

FED. ROAD DIV. NO.	STATE	STATE PROJECT NO.	SHEET NO.
6	TEXAS	C 902-00-299	1
STATE DIST. NO.	COUNTY	STATE CONTROL NO.	HIGHWAY NO.
2	TARRANT	0902-00-299	VA

INDEX

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 Sheet 2 Index of Sheets

STATE OF TEXAS
 DEPARTMENT OF TRANSPORTATION
 PLANS OF PROPOSED
 STATE HIGHWAY IMPROVEMENT

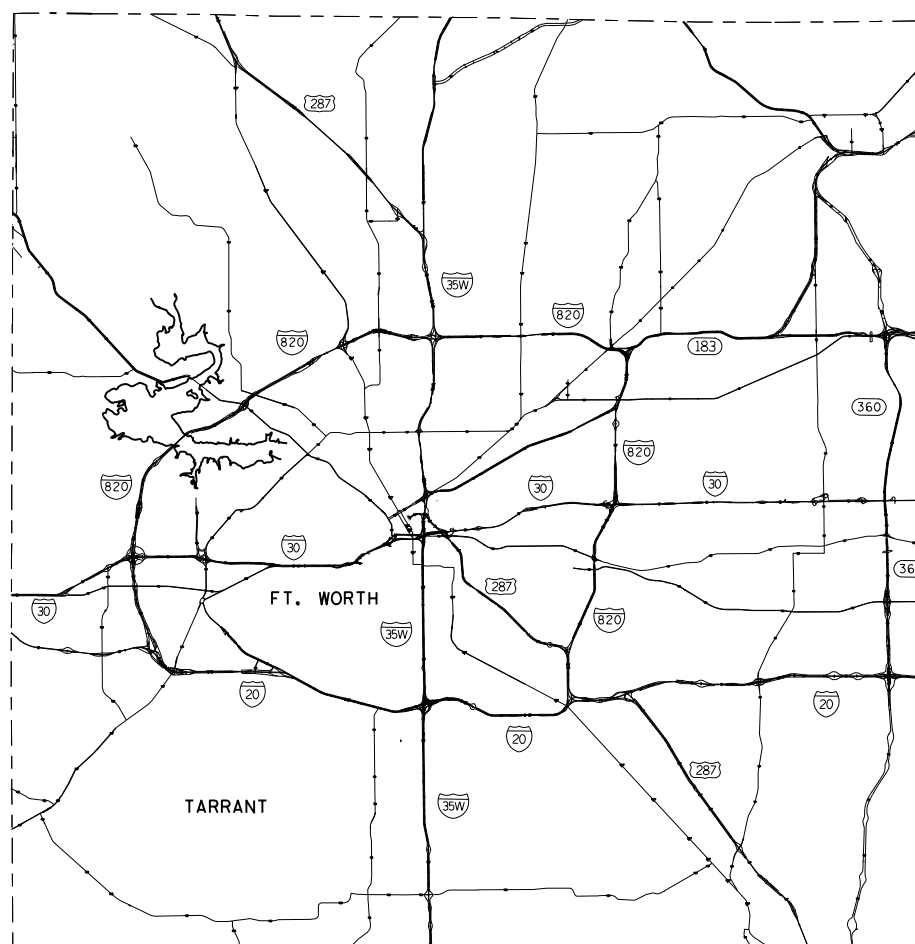
STATE PROJECT NO.: C 902-00-299
 PROJECT LENGTH: NO PROJECT LENGTH

TARRANT COUNTY
 VA

FINAL PLANS

LETTING DATE: _____
 DATE CONTRACTOR BEGAN WORK: _____
 DATE WORK WAS COMPLETED : _____
 DATE WORK WAS ACCEPTED: _____
 FINAL CONTRACT COST: \$ _____
 CONTRACTOR : _____

LIMITS OF WORK: VARIOUS LOCATIONS WITHIN FORT WORTH DISTRICT
 FOR THE CONSTRUCTION OF TRANSPORTATION NON-ROADWAY WORK
 CONSISTING OF: NON SITE SPECIFIC ITS



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

NO EQUATIONS
 NO EXCEPTIONS
 NO RAILROAD CROSSINGS

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TEXAS DEPARTMENT OF TRANSPORTATION

SUBMITTED 4/17/2024
 FOR SIGNING by: _____
Theresa Poer
 DIRECTOR OF TRANSPORTATION OPERATIONS
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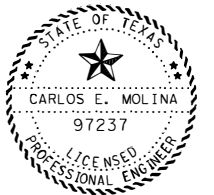
RECOMMENDED 4/29/2024
 FOR SIGNING: _____
Prasad D. Singh
 DIRECTOR, TP & D
 7879B0B92E5D403...

APPROVED 5/1/2024
 FOR SIGNING: _____
David M Salazar, P.E.
 DISTRICT ENGINEER
 B741E64FAD82411...

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STANDARD SHEETS NO. 23 TO 136 HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.



Carlos E. Molina

04/30/2024

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FTW	TARRANT		2
CONTROL	SECT.	JOB	HIGHWAY NO.
0902	00	299	VA

Project Number: C 902-00-299

County: TARRANT

Control: 0902-00-299

Highway: VA

General Notes – Intelligent Transportation Systems (ITS)

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

Theresa Poer, P.E. theresa.poer@txdot.gov
Carlos Molina, P.E. carlos.molina@txdot.gov

Questions may be submitted via the Letting Pre-Bid Q&A web page. This webpage can be accessed from the Notice to Contractors dashboard located at the following Address: <https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors>

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

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

Basis of Estimate

Item	Description	Rate	Unit
166	Fertilizer (16-8-8)	600 lb./acre**	ton
168	Vegetative Watering	169,400 gal./acre	1,000 gal.

** Non-Pay, for Contractor's Information Only.

This is a Non-Site-Specific Contract containing multiple work orders. Project locations and plan details will be incorporated into the contract by individual work order over the life of the contract.

The work contained within this contract will consist of the installation or upgrading of the different ITS systems and associated equipment within the Fort Worth District. Exact work locations will be provided within the work orders issued after the contract has been awarded.

The estimated quantities in the project proposal are estimates only to be used in the determination of the low bidder. They should not be used to determine the quantity of materials to be ordered for work in the contract.

For each individual work order issued within the project, working days will be defined in accordance with Article 8.3.1.1 'Five-Day Workweek.'

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Liquidated damages will be determined and applied on a work order basis. Each work order will be treated separately and independently in the assessment of liquidated damages. Failure to complete work assigned within the number of working days specified in the work order, including any approved additional working days, will result in liquidated damages for each working day charged over the number of working days allowed for the work order. The amount assessed for liquidated damages will be based on the amount of the original contract, not the estimated amount on individual work orders.

This contract has time charges assessed by individual work order.

There is no guaranteed amount of work under this contract.

The contractor is responsible for picking up materials furnished by the State at 2501 SW Loop 820, Fort Worth, TX 76133. Contact the TxDOT Signal Shop at 817-370-3664 forty-eight (48) hours in advance.

For dimensions of right of way not shown on the plans, see right of way map on file at the TxDOT District Office.

A pre-construction/conference meeting between the contractor and TxDOT will be held prior to beginning operations. This meeting will outline the proposed work procedures, sequence of work to be followed, and discuss the required traffic control, Plans, specifications, unusual conditions, and other pertinent items regarding the work will be discussed. The Contractor's job superintendent is requested to attend this meeting.

An onsite tailgate meeting between TxDOT and the contractor shall occur at the start of each work order.

The Contractor shall notify the TxDOT inspector no later than 8 AM each day and advise work locations for the day, number of workers, and equipment used on work site.

Provide pre-approved safety vests, hard hats, and protective toe footwear and ensure that all these safety items are worn at all times when outside vehicles within the work area.

The conduit and fiber optic cables are the main backbone of the TxDOT ITS network. Communications Systems (wireless or fiber) shall remain in operation throughout the project. A 4-hour window for switchover will be allowed at each location. The Contractor shall provide a 72-hour advance notice and receive approval for any outages from the TxDOT Signal Shop at 817-370-3664.

Furnish and install all incidental work, material and services not explicitly called for in the specifications or not shown in the plans, which may be necessary for a complete and properly functioning ITS system.

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Deliver all cabinets to be furnished and installed in this project to TxDOT at 2501 SW Loop 820, Fort Worth, TX 76133, for specification compliance.

Correct and re-test cabinet(s) failing to comply with the specifications prior to being released for transportation to and installation in the field. Transport the cabinet(s) to the field for installation after successfully completing the testing. No payment shall be made directly for the transportation of the cabinet(s) to and from TxDOT District for testing or other incidentals to complete the work. This work shall be considered subsidiary to the various types of cabinets called for in the project.

Perform all work in this project in a manner acceptable to and approved by the Engineer.

Contact Texas excavation safety system at 1-800-dig-tess or 1-800-344-8377, and TxDOT Signal Shop at 817-370-3664 prior to beginning any excavation work in the area of existing utilities, to prevent any damage or interference with present facilities.

Contact the local Cities within the limits and vicinity of the project for their utility locates including their water, electrical/illumination, and Traffic Department before any construction work. The City of Fort Worth Illumination group number is 817-392-8100.

Provide TxDOT with confirmation tickets of utility and line locates.

Contact the utility companies or the utility coordinating committee for exact locations prior to any work that might interfere with or damage present facilities. Verify the locations of all existing underground installations that would be in conflict with the new conduit prior to construction to avoid conflict or damage to utilities. Contact the respective utility company 48 hours prior to excavating. Coordinate with the respective utility company for any adjustment necessary to the utility. Contractor shall pothole the locations that conflict with utilities. Contractor is responsible for utility coordination, locates, and potholing at no additional expense to the State.

Replace within 48 hours all existing underground and above ground installations damaged by Contractor's forces during construction at no cost to the State. If the damaged installation belongs to the Department and has not been repaired within 48 hours, the Contractor will be responsible to pay a third party or the Department for the repair.

Procure all permits and licenses.

The electrical work will be inspected by the State.

The Engineer shall approve the starting date for system acceptance testing and, if required, shall terminate the system testing because of malfunctions or obvious unsuitability of the equipment.

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Do not remove or relocate existing equipment in existing cabinets without the Engineer's approval.

Install all necessary shelves, terminal panels, wiring, cabling, harnesses, etc. where new equipment is to be installed in existing cabinets. All costs associated with these cabinet modifications shall be considered subsidiary to the various bid items.

Maintain the median of the freeway in a serviceable condition, free of obstructions, and acceptable to the Engineer. Take special care to eliminate hazards to the traveling public.

Remove any obstructions to existing drainage due to the Contractor's operation as required at the Contractor's entire expense.

Do not mix materials, store materials, store equipment, or repair equipment on top of concrete pavement or bridge decks.

Remove daily all construction related debris from the R. O. W. to a dump site approved by the Engineer in writing.

Replace all pavement, shoulders and metal beam guard fence damaged by Contractor's forces during construction at no cost to the state.

Ensure existing curb, and curb and gutter are not discolored or damaged during construction operations. In the event of discoloration or damage, clean, replace, or repair as directed, at no cost to the State.

All Contractor's vehicles shall be clearly identified with company name plates when working on the project.

Item 5. Control of the Work

When supplementary shop drawings, shop details, erection drawings, working drawings, forming plans, or other drawings are required, the drawings will be prepared and submitted on sheets 8-1/2 by 11 inches, 17 by 22 inches, or full size drawings reduced to half scale if completely legible. If, in the opinion of the Engineer, the drawings are not completely legible, they will be prepared and submitted on sheets 22 by 34 inches, with a 1-1/2 inch left margin, and 1/2 inch top, right, and bottom margins.

Submit all sheets with a title in the lower right hand corner. The title must include the sheet index data shown on the lower right corner of the project plans, name of the structure or element or stream, sheet numbering for the shop drawings, name of the fabricator and the name of the Contractor.

General Notes

Sheet 3A

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The locations of all ITS related items, poles, ground boxes, and conduit, are diagrammatic only and may be adjusted to accommodate field conditions or as directed by the Engineer or Engineer's designee.

Item 6. Control of Materials

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

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

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

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

Item 7. Legal Relations and Responsibilities

No significant traffic events identified.

Item 8. Prosecution and Progress

Working days will be computed and charged in accordance with article 8.3.1.1. 'Five-Day Workweek.'

The start of work will be delayed 90 calendar days after the authorization date to begin work to allow time for the procurement of materials.

Night work is allowed with approval.

This project is to be completed in 768 working days.

Item 8.5. Project Schedules

Contractor shall submit the schedule as a bar chart, include all planned work activities and sequences and show Contract completion within the number of working days specified for each Work Order. Submit an updated hard copy when changes to the schedule occur or when requested. The Estimate will be held if schedule is not submitted.

Item 8.6. Failure to Complete Work on Time

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The amount assessed for liquidated damages will be based on the total value of original contract, in accordance with Special Provision 000-1243, not the estimated amount on individual work orders.

Item 164. Seeding for Erosion Control

Apply seeding required between December 1 and January 31 using seed types and mixtures as shown in Item 164.2.1, Table 3, If, in the opinion of the Engineer, this does not provide an effective vegetative cover, apply "straw or hay mulch" as specified in Article 164.3.2. "Straw or Hay Mulch Seeding" as soon as possible. After February 1 apply warm season seeding in order to establish a permanent protective vegetative cover.

Item 166. Fertilizer

Fertilize all areas of project to be seeded.

Item 168. Vegetative Watering

Furnish and install an approved rain gauge at the project site, as directed. Furnishing and installation of the rain gauge will not be paid for directly, but will be subsidiary to Item 168.

Apply vegetative watering for an establishment period of thirteen weeks following installation of seed, at a rate of 1/2 inch of water depth per week (approximately 13,030 gallons per acre). During the first four weeks after seeding, apply water twice per week, on non-consecutive days, each at half the weekly application rate. For the remainder of the establishment period, apply vegetative watering once per week during the months of January through June or September through December, at the weekly application rate; apply watering twice per week, on non-consecutive days during the months of July and August, each at one-half the weekly application rate.

Average weekly rainfall rates for the District are:

January—0.39"	April—0.86"	July—0.48"	October—0.68"
February—0.46"	May—1.00"	August—0.47"	November—0.46"
March—0.48"	June—0.63"	September—0.74"	December—0.37"

Item 400. Excavation and Backfill for Structures

Drilling, boring, and trenching through any type of rock or soil is subsidiary to the various bid items. No additional compensation will be paid to the contractor for the removal of rock or any other obstruction during excavation, trenching, jacking, boring, or drilling and for any additional equipment, materials, labor, tools, or incidentals required to complete the work.

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Item 416. Drilled Shaft Foundations

Contractor shall stake foundations as shown on plans. Engineer or Engineer's designee will verify and approve staked locations before installing foundations.

Item 421. Hydraulic Cement Concrete

Notify the Engineer 48 hours in advance of placing concrete. Do not place concrete without an inspector present unless approved.

Contractor personnel performing job-control (QC) testing on concrete must be ACI certified and maintain certification with annual proficiency/split tests performed with TxDOT. Provide a copy of all personnel certification papers to the Engineer at the preconstruction meeting. The Engineer may require the Contractor's testers to provide the certification papers upon arrival and before testing at the job site. Certified testers will be required to participate with certified TxDOT personnel annually for slump (Tex-415-A), air content (Tex-416-A), compression testing (Tex-418-A), and capping cylinders (Tex-450-A) to retain their certification on TxDOT projects.

Furnish a hard copy of all testing equipment calibration reports at the preconstruction meeting when non-TxDOT equipment is used to test concrete. Furnish updated reports as equipment is calibrated through the project contract. The calibration frequency will match TxDOT's and will apply for each piece of equipment as follows:

- Slump Cone - Annual
- Air Meter - Every 3 months
- Compression Tester - Annual
- Beam breaker - Annual

The Engineer may allow the use of local commercial laboratories under contract to provide these services. The Commercial Laboratory must fulfill requirements listed above prior to performing any work.

Item 502. Barricades, Signs and Traffic Handling

The total quantity for Barricades, Signs, and Traffic Handling in the proposal is not guaranteed. Quantities for Barricades, Signs, and Traffic Handling will be determined and applied on a work order basis.

Do not close a lane, shoulder, or ramp during the peak hours of 6:00 a.m. to 9:00 a.m. and 3:00 p.m. to 7:00 p.m. weekdays.

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Provide minimal interference to traffic during construction operations.

One week prior to any ramp or roadway lane closures, place message boards or sign panels, as shown on the plans or as directed by the Engineer, to inform the public of such closure.

The following Holiday/Event lane closure restriction requirements apply to this project:

No work that restricts or interferes with traffic shall be allowed between 3 PM on the day preceding a Holiday or Event and 9 AM on the day after the Holiday or Event.

Holiday Lane Closure Restrictions	
New Year's Eve and New Year's Day (December 31 through January 1)	3 PM December 30 through 9 AM January 2
Easter Holiday Weekend (Friday through Sunday)	3PM Thursday through 9 AM Monday
Memorial Day Weekend (Friday through Monday)	3 PM Thursday through 9 AM Tuesday
Independence Day (July 3 through July 5)	3 PM July 2 through 9 AM July 6
Labor Day Weekend (Friday through Monday)	3 PM Thursday through 9 AM Tuesday
Thanksgiving Holiday (Wednesday through Sunday)	3 PM Tuesday through 9 AM Monday
Christmas Holiday (December 23 through December 26)	3 PM December 22 through 9 AM December 27

Plan work schedules around the appropriate dates above to ensure productive work is performed without lane closures.

Do not leave excavation open overnight.

Do not reduce existing number of lanes open to traffic. Exceptions will only be made during off-peak hours as shown on the plans, or as approved by the Engineer.

The Engineer may direct that operations be curtailed or halted out of consideration for traffic expected to and from public gatherings, which in his opinion may result in undue traffic congestion and delays to the traveling public.

Two weeks prior to any alterations of traffic patterns, provide the Engineer, for his approval, a layout showing all signs, barricades, striping, and signalization.

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The Engineer may request additional signing not shown and this will be considered subsidiary to the pertinent bid items.

A qualified flagger may be required during certain phases of construction, and shall be equipped with the proper reflective clothing and two-way radios, as directed by the Engineer.

Notify the proper city traffic and transportation Department officials when major traffic changes are to be made. The notification must be made three days prior to the change. Use plastic drums in accordance with the plans and manufacturer's recommendations as approved by the Engineer.

Close one adjacent lane in both directions, as directed by the Engineer, at locations where the Contractor is required to replace DMS signs in the center median.

Existing signs are to remain as long as they do not interfere with construction and they do not conflict with the traffic control plan.

Any sign not detailed in the plans but called for in the layout shall be as shown in the current "Standard Highway Sign Designs for Texas".

When traffic is obstructed, arrange warning devices in accordance with arrangements indicated in the latest edition of the "Texas Manual on Uniform Traffic Control Devices".

The contractor force account "safety contingency" that has been established for this project is intended to be utilized for work zone enhancements, to improve the effectiveness of the traffic control plan that could not be foreseen in the project planning and design stage. These enhancements will be mutually agreed upon by the engineer and the contractor's responsible person based on weekly or more frequent traffic management reviews on the project. The engineer may choose to use existing bid items if it does not slow the implementation of enhancement.

Item 506. Temporary Erosion, Sedimentation, and Environmental Controls

The SW3P for this project shall consist of using the following items as directed:

- Temporary Sediment Control Fence
- Biodegradable Erosion Control Logs

Remove accumulated sediment and/or replace SW3P controls when the capacity has been reduced by 50% or when the depth of sediment at the control structure exceeds one foot.

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Item 610. Roadway Illumination Assemblies

Do not furnish luminaire arms and lamps for this Item.

Item 618. Conduit

Use materials from prequalified producer list as shown on the Texas Department of Transportation (TxDOT) materials producer list, category "Roadway Illumination and Electrical Supplies."

Place conduit runs behind curbs at all locations where curbs exist. Place conduit along the frontage road a minimum clearance of six (6) feet from the back of curbs, unless such clearance shall interfere with "straight through" conduit placement, conflict with retaining walls or utilities, or introduce additional or unnecessary right angle bends into the cable path. Adjust, with Engineer's approval, the placement of conduit and ground boxes to ensure the "straight through" conduit concept and avoid the aforementioned interference, conflict, or introduction of additional, unnecessary bends.

Refer to TxDOT standard ITS(27)-16 for trenching of ITS conduit regarding depth of conduit, spacing of conduit, flowable backfill, and concrete encasement. Flowable backfill shall be subsidiary to Item 618.

Install a continuous bare or green insulated copper wire no. 8 AWG or larger in every conduit throughout the electrical system in accordance with the electrical detail sheets, and the latest edition of the National Electrical Code.

For power carrying conduit, provide a continuous grounded system. If PVC is used, the continuous system shall be accomplished by running 1 - #8 AWG bare copper wire in conduit between foundations and grounding it at each foundation ground rod. If rigid metal conduit is used, it shall be bonded to form a continuous system.

After installing conduit and pulling conductor or communication cable, leave a high tensile strength polyester fiber pull tape in the conduit for future use. Install pull tape in all empty conduits. Provide pull tape with a tensile strength of 1,250 lbs. minimum and have foot markings to determine length installed. All work and incidentals shall not be paid for directly but shall be considered subsidiary to Item 618.

All conduit elbows and rigid metal extensions required to be installed on PVC conduit systems will not be paid for separately, but will be considered subsidiary to various bid items.

PVC conduit systems that snap or lock together without glue that are designed and UL listed to be used for bored PVC electrical conduit applications will be allowed for bored PVC Schedule

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80. when approved by the Engineer. No additional compensation will be paid to the Contractor when these specific purpose conduit systems are substituted for this purpose.

Conduit entry to all ITS ground boxes shall be perpendicular to the perforated sidewall. Do not use 90 degree or right angle fittings to achieve perpendicular conduit alignment. Where approved by the Engineer, use 3 foot minimum long radius bends. Where conduit is placed by jacking or boring, adjust the conduit placement to accommodate perpendicular entry and long sweep bends.

Seal all conduits in the cabinets and in the ground boxes with expandable urethane foam.

Place cables in conduit to provide maximum use of each conduit's capacity, as defined by the NEC. Each conduit shall be completely filled, according to NEC guidelines, before cables may be placed in another conduit; however, the Contractor is still responsible for mandated cable separations as directed by the Engineer (e.g., placing power cables in separate conduit from communications cables).

Backfill all open trench/excavation by dusk. Do not leave any open trench/excavation overnight.

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

Item 620. Electrical Conductors

Do not use non-certified persons to perform electrical work. Electrical certification for this project will be as per Item 7 of the current Texas Standard Specifications and any Special Provisions to Item 7.

All cable ties shall be securely fastened by rivet or other mechanical means. Do not use double-sided adhesive stick-ons or pressure clamps.

Include extra cable length in each run to provide adequate slack at each ground box or cabinet, as determined by the Engineer.

All electrical work shall be in conformance with latest edition of the National Electrical Code (NEC), and TxDOT Standards.

All power conductors, shielded twisted wire pair cables, cat cables, coax cables, and control cables, shall be color-coded consistently or permanently labeled, in the ground boxes and cabinets, between all connections and splices to ensure immediate identification. Submit a chart or list identifying all cables and conductors in a logical and sequential manner prior to installation for the Engineer's approval.

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All conductors shall be continuous without splices from terminal point to terminal point or otherwise as directed by the Engineer. Splices, in locations permitted by the Engineer, shall be made in accordance with the ED(3)-14 sheet.

When pulling cables, conductors or innerducts through conduit, lubricate the cables, conductors or innerducts with a lubricant generally used for this purpose. The lubricant shall be non-aqueous, non-toxic and non-conductive and shall not harm the conduit or the insulation of cable.

Test each wire of each cable or conductor before and after installation. Any incomplete circuit or damage to any wire or cable will be cause for immediate rejection of the entire cable being tested. Remove and replace the entire rejected cable at Contractor's own expense.

Bond the grounding conductors that share the same conduit, junction box, ground box or structure together at every accessible point in accordance with the electrical detail sheets, and the latest edition of the National Electrical Code, and as per TxDOT Standards.

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

Item 627. Treated Timber Poles

Use timber heights, as shown on the plans and in the material summary, for bidding purposes only. Coordinate pole locations, and make field measurements before construction to ensure a vertical clearance of 19 feet from the highest point on the roadway surface to the span. Determine the field measurements and elevations from the actual field location of the poles, considering all above and below ground utilities and existing roadway elevations.

Item 628. Electrical Services

Locations of service poles as shown on the layouts are approximate. Contact the electric provider for electric service and for exact locations. Locations of the service poles are subject to approval by the Engineer. The service pole for each location shall supply 120/240v/ 3 wire single phase circuit.

Stencil the street address of the electrical service and "Surveillance" in one inch high black letters on the cover of the service enclosure.

Do not apply power to service poles until approved by the Engineer. Verify all power locations. Place a decal stating "Danger/High Voltage ARC Flash" on the cover of the enclosure above the street address of the electrical service and surveillance lettering. The size of the decal and lettering shall be as approved by the Engineer.

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No photo-electric control, lighting contactor and control unit- "manual-off-automatic" shall be needed in the service pole.

Before installing any electrical service, verify all metering equipment requirements with the electric service provider. The Contractor shall provide a commercial grade, meter base with by-pass switch as part of this item when required by the electric provider.

Obtain 911 address and EISD from the electric utility company. TxDOT will make application to the Electric Utility Company for service.

All work and incidentals performed, as described, shall not be paid for directly but shall be considered subsidiary to Item 628.

Item 650. Overhead Sign Supports

Stencil structure numbers on the new structure for permanent identification.

Field check all overhead structure elevations, details and dimensions shown in the plans prior to fabrication.

Location of overhead structures shall be verified in the field, by the Engineer, prior to erection.

The furnishing and installing of 1 inch PVC conduit, ground rod, 1/0 ground wire, ground rod clamp and for all other materials, labor, tools, equipment and incidentals necessary to complete the grounding of the support as per NEC shall be subsidiary to Item 650.

Item 6000. Illumination Maintenance

Removal of conduit shall be paid by the length of the run regardless of the number of conduits in the run and shall not be paid by each conduit removed.

Backfill trench in accordance with Item 400, "Excavation and Backfill for Structures."

Item 6001. Portable Changeable Message Signs

Provide all portable changeable message signs and arrow panels with a photoelectric device to allow for automatic dimming of operations to approximately 50% of their normal brightness when ambient light drops to approximately five footcandles, and then increase back again for daytime operations.

Two electronic portable changeable message sign unit(s) will be required. Individual or collective use of signs will be required by the Engineer when deemed necessary to supplement the traffic control plan.

Each sign must have programmed in its permanent memory the following 15 messages:

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1. Exit Closed Ahead
2. Use Other Routes
3. Right Lane
4. Left Lane
5. Closed Ahead
6. Two Lane
7. Detour Ahead
8. Thru Traffic
9. Prepare To Stop
10. Merging Traffic
11. Expect 15 Minute Delay
12. Max Speed ** MPH
13. Merge Right
14. Merge Left
15. No Exit Next ** Miles

Item 6005. Testing, Training, Documentation, Final Acceptance and Warranty

It is the policy of the Department to require performance testing of all materials and equipment not previously tested and approved. If technical data is not considered adequate for approval, samples may be requested for test by the Engineer. The contract period will not be extended for time lost or delays caused by testing prior to final Department approval of any items.

Four (4) complete sets of operation and maintenance manuals shall be provided prior to the installation of the equipment. Schematics shall be updated at the end of the job to show "as-built" condition.

Item 6007. Intelligent Transportation System (ITS) Fiber Optic Cable

Furnish and install Corning fiber optic cable.

Furnish and install Corning FDC-001 or FDC-002 Unit, FDM06P06-19-3RH000 or FDM12P12-19-3RH000 Modules, M67-048 Splice Trays, at the satellite buildings or TransVision building.

Furnish and install Corning UDF-BAY-19E-07-075 rack unit with hardware UDF-ECO-07-075, UDF-IBD-07-075, at the satellite buildings or TransVision building.

Individually and uniquely identify the fiber optic cable in ground boxes with durable, permanent, high visibility marking, such as reflective tape or label. This marking must identify the type of fiber optic cable (i.e. single-mode and fiber counts).

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Maintain the integrity of the existing fiber optic and other cable systems. If the cables are damaged during construction, replace or repair the damaged cables, as directed by the Engineer, at Contractor's own expense. The replacement or repair method must be approved by the Engineer, prior to implementation. If the fiber optic cable is damaged, repair the damaged cable within 4 hours with Contractor's own force or be responsible to pay a third party or the Department for the repair. Depending on the severity of the damage, replace the damaged fiber, as directed by the engineer, at Contractor's own expense. Maintaining the integrity of the existing fiber optic and other cable systems during the construction shall be subsidiary to this item.

When shown in the plans and as directed by the Engineer, provide a single continuous 1/C #8 AWG bare copper wire (tracing cable) per conduit run, pulled in the same conduit where fiber optic cable is installed. It is not to be connected or bonded to the equipment grounding conductors (EGC) or equipment grounding system or to be joined together in the ground or junction boxes. Ensure that a 5-foot service loop of the #8 AWG bare copper wire is pulled up, coiled and tied in each ITS cabinet to provide conduit trace capability. Coil 10 feet of #8 AWG bare copper wire in the base of each DMS pole.

Furnish and install all necessary fiber optic jumpers with the connectors that are suitable to be connected to the fiber optic transmission equipment and patch panels at locations as shown in the plans and as directed by the Engineer. Fiber optic jumpers will be paid by each jumper furnished and installed.

Install or replace Department furnished SFPs at locations as shown in the plans and as directed by the Engineer. Installation or replacement of SFPs is subsidiary to this item.

Removal of cables shall be paid by the length of the run regardless of the number of conduits and cables in the run and shall not be paid by each cable removed. In addition, removal of #8 AWG electrical conductor (trace cable) shall be paid subsidiary to "Remove Fiber Optic Cable."

All materials, which are deemed salvageable by the Engineer, shall be the property of the Department and shall be transported to, and stored at TxDOT's Signal Shop Section, 2501 SW Loop 820, Fort Worth, TX 76133.

No payment shall be made directly for all the above mentioned work, or other incidentals required to complete the work, but shall be considered subsidiary to this item.

Item 6010. Closed Circuit Television (CCTV) Field Equipment

This item shall also include, but is not limited to the following subsidiary items:

- Connecting harnesses of appropriate length and terminated with matching connectors for interconnection with communications system equipment

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- Removal of CCTV Multiconductor Cable or Cat cables (Regardless of the number of cables)
- Cat6 cables
- PoE++ Injectors

No payment shall be made directly for all the above mentioned work and for the subsidiary items furnished and installed, materials, or other incidentals required to complete the work, but shall be considered subsidiary to this item.

The furnishing and installation of Cat6 PoE cable will be paid under Item 6004 6031 ITS COM CBL (ETHERNET).

Item 6016. ITS Multi-Duct Conduit System

After installing conduit and pulling cable, leave a high tensile strength polyester fiber pull tape in the conduit for future use. Install pull tape in all empty conduits, including empty inner ducts.

Refer to TxDOT standard ITS(27)-16 for trenching of ITS conduit regarding depth of conduit, spacing of conduit, flowable backfill, and concrete encasement. Flowable backfill shall be subsidiary to Item 6016.

Item 6027. Preparation of Existing Conduits, Ground Boxes, or Manholes

The existing ground boxes are welded shut, buried, or sealed with a concrete pad. The Contractor shall be responsible for access to the existing ground boxes and restoring to original photographically documented conditions (by the Contractor). This includes any removals necessary to access the ground box as well as concrete, welding, and repairing galvanized welded areas in accordance with Item 445 "Galvanizing," etc., to establish the ground box lid to original conditions after conduit and cable work is complete. The Contractor is responsible for the security of both new and existing ground boxes and ground box contents such as wiring, fiber optic cables, splice closures, etc. while they are uncovered or not welded. Seal ITS ground boxes by tack welding two corners for at least two inches on each side after work is completed and the seals galvanized.

Fill around conduit the voids or abandoned concrete openings, regardless of the size of the opening, with concrete grout in all ground boxes with concrete walls.

Provide a bell fitting on the end of each conduit.

No payment shall be made directly for all the above mentioned work, or other incidentals required to complete the work, but shall be considered subsidiary to Item 6027.

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Item 6028. Installation of Dynamic Message Sign System

The subsidiary items shall consist of, but is not limited to the following:

- DMS mounting supports
- DMS ground mounted cabinet installation
- Concrete foundation for DMS ground mounted cabinet
- DMS cabinet supports
- Installation of pole mounted DMS cabinets, LB connectors, Rigid Metal Conduit,
- LFMC conduits
- Junction boxes
- J-Bolts, Bolts, Nuts, Washers, and all the hardware needed for the installation of the DMS and cabinets
- Cat6 Cables
- 6 MM Fiber Optic Jumpers, with factory installed LC connectors, from the cabinet controller to the DMS sign

Quantities for subsidiary items will be shown on the plans for each work order.

The Contractor is responsible for all DMS signs, DMS cabinets, and their components during receiving, storage, transportation, and final installation. If any of the DMS signs, DMS cabinets, or their components are damaged, the Contractor will be required to repair or replace the damaged DMS signs, DMS cabinets, or their components at the Contractor's expense

Furnish and install all items, materials, hardware, and incidentals, whether or not specifically shown on the plans which may be necessary for the installation of the DMS and DMS cabinets including but not limited to DMS mounting supports, Concrete Foundations, DMS cabinet supports, junction boxes, and Liquidtight Flexible Metal Conduit (LFMC).

For the DMS foundation mounted cabinet, furnish and install the cabinet foundation according to ITS(21)-15 Type 4 cabinet with maintenance pad for dual-door cabinets.

No payment shall be made directly for all the above mentioned work and for the subsidiary items furnished and installed, materials, or other incidentals required to complete the work, but shall be considered subsidiary to this item.

Do not apply power to the DMS until approved by the Engineer.

Item 6062. Intelligent Transportation System (ITS) Radio

This item shall also include, but is not limited to the following subsidiary items:

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- Connecting harnesses of appropriate length and terminated with matching connectors for interconnection with communications system equipment.
- Removal or relocation of power/signal cable(s) (regardless of number of cables required).
- Removal or relocation of antennas.
- Cat6 cables
- PoE++ 56 V injectors
- Omni Antenna for single 900 MHz radio Connectorized Omnidirectional
- Yagi Antenna for single 900 MHz radio Connectorized Unidirectional
- Parabolic Kit Antenna (Dual Polarity) for single 5 GHz radio Connectorized Parabolic
- Additional Flat Panel Kit Antenna (Dual Polarity) for dual 5 GHz radio Integrated Unidirectional
- Parabolic Kit Antenna (Dual Polarity) and Additional Parabolic Kit Antenna (Dual Polarity) for dual 5 GHz radio Connectorized Parabolic

Quantities for subsidiary items will be shown on the plans for each work order.

No payment shall be made directly for all the above mentioned work and for the subsidiary items furnished and installed, or other incidentals required to complete the work, but shall be considered subsidiary to this item.

The furnishing and installation of Cat6 PoE cable will be paid under Item 6004 6031 ITS COM CBL (ETHERNET).

All materials, which are deemed salvageable by the Engineer, shall be the property of the Department and shall be transported to, and stored at TxDOT's Traffic Management Maintenance Section, 2501 SW Loop 820, Fort Worth, TX 76133.

Item 6163. Remove Existing Cables

Removal of existing cables (power) and removal of existing cables (communication) shall be paid by the length of the run regardless of the type or number of cables or number of conduits in the run and shall not be paid by each cable removed.

Item 6185. Truck Mounted Attenuators (TMA)

No additional shadow vehicle(s) with TMA other than those shown in the TCP Standard Sheets and as detailed on the General Note(s) of these Standard Sheets.

Therefore, 1 total shadow vehicle with TMA will be required for this type of work. The contractor will be responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs needed for the project.

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Item 6186. Intelligent Transportation System (ITS) Ground Box

The Department requires all ground boxes to be properly drained. If the engineer determines a ground box is not properly drained because it is placed to match the slope of the existing grade, reconstruct and/or relocate the drain hole and cushion (washed gravel or crushed stones), as required, to ensure efficient evacuation of fluids from the ground box. The contractor is advised, therefore, to make any adjustments required for efficient drainage prior to initial placement, to avoid any necessary re-work.

The Contractor is responsible for the security of the new ground boxes and ground box contents such as wiring, fiber optic cables, splice closures, etc. while they are uncovered or not welded. New ground boxes will be sealed by tack welding two corners for at least two inches on each side after work. Repair galvanized welded areas in accordance with Item 445 "Galvanizing."

No payment shall be made directly for all the above mentioned work, or other incidentals required to complete the work, but shall be considered subsidiary to this item.

Class "A" concrete design shall be a Fort Worth District concrete approved design.

Item 6304. Radar Vehicle Sensing Device (RVSD)

This item shall also include, but is not limited to, the following subsidiary items:

- Connecting harnesses of appropriate length and terminated with matching connectors for interconnection with communications system equipment
- RVSD cable(s) (regardless of number of cables required)
- Removal of RVSD cable(s) (regardless of number of cables)

Quantities for subsidiary items will be shown on the plans for each work order.

No payment shall be made directly for all the above mentioned work and for the subsidiary items furnished and installed, materials, or other incidentals required to complete the work, but shall be considered subsidiary to this item.

Item 6305. Lane-Use Control Signal System Equipment

This item shall also include, but is not limited to, the following subsidiary items:

- Removal of mounting brackets and hardware

Quantities for subsidiary items will be shown on the plans for each work order.

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When removing the LCS Signal Unit, care needs to be taking to ensure that no piece of equipment or hardware can fall onto traffic.

No payment shall be made directly for all the above mentioned work or other incidentals required to complete the work, but shall be considered subsidiary to this Item.

Item 6366. Installation of Wrong Way Driver System Equipment

A 3 inch strip of red reflective sheeting shall be placed on all Wrong Way Driver System Equipment posts. This sheeting shall be placed directly below the signs for the entire length of the sign post facing wrong way traffic. Sheeting shall conform to the requirements of Item 636. Clean posts with Isopropyl Alcohol and let it dry before sheeting installation.

Furnish and install single pole non-fused watertight breakaway electrical connectors for frangible pedestal pole bases, as shown on TxDOT's MPL in the file "Roadway Illumination and Electrical Supplies." Approved models are listed under Item 685. For ungrounded (hot) conductors, install a breakaway connector with a dummy fuse slug. For grounded (neutral) conductors, install a breakaway connector with a white colored marking and a permanently installed dummy fuse (slug).

No payment shall be made directly for all the above mentioned work and the material furnished and installed, or other incidentals required to complete the work, but shall be considered subsidiary to this item.

Item 6426. Remove Dynamic Message Sign System

This item shall also include, but is not limited to, the following subsidiary items:

- Removal of pole mounted cabinets
- Removal of power and communication cables from pole mounted cabinet to DMS sign
- Removal of flexible metal conduit

Quantities for subsidiary items will be shown on the plans for each work order.

No payment shall be made directly for all the above mentioned work or other incidentals required to complete the work, but shall be considered subsidiary to this Item.

Removal of Overhead Sign Support (Balance Tee) will be paid under Item 650. "Overhead Sign Supports."

Miscellaneous

General Notes

Sheet 31

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TxDOT personnel will verify network communications to the work site from an appropriate ITS cabinet, satellite building, or from TransVision. If network communications fail, the Contractor will correct the fault so that successful communication is established. The Contractor will correct all problems related to his work which develop during the test at no additional cost to the state.

Reference to any specific manufacturer's name, make or number for any item of equipment or material necessary to meet the requirements of the specifications and the plans is intended to be descriptive but not mandatory and is intended to indicate the type of equipment or materials that will be acceptable. The type of equipment or materials that will be acceptable shall be subject to acceptable test results, by the Engineer or his named representative, at the time of product installation. However, provide all like items on this contract to be identical and from the same manufacturer.

Provide four copies of descriptive manuals and brochures for each type of electronic equipment and apparatus proposed for this project. These documents shall contain sufficient technical data for complete evaluation. Incomplete submittals will not be accepted. Describe the quality, function and capability of each deliverable item. Submit originals or copies equal in quality to the originals manuals or brochures. Where a brochure describes several similar items, highlight the specific item being submitted. Where an item has several options or accessories, highlight the options or accessories he intends to deliver. Bond all manuals, brochures, and data sheets relating to a bid item together in a folder. Identify on the cover with the TxDOT contract number, title and bid item number.

Submit four copies of detailed equipment submittals and shop drawings for each fabricated item proposed for this project within thirty days after the authorization to begin work. Submit these equipment submittals and drawings to contain all information required for complete evaluation and fabrication in accordance with the plans and specifications. Submit shop drawings on sheets that are 11 inches in height and 17 inches long and ensure that they are completely clear and legible. Stamp the drawings with Contractor's approval, sequentially numbered and identified as to TxDOT contract number, title and bid item number.

The Engineer, upon approval of the above submittals, will indicate any correction to the details in the submittals.

Correct any errors in the submittals, as directed by the Engineer, and if required, shall resubmit to the Engineer four copies of the same. Begin work upon approval of the corrected drawings and equipment. No change will be permitted in the list of equipment or shop drawings once approved, unless authorized by the Engineer in writing.

Equipment will not be accepted for delivery or any payment made until the equipment, materials lists and shop drawings have been approved by the Engineer. Approval by the Engineer does not relieve the Contractor of his responsibilities to meet the requirements of the specifications and plans.

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The TxDOT, through its authorized representative, retains the right to inspect all structures, equipment and materials used in the project before, during and after installation, also the right to inspect the work during the process of fabrication or manufacture for the purpose of determining if the plans and specifications upon which the award was made are being complied with and being satisfied as to quality of the material and workmanship. Such inspection will not release the manufacturer from strict compliance with specifications when the work is finally completed and offered for acceptance.

Provide each field cabinet with three copies of the final as-built cabinet wiring diagrams. Deliver a Mylar reproducible of the cabinet wiring diagrams showing all field changes incorporated by the Contractor to the Engineer.

Provide system support during the entire project. This includes any required design reviews, complete "parts and labor" on-site maintenance until final acceptance by the state, operational support during system integration and manufacturer's warranties and guarantees at no additional cost to the state.

Conduct design reviews of the ITS system within the scope of the project as required. Provide review comments within five business days to the Engineer, at no additional cost to the State. The Engineer will review and make recommendations and/or corrections as needed.

The Contractor is responsible for all new materials and equipment furnished and installed by the Contractor, equipment furnished by TxDOT, as well as existing equipment modified as part of this contract, until final acceptance of the system. The Contractor is responsible for the replacement of equipment, including cabinets, wire, and fiber optic cable, fiber optic patch panels that fail due to all causes including theft, vandalism and "knock downs" at no cost to the State until final acceptance of the system.

Designate an ITS supervisor who shall be responsible for the ITS project and serve as the Contractor's official contact with the Department. This ITS supervisor shall be on-site from the beginning of the ITS construction until final system acceptance. Supplement the ITS supervisor's support with the services of qualified Engineers and the services of vendor technical representatives for the duration of the project.

Upon final system acceptance, furnish a set of as-built plans which shall show the actual equipment installation and construction details.

Provide complete on-site parts and labor support for the furnishing and the installation of the Intelligent Transportation Systems for the duration of the entire project and during the warranty period. During the project, make any adjustments or repairs which may be required and correct any defects or damages that may occur at Contractor expense.

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During the warranty period, furnish parts and labor required to repair, on-site, any manufacturer's defects (materials or workmanship), damage caused by manufacturer's defects and damage caused by the Contractor during the performance of warranty work. Natural disasters or other events not directly controllable by the Contractor are specifically exempted from warranty.

During the test period, make any adjustments or repairs which may be required and remedy any defects or damages that may occur at Contractor expense.

No time charges will be assessed during the 90 days test period for each work order, provided all other work is completed to the satisfaction of the Engineer.



Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0902-00-299

DISTRICT Fort Worth
HIGHWAY Various

COUNTY Tarrant

CONTROL SECTION JOB				0902-00-299		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00135507			
COUNTY				Tarrant			
HIGHWAY				Various			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	164-6027	CELL FBR MLCH SEED(PERM)(URBAN)(CLAY)	SY	1,000.000		1,000.000	
	164-6031	CELL FBR MLCH SEED(TEMP)(COOL)	SY	1,000.000		1,000.000	
	168-6001	VEGETATIVE WATERING	MG	300.000		300.000	
	416-6004	DRILL SHAFT (36 IN)	LF	40.000		40.000	
	416-6005	DRILL SHAFT (42 IN)	LF	30.000		30.000	
	416-6006	DRILL SHAFT (48 IN)	LF	250.000		250.000	
	416-6007	DRILL SHAFT (54 IN)	LF	60.000		60.000	
	416-6026	DRILL SHAFT (HIGH MAST POLE) (60 IN)	LF	50.000		50.000	
	416-6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF	10.000		10.000	
	416-6030	DRILL SHAFT (TRF SIG POLE) (24 IN)	LF	24.000		24.000	
	432-6005	RIPRAP (CONC) (CL A)	CY	8.750		8.750	
	432-6006	RIPRAP (CONC)(CL B)	CY	1.400		1.400	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	10.000		10.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	36.000		36.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	250.000		250.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	250.000		250.000	
	506-6042	BIODEG EROSN CONT LOGS (INSTL) (18")	LF	250.000		250.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	250.000		250.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	300.000		300.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	1.000		1.000	
	540-6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	3.000		3.000	
	540-6041	MTL W-BEAM GD FEN (NESTED)(TIM POST)	LF	25.000		25.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	3.000		3.000	
	610-6254	IN RD IL (TY ST) 40T-8 (250W EQ) LED	EA	1.000		1.000	
	613-6005	HI MST IL POLE (150 FT)(80 MPH)	EA	1.000		1.000	
	618-6023	CONDT (PVC) (SCH 40) (2")	LF	100.000		100.000	
	618-6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF	50.000		50.000	
	618-6025	CONDT (PVC) (SCH 40) (2") (CONC ENCSE)	LF	50.000		50.000	
	618-6026	CONDT (PVC) (SCH 40) (2") (STL ENCSE)	LF	25.000		25.000	
	618-6029	CONDT (PVC) (SCH 40) (3")	LF	1,000.000		1,000.000	
	618-6030	CONDT (PVC) (SCH 40) (3") (BORE)	LF	100.000		100.000	
	618-6031	CONDT (PVC) (SCH 40) (3") (CONC ENCSE)	LF	50.000		50.000	
	618-6032	CONDT (PVC) (SCH 40) (3") (STL ENCSE)	LF	25.000		25.000	
	618-6033	CONDT (PVC) (SCH 40) (4")	LF	50.000		50.000	
	618-6034	CONDT (PVC) (SCH 40) (4") (BORE)	LF	50.000		50.000	
	618-6035	CONDT (PVC) (SCH 40) (4") (CONC ENCSE)	LF	50.000		50.000	



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Report Created On: Apr 27, 2024 8:28:57 AM

DISTRICT	COUNTY	CCSJ	SHEET
Fort Worth	Tarrant	0902-00-299	4



CONTROLLING PROJECT ID 0902-00-299

DISTRICT Fort Worth
HIGHWAY Various

COUNTY Tarrant

Estimate & Quantity Sheet

CONTROL SECTION JOB				0902-00-299		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00135507			
COUNTY				Tarrant			
HIGHWAY				Various			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	618-6036	CONDT (PVC) (SCH 40) (4") (STL ENCSE)	LF	50.000		50.000	
	618-6046	CONDT (PVC) (SCH 80) (2")	LF	100.000		100.000	
	618-6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	50.000		50.000	
	618-6049	CONDT (PVC) (SCH 80) (2") (CONC ENCSE)	LF	50.000		50.000	
	618-6053	CONDT (PVC) (SCH 80) (3")	LF	100.000		100.000	
	618-6054	CONDT (PVC) (SCH 80) (3") (BORE)	LF	100.000		100.000	
	618-6056	CONDT (PVC) (SCH 80) (3") (CONC ENCSE)	LF	50.000		50.000	
	618-6058	CONDT (PVC) (SCH 80) (4")	LF	50.000		50.000	
	618-6059	CONDT (PVC) (SCH 80) (4") (BORE)	LF	50.000		50.000	
	618-6070	CONDT (RM) (2")	LF	50.000		50.000	
	618-6071	CONDT (RM) (2") (BORE)	LF	50.000		50.000	
	618-6074	CONDT (RM) (3")	LF	50.000		50.000	
	618-6075	CONDT (RM) (3") (BORE)	LF	50.000		50.000	
	618-6078	CONDT (RM) (4")	LF	50.000		50.000	
	618-6079	CONDT (RM) (4") (BORE)	LF	50.000		50.000	
	620-6007	ELEC CONDR (NO.8) BARE	LF	1,000.000		1,000.000	
	620-6008	ELEC CONDR (NO.8) INSULATED	LF	300.000		300.000	
	620-6009	ELEC CONDR (NO.6) BARE	LF	100.000		100.000	
	620-6010	ELEC CONDR (NO.6) INSULATED	LF	300.000		300.000	
	620-6011	ELEC CONDR (NO.4) BARE	LF	100.000		100.000	
	620-6012	ELEC CONDR (NO.4) INSULATED	LF	300.000		300.000	
	620-6015	ELEC CONDR (NO.2) BARE	LF	100.000		100.000	
	620-6016	ELEC CONDR (NO.2) INSULATED	LF	300.000		300.000	
	620-6017	ELEC CONDR (NO.1) BARE	LF	100.000		100.000	
	620-6018	ELEC CONDR (NO.1) INSULATED	LF	300.000		300.000	
	620-6019	ELEC CONDR (NO.1/0) BARE	LF	100.000		100.000	
	620-6020	ELEC CONDR (NO.1/0) INSULATED	LF	300.000		300.000	
	620-6021	ELEC CONDR (NO.2/0) BARE	LF	100.000		100.000	
	620-6022	ELEC CONDR (NO.2/0) INSULATED	LF	300.000		300.000	
	620-6023	ELEC CONDR (NO.3/0) BARE	LF	100.000		100.000	
	620-6024	ELEC CONDR (NO.3/0) INSULATED	LF	300.000		300.000	
	624-6010	GROUND BOX TY D (162922)W/APRON	EA	10.000		10.000	
	624-6028	REMOVE GROUND BOX	EA	10.000		10.000	
	625-6003	ZINC-COAT STL WIRE STRAND (3/8")	LF	100.000		100.000	
	627-6002	TIMBER POLE (CL 2) 40 FT	EA	2.000		2.000	
	627-6003	TIMBER POLE (CL 2) 50 FT	EA	2.000		2.000	
	628-6002	REMOVE ELECTRICAL SERVICES	EA	5.000		5.000	



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DISTRICT	COUNTY	CCSJ	SHEET
Fort Worth	Tarrant	0902-00-299	4A



CONTROLLING PROJECT ID 0902-00-299

DISTRICT Fort Worth
HIGHWAY Various

COUNTY Tarrant

Estimate & Quantity Sheet

CONTROL SECTION JOB				0902-00-299		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00135507			
COUNTY				Tarrant			
HIGHWAY				Various			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	628-6151	ELC SRV TY D 120/240 060(NS)SS(N)PS(U)	EA	1.000		1.000	
	628-6152	ELC SRV TY D 120/240 060(NS)SS(N)SP(O)	EA	1.000		1.000	
	628-6194	ELC SRV TY D 120/240 070(NS)SS(N)SP(O)	EA	5.000		5.000	
	628-6195	ELC SRV TY D 120/240 070(NS)SS(N)SP(U)	EA	1.000		1.000	
	628-6250	ELC SRV TY D 120/240 100(NS)SS(N)SP(O)	EA	1.000		1.000	
	628-6251	ELC SRV TY D 120/240 100(NS)SS(N)SP(U)	EA	1.000		1.000	
	628-6349	ELC SRV TY D 120/240 070(NS)SS(N)PS(U)	EA	1.000		1.000	
	644-6068	RELOCATE SM RD SN SUP&AM TY 10BWG	EA	1.000		1.000	
	644-6070	RELOCATE SM RD SN SUP&AM TY S80	EA	1.000		1.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	2.000		2.000	
	650-6035	INS OH SN SUP(35 FT BAL TEE)	EA	2.000		2.000	
	650-6204	REMOVE OVERHD SIGN SUP	EA	1.000		1.000	
	654-6006	SIGN WALKWAY (48 IN) WITH HNDRL	LF	92.000		92.000	
	654-6007	REMOVE SIGN WALKWAY	EA	1.000		1.000	
	658-6083	INSTL DEL ASSM (D-SW)SZ 1(WFLX)SRF	EA	6.000		6.000	
	658-6088	INSTL DEL ASSM (D-SY)SZ 1(YFLX)SRF	EA	6.000		6.000	
	672-6008	REFL PAV MRKR TY I-R	EA	28.000		28.000	
	677-6008	ELIM EXT PAV MRK & MRKS (ARROW)	EA	2.000		2.000	
	678-6033	PAV SURF PREP FOR MRK (RPM)	EA	28.000		28.000	
	687-6001	PED POLE ASSEMBLY	EA	1.000		1.000	
	690-6021	REMOVAL OF TIMBER POLES	EA	10.000		10.000	
	6000-6005	REMOVE UNDERGROUND CONDUIT	LF	100.000		100.000	
	6000-6098	INSTALL CIRCUIT BREAKER	EA	1.000		1.000	
	6000-6099	REPLACE CIRCUIT BREAKER	EA	1.000		1.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	100.000		100.000	
	6004-6031	ITS COM CBL (ETHERNET)	LF	1,000.000		1,000.000	
	6004-6032	ITS COM CBL (SERIAL)	LF	1,000.000		1,000.000	
	6007-6028	FO CBL (6 SMF)	LF	50.000		50.000	
	6007-6030	FO CBL (6 SMF)(AERIAL)	LF	50.000		50.000	
	6007-6034	FO CBL (6 SMF)(PIGTAIL)	LF	50.000		50.000	
	6007-6036	FO CBL (12 SMF)	LF	50.000		50.000	
	6007-6038	FO CBL (12 SMF)(AERIAL)	LF	50.000		50.000	
	6007-6042	FO CBL (12 SMF)(PIGTAIL)	LF	1,000.000		1,000.000	
	6007-6044	FO CBL (24 SMF)	LF	100.000		100.000	
	6007-6046	FO CBL (24 SMF)(AERIAL)	LF	100.000		100.000	
	6007-6050	FO CBL (36 SMF)	LF	10,000.000		10,000.000	
	6007-6052	FO CBL (36 SMF)(AERIAL)	LF	100.000		100.000	



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DISTRICT	COUNTY	CCSJ	SHEET
Fort Worth	Tarrant	0902-00-299	4B



CONTROLLING PROJECT ID 0902-00-299

DISTRICT Fort Worth
HIGHWAY Various

COUNTY Tarrant

Estimate & Quantity Sheet

CONTROL SECTION JOB				0902-00-299		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00135507			
COUNTY				Tarrant			
HIGHWAY				Various			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	6007-6058	FO CBL (48 SMF)(AERIAL)	LF	100.000		100.000	
	6007-6062	FO CBL (72 SMF)	LF	50,000.000		50,000.000	
	6007-6064	FO CBL (72 SMF)(AERIAL)	LF	100.000		100.000	
	6007-6068	FO CBL (96 SMF)	LF	100.000		100.000	
	6007-6070	FO CBL (96 SMF)(AERIAL)	LF	50.000		50.000	
	6007-6074	FO CBL (144 SMF)	LF	100.000		100.000	
	6007-6076	FO CBL (144 SMF)(AERIAL)	LF	100.000		100.000	
	6007-6087	FO SPLICE ENCLOSURE (TYPE 1)	EA	20.000		20.000	
	6007-6088	FO SPLICE ENCLOSURE (TYPE 1)(AERIAL)	EA	1.000		1.000	
	6007-6089	FO SPLICE ENCLOSURE (TYPE 2)	EA	1.000		1.000	
	6007-6090	FO SPLICE ENCLOSURE (TYPE 2)(AERIAL)	EA	1.000		1.000	
	6007-6091	FO SPLICE ENCLOSURE (TYPE 3)	EA	1.000		1.000	
	6007-6092	FO SPLICE ENCLOSURE (TYPE 3)(AERIAL)	EA	1.000		1.000	
	6007-6093	RACK MOUNTED FO SPLICE ENCLOSURE	EA	2.000		2.000	
	6007-6094	FIBER OPTIC FUSION SPLICE	EA	1,000.000		1,000.000	
	6007-6095	FIBER OPTIC PATCH PANEL (6 POSITION)	EA	1.000		1.000	
	6007-6096	FIBER OPTIC PATCH PANEL (12 POSITION)	EA	1.000		1.000	
	6007-6097	FIBER OPTIC PATCH PANEL (24 POSITION)	EA	1.000		1.000	
	6007-6098	FIBER OPTIC PATCH PANEL (36 POSITION)	EA	1.000		1.000	
	6007-6099	FIBER OPTIC PATCH PANEL (48 POSITION)	EA	1.000		1.000	
	6007-6100	FIBER OPTIC PATCH PANEL (72 POSITION)	EA	2.000		2.000	
	6007-6101	FIBER OPTIC PATCH PANEL (96 POSITION)	EA	1.000		1.000	
	6007-6102	RELOCATE FIBER OPTIC CABLE	LF	1,000.000		1,000.000	
	6007-6103	REMOVE FIBER OPTIC CABLE	LF	10,000.000		10,000.000	
	6007-6104	FO CBL (24 SMF)(PIGTAIL)	LF	1,000.000		1,000.000	
	6007-6105	PRETERM FIBER PATCH PANEL (6 POSITION)	EA	1.000		1.000	
	6007-6106	PRETERM FIBER PATCH PANEL (12 POSITION)	EA	10.000		10.000	
	6007-6107	PRETERM FIBER PATCH PANEL (24 POSITION)	EA	10.000		10.000	
	6007-6108	FIBER OPTIC PATCH PANEL UNIT	EA	2.000		2.000	
	6007-6109	FIBER OPTIC JUMPERS	EA	10.000		10.000	
	6008-6046	ITS GRND MNT CAB (TY 6) (CONF 2) (REM)	EA	10.000		10.000	
	6010-6002	CCTV FIELD EQUIPMENT (DIGITAL)	EA	10.000		10.000	
	6010-6004	CCTV MOUNT (POLE)	EA	10.000		10.000	
	6010-6011	CCTV FIELD EQUIP (DIGITAL) (INSTL ONLY)	EA	1.000		1.000	
	6010-6012	RELOCATE CCTV FIELD EQUIPMENT	EA	1.000		1.000	
	6010-6013	REMOVE CCTV FIELD EQUIPMENT	EA	1.000		1.000	
	6016-6006	ITS MULTI-DUCT CND (PVC-40)	LF	5,000.000		5,000.000	

DISTRICT	COUNTY	CCSJ	SHEET
Fort Worth	Tarrant	0902-00-299	4C



CONTROLLING PROJECT ID 0902-00-299

DISTRICT Fort Worth
HIGHWAY Various

COUNTY Tarrant

Estimate & Quantity Sheet

CONTROL SECTION JOB				0902-00-299		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00135507			
COUNTY				Tarrant			
HIGHWAY				Various			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	6016-6007	ITS MULTI-DUCT CND (PVC-40)(BORE)	LF	100.000		100.000	
	6016-6008	ITS MULTI-DUCT CND (PVC-40)(CONC ENCSE)	LF	100.000		100.000	
	6016-6009	ITS MULTI-DUCT CND (PVC-40)(STL ENCSE)	LF	50.000		50.000	
	6016-6010	ITS MULTI-DUCT CND (PVC-80)	LF	100.000		100.000	
	6016-6011	ITS MULTI-DUCT CND (PVC-80)(BORE)	LF	100.000		100.000	
	6016-6012	ITS MULTI-DUCT CND (PVC-80)(CONC ENCSE)	LF	50.000		50.000	
	6016-6013	ITS MULTI-DUCT CND (RMC)	LF	50.000		50.000	
	6016-6015	FIBER OPTIC CABLE ROAD MARKER	EA	50.000		50.000	
	6027-6002	CABLE RACK ASSEMBLY (INSTALL)	EA	10.000		10.000	
	6027-6003	CONDUIT (PREPARE)	LF	10,000.000		10,000.000	
	6027-6004	JUNCTION BOX (INSTALL)	EA	5.000		5.000	
	6027-6008	GROUND BOX (PREPARE)	EA	20.000		20.000	
	6028-6001	INSTALL DMS (POLE MTD CABINET)	EA	1.000		1.000	
	6028-6002	INSTALL DMS (FOUNDATION MTD CABINET)	EA	1.000		1.000	
	6062-6005	ITS RADIO (SNGL)(900 MHZ)-C-O	EA	2.000		2.000	
	6062-6006	ITS RADIO (SNGL)(900 MHZ)-C-U	EA	2.000		2.000	
	6062-6018	ITS RADIO (SNGL)(5 GHZ)-I-U	EA	2.000		2.000	
	6062-6024	ITS RADIO (SNGL)(5 GHZ)-C-P	EA	2.000		2.000	
	6062-6034	ITS RADIO (DUAL)(5 GHZ/5 GHZ)-I-U	EA	2.000		2.000	
	6062-6040	ITS RADIO (DUAL)(5 GHZ/5 GHZ)-C-P	EA	2.000		2.000	
	6062-6042	RELOCATE ITS RADIO	EA	10.000		10.000	
	6062-6043	REMOVE ITS RADIO	EA	10.000		10.000	
	6064-6010	ITS POLE (30 FT)(90 MPH)	EA	1.000		1.000	
	6064-6017	ITS POLE (30 FT)(REL)	EA	1.000		1.000	
	6064-6018	ITS POLE (30 FT)(REM)	EA	1.000		1.000	
	6064-6019	ITS POLE (40 FT)(90 MPH)	EA	1.000		1.000	
	6064-6037	ITS POLE (50 FT)(90 MPH)	EA	1.000		1.000	
	6064-6055	ITS POLE (60 FT)(90 MPH)	EA	10.000		10.000	
	6064-6061	ITS POLE (60 FT)(INST ONLY)	EA	1.000		1.000	
	6064-6062	ITS POLE (60 FT)(REL)	EA	1.000		1.000	
	6064-6063	ITS POLE (60 FT)(REM)	EA	1.000		1.000	
	6064-6076	ITS POLE MNT CAB (TY 1)(CONF 2)	EA	1.000		1.000	
	6064-6077	ITS POLE MNT CAB (TY 1)(CONF 2)(INS)	EA	1.000		1.000	
	6064-6078	ITS POLE MNT CAB (TY 1)(CONF 2)(REL)	EA	1.000		1.000	
	6064-6079	ITS POLE MNT CAB (TY 1)(CONF 2)(REM)	EA	1.000		1.000	
	6064-6084	ITS POLE MNT CAB (TY 2)(CONF 2)	EA	2.000		2.000	
	6064-6086	ITS POLE MNT CAB (TY 2)(CONF 2)(REL)	EA	1.000		1.000	



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DISTRICT	COUNTY	CCSJ	SHEET
Fort Worth	Tarrant	0902-00-299	40



Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0902-00-299

DISTRICT Fort Worth
HIGHWAY Various

COUNTY Tarrant

CONTROL SECTION JOB				0902-00-299		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00135507			
COUNTY				Tarrant			
HIGHWAY				Various			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	6064-6087	ITS POLE MNT CAB (TY 2)(CONF 2)(REM)	EA	1.000		1.000	
	6064-6092	ITS POLE MNT CAB (TY 3)(CONF 2)	EA	10.000		10.000	
	6064-6094	ITS POLE MNT CAB (TY 3)(CONF 2)(REL)	EA	1.000		1.000	
	6064-6095	ITS POLE MNT CAB (TY 3)(CONF 2)(REM)	EA	1.000		1.000	
	6125-6001	TERMINAL SERVER (INSTALL ONLY)	EA	10.000		10.000	
	6163-6002	REMOVE EXISTING CABLES (POWER)	LF	1,000.000		1,000.000	
	6163-6003	REMOVE EXISTING CABLES (COMMUNICATION)	LF	1,000.000		1,000.000	
	6185-6002	TMA (STATIONARY)	DAY	100.000		100.000	
	6186-6002	ITS GND BOX(PCAST) TY 1 (243636)W/APRN	EA	10.000		10.000	
	6186-6008	ITS GND BOX(PCAST) TY 2 (366036)W/APRN	EA	10.000		10.000	
	6186-6025	REMOVE ITS GROUND BOX	EA	10.000		10.000	
	6280-6001	HIGH MAST ASSEMBLY FOR ITS	EA	1.000		1.000	
	6304-6002	ITS RVSD (DATA COLLECT & WWA) SYS	EA	10.000		10.000	
	6304-6006	ITS RVSD (DC & WWA) (RELOCATE)	EA	1.000		1.000	
	6304-6008	ITS RVSD (DC & WWA) (REMOVE)	EA	1.000		1.000	
	6305-6008	LCS SIGNAL UNIT (REMOVE)	EA	10.000		10.000	
	6327-6003	INSTALL OF HARD ETHERNET SWITCH	EA	10.000		10.000	
	6366-6001	INST WRONG WAY DRIVER SYSTEM EQUIPMENT	EA	1.000		1.000	
	6399-6001	CELLULAR ROUTER	EA	1.000		1.000	
	6426-6001	REMOVE DYNAMIC MESSAGE SIGN SYSTEM	EA	1.000		1.000	
	6521-6001	FURNISH AND INSTALL RWIS	EA	1.000		1.000	
	6521-6002	ALL-IN-ONE ATMOSPHERIC SENSOR	EA	1.000		1.000	
	6521-6003	PRECIPITATION TYPE SENSOR	EA	1.000		1.000	
	6521-6004	AIR TEMP/RELATIVE HUMIDITY SENSOR	EA	1.000		1.000	
	6521-6005	ROAD SURFACE SENSOR	EA	1.000		1.000	
	6521-6006	SUBSURFACE SENSOR	EA	1.000		1.000	
	6521-6007	NON-INTRUSIVE PAVE CONDI & TEMP SENSOR	EA	1.000		1.000	
	6521-6008	RAIN SENSOR	EA	1.000		1.000	
	6521-6009	WINDSPEED/DIRECTION SENSOR	EA	1.000		1.000	
	6521-6010	BAROMETRIC PRESSURE SENSOR	EA	1.000		1.000	
	6521-6011	NON-INTRUSIVE WATER LEVEL FLOOD SENSOR	EA	1.000		1.000	
	04	PUBLIC UTILITY FORCE ACCT WORK (NON-PARTICIPATING)	LS	1.000		1.000	
	06	MATERIAL FURNISHED BY THE STATE	LS	1.000		1.000	
	08	CONTRACTOR FORCE ACCOUNT EROSION CONTROL MAINTENANCE (NON-PARTICIPATING)	LS	1.000		1.000	
		CONTRACTOR FORCE ACCOUNT SAFETY CONTINGENCY (NON-PARTICIPATING)	LS	1.000		1.000	

DISTRICT	COUNTY	CCSJ	SHEET
Fort Worth	Tarrant	0902-00-299	4E



CONTROLLING PROJECT ID 0902-00-299

Estimate & Quantity Sheet

DISTRICT Fort Worth
HIGHWAY Various

COUNTY Tarrant



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DISTRICT	COUNTY	CCSJ	SHEET
Fort Worth	Tarrant	0902-00-299	4F

FILE: T:\TRAFFIC\ITS\0902-00-299 Non-Site Specific\Quantity Summary\Quantity Summary.dgn
 DATE: 4/24/2024 9:21:03 AM

QUANTITY SUMMARY			
ITEM	DESCRIPTION	UNIT	QUANTITY
164 6027	CELL FBR MLCH SEED(PERM)(URBAN)(CLAY)	SY	1,000
164 6031	CELL FBR MLCH SEED(TEMP)(COOL)	SY	1,000
168 6001	VEGETATIVE WATERING	MG	300
416 6004	DRILL SHAFT (36 IN)	LF	40
416 6005	DRILL SHAFT (42 IN)	LF	30
416 6006	DRILL SHAFT (48 IN)	LF	250
416 6007	DRILL SHAFT (54 IN)	LF	60
416 6026	DRILL SHAFT (HIGH MAST POLE) (60 IN)	LF	50
416 6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF	10
416 6030	DRILL SHAFT (TRF SIG POLE) (24 IN)	LF	24
432 6005	RIPRAP (CONC) (CL A)	CY	8.75
432 6006	RIPRAP (CONC)(CL B)	CY	1.40
432 6045	RIPRAP (MOW STRIP)(4 IN)	CY	10
500 6001	MOBILIZATION	LS	1
502 6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	36
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	250
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	250
506 6042	BIODEG EROSN CONT LOGS (INSTL) (18")	LF	250
506 6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	250
540 6001	MTL W-BEAM GD FEN (TIM POST)	LF	300
540 6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	1
540 6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	3
540 6041	MTL W-BEAM GD FEN (NESTED)(TIM POST)	LF	25
544 6001	GUARDRAIL END TREATMENT (INSTALL)	EA	3
610 6254	IN RD IL (TY ST) 40T-8 (250W EQ) LED	EA	1
613 6005	HI MST IL POLE (150 FT)(80 MPH)	EA	1
618 6023	CONDT (PVC) (SCH 40) (2")	LF	100
618 6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF	50
618 6025	CONDT (PVC) (SCH 40) (2") (CONC ENCSE)	LF	50
618 6026	CONDT (PVC) (SCH 40) (2") (STL ENCSE)	LF	25
618 6029	CONDT (PVC) (SCH 40) (3")	LF	1,000
618 6030	CONDT (PVC) (SCH 40) (3") (BORE)	LF	100
618 6031	CONDT (PVC) (SCH 40) (3") (CONC ENCSE)	LF	50
618 6032	CONDT (PVC) (SCH 40) (3") (STL ENCSE)	LF	25
618 6033	CONDT (PVC) (SCH 40) (4")	LF	50
618 6034	CONDT (PVC) (SCH 40) (4") (BORE)	LF	50
618 6035	CONDT (PVC) (SCH 40) (4") (CONC ENCSE)	LF	50
618 6036	CONDT (PVC) (SCH 40) (4") (STL ENCSE)	LF	50
618 6046	CONDT (PVC) (SCH 80) (2")	LF	100
618 6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	50
618 6049	CONDT (PVC) (SCH 80) (2") (CONC ENCSE)	LF	50
618 6053	CONDT (PVC) (SCH 80) (3")	LF	100
618 6054	CONDT (PVC) (SCH 80) (3") (BORE)	LF	100
618 6056	CONDT (PVC) (SCH 80) (3") (CONC ENCSE)	LF	50
618 6058	CONDT (PVC) (SCH 80) (4")	LF	50
618 6059	CONDT (PVC) (SCH 80) (4") (BORE)	LF	50
618 6070	CONDT (RM) (2")	LF	50
618 6071	CONDT (RM) (2") (BORE)	LF	50
618 6074	CONDT (RM) (3")	LF	50
618 6075	CONDT (RM) (3") (BORE)	LF	50
618 6078	CONDT (RM) (4")	LF	50
618 6079	CONDT (RM) (4") (BORE)	LF	50
620 6007	ELEC CONDR (NO.8) BARE	LF	1,000
620 6008	ELEC CONDR (NO.8) INSULATED	LF	300
620 6009	ELEC CONDR (NO.6) BARE	LF	100
620 6010	ELEC CONDR (NO.6) INSULATED	LF	300
620 6011	ELEC CONDR (NO.4) BARE	LF	100
620 6012	ELEC CONDR (NO.4) INSULATED	LF	300
620 6015	ELEC CONDR (NO.2) BARE	LF	100
620 6016	ELEC CONDR (NO.2) INSULATED	LF	300

QUANTITY SUMMARY			
ITEM	DESCRIPTION	UNIT	QUANTITY
620 6017	ELEC CONDR (NO.1) BARE	LF	100
620 6018	ELEC CONDR (NO.1) INSULATED	LF	300
620 6019	ELEC CONDR (NO.1/0) BARE	LF	100
620 6020	ELEC CONDR (NO.1/0) INSULATED	LF	300
620 6021	ELEC CONDR (NO.2/0) BARE	LF	100
620 6022	ELEC CONDR (NO.2/0) INSULATED	LF	300
620 6023	ELEC CONDR (NO.3/0) BARE	LF	100
620 6024	ELEC CONDR (NO.3/0) INSULATED	LF	300
624 6010	GROUND BOX TY D (162922)W/APRON	EA	10
624 6028	REMOVE GROUND BOX	EA	10
625 6003	ZINC-COAT STL WIRE STRAND (3/8")	LF	100
627 6002	TIMBER POLE (CL 2) 40 FT	EA	2
627 6003	TIMBER POLE (CL 2) 50 FT	EA	2
628 6002	REMOVE ELECTRICAL SERVICES	EA	5
628 6151	ELC SRV TY D 120/240 060(NS)SS(N)PS(U)	EA	1
628 6152	ELC SRV TY D 120/240 060(NS)SS(N)SP(O)	EA	1
628 6194	ELC SRV TY D 120/240 070(NS)SS(N)SP(O)	EA	5
628 6195	ELC SRV TY D 120/240 070(NS)SS(N)SP(U)	EA	1
628 6250	ELC SRV TY D 120/240 100(NS)SS(N)SP(O)	EA	1
628 6251	ELC SRV TY D 120/240 100(NS)SS(N)SP(U)	EA	1
628 6349	ELC SRV TY D 120/240 070(NS)SS(N)PS(U)	EA	1
644 6068	RELOCATE SM RD SN SUP&AM TY 10BWG	EA	1
644 6070	RELOCATE SM RD SN SUP&AM TY S80	EA	1
644 6076	REMOVE SM RD SN SUP&AM	EA	2
650 6035	INS OH SN SUP(35 FT BAL TEE)	EA	2
650 6204	REMOVE OVERHD SIGN SUP	EA	1
654 6006	SIGN WALKWAY (48 IN) WITH HNDRL	LF	92
654 6007	REMOVE SIGN WALKWAY	EA	1
658 6083	INSTL DEL ASSM (D-SW)SZ 1(WFLX)SRF	EA	6
658 6088	INSTL DEL ASSM (D-SY)SZ 1(YFLX)SRF	EA	6
672 6008	REFL PAV MRKR TY I-R	EA	28
677 6008	ELIM EXT PAV MRK & MRKS (ARROW)	EA	2
678 6033	PAV SURF PREP FOR MRK (RPM)	EA	28
687 6001	PED POLE ASSEMBLY	EA	1
690 6021	REMOVAL OF TIMBER POLES	EA	10
6000 6005	REMOVE UNDERGROUND CONDUIT	LF	100
6000 6098	INSTALL CIRCUIT BREAKER	EA	1
6000 6099	REPLACE CIRCUIT BREAKER	EA	1
6001 6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	100
6004 6031	ITS COM CBL (ETHERNET)	LF	1,000
6004 6032	ITS COM CBL (SERIAL)	LF	1,000
6007 6028	FO CBL (6 SMF)	LF	50
6007 6030	FO CBL (6 SMF)(AERIAL)	LF	50
6007 6034	FO CBL (6 SMF)(PIGTAIL)	LF	50
6007 6036	FO CBL (12 SMF)	LF	50
6007 6038	FO CBL (12 SMF)(AERIAL)	LF	50
6007 6042	FO CBL (12 SMF)(PIGTAIL)	LF	1,000
6007 6044	FO CBL (24 SMF)	LF	100
6007 6046	FO CBL (24 SMF)(AERIAL)	LF	100
6007 6050	FO CBL (36 SMF)	LF	10,000
6007 6052	FO CBL (36 SMF)(AERIAL)	LF	100
6007 6058	FO CBL (48 SMF)(AERIAL)	LF	100
6007 6062	FO CBL (72 SMF)	LF	50,000
6007 6064	FO CBL (72 SMF)(AERIAL)	LF	100
6007 6068	FO CBL (96 SMF)	LF	100
6007 6070	FO CBL (96 SMF)(AERIAL)	LF	50
6007 6074	FO CBL (144 SMF)	LF	100
6007 6076	FO CBL (144 SMF)(AERIAL)	LF	100
6007 6087	FO SPLICE ENCLOSURE (TYPE 1)	EA	20
6007 6088	FO SPLICE ENCLOSURE (TYPE 1)(AERIAL)	EA	1

ONLY PAY ITEM QUANTITIES ARE SHOWN IN THIS TABLE. REFER TO LAYOUT SHEETS, GENERAL NOTES AND SPECIAL SPECIFICATIONS FOR SUBSIDIARY MATERIAL AND LABOR ITEMS.



 DIST. COUNTY SHEET NO.

FTW	TARRANT	5
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 CONTROL SECT. JOB HIGHWAY NO.

0902	00	299	VA
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 Sheet 1 of 2 Sheets

QUANTITY SUMMARY

FILE: I:\TRAFFIC\ITS\0902-00-299 Non-Site Specific\Quantity Summary\Quantity Summary.dgn
 DATE: 4/24/2024 9:18:16 AM

QUANTITY SUMMARY			
ITEM	DESCRIPTION	UNIT	QUANTITY
6007 6089	FO SPLICE ENCLOSURE (TYPE 2)	EA	1
6007 6090	FO SPLICE ENCLOSURE (TYPE 2)(AERIAL)	EA	1
6007 6091	FO SPLICE ENCLOSURE (TYPE 3)	EA	1
6007 6092	FO SPLICE ENCLOSURE (TYPE 3)(AERIAL)	EA	1
6007 6093	RACK MOUNTED FO SPLICE ENCLOSURE	EA	2
6007 6094	FIBER OPTIC FUSION SPLICE	EA	1,000
6007 6095	FIBER OPTIC PATCH PANEL (6 POSITION)	EA	1
6007 6096	FIBER OPTIC PATCH PANEL (12 POSITION)	EA	1
6007 6097	FIBER OPTIC PATCH PANEL (24 POSITION)	EA	1
6007 6098	FIBER OPTIC PATCH PANEL (36 POSITION)	EA	1
6007 6099	FIBER OPTIC PATCH PANEL (48 POSITION)	EA	1
6007 6100	FIBER OPTIC PATCH PANEL (72 POSITION)	EA	2
6007 6101	FIBER OPTIC PATCH PANEL (96 POSITION)	EA	1
6007 6102	RELOCATE FIBER OPTIC CABLE	LF	1,000
6007 6103	REMOVE FIBER OPTIC CABLE	LF	10,000
6007 6104	FO CBL (24 SMF)(PIGTAIL)	LF	1,000
6007 6105	PRETERM FIBER PATCH PANEL (6 POSITION)	EA	1
6007 6106	PRETERM FIBER PATCH PANEL (12 POSITION)	EA	10
6007 6107	PRETERM FIBER PATCH PANEL (24 POSITION)	EA	10
6007 6108	FIBER OPTIC PATCH PANEL UNIT	EA	2
6007 6109	FIBER OPTIC JUMPERS	EA	10
6008 6046	ITS GRND MNT CAB (TY 6) (CONF 2) (REM)	EA	10
6010 6002	CCTV FIELD EQUIPMENT (DIGITAL)	EA	10
6010 6004	CCTV MOUNT (POLE)	EA	10
6010 6011	CCTV FIELD EQUIP (DIGITAL) (INSTL ONLY)	EA	1
6010 6012	RELOCATE CCTV FIELD EQUIPMENT	EA	1
6010 6013	REMOVE CCTV FIELD EQUIPMENT	EA	1
6016 6006	ITS MULTI-DUCT CND (PVC-40)	LF	5,000
6016 6007	ITS MULTI-DUCT CND (PVC-40)(BORE)	LF	100
6016 6008	ITS MULTI-DUCT CND (PVC-40)(CONC ENCSE)	LF	100
6016 6009	ITS MULTI-DUCT CND (PVC-40)(STL ENCSE)	LF	50
6016 6010	ITS MULTI-DUCT CND (PVC-80)	LF	100
6016 6011	ITS MULTI-DUCT CND (PVC-80)(BORE)	LF	100
6016 6012	ITS MULTI-DUCT CND (PVC-80)(CONC ENCSE)	LF	50
6016 6013	ITS MULTI-DUCT CND (RMC)	LF	50
6016 6015	FIBER OPTIC CABLE ROAD MARKER	EA	50
6027 6002	CABLE RACK ASSEMBLY (INSTALL)	EA	10
6027 6003	CONDUIT (PREPARE)	LF	10,000
6027 6004	JUNCTION BOX (INSTALL)	EA	5
6027 6008	GROUND BOX (PREPARE)	EA	20
6028 6001	INSTALL DMS (POLE MTD CABINET)	EA	1
6028 6002	INSTALL DMS (FOUNDATION MTD CABINET)	EA	1
6062 6005	ITS RADIO (SNGL)(900 MHZ)-C-O	EA	2
6062 6006	ITS RADIO (SNGL)(900 MHZ)-C-U	EA	2
6062 6018	ITS RADIO (SNGL)(5 GHZ)-I-U	EA	2
6062 6024	ITS RADIO (SNGL)(5 GHZ)-C-P	EA	2
6062 6034	ITS RADIO (DUAL)(5 GHZ/5 GHZ)-I-U	EA	2
6062 6040	ITS RADIO (DUAL)(5 GHZ/5 GHZ)-C-P	EA	2
6062 6042	RELOCATE ITS RADIO	EA	10
6062 6043	REMOVE ITS RADIO	EA	10
6064 6010	ITS POLE (30 FT)(90 MPH)	EA	1
6064 6017	ITS POLE (30 FT)(REL)	EA	1
6064 6018	ITS POLE (30 FT)(REM)	EA	1
6064 6019	ITS POLE (40 FT)(90 MPH)	EA	1
6064 6037	ITS POLE (50 FT)(90 MPH)	EA	1
6064 6055	ITS POLE (60 FT)(90 MPH)	EA	10
6064 6061	ITS POLE (60 FT)(INST ONLY)	EA	1
6064 6062	ITS POLE (60 FT)(REL)	EA	1
6064 6063	ITS POLE (60 FT)(REM)	EA	1
6064 6076	ITS POLE MNT CAB (TY 1)(CONF 2)	EA	1

QUANTITY SUMMARY			
ITEM	DESCRIPTION	UNIT	QUANTITY
6064 6077	ITS POLE MNT CAB (TY 1)(CONF 2)(INS)	EA	1
6064 6078	ITS POLE MNT CAB (TY 1)(CONF 2)(REL)	EA	1
6064 6079	ITS POLE MNT CAB (TY 1)(CONF 2)(REM)	EA	1
6064 6084	ITS POLE MNT CAB (TY 2)(CONF 2)	EA	2
6064 6086	ITS POLE MNT CAB (TY 2)(CONF 2)(REL)	EA	1
6064 6087	ITS POLE MNT CAB (TY 2)(CONF 2)(REM)	EA	1
6064 6092	ITS POLE MNT CAB (TY 3)(CONF 2)	EA	10
6064 6094	ITS POLE MNT CAB (TY 3)(CONF 2)(REL)	EA	1
6064 6095	ITS POLE MNT CAB (TY 3)(CONF 2)(REM)	EA	1
6125 6001	TERMINAL SERVER (INSTALL ONLY)	EA	10
6163 6002	REMOVE EXISTING CABLES (POWER)	LF	1,000
6163 6003	REMOVE EXISTING CABLES (COMMUNICATION)	LF	1,000
6185 6002	TMA (STATIONARY)	DAY	100
6186 6002	ITS GND BOX(PCAST) TY 1 (243636)W/APRN	EA	10
6186 6008	ITS GND BOX(PCAST) TY 2 (366036)W/APRN	EA	10
6186 6025	REMOVE ITS GROUND BOX	EA	10
6280 6001	HIGH MAST ASSEMBLY FOR ITS	EA	1
6304 6002	ITS RVSD (DATA COLLECT & WWA) SYS	EA	10
6304 6006	ITS RVSD (DC & WWA) (RELOCATE)	EA	1
6304 6008	ITS RVSD (DC & WWA) (REMOVE)	EA	1
6305 6008	LCS SIGNAL UNIT (REMOVE)	EA	10
6327 6003	INSTALL OF HARD ETHERNET SWITCH	EA	10
6366 6001	INST WRONG WAY DRIVER SYSTEM EQUIPMENT	EA	1
6399 6001	CELLULAR ROUTER	EA	1
6426 6001	REMOVE DYNAMIC MESSAGE SIGN SYSTEM	EA	1
6521 6001	FURNISH AND INSTALL RWIS	EA	1
6521 6002	ALL-IN-ONE ATMOSPHERIC SENSOR	EA	1
6521 6003	PRECIPITATION TYPE SENSOR	EA	1
6521 6004	AIR TEMP/RELATIVE HUMIDITY SENSOR	EA	1
6521 6005	ROAD SURFACE SENSOR	EA	1
6521 6006	SUBSURFACE SENSOR	EA	1
6521 6007	NON-INTRUSIVE PAVE CONDI & TEMP SENSOR	EA	1
6521 6008	RAIN SENSOR	EA	1
6521 6009	WINDSPEED/DIRECTION SENSOR	EA	1
6521 6010	BAROMETRIC PRESSURE SENSOR	EA	1
6521 6011	NON-INTRUSIVE WATER LEVEL FLOOD SENSOR	EA	1

ONLY PAY ITEM QUANTITIES ARE SHOWN IN THIS TABLE. REFER TO LAYOUT SHEETS, GENERAL NOTES AND SPECIAL SPECIFICATIONS FOR SUBSIDIARY MATERIAL AND LABOR ITEMS.

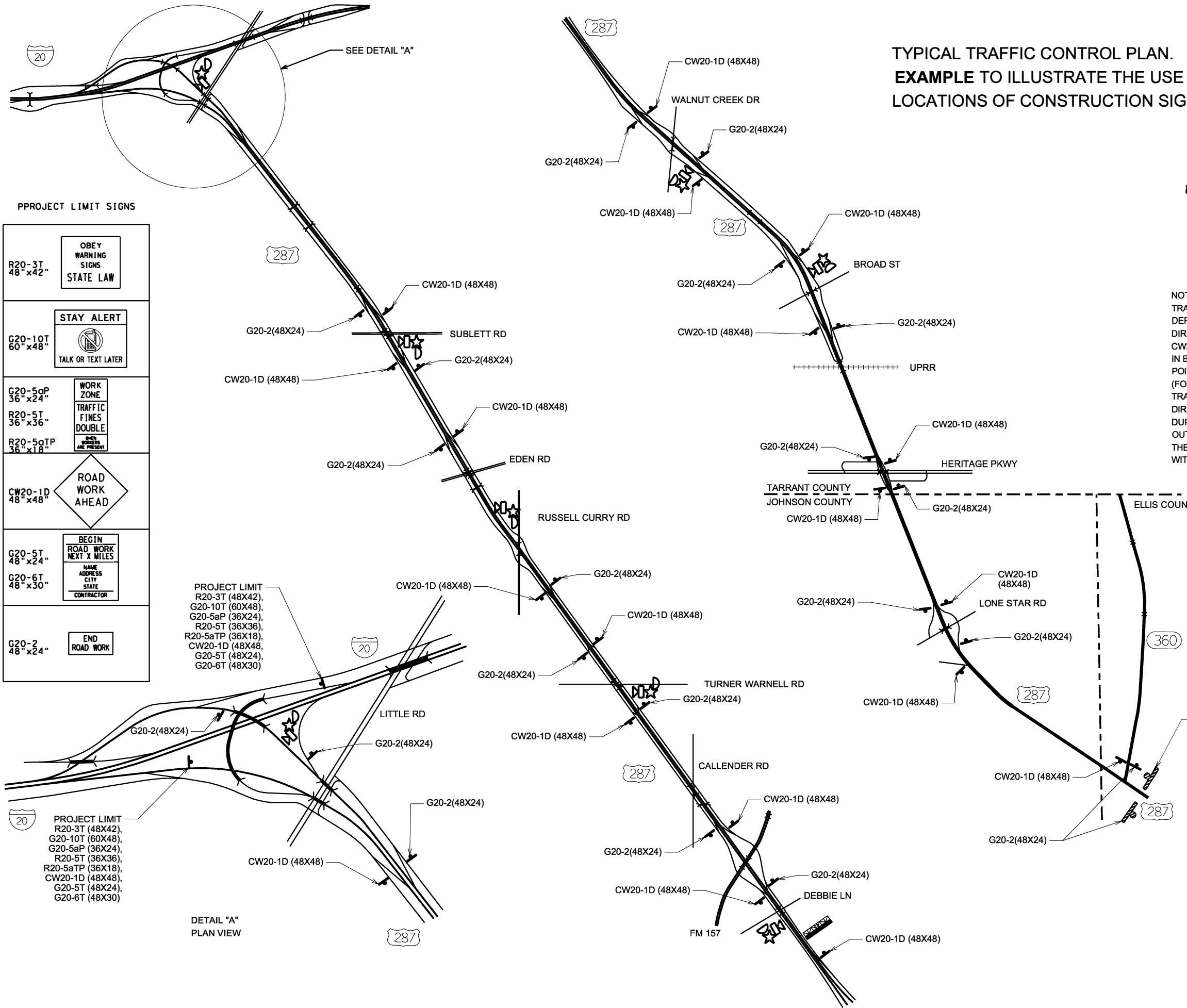


QUANTITY SUMMARY

Sheet 2 of 2 Sheets

DIST.	COUNTY	SHEET NO.
FTW	TARRANT	6
CONTROL	SECT.	JOB
0902	00	299
		HIGHWAY NO.
		VA

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**TYPICAL TRAFFIC CONTROL PLAN.
EXAMPLE TO ILLUSTRATE THE USE AND
LOCATIONS OF CONSTRUCTION SIGNS.**

PROJECT LIMIT SIGNS

R20-3T 48" x 42"	OB EY WA R N I N G S I G N S S T A T E L A W
G20-10T 60" x 48"	STAY ALERT TALK OR TEXT LATER
G20-5aP 36" x 24"	W O R K Z O N E
R20-5T 36" x 36"	T R A F F I C F I N E S D O U B L E
R20-5aTP 36" x 18"	W O R K Z O N E S I G N S A R E P R E S E N T
CW20-1D 48" x 48"	R O A D W O R K A H E A D
G20-5T 48" x 24"	B E G I N R O A D W O R K N E X T X M I L E S
G20-6T 48" x 30"	N A M E A D D R E S S C I T Y S T A T E C O N T R A C T O R
G20-2 48" x 24"	E N D R O A D W O R K

PROJECT LIMIT
R20-3T (48X42),
G20-10T (60X48),
G20-5aP (36X24),
R20-5T (36X36),
R20-5aTP (36X18),
CW20-1D (48X48),
G20-5T (48X24),
G20-6T (48X30)

PROJECT LIMIT
R20-3T (48X42),
G20-10T (60X48),
G20-5aP (36X24),
R20-5T (36X36),
R20-5aTP (36X18),
CW20-1D (48X48),
G20-5T (48X24),
G20-6T (48X30)

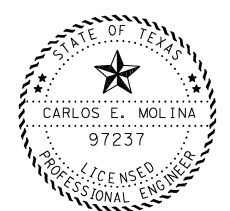
DETAIL "A"
PLAN VIEW

LEGEND

- ☆ EXISTING CLOSED CIRCUIT TELEVISION CAMERA
- ◻ EXISTING DYNAMIC MESSAGE SIGN
- D EXISTING WIRELESS ETHERNET RADIO
- ◻ EXISTING RADAR VEHICLE SENSING DEVICE
- ▬ PROPOSED SIGN POST

NOTE:

TRAFFIC SHALL BE HANDLED BY DAILY SIGNING DEPENDING UPON EACH WORK LOCATION OR AS DIRECTED BY THE ENGINEER.
CW20-1D (48X48) & G20-2 (48X24) SHALL BE PLACED IN BOTH DIRECTIONS AT ALL TIMES AND AT ALL ACCESS POINTS TO/FROM THE ACTIVE CONSTRUCTION SITE (FOR EXAMPLE: ENTRANCE/EXIT RAMP ALLOWING TRAFFIC TO ENTER/EXIT THE WORK ZONE), OR AS DIRECTED BY THE ENGINEER.
DUPLICATE SIGNS SHALL BE ERECTED ON BOTH INSIDE AND OUTSIDE SHOULDERS OF THE FREEWAY OR AS DIRECTED BY THE ENGINEER. ALL SIGN PLACEMENT SHALL BE IN ACCORDANCE WITH BC AND TCP STANDARD SHEETS.



Carlos E. Molina

04/23/2024

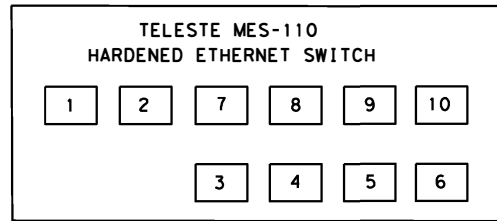


TYPICAL TRAFFIC CONTROL PLAN

Sheet 1 of 1 Sheets

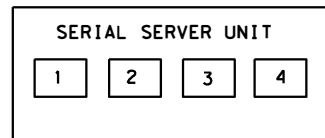
DIST.	COUNTY	SHEET NO.
FTW	TARRANT	7
CONTROL	SECT.	JOB
0902	00	299
		HIGHWAY NO.
		VA

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PORT ASSIGNMENTS:

1. TO NEXT CABINET AWAY FROM SATELLITE/MAIN NETWORK
2. BACK TO SATELLITE/MAIN NETWORK
3. DMS CONTROLLER
4. SWITCH TO SWITCH COPPER CONNECTION OR RADIO TO NEXT CABINET AWAY FROM SATELLITE/MAIN NETWORK
5. ENCODER OR RADIO TO NEXT CABINET AWAY FROM SATELLITE/MAIN NETWORK
6. SERIAL SERVER UNIT
- 7.
8. ENCODER OR RADIO TO NEXT CABINET AWAY FROM SATELLITE/MAIN NETWORK
9. RADIO BACK TO SATELLITE/MAIN NETWORK
10. CCTV POE **



PORT ASSIGNMENTS:

- 1.
2. SENSOR#1
3. SENSOR#2
4. SENSOR#3

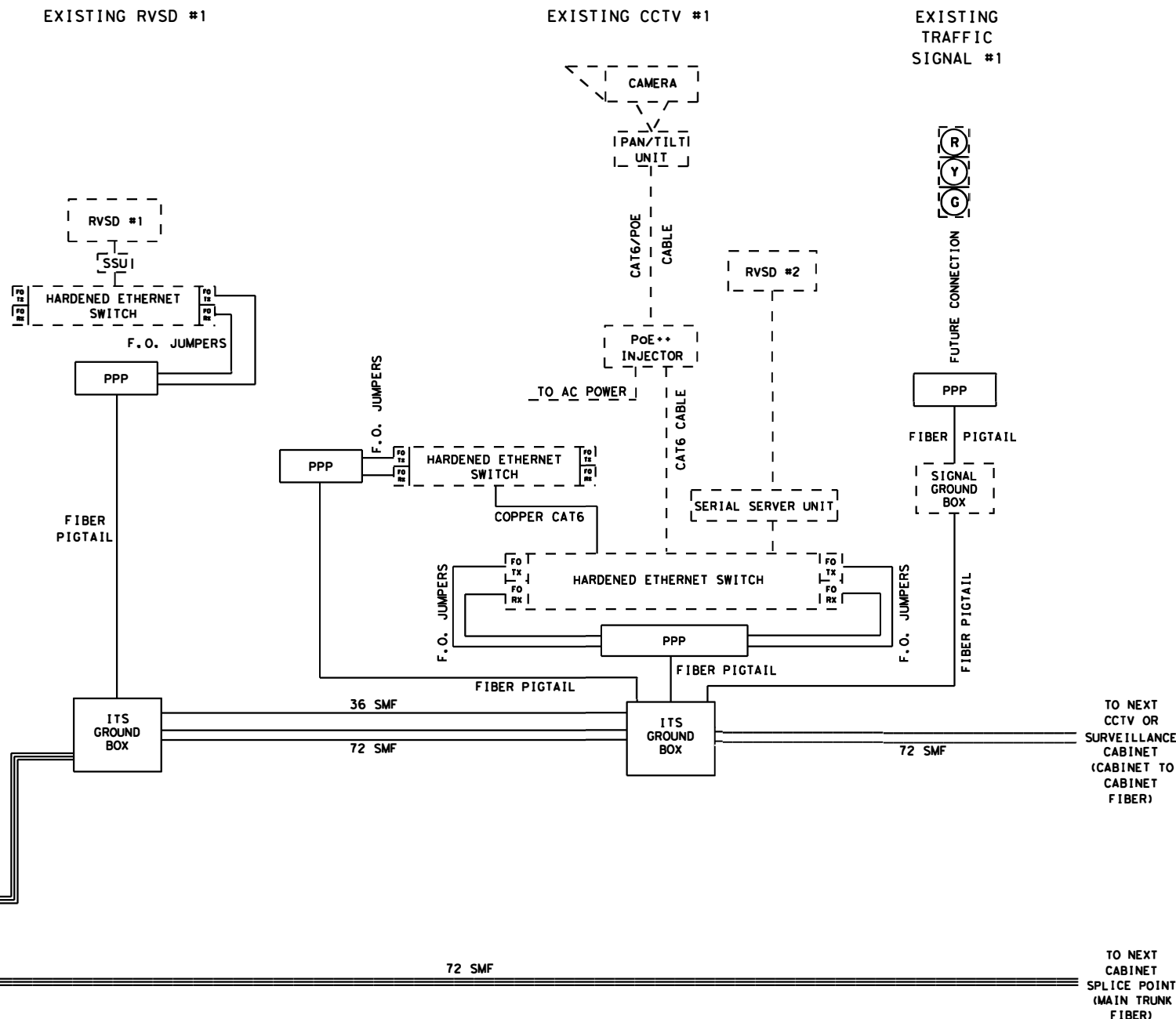
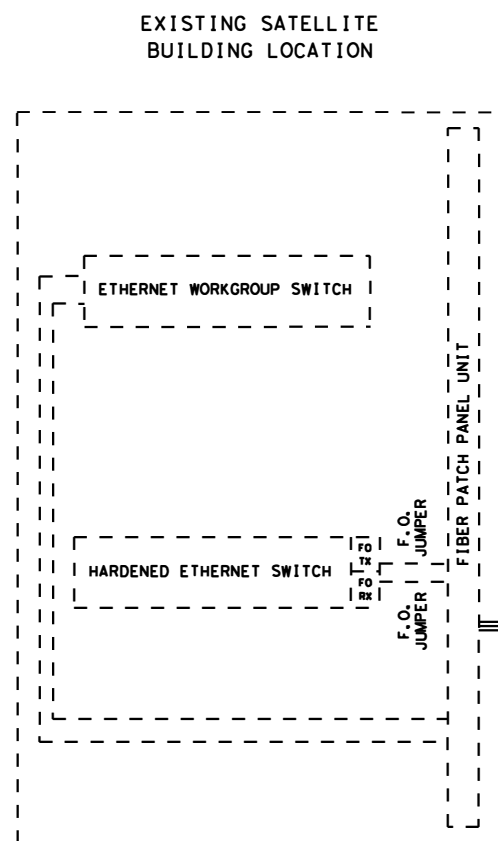
NOTES:

1. ALL FUNCTIONAL ELECTRONIC EQUIPMENT FOR THE SATELLITE MAY NOT BE SHOWN ON THIS PLAN SHEET.
2. THE CONTRACTOR SHALL MAINTAIN THE INTEGRITY OF THE EQUIPMENT PROVIDED. IF THE EQUIPMENT IS DAMAGED DURING TRANSPORTATION OR WORK THE CONTRACTOR SHALL REPLACE THE EQUIPMENT AT THE CONTRACTOR'S EXPENSE. CONTACT THE SIGNAL SHOP AT 817-370-3664 AT LEAST 48 HOURS IN ADVANCE TO COORDINATE PICK-UP AND INSTALLATION OF EQUIPMENT PROVIDED BY TxDOT.
3. CONTRACTOR SHALL FURNISH AND INSTALL ALL CABLING AND CONNECTORS NEEDED TO COMPLETE A FULLY FUNCTIONAL SYSTEM, INCLUDING BUT NOT LIMITED TO CAT6 CABLES FOR ETHERNET CONNECTION AND FIBER OPTIC JUMPERS.
4. WHEN REMOVAL OF FIBER OPTIC CABLES ARE CALLED FOR IN THE PLANS, REMOVE THE #8 AWG BARE COPPER WIRE (TRACE CABLE) ALONG WITH THE FIBER OPTIC CABLES. THIS SHALL BE CONSIDERED SUBSIDIARY TO ITEM 6007, "REMOVE FIBER OPTIC CABLE".

LEGEND

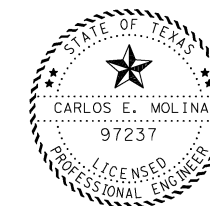
- | | |
|---------|------------------------------|
| PoE | POWER OVER ETHERNET |
| DMS | DYNAMIC MESSAGE SIGN |
| EWS | ETHERNET WORKGROUP SWITCH |
| F.O. | FIBER OPTIC |
| RVSD | RADAR VEHICLE SENSING DEVICE |
| SSU | SERIAL SERVER UNIT |
| PPP | PRETERMINATED PATCH PANEL |
| SMF | SINGLE MODE FIBER |
| — | PROPOSED |
| - - - - | EXISTING |

TYPICAL DEVICE & COMMUNICATIONS LAYOUT.
 EXAMPLE TO ILLUSTRATE A CONCEPTUAL NETWORK DIAGRAM.



TO NEXT CCTV OR SURVEILLANCE CABINET (CABINET TO CABINET FIBER)

TO NEXT CABINET SPLICE POINT (MAIN TRUNK FIBER)



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TYPICAL CONCEPTUAL DESIGN LAYOUT

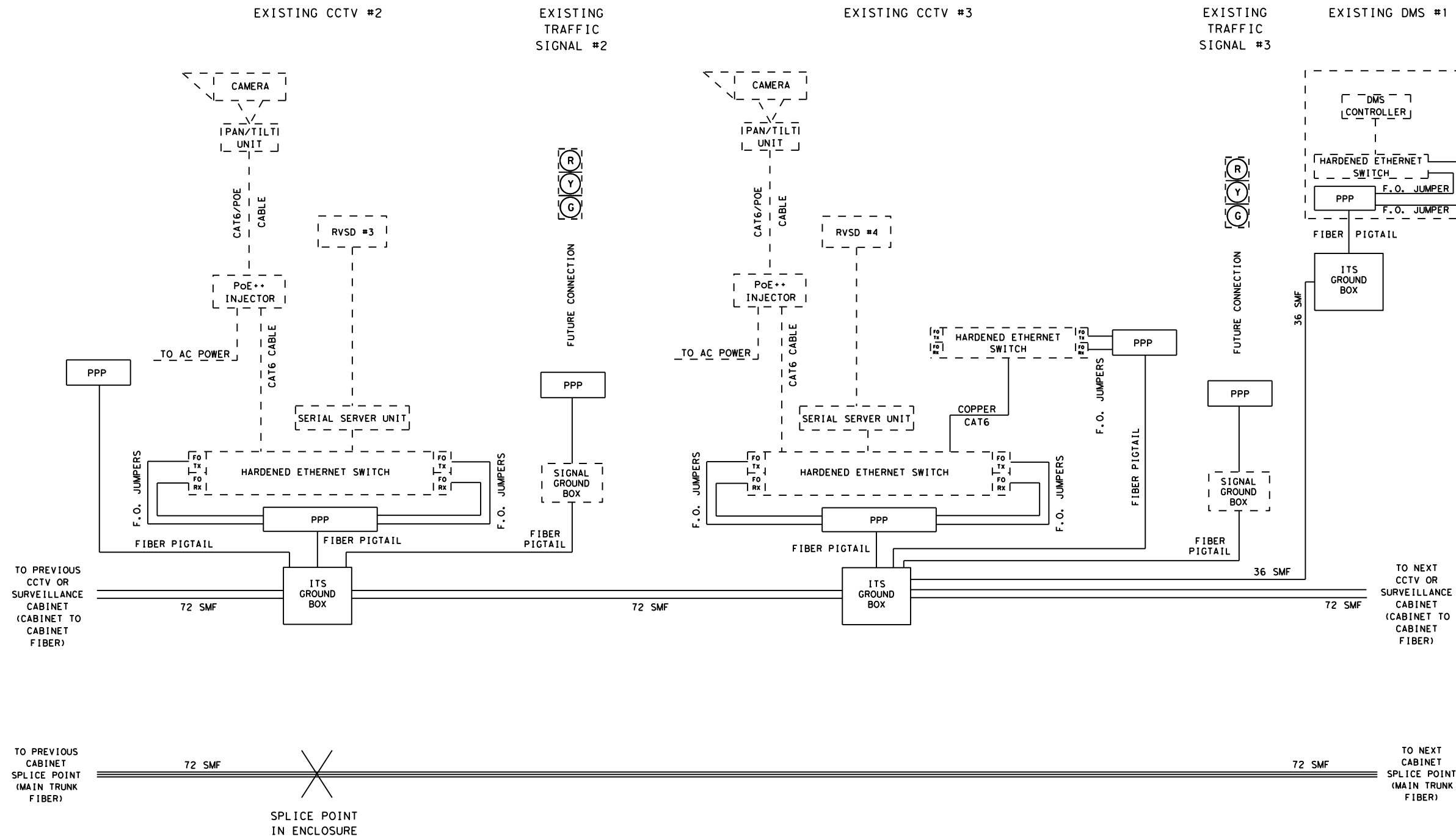
Sheet 1 of 2 Sheets

DIST.	COUNTY	SHEET NO.	
FTW	TARRANT	8	
CONTROL	SECT.	JOB	HIGHWAY NO.
0902	00	299	VA

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TYPICAL DEVICE & COMMUNICATIONS LAYOUT.
EXAMPLE TO ILLUSTRATE A CONCEPTUAL NETWORK DIAGRAM.

- LEGEND**
- PoE POWER OVER ETHERNET
 - DMS DYNAMIC MESSAGE SIGN
 - EWS ETHERNET WORKGROUP SWITCH
 - F.O. FIBER OPTIC
 - RVSD RADAR VEHICLE SENSING DEVICE
 - SSU SERIAL SERVER UNIT
 - PPP PRETERMINATED PATCH PANEL
 - SMF SINGLE MODE FIBER
 - PROPOSED
 - - - - EXISTING



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04/23/2024

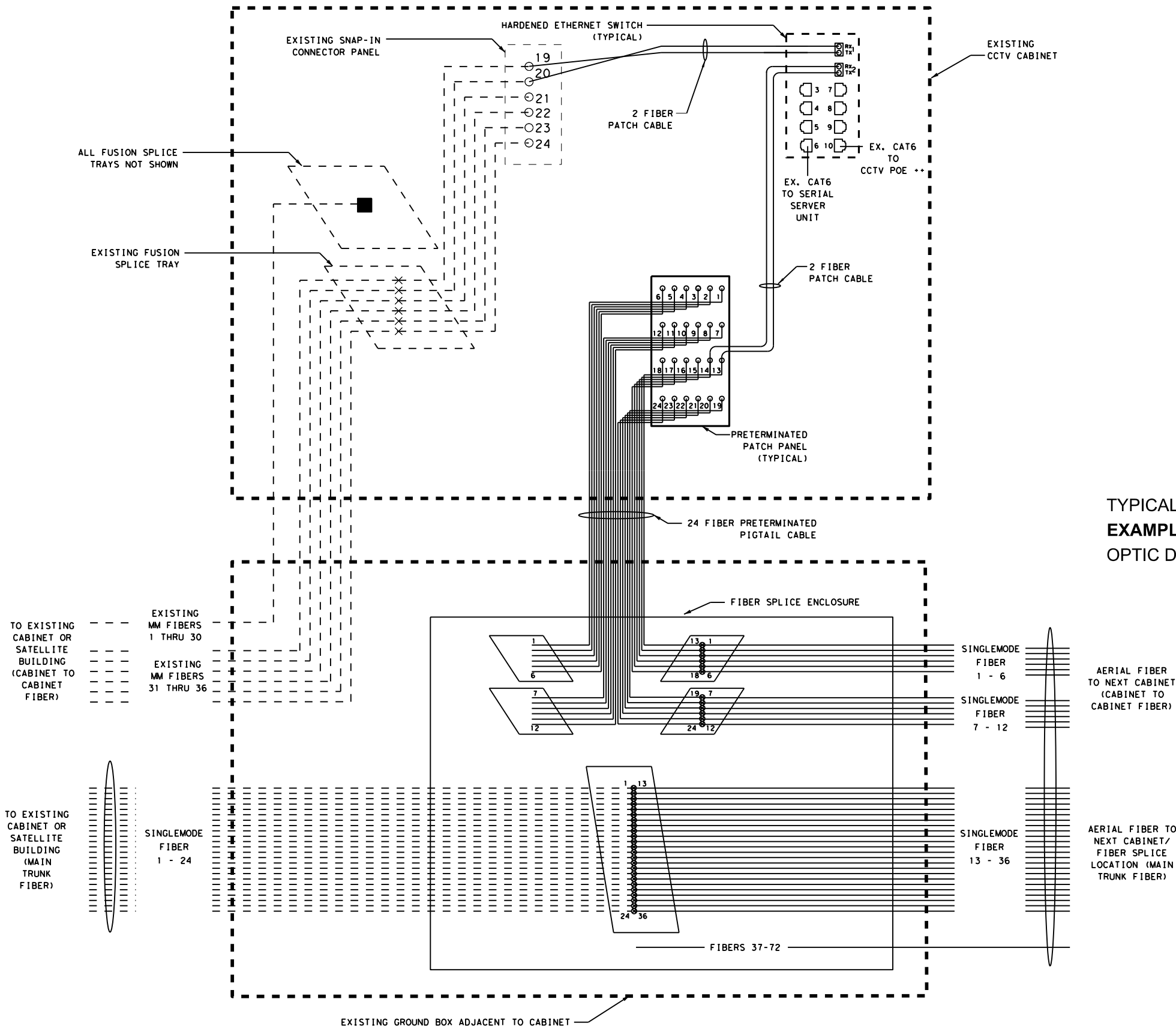


TYPICAL CONCEPTUAL DESIGN LAYOUT

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DIST.	COUNTY	SHEET NO.	
FTW	TARRANT	9	
CONTROL	SECT.	JOB	HIGHWAY NO.
0902	00	299	VA

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NOTES:

THE PRETERMINATED SIMPLEX CONNECTOR PATCH PANEL MODULE SHALL INCLUDE CONNECTOR SLEEVES AND DUST CAPS AND SHALL BE SUPPLIED FROM THE MANUFACTURER WITH SUFFICIENT CABLE LENGTH TO EXTEND FROM THE CABINET TO THE GROUND BOX PLUS 50 FEET COILED IN THE GROUND BOX.

THE CONNECTOR SHALL BE AN LC CONNECTOR.

THE SPLICE IS A FUSION SPLICE CONNECTING THE INCOMING AND OUTGOING FIBERS OF THE SAME COLOR EXCEPT AS INDICATED.

THE CONTRACTOR SHALL CONTACT THE ENGINEER PRIOR TO THE TERMINATING AND SPLICING OF FIBER OPTIC CABLES.

THE TERMINATING AND SPLICING OF FIBER OPTIC CABLES SHALL BE AS DIRECTED BY THE ENGINEER.

APPROVED REMOVABLE DUST COVERS SHALL BE USED AT ALL EMPTY PATCH PANEL CONNECTORS.

LEGEND:

— PROPOSED
 - - - EXISTING
 ⊗ PROPOSED FUSION SPLICE
 × EXISTING FUSION SPLICE
 ▭ SPLICE TRAY (SPLICE TRAYS SHOWN FOR DIAGRAMATIC PURPOSES ONLY AND MAY NOT BE THE ACTUAL NUMBER REQUIRED)

TYPICAL FIBER OPTIC CONNECTIONS.
 EXAMPLE TO ILLUSTRATE FIBER OPTIC DIAGRAMS.

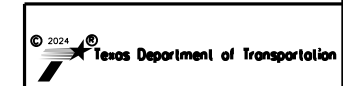
EXISTING FIBER OPTIC CABLE TO GROUND BOX NEAR CCTV CABINET OR SURVEILLANCE CABINET, THEN SPLICED TO AERIAL FIBER OPTIC CABLE.

CABINET TO CABINET
 AERIAL FIBER OPTIC CONNECTIONS SCHEMATIC FOR:
 ITS CABINET LOCATION



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04/29/2024

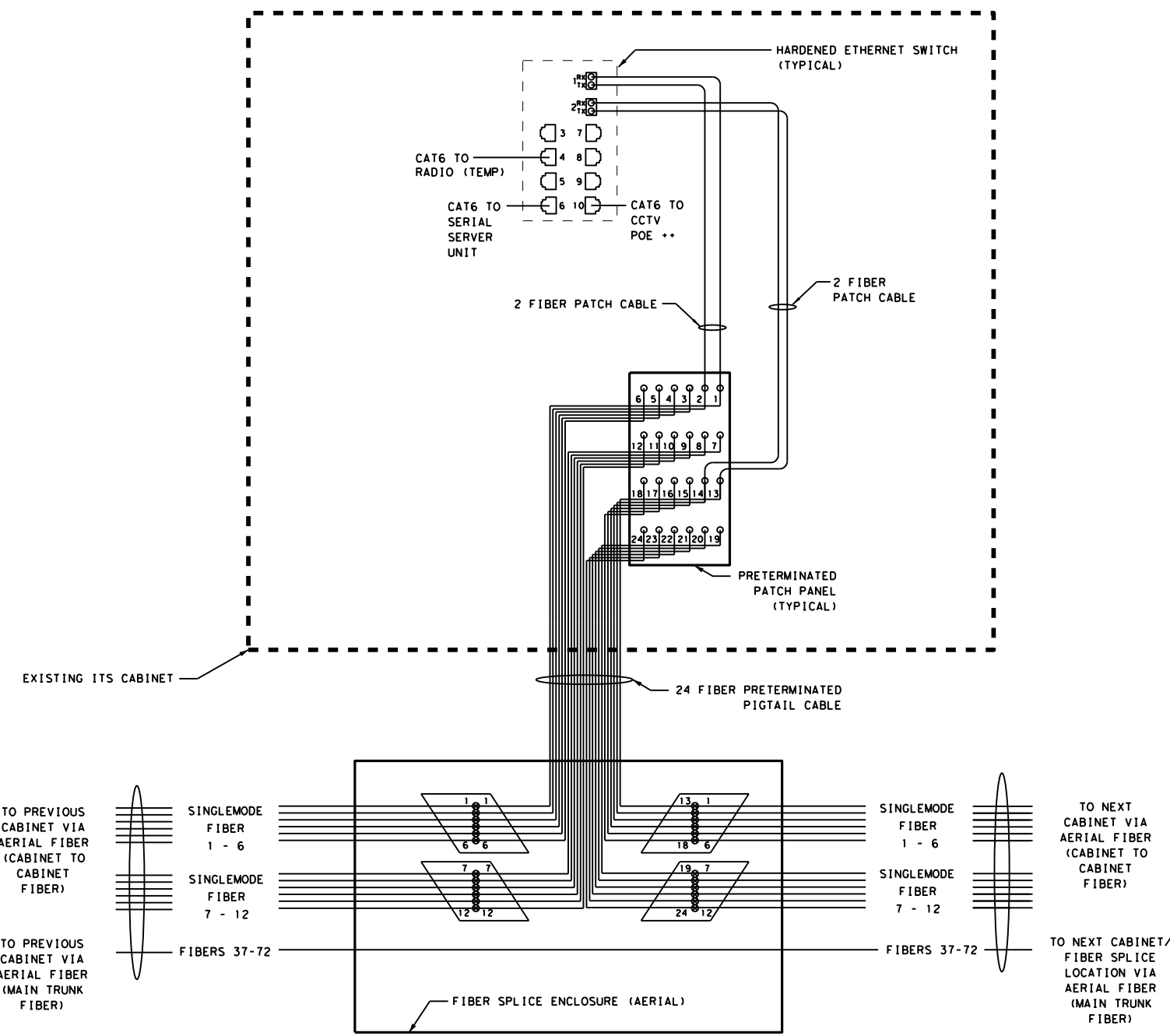


TYPICAL
 TEMPORARY
 FIBER OPTIC
 CONNECTIONS

Sheet 1 of 3 Sheets

DIST.	COUNTY	SHEET NO.
FTW	TARRANT	10
CONTROL	SECT.	JOB
0902	00	299
		HIGHWAY NO.
		VA

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AERIAL FIBER OPTIC CABLE TO ITS CABINET LOCATION, THEN SPLICED TO FIBER OPTIC PIGTAIL CABLE USING AERIAL SPLICE ENCLOSURE.

CABINET TO CABINET
 AERIAL FIBER OPTIC CONNECTIONS SCHEMATIC FOR:
 ITS CABINET LOCATION

NOTES:

THE PRETERMINATED SIMPLEX CONNECTOR PATCH PANEL MODULE SHALL INCLUDE CONNECTOR SLEEVES AND DUST CAPS AND SHALL BE SUPPLIED FROM THE MANUFACTURER WITH SUFFICIENT CABLE LENGTH TO EXTEND FROM THE CABINET TO THE GROUND BOX PLUS 50 FEET COILED IN THE GROUND BOX.

THE CONNECTOR SHALL BE AN LC CONNECTOR.

THE SPLICE IS A FUSION SPLICE CONNECTING THE INCOMING AND OUTGOING FIBERS OF THE SAME COLOR EXCEPT AS INDICATED.

THE CONTRACTOR SHALL CONTACT THE ENGINEER PRIOR TO THE TERMINATING AND SPLICING OF FIBER OPTIC CABLES.

THE TERMINATING AND SPLICING OF FIBER OPTIC CABLES SHALL BE AS DIRECTED BY THE ENGINEER.

APPROVED REMOVABLE DUST COVERS SHALL BE USED AT ALL EMPTY PATCH PANEL CONNECTORS.

LEGEND:

— PROPOSED
 - - - EXISTING
 ⊗ PROPOSED FUSION SPLICE
 × EXISTING FUSION SPLICE
 ▭ SPLICE TRAY (SPLICE TRAYS SHOWN FOR DIAGRAMATIC PURPOSES ONLY AND MAY NOT BE THE ACTUAL NUMBER REQUIRED)

TYPICAL FIBER OPTIC CONNECTIONS.
 EXAMPLE TO ILLUSTRATE FIBER OPTIC DIAGRAMS.



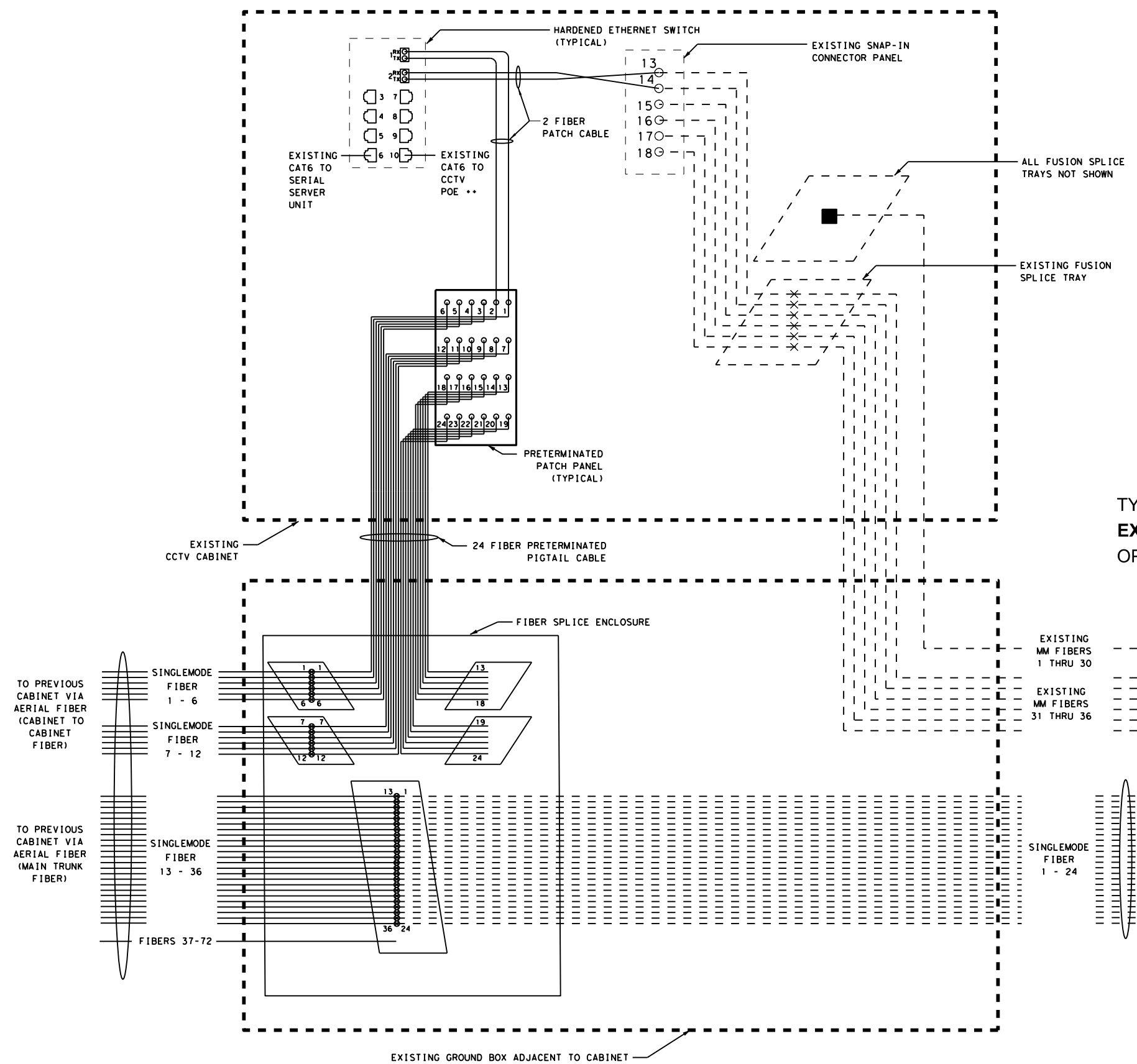
Carlos E. Molina

04/29/2024



TYPICAL TEMPORARY FIBER OPTIC CONNECTIONS			
Sheet 2 of 3 Sheets			
DIST.	COUNTY	SHEET NO.	
FTW	TARRANT	11	
CONTROL	SECT.	JOB	HIGHWAY NO.
0902	00	299	VA

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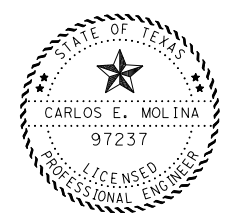
NOTES:
 THE PRETERMINATED SIMPLEX CONNECTOR PATCH PANEL MODULE SHALL INCLUDE CONNECTOR SLEEVES AND DUST CAPS AND SHALL BE SUPPLIED FROM THE MANUFACTURER WITH SUFFICIENT CABLE LENGTH TO EXTEND FROM THE CABINET TO THE GROUND BOX PLUS 50 FEET COILED IN THE GROUND BOX.
 THE CONNECTOR SHALL BE AN LC CONNECTOR.
 THE SPLICE IS A FUSION SPLICE CONNECTING THE INCOMING AND OUTGOING FIBERS OF THE SAME COLOR EXCEPT AS INDICATED.
 THE CONTRACTOR SHALL CONTACT THE ENGINEER PRIOR TO THE TERMINATING AND SPLICING OF FIBER OPTIC CABLES.
 THE TERMINATING AND SPLICING OF FIBER OPTIC CABLES SHALL BE AS DIRECTED BY THE ENGINEER.
 APPROVED REMOVABLE DUST COVERS SHALL BE USED AT ALL EMPTY PATCH PANEL CONNECTORS.

LEGEND:
 — PROPOSED
 - - - EXISTING
 ⊗ PROPOSED FUSION SPLICE
 × EXISTING FUSION SPLICE
 ▭ SPLICE TRAY (SPLICE TRAYS SHOWN FOR DIAGRAMATIC PURPOSES ONLY AND MAY NOT BE THE ACTUAL NUMBER REQUIRED)

TYPICAL FIBER OPTIC CONNECTIONS.
 EXAMPLE TO ILLUSTRATE FIBER OPTIC DIAGRAMS.

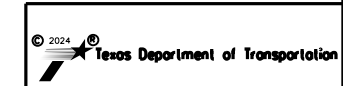
CABINET TO CABINET
 AERIAL FIBER OPTIC CONNECTIONS SCHEMATIC FOR:
 ITS CABINET LOCATION

AERIAL FIBER OPTIC CABLE FROM PREVIOUS CCTV
 CABINET OR SURVEILLANCE CABINET THEN SPLICED
 TO PERMANENT FIBER OPTIC CABLE IN GROUND BOX



Carlos E. Molina

04/29/2024

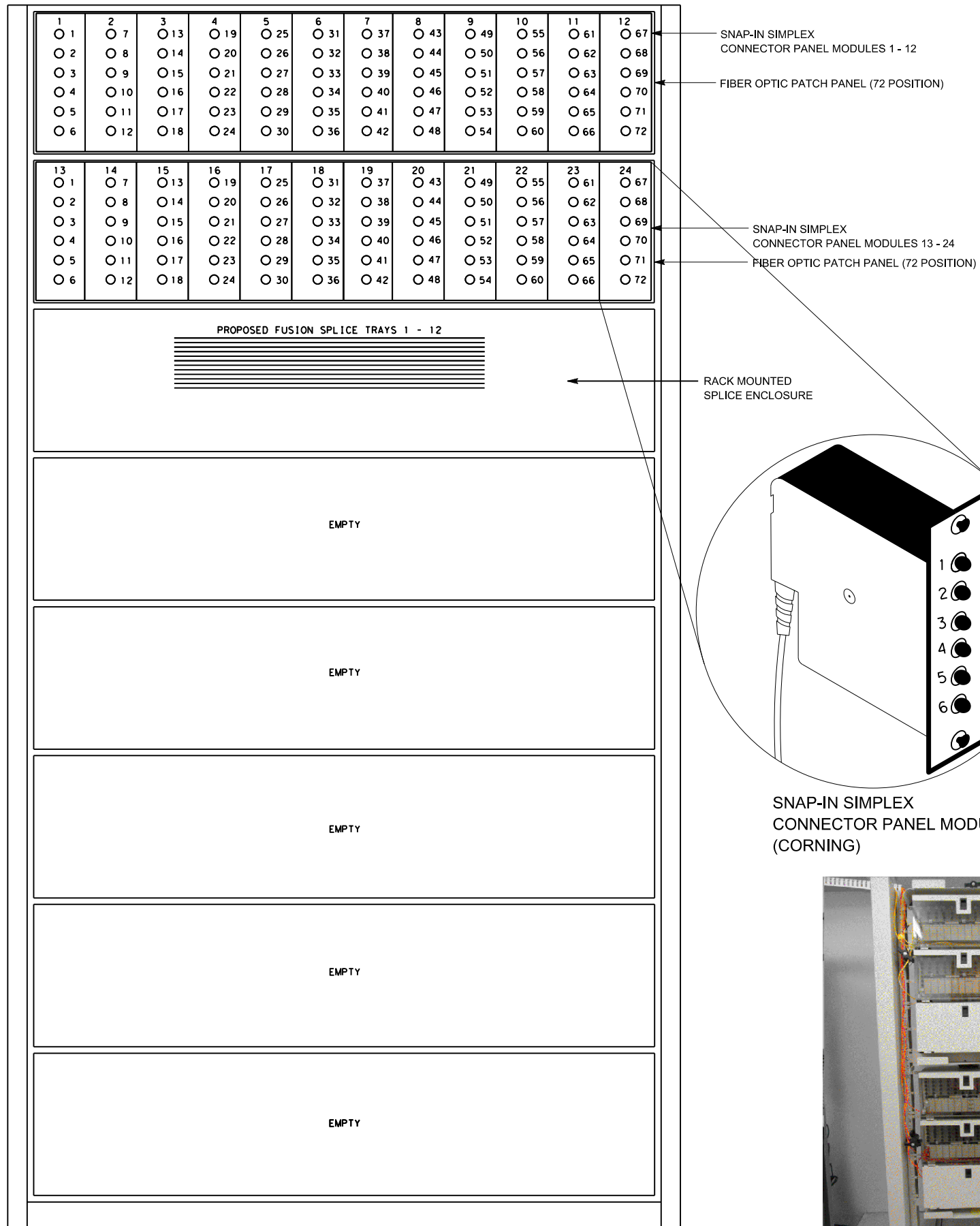


TYPICAL
 TEMPORARY
 FIBER OPTIC
 CONNECTIONS

Sheet 3 of 3 Sheets

DIST.	COUNTY	SHEET NO.
FTW	TARRANT	12
CONTROL	SECT.	JOB
0902	00	299
		HIGHWAY NO.
		VA

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NOTE: THE SNAP-IN SIMPLEX CONNECTOR PANEL MODULE SHALL INCLUDE PIGTAILS, CONNECTOR SLEEVES AND DUST CAPS. THE CONNECTOR SHALL BE AN ST CONNECTOR. THE SPLICE IS A FUSION SPLICE CONNECTING THE INCOMING AND OUTGOING FIBERS OF THE SAME COLOR. THE CONTRACTOR SHALL CONTACT THE ENGINEER PRIOR TO THE TERMINATING AND SPLICING OF FIBER OPTIC CABLES. THE TERMINATING AND SPLICING OF FIBER OPTIC CABLES SHALL BE AS DIRECTED BY THE ENGINEER.

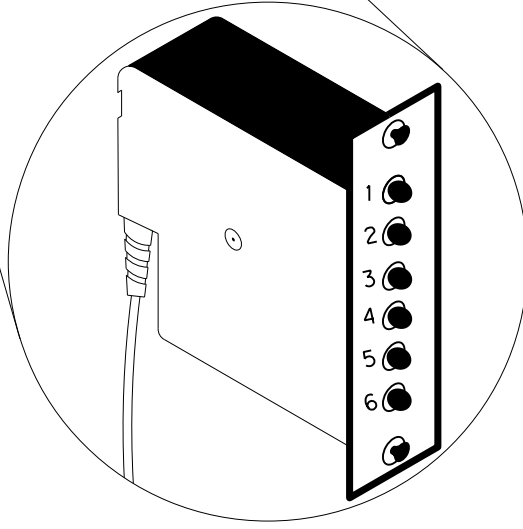
LEGEND:
 — = PROPOSED
 - - - = EXISTING

CONNECTOR PANEL MODULES ASSIGNMENT TABLE

CONNECTOR MODULE #	TYPE, FUNCTION OF CONNECTOR PANEL MODULE
1-12	SINGLE MODE ST CONNECTOR MODULE FOR SPECIFIED HIGHWAY (MAIN TRUNK)
13-24	SINGLE MODE ST CONNECTOR MODULE FOR SPECIFIED HIGHWAY (CABINET TO CABINET)

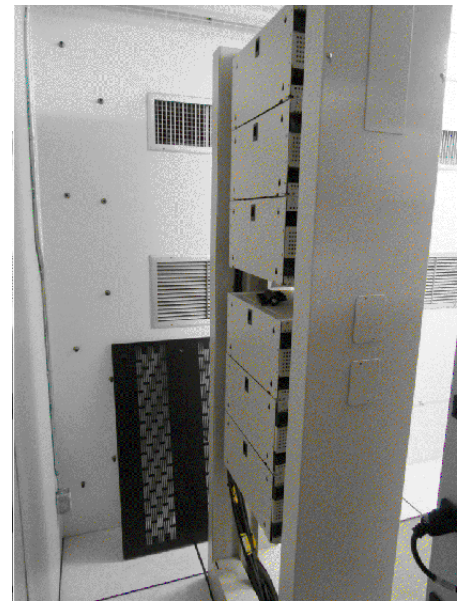
FUSION SPLICE TRAYS ASSIGNMENT TABLE

FUSION SPLICE TRAY #	TYPE, FUNCTION OF FUSION SPLICE TRAY
1 - 6	SINGLE MODE FIBER SPLICE TRAY FOR SPECIFIED HIGHWAY (MAIN TRUNK)
7-12	SINGLE MODE FIBER SPLICE TRAY FOR SPECIFIED HIGHWAY (CABINET TO CABINET)



SNAP-IN SIMPLEX CONNECTOR PANEL MODULE (CORNING)

TYPICAL FIBER OPTIC CONNECTIONS.
 EXAMPLE TO ILLUSTRATE FIBER OPTIC DIAGRAMS.



FIBER PATCH PANEL UNIT, PATCH PANELS, AND SPLICE ENCLOSURE (CORNING)

FIBER PATCH PANEL UNIT
 LOCATED AT:
 SATELLITE BLDG. NUMBER, HIGHWAY LOCATION, HIGHWAY STATION
 (SPECIFIC CROSSING ROADWAYS)



Carlos E. Molina

04/29/2024

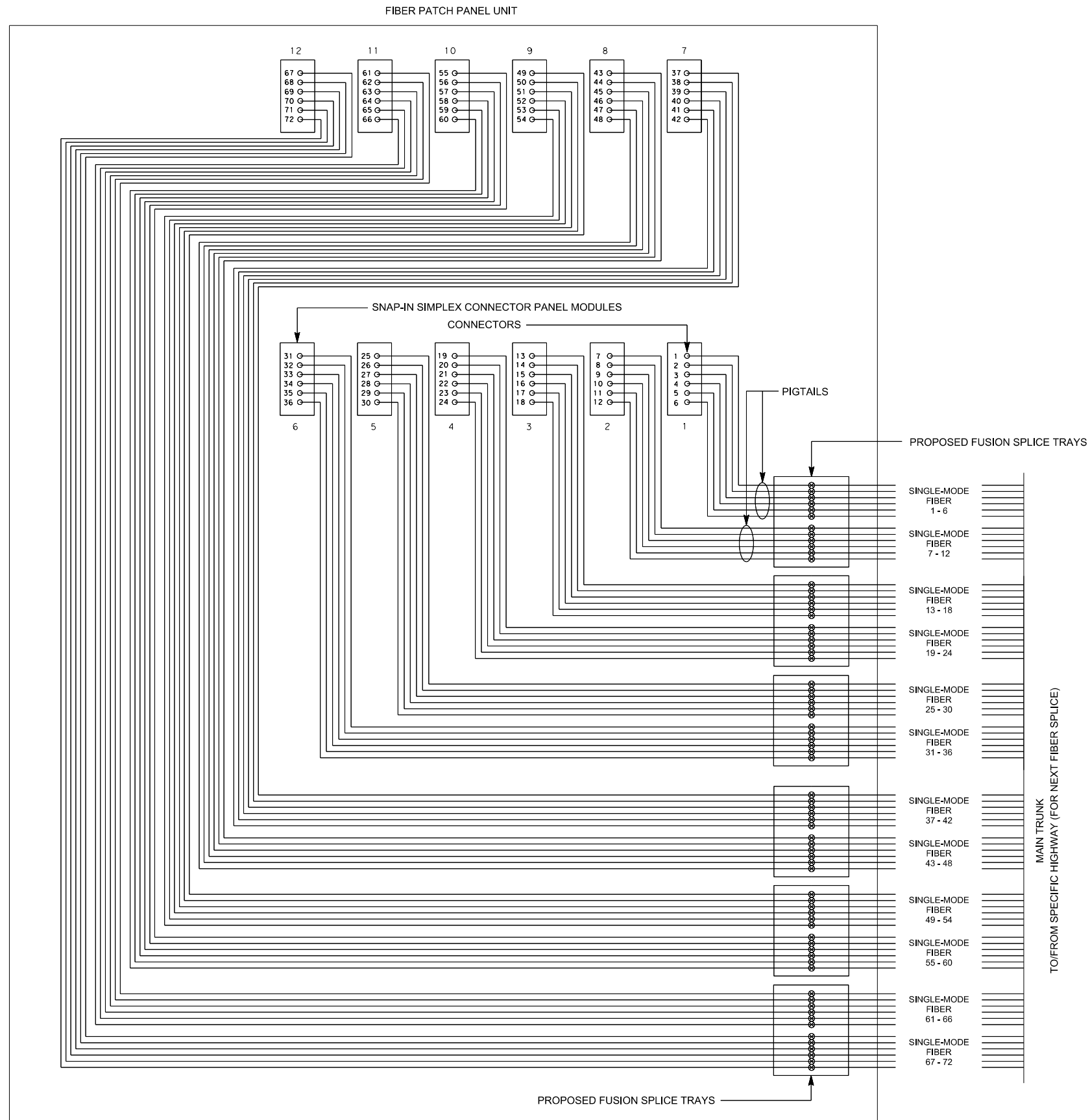


TYPICAL FIBER OPTIC CONNECTIONS

Sheet 1 of 5 Sheets

DIST.	COUNTY	SHEET NO.
FTW	TARRANT	13
CONTROL	SECT.	JOB
0902	00	299
		HIGHWAY NO.
		VA

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FIBER OPTIC CONNECTIONS SCHEMATIC AT:
 SATELLITE BLDG. NUMBER
 HIGHWAY LOCATION
 HIGHWAY STATION
 (SPECIFIC CROSSING ROADWAYS)

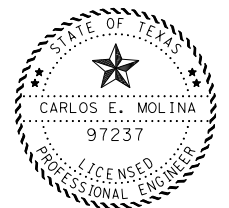
LEGEND:
 — = PROPOSED
 - - - = EXISTING
 ⊗ = PROPOSED FUSION SPLICE

NOTE: THE SNAP-IN SIMPLEX CONNECTOR PANEL MODULE SHALL INCLUDE PIGTAILS, CONNECTOR SLEEVES AND DUST CAPS. THE CONNECTOR SHALL BE AN ST CONNECTOR. THE SPLICE IS A FUSION SPLICE CONNECTING THE INCOMING AND OUTGOING FIBERS OF THE SAME COLOR. THE CONTRACTOR SHALL CONTACT THE ENGINEER PRIOR TO THE TERMINATING AND SPLICING OF FIBER OPTIC CABLES. THE TERMINATING AND SPLICING OF FIBER OPTIC CABLES SHALL BE AS DIRECTED BY THE ENGINEER.

CONNECTOR MODULE #	TYPE, FUNCTION OF CONNECTOR PANEL MODULE
1-12	SINGLE MODE ST CONNECTOR MODULE FOR SPECIFIED HIGHWAY (MAIN TRUNK)

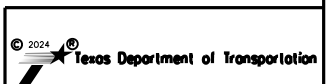
FIBER #	CONNECTOR #	FUNCTION OF FIBER/CONNECTOR
1	1	FUTURE
2	2	FUTURE
3	3	FUTURE
4	4	FUTURE
5	5	FUTURE
6	6	FUTURE
7	7	FUTURE
8	8	FUTURE
9	9	FUTURE
10	10	FUTURE
11	11	FUTURE
12	12	FUTURE
13	13	DATA COMMUNICATION TO/FROM SATELLITE BUILDING
14	14	DATA COMMUNICATION TO/FROM SATELLITE BUILDING
↓	↓	FUTURE
72	72	FUTURE

TYPICAL FIBER OPTIC CONNECTIONS.
 EXAMPLE TO ILLUSTRATE FIBER OPTIC DIAGRAMS.



Carlos E. Molina

04/23/2024

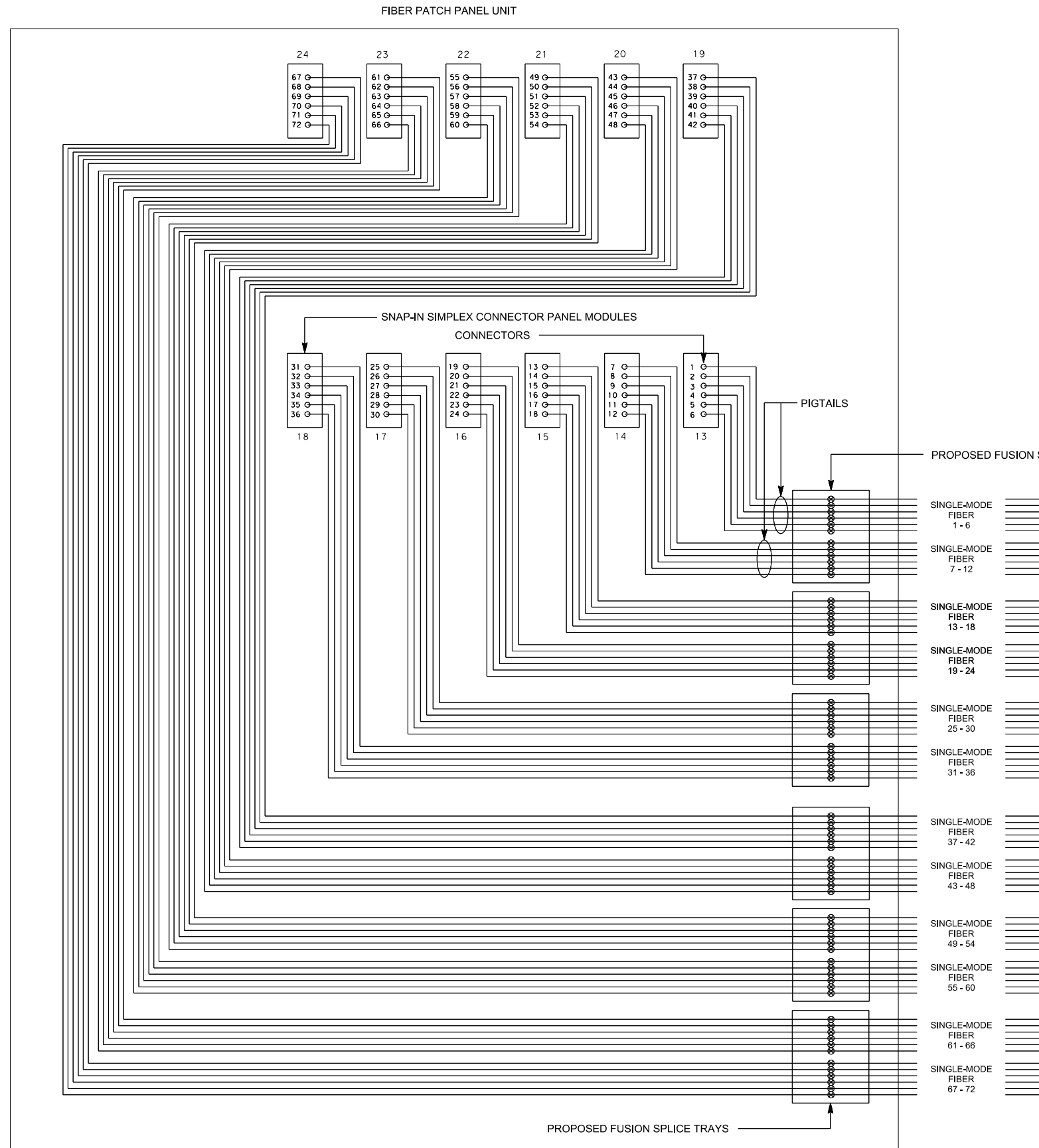


TYPICAL FIBER OPTIC CONNECTIONS

Sheet 2 of 5 Sheets

DIST.	COUNTY	SHEET NO.	
FTW	TARRANT	14	
CONTROL	SECT.	JOB	HIGHWAY NO.
0902	00	299	VA

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FIBER OPTIC CONNECTIONS SCHEMATIC AT:
 SATELLITE BLDG. NUMBER
 HIGHWAY LOCATION
 HIGHWAY STATION
 (SPECIFIC CROSSING ROADWAYS)

LEGEND:
 — = PROPOSED
 - - - = EXISTING
 ⊗ = PROPOSED FUSION SPLICE

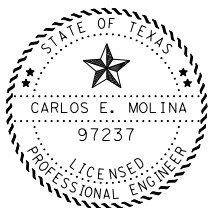
NOTE: THE SNAP-IN SIMPLEX CONNECTOR PANEL MODULE SHALL INCLUDE PIGTAILS, CONNECTOR SLEEVES AND DUST CAPS. THE CONNECTOR SHALL BE AN ST CONNECTOR. THE SPLICE IS A FUSION SPLICE CONNECTING THE INCOMING AND OUTGOING FIBERS OF THE SAME COLOR. THE CONTRACTOR SHALL CONTACT THE ENGINEER PRIOR TO THE TERMINATING AND SPLICING OF FIBER OPTIC CABLES. THE TERMINATING AND SPLICING OF FIBER OPTIC CABLES SHALL BE AS DIRECTED BY THE ENGINEER.

CONNECTOR MODULE #	TYPE, FUNCTION OF CONNECTOR PANEL MODULE
13-24	SINGLE MODE ST CONNECTOR MODULE FOR SPECIFIED HIGHWAY (CABINET TO CABINET)

FIBER #	CONNECTOR #	FUNCTION OF FIBER/CONNECTOR
1	1	DATA COMMUNICATION TO/FROM SPECIFIED HIGHWAY
2	2	DATA COMMUNICATION TO/FROM SPECIFIED HIGHWAY
3	3	FUTURE
4	4	FUTURE
5	5	FUTURE
6	6	FUTURE
7	7	FUTURE
8	8	FUTURE
9	9	FUTURE
10	10	FUTURE
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14	14	FUTURE
↓	↓	FUTURE
72	72	FUTURE

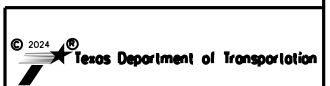
CABINET TO CABINET
 FROM SATELLITE BUILDING
 TO NEXT CABINET LOCATION SPLICE POINT ON SPECIFIED HIGHWAY

TYPICAL FIBER OPTIC CONNECTIONS.
 EXAMPLE TO ILLUSTRATE FIBER OPTIC DIAGRAMS.



Carlos E. Molina

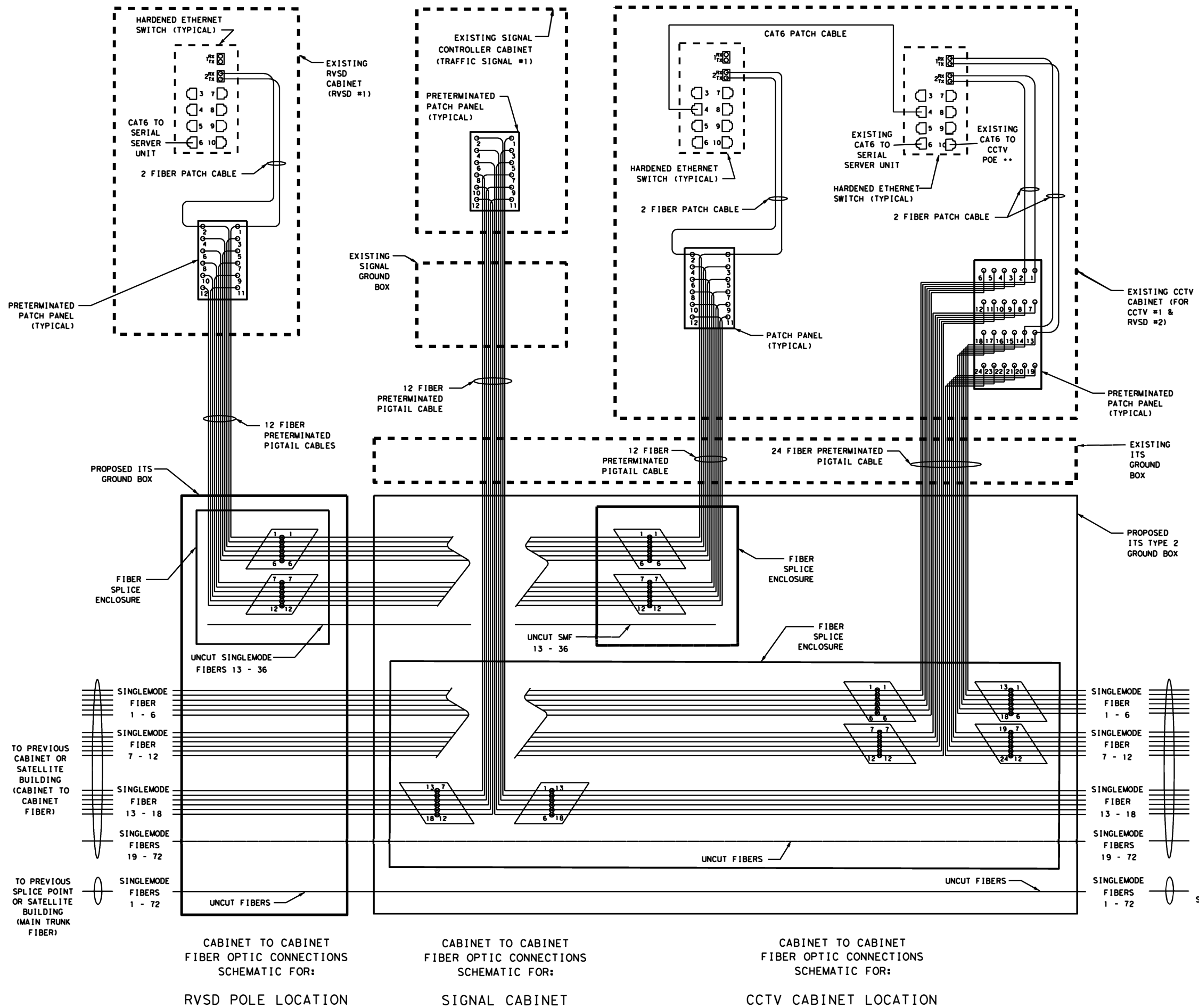
04/23/2024



TYPICAL FIBER OPTIC CONNECTIONS

Sheet 3 of 5 Sheets

DIST.	COUNTY	SHEET NO.	
FTW	TARRANT	15	
CONTROL	SECT.	JOB	HIGHWAY NO.
0902	00	299	VA



NOTES:

- THE PRETERMINATED SIMPLEX CONNECTOR PATCH PANEL MODULE SHALL INCLUDE CONNECTOR SLEEVES AND DUST CAPS AND SHALL BE SUPPLIED FROM THE MANUFACTURER WITH SUFFICIENT CABLE LENGTH TO EXTEND FROM THE CABINET TO THE GROUND BOX PLUS 50 FEET COILED IN THE GROUND BOX.
- THE CONNECTOR SHALL BE AN LC CONNECTOR.
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LEGEND:

- PROPOSED
- - - EXISTING
- ⊗ PROPOSED FUSION SPLICE
- × EXISTING FUSION SPLICE
- ▭ SPLICE TRAY (SPLICE TRAYS SHOWN FOR DIAGRAMATIC PURPOSES ONLY AND MAY NOT BE THE ACTUAL NUMBER REQUIRED)

TYPICAL FIBER OPTIC CONNECTIONS. EXAMPLE TO ILLUSTRATE FIBER OPTIC DIAGRAMS.



Carlos E. Molina

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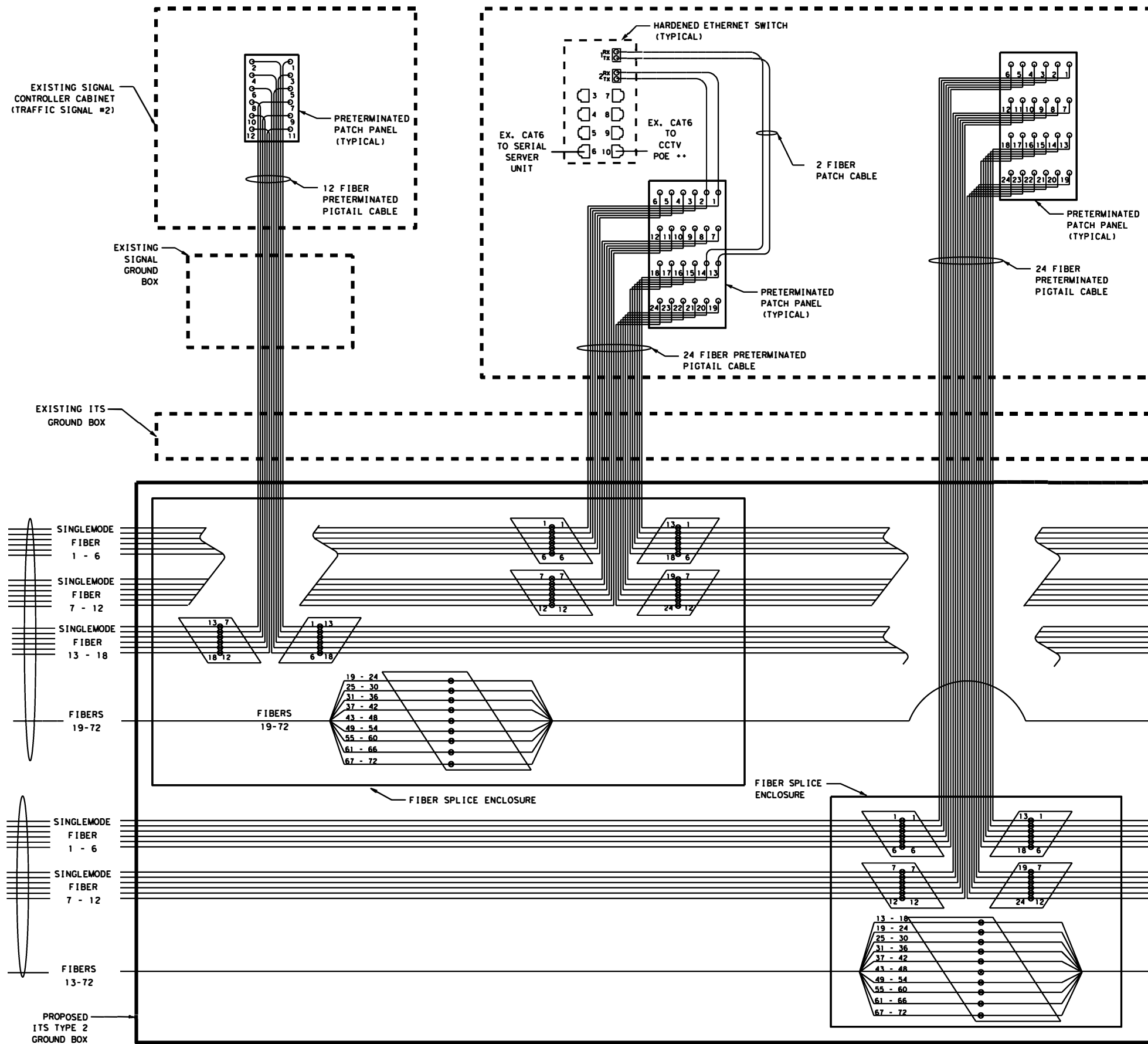


TYPICAL FIBER OPTIC CONNECTIONS

Sheet 4 of 5 Sheets

DIST.	COUNTY	SHEET NO.
FTW	TARRANT	16
CONTROL	SECT.	JOB
0902	00	299
		HIGHWAY NO.
		VA

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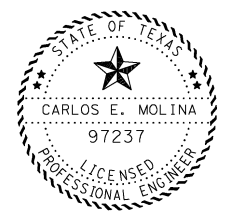
NOTES:

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LEGEND:

- PROPOSED
- - - EXISTING
- ⊗ PROPOSED FUSION SPLICE
- × EXISTING FUSION SPLICE
- ▭ SPLICE TRAY (SPLICE TRAYS SHOWN FOR DIAGRAMATIC PURPOSES ONLY AND MAY NOT BE THE ACTUAL NUMBER REQUIRED)

TYPICAL FIBER OPTIC CONNECTIONS.
EXAMPLE TO ILLUSTRATE FIBER OPTIC DIAGRAMS.



