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(SEE SHEET NO. 2)

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION
PLANS OF PROPOSED
ROUTINE MAINTENANCE CONTRACT

TYPE OF WORK

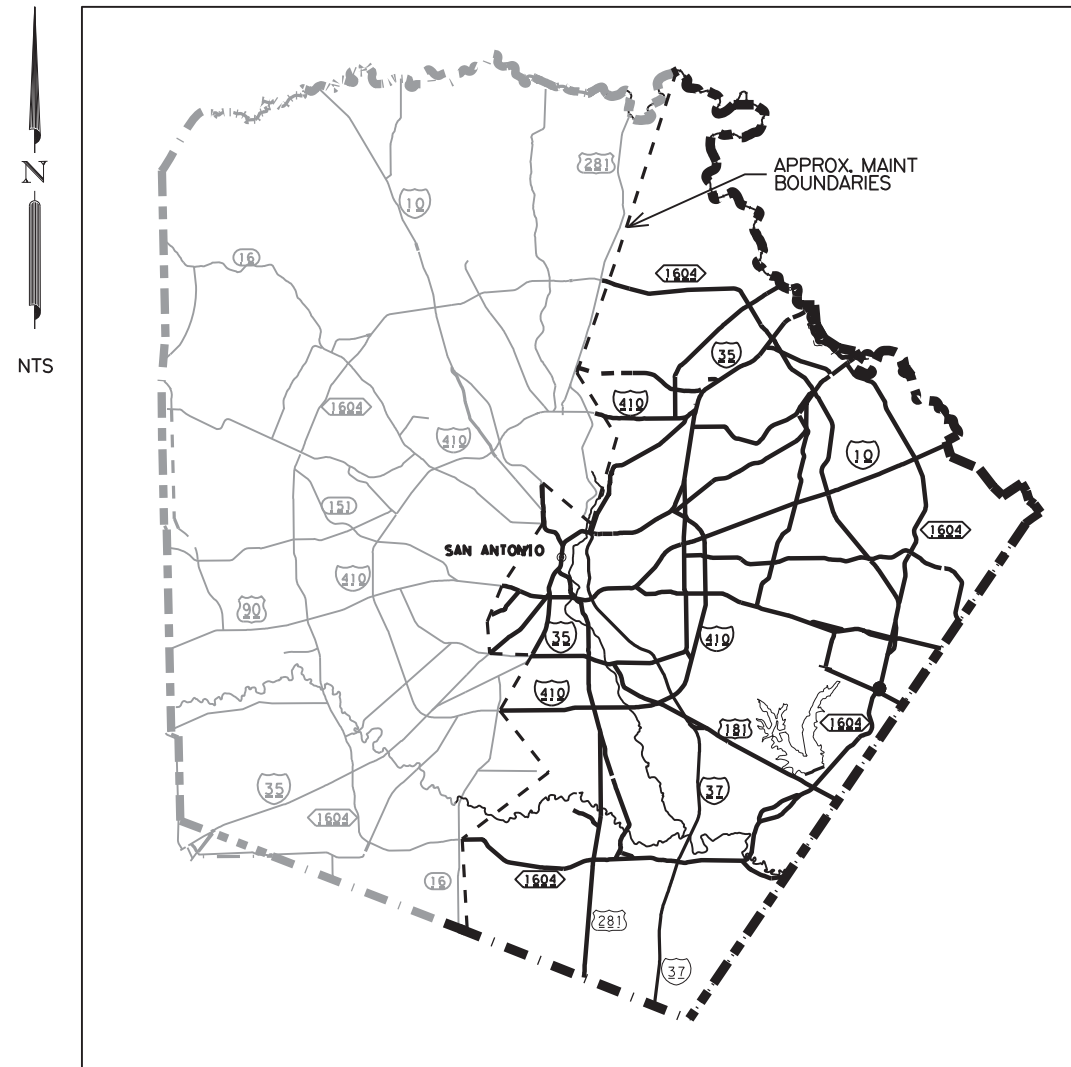
GENERAL ROUTINE MAINTENANCE

PROJECT NO.: 6372-50-001

LIMITS: EAST BEXAR COUNTY

AREA OF DISTURBED SOIL = 0.0 ACRES

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RMC 6372-50-001			I
STATE	DIST. STATE	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



EXCEPTIONS: NONE
EQUATIONS: NONE
RAILROAD: NONE

TEXAS DEPARTMENT OF TRANSPORTATION

SUBMITTED FOR LETTING:

K. J. P.E.

MAINTENANCE CONTRACT ENGINEER

11/19/2020

DATE

RECOMMENDED FOR LETTING

DocuSigned by:

Michelle Barton

12/3/2020

MAINTENANCE CONTRACT OFFICE

DATE

RECOMMENDED FOR LETTING

DocuSigned by:

Jessica Castiglione

12/3/2020

DIRECTOR OF OPERATIONS

DATE

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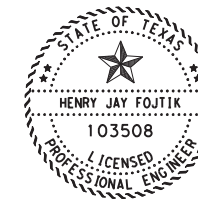
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Henry Jay Fojtik
HENRY JAY FOJTIK, P.E.

12/2/2020
DATE

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VARIOUS

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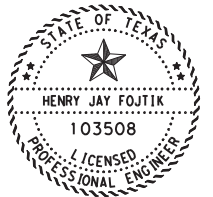
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& STATE STANDARDS


* SAN ANTONIO DISTRICT STANDARD



Henry Jay Fojtik P.E.

HENRY JAY FOJTIK, P.E. DATE 11/19/2020

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CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR.

Project Number: RMC 6372-50-001

Highway: Various

County: Bexar

Control: 6372-50-001

General Notes

TxDOT Project Engineer – The project will be managed by:

Gil Romo
9320 SE Loop 410
San Antonio, TX 78223

This project consists of mowing highway right of way, litter pickup, debris removal, sweeping, incident management, graffiti removal, snow and ice control, small and large sign repair and replacement, tree trimming, the repair of: guardrail, attenuators, concrete barrier, pedestrian rail, post and cable fence, chain link fence, concrete riprap, concrete curb, concrete sidewalks, delineation, pot holes, and cable barrier systems, and the cleaning of: pump house wells, drain inlets, raceways, bridge joints and storm drains in Bexar County.

Each contract awarded by the Department stands on its own and as such, is separate from other contracts. A contractor awarded multiple contracts, must be capable and sufficiently staffed to concurrently process any or all contracts at the same time.

Provide and maintain an e-mail address for receipt of work order and correspondence throughout the term of this contract. Respond to any correspondence within 24 hours to confirm receipt. Provide and maintain a phone number for receipt of Incident Management notification that is accessible 24 hours per day.

Notify the appropriate inspector by telephone each morning by 8:15 AM for any daytime or nighttime operations that is scheduled, with work location and time of arrival or reason for not working that day.

Remove materials or debris within the construction limits not incorporated in the project.

There are locations within the contract limits that are under construction by other contractors. Work may be performed in these areas as directed by the Engineer and will be paid for in accordance with the contract items. If this construction prevents any item of work from being performed, payment of the work quantities due to the contractor will be reduced to the percent of work actually completed. When construction is completed and work on this contract can be resumed, payment will be made according to the actual amount of work performed.

All work for guardrail, delineation, attenuator, post and cable fence, chain link fence, concrete rail/concrete barrier, cable barrier repair, concrete riprap repair, concrete curb repair, concrete sidewalk repair, small and large sign repair, pedestrian/metal rail repair, and tree trimming is considered callout work and a written work order will be issued as work is needed. A work order will consist of the location of each repair, the bid items for the repairs and the approximate quantity of work to be paid. Work orders will not include a list of required materials for the repairs. Order all materials and related components for each work order. Quantities on work orders are approximate and additional materials and work may be necessary to complete the repairs. Any additional work performed not specified in the work order will require prior approval. Complete all work on each call out work order for these work items within 30 days from the date of the work order unless otherwise specified.

When notified by emergency work order, begin physical work within 48 hours of notification and complete within 96 hours, unless otherwise approved.

Once work has started on each work order, continuously prosecute the work until all work on the work order is satisfactorily completed. Liquidated Damages will be assessed for any day charged beyond the authorized time on each work order as per the Schedule of Liquidated Damages in the Contract.

Project Number: RMC 6372-50-001

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TxDOT will provide completion forms for the contractor to document work at each location. These completion forms must be turned in each day that work is completed so that final inspection of each location can be performed. It is the responsibility of the contractor to submit these completion forms for payment purposes. Payment for a location will not be made without the submission of these completion forms.

Item 2 “Instructions to Bidders”

Contractor questions on this project are to be addressed to the following individual:
Henry Fojtik, P.E. Henry.Fojtik@txdot.gov

Contractor questions will be accepted through email to the above individuals.

All contractor questions will be reviewed by the Engineer. Once a response is developed, it will be posted to TxDOT’s Public FTP at the following Address:

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

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

This project includes plan sheets that are not part of the bid proposal.

View plans online or download from the web at:

<http://www.dot.state.tx.us/business/plansonline/ftpinfo.htm>

Order plans from any of the plan reproduction companies shown on the web at:

<http://www.txdot.gov/business/letting-bids/repro-companies.html>

Item 5 “Control of Work”

Any work required within rail road right of way will require contractor to obtain at a minimum; railroad insurance, right of entry agreement and railroad flagging operations. Any costs to the contractor to perform the work in addition to the pay item(s) required in the work order will be paid in accordance with item 5.8 “Cooperation with Railroads” of the specifications.

Item 6 “Control of Materials”

Provide all materials for this project. Provide new materials unless otherwise shown on the plans.

All salvageable material obtained after a repair is complete will become the property of the contractor.

Item 8 “Prosecution and Progress”

Between April 1st and October 31st, the Texas Commission on Environmental Quality (TCEQ), is monitoring weather conditions on a daily basis in the San Antonio area to forecast the probability of ozone formation. In the event weather conditions indicate that excessive ozone may occur, the National Weather Service working with the TCEQ will issue an Air Quality Health Alert Day for the following day. TCEQ estimates that approximately 25 Air Quality Health Alert Days might be issued during the ozone formation season.

GENERAL NOTES

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On Air Quality Health Alert Days, lane closures and the use of small gasoline engines will not be allowed until after 12 noon on all highways inside Loop 1604. The State will notify the Contractor by 4:00 p.m. of the day before the Air Quality Health Alert Day to inform them of the restrictions for the following day and to request their assistance in reducing any other operations that may contribute to an increase in the ozone readings. If these restrictions affect the critical items of work previously scheduled by the Contractor, a working day will not be charged. Time charges on these days will be as determined by the Engineer for each day.

Working days will be computed and charged in accordance with Article 8.3.1.5, Calendar Day Workweek. No work will be performed on Saturdays, Sundays, national or state holidays unless otherwise shown on the plans or approved.

Working hours for sweeping, drain cleaning, bridge joint cleaning, and storm sewer cleaning will be 9:00 PM through 5:00 AM Sunday night through Friday morning. Working hours for mowing will be daylight hours. Working hours for debris removal will be from 9:00 PM to 5:00 AM. Working hours for all other work items will be 9:00 AM through 4:00 PM when work does not require a lane closure unless otherwise directed or approved.

Perform all work during the times defined unless otherwise directed or approved by the Engineer.

Item 9 “Measurement and Payment”

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

Complete the daily tracking form provided by the department and submit invoices that agree with the tracking form for payment at the end of each month approved services were provided.

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

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

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

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

Item 104 “Removing Concrete”

Item 104-6014 “Removing Conc (Foundations)” is intended to be used to remove crash cushion attenuator foundations that are deemed to be beyond repair by the Engineer.

Item 104-6028 “Removing Conc (Misc)” is intended for removal of damaged Riprap (Mowstrip) and/or Riprap (Conc) at locations that are included with Guardrail repair/upgrade work.

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Item 420 “Concrete Substructures”

Item 420-6128 “Cl K Conc (Misc)” is intended to be used for replacement of crash cushion attenuator foundations that are deemed to be beyond repair by the Engineer. The strength requirement and minimum design strength attainment period will be dependent on the site-specific requirements for each location and as directed or approved by the Engineer. A higher early strength batch design may be required for areas needed earlier design strength due to lane closure constraints of the repair location. No additional compensation for this item will be made for these varying requirements.

Item 429 “Concrete Structure Repair”

This item is intended for repairing wingwall, retaining wall, or other damaged rail foundations as necessary when performing repairs to concrete rail or permanent concrete barrier.

Item 432 “Riprap”

Item 432-6006 “Riprap (Conc)(CL B)” is intended for installation of Riprap at locations that are included with Guardrail repair/upgrade work. This may include repair of damaged Riprap beyond the Mowstrip limits or the extension of the proposed Mowstrip.

Mow strips will be reinforced concrete. Install mow strips in accordance with the plans.

Item 500 “Mobilization”

Mobilization (Callout) will be paid once per work order, regardless of the number of locations listed on the work order for guardrail repair, delineation repair, attenuator repair, post and cable fence repair, chain link fence repair, concrete rail/concrete barrier repair, cable barrier repair, concrete riprap repair, concrete curb repair, concrete sidewalk repair, pothole repair, small and large sign repair, pedestrian/metal rail repair, tree trimming, mowing, spot debris removal, spot sweeping, graffiti removal, pump station and drainage system cleaning. Mobilization (Emergency) will be paid for each occurrence of Incident Management only.

Item 502 “Barricades, Signs, and Traffic Handling”

Furnish and install all signs, barricades and other incidentals necessary for proper traffic control, in accordance with part VI of the “Texas Manual on Uniform Traffic Control Devices for Streets and Highways” and in accordance with the standard plan sheets. Additional devices may be needed to supplement these requirements. All warning signs shall be factory made and in satisfactory condition.

The signs and traffic control devices shown are minimum requirements. Additional signs and devices may be required to address existing conditions. Traffic control (all signs and devices) will be subsidiary to the various bid items.

Mount signs on a portable support. Move signs as necessary to maintain the same relative spacing between the signs and the work area as work progresses along the roadway. Place signs as indicated on RS-TCP-05 (for mowing, litter pickup, sweeping, post and cable fence repair, chain link fence repair, cable barrier system repair, and cleaning pump house wells work).

Upon issuance of an emergency guardrail or attenuator work order, place “Guardrail Damage Ahead” signs at locations listed on the work order. These signs shall be 48” x 48” and on a 7’ stand with 2 flags on each sign. Place signs within 24 hours of notification. Place signs approximately 500’ to 700’ in advance of the damaged rail or attenuator unless directed or approved by the Engineer. Remove the signs upon completion of repairs at each location. The placement and removal of these signs will be subsidiary to the various bid items of guardrail or attenuator repair.

GENERAL NOTES

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For mowing operations, furnish and install "MOWERS AHEAD" signs with flags in accordance with DMS 8310 "Flexible Roll-Up Reflective Signs".

For litter removal operations, furnish and install "LITTER PICKUP AHEAD" head signs with flags in accordance with DMS 8310 "Flexible Roll-Up Reflective Signs".

For debris removal operations, furnish and install "DEBRIS REMOVAL AHEAD" signs with flags in accordance with DMS 8310 "Flexible Roll-Up Reflective Signs".

For Sweeping operations, furnish and install "SWEEPERS AHEAD" signs with flags in accordance with DMS 8310 "Flexible Roll-Up Reflective Signs".

For Guardrail, Attenuator, Chain Link Fence, Post and Cable Fence, Concrete Rail/Concrete Barrier Repair, Pumphouse Cleaning, Drain Cleaning, Joint Cleaning operations and Cable Barrier System operations, furnish and install "ROAD WORK AHEAD" signs with flags in accordance with DMS 8310 "Flexible Roll-Up Reflective Signs".

For nighttime work, mount signs a minimum height of 7 feet, but not more than 9 feet above the pavement surface.

When a Traffic Control Plan (TCP) standard requires the use of one of the following devices, a Type III barricade, channelizing devices or shadow vehicle with orange flags or warning lights, use a shadow vehicle equipped with a Truck Mounted Attenuator (TMA).

Erect temporary traffic control signs in locations that will not obstruct the traveling public's view of the permanent roadway signing or obstruct sight distance at intersections and curves.

Any lane closures will require prior approval. Request approval 48 hours in advance of lane closures. If a lane closure needs to be cancelled due to weather or other unforeseen circumstances, immediately notify the inspector and reschedule the lane closure as necessary. Any lane closure request that the Engineer determines will cause a negative unacceptable impact to the normal flow of traffic will not be approved.

Perform complete lane closures in gore areas in accordance with the TCP's. Request approval 48 hours in advance of these closures.

When performing work requiring the use of TCP (3-2)-13, a ramp control vehicle will be required. This work will be considered subsidiary to the various bid items of the contract.

When arrowboards are required, provide a standby unit in good working condition at the jobsite ready for immediate use.

Perform placement and removal of all traffic control devices within the working hours listed.

Item 512 "Portable Traffic Barrier"

Item 512-6087 "Port CTB Aligning" will be used as directed by the Engineer to realign portable "zipper" style movable concrete traffic barrier on the IH 35 NB ramp to US 281 SB / IH 37 NB. Use mechanical means to realign barrier without damaging the barrier and as approved by the Engineer.

Item 529 "Concrete Curb, Gutter, and Combined Curb and Gutter"

This item will be used as directed by the Engineer to repair median island noses, install missing Thrie-Beam curb, and miscellaneous curb repairs.

Project Number: RMC 6372-50-001

Highway: Various

County: Bexar

Control: 6372-50-001

Item 540 "Metal Beam Guard Fence"

This Item is intended for installation of guardrail in locations where guardrail did not previously exist or when a guardrail system is upgraded to the current standard.

When a retrofit plate (T2/T201TR and T202TR retrofit guides) is required to attach a thrie-beam or non-symmetrical transition rail to concrete bridge rail, TxDOT will provide a site-specific design, and the Contractor shall provide and install the retrofit plate. This retrofit plate installation will be paid for under item 540-6037 "Mtl Bm Gd Fen Trans (Anchor Plate)".

After installation, repair all galvanized parts on which the galvanizing has become scratched, chipped, or otherwise damaged. Repair in accordance with Item 445.3.5, "Repairs". This work is subsidiary to the various bid items of the contract.

Supply and install terminal connectors as necessary. This work is subsidiary to the installation of the guardrail.

Item 542 "Removing Metal Beam Guard Fence"

When removing guardrail, the removal will include complete removal of any existing terminal anchor section when a new terminal anchor section or guardrail end treatment will not be installed.

When removing guardrail in concrete riprap, fill in the guardrail post holes with suitable material (soil) and then place grout in the blockout area the post was removed from. This placement of grout is subsidiary to the various bid items of the contract.

Remove guardrail and terminal connectors that are temporarily attached to damaged concrete traffic barrier or rail for temporary safety purposes prior to repairing the damaged concrete rail. Deliver the guardrail and terminal connectors to the TxDOT yard located at 9320 SE LP 410 in San Antonio. The removal and delivery of the rail will be paid for with Item 542-6001 "Removing Metal Beam Guard Fence".

Item 544 "Guardrail End Treatments"

This Item is intended for:

1. Installation of guardrail end treatments (also known as single guardrail terminals or SGTs) in locations where guardrail did not previously exist.
2. Complete removal of an existing guardrail end treatment when a new guardrail end treatment will not be installed.
3. Locations that are determined to be upgraded as directed by the Engineer.

Installation of object markers on a Guardrail End Treatment will be subsidiary to the various bid items of the contract.

After installation, repair all galvanized parts on which the galvanizing has become scratched, chipped, or otherwise damaged. Repair in accordance with Item 445.3.5, "Repairs". This work is subsidiary to the various bid items of the contract.

Item 545 "Crash Cushion Attenuators"

The intent of item 545-6005 "Crash Cush Atten (Remove)" and 545-6019 "Crash Cush Atten (Instl)(S)(N)(TL3)" is to remove and replace damaged SLED Crash Cushions at locations shown on a work order.

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Item 550 "Chain Link Fence"

Damaged chain link fence may or may not include top rail. Repair chain link fence in-kind.

For all chain link fence installed on top of concrete structures or riprap, place posts with base plates and 4 concrete anchors per post.

Item 658 "Delineation"

Install delineators on guardrail as directed by the Engineer. Use GF2 type with a flexible post. Install delineators to the downstream (in relation to the adjacent lane of traffic) side of the guardrail post.

Payment for removal of delineators will be made for broken or damaged delineators or delineators otherwise deemed necessary to replace that are outside of the area of guardrail repair.

Item 700 "Pothole Repair"

All work on this item is callout work and a work order will be issued as work is needed to be performed.

If notified of an emergency repair, begin work within 3 hours of notification.

Once work has started, continuously prosecute the work until all work on the work order is satisfactorily completed. Liquidated Damages will be assessed for any day charged beyond the authorized time on each work order as per the Schedule of Liquidated Damages in the Contract.

One EA Item 500-6033 "Mobilization (Callout)" will be paid per work order regardless of number of locations on that work order for non-emergency pothole repair.

One EA Item 700-6009 "Emergency Mobilization" will be paid for each emergency work request.

Item 730 "Roadside Mowing"

Written notification of when to begin mowing will be given. The type of mowing and tracts to be mowed, the date when time charges begin, and the number of working days for completion of the work will be given on the written notification. When notified of when to begin spot mowing start work within 48 hours.

Calculation of working days is based upon mowing 230 acres for Strip Mowing (15 feet), 230 acres for Strip Mowing (30 feet), 230 acres for Full Width Mowing and 10 acres for Spot Mowing per day.

Once work has started, continuously prosecute the work until all work on the work order is satisfactorily completed. Liquidated Damages will be assessed for any day charged beyond the authorized time on each work order as per the Schedule of Liquidated Damages in the Contract.

During mowing cycles, coordinate mowing schedule with the litter cycle in order to prevent the mowing and shredding of litter on the highway. Coordinate litter pickup before mowing of a tract.

Trimming is required around all guardrail, the face of retaining walls, all appurtenances, and around all landscape plantings within or immediately adjacent to a mow area.

Trim vegetation to a height that is level with soil or hard surface of these structures. Vegetation in areas with loose gravel or other debris adjacent to travel lanes where trimming to ground level may be hazardous to passing vehicles may be cut to a height of 2" to 3" as approved to avoid scattering the material on the pavement surface.

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When mowing adjacent to the edge of pavement, mow in the direction of traffic flow.

When performing strip mowing, mow the entire right of way from the pavement edge to the right of way in front of developed areas such as houses, churches, schools, cemeteries and businesses.

There are mulched landscape planting beds with irrigation systems within the limits of this contract. Unless directed otherwise, hand trimming of vegetation along the edge of these beds (planting beds are maintained by others) up to the mulched area is required if it cannot be mowed without displacement of the mulch. If mulch is displaced as a result of mowing or hand trimming, replace the mulch to previous conditions.

There may be locations of existing cable barrier fence, MBGF (metal beam guard fence), cable and other types of dividers in the ROW within the limits of this contract. Additional dividers may also be added during the term of this contract.

The contractor is responsible for traveling the highways within this contract to determine what type of mowing equipment will be necessary for mowing narrow areas adjacent to these dividers. Conventional batwing mowers may not be suitable or acceptable for mowing these areas. Encroachment of equipment onto the paved shoulder and closures of the travel lane will not be permitted for mowing this narrow width area. Therefore, the contractor must utilize mowing equipment that will not encroach into or adversely affect traffic in the adjacent travel lane.

Traffic volumes may require the use of a shadow vehicle with TMA when crossing multiple lanes with equipment to access center medians or to enter the shoulder/travel lanes while going around bridges and other obstacles. Use of this equipment will be paid for under Item 6185-6003 "TMA (Mobile Operation)".

There will be no adjustment to the unit bid prices and no additional payment on this contract for mowing along existing or new installations of: traffic barrier, MBGF, post and cable or any other type of divider. Any additional or alternative equipment, additional labor, or other expenses necessary to complete the work will be paid for at the unit price bid for the items in this contract.

Item 734 "Litter Removal"

Remove all litter from the entire right of way, including all shoulders but excluding the traveled lanes.

Remove litter and debris from behind barrier, including MBGF and attenuator systems, that is not accessible by sweeping operations.

The Department will issue a written notice to begin the initial litter cycle. Successive cycles will be scheduled as follows:

Perform a cycle for Tracts 1 through 26 as listed in the scope of work for litter on the first day of the month or the first working day thereafter. Complete this cycle within 10 working days.

Perform a second cycle for Tracts 1 through 15 as listed in the scope of work for litter beginning on the twentieth day of the month or the first working day thereafter. Complete this cycle within 5 working days.

Once work has started on a cycle, proceed in an expeditious manner until all work on that cycle is satisfactorily completed. Liquidated damages will be assessed for any working day charged beyond the authorized time as per the Schedule of Liquidated Damages in the Contract.

Traffic volumes may require the use of a shadow vehicle with TMA when picking up bags and debris from the shoulder of the roadway or when crossing multiple lanes with equipment to access center medians. Use of this equipment will be paid for under Item 6185-6003 "TMA (Mobile Operation)".

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Spot litter removal will be callout work. A separate work order will be sent from the normal litter removal cycles. Begin work on spot litter removal within 24 hours of notice or as directed by the Engineer.

Whole tires picked up from the right-of-way may be disposed of at the Maintenance Section Yard at the locations designated below:

Deliver whole tires to:

TxDOT
Bexar Metro Maintenance Yard
9320 SE Loop 410
San Antonio, TX 78223

Item 735 “Debris Removal”

Debris cycles are meant to supplement sweeping cycles and will be performed as a separate operation from the sweeping cycles.

The Department will issue a written notice to begin the initial debris removal cycle.

Perform a cycle of debris removal for Item 735-6006 tracts 1 through 14 and 735-6148 tracts 1 through 11 beginning on the first Sunday night of the month. Perform this cycle in 3 working days.

Perform a cycle of debris removal for Item 735-6002 tracts 1 through 14 beginning on the second Sunday night of the month. Perform this cycle in 3 working days.

Perform a cycle of debris removal for Item 735-6006 tracts 10 through 14 and 735-6148 tracts 1 through 11 beginning on the third Sunday night of the month. Perform this cycle in 3 working days.

Perform a cycle of debris removal for Item 735-6002 tracts 10 through 14 beginning on the fourth Sunday night of the month. Perform this cycle in 3 working days.

Remove all collected debris (loose or bagged) from the highway right of way at the end of each working day.

Perform successive cycles coordinated with the sweeping cycles each month.

Once work has started on a cycle, proceed in an expeditious manner until all work on that cycle is satisfactorily completed. Liquidated damages will be assessed for any working day charged beyond the authorized time as per the Schedule of Liquidated Damages in the Contract.

Use TCP (3-2)-13 Traffic Control Plan Mobile Operations Divided Highways for this work. A shadow vehicle and a trail vehicle with truck mounted attenuators will be required at all times.

Item 738 “Cleaning and Sweeping Highways”

The Department will issue a written notice to begin the initial sweeping cycle. Successive cycles will begin on the first Sunday night of each month.

Provide sweeper operator with a cell phone to notify Transguide at (210) 731-5139 of the sweeper’s work location. Notify TransGuide a minimum of 30 minutes in advance of beginning work or changing work direction on any freeway main lanes. This requirement is subsidiary to the various bid items of the contract.

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Use TCP (3-2)-13 Traffic Control Plan Mobile Operations Divided Highways for this work. A shadow vehicle and a trail vehicle with truck mounted attenuators will be required at all times.

Perform a cycle of sweeping for Item 738-6002 and 738-6004 for tracts 1 through 14 beginning on the first Sunday night of each month. Perform this cycle in 3 working days.

Perform a cycle of sweeping for Item 738-6006-tracts 1 through 5, 738-6008 tracts 1 through 14 and 738-6315 tracts 1 through 11 beginning on the second Sunday night of each month. Perform this cycle in 3 working days.

Perform a cycle of sweeping for Item 738-6002 and 738-6004 for tracts 1 through 9 beginning on the third Sunday night of each month. Perform this cycle in 3 working days.

Perform a cycle of sweeping for Item 738-6008 tracts 1 through 9 and 738-6315 tracts 1 through 11 beginning on the fourth Sunday night of each month. Perform this cycle in 3 working days.

Removal of debris from pavement surface under this bid item includes but is not limited to the removal of dead animals, tires, tire fragments, wood, furniture, mattresses, household appliances, and scrap metal. Perform the removal of debris as a separate operation ahead of the sweepers in order to prevent running over debris with sweepers or to prevent sweepers from going around debris.

Clean under and around all attenuators during sweeping cycles. This work is subsidiary to the cyclical cleaning item of work.

On divided highways, clean and sweep the left paved shoulders (including raised shoulders with mountable curbs of 5" or less) and left paved gutters.

Spot sweeping will be callout work. A separate work order will be sent from the normal sweeping cycles. Begin work on spot sweeping with 24 hours or as directed by the Engineer.

Item 738-6011 “Cleaning / Sweeping Hand Work” will be a callout item used to remove trash, debris, silt, etc. from areas that are not accessible by mechanical sweepers, including but not limited to gore and other confined areas with barrier on either side. The Contractor will be required to access these confined areas to remove objectionable materials that have collected in these areas.

Removal of aggregate placed on roadways as part of a deicing operation will be paid for under the item “Aggregate Removal.” This work will be placed on a work order separately from the normal sweeping cycle. Clean and Sweep each bridge deck plus 250 ft before and after each bridge deck. Perform this work within 30 calendar days from the date of the workorder. Perform this work on Sunday nights through Thursday nights.

Once work has started on a cycle, proceed in an expeditious manner until all work on that cycle is satisfactorily completed. Liquidated damages will be assessed for any working day charged beyond the authorized time as per the Schedule of Liquidated Damages in the Contract.

Material will be disposed of at an approved landfill. The Department has secured a waste code with the BFI landfill located at 7000 IH 10 East in San Antonio. A copy of the chemical analysis is available for review by contacting the District Environmental Office. The use of an alternate landfill may require additional analysis. Costs involved to any analytical laboratory will be at the Contractor’s expense. Provide written receipts showing disposal at licensed disposal facilities.

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The Texas Department of Transportation, San Antonio District, will be listed on the manifest as the generator of the waste. The Contractor will sign the manifest as an agent for TxDOT. A letter authorizing the Contractor to sign the manifests will be provided to the Contractor when the contract is awarded. All copies of the manifests, signed by a representative of the landfill, will be returned to the Department within 45 days from the date of disposal.

Item 740 “Graffiti Removal and Anti-Graffiti Coating”

All work on this item is callout work and a work order will be issued as work is needed to be performed. Remove obscene or gang related graffiti within 24 hours, all other graffiti within 1 week.

Once work has started, continuously prosecute the work until all work on the work order is satisfactorily completed. Liquidated Damages will be assessed for any day charged beyond the authorized time on each work order as per the Schedule of Liquidated Damages in the Contract.

Item 752 “Tree Trimming and Brush Removal”

Tree trimming will be measured by the linear foot along the length of the right of way to the outer edges of the canopy of the tree.

Brush removal will be measured by the linear foot along the length of the right of way for the area of the brush to be removed.

Item 764 “Pump Stations and Drainage System Cleaning”

All work on this item is callout work and a work order will be issued as work is needed to be performed. Complete work within 5 working days of the work order.

Once work has started, continuously prosecute the work until all work on the work order is satisfactorily completed. Liquidated Damages will be assessed for any day charged beyond the authorized time on each work order as per the Schedule of Liquidated Damages in the Contract.

Follow confined space procedures as outlined in OSHA Standard 29 CFR 1910.146. Have a copy of the permit at the work site whenever entering a confined workspace.

Remove and dispose of all debris from designated areas as directed. Do not dump or stockpile debris on State Property or ROW. Dispose of all debris at an E.P.A.- and State-approved disposal facility.

Debris removed from the Pump Houses is classified by the Texas Commission of Environmental Quality (TCEQ) as storm water receptor waste. Storm water receptor waste is regulated by the TCEQ as a special waste. Storm water receptor waste must be transported with a non-hazardous special waste manifest or bill of lading identifying the material being transported as “Storm Water Receptor Waste”. The Texas Department of Transportation, San Antonio District, will be listed on the manifest as the generator of the waste. Sign the manifest as an agent for TxDOT. A letter authorizing the contractor to sign the manifest will be provided to the Contractor when the contract is awarded. All copies of the manifest, sign by a representative of the landfill, will be returned to the State within 45 days from the date of disposal.

The Department has secured a waste code with the BFI landfill located at 7000 IH 10 East in San Antonio. A copy of the chemical analysis is available for review by contacting the District Environmental Office. The contractor has the option to obtain a waste code from a different landfill. If the alternate landfill requires additional analysis, the Contractor will have to submit a sample of the waste to an analytical laboratory at the Contractor’s expense.

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Provide all water needed to perform the work during this contract. The cost of this water will be considered subsidiary to the various bid items of this contract. For information regarding obtaining a water meter for fire hydrants, contact the San Antonio Water System at (210) 704-7075.

Provide equipment for this contract that is in good working condition and free of contamination.

Pump House Locations are as follows:

- No. 1 - IH 35 NB at 1302 South Laredo St., near South Alamo St.
- No. 2 - IH 35 SB and East Elmira St., between Main Ave. and San Pedro
- No. 3 - IH 35 at McClane (St. Mary’s St.)
- No. 4 - IH 35 NB Martin St. at San Saba
- No. 5 - IH 10 EB and South Presa St. (off South Presa at 515 Schley)
- No. 9 - SP 371 (General Hudnell) at Cupples Rd. (Southeast Corner)
- No. 10 - SP 371 (General Hudnell) at Cupples Rd. (Northeast Corner)

The sump cleaning will be associated with Pumphouse No. 5 and is located in the IH 10/IH 37 interchange. Supply all pipe plugs to stop any flows into pumphouses while cleaning.

Item 770 “Guard Fence Repair”

The use of Oxygen/Acetylene torch or any other similar devices used to heat the metal to create a hole will not be allowed to create holes in any metal beam guard fence elements or steel post.

Replacement of guardrail blockouts and toenailing of blockouts will be subsidiary to the various items. After guardrail repair is complete, repair all galvanized parts on which the galvanizing has become scratched, chipped, or otherwise damaged. Repair galvanizing in accordance with Item 445.3.5, “Repairs”. This work is subsidiary to the various bid items of the contract.

For all items of work in the vicinity of riprap mow strip leave-out areas in this contract, removal and replacement of all grout for each leave-out being worked on will be required. Do not leave pieces or portions of existing grout in the leave-out sections. All leave-out grout will be placed as shown in the MBGF Mow Strip standard. Leave-out grout removal and installation will be subsidiary to the various items of work being performed. All required leave-out grout work should be performed on the same day as the repairs being performed.

The Engineer will determine whether damaged guardrail will be repaired or whether to upgrade the installation to the current standards using other items of work.

Installation/replacement of object markers, cable, anchors, struts, bearing plates and other hardware necessary to repair a Guardrail End Treatment will be subsidiary to Items 770-6021, 770-6028 and 770-6029.

A work order for radius rail will not include the degree of radius for the rail. It is the responsibility of the contractor to measure and order the radius rail required for the repair.

“Repair Rail Element W-Beam (770-6001)”, “Thrie-Beam (770-6002)”, or “Thrie-Beam Trans to W-Bm (770-6003)”

If only the W-Beam portion of a T101 bridge rail is damaged, repair the W-Beam in accordance with this Item. This repair will be paid for as Item 770-6001, “Repair Rail Element (W-Beam)”.

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When repairing rail element attached to a concrete bridge rail, remove expansion anchors and drill holes (to provide a snug fit for 7/8 inch diameter bolts) completely through the parapet wall with a masonry bit or core drill. Do not use percussion drilling in concrete walls. Mount guardrail to the parapet wall with 7/8 inch diameter bolts that extend completely through the parapet wall. This work is subsidiary to this Item.

Supply and install terminal connectors as necessary. This work is subsidiary to the installation of the guardrail.

“Remove/Replace Timber/Steel Post without Concrete Foundation (770-6010)”

When Timber or Steel Post are removed/replaced in Riprap without an existing mowstrip leave-out, the contractor will remove existing post and saw cut an 18” X 18” square hole to achieve a smooth leave-out border. Replace post, backfill, and compact with suitable material to the lower edge of the riprap and fill area between post and riprap with grout. This work will be paid with Item 770-6010 Remove/Replace Timber/Steel Post without Concrete Foundation.

Remove/Replace Timber/Steel Post with Concrete Foundation (770-6011)”

Timber/Steel Post with Concrete Foundation will be defined as a post that the entire foundation is completely encapsulated in concrete. This work will be paid using Item 770-6011 Remove/Replace Timber/Steel Post with Concrete Foundation. All other post, including those in Riprap will be paid using Item 770-6010 Remove/Replace Timber/Steel Post without Concrete Foundation.

Repair damaged steel post by exposing the post twelve inches below the damaged area. Cut post a minimum of six inches below the damaged area and weld a new post to the existing portion of post using full depth groove weld all the way around the post. Backfill will consist of grout.

When field welding is required, provide a “Certified Steel Structures Welder” in accordance with Item 448.4.2. “Welder Qualification”. Correct unsatisfactory welds at the Contractor’s expense.

“Realignment of Posts (770-6017)”

Do not damage existing posts when realigning posts. For posts needing to be aligned by more than 2”, drill new post holes and reset existing posts as directed. Posts that are realigned by 2” or less do not require new holes to be drilled. Plumb posts by hand and tamp behind the post to achieve proper alignment and compaction. Payment to realign posts that are 2” or less out of alignment will not be made and should be considered subsidiary to other work items being performed.

If an SGT post must be realigned, removal and resetting of a steel tube will be necessary to complete the realignment of the post. This removal and resetting of the steel tube will be subsidiary to this item. Concrete/grout work may be necessary to perform the realignment of posts. This concrete/grout work will be subsidiary to this item. Work for Item 770-6017 “Realign Posts” may include posts where the guardrail is not damaged.

When the Engineer determines that removal of undamaged guardrail is necessary in order to achieve proper realignment of posts and rail, additional payment for removal of the existing rail and reinstalling the existing rail will be paid for by Item 770-6008 “Realign Existing Rail”. Additional payment will not be made for the removal of the existing rail and reinstalling the existing rail when the Engineer has not directed such work.

“Remove and Reset SGT Impact Head (770-2022)”

This item is intended for removal and re-installation of the impact head when a collision has caused the impact head to be moved out of its required position and the impact head is not damaged as determined by the Engineer. Remove damaged guardrail from the Impact Head as recommended by the manufacturer.

“Remove Guardrail End Treatment/Replace with SGT (770-6027)”

Removal of the existing Terminal Anchor Section and/or the existing guardrail end treatment will be considered subsidiary to this Item.

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“Replace SGT Impact Head (770-6028)”

This item is intended for removal of a damaged SGT impact head and replacement with a new impact head.

“Replace Single Guardrail Term Post (Wood) (770-6062)” and “Replace Single Guardrail Term Post (Steel) (770-6063)”

The replacement of a SGT post may include replacement of the soil tube. Replace kinked or bent soil tubes or as directed by the Engineer. The replacement of the soil tube is subsidiary to the replacement of the SGT post. Driving of steel tubes will not be allowed. Replacement of both SGT steel hinged and unhinged posts will be paid for under this item.

Item 771 “Repair Cable Barrier System”

Repair cable barrier system in accordance with the manufacturer’s recommendations as shown on the detail sheets.

TL-3 and TL-4 systems being repaired in this contract may be from a variety of manufacturers including but is not limited to Gibraltar, Inc., Trinity Highway Products, LLC. and Nucor Steel Marion, Inc. Standards for each of these Manufacturers are included in this contract. Payment for the repair of all cable barrier systems will be made for any system encountered in the field regardless of the manufacturer of the system being repaired.

Re-tensioning a repaired stretch of cable barrier system will not be paid for directly, but will be subsidiary to the various bid items in the contract. Replace any damaged/missing hardware components of the system during a repair. This replacement is subsidiary to the various bid items of the contract.

“Replace Posts (TL-3) (771-6001)” and “Replace Posts (TL-4) (771-6002)”

This item will be paid only when a post and/or posts are completely removed and replaced. If a post is reused, there will be no payment made. The reuse of a post and supplying any missing hardware for reused post is subsidiary to the various bid items in the contract.

“Cable Splice/Turnbuckle (TL-3) (771-6003)” and “Cable Splice/Turnbuckle (TL-4) (771-6004)”

A splice can be made to all types of cable barrier, regardless of manufacturer, using the turnbuckle or torpedo style splice.

“Repr or Replc Cable Barr Term Sec (TL-3) (771-6007)” and “Repr or Replc Cable Barr Term Sec (TL-4) (771-6008)”

A terminal section includes all posts and anchors included in the end section as shown the detail sheets. Payment is for the entire section, not each post.

“Replace Cable (TL-3) (771-6009)” and “Replace Cable (TL-4) (771-6010)”

This item will be paid only when cable is completely removed and replaced. If the cable is loose and just reattached to posts, there will be no payment made. The reuse of cable is subsidiary to the various bid items in the contract.

“Check / Re-Tension Cable (771-6011)”

This item will be paid for when a non-damaged system not being repaired by the Contractor is requested to be checked and re-tensioned only.

Item 772 “Post and Cable Fence

Replace any missing cylinder reflectors, reflector keepers, or any other missing or damaged incidental hardware between repair area from pull post to pull post in accordance with Post and Cable Fence standard sheet. This work will be considered subsidiary to the Post and Cable Repair item of work. When Post and Cable Fence (Repair) is specified, the minimum length of repair will be 25 LF.

Any additional cable required to be loosened, re-stretched, spliced, and re-tightened as part of the repair or replacement will not be paid for directly, but will be considered subsidiary to the various bid items of the contract.

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Item 774 “Attenuator Repair”

Repair of VIA-SFPM’s will be by each barrel removed and replaced. The addition of any barrel to an existing VIA-SFPM attenuator system necessary to ensure the system meets the current standards will be paid for under this item. This item will be paid for in accordance with item 774-6048 “Repair (VIA-Sand Filled Plastic Barrel)”.

Realignment of existing undamaged VIA Barrels will be subsidiary to Item 774-6048, “Repair (VIA-Sand Filled Plastic Barrel)”.

Make repairs and installations in accordance with manufacturer’s instructions and recommendations. The bid price will be full compensation for all materials recommended by the manufacturer. Perform all site preparation necessary to ensure correct installation of a new crash cushion attenuator (examples – removal of asphalt, debris, parts of old attenuator, etc.). This site preparation is subsidiary to the various bid items of the contract.

This site preparation is subsidiary to the various bid items of the contract.

Any “wide” attenuator installation or repair may include straight, curved, or offset rear transition sections. The repair of front attenuator portion and/or rear transition sections will be paid for in accordance with various repair bid item described as “wide” installations. Remove and replace attenuator payment will include removal and replacement of both the front attenuator portion and the rear transition section when attenuator replacement is work ordered. No additional payment will be made for any unique installation or repair scenario associated with this work.

For repair of Quadguard systems, payment for the first bay will include nose assembly, cartridge and mounting hardware. No additional payment will be made for these items. Reposition undamaged cartridges in a Quadguard repair as necessary to ensure the system meets the specifications. The repositioning of cartridges is subsidiary to the various bid items in the contract. Payment of Quadguard bays will be for damaged bays.

For repair of the TRACC systems, repair or replacement of the nose assembly will be subsidiary to the TRACC repair.

All components and appurtenances (ie, bolts, cable, covers, etc.) required for repair of any attenuator system will be subsidiary to the various bid items. Repairs to damaged foundations will be considered subsidiary to the various bid items. Repair foundations in accordance with the Manufacturer’s recommendations listed on the standard sheets.

“Repair (REACT) (774-6010)”

This item is intended to pay for the pulling (over-stretching) of a REACT 350 system during a repair. Object marker replacement/installation on a REACT 350 system is subsidiary to the various bid items of the contract. When a REACT 350 system is damaged, reuse the cylinder covers, if deemed salvageable by the Engineer. If the cylinder covers are not salvageable or were not present before the REACT 350 was damaged, obtain and install new cylinder covers. This installation/replacement of cylinder covers is subsidiary to the various bid items of the contract. Do not turn cylinders of a damaged REACT 350 system in order to try bring the system back to full length. The replacement of a damaged REACT 350 base track (front and/or rear section) (Ty-S or TY-B) is subsidiary to the various bid items of the contract. The replacement of damaged nuts, bolts, washers, anchors, anchor plates, brackets, and the cable system of a damaged REACT 350 system is subsidiary to the various bid items of the contract.

“Repair REACT (N) (Cylinders) (774-6027)”

This item is intended to pay for the replacement of damaged cylinders on the REACT 350 system. Payment for the box beams associated with cylinders #1 and #2 is included in payment of this item. Do not turn cylinders of a damaged REACT 350 system in order to try bring the system back to full length. The determination of whether to use this pay item will be made by the Engineer.

Project Number: RMC 6372-50-001

Highway: Various

County: Bexar

Control: 6372-50-001

Item 776 “Metal Rail Repair”

“Repair (Existing Metal Pedestrian Rail) (776-6037)”

This item is intended to repair existing Metal Pedestrian Rail. The types of Pedestrian Rail that can be called out for repair under this Item may include Handrail (TY A), Handrail (TY B), Handrail (TY C), Handrail (TY D), Handrail (TY E) and Handrail (TY F).

“Replace (Steel Rail) (776-6053)”

This item is intended to replace steel rail attached to existing concrete rail when it is damaged and needs to be replaced. The type of rail will vary by location and may include any type rail included in the plan set and shown on a work order.

Item 778 “Concrete Rail and Concrete Barrier Repair”

Attach a terminal connector and guardrail or attach a Thrie-beam assembly (whichever is work ordered) when repairing concrete barrier ends that have been damaged. The guardrail/terminal connector or Thrie-beam assembly will be paid for in accordance with the pertinent Item 540 pay items.

Remove guardrail and terminal connectors that are temporarily attached to damaged concrete traffic barrier or rail for temporary safety purposes prior to repairing the damaged concrete rail. Deliver the guardrail and terminal connectors to the TxDOT yard located at 9320 SE LP 410 in San Antonio. The removal and delivery of the rail will be paid for with Item 542-6001 “Removing Metal Beam Guard Fence”.

Dowel and tie bar adhesive shall be Type III, Class A or Class C, in accordance with the DMS 6100 “Epoxy and Adhesives.”

Rapid setting concrete/hardener will conform to DMS 4655 -"Rapid-Hardening Cementing Materials for Concrete Repair" for concrete rail repairs.

Item 6044 “Small Roadside Sign Assemblies”

All work on this item is callout work and a work order will be issued as work is needed to be performed.

Once work has started, continuously prosecute the work until all work on the work order is satisfactorily completed. Liquidated Damages will be assessed for any day charged beyond the authorized time on each work order as per the Schedule of Liquidated Damages in the Contract.

Item 6044-6003 “Replace Small Rdsd Supp & Assem” is intended for removing and replacing existing signs only.

All Schedule 80 and 10 BWG sign posts that are replaced shall be delineated with a 12-inch retroreflective strip (yellow or red) as per Section 2A.21 of the 2011 Texas MUTCD. The material shall be wrapped completely around the sign post, be visible in all directions, and be placed approximately four (4) feet above the edge of the roadway. The color of the wrap should be yellow, except for the YIELD and STOP sign posts which should be red. All DO NOT ENTER and WRONG WAY sign posts that are replaced on controlled-access freeway ramps shall display a four-inch red retroreflective vertical strip the full length of the sign post to within two feet above the edge of the roadway. This vertical strip shall not be visible to motorists traveling in the correct direction on the ramp.

Item 6223 “Large Roadside Sign Assemblies”

All work on this item is callout work and a work order will be issued as work is needed to be performed.

GENERAL NOTES

FED. DIV. NO.		PROJECT		SHEET NO.
6		RMC 6372-50-001		4G
STATE	DIST.	COUNTY		
TEXAS	SAT	BEXAR		
CONT.	SECT.	JOB	HIGHWAY NO.	
6372	50	001	VAR	

Project Number: RMC 6372-50-001

Highway: Various

County: Bexar

Control: 6372-50-001

Once work has started, continuously prosecute the work until all work on the work order is satisfactorily completed. Liquidated Damages will be assessed for any day charged beyond the authorized time on each work order as per the Schedule of Liquidated Damages in the Contract.

Item 6223-6003 "Repl Large Rdsd Sign Supp & Assem" is intended for removing and replacing existing signs only.

Item 6224 "Incident Management"

Notification for response to perform Traffic Control operations for Incident Management will be by phone. Provide a telephone number to be used for response to Incident Management that will be accessible 24 hours per day.

Item 500-6034 "Mobilization (Emergency)" EA will be paid for each occurrence of an Incident where traffic control will be performed for this item.

Failure to respond within the designated time as stated in Special Specification 6224 will result in a penalty of \$8,000 per hour assessed to the Contractor until all required equipment and personnel have been deployed.

Item 7000 "Removal and Proper Disposal of Driftwood and Debris"

The intent for this item is to pay for the removal of illegal dump sites or other bulk materials on the right of way as shown on a work order.

Item 7013 "Vacuum Cleaning"

Perform one cycle of Vacuum Cleaning of Drain Inlets/Raceways once every 3 months. Perform this work at night, from 9:00 PM until 5:00 AM on Sunday through Thursday nights. A separate work order will be sent for this work. There are approximately 628 drains. Complete this cycle within 10 working days. The locations for this work will be:

On IH 10 (Elevated Lanes and Ramps) from W. Poplar to approx. 500 ft east of Fulton Ave. (approx. 186 drains), and on IH 35 (Elevated Lanes and Ramps, including IH 10/IH 35 interchange) from IH 37 to approx. 400 ft south of Laredo Street (approx. 442 drains).

Perform one cycle of Vacuum Cleaning of Bridge Joints once every 6 months. Perform this work at night, from 9:00 PM until 5:00 AM on Sunday through Thursday nights. A separate work order will be sent for this work. Complete this cycle within 10 working days. The locations for this work will be on IH 10 from W. Poplar to approx. 500 ft east of Fulton Ave. and on IH 35 from IH 37 to approx. 400 ft south of Laredo Street.

Once work has started on a cycle, proceed in an expeditious manner until all work on that cycle is satisfactorily completed. Liquidated damages will be assessed for any working day charged beyond the authorized time as per the Schedule of Liquidated Damages in the Contract.

Empty and clean vacuum truck storage compartments prior to working on this project. Get TxDOT inspection of equipment prior to commencing work. A small amount of normal wash in the tank will be permitted.

Test, at an approved laboratory, debris or wash water removed that smells of volatiles or shows signs of environmental contamination. Provide written receipts showing disposal at licensed disposal facilities for material testing positive for contamination.

Remove and replace grates as needed or directed. Furnish replacement hardware for any missing or damaged nuts, bolts, and washers, unless otherwise approved. This replacement is subsidiary to the various bid items of the contract.

Project Number: RMC 6372-50-001

Highway: Various

County: Bexar

Control: 6372-50-001

Item 7116 "Snow & Ice Control"

The Winter Weather Season will be defined as the months of November through March. The material for snow and ice control will be provided by the Department at the following locations:

Magnesium Chloride:

1. Northeast Bexar Maintenance yard (6550 Walzem Rd)
2. East Bexar Maintenance office (9320 SE Loop 410)

Brine:

1. Northeast Bexar Maintenance yard (6550 Walzem Rd)
2. East Bexar Maintenance office (9320 SE Loop 410)

Aggregate Stockpiles:

1. Northeast Bexar Maintenance yard (6550 Walzem Rd)
2. East Bexar Maintenance office (9320 SE Loop 410)

Any unused material will be returned to the designated locations.

Methods of Operation and Equipment

The Engineer will determine the size and type of resources required etc., and a callout detailing this information will be provided to the Contractor to respond to a Winter Weather Event (WWE). The number of hours and equipment use will vary with the number and severity of each WWE.

A call-out to a WWE will require the following equipment divided among all stockpile locations, the preparation and deployment of:

- a) 8 ten-yard capacity trucks (including operating and spotting personnel) equipped with 8 "V" Bottom, self-contained aggregate spreader with an approximate loaded weight of 24,000 lbs and a remote in-cab control will be required.
- b) 15 trucks (including operating and spotting personnel) equipped with a minimum 1,000 gallon tank with a rear-mounted spray bar installed with straight stream nozzles that are capable of spraying 1-3 lanes in a single pass. Nozzles should be capable of applying 15 to 60 gallons per lane mile. A remote in-cab control will be required.

Support equipment consists of:

- Shadow vehicles

Provide sufficient personnel to operate all required equipment and a minimum of 2 workers will be required at each location to spot operators and load material onto equipment.

Failure to Respond to Call-out

Failure to respond within the designated time as stated in the Special Specification will result in a penalty of \$8,000 per hour assessed to the Contractor until all required equipment and personnel have been deployed.

Failure to Maintain Roadways Open to Traffic

If, in the opinion of the Engineer, the Contractor failed to take the necessary actions to maintain the roadways open to traffic, it will result in a penalty of \$8,000 per hour per lane for mainlanes, and \$3,000 per hour per lane for frontage roads, assessed to the Contractor until the lane, etc., are re-opened to traffic.

GENERAL NOTES

FED. DIV. NO.		PROJECT		SHEET NO.
6		RMC 6372-50-001		4H
STATE	DIST.	COUNTY		
TEXAS	SAT	BEXAR		
CONT.	SECT.	JOB	HIGHWAY NO.	
6372	50	001	VAR	

Estimate Sheet

ESTIMATE SUMMARY															
						CONTROL 6372-50-001 IH0035		A L T	ITEM CODE			DESCRIPTION	UNIT	TOTAL	
EST	FINAL	EST	FINAL	EST	FINAL	EST	FINAL		ITEM CODE	DESC CODE	SP NO			EST	FINAL
						100.000			104	6011		REMOVING CONC (MEDIANS)	SY	100.000	
						20.000			104	6014		REMOVING CONC (FOUNDATIONS)	CY	20.000	
						100.000			104	6021		REMOVING CONC (CURB)	LF	100.000	
						100.000			104	6028		REMOVING CONC (MISC)	SY	100.000	
						100.000			401	6001		FLOWABLE BACKFILL	CY	100.000	
						100.000			420	6128		CL K CONC (MISC)	CY	100.000	
						20.000			429	6007		CONC STR REPAIR (VERTICAL & OVERHEAD)	SF	20.000	
						50.000			432	6006		RIPRAP (CONC)(CL B)	CY	50.000	
						50.000			432	6045		RIPRAP (MOW STRIP)(4 IN)	CY	50.000	
						800.000			500	6033		MOBILIZATION (CALLOUT)	EA	800.000	
						100.000			500	6034		MOBILIZATION (EMERGENCY)	EA	100.000	
						10000.000			512	6087		PORT CTB (ALIGNING)	LF	10000.000	
						100.000			529	6002		CONC CURB (TY II)	LF	100.000	
						100.000			531	6001		CONC SIDEWALKS (4")	SY	100.000	
						1000.000			540	6001	001	MTL W-BEAM GD FEN (TIM POST)	LF	1000.000	
						100.000			540	6002	001	MTL W-BEAM GD FEN (STEEL POST)	LF	100.000	
						50.000			540	6003	001	MTL THRIE-BEAM GD FEN (TIM POST)	LF	50.000	
						100.000			540	6016	001	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	100.000	
						15.000			540	6018	001	MTL BM GD FEN TRANS (NON - SYM)	EA	15.000	
						10.000			540	6037	001	MTL BM GD FEN TRANS (ANCHOR PLATE)	EA	10.000	
						500.000			542	6001		REMOVE METAL BEAM GUARD FENCE	LF	500.000	
						5.000			542	6002		REMOVE TERMINAL ANCHOR SECTION	EA	5.000	
						15.000			542	6003		REMOVE DOWNSTREAM ANCHOR TERMINAL	EA	15.000	
						5.000			544	6001		GUARDRAIL END TREATMENT (INSTALL)	EA	5.000	
						5.000			544	6003		GUARDRAIL END TREATMENT (REMOVE)	EA	5.000	
						2.000			545	6005		CRASH CUSH ATTEN (REMOVE)	EA	2.000	
						2.000			545	6019		CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	EA	2.000	
						200.000			550	6001		CHAIN LINK FENCE (INSTALL) (6')	LF	200.000	
						100.000			550	6002		CHAIN LINK FENCE (REPAIR) (6')	LF	100.000	
						2000.000			550	6003		CHAIN LINK FENCE (REMOVE)	LF	2000.000	
						500.000			550	6007		CHAIN LINK FENCE (REPAIR) (4')	LF	500.000	
						8.000			550	6016		CHN LNK FNCE GATE(PVC CTD)(INSTL)6'X4'	EA	8.000	
						200.000			550	6020		CHAIN LINK FENCE (INSTALL) (4')	LF	200.000	
						200.000			658	6060		REMOVE DELIN & OBJECT MARKER ASSMS	EA	200.000	
						300.000			658	6067		INSTL DEL ASSM (D-DW)SZ 1(BRF)GF2	EA	300.000	
						300.000			658	6068		INSTL DEL ASSM (D-DY)SZ 1(BRF)GF2	EA	300.000	
						2000.000			700	6001		POTHOLE REPAIR (STANDARD)	SY	2000.000	
						200.000			700	6009		EMERGENCY MOBILIZATION	EA	200.000	
						8970.000			730	6001		STRIP MOWING	AC	8970.000	
						33056.000			730	6002		FULL - WIDTH MOWING	AC	33056.000	
						150.000			730	6003		SPOT MOWING	AC	150.000	
						183408.000			734	6001		LITTER REMOVAL	AC	183408.000	
						100.000			734	6003		LITTER REMOVAL (SPOT)	AC	100.000	
						4838.400			735	6002		DEBRIS REMOVAL (CNTR MEDIANS/MAINLANES)	MI	4838.400	
						2085.120			735	6006		DEBRIS REMOVAL (ENTRANCE/EXIT RAMPS)	MI	2085.120	
						500.000			735	6007		DEBRIS REMOVAL (SPOT DEBRIS)	MI	500.000	
						1694.400			735	6148		DEBRIS REMOVAL (DIRECT CONNECTOR)	MI	1694.400	
						3480.000			738	6002		CLEANING / SWEEPING (CENTER MEDIAN)	MI	3480.000	
						3480.000			738	6004		CLEANING / SWEEPING (OUTSIDE MAIN LANE)	MI	3480.000	
						895.200			738	6006		CLEANING / SWEEPING (FRONTAGE ROAD)	MI	895.200	

ESTIMATE & QUANTITY SHEET

DIST	COUNTY	CCSJ	SHEET
15	BEXAR	6372-50-001	5

Estimate Sheet

ESTIMATE SUMMARY															
						CONTROL 6372-50-001 IH0035		A L T	ITEM CODE			DESCRIPTION	UNIT	TOTAL	
EST	FINAL	EST	FINAL	EST	FINAL	EST	FINAL		ITEM CODE	DESC CODE	SP NO			EST	FINAL
						1869.600			738	6008		CLEANING / SWEEPING(ENTRANCE/EXIT RAMP)	MI	1869.600	
						100.000			738	6009		CLEANING / SWEEPING (AGGREGATE REMOVAL)	MI	100.000	
						50.000			738	6010		CLEANING / SWEEPING (SPOT)	MI	50.000	
						10000.000			738	6011		CLEANING / SWEEPING (HANDWORK)	SY	10000.000	
						1694.400			738	6315		CLEANING / SWEEPING (DIRECT CONNECTOR)	MI	1694.400	
						120000.000			740	6002		GRAFFITI REMOVAL (PAINTING)	SF	120000.000	
						1000.000			752	6022	001	TREE TRIMMING AND BRUSH REMOVAL	LF	1000.000	
						500.000			764	6001		DRAIN INLET CLEANING	EA	500.000	
						75.000			764	6002		PUMP STATION WELL CLEANING	EA	75.000	
						75.000			764	6003		BASKET AND INLET PIPE CLEANING	EA	75.000	
						50.000			764	6004		DOWNSPOUT CLEANING	EA	50.000	
						10.000			764	6005		SUMP CLEANING	EA	10.000	
						1000.000			764	6021		SLOTTED DRAIN CLEANING	LF	1000.000	
						50000.000			770	6001	001	REPAIR RAIL ELEMENT (W - BEAM)	LF	50000.000	
						100.000			770	6002	001	REPAIR RAIL ELEMENT (THRIE - BEAM)	LF	100.000	
						50.000			770	6003	001	REP RAIL ELMNT(THRIE-BM TRANS TO W -BM)	LF	50.000	
						100.000			770	6004	001	REPAIR RAIL ELEMENT (CURVED RAIL)	LF	100.000	
						500.000			770	6008	001	REALIGN EXISTING RAIL	LF	500.000	
						2000.000			770	6010	001	REM / REPL TIMBER/STL POST W/O CONC FND	EA	2000.000	
						50.000			770	6011	001	REM / REPL TIMBER / STL POST W/CONC FND	EA	50.000	
						50.000			770	6016	001	REPAIR STEEL POST WITH BASE PLATE	EA	50.000	
						3000.000			770	6017	001	REALIGN POSTS	EA	3000.000	
						10000.000			770	6021	001	REPLACE SINGLE GDRAIL TERMINAL RAIL	LF	10000.000	
						1000.000			770	6022	001	REPLACE SINGLE GDRAIL TERMINAL POST	EA	1000.000	
						5.000			770	6023	001	REPAIR OF TERMINAL ANCHORS POSTS	EA	5.000	
						5.000			770	6024	001	REPLACE TERMINAL ANCHOR POSTS	EA	5.000	
						75.000			770	6027	001	REMOVE GDRAIL END TRT / REPL WITH SGT	EA	75.000	
						100.000			770	6028	001	REPL SINGLE GDRAIL TERM IMPACT HEAD	EA	100.000	
						350.000			770	6029	001	REM & RESET SGT IMPACT HEAD	EA	350.000	
						50.000			770	6060	001	REMOVE AND REPLACE DAT	EA	50.000	
						250.000			770	6061	001	REPAIR MTL BM GD FEN(LONG SPAN SYS)	LF	250.000	
						50.000			770	6062	001	REPLACE SINGLE GDRAIL TERM POST(WOOD)	EA	50.000	
						50.000			770	6063	001	REPLACE SINGLE GDRAIL TERM POST(STEEL)	EA	50.000	
						5.000			770	6067	001	REPLACE NON-SYMMETRICAL TRANSITION	EA	5.000	
						2000.000			771	6001		REPLACE POSTS (TL-3)	EA	2000.000	
						500.000			771	6002		REPLACE POSTS (TL-4)	EA	500.000	
						10.000			771	6003		CABLE SPLICE / TURNBUCKLE (TL-3)	EA	10.000	
						10.000			771	6004		CABLE SPLICE / TURNBUCKLE (TL-4)	EA	10.000	
						10.000			771	6005		REPAIR CONCRETE FOUNDATION (TL-3)	EA	10.000	
						10.000			771	6006		REPAIR CONCRETE FOUNDATION (TL-4)	EA	10.000	
						50.000			771	6007		REPR OR REPLC CABLE BARR TERM SEC(TL-3)	EA	50.000	
						50.000			771	6008		REPR OR REPLC CABLE BARR TERM SEC(TL-4)	EA	50.000	
						2000.000			771	6009		REPLACE CABLE (TL-3)	LF	2000.000	
						1000.000			771	6010		REPLACE CABLE (TL-4)	LF	1000.000	
						20.000			771	6011		CHECK / RE-TENSION CABLE	EA	20.000	
						2000.000			772	6001		POST AND CABLE FENCE (REMOVAL)	LF	2000.000	
						20.000			772	6002		POST AND CABLE FENCE (REMV CONC ANCHOR)	EA	20.000	
						2500.000			772	6003		POST AND CABLE FENCE (NEW INSTALLATION)	LF	2500.000	
						15.000			772	6004		POST AND CABLE FENCE (NEW CONC ANCHOR)	EA	15.000	
						200.000			772	6005		POST AND CABLE FENCE(REMV / REPL POSTS)	EA	200.000	

ESTIMATE & QUANTITY SHEET

DIST	COUNTY	CCSJ	SHEET
15	BEXAR	6372-50-001	5A

Estimate Sheet


ESTIMATE SUMMARY															
						CONTROL 6372-50-001 IH0035		A L T	ITEM CODE			DESCRIPTION	UNIT	TOTAL	
EST	FINAL	EST	FINAL	EST	FINAL	EST	FINAL		ITEM CODE	DESC CODE	SP NO			EST	FINAL
						15.000			772	6006		POST AND CABLE FENCE(RMV/REPL CNC ANCH)	EA	15.000	
						1000.000			772	6007		POST AND CABLE FENCE (REMV/ REPL CABLE)	LF	1000.000	
						15000.000			772	6009		POST AND CABLE FENCE (REPAIR)	LF	15000.000	
						2.000			774	6001		REMOVE AND REPLACE (TRACC)	EA	2.000	
						2.000			774	6002		REMOVE AND REPLACE (WIDE TRACC)	EA	2.000	
						2.000			774	6003		REMOVE AND REPLACE (NARROW REACT 350)	EA	2.000	
						2.000			774	6004		REMOVE AND REPLACE (WIDE REACT 350)	EA	2.000	
						25.000			774	6006		REPAIR (TRACC)	EA	25.000	
						5.000			774	6008		REPAIR (WIDE TRACC)	EA	5.000	
						10.000			774	6010		REPAIR (REACT)	EA	10.000	
						1.000			774	6014		REMOVE AND REPLACE (NARROW QUAD)	EA	1.000	
						2.000			774	6018		REPAIR (CATGR - FRONT SECTION)	EA	2.000	
						2.000			774	6019		REPAIR (CATGR - END SECTION)	EA	2.000	
						10.000			774	6027		REPAIR REACT (N) (CYLINDERS)	EA	10.000	
						175.000			774	6028		REPAIR (QUAD) (N) (BAY)	EA	175.000	
						25.000			774	6029		REPAIR (QUAD) (W) (BAY)	EA	25.000	
						15.000			774	6038		REMOVE AND REPLACE (FASTRACC)	EA	15.000	
						20.000			774	6039		REPAIR (QUAD - ELITE) NARROW (BAY)	EA	20.000	
						20.000			774	6040		REPAIR (QUAD - ELITE) WIDE (BAY)	EA	20.000	
						3.000			774	6044		REMOVE AND REPLACE (SMTC) (N)	EA	3.000	
						25.000			774	6045		REPAIR (SMTC) (N)	EA	25.000	
						1.000			774	6046		REMOVE AND REPLACE (SMTC) (W)	EA	1.000	
						5.000			774	6047		REPAIR (SMTC) (W)	EA	5.000	
						800.000			774	6048		REPAIR (VIA -SAND FILL PLASTIC BARRELS)	EA	800.000	
						2.000			774	6050		REMOVE AND REPLACE (SHORTRACC)	EA	2.000	
						2.000			774	6064		REMOVE AND REPLACE (TAU II) (N)	EA	2.000	
						10.000			774	6066		REPAIR TAU II (N)	LF	10.000	
						2.000			774	6117		REMOVE AND REPLACE (QUADGUARD)(MASH)(N)	EA	2.000	
						500.000			774	6120		REPAIR (QUADGUARD)(MASH)(N)	LF	500.000	
						2.000			774	6121		REMOVE AND REPLACE (TAU)(MASH)(N)	EA	2.000	
						500.000			774	6124		REPAIR (TAU)(MASH)(N)	LF	500.000	
						500.000			776	6004		REPAIR (STL POST W/ DOUBLED W-BEAMS-T6)	LF	500.000	
						500.000			776	6009		REPAIR (STL PIPE PEDESTRIAN RAIL - PR1)	LF	500.000	
						500.000			776	6037		REPAIR (EXISTING METAL PED. RAIL)	LF	500.000	
						100.000			776	6053		REPLACE (STEEL RAIL)	LF	100.000	
						200.000			778	6001	001	CONCRETE RAIL REPAIR (IN-KIND)	LF	200.000	
						200.000			778	6076	001	CONCRETE RAIL REPLACEMENT (IN-KIND)	LF	200.000	
						50.000			5047	6001		REM/REPLACE CURB GUIDANCE SYSTEM	EA	50.000	
						150.000			5047	6002		REM/REPLACE CURB	EA	150.000	
						250.000			5047	6003		REM/REPLACE VISION STRIP	EA	250.000	
						25.000			5047	6004		REM/REPLACE CURB TRANS END SECTION	EA	25.000	
						200.000			5047	6005		REM/REPLACE DELINEATOR POST ASSEMBLY	EA	200.000	
						100.000			6001	6001		PORTABLE CHANGEABLE MESSAGE SIGN	DAY	100.000	
						500.000			6044	6001	001	REPAIR SMALL RDSG SIGN SUPT & ASSEM	EA	500.000	
						50.000			6044	6002	001	RELOC SMALL RDSG SIGN SUPT & ASSEM	EA	50.000	
						300.000			6044	6003	001	REPLACE SMALL RDSG SIGN SUPP & ASSEM	EA	300.000	
						50.000			6044	6004	001	RELOC SMALL RDSG SIGN SUPP & ASSEM	EA	50.000	
						5200.000			6185	6002	002	TMA (STATIONARY)	DAY	5200.000	
						25000.000			6185	6003	002	TMA (MOBILE OPERATION)	HR	25000.000	
						5200.000			6185	6005	002	TMA (MOBILE OPERATION)	DAY	5200.000	

ESTIMATE & QUANTITY SHEET

DIST	COUNTY	CCSJ	SHEET
15	BEXAR	6372-50-001	5B

MOWING SCOPE OF WORK

Tract No.	Highway	Limits	Ref Mark	Total Miles	Strip (15 Feet)			Strip (30 Feet)			Full Width		
					No. Est. Mows	Acres Per Mow (approx)	Days Per Mow	No. Est. Mows	Acres Per Mow (approx)	Days Per Mow	No. Est. Mows	Acres Per Mow (approx)	Days Per Mow
1	IH 10	From Fresno Dr. To Martin St.	567 570	3.2							8	35	0.2
2	IH 10	From Flores St. To Roosevelt Ave.	573 574	2.1							8	37	0.2
3	IH 10	From S. Hackberry To Eddie St.	575 583	5.7							8	160	0.7
4	IH 10	From Peggy St. To LP 1604	581 587	7.0							8	181	0.8
5	IH 10	From LP 1604 To Bexar/Guadalupe C/L	587 595	7.0							8	214	1.0
6	IH 35	From LP 13 To St. Mary's St. (includes IH 10 from west of IH 35 at Nogalitos to east of IH 35 at Flores St.)	151 157	6.0							8	177	0.8
7	IH 35	From New Braunfels Ave. To Walzem Rd. (includes IH 410 & IH 35 SPRR)	159 166	7.0							8	219	1.0
8	IH 35	From 800 ft north of Randolph Blvd. at intersection of IH 410 & To Bexar/Guadalupe C/L (includes intersection of LP 1604 from Lookout Rd. to SH 218)	167 174	5.4							8	180	0.8
9	IH 37	From SP 122 To Bexar/Atascosa County Line (includes interchange at US 181 to Old Corpus Christi Rd)	118 132	13.1	2	263	1.2	6	415	1.9			
10	IH 37	From Grayson St To Old Corpus Christi Rd. (includes IH 10 I/C from Roosevelt Ave. to S. Hackberry and IH 35 I/C from St. Mary's St. to New Braunfels Ave. (includes LP 13 I/C from Pickwell to Goliad) (includes IH 410 from Salado Creek to Goliad Rd.)	132 143	11.3							8	562	2.5
11	IH 410	From Airport Blvd. To Perrin Beitel Rd. From Walzem Rd. To 800 ft North of Randolph Blvd. on IH 35 From Perrin Beitel Rd. on IH 410 To IH 35 From Walzem Rd. on LP 368 To IH 410	21 26	5.0							8	104	0.5
12	IH 410	From FM 78 To SH 16 (S Bexar County) (includes the IH10/410 I/C)	31 50	18.6							8	652	2.9
13	US 90	From Nogalitos (LP 353) To Cupples St.	572 570	2.2							8	32	0.2
14	US 281	From IH 410 To Bexar/Atascosa County Line	550 563	12.4	2	139	0.7				6	179	0.8
15	US 181	From JCT of Old Corpus Christi Rd To Bexar/Wilson County Line	507 517	7.4	2	123	0.6				6	142	0.7
16	US 87	From IH 410 To Triple Tree	699 703	3.2							8	43	0.2
17	US 87	From Triple Tree To Bexar/Wilson County Line	703 712	8.4	2	91	0.4				6	122	0.6
18	LP 13	From San Antonio River To Southcross Blvd.	495 501	4.8							8	33	0.2
19	LP 106	From west of JCT 87 To east JCT of US 87	504 506	1.5							8	14	0.1
20	LP 107	From JCT of US 87 To FM 3465	508 510	1.2							8	9	0.1
21	LP 1604	From US 281 To Lookout Road	530 539	7.9							8	259	1.2
22	LP 1604	From SH 218 To IH 10	539 547	7.5							8	251	1.1
23	LP 1604	From IH 10 to SH 16 (in S. Bexar County)	547 583	33.5	2	563	2.5	6	615	2.7			


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MOWING SCOPE OF WORK

SHEET 1 OF 3

FED. DIV. NO.	PROJECT	SHEET NO.
6	RMC 6372-50-001	6
STATE	DIST.	COUNTY
TEXAS	SAT	BEXAR
CONT.	SECT.	JOB
6372	50	001
		HIGHWAY NO.
		VAR

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MOWING SCOPE OF WORK (CONT)

Tract No.	Highway	Limits	Ref Mark	Total Miles	Strip (15 Feet)			Strip (30 Feet)			Full Width		
					No. Est. Mows	Acres Per Mow (approx)	Days Per Mow	No. Est. Mows	Acres Per Mow (approx)	Days Per Mow	No. Est. Mows	Acres Per Mow (approx)	Days Per Mow
24	SP 117	From JCT of LP 13 To JCT of IH 410	504 505	0.3							8	3	0.1
25	SP 122	From LP 13 To north side of IH 410	504 507	2.7							8	23	0.1
26	SP 122	From south side of IH 410 To JCT of US 181	507 510	2.4	2	11	0.1				6	24	0.2
27	SP 371	From JCT US 90 at westbound exit and eastbound To San Antonio Port Authority	502 504	1.6							8	25	0.2
28	FM 78	From IH 35 To Cibolo Creek	498 510	11.0							8	24	0.2
29	FM 327	From east JCT of LP 1604 To west JCT of LP 1604	508 511	2.3							8	21	0.1
30	FM 1303	From JCT of LP 1604 To Bexar/Wilson County Line	498 501	2.2	2	13	0.1				6	19	0.1
31	FM 1346	From Pop Gun St.(eastside of CPS Energy parking lot)	496 514	13.8	2	63	0.3				6	94	0.5
32	FM 1516	From FM 3502 To FM 1346	492 502	9.2							8	57	0.3
33	FM 1518	From IH 35 To Oak Street	488 492	3.7							8	25	0.2
34	FM 1518	From FM 78 To JCT of LP 1604	496 505	12.5	2	45	0.2				6	92	0.4
35	FM 1628	From JCT of LP 106 To FM 3432	502 504	1.7							8	8	0.1
36	FM 1976	From IH 35 To LP 1604	498 506	7.0							8	54	0.3
37	FM 1937	From JCT of US 281 To JCT of LP 1604	508 515	6.5	2	34	0.2				6	44	0.2
38	FM 2252	From O'Connor Road To Cibolo Creek	490 495	4.3							8	18	0.1
39	FM 2537	From JCT of US 281 To South of Pleasanton Rd.	512 514	1.4	2	9	0.1				6	10	0.1
40	FM 3432	From FM 1628 To Bexar/Wilson County Line	504 509	4.1	2	38	0.2				6	46	0.2
41	FM 3465	From north JCT of LP 1604 To south JCT of LP 1604	502 504	1.4							8	10	0.1
42	FM 3499	From JCT of FM 1937 To JCT of LP 1604	512 513	0.4	2	3	0.1				6	4	0.1
43	FM 3502	From FM 1516 To FM 78	502 503	0.7							8	7	0.1
44	PA 1502	From IH 35 To US 281	494 502	7.6							8	113	0.5



MOWING SCOPE OF WORK

SHEET 2 OF 3

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		7
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR

MOWING SCOPE OF WORK (CONT)

SPECIAL MOWING NOTES:

TRACT # 6 - USE OF MOWING EQUIPMENT INCLUDING SELF-PROPELLED WHEELED OR TRACKED EQUIPMENT THAT IS DETERMINED BY THE ENGINEER TO BE DAMAGING TO THE INTEGRITY OF STEEP SLOPES WILL NOT BE ALLOWED AT LOCATION INDICATED AT THE LOCATIONS SHOWN ON THE IH 35 MOWING LOCATION SHEETS.

TRACT # 8 - MOW EASEMENT ACROSS FROM RETAMA PARK, ADJACENT TO OLYMPIA PKWY GOLF COURSE. SEE IH 35 AT OLYMPIA HILLS MOWING LOCATION SHEET.

TRACT # 10 - THERE ARE 6 LOTS ON IH 37 OWNED BY THE STATE BETWEEN STEVES AVE AND LP 13 THAT ARE INCLUDED IN THIS TRACT. THEY CAN BE CUT WITH A SMALL UTILITY TRACTOR WITH A 5* MOWER OR OTHER APPROVED EQUIPMENT. ACCESS TO THESE LOTS IS THROUGH CITY STREETS BECAUSE OF THEIR LOCATION BEHIND THE CONTROL OF ACCESS FENCE. THE LOCATIONS OF THESE LOTS ARE AS FOLLOWS:

IH 37 SOUTH: CORNER OF BETTY JEAN ST AND AVONDALE DR. SEE IH 37 AT BETTY JEAN ST MOWING LOCATION SHEET.
 CORNER OF GLAD DR AND LILLA JEAN DR. SEE IH 37 AT GLAD DR MOWING LOCATION SHEET.
 ADJACENT TO 847 KOEHLER CT. SEE IH 37 AT KOEHLER CT MOWING LOCATION SHEET.

IH 37 NORTH: CORNER OF GOLIAD RD AND IH 37, NEXT TO CARVEL SKATELAND. SEE IH 37 AT GOLIAD RD MOWING LOCATION SHEET.
 ADJACENT TO 238 MAURINE DR. SEE IH 37 AT MAURINE DR MOWING LOCATION SHEET.
 ADJACENT TO 138 MERRY ANN DR. SEE IH 37 AT MERRY ANN DR MOWING LOCATION SHEET.

(STREET ADDRESSES GIVEN ARE NOT ACTUAL LOCATIONS. THESE ARE ADJACENT TO THE LOTS TO BE MOWED.)

TRACT # 12 - MOW EASEMENT WEST OF SOUTHTON RD BEHIND WHITESIDES STATION. SEE LP 410 AT SOUTHTON RD MOWING LOCATION SHEET.

TRACT # 14 - MOW EASEMENT LOCATED ON EAST ROW APPROX. 0.85 MILES SOUTH OF LP 1064. SEE US 281 SOUTH TRACT #14 MOWING LOCATION SHEET.

TRACT # 21 - MOW FULL WIDTH INSIDE AND OUTSIDE OF RETENTION POND LOCATED NEAR MUD CREEK EACH CYCLE. SEE LP 1604 AT MUD CREEK MOWING LOCATION SHEET.

TRACT # 44 - LIMITED RIGHT-OF-WAY AND SPECIAL CONDITIONS ON THIS TRACT REQUIRES USE OF MOWING EQUIPMENT OTHER THAN TYPICAL.

MOW EASEMENTS/BASINS AT:

- EAST BOUND JUST PAST WETMORE RD ON RIGHT SIDE. SEE WURZBACH PARKWAY AT WETMORE MOWING LOCATION SHEET.
- EAST BOUND AT EXIT TO NACOGDOCHES RD ON RIGHT SIDE. SEE WURZBACH PARKWAY AT NACOGDOCHES RD MOWING LOCATION SHEET
- EAST BOUND AT WEIDNER RD ON RIGHT SIDE. SEE WURZBACH PARKWAY AT WEIDNER RD MOWING LOCATION SHEET.

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MOWING SCOPE OF WORK

SHEET 3 OF 3

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		8
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR

LITTER SCOPE OF WORK

Tract No.	Highway	Limits	Ref Mark	Total Miles	Total Acres (approx)	No. Est. Cycles
1	IH 10	From Fresno To IH 35 Interchange	567 570	3.4	43	48
2	IH 10	From Peggy St. To LP 1604	581 587	7.0	198	48
3	IH 10	From Flores St. To Roosevelt Ave.	573 574	2.1	42	48
4	IH 10	From S. Hackberry To Eddie St.	575 583	5.7	173	48
5	IH 35	From LP 13 To St. Mary's St. (includes IH 10 from west of IH 35 at Nogalitos to east of IH 35 at Flores St.)	151 157	6.0	191	48
6	IH 35	From New Braunfels Ave. To Walzem Rd. (includes IH 410 & IH 35 SPRR)	159 166	7.0	235	48
7	IH 35	From 800' north of Randolph Blvd. at intersection of IH 410 & To Cibolo Creek (includes intersection of LP 1604 from Lookout Rd. to SH 218)	167 174	5.4	175	48
8	IH 37	From Josephine St. To Old Corpus Christi Rd. (includes IH 10 I/C from Roosevelt Ave. to S. Hackberry and IH 35 I/C from St. Mary's St. to New Braunfels Ave.) (includes LP 13 I/C from Pickwell to Goliad) (includes IH 410 from Salado Creek to Goliad Rd.)	133 143	12.1	502	48
9	IH 410	From Airport Blvd. To Perrin Beitel Rd. From Walzem Rd. To 800' north of Randolph Blvd. on IH 35 From Perrin Beitel Rd. on IH 410 To IH 35 From Walzem Rd. on LP 368 To IH 410	21 26	5.0	116	48
10	LP 1604	From US 281 To Lookout Rd.	530 539	7.9	283	48
11	LP 1604	From SH 218 to IH 10 (East Bexar County)	539 547	7.5	266	48
12	LP 368	From IH 410 To Walzem Rd.	494 495	1.0	11	48
13	US 90	From Nogalitos (LP 353) To Cupples	572 570	2.2	37	48
14	FM 1976	From IH 35 To LP 1604	498 506	7.0	57	48
15	PA 1502	From IH 35 To US 281	494 502	7.6	94	48
16	IH 10	From LP 1604 To Cibolo Creek	587 595	7.0	230	24
17	IH 37	From Old Corpus Christi Rd. To Bexar/Atascosa County Line (includes interchange at US 181 to Old Corpus Christi Rd)	118 133	14.7	545	24
18	IH 410	From FM 78 To SH 16 (S Bexar County) (includes the IH10/410 I/C)	31 50	18.6	697	24
19	LP 1604	From IH 10 (East Bexar County) To SH 16 (S Bexar County)	547 583	35.5	683	24
20	US 87	From IH 410 To Triple Tree	699 703	3.2	49	24
21	US 281	From IH 410 To Bexar/Atascosa County Line	550 563	12.4	203	24
22	FM 1303	From JCT of LP 1604 To Bexar/Wilson County Line	498 501	2.2	21	24
23	FM 1346	From Pop Gun St. (eastside of CPS Energy parking lot) To FM 1516	496 501	3.3	30	24
24	FM 1937	From JCT of US 281 To JCT of LP 1604	508 515	6.5	50	24
25	US 181	From Old Corpus Christi Rd. To Bexar/Wilson County Line	508 517	8.5	154	24
26	US 87	From Triple St. To Bexar/Wilson County Line	703 712	8.8	134	24



LITTER SCOPE OF WORK

SHEET 1 OF 1

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		9
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR

DEBRIS SCOPE OF WORK

735-6002 Debris Removal Center (Medians/Mainlanes)				
TRACT	HWY	LIMITS	MILES	CYCLES
1	IH 10	From Fresno Dr. To IH 10/IH 35 I/C (Ground Level Lanes)	3.4	24
2	IH 10	From Poplar St. to 500' E. of Fulton (Elevated Lanes)	1.7	24
3	IH 35	From LP 13 To Bexar/Guadalupe County Line	23.1	24
4	IH 35	From 400' South of Laredo St To St. Mary's St.(Elevated	1.8	24
5	IH 37	From Josephine St. To US 181	11.5	24
6	IH 410	From Airport Blvd. To IH 35	4.0	24
7	IH 410	From IH 35 (South of Rittiman Rd.) To FM 1346	3.5	24
8	US 90	From Nogalitos (LP 353) To Couples Rd.	2.2	24
9	SP 371	From 90 To San Antonio Port Authority	2.0	24
10	IH 10	From IH 35 To Bexar/Guadalupe County Line	21.7	48
11	IH 37	From US 181 to Bexar/Atascosa County Line	13.2	48
12	IH 410	From FM 1346 To SH 16 (South Bexar County)	15.5	48
13	LP 1604	From US 281 To IH 10 (East Bexar County)	16.1	48
14	PA 1502	From IH 35 To US 281	7.7	48

735-6006 Debris Removal (Entrance/Exit Ramps)				
TRACT	HWY	LIMITS	MILES	CYCLES
1	IH 10	From Fresno Dr. To IH 10/IH 35 I/C (Ground Level Lanes)	1.3	24
2	IH 10	From Poplar St. To 500' East of Fulton (Elevated Lanes)	3.5	24
3	IH 35	From LP 13 To Bexar/Guadalupe County Line	10.7	24
4	IH 35	From 400' South of Laredo St To St. Mary's St.(Elevated	2.5	24
5	IH 37	From Josephine St. To US 181	7.2	24
6	IH 410	From Airport Blvd. To IH 35	3.1	24
7	IH 410	From IH 35 (South of Rittiman Rd.) To FM 1346	1.2	24
8	US 90	From Nogalitos (LP 353) To Couples Rd.	0.2	24
9	SP 371	From 90 To San Antonio Port Authority	2.0	24
10	IH 10	From IH 35 To Bexar/Guadalupe County Line	8.0	48
11	IH 37	From US 181 To Bexar/Atascosa County Line	3.0	48
12	IH 410	From FM 1346 To SH 16 (South Bexar County)	3.9	48
13	LP 1604	From US 281 To IH 10 (East Bexar County)	6.5	48
14	PA 1502	From IH 35 To US 281	6.2	48

735-6148 Debris Removal (Direct Connector)				
TRACT	HWY	LIMITS	MILES	CYCLES
1	IH 35	IH 35/LP 1604 NE Bexar County	5.8	48
2	IH35	IH 35/IH 410 near Randolph BLVD	3.4	48
3	IH35	IH 35/IH 410 near FM 78	4.2	48
4	IH 35	IH 35/IH 37 north end of downtown.	3.3	48
5	IH 35	IH 35/IH 10 Downtown Y	1.3	48
6	IH 35	IH 35/US 90 near Burbank High School	2.9	48
7	US 90	US 90/SP 371	1.0	48
8	IH 37	IH 37/US 181	1.4	48
9	IH 37	IH 37/IH 410	3.5	48
10	IH 37	IH 37/IH 10	3.5	48
11	IH 10	IH 10/IH 410 (East Side)	5.0	48



DEBRIS SCOPE OF WORK

SHEET 1 OF 1

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		10
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR

CLEANING/SWEEPING SCOPE OF WORK

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738-6002 Cleaning/Sweeping (Center Median)				
TRACT	HWY	LIMITS	MILES	CYCLES
1	IH 10	From Fresno To IH 10/IH 35 I/C (Ground Level Lanes)	3.4	48
2	IH 10	From Poplar St. To 500' East of Fulton (Elevated Lanes)	1.7	48
3	IH 35	From LP 13 To Bexar/Guadalupe County Line	23.1	48
4	IH 35	From 400' South of Laredo St. To St. Mary's St. (Elevated Lanes)	1.8	48
5	IH 37	From Josephine St. To Steves Ave.	3.9	48
6	IH 410	From Airport Blvd. To IH 35	4.0	48
7	IH 410	From IH 35 To Southcross Blvd.	7.8	48
8	US 90	From Nogalitos (LP 353) To Couples Rd.	2.2	48
9	SP 371	From US 90 To San Antonio Port Authority	2.0	48
10	IH 10	From IH 35 To Ackerman Rd.	9.0	24
11	IH 37	From Steves Ave. To US 181	7.6	24
12	IH 410	From Southcross To SH 16	11.1	24
13	LP 1604	From US 281 To Kitty Hawk Rd.	9.8	24
14	PA 1502	From IH 35 To US 281	7.7	24

738-6008 Cleaning/Sweeping (Entrance/Exit Ramp)				
TRACT	HWY	LIMITS	MILES	CYCLES
1	IH 10	From Fresno To IH 10/IH 35 I/C (Ground Level Lanes)	1.3	48
2	IH 10	From Poplar St. To 500' East of Fulton (Elevated Lanes)	3.5	48
3	IH 35	From LP 13 To Bexar/Guadalupe County Line	10.7	48
4	IH 35	From 400' South of Laredo St. To St. Mary's St. (Elevated Lanes)	2.5	48
5	IH 37	From Josephine St. To Steves Ave.	2.8	48
6	IH 410	From Airport Blvd. To IH 35	3.1	48
7	IH 410	From IH 35 To Southcross Blvd.	2.3	48
8	US 90	From Nogalitos (LP 353) To Couples Rd.	0.2	48
9	SP 371	From US 90 To San Antonio Port Authority	0.7	48
10	IH 10	From IH 35 To Ackerman Rd.	5.4	24
11	IH 37	From Steves Ave. To US 181	4.4	24
12	IH 410	From Southcross To SH 16	2.8	24
13	LP 1604	From US 281 To Kitty Hawk Rd.	4.9	24
14	PA 1502	From IH 35 To US 281	6.2	24

738-6004 Cleaning/Sweeping (Outside Mainlane)				
TRACT	HWY	LIMITS	MILES	CYCLES
1	IH 10	From Fresno To IH 10/IH 35 I/C (Ground Level Lanes)	3.4	48
2	IH 10	From Poplar St. To 500' East of Fulton (Elevated Lanes)	1.7	48
3	IH 35	From LP 13 To Bexar/Guadalupe County Line	23.1	48
4	IH 35	From 400' South of Laredo St. To St. Mary's St. (Elevated Lanes)	1.8	48
5	IH 37	From Josephine St. To Steves Ave.	3.9	48
6	IH 410	From Airport Blvd. To IH 35	4.0	48
7	IH 410	From IH 35 To Southcross Blvd.	7.8	48
8	US 90	From Nogalitos (LP 353) To Couples Rd.	2.2	48
9	SP 371	From US 90 To San Antonio Port Authority	2.0	48
10	IH 10	From IH 35 To Ackerman Rd.	9.0	24
11	IH 37	From Steves Ave. To US 181	7.6	24
12	IH 410	From Southcross To SH 16	11.1	24
13	LP 1604	From US 281 To Kitty Hawk Rd.	9.8	24
14	PA 1502	From IH 35 To US 281	7.7	24

738-6315 Cleaning/Sweeping (Direct Connect Ramps)				
TRACT	HWY	LIMITS	MILES	CYCLES
1	IH 35	IH 35/LP 1604 NE Bexar County	5.8	48
2	IH35	IH 35/IH 410 near Randolph Blvd	3.4	48
3	IH35	IH 35/IH 410 near FM 78	4.2	48
4	IH 35	IH 35/IH 37 North End of Downtown.	3.3	48
5	IH 35	IH 35/IH 10 Downtown Y	1.3	48
6	IH 35	IH 35/US 90 near Burbank High School	2.9	48
7	US 90	US 90/SP 371	1.0	48
8	IH 37	IH 37/US 181	1.4	48
9	IH 37	IH 37/IH 410	3.5	48
10	IH 37	IH 37/IH 10	3.5	48
11	IH 10	IH 10/IH 410 (East Side)	5.0	48

738-6006 Cleaning/Sweeping (Frontage Road)				
TRACT	HWY	LIMITS	MILES	CYCLES
1	IH 10	From Fresno To IH 10/IH 35 I/C (Ground Level Lanes)	2.8	24
2	IH 35	From LP 13 To Bexar/Guadalupe County Line	23.1	24
3	IH 37	From Josephine St. To Steves Ave.	3.9	24
4	IH 410	From Airport Blvd. To IH 35	4.0	24
5	IH 410	IH 35 To FM 1346	3.5	24

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CLEANING/SWEEPING SCOPE OF WORK

SHEET 1 OF 1

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		11
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR

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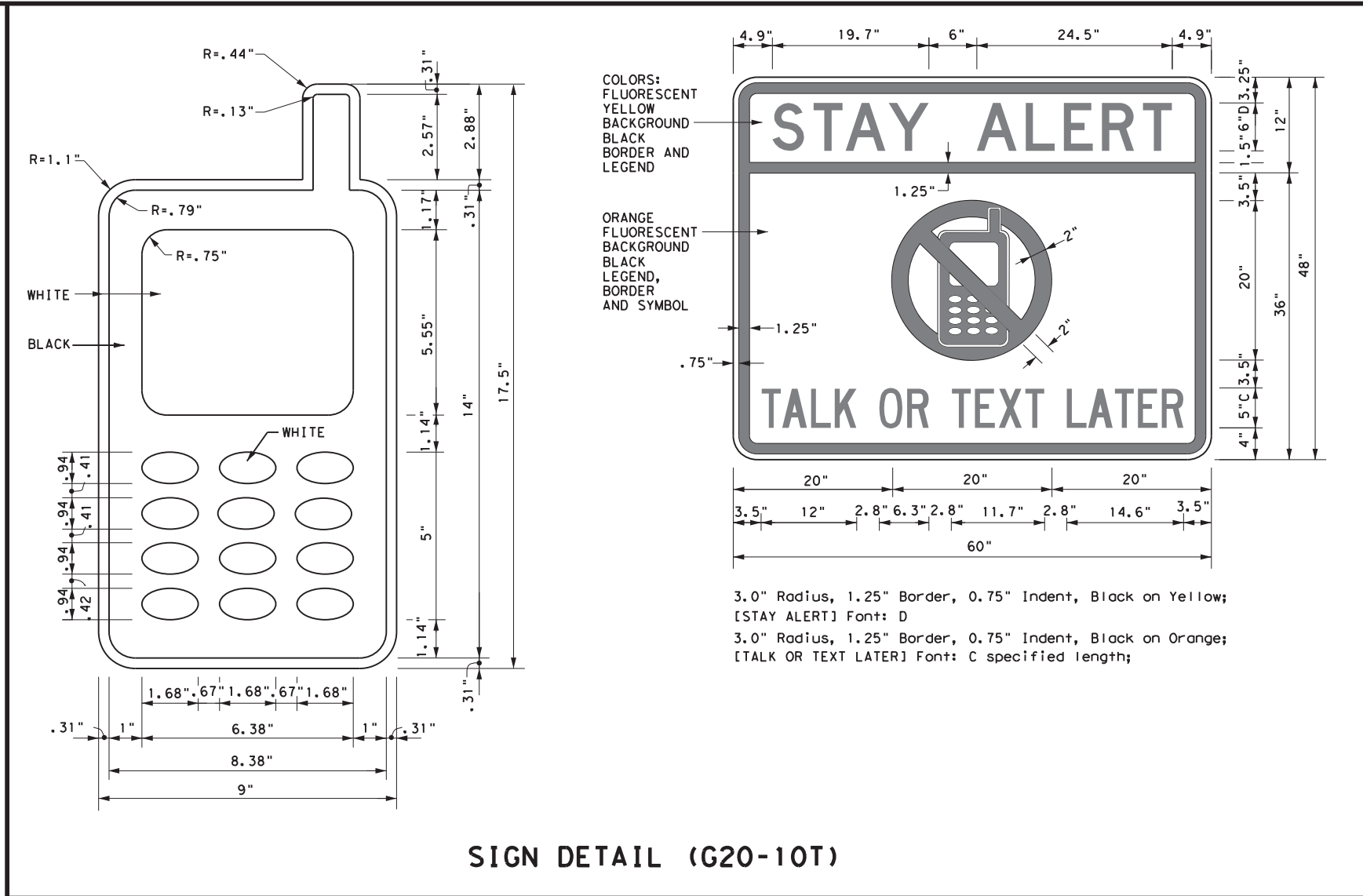
BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

- 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).
- The development and design of the Traffic Control Plan (TCP) is the responsibility of the Engineer.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER (see Sign Detail G20-10T) and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. However, the TRAFFIC FINES DOUBLE sign will not be required on projects consisting solely of mobile operation work, such as striping or milling edgeline rumble strips. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.
- Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.
- The Engineer has the final decision on the location of all traffic control devices.
- Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY APPAREL NOTES:

- 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.

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Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found on-line at the web address given below or by contacting:

Texas Department of Transportation
 Traffic Operations Division - TE
 Phone (512) 416-3118

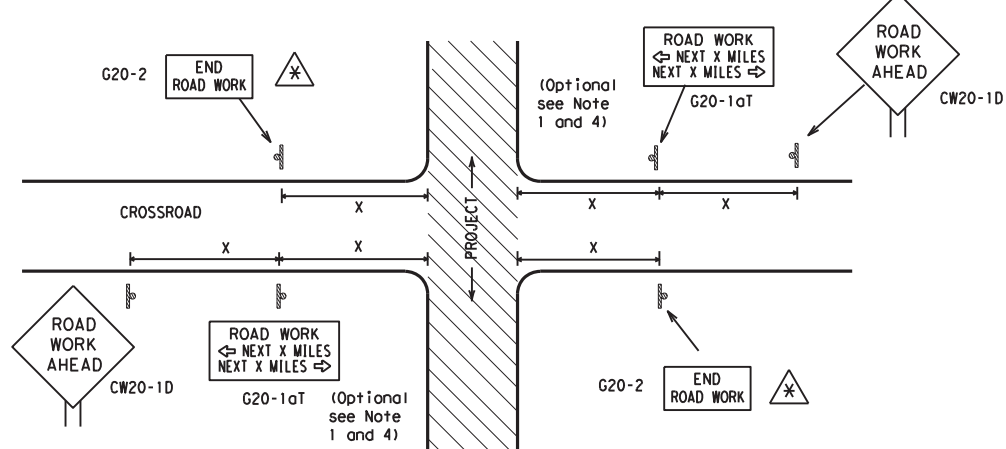
THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT http://www.txdot.gov	
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)	
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)	
MATERIAL PRODUCER LIST (MPL)	
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"	
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)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

SHEET 1 OF 12

		<i>Traffic Operations Division Standard</i>
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS		
BC (1) - 14		
FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT: 6372	SECT: 50
REVISIONS	DATE	BY
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9-07	7-13	
JOB: 001	HIGHWAY: VAR.	SHEET NO.: 12
DIST: SAT	COUNTY: BEXAR	

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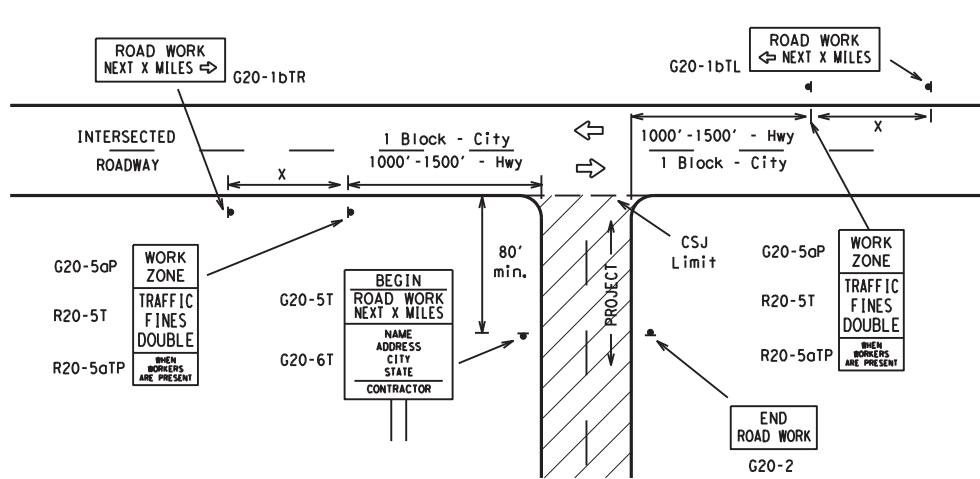
TYPICAL LOCATION OF CROSSROAD SIGNS



* 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. 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 Spacing "X" Feet (Apprx.)
CW20 ⁴	48" x 48"	48" x 48"	30	120
CW21			35	160
CW22			40	240
CW23			45	320
CW25			50	400
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"	55	500 ²
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

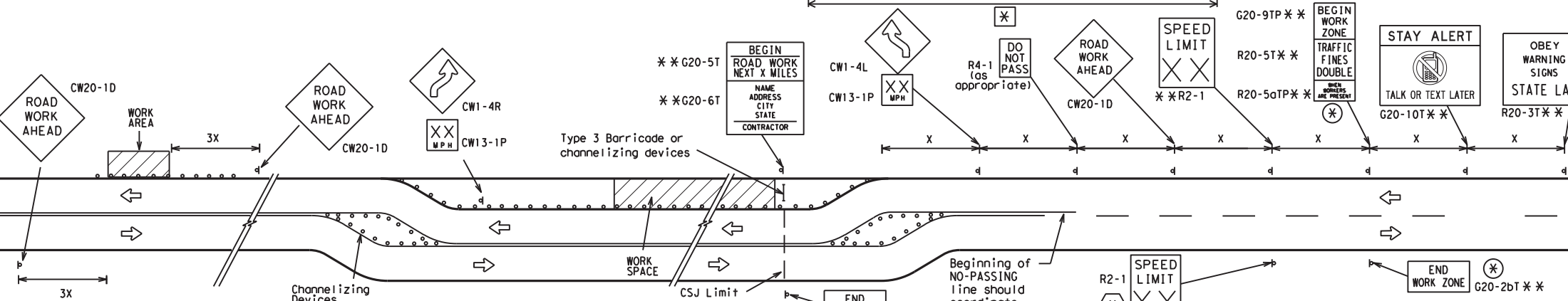
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

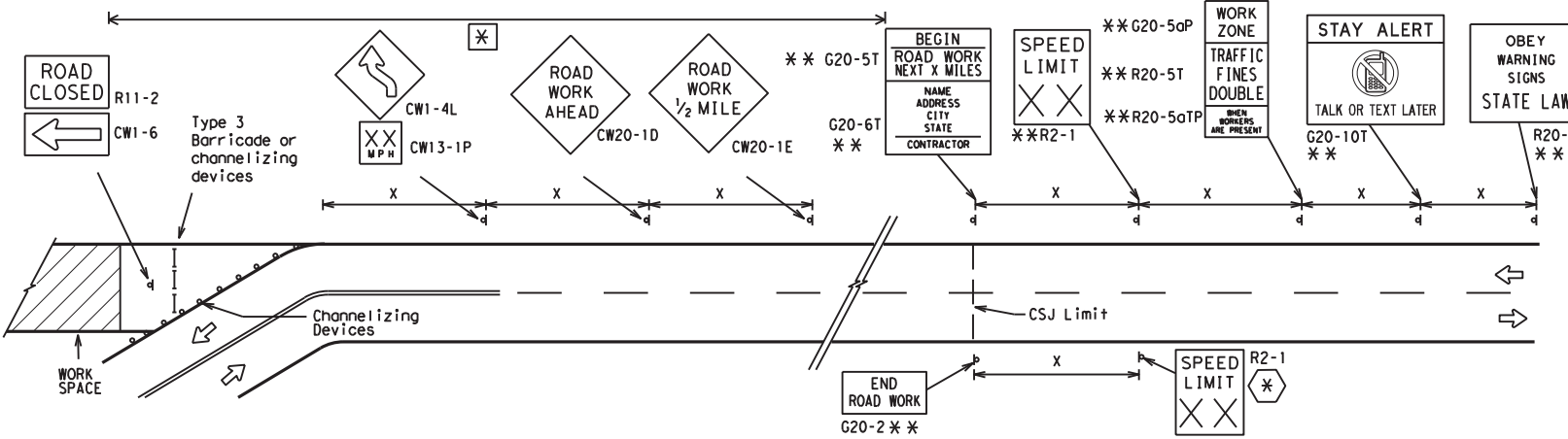
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be used on low volume crossroads at the discretion of the Engineer. 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

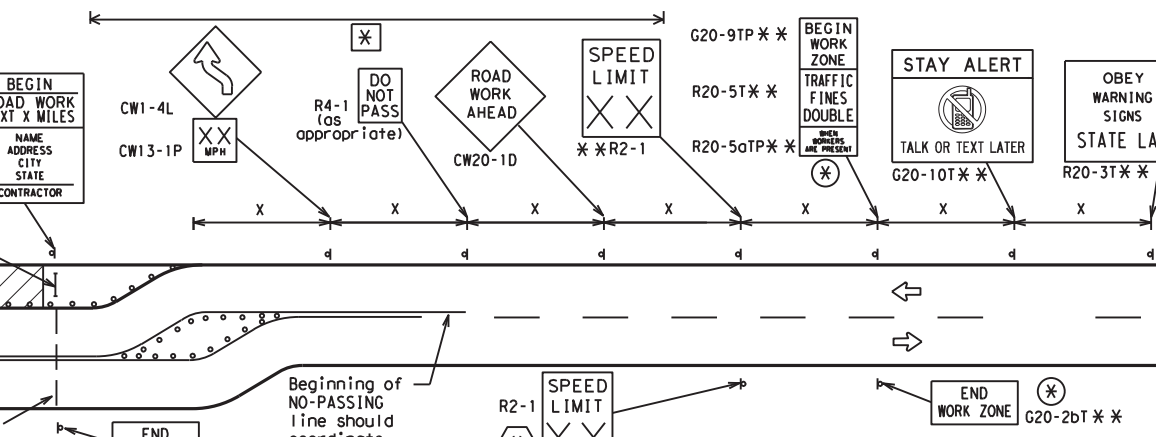


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing 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.
- ** Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.
- * Area for placement of "ROAD WORK AHEAD" (CW20-1D) sign and other signs or devices as called for on the Traffic Control Plan.
- * Contractor will install a regulatory speed limit sign at the end of the work zone.

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

SHEET 2 OF 12



BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

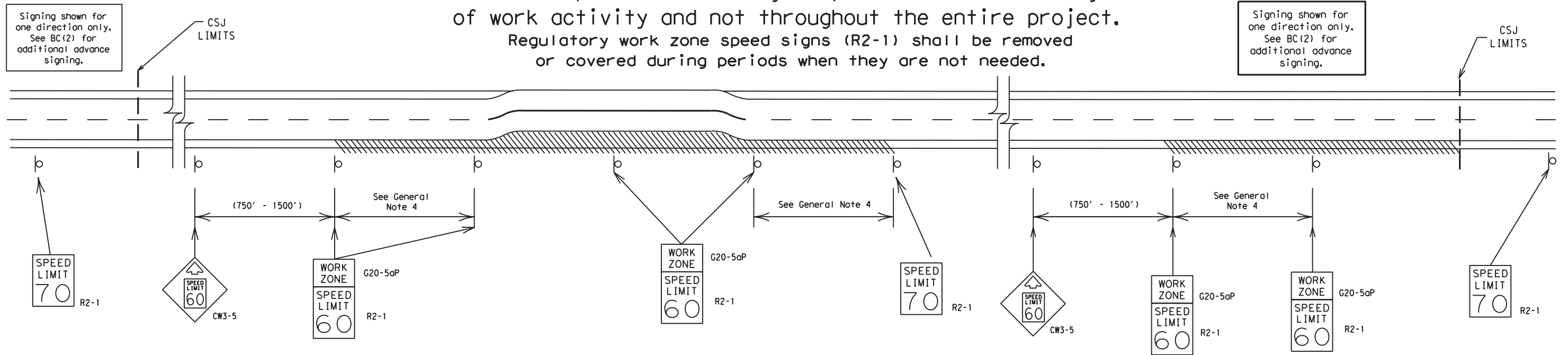
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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project. Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

- 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



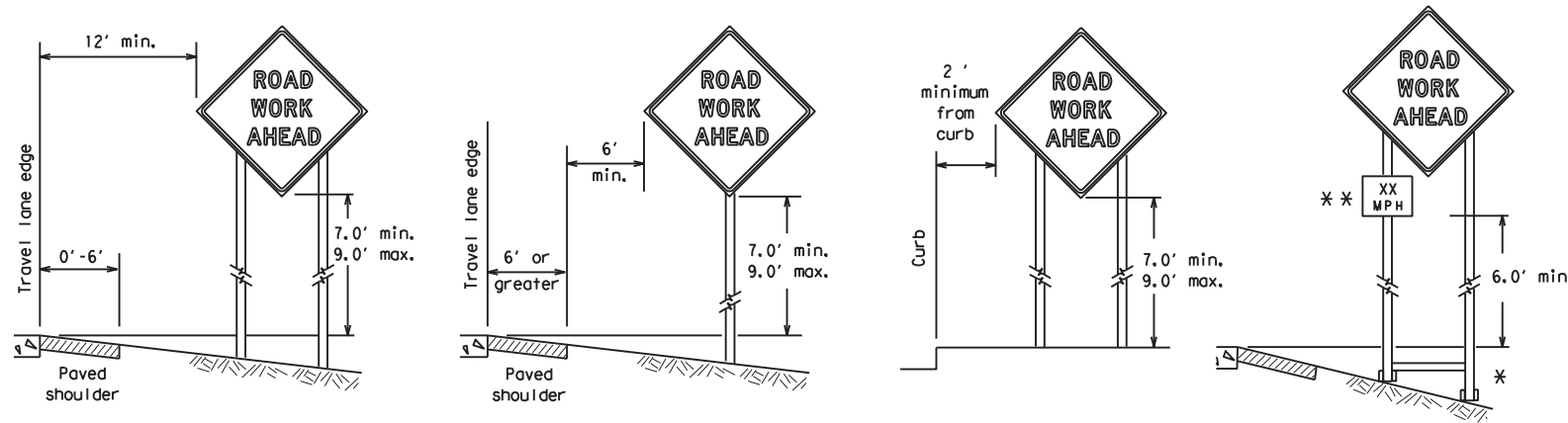
BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

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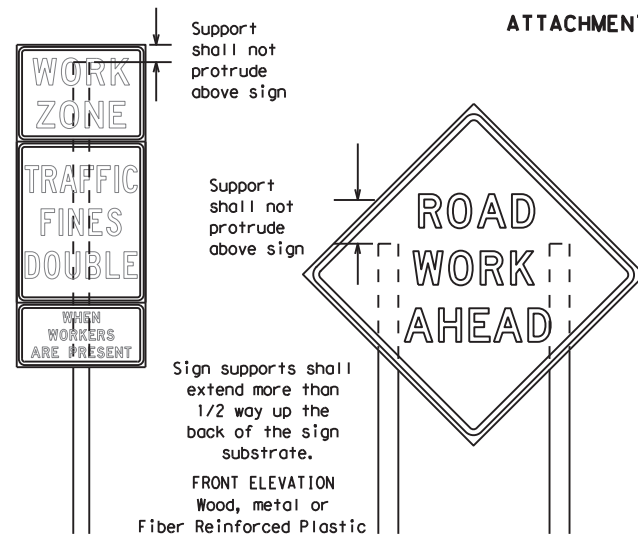
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



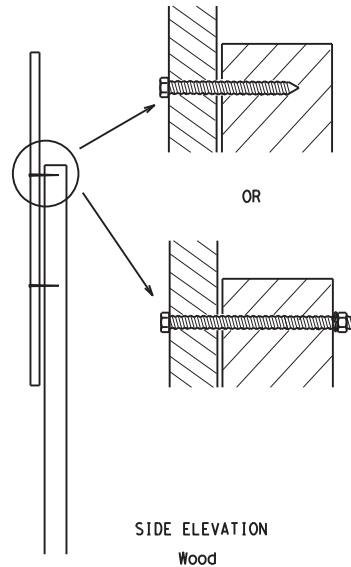
* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS



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

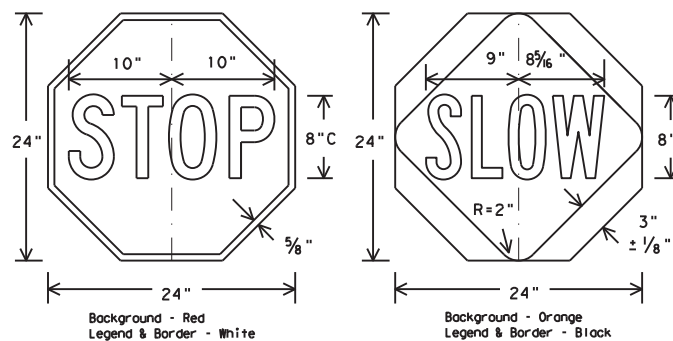


Nails shall NOT be allowed. Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the 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

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



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

1. Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
 2. Wooden sign posts shall be painted white.
 3. Barricades shall NOT be used as sign supports.
 4. All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
 5. The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
 6. The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD). The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
 7. The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
 8. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
 9. The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.
- DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)**
1. The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
 - a. Long-term stationary - work that occupies a location more than 3 days.
 - b. Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
 - c. Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
 - d. Short, duration - work that occupies a location up to 1 hour.
 - e. Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

SHEET 4 OF 12



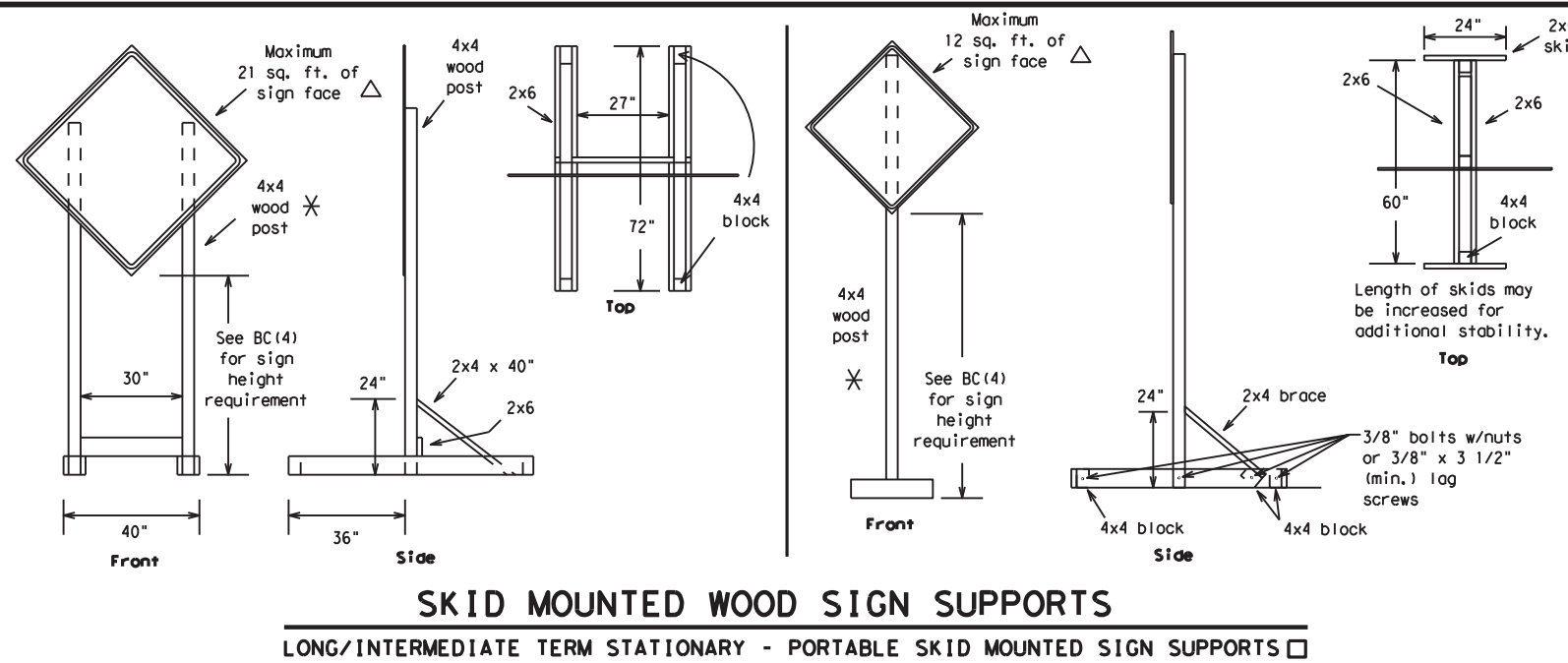
BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC (4) - 14

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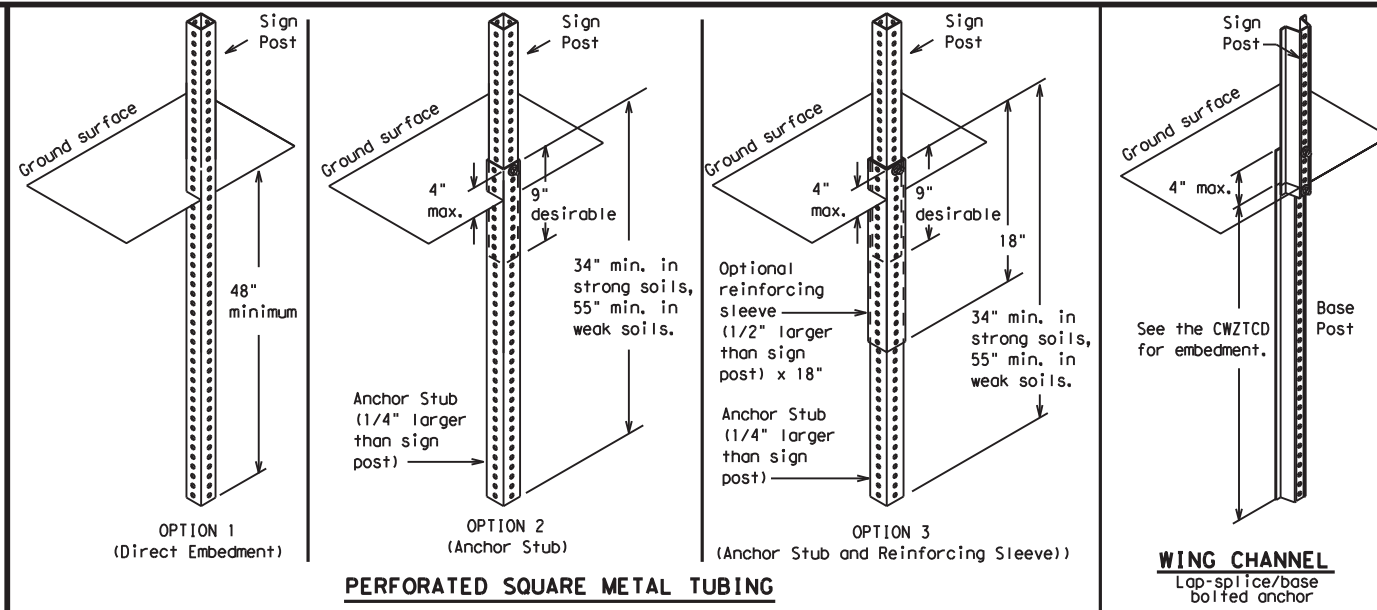
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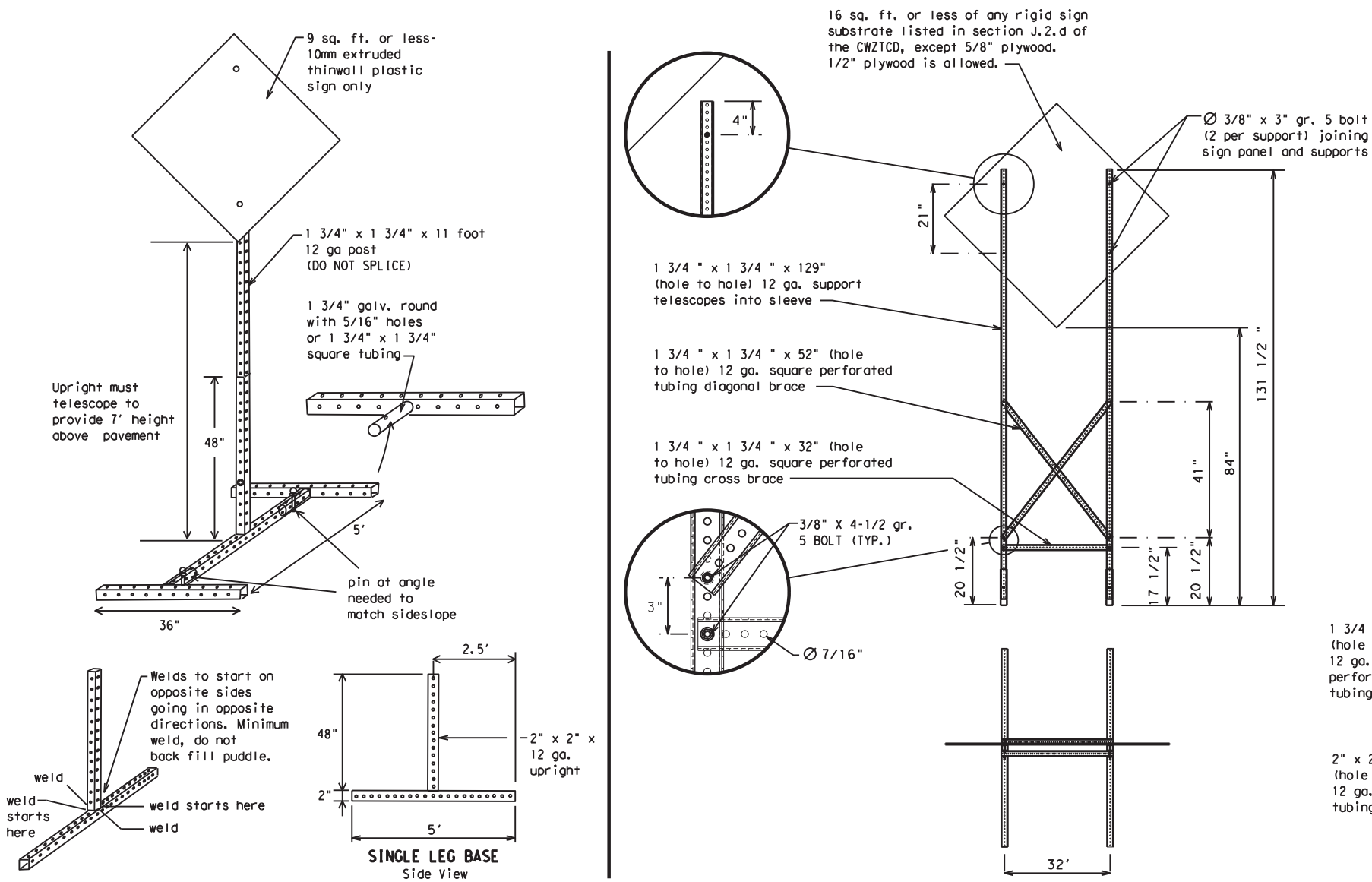
SKID MOUNTED WOOD SIGN SUPPORTS

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

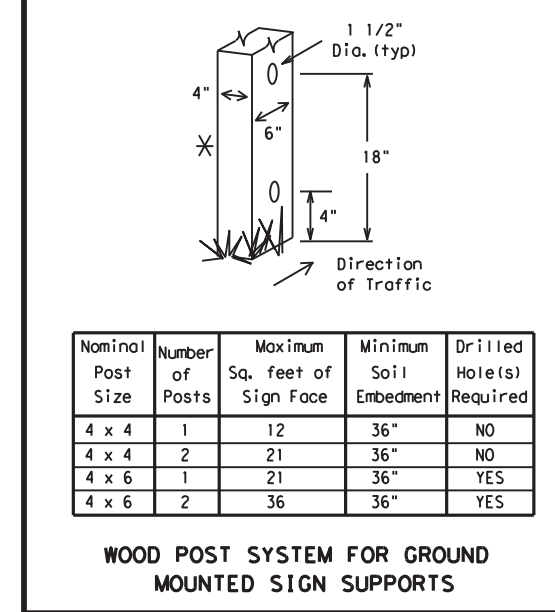


GROUND MOUNTED SIGN SUPPORTS

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



WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS

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

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

- 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.
- No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
- 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) - 14

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

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
ROAD CLOSED AT SH XXX
ROAD CLSD AT FM XXXX
RIGHT X LANES CLOSED
CENTER LANE CLOSED
NIGHT LANE CLOSURES
VARIOUS LANES CLOSED
EXIT CLOSED
MALL DRIVEWAY CLOSED
XXXXXXXX BLVD CLOSED

Other Condition List

FRONTAGE ROAD CLOSED
SHOULDER CLOSED XXX FT
RIGHT LN CLOSED XXX FT
RIGHT X LANES OPEN
DAYTIME LANE CLOSURES
I-XX SOUTH EXIT CLOSED
EXIT XXX CLOSED X MILE
RIGHT LN TO BE CLOSED
X LANES CLOSED TUE - FRI

ROADWORK XXX FT
FLAGGER XXXX FT
RIGHT LN NARROWS XXXX FT
MERGING TRAFFIC XXXX FT
LOOSE GRAVEL XXXX FT
DETOUR X MILE
ROADWORK PAST SH XXXX
BUMP XXXX FT
TRAFFIC SIGNAL XXXX FT

ROAD REPAIRS XXXX FT
LANE NARROWS XXXX FT
TWO-WAY TRAFFIC XX MILE
CONST TRAFFIC XXX FT
UNEVEN LANES XXXX FT
ROUGH ROAD XXXX FT
ROADWORK NEXT FRI-SUN
US XXX EXIT X MILES
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
DETOUR NEXT X EXITS
USE EXIT XXX
STAY ON US XXX SOUTH
TRUCKS USE US XXX N
WATCH FOR TRUCKS
EXPECT DELAYS
REDUCE SPEED XXX FT
USE OTHER ROUTES
STAY IN LANE *

FORM X LINES RIGHT
USE XXXXX RD EXIT
USE EXIT I-XX NORTH
USE I-XX E TO I-XX N
WATCH FOR TRUCKS
EXPECT DELAYS
PREPARE TO STOP
END SHOULDER USE
WATCH FOR WORKERS

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

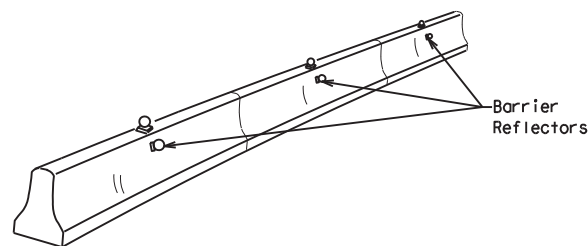
Roadway designation # IH-number, US-number, SH-number, FM-number

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<h3>BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)</h3>			
<h2>BC (6) - 14</h2>			
FILE: bc-14.dgn	DN: TxDOT	CR: TxDOT	DW: TxDOT
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REVISIONS: 9-07 8-14	DIST: COUNTY		SHEET NO.:
7-13	SAT: BEXAR		17

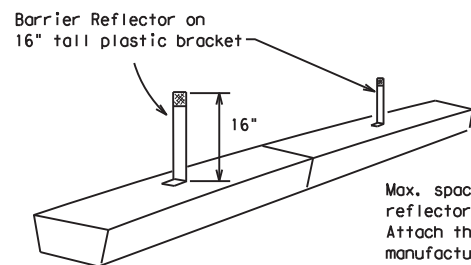
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors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



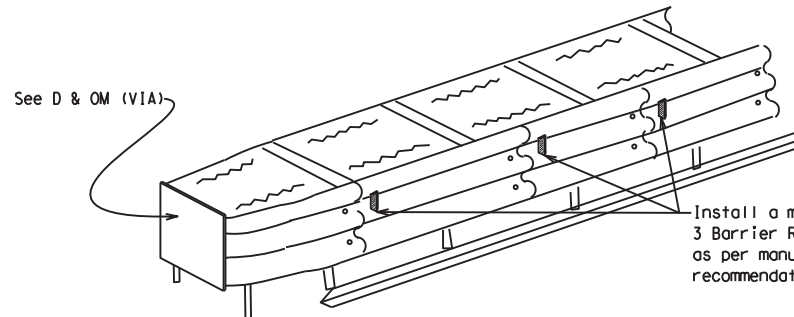
CONCRETE TRAFFIC BARRIER (CTB)

- 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)

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



DELINEATION OF END TREATMENTS

END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet crashworthy standards as defined in the National Cooperative Highway Research Report 350. Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS

WARNING LIGHTS

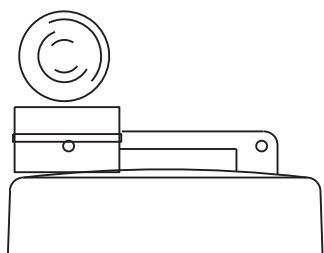
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet 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_{FL} 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

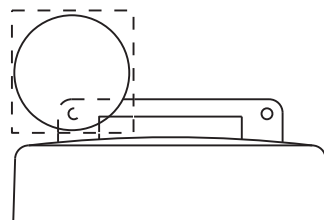
- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing 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.



