWAYS, DRUMS ARE THE PREFERRED CHANNELIZING DEVICE BUT MAY BE REPLACED IN TAPERS, TRANSITIONS AND TANGENT SECTIONS BY VERTICAL PANELS, TWO-PIECE CONES OR ONE-PIECE CONES AS APPROVED BY THE ENGINEER.
4. DRUMS AND ALL RELATED ITEMS SHALL COMPLY WITH THE REQUIREMENTS OF THE CURRENT VERSION OF THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (TMUTCD) AND THE "COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST" (CWZTCD).
5. DRUMS, BASES, AND RELATED MATERIALS SHALL EXHIBIT GOOD WORKMANSHIP AND SHALL BE FREE FROM OBJECTIONABLE MARKS OR DEFECTS THAT WOULD ADVERSELY AFFECT THEIR APPEARANCE OR SERVICEABILITY.
6. THE CONTRACTOR SHALL HAVE A MAXIMUM OF 24 HOURS TO REPLACE ANY PLASTIC DRUMS IDENTIFIED FOR REPLACEMENT BY THE ENGINEER/INSPECTOR. THE REPLACEMENT DEVICE MUST BE AN APPROVED DEVICE.

GENERAL DESIGN REQUIREMENTS

PRE-QUALIFIED PLASTIC DRUMS SHALL MEET THE FOLLOWING REQUIREMENTS:

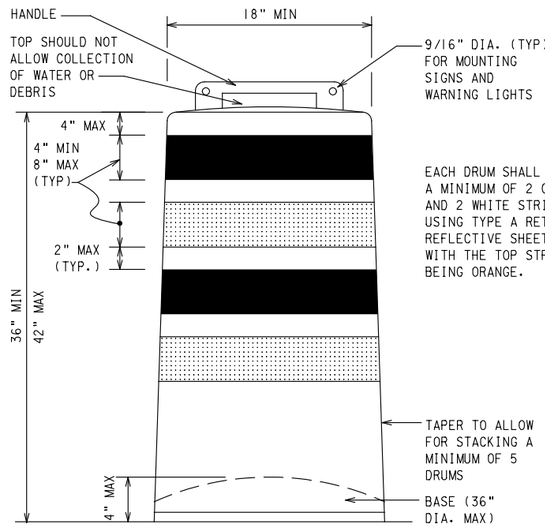
1. PLASTIC DRUMS SHALL BE A TWO-PIECE DESIGN, THE "BODY" OF THE DRUM SHALL BE THE TOP PORTION AND THE "BASE" SHALL BE THE BOTTOM.
2. THE BODY AND BASE SHALL LOCK TOGETHER IN SUCH A MANNER THAT THE BODY SEPARATES FROM THE BASE WHEN IMPACTED BY A VEHICLE TRAVELING AT A SPEED OF 20 MPH OR GREATER BUT PREVENTS ACCIDENTAL SEPARATION DUE TO NORMAL HANDLING AND/OR AIR TURBULENCE CREATED BY PASSING VEHICLES.
3. PLASTIC DRUMS SHALL BE CONSTRUCTED OF LIGHTWEIGHT FLEXIBLE, AND DEFORMABLE MATERIALS. THE CONTRACTOR SHALL NOT USE METAL DRUMS OR SINGLE PIECE PLASTIC DRUMS AS CHANNELIZATION DEVICES OR SIGN SUPPORTS.
4. DRUMS SHALL PRESENT A PROFILE THAT IS A MINIMUM OF 18 INCHES IN WIDTH AT THE 36 INCH HEIGHT WHEN VIEWED FROM ANY DIRECTION. THE HEIGHT OF DRUM UNIT (BODY INSTALLED ON BASE) SHALL BE A MINIMUM OF 36 INCHES AND A MAXIMUM OF 42 INCHES.
5. THE TOP OF THE DRUM SHALL HAVE A BUILT-IN HANDLE FOR EASY PICKUP AND SHALL BE DESIGNED TO DRAIN WATER AND NOT COLLECT DEBRIS. THE HANDLE SHALL HAVE A MINIMUM OF TWO WIDELY SPACED 9/16 INCH DIAMETER HOLES TO ALLOW ATTACHMENT OF A WARNING LIGHT, WARNING REFLECTOR UNIT OR APPROVED COMPLIANT SIGN.
6. THE EXTERIOR OF THE DRUM BODY SHALL HAVE A MINIMUM OF FOUR ALTERNATING ORANGE AND WHITE RETROREFLECTIVE CIRCUMFERENTIAL STRIPES NOT LESS THAN 4 INCHES NOR GREATER THAN 8 INCHES IN WIDTH. ANY NON-REFLECTORIZED SPACE BETWEEN ANY TWO ADJACENT STRIPES SHALL NOT EXCEED 2 INCHES IN WIDTH.
7. BASES SHALL HAVE A MAXIMUM WIDTH OF 36 INCHES, A MAXIMUM HEIGHT OF 4 INCHES, AND A MINIMUM OF TWO FOOTHOLDS OF SUFFICIENT SIZE TO ALLOW BASE TO BE HELD DOWN WHILE SEPARATING THE DRUM BODY FROM THE BASE.
8. PLASTIC DRUMS SHALL BE CONSTRUCTED OF ULTRA-VIOLET STABILIZED, ORANGE, HIGH-DENSITY POLYETHYLENE (HDPE) OR OTHER APPROVED MATERIAL.
9. DRUM BODY SHALL HAVE A MAXIMUM UNBALLASTED WEIGHT OF 11 LBS.
10. DRUM AND BASE SHALL BE MARKED WITH MANUFACTURER'S NAME AND MODEL NUMBER.

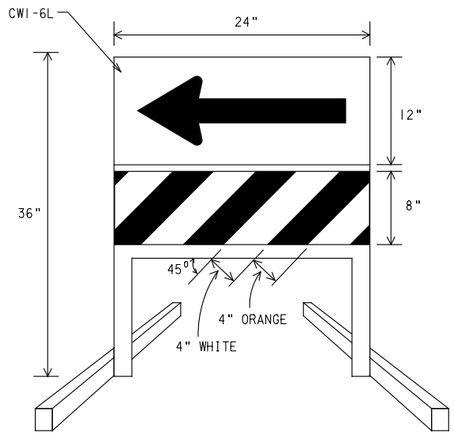
RETROREFLECTIVE SHEETING

1. THE STRIPES USED ON DRUMS SHALL BE CONSTRUCTED OF SHEETING MEETING THE COLOR AND RETROREFLECTIVITY REQUIREMENTS OF DEPARTMENTAL MATERIALS SPECIFICATION DMS-8300, "SIGN FACE MATERIALS." TYPE A 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

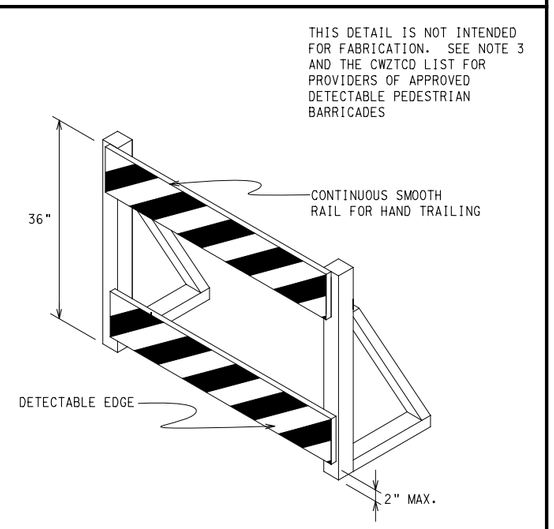
1. UNBALLASTED BASES SHALL BE LARGE ENOUGH TO HOLD UP TO 50 LBS. OF SAND. THIS BASE, WHEN FILLED WITH THE BALLAST MATERIAL, SHOULD WEIGH BETWEEN 35 LBS (MINIMUM) AND 50 LBS (MAXIMUM). THE BALLAST MAY BE SAND IN ONE TO THREE SANDBAGS SEPARATE FROM THE BASE, SAND IN A SAND-FILLED PLASTIC BASE, OR OTHER 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.





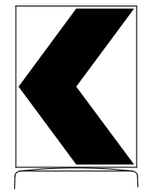
DIRECTION INDICATOR BARRICADE

1. THE DIRECTION INDICATOR BARRICADE MAY BE USED IN TAPERS, TRANSITIONS, AND OTHER AREAS WHERE SPECIFIC DIRECTIONAL GUIDANCE TO DRIVERS IS NECESSARY.
2. IF USED, THE DIRECTION INDICATOR BARRICADE SHOULD BE USED IN SERIES TO DIRECT THE DRIVER THROUGH THE TRANSITION AND INTO THE INTENDED TRAVEL LANE.
3. THE DIRECTION INDICATOR BARRICADE SHALL CONSIST OF ONE-DIRECTION LARGE ARROW (CW1-6) SIGN IN THE SIZE SHOWN WITH A BLACK ARROW ON A BACKGROUND OF TYPE B_{FL} OR TYPE C_{FL} ORANGE RETROREFLECTIVE SHEETING ABOVE A RAIL WITH TYPE A RETROREFLECTIVE SHEETING IN ALTERNATING 4" WHITE AND ORANGE STRIPES SLOPING DOWNWARD AT AN ANGLE OF 45 DEGREES IN THE DIRECTION ROAD USERS ARE TO PASS. SHEETING TYPES SHALL BE AS PER DMS 8300.
4. DOUBLE ARROWS ON THE DIRECTION INDICATOR BARRICADE WILL NOT BE ALLOWED.
5. APPROVED MANUFACTURERS ARE SHOWN ON THE CWZTCD LIST. BALLAST SHALL BE AS APPROVED BY THE MANUFACTURERS INSTRUCTIONS.

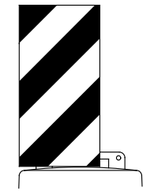


DETECTABLE PEDESTRIAN BARRICADES

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.
2. WHERE PEDESTRIANS WITH VISUAL DISABILITIES NORMALLY USE THE CLOSED SIDEWALK, A DEVICE THAT IS DETECTABLE BY A PERSON WITH A VISUAL DISABILITY TRAVELING WITH THE AID OF A LONG CANE SHALL BE PLACED ACROSS THE FULL WIDTH OF THE CLOSED SIDEWALK.
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 FOR BUILDINGS AND FACILITIES (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 MAY 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 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 Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

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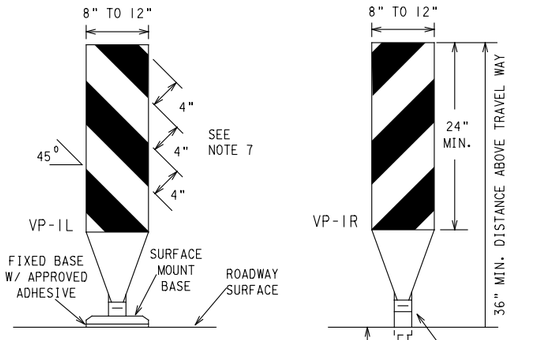
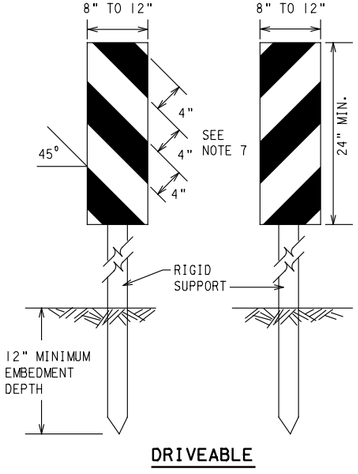


FIXED

(RIGID OR SELF-RIGHTING)



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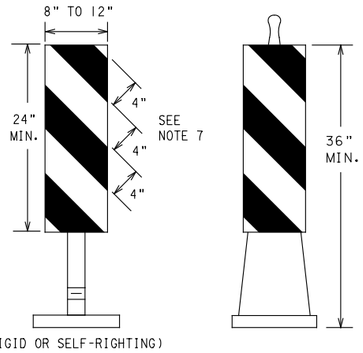
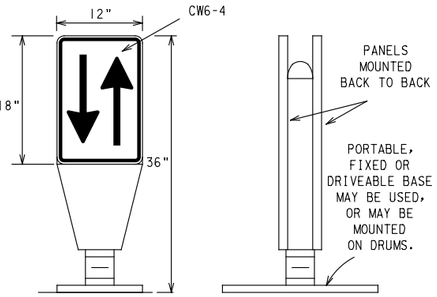


(RIGID OR SELF-RIGHTING)

PORTABLE

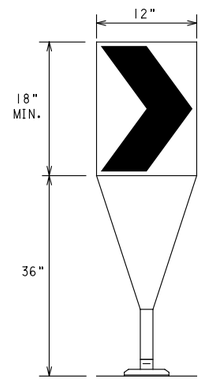
1. VERTICAL PANELS (VP'S) ARE NORMALLY USED TO CHANNELIZE TRAFFIC OR DIVIDE OPPOSING LANES OF TRAFFIC.
2. VP'S MAY BE USED IN DAYTIME OR NIGHTTIME SITUATIONS. THEY MAY BE USED AT THE EDGE OF SHOULDER DROP-OFFS AND OTHER AREAS SUCH AS LANE TRANSITIONS WHERE POSITIVE DAYTIME AND NIGHTTIME DELINEATION IS REQUIRED. THE ENGINEER/INSPECTOR SHALL REFER TO THE ROADWAY DESIGN MANUAL APPENDIX B "TREATMENT OF PAVEMENT DROP-OFFS IN WORK ZONES" FOR ADDITIONAL GUIDELINES ON THE USE OF 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 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.

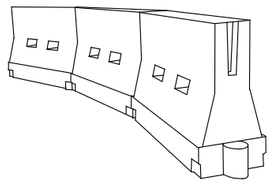
OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



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



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) PLACED 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 NCHRP 350 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

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.

POSTED SPEED *	FORMULA	MINIMUM DESIRABLE TAPER LENGTHS ** 10' OFFSET	11' OFFSET	12' OFFSET	SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES ON A TAPER	ON A TANGENT
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40		265'	295'	320'	40'	80'
45	L = WS	450'	495'	540'	45'	90'
50		500'	550'	600'	50'	100'
55		550'	605'	660'	55'	110'
60		600'	660'	720'	60'	120'
65		650'	715'	780'	65'	130'
70		700'	770'	840'	70'	140'
75		750'	825'	900'	75'	150'
80		800'	880'	960'	80'	160'

** TAPER LENGTHS HAVE BEEN ROUNDED OFF.
L=LENGTH OF TAPER (FT.) W=WIDTH OF OFFSET (FT.)
S=POSTED SPEED (MPH)

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

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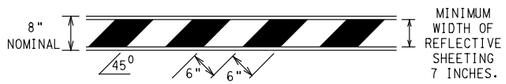
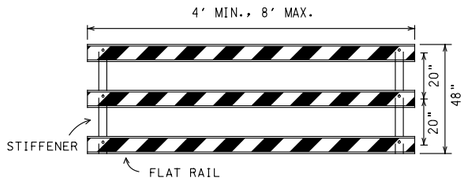
TYPE 3 BARRICADES

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 CONFORMING TO DEPARTMENTAL MATERIAL SPECIFICATION DMS-8300 UNLESS OTHERWISE NOTED.

BARRICADES SHALL NOT BE USED AS A SIGN SUPPORT.



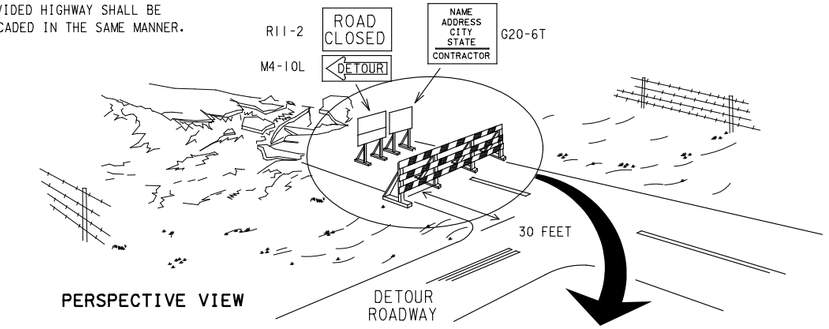
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

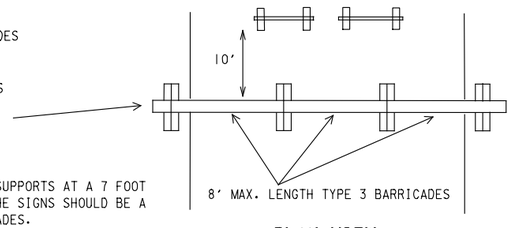
EACH ROADWAY OF A DIVIDED HIGHWAY SHALL BE BARRICADED IN THE SAME MANNER.



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.

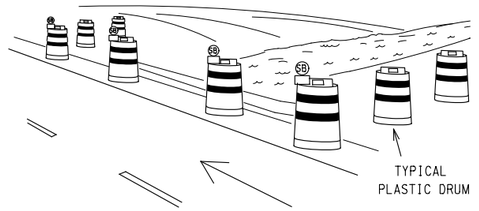
BARRICADE STRIPING SHOULD SLANT DOWNWARD IN THE DIRECTION OF DETOUR.



PLAN VIEW

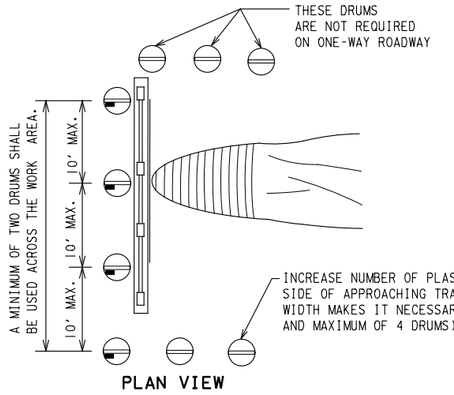
1. SIGNS SHOULD BE MOUNTED ON INDEPENDENT SUPPORTS AT A 7 FOOT MOUNTING HEIGHT IN CENTER OF ROADWAY. THE SIGNS SHOULD BE A MINIMUM OF 10 FEET BEHIND TYPE 3 BARRICADES.
2. ADVANCE SIGNING SHALL BE AS SPECIFIED ELSEWHERE IN THE PLANS.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

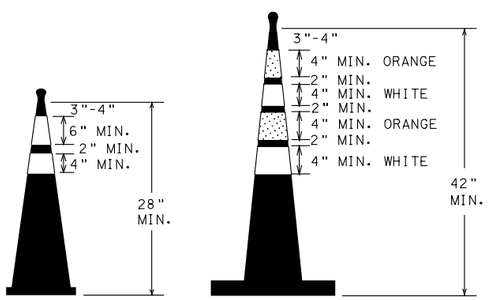
1. WHERE POSITIVE REDIRECTIONAL CAPABILITY IS PROVIDED, DRUMS MAY BE OMITTED.
2. PLASTIC CONSTRUCTION FENCING MAY BE USED WITH DRUMS FOR SAFETY AS REQUIRED IN THE PLANS.
3. VERTICAL PANELS ON FLEXIBLE SUPPORT MAY BE SUBSTITUTED FOR DRUMS WHEN THE SHOULDER WIDTH IS LESS THAN 4 FEET.
4. WHEN THE SHOULDER 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

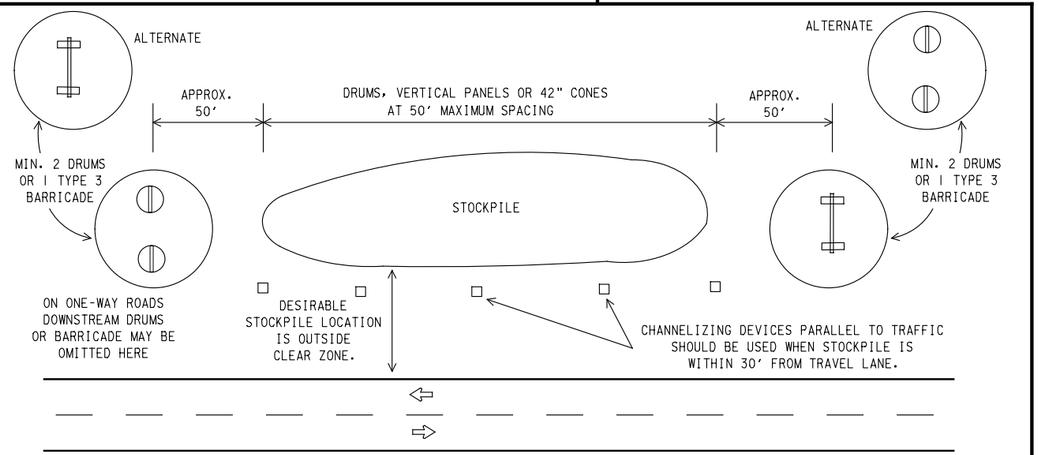
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



28" CONES SHALL HAVE A MINIMUM WEIGHT OF 9 1/2 LBS.

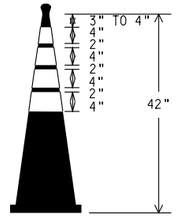
42" 2-PIECE CONES SHALL HAVE A MINIMUM WEIGHT OF 30 LBS. INCLUDING BASE.

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 USED AT NIGHT 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.
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

THIS DEVICE SHALL NOT BE USED ON PROJECTS LET AFTER MARCH 2014.



EDGELINE CHANNELIZER

1. THIS DEVICE IS INTENDED ONLY FOR USE IN PLACE OF A VERTICAL PANEL TO CHANNELIZE TRAFFIC BY INDICATING THE EDGE OF THE TRAVEL LANE. IT IS NOT INTENDED TO BE USED IN TRANSITIONS OR TAPERS.
2. THIS DEVICE SHALL NOT BE USED TO SEPARATE LANES OF TRAFFIC (OPPOSING OR OTHERWISE) OR WARN OF OBJECTS.
3. THIS DEVICE IS BASED ON A 42 INCH, TWO-PIECE CONE WITH AN ALTERNATE STRIPING PATTERN; FOUR 4 INCH RETROREFLECTIVE BANDS, WITH AN APPROXIMATE 2 INCH GAP BETWEEN BANDS. THE COLOR OF THE BAND SHOULD CORRESPOND TO THE COLOR OF THE EDGELINE (YELLOW FOR LEFT EDGELINE, WHITE FOR RIGHT EDGELINE) FOR WHICH THE DEVICE IS SUBSTITUTED OR FOR WHICH IT SUPPLEMENTS. THE REFLECTORIZED BANDS SHALL BE RETROREFLECTIVE TYPE A CONFORMING TO DEPARTMENTAL MATERIAL SPECIFICATION DMS-8300, UNLESS OTHERWISE NOTED.
4. THE BASE MUST WEIGH A MINIMUM OF 30 LBS.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

FILE: BC-14.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TXDOT NOVEMBER 2002	CONT	SECT	JOB	HIGHWAY
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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.

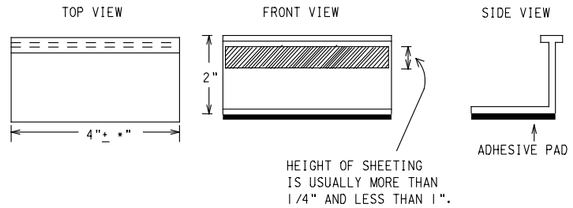
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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 Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

FILE: BC-14.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TXDOT FEBRUARY 1998	CONT	SECT	JOB	HIGHWAY
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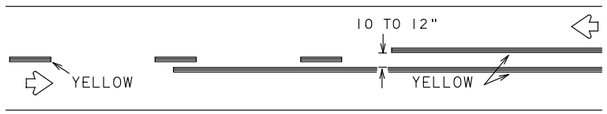
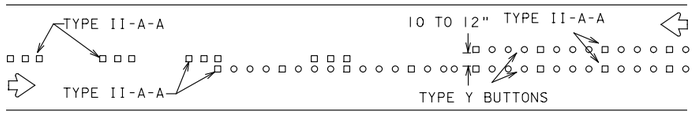
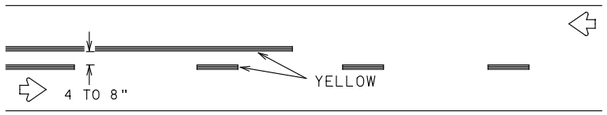
PAVEMENT MARKING PATTERNS



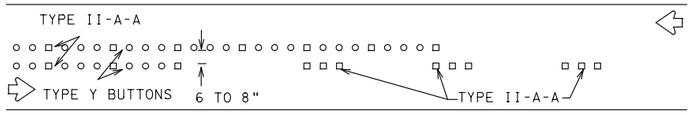
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



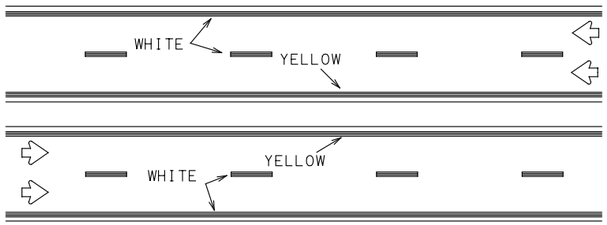
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



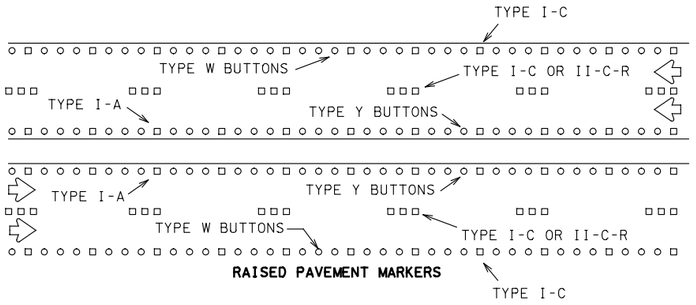
RAISED PAVEMENT MARKERS - PATTERN B

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



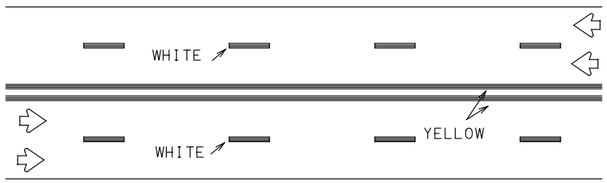
REFLECTORIZED PAVEMENT MARKINGS



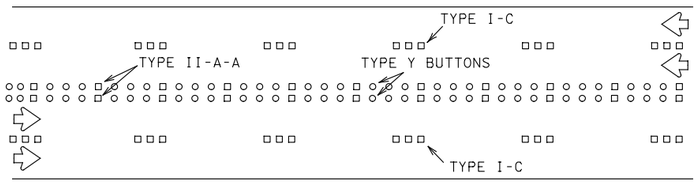
RAISED PAVEMENT MARKERS

PREFABRICATED MARKINGS MAY BE SUBSTITUTED FOR REFLECTORIZED PAVEMENT MARKINGS.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



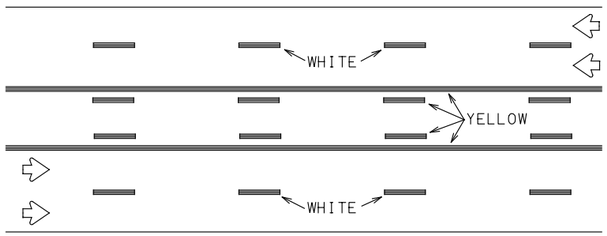
REFLECTORIZED PAVEMENT MARKINGS



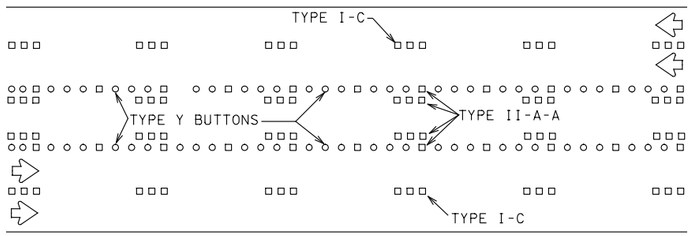
RAISED PAVEMENT MARKERS

PREFABRICATED MARKINGS MAY BE SUBSTITUTED FOR REFLECTORIZED PAVEMENT MARKINGS.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

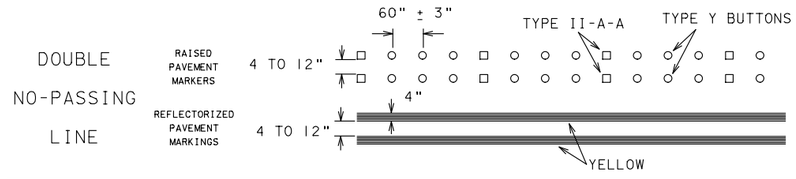
PREFABRICATED MARKINGS MAY BE SUBSTITUTED FOR REFLECTORIZED PAVEMENT MARKINGS.

TWO-WAY LEFT TURN LANE

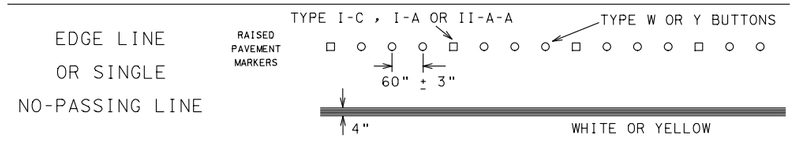
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

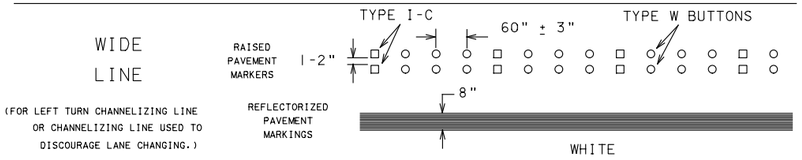


EDGE LINE OR SINGLE NO-PASSING LINE



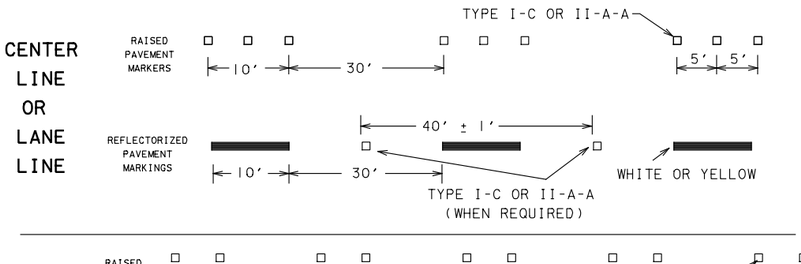
WIDE LINE

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

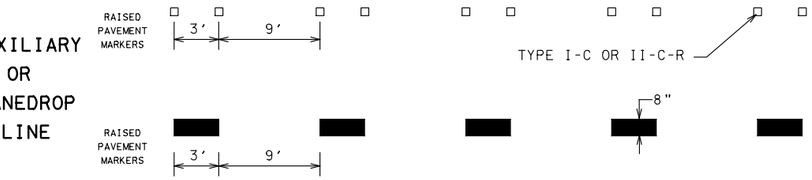


BROKEN LINES

CENTER LINE OR LANE LINE

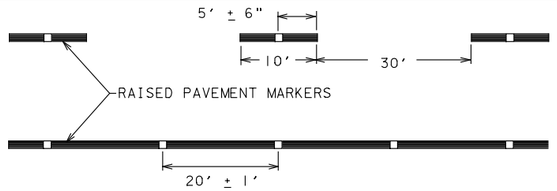


AUXILIARY OR LANEDROP LINE



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 Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

FILE: BC-14.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TXDOT FEBRUARY 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	00	200	VARIOUS
1-97 9-07	DIST	COUNTY		SHEET NO.
2-98 7-13	SAT	BEXAR		28
11-02 8-14				

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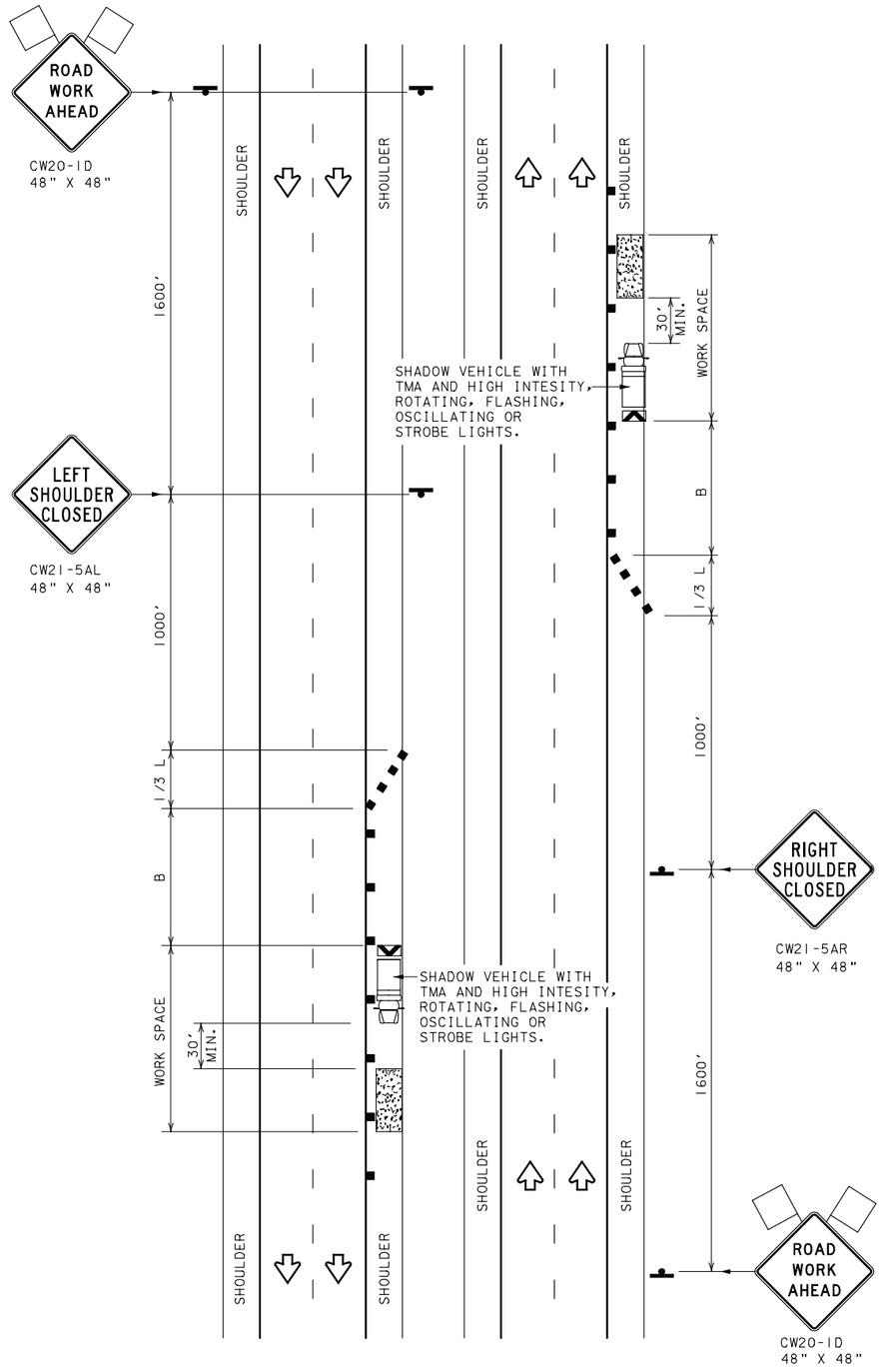
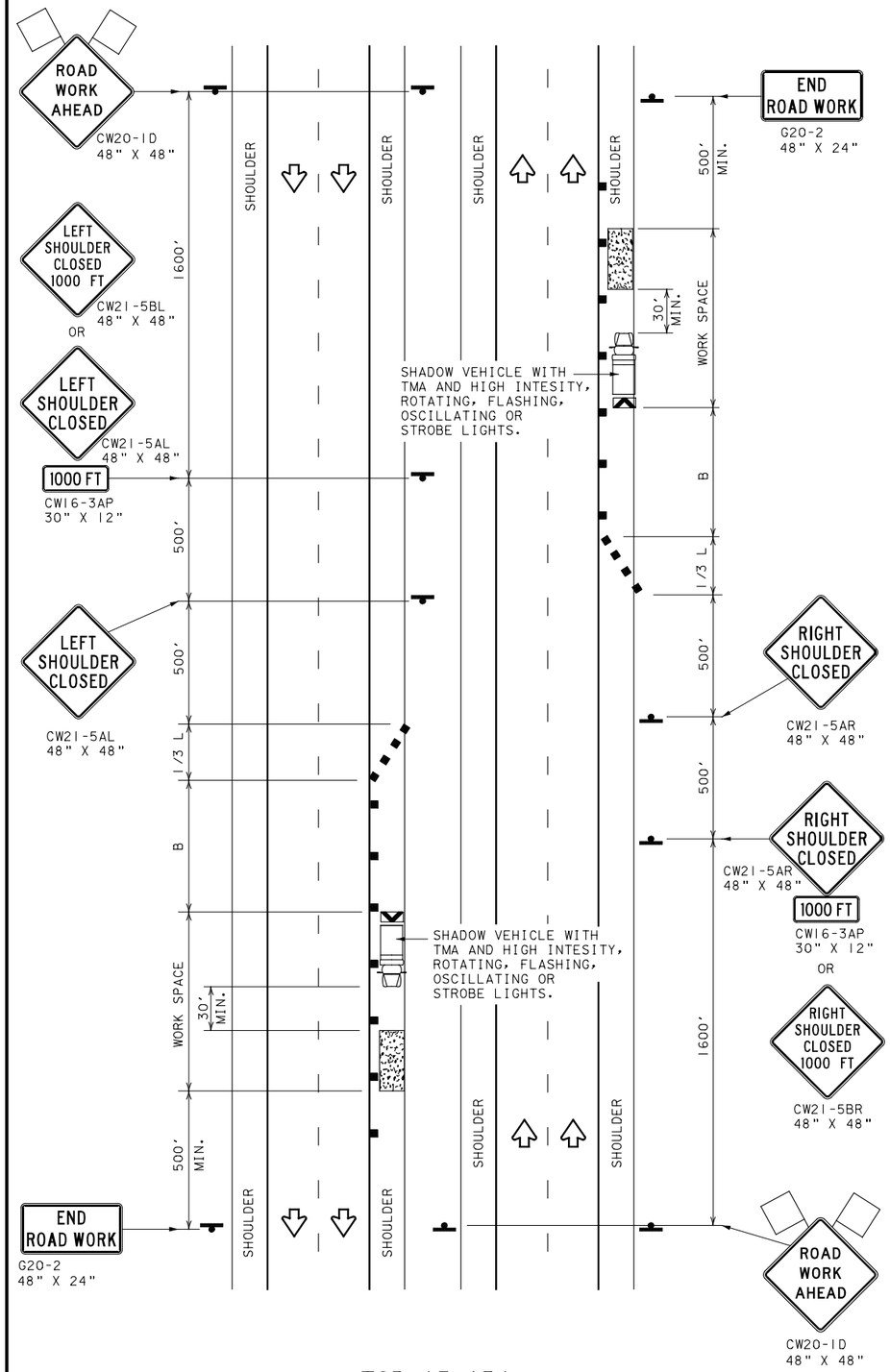


TCP (5-1A)

WORK AREA ON SHOULDER



TCP (5-1B)

WORK AREA ON SHOULDER

LEGEND			
	TYPE 3 BARRICADE		CHANNELIZING DEVICES
	HEAVY WORK VEHICLE		TRUCK MOUNTED ATTENUATOR (TMA)
	TRAILER MOUNTED FLASHING ARROW BOARD	M	PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
	SIGN		TRAFFIC FLOW
	FLAG		FLAGGER

POSTED SPEED *	FORMULA	MINIMUM DESIRABLE TAPER LENGTHS **			SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES		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'	90'
35		205'	225'	245'	35'	70'	120'
40		265'	295'	320'	40'	80'	155'
45	L = WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

* CONVENTIONAL ROADS ONLY
** TAPER LENGTHS HAVE BEEN ROUNDED OFF.
L=LENGTH OF TAPER(FT) W=WIDTH OF OFFSET(FT) S=POSTED SPEED(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	TCP(5-1A)	TCP(5-1B)	TCP(5-1B)	

GENERAL NOTES

1. A SHADOW VEHICLE WITH A TMA SHOULD BE USED ANYTIME IT CAN BE POSITIONED 30' TO 100' IN ADVANCE OF THE AREA OF CREW EXPOSURE WITHOUT ADVERSELY EFFECTING THE PERFORMANCE OR QUALITY OF THE WORK. TYPE 3 BARRICADES OR DRUMS MAY BE SUBSTITUTED WHEN WORKERS ON FOOT ARE NO LONGER PRESENT WHEN APPROVED BY THE ENGINEER.
2. 28" TALL OR TALLER ONE-PIECE CONES WILL BE ALLOWED ONLY FOR SHORT DURATION OR SHORT TERM STATIONARY OPERATIONS WHEN WORKERS ARE PRESENT TO MAINTAIN THE DEVICES UPRIGHT AND IN PROPER LOCATION. INTERMEDIATE TERM STATIONARY WORK AREAS SHOULD USE DRUMS, VERTICAL PANELS OR 42" TALL TWO-PIECE CONES.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN SHOULDER WORK FOR FREEWAYS / EXPRESSWAYS

TCP(5-1)-18

FILE: TCP5-1-18.DGN	DN:	CK:	DW:	CK:
©TXDOT FEBRUARY 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	00	200	VARIOUS
2-18	DIST	COUNTY		SHEET NO.
	SAT	BEXAR		29