Carlos E. Molina

04/29/2024



TYPICAL FIBER OPTIC CONNECTIONS

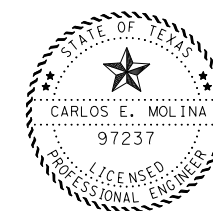
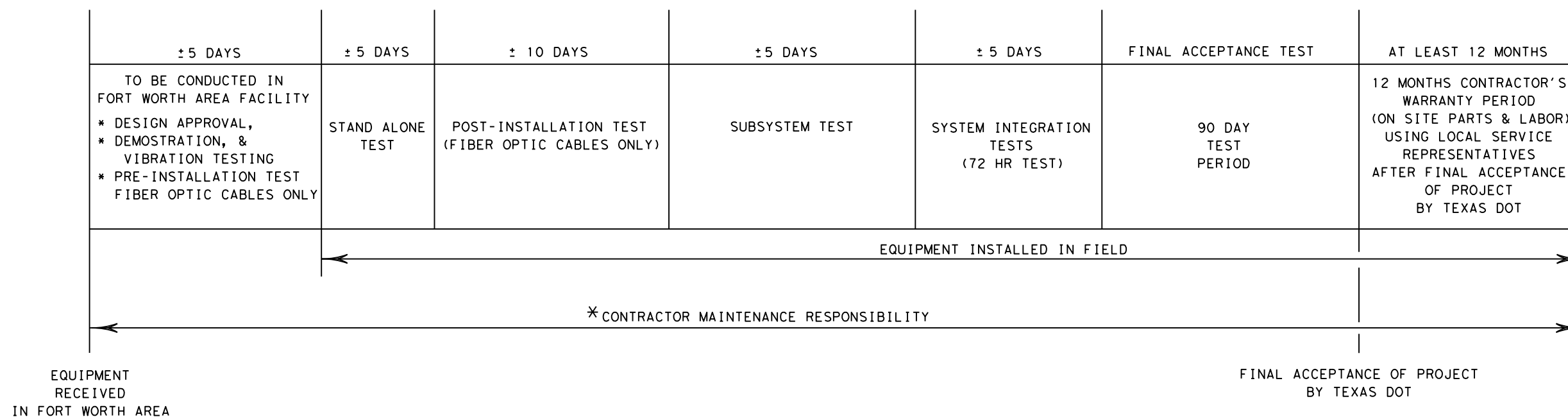
Sheet 5 of 5 Sheets

DIST.	COUNTY	SHEET NO.
FTW	TARRANT	17
CONTROL	SECT.	JOB
0902	00	299
		HIGHWAY NO.
		VA

CABINET TO CABINET FIBER OPTIC CONNECTIONS SCHEMATIC FOR: SIGNAL CABINET

CABINET TO CABINET FIBER OPTIC CONNECTIONS SCHEMATIC FOR: CCTV CABINET LOCATION

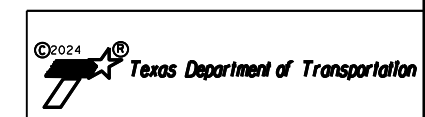
TIMELINE DESCRIPTION OF TESTING PROCEDURES



Carlos E. Molina

04/23/2024

* THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING COMPLETE ON SITE PARTS AND LABOR SUPPORT FOR THE INSTALLATION OF THE INTELLIGENT TRANSPORTATION SYSTEM FOR THE DURATION OF THE ENTIRE PROJECT AND FOR 12 MONTHS AFTER FINAL PROJECT ACCEPTANCE BY TEXAS DOT.



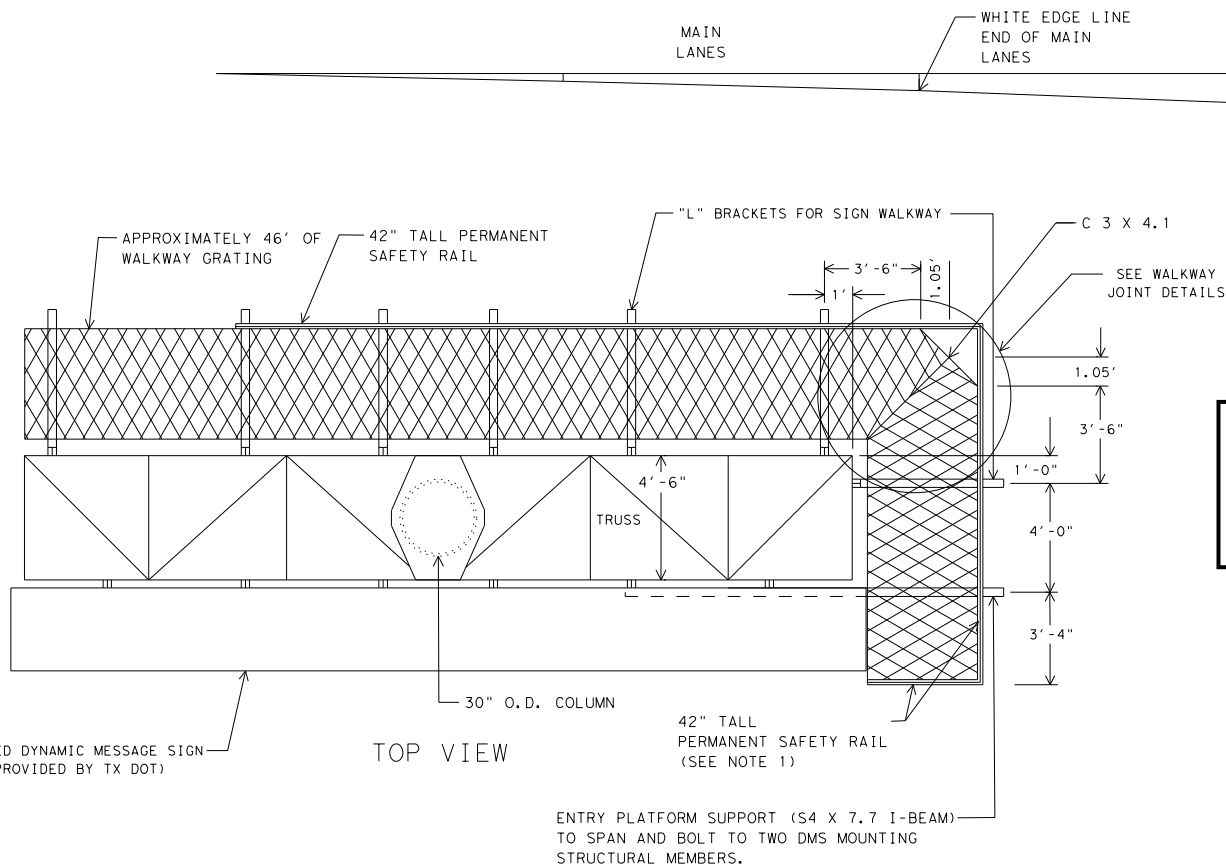
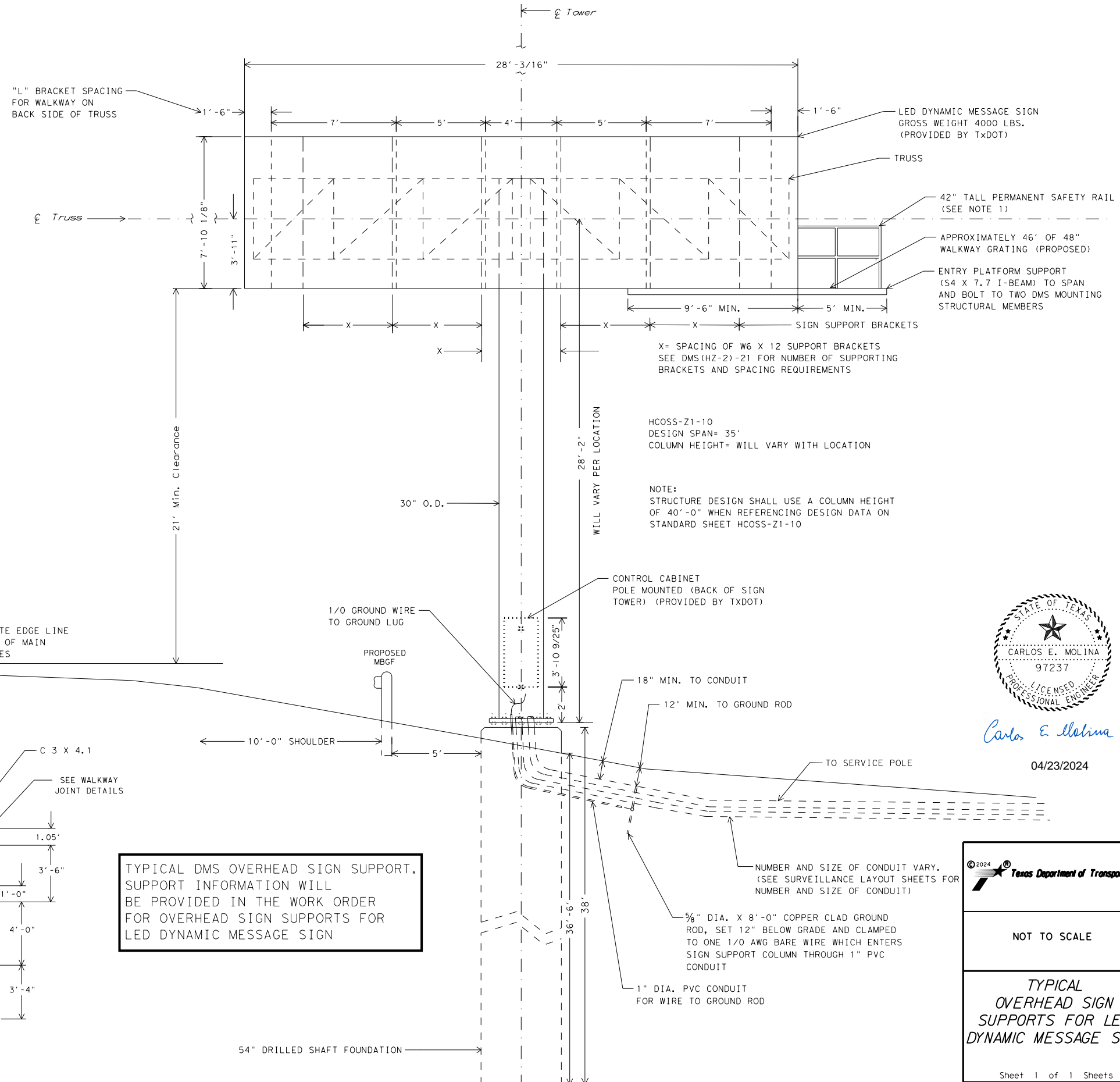
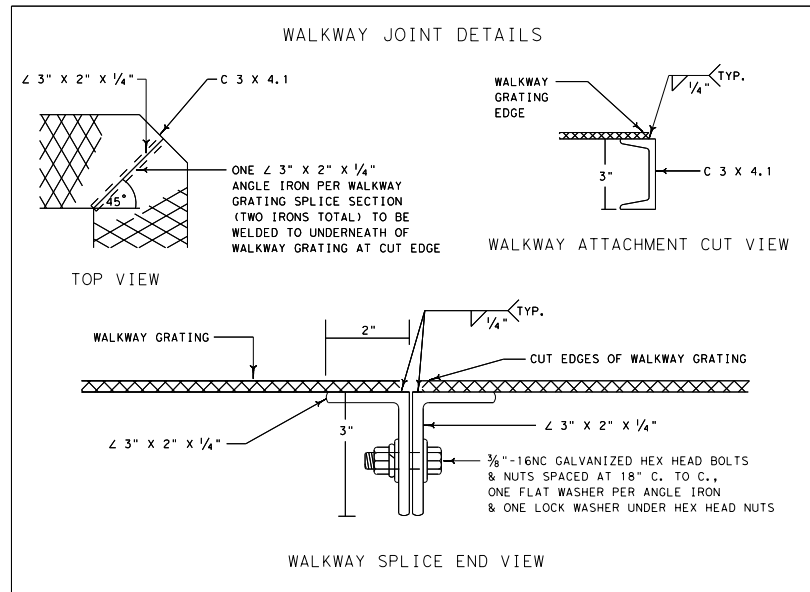
TIMELINE DESCRIPTION OF TESTING PROCEDURES

Sheet 1 of 1 Sheets

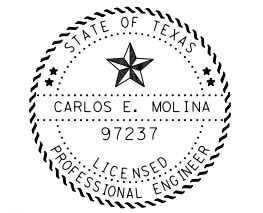
DIST.	COUNTY	SHEET NO.	
FTW	TARRANT	18	
CONTROL	SECT.	JOB	HIGHWAY NO.
0902	00	299	VA

NOTES:

1. THE CONTRACTOR SHALL SUBMIT THE STRUCTURAL DESIGN, MOUNTING DETAILS FOR THE DMS WALKWAY PLATFORM WITH 42" TALL PERMANENT SAFETY RAIL, AND DMS TO TRUSS-MOUNTING DESIGN DETAILS TO THE ENGINEER FOR APPROVAL PRIOR TO FABRICATION. THE SUBMITTED DRAWINGS FOR THE STRUCTURAL DESIGN, MOUNTING DETAILS OF THE DMS WALKWAY PLATFORM WITH 42" TALL PERMANENT SAFETY RAIL, AND DMS TO TRUSS-MOUNTING DESIGN SHALL BE DONE BY A TEXAS REGISTERED PROFESSIONAL ENGINEER, SHALL BE DATED AND SHALL BEAR THE ENGINEER'S SEAL AND SIGNATURE. SPACING OF HANDRAIL UPRIGHTS (VERTICAL MEMBERS) SHALL NOT EXCEED 24" CENTER TO CENTER.
2. PRIOR TO DRILLING SHAFT, THE DEPARTMENT WILL PROVIDE THE CONTRACTOR WITH THE VIEW ANGLE OFFSET FOR THE DMS LOCATION. THIS OFFSET WILL BE REQUIRED BY THE CONTRACTOR TO COORDINATE DRILL SHAFT ORIENTATION WITH THE SIGN MANUFACTURER FOR OPTIMUM DMS VIEW AXIS ALIGNMENT. THE NAME, ADDRESS AND CONTACT PERSON FOR THE DMS MANUFACTURER SHALL BE PROVIDED BY THE DEPARTMENT. PAYMENT SHALL NOT BE MADE DIRECTLY FOR SUCH COORDINATION, OR OTHER INCIDENTALS REQUIRED TO COMPLETE THIS WORK, BUT SHALL BE CONSIDERED SUBSIDIARY TO THE ITEM 416 "DRILLED SHAFT FOUNDATION".
3. THE FURNISHING AND INSTALLING OF 1" PVC CONDUIT, GROUND ROD, 1/0 AWG GROUND WIRE, GROUND ROD CLAMP, AND ALL OTHER MATERIALS, LABOR, TOOLS, EQUIPMENT, AND INCIDENTALS NECESSARY TO COMPLETE THE GROUNDING OF THE STRUCTURE AS PER NEC SHALL BE SUBSIDIARY TO ITEM 650.
4. DMS AND CABINET WILL BE STORED BY THE DEPARTMENT FOR PICKUP AT THE TXDOT TRAFFIC MANAGEMENT SECTION. 2501 SW LOOP 820, FORT WORTH, TX 76133.



TYPICAL DMS OVERHEAD SIGN SUPPORT. SUPPORT INFORMATION WILL BE PROVIDED IN THE WORK ORDER FOR OVERHEAD SIGN SUPPORTS FOR LED DYNAMIC MESSAGE SIGN



Carlos E. Molina
04/23/2024



NOT TO SCALE

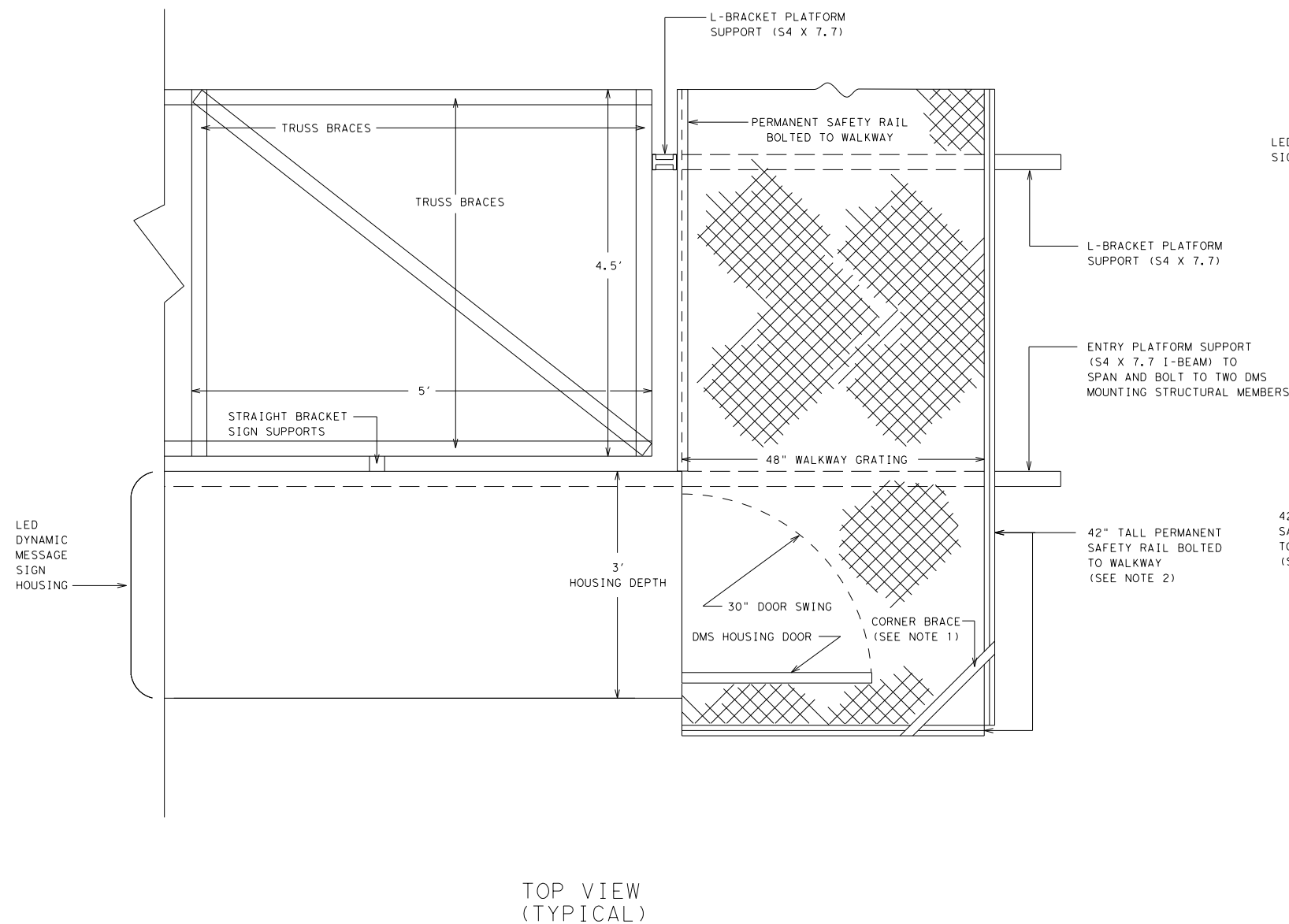
TYPICAL OVERHEAD SIGN SUPPORTS FOR LED DYNAMIC MESSAGE SIGN

Sheet 1 of 1 Sheets

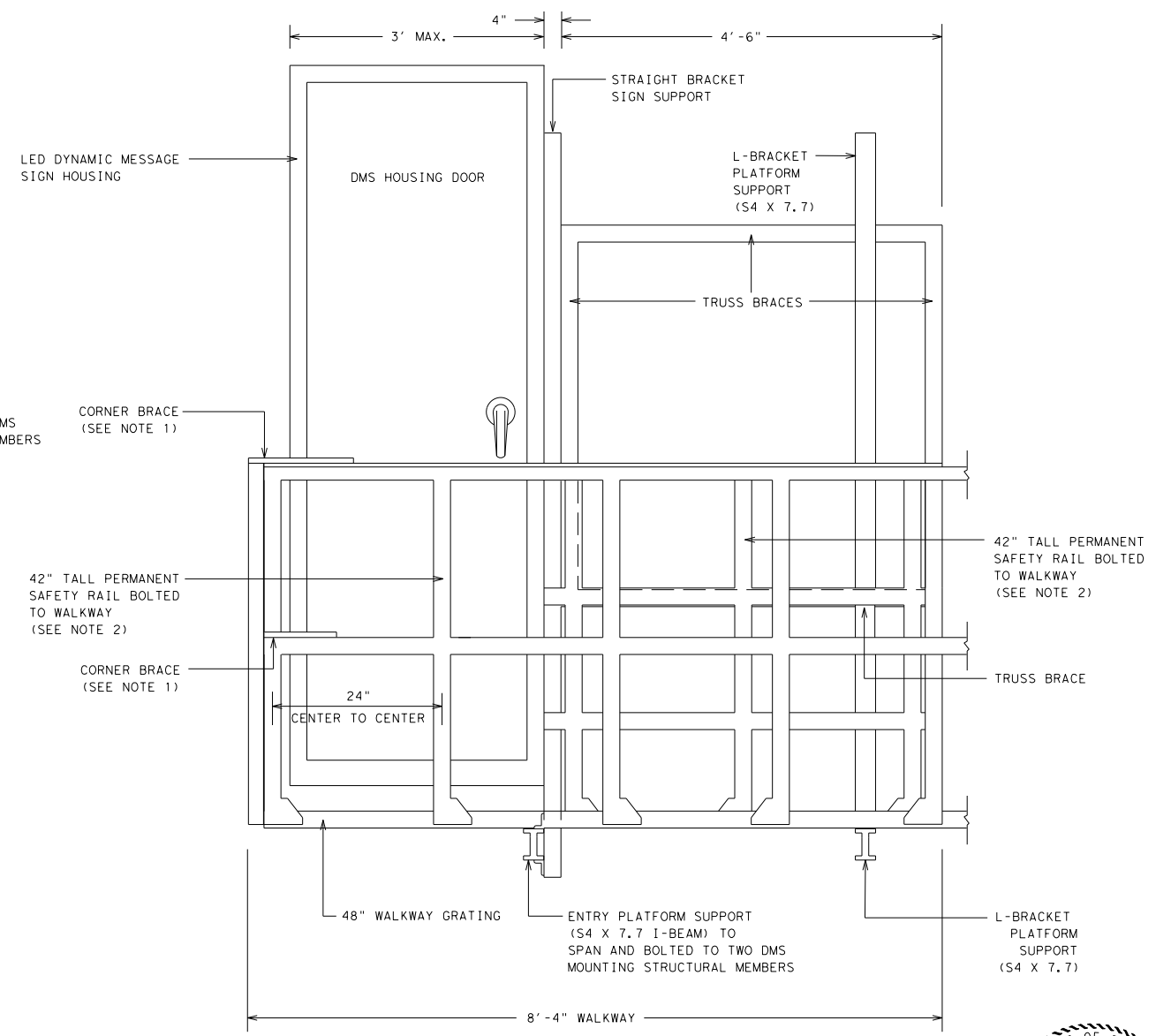
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FTW	TARRANT	19
CONTROL SECT.	JOB	HIGHWAY NO.
0902 00	299	VA

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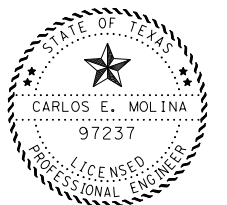
TOP VIEW (TYPICAL)



FRONT VIEW (TYPICAL)

NOTES:

1. TWO CORNER BRACES SHALL BE BOLTED AT A 45° ANGLE TO THE FRONT & SIDE PERMANENT SAFETY RAILS. ONE BRACE SHALL BE MOUNTED TO THE TOP RAILS & THE OTHER TO THE SECOND RAILS.
2. THE CONTRACTOR SHALL SUBMIT THE STRUCTURAL DESIGN, MOUNTING DETAILS FOR THE DMS WALKWAY PLATFORM WITH 42" TALL PERMANENT SAFETY RAIL, AND DMS TO TRUSS-MOUNTING DESIGN DETAILS TO THE ENGINEER FOR APPROVAL PRIOR TO FABRICATION. THE SUBMITTED DRAWINGS FOR THE STRUCTURAL DESIGN AND MOUNTING DETAILS OF THE DMS WALKWAY PLATFORM WITH 42" TALL PERMANENT SAFETY RAIL AND DMS TO TRUSS-MOUNTING DESIGN SHALL BE DONE BY A TEXAS REGISTERED PROFESSIONAL ENGINEER, SHALL BE DATED AND SHALL BEAR THE ENGINEER'S SEAL AND SIGNATURE. SPACING OF HANDRAIL UPRIGHTS (VERTICAL MEMBERS) SHALL NOT EXCEED 24" CENTER TO CENTER.



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04/23/2024

TYPICAL WALKWAY PLATFORM DETAILS FOR SINGLE DYNAMIC MESSAGE SIGN

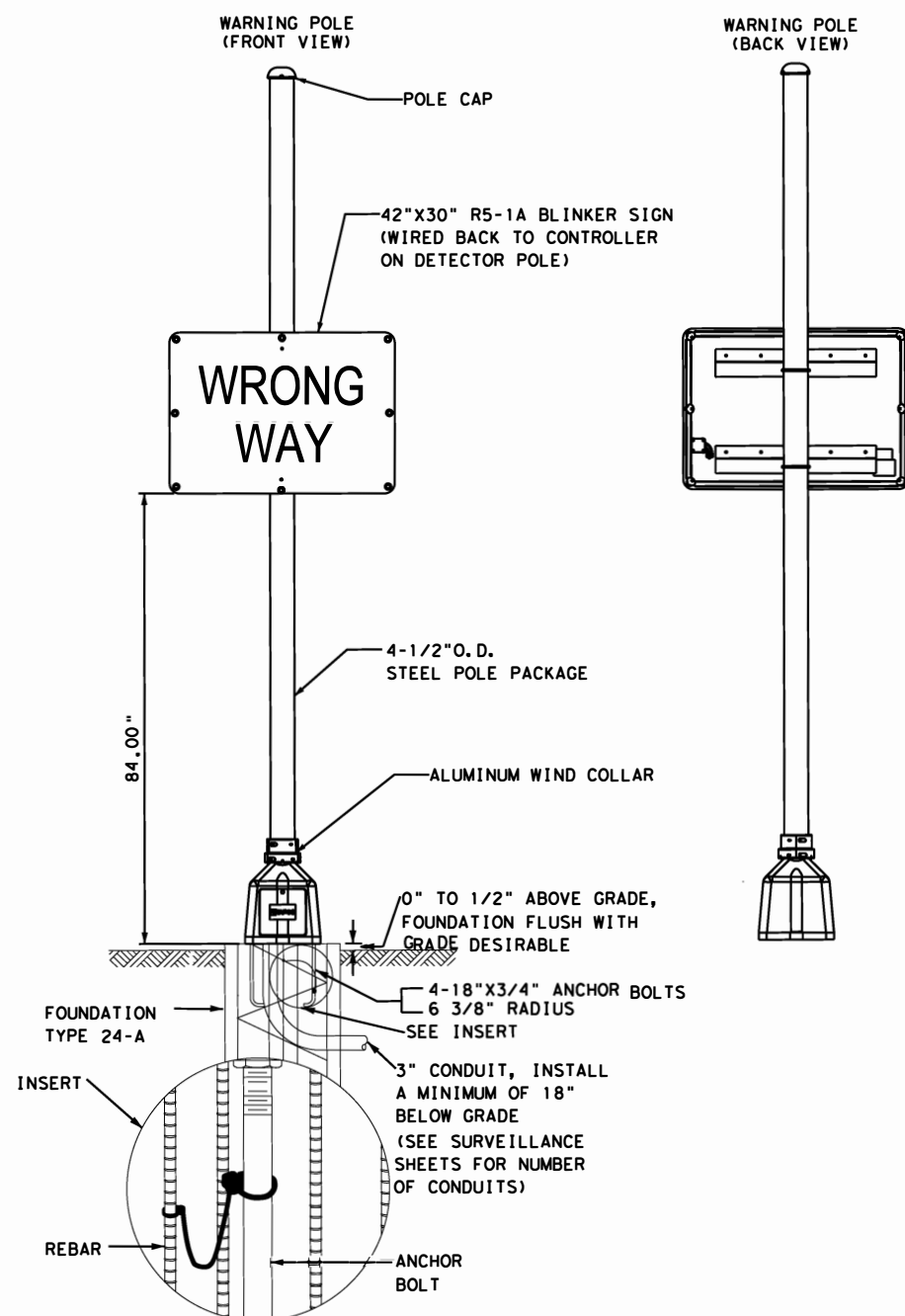
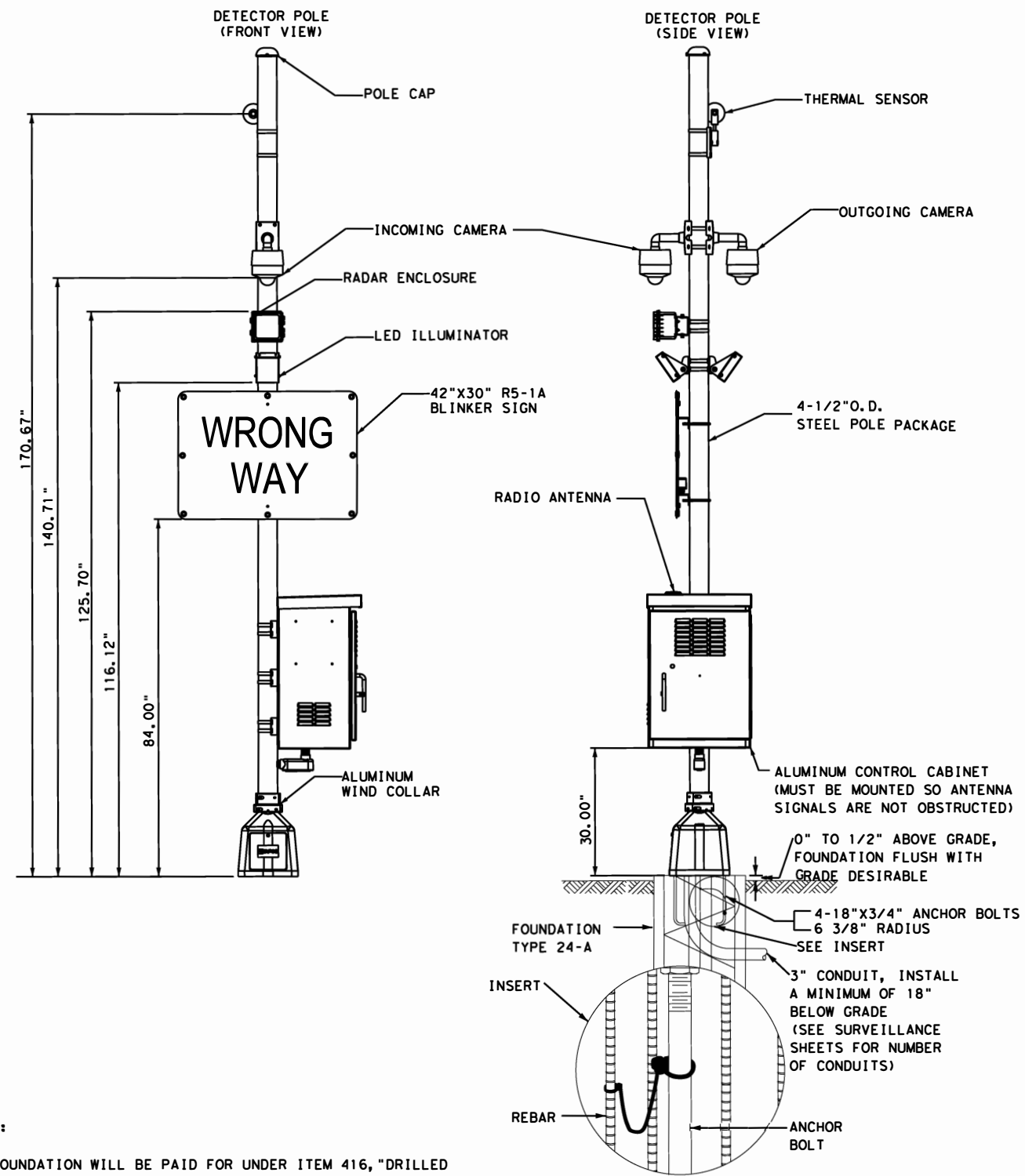


TYPICAL
LED
DYNAMIC MESSAGE SIGN
WALKWAY PLATFORM DETAILS
FOR SINGLE SIGN

Sheet 1 of 1 Sheets

DIST.	COUNTY	SHEET NO.	
FTW	TARRANT	20	
CONTROL	SECT.	JOB	HIGHWAY NO.
0902	00	299	VA

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NOTES:

1. FOUNDATION WILL BE PAID FOR UNDER ITEM 416, "DRILLED SHAFT FOUNDATIONS". INSTALL THE FOUNDATION IN ACCORDANCE WITH THE TS-FD-12 STANDARD SHEET.
2. BOND ANCHOR BOLTS TO REBAR CAGE, TWO LOCATIONS USING #3 BAR OR #6 AWG COPPER JUMPER. MECHANICAL CONNECTORS SHALL BE UL LISTED FOR CONCRETE ENCASEMENT. MECHANICAL CONNECTORS NOT SHOWN.
3. PER MANUFACTURER'S RECOMMENDATIONS, ENGAGE ALL THREADS ON THE PEDESTAL POLE BASE AND PIPE UNLESS THE PIPE IS FULLY SEATED INTO THE BASE. USE A POLE AND BASE COLLAR ASSEMBLY TO ADD STRENGTH AND PREVENT LOOSENING THE CONNECTION.
4. SEE FOUNDATION TYPE 24-A ON STANDARD SHEET TS-FD-12 FOR FOUNDATION STRUCTURE DESIGN DETAILS.
5. CONTROL CABINET HEIGHT MAY VARY.
6. SNAP LOCKS ARE PROVIDED, STANDARD 3/4" S/S BANDING IS RECOMMENDED.
7. J-BOLTS NOT SHOWN.
8. ALL DIMENSIONS ARE FOR REFERENCE ONLY.
9. CONTRACTOR SHALL VERIFY ALL ELEVATIONS SHOWN.
10. A 3 INCH WIDE STRIP OF RED REFLECTION SHEETING SHALL BE PLACED DIRECTLY BELOW THE SIGNS FOR THE ENTIRE LENGTH OF THE POLE FACING THE WRONG WAY TRAFFIC.
11. THE LOCATION OF THE EQUIPMENT IS DIAGRAMMATIC ONLY. THE EQUIPMENT SHOWN MAY NOT BE ALL THE EQUIPMENT REQUIRED FOR THE CORRECT FUNCTIONING OF THE SYSTEM. INSTALL AND ADJUST THE EQUIPMENT AS DIRECTED BY THE ENGINEER OR THE EQUIPMENT MANUFACTURER'S REPRESENTATIVE.
12. USE 1/2 IN. -13 UNC THREADED, COPPER OR TIN-PLATED COPPER, POLE BONDING CONNECTOR, SIZED APPROPRIATELY FOR CONDUCTORS, BONDED TO THE POLE BASE.
13. PROVIDE SINGLE POLE NON-FUSED WATERTIGHT BREAKAWAY ELECTRICAL CONNECTORS FOR FRANGIBLE PEDESTAL POLE BASES, AS SHOWN ON TxDOT'S MPL IN THE FILE "ROADWAY ILLUMINATION AND ELECTRICAL SUPPLIES." APPROVED MODELS ARE LISTED UNDER ITEM 685. FOR UNGROUNDED (HOT) CONDUCTORS, INSTALL A BREAKAWAY CONNECTOR WITH A DUMMY FUSE (SLUG). FOR GROUNDED (NEUTRAL) CONDUCTORS, INSTALL A BREAKAWAY CONNECTOR WITH A WHITE COLORED MARKING AND A PERMANENTLY INSTALLED DUMMY FUSE (SLUG).
14. 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.



Carlos E. Molina

04/23/2024

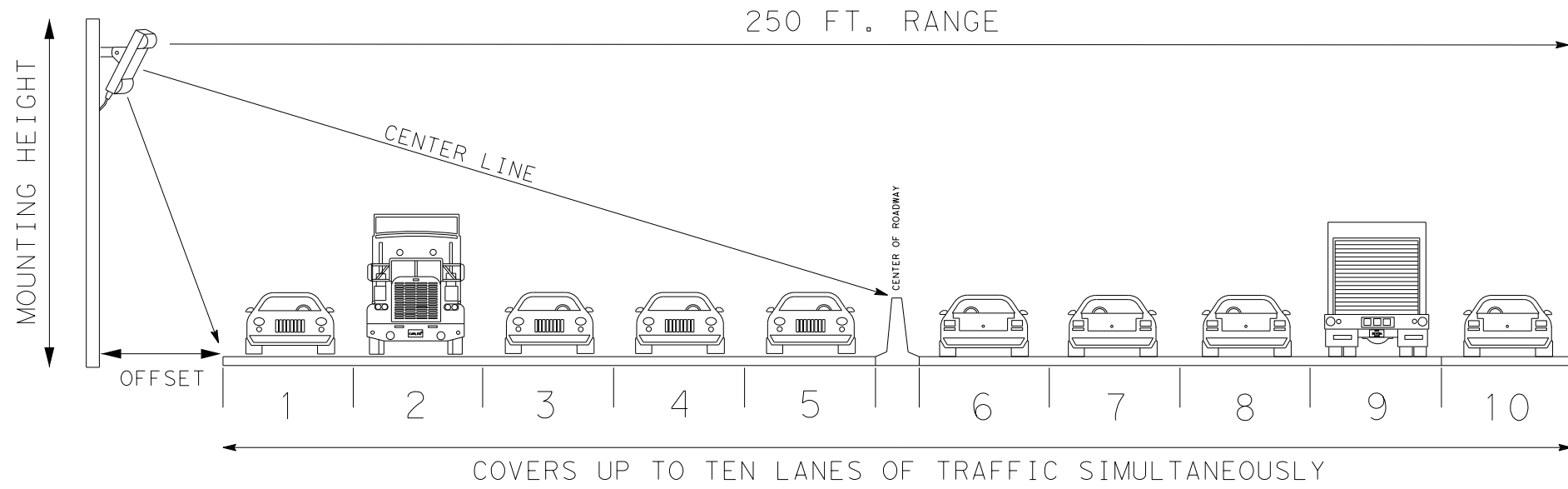
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**TYPICAL
WRONG WAY
DRIVER DETECTION
SYSTEM EQUIPMENT**

Sheet 1 of 1 Sheets

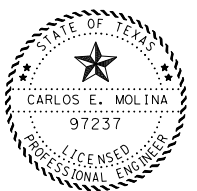
DIST.	COUNTY	SHEET NO.	
FTW	TARRANT	21	
CONTROL	SECT.	JOB	HIGHWAY NO.
0902	00	299	VA

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MOUNTING GUIDELINES	
Offset (feet)	Mounting Height (feet)
15	15
20	18
25	26
30	29
35	30
40	33

Recommended Offset



Carlos E. Molina

04/23/2024



RADAR VEHICLE SENSING DEVICE			
Sheet 1 of 1 Sheets			
DIST.	COUNTY		SHEET NO.
FTW	TARRANT		22
CONTROL	SECT.	JOB	HIGHWAY NO.
0902	00	299	VA

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

1. The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. The development and design of the Traffic Control Plan (TCP) is the responsibility of the Engineer.
3. The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.
4. The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.
5. Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.
6. When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.
7. The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.
9. The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.
10. Where highway construction or maintenance work is being undertaken, other than mobile operations as defined by the Texas Manual on Uniform Traffic Control Devices, CSJ limit signs are required. CSJ limit signs are shown on BC(2). The OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits. For mobile operations, CSJ limit signs are not required.
11. Traffic control devices should be in place only while work is actually in progress or a definite need exists.
12. The Engineer has the final decision on the location of all traffic control devices.
13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY NOTES:


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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

1. Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.
2. Work zone traffic control devices shall be compliant with the Manual for Assessing safety Hardware (MASH).

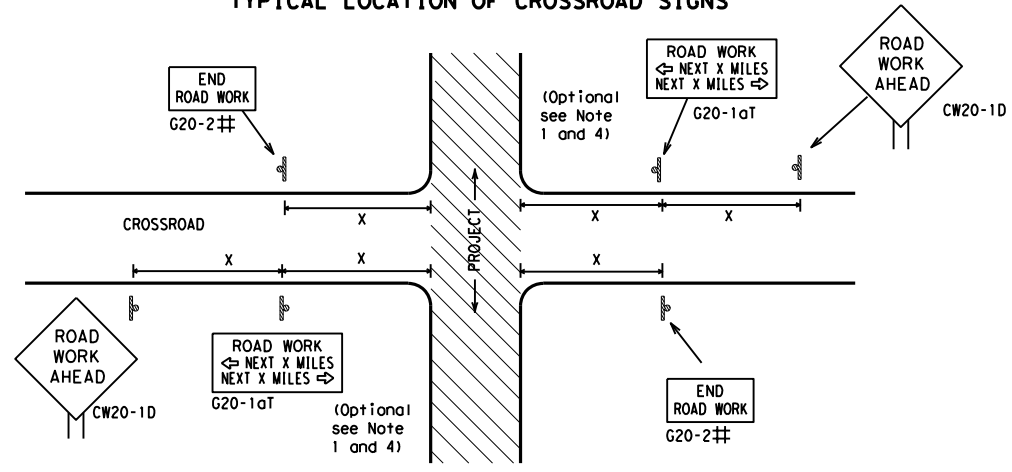
<p>THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT http://www.txdot.gov</p>
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)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

SHEET 1 OF 12

 Texas Department of Transportation		Traffic Safety Division Standard	
<p>BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS</p> <p>BC (1) - 21</p>			
FILE: bc-21.dgn	DN: TxDOT	CR: TxDOT	DW: TxDOT
© TxDOT November 2002	CONT	SECT	HIGHWAY
4-03 7-13	0902	00	299
9-07 8-14	DIST	COUNTY	SHEET NO.
5-10 5-21	FTW	TARRANT	23

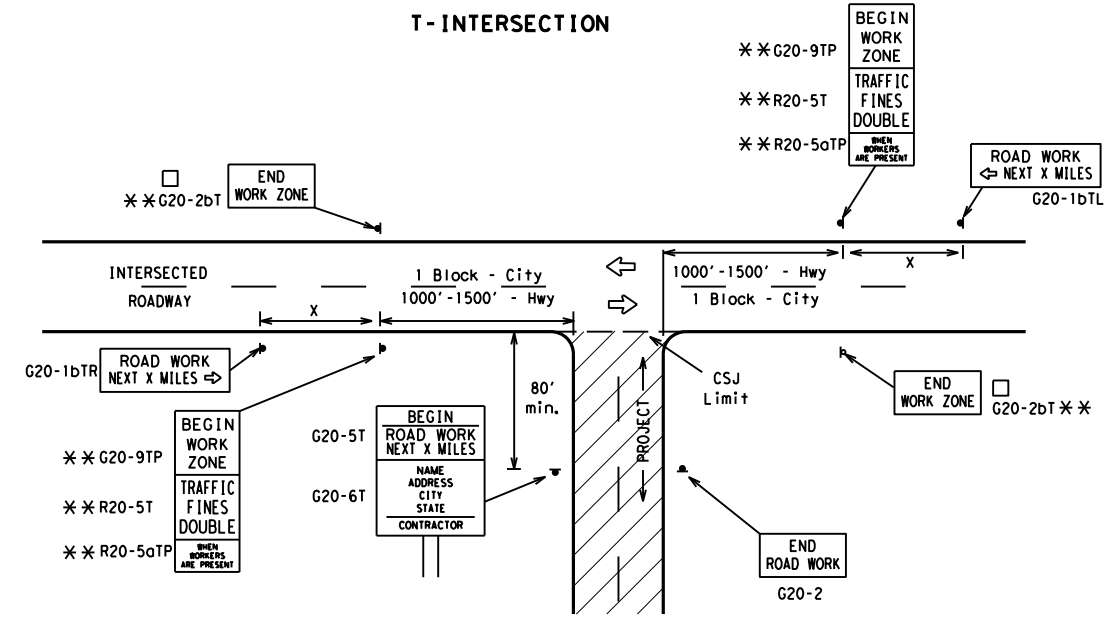
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TYPICAL LOCATION OF CROSSROAD SIGNS



- ## May be mounted on back of "ROAD WORK AHEAD" (CW20-1D) sign with approval of Engineer. (See note 2 below)
- 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.
 - The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK" (G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume as per TMUTCD Part 5. This information shall be shown in the plans.
 - 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.
 - 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.
 - Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
 - 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

- 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.
- If construction closes the road at a T-intersection, the Contractor shall place the "CONTRACTOR NAME" (G20-6T) sign behind the Type 3 Barricades for the road closure (see BC(10) also). The "ROAD WORK NEXT X MILES" left arrow (G20-1bTL) and "ROAD WORK NEXT X MILES" right arrow (G20-1bTR) signs shall be replaced by the detour signing called for in the plans.

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING^{1,5,6}

Sign Number or Series	SIZE		SPACING	
	Conventional Road	Expressway/Freeway	Posted Speed MPH	Sign Δ Spacing "x" Feet (Apprx.)
CW20 ⁴	48" x 48"	48" x 48"	30	120
CW21			35	160
CW22			40	240
CW23			45	320
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"	50	400
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"	60	600 ²
			65	700 ²
			70	800 ²
			75	900 ²
			80	1000 ²
			*	* ³

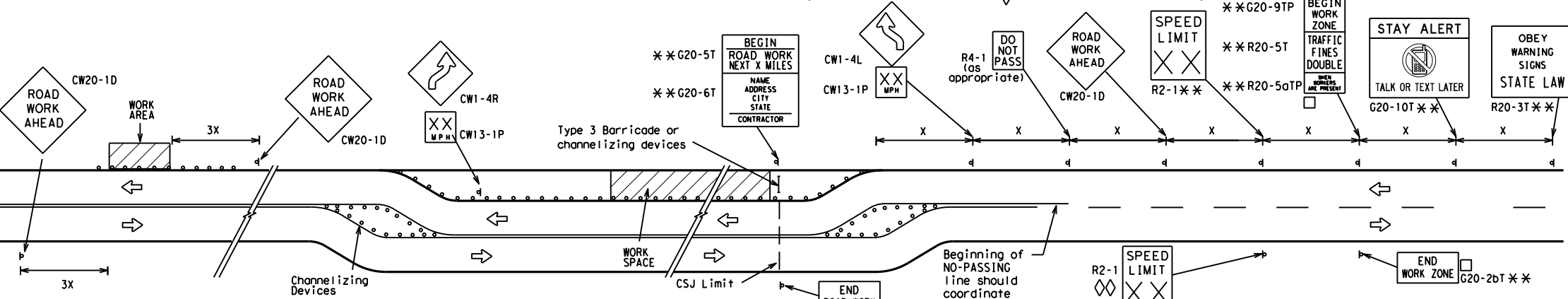
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

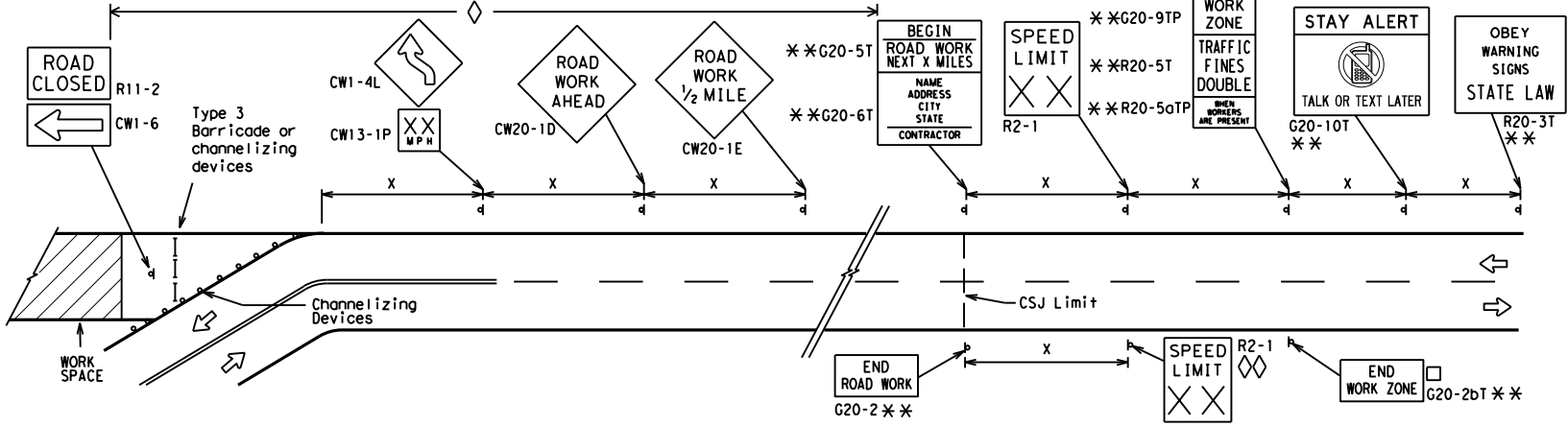
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

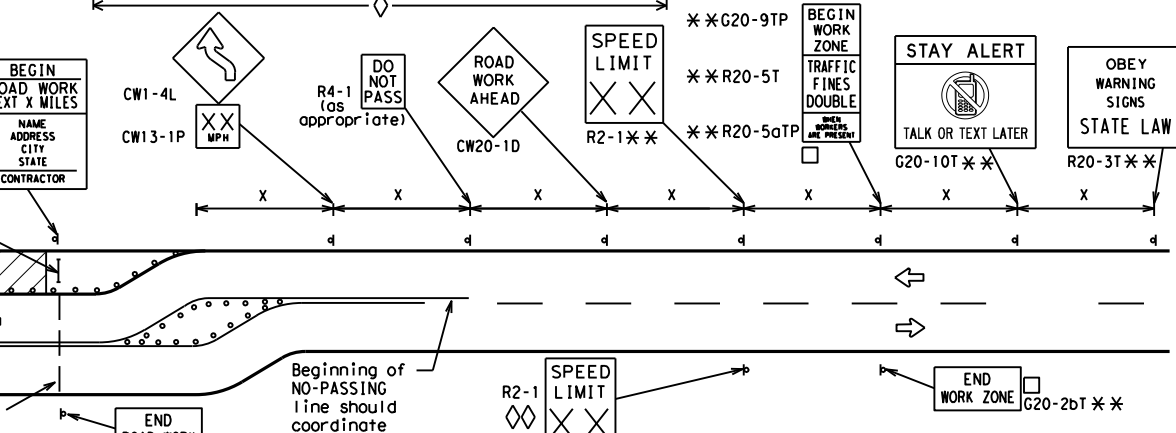


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

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



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



NOTES

- The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES" (G20-5T) sign for each specific project. This distance shall replace the "x" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.
- The "BEGIN WORK ZONE" (G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.
 - CSJ limit signing is required for highway construction and maintenance work, with the exception of mobile operations.
 - Area for placement of "ROAD WORK AHEAD" (CW20-1D) sign and other signs or devices as called for on the Traffic Control Plan.
 - Contractor will install a regulatory speed limit sign at the end of the work zone.

LEGEND

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

SHEET 2 OF 12



BARRICADE AND CONSTRUCTION PROJECT LIMIT

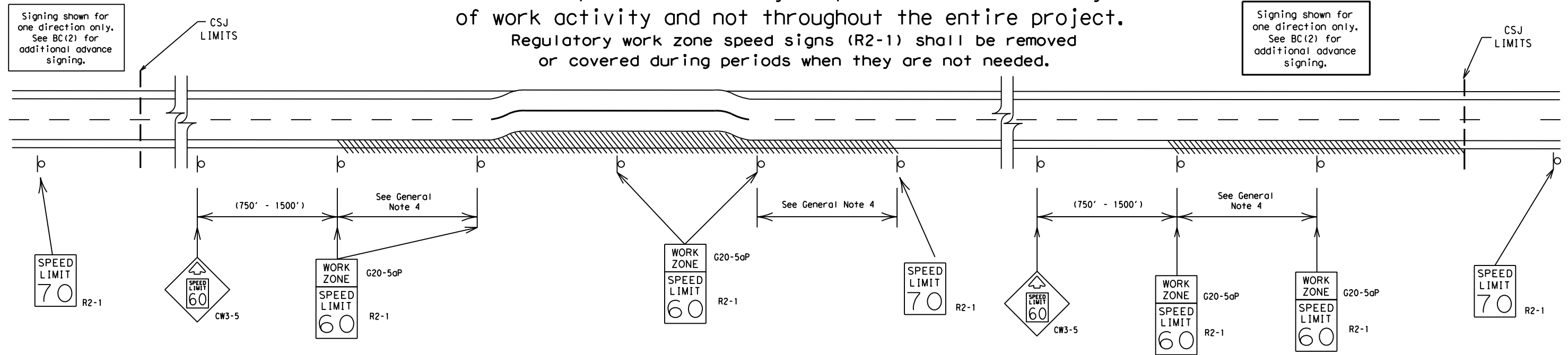
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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	00	299	VA
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	FTW	TARRANT	24	

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:

- rough road or damaged pavement surface
- substantial alteration of roadway geometrics (diversions)
- construction detours
- grade
- width
- other conditions readily apparent to the driver

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

- Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
- Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
- Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
- 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
- Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
- 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.
- Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
- Techniques that may help reduce traffic speeds include but are not limited to:
 - Law enforcement.
 - Flagger stationed next to sign.
 - Portable changeable message sign (PCMS).
 - Low-power (drone) radar transmitter.
 - Speed monitor trailers or signs.
- Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
- 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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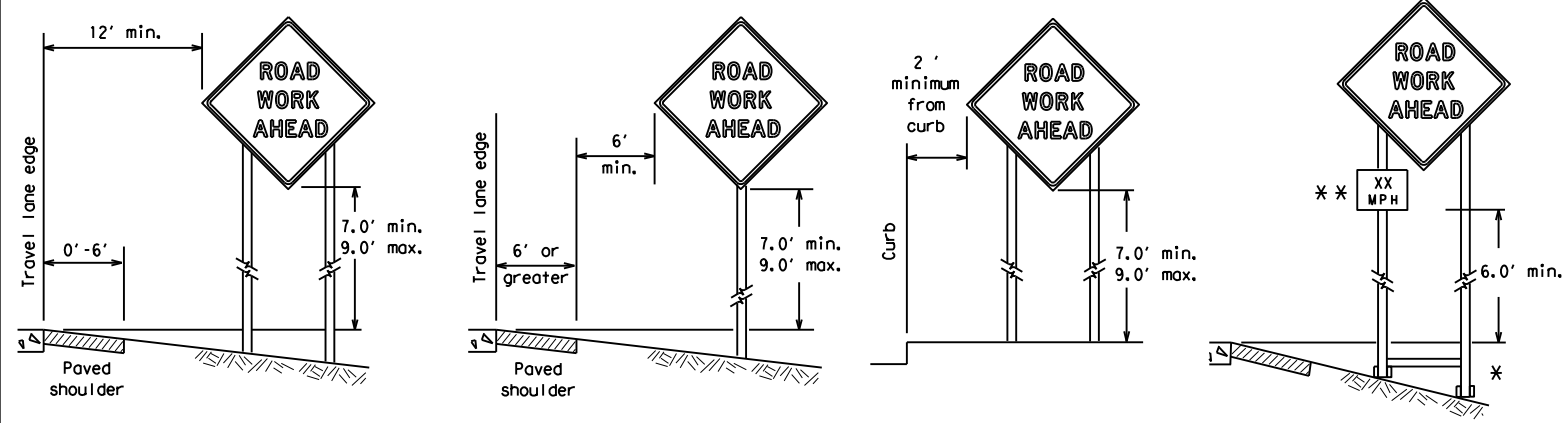
SHEET 3 OF 12

		Traffic Safety Division Standard	
<h2>BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT</h2>			
<h3>BC (3) -21</h3>			
FILE:	bc-21.dgn	DW:	TxDOT
© TxDOT	November 2002	CONT SECT:	0902 00
REVISIONS:		JOB:	299
9-07 8-14		HIGHWAY:	VA
7-13 5-21		DIST:	FTW
		COUNTY:	TARRANT
		SHEET NO.:	25

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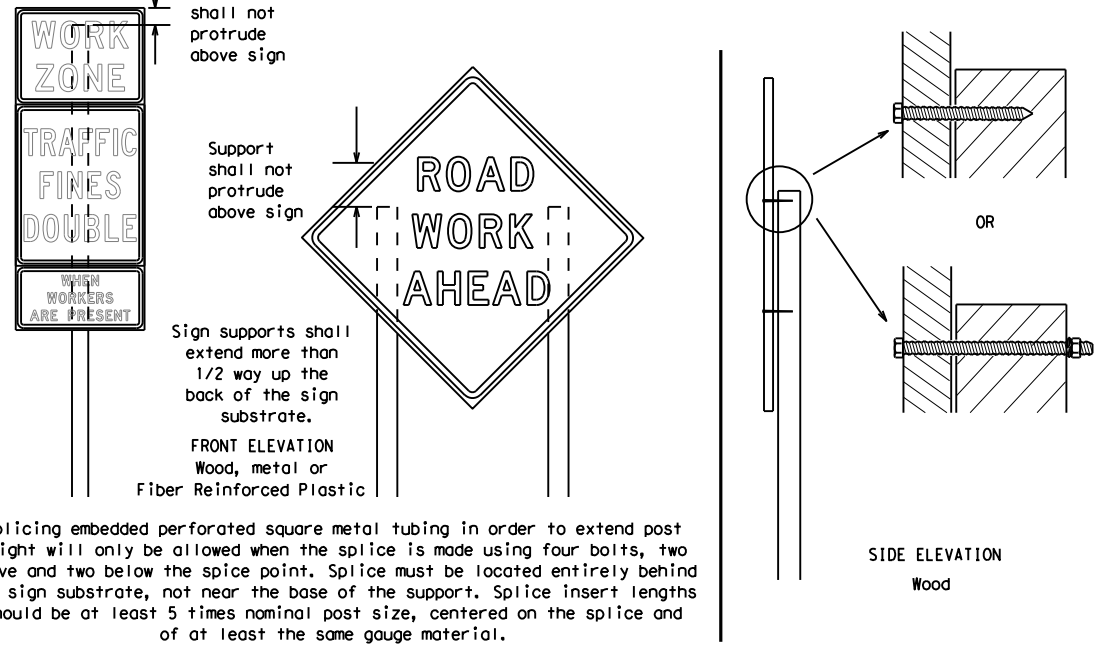
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



* 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

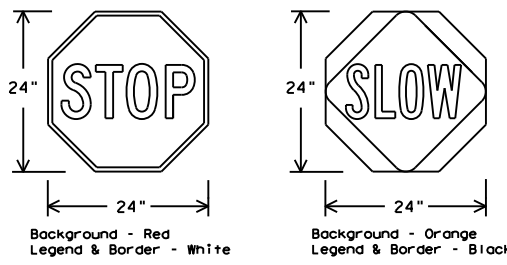


Nails shall NOT be allowed.
 Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

- Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, specific service (LOGO), or cultural information. Drivers proceeding through a work zone need the same, if not better route guidance as normally installed on a roadway without construction.
- When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition. For details for covering large guide signs see the TS-CD standard.
- When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
- 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.
- If permanent signs are to be removed and relocated using temporary supports, the Contractor shall use crashworthy supports as shown on the BC standard sheets, TLRs standard sheets or the CWZTCD list. The signs shall meet the required mounting heights shown on the BC, or the SMD standard sheets during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
- 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

- Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
- Wooden sign posts shall be painted white.
- Barricades shall NOT be used as sign supports.
- 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.
- 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.
- The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD) for small roadside signs. Supports for temporary large roadside signs shall meet the requirements detailed on the Temporary Large Roadside Signs (TLRS) standard sheets. The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
- 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.
- 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.
- 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)

- 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.
 - Long-term stationary - work that occupies a location more than 3 days.
 - 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.
 - Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
 - Short, duration - work that occupies a location up to 1 hour.
 - Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

- 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.
- 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.
- Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
- 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.
- 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

- 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

- 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.
- "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
- 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

- 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).
- White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
- 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

- 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

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

SIGN SUPPORT WEIGHTS

- Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
- The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
- Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
- 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.
- 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.
- 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.
- Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

- 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.

SHEET 4 OF 12

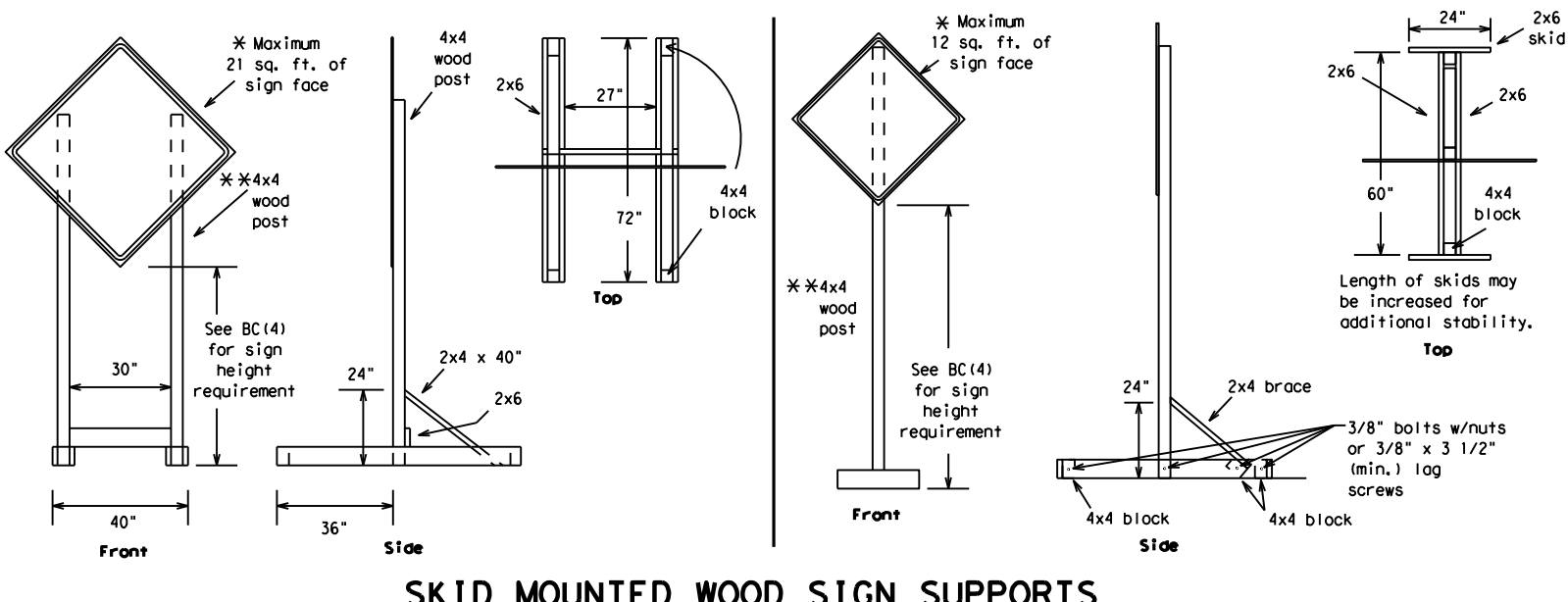


BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC (4) - 21

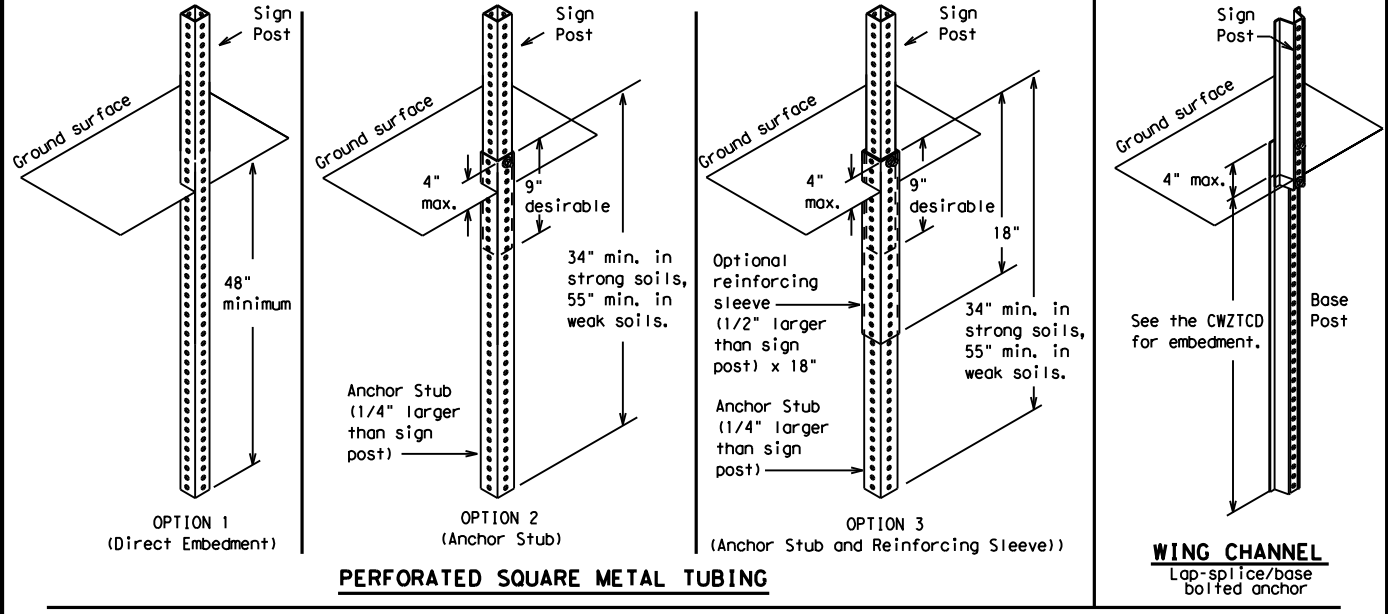
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© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
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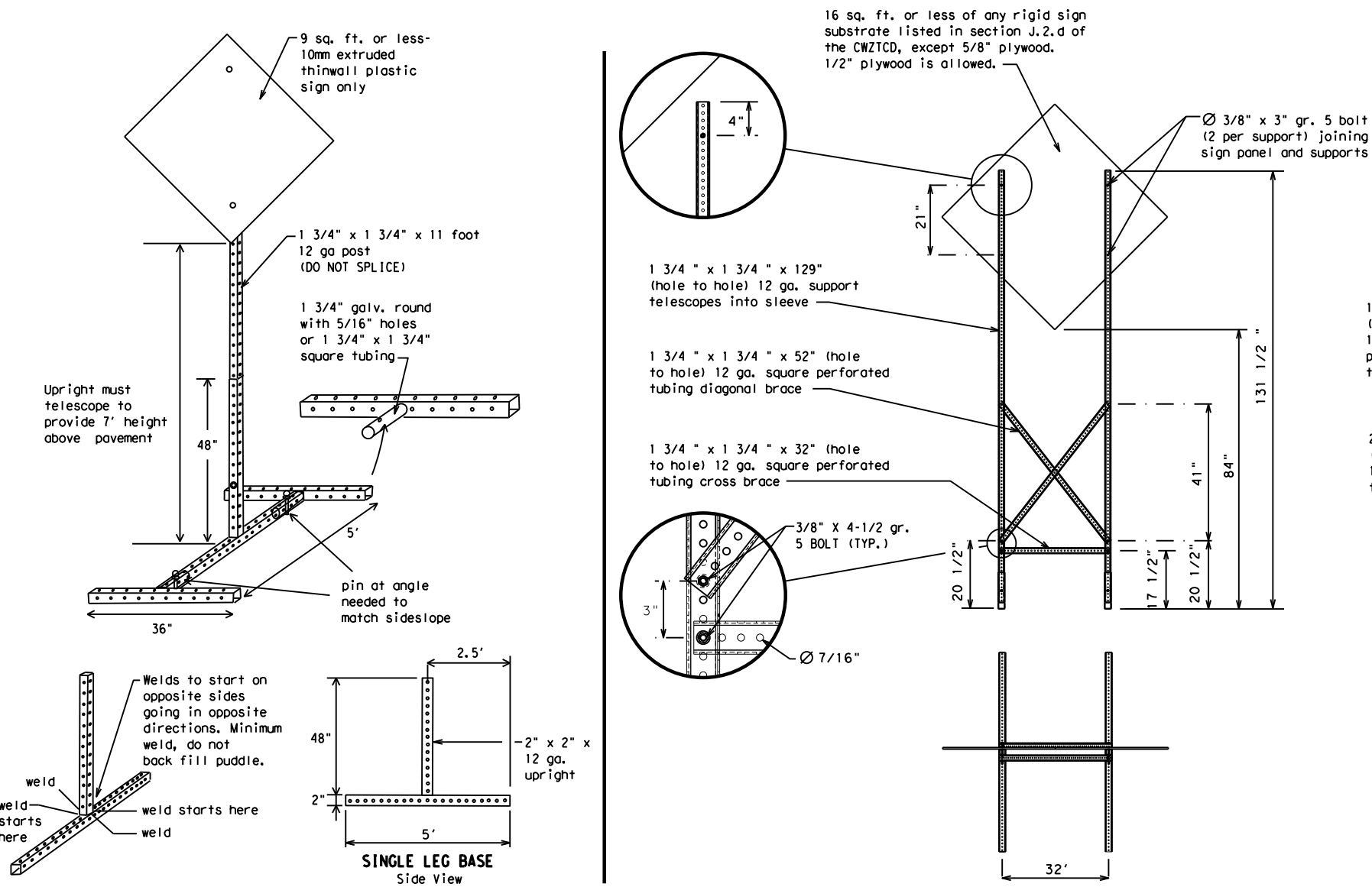
SKID MOUNTED WOOD SIGN SUPPORTS

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



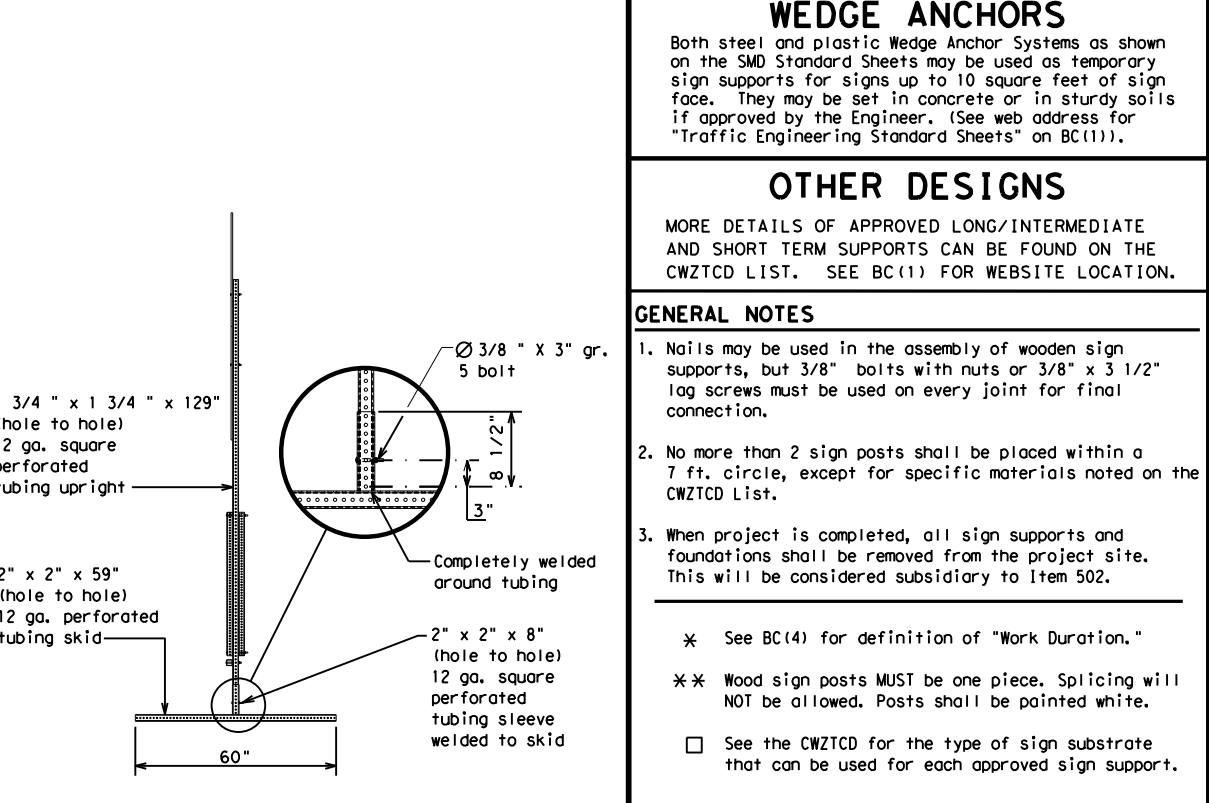
GROUND MOUNTED SIGN SUPPORTS

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.



SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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



WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

- * See BC(4) for definition of "Work Duration."
- ** Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.
- See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

SHEET 5 OF 12



BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5) - 21

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

PORTABLE CHANGEABLE MESSAGE SIGNS

- The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
- 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.
- 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.
- Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
- Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
- When in use, the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
- 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.
- 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.
- Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
- 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.
- Do not use the word "Danger" in message.
- Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
- Do not display messages that scroll horizontally or vertically across the face of the sign.
- 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.
- 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.
- Each line of text should be centered on the message board rather than left or right justified.
- 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.

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
XXXXXXXX TO XXXXXX
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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

- Only 1 or 2 phases are to be used on a PCMS.
- The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
- A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
- A Location Phase is necessary only if a distance or location is not included in the first phase selected.
- 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.
- 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

- The words RIGHT, LEFT and ALL can be interchanged as appropriate.
- Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
- EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
- Highway names and numbers replaced as appropriate.
- ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
- AHEAD may be used instead of distances if necessary.
- FT and MI, MILE and MILES interchanged as appropriate.
- AT, BEFORE and PAST interchanged as needed.
- 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

- 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.
- 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.
- 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.
- 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.

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WORD OR PHRASE	ABBREVIATION	WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD	Major	MAJ
Alternate	ALT	Miles	MI
Avenue	AVE	Miles Per Hour	MPH
Best Route	BEST RTE	Minor	MNR
Boulevard	BLVD	Monday	MON
Bridge	BRDG	Normal	NORM
Canal	CANT	North	N
Center	CTR	Northbound	(route) N
Construction Ahead	CONST AHD	Parking	PKING
CROSSING	XING	Road	RD
Detour Route	DETOUR RTE	Right Lane	RT LN
Do Not	DONT	Saturday	SAT
East	E	Service Road	SERV RD
Eastbound	(route) E	Shoulder	SHLDR
Emergency	EMER	Slippery	SLIP
Emergency Vehicle	EMER VEH	South	S
Entrance, Enter	ENT	Southbound	(route) S
Express Lane	EXP LN	Speed	SPD
Expressway	EXPWY	Street	ST
XXXX Feet	XXXX FT	Sunday	SUN
Fog Ahead	FOG AHD	Telephone	PHONE
Freeway	FRWY, FWY	Temporary	TEMP
Freeway Blocked	FWY BLKD	Thursday	THURS
Friday	FRI	To Downtown	TO DWNTN
Hazardous Driving	HAZ DRIVING	Traffic	TRAF
Hazardous Material	HAZMAT	Travelers	TRVLR
High-Occupancy Vehicle	HOV	Tuesday	TUES
Highway	Hwy	Time Minutes	TIME MIN
Hour(s)	HR, HRS	Upper Level	UPR LEVEL
Information	INFO	Vehicles (s)	VEH, VEHS
It Is	ITS	Warning	WARN
Junction	JCT	Wednesday	WED
Left	LFT	Weight Limit	WT LIMIT
Left Lane	LFT LN	West	W
Lane Closed	LN CLOSED	Westbound	(route) W
Lower Level	LWR LEVEL	Wet Pavement	WET PVMT
Maintenance	MAINT	Will Not	WONT

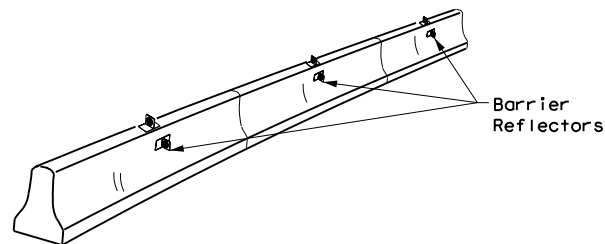
Roadway designation # IH-number, US-number, SH-number, FM-number

<h3>BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)</h3>			
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		299	VA
		DIST	COUNTY
		FTW	TARRANT
		SHEET NO.	28

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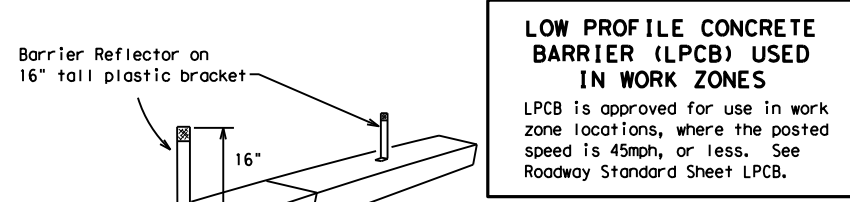
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors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



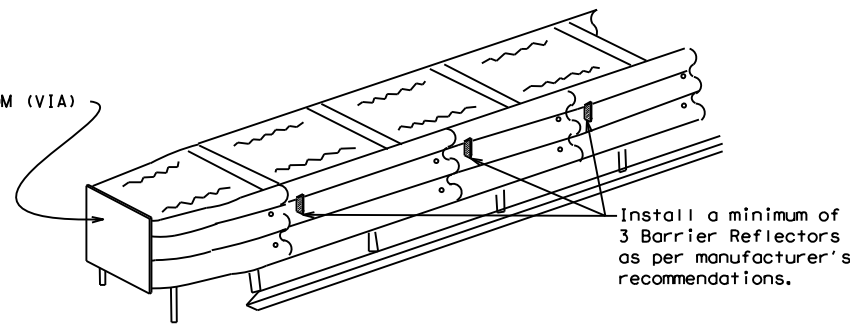
CONCRETE TRAFFIC BARRIER (CTB)

- 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.
- 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.
- When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
- Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
- Maximum spacing of Barrier Reflectors is forty (40) feet.
- Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
- Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
- Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
- Single slope barriers shall be delineated as shown on the above detail.



LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES
 LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

LOW PROFILE CONCRETE BARRIER (LPCB)



DELINEATION OF END TREATMENTS

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS

WARNING LIGHTS

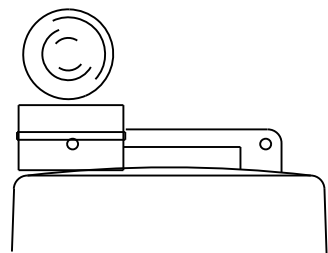
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet 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_{PL} or C_{FL} Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
- 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".
- The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
- 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.
- 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.
- The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

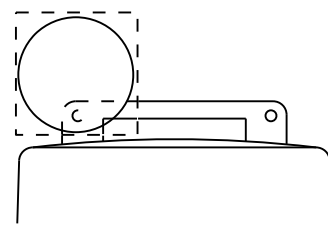
- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing 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.
- 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.
- Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
- Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
- 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

- 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.
- 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.
- The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
- Round reflectors shall be fully reflectorized, including the area where attached to the drum.
- 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.
- 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.
- When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
- The warning reflector should be mounted on the side of the handle nearest approaching traffic.
- The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.



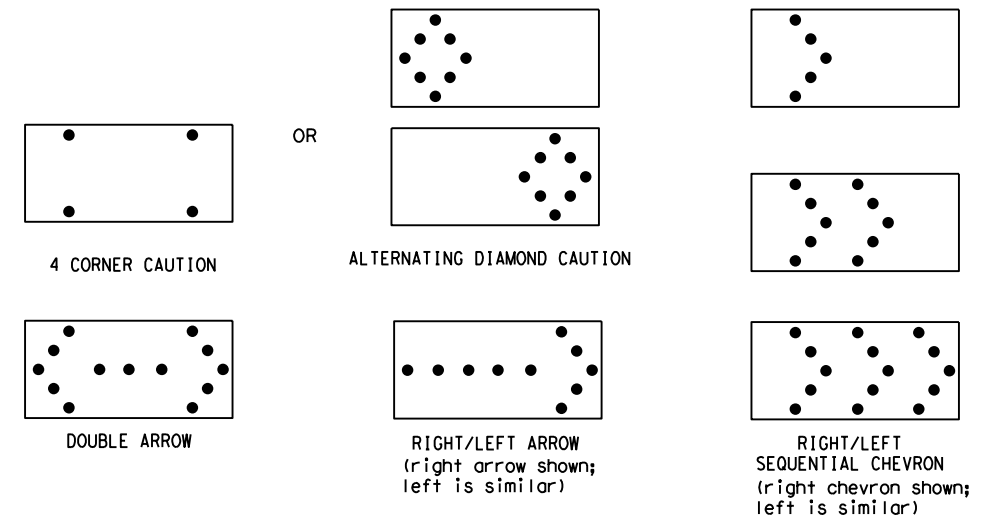
Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



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

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.

- 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.
- 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.
- 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.
- The Flashing Arrow Board should be able to display the following symbols:



- The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
- The straight line caution display is NOT ALLOWED.
- 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.
- 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.
- The sequential arrow display is NOT ALLOWED.
- The flashing arrow display is the TxDOT standard; however, the sequential chevron display may be used during daylight operations.
- The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
- A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
- 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.
- 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

SHEET 7 OF 12

TRUCK-MOUNTED ATTENUATORS

- Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
- Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
- Refer to the CWZTCD for a list of approved TMAs.
- TMAs are required on freeways unless otherwise noted in the plans.
- 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.
- The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

Texas Department of Transportation
 Traffic Safety Division Standard

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

BC (7) -21

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GENERAL NOTES

- For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
- 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.
- 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.
- 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).
- 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.
- 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:

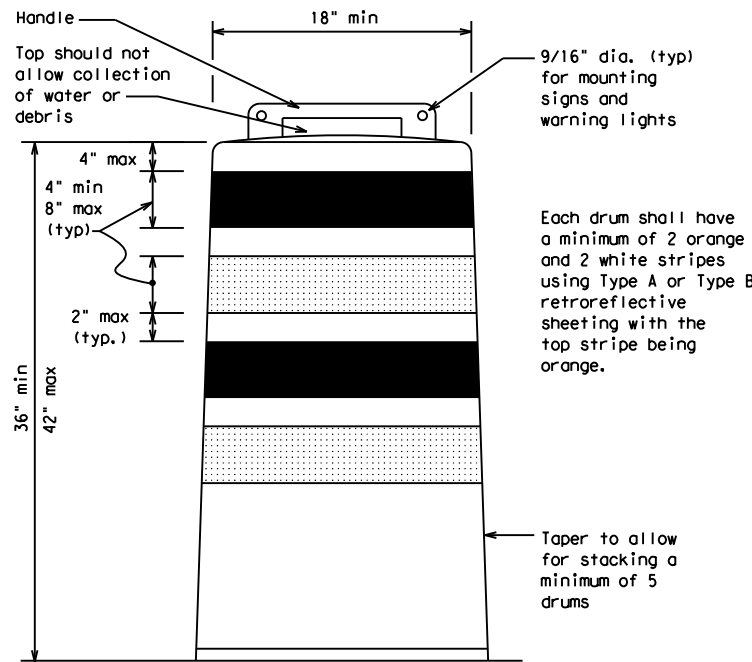
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
- 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.
- 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.
- 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.
- 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.
- 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.
- Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
- Drum body shall have a maximum unballasted weight of 11 lbs.
- Drum and base shall be marked with manufacturer's name and model number.

RETROREFLECTIVE SHEETING

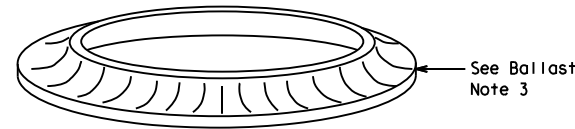
- The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
- The sheeting shall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

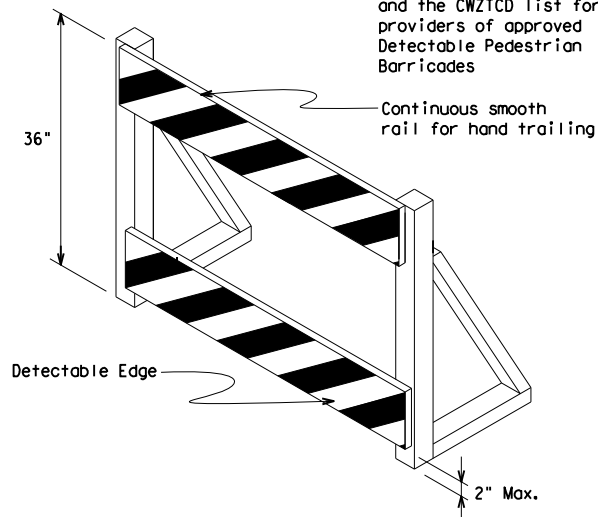
- Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other 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.
- 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.
- Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
- 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.
- 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.
- Ballast shall not be placed on top of drums.
- Adhesives may be used to secure base of drums to pavement.



Each drum shall have a minimum of 2 orange and 2 white stripes using Type A or Type B retroreflective sheeting with the top stripe being orange.

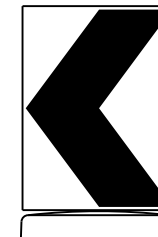


This detail is not intended for fabrication. See note 3 and the CWZTCD list for providers of approved Detectable Pedestrian Barricades

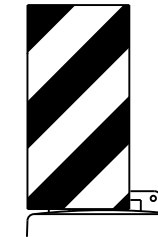


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

- Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
- 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.
- Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type A or Type B. Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
- 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.
- Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
- Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
- 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.
- 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.

SHEET 8 OF 12



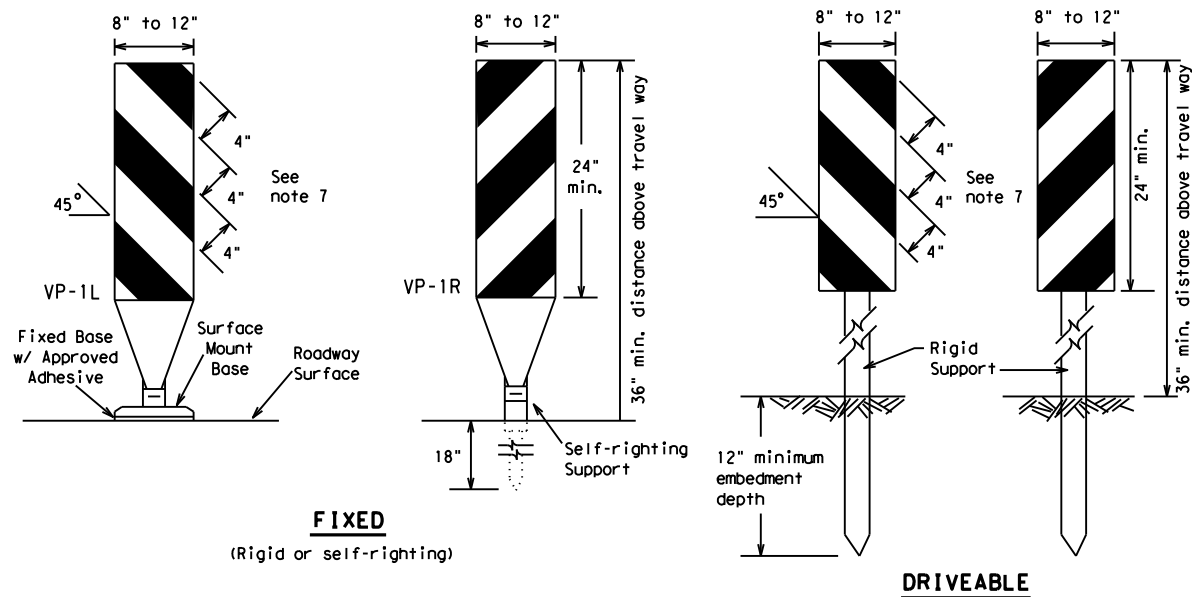
BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (8) - 21

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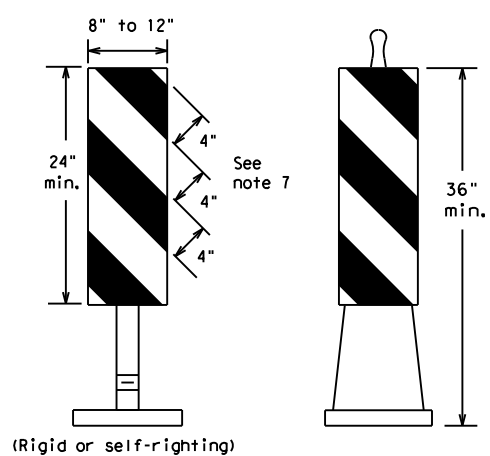
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FIXED
(Rigid or self-righting)

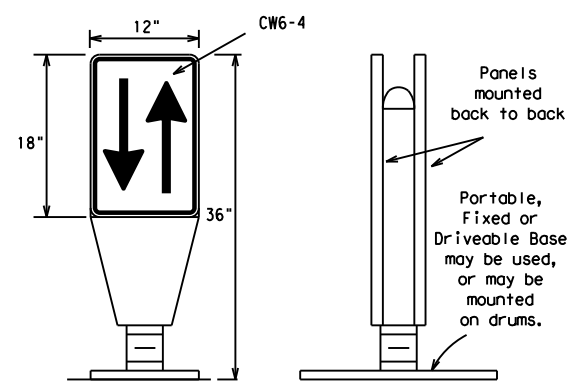
DRIVEABLE



PORTABLE

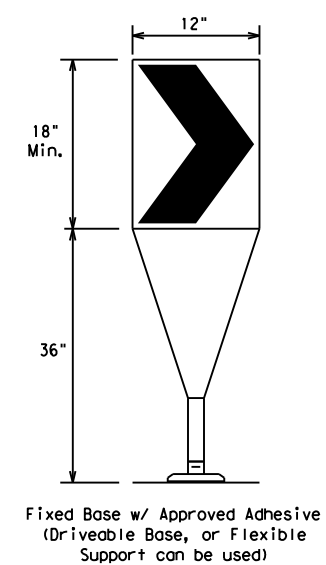
VERTICAL PANELS (VPs)

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



OPPOSING TRAFFIC LANE DIVIDERS (OTLD)

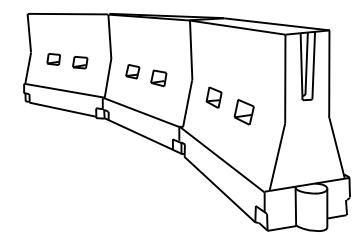
- Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
- The OTLD may be used in combination with 42" cones or VPs.
- Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
- 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.



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

- The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
- 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.
- 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.
- To be effective, the chevron should be visible for at least 500 feet.
- 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.
- 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)

- 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.
- LCDs may be used instead of a line of cones or drums.
- LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
- LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
- LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10). Place reflective sheeting near the top of the LCD along the full length of the device.

WATER BALLASTED SYSTEMS USED AS BARRIERS

- Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate Manual for Assessing Safety Hardware (MASH) crashworthiness requirements based on roadway speed and barrier application.
- 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.
- 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.
- 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.
- 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

- 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).
- 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.
- 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).
- 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.
- Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
- 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.
- 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 * *			Suggested Maximum Spacing of Channelizing Devices	
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent
30	L = WS ² / 60	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40		265'	295'	320'	40'	80'
45	L = WS	450'	495'	540'	45'	90'
50		500'	550'	600'	50'	100'
55		550'	605'	660'	55'	110'
60		600'	660'	720'	60'	120'
65		650'	715'	780'	65'	130'
70		700'	770'	840'	70'	140'
75		750'	825'	900'	75'	150'
80		800'	880'	960'	80'	160'

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (9) - 21

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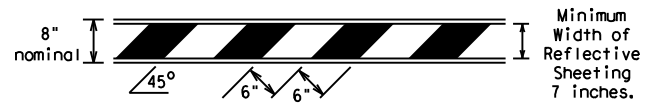
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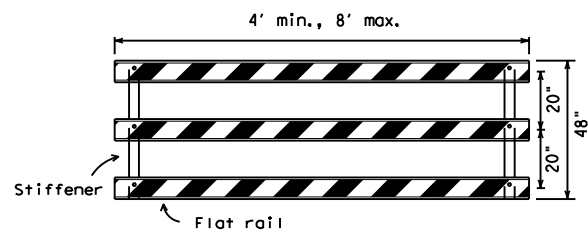
TYPE 3 BARRICADES

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

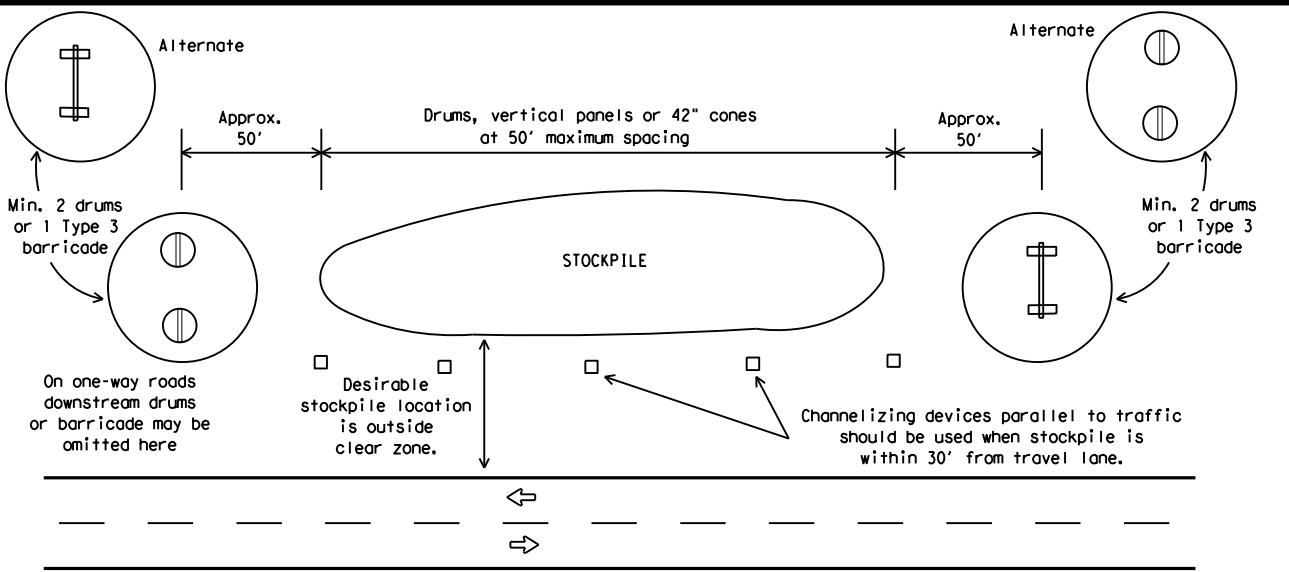
Barricades shall NOT be used as a sign support.



TYPICAL STRIPING DETAIL FOR BARRICADE RAIL

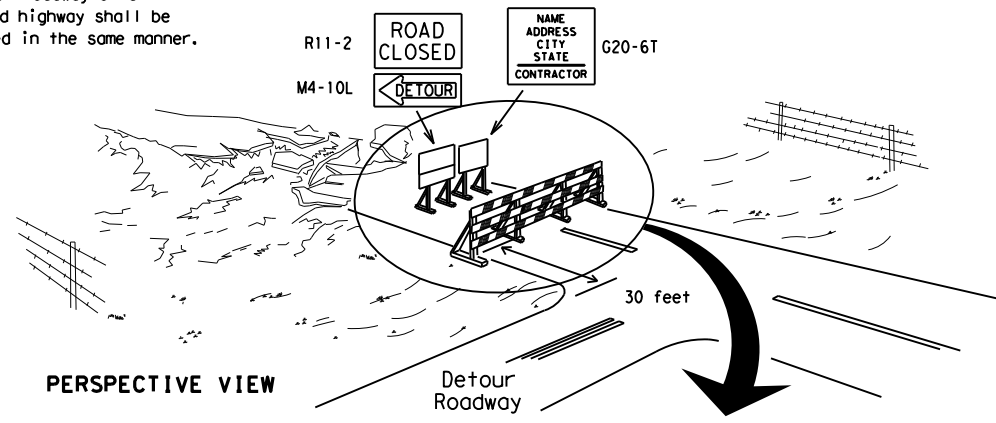


TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES



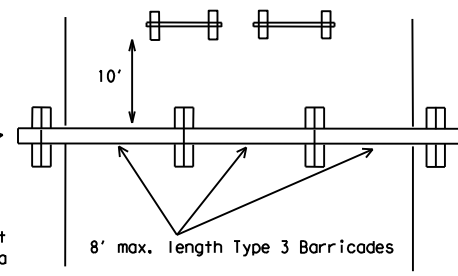
TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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



PERSPECTIVE VIEW

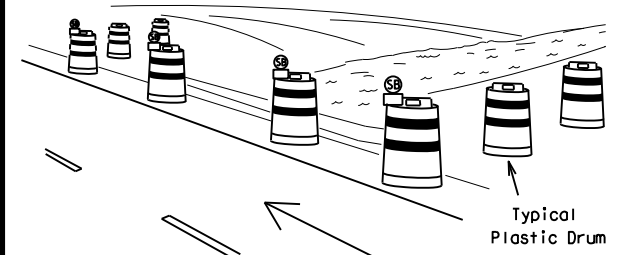
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



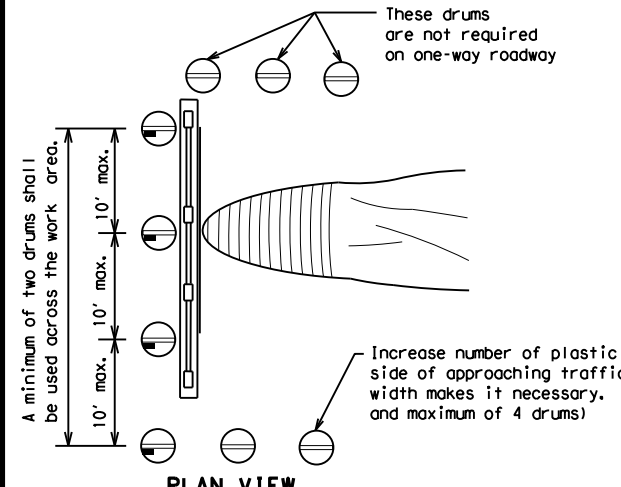
PLAN VIEW

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

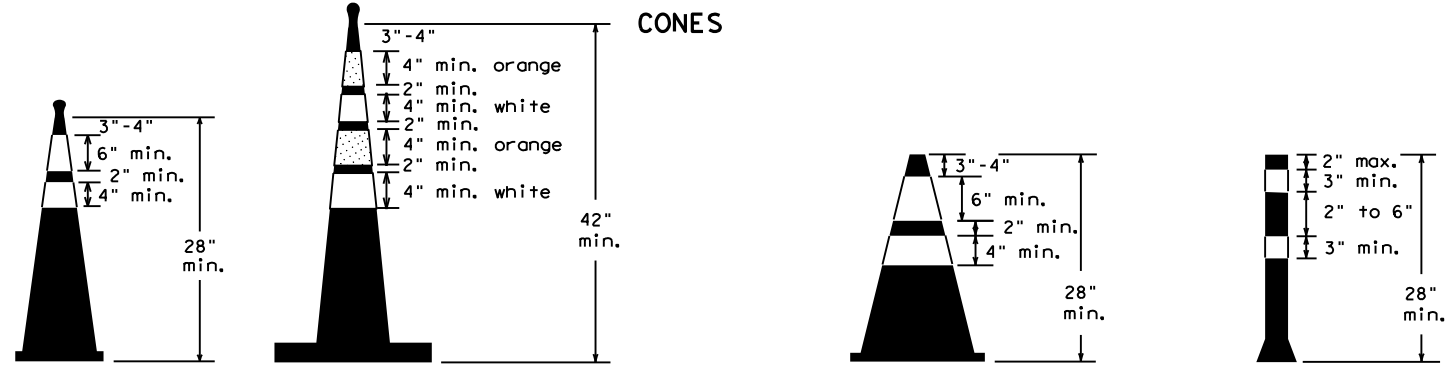


PLAN VIEW

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS

1. Where positive redirection 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
	Steady burn warning light or yellow warning reflector



Two-Piece cones

One-Piece cones

Tubular Marker

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

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



BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

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WORK ZONE PAVEMENT MARKINGS

GENERAL

- 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.
- Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Additional supplemental pavement marking details may be found in the plans or specifications.
- Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
- 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).
- 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.
- All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

- Raised pavement markers are to be placed according to the patterns on BC(12).
- 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

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

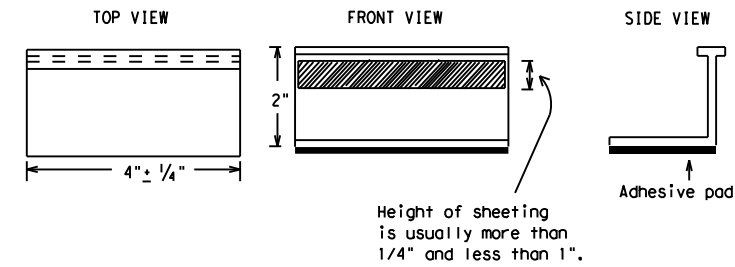
MAINTAINING WORK ZONE PAVEMENT MARKINGS

- The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
- 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.
- 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.
- 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

- 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.
- 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.
- 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".
- The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
- Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
- Blast cleaning may be used but will not be required unless specifically shown in the plans.
- Over-painting of the markings SHALL NOT BE permitted.
- Removal of raised pavement markers shall be as directed by the Engineer.
- 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.
- 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**

- Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
- 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.
 - 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.
 - 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.
- Small design variances may be noted between tab manufacturers.
- 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

- Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
- All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
- 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).

SHEET 11 OF 12



BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	00	299	VA
2-98 9-07 5-21	DIST	COUNTY	SHEET NO.	
1-02 7-13	FTW	TARRANT	33	
11-02 8-14				

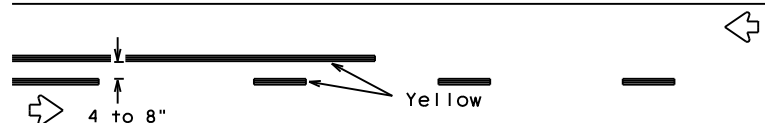
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PAVEMENT MARKING PATTERNS

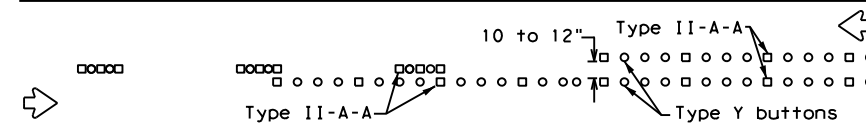


REFLECTORIZED PAVEMENT MARKINGS - PATTERN A

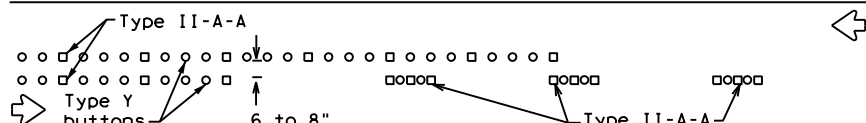


REFLECTORIZED PAVEMENT MARKINGS - PATTERN B

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.

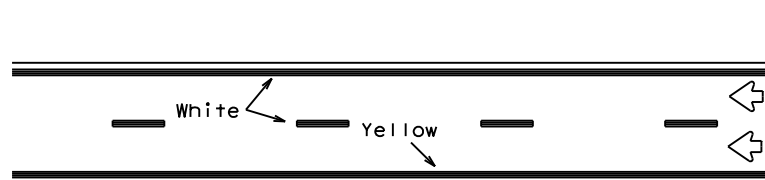


RAISED PAVEMENT MARKERS - PATTERN A



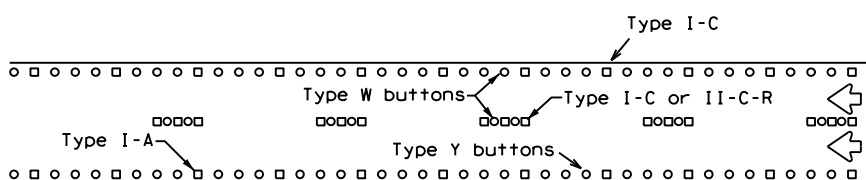
RAISED PAVEMENT MARKERS - PATTERN B

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



REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



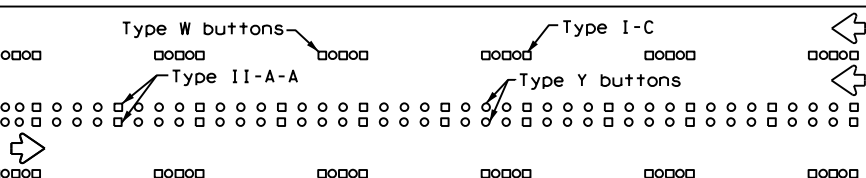
RAISED PAVEMENT MARKERS

EDGE & LANE LINES FOR DIVIDED HIGHWAY



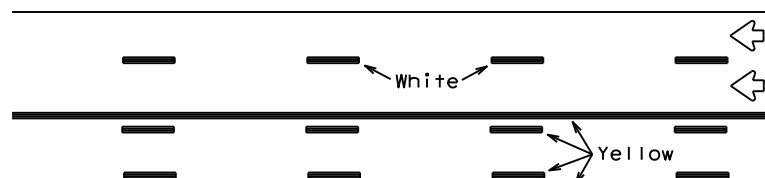
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



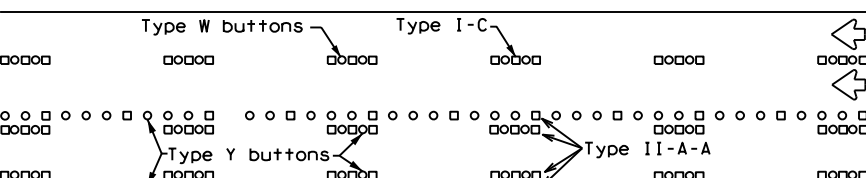
RAISED PAVEMENT MARKERS

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

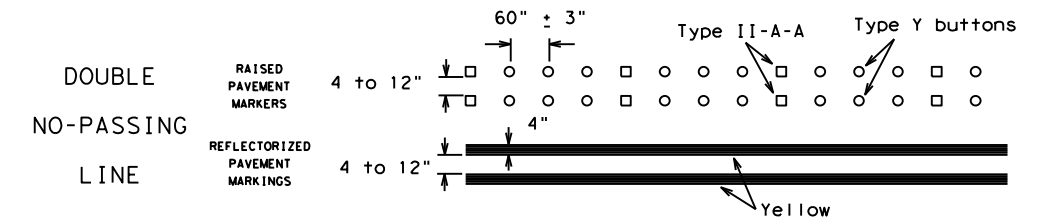
Prefabricated markings may be substituted for reflectORIZED pavement markings.



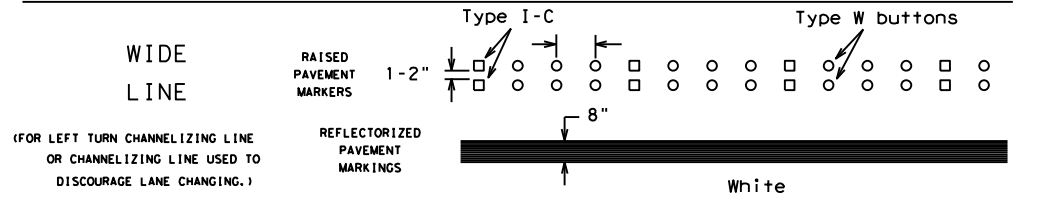
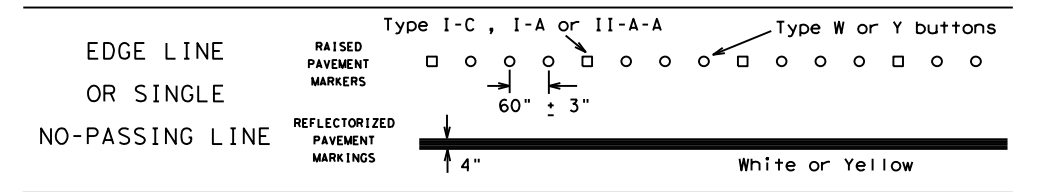
RAISED PAVEMENT MARKERS

TWO-WAY LEFT TURN LANE

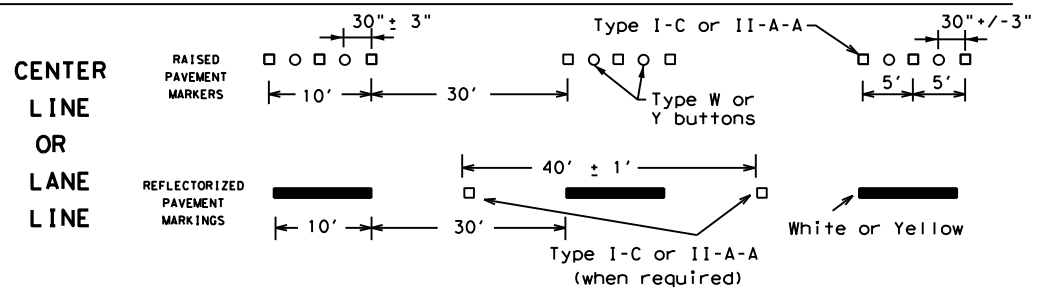
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



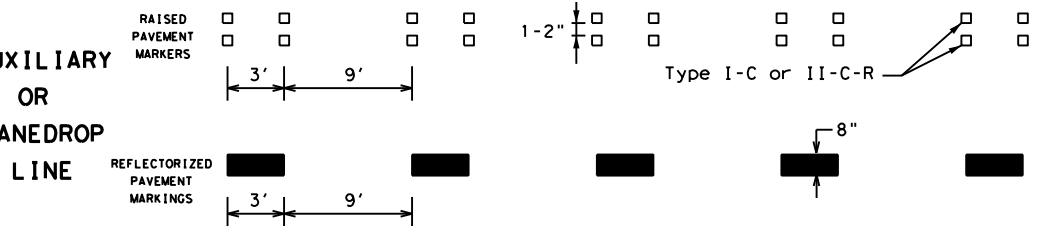
SOLID LINES



BROKEN LINES

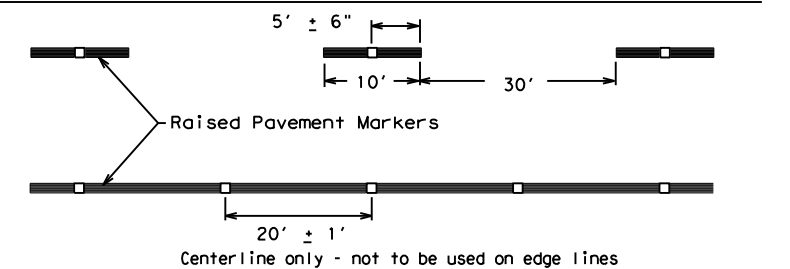


AUXILIARY OR LANEDROP LINE



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.



SHEET 12 OF 12



BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

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."

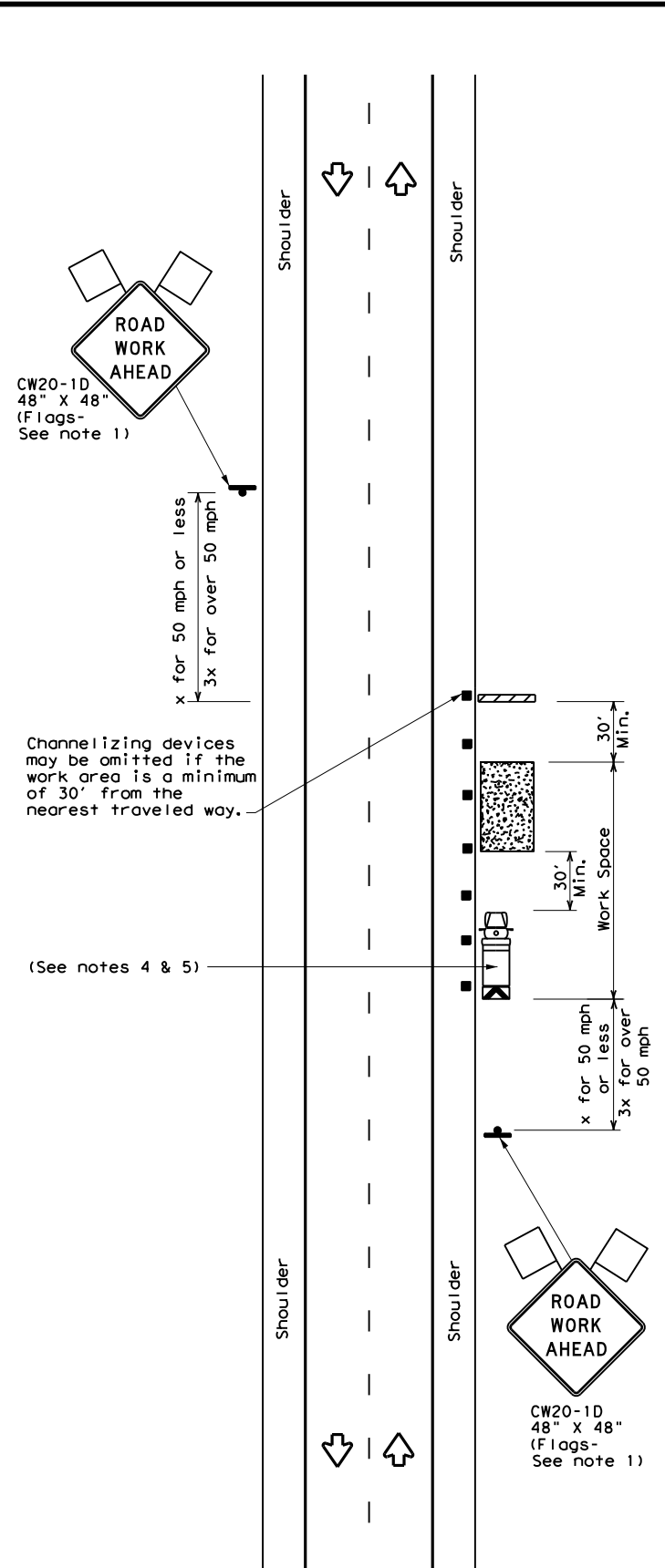
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©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	00	299	VA
1-97 9-07 5-21	DIST	COUNTY	SHEET NO.	
2-98 7-13	FTW	TARRANT	34	
11-02 8-14				

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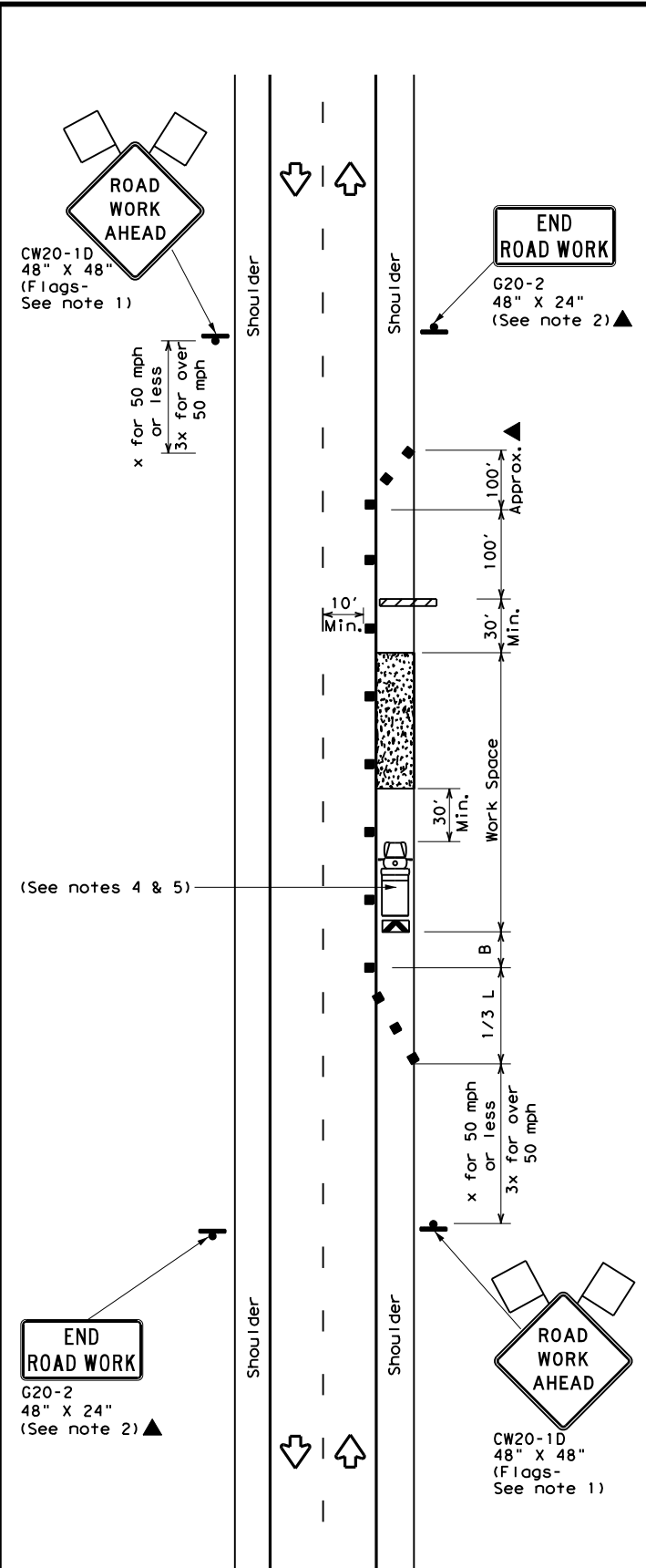
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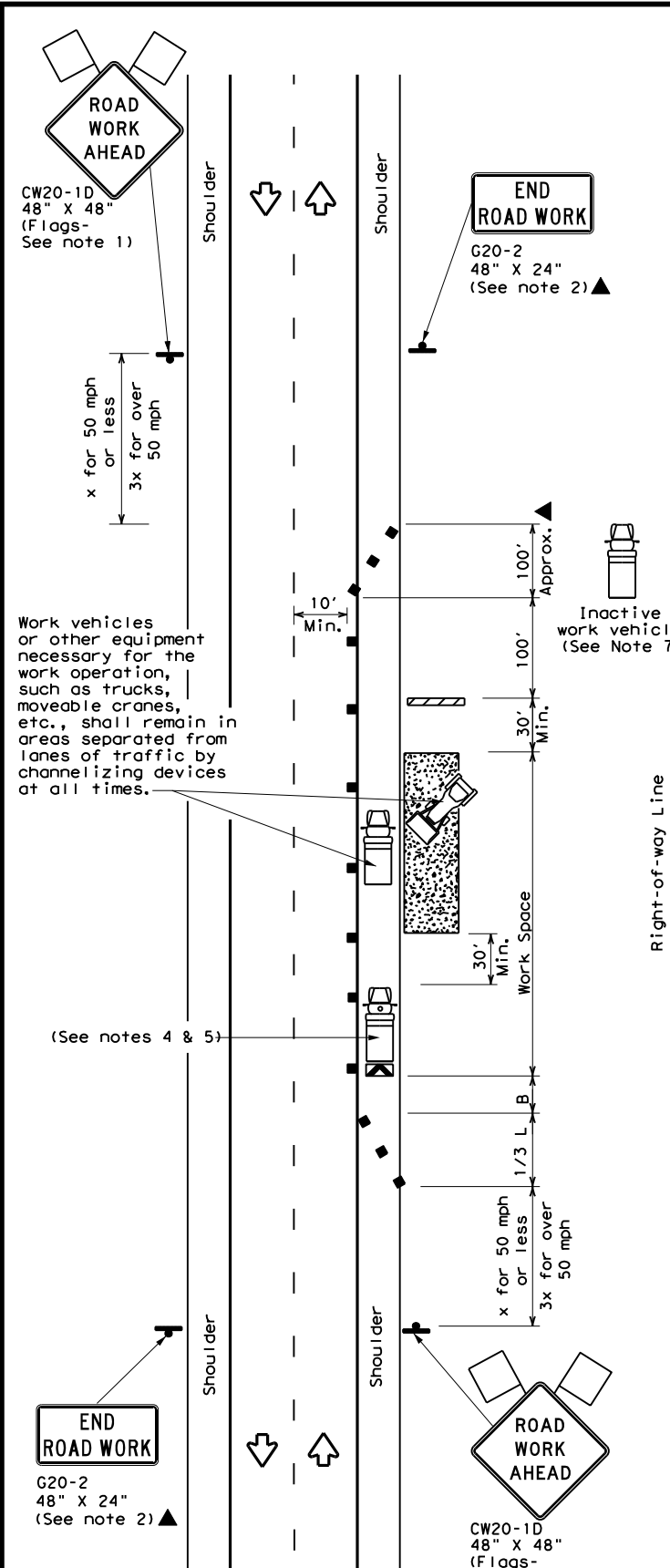
TCP (2-1a)

WORK SPACE NEAR SHOULDER
 Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
 Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
 Conventional Roads

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

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

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

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

GENERAL NOTES

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



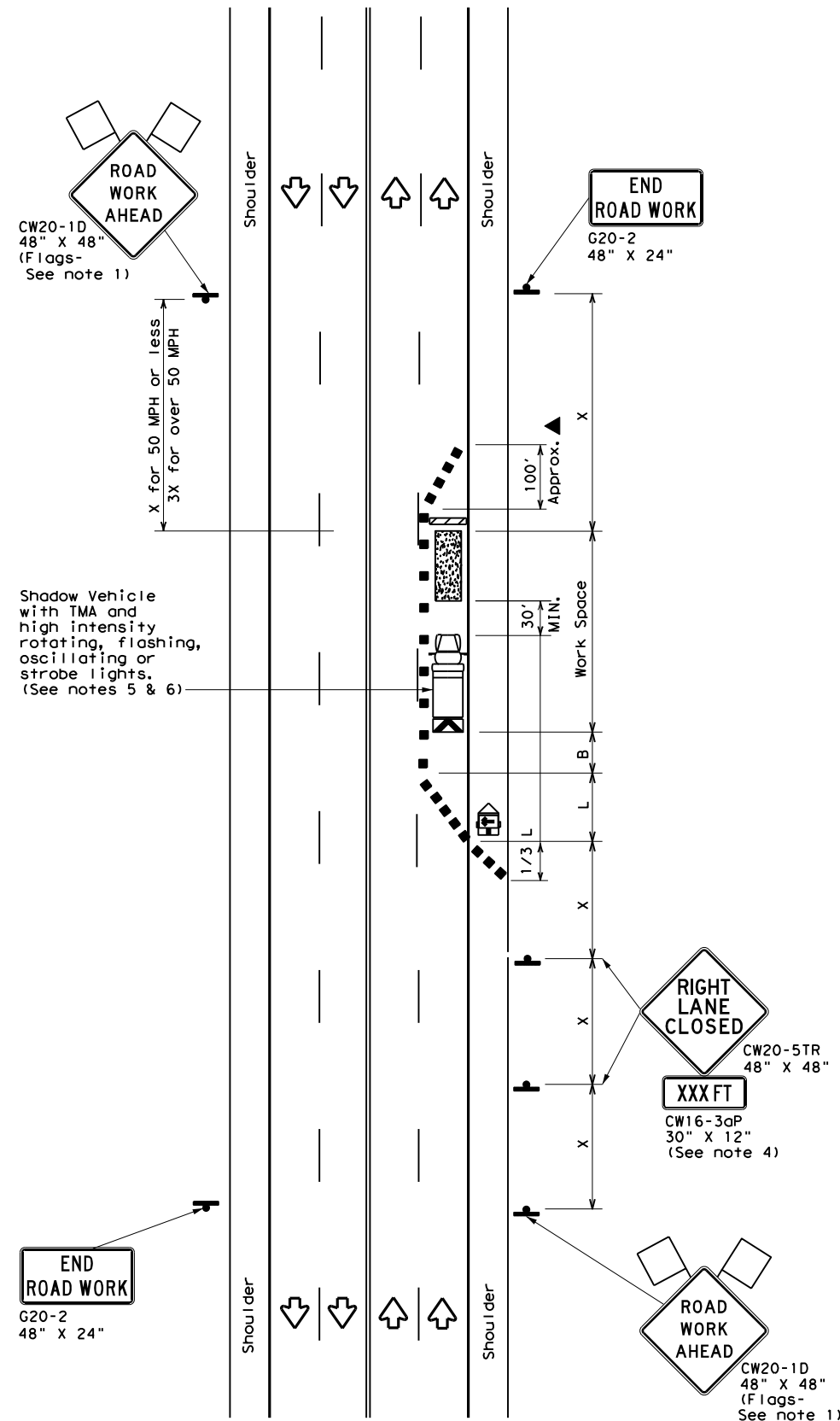
TRAFFIC CONTROL PLAN
CONVENTIONAL ROAD
SHOULDER WORK

TCP (2-1) - 18

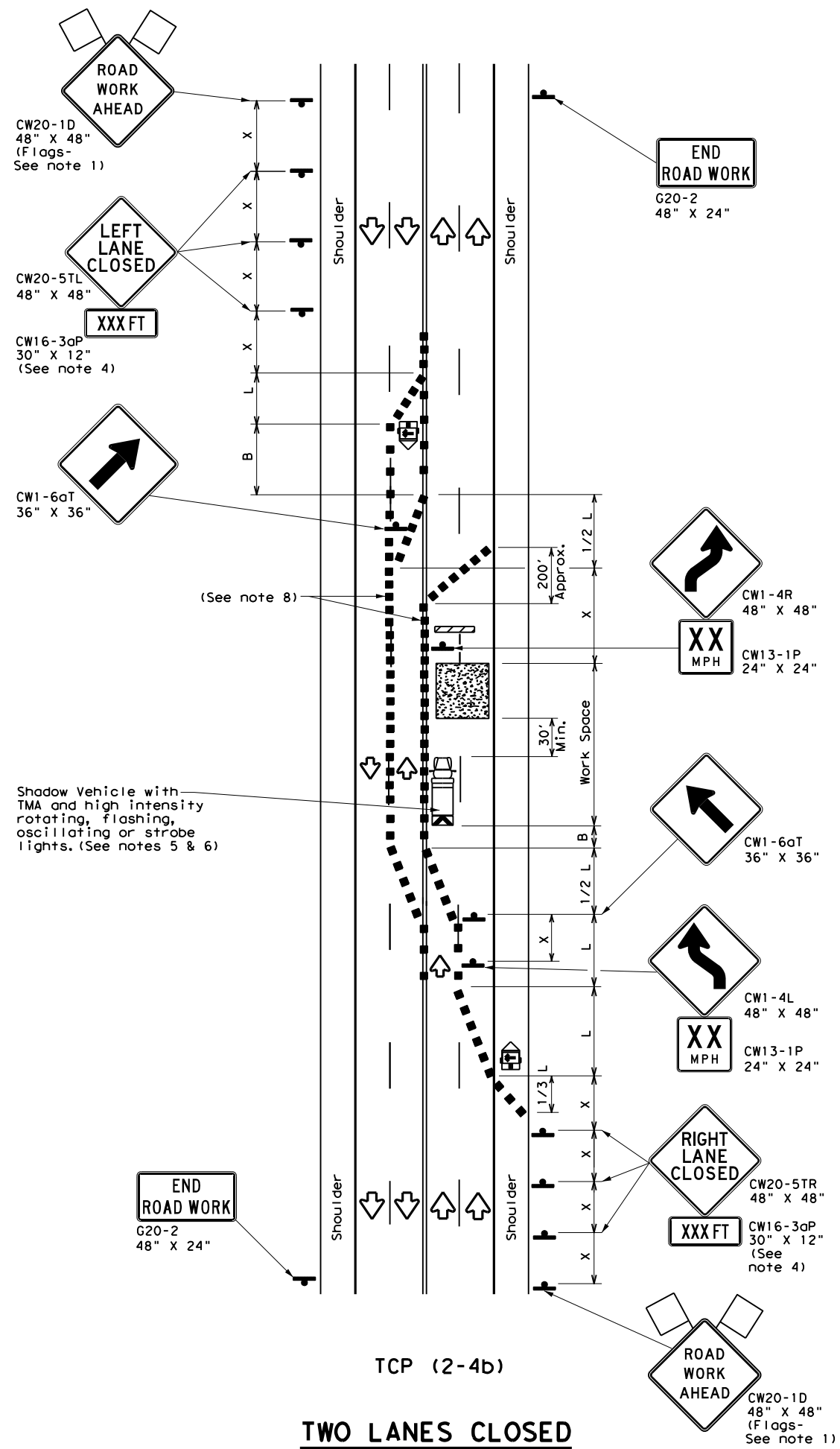
FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	00	299	VA
2-94 4-98	DIST	COUNTY	SHEET NO.	
8-95 2-12	FTW	TARRANT	35	
1-97 2-18				

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TCP (2-4a)
ONE LANE CLOSED



TCP (2-4b)
TWO LANES CLOSED

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

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

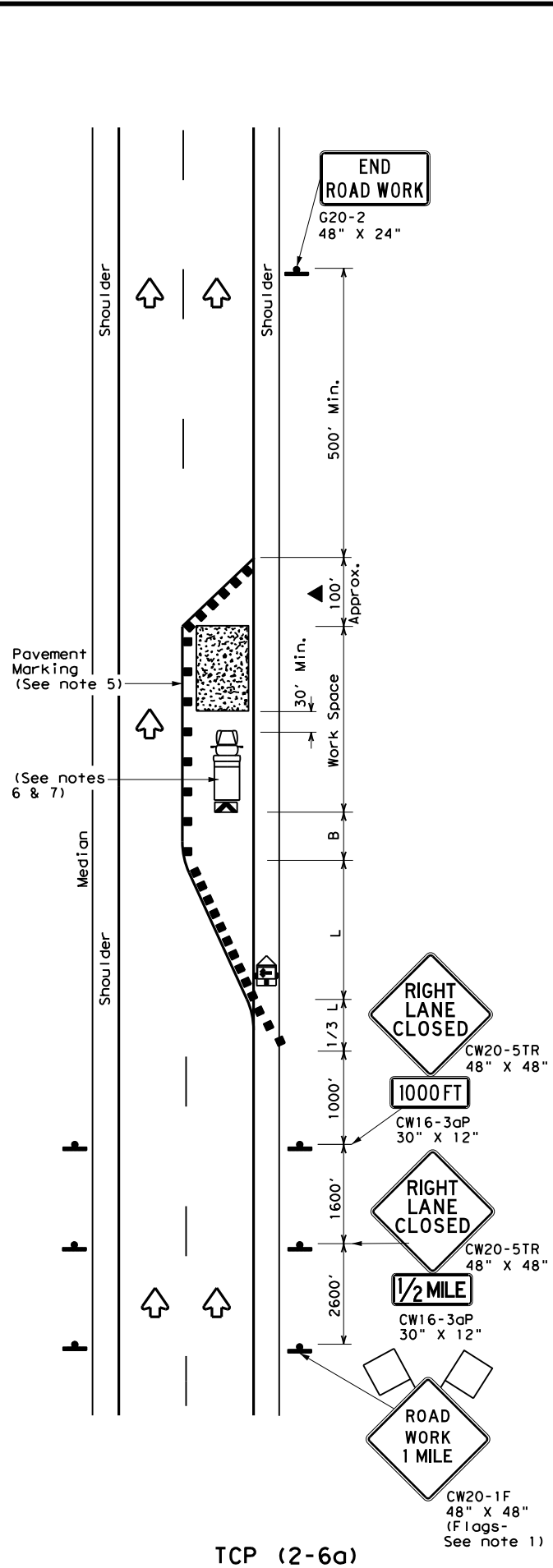
* Conventional Roads Only
 ** Taper lengths have been rounded off.
 L=Length of Taper (FT) W=Width of Offset (FT) S=Posted Speed (MPH)

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

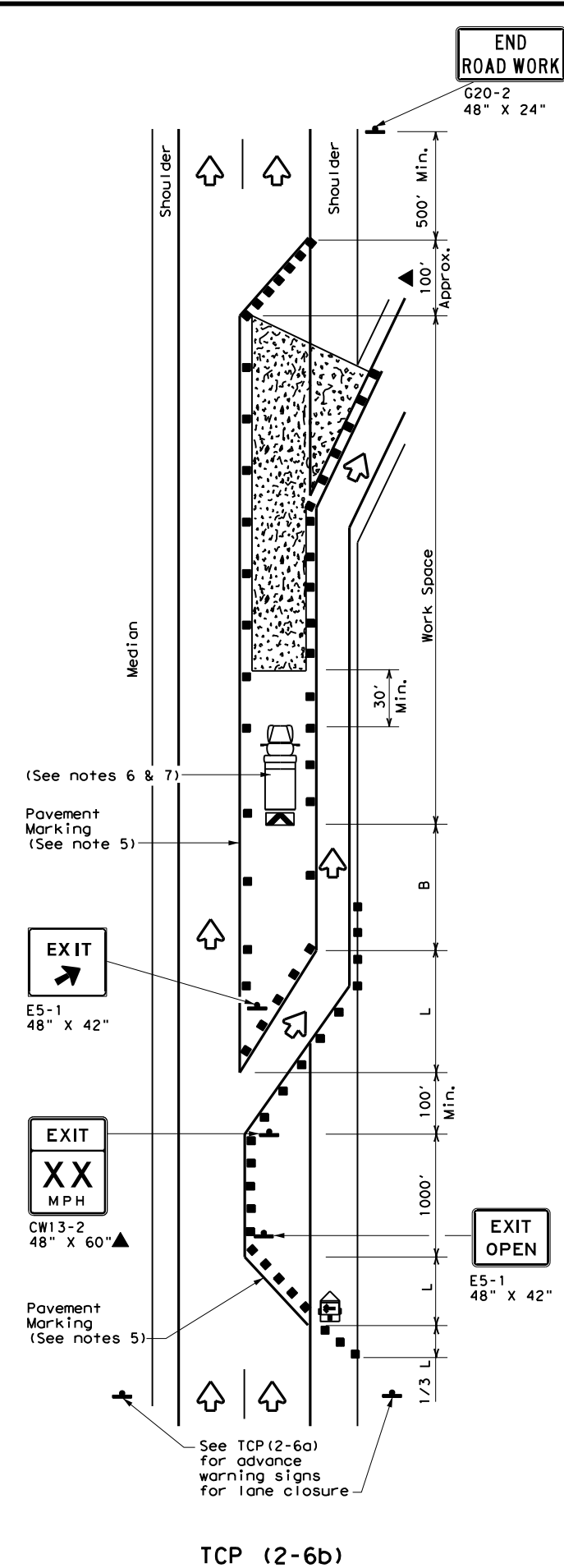
- GENERAL NOTES**
- Flags attached to signs where shown, are REQUIRED.
 - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
 - The downstream taper is optional. When used, it should be 100 feet minimum length per lane.
 - For short term applications, when post mounted signs are not used, the distance legend may be shown on the sign face rather than on a CW16-3aP supplemental plaque.
 - A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
 - Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.
- TCP (2-4a)**
- If this TCP is used for a left lane closure, CW20-5TL "LEFT LANE CLOSED" signs shall be used and channelizing devices shall be placed on the centerline to protect the work space from opposing traffic with the arrow board placed in the closed lane near the end of the merging taper.
- TCP (2-4b)**
- For shorter durations where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2(S) where S is the speed in mph. This tighter devices spacing is intended for the area of conflicting markings, not the entire work zone.

		Traffic Operations Division Standard	
TRAFFIC CONTROL PLAN			
LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS			
TCP (2-4) - 18			
FILE:	tcp2-4-18.dgn	DN:	CK:
© TxDOT	December 1985	CONT	SECT
REVISIONS		0902	00
8-95	3-03	JOB	299
1-97	2-12	COUNTY	VA
4-98	2-18	FTW	TARRANT
			SHEET NO. 36

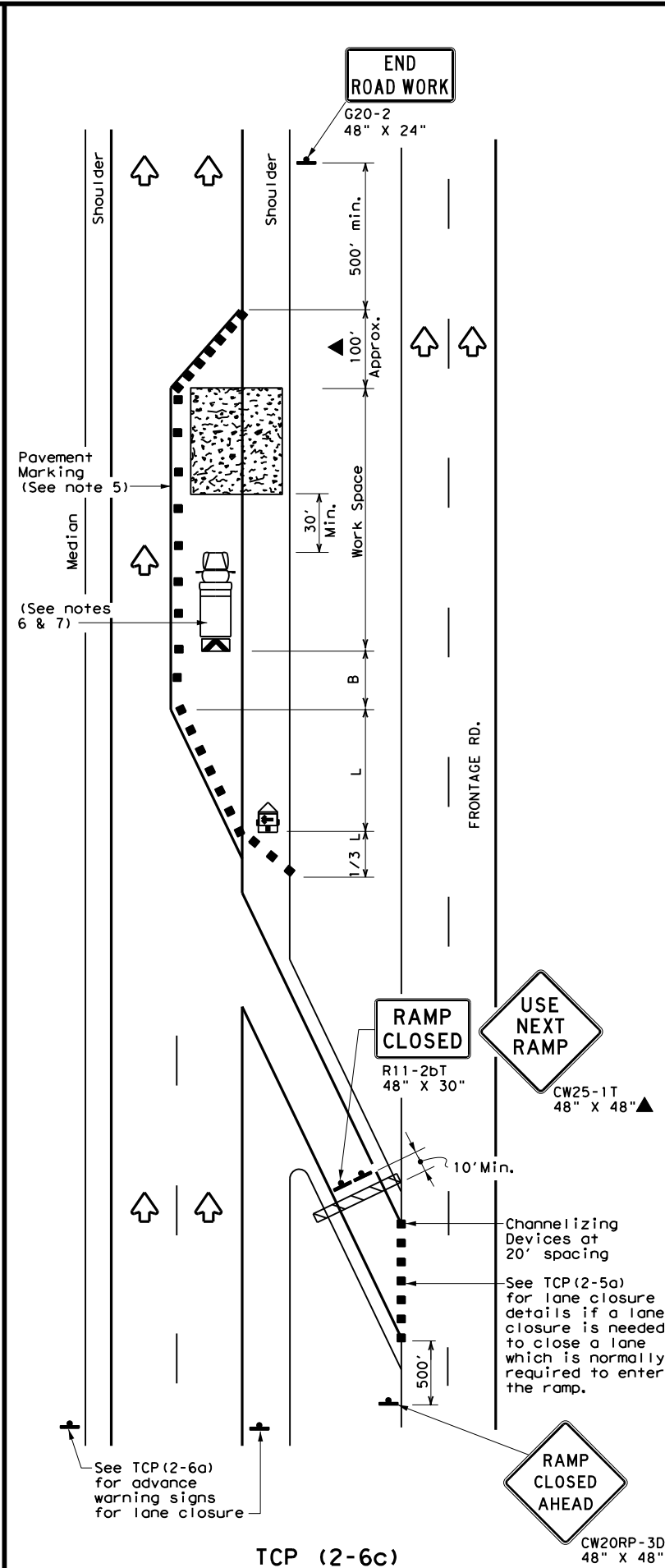
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TCP (2-6a)
ONE LANE CLOSURE



TCP (2-6b)
LANE CLOSURE NEAR EXIT RAMP



TCP (2-6c)
LANE CLOSURE NEAR ENTRANCE RAMP

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

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

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

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

- GENERAL NOTES**
- Flags attached to signs where shown, are REQUIRED.
 - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
 - Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
 - Channelizing devices used along the work space or along tangent sections may be supplemented with vertical panels (VP) placed on every other channelizing device. If night time conditions make it difficult to see at least two VPs, the VPs may be placed on each channelizing device.
 - The placement of pavement markings may be omitted on intermediate-term stationary work zones with the approval of the Engineer.
 - Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
 - Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

Texas Department of Transportation
 Traffic Operations Division Standard

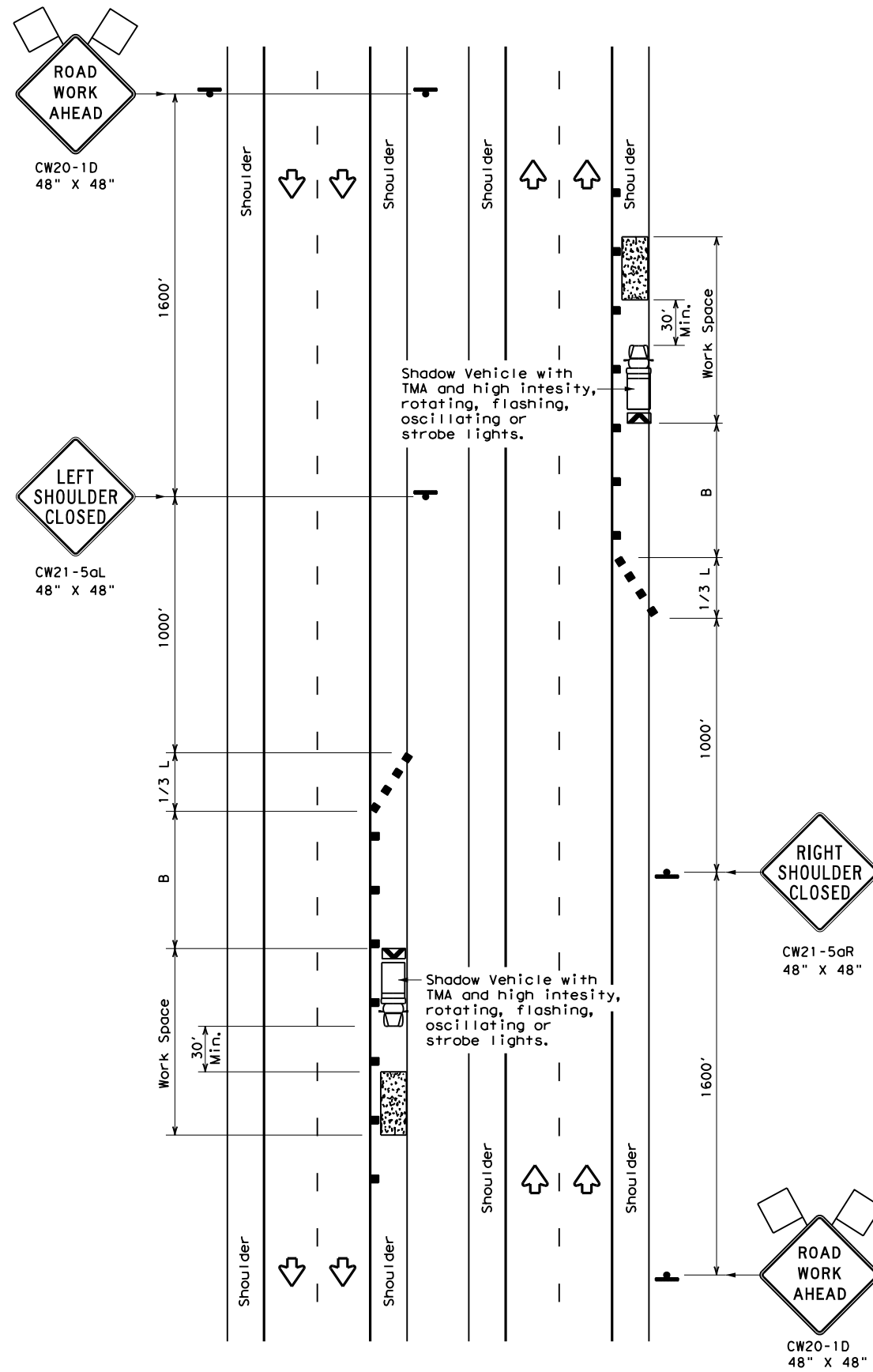
TRAFFIC CONTROL PLAN LANE CLOSURES ON DIVIDED HIGHWAYS

TCP (2-6) - 18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	00	299	VA
2-94 4-98	DIST	COUNTY	SHEET NO.	
8-95 2-12	FTW	TARRANT	37	
1-97 2-18				

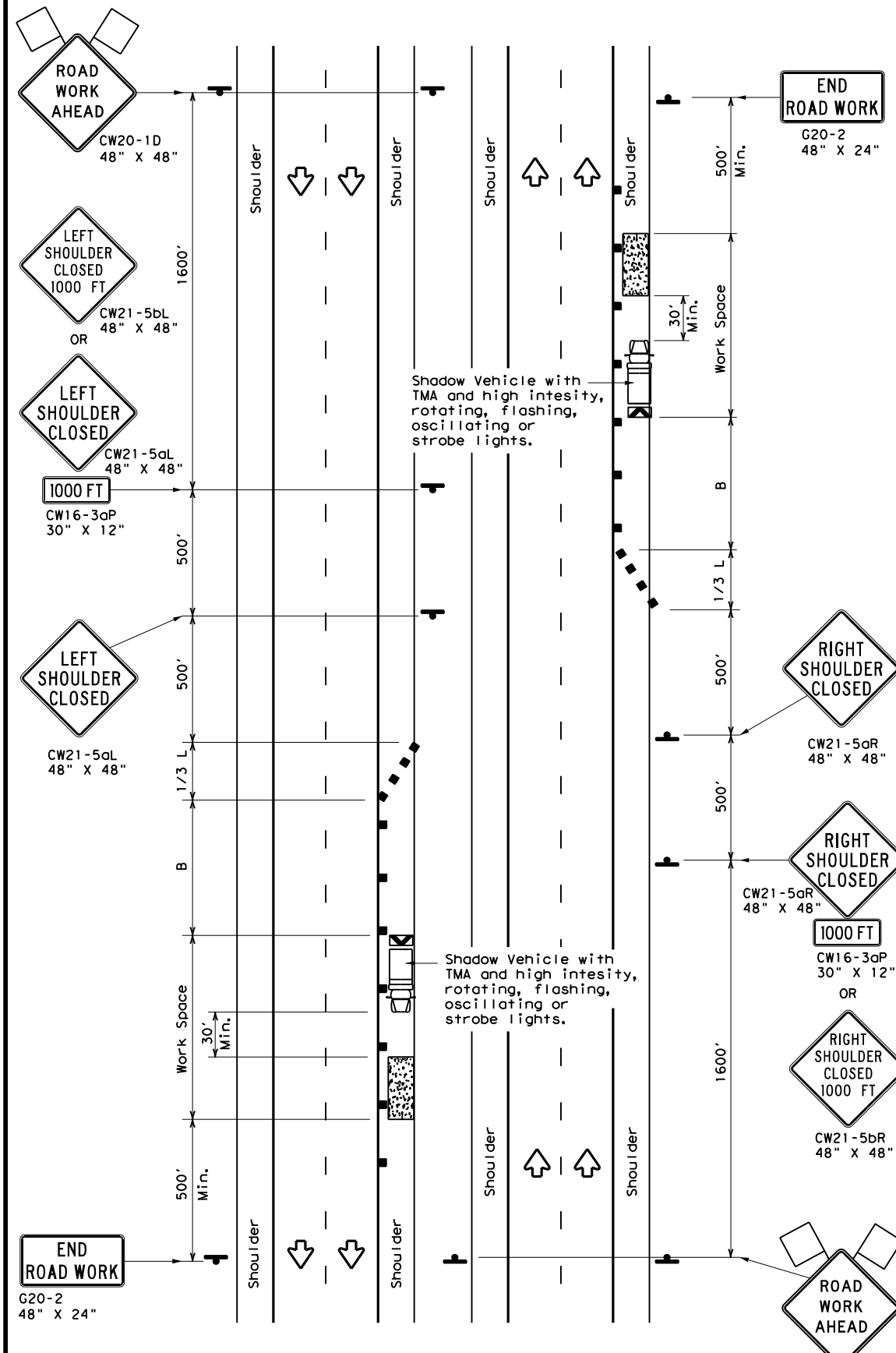
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TCP (5-1a)

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		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 = 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 affecting 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.

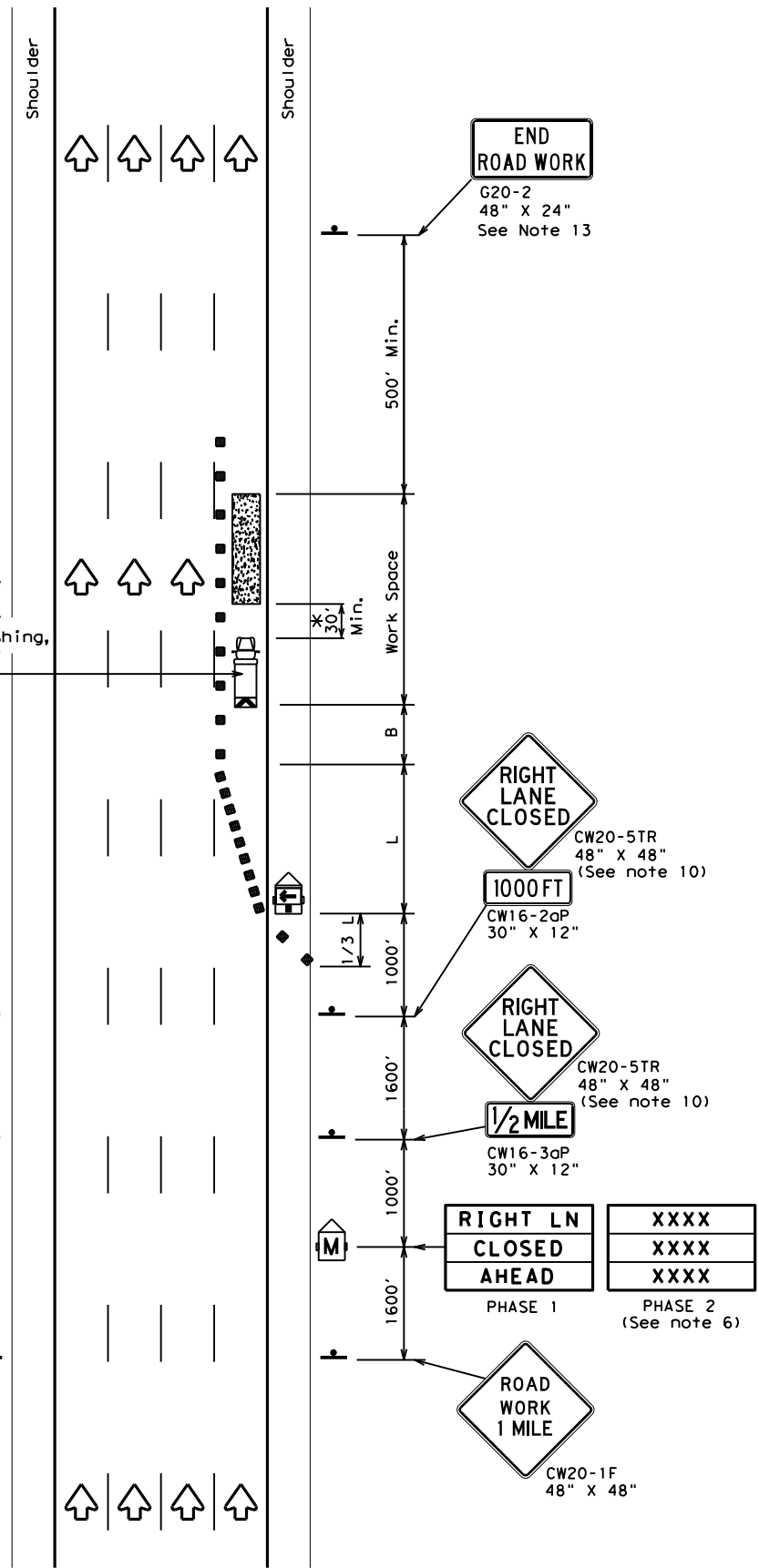


**TRAFFIC CONTROL PLAN
 SHOULDER WORK FOR
 FREEWAYS / EXPRESSWAYS**

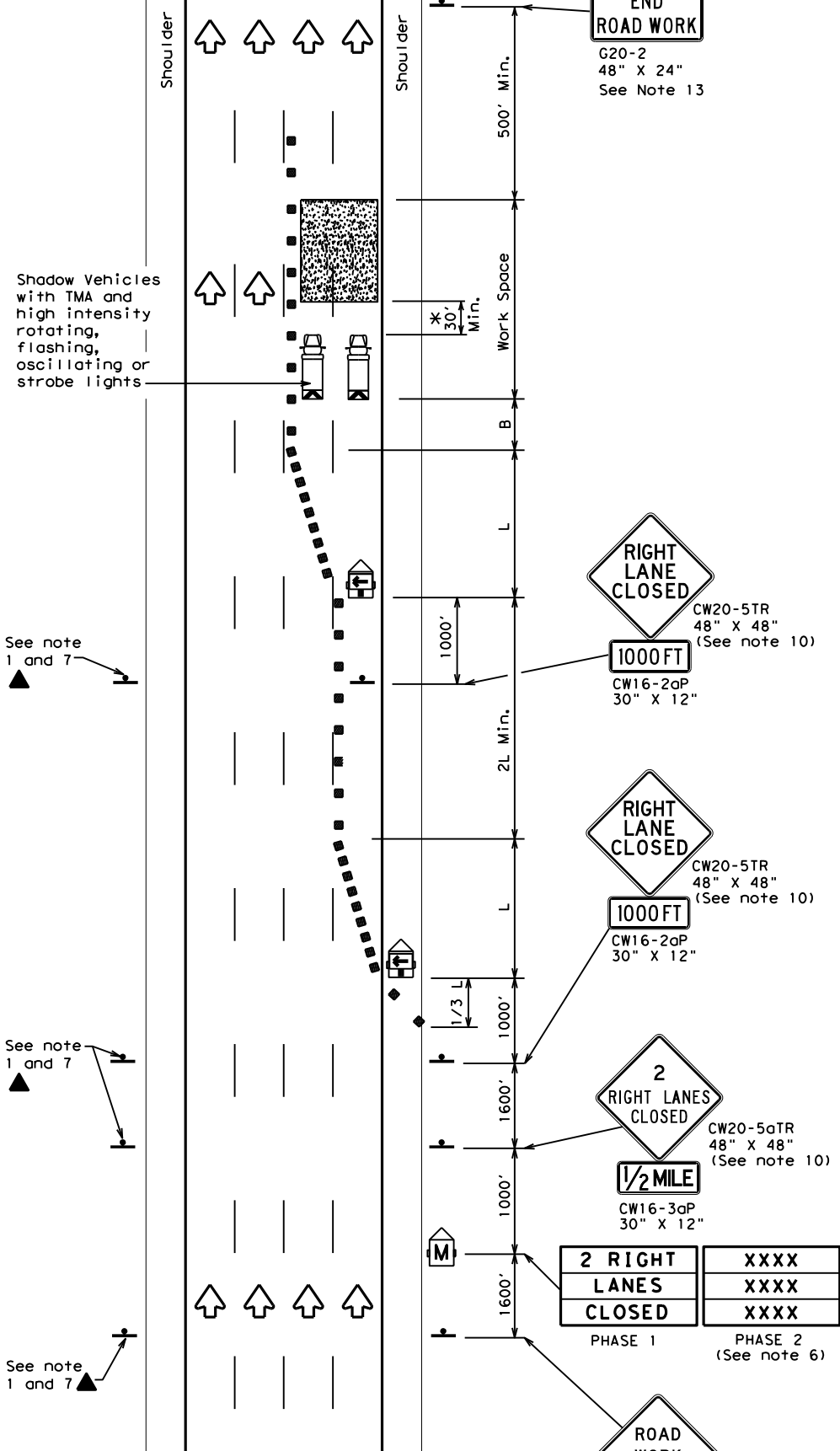
TCP (5-1) - 18

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© TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	00	299	VA
2-18	DIST	COUNTY	SHEET NO.	
	FTW	TARRANT	38	

DATE: 4/9/2024 2:31:12 PM
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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		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

- All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
- 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.
- All construction signs and barricades placed during any phase of work shall remain in place until removal is approved by the Engineer.
- The Engineer may direct the Contractor to furnish additional signs and barricades as required to maintain traffic flow, detours and motorist safety during construction.
- 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.
- 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.
- Duplicate construction warning signs should be erected on the medians side of freeways where median width will permit and traffic volume justifies the signing.
- 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.
- Warning signs for intermediate term stationary work should be mounted at 7' to the bottom of the sign.
- 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.
- 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.
- 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.
- 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.