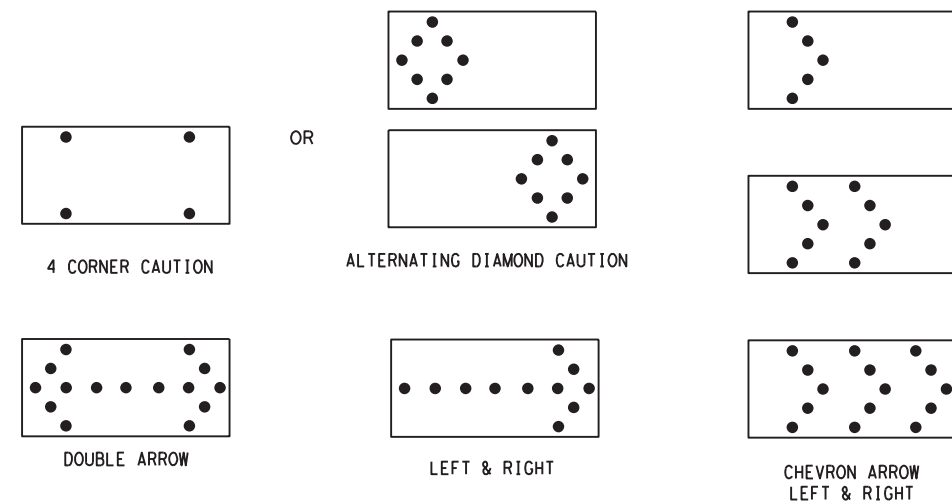
Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



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 National Cooperative Highway Research Report No. 350 (NCHRP 350) or 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.



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

BC (7) - 14

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© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
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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:

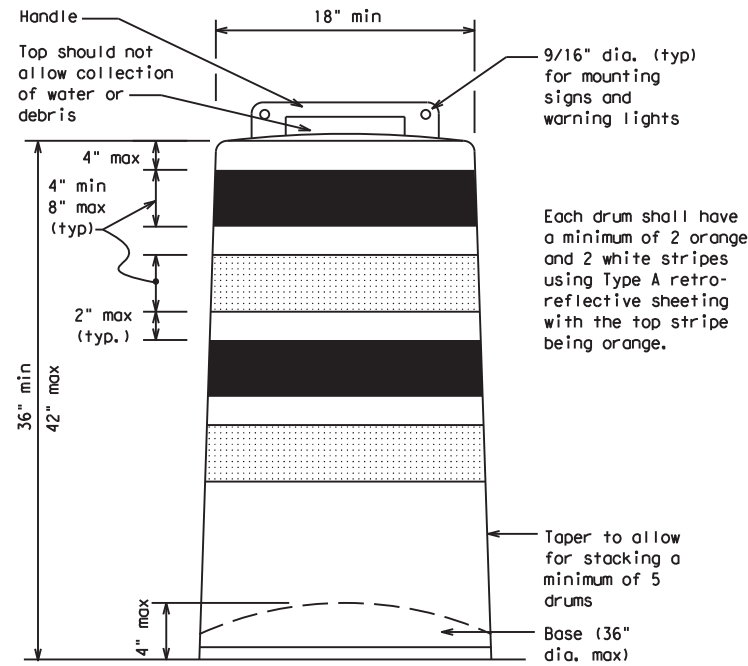
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

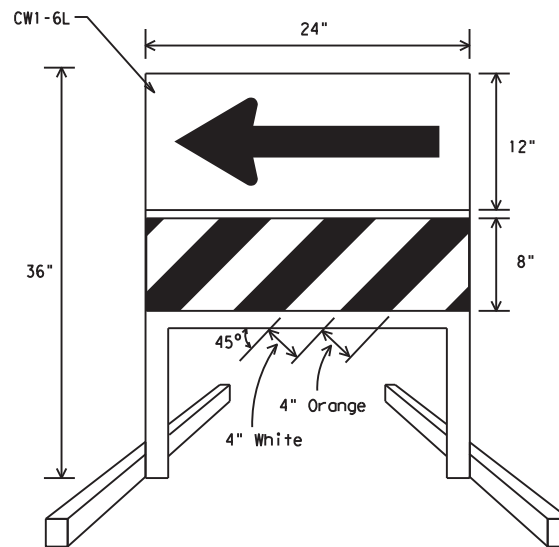
- The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A reflective sheeting shall be supplied unless otherwise specified in the plans.
- The sheeting shall be suitable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



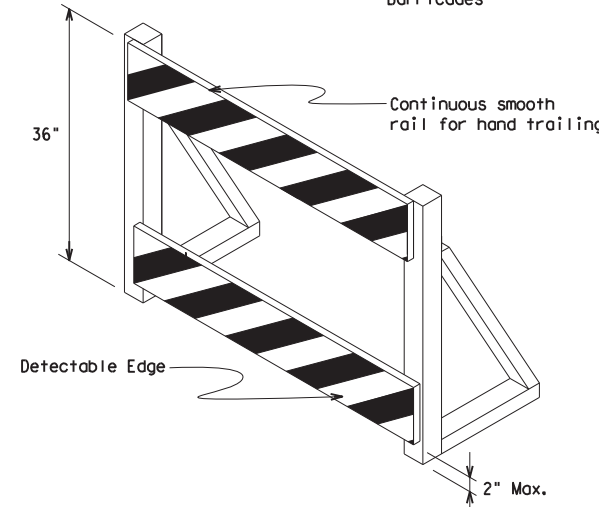
DIRECTION INDICATOR BARRICADE

- The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
- If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
- The Direction Indicator Barricade shall consist of One-Direction Large Arrow (CWI-6) sign in the size shown with a black arrow on a background of Type B_{FL} or Type C_{FL} Orange retroreflective sheeting above a rail with Type A retroreflective sheeting in alternating 4" white and orange stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Sheetting types shall be as per DMS 8300.
- Double arrows on the Direction Indicator Barricade will not be allowed.
- Approved manufacturers are shown on the CWZTCD List. Ballast shall be as approved by the manufacturers instructions.

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.
- Where pedestrians with visual disabilities normally use the closed sidewalk, a device that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.
- 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 for Buildings and Facilities (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 may use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.

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



18" x 24" Sign
(Maximum Sign Dimension)
Chevron CWI-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

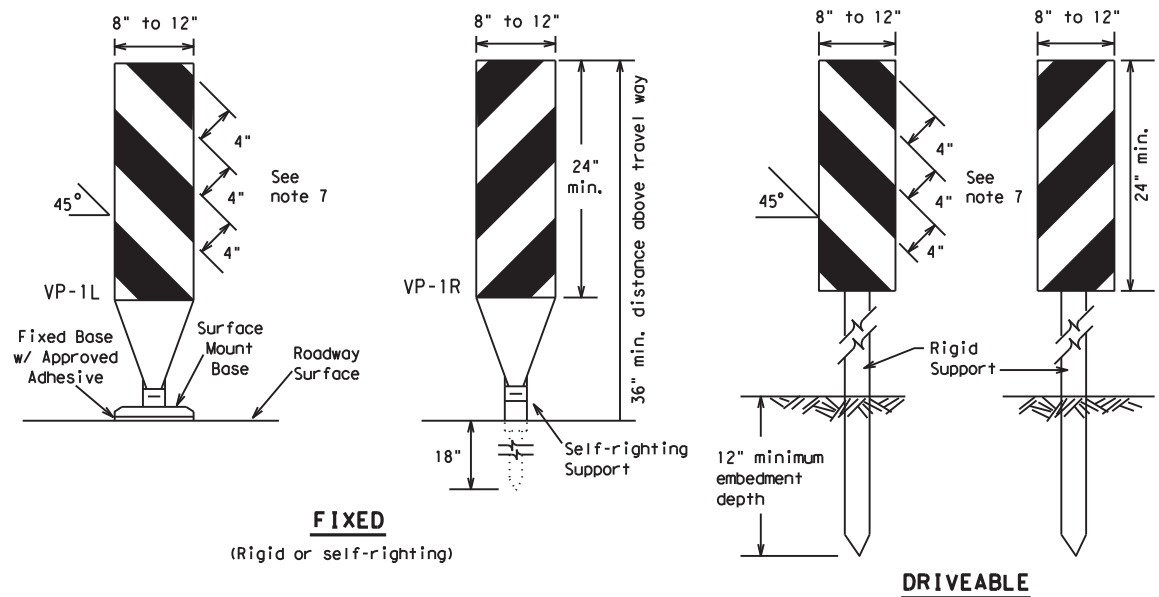
- Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
- Chevrons and other work zone signs with an orange background shall be manufactured with Type B_{FL} or Type C_{FL} Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face 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 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.

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (8) - 14

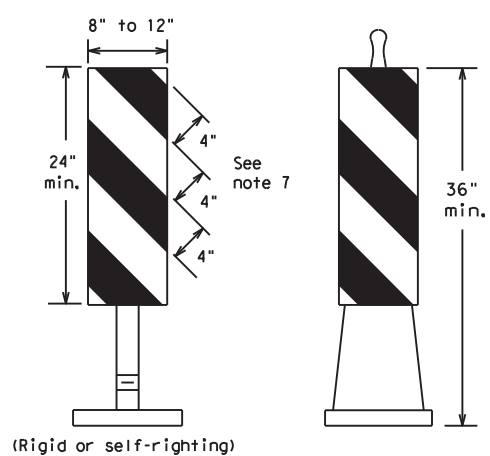
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© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
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9-07	8-14	SAT	BEXAR	19					

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FIXED
(Rigid or self-righting)

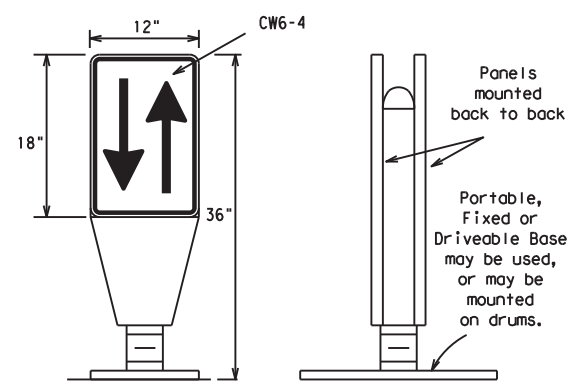
DRIVEABLE



PORTABLE

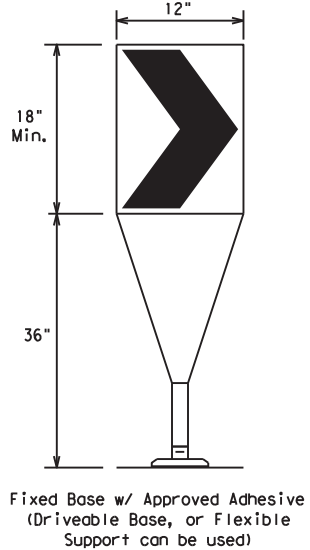
VERTICAL PANELS (VPs)

- 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 Appendix B "Treatment of Pavement Drop-offs in Work Zones" for additional guidelines on the use of 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 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.



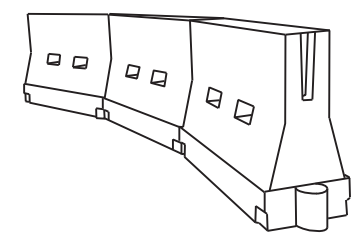
OPPOSING TRAFFIC LANE DIVIDERS (OTLD)

- 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.



- 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) placed 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 NCHRP 350 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

SHEET 9 OF 12



BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (9) - 14

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7-13	SAT	BEXAR	20	

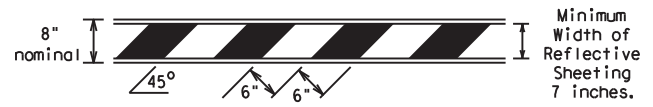
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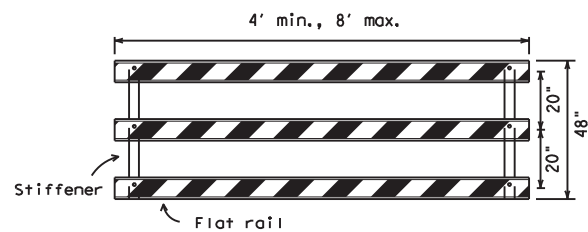
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.

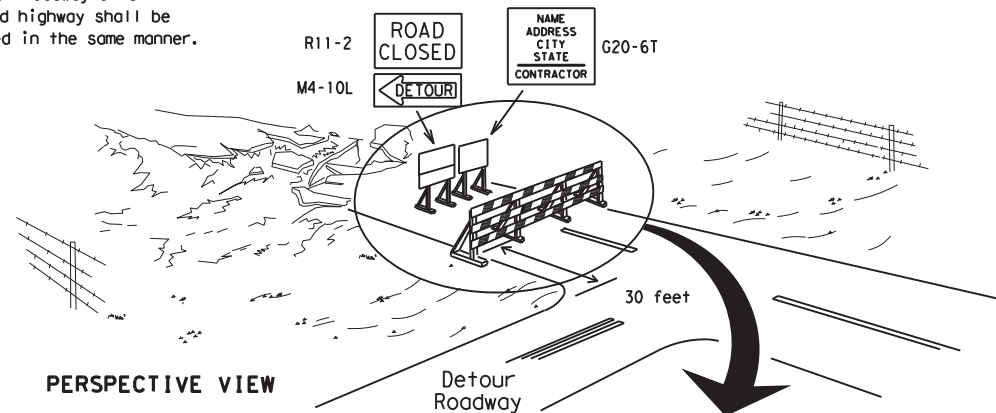


TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



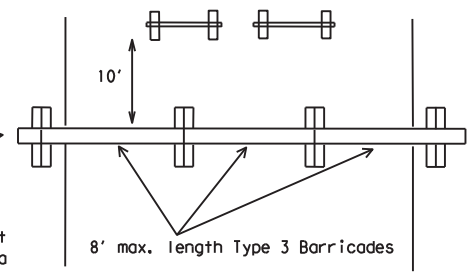
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

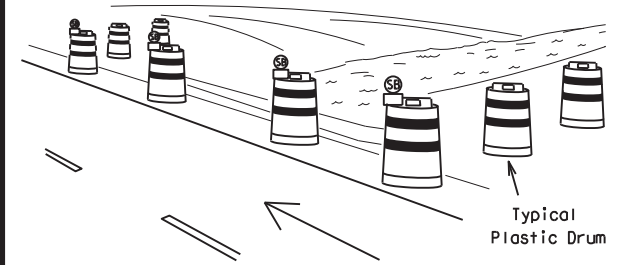
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



PLAN VIEW

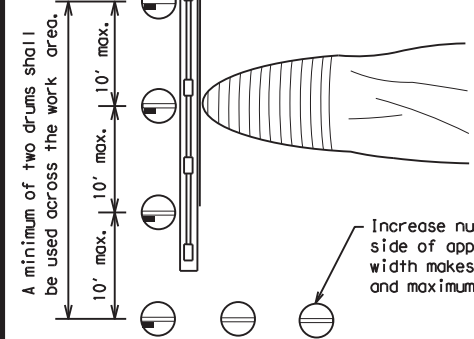
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

These drums are not required on one-way roadway

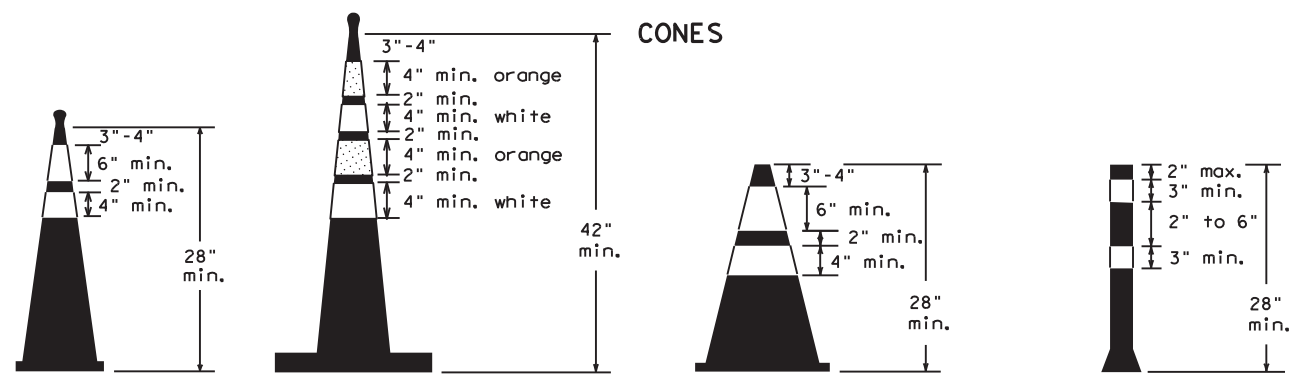


PLAN VIEW

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.

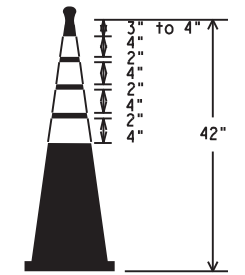
LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
	Steady burn warning light or yellow warning reflector



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

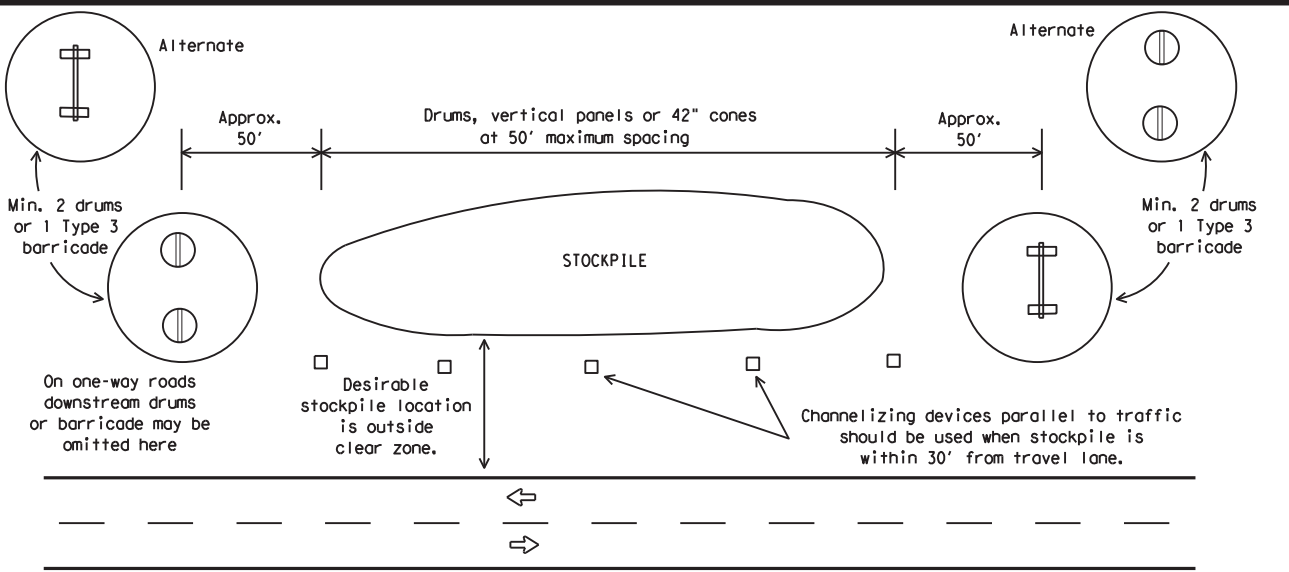
1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added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

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



EDGE LINE CHANNELIZER

1. This device is intended only for use in place of a vertical panel to channelize traffic by indicating the edge of the travel lane. It is not intended to be used in transitions or tapers.
2. This device shall not be used to separate lanes of traffic (opposing or otherwise) or warn of objects.
3. This device is based on a 42 inch, two-piece cone with an alternate striping pattern: four 4 inch retroreflective bands, with an approximate 2 inch gap between bands. The color of the band should correspond to the color of the edgeline (yellow for left edgeline, white for right edgeline) for which the device is substituted or for which it supplements. The reflectorized bands shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless otherwise noted.
4. The base must weigh a minimum of 30 lbs.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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.

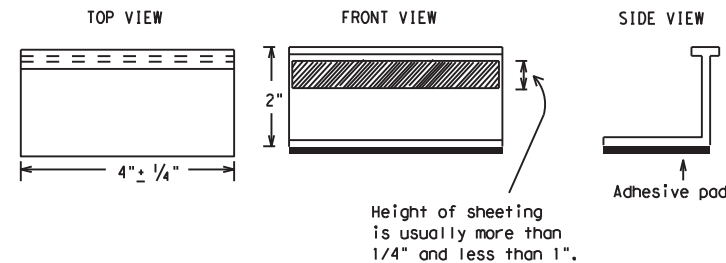
MAINTAINING WORK ZONE PAVEMENT MARKINGS

- 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) - 14

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11-02 8-14				

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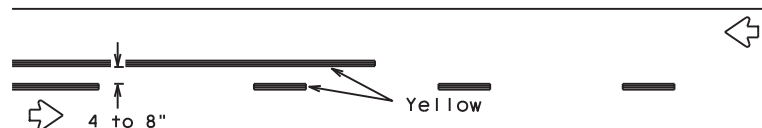
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FILE:

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PAVEMENT MARKING PATTERNS

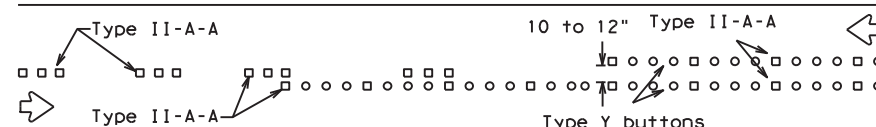


REFLECTORIZED PAVEMENT MARKINGS - PATTERN A

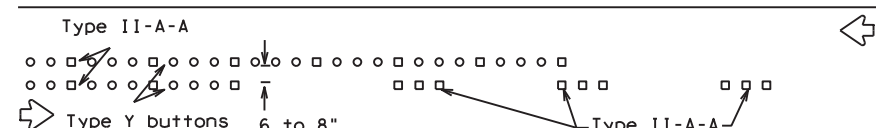


REFLECTORIZED PAVEMENT MARKINGS - PATTERN B

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.

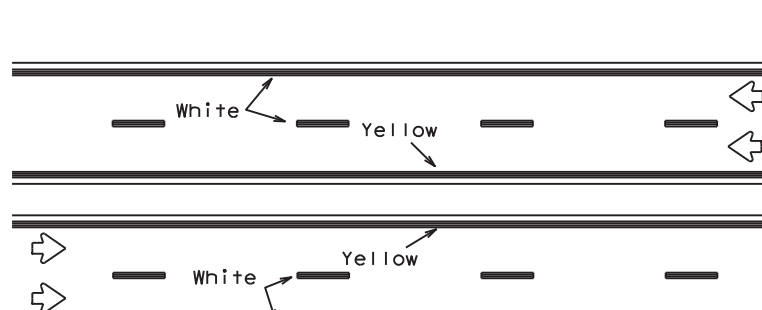


RAISED PAVEMENT MARKERS - PATTERN A



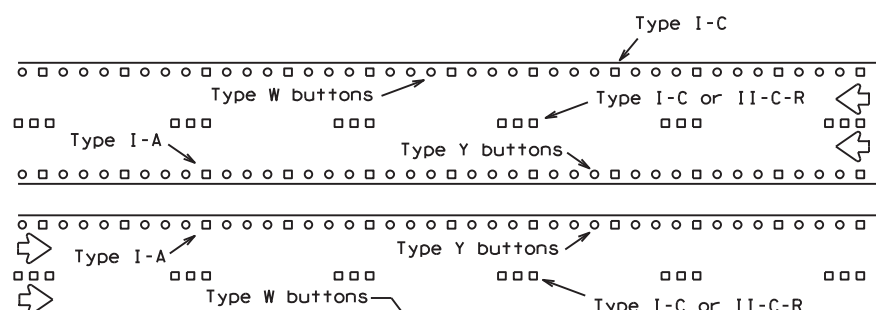
RAISED PAVEMENT MARKERS - PATTERN B

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



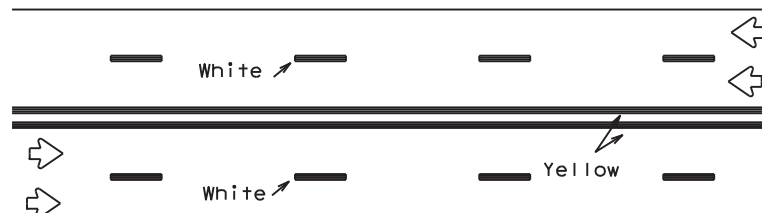
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectorized pavement markings.



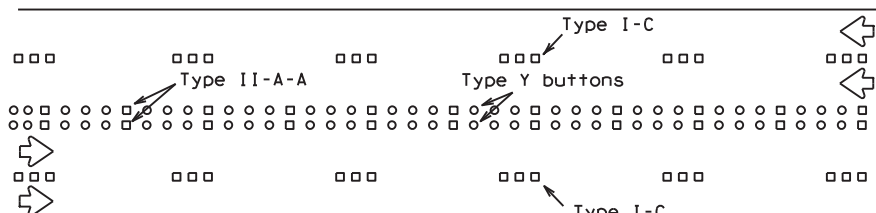
RAISED PAVEMENT MARKERS

EDGE & LANE LINES FOR DIVIDED HIGHWAY



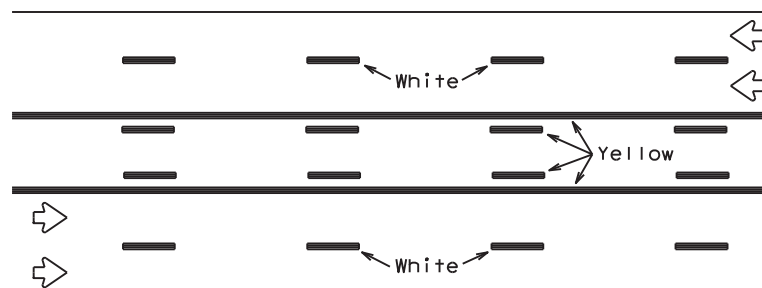
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectorized pavement markings.



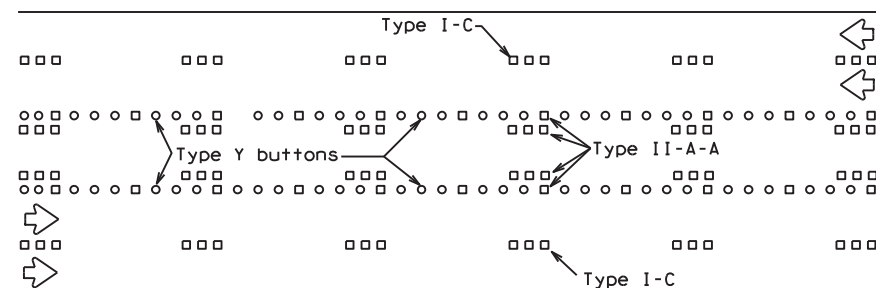
RAISED PAVEMENT MARKERS

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

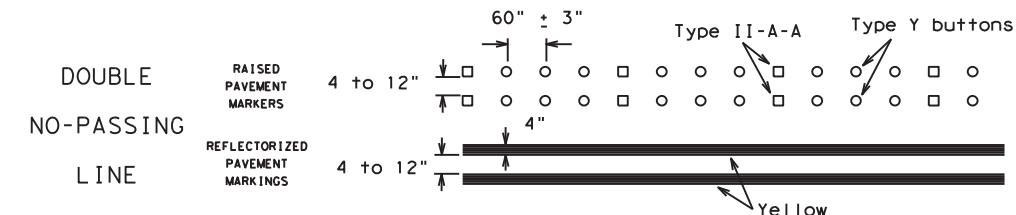
Prefabricated markings may be substituted for reflectorized pavement markings.



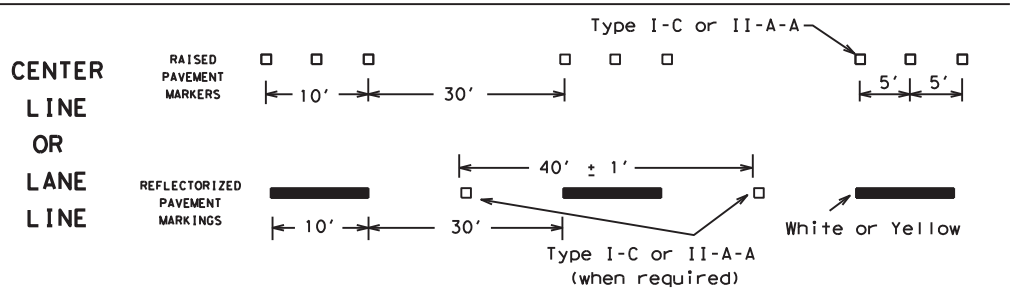
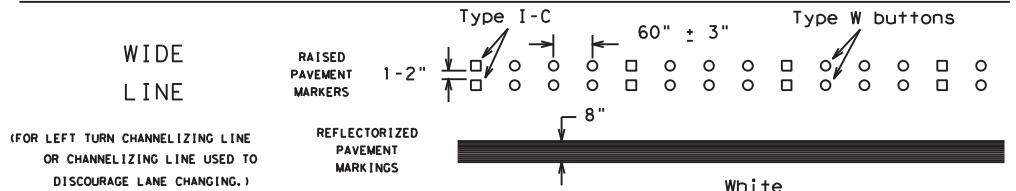
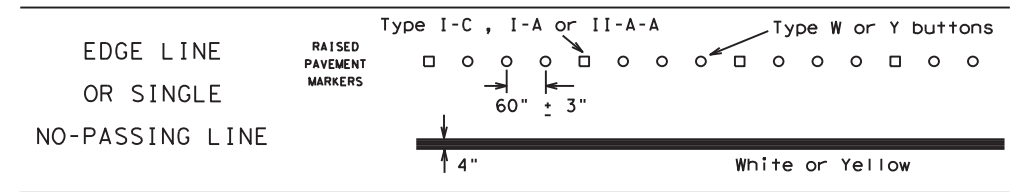
RAISED PAVEMENT MARKERS

TWO-WAY LEFT TURN LANE

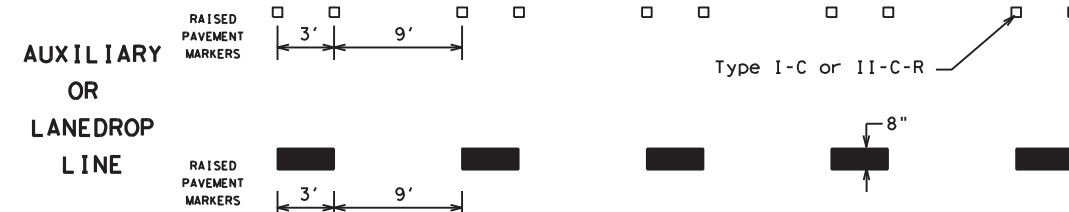
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



SOLID LINES

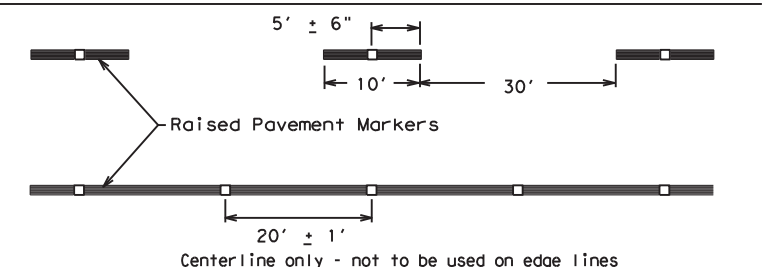


BROKEN LINES



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

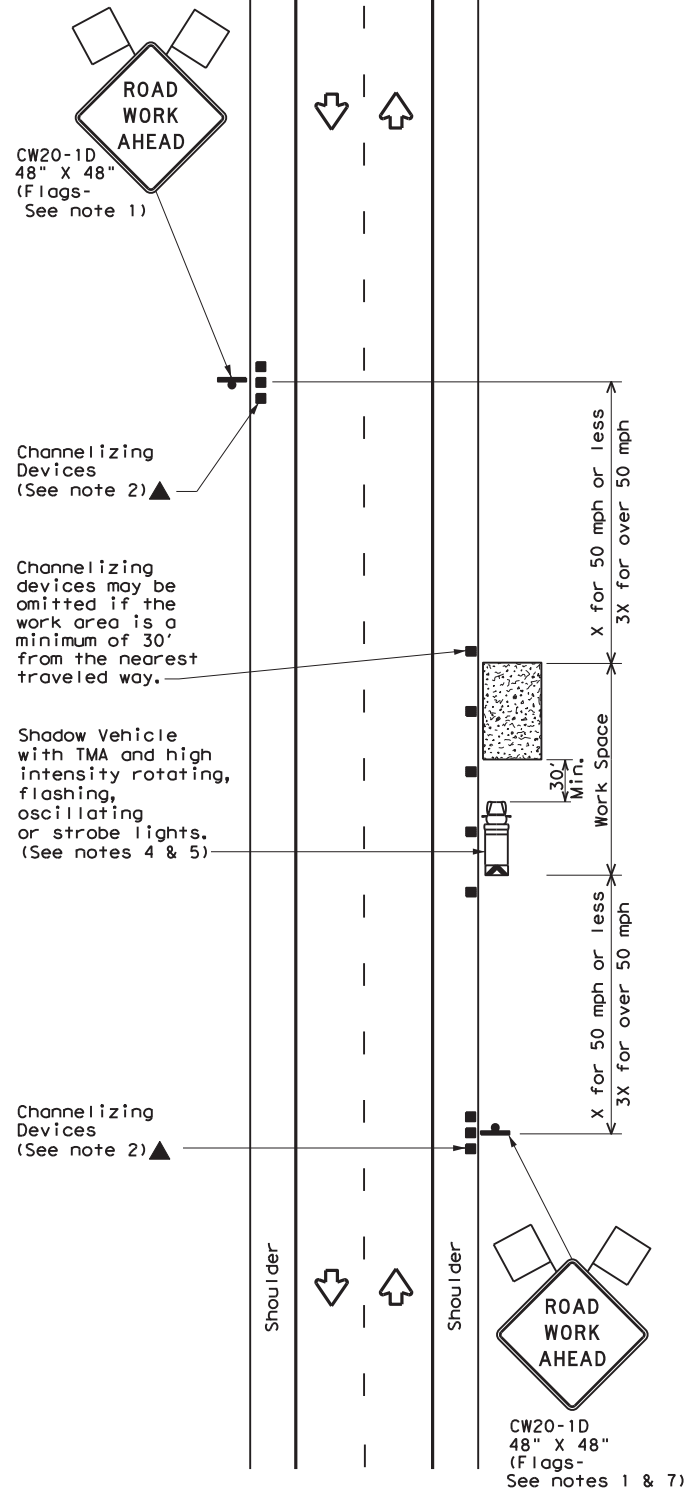
BC (12) - 14

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© TxDOT February 1998	CONT: 6372	SECT: 50	JOB: 001	HIGHWAY: VAR.
REVISIONS				
1-97 9-07				
2-98 7-13				
11-02 8-14	SAT		COUNTY: BEXAR	SHEET NO.: 23

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."

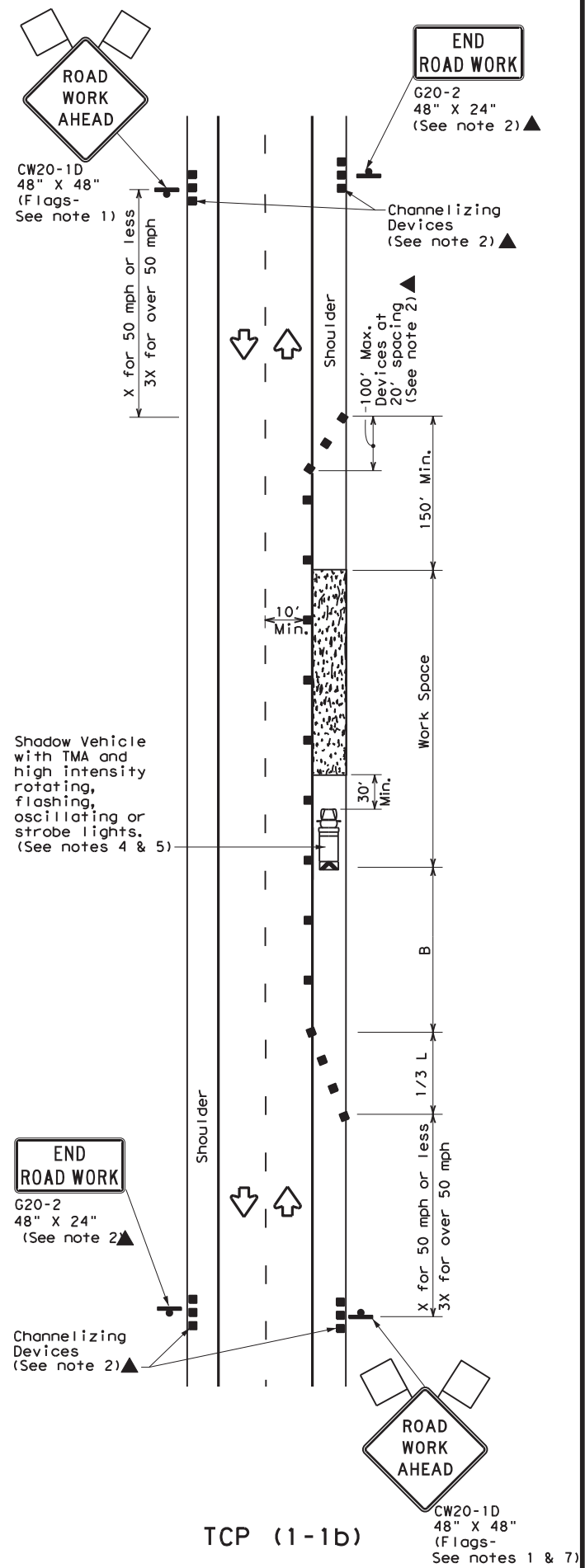
DATE: FILE:

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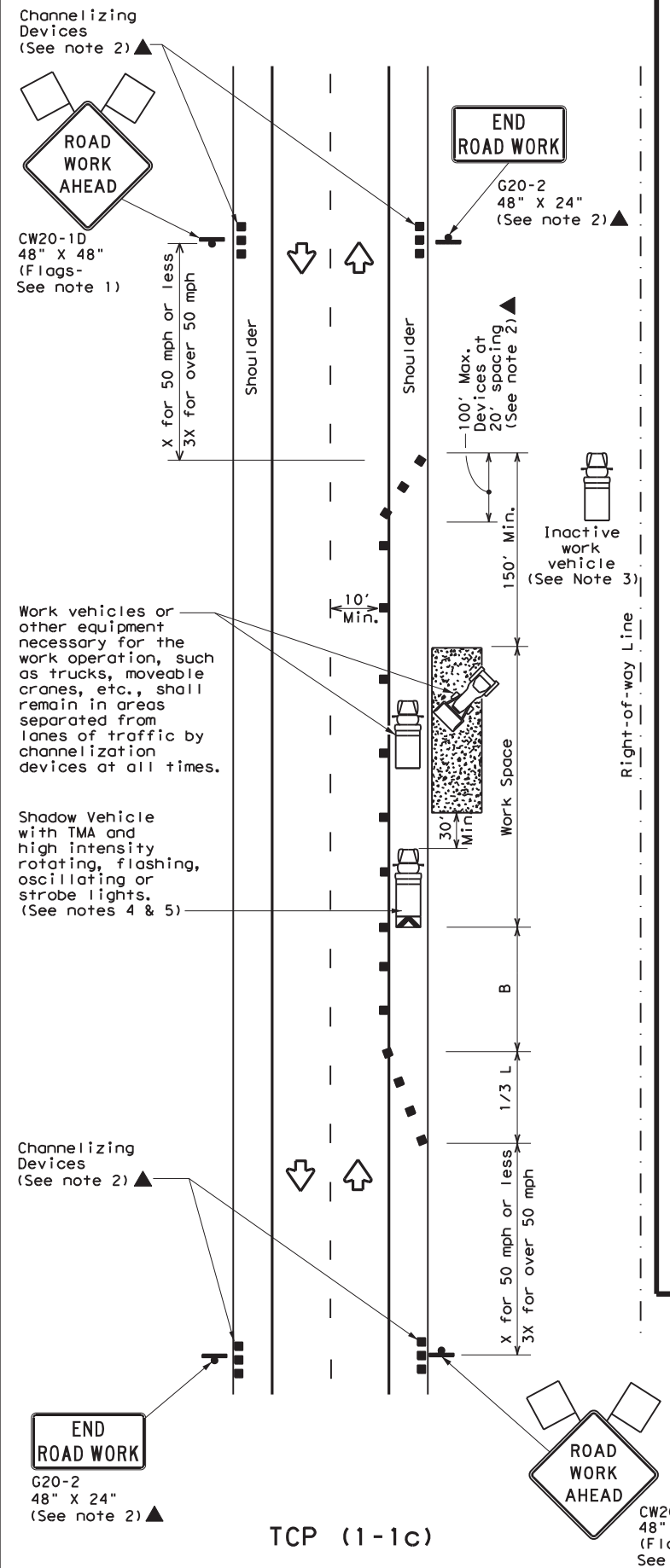
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		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.
 - Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
 - 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 wider work spaces.
 - See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
 - CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

TRAFFIC CONTROL PLAN
CONVENTIONAL ROAD
SHOULDER WORK

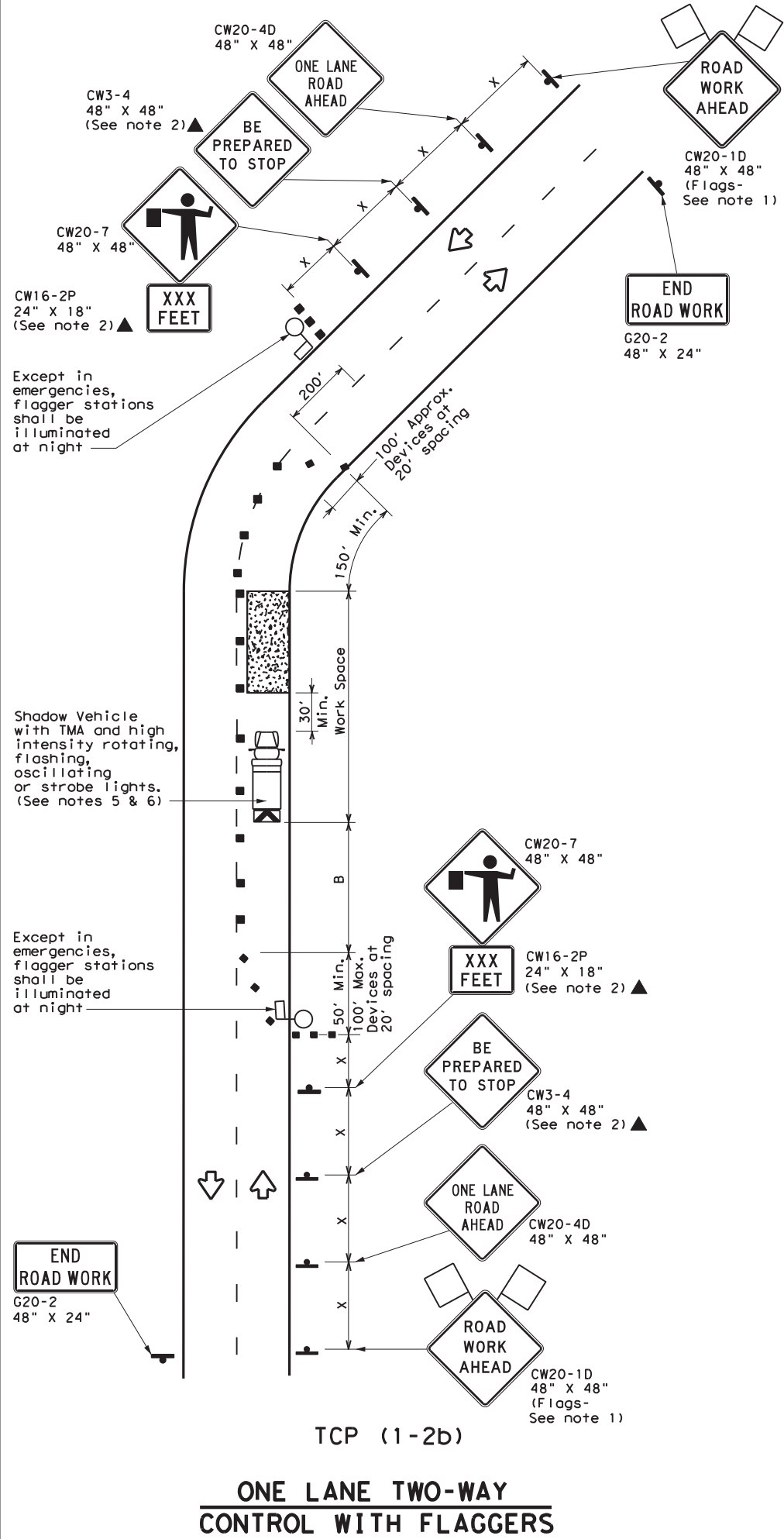
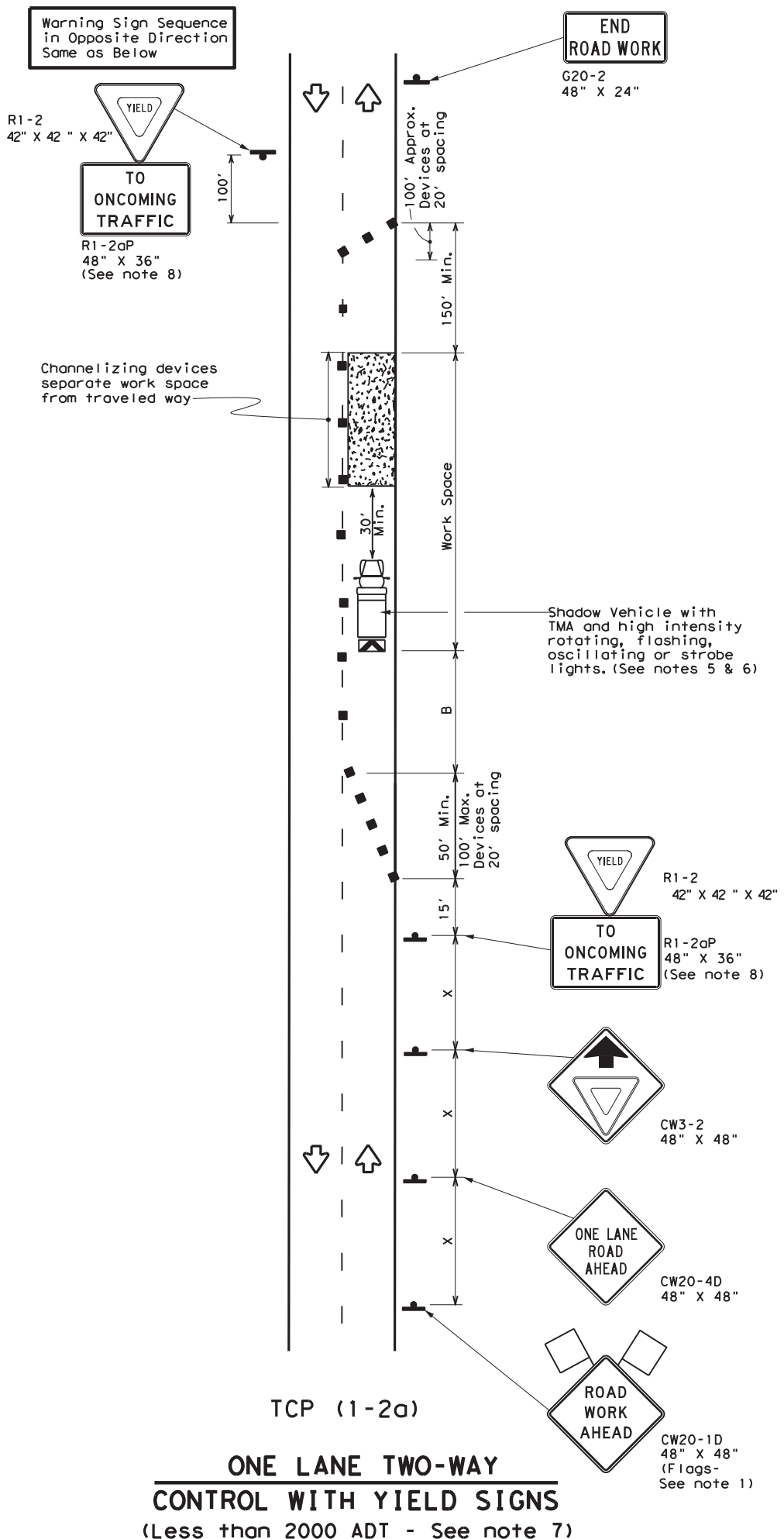
TCP (1-1) - 18

FILE: tcp1-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
2-94 4-98	DIST	COUNTY	SHEET NO.	
8-95 2-12	SAT	BEXAR	24	
1-97 2-18				

DATE:
FILE:

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DATE: FILE:



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 * X	Formula L = WS ² / 60	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent			
30	L = WS ² / 60	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45		450'	495'	540'	45'	90'	320'	195'	360'
50	L = WS	500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75	750'	825'	900'	75'	150'	900'	540'	820'	

* 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 CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign, but proper sign spacing shall be maintained.
 - Sign spacing may be increased or an additional CW20-1D "ROAD WORK AHEAD" sign may be used if advance warning ahead of the flagger or R1-2 "YIELD" sign is less than 1500 feet.
 - 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 wider work spaces.
- TCP (1-2a)**
- R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work spaces should be no longer than one half city block. In rural areas on roadways with less than 2000 ADT, work spaces should be no longer than 400 feet.
 - R1-2 "YIELD" sign with R1-2aP "TO ONCOMING TRAFFIC" plaque shall be placed on a support at a 7 foot minimum mounting height.
- TCP (1-2b)**
- Flaggers should use two-way radios or other methods of communication to control traffic.
 - Length of work space should be based on the ability of flaggers to communicate.
 - If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain adequate stopping sight distance to the flagger and a queue of stopped vehicles (see table above).
 - Channelizing devices on the center-line may be omitted when a pilot car is leading traffic and approved by the Engineer.
 - Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situations.

Texas Department of Transportation Traffic Operations Division Standard

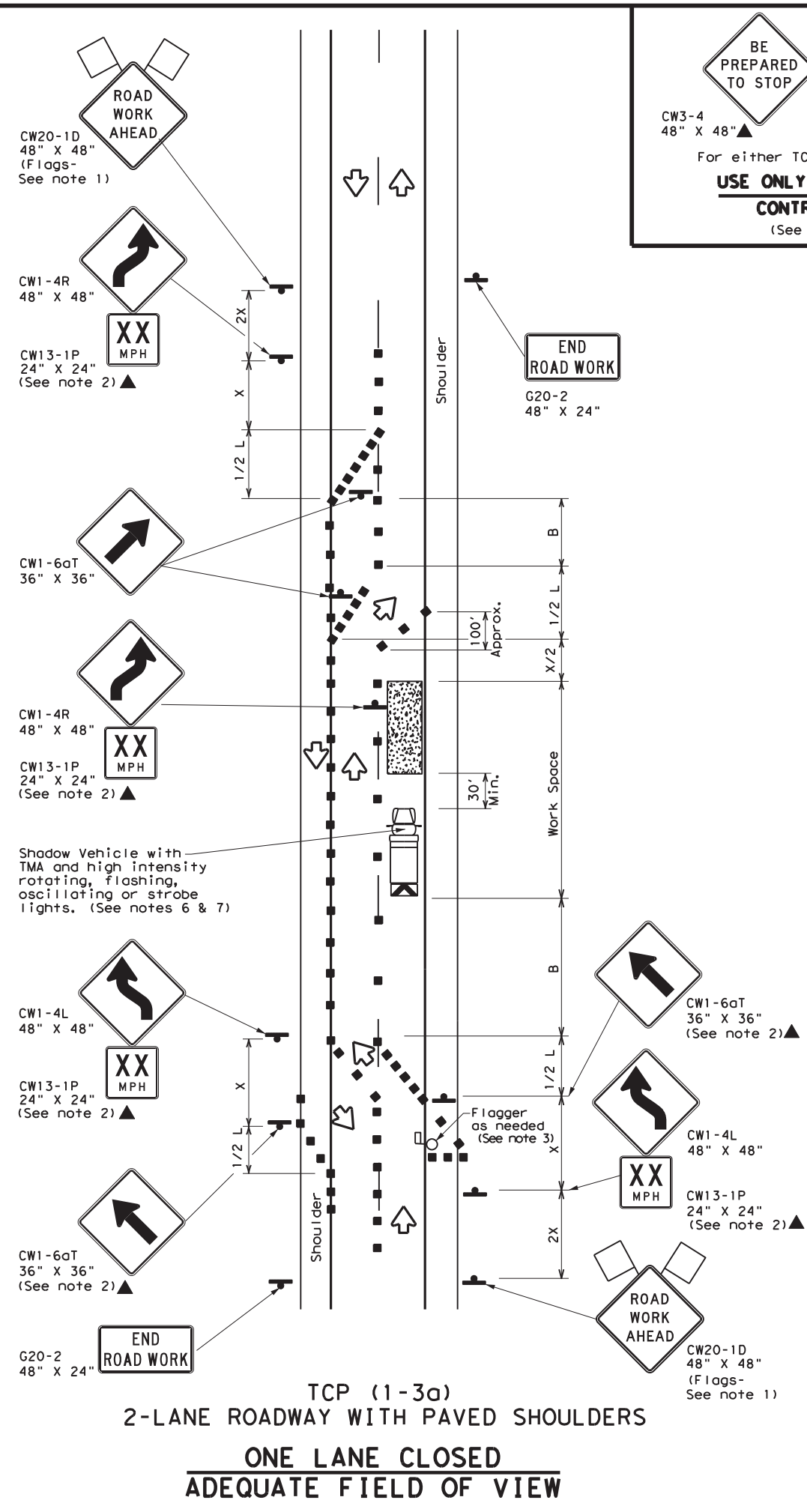
TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

TCP (1-2) - 18

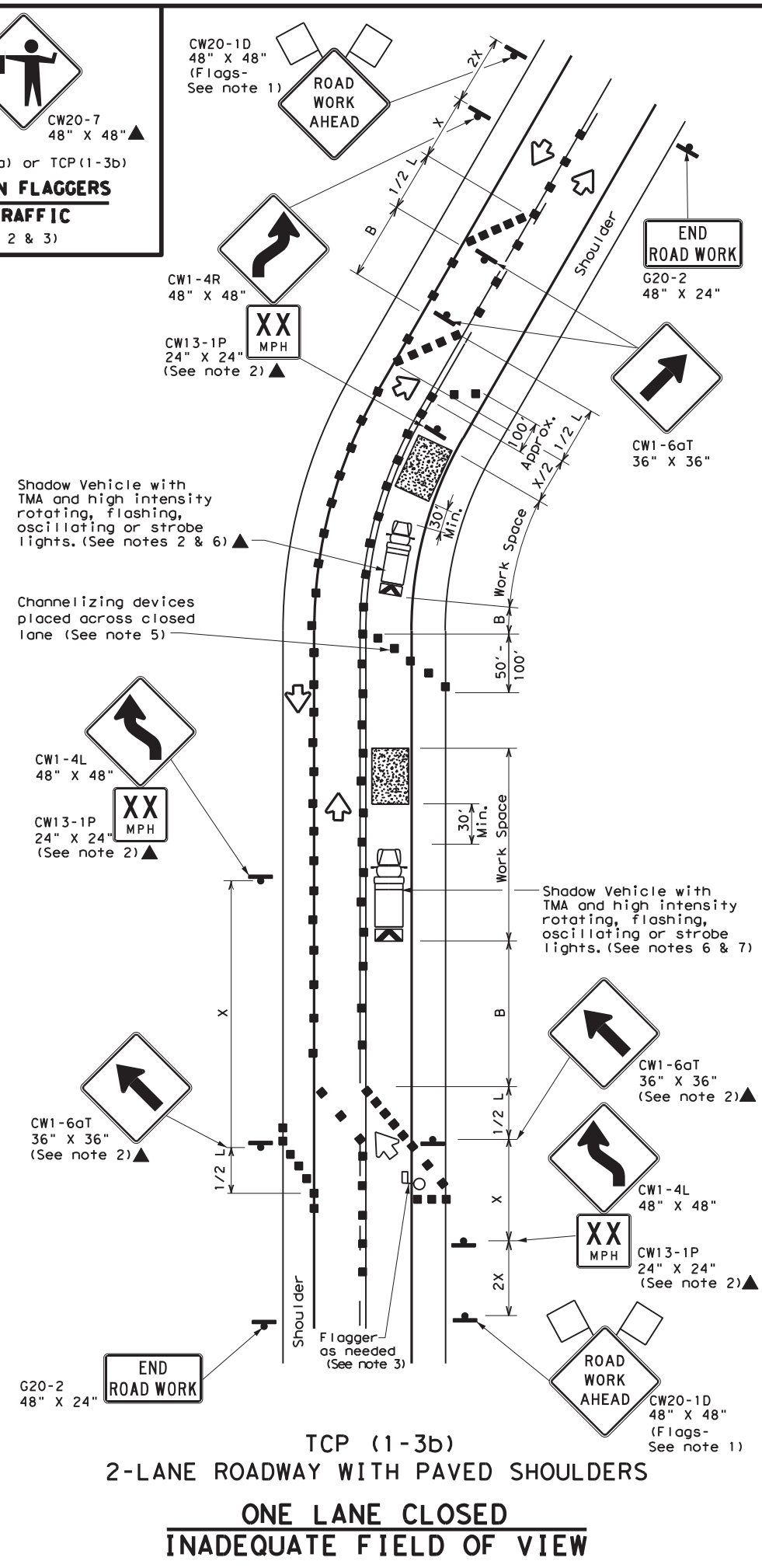
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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
4-90 4-98	DIST	COUNTY	SHEET NO.	
2-94 2-12	SAT	BEXAR	25	
1-97 2-18				

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BE PREPARED TO STOP
CW3-4 48" X 48"▲
CW20-7 48" X 48"▲
For either TCP(1-3a) or TCP(1-3b)
USE ONLY WHEN FLAGGERS CONTROL TRAFFIC
(See Notes 2 & 3)



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/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.
 - Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Additional flaggers may be positioned in advance of traffic queues to alert traffic to reduce speed.
 - DO NOT PASS, PASS WITH CARE and construction regulatory speed zone signs may be installed downstream of the ROAD WORK AHEAD signs.
 - When the work zone is made up of several work spaces, channelizing devices should be placed laterally across the closed lane to re-emphasize closure. Laterally placed channelizing devices should be repeated every 500 to 1000 feet in urban areas and every 1/4 to 1/2 mile in rural areas.
 - 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 wider work spaces.
 - 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 speed are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device spacing is intended for the area of conflicting markings not the entire work zone.

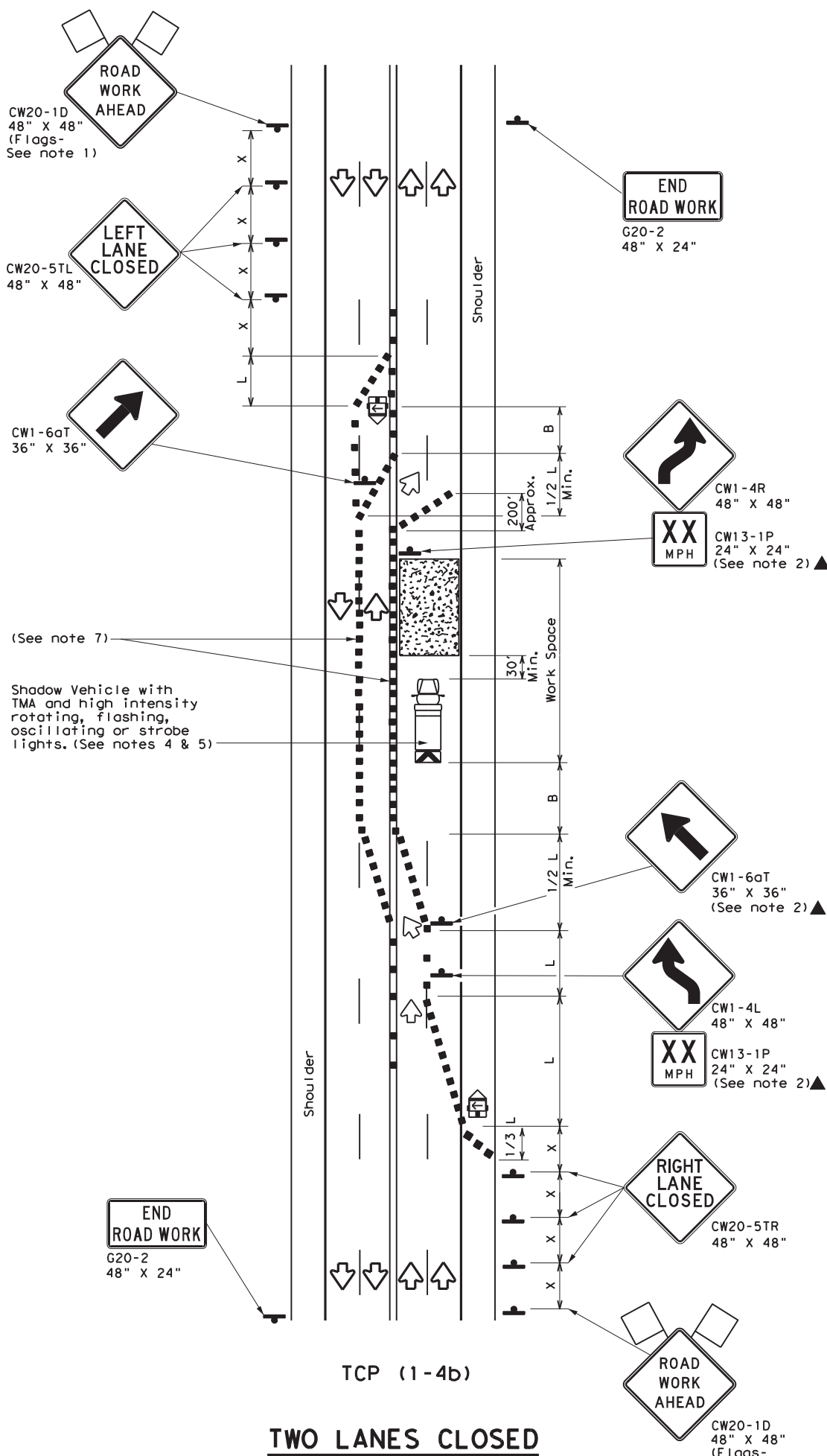
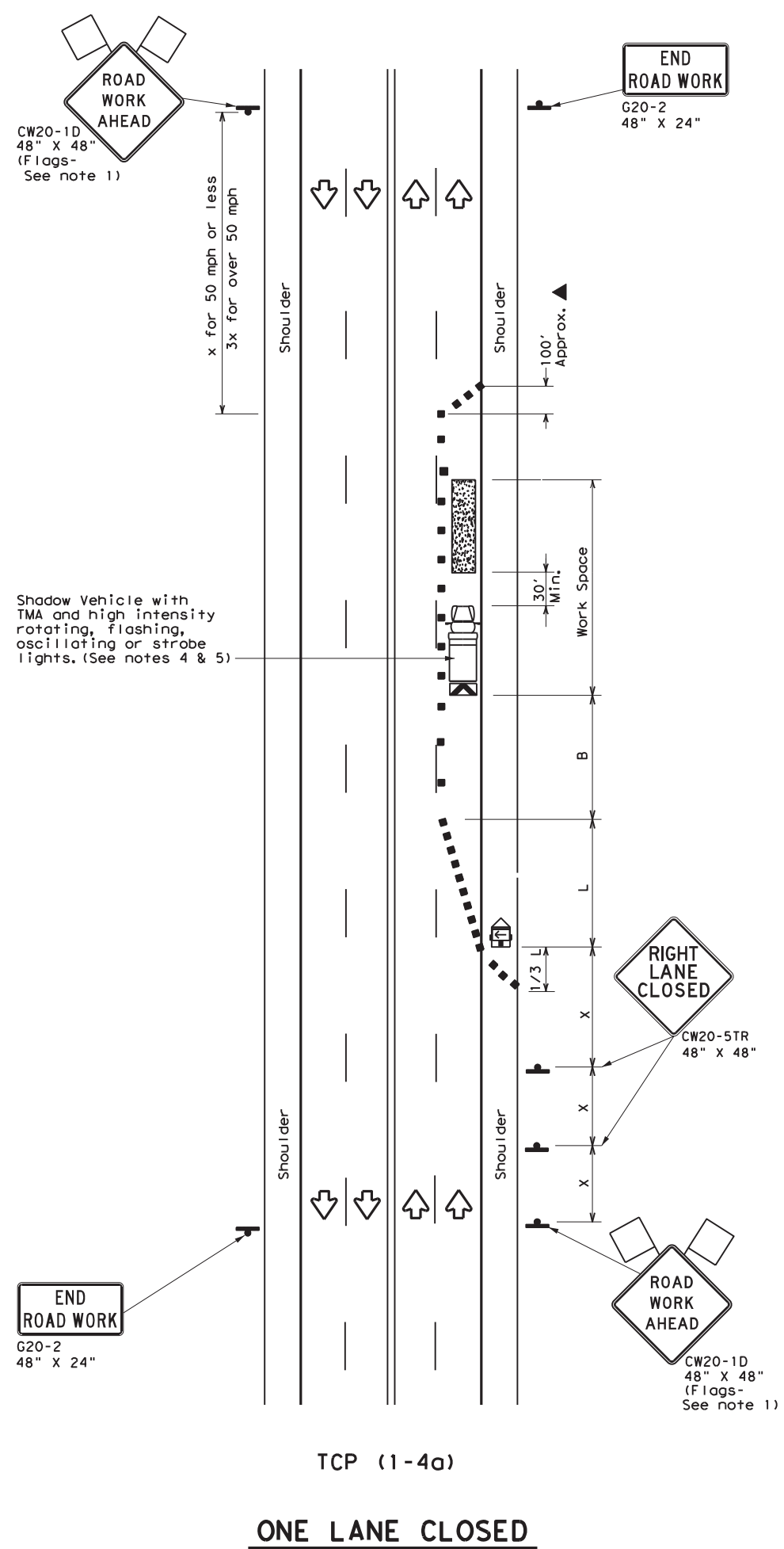
Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
TRAFFIC SHIFTS ON
TWO LANE ROADS
TCP(1-3)-18

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REVISIONS	6372	50	OOI	VAR.
2-94 4-98				
8-95 2-12	DIST	COUNTY		SHEET NO.
1-97 2-18	SAT	BEXAR		26

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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)

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 CW20-1D "ROAD WORK AHEAD" sign may be repeated if the visibility of the work zone is less than 1500 feet.
 - 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 wider work spaces.

TCP (1-4a)

- 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 where needed to protect the work space from opposing traffic with the arrow panel placed in the closed lane near the end of the merging taper.

TCP (1-4b)

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

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

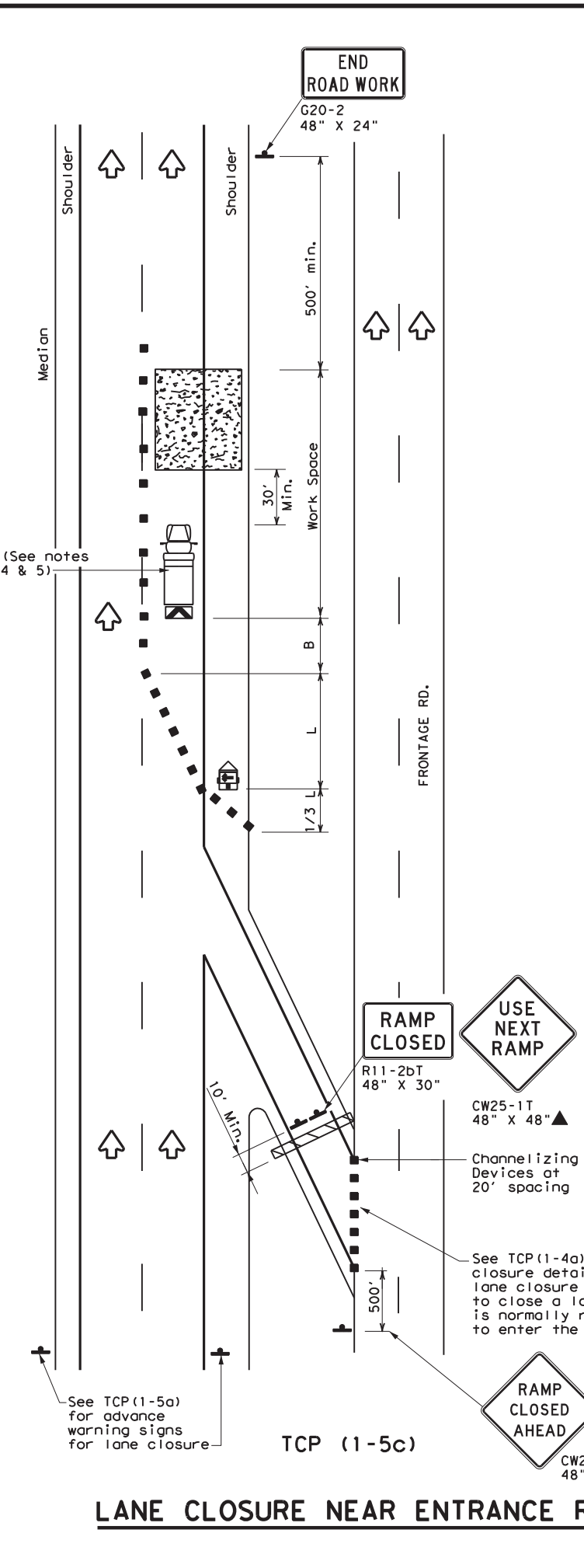
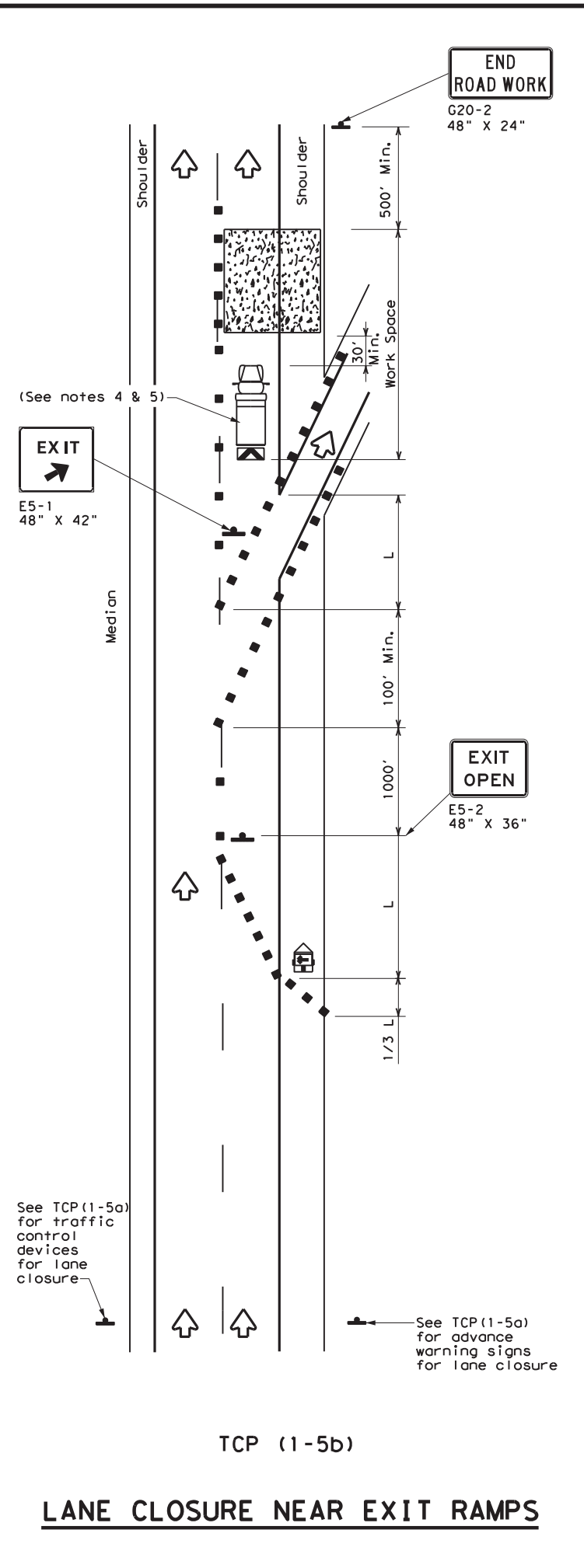
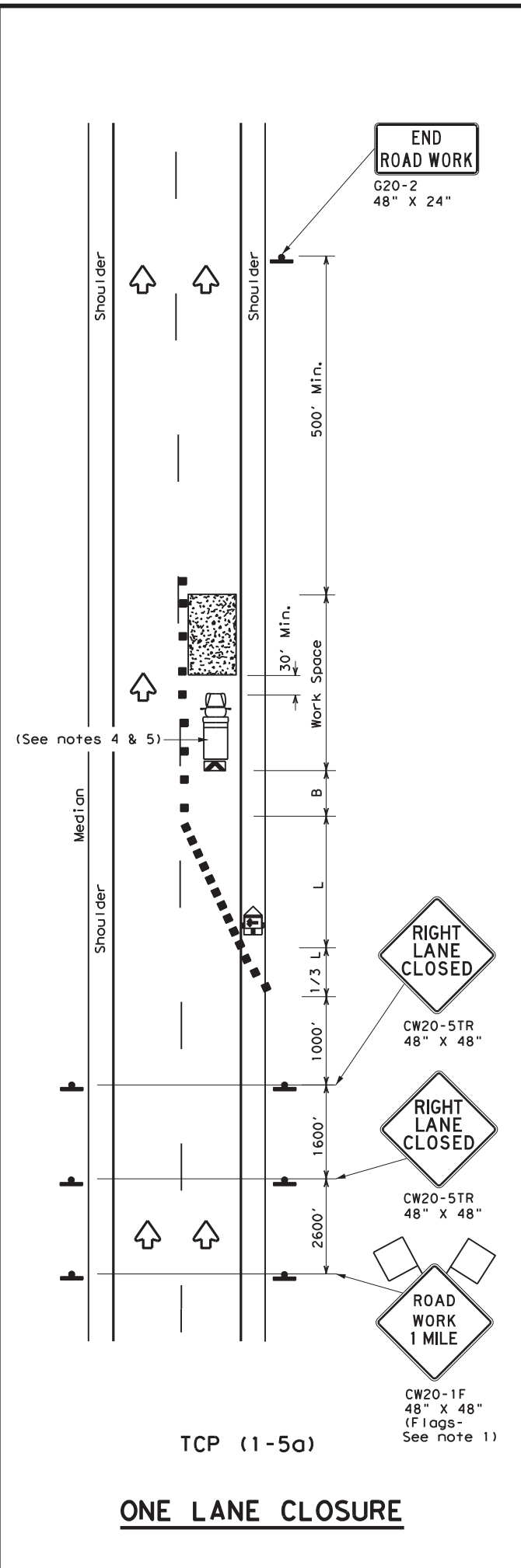
TCP (1-4) - 18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	OOI	VAR.
2-94 4-98	DIST	COUNTY	SHEET NO.	
8-95 2-12	SAT	BEXAR	27	
1-97 2-18				

154

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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)

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.
 - 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

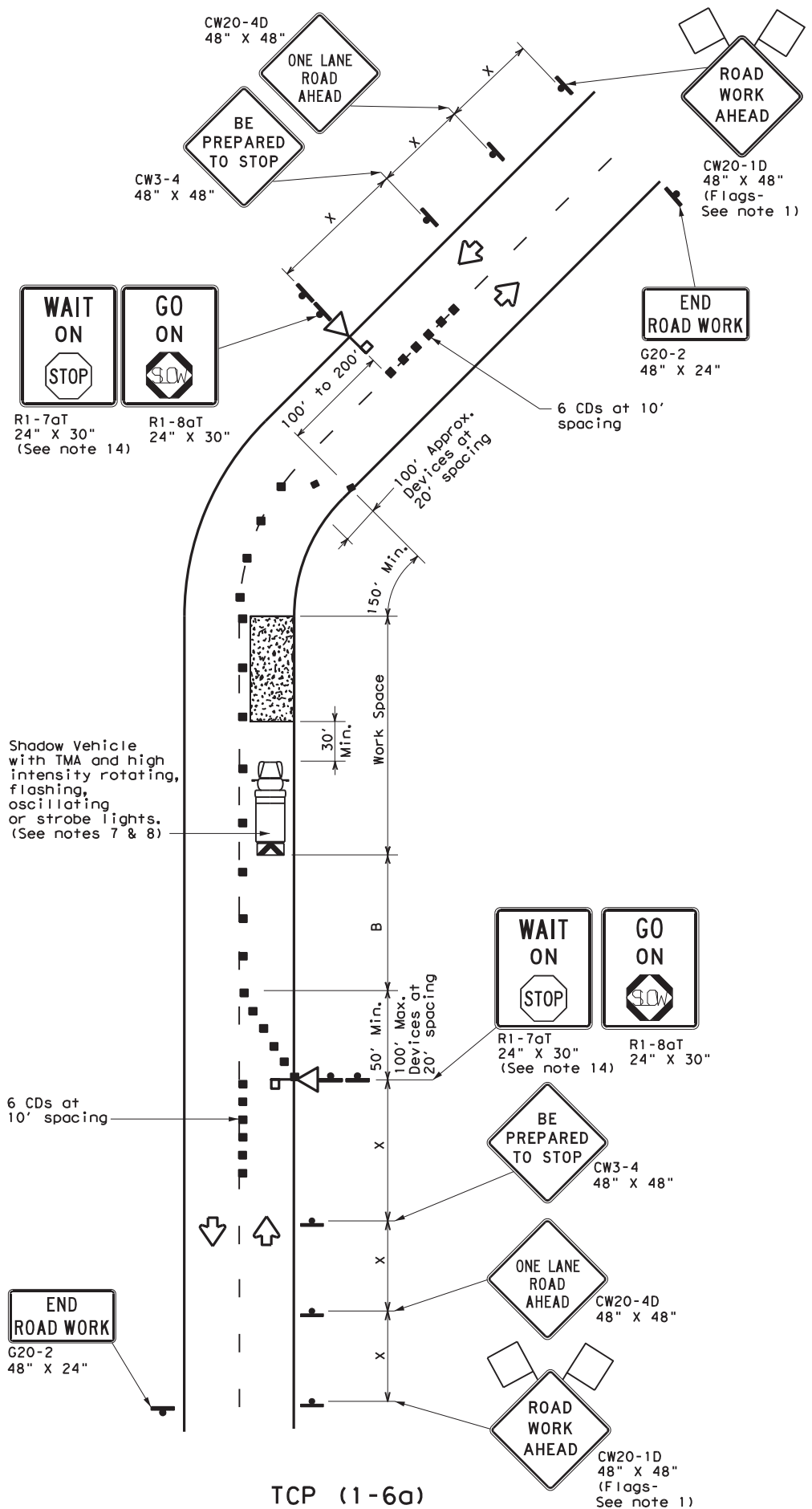
TRAFFIC CONTROL PLAN LANE CLOSURES FOR DIVIDED HIGHWAYS

TCP (1-5) - 18

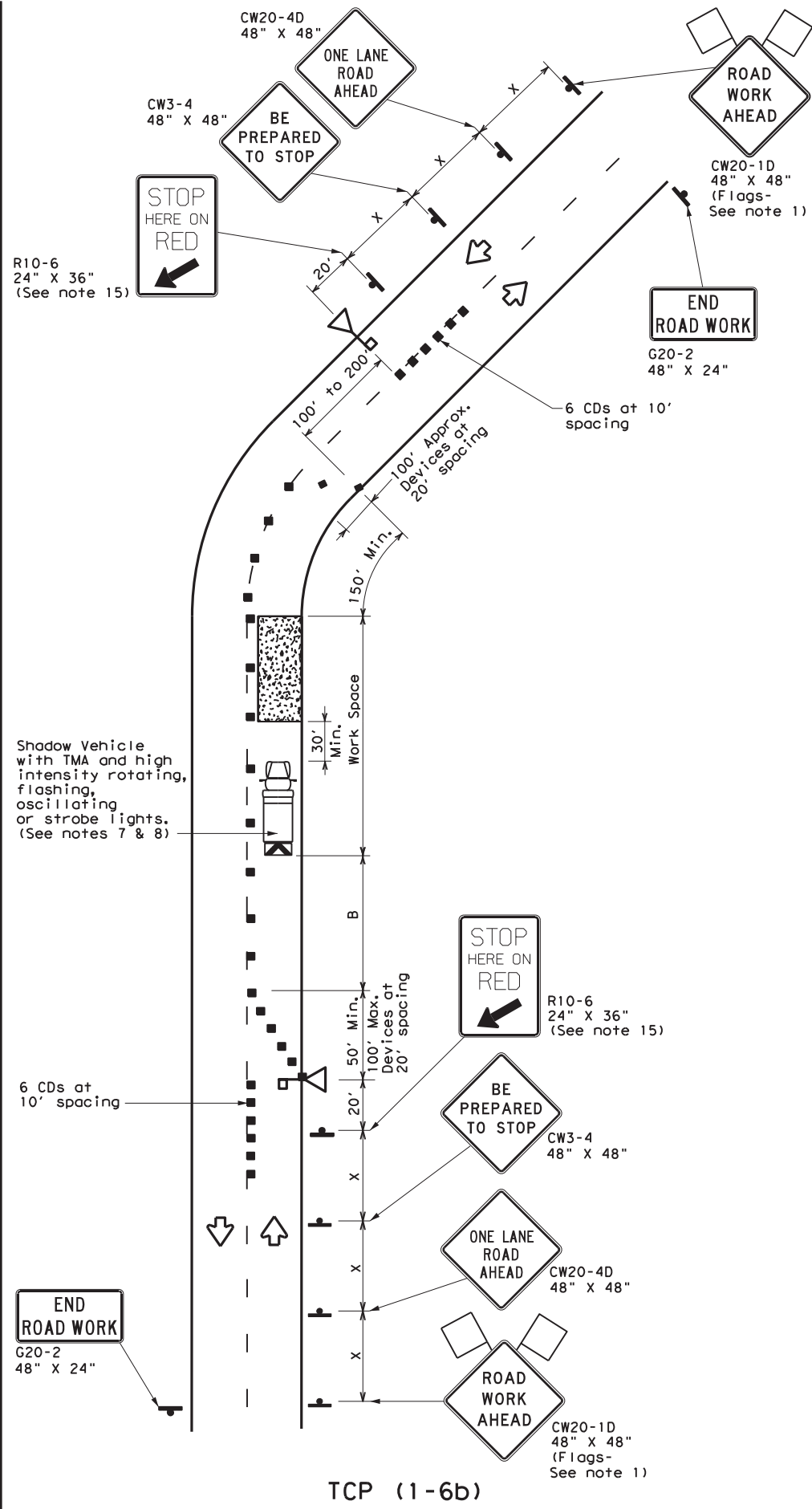
FILE: tcp1-5-18.dgn	DN:	CK:	DW:	CK:
© TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
2-18	6372	50	001	VAR.
	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	28	

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DATE:
FILE:



TCP (1-6a)
ONE LANE TWO-WAY CONTROL WITH STOP/SLOW AFADs



TCP (1-6b)
ONE LANE TWO-WAY CONTROL WITH RED/YELLOW LENS AFADs

LEGEND			
	Type 3 Barricade		Channelizing Devices (CDs)
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Automated Flagger Assistance Device (AFAD)		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"	Stopping Sight Distance
		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'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L = WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

* 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.
- AFADs shall only be used in situations where there is one lane of approaching traffic in the direction to be controlled.
- Adequate stopping sight distance must be provided to each AFAD location for approaching traffic. (See table above).
- Each AFAD shall be operated by a qualified/certified flagger. Flaggers operating AFADs shall not leave them unattended while they are in use.
- One flagger may operate two AFADs only when the flagger has an unobstructed view of both AFADs and of the approaching traffic in both directions.
- When pilot cars are used, a flagger controlling traffic shall be located on each approach. AFADs shall not be operated by the pilot car operator.
- All AFADs shall be equipped with gate arms with an orange or fluorescent red-orange flag attached to the end of the gate arm. The flag shall be a minimum of 16" square.
- 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 wider work spaces.
- Flaggers should use two-way radios or other methods of communication to control traffic.
- Length of work space should be based on the ability of flaggers to communicate.
- If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain stopping sight distance to the AFAD.
- Channelizing devices on the center line may be omitted when a pilot car is leading traffic and approved by the Engineer.
- The R1-7aT "WAIT ON STOP" sign and the R1-8aT "GO ON SLOW" sign shall be installed at the AFAD location on separate supports or they may be fabricated as one 48" x 30" sign. They shall not obscure the face of the STOP/SLOW AFAD.
- The R10-6 "STOP HERE ON RED" arrow sign shall be offset so as not to obscure the lenses of the AFAD.

Texas Department of Transportation
 Traffic Operations Division Standard

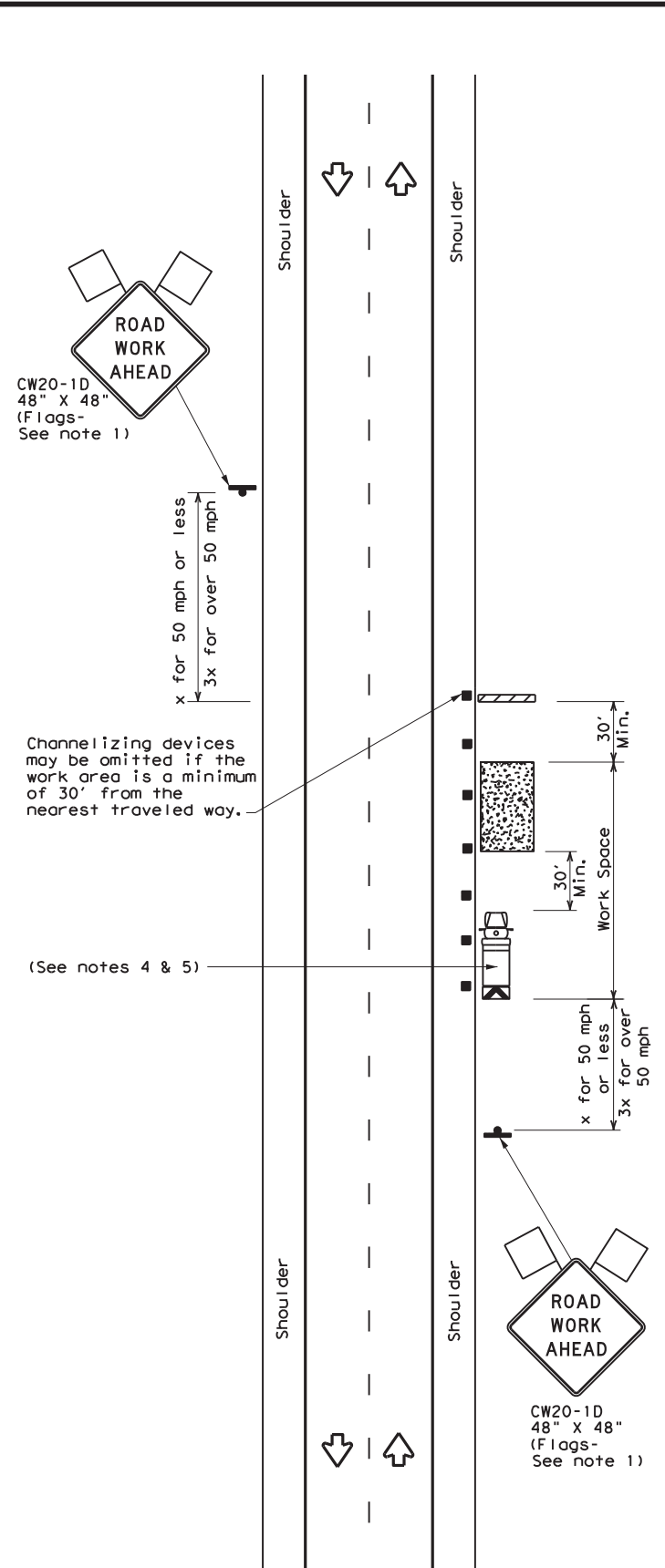
**TRAFFIC CONTROL PLAN
 AUTOMATED FLAGGER ASSISTANCE DEVICES (AFADs)**

TCP (1-6)-18

FILE: tcp1-6-18.dgn	DN:	CK:	DW:	CK:
© TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
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2-18	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	29	

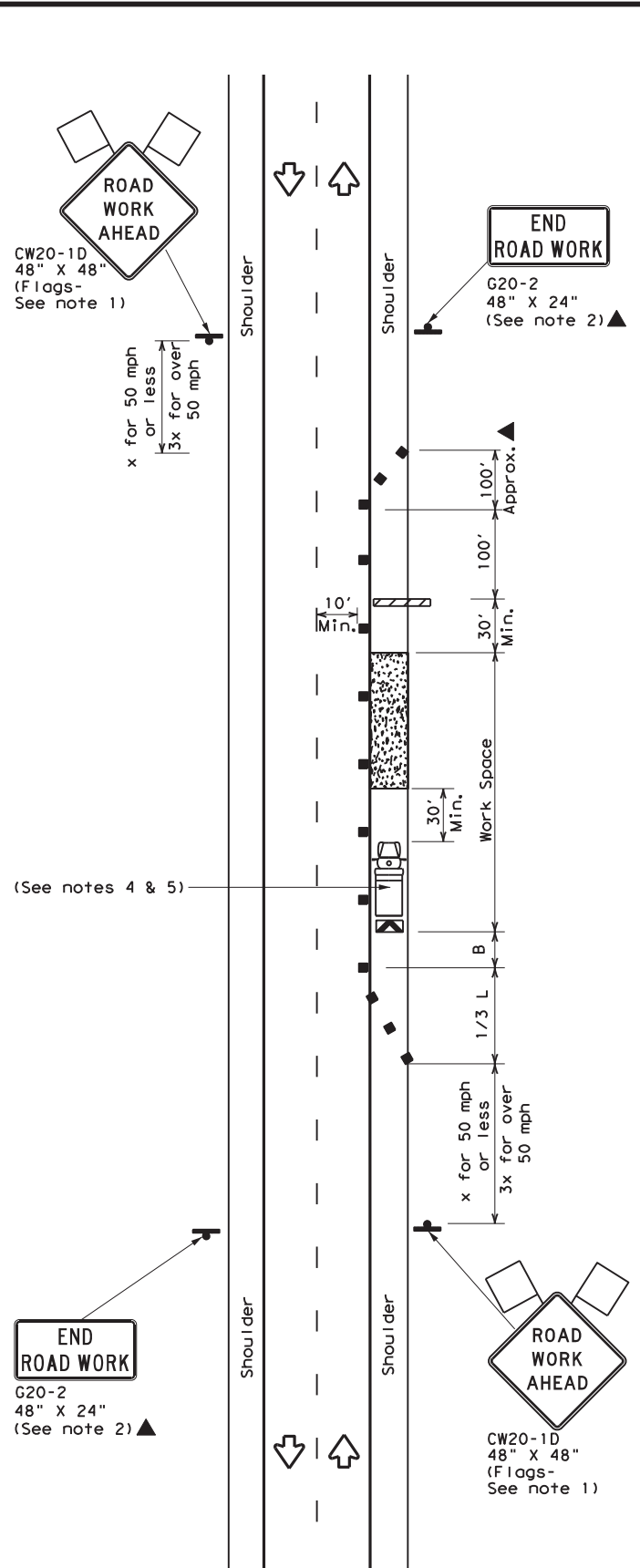
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:



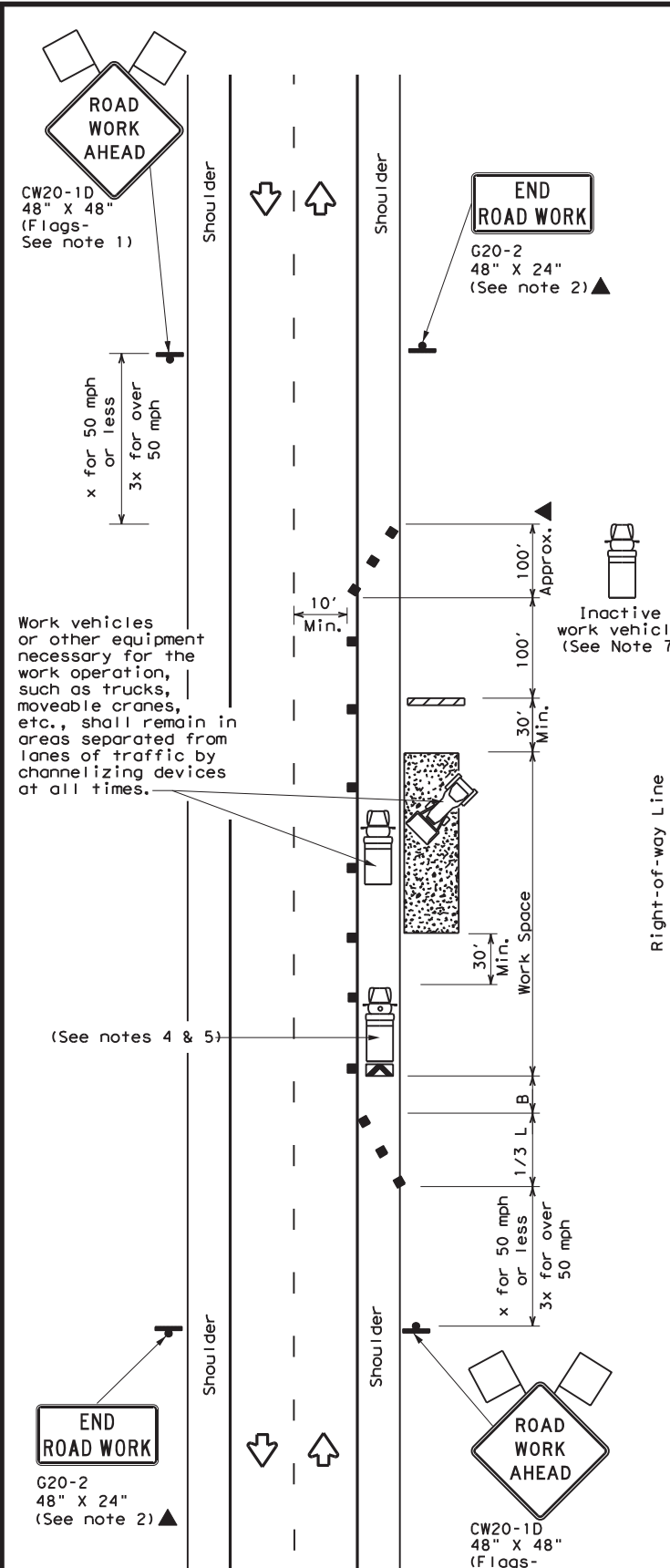
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		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.
- Inactive 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 CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

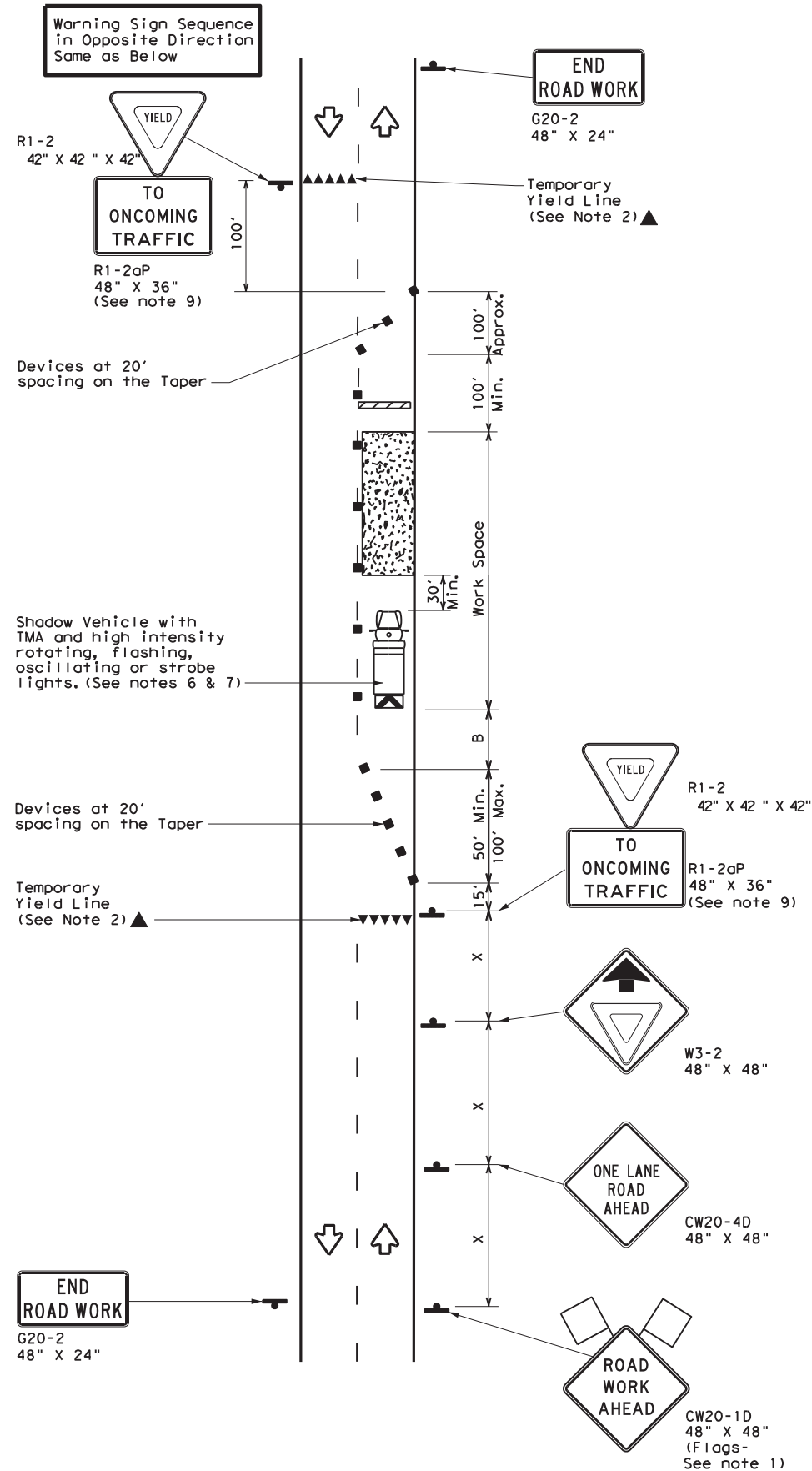


TRAFFIC CONTROL PLAN
CONVENTIONAL ROAD
SHOULDER WORK

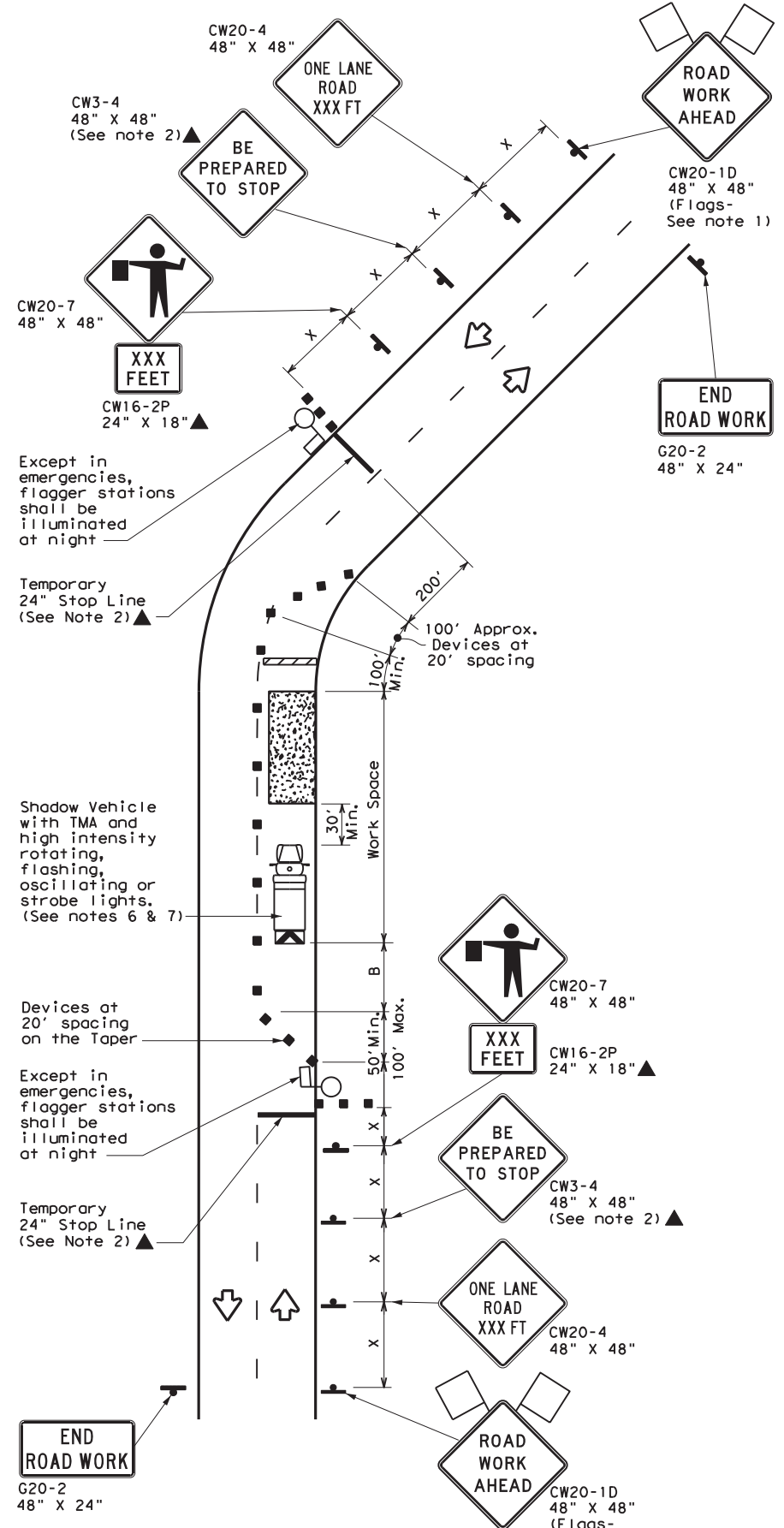
TCP (2-1) - 18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CON: 6372	SECT: 50	JOB: 001	HIGHWAY: VAR.
REVISIONS	DIST: COUNTY		SHEET NO.	
2-94 4-98	SAT BEXAR		30	
8-95 2-12				
1-97 2-18				

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TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



TCP (2-2b)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH FLAGGERS

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"	Stopping Sight Distance
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent			
30	L = WS ² / 60	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L = WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

* 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 CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4 "ONE LANE ROAD XXX FT" sign, but proper sign spacing shall be maintained.
 - Flaggers should use two-way radios or other methods of communication to control traffic.
 - Length of work space should be based on the ability of flaggers to communicate.
 - 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.
- TCP (2-2a)**
- The R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work space should be no longer than one half city block. In rural areas, roadways with less than 2000 ADT, work space should be no longer than 400 feet.
 - The R1-2aP "YIELD TO ONCOMING TRAFFIC" sign shall be placed on a support at a 7 foot minimum mounting height.
- TCP (2-2b)**
- Channelizing devices on the center line may be omitted when a pilot car is leading traffic and approved by the Engineer.
 - If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain stopping sight distance to the flagger and a queue of stopped vehicles. (See table above).
 - Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situations.



**TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL**

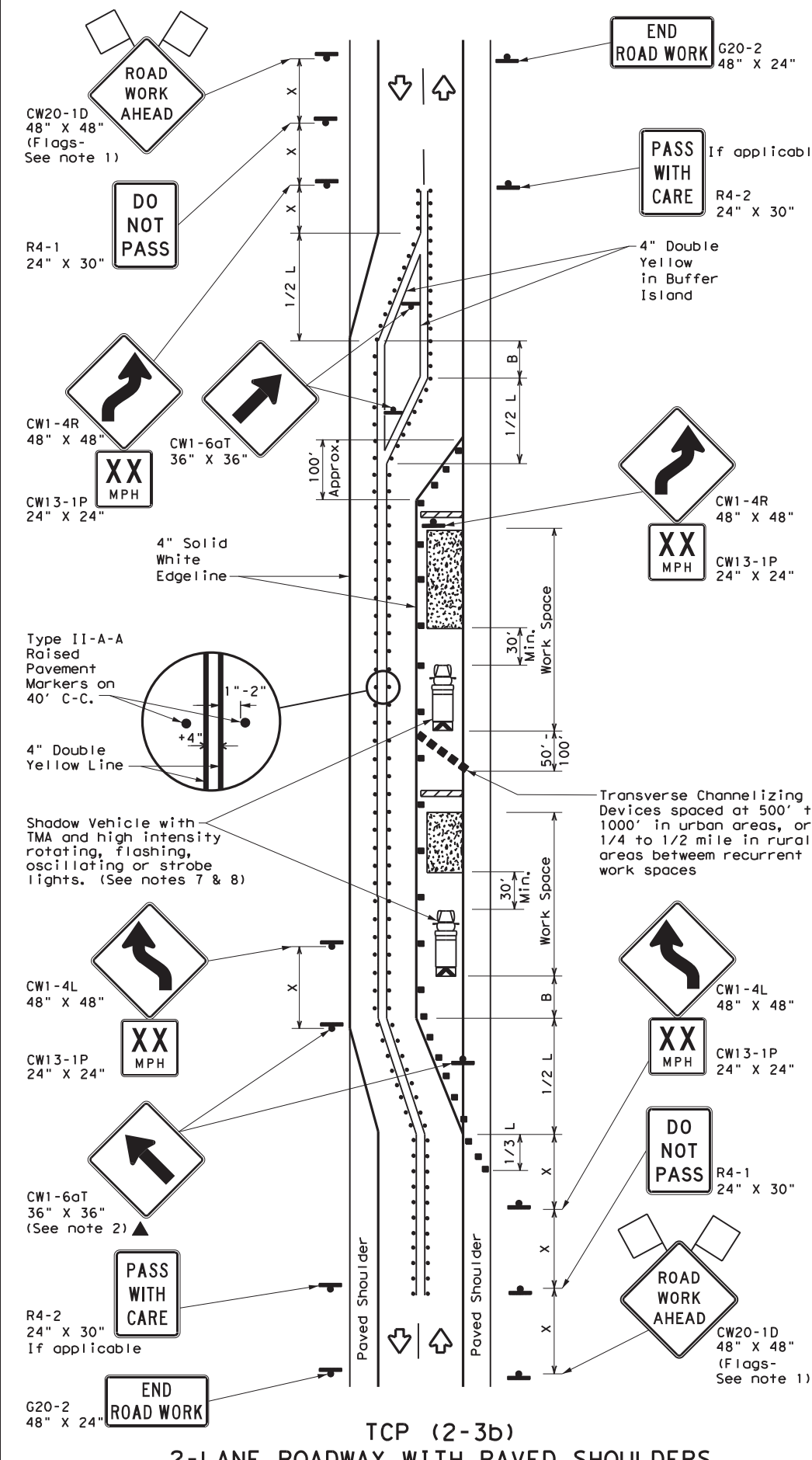
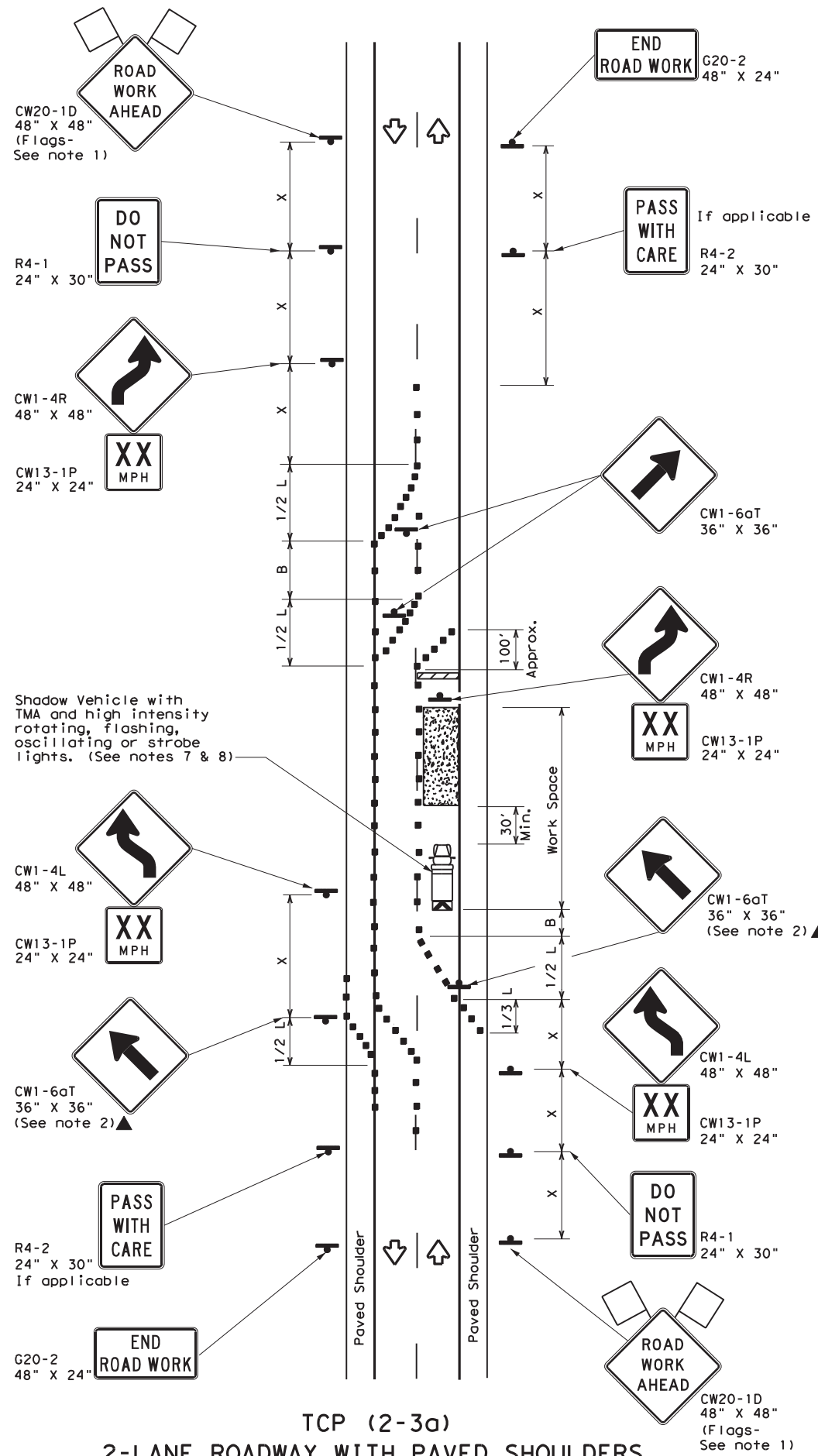
TCP (2-2) - 18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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8-95 3-03	DIST	COUNTY	SHEET NO.	
1-97 2-12	SAT	BEXAR	31	
4-98 2-18				

DATE:
FILE:

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DATE: FILE:



LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Raised Pavement Markers Ty II-AA
	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'	70'	120'	90'
35		205'	225'	245'	35'	80'	160'	120'
40		265'	295'	320'	40'	90'	240'	155'
45	L = WS	450'	495'	540'	45'	100'	320'	195'
50		500'	550'	600'	50'	110'	400'	240'
55		550'	605'	660'	55'	120'	500'	295'
60		600'	660'	720'	60'	130'	600'	350'
65		650'	715'	780'	65'	140'	700'	410'
70		700'	770'	840'	70'	150'	800'	475'
75		750'	825'	900'	75'	160'	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
			✓	✓
				TCP (2-3b) ONLY

- 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.
 - When work space will be in place less than three days existing pavement markings may remain in place. Channelizing devices shall be used to separate traffic.
 - Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Flagger should be positioned at end of traffic queue.
 - The R4-1 "DO NOT PASS," R4-2 "PASS WITH CARE" and construction regulatory speed zone signs may be installed within CW20-1D "ROAD WORK AHEAD" signs. Proper spacing of signs shall be maintained.
 - Conflicting pavement marking shall be removed for long term projects.
 - 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.
 - Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
- TCP (2-3a)**
- Conflicting pavement markings shall be removed for long-term projects. 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 device spacing is intended for the area of the conflicting markings, not the entire work zone.