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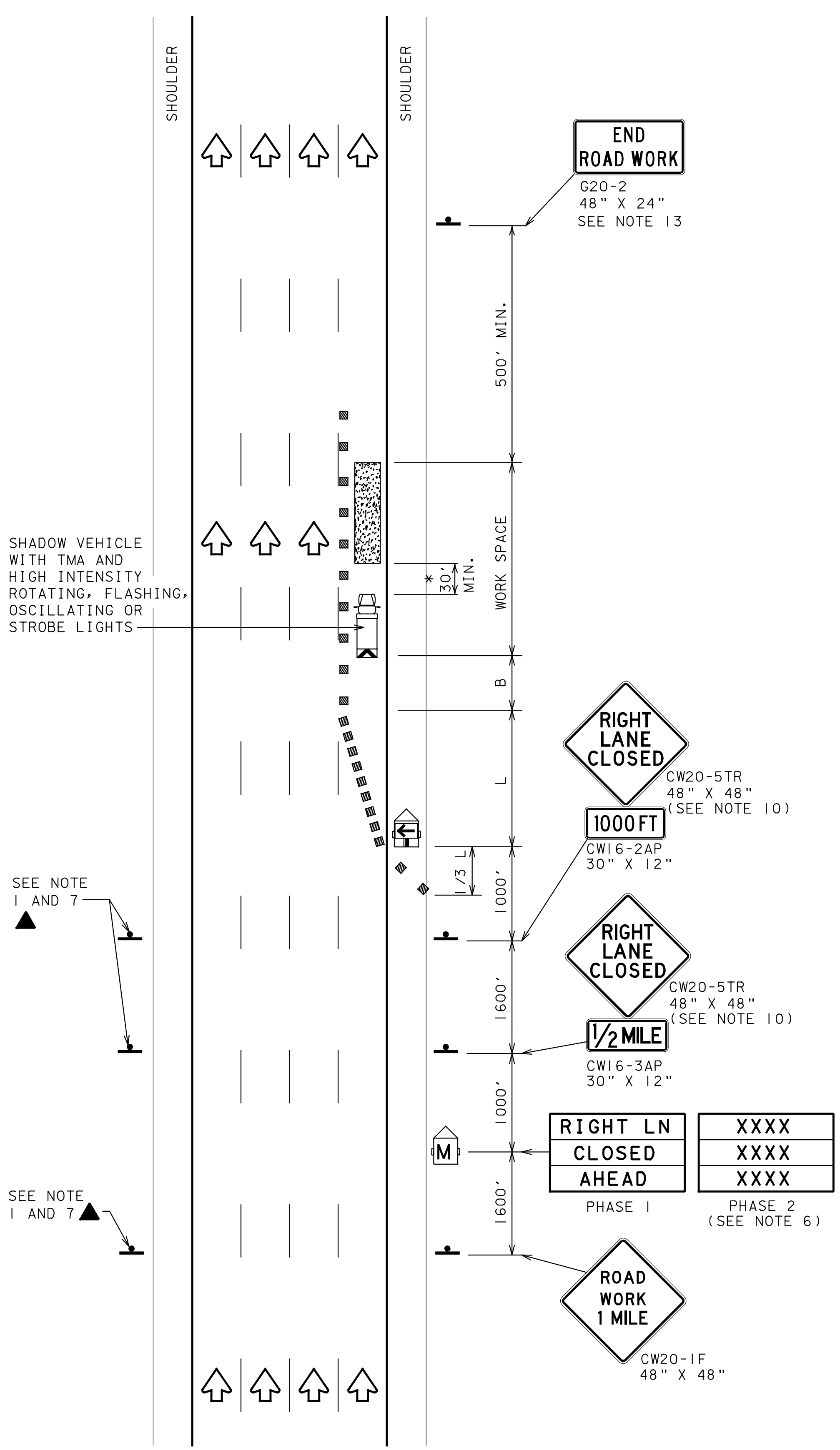
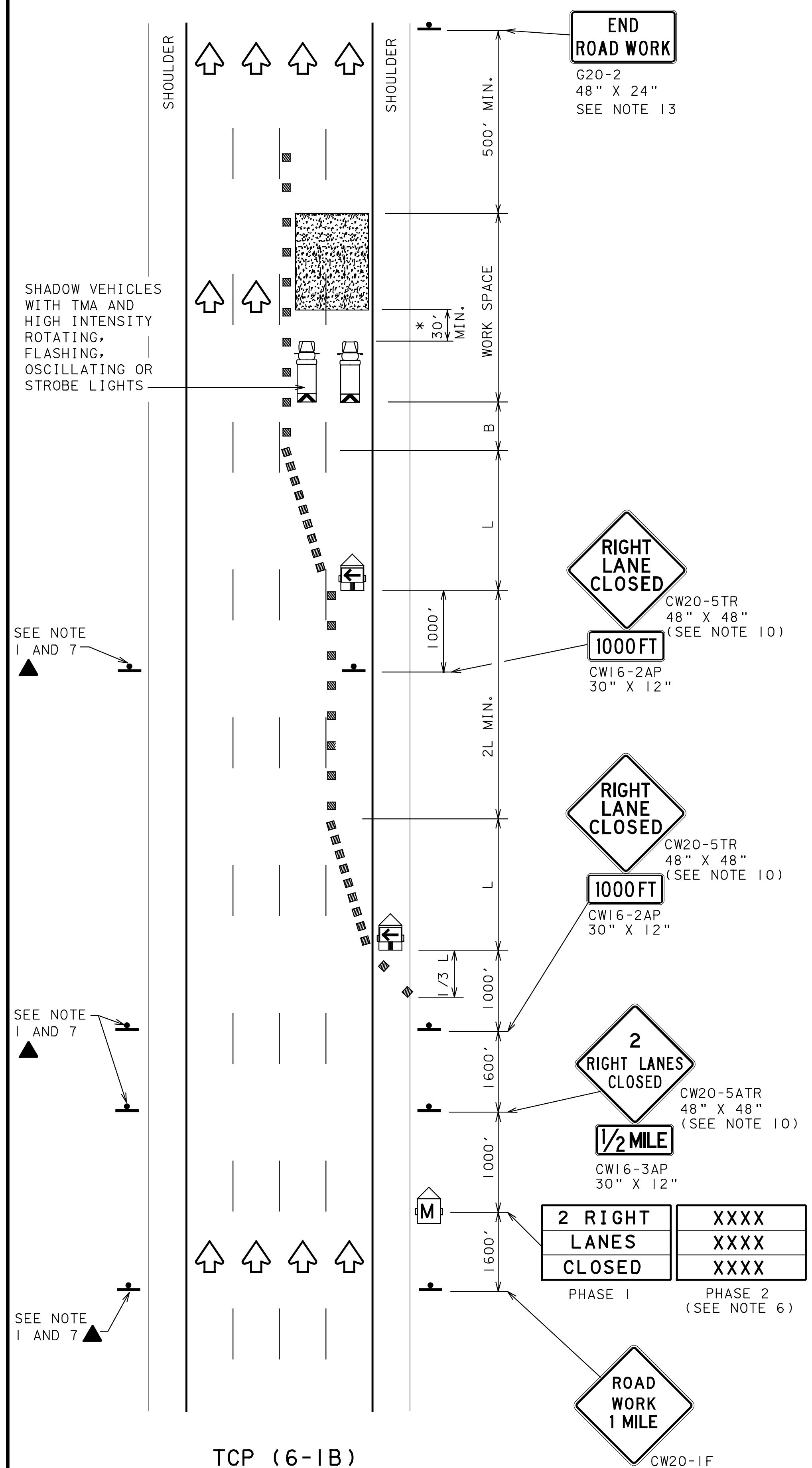


TCP (6-1A)

TYPICAL FREEWAY
ONE LANE CLOSURE



TCP (6-1B)

TYPICAL FREEWAY
TWO LANE CLOSURE

LEGEND

▨	TYPE 3 BARRICADE	■ ■	CHANNELIZING DEVICES
	HEAVY WORK VEHICLE		TRUCK MOUNTED ATTENUATOR (TMA)
	TRAILER MOUNTED FLASHING ARROW BOARD	M	PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
	SIGN		TRAFFIC FLOW
	FLAG		FLAGGER

POSTED SPEED	FORMULA	MINIMUM DESIRABLE TAPER LENGTHS "L" **			SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES		SUGGESTED LONGITUDINAL BUFFER SPACE "B"
		10' OFFSET	11' OFFSET	12' OFFSET	ON A TAPER	ON A TANGENT	
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

** TAPER LENGTHS HAVE BEEN ROUNDED OFF.
L=LENGTH OF TAPER(FT) W=WIDTH OF OFFSET(FT) S=POSTED SPEED(MPH)

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

GENERAL NOTES

1. ALL TRAFFIC CONTROL DEVICES ILLUSTRATED ARE REQUIRED. DEVICES DENOTED WITH THE TRIANGLE SYMBOL MAY BE OMITTED WHEN STATED ELSEWHERE IN THE PLANS.
2. DRUMS OR 42"CONES ARE THE TYPICAL CHANNELIZING DEVICES. FOR INTERMEDIATE TERM STATIONARY WORK, DRUMS SHALL BE USED ON TAPERS WITH DRUMS OR 42" CONES USED ON TANGENT SECTIONS. OTHER CHANNELIZING DEVICES MAY BE USED AS DIRECTED BY THE ENGINEER.
3. ALL CONSTRUCTION SIGNS AND BARRICADES PLACED DURING ANY PHASE OF WORK SHALL REMAIN IN PLACE UNTIL REMOVAL IS APPROVED BY THE ENGINEER.
4. THE ENGINEER MAY DIRECT THE CONTRACTOR TO FURNISH ADDITIONAL SIGNS AND BARRICADES AS REQUIRED TO MAINTAIN TRAFFIC FLOW, DETOURS AND MOTORIST SAFETY DURING CONSTRUCTION.
5. STATIC MESSAGE BOARDS OR CHANGEABLE MESSAGE SIGNS STATING THE DATE AND DURATION OF RAMP OR FREEWAY LANE CLOSURES SHALL BE PLACED A MINIMUM OF SEVEN (7) CALENDAR DAYS IN ADVANCE OF THE ACTUAL CLOSURE.
6. PHASE 2 OF THE PCMS MESSAGE SHOULD INCLUDE APPROPRIATE INFORMATION FORMATTED AS SHOWN ON BC(6), SUCH AS "MERGE LEFT," RECOMMENDED ADVISORY SPEED, DELAY INFORMATION, OR OTHER SPECIFIC WARNINGS.
7. DUPLICATE CONSTRUCTION WARNING SIGNS SHOULD BE ERECTED ON THE MEDIANS SIDE OF FREEWAYS WHERE MEDIAN WIDTH WILL PERMIT AND TRAFFIC VOLUME JUSTIFIES THE SIGNING.
8. THE NUMBER OF CLOSED LANES MAY BE INCREASED PROVIDED THE SPACING OF TRAFFIC CONTROL DEVICES, TAPER LENGTHS AND TANGENT LENGTHS MEET THE REQUIREMENTS OF THE TMUTCD.
9. WARNING SIGNS FOR INTERMEDIATE TERM STATIONARY WORK SHOULD BE MOUNTED AT 7' TO THE BOTTOM OF THE SIGN.
10. WARNING SIGNS SHOWN SHALL BE APPROPRIATELY ALTERED FOR LEFT LANE CLOSURES. WHEN SIGNS ARE MOUNTED AT 1' HEIGHT FOR SHORT TERM STATIONARY OR SHORT DURATION WORK, SIGN VERSIONS SHOWN IN THE SHSD FOR TEXAS WITH DISTANCES ON THE SIGN FACE RATHER THAN MOUNTED ON A PLAQUE BELOW THE SIGN MAY BE USED.
11. WHEN POSSIBLE, PCMS UNITS SHOULD BE LOCATED IN ADVANCE OF THE LAST AVAILABLE EXIT RAMP PRIOR TO THE LANE CLOSURE TO ALLOW MOTORISTS AN ALTERNATE ROUTE. THEY MAY ALSO BE RELOCATED TO IMPROVE ADVANCE WARNING IN CASE OF UNANTICIPATED QUEUING OR CONGESTION.
12. FOR INTERMEDIATE TERM STATIONARY WORK AT NIGHT, FLOODLIGHTS SHOULD BE USED TO ILLUMINATE THE WORK AREA AND EQUIPMENT CROSSINGS. FLOODLIGHTS SHALL NOT PRODUCE A DISABLING GLARE CONDITION FOR ROAD USERS OR WORKERS.
13. THE END ROAD WORK (G20-2) SIGN MAY BE OMITTED WHEN IT CONFLICTS WITH G20-2 SIGNS ALREADY IN PLACE ON THE PROJECT.

* A SHADOW VEHICLE EQUIPPED WITH A TRUCK MOUNTED ATTENUATOR IS TYPICALLY REQUIRED. A SHADOW VEHICLE EQUIPPED WITH A TMA SHALL BE USED IF IT CAN BE POSITIONED 30' TO 100' IN ADVANCE OF THE AREA OF CREW EXPOSURE WITHOUT ADVERSELY AFFECTING THE WORK PERFORMANCE.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN FREEWAY LANE CLOSURES

TCP(6-1)-12

FILE: TCP6-1.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TXDOT FEBRUARY 1998	CONT	SECT	JOB	HIGHWAY
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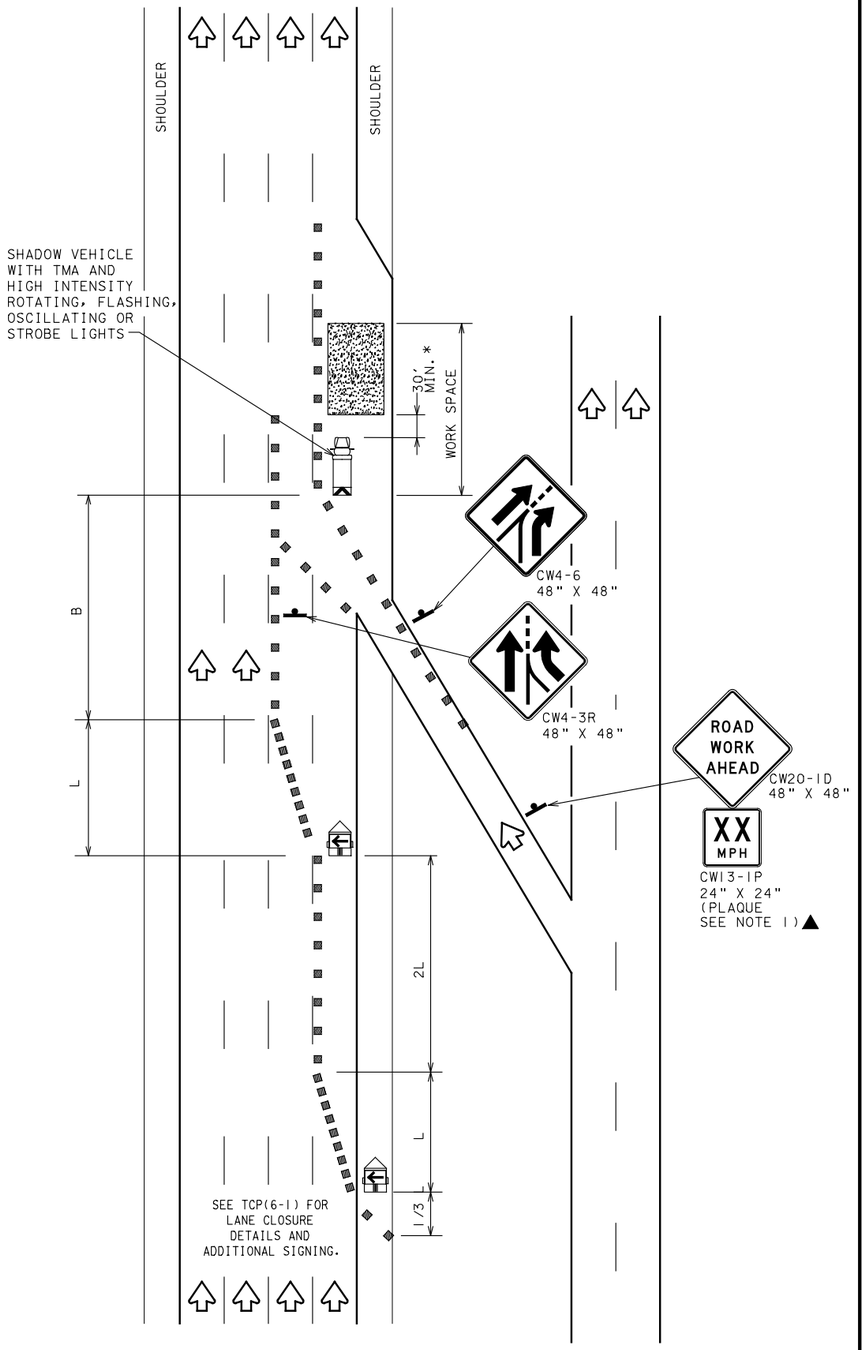
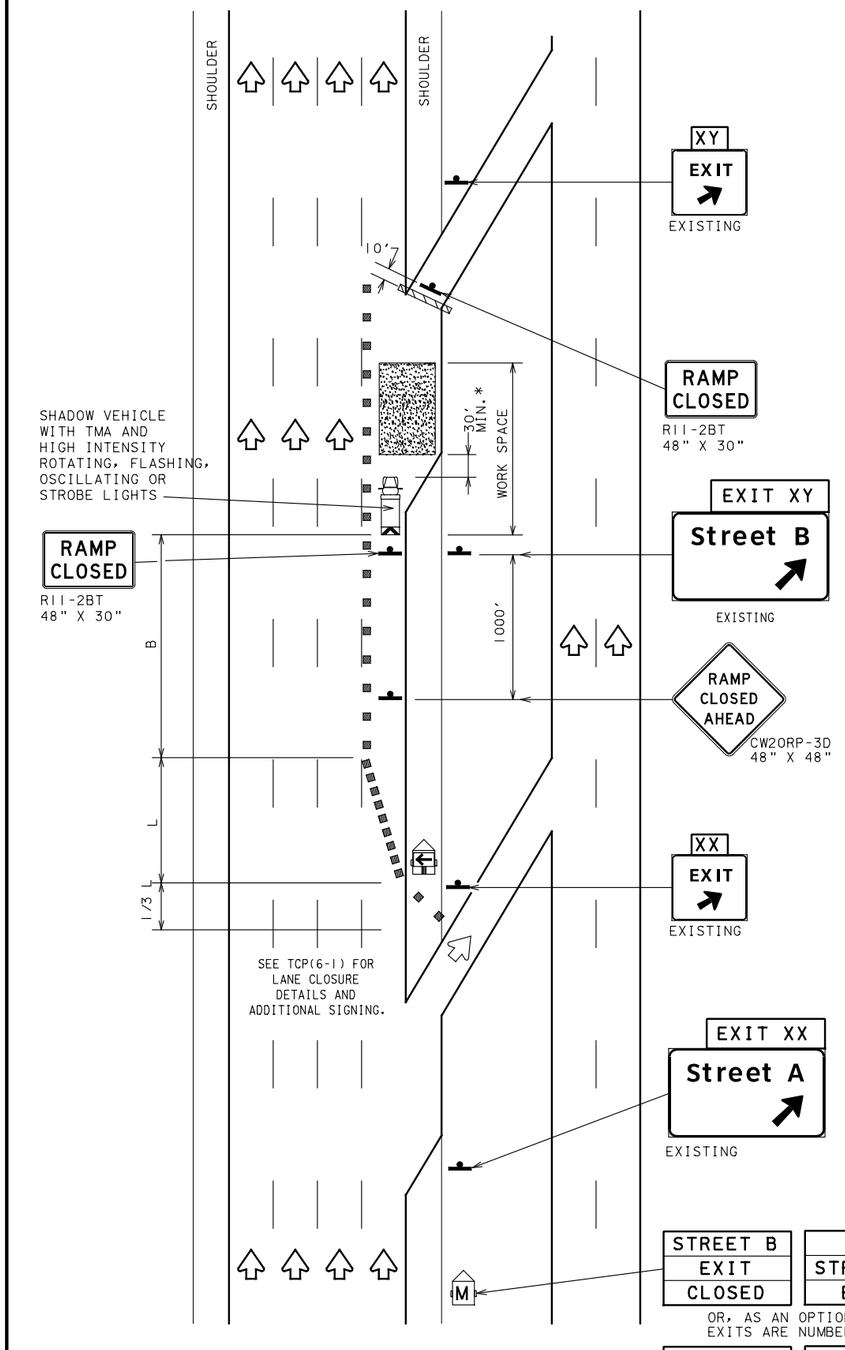
	SAT		BEXAR	30



TCP (6-3A)

ENTRANCE RAMP OPEN



STREET B	USE
EXIT	STREET A
CLOSED	EXIT

OR, AS AN OPTION WHEN EXITS ARE NUMBERED

EXIT XY	USE
CLOSED	EXIT XX

PLACE 1 MILE (APPROX.) IN ADVANCE OF STREET A EXIT.

TCP (6-3B)

EXIT RAMP CLOSED
TRAFFIC EXITS PRIOR TO CLOSED RAMP

LEGEND			
	TYPE 3 BARRICADE		CHANNELIZING DEVICES
	HEAVY WORK VEHICLE		TRUCK MOUNTED ATTENUATOR (TMA)
	TRAILER MOUNTED FLASHING ARROW BOARD	M	PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
	SIGN		TRAFFIC FLOW
	FLAG		FLAGGER

POSTED SPEED	FORMULA	MINIMUM DESIRABLE TAPER LENGTHS "L" **			SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES		SUGGESTED LONGITUDINAL BUFFER SPACE "B"
		10' OFFSET	11' OFFSET	12' OFFSET	ON A TAPER	ON A TANGENT	
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

** TAPER LENGTHS HAVE BEEN ROUNDED OFF.
L=LENGTH OF TAPER(FT) W=WIDTH OF OFFSET(FT) S=POSTED SPEED(MPH)

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

GENERAL NOTES:

1. ALL TRAFFIC CONTROL DEVICES ILLUSTRATED ARE REQUIRED. DEVICES DENOTED WITH THE TRIANGLE SYMBOL MAY BE OMITTED WHEN STATED ELSEWHERE IN THE PLANS.

* A SHADOW VEHICLE EQUIPPED WITH A TRUCK MOUNTED ATTENUATOR IS TYPICALLY REQUIRED. A SHADOW VEHICLE EQUIPPED WITH A TMA SHALL BE USED IF IT CAN BE POSITIONED 30' TO 100' IN ADVANCE OF THE AREA OF CREW EXPOSURE WITHOUT ADVERSELY AFFECTING THE WORK PERFORMANCE.

ADDITIONAL REQUIREMENTS FOR LANE CLOSURES AND ADVANCE SIGNING SHALL BE AS SHOWN ON TCP (6-1) OR AS DIRECTED BY THE ENGINEER.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
WORK AREA BEYOND RAMP

TCP(6-3)-12

FILE: TCP6-3.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TXDOT FEBRUARY 1994	CONT	SECT	JOB	HIGHWAY
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4-98 8-12	SAT	BEXAR		31

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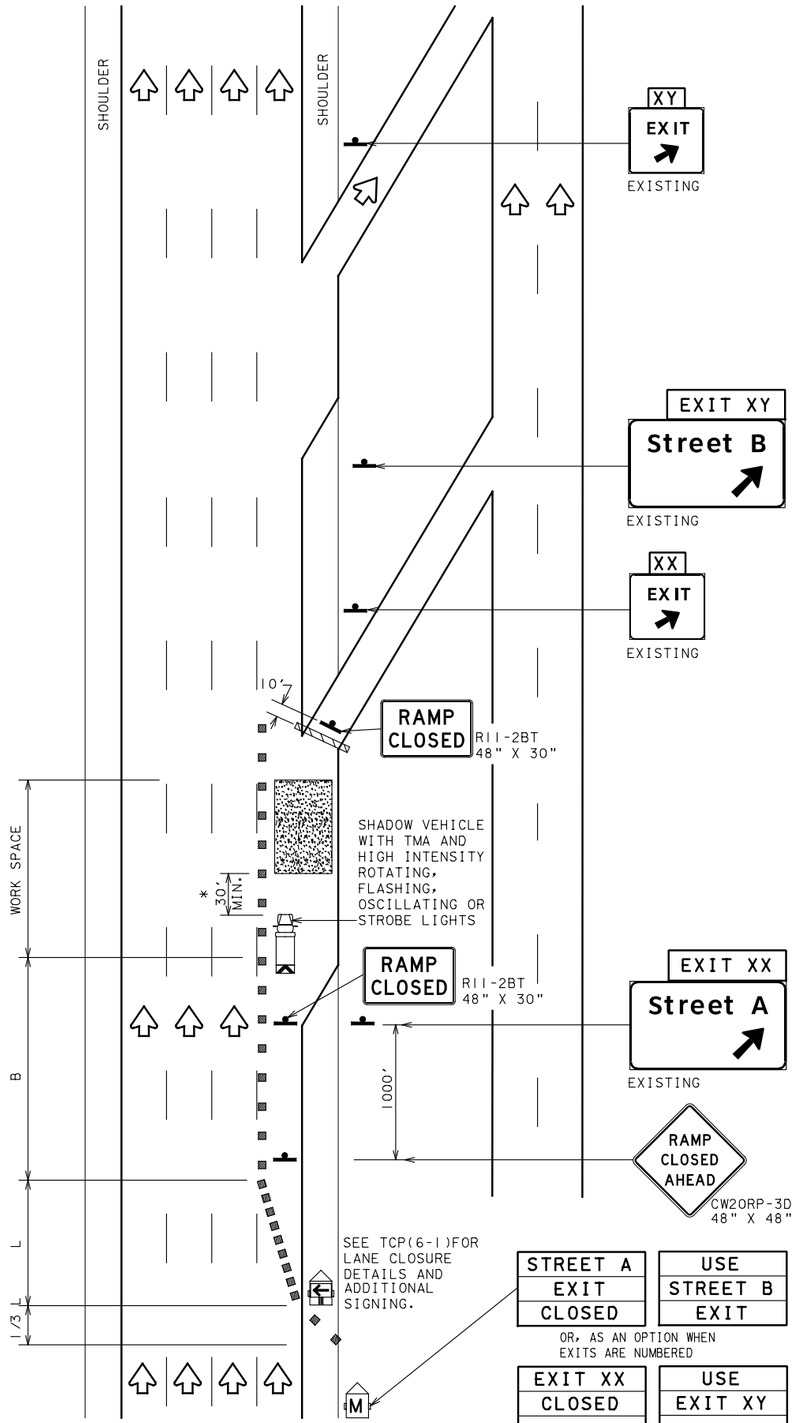
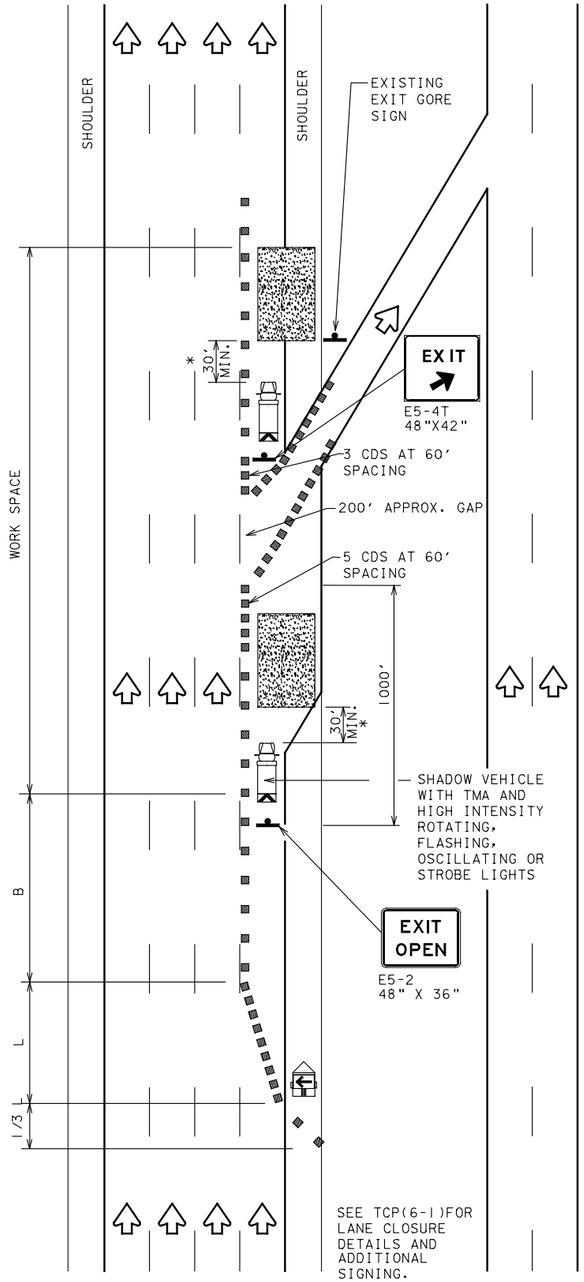


TCP (6-4A)

EXIT RAMP CLOSED
TRAFFIC EXITS PAST CLOSED RAMP



TCP (6-4B)

EXIT RAMP OPEN

LEGEND

	TYPE 3 BARRICADE		CHANNELIZING DEVICES (CDS)
	HEAVY WORK VEHICLE		TRUCK MOUNTED ATTENUATOR (TMA)
	TRAILER MOUNTED FLASHING ARROW BOARD	M	PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
	SIGN		TRAFFIC FLOW
	FLAG		FLAGGER

POSTED SPEED	FORMULA	MINIMUM DESIRABLE TAPER LENGTHS "L" **			SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES		SUGGESTED LONGITUDINAL BUFFER SPACE "B"
		10' OFFSET	11' OFFSET	12' OFFSET	ON A TAPER	ON A TANGENT	
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

** TAPER LENGTHS HAVE BEEN ROUNDED OFF.
L=LENGTH OF TAPER(FT) W=WIDTH OF OFFSET(FT) S=POSTED SPEED(MPH)

TYPICAL USAGE

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

GENERAL NOTES

1. ALL TRAFFIC CONTROL DEVICES ILLUSTRATED ARE REQUIRED. DEVICES DENOTED WITH THE TRIANGLE SYMBOL MAY BE OMITTED WHEN STATED ELSEWHERE IN THE PLANS.

2. SEE BC STANDARDS FOR SIGN DETAILS.

* A SHADOW VEHICLE EQUIPPED WITH A TRUCK MOUNTED ATTENUATOR IS TYPICALLY REQUIRED. A SHADOW VEHICLE EQUIPPED WITH A TMA SHALL BE USED IF IT CAN BE POSITIONED 30' TO 100' IN ADVANCE OF THE AREA OF CREW EXPOSURE WITHOUT ADVERSELY AFFECTING THE WORK PERFORMANCE.

ADDITIONAL REQUIREMENTS FOR LANE CLOSURES AND ADVANCE SIGNING SHALL BE AS SHOWN ON TCP (6-1) OR AS DIRECTED BY THE ENGINEER.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
WORK AREA AT EXIT RAMP

TCP(6-4)-12

FILE: TCP6-4.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TXDOT FEBURARY 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	00	200	VARIOUS
1-97 8-98	DIST	COUNTY		SHEET NO.
4-98 8-12	SAT	BEXAR		32

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 • IN. OR LESS IN DIAMETER.

4. PROVIDE THE FOLLOWING TEST EQUIPMENT AS REQUIRED BY THE ENGINEER TO CONFIRM COMPLIANCE WITH THE CONTRACT AND THE NEC: VOLTMETER, AMMETER, MEGOHM METER (1000 VOLT DC), GROUND RESISTANCE TESTER, TORQUE WRENCHES, AND TORQUE SCREWDRIVERS. ENSURE ALL EQUIPMENT HAS BEEN PROPERLY CALIBRATED WITHIN THE LAST YEAR. PROVIDE CALIBRATION CERTIFICATION TO THE ENGINEER UPON REQUEST. OPERATE TEST EQUIPMENT DURING INSPECTION AS REQUESTED BY THE ENGINEER.

5. INSTALL GROUNDING AS SHOWN ON THE PLANS AND IN ACCORDANCE WITH THE NEC. ENSURE ALL METALLIC CONDUITS, METAL POLES, LUMINAIRES, AND METAL ENCLOSURES ARE BONDED TO THE EQUIPMENT GROUNDING CONDUCTOR. PROVIDE STRANDED BARE COPPER OR GREEN INSULATED GROUNDING CONDUCTORS. GROUND RODS, CONNECTORS, AND BONDING JUMPERS ARE SUBSIDIARY TO THE VARIOUS BID ITEMS.

6. WHEN REQUIRED BY THE ENGINEER, NOTIFY THE DEPARTMENT IN WRITING OF MATERIALS FROM THE MATERIAL PRODUCERS LIST (MPL) INTENDED FOR USE ON EACH PROJECT. PREQUALIFIED MATERIALS ARE LISTED ON THE MPL ON TXDOT'S WEBSITE UNDER "ROADWAY ILLUMINATION AND ELECTRICAL SUPPLIES." NO SUBSTITUTIONS WILL BE ALLOWED FOR MATERIALS ON THIS LIST.

CONDUIT

A. MATERIALS

1. PROVIDE CONDUIT, JUNCTION BOXES, FITTINGS, AND HARDWARE AS PER TXDOT DEPARTMENTAL MATERIAL SPECIFICATION (DMS) 11030 "CONDUIT" AND ITEM 618 "CONDUIT" OF TXDOT'S "STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS, AND BRIDGES," LATEST EDITION. PROVIDE CONDUITS LISTED UNDER ITEM 618 ON THE MPL UNDER "ROADWAY ILLUMINATION AND ELECTRICAL SUPPLIES." PROVIDE CONDUIT TYPES ACCORDING TO THE DESCRIPTIVE CODE OR AS SHOWN ON THE PLANS. DO NOT SUBSTITUTE OTHER TYPES OF CONDUITS FOR THOSE SHOWN. PROVIDE LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC) WHEN FLEXIBLE CONDUIT IS CALLED FOR ON GALVANIZED STEEL RIGID METALLIC CONDUIT (RMC) SYSTEMS. PROVIDE LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC) WHEN FLEXIBLE CONDUIT IS CALLED FOR ON POLYVINYL CHLORIDE (PVC) SYSTEMS.

2. PROVIDE GALVANIZED STEEL RMC FOR ALL EXPOSED CONDUITS, UNLESS OTHERWISE SHOWN ON THE PLANS. PROPERLY BOND ALL METAL CONDUITS.

3. UNLESS OTHERWISE SHOWN ON THE PLANS, PROVIDE JUNCTION BOXES WITH A MINIMUM SIZE AS SHOWN IN THE FOLLOWING TABLE, WHICH APPLIES TO THE GREATEST NUMBER OF CONDUCTORS ENTERING THE BOX THROUGH ONE CONDUIT WITH NO MORE THAN FOUR CONDUITS PER BOX. WHEN A MIXTURE OF CONDUCTOR SIZES IS PRESENT, COUNT THE CONDUCTORS AS IF ALL ARE OF THE LARGER SIZE. FOR SITUATIONS NOT APPLICABLE TO THE TABLE, SIZE JUNCTION BOXES IN ACCORDANCE WITH NEC.

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
•1	10" X 10" X 4"	12" X 12" X 4"	16" X 16" X 4"
•2	8" X 8" X 4"	10" X 10" X 4"	12" X 12" X 4"
•4	8" X 8" X 4"	10" X 10" X 4"	10" X 10" X 4"
•6	8" X 8" X 4"	8" X 8" X 4"	10" X 10" X 4"
•8	8" X 8" X 4"	8" X 8" X 4"	8" X 8" X 4"

4. JUNCTION BOXES WITH AN INTERNAL VOLUME OF LESS THAN 100 CU. IN. AND SUPPORTED BY ENTERING RACEWAYS MUST HAVE THREADED ENTRIES OR HUBS IDENTIFIED FOR THE INTENDED PURPOSE AND SUPPORTED BY CONNECTION OF TWO OR MORE RIGID METAL CONDUITS. SECURE CONDUIT WITHIN 3 FT. OF THE ENCLOSURE OR WITHIN 18 IN. OF THE ENCLOSURE IF ALL CONDUIT ENTRIES ARE ON THE SAME SIDE. MECHANICALLY SECURE ALL JUNCTION BOXES WITH AN INTERNAL VOLUME GREATER THAN 100 CU. INCHES.

5. PROVIDE HOT DIPPED GALVANIZED CAST IRON OR SAND CAST ALUMINUM OUTLET BOXES FOR JUNCTION BOXES CONTAINING ONLY 10 AWG OR 12 AWG CONDUCTORS. DO NOT USE DIE CAST ALUMINUM BOXES. SIZE OUTLET BOXES ACCORDING TO THE NEC.

6. DO NOT USE INTERMEDIATE METAL CONDUIT (IMC) OR ELECTRICAL METALLIC TUBING (EMT) UNLESS SPECIFICALLY REQUIRED BY THE PLAN SHEETS. WHEN EMT IS CALLED FOR, PROVIDE JUNCTION BOXES MADE FROM GALVANIZED STEEL SHEETING, LISTED AND APPROVED FOR OUTDOOR USE, UNLESS OTHERWISE NOTED ON THE PLANS. SIZE ALL GALVANIZED STEEL JUNCTION BOXES IN ACCORDANCE WITH THE NEC. PROVIDE JUNCTION BOXES FOR IMC CONDUIT SYSTEMS THAT MEET THE SAME REQUIREMENTS FOR JUNCTION BOXES USED WITH RMC SYSTEMS.

7. PROVIDE PVC JUNCTION BOXES INTENDED FOR OUTDOOR USE ON PVC CONDUIT SYSTEMS, UNLESS OTHERWISE NOTED ON THE PLANS.

8. PROVIDE PVC ELBOWS IN PVC CONDUIT SYSTEMS, UNLESS OTHERWISE SHOWN ON THE PLANS. USE ONLY A FLAT, HIGH TENSILE STRENGTH POLYESTER FIBER PULL TAPE FOR PULLING CONDUCTORS THROUGH THE PVC CONDUIT SYSTEM. WHEN GALVANIZED STEEL RMC ELBOWS ARE SPECIFICALLY CALLED FOR IN THE PLANS AND ANY PORTION OF THE RMC ELBOW IS BURIED LESS THAN 18 IN., GROUND THE RMC ELBOW BY MEANS OF A GROUNDING BUSHING ON A RIGID METAL EXTENSION. GROUNDING OF THE RIGID METAL ELBOW IS NOT REQUIRED IF THE ENTIRE RMC ELBOW IS ENCASED IN A MINIMUM OF 2 IN. OF CONCRETE. PVC EXTENSIONS ARE ALLOWED ON THESE CONCRETE ENCASED RIGID METAL ELBOWS. RMC OR PVC ELBOWS ARE SUBSIDIARY TO VARIOUS BID ITEMS.

9. WHEN REQUIRED, PROVIDE HIGH-DENSITY POLYETHYLENE (HDPE) CONDUIT WITH FACTORY INSTALLED INTERNAL CONDUCTORS ACCORDING TO ITEM 622 "DUCT CABLE." AT THE CONTRACTOR'S REQUEST AND WITH APPROVAL BY THE ENGINEER, SUBSTITUTE HDPE CONDUIT WITH NO CONDUCTORS FOR BORED SCHEDULE 40 OR SCHEDULE 80 PVC CONDUIT BID UNDER ITEM 618. ENSURE BORED HDPE SUBSTITUTED FOR PVC IS SCHEDULE 40 AND OF THE SAME SIZE PVC CALLED FOR IN THE PLANS. ENSURE THE SUBSTITUTED HDPE MEETS THE REQUIREMENTS OF ITEM 622, EXCEPT THAT THE CONDUIT IS SUPPLIED WITHOUT FACTORY-INSTALLED CONDUCTORS. MAKE THE TRANSITION OF THE HDPE CONDUIT TO PVC (OR RMC ELBOW WHEN REQUIRED) AT THE BORE PIT. PROVIDE CONDUIT OF THE SIZE AND SCHEDULE AS SHOWN ON THE PLANS. DO NOT EXTEND SUBSTITUTED CONDUIT INTO GROUND BOXES OR FOUNDATIONS. PROVIDE PVC OR GALVANIZED STEEL RMC ELBOWS AS CALLED FOR AT ALL GROUND BOXES AND FOUNDATIONS.

10. USE TWO-HOLE STRAPS WHEN SUPPORTING 2 IN. AND LARGER CONDUITS. ON ELECTRICAL SERVICE POLES, PROPERLY SIZED STAINLESS STEEL OR HOT DIPPED GALVANIZED ONE-HOLE STANDOFF STRAPS ARE ALLOWED ON THE SERVICE RISER CONDUIT.

B. CONSTRUCTION METHODS

1. PROVIDE AND INSTALL EXPANSION JOINT CONDUIT FITTINGS ON ALL STRUCTURE-MOUNTED CONDUITS AT THE STRUCTURE'S EXPANSION JOINTS TO ALLOW FOR MOVEMENT OF THE CONDUIT. IN ADDITION, PROVIDE AND INSTALL EXPANSION JOINT FITTINGS ON ALL CONTINUOUS RUNS OF GALVANIZED STEEL RMC CONDUIT EXTERNALLY EXPOSED ON STRUCTURES SUCH AS BRIDGES AT MAXIMUM INTERVALS OF 150 FT. WHEN REQUESTED BY THE PROJECT ENGINEER, SUPPLY MANUFACTURER'S SPECIFICATION SHEET FOR EXPANSION JOINT CONDUIT FITTINGS. REPAIR OR REPLACE EXPANSION JOINT FITTINGS THAT DO NOT ALLOW FOR MOVEMENT AT NO ADDITIONAL COST TO THE DEPARTMENT. PROVIDE THE METHOD OF DETERMINING THE AMOUNT OF EXPANSION TO THE ENGINEER UPON REQUEST. DO NOT USE LFMC OR LFNC AS A SUBSTITUTE FOR THE REQUIRED EXPANSION CONDUIT FITTINGS.

2. SPACE ALL CONDUIT SUPPORTS AT MAXIMUM INTERVALS OF 5 FT. INSTALL CONDUIT SPACERS WHEN ATTACHING METAL CONDUIT TO SURFACE OF CONCRETE STRUCTURES. SEE "CONDUIT MOUNTING OPTIONS" ON ED(2). INSTALL CONDUIT SUPPORT WITHIN 3 FT. OF ALL ENCLOSURES AND CONDUIT TERMINATIONS.

3. DO NOT ATTACH CONDUIT SUPPORTS DIRECTLY TO PRE-STRESSED CONCRETE BEAMS EXCEPT AS SHOWN SPECIFICALLY IN THE PLANS OR AS APPROVED BY THE ENGINEER.

4. UNLESS OTHERWISE SHOWN ON THE PLANS, JACK OR BORE CONDUIT PLACED BENEATH EXISTING ROADWAYS, DRIVEWAYS, SIDEWALKS, OR AFTER THE BASE OR SURFACING OPERATION HAS BEGUN. BACKFILL AND COMPACT THE BORE PITS BELOW THE CONDUIT PER ITEM 476 "JACKING, BORING, OR TUNNELING PIPE OR BOX" PRIOR TO INSTALLING CONDUIT OR DUCT CABLE TO PREVENT BENDING OF THE CONNECTIONS.

5. WHEN PLACING CONDUIT IN THE SUB-GRADE OF NEW ROADWAYS, BACKFILL ALL TRENCHES WITH EXCAVATED MATERIAL UNLESS OTHERWISE NOTED ON THE PLANS. WHEN PLACING CONDUIT IN THE SUB-BASE OF NEW ROADWAYS, BACKFILL ALL TRENCHES WITH CEMENT-STABILIZED BASE AS PER REQUIREMENTS OF ITEMS 110 "EXCAVATION", 400 "EXCAVATION AND BACKFILL FOR STRUCTURES", 401 "FLOWABLE BACKFILL", 402 "TRENCH EXCAVATION PROTECTION", AND 403 "TEMPORARY SPECIAL SHORING."

6. PROVIDE AND PLACE WARNING TAPE APPROXIMATELY 10 IN. ABOVE ALL TRENCHED CONDUIT AS PER ITEM 618.

7. DURING CONSTRUCTION, TEMPORARILY CAP OR PLUG OPEN ENDS OF ALL CONDUIT AND RACEWAYS IMMEDIATELY AFTER INSTALLATION TO PREVENT ENTRY OF DIRT, DEBRIS AND ANIMALS. TEMPORARY CAPS CONSTRUCTED OF DURABLE DUCT TAPE ARE ALLOWED. TIGHTLY FIX THE TAPE TO THE CONDUIT OPENING. CLEAN OUT THE CONDUIT AND PROVE IT CLEAR IN ACCORDANCE WITH ITEM 618 PRIOR TO INSTALLING ANY CONDUCTORS.

8. ENSURE CONDUIT ENTRY INTO THE TOP OF ANY ENCLOSURE IS WATERPROOF BY INSTALLING CONDUIT SEALING HUBS OR USING BOXES WITH THREADED BOSSES. THIS INCLUDES SURFACE MOUNTED SAFETY SWITCHES, METER CANS, SERVICE ENCLOSURES, AUXILIARY ENCLOSURES AND JUNCTION BOXES. GROUNDING BUSHINGS ON WATER TIGHT SEALING HUBS ARE NOT REQUIRED.

9. FIT THE ENDS OF ALL PVC CONDUIT TERMINATIONS WITH BUSHINGS OR BELL END FITTINGS. PROVIDE AND INSTALL A GROUNDING TYPE BUSHING ON ALL METAL CONDUIT TERMINATIONS.

10. INSTALL A BONDING JUMPER FROM EACH GROUNDING BUSHING TO THE NEAREST GROUND ROD, GROUNDING LUG, OR EQUIPMENT GROUNDING CONDUCTOR. ENSURE ALL BONDING JUMPERS ARE THE SAME SIZE AS THE EQUIPMENT GROUNDING CONDUCTOR. BONDING OF CONDUIT USED AS A CASING UNDER ROADWAYS FOR DUCT CABLE IS NOT REQUIRED, IF THE DUCT EXTENDS THE FULL LENGTH THROUGH THE CASING.

11. AT ALL ELECTRICAL SERVICES, INSTALL A 6 AWG SOLID COPPER GROUNDING ELECTRODE CONDUCTOR.

12. PLACE CONDUITS ENTERING GROUND BOXES SO THAT THE CONDUIT OPENINGS ARE BETWEEN 3 IN. AND 6 IN. FROM THE BOTTOM OF THE BOX. SEE THE GROUND BOX DETAIL ON SHEET ED(4).

13. SEAL ENDS OF ALL CONDUITS WITH DUCT SEAL, EXPANDABLE FOAM, OR BY OTHER METHODS APPROVED BY THE ENGINEER. SEAL CONDUIT IMMEDIATELY AFTER COMPLETION OF CONDUCTOR INSTALLATION AND PULL TESTS. DO NOT USE DUCT TAPE AS A PERMANENT CONDUIT SEALANT. DO NOT USE SILICONE CAULK AS A CONDUIT SEALANT.