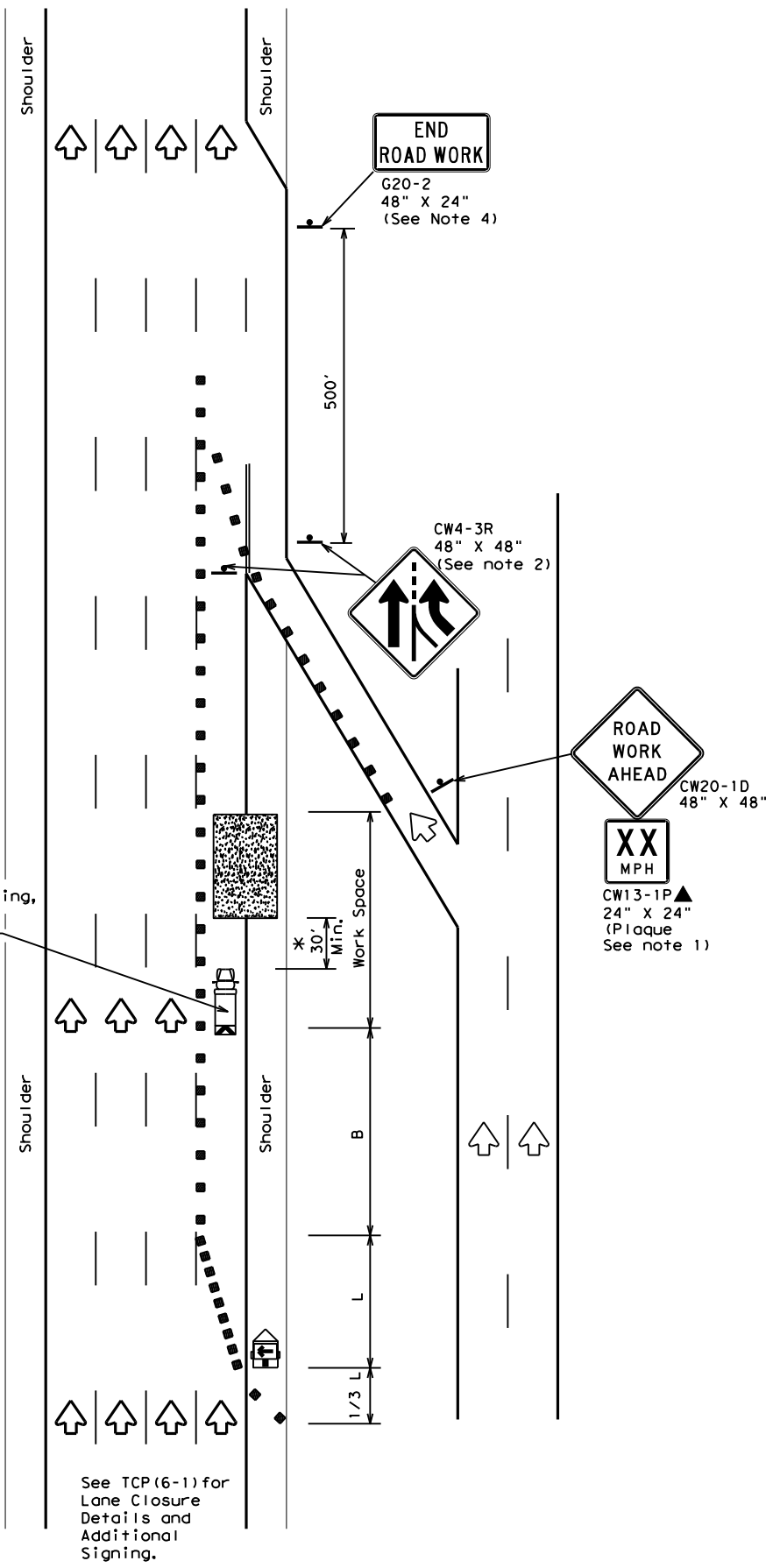
**TRAFFIC CONTROL PLAN
 FREEWAY LANE CLOSURES**

TCP (6-1) - 12

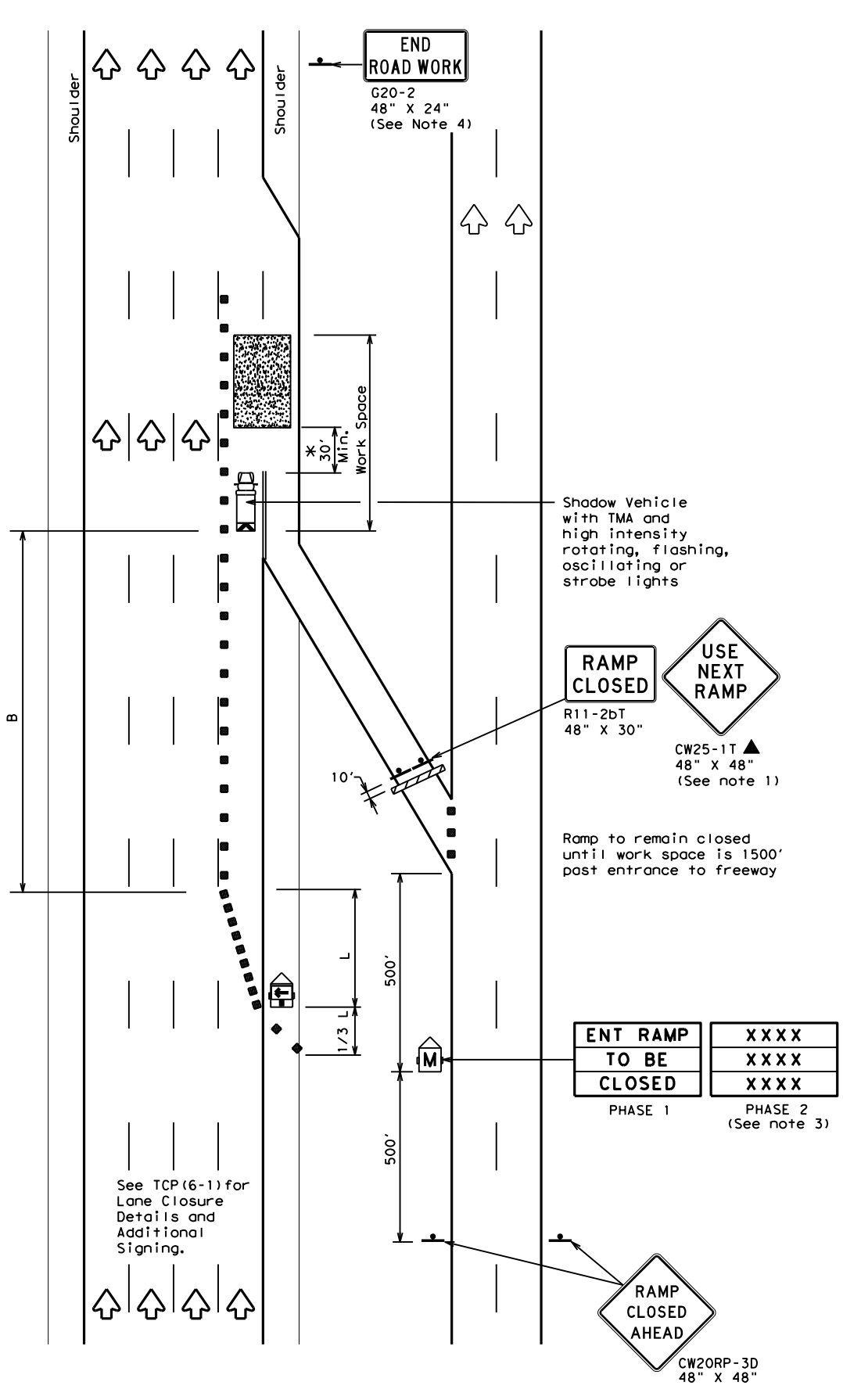
FILE:	tcp6-1.dgn	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CK:	TxDOT
© TxDOT	February 1998	CONT	SECT	JOB	HIGHWAY				
8-12	REVISIONS	0902	00	299	VA				
	DIST	COUNTY		SHEET NO.					
	FTW	TARRANT		39					

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 FILE: T:\TRAFFIC\ITS\0902-00-299 Non-Site Specific\Typical Traffic Control Plans\0902-00-299



TCP (6-2a)
ENTRANCE RAMP OPEN
WORK WITHIN 500' OF RAMP



TCP (6-2b)
ENTRANCE RAMP CLOSED

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		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

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

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



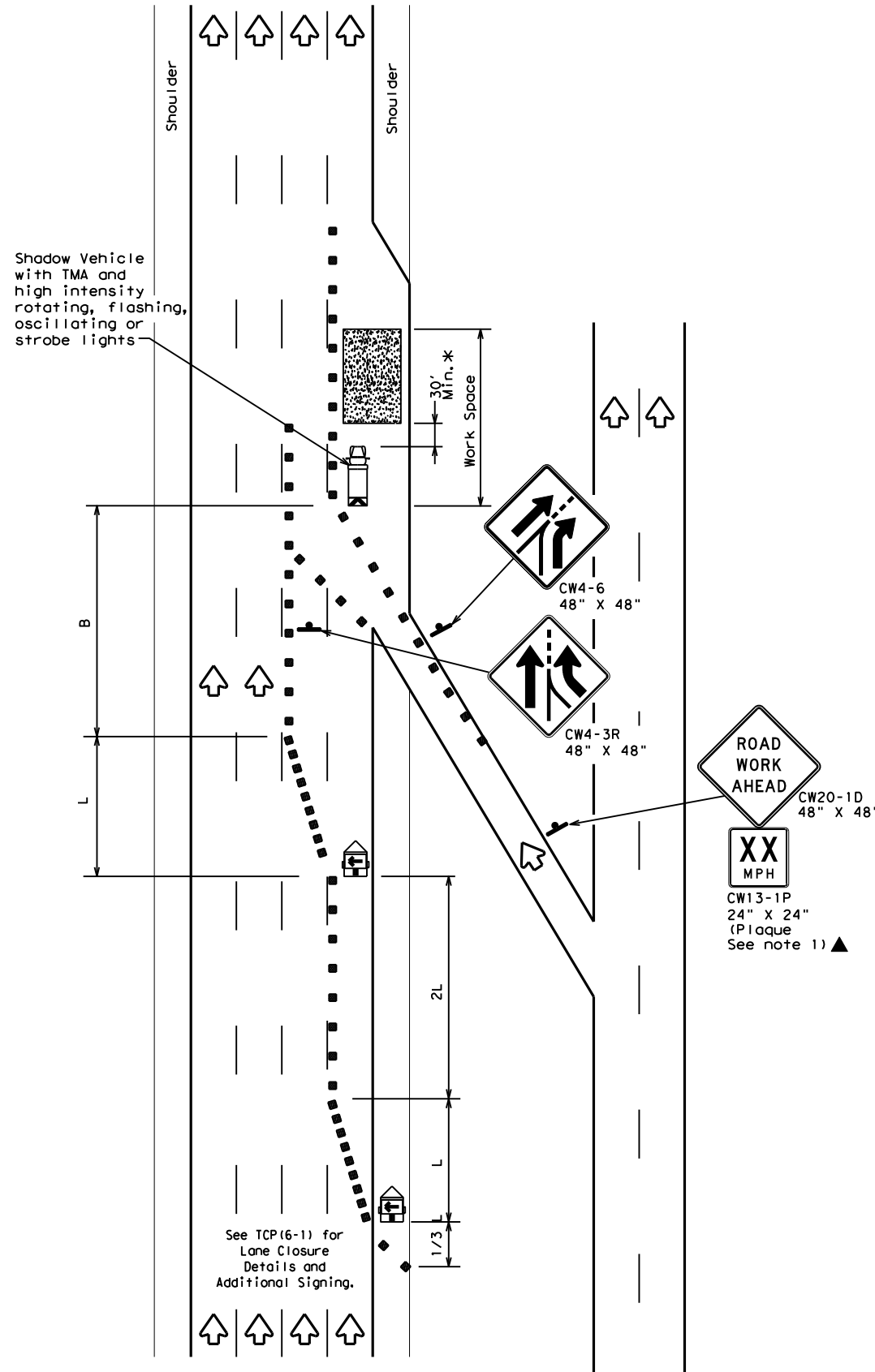
TRAFFIC CONTROL PLAN
WORK AREA NEAR RAMP

TCP (6-2) - 12

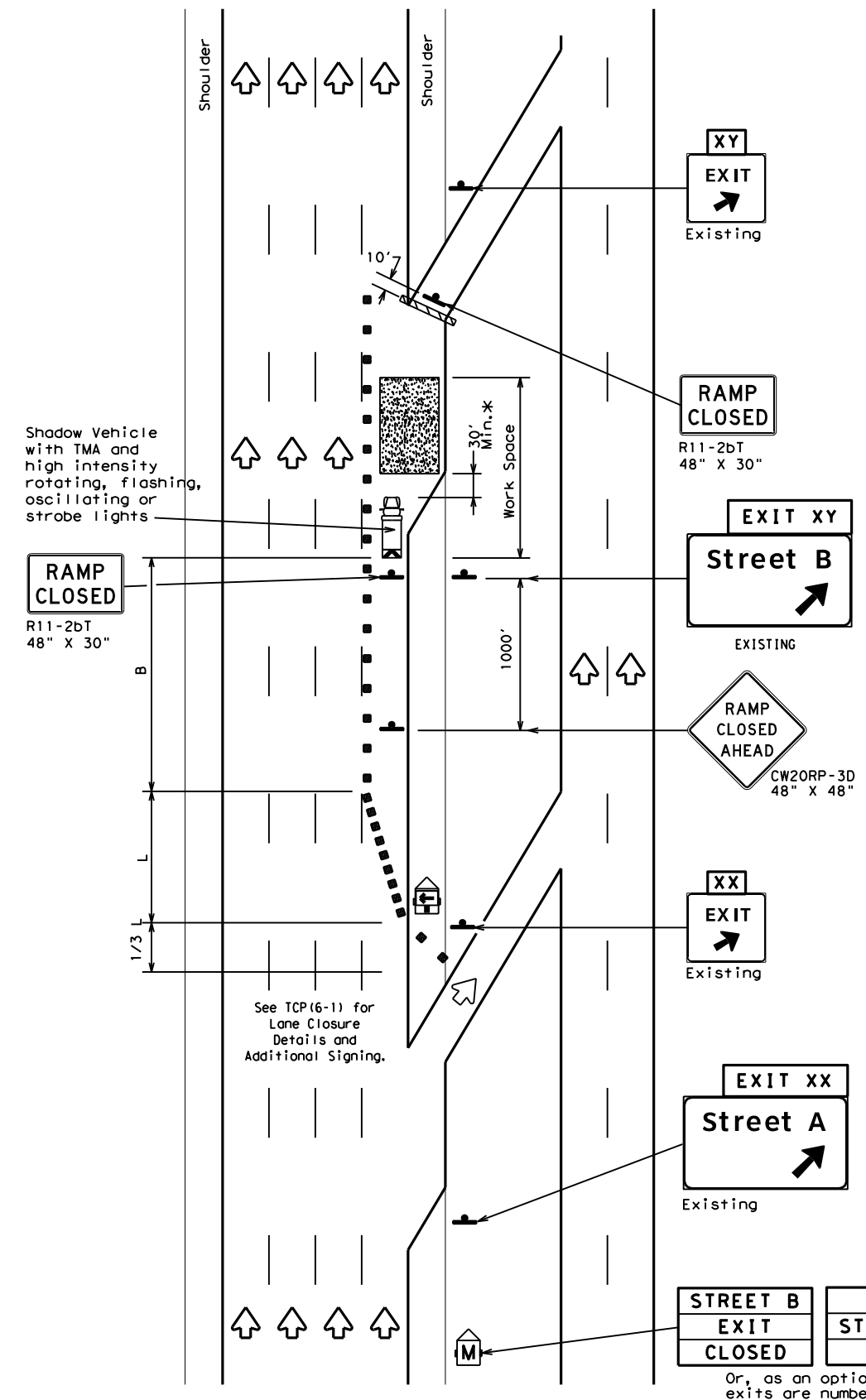
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©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902 00		299	VA
1-97 8-98	DIST	COUNTY	SHEET NO.	
4-98 8-12	FTW	TARRANT	40	

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TCP (6-3a)
ENTRANCE RAMP OPEN



TCP (6-3b)
EXIT RAMP CLOSED
TRAFFIC EXITS PRIOR TO CLOSED RAMP

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		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

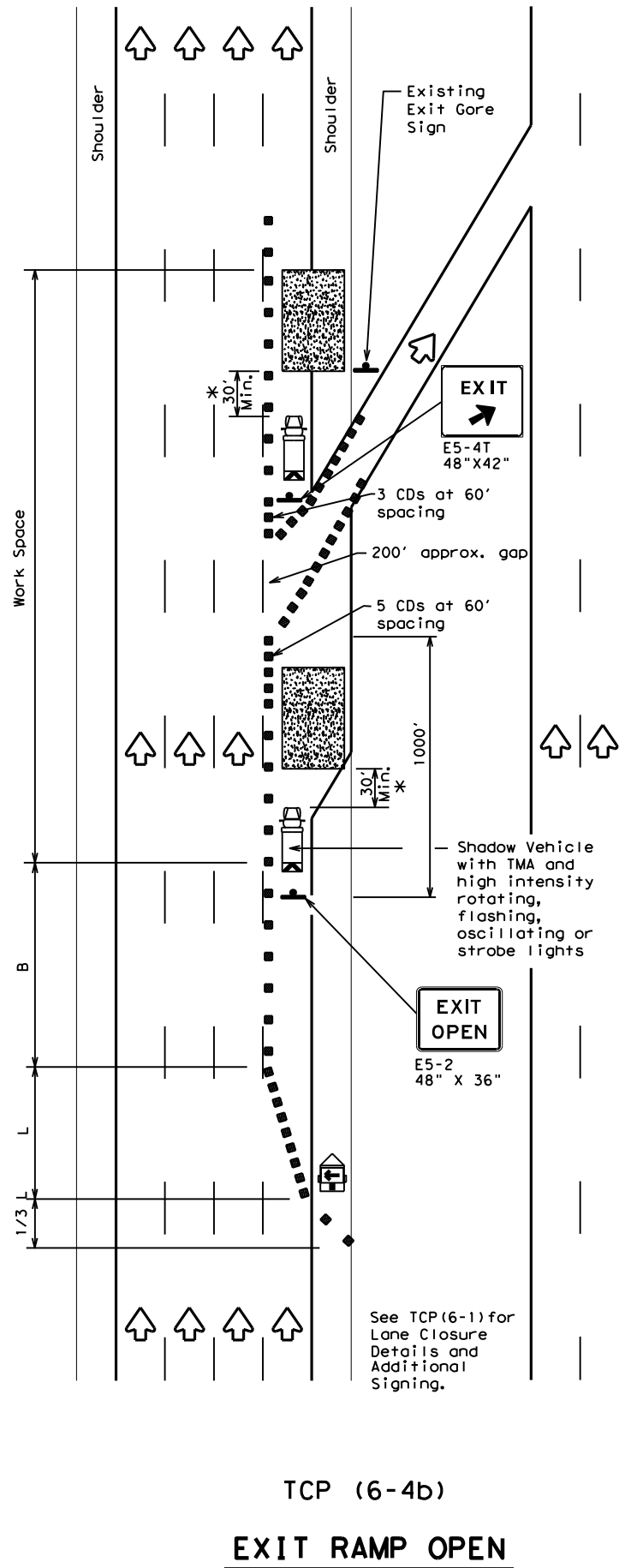
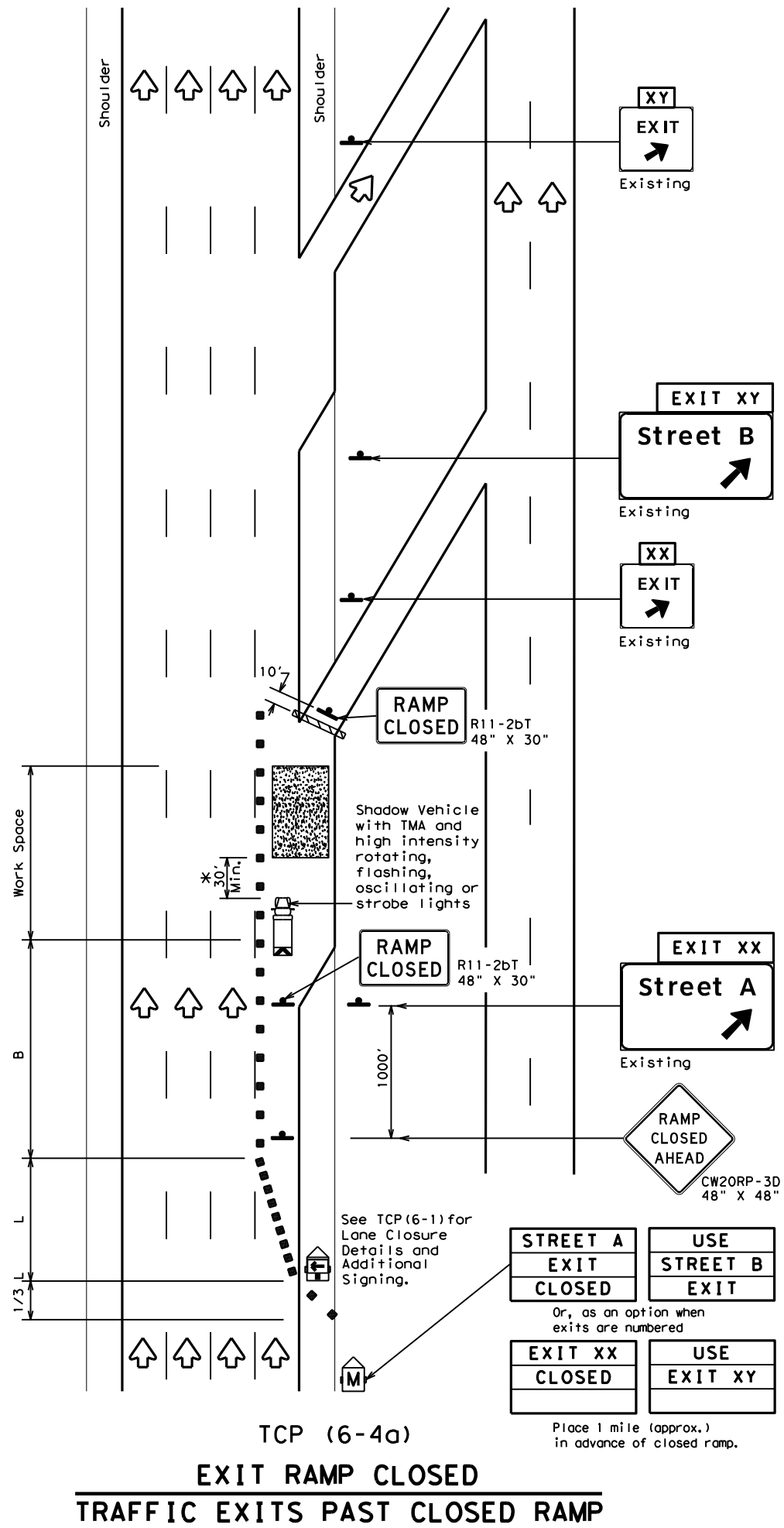
**TRAFFIC CONTROL PLAN
 WORK AREA BEYOND RAMP**

TCP (6-3) - 12

FILE: tcp6-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	00	299	VA
1-97 8-98	DIST	COUNTY	SHEET NO.	
4-98 8-12	FTW	TARRANT	41	

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FILE: I:\TRAFFIC\ITS\0902-00-299 Non-Site Specific\Typical Traffic Control



LEGEND			
	Type 3 Barricade		Channelizing Devices (CDs)
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		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**
- All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
 - 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

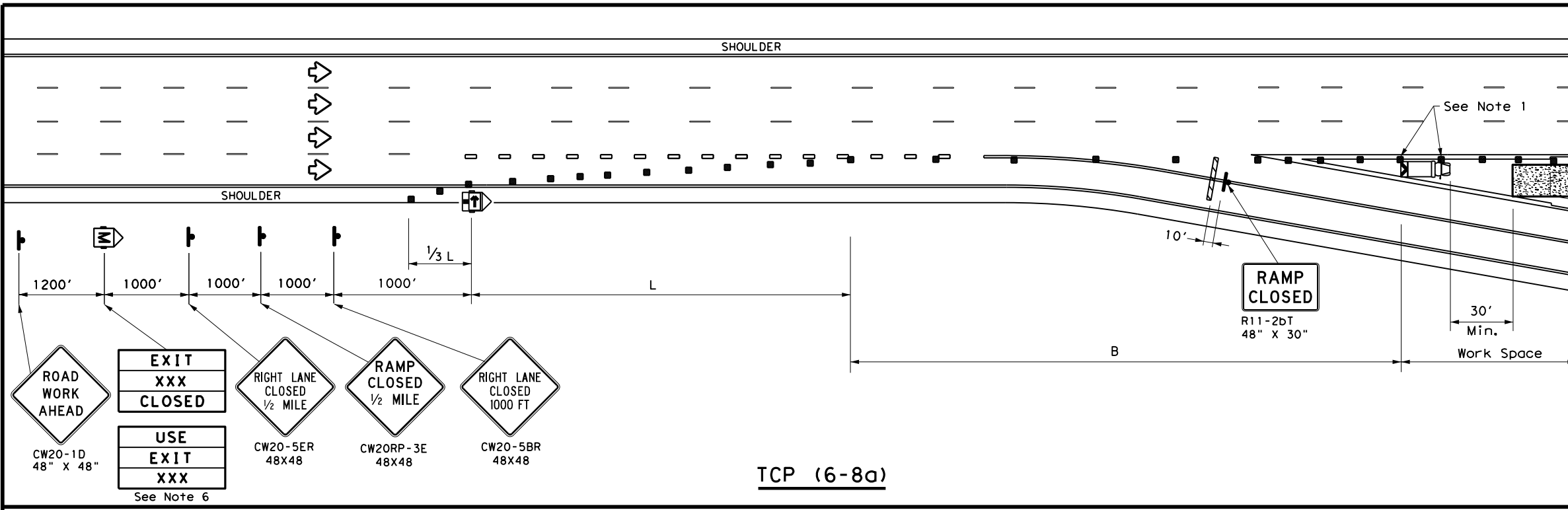
TRAFFIC CONTROL PLAN
WORK AREA AT EXIT RAMP

TCP (6-4) - 12

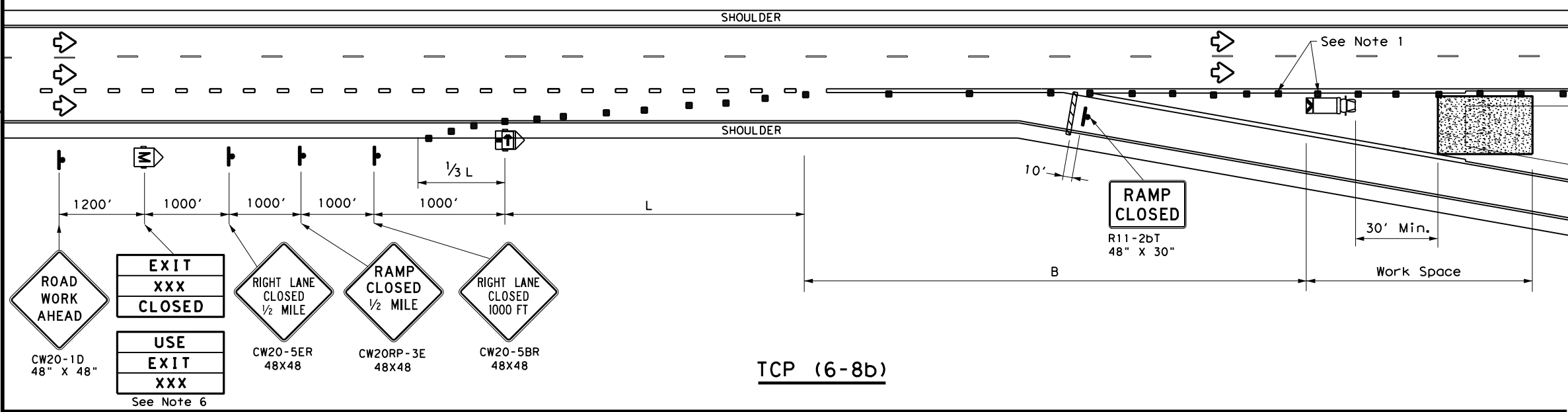
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© TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	00	299	VA
1-97 8-98	DIST	COUNTY	SHEET NO.	
4-98 8-12	FTW	TARRANT	42	

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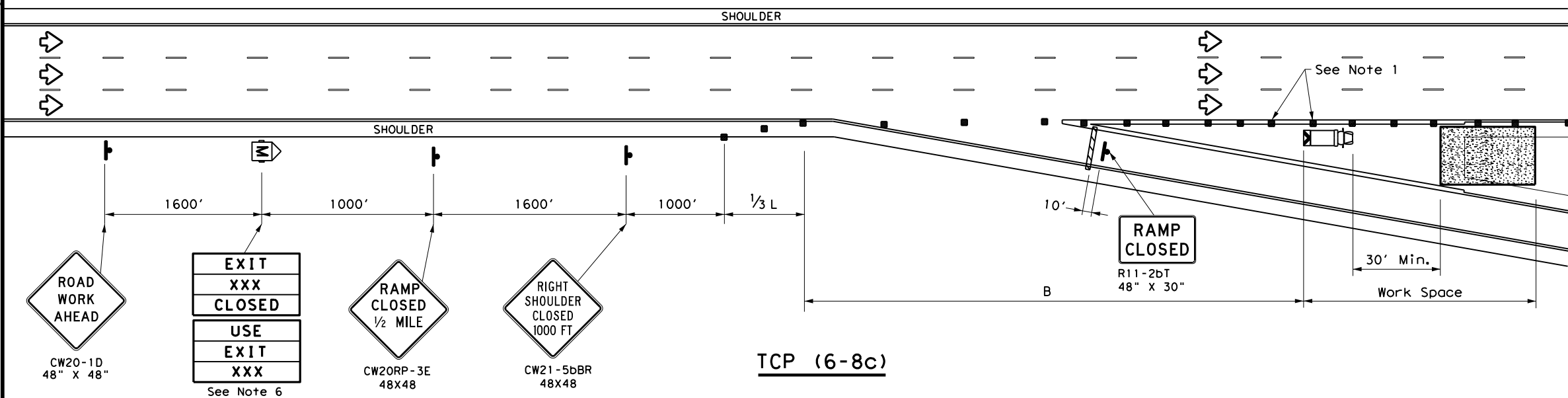
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TCP (6-8a)



TCP (6-8b)



TCP (6-8c)

LEGEND			
	Type 3 Barricade		Channelizing Devices (CDs)
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		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**
- Place channelizing devices in the gore at 20' spacing.
 - See the Standard Highway Sign Design for Texas (SHSD) for sign details.
 - The PCMS may be omitted when a permanent DMS sign is available in an appropriate location to display a similar message as called for on the PCMS.
 - When it is determined that a through lane should be closed in addition to the exit ramp, refer to TCP(6-4) for traffic control details.
 - Truck mounted attenuator is required.
 - The PCMS may be omitted if replaced with a "RAMP CLOSED" AHEAD (CW20RP-3D) Sign.
 - Roadway ADT should be greater than 10,000.

Texas Department of Transportation
 Traffic Operations Division Standard

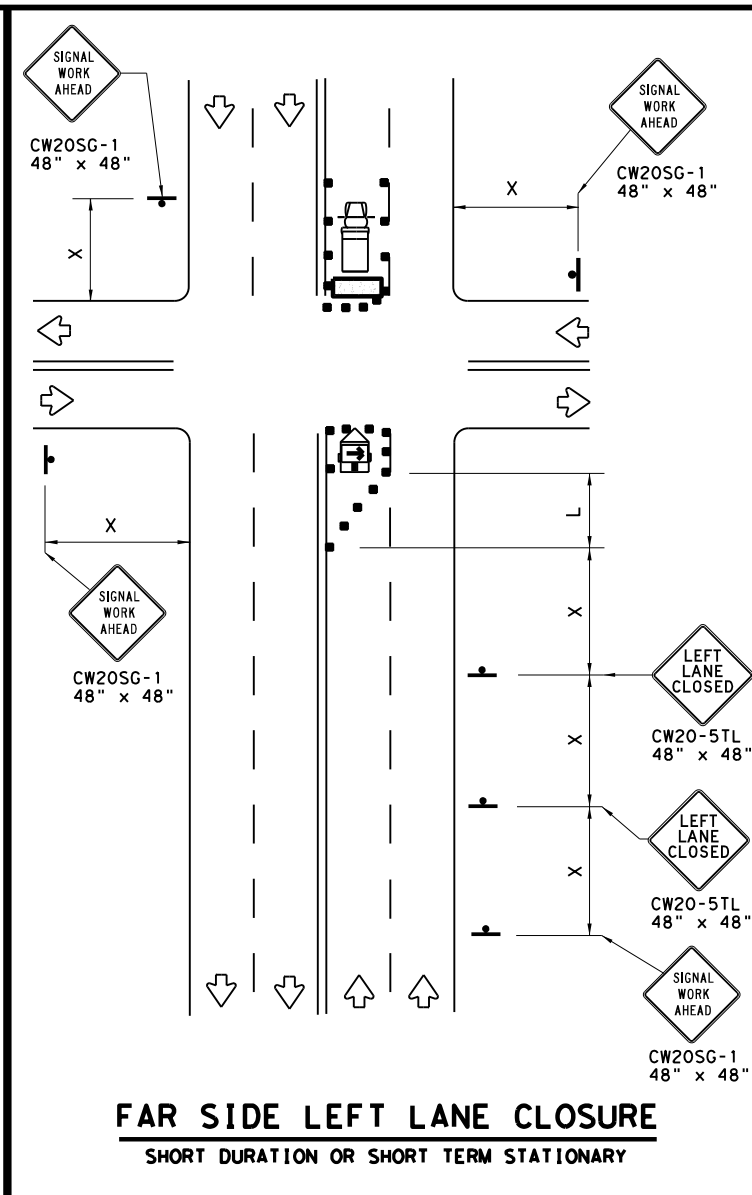
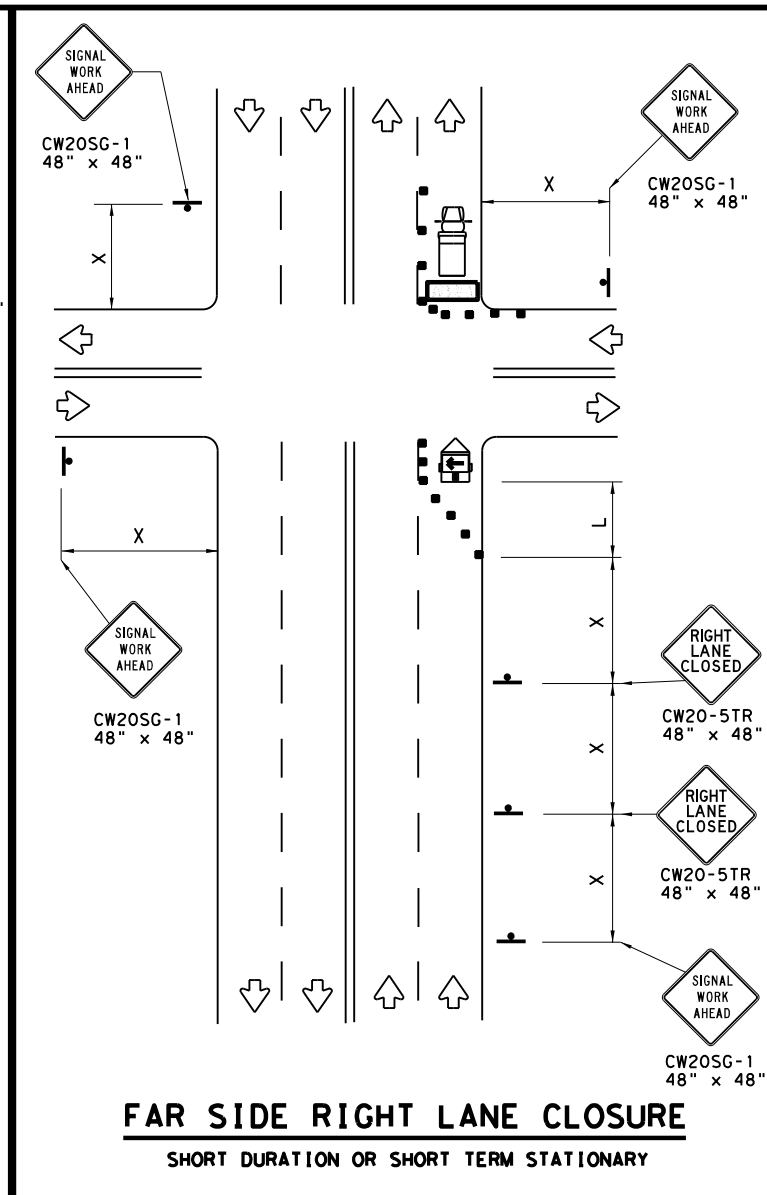
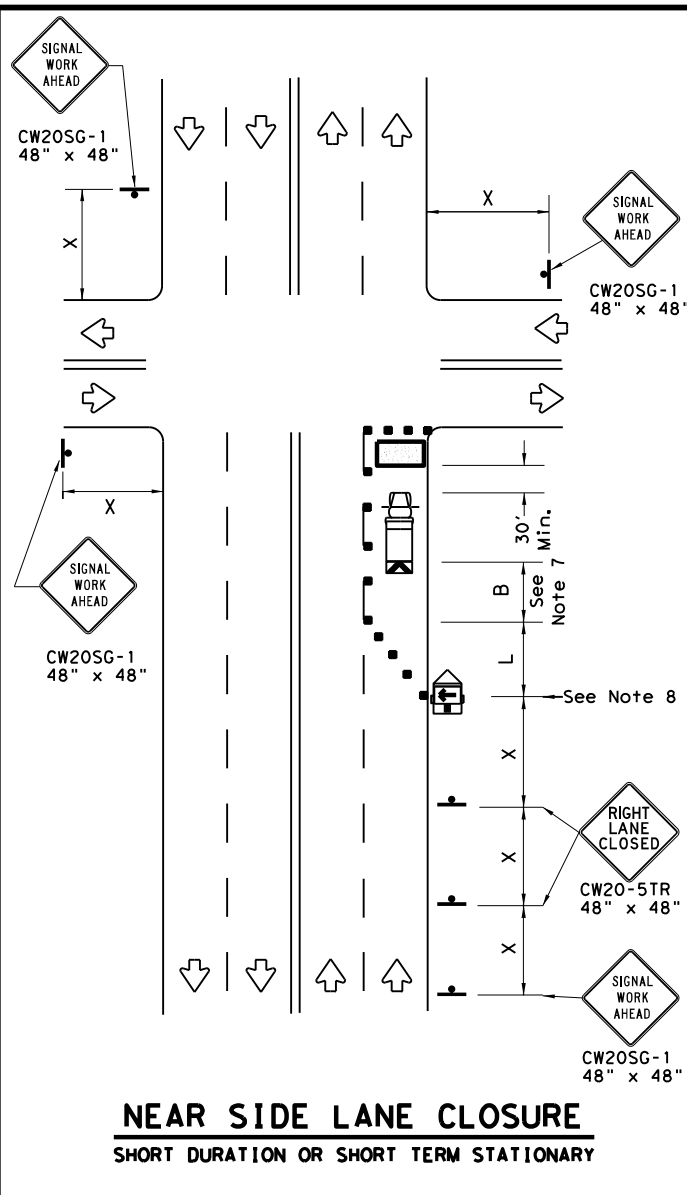
WORK IN EXIT GORE FOR ADT GREATER THAN 10,000

TCP (6-8) - 14

FILE: tcp6-8.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	00	299	VA
DIST	COUNTY	SHEET NO.		
FTW	TARRANT	43		

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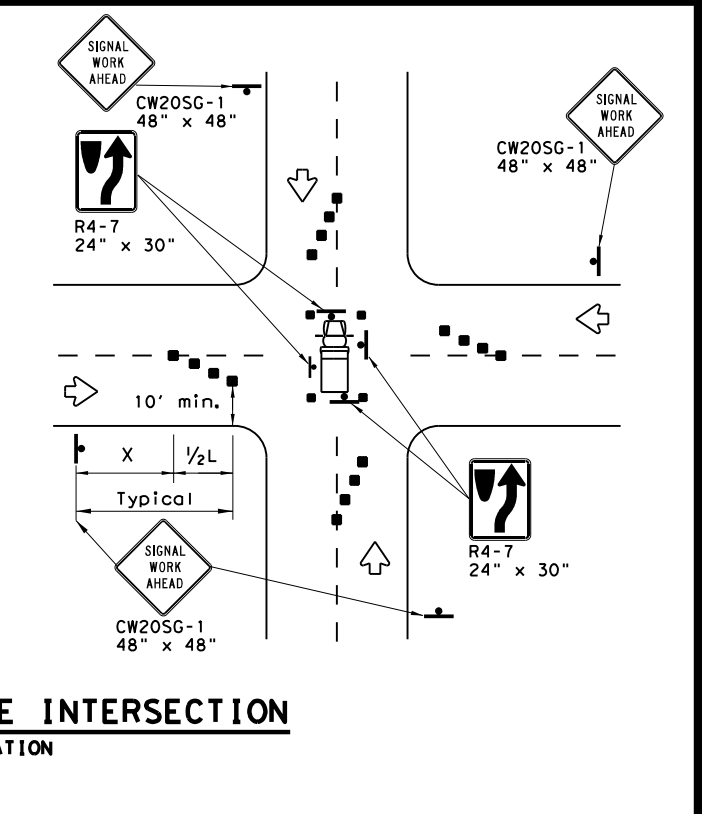
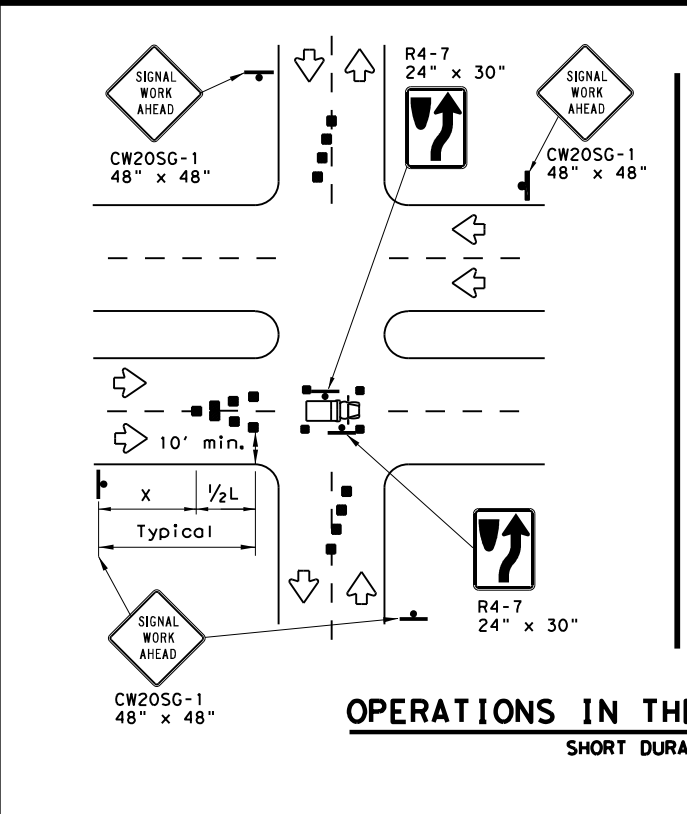


LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

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

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

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



GENERAL NOTES

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

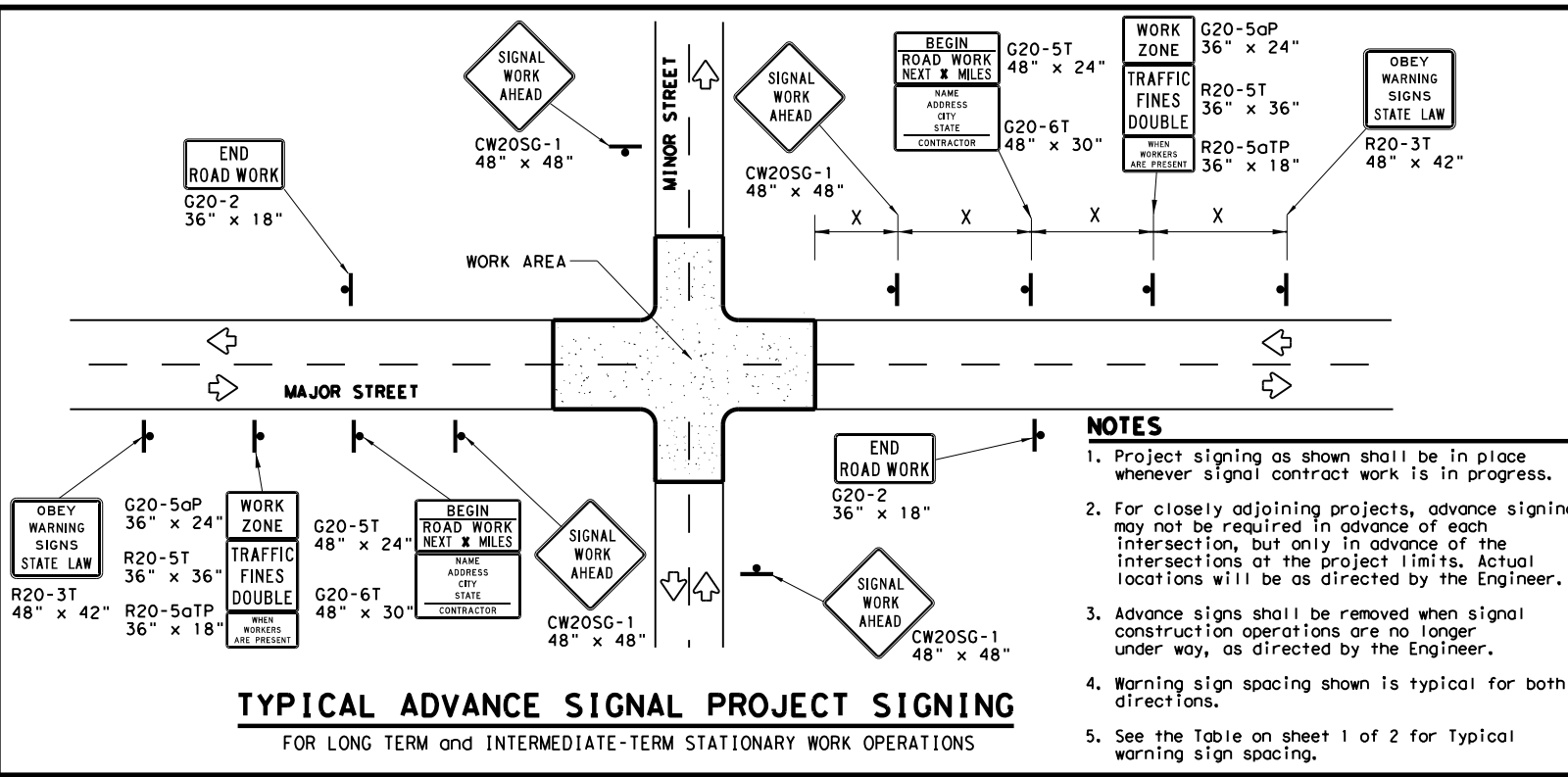
TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ (BTS-1) - 13

FILE: wzbts-13.dgn	DN: TxDOT	CR: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	00	299	VA
2-98 10-99 7-13	DIST	COUNTY	SHEET NO.	
4-98 3-03	FTW	TARRANT	44	

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 FILE: T:\TRAFFIC\ITS\0902-00-299 Non-Site Specific Standards\WZ (BTS-2) -13.dgn



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

GENERAL NOTES FOR WORK ZONE SIGNS

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

DURATION OF WORK

1. Work zone durations are defined in Part 6, Section 60.02 of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

SIGN MOUNTING HEIGHT

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

REMOVING OR COVERING

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

REFLECTIVE SHEETING

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

SIGN SUPPORT WEIGHTS

1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber, such as fire 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.

LEGEND

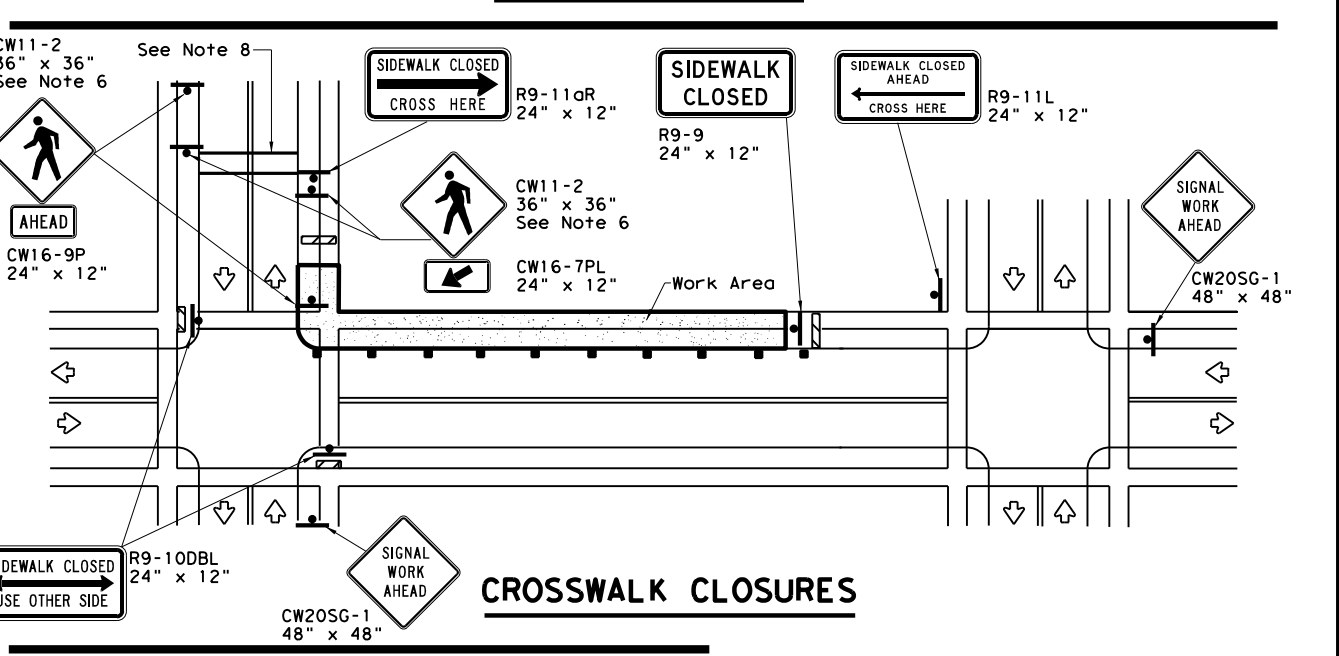
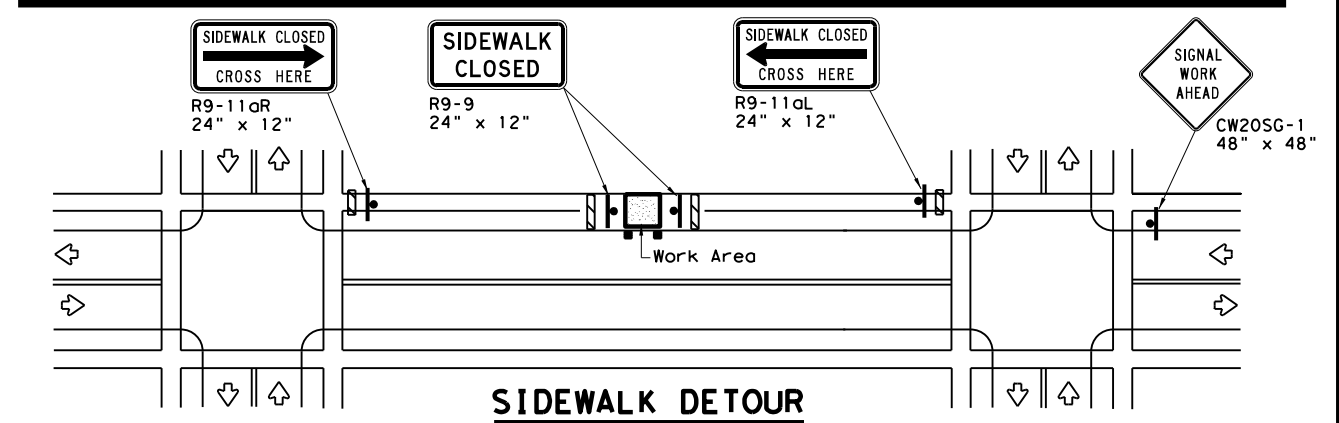
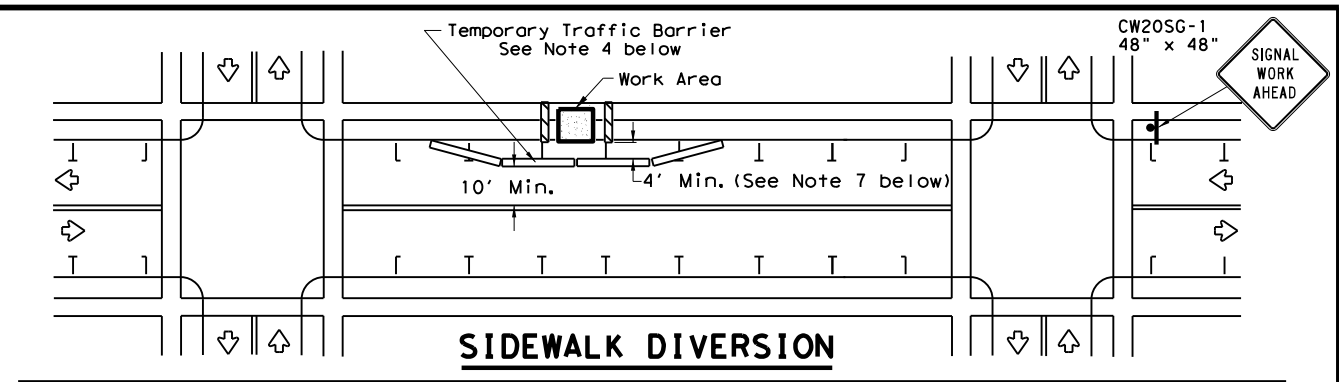
	Sign
	Channelizing Devices
	Type 3 Barricade

DEPARTMENTAL MATERIAL SPECIFICATIONS

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

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

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



PEDESTRIAN CONTROL

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

SHEET 2 OF 2

Texas Department of Transportation
 Traffic Operations Division Standard

TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

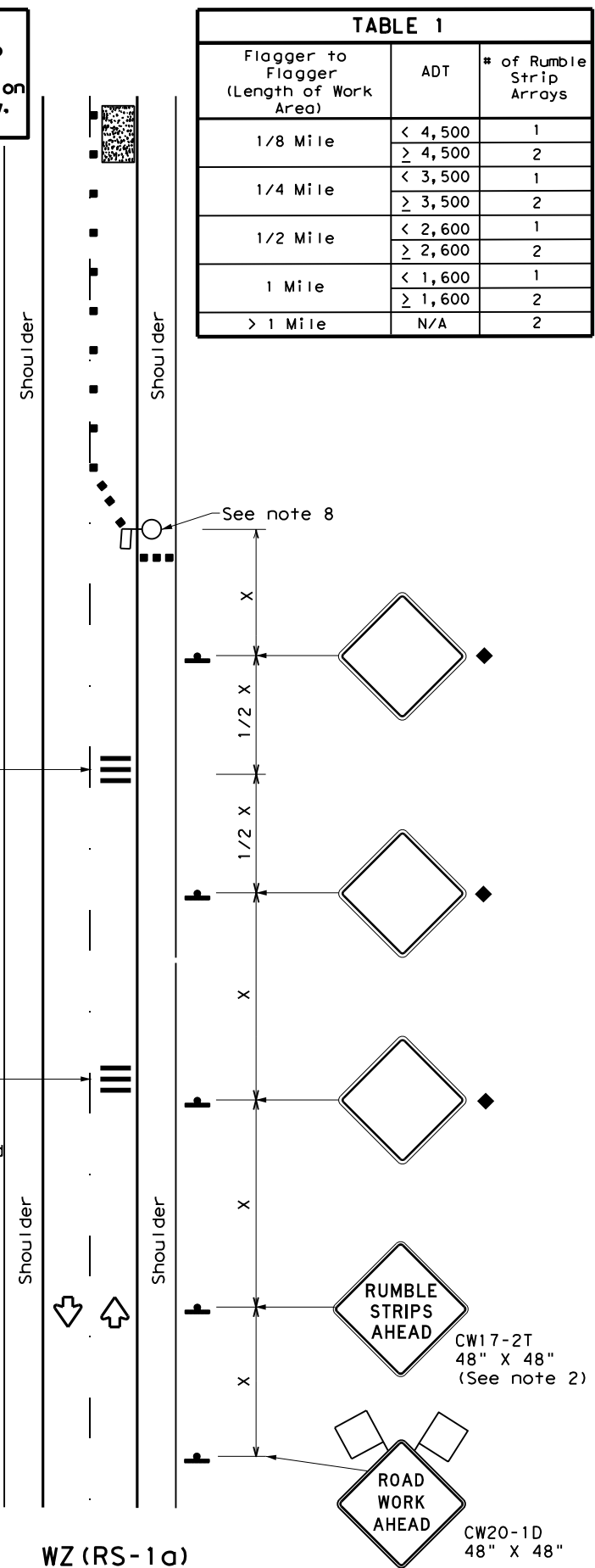
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© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
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4-98 3-03	FTW	TARRANT	45	

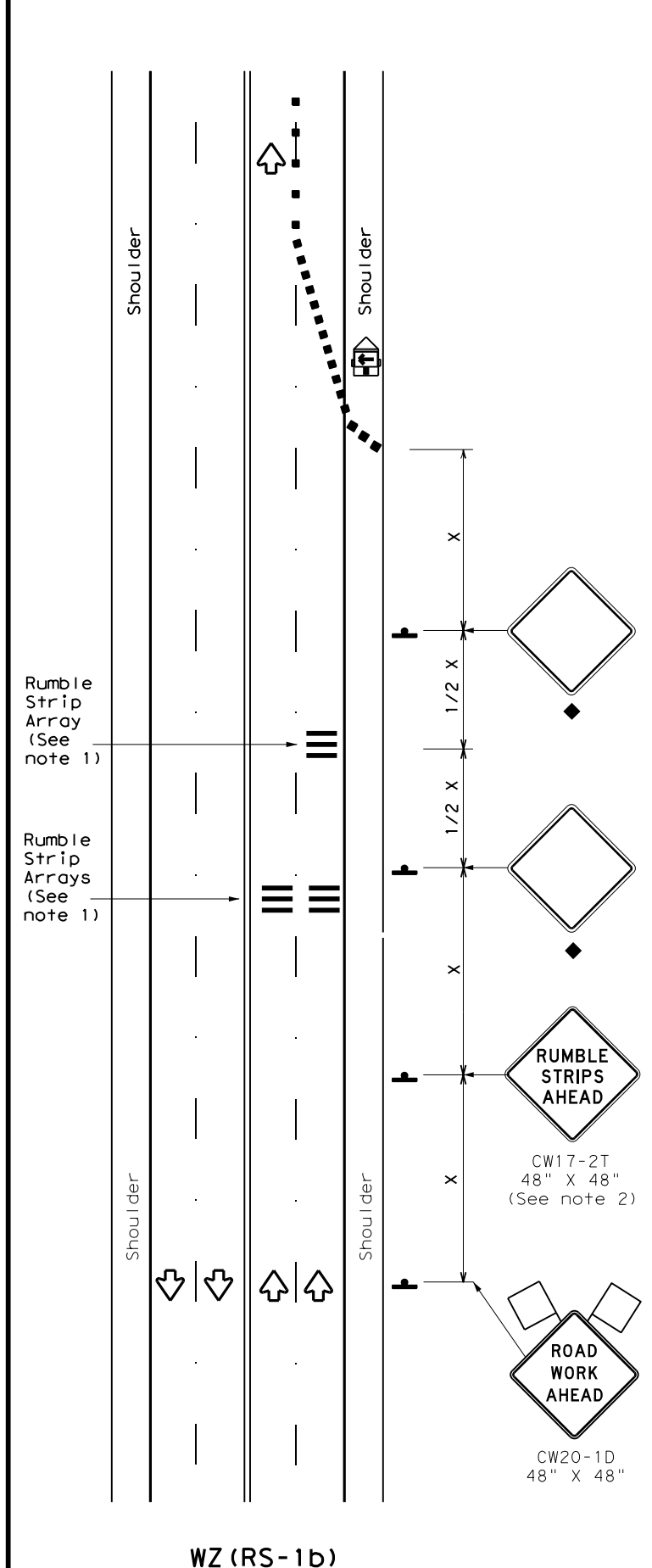
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Warning sign and rumble strip sequence in opposite direction is same as below.

Flagger to Flagger (Length of Work Area)	ADT	# of Rumble Strip Arrays
1/8 Mile	< 4,500	1
	≥ 4,500	2
1/4 Mile	< 3,500	1
	≥ 3,500	2
1/2 Mile	< 2,600	1
	≥ 2,600	2
1 Mile	< 1,600	1
	≥ 1,600	2
> 1 Mile	N/A	2



RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

- Each Rumble Strip Array should consist of three rumble strips spaced center to center at the spacing shown in Table 2, placed transverse across the lane at locations shown.
- The CW17-2T "RUMBLE STRIPS AHEAD" sign should be located after the CW20-1D "ROAD WORK AHEAD" sign and spaced as shown. If traffic is observed to be queuing, or is expected to queue beyond the Rumble Strips, the CW17-2T sign and the first Rumble Strip Array may be located upstream of the CW20-1D sign as necessary to provide needed warning.
- Temporary Rumble Strips will be considered subsidiary to Item 502, and shall be a product listed on the Compliant Work Zone Traffic Control Devices.
- Remove Temporary Rumble Strips before removing the advanced warning signs.
- Temporary Rumble Strips should not be used on horizontal curves, loose gravel, soft or bleeding asphalt, heavily rutted pavements or unpaved surfaces.
- Temporary Rumble Strips shall be installed and maintained as per manufacturer's recommendations.
- This standard sheet shall be used in conjunction with other appropriate TCP standard, TMUTCD typical application or project specific detail for the project.
- The one-lane two-way application may utilize a flagger, an Automated Flagger Assistance Device (AFAD) or a Portable Traffic Signal (PTS).
- Replace defective Temporary Rumble Strips as directed by the Engineer.
- Temporary Rumble Strips may be used on freeways or expressways based on engineering judgment and written direction from the Engineer.

Speed	Approximate distance between strips in an array
≤ 40 MPH	10'
> 40 MPH & ≤ 55 MPH	15'
= 60 MPH	20'
≥ 65 MPH	* 35' +

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

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

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

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

◆ Signs are for illustrative purposes only. Signs required may vary depending on the TCP, TMUTCD Typical Application, or project specific details for the project.
 * For posted speeds in excess of 65 MPH, it is recommended that spacing is increased as speed limits increase. Increasing space between rumble strips will improve effectiveness.

Texas Department of Transportation Traffic Safety Division Standard

TEMPORARY RUMBLE STRIPS

WZ (RS) - 22

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2-14 1-22	DIST	COUNTY	SHEET NO.	
4-16	FTW	TARRANT	46	

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GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.
2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.
3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is 1/2 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.

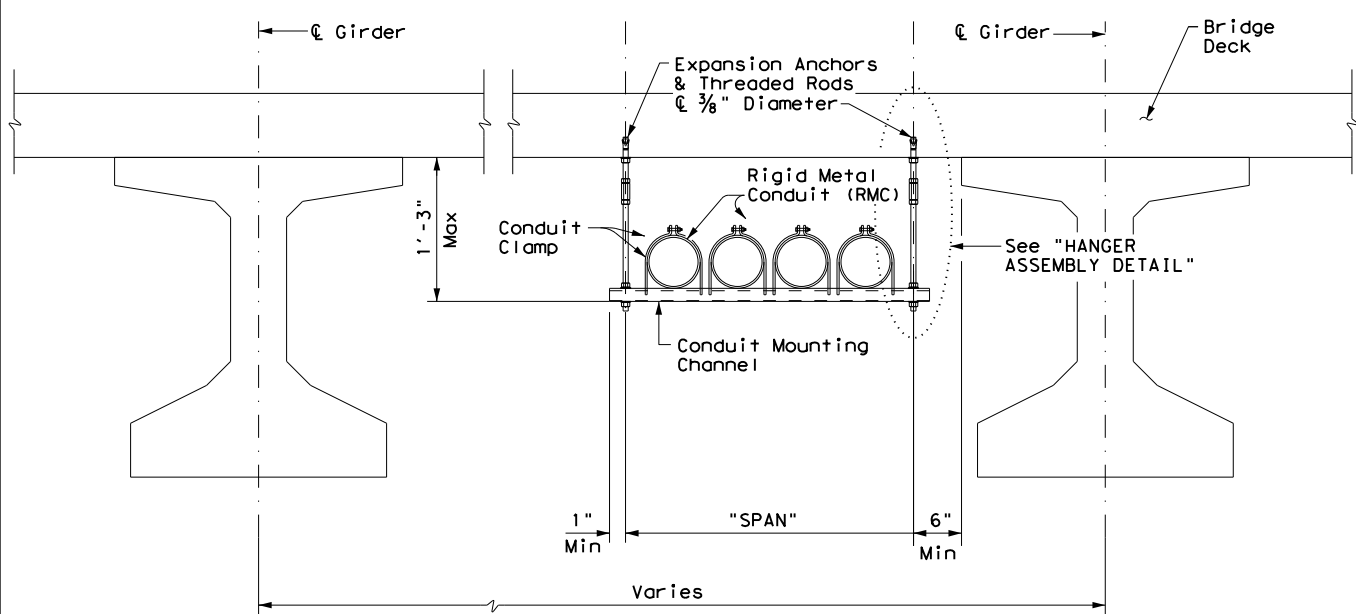
B. CONSTRUCTION METHODS

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.

				Traffic Operations Division Standard	
<h1>ELECTRICAL DETAILS CONDUITS & NOTES</h1>					
<h2>ED(1) - 14</h2>					
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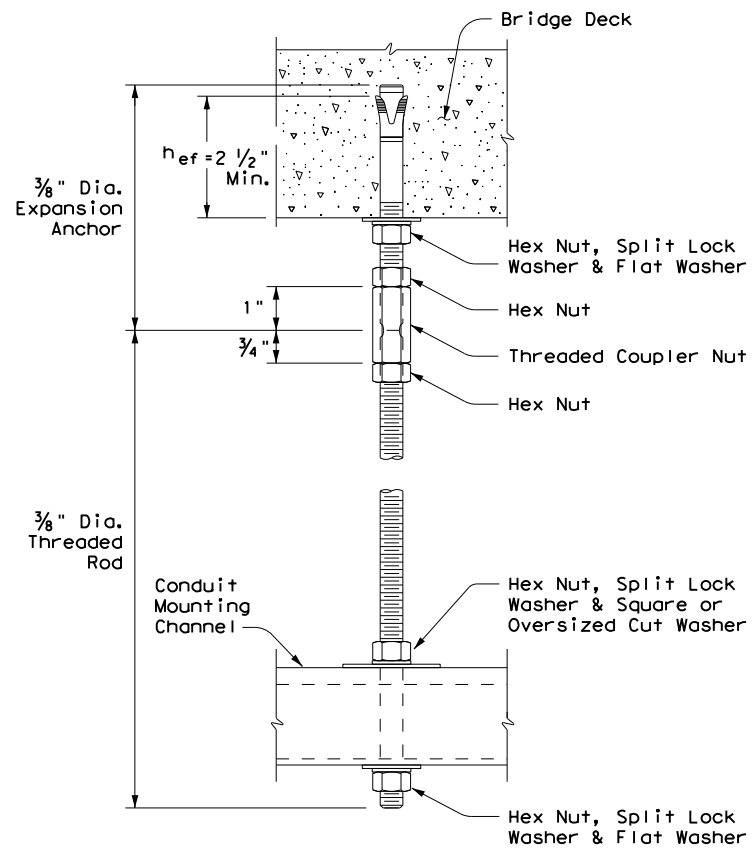
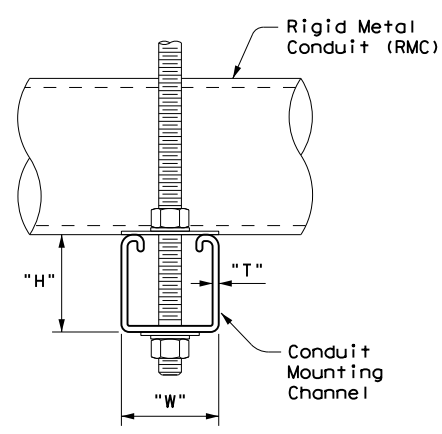
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CONDUIT HANGING DETAIL

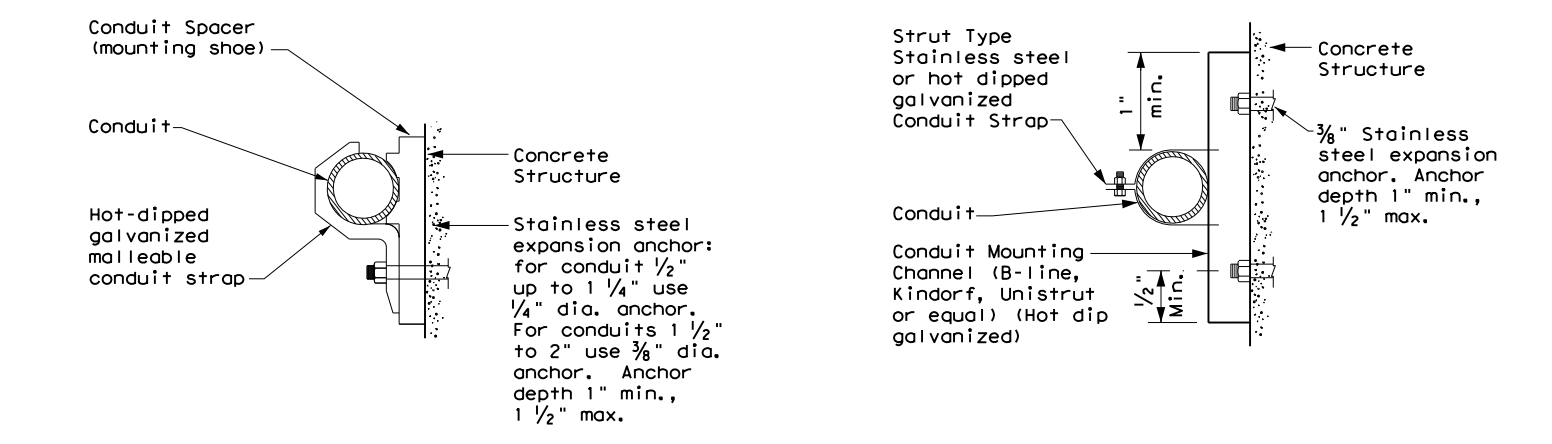
CONDUIT MOUNTING CHANNEL		
"SPAN"	"W" x "H"	"T"
less than 2'	1 5/8" x 1 3/8"	12 Ga.
2'-0" to 2'-6"	1 5/8" x 1 5/8"	12 Ga.
>2'-6" to 3'-0"	1 5/8" x 2 7/16"	12 Ga.

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



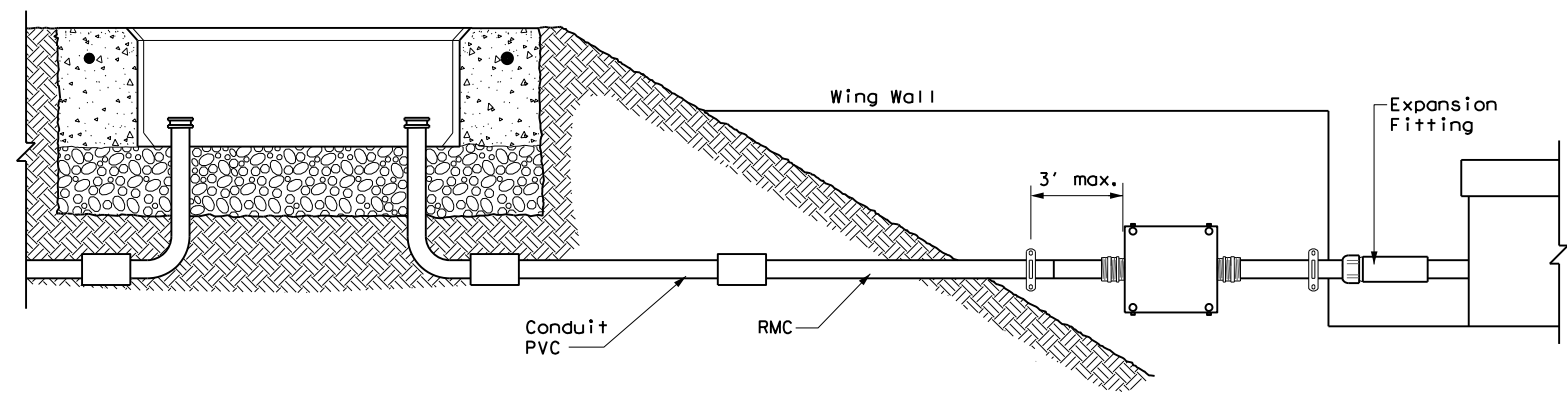
HANGER ASSEMBLY DETAIL

ELECTRIC CONDUIT TO BRIDGE DECK ATTACHMENT



CONDUIT MOUNTING OPTIONS

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



TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL

EXPANSION ANCHOR NOTES FOR BRIDGE DECK ATTACHMENT

1. Use torque controlled mechanical expansion anchors that are approved for use in cracked concrete by the International Code Council, Evaluation Service (ICC-ES). The chosen anchor product shall have a designated ICC-ES Evaluation Report number, and its approval status shall be maintained on the ICC-ES website under Division 031600 for Concrete Anchors.
2. Unless otherwise approved by the Engineer: do not use adhesive anchors; do not use expansion anchors that are not included in the ICC-ES approval list; and do not use expansion anchors that are only approved for use in uncracked concrete.
3. Use anchors manufactured with stainless steel expansion wedges. Anchors manufactured with carbon steel expansion wedges are not allowed. Anchor bodies can be either zinc-plated carbon steel or stainless steel. For application in marine environment, both the anchor body and expansion wedge shall be stainless steel.
4. Install anchors as shown on the plans and in accordance with the anchor manufacturer's published installation instructions. Arrange a field demonstration test to evaluate the procedures and tools. The test shall be witnessed and approved by the Engineer prior to furnishing anchors on the structure.
5. Prior to hole drilling, use rebar locator to ensure clearing of existing deck strands or reinforcement. Install anchors to ensure a minimum effective embedment depth, (h_{ef}), as shown. Increase (h_{ef}) as needed to ensure sufficient thread length for proper torquing and tightening of anchors.
6. Use anchors of minimum 1600 Lbs tensile capacity (minimum of steel, concrete breakout, and concrete pullout strengths as determined by ACI 318 Appendix D) at the required minimum embedment depth (h_{ef}). No lateral loads shall be introduced after conduit installation.

<h2>ELECTRICAL DETAILS CONDUIT SUPPORTS</h2>			
<h3>ED(2) - 14</h3>			
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REVISIONS	0902	00	299 VA
DIST	COUNTY		SHEET NO.
FTW	TARRANT		48

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.

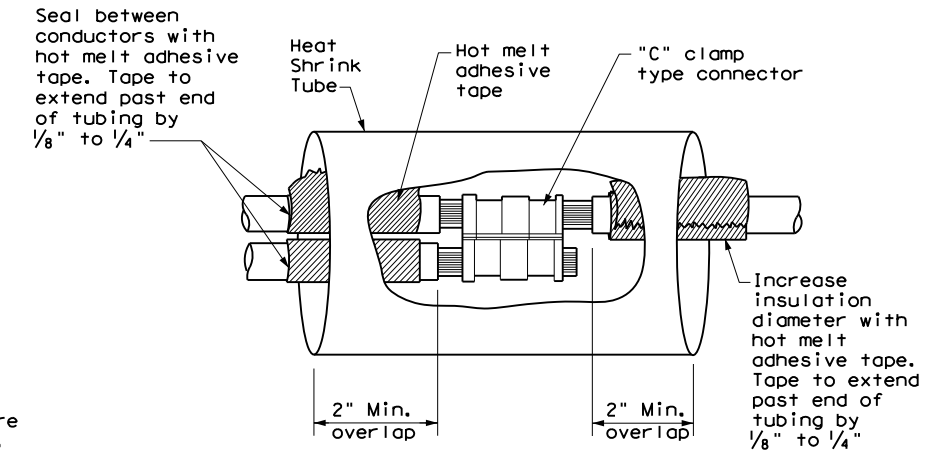
B. CONSTRUCTION METHODS

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 seal. 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.



**SPLICE OPTION 1
Compression Type**

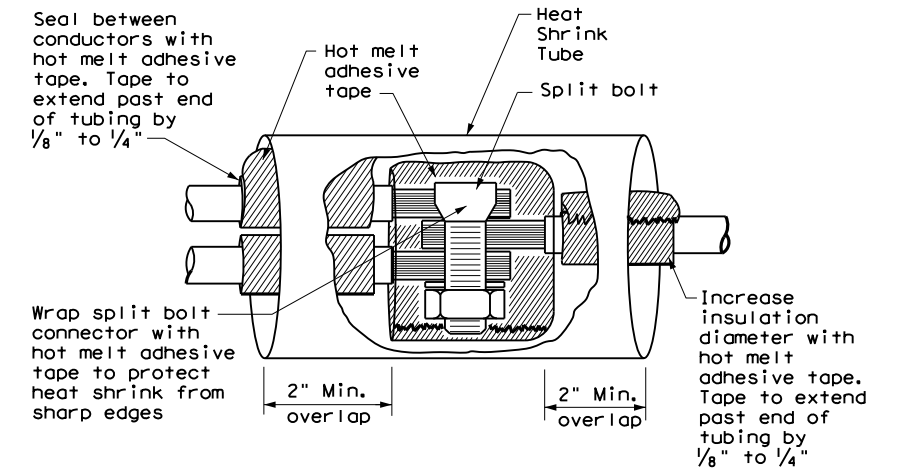
GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

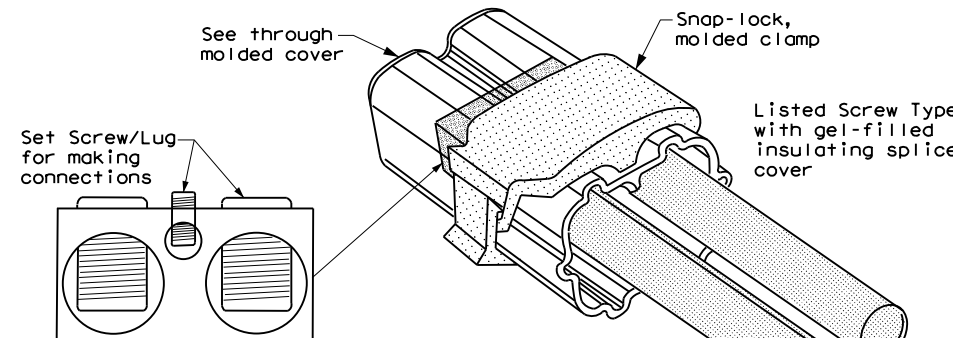
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in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

B. CONSTRUCTION METHODS

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



**SPLICE OPTION 2
Split Bolt Type**

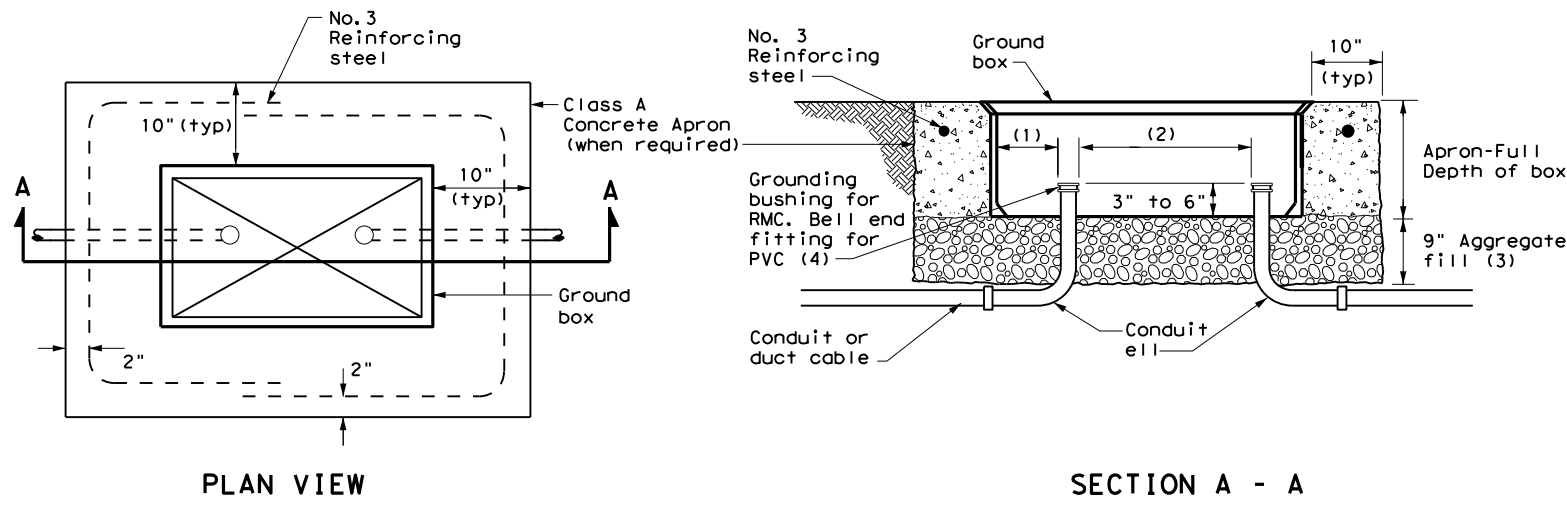


**SPLICE OPTION 3
Listed Screw Type**

		Texas Department of Transportation		Traffic Operations Division Standard	
<h1>ELECTRICAL DETAILS CONDUCTORS</h1>					
<h2>ED(3) - 14</h2>					
FILE:	ed3-14.dgn	DN:	TxDOT	CK:	TxDOT
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REVISIONS		090200	299	VA	
DIST:	FTW	COUNTY:	TARRANT	SHEET NO.:	49

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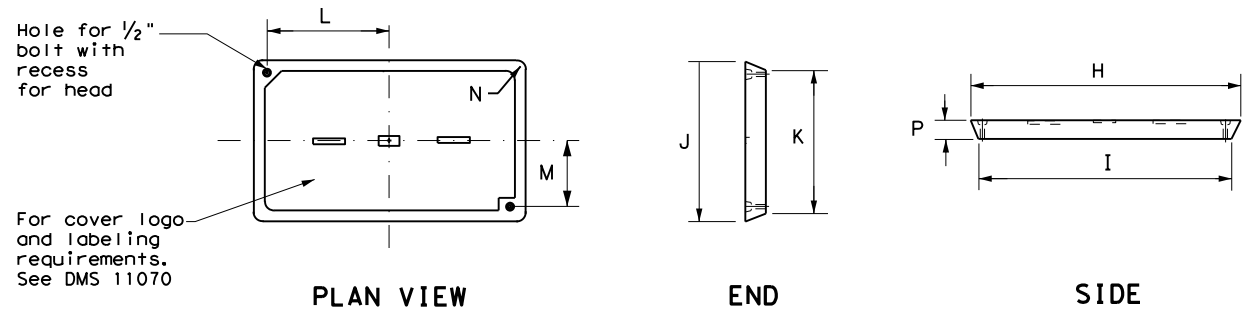


APRON FOR GROUND BOX

- (1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.
- (2) Maintain sufficient space between conduits to allow for proper installation of bushing.
- (3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.
- (4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

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

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



GROUND 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.

				Traffic Operations Division Standard	
<h2>ELECTRICAL DETAILS</h2> <h3>GROUND BOXES</h3>					
<h3>ED(4) - 14</h3>					
FILE:	ed4-14.dgn	DN:	TxDOT	CK:	TxDOT
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REVISIONS		0902	00	299	VA
DIST	COUNTY		SHEET NO.		
FTW	TARRANT		50		

ELECTRICAL SERVICES NOTES

- 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.
- 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.
- Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.
- 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.
- 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.
- 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.
- When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.
- 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.
- 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.
- Provide rigid metal conduit (RMC) for all conduits on service, except for the 1/2 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.
- 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.
- Ensure all mounting hardware and installation details of services conform to utility company specifications.
- 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 1/2 in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.
- 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 1/2 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.
- 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

- Provide threaded hub for all conduit entries into the top of enclosure.
- 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 photoceII or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.
- 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.
- 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

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

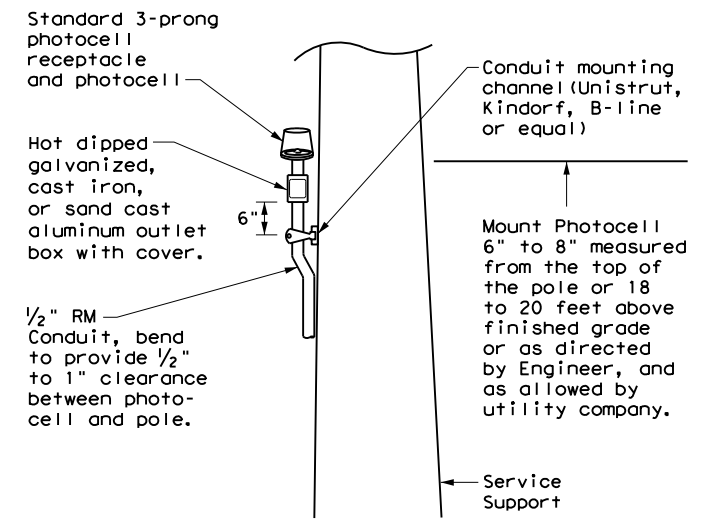
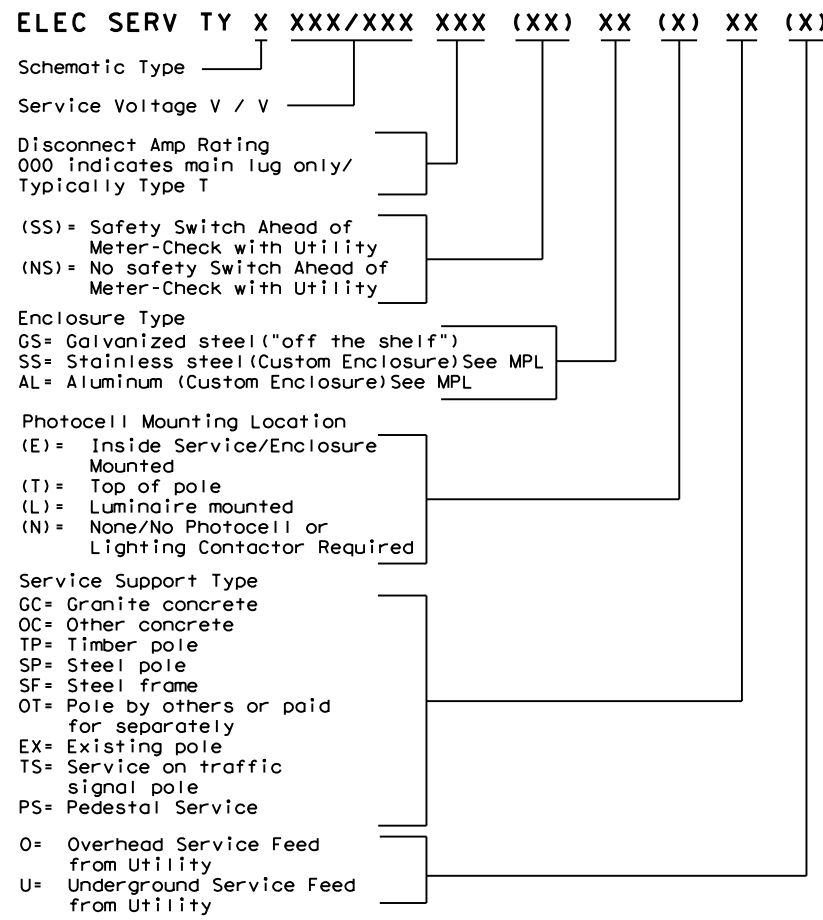
PHOTOELECTRIC CONTROL

- 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 *xSize	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 1/4"	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 1/4"	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



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

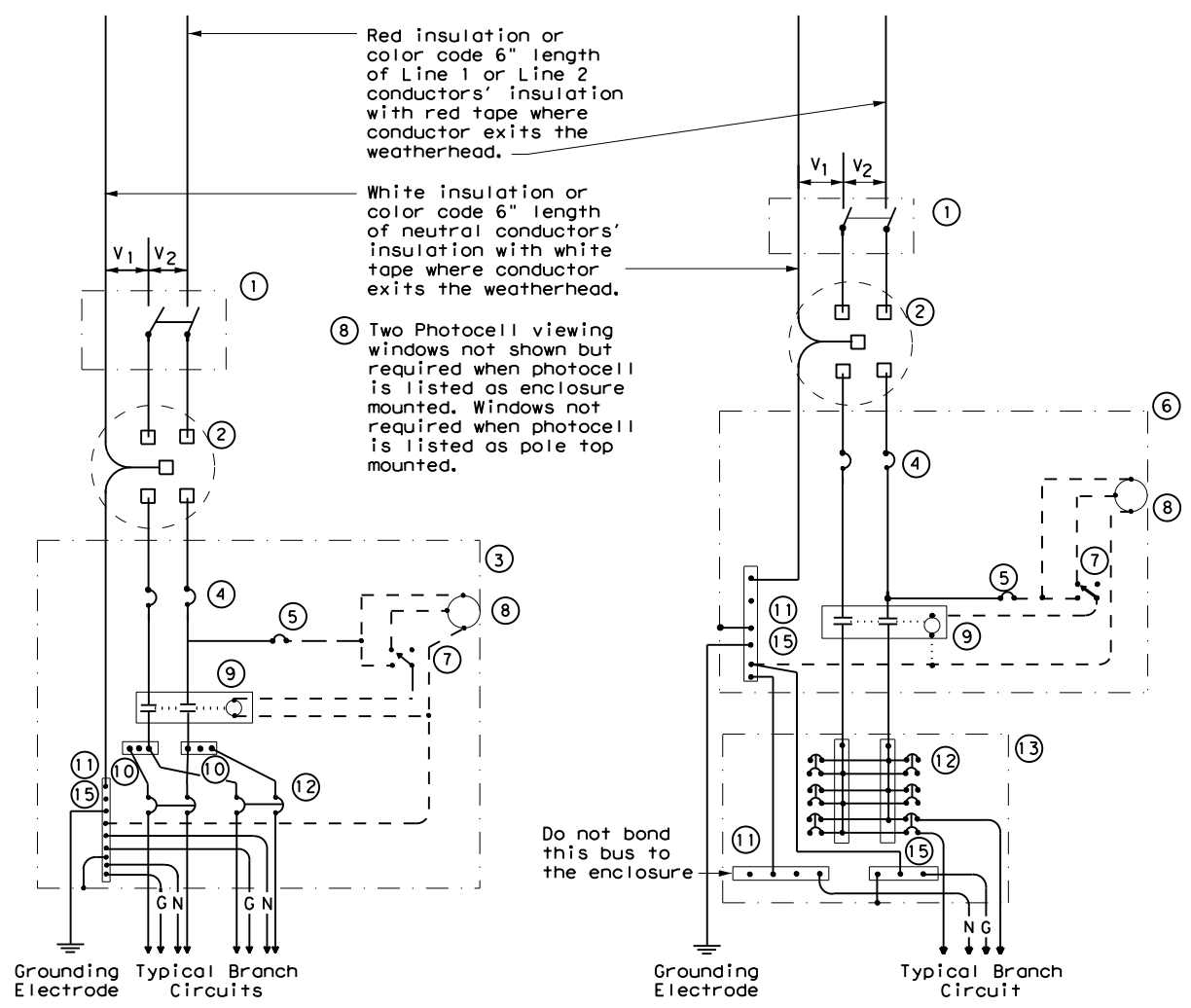
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REVISIONS	0902 00		299	VA
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	FTW	TARRANT	51	

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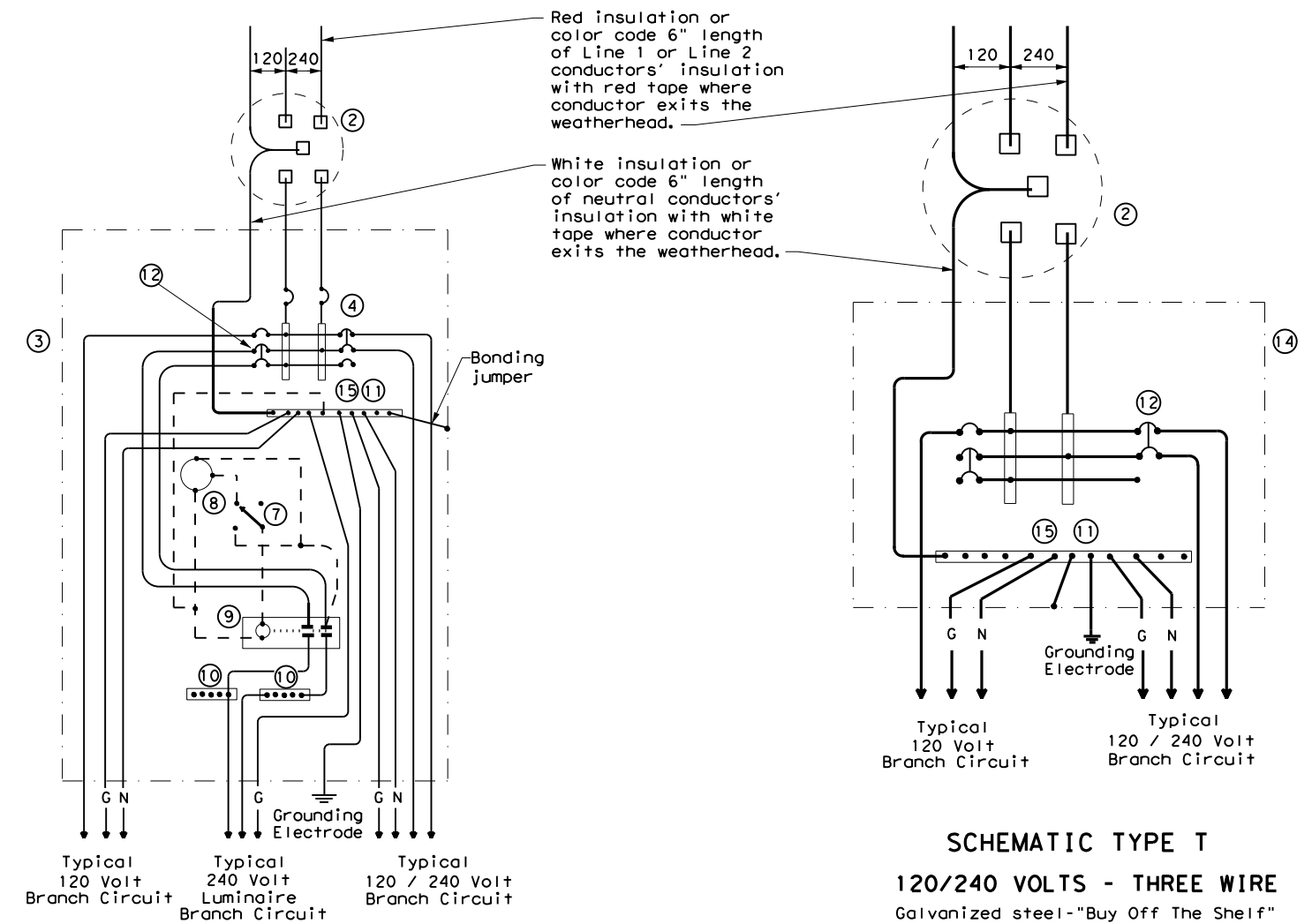
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**SCHEMATIC TYPE A
THREE WIRE**

**SCHEMATIC TYPE C
THREE WIRE**

WIRING LEGEND	
————	Power Wiring
- - - -	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required



**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

				Traffic Operations Division Standard	
ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES					
ED(6)-14					
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SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS)11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 1/2 in. or 1 3/8 in. wide by 1 in. up to 3 3/4 in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.
2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.
3. Provide and install galvanized 3/4 in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized 3/4 in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 1/4 in. to 3 1/2 in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.
4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.
5. Furnish and install rigid metallic ells in all steel pole and steel frame foundations for all conduits entering the service from underground.
6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.
7. Drill and tap steel poles and frames for 1/2 in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.
8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.
9. Provide 1/4" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.
10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.
11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.

White insulation or color code 6" of neutral conductor's insulation with white tape where conductor exits weatherhead.

Red insulation or color code 6" length of Line 1 or Line 2 conductor's insulation with red tape where conductor exits the weatherhead. Conductor slack length, 12" min., 18" max.

2" to 6" 4" (typ.)

RMC

Service Enclosure

Inset A

Channel bracket or other arrangement approved by the Engineer. (Kindorf, Unistrut, B-line or equal.)

Inset A

Inset B

60" TYP.

2"

Class "C" concrete

RMC

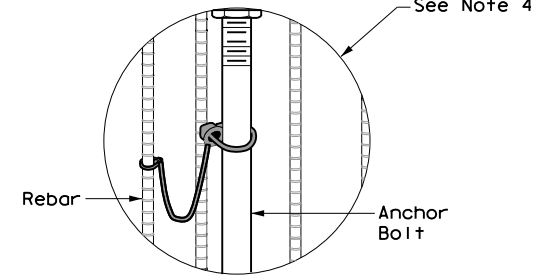
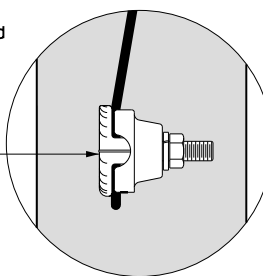
PVC

18" Min.

24 Dia. x 60" depth foundation 4-#5 reinforcing bars and #2 spiral (typ.) at 6" pitch

WITH SAFETY SWITCH
WITHOUT SAFETY SWITCH
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE

Drill, tap, and thread 1/2" X 13 UNC. Install tank ground fitting, connect electrical service grounding electrode conductor. See Note 7.



Safety switch (when required)

3' max.

2"

60" (typ.)

18" Min.

RMC to utility

24" dia. x 36" depth foundation 4-#5 reinforcing bars and #2 spiral (typ.) at 6" pitch

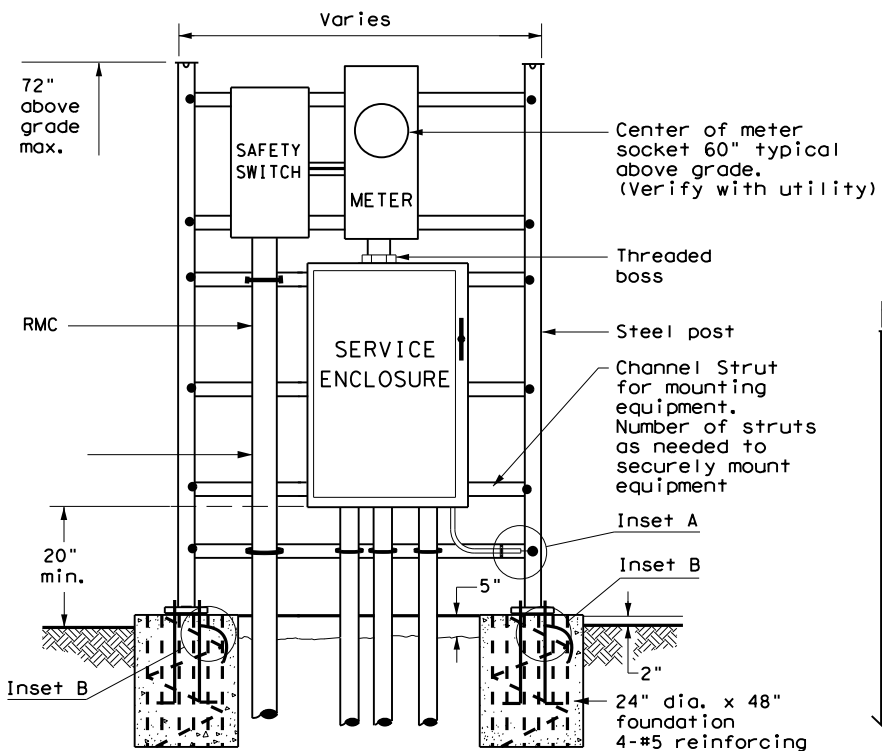
RMC

PVC

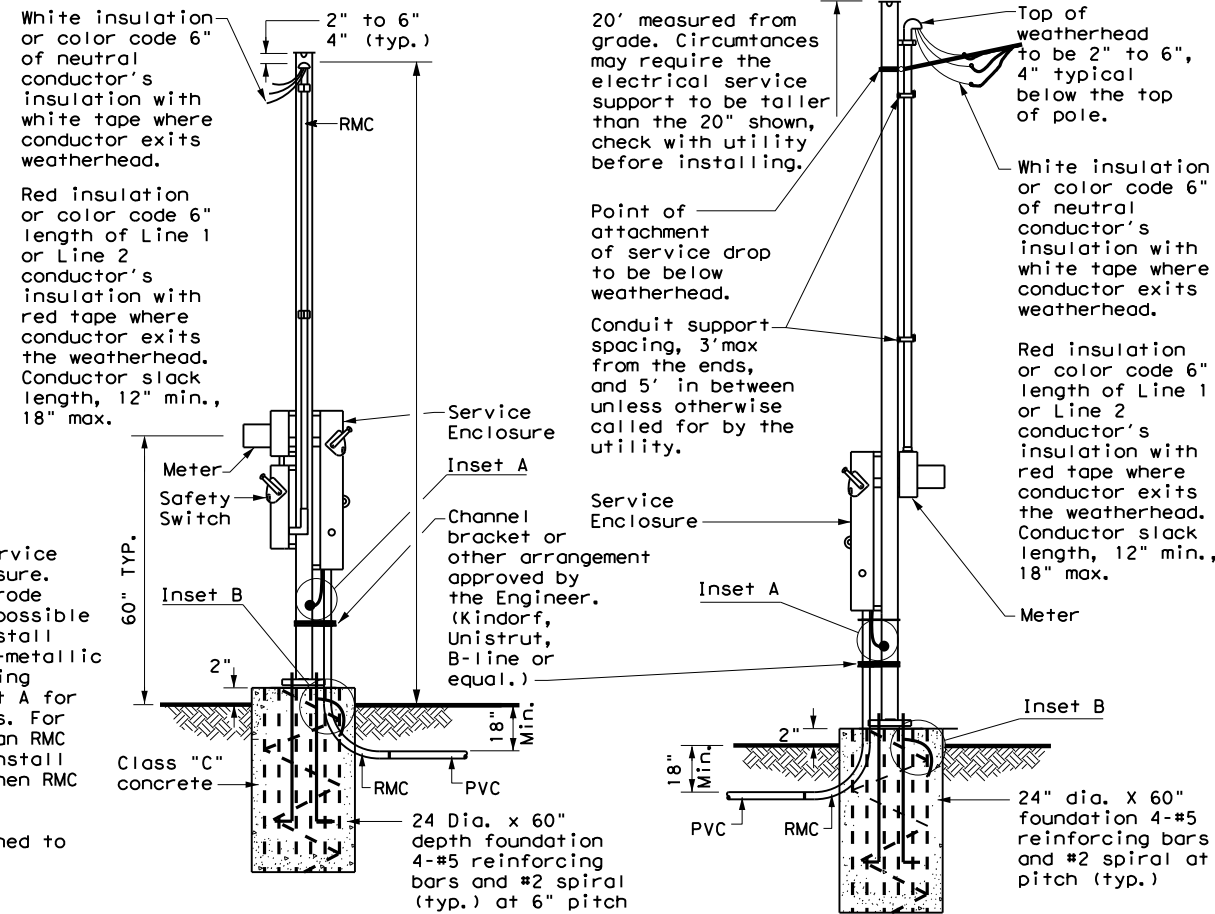
18" Min.

WITH SAFETY SWITCH

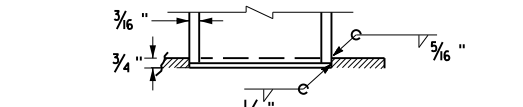
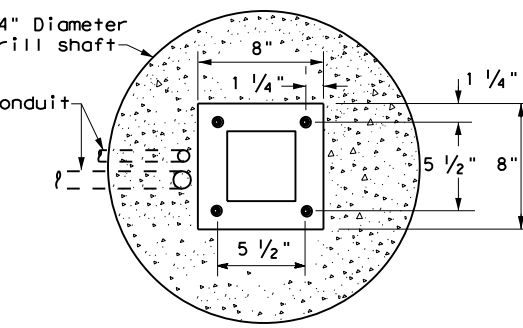
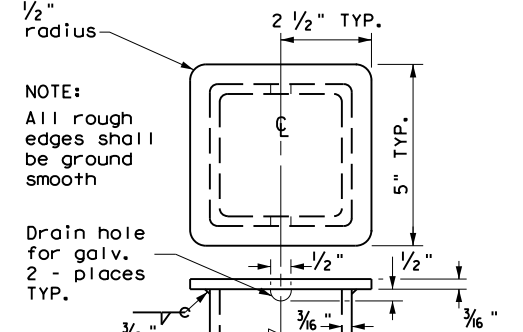
SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE



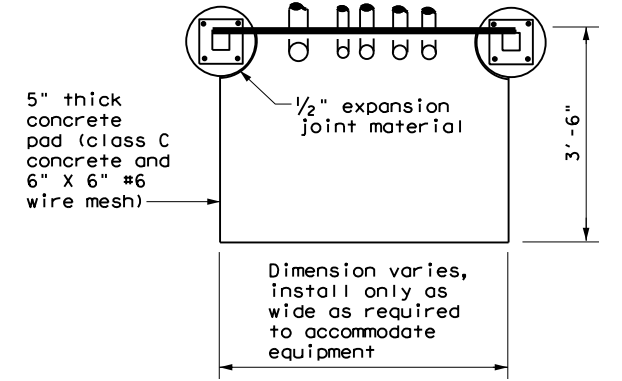
WITH SAFETY SWITCH
WITHOUT SAFETY SWITCH
SERVICE SUPPORT TYPE SF (U) - UNDERGROUND SERVICE



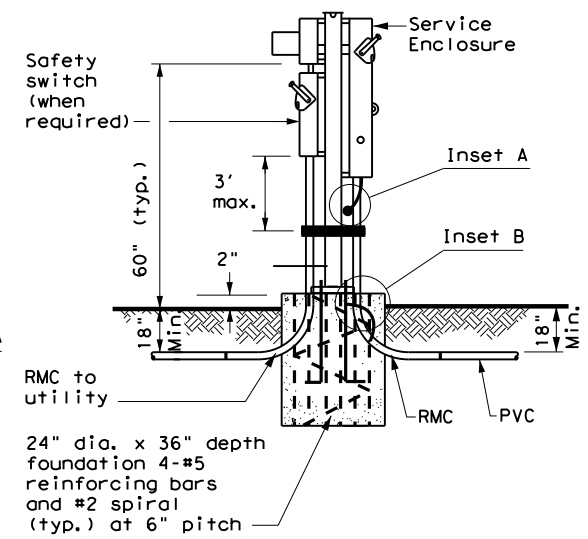
WITH SAFETY SWITCH
WITHOUT SAFETY SWITCH
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE



SERVICE SUPPORT TYPE SF & SP



SERVICE SUPPORT TY SF (O) & SF (U)



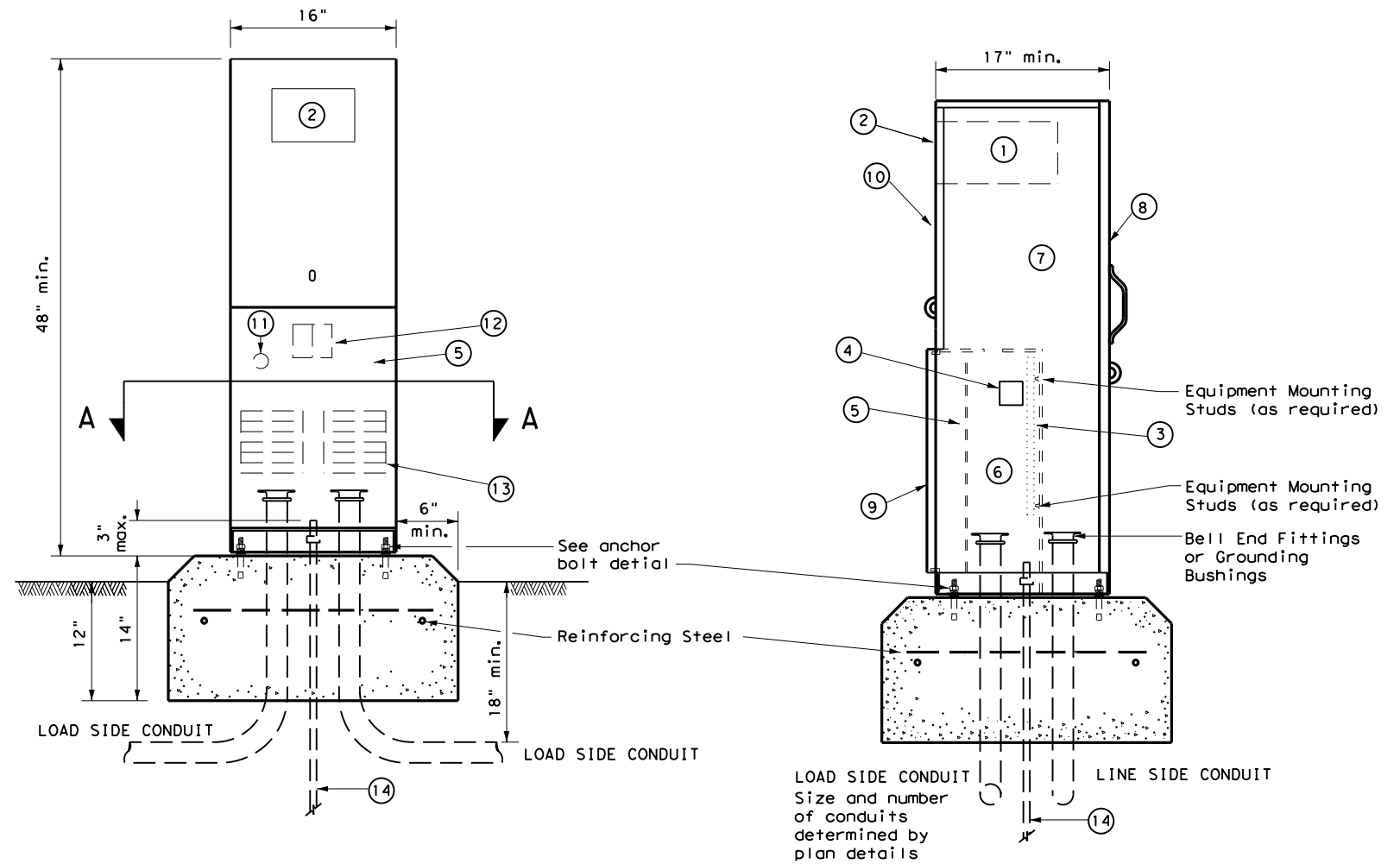
SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE

		Traffic Operations Division Standard	
ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP ED(7)-14			
FILE: ed7-14.dgn	DW: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT October 2014	CON: 0902	SECT: 00	JOB: 299
REVISIONS	0902	00	299
DIST: FTW	COUNTY: TARRANT	SHEET NO.: 53	

DATE: 4/9/2024 2:31:40 PM
 FILE: I:\TRAFFIC\ITS\0902-00-299 Non-Site_SpecificStandards\ED(9)-14.dgn
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PEDESTAL SERVICE NOTES

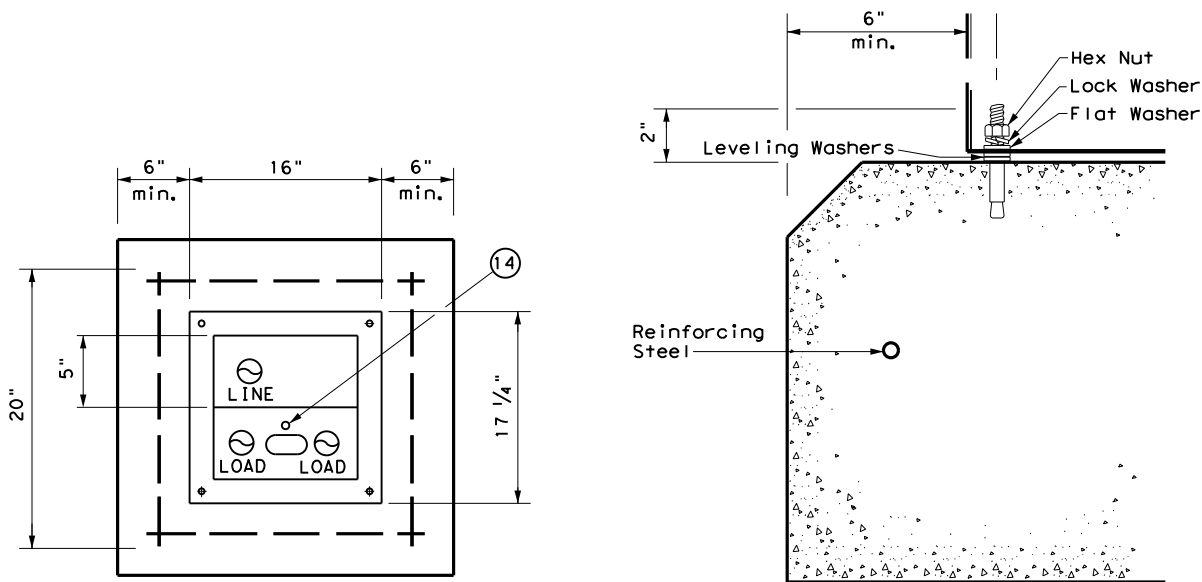
1. Manufacture pedestal electrical services in accordance with Departmental Material Specifications (DMS) 11080 "Electrical Services", 11085 "Electrical Services-Pedestal (PS)" and Item 628 "Electrical Services." Provide pedestal electrical services as listed on the Material Producers List (MPL) on the Department's web site under "Roadway Illumination and Electrical Supplies," Item 628. Ensure all mounting hardware and installation details of services meet utility company specifications. Contact the local utility company for approval of pedestal details prior to installing the electrical pedestal service. Submit any changes required by the utility company prior to manufacturing the pedestal enclosure.
2. When a meter socket is required, provide a socket with a minimum 100 amp rating that complies with local utility requirements.
3. Provide Class A or C concrete for pedestal service foundations in accordance with Item 420, "Concrete Substructures," except that concrete will not be paid for directly but is considered subsidiary to Item 628.
4. Provide #4 reinforcing steel for foundations in accordance with Item 440, "Reinforcement for Concrete."
5. Install 1/2 in. X 2 1/16 in. minimum length concrete single expansion type anchors for mounting pedestal enclosure to foundation. Anchor location to match mounting holes in each corner of enclosure. Secure each of the four corners of the pedestal enclosure to the anchors in the foundation with a 1/2 in. galvanized or stainless steel machine thread bolt, a properly sized locknut and a flat washer.
6. Finish top of concrete foundation in a neat and workmanlike manner. If leveling washers are used, ensure no more than 1/8 in. gap at any corner. Do not exceed a maximum dip or rise in the foundation of 1/8 in. per foot. When properly installed, ensure the top of the service enclosure is level front to back and side to side within 1/4 in. Repair rocking or movement of the service enclosure at no additional cost to the department.
7. Do not use liquidtight flexible metal conduit (LFMC) on pedestal type services.
8. Ensure all elbows in the foundation are sized as per utility provider's conduit requirements for underground conduit and feeders. PVC extensions may be installed provided the ends of the rigid metal conduits are more than 2 in. below the top of the concrete foundation. Where extension conduits are metal, grounding bushings must be installed with a bonding jumper properly terminated.



FRONT VIEW

SIDE VIEW

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



SECTION A-A

ANCHOR BOLT DETAIL

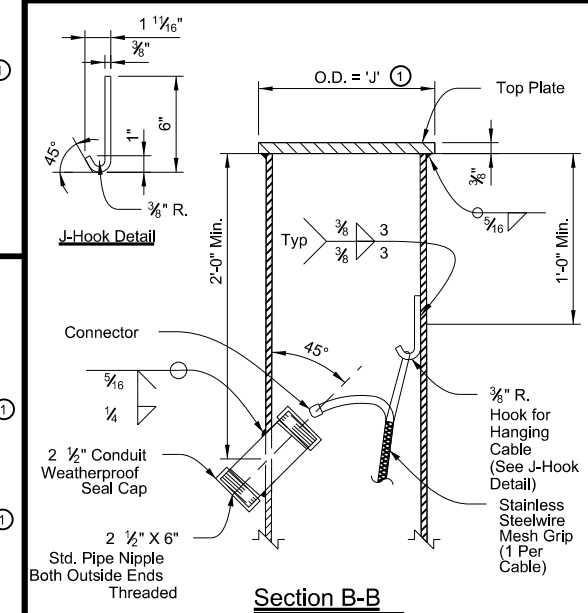
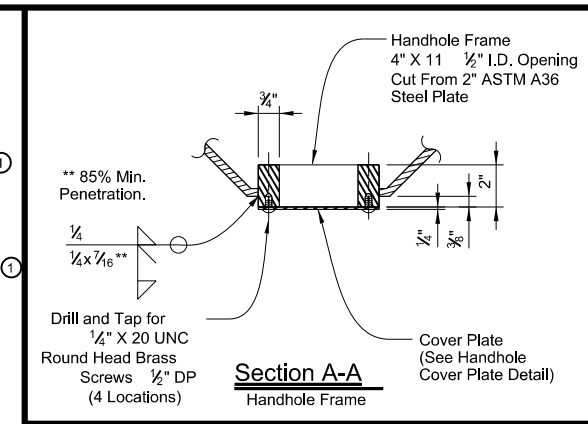
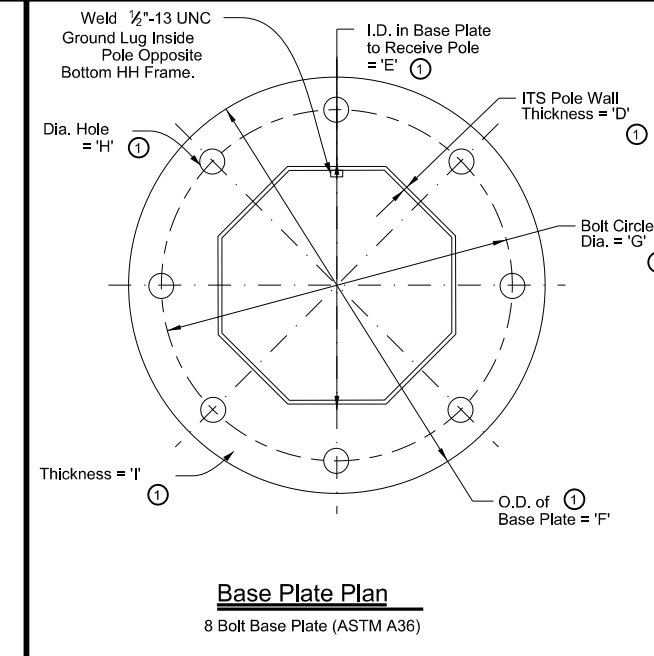
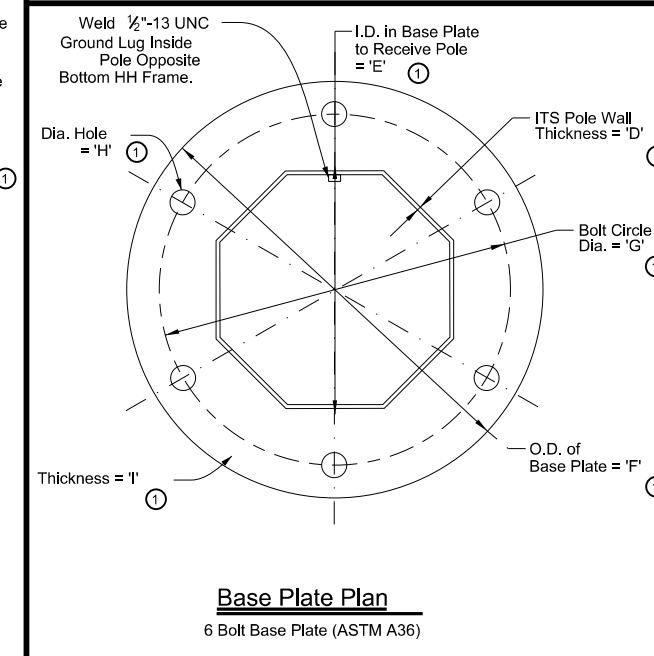
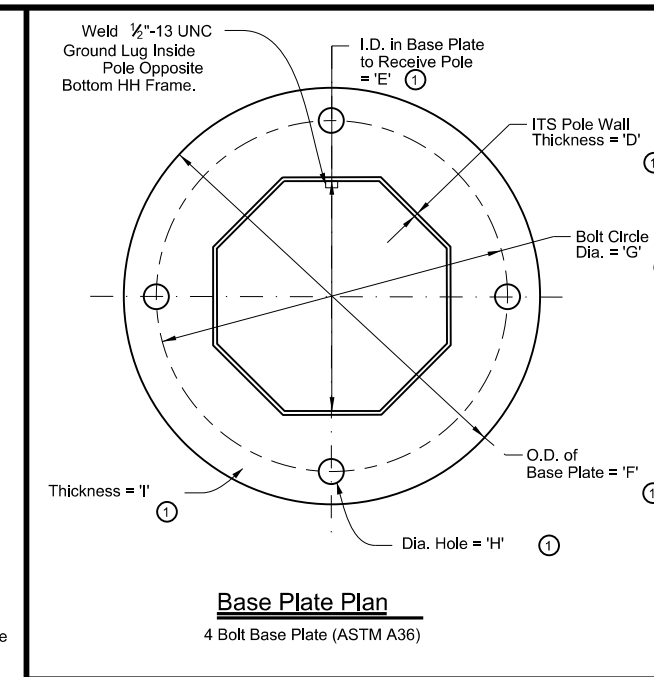
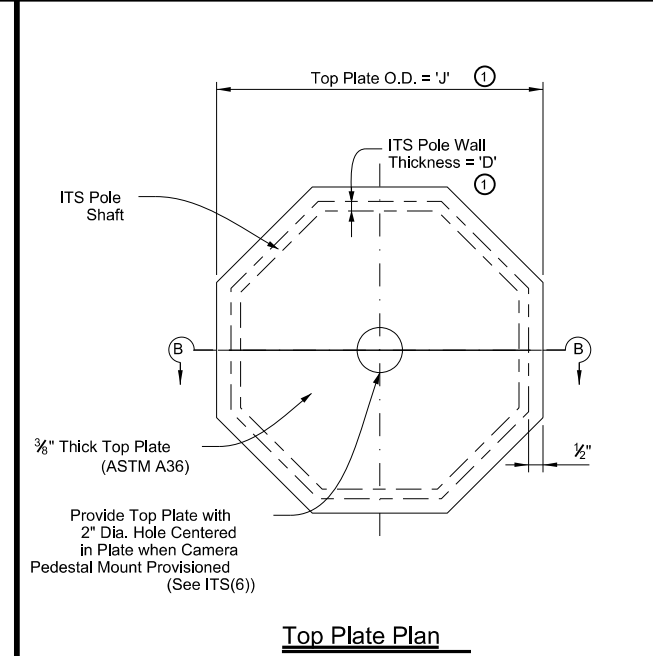
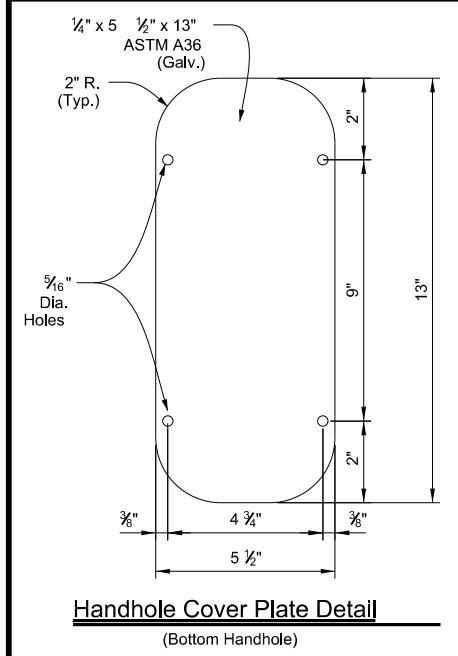
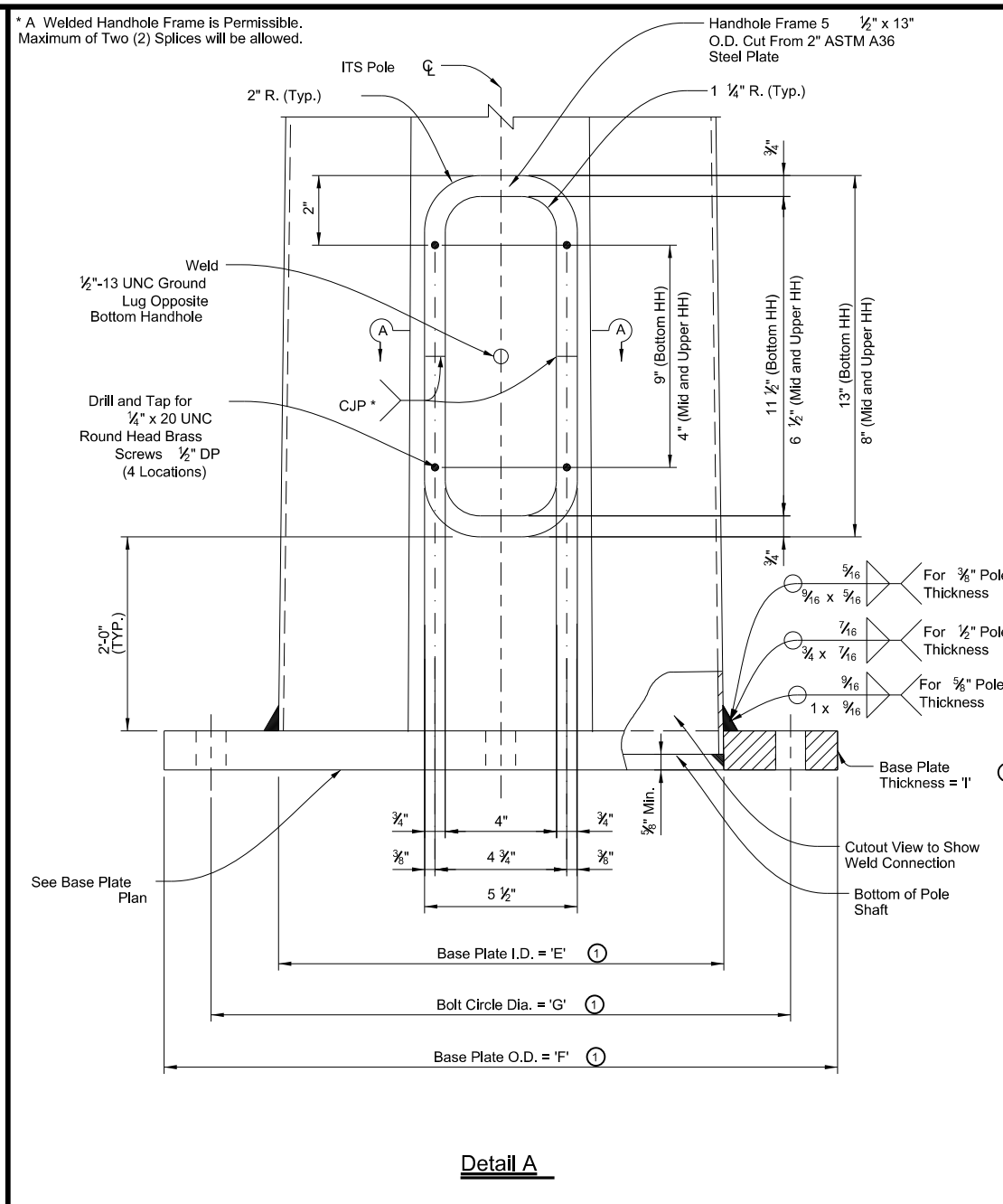
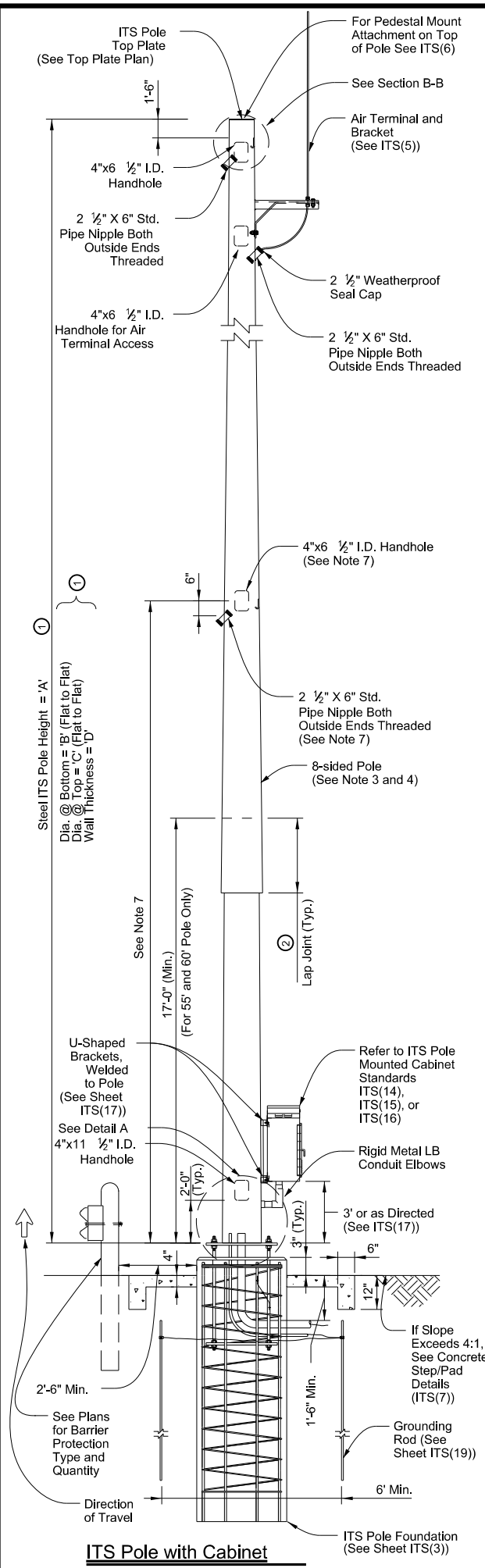
LEGEND

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

		Traffic Operations Division Standard	
ELECTRICAL DETAILS ELECTRICAL SERVICE SUPPORT PEDESTAL SERVICE TYPE PS			
ED(9) - 14			
FILE: ed9-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT October 2014	CONT: 0902	SECT: 00	JOB: 299
REVISIONS		HIGHWAY: VA	
DIST: FTW	COUNTY: TARRANT	SHEET NO.: 54	

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DATE:
FILE:



- 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

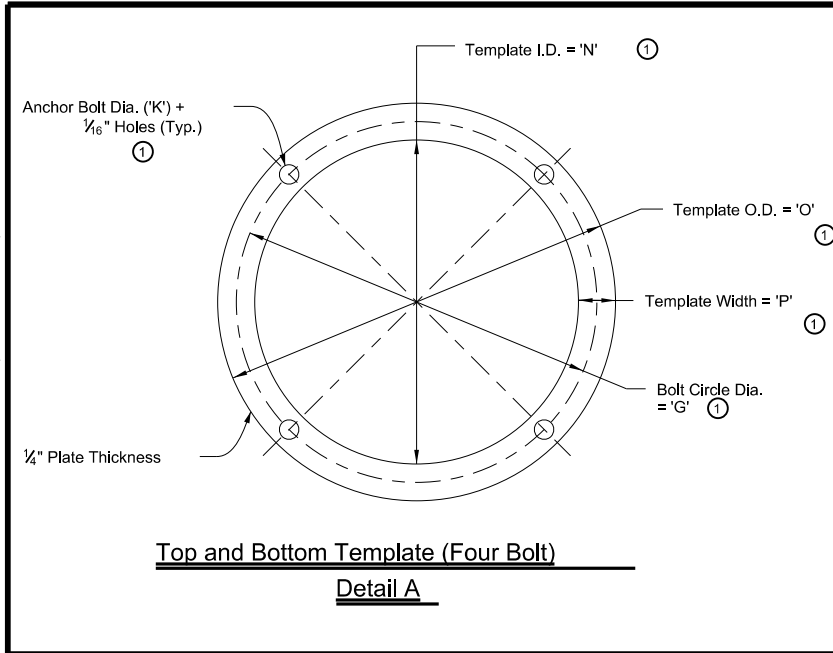
**ITS POLE DETAILS
 OCTAGONAL POLE
 (EIGHT SIDED POLE)**

ITS(1)-15

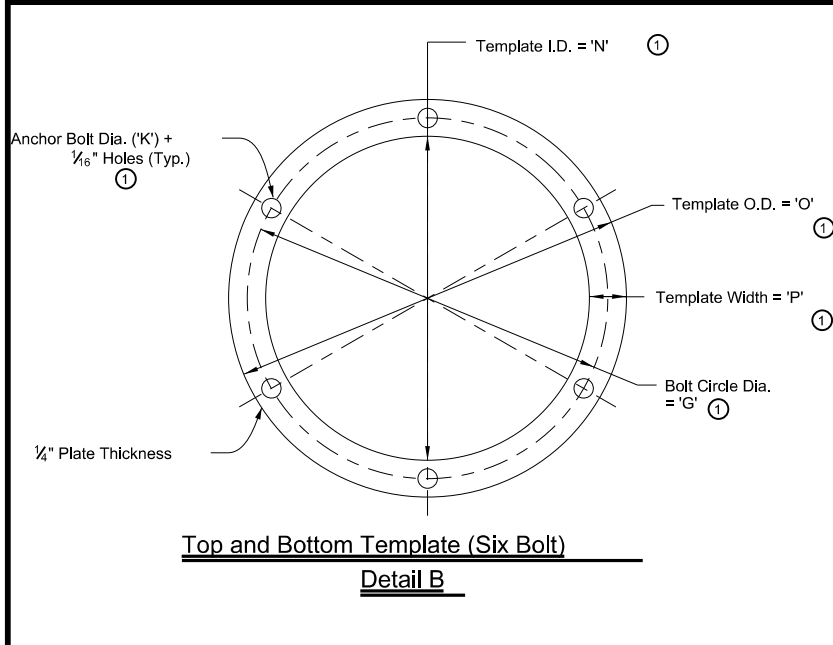
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© TxDOT June 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	00	299	VA
DIST	COUNTY		SHEET NO.	
FTW	TARRANT		55	

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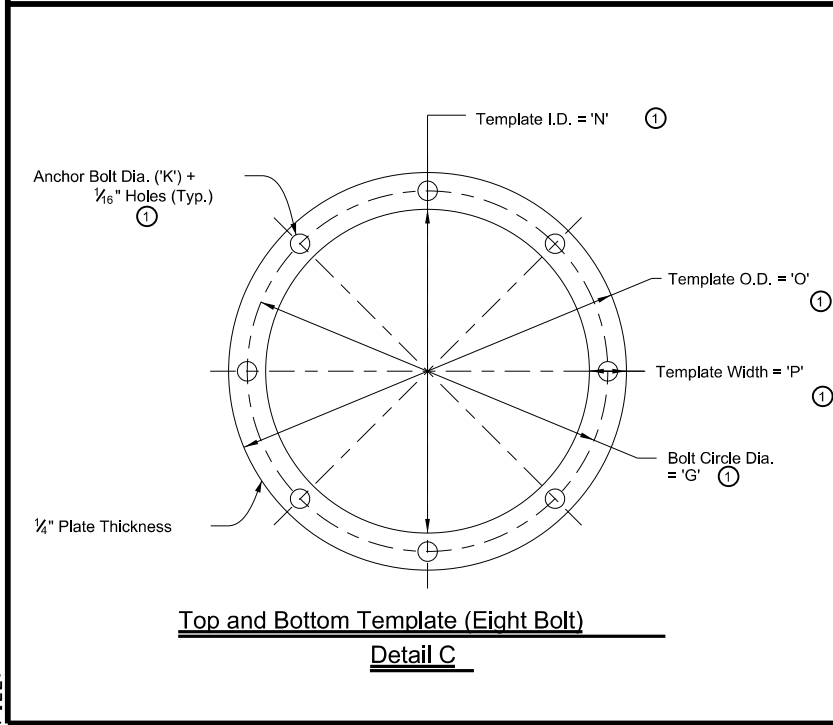
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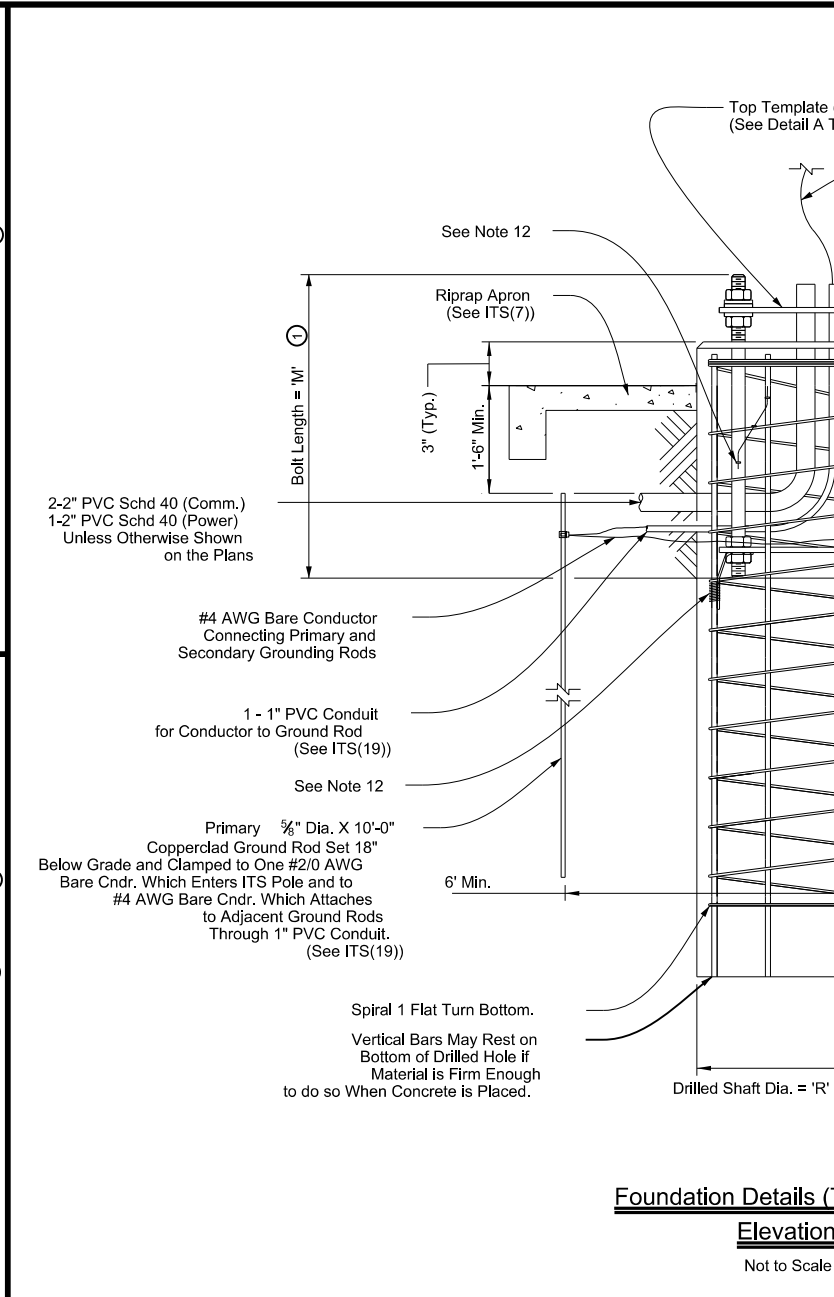
Top and Bottom Template (Four Bolt)
Detail A



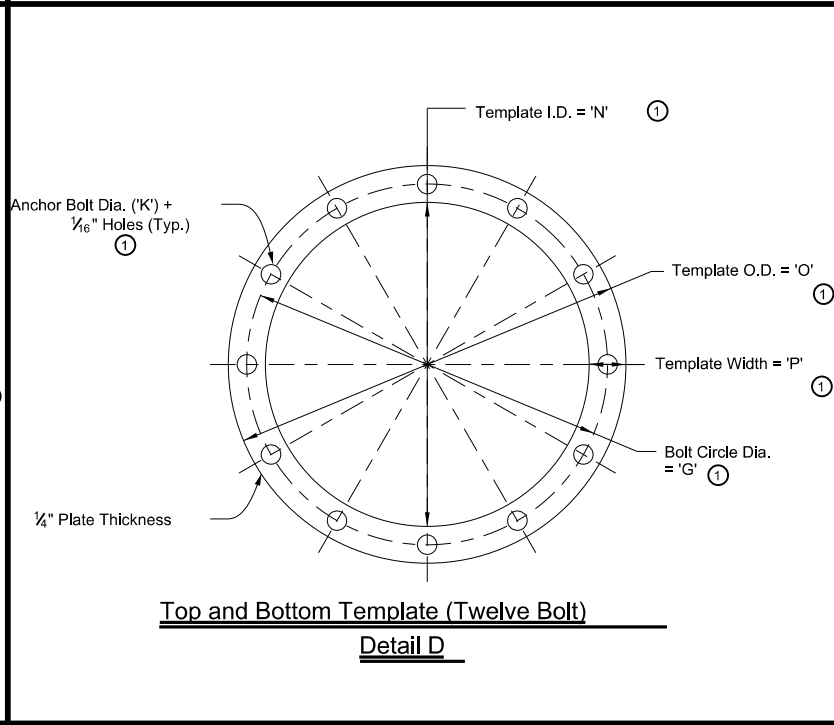
Top and Bottom Template (Six Bolt)
Detail B



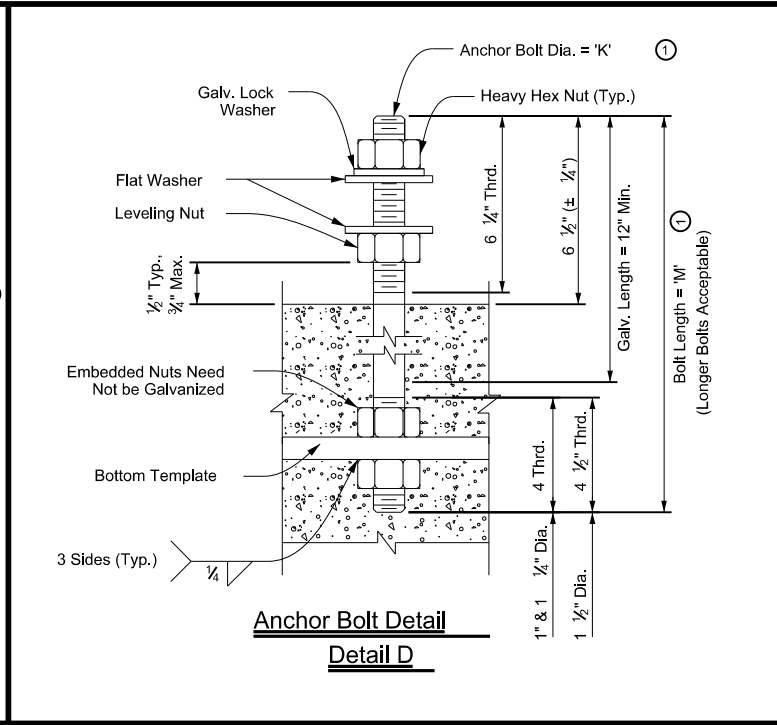
Top and Bottom Template (Eight Bolt)
Detail C



Foundation Details (Typical)
Elevation
Not to Scale



Top and Bottom Template (Twelve Bolt)
Detail D



Anchor Bolt Detail
Detail D

- 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 (F_y = 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.

Reference Notes:

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

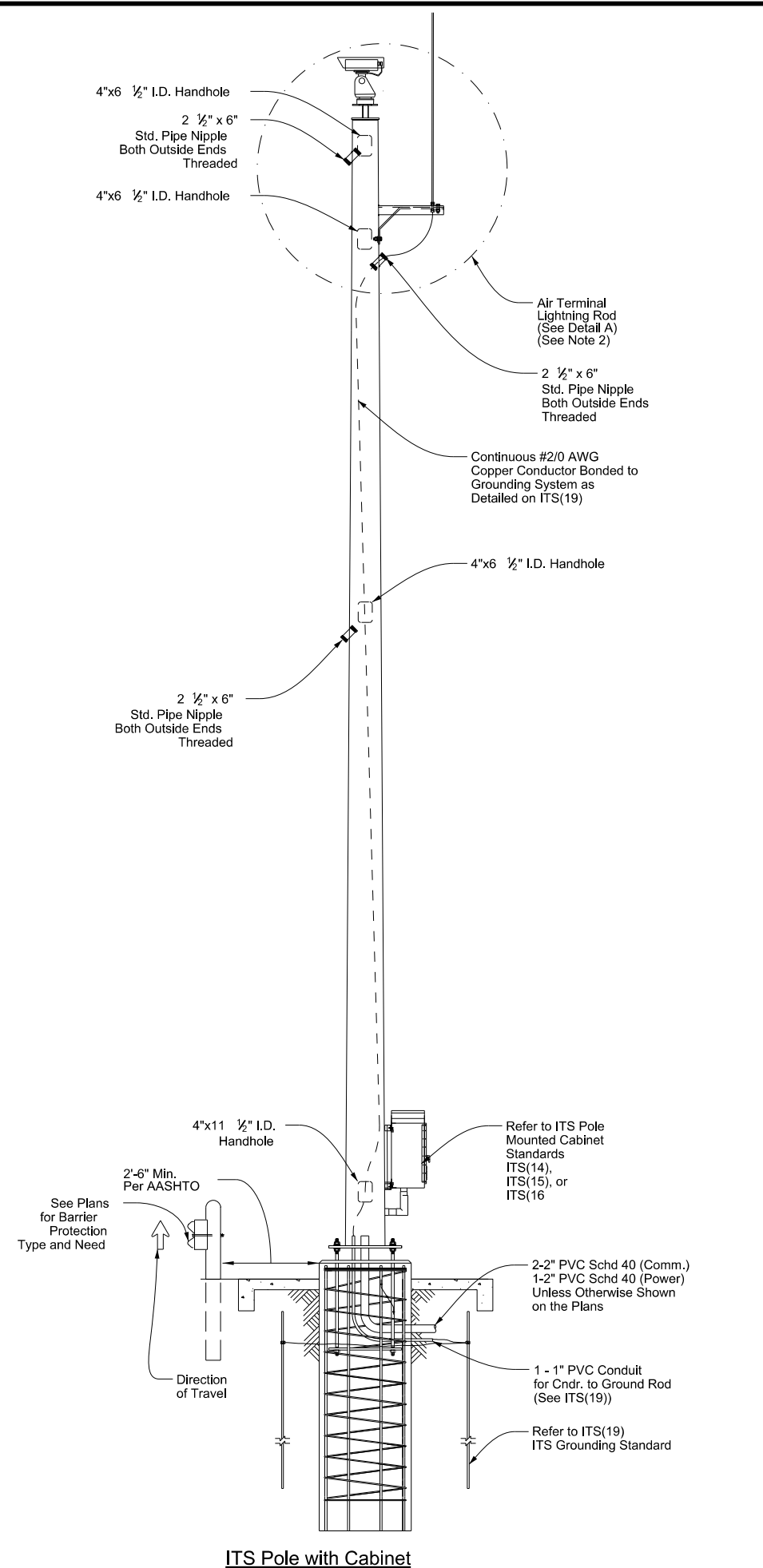
Texas Department of Transportation Traffic Operations Division Standard

ITS POLE FOUNDATION DETAILS

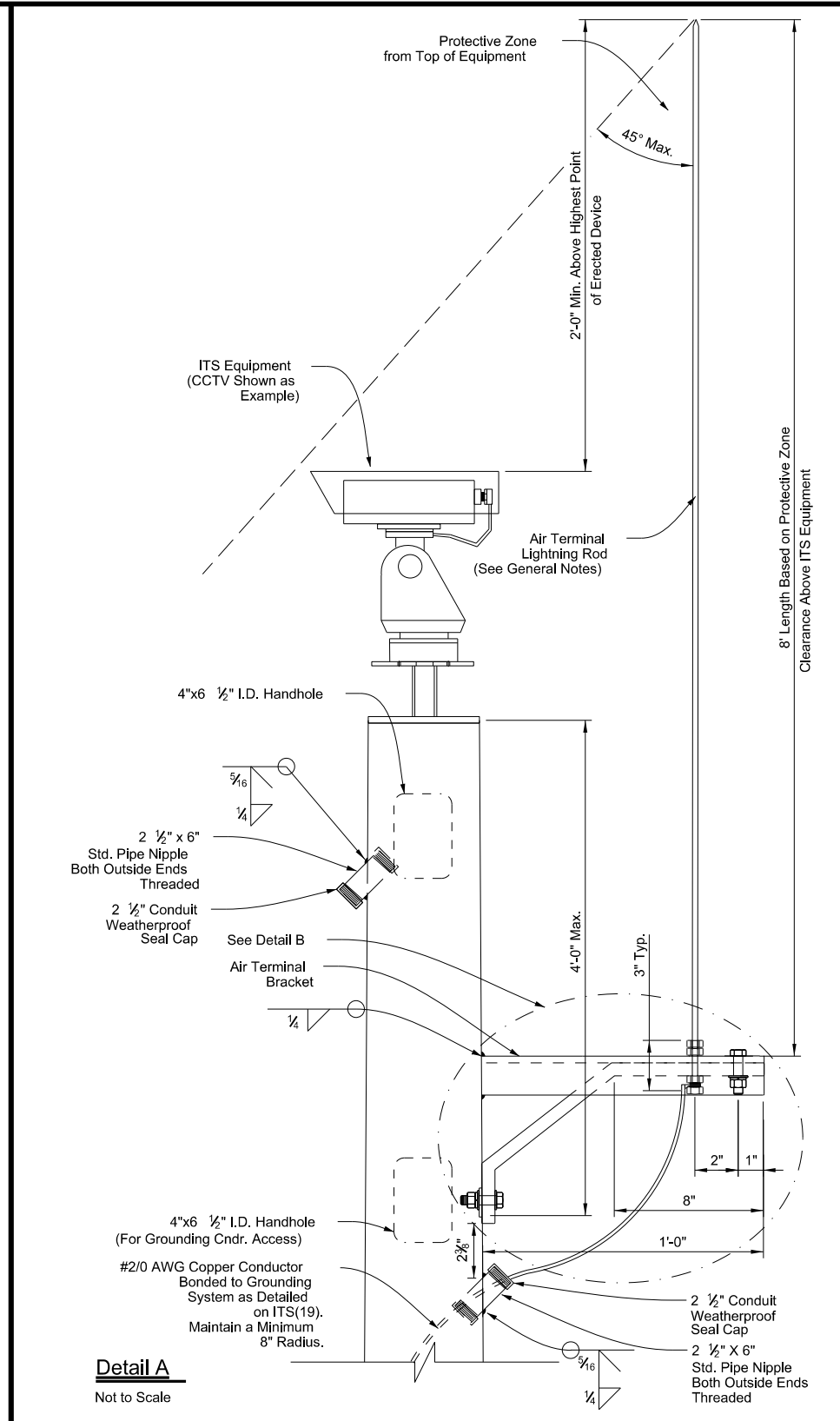
ITS(3) - 16

FILE: its(3) - 16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT June 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	00	299	VA
April 2016	DIST	COUNTY	SHEET NO.	
	FTW	TARRANT	56	

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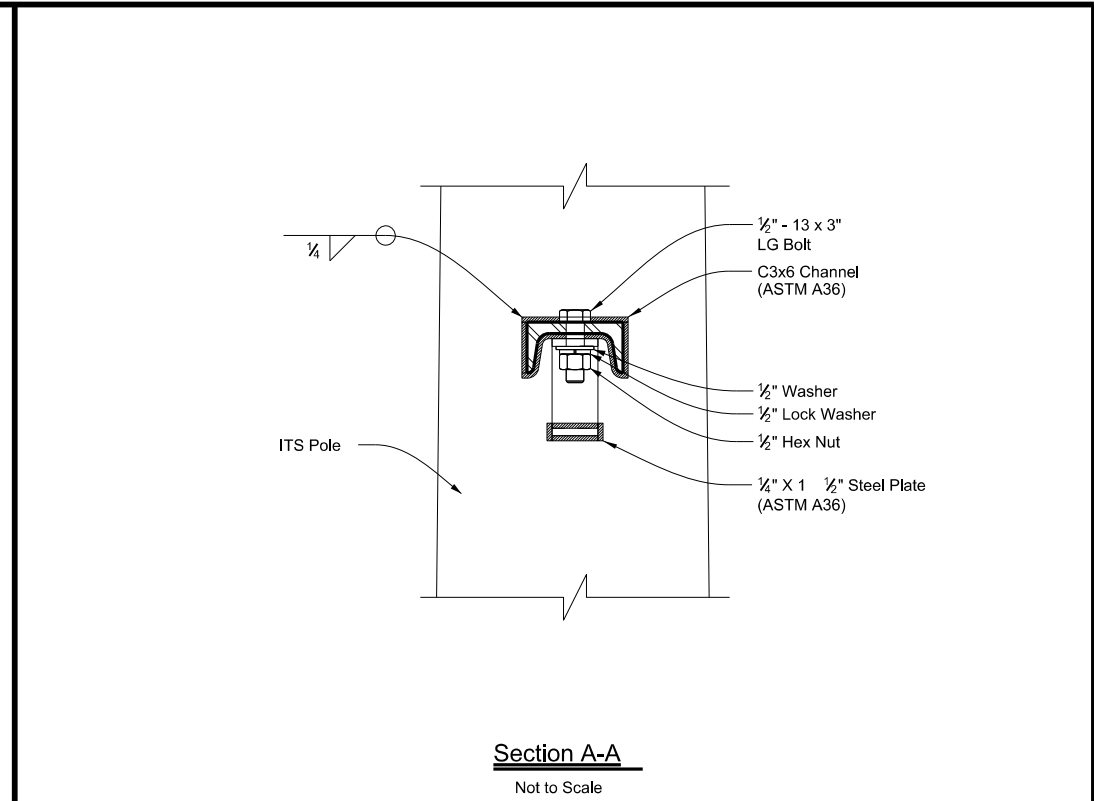


ITS Pole with Cabinet



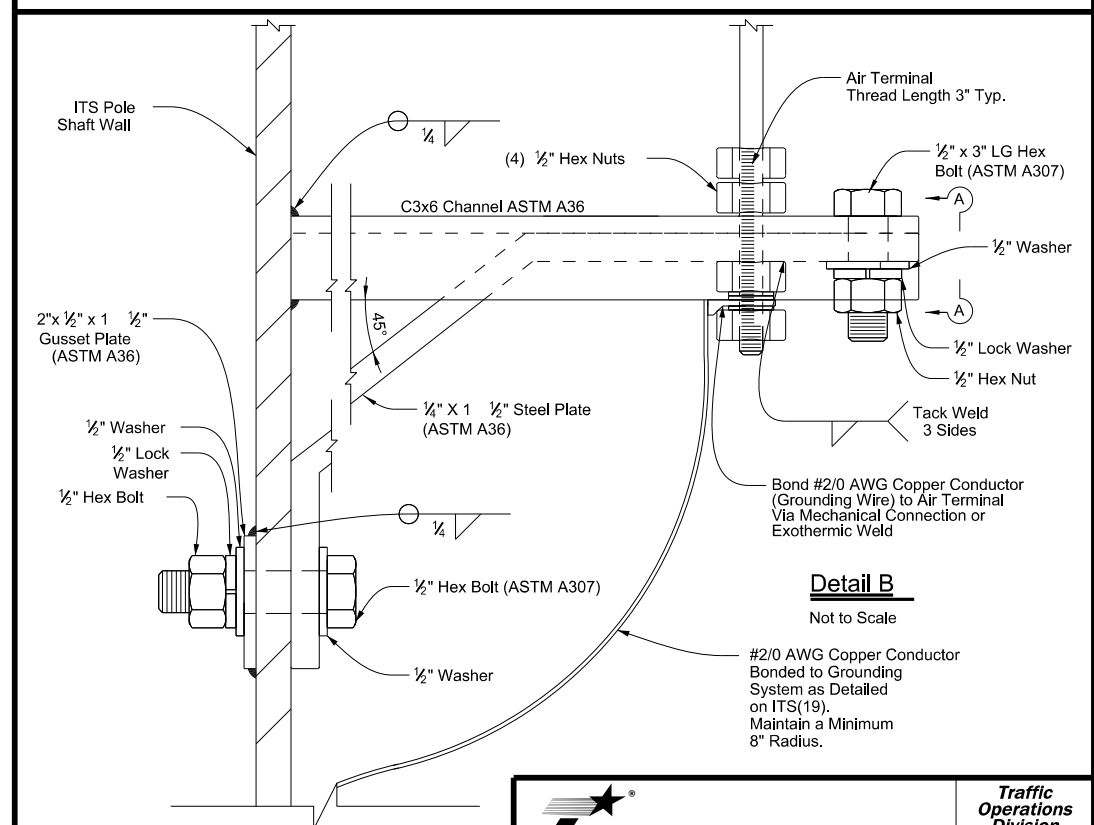
Detail A

Not to Scale



Section A-A

Not to Scale



Detail B

Not to Scale

General Notes:

- 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:
 - Position - in center of least utilized field of view.
 - Height - camera equipment to be within 45 degree protective zone of air terminal.
 - Material - 1/2" ETP alloy 110 copper air terminal (Class II)
 - Clearance - 24" minimum height above highest point of ITS equipment.
 - Bonding - attach air terminal to bracket by exothermic weld or with approved clamping.
 - Structure wind rating in accordance with TxDOT WV & IZ (LTS2013).
 - Galvanize air terminal bracket in accordance with Item 445, "Galvanizing."
- 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.
- Weld air terminal bracket to ITS pole in accordance with Item 448 "Structural Field Welding." Bracket may be welded by the fabricator in the shop prior to delivery. A bolted connection for the air terminal bracket is acceptable in lieu of a welded connection with approval by the Engineer and detailed in the shop drawings.