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
TRAFFIC SHIFTS ON
TWO-LANE ROADS

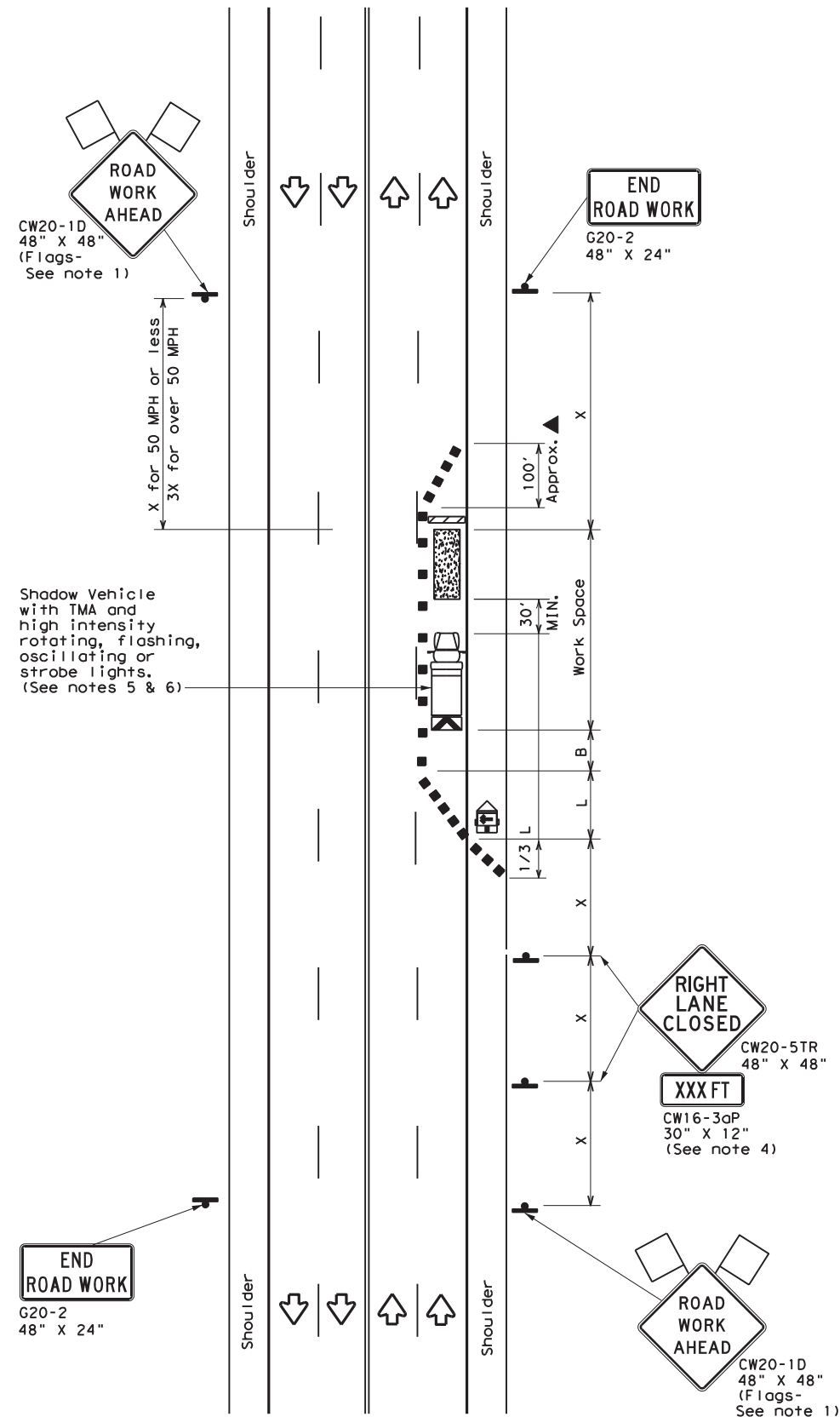
TCP (2-3) - 18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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8-95 3-03	DIST	COUNTY	SHEET NO.	
1-97 2-12	SAT	BEXAR	32	
4-98 2-18				

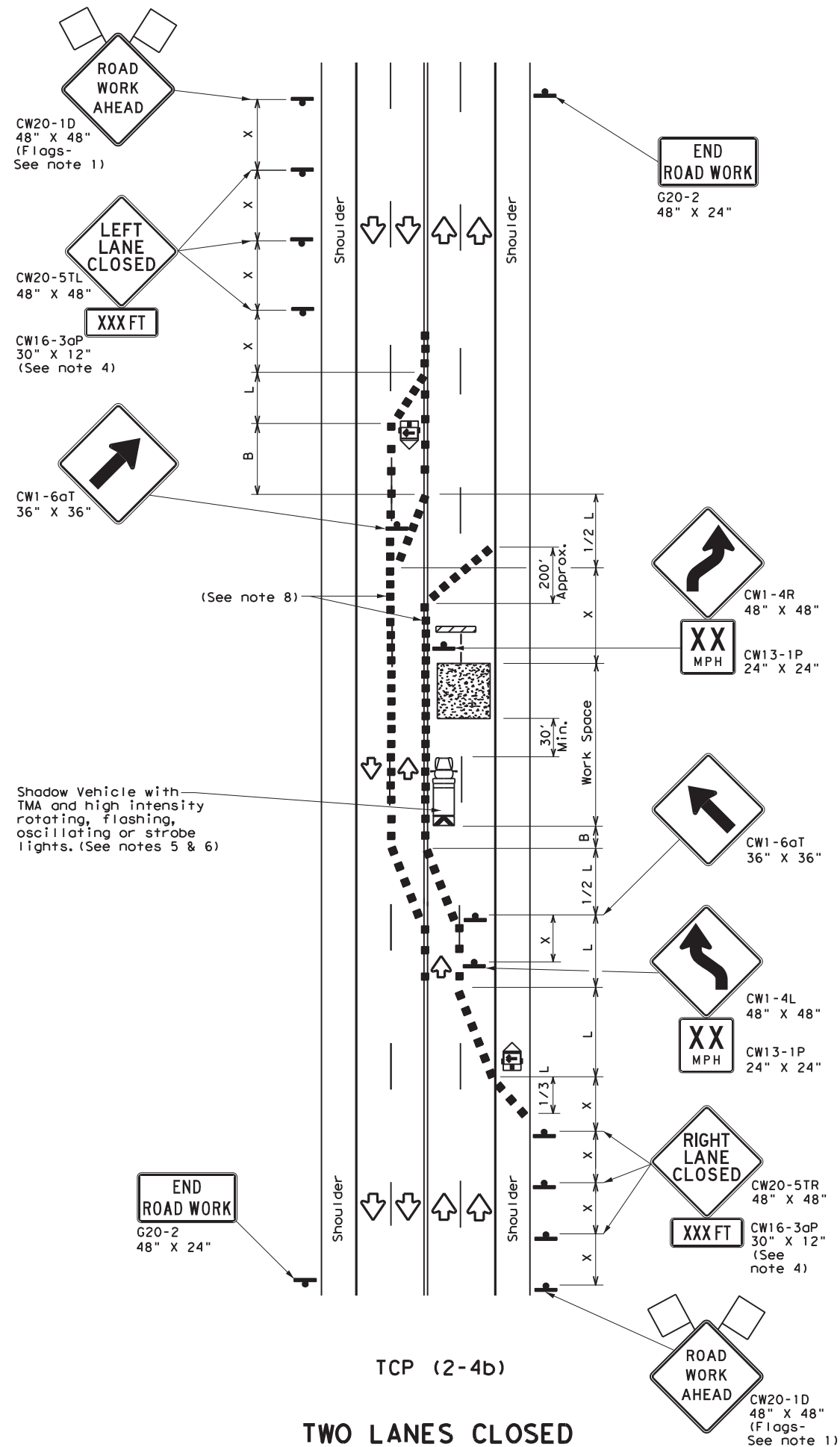
163

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DATE: FILE:



TCP (2-4a)
ONE LANE CLOSED



TCP (2-4b)
TWO LANES CLOSED

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

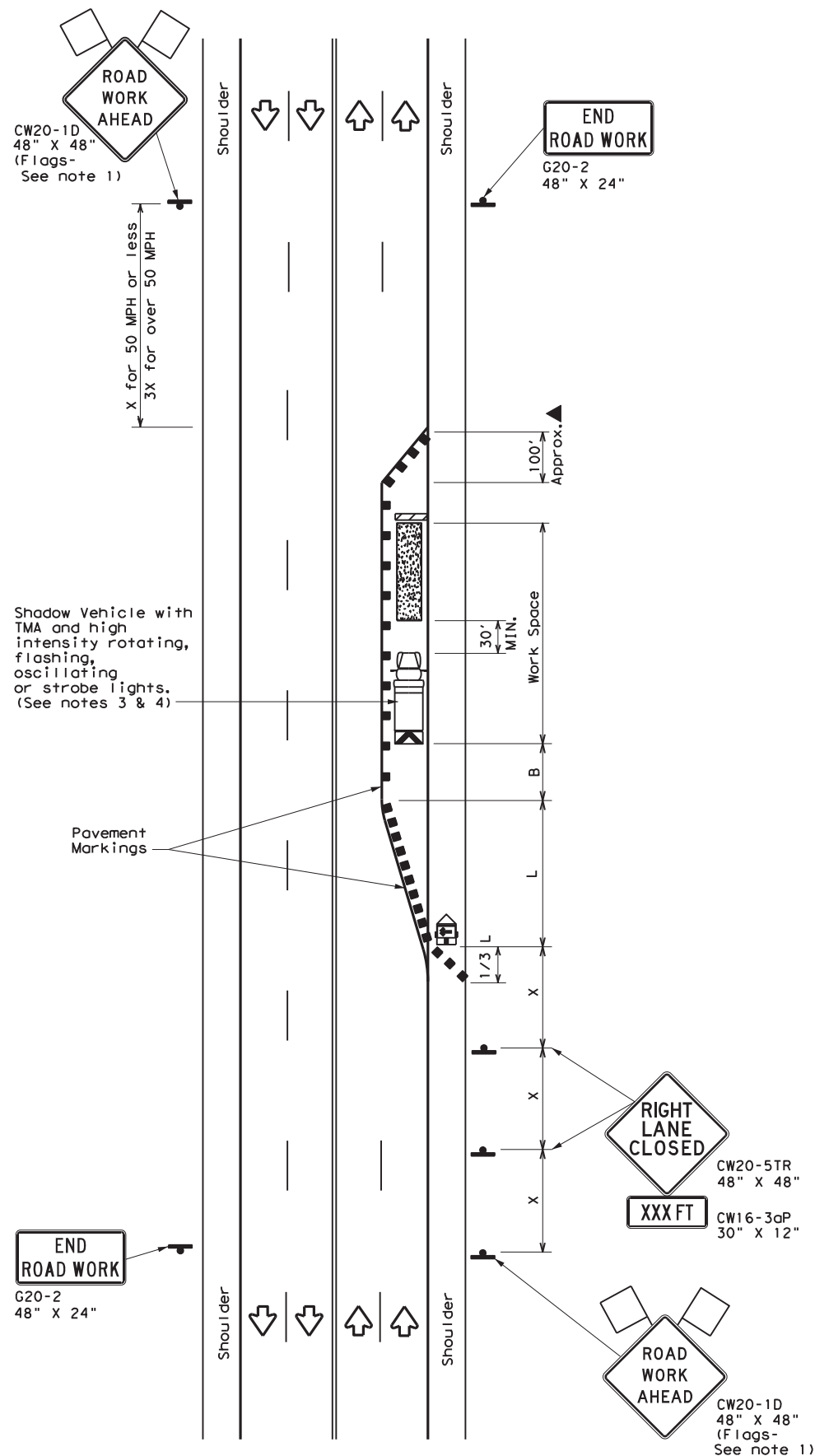
TCP (2-4b)

- 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.

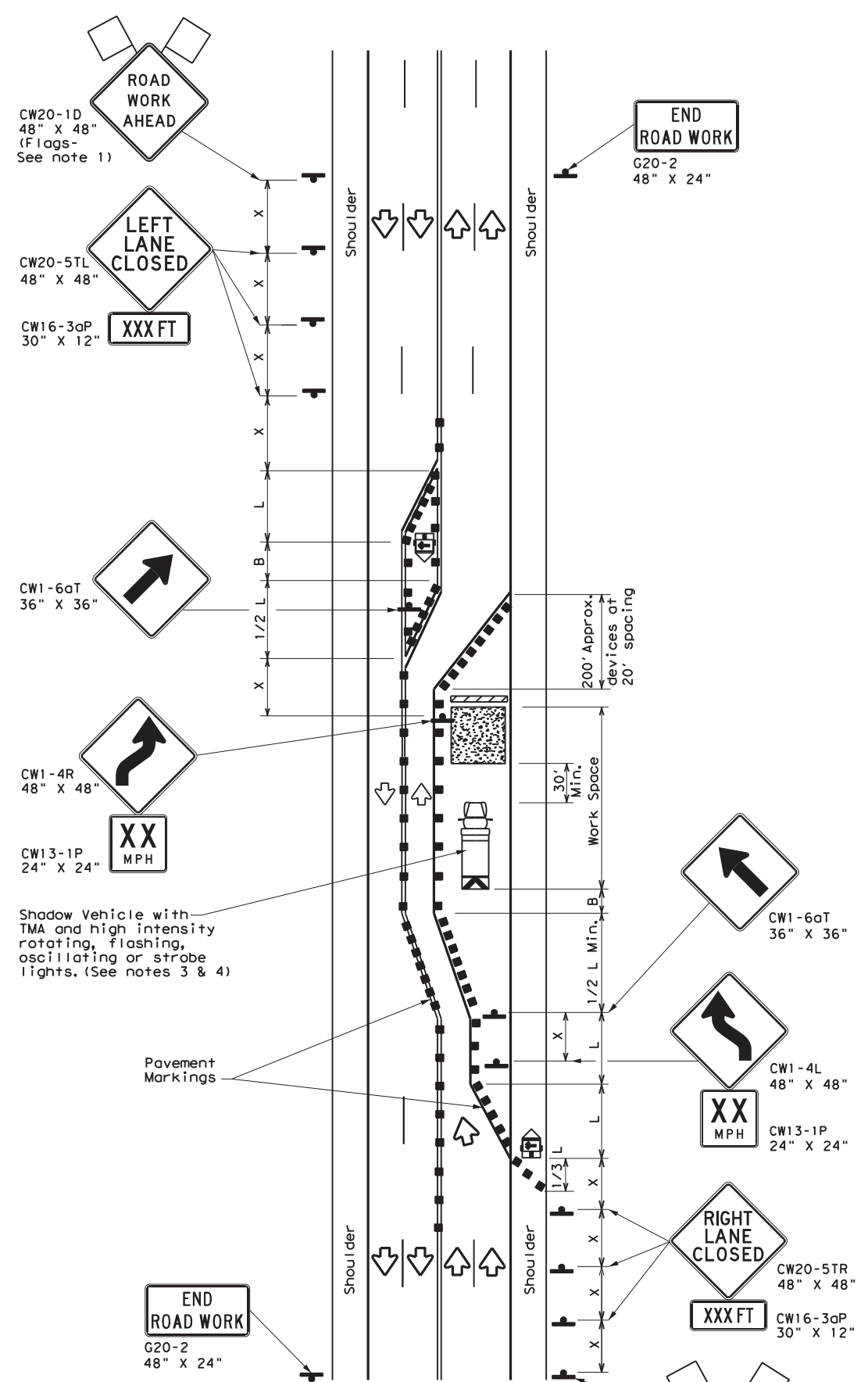
		Traffic Operations Division Standard	
TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS			
TCP (2-4) - 18			
FILE: tcp2-4-18.dgn	DN:	CK:	DW:
© TxDOT December 1985	CONT	SECT	JOB
REVISIONS	6372	50	OOI
8-95 3-03	DIST	COUNTY	SHEET NO.
1-97 2-12	SAT	BEXAR	33
4-98 2-18			

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DATE: FILE:



TCP (2-5a)
ONE LANE CLOSED



TCP (2-5b)
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 X X			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.
 - 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.
 - The downstream taper is optional. When used, it should be 100 feet approximately per lane, with channelizing devices spaced at 20 feet.

- TCP (2-5a)**
- 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 (2-5b)**
- Conflicting pavement markings shall be removed for long-term projects.

Texas Department of Transportation Traffic Operations Division Standard

**TRAFFIC CONTROL PLAN
LONG TERM LANE CLOSURES
MULTILANE CONVENTIONAL RDS.**

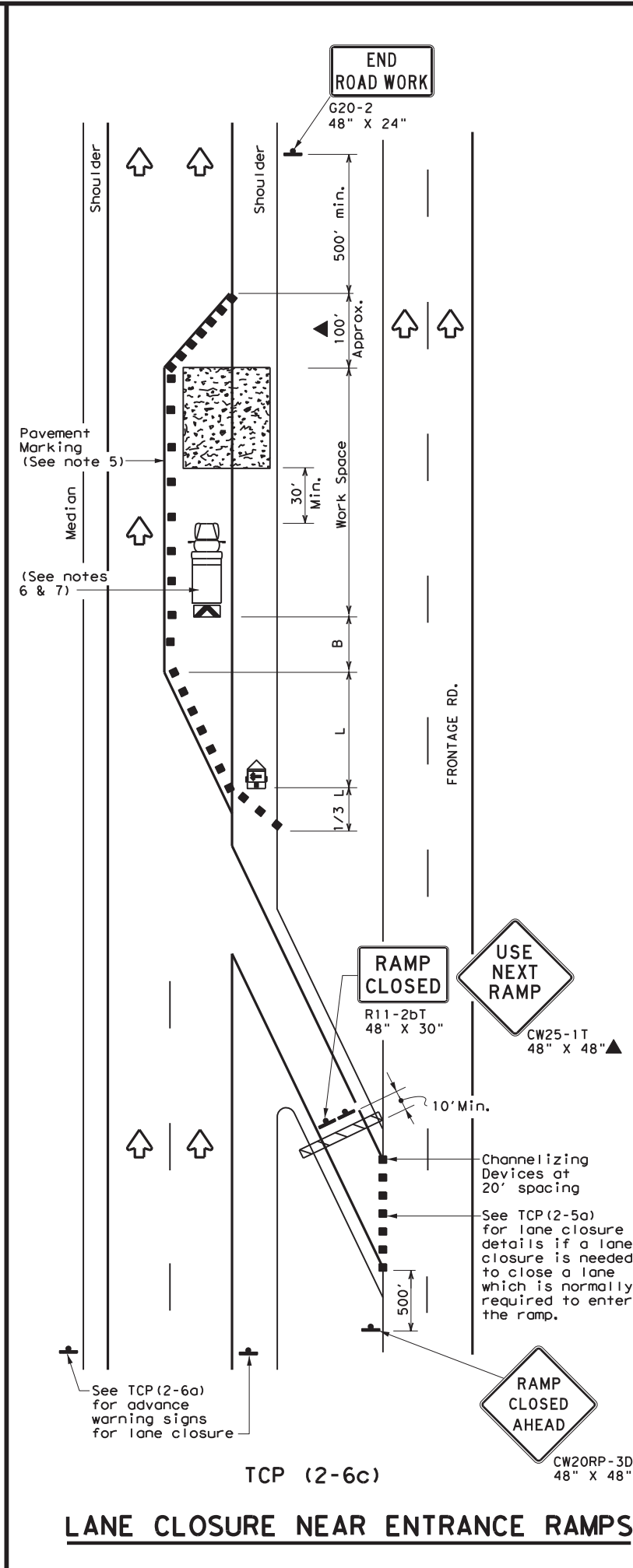
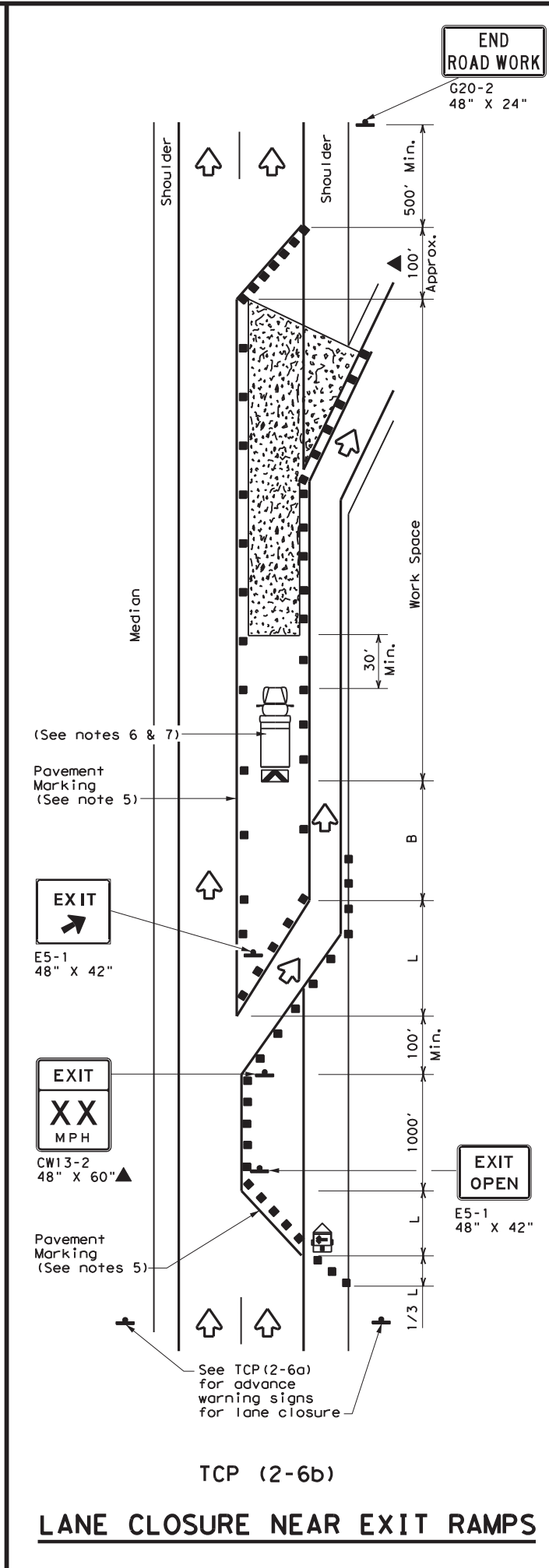
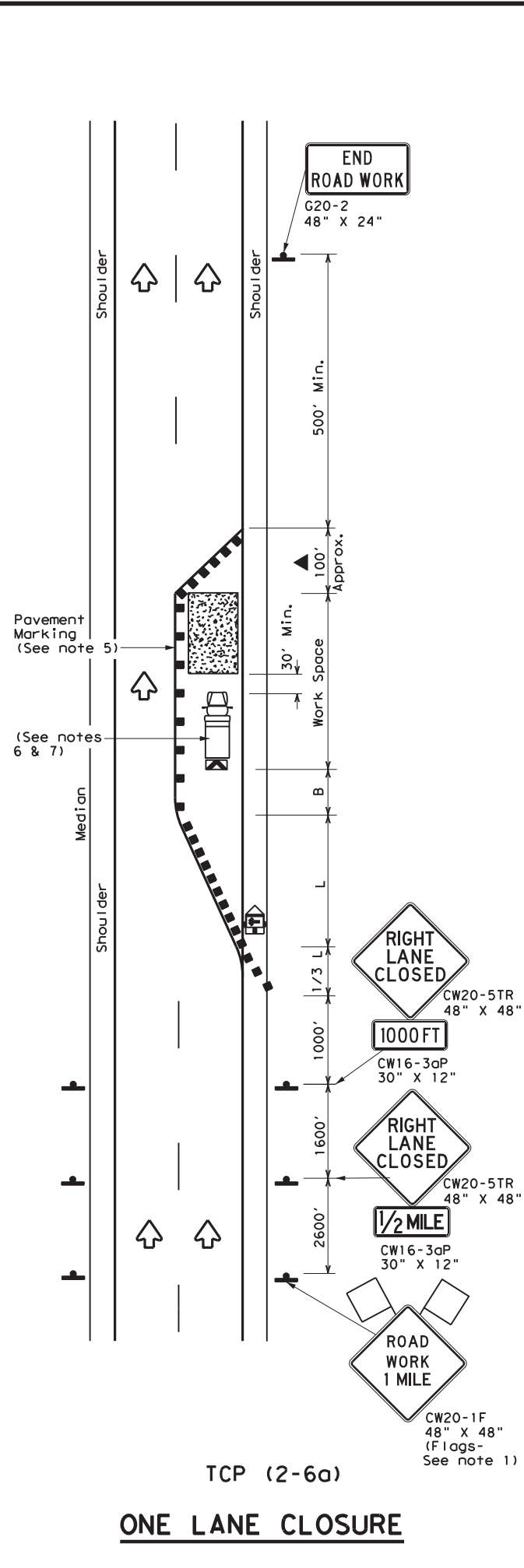
TCP (2-5) - 18

FILE: tcp2-5-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
8-95 2-12 REVISIONS	6372	50	OOI	VAR.
1-97 3-03	DIST	COUNTY	SHEET NO.	
4-98 2-18	SAT	BEXAR	34	

1165

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DATE:
FILE:



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. 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.

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON DIVIDED HIGHWAYS

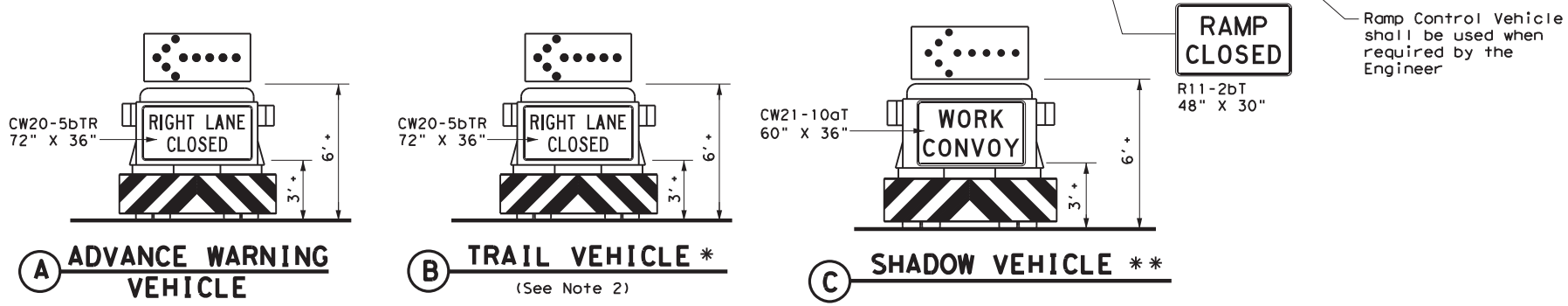
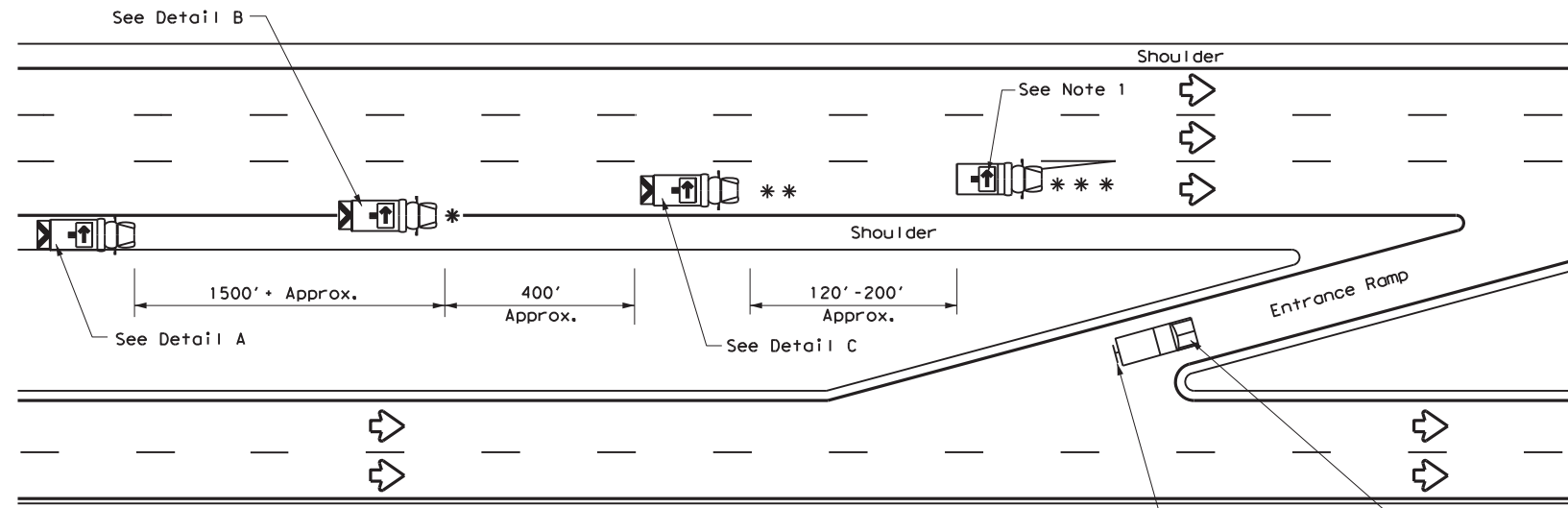
TCP (2-6) - 18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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8-95 2-12	SAT	BEXAR	35	
1-97 2-18				

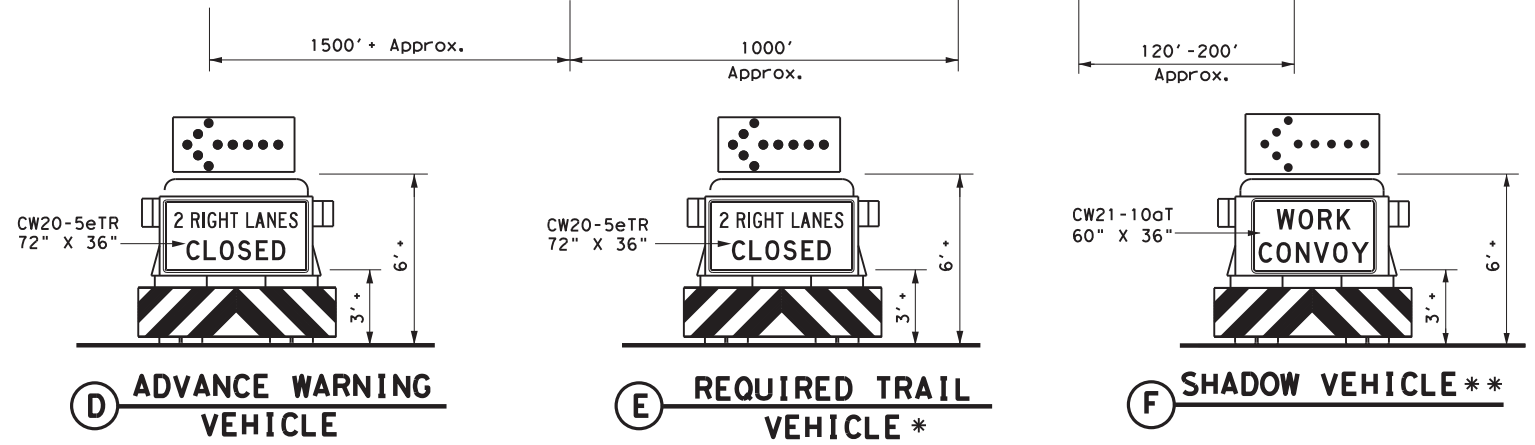
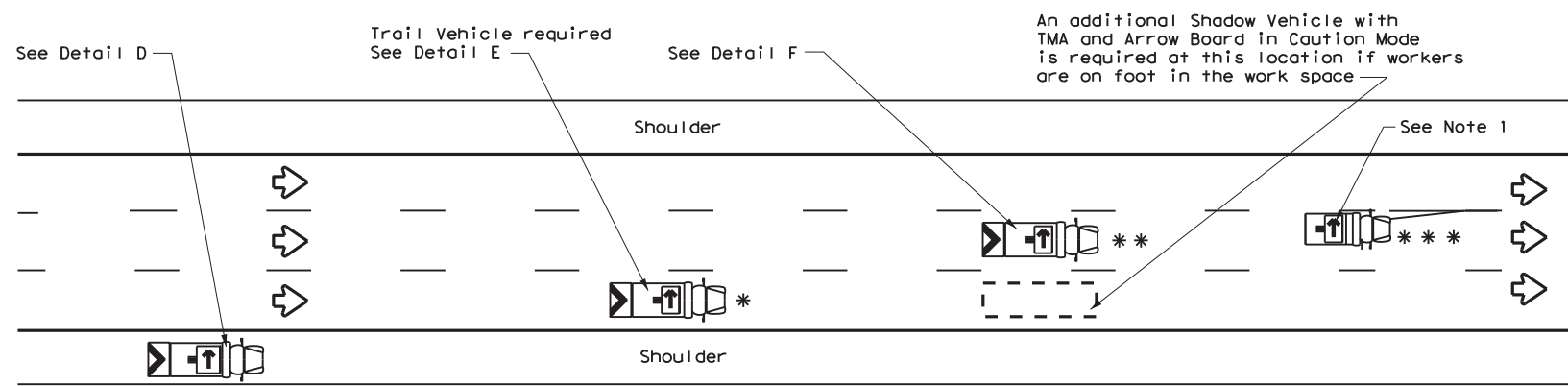
166

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DATE: FILE:



RIGHT LANE CLOSURE ON DIVIDED HIGHWAY - TCP(3-2a)



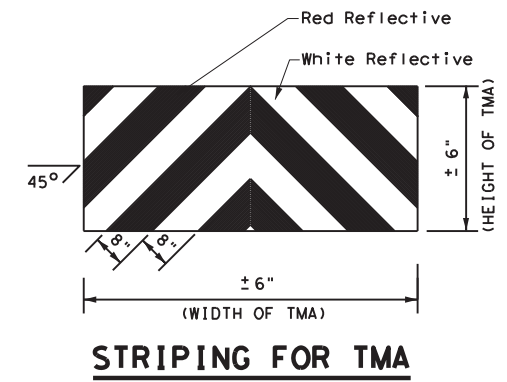
INTERIOR LANE CLOSURE ON MULTI-LANE DIVIDED HIGHWAY - TCP(3-2b)

LEGEND			
*	Trail Vehicle	ARROW BOARD DISPLAY	
**	Shadow Vehicle		
***	Work Vehicle	→	RIGHT Directional
☐	Heavy Work Vehicle	←	LEFT Directional
▲	Truck Mounted Attenuator (TMA)	↔	Double Arrow
↶	Traffic Flow	⚠	CAUTION (Alternating Diamond or 4 Corner Flash)

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

GENERAL NOTES

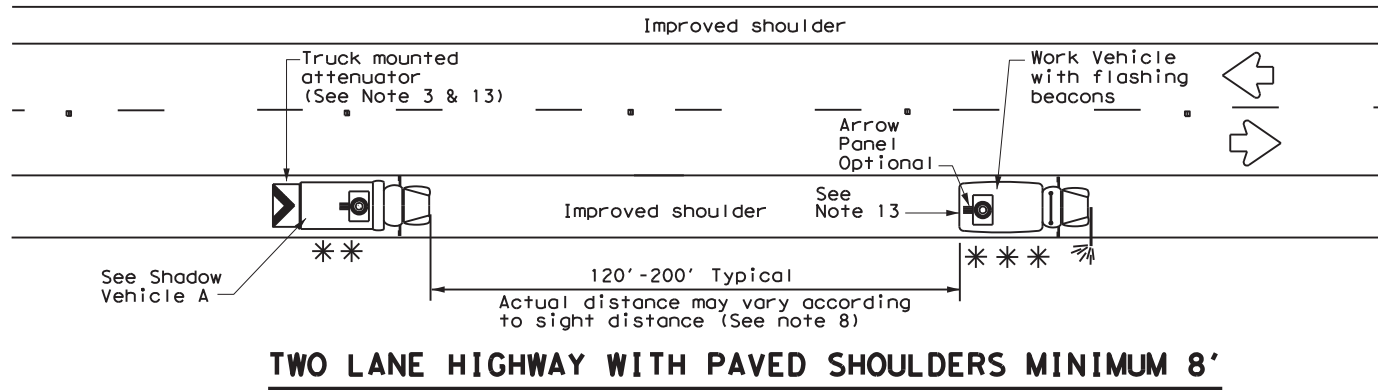
- ADVANCE WARNING, TRAIL and SHADOW vehicles shall be equipped with Type B or Type C flashing arrow boards as per the Barricade and Construction (BC) standards. Arrow boards on WORK vehicles will be optional based on the type of work being performed. The arrow boards shall be operated from inside the vehicle.
- For TCP(3-2a) the Engineer will determine if the TRAIL VEHICLE is required based on prevailing roadway conditions, traffic volume, and sight distance restrictions. All other vehicles shown for both TCP(3-2a) and TCP(3-2b) are required.
- The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
- The use of truck mounted attenuators (TMA) on the ADVANCE WARNING, SHADOW, and TRAIL vehicles are required.
- Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DMS 8300, Type A.
- Each vehicle shall have two-way radio communication capability.
- When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
- Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE may vary according to terrain, work activity and other factors.
- Standard 48" X 48" diamond shaped warning signs with the same message as those shown may be used where adequate mounting space exists.
- The signs shown should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or a truck mounted changeable message sign (TMCMS) with a minimum character height of 12", and displaying the same legend may be substituted for these signs. An appropriate directional arrow display, simulating the size and legibility of the flashing arrow board, must be used in the second phase of the PCMS/TMCMS message. When this is done, the arrow board will not be required on the Advance Warning Vehicle.
- Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
- The principles on this sheet may be used to close lanes from the left side of the roadway considering the number of lanes, shoulder width, sight distance, and ramp frequency.
- Signs and flashing arrow board modes shall be appropriately altered when implementing left lane closures or interior closures which close the left lanes.
- The Advance Warning Vehicle may straddle the edgeline when shoulder width makes it necessary.



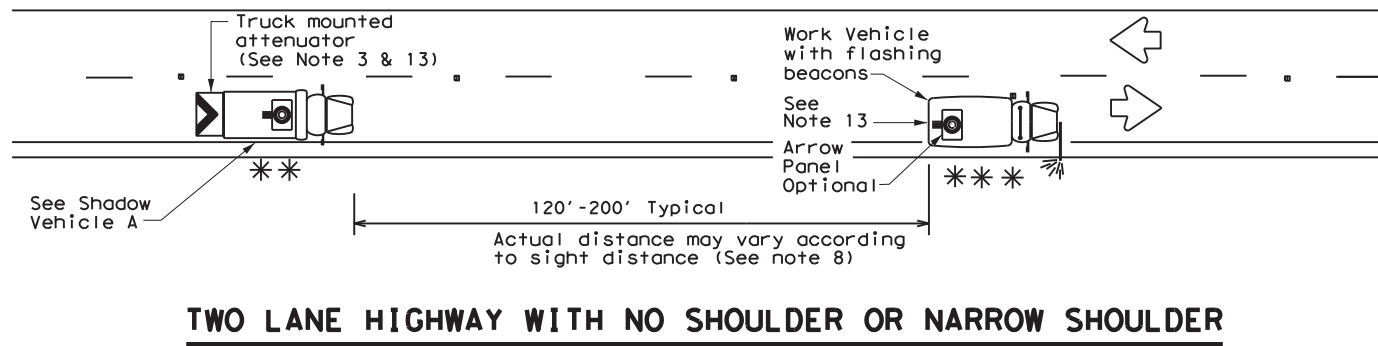
		Traffic Operations Division Standard	
TRAFFIC CONTROL PLAN MOBILE OPERATIONS DIVIDED HIGHWAYS			
TCP(3-2)-13			
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© TxDOT December 1985	CONT: 6372	SECT: 50	JOB: OO1
REVISIONS	DATE	BY	VAR.
2-94	4-98		
8-95	7-13		
1-97			
DIST: SAT	COUNTY: BEXAR	SHEET NO.: 38	

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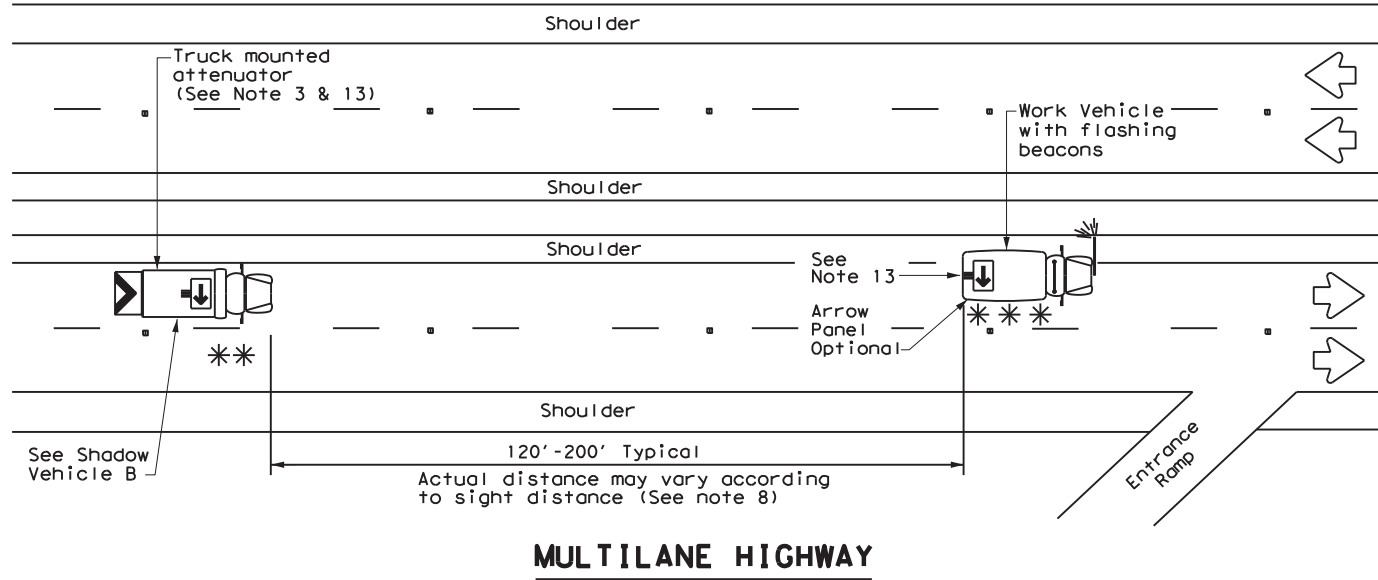
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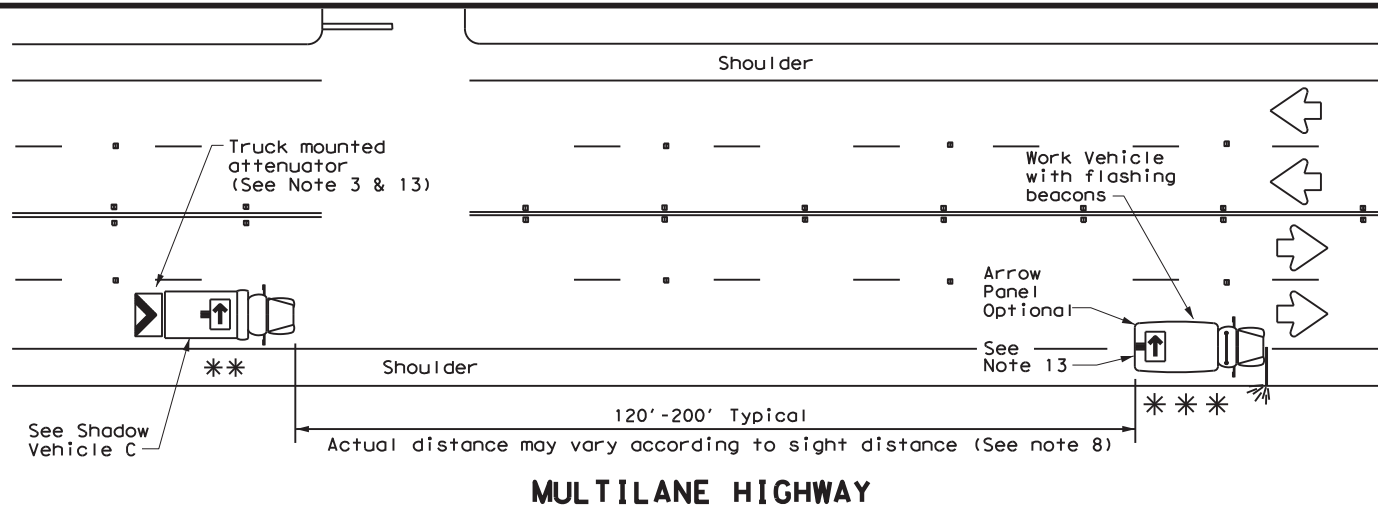
TWO LANE HIGHWAY WITH PAVED SHOULDERS MINIMUM 8'



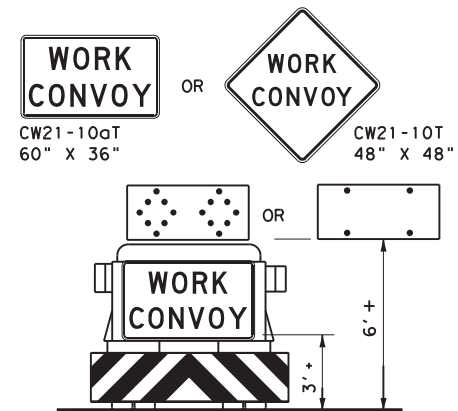
TWO LANE HIGHWAY WITH NO SHOULDER OR NARROW SHOULDER



MULTILANE HIGHWAY

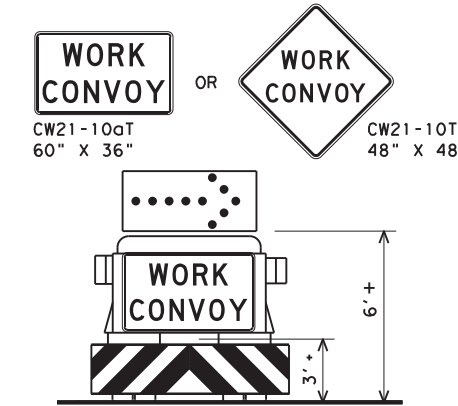


MULTILANE HIGHWAY



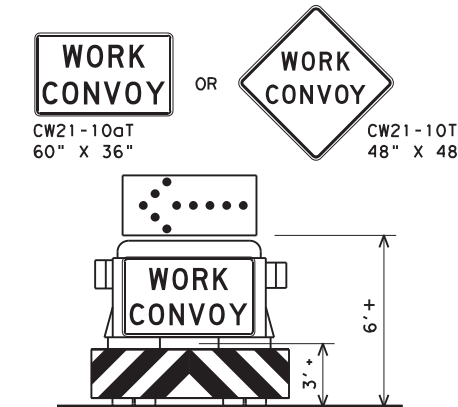
SHADOW VEHICLE A

with Flashing Arrow Board in Caution Mode



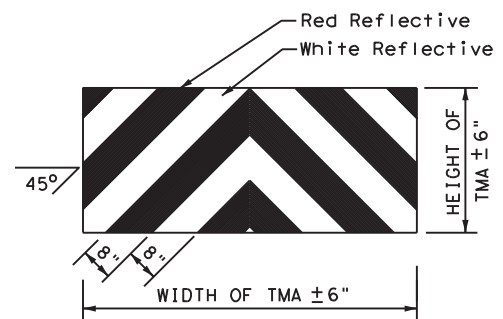
TYPICAL SHADOW VEHICLE B

with RIGHT Directional display Flashing Arrow Board



TYPICAL SHADOW VEHICLE C

with LEFT Directional display Flashing Arrow Board



STRIPING FOR TMA

LEGEND

**	Shadow Vehicle	ARROW BOARD DISPLAY	
***	Work Vehicle		
⬆	Sign	➡	RIGHT Directional
⬅	Heavy Work Vehicle	⬅	LEFT Directional
↔	Traffic Flow	↔	Double Arrow
⚠	Truck Mounted Attenuator (TMA) or Trailer Attenuator (TA)	⚠	CAUTION (Alternating Diamond or 4 Corner Flash)

TYPICAL USAGE

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

GENERAL NOTES

- All traffic control devices shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD), latest edition.
- The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
- The use of truck mounted attenuators (TMA) on the Shadow Vehicle is required.
- Striping on the back panel of all TMAs shall be 8" red reflective sheeting with white background, placed in an inverted "V" design. Reflective sheeting shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS-8300, TYPE A.
- Flashing Arrow Panels shall be Type B or Type C as per BC Standards. The panel operation shall be controlled from inside the vehicle.
- Each vehicle shall have two-way radio communication capability.
- When the work convoy must change lanes, the Shadow Vehicle should change lanes first to protect the Work Vehicle.
- Spacing between Shadow and Work Vehicle will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the Shadow Vehicle in time to slow down and/or change lanes as they approach the Work Convoy.
- Use of an arrow panel on the Work Vehicle is optional except as provided in note 13, but may be required by the Engineer. If an arrow panel is not used, dual flashing beacons, mounted as high and as widely separated as practicable at the rear of the Work Vehicle shall be required.
- On two-lane two-way roadways, the Work and Shadow Vehicles should pull over periodically to allow motor vehicle traffic to pass.
- Work and Shadow Vehicles should stay on the shoulder of highways having 8' or wider shoulders when possible.
- A Trail Vehicle may be added to the operation when approved by the Engineer. See TCP (3) series standards.
- The shadow vehicle may be omitted on conventional roadways when a TMA or TA and arrow panel is mounted to the herbicide vehicle. A separate shadow vehicle will be required on expressways and Freeways.

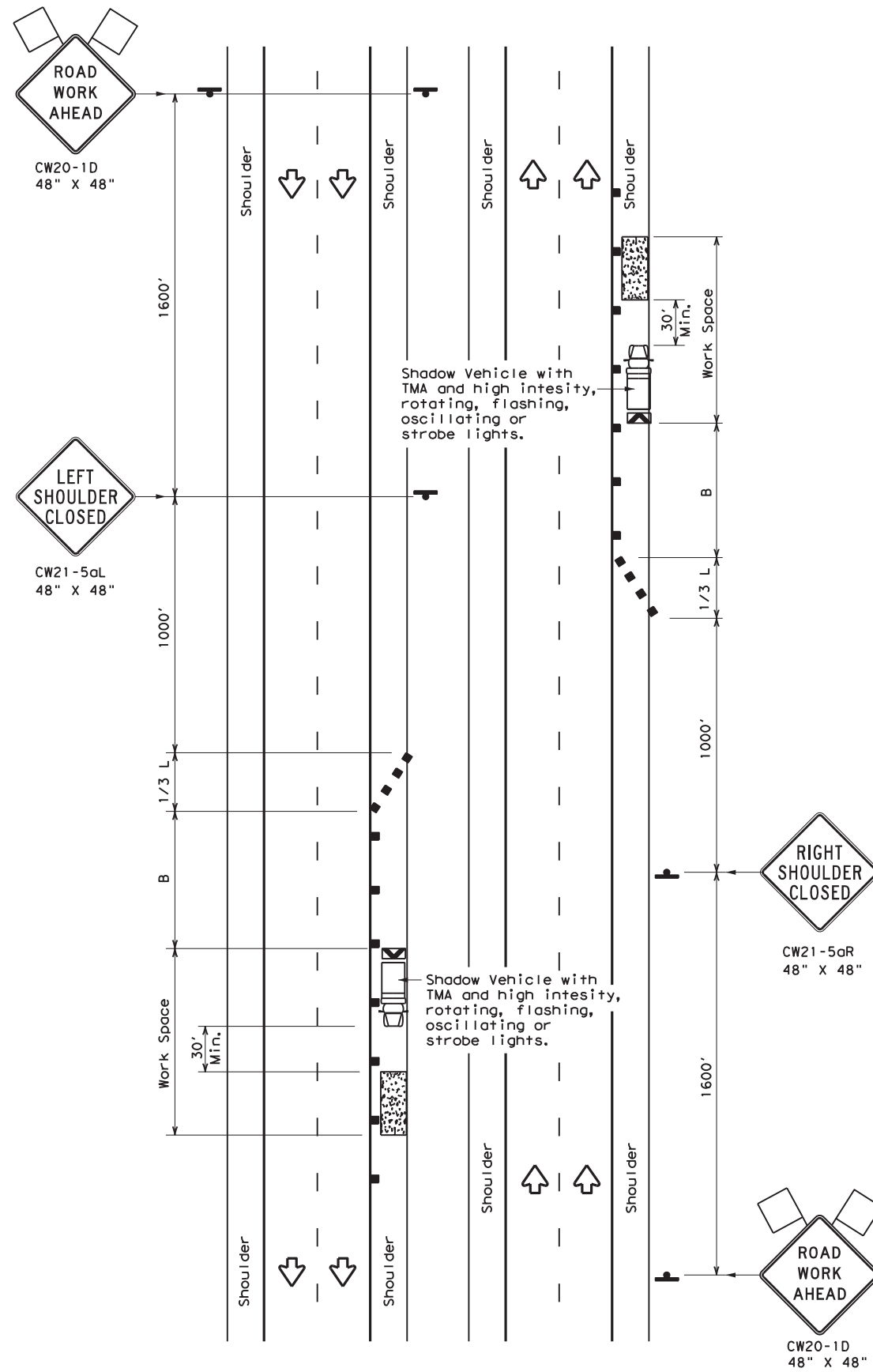
Texas Department of Transportation
Traffic Operations Division Standard

**TRAFFIC CONTROL PLAN
MOBILE OPERATIONS
HERBICIDE TRUCK
OPERATIONS
TCP (3-5) - 18**

FILE: tcp3-5.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT July 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	OOI	VAR.
4-18	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	39	

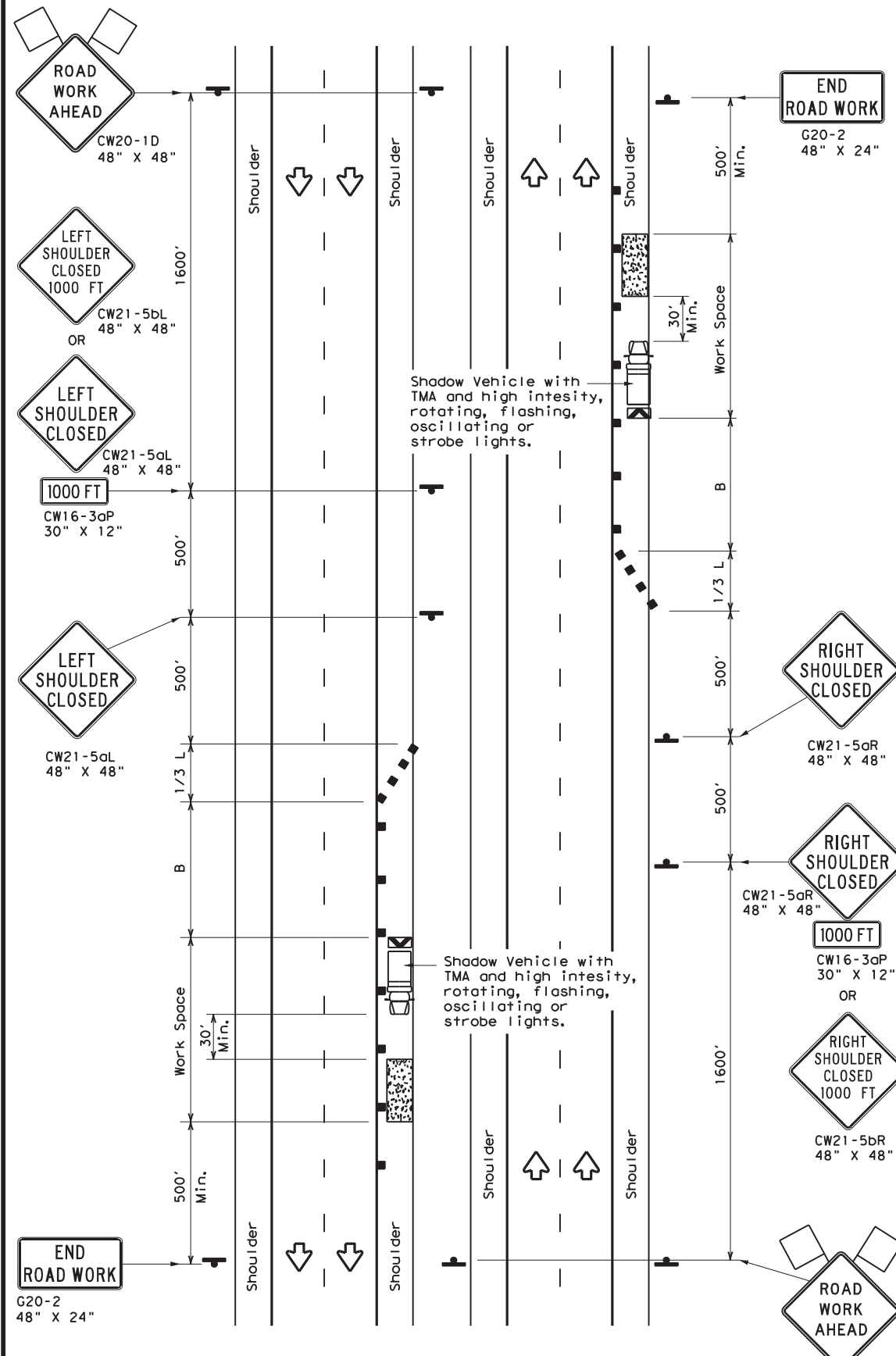
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TCP (5-1a)

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	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	90'
35		205'	225'	245'	35'	70'	120'
40		265'	295'	320'	40'	80'	155'
45	L = WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60	L = WS	600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75	L = WS	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.



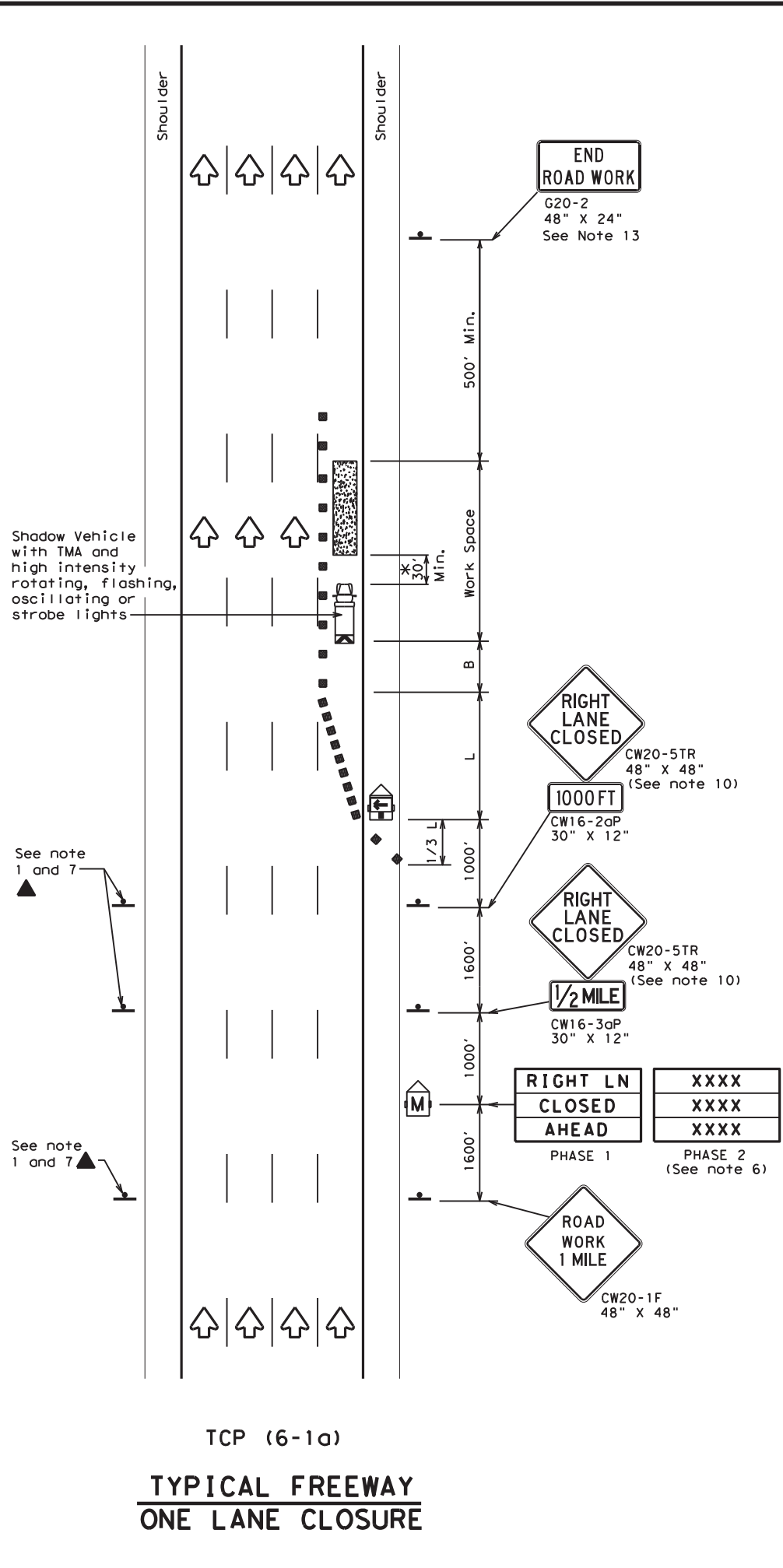
**TRAFFIC CONTROL PLAN
 SHOULDER WORK FOR
 FREEWAYS / EXPRESSWAYS**

TCP (5-1) - 18

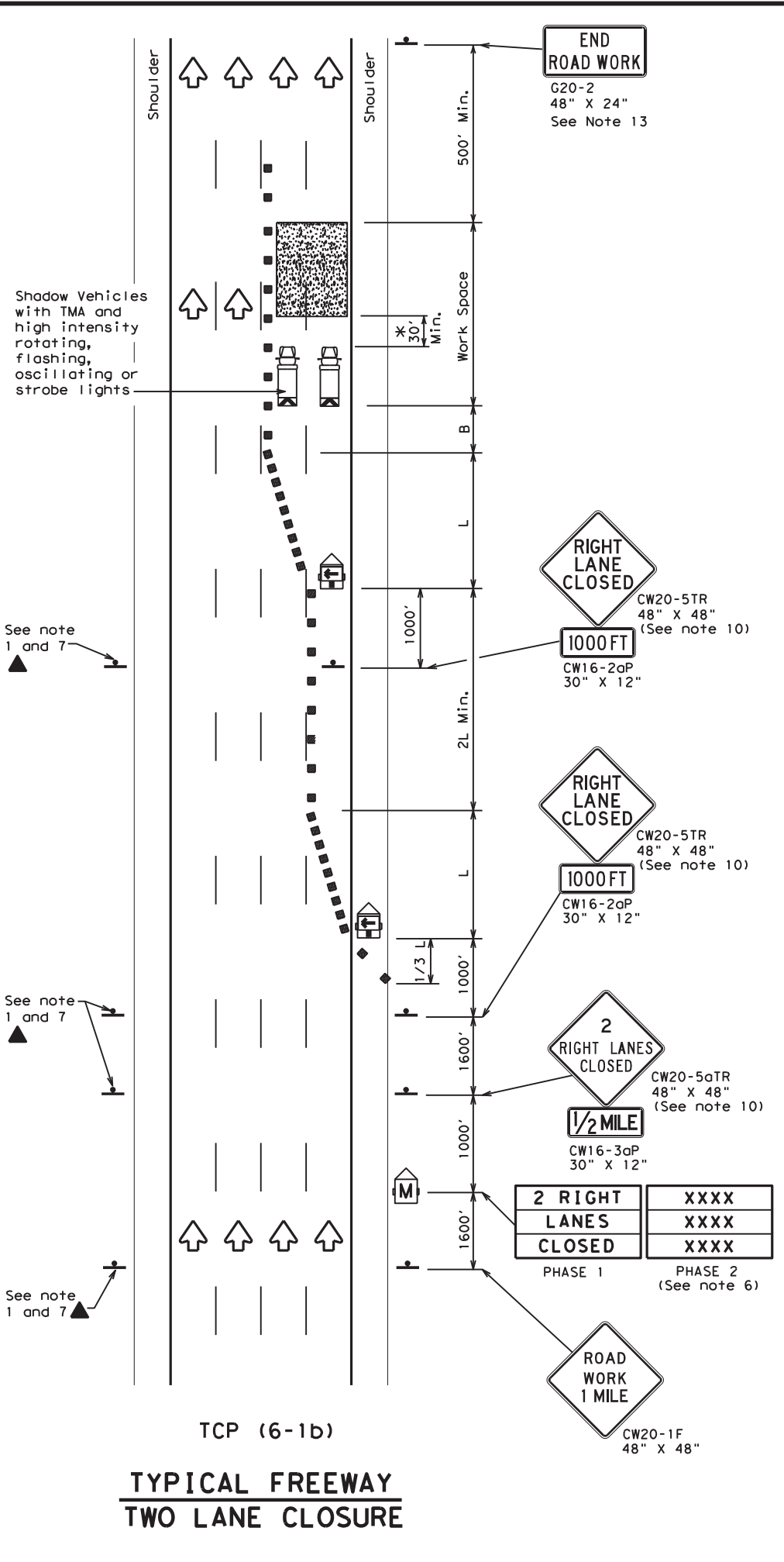
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© TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	OOI	VAR.
2-18	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	40	

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DATE: FILE:



TCP (6-1a)
TYPICAL FREEWAY ONE LANE CLOSURE



TCP (6-1b)
TYPICAL FREEWAY TWO LANE CLOSURE

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



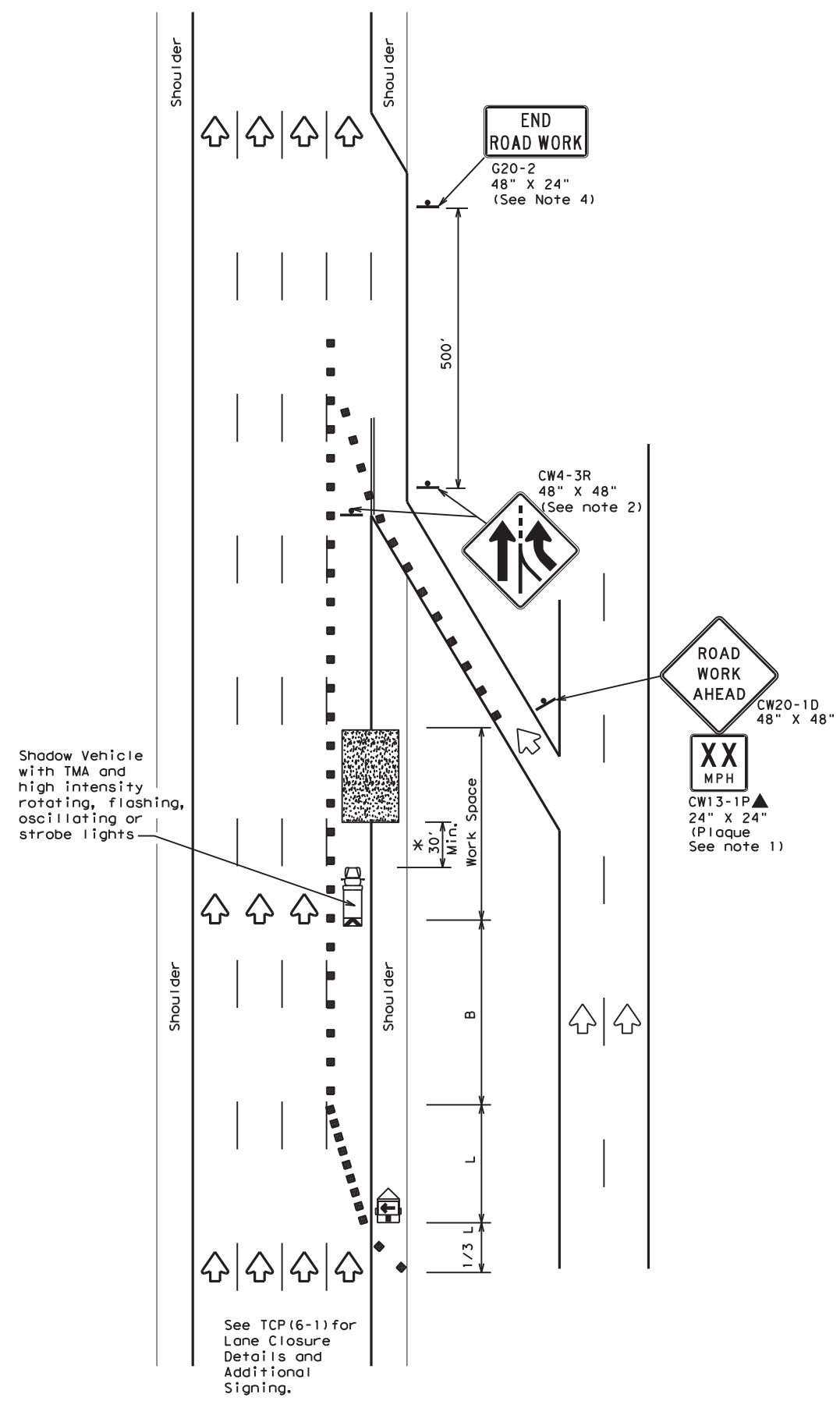
**TRAFFIC CONTROL PLAN
FREEWAY LANE CLOSURES**

TCP (6-1) - 12

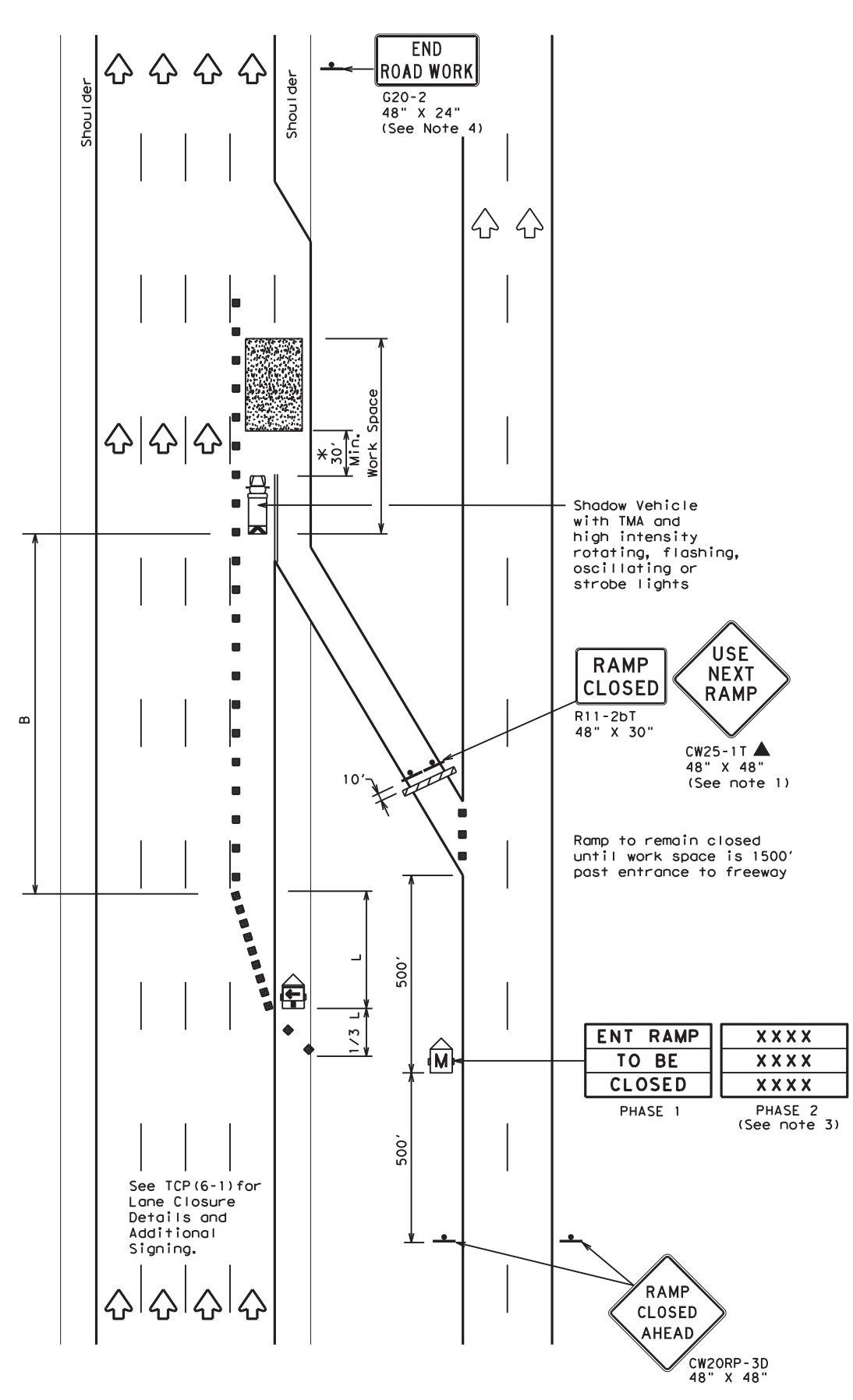
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© TxDOT	February 1998	CONT	SECT	JOB	HIGHWAY				
8-12	REVISIONS	6372	50	001	VAR.				
	DIST	COUNTY		SHEET NO.					
	SAT	BEXAR		41					

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DATE:
FILE:



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 mainline 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.



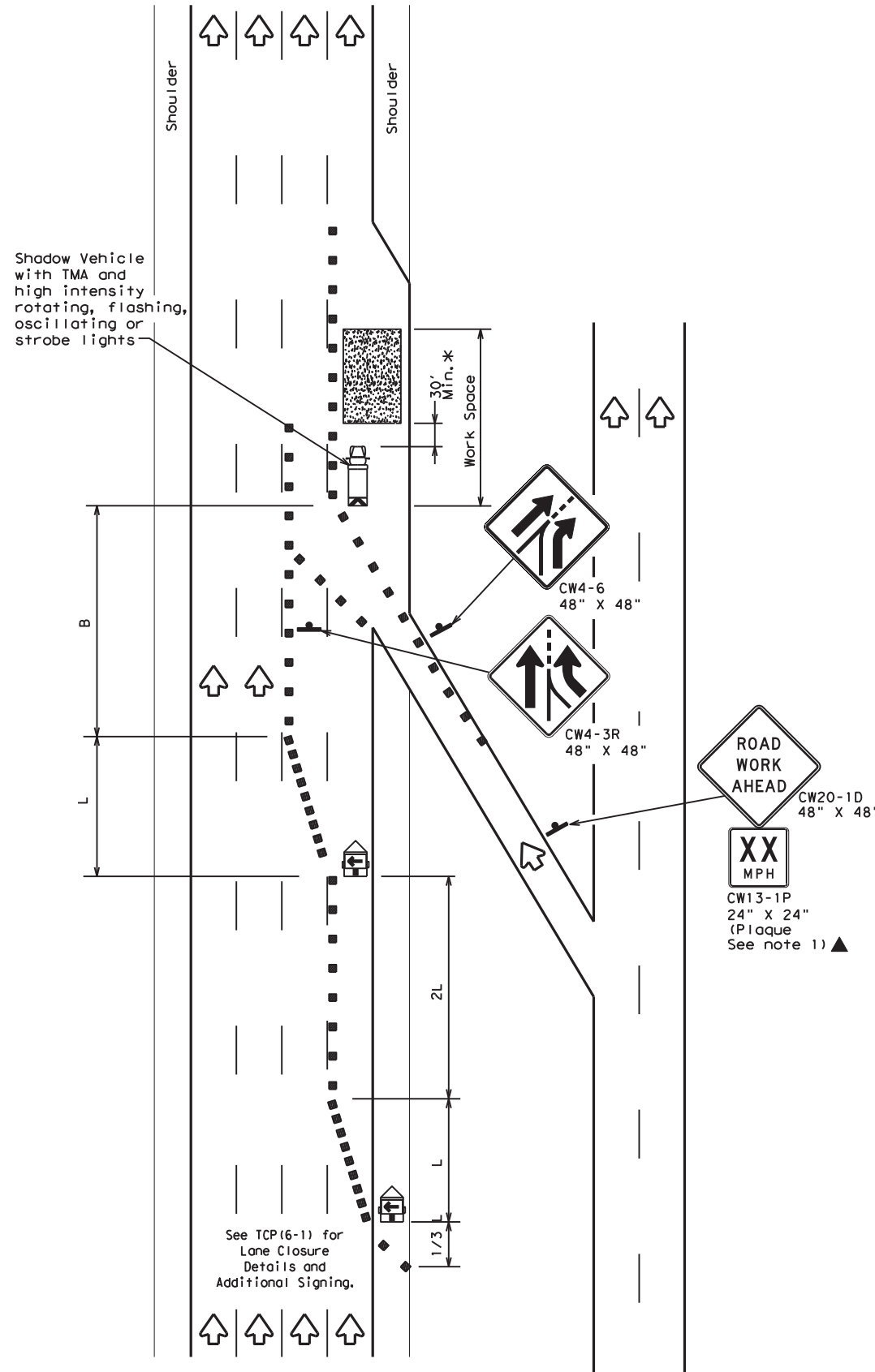
TRAFFIC CONTROL PLAN
WORK AREA NEAR RAMP

TCP (6-2) - 12

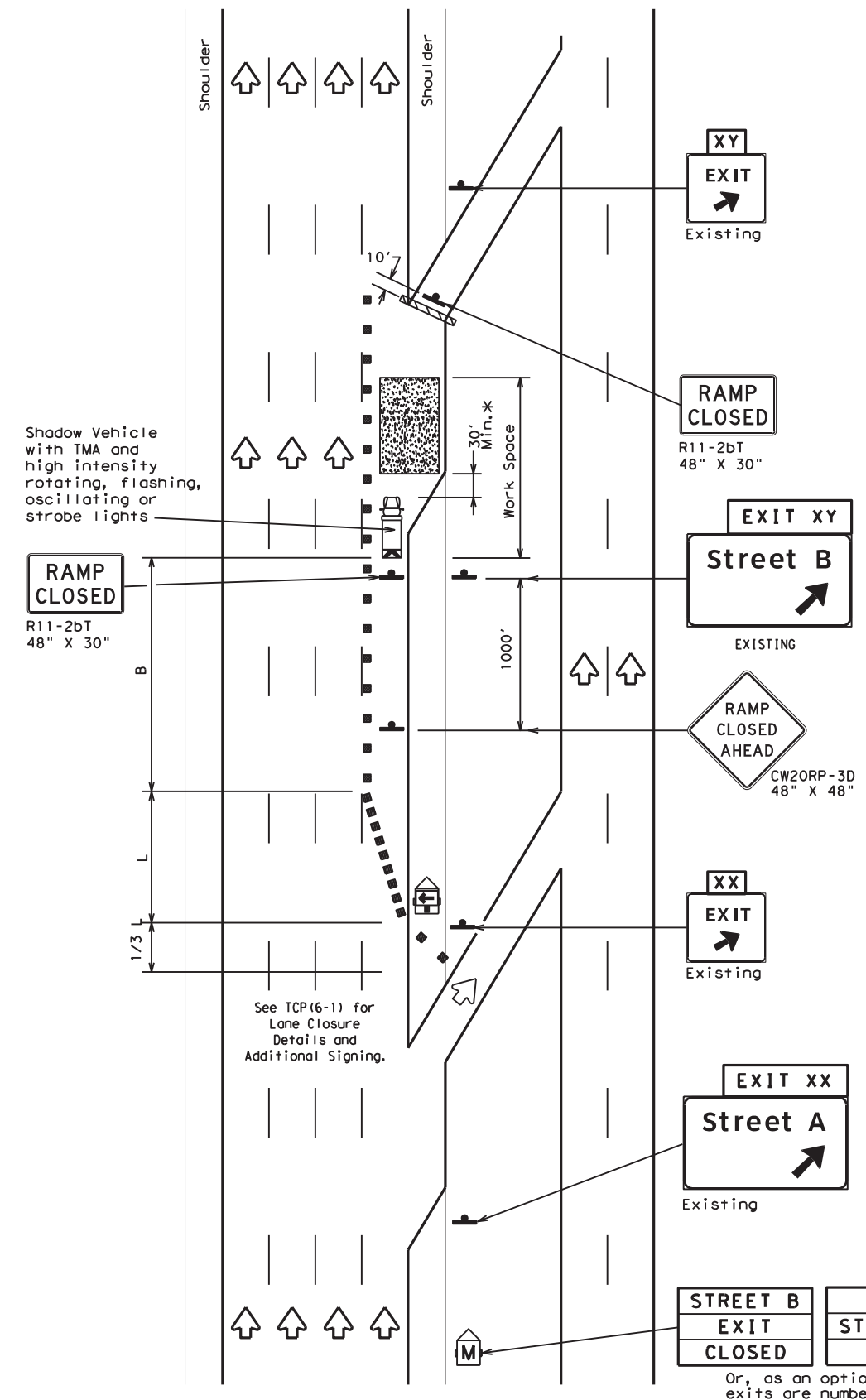
FILE:	tcp6-2.dgn	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CK:	TxDOT
©TxDOT	February 1994	CONT	SECT	JOB	HIGHWAY	REVISIONS			
		6372	50	OOI	VAR.				
1-97	8-98	DIST	COUNTY	SHEET NO.					
4-98	8-12	SAT	BEXAR	42					

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DATE: FILE:



TCP (6-3a)
ENTRANCE RAMP OPEN



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

STREET B
EXIT
CLOSED

USE
STREET A
EXIT

EXIT XY
CLOSED

USE
EXIT XX

Or, as an option when exits are numbered

Place 1 mile (approx.) in advance of Street A exit.

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

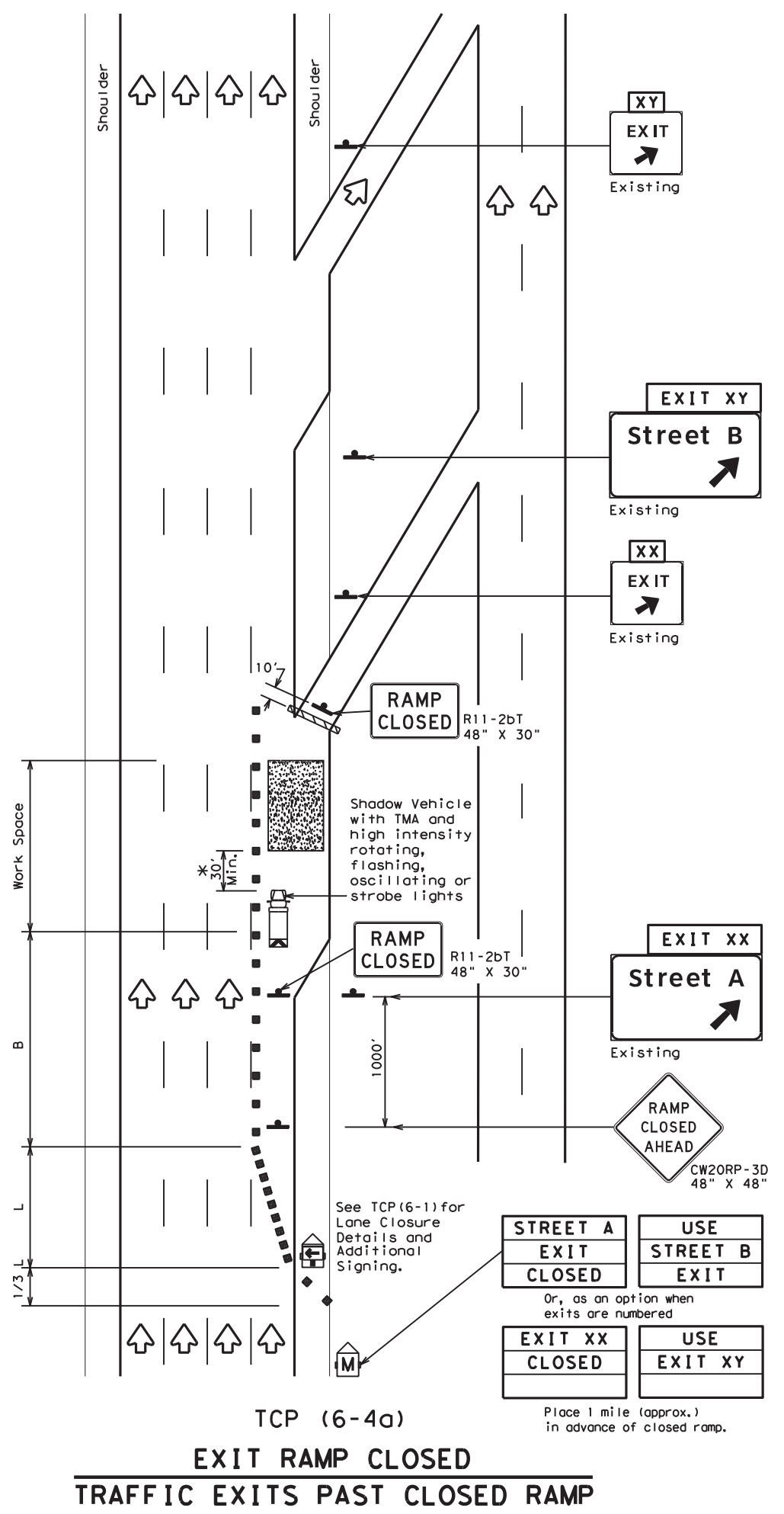
TRAFFIC CONTROL PLAN
WORK AREA BEYOND RAMP

TCP (6-3) - 12

FILE: tcp6-3.dgn	DN: TxDOT	CR: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
1-97 8-98	DIST	COUNTY	SHEET NO.	
4-98 8-12	SAT	BEXAR	43	

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DATE: FILE:

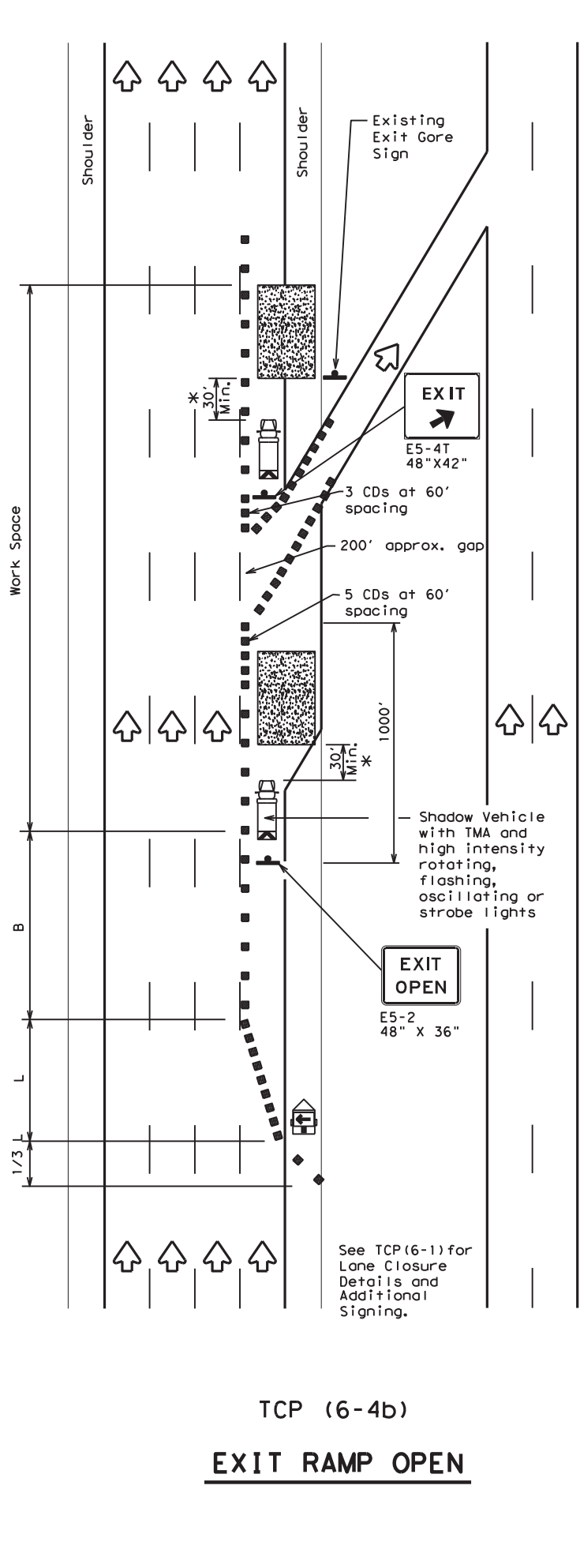


TCP (6-4a)
EXIT RAMP CLOSED
TRAFFIC EXITS PAST CLOSED RAMP

STREET A EXIT CLOSED	USE STREET B EXIT
EXIT XX CLOSED	USE EXIT XY

Or, as an option when exits are numbered

Place 1 mile (approx.) in advance of closed ramp.



TCP (6-4b)
EXIT RAMP OPEN

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



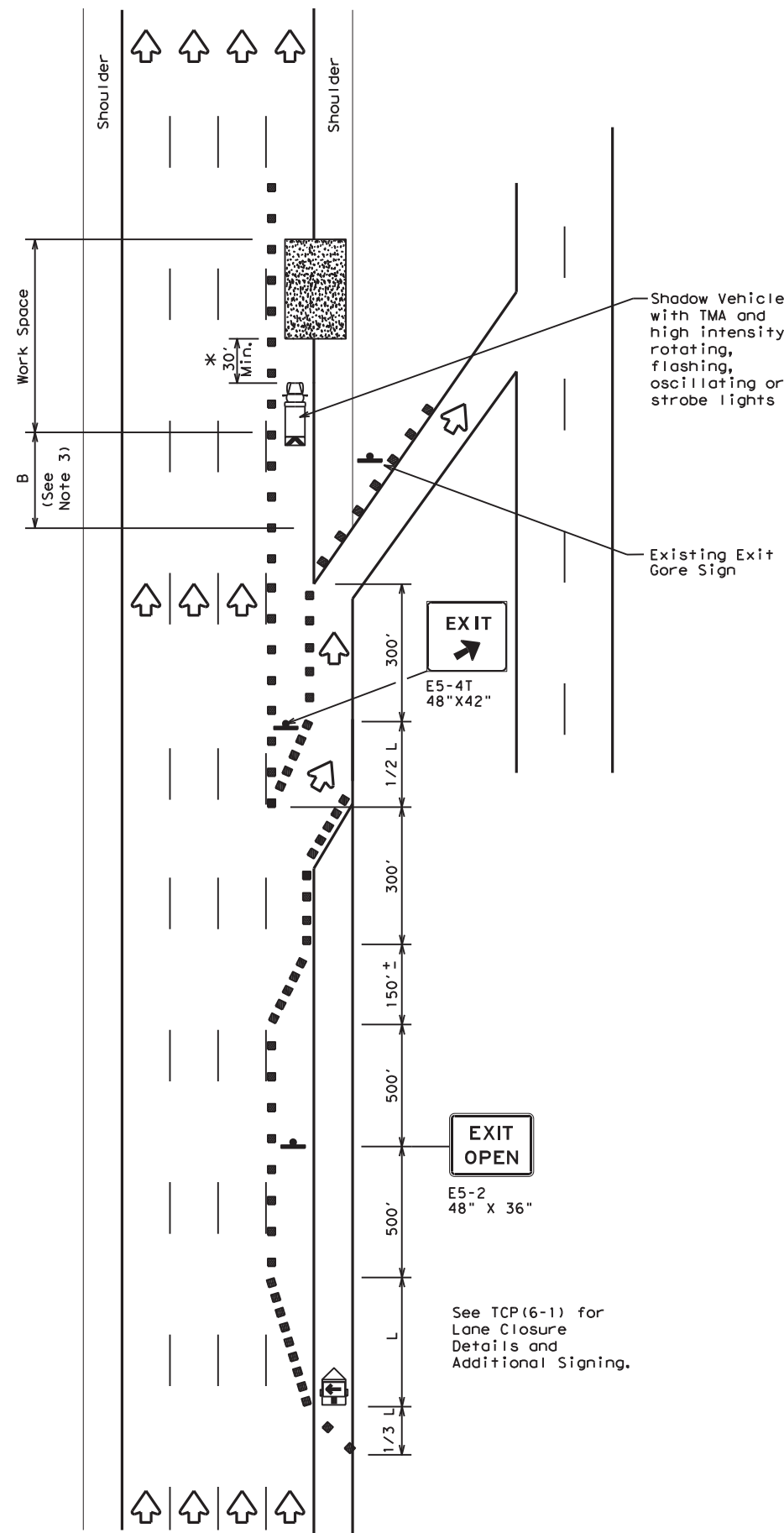
TRAFFIC CONTROL PLAN
WORK AREA AT EXIT RAMP

TCP (6-4) - 12

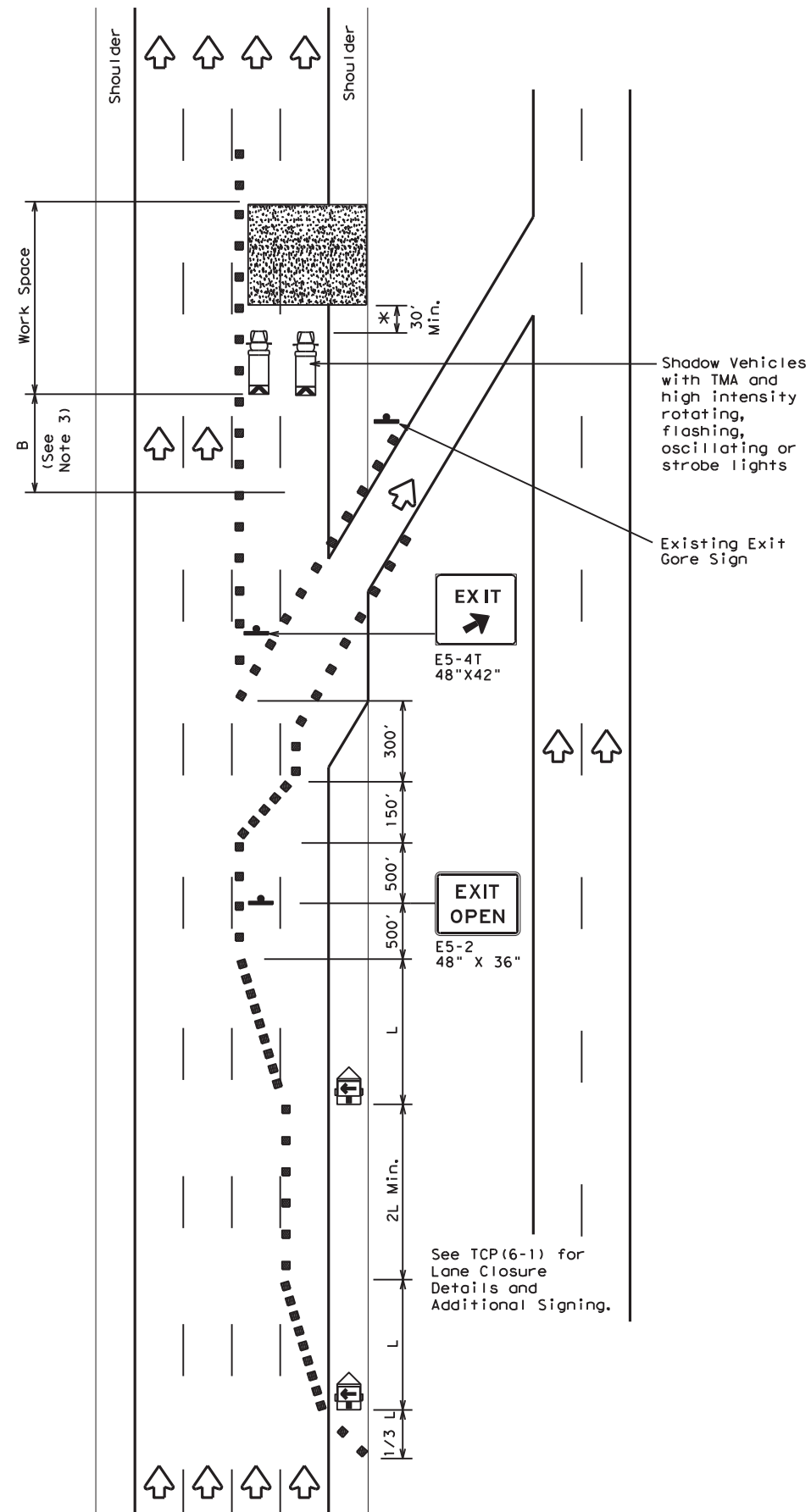
FILE: tcp6-4.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
1-97 8-98	DIST	COUNTY	SHEET NO.	
4-98 8-12	SAT	BEXAR	44	

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DATE:
FILE:



TCP (6-5a)
EXIT RAMP OPEN



TCP (6-5b)
**EXIT RAMP OPEN
TWO LANE CLOSURE WITHIN
1500' PAST EXIT RAMP**

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		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.
- If adequate longitudinal buffer length "B" does not exist between the work space and the exit ramp, consideration should be given to closing the ramp.

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

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

Texas Department of Transportation
Traffic Operations Division Standard

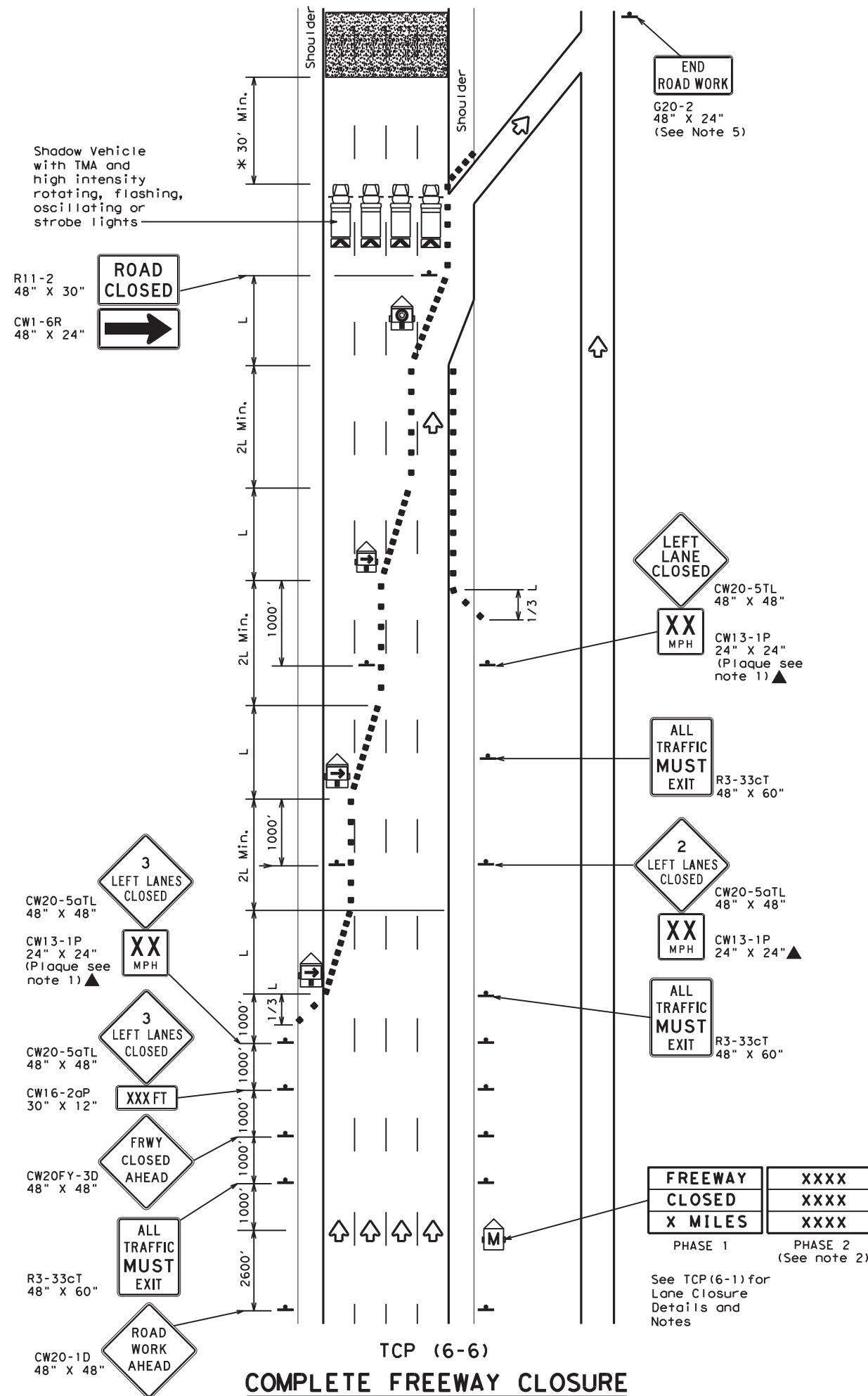
**TRAFFIC CONTROL PLAN
WORK AREA BEYOND EXIT RAMP**

TCP (6-5) - 12

FILE:	tcp6-5.dgn	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CR:	TxDOT
© TxDOT	February 1998	CONT:	6372	SECT:	50	JOB:	001	HIGHWAY:	VAR.
REVISIONS:		DIST:		COUNTY:		SHEET NO.:			
1-97	8-98	SAT:		BEXAR					45
4-98	8-12								

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DATE:
FILE:



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

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.
- Phase 2 of the PCMS message should include appropriate information formatted as shown on BC(6), such as "MERGE RIGHT," recommended speed, delay, exit information, or other specific warnings.
- Where queuing is anticipated beyond signing shown, additional PCMS signs, other warning signs, devices or Law Enforcement Officers should be available to warn approaching high speed traffic of the end of the queue, as directed by the Engineer.
- Entrance ramps located from the advance warning area to the exit ramp should be closed whenever possible.
- 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.



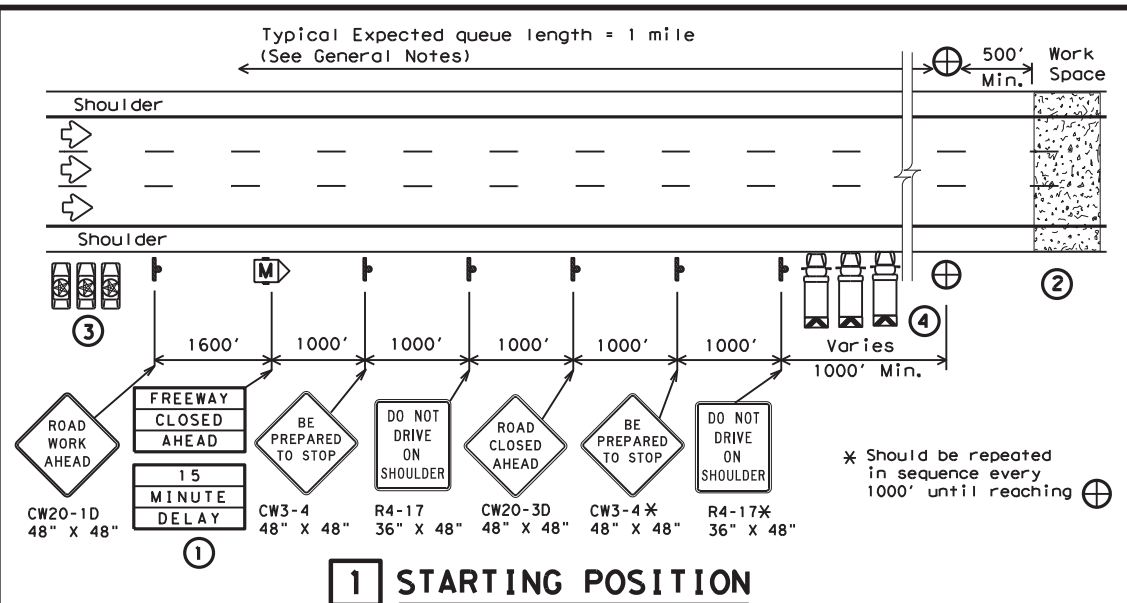
**TRAFFIC CONTROL PLAN
FREEWAY CLOSURE**

TCP (6-6) - 12

FILE:	tcp6-6.dgn	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CK:	TxDOT
©TxDOT	February 1994	CONT	SECT	JOB	HIGHWAY	REVISIONS			
		6372	50	001	VAR.				
		DIST	COUNTY	SHEET NO.					
		SAT	BEXAR	46					

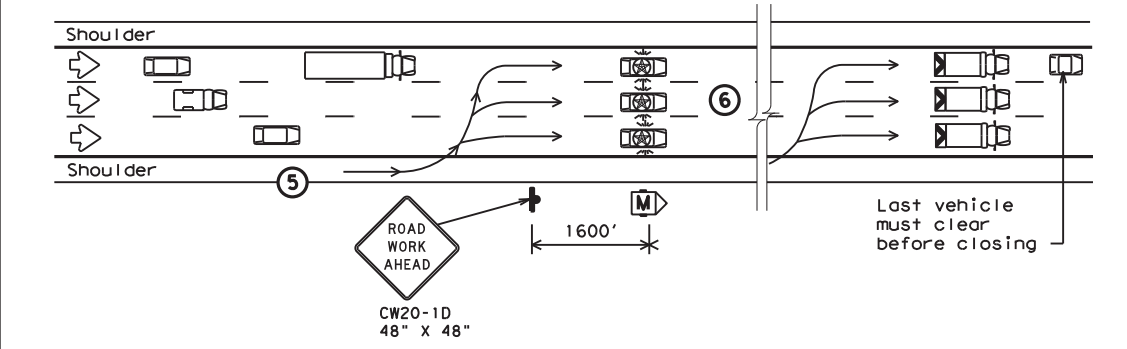
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DATE: FILE:



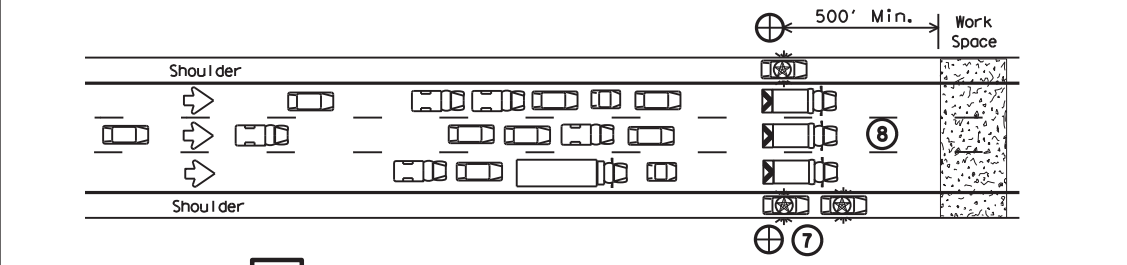
1 STARTING POSITION

- ① Traffic control devices should be installed or located near their intended position prior to beginning temporary roadway closure sequence. Duplicate signs should be erected on the median side of the roadway when median width permits. Warning signs should not be placed on the paved shoulders that will be used by the WARNING LEOV, or where movement of the LEOVs or barrier vehicles will be impeded.
- ② Prior to beginning the roadway closure sequence, all equipment, materials, personnel, and other items necessary to complete the work should be gathered near the work area. Entrance ramps located in the area where a queue is expected to build should be closed.
- ③ There should be one LEOV for every lane to be controlled, plus a minimum of one to warn traffic approaching a queue. An additional lead law enforcement officer is desirable to remain with the Engineer's or Contractor's point of contact (POC) during the operation in order to improve communication with all LEOVs involved.
- ④ One barrier vehicle with a Truck Mounted Attenuator and amber or blue and amber high intensity flashing/oscillating/strobe lighting shall be used for each lane to be closed.



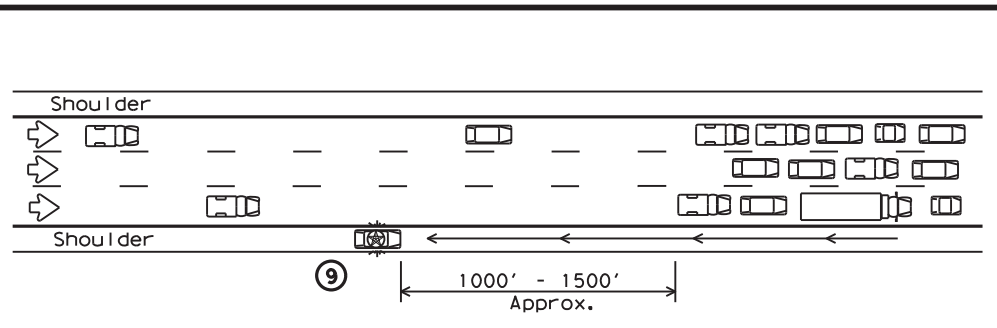
2 REDUCING SPEED OPERATION

- ⑤ Starting position of the LEOVs should be in advance of the most distant warning signs.
- ⑥ Once the LEOVs have achieved an abreast blocking formation while traveling toward the CP, emergency lights and headlights should be turned "ON". The LEOVs should maintain formation, not allow traffic to pass, and begin to decelerate. The LEOVs should continue to decelerate, giving the barrier vehicles opportunity to be staged upstream of the work space after traffic has cleared. The LEOVs should then continue to decelerate slowly until bringing traffic to a stop near the barrier vehicles.



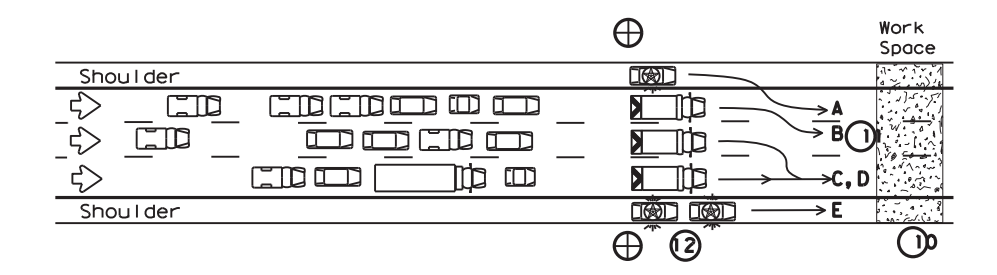
3 ALL TRAFFIC STOPPED AT CP

- ⑦ Once traffic is stopped the LEOVs should park on the shoulders with emergency lighting "ON" in order to provide law enforcement presence at the closure and keep shoulders blocked ahead of the work space. They should stay in radio contact with the WARNING LEOV.
- ⑧ The barrier vehicles should be parked, one in each lane, the parking brake set, with the high visibility flashing/oscillating/strobe lighting "ON," and the transmission in gear.



4 WARNING THE TRAFFIC QUEUE

- ⑨ The WARNING LEOV should proceed to the right shoulder of the roadway, with emergency lights on approximately 1000' in advance of the traffic queue (stopped traffic) as the queue develops. When determined that limited sight distance situations (crest of hills, sharp roadway curvature, etc.) may occur to motorists approaching the queue, the WARNING LEOV may proceed 1/4 mile or more in advance of the queue.



5 RELEASING STOPPED TRAFFIC

- ⑩ All equipment, materials, personnel, and other items should be removed from the roadway and maintain an adequate clear zone.
- ⑪ When the roadway is clear for traffic, the LEOV should proceed forward from the left shoulder followed by the barrier vehicles, from left to right, as shown alphabetically in the plan view.
- ⑫ The LEOV or LEOVs on the right shoulder may remain on the shoulder until satisfied that traffic is moving satisfactorily before merging or proceeding.
- ⑬ LEOVs and barrier vehicles should re-group at their respective starting positions if necessary.

LEGEND			
■	Channelizing Devices	⊕	Control Position (CP)
M	Portable Changeable Message Sign (PCMS)	⊠	Barrier Vehicle with Truck Mounted Attenuator
Ⓜ	Law Enforcement Officer's Vehicle (LEOV)	←	Traffic Flow

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

GENERAL NOTES

1. All traffic control devices shall conform with the latest edition of the Texas Manual on Uniform Traffic Control Devices (TMUTCD). Additional guidelines for traffic control devices may be found in the TMUTCD. Signs conflicting with the roadway closure sequence should be completely removed or covered. Additional traffic control devices may be required for closure of access roads, cross streets, exit and entrance ramps as directed by the Engineer.
2. Law enforcement officers and all workers involved should review and understand all procedures before the roadway closure sequence begins. Pre-work meetings may be held for this purpose. Local emergency services and media should have advance notification of roadway closure, expected dates and approximate times of closures.
3. Law enforcement officers shall be in uniform and have jurisdiction in the locale of the work area. An additional WARNING Law Enforcement Officer's Vehicle (LEOV) may be used on the median side of the roadway where median shoulder width permits (See sequence #9).
4. The roadway closure should be during off-peak hours, as shown in the plans, or as directed by the Engineer.
5. Work should be limited to approximately 15 minutes maximum duration unless otherwise directed by the Engineer based on existing roadway conditions. If the work is not complete within 15 minutes, or if the end of the traffic queue extends past the most distant advance warning signs, the work area should be cleared of all equipment, materials, personnel, and other items, and the roadway reopened. When the queue has dissipated and the traffic flow appears normal the roadway closure sequence may be repeated.
6. For traffic volumes greater than 1000 Passenger Cars Per Hour Per Lane (PCPHPL), or for roadway closures that exceed 15 minutes, see details elsewhere in the plan.
7. If traffic queues beyond the advance warning signs during one road closure sequence, the advance warning should be extended prior to repeating the road closure sequence. When possible, PCMS signs should be located in advance of the last available exit prior to the closure to allow motorists the choice of an alternate route.

THIS PLAN IS INTENDED TO BE USED AT LOCATIONS/TIMES WHEN TRAFFIC VOLUMES ARE LESS THAN 1000 PASSENGER CARS PER HOUR PER LANE.

Texas Department of Transportation
Traffic Operations Division Standard

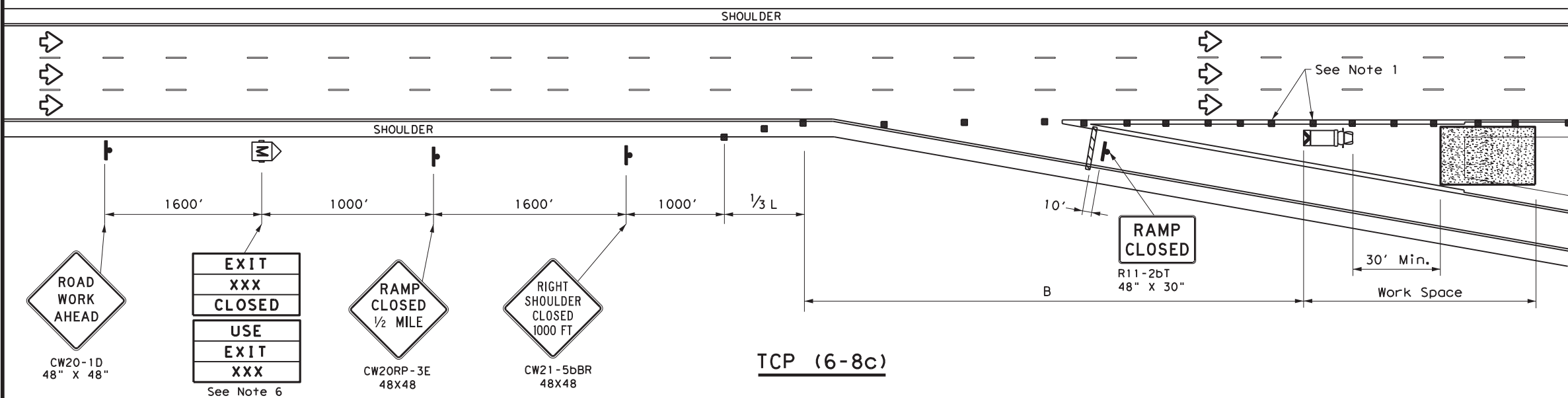
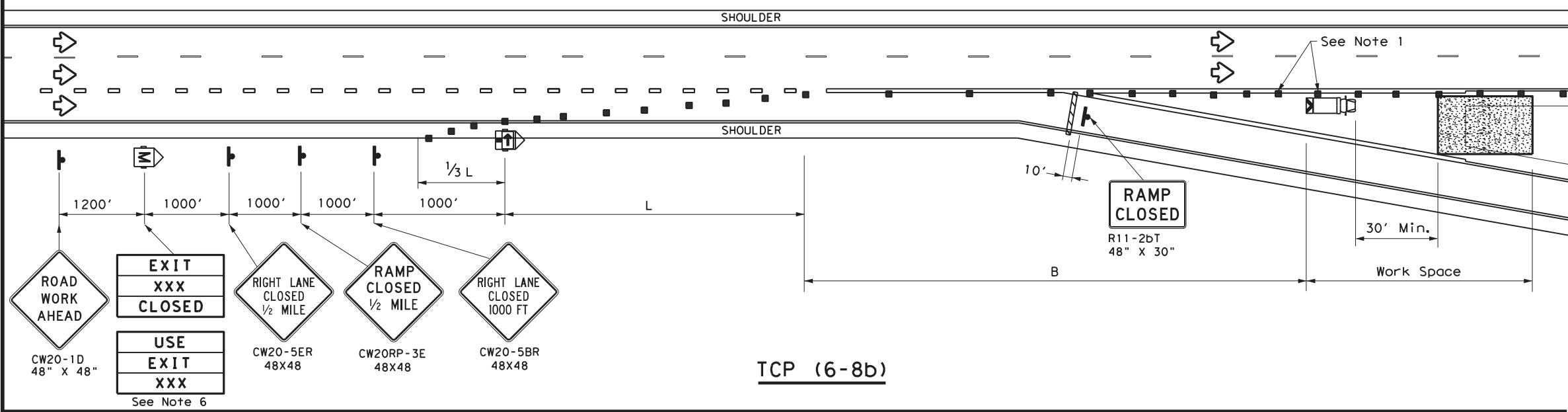
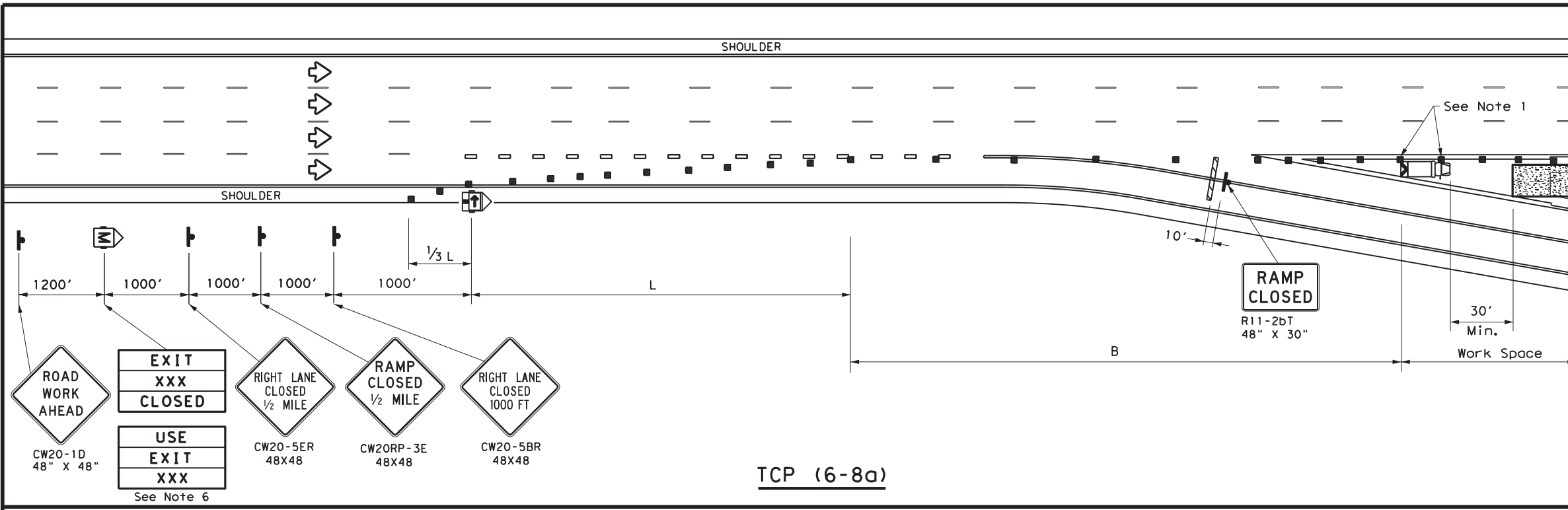
TRAFFIC CONTROL PLAN SHORT DURATION FREEWAY CLOSURE SEQUENCE

TCP (6-7) - 12

FILE: tcp6-7.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	OOI	VAR.
1-97 8-12	DIST	COUNTY	SHEET NO.	
4-98	SAT	BEXAR	47	

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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.