14. FILE SMOOTH THE CUT ENDS OF ALL MOUNTING STRUT AND CONDUIT. BEFORE INSTALLING, PAINT THE FIELD CUT ENDS OF ALL MOUNTING STRUT AND RMC (THREADED OR NON-THREADED) WITH ZINC RICH PAINT (94% OR MORE ZINC CONTENT) TO ALLEVIATE OVERSPRAY. USE ZINC RICH PAINT TO TOUCH UP GALVANIZED MATERIAL AS ALLOWED UNDER ITEM 445 "GALVANIZING." DO NOT PAINT NON-GALVANIZED MATERIAL WITH A ZINC RICH PAINT AS AN ALTERNATIVE FOR MATERIALS REQUIRED TO BE GALVANIZED.

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Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

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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.

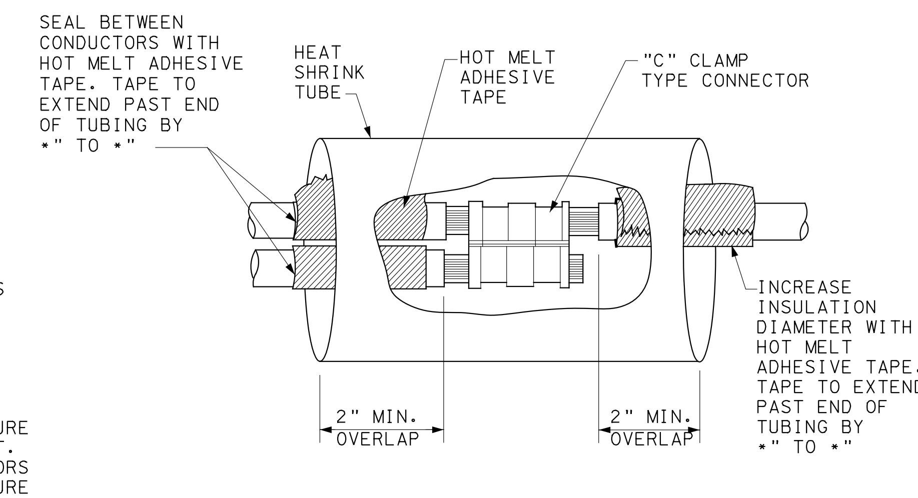
GROUND RODS & GROUNDING ELECTRODES

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.



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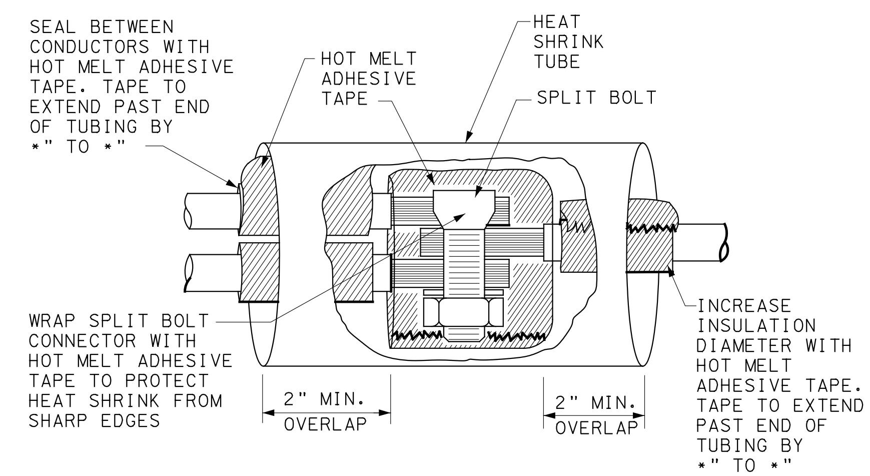

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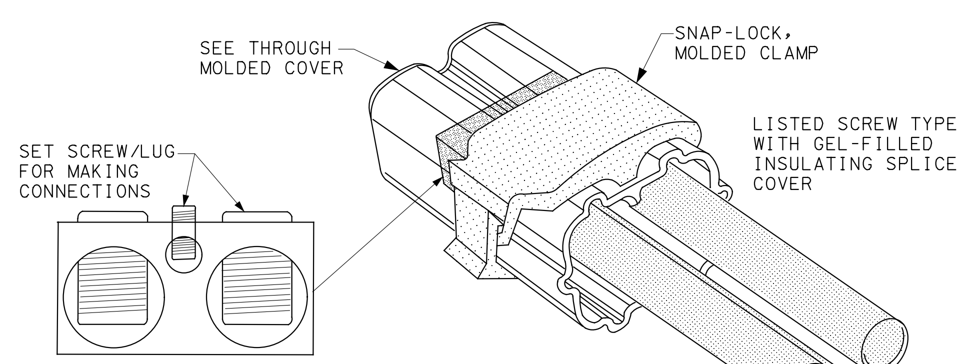

SPLICE OPTION 3
LISTED SCREW TYPE

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUCTORS

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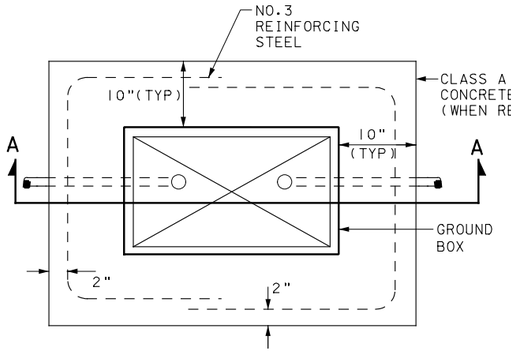
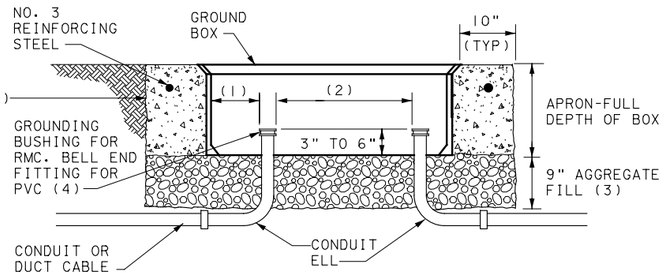


PLAN VIEW



SECTION A - A

APRON FOR GROUND BOX

(1) UNIFORMLY SPACE ENDS OF CONDUITS WITHIN THE GROUND BOX. POSITION ENDS OF CONDUITS SO THAT GROUND BOX WALLS DO NOT INTERFERE WITH THE INSTALLATION OF GROUNDING BUSHINGS OR BELL END FITTINGS.

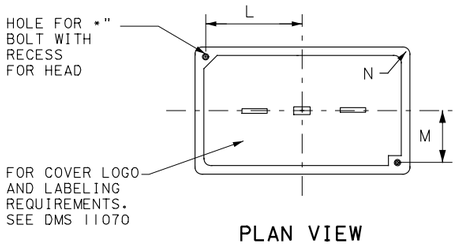
(2) MAINTAIN SUFFICIENT SPACE BETWEEN CONDUITS TO ALLOW FOR PROPER INSTALLATION OF BUSHING.

(3) PLACE AGGREGATE UNDER THE BOX, NOT IN THE BOX. AGGREGATE SHOULD NOT ENCROACH ON THE INTERIOR VOLUME OF THE BOX.

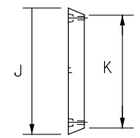
(4) INSTALL A GROUNDING BUSHING ON THE UPPER END OF ALL RMC TERMINATING IN A GROUND BOX. GROUND RMC ELBOWS WHEN ANY PART OF THE ELBOW IS LESS THAN 18 IN. BELOW THE BOTTOM OF THE GROUND BOX. INSTALL A PVC BUSHING OR BELL END FITTING ON THE UPPER END OF ALL PVC CONDUITS TERMINATING IN A GROUND BOX.

GROUND BOX DIMENSIONS	
TYPE	OUTSIDE DIMENSIONS (INCHES) (WIDTH X LENGTH X DEPTH)
A	12 X 23 X 11
B	12 X 23 X 22
C	16 X 29 X 11
D	16 X 29 X 22
E	12 X 23 X 17

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



PLAN VIEW



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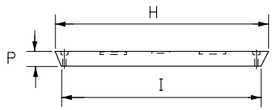

SIDE

GROUND BOX COVER

GROUND BOXES

A. MATERIALS

1. PROVIDE POLYMER CONCRETE GROUND BOXES MEASURING 16X30X24 IN. (WXLXD) OR SMALLER IN ACCORDANCE WITH DEPARTMENTAL MATERIAL SPECIFICATION (DMS) 11070 "GROUND BOXES" AND ITEM 624 "GROUND BOXES."

2. PROVIDE TYPE A, B, C, D, AND E GROUND BOXES AS SHOWN IN THE PLANS, AND AS LISTED ON THE MATERIAL PRODUCERS LIST (MPL) ON THE DEPARTMENT WEB SITE UNDER "ROADWAY ILLUMINATION AND ELECTRICAL SUPPLIES," ITEM 624.

3. ENSURE GROUND BOX COVER IS CORRECTLY LABELED IN ACCORDANCE WITH DMS 11070.

4. PROVIDE LARGER GROUND BOXES IN ACCORDANCE WITH ITEM 624 AND AS SHOWN IN THE PLANS.

B. CONSTRUCTION METHODS

1. REMOVE ALL GRAVEL AND DIRT FROM CONDUIT. CAP ALL CONDUITS PRIOR TO PLACING AGGREGATE AND SETTING GROUND BOX. PROVIDE GRADE 3 OR 4 COARSE AGGREGATE AS SHOWN ON TABLE 2 OF ITEM 302 "AGGREGATES FOR SURFACE TREATMENTS." ENSURE AGGREGATE BED IS IN PLACE AND AT LEAST 9 INCHES DEEP, PRIOR TO SETTING THE GROUND BOX. INSTALL GROUND BOX ON TOP OF AGGREGATE.

2. CAST GROUND BOX APRONS IN PLACE. REINFORCING STEEL MAY BE FIELD BENT. ENSURE THE DEPTH OF CONCRETE FOR THE APRON EXTENDS FROM FINISHED GRADE TO THE TOP OF THE AGGREGATE BED UNDER THE BOX. GROUND BOX APRONS, INCLUDING CONCRETE AND REINFORCING STEEL, ARE SUBSIDIARY TO GROUND BOXES WHEN CALLED FOR BY DESCRIPTIVE CODE.

3. KEEP BOLT HOLES IN THE BOX CLEAR OF DIRT. BOLT COVERS DOWN WHEN NOT WORKING IN GROUND BOXES.

4. INSTALL ALL CONDUITS AND ELLS IN A NEAT AND WORKMANLIKE MANNER. UNIFORMLY SPACE CONDUITS SO GROUNDING BUSHINGS AND BELL END FITTINGS CAN EASILY BE INSTALLED.

5. TEMPORARILY SEAL ALL CONDUITS IN THE GROUND BOX UNTIL CONDUCTORS ARE INSTALLED.

6. PERMANENTLY SEAL CONDUITS IMMEDIATELY AFTER THE COMPLETION OF CONDUCTOR INSTALLATION AND PULL TESTS. PERMANENTLY SEAL THE ENDS OF ALL CONDUITS WITH DUCT SEAL, EXPANDABLE FOAM, OR OTHER METHOD AS APPROVED. DO NOT USE DUCT TAPE AS A PERMANENT CONDUIT SEALANT. DO NOT USE SILICONE CAULK AS A SEALANT.

7. WHEN A GROUND ROD IS PRESENT IN A GROUND BOX, BOND ALL EQUIPMENT GROUNDING CONDUCTORS TOGETHER AND TO THE GROUND ROD WITH LISTED CONNECTORS.

8. WHEN A TYPE B OR D GROUND BOX IS STACKED TO MEET VOLUME REQUIREMENTS, IT IS ALLOWABLE TO CUT AN APPROPRIATELY SIZED HOLE FOR CONDUIT ENTRY IN THE SIDE WALL AT LEAST 18 INCHES BELOW GRADE.

9. IF AN EXISTING GROUND BOX IN THE CONTRACT HAS A METAL COVER, BOND THE COVER TO THE EQUIPMENT GROUNDING CONDUCTOR WITH A 3 FT. LONG STRANDED BONDING JUMPER THE SAME SIZE AS THE GROUNDING CONDUCTOR. THE BONDING JUMPER IS SUBSIDIARY TO VARIOUS BID ITEMS. VERIFY EXISTING GROUND BOXES WITH METAL COVERS ARE SHOWN ON THE PLANS, WITH NOTES FULLY DESCRIBING THE WORK REQUIRED.

10. IF OTHER GROUND BOXES WITH METAL COVERS ARE WITHIN THE PROJECT LIMITS BUT ARE NOT PART OF THE CONTRACT, THE ENGINEER MAY DIRECT THE CONTRACTOR TO BOND THE METAL COVERS, IDENTIFYING THE SPECIFIC BOXES IN WRITING. THIS WORK WILL BE PAID FOR SEPARATELY.

11. BOND METAL GROUND BOX COVERS TO THE GROUNDING CONDUCTOR WITH A TANK GROUND TYPE LUG.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS GROUND BOXES

ED(4)-14

FILE: ED4-14.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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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 * 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 * 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 * 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 *"	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 *"	3/#6	N/A	N/A	N/A	70	FLASHING BEACON 1	1P/20	4	1.0
									FLASHING BEACON 2	1P/20	4	

* EXAMPLE ONLY, NOT FOR CONSTRUCTION. ALL NEW ELECTRICAL SERVICES MUST HAVE ELECTRICAL SERVICE DATA CHART SPECIFIC TO THAT SERVICE AS SHOWN IN THE PLANS.

** VERIFY SERVICE CONDUIT SIZE WITH UTILITY. SIZE MAY CHANGE DUE TO UTILITY METER REQUIREMENTS. ENSURE CONDUIT SIZE MEETS THE NATIONAL ELECTRICAL CODE.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE

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

SCHEMATIC TYPE

SERVICE VOLTAGE V / V

DISCONNECT AMP RATING
000 INDICATES MAIN LUG ONLY/
TYPICALLY TYPE T

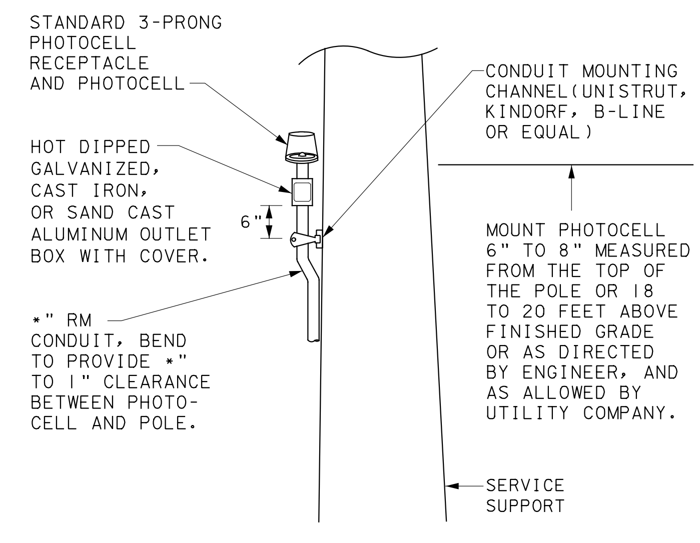
(SS)= SAFETY SWITCH AHEAD OF METER-CHECK WITH UTILITY
(NS)= NO SAFETY SWITCH AHEAD OF METER-CHECK WITH UTILITY

ENCLOSURE TYPE
GS= GALVANIZED STEEL("OFF THE SHELF")
SS= STAINLESS STEEL(CUSTOM ENCLOSURE)SEE MPL
AL= ALUMINUM (CUSTOM ENCLOSURE)SEE MPL

PHOTOCELL MOUNTING LOCATION
(E)= INSIDE SERVICE/ENCLOSURE MOUNTED
(T)= TOP OF POLE
(L)= LUMINAIRE MOUNTED
(N)= NONE/NO PHOTOCELL OR LIGHTING CONTACTOR REQUIRED

SERVICE SUPPORT TYPE
GC= GRANITE CONCRETE
OC= OTHER CONCRETE
TP= TIMBER POLE
SP= STEEL POLE
SF= STEEL FRAME
OT= POLE BY OTHERS OR PAID FOR SEPARATELY
EX= EXISTING POLE
TS= SERVICE ON TRAFFIC SIGNAL POLE
PS= PEDESTAL SERVICE

O= OVERHEAD SERVICE FEED FROM UTILITY
U= UNDERGROUND SERVICE FEED FROM UTILITY



TOP MOUNTED PHOTOCELL

INSTALL CONDUIT STRAP MAXIMUM 3 FEET FROM BOX. 5 FOOT MAXIMUM SPACING BETWEEN STRAPS SUPPORTING CONDUIT.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

ED(5)-14

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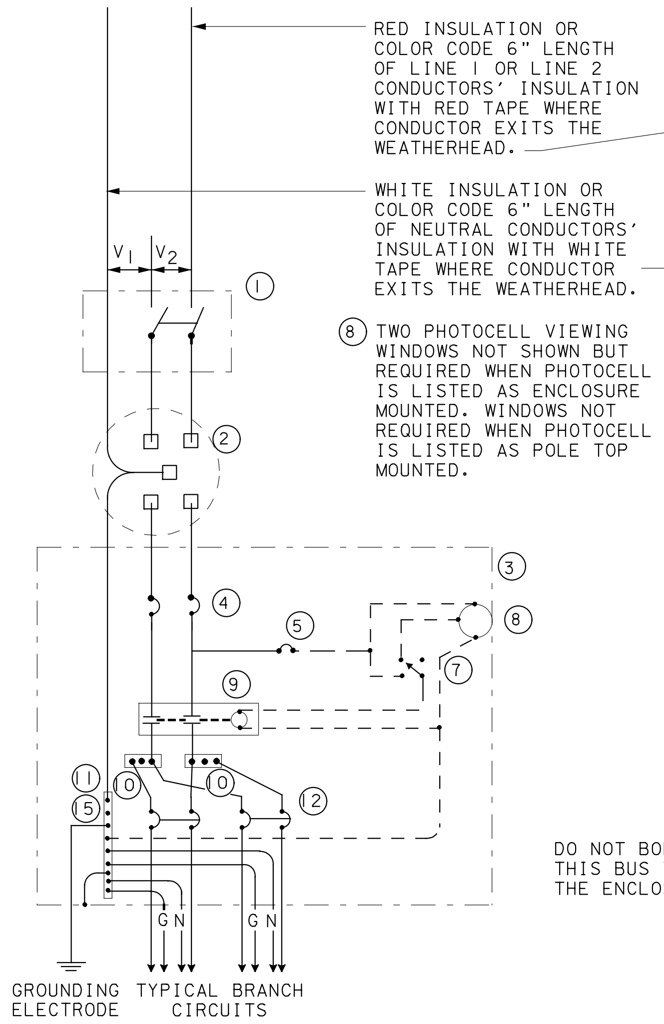
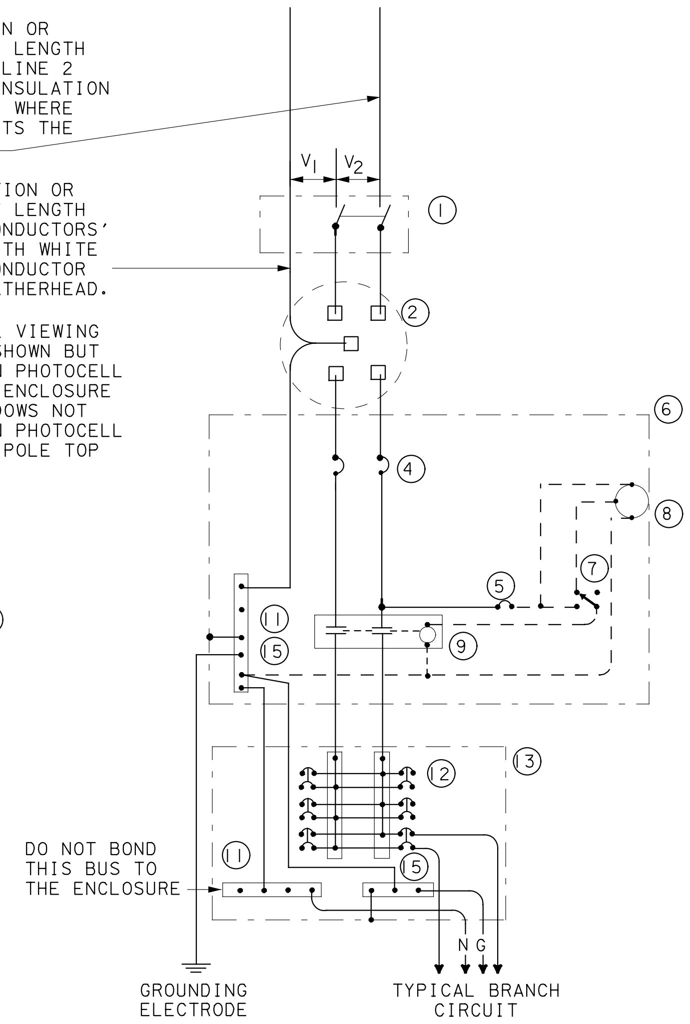
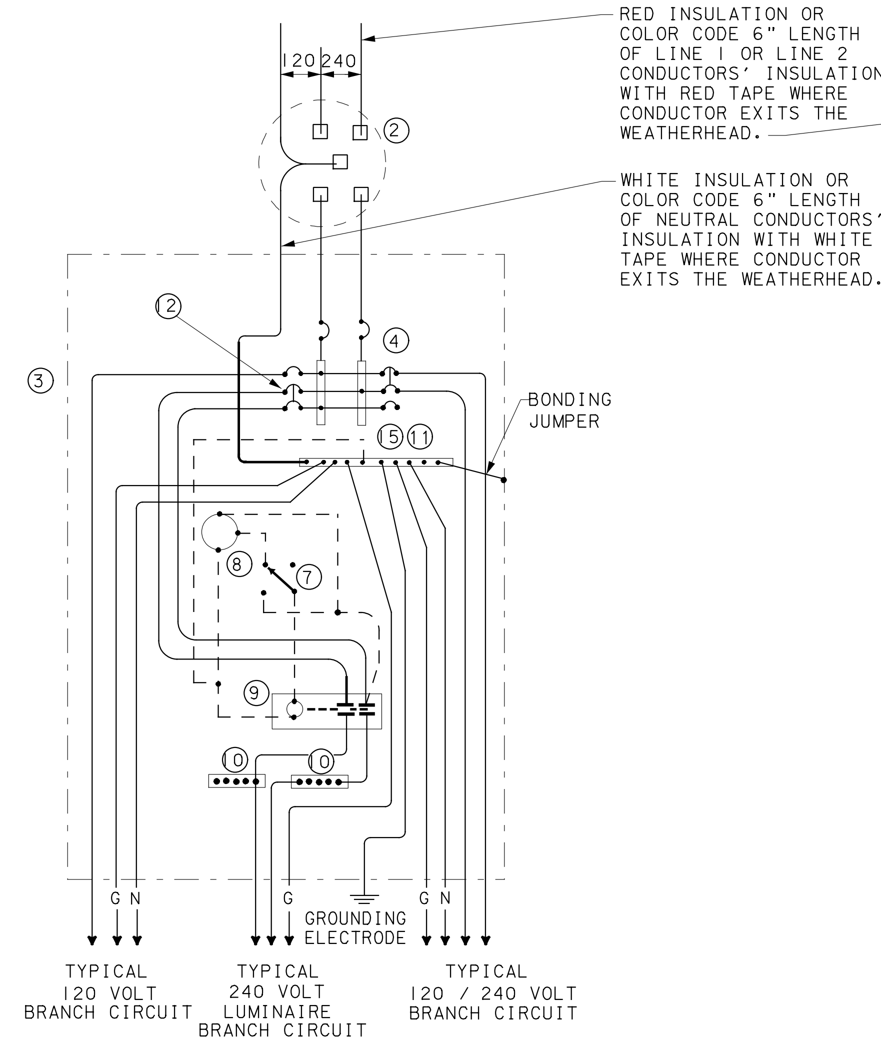


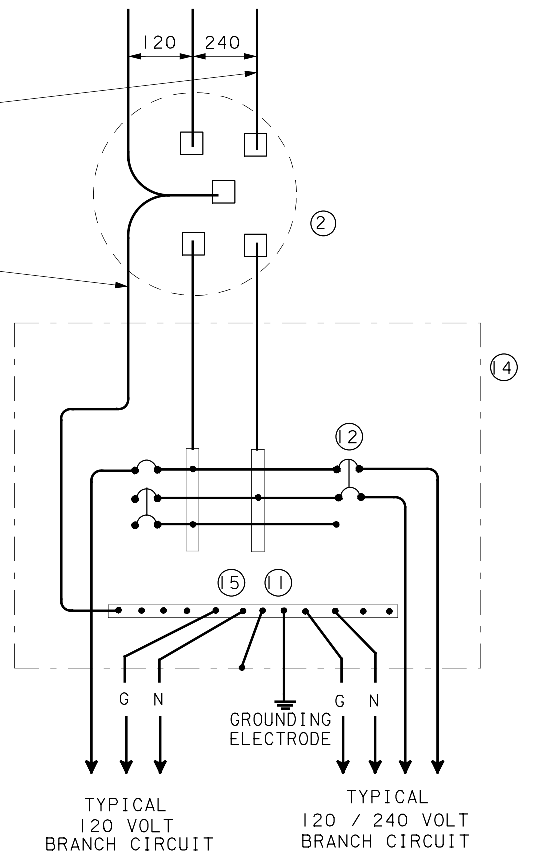
SCHEMATIC TYPE A
THREE WIRE



SCHEMATIC TYPE C
THREE WIRE



SCHEMATIC TYPE D - CUSTOM
120/240 VOLTS - THREE WIRE



SCHEMATIC TYPE T
120/240 VOLTS - THREE WIRE

GALVANIZED STEEL-"BUY OFF THE SHELF" ONLY. WHEN REQUIRED INSTALL PHOTOCELL TOP OF THE POLE OR ON LUMINAIRE ONLY, NO LIGHTING CONTRACTOR WILL BE INSTALLED.

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

WIRING LEGEND

———	POWER WIRING
— — — —	CONTROL WIRING
—N—	NEUTRAL CONDUCTOR
—G—	EQUIPMENT GROUNDING CONDUCTOR-ALWAYS REQUIRED

Texas Department of Transportation
Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES

ED(6)-14

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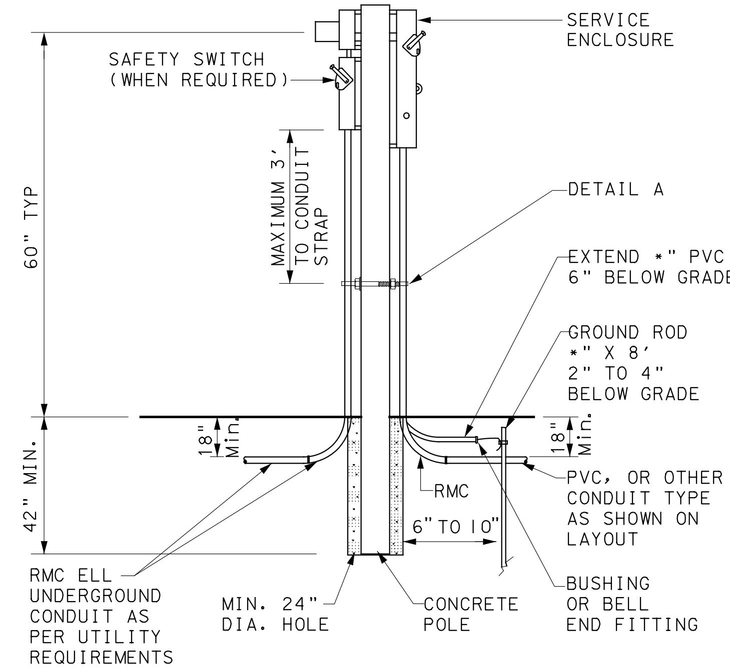
TIMBER POLE (TP) SERVICE SUPPORT NOTES

1. ENSURE ELECTRICAL SERVICE SUPPORT IS A CLASS 5 TREATED TIMBER POLE AS PER ITEM 627 "TREATED TIMBER POLES." EMBED TIMBER POLE TO DEPTH REQUIRED IN ITEM 627.
2. CONDUIT AND ELECTRICAL CONDUCTORS ATTACHED TO THE ELECTRICAL SERVICE POLE AND UNDERGROUND WITHIN 12 IN. OF SERVICE POLE ARE NOT PAID FOR DIRECTLY BUT ARE SUBSIDIARY TO THE 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 * IN. MAX. DEPTH AND 1 * 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 * IN. MAXIMUM DEPTH, AND 1* IN. TO 1* 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, * IN. MINIMUM DIAMETER BY 1* 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.

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.

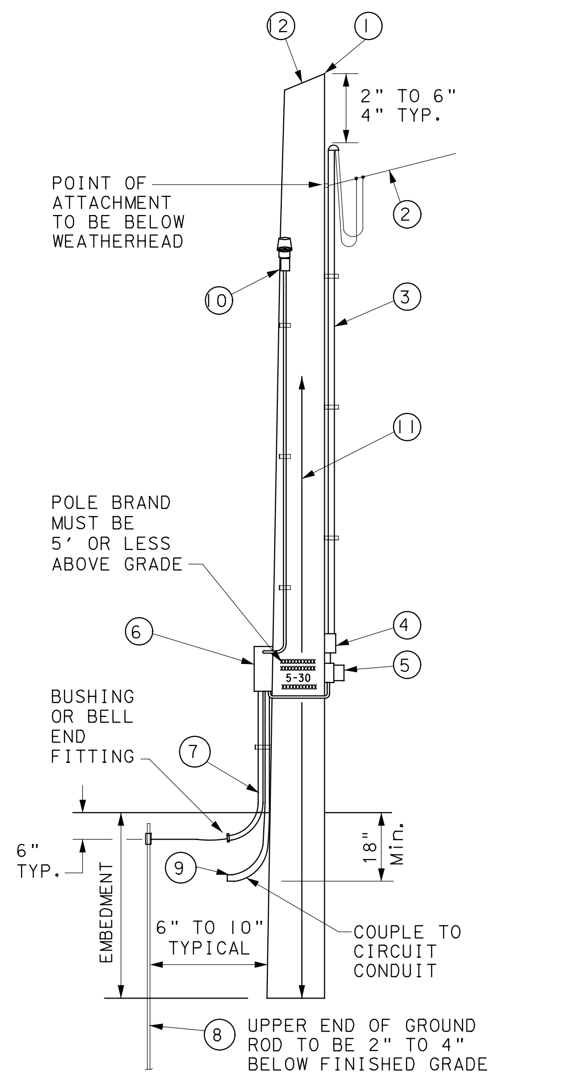
1. PROVIDE GC AND OC POLES THAT MEET THE REQUIREMENTS OF DMS 11080 "ELECTRICAL SERVICES."
2. PROVIDE PRESTRESSED CONCRETE POLES SUITABLE FOR DIRECT EMBEDMENT INTO THE GROUND WITHOUT SPECIAL FOUNDATIONS.
3. VERIFY POLES ARE MARKED AS REQUIRED ON DMS 11080. LOCATION OF MARKING SHOULD BE APPROXIMATELY 4' 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 * IN. OR 1 * IN. WIDE BY 1 IN. UP TO 3 * 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.



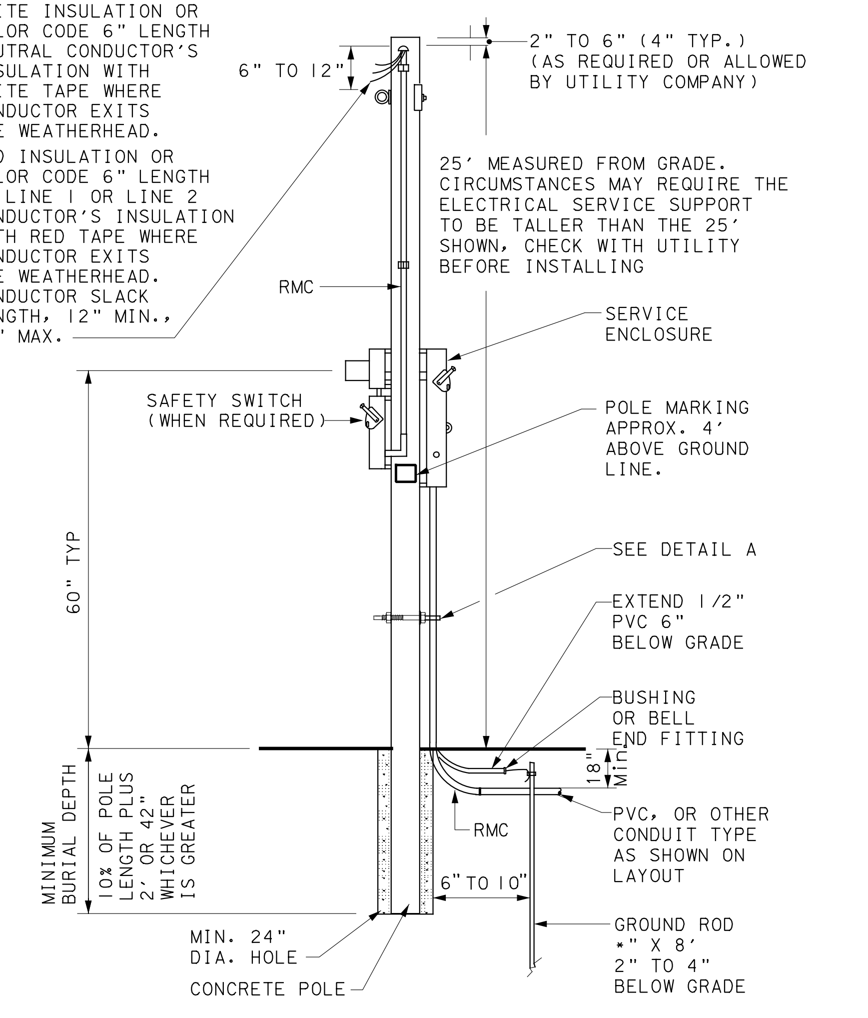
CONCRETE SERVICE SUPPORT

UNDERGROUND (U)

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 * IN. PVC TO GROUND ROD - EXTEND * IN. PVC 6 IN. UNDERGROUND.
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.

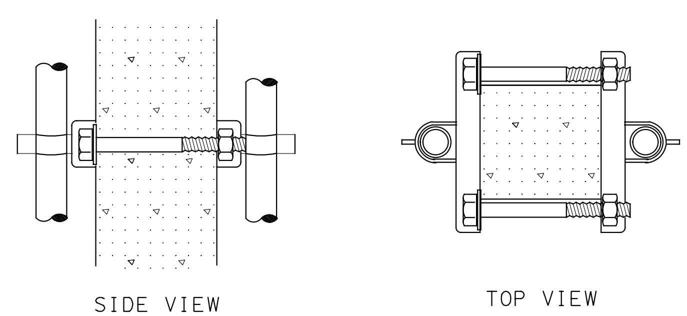


SERVICE SUPPORT TYPE TP (O)



CONCRETE SERVICE SUPPORT

OVERHEAD (O)



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

FILE: ED10-14.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TXDOT OCTOBER 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	00	200	VARIOUS
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	SAT		BEXAR	38

71K

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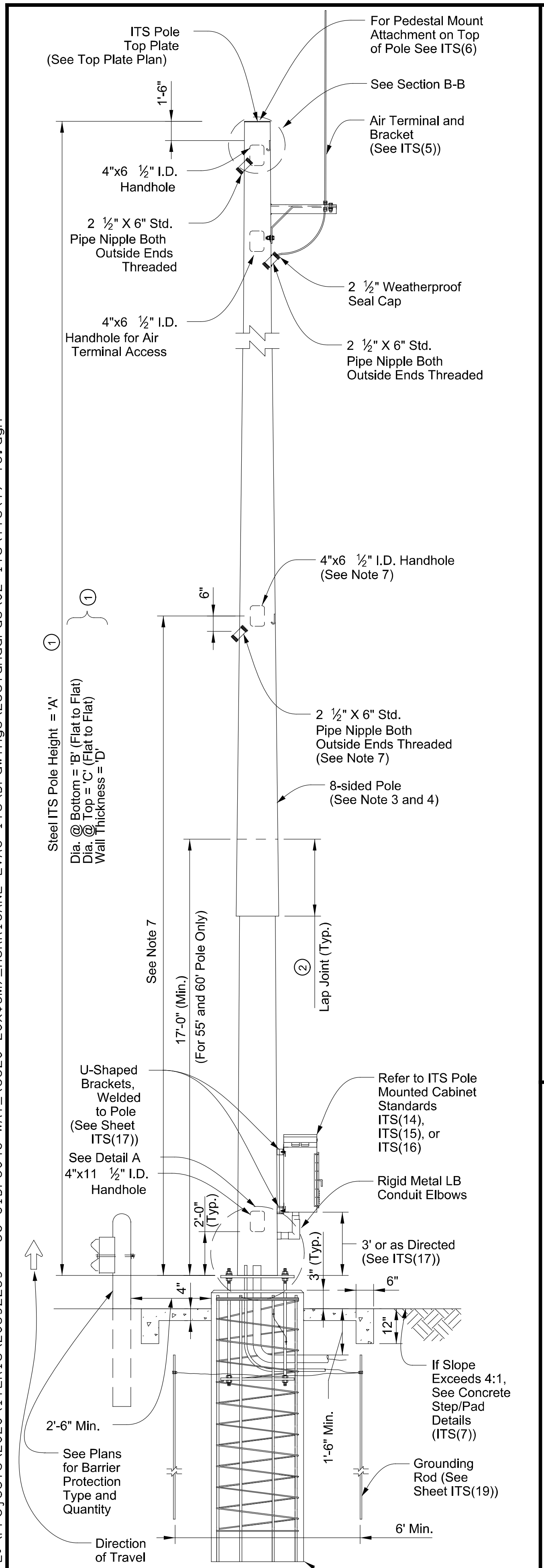
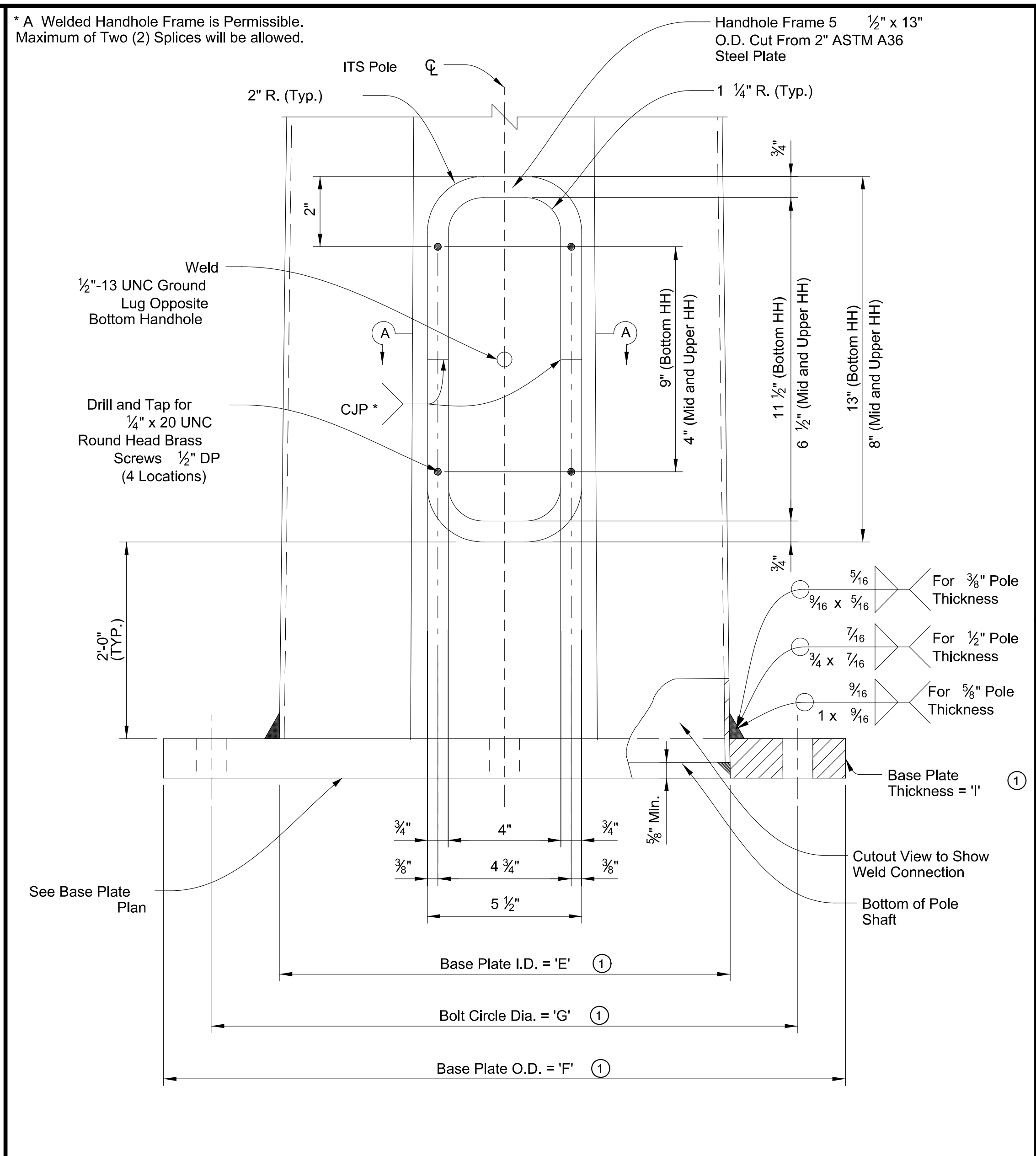
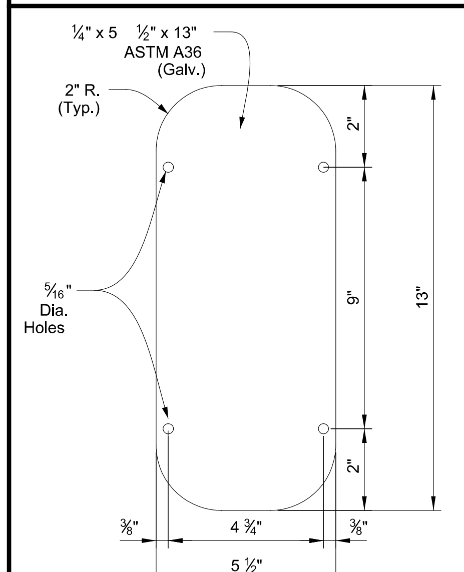


ITS Pole with Cabinet

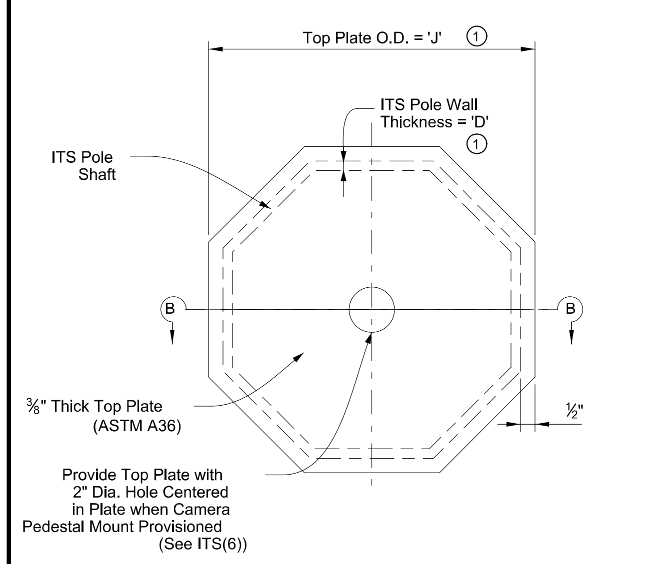


Detail A

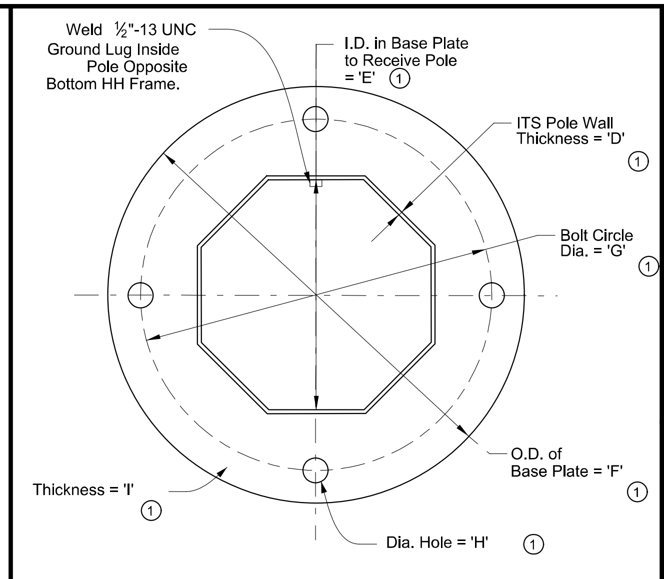


Handhole Cover Plate Detail

(Bottom Handhole)

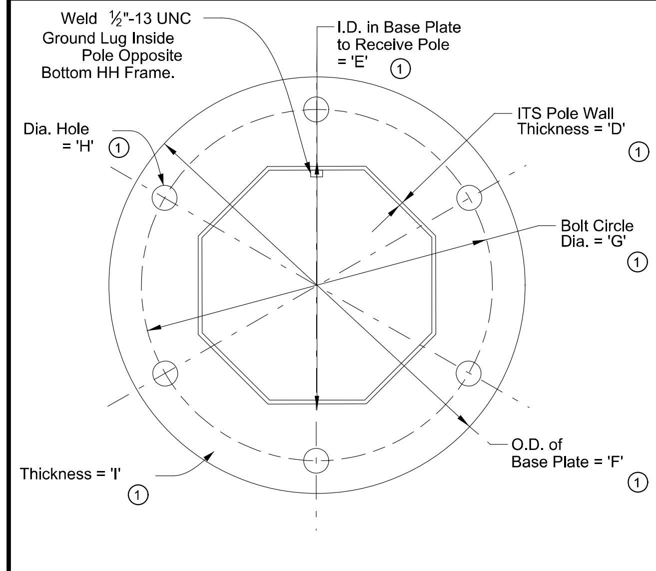


Top Plate Plan



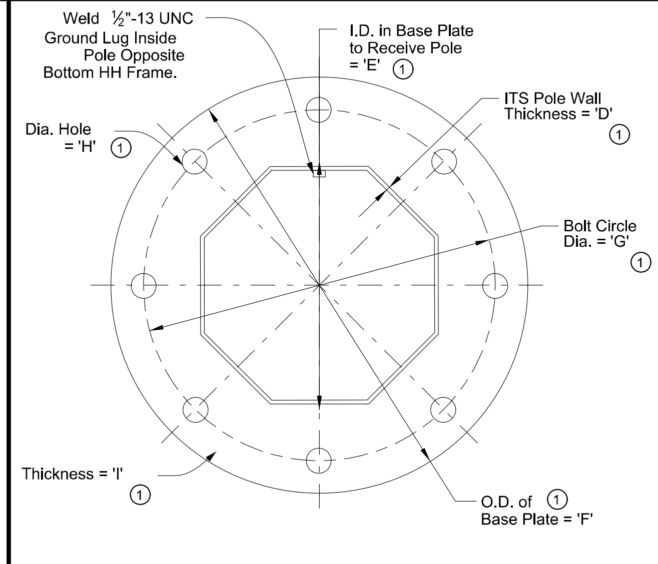
Base Plate Plan

4 Bolt Base Plate (ASTM A36)



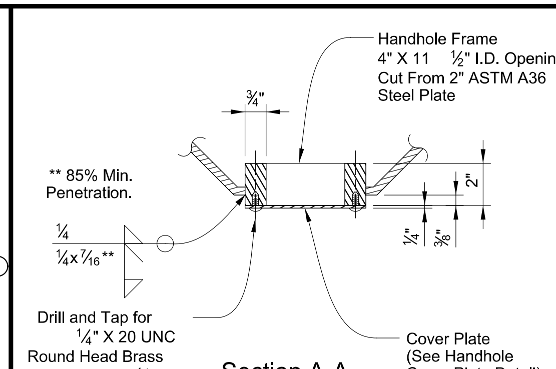
Base Plate Plan

6 Bolt Base Plate (ASTM A36)



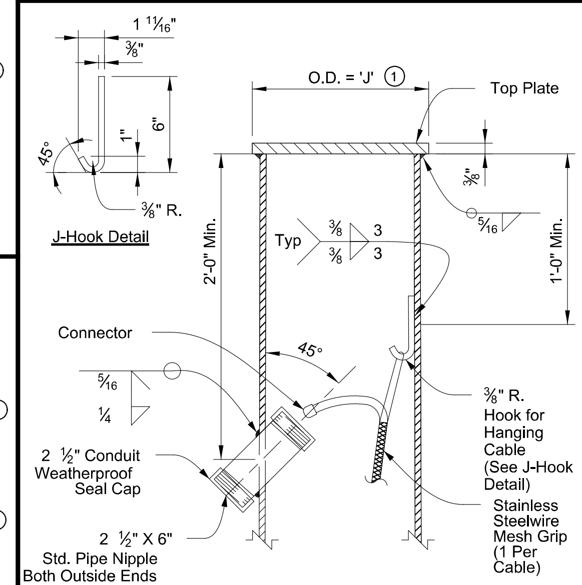
Base Plate Plan

8 Bolt Base Plate (ASTM A36)



Section A-A

Handhole Frame



Section B-B

General Notes

1. Designed according to Sixth Edition 2013 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications.
2. Unless otherwise noted, all parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
3. Deviation from the design criteria, values, and dimensions shown herein and on ITS(4), constitutes an alternative design and will require submission of shop drawings and calculations for approval, sealed by a Texas Professional Engineer.
4. Direct substitution of twelve sided or round poles, matching the design criteria, values, and dimensions shown herein, require submission of shop drawings for approval to confirm design criteria and values on ITS(4) is met.
5. Locate handholes opposite of the direction of travel.
6. Appropriate number of anchor bolts for base plate determined by height of pole. See 'L' on sheet ITS(4).
7. Location for ITS equipment mount may vary by device. Locate mid span handhole and pipe nipple to accommodate location for ITS equipment as identified in the plans or per manufacturer recommendations. Identify location for mid span handhole and pipe nipple on shop drawings for approval.