Texas Department of Transportation
Traffic Operations Division Standard

ITS POLE AIR TERMINAL DETAILS

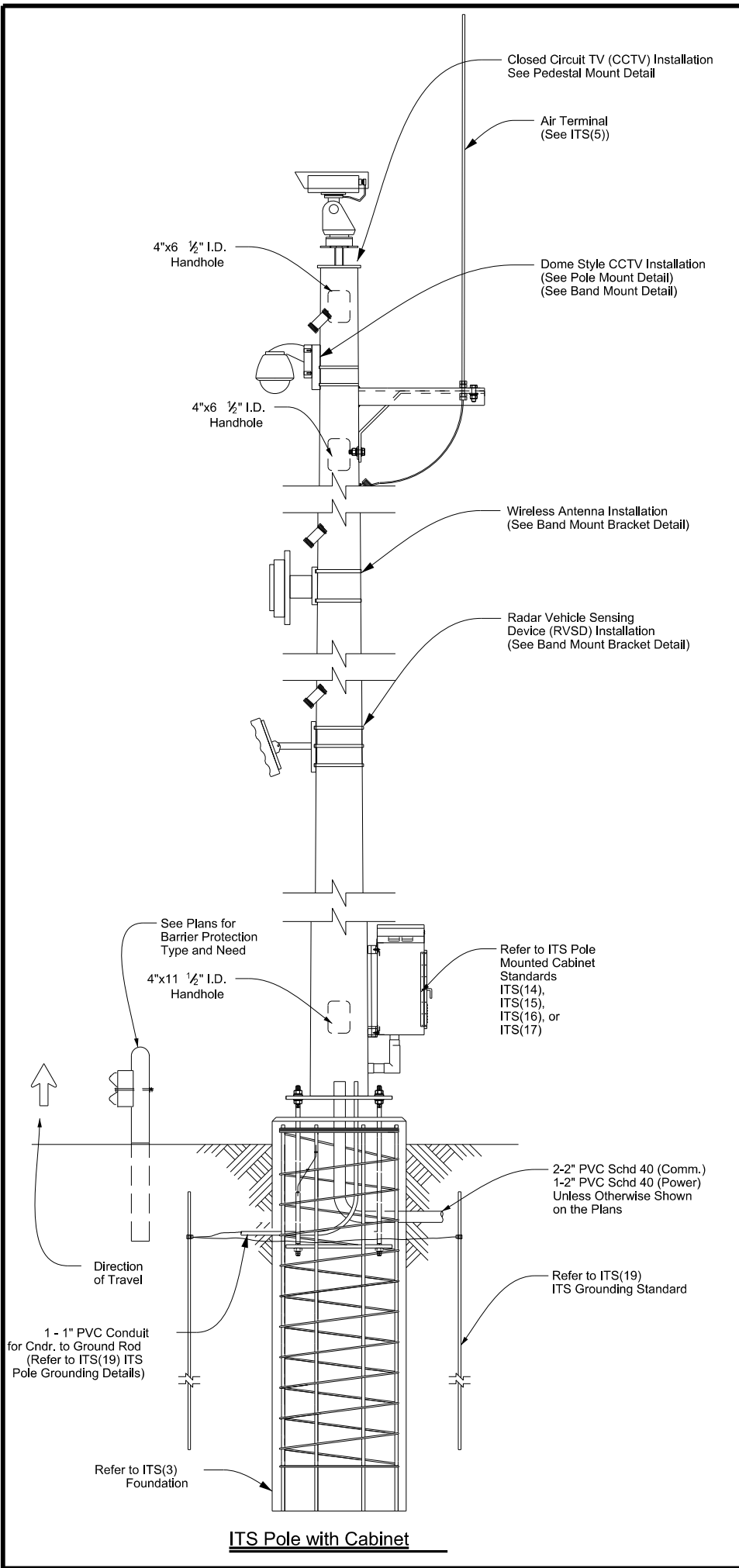
ITS(5) - 15

FILE: its(5) - 15.dgn	DWN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT June 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	00	299	VA
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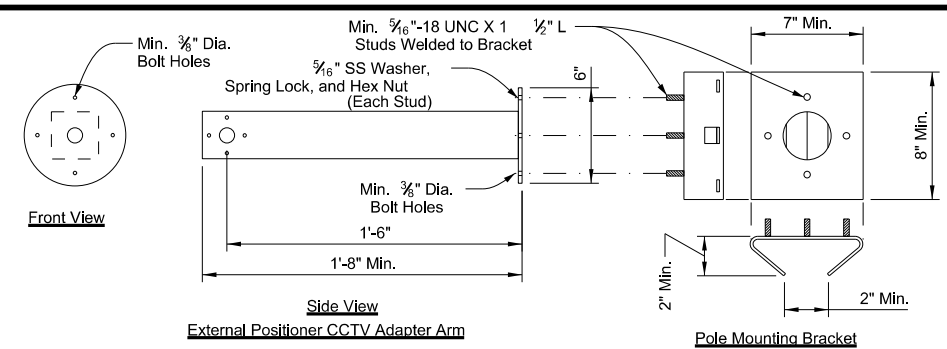
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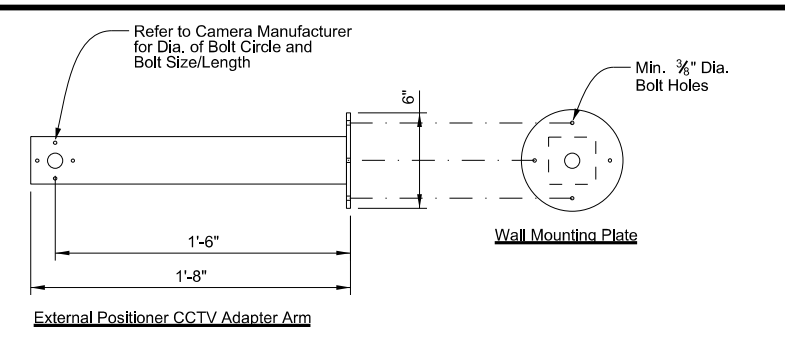
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ITS Pole with Cabinet

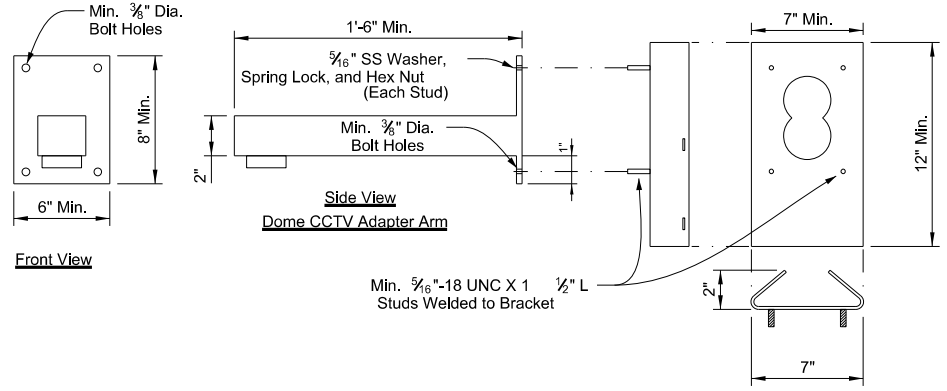


External Positioner CCTV Adapter Arm



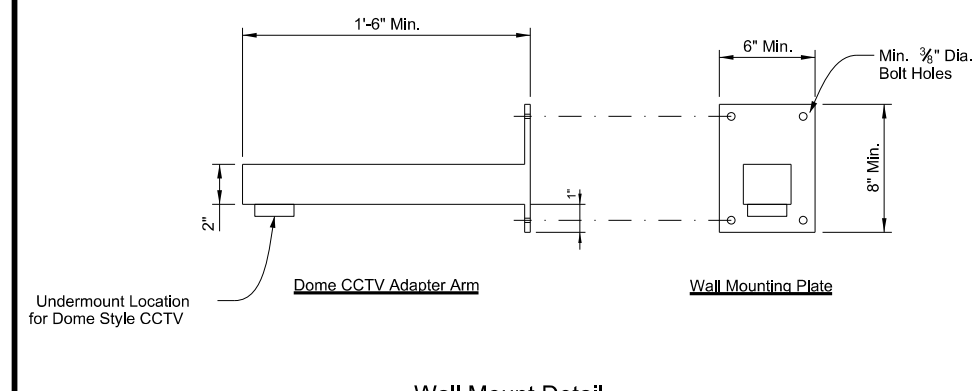
External Positioner CCTV Adapter Arm

Wall Mounting Plate

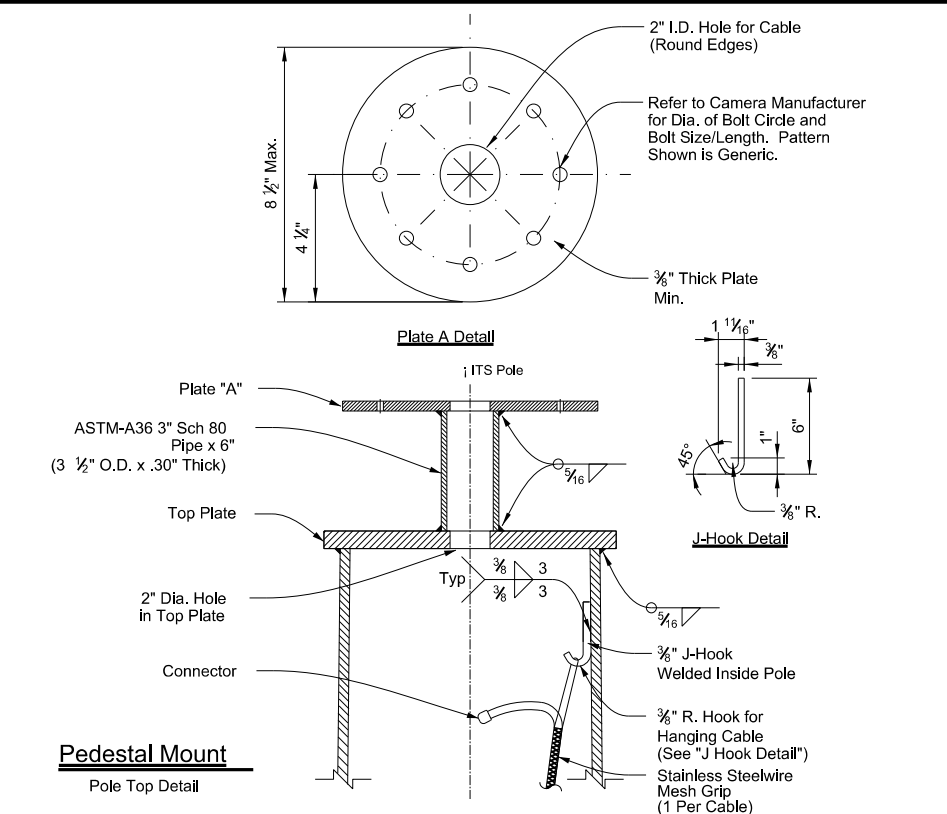


Pole Mount Detail for Camera

Pole Mounting Bracket

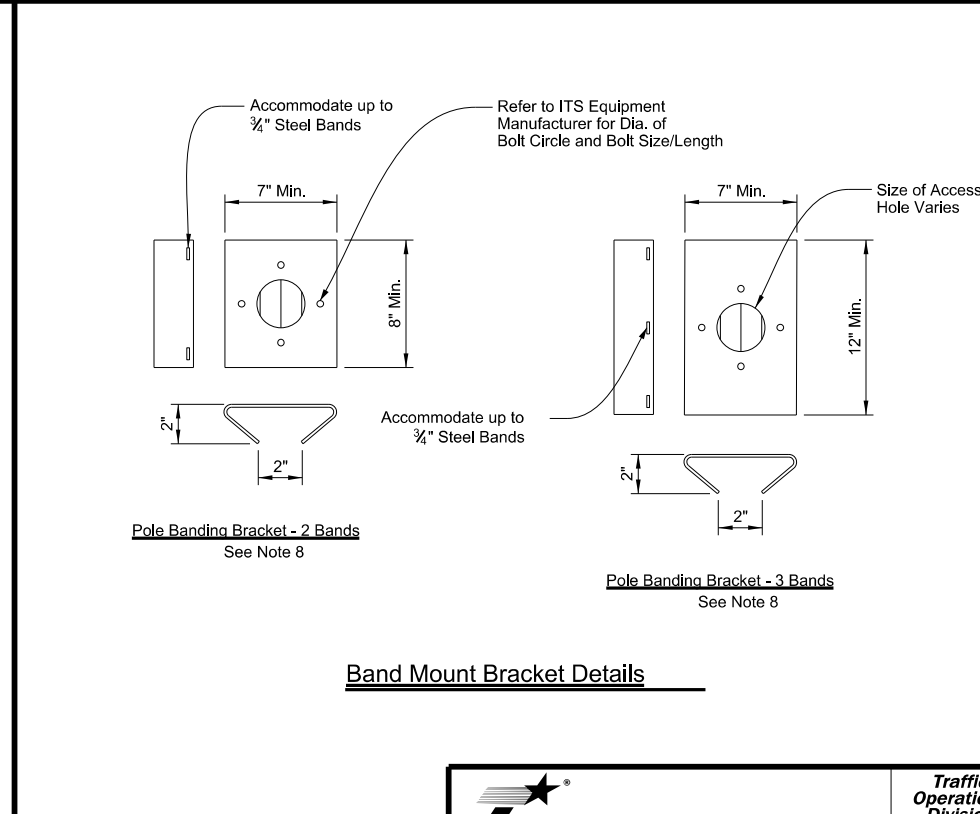


Wall Mount Detail



Pedestal Mount

Pole Top Detail



Band Mount Bracket Details

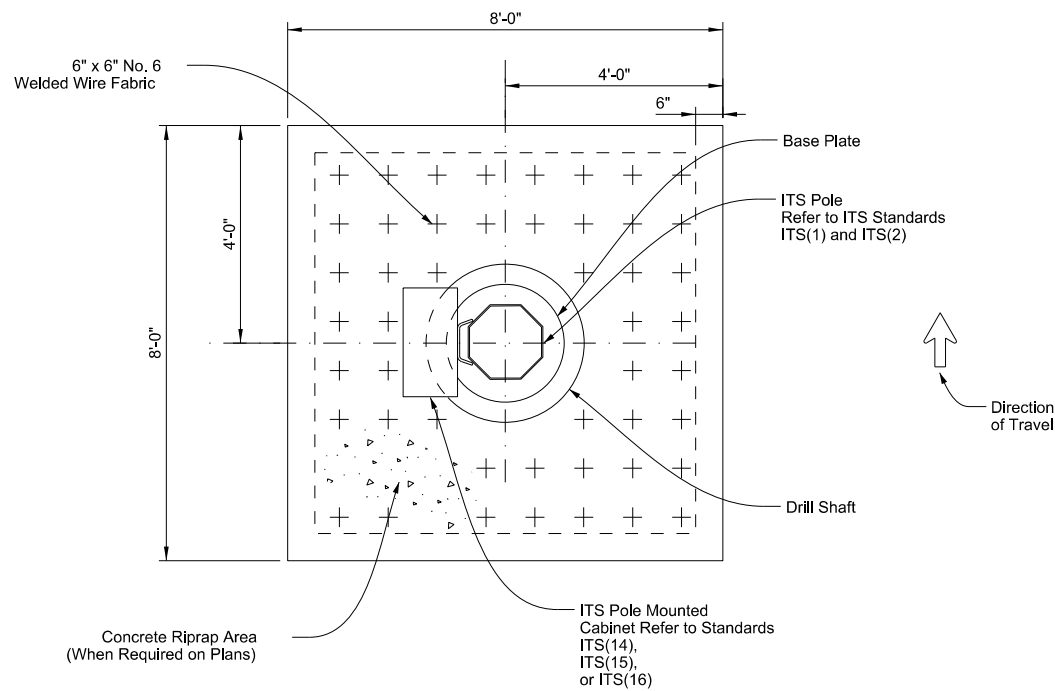
General Notes:

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 AWS D 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.

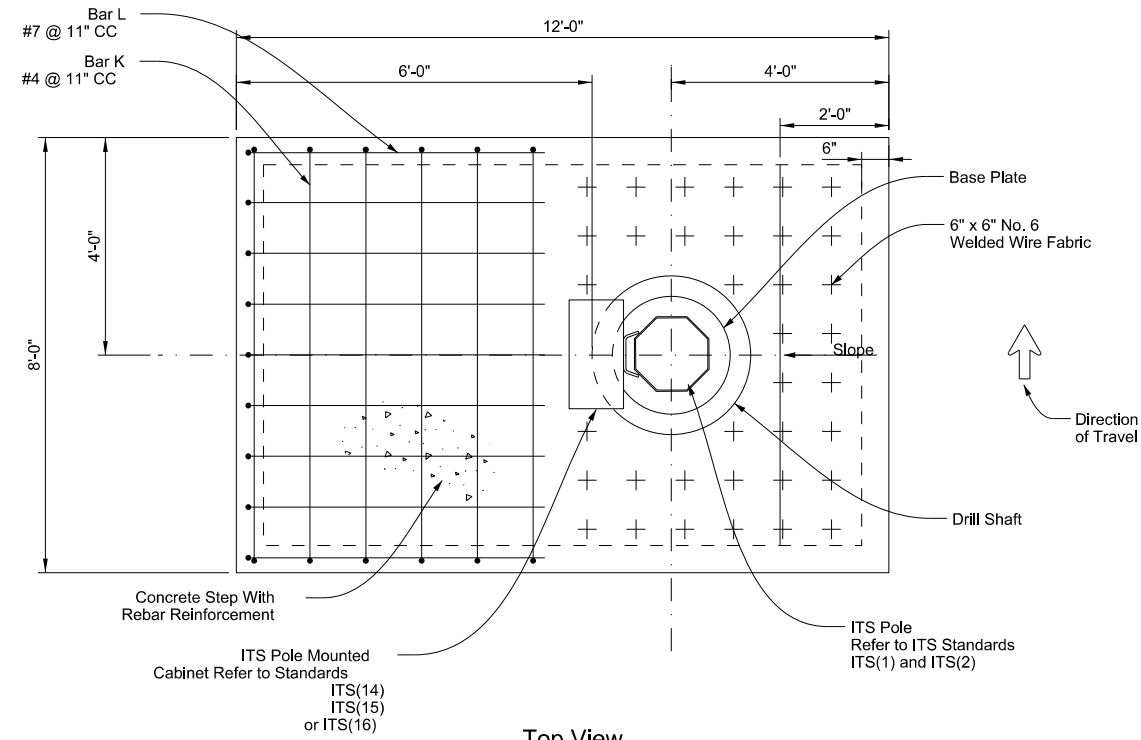
		Traffic Operations Division Standard	
<h2>ITS POLE EQUIPMENT MOUNTING DETAILS</h2> <h3>ITS (6) - 15</h3>			
FILE: its(6)-15.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT	REV: 00	JOB: 0902 00	HIGHWAY: 299 VA
DIST: FTW		COUNTY: TARRANT	SHEET NO.: 59

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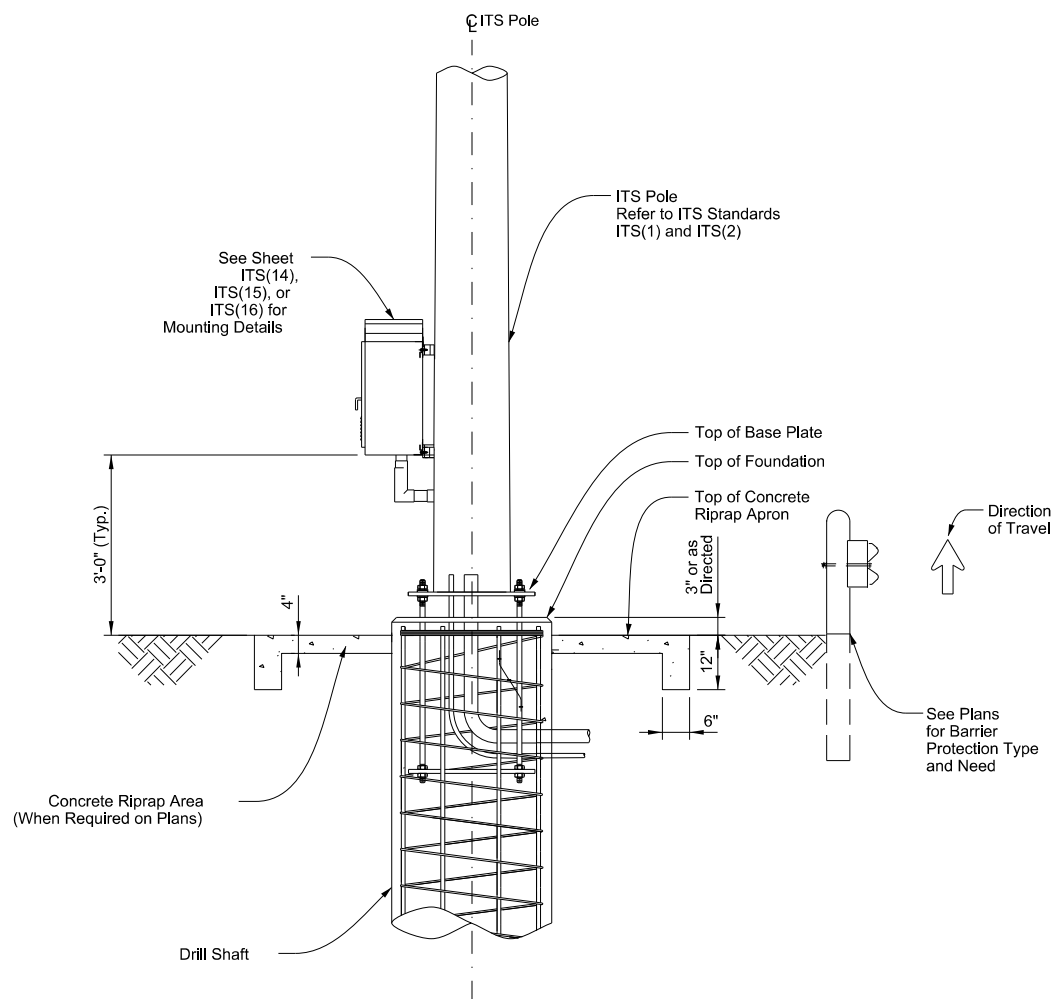
Top View
Riprap - Non-Sloped Conditions



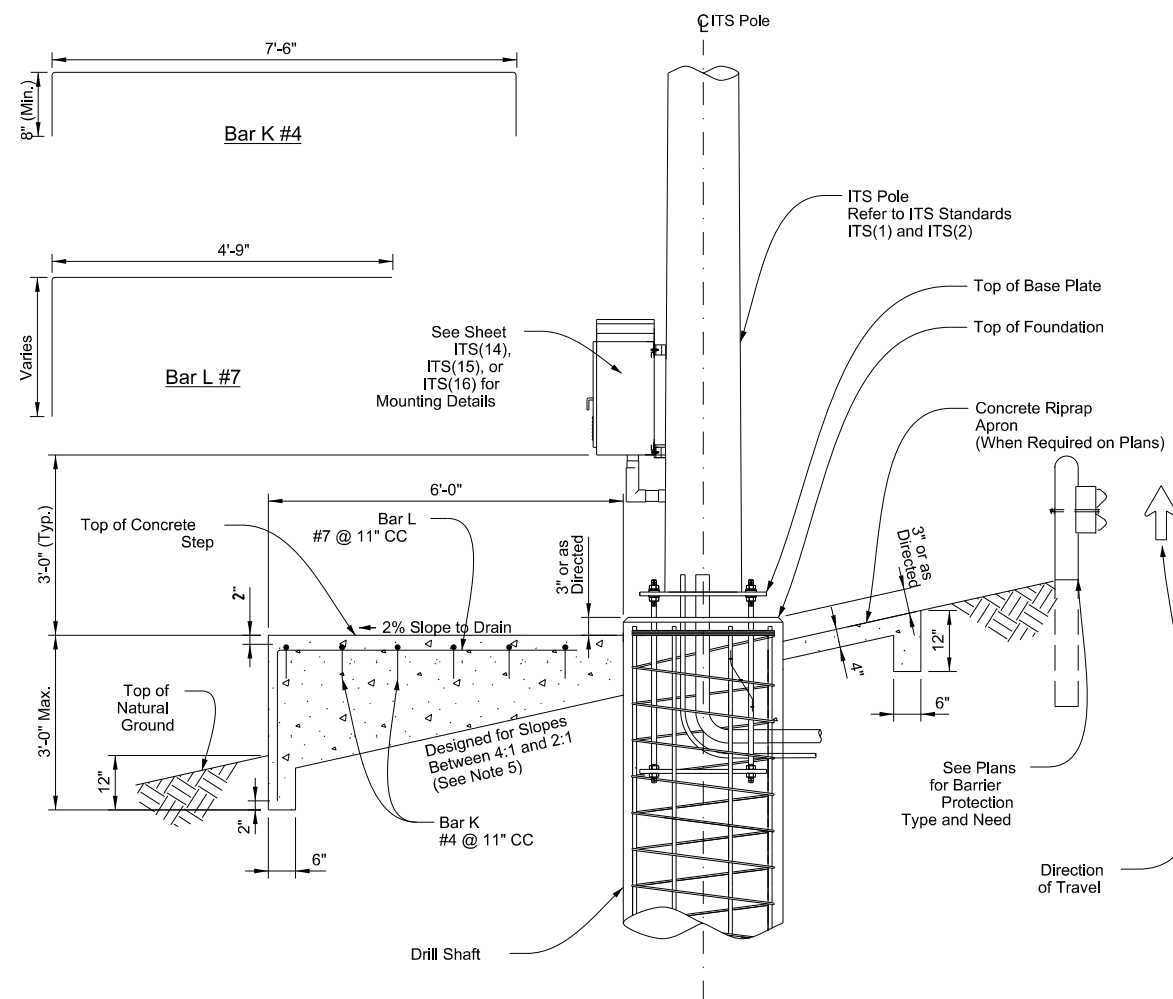
Top View
Step and Riprap - Sloped Conditions

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)

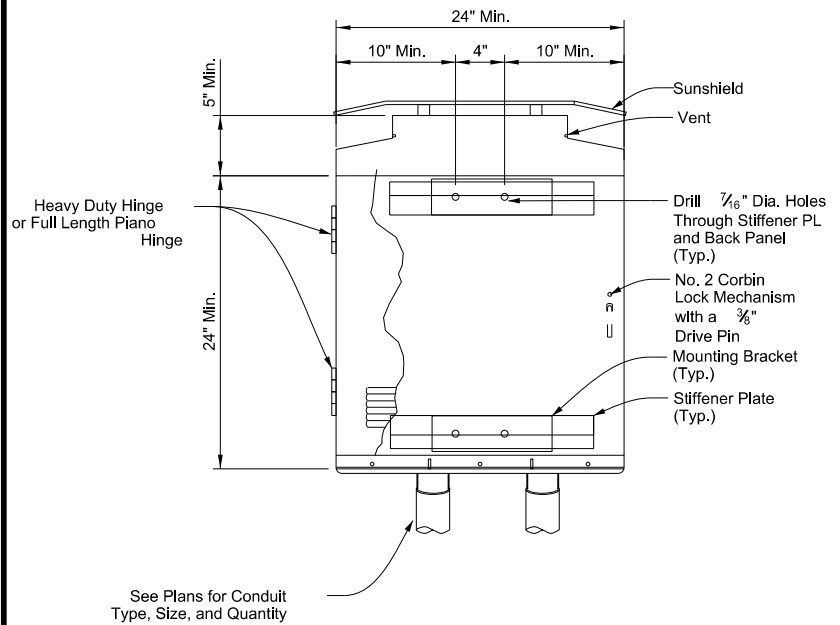


**ITS POLE
RIPRAP DETAILS**

ITS(7) - 15

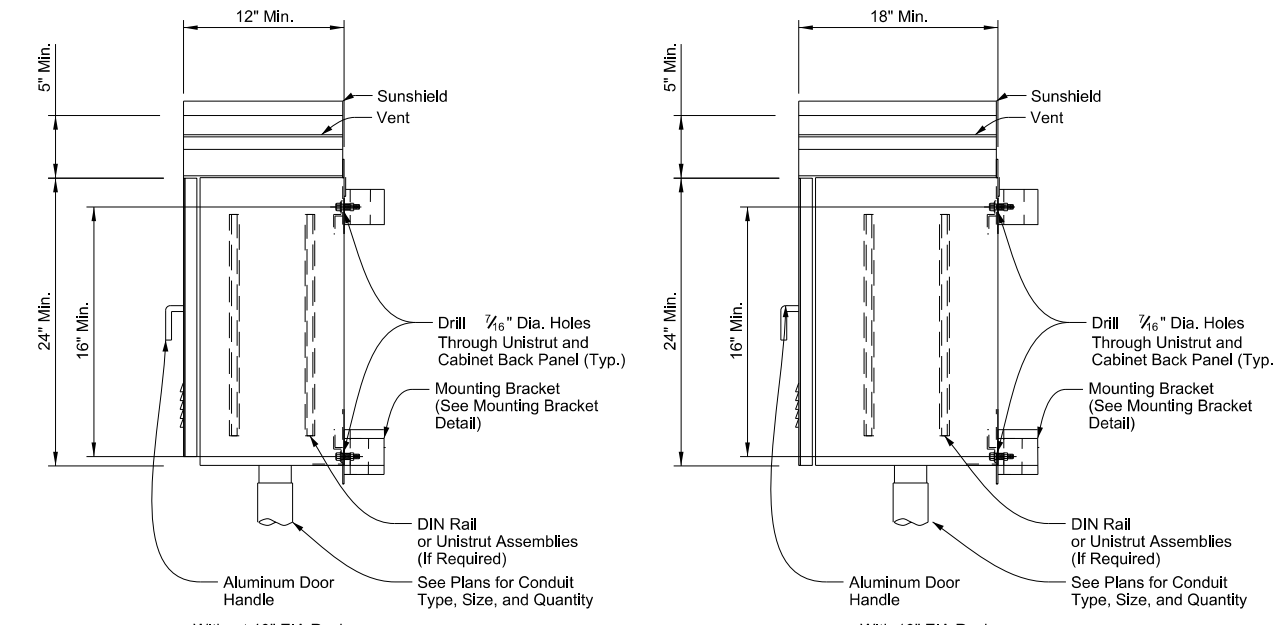
FILE: its(7) - 15.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
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REVISIONS	0902	00	299	VA
	DIST	COUNTY	SHEET NO.	
	FTW	TARRANT	60	

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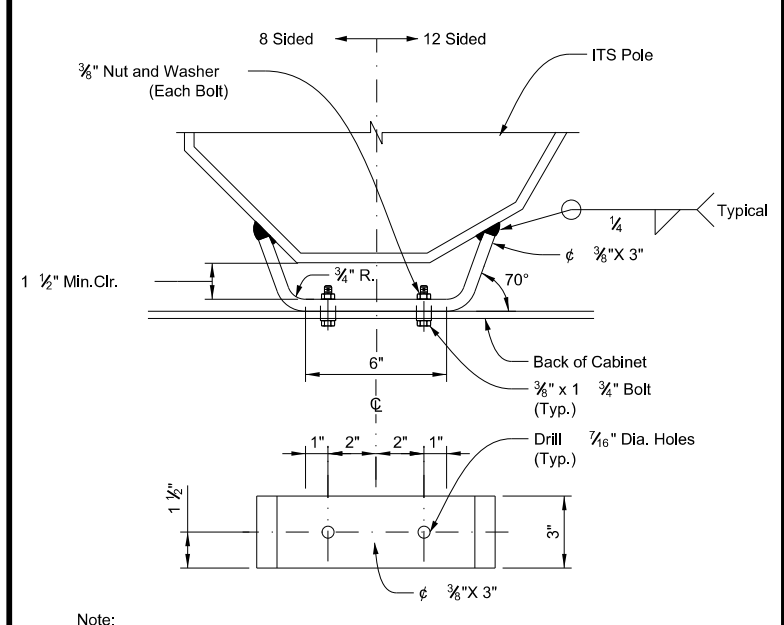
Pole Mounted Cabinet - Type 1 Front View

Not to Scale



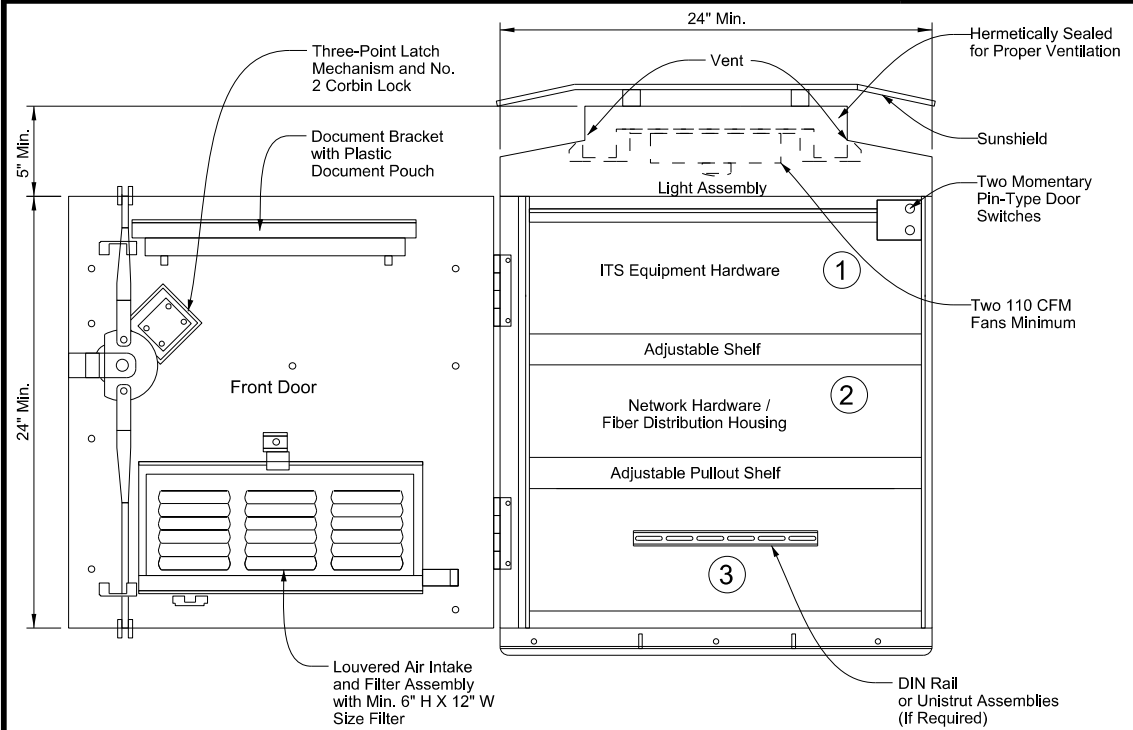
Pole Mounted Cabinet - Type 1 Side View

Not to Scale



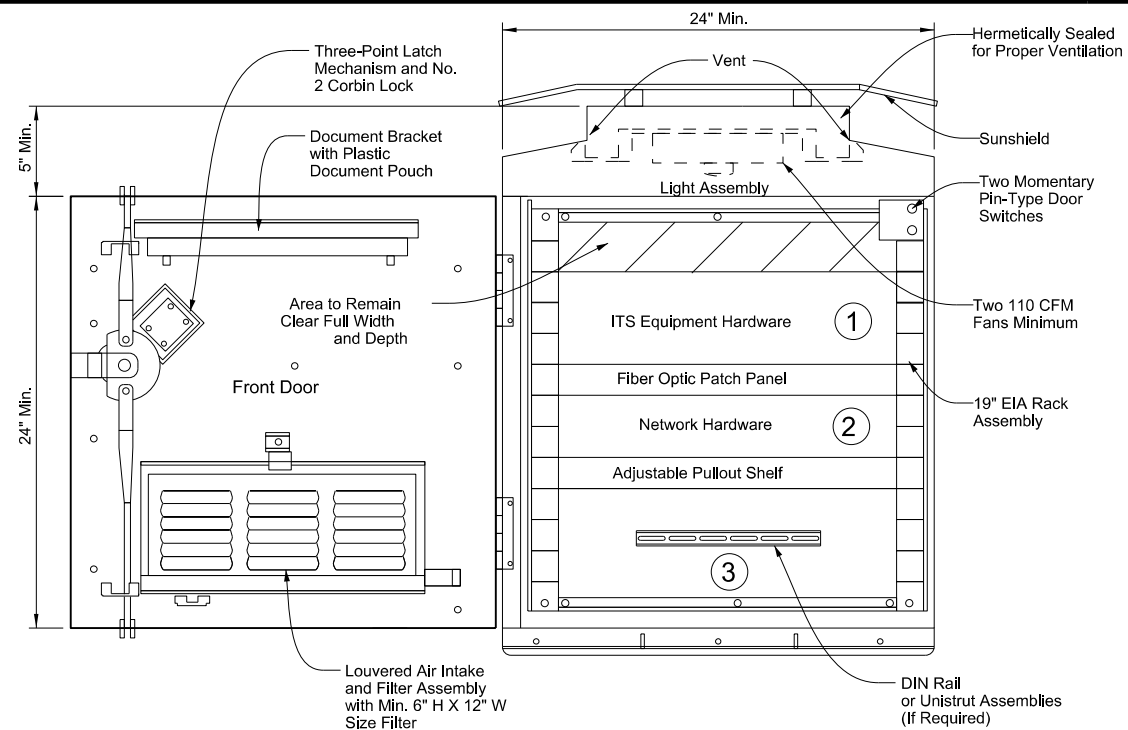
Mounting Bracket Detail

Not to Scale



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

Not to Scale



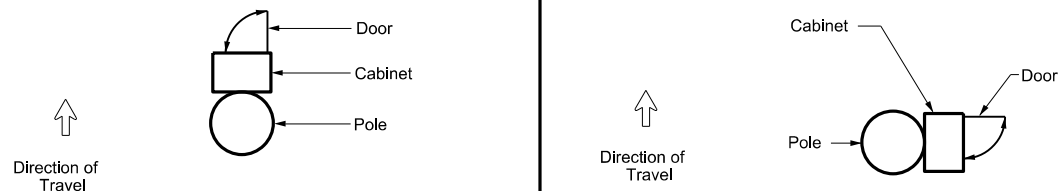
Interior - Type 1 With 19" EIA Rack - Front View

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:

- 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.
- 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.
- 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.
- All dimensions are approximate and represent minimum cabinet dimensions.
- Provide conduit entrances at the bottom of the cabinet.
- 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



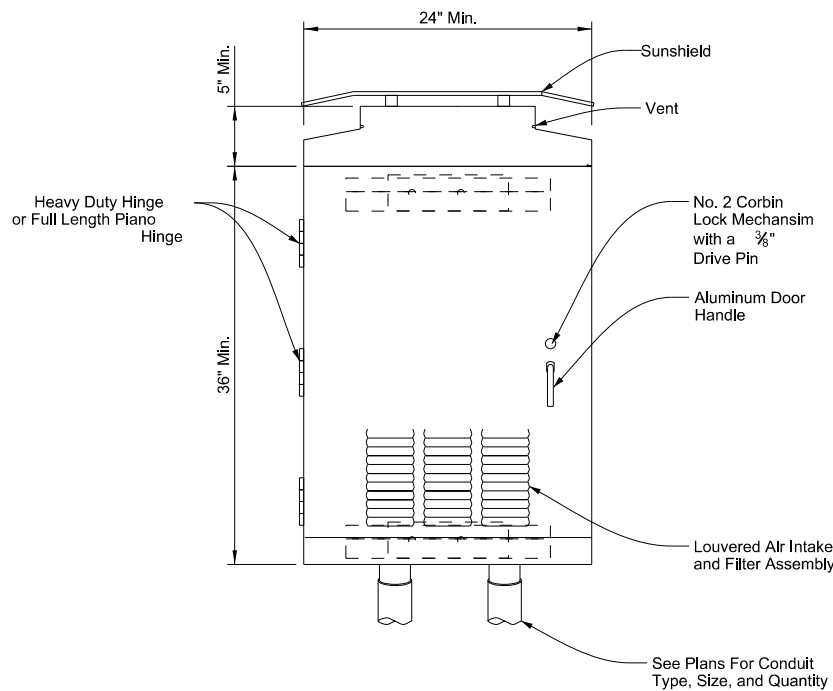
ITS POLE MOUNTED CABINET TYPE 1 DETAILS

ITS(14)-15

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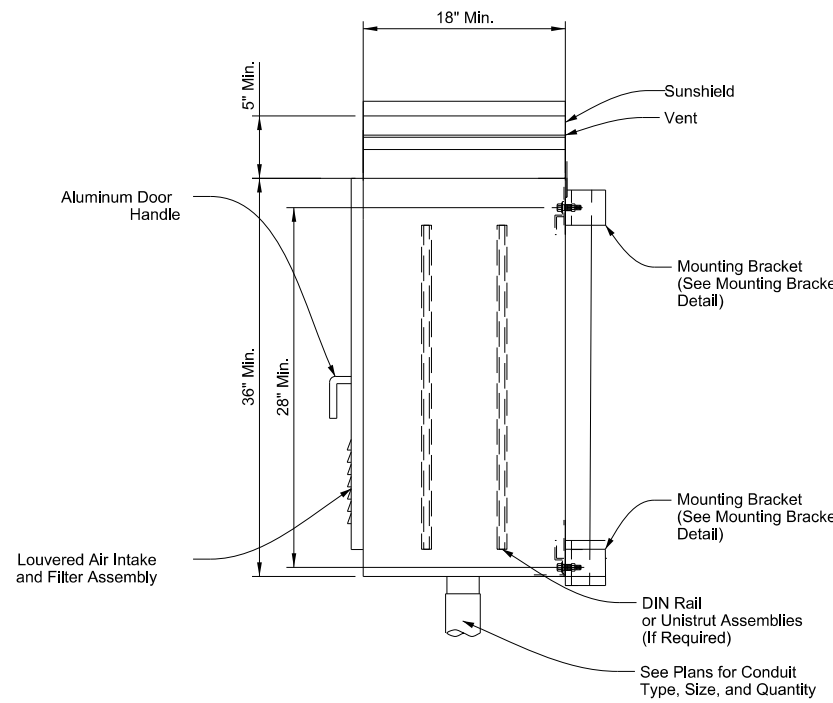
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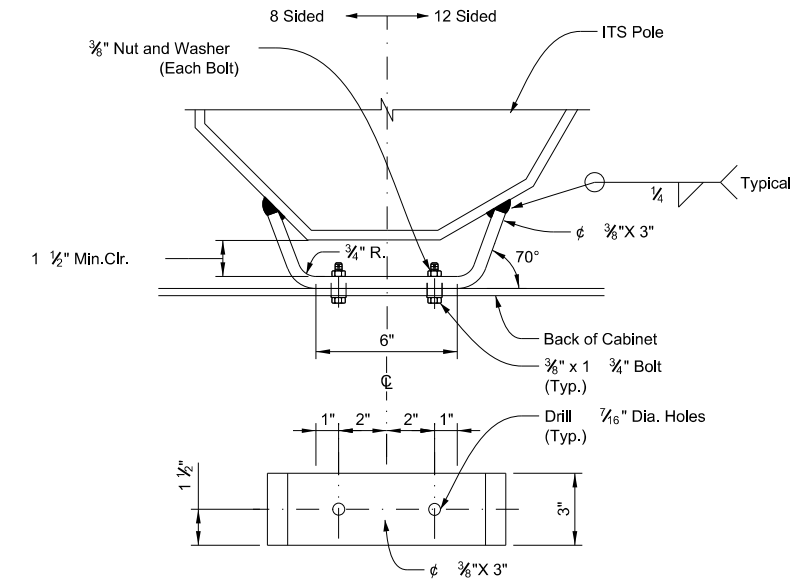
Pole Mounted Cabinet - Type 2 Front View

Not to Scale



Pole Mounted Cabinet - Type 2 Side View

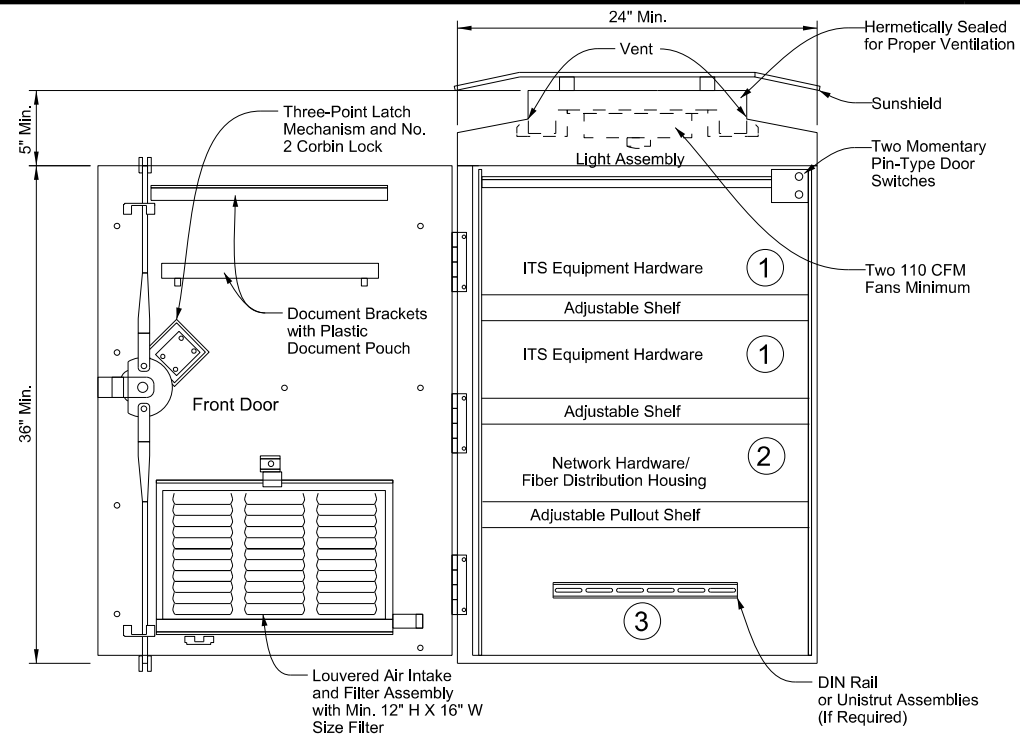
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Note:
 ITS Pole May be Round, Octagonal (8 Sided), or Dodecahedron (12 Sided).
 See ITS(1), and ITS(2) for Details.

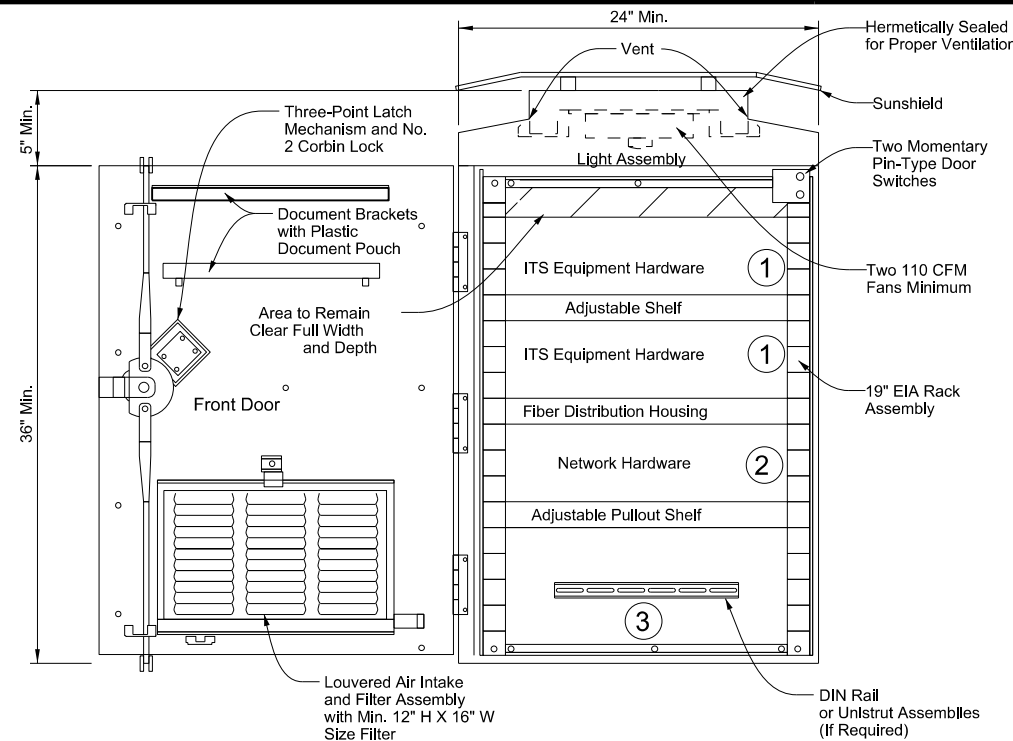
Mounting Bracket Detail

Not to Scale



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

Not to Scale



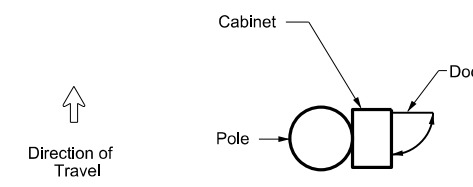
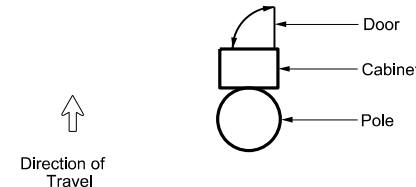
Interior - Type 2 With 19" EIA Rack - Front View

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:

- 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.
- 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.
- 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.
- All dimensions are approximate and represent minimum cabinet dimensions.
- Provide conduit entrances at the bottom of the cabinet.
- Paid under Special Specification "ITS Pole with Cabinet" (Configuration 1) without 19" EIA rack.
 Paid under Special Specification "ITS Pole with Cabinet" (Configuration 2) with 19" EIA rack.



Orientation of Type 2 Cabinet on ITS Pole (Typical)

Not to Scale

Texas Department of Transportation
 Traffic Operations Division Standard

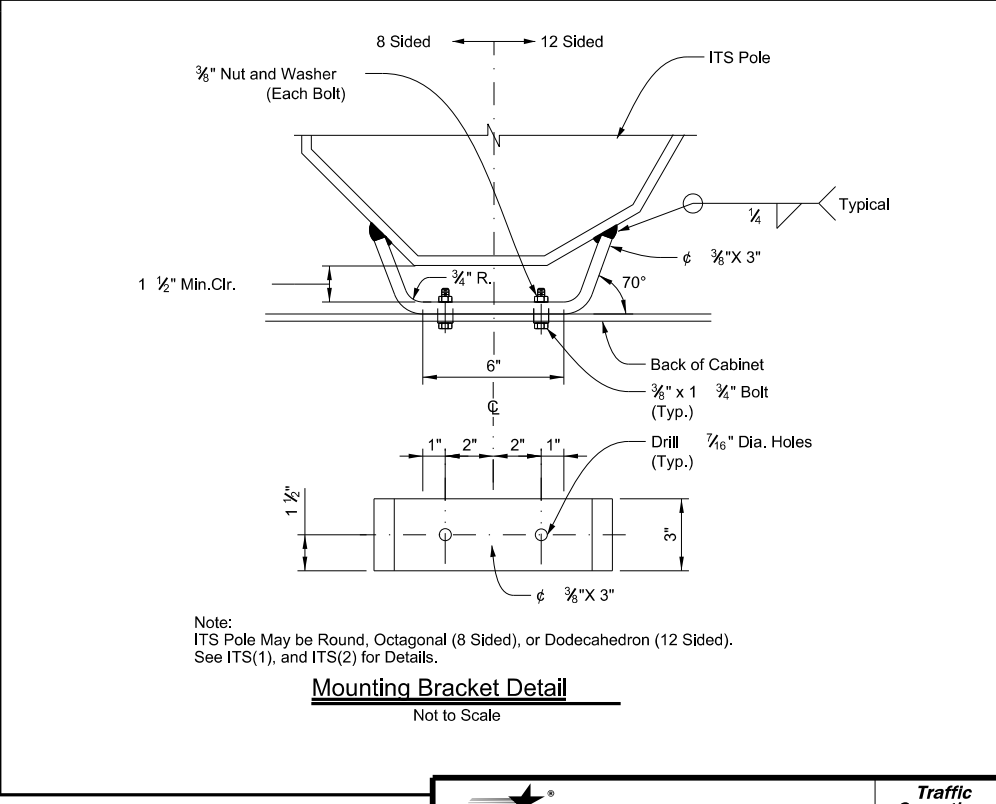
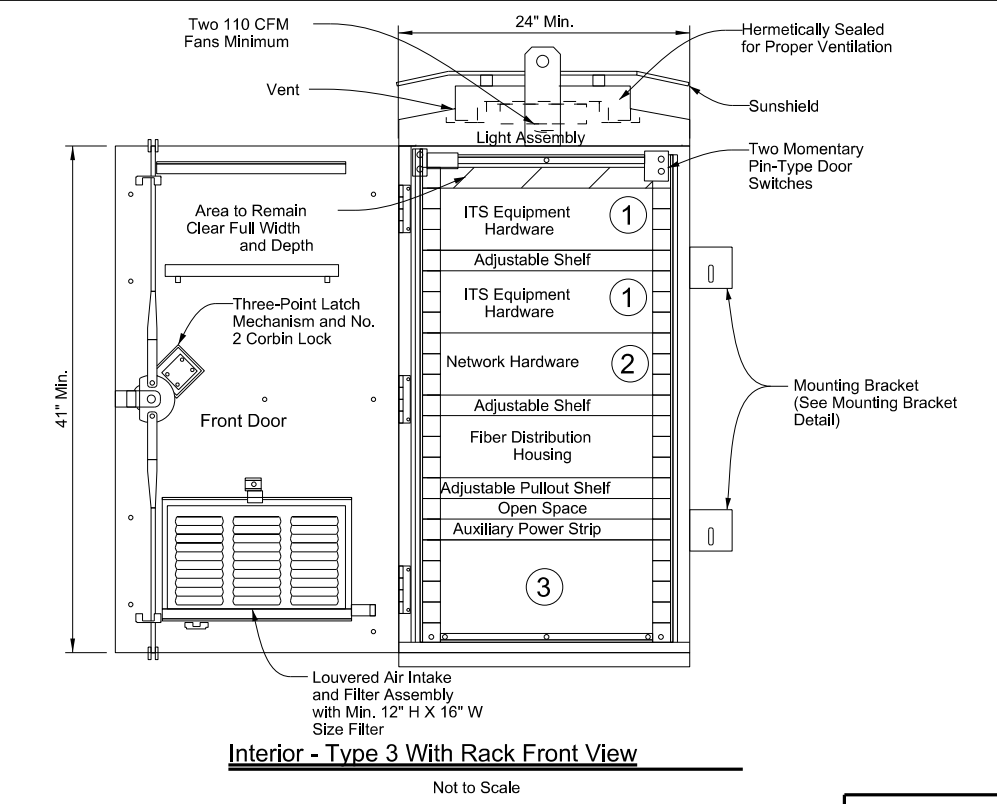
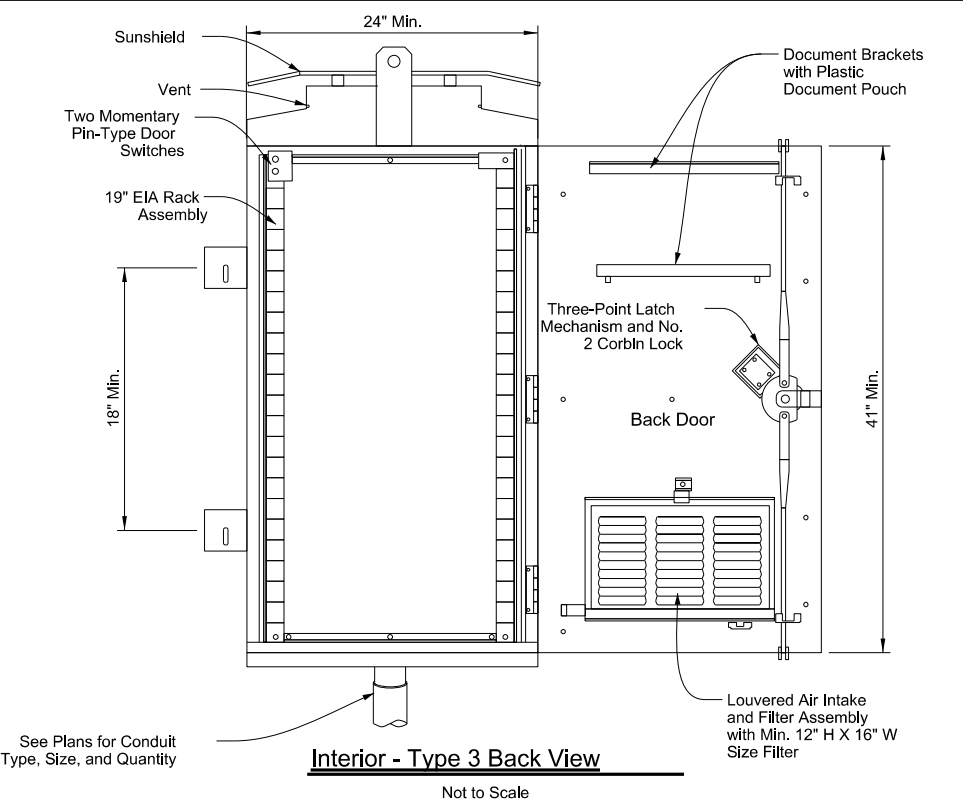
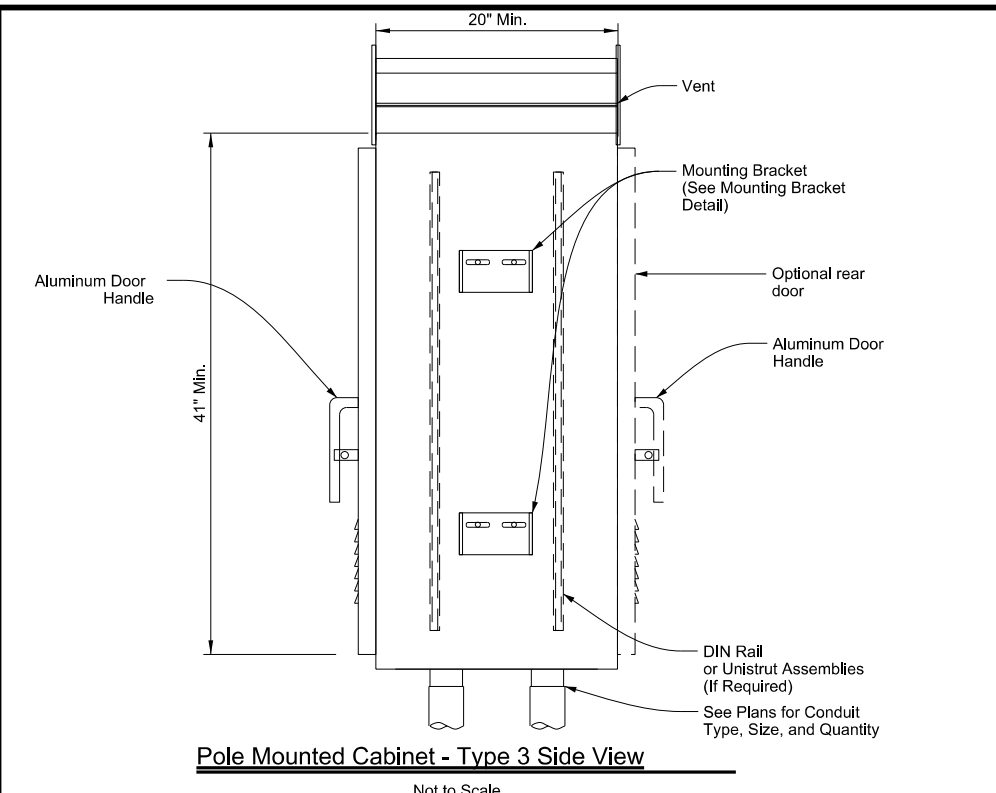
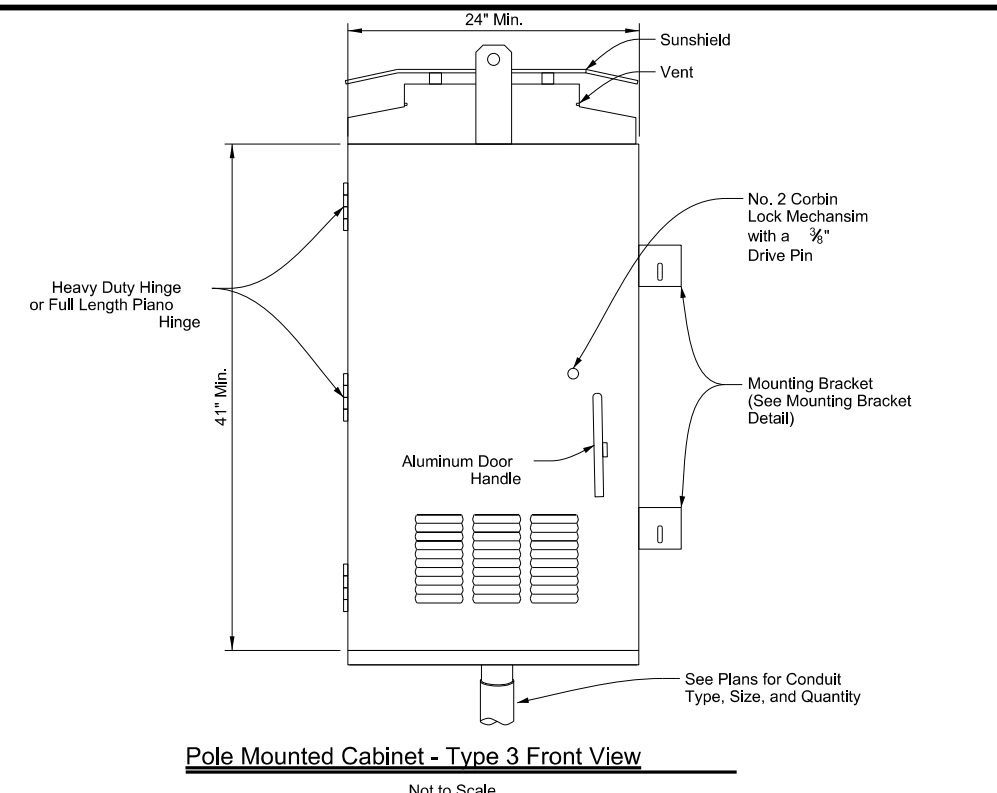
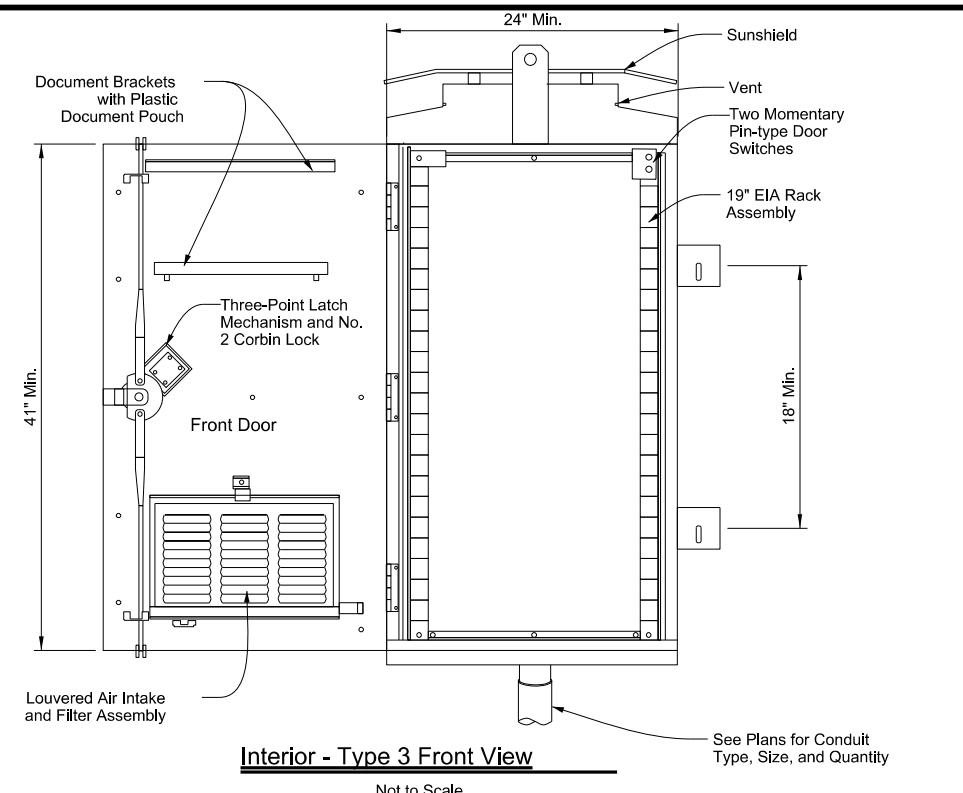
ITS POLE MOUNTED CABINET TYPE 2 DETAILS

ITS(15)-15

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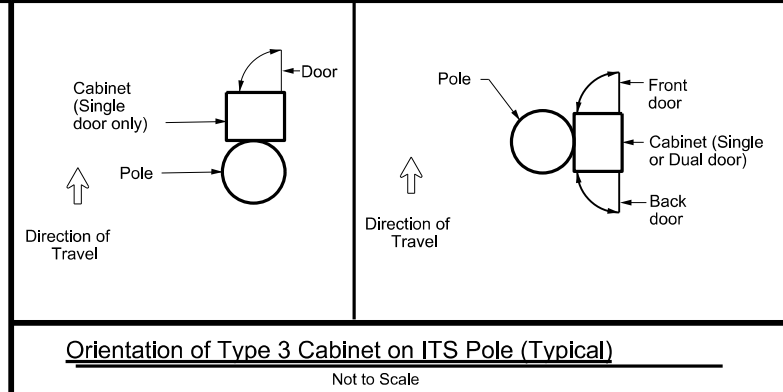
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General Notes:

- Layout of hardware equipment and configuration shown is diagrammatic in nature and intended to represent a preferred Type 3 pole mounted cabinet setup. Hardware needed for each Type 3 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.
- Mount cabinet as detailed on 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. A dual door configuration (configuration 2) is detailed above.
- 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.
- All dimensions are approximate and represent minimum cabinet dimensions.
- Provide conduit entrances at the bottom of the cabinet.
- Paid under Special Specification "ITS Pole with Cabinet" (Configuration 1) with single door.
 Paid under Special Specification "ITS Pole with Cabinet" (Configuration 2) with dual door



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

Texas Department of Transportation
 Traffic Operations Division Standard

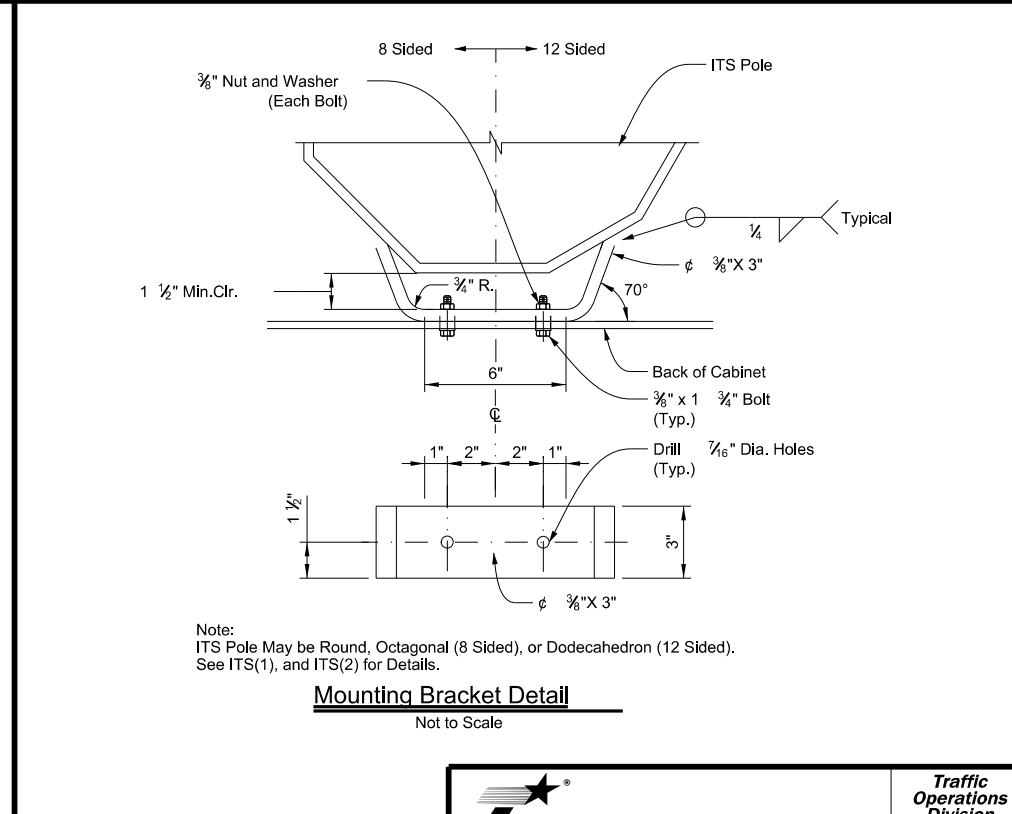
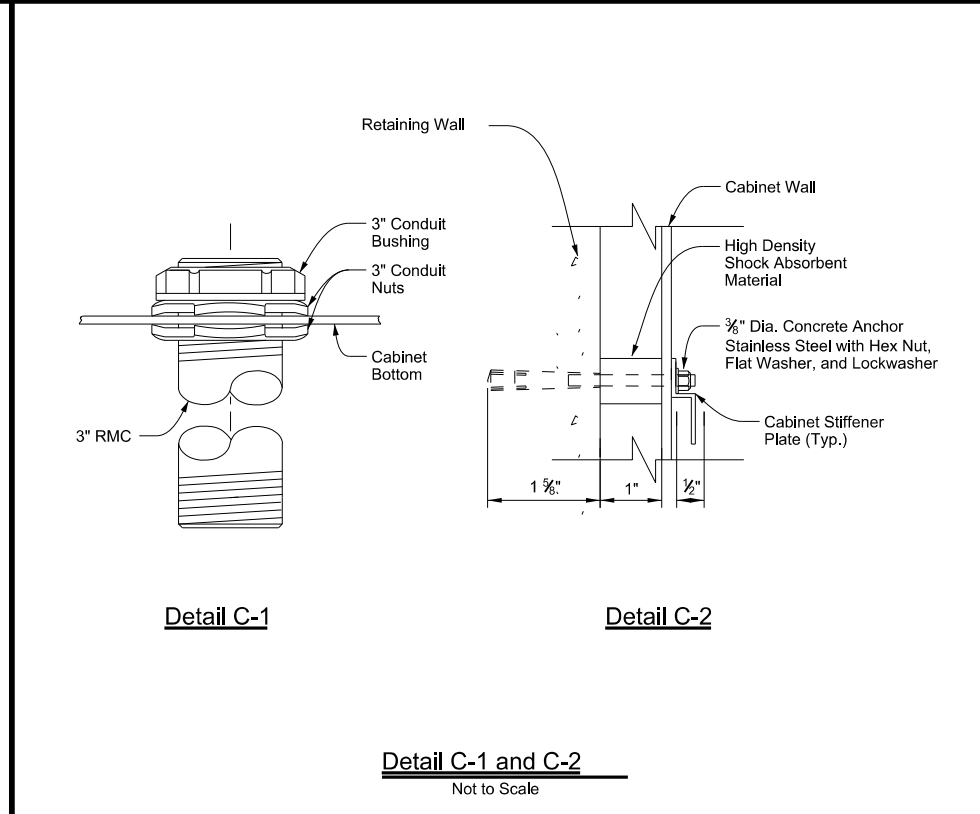
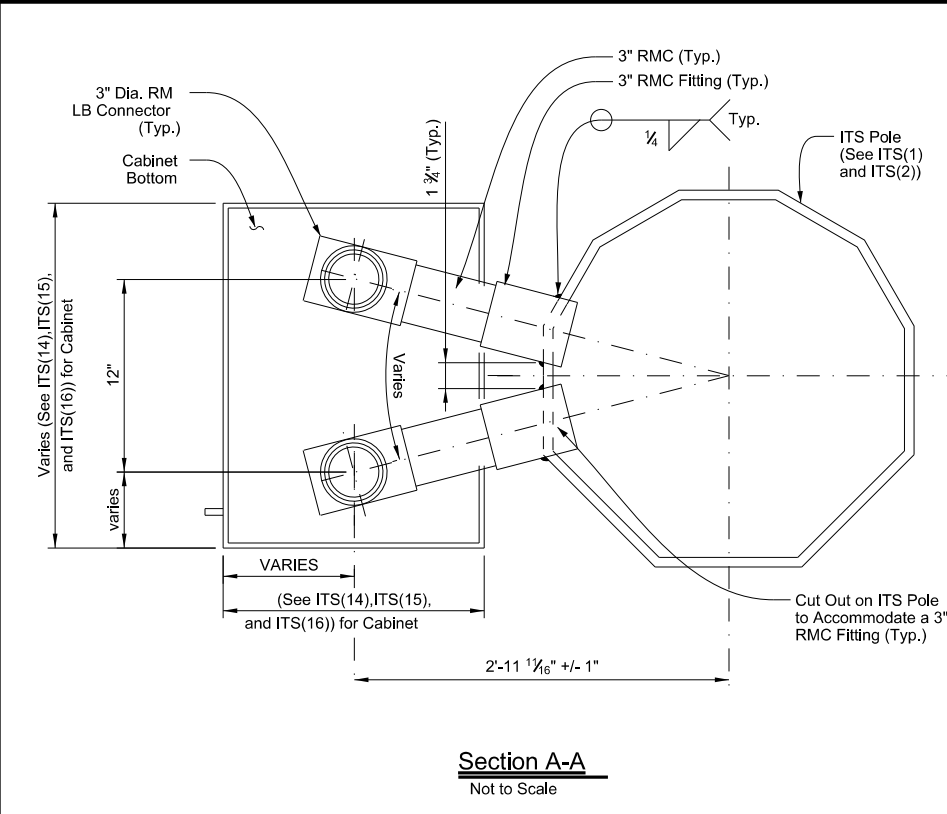
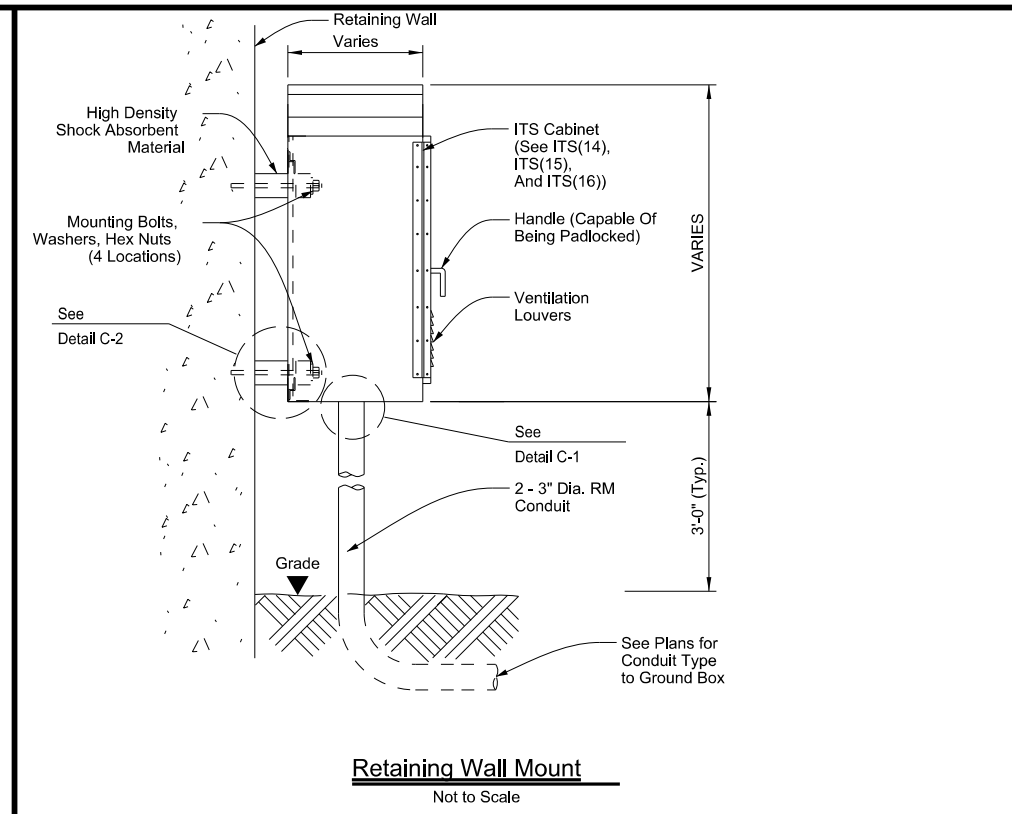
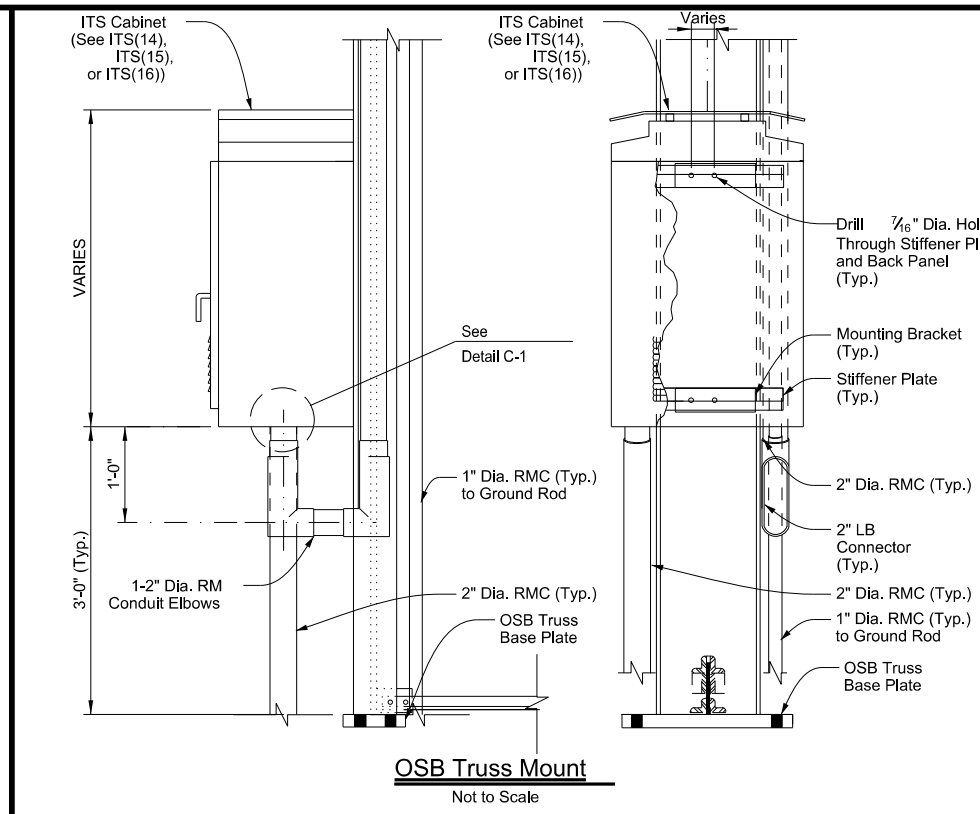
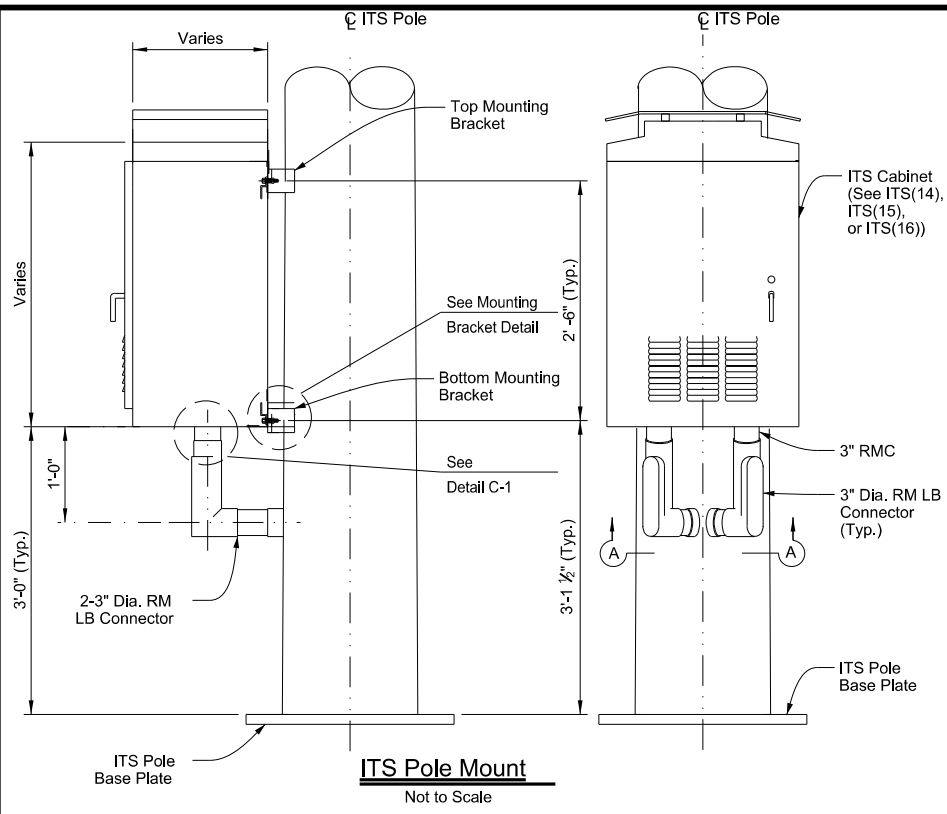
ITS POLE MOUNTED CABINET TYPE 3 DETAILS

ITS(16)-15

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- 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

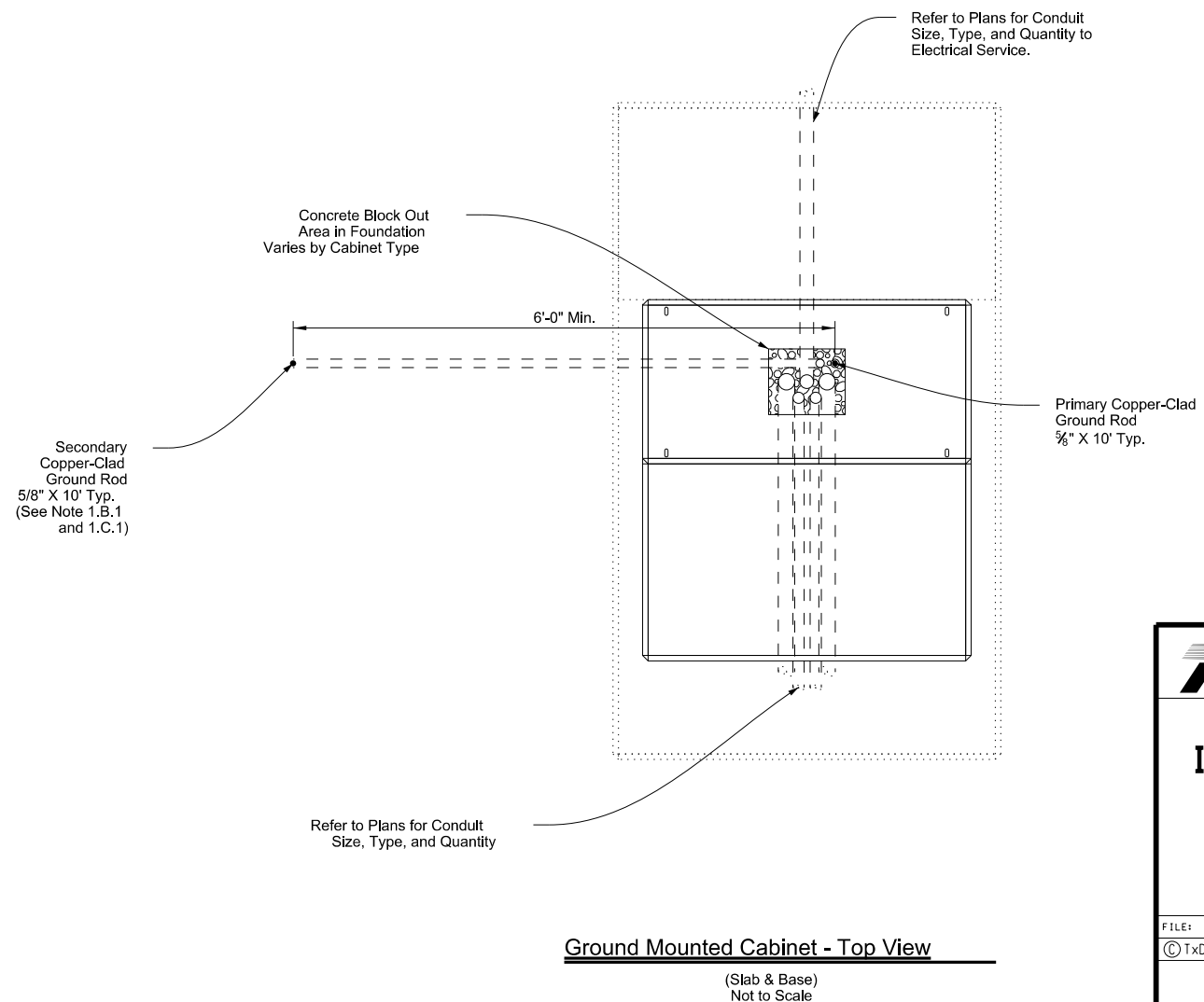
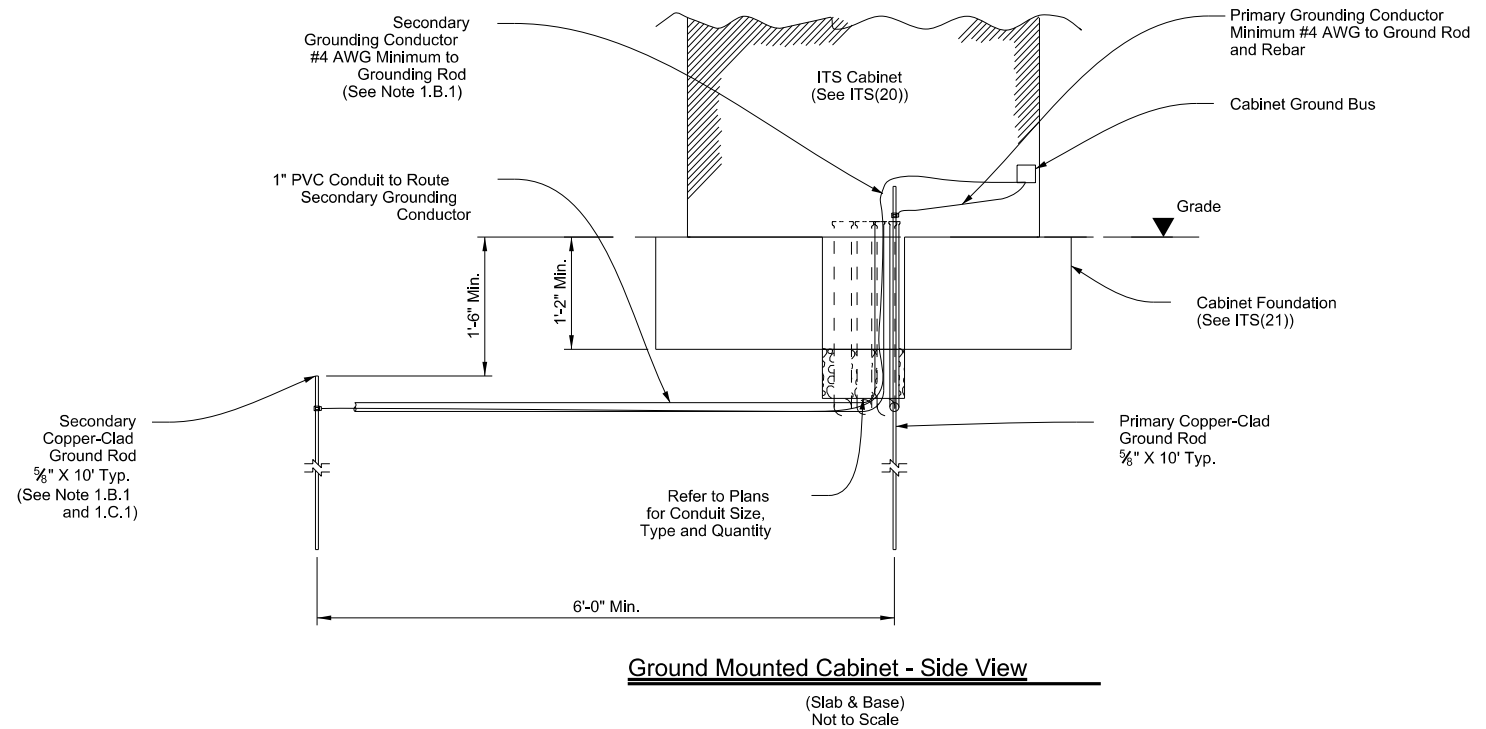
ITS(17)-15

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DIST	COUNTY		SHEET NO.	
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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.
 2. 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: 5/8 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.



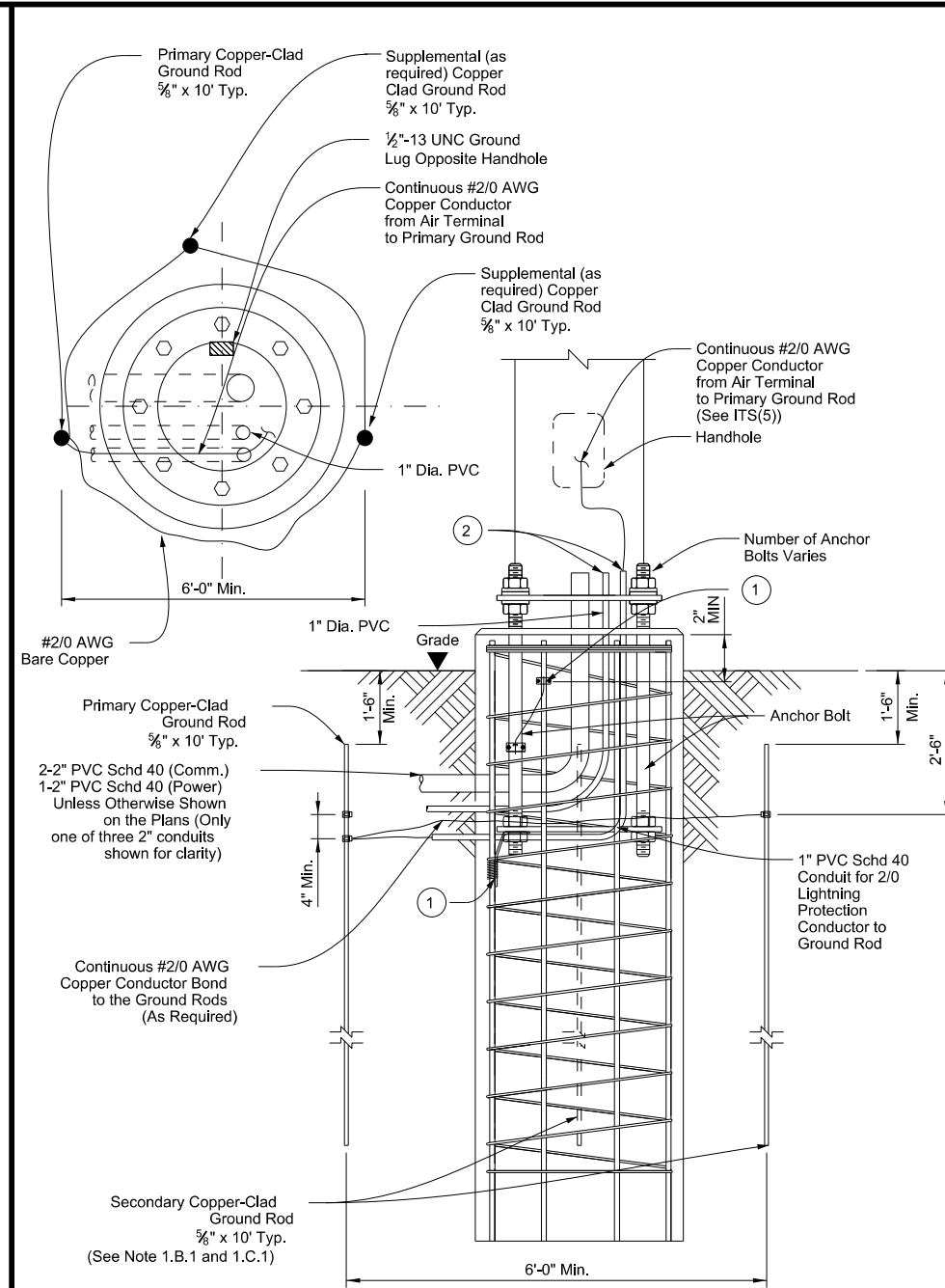
		Traffic Operations Division Standard	
<h2>ITS CABINET GROUNDING DETAILS</h2>			
<h3>ITS(18)-15</h3>			
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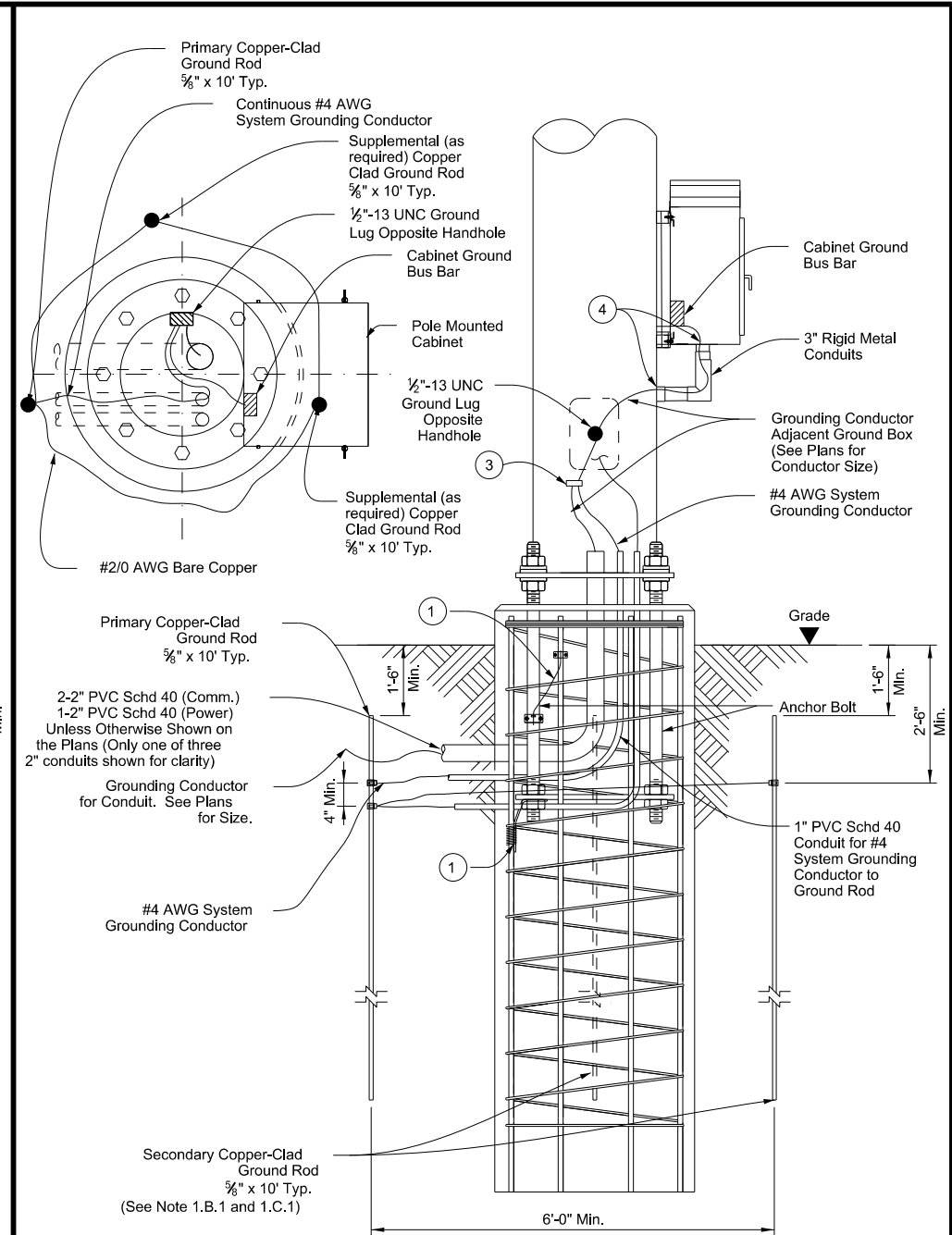
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General Notes:

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 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.
 - b. 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 throughout the project.
 2. Ground Rods:
 - a. Provide copper-clad steel ground rods conforming to the requirements specified in DMS 11040.
 - 1) Diameter: 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



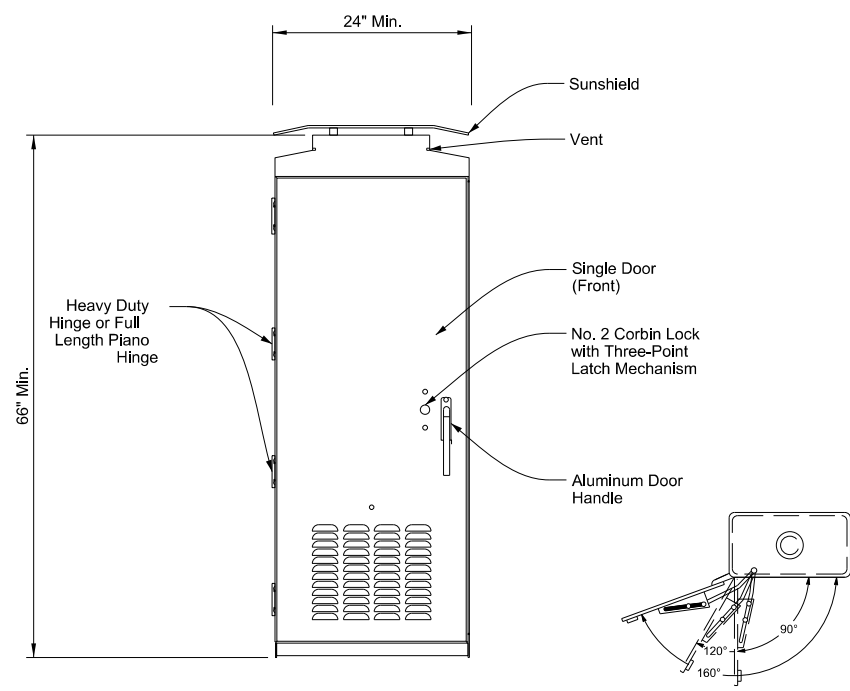
Grounding System with Pole Mounted Cabinet
Not to Scale

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.

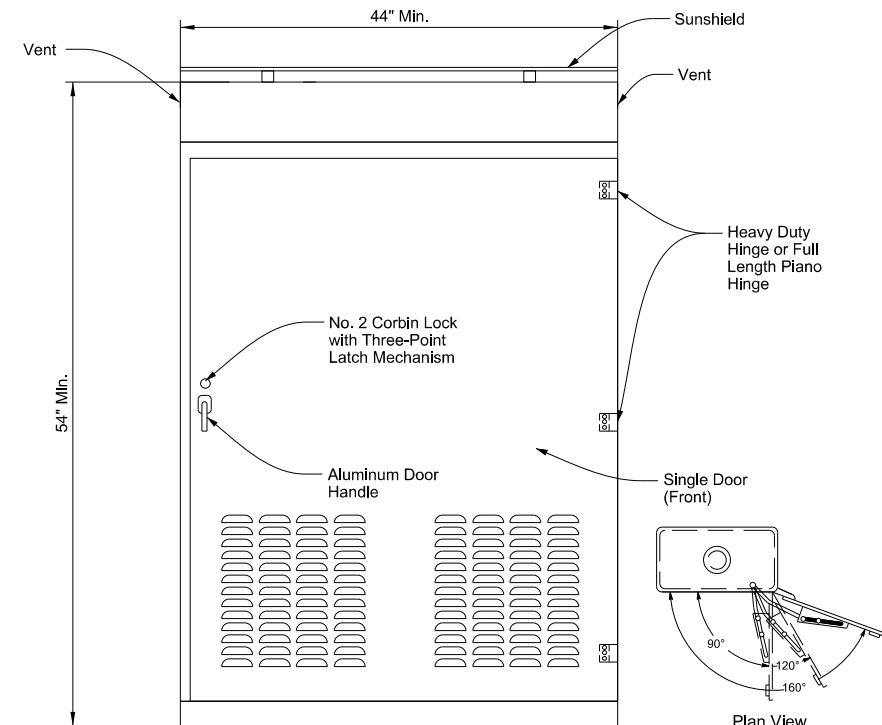
		Traffic Operations Division Standard	
<h2>ITS POLE GROUNDING DETAILS</h2>			
<h3>ITS(19)-17</h3>			
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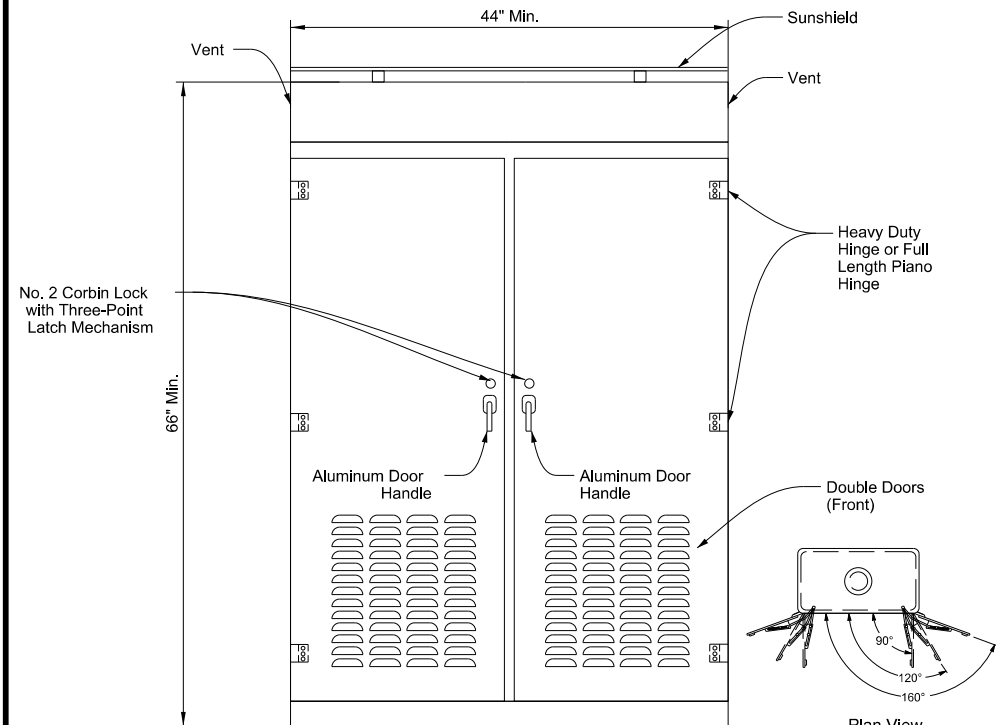
Type 4 (Small) Cabinet
Front View

Plan View
Door Stop Detail
(3 Positions)



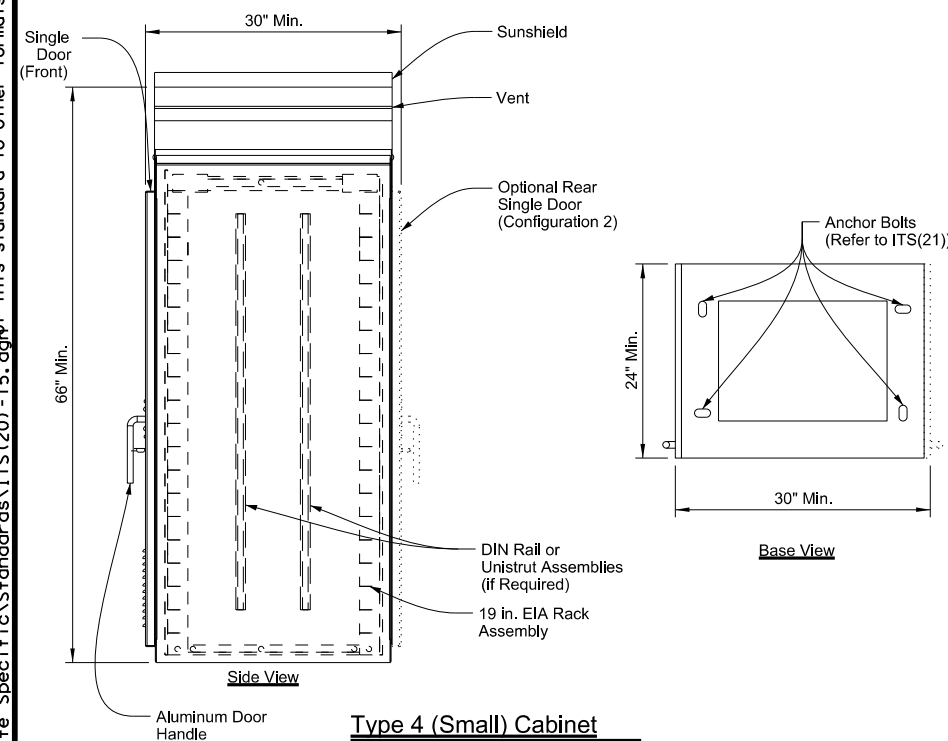
Type 5 (Medium) Cabinet
Front View

Plan View
Door Stop Detail
(3 Positions)



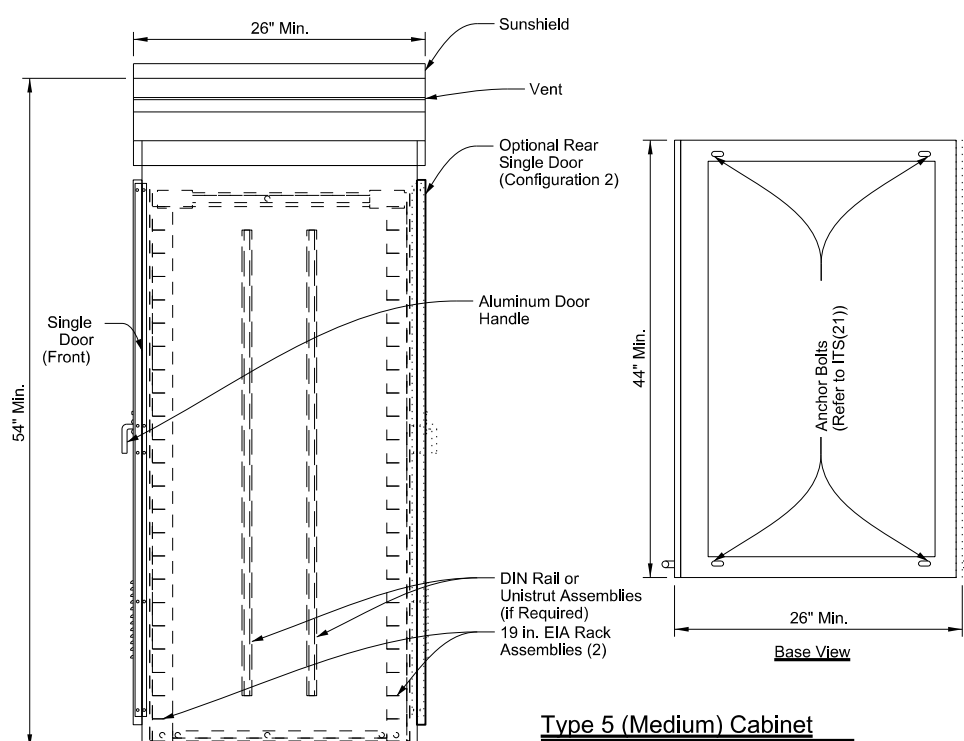
Type 6 (Large) Cabinet
Front View

Plan View
Door Stop Detail
(3 Positions)



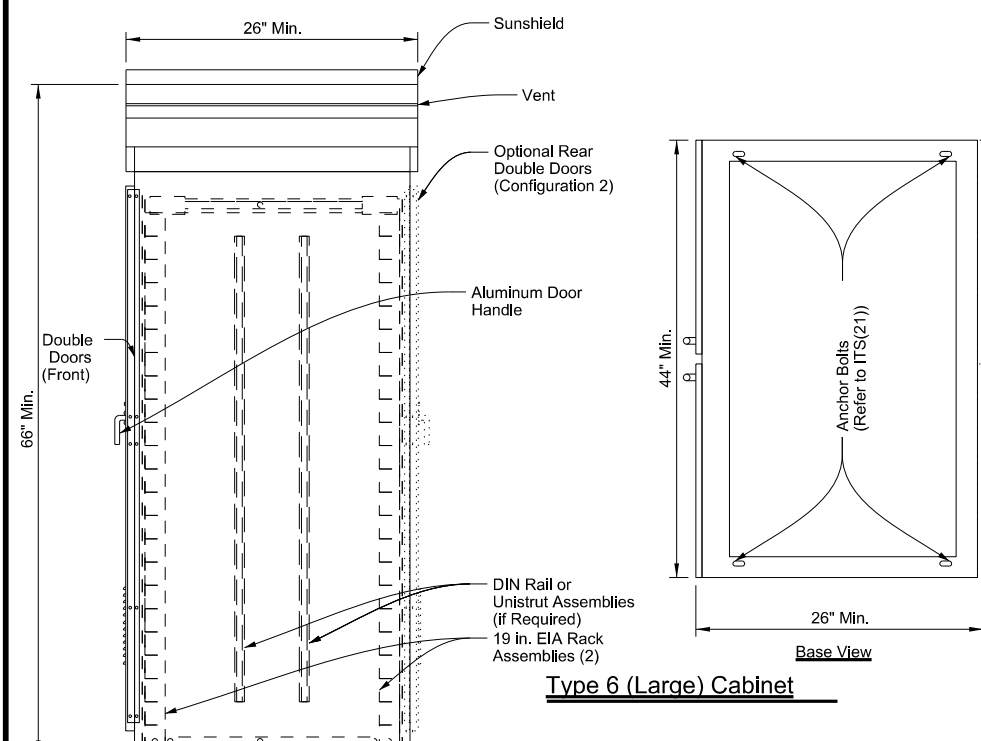
Type 4 (Small) Cabinet
Side View

Base View



Type 5 (Medium) Cabinet
Side View

Base View



Type 6 (Large) Cabinet
Side View

Base View

General Notes:

- Cabinet hardware equipment and door configuration shown is diagrammatic in nature and intended to represent a preferred ground mounted cabinet setup. Door orientation may vary and will be noted in the plans. The contractor will be responsible for configuring cabinets with all appropriate ITS hardware and power supplies in accordance with the plans and specifications. The contractor may alter the cabinet configuration shown to maximize space and ensure easy access for maintenance.
- All dimensions are approximate and represent minimum dimensions.
- Provide conduit entrances at the bottom of the cabinet.
- Paid under Special Specification "ITS Ground Mounted Cabinet" (Configuration 1) with single door.
Paid under Special Specification "ITS Ground Mounted Cabinet" (Configuration 2) for rear door option.
- Sunshield to be mounted to cabinet using nuts, bolts, and spacers.
Water proof sealant to be used at cabinet surface/bolt contact points.



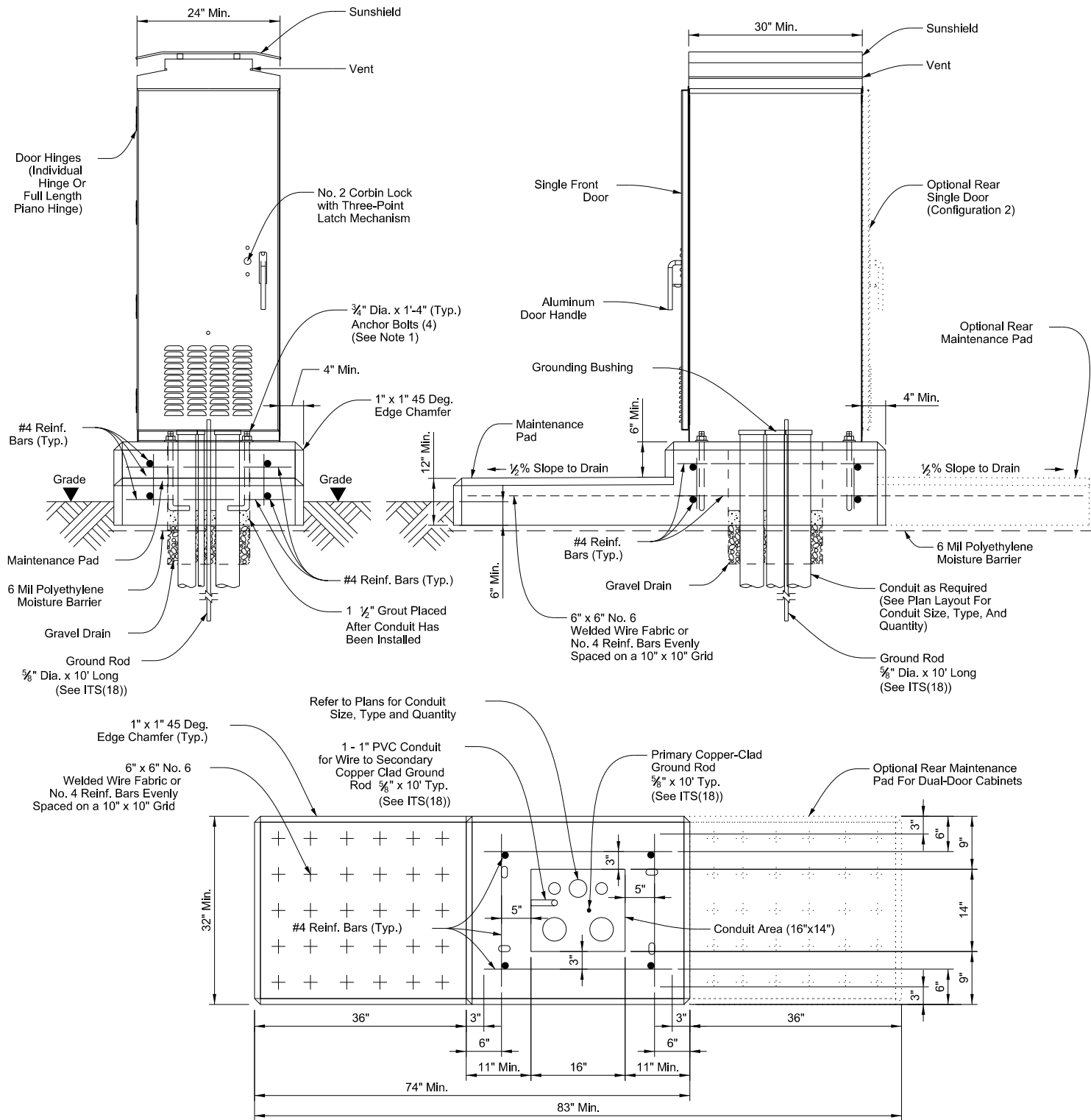
**ITS GROUND MOUNTED
CABINET ELEVATION
DETAILS**

ITS(20)-15

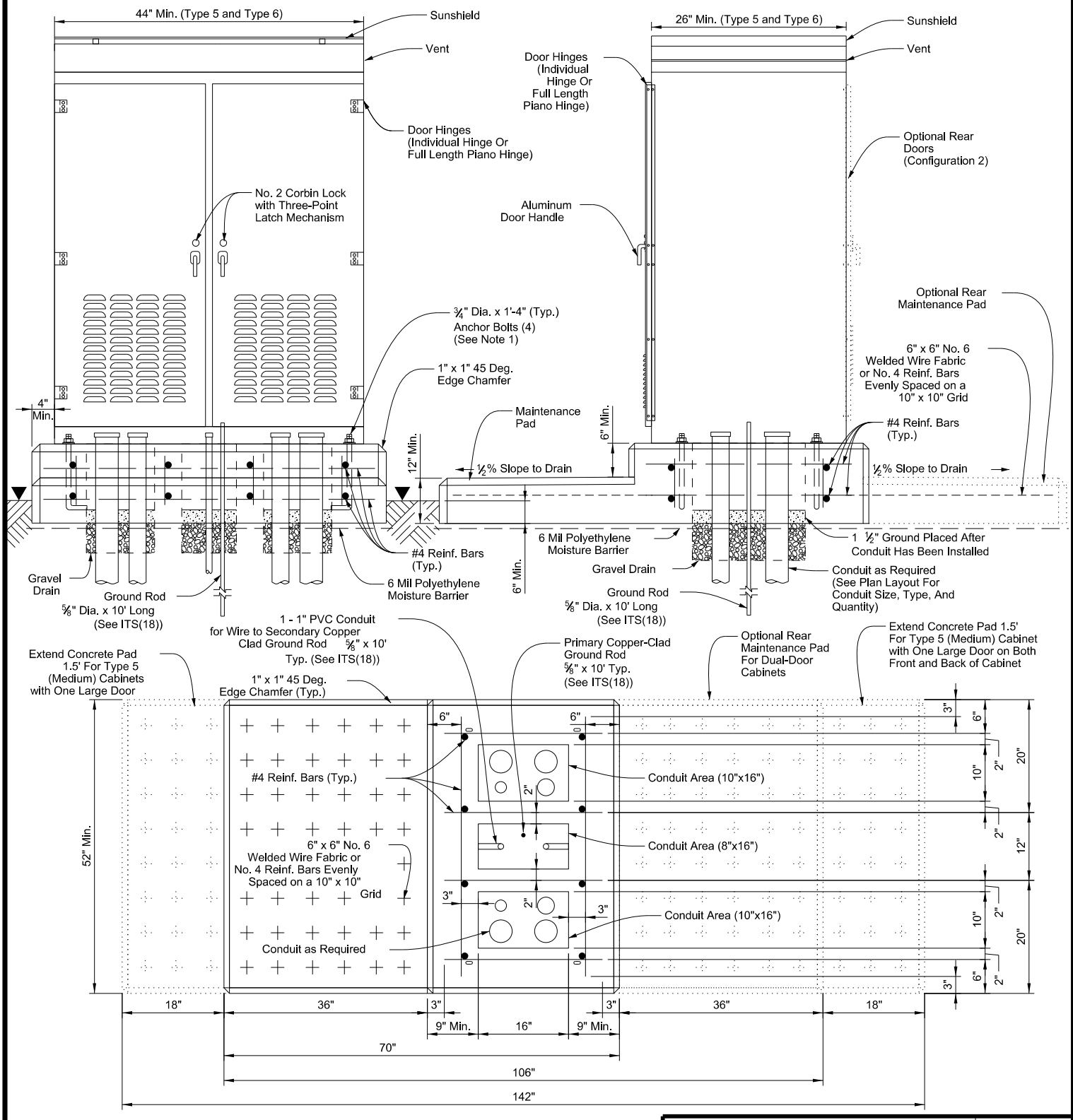
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Type 4 (Small) Cabinet



Type 5 (Medium) & Type 6 (Large) Cabinet

General Notes:

- Details of anchor bolt location to be furnished by the cabinet manufacturer. Size and length of anchor bolts shown in details may vary by manufacturer.
- Modify concrete base dimensions to fit required cabinet type.
- Ensure conduit area has gravel drain, 12" depth, coarse aggregate, grade No. 1.
- All concrete to be Class "A" in accordance with Item 421.
- Set the cabinet foundation level with the pavement surface, in unpaved area. The foundation shall be a minimum of 4" above surrounding grade, or as approved by the Engineer.
- Furnish any additional concrete which may be necessary to stabilize foundation at unusual locations.
- Foundation will be subsidiary to Special Specification "ITS Ground Mounted Cabinet."
- Ground cabinet as required in cabinet specifications and as detailed on ITS(18) in accordance with the National Electric Code (NEC).
- Treat cabinet foundation with moisture sealant.
- Type 5 cabinet foundation will have a slightly larger foundation than Type 6. See foundation notes on details.
- Drain pipe shall be screened for drainage portion below foundation in gravel.

Texas Department of Transportation
 Traffic Operations Division Standard

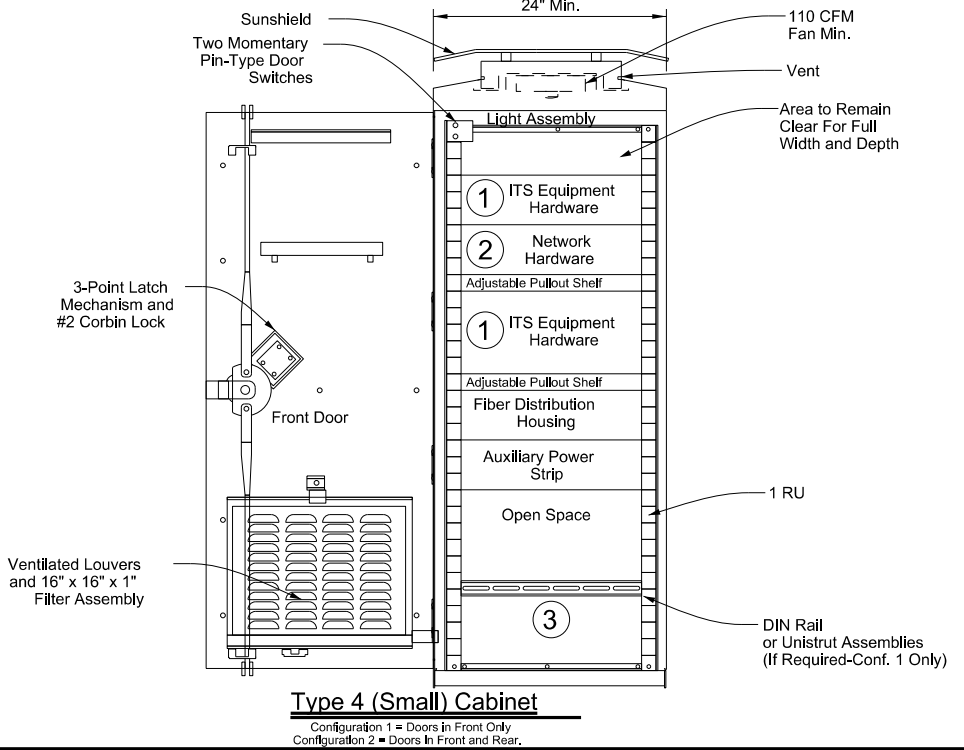
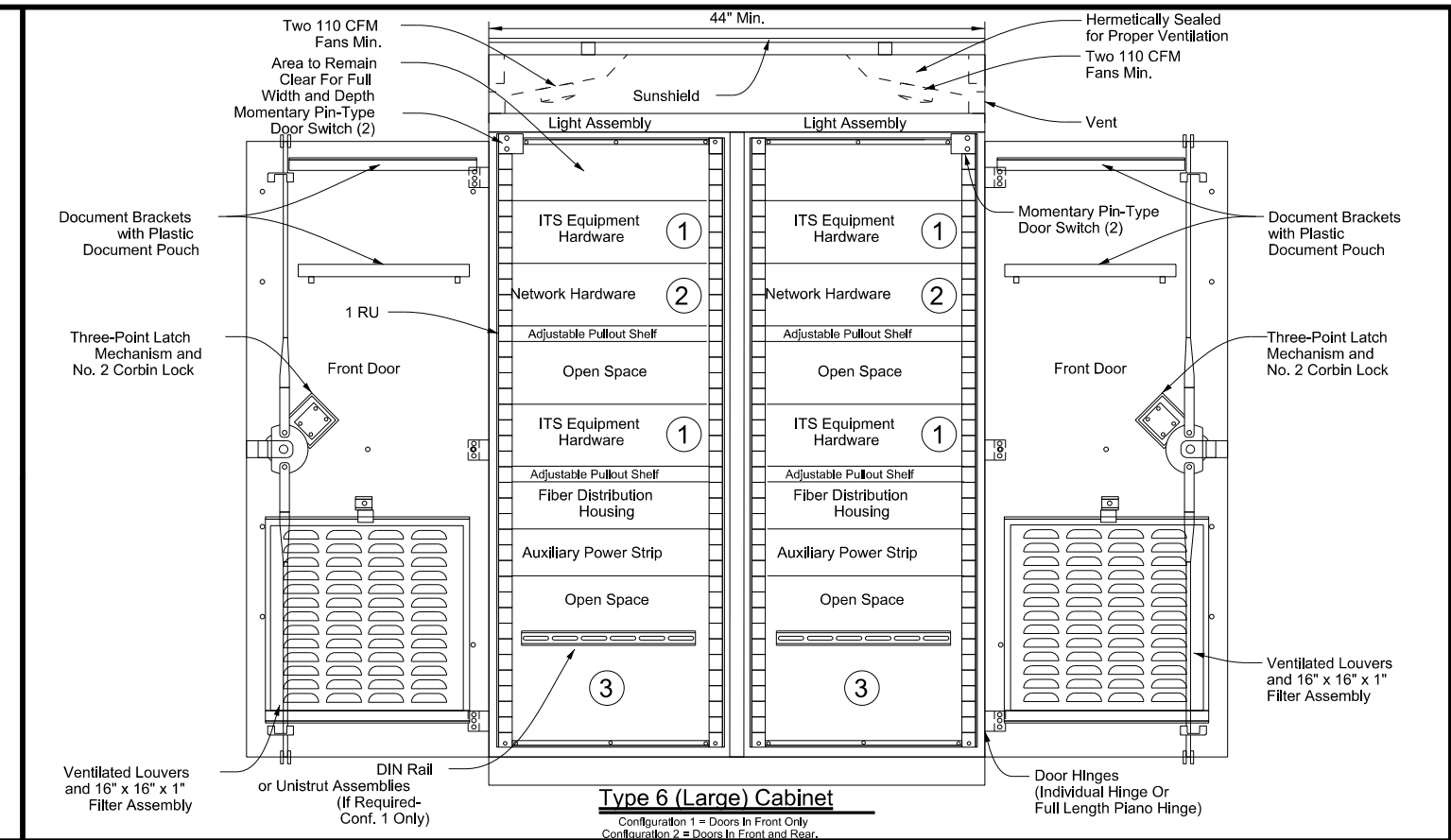
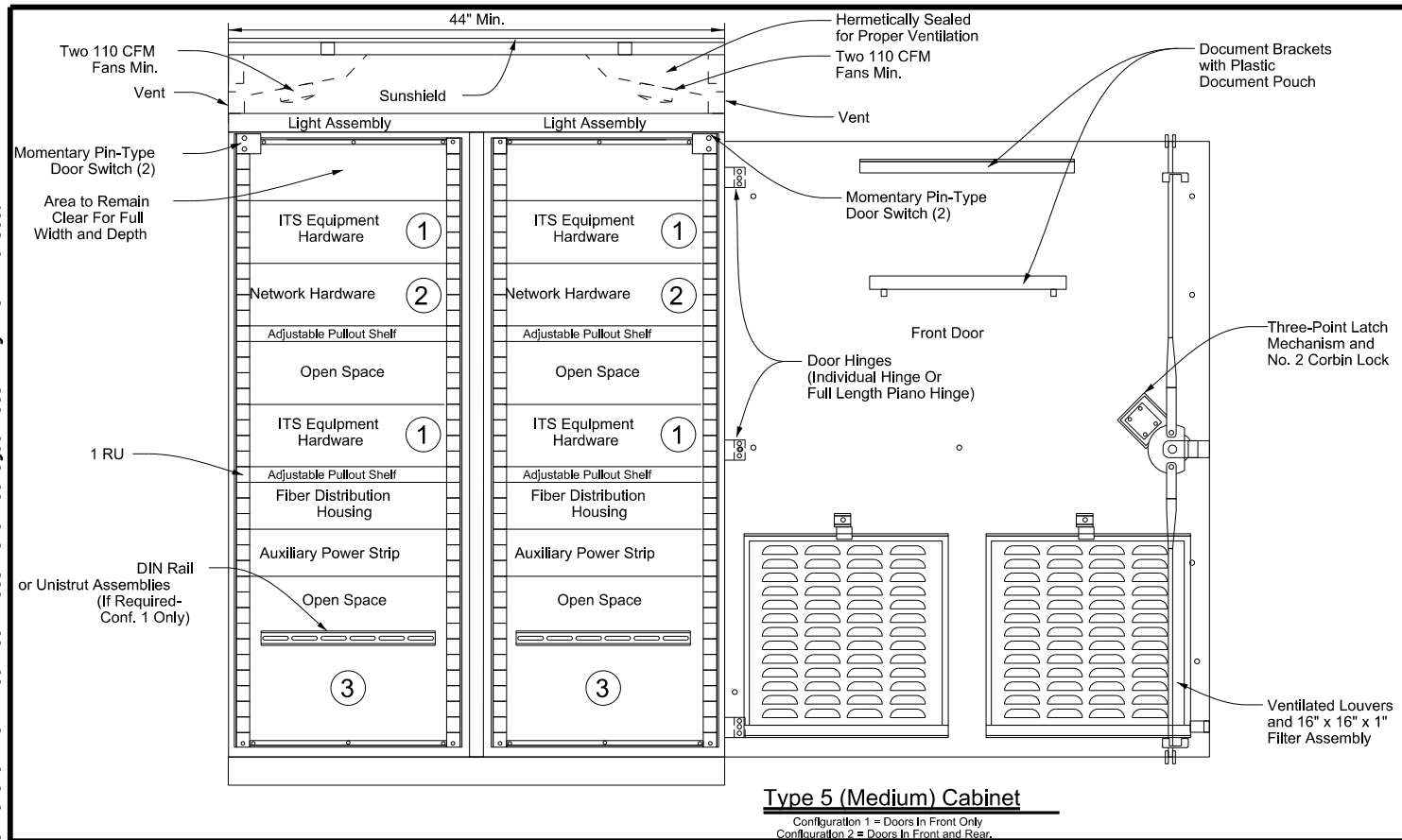
ITS GROUND MOUNTED CABINET FOUNDATION DETAILS

ITS(21)-15

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Typical Equipment Layout Legend	
Example Equipment	
①	CCTV Interface Panel, Radar Vehicle Sensing Device (RVSD) Equipment, DMS/LCS Controller, Environmental Sensor Station (ESS) Equipment, Bluetooth Equipment, Highway Advisory Radio (HAR), Ramp Meter or Inductive Loop Card Rack, Automatic Vehicle Identification (AVI) Equipment, or ITS Radio Equipment (See General Note 1)
②	Ethernet Switch, Video Encoder, Terminal Server, Fiber Optic Transceivers, or Media Conversion Equipment (See General Note 1)
③	Power Distribution Assembly, Service Entrance Breakers, Primary AC Power, Auxiliary Power Strip, Ground Bus Bar, Surge Protection Equipment, Solar Power System (If Required)

General Notes:

- Layout of hardware equipment and configuration shown is diagrammatic in nature and intended to represent a preferred ground mounted cabinet setup. Hardware needed for each cabinet varies and not all cabinet equipment may be shown. The contractor will be responsible for configuring cabinets with all appropriate ITS hardware and power supplies in accordance with the plans and specifications. The contractor may alter the cabinet configuration shown to maximize space and ensure easy access for maintenance.
- All dimensions are approximate and represent minimum dimensions.
- Provide conduit entrances at the bottom of the cabinet.
- Paid under Special Specification "ITS Ground Mounted Cabinet" (Configuration 1) with single door.
 Paid under Special Specification "ITS Ground Mounted Cabinet" (Configuration 2) for rear door option.
- RU = rack unit.
- Contractor to remove the cabinet removable center support, which ensures cabinet rigidity during shipping, during installation.

Texas Department of Transportation
 Traffic Operations Division Standard

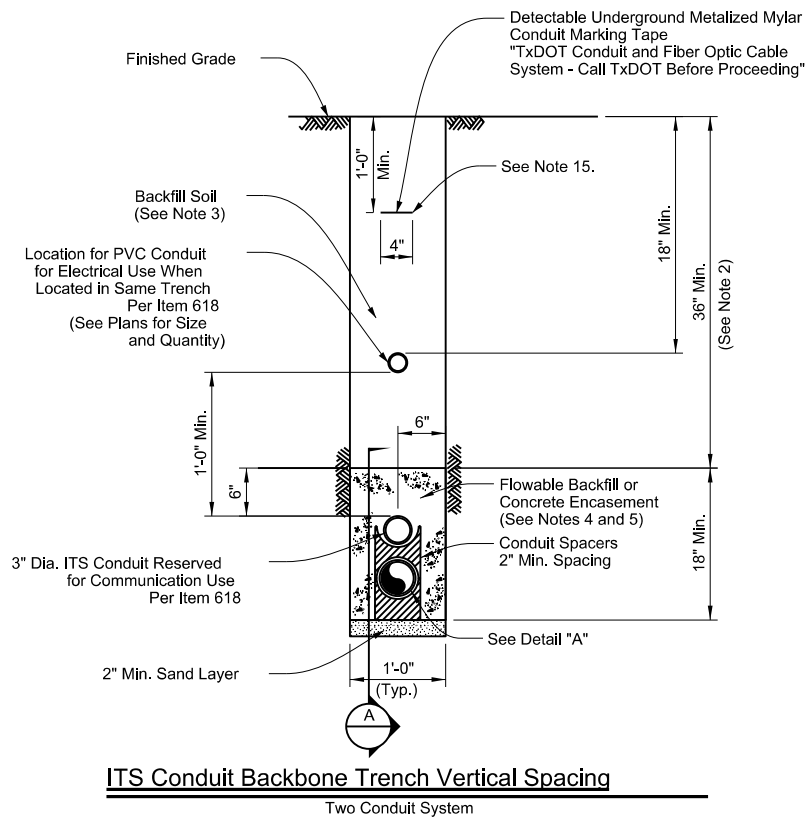
ITS GROUND MOUNTED CABINET INTERIOR DETAILS

ITS(23)-15

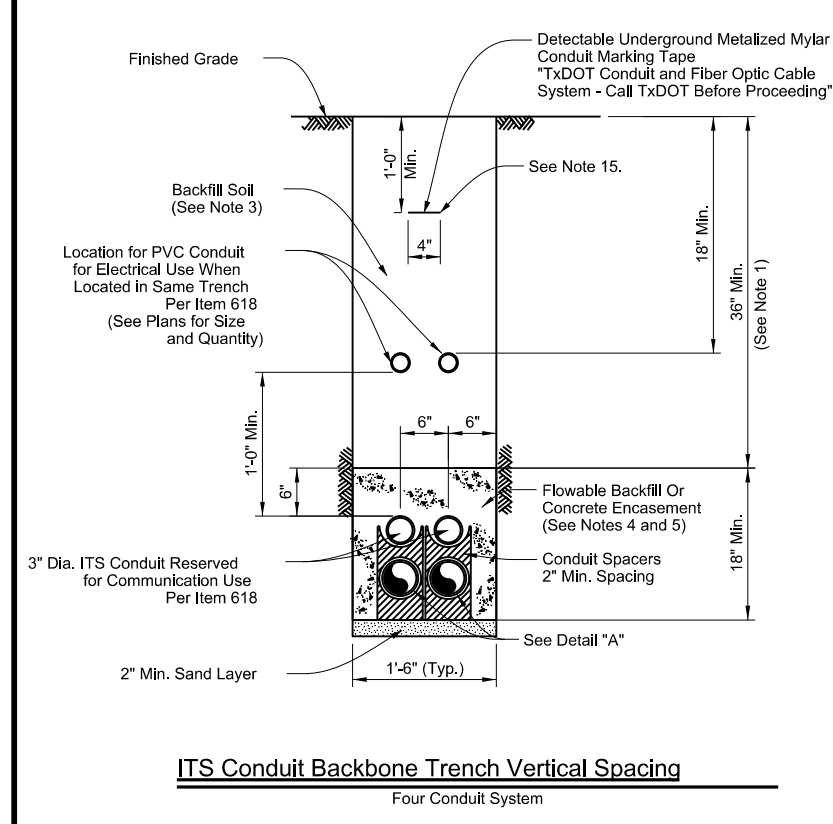
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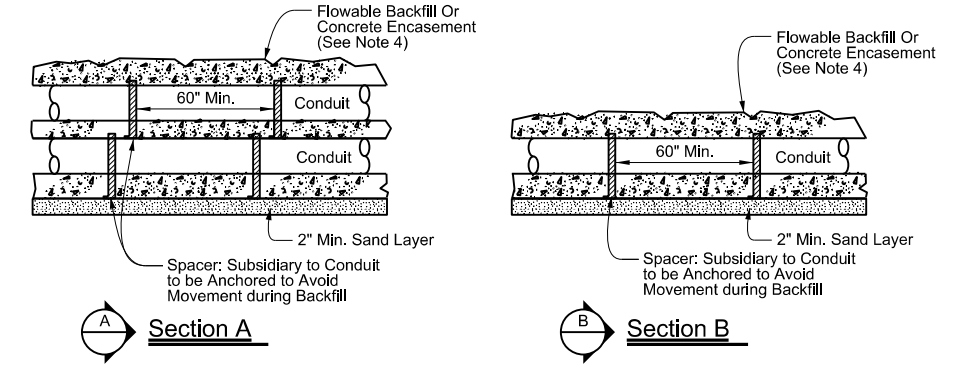
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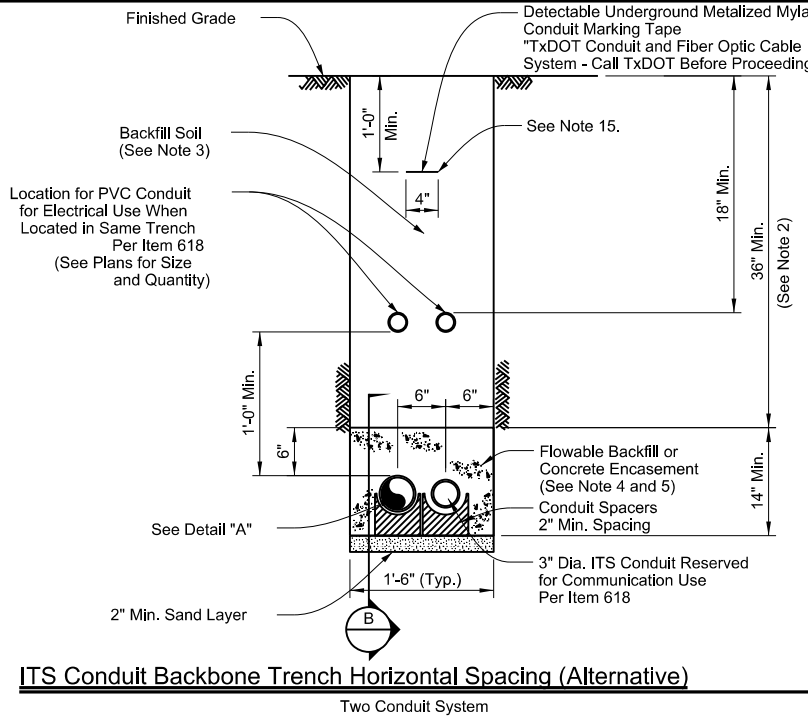
ITS Conduit Backbone Trench Vertical Spacing
Two Conduit System



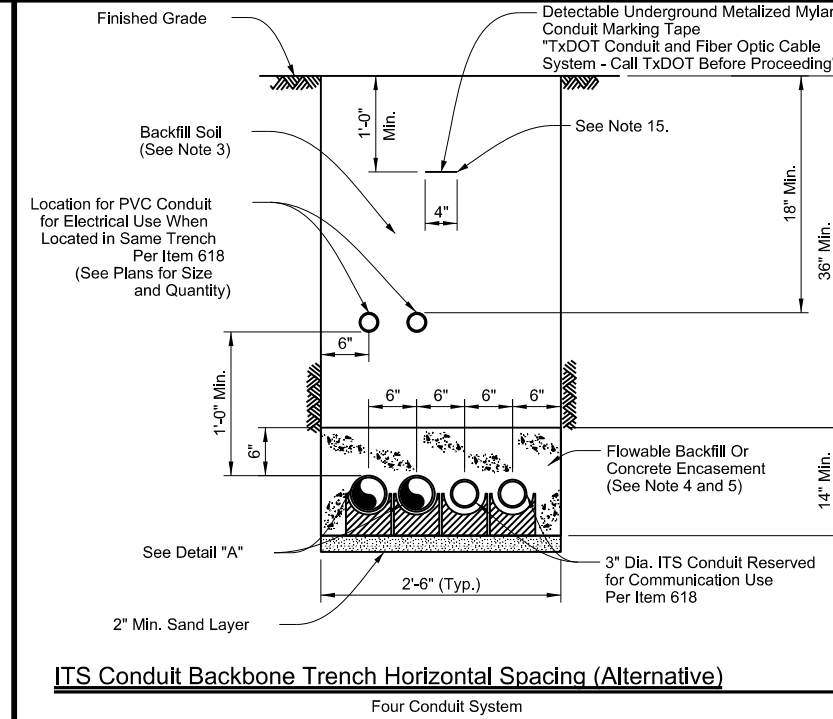
ITS Conduit Backbone Trench Vertical Spacing
Four Conduit System



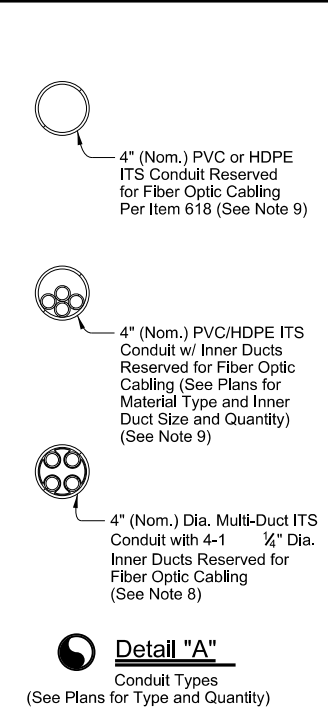
Open Cut Trenching Details



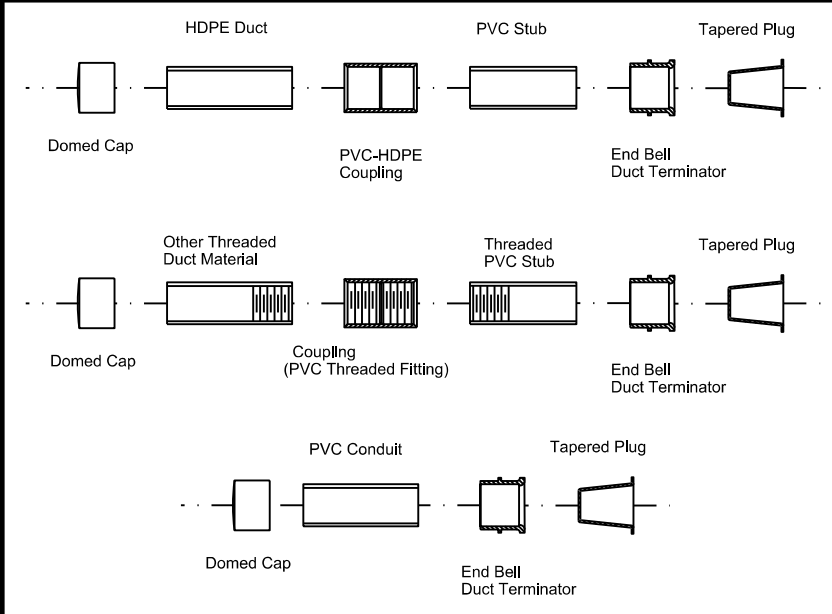
ITS Conduit Backbone Trench Horizontal Spacing (Alternative)
Two Conduit System



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:

- 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.
- 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.
- Perform trench excavation and backfilling in accordance with Item 400, "Excavation and Backfill for Structures."
- 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.
- 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."
- Concrete encasement will be paid for under Special Specification "ITS Multi-Duct Conduit" or as shown on the plans.
- Provide ITS PVC conduit identified for electrical and communication use in accordance with Item 618, "Conduit."
- Provide ITS multi-duct conduit identified for fiber optic communication use in accordance with Special Specification "ITS Multi-Duct Conduit."