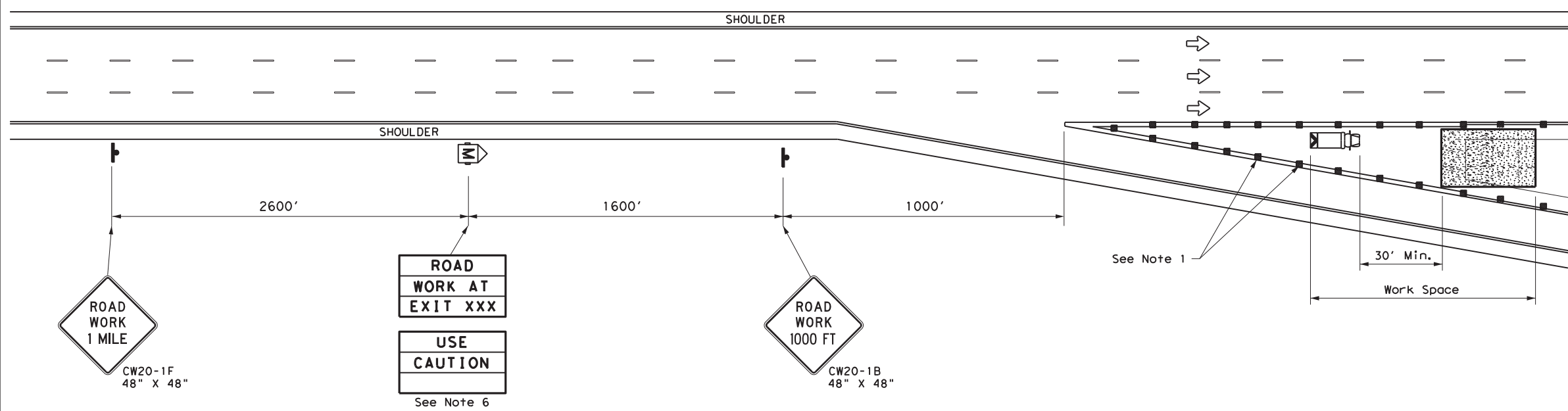
WORK IN EXIT GORE FOR ADT GREATER THAN 10,000

TCP (6-8) - 14

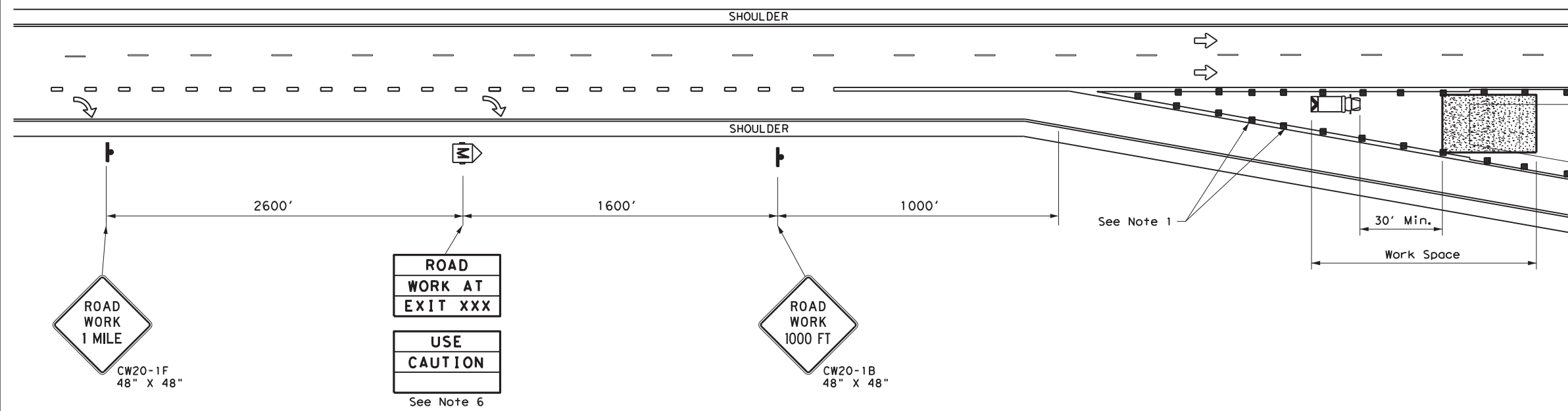
FILE: tcp6-8.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	48	

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DATE:
FILE:



TCP (6-9a)



TCP (6-9b)

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) and TCP (6-8) for traffic control details.
 - Truck mounted attenuators are required.
 - The PCMS may be omitted if replaced with a "ROAD WORK 1/2 MILE" (CW20-1E).
 - Roadway ADT should be less than 10,000.



WORK IN EXIT GORE FOR ADT LESS THAN 10,000

TCP (6-9) - 14

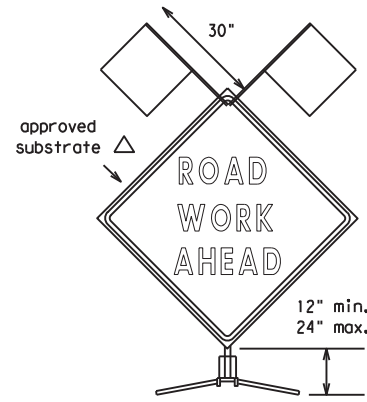
FILE: tcp6-9.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT February 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	49	

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.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	

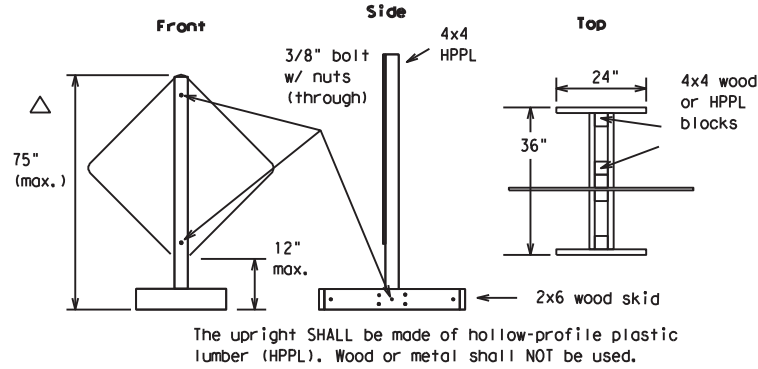
EXAMPLES OF SIGN SUPPORTS

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



Flags as required by Engineer or as shown on plans

SHORT TERM DURATION, DAYTIME USE ONLY PORTABLE SIGN SUPPORTS

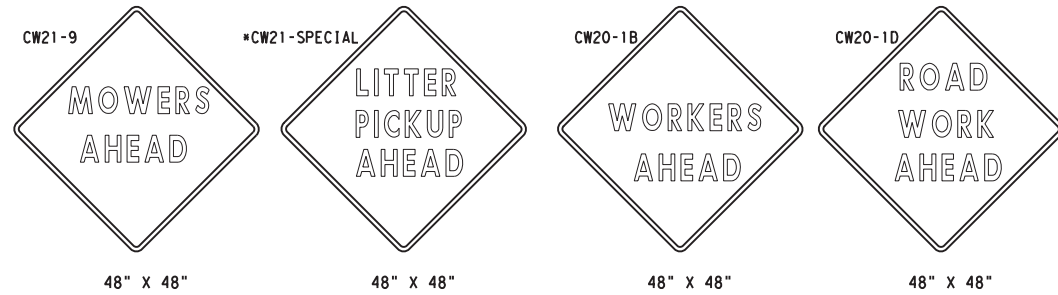


The upright SHALL be made of hollow-profile plastic lumber (HPPL). Wood or metal shall NOT be used.

1 Foot Mounting Height

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

Nails will NOT be allowed.



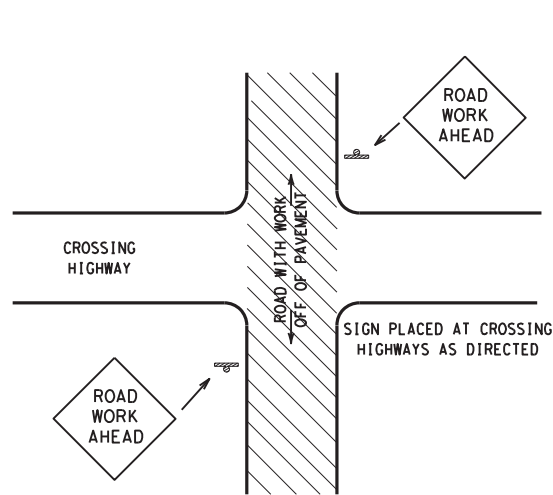
SIGN IN ACCORDANCE WITH THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS

MOWERS AHEAD SIGNS ARE USED FOR MOWING OPERATIONS.

LITTER PICKUP AHEAD, ROAD WORK AHEAD AND WORKER AHEAD SIGNS ARE USED AS DIRECTED FOR OTHER MAINTENANCE OPERATIONS WHEN ALL WORK OCCURS OFF OF THE PAVED HIGHWAY SURFACE.

ROLL-UP SIGNS CONFORMING TO DMS-8310 AND THE CWZTCD ALLOWED

*Letter dimensions and spacing for "CW21-SPECIAL" is the same as C20-1D



TYPICAL LOCATION OF SIGNS AT HIGHWAY CROSSING

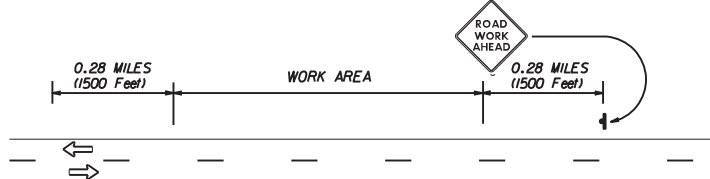
WORK AREA IS A MAXIMUM OF 2.0 MILES UNLESS OTHERWISE DIRECTED. SIGNS MAY REMAIN IN PLACE ONLY DURING DAYLIGHT HOURS.

SIGNS ARE TO BE PLACED 6' TO 12' OFF OF THE PAVED SURFACE UNLESS OTHERWISE DIRECTED.

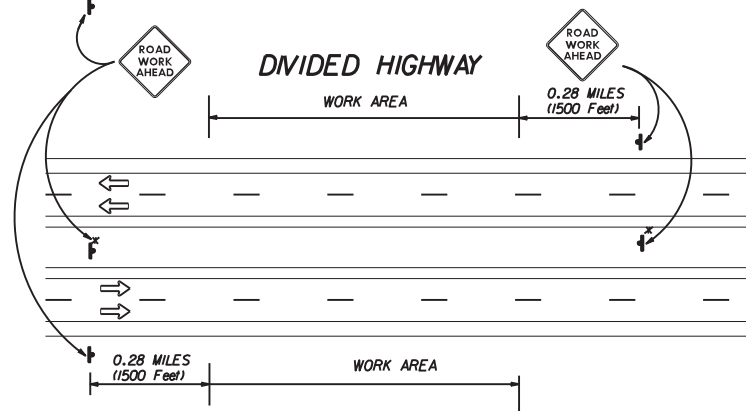
ROAD WORK AHEAD SIGNS SHOWN AS EXAMPLES, ONE OF THE FOUR TYPE SIGNS WILL BE USED AS DIRECTED.

* SIGNS IN THE MEDIAN ARE REQUIRED WHEN WORK OCCURS IN MEDIAN

UNDIVIDED HIGHWAY OR FRONTAGE ROAD



DIVIDED HIGHWAY



TRAFFIC CONTROL PLAN FOR WORK OFF OF THE PAVED SURFACE.

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.
- Nails shall NOT be used to attach signs to any support.
- 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 additional signs requested by the Engineer/Inspector shall not be subsidiary.
- The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD). The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so that the Engineer can verify the correct procedures are being followed.
- The Contractor is responsible for sign installations 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".
- 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 VI)

- The Contractor is responsible for ensuring the sign support and substrate meets crashworthiness. For mowing operation all signs and supports are Short-term Duration for daytime work.
- The Contractor shall furnish the sign sizes shown on this sheet or as directed by the Engineer.

SIGN SUBSTRATES

- The Contractor shall ensure that the sign substrate is allowed 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.
- 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 faces.

REFLECTIVE SHEETING

- Reflectorized signs shall be constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 or DMS-8310. The DMS specifications can be accessed from the following web address:
http://manuals.dot.state.tx.us:80/dynaweb/colmates/@Generic_CollectionView;cs=default;ts=default
- White sheeting, meeting the requirements of DMS-8300 Type C (High Specific Intensity), shall be used for signs with white background and channelizing devices.
- Orange sheeting, meeting the requirements of DMS-8300 Type E (Fluorescent Prismatic), shall be used for 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

- Signs should be removed or completely covered when not mowing.
- Duct tape or other adhesive material shall NOT be affixed to a sign face.
- Signs and supports shall be removed by the end of the day.

SIGN SUPPORT WEIGHTS

- Where sign supports 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.
- Rock, concrete, iron, steel or other solid objects will 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 for sandbags.
- Rubber ballasts (such as those used with cones or edgeline channelizers) shall NOT be used as sign support weights.
- 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 supports.
- Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

Any sign, sign support or traffic control device that is struck or damaged by the Contractor or his/her construction equipment shall be replaced or repaired as soon as possible by the Contractor at the Contractor's expense.

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 obtained by contacting:

Standards Engineer
Traffic Operations Division - TE
Texas Department of Transportation
125 East 11th Street
Austin, Texas 78701-2483
Phone (512) 416-3120
Fax (512) 416-3299

Instructions to locate the "CWZTCD" on TxDOT website are:

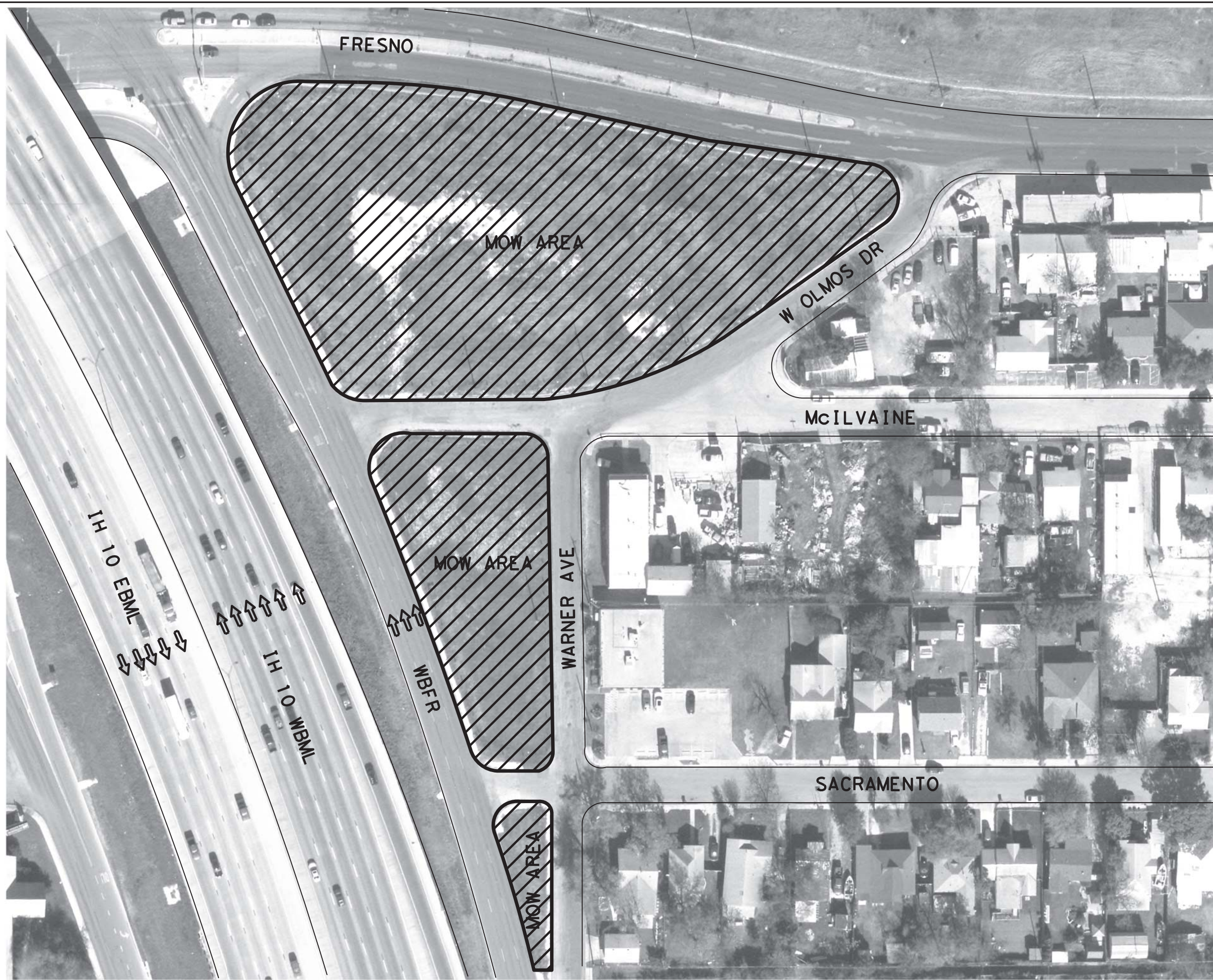
Start at website - www.dot.state.tx.us
Click on "About TxDOT",
Click on "Organizational Chart",
Click on "Traffic Operations Box",
Click on "Compliant Work Zone Traffic Control Devices",
Click on "View PDF".
This site is printable.

Texas Department of Transportation
Maintenance Division
Standard Plans

ROADSIDE TRAFFIC CONTROL PLAN

SHEET 1 OF 1 RS-TCP-05 NOT TO SCALE

FILE: RSTCPO5.DGN	DW: LJB	CK: JG	DW: -	CK: -	NEG NO.:
©TxDOT FEBRUARY 2005		STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT	
REVISED: September 17, 2004	SAT	6	SHEET 50		
REVISED: FEBRUARY 2, 2005 Sign placement in TCP	COUNTY	CONTROL SECTION	JOB	HIGHWAY	
REVISED:	BEXAR	6372	50	001	VAR.



- LEGEND**
-  CHAIN LINK FENCE
 -  MOWING AREA

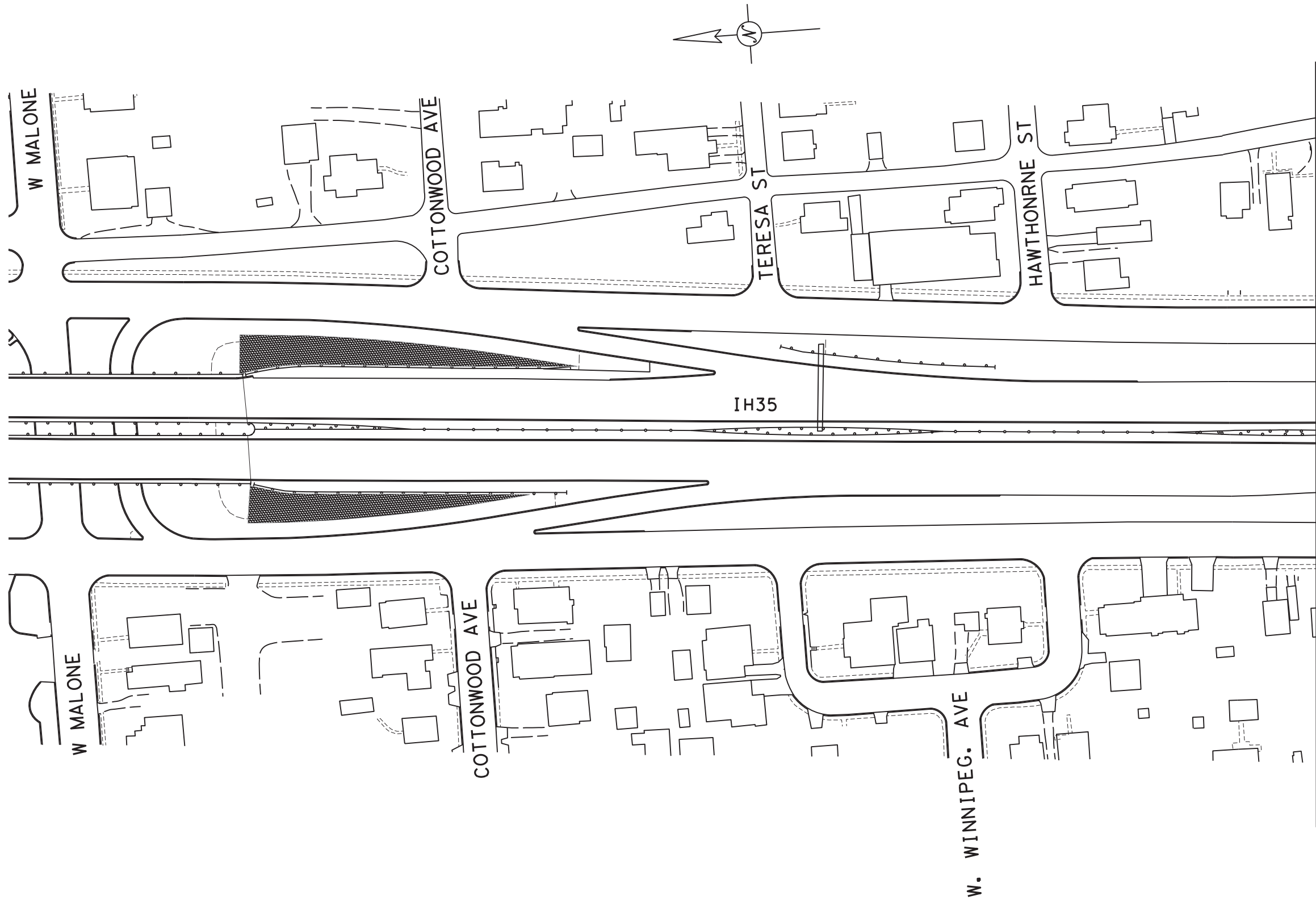
NOT TO SCALE



**IH 10
at FRESNO ST
TRACT #1
MOWING LOCATION**

SHEET 1 OF 28

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		51
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



LEGEND
 STEEP SLOPES REQUIRING SPECIAL MOWING TO AVOID DAMAGE TO VEGETATION

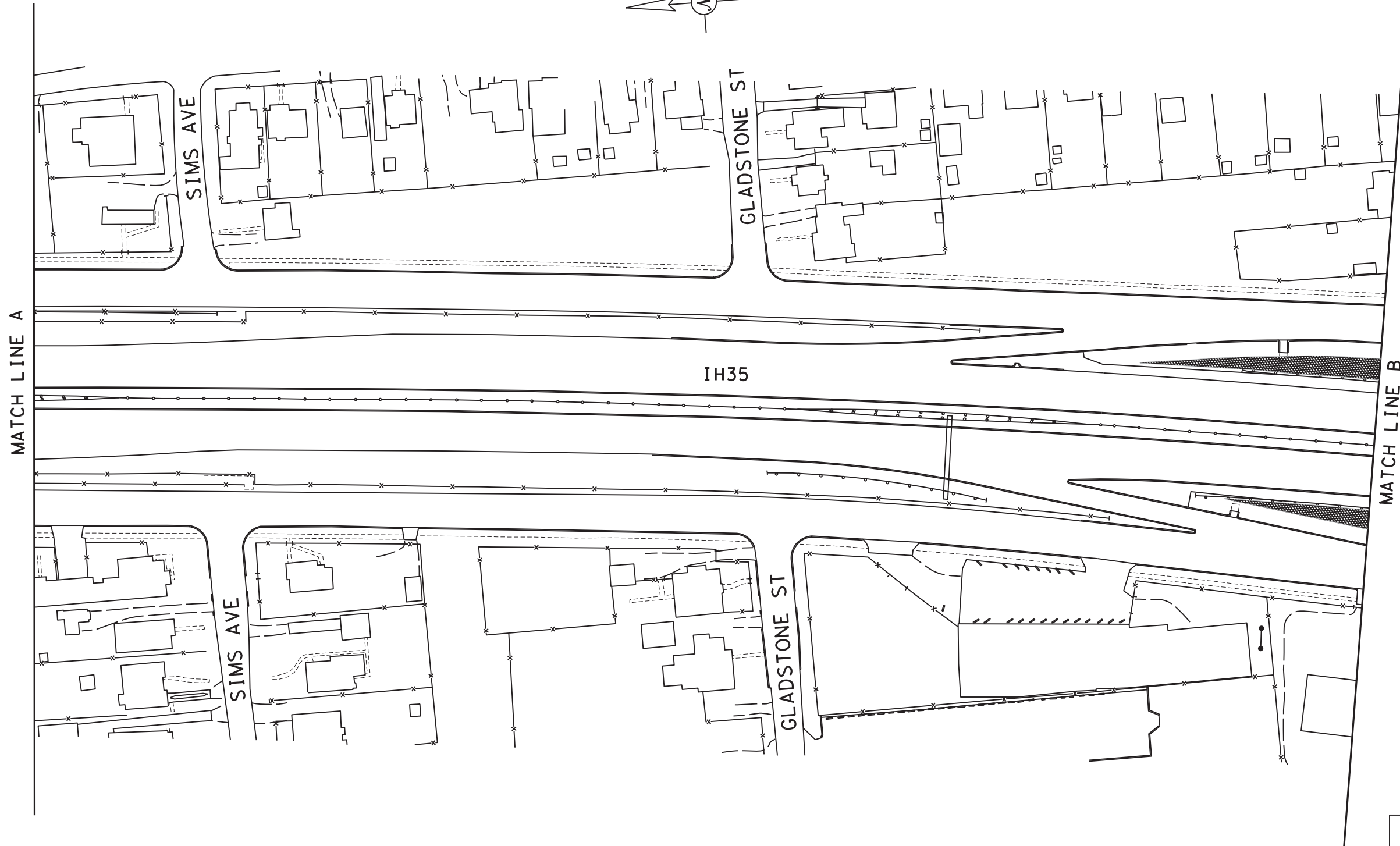
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IH 35
 TRACT #6
 MOWING LOCATION

SHEET 2 OF 28

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		52
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



LEGEND
 STEEP SLOPES REQUIRING SPECIAL MOWING TO AVOID DAMAGE TO VEGETATION

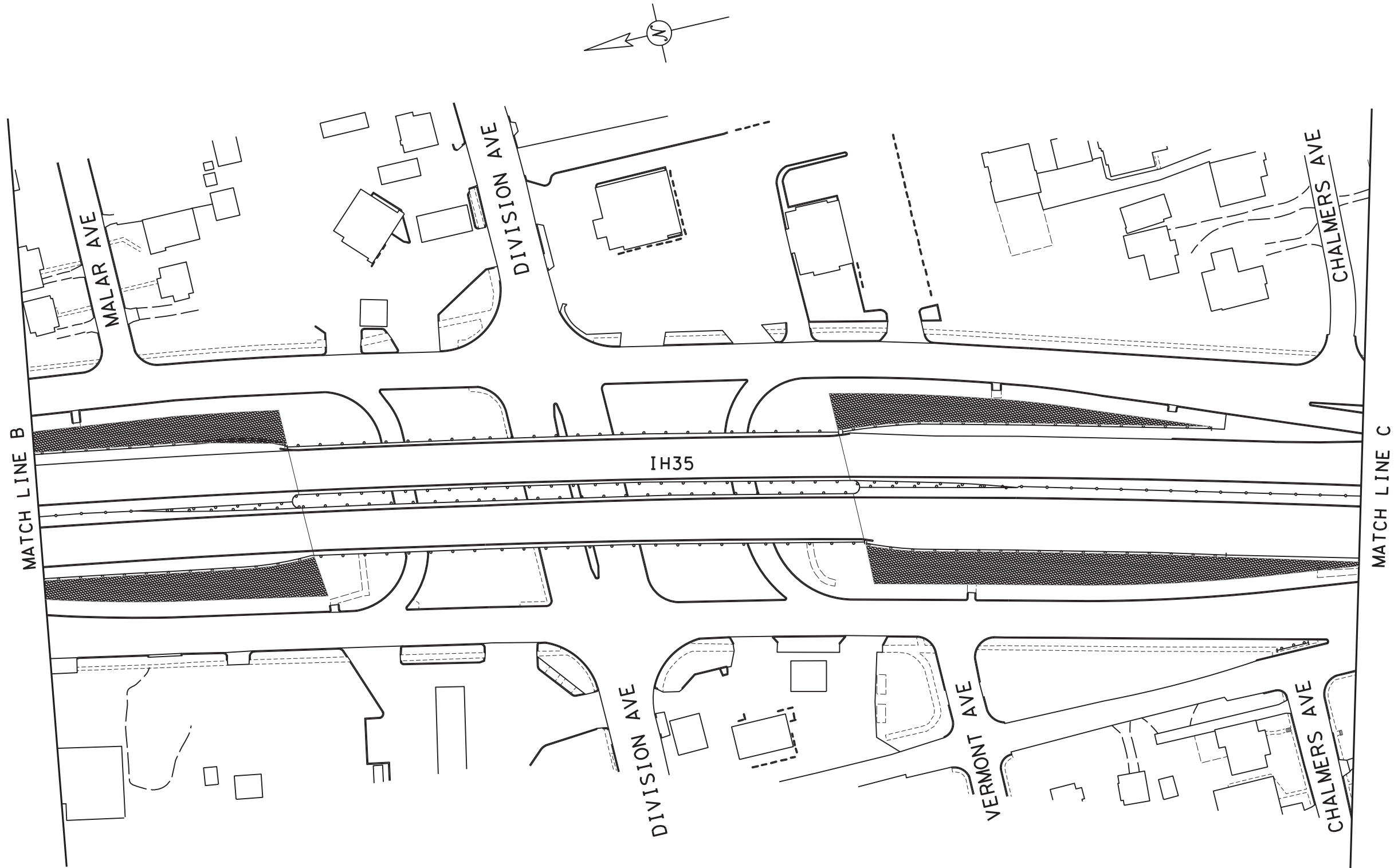
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**IH 35
 TRACT #6
 MOWING LOCATION**

SHEET 3 OF 28

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		53
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



LEGEND
 STEEP SLOPES REQUIRING SPECIAL MOWING TO AVOID DAMAGE TO VEGETATION

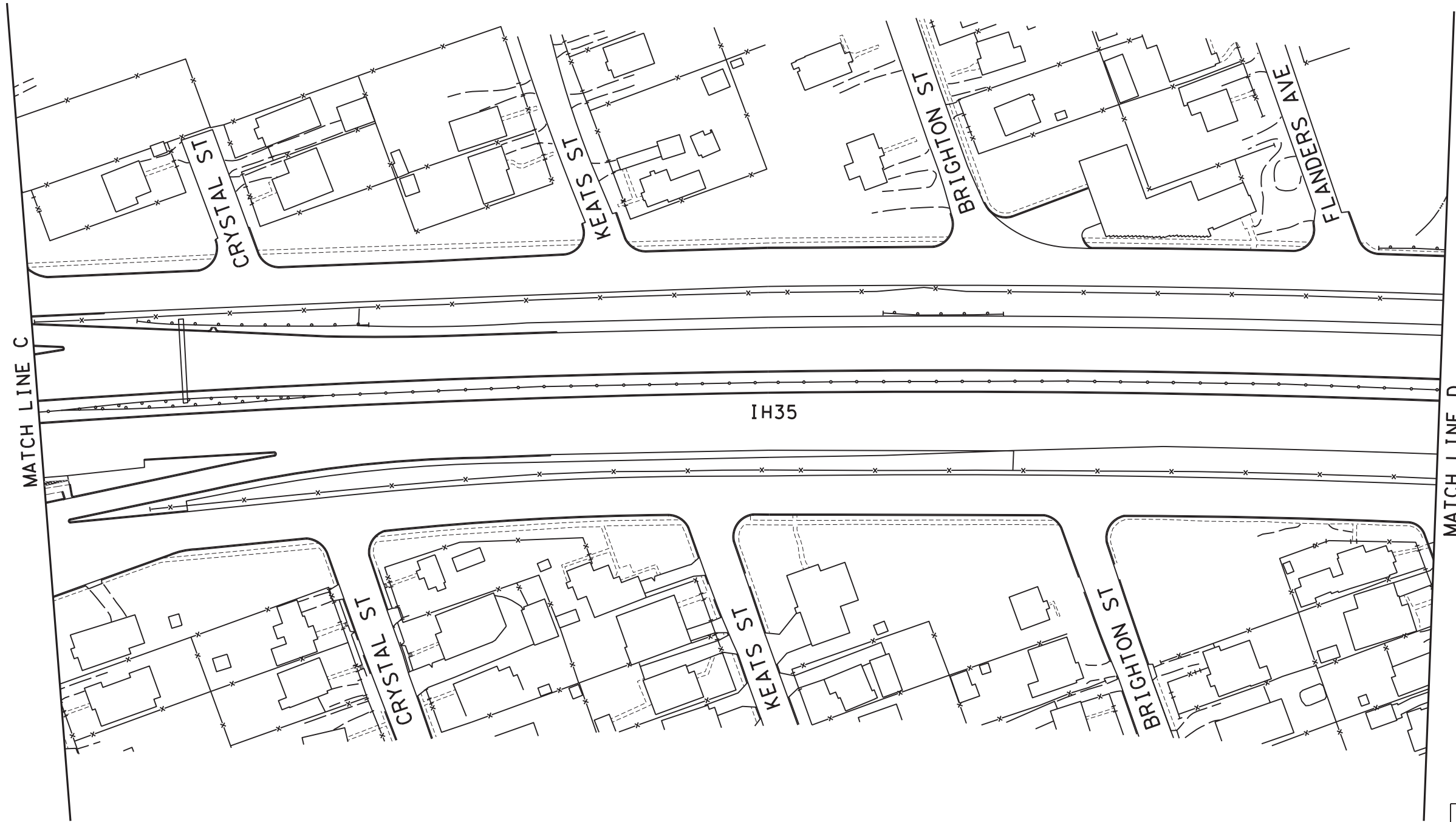
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**IH 35
 TRACT #6
 MOWING LOCATION**

SHEET 4 OF 28

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		54
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



LEGEND

 STEEP SLOPES REQUIRING SPECIAL MOWING TO AVOID DAMAGE TO VEGETATION

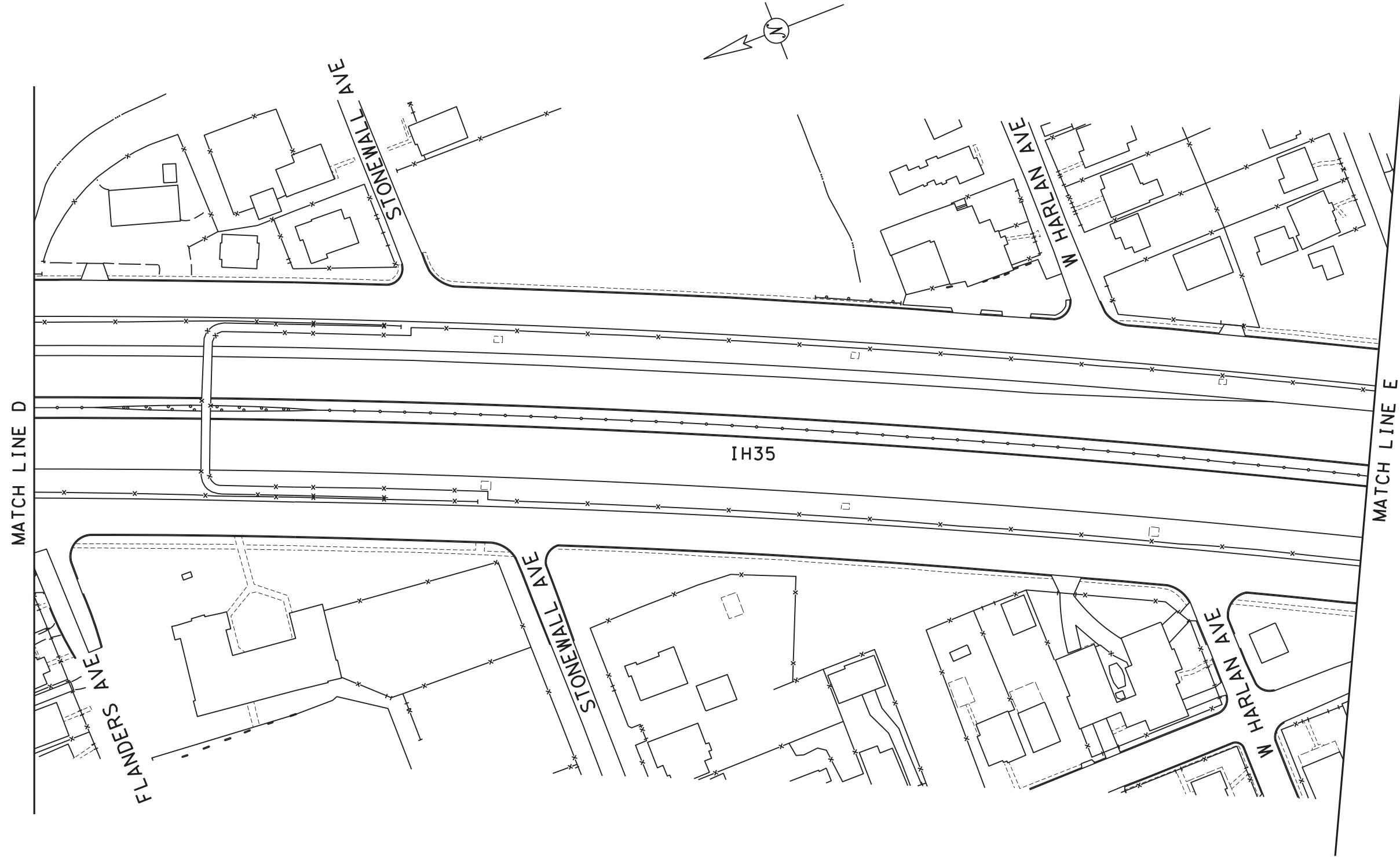
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**IH 35
TRACT #6
MOWING LOCATION**

SHEET 5 OF 28

FED. RD. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		55
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



LEGEND
 STEEP SLOPES REQUIRING SPECIAL MOWING TO AVOID DAMAGE TO VEGETATION

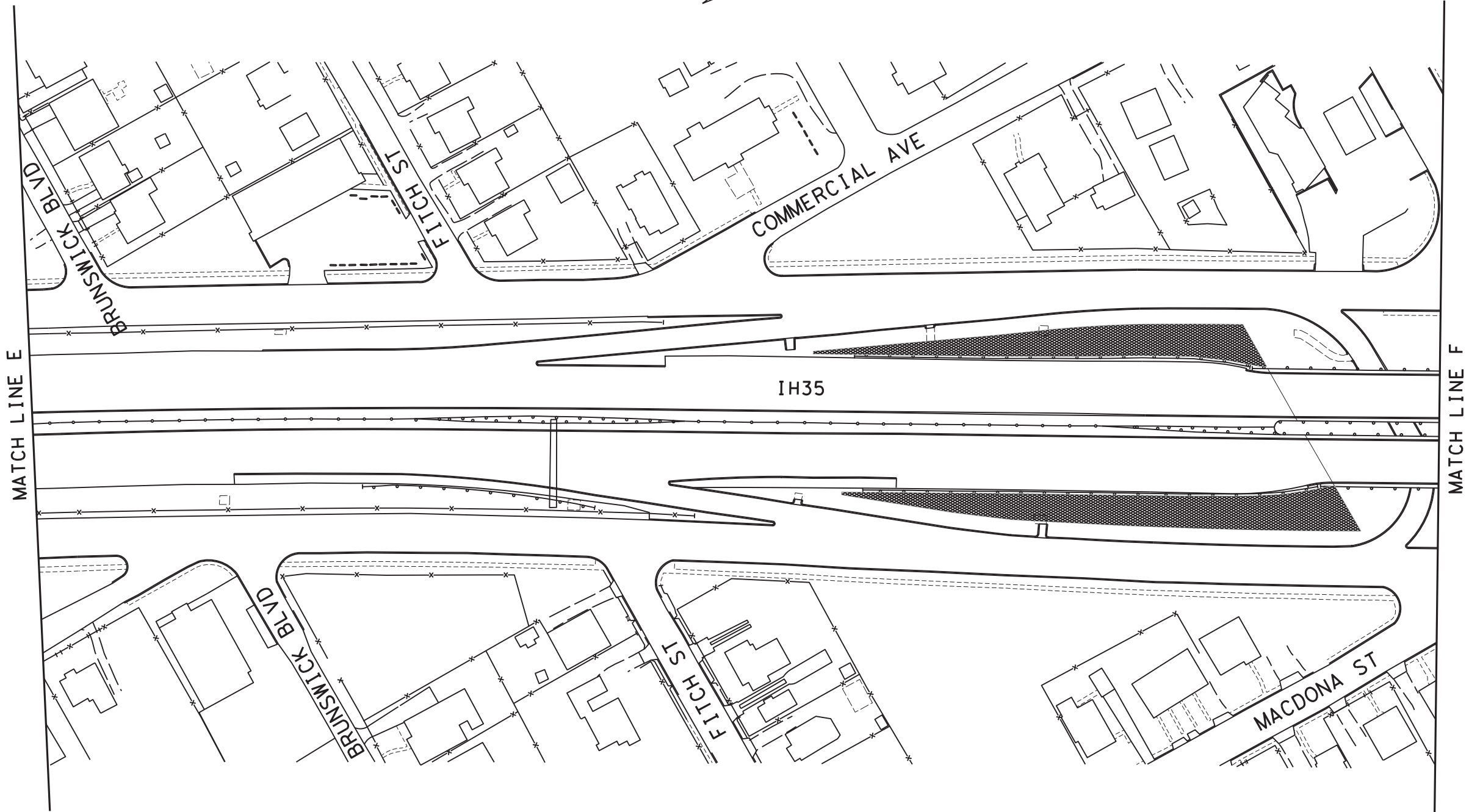
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**IH 35
 TRACT #6
 MOWING LOCATION**

SHEET 6 OF 28

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		56
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



LEGEND
 STEEP SLOPES REQUIRING SPECIAL MOWING TO AVOID DAMAGE TO VEGETATION

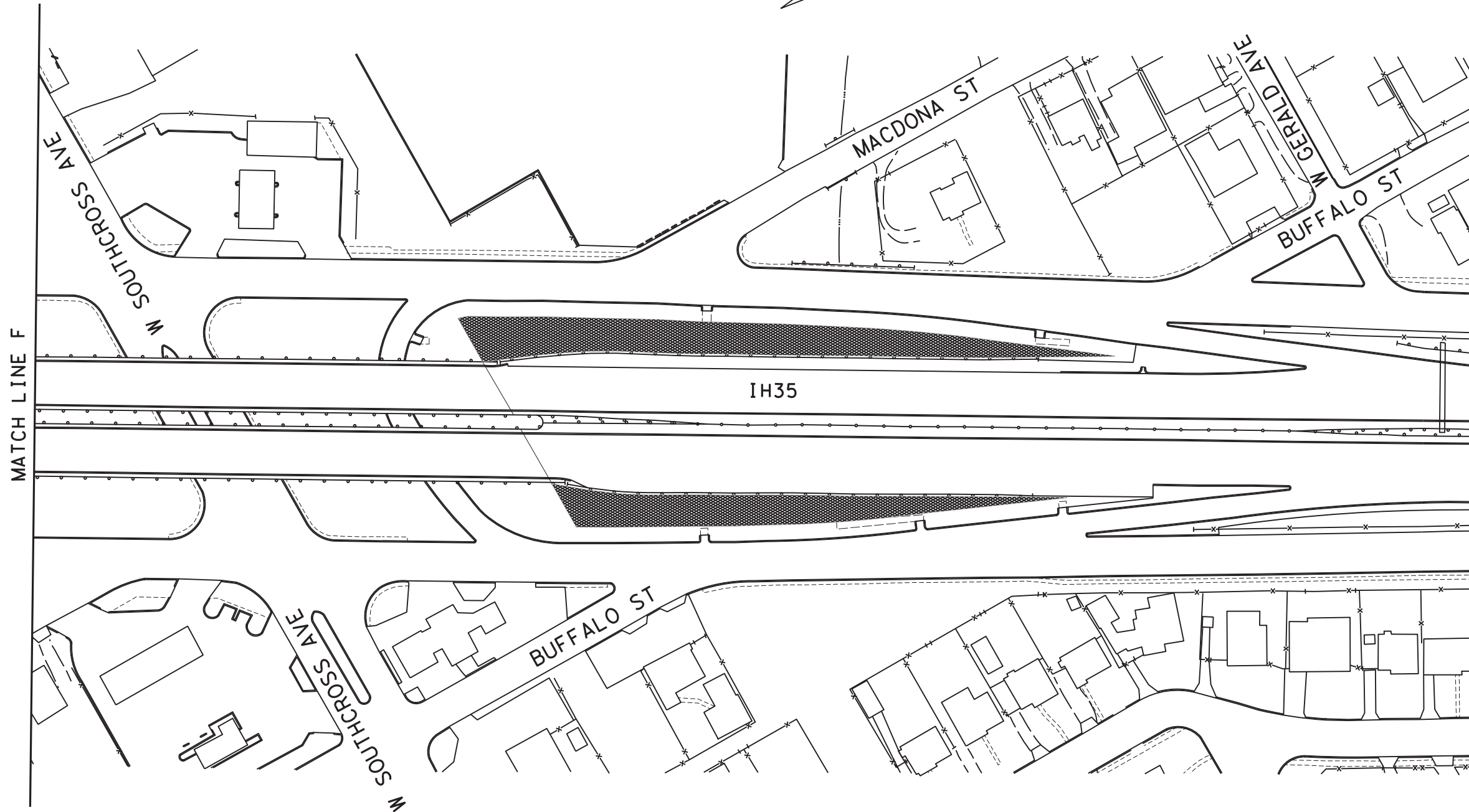
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IH 35
 TRACT #6
 MOWING LOCATION

SHEET 7 OF 28

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		57
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



LEGEND

 STEEP SLOPES REQUIRING SPECIAL MOWING TO AVOID DAMAGE TO VEGETATION

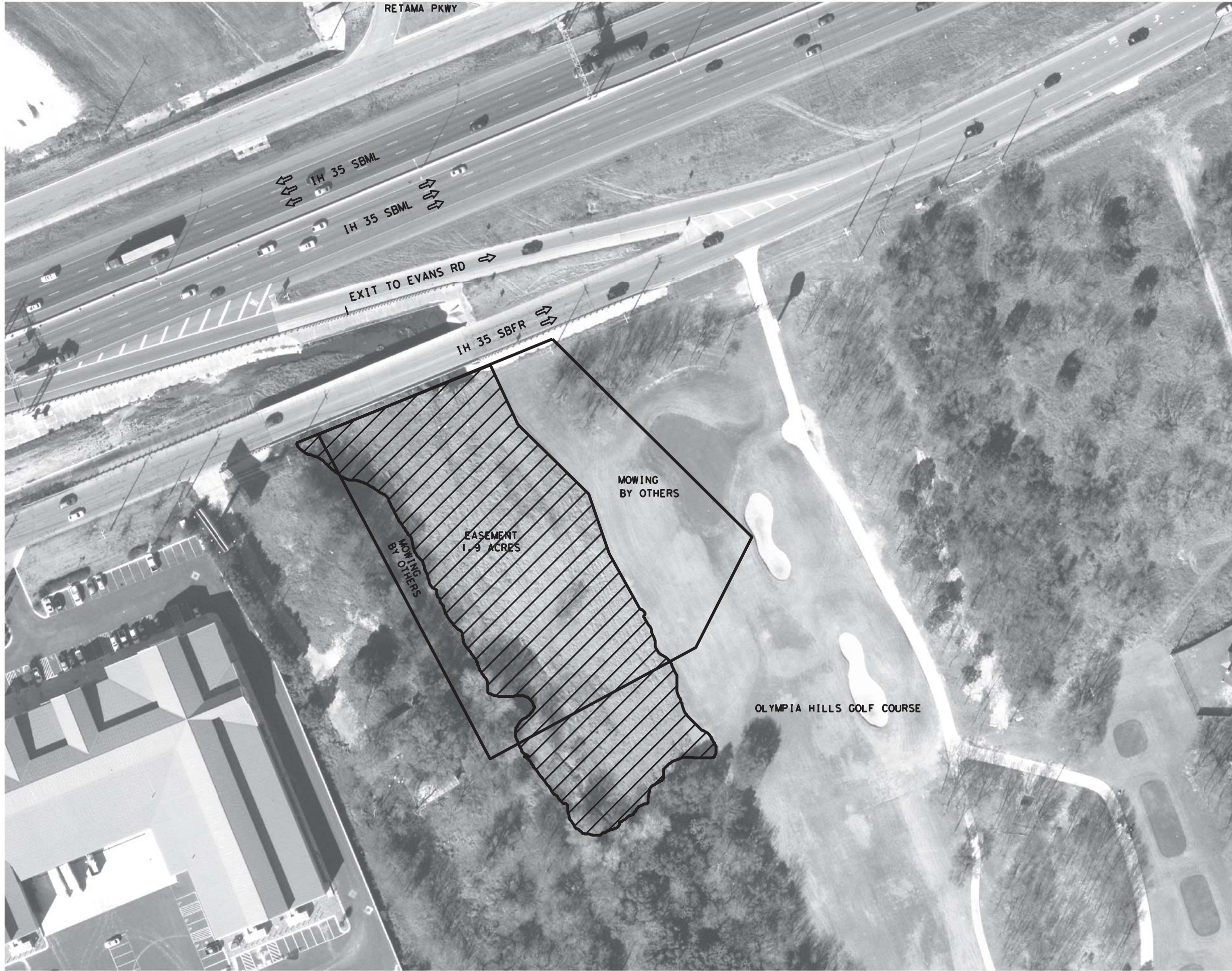
NOT TO SCALE



IH 35
TRACT #6
MOWING LOCATION

SHEET 8 OF 28

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		58
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



NOTE: AVOID DAMAGES IN THE EASEMENT DUE TO RUTTING UNDER WET CONDITIONS. OBTAIN APPROVAL FROM THE ENGINEER PRIOR TO MOWING THIS EASEMENT.



COORDINATES:
LAT. 29.5796
LON. -98.3137

- LEGEND**
-  CHAIN LINK FENCE
 -  MOWING AREA

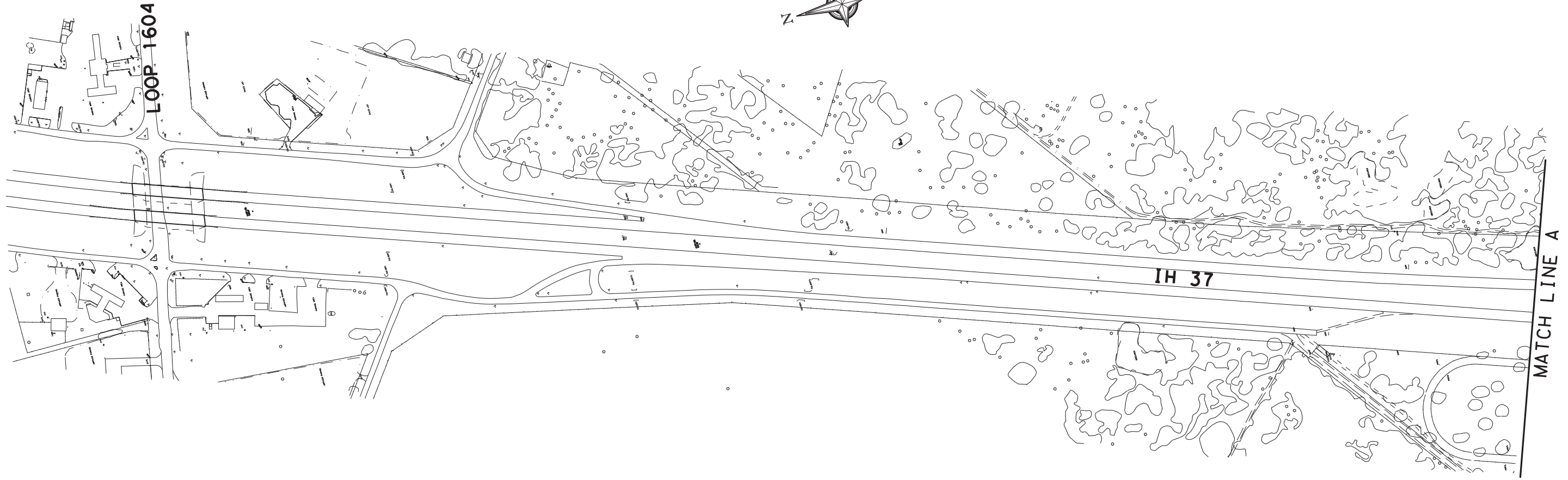
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**IH 35
at OLYMPIA HILLS
TRACT #8
MOWING LOCATION**

SHEET 9 OF 26

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		59
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



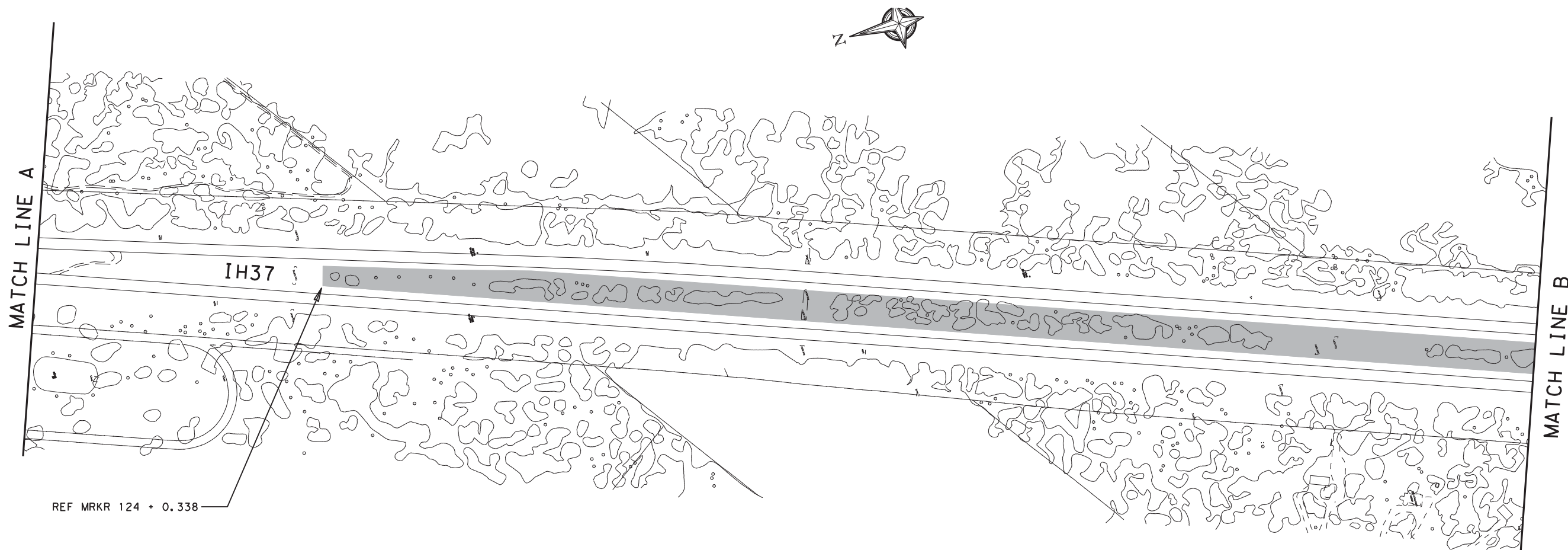
LEGEND
 ■ NON-MOW AREA

NOT TO SCALE



**IH 37
 TRACT #9
 MOWING LOCATION**
 SHEET 10 OF 28

FED. DIV. NO.		PROJECT		SHEET NO.	
6		RMC 6372-50-001		60	
STATE		DIST.		COUNTY	
TEXAS		SAT		BEXAR	
CONT.		SECT.		JOB	
6372		50		001	
				HIGHWAY NO.	
				VAR	



LEGEND

■ NON-MOW AREA

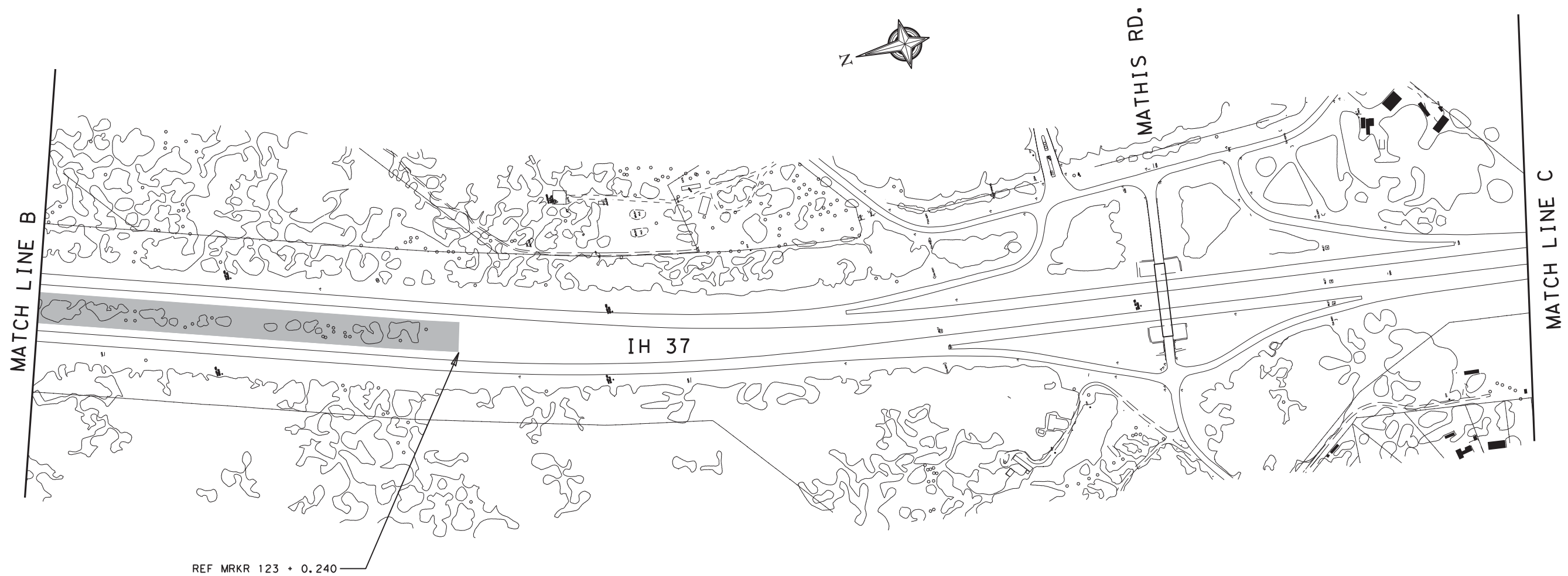
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IH 37
TRACT #9
MOWING LOCATION

SHEET 11 OF 28

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		61
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



LEGEND

■ NON-MOW AREA

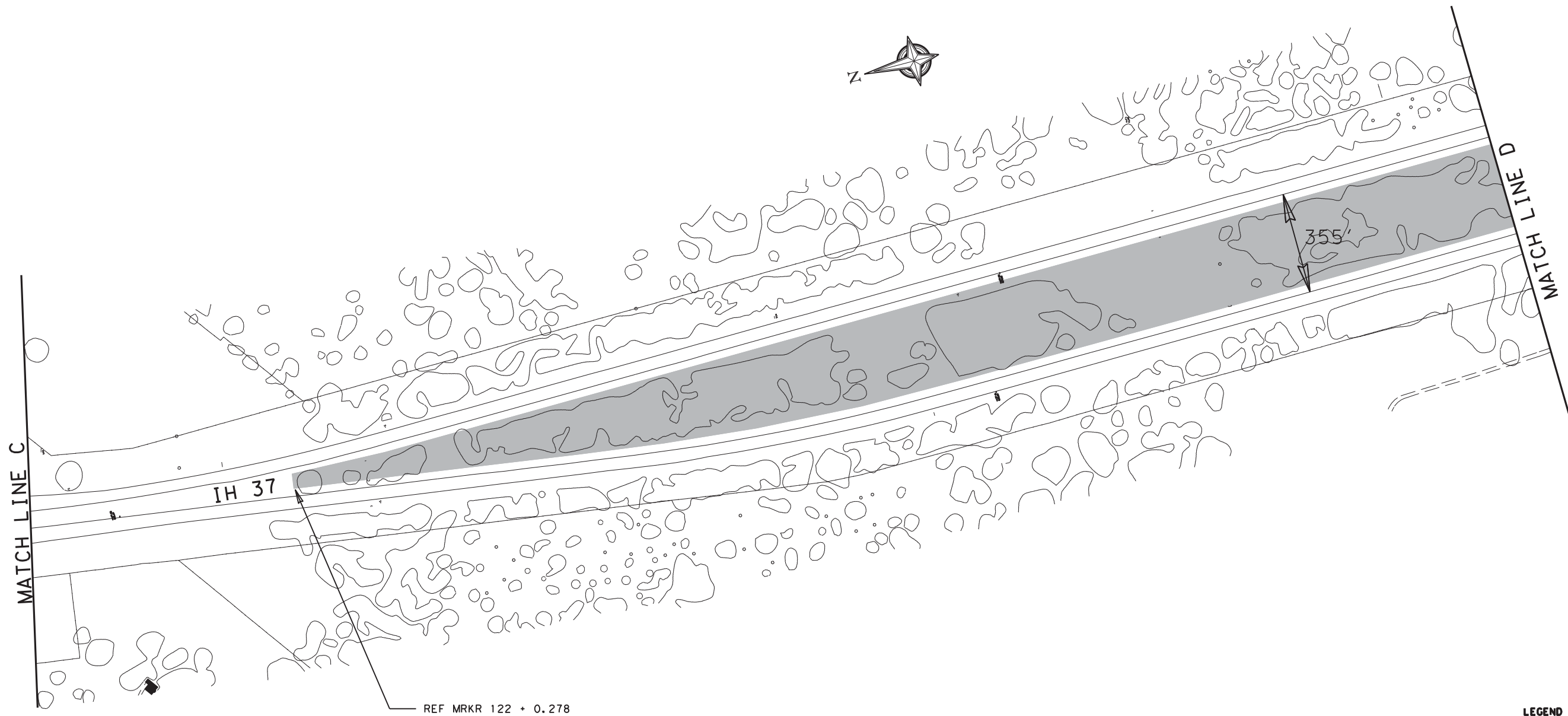
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**IH 37
TRACT #9
MOWING LOCATION**

SHEET 12 OF 28

FED. RD. DIV. NO.		PROJECT		SHEET NO.	
6		RMC 6372-50-001		62	
STATE		DIST.		COUNTY	
TEXAS		SAT		BEXAR	
CONT.		SECT.		JOB	
6372		50		001	
				HIGHWAY NO.	
				VAR	



LEGEND

NON-MOW AREA

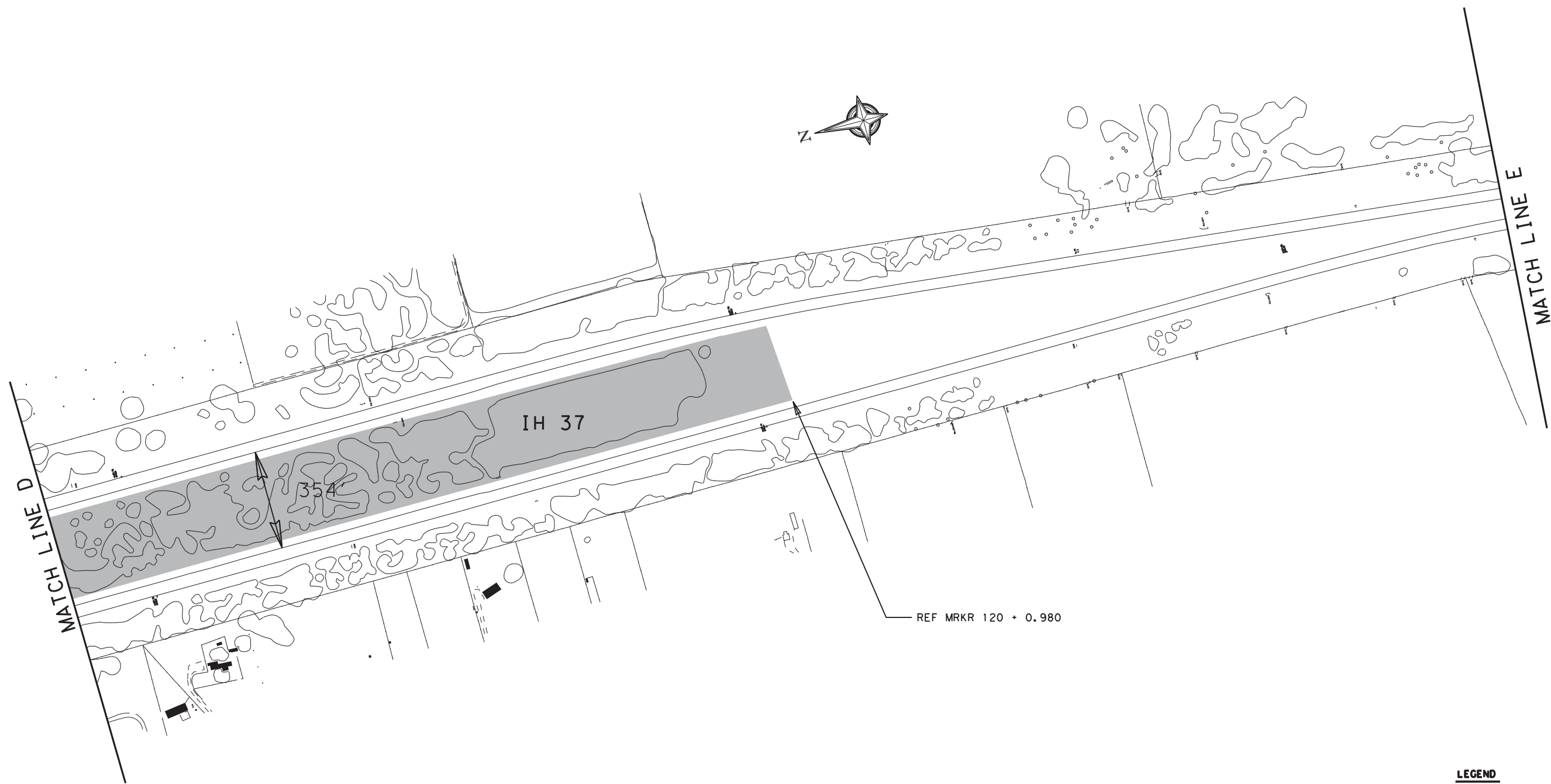
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**IH 37
TRACT #9
MOWING LOCATION**

SHEET 13 OF 28

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		63
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



LEGEND

■ NON-MOW AREA

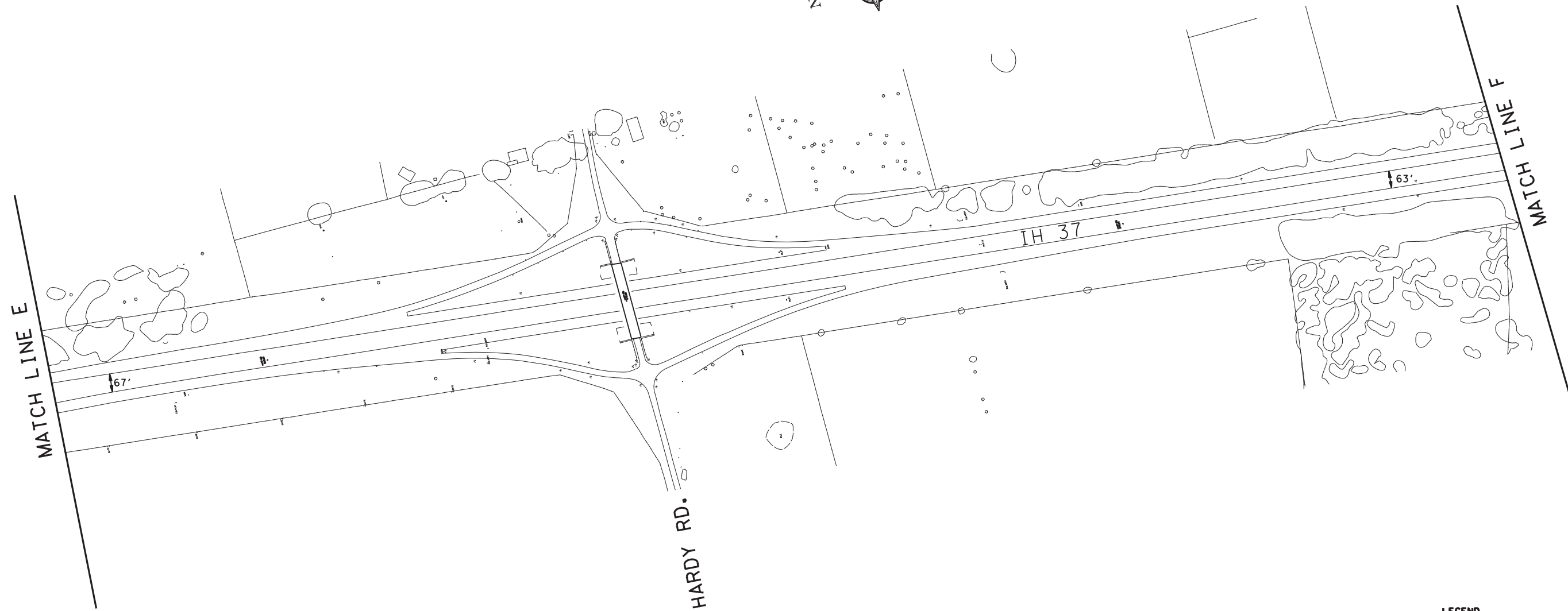
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**IH 37
TRACT #9
MOWING LOCATION**

SHEET 14 OF 28

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6	RMC 6372-50-001		64
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



LEGEND

NON-MOW AREA

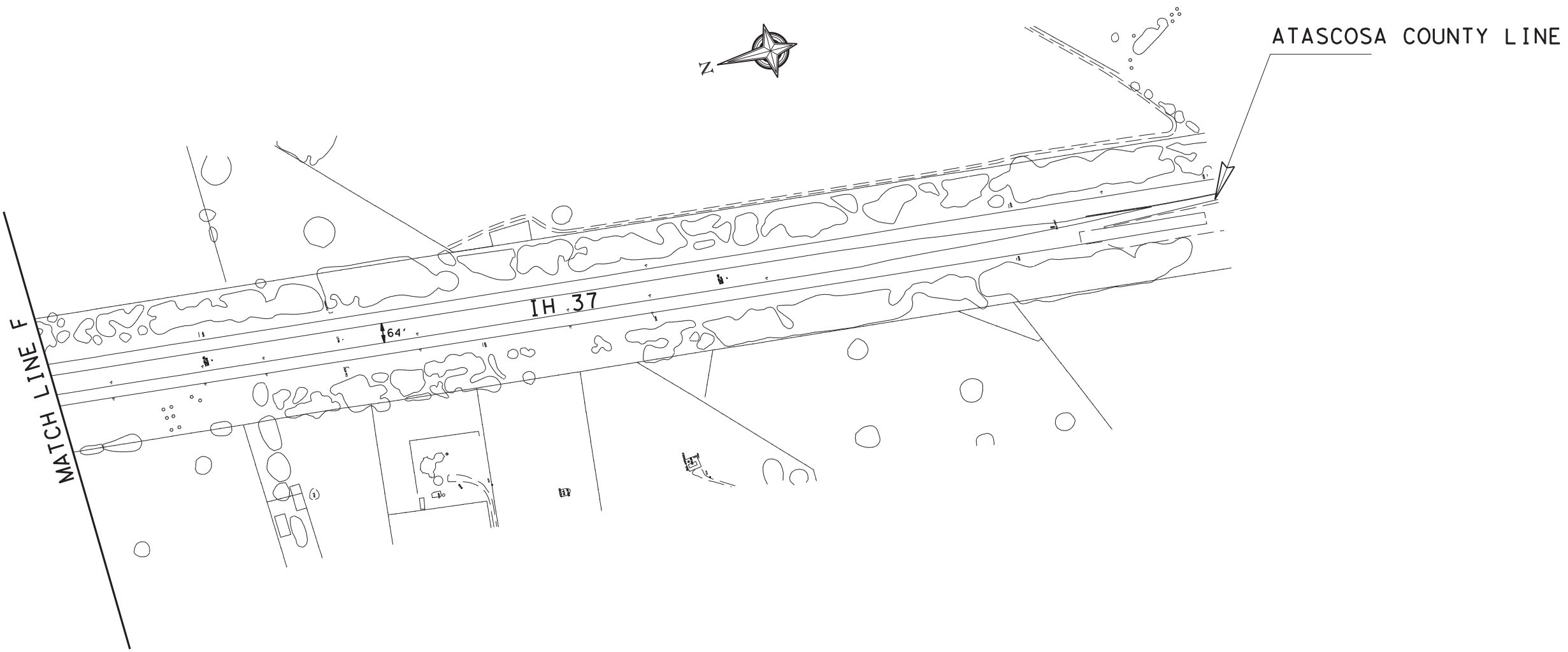
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**IH 37
TRACT #9
MOWING LOCATION**

SHEET 15 OF 28

FED. RD. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		65
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



LEGEND

NON-MOW AREA

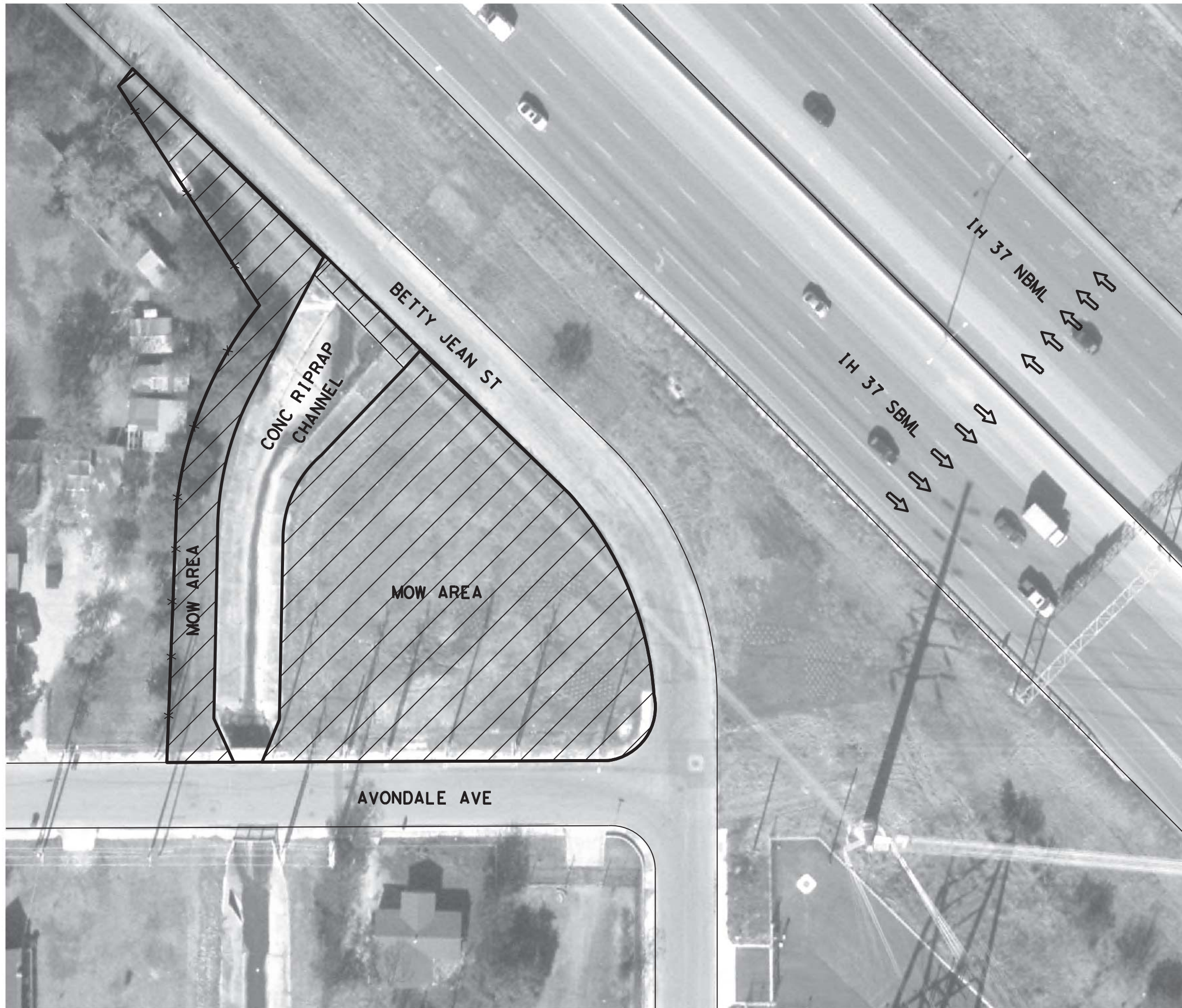
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**IH 37
TRACT #9
MOWING LOCATION**

SHEET 16 OF 28

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		66
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



- LEGEND**
-  CHAIN LINK FENCE
 -  MOWING AREA

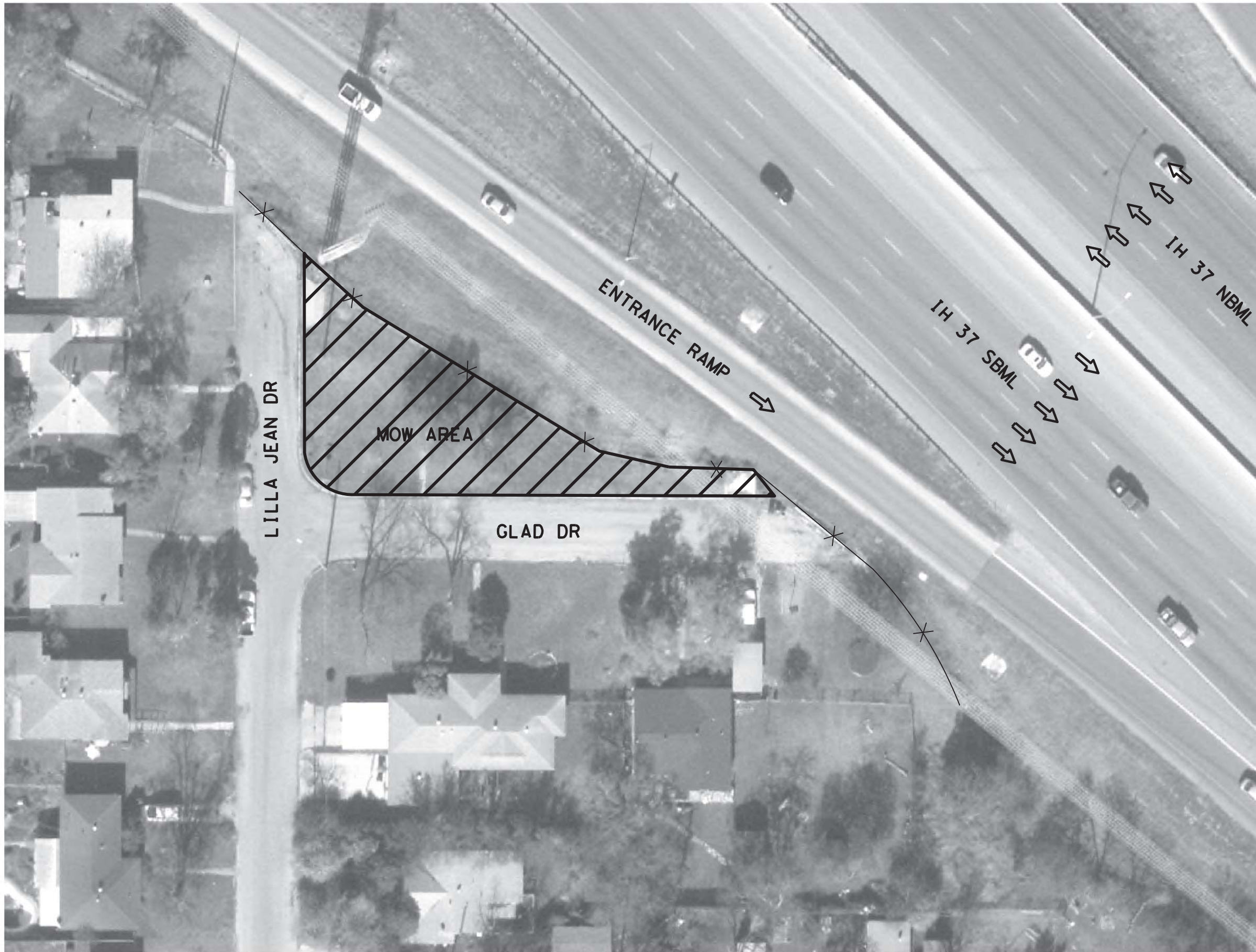
NOT TO SCALE



**IH 37
at BETTY JEAN ST
TRACT #10
MOWING LOCATION**

SHEET 17 OF 28

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		67
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



- LEGEND**
-  CHAIN LINK FENCE
 -  MOWING AREA

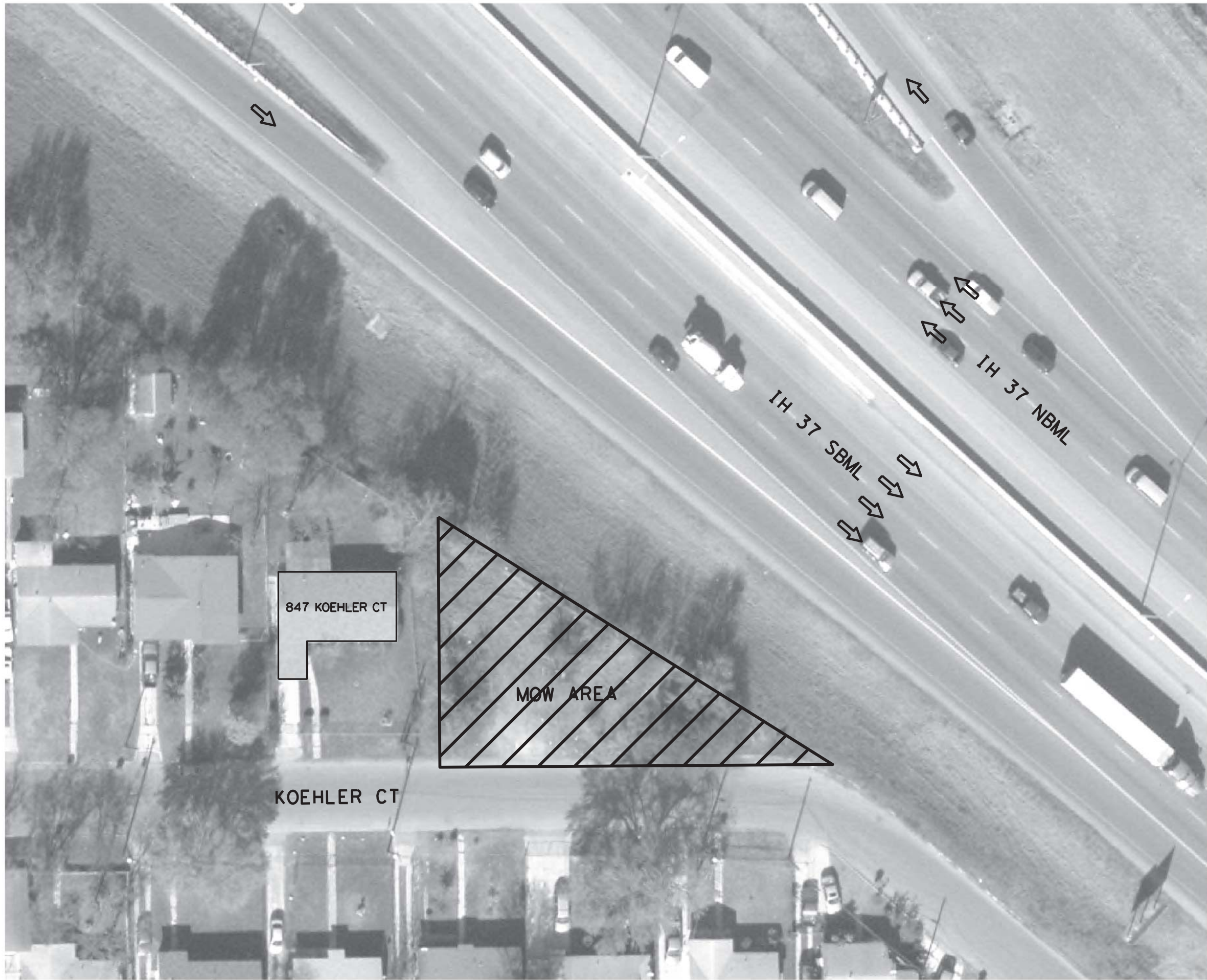
NOT TO SCALE



**IH 37
at GLAD DR
TRACT #10
MOWING LOCATION**

SHEET 18 OF 28

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		68
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



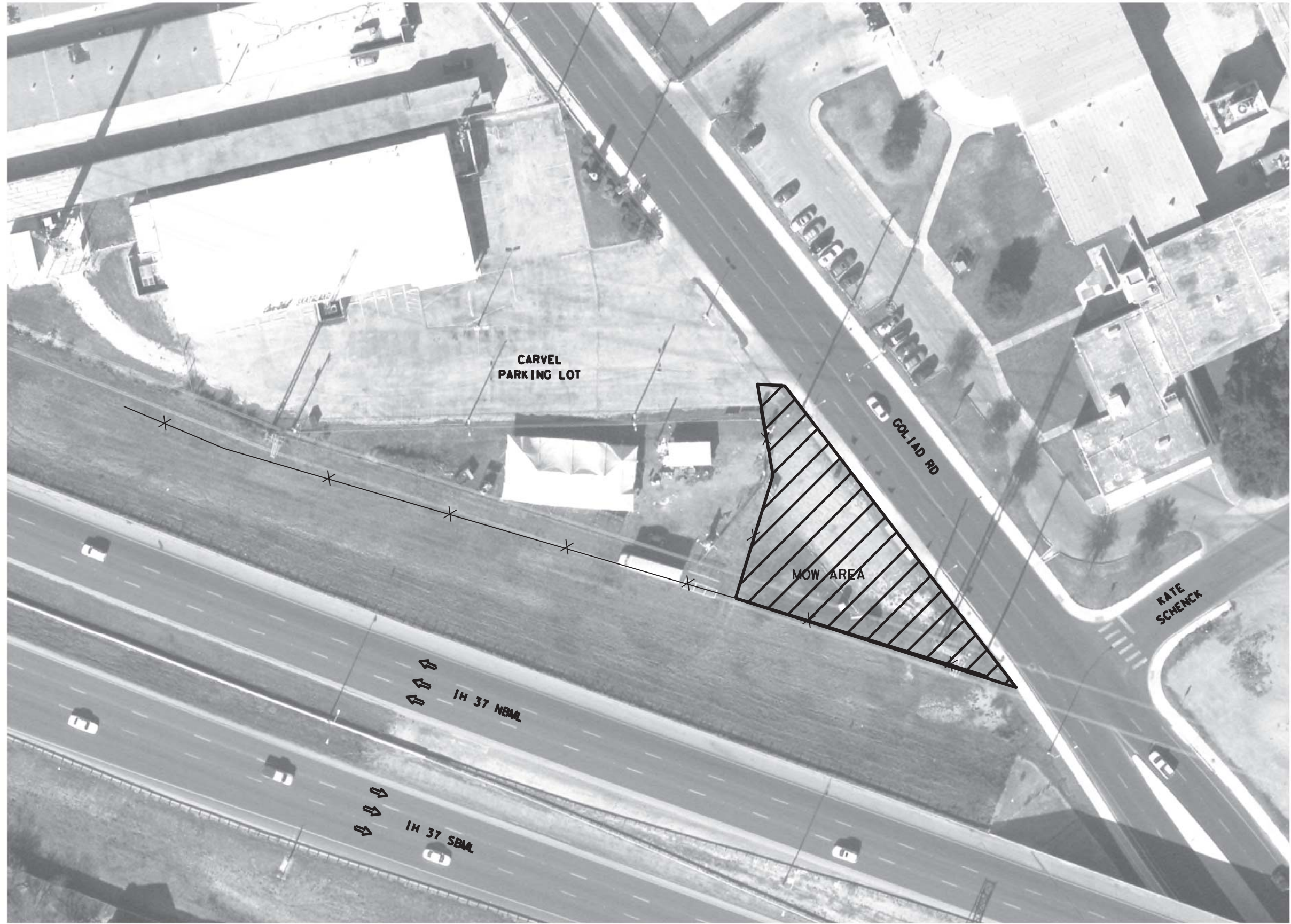
- LEGEND**
-  CHAIN LINK FENCE
 -  MOWING AREA

NOT TO SCALE



IH 37
at KOEHLER CT
TRACT #10
MOWING LOCATION
 SHEET 19 OF 28

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		69
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



- LEGEND**
- CHAIN LINK FENCE
 - MOWING AREA

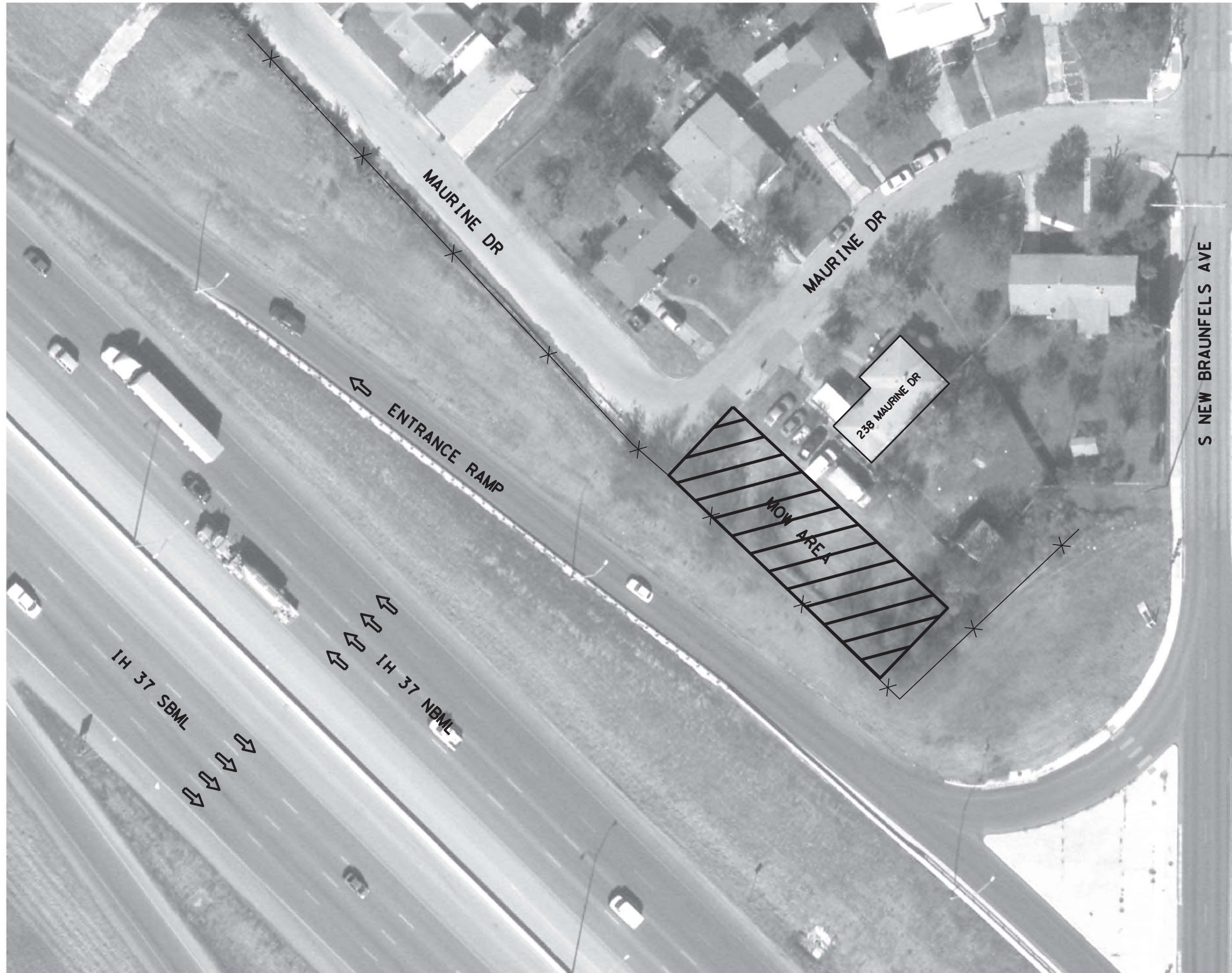
NOT TO SCALE



**IH 37
at GOLIAD RD
TRACT #10
MOWING LOCATION**

SHEET 20 OF 28

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		70
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



- LEGEND**
-  CHAIN LINK FENCE
 -  MOWING AREA

NOT TO SCALE



**IH 37
at MAURINE DR
TRACT#10
MOWING LOCATION**

SHEET 21 OF 28

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		71
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



- LEGEND**
-  CHAIN LINK FENCE
 -  MOWING AREA

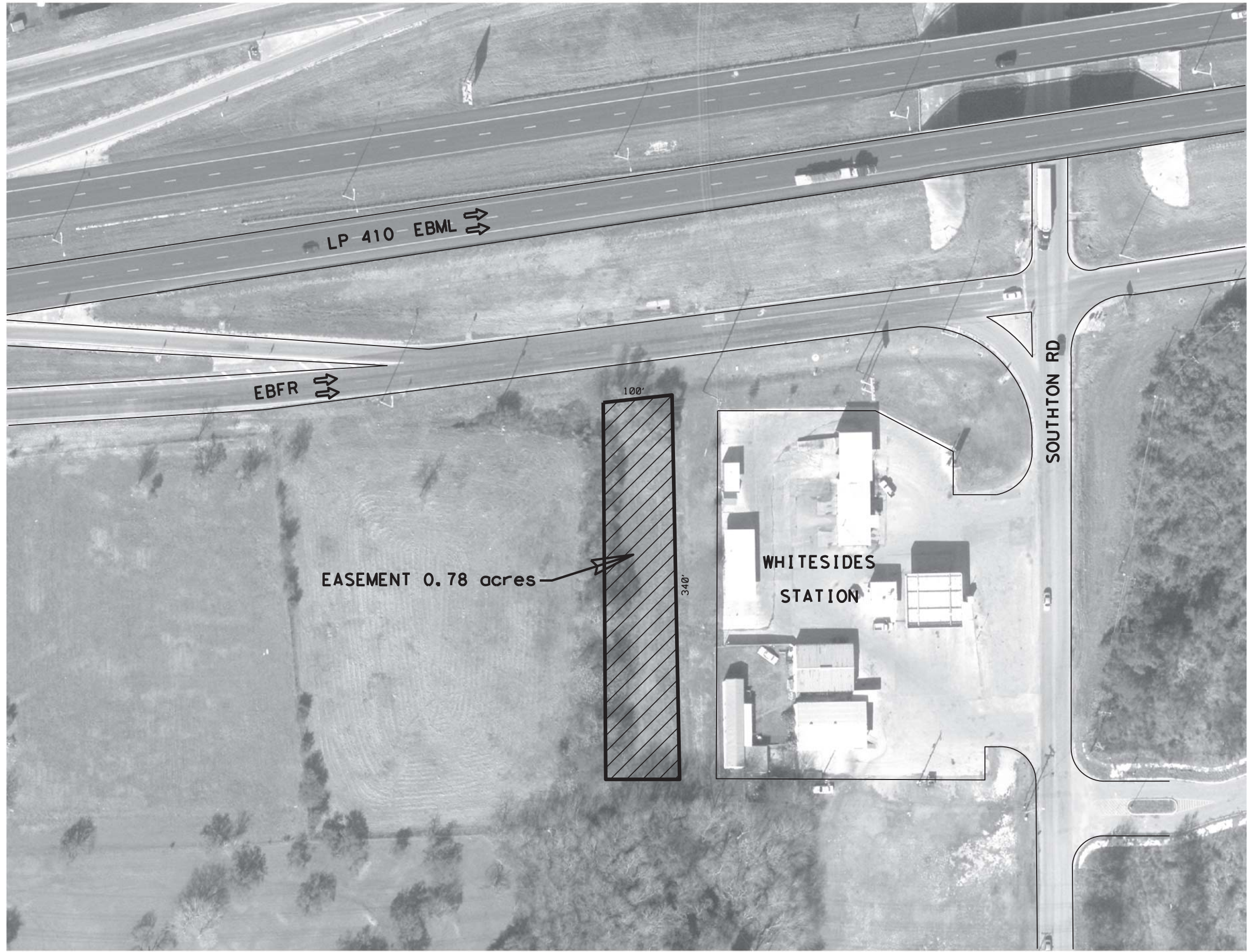
NOT TO SCALE



**IH 37
at MERRY ANN DR
TRACT #10
MOWING LOCATION**

SHEET 22 OF 28

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		72
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



- LEGEND**
-  CHAIN LINK FENCE
 -  MOWING AREA

NOT TO SCALE



**LP 410
of SOUTHTON RD
TRACT #12
EASEMENT MOW LOCATION**

SHEET 23 OF 28

FED. DIV. NO.		PROJECT		SHEET NO.	
6		RMC 6372-50-001		73	
STATE	DIST.	COUNTY			
TEXAS	SAT	BEXAR			
CONT.	SECT.	JOB	HIGHWAY NO.		
6372	50	001	VAR		



- LEGEND**
-  CHAIN LINK FENCE
 -  MOWING AREA

NOT TO SCALE



**US 281 SOUTH
0.85 MI S. OF LP 1604
TRACT #14
EASEMENT MOW LOCATION**

SHEET 24 OF 28

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		74
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR



- LEGEND**
-  CHAIN LINK FENCE
 -  MOWING AREA

NOT TO SCALE



**LP 1604
of MUD CREEK
TRACT #21
EASEMENT MOW LOCATION**

SHEET 25 OF 28

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		75
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR

NOTE: AVOID DAMAGING ROCK FILTER DAMS AND PIPE DRAINAGE SYSTEMS AND AVOID RUTTING IN BASIN AREAS.



COORDINATES:
LAT. 29.5410
LON. -98.4227

- LEGEND**
- CHAIN LINK FENCE
 - MOWING AREA

NOT TO SCALE

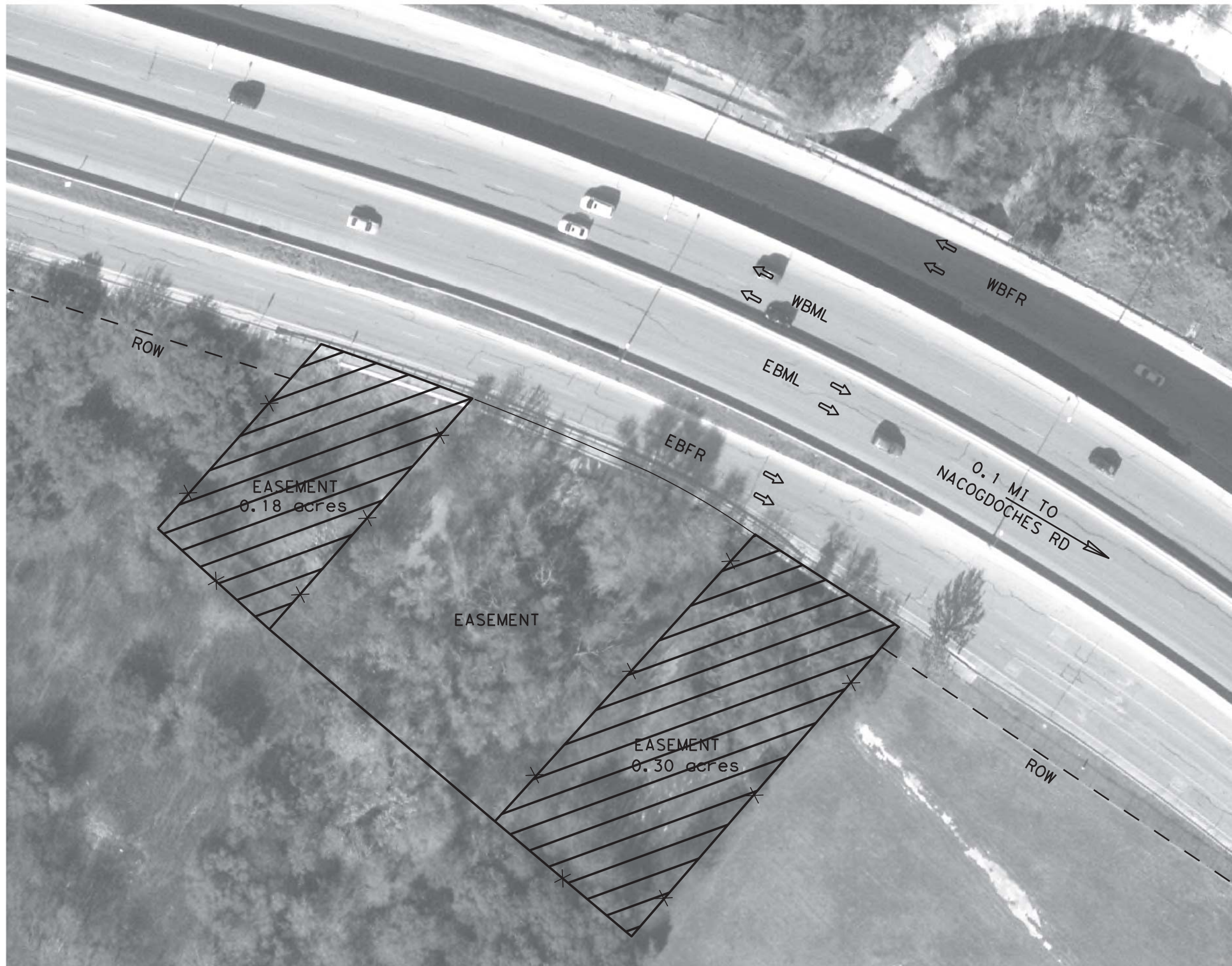


**WURZBACH PKWY
at WETMORE RD
TRACT #44
MOWING LOCATION**

SHEET 26 OF 28

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		76
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR

NOTE: AVOID DAMAGING BASIN DUE TO RUTTING IN BASIN AREAS. OBTAIN APPROVAL FROM THE ENGINEER PRIOR TO MOWING BASINS.



COORDINATES:
LAT. 29.5410
LON. -98.4227

- LEGEND**
-  CHAIN LINK FENCE
 -  MOWING AREA

NOT TO SCALE

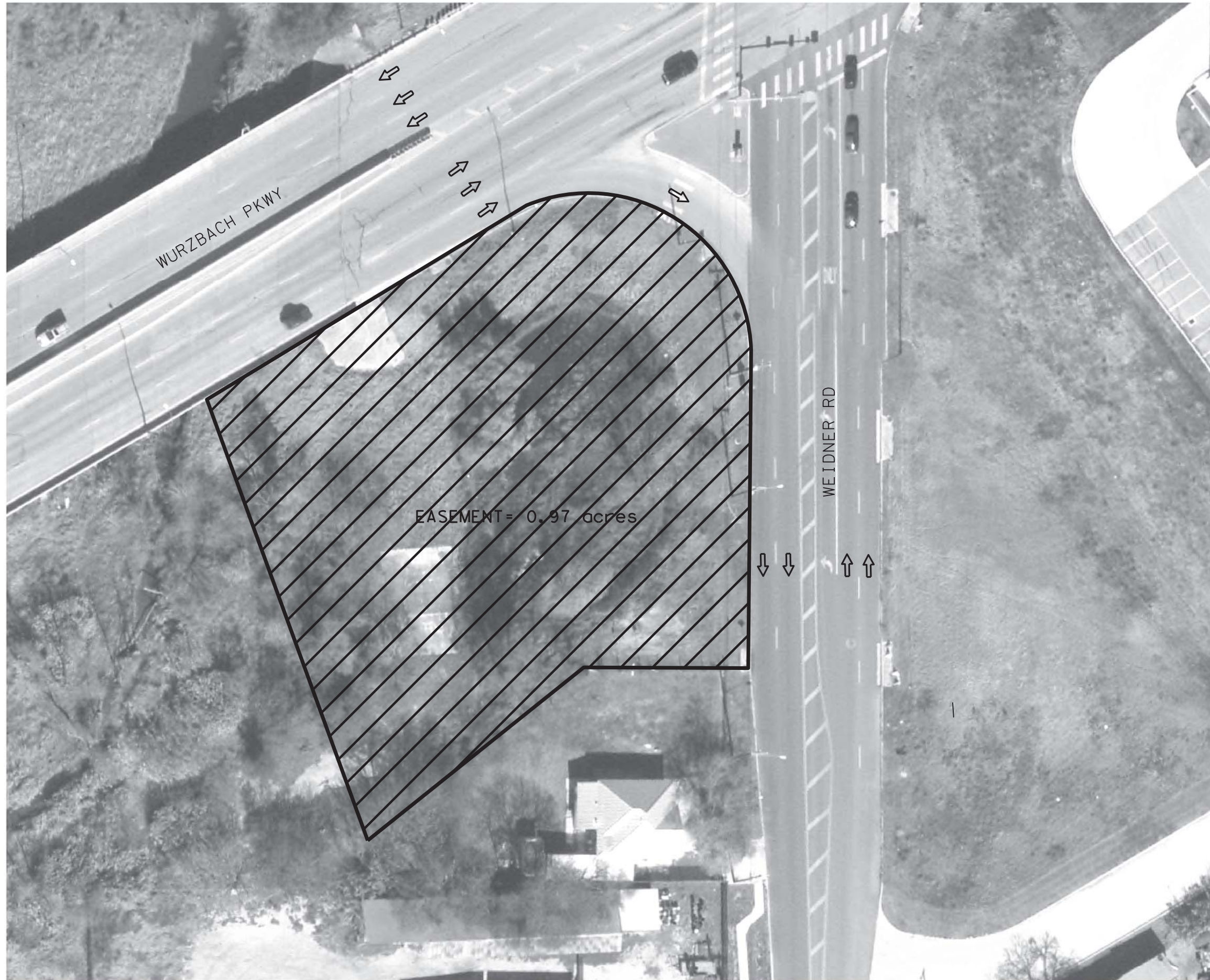


**WURZBACH PKWY
at NACOGDOCHES RD
TRACT #44
MOWING LOCATION**

SHEET 27 OF 28

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		77
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR

NOTE: AVOID DAMAGING BASIN DUE TO RUTTING IN BASIN AREAS. OBTAIN APPROVAL FROM THE ENGINEER PRIOR TO MOWING BASINS.



EASEMENT = 0.97 acres

WURZBACH PKWY

WEIDNER RD



COORDINATES:
 LAT. 29.5453
 LON. -98.3827

LEGEND

-  CHAIN LINK FENCE
-  MOWING AREA

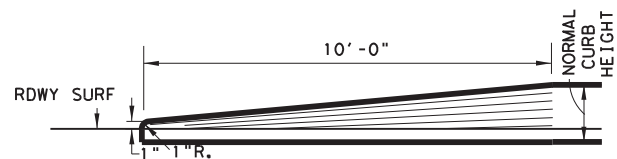


**WURZBACH PKWY
 at WEIDNER RD
 TRACT #44
 MOWING LOCATION**

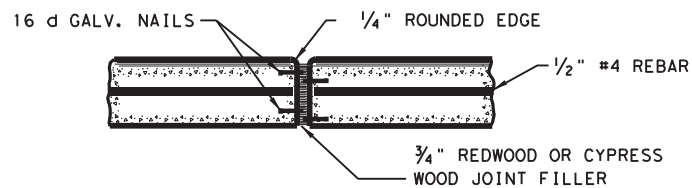
SHEET 28 OF 28

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		78
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR

NOTE: AVOID DAMAGING BASIN DUE TO RUTTING IN BASIN AREAS. OBTAIN APPROVAL FROM THE ENGINEER PRIOR TO MOWING BASINS.

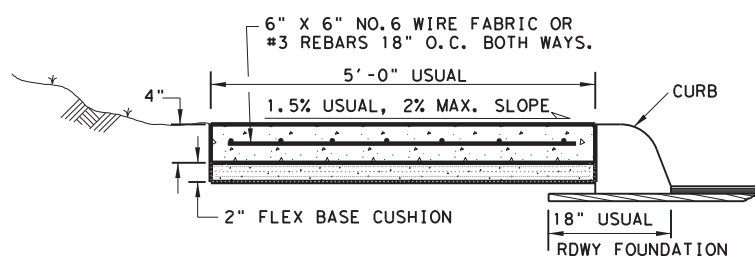


TRANSITION FOR CONCRETE CURB ENDS



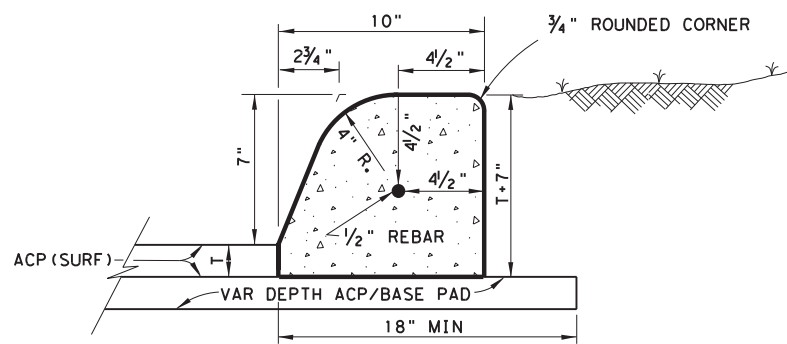
EXPANSION JOINTS TO BE PLACED AT BEGINNING AND END OF CURVES, DRIVEWAYS WHEELCHAIR RAMPS, INLETS, ILLUMINATION/SIGNAL FOUNDATIONS AND OTHER FIXED OBJECTS.

TYPICAL CURB EXPANSION JOINT DETAIL

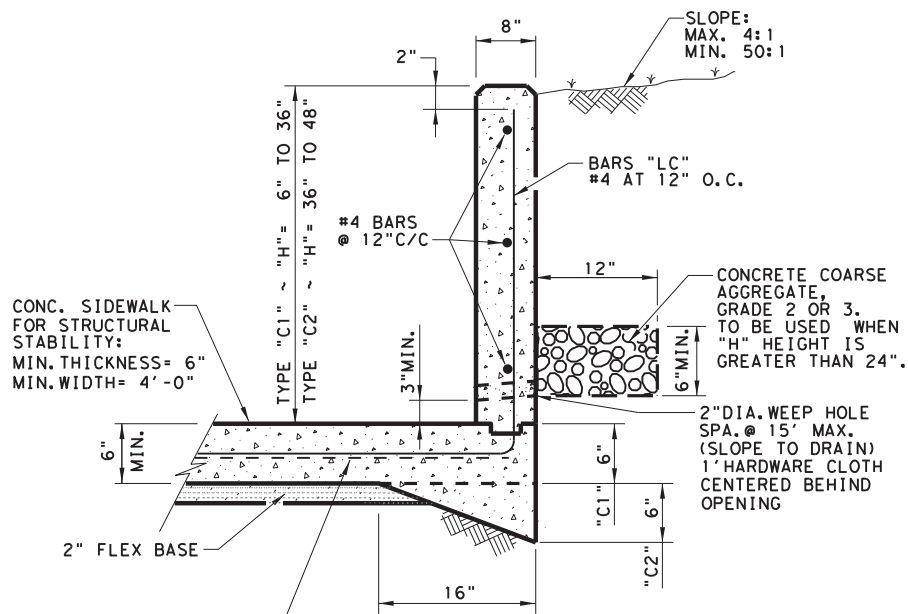


TYPICAL SIDEWALK SECTION

GROOVED JOINTS IN THE SIDE WALK SHALL BE AT A MAX. SPACING OF 10 FT. AND SHALL HAVE 3/4" EXPANSION JOINTS AT A MAX. SPACING OF 60' AND TO COINCIDE WITH THE CURB EXP. JOINTS.



CONCRETE CURB (TYPE 1)



TYPE "C1" & "C2" CURB

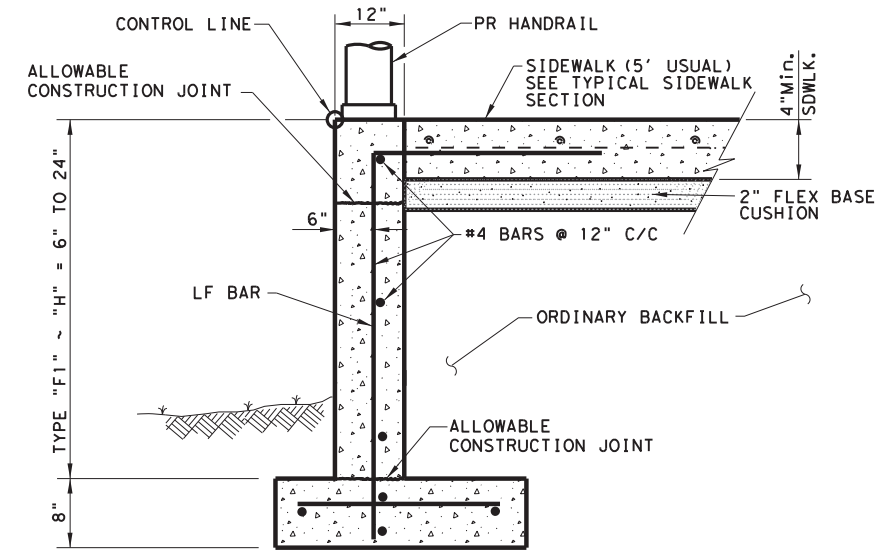
BAR "LC"

GENERAL NOTES:

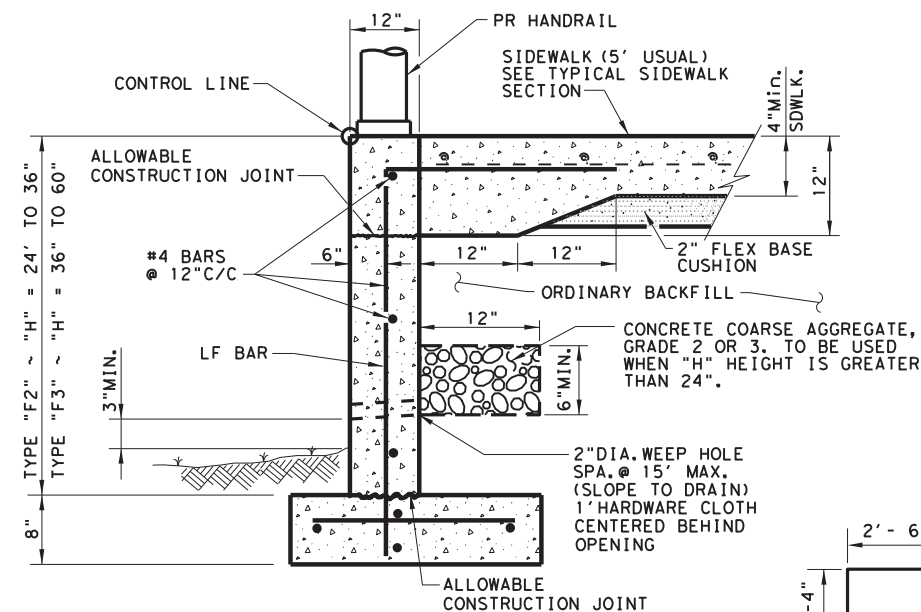
- All Concrete shall be Class "C".
- All Reinforcing Steel shall be Grade 60.
- † Until the sidewalk is complete, lateral support for the "F" curbs will be required.

DESIGN SOIL PARAMETERS:

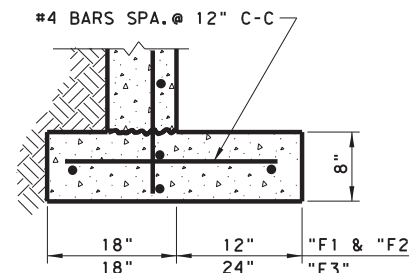
- Soil Unit Wt. = 120 pcf
- Phi = 30 Degrees
- Cohesion = 50 psf
- Min. PI = 15
- Max. PI = 30
- SURCHARGE:**
- TYPE F CURB q = 2' Adjacent to sidewalk
- Max. slope behind TYPE C Curb = 4:1
- Min. Factor of Safety against sliding is 1.5.
- Designed in accordance with current AASHTO Standards and Interim Specifications.



TYPE "F1" CURB †



TYPE "F2" & "F3" CURB †



FOOTING DETAIL

BAR "LF"

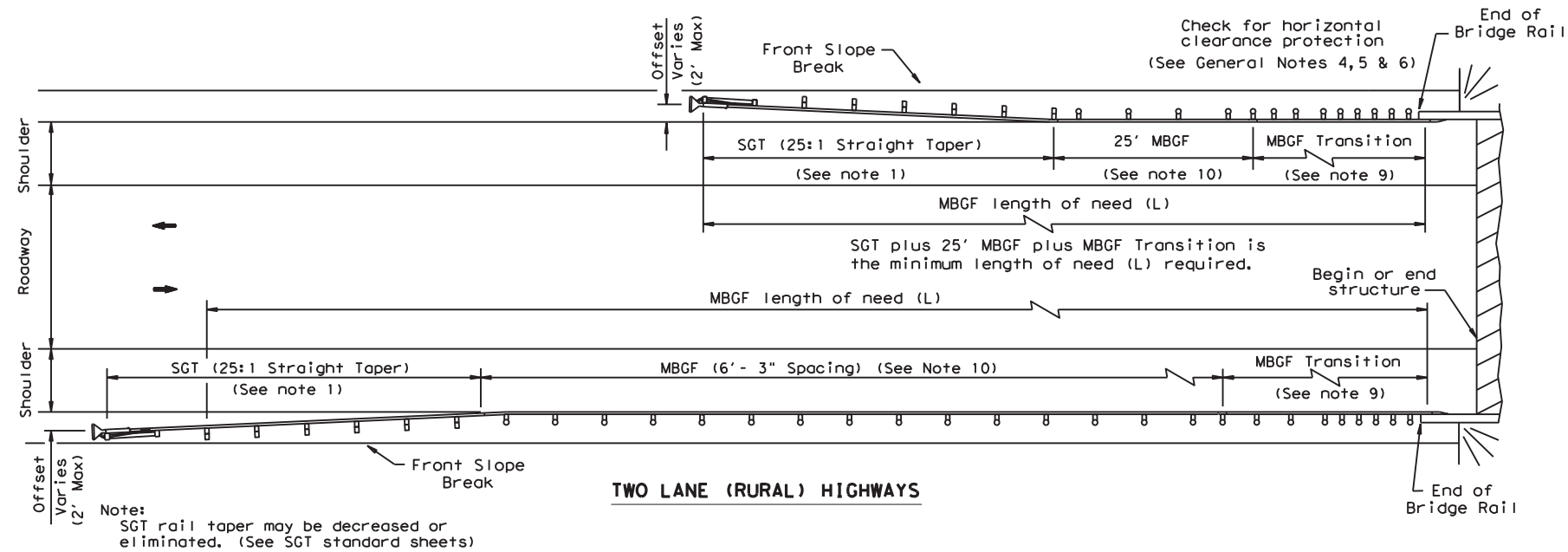
MISCELLANEOUS CURB AND SIDEWALK DETAILS

San Antonio District Standard

T:\Engdata\Standards\miscdet01.s.dgn		PREPARED BY AND FOR USE OF TxDOT.	
ORIGINAL DRAWING DATE:	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT SHEET
09-01-08	SAT	6	79
REVISIONS		COUNTY	CONTROL SECTION JOB HIGHWAY
		BEXAR	6372 50 001 VAR.