Reference Notes:

1. See tables on Sheet ITS(4) for values of dimension variables.
2. See lap joint note for 55' and 60' pole heights on ITS(4) at the bottom of each table.

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE DETAILS OCTAGONAL POLE (EIGHT SIDED POLE)

ITS(1)-15

FILE: ITS(1)-15.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TXDOT JUNE 2015	CONT 0915	SECT 00	JOB 200	HIGHWAY VARIOUS
REVISIONS	DIST SAT		COUNTY BEXAR	SHEET NO. 39

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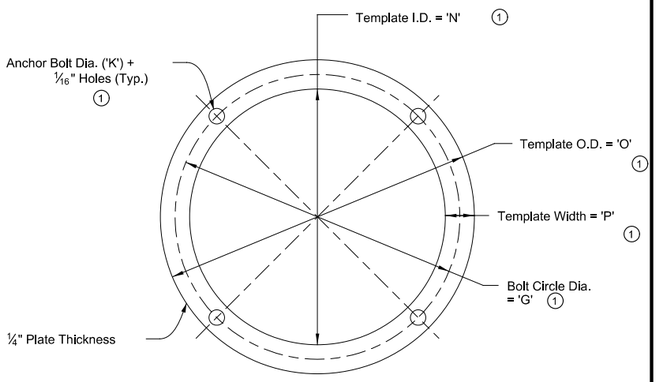
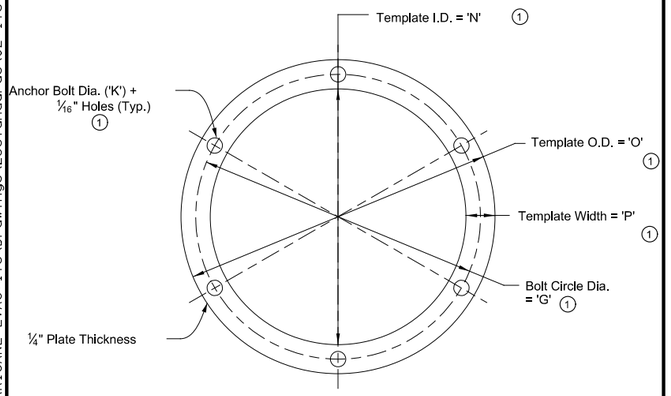


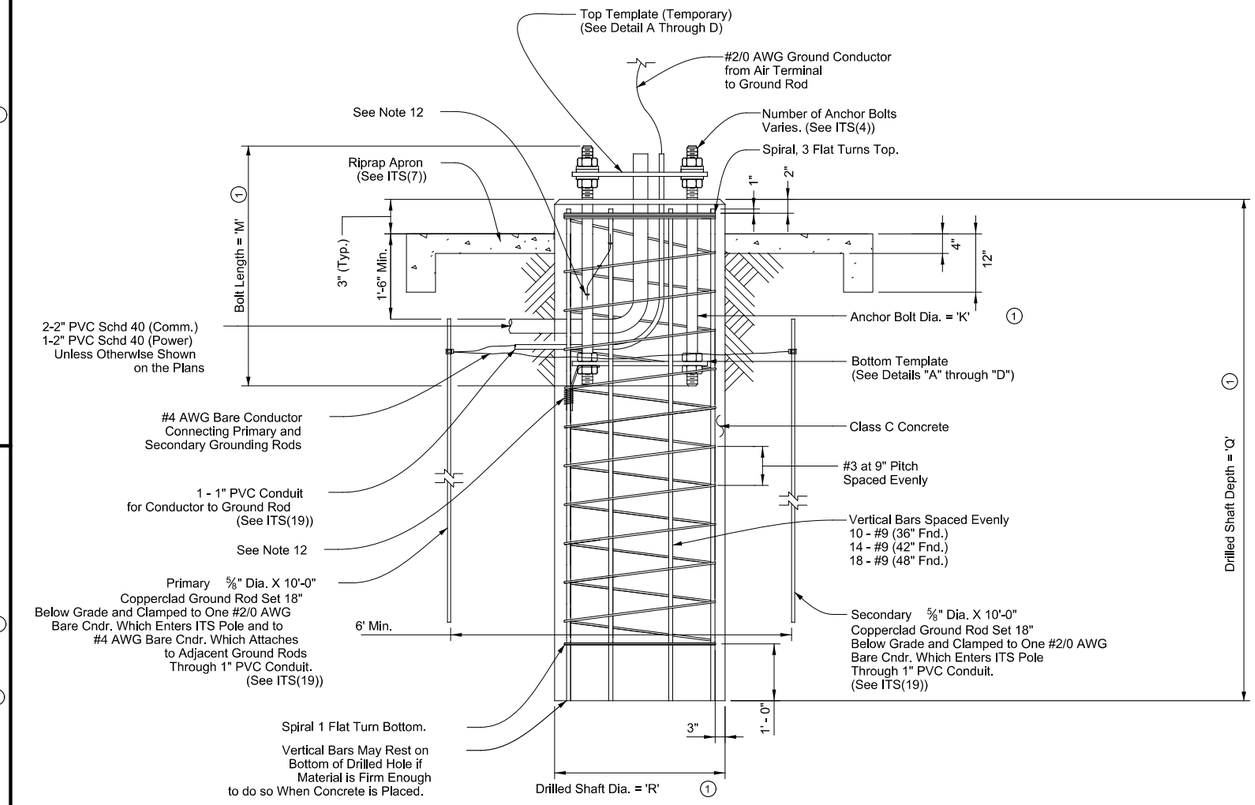
Top and Bottom Template (Four Bolt)

Detail A



Top and Bottom Template (Six Bolt)

Detail B



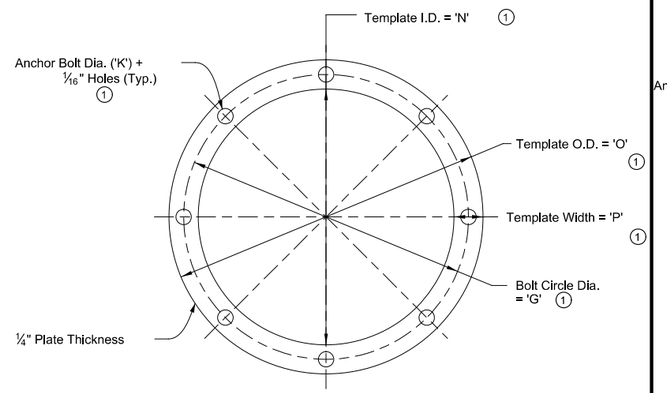
Foundation Details (Typical)

Elevation

Not to Scale

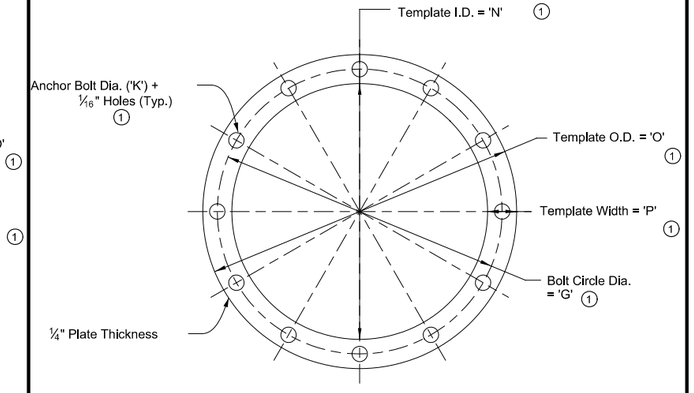
General Notes:

1. Drilled shaft concrete shall be Class "C" (f'c = 3,600 PSI) in accordance with Item 416, "Drilled Shaft Foundations."
2. Reinforcing bars shall be Grade 60 (Fy = 60 KSI) and conform to ASTM A-615. All reinforcing shall conform to Item 440, "Reinforcing Steel."
3. Provide ASTM A-36 steel for templates. Top and bottom templates need not be galvanized.
4. Anchor bolts shall be rigidly held in position during concrete placement using steel templates at the top and bottom. Top templates shall remain in place until the concrete has cured in place beyond initial set time.
5. Lubricate and tighten anchor bolts, when erecting pole, in accordance with Item 449, "Anchor Bolts."
6. Anchor bolts shall conform to ASTM F1554 Grade 55, or ASTM A193 B7 with ASTM A194 Grade 2H or A563 heavy hex nuts with F436 washers. Galvanize a minimum of the top end thread length plus 6 inches for all anchor bolts unless otherwise noted. Exposed washers and exposed nuts shall be galvanized. All galvanizing shall be in accordance with Item 445, "Galvanizing."
7. All vertical reinforcement shall be carried to the bottom of the drilled shaft.
8. Place three flat turns of the spiral bar at the top and one flat turn at the bottom of the drilled shaft.
9. Drilled shaft shall be measured by the linear foot and paid under Item 416, "Drill Shaft Foundations."
10. If rock is encountered, the drilled shaft to extend a minimum of two diameters into solid rock.
11. Location for conduit entering foundation may vary. Orient conduit entering foundation to coincide with location of ground boxes and primary ground rod.
12. Bond anchor bolts to rebar with #2/0 AWG jumper and two mechanical connectors or by bending No. 3 bar on bottom template as shown and wire tightly with ten turns of No. 10 wire or one mechanical connector. Mechanical connectors shall be UL Listed for concrete encasement.



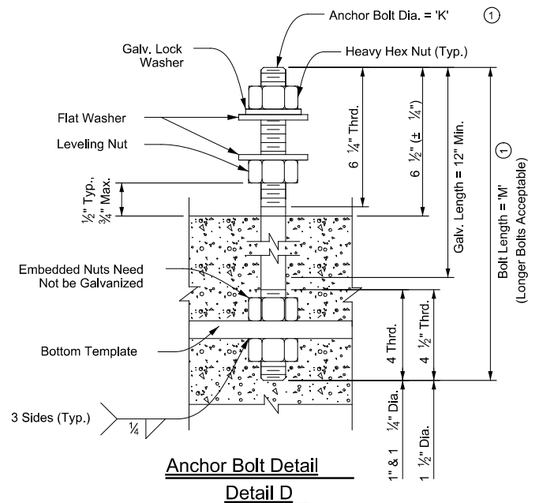
Top and Bottom Template (Eight Bolt)

Detail C



Top and Bottom Template (Twelve Bolt)

Detail D



Anchor Bolt Detail

Detail D

Reference Notes:

(1) See tables on Sheet ITS(4) for values of dimension variables.

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE FOUNDATION DETAILS

ITS(3)-16

FILE: ITS(3)-16.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TXDOT JUNE 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS APRIL 2016	0915	00	200	VARIOUS
	DIST	COUNTY		SHEET NO.
	SAT	BEXAR		40

TABLE 1: ITS POLE - 90 MPH (W/ 2 SOLAR PANELS) ④

POLE TYPE ①	POLE HEIGHT (FT)	POLE SHAFT ① ⑩ BOTTOM OUTSIDE DIA. (IN)	TOP OUTSIDE DIA. (IN)	WALL THICKNESS (IN)	BASE PLATE ① INSIDE DIA. (IN)	OUTSIDE DIA. (IN)	BOLT CIRCLE DIA. (IN)	BOLT HOLE DIA. (IN)	THICKNESS (IN)	TOP PLATE ② OUTSIDE DIA. (IN)	ANCHOR BOLT ③ DIA. (IN)	NO. OF BOLTS	LENGTH OF BOLT MIN. (IN)	TEMPLATE INSIDE DIA. (IN)	TEMPLATE OUTSIDE DIA. (IN)	TEMPLATE WIDTH (IN)	FOUNDATION ③ DRILL SHAFT DEPTH - TEXAS CONE PENETROMETER (N - BLOWS/FT.) (SEE NOTE 5) N = 10	N = 15	N = 40	DRILLED SHAFT DIA. (IN)
	'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'I'	'J'	'K'	'L'	'M'	'N'	'O'	'P'	'Q'	'Q'	'Q'	'R'
8 SIDED	20	10	8	1/2	10-1/16	21	16	1-1/4	1-1/2	9	1	4	29	14	18	2	12	11	10	36
8 SIDED	30	13	9	1/2	13-1/16	24	19	1-9/16	1-1/2	10	1-1/4	4	35	16-1/2	21-1/2	2-1/2	15	13	10	36
8 SIDED	40	15	9	1/2	15-1/16	26	21	1-9/16	1-1/2	10	1-1/4	6	35	18-1/2	23-1/2	2-1/2	17	14	11	42
8 SIDED	45	16	10	1/2	16-1/16	27	22	1-9/16	1-1/2	11	1-1/4	6	35	19-1/2	24-1/2	2-1/2	18	16	12	42
8 SIDED	50	17	10	1/2	17-1/16	28	23	1-9/16	1-1/2	11	1-1/4	6	35	20-1/2	25-1/2	2-1/2	19	16	12	42
8 SIDED	55 ⑥ ⑦	19	11	5/8	19-1/16	30	25	1-13/16	2	12	1-1/2	6	40	22	28	3	21	18	13	42
8 SIDED	60 ⑥ ⑦	20	11	5/8	20-1/16	31	26	1-13/16	2	12	1-1/2	6	40	23	29	3	21	19	14	48

TABLE 2: ITS POLE - 110 MPH (W/ 2 SOLAR PANELS) ④

POLE TYPE ①	POLE HEIGHT (FT)	POLE SHAFT ① ⑩ BOTTOM OUTSIDE DIA. (IN)	TOP OUTSIDE DIA. (IN)	WALL THICKNESS (IN)	BASE PLATE ① INSIDE DIA. (IN)	OUTSIDE DIA. (IN)	BOLT CIRCLE DIA. (IN)	BOLT HOLE DIA. (IN)	THICKNESS (IN)	TOP PLATE ② OUTSIDE DIA. (IN)	ANCHOR BOLT ③ DIA. (IN)	NO. OF BOLTS	LENGTH OF BOLT MIN. (IN)	TEMPLATE INSIDE DIA. (IN)	TEMPLATE OUTSIDE DIA. (IN)	TEMPLATE WIDTH (IN)	FOUNDATION ③ DRILL SHAFT DEPTH - TEXAS CONE PENETROMETER (N - BLOWS/FT.) (SEE NOTE 5) N = 10	N = 15	N = 40	DRILLED SHAFT DIA. (IN)
	'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'I'	'J'	'K'	'L'	'M'	'N'	'O'	'P'	'Q'	'Q'	'Q'	'R'
8 SIDED	20	10	8	1/2	10-1/16	21	16	1-1/4	1-1/2	9	1	4	29	14	18	2	14	12	10	36
8 SIDED	30	13	9	1/2	13-1/16	24	19	1-9/16	1-3/4	10	1-1/4	6	35	16-1/2	21-1/2	2-1/2	18	15	11	36
8 SIDED	40	15	9	1/2	15-1/16	25	21	1-9/16	1-3/4	10	1-1/4	6	35	18-1/2	23-1/2	2-1/2	20	17	12	42
8 SIDED	45	16	10	1/2	17-1/16	27	22	1-9/16	1-3/4	11	1-1/4	8	35	19-1/2	24-1/2	2-1/2	21	18	13	42
8 SIDED	50	17	10	1/2	18-1/16	28	23	1-9/16	1-3/4	11	1-1/4	8	35	20-1/2	25-1/2	2-1/2	22	19	14	42
8 SIDED	55 ⑦	19	11	5/8	19-1/16	30	25	1-9/16	2	12	1-1/4	8	35	22-1/2	27-1/2	2-1/2	24	20	14	42
8 SIDED	60 ⑦	20	11	5/8	20-1/16	31	26	1-13/16	2	12	1-1/2	6	40	23	29	3	25	21	15	48

TABLE 3: ITS POLE - 130 MPH (W/ 1 SOLAR PANEL) ⑤

POLE TYPE ①	POLE HEIGHT (FT)	POLE SHAFT ① ⑩ BOTTOM OUTSIDE DIA. (IN)	TOP OUTSIDE DIA. (IN)	WALL THICKNESS (IN)	BASE PLATE ① INSIDE DIA. (IN)	OUTSIDE DIA. (IN)	BOLT CIRCLE DIA. (IN)	BOLT HOLE DIA. (IN)	THICKNESS (IN)	TOP PLATE ② OUTSIDE DIA. (IN)	ANCHOR BOLT ③ DIA. (IN)	NO. OF BOLTS	LENGTH OF BOLT MIN. (IN)	TEMPLATE INSIDE DIA. (IN)	TEMPLATE OUTSIDE DIA. (IN)	TEMPLATE WIDTH (IN)	FOUNDATION ③ DRILL SHAFT DEPTH - TEXAS CONE PENETROMETER (N - BLOWS/FT.) (SEE NOTE 5) N = 10	N = 15	N = 40	DRILLED SHAFT DIA. (IN)
	'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'I'	'J'	'K'	'L'	'M'	'N'	'O'	'P'	'Q'	'Q'	'Q'	'R'
8 SIDED	20	10	8	1/2	10-1/16	21	16	1-9/16	1-3/4	9	1-1/4	4	35	13-1/2	18-1/2	2-1/2	16	14	10	36
8 SIDED	30	13	9	1/2	15-1/16	24	19	1-9/16	1-3/4	10	1-1/4	6	35	16-1/2	21-1/2	2-1/2	18	16	11	36
8 SIDED	40	15	9	1/2	15-1/16	26	21	1-9/16	1-3/4	10	1-1/4	6	35	18-1/2	23-1/2	2-1/2	21	18	13	42
8 SIDED	45	16	10	1/2	16-1/16	27	22	1-9/16	1-3/4	11	1-1/4	8	35	19-1/2	24-1/2	2-1/2	23	19	14	42
8 SIDED	50	17	10	1/2	17-1/16	28	23	1-9/16	2	11	1-1/2	8	40	20	26	3	24	20	14	42
8 SIDED	55 ⑦	19	11	5/8	19-1/16	30	25	1-13/16	2	12	1-1/2	8	40	22	28	3	27	22	15	42
8 SIDED	60 ⑦	20	11	5/8	20-1/16	31	26	1-13/16	2	12	1-1/2	8	40	23	29	3	28	23	16	48

TABLE 4: ITS POLE WITH STIFFENERS - 90 MPH (W/ 4 SOLAR PANELS) ⑧

POLE TYPE ①	POLE HEIGHT (FT)	POLE SHAFT ① BOTTOM OUTSIDE DIA. (IN)	TOP OUTSIDE DIA. (IN)	WALL THICKNESS (IN)	BASE PLATE ① INSIDE DIA. (IN)	OUTSIDE DIA. (IN)	BOLT CIRCLE DIA. (IN)	BOLT HOLE DIA. (IN)	THICKNESS (IN)	TOP PLATE ② OUTSIDE DIA. (IN)	ANCHOR BOLT ③ DIA. (IN)	NO. OF BOLTS	LENGTH OF BOLT MIN. (IN)	TEMPLATE INSIDE DIA. (IN)	TEMPLATE OUTSIDE DIA. (IN)	TEMPLATE WIDTH (IN)	FOUNDATION ③ DRILL SHAFT DEPTH - TEXAS CONE PENETROMETER (N - BLOWS/FT.) (SEE NOTE 5) N = 10	N = 15	N = 40	DRILLED SHAFT DIA. (IN)
	'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'I'	'J'	'K'	'L'	'M'	'N'	'O'	'P'	'Q'	'Q'	'Q'	'R'
8 SIDED	30	13	9	3/8	13-1/16	28	22	1-1/4	1-3/4	10	1	8	29	20	24	2	17	15	11	42
8 SIDED	40	15	9	1/2	15-1/16	30	24	1-1/4	2	10	1	8	29	22	26	2	20	17	12	42
8 SIDED	45	16	10	1/2	16-1/16	31	25	1-9/16	2	11	1-1/4	8	35	22-1/2	27-1/2	2-1/2	21	18	13	42
8 SIDED	50	17	10	1/2	17-1/16	32	26	1-9/16	2	11	1-1/4	8	35	23-1/2	28-1/2	2-1/2	21	18	13	42
12 sided	55 ⑦	19	11	5/8	19-1/16	34	27	1-9/16	2	12	1-1/4	12	35	24-1/2	29-1/2	2-1/2	21	18	13	48
12 sided	60 ⑦	20	12	5/8	20-1/16	35	28	1-9/16	2	13	1-1/4	12	35	25-1/2	30-1/2	2-1/2	22	19	14	48

TABLE 5: ITS POLE WITH STIFFENERS - 110 MPH (W/ 4 SOLAR PANELS) ⑧

POLE TYPE ①	POLE HEIGHT (FT)	POLE SHAFT ① BOTTOM OUTSIDE DIA. (IN)	TOP OUTSIDE DIA. (IN)	WALL THICKNESS (IN)	BASE PLATE ① INSIDE DIA. (IN)	OUTSIDE DIA. (IN)	BOLT CIRCLE DIA. (IN)	BOLT HOLE DIA. (IN)	THICKNESS (IN)	TOP PLATE ② OUTSIDE DIA. (IN)	ANCHOR BOLT ③ DIA. (IN)	NO. OF BOLTS	LENGTH OF BOLT MIN. (IN)	TEMPLATE INSIDE DIA. (IN)	TEMPLATE OUTSIDE DIA. (IN)	TEMPLATE WIDTH (IN)	FOUNDATION ③ DRILL SHAFT DEPTH - TEXAS CONE PENETROMETER (N - BLOWS/FT.) (SEE NOTE 5) N = 10	N = 15	N = 40	DRILLED SHAFT DIA. (IN)
	'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'I'	'J'	'K'	'L'	'M'	'N'	'O'	'P'	'Q'	'Q'	'Q'	'R'
8 SIDED	30	13	9	1/2	13-1/16	28	22	1-9/16	2-1/4	10	1-1/4	8	35	19-1/2	24-1/2	2-1/2	20	17	12	42
8 SIDED	40	16	10	1/2	16-1/16	31	25	1-9/16	2-1/4	11	1-1/4	8	35	22-1/2	27-1/2	2-1/2	24	20	14	42
8 SIDED	45	17	11	1/2	17-1/16	32	26	1-9/16	2-1/4	12	1-1/4	8	35	23-1/2	28-1/2	2-1/2	25	21	15	42
8 SIDED	50	18	11	1/2	18-1/16	32	26	1-13/16	2-1/2	12	1-1/2	8	40	23	29	3	25	21	15	48
12 SIDED	55 ⑦	19	11	5/8	19-1/16	34	27	1-9/16	2-1/4	12	1-1/4	12	35	24-1/2	29-1/2	2-1/2	24	21	15	48
12 SIDED	60 ⑦	20	12	5/8	20-1/16	35	28	1-9/16	2-1/4	13	1-1/4	12	35	25-1/2	30-1/2	2-1/2	25	22	15	48

TABLE 6: ITS POLE WITH STIFFENERS - 130 MPH (W/ 3 SOLAR PANELS) ⑨

POLE TYPE ①	POLE HEIGHT (FT)	POLE SHAFT ① BOTTOM OUTSIDE DIA. (IN)	TOP OUTSIDE DIA. (IN)	WALL THICKNESS (IN)	BASE PLATE ① INSIDE DIA. (IN)	OUTSIDE DIA. (IN)	BOLT CIRCLE DIA. (IN)	BOLT HOLE DIA. (IN)	THICKNESS (IN)	TOP PLATE ② OUTSIDE DIA. (IN)	ANCHOR BOLT ③ DIA. (IN)	NO. OF BOLTS	LENGTH OF BOLT MIN. (IN)	TEMPLATE INSIDE DIA. (IN)	TEMPLATE OUTSIDE DIA. (IN)	TEMPLATE WIDTH (IN)	FOUNDATION ③ DRILL SHAFT DEPTH - TEXAS CONE PENETROMETER (N - BLOWS/FT.) (SEE NOTE 5) N = 10	N = 15	N = 40	DRILLED SHAFT DIA. (IN)
	'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'I'	'J'	'K'	'L'	'M'	'N'	'O'	'P'	'Q'	'Q'	'Q'	'R'
8 SIDED	30	13	9	1/2	13-1/16	28	22	1-9/16	2-1/2	10	1-1/4	8	35	19-1/2	24-1/2	2-1/2	23	19	14	42
8 SIDED	40	16	10	1/2	16-1/16	31	25	1-9/16	2-1/2	11	1-1/2	8	40	22	28	3	25	21	14	42
8 SIDED	45	17	11	1/2	17-1/16	32	26	1-13/16	2-1/2	12	1-1/2	8	40	23	29	3	26	22	16	48
8 SIDED	50	18	11	1/2	18-1/16	33	27	1-13/16	2-1/2	12	1-1/2	8	40	24	30	3	27	23	16	48
12 SIDED	55 ⑦	19	11	5/8	19-1/16	34	27	1-9/16	2-1/4	12	1-1/4	12	35	24-1/2	29-1/2	2-1/2	26	22	16	48
12 SIDED	60 ⑦	20	12	5/8	20-1/16	35	28	1-9/16	2-1/4	13	1-1/4	12	35	25 1/2	30 1/2	2-1/2	27	23	16	48

General Notes:

1. Designed according to Sixth Edition 2013 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto.

2. Table 1 and Table 4 design wind speed equals 90 MPH (3-Second Wind Gusts) with a 1.14 gust factor. A wind importance factor of 1.00 is applied to adjust the wind speed to a 50 year recurrence interval at 33 FT above the ground for Exposure C category in accordance with TxDOT WV&IZ(LTS2013). Design values listed in the table allow the base of the pole to be elevated above the surrounding ground level no more than 20 FT.

3. Table 2 and Table 5 design wind speed equals 110 MPH (3-Second Wind Gusts) with a 1.14 gust factor. A wind importance factor of 1.00 is applied to adjust the wind speed to a 50 year recurrence interval at 33 FT above the ground for Exposure C category in accordance with TxDOT WV&IZ(LTS2013). Design values listed in the table allow the base of the pole to be elevated above the surrounding ground level no more than 20 FT.

4. Table 3 and Table 6 design wind speed equals 130 MPH (3-Second Wind Gusts) with a 1.14 gust factor. A wind importance factor of 1.00 is applied to adjust the wind speed to a 50 year recurrence interval at 33 FT above the ground for Exposure C category in accordance with TxDOT WV&IZ(LTS2013). Design values listed in the table allow the base of the pole to be elevated above the surrounding ground level no more than 20 FT.

5. Recommended embedment lengths are for information purposes only. Foundation embedment depth is based off Texas Cone Penetrometer Value N = 10 blows/ft. for soft soils and up to 40 blows/ft. for hard soils. Foundation lengths shall be as shown on the plans, or as directed by the Engineer. Foundations will be paid for under Item 416, "Drilled Shaft Foundations" unless otherwise shown on the plans.

6. Deviation from the design criteria and values contained in the tables above constitute and alternative design and will require submission of shop drawings and calculations for approval, sealed by a Texas Professional Engineer.

7. 12-sided or round poles as a direct substitution for 8-sided and round poles as a direct substitution for 12-sided poles, meeting the design criteria and values contained in the tables above, require submission of shop drawings for approval.

Reference Notes

① See the following ITS Pole Standard sheets:
- 8-sided Pole - ITS(1)
- 12-sided Pole - ITS(2)

② Provision for 2" Dia. opening in top plate for poles requiring cameras mounted on top.
- See ITS Pole Mounting Details - ITS(6)

③ See ITS Pole Foundation Details - ITS(3)

④ Designed to support the following:
- Two Type 3 ITS pole mounted cabinets (280 LBS/EA and EPA = 14.50 sq. ft. per cabinet). See ITS(16).
- Two 250 W (50 LBS/EA and EPA = 30.70 sq. ft. per panel) solar panels (see ITS(24) "Solar Panel Matrix Table")
- Combined ITS equipment dead load of 170 LBS with an EPA = 6 sq. ft.

⑤ Designed to support the following:
- Two Type 3 ITS pole mounted cabinets (280 LBS/EA and EPA = 14.50 sq. ft. per cabinet). See ITS(16).
- One 250 W (50 LBS/EA and EPA = 30.70 sq. ft. per panel) solar panels (see ITS(24) "Solar Panel Matrix Table")
- Combined ITS equipment dead load of 170 LBS with an EPA = 6 sq. ft.

⑥ Pole heights at 55 Ft. and 60 Ft. located in the AMA, CHS, and LBB Districts, will require special design and design values shown shall not be used. Submit shop drawings for pole design and supporting calculations for 55 Ft. and 60 Ft. pole heights signed and sealed by a Texas Professional Engineer for approval.

⑦ Ensure minimum nominal splice length is 1.5 times the average pole diameter at the splice to the nearest inch. Ensure longitudinal seam welds that will be in contact at a slip joint splice are ground smooth for the length of splice plus a minimum of six inches. Ensure a 100% longitudinal seam weld for a length of 1.5 pole diameter plus a minimum of 6 inches in outer sections at splices and at base plate. Provide 85% penetration in longitudinal seam welds at other pole sections.

⑧ Designed to support the following:
- Two Type 3 ITS pole mounted cabinets (280 LBS/EA and EPA = 14.50 sq. ft. per cabinet). See ITS(16).
- Four 250 W (50 LBS/EA and EPA = 30.70 sq. ft. per panel) solar panels (see ITS(24) "Solar Panel Matrix Table")
- Combined ITS equipment dead load of 170 LBS with an EPA = 6 sq. ft.

Refer to ITS(4A) for stiffening plate details at the pole to base plate connection.

⑨ Designed to support the following:
- Two Type 3 ITS pole mounted cabinets (280 LBS/EA and EPA = 14.50 sq. ft. per cabinet). See ITS(16).
- Three 250 W (50 LBS/EA and EPA = 30.70 sq. ft. per panel) solar panels (see ITS(24) "Solar Panel Matrix Table")
- Combined ITS equipment dead load of 170 LBS with an EPA = 6 sq. ft.

Refer to ITS(4A) for stiffening plate details at the pole to base plate connection.

⑩ When solar panels are not provisioned in the plans, ITS pole wall thickness may be reduced by ⅛".

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE DESIGN DETAILS DATA LOOKUP TABLE

ITS(4)-15

FILE: ITS(4)-15.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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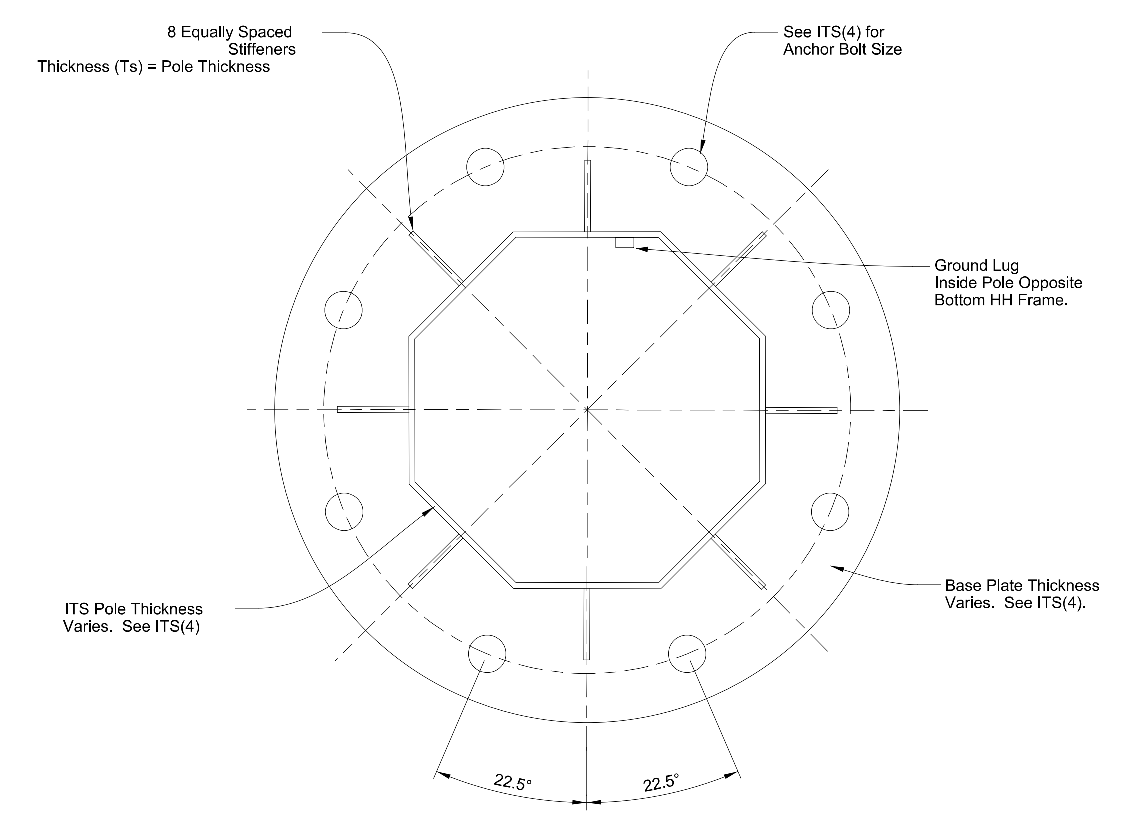
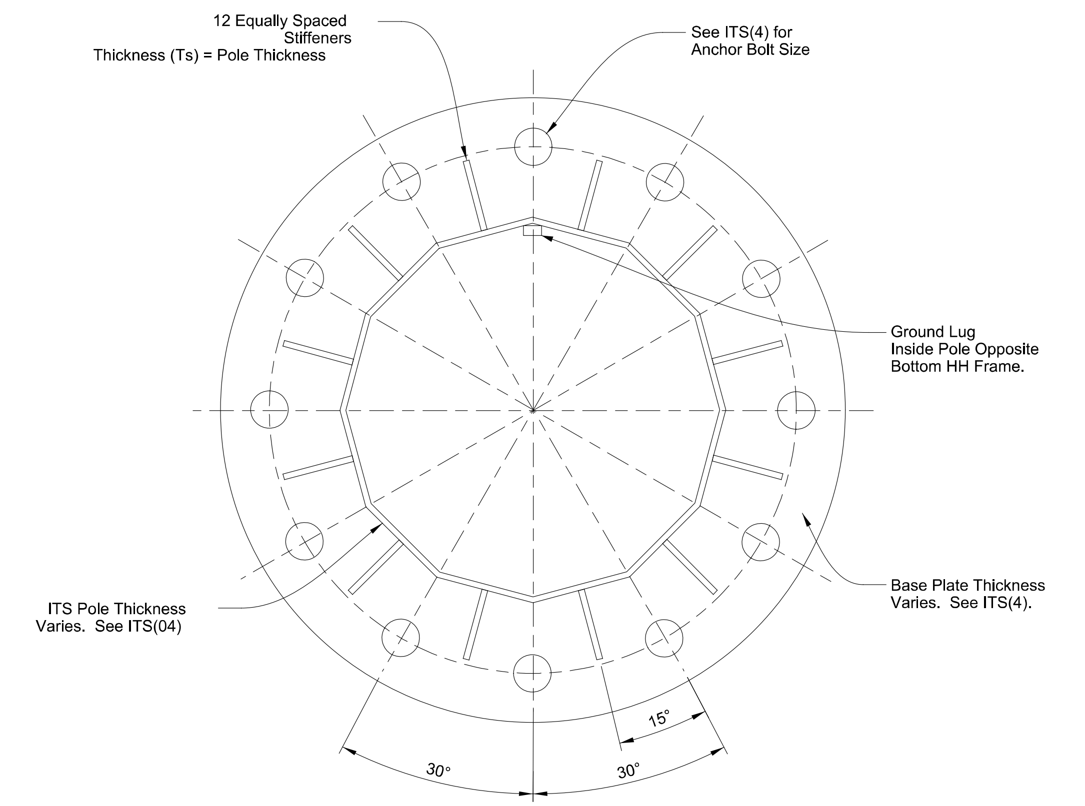


8-sided Pole Base Plate Detail



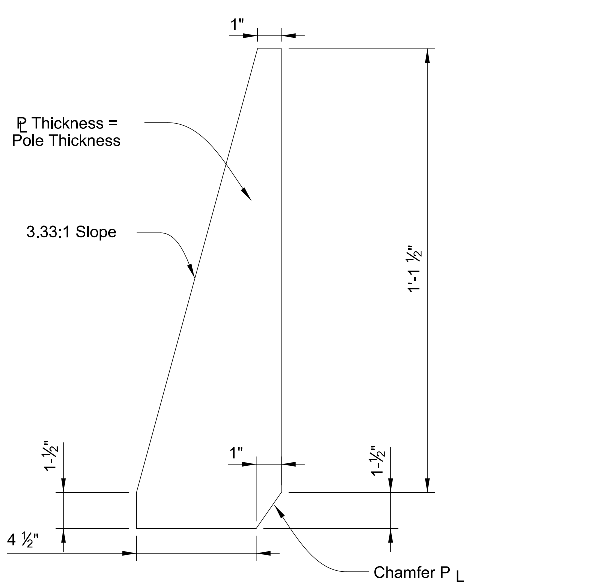
12-sided Pole Base Plate Detail

General Notes:

1. Steel stiffening plates shall conform to ASTM A36.
2. Make all welds conform to Item 441, "Steel Structures."
3. Galvanize in accordance with Item 445, "Galvanizing" unless otherwise noted.
4. Submit shop drawings detailing stiffening plate orientation along with ITS equipment intended for mounting for review and approval prior to fabrication.
5. HH = Handhole
6. T P = Thickness

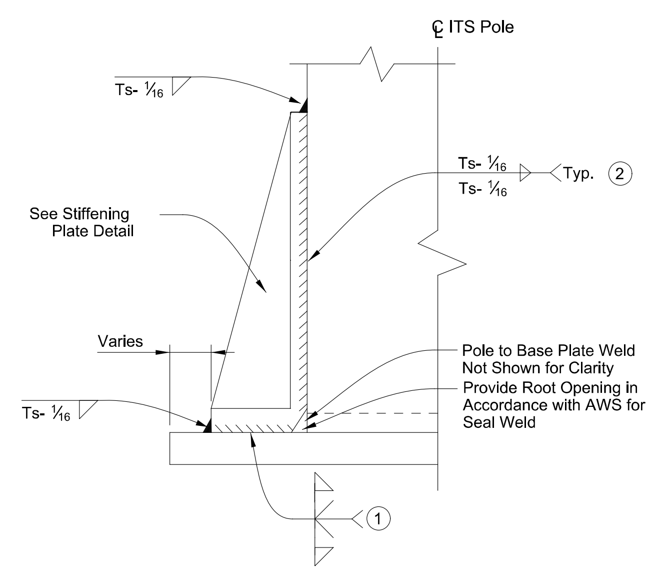
Reference Notes:

(1) Complete Joint Penetration Weld per AWS
(2) Wrap Fillet Weld Around Tip of Stiffener