- Conduit per Item 618, "Conduit" (See Plans for Material Type and Quantity).
- 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."
- 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.
- Remove saw cut width to accommodate conduit installation.
- Replace rebar as necessary, lapped and tied a minimum of 3 inches to existing rebar.
- Replace broken pavement materials with similar materials to exact shape, and thickness of existing.
- 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.
- 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 1 OF 2



ITS CONDUIT TRENCH DETAILS

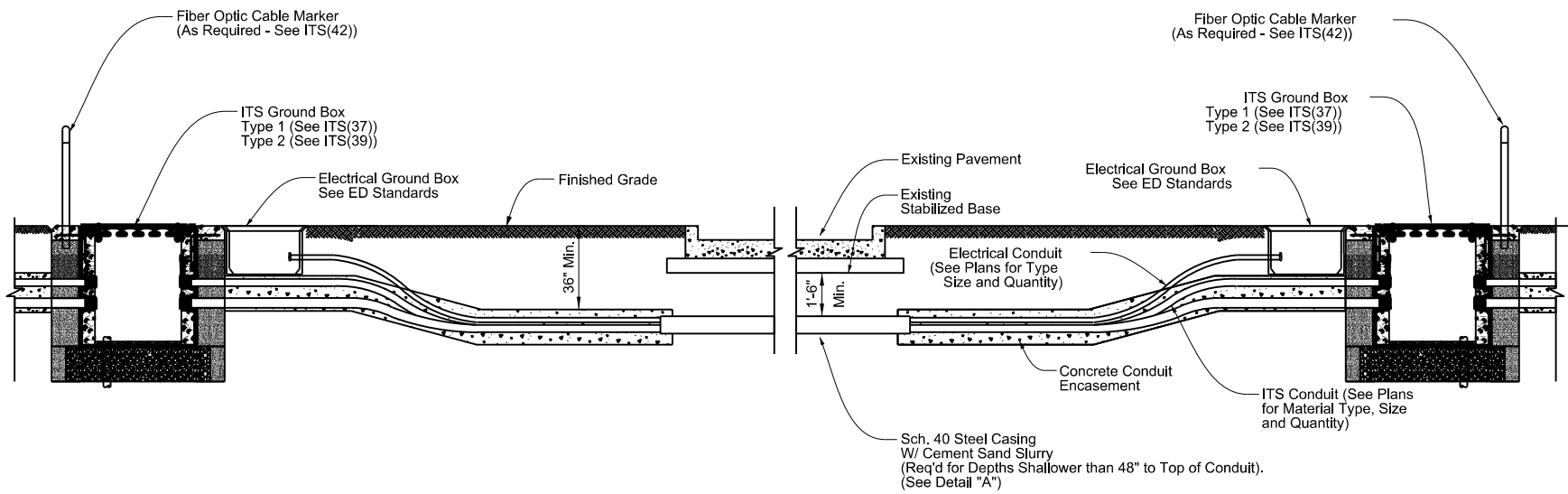
ITS(27)-16

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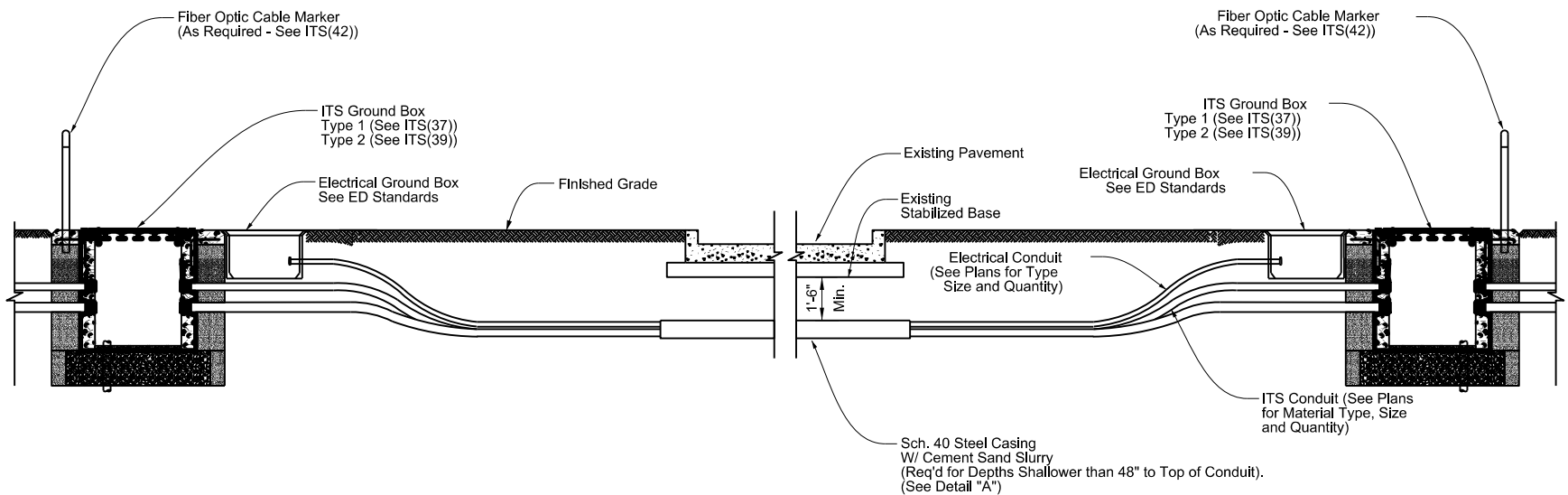
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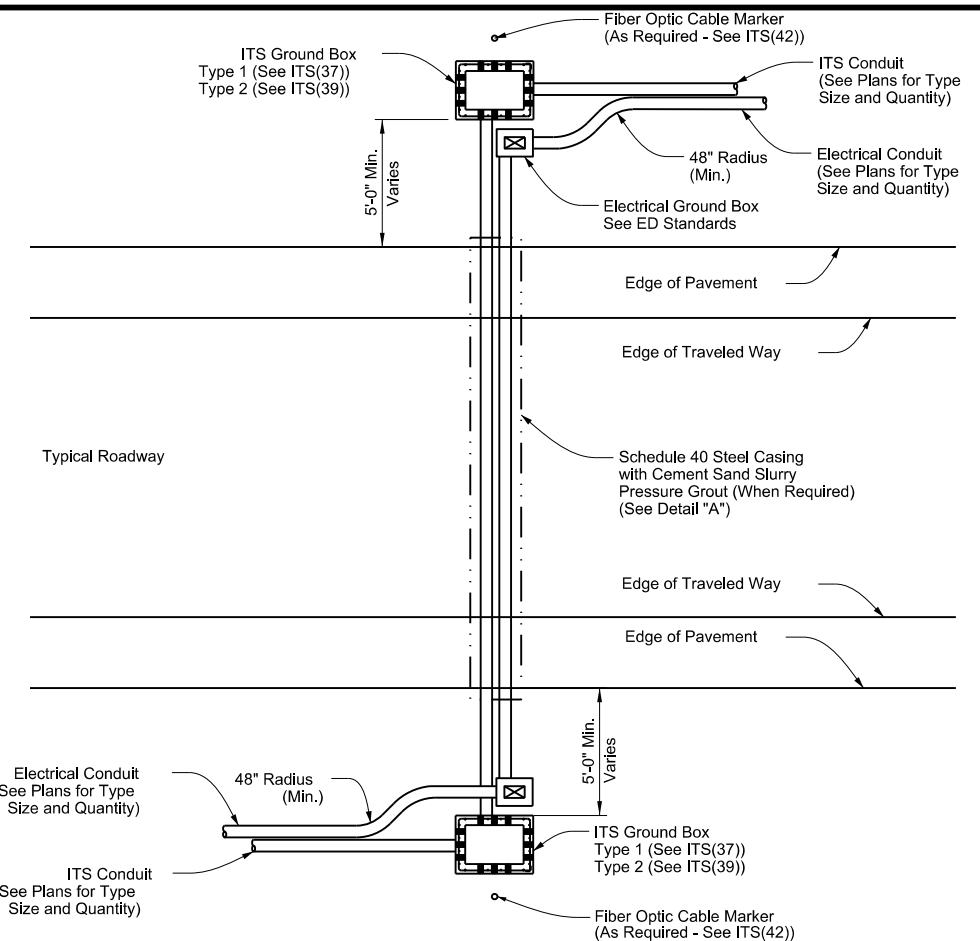
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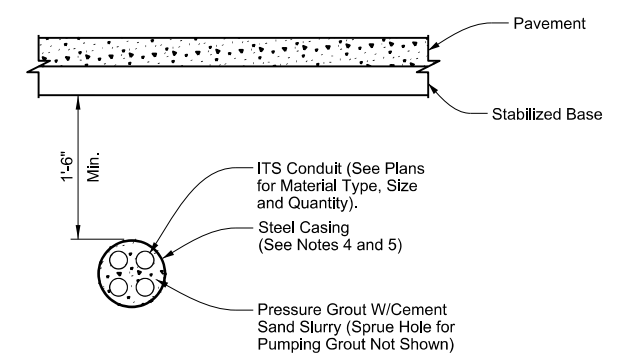
Typical Conduit Installation Jacking or Boring Beneath Existing Roadway



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



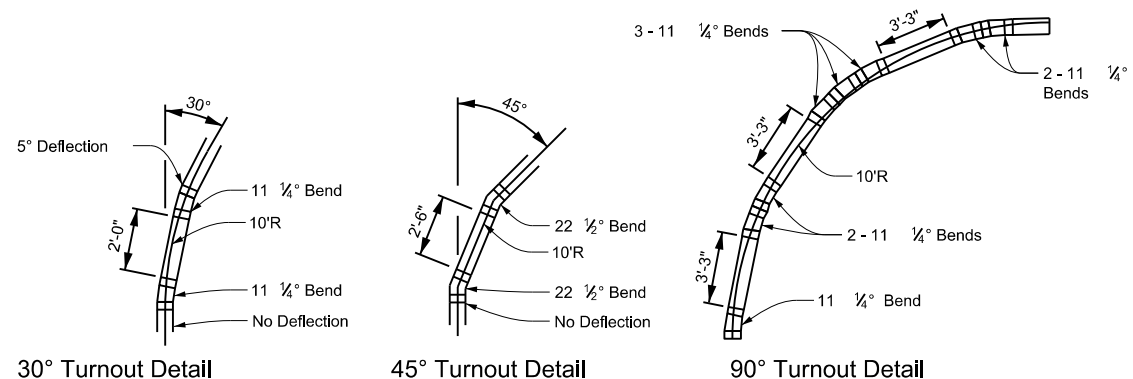
Bore Under Pavement



Steel Casing Detail "A"

General Notes:

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



30° Turnout Detail

45° Turnout Detail

90° Turnout Detail

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

Sheet Details
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SHEET 2 OF 2



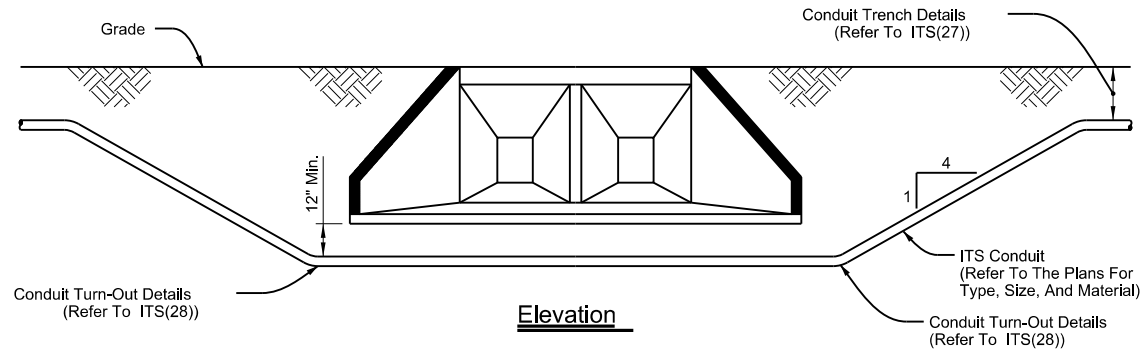
ITS CONDUIT BORE AND STEEL CASING DETAILS

ITS(28)-16

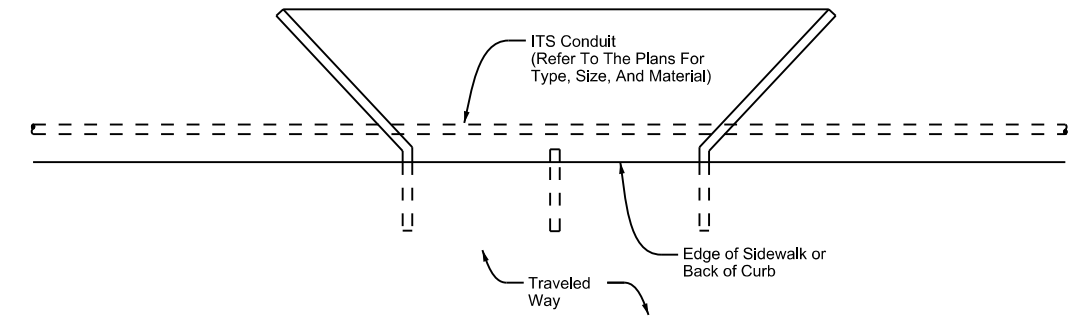
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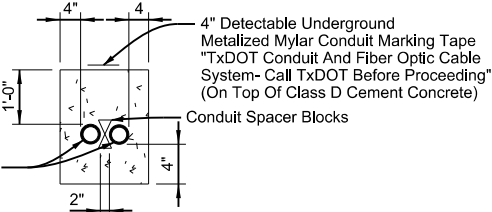
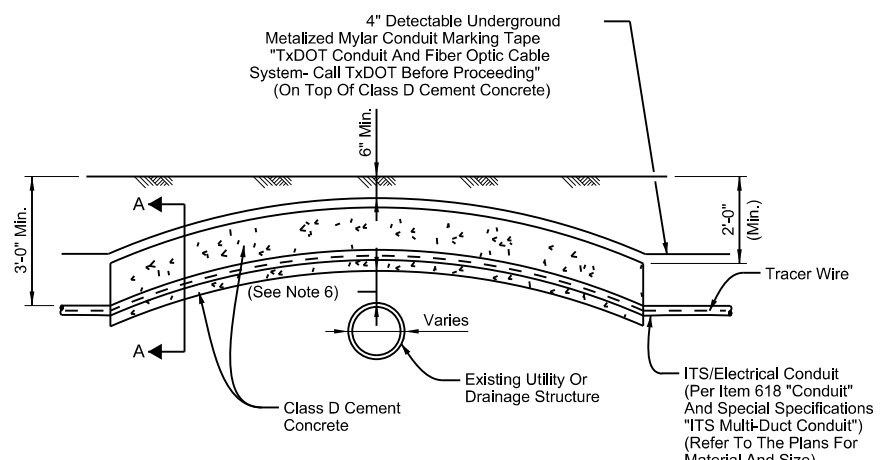


Elevation



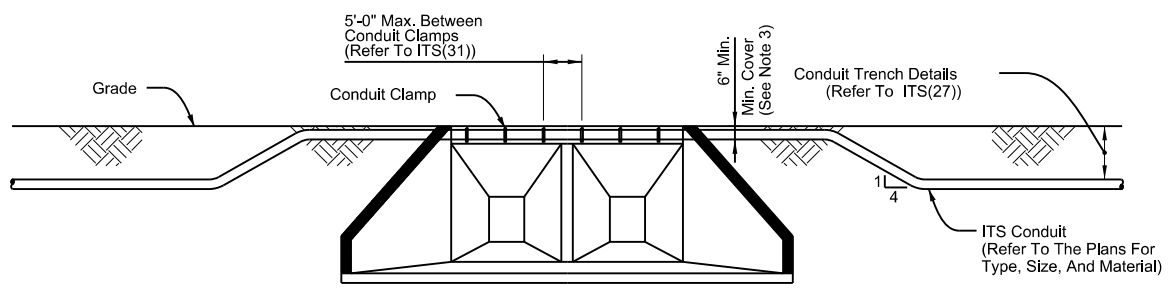
Plan View

Conduit Bored Under Culvert

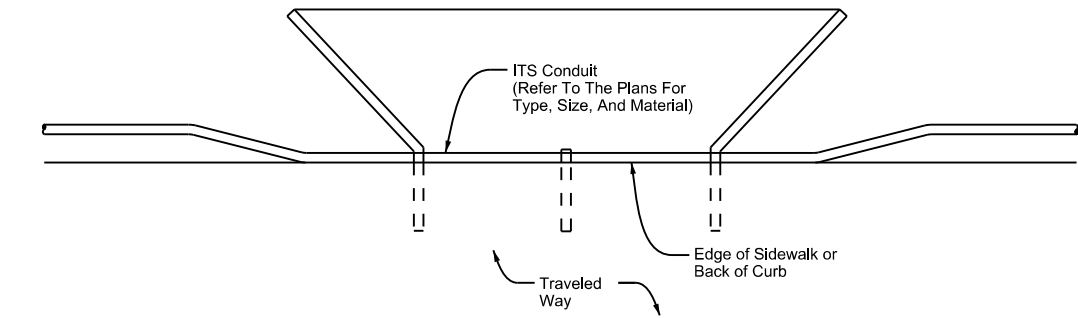


Section A-A

Conduit Installation Detail Above Existing Drain Pipes Or Utilities

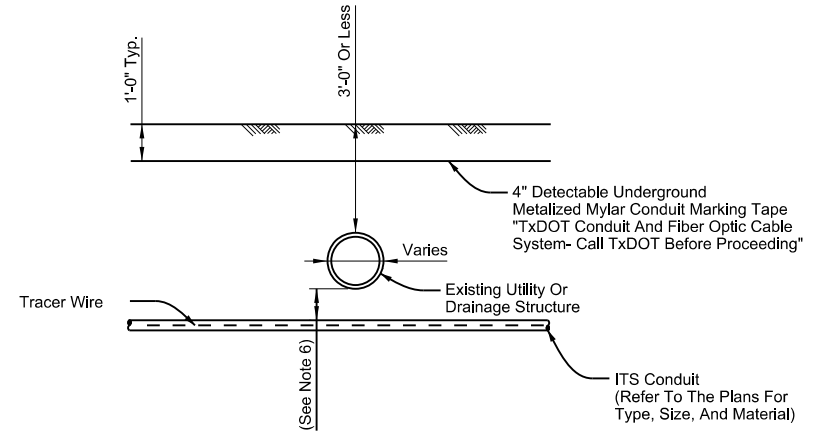


Elevation



Plan View

Conduit Attached To Culvert Headwall



Conduit Installation Detail Below Existing Drain Pipes Or Utilities

General Notes:

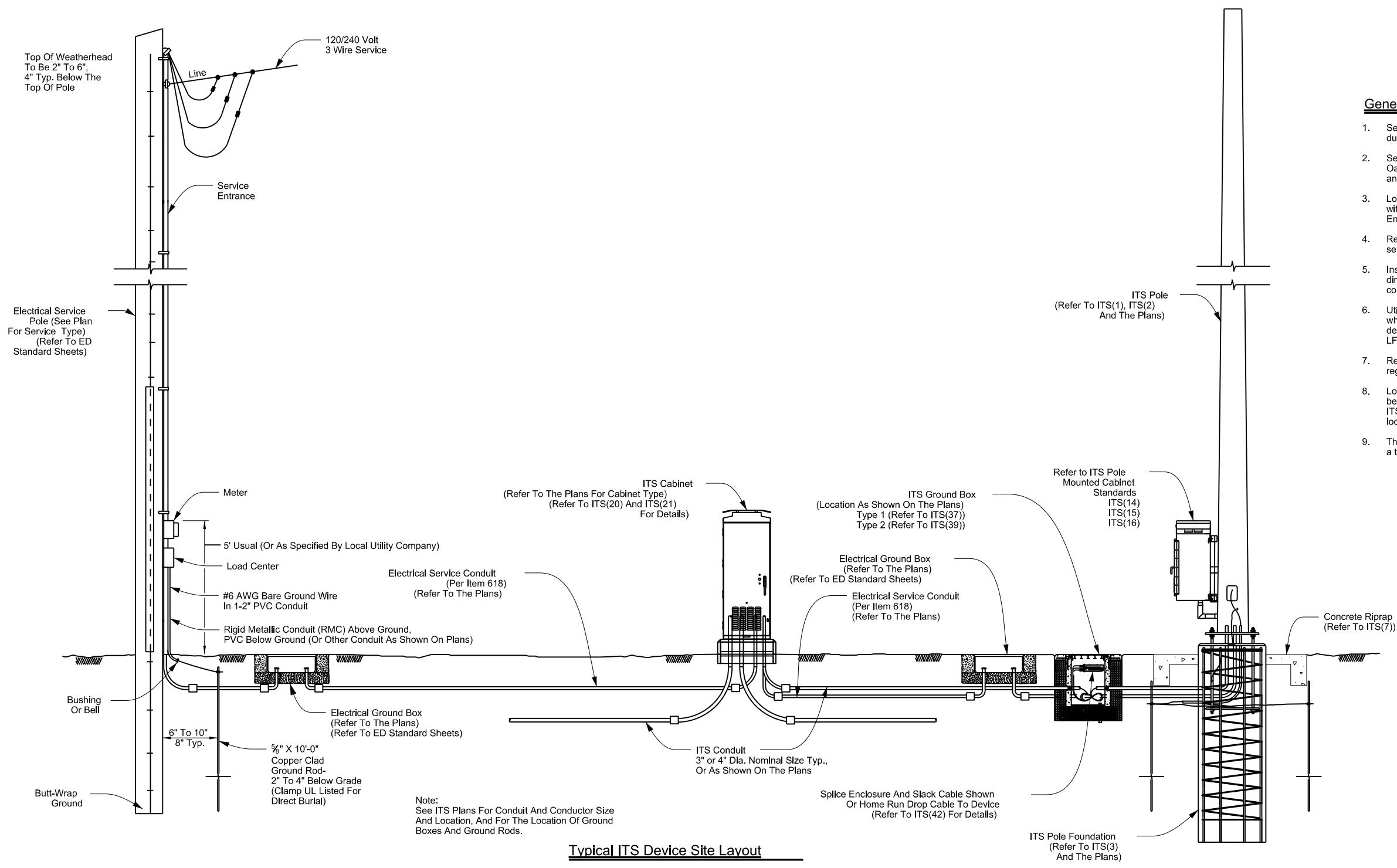
1. With approval from the field engineer adjust the final burial depth of conduit(s) in circumstances requiring traversal of non-movable object conflicts.
2. Where conduits are to be installed over existing underground infrastructure (i.e., existing utility or drainage structure) which are less than 3'-0" deep, encase conduit in Class D cement concrete in accordance with Item 421, "Hydraulic Cement Concrete", for the entire length of the conduit that is installed at a depth of less than 3'-0".
3. If depth of cover over encasement is less than 6", install the conduit to pass beneath the underground infrastructure.
4. Refer to the plans for type, size and configuration of all conduits. Refer to ITS(27) and ITS(28) for further installation details.
5. It is the responsibility of the contractor to verify all existing underground infrastructure. The contractor is responsible for any damage to any underground infrastructure during construction. Verify all utility locations at least 100' in advance of trenches, plowing or boring, and make changes in conduit placement in the event of conflict.
6. If proposed conduit is crossing or in close proximity to an existing underground utility, maintain a minimum clearance of 1'-6" vertical, 1'-6" horizontal or a clearance dictated by municipal code and/or utility owner.
7. Install underground warning tape directly above all conduits per ITS(27) standard.
8. Do not install communications and electric cables in the same conduit. Separate conduits installed within the same trench based on NFPA 70, National Electrical Code. Refer to ITS(27) for additional conduit installation details.
9. Ensure all work is in compliance with the latest edition of NFPA 70, National Electrical Code.
10. Utilize PVC conduit for all underground applications as required by design. Transition with a conduit coupling to RMC conduit or other as required by design that is approved for above ground applications.
11. Do not exceed a rise:run ratio of 1:4 for conduit sloped through increases or decreases in elevation.

Sheet Details
 Not to Scale

		Traffic Operations Division Standard	
<h2>ITS CONDUIT OBSTRUCTION CROSSING</h2>			
<h3>ITS(35)-16</h3>			
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Typical ITS Device Site Layout

General Notes:

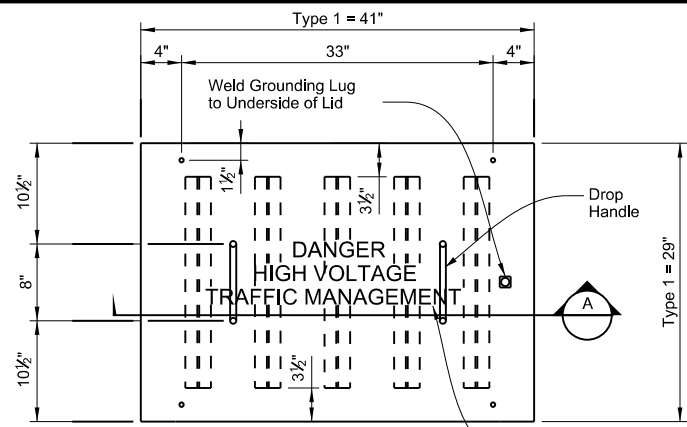
1. Seal all ITS communications conduits with waterproof duct plugs and seals.
2. Seal ends of all conduit entries into ITS cabinets with Oakum or other as approved by the District representative and pack with duct sealant.
3. Locate ground boxes for electrical and ITS communications within 5'-0" of cabinet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

		Traffic Operations Division Standard	
<h2>TYPICAL ITS DEVICE SITE LAYOUT</h2> <h3>ITS(36)-16</h3>			
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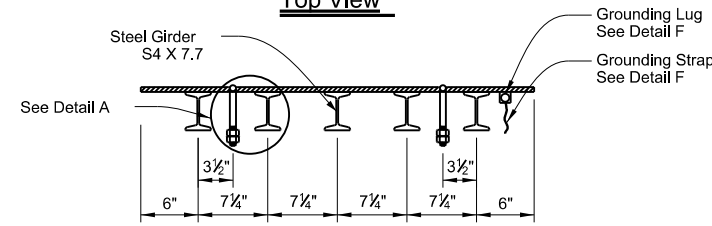
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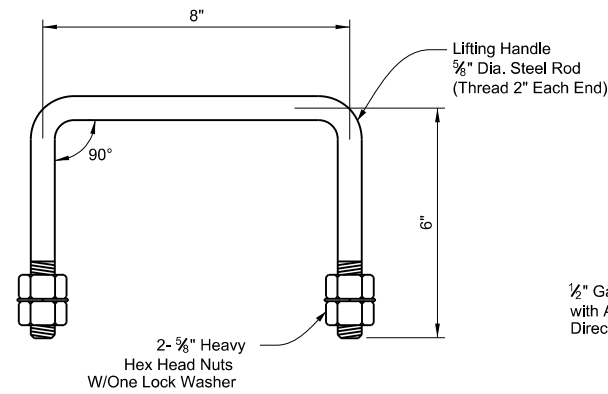
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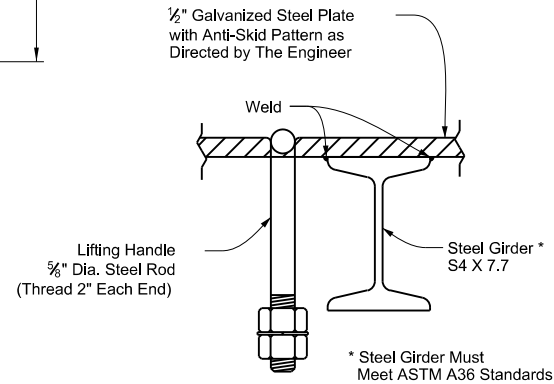
Type 1 Steel Cover Details
Top View



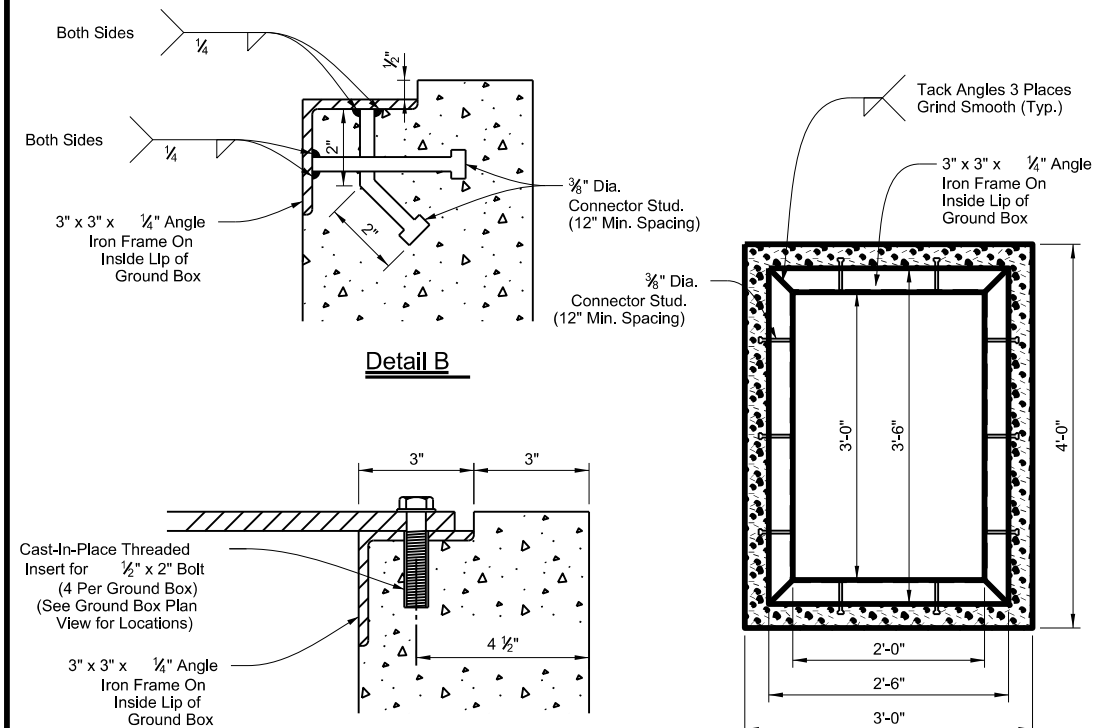
Section A



Drop Handle Detail



Detail A

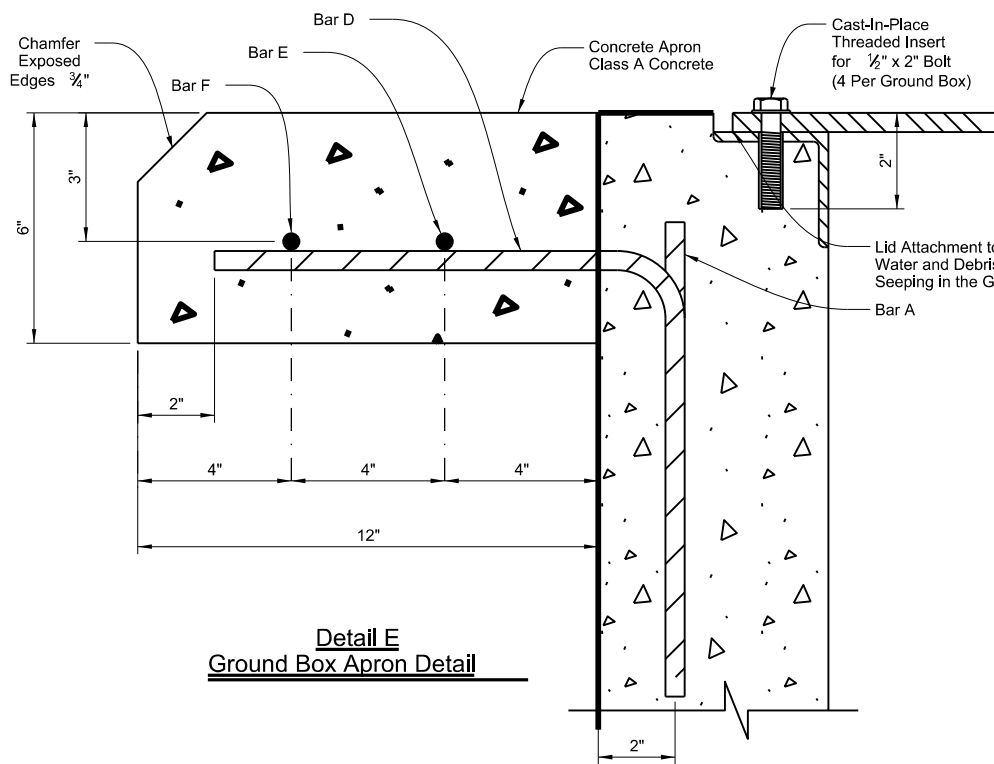


Detail B

Detail C

Lid Attachment Detail

Detail D



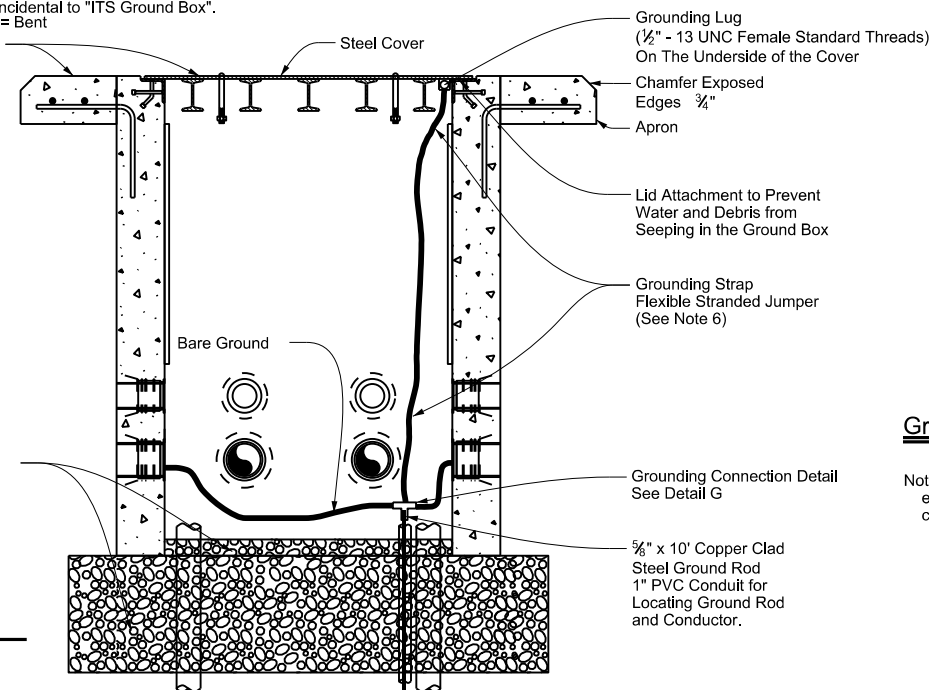
Detail E
Ground Box Apron Detail

Ground Box Type 1	BAR A					BAR B					BAR D					BAR E					BAR F					TOTALS	
	No.	Size	Ty.	Length	Weight	No.	Size	Ty.	Length	Weight	No.	Size	Ty.	Length	Weight	No.	Size	Ty.	Length	Weight	No.	Size	Ty.	Length	Weight	Steel * LBS.	Conc. * CY
36" Depth	22	#4	St.	2'-8"	39.3	5	#4	Bt.	13'-2"	44.1	8	#4	Bt.	2'-0"	10.7	1	#3	Bt.	17'-2"	6.5	1	#3	Bt.	19'-10"	7.5	108.1	.67
48" Depth	22	#4	St.	3'-8"	54.0	7	#4	Bt.	13'-2"	61.8	8	#4	Bt.	2'-0"	10.7	1	#3	Bt.	17'-2"	6.5	1	#3	Bt.	19'-10"	7.5	140.5	.89
60" Depth	22	#4	St.	4'-8"	68.8	8	#4	Bt.	13'-2"	70.6	8	#4	Bt.	2'-0"	10.7	1	#3	Bt.	17'-2"	6.5	1	#3	Bt.	19'-10"	7.5	164.1	1.11

* - For Contractors Information Only. Incidental to "ITS Ground Box".
 Legend: Ty. = Type, St. = Straight, Bt. = Bent

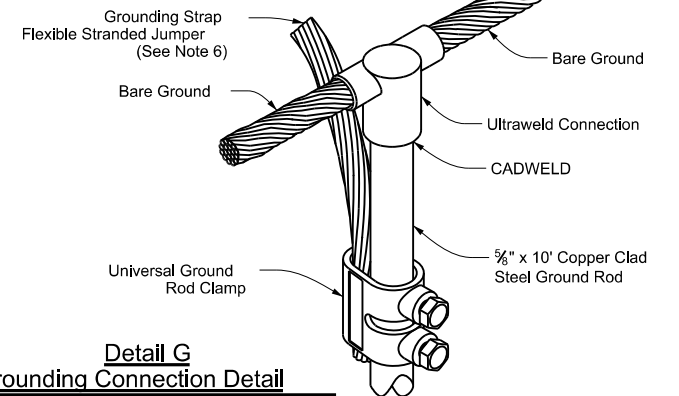
Top Flush With Surrounding Grade

Detail F
Grounding Detail



Detail G
Grounding Connection Detail

Note - All grounding connections to be CADWELDED or approved equal. This work will not be paid for directly, but is considered incidental to ITS ground box.



General Notes:

- See ITS(37) for additional Type "1" ground box details.
- Hot-dip galvanized steel covers after all welds are made.
- Label top of cover with the words "DANGER HIGH VOLTAGE TRAFFIC MANAGEMENT" using template-guided, hand-welded lettering at a height of 2 inches to ensure neatness.
- Provide all Type "1" ground boxes with a securable, tamper-proof cover equipped with a bolting system that positively secures the cover in place.
- Ground steel covers in accordance with the National Electrical Code.
- Ground covers to the grounding cable using a split-bolt kearney clamp, and a minimum 8-foot long flexible stranded jumper the same size as the grounding conductor. Terminate to metal ground box cover with a tank ground type lug as approved and directed by the Engineer.
- Provide Type "1" ground box and cover designed for heavy duty loading in accordance with AASHTO H20 loading when located where the box may experience deliberate, continuous vehicular traffic, such as near the shoulder or an auxiliary lane, or immediately adjacent to the unprotected edge of pavement.
- Provide a Type "1" ground box and cover tested by a laboratory independent of the manufacturer certifying loading requirements are met. Provide certification of such tests to the Engineer for approval.
- Provide a steel or cast iron cover in accordance with Item 471, Article 471.2, "Frames, Grates, Rings, and Covers." Provide covers with the number of drop handles shown. Provide Class "A" concrete for ground box construction and aprons.
- Fabricate cover so to fits properly on the ground box, and no undue noise results when traffic contacts the cover.

SHEET 2 OF 2



**ITS GROUND BOX DETAILS
TYPE "1" WITH STEEL COVER**

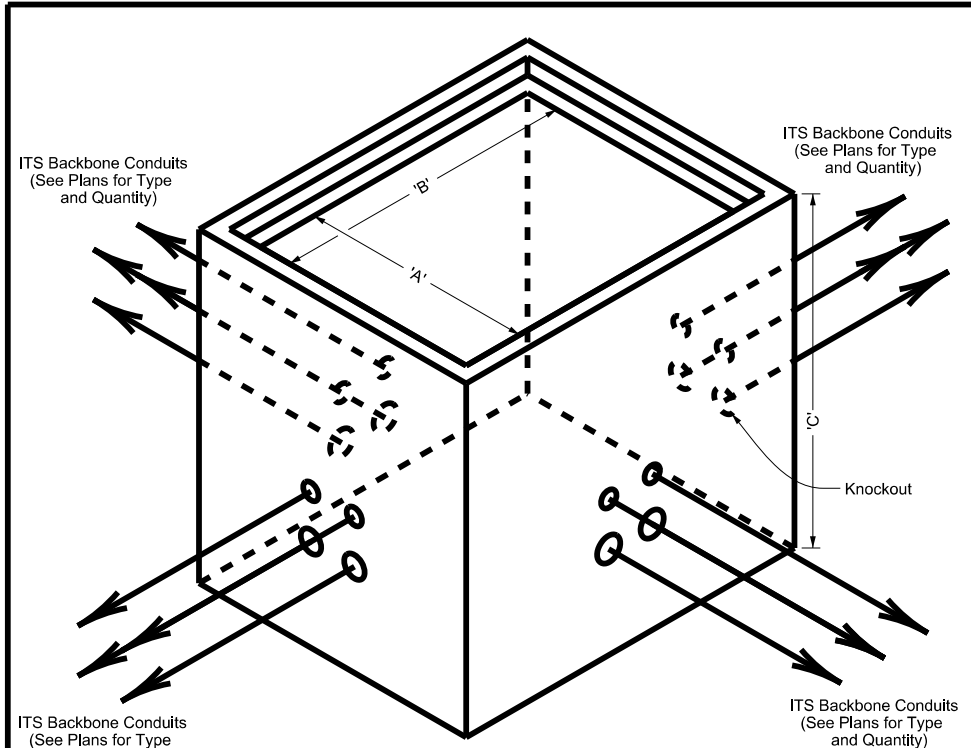
ITS(38)-17

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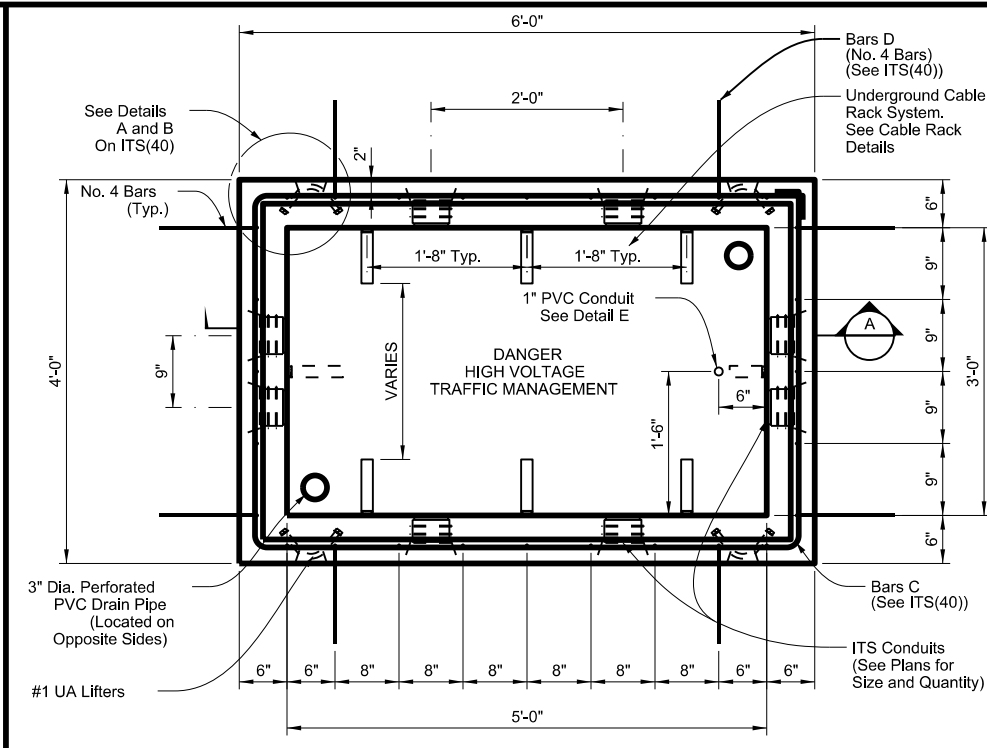
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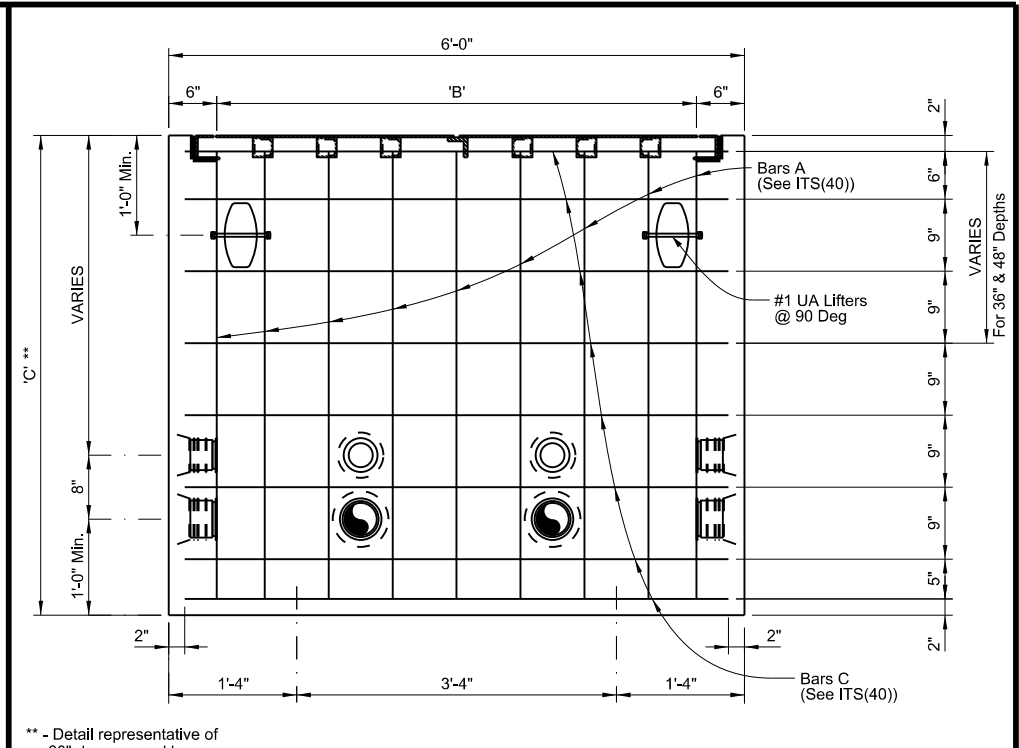
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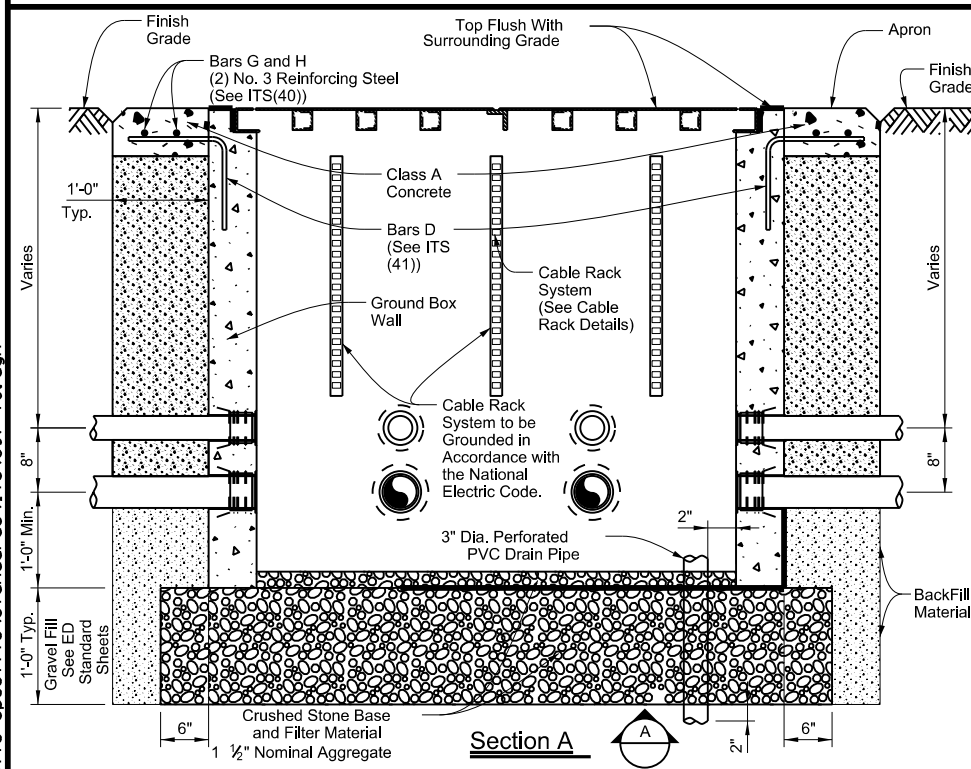
See Ground Box Schedule for A, B, and C Dimensions
Type 2 Ground Box Isometric View



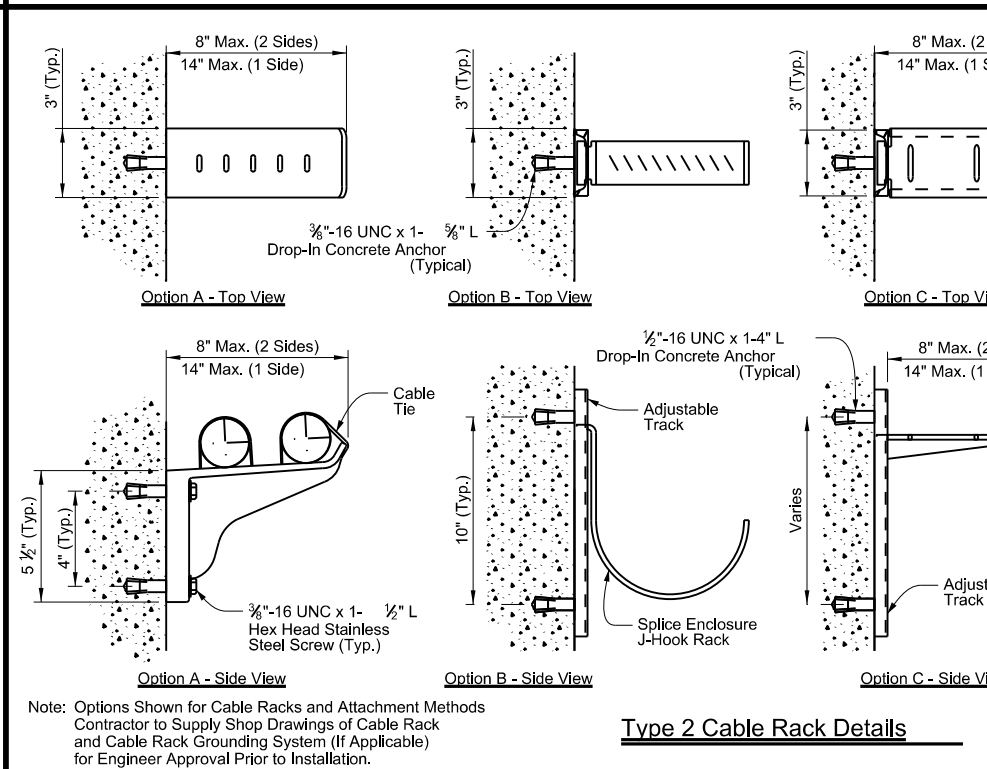
Note: Bar Spacing is The Same on Opposing Sides.
Type 2 Ground Box Plan View



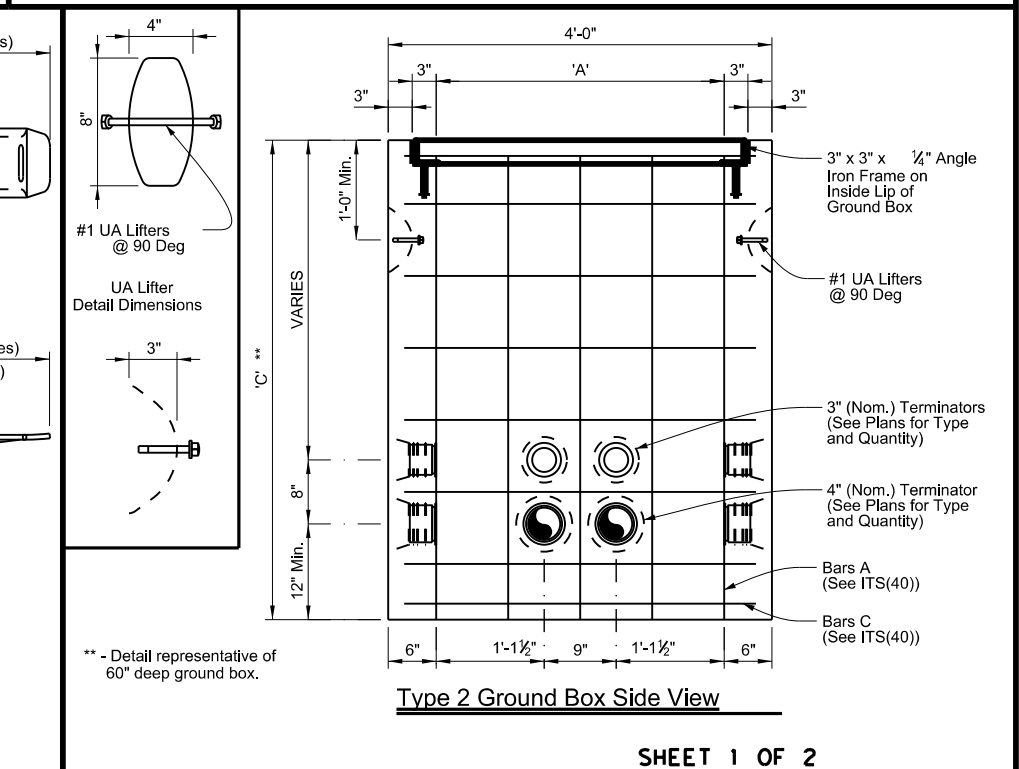
Type 2 Ground Box Elevation View



Section A



Type 2 Cable Rack Details



Type 2 Ground Box Side View

General Notes:

- Conduit entry points shown represent the standard configuration for backbone conduit as detailed on ITS(27). Additional conduits may be required as shown on the plans.
- Provide Class "A" concrete for Type "2" ground boxes.
- Provide terminators for the PVC conduit cast in the walls and placed symmetrically about the centerline of the box at the depths shown, unless otherwise noted, for the number of conduits identified on the plans to enter the box.
- Provide terminators appropriately sized for the conduits indicated on the plans. Provide terminators with an air tight and water tight connection.
- Closed bottom Type "2" ground boxes are acceptable in lieu of open bottom boxes. Provide two 3" Dia. perforated PVC drain pipes on opposite corners to optimize water drainage. Provide closed bottom boxes with a 12-inch base of crushed stone which extends 6 inches in all directions from the perimeter of the box. Crushed stone will be subsidiary to Special Specification, "ITS Ground Box."
- When additional conduit entry points are needed to accommodate existing conduit, core drill conduit knockouts in the field of the appropriate number and size of conduit at each location, as directed by the Engineer.
- Provide a bell fitting on the end of each conduit to ensure a flush fit inside the ground box.
- Concrete grout around the knockout (inside and out) and around the conduit and bell fitting to ensure a neat watertight fit after the conduit and bell fitting have been placed in a knockout. Ensure all openings in the ground box are sealed prior to grouting operations.
- Install a nylon string and plug all unused conduits with tug-plugs sized for the particular conduits. Provide split innerduct plugs in conduits or innerducts with cables to seal the innerduct around the cables to prevent water and dirt from entering.
- Install all open bottom Type "2" ground boxes on a 12-inch base of crushed stone which extends 6 inches in all directions from the perimeter of the box. Crushed stone will be subsidiary to special specification, "ITS Ground Box."
- Cap and seal terminators that do not have conduits attached.
- Backfill in accordance with Item 400, "Excavation and Backfill for Structures."
- Provide steel (ASTM A-153), glass reinforced nylon, or equivalent cable rack assemblies designed to support the amount of cable storage slack and splice enclosures identified in the plans. Locate cable rack system on any side but allow for sufficient access to the inside of the ground box. Cable racks may be installed at the factory or in the field. When mounting cable racks in the field, seal all penetrations to the concrete side wall to prevent moisture penetration. Ground metallic cable rack systems to grounding system inside ground box in accordance with the National Electrical Code.

Ground Box Schedule			
Ground Box Type	'A' Width Inside (Inches)	'B' Length Inside (Inches)	'C' Depth Inside (Inches)
Type 2	36	60	36, 48, 60

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SHEET 1 OF 2

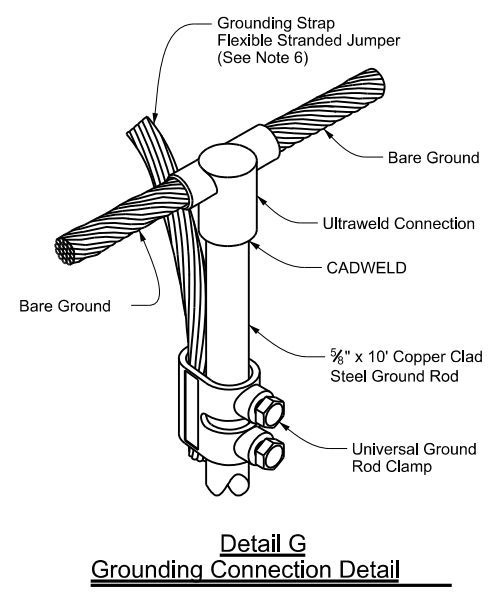
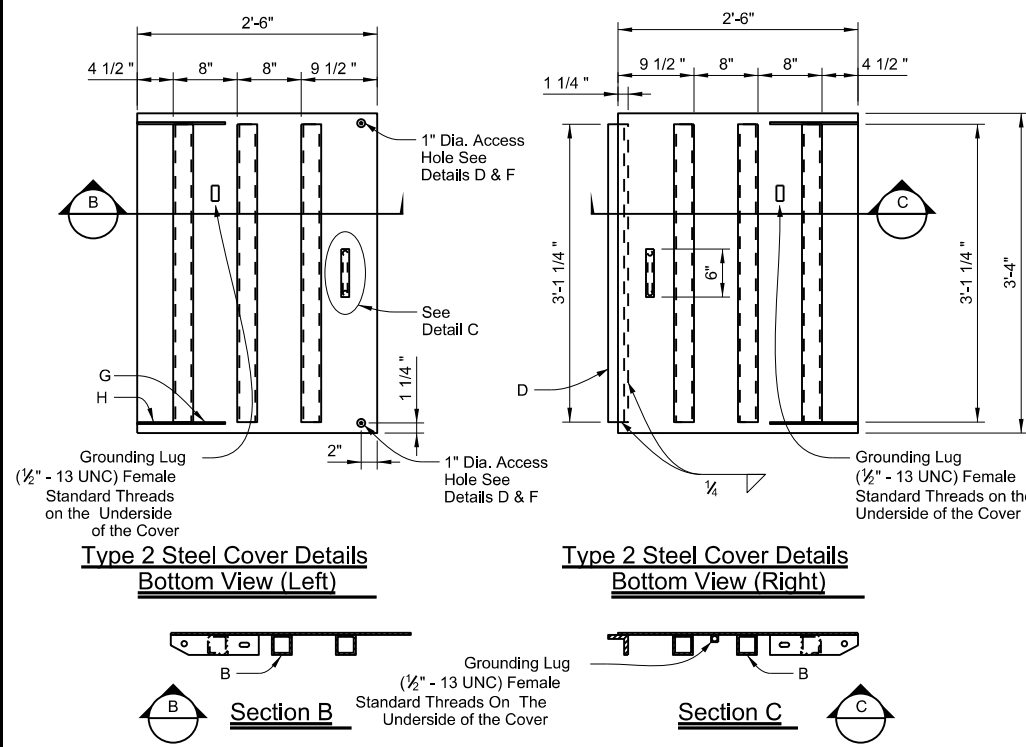
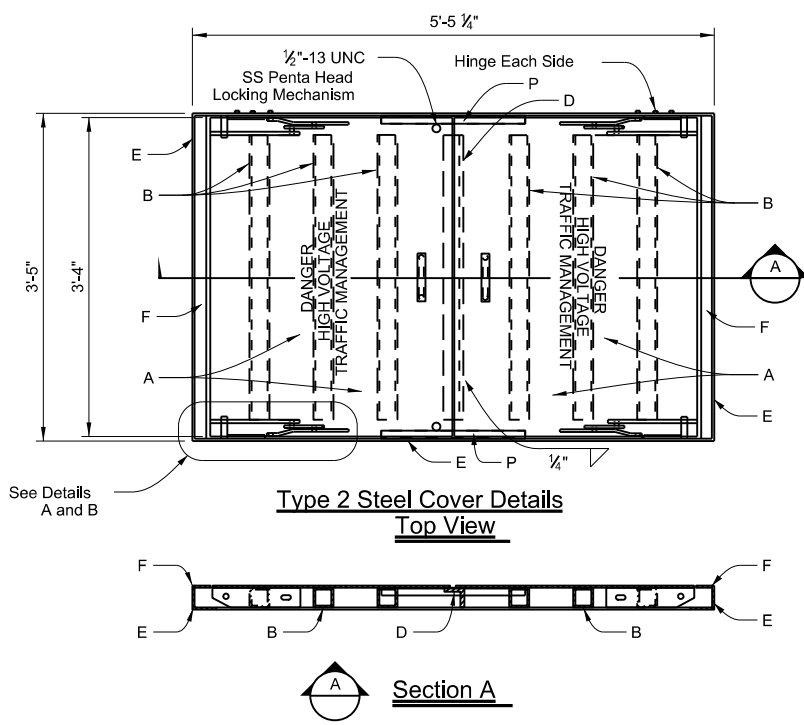
Texas Department of Transportation
 Traffic Operations Division Standard

ITS GROUND BOX DETAILS TYPE "2" WITH STEEL COVER

ITS(39)-16

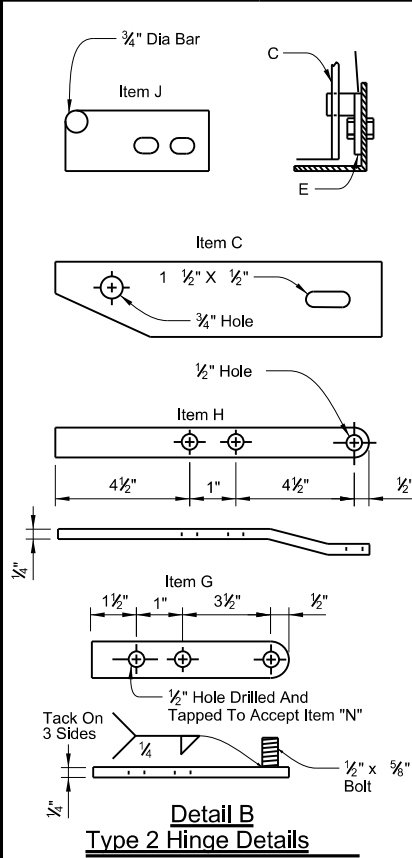
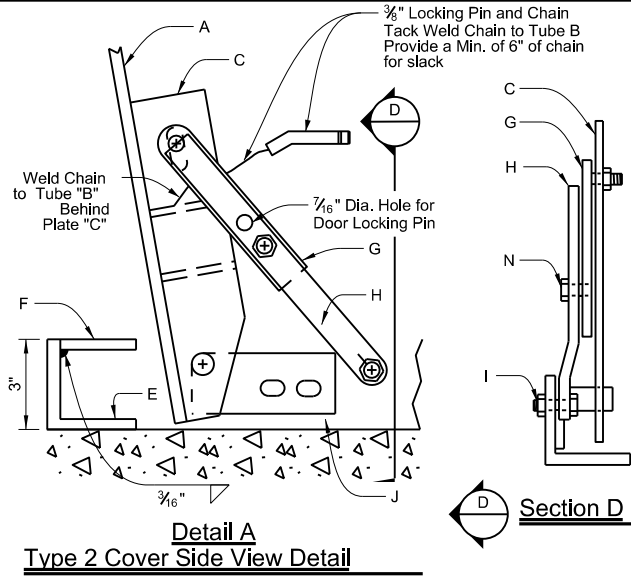
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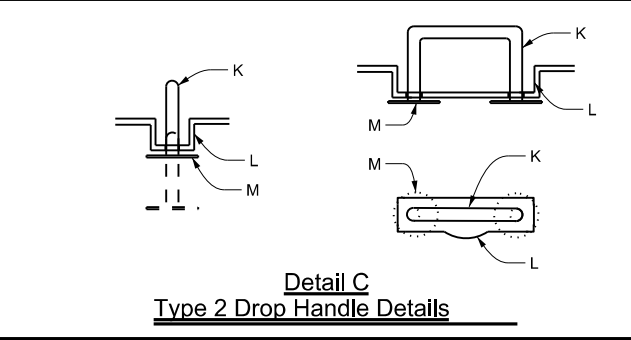
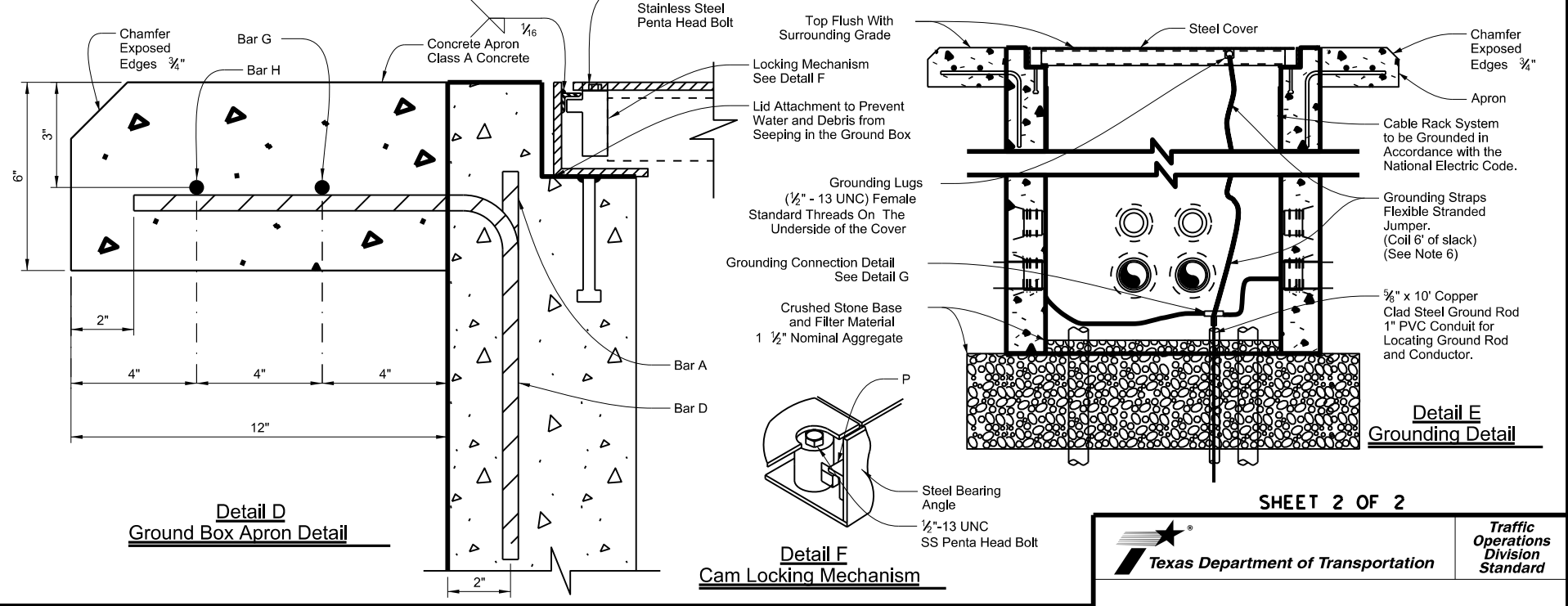
Item	Qty	Incidental "ITS Ground Box" Material
A	2	1/4" Floor Plate 40" x 30"
B	6	2 1/2" x 2 1/2" x 37 1/4" Tube
C	4	11" x 2 1/2" x 1/4" Plate
D	1	2 1/2" x 2 1/2" x 1/2" x 37" 1/4" Angle
E	4	3" x 3" x 1/4" Angle
F	2	40 1/2" x 2" x 1/4" Plate
G	4	6 1/2" x 1 1/4" x 1/4" Plate
H	4	10 1/2" x 1 1/4" x 1/4" Plate
I	12	1/2" Bolt/Nut
J	4	4 3/4" x 2" x 3/4" Plate
K	2	5/8" Drop Handle
L	2	1 1/2" x 5/8" x 3/16" Channel x 7"
M	4	1 1/2" x 1/8" P Disk
N	8	1/2" x 5/8" Bolt
P	2	1" x 1" x 1/8" Angle x 18"

Note - All grounding connections to be CADWELD or approved equal. This work will not be paid for directly, but is considered incidental to ITS ground box.



Ground Box Type 2	BAR A					BAR C					BAR D					BAR G					BAR H					TOTALS	
	No.	Size	Ty.	Length	Weight	No.	Size	Ty.	Length	Weight	No.	Size	Ty.	Length	Weight	No.	Size	Ty.	Length	Weight	No.	Size	Ty.	Length	Weight	Steel * LBS.	Conc. * CY
36" Depth	28	#4	St.	2'-8"	50.0	5	#4	Bt.	19'-1"	63.9	8	#4	Bt.	2'-0"	10.7	1	#3	Bt.	23'-3"	8.8	1	#3	Bt.	25'-11"	9.8	143.2	1.00
48" Depth	28	#4	St.	3'-8"	68.8	7	#4	Bt.	19'-1"	89.5	8	#4	Bt.	2'-0"	10.7	1	#3	Bt.	23'-3"	8.8	1	#3	Bt.	25'-11"	9.8	187.6	1.33
60" Depth	28	#4	St.	4'-8"	87.5	8	#4	Bt.	19'-1"	102.3	8	#4	Bt.	2'-0"	10.7	1	#3	Bt.	23'-3"	8.8	1	#3	Bt.	25'-11"	9.8	219.1	1.67

* - For Contractors Information Only. Incidental to "ITS Ground Box".
 Legend: Ty. = Type, St. = Straight, Bt. = Bent



- General Notes:**
- See ITS(39) for additional Type "2" ground box details.
 - Hot-dip galvanized steel covers after all welds are made.
 - Label top of cover with the words "DANGER HIGH VOLTAGE TRAFFIC MANAGEMENT" using template-guided, hand-welded lettering at a height of 2 inches to ensure neatness.
 - Provide all Type "2" ground boxes with a securable, tamper-proof cover equipped with a bolting system that positively secures the cover in place.
 - Ground steel covers in accordance with the National Electrical Code.
 - Ground covers to the grounding cable using a split-bolt kearney clamp, and a minimum 8-foot long flexible stranded jumper the same size as the grounding conductor. Terminate to metal ground box cover with a tank ground type lug as approved and directed by the Engineer.

- Provide Type "2" ground box and cover designed for heavy duty loading in accordance with AASHTO H20 loading when located where the box may experience deliberate, continuous vehicular traffic, such as near the shoulder or an auxiliary lane, or immediately adjacent to the unprotected edge of pavement.
- Provide a Type "2" ground box and cover tested by a laboratory independent of the manufacturer certifying loading requirements are met. Provide certification of such tests to the Engineer for approval.
- Provide a steel or cast iron cover in accordance with Item 471, Article 471.2, "Frames, Grates, Rings, and Covers." Provide covers with the number of drop handles shown. Provide Class "A" concrete for ground box construction and aprons.
- Fabricate cover so to fits properly on the ground box, and no undue noise results when traffic contacts the cover.

SHEET 2 OF 2

Texas Department of Transportation
 Traffic Operations Division Standard

ITS GROUND BOX DETAILS TYPE "2" WITH STEEL COVER

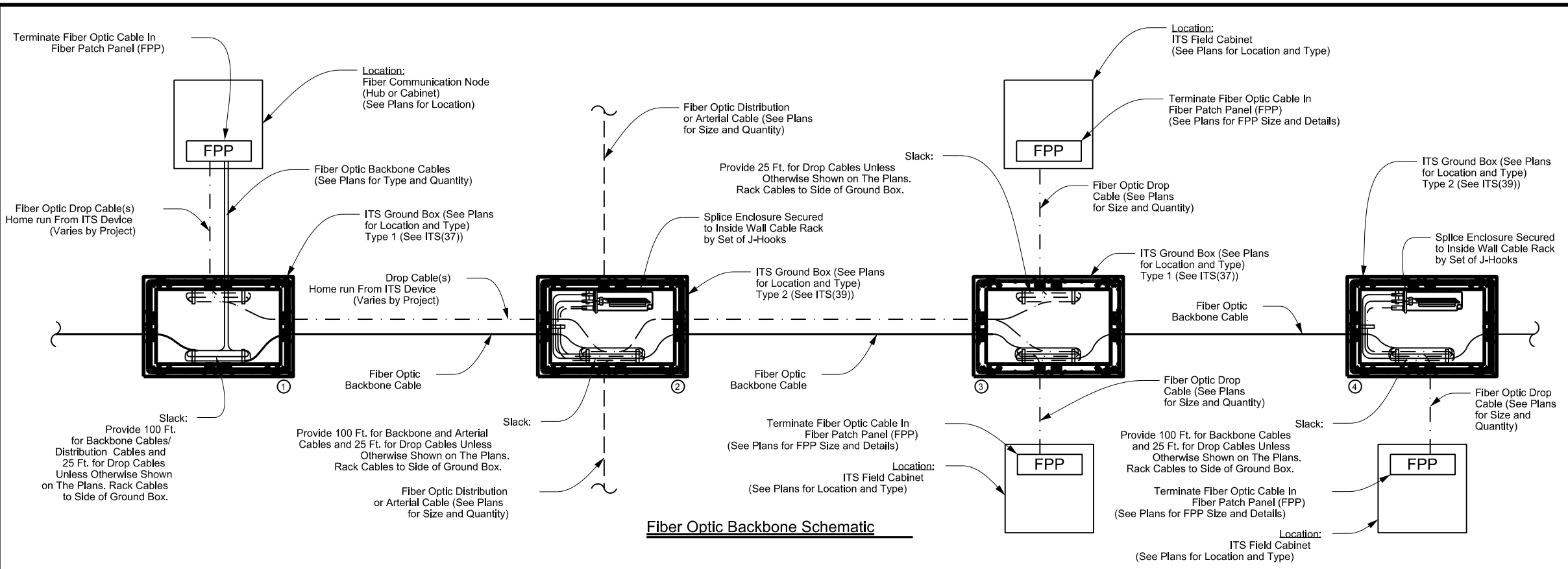
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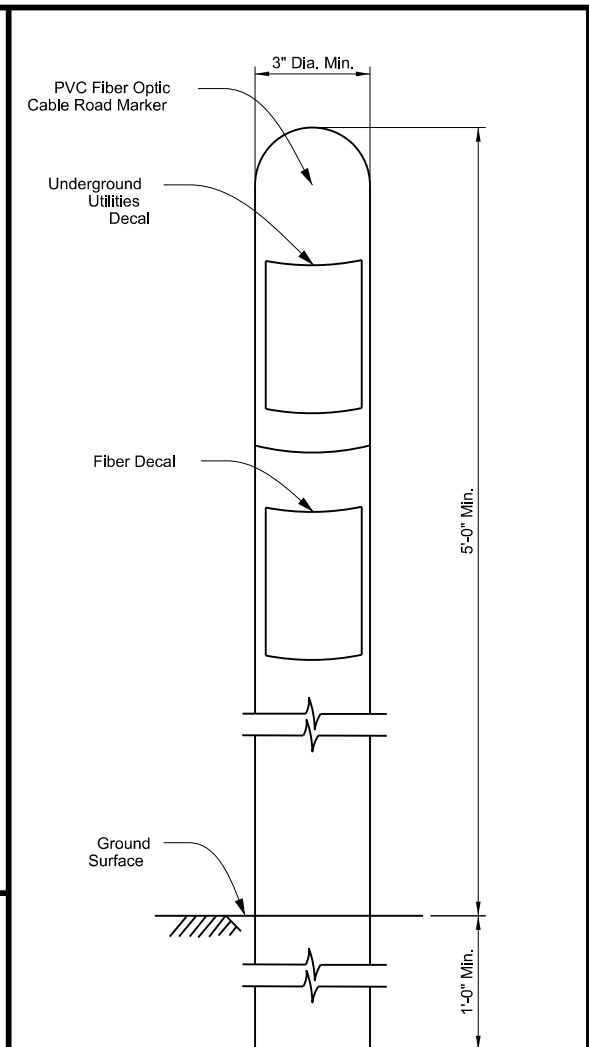
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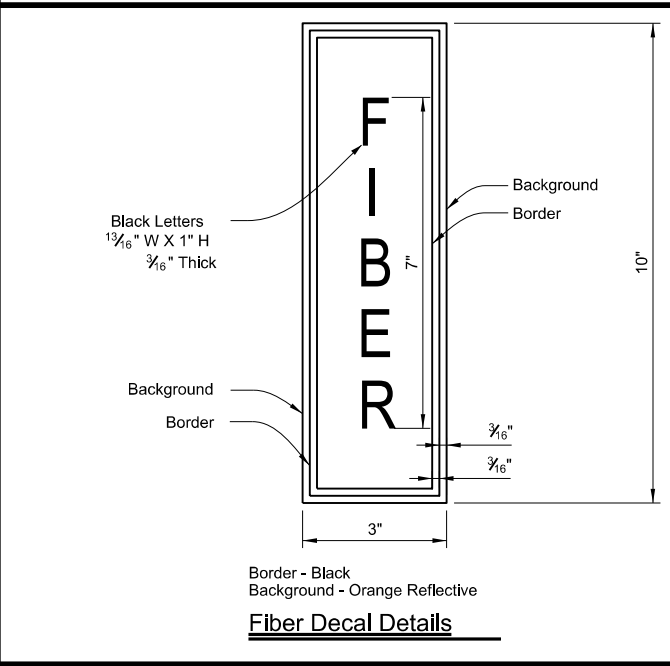


Fiber Optic Backbone Schematic

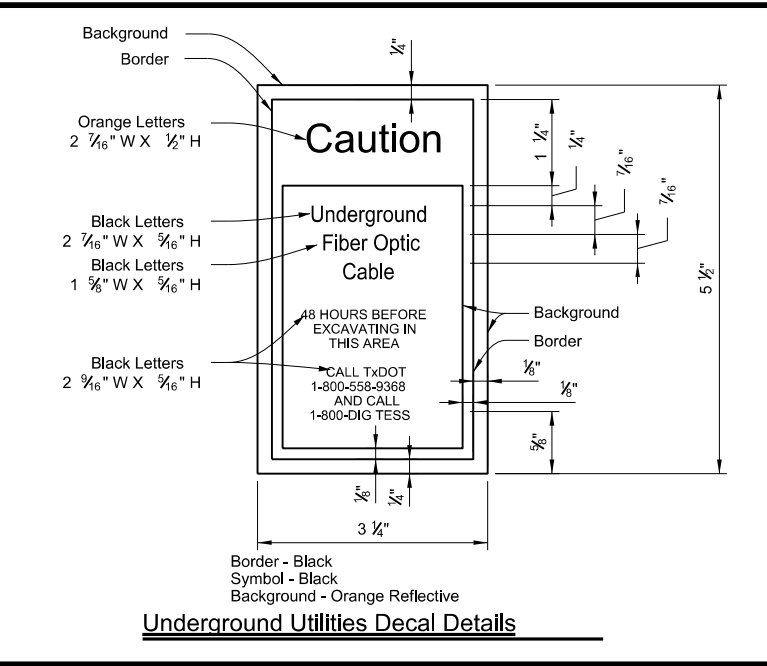


- Notes:
1. Space fiber optic cable road markers at maximum 1000' intervals or at significant changes in direction such as a 90 degree turn.
 2. Provide all orange fiber optic cable road markers for non-splice locations.
 3. Provide orange fiber optic cable road markers with white dome for splice locations.
 4. Locate marker within concrete apron of fiber ground box.

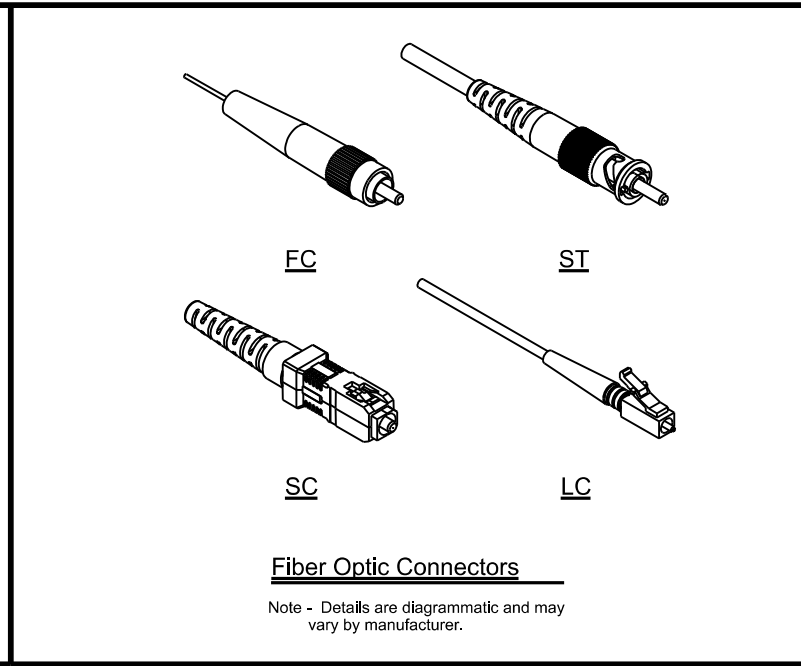
Fiber Optic Cable Road Markers



Fiber Decal Details



Underground Utilities Decal Details



Fiber Optic Connectors

Note - Details are diagrammatic and may vary by manufacturer.

General Notes:

1. The fiber optic backbone schematic shown is diagrammatic only and intended to represent the various fiber optic communication architectures seen across the state and may not show all configurations seen. Connection of ITS field equipment to ITS communication nodes or hubs is achieved through home run drop cables or spliced to the backbone in a splice enclosure. Refer to fiber communication schematic details and fiber termination information shown on the plans for further information.
2. Install a flat pull cord in all empty conduits and inner-ducts identified for communication use. The pull cord must have a tensile strength of 1,250 lbs minimum and have foot markings to determine length installed. Furnish and installation of pull cord will be subsidiary to special specification "ITS Fiber Optic Cable".
3. Color code each type of fiber optic cable to identify the cable as a "backbone" (green or blue), "distribution" (red), or "drop" (orange or yellow).
4. Terminate fibers at fiber patch panel (FPP), also referred to as patch panel, with SC connectors for new installations. When connecting to existing FPP, terminate with FC or ST connectors as shown on the plans. Provide connector adaptors as required to accommodate existing equipment if information is not provided in the plans.
5. Provide a list showing cable number assignments and highway or facility that the cable services.
6. Provide a single 1/8" #14 insulated wire in conduit runs which have been identified in the plans to carry fiber optic cable. Provide UL listed solid copper wire with orange color low density polyethylene insulation suitable for conduit installation rated for temperature range -20 C to 60 C and a voltage rating of 600V. This wire will serve as a tracer, or locate, wire for locating underground conduit containing fiber optic cabling and will be paid for under Item 620, "Electrical Conductors."
7. Ensure each cable is marked on the outer jacket with a label detailing the manufacturer's name, the date of manufacturer (month/year), the fiber count (Example: 48F SM or 48 SMF), and sequential length markings at maximum 3 FT increments.

Reference Notes:

- ① Fiber architecture at communication node.
- ② Fiber architecture for splicing arterial distribution cables.
- ③ Fiber architecture for home run of drop cables from ITS field equipment cabinets to communication node.
- ④ Fiber architecture for splicing drop cable from ITS field equipment cabinet.

SHEET 1 OF 2



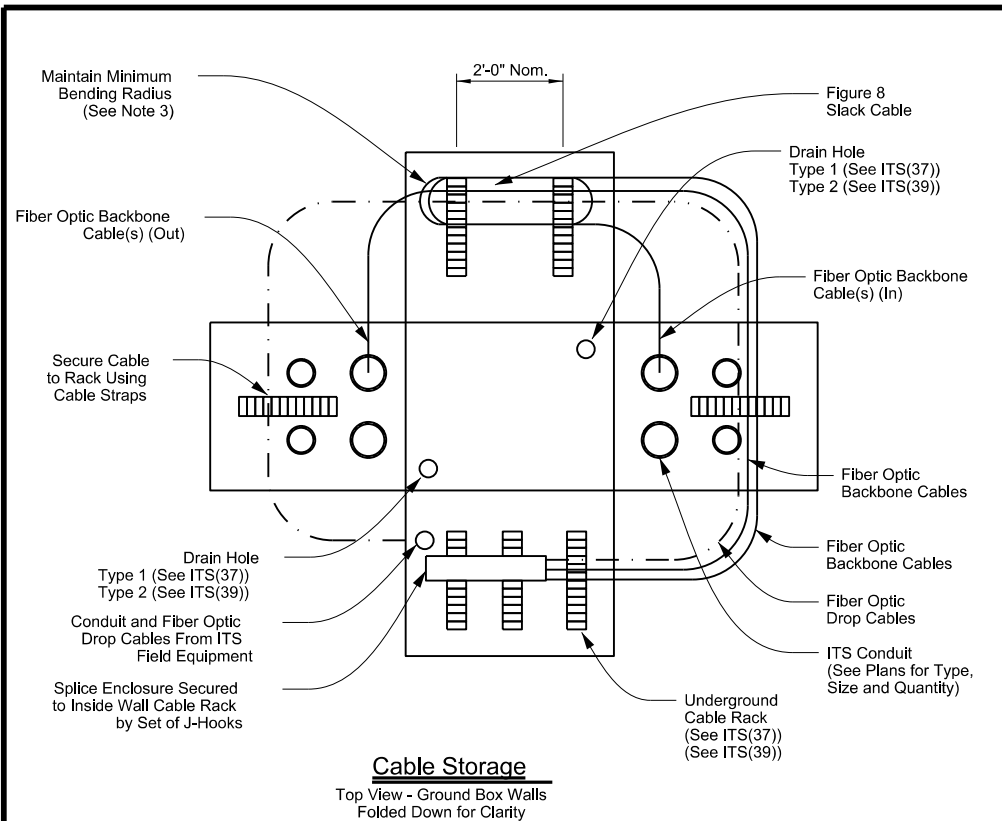
ITS FIBER OPTIC CABLE MISCELLANEOUS DETAILS

ITS(42)-16

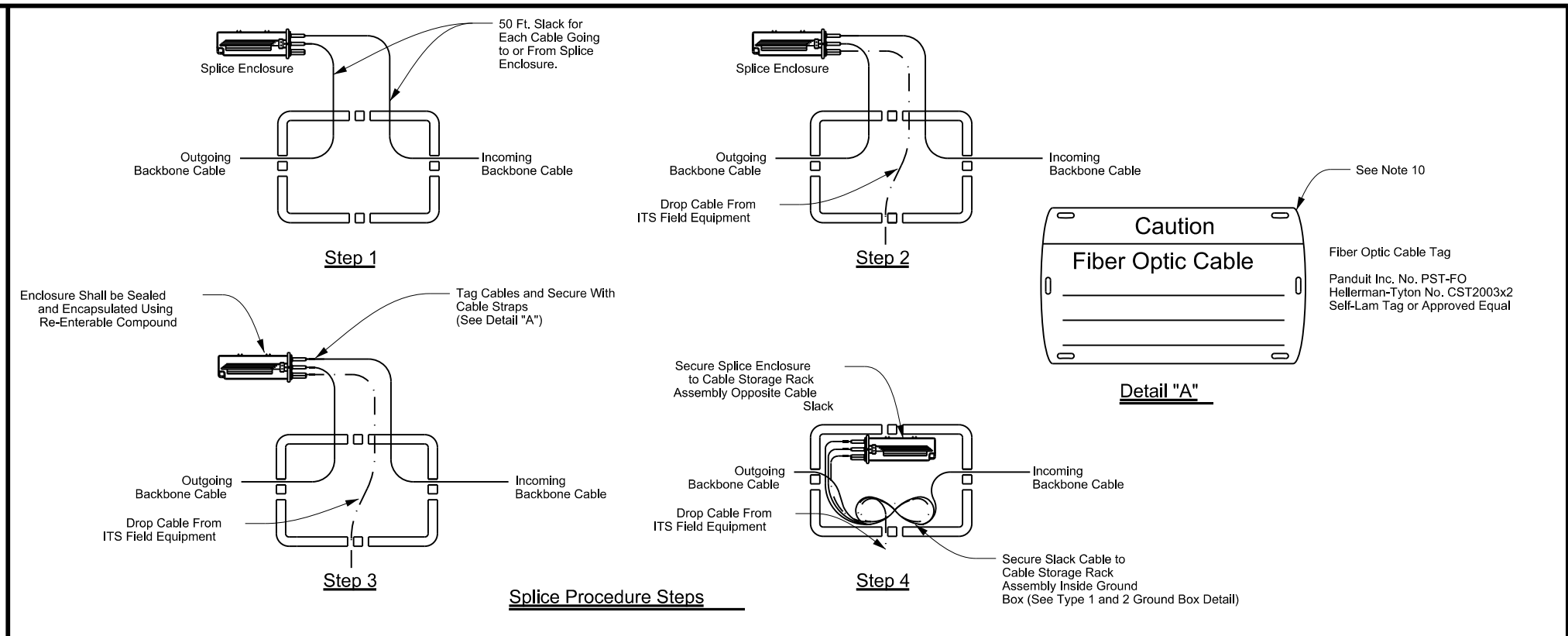
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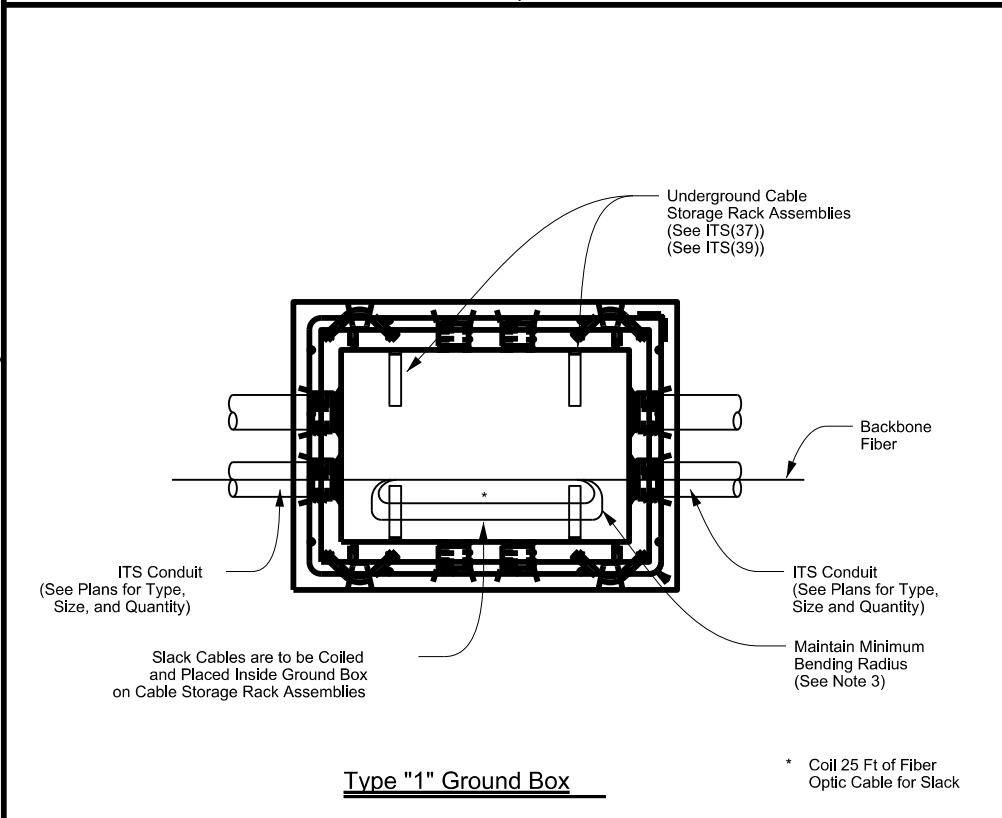
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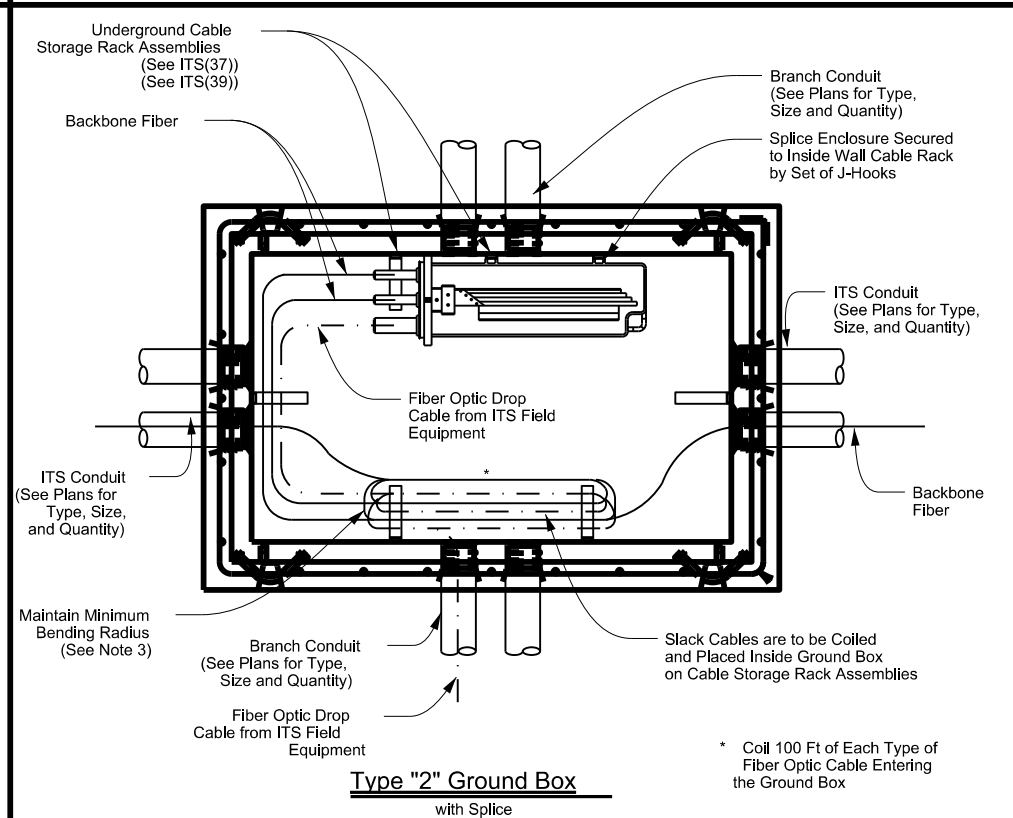
Cable Storage
Top View - Ground Box Walls Folded Down for Clarity



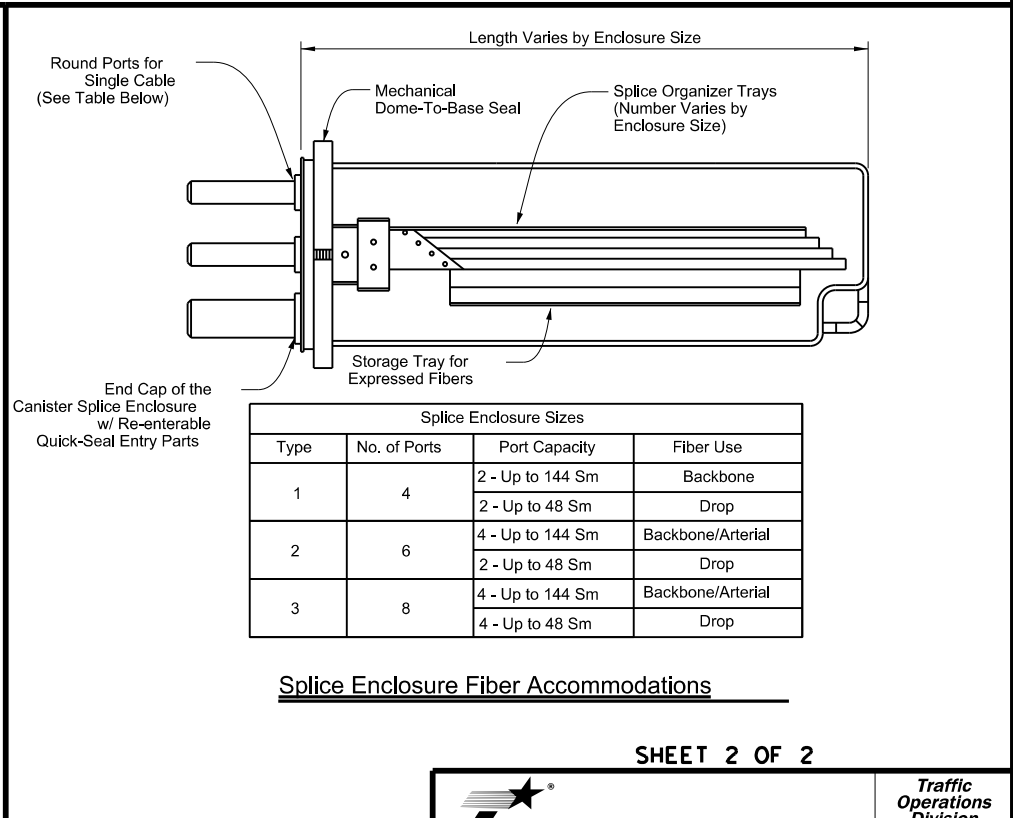
Splice Procedure Steps



Type "1" Ground Box



Type "2" Ground Box with Splice



Splice Enclosure Fiber Accommodations

General Notes:

1. Conduit entry points to the Type 1 and Type 2 ground boxes are diagrammatic. Refer to ITS ground box standards, ITS(37) and ITS(39), for more information. Additional conduits may be required as shown on the plans.
2. Type 2 ground boxes are to be used, as shown on the plans, when splice enclosures are required.
3. Maintain a minimum bend radius of 20 times the fiber optic cable diameter during installation, relocation, and removal and a minimum of 10 times the fiber optic cable diameter when in operation.
4. Caulk all conduit around the top of the cable ducts with an engineer approved caulking compound to seal clearance between the cables and ducts. Place conduit plugs in all vacant conduits or inner-ducts.
5. Provide cable straps that will withstand ultra-violet exposure and do not damage cables when tightening.
6. All incidental equipment necessary for the cable installation and mounting of splice enclosure within the ground box will be incidental to Special Specification, "ITS Fiber Optic Cable."
7. Submit all splice locations to the field engineer for approval before beginning work.

8. Provide splice enclosures designed to seal, bond, anchor, and protect fiber optic cable splices. Provide splice enclosures designed to handle mechanical and fusion type splices. Provide splice enclosures with port configurations for the sizes detailed above.
9. Provide splice enclosures designed for underground placement with a sealing system preventing water penetration when submerged under 10 ft. of water.
10. Furnish, install, and secure fiber optic cable tags for each fiber optic cable entering a ground box, ITS field equipment cabinet (ground and pole), and hub building or communication node as detailed above. Provide information including fiber optic type, count, origin, and destination on the cable tag. Use UV resistant tie-wraps for securing the tag to the cable. Provide tie-wraps that do not damage fiber when securing to cable.

SHEET 2 OF 2



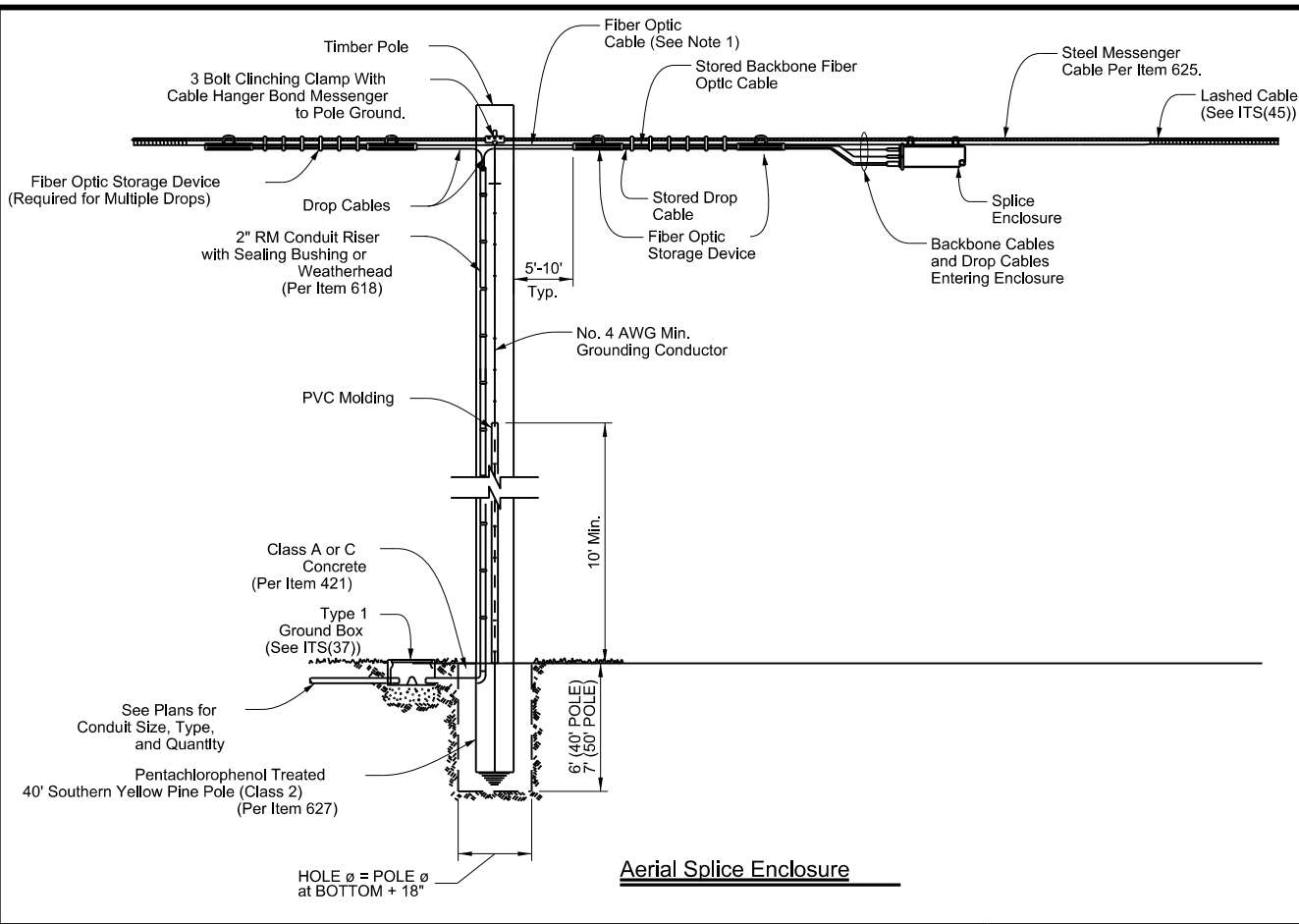
ITS FIBER OPTIC CABLE MISCELLANEOUS DETAILS

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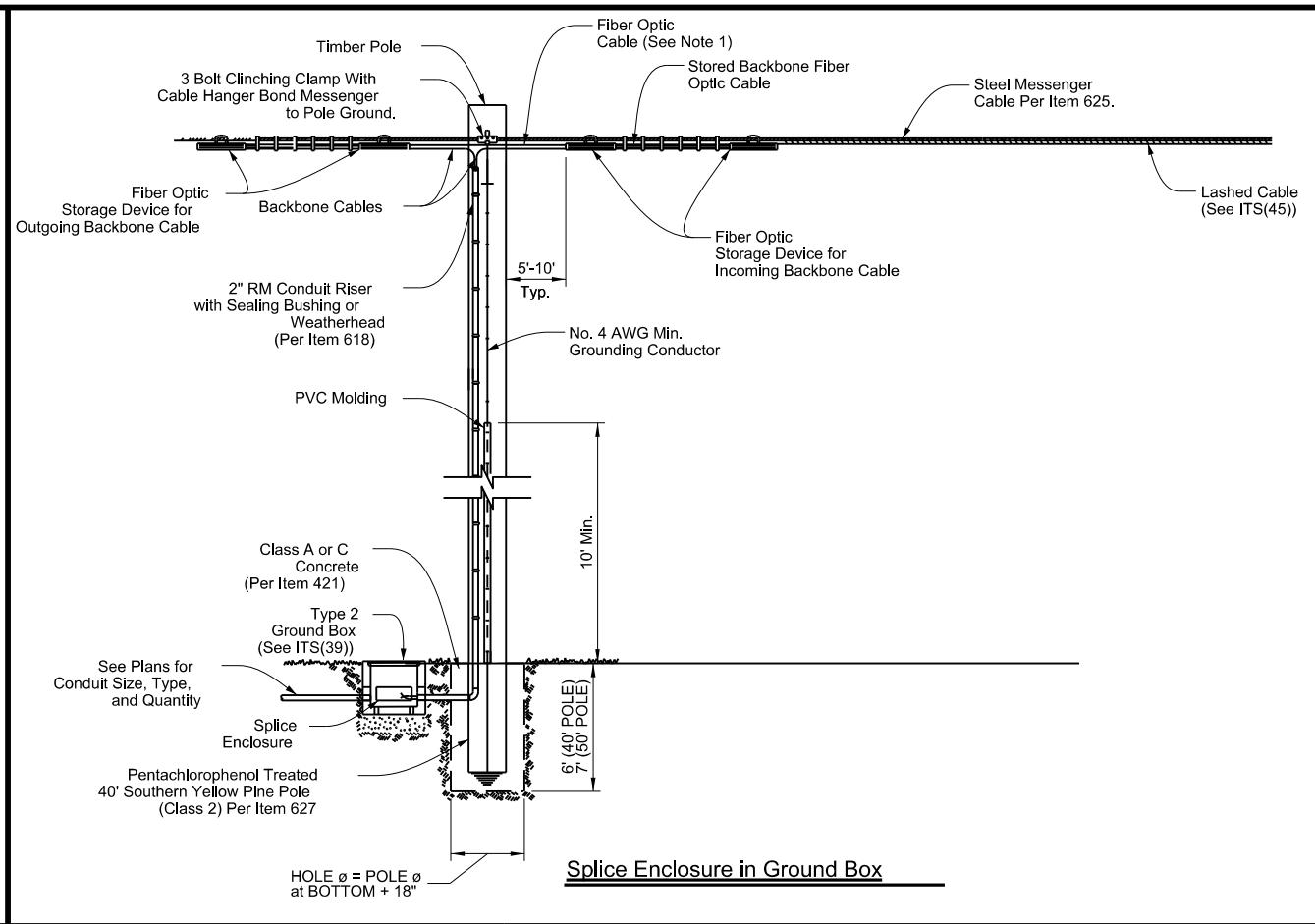
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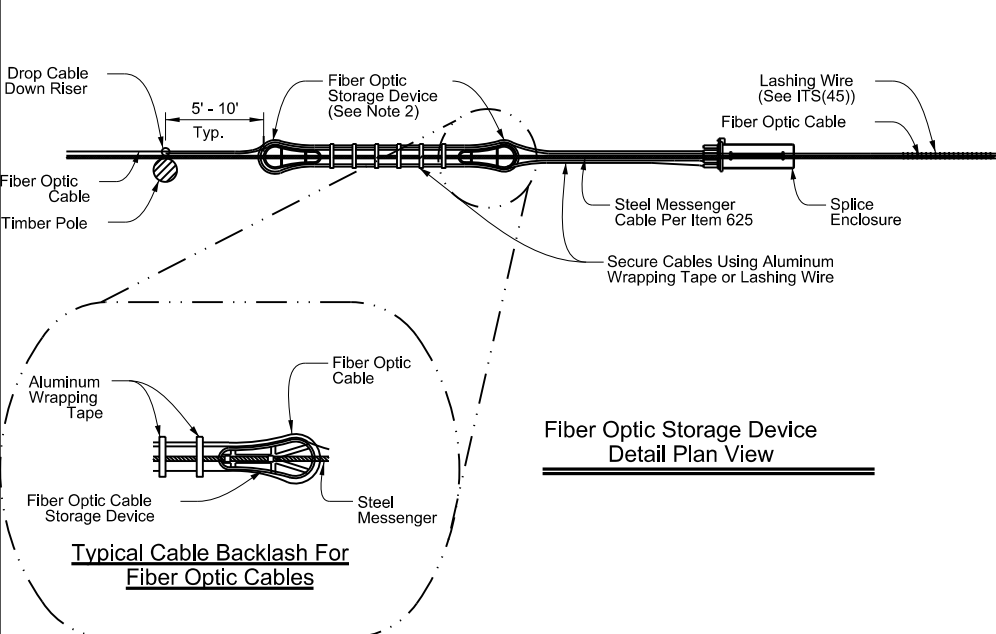
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Aerial Splice Enclosure

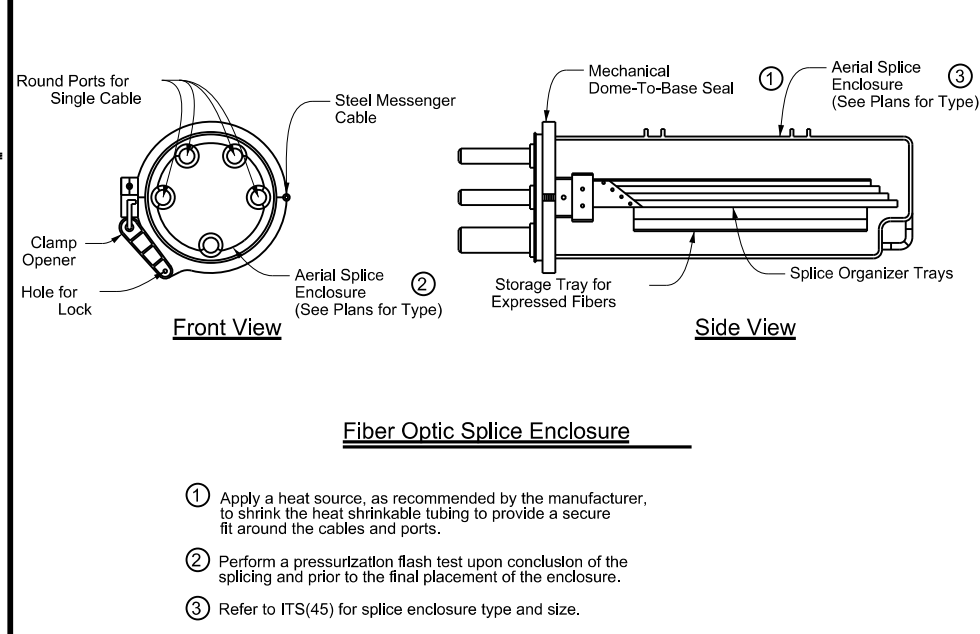


Splice Enclosure in Ground Box



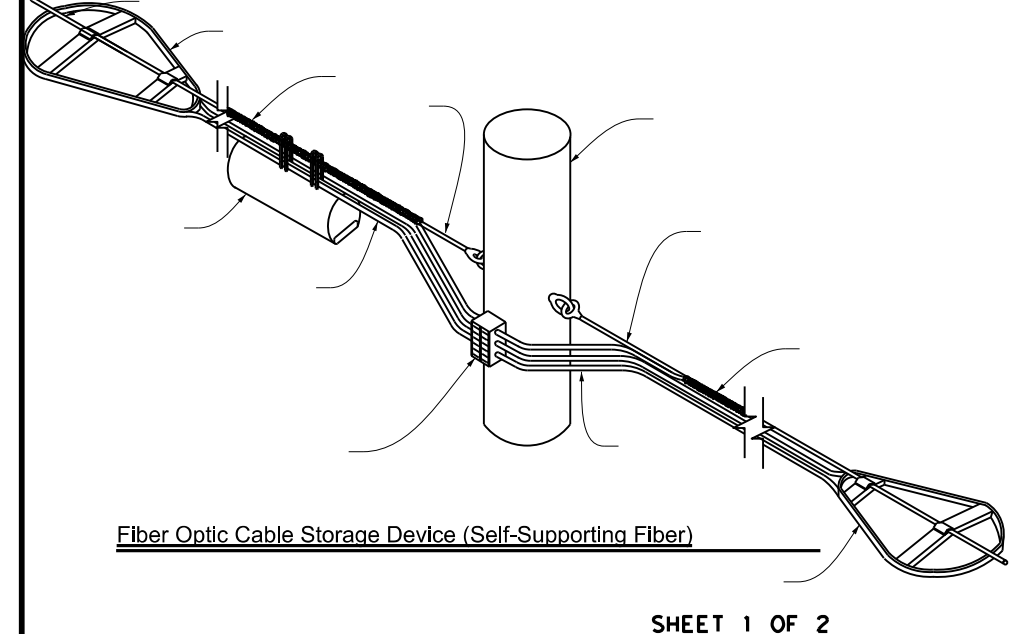
Fiber Optic Storage Device Detail Plan View

Typical Cable Backlash For Fiber Optic Cables



Fiber Optic Splice Enclosure

- ① Apply a heat source, as recommended by the manufacturer, to shrink the heat shrinkable tubing to provide a secure fit around the cables and ports.
- ② Perform a pressurization flash test upon conclusion of the splicing and prior to the final placement of the enclosure.
- ③ Refer to ITS(45) for splice enclosure type and size.



Fiber Optic Cable Storage Device (Self-Supporting Fiber)

SHEET 1 OF 2

- General Notes:**
1. Provide outdoor rated non-armored all-dielectric (requires steel messenger support) or non-armored all-dielectric self-supporting fiber optic cable designed for aerial installation. Fiber optic cable constructed with integrated steel messenger cable is acceptable.
 2. See plans for location and amount of spare fiber optic cable slack. Determine the quantity of cable storage racks necessary to secure fiber optic cable slack identified and to accommodate the number of fiber optic cable drops as shown on the plans.
 3. Do not store spare cable slack over roadways, driveways, railroads, or buildings.
 4. Provide required clearance from electrical power lines and other cables in accordance with Section 23 of the National Electric Safety Code (NESC).
 5. Use the lashing wire method for lashing non self-supporting fiber optic cable requiring lashing to a steel messenger cable.
 6. Use a lasher to secure the fiber optic cable to the steel wire strand by wrapping the strand and cable in a spiral manner. The fiber optic cable must be installed without loose lashing, twisting, or weaving along the strand. Rippling, kinking, or any kind of deformation of the cable will lead to a required replacement of the cable by the contractor.
 7. Ensure at least one wrap of lashing wire per linear foot is provided when lashing the fiber optic cable to the steel messenger cable.
 8. Provide lasher of sufficient size to lash the fiber optic cable without damaging the cable.

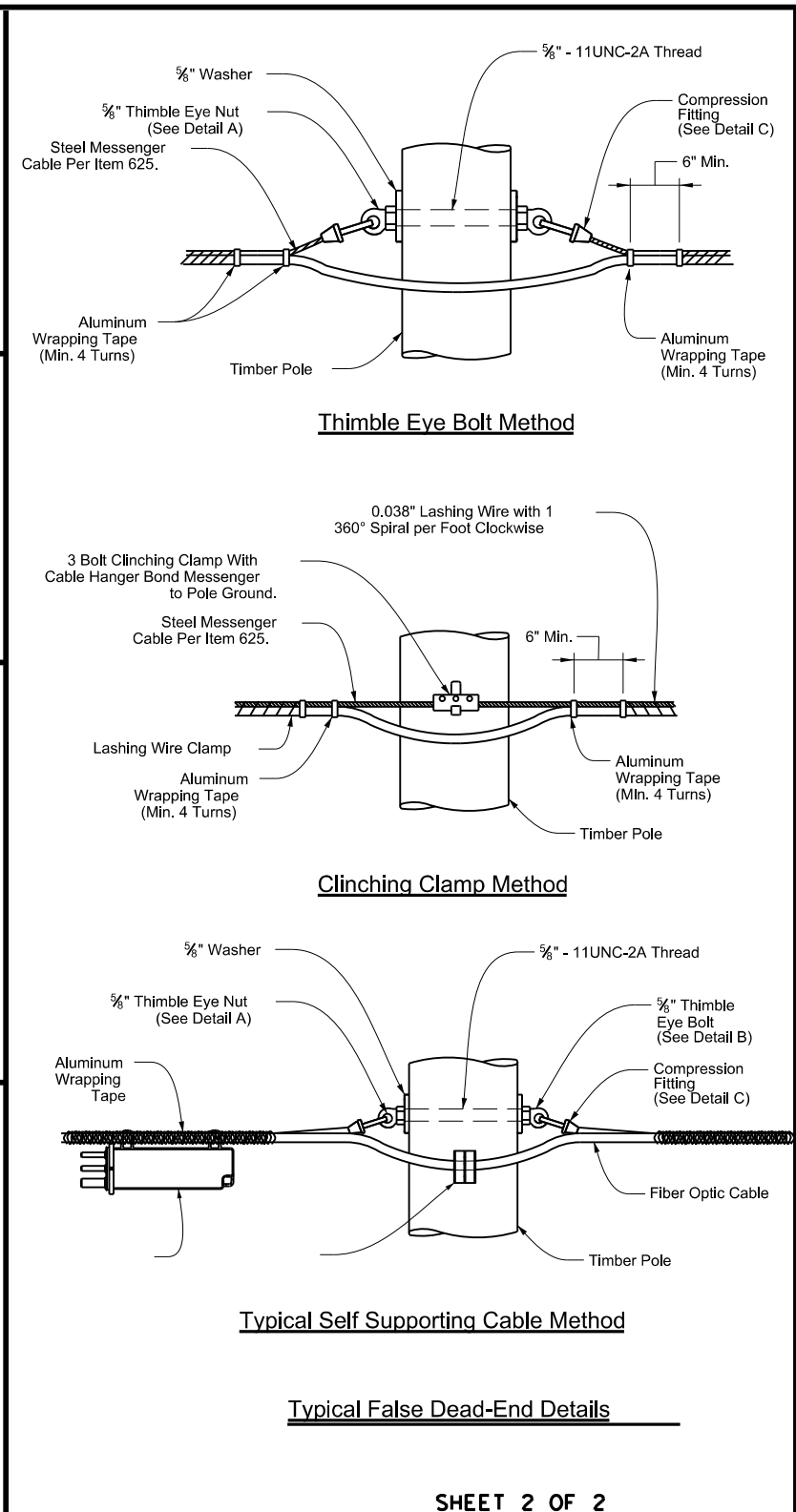
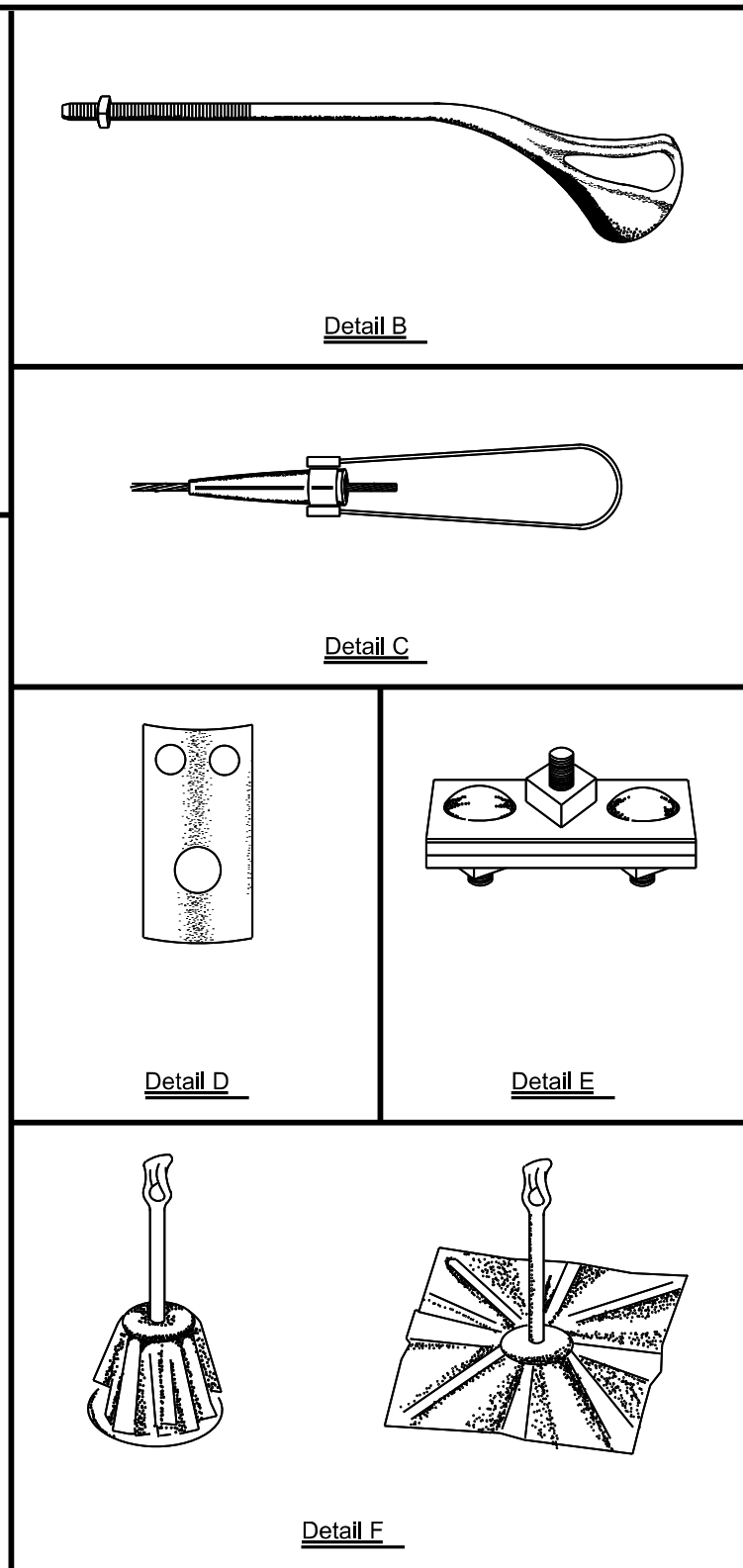
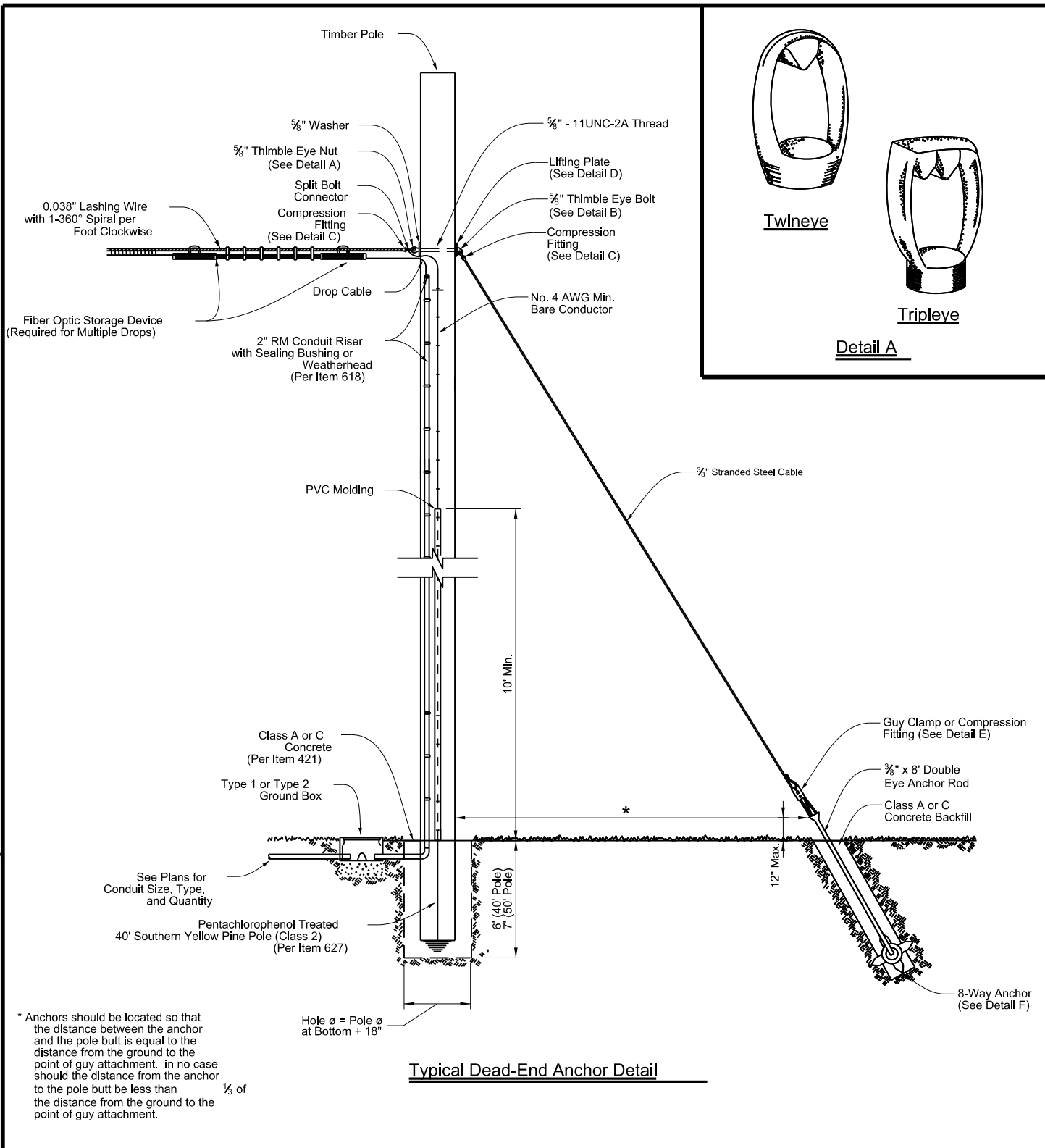
ITS FIBER OPTIC CABLE AERIAL INSTALLATION DETAILS
ITS(44)-16

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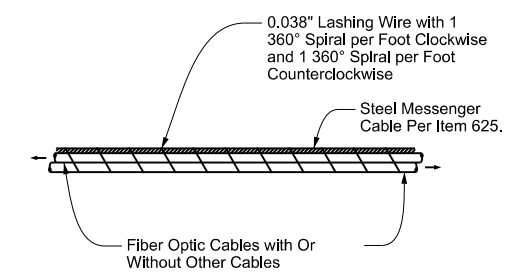
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General Notes:

1. Provide outdoor rated non-armored all-dielectric (requires steel messenger support) or non-armored all-dielectric self-supporting fiber optic cable designed for aerial installation. Fiber optic cable constructed with integrated steel messenger cable is acceptable.
2. See plans for location and amount of fiber optic cable slack. Contractor to determine the quantity of cable storage racks necessary to secure fiber optic cable slack identified and to accommodate the number of fiber optic cable drops as shown on the plans.
3. Do not store spare cable over roadways, driveways, railroads, or buildings.
4. Provide required clearance from electrical power lines and other cables in accordance with Section 23 of the National Electric Safety Code (NESC).
5. Use the lashing wire method for lashing non self-supporting fiber optic cable requiring lashing to a steel messenger cable.
6. Use a lasher to secure the fiber optic cable to the steel wire strand by wrapping the strand and cable in a spiral manner. The fiber optic cable must be installed without loose lashing, twisting, or weaving along the strand. Rippling, kinking, or any kind of deformation of the cable will lead to a required replacement of the cable by the contractor.
7. Ensure at least one wrap of lashing wire per linear foot is provided when lashing the fiber optic cable to the steel messenger cable.
8. Provide lasher of sufficient size to lash the fiber optic cable without damaging the cable.



Typical Cable Lashing Detail Double Lashing For Railroad Crossings

Sheet Details
Not to Scale

SHEET 2 OF 2

Texas Department of Transportation
 Traffic Operations Division Standard

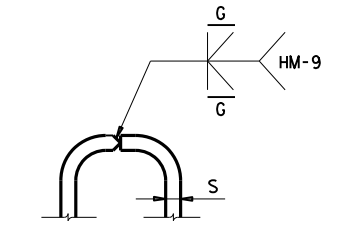
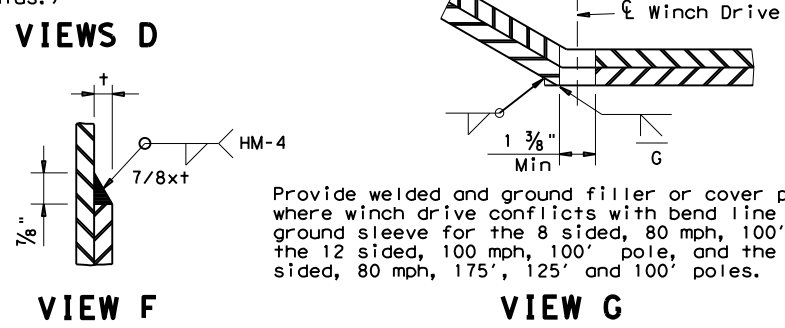
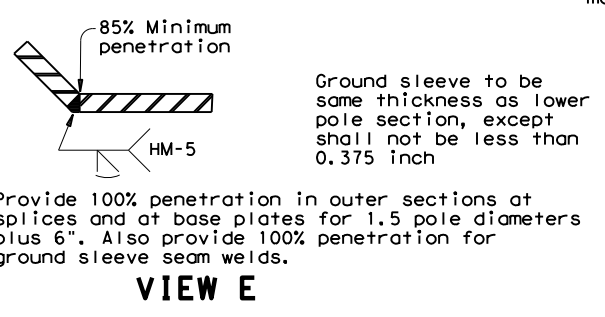
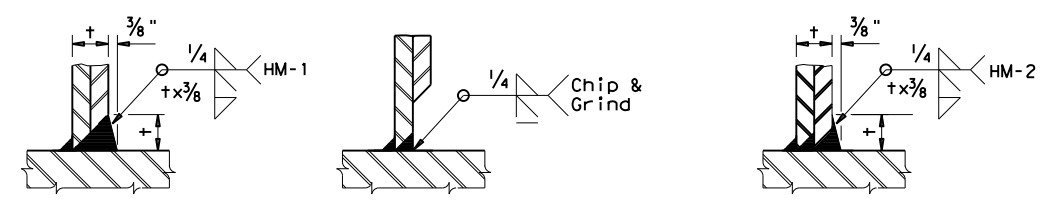
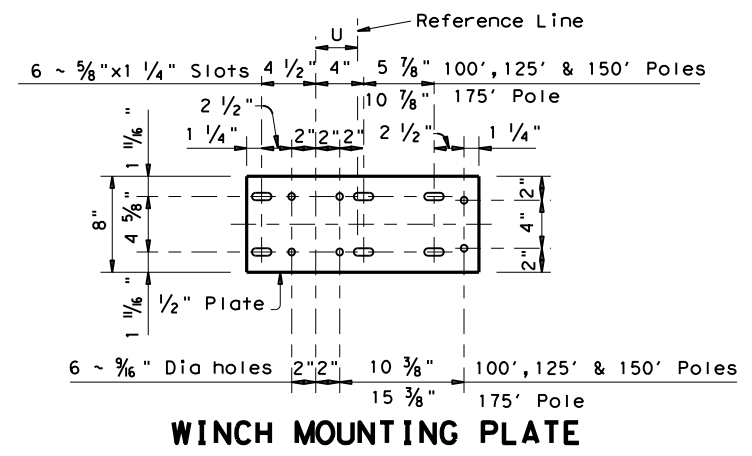
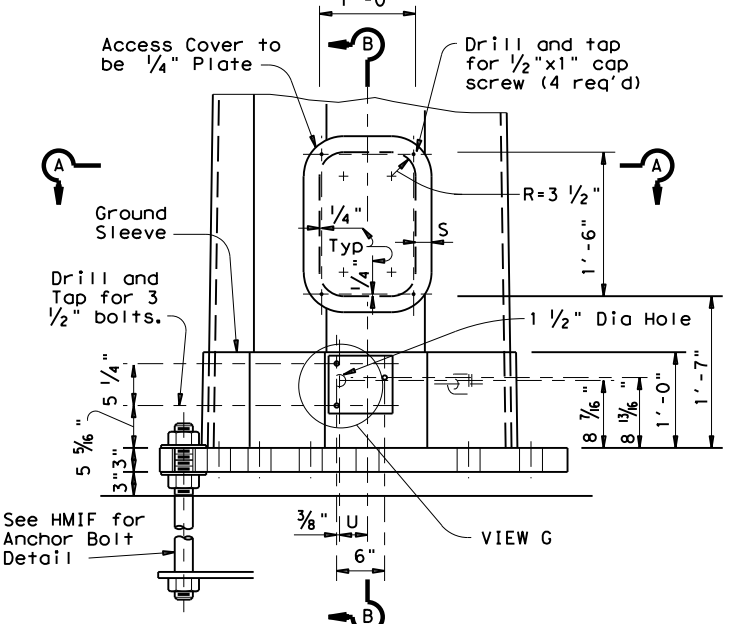
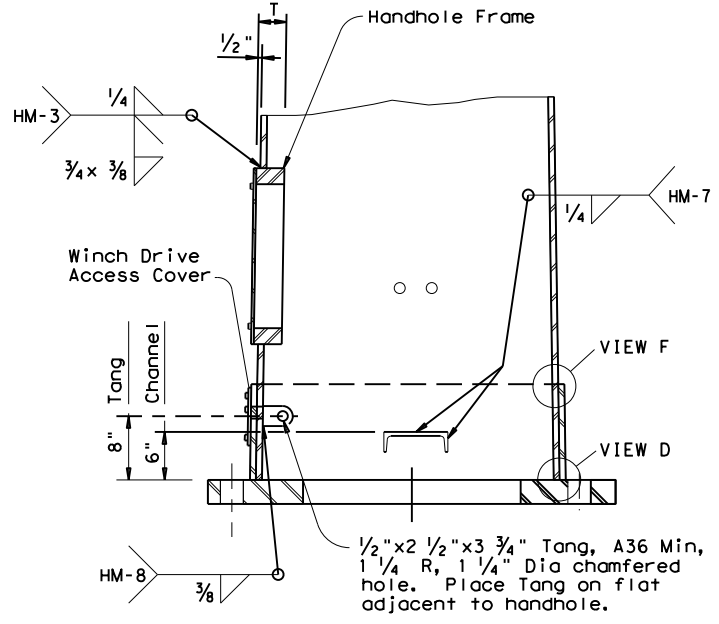
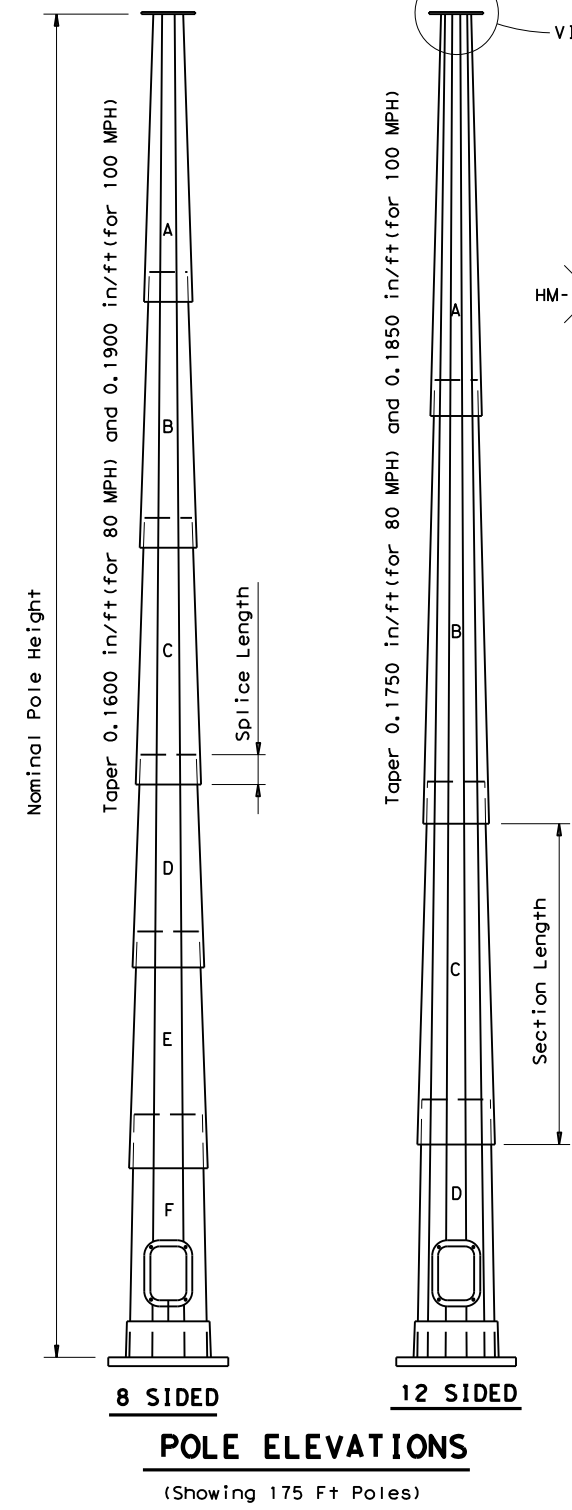
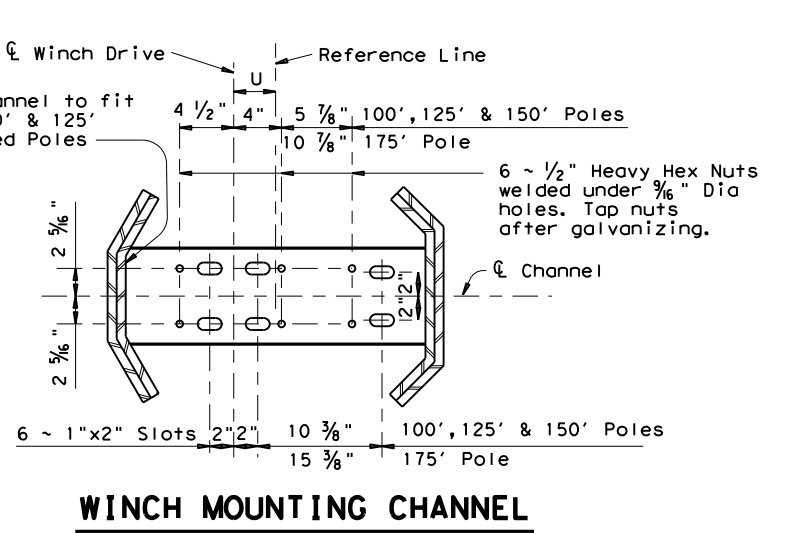
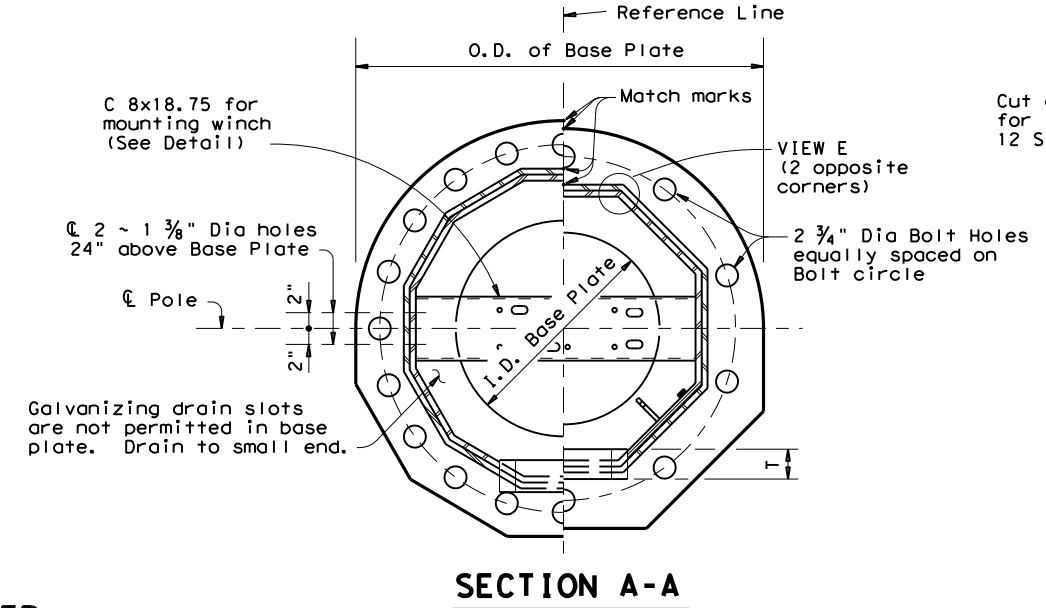
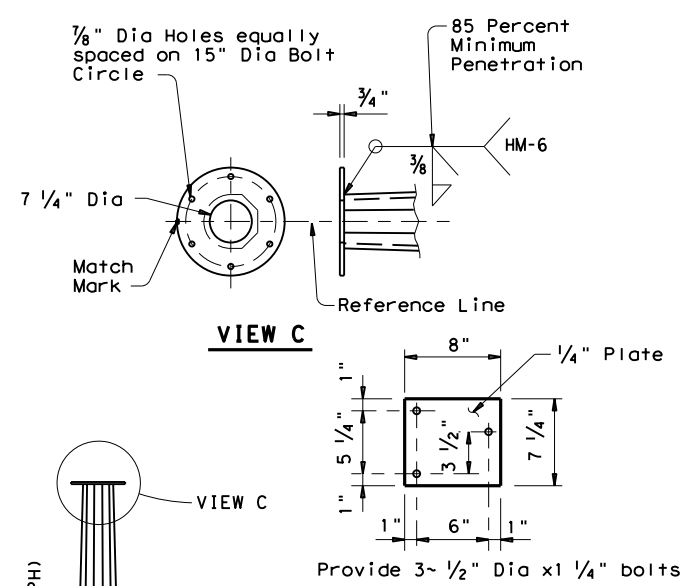
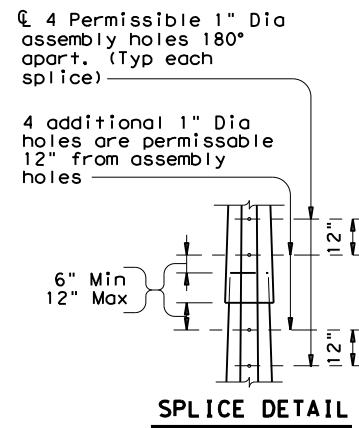
ITS FIBER OPTIC CABLE AERIAL INSTALLATION DETAILS

ITS(45)-16

FILE: its(45)-16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT FEBRUARY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	00	299	VA
DIST	COUNTY		SHEET NO.	
FTW	TARRANT		81	

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A bent and welded handhole frame is permissible. Heating, bending, and finish grinding must be approved with the HM-9 weld procedure.

OPTIONAL HANDHOLE FRAME

		Traffic Operations Division Standard	
HIGH MAST ILLUMINATION POLES 100' - 125' - 150' - 175'			
HMIP(1)-16			
FILE: hmip-16.dgn	DWG: CK:	DWG: DW:	CK:
© TxDOT August 1995	CONT: 0902	SECT: 00	JOB: 299
5-98	DIST: FTW	COUNTY: TARRANT	SHEET NO.: 82
8-16			

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TABLE OF VARIABLE POLE DIMENSIONS											
Ht (ft)	Section	8 SIDED POLE					12 SIDED POLE				
		Diameter (Inches)		Thickness (inches)	Length (feet)	Splice (inches)	Diameter (Inches)		Thickness (inches)	Length (feet)	Splice (inches)
		Bottom	Top				Bottom	Top			
175	A	13.083	7.750	.250	33.33	19	16.792	7.750	.250	51.67	24
	B	17.792	12.205	.375	34.92	25	24.858	15.817	.313	51.67	36
	C	22.250	16.583	.375	35.42	32	32.625	23.583	.313	51.67	48
	D	25.375	20.948	.438	27.67	36	36.250	31.175	.375	29.00	~
	E	28.375	23.895	.500	28.00	41					
	F	31.250	26.703	.500	28.42	~					
150	A	13.083	7.750	.250	33.33	19	16.792	7.750	.250	51.67	24
	B	17.792	12.205	.375	34.92	25	24.858	15.817	.313	51.67	36
	C	22.250	16.583	.375	35.42	32	32.625	23.583	.313	51.67	~
	D	25.375	20.948	.438	27.67	36					
	E	28.375	23.895	.500	28.00	~					
125	A	13.083	7.750	.250	33.33	19	16.792	7.750	.250	51.67	24
	B	17.792	12.205	.375	34.92	25	24.858	15.817	.313	51.67	36
	C	22.250	16.583	.375	35.67	32	28.250	23.583	.313	26.67	~
	D	25.375	20.948	.438	27.67	~					
100	A	13.083	7.750	.250	33.33	19	16.792	7.750	.250	51.67	24
	B	17.792	12.205	.375	34.67	25	24.625	15.817	.313	50.33	~
	C	22.250	16.583	.375	35.67	~					
175	A	14.208	7.875	.313	33.33	20	17.433	7.875	.375	51.67	25
	B	19.792	13.142	.375	35.00	28	25.747	16.173	.438	51.75	37
	C	25.250	18.473	.438	35.67	36	33.750	24.176	.438	51.75	49
	D	29.000	23.680	.500	28.00	42	37.375	31.995	.500	29.08	~
	E	32.625	27.210	.563	28.50	47					
	F	36.125	30.631	.563	28.92	~					
150	A	14.208	7.875	.313	33.33	20	17.433	7.875	.375	51.67	25
	B	19.792	13.142	.375	35.00	28	25.747	16.173	.438	51.75	37
	C	25.250	18.473	.438	35.67	36	33.750	24.176	.438	51.75	~
	D	29.00	23.680	.500	28.00	42					
	E	32.625	27.210	.563	28.50	~					
125	A	14.208	7.875	.313	33.33	20	17.433	7.875	.375	51.67	25
	B	19.792	13.142	.375	35.00	28	25.747	16.173	.438	51.75	37
	C	25.250	18.473	.438	35.67	36	29.125	24.176	.438	26.75	~
	D	29.00	23.680	.500	28.00	~					
100	A	14.208	7.875	.313	33.33	20	17.433	7.875	.375	51.67	25
	B	19.792	13.142	.375	35.00	28	25.500	16.173	.375	50.42	~
	C	25.250	18.473	.438	35.67	~					

Diameters are measured across the flats.

MATERIALS	
Polygonal Shafts Ground Sleeves	ASTM A709 Grade 50 A572 Grade 50 ①②
Base Plate and Handhole Frame	ASTM A709 Grade 50 A572 Grade 50 ① A633 Grade C ①
Miscellaneous Steel	ASTM A36 or equal

- ① ASTM A572 and A633 may have higher yield strength but shall not have less elongation than the grade indicated.
- ② The silicon content of all steel shall be controlled to ensure high quality galvanizing and to avoid discoloration.

TABLE OF VARIABLE BASE DIMENSIONS							
Ht (ft)	O.D. (inches)	I.D. (inches)	Bolt Cir (inches)	No. Bolts	S (inches)	T (inches)	U (inches)
8 SIDED POLE							
175'	47	22	41	16	2.00	3.75	4.50
150'	44	18	38	12	2.00	4.00	3.50
125'	41	16	35	8	2.00	4.50	3.50
100'	37	14	31	6	2.00	5.00	3.50
12 SIDED POLE							
175'	50	24	44	12	1.75	3.50	3.50
150'	47	22	41	10	1.75	3.50	2.50
125'	42	18	36	8	1.75	3.75	2.50
100'	38	13	32	6	1.75	4.00	2.50
8 SIDED POLE							
175'	52	27	46	20	1.75	3.50	4.50
150'	49	23	43	16	1.75	4.00	3.50
125'	45	21	39	12	1.75	4.50	3.50
100'	40	17	34	10	1.75	4.50	3.50
12 SIDED POLE							
175'	52	27	46	16	1.75	3.25	3.50
150'	50	25	44	12	1.75	3.50	2.50
125'	46	22	40	10	1.75	3.75	2.50
100'	42	19	36	6	1.75	4.00	2.50

NOTE: Base Plate may be round or with 8 or 12 equal segments matching the pole.

GENERAL NOTES:

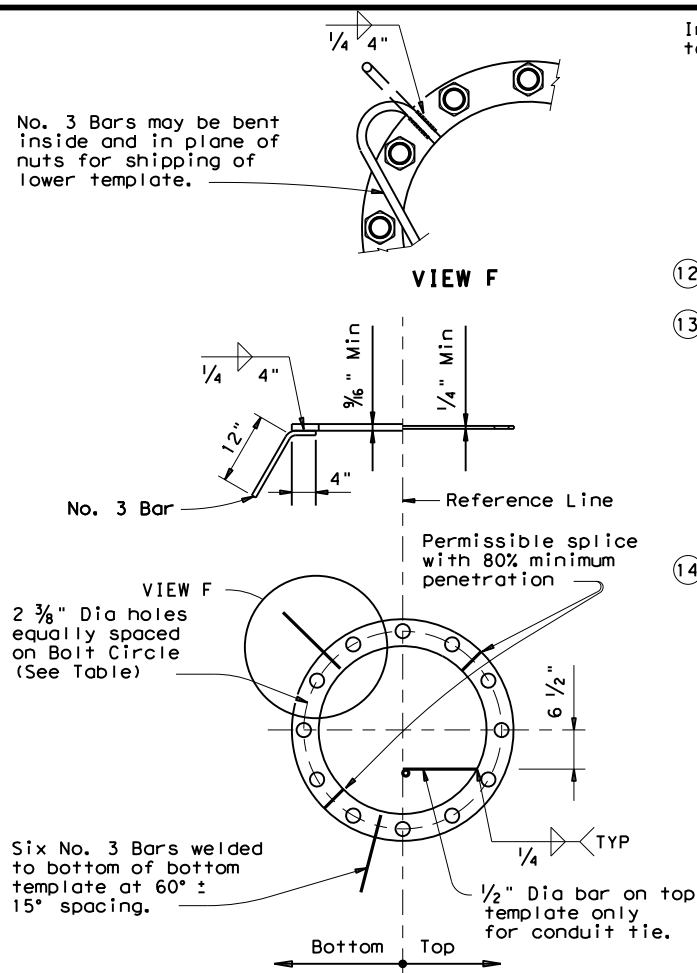
- Design conforms to AASHTO 1994 Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals and Interim Revisions thereto. The Design Wind Speed is 80 mph or 100 mph.
- The required design height and wind speed shall be as shown elsewhere in the plans.
- Each pole section, top flange plate and base plate shall be permanently marked on the reference line. The required mark locations are shown on the baseplate, top plate, and foundation plan details. These marks shall be used in pole assembly and erection alignment. The reference line and anchor bolt orientation shall be parallel to roadway centerline unless otherwise shown on Lighting Layouts.

SHEET 2 OF 2

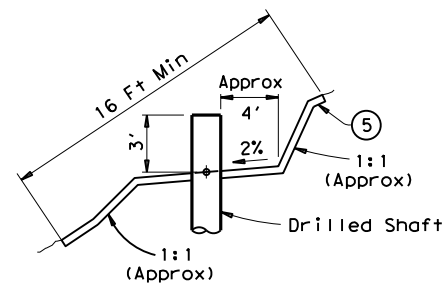
				Traffic Operations Division Standard	
HIGH MAST ILLUMINATION POLES 100' - 125' - 150' - 175'					
HMIP (2) - 16					
FILE: hmip-16.dgn	DN:	CK:	DW:	CK:	
© TxDOT August 1995	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0902	00	299	VA	
5-98	DIST	COUNTY	SHEET NO.		
8-16	FTW	TARRANT	83		

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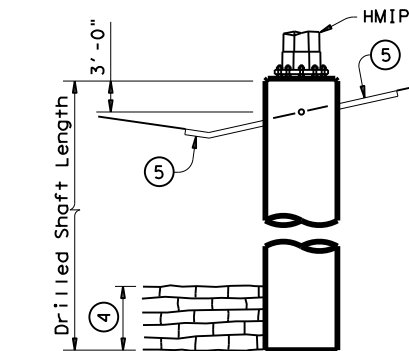
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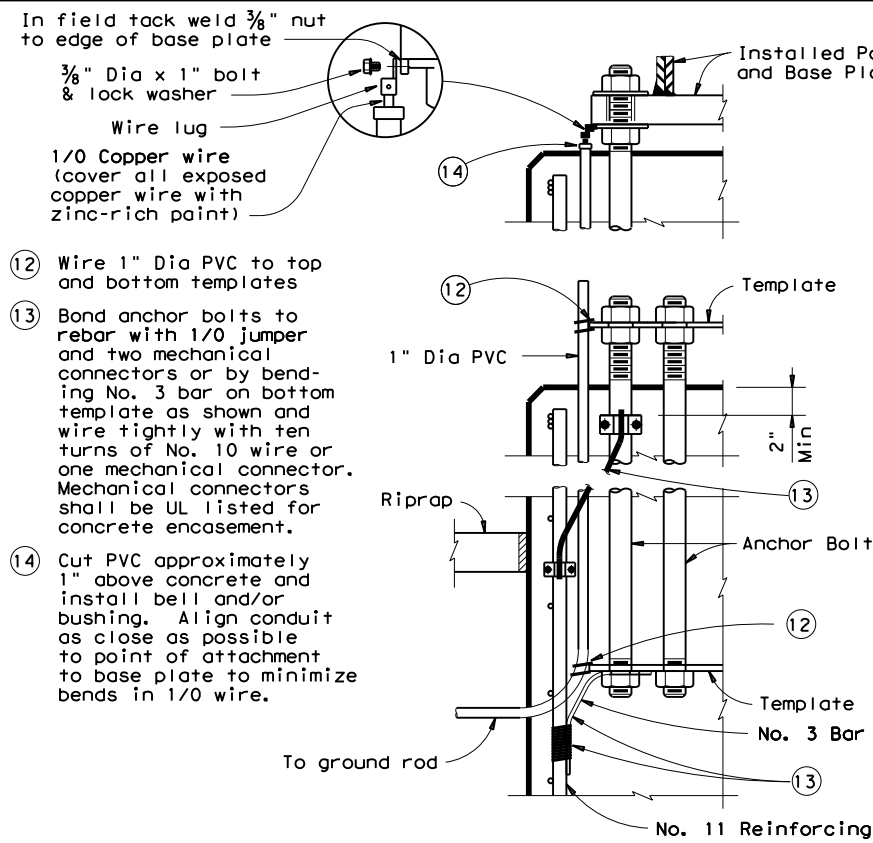
ANCHOR BOLT TEMPLATES



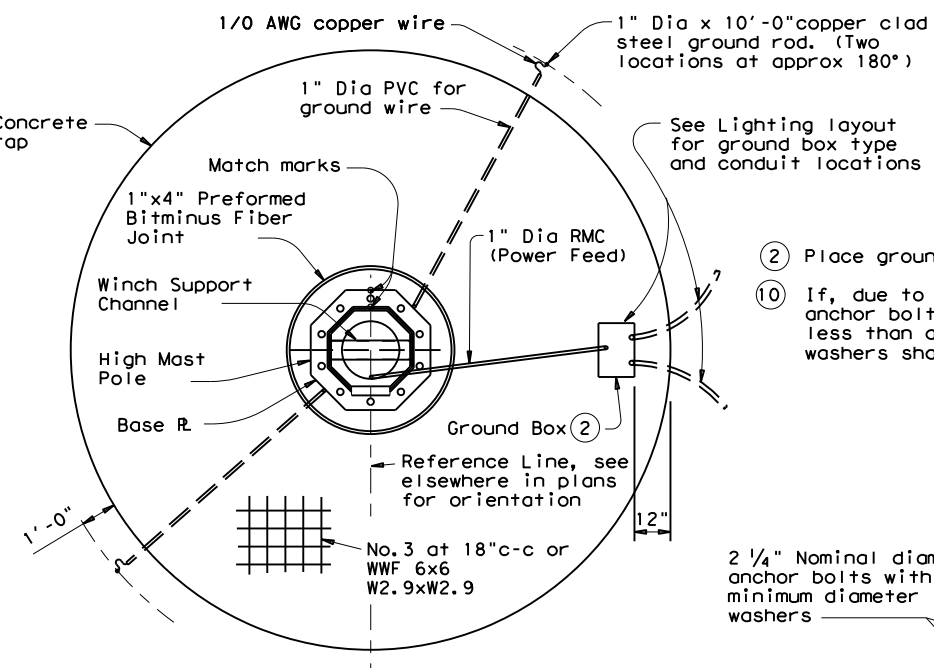
RIPRAP ON SLOPES



- ⑤ Match slope of finished ground if slope is less than approx 4 to 1. For steeper slopes, bench to provide work area with approx 2% slope around pole base. Other configurations may be shown elsewhere on the plans.
- ④ If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.



LIGHTNING PROTECTION SYSTEM



- ② Place ground box cover flush with riprap.
- ⑩ If, due to tolerances in fabrication, the anchor bolt hole to ground sleeve weld is less than approx 1/8", clipped 1/2" thick washers shall be supplied at those

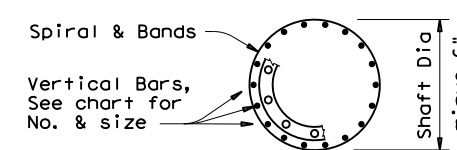
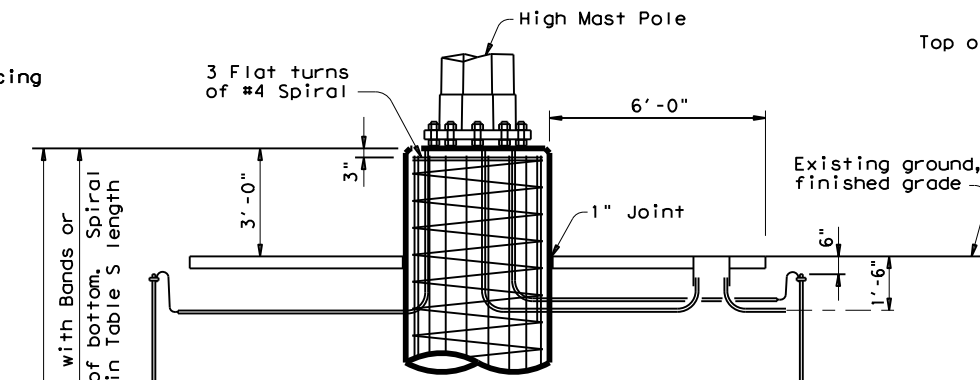
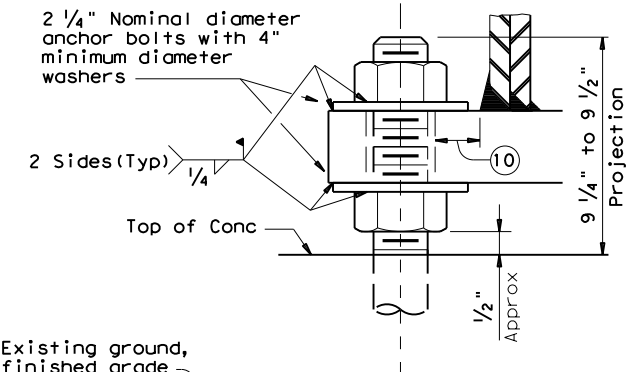


TABLE 5	
Shaft Dia (inches)	Min Spiral Length (feet)
48	19
54	21
60	23
66	26

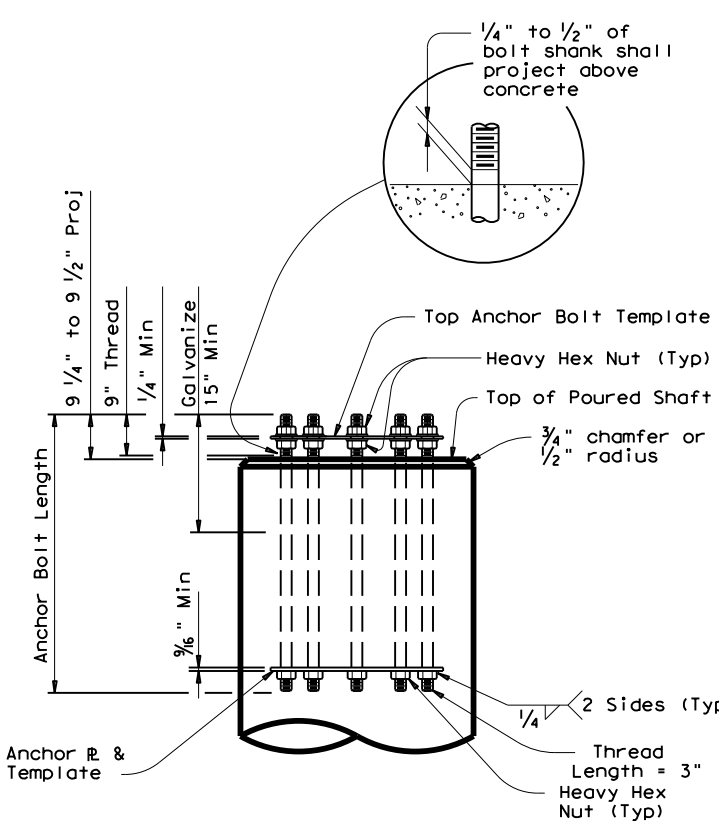
Drilled Shaft Length (See Chart)

Equally spaced Bands at 4'-0" Max spacing or Spiral at 9" pitch

Spiral (see Table S) with Bands or Spiral to within 1 ft of bottom. Spiral not to be welded within Table S length

Vertical bars may be supported on bottom of drilled hole if material is firm enough to do so when concrete is placed

DRILLED SHAFT FOUNDATION DETAIL



ANCHOR BOLT ASSEMBLY

(See Anchor Bolt Table for number of bolts required)



HIGH MAST ILLUMINATION POLE FOUNDATIONS

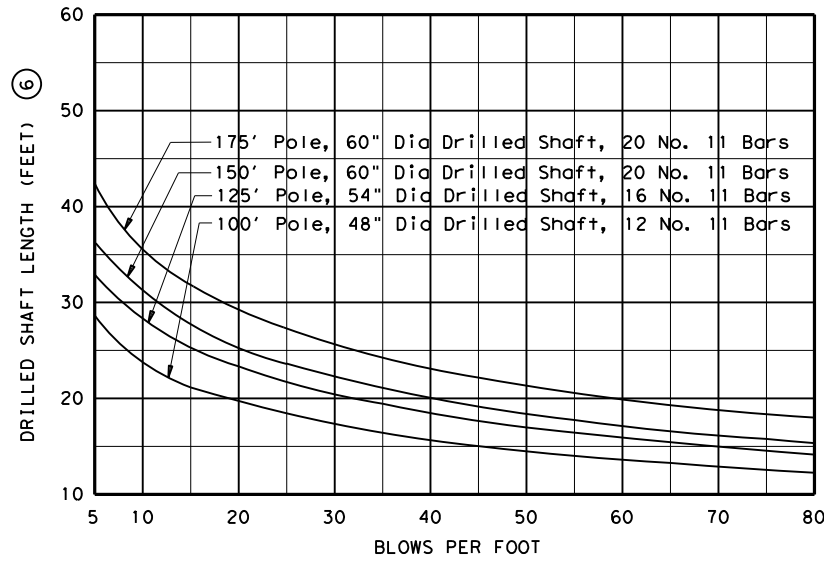
SHEET 1 OF 2 HMIF (1) -98

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11-97	REVISIONS	CONT	SECT	JOB	HIGHWAY
5-98	Anchor Bolt Circle Dia	0902	00	299	VA
		DIST	COUNTY		SHEET NO.
		FTW	TARRANT		84

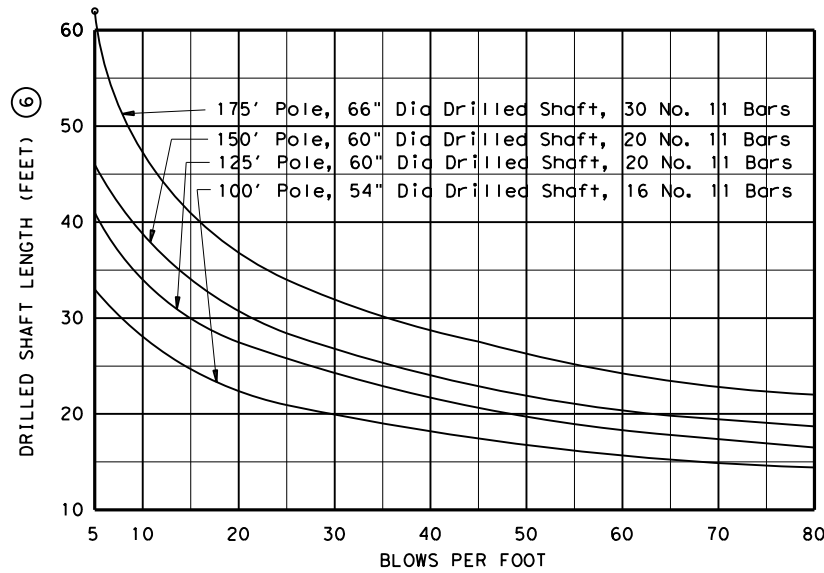
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⑥ Includes normal 3 Ft exposure.
 Shafts with more than 3 Ft exposure must have additional length.