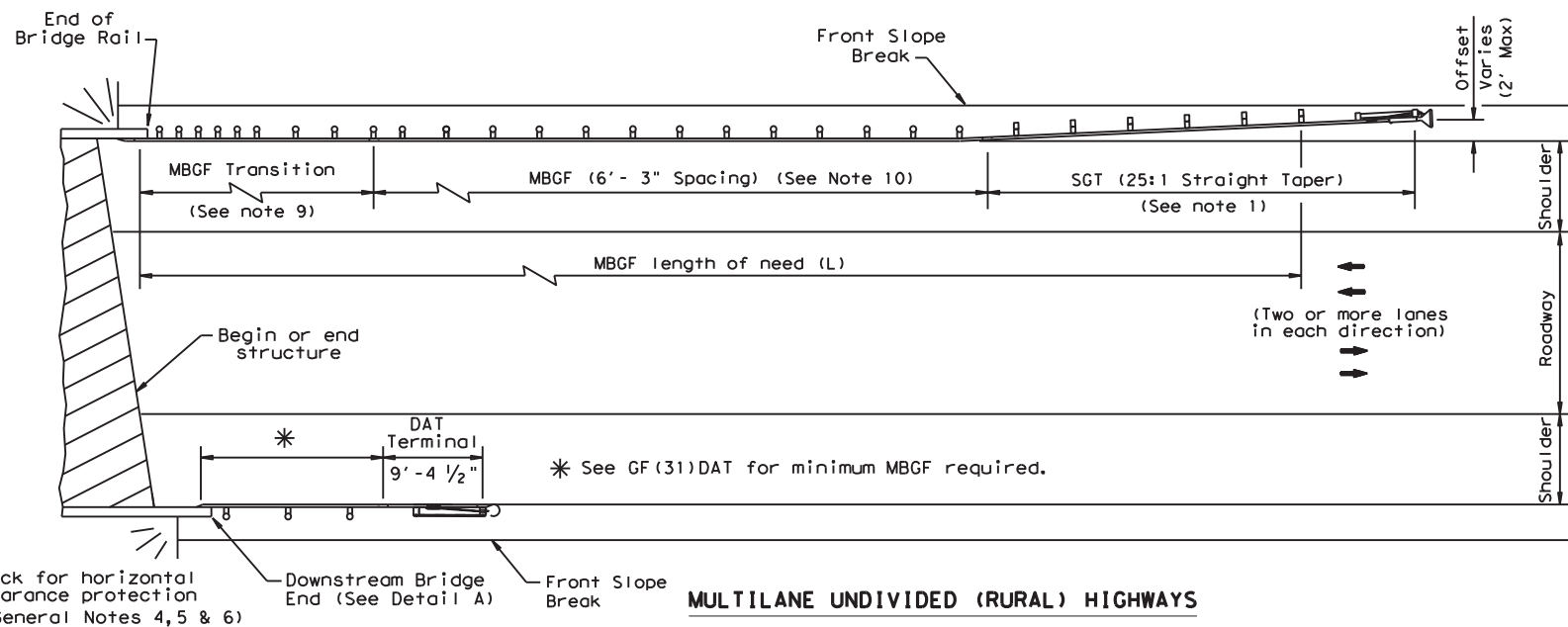
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:

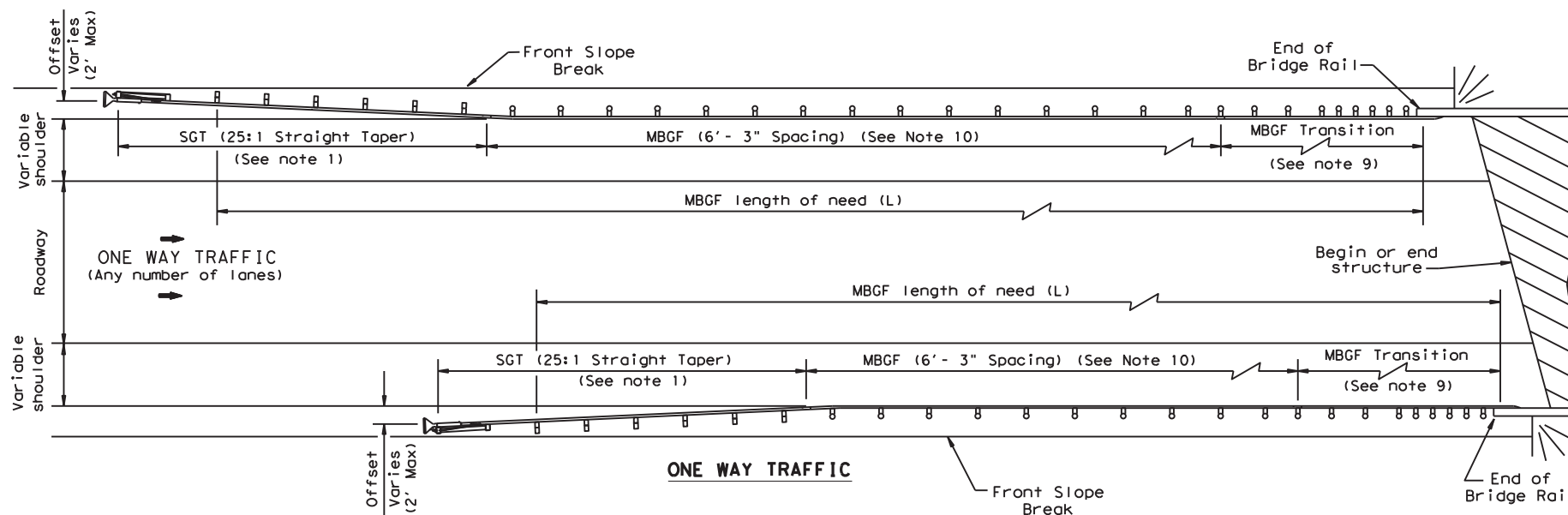


TWO LANE (RURAL) HIGHWAYS

Note:
SGT rail taper may be decreased or eliminated. (See SGT standard sheets)



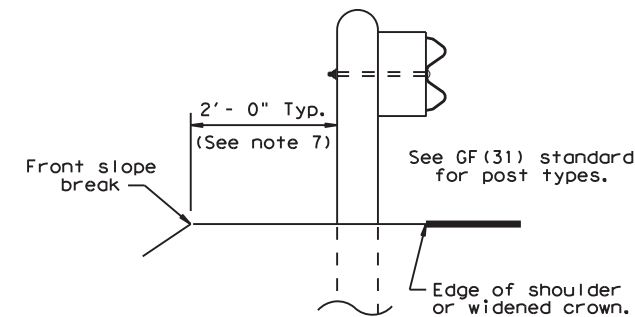
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



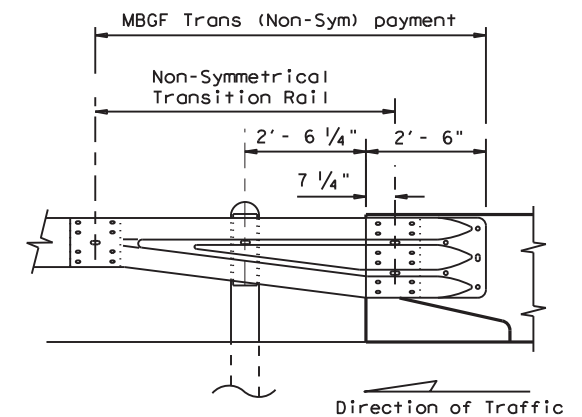
ONE WAY TRAFFIC

GENERAL NOTES

1. For more detail: See GF(31), SGT()31, GF(31)TR, and GF(31)TL2 standard sheets.
2. Quantities of metal beam guard fence (MBSG) at individual bridge ends are as shown in the plans.
3. Use average daily traffic (ADT) for the current year to determine MBSG length of need in accordance with the Roadway Design Manual unless otherwise specified. Where significant traffic volume growth is anticipated on low volume (0-750 ADT) highways, use length determinations for the higher volume category.
4. MBSG may not be required to shield departure end of bridge unless other obstacles within the horizontal clearance limits or opposing traffic indicate a MBSG consideration.
5. Downstream anchor terminals (DAT) are only for downstream end anchorage use, outside the horizontal clearance area of opposing traffic.
6. Direct connection of MBSG to concrete rails are only for downstream rail connections outside the horizontal clearance area of opposing traffic. (This requires a minimum of three standard line posts plus the DAT terminal, See Detail A)
7. The crown shall be widened to accommodate MBSG. Typically the "front slope" break should be 2'-0" from the back of the MBSG post. This applies to new construction on new alignment or where existing roadway cross section is to be widened to increase roadway width. This does not apply to rehabilitation work where existing roadway crown width is to be retained (See Typical Cross Section at MBSG).
8. For restrictive bridge widths: The MBSG should be properly transitioned from the existing bridge rail to the adjoining MBSG (See MBSG Transition Standards). Metal beam guard fence at these bridge locations shall be flared at the rate of 25:1 or flatter, and be of the length necessary to locate the terminal end at the 2 ft. "maximum" offset from the shoulder edge in the approach direction.
9. Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.
10. A minimum 25' length of MBSG will be required.



TYPICAL CROSS SECTION AT MBSG



Note:
All rail elements shall be lapped in the direction of adjacent traffic.

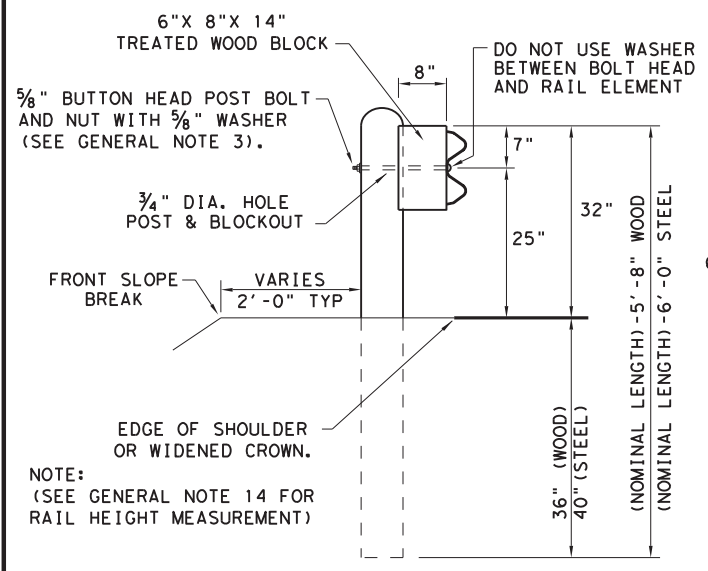
DETAIL A

Showing Downstream Rail Attachment

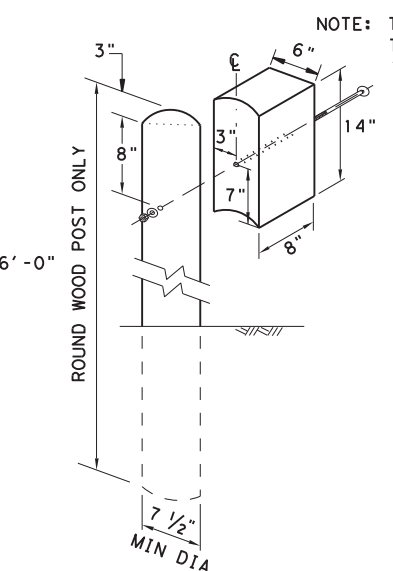
				Design Division Standard	
BRIDGE END DETAILS (METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)					
BED-14					
FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL	
© TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY	
REVISED APRIL 2014 SEE (MEMO 0414)	6372	50	001	VAR.	
	DIST	COUNTY		SHEET NO.	
	SAT	BEXAR		80	

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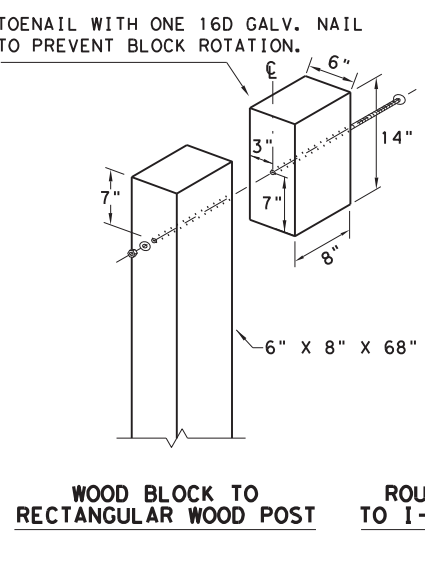
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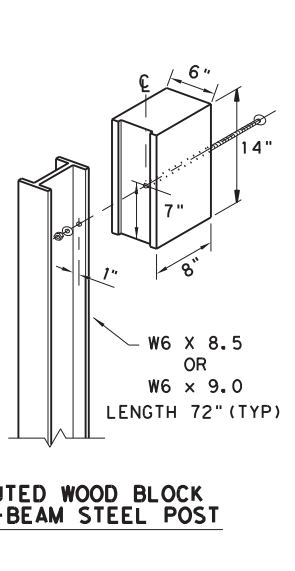
TYPICAL POST PLACEMENT



WOOD BLOCK TO ROUND WOOD POST



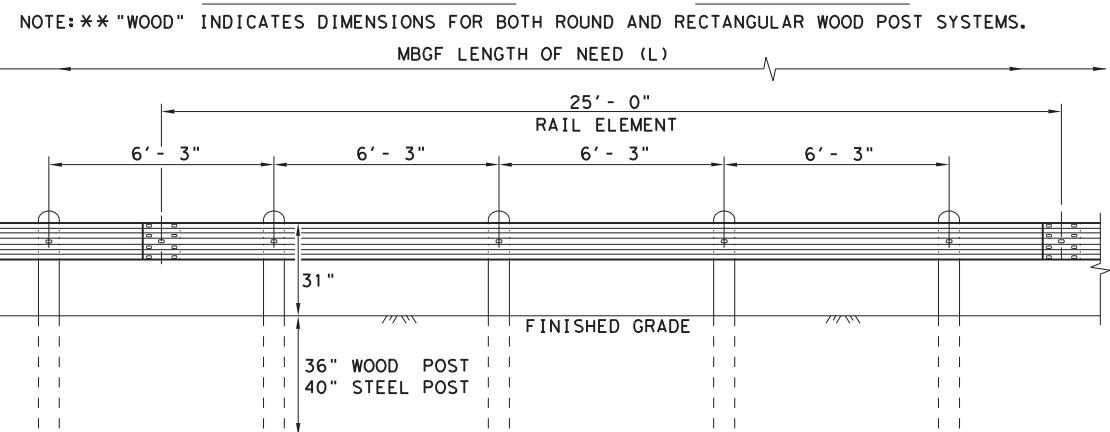
WOOD BLOCK TO RECTANGULAR WOOD POST



ROUTED WOOD BLOCK TO I-BEAM STEEL POST

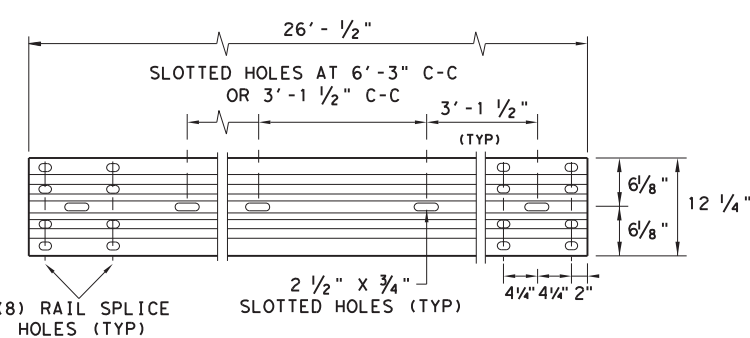
GENERAL NOTES

1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25'-0", OR 12'-6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'-1 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.
3. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND 3/8" WASHER (FWC160) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
6. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
8. UNLESS OTHERWISE SHOWN IN THE PLANS, GUARD FENCE PLACED IN THE VICINITY OF CURBS SHALL BE POSITIONED SO THAT THE FACE OF CURB IS LOCATED DIRECTLY BELOW OR BEHIND THE FACE OF THE RAIL. RAIL PLACED OVER CURBS SHALL BE INSTALLED SO THAT THE POST BOLT IS LOCATED APPROXIMATELY 25 INCHES ABOVE THE GUTTER PAN OR EDGE OF SHOULDER.
9. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. IF SOLID ROCK IS ENCOUNTERED WITHIN 0 TO 18" OF THE FINISHED GRADE, DRILL A 24" DIA. HOLE, 24" INTO THE ROCK. IF SOLID ROCK IS ENCOUNTERED BELOW 18", DRILL A 12" DIA. HOLE, 12" INTO THE ROCK OR TO THE STANDARD EMBEDMENT DEPTH, WHICHEVER MAYBE LESS. ANY EXCESS POST LENGTH, AFTER MEETING THESE DEPTHS, MAY BE FIELD CUT TO ENSURE PROPER GUARDRAIL MOUNTING HEIGHT. BACKFILL WITH COARSE AGGREGATE MATERIAL.
10. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
11. SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 150 FT. RADIUS.
12. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210 ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
- 13.



ELEVATION MID-SPAN RAIL SPLICE

SHOWING A 25' - 0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



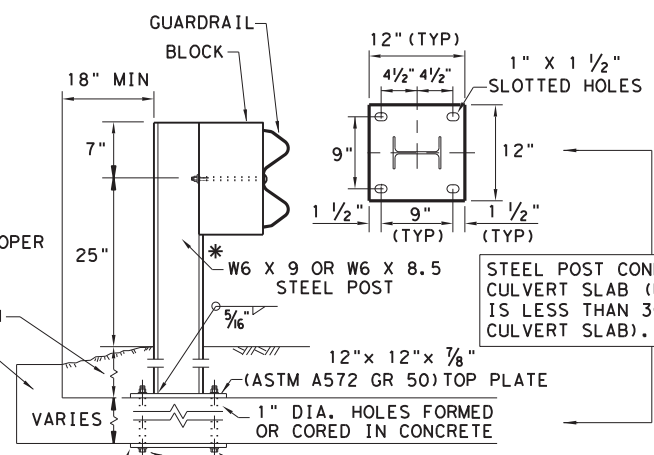
ELEVATION 25' - 0" (NOM.) W-BEAM SECTION

NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES. SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.

* POST(S) MAY REQUIRE FIELD MODIFICATION TO ENSURE PROPER GUARDRAIL HEIGHT.

12" x 12" x 1/4" (ASTM A36) STEEL BOTTOM PLATE WITH 1" DIA. HOLES REQUIRED WITH BOLT-THROUGH INSTALLATION.

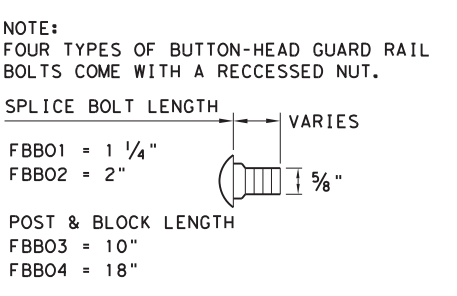
LOW FILL CULVERT POST



NOTE: TWO INSTALLATION OPTIONS.

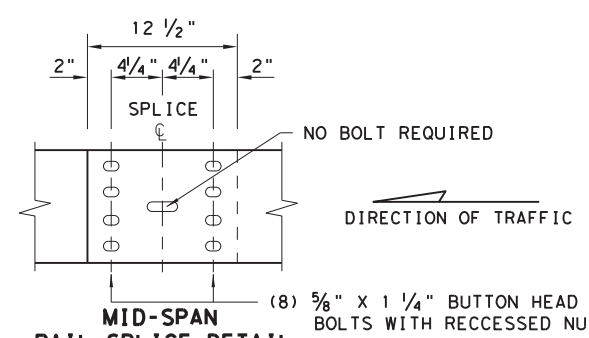
1. **BOLT-THROUGH OPTION:** REQUIRES A 6" MIN. SLAB THICKNESS. 7/8" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS. NOTE: BOLT LENGTH = SLAB PLUS 2 1/4" MIN.
2. **EPOXY ANCHOR OPTION:** THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR 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.



BUTTON HEAD BOLT

NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.



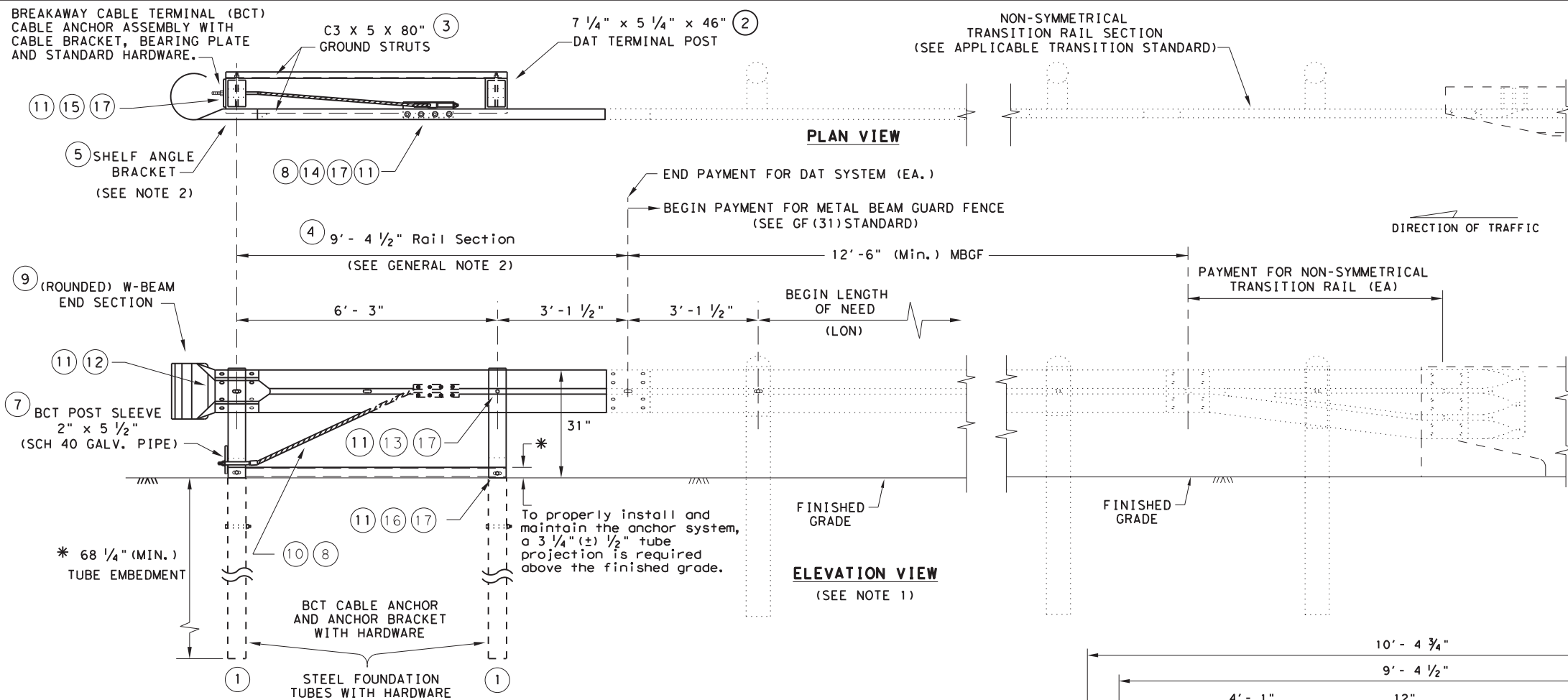
MID-SPAN RAIL SPLICE DETAIL

NOTE: GF(31), MID-SPAN RAIL SPLICES ARE REQUIRED WITH 6'-3" POST SPACINGS.

				Design Division Standard
METAL BEAM GUARD FENCE TL-3 MASH COMPLIANT GF(31)-19				
FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
© TXDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	OOI	VAR.
	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	81	

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DATE: FILE:

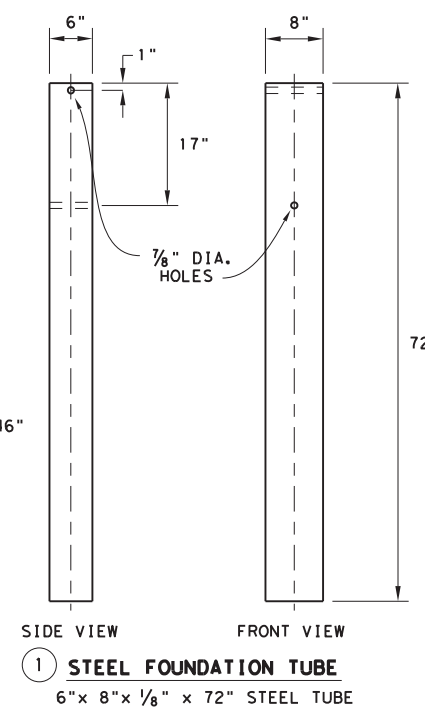
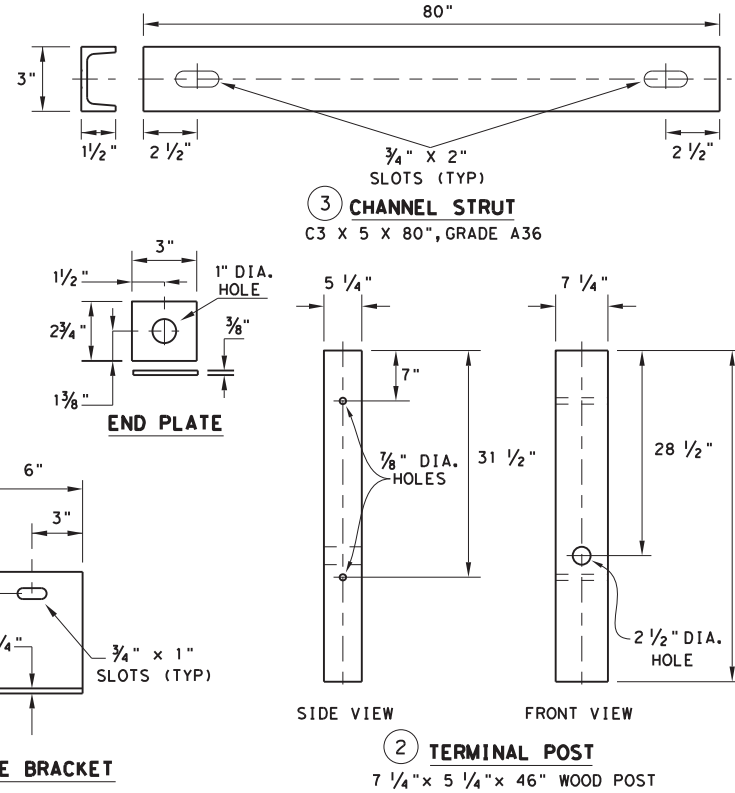
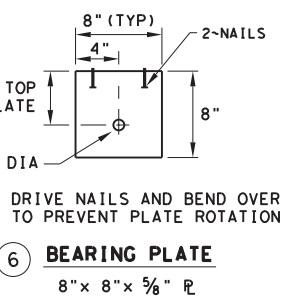
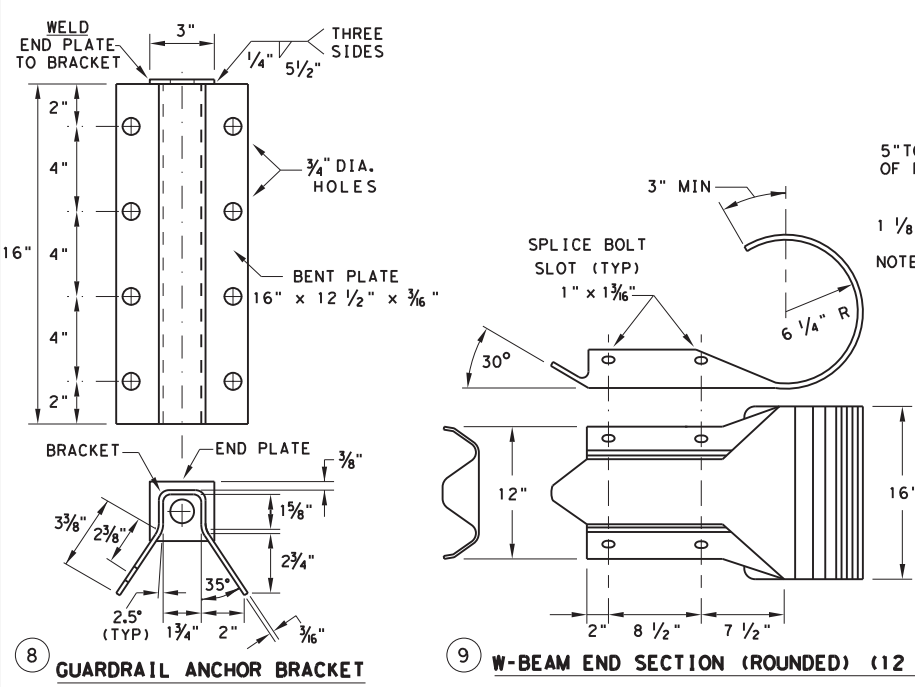
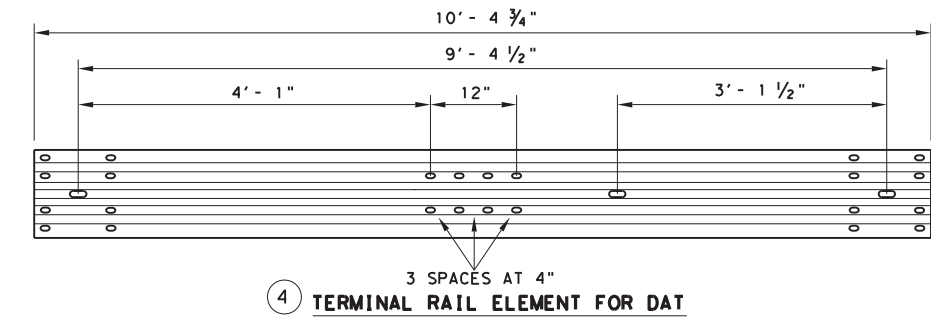


DOWNSTREAM ANCHOR TERMINAL (DAT)
NOTE: ONLY FOR DOWNSTREAM USE, WHEN LOCATED OUTSIDE THE HORIZONTAL CLEARANCE AREA OF OPPOSING TRAFFIC.

- GENERAL NOTES**
1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
 2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
 3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN 3 3/4" ABOVE THE FINISHED GRADE.
 4. ALL HARDWARE FOR DAT SHALL BE ASTM A307 UNLESS OTHERWISE SHOWN.
 5. REFER TO GF(31) SHEET FOR TERMINAL CONNECTION DETAILS.

MOW STRIP INSTALLATION
IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

#	(DAT) PARTS LIST	QTY
1	STEEL FOUNDATION TUBE	2
2	DAT TERMINAL POST	2
3	CHANNEL STRUT	2
4	TERMINAL RAIL ELEMENT	1
5	SHELF ANGLE BRACKET	1
6	BCT BEARING PLATE	1
7	BCT POST SLEEVE	1
8	GUARDRAIL ANCHOR BRACKET	1
9	(ROUNDED) W-BEAM END SECTION	1
10	BCT CABLE ANCHOR	1
11	RECESSED NUT, GUARDRAIL	20
12	1 1/4" BUTTON HEAD BOLT	4
13	10" BUTTON HEAD BOLT	2
14	5/8" X 2" HEX HEAD BOLT	8
15	5/8" X 8" HEX HEAD BOLT	4
16	5/8" X 10" HEX HEAD BOLT	2
17	5/8" FLAT WASHER	18



Texas Department of Transportation
Design Division Standard

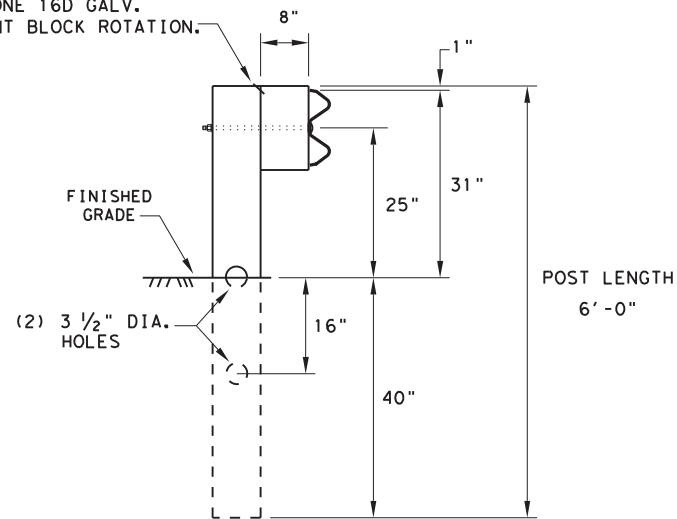
METAL BEAM GUARD FENCE (DOWNSTREAM ANCHOR TERMINAL) TL-3 MASH COMPLIANT GF(31)DAT-19

FILE: gf31dot19.dgn	DN: TXDOT	CK: KM	DW: VP	CK: CGL/AG
©TXDOT: NOVEMBER 2019 REVISIONS	CONT: 6372	SECT: 50	JOB: 001	HIGHWAY: VAR.
	DIST: SAT	COUNTY: BEXAR	SHEET NO.: 82	

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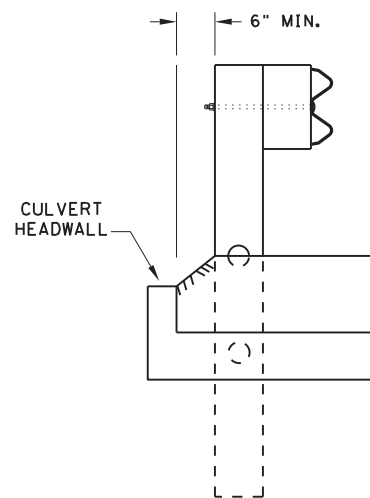
DATE:
 FILE:

NOTE: TOENAIL WITH ONE 16D GALV. NAIL TO PREVENT BLOCK ROTATION.



**RECTANGULAR CRT POST
(6" X 8" X 6' LONG)**

(6) CRT REQUIRED
SEE ELEVATION DETAIL FOR LOCATIONS



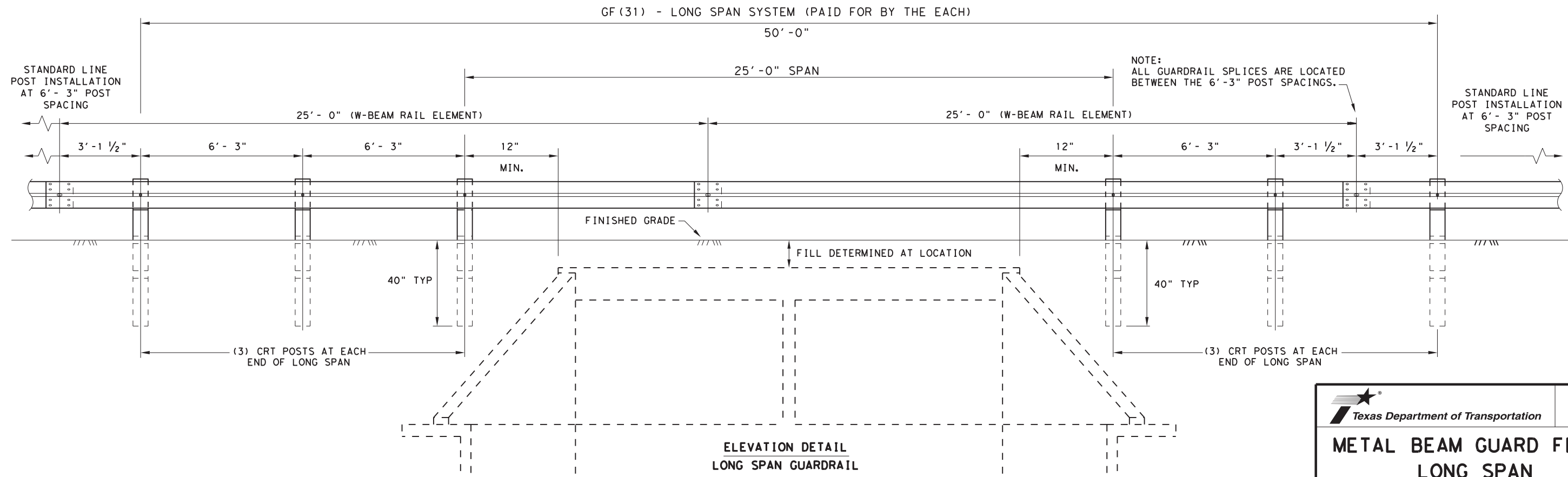
**LATERAL OFFSET BETWEEN THE
GUARDRAIL AND THE CULVERT HEADWALL**

GENERAL NOTES

1. THE TYPE OF LINE POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF THE TRANSITIONS SHALL BE AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENT SHALL MEET ALL REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 12'-6" OR 25'-0" NOMINAL LENGTHS.
3. RAIL POST HOLES ARE OFFSET 3'-1 1/2" FROM STANDARD GUARDRAIL TO ACCOMMODATE THE MIDSPAN SPLICING.
4. 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 (FWC160) AND NO MORE THAN 1" BEYOND IT.
5. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
7. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
8. REFER TO GF(31) STANDARD SHEET FOR ADDITIONAL DETAILS.
9. FLAME CUTTING OF HOLES IN GUARDRAIL SHALL NOT BE PERMITTED. IF YOU ENCOUNTER MIS-ALIGNED BOLT HOLES IN GUARDRAIL CONTACT THE DESIGN DIVISION FOR ADDITIONAL INFORMATION & OPTIONS.

NOTE: SEE GF(31) STANDARD FOR STANDARD LINE POSTS.

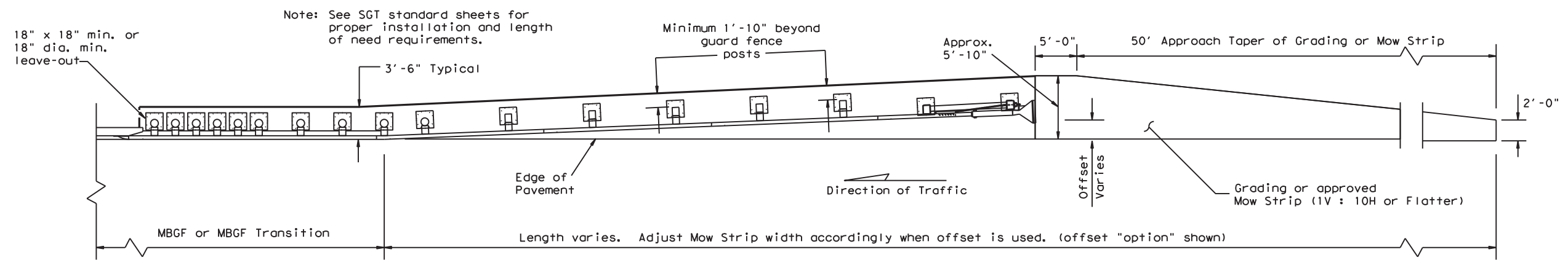
DIRECTION OF TRAFFIC



**ELEVATION DETAIL
LONG SPAN GUARDRAIL**

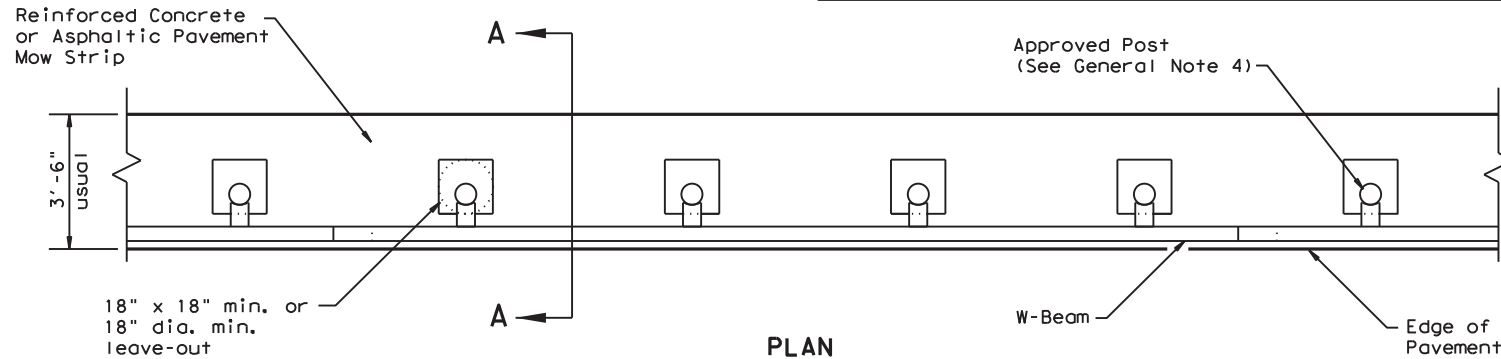
		<i>Design Division Standard</i>	
METAL BEAM GUARD FENCE LONG SPAN TL-3 MASH COMPLIANT			
GF(31)LS-19			
FILE: gf31ls19.dgn	DN: TxDOT	CK: KM	DW: VP
©TXDOT: NOVEMBER 2019	CONT	SECT	JOB
REVISIONS	6372	50	001
	DIST	COUNTY	SHEET NO.
	SAT	BEXAR	83

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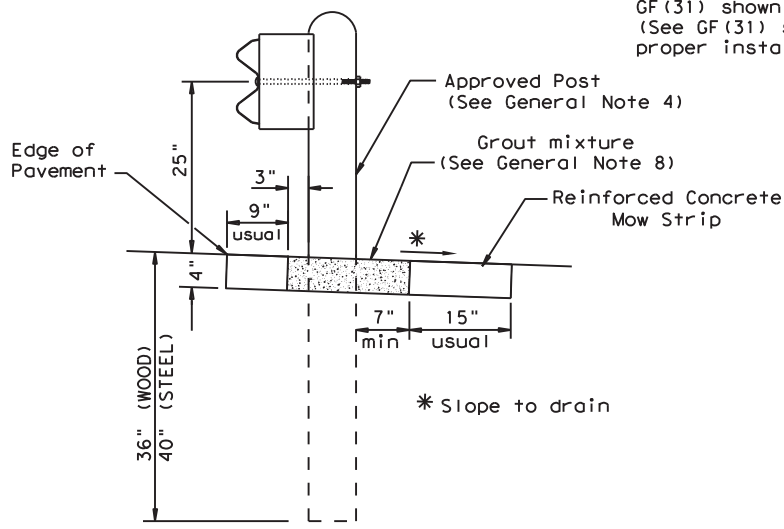
GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS

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.



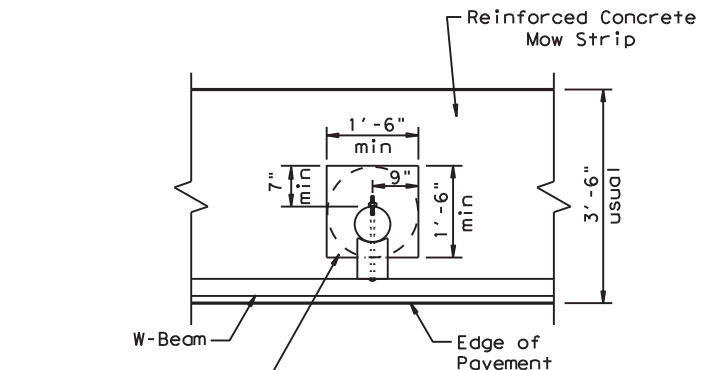
PLAN

GF(31) shown with Mow Strip
 (See GF(31) standard sheet for proper installation)



SECTION A-A

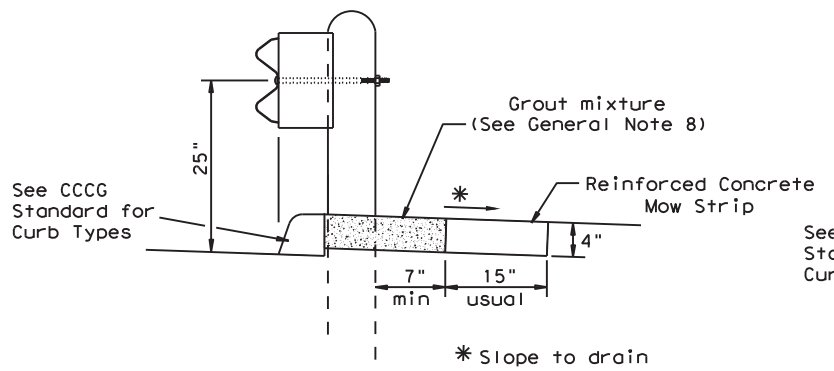
Typical



MOW STRIP DETAIL

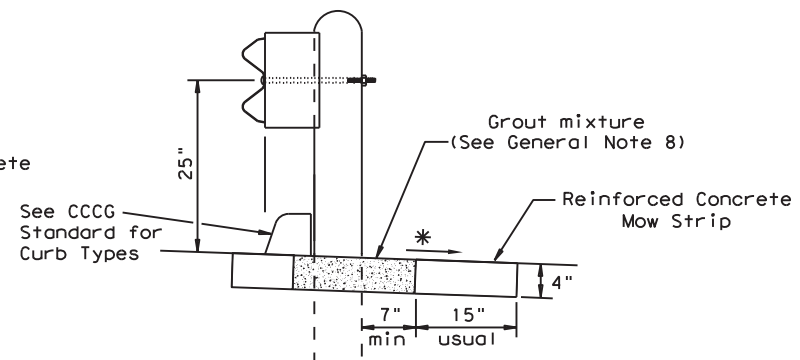
Reinforced Concrete Mow Strip with 18\"/>

- 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 1 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.



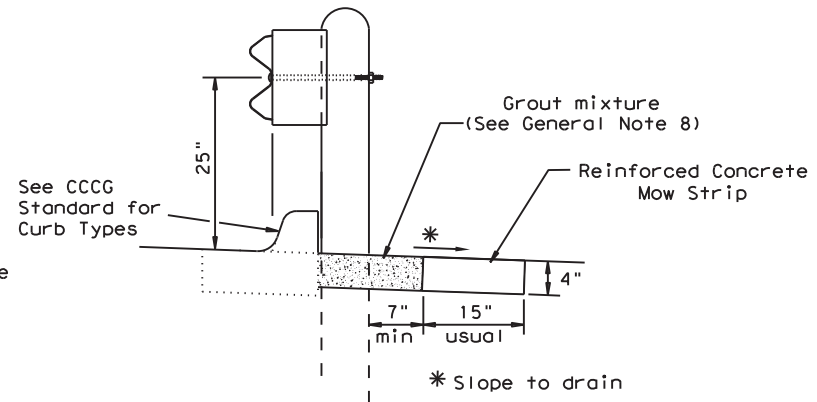
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



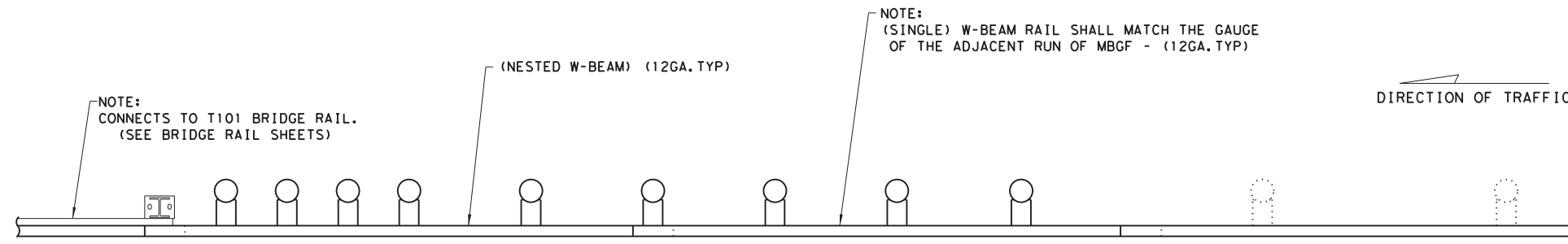
CURB OPTION (3)

		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: 6372	SECT: 50	JOB: 001
REVISIONS	SAT		COUNTY: BEXAR
			SHEET NO.: 84

DATE:
FILE:

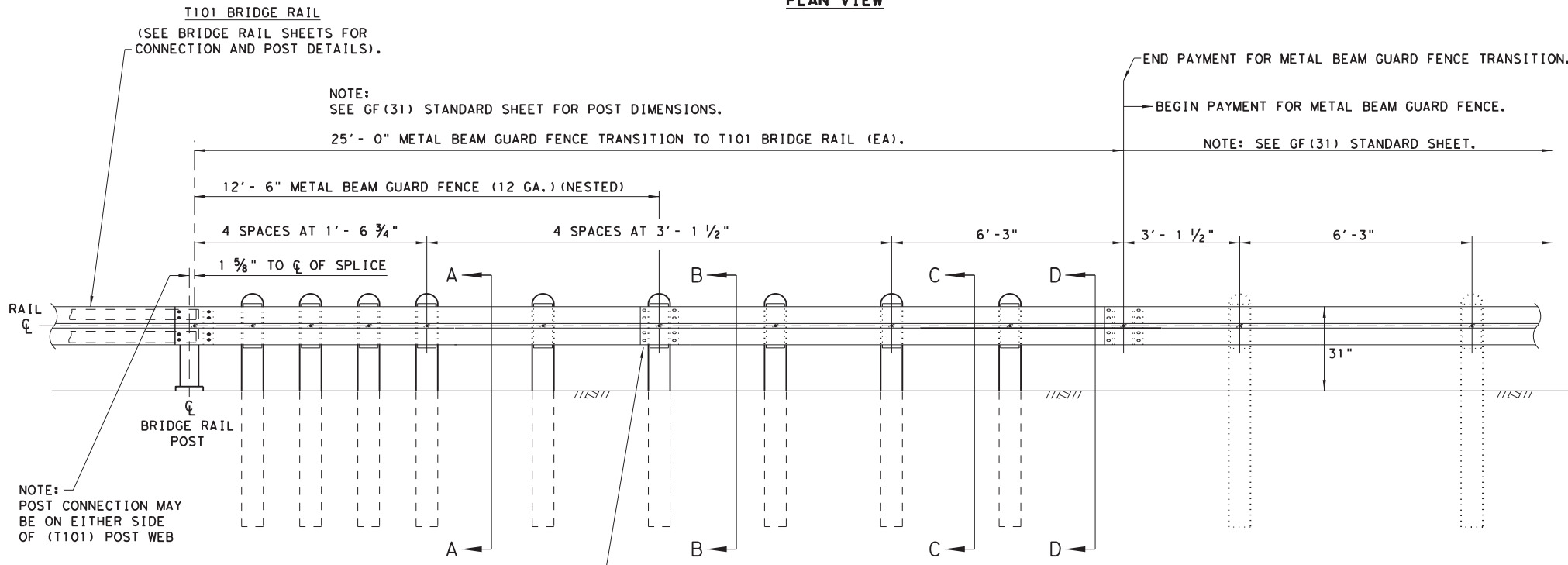
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DATE:
FILE:



PLAN VIEW

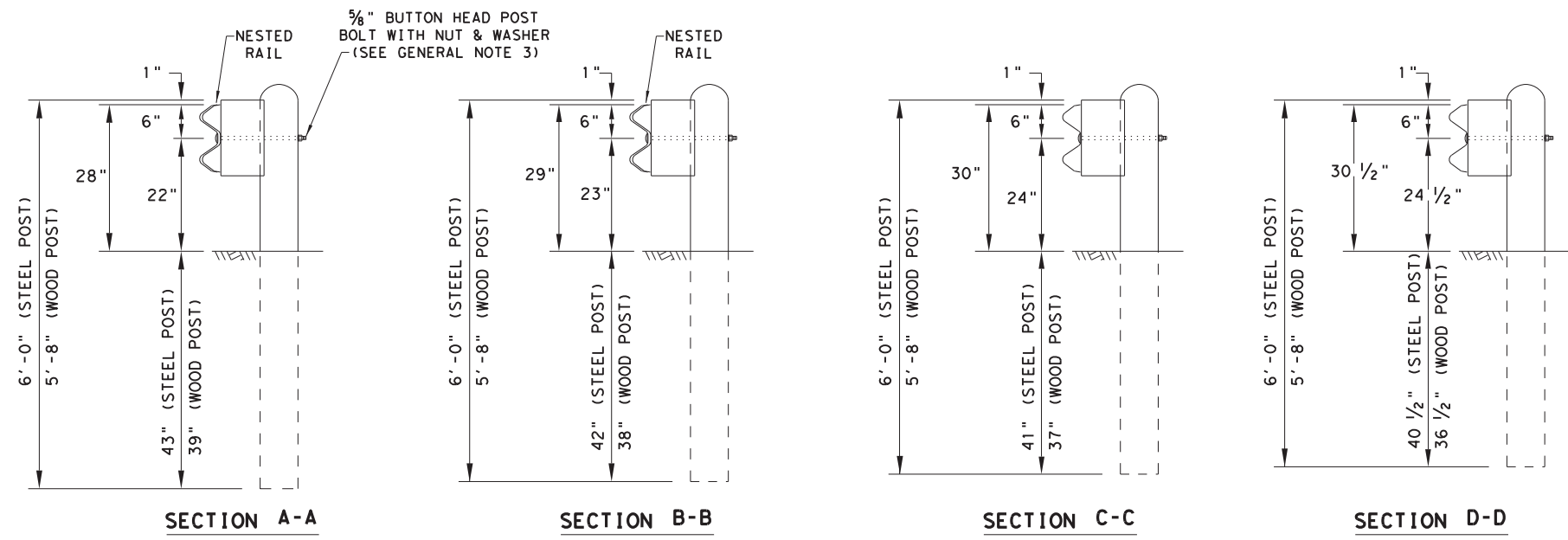
- GENERAL NOTES**
1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
 2. RAIL ELEMENT 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 TRANSITION SECTIONS OF GUARDRAIL.
 3. BUTTON HEAD "POST" BOLTS (ASTM A307 GR. A) SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT (ASTM A563) AND 5/8" ROUND WASHER (ASTM F436) AND NOT MORE THAN 1" BEYOND IT. BUTTON HEAD "SPlice" BOLTS (ASTM A307) ARE 5/8" X 1-1/4" WITH 5/8" NUTS (ASTM A563).
 4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM REQUIRING CONSTRUCTION OF THE TRANSITION.
 5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
 6. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
 7. POSTS SHALL NOT BE SET IN CONCRETE.
 8. 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.
 9. REFER TO STANDARD GF(31) AND APPLICABLE BRIDGE RAILING STANDARD FOR ADDITIONAL DETAILS.



ELEVATION VIEW

(8) 5/8" DIA. X 2" GUARDRAIL SPLICE BOLTS (FBB02) WITH 5/8" GUARDRAIL NUTS (ASTM A563) (SEE GENERAL NOTE 3)

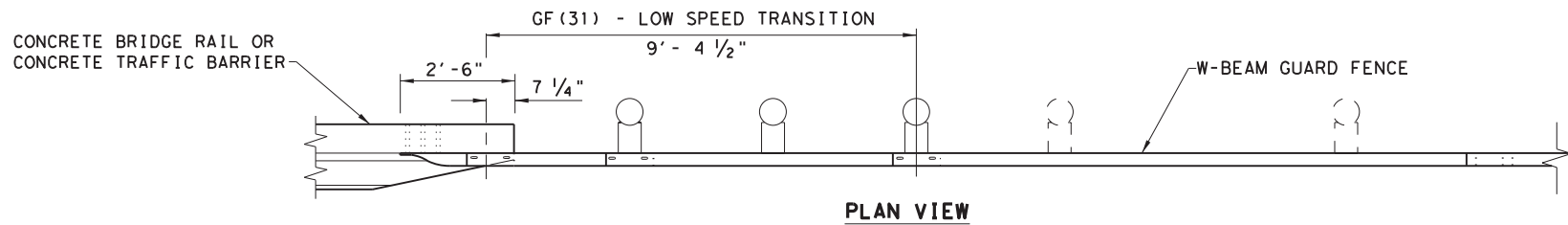
* "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



				Design Division Standard	
METAL BEAM GUARD FENCE TRANSITION (T101) GF(31)T101-19					
FILE: gf31+10119	DN: TXDOT	CK: KM	DW: VP	CK: CGL/AG	
©TXDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	6372	50	001	VAR.	
	DIST	COUNTY	SHEET NO.		
	SAT	BEXAR	85		

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DATE:
FILE:

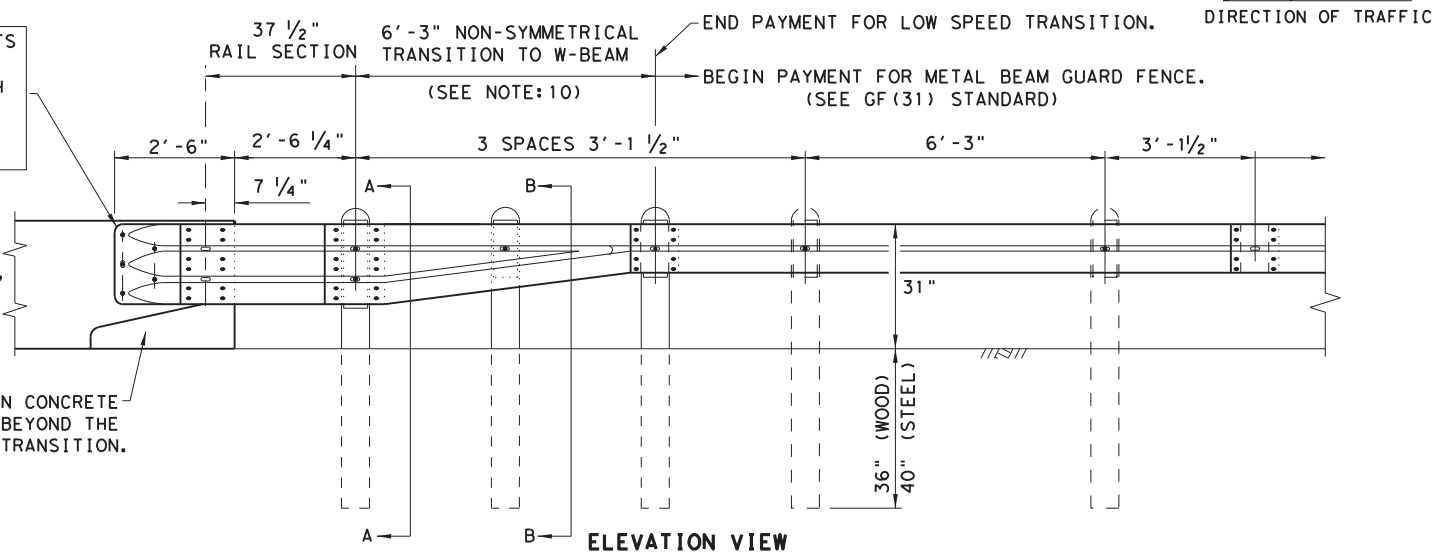


- (5) 7/8" DIA. HEAVY HEX HEAD BOLTS (ASTM A325 OR A449)
- (10) 1 3/4" O.D. WASHER UNDER EACH HEX BOLT HEAD AND NUT.
- (5) 7/8" DIA. HEAVY HEX NUTS (ASTM A194 OR A563)

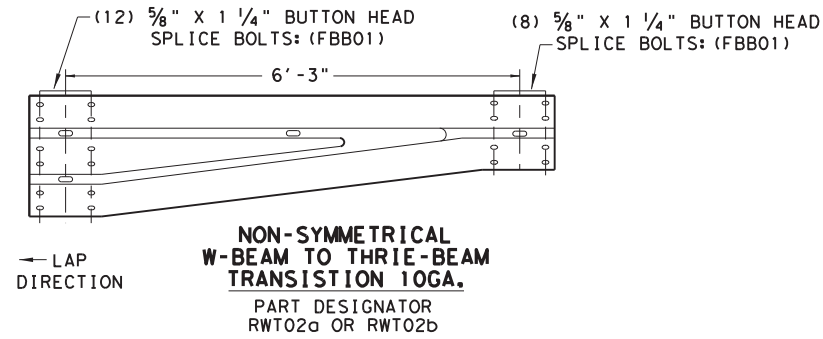
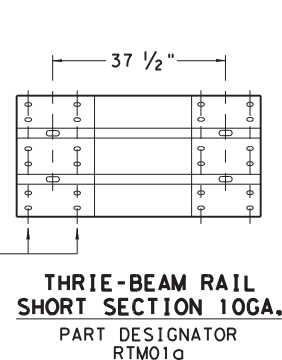
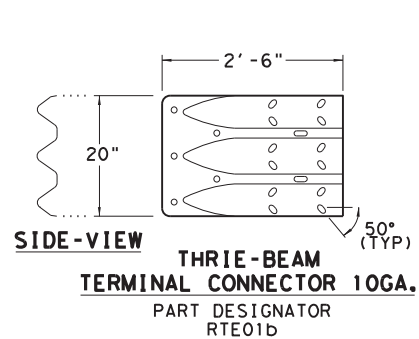
THRIE-BEAM CONNECTOR TO CONCRETE RAIL

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: CHAMFER REQUIRED ON CONCRETE RAILS THAT EXTEND BEYOND THE FACE OF GUARDRAIL TRANSITION.



- ### 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 TRANSITIONS SHALL BE AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. REFER TO GF(31) STANDARD SHEET.
 - RAIL ELEMENT SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS.
 - FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM REQUIRING CONSTRUCTION OF THE TRANSITION.
 - 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 (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM BOLT LENGTH TO MEET REQUIRED LENGTH.
 - POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
 - CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
 - WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
 - 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 CAN FURNISH COMPOSITE MATERIAL BLOCKS.
 - REFER TO GF(31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
 - FOR ROUND WOOD POSTS SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 1/2" DIA. MINIMUM THROUGHOUT THE TRANSITION.

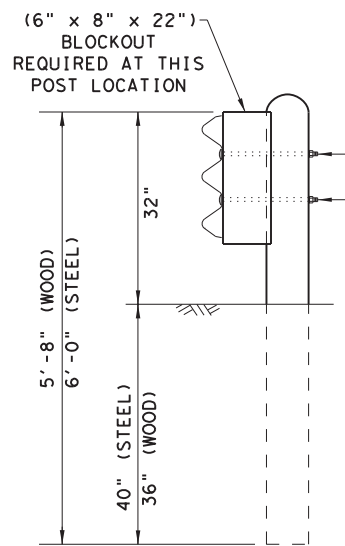


- (2) 5/8" BUTTON HEAD POST BOLTS & NUTS: (FBB04)
- (1) 5/8" FLAT WASHER: (FWC14a) UNDER EACH NUT

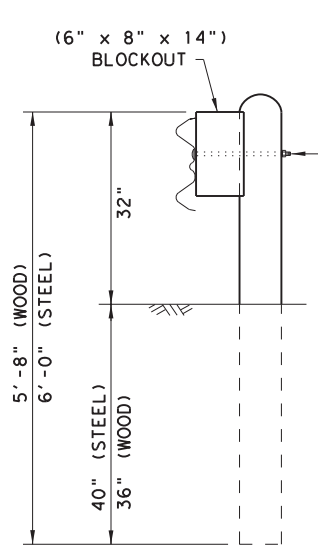
- (1) 5/8" BUTTON HEAD POST BOLT & NUT: (FBB04)
- (1) 5/8" FLAT WASHER: (FWC14a) UNDER EACH NUT

PLATE WASHER INSTRUCTIONS

BRIDGE APPROACH - UPSTREAM: THE SHORT 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.

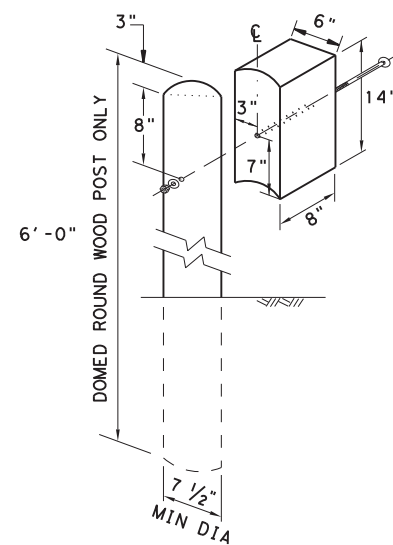


SECTION A-A

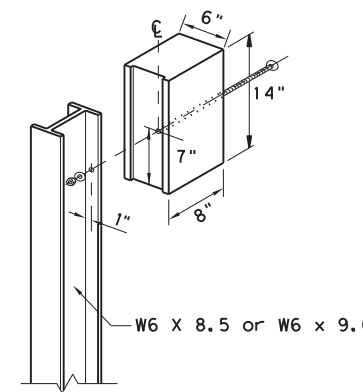
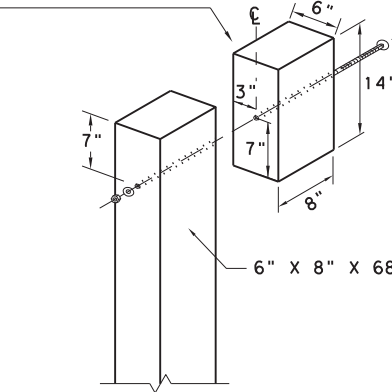


SECTION B-B

NOTE: * "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



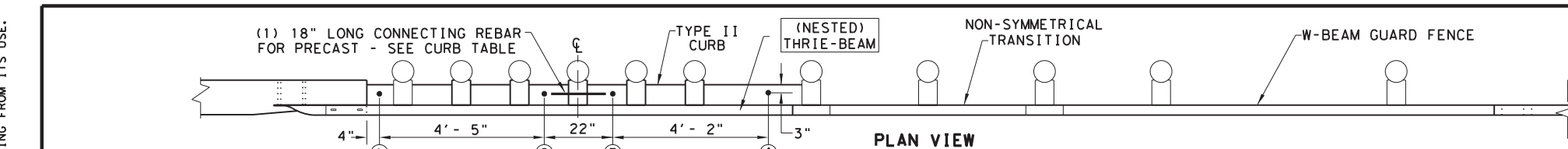
NOTE: TOENAIL WITH ONE 16D GALV. NAIL TO PREVENT BLOCK ROTATION.



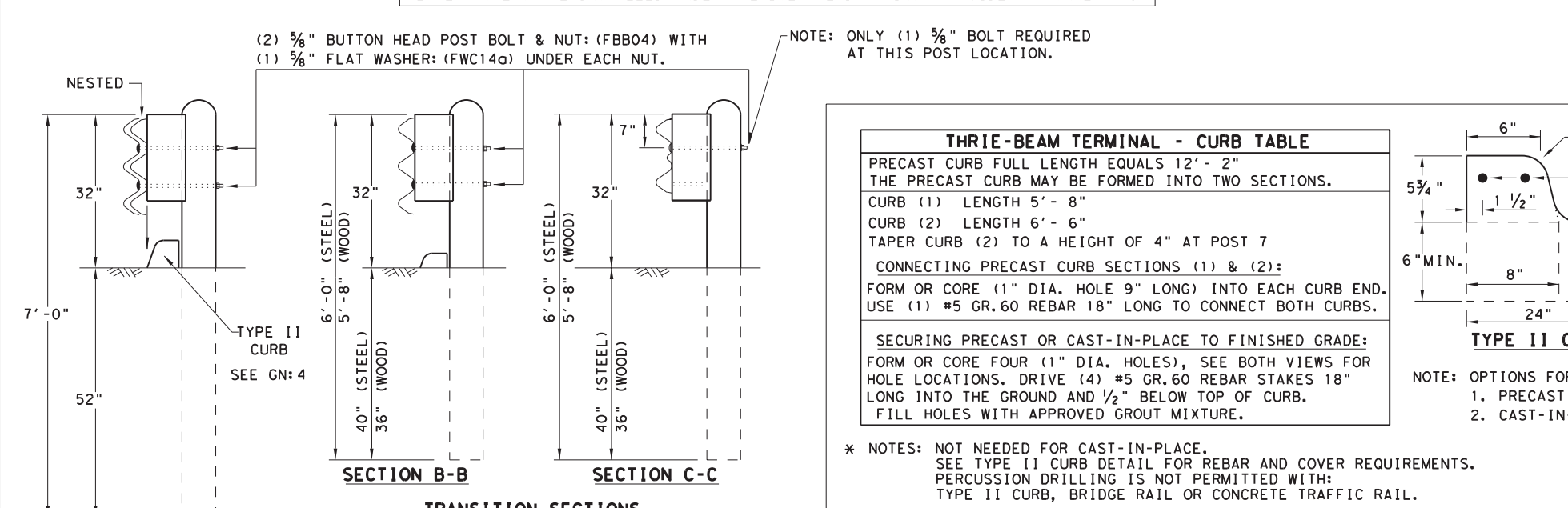
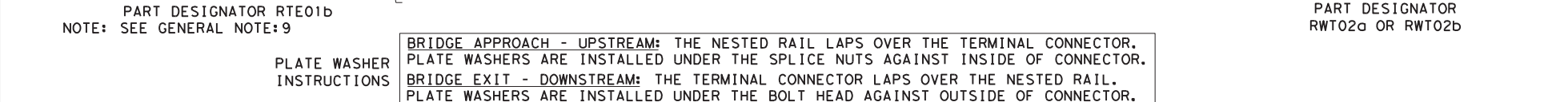
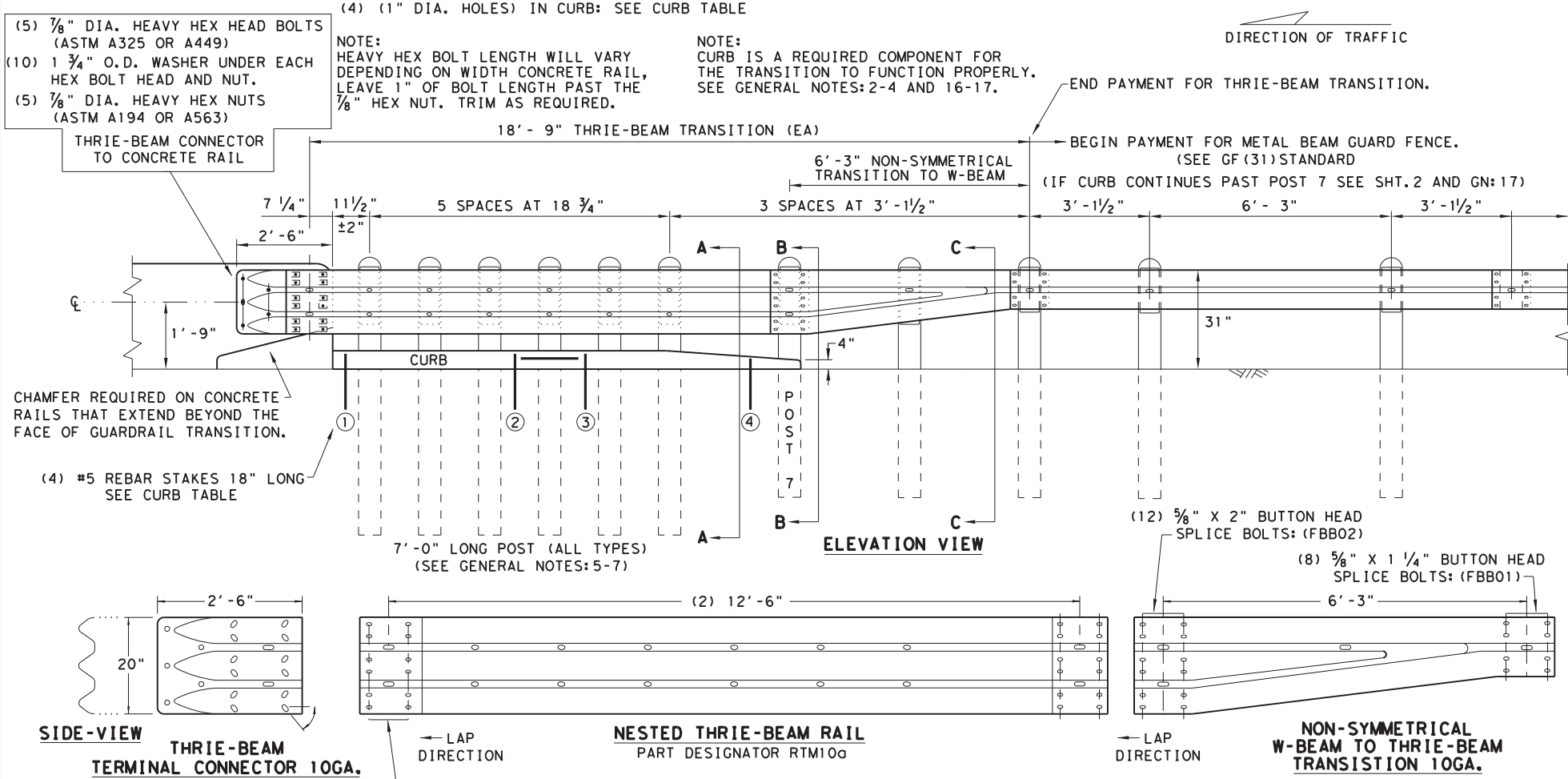
LOW-SPEED TRANSITION

		Design Division Standard		
METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-2 MASH COMPLIANT GF(31) TR TL2-19				
FILE: gf31tr+1219.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
© TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	86	

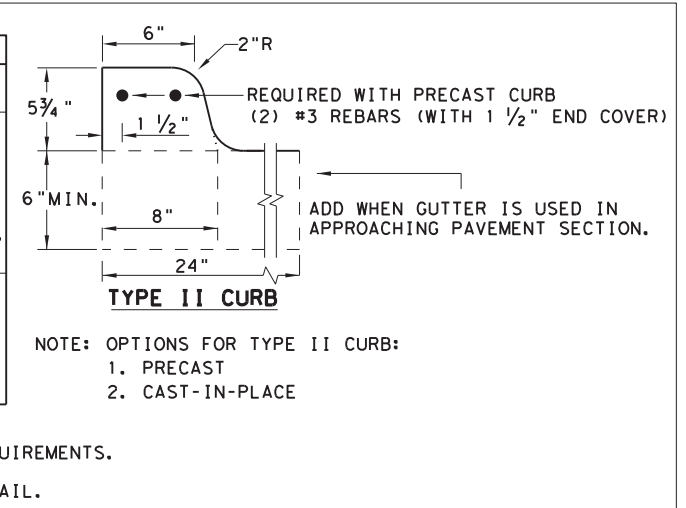
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- ### GENERAL NOTES
- CONTACT THE DESIGN DIVISION FOR DRAINAGE CUT OUT OPTIONS NEEDED WITHIN THE CURB SECTION OF THE THRIE-BEAM TRANSITION. (512) 416-2678
 - CONCRETE CURB MAY BE CAST-IN-PLACE OR PRECAST AS SHOWN ON THIS SHEET. WHEN USED IN CONJUNCTION WITH THE THRIE-BEAM TRANSITIONS, CURB SHALL BE TYPE II (5'-3/4") HEIGHT; SEE CURRENT CCCC 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.
 - 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.
 - 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.
 - FOR ROUND WOOD POST SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 1/2" DIA. MINIMUM THROUGHOUT THE THRIE-BEAM TRANSITION.
 - 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.
 - 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.
 - POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
 - 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.
 - 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 (FWC16a) 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 TRANSITIONS.
 - WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
 - 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 CONSTRUCTION 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.
 - REFER TO GF(31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
 - 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.
 - 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.



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)	USE (1) #5 GR.60 REBAR 18" LONG TO CONNECT BOTH CURBS.
SECURING PRECAST OR CAST-IN-PLACE TO FINISHED GRADE:	
FORM OR CORE	FOUR (1" DIA. HOLES), SEE BOTH 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.



NOTE: ** "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.

HIGH-SPEED TRANSITION

SHEET 1 OF 2

METAL BEAM GUARD FENCE

THRIE-BEAM TRANSITION

TL-3 MASH COMPLIANT

GF(31)TR TL3-19

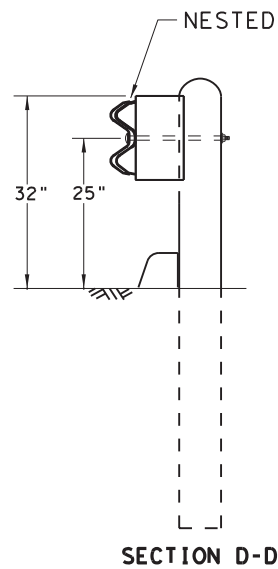
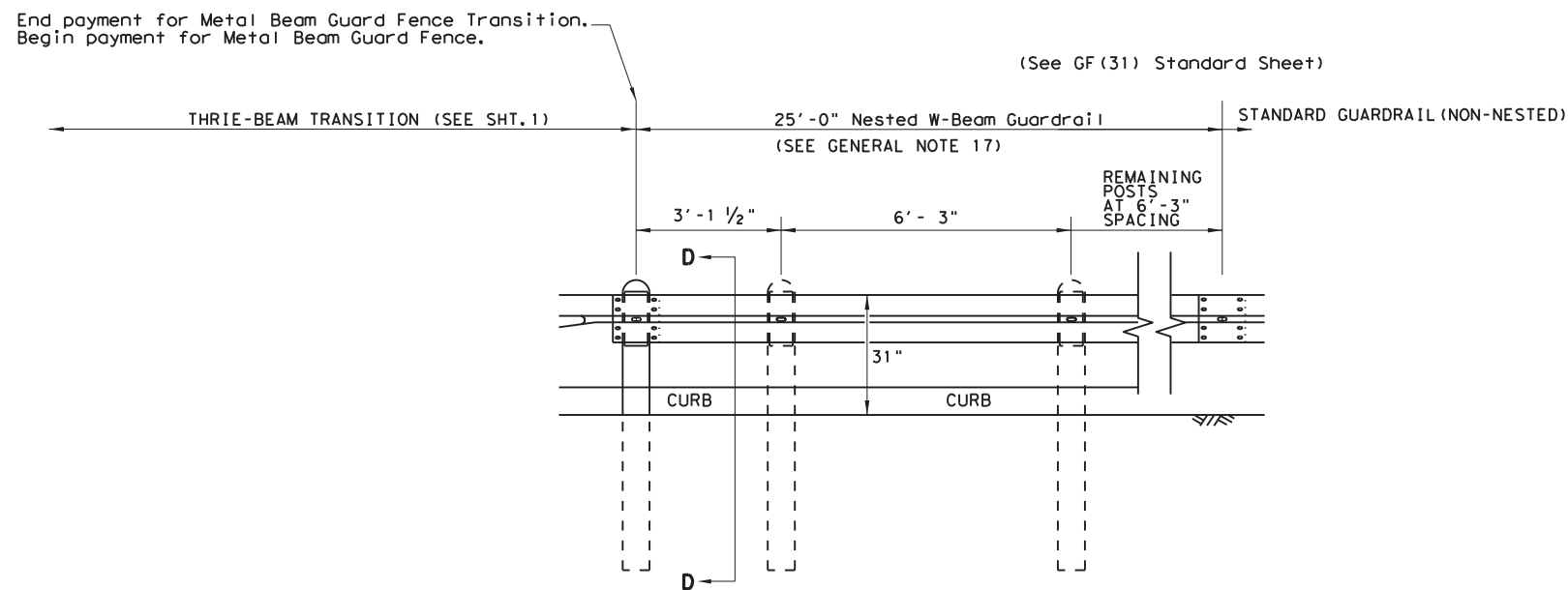
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©TXDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	87	

DATE: FILE:

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DATE:
FILE:

REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



HIGH-SPEED TRANSITION

SHEET 2 OF 2

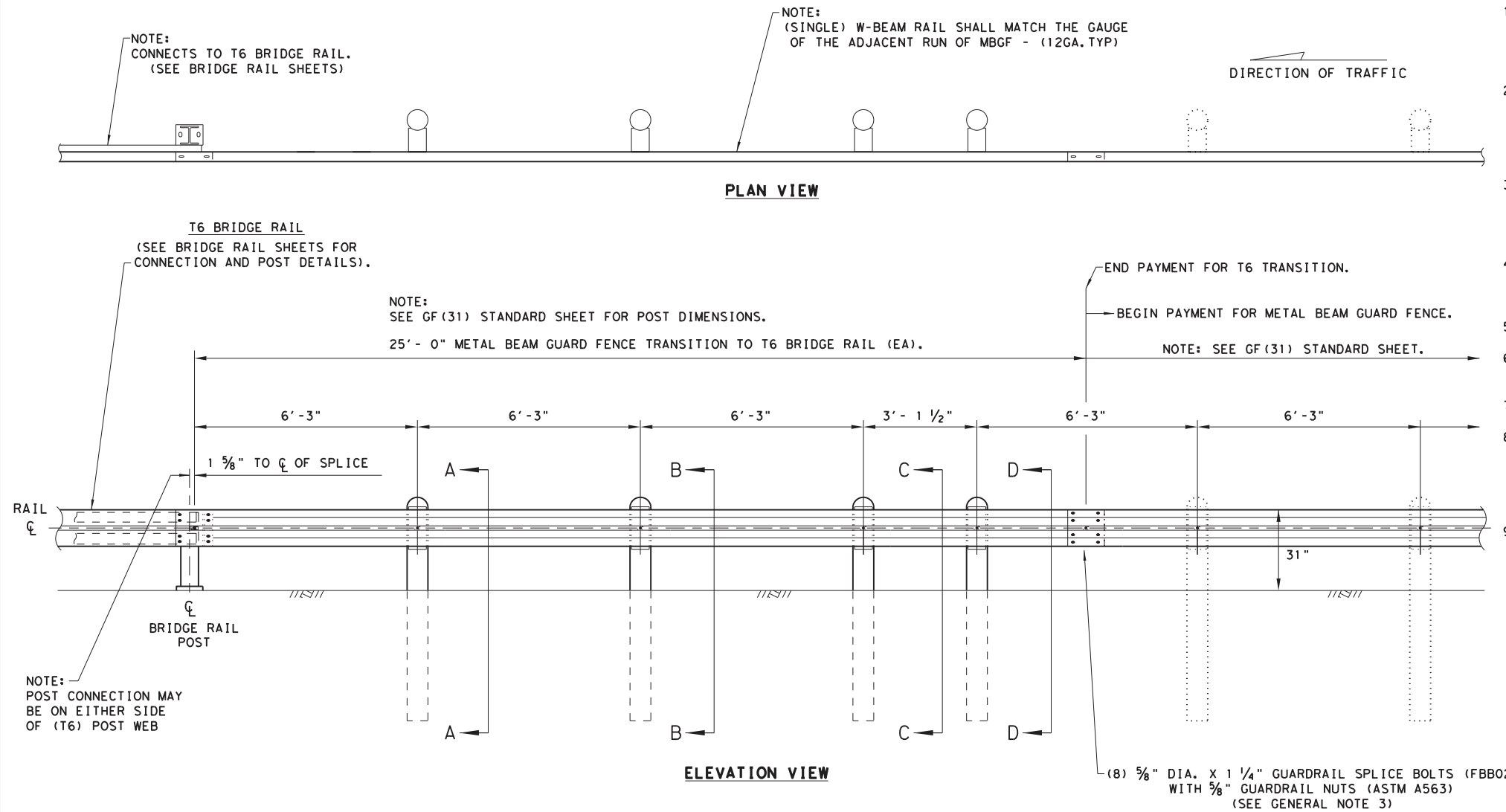


METAL BEAM GUARD FENCE
THRIE-BEAM TRANSITION
TL-3 MASH COMPLIANT
GF(31)TR TL3-19

FILE: gf31tr+1319.dgn	DN: TXDOT	CK: KM	DW: KM	CK: CGL/AG
©TXDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	88	

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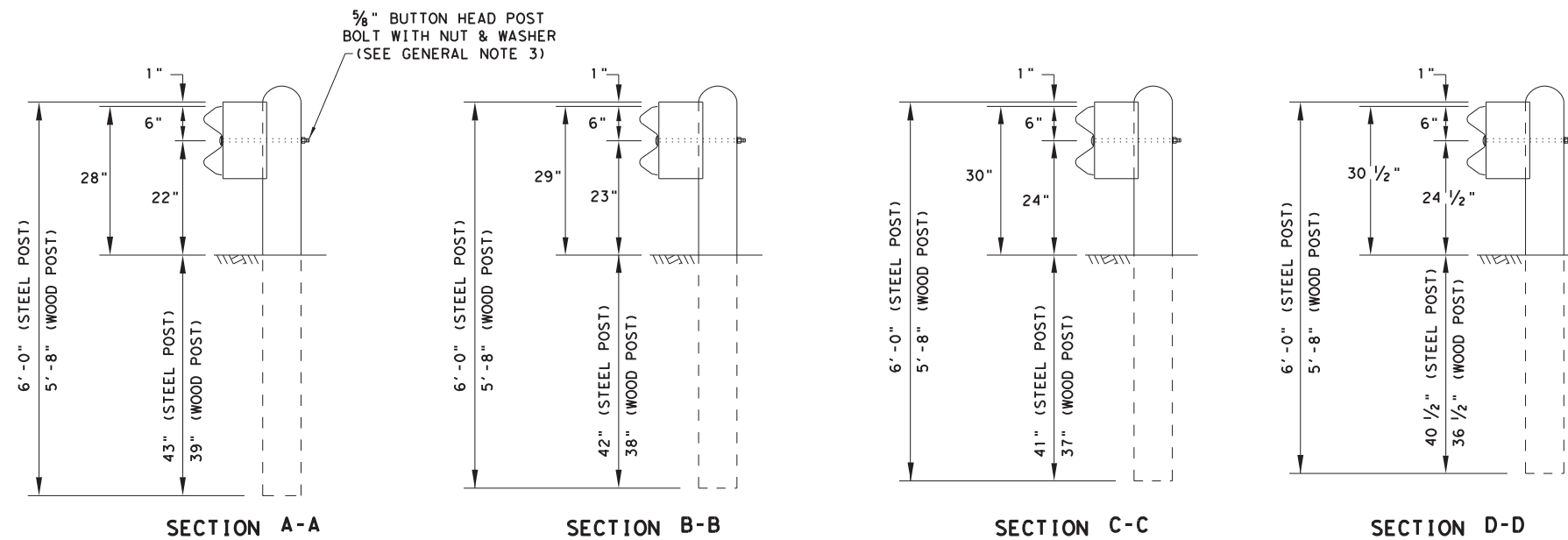
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GENERAL NOTES

1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENT 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 TRANSITION SECTIONS OF GUARDRAIL.
3. BUTTON HEAD "POST" BOLTS (ASTM A307 GR. A) SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT (ASTM A563) AND 5/8" ROUND WASHER (ASTM F436) AND NOT MORE THAN 1" BEYOND IT. BUTTON HEAD "SPLICE" BOLTS (ASTM A307) ARE 5/8" X 1 - 1/4" WITH 5/8" NUTS (ASTM A563).
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM REQUIRING CONSTRUCTION OF THE TRANSITION.
5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
6. WHERE SOLID ROCK IS ENCOUNTERED. CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
7. POSTS SHALL NOT BE SET IN CONCRETE.
8. 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.
9. REFER TO STANDARD GF (31) & APPLICABLE BRIDGE RAILING STANDARD FOR ADDITIONAL DETAILS.

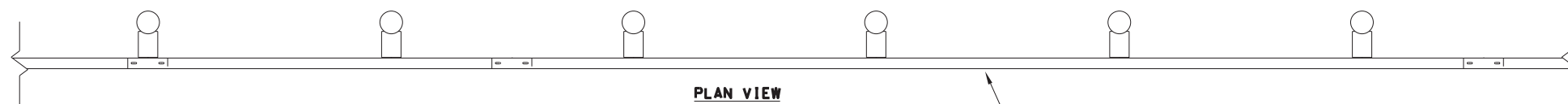
* "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



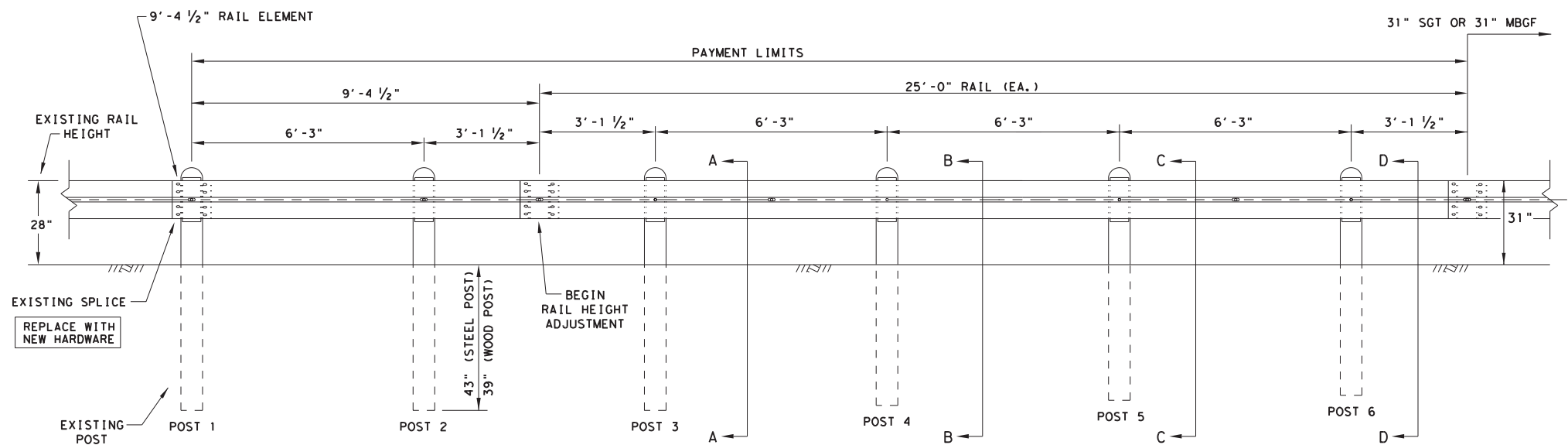
				Design Division Standard	
METAL BEAM GUARD FENCE TRANSITION (T6) GF (31) T6-19					
FILE: gf31t619.dgn	DN: TXDOT	CK: KM	DW: VP	CK: CGL/AG	
© TXDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	6372	50	001	VAR.	
	DIST	COUNTY	SHEET NO.		
	SAT	BEXAR	89		

GENERAL NOTES

1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENT 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 TRANSITION SECTIONS OF GUARDRAIL.
3. BUTTON HEAD "POST" BOLTS (ASTM A307) SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT (ASTM A563) AND 3/8" ROUND WASHER (ASTM F436) AND NOT MORE THAN 1" BEYOND IT. BUTTON HEAD "SPLICE" BOLTS (ASTM A307) ARE 5/8" X 1-1/4" WITH 3/8" NUTS (ASTM A563).
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM REQUIRING CONSTRUCTION OF THE TRANSITION.
5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
6. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
8. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. SEE GF(31) STANDARD FOR INSTALLATION GUIDANCE.
9. POSTS SHALL NOT BE SET IN CONCRETE.
10. 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.
11. REFER TO STANDARD GF(31) FOR ADDITIONAL DETAILS.
12. RAIL HEIGHT ADJUSTMENT IS ASSESSED AT TL-3 MASH COMPLIANT FOR STEEL POST HEIGHT TRANSITION TO 28" STEEL POST GUARDRAIL.

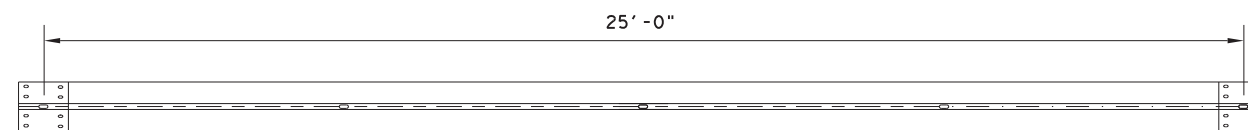
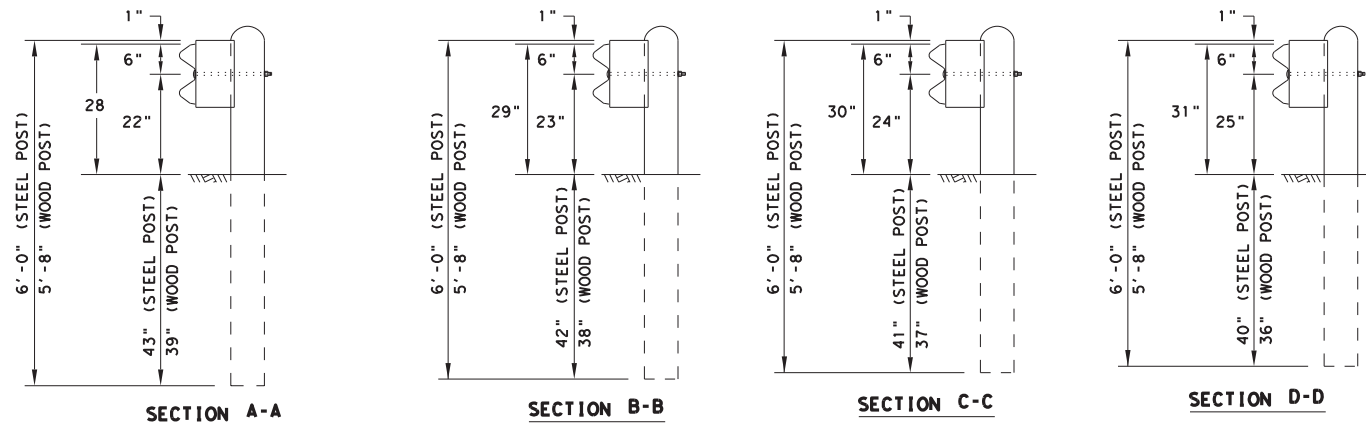


(SINGLE) W-BEAM SHALL MATCH THE GAUGE OF THE ADJACENT RUN OF MBGF.

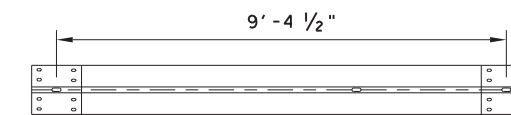


ELEVATION VIEW

* "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



25'-0" (NOM.) W-BEAM RAIL ELEMENT



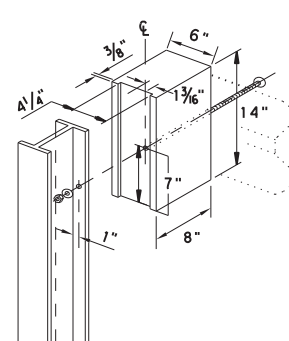
9'-4 1/2" (NOM.) W-BEAM RAIL ELEMENT

HARDWARE LIST	
QTY	DESCRIPTION
1	9'-4 1/2" W-BEAM RAIL ELEMENT 12GA.
1	25'-0" W-BEAM RAIL ELEMENT 12GA. (TYP)
6	7 1/2" DIA X 6'-0" DOMED ROUND WOOD POSTS (TYP)
6	6" X 8" X 68" RECTANGULAR WOOD POSTS (TYP)
6	W6 X 8.5 OR W6 X 9 X 72" STEEL POSTS (TYP)
6	6" X 8" X 14" WOOD BLOCKS OR COMPOSITE (TYP)
6	5/8" X 18" GUARDRAIL BOLTS WITH NUTS (FBB04)
6	5/8" ROUND WASHERS (ASTM F436) (FWC16a)
6	5/8" X 10" GUARDRAIL BOLTS WITH NUTS (FBB03)
24	5/8" X 1-1/4" GUARDRAIL SPLICE BOLTS WITH DOUBLE RECESSED NUTS (ASTM A563) (FBB01)

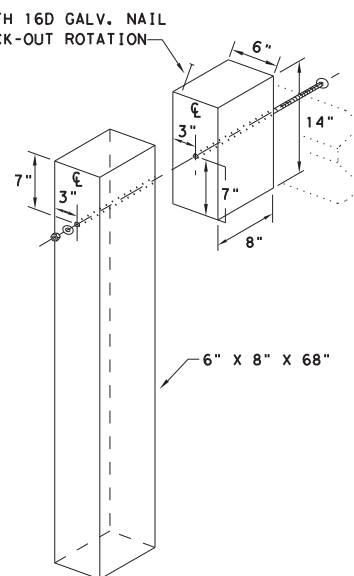
POST AND BLOCK-OUT TYPES AVAILABLE

FOR WOOD POST

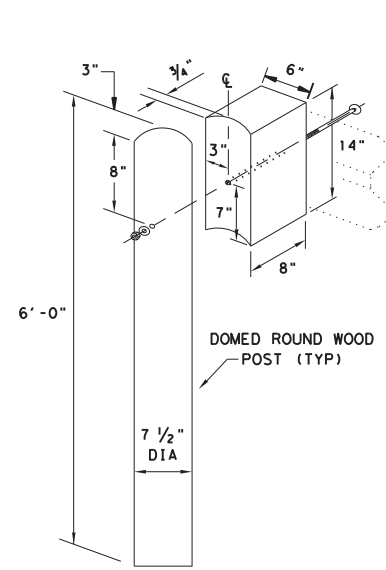
FOR STEEL POST



ROUTED WOOD BLOCK-OUT TO STEEL POST



WOOD BLOCK TO RECTANGULAR WOOD POST



WOOD BLOCK-OUT TO DOMED ROUND WOOD POST

TOENAIL BLOCK WITH 16D GALV. NAIL TO PREVENT BLOCK-OUT ROTATION

NOTE: HARDWARE SHALL MEET THE FOLLOWING REQUIREMENTS.

- GUARDRAIL POST BOLTS (ASTM A307 GR. A)
- GUARDRAIL ROUND WASHERS (ASTM F436)
- GUARDRAIL DOUBLE RECESSED NUTS (ASTM A563)
- GUARDRAIL SPLICE BOLTS (ASTM A307 GR. A)
- GUARDRAIL SPLICE NUTS (ASTM A563)



**METAL BEAM GUARD FENCE
RAIL HEIGHT ADJUSTMENT
(28" TO 31")
TL-3 MASH COMPLIANT
RAIL-ADJ(A)-19**

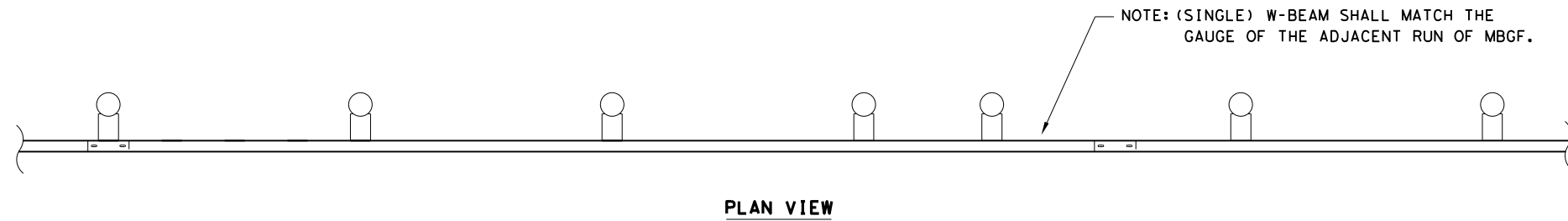
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© TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
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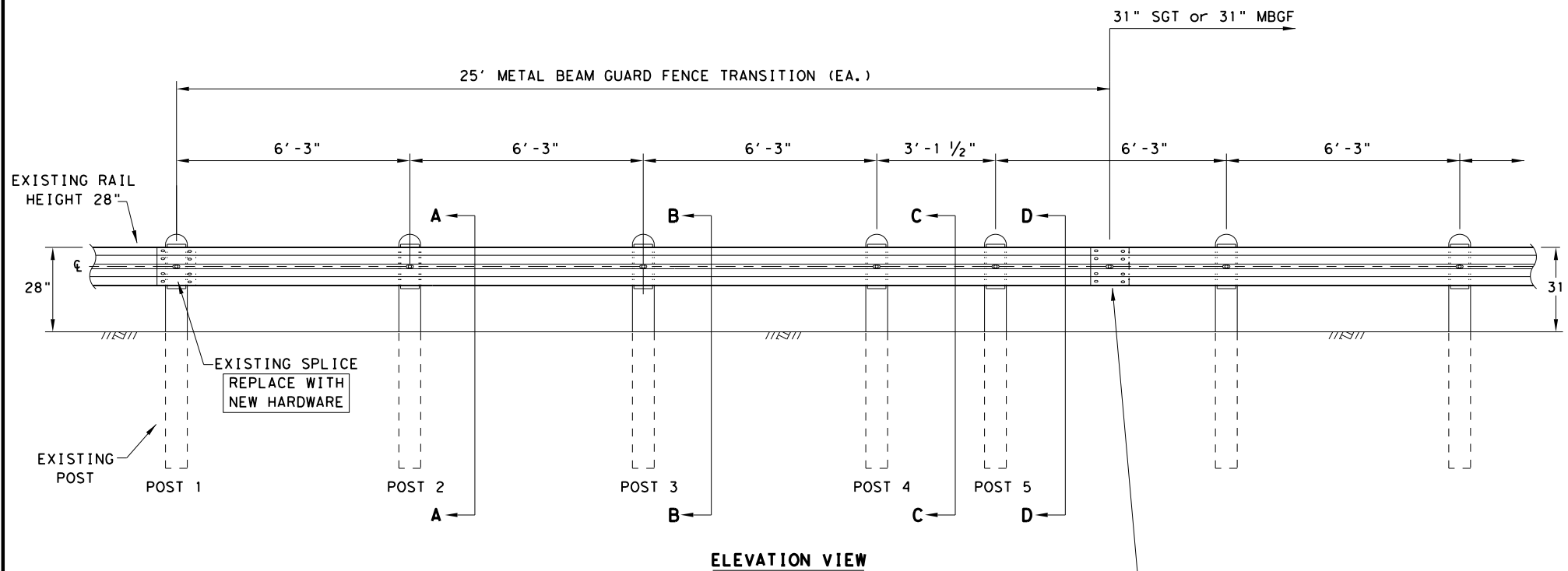
DATE: _____ FILE: _____

GENERAL NOTES

1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENT 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 TRANSITION SECTIONS OF GUARDRAIL.
3. BUTTON HEAD "POST" BOLTS (ASTM A307) SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT (ASTM A563) AND 5/8" ROUND WASHER (ASTM F436) AND NOT MORE THAN 1" BEYOND IT. BUTTON HEAD "SPLICE" BOLTS (ASTM A307) ARE 5/8" X 1-1/4" WITH 5/8" NUTS (ASTM A563).
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7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
8. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. SEE GF(31) STANDARD FOR INSTALLATION GUIDANCE.
9. POSTS SHALL NOT BE SET IN CONCRETE.
10. 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.
11. REFER TO STANDARD GF(31) FOR ADDITIONAL DETAILS.
12. RAIL HEIGHT ADJUSTMENT IS ASSESSED AT TL-3 MASH COMPLIANT FOR STEEL POST HEIGHT TRANSITION TO 28" STEEL POST GUARDRAIL.



PLAN VIEW



ELEVATION VIEW

* "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.

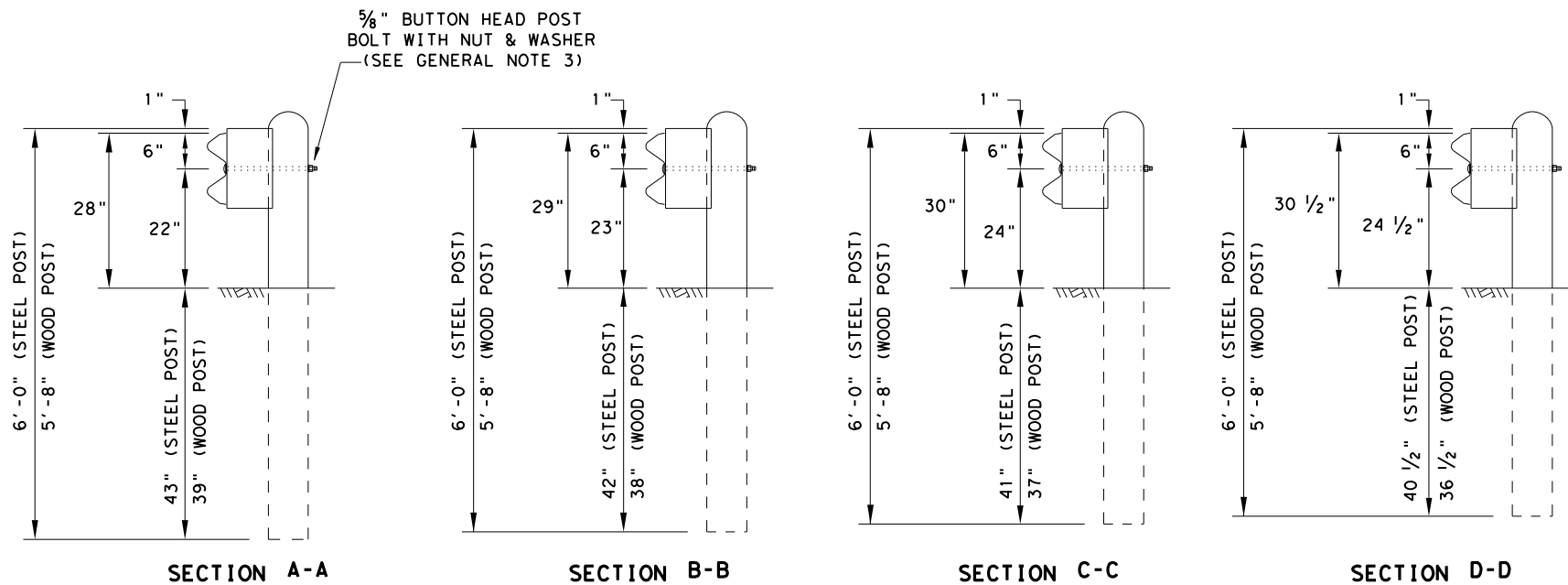
(8) 5/8" DIA. X 1 1/4" GUARDRAIL SPLICE BOLTS WITH 5/8" NUTS (ASTM A563). (SEE GENERAL NOTE 3).

POST AND BLOCK-OUT TYPES AVAILABLE

FOR WOOD POST

FOR STEEL POST

HARDWARE LIST	
QTY	DESCRIPTION
1	25'-0" W-BEAM RAIL ELEMENT 12GA. (TYP)
5	7 1/2" DIA X 6'-0" DOMED ROUND WOOD POSTS (TYP)
5	6" X 8" X 68" RECTANGULAR WOOD POSTS (TYP)
5	W6 X 8.5 OR W6 X 9 X 72" STEEL POSTS (TYP)
5	6" X 8" X 14" WOOD BLOCKS OR COMPOSITE (TYP)
5	5/8" X 18" GUARDRAIL BOLTS AND NUTS (FBB04)
5	5/8" ROUND WASHERS (ASTM F436) (FWC16a)
5	5/8" X 10" GUARDRAIL BOLTS AND NUTS (FBB03)
16	5/8" X 1-1/4" GUARDRAIL SPLICE BOLTS WITH DOUBLE RECESSED NUTS (ASTM A563) (FBB01)



NOTE: HARDWARE SHALL MEET THE FOLLOWING REQUIREMENTS.
 GUARDRAIL POST BOLTS (ASTM A307 GR. A)
 GUARDRAIL ROUND WASHERS (ASTM F436)
 GUARDRAIL DOUBLE RECESSED NUTS (ASTM A563)
 GUARDRAIL SPLICE BOLTS (ASTM A307 GR. A)
 GUARDRAIL SPLICE NUTS (ASTM A563)

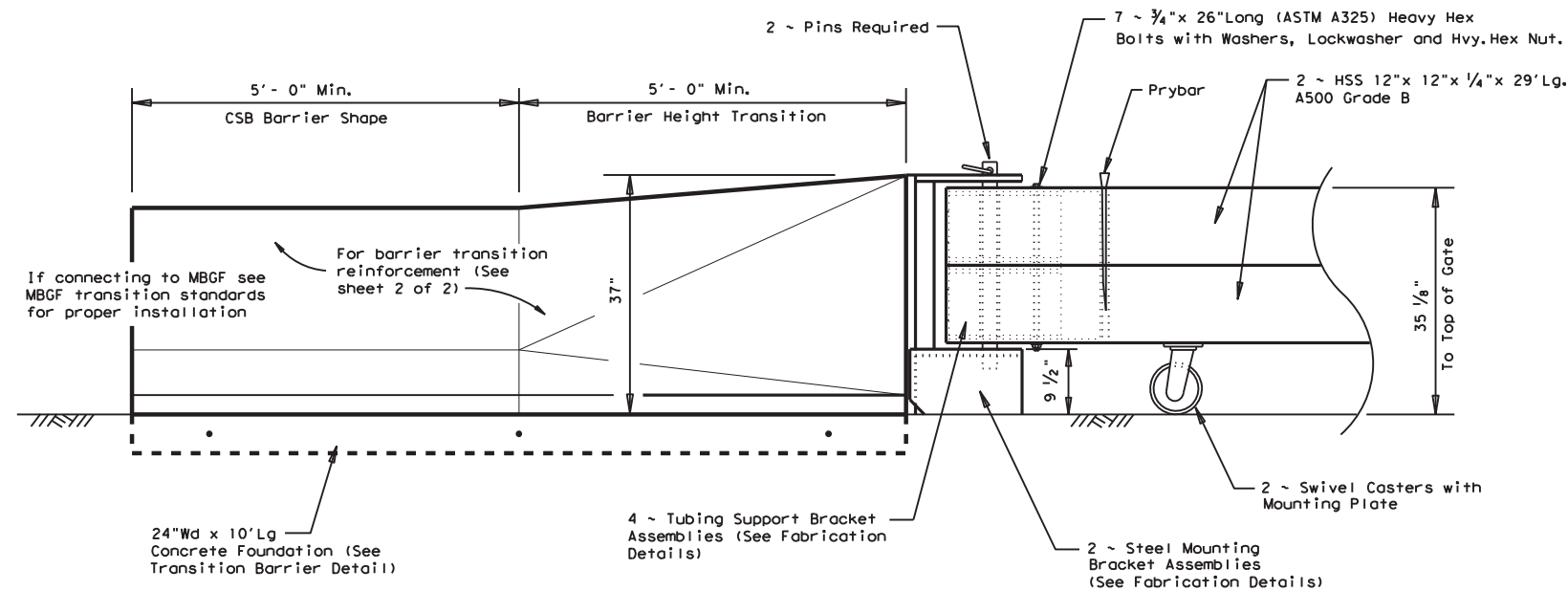
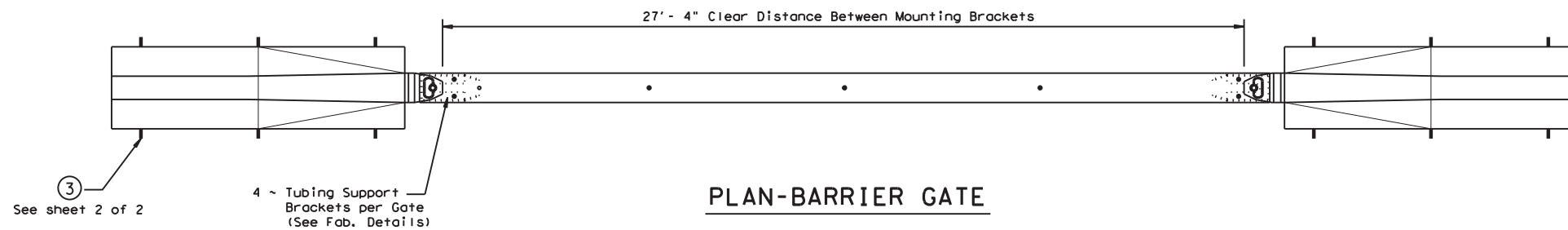
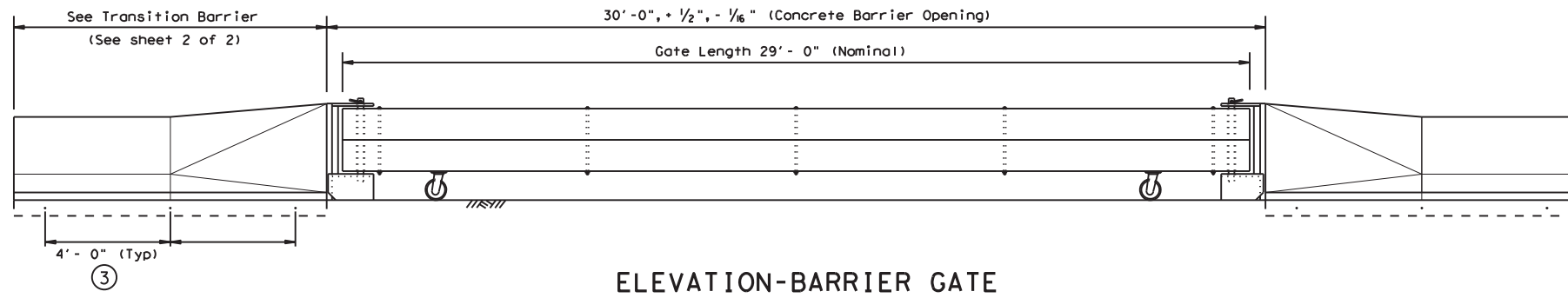
Design Division Standard

METAL BEAM GUARD FENCE
 RAIL HEIGHT ADJUSTMENT
 (28" TO 31")
 TL-3 MASH COMPLIANT
 RAIL-ADJ(B)-19

FILE: railadjb19	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
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FILE:



BARRIER GATE

Showing typical end connection and required number of components for each gate installation. (See fabrication details for assembly)

GENERAL NOTES

1. Concrete shall be Class C, unless otherwise specified in the plans.
2. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
3. All barrier edges shall have a 3/4" chamfer or tooled radius.
4. All concrete, reinforcement, joint connection systems, grout etc. as shown, are considered as part of the barrier payment.
5. All steel assemblies for the Barrier Gate shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
6. The steel mounting bracket is required as a forming bulkhead for the concrete transition barriers.

For steel gate assembly, steel mounting bracket welding requirements, and the required hardware, see "Barrier Gate (Fabrication Details)" at TxDOT CAD Standard Plans Files, Roadway Standards, Design Guidelines.