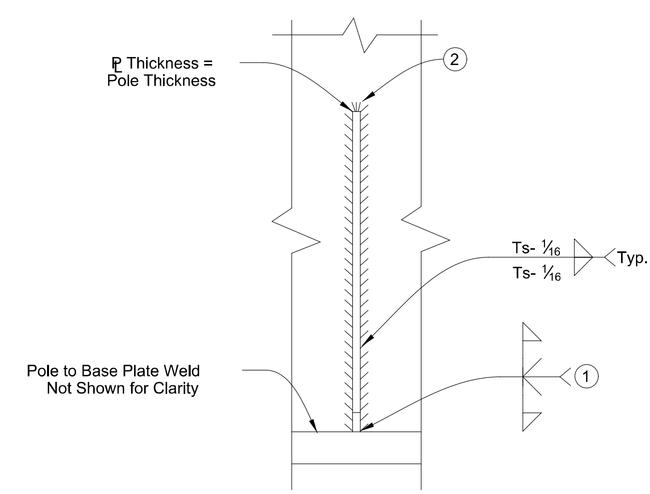
Stiffening Plate Detail

Not to Scale



Stiffening Detail - Elevation View

Not to Scale



Stiffening Detail - Front View

Not to Scale

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE STIFFENER PLATE DETAILS

ITS(4A)-15

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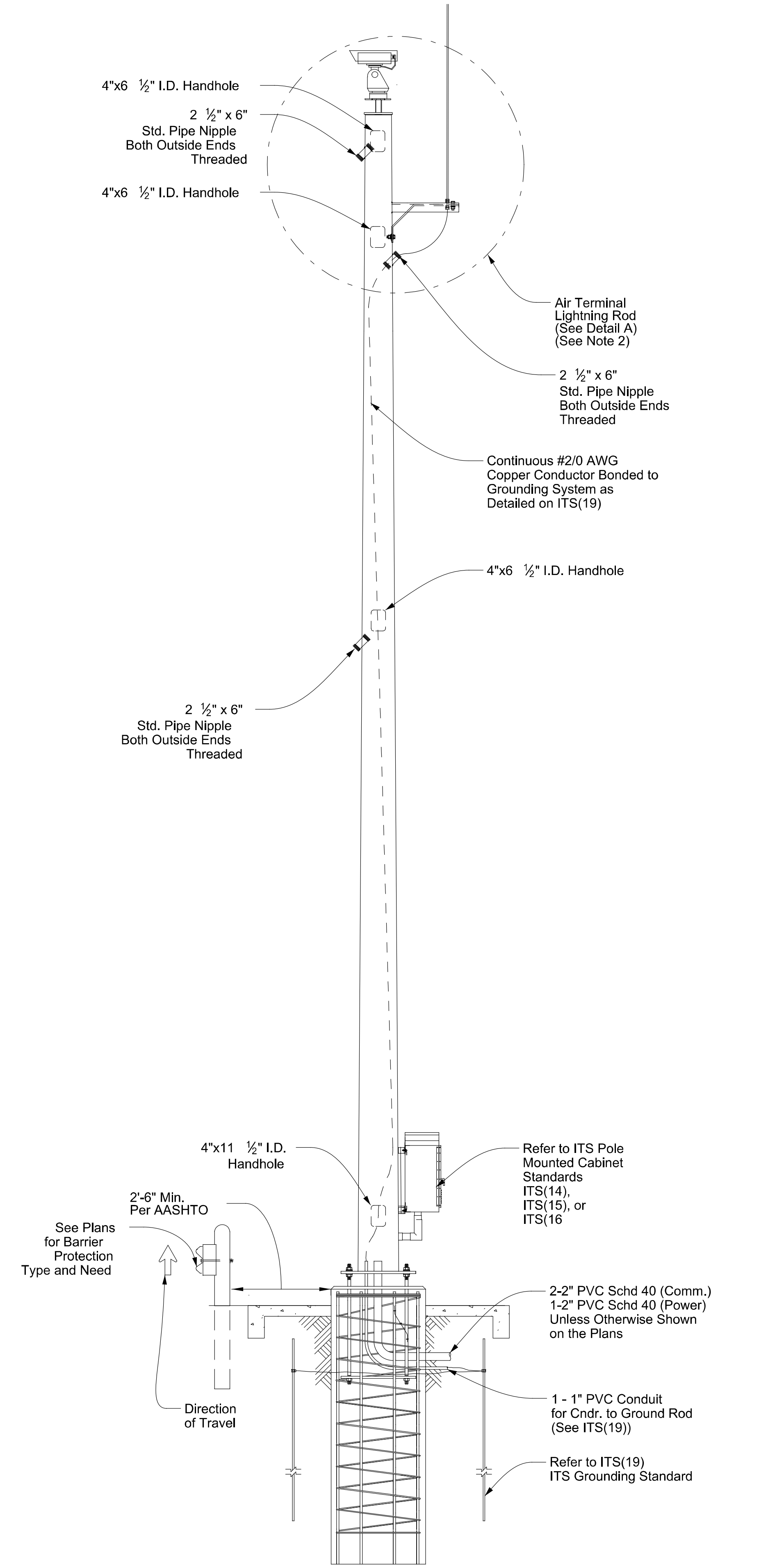
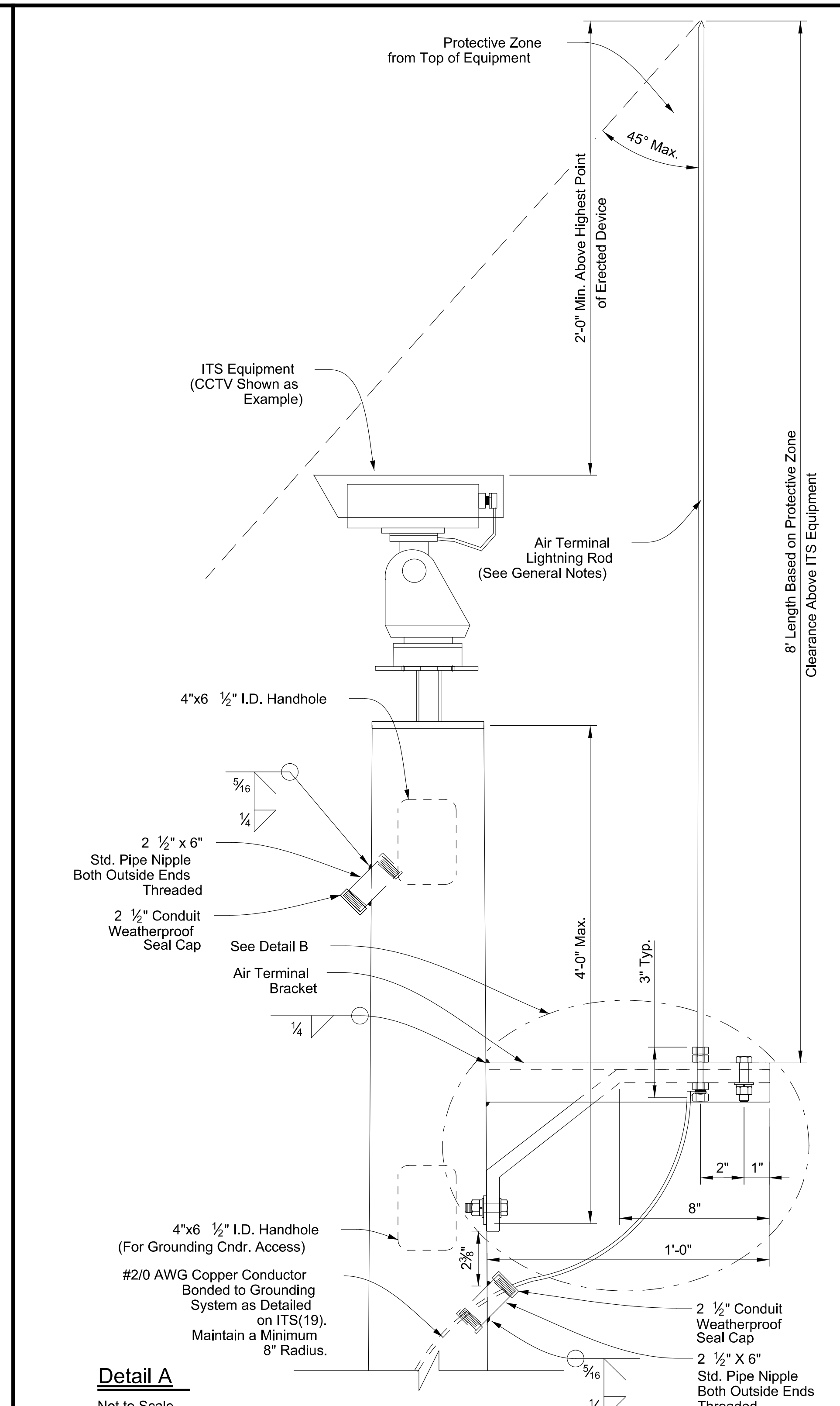


ITS Pole with Cabinet



Detail A

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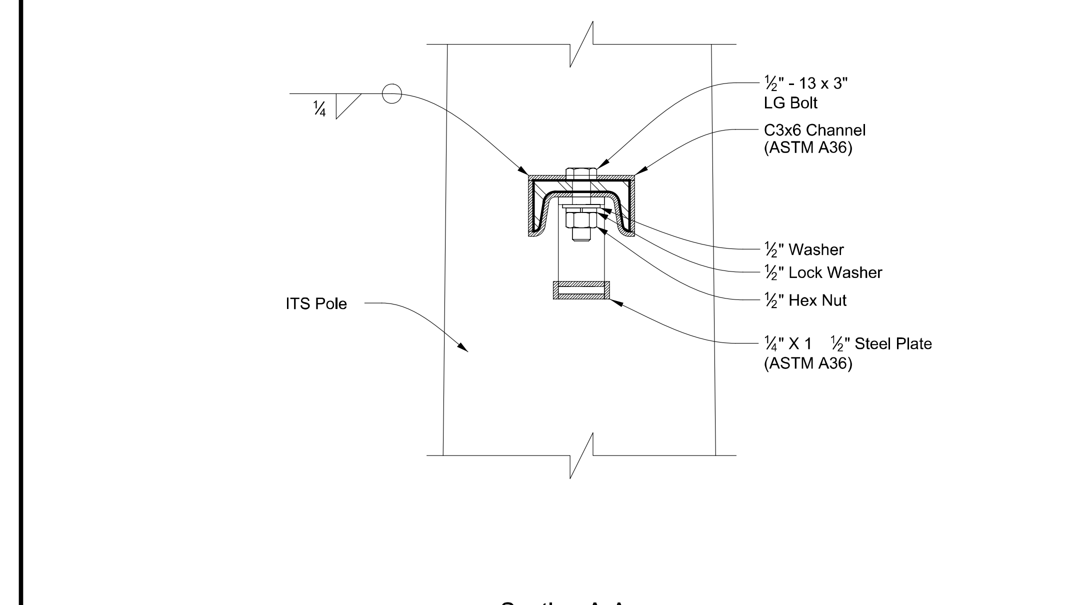

Section A-A

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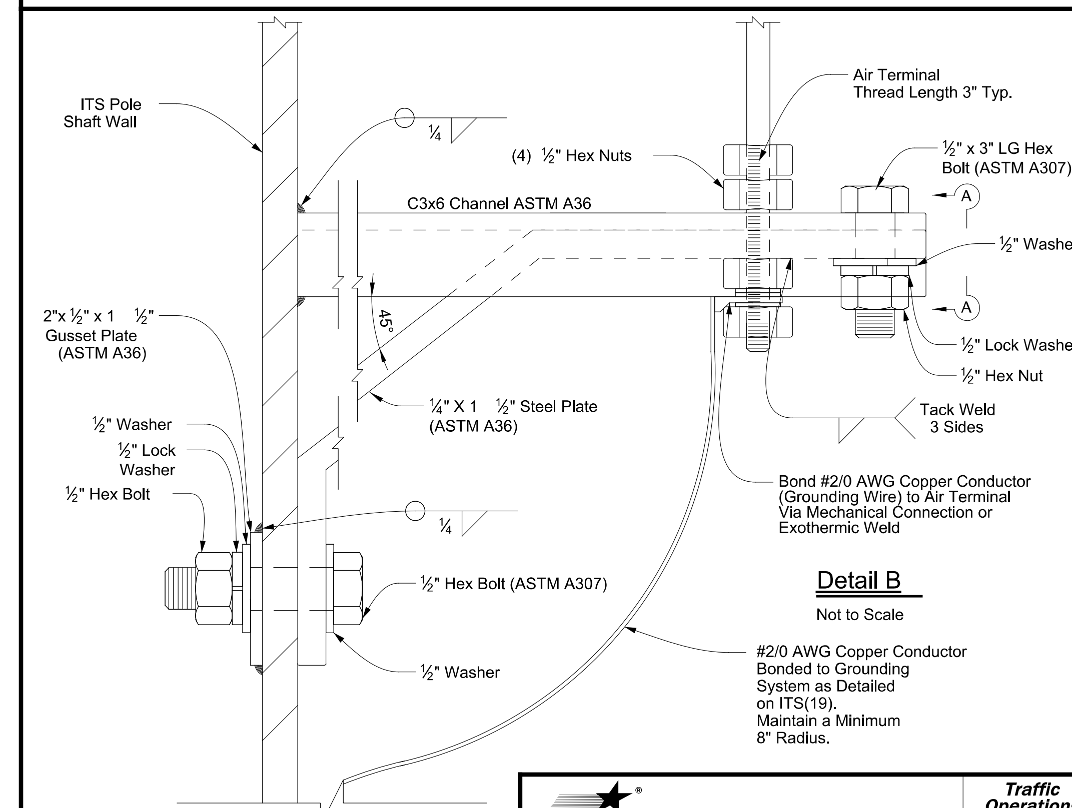

Detail B

Not to Scale

General Notes:

1. Provide lightning protection using air terminals on structures utilizing the rolling sphere method. Provide lightning protection system consisting of air terminals, down conductor, and grounding system installed in accordance with NFPA 780 and tested in accordance with IEEE 142. Meet the following requirements:
   - A. Position - in center of least utilized field of view.
   - B. Height - camera equipment to be within 45 degree protective zone of air terminal.
   - C. Material - ½" ETP alloy 110 copper air terminal (Class II)
   - D. Clearance - 24" minimum height above highest point of ITS equipment.
   - E. Bonding - attach air terminal to bracket by exothermic weld or with approved clamping.
   - F. Structure wind rating in accordance with TxDOT WV & IZ (LTS2013).
   - G. Galvanize air terminal bracket in accordance with Item 445, "Galvanizing."
2. Alternative orientation for air terminal and pole mounted cabinet due to project specific needs to be indicated on the plans and detailed in shop drawing submittal for approval.
3. Weld air terminal bracket to ITS pole in accordance with Item 448 "Structural Field Welding." Bracket may be welded by the fabricator in the shop prior to delivery. A bolted connection for the air terminal bracket is acceptable in lieu of a welded connection with approval by the Engineer and detailed in the shop drawings.

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ITS POLE AIR TERMINAL DETAILS

ITS(5)-15

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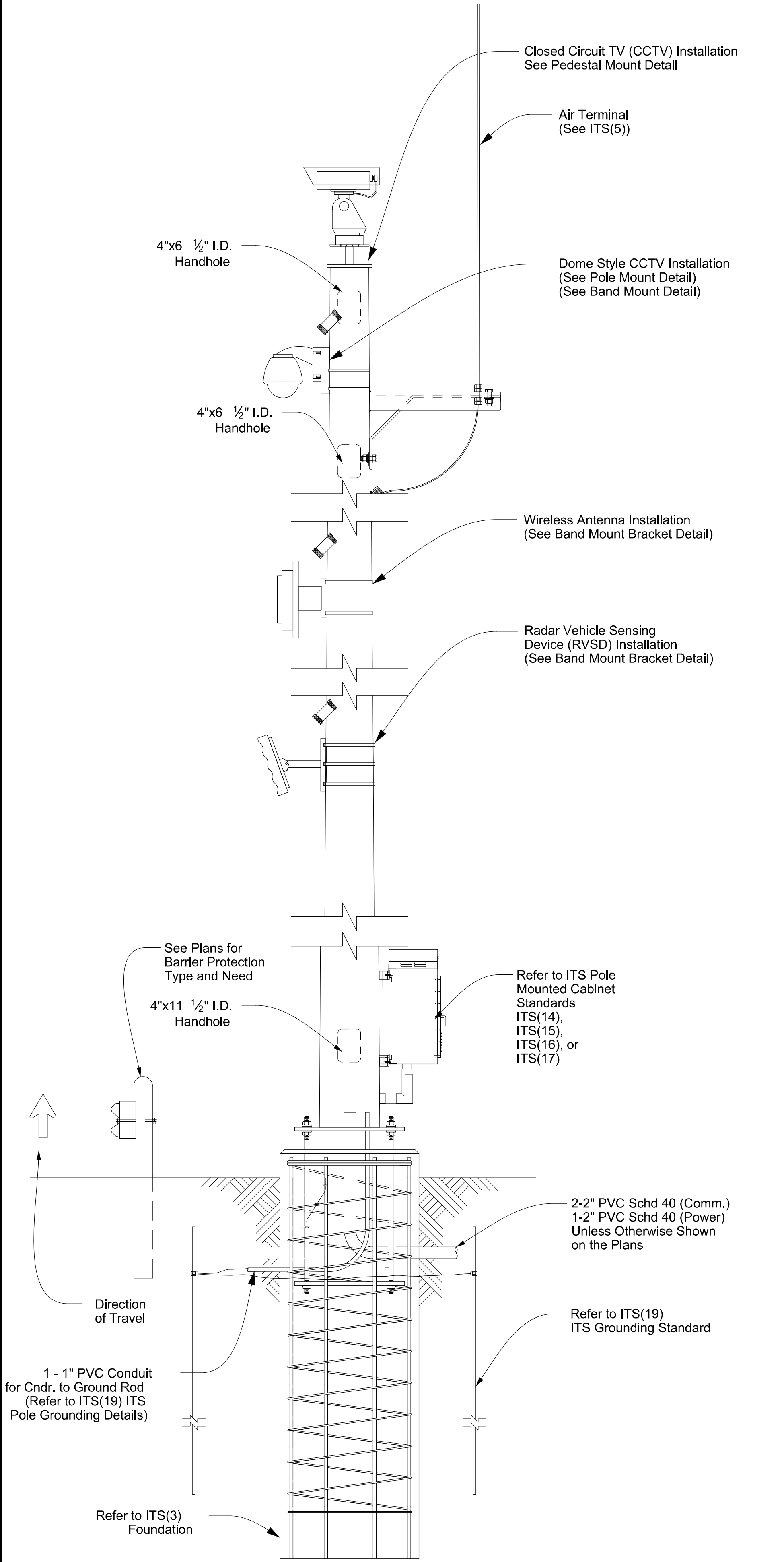
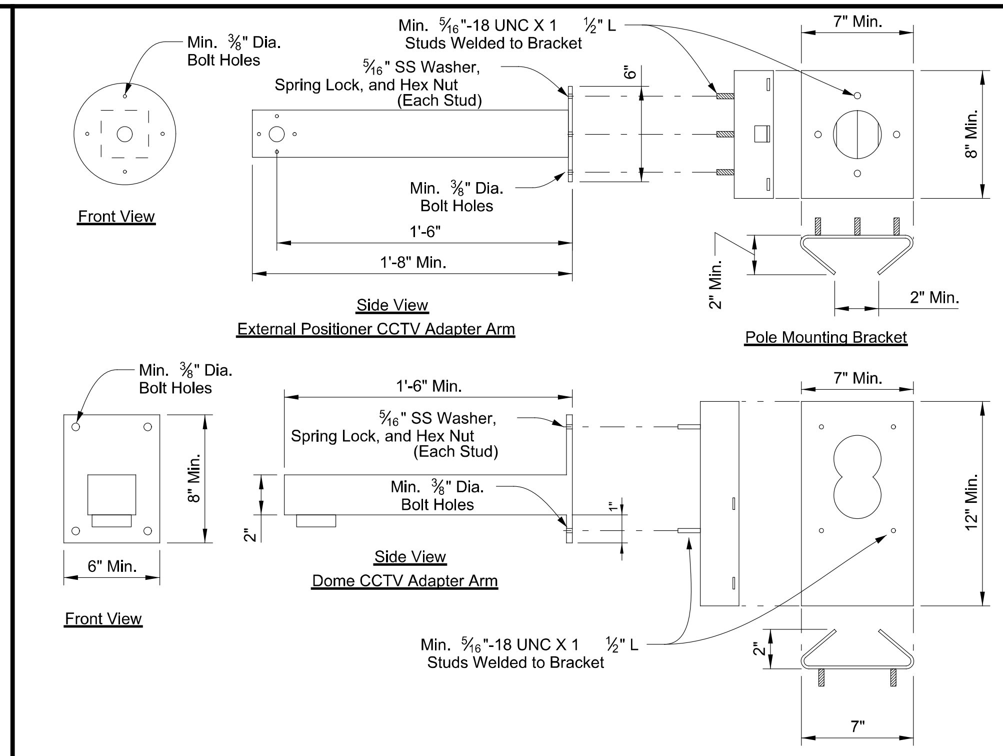
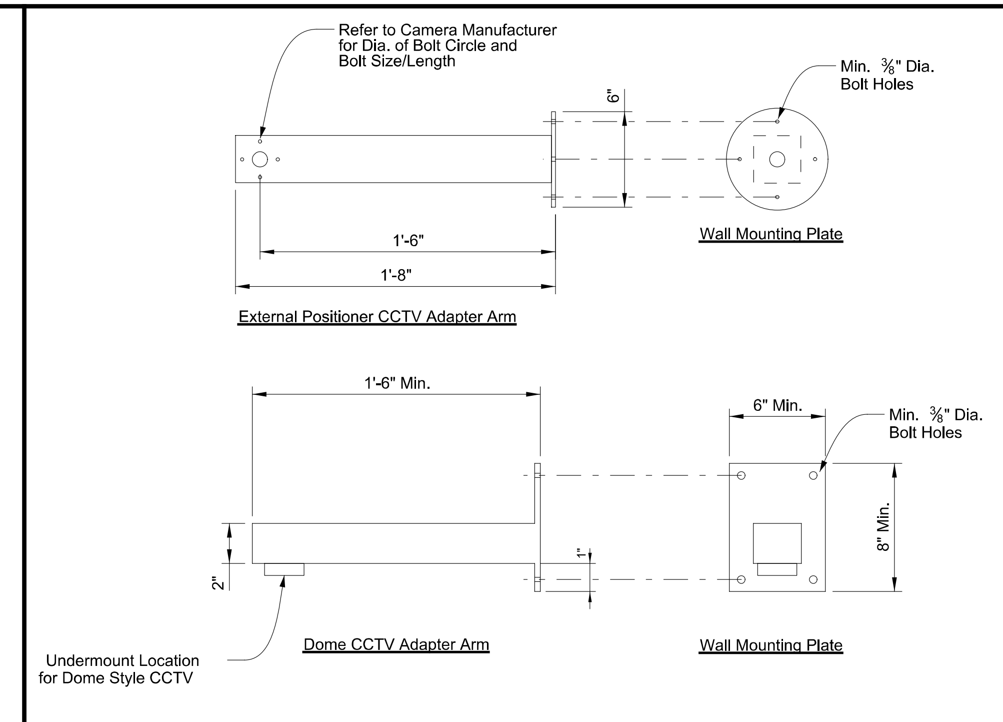


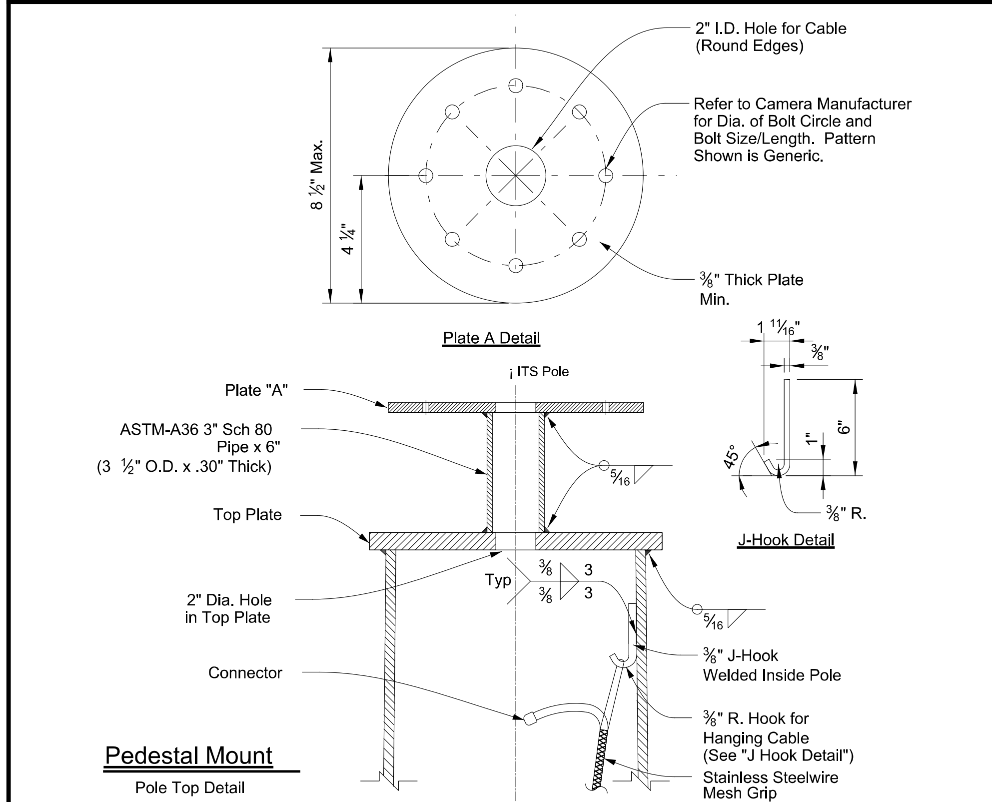
ITS Pole with Cabinet



Pole Mount Detail for Camera

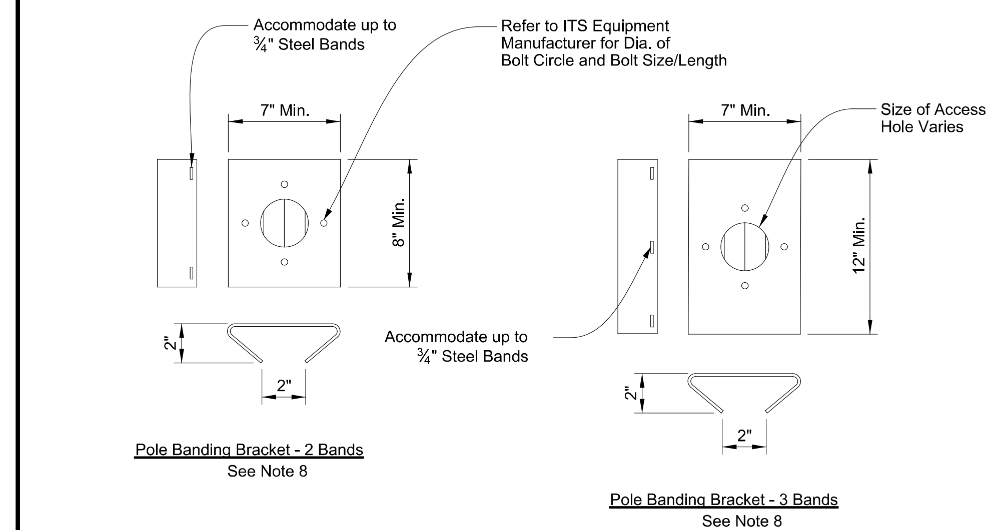


Wall Mount Detail



Pedestal Mount

Pole Top Detail



Band Mount Bracket Details

General Notes:

1. Designed according to Sixth Edition AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications.
2. Hang all cabling inside ITS pole structure with stainless steel wire mesh grips.
3. Bolt positioning in the pedestal top plate (Plate "A") for the pan/tilt base must be determined in the field per camera manufacturers recommendations. This will allow positioning of the camera to maximize coverage area. The Engineer will determine the camera's blind zone at each location.
4. Provide pedestal top plate and Plate "A" that conform to ASTM A36.
5. Make all welds conform to Item 441 and AWSD 1.1 (Structural Welding). Repair damaged galvanized coating per Item 445, "Galvanizing."
6. Galvanize parts in accordance with Item 445, "Galvanizing" unless otherwise noted.
7. The type of ITS equipment shown to be mounted to the ITS pole is intended to represent the most common ITS equipment applications and should not be treated as all inclusive. Other ITS equipment applications may exist that are project specific.
8. Mounting brackets are intended to be diagrammatic and for information only, and are not all inclusive. Contractor responsible for submitting mounting bracket design for approval by the Engineer prior to fabrication. Mounting bracket designed to support a maximum 35 Lbs. Off-the-shelf mounting brackets are acceptable and shall be submitted by shop drawing for approval.
9. Mounting heights to be determined in the field based on manufacturer recommendations.

Texas Department of Transportation

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ITS POLE EQUIPMENT MOUNTING DETAILS

ITS(6)-15

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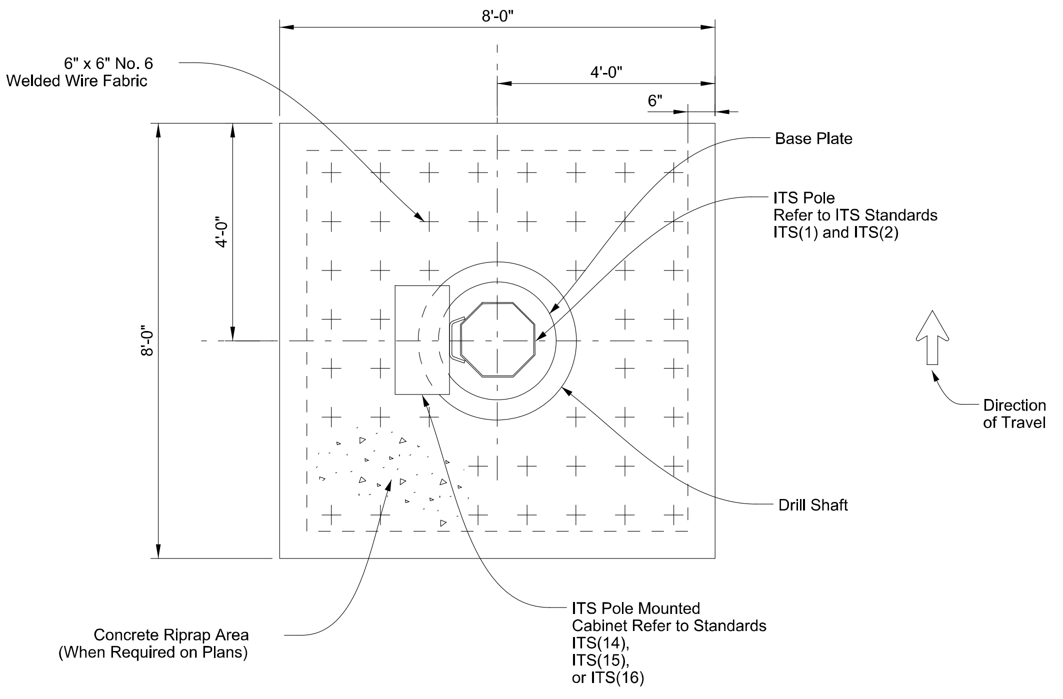
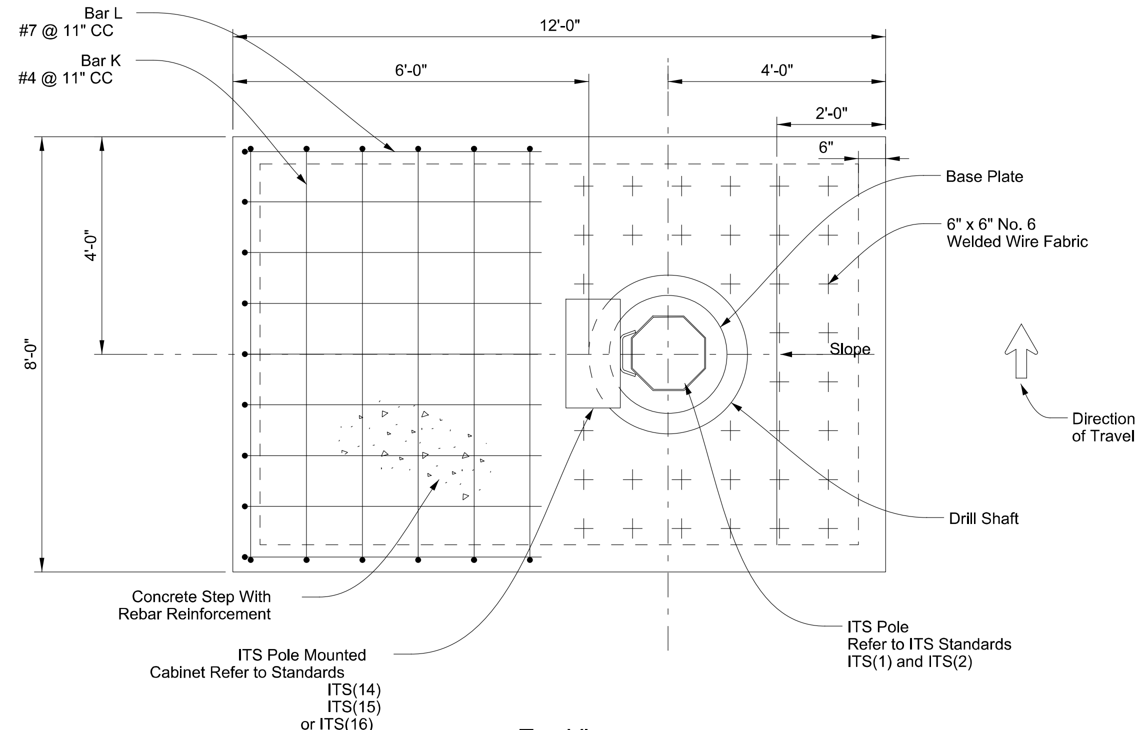


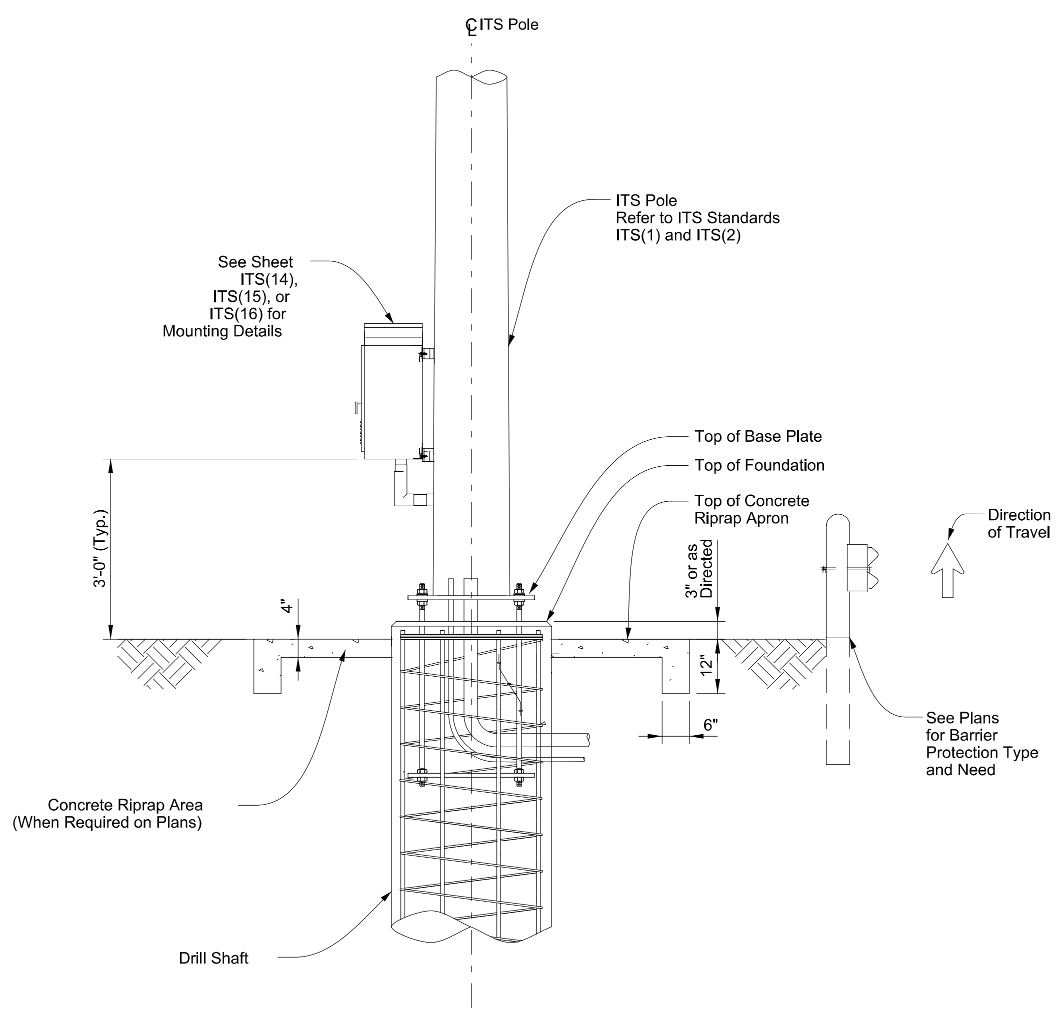
Top View
Riprap - Non-Sloped Conditions



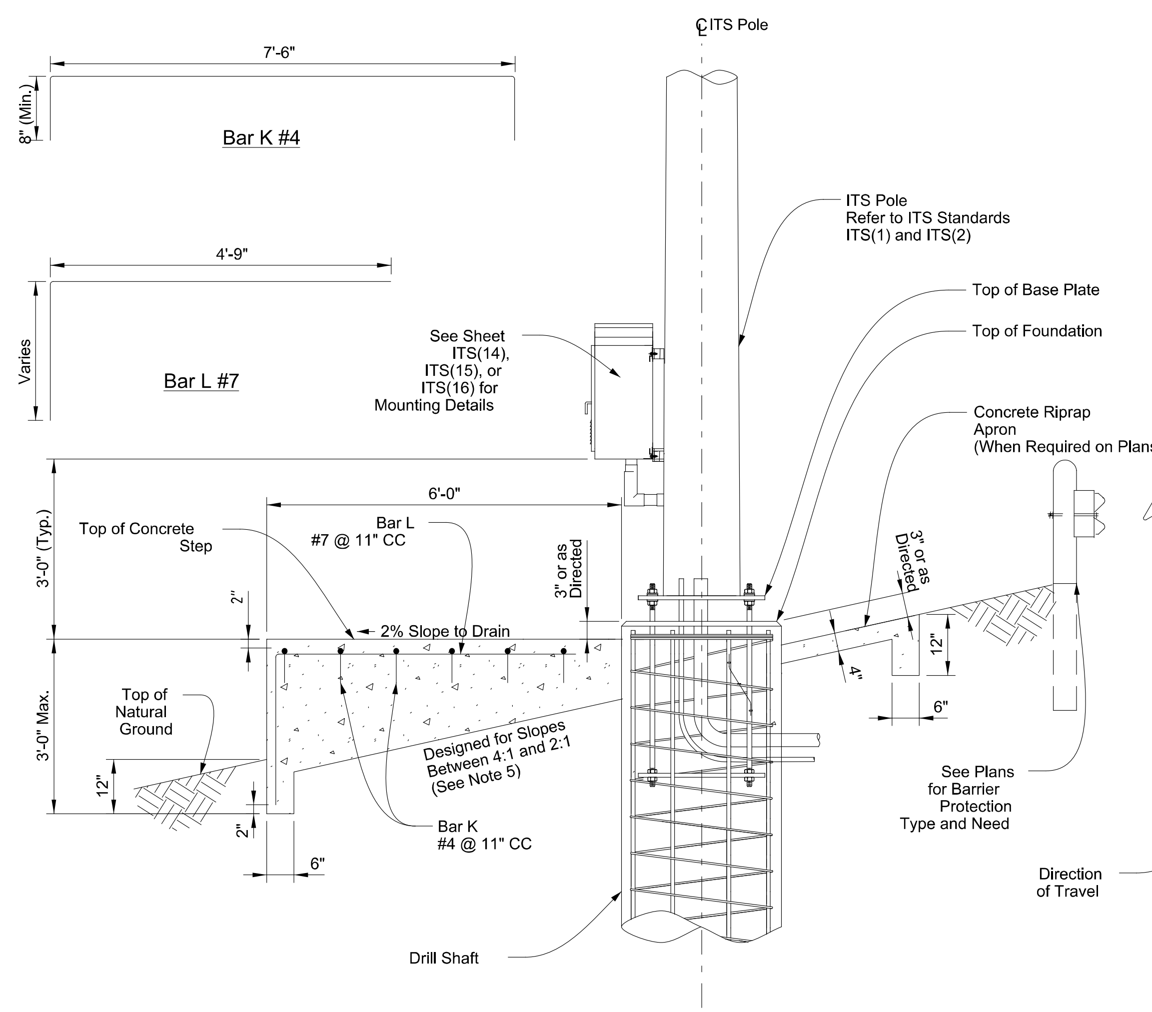
Top View
Step and Riprap - Sloped Conditions

General Notes:

1. For non-sloped grassy areas, an 8' x 8' concrete riprap apron shall be poured around ITS pole foundations (see detail on this sheet), estimated at 1.25 CY per site, paid for under Item 432 "Riprap."
2. For sloped grassy areas, a concrete "step" (for maintenance personnel to access cabinet) shall be poured as part of the riprap apron. The step shall vary in height depending on slope, but shall extend 6' horizontally from ITS pole drilled shaft foundation and be the same width as riprap apron (8'). Step shall be poured at same time as riprap apron (see detail on this sheet). Any additional concrete necessary to fabricate step (over and above the 1.25 CY) shall be considered subsidiary to the various bid items and no direct payment shall be made.
3. For sloped areas where riprap exists, a 6' (horizontal from drilled shaft foundation) x 4' wide step shall be installed (see detail this sheet). Concrete for step shall be considered subsidiary to the various bid items and no direct payment shall be made.
4. Cabinet orientation may vary depending on field conditions or project constraints. Accommodate configuration of platform according to cabinet orientation.
5. Slopes greater than a 2:1 or when 3'-0" Max. step wall height is exceeded, an alternative design with safety railing is required and shall be detailed in the shop drawings for approval.