Do not extrapolate below 5 Blows/Ft. A special design will be required for soil less than 5 Blows/Ft.



Do not extrapolate below 5 Blows/Ft. A special design will be required for soil less than 5 Blows/Ft.

TEXAS CONE PENETROMETER TEST TABLES

NOTE: Use average "N" value over the top third of the embedded shaft. Ignore the top 2' of soil.

ANCHOR BOLT TABLE

Pole Height (feet)	Bolt Diameter (inches)	Bolt Length (feet)	Bolt Templates		No. of Bolts	Bolt Cir Dia (inches)
			O D (inches)	I D (inches)		
80 MPH DESIGNS						
8 SIDED POLE						
175	2.25	4.83	45.5	36.5	16	41
150	2.25	4.83	42.5	33.5	12	38
125	2.25	4.83	39.5	30.5	8	35
100	2.25	4.83	35.5	26.5	6	31
12 SIDED POLE						
175	2.25	4.83	48.5	39.5	12	44
150	2.25	4.83	45.5	36.5	10	41
125	2.25	4.83	40.5	31.5	8	36
100	2.25	4.83	36.5	27.5	6	32
100 MPH DESIGNS						
8 SIDED POLE						
175	2.25	4.83	50.5	41.5	20	46
150	2.25	4.83	47.5	38.5	16	43
125	2.25	4.83	43.5	34.5	12	39
100	2.25	4.83	38.5	29.5	10	34
12 SIDED POLE						
175	2.25	4.83	50.5	41.5	16	46
150	2.25	4.83	48.5	39.5	12	44
125	2.25	4.83	44.5	35.5	10	40
100	2.25	4.83	40.5	31.5	6	36

MISCELLANEOUS QUANTITIES - ONE HMIF

Item	48	54	60
Shaft Diameter (in) ⑦	48	54	60
Concrete Riprap (CY)	2.33	2.44	2.56
Reinforcing (Lbs) ⑧	94	99	103
Ground Box (ea)	1	1	1
R O W Marker (ea) ⑨	1	1	1

- ⑦ See elsewhere on plans for length of Drilled Shaft required.
- ⑧ For Contractors information only.
- ⑨ Designated elsewhere on plans if required.

GENERAL NOTES:

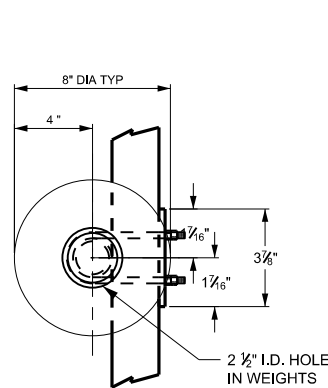
- Unless otherwise noted, the welded steel bands may be replaced with spiral as shown on the foundation details.
- Anchor bolts shall be placed in foundation so there are always two bolts on reference line.
- Drilled shaft lengths as determined from the foundation design chart or other acceptable methods are to be as shown elsewhere on the plans.
- ODSR may not be used for HMIF drilled shafts.
- Concrete for drilled shafts shall be Class C.
- Repair welded areas with zinc-rich paint.
- All Anchor Bolts, Nuts and Washers shall be galvanized in accordance with Item 445, "Galvanizing".



HIGH MAST ILLUMINATION POLE FOUNDATIONS

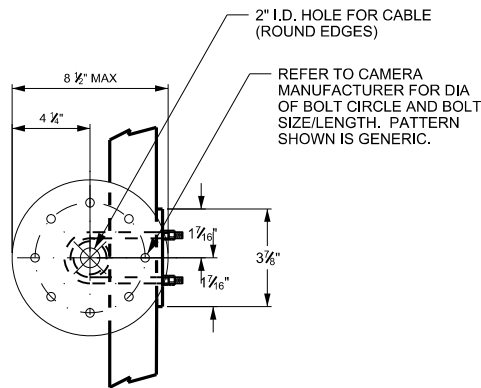
SHEET 2 OF 2 HMIF (2) -98

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5-98 - Anchor Bolt	REVISIONS	CONT	SECT	JOB	HIGHWAY
Circle Dia		0902	00	299	VA
		DIST	COUNTY		SHEET NO.
		FTW	TARRANT		85



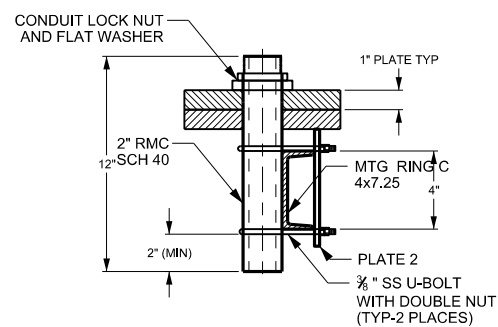
COUNTER WEIGHT MOUNTING DETAIL

TOP VIEW



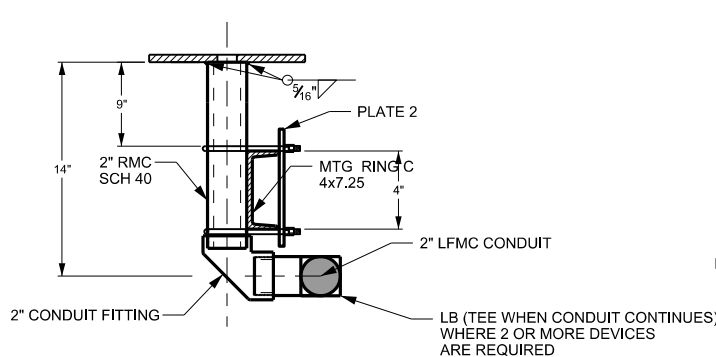
CAMERA MOUNTING DETAIL

TOP VIEW



COUNTER WEIGHT MOUNTING DETAIL

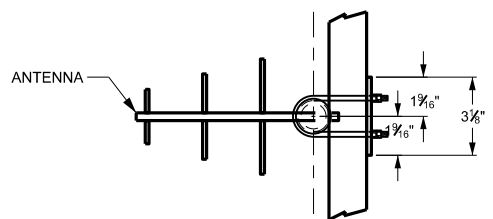
SIDE VIEW



CAMERA MOUNTING DETAIL

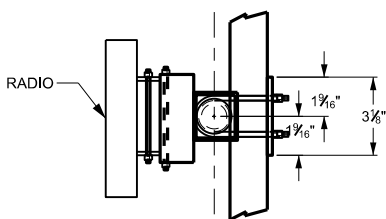
SIDE VIEW

INSTALL AT LOCATIONS SHOWN ON PLANS. INVERT FOR UNDERSLUNG CAMERAS



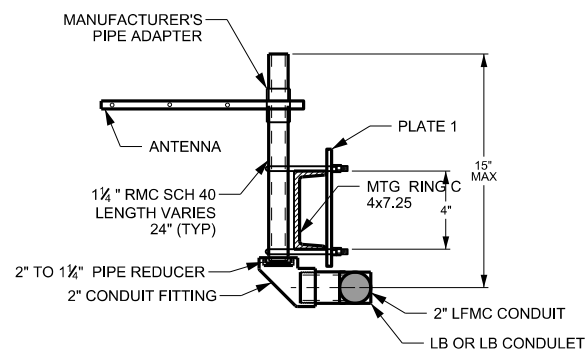
ANTENNA(S) MOUNTING DETAIL

TOP VIEW



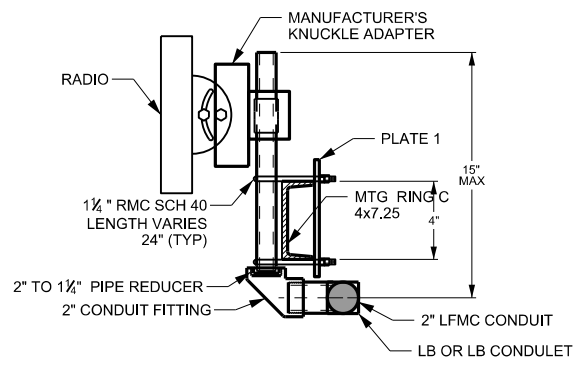
ETHERNET RADIO ANTENNA MOUNTING DETAIL

TOP VIEW



ANTENNA(S) MOUNTING DETAIL

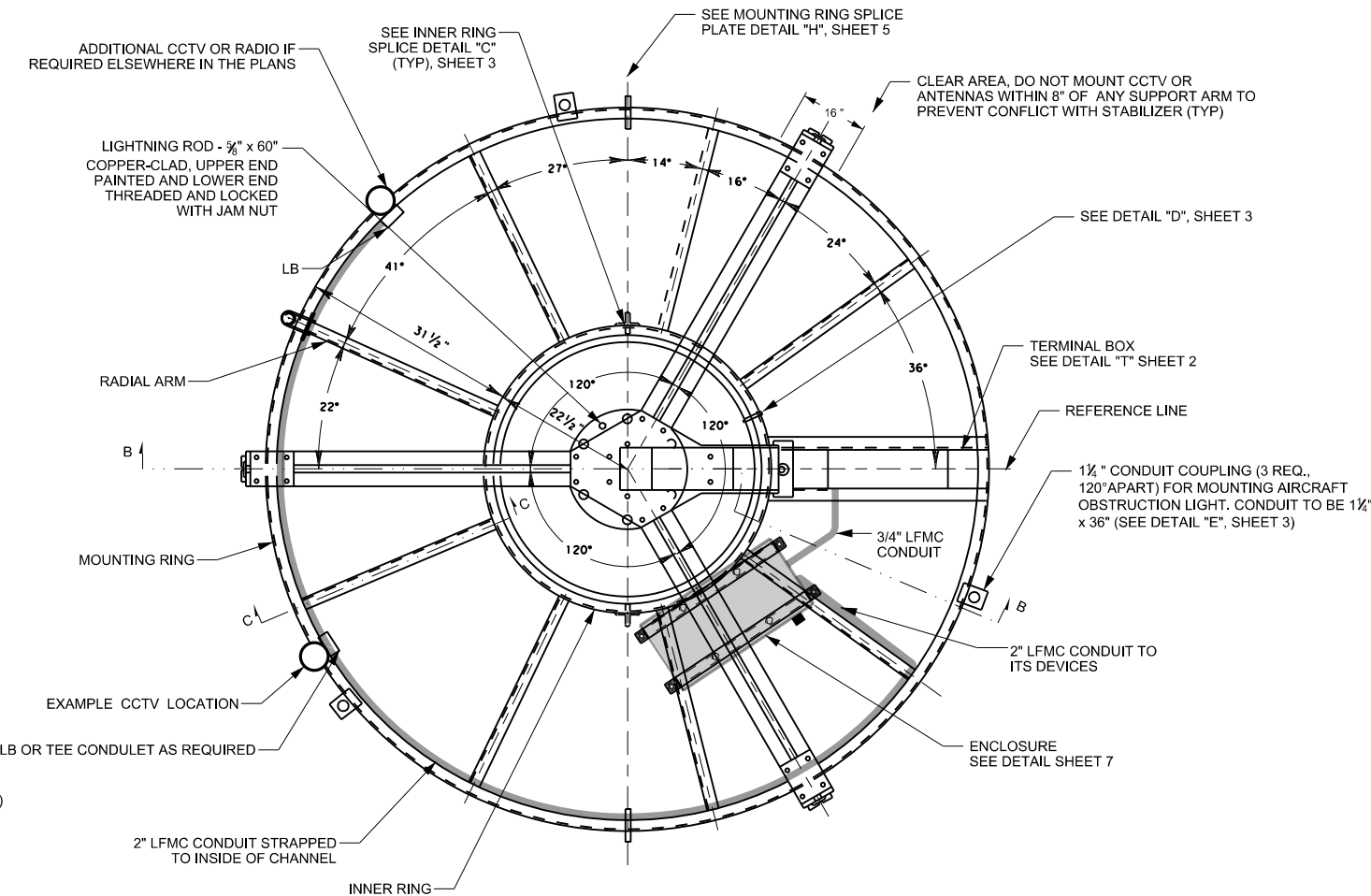
SIDE VIEW



ETHERNET RADIO ANTENNA MOUNTING DETAIL

SIDE VIEW

INSTALL AT LOCATIONS SHOWN ON THE PLANS



MOUNTING RING & SUPPORT ASSEMBLY

NOTES:

- POLE, RING, AND RING SUPPORT SHALL BE ASSEMBLED AND ERECTED WITH HAND HOLE OPPOSITE SIDE FROM TRAFFIC SO THAT REFERENCE LINE IS PARALLEL TO CENTER LINE OF ROADWAY.
- CCTV EQUIPMENT IS GENERALLY LIGHT WEIGHT AND NOT EXPECTED TO PRESENT IMBALANCE ISSUES. ADJUST SPRING SWAGE TERMINAL NUTS TO COMPENSATE FOR UNEQUAL WIRE ROPE LENGTHS AND ENSURE SPRINGS ARE EQUALLY COMPRESSED AND STABILIZERS FULLY SEATED. USE COUNTER WEIGHTS ONLY WHEN RING STABILIZERS WILL NOT SEAT PROPERLY, OR SPRINGS ARE NOT EQUALLY COMPRESSED. ALL COUNTER WEIGHTS SHALL BE HOT DIPPED GALVANIZED, 1" THICK PLATES, 2 1/2" I.D. x 8" O.D., WEIGHING APPROXIMATELY 12.9 LBS EACH. ADD WEIGHTS AS REQUIRED TO BALANCE RING NOT TO EXCEED 100 LBS. TOTAL (ALTERNATIVE WEIGHT ATTACHMENT METHODS MAY BE SUBMITTED FOR APPROVAL).
- INSTALL ALL EQUIPMENT IN MANNER THAT THE WEIGHT DISTRIBUTION IS APPROXIMATELY BALANCED. ENSURE CCTV VIEW IS NOT BLOCKED BY ADJACENT EQUIPMENT.
- ALTERNATE ANTENNA & CCTV ATTACHMENT METHODS MAY BE SUBMITTED FOR APPROVAL.
- INSTALL LIGHTNING ROD 3/8" x 60" COPPER-CLAD STEEL. LOCK WITH JAM NUT. SEE DETAIL "G" SHEET 4.
- ALL U BOLTS DOUBLE NUT, WITH FLAT WASHER AND LOCK WASHER.
- LOCATE ANTENNAS AND CCTV AT RADIAL ARMS TO ALLOW FOR CONDUIT ATTACHMENTS AS SHOWN. DO NOT ALLOW FLEX CONDUIT TO DROOP. DO NOT USE DRIP LOOPS IN CONDUIT THAT WILL CREATE HIGHER WIND LOADING. USE CONDUIT BODIES AS SHOWN.
- STRAP LIQUID-TIGHT FLEXIBLE METAL CONDUIT (LFMC) TO THE CHANNEL TO KEEP FLEX CONDUIT AS CLOSE TO RING WEB AS POSSIBLE. SEE DETAIL "E", SHEET 3.

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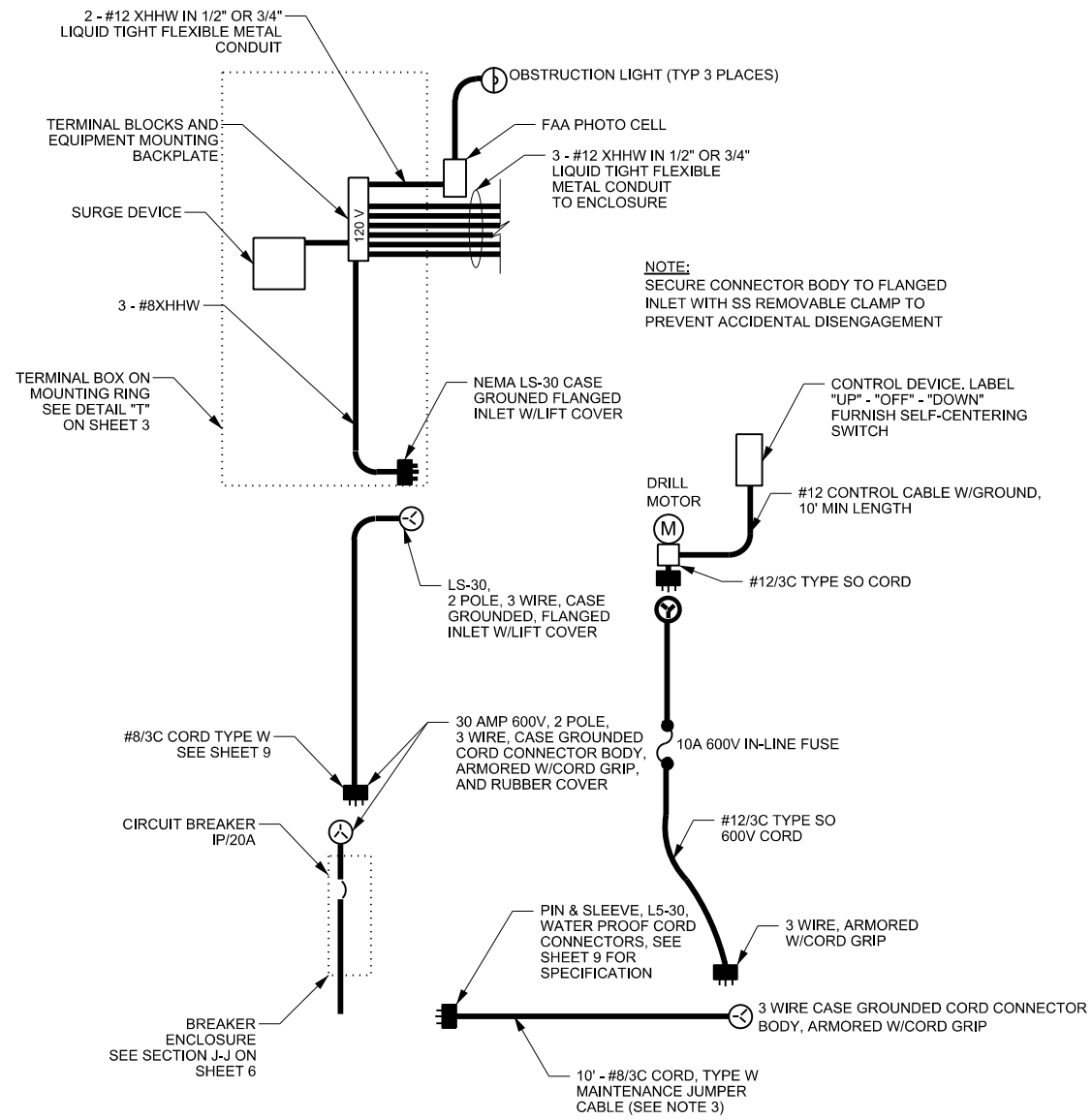
LEVELS DISPLAYED	
1	
2	

HIGH MAST CCTV MOUNTING ASSEMBLIES

HM-ITS (1)-21 (FTW)

FILE:	TP80.DGN	DN:	KAB	CK:	MBY	DW:	PDA	CK:
CONT:	0902	SECT:	00	JOB:	299	HIGHWAY:	VA	
DIST:	FTW	COUNTY:	TARRANT	SHEET NO.:	86			

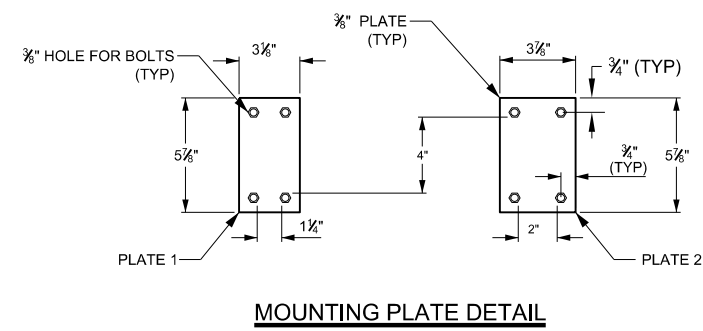
DISCLAIMER: The use of this standard is governed by the Texas Engineering Practice Act. No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.



ONE-LINE SCHEMATIC
SUPPLY HIGH MAST POLE FOR ITS WITH A 30A/120 VOLT BRANCH CIRCUIT

NOTES:

- 1. SEE GENERAL NOTES 1.D, SHEET 9 FOR PIN AND SLEEVE CONNECTORS.
- 2. NO CONDUITS SHALL ENTER THE TOP OF ENCLOSURES.
- 3. A MINIMUM OF ONE (1) MAINTENANCE JUMPER CABLE SHALL BE SUPPLIED FOR EACH PROJECT. SUPPLY ONE (1) PORTABLE TRANSFORMER FOR EACH POWER DRIVE UNIT REQUIRED FOR PROJECT. ENSURE RECEPTACLES FIT TOGETHER PROPERLY TO POWER DRILL MOTOR FROM BREAKER ENCLOSURE.
- 4. DRILL $\frac{1}{8}$ " DRAIN HOLES ON THE BOTTOM OF THE TERMINAL BOX.



LEVELS DISPLAYED	
1	2

Texas Department of Transportation
Fort Worth District

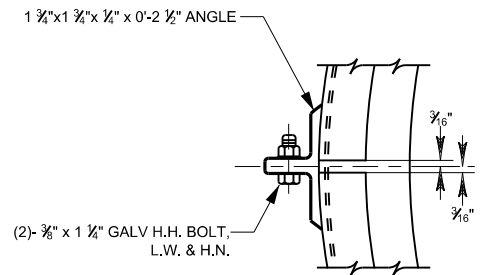
**HIGH MAST CCTV
MOUNTING ASSEMBLIES**

HM-ITS (2)-21 (FTW)

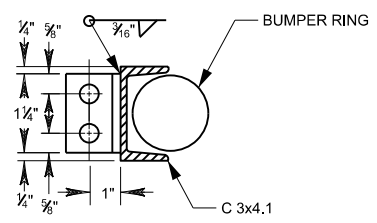
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		CONT:		SECT:		JOB:			
		REVISIONS:	0902	00	299	VA			
		DIST:	COUNTY			SHEET NO.			
		FTW	TARRANT			87			

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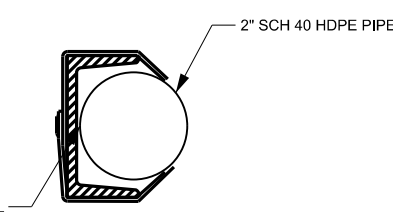
LEVELS DISPLAYED	
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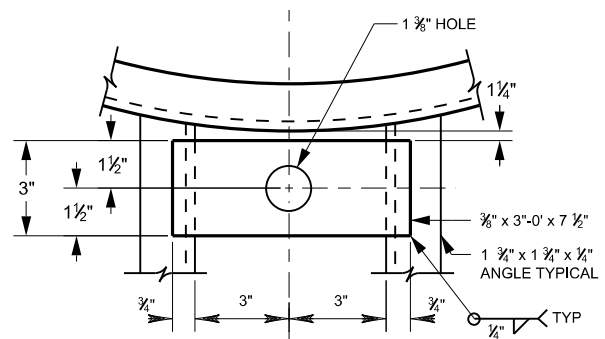
PLAN VIEW



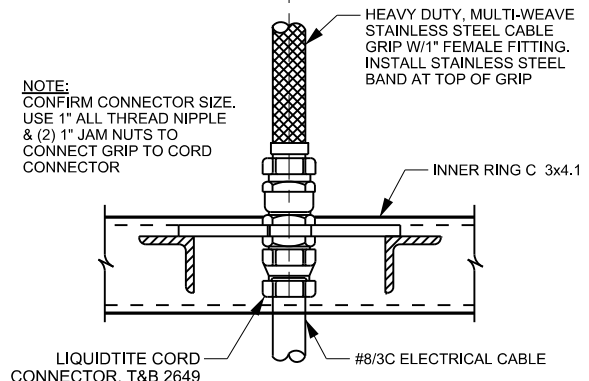
DETAIL "C"
INNER RING SPLICE



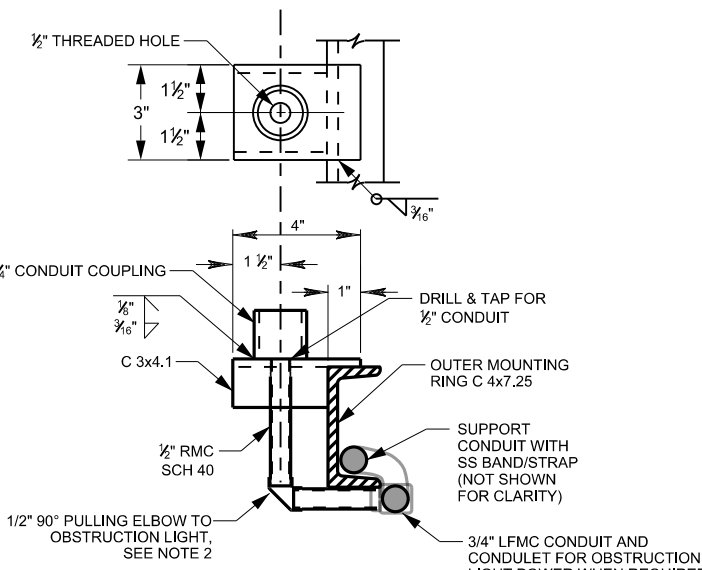
DETAIL "D"
BUMPER RING ATTACHMENT



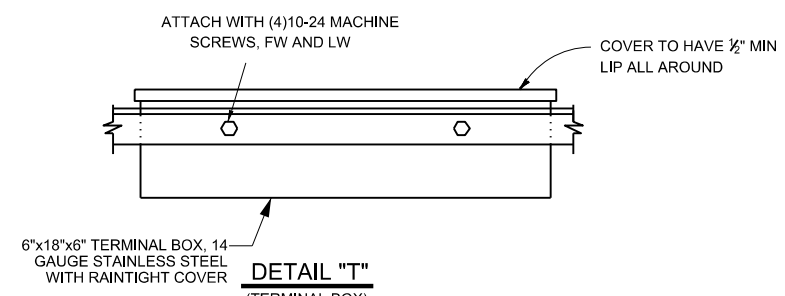
PLAN VIEW



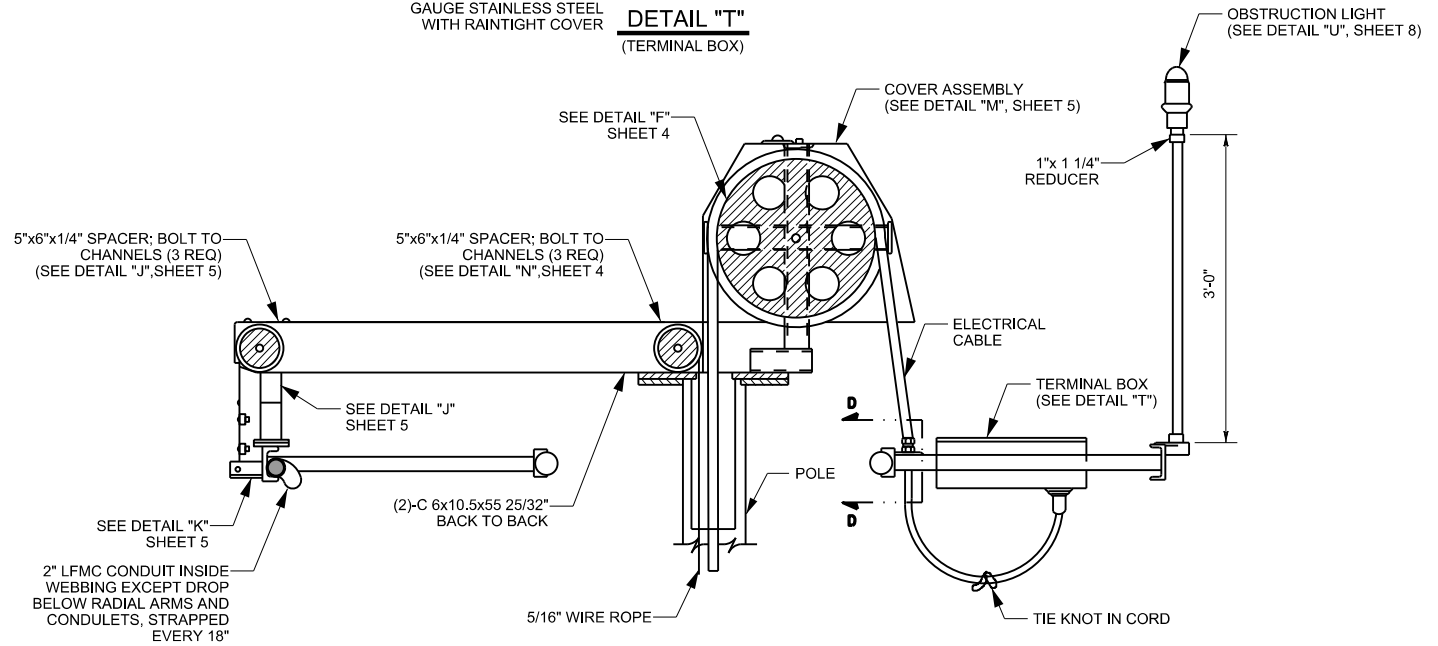
SECTION D-D
COVER CORD WITH HEAT SHRINK TUBING FROM CABLE GRIP TO WITHIN ONE INCH OF GRIP TO CONNECTOR TRANSITION PRIOR TO INSTALLING CABLE GRIP



DETAIL "E"
(CONDUIT ATTACHMENT FOR OBSTRUCTION LIGHTS. TYPICAL (3) PLACES)



DETAIL "T"
(TERMINAL BOX)



SECTION B-B

NOTES:

1. ALUMINUM, STEEL, OR ZINC DIE CAST 90° PULLING ELBOW "JAKE ELL", 2" FOR CCTV AND ANTENNA.
2. ALUMINUM, STEEL, OR ZINC DIE CAST 90° PULLING ELBOW "JAKE ELL" 1/2" FOR OBSTRUCTION LIGHT. STRAP TO MOUNTING RING AND RING RADIALS.

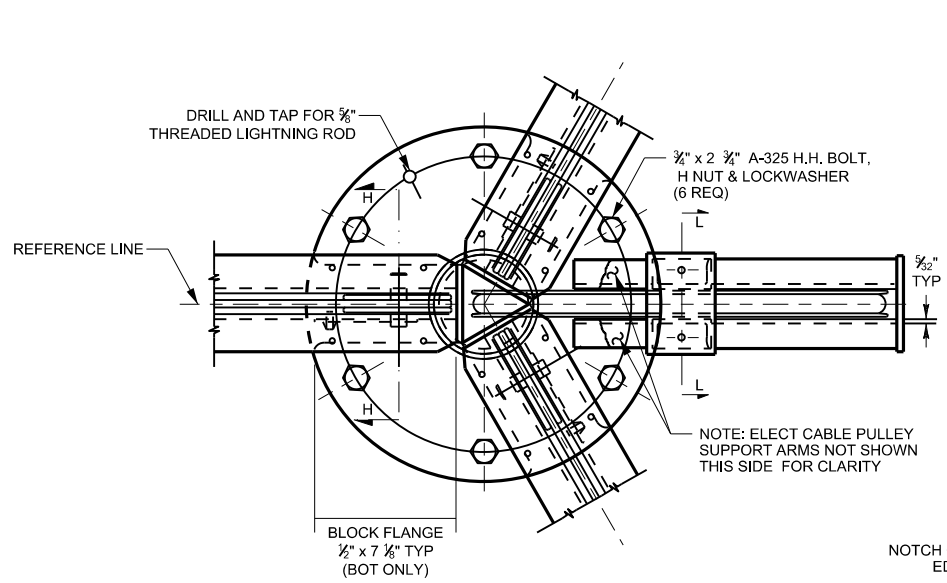
HIGH MAST CCTV
MOUNTING ASSEMBLIES

HM-ITS (3)-21 (FTW)

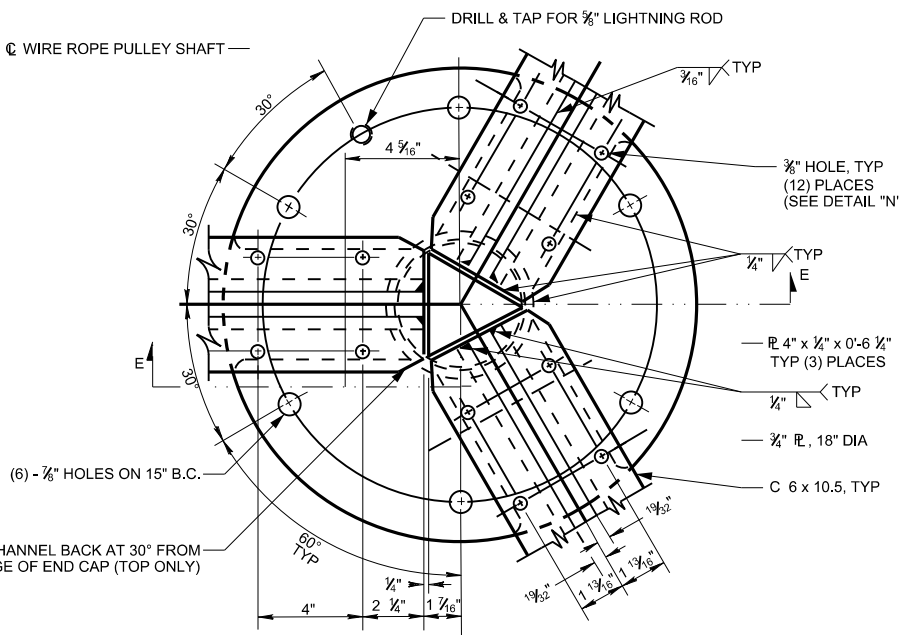
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CONTRACT:	0902	SECTION:	00	JOB NO.:	299	COUNTY:	VA	SHEET NO.:	88
REVISIONS:	DIST:		COUNTY:		TARRANT				

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LEVELS DISPLAYED	
1	
2	

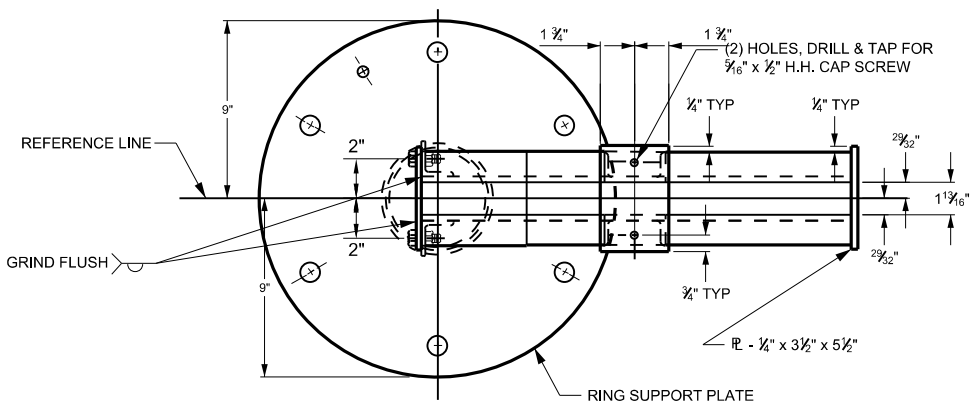


PLAN VIEW

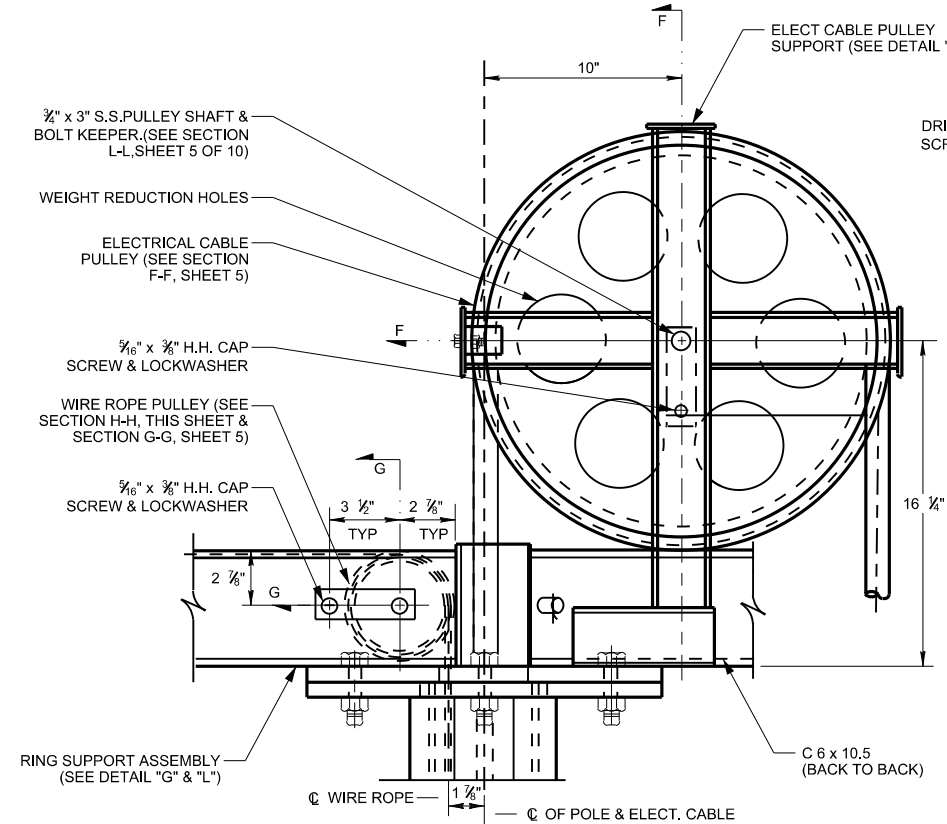


DETAIL "G"

TOP PLATE CONNECTION (LESS ELECT CABLE PULLEY SUPPORT) (SEE DETAIL "L")

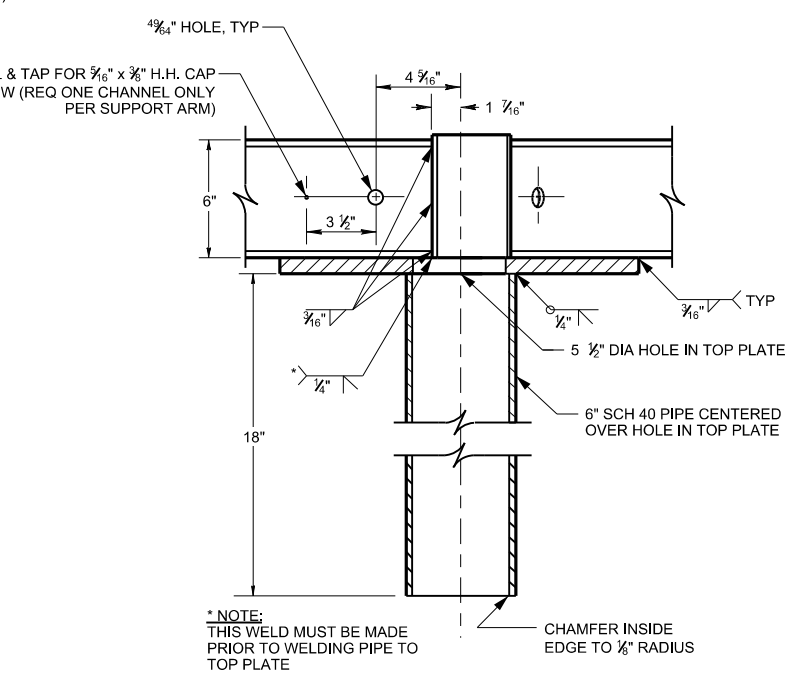


PLAN VIEW

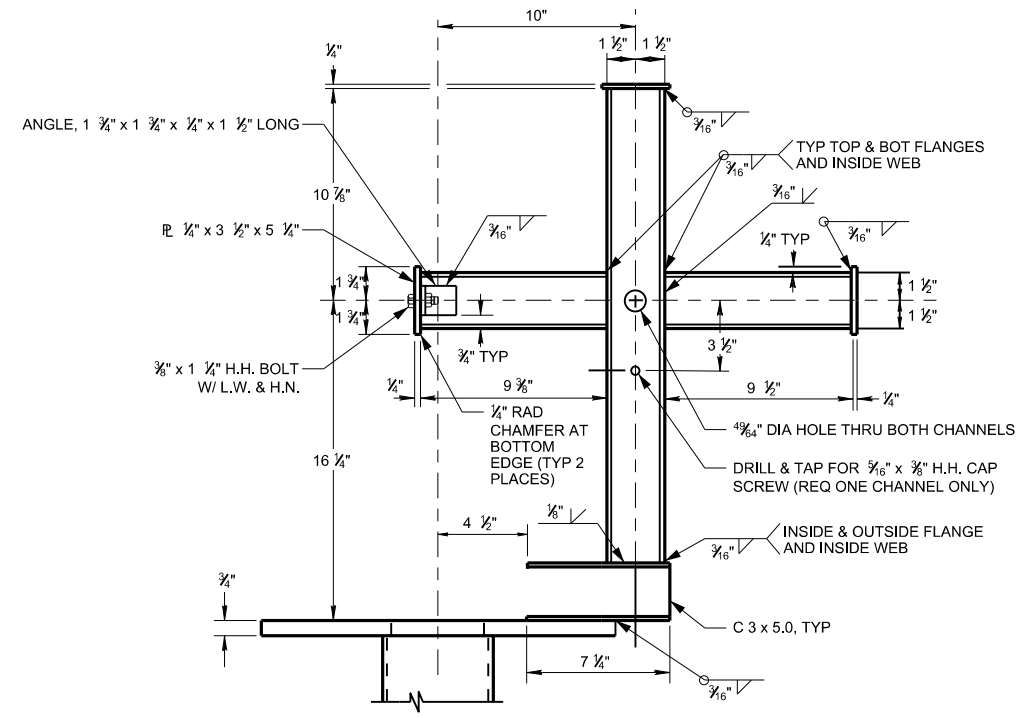


DETAIL "F"

RING SUPPORT ASSEMBLY (NEAR SIDE SUPPORT ARM & ELECT. CABLE PULLEY COVER NOT SHOWN FOR CLARITY)

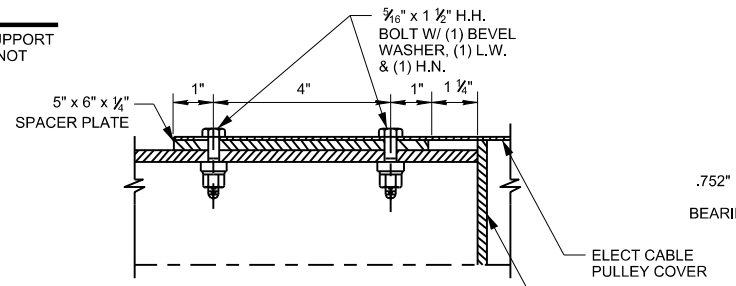


SECTION E-E

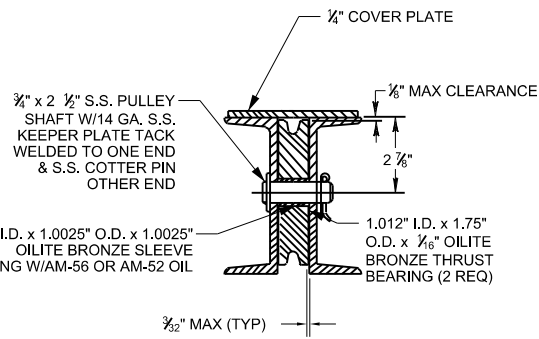


DETAIL "L"

ELECT. CABLE PULLEY SUPPORT (RING SUPPORT ARMS NOT SHOWN FOR CLARITY)



DETAIL "N"



SECTION H-H

PULLEY MOUNTING FOR RING SUPPORT ARMS

NOTE: SECURE CONNECTOR BODY TO FLANGED INLET WITH SS REMOVABLE CLAMP TO PREVENT ACCIDENTAL DISENGAGEMENT

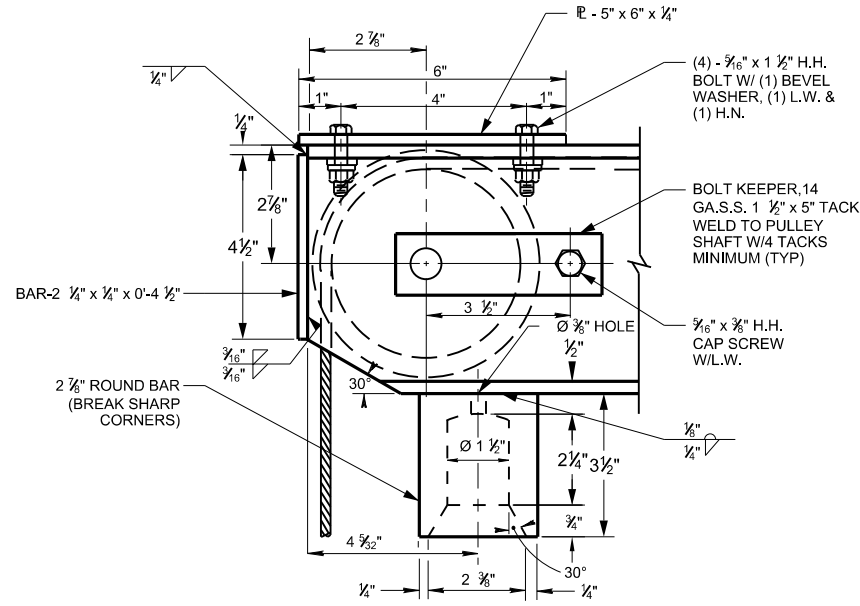
HIGH MAST CCTV MOUNTING ASSEMBLIES

HM-ITS (4)-21 (FTW)

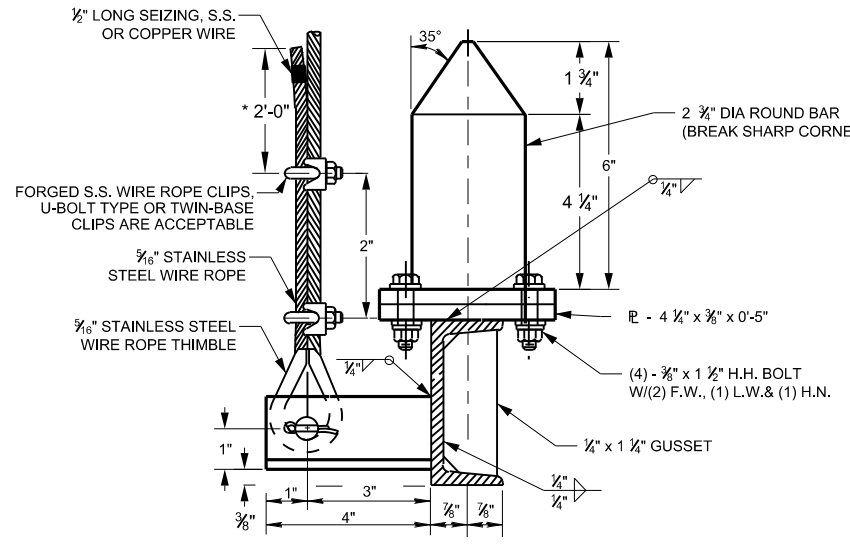
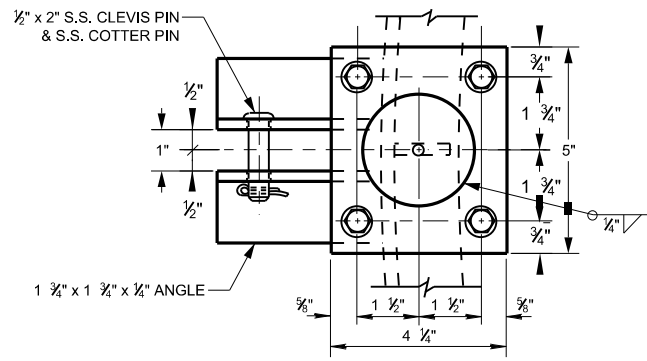
FILE: TP80.DGN	DN: KAB	CK: MBY	DW: PDA	CK:
CON: TxDOT APRIL 2017	SECT:	JOB:	299	VA
REVISIONS:	0902	00		
DIST:	COUNTY:		SHEET NO.	
FTW	TARRANT		89	

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LEVELS DISPLAYED	1	2

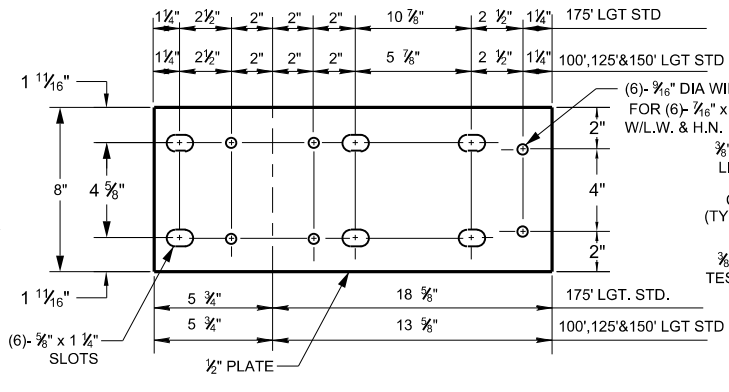


DETAIL "J"



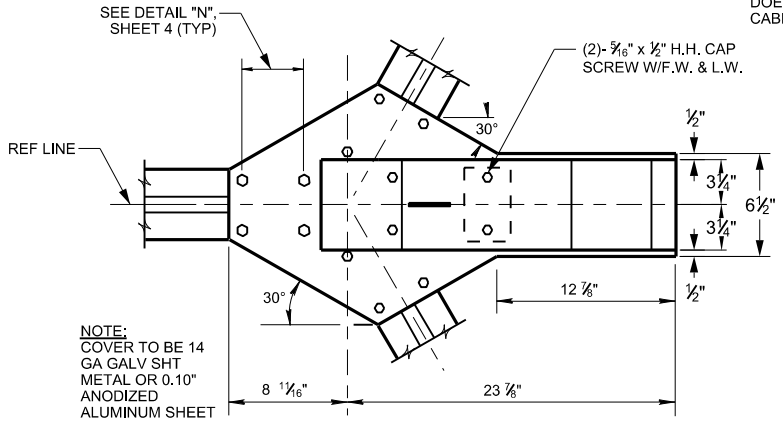
DETAIL "K"

MOUNTING RING CONNECTION & STABILIZER
 * EXTRA 2'-0" OF WIRE CABLE TO BE ATTACHED TO RING WITH SS BANDS AS DIRECTED BY ENGINEER

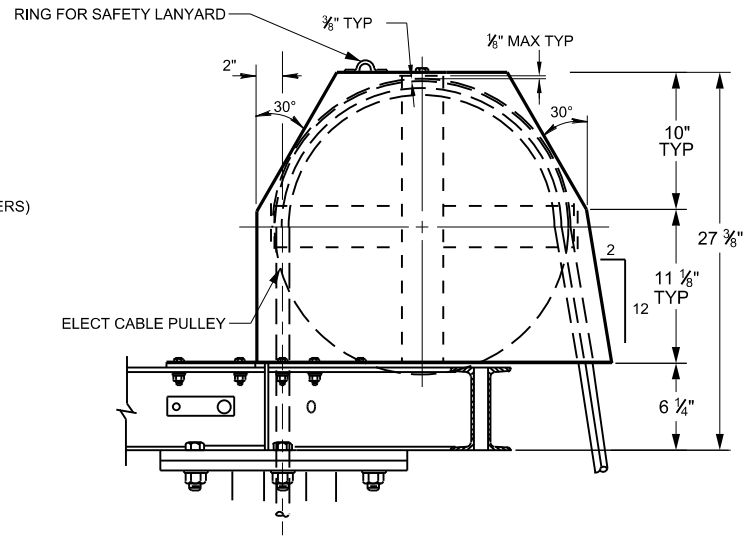


DETAIL "V"

WINCH MOUNTING PLATE
 NOTE: DIMENSIONS MAY VARY-VERIFY WITH WINCH MANUFACTURER

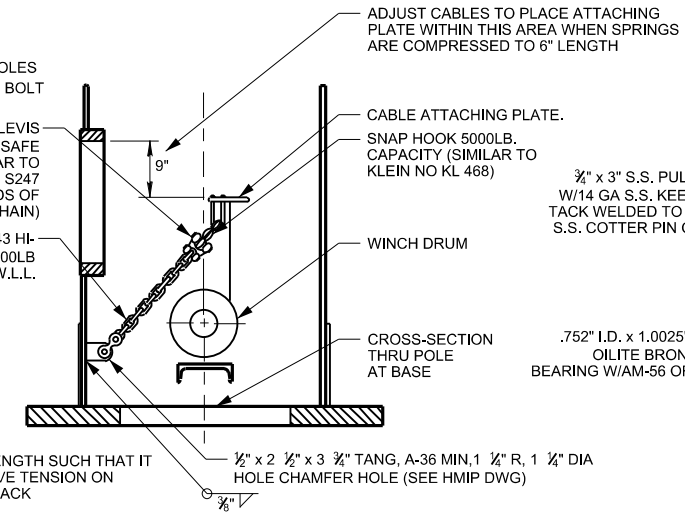


PLAN VIEW



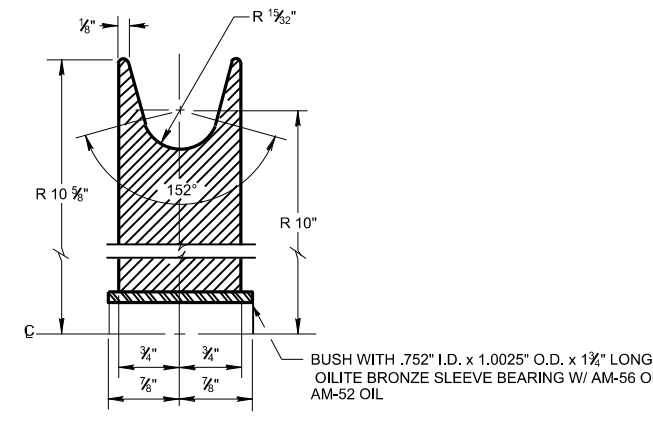
DETAIL "M"

COVER CAP ASSEMBLY
 NOTE: COVER TO BE 14 GA. GALV SHT METAL OR 0.10" ANODIZED ALUMINUM SHEET



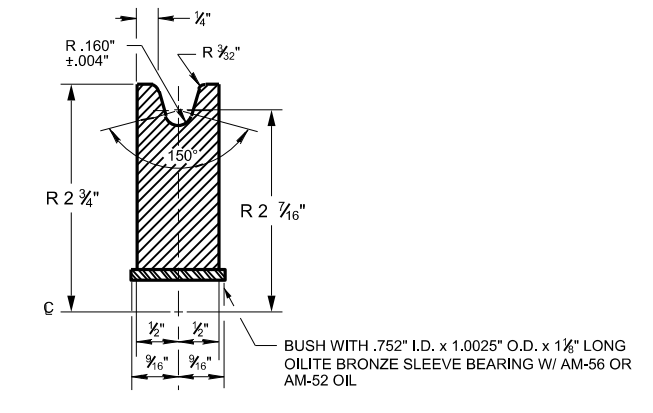
SAFETY LANYARD DETAIL

NOTE: ADJUST CHAIN LENGTH SUCH THAT IT DOES NOT RELIEVE TENSION ON CABLE, 4" MAX SLACK



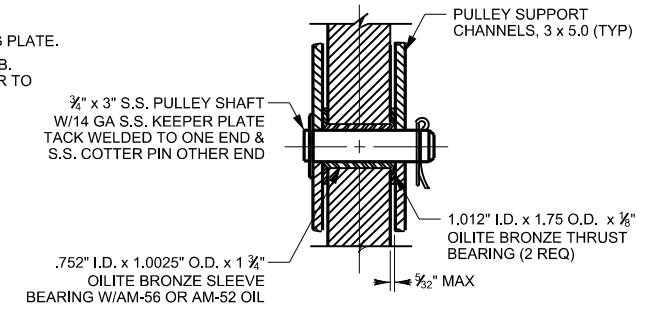
SECTION F-F

ELECTRICAL CABLE PULLEY (PULLEY MATERIAL TO BE ALUMINUM ALLOY, TYPE 356-T6 OR EQUAL)

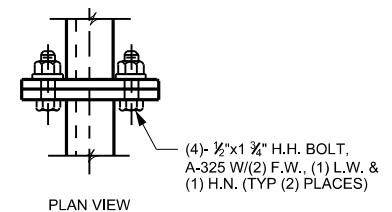


SECTION G-G

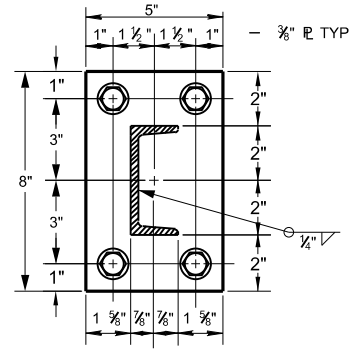
WIRE ROPE PULLEY (PULLEY MATERIAL TO BE PLATED STEEL OR STAINLESS STEEL)



SECTION L-L
 ELECTRICAL CABLE PULLEY MOUNTING



PLAN VIEW



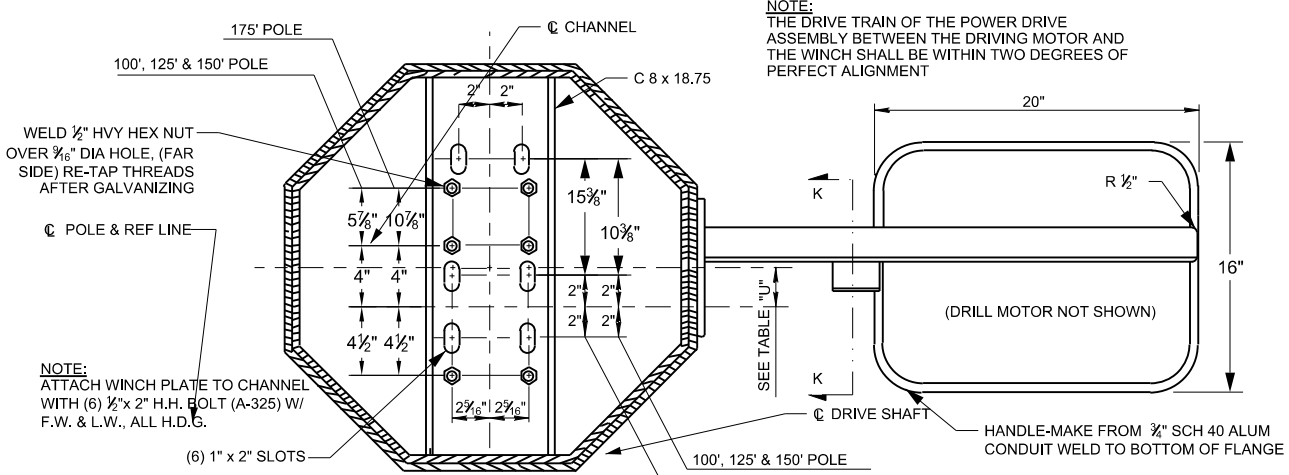
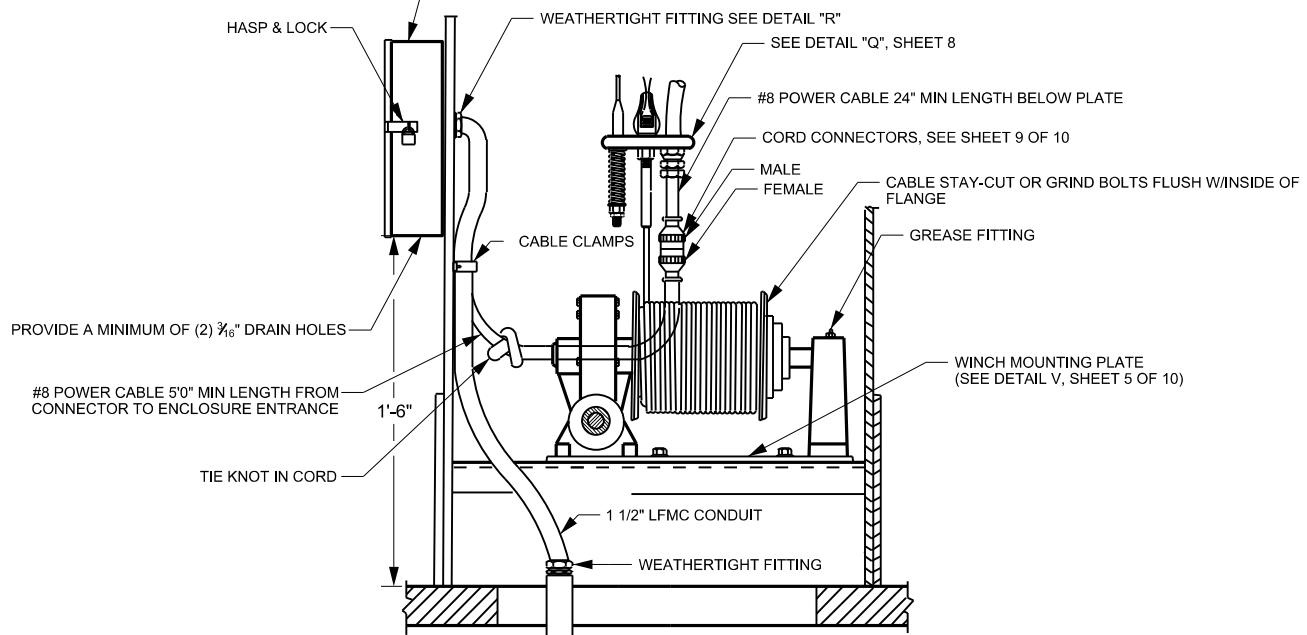
DETAIL "H"
 MOUNTING RING SPLICE PLATE

HIGH MAST CCTV MOUNTING ASSEMBLIES

HM-ITS (5)-21 (FTW)

FILE:	TP80.DGN	DN:	KAB	CK:	MBY	DW:	PDA	CK:
CON:	TxDOT APRIL 2017	SECT:		JOB:		299		HIGHWAY
REVISIONS:		0902	00	COUNTY:				SHEET NO.
		FTW		TARRANT				90

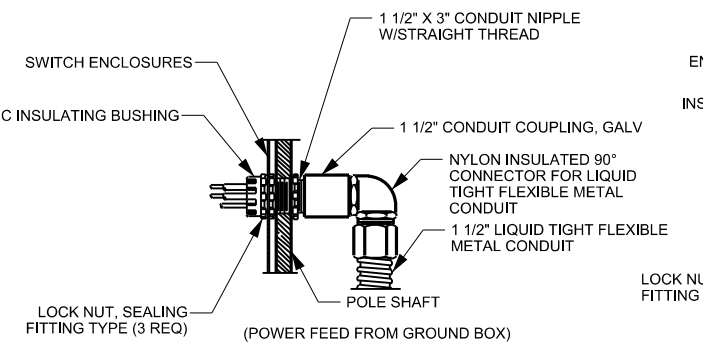
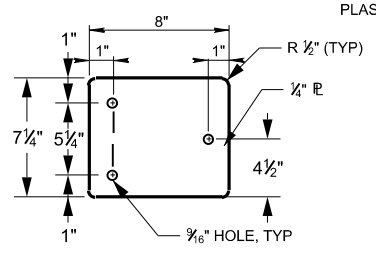
20 A 120V CIRCUIT BREAKER NEMA 4. ENCLOSURE SHALL BE STAINLESS STEEL, 14 GA. WEATHERPROOF WITH FULL LENGTH VERTICAL DOOR HINGE, WELDED HASP, LOCK AND TWO SETS OF KEYS. HINGE PIN SHALL BE TACK-WELDED TO PREVENT REMOVAL. LOCK(MASTER # 2195) AND KEYS SHALL BE FURNISHED BY THE CONTRACTOR AND SHALL BE THE SAME TYPE AS USED FOR THE SERVICE ENCLOSURES. ENCLOSURE DIMENSIONS SHALL BE APPROX 20" HIGH x 9" WIDE x 5" DEEP, ATTACH ENCLOSURE WITH (4) 1/4" S.S. BOLTS & NUTS W/ 1/4" SPACERS BREAKERS ARE TO BE MOUNTED ON A DIELECTRIC MOUNTING BOARD OR HIGH VOLTAGE INSULATING PAPER



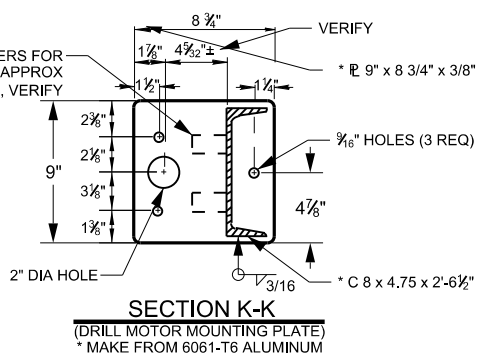
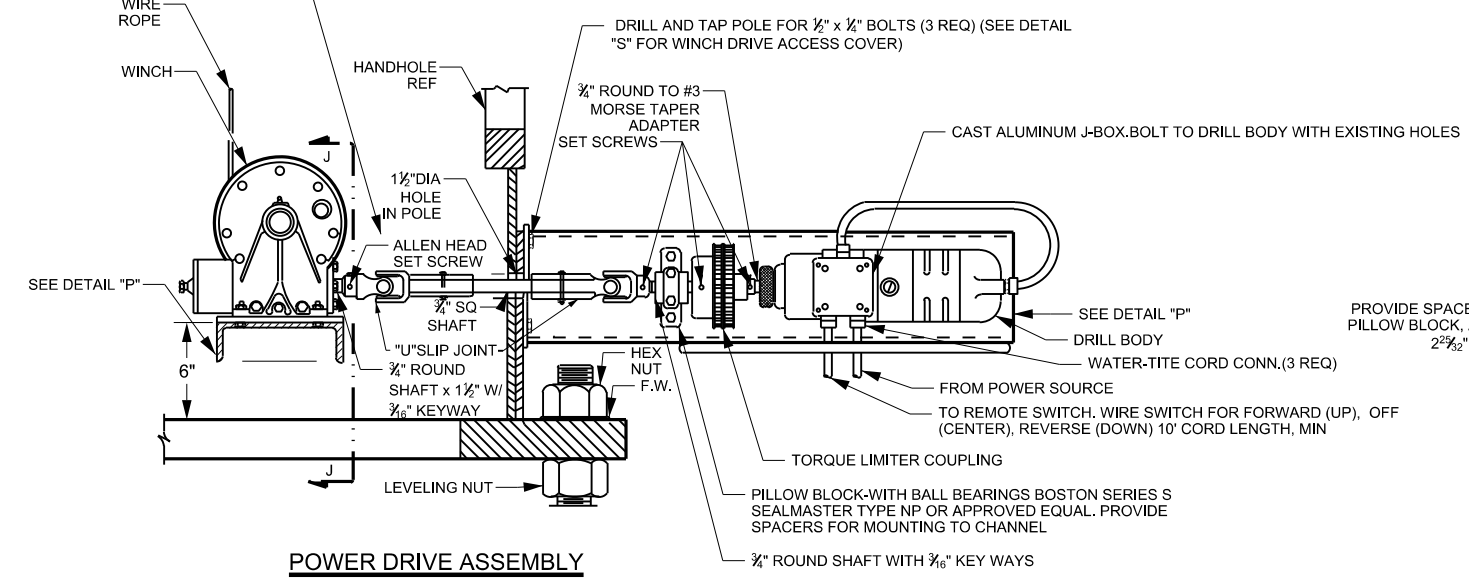
NOTE:
THE DRIVE TRAIN OF THE POWER DRIVE ASSEMBLY BETWEEN THE DRIVING MOTOR AND THE WINCH SHALL BE WITHIN TWO DEGREES OF PERFECT ALIGNMENT

TABLE OF "U" DIMENSIONS

POLE HT. FT.	8 SIDED 80 MPH	8 SIDED 100 MPH	12 SIDED 80 MPH	12 SIDED 100 MPH
100	3 1/2"	3 1/2"	2 1/2"	2 1/2"
125	3 1/2"	3 1/2"	2 1/2"	2 1/2"
150	3 1/2"	3 1/2"	2 1/2"	2 1/2"
175	4 1/2"	4 1/2"	3 1/2"	3 1/2"



"U" SLIP JOINT SHALL BE KEYPED TO WINCH SHAFT AND SECURED BY SET SCREW. "U" JOINT SHALL REMAIN ATTACHED TO THE WINCH



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LEVELS DISPLAYED

1	2
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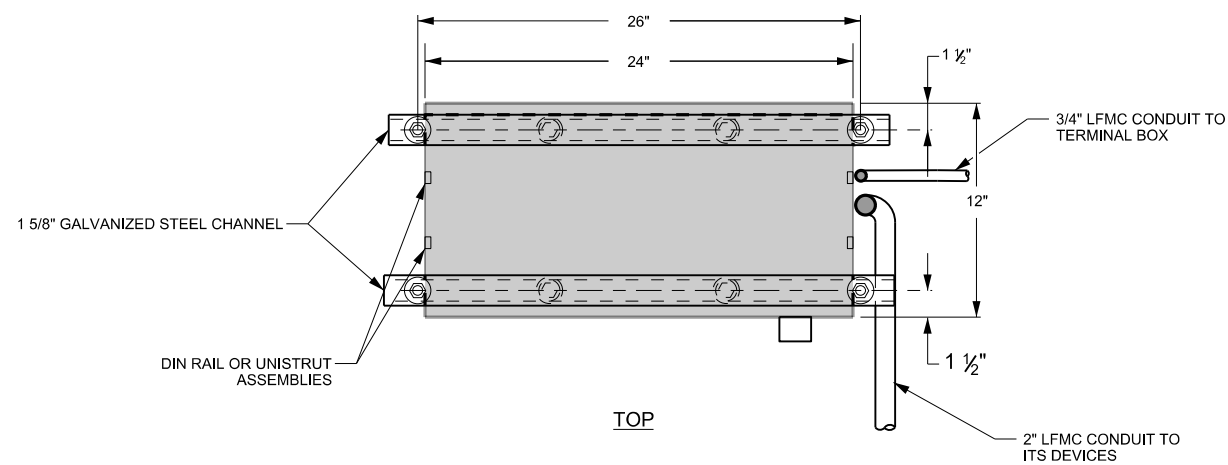
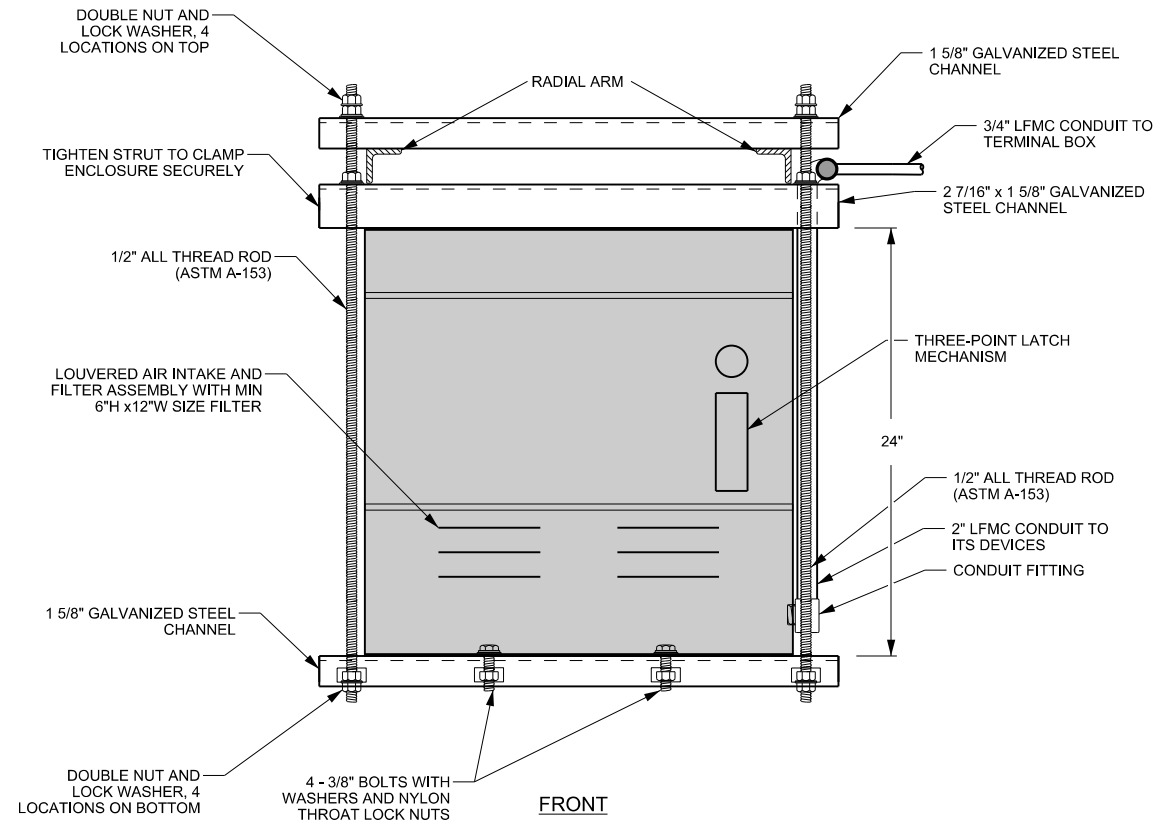
HIGH MAST CCTV MOUNTING ASSEMBLIES

HM-ITS (6)-21 (FTW)

FILE:	TP80.DGN	DN:	KAB	CK:	MBY	DW:	PDA	CK:
CONT:	0902	SECT:	00	JOB:	299	HIGHWAY		VA
REVISIONS:	DIST:		COUNTY:		SHEET NO.			
	FTW	TARRANT				91		

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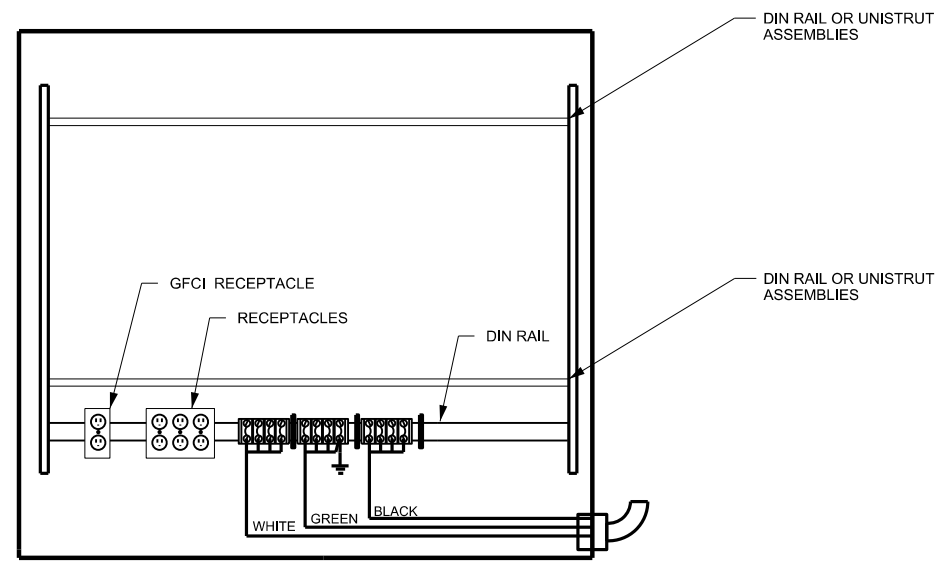
LEVELS DISPLAYED	
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2	



ENCLOSURE DETAILS

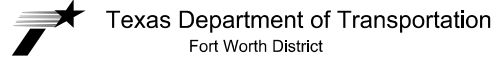
EFFECTIVE PROJECTED AREA (EPA) ALLOCATION (APPLIES TO 80MPH OR 100MPH)	EPA
STANDARD MOUNTING RING, SUPPORT ASSEMBLY, COVER, OBSTRUCTION LIGHTS, AND EXPOSED POWER CABLE	18 SF
HM-ITS ENCLOSURE AND MOUNTING HARDWARE	10 SF
MAXIMUM EPA AVAILABLE FOR MOUNTED ITEMS INCLUDING ALLOWANCE FOR EXPOSED CONDUIT, CCTV, ANTENNAS, FITTINGS, SUPPORT PIPES, AND HARDWARE	29 SF
TOTAL	57 SF

EPA ALLOCATION



ENCLOSURE ARRANGEMENT
INTERNAL WIRING NOT SHOWN

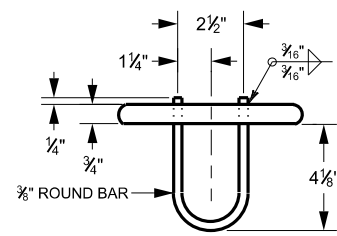
- NOTES:
- SEE SHEET 11 OF 11 FOR ENCLOSURE, INTERNAL COMPONENTS, AND WIRING REQUIREMENTS.
 - ENCLOSURE SHALL BE MOUNTED TO STRUT WITH 1/2" BOLTS FW AND LW.



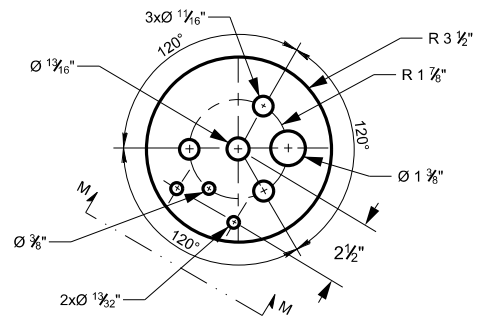
HIGH MAST CCTV
MOUNTING ASSEMBLIES

HM-ITS (7)-21 (FTW)

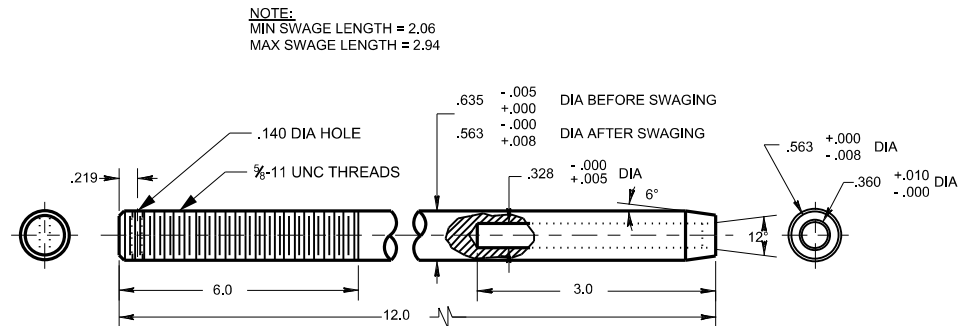
FILE:	TP80.DGN	DN:	KAB	CK:	MBY	DW:	PDA	CK:	
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REVISIONS		DIST:	FTW	COUNTY:	TARRANT	SHEET NO.:		92	



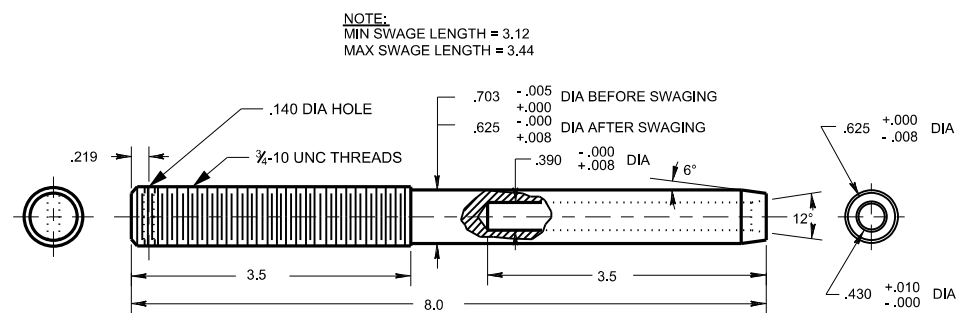
SECTION M-M



PLAN VIEW

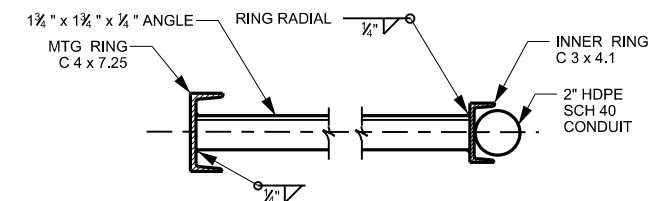


TERMINAL FOR 3/8" WIRE ROPE
MATERIAL: STAINLESS STEEL, TYPE 303SE OR 304
WITH 115,000 P.S.I. MAX ULTIMATE TENSILE STRENGTH

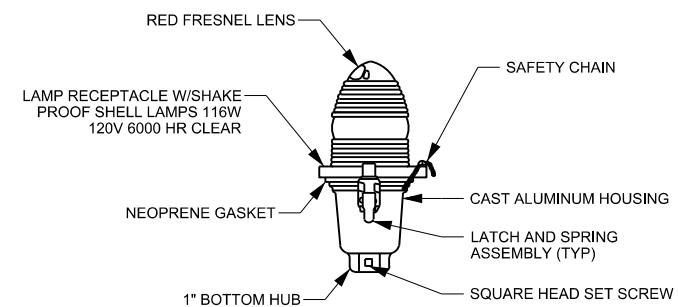


TERMINAL FOR 1/2" WIRE ROPE
MATERIAL: STAINLESS STEEL, TYPE 303SE OR 304
WITH 115,000 P.S.I. MAX. ULTIMATE TENSILE STRENGTH

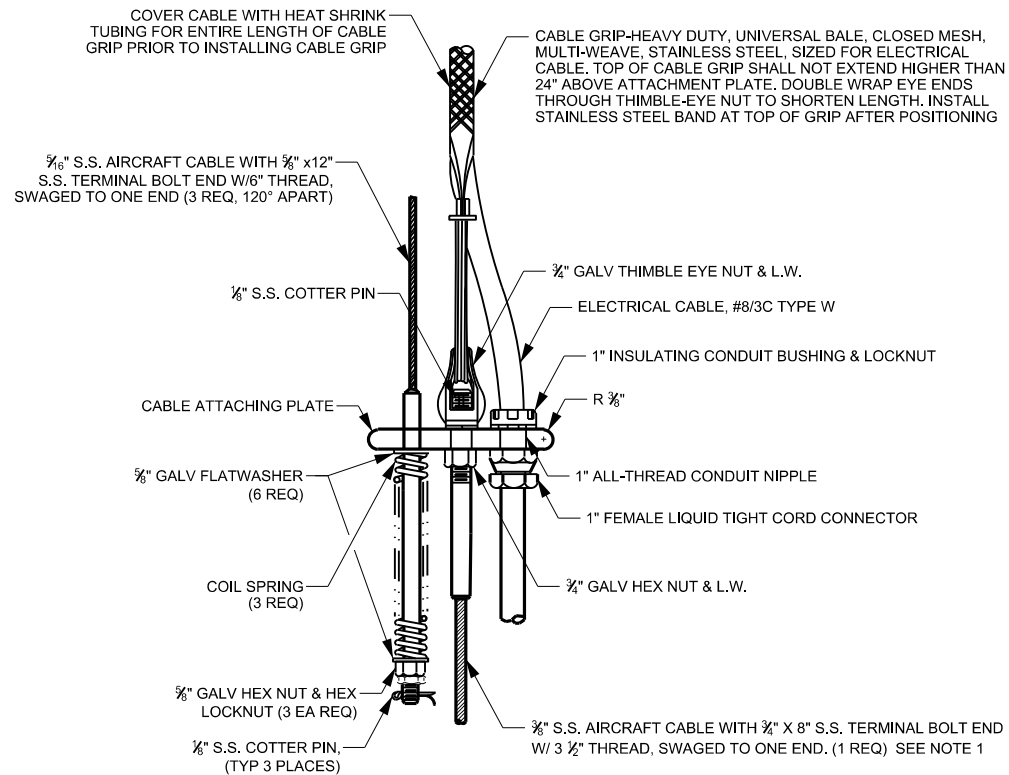
SWAGE TERMINALS
ALL DIMENSION IN INCHES



SECTION C-C



DETAIL "U"
(OBSTRUCTION LIGHT)
USE FAA APPROVED LED OBSTRUCTION LIGHT. DETAILS MAY VARY



DETAIL "Q"
(CABLE ATTACHING PLATE)

NOTES:

- 3/8" CABLE SHALL BE ROTATION RESISTANT SEE GENERAL NOTES SHEET 9.

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LEVELS DISPLAYED

1	2
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HIGH MAST CCTV
MOUNTING ASSEMBLIES

HM-ITS (8)-21 (FTW)

FILE:	TP80.DGN	DN:	KAB	CK:	MBY	DW:	PDA	CK:
CONTR:	0902	SECT:	00	JOB:	299	HIGHWAY		VA
DIST:	COUNTY:		SHEET NO.					
FTW:	TARRANT		93					

GENERAL NOTES:

1. GENERAL

A. All material shall be in accordance with the applicable sections of the NEC. All conduit and conductors shall be in accordance with the materials and construction methods requirements of items 618 and 620. Heat shrink tubing for use with cable grips and cable splicing shall meet the requirements of item 620. Alternates for minor components and arrangements may be used when approved by the Engineer in writing. Make brochure submittal for approvals.

B. Where stainless steel bands are called for on the HM-ITS sheets, stainless steel hose clamps may be provided. Stainless steel bands and stainless steel hose clamps shall be provided with stainless steel clips or stainless steel screws.

C. Obstruction lights

1. When obstruction lights are required by layout sheets, summary sheets or general notes, obstruction lights shall be controlled by an FAA approved photocell mounted on the ring. Photocells shall meet the following requirements:

a) All photocells shall consist of a photoelectric cell, an internal lightning arrestor, and a relay or bimetallic switch mounted inside a weather proof enclosure with standard 3-prong twist lock photocell plug and receptacle. The enclosure shall be made of poly-acrylic with clear acrylic window. Enclosure chassis shall be molded thermosetting plastic. The photocell shall have an arrestor rated 2.0kV sparkover with 5000 amps, and the photocell shall be rated a minimum of 1800 VA.

b) Photocell (FAA photocell) shall turn on at light levels below 35 foot-candles and off at levels above 58 foot-candles, in accordance with FAA requirements. This photocell shall be rated for operation at 120 volts.

2. When obstruction lights are not required, eliminate the 3 obstruction light fixtures.

D. The male cord connector on the lower end of the type W cord running up the pole, the female cord connector for the type W cord running to the circuit breaker enclosure, the male connector on the maintenance jumper, and flange receptacle in the ring mounted enclosure and the cord connector at the top end of the TYPE W cord shall meet the following or approved equal specifications:

1. Arrow Hart pin and sleeve watertight connectors UL listed, catalog numbers AH330C7W and AH330P6W.

2. Bryant watertight pin and sleeve connectors UL listed, catalog numbers 330C6W and 330P6W.

3. Hubble pin and sleeve connectors UL listed, catalog numbers HBL330C7W and HBL330P7W.

4. The male connector for use with the type W maintenance jumper shall be a pin and sleeve connector of one of the above types. The contractor shall attach a twist lock receptacle to the opposite end of the maintenance jumper to match the flange mounted plug on the ring.

5. Suitable for use at 30A, 125VAC

6. The contractor shall make a brochure submittal on the cord connectors.

2. TESTING

After High Mast Assembly for ITS has been completely assembled, the Engineer may require Contractor to fully lower and raise each high mast ring one time to demonstrate proper operation of the lowering mechanism, or may require the ring to be lowered for ring camera, cabinet, wiring, and radio inspection. If any malfunction occurs, the problem shall be corrected at the Contractor's expense and the lowering test will be repeated.

3. MOUNTING RING AND SUPPORT ASSEMBLY

A. Ring and support assembly shall be fabricated from steel having a minimum yield strength of 36 KSI.

B. Cover assemblies, fittings and miscellaneous parts shall be as outlined on the plans.

C. All hardware shall be hot-dipped galvanized per ASTM A153 or shall be stainless steel, unless noted otherwise on the plans.

4. WINCH

A. Housing shall be high tensile strength die-cast silicon aluminum. Cable drum shall be fabricated from seamless steel tubing with stamped steel flanges and shall be hot-dipped galvanized. Drum shall have a minimum diameter of 4.5 inches. Drum shall be keyed to drum shaft. Drum and flanges shall be sized so that, when the fixture mounting ring is in the raised position, the cable including one full layer will fill the drum to no more than two-thirds of full capacity. Drum shaft shall be ground from stainless steel and mounted on lubricated bronze bearings with seals. Wormgear shall be made of nickel-bronze and worm shaft shall be high-strength stress-proofed steel, ground and polished and supported by tapered roller bearings.

B. Gear ratio shall be 36:1 with safe hoisting capacity of not less than 4000 pounds.

C. Winch shall incorporate adjustable automatic brake to assure positive load suspension. Brake shall be multiple disc with friction plates running in oil bath and one-direction clutch which operates only when load is suspended or lowered. Winch shall not have throw-out clutch.

D. Any winch that is operated without oil shall be considered damaged and shall be replaced by the Contractor at the Contractor's expense.

5. WIRE ROPE AND TERMINALS

A. $\frac{5}{16}$ " and $\frac{3}{8}$ " wire rope shall be 19x7 Rotation Resistant IWRC stainless steel. 19x7 rotation resistant wire rope shall meet the construction requirements of Fed. Spec. RR-W-41OD, Type IV, class 2, modified for stainless steel with a nominal breaking strength of 11,100 lbs. All wire rope shall be pre-formed and factory lubricated. Wire rope shall meet the requirements of the applicable specification except where modified by this specification. Quality Assurance testing shall be the responsibility of the manufacturer and shall meet recognized wire rope industry standards. No special tensile or torsion testing will be required. Mill Test Reports shall be furnished.

B. Winch cable shall be of sufficient length to leave a minimum of one full layer of cable on the drum when the fixture mounting ring is in the full down position.

C. Wire rope terminals shall be stainless steel, solid stud type as shown on Sheet 8. All terminals shall be drilled for cotter pin. Material to be 303 SE or 304 stainless steel with a maximum tensile strength of 115,000 p.s.i. Mill Test Reports shall be furnished.

D. All terminals shall be proof-tested by the manufacturer to 40% of rated strength of the wire rope. Each terminal shall be identified by manufacturer's logo permanently incised on terminal. Manufacturer shall furnish certification of tests. Contractor shall also furnish one sample of each size of terminal with 5 ft. Of wire rope for load tests by the state. Samples tested must withstand test load not less than 100% of rated breaking strength of wire rope. If sample fails test, all terminals of same size will be rejected.

E. Wire rope shall be delivered from the manufacturer on a reel.

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1	2



HIGH MAST CCTV MOUNTING ASSEMBLIES

HM-ITS (9)-21 (FTW)

FILE:	TP80.DGN	DN:	KAB	CK:	MBY	DW:	PDA	CK:
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	0902	00	299	VA				
	DIST	COUNTY	SHEET NO.					
	FTW	TARRANT	94					

GENERAL NOTES (CONTINUED):

6. SPRINGS

- A. Provide three steel springs as shown on plans.
- B. Springs shall have an uncompressed length of approximately 8 inches and shall compress 3 inches under 700-pound load.
- C. Springs shall contain approximately 19 total coils with ID of 0.875 and OD of 1.375 inches. Ends shall be closed and ground. Springs shall be zinc-plated.
- D. Springs shall be made from ¼" diameter oil-tempered MB steel treated for overstress. Springs shall not develop permanent set from 3-inch compression.

7. ELECTRICAL POWER CABLE

- A. Power cable shall be No. 8 awg three-conductor round Type W, rated 90 degrees C, 600 volt or 2000 volt. Each conductor shall be tinned copper and shall consist of 133 strands. Insulation shall be ethylene propylene rubber. Jacket shall be chlorosulfonated polyethylene (CSPE), with glass fiber or nylon reinforcing mesh between two layers of CSPE. Nominal diameter shall be 0.91". Filler shall be rubber compound or other approved non-hygroscopic compound. Jacket shall be Hypalon Power Flex 90, with no substitutions allowed.

8. POWER DRIVE ASSEMBLY (ONE ONLY REQUIRED THIS CONTRACT UNLESS OTHERWISE SHOWN ELSEWHERE ON THE PLANS)

A. Drive motor

- 1. Drive motor shall be 1¼" heavy-duty reversible portable electric drill modified as shown on plans.
- 2. Shall have a minimum of 6 radial ball bearings, one thrust bearing, and one needle bearing.
- 3. Shall have No. 3 Morse Taper socket.
- 4. Shall be designed for 115 volt 60 hertz single phase operation 250 RPM at no load.
- 5. Shall be designed for continuous rated duty of 160 RPM and 15 amperes at 115 volts with delivery of 33-pound-feet of torque. Drill motor to be operated only at low speed range. (i.e. 150 to 160 RPM)
- 6. Shall develop 240 pound-feet of torque at stalled rotor condition.

B. Torque limiter coupling

- 1. Torque limiter coupling shall consist of standard torque limiter with Type A sprocket center member coupled to a Type B sprocket by an ASA double strand roller chain. Type A sprocket shall be chrome-plated.
- 2. Coupling shall have torque capacity minimum of 15 pound-feet and a maximum of 55 pound-feet.
- 3. Limiter section of coupling shall consist of integral hub and pressure plate, two friction facings, sintered iron bushing, pilot plate, disk spring, lock washer and hex adjustment nut. All major components except spring and friction facings shall be cadmium plated with dichromate treatment.
- 4. Type A center sprocket shall have ground face (63 micro-inch) and shall be run-in for 4 minutes at approximately 60 RPM at a torque setting 70% to 80% of spring rating. Contractor shall provide written certification that run-in has been accomplished.
- 5. The torque limiter coupling shall, after run-in, be set to a torque limit of 35 pound-feet or as directed by the Engineer. The proper setting of the coupling shall be demonstrated to the Engineer.

C. Universal joints

- 1. Shall be slip-type with 4-inch barrel. A grease fitting shall be so located in the spider that all caps and needle bearings may be adequately serviced. The assembly shall be disassembled and zinc-plated, then reassembled and properly lubricated.
- 2. Shall have a minimum torque rating of 1270 inch-pounds at 200 RPM.
- 3. Shall have set screw and keyed coupling as shown on plans.

9. CONSTRUCTION METHODS

A. Fabrication

- 1. Fabrication and welding shall be in accordance with Item 441, "Steel Structures".
- 2. All holes supporting pulley shafts shall be drilled (not punched) prior to galvanizing.
- 3. All component parts shall be galvanized, where galvanizing is applicable, after fabrication.
- 4. Galvanizing on all parts which have become scratched, chipped or otherwise damaged shall be thoroughly cleaned and the cleaned area painted with two coats of zinc dust-zinc oxide paint conforming to the requirements of repair compounds meeting federal specification TT-P-641 b.
- 5. Mounting rings and ring support assemblies shall be fabricated with the use of jigs that have been inspected and approved by material and Test Division personnel prior to their usage.
- 6. The fabricator shall submit his proposed welding procedures in accordance with Item 441, "Steel Structures".

B. Installing wire rope

- 1. Extreme care shall be used to prevent wire rope from kinking, nicking, or from sustaining other damage during installation. Rope shall not be installed by pulling from flat coil, but shall be carefully unrolled its full length or placed on a horizontal axis and unreeled according to wire rope industry standards.
- 2. For right lay rope, the rope shall be attached to the drum on the end opposite the winch gear train, and wound on drum so that the free end of the rope comes off the backside of the drum during normal operation of the winch. Rope must be unreeled carefully as stated above. Care must be taken to insure that all layers lay full and tight on drum.
- 3. Installation of all wire rope shall be accomplished only under direct supervision of the engineer or his authorized representative. Contractor shall not remove wire rope from manufacturer's reel until authorized by the Engineer. Installation of wire rope on winch shall be in accordance with the above and accepted industry practice. Installation of the three hoist cables shall be made from the top end of the pole and as directed by the engineer or his representative.

C. Installing wire rope clips

- 1. Turn back approx. 2' 3" of rope, measured from the top of thimble. Apply seizing to pigtail end of wire rope prior to cutting to length. See detail "K", Sheet 5. Apply first clip approx. 3" from the dead end of the wire rope with u-bolt over dead end and live end in clip saddle. Tighten nuts evenly to 30 pound-feet of torque, or as recommended by manufacturer.
- 2. Install second clip as near loop as possible, take out slack and torque nuts evenly to 30 pound-feet or as recommended by manufacturer.
- 3. After final erection and assembly of the pole and high mast assembly, retighten nuts to required torque.

D. Installing Mounting Ring and Equipment

- 1. Prior to mounting equipment to the mounting ring, contractor shall ensure the ring is level.

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LEVELS DISPLAYED									
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HIGH MAST CCTV MOUNTING ASSEMBLIES

HM-ITS (10)-21 (FTW)

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		FTW	TARRANT				95		

GENERAL NOTES (CONTINUED):

10. ENCLOSURE CABINET SPECIFICATIONS

A. Requirements.

1. Place all terminals and panel facilities on the lower portion of the enclosure walls below all shelves.
2. **Duplex Receptacles.** Provide three 120 VAC NEMA type 5-20R duplex receptacles, or as shown on the plans. Permanently label duplex receptacles "For Internal ITS Equipment Only". Install duplex receptacle non-metallic covers.
3. **Ground Fault Circuit Interrupter (GFCI) duplex receptacles.** Provide at least one 120 VAC NEMA type 5-20R GFCI duplex receptacle, or as shown on the plans, protected by a circuit breaker. This GFCI duplex receptacle is intended for maintenance personnel and is not to be used to serve equipment inside the enclosure. Permanently label GFCI duplex receptacles "For Personnel Use". Install GFCI duplex receptacles in a readily accessible location.
4. **Circuit Breakers.** Install 1P/20A circuit breaker at the base of the pole. Provide Underwriters Laboratories (UL) listed circuit breakers rated for 120/240 VAC operation. Provide circuit breakers with a minimum interrupt capacity of 10,000 A.
5. **Power Line Surge Protection.** Provide and install power line surge protection devices in terminal box and in enclosure as shown below.
6. **Power Cable Input Junction Terminals.** Provide power distribution blocks suitable for use as a power feed and junction points for 2 and 3 wire circuits. Accommodate up to No. 10 AWG conductors on the line side of each circuit. Electrically isolate the AC neutral and equipment ground wiring from the line wiring by an insulation resistance of at least 10 megohms when measured at the AC neutral. Color code the AC neutral and equipment grounding wiring white and green respectively in accordance with the most current version of the NEC. Utilize the back panel to distribute and properly interconnect all enclosure wiring related to the specific complement of equipment called out on the plans. Each item of equipment including any furnished by the department must have the cable harness properly terminated at terminal boards on the back panel. Ensure all functions available at the equipment connector are carried in the connector cable harness to the terminal blocks from the power distribution panel mounted on the left side panel of the enclosure.
7. **Wiring.** Ensure all enclosure wiring identified by the use of insulated pre-printed sleeving slipped over the wire before attachment of the lug or making the connection. Supply enough text on wire markers in plain words or abbreviations with sufficient level of detail so that a translating sheet will not be required to identify the type and size of wire. Cut all wires to the proper length before assembly. Ensure no wires are doubled back to take up slack. Ensure harnesses to connectors are covered with braided cable sleeves. Secure cables with nylon cable clamps. Provide service loops to facilitate removal and replacement of assemblies, panels and modules. Use insulated parts and wire rated for at least 600 V. Color-code harnesses and wiring. Route and bundle all wiring containing line voltage ac separately and shield from all low voltage, i.e., control circuits. Cover all conductors and live terminals or parts, which could be hazardous to maintenance personnel, with suitable insulating material. Provide AC internal enclosure wiring identified in accordance with the most current version of the NEC. Provide white insulated conductors for ac neutral. Provide green insulated conductors for equipment ground. Provide any color different from the foregoing on other conductors in accordance with the most current version of the NEC. For equipment that requires grounding, provide grounding conductors and do not use conduit for grounding. Provide conductors that are UL-listed THNN least size no. 14 AWG. no strands of any conductor may be trimmed to fit the wiring into the breaker or terminal block.
8. **Terminal Strips.** Provide terminal strips located on the back panel that are accessible to the extent that it is not necessary to remove the electronic equipment from the enclosure to make an inspection or connection. Ensure terminal blocks are 2 position, multiple pole barrier type. Provide shorting bars in each of the positions provided along with an integral marking strip. Arrange terminal blocks such that they will not upset the entrance, training and connection of incoming field conductors. Identify all terminals with legends permanently affixed and attached to the terminal blocks. Ensure no electrically energized components or connectors extend beyond the protection afforded by the barriers. Locate all terminal blocks below the shelves. Ensure terminals used for field connections are secure conductors by means of a No. 10-32 nickel or cadmium plated brass binder head screw. Ensure terminals used for interwiring connections, but not for field connections, are secure conductors by means of a No. 5-32 nickel plated brass binder head screw. Terminate all connections to and from the electronic equipment to an interwiring type block. These blocks will act as intermediate connection points for all electronic equipment input and output. Provide termination panels that are used to distribute and properly interconnect all enclosure wiring related to the specific complement of equipment as shown on the plans. Provide properly terminated cable harnesses for each item including any furnished by the department. Provide all functions available at the equipment terminals that are carried in the connector cable harness.
9. **Enclosure internal grounding.** The enclosure internal ground consists of at least 1 ground bus-bar permanently affixed to the enclosure and connected to the grounding electrode. Return ac neutral and equipment ground wiring to these bus-bars.
10. **Door switch.** Provide door switch meeting the following requirements:
 - Momentary, pin-type door switch,
 - Installed in the enclosure or on the door, and
 - Connected to a terminal so that the equipment installed in the enclosure can confirm input is connected to logic ground when the enclosure door is open.

Provide 2 momentary, pin type door switches for each door provided with the enclosure. Wire 1 switch to turn on the enclosure lights when the door is open and off when the door is closed. Wire the other in parallel to a terminal block to detect an enclosure intrusion condition.
11. **Size and construction.** Provide its enclosure as detailed herein and as shown on the plans.

**TABLE 1
MINIMUM ENCLOSURE INTERNAL DIMENSIONS**

	WIDTH (IN.)	HEIGHT (IN.)	LENGTH (IN.)
TYPE HM	12 1	24	24

1. Minimum dimension for enclosure provided without EIA 19 in. rack assembly.

12. **Ventilation.** Provide the enclosure with vent openings to allow cooling of electronic components. Locate louvered air intake vent openings on the lower portion of the enclosure doors and covered fully on the inside with a commercially available disposable 3 layer graded pleated type filter of minimum size 6 in. (high) x 12 in. (wide) for type HM enclosure. Size the louvered intake area and filter to allow maximum filtered air flow and cooling, securely mounted so that any air entering the enclosure must pass through the filter. Ensure the enclosure opening for intake of air is large enough to accommodate filter size. Screen the exhaust to prevent entry of insects. Provide the screen openings no larger than 0.0125-sq. in. Provide a, minimum of 2, thermostatically controlled fans that are adjustable with an adjustment range of 70 to 110°F. Provide a press-to-test switch to test the operation of the fan. Provide a fan with a capacity of at least 110 cfm each. There is no opening on the roof of the enclosure.

13. **Exterior finish.** Provide enclosures with a smooth aluminum finish and the exterior in its unpainted natural color.
14. **Serial number.** Provide the enclosures with a serial number unique to the manufacturer, preceded by an assigned 2 letter manufacturer's code. Provide at least a 0.2 in. Letter height. Stamp the entire identification code and number on a metal plate which is riveted to the enclosure, stamp directly on the enclosure wall, or engrave on a metalized mylar plate that is epoxied on the upper right hand enclosure side wall.
15. **Modular design.** Provide enclosures that have a modular design and allows its equipment to be installed in a variety of mounting configurations as detailed on the plans or as directed.
16. **Shelves.** Provide adjustable shelves in each enclosure as required to support the equipment as specified on the plans. Ensure shelf adjustment at 2 inch intervals in the vertical position. Provide shelves that are removable and capable of supporting the electronic equipment. Provide a minimum of 2 in. between the back and front edge of the shelf to back inside wall and door of the enclosure respectively to allow room for the equipment cables and connectors.
17. **Mounting hardware.** Provide enclosures with the appropriate channel mounting brackets, stiffening plates, anchor bolts, and any other necessary hardware to mount the enclosure on the ITS pole structure as shown on the plans. Provide mounting brackets made of 0.250 in. Thick steel. Do not band the enclosure or mounting plates to the pole. Alternate mounting details may be submitted for approval. Reducing overall wind loading will be a primary consideration for alternative detail approvals.
18. **Environmental design requirements.** Provide enclosures that meet the functional requirements of this item during and after subjection to any combination of the following requirements:
 - Ambient temperature range of -30 to 165°F,
 - Temperature shock not to exceed 30° F per hour, during which the relative humidity does not exceed 95%,
 - Relative humidity range not to exceed 95% over the temperature range of 40 to 110°F, and
 - Moisture condensation on all surfaces caused by temperature changes.
19. **Vibration.** Material used must show no degradation of mechanical structure, soldered components, plug in components or satisfactory operation in accordance with the manufacturer's equipment specifications after being subjected to the vibration test as described in the nema standard TS2, section 2.2.8, vibration test or the latest revision.

B. Fabrication

1. **Enclosure.** Continuously weld all exterior seams for enclosure and doors. Fill edges to a radius of 0.03125 in. Minimum. Smooth exterior welds. Welding on aluminum enclosures are done by the gas metal arc (MIG) or gas tungsten arc (TIG) process using bare aluminum welding electrodes. Ensure electrodes conform to the requirements of the American Welding Society (AWS) A5.10 for ER5356 aluminum alloy bare welding electrodes. Procedures, welding machines and welding machine operators for welding on aluminum must be qualified and conform with the requirements of AWS B3.0, "Welding Procedures and Performance Qualification", and to the practices recommended in AWS C5.6. Construct all enclosures of welded sheet aluminum with a thickness of at least 0.125 in. Meeting NEMA 3R standards. Do not allow wood, wood fiber product, or flammable products in the enclosure. Seal enclosure structure to prevent the entry of rain, dust, and dirt.
2. **Door.** Provide sturdy and torsionally rigid enclosure doors that substantially cover the full area of the enclosure access opening. Attach enclosure doors by a minimum of 2 heavy duty hinges or full length hinge. provide stainless steel hinge pins. Fabricate the doors and hinges to withstand a 100 lb. per vertical ft. force applied to the outer edge of the door when open without permanent deformation or impairment of the door or enclosure body when the load is removed. Fit the enclosure doors with number 2 corbin locks and aluminum or chrome plated handles with a minimum 3/8 in. drive pin and a 3 point latch. Design the lock and latch so that the handles cannot be released until the lock is released. Provide a locking ring for a padlock along with a padlock. provide 2 keys for the door and 2 keys for the padlock with each enclosure. Locate the lock clear of the arc of the handle. Keys must be removable in the locked position only. Mount locks with 2 stainless steel machine screws. Provide enclosure doors with a catch mechanism to hold the door open at 2 positions: 90° and 120°. Fabricate the door and door stop mechanism to withstand a simulated wind load of 5 lb. per sq. ft. applied to both inside and outside surfaces without failure, permanent deformation, or compromising of door position. Provide enclosures without auxiliary police doors. Provide a gasket to act as a permanent and weather resistant seal at the enclosure door facing. The gasket material must be of a non-absorbent material and maintain its resiliency after long term exposure to the outdoor environment. Provide a gasket with a minimum thickness of 0.25 in. Locate the gasket in a channel provided for this purpose either on the enclosure or on the door. An "L" bracket is acceptable instead of this channel if the gasket is fitted snugly against the bracket to insure a uniformly dust and weather resistant seal around the entire door facing.
3. **Environmental design requirements.** The enclosure must meet all functional requirements during and after subjection to any combination of the following requirements:
 - Ambient temperature range of 0°F to 158°F.
 - Temperature shock not to exceed 30°F per hr., during which the relative humidity must not exceed 95%.
 - Relative humidity range not to exceed 95% over the temperature range of 40°F to 110°F.
 - Moisture condensation on all surfaces caused by temperature changes.



**HIGH MAST CCTV
MOUNTING ASSEMBLIES**

HM-ITS (11)-21 (FTW)

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ROADWAY ILLUMINATION ASSEMBLY NOTES

1. Details apply to roadway lighting installations bid or referenced under Item 610, "Roadway Illumination Assemblies." Provide, furnish, and install all other materials not shown on the plans which may be necessary for complete and proper construction. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the State such warranties or guarantees.
2. The locations of poles and fixtures may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.
3. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association, Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection.
4. Provide Roadway Illumination Light Fixtures as per TxDOT Departmental Material Specification (DMS) 11010, Item 610, and as shown on the Material Producers List (MPL) for Roadway Illumination and Electrical Supplies.
5. Fabricate steel roadway illumination poles in accordance with Roadway Illumination Poles (RIP) standards and Item 610. Poles fabricated according to RIP standards do not require shop drawing submittals.
 - a. Alternate designs to RIP standards or the use of aluminum to fabricate poles will require the submission of shop drawings electronically. For instructions on submitting shop drawings electronically see "Guide to Electronic Shop Drawing Submittal" on the TxDOT web site.
 - b. Limitations on use of the RIP standard: The RIP standard details were developed for installations in locations where the 3-second gust basic maximum wind speed is 110 mph, and where the elevation of the base of the pole is less than (i.e. not more than) 25' above the elevation of the surrounding terrain, in accordance with the "AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals," 6th Edition (2013) of the AASHTO Design Specifications. For poles to be installed in regions where the maximum basic wind speed exceeds 110 mph or to be mounted more than 25' above the surrounding terrain, provide poles meeting the following requirements:
 - i. Submittals. Following the electronic shop drawing submittal process (see Guide to Electronic Shop Drawing Submittal on the TxDOT web site), submit to the Engineer for approval fabrication drawings and calculations for the poles, sealed by a Texas licensed professional engineer (P.E.).
 - ii. Luminaire Structural Support Requirements. Provide light poles, arms, and anchor bolt assemblies with a 25 year design life to safely resist dead loads, ice loads and the required basic wind speeds at the location of installation in accordance with the 6th edition (2013) of the AASHTO Design Specifications. For transformer base poles, include transformer base and connecting hardware in calculations and shop drawing submittals. Structurally test all transformer bases to resist the theoretical plastic moment capacity of the pole. Submit certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished with the shop drawings. Show breakaway base model number, manufacturer's name, and logo on shop drawings. Include on manufacturer's shop drawings the ASTM designations for all materials to be used.
6. For both transformer and shoe-base type illumination poles, provide and install double-pole breakaway fuse holders as specified by DMS-11040. Breakaway fuse holders are listed on the MPL for Roadway Illumination and Electrical Supplies under Items 610 & 620. Provide 10 amp time delay fuses for breakaway connectors in light poles, or inside the light fixture for underpass luminaires. In each pole, connect luminaires to the breakaway connector with continuous stranded 12 AWG copper conductors as listed on the MPL. Bond all equipment grounding conductors together and to the ground lug in the transformer base or hand hole.
7. Tighten anchor bolts for shoe base, concrete traffic barrier base, and bridge mount roadway illumination poles, in accordance with Item 449.
8. Install T-Base with following procedure:
 - a. Anchor Bolt Tightening.
 - i. Coat the threads of the anchor bolts with electrically conductive lubricant.
 - ii. Place the T-base over the anchor bolts. Foundation must be level and flat. The maximum permissible gap under any one corner of the t-base is 1/8" before nuts are tightened.
 - iii. Coat the bearing surfaces of the nuts and washers with electrically conductive lubricant. Install (1) 1/2" hold down washer, (1) lock washer, and (1) nut on each anchor bolt. Turn the nuts onto the bolts so that each is hand-tight against the washer.
 - iv. Using a torque wrench, tighten each nut to 150 ft-lb. Uniform contact is required between the foundation and the T-base in the corner regions of the T-base, and all corner gaps must be closed after applying torque. If a gap still exists after torquing to 150 ft-lbs, continue torquing each bolt incrementally until gap is closed or maximum allowable torque of 250 ft. pound is reached, whichever comes first. If 250 ft-lbs is not enough to close the gap the foundation must be leveled. Gaps along the straight sides of the T-bases and the foundation are permissible. Ensure that no high point of contact occurs between the straight sides of the T-base and the foundation.
 - v. Check top of T-base for level. If not level then foundation must be leveled.
 - b. Top Bolt Procedure
 - i. Erect pole over T-base with crane. Coat bolts, nuts, washers, and lock washers with electrically conductive lubricant.

- ii. Install bolts and 1/2" connecting washers from the inside of the T-base, thread up through the pole base. Install flat washers, lock washers and nuts snug tight according to Item 447, "Structural Bolting."
 - iii. Tighten each nut to 150 ft-lb. using a torque wrench.
- c. Level and Plumb
- i. Ensure pole is plumb and mast arm is perpendicular to the roadway according to plans to within 5 degrees.

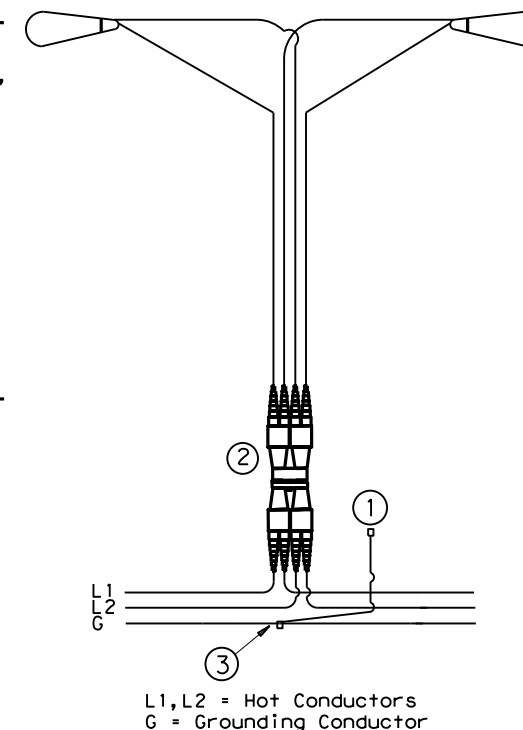
9. Construct luminaire pole foundations in accordance with Item 416, "Drilled Shaft Foundations," and TxDOT standard sheet RID(2).
10. Provide and install underpass luminaires in accordance with Item 610, DMS-11010, and TxDOT standard sheet RID(3). Typical luminaire size for underpass luminaires is 150W HPS or 150W EQ LED.
11. Mount luminaires on arms level as shown by the luminaire level indicator.
12. Orient luminaires perpendicular to the roadway intended to be lit unless otherwise shown on the plans.

Wiring Diagram Notes:

- ① Use 1/2 in. -13 UNC threaded, copper or tin-plated copper, pole bonding connector, sized appropriately for conductors, bonded to T-base, or use ground lug in handhole as available.
- ② Use pre-qualified two-pole breakaway connectors for all luminaire pole installations. For luminaires fed by a circuit with a neutral conductor, use double pole breakaway connectors with the neutral side unfused and marked white.
- ③ Split Bolt or other connector.

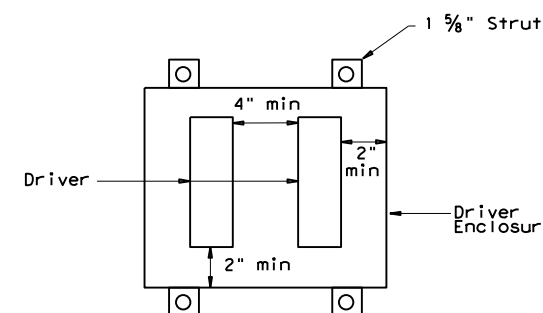
Decorative LED Lighting Notes:

1. LED Drivers in Remote Outdoor enclosures (for drivers that do not include an enclosure as part of a factory assembly):
 - a. Provide NEMA 3R outdoor enclosure or as approved.
 - b. Install enclosure at least 12" above ground or other horizontal surface. Mount vertically or on ceiling, and avoid direct sun where possible.
 - c. Install drivers with at least 2 inches of space from enclosure walls.
 - d. For multiple drivers in an enclosure, provide at least 4 inches side to side and 1 inch end to end from other drivers or electronic equipment
 - e. For drivers mounted on back wall of enclosure, mount enclosure on 1 5/8" strut or other standoff to dissipate heat, or mount driver to side of the enclosure or to the metal cover.
 - f. Provide remote drivers with a maximum of 100 watts
 - g. Provide drivers with documentation of 100,000 hr lifetime at Tcase of 65C or higher.



TYPICAL WIRING DIAGRAM

LUMINAIRES SERVED AT 480V ON 240/480 VOLT SERVICE OR LUMINAIRES SERVED AT 240V FOR 120/240 VOLT SERVICE.



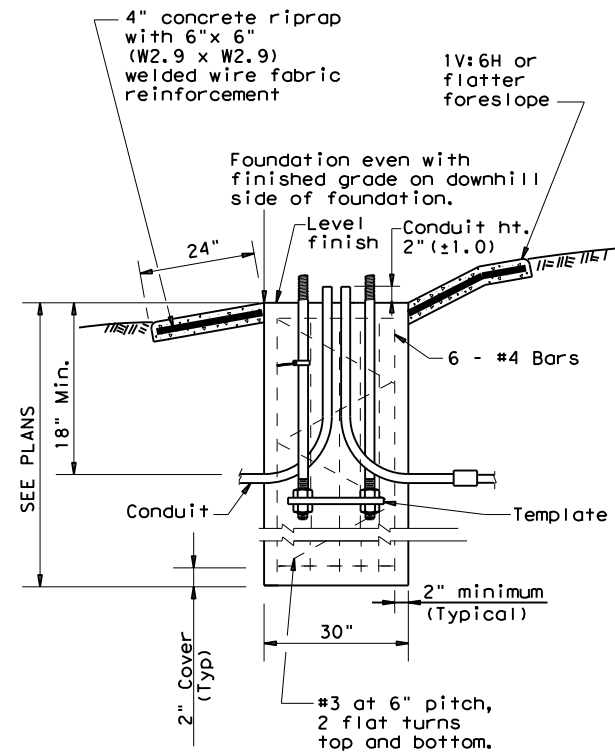
Driver Spacing In Remote Enclosure

<h2>ROADWAY ILLUMINATION DETAILS</h2> <h3>RID(1)-20</h3>			
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7-17	DIST	COUNTY	SHEET NO.
12-20	FTW	TARRANT	97

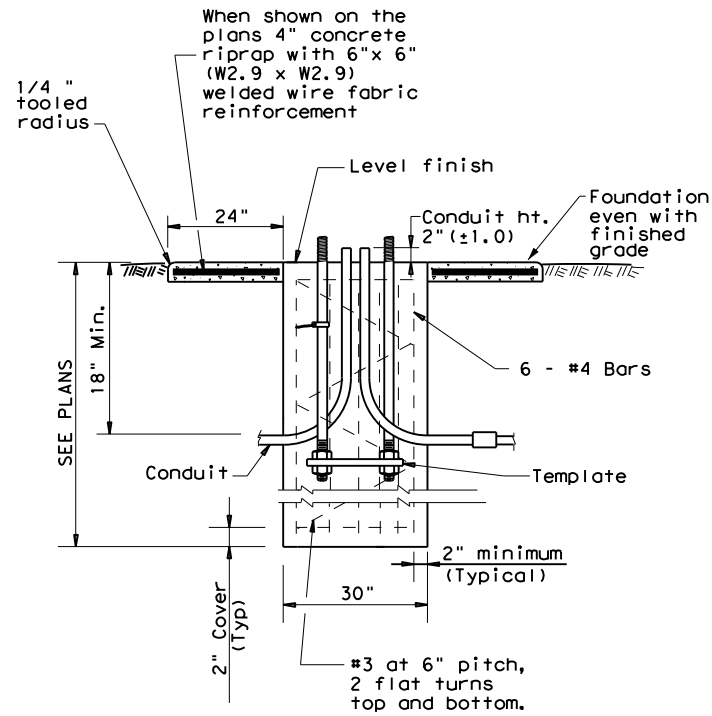
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SECTION A-A
SHOWING SLOPED GRADE



SECTION A-A
SHOWING CONSTANT GRADE

TABLE 1

ANCHOR BOLTS

POLE MOUNTING HEIGHT	BOLT CIRCLE		ANCHOR BOLT SIZE
	Shoe Base	T-Base	
<40 ft.	13 in.	14 in.	1 in. x 30 in.
40-50 ft.	15 in.	17 1/4 in.	1 1/4 in. x 30 in.

TABLE 2

RECOMMENDED FOUNDATION LENGTHS
(See note 1)

MOUNTING HEIGHT	TEXAS CONE PENETROMETER N Blows/ft		
	10	15	40
≤20 ft.	6'	6'	6'
>20 ft. to 30 ft.	8'	6'	6'
>30 ft. to 40 ft.	8'	8'	6'
>40 ft. to 50 ft.	10'	8'	6'

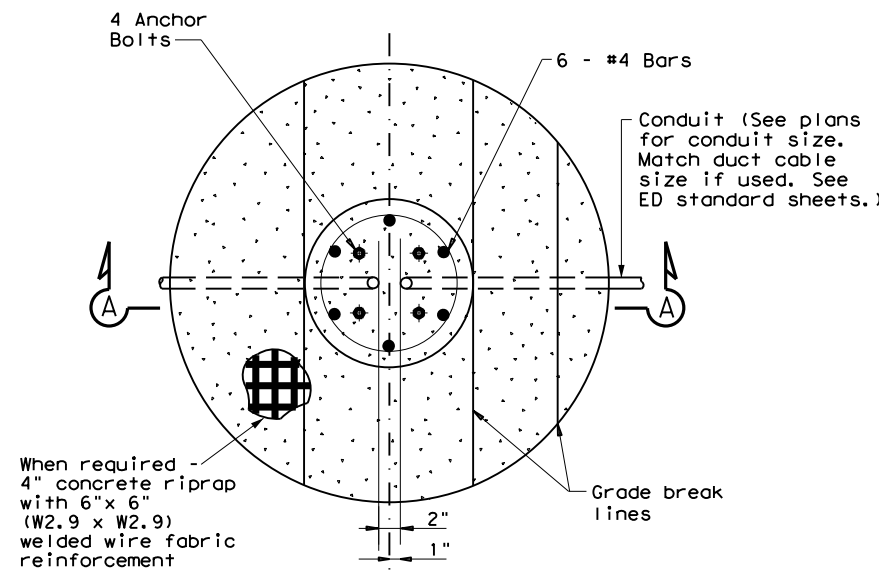
TABLE 3

PAY QUANTITY OF RIPRAP PER FOUNDATION
(Install only when shown on the plans)

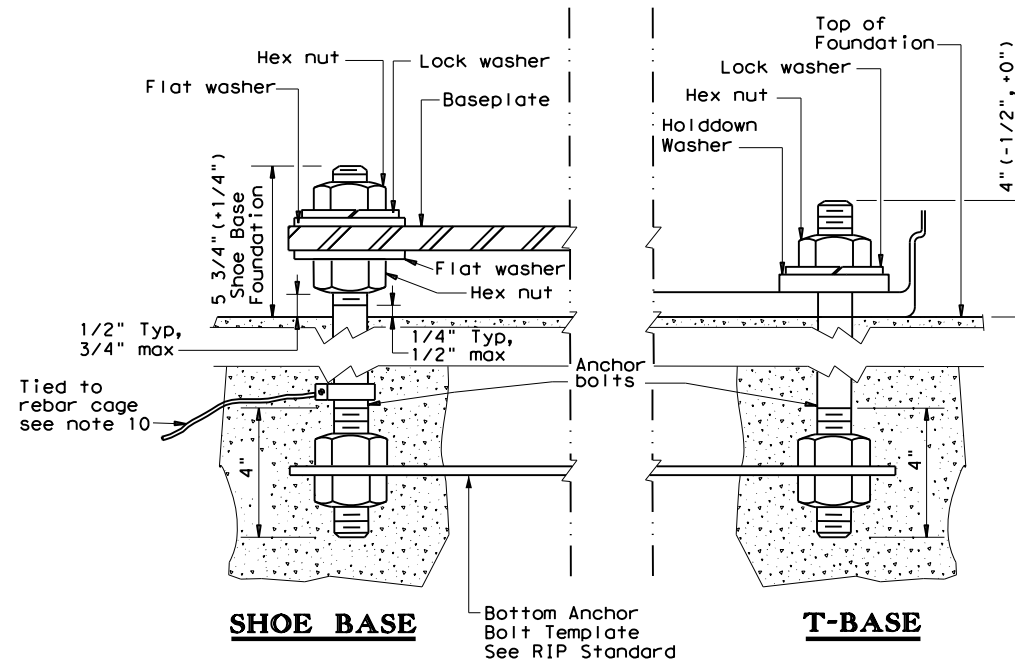
Foundation Diameter	RIPRAP DIAMETER	RIPRAP (CONC) (CL B)
30 in.	78 in.	0.35 CY

GENERAL NOTES:

1. "Recommended Foundation Lengths" table is for information purposes only. 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.
2. Erect roadway illumination assembly poles plumb and true. Form and level the top 6" of the foundation so the pole will be plumb. Use leveling nuts to plumb shoe base poles. Do not use shims or leveling nuts under transformer bases. Do not grout between baseplate and the foundation.
3. Ensure Class 2A and 2B fit for anchor bolts and nuts. Tap and chase nuts after galvanizing. Anchor bolt body with rolled threads need not be full size.
4. Use appropriate class of concrete as specified in Items 416 and 432. Concrete for riprap may be upgraded to Class C at no extra cost to the Department.
5. Place riprap around the foundation when called for elsewhere in the plans. Riprap will be paid for under Item 432.
6. Locate breakaway roadway illumination assemblies as shown in the placement table, unless otherwise dimensioned on the plans. Protect non-breakaway illumination assemblies from vehicular impact (i.e. 2.5 ft. behind guard rail or mounted on traffic barrier), or located outside the clear zone, except that 2.5 ft. from curb face is minimum desired for light poles on city streets, 45 mph or less. See Roadway Design Manual for further information.
7. Use 4 hold down and 4 connecting washers on transformer base poles as recommended by the manufacturer and supplied with base.
8. Install a minimum of 2 conduits in each foundation. See lighting layout sheets for locations of foundations with more than 2 conduits. Cap unused conduits in foundations on both ends.
9. Conduit location in foundations is critical for breakaway devices. Place conduits 2 in. apart on centerline as shown.
10. Bond anchor bolt to rebar cage with #6 bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. The bonded steel in the foundation creates a concrete encased grounding electrode which replaces the ground rod.
11. Grade earthwork around T-base foundations even with the finished grade as shown in Section A-A to ensure proper function of the breakaway device. Use riprap on T-base foundations that are located on sloped grades, and as shown on the plans for level grades.



FOUNDATION DETAIL



ANCHOR BOLT DETAIL

TABLE 4

BREAKAWAY POLE PLACEMENT (See note 6)

ROADWAY FUNCTIONAL CLASSIFICATION	** POLE OFFSET (DISTANCE TO FACE OF TRANSFORMER BASE)
Freeway Mainlanes (roadway with full control of access)	15 ft. (minimum and typical) from lane edge
All curbed, 45 mph or less design speed	2.5 ft. minimum (15 ft. desirable) from curb face
All others	10 ft. minimum*(15 ft. desirable) from lane edge

* or as close to ROW line as is practical

** provide 2/5 of the luminaire mounting height behind the pole for "falling area" to prevent encroachment on the other travel lanes. See design guidelines.

Texas Department of Transportation
 Traffic Safety Division Standard

ROADWAY ILLUMINATION DETAILS (RDWY ILLUM FOUNDATIONS)

RID(2)-20

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12-20				

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SHIPPING PARTS LIST - POLES AND LUMINAIRE ARMS

Nominal Mounting Ht. (ft)	Shoe Base					T-Base					CSB/SSCB Mounted							
	Designation					Quantity	Designation					Quantity	Designation					Quantity
	Pole	A1	A2	Luminaire			Pole	A1	A2	Luminaire			Pole	A1	A2	Luminaire		
20	(Type SA 20 S - 4)			(150W EQ) LED		(Type SA 20 T - 4)			(150W EQ) LED									
	(Type SA 20 S - 4 - 4)			(150W EQ) LED		(Type SA 20 T - 4 - 4)			(150W EQ) LED									
	(Type SA 20 S - 8)			(250W EQ) LED		(Type SA 20 T - 8)			(250W EQ) LED									
	(Type SA 20 S - 8 - 8)			(250W EQ) LED		(Type SA 20 T - 8 - 8)			(250W EQ) LED									
30	(Type SA 30 S - 4)			(250W EQ) LED		(Type SA 30 T - 4)			(250W EQ) LED			(Type SP 28 S - 4)			(250W EQ) LED			
	(Type SA 30 S - 4 - 4)			(250W EQ) LED		(Type SA 30 T - 4 - 4)			(250W EQ) LED			(Type SP 28 S - 4 - 4)			(250W EQ) LED			
	(Type SA 30 S - 8)			(250W EQ) LED		(Type SA 30 T - 8)			(250W EQ) LED			(Type SP 28 S - 8)			(250W EQ) LED			
	(Type SA 30 S - 8 - 8)			(250W EQ) LED		(Type SA 30 T - 8 - 8)			(250W EQ) LED			(Type SP 28 S - 8 - 8)			(250W EQ) LED			
	(Type SA 30 S - 10)			(250W EQ) LED		(Type SA 30 T - 10)			(250W EQ) LED			(Type SP 38 S - 4)			(250W EQ) LED			
	(Type SA 30 S - 10 - 10)			(250W EQ) LED		(Type SA 30 T - 10 - 10)			(250W EQ) LED			(Type SP 38 S - 4 - 4)			(250W EQ) LED			
	(Type SA 30 S - 12)			(250W EQ) LED		(Type SA 30 T - 12)			(250W EQ) LED			(Type SP 38 S - 8)			(250W EQ) LED			
	(Type SA 30 S - 12 - 12)			(250W EQ) LED		(Type SA 30 T - 12 - 12)			(250W EQ) LED			(Type SP 38 S - 8 - 8)			(250W EQ) LED			
40	(Type SA 40 S - 4)			(250W EQ) LED		(Type SA 40 T - 4)			(250W EQ) LED			(Type SP 38 S - 10)			(250W EQ) LED			
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	(Type SA 40 S - 8)			(250W EQ) LED		(Type SA 40 T - 8)			(250W EQ) LED			(Type SP 38 S - 12)			(250W EQ) LED			
	(Type SA 40 S - 8 - 8)			(250W EQ) LED		(Type SA 40 T - 8 - 8)			(250W EQ) LED			(Type SP 38 S - 12 - 12)			(250W EQ) LED			
	(Type SA 40 S - 10)			(250W EQ) LED		(Type SA 40 T - 10)			(250W EQ) LED			(Type SP 48 S - 4)			(400W EQ) LED			
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	(Type SA 40 S - 12)			(250W EQ) LED		(Type SA 40 T - 12)			(250W EQ) LED			(Type SP 48 S - 8)			(400W EQ) LED			
	(Type SA 40 S - 12 - 12)			(250W EQ) LED		(Type SA 40 T - 12 - 12)			(250W EQ) LED			(Type SP 48 S - 8 - 8)			(400W EQ) LED			
50	(Type SA 50 S - 4)			(400W EQ) LED		(Type SA 50 T - 4)			(400W EQ) LED			(Type SP 48 S - 10)			(400W EQ) LED			
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	(Type SA 50 S - 10)			(400W EQ) LED		(Type SA 50 T - 10)			(400W EQ) LED			(Type SP 48 S - 12)			(400W EQ) LED			
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	(Type SA 50 S - 12 - 12)			(400W EQ) LED		(Type SA 50 T - 12 - 12)			(400W EQ) LED			(Type SP 48 S - 12 - 12)			(400W EQ) LED			

OTHER				
Designation				Quantity
Pole	A1	A2	Luminaire	

GENERAL NOTES:

1. All work, materials and services not shown on the plans which may be necessary for complete and proper construction shall be performed, furnished and installed by the Contractor. Faulty fabrication or poor workmanship in any material, equipment or installation will be considered justification for rejection. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the Department such warranties or guarantees.
2. The location of poles and fixtures are diagrammatic only and may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.
3. Standard Steel Pole Designs. Steel poles fabricated in accordance with the details and dimensions shown herein, shall be considered standard designs. Submission of shop drawings and design calculations for standard designs is not required.
4. Optional Steel Pole Designs. Multi-sided steel poles may be allowed as optional designs, if steel poles are permitted or required, pending approval by the Department as outlined below.
 - a. Shop Drawings. Optional designs require submission of shop drawings and design calculations bearing the seal of an engineer licensed in the State of Texas, in accordance with Item 441, "Steel Structures." The Department may elect to pre-approve some shop drawings for optionally designed poles. Submission of shop drawings and design calculations is not required for structures fabricated in accordance with the details of shop drawings on the pre-approved list maintained by the TxDOT Traffic Operations Division. Any deviation from the pre-approved shop drawings will require submission of shop drawings of the complete assembly and design calculations as described above.
 - b. Structural Support Design for Luminaires. Lighting support structures shall be designed for a 25 year design life in accordance with the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto. All poles shall be designed for 110 mph 3-second gust wind speeds. The Gust Factor, G, and Wind Importance Factor, Ir, shall be applied as per the AASHTO Specifications assuming a 25-year design life. The design wind pressure for hurricane wind velocities greater than 100 mph shall not be less than the design wind pressure using 100 mph with the non-hurricane Wind Importance Factor, Ir, value. For transformer base poles, fabricator shall include transformer base and connecting hardware in design calculations and shop drawing submittals. All transformer bases shall have been structurally tested to resist the theoretical plastic moment capacity of the pole. Certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished shall be submitted with the shop drawings. Shop drawings shall show breakaway base model number, and manufacturer's name and logo. Manufacturer's shop drawings shall include the ASTM designations for all materials to be used.
 - c. Mast Arm Attachments. All poles and attachments shall be structurally designed to support two 12-foot mast arms and luminaires. Poles shall be supplied with mast arm combinations as shown in the plans. All mast arms shall be designed for a 60-pound luminaire having an effective projected area of 1.6 square feet.
 - d. Anchor Bolt Assembly. Anchor bolt assemblies for optionally designed poles shall be the same as those shown herein.
5. Aluminum Pole Designs. Aluminum pole designs may be allowed, if aluminum poles are permitted or required, pending approval by the Department as outlined below.
 - a. Meet all of the requirements stated above for optional steel pole designs and the following:
 1. Aluminum poles shall be fabricated in accordance with "Structural Welding Code-Aluminum" AWS D1.2.
 2. Aluminum pole designs shall use the same anchor bolt assembly and be subject to the same geometric restraints and other requirements for steel poles specified herein.
 3. Aluminum poles shall be equipped with vibration mitigation devices, as approved by the engineer.
 4. Pole components shall be constructed using the following material:
 - Shaft: ASTM B221 or B241 Alloy 6063-T6, ASTM B209 Alloy 5086-H34, ASTM B221 Alloy 6005-T5.
 - Base Flange: ASTM B26 Alloy 356.0-T6 or ASTM B108 Alloy 356.0-T6 (Yield strength test required).
 - Mast Arm Fitting: ASTM B209 Alloy 6061-T6 or ASTM B221 Alloy 6005-T5.
 - Mast Arms: ASTM B241 Alloy 6061-T6 or Alloy 6063-T6.
 - Pole Cap: ASTM B209 Alloy 5086-H32 or ASTM B108 or B26 Alloy 356.0-T6.
 - Bolts: Stainless Steel AISI 300 series. Bolts threading into aluminum threads shall be treated with anti-seize compound, Never-Seez Compound, Permatex 133K or equal.
6. Special Designs. Poles with architectural treatments shall meet the requirements shown elsewhere in the plans.
7. Luminaire Mounting Height. Actual luminaire mounting height shall be the nominal mounting height given on RIP(2) for all pole-arm combinations except for poles with 4 ft. luminaire arms, which shall be 3'-0" lower than the nominal height, unless otherwise shown or directed.

EXPLANATION OF ROADWAY ILLUMINATION ASSEMBLY DESIGNATIONS

(TYPE SA 50 T - X - X) (400W EQ) LED

SA: Pole and mast arm may be steel or aluminum.

ST: Pole and mast arm must be steel.

AL: Pole and mast arm must be aluminum.

SP: Special (ovalized) steel or aluminum pole for installing on CSB or SSCB. See standard sheet CSB (4), or SSCB (4).

Two numerical digits denote nominal mounting height in feet.

Next letter denotes type of base, (S-Shoe Base, T-Transformer Base, or B-Bridge/Ret.Wall Mount)

First number denotes length of mast arm in feet.

Use of second mast arm is indicated by second dashed number which denotes length in feet.

Luminaire rating in watts (i.e. 400W). Equivalent wattage LED fixtures will include EQ (i.e. 400W EQ)

Last letters indicate light source (S - High Pressure Sodium; LED - LED Luminaire)

SHEET 1 OF 4



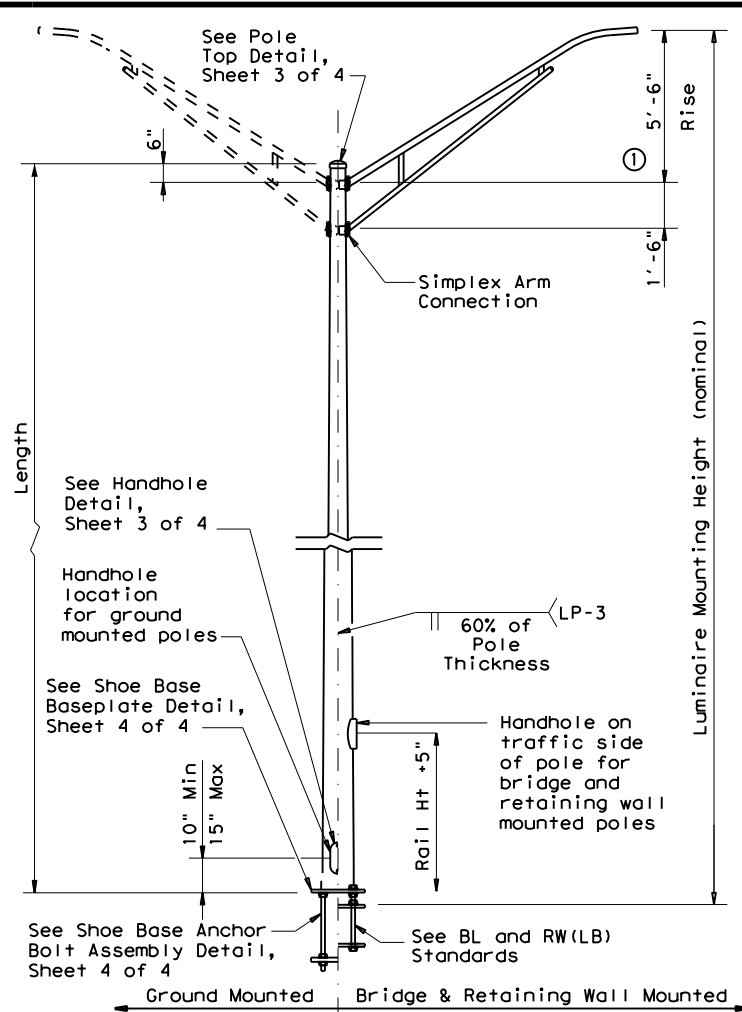
ROADWAY ILLUMINATION POLES

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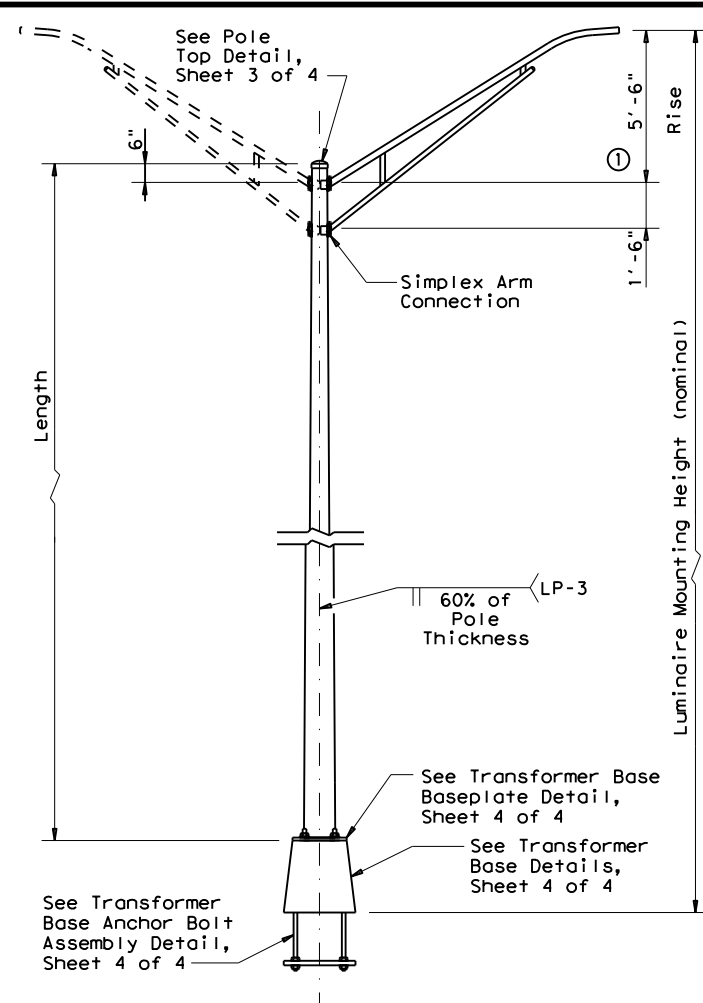
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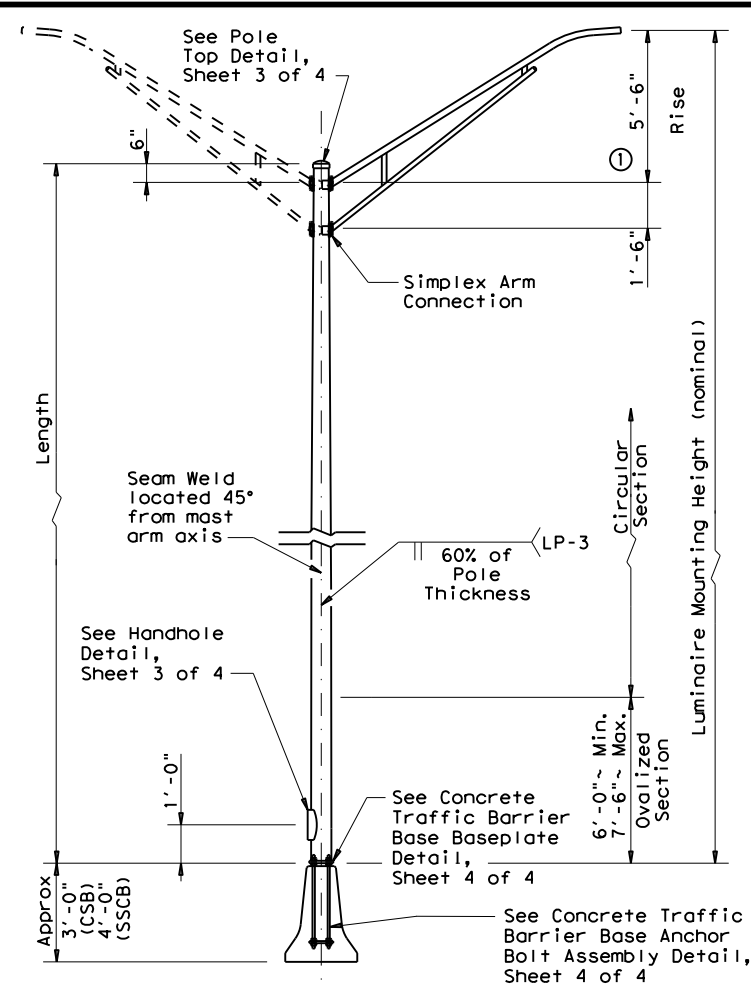
SHOE BASE POLE

Luminaire Mounting Height (Nominal) (ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)
20.00	7.00	4.90	15.00	0.1196	7.1
30.00	7.50	4.00	25.00	0.1196	13.2
31.00-39.00	8.00	4.36-3.24	26.00-34.00	0.1196	20.7
40.00	8.50	3.60	35.00	0.1196	20.7
50.00	10.50	4.20	45.00	0.1196	30.3



TRANSFORMER BASE POLE

Luminaire Mounting Height (Nominal) (ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)
20.00	7.00	5.11	13.50	0.1196	7.1
30.00	7.50	4.21	23.50	0.1196	13.2
31.00-39.00	8.00	4.57-3.45	24.50-32.50	0.1196	20.7
40.00	8.50	3.81	33.50	0.1196	20.7
50.00	10.00	3.91	43.50	0.1196	30.3



CONCRETE TRAFFIC BARRIER BASE POLE

CONCRETE TRAFFIC BARRIER BASE POLE (CSB/SSCB)						
Luminaire Mounting Height (Nominal) (ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)	
					About C of Rail	Perp. to Rail
28.00	9.00	5.78	23.00	0.1196	10.3	13.2
38.00	9.00	4.38	33.00	0.1196	16.6	20.8
48.00	10.50	4.48	43.00	0.1345	25.1	30.5

GENERAL NOTES:

- Designs conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminares, and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto. Design 3-Second Gust Wind Speed equals 110 mph with a 1.14 gust factor. A wind importance factor of 0.80 is applied to adjust the wind speed to a 25 year recurrence interval. Design moments listed in tables assume base of pole is 25' above natural ground level.
- Structures are designed to support two 12' luminaire mast arms and luminaires. Mast arms are designed to support a 60-pound luminaire having an effective projected area of 1.6 square feet.
- Fabrication shall be in accordance with the Specifications and with the details, dimensions, and weld procedures shown herein. Do not submit shop drawings for roadway illumination pole assemblies fabricated in accordance with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of these sheets and the Specifications. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.
- For mounting heights between values shown in the tables, use base diameter and thickness values for the larger height.
- Unless otherwise noted, all steel parts shall be galvanized in accordance with Item 445, "Galvanizing."
- Steel poles shall be fabricated in accordance with Item 441, "Steel Structures." Longitudinal seam welds for pole sections shall have 60% minimum penetration. All welding shall be in accordance with AWS D1.1, Structural Welding Code-Steel.
- Two-section poles joined by circumferential welds will not be permitted, unless otherwise shown on the plans. Poles may be fabricated in two sections and field-assembled by the lap-joint method. The two sections shall telescope together with a lap length of not less than 1-1/2 times the shaft diameter at the lap joint.
- Alternate material equal to or better than material specified may be substituted with the approval of the Engineer.
- Lubricate and tighten anchor bolts, when erecting shoe base poles and concrete traffic barrier base poles, in accordance with Item 449, "Anchor Bolts."
- All poles, except Transformer Base Poles, shall have hand holes with reinforcing frames and covers. For ground mounted shoe base poles, hand holes shall be placed 90 degrees to mast arm unless otherwise noted on the plans. For poles mounted on a concrete traffic barrier with one luminaire arm, hand holes shall be located 180 degrees from luminaire arm. For poles mounted on a concrete traffic barrier with two luminaire arms, all hand holes shall be on the same side of the barrier. For poles mounted on a bridge lighting bracket or a retaining wall lighting bracket, hand hole shall be on traffic side of the pole, at a height that will clear the barrier.
- The finished pole shall have a smooth, uniform finish free of pits, blisters, or other defects. Scratched, chipped, and other damaged galvanized areas on poles and mast arms shall be repaired in accordance with Item 445, "Galvanizing."
- Pole length is based on a 5'-6" luminaire arm rise. 4 ft. luminaire arms have a 2'-6" rise. A pole with 4 ft. luminaire arms will have an actual mounting height 3'-0" less than the nominal mounting height. Increasing the pole length to meet the nominal mounting height is allowed, but unnecessary unless otherwise directed by the engineer.
- Erect transformer base poles in accordance with sheet RID(1).

MATERIAL DATA

COMPONENT	ASTM DESIGNATION	MIN. YIELD (ksi)
Pole Shaft (0.14"/ft. Taper)	A572 Gr 50, A595 Gr A, A1011 HSLAS Gr 50 Cl 2 ③, or A1008 HSLAS Gr 50 Cl 2	50
Base Plate and Handhole Frame	A572 Gr.50, or A36	36
T-Base Connecting Bolts	F3125 Gr A325	92
Anchor Bolts	F1554 Gr 55, A193-B7 or A321	55 105
Anchor Bolt Templates	A36	36
Heavy Hex (H.H.) Nuts	A194 Gr 2H, or A563 Gr DH	
Flat Washers	F436	

NOTES:

- 2'-6" rise for 4 ft. luminaire arms.
- Before ovalized as shown on Concrete Traffic Barrier Base Baseplate details, Sheet 4 of 4.
- A1011 SS Gr 50 may be used instead of HSLAS, provided the material meets the elongation requirements for HSLAS.

POLE ASSEMBLY FABRICATION TOLERANCES TABLE

DIMENSION	TOLERANCE
Shaft length	+1"
I.D. of outside piece of slip fitting pieces	+1/8", -1/16"
O.D. of inside piece of slip fitting pieces	+1/32", -1/8"
Shaft diameter: other	+3/16"
Out of "round"	1/4"
Straightness of shaft	±1/4" in 10 ft
Twist in multi-sided shaft	4° in 50 ft
Perpendicular to baseplate	1/8" in 24"
Pole centered on baseplate	±1/4"
Location of Attachments	±1/4"
Bolt hole spacing	±1/16"

SHEET 2 OF 4

Texas Department of Transportation
 Traffic Safety Division Standard

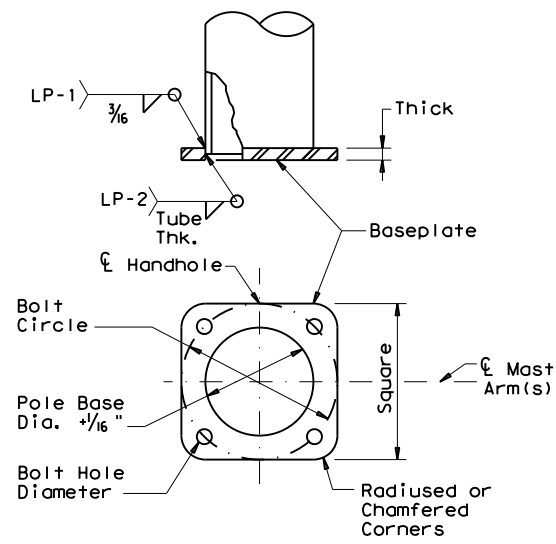
ROADWAY ILLUMINATION POLES

RIP(2) - 19

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7-17	DIST	COUNTY	SHEET NO.	
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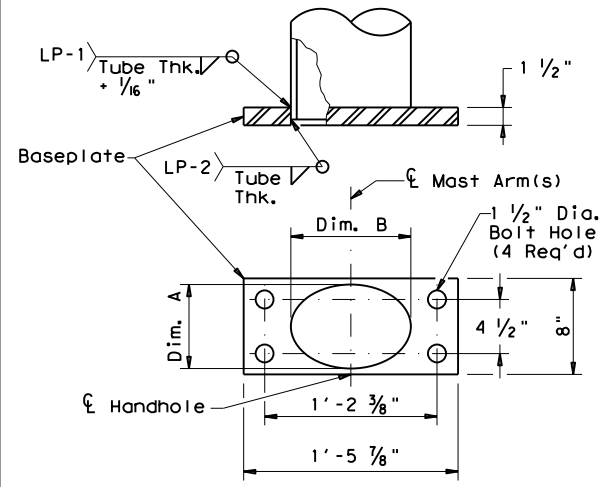
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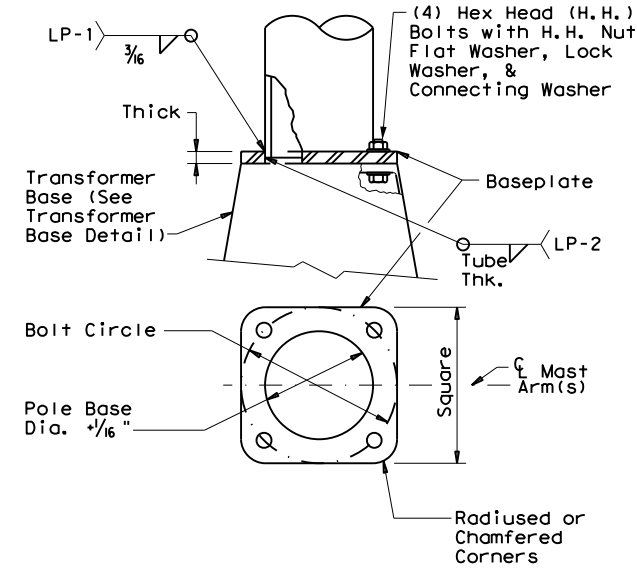
SHOE BASE BASEPLATE

SHOE BASE BASEPLATE TABLE				
MOUNTING HEIGHTS (nominal)	BOLT CIRCLE	SQUARE	THICK	BOLT HOLE DIAMETER
20' - 39'	13"	13"	1 1/4"	1 1/4"
40'	15"	15"	1 1/4"	1 1/2"
50'	15"	15"	1 1/2"	1 1/2"



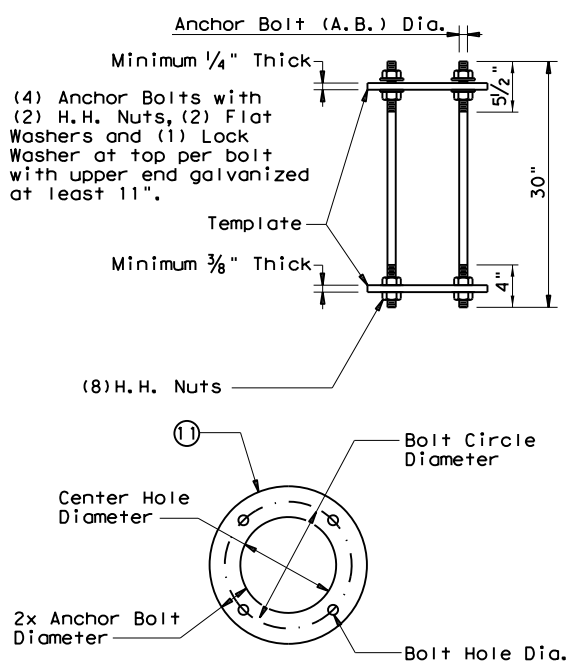
CONCRETE TRAFFIC BARRIER BASE BASEPLATE

CONCRETE TRAFFIC BARRIER BASE BASEPLATE TABLE			
MOUNTING HEIGHTS (nominal)	POLE DIA. (1)	DIM. A	DIM. B
28' - 38'	9"	7" ± 1/4"	10" ± 1/4"
48'	10 1/2"	7" ± 1/4"	13" ± 1/4"



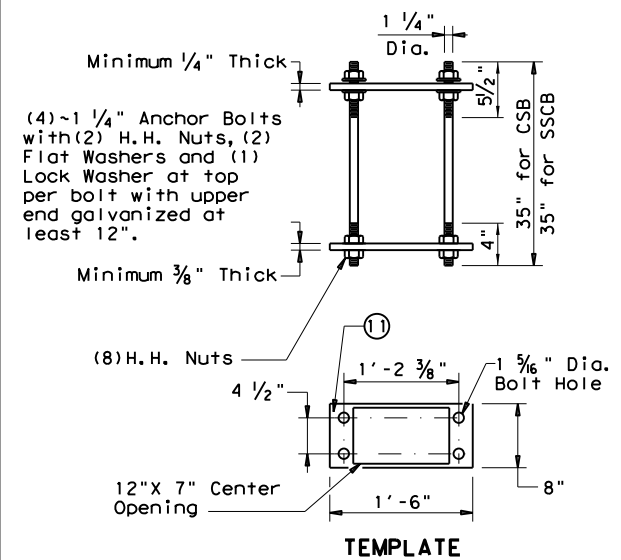
TRANSFORMER BASE BASEPLATE

TRANSFORMER BASE BASEPLATE TABLE						
MOUNTING HEIGHTS (nominal)	BOLT CIRCLE	SQUARE	THICK	CONNECTING BOLT DIA.	BOLT HOLE DIAMETER	TRANSFORMER BASE TYPE
20' - 39'	13"	13"	1 1/4"	1"	1 1/4"	A
40'	15"	15"	1 1/4"	1 1/4"	1 1/2"	B
50'	15"	15"	1 1/2"	1 1/4"	1 1/2"	B



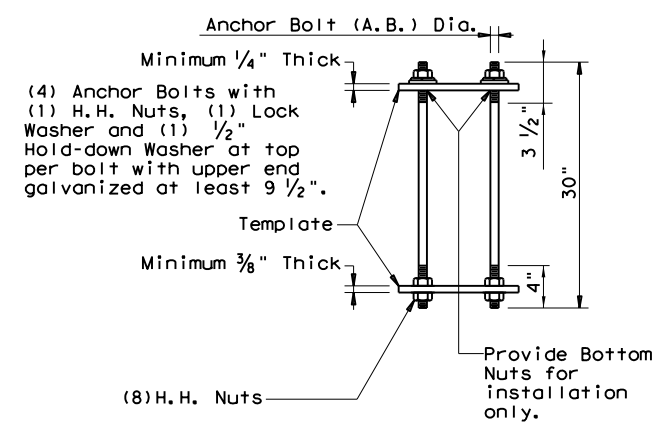
SHOE BASE ANCHOR BOLT ASSEMBLY

SHOE BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20' - 39'	1"	13"	11"	1 1/16"
40' - 50'	1 1/4"	15"	12 1/2"	1 5/16"



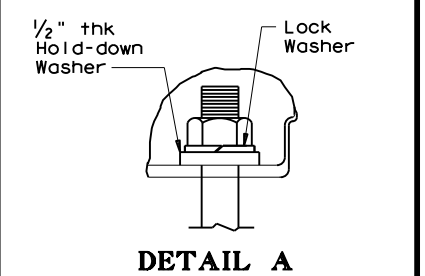
CONCRETE TRAFFIC BARRIER BASE ANCHOR BOLT ASSEMBLY

CONCRETE TRAFFIC BARRIER BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20' - 39'	1"	14"	12"	1 1/16"
40' - 50'	1 1/4"	17 1/4"	14 3/4"	1 5/16"

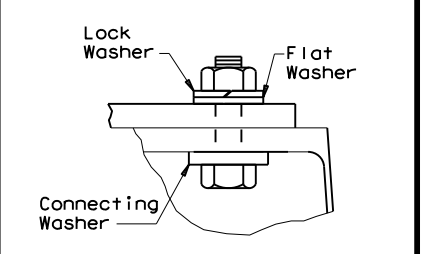


TRANSFORMER BASE ANCHOR BOLT ASSEMBLY

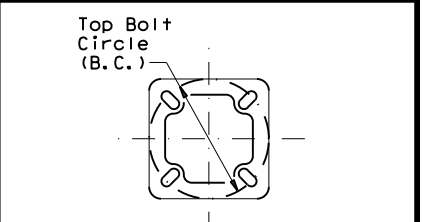
TRANSFORMER BASE TABLE		
TYPE	TOP B.C.	BTM. B.C.
A	13"	14"
B	15"	17 1/4"



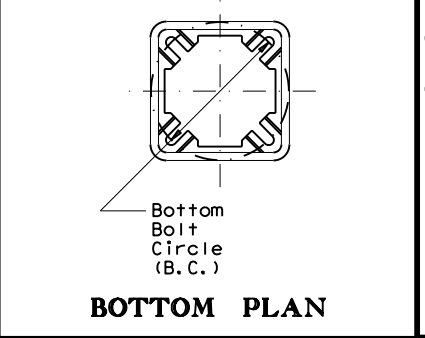
DETAIL A



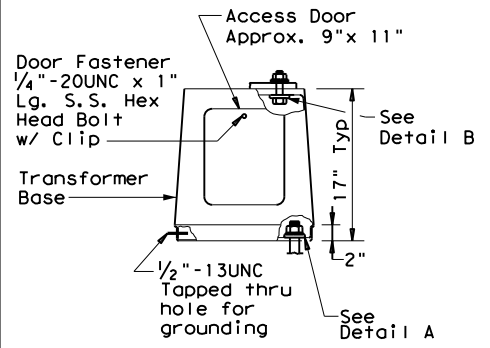
DETAIL B



TOP PLAN



BOTTOM PLAN



ELEVATION

TRANSFORMER BASE DETAILS

GENERAL NOTES:

- For mounting heights between those shown in the table, use the values in the table for the larger mounting height.
- All breakaway bases shall meet the breakaway requirements of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto, and shall have been tested by FHWA-approved methods. All bases shall have been structurally tested to resist 150% of the design moment.
- Transformer bases shall be cast from aluminum, ASTM B108 or B26 Alloy 356.0-T6, or other material approved by the Engineer. Four Hex Head (H.H.) bolts with four H.H. nuts, four lock washers, four flat washers, and connecting and hold-down washers as recommended by the manufacturer, galvanized to ASTM A153 Class C or D, or B695 Class 50, shall be provided with each transformer base for connecting the pole. Bolts shall be ASTM A325 or approved equal. Nuts shall be ASTM A563 grade DH galvanized.
- Bases shall be stamped, incised or by other approved permanent means, marked to show fabricator's name or logo, and model number. Such information shall be placed in a readily seen location, inside or outside the base, but shall not be placed on the door.
- Doors for transformer bases shall be made of plastic, fiberglass or other non-metallic material approved by the Engineer and shall be attached with stainless steel screws or bolts. Transformer bases shall be cleaned by grit blast cleaning after heat treatment. Certification by the manufacturer of heat treatment shall be furnished with transformer bases. The certification shall show the metal alloy and temper and that the base meets those requirements, chemical and physical. The certification shall also show the material ASTM specification. Transformer bases shall be cast with a removable tab bar for material testing. Some bars may have been removed by the manufacturer for testing.