QTY	STEEL GATE MATERIAL LIST
2	Steel Mounting Bracket Assembly
4	Headed Studs 5/8" x 6" (min)
4	Tubing Support Bracket Assembly
2	HSS 12"x 12"x 1/4"x 29' Long
2	Swivel Casters Wheels
2	Pin Assemblies (A36)
1	Prybar
7	3/4" x 26" Lg (ASTM A325) Heavy Hex Bolts with 2 Washers, 1 Lockwasher and Heavy Hex Nut

SHEET 1 OF 2



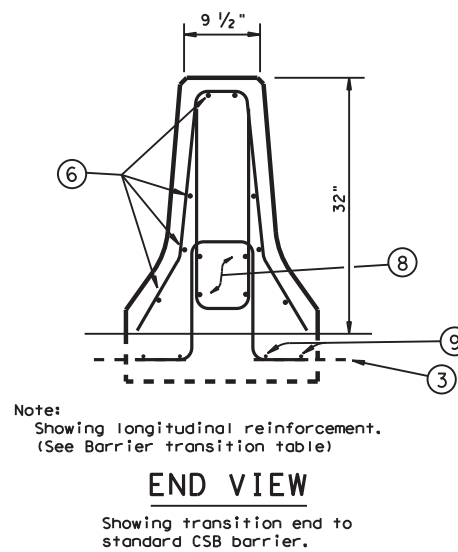
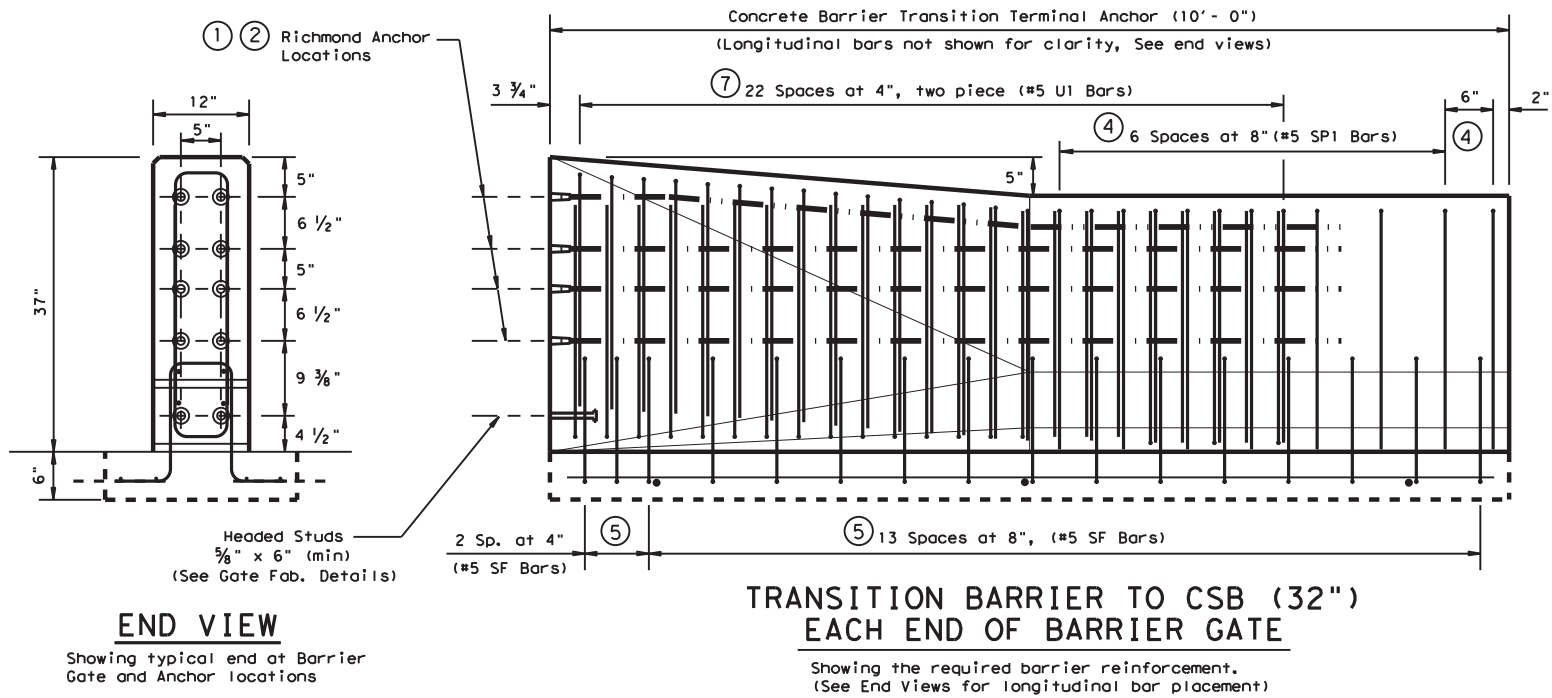
BARRIER GATE

BG-11

FILE: bg11.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
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REVISIONS	6372	50	001	VAR.
	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	92	

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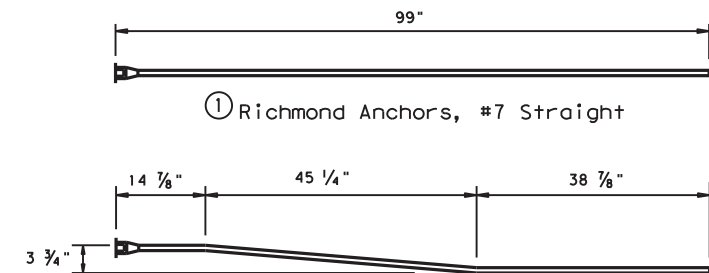
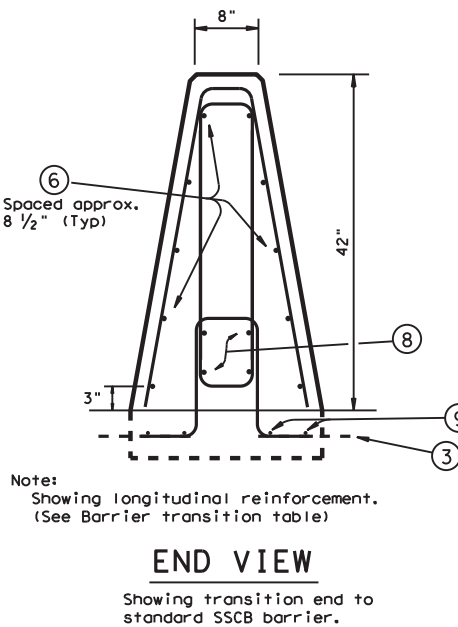
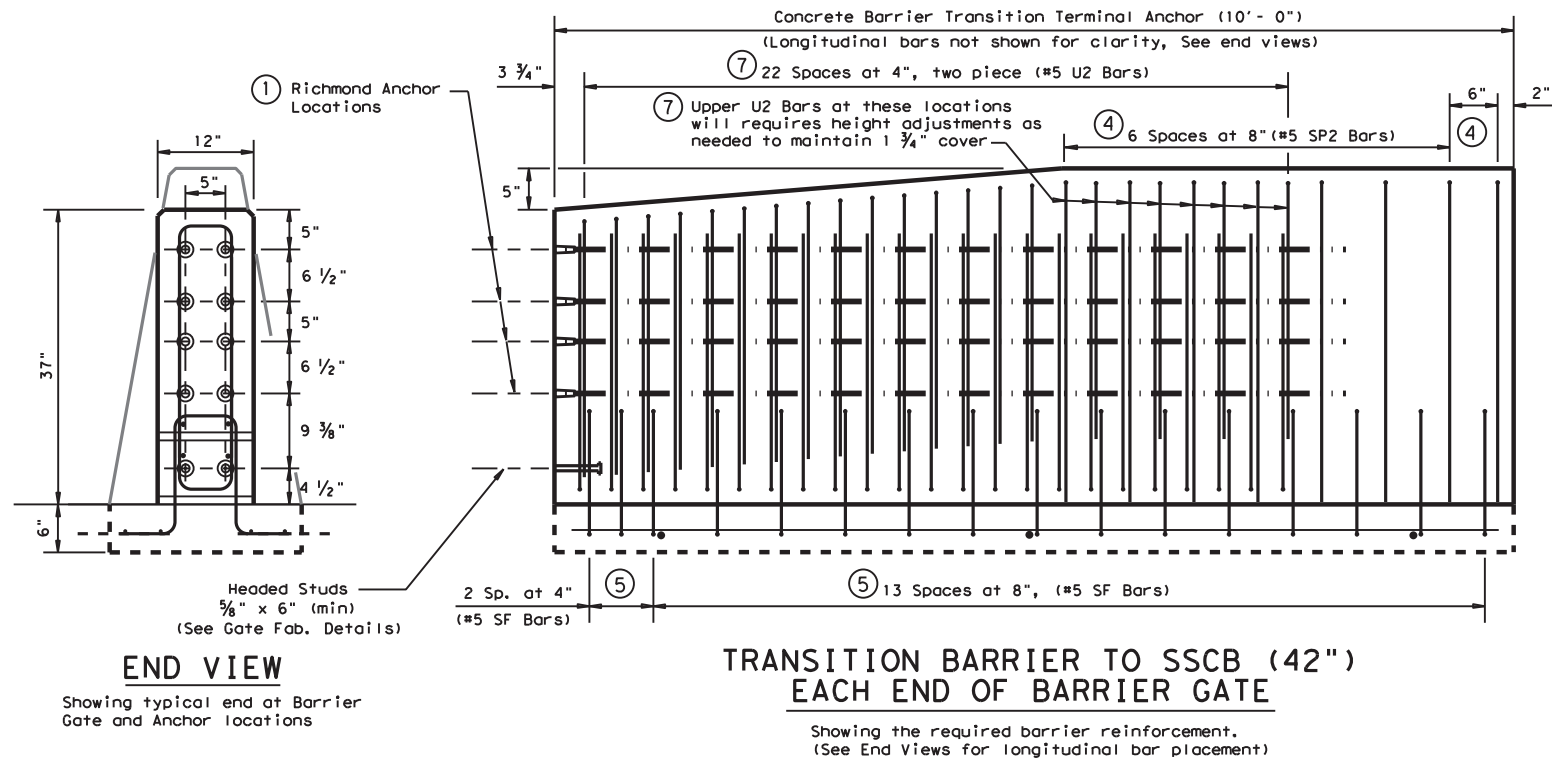
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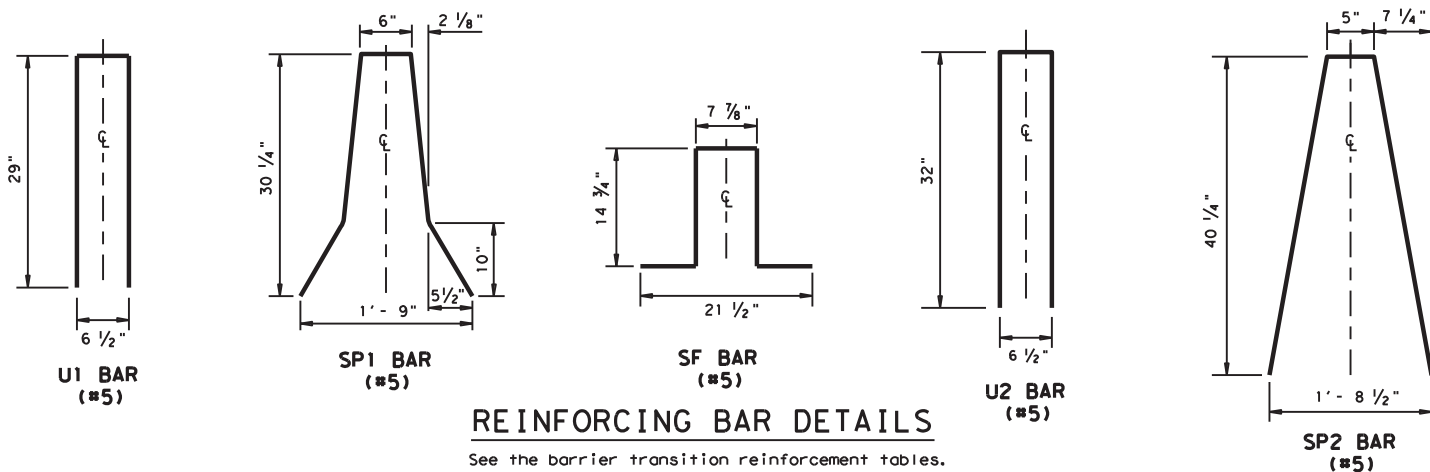
TRANSITION TO (32") CSB		
#	BARRIER TRANSITION REINFORCEMENT TABLE	QTY
①	Richmond Anchors, #7 Straight	12
②	Richmond Anchors, #7 Bent	4
③	Rebar, #5 x 12" Long	12
④	SP-Bar, #5	16
⑤	SF-Bar, #5	32
⑥	Rebar, #5 x 57" Long	16
⑦	U-Bar, #5	76
⑧	Rebar, #5 x 93" Long	8
⑨	Rebar, #4 x 116" Long	8

TRANSITION TO (42") SSCB		
#	BARRIER TRANSITION REINFORCEMENT TABLE	QTY
①	Richmond Anchors, #7 Straight	16
③	Rebar, #5 x 12" Long	12
④	SP2 Bar, #5	16
⑤	SF Bar, #5	32
⑥	Rebar, #5 x 57" Long	20
⑦	U2 Bar, #5	76
⑧	Rebar, #5 x 93" Long	8
⑨	Rebar, #4 x 116" Long	8

Note:
Use 2" Bending pin on all bends



① Richmond Anchors, #7 Straight
② Richmond Anchors, #7 Bent
RICHMOND ANCHORS

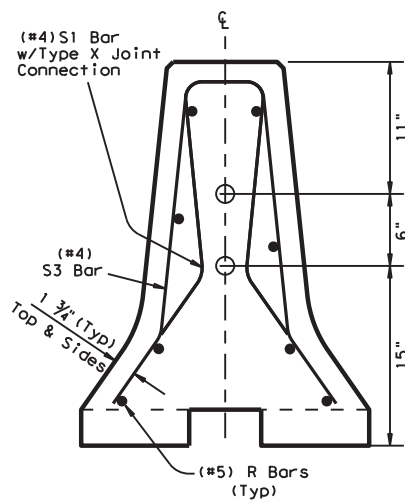


SHEET 2 OF 2

		Design Division Standard	
<h1>BARRIER GATE</h1> <h2>BG-11</h2>			
FILE: bg11.dgn	DN: TxDOT	CK: AM	DW: BD
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REVISIONS	SAT	COUNTY: BEXAR	SHEET NO.: 93

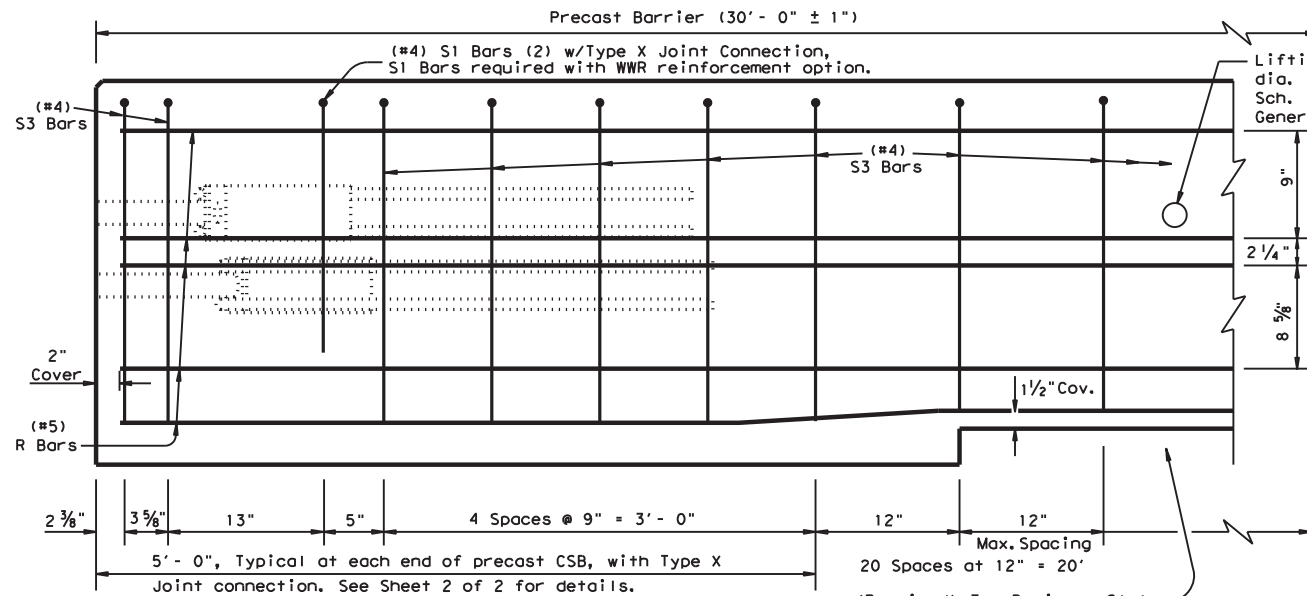
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**End View
Precast Barrier**

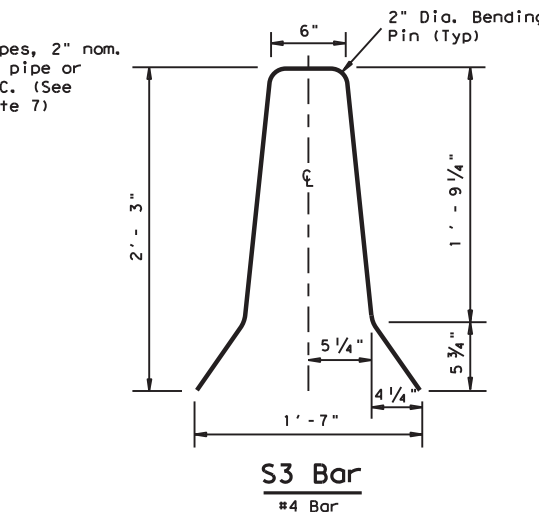
See sheet 2 of 3 for
Joint connection Type X



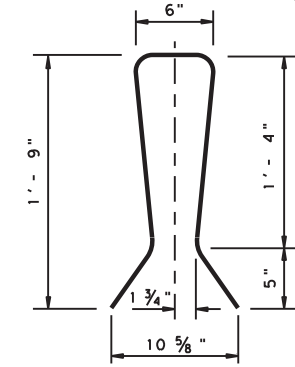
**Reinforcement for Precast (CSB)
Concrete Safety Barrier (Type 1)**

Showing reinforcement for Joint Type X

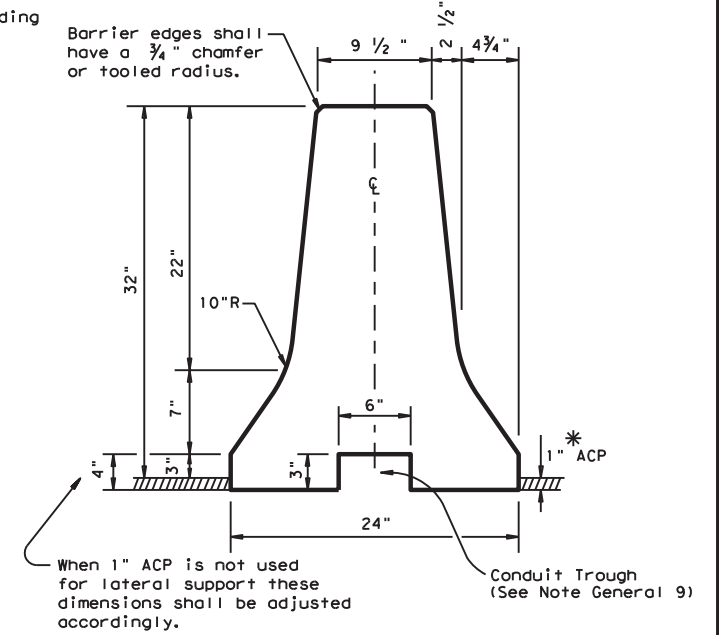
(Required) Two Drainage Slots
36" Long x 3" Deep, beginning
6' - 0" from each end of the
30' - 0" barrier segment.



S3 Bar
#4 Bar



S1 Bar
#4 Bar (2)
(Joint Type X)

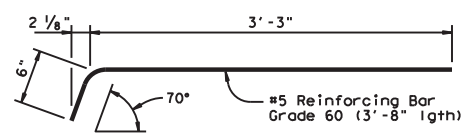


Concrete Safety Barrier

* When 1" ACP is "not" used as lateral support for permanent barrier placement. A permissible method of attaining the equivalent lateral support may be used, See CSB(6) sheet.

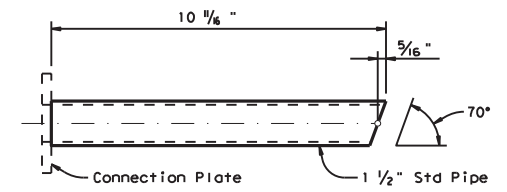
GENERAL NOTES

- Concrete shall be Class H with a minimum compressive strength of 3,600 psi.
- Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
- Precast barrier length shall be 30 ft. unless otherwise specified on the plans.
- All precast barrier edges shall have a 3/4 inch chamfer or tooling radius.
- All concrete, reinforcement, joint connection systems, grout etc. as shown, are considered as part of the barrier payment.
- All steel assemblies for joint shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
- Regardless of the method of handling, barrier lifting points shall be approx. 7.5 feet from the ends of the barrier. Lifting devices and attachments to barrier sections shall be approved by the Engineer.
- Surface finishing and grouting (where required) shall be two parts sand one part cement with enough water to make the mixture plastic. Grouting shall be done in a manner that will assure a smooth surface. Surface finishing shall be considered subsidiary to the various bid items involved.
- Conduit trough when required shall be shown elsewhere on the plans, or as directed by the Engineer.



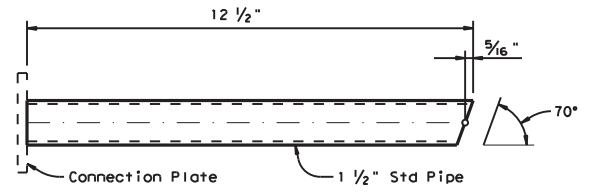
DEFORMED BAR ANCHOR DETAILS

Two (2) Bars required per assembly.
Eight (8) required per joint.



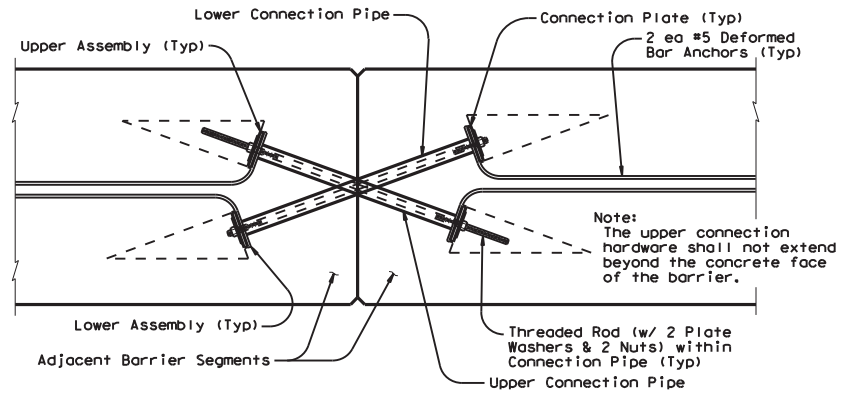
UPPER CONNECTION PIPE DETAILS

One (1) Steel Pipe required per Upper Assembly.
Two (2) required per joint.



LOWER CONNECTION PIPE DETAILS

One (1) Steel Pipe required per Lower Assembly.
Two (2) required per joint.



TYPE X JOINT INSTALLATION DETAIL

Barrier reinforcing and Type X Joint Leave-Out dimensions not shown for clarity.

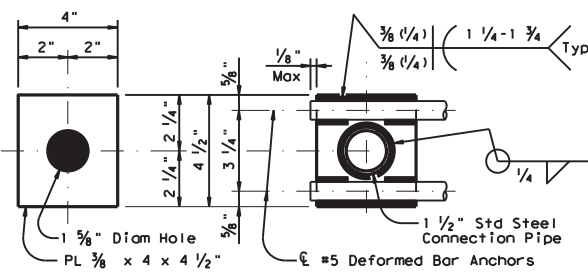
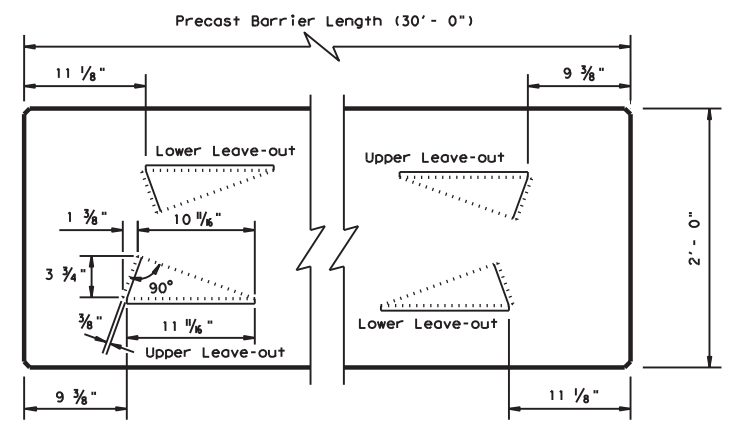


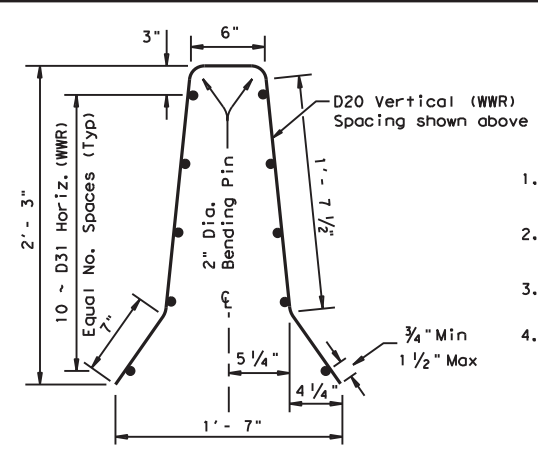
PLATE DIMENSIONS **WELDING DETAILS**

CONNECTION PLATE DETAILS

One (1) Plate required per assembly.
Four (4) required per joint. All steel fittings for joint Type X shall be galvanized after fabrication in accordance with Item 445.



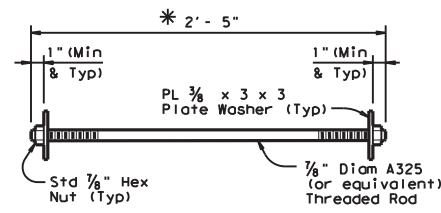
BARRIER PLAN AT END JOINTS



Welded Wire Reinforcement (WWR) Option for Bars R and S3

(WWR) General Notes

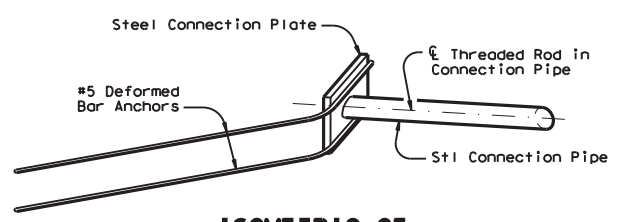
- Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
- Welded wire cage may be cut or bent to accommodate the Type X joint connection and drainage slots, as directed by the Engineer.
- All reinforcement shall comply with Item 440, "Reinforcing Steel."
- Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".



**CONNECTION BOLT OR
THREADED ROD DETAIL**

Two (2) Threaded Rods (or Equivalent Hex Hd. Bolts) (w/ Two (2) PL 3/8 x 3 x 3 Plate Washers & Two (2) Std Hex Nuts) required per joint.

* The connection hardware shall not extend beyond the concrete face of the barrier. Hex head bolts may be provided. The proper length of all hardware should be verified.



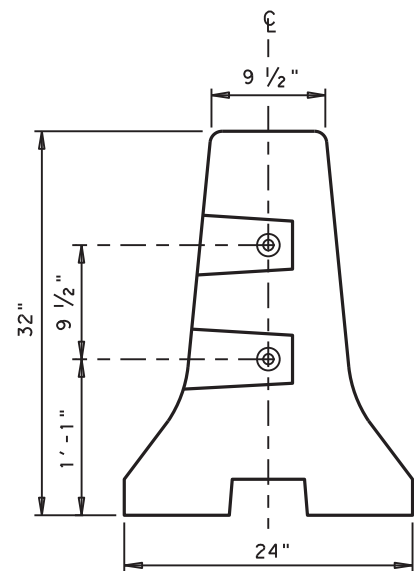
**ISOMETRIC OF
TYPICAL WELDED ASSEMBLY**

Four (4) [2 Upper & 2 Lower] Assemblies required per joint.

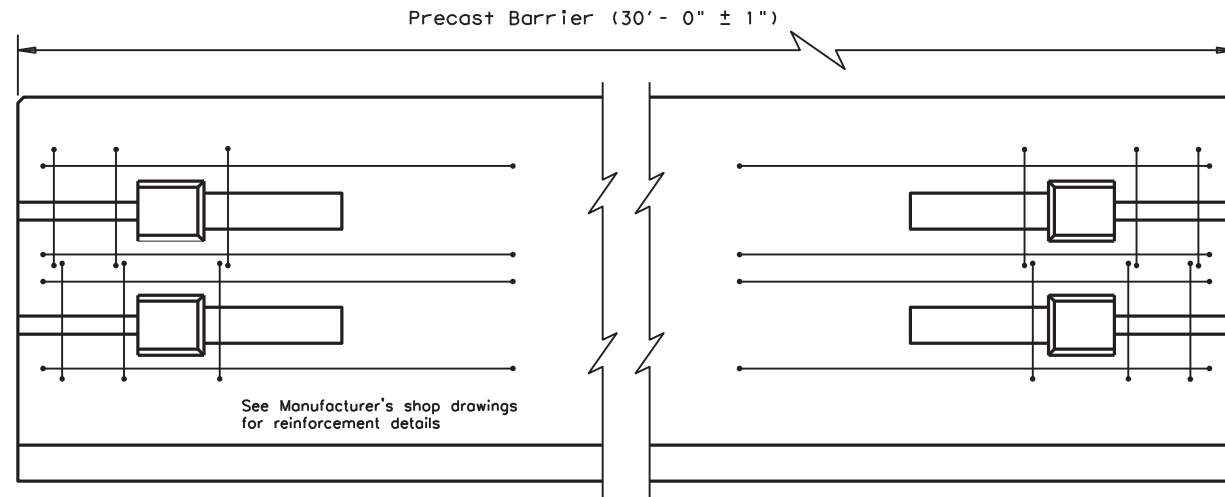
Weight of one Precast 30 ft. (CSB) segment = Approx. 6.5 Tons or 440 lbs per ft.

		Design Division Standard	
CONCRETE SAFETY BARRIER (F-SHAPE)			
PRECAST BARRIER (TYPE 1)			
CSB(1)-10			
FILE: csb110.dgn	DN: TxDOT	CK: AM	DW: BD
© TxDOT December 2010	CONT: 6372	SECT: 50	JOB: 001
REVISIONS	SAT	COUNTY: BEXAR	SHEET NO.: 94

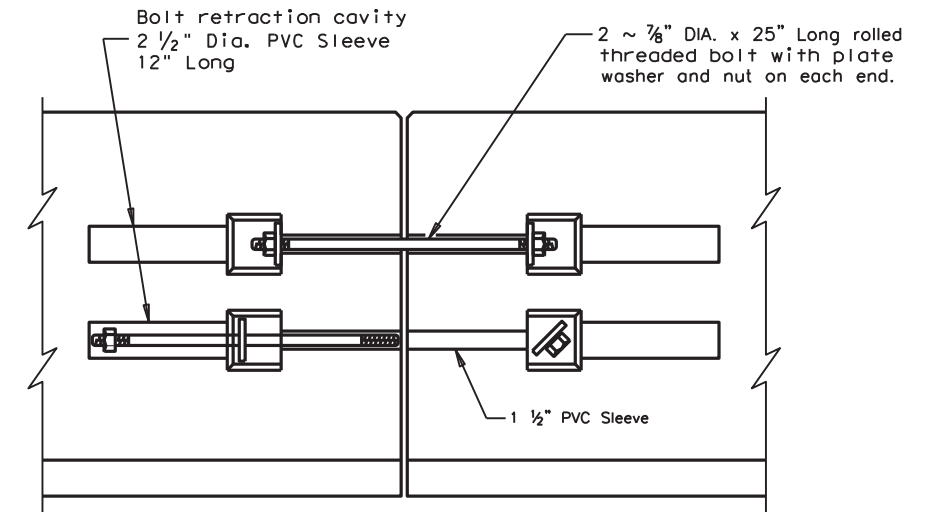
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END VIEW (CSB) QUICK-BOLT
QUICK-BOLT POCKET LOCATIONS

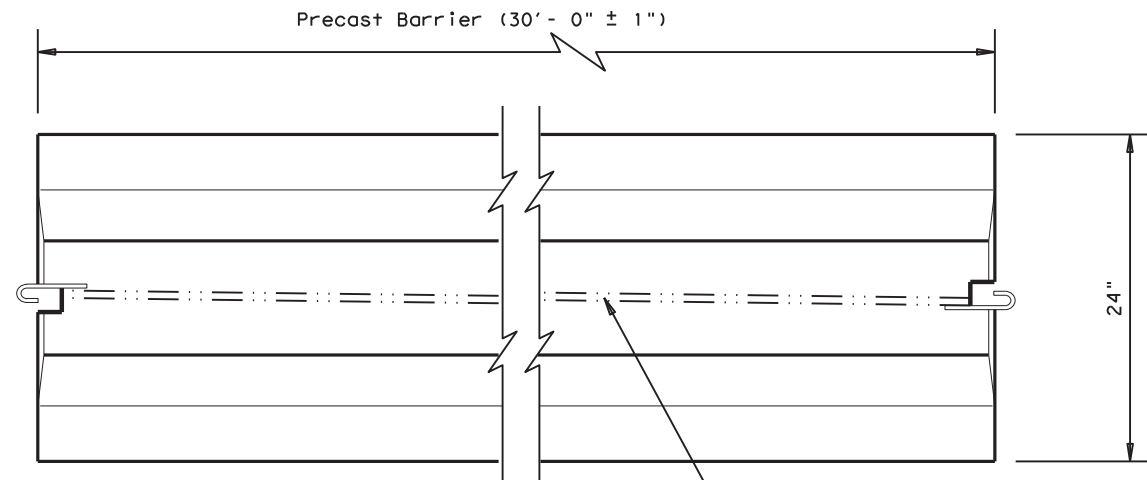


ELEVATION (CSB) QUICK-BOLT
See Manufacturer's shop drawing for additional details

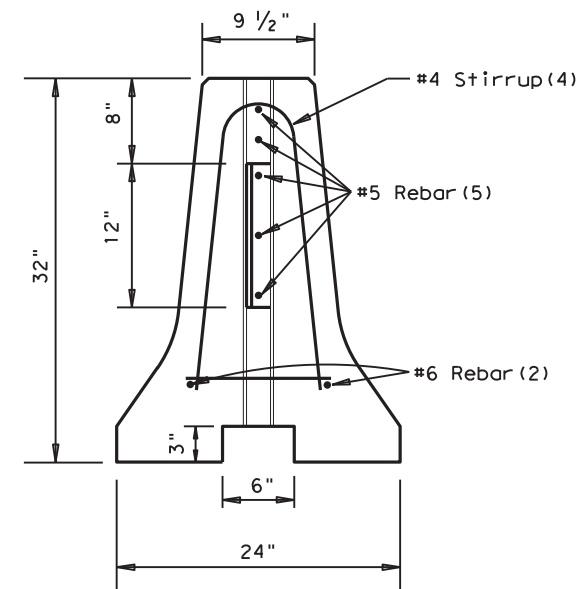


ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

Joint Connection (Type Q)

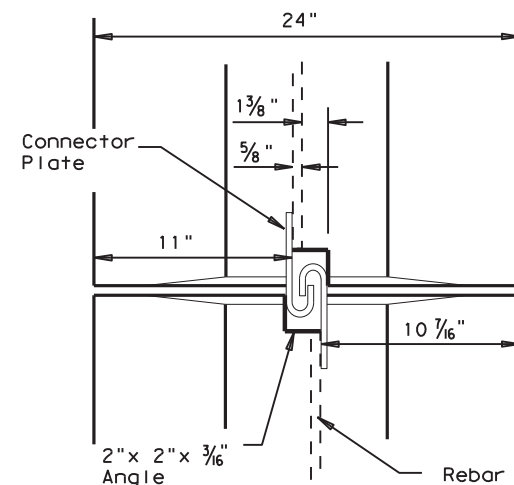


TOP VIEW
PRECAST (CSB) WITH J-J HOOKS
See Manufacturer's shop drawing for additional details



END VIEW
J-J HOOK CONNECTION

Joint Connection (Type J)



VIEW FROM ABOVE
J-J HOOK CONNECTION

Proprietary Joint Connections (CSB)

Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

J-J Hooks by Easi-Set Industries, (800)547-4045
Quick-Bolt by Bexar Concrete, (210)497-3773

If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.

SHEET 2 OF 2



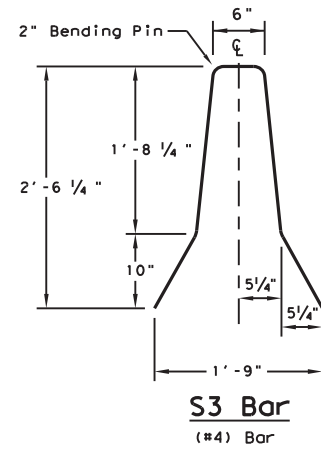
CONCRETE SAFETY BARRIER (F-SHAPE)
PRECAST BARRIER (TYPE 1)

CSB(1)-10

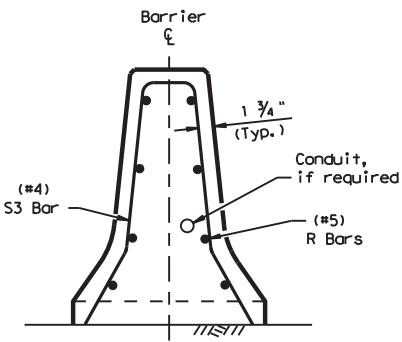
FILE: csb110.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
© TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
DIST	COUNTY		SHEET NO.	
SAT	BEXAR		95	

DATE:
FILE:

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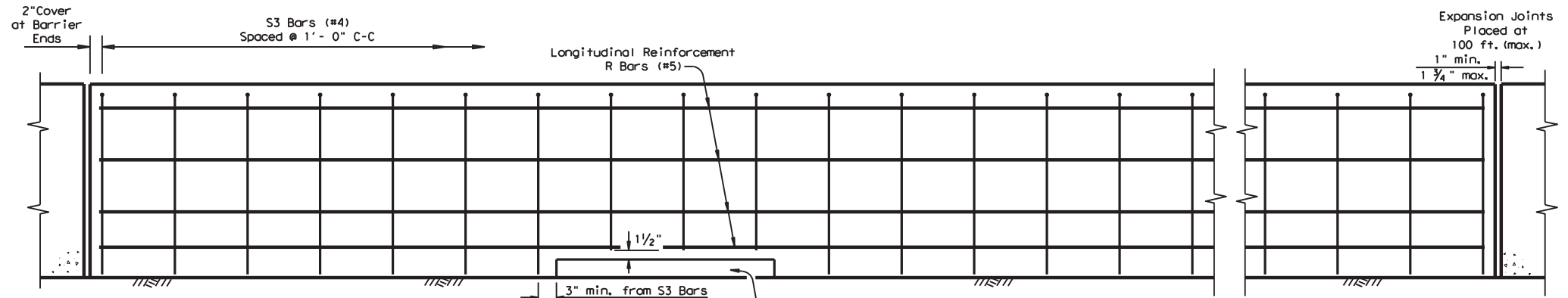


S3 Bar
(#4) Bar



END VIEW

Cast-in-Place (CIP) Barrier
Barrier is Symmetrical About the Center Line

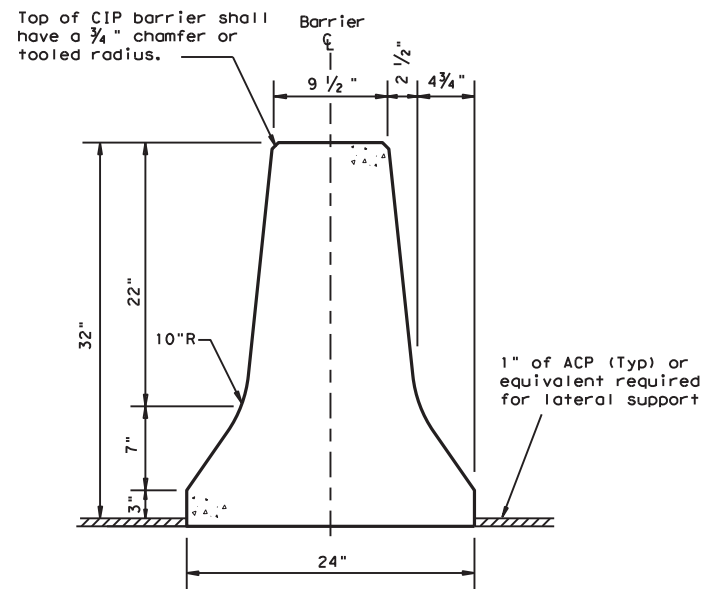


ELEVATION VIEW

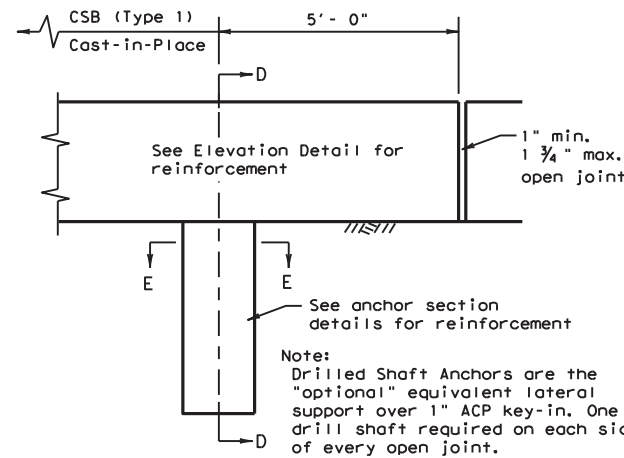
Cast-in-Place (CSB) on Flexible Pavement

Note:
Reinforcement cage may rest on top of the finished grade.
3' Long X 3" Deep Drainage Slots, as required (See General Note 5)

Expansion Joints
Placed at
100 ft. (max.)
1" min.
1 3/4" max.

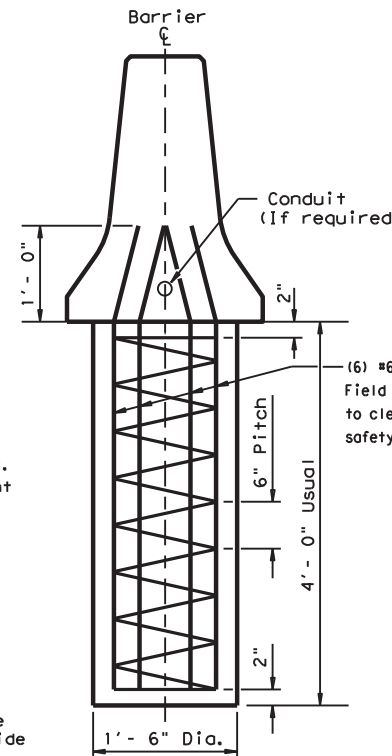


CONCRETE SAFETY BARRIER (CSB)

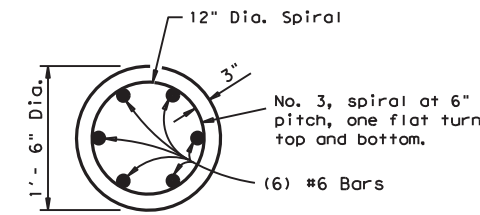


**DRILLED SHAFT ANCHOR
LOCATION DETAIL**

Note:
Drilled Shaft Anchors are the "optional" equivalent lateral support over 1" ACP key-in. One drill shaft required on each side of every open joint.



**SECTION D-D
DRILLED SHAFT ANCHOR**



**SECTION E-E
DRILLED SHAFT ANCHOR**

See drilled shaft anchor location detail

GENERAL NOTES

- Concrete shall be Class C, unless otherwise specified in the plans.
- Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
- Axis of cast-in-place barrier shall be vertical, except where roadway is superelevated, then axis is normal to roadway surface.
- Top edges of cast-in-place barrier shall have a 3/4 inch chamfer or tooled radius.
- Drainage slot depths may be increased 1 inch to accommodate ACP. Slot locations (12'-0", C-C Min. Spacing) are shown elsewhere, or as directed by the Engineer.
- Cast-in-place barrier may be slip formed. Bracing may be tied or tack welded to the reinforcement cage to provide cage stability. Do not weld to anchor bars. The reinforcement cage may rest on top of the finished grade.
- For locations where lighting is required, see the CSB(4) sheet for the proper reinforcement and anchorage.

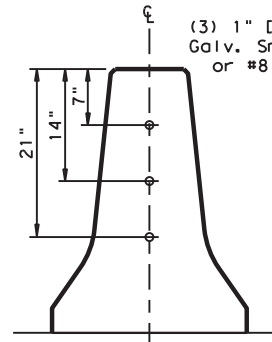
Cast-In-Place or Slip-Formed (CSB)

Cast-in-Place barrier may be connected to precast CSB. Joint connection "Types" may be used in Cast-in-Place barrier, to match the precast barrier connection. (See required connection "Type" elsewhere in the plans)

The weight of Cast-in-Place (CSB) (F-Shape) is approx. 440 lbs per ft.

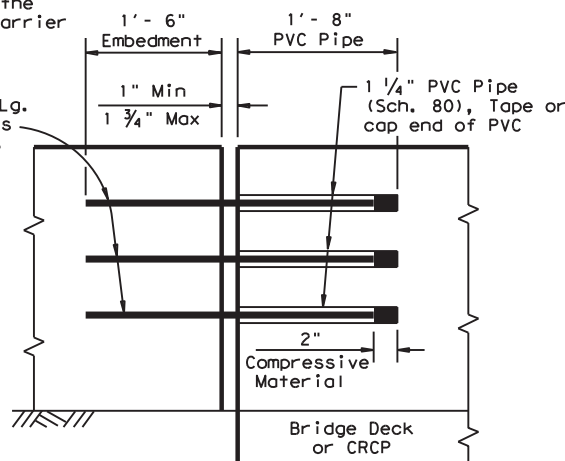
EXPANSION JOINT (Dowel Location)

Dowels may be used as directed by the Engineer, in locations where the barrier could be laterally displaced.



END VIEW

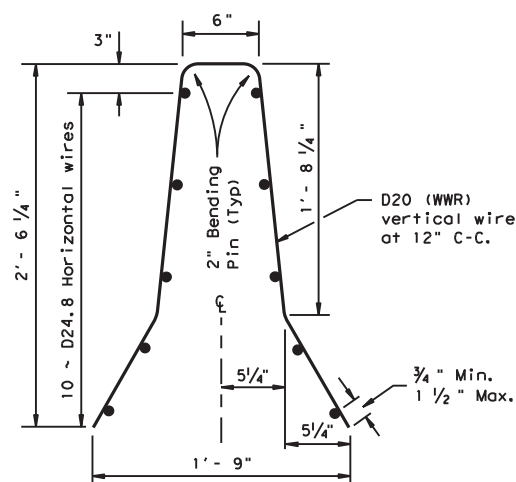
Dowel locations



WELDED WIRE REINFORCEMENT (WWR) OPTION FOR BARS S AND R

(WWR) General Notes

- Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
- The welded wire cage at the drainage slots may be cut or bent to accommodate the edge and top clearances, as directed by the Engineer.
- The welded wire splice locations shall have a "minimum" splice lap length of 12".
- Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".

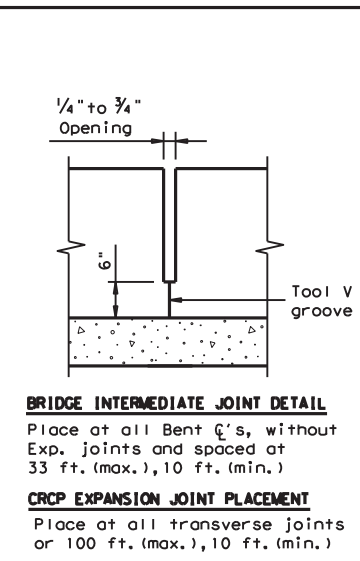
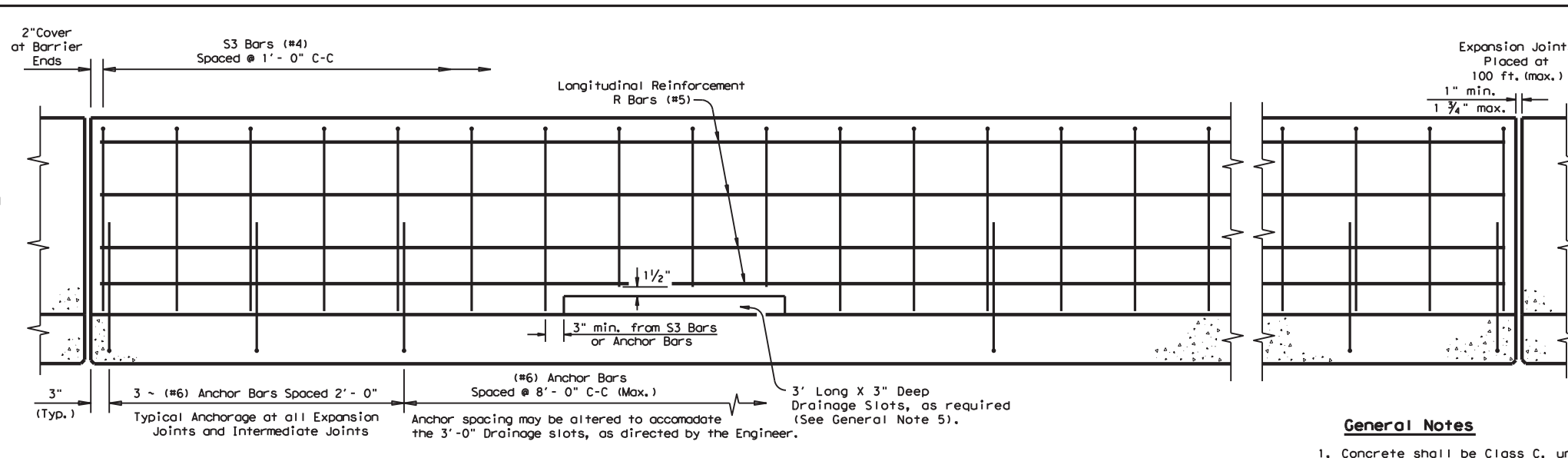
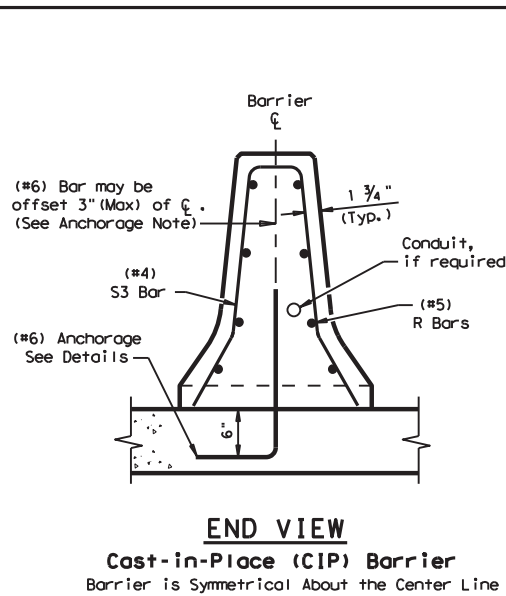


DATE:
FILE:

				Design Division Standard	
CONCRETE SAFETY BARRIER (F-SHAPE) CAST-IN-PLACE (TYPE 1) (FLEXIBLE PAVEMENT) CSB (2) - 13					
FILE: csb213.dgn	DN: TxDOT	CK: AM	DW: VP	CK:	
© TxDOT December 2010	CONT	SECT	JOB	HIGHWAY	
REVISIONS	6372	50	001	VAR.	
	DIST	COUNTY		SHEET NO.	
	SAT	BEXAR		96	

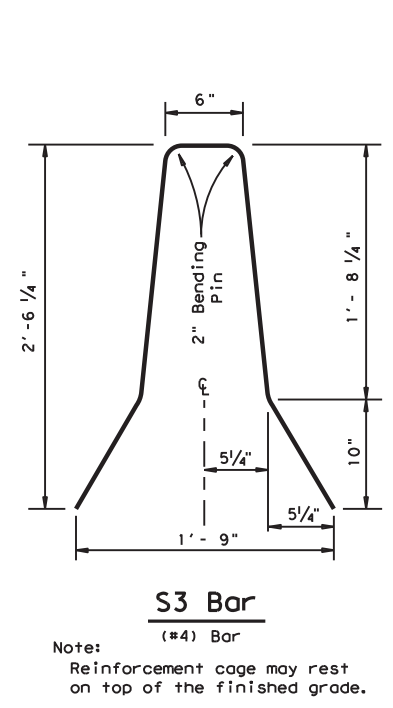
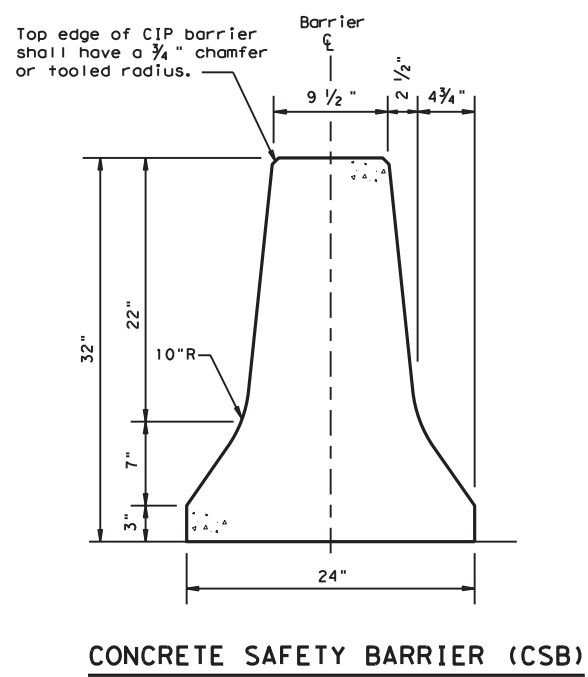
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FILE:



General Notes

- Concrete shall be Class C, unless otherwise specified in the plans.
- Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615. If the bridge deck requires epoxy "coated" reinforcement, the barrier and/or anchorage may require the same, as shown elsewhere in the plans.
- Axis of cast-in-place barrier shall be vertical, except where the roadway is superelevated, then axis shall be normal to roadway surface.
- Top edges of cast-in-place barrier shall have a 3/4" chamfer or tooled radius.
- Anchorage: The "Optional" Anchor system shall be embedded 6" into fresh concrete or using a Type III, Class C Epoxy anchorage system. Follow the manufacturer's directions for installing the expoxied anchor bars. All anchorage shown is the minimum required, and considered subsidiary to the bid item.
- Drainage slot depths may be increased 1" to accommodate ACP. Slot locations (12'-0", C-C Min. Spacing) are shown elsewhere, or as directed by the Engineer.
- Cast-in-place barrier may be slip formed. Bracing may be tied or tack welded to the reinforcement cage to provide cage stability. Do not weld to anchor bars. The reinforcement cage may rest on the top of the finished grade.
- For locations where lighting is required, see the CSB(4) sheet for the proper reinforcement and anchorage.

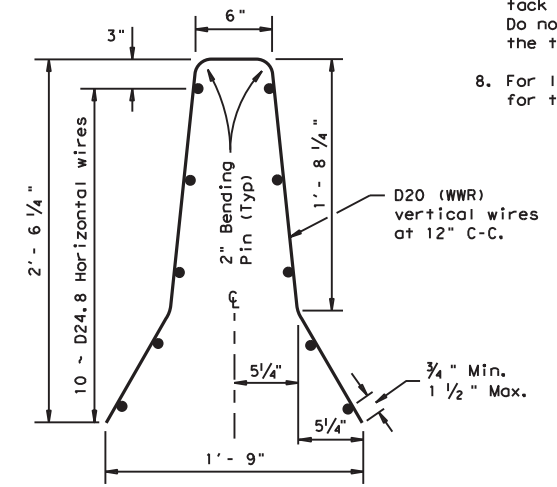
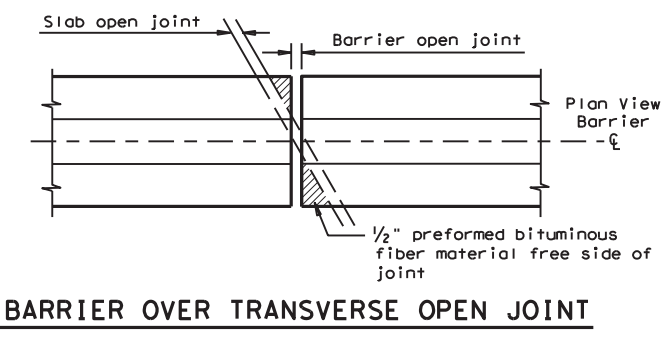


BARRIER PLACEMENT OVER (CRCP) JOINTS

Barrier may be cast over a "Longitudinal" CRCP joint.

CRCP Joints (with or without tiebars): Two layers of 30# roofing felt or 1/2" preformed bituminous fiber material.

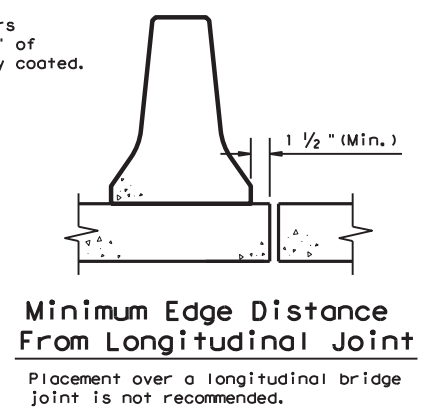
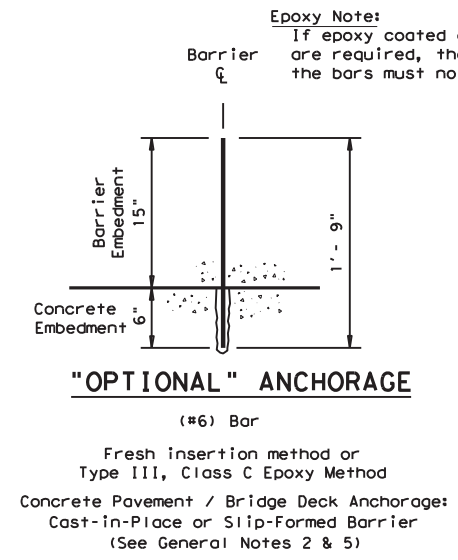
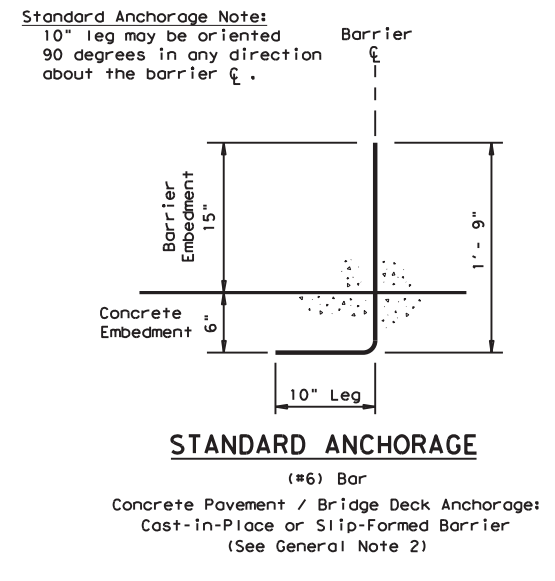
Barrier Anchorage Note: Anchorage must be located at least 3" from a longitudinal joint.



Cast-In-Place or Slip-Formed (CSB)

Cast-in-Place barrier may be connected to precast CSB. Joint connection "Types" may be used in Cast-in-Place barrier, to match the precast barrier connection. (See required connection "Type" elsewhere in the plans)

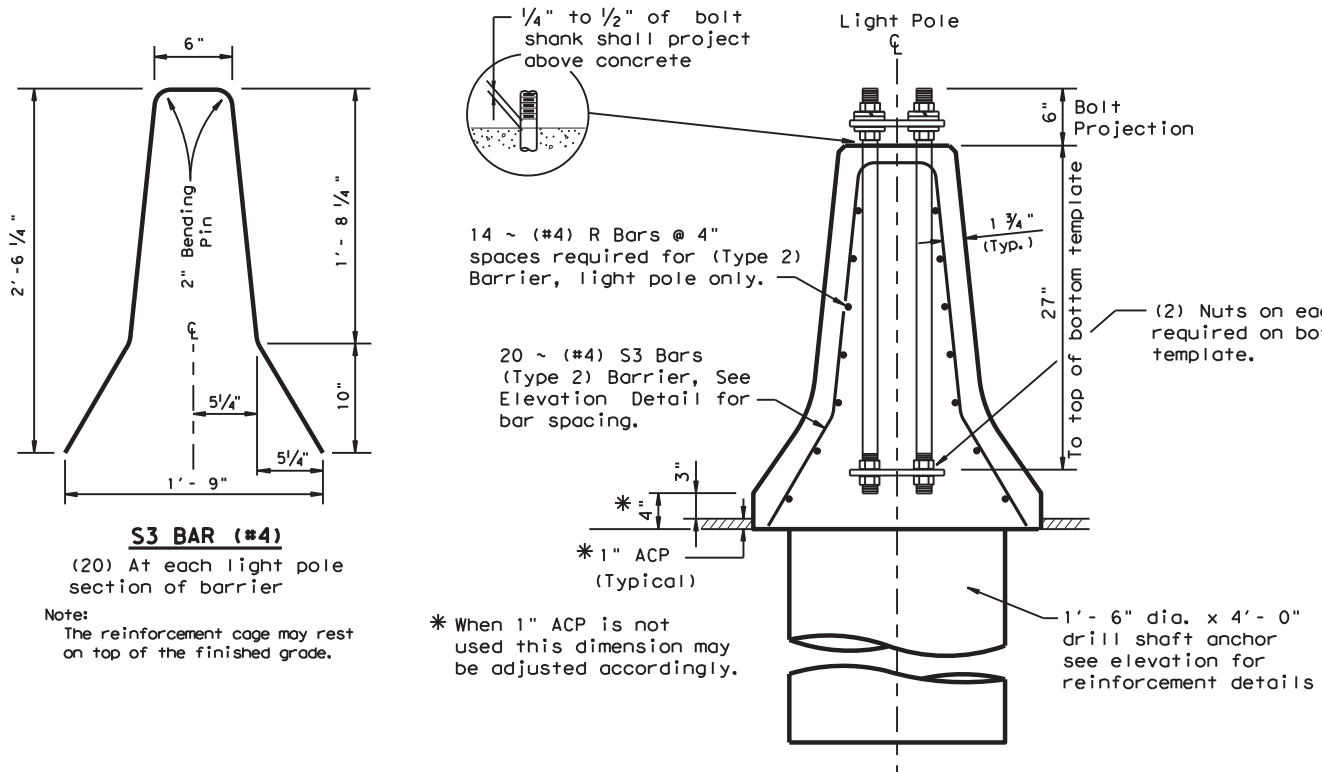
The weight of Cast-in-Place (CSB) (F-Shape) is approx. 440 lbs per ft.



- WWR) General Notes**
- Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
 - The welded wire cage at the drainage slots may be cut or bent to accommodate the edge and top clearances, as directed by the Engineer.
 - The welded wire splice locations shall have a "minimum" splice lap length of 12".
 - Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".

		Design Division Standard	
CONCRETE SAFETY BARRIER (F-SHAPE) CAST-IN-PLACE (TYPE 1) (BRIDGE DECK or CRCP) CSB(3) - 16			
FILE: csb316.dgn	DW: TxDOT	CK: HC/AN	DR: BD/VP
© TxDOT January 2016	CONT: 6372	SECT: 50	JOB: OOI
CST 01-2016	REVISIONS	DIST: SAT	COUNTY: BEXAR
			SHEET NO.: 97

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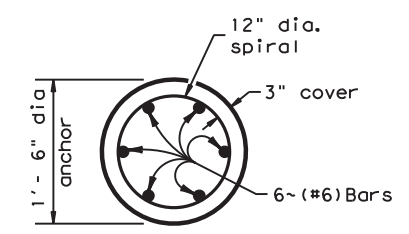


(ROADWAY) SECTION AT LIGHT POLE
Symmetrical about center line

Schedule of reinforcement for each 10 foot cast-in-place section at light poles (excluding anchorage)

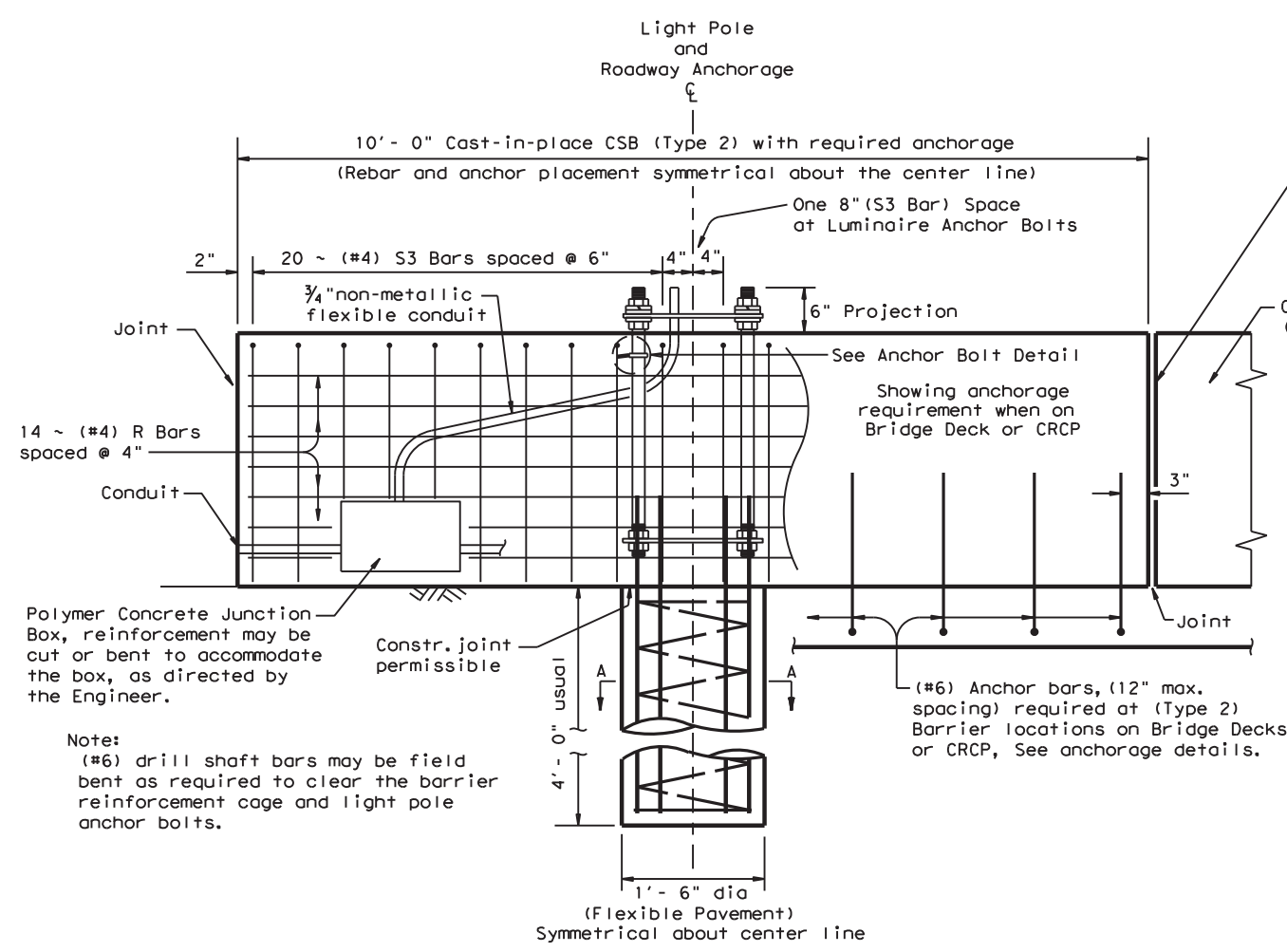
BAR	SIZE	QUANTITY
S3	#4	20
R	#4	14

Welded Wire Reinforcement (WWR) IS NOT APPROVED FOR USE WITH (TYPE 2) BARRIER.



SECTION A-A

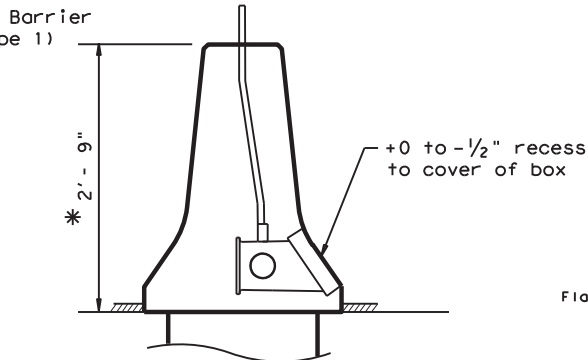
- GENERAL NOTES**
- All concrete shall be Class C, unless otherwise specified in the plans.
 - Anchor bolts, junction box, non-metallic flexible conduit, and bonding to steel shall not be paid for directly, but will be subsidiary to the various bid items.
 - For proper installation and material requirements for the anchor bolts and light pole, see Traffic Engineering RIP standard sheets.
 - Junction boxes shall be polymer concrete, and shall be mounted flush (+0, -1/2") with concrete surface. For details and material requirements on barrier junction box, see DMS-11030.
 - Install 12 AWG stranded conductors from load side of fused breakaway connector to luminaire. Fused breakaway connectors shall be installed as required on Traffic Engineering RID Sheets. Typically fused breakaway connectors are installed in the barrier junction box adjacent to each light pole. If fused breakaway connectors are installed in the pole's handhole, increase the size of the 3/4" flexible non-metallic conduit according to the NEC as needed to accommodate the branch circuit conductors.
 - Anchor bolts and their assemblies shall be in accordance with Item 449, "Anchor Bolts" High-Strength Steel or Alloy Steel. Galvanization requirements for anchor bolts are shown on RIP sheets.
 - The required anchorage for Type 2 barrier (drill shaft, standard or optional concrete anchorage) shall not be paid for directly, but is subsidiary to Item 514, "Permanent Concrete Traffic Barrier."
 - 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.



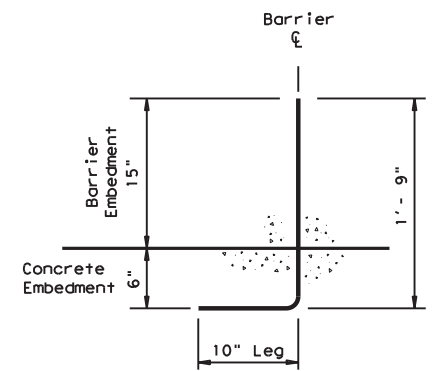
ELEVATION SHOWING THE REQUIRED REINFORCEMENT AND ANCHORAGE OF (TYPE 2) BARRIER

The "Drilled Shaft Anchor" is the required anchorage for (Type 2) barrier on roadways with Flexible Pavement. The #6 Anchor Bars (Shown) is the required anchorage for (Type 2) barrier on Bridge Decks and CRCP.

Each end of cast-in-place light pole section shall be formed to mate with the adjacent precast (Type 1) roadway barrier. The cast-in-place section shall be connected at each end to the precast sections in the same manner that precast sections are connected at joints as shown elsewhere.



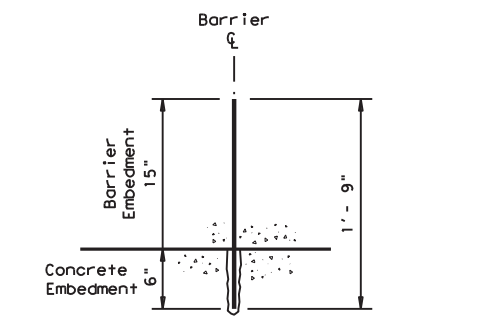
SECTION SHOWING JUNCTION BOX CONCRETE SAFETY BARRIER (TYPE 2)



STANDARD "CONCRETE" ANCHORAGE

(#6) Bar
Concrete Pavement / Bridge Deck Anchorage:
Cast-in-Place or Slip-Formed Barrier

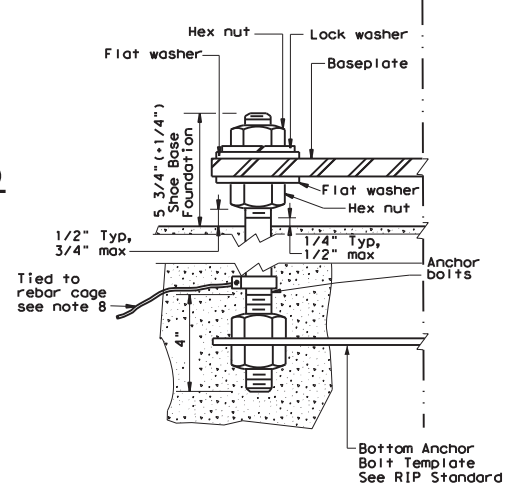
Standard Anchorage Note:
10" leg may be oriented 90 degrees in any direction about the barrier centerline.



"OPTIONAL" EPOXY ANCHORAGE

(#6) Bar
Type III, Class C Epoxy
Concrete Pavement / Bridge Deck Anchorage:
Cast-in-Place or Slip-Formed Barrier

Epoxy Note:
If epoxy coated anchor bars are required, the lower 6" of the bars must not be epoxy coated.



ANCHOR BOLT DETAIL

Texas Department of Transportation
Design Division Standard

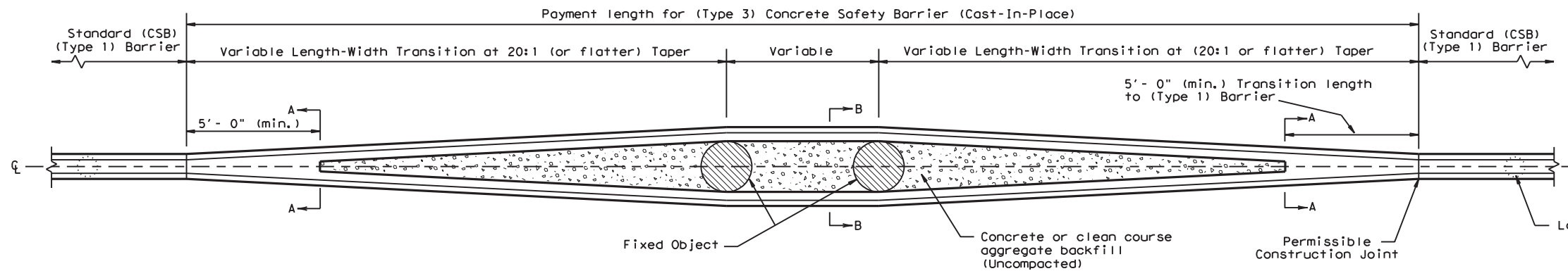
CONCRETE SAFETY BARRIER (F-SHAPE) CAST-IN-PLACE (TYPE 2) AT LIGHT POLE TL-3 MASH COMPLIANT CSB(4) - 19

FILE: csb419.dgn	DN: TxDOT	CK: KM	DW: BD	CK:
© TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	98	

DATE: FILE:

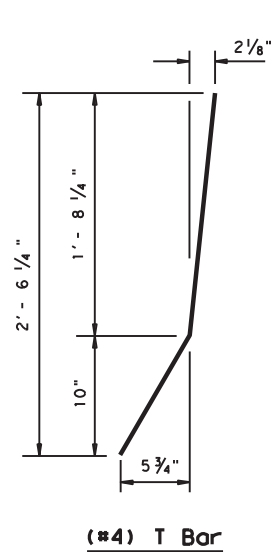
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DATE:
FILE:

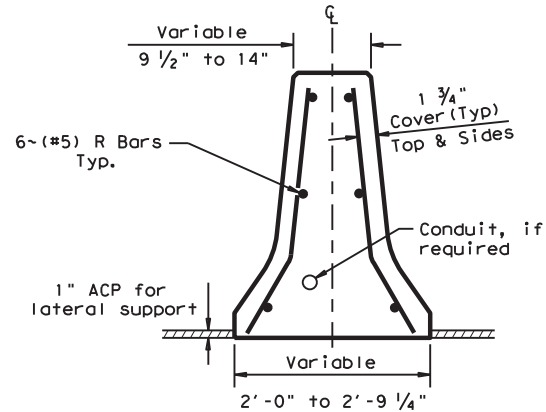


PLAN (TYPE 3) BARRIER

Lateral Support Options:
a) 1" ACP, both sides of barrier, or
b) 18" dia x 48" deep Drill Shaft, See CSB(2) sheet, or
c) Rebar Anchorage, See CSB(3) sheet.

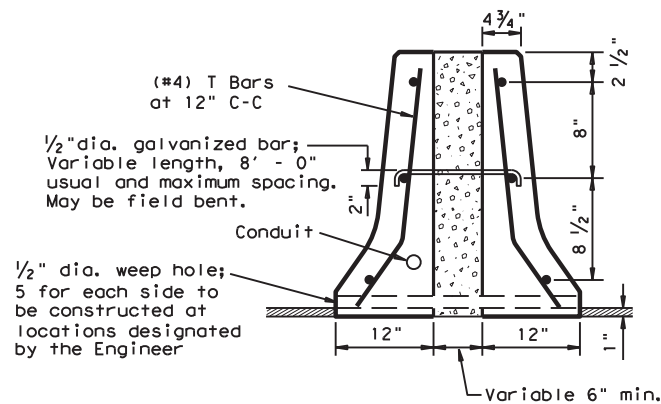


(#4) T Bar



SECTION A-A
TYPE 3 BARRIER

Note:
Bottom of the reinforcement cage shall rest on top of the finished grade.



SECTION B-B
TYPE 3 BARRIER

Note:
Outside face dimensions and slopes for (Type 3) CSB are the same as for (Type 1) CSB.

GENERAL NOTES

- Axis of concrete barrier shall be vertical, except where roadway is superelevated, then axis shall be normal to roadway surface.
- All steel that requires galvanizing shall be in accordance with Item 445, "Galvanizing."
- Unless otherwise shown in the plans the contractor has the option of placing either precast or cast-in-place (Type 1) CSB.
- Bid price per liner foot of (Type 1) CSB and (Type 3) CSB, including terminal and anchor sections, shall include all of the concrete, reinforcement, drilled shaft foundations and aggregate backfill.
- All concrete shall be Class C.
- Longitudinal and vertical bars for roadway barrier shall conform to ASTM A615 (Grade 60), unless otherwise specified.
- At construction joints the longitudinal bars shall extend beyond the joint so that bar splices will be a minimum of two feet from the construction joint.
- Welded wire reinforcement (WWR) may be used as an option to conventional reinforcement and shall meet area requirement for the (Type 3) R and T bars.
- Any method devised by the contractor and approved by the Engineer that will assure the longitudinal steel for (Type 1) CSB and (Type 3) CSB will be positioned $\pm 1/2$ inch as dimensioned will be satisfactory.
- Conduit to be provided only when called for elsewhere in the plans. Position of conduit may be adjusted to facilitate construction subject to the approval of the Engineer.
- See CSB(4) standard for barrier with illumination.

Welded Wire Reinforcement (WWR) Option
for Bars T and H1 (Type 3) Barrier

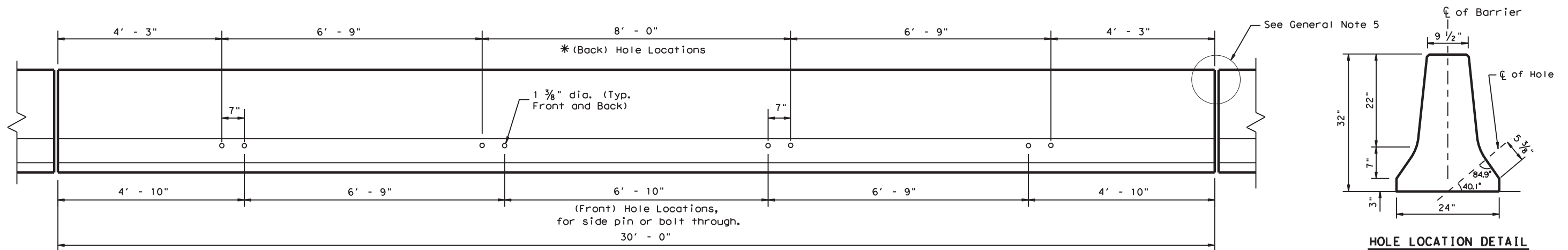
(WWR) General Notes

- WWR design required for (Type 3) CSB barrier: D20 vertical (12" C-C) x D31 horizontal wires spaced as shown in Section B-B.
- Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
- Welded wire cage may be cut and bent to accommodate the drainage slots, as directed by the Engineer.
- Welded wire splice locations shall have a "minimum" splice lap length of 12".
- Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".

				Design Division Standard	
CONCRETE SAFETY BARRIER (F-SHAPE) CAST-IN-PLACE (TYPE 3) AT FIXED OBJECTS CSB(6) - 10					
FILE:	csb610.dgn	DN:	TxDOT	CK:	AM
		DW:	BD	CK:	
© TxDOT	December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS		6372	50	001	VAR.
		DIST	COUNTY	SHEET NO.	
		SAT	BEXAR	99	

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FILE:

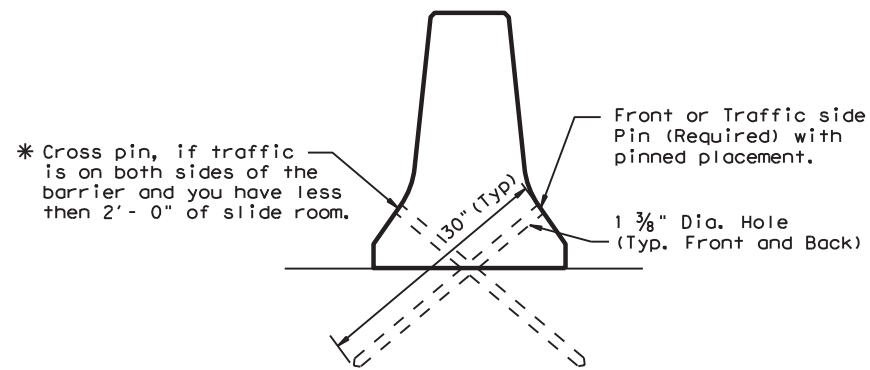


DETAIL 1

HOLE LOCATION DETAIL

GENERAL NOTES

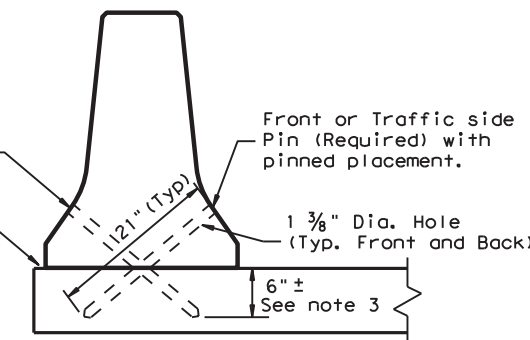
1. These details provide a method of laterally restraining precast concrete barrier to limit deflections under normally expected passenger vehicle impacts. These details are intended for use in work zones, primarily on bridge decks, or pavement where temporary barrier must be placed less than 2 ft. from the longitudinal edge of the deck or dropoff and parallel to the direction of travel. Other applications of these details are acceptable as directed by the Engineer.
2. Each precast concrete barrier section shall have a minimum of four or total of eight 1 3/8" ID, holes formed or cored through the barrier. The center lines of the holes are shown in the hole location detail. If rebar is encountered, the entry point may be shifted 2" plus or minus longitudinally along the barrier. The eight holes are spaced along the length of the barrier as shown in Detail 1.
3. The drilling of the travel surface is accomplished by placing the pre-drilled barrier section on the travel surface in the desired position. Then the hole is drilled with the bit passing through the hole in the barrier. The bit is to be inserted into the hole in the barrier so that the travel surface is drilled to a point which is slightly more than the pin length.
4. Note that steel washers have been welded to the top of the steel pins, to aid in the removal of the pins, when the barrier is removed.
5. See CSB(1) standard sheets for reinforcement requirements and joint connection types.
6. The forming or coring of holes in the barrier, drilling of holes in bridge deck or pavement, fabrication and materials for the 1 1/4" pins, installation of pins, and any repair to the barrier shall be considered as subsidiary to the barrier bid items.
7. The barrier and travel surface will be repaired as directed by the Engineer in accordance with Item 429, "Concrete Structure Repair."
8. Provide galvanized bolts, nuts, and plate washers. All steel pins shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
9. Weight of barrier is approx. 440 lbs per foot.



DETAIL 2

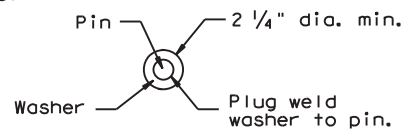
Placement on (ACP) Asphalt Concrete Pavement or Treated Base Material (30" Pin required)

* Cross pin, if traffic is on both sides of the barrier and you have less than 2'-0" of slide room. Cross pin recommended but not required if less than 2'-0" on Bridge Decks. (See General note 1)



DETAIL 3

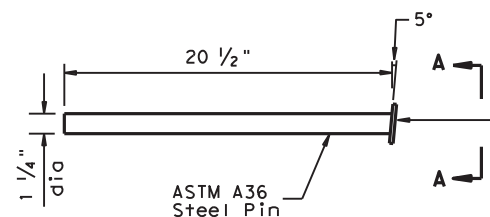
Bridge Deck or CRCP (21" pin required)



VIEW A-A

CORE DRILLING EXISTING BARRIER

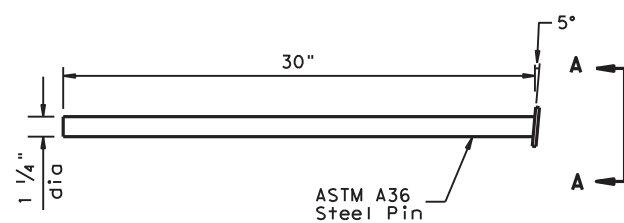
Core drilling existing concrete barrier is permitted. Holes shall be drilled with coring or masonry drilling type equipment. Percussion (star) drilling shall not be used. A special drill bit (to cut through existing reinforcing) will likely be required. Spalls in the concrete exceeding 1/2" shall be patched.



(21") PIN DETAIL

See Detail 3

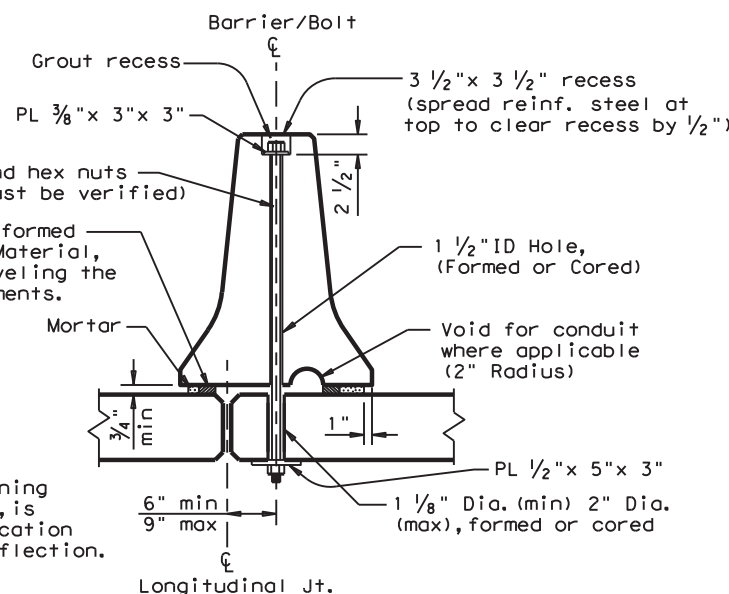
Steel washer welded to pin at 5 degree angle so that the washer is flush to the barrier surface. (See View A-A)



(30") PIN DETAIL

See Detail 2

Note: The "Bolt Through" method of pinning precast barrier on a bridge deck, is primarily used in a permanent location that requires limited barrier deflection.

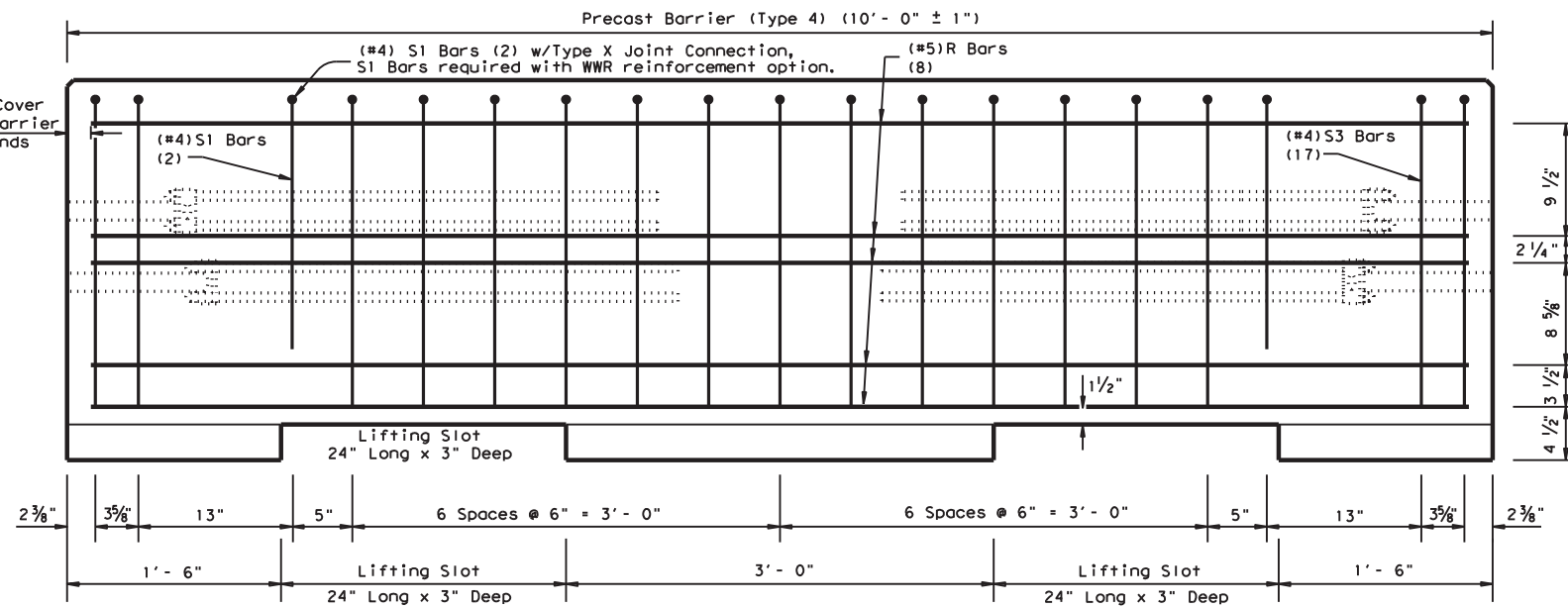
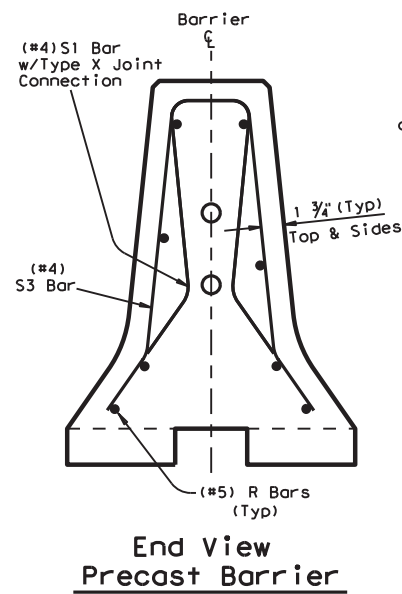


PRECAST CSB (BOLT THROUGH) PLACEMENT OVER LONGITUDINAL EXPANSION JOINT

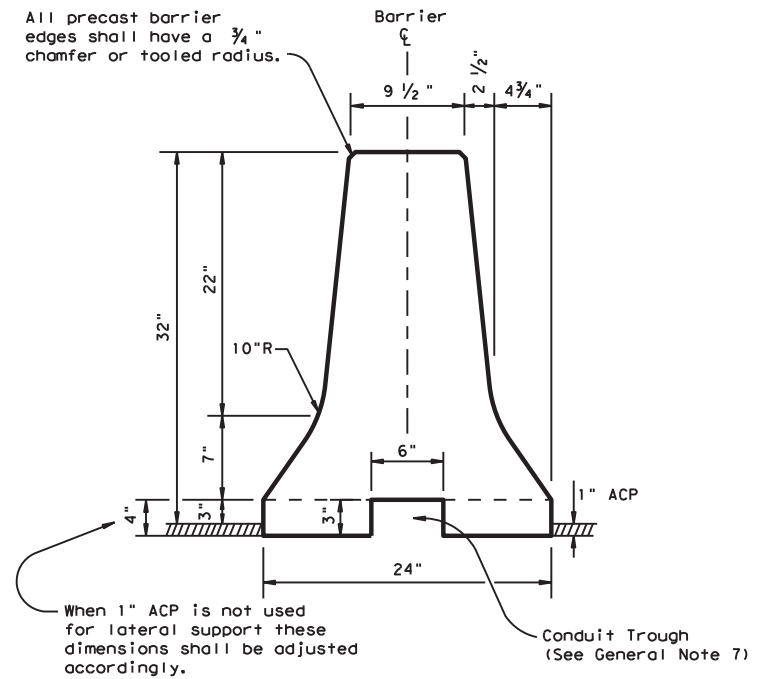
For bolt through locations, use the (Front) hole locations shown on Detail 1.

		Design Division Standard	
CONCRETE SAFETY BARRIER (F-SHAPE) PRECAST BARRIER (TYPE 1) PINNED PLACEMENT CSB(7)-10			
FILE: csb710.dgn	DN: TxDOT	CK: AM	DW: BD
© TxDOT December 2010	CONT: 6372	SECT: 50	JOB: 001
REVISIONS			HIGHWAY: VAR.
	DIST: SAT	COUNTY: BEXAR	SHEET NO.: 100

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Reinforcement for (10 ft) Precast Concrete Safety Barrier (Type 4)

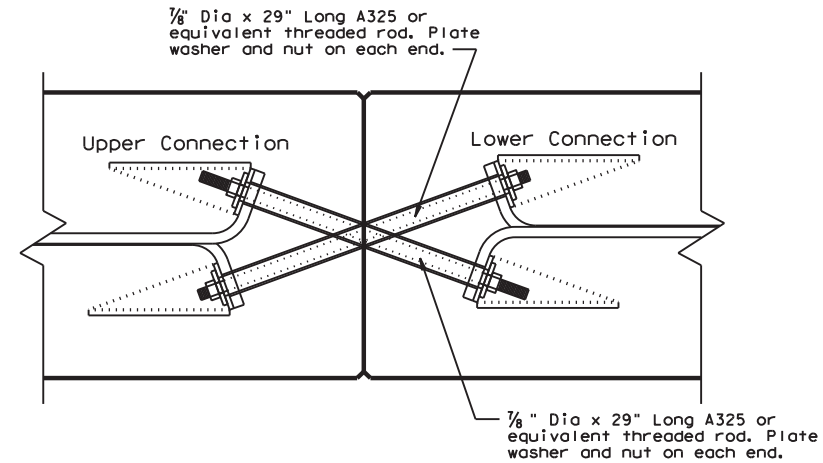
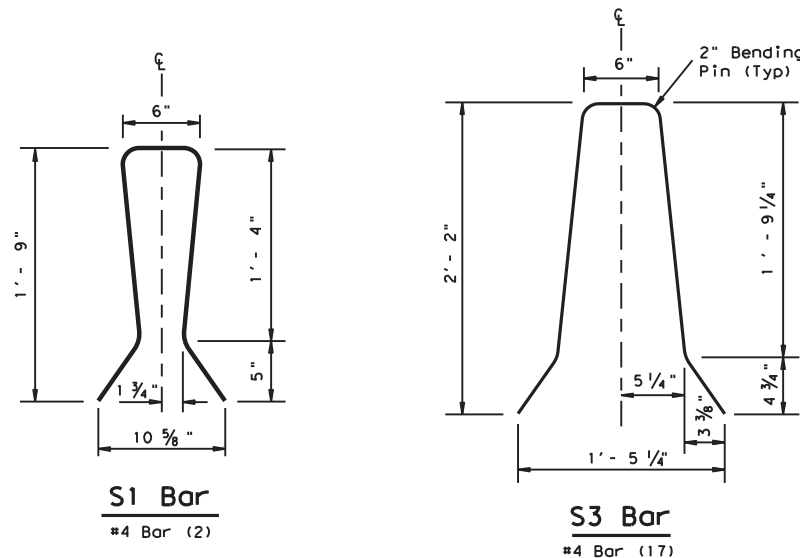


Concrete Safety Barrier

Schedule of reinforcement for each 10 foot precast section.

BAR	SIZE	QUANTITY
S1	#4	2
R3	#4	17
R	#5	8

Notes:
Two S1 Bars are required with the use of WWR reinforcement option. The S1 Bars may need a slight modification to fit within the WWR cage, as directed by the Engineer.



Top view showing Joint Connection Type X

Joint Type X Connection Required with (10 foot) barrier length, See CSB(1), sheet 1 of 2 for Joint Type X details.

Approximate Per L.F. Quantities

	Precast
Concrete	CY. 0.108
Rebar	LB. 14.8

For Contractor's information only
Weight of one Precast 10 ft. unit = Approx. 2 Tons

General Notes

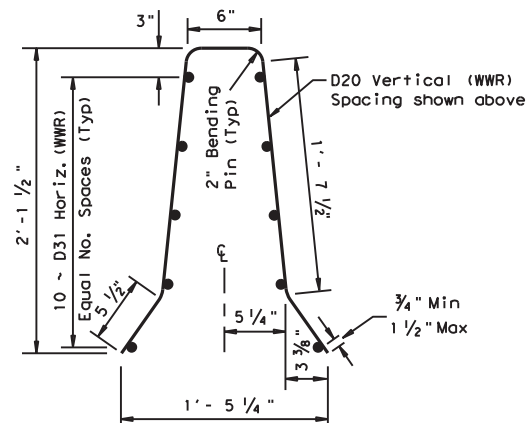
- The 10 foot barrier is intended for maintenance applications of short duration periods. The 10 foot barrier is limited to use in temporary work zone conditions not to exceed 2 calendar months, unless approved in writing by the TxDOT engineer, noting the duration and location of the barrier placement in the written approval.
- 30 ft. (Type 1) barrier and 10 ft. (Type 4) barrier sections shall not be mixed in a single run of barrier.
- Barrier lengths other than 10 ft. for (Type 4) barrier are not allowed.
- Concrete shall be Class H, with a minimum compressive strength of 3,600 psi.
- Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
- Only the Type X joint connection system is to be used with Type 4 barrier and is considered subsidiary. See CSB(1), Sheet 1 of 2, for (Type X) connection details.
- Conduit trough may be omitted, as shown elsewhere or as directed by the Engineer.

NOTE:
USAGE OF THE 10 FT (TYPE 4) CSB BARRIER REQUIRES A MINIMUM OF 100 LINEAR FEET.
SHORTER LENGTHS THAN THESE SHOULD BE DISCUSSED WITH THE DESIGN DIVISION.

Welded Wire Reinforcement (WWR) Option for Bars R and S3

(WWR) General Notes

- Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
- Welded wire cage may be cut or bent to accommodate the Type X joint connection and drainage slots, as directed by the Engineer.
- All reinforcement shall comply with Item 440, "Reinforcing Steel."
- Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".



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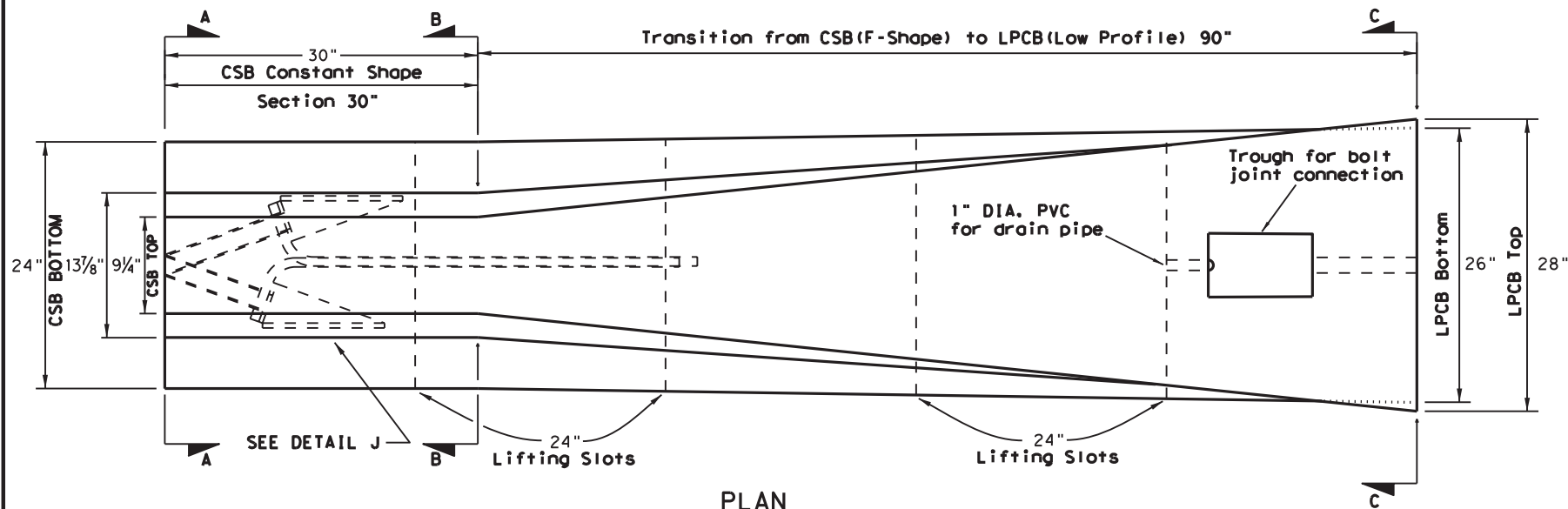
Texas Department of Transportation
Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE) PRECAST BARRIER (TYPE 4) (10 FOOT, BARRIER SEGMENT) CSB(8) - 10

FILE: csb810.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
© TxDOT December 2010	CONT: 6372	SECT: 50	JOB: 001	HIGHWAY: VAR.
REVISIONS	DIST: SAT	COUNTY: BEXAR	SHEET NO. 101	

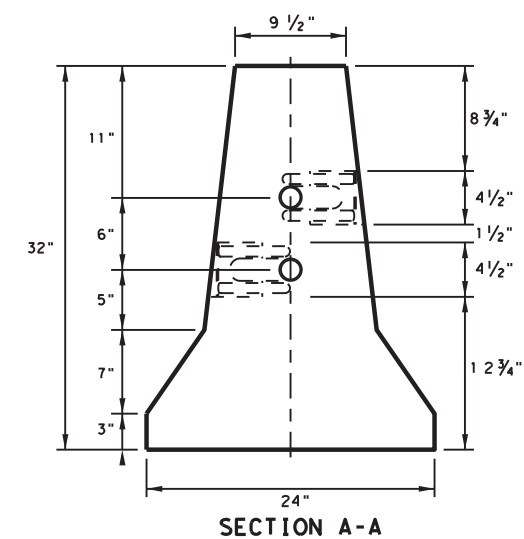
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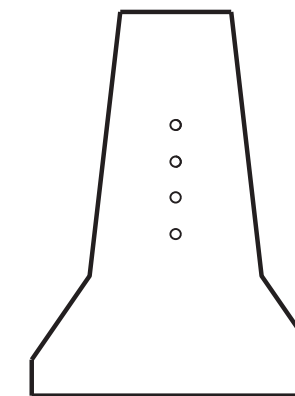


PLAN

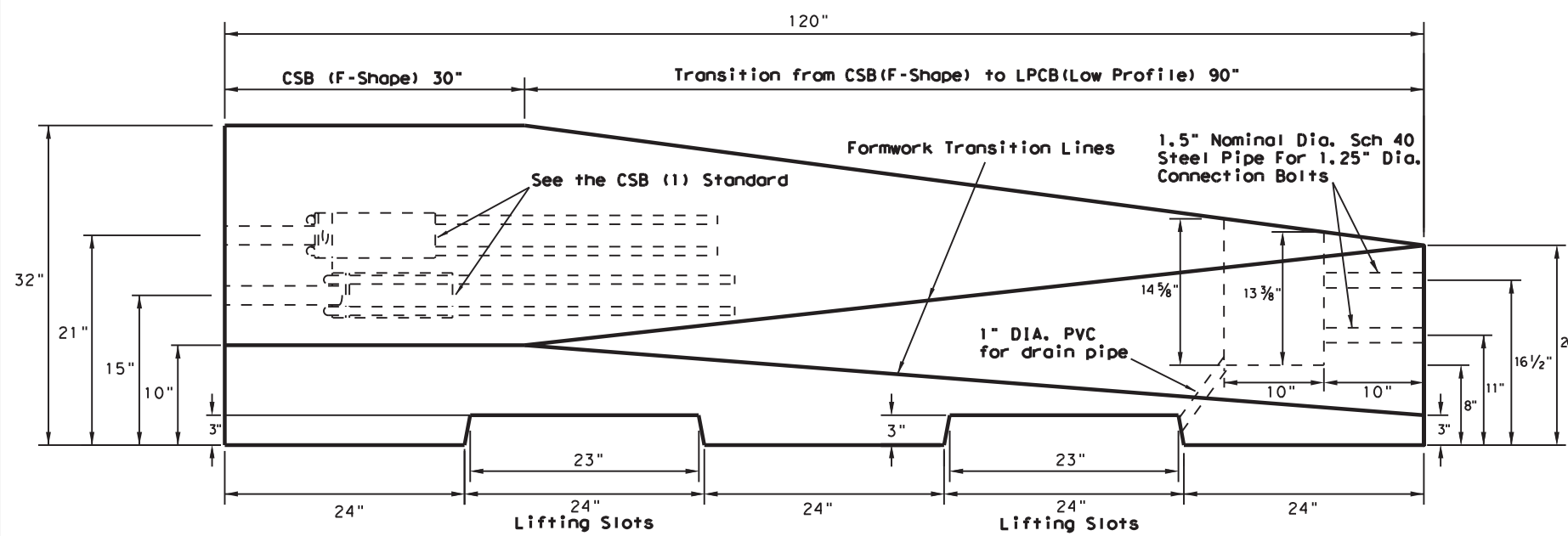
See detail sheet 2 of 2 for reinforcement.



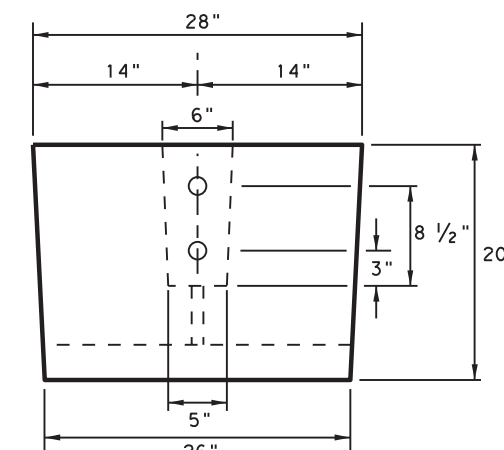
SECTION A-A



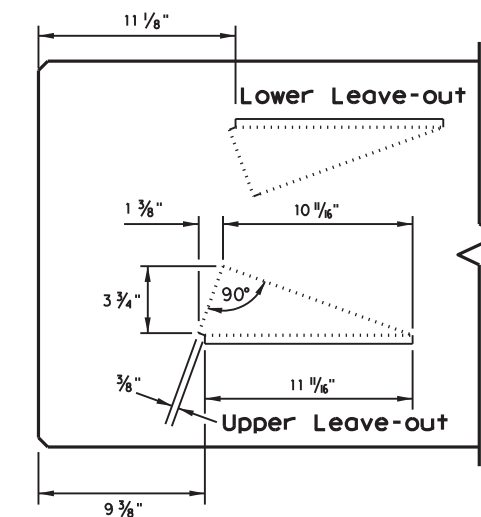
SECTION B-B



ELEVATION



SECTION C-C



**DETAIL J
CSB-Side Block-Outs**

General Notes

- Concrete shall be Class H for precast barrier with a minimum compressive strength of 3600 psi.
- Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
- These details cover barrier per Item 512, "Portable Concrete Traffic Barrier."
- Barrier edges shall have a 3/4 inch chamfer or a tooled radius.
- Precast barrier transition length shall be 10 ft.
- Joint connection systems are considered subsidiary.
- All steel assemblies for joint connections shall be galvanized after fabrication in accordance with Item 445, "Galvanizing".
- For rebars, use 2" bending pin unless otherwise shown.

SHEET 1 OF 2

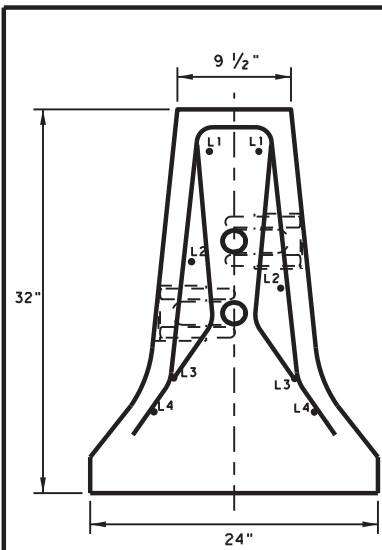


**F-SHAPE TO LOW PROFILE
PRECAST BARRIER TRANSITION
(TYPE T)**

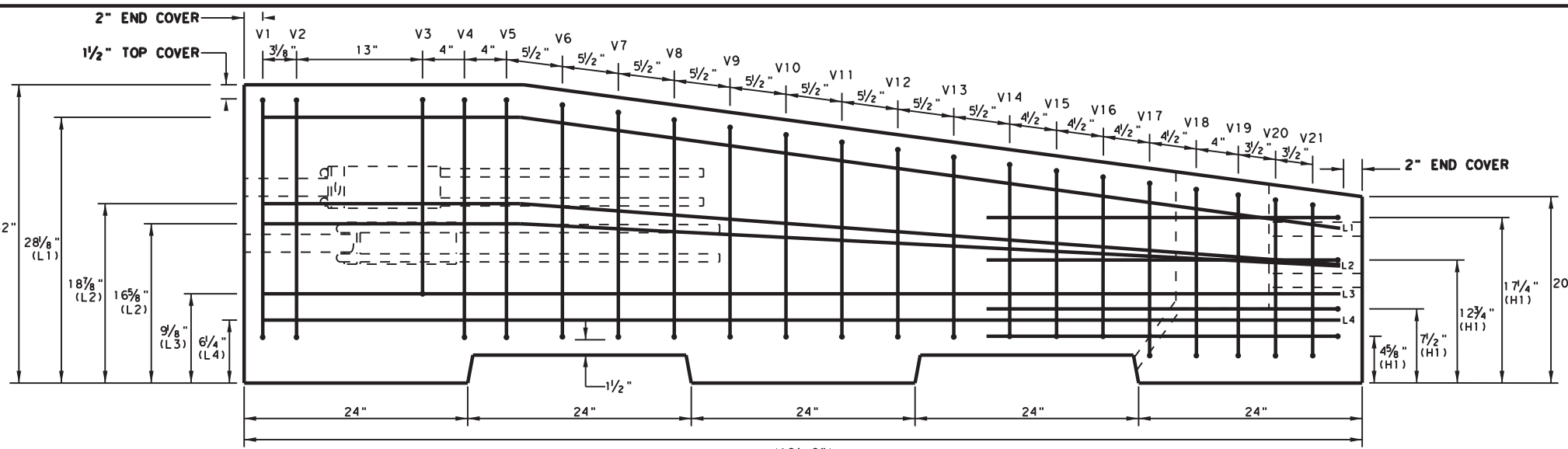
FSLP (TR) - 10

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DIST	COUNTY		SHEET NO.	
SAT	BEXAR		102	

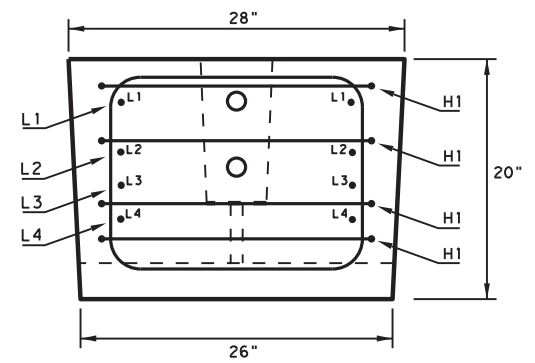
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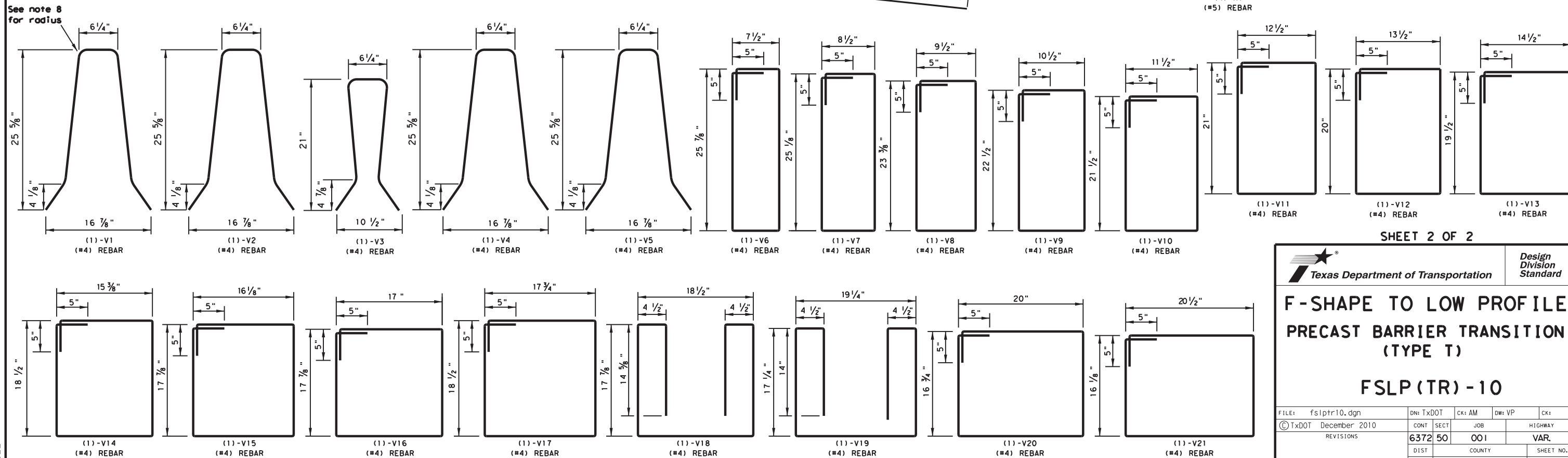
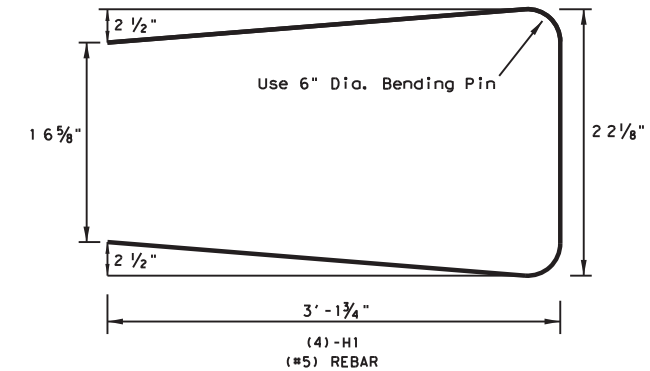
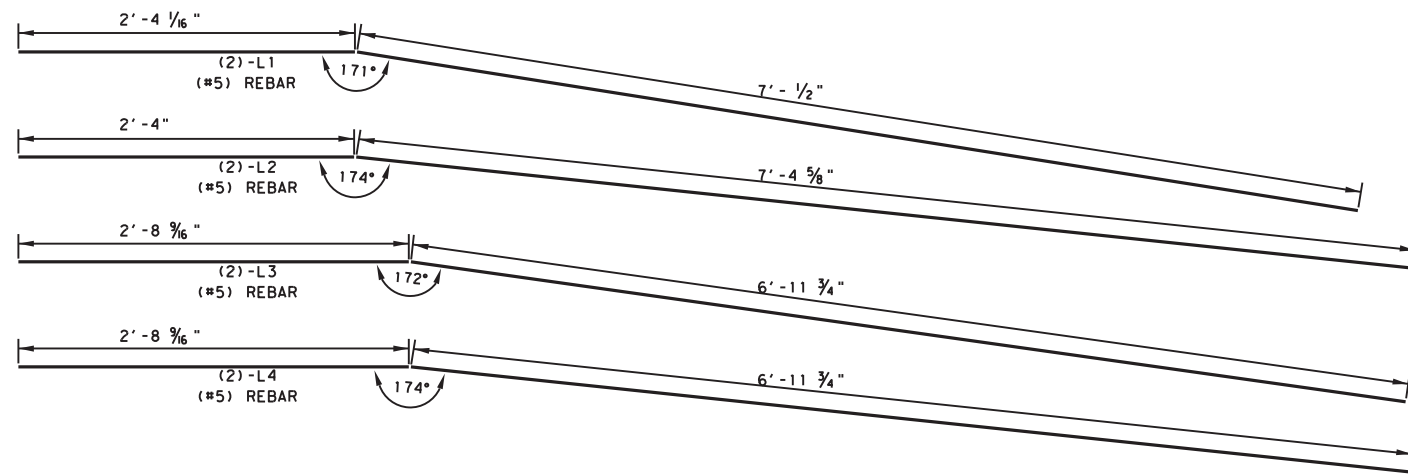
END SECTION AT CSB (F-SHAPE) BARRIER
For Type X Connection
(See the CSB(1) Standard)



BARRIER TRANSITION ELEVATION
Showing Reinforcement Placement



END SECTION AT LOW PROFILE BARRIER
For Connection Details
(See the LPCB Standard)



SHEET 2 OF 2



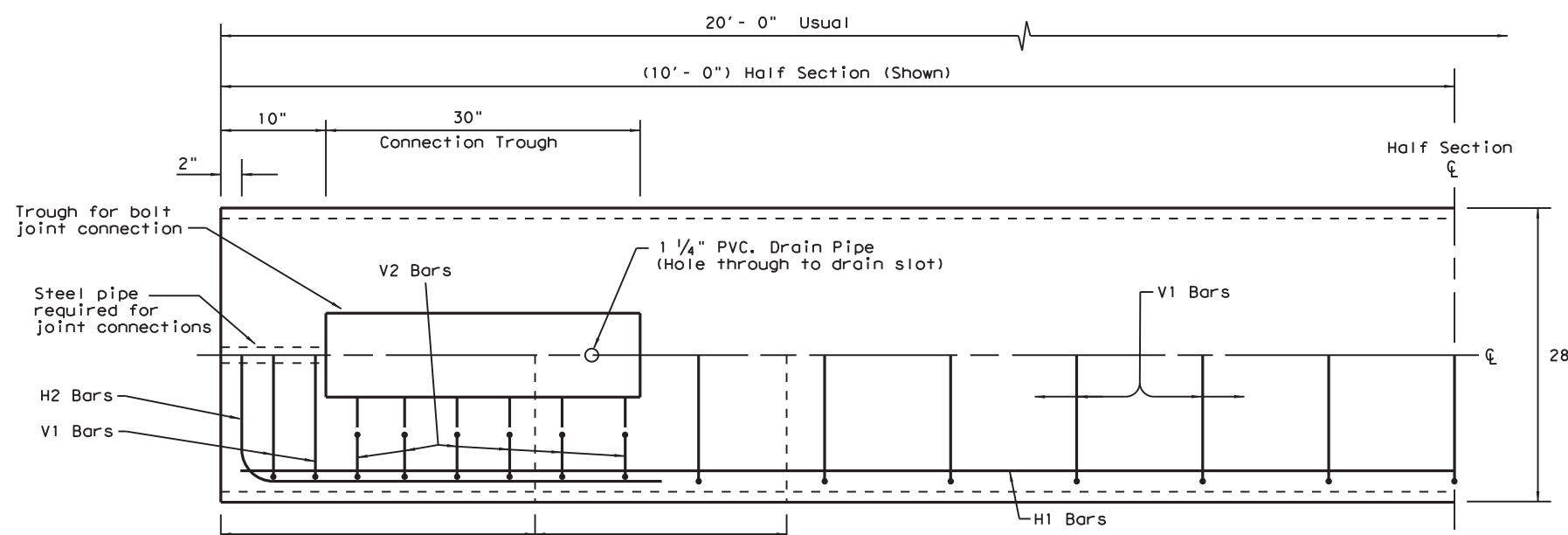
F-SHAPE TO LOW PROFILE PRECAST BARRIER TRANSITION (TYPE T)

FSLP (TR) - 10

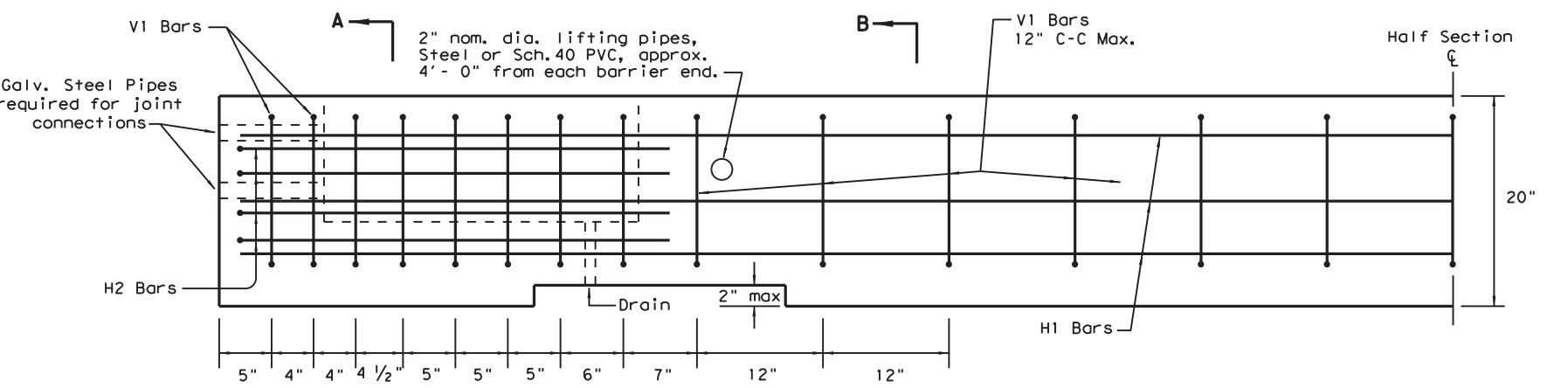
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©TxDOT December 2010	CONT: 6372	SECT: 50	JOB: 001	HIGHWAY: VAR.
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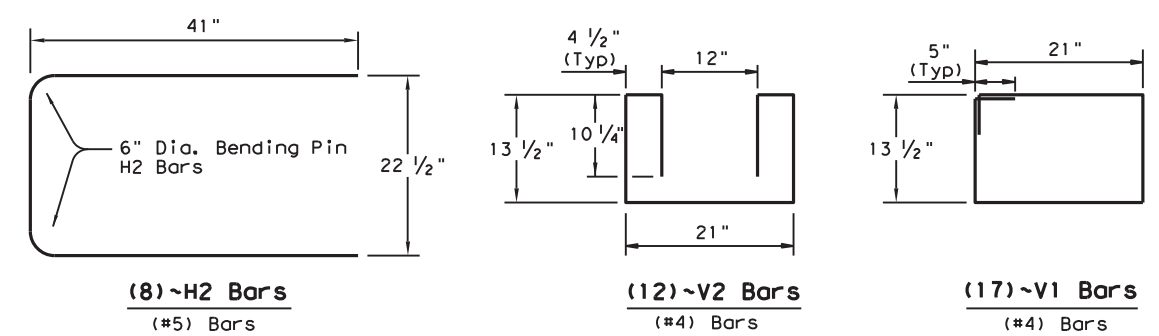
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PLAN
(TYPE 1) BARRIER SEGMENT
(SYMMETRICAL ABOUT CENTER LINES)

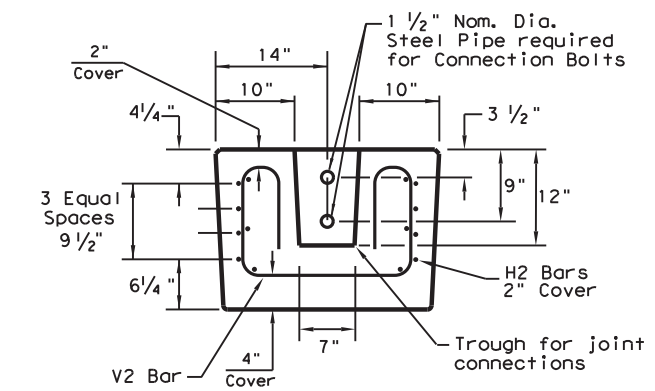


ELEVATION
(TYPE 1) BARRIER SEGMENT
(SYMMETRICAL ABOUT CENTER LINES)

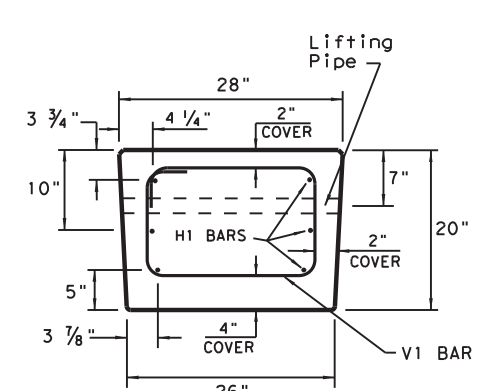


REINFORCING STEEL DETAILS
TYPE 1 - BARRIER SEGMENT

Note: Use 2" Dia. Bending Pin, unless otherwise shown



SECTION A-A



SECTION B-B

GENERAL NOTES

1. Low Profile Concrete Barrier (LPCB), is approved for use in temporary work zone locations, where the posted speed is 45 mph, or less.
2. Concrete shall be Class H for precast barrier with a minimum compressive strength of 3,600 psi.
3. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
4. Precast LPCB barrier length shall be 20 ft.
5. All barrier edges shall have 3/4" chamfer or a tooled radius.
6. Joint connection hardware shall be in accordance with Item 449, "Anchor Bolts." and is considered subsidiary.
7. Steel pipe required for joint connection bolts shall be galvanized in accordance with Item 445, "Galvanizing."
8. Welded wire reinforcement (WWR) may be used in lieu of conventional reinforcement for Type 1 barrier, and shall meet the requirements shown.