Elevation View
Riprap Apron Detail - Non-Sloped Conditions



Elevation View
Riprap Apron/Step Detail - Sloped Conditions
(Slopes Exceeding 4:1)

Texas Department of Transportation
Traffic Operations Division Standard

ITS POLE RIPRAP DETAILS

ITS(7)-15

FILE: ITS(7)-15.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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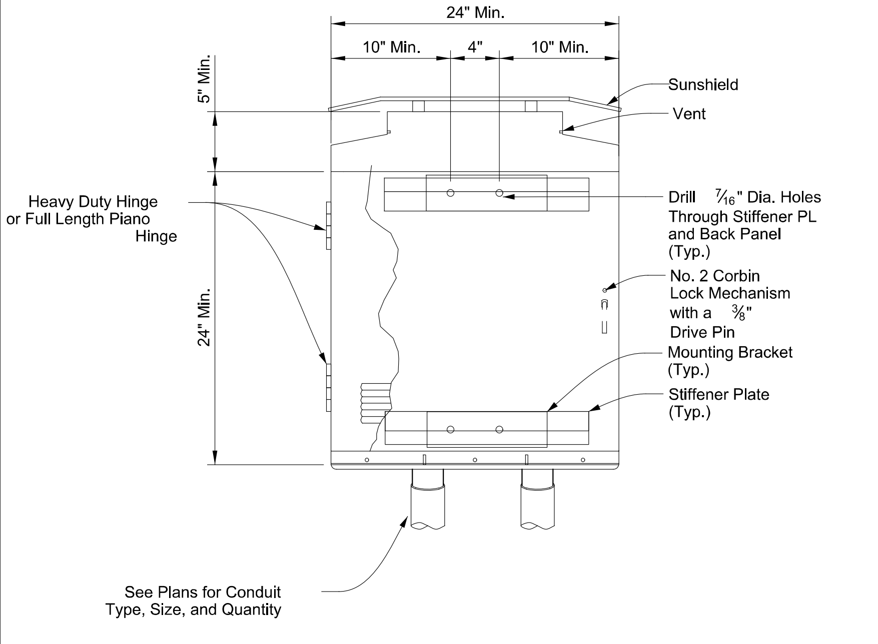
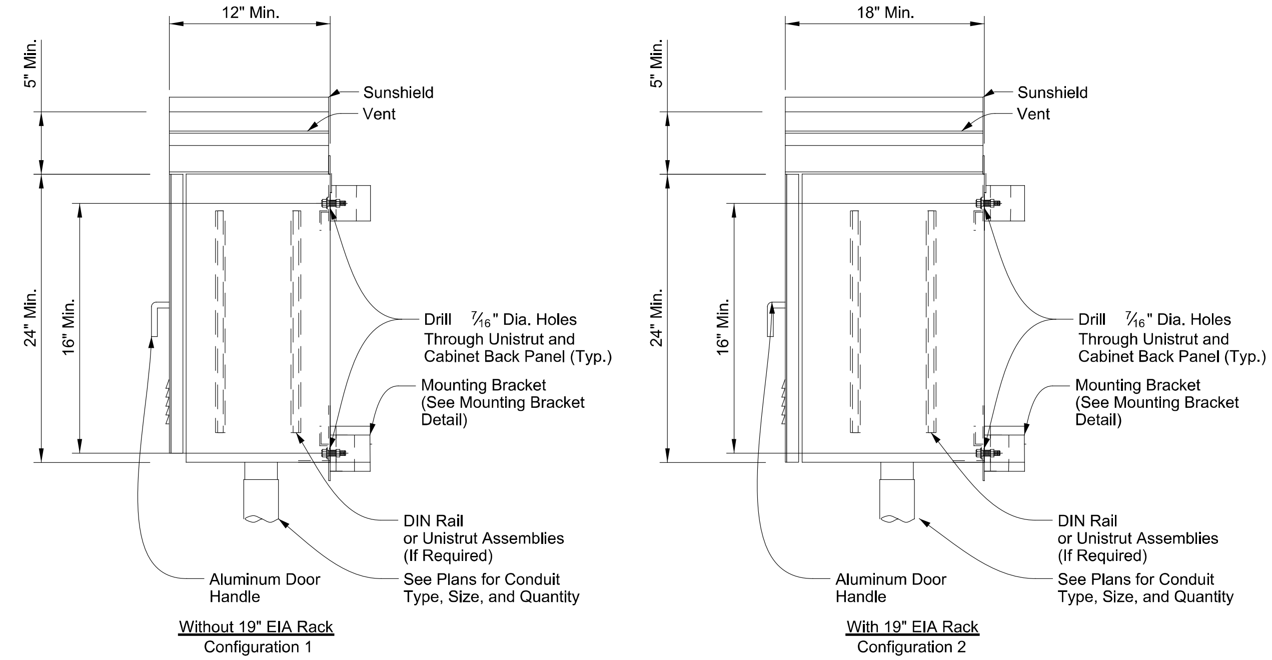


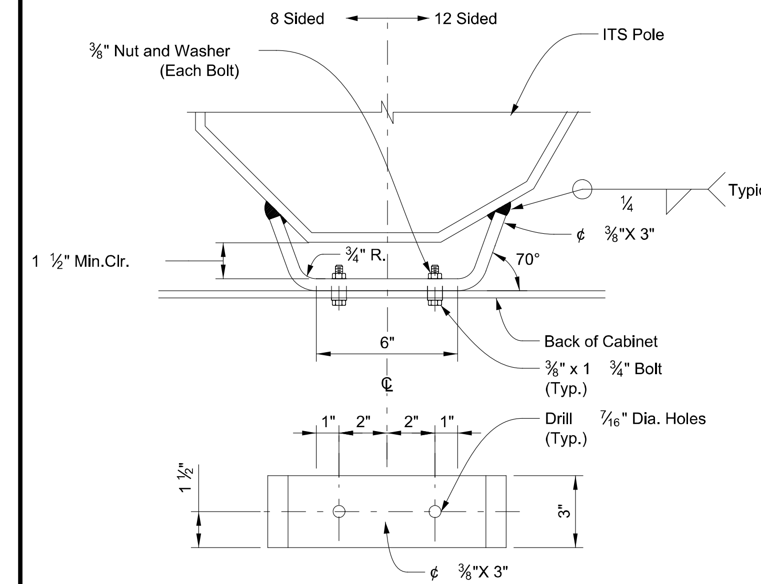
Pole Mounted Cabinet - Type 1 Front View

Not to Scale



Pole Mounted Cabinet - Type 1 Side View

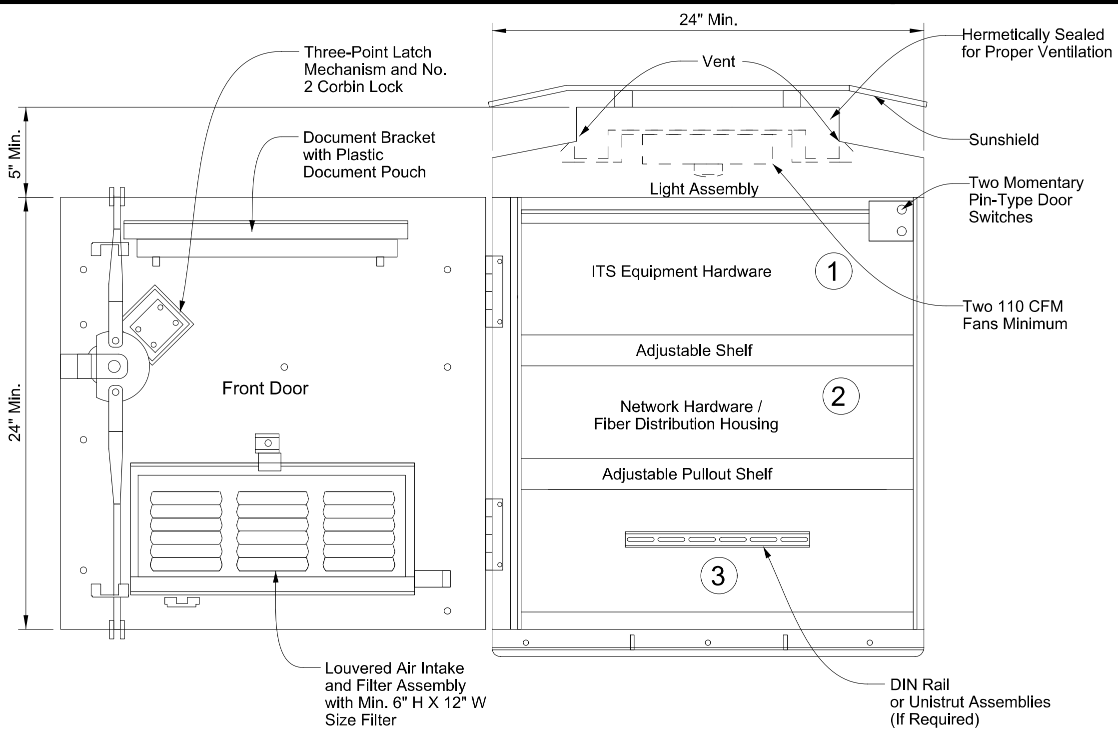
Not to Scale



Note:
ITS Pole May be Round, Octagonal (8 Sided), or Dodecahedron (12 Sided).
See ITS(1), and ITS(2) for Details.

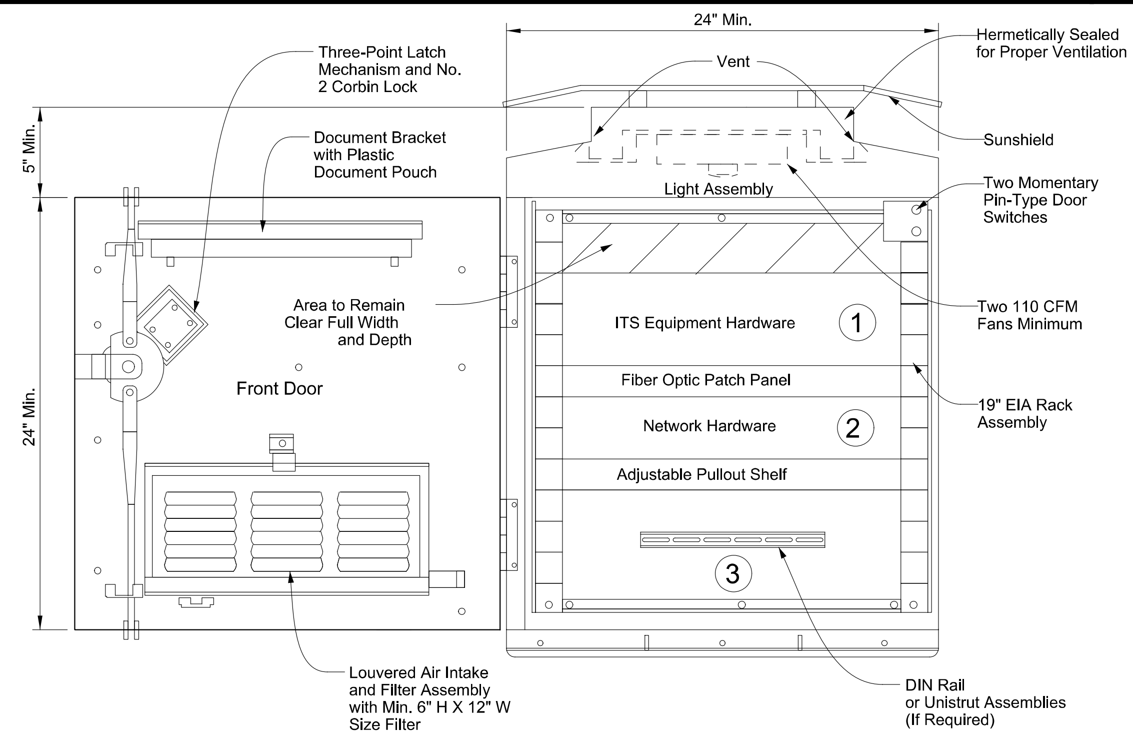
Mounting Bracket Detail

Not to Scale



Interior - Type 1 Without 19" EIA Rack - Front View

Not to Scale



Interior - Type 1 With 19" EIA Rack - Front View

Not to Scale

Typical Equipment Layout Legend	
	Example Equipment
1	CCTV Interface Panel, Radar Vehicle Sensing Device (RVSD) Equipment, Environmental Sensor Station (ESS) Equipment, Bluetooth Equipment, or ITS Radio Equipment (See General Note 1)
2	Ethernet Switch, Video Encoder, Terminal Server, Fiber Optic Transceivers, or Media Conversion Equipment (See General Note 1)
3	Power Distribution Assembly, Service Entrance Breakers, Primary AC Power, Auxiliary Power Strip, Ground Bus Bar Surge Protection Equipment

General Notes:

1. Layout of hardware equipment and configuration shown is diagrammatic in nature and intended to represent a preferred Type 1 pole mounted cabinet setup. Hardware needed for each Type 1 cabinet varies and not all cabinet equipment may be shown. The contractor will be responsible for configuring cabinets with all appropriate ITS hardware and power supplies in accordance with the plans and specifications. The contractor may alter the cabinet configuration shown to maximize space and ensure easy access for maintenance.
2. Mount cabinet as detailed on ITS(14) or ITS(17). Orientation of cabinet on ITS pole may vary depending on field conditions. Mount the pole mounted cabinet to the backside of the ITS pole, to allow maintenance personnel to access the cabinet while being able to view oncoming traffic.
3. For ITS pole sites located on slopes greater than 4H:1V, mount the cabinet to the backside of the ITS pole as detailed on ITS(7). Mounting height to accommodate maintenance pad for easy access.
4. All dimensions are approximate and represent minimum cabinet dimensions.
5. Provide conduit entrances at the bottom of the cabinet.
6. Paid under Special Specification "ITS Pole with Cabinet" (Configuration 1) without 19" EIA rack. Paid under Special Specification "ITS Pole with Cabinet" (Configuration 2) with 19" EIA rack.

Orientation of Type 1 Cabinet on ITS Pole (Typical)

Not to Scale

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE MOUNTED CABINET TYPE I DETAILS

ITS(14)-15

FILE: ITS(14)-15.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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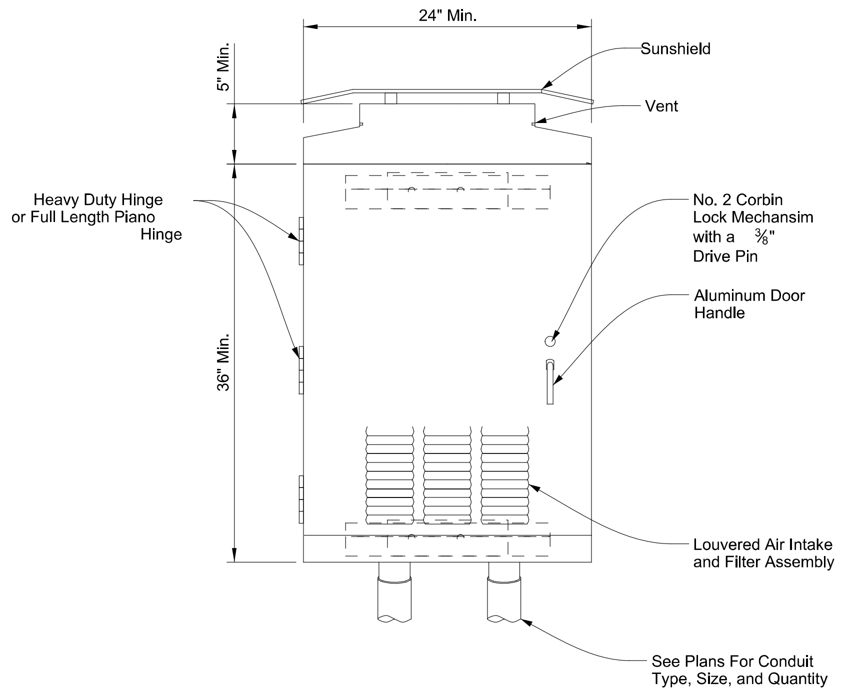
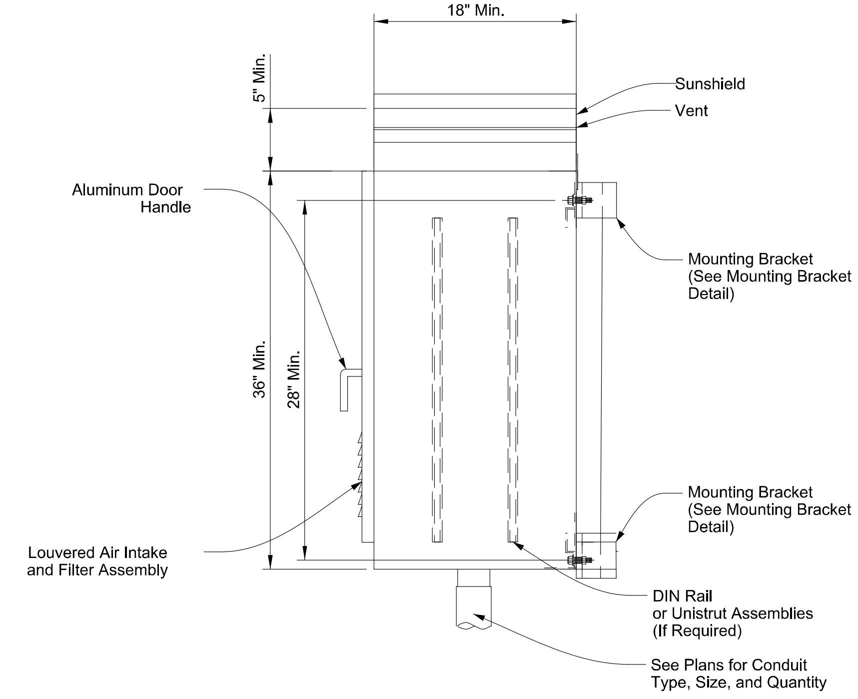


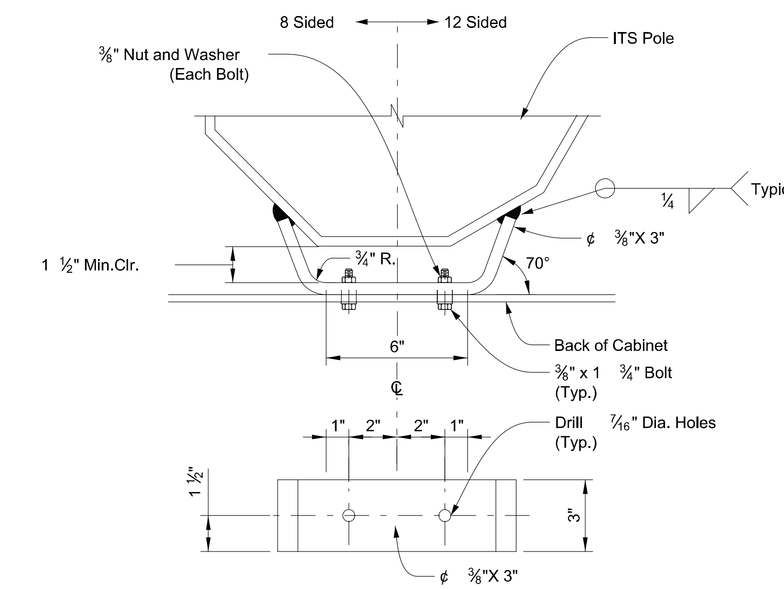
Pole Mounted Cabinet - Type 2 Front View

Not to Scale



Pole Mounted Cabinet - Type 2 Side View

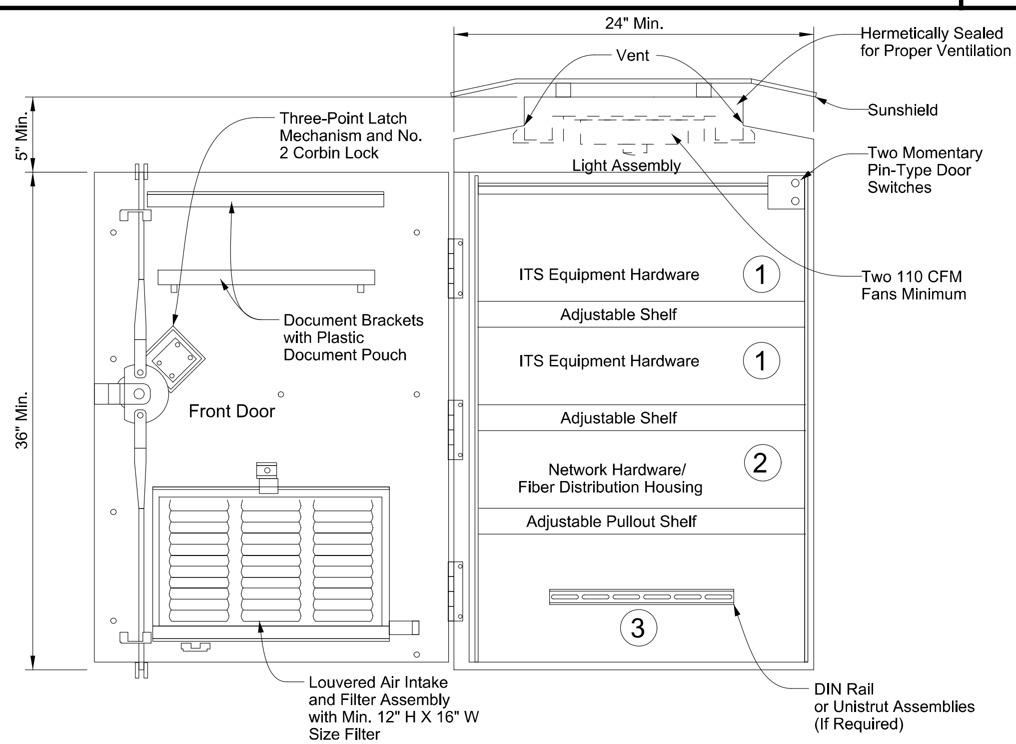
Not to Scale



Note:
ITS Pole May be Round, Octagonal (8 Sided), or Dodecahedron (12 Sided).
See ITS(1), and ITS(2) for Details.

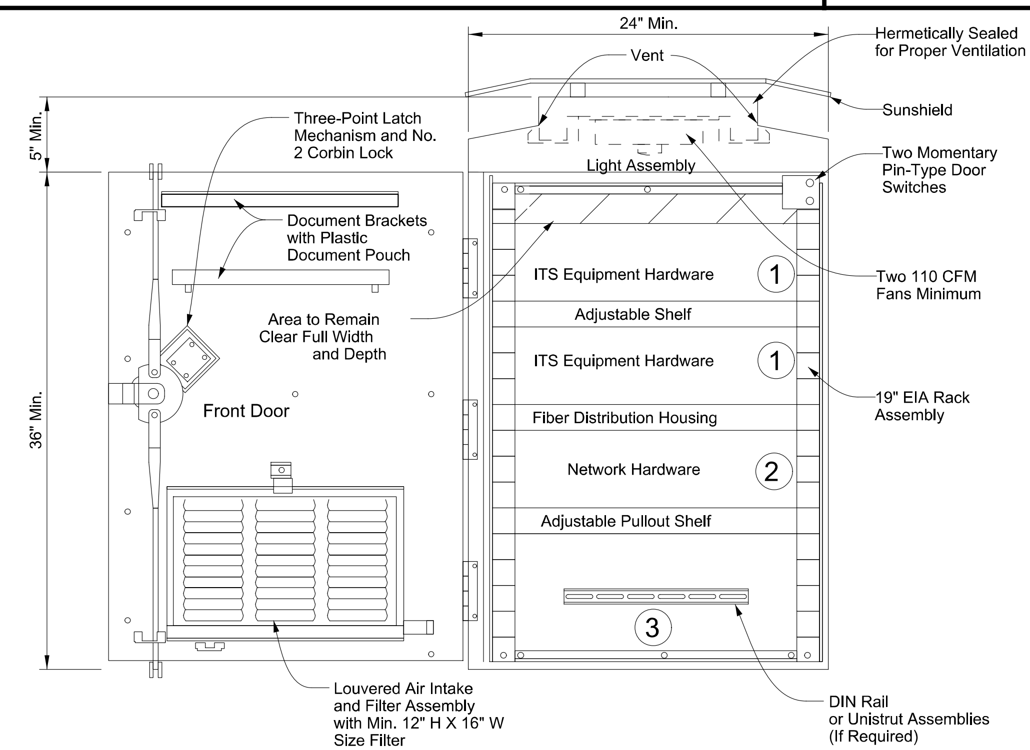
Mounting Bracket Detail

Not to Scale



Interior - Type 2 Without 19" EIA Rack - Front View

Not to Scale



Interior - Type 2 With 19" EIA Rack - Front View

Not to Scale

Typical Equipment Layout Legend

	Example Equipment
1	CCTV Interface Panel, Radar Vehicle Sensing Device (RVSD) Equipment, DMS/LCS Controller, Environmental Sensor Station (ESS) Equipment, Bluetooth Equipment, or ITS Radio Equipment (See General Note 1)
2	Ethernet Switch, Video Encoder, Terminal Server, Fiber Optic Transceivers, or Media Conversion Equipment (See General Note 1)
3	Power Distribution Assembly, Service Entrance Breakers, Primary AC Power, Auxiliary Power Strip, Ground Bus Bar Surge Protection Equipment

General Notes:

1. Layout of hardware equipment and configuration shown is diagrammatic in nature and intended to represent a preferred Type 2 pole mounted cabinet setup. Hardware needed for each Type 2 cabinet varies and not all cabinet equipment may be shown. The contractor will be responsible for configuring cabinets with all appropriate ITS hardware and power supplies in accordance with the plans and specifications. The contractor may alter the cabinet configuration shown to maximize space and ensure easy access for maintenance.

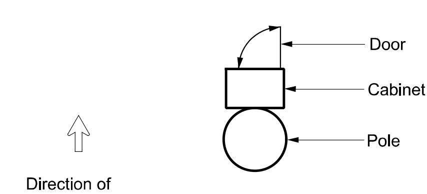
2. Mount cabinet as detailed on ITS(15) or ITS(17). Orientation of cabinet on ITS pole may vary depending on field conditions. Mount the pole mounted cabinet to the backside of the ITS pole, to allow maintenance personnel to access the cabinet while being able to view oncoming traffic.

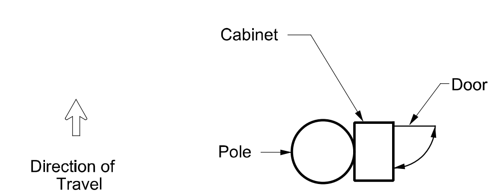
3. For ITS pole sites located on slopes greater than 4H:1V, mount the cabinet to the backside of the ITS pole as detailed on ITS(7). Mounting height to accommodate maintenance pad for easy access.

4. All dimensions are approximate and represent minimum cabinet dimensions.

5. Provide conduit entrances at the bottom of the cabinet.

6. Paid under Special Specification "ITS Pole with Cabinet" (Configuration 1) without 19" EIA rack. Paid under Special Specification "ITS Pole with Cabinet" (Configuration 2) with 19" EIA rack.





Orientation of Type 2 Cabinet on ITS Pole (Typical)

Not to Scale

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE MOUNTED CABINET TYPE 2 DETAILS

ITS(15)-15

FILE: ITS(15)-15.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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	SAT		BEXAR	47

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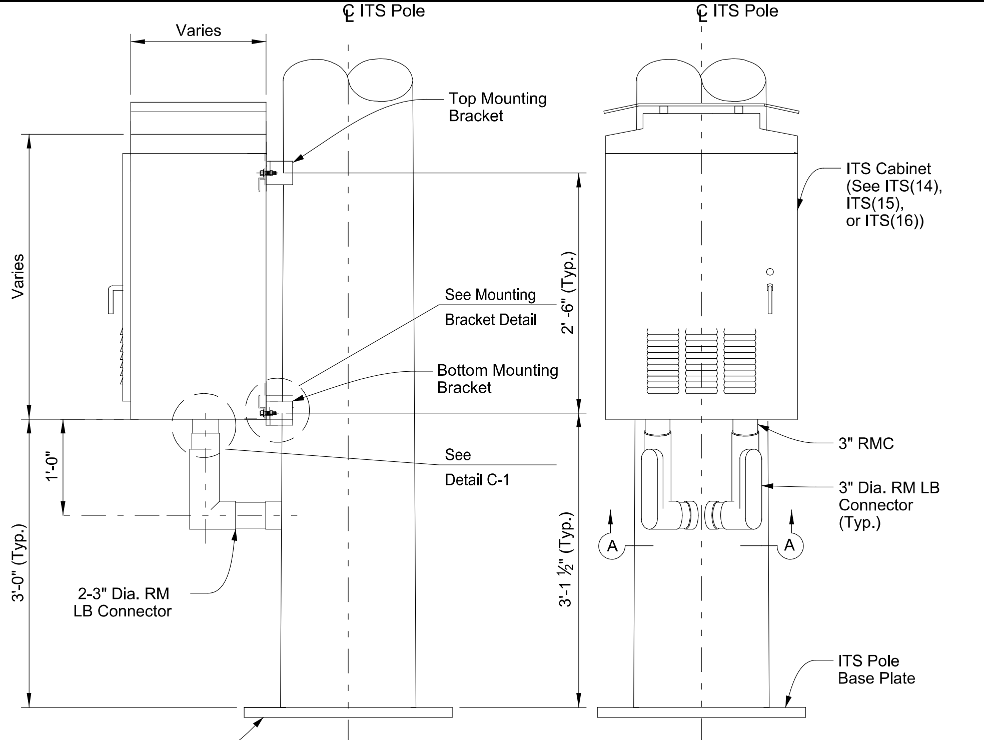
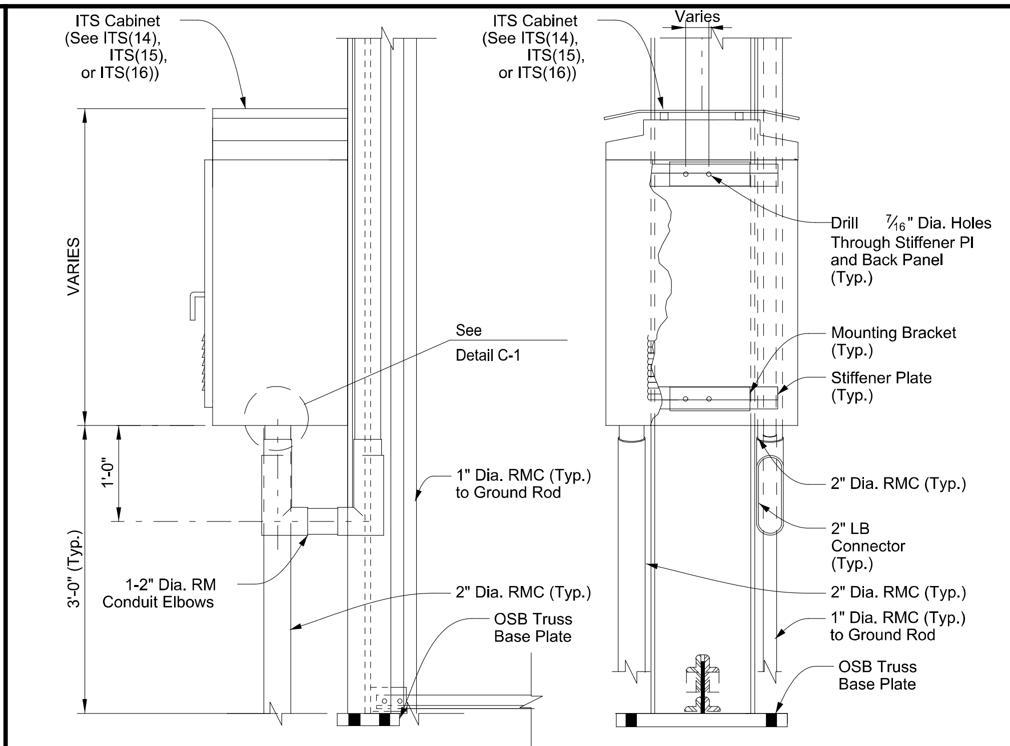


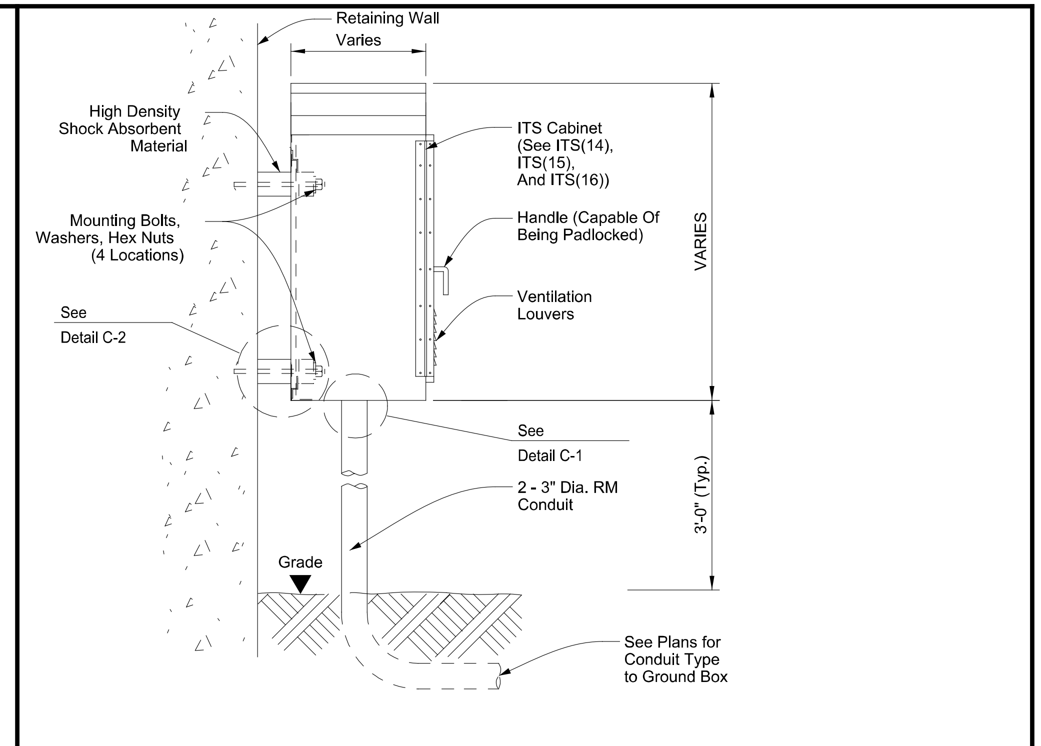
ITS Pole Mount

Not to Scale



OSB Truss Mount

Not to Scale



Retaining Wall Mount

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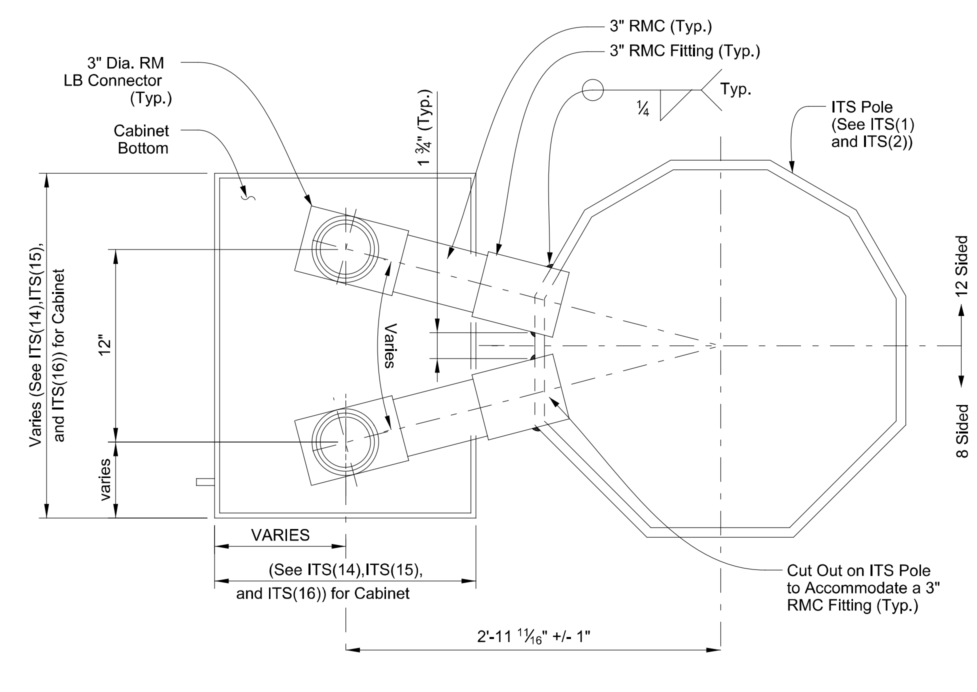

Section A-A

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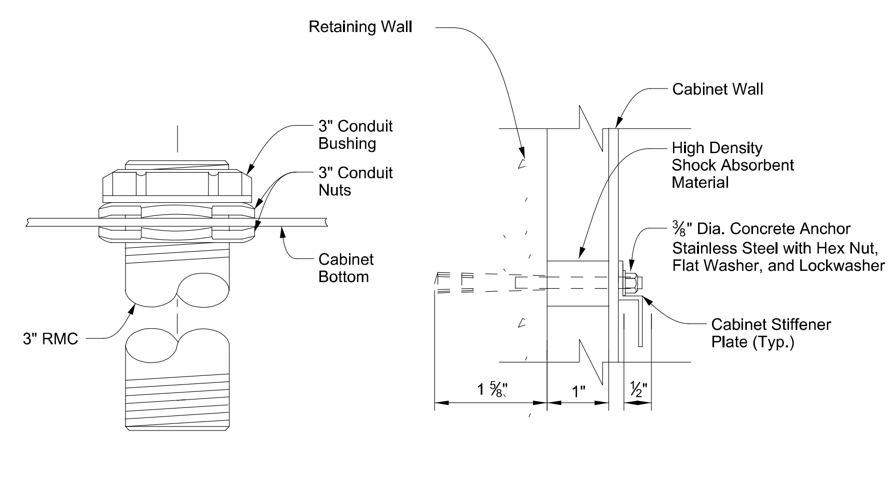
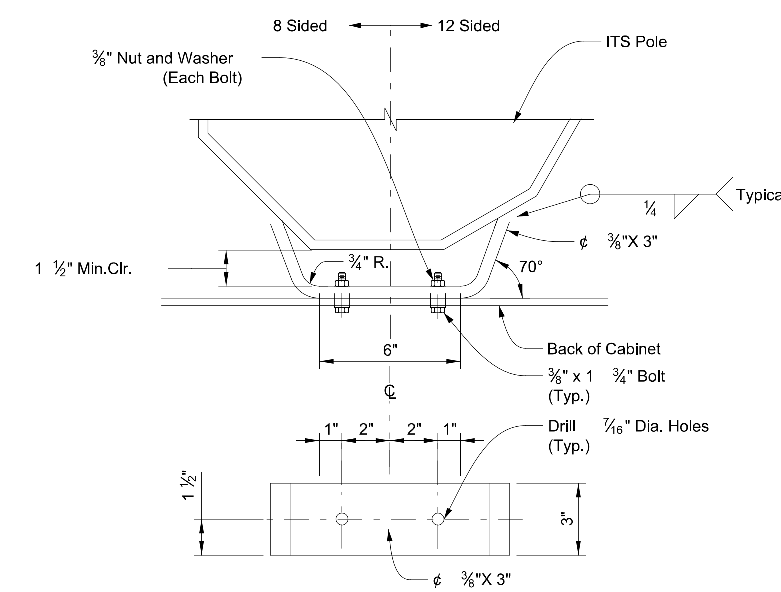


Detail C-1

Detail C-2

Detail C-1 and C-2

Not to Scale



Note:
ITS Pole May be Round, Octagonal (8 Sided), or Dodecahedron (12 Sided).
See ITS(1), and ITS(2) for Details.

Mounting Bracket Detail

Not to Scale

General Notes:

1. Mount cabinet as detailed on ITS(14), ITS(15), ITS(16), or ITS(17). Orientation of cabinet on ITS pole may vary depending on field conditions. Mount the pole mounted cabinet to the backside of the ITS pole, to allow maintenance personnel to access the cabinet while being able to view oncoming traffic.

2. For ITS pole sites located on slopes greater than 4V:1H, mount the cabinet to the backside of the ITS pole as detailed on ITS(7). Mounting height to accommodate maintenance pad for easy access.

3. All dimensions are approximate and represent minimum dimensions.

4. Provide conduit entrances at the bottom of the cabinet.

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE MOUNTED CABINET MISC. MOUNTING DETAILS

ITS(17)-15

FILE: ITS(17)-15.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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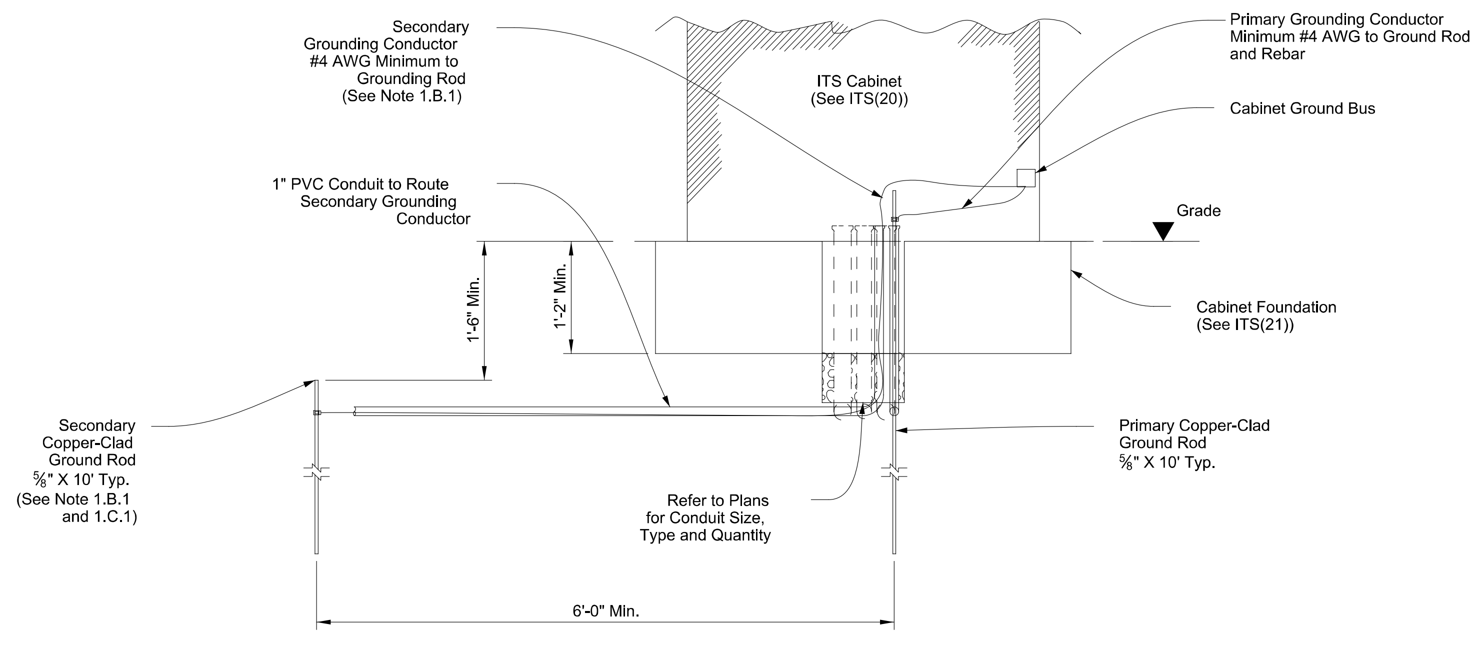
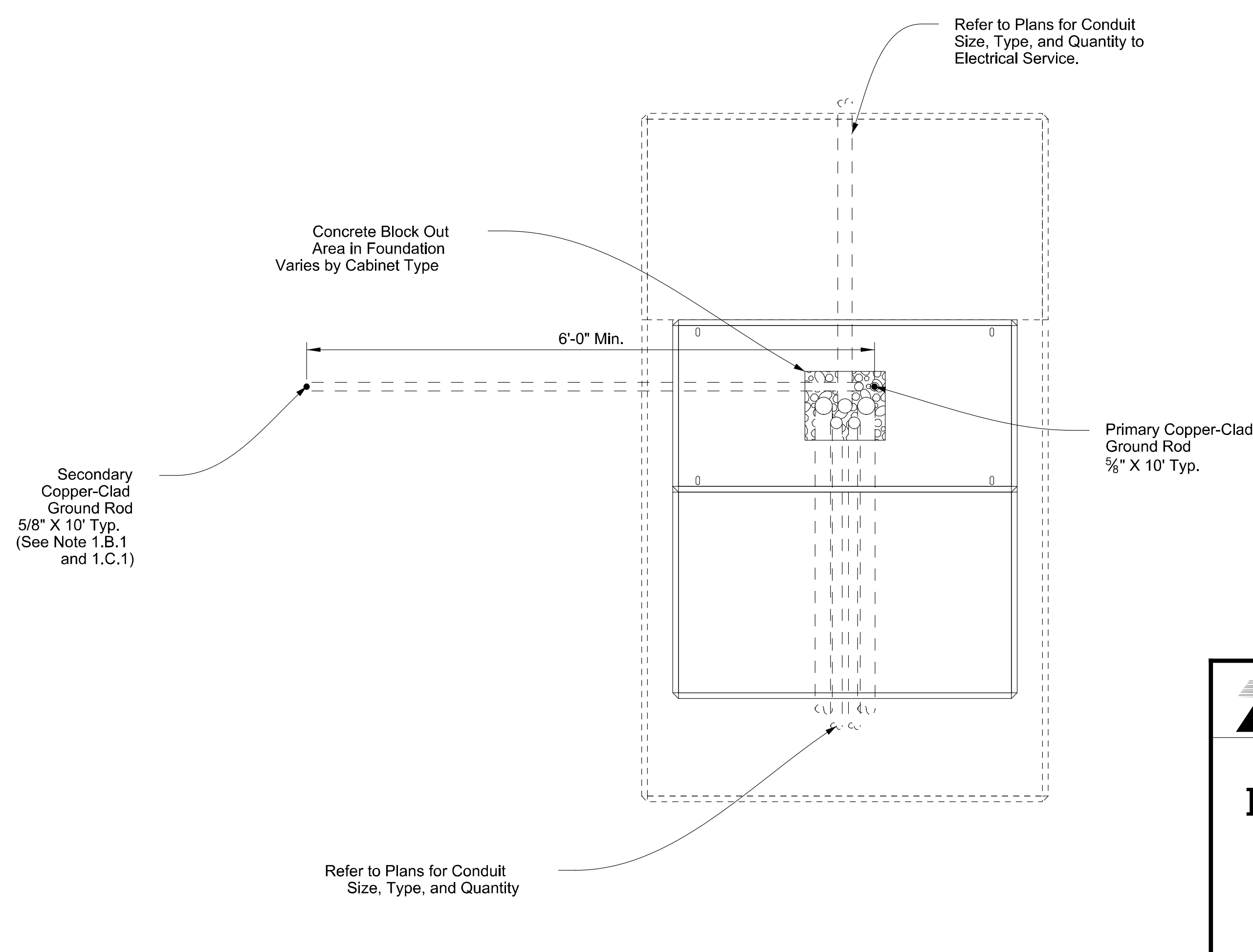
General Notes:

1. Grounding System:
   A. Description:
      1. Provide ground system consisting of copper wires, ground rods, and concrete-encased grounding electrodes (Ufers), of the configuration shown to minimize potential gradient irregularities, drain leakage, and fault currents to earth.
   B. Performance:
      1. Provide a grounding system, consisting of a minimum one ground rod, having a resistance not greater than 5 Ohms to ground. Additional ground rods may be added to the system to achieve less than 5 Ohms resistance.
   C. Design Criteria:
      1. The combined ground resistance of separate systems bonded together below grade may be used to meet the specified ground resistance, but the minimum number of rods indicated shall still be provided.
      2. Measure the resistance of systems requiring separate ground resistance separately before bonding below grade.
      3. Only provide UL-approved materials listed for grounding systems.
      4. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture, unless moisture is permanently excluded from the junction of such materials.
      5. Submit product data for the materials and products used to perform the work of this section.
   D. Materials:
      1. Conductors:
         a. Bare Ground Conductor:
            1) For No. 8 AWG or larger bare ground wire sizes, provide soft drawn copper, Class A or Class B, stranded wire meeting the requirements of ASTM B 8.
      2. Ground Compression Connectors:
         a. Provide molds, thermite packages, and other material for ground compression connectors that are full-rated to carry 100% of the cable rating and which meet IEEE 837.
            1) Provide the compression materials from a single manufacturer throughout the project.
         b. Provide the items necessary for connecting cable to ground rods.
      3. Ground Rods:
         a. Provide copper-clad steel ground rods conforming to the requirements specified in UL 467.
            1) Diameter: ⅝ in.
            2) Length: 10 Ft.
2. Installation:
   A. Install grounding components and systems in accordance with the requirements specified in UL 467, IEEE 81, and IEEE 142.
   B. System Grounding:
      1. Ground Rods:
         a. Drive ground rods into the ground until the tops of the rods are approximately 18 in. below finished grade.
         b. If multiple ground rods are needed to meet the minimum resistance of 5 Ohms, space ground rods as evenly as possible, at least 6 feet apart, and so conductors will be connected below grade.
      2. Conductors:
         a. Provide minimum No. 4 AWG ground wire for system and equipment grounding.
         b. Using suitable fasteners, securely attach exposed ground wires to structural supports at not more than 2 ft. intervals, where applicable.
         c. Bends in ground wires greater than 45 degrees are unacceptable.
      3. Cable Connections:
         a. Use approved exothermic-welded connections for conductor splices and connections between conductors and other components.
3. Testing:
   A. Resistance Test:
      1. Test Procedure:
         a. The ground-resistance measurements of each ground Rod shall be taken.
            1) The resistance to ground shall be measured in accordance with the fall-of-potential method specified in IEEE 81 and IEEE 142.
            2) Ground-resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds.
         b. Test reports shall be prepared that indicate the location of the ground rod, the grounding system, and the resistance and soil conditions at the time the test was performed.
      2. Acceptance Criteria:
         a. The grounding system must have a resistance not greater than 5 Ohms.
         b. Do not energize any part of the electrical distribution system prior to the resistance testing of that system's ground rods and grounding system, and submission of the test results for approval.
      3. Inspections:
         a. Prepare and submit as-built record drawings of the grounding system as installed and test reports for approval.