NOTES:

- Anchor Bolt Templates do not need to be galvanized.
- Pole diameter before ovalized.

ANCHOR BOLT FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Length	± 1/2"
Threaded length	± 1/2"
Galvanized length (if required)	- 1/4"

SHEET 4 OF 4

Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(4)-19

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©TxDOT January 2007	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902 00	299	VA	
7-17	DIST	COUNTY	SHEET NO.	
12-19	FTW	TARRANT	101	

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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

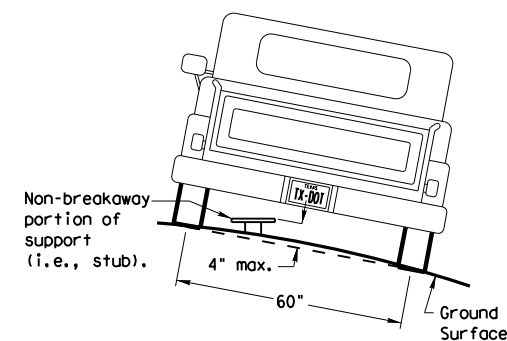
Post Type
 FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
 TWT = Thin-Walled Tubing (see SMD(TWT))
 10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
 S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

Anchor Type
 UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
 UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
 WS = Wedge Anchor Steel - (see SMD(TWT))
 WP = Wedge Anchor Plastic (see SMD(TWT))
 SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
 SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation
 P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
 T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
 U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
 IF REQUIRED
 1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
 BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
 WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
 EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-3))

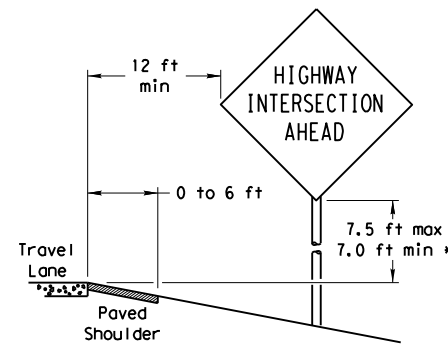
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

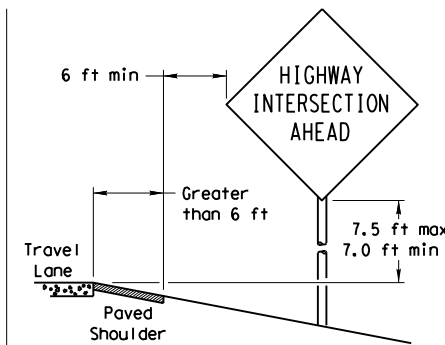
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

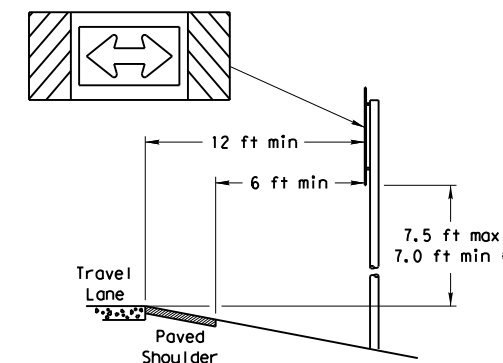
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



GREATER THAN 6 FT. WIDE

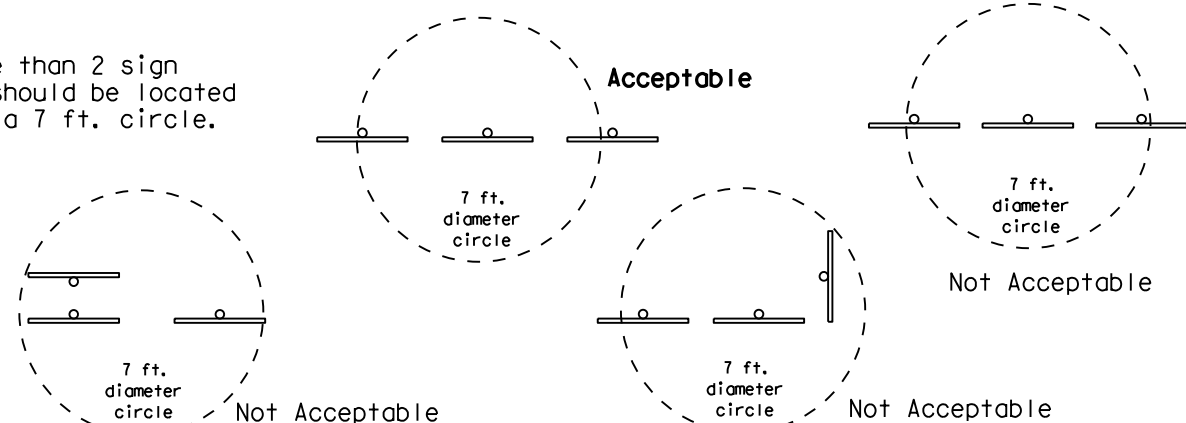
When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

T-INTERSECTION

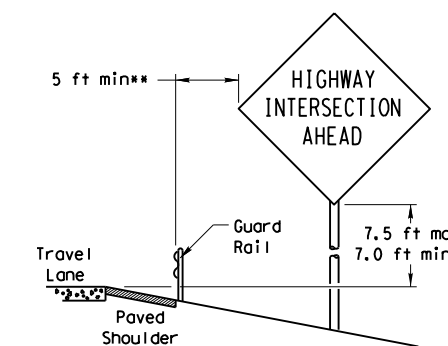


When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.

No more than 2 sign posts should be located within a 7 ft. circle.

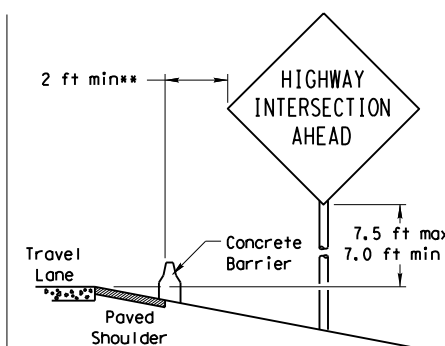


BEHIND BARRIER



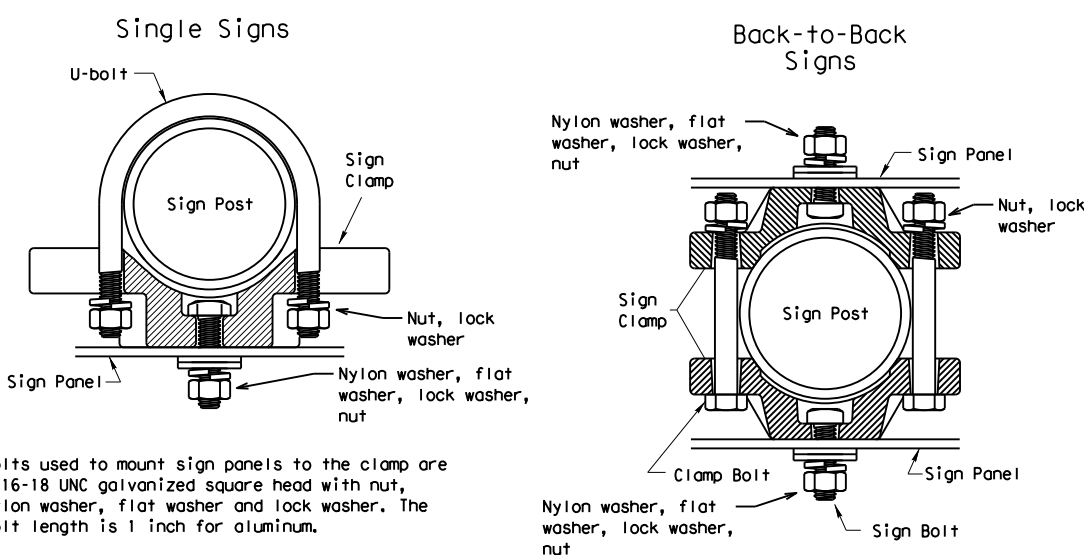
BEHIND GUARDRAIL

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.



BEHIND CONCRETE BARRIER

TYPICAL SIGN ATTACHMENT DETAIL



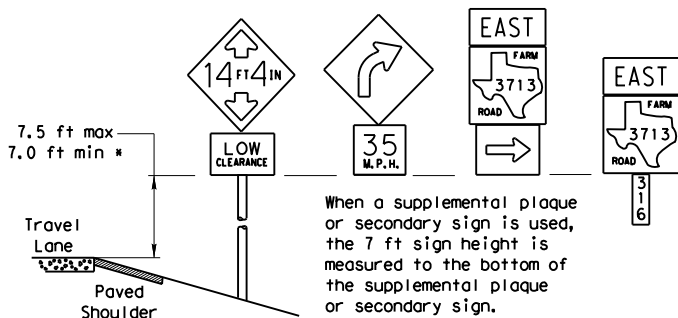
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

Sign clamps may be either the specific size clamp or the universal clamp.

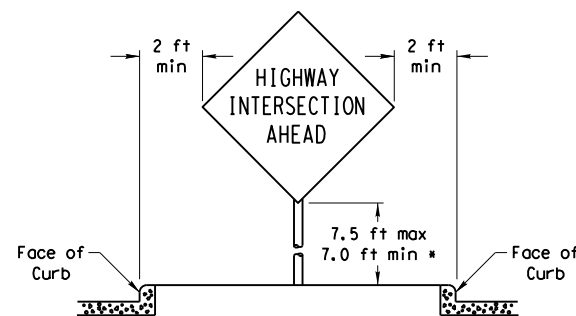
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES

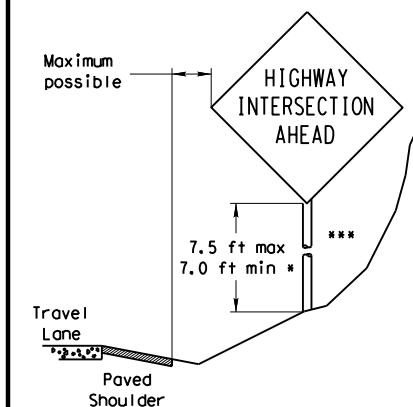


When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



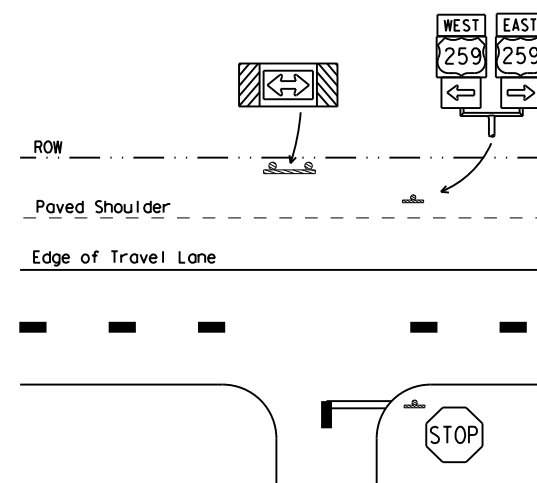
RESTRICTED RIGHT-OF-WAY (When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.



* Signs shall be mounted using the following condition that results in the greatest sign elevation:

- (1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or
- (2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

The website address is:
<http://www.txdot.gov/publications/traffic.htm>

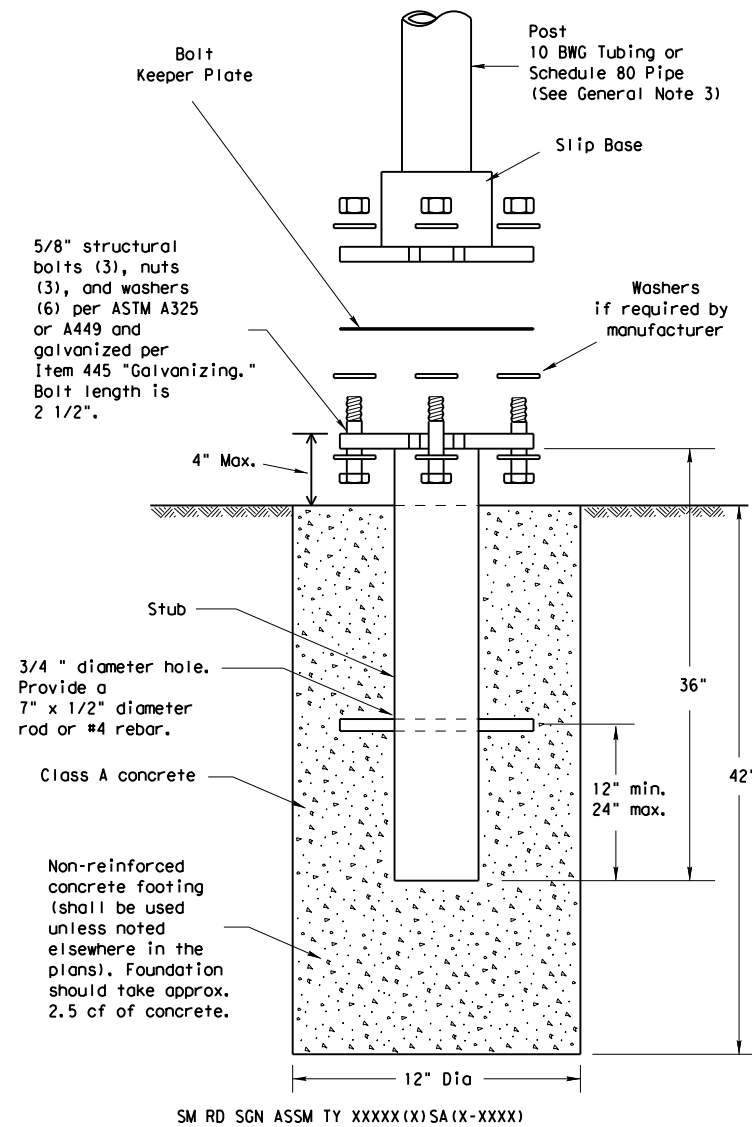
Texas Department of Transportation
 Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN) - 08

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9-08	REVISIONS	CONT	SECT	JOB	HIGHWAY
		0902	00	299	VA
		DIST	COUNTY		SHEET NO.
		FTW	TARRANT		102

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

- Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
- Material used as post with this system shall conform to the following specifications:
 - 10 BWG Tubing (2.875" outside diameter)
 - 0.134" nominal wall thickness
 - Seamless or electric-resistance welded steel tubing or pipe
 - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
 - Other steels may be used if they meet the following:
 - 55,000 PSI minimum yield strength
 - 70,000 PSI minimum tensile strength
 - 20% minimum elongation in 2"
 - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
 - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
 - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
 - Schedule 80 Pipe (2.875" outside diameter)
 - 0.276" nominal wall thickness
 - Steel tubing per ASTM A500 Gr C
 - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
 - 46,000 PSI minimum yield strength
 - 62,000 PSI minimum tensile strength
 - 21% minimum elongation in 2"
 - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
 - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
 - Galvanization per ASTM A123
- See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: <http://www.txdot.gov/publications/traffic.htm>
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

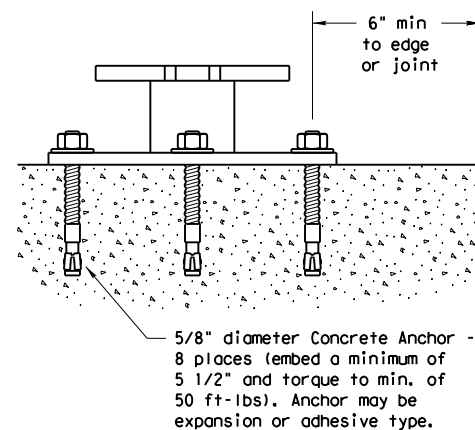
Foundation

- Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
- The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
- Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
- Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
- The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support

- Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
- Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



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

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxyes and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.



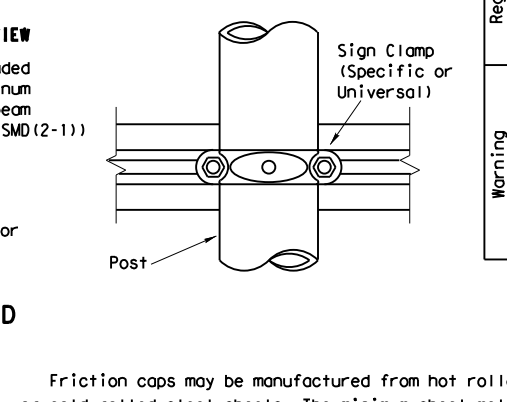
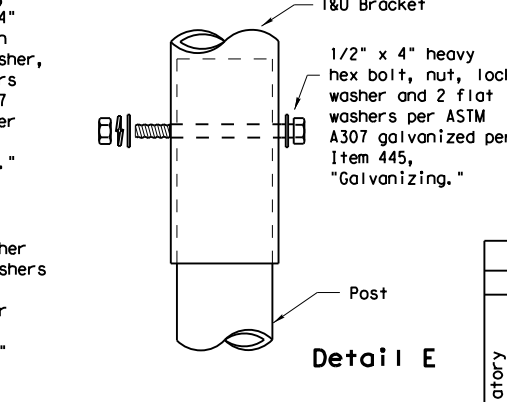
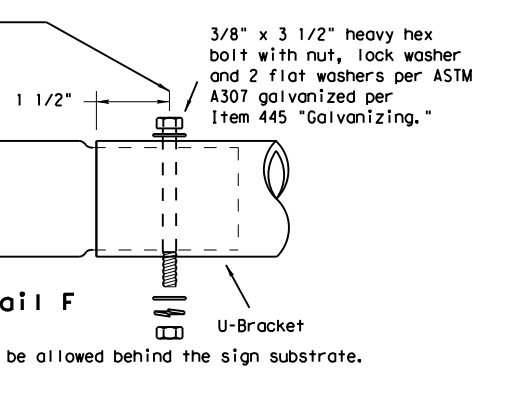
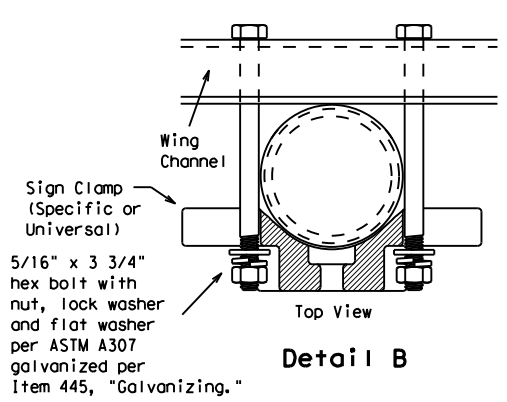
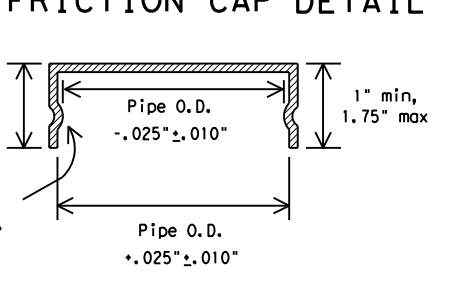
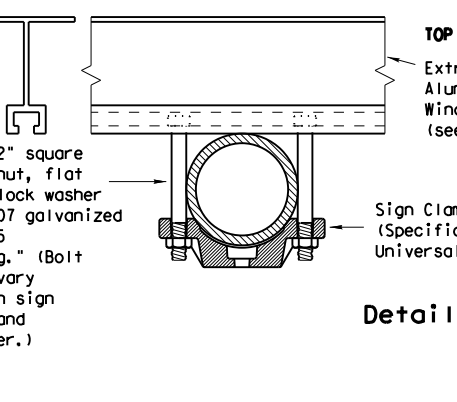
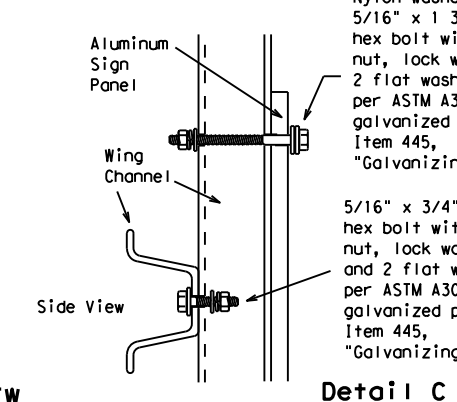
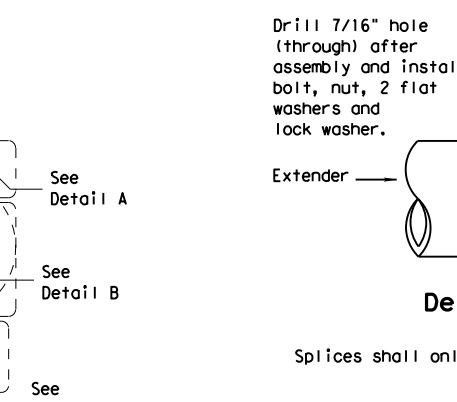
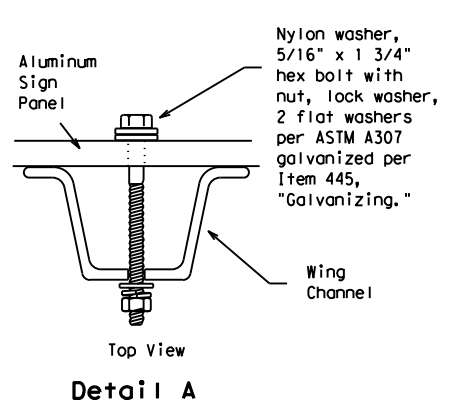
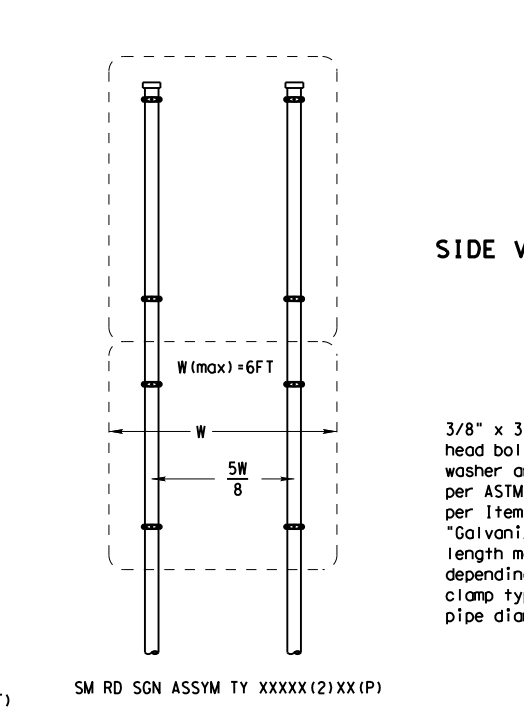
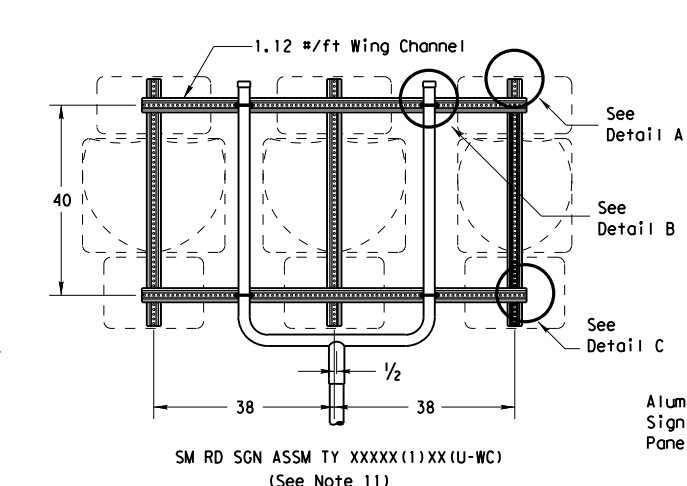
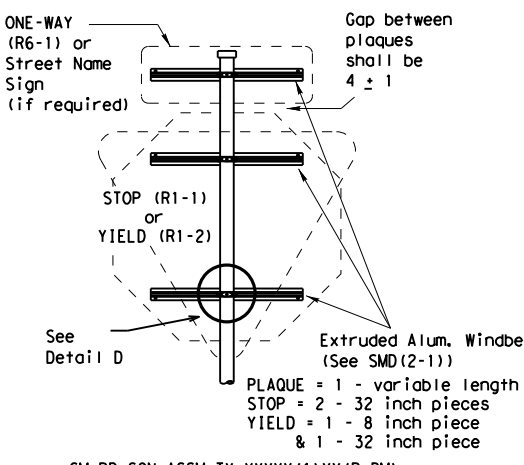
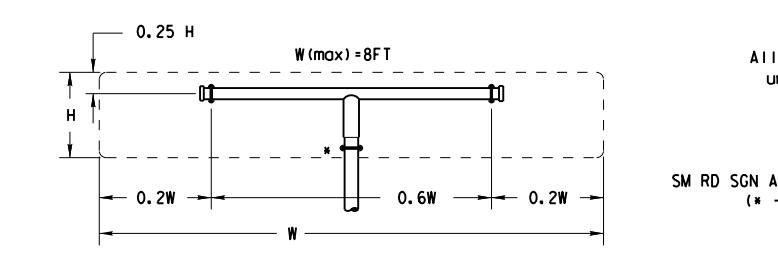
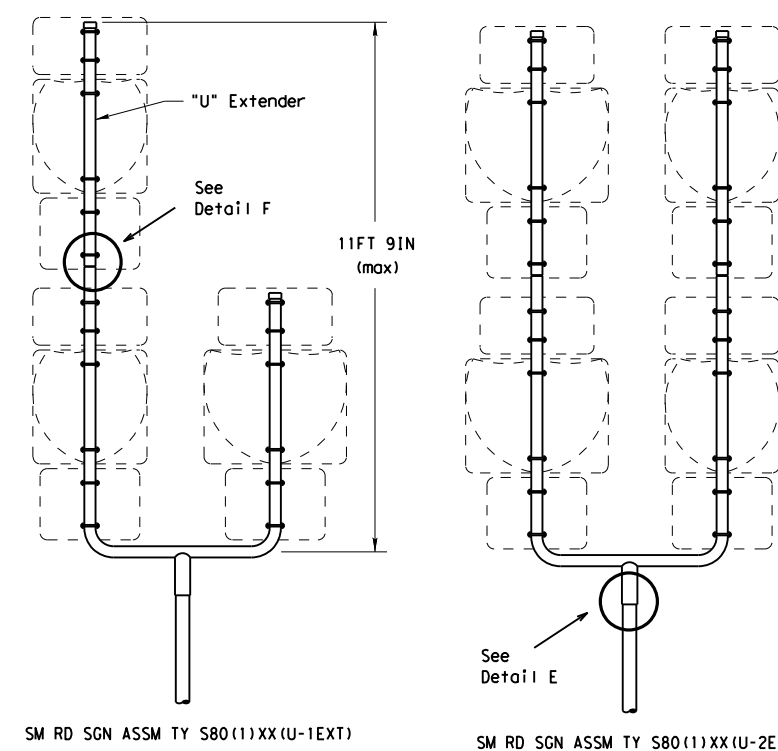
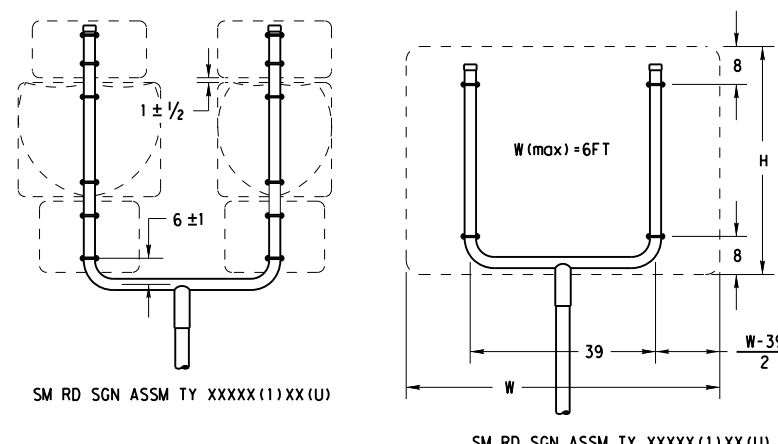
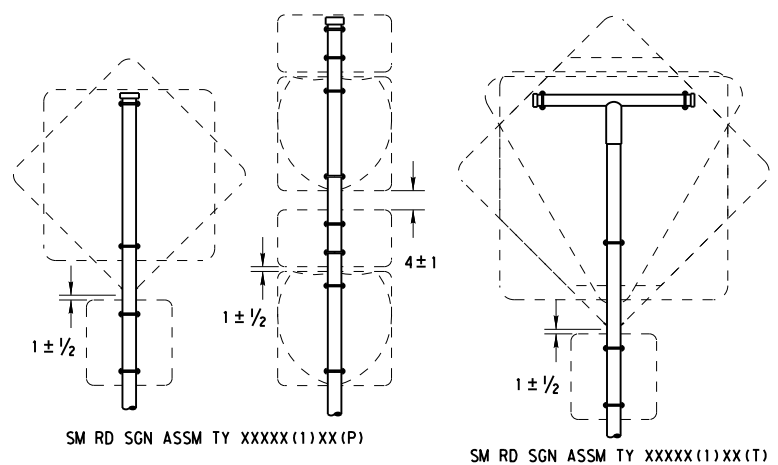
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

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9-08	REVISIONS	CONT	SECT	JOB	HIGHWAY
		0902	00	299	VA
		DIST	COUNTY	SHEET NO.	
		FTW	TARRANT	103	

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GENERAL NOTES:

1. SIGN SUPPORT # OF POSTS MAX. SIGN AREA

10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF
2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT		
SIGN DESCRIPTION	SUPPORT	
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
Warning	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)	
Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)	

All dimensions are in english unless detailed otherwise.

SM RD SGN ASSM TY XXXX(1)XX(T) (* - See Note 12)

Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes. The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture. Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.



**SIGN MOUNTING DETAILS
 SMALL ROADSIDE SIGNS
 TRIANGULAR SLIPBASE SYSTEM
 SMD(SLIP-2)-08**

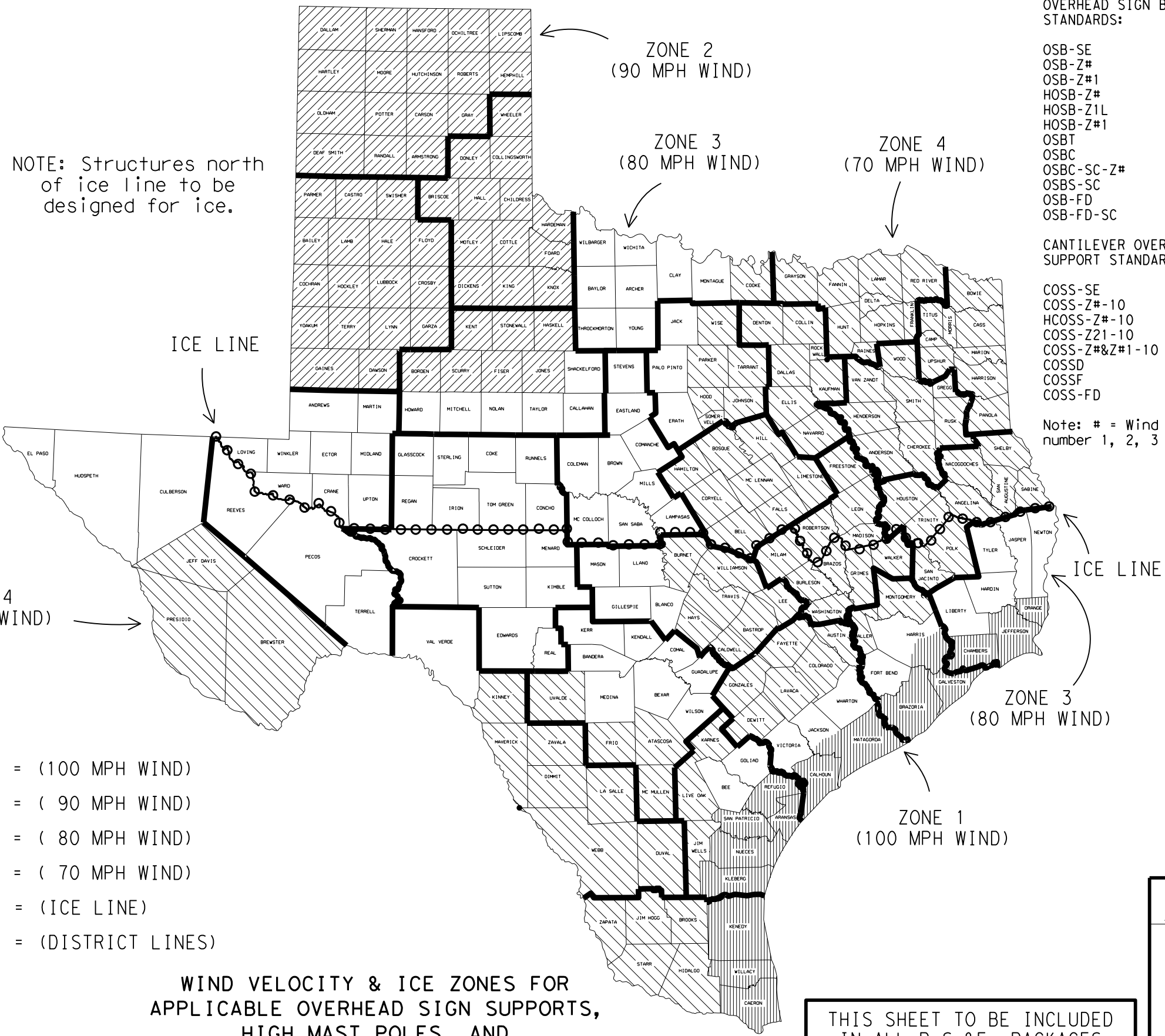
© TxDOT July 2002	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08 REVISIONS	CON: 0902	SECT: 00	JOB: 299	HIGHWAY: VA
	DIST: FTW	COUNTY: TARRANT	SHEET NO. 104	

DATE: 4/9/2024 2:33:27 PM
 FILE: T:\TRAFFIC\ITS\0902-00-299 Non-Site Specific Standards\WV&IZ-14.dgn

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APPLICABLE STANDARDS SHEETS

- OVERHEAD SIGN BRIDGE STANDARDS:
 OSB-SE
 OSB-Z#
 OSB-Z#1
 OSB-Z#
 HOSB-Z#1
 HOSB-Z#1
 OSBT
 OSBC
 OSBC-SC-Z#
 OSBS-SC
 OSB-FD
 OSB-FD-SC
- HIGH MAST ILLUMINATION POLE STANDARDS:
 HMIP-98
 HMIF-98
- WALKWAYS AND BRACKETS STANDARDS:
 SWW
 SB(SWL-1)
- TRAFFIC SIGNAL POLE STANDARDS:
 SP-80
 SP-100
 SMA-80
 SMA-100
 DMA-80
 DMA-100
 MA-C
 MAC (ILSN)
 MAD-D
 TS-FD
 LUM-A
 CFA
 LMA
 TS-C
 MA-DPD
- CANTILEVER OVERHEAD SIGN SUPPORT STANDARDS:
 COSS-SE
 COSS-Z#-10
 HCOSS-Z#-10
 COSS-Z21-10
 COSS-Z#&Z#1-10
 COSSD
 COSSF
 COSS-FD
- Note: # = Wind Zone number 1, 2, 3 or 4



NOTE: Structures north of ice line to be designed for ice.

LEGEND

- ZONE 1 - [diagonal lines] = (100 MPH WIND)
- ZONE 2 - [diagonal lines] = (90 MPH WIND)
- ZONE 3 - [white box] = (80 MPH WIND)
- ZONE 4 - [diagonal lines] = (70 MPH WIND)
- [dashed line with circles] = (ICE LINE)
- [solid black line] = (DISTRICT LINES)

WIND VELOCITY & ICE ZONES FOR APPLICABLE OVERHEAD SIGN SUPPORTS, HIGH MAST POLES, AND TRAFFIC SIGNAL POLES

Based on 50 Year Mean Recurrence Interval of Fastest Mile Wind Velocity at 33 feet height.

THIS SHEET TO BE INCLUDED IN ALL P.S.&E. PACKAGES CONTAINING ONE OR MORE OF THE APPLICABLE STANDARD SHEETS LISTED HEREON

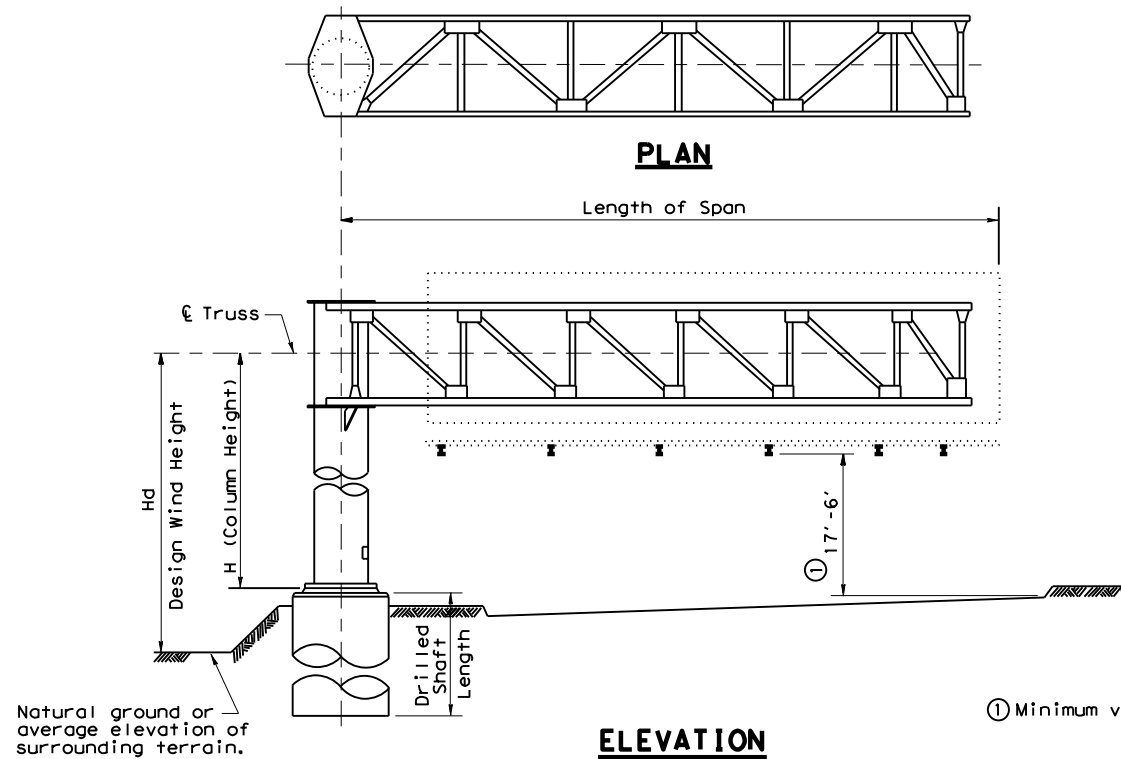
FOR HARRIS CO. ONLY
 Zone line is just North of US 90, around on the North, West and South sides of IH 610 and down the West side of SH 288.

FOR JACKSON CO. ONLY
 Zone line is just North of SH 616.

		Traffic Operations Division Standard	
<h2>WIND VELOCITY AND ICE ZONES</h2> <h3>WV & IZ-14</h3>			
FILE:	windice.dgn	DN: TxDOT	CK: TxDOT
© TxDOT	April 1996	CONT	SECT
REVISIONS		JOB	HIGHWAY
8-14-Added list of applicable standards, restricting use to structures designed for Fastest Mile wind speeds.	0902 00	299	VA
DIST	COUNTY	SHEET NO.	
FTW	TARRANT	105	

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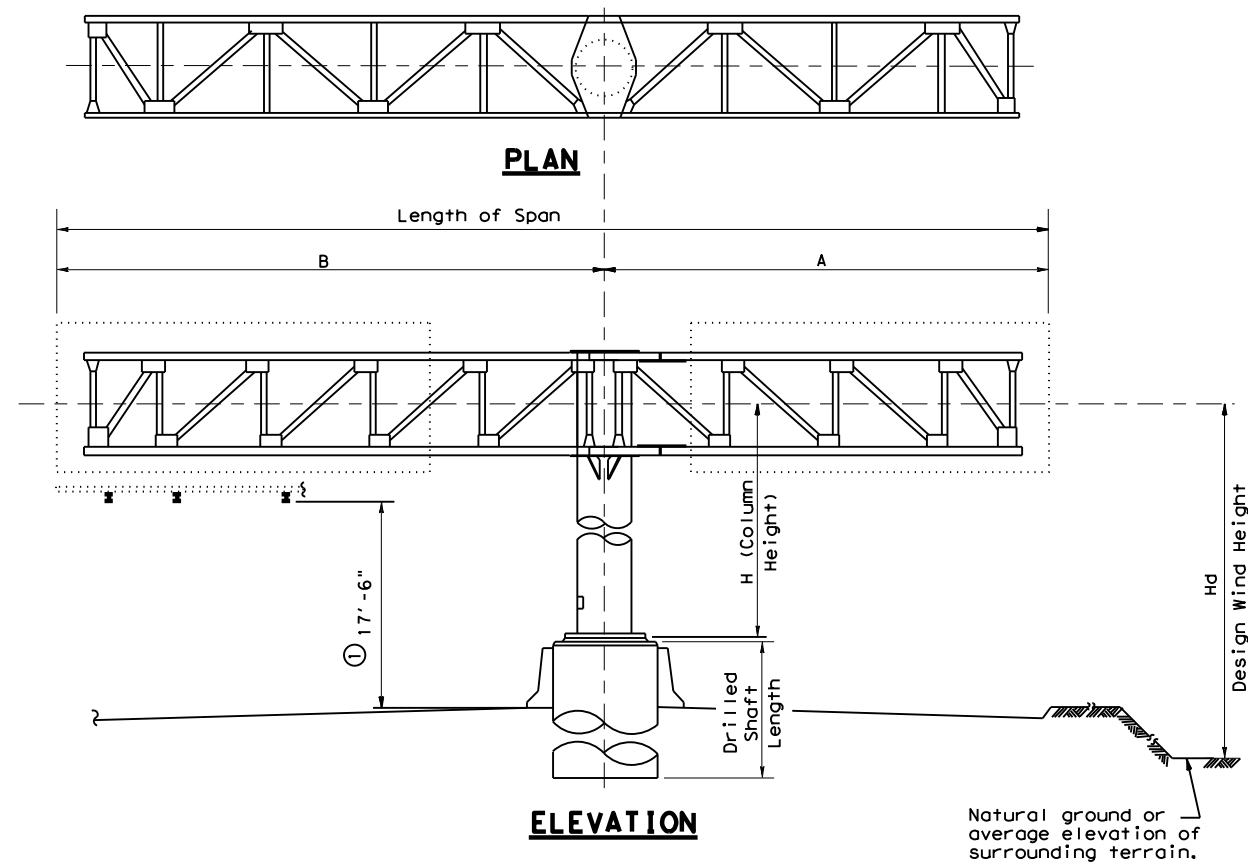
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SELECTION EXAMPLE CANTILEVER SPAN

Given: Cantilever Span = 33'; Column Height, H = 23.3'; Design Wind Height, Hd = 27'; Avg. Penetrometer Value, N = 15 (clay type soil); Hill County

- Step 1: Select applicable COSS standard. From Wind Velocity and Ice Zone sheet (WV & IZ-96) determine that Hill County is in Zone 4 (70 mph) and is above the ice line. Since Design Wind Height is less than 30', use standard COSS-Z4 & Z4I. If Design Wind Height is more than 30', use COSS-Z3 & Z3I. NOTE: In Zone 1 if Design Wind Height is greater than 30' use HCOSS-Z1.
- Step 2: Determine tower details from COSS-Z4 & Z4I. Use column height to nearest tabulated value, i.e., 23'. Round span length up to the nearest tabulated value, i.e., 35'. Tower details are:
 Tower pipe 24" Dia with min. wall thickness = 0.312"
 Base plate 33 3/4" Dia x 1 3/4"
 Anchor bolts 8-1 3/4" Dia on 29 3/8" bolt circle
 Horizontal deflection of tower at \bar{C} truss = 0.889". During installation, double nuts at base plate may be used to plumb tower to compensate for horizontal deflection.
 Design Moment = 244 Kip-ft
 Design Torsion = 162 Kip-ft
- Step 3: Determine truss details from COSS-Z4 & Z4I. Read from small table at bottom of sheet for span = 35'. Truss design width, W and depth, D = 4.0' x 4.0'.
 Chord L 3 x 3 x 3/8 (HYC) with 6 bolt connection at tower
 D.L. Diag. L 2 x 2 x 3/8 (HYC) with 2 bolt connection
 W. L. Diag. L 3 x 3 x 3/8 (HYC) with 2 bolt connection
 D. L. Vert. L 2 x 2 x 3/8 (HYC) with 2 bolt connection
 W. L. Strut. L 2 x 2 x 3/8 (HYC) with 1 bolt connection
 Bolts are 3/8" Dia high strength with 5-3/4" Dia bolt alternate for chord connection at tower.
 D.L. of truss = 50 lb/ft
 Truss deflection at free end = 3.2". The fabricator shall compensate for this deflection by offsetting bolt holes between the upper and lower chords at the truss-to-tower connection.
- Step 4: Determine foundation details. Use standard COSSF. From COSSF with 24" Dia pipe and 1 3/4" Dia anchor bolts:
 Anchor Bolts 1 3/4" Dia x 3'-10"
 Drilled Shaft Dia 42"
 Vertical Reinforcing 12 ~ #10 bars
 Spiral C = #4 at 6" pitch Grade 60.
 Misc. handhole, base plate, anchor bolt, and foundation details are shown on COSSF.
- Step 5: Determine drilled shaft length from COSS-FD. Enter the appropriate graph (for 42" Dia drilled shaft in clay soil) from the bottom with N = 15. Proceed upward interpolating moment curves (solid lines) to locate 244 Kip-ft. Project to the left side of the graph to determine the required embedment length, i.e., 12'. Repeat the procedure for torsion curves (dashed lines) to locate 162 Kip-ft. The embedment length required to satisfy torsion is 14'. Add 3'-0" to the longer length to obtain a required drilled shaft length of 17'.



SELECTION EXAMPLE DOUBLE CANTILEVER SPAN

Given: Short span, A = 9'; Long Span, B = 25'; Total Cantilever Span = 34'; Column Height, H = 24'; Design Wind Height, Hd = 26'; Avg. Penetrometer Value, N = 20 (clay type soil); Wheeler County.

- Step 1: Select applicable COSS standard. From Wind Velocity and Ice Zone sheet determine that Wheeler County is in Zone 2 (90 mph) and is above the ice line. Since Design Wind Height is less than 30' use standard COSS-Z2I. If Design Wind Height is more than 30', use HCOSS-Z1.
- Step 2: Determine tower details from COSS-Z2I. Use column height = 24'. Round total span length up to the next longer tabulated length span, i.e., 35'. If total span length is greater than 40', a special design would be required. Tower details are:
 Tower pipe 30" Dia with min. wall thickness = 0.310"
 Base Plate 40 1/2" Dia x 1 3/4"
 Anchor bolts 8 ~ 2" Dia on 35 3/4" bolt circle
 Horizontal deflection of tower at \bar{C} truss = 0.574-0.316 = 0.26". During installation, double nuts at base plate may be used to plumb tower and compensate for horizontal deflection.
 Design Moment = 403 Kip-ft (use total span = 35')
 Design Torsion = 136 Kip-ft (use long span = 25')
- Step 3: Determine truss details from COSS-Z2I. Read from small table at bottom of sheet 2 of 2 for Span A = 9' (use 10'):
 Chord L 3 x 3 x 3/8 (HYC) with 3 bolt connection at splice
 D.L. Diag. L 2 x 2 x 3/8 (HYC) with 2 bolt connection
 W.L. Diag. L 3 x 3 x 3/8 (HYC) with 2 bolt connection
 D.L. Vert. L 2 x 2 x 3/8 (HYC) with 2 bolt connection
 W.L. Strut. L 2 x 2 x 3/8 (HYC) with 1 bolt connection
 Bolts are 3/8" Dia high strength.
 D.L. of truss = 42 lb/ft.
 Span B = 25':
 Chord L 3 x 3 x 1/4 (HYC) with 4 bolt connection at tower
 D.L. Diag. L 2 x 2 x 3/8 (HYC) with 2 bolt connection
 W.L. Diag. L 3 x 3 x 3/8 (HYC) with 2 bolt connection
 D.L. Vert. L 2 x 2 x 3/8 (HYC) with 2 bolt connection
 W.L. Strut. L 2 x 2 x 3/8 (HYC) with 1 bolt connection
 Bolts are 3/8" Dia high strength with 3 ~ 3/4" Dia bolt alternate for chord connection at tower.
 D.L. of truss = 47 lb/ft.
 Truss defl. at free end = 0.2" for Span A, = 1.3" for Span B. The fabricator shall compensate for deflections by offsetting bolt holes between upper and lower chords at splice and at truss-to-tower connection. Top chord shall be shortened between the tower and the splice to achieve the required offset.

- Step 4: Determine foundation details. Use standard COSSF. From COSSF with 30" Dia pipe and 2" Dia anchor bolts:
 Anchor bolts 2" Dia x 4'-3"
 Drilled shaft Dia 54"
 Vertical Reinforcing 18 ~ #10 bars
 Spiral C = #4 at 6" pitch Grade 60
 Misc. handhole, base plate, anchor bolt, and foundation details are shown on COSSF.

- Step 5: Determine drilled shaft length from COSS-FD. Enter the appropriate graph (for 54" Dia drilled shaft in clay type soil) from the bottom with N = 20. Proceed upward interpolating moment curves (solid lines) to locate 403 Kip-ft. Project to the left side of graph to determine required embedment length, i.e., 13'. Repeat the procedure for the torsion curves (dashed lines) to locate 136 Kip-ft. Embedment length required to satisfy torsion is 9'. Add 3' to the longer length to obtain required drilled shaft length of 16'.



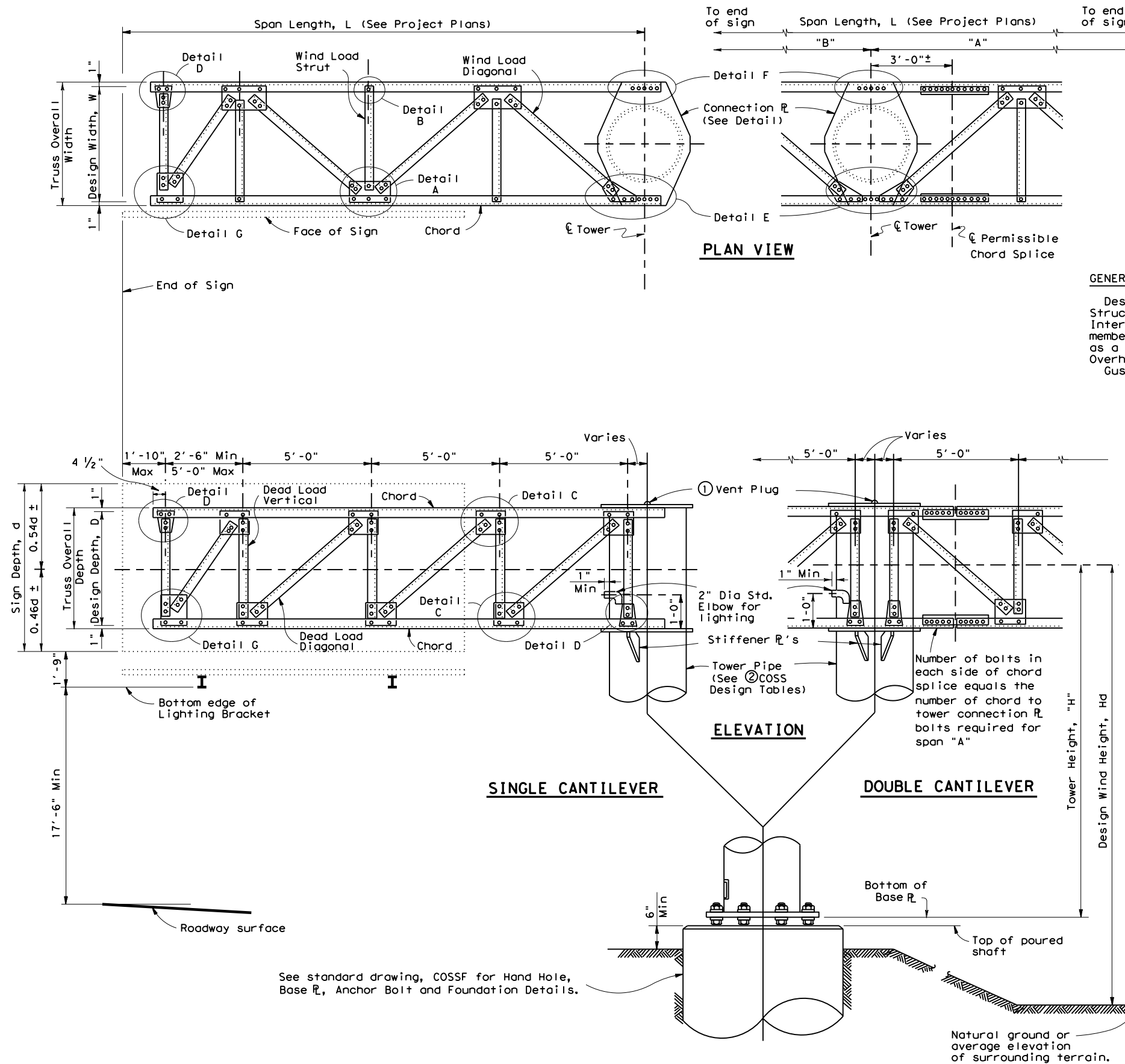
CANTILEVER OVERHEAD SIGN SUPPORTS SELECTION EXAMPLES

COSSE-SE

© TxDOT November 2007		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
REVISIONS					
CONT	SECT	JOB	HIGHWAY		
0902	00	299	VA		
DIST	COUNTY		SHEET NO.		
FTW	TARRANT		106		

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GENERAL NOTES:

Design conforms to 1975 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and Interim revisions thereto. Connection details are typical only. Actual size of member and number of bolts will vary. The details on this sheet are intended as a guide only. See "Cantilever Overhead Sign Supports" or "High Level Cantilever Overhead Sign Supports" sheets for number of bolts and size of members. Gusset plates to be same thickness as thickest web member in connection.

- ① Note: Cap shall be solid steel sheet $\frac{3}{8}$ " nominal thickness. Drill, tap and plug galvanizing vent. Weld plate to pipe with $\frac{3}{8}$ " weld all around.
- ② For COSS design tables see standard drawing, "Cantilever Overhead Sign Supports" or "High Level Cantilever Overhead Sign Supports".

SHEET 1 OF 2

Texas Department of Transportation
 Traffic Operations Division

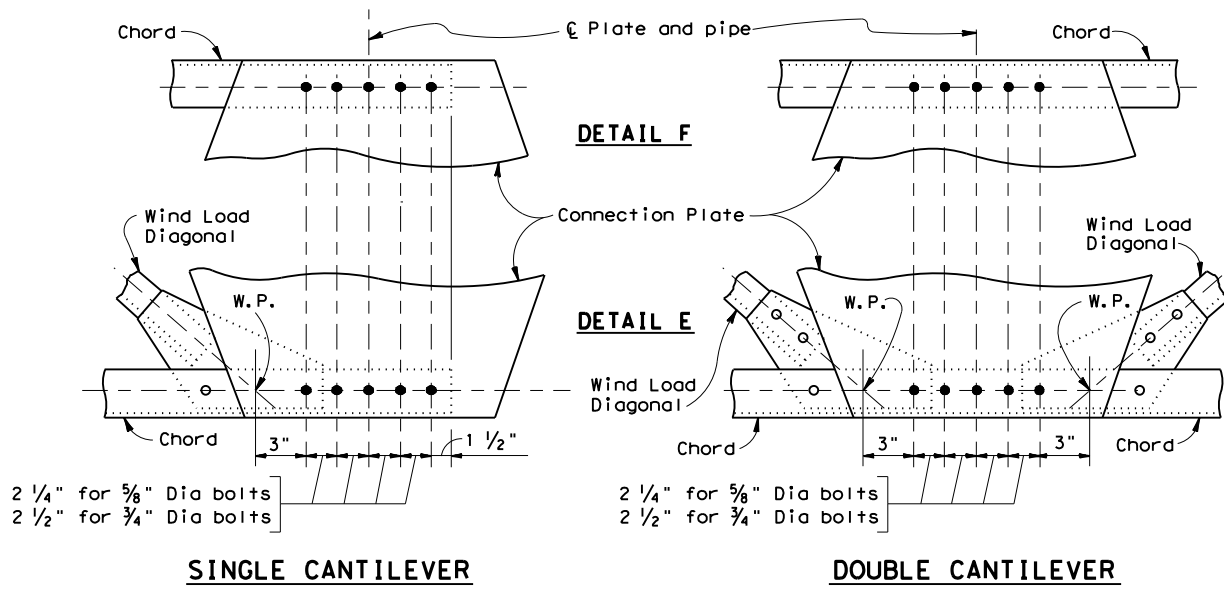
**CANTILEVER OVERHEAD
 SIGN SUPPORT DETAILS**

COSSD

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REVISIONS					
CONT	SECT	JOB		HIGHWAY	
0902	00	299		VA	
DIST		COUNTY		SHEET NO.	
FTW		TARRANT		107	

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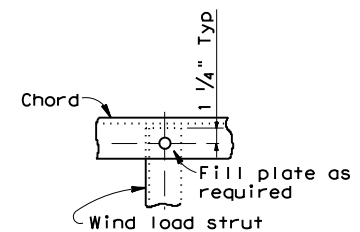


2 1/4" for 5/8" Dia bolts
 2 1/2" for 3/4" Dia bolts

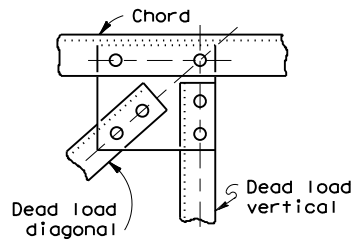
SINGLE CANTILEVER

DOUBLE CANTILEVER

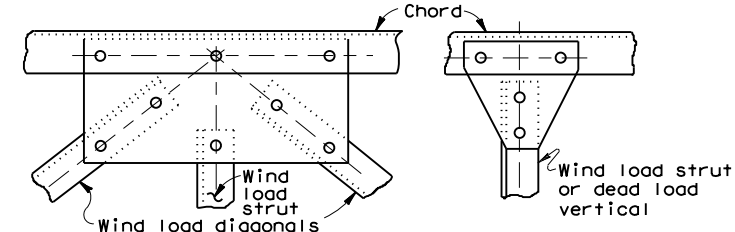
CONNECTION DETAILS



DETAIL B

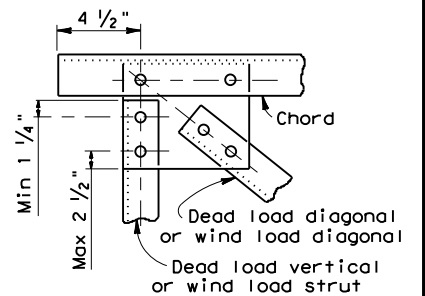


DETAIL C



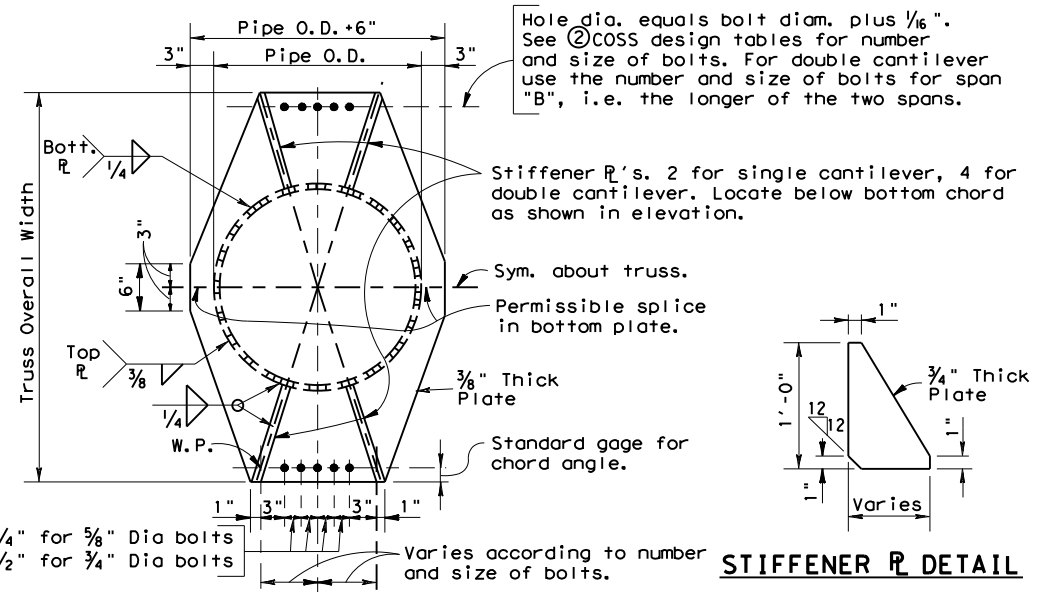
DETAIL A

DETAIL D



DETAIL G

TOTAL NO. OF BOLTS IN DIAG'S. IN JOINT	NUMBER OF BOLTS REQD. IN GUSSET PL TO CHORD CONNECTION
0	2
2	2
3	3
4	3
5	4
6	4
8	5
10	6



Hole dia. equals bolt diam. plus 1/16". See ② COSS design tables for number and size of bolts. For double cantilever use the number and size of bolts for span "B", i.e. the longer of the two spans.

Stiffener R's. 2 for single cantilever, 4 for double cantilever. Locate below bottom chord as shown in elevation.

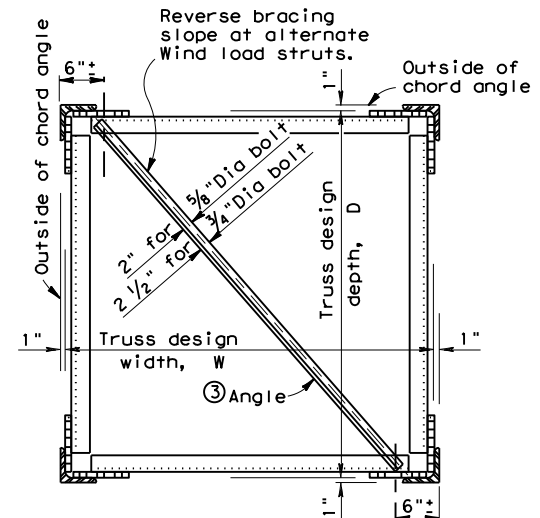
Sym. about truss.
 Permissible splice in bottom plate.

3/8" Thick Plate
 Standard gage for chord angle.

2 1/4" for 5/8" Dia bolts
 2 1/2" for 3/4" Dia bolts

Varies according to number and size of bolts.

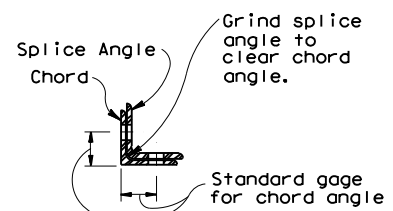
STIFFENER PLATE DETAIL



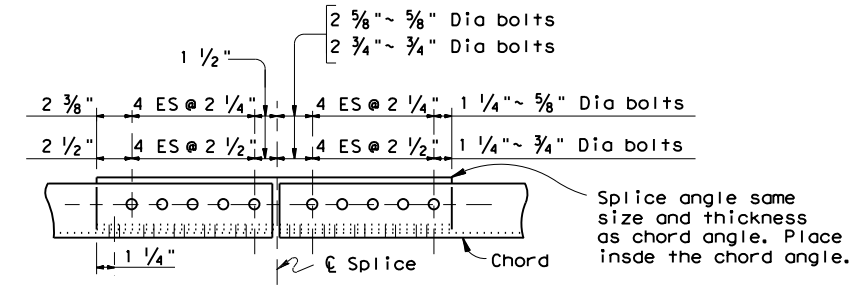
③ 2" x 2" x 3/16" angle for 5/8" Dia bolts [1]
 2 1/2" x 2" x 3/16" angle for 3/4" Dia bolts [1]

TRUSS SECTION

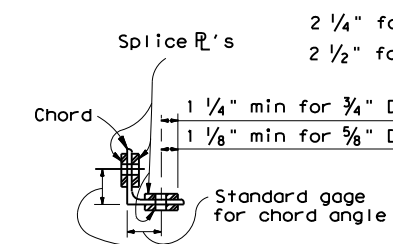
(DIAGONALS NOT SHOWN)



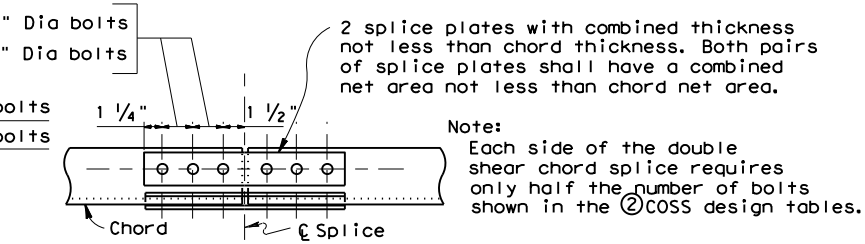
SECTION ON C SPLICE



SINGLE SHEAR CHORD SPLICE



SECTION ON C SPLICE

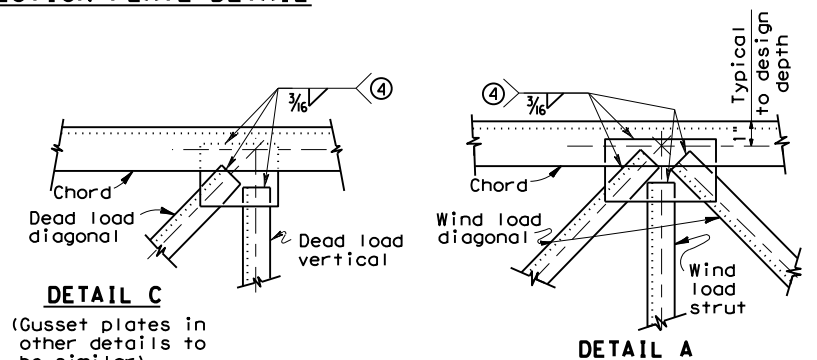


DOUBLE SHEAR CHORD SPLICE

SPLICE DETAILS

Note:
 Each side of the double shear chord splice requires only half the number of bolts shown in the ② COSS design tables.

CONNECTION PLATE DETAIL



DETAIL C
 (Gusset plates in other details to be similar)

DETAIL A

ALTERNATE WELDED CONNECTION DETAILS

NUMBER OF BOLTS	④ MINIMUM LENGTH OF 3/16" FILLET WELD REQUIRED	
	TO REPLACE 5/8" DIA BOLTS	TO REPLACE 3/4" DIA BOLTS
1	2"	3"
2	4"	6"
3	6"	9"
4	8"	11 1/2"
5	10"	14 1/2"
6	12"	17 1/2"
7	14"	20"

CANTILEVER OVERHEAD SIGN SUPPORT DETAILS

COSSD

REVISIONS		DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
CONT	SECT	JOB	HIGHWAY		
0902	00	299	VA		
DIST	COUNTY	SHEET NO.			
FTW	TARRANT	108			

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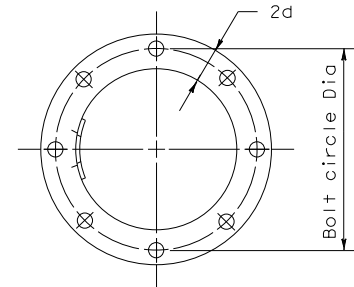
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Washers shall conform to ASTM F436.

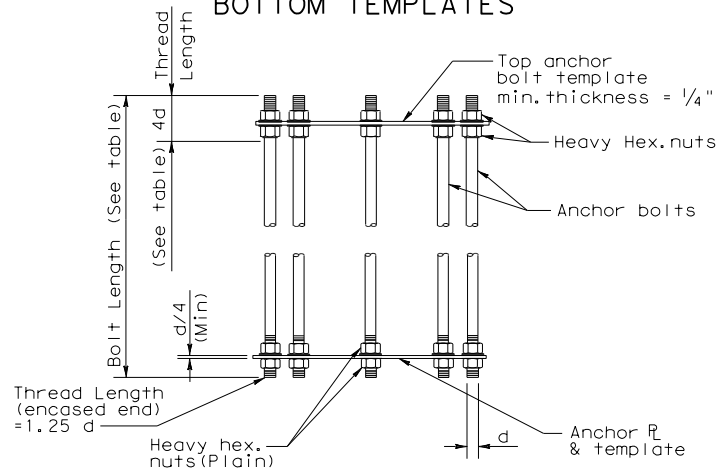
ANCHOR BOLT DIA.	WASHER DIMENSIONS			HOLE IN BASE PLATE	
	OUTSIDE DIAMETER	HOLE DIAMETER	THICKNESS		
			MIN.		MAX.
d	2d	d + 1/8"	0.136"	0.177"	d + 1/4"
1 1/2" or less	2d	d + 1/8"	0.178"	0.280"	d + 5/16"
1 3/4"	2d - 1/8"	d + 1/8"	0.178"	0.280"	d + 5/16"
2"	2d - 1/4"	d + 1/8"	0.178"	0.280"	d + 5/16"
Over 2"	2d - 1/2"	d + 1/8"	0.240"	0.340"	d + 5/16"

ANCHOR BOLT SIZE				
DIA	BOLT LENGTH	THREAD LENGTH	PROJECTION LENGTH	GALVAN. LENGTH
1 1/4"	2'-11"	5"	5 1/4"	11 1/4"
1 3/8"	3'-1"	5 1/2"	5 3/4"	11 3/4"
1 1/2"	3'-4"	6"	6 1/4"	1'-0 1/4"
1 3/4"	3'-10"	7"	7 1/4"	1'-1 1/4"
2"	4'-3"	8"	8 1/4"	1'-2 1/4"
2 1/4"	4'-9"	9"	9 1/4"	1'-3 1/4"
2 1/2"	5'-2"	10"	10 1/4"	1'-4 1/4"
2 3/4"	5'-8"	11"	11 1/4"	1'-5 1/4"
3"	6'-1"	1'-0"	1'-0 1/4"	1'-6 1/4"

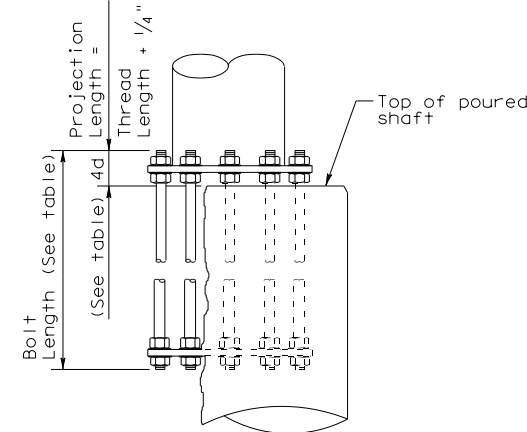
- ① Anchor Bolt Fabrication Tolerances:
 Bolt Length ~ ±1/2"
 Thread Length ~ ±1/2"
 Galvanized Length ~ -1/4"
- ② Thread length applies to upper and lower threads



TOP VIEW OF TOP & BOTTOM TEMPLATES

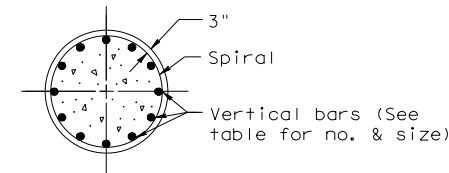


ANCHOR BOLT ASSEMBLY (PRIOR TO INSTALLATION)

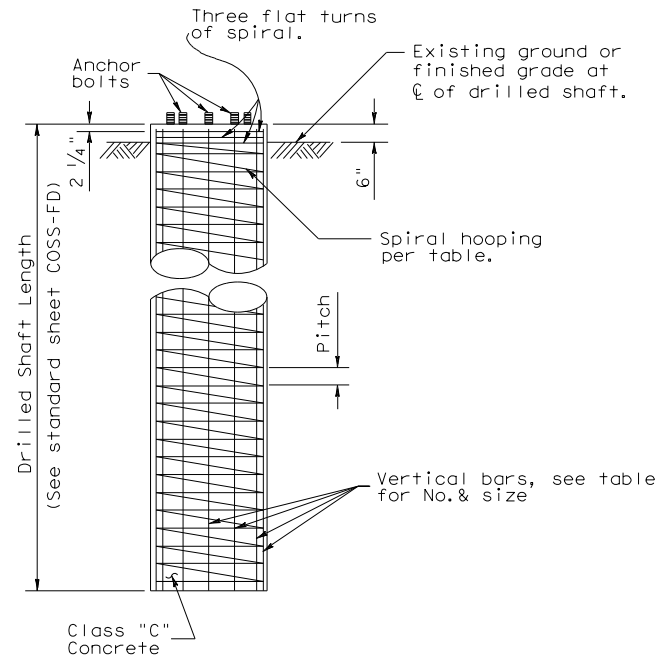


BEARING SEAT ELEVATION

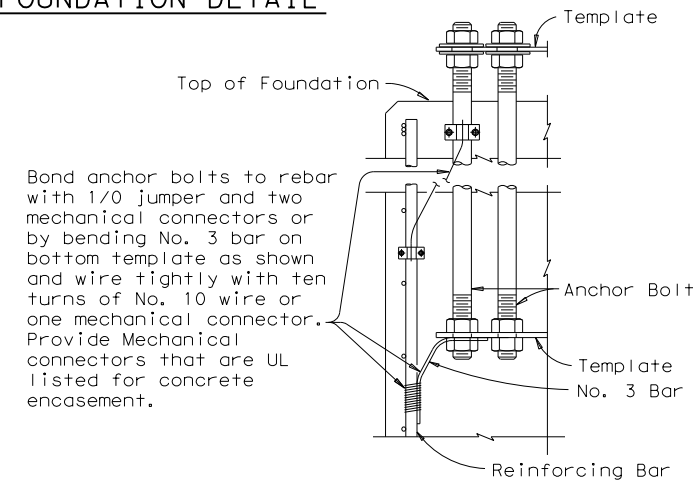
ANCHOR BOLT SIZE	PIPE OUTSIDE DIAMETER											
	16"			20"			24"			30"		
	BOLT CIRCLE DIA	DRILLED SHAFT SIZE	DRILLED SHAFT REINF	BOLT CIRCLE DIA	DRILLED SHAFT SIZE	DRILLED SHAFT REINF	BOLT CIRCLE DIA	DRILLED SHAFT SIZE	DRILLED SHAFT REINF	BOLT CIRCLE DIA	DRILLED SHAFT SIZE	DRILLED SHAFT REINF
1 1/4" Dia x 2'-11"	20 1/2"	36" Dia	14-#8 (A)	24 1/2"	36" Dia	14-#8 (A)						
1 3/8" Dia x 3'-1"	20 3/4"	36" Dia	12-#9 (A)	24 3/4"	42" Dia	14-#9 (A)						
1 1/2" Dia x 3'-4"	21"	36" Dia	12-#9 (A)	25"	42" Dia	14-#9 (A)	29"	42" Dia	14-#9 (C)			
1 3/4" Dia x 3'-10"	21 1/2"	36" Dia	10-#10 (A)	25 3/8"	42" Dia	12-#10 (B)	29 3/8"	48" Dia	16-#10 (C)	35 3/8"	54" Dia	18-#10 (C)
2" Dia x 4'-3"	22"	36" Dia	12-#10 (A)	25 3/4"	42" Dia	12-#10 (B)	29 3/4"	48" Dia	16-#10 (C)	35 3/4"	54" Dia	18-#10 (C)
2 1/4" Dia x 4'-9"	22 1/2"	42" Dia	12-#11 (A)	26"	42" Dia	10-#11 (B)	30"	48" Dia	14-#11 (C)	36"	54" Dia	14-#11 (D)
2 1/2" Dia x 5'-2"				26 1/2"	42" Dia	12-#11 (B)	30 1/2"	48" Dia	16-#11 (C)	36 1/2"	54" Dia	16-#11 (D)
2 3/4" Dia x 5'-8"							31 1/2"	48" Dia	18-#11 (D)	37"	54" Dia	20-#11 (D)
3" Dia x 6'-1"										37 1/2"	54" Dia	24-#11 (D)



SECTION



FOUNDATION DETAIL



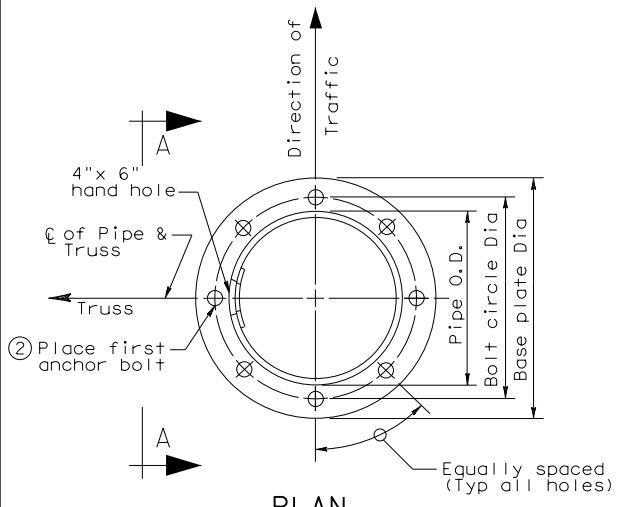
Bond anchor bolts to rebar with 1/0 jumper and two mechanical connectors or by bending No. 3 bar on bottom template as shown and wire tightly with ten turns of No. 10 wire or one mechanical connector. Provide Mechanical connectors that are UL listed for concrete encasement.

LIGHTNING PROTECTION SYSTEM

- A = #3 Plain spiral at 6" pitch (Grade 40)
- B = #4 Plain spiral at 6" pitch (Grade 40)
- C = #4 Plain spiral at 6" pitch (Grade 60)
- D = #4 Plain spiral at 3 1/2" pitch (Grade 60)

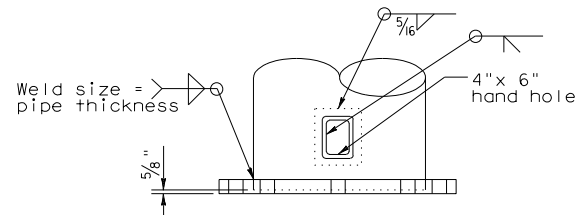
GENERAL NOTES

- Concrete shall be Class "C".
- Reinforcing shall conform to Item 440, "Reinforcing Steel".
- Anchor bolts and nuts for anchor bolts shall be "Alloy Steel" per Item 449, "Anchor Bolts".
- Anchor bolts shall be rigidly held in position during concrete placement using steel templates at the top and bottom. The top templates shall be removed after the concrete has set.
- Lubricate and tighten anchor bolts when erecting the structure per Item 449, "Anchor Bolts". After the structure has been aligned in its final position and the anchor bolts have been properly tightened, tack weld anchor bolt nuts to washer, and tack weld washers to base plate. Galvanizing in tack welded areas shall be repaired in accordance with Item 445, "Galvanizing".
- All vertical reinforcing shall be carried to the bottom of the Drilled Shaft.



PLAN

- ② See "Cantilever Overhead Sign Support" or "High Level Cantilever Overhead Sign Support" sheets for number and size.



VIEW A-A

③ BASE PLATE & HANDHOLE DETAILS

- ③ See "Cantilever Overhead Sign Support" or "High Level Cantilever Overhead Sign Support" sheets for Diameter and thickness of base plate.

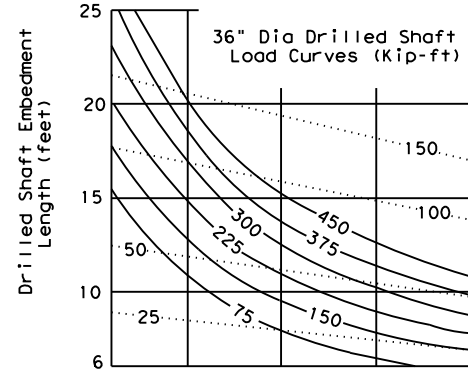
Cut 5" x 7" hole in pipe. Center 4" x 6" hand hole in 3/8" x 8" x 10" back up plate. Provide attachable cover made from section cut from pipe.

<h2>CANTILEVER OVERHEAD SIGN SUPPORT FOUNDATION</h2> <h3>COSSE-21</h3>			
FILE: cossef-21.dgn	DN:	CK:	DW:
© TxDOT November 2007	CONT SECT	JOB	HIGHWAY
8-21 REVISIONS	0902 00	299	VA
DIST	COUNTY	SHEET NO.	
FTW	TARRANT	109	

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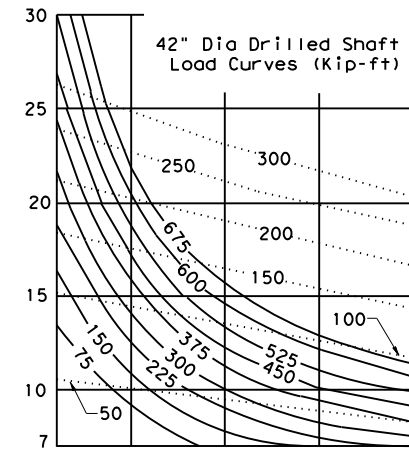
DISCLAIMER:

DATE: 4/9/2024 2:33:34 PM
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①	28.5°	30°	32°	34°	36°
②	12	21	35	50	65

- ① ϕ = Angle of internal friction of soil (degrees)
- ② N = Texas cone penetrometer value (blows per ft)
- ④ C(psi) = Cohesive shear strength of soil (psi)
- ⑤ C(psf) = Cohesive shear strength of soil (psf)

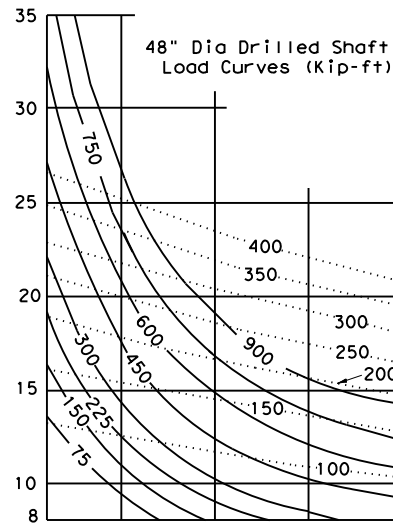


①	28.5°	30°	32°	34°	36°
②	12	21	35	50	65

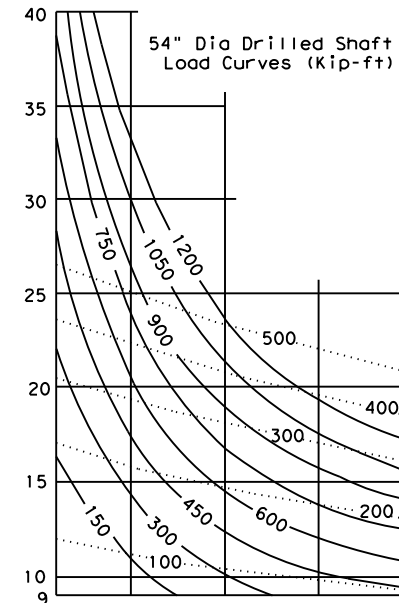
③ SUBMERGED SAND SOIL (COHESIONLESS)

Moment _____
Torsion

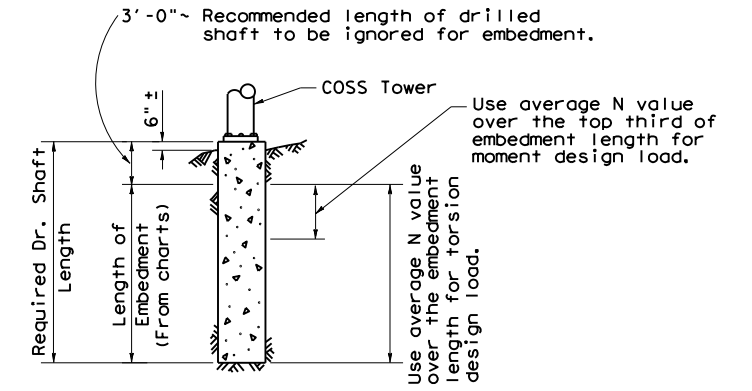
③ Note:
For unsubmerged sands and clayey sands the charts for clay soil will give a conservative foundation design.



①	28.5°	30°	32°	34°	36°
②	12	21	35	50	65



①	28.5°	30°	32°	34°	36°
②	12	21	35	50	65

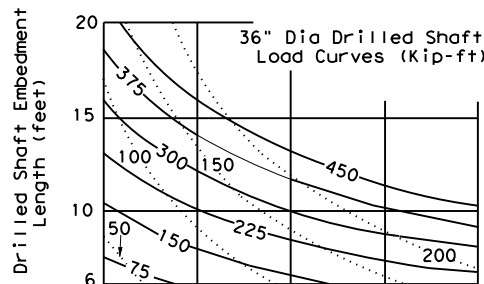


PROCEDURE:

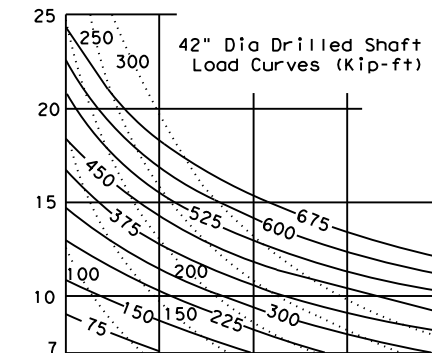
1. Determine design moment and torsion, and the required drilled shaft diameter as outlined in the selection example sheet COSSE-SE.
2. Make an initial estimate of the required embedment length.
3. From soil exploration data determine type of soil and average N value or soil property along the upper third of the drilled shaft.
4. Enter chart (for the correct shaft diameter and soil type) from the bottom at the average N value or soil property determined in step 3.
5. Proceed vertically into chart and locate intersection with design moment. Interpolate between moment curves (solid lines) as needed.
6. From intersection point turn 90° to left and read embedment length along vertical scale.
7. If embedment length differs significantly from estimated value return to step 3 with the embedment length determined in step 6.
8. From soil exploration data determine average N value or soil property over the entire length of the embedment.
9. Enter chart (for correct shaft diameter and soil type) from the bottom at the average N value or soil property determined in step 8.
10. Proceed vertically into chart and locate intersection with design torsion. Interpolate between torsion curves (dashed lines) as needed.
11. From intersection point turn 90° to left and read embedment length along vertical scale.
12. Compute the required length of drilled shaft by adding 3'-0" to longer embedment length required for moment or torsion.

GENERAL NOTES:

These charts are for use with Cantilever Overhead Sign Supports with one shaft per tower.
 Solid curves are base moment in Kip-ft.
 Dash curves are base torsion in Kip-ft.
 Minimum embedment of drilled shaft is two diameters.
 Add 3'-0" to the required embedment length to determine the required length of drilled shaft.



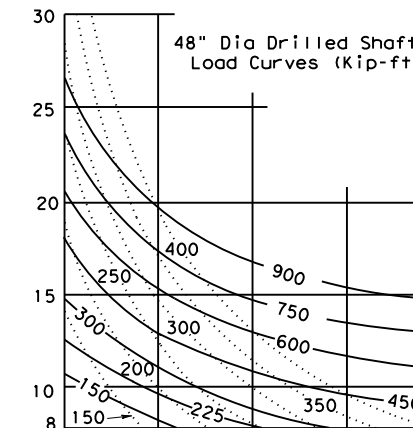
④	4	8	12	16	20
⑤	576	1152	1728	2304	2880
②	10	20	30	40	50



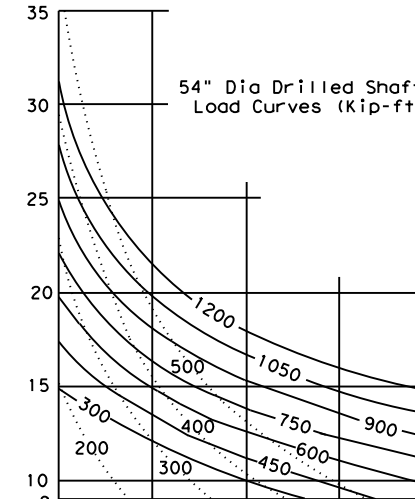
④	4	8	12	16	20
⑤	576	1152	1728	2304	2880
②	10	20	30	40	50

CLAY SOIL (COHESIVE)

Moment _____
Torsion



④	4	8	12	16	20
⑤	576	1152	1728	2304	2880
②	10	20	30	40	50



④	4	8	12	16	20
⑤	576	1152	1728	2304	2880
②	10	20	30	40	50



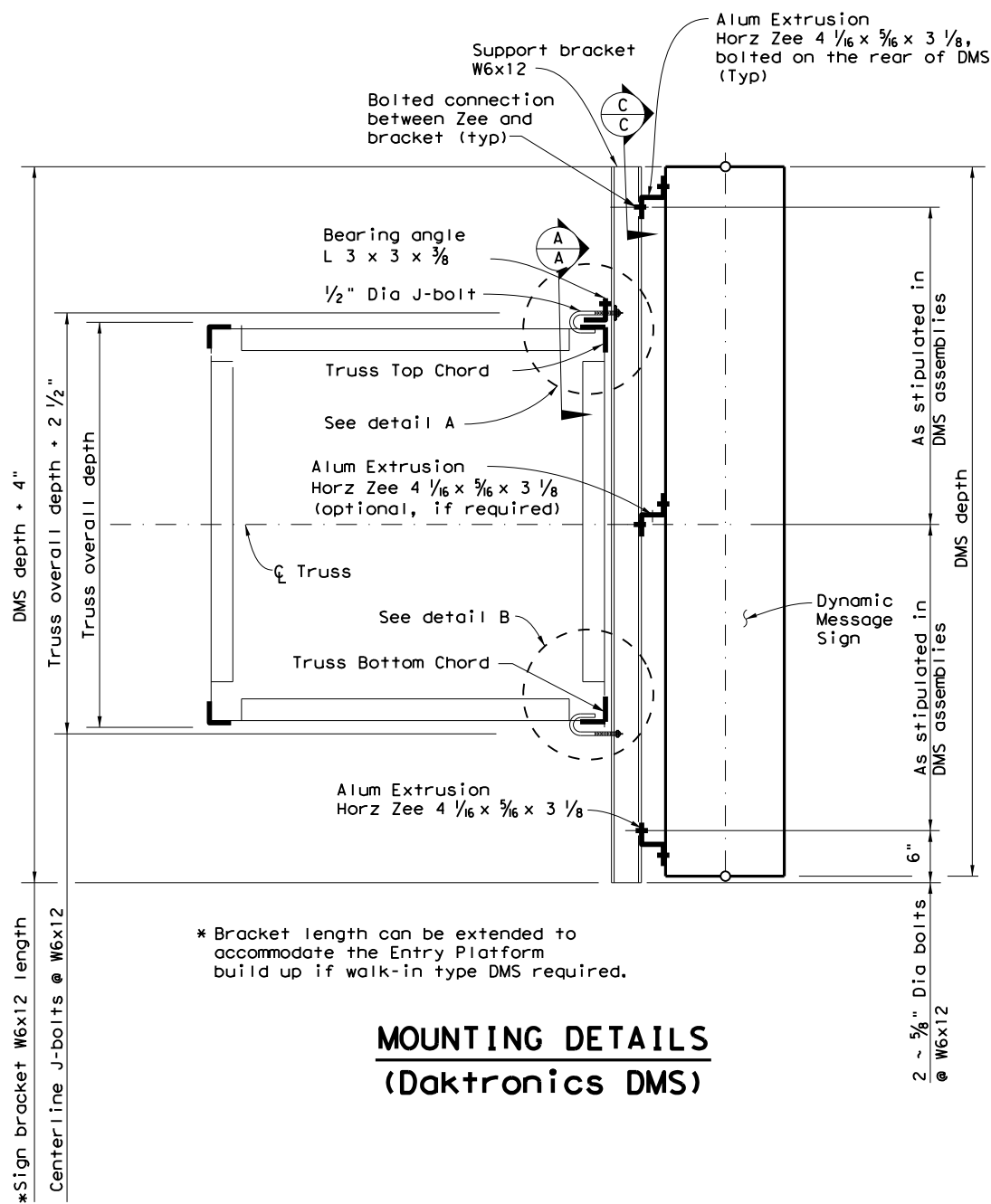
FOUNDATION EMBEDMENT SELECTION CHARTS

COSSE-FD

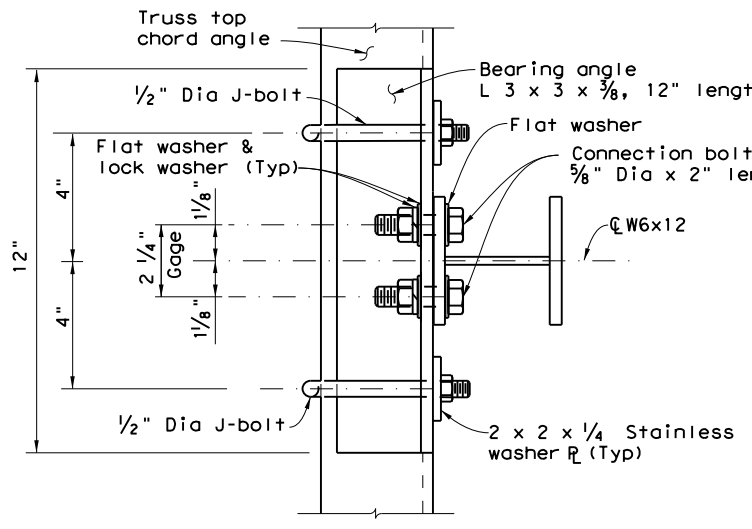
© TxDOT November 2007		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
REVISIONS		CONT	SECT	JOB	HIGHWAY
		0902	00	299	VA
		DIST	COUNTY		SHEET NO.
		FTW	TARRANT		110

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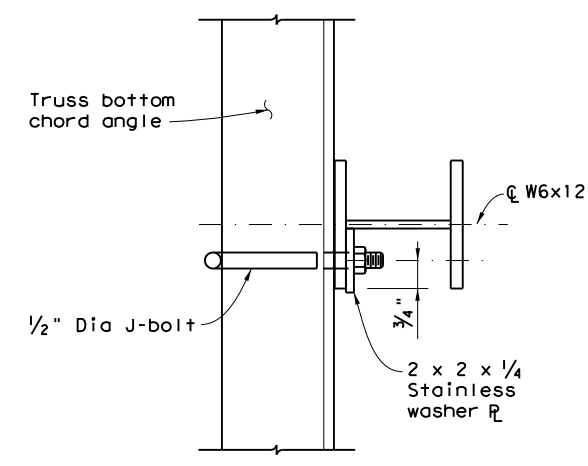
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**MOUNTING DETAILS
(Daktronics DMS)**



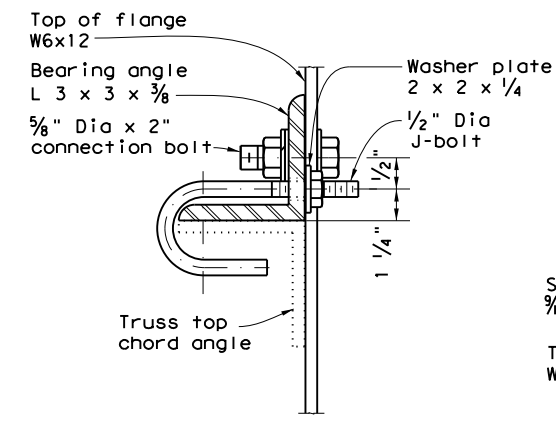
**TOP VIEW
TRUSS TOP CONNECTION**



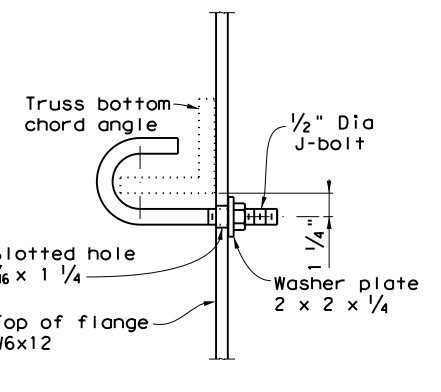
**TOP VIEW
TRUSS BOTTOM CONNECTION**

GENERAL NOTES:

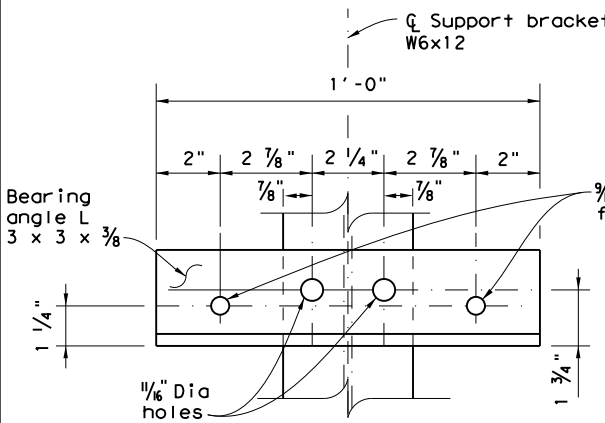
- Determine the adequacy of the overhead sign support structure to support the dynamic message sign (DMS) prior to attaching the sign to the truss.
- Designed according to the 1994 edition of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions. Designed for a Sustained (Fastest Mile) Wind Velocity of 100 mph with a gust factor of 1.3. Connections are designed for a DMS weight of 3800 lbs. The structural support is designed for an Effective Projected Area (EPA) of 399 sq. ft. based on a DMS nominal width of 29.1 feet and nominal depth of 7.8 feet, with a drag coefficient of 1.7 applied, plus four 1'-8" square flashing beacons with a drag coefficient of 1.2. DMS attachment is designed for a horizontal eccentricity of 2.4 ft. from the face of the truss to the center of gravity of the DMS. Provide an even number of sign supporting brackets (6 minimum), W6x12, spaced at 5'-6" max. The maximum distance between the sign edge to the nearest supporting bracket is 2'-3".
- Verify applicable field dimensions before fabrication. Determine the required number and spacing of sign support brackets, along with the Aluminum Extrusion Horizontal Zees provided by the DMS manufacturer, to connect the DMS to the truss. For the J-bolt connection of DMS to overhead sign structure, align each arranged sign bracket with its bearing angle to avoid conflict with the truss connection bolts at the point of attachment.
- Provide structural steel meeting the requirements of ASTM A36, A572 Gr 50 or A588. Provide connection bolts meeting the requirements of ASTM F3125, Grade A325 or A449 with 1 heavy hex nut, 2 flat washers, and 1 lock washer. Provide Type 304 stainless steel J bolt and washer plate, with bolt minimum yield strength of 50 ksi and an elongation of 16 percent in 2 inches. Galvanize all parts except stainless steel.
- Prior to the initialization of DMS mounting, the DMS manufacturer must provide and install the 6061-T6 Aluminum Extrusion Horizontal Zees, 4 1/16 x 5/16 x 3 1/8.
- The sign support bracket attached to the truss shown here is an example only. Adjust the bracket position along the truss depth to achieve the required vertical clearance to be confirmed by the Engineer.
- When the structure is to be exposed to a highly corrosive environment, provide elastomeric spacer to separate aluminum alloy parts from direct contact with steel.



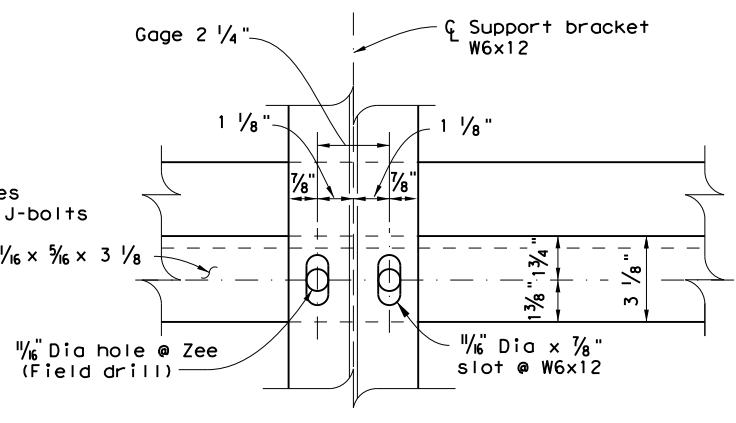
DETAIL A



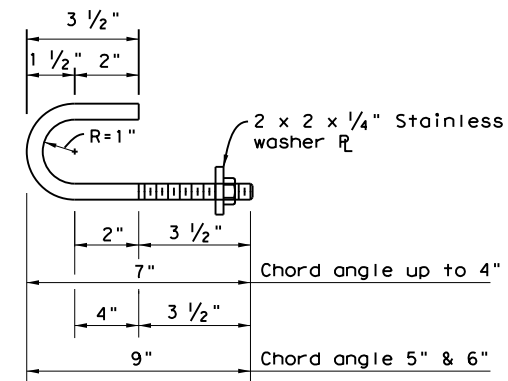
DETAIL B



**SECTION A-A
(Truss chord angle not shown)**



SECTION C-C

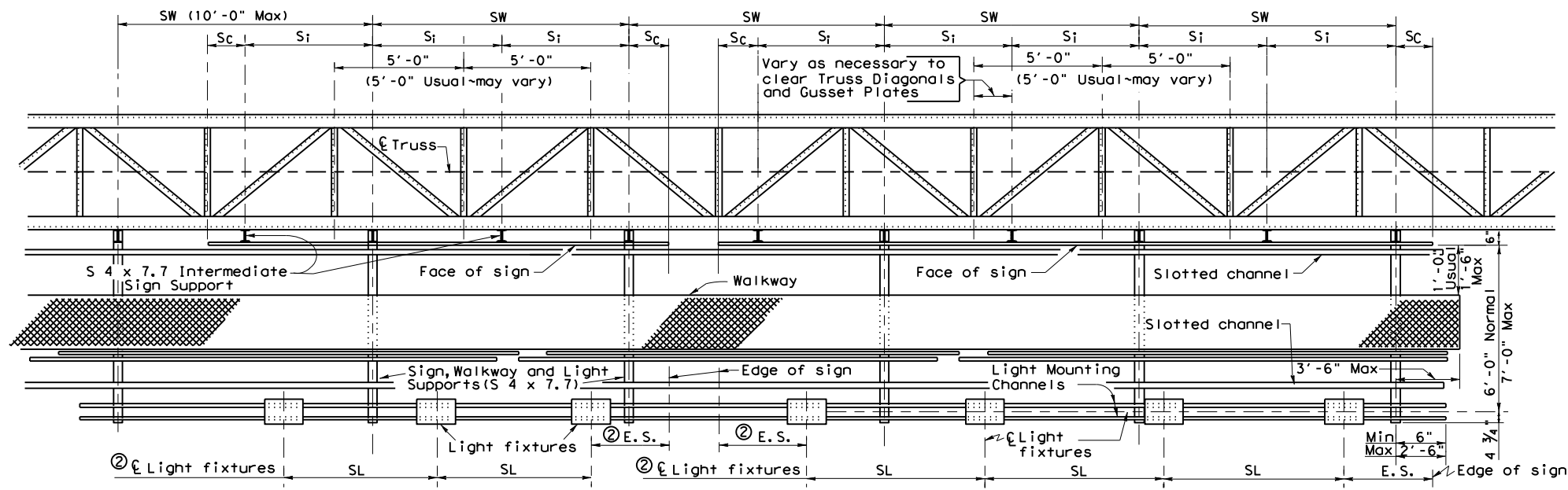


1/2" Dia J-BOLT

DMS-TO-TRUSS MOUNTING WITH HORIZONTAL ZEE EXTRUSIONS			
DMS (HZ-2) - 21			
FILE: dms (hz-2) - 21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT February 2021	CONT	SECT	JOB
REVISIONS	0902	00	299
DIST	COUNTY		SHEET NO.
FTW	TARRANT		112

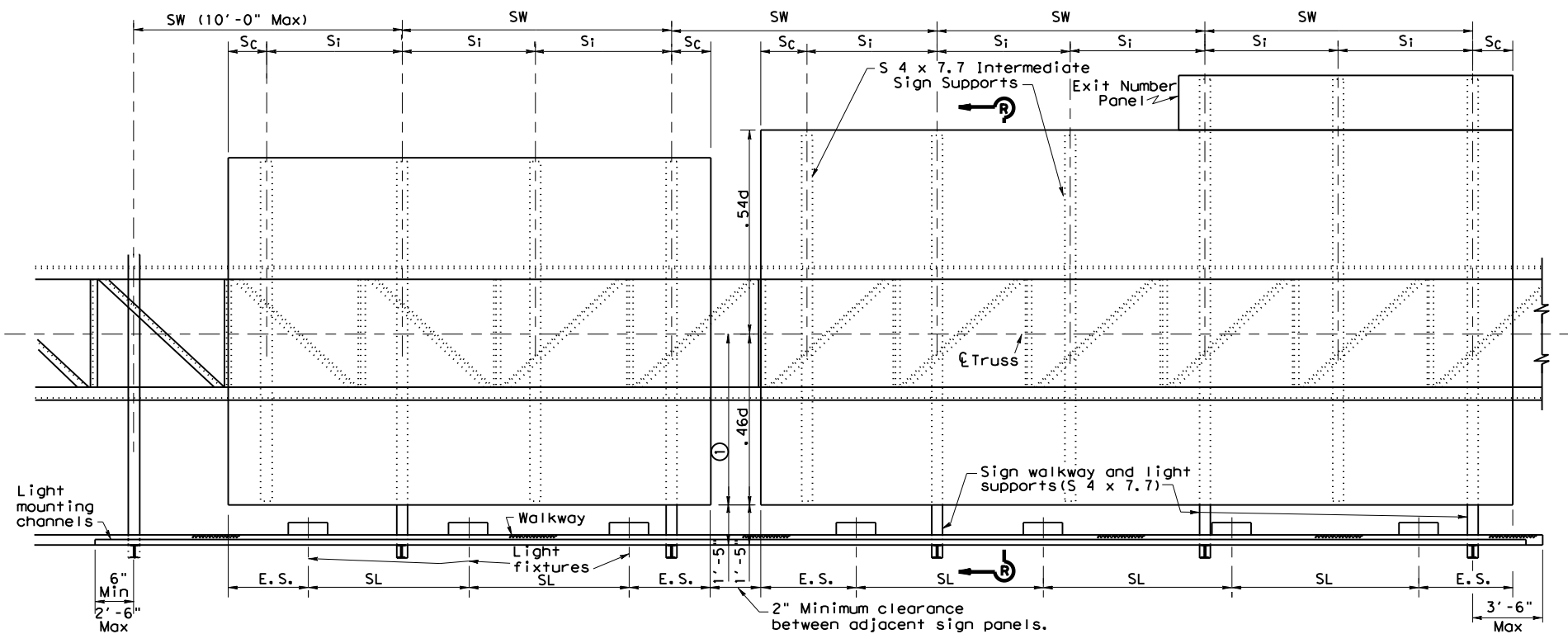
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Sc=6" Min and .25 Si Max
 (2) See SL(MV) for light fixture spacing.

PART PLAN
 (Showing Truss, Signs, Walkways and Lights)

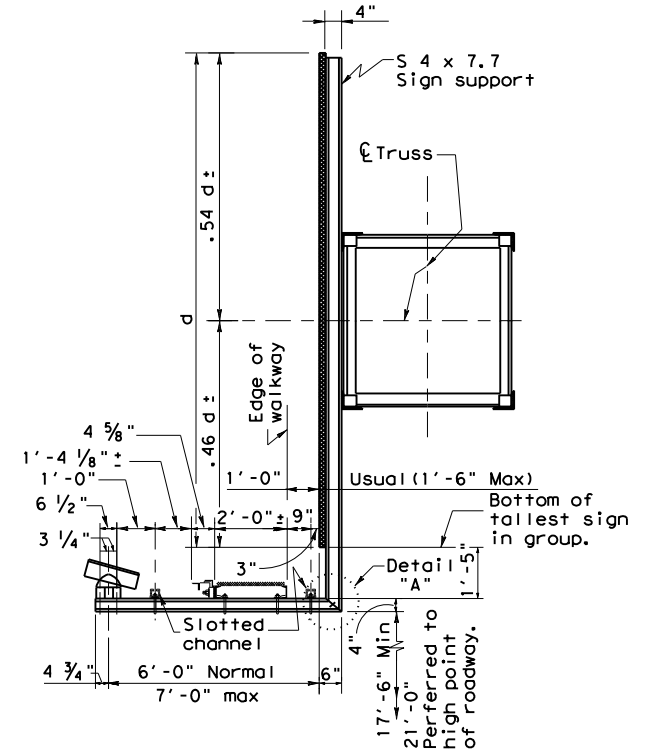


PART ELEVATION

① Where signs of different depths are used, the bottom edge of all signs may be placed in line. Where this is done, all signs should be so positioned that the bottom edges are approximately 0.46 of the depth of the deepest sign below the $\bar{\epsilon}$ of the truss. When signs are spaced thus, Si is determined by the deepest sign.

See sheet SL(MV) for Lighting Details & Spa.S.L. & E.S.
 See sheet SWW(1) for Walkway Details.
 See sheet SMD(2-4) for Extruded Aluminum Sign Details & Max. Spa. for Si.
 Sc= 6" min, .25 Si max.

Note: Exit Number Panel may be supported by sign support brackets as shown hereon, or may be supported as shown on sheet SMD(2-4). Regardless of method used spacing of supports shall not exceed Si.



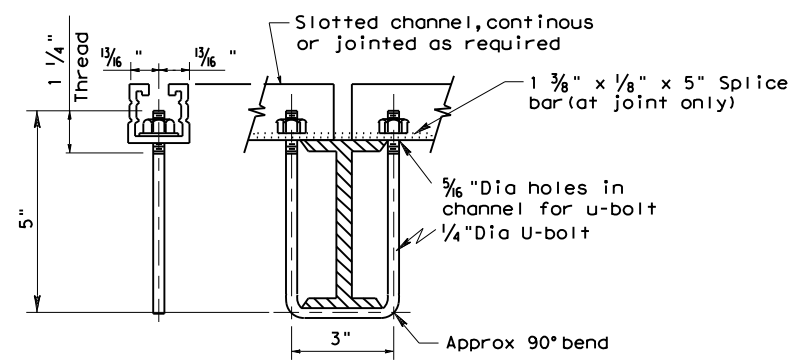
SECTION R-R

SHEET 1 OF 2

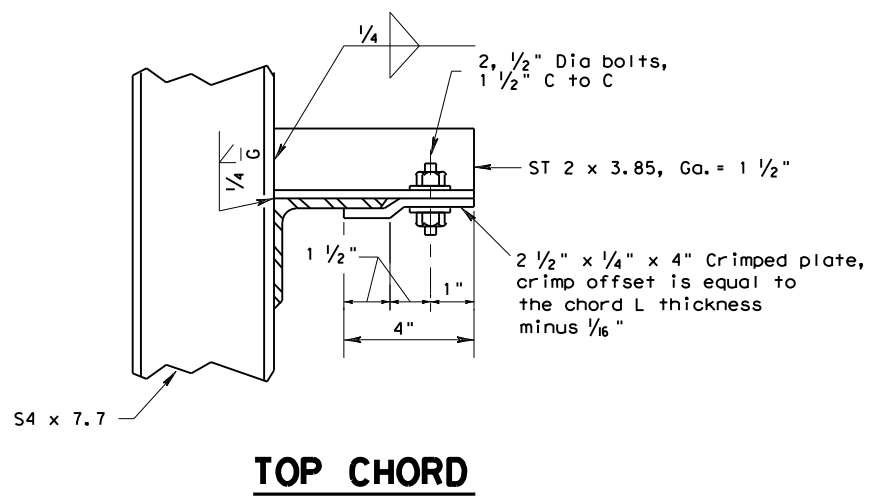
				Traffic Operations Division Standard	
<h2>SUPPORT BRACKETS FOR SIGNS, WALKWAYS & LIGHTS</h2> <h3>SB(SWL-1)-14</h3>					
FILE: SWL-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT	
©TxDOT April 2014	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0902	00	299	VA	
DIST	COUNTY	SHEET NO.			
FTW	TARRANT	113			

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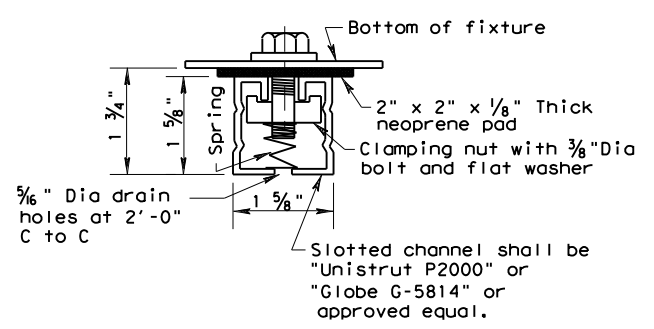
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SECTION A-A

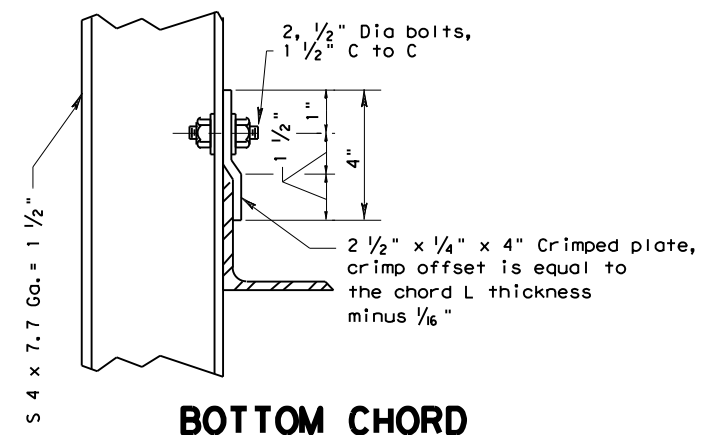


TOP CHORD



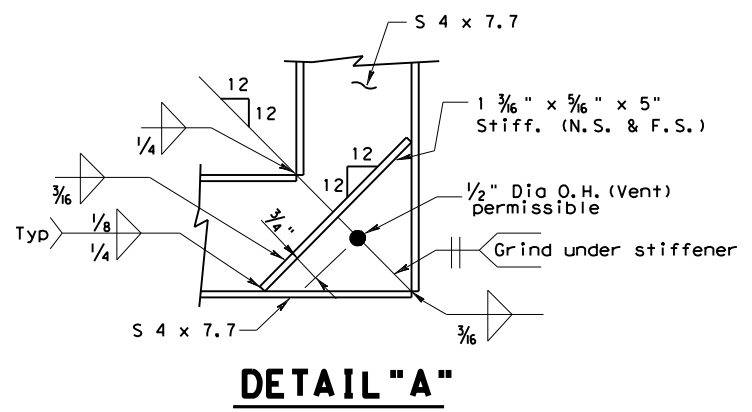
TYPICAL SLOTTED CHANNEL

CONNECTED TO LIGHTING FIXTURE



BOTTOM CHORD

SUPPORT TO TRUSS CONNECTION



DETAIL "A"

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and Interim revisions thereto.

Materials, fabrication, construction and erection shall conform to Item 654, "Sign Walkways" and with details, dimensions, and weld procedures shown herein. Structural steel shall conform with ASTM A36 unless noted otherwise.

Bolts shall have hexagon heads and nuts and conform with ASTM A307.

All parts shall be galvanized after fabrication per Item 445, "Galvanizing".

SHEET 2 OF 2



SUPPORT BRACKETS FOR SIGNS, WALKWAYS & LIGHTS SB(SWL-1)-14

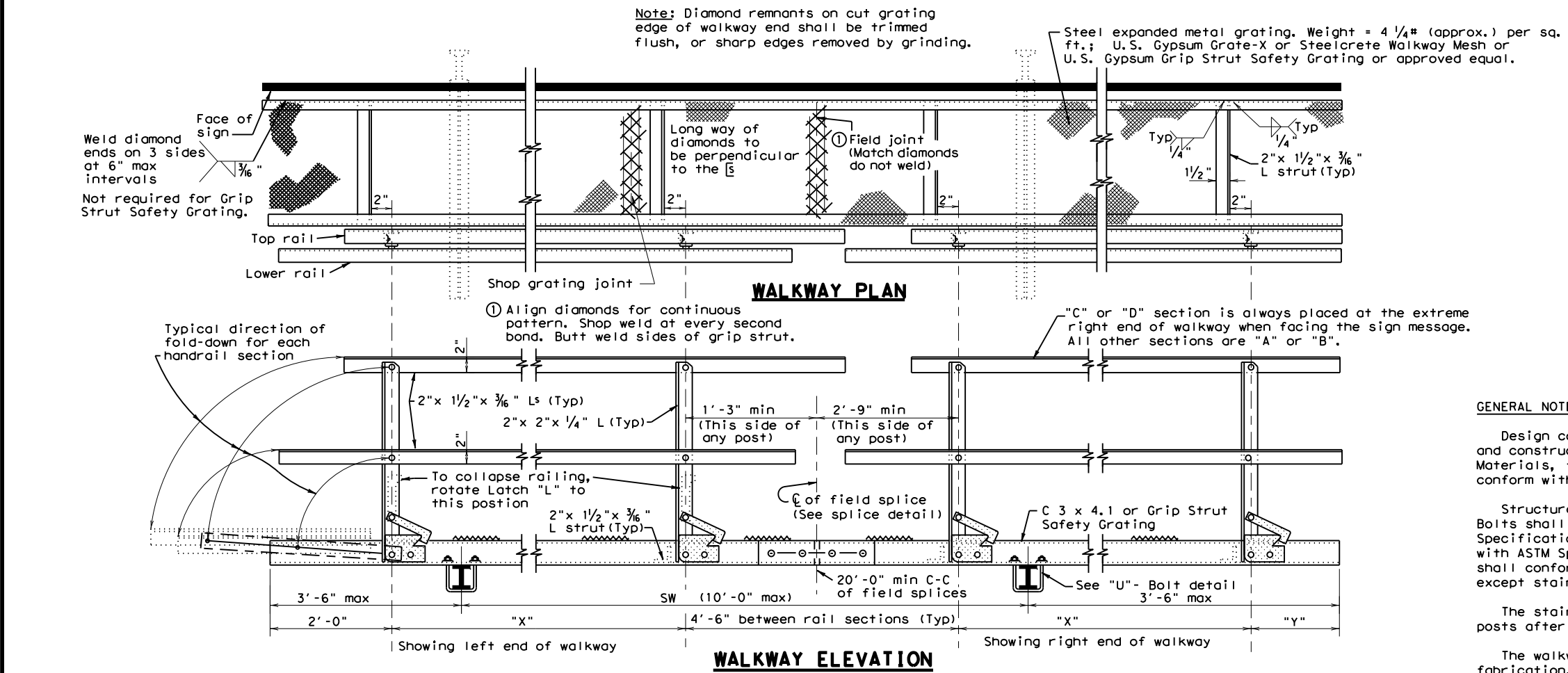
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© TxDOT April 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	00	299	VA
DIST	COUNTY		SHEET NO.	
FTW	TARRANT		114	

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GENERAL NOTES

Design conforms to AASHTO Specifications for the design and construction of Structural Supports for Highway Signs. Materials, fabrication, construction, and erection shall conform with the specifications.

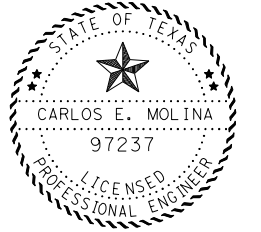
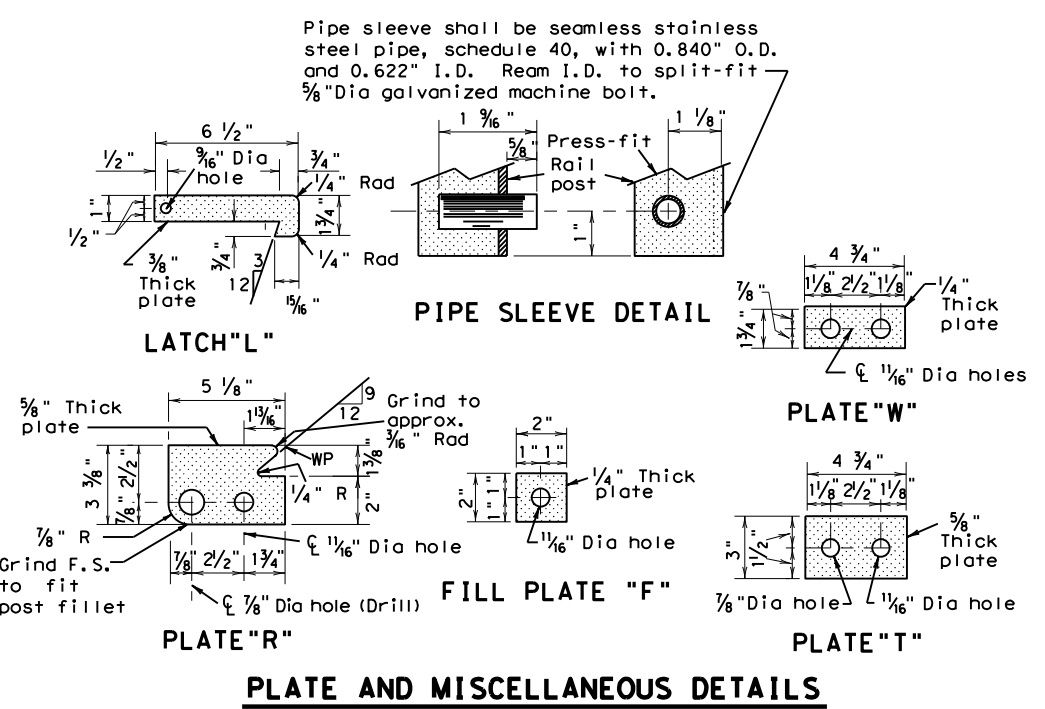
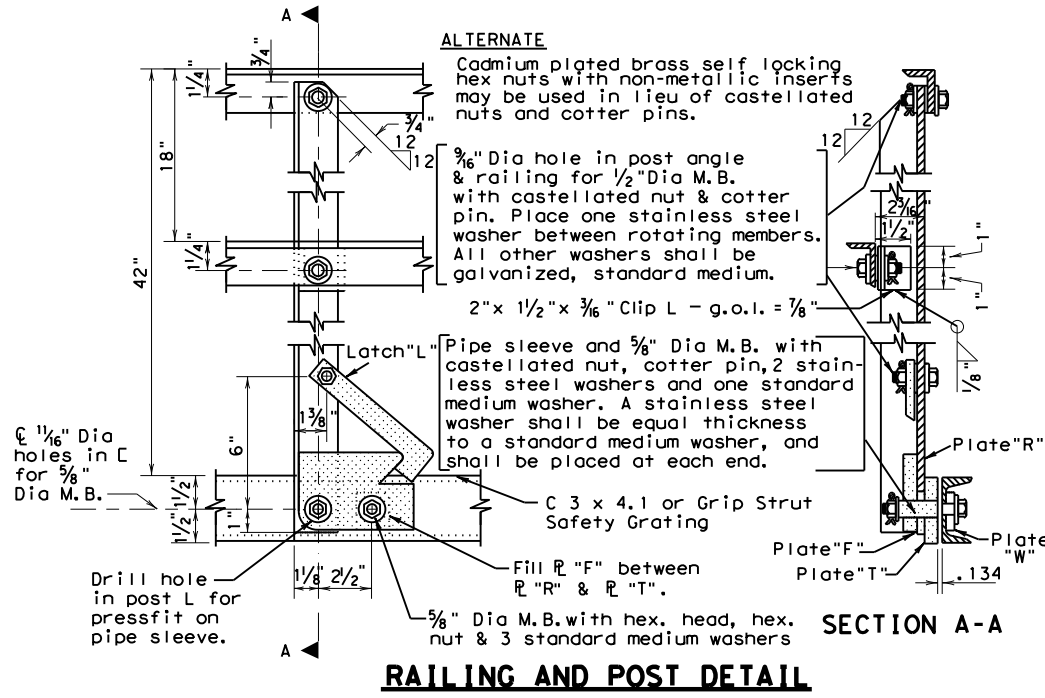
Structural steel shall conform with ASTM Specification A36. Bolts shall have hexagon heads and nuts and conform with ASTM Specification A307. Stainless steel pipe bushings shall conform with ASTM Specification A312 Type TP 304. Stainless steel washers shall conform with ASTM Specification A167 Type 302. All parts, except stainless steel shall be galvanized after fabrication.

The stainless steel bushings shall be pressed in the rail posts after posts are galvanized.

The walkway and railing shall be shop assembled to check fabrication.

10'-0" maximum spacing for Walkway, Lights and Sign Support Bracket spacing, see sheets SL(2), SL(MV), SMD(P-1) PLYWOOD & SMD(A-1) ALUMINUM for other limitations to spacing.

Note: Eliminate C 3 x 4.1 when Grip Strut Safety Grating is used. All other details and materials apply unless otherwise noted.



Carlos E. Molina
 04/23/2024

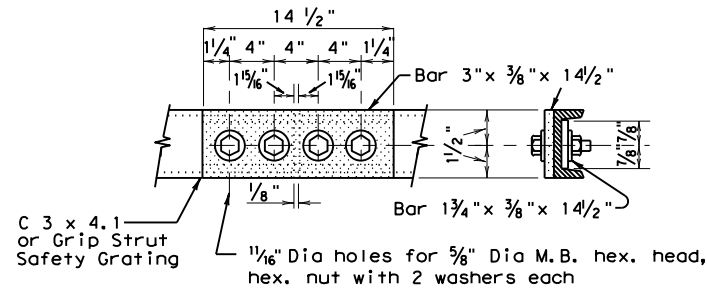
STANDARD PLANS
 TEXAS DEPARTMENT OF TRANSPORTATION
 Traffic Operations Division

SIGN WALKWAY AND HANDRAIL

SHEET 1 OF 2 **SWW(1) (MOD.)**

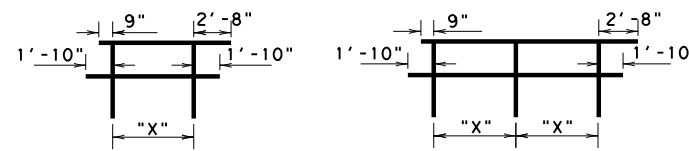
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REVISIONS						
STATE DISTRICT	FEDERAL REGION	PROJECT NO.		SHEET		
FTW	6	SEE TITLE SHEET		115		
COUNTY	CONTROL SECTION	JOB		HIGHWAY		
TARRANT	0902 00	299		VA		

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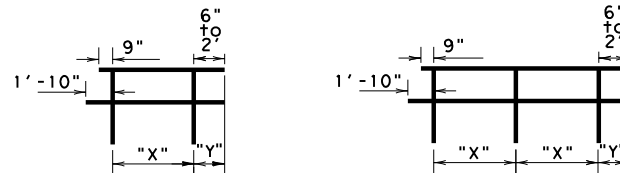
FIELD SPLICE DETAIL

(See WALKWAY ELEVATION for location; sheet 1 of 2)



"A" SECTION

"B" SECTION

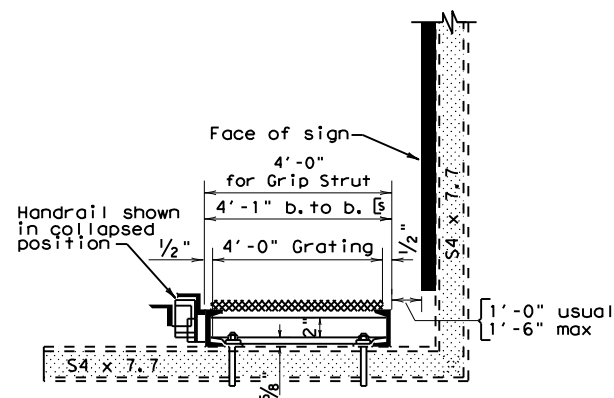


"C" SECTION

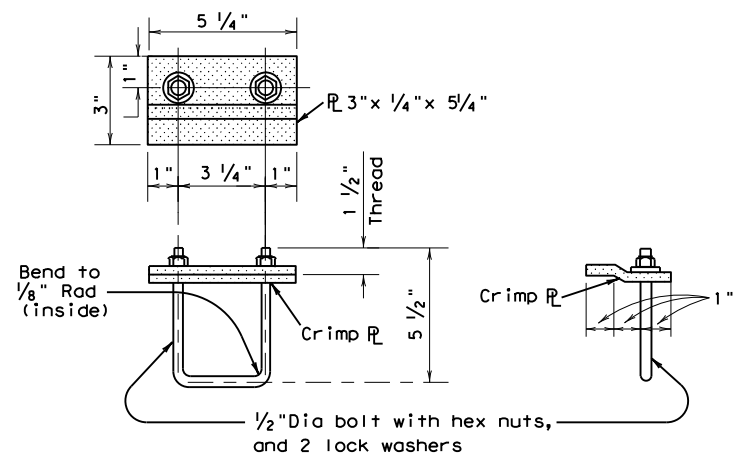
"D" SECTION

"X" dimension = 8'-0" max. See table for min dimension "X".
 "X" shall be the same for all sections in any one walkway.
 "Y" dimension = 6" usual, but variable between 6" and 2'-0" to obtain maximum dimension for "X" in even inches.

TYPICAL OF HANDRAIL SECTION

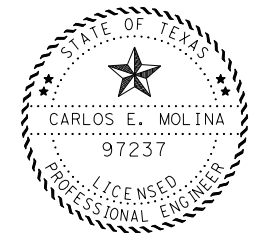


END VIEW OF WALKWAY



U-BOLT AND CLAMP DETAIL

WALKWAY LENGTH	MINIMUM "X" DIMENSION	REQUIRED NO. OF SECTIONS			
		"A"	"B"	"C"	"D"
7'-6" to 12'-0"	1 @ 5'-0"	~	~	1	~
12'-6" to 20'-0"	2 @ 5'-0"	~	~	~	1
20'-6" to 24'-6"	2 @ 6'-9"	1	~	1	~
25'-0" to 32'-6"	3 @ 6'-0"	~	1	1	~
33'-0" to 40'-6"	4 @ 6'-6"	~	1	~	1
41'-0" to 45'-0"	4 @ 7'-4 1/2"	1	1	1	~
45'-6" to 53'-0"	5 @ 6'-9"	~	2	1	~
53'-6" to 61'-0"	6 @ 7'-0"	~	2	~	1
61'-6" to 73'-6"	7 @ 6'-6"	~	3	1	~
74'-0" to 81'-6"	8 @ 7'-3"	~	3	~	1
82'-0" to 94'-0"	9 @ 6'-10"	~	4	1	~
94'-6" to 102'-0"	10 @ 7'-4"	~	4	~	1
102'-6" to 114'-6"	11 @ 7'-0"	~	5	1	~
115'-0" to 122'-6"	12 @ 7'-6"	~	5	~	1



Carlos E. Molina

04/23/2024

STANDARD PLANS
 TEXAS DEPARTMENT OF TRANSPORTATION
 Traffic Operations Division

SIGN WALKWAY AND HANDRAIL

SWW(1) (MOD.)

SHEET 2 OF 2

ORIG DRAW DATE: 2-82	DN: -	CK: -	DN: -	CK: -	NEG NO.:
REVISIONS					
STATE DISTRICT	FEDERAL REGION	PROJECT NO.		SHEET	
FTW 6	SEE TITLE SHEET	116			
COUNTY	CONTROL SECTION	JOB	HIGHWAY		
TARRANT	0902 00	299	VA		

DN:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CK:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
DW:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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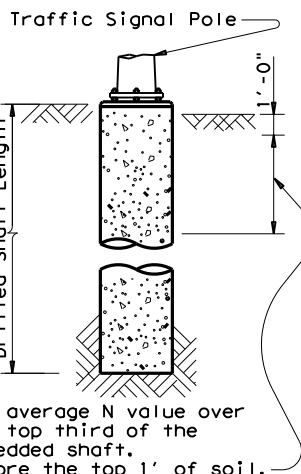
FOUNDATION DESIGN TABLE

FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		EMBEDDED DRILLED SHAFT LENGTH-ft (4, 5, 6)			ANCHOR BOLT DESIGN (1)			FOUNDATION DESIGN LOAD (2)		TYPICAL APPLICATION	
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N Blows/ft			ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft		SHEAR Kips
				10	15	40							
24-A	24"	4- #5	#2 at 12"	5.7	5.3	4.5	3/4"	36	12 3/4"	1	10	1	Pedestal pole, pedestal mounted controller.
30-A	30"	8- #9	#3 at 6"	11.3	10.3	8.0	1 1/2"	55	17"	2	87	3	Mast arm assembly. (see Selection Table)
36-A	36"	10- #9	#3 at 6"	13.2	12.0	9.4	1 3/4"	55	19"	2	131	5	Mast arm assembly. (see Selection Table) 30' strain pole with or without luminaire.
36-B	36"	12- #9	#3 at 6"	15.2	13.6	10.4	2"	55	21"	2	190	7	Mast arm assembly. (see Selection Table) Strain pole taller than 30' & strain pole with mast arm
42-A	42"	14- #9	#3 at 6"	17.4	15.6	11.9	2 1/4"	55	23"	2	271	9	Mast arm assembly. (see Selection Table)

FOUNDATION SELECTION TABLE FOR STANDARD MAST ARM PLUS ILSN SUPPORT ASSEMBLIES (ft)

WIND SPEED	MAX SINGLE ARM LENGTH	FDN 30-A	FDN 36-A	FDN 36-B	FDN 42-A
		80 MPH DESIGN	32'	48'	
80 MPH DESIGN	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	24' X 24'			
		28' X 28'			
		32' X 28'			
			32' X 32'		
			36' X 36'		
		40' X 36'			
		44' X 28'			
			44' X 36'		
100 MPH DESIGN	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS		36'		
				44'	
				32' X 32'	
				36' X 36'	
				40' x 24'	40' X 36'
			44' x 36'		

- EXAMPLE:
- For 80mph design wind speed, foundation 30-A can support up to a 32' arm with another arm up to 28'
 - For 100mph design wind speed, foundation 36-A can support a single 36' mast arm.



NOTES:

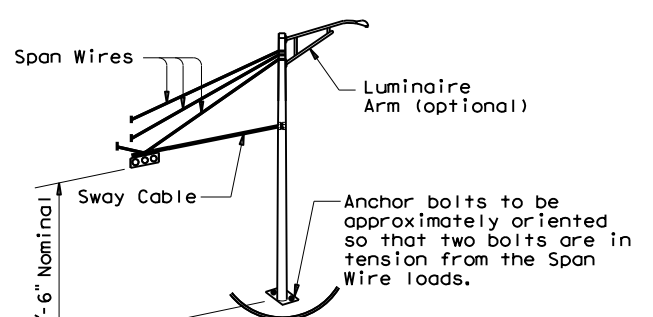
- Anchor bolt design develops the foundation capacity given under Foundation Design Loads.
- Foundation Design Loads are the allowable moments and shears at the base of the structure.
- Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.
- Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.
- If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.
- Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

FOUNDATION SUMMARY TABLE (3)

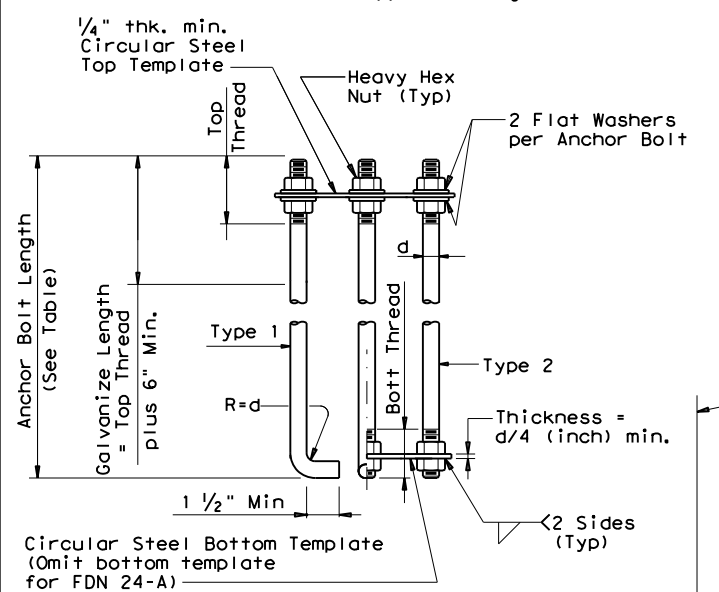
LOCATION IDENTIFICATION	AVG. N BLOW /ft.	FDN TYPE	NO. EA	DRILLED SHAFT LENGTH (6) (FEET)						
				24-A	30-A	36-A	36-B	42-A		
TOTAL DRILLED SHAFT LENGTHS										

BOLT DIA IN.	(7) BOLT LENGTH	TOP THREAD	BOTTOM THREAD	BOLT CIRCLE	R2	R1
3/4"	1'-6"	3"		12 3/4"	7 1/8"	5 5/8"
1 1/2"	3'-4"	6"	4"	17"	10"	7"
1 3/4"	3'-10"	7"	4 1/2"	19"	11 1/4"	7 3/4"
2"	4'-3"	8"	5"	21"	12 1/2"	8 1/2"
2 1/4"	4'-9"	9"	5 1/2"	23"	13 3/4"	9 1/4"

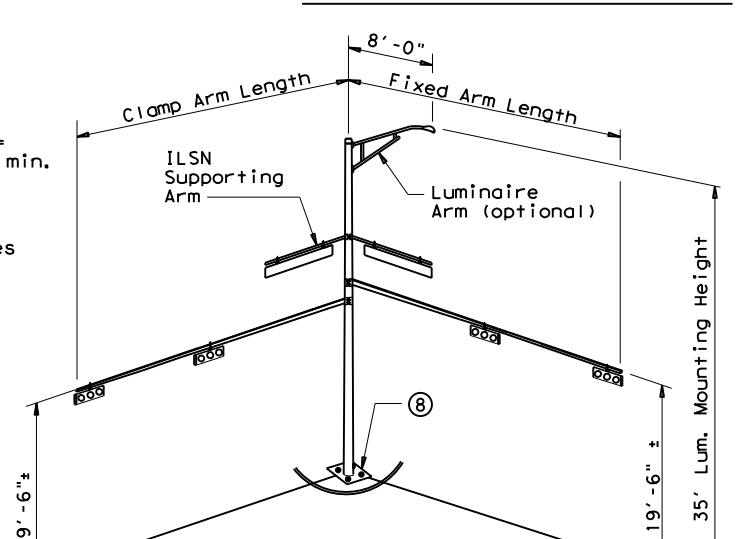
(7) Min dimensions given, longer bolts are acceptable.



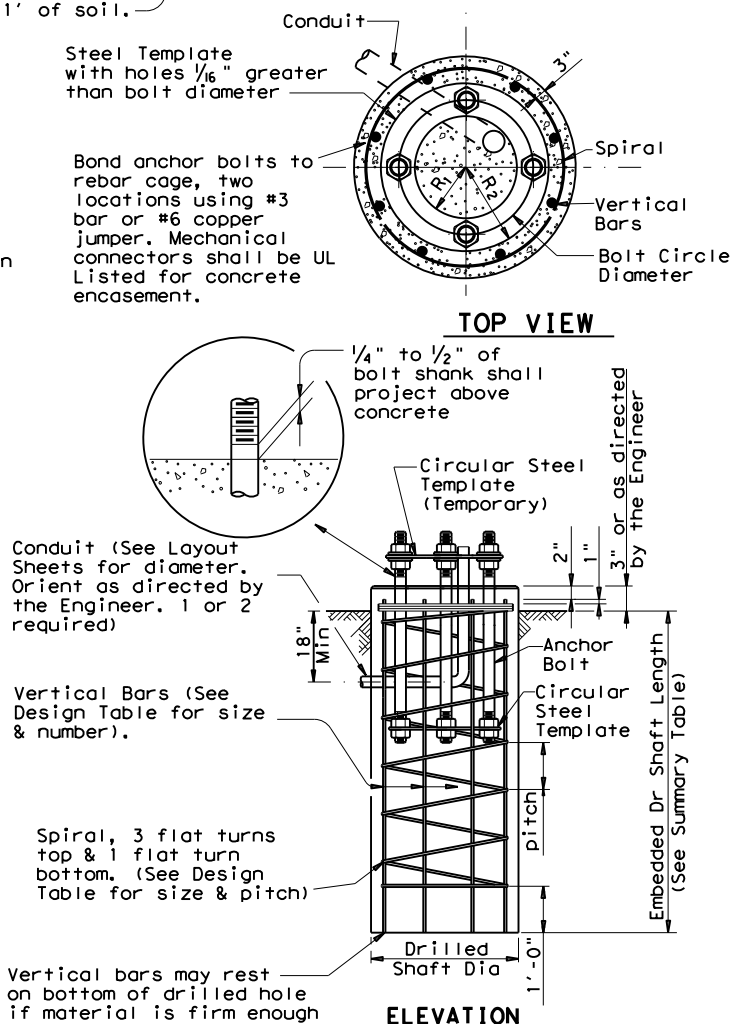
TYPICAL STRAIN POLE ASSEMBLY



ANCHOR BOLT ASSEMBLY



TYPICAL MAST ARM ASSEMBLY



FOUNDATION DETAILS

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and interim revisions thereto.

Reinforcing steel shall conform to Item 440, "Reinforcing Steel".
Concrete shall be Class "C".

Threads for anchor bolts and nuts shall be rolled or cut threads of 8UN series up to 2" in diameter or UNC series for all sizes. Bolts and nuts shall have Class 2A and 2B fit tolerances. Galvanized nuts shall be tapped after galvanizing.

Anchor bolts that are larger than 1" in diameter shall conform to "alloy steel" or "medium-strength mild steel" per Item 449, "Anchor Bolts". Anchor bolts that are 1" in diameter or less shall conform to ASTM A36. Galvanize a minimum of the top end thread length plus 6" for all anchor bolts unless otherwise noted. Exposed washers and exposed nuts shall be galvanized. All galvanizing shall be in accordance with Item 445, "Galvanizing".

Templates and embedded nuts need not be galvanized. Lubricate and tighten anchor bolts when erecting the structure in accordance with Item 449, "Anchor Bolts".

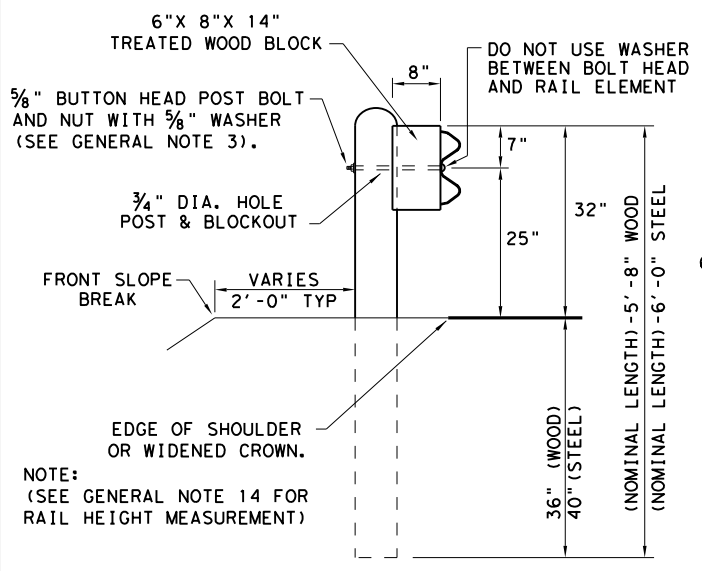


TRAFFIC SIGNAL POLE FOUNDATION

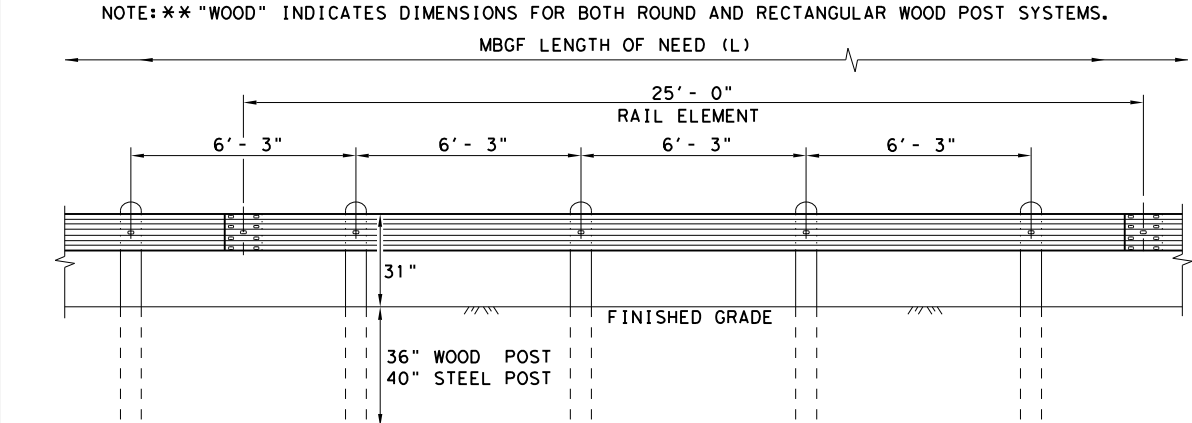
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© TxDOT August 1995		DN: MS	CK: JSY	DW: MAQ/MMF	CK: JSY/TEB
REVISIONS		CONT	SECT	JOB	HIGHWAY
0902	00	299			VA
DIST	COUNTY	SHEET NO.			
FTW	TARRANT	117			

DATE: 4/9/2024
 FILE: T:\TRAFFIC\ITS\0902-00-299 Non-Site Specific\MBGF\GF (31)-19.dgn
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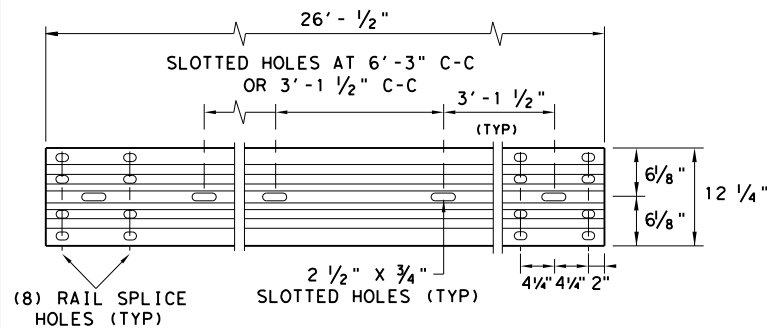


TYPICAL POST PLACEMENT



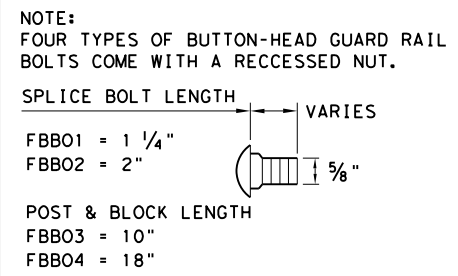
ELEVATION MID-SPAN RAIL SPLICE

SHOWING A 25'-0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



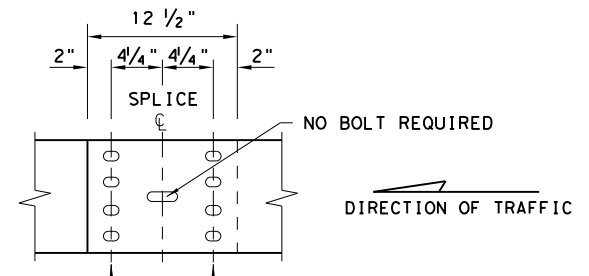
ELEVATION 25'-0" (NOM.) W-BEAM SECTION

NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES. SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.



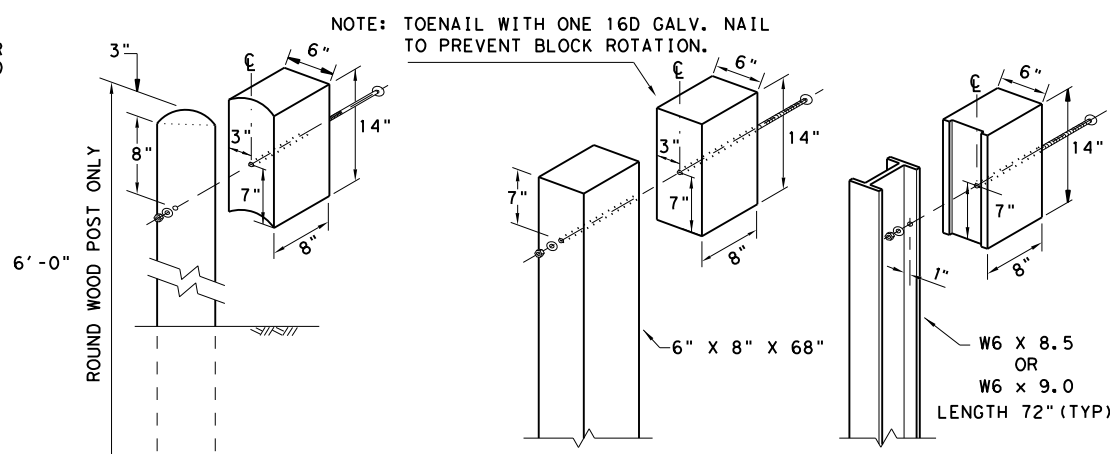
BUTTON HEAD BOLT

NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.



MID-SPAN RAIL SPLICE DETAIL

NOTE: GF(31), MID-SPAN RAIL SPLICES ARE REQUIRED WITH 6'-3" POST SPACINGS.



WOOD BLOCK TO RECTANGULAR WOOD POST

ROUTED WOOD BLOCK TO I-BEAM STEEL POST

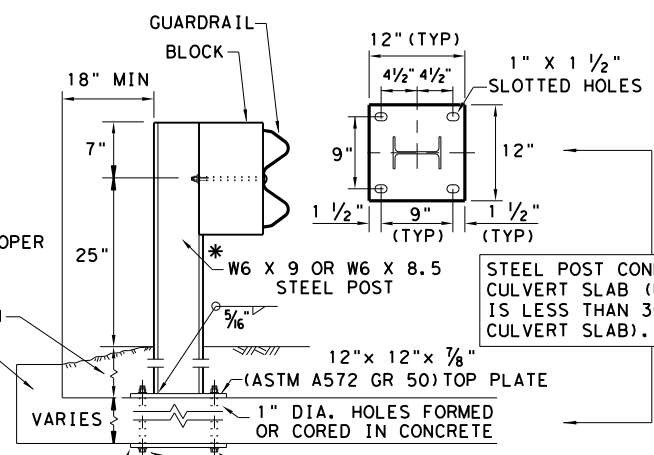
WOOD BLOCK TO ROUND WOOD POST

ROUTED WOOD BLOCK TO I-BEAM STEEL POST

WOOD BLOCK TO ROUND WOOD POST

NOTE: **WOOD INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.