FOR CONTRACTORS INFORMATION ONLY

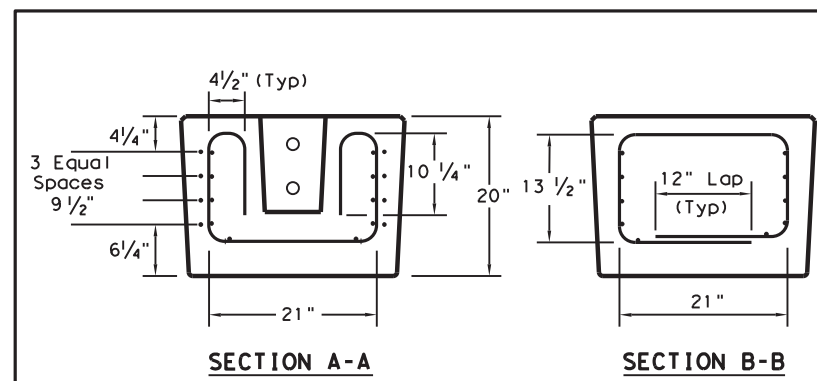
(TYPE 1) APPROX. QUANTITIES 20 FT. SECTION		
CONCRETE	CY	2.6
REINFORCING STEEL	LBS	330
TOTAL BARRIER WT.	LBS	11000

(WWR) GENERAL NOTES

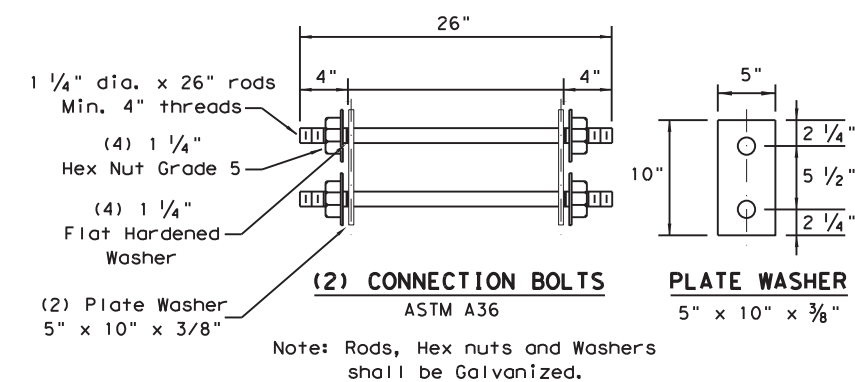
1. Deformed Welded Wire Reinforcement shall conform to ASTM A497.
2. Welded wire cage may be cut or bent, if necessary, but must be approved by the Engineer.
3. Combinations of reinforcing steel and WWR are permitted, as directed by the Engineer. The dimensions from the end of the barrier section to the first wire shall not exceed 3".

REQUIRED (WWR) WIRE DESIGN

- 8 ~ (D31) Horizontal Wires (Equally spaced)
- 10 ~ (D20) Horizontal Wires (Equally spaced)
- 29 ~ (D20) Vertical Wires (Spaced as shown in Elevation View)



WELDED WIRE REINFORCEMENT (WWR) - OPTIONAL REINFORCING



Note: Rods, Hex nuts and Washers shall be Galvanized.

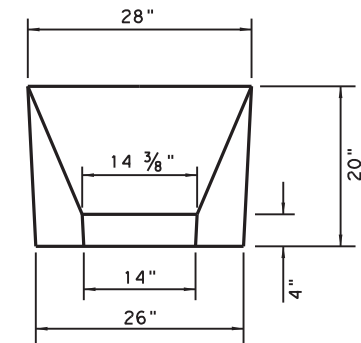
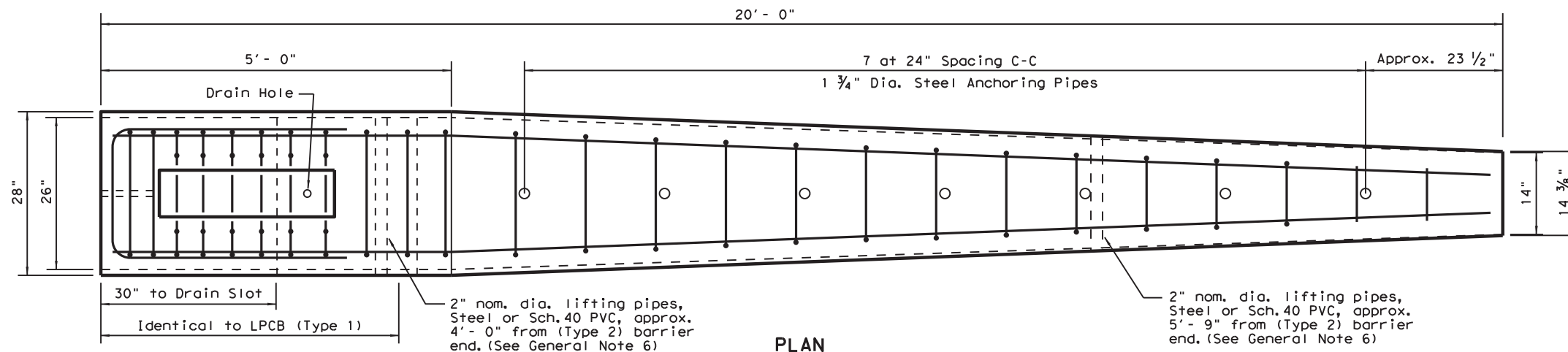


LOW PROFILE CONCRETE BARRIER PRECAST BARRIER (TYPE 1) LPCB-13

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© TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
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DATE: FILE:

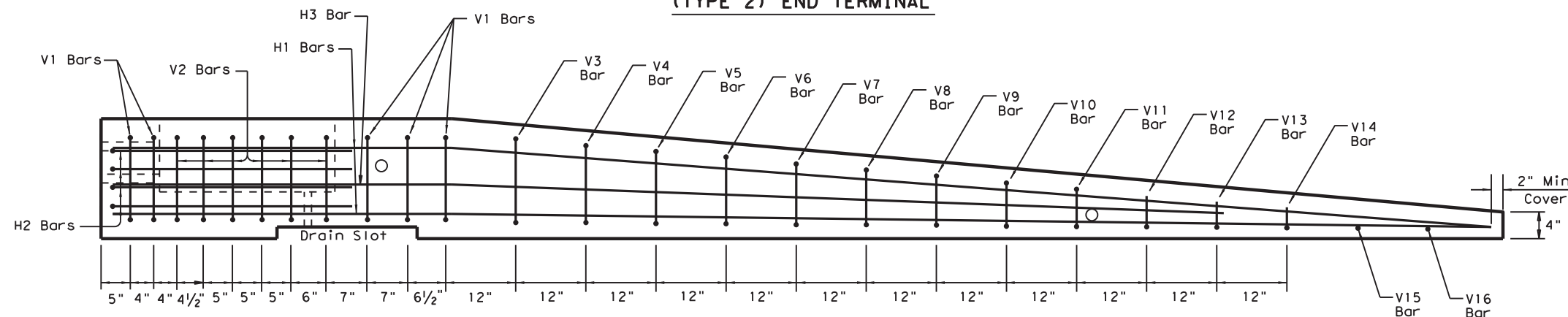
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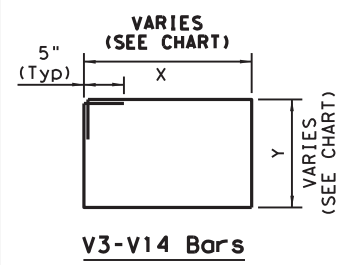
APPROACH VIEW

TYPE 2 - NOTES

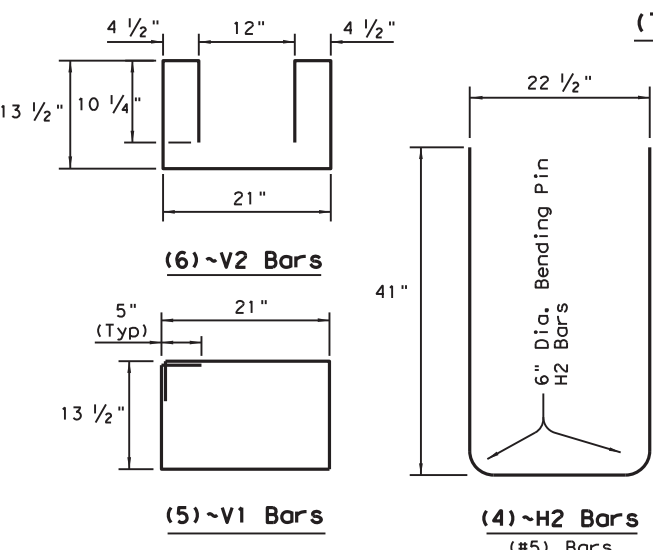
1. Welded wire reinforcement (WWR) is "not" an option for Type 2 Barrier.
2. Type 2 Barrier shall be used as an end treatment for the Type 1 barrier segments, when applicable.
3. The end treatment can be used without the anchor pins in locations that can accommodate approximately 4 ft. of lateral displacement of the end treatment. The use of non-pinned end treatment does not affect the performance or the deflection of the Low-Profile barrier system.
4. The anchor pins are all the same length and are to be driven flush with the top of the (Type 2) barrier surface.
5. The bends in the H3 and H1 bars are slight, no formal bend is necessary.
6. The Type 2 barrier segment must be lifted from the rear first, to prevent cracking of sloped section.
7. See LPCB sheet 1 for additional information.



Note: Anchoring pipes not shown in Elevation View

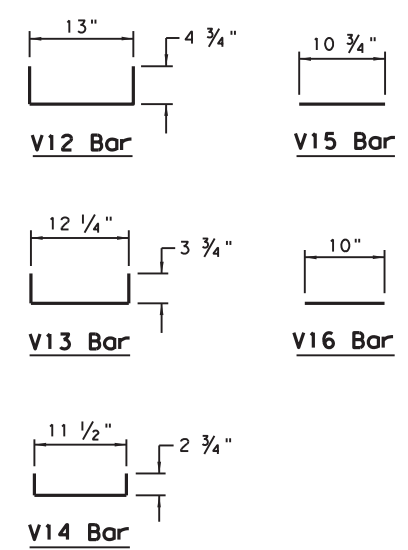


BAR (#4)	X (IN.)	Y (IN.)
V3 BAR	20 1/4	14 1/2
V4 BAR	19 1/2	13 1/2
V5 BAR	18 1/2	12 1/4
V6 BAR	17 1/2	11 1/4
V7 BAR	17	10 1/4
V8 BAR	16 1/4	9
V9 BAR	15 1/2	8
V10 BAR	14 1/2	7
V11 BAR	13 3/4	6

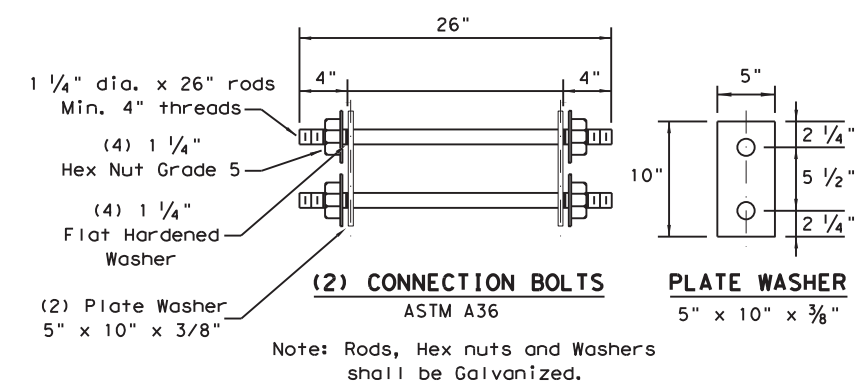
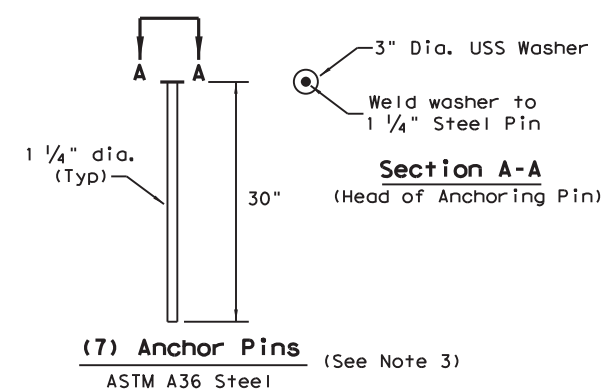


REINFORCING STEEL DETAILS
TYPE 2 - END TERMINAL

ELEVATION (TYPE 2) END TERMINAL

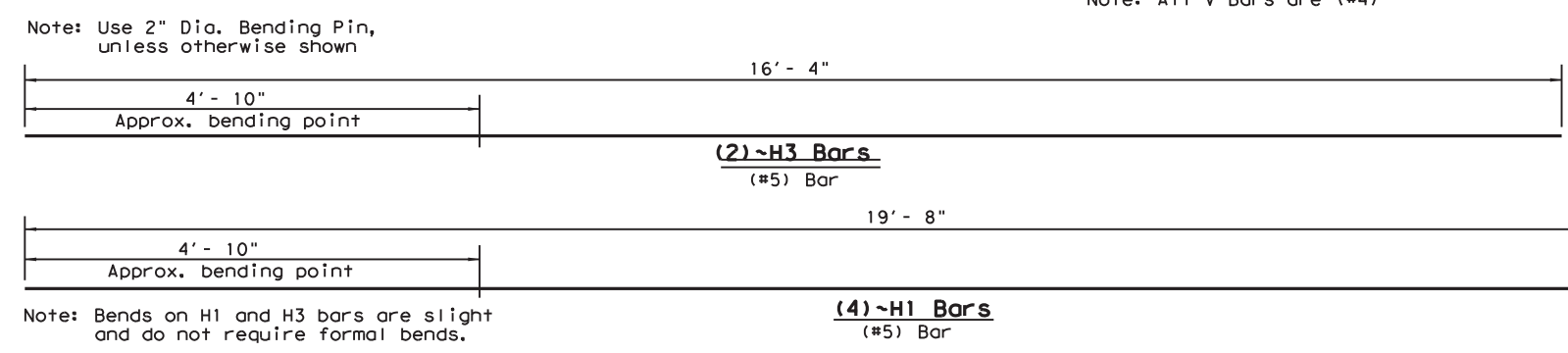


Note: All V Bars are (#4)



FOR CONTRACTORS INFORMATION ONLY

(TYPE 2)		APPROX. QUANTITIES 20 FT. SECTION	
CONCRETE	CY	1.65	
REINFORCING STEEL	LBS	240	
TOTAL BARRIER WT.	LBS	7000	



Note: Bends on H1 and H3 bars are slight and do not require formal bends.

Texas Department of Transportation

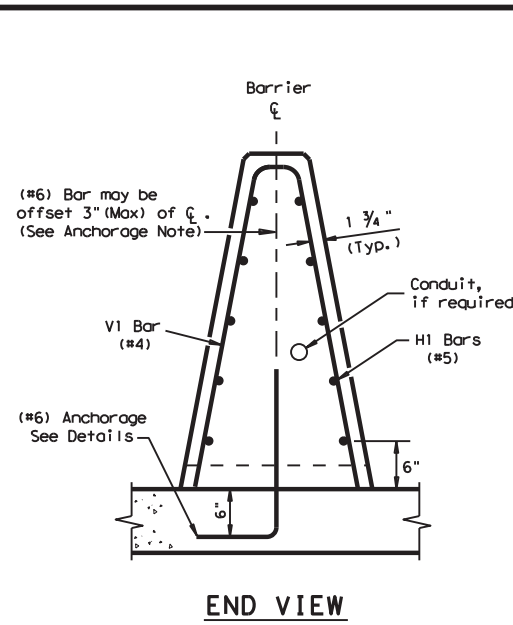
LOW PROFILE CONCRETE BARRIER PRECAST BARRIER (TYPE 2) LPCB-13

FILE: lpcb13.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
© TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
DIST	COUNTY		SHEET NO.	
SAT	BEXAR		105	

Design Division Standard

DATE: FILE:

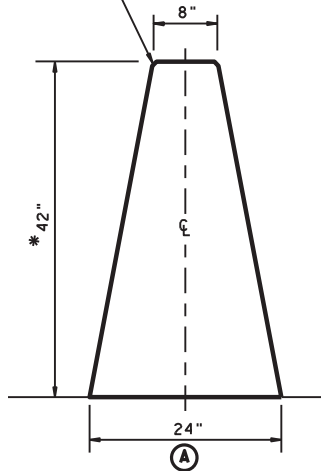
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END VIEW

CAST-IN-PLACE (CIP) BARRIER
Barrier is Symmetrical About the Center Line

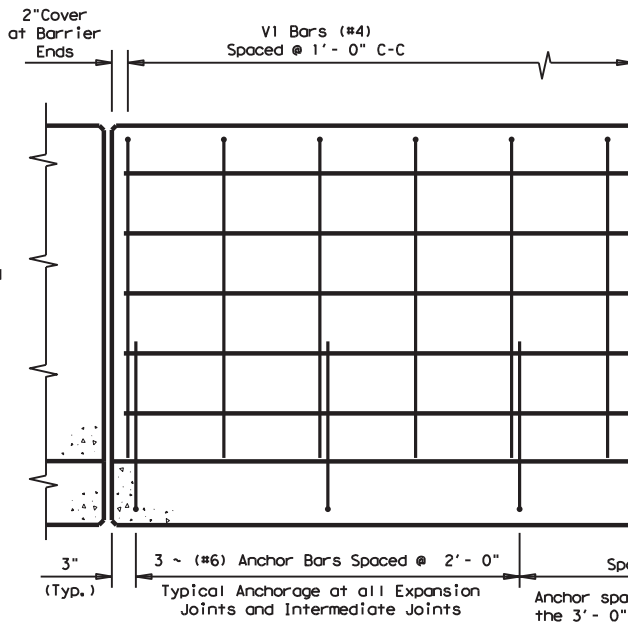
Top edges of CIP barrier shall have a 3/4" chamfer or tooling radius.



SINGLE SLOPE CONCRETE BARRIER (SSCB) (42")

* Barrier height (IN.)	Dimensions (IN.)		
	(A)	(B)	(C)
42	24	40 1/4	20 1/2
48	26 1/4	46 1/4	22 3/4
54	28 1/2	52 1/4	25 1/6

* (SSCB) (42") Barrier height may be increased to 48" or 54". This would increase the barrier and reinforcement dimensions accordingly.



ELEVATION VIEW

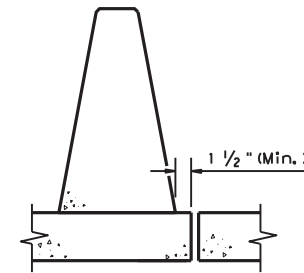
Cast-in-Place (SSCB) on Bridge Decks or Continuously Reinforced Concrete Pavement (CRCP) (Showing Reinforcement and Anchor Placement)

BARRIER PLACEMENT OVER (CRCP) JOINTS

Barrier may be cast over a "Longitudinal" CRCP joint.

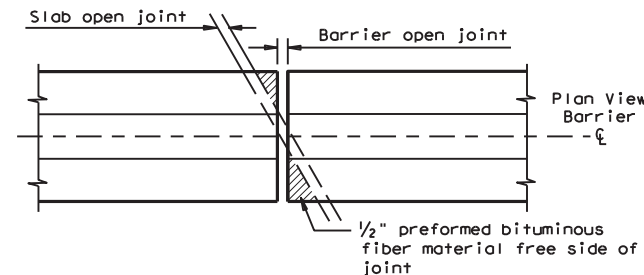
CRCP Joints (with or without tiebars): Two layers of 30 lb roofing felt or 1/2" preformed bituminous fiber material.

Barrier Anchorage Note: Anchorage must be located at least 3" from a longitudinal joint.



MINIMUM EDGE DISTANCE FROM LONGITUDINAL JOINT

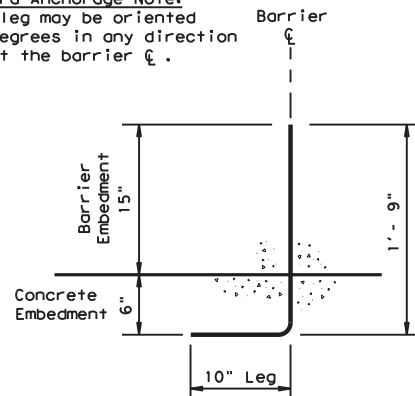
Barrier placement over a longitudinal bridge joint is not recommended.



BARRIER OVER TRANSVERSE OPEN JOINT

Standard Anchorage Note:

10" leg may be oriented 90 degrees in any direction about the barrier centerline.

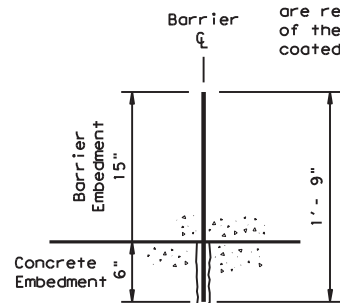


STANDARD ANCHORAGE

(#6) Bar
Concrete Pavement / Bridge Deck Anchorage:
Cast-in-Place or Slip-Formed Barrier
(See General Notes 2)

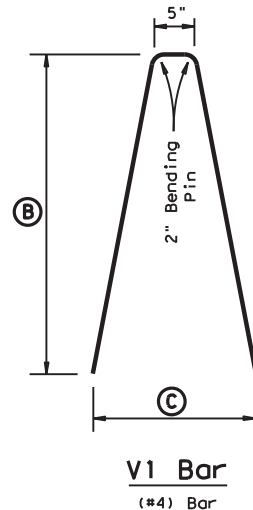
Epoxy Note:

If epoxy coated anchor bars are required, the lower 6" of the bars must not be epoxy coated.



"OPTIONAL" ANCHORAGE

(#6) Bar
Fresh insertion method or Type III, Class C Epoxy Method
Concrete Pavement / Bridge Deck Anchorage:
Cast-in-Place or Slip-Formed Barrier
(See General Notes 2 & 4)



V1 Bar (#4) Bar

Welded Wire Reinforcement (WWR) Option for Bars V1 and H1

(WWR) General Notes

- Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
- Welded wire cage may be cut and bent to accommodate the drainage slots, as directed by the Engineer.
- Welded wire splice locations shall have a "minimum" splice lap length of 12".
- Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".

General Notes

- Concrete shall be Class C. Unless otherwise specified in the plans.
- Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615. If the bridge slab requires epoxy "coated" reinforcement, the barrier and/or anchorage may require the same, if shown elsewhere in the plans.
- These details cover barrier per Item 514, "Permanent Concrete Traffic Barrier".
- Anchorage: The "Optional" Anchor system shall be embedded 6" into fresh concrete or using a Type III, Class C Epoxy anchorage system. Follow the manufacturer's directions for installing the expoxied anchor bars. All anchorage shown is the minimum required, and considered subsidiary to the bid item.
- Top edges of CIP barrier shall have a 3/4" chamfer or tooling radius.
- Drainage slot locations (12'-0", C-C Min. Spacing) are shown elsewhere, or as directed by the Engineer. Drainage slot heights on the SSCB may be increased to a maximum of 5 inches, without geometric changes to the barrier face.
- Cast-in-place barrier may be slip formed. Bracing may be tied or tack welded to the reinforcement cage to provide cage stability. Do not weld to anchor bars. The reinforcement cage may rest on the top of the finished grade.
- For locations where lighting is required, see the SSCB(4) sheet for the proper reinforcement and anchorage.

Cast-in-Place (CIP) or Slip-Formed (SSCB)

Cast-in-Place barrier may be connected to precast SSCB. Joint connection "Types" may be used in Cast-in-Place barrier, to match the precast barrier connection. (See required connection "Type" elsewhere in the plans)

The weight of Cast-in-Place (SSCB)42" is approx. 717 lbs per ft.

Texas Department of Transportation
SINGLE SLOPE CONCRETE BARRIER
CAST-IN-PLACE (TYPE 1)
(BRIDGE DECK OR CRCP)
SSCB(1)-16

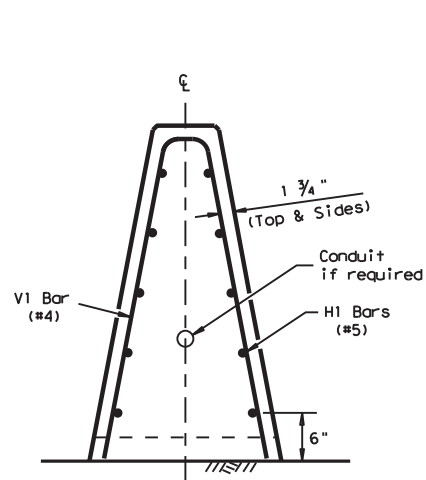
FILE: sscb116.dgn	DN: TxDOT	CK: HC/AN	DW: BD/VP	CK: KM
© TxDOT January 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
CST 01-2016	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	106	

Design Division Standard

DATE: FILE:

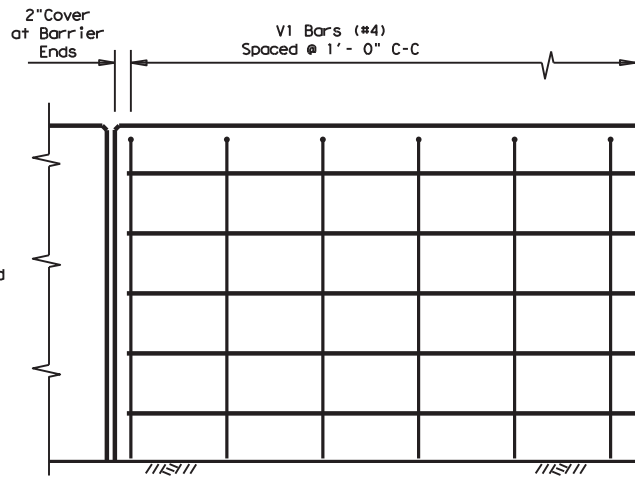
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END VIEW

CAST-IN-PLACE (CIP) BARRIER
Barrier is Symmetrical About the Center Line

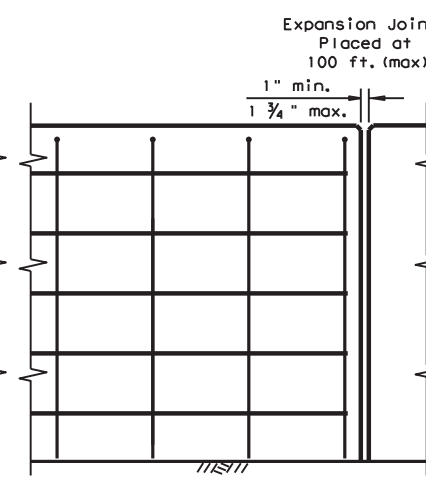


ELEVATION VIEW

Cast-in-Place (SSCB) (Type 2) on Roadway

Note:
Bottom of reinforcement cage may rest on top of the finished grade.
Reinforcement around the drainage slots may be cut or bent to accommodate the edge and top clearances.

3' Long X 3" Deep (Min.)
Drainage Slots, as required
(See General Note 6).

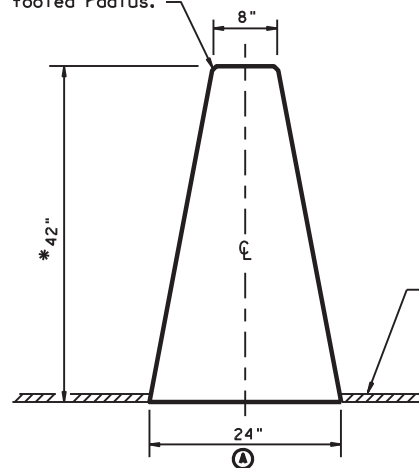


Expansion Joints
Placed at
100 ft. (max).
1" min.
1 3/4" max.

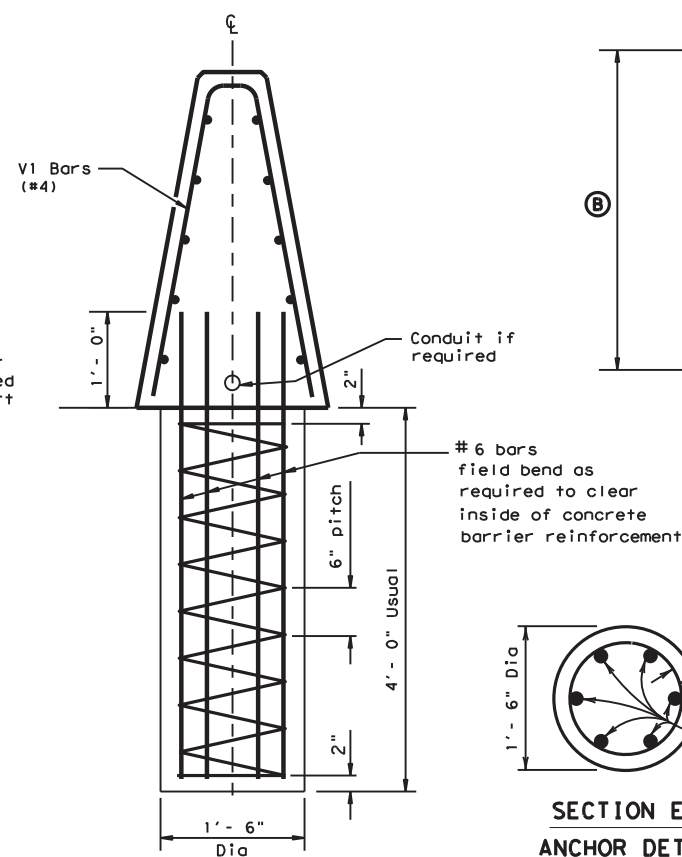
GENERAL NOTES

- Concrete shall be Class C. Unless otherwise specified in the plans.
- Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
- These details cover barrier per Item 514, "Permanent Concrete Traffic Barrier".
- The Anchorage shown is considered subsidiary to the bid item.
- Top edges of CIP barrier shall have a 3/4" chamfer or tooled radius.
- Drainage slot locations (12'-0", C-C Min. Spacing) are shown elsewhere, or as directed by the Engineer. Drainage slot heights on the SSCB may be increased to a maximum of 5 inches, without geometric changes to the barrier face.
- Cast-in-place barrier may be slip formed. Bracing may be tied or tack welded to the reinforcement cage to provide cage stability. Do not weld to anchorage.
- For locations where lighting is required, see the SSCB(4) sheet for the proper reinforcement and anchorage.

Top edges of CIP barrier shall have 3/4" chamfer or tooled radius.

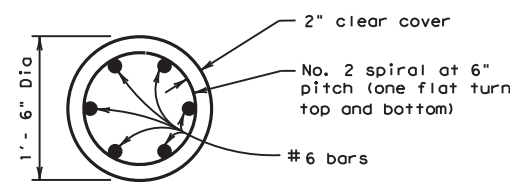


SINGLE SLOPE CONCRETE BARRIER (SSCB) (42")



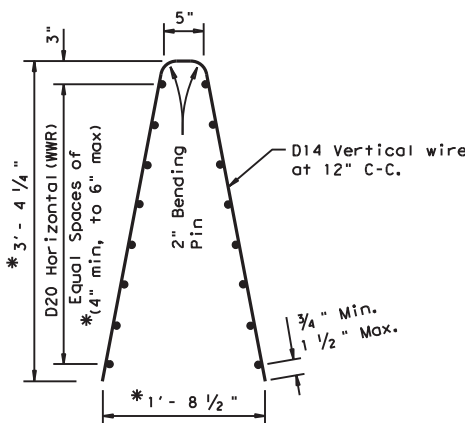
SECTION D-D
ANCHOR DETAIL

SECTION E-E
ANCHOR DETAIL



BARRIER HEIGHT (IN.)	* DIMENSIONS (IN.)		
	A	B	C
42	24	40 1/4	20 1/2
48	26 1/4	46 1/4	22 3/4
54	28 1/2	52 1/4	25 1/6

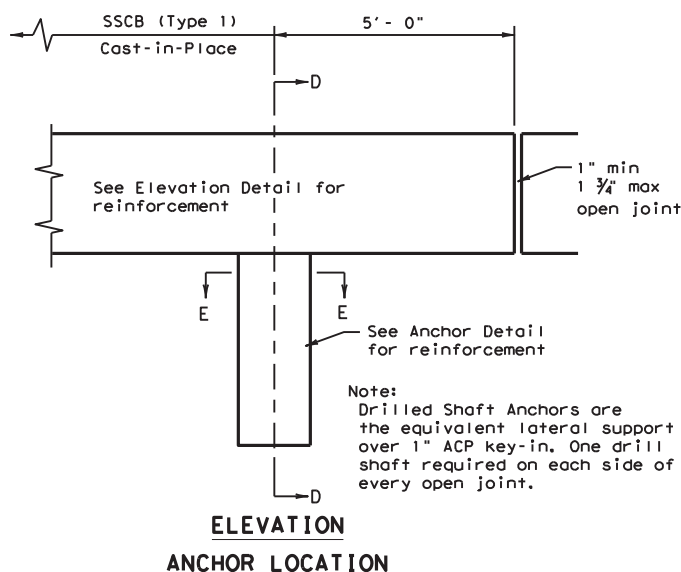
*(SSCB) (42") Barrier height may be increased to 48" or 54". This would increase the barrier and reinforcement dimensions accordingly.



Welded Wire Reinforcement (WWR) Option for Bars V1 and H1

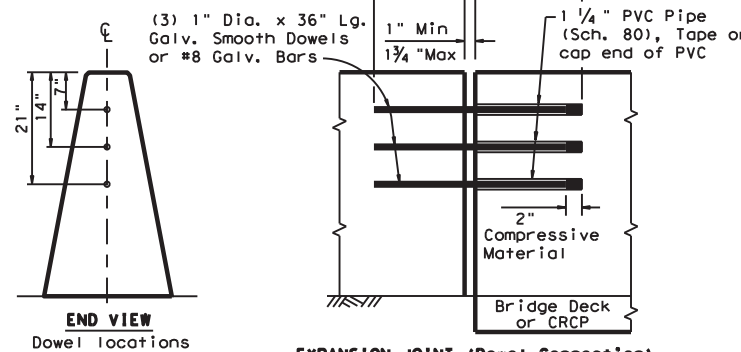
(WWR) General Notes

- Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
- Welded wire cage may be cut and bent to accommodate the drainage slots, as directed by the Engineer.
- Welded wire splice locations shall have a "minimum" splice lap length of 12".
- Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".



ELEVATION
ANCHOR LOCATION

Note:
Drilled Shaft Anchors are the equivalent lateral support over 1" ACP key-in. One drill shaft required on each side of every open joint.



END VIEW
Dowel locations

EXPANSION JOINT (Dowel Connection)

Dowels may be used, as directed by the Engineer, in locations where the barrier could be laterally displaced.

Cast-In-Place (CIP) or Slip-Formed (SSCB)

Cast-in-Place barrier may be connected to precast SSCB. Joint connection "Types" may be used in Cast-in-Place barrier, to match the precast barrier connection. (See required connection "Type" elsewhere in the plans)

The weight of Cast-in-Place (SSCB) 42" is approx. 717 lbs per ft.

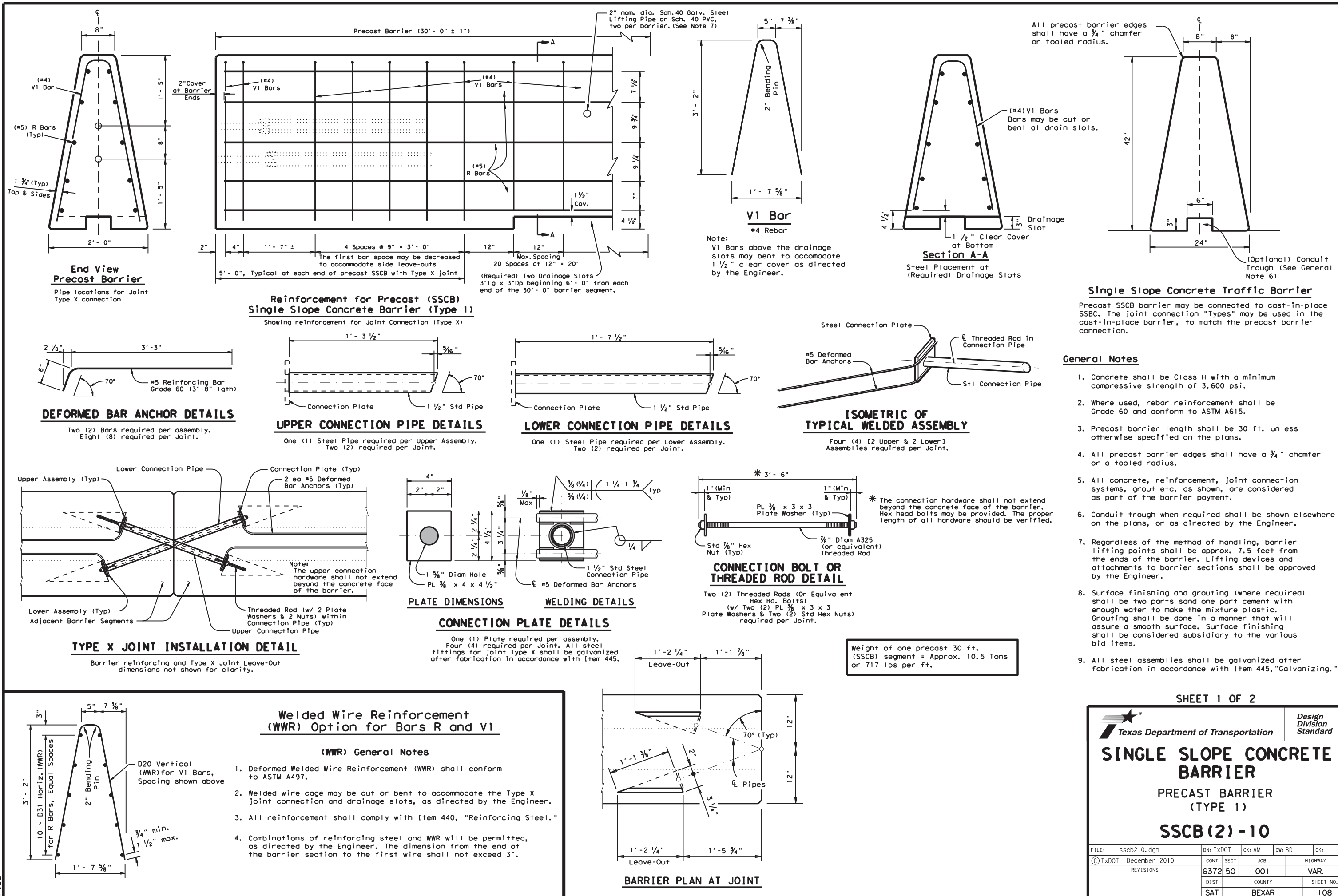
Texas Department of Transportation
Design Division Standard

SINGLE SLOPE CONCRETE BARRIER
CAST-IN-PLACE (TYPE 1)
(FLEXIBLE PAVEMENT)
SSCB(1F) - 10

FILE: sscb1f10.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
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REVISIONS	DIST: SAT	COUNTY: BEXAR	SHEET NO. 107	

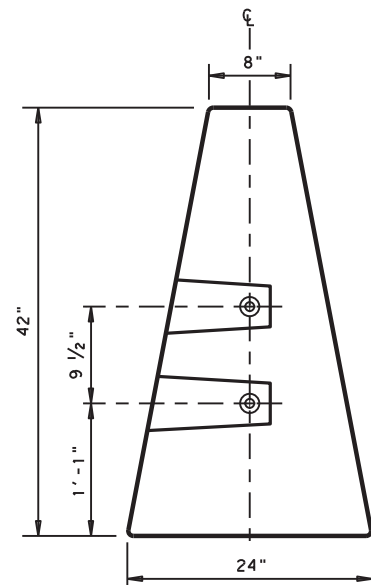
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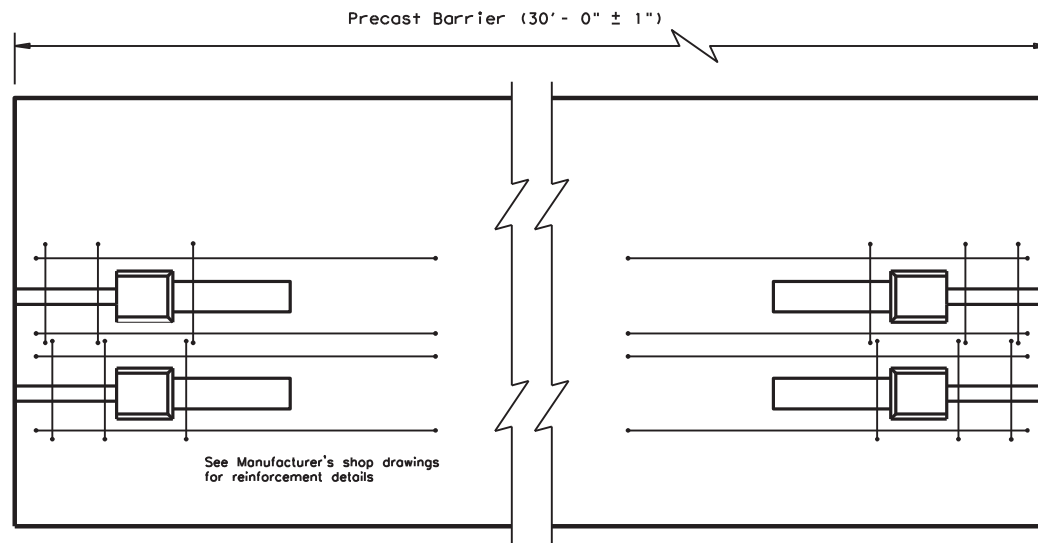


		Design Division Standard	
SINGLE SLOPE CONCRETE BARRIER PRECAST BARRIER (TYPE 1) SSCB(2)-10			
FILE: sscb210.dgn	DN: TxDOT	CR: AM	DW: BD
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REVISIONS			HIGHWAY: VAR.
	DIST: SAT	COUNTY: BEXAR	SHEET NO.: 108

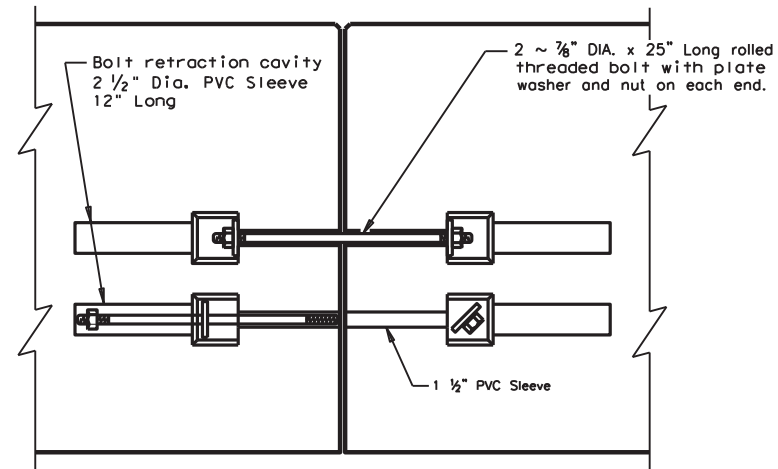
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END VIEW
"QUICK-BOLT" POCKET LOCATIONS

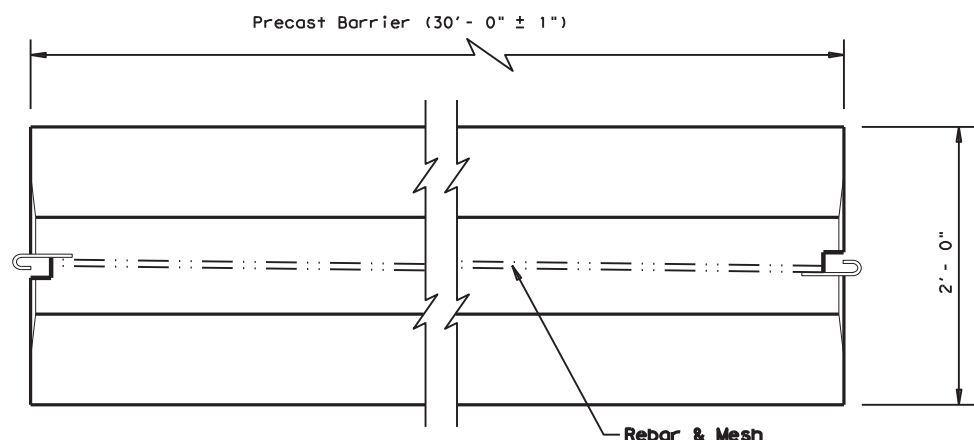


ELEVATION VIEW
"QUICK-BOLT" (SSCB)
See Manufacturer's shop drawing for additional details

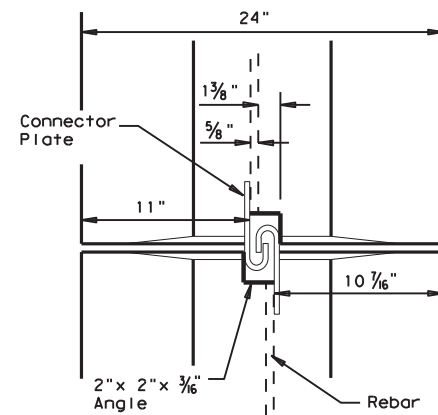


ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

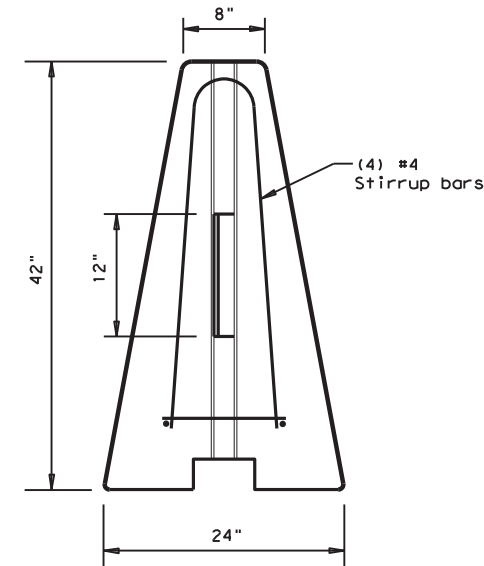
Joint Connection (Type Q)



TOP VIEW
PRECAST (SSCB) WITH J-J HOOKS
See Manufacturer's shop drawing for additional details



VIEW FROM ABOVE
J-J HOOK CONNECTION



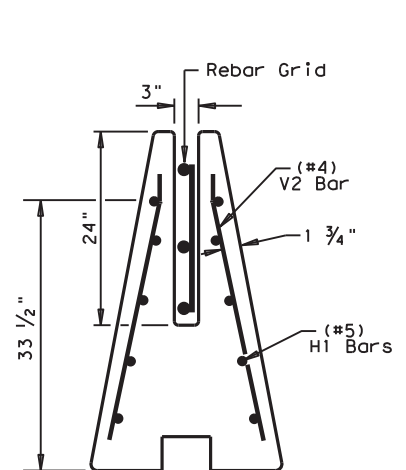
END VIEW

Proprietary Joint Connections (SSCB)

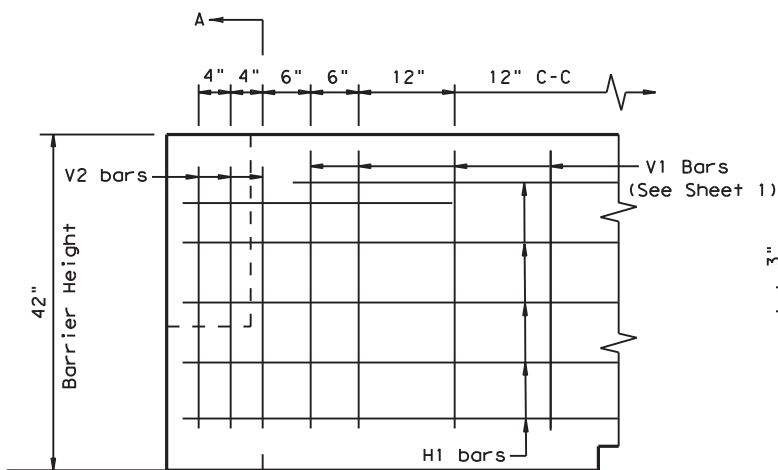
Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

J-J Hooks by Easi-Set Industries, (800)547-4045
Quick-Bolt by Bexar Concrete, (210)497-3773

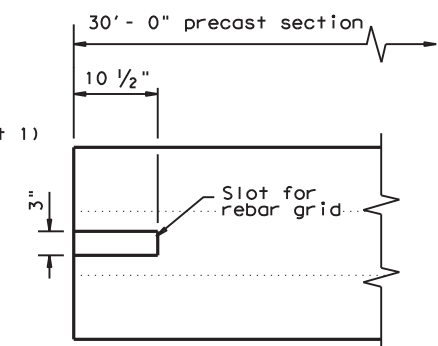
If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.



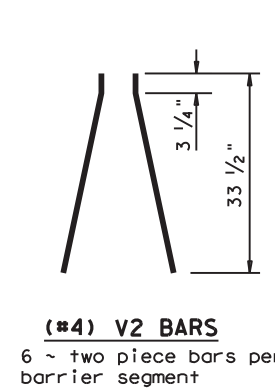
SECTION A-A
Showing (Type R)
Rebar Grid



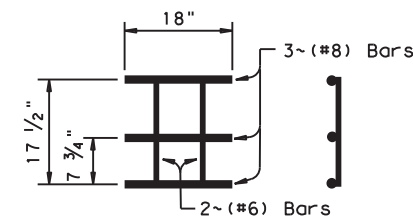
ELEVATION
V1 Bars (See Sheet 1)



TOP VIEW
JOINT CONNECTION
Typical at both ends of barrier segment



(#4) V2 BARS
6 ~ two piece bars per
barrier segment



WELDED REBAR GRID

Joint Connection (Type R)

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER
(TYPE 1)

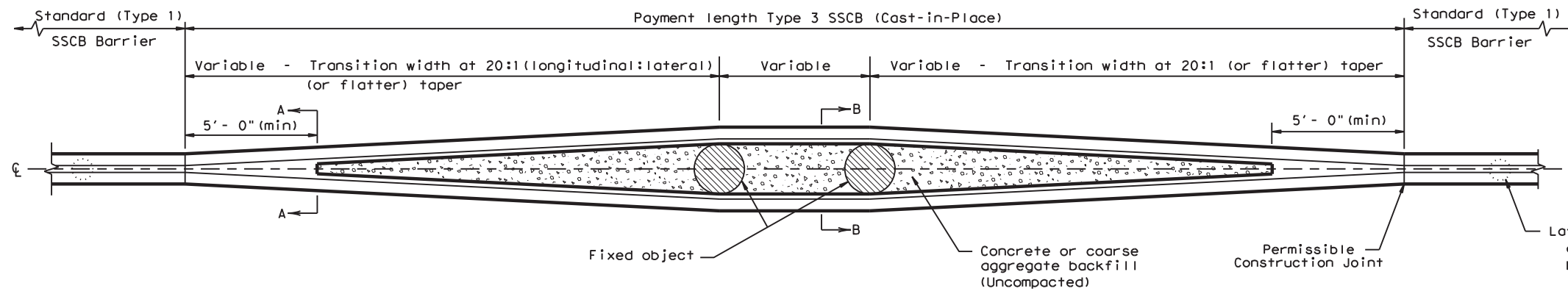
SSCB(2) - 10

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REVISIONS	DIST: SAT	COUNTY: BEXAR	SHEET NO.:	109

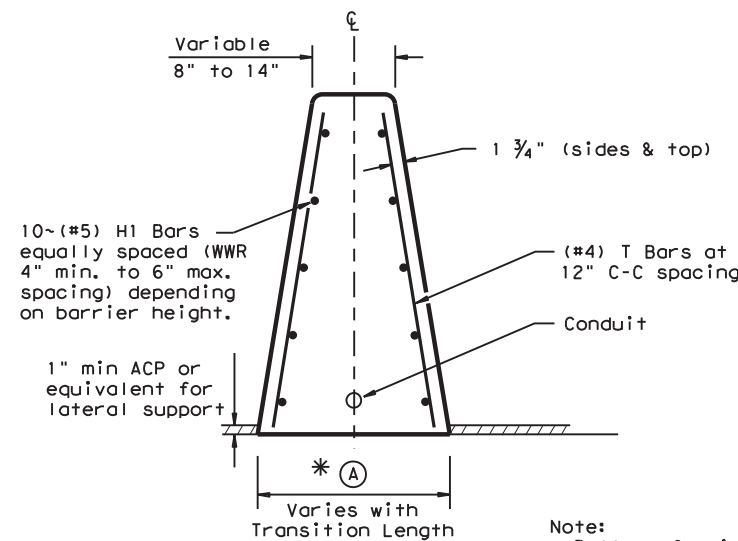
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DATE: FILE:

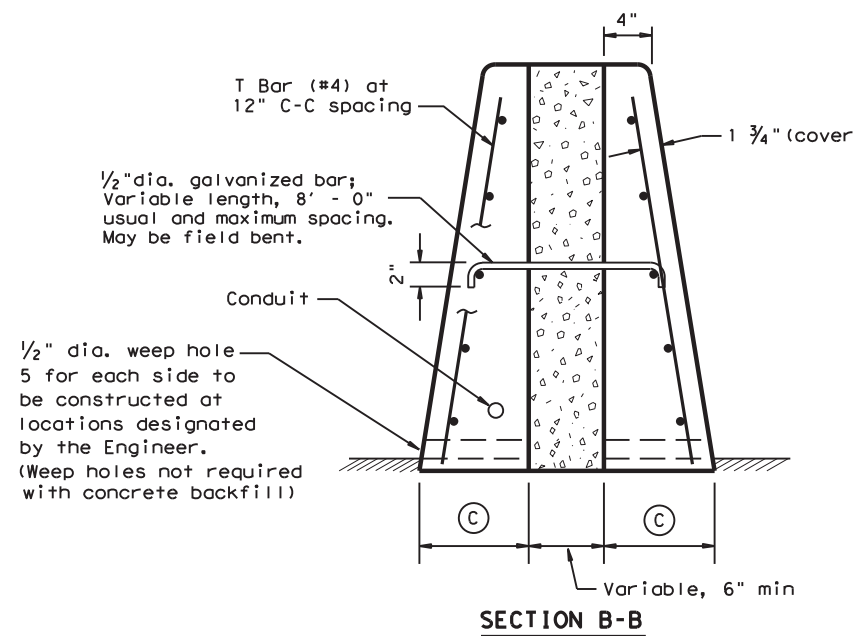
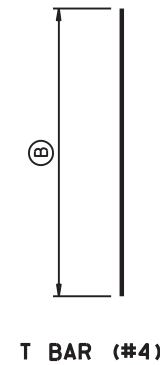


PLAN (TYPE 3) BARRIER



SECTION A-A

Note:
 Bottom of reinforcement cage may rest on top of finished grade.



SECTION B-B

Barrier height (in.)	* Dimensions (in.)		
	A	B	C
42	24 Plus	40 1/4	12
48	26 1/4 Plus	46 1/4	13 1/8
54	28 1/2 Plus	52 1/4	14 1/4

* (SSCB) (42") Barrier height may be increased to 48" or 54". This would increase the barrier and reinforcement dimensions accordingly.

Welded Wire Reinforcement (WWR) Option for Bars T and H1 (Type 3) Barrier

(WWR) General Notes

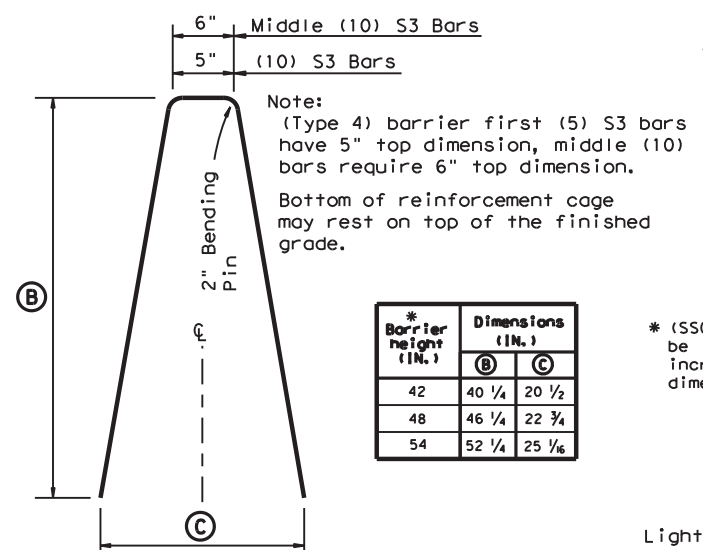
1. WWR design required for (Type 3) SSCB barrier: D14 vertical (12" C-C) x D20 horizontal wires spaced (4" min. to 6" max.) as height requires.
2. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
3. Welded wire cage may be cut and bent to accommodate the drainage slots, as directed by the Engineer.
4. Welded wire splice locations shall have a "minimum" splice lap length of 12".
5. Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".

GENERAL NOTES

1. Axis of concrete barrier shall be vertical, except where roadway is superelevated, then axis shall be normal to roadway surface.
2. All steel that requires galvanizing shall be in accordance with Item 445, "Galvanizing."
3. Bid price per liner foot of (Type 3) SSCB, including anchor sections, shall include all of the concrete, reinforcement, and aggregate backfill.
4. All concrete shall be Class C.
5. Longitudinal and vertical bars for roadway barrier shall conform to ASTM A615 (Grade 60), unless otherwise specified.
6. At construction joints the longitudinal bars shall extend beyond the joint so that bar splices will be a minimum of two feet from the construction joint.
7. Welded wire reinforcement (WWR) may be used as an option to conventional reinforcement and shall meet requirements shown.
8. Any method devised by the contractor and approved by the Engineer that will assure the longitudinal steel for and (Type 3) SSCB will be positioned ± 1/2 inch as dimensioned will be satisfactory.
9. Conduit to be provided only when called for elsewhere in the plans. Position of conduit may be adjusted to facilitate construction subject to the approval of the Engineer.
10. See SSCB(4) standard for barrier with illumination.

				Design Division Standard	
SINGLE SLOPE CONCRETE BARRIER CAST-IN-PLACE (TYPE 3) AT FIXED OBJECTS SSCB (3) - 10					
FILE: sscb310.dgn	DN: TxDOT	CK: AM	DW: BD	CK:	
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REVISIONS	6372	50	001	VAR.	
	DIST	COUNTY	SHEET NO.		
	SAT	BEXAR	110		

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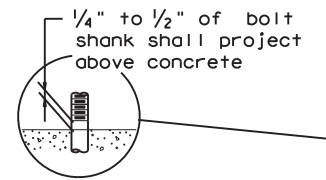
* Barrier height (IN.)	Dimensions (IN.)	
	B	C
42	40 1/4	20 1/2
48	46 1/4	22 3/4
54	52 1/4	25 1/8

Schedule of reinforcement for each 10 foot cast-in-place section at light poles (excluding anchorage)

BAR	SIZE	QUANTITY
S3	#4	20
R	#4	18

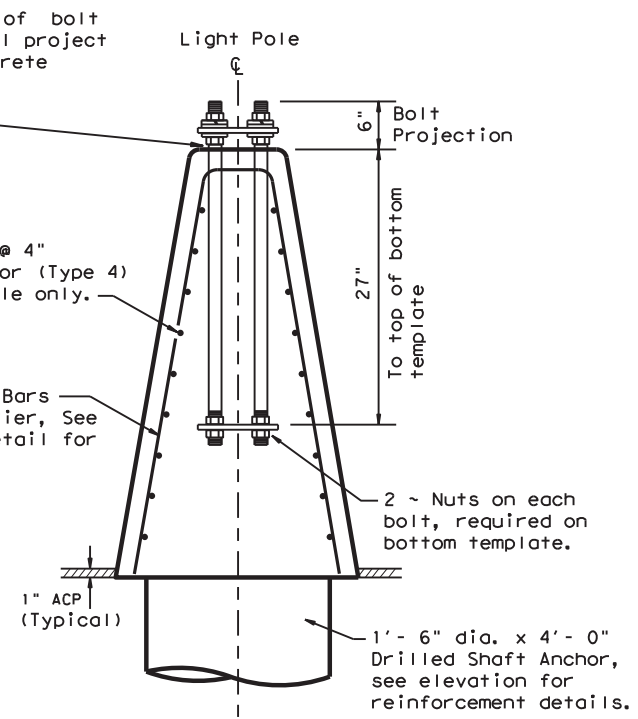
Welded Wire Reinforcement (WWR): IS NOT APPROVED FOR USE WITH (TYPE 4) BARRIER.

* (SSCB) (42") (Type 4) Barrier height may be increased to 48" or 54". This would increase the barrier and reinforcement dimensions accordingly.

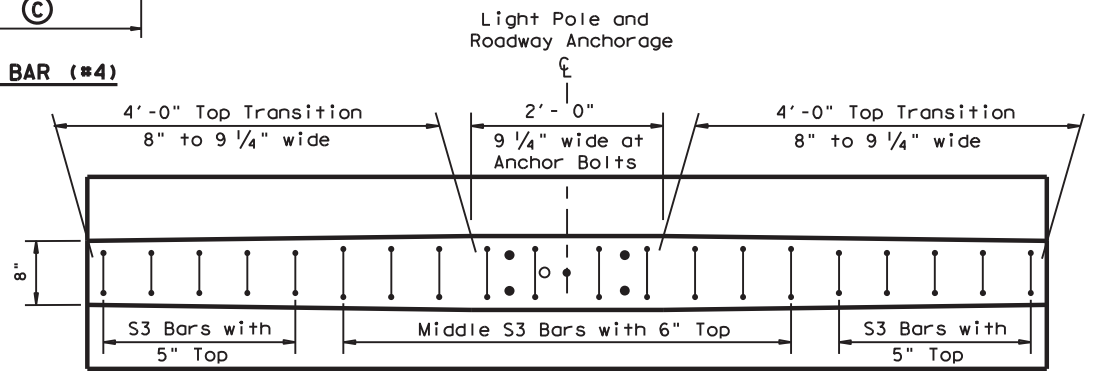


18 ~ (#4) R Bars @ 4" spaces required for (Type 4) Barrier, light pole only.

20 ~ (#4) S3 Bars (Type 4) Barrier, See Elevation Detail for bar spacing.

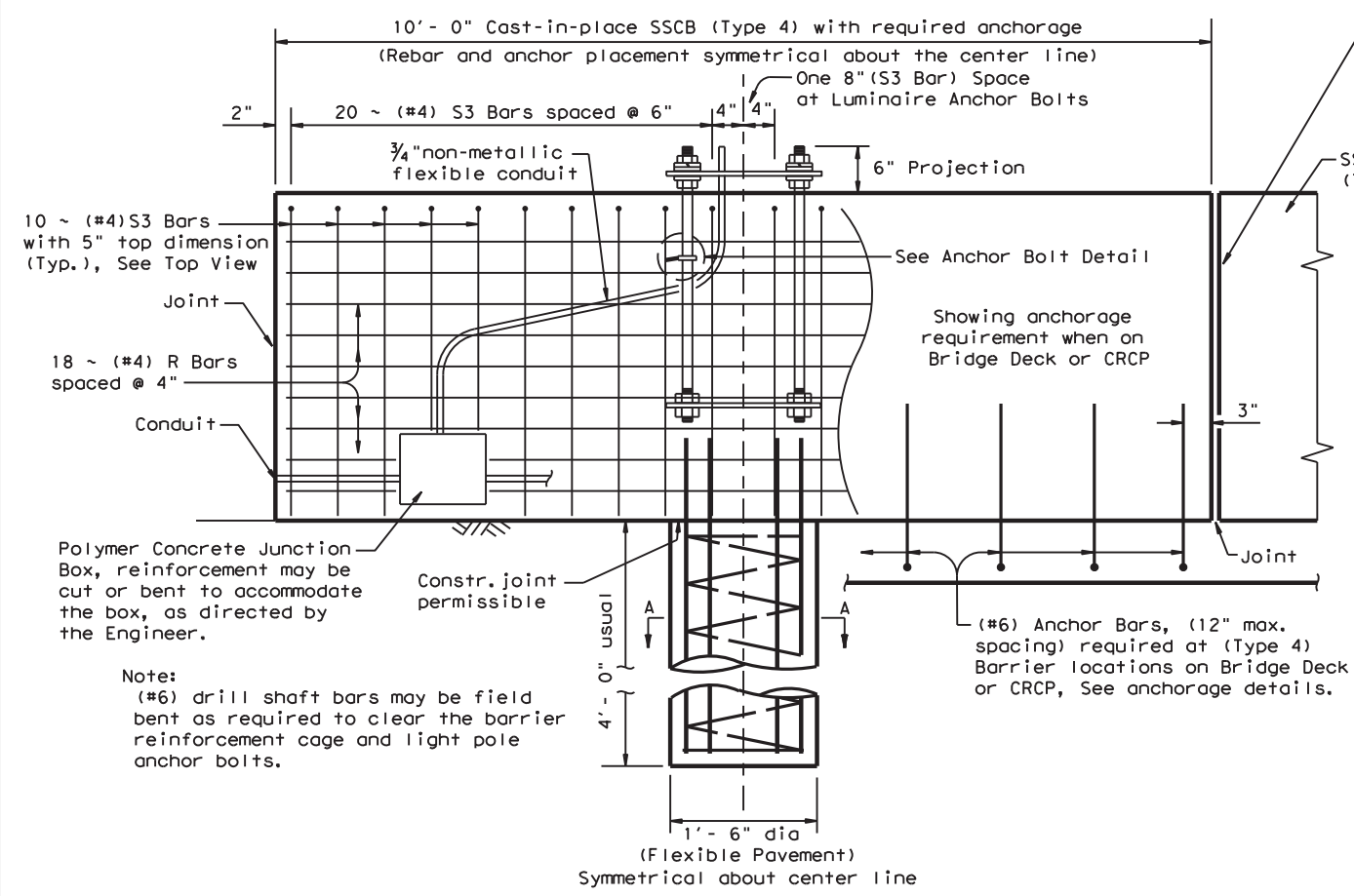


(ROADWAY) SECTION AT LIGHT POLE
Symmetrical about center line



Note: Top of barrier transitions from 8" to 9 1/4" to clear anchor bolts.

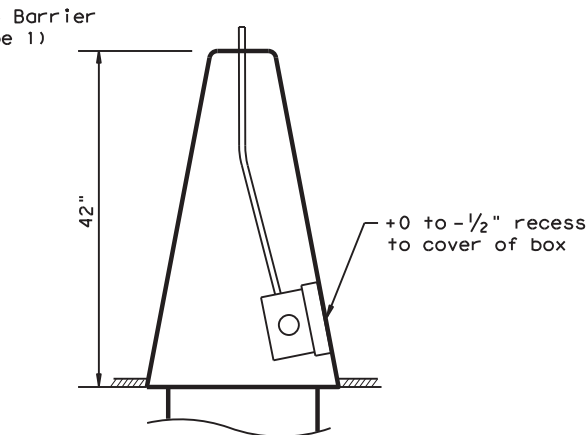
BARRIER (TYPE 4)
TOP VIEW
Showing S3 Bars and top dimension.



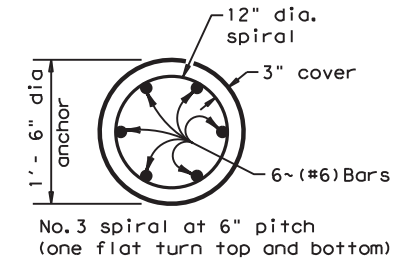
ELEVATION SHOWING THE REQUIRED REINFORCEMENT AND ANCHORAGE FOR (TYPE 4) BARRIER

The "Drilled Shaft Anchor" is the required anchorage for (Type 4) barrier on roadways with Flexible Pavement. The #6 Anchor Bars (Shown) is the required anchorage for (Type 4) barrier on Bridge Decks and CRCP.

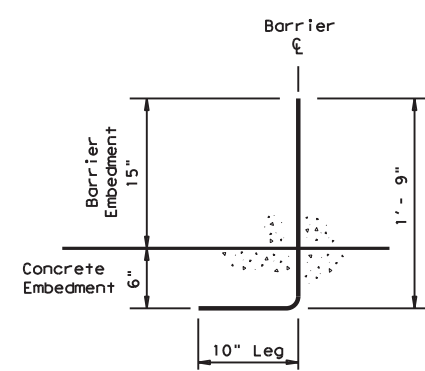
Each end of cast-in-place light pole section shall be formed to mate with the adjacent precast (Type 1) roadway barrier. The cast-in-place section shall be connected at each end to the precast sections in the same manner that precast sections are connected at joints as shown elsewhere.



SECTION SHOWING JUNCTION BOX
CONCRETE SAFETY BARRIER (TYPE 4)

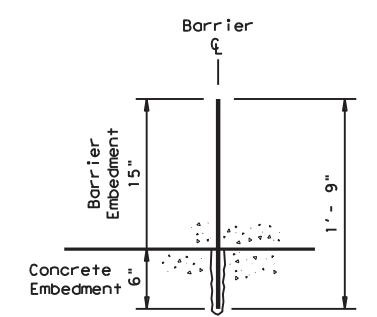


SECTION A-A



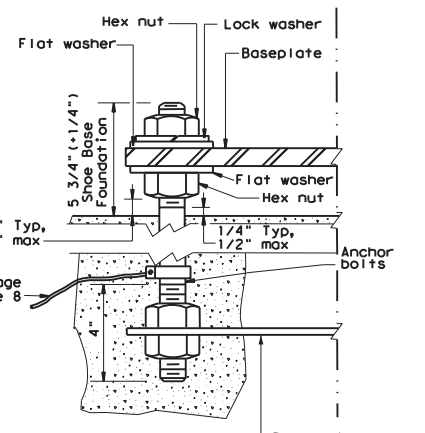
STANDARD "CONCRETE" ANCHORAGE

Standard Anchorage Note:
10" leg may be oriented 90 degrees in any direction about the barrier centerline.



"OPTIONAL" EPOXY ANCHORAGE

(#6) Bar
Type III, Class C Epoxy
Concrete Pavement / Bridge Deck Anchorage:
Cast-in-Place or Slip-Formed Barrier
Epoxy Note:
If epoxy coated anchor bars are required, the lower 6" of the bars must not be epoxy coated. Follow the manufacturer's directions for installing the epoxied anchor bars.



ANCHOR BOLT DETAIL

GENERAL NOTES

- All concrete shall be Class C.
- Anchor bolts, junction box, non-metallic flexible conduit, and bonding to steel shall not be paid for directly, but will be considered subsidiary to the various bid items.
- For proper installation and material requirements for the anchor bolts and light pole, see Traffic Engineering RIP standard sheets.
- Junction boxes shall be polymer concrete, and shall be mounted flush (+0, - 1/2") with concrete surface. For details and material requirements on barrier junction box, see DMS-11030.
- Install 12 AWG stranded conductors from load side of fused breakaway connector to luminaire. Fused breakaway connectors shall be installed as required on Traffic Engineering RID Sheets. Typically fused breakaway connectors are installed in the barrier junction box adjacent to each light pole. If fused breakaway connectors are installed in the pole's handhole, increase the size of the 3/4" flexible non-metallic conduit according to the NEC as needed to accommodate the branch circuit conductors.
- Anchor bolts and their assemblies shall be in accordance with Item 449, "Anchor Bolts" High-Strength Steel or Alloy Steel. Galvanization requirements for anchor bolts are shown on RIP sheets.
- The required anchorage for Type 4 barrier (drill shaft, standard or optional concrete anchorage) shall not be paid for directly, but is subsidiary to Item 514, "Permanent Concrete Traffic Barrier."
- 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.

Texas Department of Transportation
Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

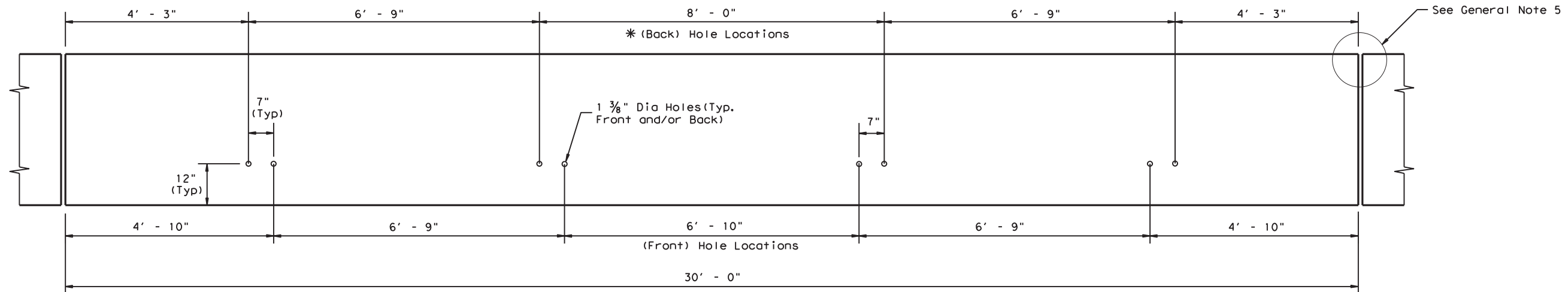
CAST-IN-PLACE (TYPE 4) AT LIGHT POLE
TL-4 MASH COMPLIANT
SSCB (4) - 19

FILE: sscb419.dgn	DN: TxDOT	CR: KM	DW: BD	CK:
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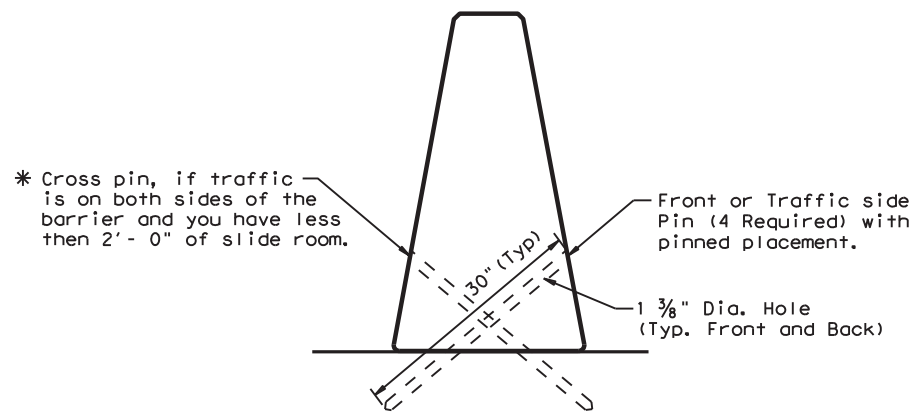
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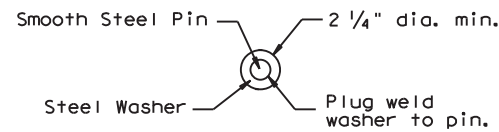
DETAIL 1

Precast SSCB (42")
Showing hole locations

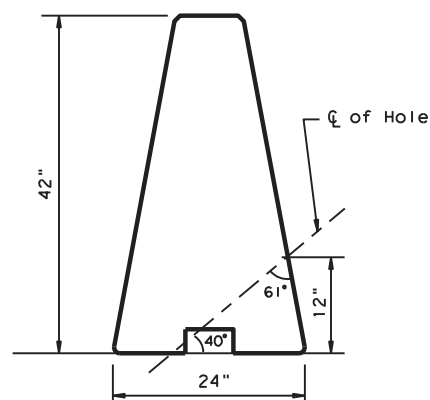


DETAIL 2

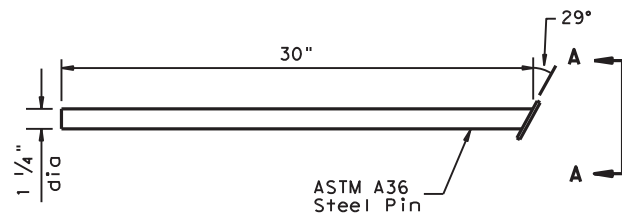
Placement on (ACP)
Asphalt Conc. Pavement
or Treated Base Material
(30" Pin required)



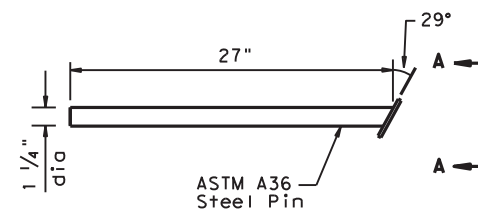
VIEW A-A



HOLE LOCATION DETAIL



(30") PIN DETAIL
See Detail 2



(27") PIN DETAIL
See Detail 3

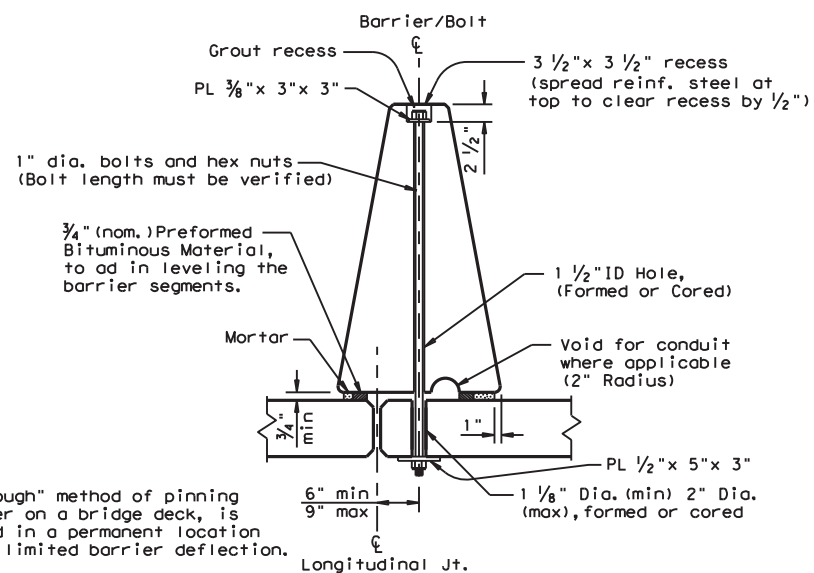
Note:
Steel washer welded to pin at 29° angle so that the washer is flush with barrier surface. (See View A-A)

Note:
The "Bolt Through" method of pinning precast barrier on a bridge deck, is primarily used in a permanent location that requires limited barrier deflection.

PRECAST SSCB (BOLT THROUGH) PLACEMENT OVER LONGITUDINAL EXPANSION JOINT

For bolt through locations, use the (Front) hole locations shown on Detail 1.

CORE DRILLING EXISTING BARRIER
Core drilling existing concrete barrier is permitted. Holes shall be drilled with coring or masonry drilling type equipment. Percussion (star) drilling shall not be used. A special drill bit (to cut through existing reinforcing) will likely be required. Spalls in the concrete exceeding 1/2" shall be patched.



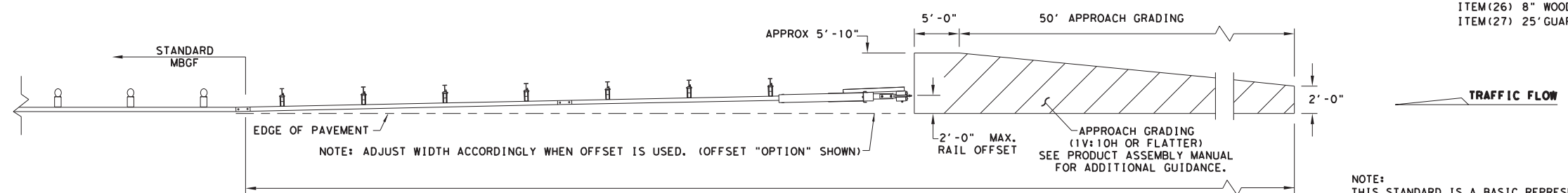
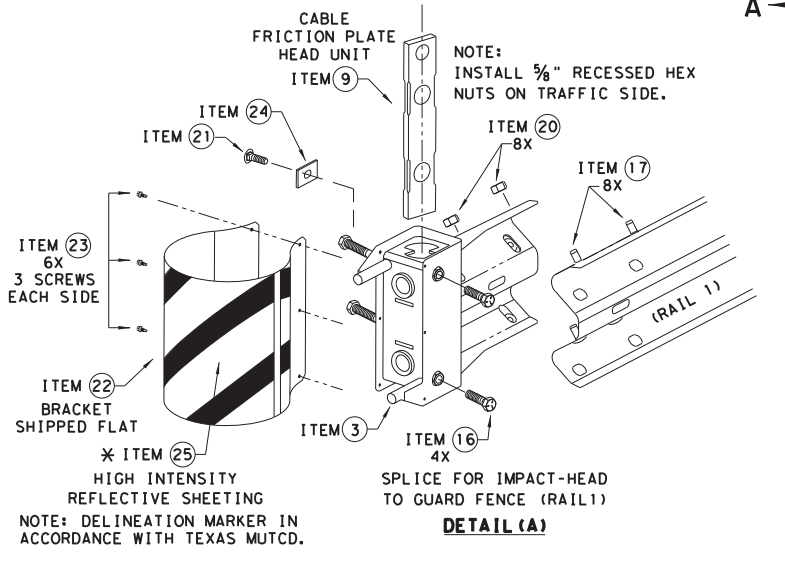
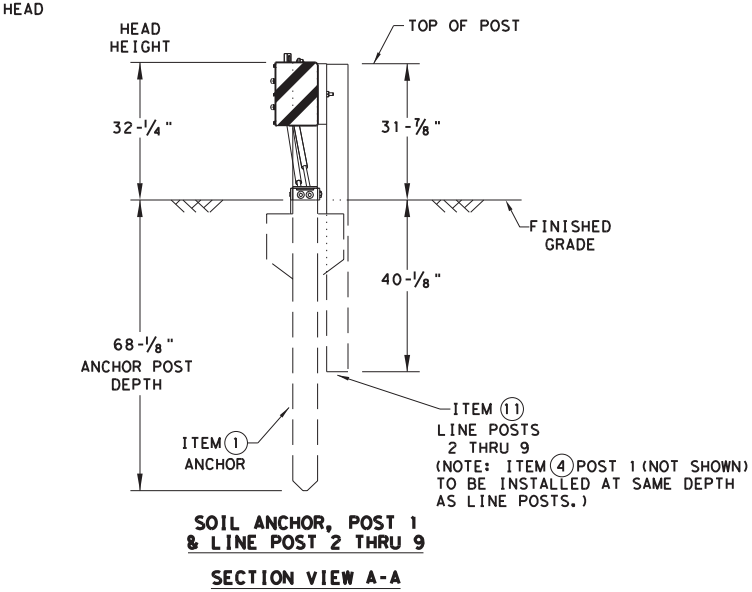
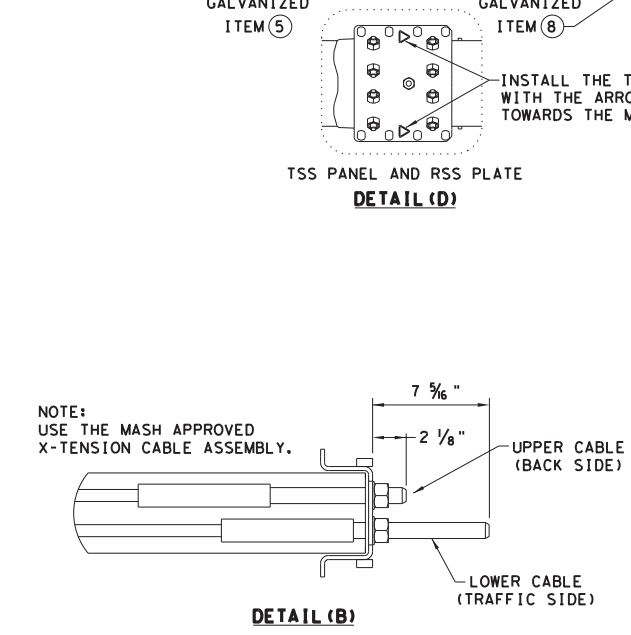
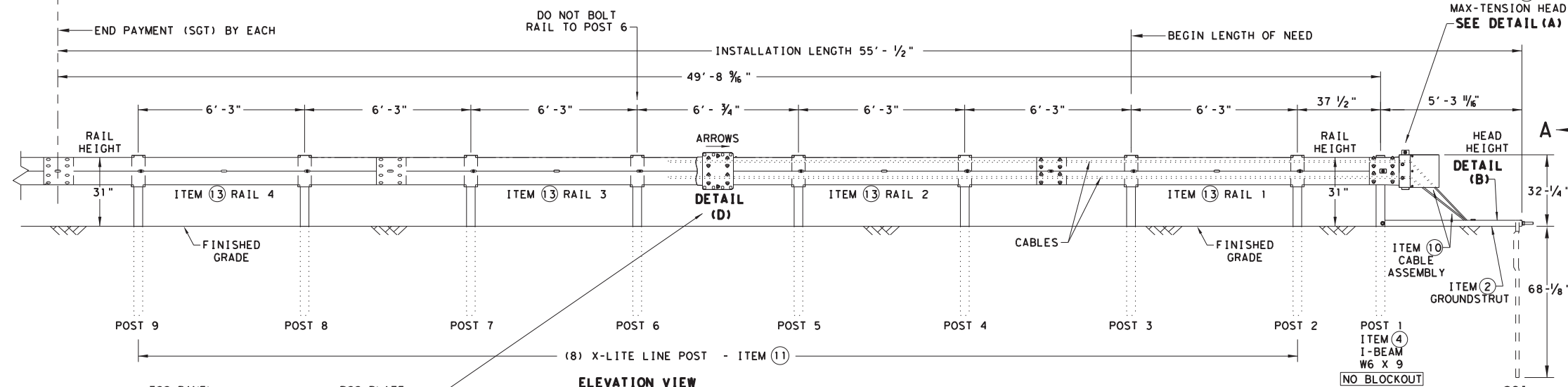
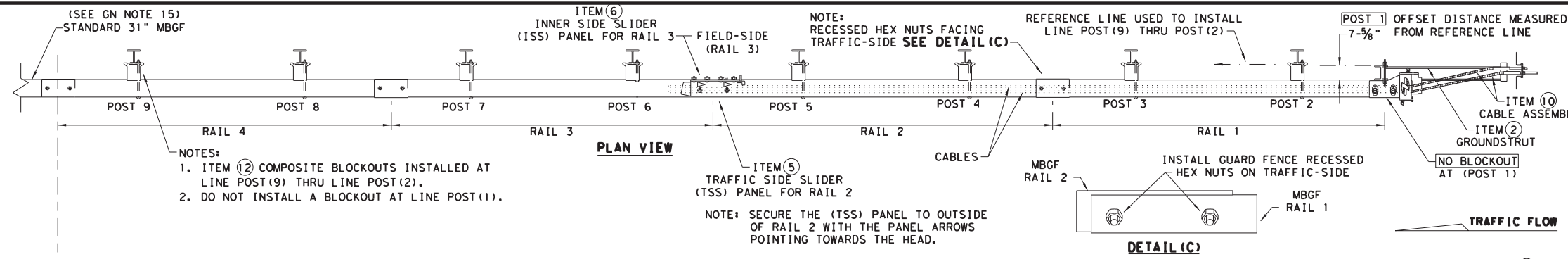
GENERAL NOTES

- These details provide a method of laterally restraining precast concrete barrier to limit deflections under normally expected passenger vehicle impacts. These details are intended for use in work zones, primarily on bridge decks, or pavement where temporary barrier must be placed less than 2 ft. from the longitudinal edge of the deck or dropoff and parallel to the direction of travel. Other applications of these details are acceptable as directed by the Engineer.
- Each precast concrete barrier section shall have a minimum of four or total of eight 1 3/8 in. ID holes formed or cored through the barrier. The center lines of the holes are shown in the hole location detail. If rebar is encountered, the entry point may be shifted 2" plus or minus longitudinally along the barrier. The eight holes are spaced along the length of the barrier as shown in Detail 1.
- The drilling of the travel surface is accomplished by placing the pre-drilled barrier section on the travel surface in the desired position. Then the hole is drilled with the bit passing through the hole in the barrier. The bit is to be inserted into the hole in the barrier so that the travel surface is drilled to a point which is slightly more than the pin length.
- Note that steel washers have been welded to the top of the steel pins to aid in the removal of the pins, when the barrier is removed.
- See SSCB(2) standard sheet for reinforcement requirements and joint connection types.
- The forming or coring of holes in the barrier, drilling of holes in bridge deck or pavement, fabrication and materials for the 1 1/4 in. pins, installation of pins, and any repair to the barrier shall be considered as subsidiary to the barrier bid items.
- The barrier and travel surface will be repaired as directed by the Engineer in accordance with Item 429, "Concrete Structure Repair."
- All steel pins shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
- Weight of barrier is approx. 700 lbs per foot.

		Design Division Standard	
<h1>SINGLE SLOPE CONCRETE BARRIER</h1> <h2>PRECAST BARRIER (TYPE 1) PINNED PLACEMENT</h2> <h3>SSCB(5) - 10</h3>			
FILE: sscb510.dgn	DN: TxDOT	CK: AM	DW: BD
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GENERAL NOTES

- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800
- FOR INSTALLATION, REPAIR, & MAINTENANCE REFER TO THE MAX-TENSION INSTALLATION INSTRUCTION MANUAL, P/N MANMAX REV D (ECN 3516).
- 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.
- ALL STEEL COMPONENTS ARE GALVANIZED PER ASTM A123 OR EQUIVALENT UNLESS OTHERWISE STATED.
- SYSTEM SHOWN USING STEEL WIDE FLANGE POST WITH COMPOSITE BLOCKOUTS.
- COMPOSITE MATERIAL BLOCKOUT THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
- REFER TO INSTALLATION MANUAL FOR SPECIFIC PANEL LAPPING GUIDANCE.
- IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL FOR INSTALLATION GUIDANCE.
- POSTS SHALL NOT BE SET IN CONCRETE.
- A DRIVING CAP WITH A TIMBER OR PLASTIC INSERT SHALL BE USED WHEN DRIVING POST TO PREVENT DAMAGE TO THE GALVANIZING ON TOP OF THE POST.
- MAX-TENSION SYSTEM SHALL NEVER BE INSTALLED WITHIN A CURVED SECTION OF GUARDRAIL.
- IF A DELINEATION MARKER IS REQUIRED, MARKER SHALL BE IN ACCORDANCE WITH TEXAS MUTCD.
- THE SYSTEM IS SHOWN WITH 12'-6" MBGF PANELS, 25'-0" MBGF PANELS ARE ALSO ALLOWED.
- A MINIMUM OF 12'-6" OF 12GA. MBGF IS REQUIRED IMMEDIATELY DOWNSTREAM OF THE MAX-TENSION SYSTEM.

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT. -GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	5/8" X 7" THREAD BOLT HH (GR.5)GEOMET	1
16	BSI-2001885	3/4" X 3" ALL-THREAD BOLT HH (GR.5)GEOMET	4
17	4001115	5/8" X 1 1/4" GUARD FENCE BOLTS (GR.2)MGAL	48
18	2001840	5/8" X 10" GUARD FENCE BOLTS MGAL	8
19	2001636	5/8" WASHER F436 STRUCTURAL MGAL	2
20	4001116	5/8" RECESSED GUARD FENCE NUT (GR.2)MGAL	59
21	BSI-2001888	5/8" X 2" ALL THREAD BOLT (GR.5)GEOMET	1
22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
23	BSI-2001887	1/4" X 3/4" SCREW SD HH 410SS	7
24	4002051	GUARDRAIL WASHER RECT AASHTO FWRO3	1
25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL, 8-SPACE, 12GA.	2
28	MANMAX Rev-(D)	MAX-TENSION INSTALLATION INSTRUCTIONS	1

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.
 ** ALTERNATIVE ITEMS NOT SHOWN.
 ITEM(26) 8" WOOD-BLOCKOUTS
 ITEM(27) 25' GUARD FENCE PANELS

Texas Department of Transportation
Design Division Standard

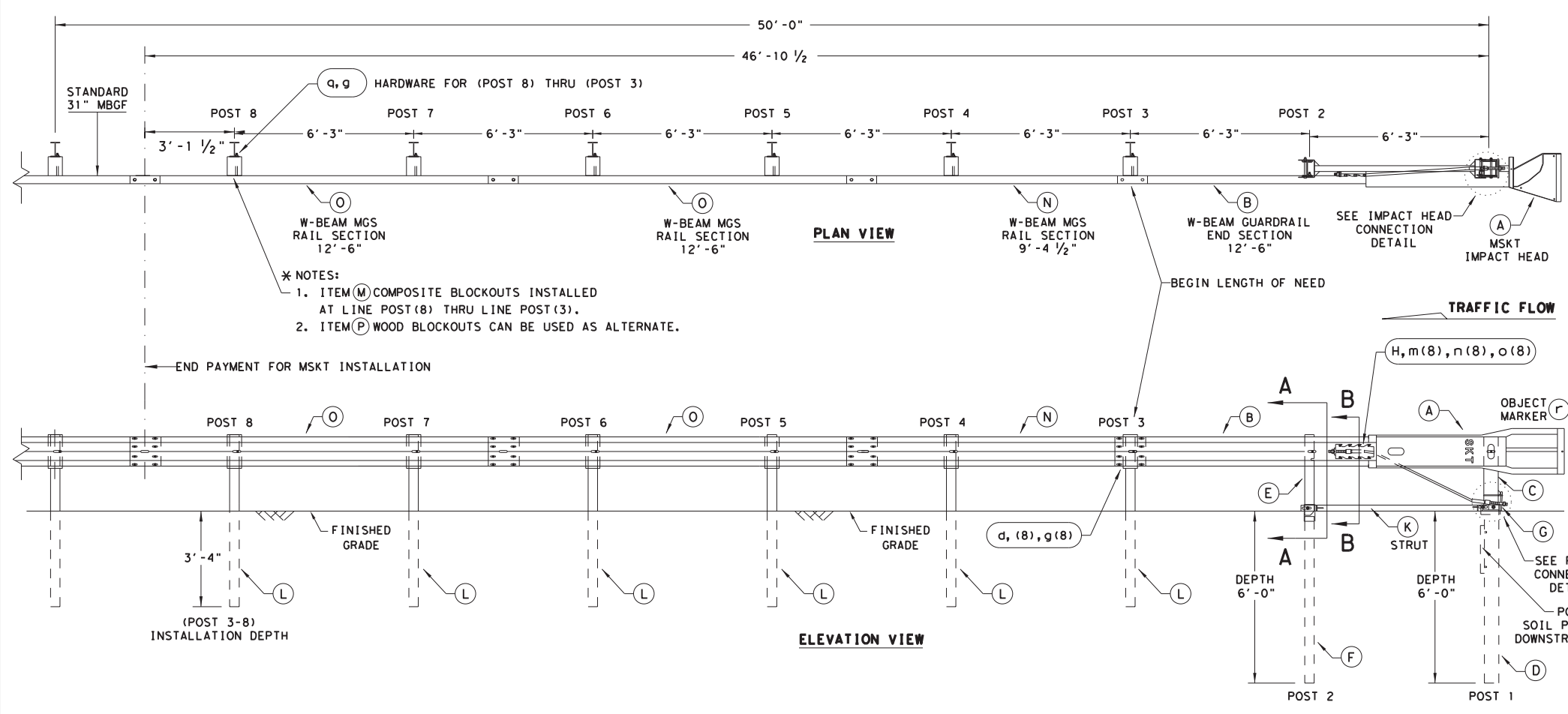
MAX-TENSION END TERMINAL
MASH - TL-3
SGT (11S) 31-18

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	SAT	BEXAR		114

NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE MAX-TENSION END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

DISCLAIMER: 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.

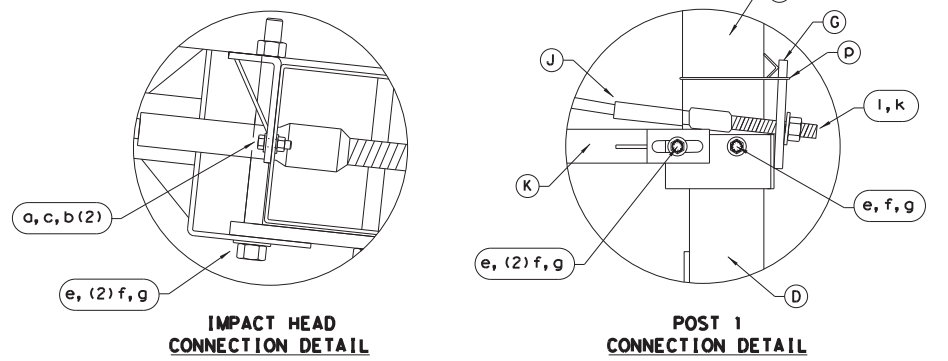
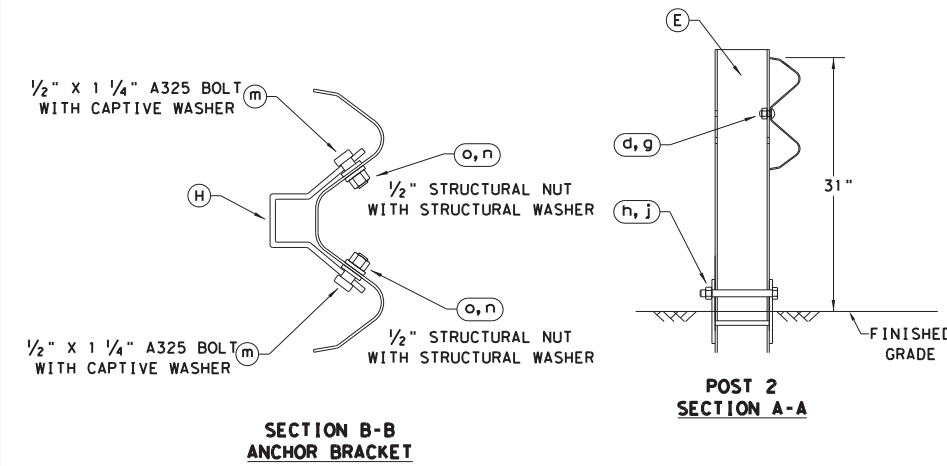
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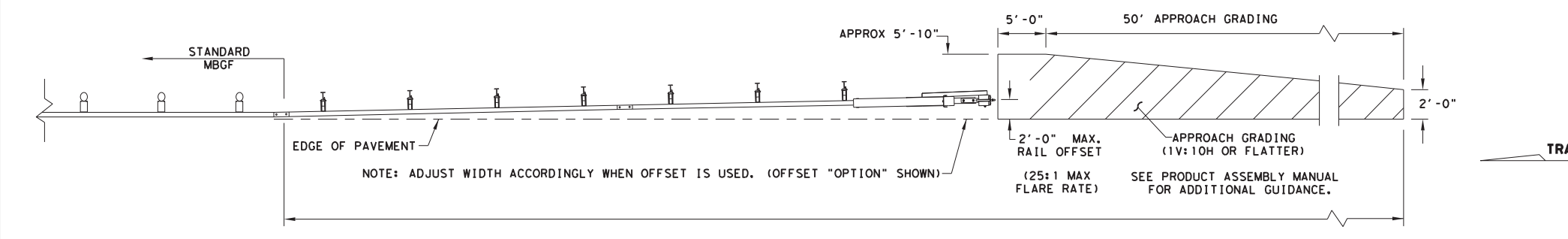
- * NOTES:**
- ITEM (M) COMPOSITE BLOCKOUTS INSTALLED AT LINE POST (8) THRU LINE POST (3).
 - ITEM (P) WOOD BLOCKOUTS CAN BE USED AS ALTERNATE.

- 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 MBSG STANDARD FOR INSTALLATION GUIDANCE.
 - POSTS SHALL NOT BE SET IN CONCRETE.
 - SYSTEM MUST BE ATTACHED TO STANDARD 31" MBSG.
 - 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 ENCRANCHING 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" MBSG PANELS, ONE 25'-0" MBSG 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



ALTERNATIVE ITEMS NOT SHOWN. * *
 * ITEM (P) 8" WOOD-BLOCKOUT
 * * ITEM (Q) 25' GUARD FENCE PANEL



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

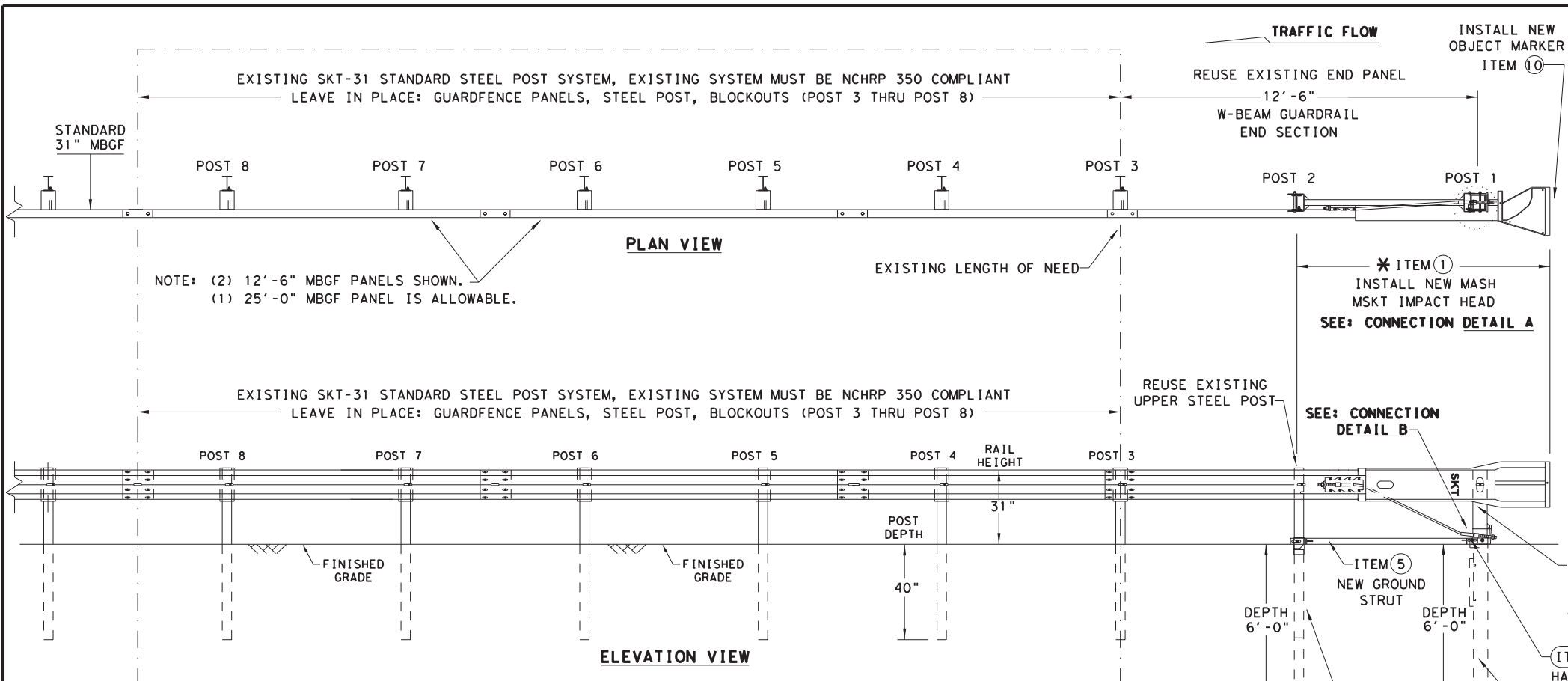
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SGT (12S) 31-18

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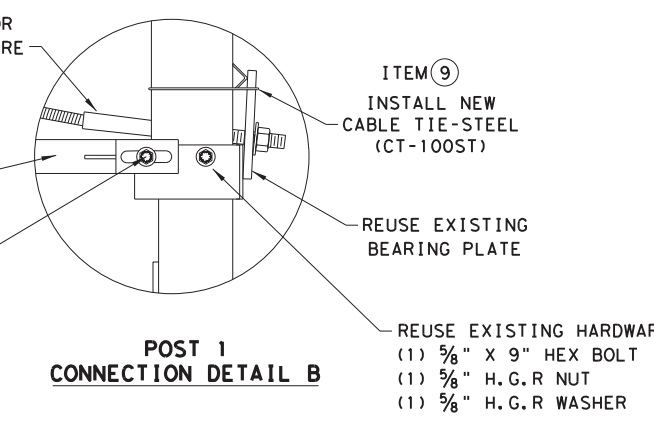
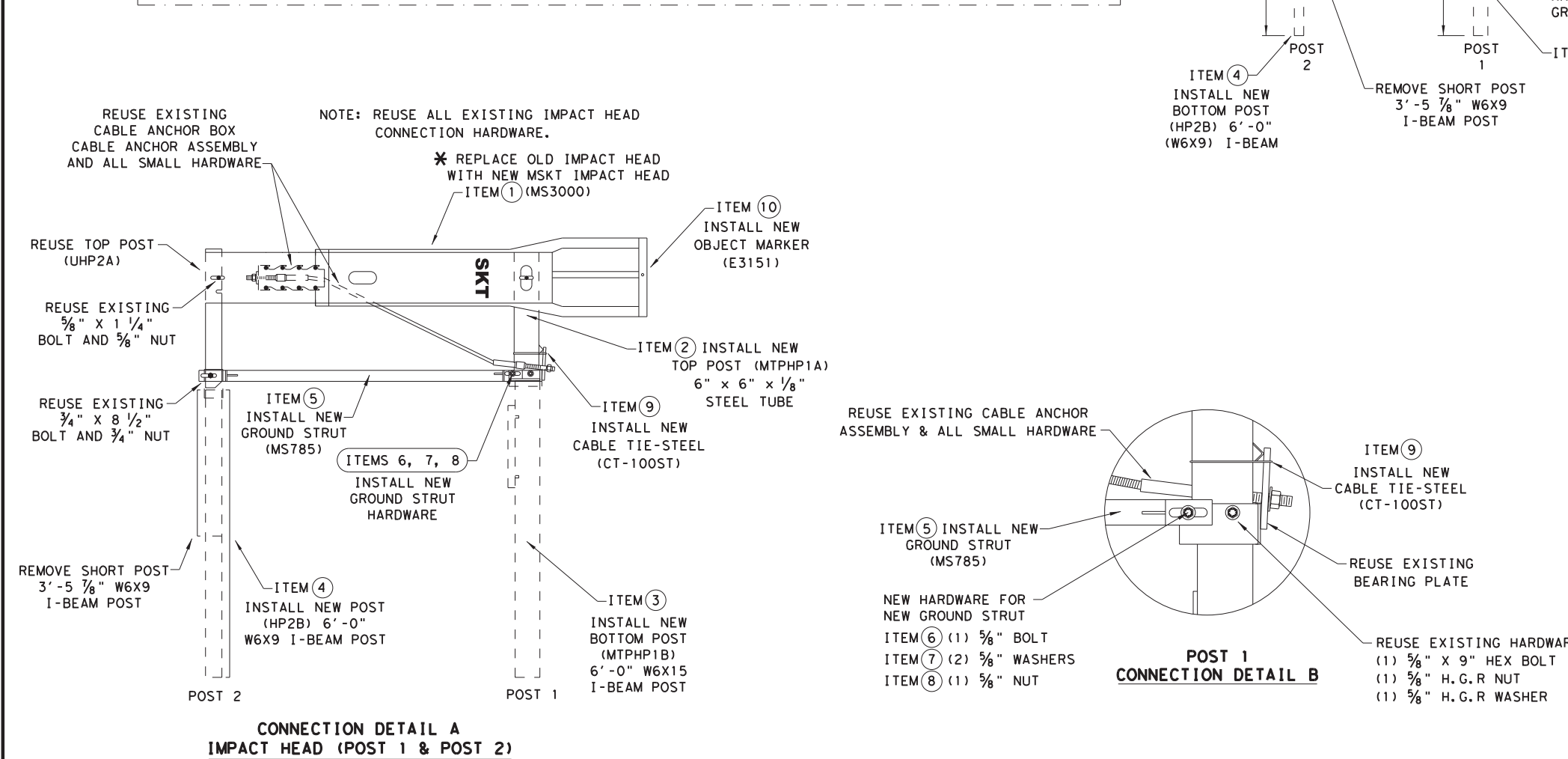
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GENERAL NOTES

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- 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.
- IF SOLID ROCK IS ENCOUNTERED IN THE AREA OF (POST 1) AND / OR (POST 2) CONTACT THE MANUFACTURER, AND REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
- POSTS SHALL NOT BE SET IN CONCRETE.
- THE EXISTING SKT 31" STANDARD STEEL POST SYSTEM MUST BE THOROUGHLY INSPECTED, AND DETERMINED TO BE INTACT, AND FREE OF ANY DAMAGE OR DEFECTS BEFORE RETROFITTING. THIS INSPECTION INCLUDES COMPLETING THE MSKT RETROFIT INSPECTION CHECKLIST FOR THE EXISTING SKT 31" STEEL POST NCHRP 350 SYSTEM. ALL EXISTING, AND REUSABLE PARTS MUST BE FREE OF ANY DAMAGE FOR A MASH COMPLIANT RETROFIT.
- 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 ENCRANCHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.
- SPECIAL DRIVING CAP TO BE USED WHEN DRIVING (LOWER POSTS 1 & 2) TO PREVENT DAMAGE TO THE WELDED PLATES.



ITEMS	QTY	MAIN SYSTEM COMPONENTS	PART NUMBERS
*	1	MSKT IMPACT HEAD	MS3000
	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
	1	GROUND STRUT	MS785
	1	5/8" X 9" HEX BOLT (GRD A449)	B580904A
	2	5/8" WASHERS	W050
	1	5/8" H.G.R NUT	N050
	1	CABLE TIE-STEEL	CT-100ST
*	1	OBJECT MARKER 18" X 18"	E3151

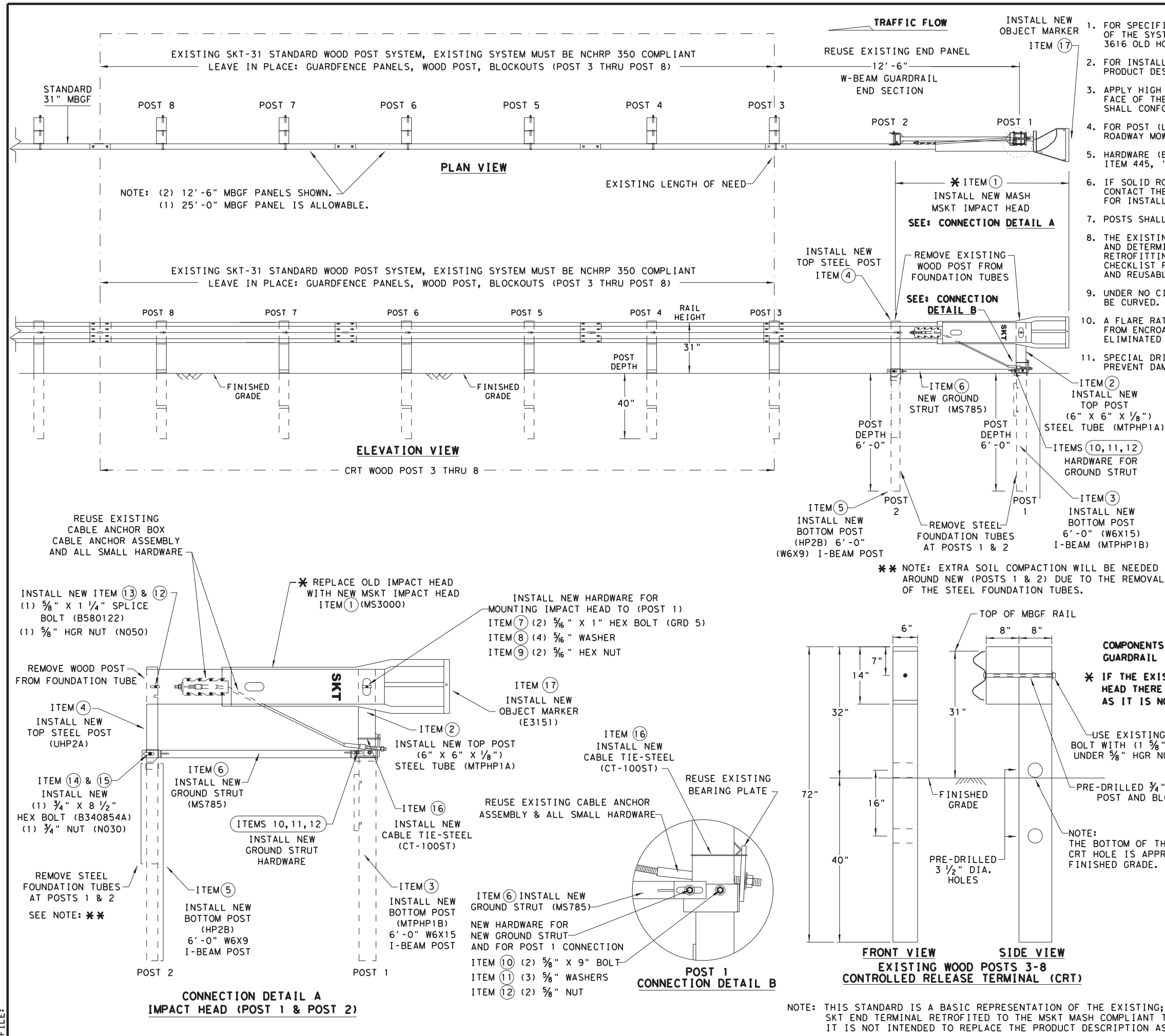
COMPONENTS REQUIRED TO RETROFIT: EXISTING 31" STEEL POST (NCHRP 350 SKT) GUARDRAIL TERMINAL WITH THE NEW 31" (MASH COMPLIANT MSKT IMPACT HEAD).
 * IF THE EXISTING NCHRP 350 (31" STEEL POST SKT) ALREADY HAS THE MSKT IMPACT HEAD THERE IS NO NEED TO REPLACE THE IMPACT HEAD OR OBJECT MARKER AS LONG AS IT IS NOT DAMAGED.

RETROFIT STANDARD
SKT 31" STEEL POST SYSTEM
TO MASH MSKT
SGT (13S) 31-18

FILE: sgt13s3118.dgn	DN: TXDOT	CK: KM	DW: VP	CK: CL
© TXDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	OOI	VAR.
	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	116	

NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE EXISTING; SKT END TERMINAL RETROFITTED TO THE MSKT MASH COMPLIANT TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION 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.

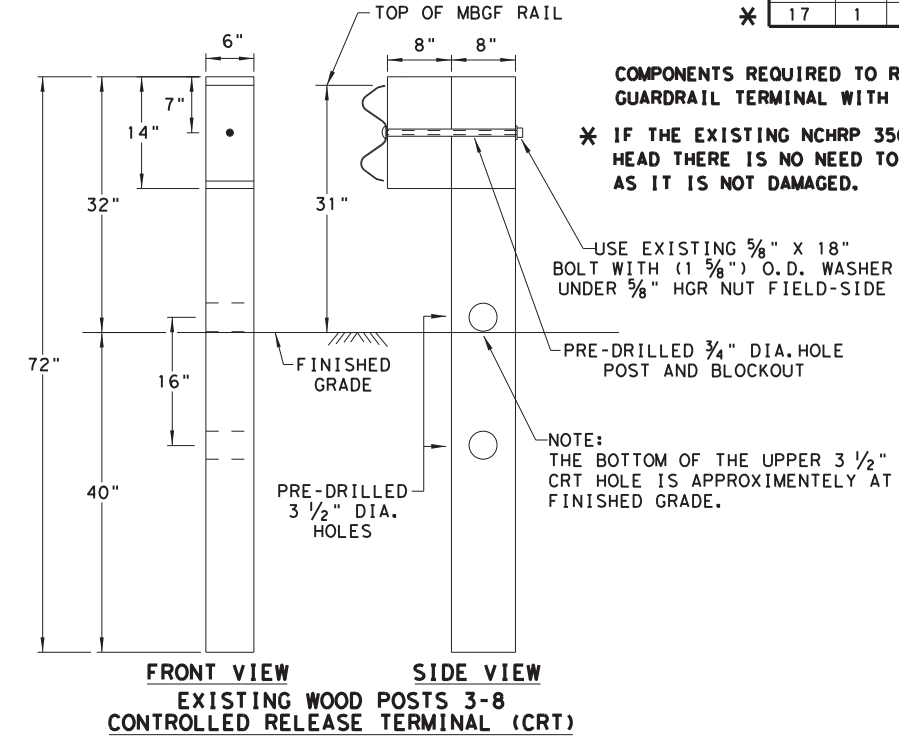


GENERAL NOTES

- 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: 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.
- IF SOLID ROCK IS ENCOUNTERED IN THE AREA OF (POST 1) AND / OR (POST 2) CONTACT THE MANUFACTURER, AND REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
- POSTS SHALL NOT BE SET IN CONCRETE.
- THE EXISTING SKT 31" STANDARD WOOD POST SYSTEM MUST BE THOROUGHLY INSPECTED, AND DETERMINED TO BE INTACT, AND FREE OF ANY DAMAGE OR DEFECTS BEFORE RETROFITTING. THIS INSPECTION INCLUDES COMPLETING THE MSKT RETROFIT INSPECTION CHECKLIST FOR THE EXISTING SKT 31" WOOD POST NCHRP 350 SYSTEM. ALL EXISTING, AND REUSABLE PARTS MUST BE FREE OF ANY DAMAGE FOR A MASH COMPLIANT RETROFIT.
- 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 ENCRANCHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.
- SPECIAL DRIVING CAP TO BE USED WHEN DRIVING (LOWER POSTS 1 & 2) TO PREVENT DAMAGE TO THE WELDED PLATES.

ITEMS	QTY	MAIN SYSTEM COMPONENTS	PART NUMBERS
1	1	MSKT IMPACT HEAD	MS3000
2	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
3	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
4	1	POST 2 - ASSEMBLY TOP	UHP2A
5	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
6	1	GROUND STRUT	MS785
7	2	5/16" X 1" HEX BOLT (GRD 5)	B516014A
8	4	5/16" WASHERS	W0516
9	2	5/8" HEX NUT	N0516
10	2	5/8" X 9" HEX BOLT (GRD A449)	B580904A
11	3	5/8" WASHERS	W050
12	3	5/8" H.G.R NUT	N050
13	1	5/8" X 1 1/4" SPLICE BOLT	B580122
14	1	3/4" X 8 1/2" HEX BOLT (GRD 5)	B340854A
15	1	3/4" HEX NUT	N030
16	1	CABLE TIE-STEEL	CT-100ST
17	1	OBJECT MARKER 18" X 18"	E3151

COMPONENTS REQUIRED TO RETROFIT: EXISTING 31" WOOD POST (NCHRP 350 SKT) GUARDRAIL TERMINAL WITH THE NEW 31" (MASH COMPLIANT MSKT IMPACT HEAD).
 * IF THE EXISTING NCHRP 350 (31" WOOD POST SKT) ALREADY HAS THE MSKT IMPACT HEAD THERE IS NO NEED TO REPLACE THE IMPACT HEAD OR OBJECT MARKER AS LONG AS IT IS NOT DAMAGED.