Ground Mounted Cabinet - Side View

(Slab & Base)
Not to Scale



Ground Mounted Cabinet - Top View

(Slab & Base)
Not to Scale

Texas Department of Transportation

Traffic Operations Division Standard

ITS CABINET GROUNDING DETAILS

ITS(18)-15

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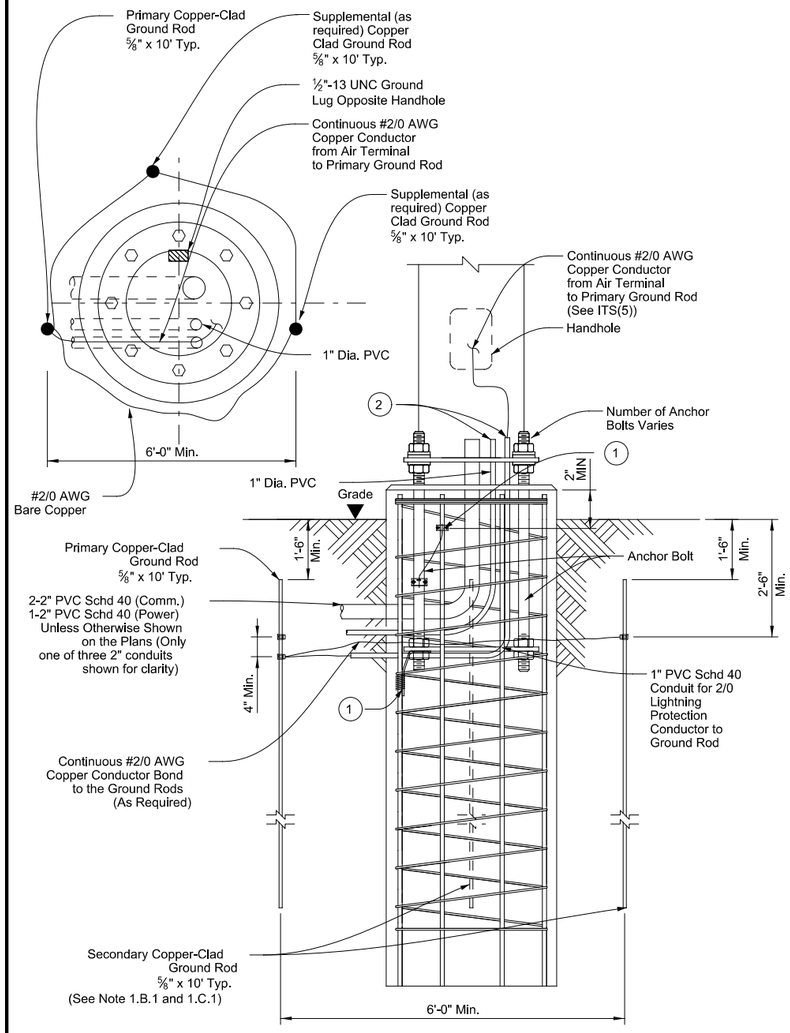
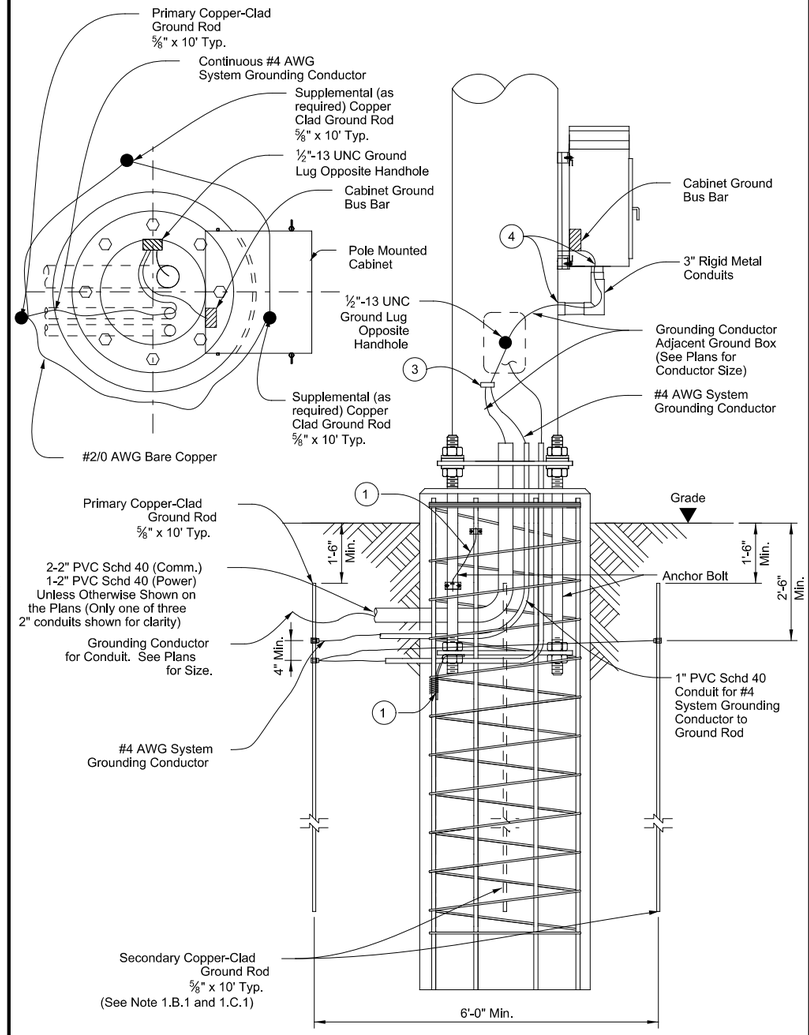
General Notes:

1. Grounding System:
   - A. Description:
     1. Provide ground system consisting of copper wires, ground rods, and concrete-encased grounding electrodes (Ufers), of the configuration shown to minimize potential gradient irregularities, drain leakage, and fault currents to earth.
   - B. Performance:
     1. Provide a grounding system, consisting of a minimum one ground rod, having a resistance not greater than 5 Ohms to ground. Provide up to 2 additional supplemental ground rods if necessary to achieve a resistance not greater than 5 Ohms to ground. If a total of 3 ground rods is needed then install as as part of a ground ring.
     2. If a ground ring is required, provide a minimum conductor length of 20 ft. placed at a minimum depth of 30 in..
   - C. Design Criteria:
     1. The grounding system of the ITS pole may be bonded below grade to the grounding systems of other nearby equipment to meet the specified grounding resistance. A minimum of one ground rod for the ITS pole is still required.
     2. Separately measure the grounding resistance of each system before bonding together below grade.
     3. Only provide UL-approved materials listed for grounding systems.
     4. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture, unless moisture is permanently excluded from the junction of such materials.
     5. Submit product data for the materials and products used to perform the work of this section.
   - D. Materials:
     1. Conductors:
        a. Bare Ground Conductor:
           1) Provide prequalified copper conductors appearing on the Material Producers List according to Item 618.
     2. Ground Compression Connectors:
        a. Provide molds, thermite packages, and other material for exothermic welding of grounding connections.
        b. Provide listed compression connectors fully rated to carry 100% of the cable rating and that meet IEEE 837. Provide compression materials from a single manufacturer througout the project.
     3. Ground Rods:
        a. Provide copper-clad steel ground rods conforming to the requirements specified in DMS 11040.
           1) Diameter: $\frac{5}{8}$ in.
           2) Length: 10 ft.
2. Installation:
   - A. Install grounding components and systems in accordance with the requirements specified in IEEE 142.
   - B. System Grounding:
     1. Ground Rods:
        a. Drive ground rods into the ground until the tops of the rods are a minimum of 18 in. below finished grade.
        b. If multiple ground rods are needed to meet the minimum resistance of 5 Ohms, space ground rods as evenly as possible, at least 6 feet apart, so conductors will be connected below grade.
     2. Conductors:
        a. Provide minimum No. 2/0 AWG ground wire for lightning protection from air terminal.
        b. Provide minimum No. 4 AWG ground wire for system and equipment grounding.
        c. Using suitable fasteners, securely attach exposed ground wires to structural supports at not more than 2 ft. intervals, where applicable.
        d. Bends in ground wires greater than 45 degrees are unacceptable.
     3. Cable Connections:
        a. Use exothermic-welded connections or listed compression connectors for conductor splices and connections between conductors and other components.
3. Testing:
   - A. Resistance Test:
     1. Test Procedure:
        a. The ground-resistance measurements of each ground Rod shall be taken.
           1) The resistance to ground shall be measured in accordance with the fall-of-potential method specified in IEEE 81 and IEEE 142.
           2) Ground-resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds.
        b. Test reports shall be prepared that indicate the location of the ground rod, the grounding system, and the resistance and soil conditions at the time the test was performed.
     2. Acceptance Criteria:
        a. The grounding system must have a resistance not greater than 5 Ohms.
        b. Do not energize any part of the electrical distribution system prior to the resistance testing of that system's ground rods and grounding system, and submission of the test results for approval.
     3. Inspections:
        a. Prepare and submit as-built record drawings of the grounding system as installed and test reports for approval.



Grounding System

Not to Scale



Grounding System with Pole Mounted Cabinet

Not to Scale

Reference Notes:

1. Bond anchor bolts to rebar with #2/0 AWG jumper and two mechanical connectors or by bending No. 3 bar on bottom template as shown and wire tightly with ten turns of No. 10 wire or one mechanical connector. Mechanical connectors shall be UL Listed for concrete encasement.
2. Cut PVC approximately 1 in. above concrete and install bell or bushing. Align conduit as close as possible to point of attachment to base plate to minimize bends in #2/0 wire.
3. Bond grounding conductors via cadweld or mechanical connector, rated for size and number of conductors.
4. Provide and install a grounding type bushing on metal conduit terminations. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor.

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE GROUNDING DETAILS

ITS(19)-17

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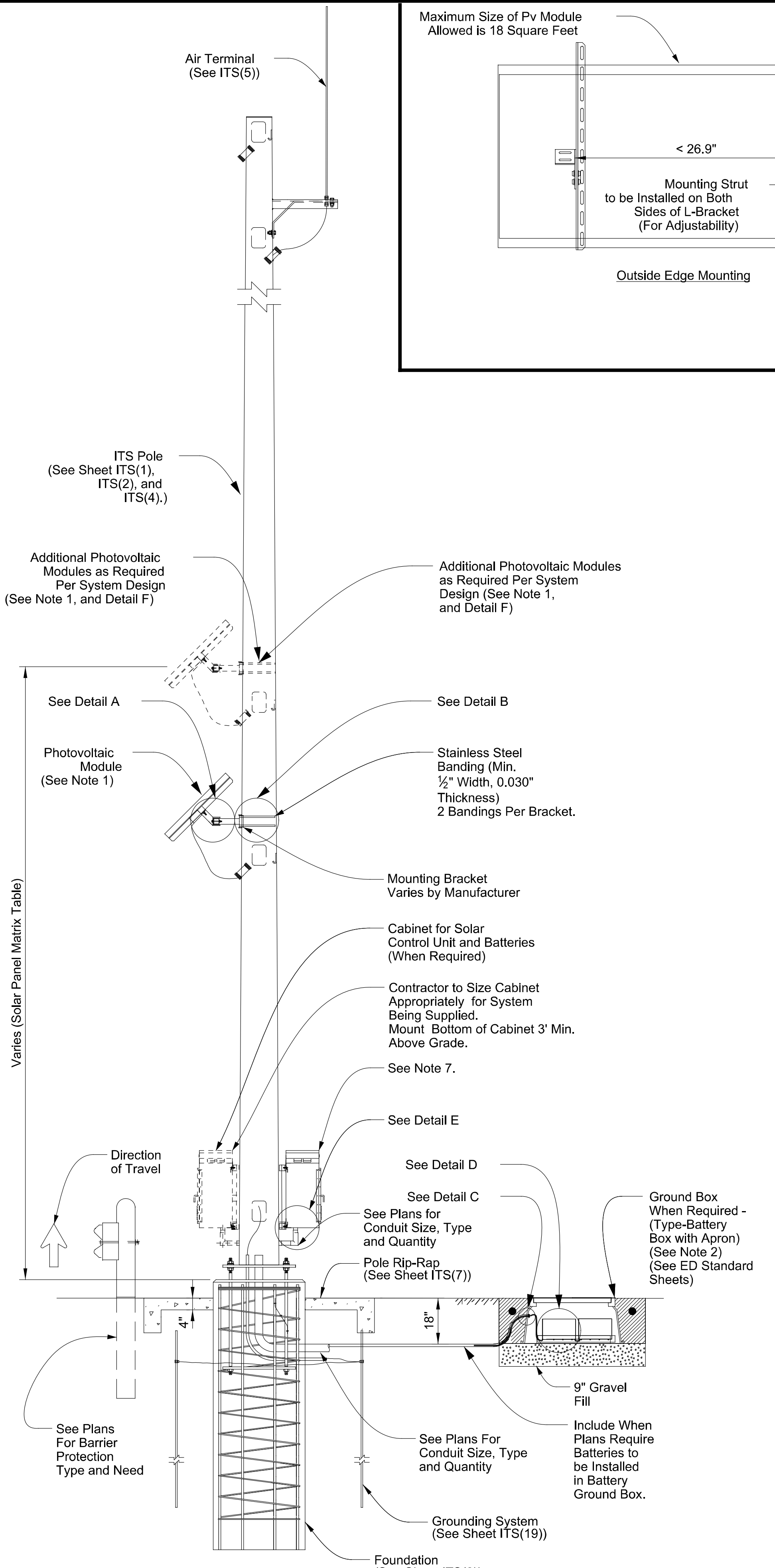

ITS Pole with Cabinet
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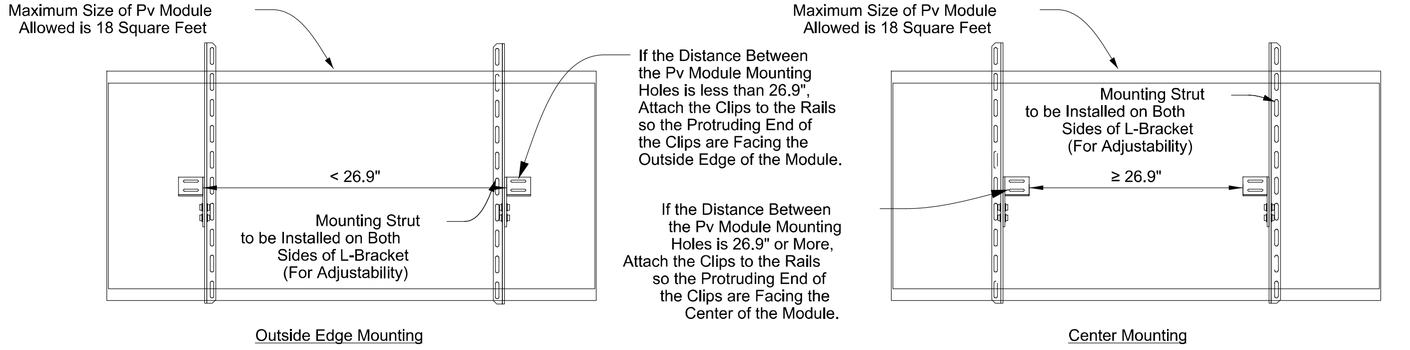
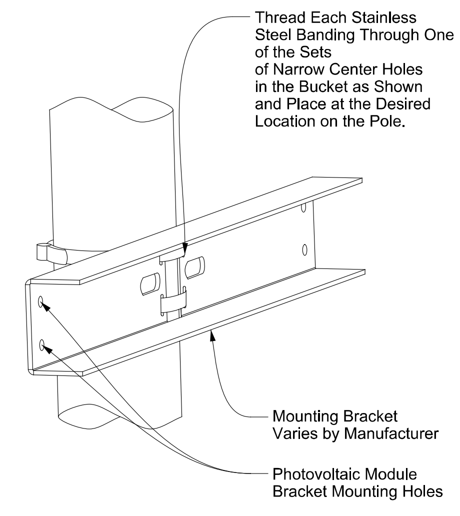


Detail A



Detail B

Explanation of ITS Solar Power System Descriptive Code

SPS X (X W) X W (X AH) X xX A (X) — fields 1 through 7

1. Construction Application
   INS = Install
   REM = Remove
   REL = Relocate
2. Total System Load Capacity (Watts)
3. Total Solar Panel Capacity (Watts)
4. Total Battery Capacity (Amp Hours)
5. No. of Charge Controllers (EA) x
6. Amperage Capacity of Each (Amps)
7. Cabinet Installation Type
   1 = ITS Pole Mounted Cabinet (Type 1, 2, or 3)
   2 = Manufacturer Supplied on Pedestal Pole
   3 = Manufacturer Supplied on Timber Pole

Example: SPS INS (60W) 1440W (750AH) 3x50A (1)

Solar Panel Mounting Table

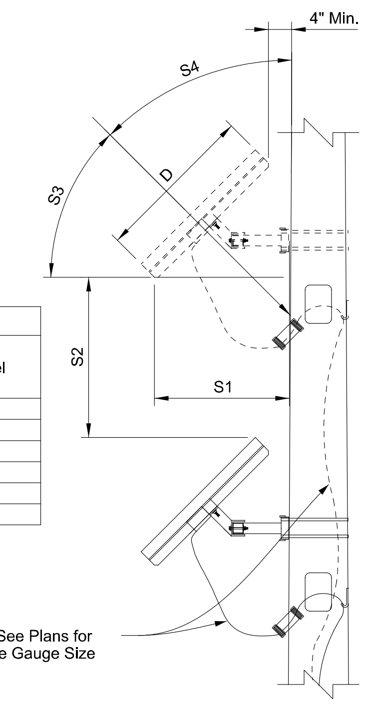
Dimension	Distance/Angle
S1	= D x (sin (S3)) + 4 (in.)
S2	= D x (sin(S3)) x (tan(S3)) (in.)
S3	= 90 deg. - S4 (zenith angle)
S4	Variable

S1 = Panel offset
S2 = Optimum vertical clearance between panels (in.)
S3 = Tilt angle (degrees), also sun elevation from horizon
S4 = Sun zenith angle (degrees) oriented for maximum exposure per National Renewable Energy Laboratory (NREL)
D = Depth of panel (in.)

Solar Panel Matrix Table *

Wind Zone (MPH)	Pole Height (FT)	Stiffeners	Max. No. of Solar Panels	Max. Height of Upper Solar Panel (FT)
90 or 110	20	Not Included	1	15
90 or 110	30-60	Not Included	2	20
90 or 110	30	Included	3	25
90 or 110	40-60	Included	4	30
130	20-60	Not Included	1	15
130	30-60	Included	3	25

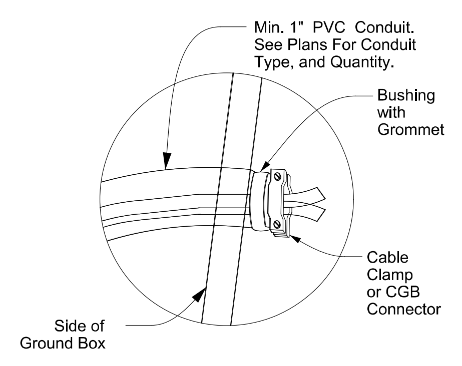
* - ITS pole height less than 20 ft. have not been designed to support solar panels



Detail F

General Notes:

1. Orient photovoltaic module (Pv) for optimum exposure to sunlight (face to the south) per National Renewable Energy Laboratory (NREL) guidelines. Prior to installation, check the location to ensure there is no overhead obstruction that would block the Photovoltaic Module from receiving full sunlight. Unless specified elsewhere, mount a minimum of 14' above grade.
2. When required for batteries to be installed in a battery ground box, place the batteries on a 3/16" thick plastic sheet and connect batteries together. Place a plastic cover (battery bell jar) over the top of each battery and secure the battery bell jar to the battery with a strap. The batteries, bell jars, straps and 3/16" thick plastic sheet will be subsidiary to special specification "ITS Solar Power System."
3. When required for batteries to be installed in an pole mounted cabinet, wire batteries according to manufacturer's recommendations. Provide the number of batteries as required by the manufacturer. Stack the batteries in the cabinet on shelves with 1" vertical separation.
4. See Electrical Details (ED) standard sheets for additional requirements regarding the installation of ground boxes/battery boxes, and conduit.
5. Use materials specifically designed for attaching cabinets, photovoltaic modules, etc., to poles.
6. See special specification "ITS Solar Power System" for further requirements.
7. When provisioned in the plans, solar controller and batteries are permitted to be installed along with ITS equipment inside ITS pole mounted cabinet for new installations. For existing conditions, solar controller and batteries are permitted if spare capacity exists. Engineer to verify existing cabinet type and spare capacity before sizing solar power system.
8. Pv = Photovoltaic
9. See sheets ITS(1), ITS(2), and ITS(4) "ITS Pole Details" for further information regarding the ITS pole assembly.
10. Use hardware specifically designed for attaching equipment (i.e., cabinet, photovoltaic module, etc.) to pole as recommended by equipment manufacturer. Provide mounting details for approval.



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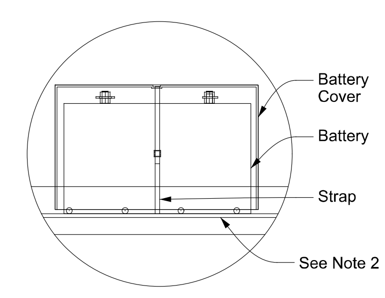

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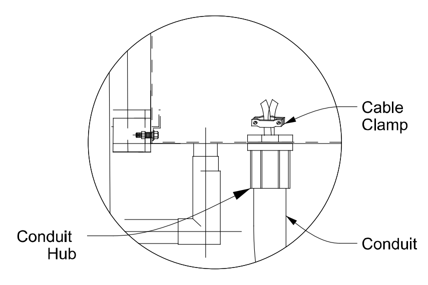

Detail E

Texas Department of Transportation
Traffic Operations Division Standard

ITS SOLAR POWER SYSTEM POLE MOUNTING DETAILS

ITS(24)-15

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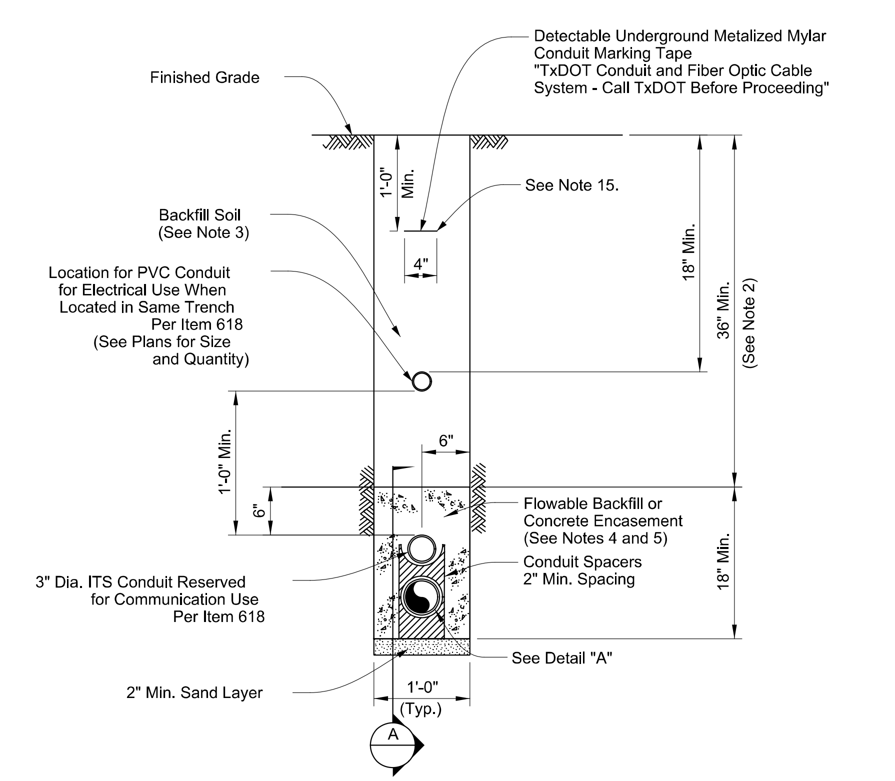
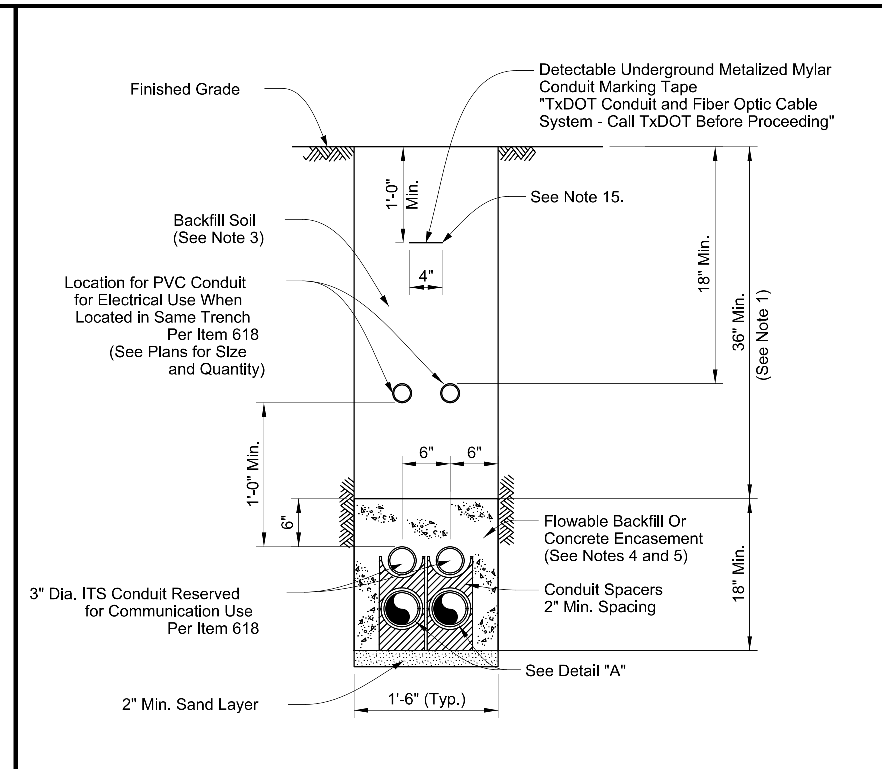
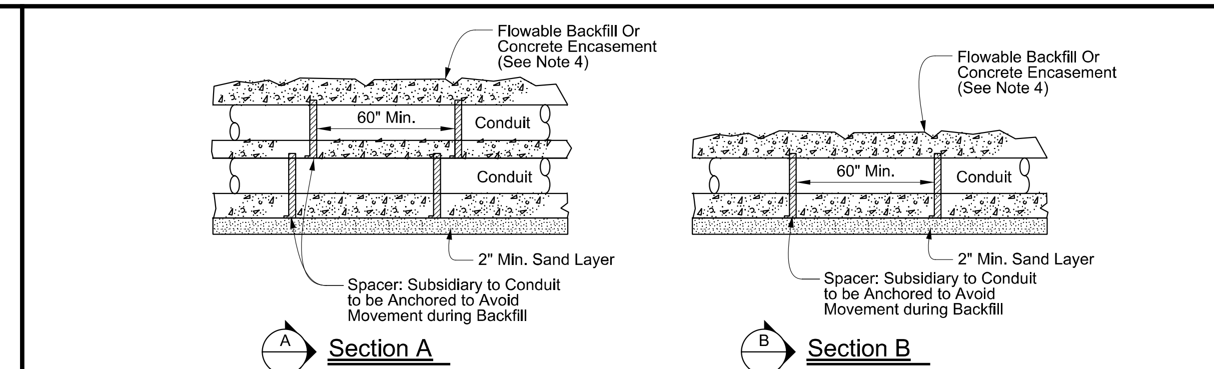
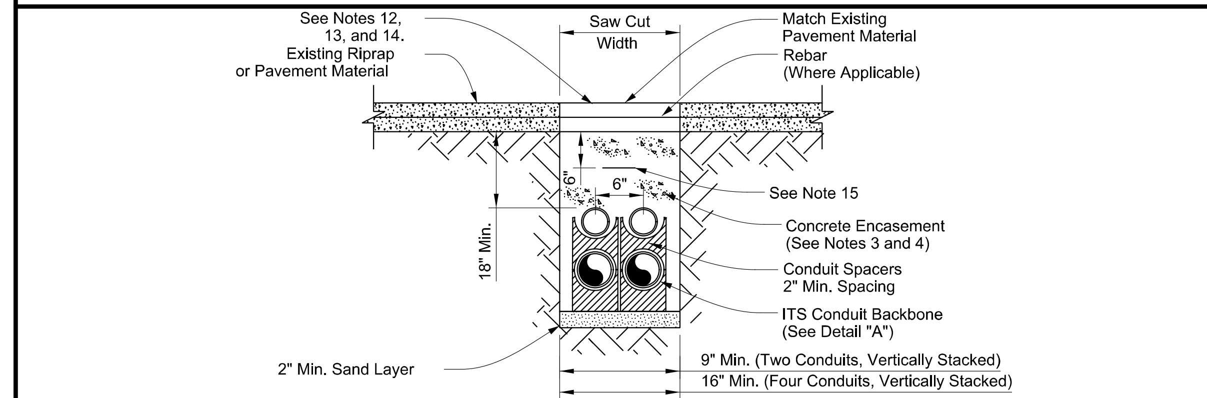


ITS Conduit Backbone Trench Vertical Spacing
Two Conduit System

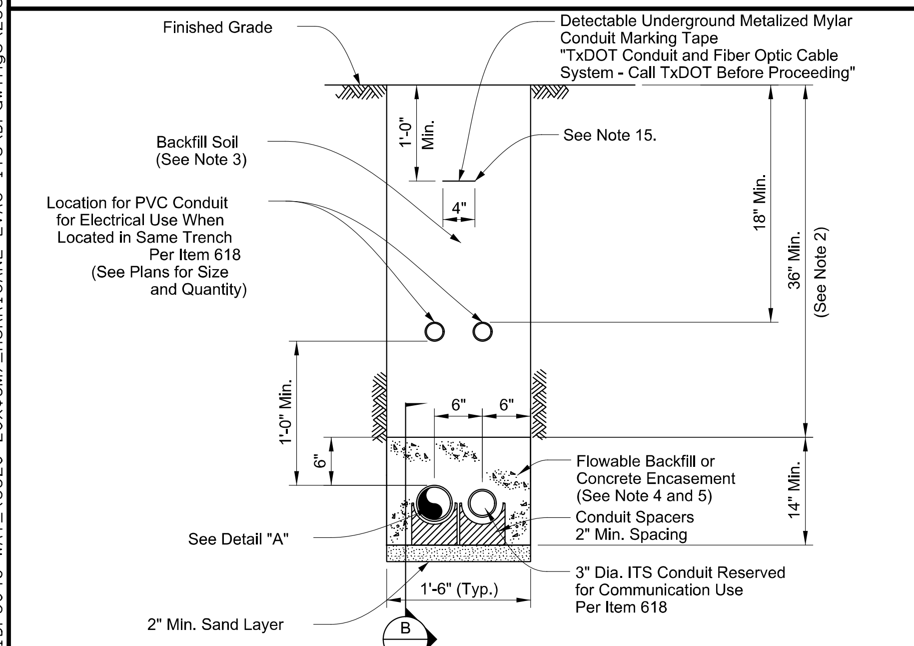


ITS Conduit Backbone Trench Vertical Spacing
Four Conduit System

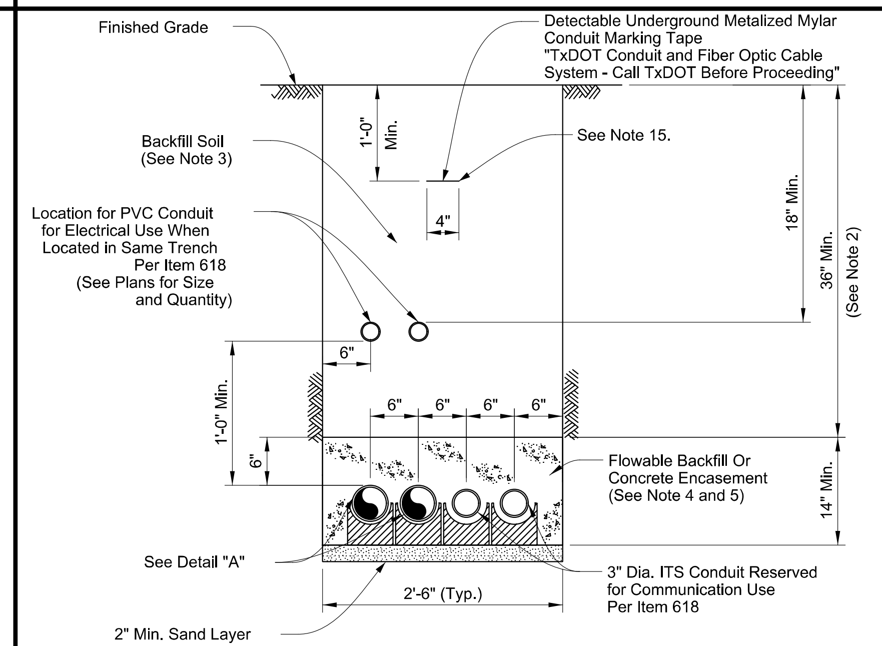




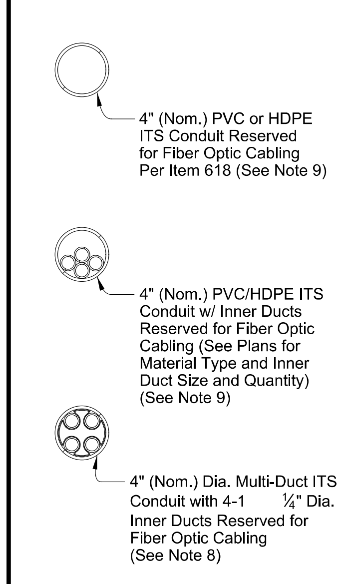
Open Cut Trenching Details



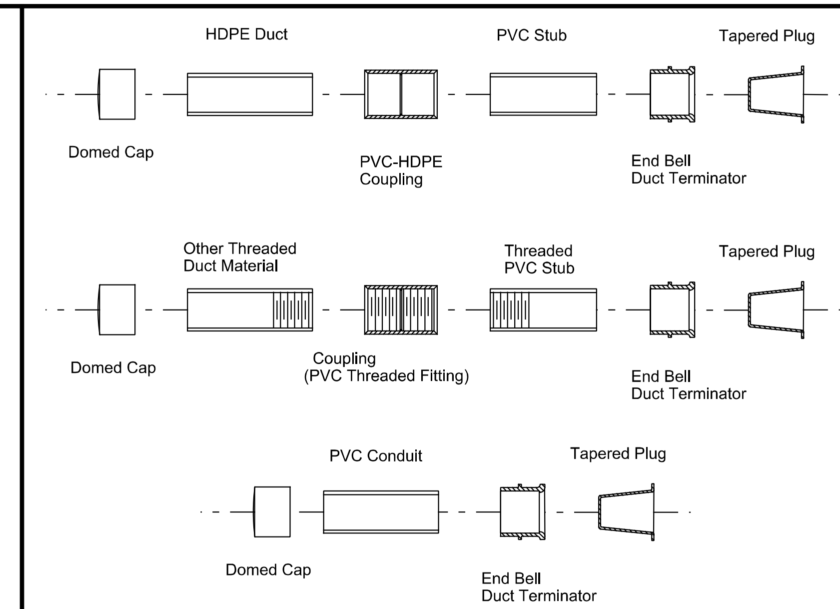
ITS Conduit Backbone Trench Horizontal Spacing (Alternative)
Two Conduit System



ITS Conduit Backbone Trench Horizontal Spacing (Alternative)
Four Conduit System



Detail "A"
Conduit Types
(See Plans for Type and Quantity)



Typical Conduit Fitting Combinations
2 Conduit and Single Conduit Configuration

General Notes:

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

Sheet Details
Not to Scale

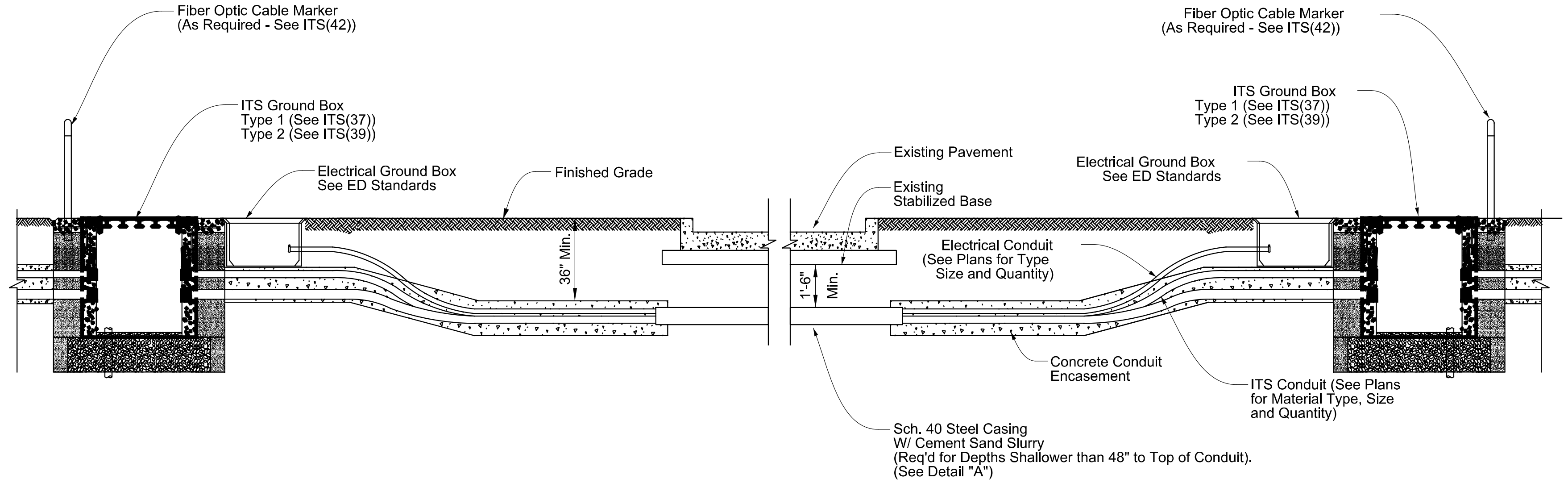
Texas Department of Transportation

Traffic Operations Division Standard

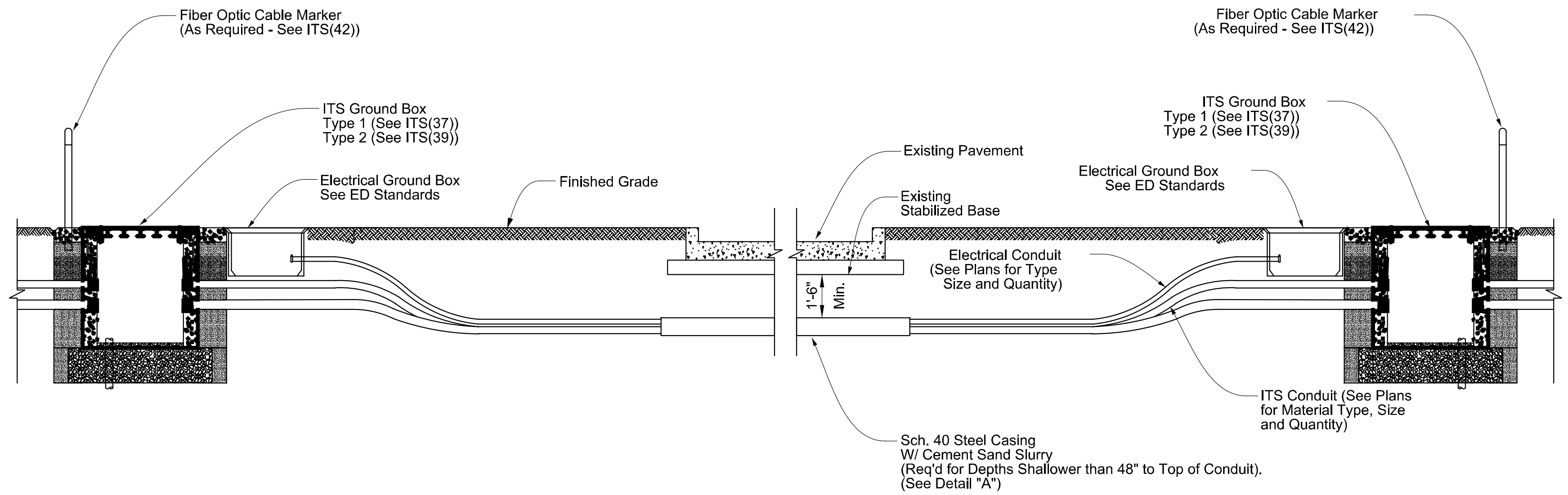
ITS CONDUIT TRENCH DETAILS

ITS(27)-16

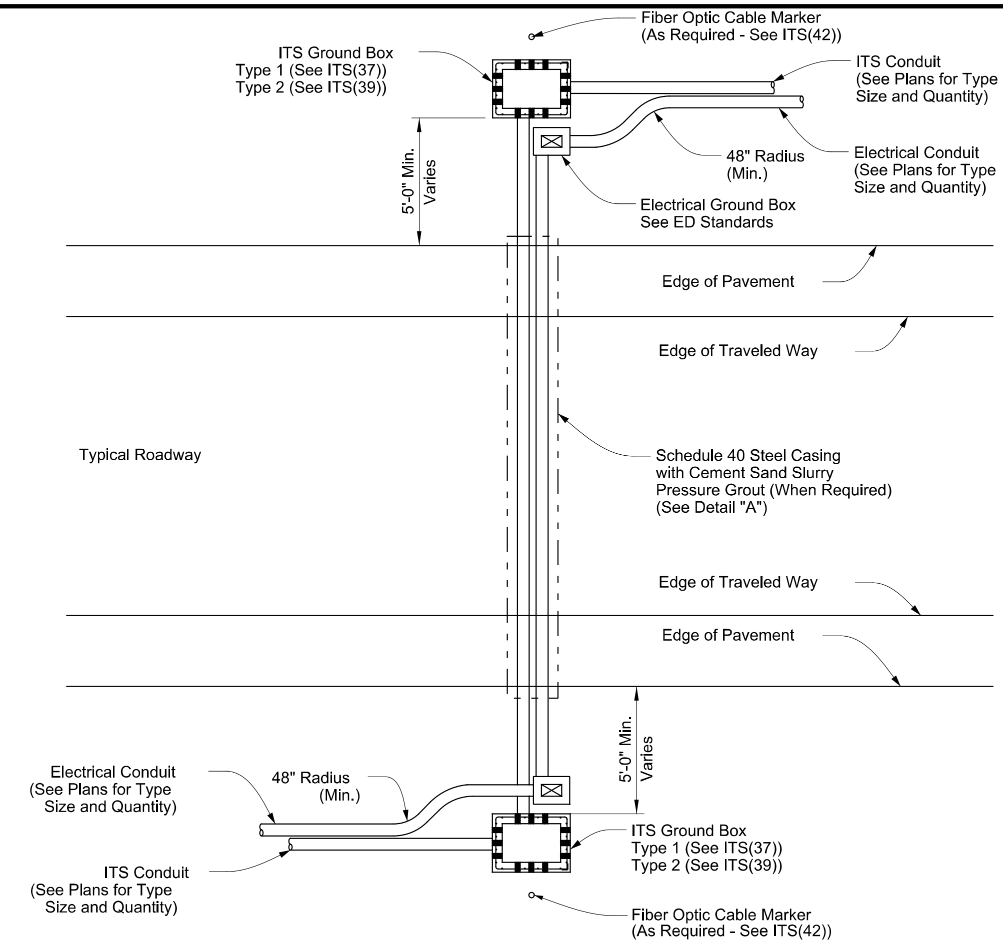
FILE: ITS(27)-16.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TXDOT FEBRUARY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	00	200	VARIOUS
	DIST		COUNTY	SHEET NO.
	SAT		BEXAR	52