DIRECTION OF TRAFFIC



LOW FILL CULVERT POST

12" x 12" x 1/4" (ASTM A36) STEEL BOTTOM PLATE WITH 1" DIA. HOLES REQUIRED WITH BOLT-THROUGH INSTALLATION.

- BOLT-THROUGH OPTION:** REQUIRES A 6" MIN. SLAB THICKNESS. 7/8" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS. NOTE: BOLT LENGTH = SLAB PLUS 2 1/4" MIN.
- EPOXY ANCHOR OPTION:** THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE 7/8" DIA. ASTM A449 OR A193 GRADE B7 WITH HEAVY HEX NUT, AND ONE HARDENED WASHER EACH. EMBED ANCHOR RODS 6" WITH HILTI HIT RE 500 EPOXY ADHESIVE. OTHER TYPE III CLASS C EPOXY ADHESIVES MEETING THE REQUIREMENTS OF DMS-6100, "EPOXIES AND ADHESIVES", MAY BE USED IF IT CAN BE DEMONSTRATED THAT THEY MEET OR EXCEED THE STRENGTH OF HILTI HIT RE 500 WITH THE SAME EMBEDMENT DEPTH AND THREADED ROD DIA. FOLLOW THE MANUFACTURER'S REQUIREMENTS FOR INSTALLING EPOXIED THREADED RODS. EXTEND RODS 1/4" MIN. BEYOND NUT.

NOTE: CULVERTS OF 25 FT. OR LESS, SEE GF(31)LS STANDARD FOR "LONG SPAN" OPTION.

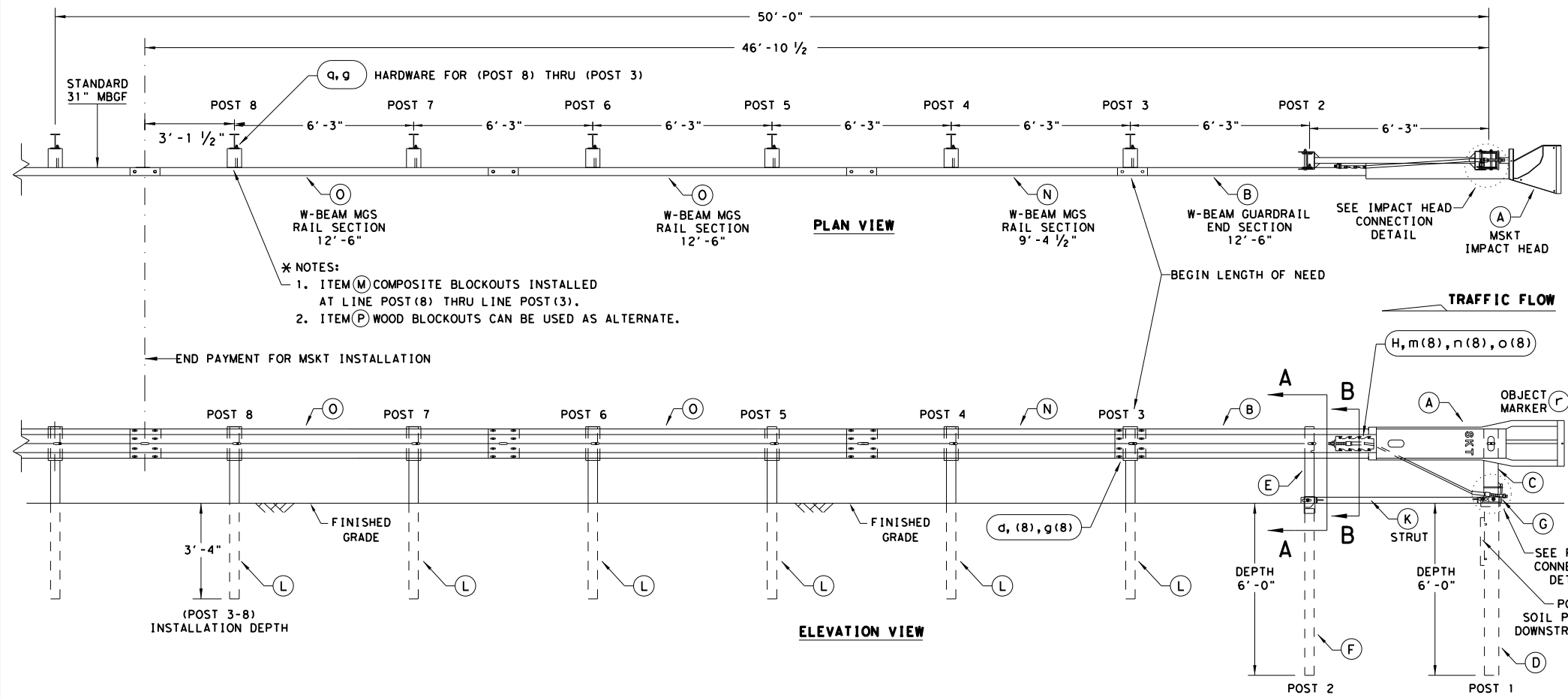
GENERAL NOTES

- THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
- RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25'-0", OR 12'-6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'-1 1/2" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE DOWNSTREAM ANCHOR TERMINAL (DAT) AND THE TRANSITION SECTIONS OF GUARDRAIL.
- BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND 3/8" WASHER (FWC16G) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
- FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
- CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
- THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
- IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
- UNLESS OTHERWISE SHOWN IN THE PLANS, GUARD FENCE PLACED IN THE VICINITY OF CURBS SHALL BE POSITIONED SO THAT THE FACE OF CURB IS LOCATED DIRECTLY BELOW OR BEHIND THE FACE OF THE RAIL. RAIL PLACED OVER CURBS SHALL BE INSTALLED SO THAT THE POST BOLT IS LOCATED APPROXIMATELY 25 INCHES ABOVE THE GUTTER PAN OR EDGE OF SHOULDER.
- APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. IF SOLID ROCK IS ENCOUNTERED WITHIN 0 TO 18" OF THE FINISHED GRADE, DRILL A 24" DIA. HOLE, 24" INTO THE ROCK. IF SOLID ROCK IS ENCOUNTERED BELOW 18", DRILL A 12" DIA. HOLE, 12" INTO THE ROCK OR TO THE STANDARD EMBEDMENT DEPTH, WHICHEVER MAYBE LESS. ANY EXCESS POST LENGTH, AFTER MEETING THESE DEPTHS, MAY BE FIELD CUT TO ENSURE PROPER GUARDRAIL MOUNTING HEIGHT. BACKFILL WITH COARSE AGGREGATE MATERIAL.
- POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
- SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 150 FT. RADIUS.
- UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210 ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
- FOR THE LOW FILL CULVERT OPTION, POSTS LOCATED PARTIALLY OR WHOLLY BETWEEN PRECAST BOX CULVERT UNITS, THE USE OF A CAST-IN-PLACE CONCRETE CLOSURE BETWEEN BOXES IS REQUIRED. THE LENGTH OF THE CAST-IN-PLACE CONCRETE CLOSURE SHALL ACCOMMODATE THE PLACEMENT OF THE LOW FILL CULVERT OPTION. SEE CONCRETE CLOSURE DETAILS ON BRIDGE STANDARD SCP-MD.
- GUARDRAIL HEIGHT MEASUREMENT: WHEN THE GUARDRAIL IS LOCATED ABOVE PAVEMENT, MEASURE THE HEIGHT FROM THE PAVEMENT TO THE TOP OF THE W-BEAM RAIL. WHEN THE GUARDRAIL IS LOCATED UP TO 2 FT. OFF OF THE EDGE OF PAVEMENT OR FOR A PAVEMENT OVERLAY, USE A 10-FOOT STRAIGHTEDGE TO EXTEND THE PAVEMENT/SOULDER SLOPE TO THE BACK OF RAIL, MEASURE FROM THE BOTTOM OF STRAIGHTEDGE TO THE TOP OF RAIL. FOR GUARDRAIL LOCATED DOWN A 10:1 SLOPE, MEASURE FROM THE NOMINAL TERRAIN.

NOTE: TRANSITIONS TO BRIDGE RAILS OR TRAFFIC BARRIERS. SEE GF(31)TL3 TR STANDARD FOR HIGH-SPEED TL-3 TRANSITIONS. SEE GF(31)TL2 TR STANDARD FOR LOW-SPEED TL-2 TRANSITIONS.

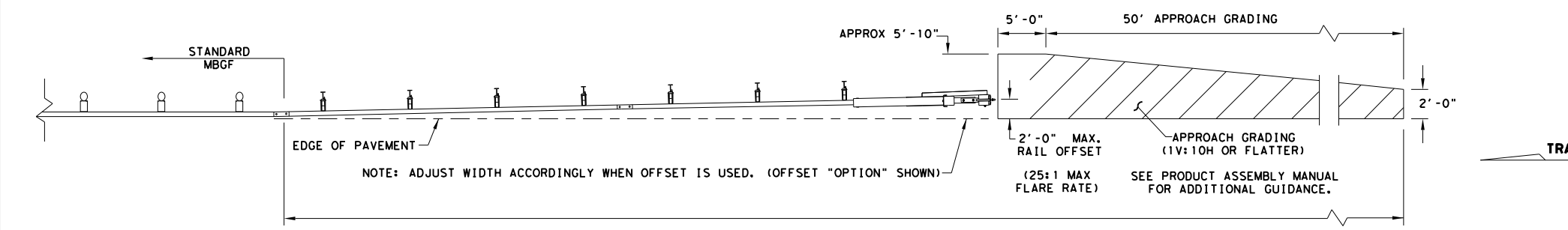
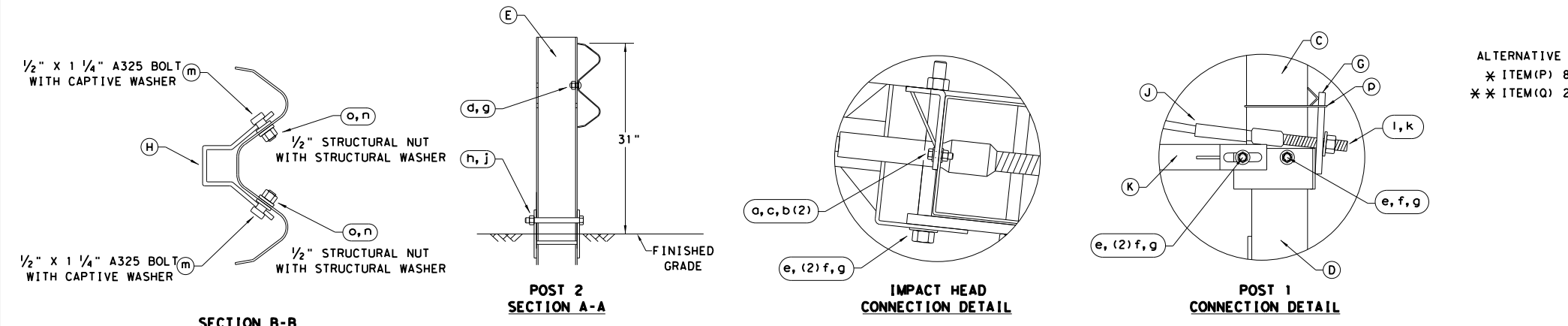
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METAL BEAM GUARD FENCE TL-3 MASH COMPLIANT GF (31)-19				
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© TXDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	00	299	VA
	DIST	COUNTY	SHEET NO.	
	FTW	TARRANT	118	

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- GENERAL NOTES**
- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: ROAD SYSTEMS, INC. (432)263-2435. 3616 OLD HOWARD COUNTY AIRPORT, BIG SPRING, TX 79720
 - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE: MSKT END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL (PUBLICATION-062717).
 - APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
 - FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
 - HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
 - SYSTEM SHOWN USING STEEL WIDE FLANGE POSTS WITH COMPOSITE BLOCKOUTS.
 - A COMPOSITE MATERIAL BLOCKOUTS THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS OF SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
 - IF SOLID ROCK IS ENCOUNTERED IN THE AREA OF (POST 1) AND / OR (POST 2) CONTACT THE MANUFACTURER, & REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
 - POSTS SHALL NOT BE SET IN CONCRETE.
 - SYSTEM MUST BE ATTACHED TO STANDARD 31" MBGF.
 - UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE MSKT SYSTEM BE CURVED.
 - A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCRoACHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.
 - THE SYSTEM IS SHOWN WITH TWO 12'-6" MBGF PANELS, ONE 25'-0" MBGF PANEL IS ALSO ALLOWED IN ITS PLACE.
 - A DRIVING CAP WITH A TIMBER OR PLASTIC INSERT SHALL BE USED WHEN DRIVING POSTS 3-8 TO PREVENT DAMAGE TO THE GALVANIZING ON TOP OF THE POST. SPECIAL DRIVING CAP TO BE USED ON LOWER POSTS 1 & 2 TO PREVENT DAMAGE TO THE WELDED PLATES.

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Go.	SF1303
C	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6X9 OR W6X8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 1/2")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
SMALL HARDWARE			
o	2	5/8" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	5/8" WASHER	W0516
c	2	5/8" HEX NUT	N0516
d	25	5/8" Dia. x 1 1/4" SPLICE BOLT (POST 2)	B580122
e	2	5/8" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	5/8" WASHER	W050
g	33	5/8" Dia. H.G.R NUT	N050
h	1	3/4" Dia. x 8 1/2" HEX BOLT (GRD A449)	B340854A
j	1	3/4" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	1/2" x 1 1/4" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	1/2" STRUCTURAL NUTS	N012A
o	8	1 1/8" O.D. x 3/8" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	5/8" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151



NOTE: TXDOT GENERIC APPROACH GRADING LAYOUT USED FOR ALL TANGENT TYPE END TREATMENTS.

NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE MSKT END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.


 Design Division Standard

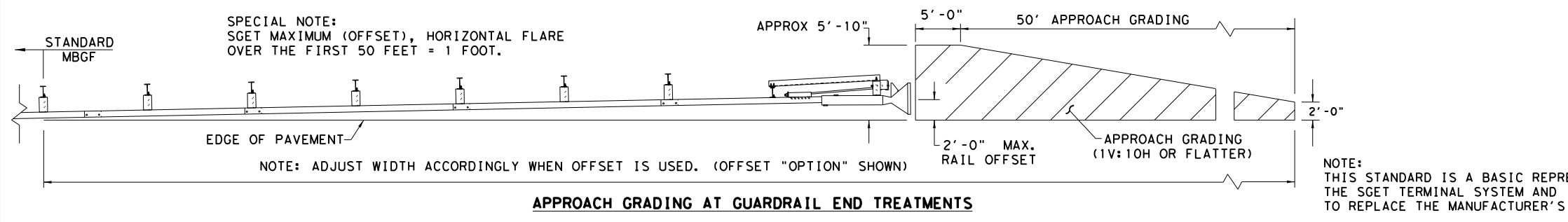
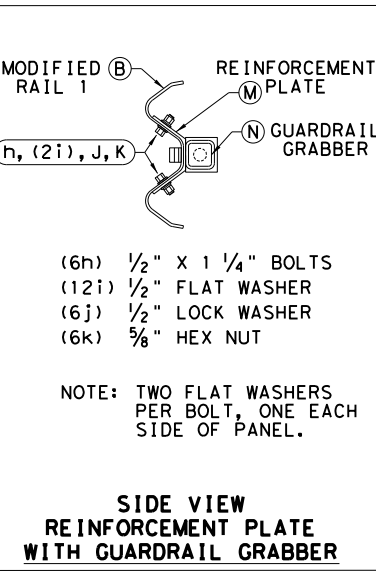
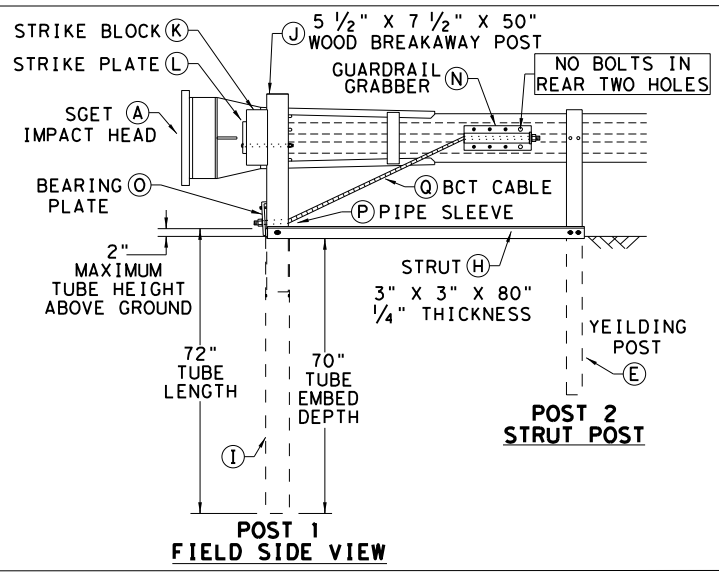
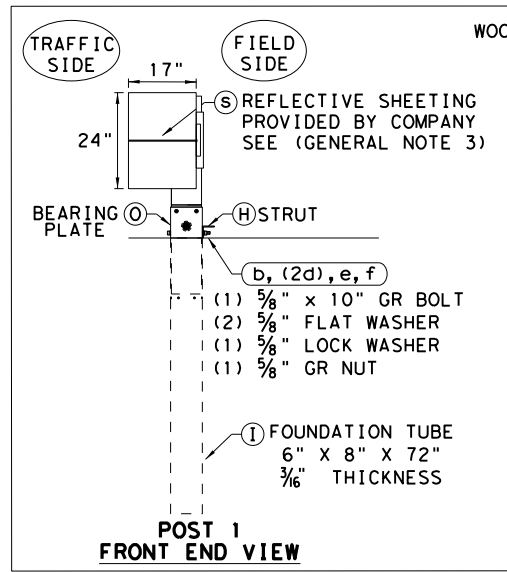
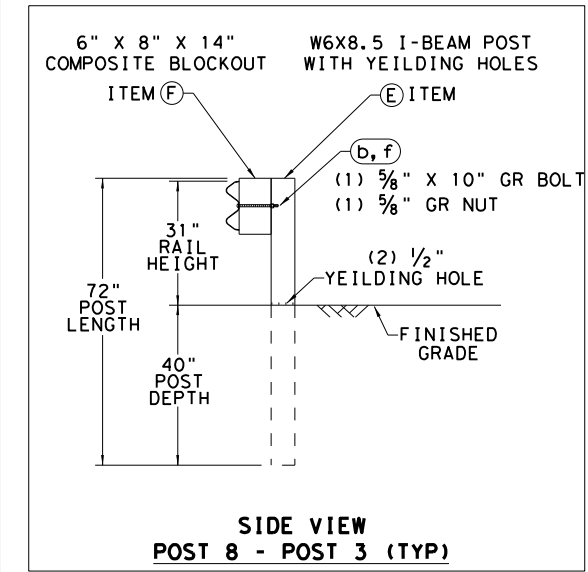
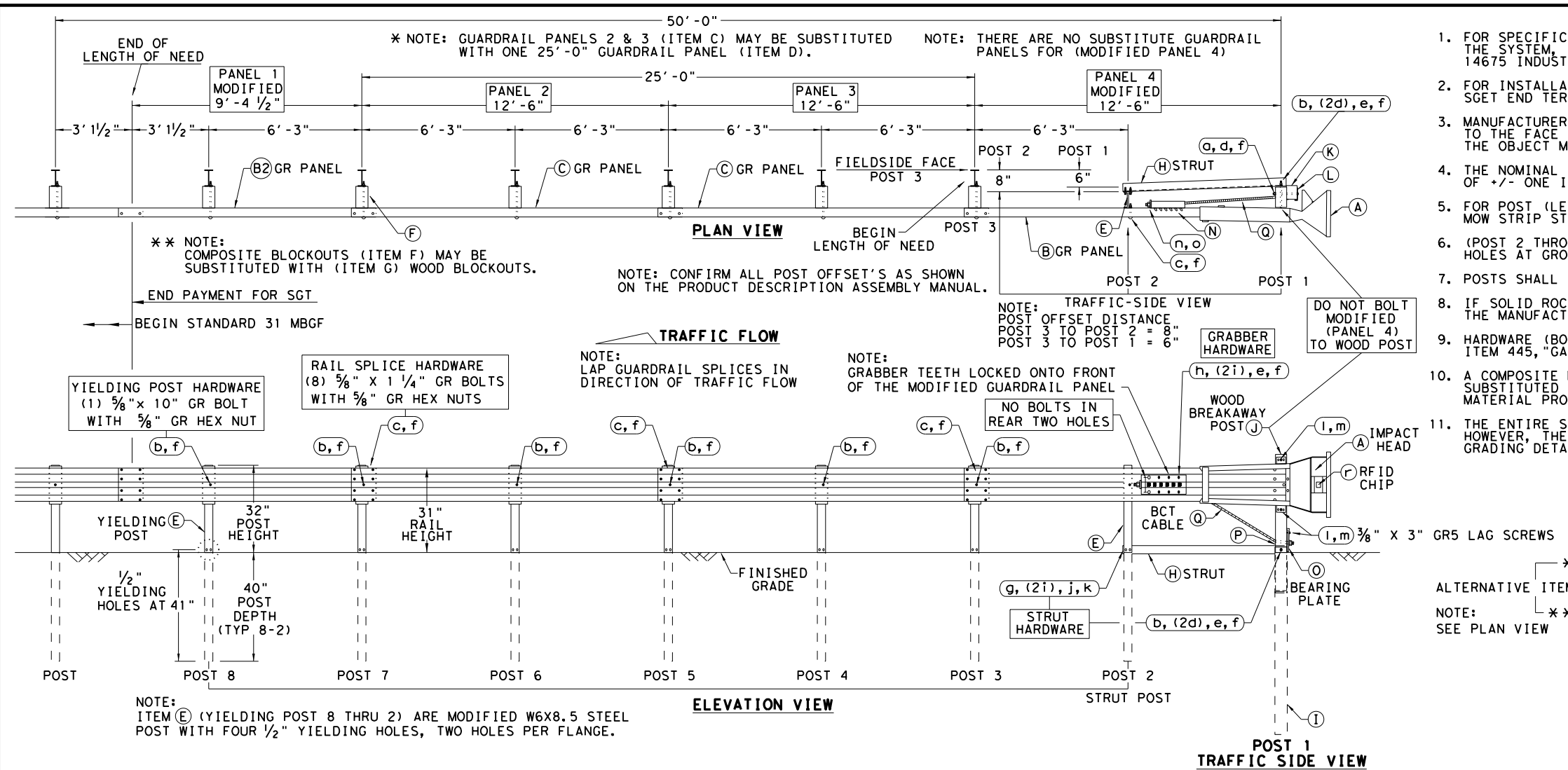
SINGLE GUARDRAIL TERMINAL

MSKT-MASH-TL-3

SGT (12S) 31-18

FILE: sgt12s3118.dgn	DN: TXDOT	CK: KM	DW: VP	CK: CL
© TXDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	00	299	VA
	DIST	COUNTY	SHEET NO.	
	FTW	TARRANT	119	

DATE: 4/9/2024
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 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.



- ### GENERAL NOTES
- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
 - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL.
 - MANUFACTURER WILL APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" TO THE FACE PLATE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. THE OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
 - THE NOMINAL HEIGHT OF THE GUARDRAIL BEAM IS 31 INCHES WITH A TOLERANCE OF +/- ONE INCH.
 - FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
 - (POST 2 THROUGH POST 8) ARE MODIFIED STEEL-YIELDING POSTS WITH YIELDING HOLES AT GROUND LEVEL. THERE ARE NO SUBSTITUTE POSTS.
 - POSTS SHALL NOT BE SET IN CONCRETE.
 - IF SOLID ROCK IS ENCOUNTERED FOR ANY OF THE POSTS IN THE SYSTEM, CONTACT THE MANUFACTURER FOR SPECIFIC INSTALLATION GUIDANCE.
 - HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
 - A COMPOSITE MATERIAL BLOCKOUT THAT MEETS DMS-7210 REQUIREMENTS MAY BE SUBSTITUTED FOR AN APPROVED WOOD BLOCKOUT. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
 - THE ENTIRE SYSTEM MUST BE INSTALLED IN A STRAIGHT LINE WITHOUT ANY CURVE. HOWEVER, THE SYSTEM CAN BE OFFSET BY TWO FEET AS SHOWN ON THE APPROACH GRADING DETAIL TO HELP OFF-SET THE IMPACT HEAD FROM SHOULDER OF THE ROAD.

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM #
A	1	SGET IMPACT HEAD	SIH1A
B	1	MODIFIED GUARDRAIL PANEL 12'-6" 12GA	126SPZGP
B2	1	MODIFIED GUARDRAIL PANEL 9'-4 1/2" 12GA	GP94
C	2	STANDARD GUARDRAIL PANEL 12'-6" 12GA	GP126
D	1	STANDARD GUARDRAIL PANEL 25'-0" 12GA	GP25
E	7	MODIFIED YIELDING I-BEAM POST W6x8.5	YP6MOD
F	6	COMPOSITE BLOCKOUT 6" X 8" X 14"	CBO8
G	6	WOOD BLOCKOUT 6" X 8" X 14"	WBO8
H	1	STRUT 3" X 3" X 80" X 1/4" A36 ANGLE	STR80
I	1	FOUNDATION TUBE 6" X 8" X 72" X 3/16"	FNDT6
J	1	WOOD BREAKAWAY POST 5 1/2" X 7 1/2" X 50"	WBRK50
K	1	WOOD STRIKE BLOCK	WSBK14
L	1	STRIKE PLATE 1/4" A36 BENT PLATE	SPLT8
M	1	REINFORCEMENT PLATE 12 GA. GR55	REPLT17
N	1	GUARDRAIL GRABBER 2 1/2" X 2 1/2" X 16 1/2"	GGR17
O	1	BEARING PLATE 8" X 8 5/8" X 5/8" A36	BPLT8
P	1	PIPE SLEEVE 4 1/4" X 2 3/8" O.D. (2 1/8" I.D.)	PSLV4
Q	1	BCT CABLE 3/4" X 81" LENGTH	CBL81

ITEM	QTY	SMALL HARDWARE	ITEM #
a	1	5/8" X 12" GUARDRAIL BOLT 307A HDG	12GRBLT
b	7	5/8" X 10" GUARDRAIL BOLT 307A HDG	10GRBLT
c	33	5/8" X 1 1/4" GR SPlice BOLTS 307A HDG	1GRBLT
d	3	5/8" FLAT WASHER F436 A325 HDG	58FW436
e	1	5/8" LOCK WASHER HDG	58LW
f	39	5/8" GUARDRAIL HEX NUT HDG	58HN563
g	2	1/2" X 2" STRUT BOLT A325 HDG	2BLT
h	6	1/2" X 1 1/4" PLATE BOLT A325 HDG	125BLT
i	16	1/2" FLAT WASHER F436 A325 HDG	12FWF436
j	8	1/2" LOCK WASHER HDG	12LW
k	8	1/2" HEX NUT A563 HDG	12HN563
l	4	3/8" X 3" HEX LAG SCREW GR5 HDG	38LS
m	4	3/8" FLAT WASHER F436 A325 HDG	38FW844
n	2	1" FLAT WASHER F436 A325 HDG	1FWF436
o	2	1" HEX NUT A563HD HDG	1HN563
p	1	18" TO 24" LONG ZIP TIE RATED 175-200LB	ZPT18
q	1	1 1/2" X 4" SCH-40 PVC PIPE	PSPCR4
r	1	RFID CHIP RATED MIL-STD-810F	RFID810F
s	1	IMPACT HEAD REFLECTIVE SHEETING	RS30M

Design Division Standard

SPIG INDUSTRY, LLC

SINGLE GUARDRAIL TERMINAL

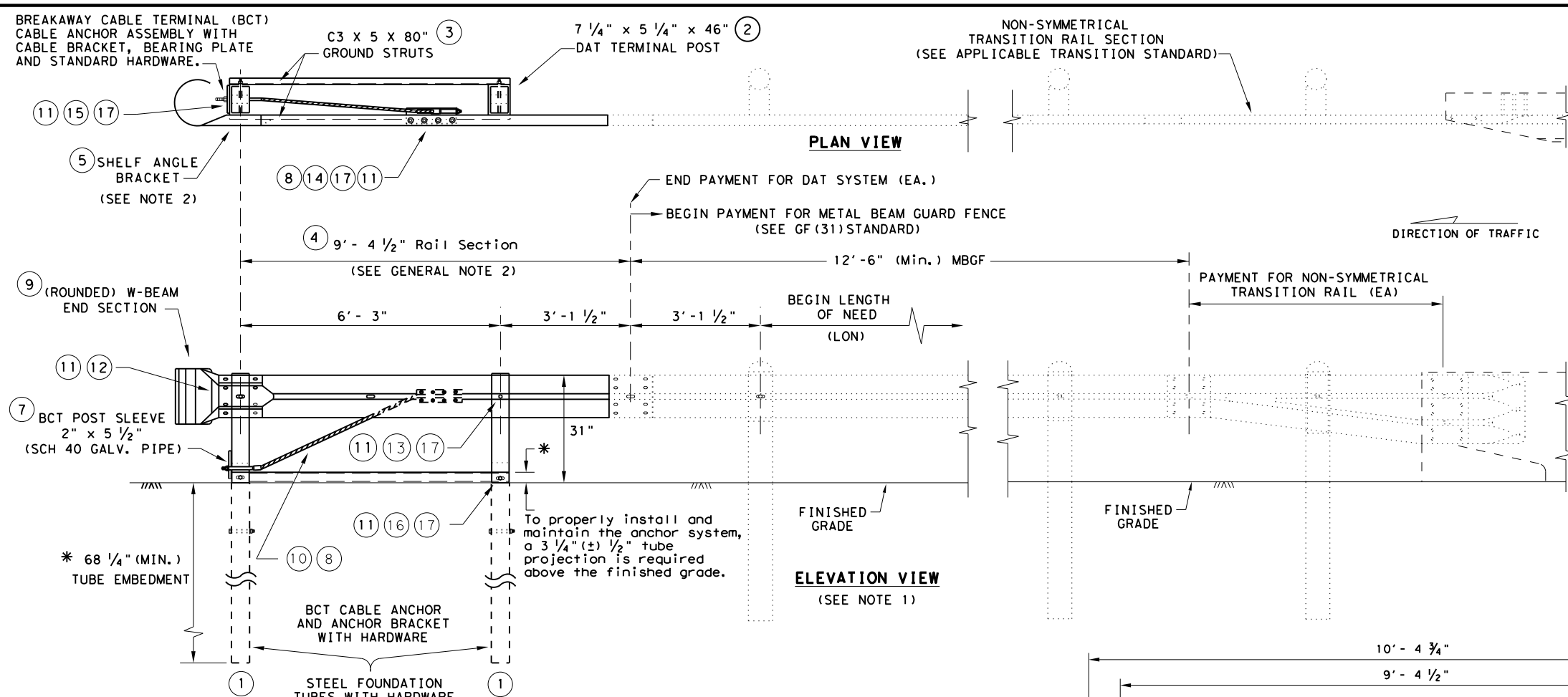
SGET - TL-3 - MASH

SGT (15)31-20

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© TXDOT: APRIL 2020	CONT: 0902	SECT: 00	JOB: 299	HIGHWAY: VA
REVISIONS	0902	00	299	VA
DIST: FTW	COUNTY: TARRANT	SHEET NO. 120		

NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE SGET TERMINAL SYSTEM AND IS NOT INTENDED TO REPLACE THE MANUFACTURER'S ASSEMBLY MANUAL.

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.

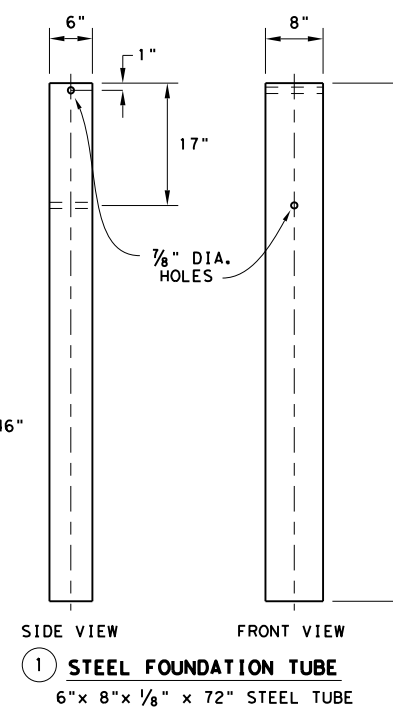
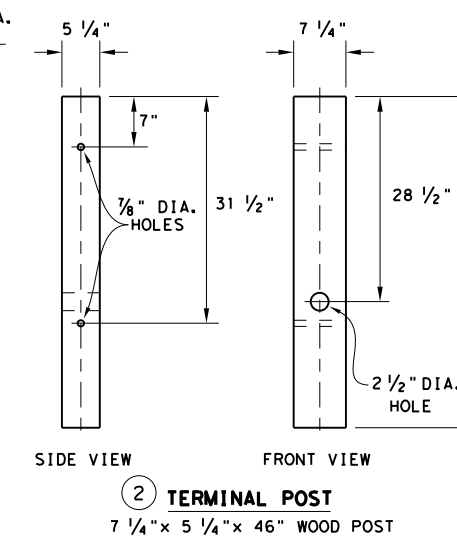
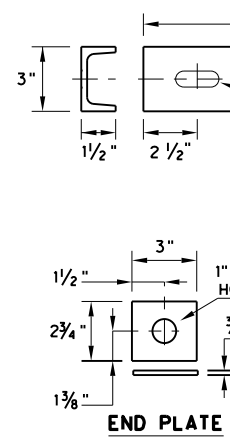
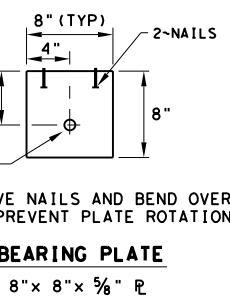
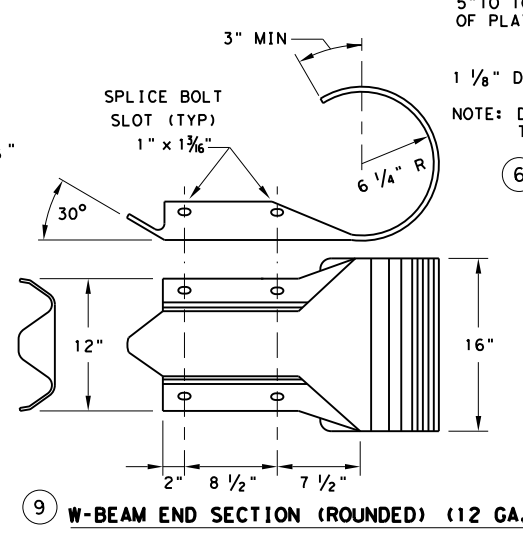
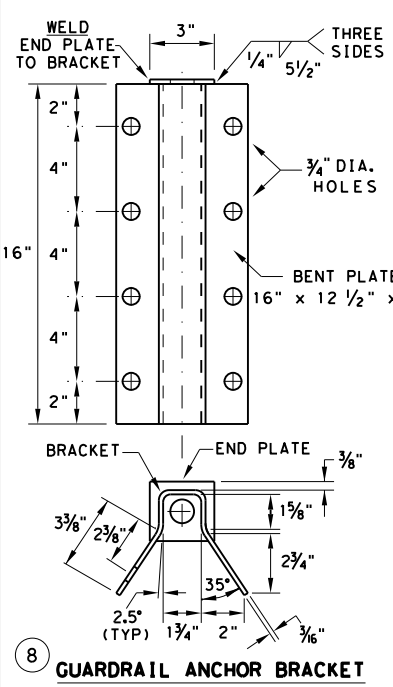
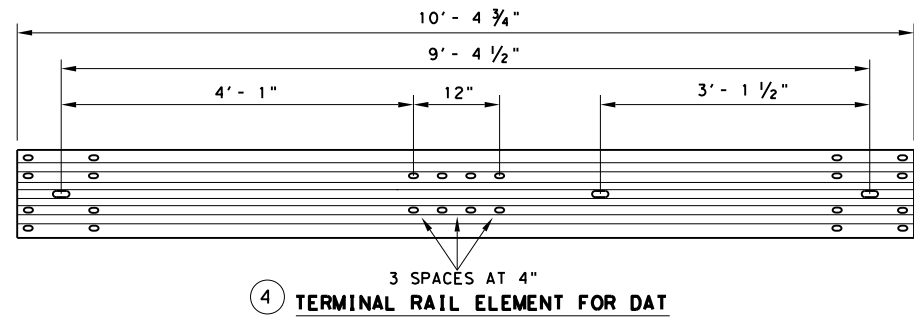


DOWNSTREAM ANCHOR TERMINAL (DAT)
 NOTE: ONLY FOR DOWNSTREAM USE, WHEN LOCATED OUTSIDE THE HORIZONTAL CLEARANCE AREA OF OPPOSING TRAFFIC.

- GENERAL NOTES**
1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
 2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
 3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN 3 3/4" ABOVE THE FINISHED GRADE.
 4. ALL HARDWARE FOR DAT SHALL BE ASTM A307 UNLESS OTHERWISE SHOWN.
 5. REFER TO GF (31) SHEET FOR TERMINAL CONNECTION DETAILS.

MOW STRIP INSTALLATION
 IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

#	(DAT) PARTS LIST	QTY
1	STEEL FOUNDATION TUBE	2
2	DAT TERMINAL POST	2
3	CHANNEL STRUT	2
4	TERMINAL RAIL ELEMENT	1
5	SHELF ANGLE BRACKET	1
6	BCT BEARING PLATE	1
7	BCT POST SLEEVE	1
8	GUARDRAIL ANCHOR BRACKET	1
9	(ROUNDED) W-BEAM END SECTION	1
10	BCT CABLE ANCHOR	1
11	RECESSED NUT, GUARDRAIL	20
12	1 1/4" BUTTON HEAD BOLT	4
13	10" BUTTON HEAD BOLT	2
14	5/8" X 2" HEX HEAD BOLT	8
15	5/8" X 8" HEX HEAD BOLT	4
16	5/8" X 10" HEX HEAD BOLT	2
17	5/8" FLAT WASHER	18



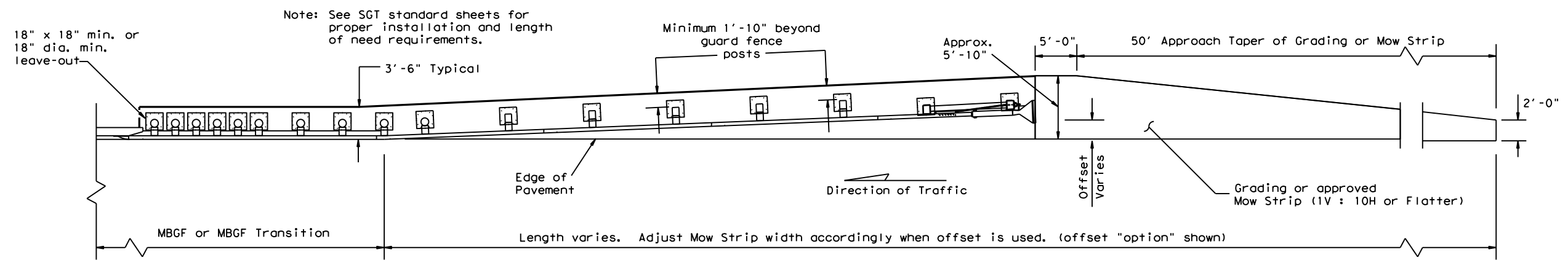
Design Division Standard

METAL BEAM GUARD FENCE
(DOWNSTREAM ANCHOR TERMINAL)
TL-3 MASH COMPLIANT
GF (31) DAT-19

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© TXDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	00	299	VA
	DIST	COUNTY	SHEET NO.	
	FTW	TARRANT	121	

DATE: 4/9/2024
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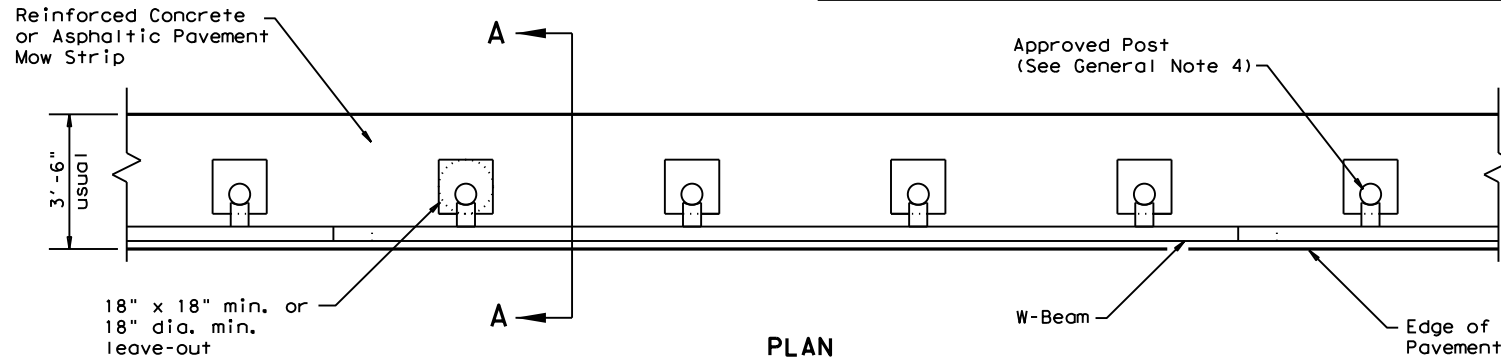
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Note: See SGT standard sheets for proper installation and length of need requirements.

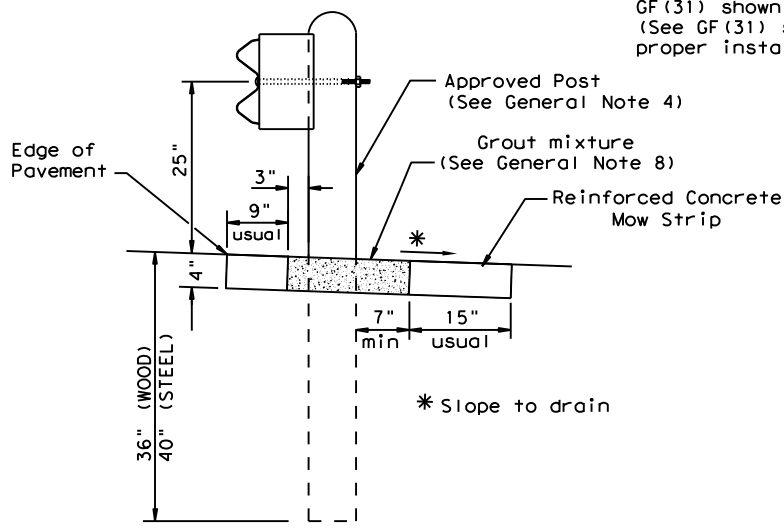
GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS

Note: Site Condition(s)
 Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.
 Approach grading or mow strip may be decreased or eliminated, as directed by the Engineer.



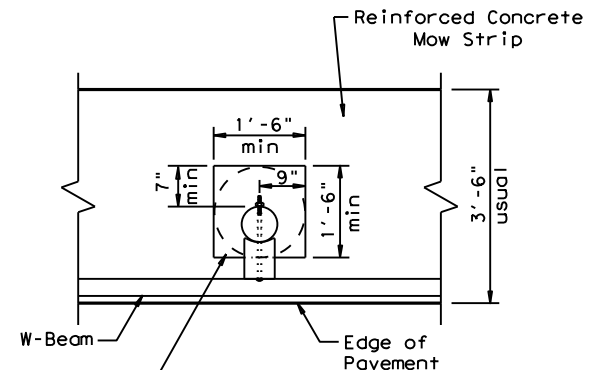
PLAN

GF(31) shown with Mow Strip (See GF(31) standard sheet for proper installation)



SECTION A-A

Typical

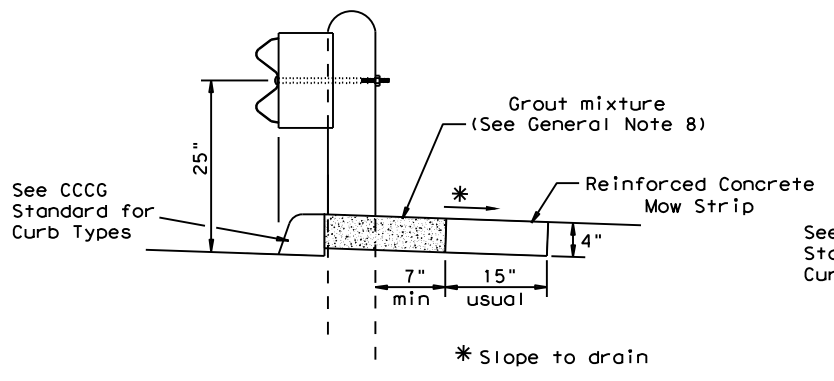


MOW STRIP DETAIL

Reinforced Concrete Mow Strip with 18" x 18" Square or 18" Dia. minimum leave-out.

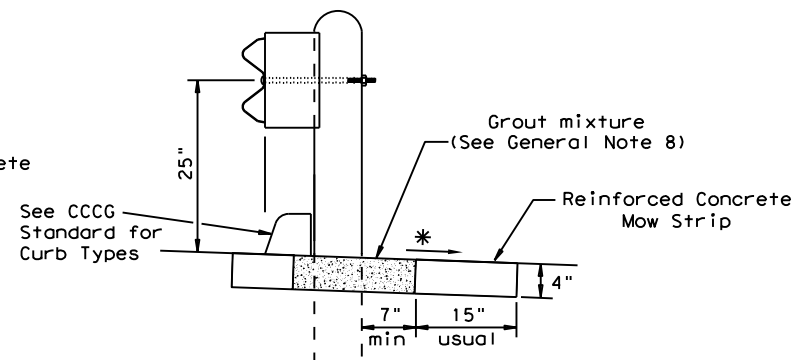
Fill leave-out with Grout mixture (See General Note 8)

- GENERAL NOTES**
1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments. See applicable GF(31) MBGF or GF(31) Transition Standard sheet for additional information.
 2. Mow strips shall be reinforced concrete with (wire mesh or synthetic fiber), as shown on the plans and will be paid for under the pertinent bid item. Reinforced concrete shall be placed in accordance with Item 432, "Riprap." The use of the synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Material Producer List (MPL), maintained by TxDOT, Construction Division.
 3. The leave-out behind the post shall be a minimum of 7".
 4. Only steel (W6 x 8.5 or W6 x 9.0), or 7 1/2" Dia. round wood posts are acceptable for use in the mow strip. See GF(31) Standard for additional details.
 5. Other curb placement options may be used. Curbs are not considered part of the mow strip and will be paid for under other pertinent bid item.
 6. Thickness of the mow strip will be 4".
 7. The limits of payment for reinforced concrete will include leave-outs for the posts.
 8. The leave-outs shall be filled with a Grout mixture consisting of: 2719 pounds sand, 188 pounds Type I or II cement, and 550 pounds of water per cubic yard, with a 28-day compressive strength of approximately 230 psi or less. Provide grout with a consistency that will flow into and completely fill all voids. Due to auger size, larger leave-out dimensions are acceptable from both an impact performance and maintenance repair standpoint (Suggested Maximum leave-out of 20"). Payment for furnishing and placing the grout mixture will be subsidiary to the pay item of riprap mow strip.



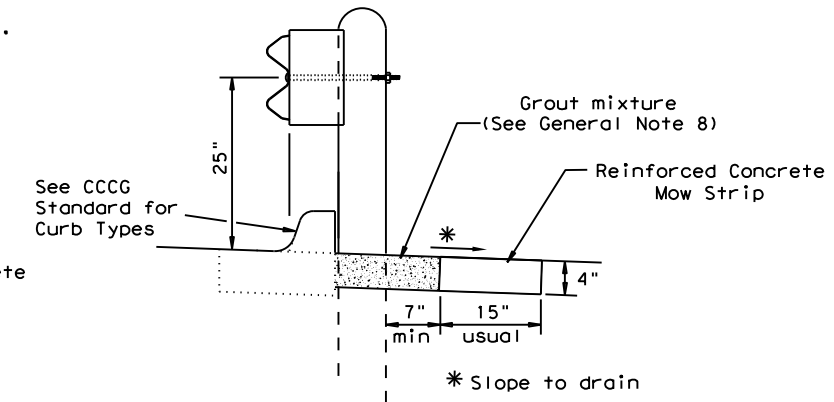
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

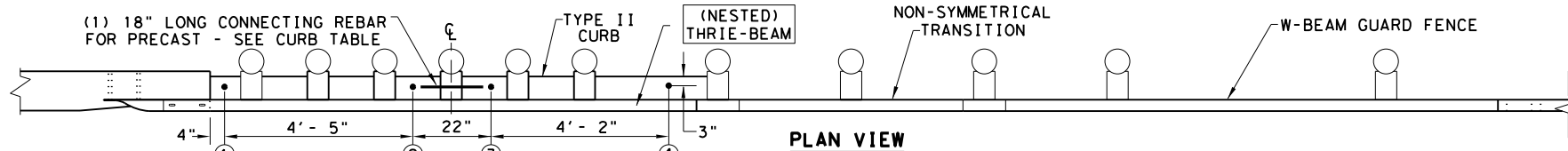
Curb shown on top of mow strip



CURB OPTION (3)

		Design Division Standard	
METAL BEAM GUARD FENCE (MOW STRIP) TL-3 MASH COMPLIANT GF(31)MS-19			
FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP
© TXDOT: NOVEMBER 2019	CONT	SECT	JOB
REVISIONS	0902 00	299	VA
	DIST	COUNTY	SHEET NO.
	FTW	TARRANT	122

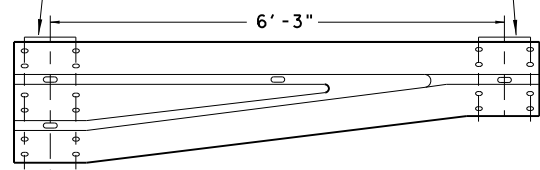
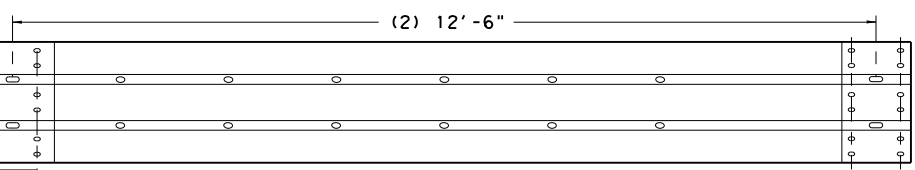
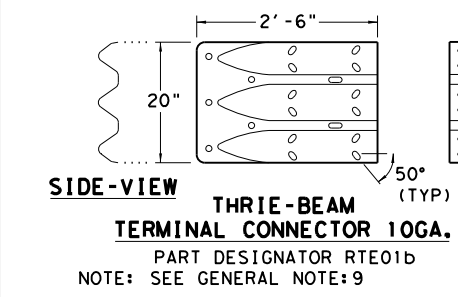
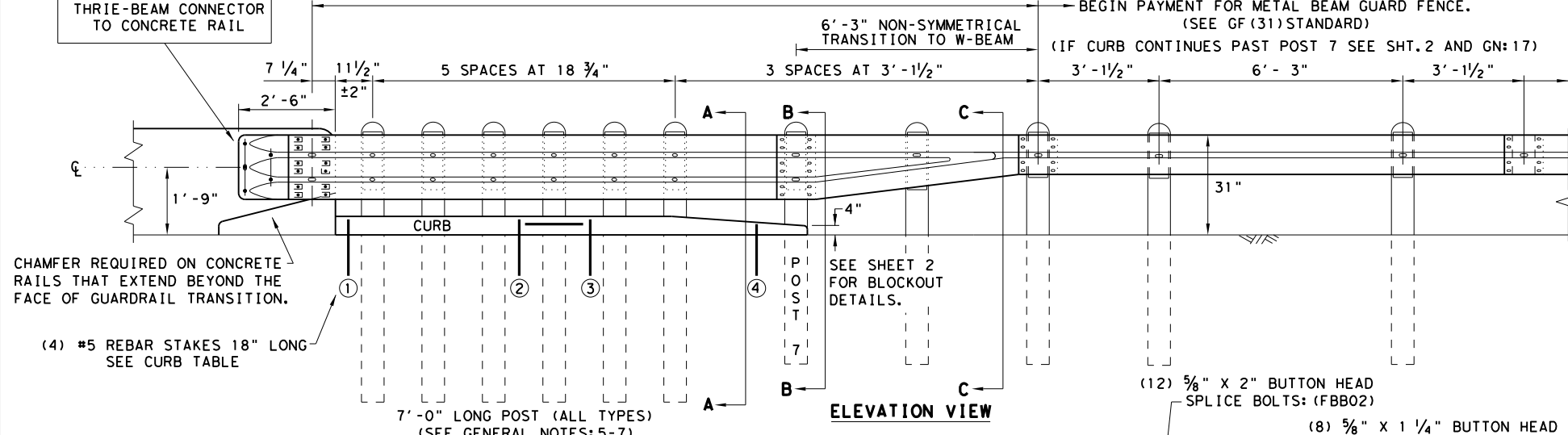
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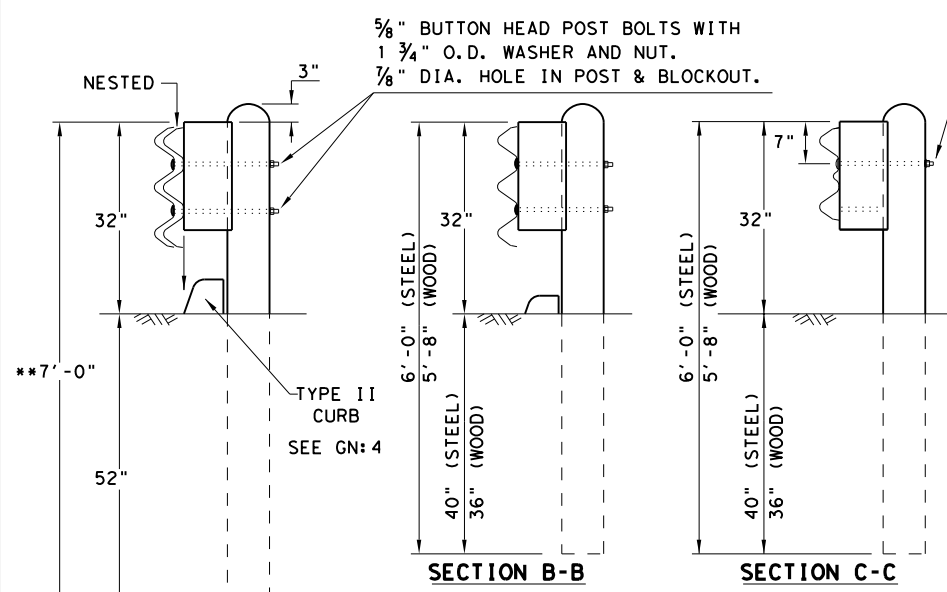
- (5) 1" DIA. HOLES.
- (5) 7/8" DIA. HEAVY HEX HEAD BOLTS (FACING TRAFFIC SIDE) (ASTM F3125 GR A325 OR A449).
- (10) 1 3/4" O.D. WASHER UNDER EACH HEX BOLT HEAD AND NUT.
- (5) 7/8" DIA. HEAVY HEX NUTS (ASTM A194 OR A563).

NOTE:
HEAVY HEX BOLT LENGTH WILL VARY DEPENDING ON WIDTH CONCRETE RAIL, LEAVE 1" OF BOLT LENGTH PAST THE 7/8" HEX NUT. TRIM AS REQUIRED.

NOTE:
CURB IS A REQUIRED COMPONENT FOR THE TRANSITION TO FUNCTION PROPERLY. SEE GENERAL NOTES: 2-4 AND 16-17.

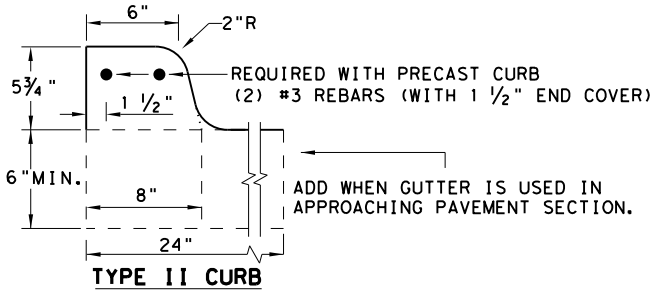


BRIDGE APPROACH - UPSTREAM: THE NESTED RAIL LAPS OVER THE TERMINAL CONNECTOR. PLATE WASHERS ARE INSTALLED UNDER THE SPLICE NUTS AGAINST INSIDE OF CONNECTOR.
 BRIDGE EXIT - DOWNSTREAM: THE TERMINAL CONNECTOR LAPS OVER THE NESTED RAIL. PLATE WASHERS ARE INSTALLED UNDER THE BOLT HEAD AGAINST OUTSIDE OF CONNECTOR.



THRIE-BEAM TERMINAL - CURB TABLE	
PRECAST CURB FULL LENGTH EQUALS 12'- 2"	
THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.	
CURB (1) LENGTH	5'- 8"
CURB (2) LENGTH	6'- 6"
TAPER CURB (2) TO A HEIGHT OF 4" AT POST 7	
CONNECTING PRECAST CURB SECTIONS (1) & (2):	
FORM OR CORE	1" DIA. HOLE 9" LONG INTO EACH CURB END.
USE	(1) #5 GR.60 REBAR 18" LONG TO CONNECT BOTH CURBS.
SECURING PRECAST OR CAST-IN-PLACE TO FINISHED GRADE *:	
FORM OR CORE	(4) 1" DIA. HOLES, SEE PLAN AND ELEVATION VIEWS FOR HOLE LOCATIONS. DRIVE (4) #5 GR.60 REBAR STAKES 18" LONG INTO THE GROUND AND 1/2" BELOW TOP OF CURB.
FILL HOLES WITH APPROVED GROUT MIXTURE.	

* NOTES: NOT NEEDED FOR CAST-IN-PLACE. SEE TYPE II CURB DETAIL FOR REBAR AND COVER REQUIREMENTS. PERCUSSION DRILLING IS NOT PERMITTED WITH: TYPE II CURB, BRIDGE RAIL OR CONCRETE TRAFFIC RAIL.



NOTE: OPTIONS FOR TYPE II CURB:
 1. PRECAST
 2. CAST-IN-PLACE

GENERAL NOTES

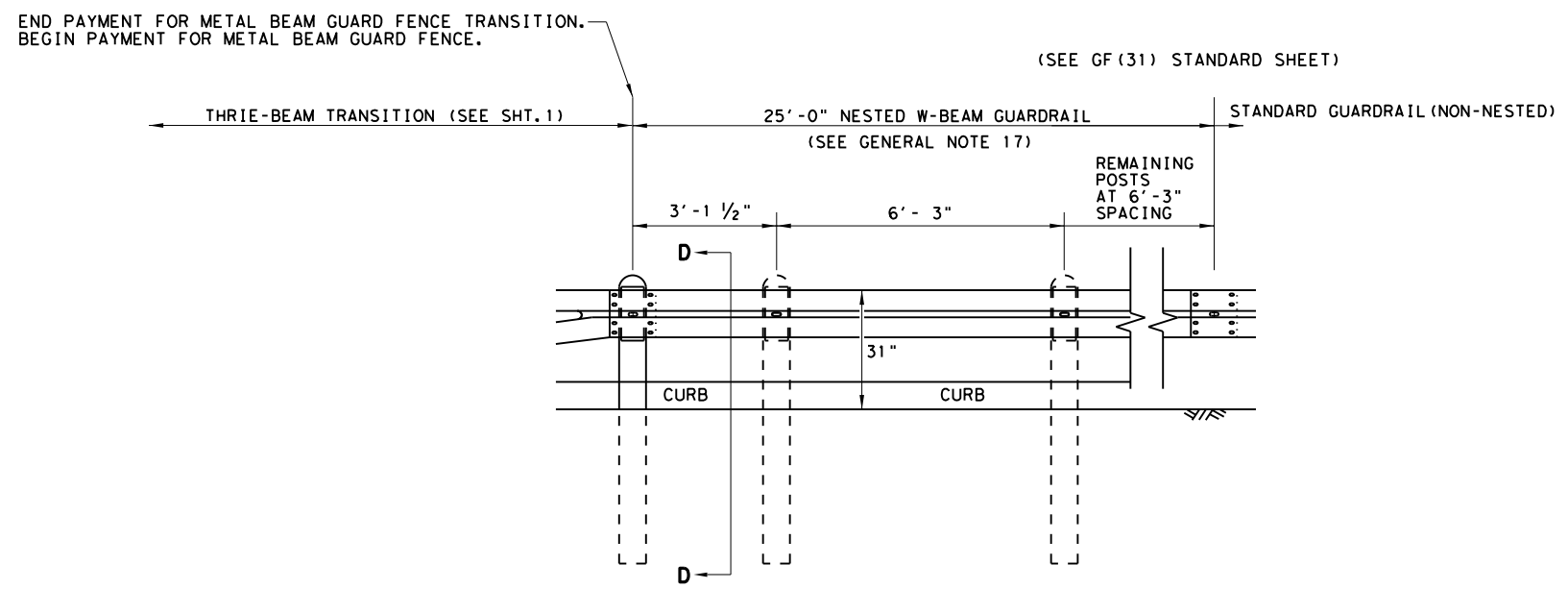
1. CONTACT THE DESIGN DIVISION FOR DRAINAGE CUT OUT OPTIONS NEEDED WITHIN THE CURB SECTION OF THE THRIE-BEAM TRANSITION. (512) 416-2678
2. CONCRETE CURB MAY BE CAST-IN-PLACE OR PRECAST AS SHOWN ON THIS SHEET. WHEN USED IN CONJUNCTION WITH THE THRIE-BEAM TRANSITIONS, CURB SHALL BE TYPE II (5- 3/4" HEIGHT); SEE CURRENT CCGG STANDARD SHEET FOR FURTHER DETAILS. IF OTHER CURB HEIGHTS ARE SHOWN IN THE PLANS IN CONJUNCTION WITH THE TRANSITION, THE CURB HEIGHT MAY BE FROM 4" TO 8" WITH A RELATIVELY VERTICAL FACE. CONCRETE CURB SHALL BE CONTINUOUS TO THE SEVENTH POST UNLESS OTHERWISE SHOWN IN THE PLANS. SEE GENERAL NOTE:17 FOR CIRCUMSTANCES WHERE CURB CONTINUES PAST POST 7.
3. CONCRETE CURB TYPE II SUBSIDIARY TO "METAL BEAM GUARD FENCE TRANSITION". IF NO ADDITIONAL CURB IS INDICATED BEYOND THE TRANSITION, THEN ANY CURB HEIGHT GREATER THAN 4" WILL BE TAPERED DOWN BEGINNING AT THE LAST 7 FT. POST TO A MAXIMUM HEIGHT OF 4" AT POST 7. IF SHOWN ELSEWHERE IN THE PLANS, ADDITIONAL CURB UNDERNEATH GUARDRAIL WILL BE PAID FOR BY THE LINEAR FOOT.
4. UNLESS OTHERWISE SHOWN IN THE PLANS, TRANSITIONS SHALL BE PLACED WITH THE BLOCKOUT FACE IN FRONT OF OR DIRECTLY ABOVE THE CURB FACE. SEE SECTION A-A.
5. FOR ROUND WOOD POST SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 1/2" DIA. MINIMUM THROUGHOUT THE THRIE-BEAM TRANSITION.
6. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. REFER TO GF(31) STANDARD SHEET.
7. THE POST LENGTH SHALL BE MARKED ON ALL 7'- 0" LONG POSTS BY THE MANUFACTURER. THE MARK SHALL BE LOCATED WITHIN THE TOP 1 FT. REGION OF THE POST, AT LEAST 5/8" IN HEIGHT, AND VISIBLE AFTER INSTALLATION. WOODEN POSTS SHALL BE MARKED WITH A BRAND, AND STEEL POSTS WITH A STENCIL BEFORE GALVANIZING.
8. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
9. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE THRIE-BEAM TERMINAL CONNECTOR AND THE THRIE-BEAM TRANSITION TO W-BEAM SHALL BE OF THE SAME MATERIAL, BUT SHALL NOT BE LESS THAN 10 GAUGE. CONTRACTOR SHALL VERIFY THAT THE LOCATIONS OF BOLT HOLES MATCH THOSE IN THE THRIE-BEAM TERMINAL CONNECTOR PRIOR TO ORDERING MATERIALS.
10. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND 5/8" WASHER (FWC16G) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
11. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
12. CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
13. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
14. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. TXDOT'S MATERIALS AND TESTS DIVISION MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL CAN FURNISH COMPOSITE MATERIAL BLOCKS.
15. REFER TO GF(31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
16. THE INSTALLATION OF THE TYPE II CURB IS CRITICAL FOR THE PERFORMANCE OF THE THRIE-BEAM TRANSITION SYSTEM. THE CURB PREVENTS (VEHICLE WHEEL SNAGGING) AT THE CONCRETE RAIL AND IS REQUIRED TO MEET MASH CRASH TEST CRITERIA.
17. IF CURB EXTENDS BEYOND POST 7, 25' OF NESTED W-BEAM GUARDRAIL SHALL BE INSTALLED BEYOND THE PAY LIMITS OF THRIE-BEAM TRANSITION SECTION, (SEE SHT.2). PAYMENT FOR THIS 25' SECTION WILL BE BY LINEAR FOOT, PAY ITEM "0540 6XXX MTL W-BEAM GD FEN (NESTED) (TIM POST)" OR "540 6XXX MTL W-BEAM GD FEN (NESTED) (STEEL POST)" AS APPLICABLE FOR POST TYPE. SEE SHT.2 FOR ADDITIONAL INFORMATION.

**HIGH-SPEED TRANSITION
SHEET 1 OF 2**

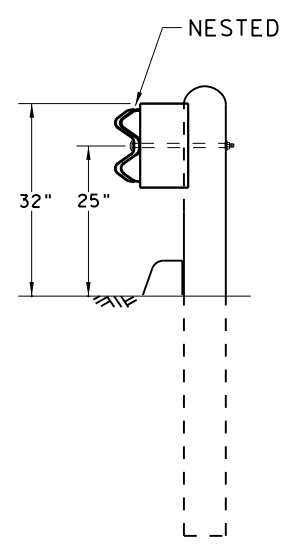
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METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-3 MASH COMPLIANT			
GF(31)TR TL3-20			
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©TXDOT: NOVEMBER 2020	CONT	SECT	JOB
REVISIONS	0902	00	299
DIST	COUNTY	SHEET NO.	
FTW	TARRANT	123	

DATE: 4/9/2024
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 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.

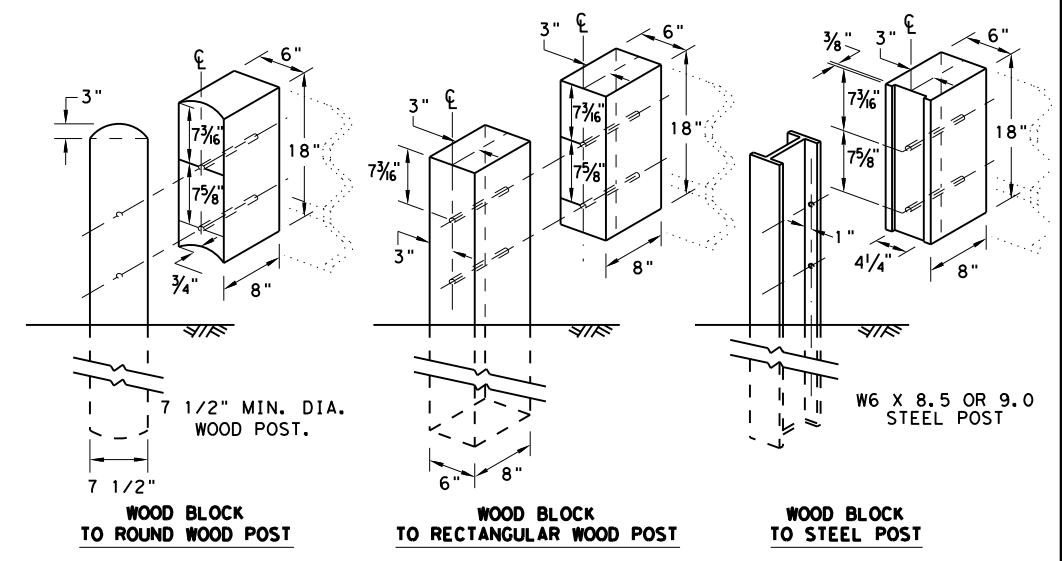
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THREE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

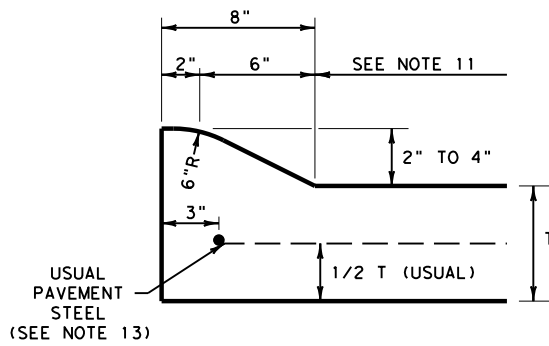


METAL BEAM GUARD FENCE
 THREE-BEAM TRANSITION
 TL-3 MASH COMPLIANT
 GF (31) TR TL3-20

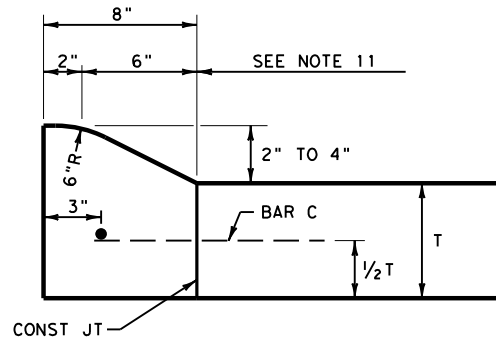
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©TXDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	00	299	VA
	DIST	COUNTY	SHEET NO.	
	FTW	TARRANT	124	

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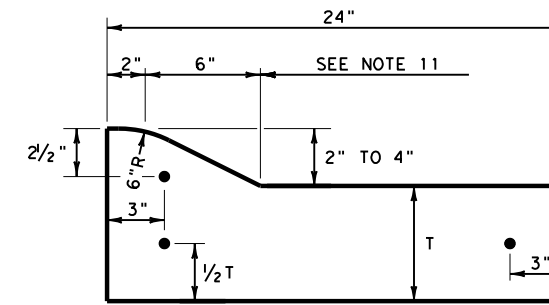
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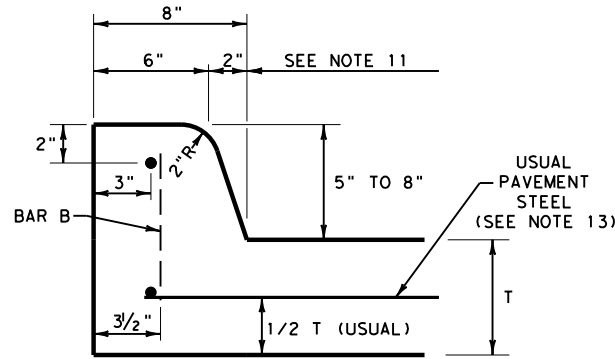
**TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT**



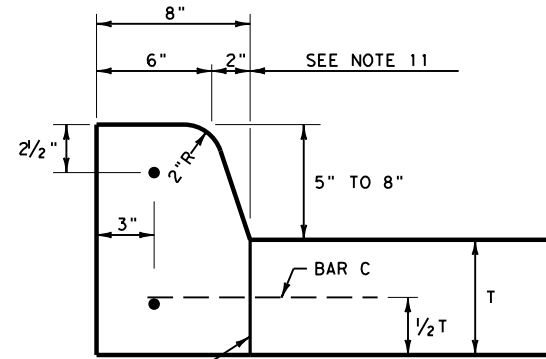
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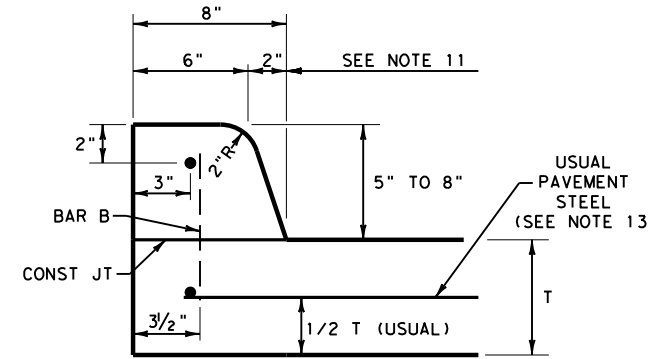
**TYPE I CURB AND GUTTER
2" - 4" HEIGHT**



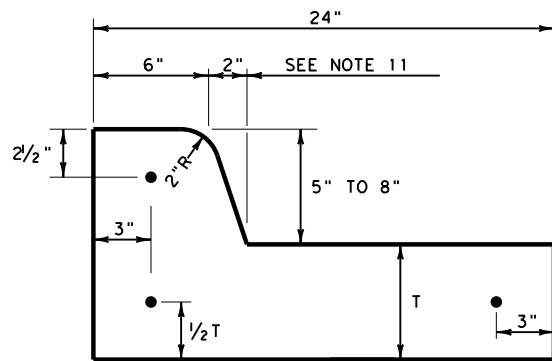
**TYPE II CURB (MONOLITHIC)
5" - 8" HEIGHT**



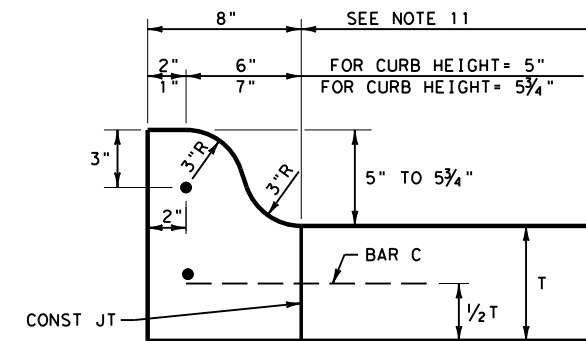
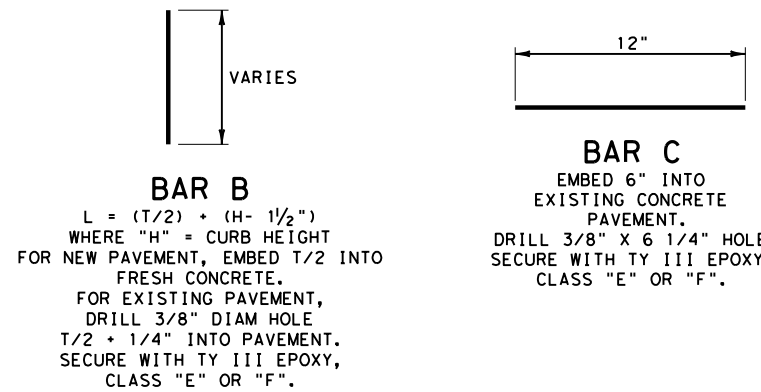
**TYPE II CURB
5" - 8" HEIGHT
DOWELED VERTICAL JOINT**



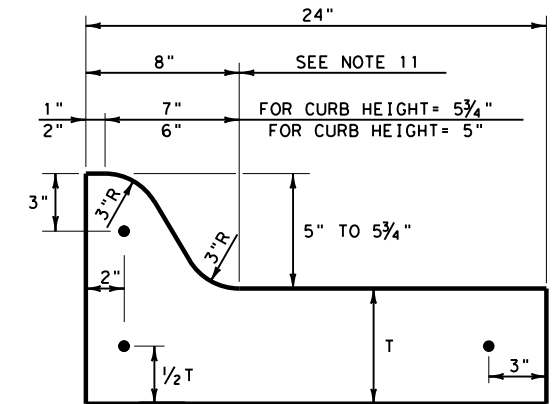
**TYPE II CURB
5" - 8" HEIGHT
DOWELED HORIZONTAL JOINT**



**TYPE II CURB AND GUTTER
5" - 8" HEIGHT**



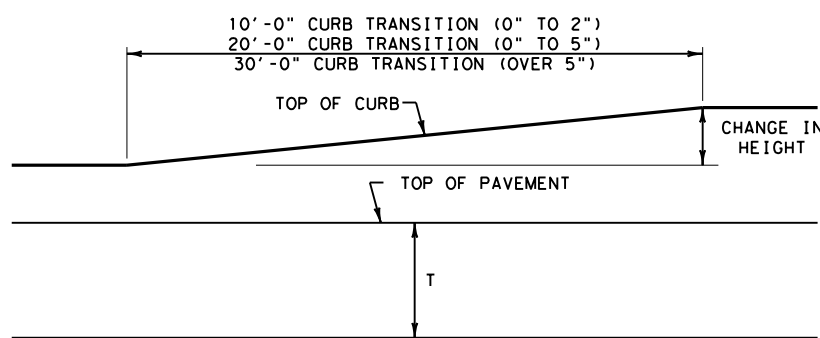
**TYPE IIA CURB
5" - 5 3/4" HEIGHT**



**TYPE IIA CURB AND GUTTER
5" - 5 3/4" HEIGHT**

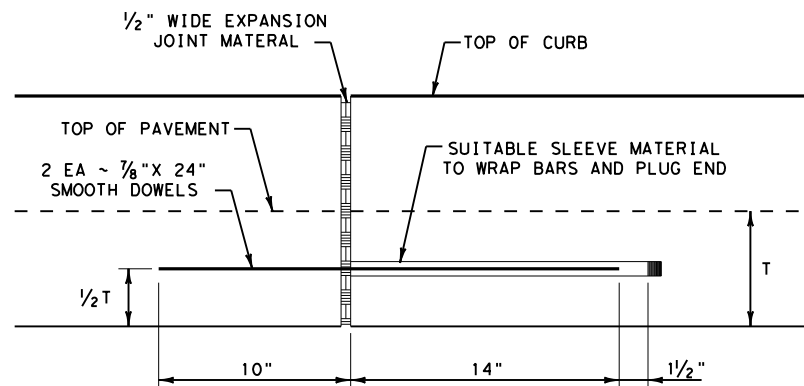
GENERAL NOTES

- ALL MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH ITEM 529, "CONCRETE CURB, GUTTER, AND COMBINED CURB AND GUTTER".
- ALL CONCRETE SHALL BE CLASS "A".
- ALL REINFORCING BARS SHALL BE #4, UNLESS OTHERWISE SHOWN.
- CURB HEIGHT SHALL BE AS SHOWN ON TYPICAL SECTIONS OR PLAN-PROFILE SHEETS.
- ROUND EXPOSED SHARP EDGES WITH A ROUNDING TOOL, TO A MINIMUM RADIUS OF 1/4".
- ALL EXISTING CURBS AND DRIVEWAYS TO BE REMOVED SHALL BE SAW CUT FULL DEPTH OR REMOVED AT EXISTING JOINTS.
- WHERE CONCRETE CURB IS PLACED ON EXISTING CONCRETE PAVEMENT, THE PAVEMENT SHALL BE DRILLED AND THE REINFORCING BARS GROUTED OR EPOXIED IN PLACE.
- EXPANSION AND CONTRACTION JOINTS SHALL BE CONSTRUCTED TO MATCH PAVEMENT JOINTS IN ALL CURBS OR CURB AND GUTTER ADJACENT TO JOINTED CONCRETE PAVEMENT. WHERE PLACEMENT OF CURB OR CURB AND GUTTER IS NOT ADJACENT TO CONCRETE PAVEMENT, EXPANSION JOINTS SHALL BE PROVIDED AT STRUCTURES, CURB RETURNS AT STREETS OR DRIVEWAYS, AND AT LOCATIONS DIRECTED BY THE ENGINEER.
- VERTICAL AND HORIZONTAL DOWELS BARS AND TRANSVERSE REINFORCING BARS SHALL BE PLACED AT 4' C-C.
- DIMENSION "T" SHOWN IS THE THICKNESS OF ADJACENT CONCRETE PAVEMENT, OR, WHEN CURB IS INSTALLED ADJACENT TO FLEXIBLE PAVEMENT, "T" IS 6" MINIMUM, 8" MAXIMUM.
- USUAL PROFILE GRADE LINE. REFER TO TYPICAL SECTIONS AND PLAN-PROFILE SHEETS FOR EXACT LOCATIONS.
- A SEALED, 1/2" EXPANSION JOINT SHALL BE PROVIDED WHERE CURB AND GUTTER IS ADJACENT TO SIDEWALK OR RIPRAP.
- LONGITUDINAL AND TRANSVERSE PAVEMENT STEEL SHALL BE PLACED IN ACCORDANCE WITH PAVEMENT DETAILS SHOWN ELSEWHERE IN THE PLANS.



CURB TRANSITION

NOTE: TO BE PAID FOR AS HIGHEST CURB



EXPANSION JOINT DETAIL

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		Fort Worth District Standard	
CONCRETE CURB AND CURB AND GUTTER DETAILS CCCG (FTW)			
ORIGINAL DRAWING: 05/2019	cccg-ftw.dgn	FED. RD. DIV. NO. 6	PROJECT NO. C 902-00-299
DATE: 05/2019	REVISIONS: REPLACES CC-CG(FW)	STATE DIST. NO. TEXAS	COUNTY TARRANT
		CONTRACT NO. 0902	SECTION 00
		JOB NO. 299	HIGHWAY NO. VA
		SHEET NO. 125	

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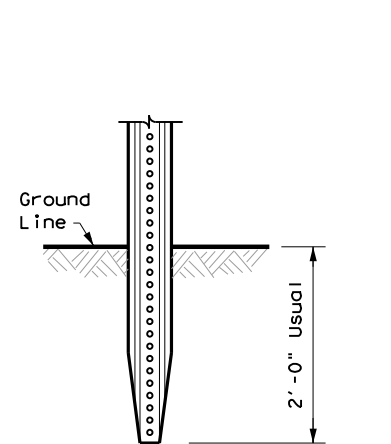
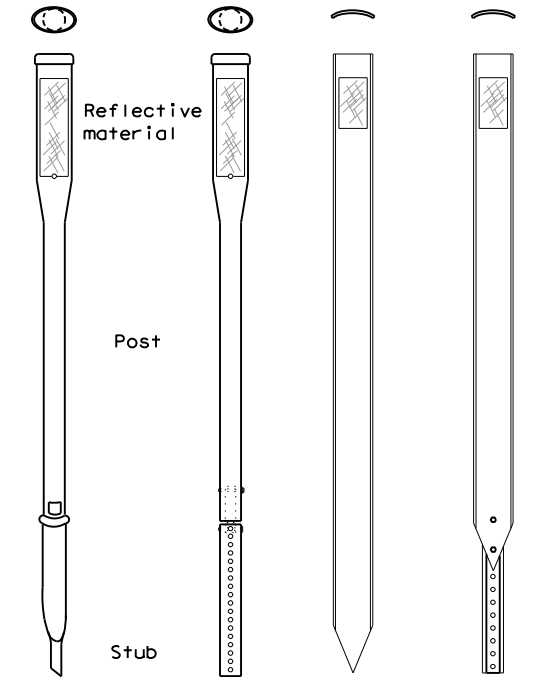
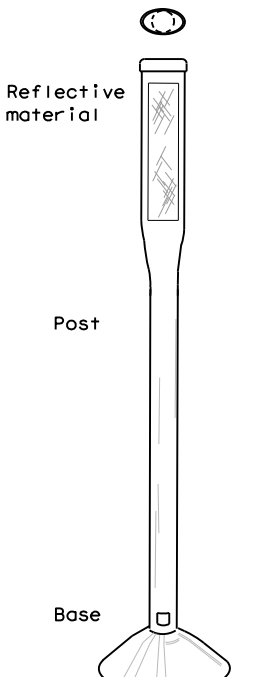
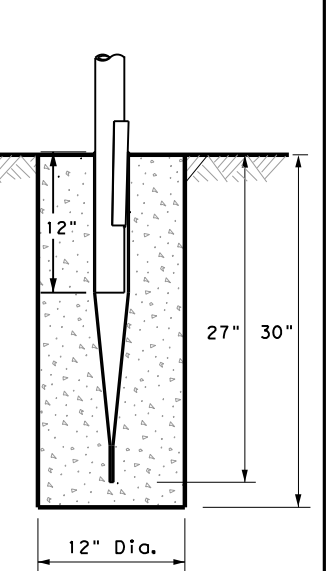
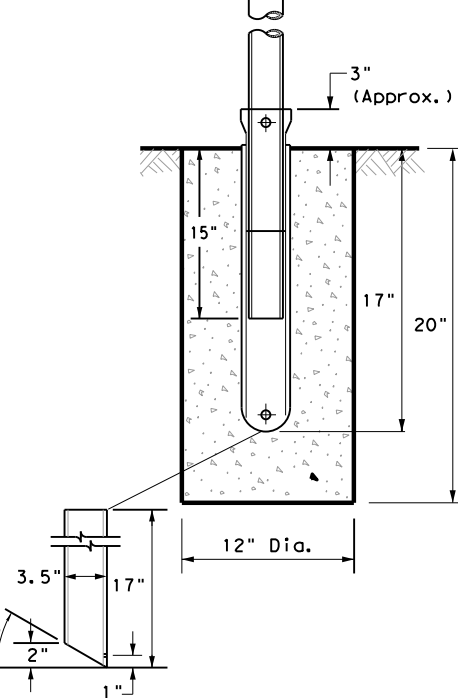
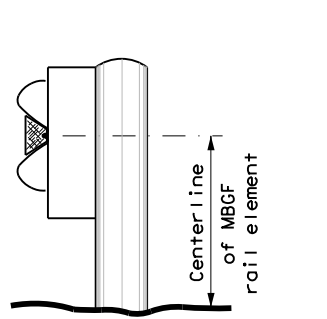
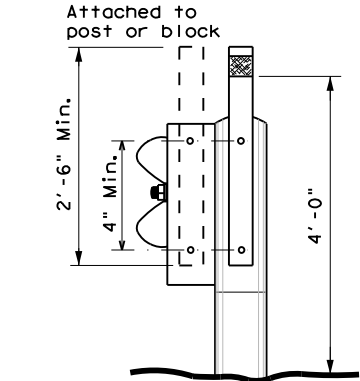
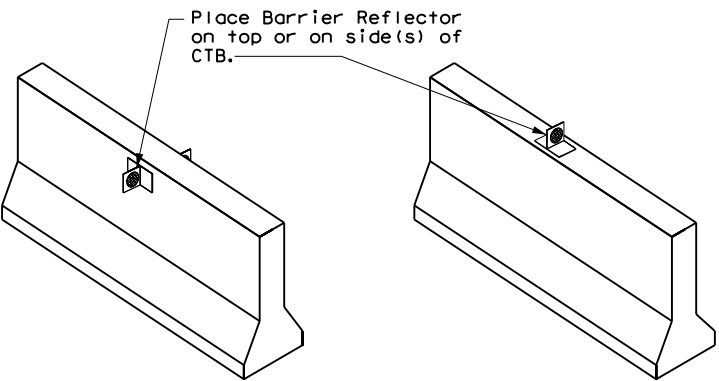
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REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS				DELINEATORS				D & OM DESCRIPTIVE CODES			
DEVICE	SIZE 1	SIZE 2	SIZE 3	SIZE 4	DEVICE	SINGLE	DOUBLE	INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)			
								NUMBER OF REFLECTORS S = Single D = Double COLOR OF REFLECTORS W = White Y = Yellow R = Red REFLECTOR UNIT SIZE 1 or 2 TYPE OF POST OR DELINEATOR WC = Wing Channel Post YFLX = Yellow Flexible Post WFLX = White Flexible Post BRFL = Barrier Reflector TYPE OF MOUNT GND = Embedded (drivable or set in concrete) CTB = Concrete Barrier Mount GF1 or GF2 = Guard Fence Attachment SRF = Surface Mount		SHEETING: Yellow, White or Red Type B or C reflective sheeting NOTE: 1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (fix). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.	
SHEETING: Yellow, White or Red Type B or C reflective sheeting				SHEETING: Yellow, White or Red Type B or C Reflective Sheeting				DIRECTION: If Required BI = Bi-Directional BR = Bi-Directional with red on back		INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)	
POST TYPE: WC, YFLX, WFLX				MOUNT TYPE: GND, SRF				TYPE OF OBJECT MARKER: 1, 2, 3, or 4		NUMBER OF REFLECTORS OR DIRECTION: X = 3-Size 2 reflector unit (Type 2 only) Y = 1-Size 3 reflector unit (Type 2 only) Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only) L = Left Side (Type 3 Object Marker only) R = Right Side (Type 3 Object Marker only) C = Center (Type 3 Object Marker only)	

OBJECT MARKERS								
DEVICE	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
								TYPE OF POST WC = Wing Channel Post WFLX = White Flexible Post TWT = Thin Walled Tubing TYPE OF MOUNT GND = Embedded (drivable) SRF = Surface Mount WAS = Wedge Anchor Steel WAP = Wedge Anchor Plastic DIRECTION: If Required BI = Bi-Directional
SHEETING: Yellow-Type B _{FL} or C _{FL} Sheeting	SHEETING: Yellow - Type B or C Sheeting			SHEETING: Alternating acrylic black and retroreflective yellow - Type B _{FL} or C _{FL} Sheeting			SHEETING: Red -Type B _{FL} or C _{FL} Sheeting	DEPARTMENTAL MATERIAL SPECIFICATIONS FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES) DMS-4400 SIGN FACE MATERIALS DMS-8300 DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS DMS-8600
POST TYPE: TWT	WC	WC	WFLX	TWT			TWT	
MOUNT TYPE: WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP	

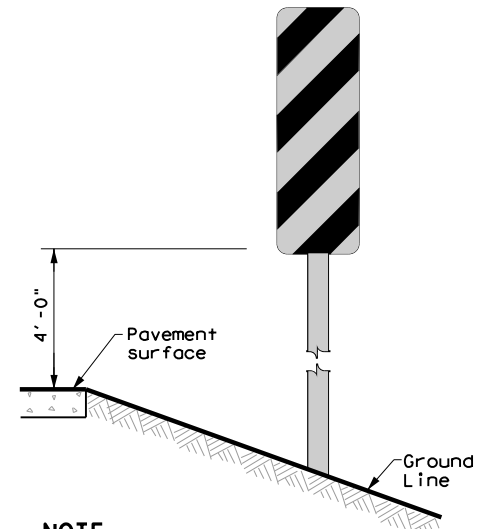
BARRIER REFLECTORS (BRF)			CHEVRONS				ONE DIRECTION LARGE ARROW		NOTE: Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.	
DEVICE	GF1	GF2	CTB	DEVICE				DEVICE		
									Traffic Safety Division Standard DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION D & OM(1)-20	
1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.			SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)	SIZE (W x L)		48" x 24" (Conventional)
SHEETING: Yellow, White, Red			MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only		MOUNTING HEIGHT	7'-0"	
NOTE: 1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.			NOTE: 1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies). 2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).							
FILE: dom1-20.dgn			DN: TxDOT		CK: TxDOT		DW: TxDOT		CR: TxDOT	
© TxDOT August 2004			CONT		SECT		JOB		HIGHWAY	
REVISIONS			0902 00		299		VA			
10-09 3-15			DIST		COUNTY		SHEET NO.			
4-10 7-20			FTW		TARRANT		126			

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POST TYPE AND SUPPORT FOUNDATION DETAILS				TYPE OF BARRIER MOUNTS		
WING CHANNEL (WC)	FLEXIBLE POSTS (YFLX, WFLX)		WEDGE ANCHOR SYSTEMS		GUARD FENCE ATTACHMENT	
GND	GND	SRF	WAS	WAP	GF 1	
						
	EMBEDDED	SURFACE MOUNT	STEEL	PLASTIC	CONCRETE TRAFFIC BARRIER (CTB)	
NOTES 1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only. 2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.	NOTES 1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices. 2. Install per manufacturer's recommendations. 3. Post length may vary to meet field conditions. 4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.		NOTE 1. Install per manufacturer's recommendations.			

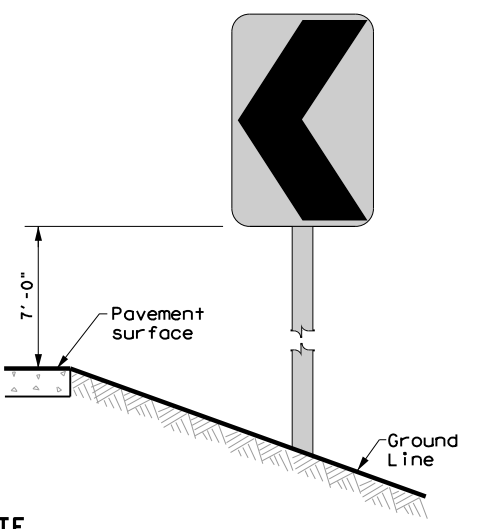
- GENERAL NOTES**
- Place delineators on a section of roadway at a consistent distance from the edge of pavement.
 - Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
 - When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
 - Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
 - Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
 - Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

TYPES 1,3, AND 4 OBJECT MARKERS AND CHEVRONS



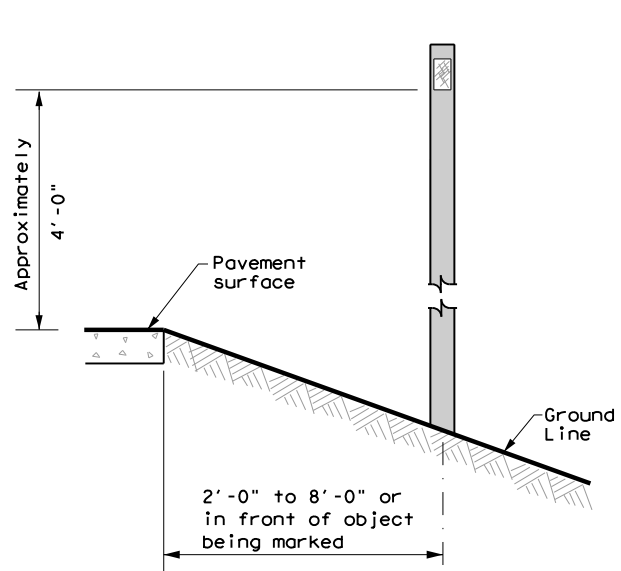
NOTE
 Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN




NOTE
 Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.



Texas Department of Transportation
Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

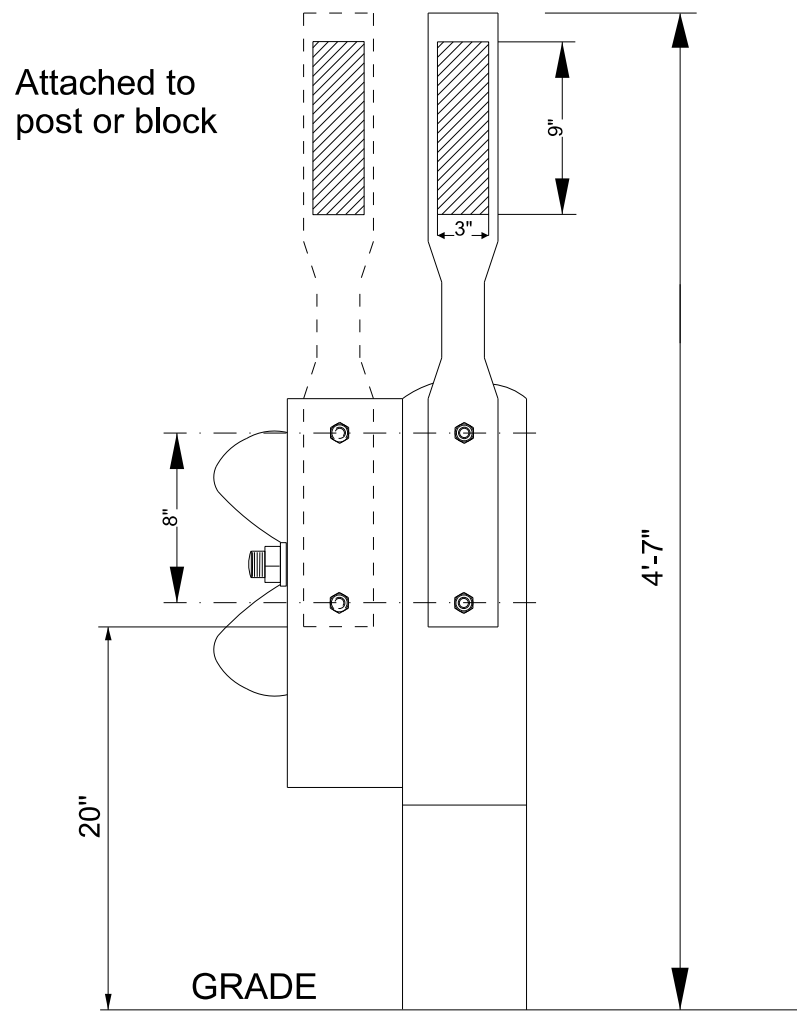
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10-09 3-15	DIST	COUNTY	SHEET NO.	
4-10 7-20	FTW	TARRANT	127	

20B

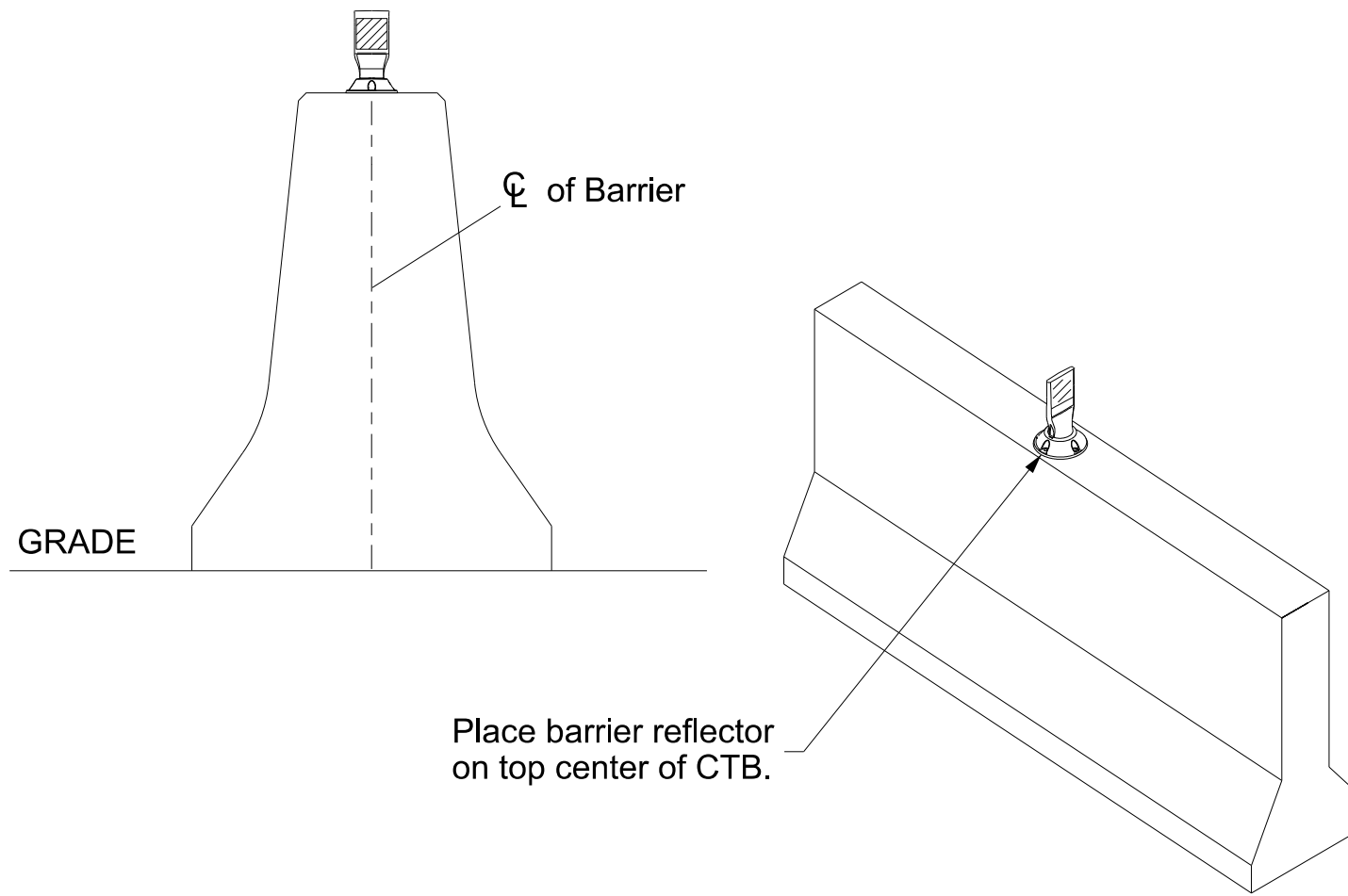
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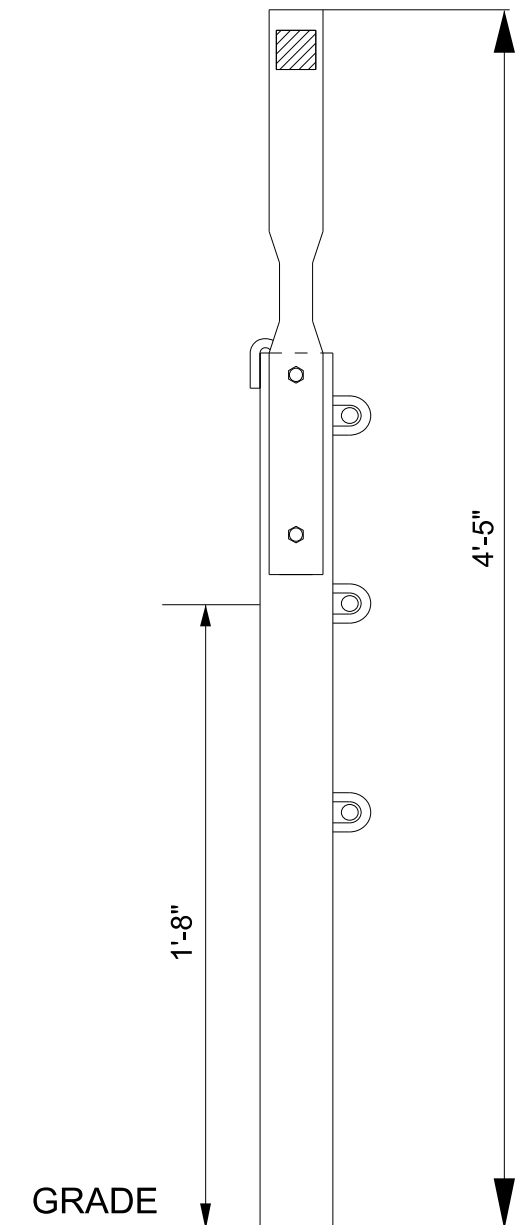
TYPICAL METAL BEAM GAURD FENCE



TYPICAL CONCRETE TRAFFIC BARRIER

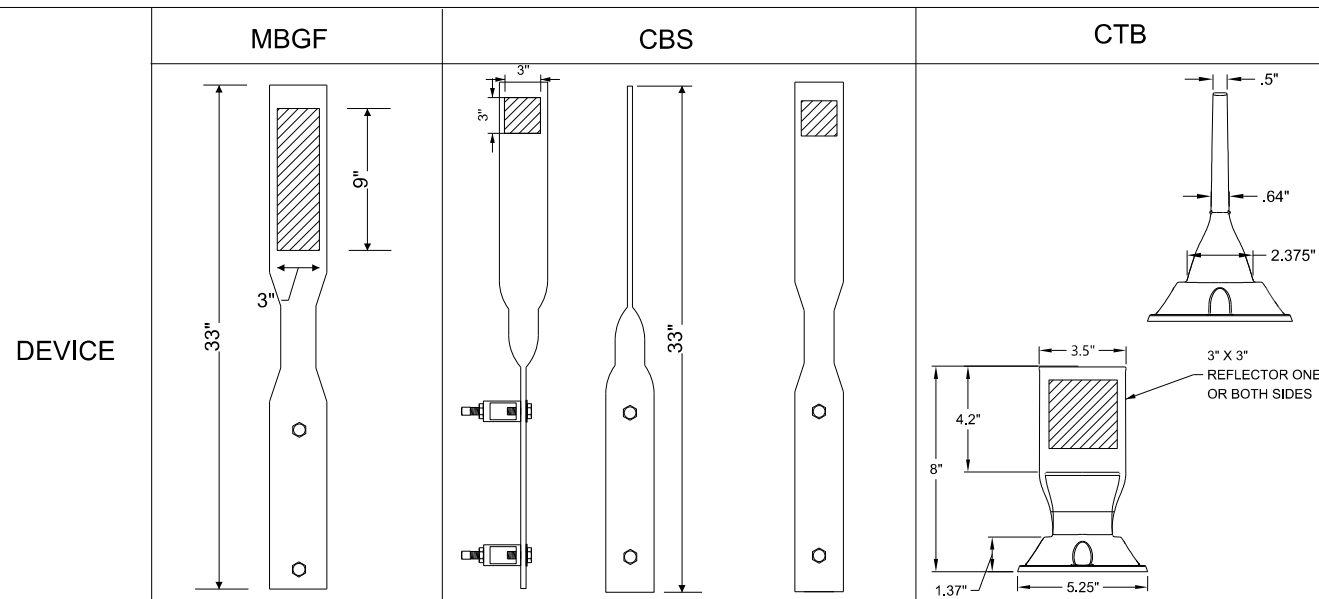


TYPICAL CABLE BARRIER SYSTEM



BARRIER REFLECTORS (BRF)

GENERAL NOTES



1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. When separating opposing direction of travel, such as centerline or median use, the posts shall be yellow.
4. Barrier reflectors shall meet the requirements of DMS 8600.
5. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.
6. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.
7. Posts shall be permanently sealed at the top and have a 3-1/2 wide x 13" flattened surface to accommodate up to a 3" x 12" reflective sheet on both sides.
8. The delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
9. Single red delineators may be mounted on the back side of the delineator posts for wrong way drive applications.

DEPARTMENT MATERIAL SPECIFICATIONS

FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600



DELINEATOR &
OBJECT MARKER
D & OM (ST-FTW) - 21

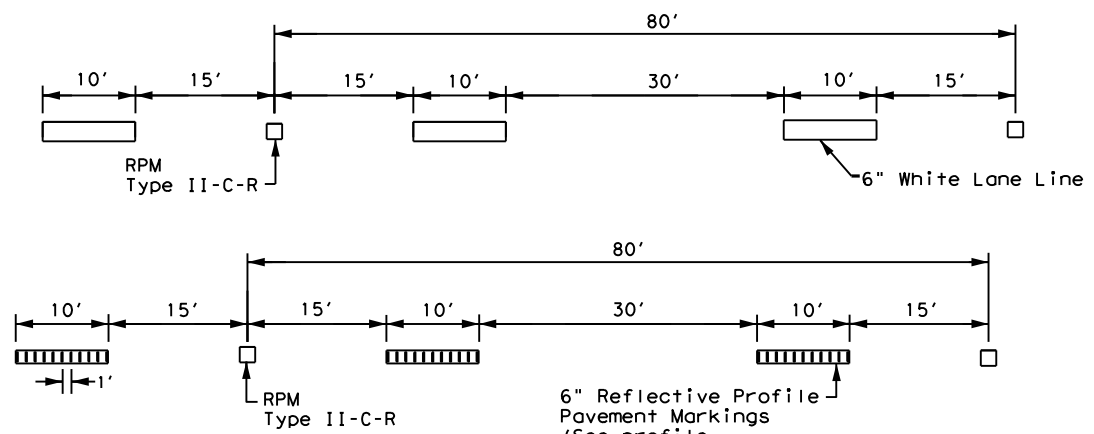
SHEETING

Yellow, White & Red

ORIGINAL DRAWING: 10/2021	st-f.t.w. dgn	DIST.	COUNTY	SHEET NO.
DATE	REVISIONS	FTW	TARRANT	128
10/19/21		CONT	SECT	JOB
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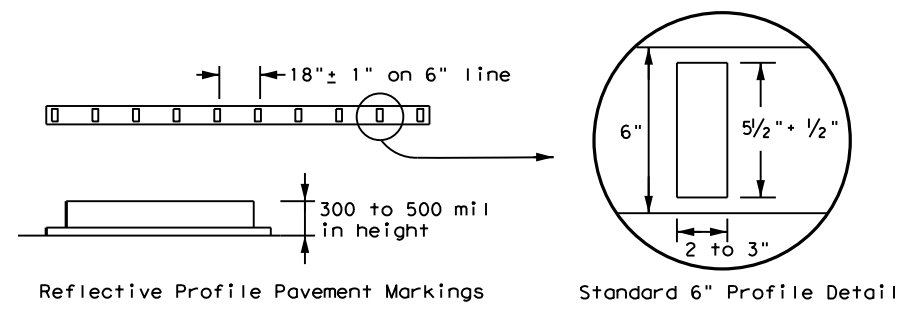
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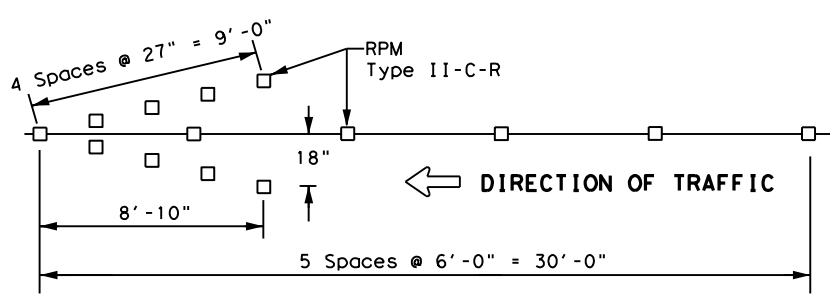
NOTE
 ReflectORIZED raised pavement markers Type II-C-R shall be spaced on 80' centers with the clear face toward normal traffic and the red face toward wrong way traffic. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.

TRAFFIC LANE LINES PAVEMENT MARKING



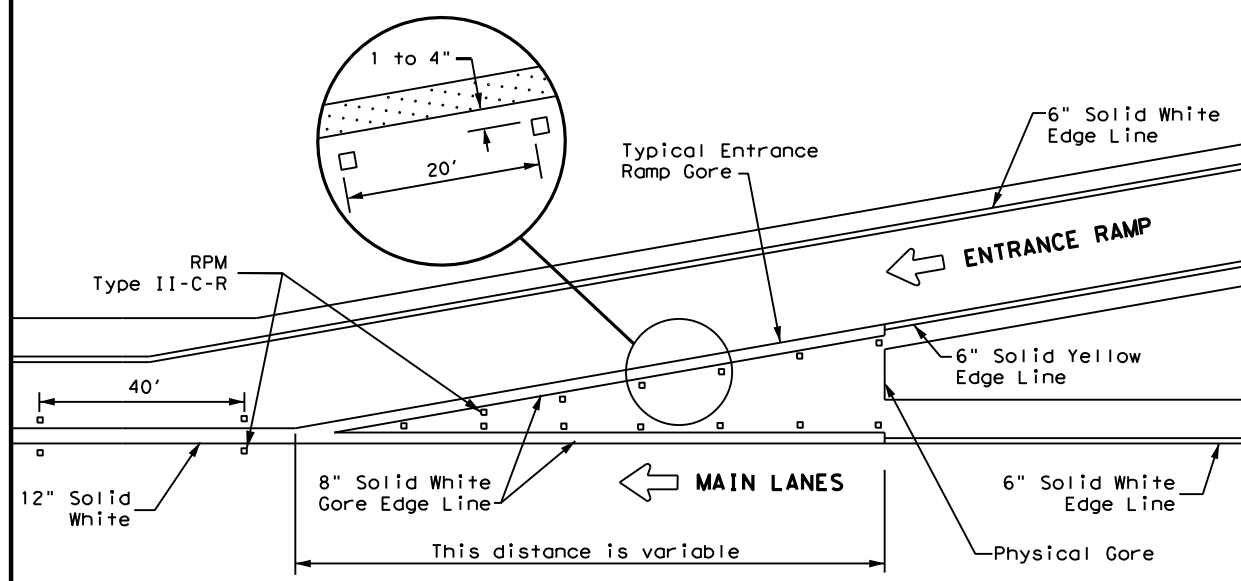
NOTE
 Edge lines should typically be 6" wide and the materials shall be as specified in the plans. See details above if reflective profile pavement markings are to be used.

EDGE LINE PAVEMENT MARKINGS

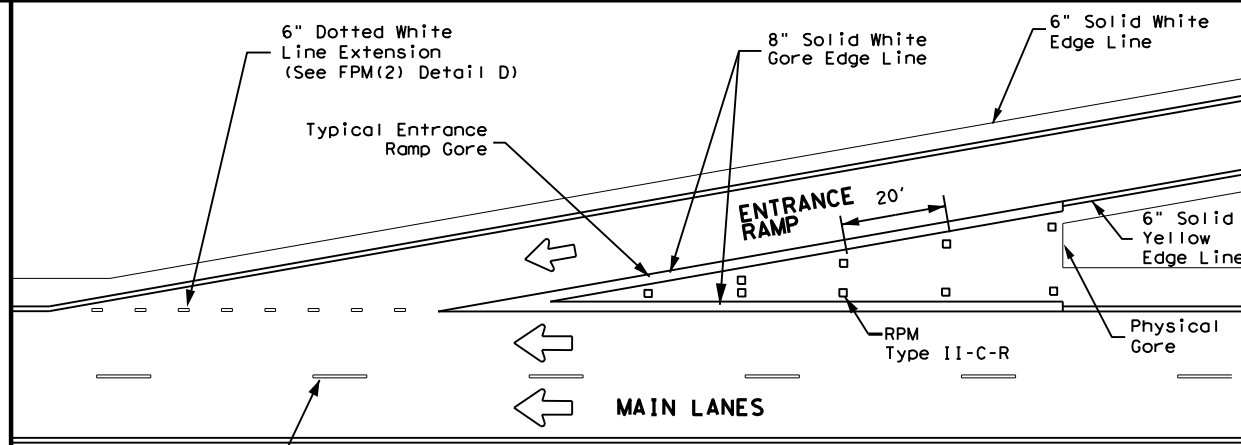


NOTES
 1. ReflectORIZED raised pavement markers Type-II-C-R in the wrong way arrow shall have the clear face toward normal traffic and the red face toward the wrong way traffic.
 2. Red reflectORIZED wrong way arrows, not to exceed two, may be placed on exit ramps. Locations of the arrows shall be as shown in the plans or as directed by the engineer.

WRONG WAY ARROW

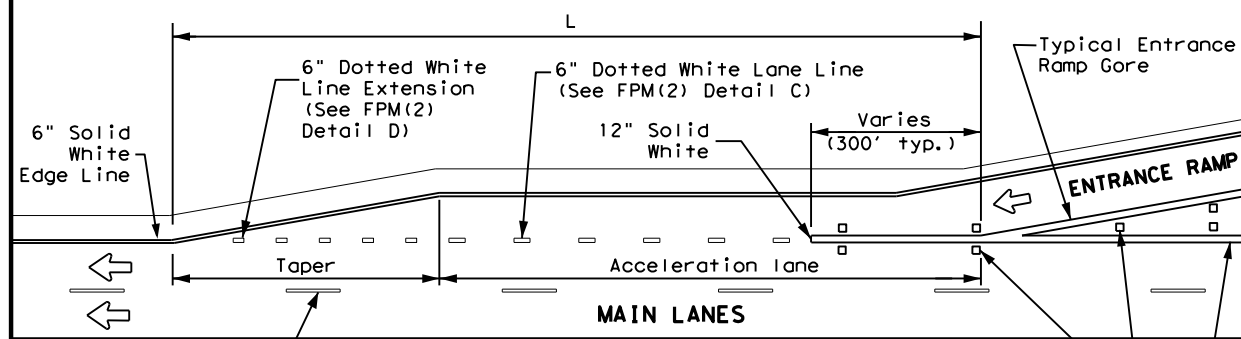


TYPICAL ENTRANCE RAMP GORE MARKING



NOTE
 See the Roadway Design Manual Chapter 3 to determine if a tapered acceleration lane may be used.

TAPERED ACCELERATION LANE



NOTE
 See the Roadway Design Manual Chapter 3 to determine lengths of the acceleration lane and taper.

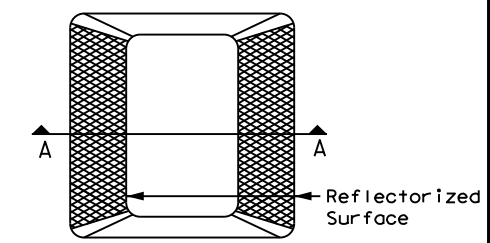
PARALLEL ACCELERATION LANE

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

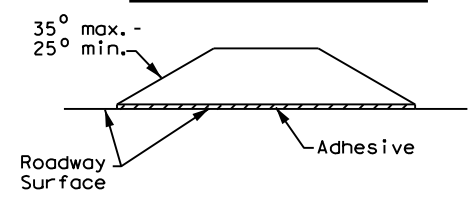
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.

LEGEND	
←	Traffic flow
↩	Pavement marking arrows (white)
□	ReflectORIZED Raised Markers (RPM) Type II-C-R

GENERAL NOTE
 On concrete pavements the raised pavement markers shall be placed to one side of the longitudinal joints.



Type II (Top View)



SECTION A

REFLECTORIZED RAISED PAVEMENT MARKER (RPM)

Texas Department of Transportation
 Traffic Safety Division Standard

TYPICAL STANDARD FREEWAY PAVEMENT MARKINGS WITH RAISED PAVEMENT MARKERS FPM(1)-22

FILE: fpm(1)-22.dgn	DN:	CK:	DW:	CK:
© TxDOT October 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	00	299	VA
5-74 8-00 2-12	DIST	COUNTY	SHEET NO.	
4-92 2-08 10-22	FTW	TARRANT	129	
5-00 2-10				

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DATE: FILE:

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

- 1.
2. 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 SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

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

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

- No Permit Required
- Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
- Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
- Individual 404 Permit Required
- Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

- 1.
- 2.
- 3.
- 4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
<input type="checkbox"/> Temporary Vegetation	<input type="checkbox"/> Silt Fence	<input type="checkbox"/> Vegetative Filter Strips
<input type="checkbox"/> Blankets/Matting	<input type="checkbox"/> Rock Berm	<input type="checkbox"/> Retention/Irrigation Systems
<input type="checkbox"/> Mulch	<input type="checkbox"/> Triangular Filter Dike	<input type="checkbox"/> Extended Detention Basin
<input type="checkbox"/> Sodding	<input type="checkbox"/> Sand Bag Berm	<input type="checkbox"/> Constructed Wetlands
<input type="checkbox"/> Interceptor Swale	<input type="checkbox"/> Straw Bale Dike	<input type="checkbox"/> Wet Basin
<input type="checkbox"/> Diversion Dike	<input type="checkbox"/> Brush Berms	<input type="checkbox"/> Erosion Control Compost
<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Mulch Filter Berm and Socks
<input type="checkbox"/> Mulch Filter Berm and Socks	<input type="checkbox"/> Mulch Filter Berm and Socks	<input type="checkbox"/> Compost Filter Berm and Socks
<input type="checkbox"/> Compost Filter Berm and Socks	<input type="checkbox"/> Compost Filter Berm and Socks	<input type="checkbox"/> Vegetation Lined Ditches
<input type="checkbox"/> Erosion Control Logs	<input type="checkbox"/> Stone Outlet Sediment Traps	<input type="checkbox"/> Sand Filter Systems
	<input type="checkbox"/> Sediment Basins	<input type="checkbox"/> 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.
- 2.
- 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 immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

BMP: Best Management Practice	SPCC: Spill Prevention Control and Countermeasure
CGP: Construction General Permit	SW3P: Storm Water Pollution Prevention Plan
DSHS: Texas Department of State Health Services	PCN: Pre-Construction Notification
FHWA: Federal Highway Administration	PSL: Project Specific Location
MOA: Memorandum of Agreement	TCEQ: Texas Commission on Environmental Quality
MOU: Memorandum of Understanding	TPDES: Texas Pollutant Discharge Elimination System
MS4: Municipal Separate Stormwater Sewer System	TPWD: Texas Parks and Wildlife Department
MBTA: Migratory Bird Treaty Act	TxDOT: Texas Department of Transportation
NOT: Notice of Termination	T&E: Threatened and Endangered Species
NWP: Nationwide Permit	USACE: U.S. Army Corps of Engineers
NOI: Notice of Intent	USFWS: U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used. Obtain and keep on-site 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 following 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

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

- Yes No

If "No", then no further action is required.

If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

- Yes No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

- No Action Required Required Action

Action No.

- 1.
- 2.
- 3.


VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

- No Action Required Required Action

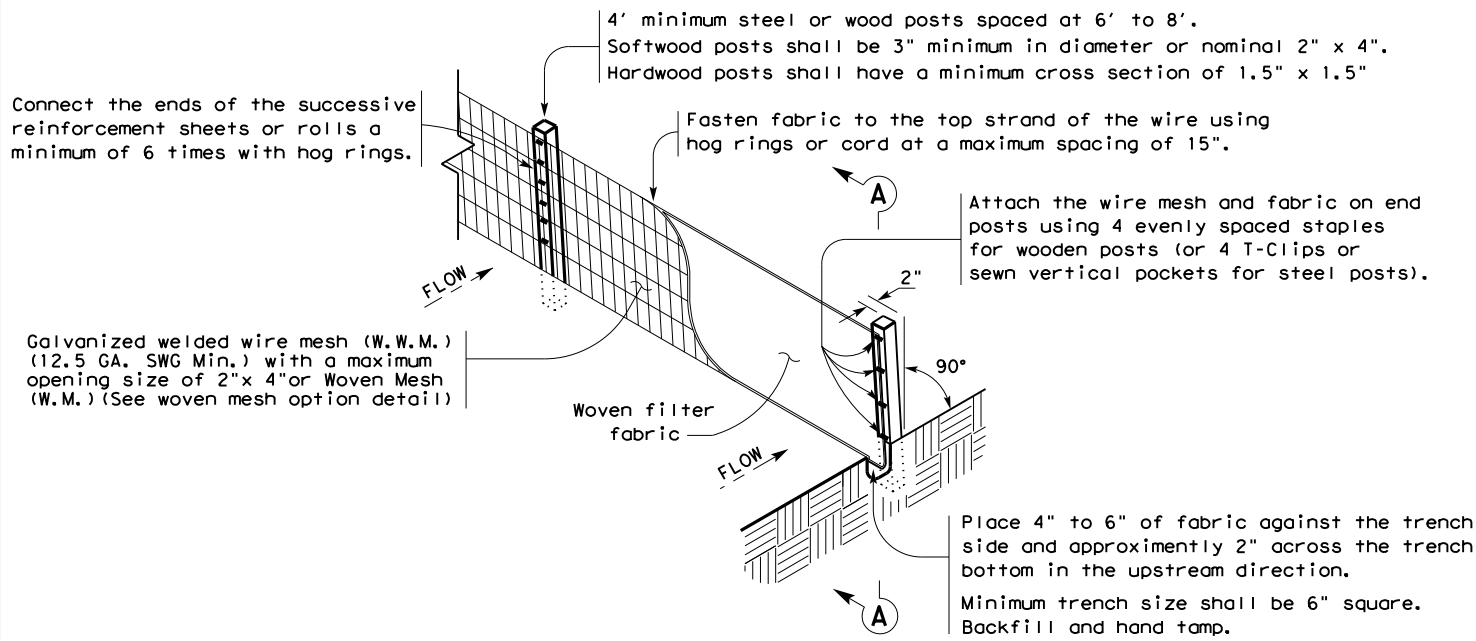
Action No.

- 1.
- 2.
- 3.

 Texas Department of Transportation		<i>Design Division Standard</i>	
ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS EPIC			
FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP
©TxDOT: February 2015	CONT	SECT	JOB
12-12-2011 (DS) REVISIONS	0902	00	299
05-07-14 ADDED NOTE SECTION IV.	DIST	COUNTY	SHEET NO.
01-23-2015 SECTION I CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	FTW	TARRANT	130

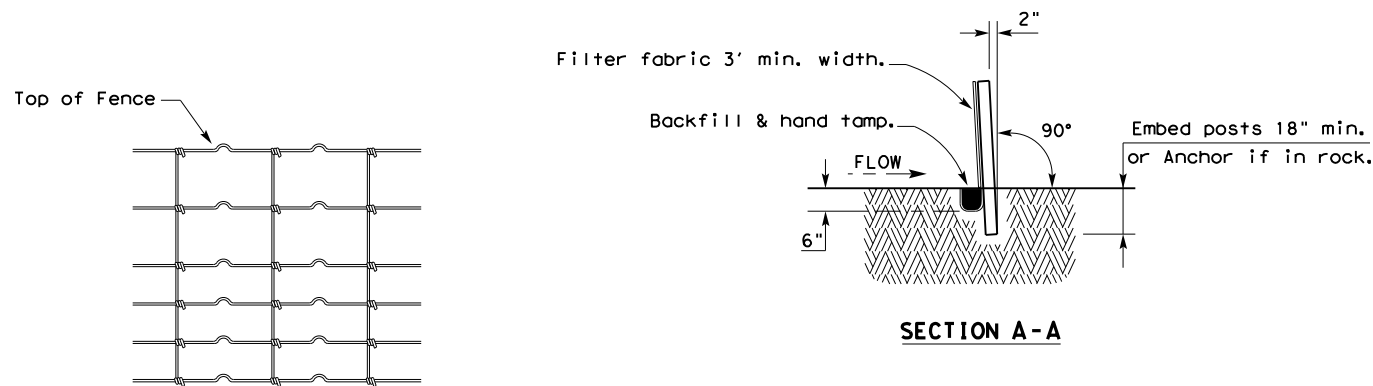
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TEMPORARY SEDIMENT CONTROL FENCE

SCF



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/FT². Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

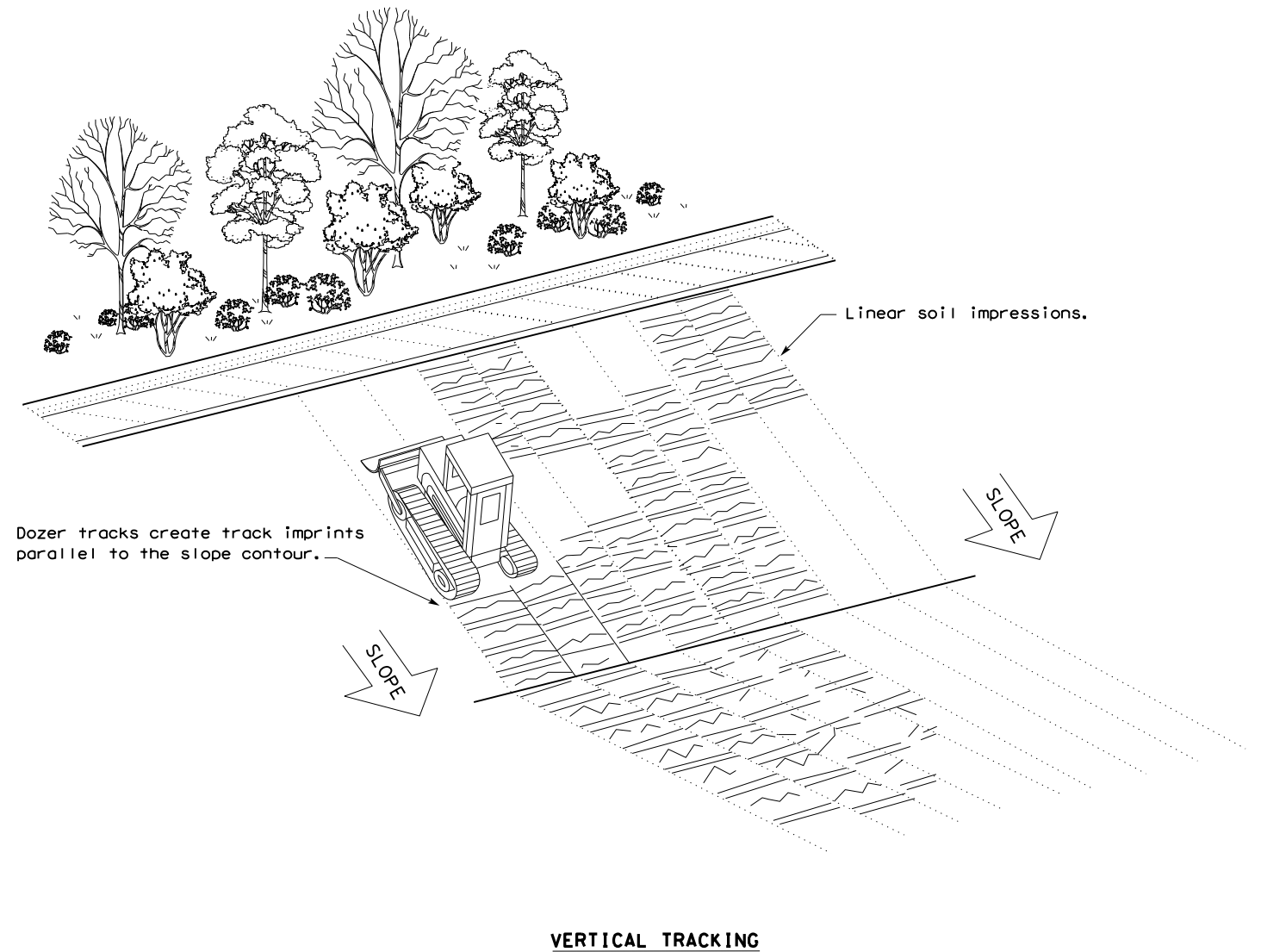
LEGEND

Sediment Control Fence

SCF

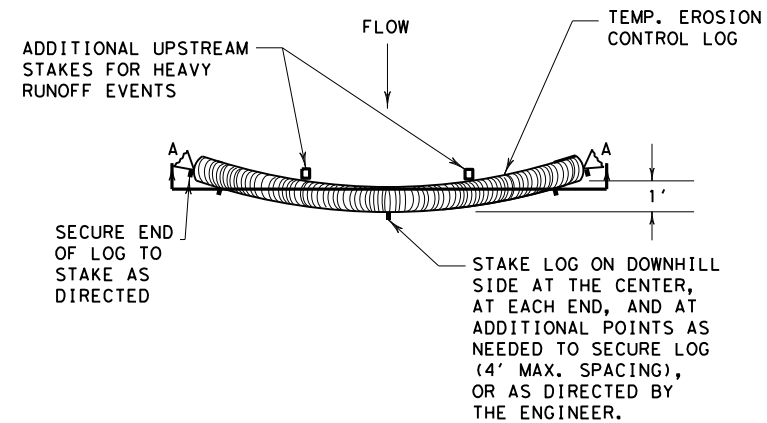
GENERAL NOTES

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 continuous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.

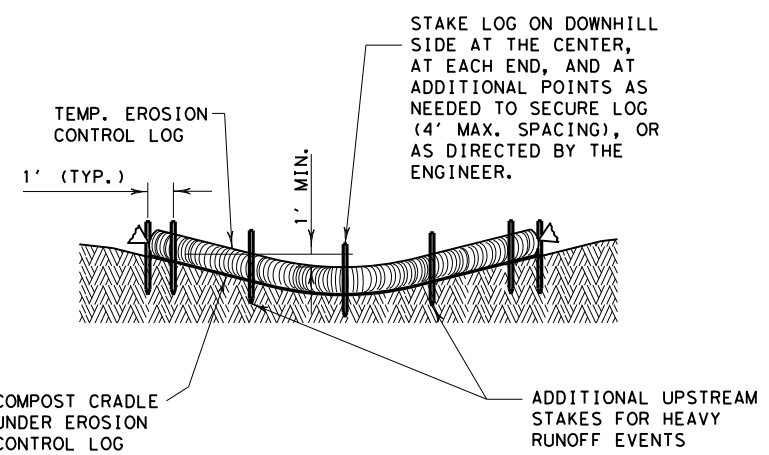


				Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES FENCE & VERTICAL TRACKING EC(1)-16					
FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS	
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REVISIONS	0902	00	299	VA	
	DIST	COUNTY		SHEET NO.	
	FTW	TARRANT		131	

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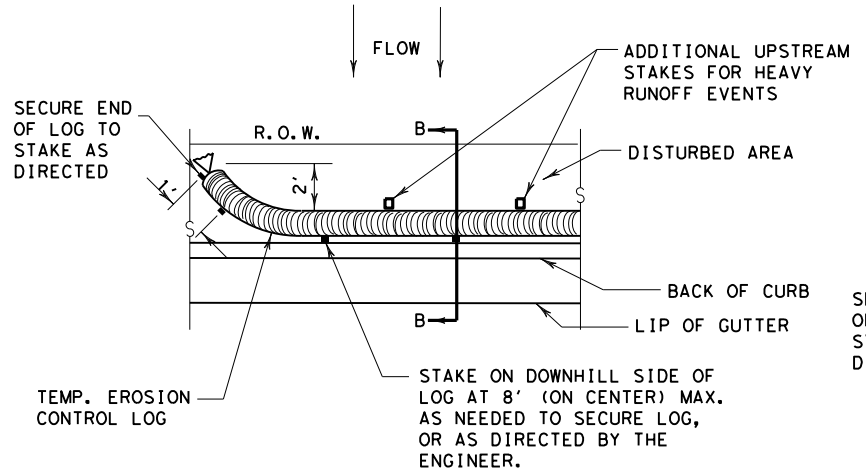


PLAN VIEW

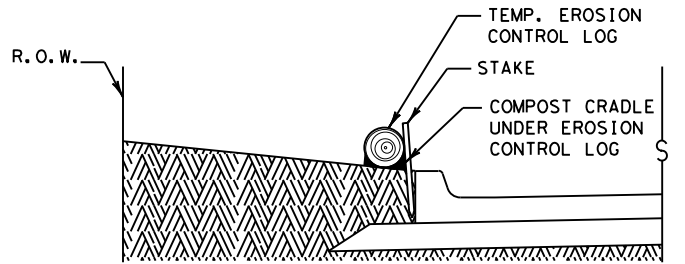


SECTION A-A
EROSION CONTROL LOG DAM

CL-D



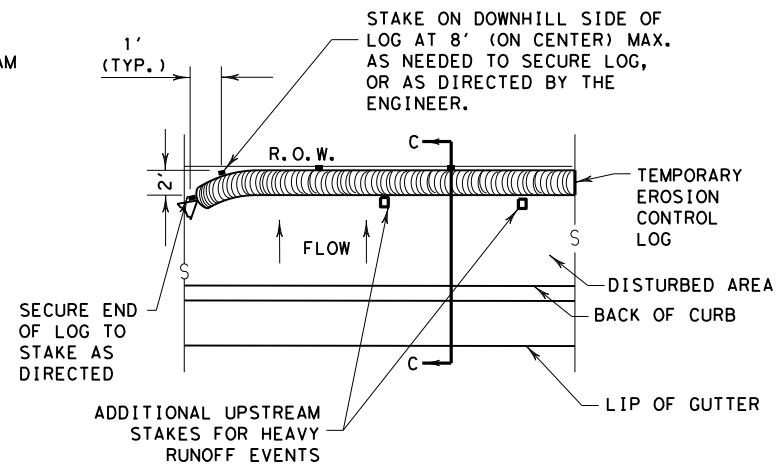
PLAN VIEW



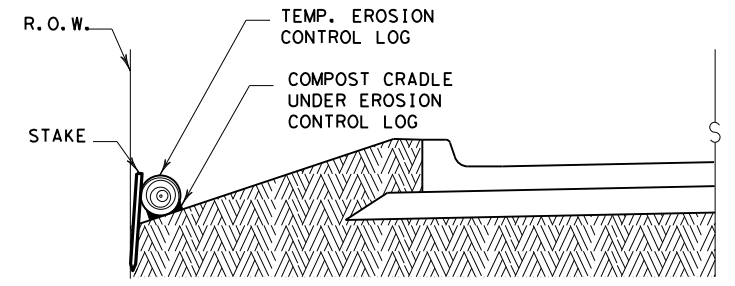
SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

CL-BOC



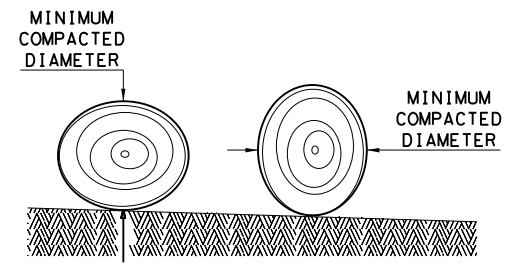
PLAN VIEW



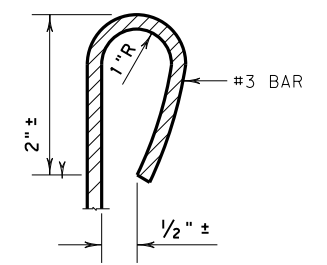
SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS



REBAR STAKE DETAIL

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.

GENERAL NOTES:

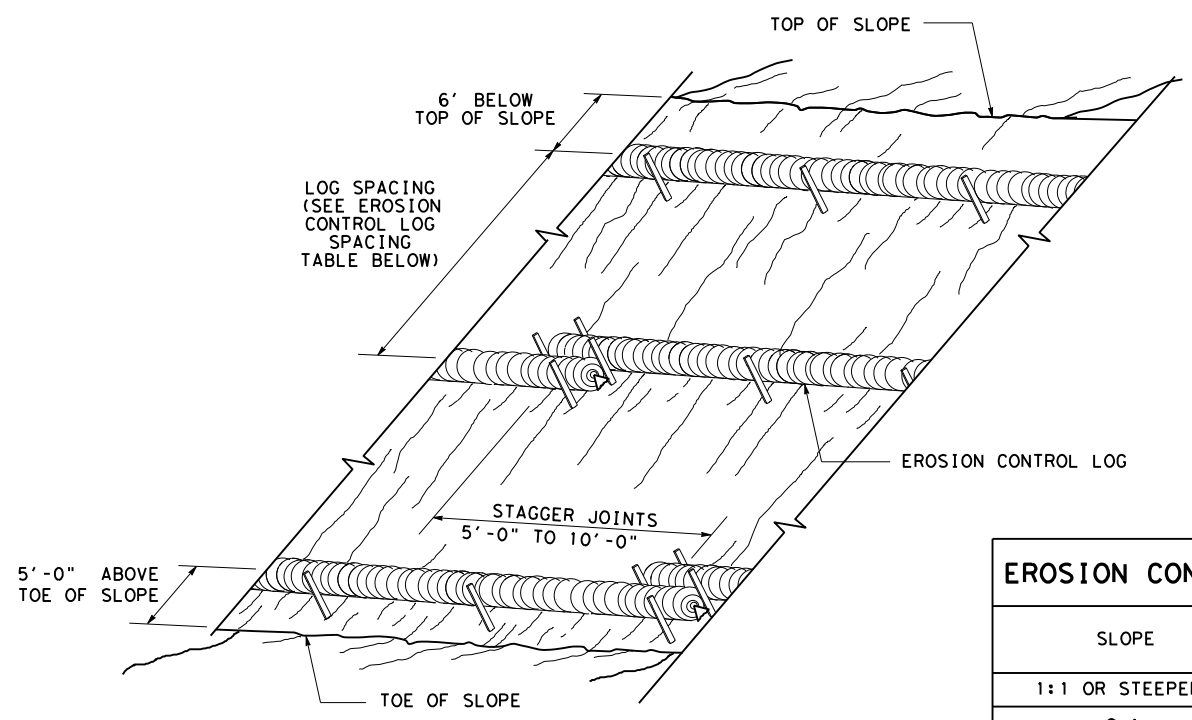
1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.

- LEGEND**
- CL-D EROSION CONTROL LOG DAM
 - CL-BOC EROSION CONTROL LOG AT BACK OF CURB
 - CL-ROW EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
 - CL-SST EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
 - CL-SSL EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
 - CL-DI EROSION CONTROL LOG AT DROP INLET
 - CL-CI EROSION CONTROL LOG AT CURB INLET
 - CL-GI EROSION CONTROL LOG AT CURB & GRATE INLET

SHEET 1 OF 3

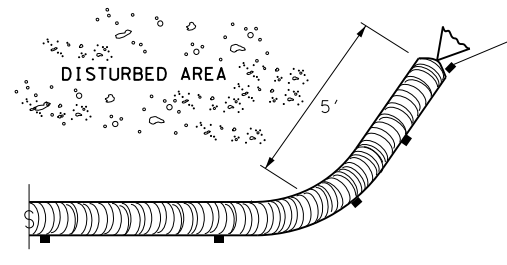
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FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT
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**EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING**

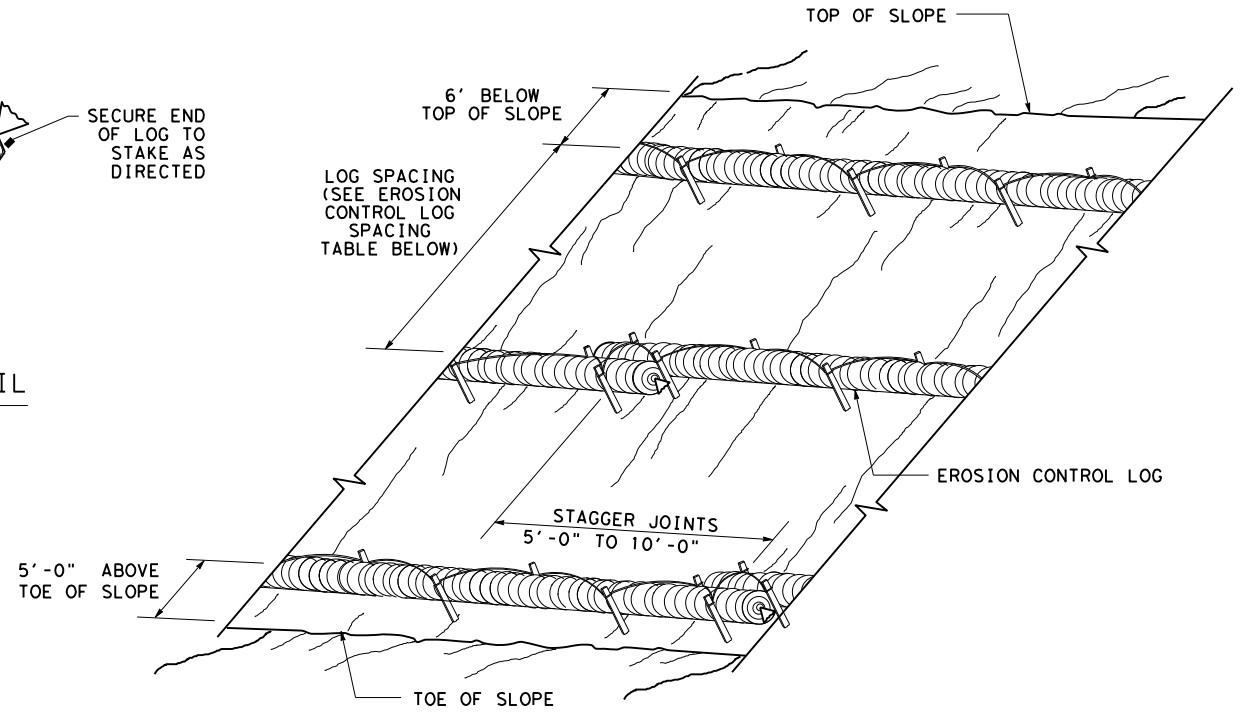
CL-SST



END SECTION RAP DETAIL

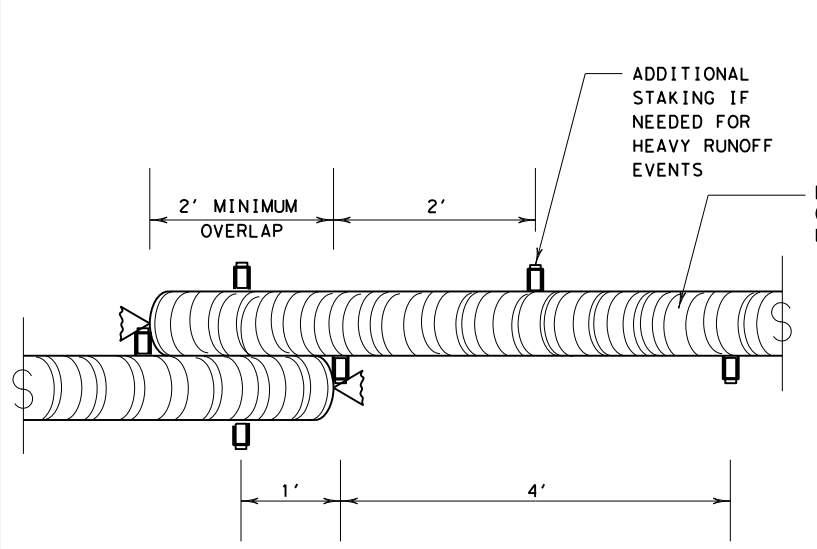
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
 SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
 HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



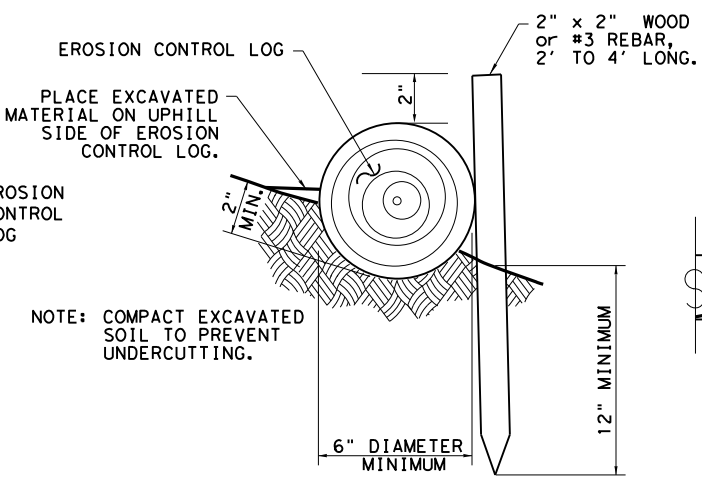
**EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING**

CL-SSL



STAKE AND TRENCHING ANCHORING DETAIL

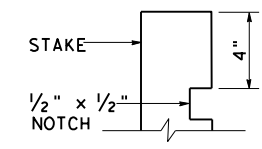
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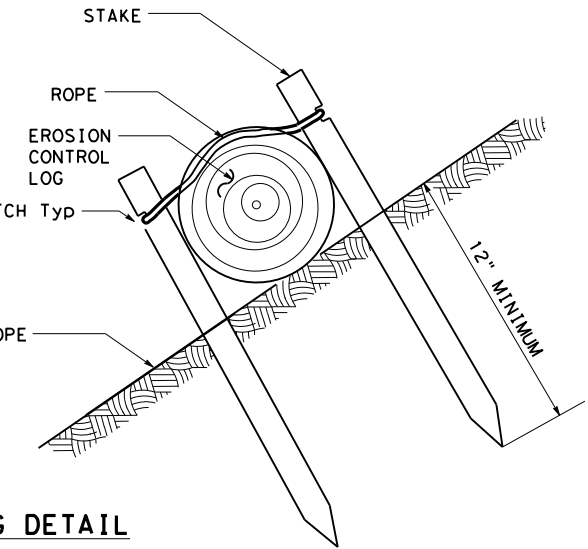
STAKE AND LASHING ANCHORING DETAIL

CL-SSL

LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"



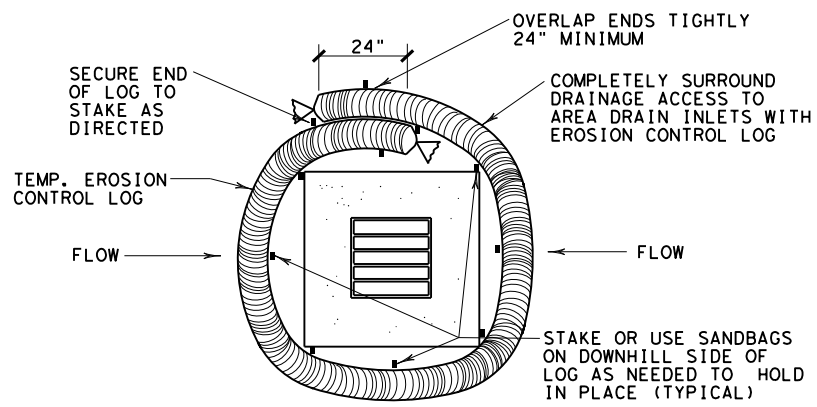
STAKE NOTCH DETAIL



SHEET 2 OF 3

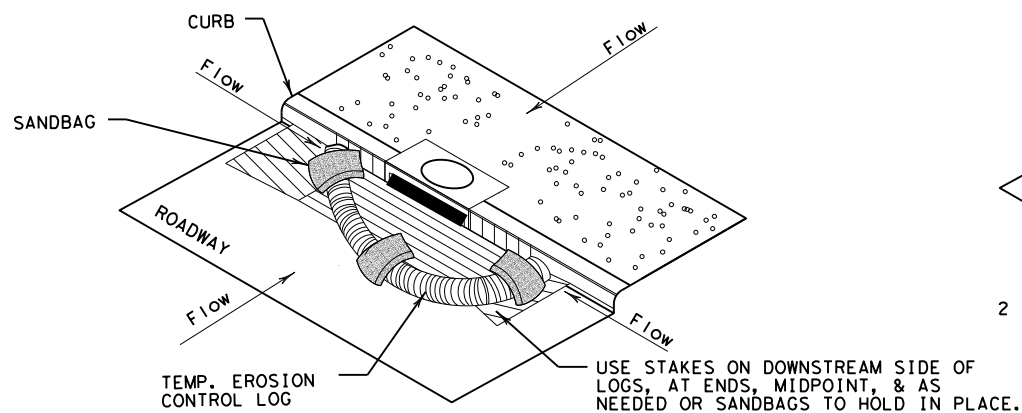
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TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES EROSION CONTROL LOG EC(9) - 16			
FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT
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REVISIONS	0902 00	299	VA
DIST	COUNTY	SHEET NO.	
FTW	TARRANT	133	

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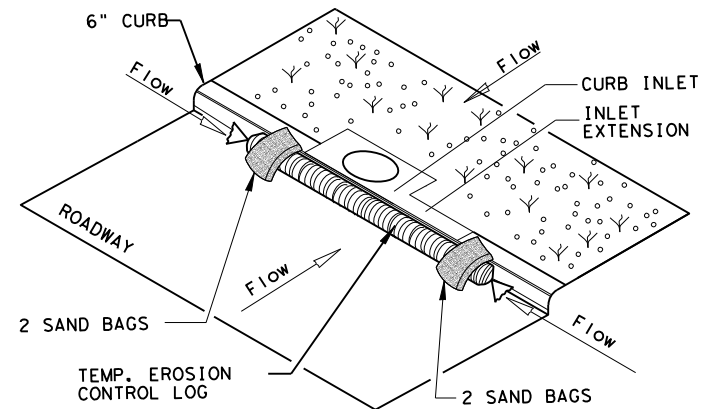
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

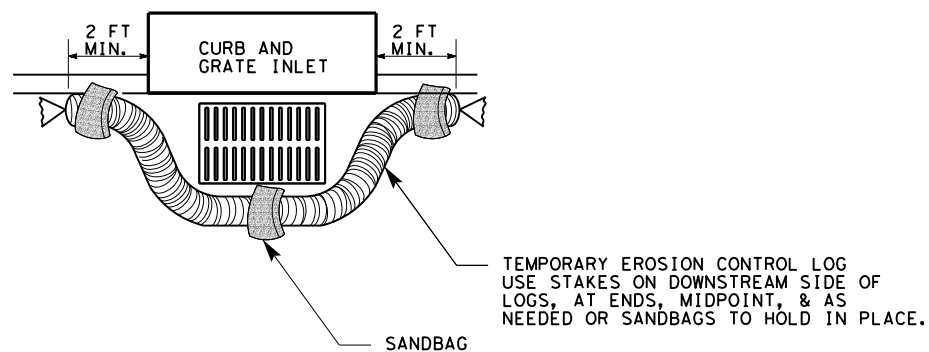
CL-CI



EROSION CONTROL LOG AT CURB INLET

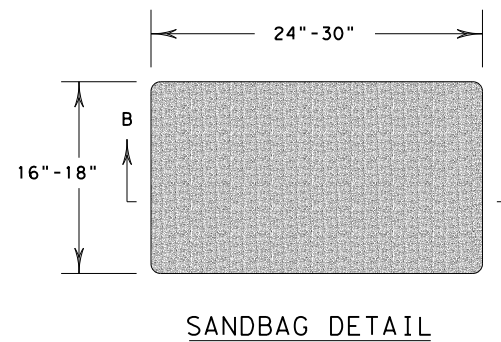
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NOTE:
 EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI



SHEET 3 OF 3

		<i>Design Division Standard</i>	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES EROSION CONTROL LOG EC (9) - 16			
FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT
© TxDOT: JULY 2016	CONT SECT	JOB	HIGHWAY
REVISIONS	0902 00	299	VA
DIST	COUNTY	SHEET NO.	
FTW	TARRANT	134	

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

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

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

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

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):

1.2 PROJECT LIMITS:

From: _____

To: _____

1.3 PROJECT COORDINATES:

BEGIN: (Lat)_____,(Long)_____

END: (Lat)_____,(Long)_____

1.4 TOTAL PROJECT AREA (Acres): _____

1.5 TOTAL AREA TO BE DISTURBED (Acres): _____

1.6 NATURE OF CONSTRUCTION ACTIVITY:

1.7 MAJOR SOIL TYPES:

Soil Type	Description

1.8 PROJECT SPECIFIC LOCATIONS (PSLs):

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

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

Type	Sheet #s

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

1.9 CONSTRUCTION ACTIVITIES:

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

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

Other: _____

Other: _____

Other: _____

1.10 POTENTIAL POLLUTANTS AND SOURCES:

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

Other: _____

Other: _____

Other: _____

1.11 RECEIVING WATERS:

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

Tributaries	Classified Waterbody

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

1.12 ROLES AND RESPONSIBILITIES: TxDOT

- Development of plans and specifications
- Perform SWP3 inspections
- Maintain SWP3 records and update to reflect daily operations

Other: _____

Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

- Day To Day Operational Control
- Maintain schedule of major construction activities
- Install, maintain and modify BMPs

Other: _____

Other: _____

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



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6	C 902-00-299		135
STATE	STATE DIST.	COUNTY	
TEXAS	FTW	TARRANT	
CONT.	SECT.	JOB	HIGHWAY NO.
0902	00	299	VA

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

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

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

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

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

2.2 SEDIMENT CONTROL BMPs:

T / P

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

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

2.3 PERMANENT CONTROLS:

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

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To

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

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

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

Other: _____

Other: _____

Other: _____

2.5 POLLUTION PREVENTION MEASURES:

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

Other: _____

Other: _____

Other: _____

2.6 VEGETATED BUFFER ZONES:

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

Type	Stationing	
	From	To

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

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

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

2.8 DEWATERING:

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

2.9 INSPECTIONS:

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

2.10 MAINTENANCE:

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

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



FED. RD. DIV. NO.	PROJECT NO.			SHEET NO.
6	C 902-00-299			136
STATE	STATE DIST.	COUNTY		
TEXAS	FTW	TARRANT		
CONT.	SECT.	JOB	HIGHWAY NO.	
0902	00	299	VA	