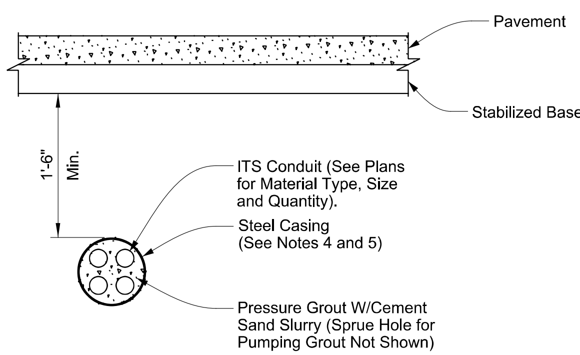
Typical Conduit Installation Jacking
or Boring Beneath Existing Roadway



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



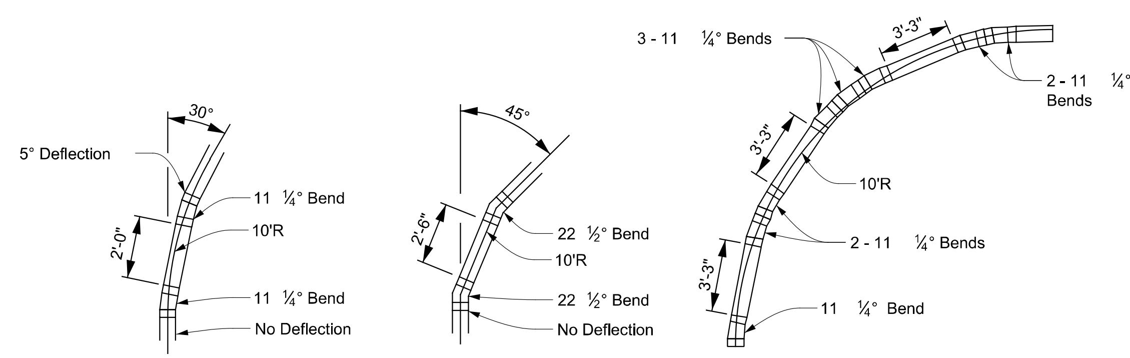
Bore Under Pavement



Steel Casing Detail "A"

General Notes:

1. Typical conduit installation details for jacking or boring beneath existing roadway is diagrammatic in nature. Roadway cross-slopes may vary for each crossing.
2. Jack or bore in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box" except for measurement and payment.
3. Furnishing and installation of pressure grouting will not be paid for directly but considered incidental to Special Specification "ITS Multi-Duct Conduit" or Item 618, "Conduit."
4. When boring under pavement shallower than 48 inches from finished grade to top of conduit, provide Schedule 40 steel casing under pavement to encase the conduit system. Provide steel casing of a size to accommodate ITS conduit and electrical conduit as shown in the plans. Provide a minimum 20 percent void space around all conduits. Steel casing will not be paid for directly but considered incidental to Special Specification, "ITS Multi-Duct Conduit" or Item 618, "Conduit."
5. When a depth greater than 48 inches can be achieved from finished grade to top of conduit, provide Schedule 80 PVC. No steel casing required unless otherwise directed.
6. Ensure all conduit bends are in conformance with the latest edition of the National Electrical Code.
7. Provide GPS coordinate points to the District for all ground boxes installed, and shifts or deviations of the conduit alignment from the plans required to avoid obstructions or utilities. Take GPS coordinate points at the start of the transition, at the point of curvature, and at the end of the transition at the point of tangency. Document the turnout radius and installed depth. Provide GPS coordinate points in NAD83 coordinate system and be accurate to 5 feet.



30° Turnout Detail   45° Turnout Detail   90° Turnout Detail

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

Sheet Details
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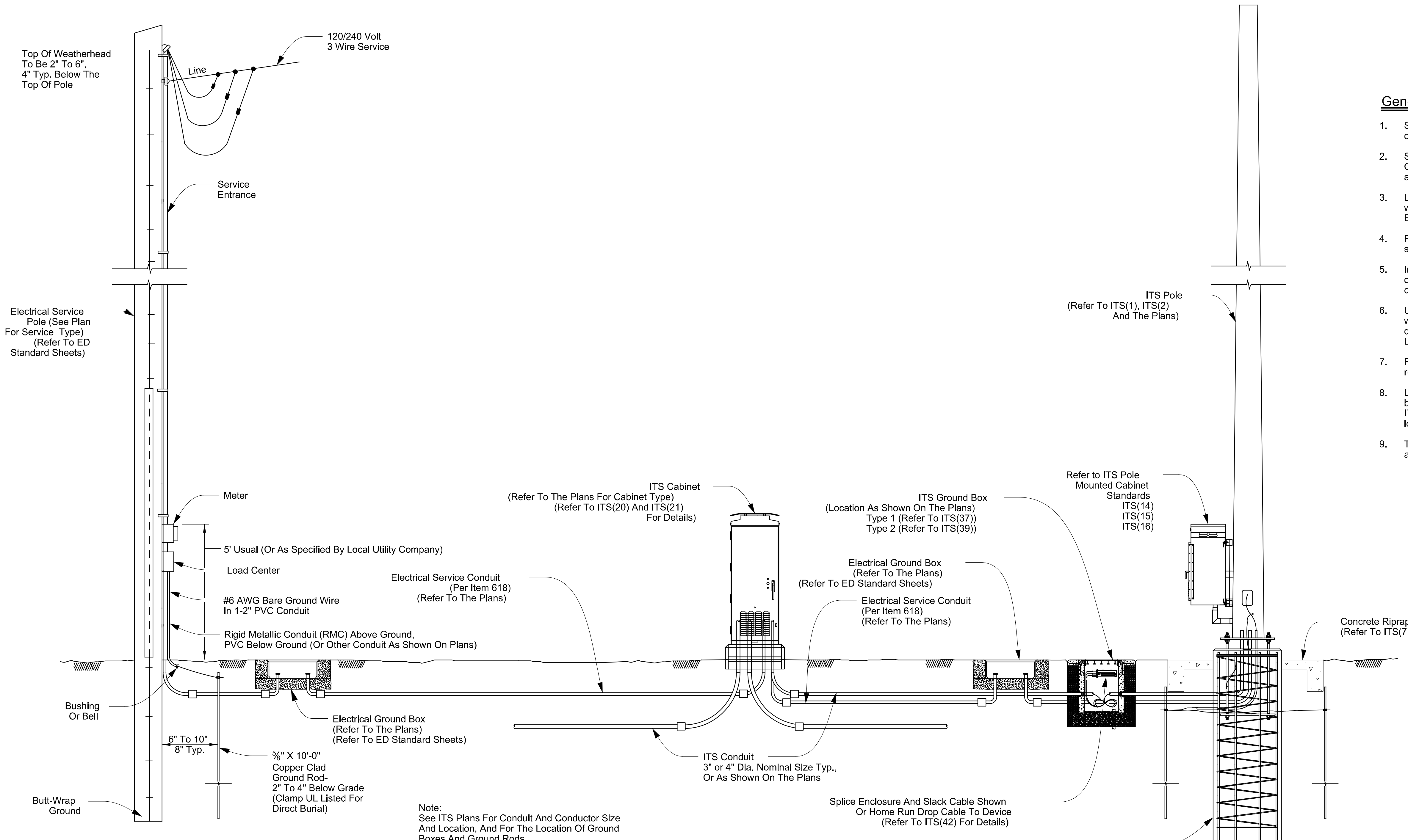
SHEET 2 OF 2

Texas Department of Transportation — Traffic Operations Division Standard

ITS CONDUIT BORE AND STEEL CASING DETAILS

ITS(28)-16

FILE: ITS(28)-16.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TXDOT FEBRUARY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	00	200	VARIOUS
	DIST		COUNTY	SHEET NO.
	SAT		BEXAR	53



Typical ITS Device Site Layout

General Notes:

1. Seal all ITS communications conduits with waterproof duct plugs and seals.
2. Seal ends of all conduit entries into ITS cabinets with Oakum or other as approved by the District representative and pack with duct sealant.
3. Locate ground boxes for electrical and ITS communications within 5'-0" of cabinet enclosure, or as directed by the Engineer.
4. Refer to ED standard sheets for additional notes regarding electrical service.
5. Install service pole ground rod at alternate location when directed by the engineer. Maintain a minimum of 8'-0" in contact with the earth.
6. Utilize liquidtight flexible metal conduit (LFMC), as required when meter and service enclosure are mounted 90 to 180 degrees to each other. Refer to ED standard sheets for details on LFMC use.
7. Refer to ITS(21), ITS(37) and ITS(39) for details regarding conduit depth and entry into ITS ground boxes.
8. Lock all enclosures and bolt all ground box covers before power is applied to the circuit. Refer to the ITS cabinet references indicated on this sheet for cabinet lock requirements.
9. The detail shown is diagrammatic and is intended to represent a typical layout from electrical service to ITS devices.

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Sheet Details
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Texas Department of Transportation

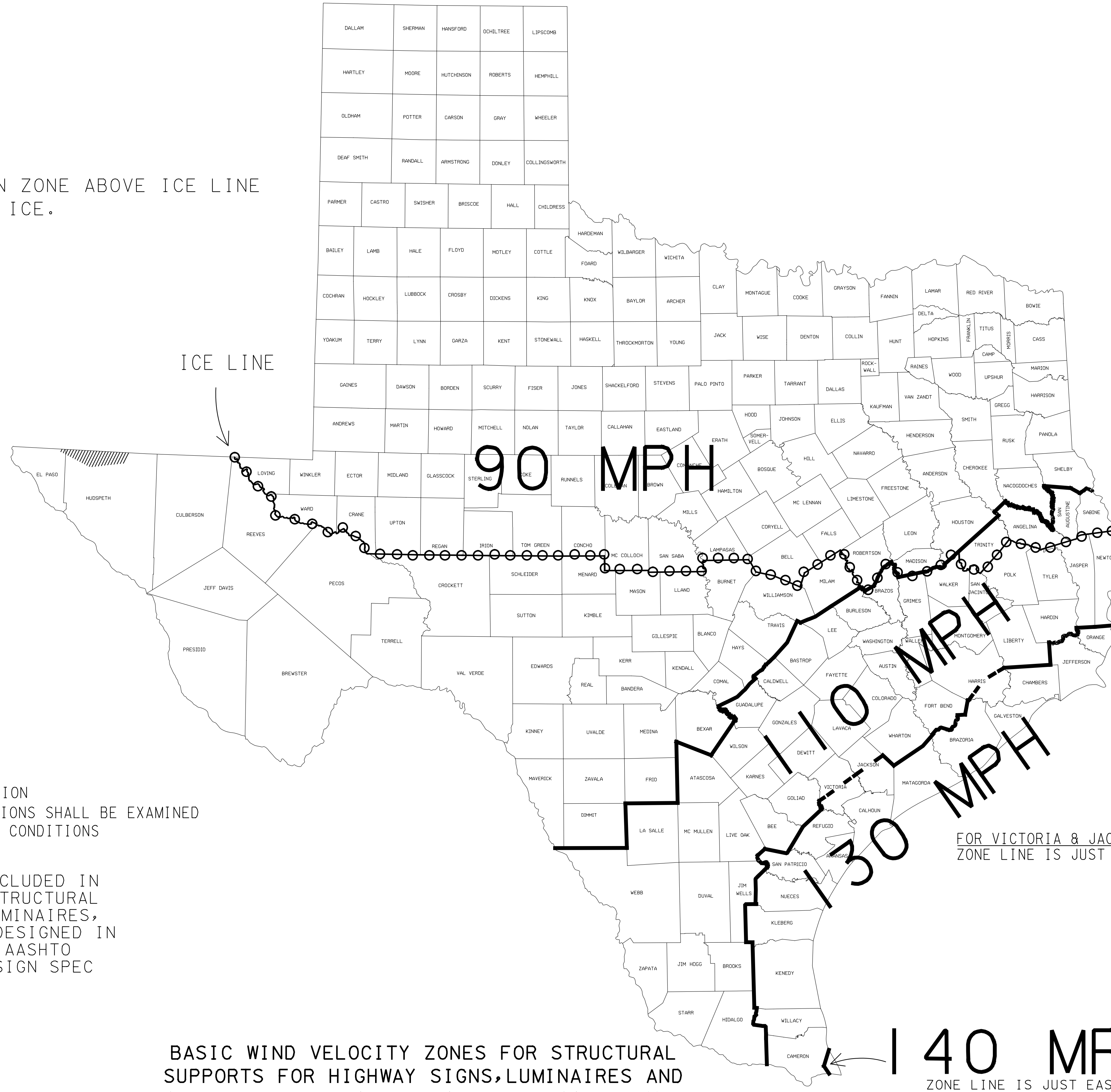
Traffic Operations Division Standard

TYPICAL ITS DEVICE SITE LAYOUT

ITS(36)-16

FILE: ITS(36)-16.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TXDOT FEBRUARY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	00	200	VARIOUS
	DIST	COUNTY		SHEET NO.
	SAT	BEXAR		54

NOTE: STRUCTURES IN ZONE ABOVE ICE LINE TO BE DESIGNED FOR ICE.



FOR HARRIS CO. ONLY
ZONE LINE IS JUST NORTH OF US 90, AROUND ON THE NORTH, WEST AND SOUTH SIDES OF IH 610 AND DOWN THE WEST SIDE OF SH 288.

FOR VICTORIA & JACKSON COUNTIES ONLY
ZONE LINE IS JUST SOUTH OF US 59.

SPECIAL WIND REGION
SPECIAL WIND REGIONS SHALL BE EXAMINED FOR UNUSUAL WIND CONDITIONS

THIS SHEET IS TO BE INCLUDED IN ALL P.S.&E.'S HAVING STRUCTURAL SUPPORTS FOR SIGNS, LUMINAIRES, AND/OR TRAFFIC SIGNALS DESIGNED IN ACCORDANCE WITH THE AASHTO 2001 THRU 2013 LTS DESIGN SPEC

140 MPH
ZONE LINE IS JUST EAST OF BOTH CO 1847 & FM 511

BASIC WIND VELOCITY ZONES FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS DESIGNED IN ACCORDANCE WITH THE AASHTO 2001 THRU 2013 LTS DESIGN SPEC

VALUES ARE NOMINAL DESIGN 3-SEC GUST WIND SPEEDS IN MPH AT 33 FT ABOVE GROUND FOR EXPOSURE C CATEGORY. (50-YEAR MEAN RECURRENCE INTERVAL)

NOTE: AASHTO 2001 THRU 2013 LTS DESIGN SPEC =AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS, 4TH THRU 6TH EDITION

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Texas Department of Transportation — Traffic Operations Division Standard

WIND VELOCITY AND ICE ZONES (AASHTO 2001-2013 LTS DESIGN SPEC)

WV & IZ(LTS2013)-14

FILE: LTS2013.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TXDOT AUGUST 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	00	200	VARIOUS
	DIST		COUNTY	SHEET NO.
	SAT		BEXAR	55

30B

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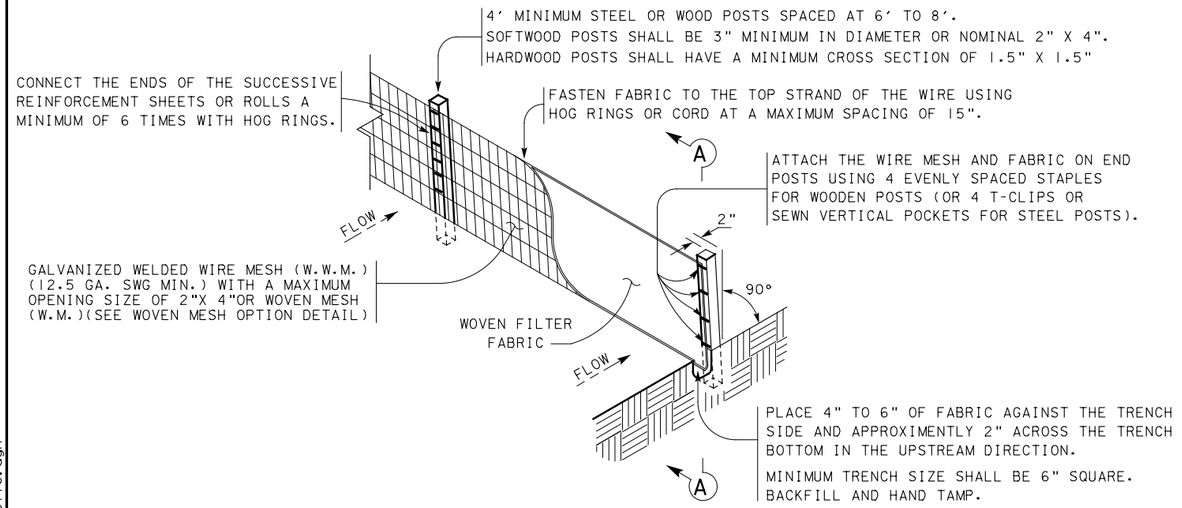
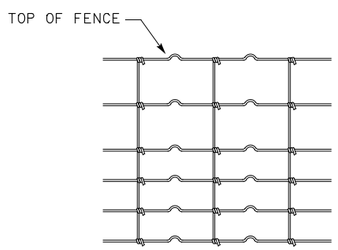
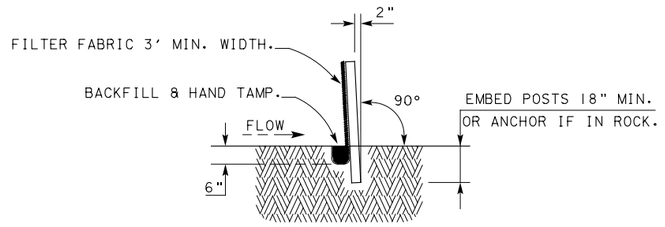


TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

GALVANIZED HINGE JOINT KNOT WOVEN MESH (12.5 GA.SWG MIN.) REQUIRES A MINIMUM OF FIVE HORIZONTAL WIRES SPACED AT A MAXIMUM OF 12 INCHES APART AND ALL VERTICAL WIRES SPACED AT A MAXIMUM OF 12 INCHES APART.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A SEDIMENT CONTROL FENCE MAY BE CONSTRUCTED NEAR THE DOWNSTREAM PERIMETER OF A DISTURBED AREA ALONG A CONTOUR TO INTERCEPT SEDIMENT FROM OVERLAND RUNOFF. A 2 YEAR STORM FREQUENCY MAY BE USED TO CALCULATE THE FLOW RATE TO BE FILTERED.

SEDIMENT CONTROL FENCE SHOULD BE SIZED TO FILTER A MAXIMUM FLOW THROUGH RATE OF 100 GPM/FT^2. SEDIMENT CONTROL FENCE IS NOT RECOMMENDED TO CONTROL EROSION FROM A DRAINAGE AREA LARGER THAN 2 ACRES.

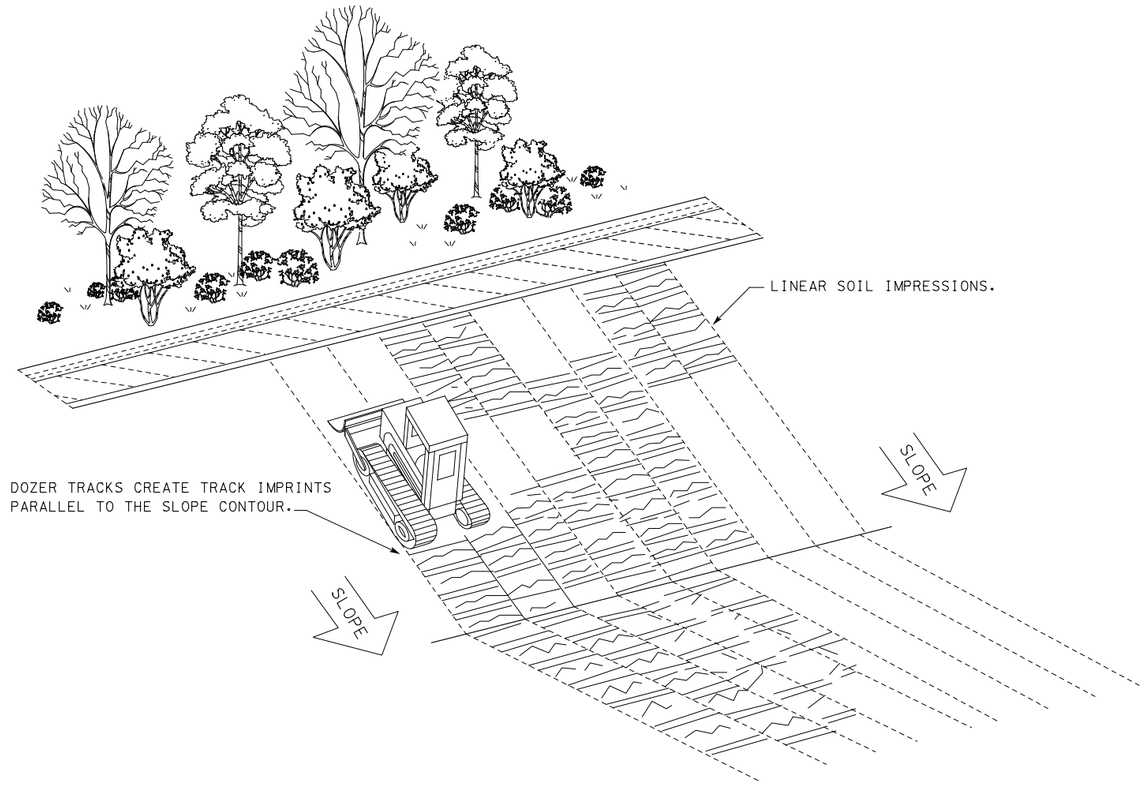
LEGEND

SEDIMENT CONTROL FENCE

SCF

GENERAL NOTES

1. VERTICAL TRACKING IS REQUIRED ON PROJECTS WHERE SOIL DISTRIBUTING ACTIVITIES HAVE OCCURRED UNLESS OTHERWISE APPROVED.
2. PERFORM VERTICAL TRACKING ON SLOPES TO TEMPORARILY STABILIZE SOIL.
3. PROVIDE EQUIPMENT WITH A TRACK UNDERCARRIAGE CAPABLE OF PRODUCING LINEAR SOIL IMPRESSIONS MEASURING A MINIMUM OF 12" IN LENGTH BY 2" TO 4" IN WIDTH BY 1/2" TO 2" IN DEPTH.
4. DO NOT EXCEED 12" BETWEEN TRACK IMPRESSIONS.
5. INSTALL CONTINOUS LINEAR TRACK IMPRESSIONS WHERE THE MINIMUM 12" LENGTH IMPRESSIONS ARE PERPENDICULAR TO THE SLOPE OR DIRECTION OF WATER FLOW.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: EC116	DN:TXDOT		CK:KM		DW:VP	DN/CK:LS
©TXDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0915	00	200		VARIOUS	
	DIST		COUNTY			SHEET NO.
	SAT		BEXAR			56

Note 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 it's relative position.

A. GENERAL SITE DATA

1. PROJECT LIMITS: *Same as stated on the Title Sheet*

2. PROJECT SITE MAPS:

- * *Project Latitude SEE TITLE SHEET Project Longitude SEE TITLE SHEET*
- * *Project Location Map: Shown on Title Sheet*
- * *Drainage Patterns: Shown on Drainage Area Maps (N/A)*
- * *Approx. Slopes Anticipated After Major Gradings and Areas of Soil Disturbance: Shown on Typical Sections (N/A)*
- * *Major Controls and Locations of Stabilization Practices: Shown on SW3P Sheets (AS SHOWN HERE)*
- * *Project Specific Locations: Off-site waste, borrow, or storage areas are not part of this SW3P.*
- * *Surface Waters and Discharge Locations: Shown on Drainage and Culvert Layout Sheets (N/A)*

3. PROJECT DESCRIPTION: *Same description as stated on Title Sheet*

- * *Joint-bid utilities are covered by this SW3P (N/A)*
  Non-Joint Bid Utilities are not part of this SW3P.

4. FOR MAJOR SOIL DISTURBING ACTIVITIES SEQUENCE OF EVENTS:

1. Install controls down-slope of work area and initiate inspection and maintenance activities.

2. Begin phased construction with interim stabilization practices. Adjust erosion and sedimentation controls during construction to meet requirements and changing conditions and as directed/approved by the Engineer.

3. Major soil disturbing activities may include but are not limited to: right-of-way preparation, cut and/or fill to improve roadway profile, final grading and placement of topsoil and the following (if marked):

- ___ *Placement of road base*
- ___ *Exstensive ditch grading*
- ___ *Upgrading or replacing culverts or bridges*
- ___ *Temporary detour road(s)*
- ___ *Other:* _____

5. EXISTING AND PROPOSED CONDITIONS:

Description of existing vegetative cover: GRASS AND SHRUBS
Percentage of existing vegetative cover: 70%
Existing vegetative cover: (mark one)
___ *Thick or uniformly established*
_X_ *Thin and Patchy*
___ *None or minimal cover*
Description of soils: UNKNOWN
Site Acreage: > 1.00 *Acreage disturbed: > 1.00*
Site runoff coefficient (pre-construction): 0.20 *Site runoff coefficient (post-construction): 0.20*

6. RECEIVING WATERS: *(Mark all that apply)*

_X_ *A classified stream does not pass through project.*
___ *A classified stream passes through project. Name* _____ *Segment Number* _____
Name of receiving waters that will receive discharges from disturbed areas of the project: _____

Site is in a Municipal Separate Storm Sewer System (MS4).
MS4 Operator (name): _____

B. BEST MANAGEMENT PRACTICES

General timing or sequence for implementation of BMPs shall be as required and/or as directed/approved by the Engineer to provide adequate controls. BMPs shown on plan sheets are to be considered "proposed" unless/until install date is shown. BMPs are to reduce sediments from road construction activities.

1. SOIL STABILIZATION PRACTICES: (SELECT T = TEMPORARY OR P = PERMANENT, AS APPLICABLE)

___ SEEDING
___ MULCHING (HAY OR STRAW)
___ BUFFER ZONES
___ PLANTING
___ COMPOST/MULCH FILTER BERM
___ SODDING
___ PRESERVATION OF NATURAL RESOURCES
___ FLEXIBLE CHANNEL LINER
___ RIGID CHANNEL LINER
P___ SOIL RETENTION BLANKET
___ COMPOST MANUFACTURED TOPSOIL
___ OTHER: (SPECIFY PRACTICE)

2. STRUCTURAL PRACTICES: (SELECT T = TEMPORARY OR P = PERMANENT, AS APPLICABLE)

T___ SILT FENCES
___ HAY BALES
___ ROCK FILTER DAMS
___ DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
___ DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
___ DIVERSION DIKE AND SWALE COMBINATIONS
___ PIPE SLOPE DRAINS
___ PAVED FLUMES
___ ROCK BEDDING AT CONSTRUCTION EXIT
___ TIMBER MATTING AT CONSTRUCTION EXIT
___ CHANNEL LINERS
T___ SEDIMENT TRAPS
___ SEDIMENT BASINS
___ STORM INLET SEDIMENT TRAP
___ STONE OUTLET STRUCTURES
___ CURBS AND GUTTERS
___ STORM SEWERS
___ VELOCITY CONTROL DEVICES
___ OTHER: *(Specify Practice)*

3. STORM WATER MANAGEMENT:

The proposed facility was designed in consideration of hydraulic design standards to convey stormwater in a manner that is protective of public safety and property. The control of erosion from the facility is inherent to the design. Additional factors affecting post-construction stormwater at the project location include: (mark all that apply)

___ *Existing or new vegetation provides natural filtration.*
___ *The design includes provisions for permanent erosion controls provided by strategically placed pervious and impervious surfaces.*
___ *Project includes permanent sedimentation controls (other than grass).*
___ *Velocities do not require dissipation devices.*
___ *Velocity-dissipation devices included in the design.*
___ *Other :* _____
_____

4. NON-STORM WATER DISCHARGES:

Off-site discharges are prohibited except as follows:

1. Discharges from fire fighting activities and/or fire hydrant flushings.
2. Vehicle, external building, and pavement wash water where detergents and soaps are not used and where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed).
3. Plain water used to control dust.
4. Plain water originating from potable water sources.
5. Uncontaminated groundwater, spring water or accumulated stormwater.
6. Foundation or footing drains where flows are not contaminated with process materials such as solvents.
7. Other: _____

Concrete truck wash water discharges on the site should be prohibited or minimized. If allowed by the Engineer, they must be managed in a manner so as not to contaminate surface water. They must not be located in areas of concentrated flow. Concrete truck wash-out locations must be shown on the SW3P Layout and included in the inspections.

Hazardous material spill/leak shall be prevented or minimized. At a minimum, this includes asphalt products, fuels, oils, lubricants, solvents, paints, acids, concrete curing compounds and chemical additives for soil stabilization. BMPs shall be implemented to the storage areas of these products. All spills must be cleaned and disposed properly and reported to the Engineer. Report any release at or above the reportable quantity during a 24 hour period to the National Response Center at 1-800-424-8802.

C. OTHER REQUIREMENTS & PRACTICES

1. MAINTENANCE:

All erosion and sediment controls shall be maintained in good working order. If a repair is necessary, it shall be performed before the next anticipated storm event but no later than 7 calendar days after the surrounding exposed ground has dried sufficiently to prevent further damage from equipment. If maintenance prior to the next anticipated storm event is impracticable, maintenance must be scheduled and accomplished as soon as practicable. Disturbed areas on which construction activities have ceased, temporarily or permanently, shall be stabilized within 14 calendar days unless they are scheduled to and do resume within 21 calendar days. The areas adjacent to creeks and drainageways shall have priority followed by protecting storm sewer inlets.

2. INSPECTION:

For areas of the construction site that have not been finally stabilized, areas used for storage of materials, structural control measures, and locations where vehicles enter or exit the site, personnel provided by the permittee and familiar with the SW3P must inspect disturbed areas at least once every seven (7) calendar days. An inspection and Maintenance Report shall be prepared for each inspection and the controls shall be revised on the SW3P within seven (7) calendar days following the inspection.

3. WASTE MATERIALS:

All non-hazardous municipal waste materials such as litter, rubbish, trash and garbage located on or originating from the project shall be collected and stored in a securely lidded metal dumpster, provided by the Contractor. The dumpster shall be emptied as necessary or as required by local regulation and the trash shall be hauled to a permitted disposal facility. The burying of non-hazardous municipal waste on the project shall not be permitted. Construction material waste sites, stockpiles and haul roads shall be constructed to minimize and control the amount of sediment that may enter receiving waters. Construction material waste sites shall not be located in any wetland, water body or stream bed. Construction staging areas and vehicle maintenance areas shall be constructed in a manner to minimize the runoff of pollutants.

4. OFFSITE VEHICLE TRACKING:

Off-site vehicle tracking of sediments and the generation of dust must be minimized. Excess sediments on road shall be removed on a regular basis as directed/approved by the Engineer.

5. OTHER:

See the EPIC sheet for additional environmental information.

OTHON CONSULTING ENGINEERS
F-1471 · HOUSTON · DALLAS
2140 Lake Park Boulevard|Richardson, Texas 75080
P: 214.340.7344| F: 214.221.7411

 Texas Department of Transportation

STATE OF TEXAS
SRINIVAS M. SANGINENI
85575
LICENSED
PROFESSIONAL ENGINEER

Srinivas M. Sangineni, P.E. 2/17/2021
SIGNATURE OF REGISTRANT & DATE

REVISION DATE: 10/12

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
6	(SEE TITLE SHEET)		VARIOUS
STATE	DISTRICT	COUNTY	
TEXAS	SAT	BEXAR	
CONTROL	SECTION	JOB	SHEET NO.
0915	00	200	57

DISCLAIMER:
THE USE OF THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. TXDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TEXAS POLLUTANT DISCHARGE ELIMINATION SYSTEM (TPDES) TXR 150000, STORMWATER DISCHARGE PERMIT OR CONSTRUCTION GENERAL PERMIT (CGP) REQUIRED FOR PROJECTS WITH 1 OR MORE ACRES DISTRUBED SOIL. PROJECTS WITH ANY DISTURBED SOIL MUST PROTECT FOR EROSION AND SEDIMENTATION IN ACCORDANCE WITH ITEM 506.

☒ NO ACTION REQUIRED ☐ REQUIRED ACTION

ACTION NO.

1. PREVENT STORMWATER POLLUTION BY CONTROLLING EROSION AND SEDIMENTATION IN ACCORDANCE WITH TPDES PERMIT TXR 150000.
2. COMPLY WITH THE STORM WATER POLLUTION PREVENTION PLAN (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 TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ), ENVIRONMENTAL PROTECTION AGENCY (EPA) OR OTHER INSPECTORS.
4. WHEN CONTRACTOR PROJECT SPECIFIC LOCATIONS (PSL'S) INCREASE DISTURBED SOIL AREA TO 5 ACRES OR MORE, CONTRACTOR SHALL SUBMIT NOTICE OF INTENT (NOI) TO TCEQ AND THE ENGINEER.
5. NOI REQUIRED, ☐YES ☐NO

NOTE, IF AMOUNT OF SOIL DISTURBANCE CHANGES, PERMIT REQUIREMENTS MAY CHANGE.

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

US ARMY CORPS OF ENGINEERS (USACE) PERMIT REQUIRED FOR FILLING, DREDGING, EXCAVATING OR OTHER WORK IN ANY POTENTIAL USACE JURISDICTIONAL WATER, SUCH AS, RIVERS, CREEKS, STREAMS, OR WETLANDS.

THE CONTRACTOR SHALL ADHERE TO ALL OF THE TERMS AND CONDITIONS ASSOCIATED WITH THE FOLLOWING PERMIT(S),

☒ NO PERMIT REQUIRED
☐ NATIONWIDE PERMIT (NWP) 14 - PRE-CONSTRUCTION NOTICE (PCN) NOT REQUIRED
☐ NATIONWIDE PERMIT 14 - PCN REQUIRED
☐ INDIVIDUAL 404 PERMIT REQUIRED
☐ OTHER NATIONWIDE PERMIT REQUIRED, NWP• _____

REQUIRED ACTIONS, LIST WATERS OF THE US PERMIT APPLIES TO, LOCATION IN PROJECT AND CHECK BEST MANAGEMENT PRACTICES (BMPS) PLANNED TO CONTROL EROSION, SEDIMENTATION AND POST-PROJECT TOTAL SUSPENDED SOLIDS (TSS).

1.

2.

3.

4.

401 BEST MANAGEMENT PRACTICES, (NOT APPLICABLE IF NO USACE PERMIT)

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	☐ SEDIMENTATION CHAMBERS
		☐ GRASSY SWALES

III. CULTURAL RESOURCES

REFER TO TXDOT STANDARD SPECIFICATIONS IN THE EVENT HISTORICAL ISSUES OR ARCHEOLOGICAL ARTIFACTS ARE FOUND DURING CONSTRUCTION. UPON DISCOVERY OF ARCHEOLOGICAL ARTIFACTS (BONES, BURNT ROCK, FLINT, POTTERY, ETC.) CEASE WORK IN THE IMMEDIATE AREA AND CONTACT THE ENGINEER IMMEDIATELY.

☒ NO ACTION REQUIRED ☐ REQUIRED ACTION

ACTION NO.

1.

2.

3.

4.

IV. VEGETATION RESOURCES

PRESERVE NATIVE VEGETATION TO THE EXTENT PRACTICAL. CONTRACTOR MUST ADHERE TO CONSTRUCTION SPECIFICATION REQUIREMENTS SPECS 162,164, 192, 193, 506, 730, 751, 752 IN ORDER TO COMPLY WITH REQUIREMENTS FOR INVASIVE SPECIES, BENEFICIAL LANDSCAPING, AND TREE/BRUSH REMOVAL COMMITMENTS.

☒ NO ACTION REQUIRED ☐ REQUIRED ACTION

ACTION NO.

1.

2.

3.

4.

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

☐ NO ACTION REQUIRED ☒ REQUIRED ACTION

ACTION NO.

1. MIGRATORY BIRD NESTS: SCHEDULE CONSTRUCTION ACTIVITIES AS NEEDED TO MEET THE FOLLOWING REQUIREMENTS,

   A. DO NOT REMOVE OR DESTROY ANY ACTIVE MIGRATORY BIRD NESTS (NESTS CONTAINING EGGS AND/OR FLIGHTLESS BIRDS) AT ANY TIME OF YEAR. IF THERE ARE ANY ACTIVE NESTS, THEY SHALL NOT BE REMOVED UNTIL THE NESTS BECOME INACTIVE.

   B. ON/IN STRUCTURES, IF THERE ARE ANY ACTIVE NESTS, THEY SHALL NOT BE REMOVED UNTIL ALL NESTS BECOME INACTIVE. AFTER INACTIVE NESTS ARE REMOVED AND/OR BEFORE NEST ACTIVITY BEGINS, DETERRENT MATERIALS MAY BE APPLIED TO THE STRUCTURES TO PREVENT FUTURE NEST BUILDING.

2. SEE ITEM 5 IN GENERAL NOTES.

3.

4.

IF ANY OF THE LISTED SPECIES ARE OBSERVED, CEASE WORK IN THE IMMEDIATE AREA, DO NOT DISTURB SPECIES OR HABITAT AND CONTACT THE ENGINEER IMMEDIATELY. THE WORK MAY NOT REMOVE ACTIVE NESTS FROM BRIDGES AND OTHER STRUCTURES DURING NESTING SEASON OF THE BIRDS ASSOCIATED WITH THE NESTS. IF CAVES OR SINKHOLES ARE DISCOVERED, CEASE WORK IN THE IMMEDIATED AREA, AND CONTACT THE ENGINEER IMMEDIATELY.

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 APPROPIATE FOR ANY HAZARDOUS MATERIALS USED.

OBTAIN AND KEEP ON-SITE MATERIAL SAFETY DATA SHEETS (MSDS) FOR ALL HAZARDOUS PRODUCTS USED ON THE PROJECT, WHICH MAY INCLUDE, BUT ARE NOT LIMITED TO THE FOLLOWING CATEGORIES, PAINTS, ACIDS, SOLVENTS, ASPHALT PRODUCTS, CHEMICAL ADDITIVES, FUELS AND CONCRETE CURING COMPOUNDS OR ADDITIVES. PROVIDE PROTECTED STORAGE, OFF BARE GROUND AND COVERED, FOR PRODUCTS WHICH MAY BE HAZARDOUS. MAINTAIN PRODUCT LABELLING AS REQUIRED BY THE ACT.

MAINTAIN AN ADEQUATE SUPPLY OF ON-SITE SPILL RESPONSE MATERIALS, AS INDICATED IN THE MSDS. IN THE EVENT OF A SPILL, TAKE ACTIONS TO MITIGATE THE SPILL AS INDICATED IN THE MSDS, IN ACCORDANCE WITH SAFE WORK PRACTICES, AND CONTACT THE DISTRICT SPILL COORDINATOR IMMEDIATELY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER CONTAINMENT AND CLEANUP OF ALL PRODUCT SPILLS.

CONTACT THE ENGINEER IF ANY OF THE FOLLWING ARE DETECTED,

* DEAD OR DISTRESSED VEGETATION (NOT IDENTIFIED AS NORMAL)
* TRASH PILES, DRUMS, CANISTER, BARRELS, ETC.
* UNDESIRABLE SMELLS OR ODORS
* EVIDENCE OF LEACHING OR SEEPAGE OF SUBSTANCES

HAZARDOUS MATERIALS OR CONTAMINATION ISSUES SPECIFIC TO THIS PROJECT,

☒ NO ACTION REQUIRED ☐ REQUIRED ACTION

ACTION NO.

1.

2.

3.

DOES THE PROJECT INVOLVE THE DEMOLITION OF A SPAN BRIDGE?

☐ YES ☒ NO (NO FURTHER ACTION REQUIRED)

IF "YES", A PRE- DEMOLITION NOTIFICATION MUST BE SUBMITTED TO THE TEXAS DEPARTMENT OF STATE HEALTH SERVICES. THE CONTRACTOR SHALL CONTACT TXDOT'S PROJECT ENGINEER 25 CALENDAR DAYS PRIOR TO THE DEMOLITION OF THE BRIDGES(S) ON THE PROJECT TO ASSIST WITH THE NOTIFICATION.

VII. OTHER ENVIRONMENTAL ISSUES

(INCLUDES REGIONAL ISSUES SUCH AS EDWARDS AQUIFER DISTRICT, ETC.)

☐ NO ACTION REQUIRED ☒ REQUIRED ACTION

ACTION NO.

1.

2.

3.

Texas Department of Transportation
San Antonio District Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: EPIC_2015-10-09_SAT.DGN	DN: TXDOT		CK: TXDOT	DW:		CK:	
©TXDOT OCTOBER 2015	CONT	SECT	JOB		HIGHWAY		
REVISIONS	0915	00	200		VARIOUS		
	DIST	COUNTY			SHEET NO.		
	SAT	BEXAR			58		