Design Division Standard

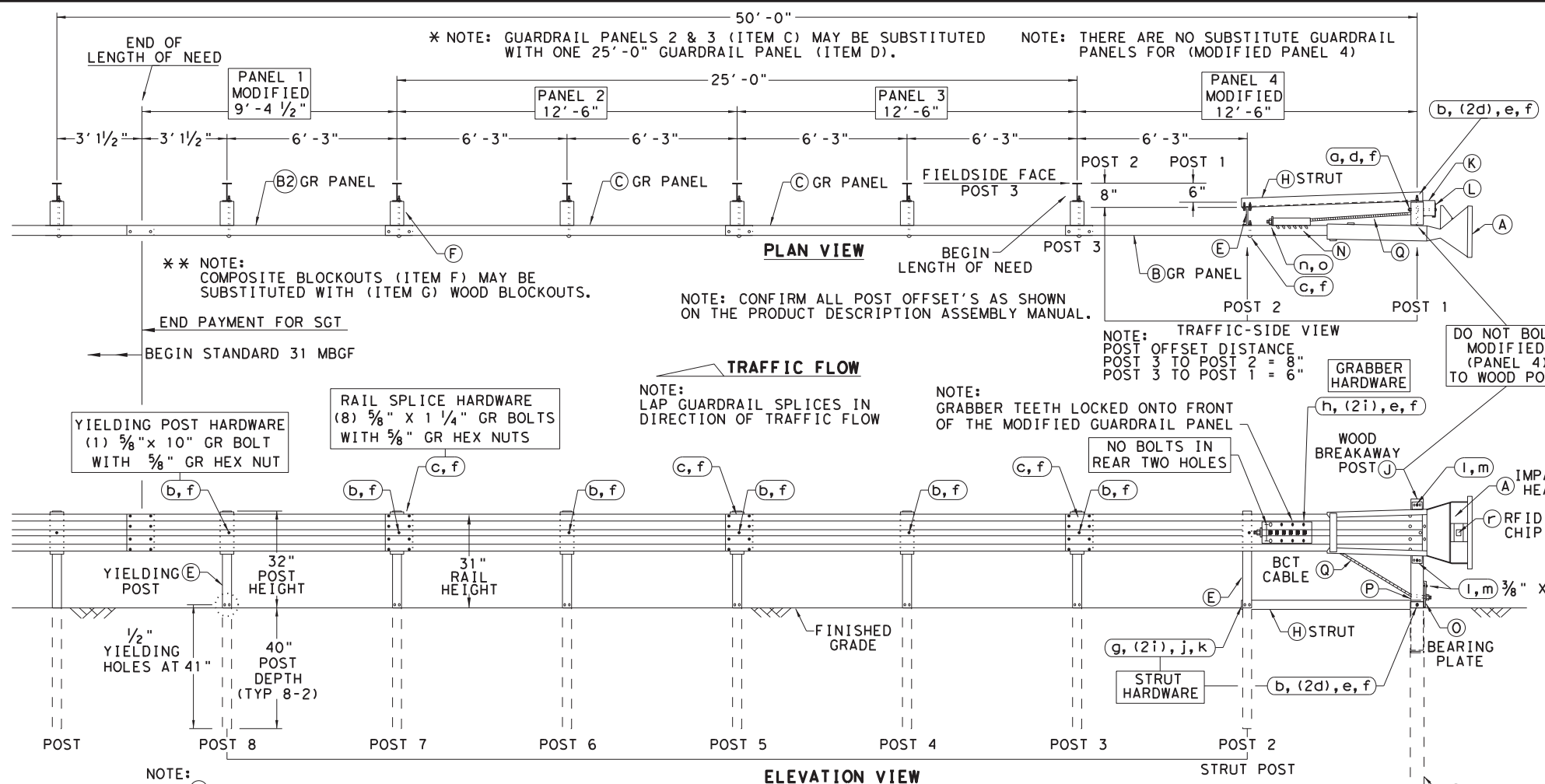
RETROFIT STANDARD SKT 31" WOOD POST SYSTEM TO MASH MSKT SGT (14W) 31-18

FILE: sgt14w3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL
© TXDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	OOI	VAR.
	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	117	

NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE EXISTING; SKT END TERMINAL RETROFITTED TO THE MSKT MASH COMPLIANT TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

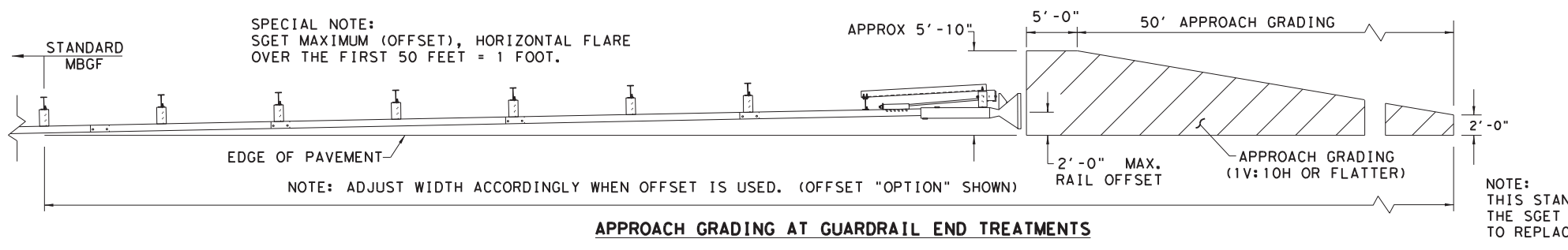
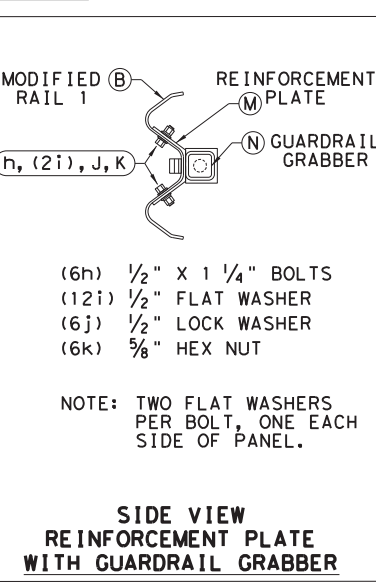
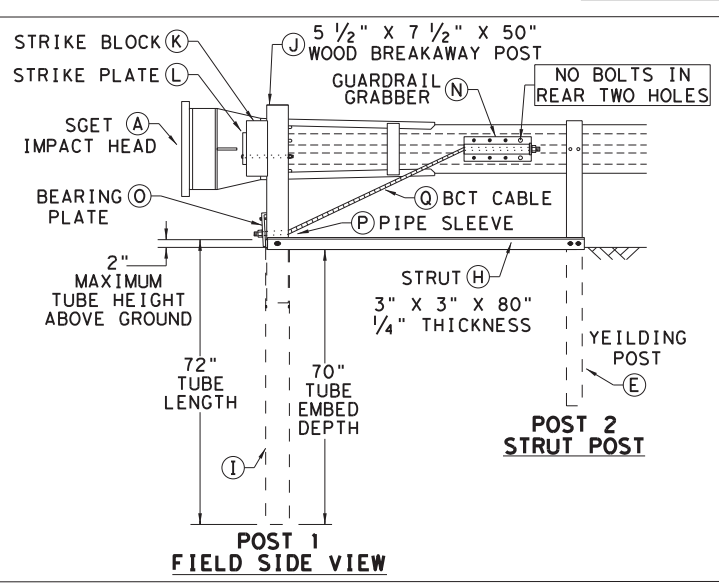
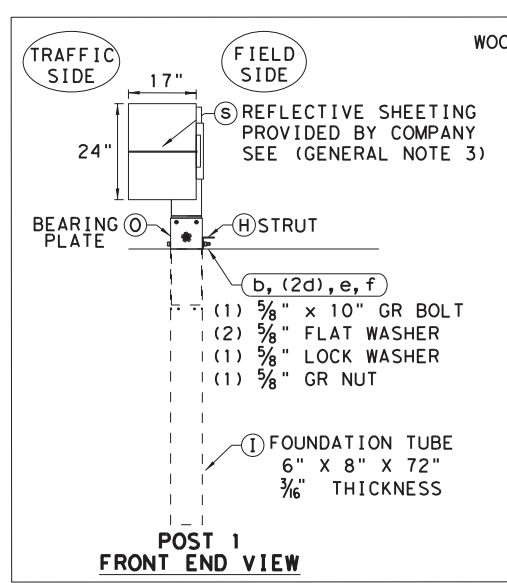
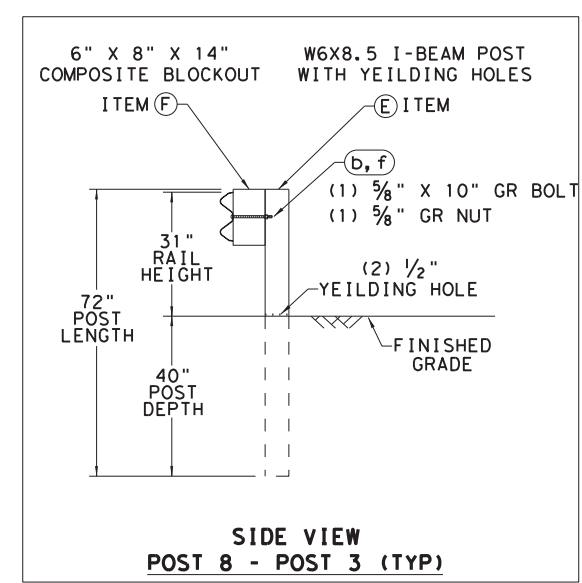
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DISCLAIMER: THE USE OF THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. TXDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR 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 3/8"	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"	GR17
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
SMALL HARDWARE			
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



NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE SGET TERMINAL SYSTEM AND IS NOT INTENDED TO REPLACE THE MANUFACTURER'S ASSEMBLY MANUAL.

Design Division Standard

SPIG INDUSTRY, LLC
 SINGLE GUARDRAIL TERMINAL
 SGET - TL-3 - MASH
 SGT (15) 31-20

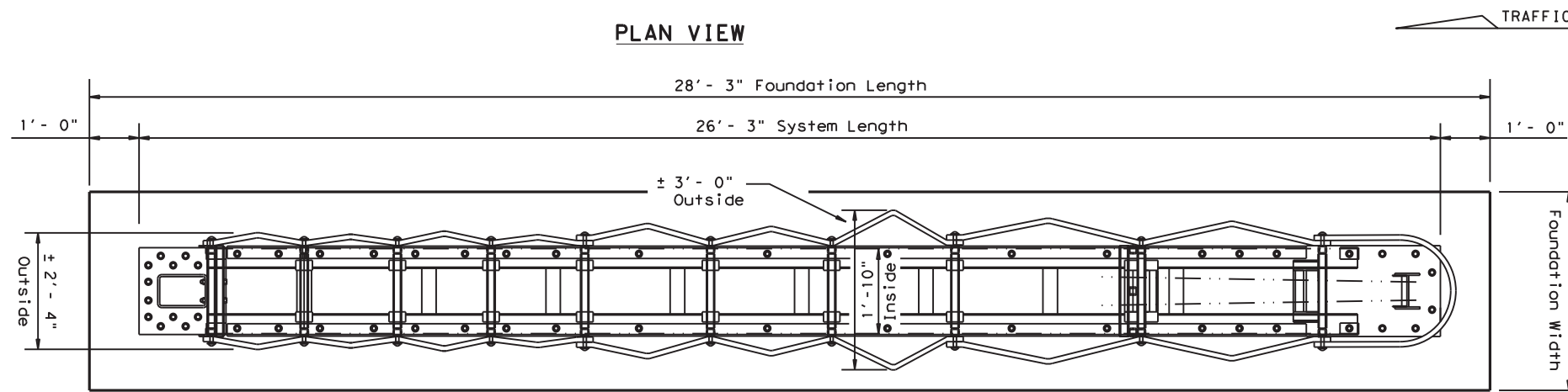
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REVISIONS	DIST: SAT	COUNTY: BEXAR	SHEET NO. 118	

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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.

DATE: FILE:

PLAN VIEW



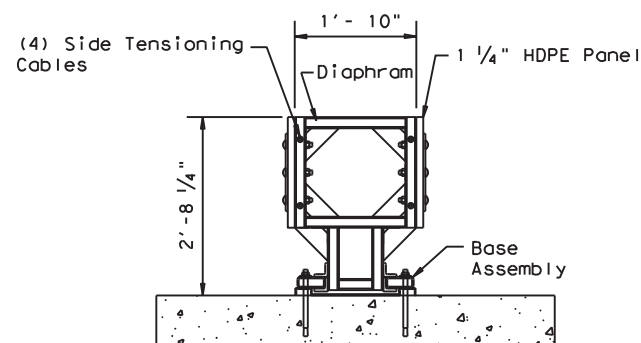
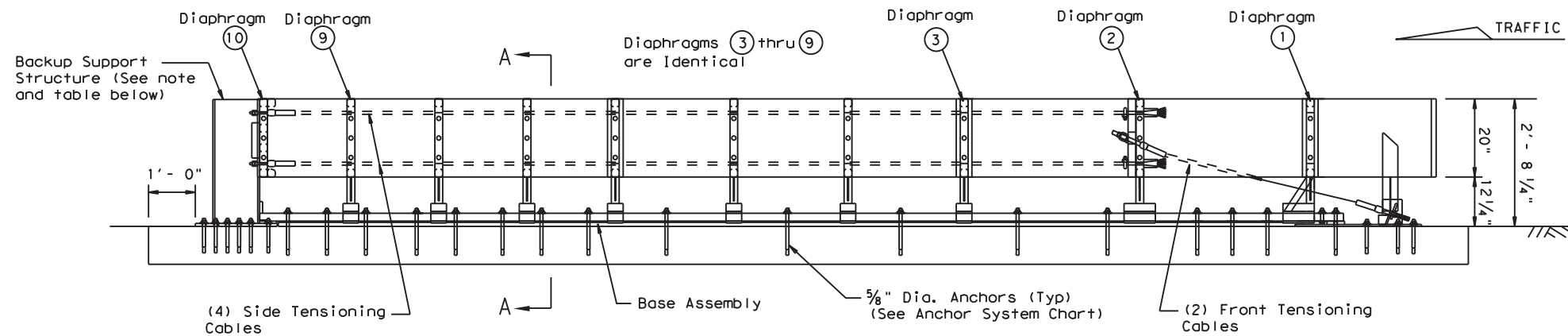
NOTE: BACKUP SUPPORT SHOWN IS THE STEEL POST OPTION. THE HEART SYSTEM MAY BE CONNECTED WITH RECTANGULAR CROSS SECTIONS SUCH AS: PIERS, PARAPETS AND CONCRETE TRAFFIC BARRIERS.

SYSTEM SHOWN IS HEART (TL-3) WITH UNI-DIRECTIONAL TRAFFIC

GENERAL NOTES

- For specific information regarding installation and technical guidance of the system, contact: Trinity Highway at 1(888)323-6374, 2525 N. Stemmons Freeway, Dallas, TX 75207
- For bi-directional traffic, appropriate transition panels will be required.
- Details of components for the HEART and backups and reinforcing details will be shown on the manufacturer's shop drawings furnished to the Engineer.
- Concrete shall be class "S" with a minimum compressive strength of 4,000 p.s.i.
- If the cross-slope varies more than 2% over the length of the system, the concrete pad will require levelling. Maximum permissible cross-slope is 8%.
- The installation area should be free from curbs, elevated objects, or depressions.
- The HEART system should be approximately parallel with the barrier or $\frac{1}{2}$ of merging barriers.

ELEVATION VIEW



SECTION A-A

HEART (NARROW) SYSTEM		
TEST LEVEL	SYSTEM LENGTH	PAD LENGTH
TL-2	13' - 9 1/2"	15' - 9 1/2"
TL-3	26' - 3"	28' - 3"
70	28' - 9"	30' - 9"

CONCRETE PAD LENGTH ON THE HEART SYSTEM DEPENDS ON BACKUP TYPE. (MINIMUM LENGTH SHOWN)

BACKUP SUPPORT OPTIONS	
Steel Post Backup (Shown)	
Rectangular Concrete Backup (18" Width Max.)	
Concrete Barrier (CTB) Backup	
Single Slope Concrete Barrier (SSCB)	
TRANSITION OPTIONS	
THE HEART SYSTEM IS APPROVED FOR USE AT BI-DIRECTIONAL SITES, ADDITIONAL HARDWARE IS REQUIRED. (SEE MANUFACTURER'S PRODUCT MANUAL)	

BACKUP AND TRANSITION TYPES ARE SHOWN ELSEWHERE ON THE PLANS. (I.E. ATTENUATOR LOCATION DETAILS OR IN THE GENERAL NOTES)

FOUNDATION OPTIONS	
6" Reinforced Concrete	
8" Unreinforced Concrete	
8" Minimum Asphalt	
For asphalt overlays on concrete, contact the manufacturer.	

FOR STEEL PLACEMENT IN CONCRETE FOUNDATIONS (SEE MANUFACTURER'S PRODUCT MANUAL)

ANCHOR SYSTEM CHART	
On Concrete:	10" Bolts used on base rails, 7 1/2" Bolts used on base plates.
On Asphalt:	18" Bolts used on base rails and base plates.

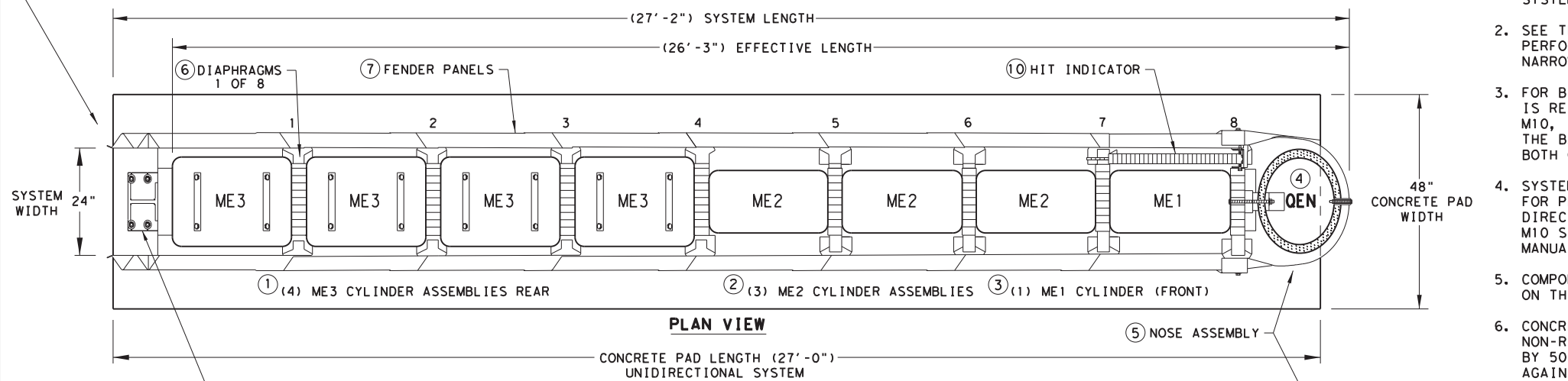
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TRINITY HIGHWAY HEART HYBRID ENERGY ABSORBING TERMINAL HEART-16					
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© TxDOT: March 2010	CONT	SECT	JOB	HIGHWAY	
	6372	50	001	VAR.	
REVISIONS					
REVISED 06, 2013 (VP)					
REVISED 03, 2016 (VP)					
	DIST	COUNTY	SHEET NO.		
	SAT	BEXAR	119		

LOW MAINTENANCE

DISCLAIMER: 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.

NOTE:
A TRANSITION MAY BE REQUIRED TO INSTALL THE QUADGUARD ELITE M10 TO THE OBJECT BEING SHIELDED.

QUADGUARD ELITE M10 24" WIDE (8 BAY) SYSTEM

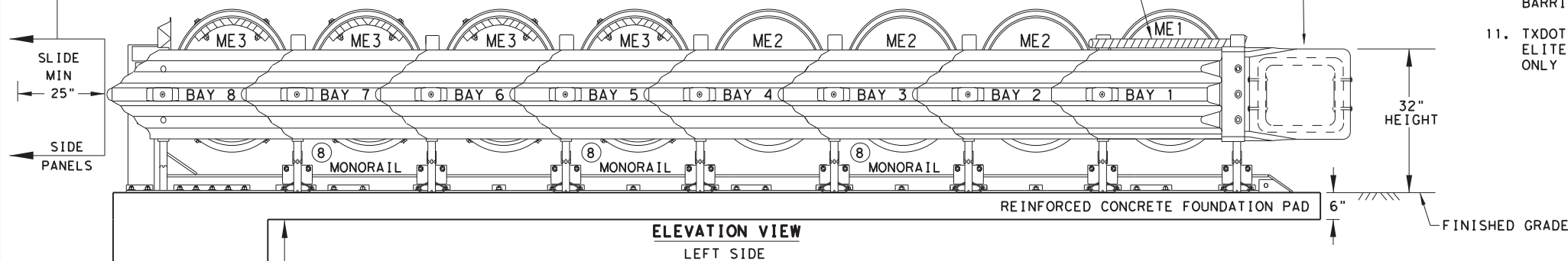


KEY	KEY	KEY
① ME3 CYLINDER ASSEMBLIES	⑥ DIAPHRAGMS	⑩ HIT INDICATOR
② ME2 CYLINDER ASSEMBLIES	⑦ FENDER PANELS	
③ ME1 CYLINDER ASSEMBLY	⑧ MONORAILS	
④ QEN CYLINDER	⑨ TYPE OF BACKUP	
⑤ NOSE BELT ASSEMBLY		

NOTE:
HIT INDICATOR WILL RAISE UPON IMPACT.

④ QEN CYLINDER INSTALLED INSIDE OF NOSE BELT ASSEMBLY ⑤

NOTE:
PROVISION SHALL BE MADE FOR REAR FENDER SIDE PANELS TO SLIDE REARWARD UPON IMPACT, 25" MIN.



NOTES:
CONTACT THE MANUFACTURER WITH SITE SPECIFIC DATA (SSD) FOR CONCRETE PAD AND ANCHOR BLOCK INSTALLATION REQUIREMENTS.

A MANUFACTURER'S DRAWING PACKAGE UNIQUE AND SPECIFIC FOR THE QUADGUARD ELITE M10 FIELD INSTALLATION AND INFORMATION REGARDING THE TYPE OF BACKUP ASSEMBLY REQUIRED FOR THE TRANSITION WILL BE PROVIDED BY THE MANUFACTURER TO THE ENGINEER AND INSTALLER.

6" REINFORCED CONCRETE PAD REQUIRES THE INSTALLATION OF AN ANCHOR BLOCK AS SHOWN ON THE MANUFACTURER'S DRAWING PACKAGE.

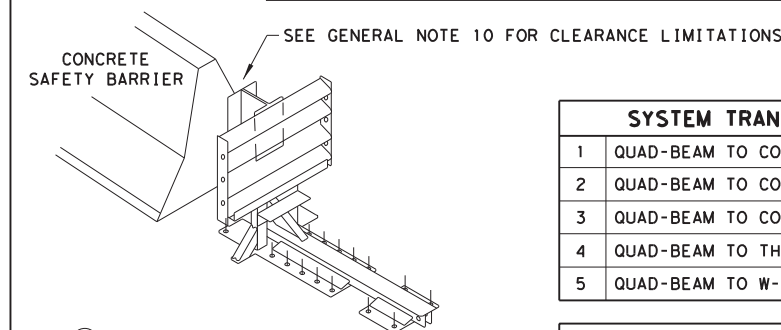
8" NON-REINFORCED CONCRETE PAD MAY NOT REQUIRE AN ANCHOR BLOCK, IF THE PAD IS INSTALLED AGAINST AN IMMOVABLE CONCRETE BACKUP.

CONCRETE PAD AND ANCHOR BLOCK COMBINATIONS SHALL BE CONFIRMED WITH THE MANUFACTURER BASED UPON SITE SPECIFIC DATA (SSD).

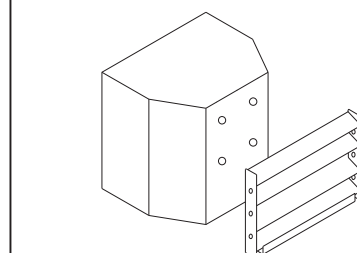
NOTE:
THE QUADGUARD ELITE M10 8-BAY, 24" WIDE - NARROW SYSTEM TESTED TO MASH TEST LEVEL 3.

TL-3 MODEL #	QM10024E	CYLINDER TYPES IN BAYS			
BAYS	8	TYPE-ME3	TYPE-ME2	TYPE-ME1	TYPE-QEN
DIAPHRAGMS	8	4	3	1	1
WIDTH	24"	REAR	FRONT		NOSE

BACKUP ASSEMBLY TYPES FOR SYSTEM TRANSITIONS



⑨ TENSION STRUT BACKUP



⑨ CONCRETE BACKUP

SYSTEM TRANSITIONS TYPES	
1	QUAD-BEAM TO CONCRETE SAFETY BARRIER
2	QUAD-BEAM TO CONCRETE BRIDGE RAIL
3	QUAD-BEAM TO CONCRETE END SHOE
4	QUAD-BEAM TO THRIE-BEAM RAIL
5	QUAD-BEAM TO W-BEAM RAIL

NOTE:
TRANSITION ASSEMBLIES FOR THE QUADGUARD ELITE M10 TO THRIE-BEAM OR W-BEAM FENCE REQUIRES I-BEAM POSTS:
10 (W6X9) I-BEAM POSTS.
POST 1 THRU 4 (84" LONG)
POST 5 THRU 10 (72" LONG)

NOTES:
CONTACT THE MANUFACTURER WITH SITE SPECIFIC DATA (SSD) FOR THE CORRECT BACKUP ASSEMBLY AND TRANSITION PANELS OR SIDE PANELS USED FOR STANDARD AND BI-DIRECTIONAL INSTALLATIONS: AT DIVIDED-HIGHWAY MEDIANS OR UNDIVIDED ROADWAYS WHERE THE SYSTEM IS EXPOSED TO IMPACTS FROM ONE OR TWO DIFFERENT DIRECTIONS OF TRAFFIC FLOW.

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE QUADGUARD ELITE M10 SYSTEM AND IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

GENERAL NOTES

- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY - ENERGY ABSORPTION INC. AT 1(888)323-6374.
- SEE THE RECENT QUADGUARD ELITE M10 PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITATIONS AND THE DRAWING PACKAGE FOR THE NARROW 24" SYSTEM BEFORE INSTALLING THE QUADGUARD ELITE M10 AT ANY GIVEN LOCATION.
- FOR BI-DIRECTIONAL TRAFFIC: THE LOCATION AND OR WIDTH OF THE QUADGUARD ELITE M10 IS RESTRICTED. AS BI-DIRECTIONAL TRAFFIC APPROACHES THE REAR OF THE QUADGUARD ELITE M10, THE QUADGUARD ELITE M10 SHOULD NOT EXTEND FURTHER INTO THE TRAFFIC-SIDE OF THE BARRIER THAN THE OBSTACLE. ANY TRANSITION INSTALLED MUST EITHER BE TANGENT TO BOTH QUADGUARD ELITE M10 AND OBSTACLE OR MUST ANGLE TOWARD FIELD SIDE OF THE BARRIER.
- SYSTEM TRANSITION: APPROPRIATE TRANSITION PANELS OR SIDE PANELS WILL BE REQUIRED FOR PROPER IMPACT PERFORMANCE. THE CORRECT PANEL(S) TO USE WILL DEPEND ON THE DIRECTION OF TRAFFIC FLOW AND WHAT TYPE OF BARRIER OR ROAD FEATURE THE QUADGUARD ELITE M10 SYSTEM IS SHIELDING. SEE THE QUADGUARD ELITE M10 PRODUCT DESCRIPTION & ASSEMBLY MANUAL FOR FURTHER DETAILS.
- COMPONENTS FOR THE QUADGUARD ELITE (M10) BACKUP AND REINFORCING DETAILS ARE SHOWN ON THE QUADGUARD ELITE M10 PRODUCT DESCRIPTION & ASSEMBLY MANUAL.
- CONCRETE PAD SHALL BE 6" MIN. REINFORCED 28MPa [4,000 PSI] (P.C.) OR 8" MIN. NON-REINFORCED 28MPa [4,000 PSI] CONCRETE ROADWAY MEASURING AT LEAST 12'-0" WIDE BY 50'-0" LONG. ANCHOR BLOCK IS NOT REQUIRED WHEN USING 8" CONCRETE PAD INSTALLED AGAINST AN IMMOVABLE STRUCTURE, E.G. CONCRETE WALL.
- IF THE CROSS-SLOPE VARIES MORE THAN 2% OVER THE LENGTH OF THE SYSTEM, THE CONCRETE PAD WILL REQUIRE LEVELING. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
- THE INSTALLATION AREA SHOULD BE FREE OF CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
- THE QUADGUARD ELITE M10 SYSTEM SHOULD BE INSTALLED APPROXIMATELY PARALLEL WITH THE BARRIER.
- FOR THE TENSION STRUT BACKUP THE DISTANCE BETWEEN THE BACK OF BACKUP AND THE BARRIER WALL SHOULD NOT EXCEED 7" IN ANY CASE.
- TXDOT HAS ONLY APPROVED THE 24" WIDE QUADGUARD ELITE M10 SYSTEM. THE QUADGUARD ELITE M10 PRODUCT DESCRIPTION AND ASSEMBLY MANUAL INCLUDES SYSTEM WIDTH OF 24". ONLY THE 24" SYSTEM IS ALLOWED TO BE INSTALLED ON TEXAS ROADWAYS.

**FOUNDATION & ANCHORING REQUIREMENTS
FOUNDATION TYPES: A, B, C, & D**

FOUNDATION TYPE: A	REINFORCED CONCRETE PAD OR ROADWAY
FOUNDATION:	6" MINIMUM DEPTH (P.C.C.)
ANCHORAGE:	7" STUDS EMBEDDED 5 1/2" - APPROVED ADHESIVE
FOUNDATION TYPE: B	ASPHALT OVER P.C.C.
FOUNDATION:	3" MIN. (A.C.) OVER 3" MIN. (P.C.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 1/2"
FOUNDATION TYPE: C	ASPHALT OVER SUBBASE
FOUNDATION:	6" MIN. (A.C.) OVER 6" MIN. (C.S.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 1/2" - APPROVED ADHESIVE
FOUNDATION TYPE: D	ASPHALT ONLY
FOUNDATION:	8" MIN. (A.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 1/2" - APPROVED ADHESIVE

KEY:
ASPHALT CONCRETE (A.C.)
COMPACTED SUBBASE (C.S.)
PORTLAND CEMENT CONCRETE (P.C.C.)

NOTE: SEE TRINITY'S PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR THE APPROVED ADHESIVE.

IF THE UNIT IS ANCHORED TO ASPHALTIC CONCRETE, IT SHOULD BE RELOCATED TO FRESH, UNDISTURBED ASPHALT AND RE-ANCHORED AFTER EACH IMPACT TO ENSURE ADEQUATE FUTURE PERFORMANCE.

TENSION STRUT BACKUP MAY BE USED IN CONSTRUCTION ZONES ON ASPHALT CONCRETE (A.C.) FOR TEMPORARY USE ONLY.

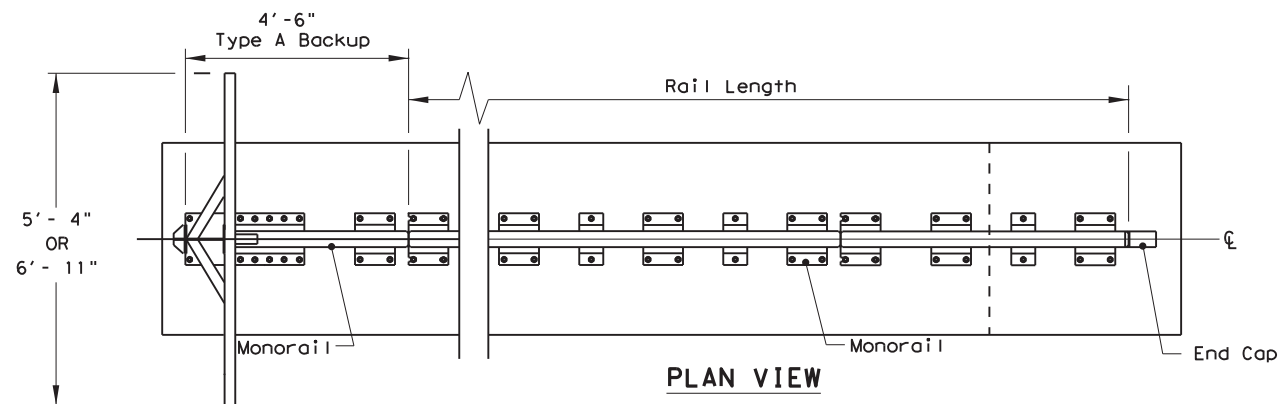
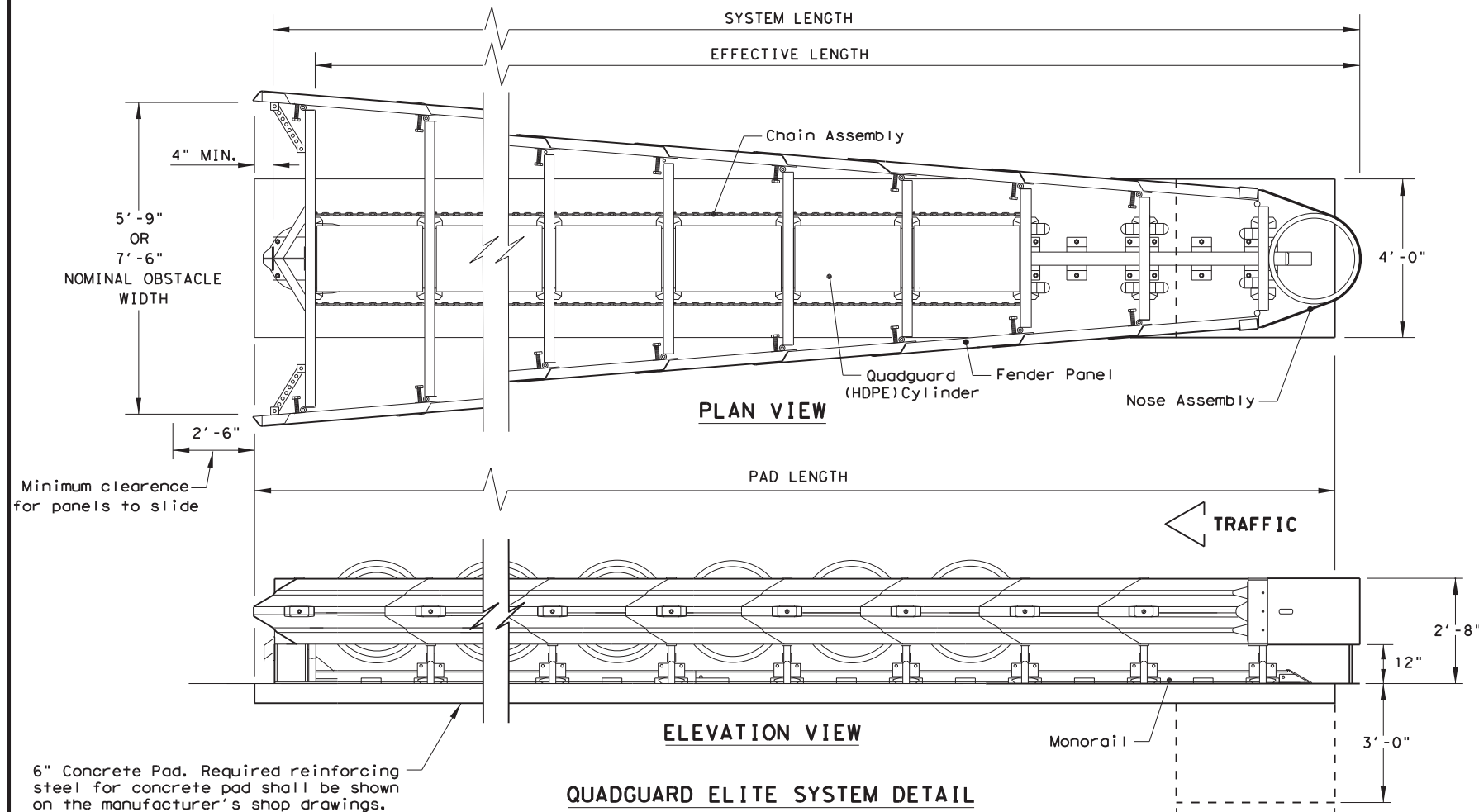
		Design Division Standard	
TRINITY HIGHWAY ENERGY ABSORPTION QUADGUARD ELITE M10 (MASH TL-3) QGUARD ELITE (M10) (N) -20			
FILE: qgel1tem10n20.dgn	DN: TXDOT	CK: KM	DW: VJP
© TXDOT: APRIL 2020	CONT: 6372	SECT: 50	JOB: OOI
REVISIONS	SAT		HIGHWAY: BEXAR
	SHEET NO. 120		

LOW MAINTENANCE

DATE:
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FILE:



MONORAIL ASSEMBLY DETAIL

(See the manufacturer's shop drawings for monorail hardware installation.)

QUADGUARD ELITE (WIDE) SYSTEM						
Test Level	NO. OF BAYS	SYSTEM LENGTH	UNIT EFFECTIVE LENGTH	PAD LENGTH	RAIL LENGTH	OBSTACLE WIDTH
TL-2	5	17'-11"	17'-3"	18'-0"	12'-0"	69" to 90"
TL-3	8	26'-7"	25'-11"	27'-1"	21'-0"	

SEE MANUFACTURER'S SHOP DRAWINGS FOR TYPE A BACKUP INFORMATION.

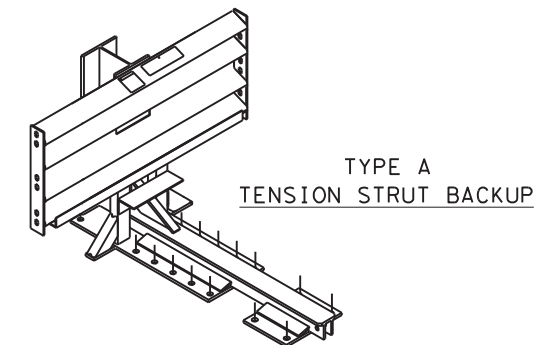
WITH FOUNDATION TYPE:	ANCHOR WITH:
Minimum 6" portland cement reinforced concrete pad or 8" non-reinforced concrete pad	Epoxy anchoring system with 7" studs and 5.5" embedment

ANCHORAGE REQUIREMENTS ARE AS FOLLOWS:

Concrete toe anchor block required, unless used on CRCP, Bridge Deck, or in front of concrete barrier.

GENERAL NOTES

- For specific information regarding installation and technical guidance of the system, contact: Trinity Highway - Energy Absorption at 1(888)323-6374, 70 W. Madison St. Suite 2350. Chicago, IL 60602
- After each impact, measurements should be taken of the shortest outside diameter of the last cylinder (closest to the backup). When this diameter is reduced from its original 32" to 26" or less, all the HDPE cylinders will need to be replaced, including the nose cylinder.
- For bi-directional traffic, appropriate transition panels will be required.
- Details of components for the QG(ELITE) and backups and reinforcing details will be shown on the manufacturer's shop drawings furnished to the Engineer.
- Concrete shall be class "S" with a minimum compressive strength of 4,000 p.s.i.
- If the cross-slope varies more than 2% over the length of the system, the concrete pad will require levelling. Maximum permissible cross-slope is 8%.
- The installation area should be free from curbs, elevated objects, or depressions.
- The QG(ELITE) system should be approximately parallel with the barrier or ϕ of merging barriers.
- Unit width selected should be adequate to protect an errant vehicle travelling at 15 degrees to the roadway from the face or corner of the fixed object.



TENSION STRUT:
Consists of diagonal struts, connections, and accessories, as detailed by the manufacturer, located at the rear of the QG(ELITE) unit.

Typical application:
QG(ELITE) units attached to [Double-Face Guard-Rail.] When used a 4'-0" x 4'-0" x 3'-0" concrete toe anchor block shall be provided beneath the front portion of the concrete pad, except where the QG(ELITE) unit is to be placed on continuously reinforced concrete pavement or bridge deck (7" minimum, 4,000 psi) or non-reinforced concrete pavement (8" minimum, 4,000 psi)

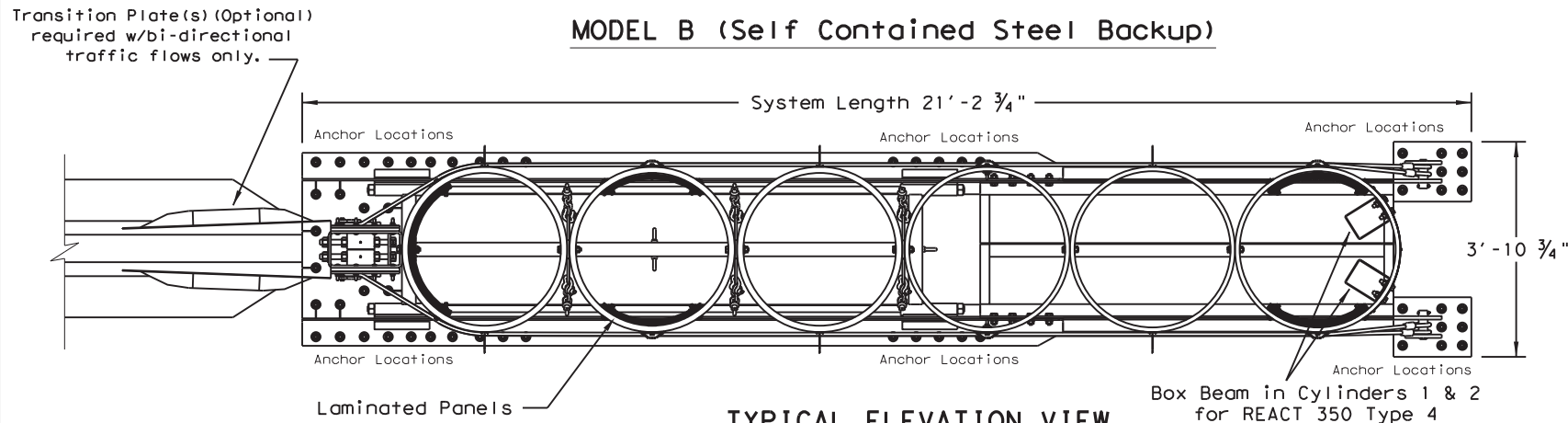
LOW MAINTENANCE

				Design Division Standard	
TRINITY HIGHWAY ENERGY ABSORPTION (QUADGUARD ELITE) (WIDE) QGELITE (W) - 19					
FILE: qgelite19.dgn	DN: TxDOT	CK: KM	DW: VP	CK:	
© TxDOT: JULY 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	6372	50	001	VAR.	
REVISED 05, 2013 (VP)	DIST	COUNTY	SHEET NO.		
REVISED 03, 2016 (VP)	SAT	BEXAR	121		
REVISED 03, 2017 (KM)					
REVISED 05, 2019 (KM)					

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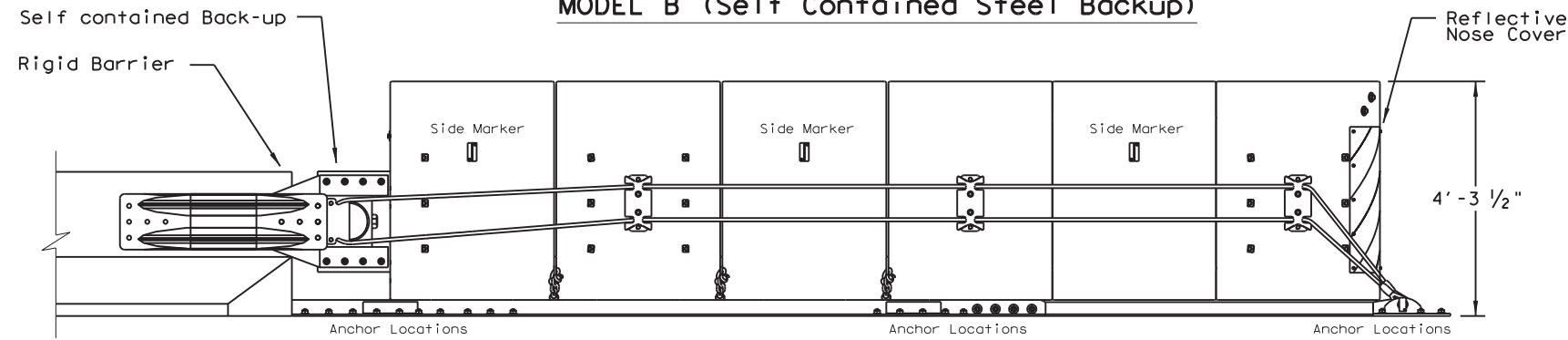
TYPICAL PLAN VIEW

MODEL B (Self Contained Steel Backup)



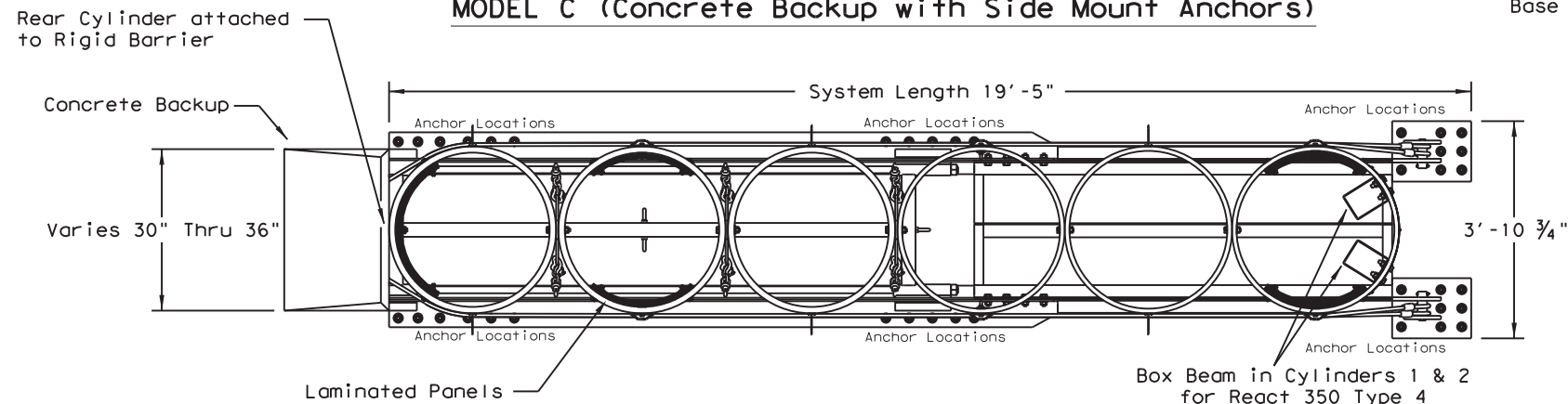
TYPICAL ELEVATION VIEW

MODEL B (Self Contained Steel Backup)



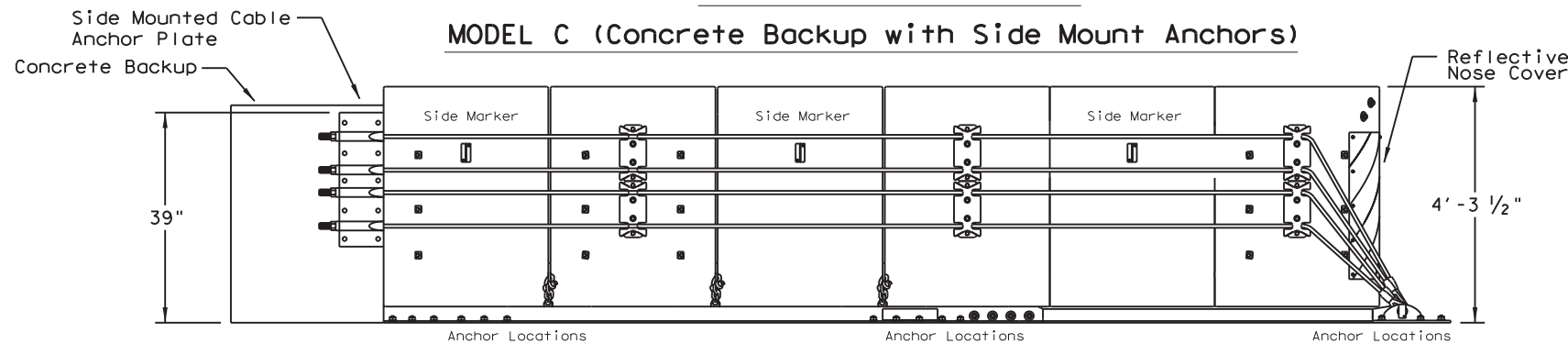
TYPICAL PLAN VIEW

MODEL C (Concrete Backup with Side Mount Anchors)



TYPICAL ELEVATION VIEW

MODEL C (Concrete Backup with Side Mount Anchors)

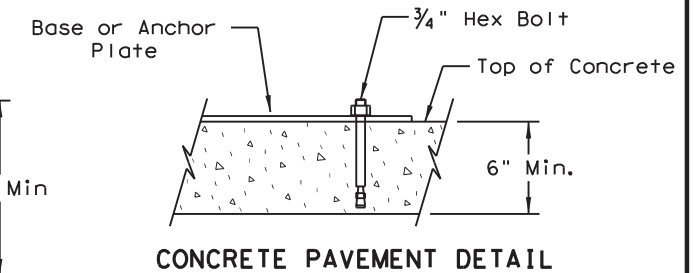
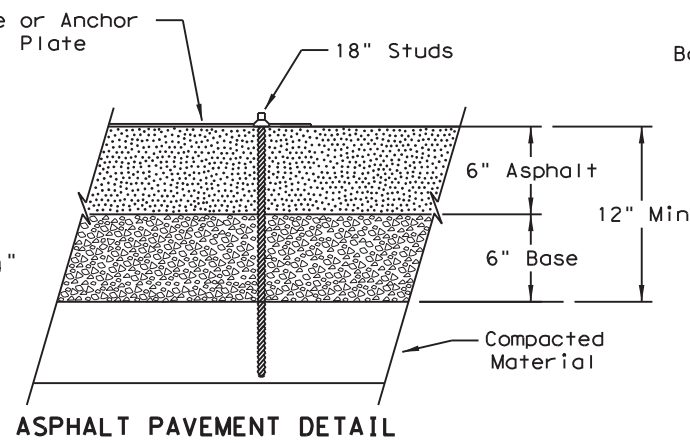


GENERAL NOTES

1. For specific information regarding installation and technical guidance of the system, contact: Trinity Highway - Energy Absorption at 1(888)323-6374, 70 W. Madison St. Suite 2350, Chicago, IL 60602
2. The nose of the REACT 350 shall be clad with a plastic wrap with standard delineation adhered to the wrap and shall have a series of side marker reflectors on both sides of the unit. See site plan views for marker and plastic wrap color orientation.
3. All steel components to be hot dipped galvanized except stakes, drive spikes, threaded bolts in backup unit, and wedge fittings on cables.
4. The installation area should be free from curbs, elevated objects, or depressions. If the REACT system is to span expansion joints contact the manufacturer.
5. The REACT system should be approximately parallel with the barrier or ϕ of merging barriers. The maximum permissible cross-slope is 8%.
6. REACT 350 II has laminated panels in cylinders 1, 5, & 6.

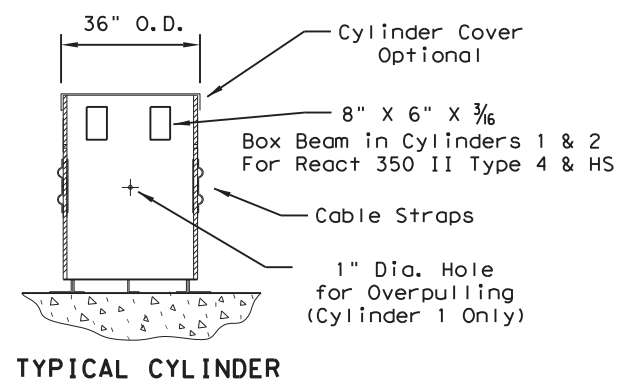
TYPE	REACT 350 4-B	REACT 350 4-C	REACT 350 II 6-B	REACT 350 II 6-C
Test Level	TL-2	TL-2	TL-3	TL-3
OVERALL LENGTH	15'-3"	13'-9"	21'-3"	19'-5"

	FOUNDATION TYPE	MINIMUM THICKNESS	ANCHORAGE
A	CONCRETE PAD OR ROADWAY	6"	MP-3 WITH 7" STUDS [5.5" EMBEDMENT]
B	ASPHALT OVER CONCRETE PAVEMENT	6" CONCRETE PAVEMENT	ANCHOR LENGTH REQUIRED IS 7" STUD PLUS ASPHALT THICKNESS
C	ASPHALT OVER BASE	6" ACP + 6" BASE	MP-3 WITH 18" STUDS [16.5" EMBEDMENT]
D	ASPHALT ONLY	8"	MP-3 WITH 18" STUDS [16.5" EMBEDMENT]



ASPHALT PAVEMENT DETAIL

CONCRETE PAVEMENT DETAIL



TYPICAL CYLINDER

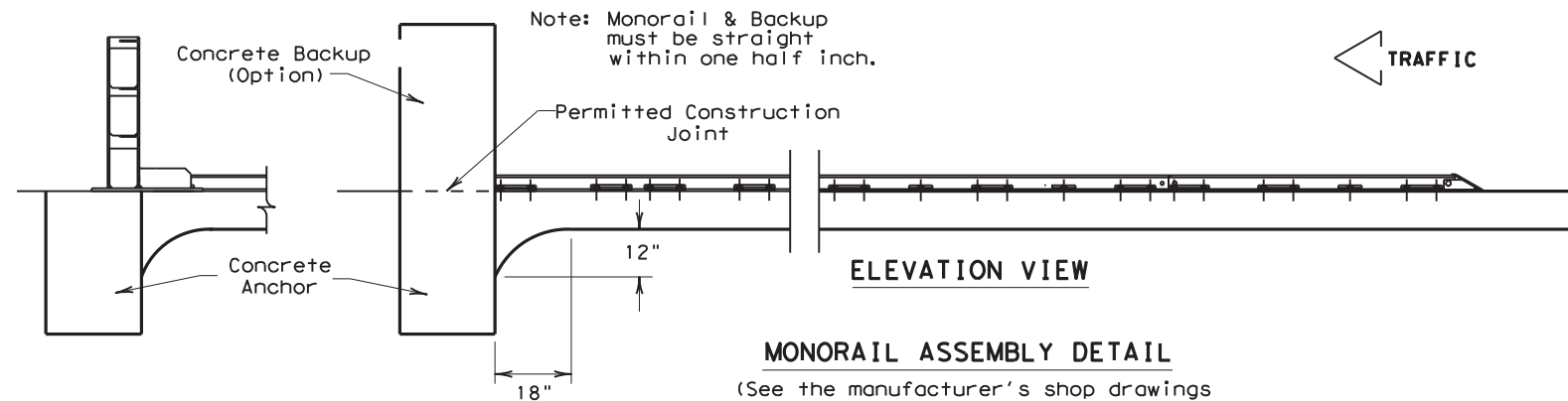
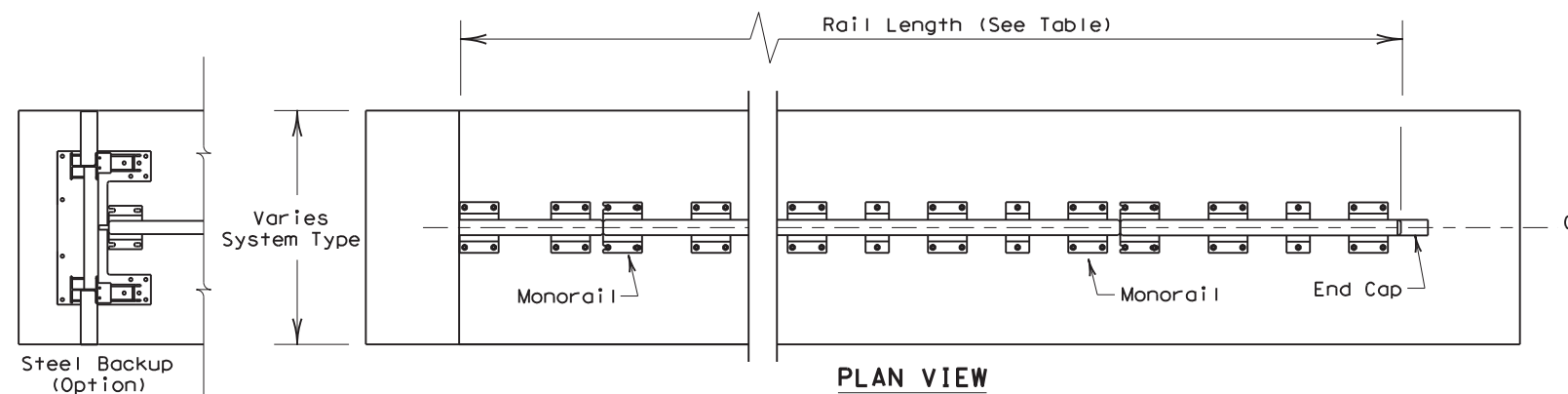
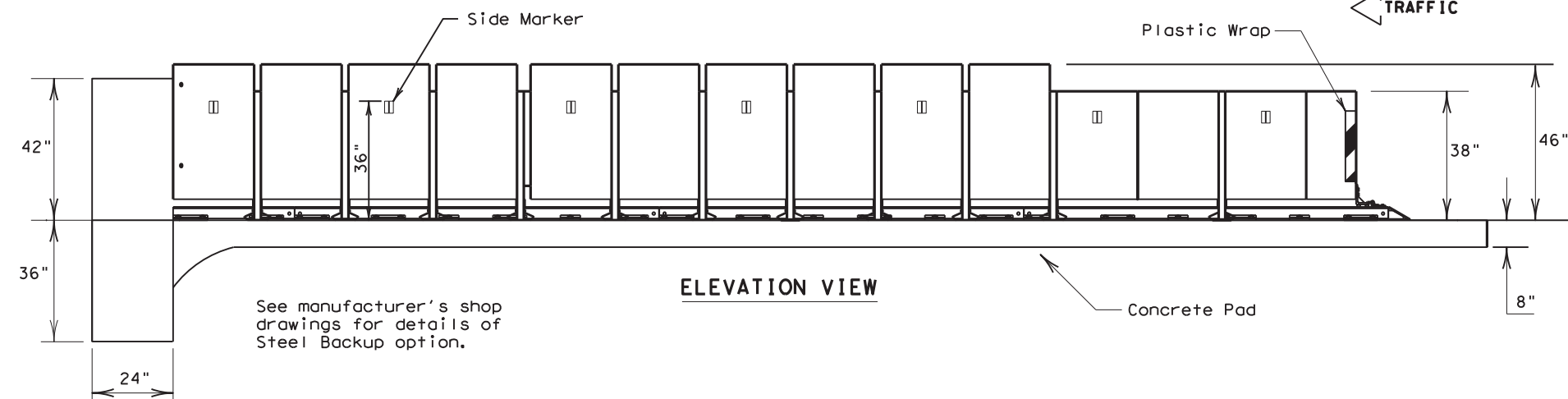
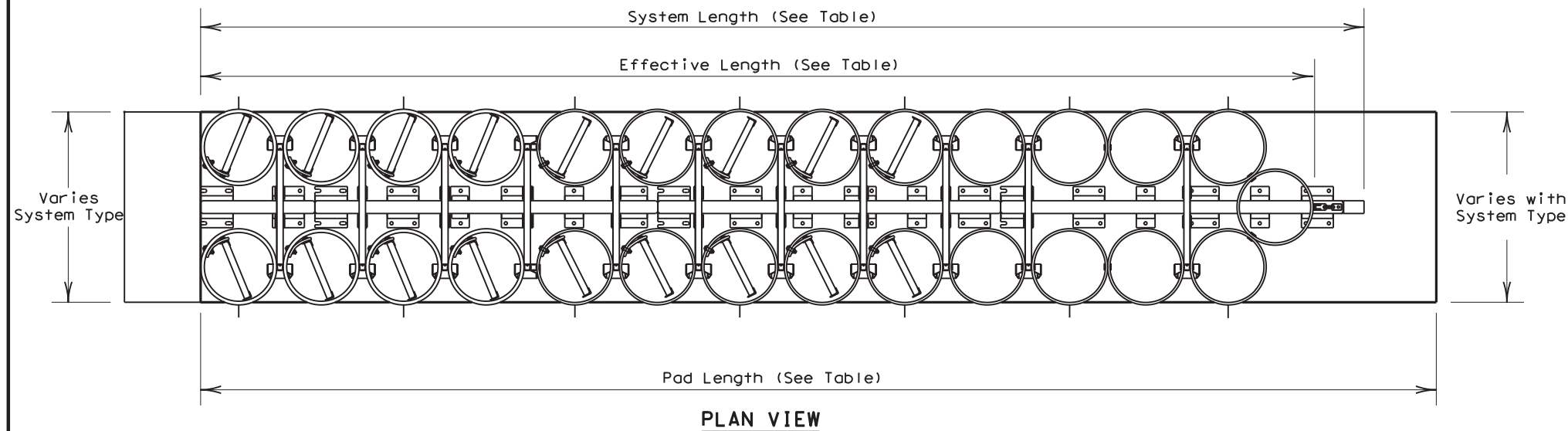
LOW MAINTENANCE

		Design Division Standard	
TRINITY HIGHWAY ENERGY ABSORPTION (REACT 350 NARROW) (REACT 350 II NARROW) REACT (N) - 16			
FILE: reactn16.dgn	DN: TxDOT	CK: KM	DW: VP
© TxDOT February 1998	CONT	SECT	JOB
REVISIONS	6372	50	OO1
REVISD 06, 2013 (VP)	DIST	COUNTY	SHEET NO.
REVISD 03, 2016 (VP)	SAT	BEXAR	122

DATE: FILE:

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MONORAIL ASSEMBLY DETAIL
(See the manufacturer's shop drawings for monorail hardware installation.)

GENERAL NOTES

1. For specific information regarding installation and technical guidance of the system, contact: Trinity Highway - Energy Absorption at 1(888)323-6374, 70 W. Madison St. Suite 2350, Chicago, IL 60602
2. The nose of the REACT 350 shall be clad with a plastic wrap with standard delineation adhered to the wrap and shall have a series of side marker reflectors on both sides of the unit. See site plan views for marker and plastic wrap color orientation.
3. For bi-directional traffic, appropriate transition details will be as shown on the manufacturer's shop drawings.
4. Details of components for the REACT(W) and backups and reinforcing details will be shown on the manufacturer's shop drawings furnished to the Engineer.
5. If the cross-slope varies more than 2% over the length of the system, the concrete pad will require leveling. Maximum permissible cross-slope is 8%.
6. The installation area should be free from curbs, elevated objects, or depressions.
7. The REACT(W) system should be approximately parallel with the barrier or centerline of merging barriers.
8. All steel components to be hot dipped galvanized except stakes, drive spikes, threaded bolts in backup unit, and wedge fittings on cables.

WIDE REACT SYSTEMS

SYSTEM TYPE	BACKUP WIDTH	TEST LEVEL	SYSTEM LENGTH	EFFECTIVE LENGTH	PAD LENGTH
W60	60"	TL-2	18'-10"	16'-3"	19'-6"
		TL-3	30'-10"	29'-3"	32'-6"
W96	96"	TL-2	18'-10"	17'-6"	19'-7"
		TL-3	34'-9"	32'-10"	35'-6"
W120	120"	TL-3	33'-10"	32'-2"	35'-6"

(See the manufacturer's shop drawings for additional details.)

ANCHOR SYSTEM TYPE

MP-3® polyester anchoring system with 7.5" studs, 5.5" embedment

FOUNDATION TYPES

Minimum 8" Reinforced concrete pad (Required reinforcing steel for concrete pad shall be shown on the manufacturer's shop drawings.)

Minimum 8" Non-reinforced concrete roadway (Measuring at least 12' wide by 50' long)

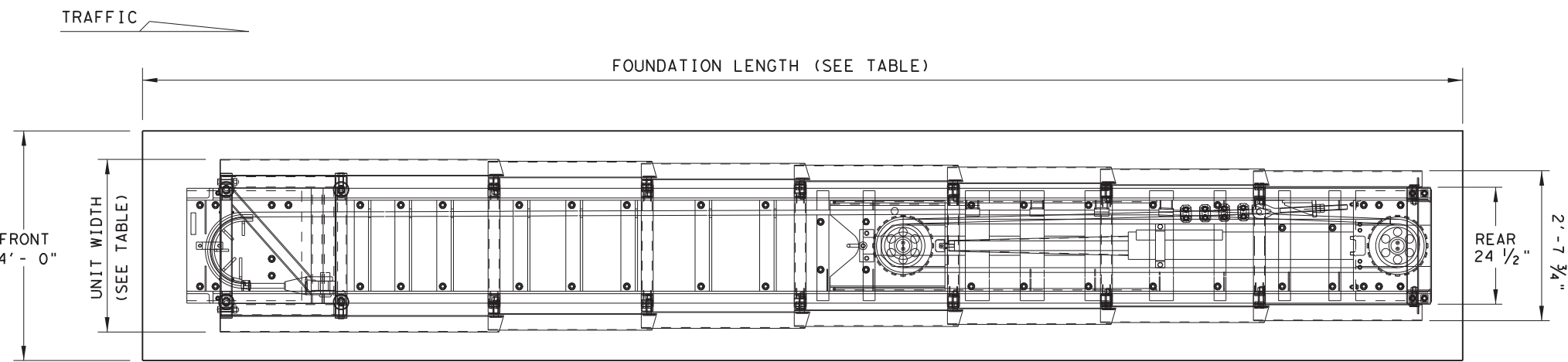
Minimum 7" Concrete deck structure, or Minimum 6" Reinforced concrete roadway

		Design Division Standard	
TRINITY HIGHWAY ENERGY ABSORPTION CRASH CUSHION (REACT 350 WIDE) REACT (W) - 16			
FILE: reactw16.dgn	DN: TxDOT	CK: KM	DW: VP
©TxDOT: October 2001	CONT	SECT	JOB
REVISIONS	6372	50	OOI
REVISED 03, 2016 (VP)	DIST	COUNTY	SHEET NO.
	SAT	BEXAR	123

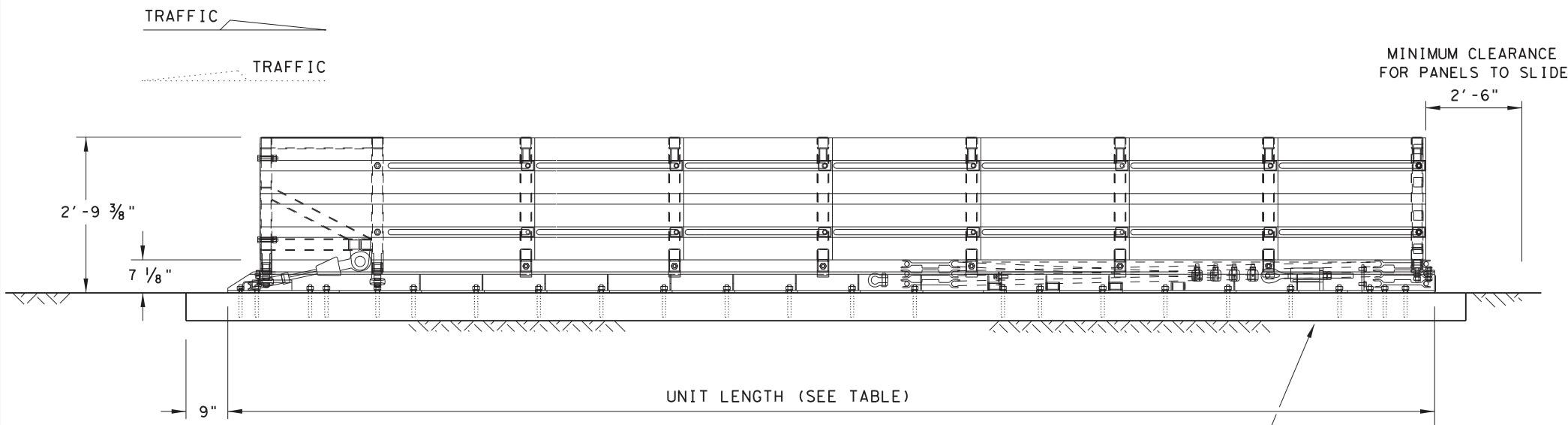
LOW MAINTENANCE

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PLAN VIEW



ELEVATION VIEW

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: WORK AREA PROTECTION, CORP. AT (800) 327-4417, OR (630) 377-9100.
2. FOR BI-DIRECTIONAL TRAFFIC, APPROPRIATE TRANSITION PANELS WILL BE REQUIRED.
3. ADDITIONAL DETAILS FOR THE TRANSITION OPTION AND FOUNDATION OPTION WILL BE SHOWN ON THE MANUFACTURER'S SHOP DRAWINGS FURNISHED TO THE ENGINEER.
4. CONCRETE SHALL BE CLASS "S" WITH A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI.
5. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
6. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
7. THE SCI100GM & SCI70GM SYSTEMS SHOULD BE APPROXIMATELY PARALLEL WITH THE BARRIER OR CENTERLINE OF MERGING BARRIERS.

NOTE:
FOR ATTACHMENT AND TRANSITIONS TO OTHER SHAPES, BARRIERS, RAILINGS AND BI-DIRECTIONAL TRAFFIC FLOWS ARE AVAILABLE. (SEE MANUFACTURER'S PRODUCT MANUAL)

NOTE:
SIDE PANELS CAN TRAVEL 30" BEYOND THE LAST TERMINAL BRACE AT THE REAR OF THE CUSHION. ALL OBJECTS THAT MAY INTERFERE WITH THIS MOTION CAN AFFECT PERFORMANCE OF AND MAY CAUSE UNDUE DAMAGE TO THE CRASH CUSHION.

MODEL	TEST LEVEL	UNIT LENGTH (approx.)	UNIT WIDTH	FOUNDATION LENGTH	OBSTACLE WIDTH
SCI70GM	TL-2	13'-6"	2'-10 5/8"	15'- 6 1/4"	24" to 36"
SCI100GM	TL-3	21'-6"	3'-1 1/2"	23'- 0"	24" to 36"

SYSTEM AND PAD LENGTHS VARY DEPENDING ON BACKUP TYPE.

FOUNDATION OPTIONS
6" REINFORCED CONCRETE (5 1/2" ANCHOR EMBEDMENT)
8" UNREINFORCED CONCRETE (5 1/2" ANCHOR EMBEDMENT)
3" MIN. ASPHALT OVER 3" MIN. CONCRETE (16 1/2" ANCHOR EMBED.)
6" ASPHALT OVER 6" COMPACT SUBBASE (16 1/2" ANCHOR EMBED.)
8" MINIMUM ASPHALT (16 1/2" ANCHOR EMBEDMENT)

FOR STEEL PLACEMENT IN CONCRETE FOUNDATIONS, SEE MANUFACTURER'S PRODUCT MANUAL.

TRANSITION OPTIONS
CONCRETE VERTICAL WALL
CONCRETE TRAFFIC BARRIERS
GUARDRAIL (W-BEAM)
GUARDRAIL (THRIE-BEAM)

TRANSITION TYPES ARE SHOWN ELSEWHERE ON THE PLANS (I.E. ATTENUATOR LOCATION DETAILS OR IN THE GENERAL NOTES).

FOR BI-DIRECTIONAL TRANSITION PANEL AND END SHOE DETAILS, SEE MANUFACTURER'S PRODUCT MANUAL.



**WORK AREA PROTECTION
CORP
(SMART-NARROW)**

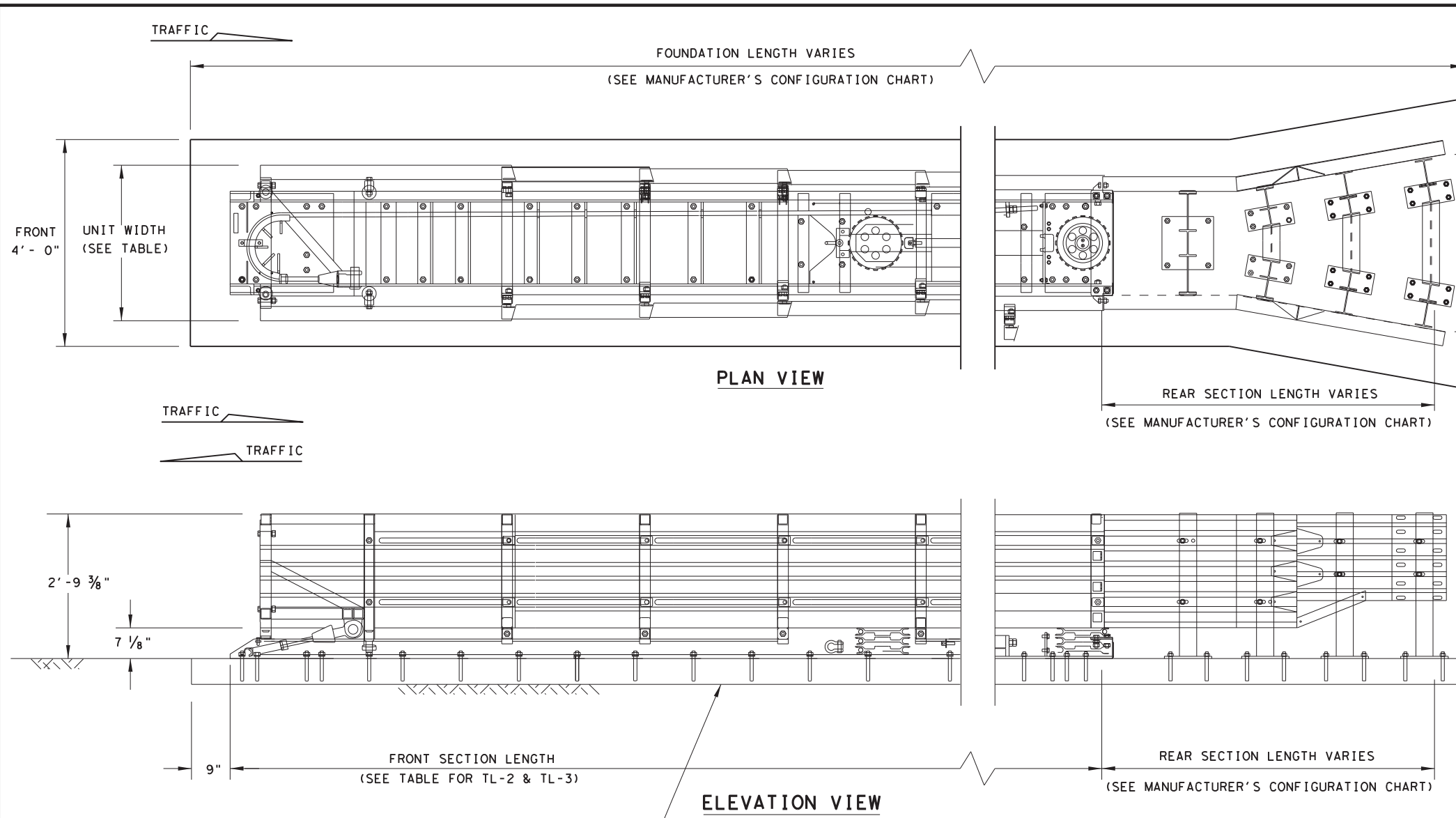
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REVISED 06, 2013 (VP)	DIST	COUNTY	SHEET NO.	
REVISED 03, 2016 (VP)	SAT	BEXAR	124	

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GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: WORK AREA PROTECTION, CORP. AT (800) 327-4417, OR (630) 377-9100.
2. FOR BI-DIRECTIONAL TRAFFIC, APPROPRIATE TRANSITION PANELS WILL BE REQUIRED.
3. ADDITIONAL DETAILS FOR THE TRANSITION OPTIONS AND FOUNDATION OPTIONS WILL BE SHOWN ON THE MANUFACTURER'S SHOP DRAWINGS FURNISHED TO THE ENGINEER.
4. CONCRETE SHALL BE CLASS "S" WITH A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI.
5. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
6. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
7. THE SCI100GM & SC170GM SYSTEMS SHOULD BE APPROXIMATELY PARALLEL WITH THE BARRIER OR $\frac{1}{2}$ OF MERGING BARRIERS.

NOTE: FOR ATTACHMENT AND TRANSITIONS TO OTHER SHAPES, BARRIERS RAILINGS AND BI-DIRECTIONAL TRAFFIC FLOWS ARE AVAILABLE. (SEE MANUFACTURER'S PRODUCT MANUAL)

NOTE: SIDE PANELS CAN TRAVEL 30" BEYOND THE LAST TERMINAL BRACE AT THE REAR OF THE CUSHION. ALL OBJECTS THAT MAY INTERFERE WITH THIS MOTION CAN AFFECT PERFORMANCE OF AND MAY CAUSE UNDUE DAMAGE TO THE CRASH CUSHION.

WIDE TRANSITION LENGTHS		
GORE WIDTH	TL-2 OVERALL SYSTEM LENGTH	TL-3 OVERALL SYSTEM LENGTH
41"	20'-1"	28'-1"
48"	21'-10"	29'-10"
55"	23'-5"	31'-5"
60"	24'-7"	32'-7"
68"	26'-6"	34'-6"
69"	26'-8"	34'-8"
81"	29'-7"	37'-7"
88"	31'-2"	39'-2"
94"	32'-7"	40'-7"
100"	34'-1"	42'-1"
107"	35'-8"	43'-8"
112"	36'-11"	44'-11"
120"	38'-10"	46'-10"
126"	40'-2"	48'-2"
133"	41'-11"	49'-11"

6" REINFORCED PAD SHOWN (SEE FOUNDATION OPTIONS)

FOUNDATION OPTIONS
6" Reinforced Concrete (5 1/2" Anchor Embedment)
8" Unreinforced Concrete (5 1/2" Anchor Embedment)
3" Min. Asphalt over 3" Min. Concrete (16 1/2" Anchor Embed.)
6" Asphalt over 6" Compact Subbase (16 1/2" Anchor Embed.)
8" Minimum Asphalt (16 1/2" Anchor Embedment)

FOR STEEL PLACEMENT IN CONCRETE FOUNDATIONS, SEE MANUFACTURER'S PRODUCT MANUAL.

TRANSITION OPTIONS
Concrete Vertical Wall
Concrete Traffic Barriers
Guardrail (W-Beam)
Guardrail (Thrie-Beam)

TRANSITION TYPES ARE SHOWN ELSEWHERE ON THE PLANS (I.E. ATTENUATOR LOCATION DETAILS OR IN THE GENERAL NOTES).

FOR BI-DIRECTIONAL TRANSITION PANEL AND END SHOE DETAILS, SEE MANUFACTURER'S PRODUCT MANUAL.

MODEL (WIDE)	TEST LEVEL	FRONT SECTION LENGTH	UNIT WIDTH	FOUNDATION LENGTH	GORE WIDTH
SC170GM	TL-2	13'-6"	2'-10 5/8"	OVERALL LENGTH PLUS 1'-6"	41" TO 133"
SC1100GM	TL-3	21'-6"	3'-1 1/2"	OVERALL LENGTH PLUS 1'-6"	41" TO 133"

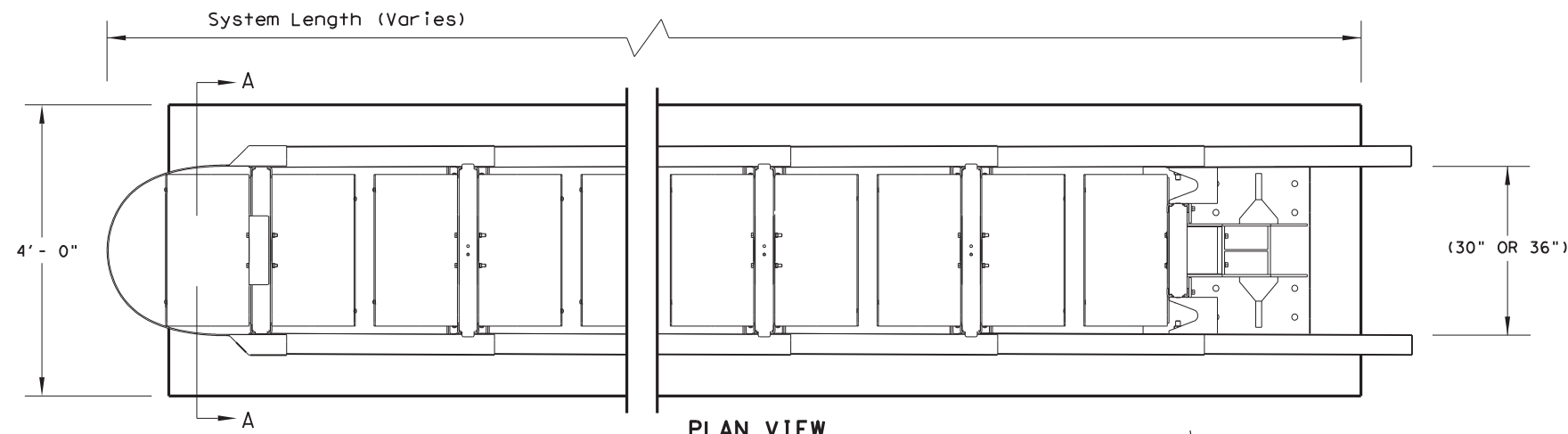
SYSTEM AND PAD LENGTHS VARY DEPENDING ON BACKUP TYPE.

LOW MAINTENANCE

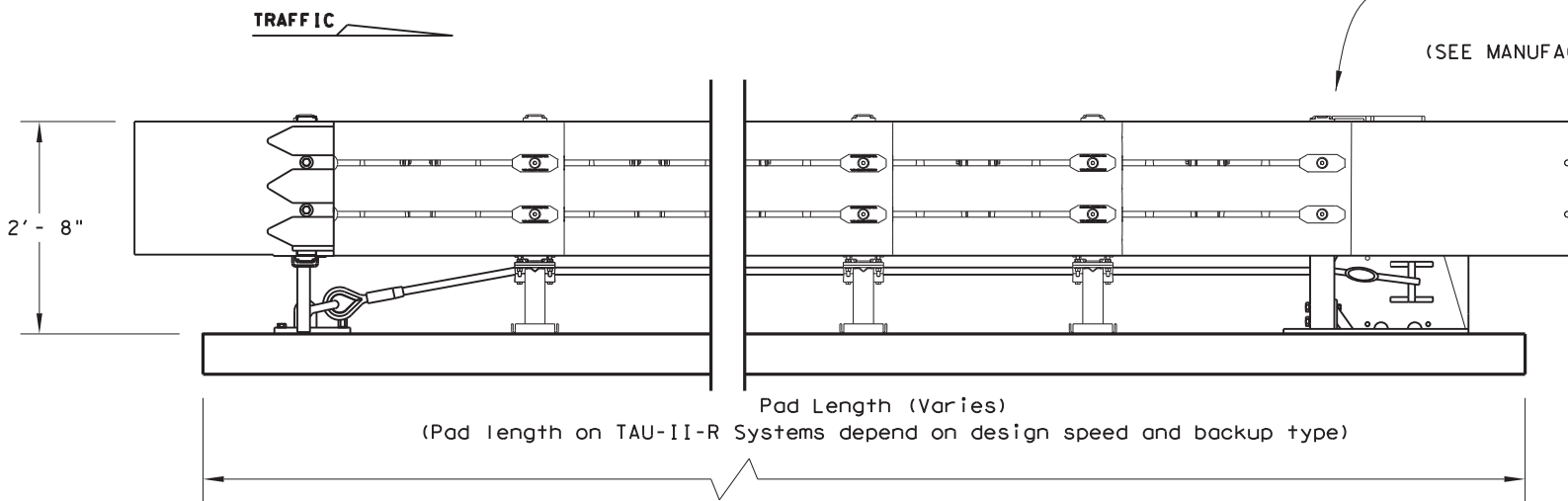
				Design Division Standard	
WORK AREA PROTECTION CORP (SMART-WIDE)					
SMTC (W) - 16					
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REVISED 03, 2016 VP					
REVISED 04, 2018 VP					
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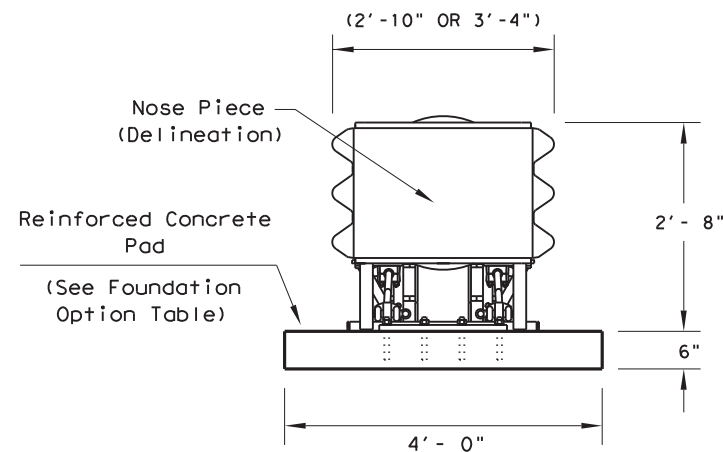
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PLAN VIEW



ELEVATION VIEW



SECTION A-A

Nose Piece delineation orientation, is shown elsewhere on the plans.

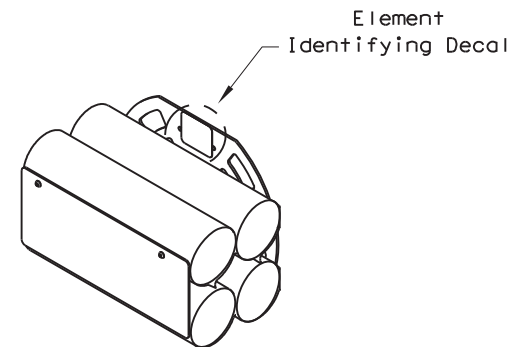
TRANSITION OPTIONS
Vertical Wall
Concrete Traffic Barriers
W-Beam Guardrail
Thrie Beam Guardrail

For bi-directional transition panel and end shoe details. (See manufacturer's product manual.)

FOUNDATION OPTIONS
6" Reinforced Concrete
8" Unreinforced Concrete
Asphalt over Concrete with Minimum 6" Embedment in Concrete
6" Asphalt over 6" Compact Subbase
8" Minimum Asphalt

For steel placement in concrete foundations. (See manufacturer's product manual)

Attachments and transitions to various barrier shapes, barrier railings and bi-directional traffic flows are available. (SEE MANUFACTURER'S PRODUCT MANUAL)



ENERGY ABSORBING ELEMENTS (EAE)

BACKUP SUPPORT OPTIONS
Compact (Stand Alone)
Flush Mount
PCB (Concrete Barrier)

TAU-II-R (NARROW) SYSTEM LENGTHS			
BACKSTOP	TL-2	TL-3	70 mph
PCB	13'-7"	27'-10"	30'-7"
Flush Mount	14'-0"	28'-3"	31'-0"
Compact	15'-3"	29'-6"	32'-3"

Backup and Transition types are shown elsewhere on the plans, (i.e. Attenuator location details or in the general notes).

Note: System lengths are ± 2"

GENERAL NOTES

- For specific information regarding installation and technical guidance of the system, contact: Lindsay Transportation Solutions - Barrier Systems, Inc. at (707) 374-6800. 180 River Road, Rio Vista, CA 94571
- For bi-directional traffic, appropriate transition panels will be required.
- Additional details for the backup support option, transition options and foundation option will be shown on the manufacturer's shop drawings furnished to the Engineer.
- Concrete shall be class "S" with a minimum compressive strength of 4,000 psi.
- Maximum permissible cross-slope is 8%.
- The installation area should be free from curbs, elevated objects, or depressions.
- The TAU-II-R system should be approximately parallel with the barrier or center of merging barriers.
- Refer to Universal TAU-II-R configuration chart for specific systems configuration number and location of each type of energy absorbing element.
- 30-inch (30") model shown, also available in 36-inch (36") configuration.

BILL OF MATERIAL

PRODUCT CODE	QTY	DESCRIPTION
B030704	1	Front Support
B030703	TBD	Mid Support
TBD	1	Backstop Assembly (See Table)
TBD	1	Front Cable Anchor
TBD	1	Nose Assembly
B010202	TBD	Sliding Panel
B010659	2	End Panel
K001003	1	Slider Assembly Kit
BSI-1202006-KT	TBD	TAU-II-R Slider Kit
BSI-1107131-KT	TBD	TAU-II-R EAE Mounting Hw Kit
BSI-1012069-00	TBD	Energy Absorbing Element, Type 1
BSI-1012070-00	TBD	Energy Absorbing Element, Type 2
BSI-1012071-00	TBD	Energy Absorbing Element, Type 3
BSI-1110009-00	TBD	Energy Absorbing Element, Type 3N
TBD	TBD	Cable Assembly
K001004	TBD	Cable Guide Kit
K001005	2	Front Support Leg Kit
B010651	4	Pipe Panel Mount
TBD	1	Anchoring Package

(TBD) = To Be Determined, depending on Backup Type and System Length.

(See manufacturer's product manual for details)



LTS-BARRIER SYSTEMS
CRASH CUSHION
(R-NARROW)

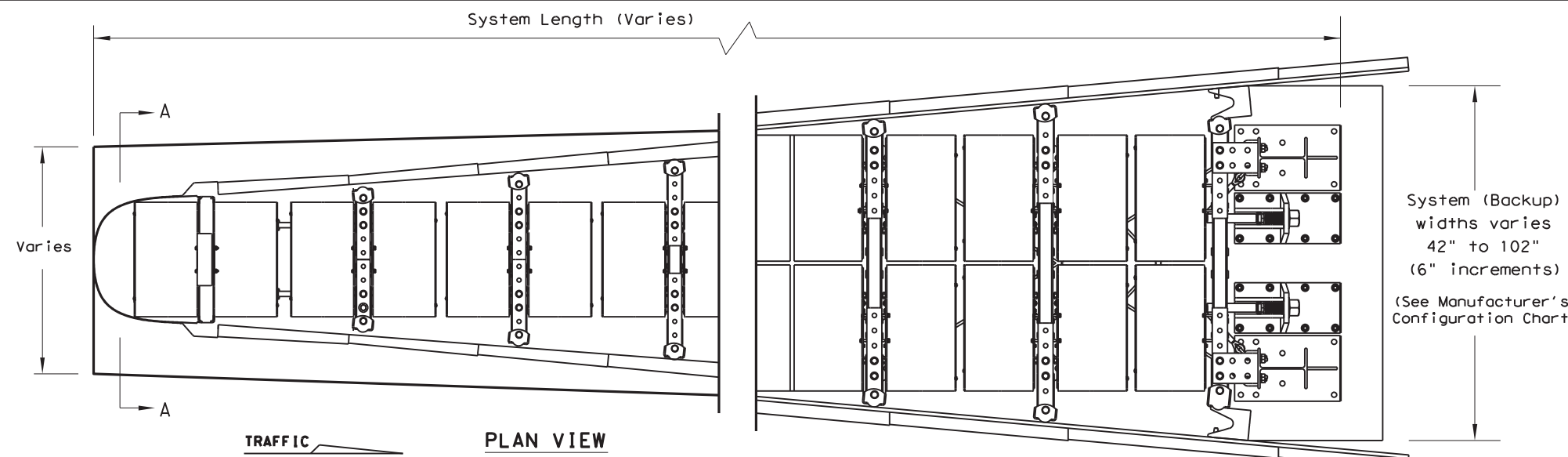
TAU-II-R(N)-16

LOW MAINTENANCE

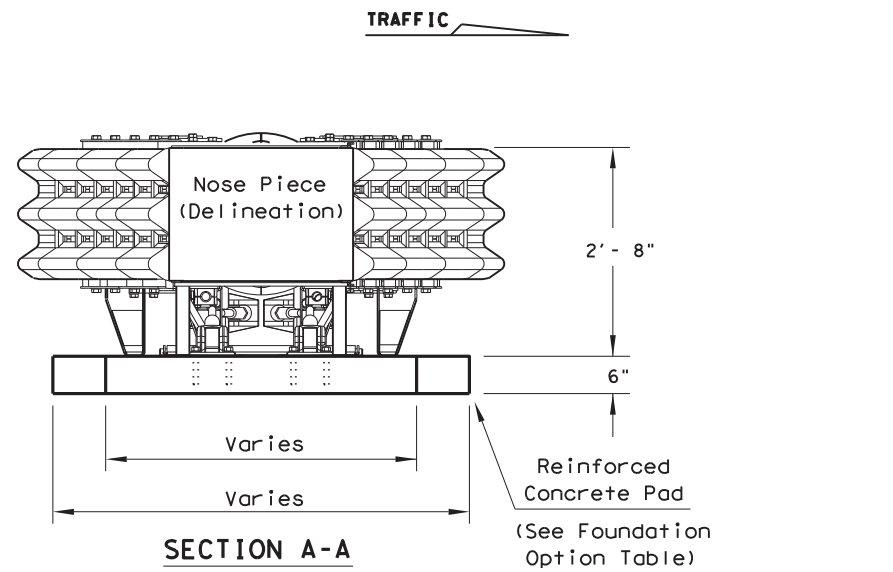
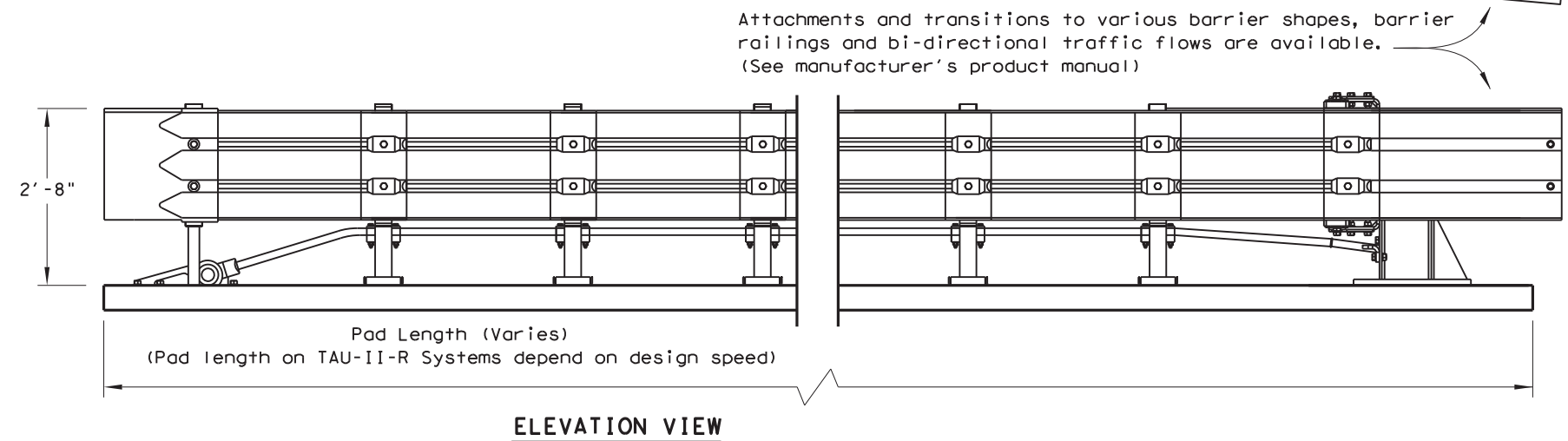
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©TxDOT: January 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
REVISED 06, 2013 (VP)	DIST	COUNTY	SHEET NO.	
REVISED 03, 2016 (VP)	SAT	BEXAR	126	

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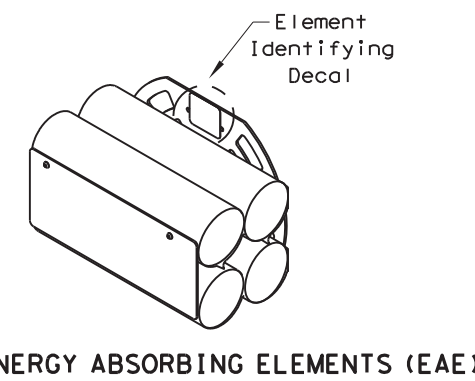


- ### GENERAL NOTES
- For specific information regarding installation and technical guidance of the system, contact: Lindsay Transportation Solutions - Barrier Systems, Inc. at (707) 374-6800, 180 River Road, Rio Vista, CA 94571
 - For bi-directional traffic, appropriate transition panels will be required.
 - Additional details for the backup support option, transition option and foundation option will be shown on the manufacturer's shop drawings furnished to the Engineer.
 - Concrete shall be class "S" with a minimum compressive strength of 4,000 psi
 - Maximum permissible cross-slope is 8%.
 - The installation area should be free from curbs, elevated objects, or ground depressions.
 - The TAU-II-R system should be installed approximately parallel with the barrier or center of merging barriers.
 - Refer to Universal TAU-II-R configuration chart for system configuration numbers and location of each type of energy absorbing element.



TAU-II-R (WIDE) SYSTEM LENGTHS			
SYSTEM WIDTH	TL-2	TL-3	70 mph
42"	15'-4"	29'-5"	32'-3"
48"	15'-4"	29'-5"	32'-3"
54"	15'-4"	29'-5"	32'-3"
60"	12'-5"	29'-5"	32'-3"
66"	12'-5"	26'-7"	29'-5"
72"	12'-5"	26'-7"	26'-7"
78"	12'-5"	26'-7"	26'-7"
84"	12'-5"	26'-7"	26'-7"
90"	12'-5"	26'-7"	26'-7"
96"	12'-5"	26'-7"	26'-7"
102"			26'-7"

Note: System Lengths are +/-2"



BILL OF MATERIAL		
PRODUCT CODE	QTY	DESCRIPTION
B030704	1	Front Support
B030703	TBD	Mid Support
TBD	TBD	XL Bulkhead
TBD	TBD	XXL Bulkhead
TBD	TBD	XXXL Bulkhead
TBD	1	Backstop Assembly (See Table)
TBD	2	Front Cable Anchor
TBD	1	Nose Assembly
B010202	TBD	Sliding Panel
B010659	2	End Panel
K001003	1	Slider Assembly Kit
BSI-1202006-KT	TBD	TAU-II-R Slider Kit
BSI-1107131-KT	TBD	TAU-II-R EAE Mounting Hw Kit
BSI-1012069-00	TBD	Energy Absorbing Element, Type 1
BSI-1012070-00	TBD	Energy Absorbing Element, Type 2
BSI-1012071-00	TBD	Energy Absorbing Element, Type 3
BSI-1109042-00	TBD	Energy Absorbing Element, Type 1S
BSI-1107116-00	TBD	Energy Absorbing Element, Type 2S
BSI-1110009-00	TBD	Energy Absorbing Element, Type 3N
TBD	TBD	Cable Assembly
K001031	TBD	Lateral Support Kit
K001004	TBD	Cable Guide Kit
K001005	2	Front Support Leg Kit
TBD	1	Anchoring Package

(TBD) = To Be Determined, depending on Backup Type and System Length.
 (See manufacturer's product manual for details)

Nose Piece delineation orientation, is shown elsewhere on the plans.

BACKUP SUPPORT OPTIONS
Wide Flange (Stand alone)

Backup and Transition types are shown elsewhere on the plans, (i.e. Attenuator location details or in the general notes).

FOUNDATION OPTIONS
6" Reinforced Concrete
8" Unreinforced Concrete
Asphalt over Concrete with Minimum 6" Embedment in Concrete

For steel placement in concrete foundations. (See manufacturer's product manual)

TRANSITION OPTIONS
Vertical Wall
Concrete Traffic Barriers
W-Beam Guardrail
Thrie Beam Guardrail

For bi-directional transition panel and end shoe details. (See manufacturer's product manual)

LOW MAINTENANCE

Design Division Standard

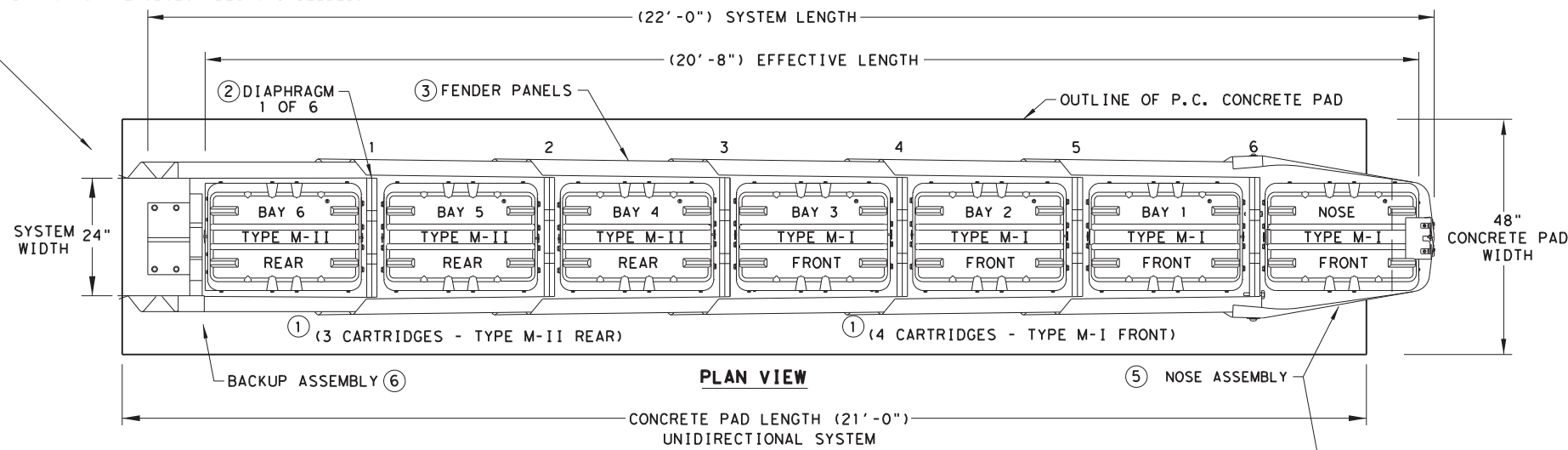
LTS-BARRIER SYSTEMS CRASH CUSHION (R-WIDE) TAU-II-R(W)-16

FILE: tau11rw16.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL
©TxDOT: January 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
REVISED 06, 2013 (VP)	DIST	COUNTY	SHEET NO.	
REVISED 02, 2016 (VP)	SAT	BEXAR	127	

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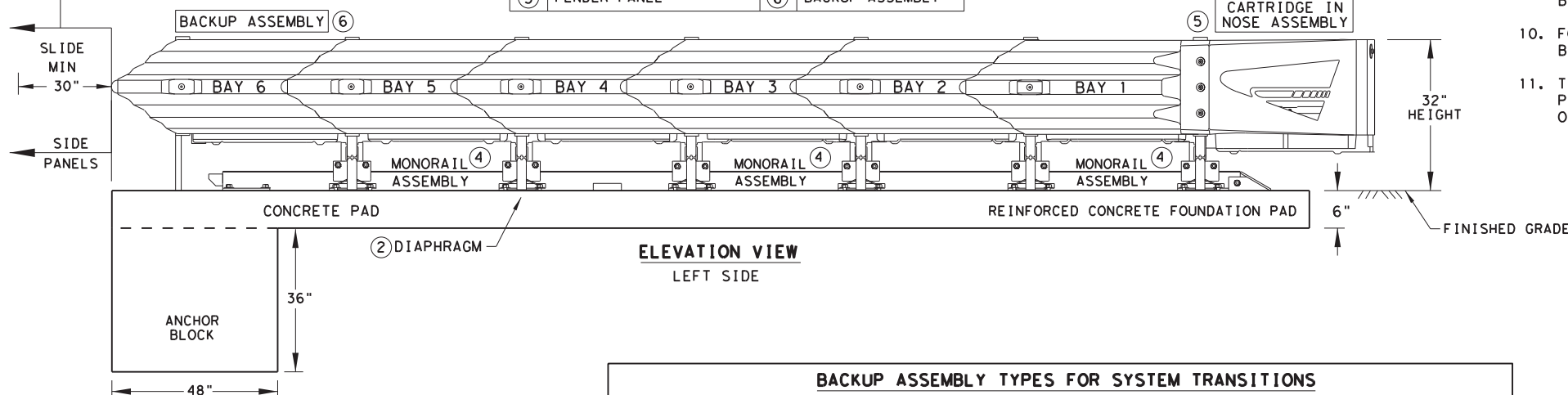
NOTE:
A TRANSITION MAY BE REQUIRED TO INSTALL THE QUADGUARD M10 TO THE OBJECT BEING SHIELDED.

QUADGUARD M10 24" WIDE 6-BAY SYSTEM

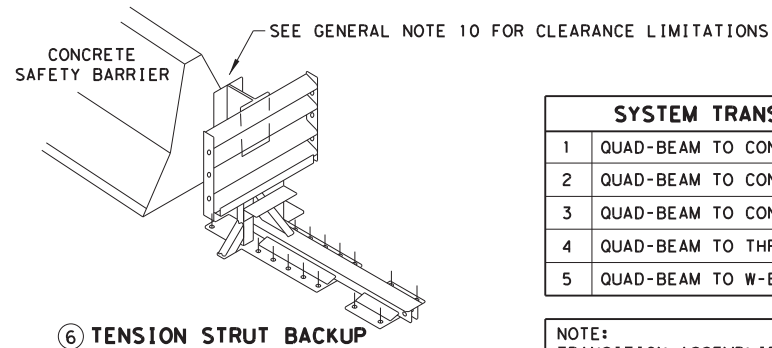


KEY		KEY	
①	QUADGUARD CARTRIDGE	④	MONORAILS
②	DIAPHRAGM	⑤	NOSE ASSEMBLY
③	FENDER PANEL	⑥	BACKUP ASSEMBLY

NOTE:
PROVISION SHALL BE MADE FOR REAR FENDER SIDE PANELS TO SLIDE REARWARD UPON IMPACT, 30" MIN.

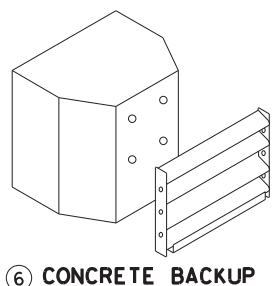


BACKUP ASSEMBLY TYPES FOR SYSTEM TRANSITIONS



SYSTEM TRANSITIONS TYPES	
1	QUAD-BEAM TO CONCRETE SAFETY BARRIER
2	QUAD-BEAM TO CONCRETE BRIDGE RAIL
3	QUAD-BEAM TO CONCRETE END SHOE
4	QUAD-BEAM TO THRIE-BEAM RAIL
5	QUAD-BEAM TO W-BEAM RAIL

NOTE:
TRANSITION ASSEMBLIES FOR THE QUADGUARD M10 TO THRIE-BEAM OR W-BEAM FENCE REQUIRES I-BEAM POSTS:
10 (W6X9) I-BEAM POSTS.
POST 1 THRU 4 (84" LONG)
POST 5 THRU 10 (72" LONG)



NOTE:
CONTACT THE MANUFACTURER WITH SITE SPECIFIC DATA (SSD) FOR THE CORRECT BACKUP ASSEMBLY AND TRANSITION PANELS OR SIDE PANELS USED FOR STANDARD AND BI-DIRECTIONAL INSTALLATIONS: AT DIVIDED-HIGHWAY MEDIANS OR UNDIVIDED ROADWAYS WHERE THE SYSTEM IS EXPOSED TO IMPACTS FROM ONE OR TWO DIFFERENT DIRECTIONS OF TRAFFIC FLOW.

GENERAL NOTES

- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY - ENERGY ABSORPTION INC. AT 1 (888) 323-6374.
- SEE THE RECENT QUADGUARD M10 PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITATIONS AND THE DRAWING PACKAGE FOR THE NARROW 24" SYSTEM BEFORE INSTALLING THE QUADGUARD M10 SYSTEM AT ANY GIVEN LOCATION.
- FOR BI-DIRECTIONAL TRAFFIC: THE LOCATION AND OR WIDTH OF THE QUADGUARD M10 IS RESTRICTED. AS BI-DIRECTIONAL TRAFFIC APPROACHES THE REAR OF THE QUADGUARD M10, THE QUADGUARD M10 SHOULD NOT EXTEND FURTHER INTO THE TRAFFIC-SIDE OF THE BARRIER THAN THE OBSTACLE. ANY TRANSITION INSTALLED MUST EITHER BE TANGENT TO BOTH QUADGUARD AND OBSTACLE OR MUST ANGLE TOWARD FIELD SIDE OF THE BARRIER.
- SYSTEM TRANSITION: APPROPRIATE TRANSITION PANELS OR SIDE PANELS WILL BE REQUIRED FOR PROPER IMPACT PERFORMANCE. THE CORRECT PANEL(S) TO USE WILL DEPEND ON THE DIRECTION OF TRAFFIC FLOW AND WHAT TYPE OF BARRIER OR ROAD FEATURE THE QUADGUARD M10 SYSTEM IS SHIELDING. SEE THE QUADGUARD M10 PRODUCT DESCRIPTION & ASSEMBLY MANUAL FOR FURTHER DETAILS.
- COMPONENTS FOR THE QUADGUARD M10 BACKUP AND REINFORCING DETAILS ARE SHOWN ON THE QUADGUARD M10 PRODUCT DESCRIPTION & ASSEMBLY MANUAL.
- CONCRETE PAD SHALL BE 6" MIN. REINFORCED 28MPa [4,000 PSI] (P.C.) OR 8" MIN. NON-REINFORCED 28MPa [4,000 PSI] CONCRETE ROADWAY MEASURING AT LEAST 12'-0" WIDE BY 50'-0" LONG. ANCHOR BLOCK IS NOT REQUIRED WHEN USING 8" CONCRETE PAD INSTALLED AGAINST AN IMMOVABLE STRUCTURE, E.G. CONCRETE WALL.
- IF THE CROSS-SLOPE VARIES MORE THAN 2% OVER THE LENGTH OF THE SYSTEM, THE CONCRETE PAD WILL REQUIRE LEVELING. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
- THE INSTALLATION AREA SHOULD BE FREE OF CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
- THE QUADGUARD M10 SYSTEM SHOULD BE INSTALLED APPROXIMATELY PARALLEL WITH THE BARRIER.
- FOR THE TENSION STRUT BACKUP THE DISTANCE BETWEEN THE BACK OF BACKUP AND THE BARRIER WALL SHOULD NOT EXCEED 7" IN ANY CASE.
- TXDOT HAS ONLY APPROVED THE 24" WIDE QUADGUARD M10 SYSTEM. THE QUADGUARD M10 PRODUCT DESCRIPTION AND ASSEMBLY MANUAL INCLUDES SYSTEM WIDTH OF 24". ONLY THE 24" SYSTEM IS ALLOWED TO BE INSTALLED ON TEXAS ROADWAYS.

FOUNDATION & ANCHORING REQUIREMENTS
FOUNDATION TYPES: A, B, C, & D

FOUNDATION TYPE:A	REINFORCED CONCRETE PAD OR ROADWAY
FOUNDATION:	6" MINIMUM DEPTH (P.C.C.)
ANCHORAGE:	7" STUDS EMBEDDED 5 1/2" - APPROVED ADHESIVE
FOUNDATION TYPE:B	ASPHALT OVER P.C.C.
FOUNDATION:	3" MIN. (A.C.) OVER 3" MIN. (P.C.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 1/2"
FOUNDATION TYPE:C	ASPHALT OVER SUBBASE
FOUNDATION:	6" MIN. (A.C.) OVER 6" MIN. (C.S.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 1/2" - APPROVED ADHESIVE
FOUNDATION TYPE:D	ASPHALT ONLY
FOUNDATION:	8" MIN. (A.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 1/2" - APPROVED ADHESIVE

KEY:
ASPHALT CONCRETE (A.C.)
COMPACTED SUBBASE (C.S.)
PORTLAND CEMENT CONCRETE (P.C.C.)
NOTE: SEE TRINITY'S PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR THE APPROVED ADHESIVE.

IF THE UNIT IS ANCHORED TO ASPHALTIC CONCRETE, IT SHOULD BE RELOCATED TO FRESH, UNDISTURBED ASPHALT AND RE-ANCHORED AFTER EACH IMPACT TO ENSURE ADEQUATE FUTURE PERFORMANCE.

TENSION STRUT BACKUP MAY BE USED IN CONSTRUCTION ZONES ON ASPHALT CONCRETE (A.C.) FOR TEMPORARY USE ONLY.

NOTES:
CONTACT THE MANUFACTURER WITH SITE SPECIFIC DATA (SSD) FOR CONCRETE PAD AND ANCHOR BLOCK INSTALLATION REQUIREMENTS.

A MANUFACTURER'S DRAWING PACKAGE UNIQUE AND SPECIFIC FOR THE QUADGUARD M10 (N) INSTALLATION AND DETAILED INFORMATION REGARDING THE TYPE OF BACKUP ASSEMBLY FOR THE REQUIRED TRANSITION WILL BE PROVIDED TO THE ENGINEER AND INSTALLER.

6" REINFORCED CONCRETE PAD REQUIRES THE INSTALLATION OF AN ANCHOR BLOCK AS SHOWN ON THE MANUFACTURER'S DRAWING PACKAGE.

8" NON-REINFORCED CONCRETE PAD MAY NOT REQUIRE AN ANCHOR BLOCK, IF THE PAD IS INSTALLED AGAINST AN IMMOVABLE CONCRETE BACKUP.

CONCRETE PAD AND ANCHOR BLOCK COMBINATIONS SHALL BE CONFIRMED WITH THE MANUFACTURER BASED UPON SITE SPECIFIC DATA (SSD).

NOTE:
THE QUADGUARD M10 24" WIDE 6-BAY - NARROW SYSTEM HAS BEEN TESTED TO MASH TEST LEVEL 3.

TL-3 MODEL #	QM10024	CYLINDER TYPES IN BAYS		
BAYS	6	TYPE-MII	TYPE-MI	TYPE-MI
DIAPHRAGMS	6	3	3	1
WIDTH	24"	REAR	FRONT	NOSE

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE QUADGUARD M10 SYSTEM AND IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

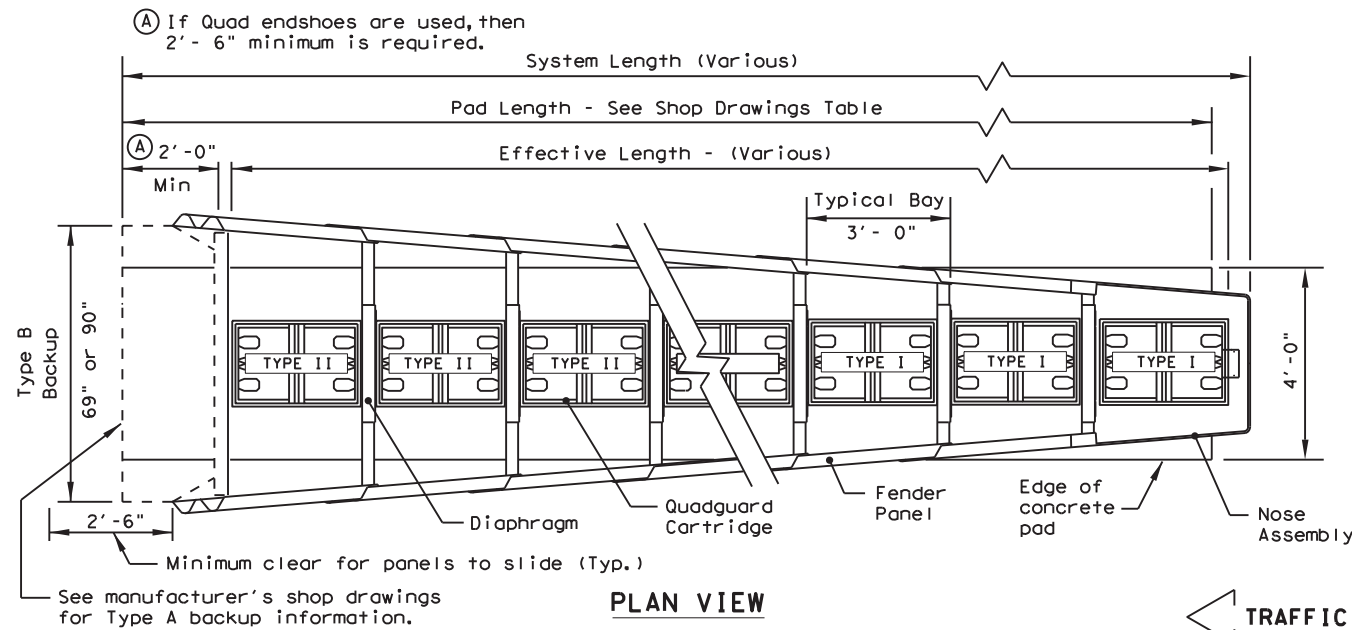
REUSABLE

		Design Division Standard	
TRINITY HIGHWAY ENERGY ABSORPTION QUADGUARD M10 (MASH TL-3 NARROW-24" ONLY)			
QUADGUARD (M10) (N) - 20			
FILE: qguardm10n20.dgn	DN: TXDOT	CK: KM	DW: VP
© TXDOT: APRIL 2020	CONT SECT	JOB	HIGHWAY
REVISIONS	6372 50	OOI	VAR.
	DIST	COUNTY	SHEET NO.
	SAT	BEXAR	128

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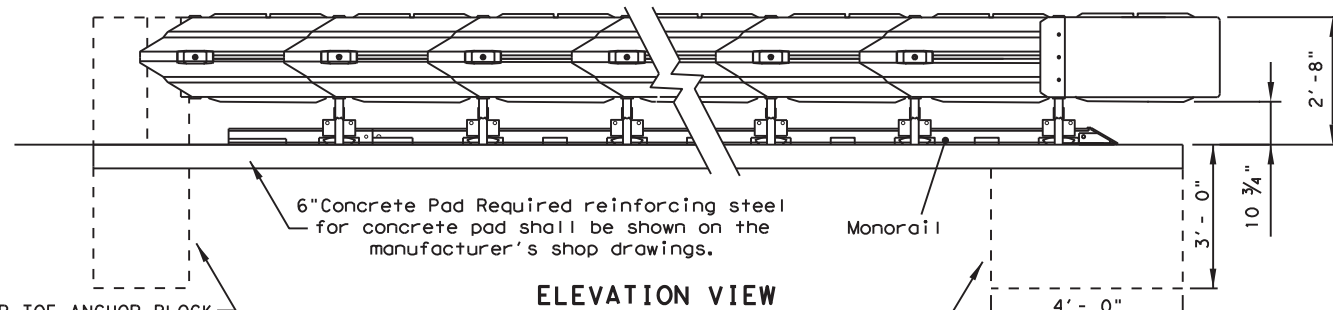
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PLAN VIEW

TRAFFIC



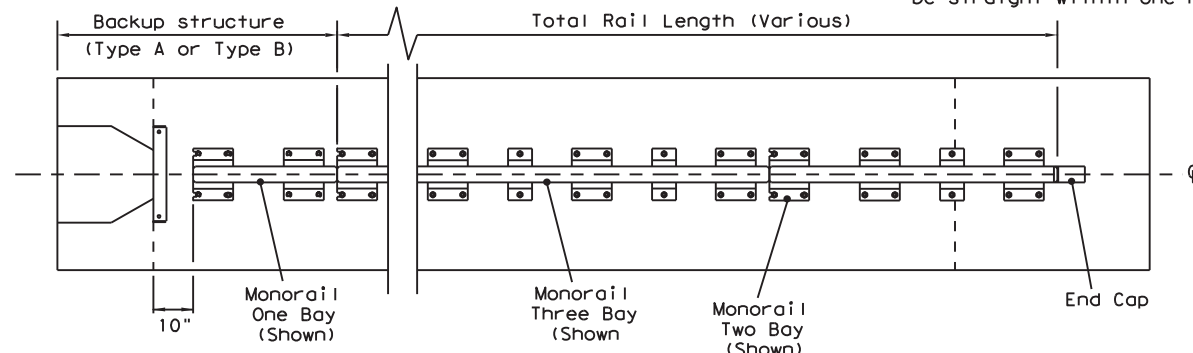
ELEVATION VIEW
QUADGUARD II SYSTEM DETAIL

CONCRETE TOE ANCHOR BLOCK required with Type A backup only, unless used on CRCP, Bridge Deck, or in front of concrete barrier.

Note: Monorail and Backup Assembly must be straight within one-half inch.

REAR TOE ANCHOR BLOCK (Required only with Type-B backup structure)

Required reinforcing steel for concrete anchor shall be shown on the manufacturer's shop drawings.



PLAN VIEW

TRAFFIC

Type B Backup (Option)

ELEVATION VIEW

MONORAIL ASSEMBLY DETAIL

(See the manufacturer's shop drawings for monorail hardware installation.)

Concrete rear toe anchor block

Concrete toe anchor block (see additional information in System Detail.)

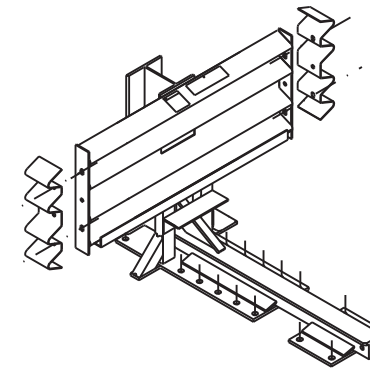
GENERAL NOTES

- For specific information regarding installation and technical guidance of the system, contact: Trinity Highway - Energy Absorption at 1(888)323-6374, 70 W. Madison St. Suite 2350, Chicago, IL 60602
- For bi-directional traffic, appropriate transition panels will be required.
- Details of components for the QUAD and backups and reinforcing details will be shown on the manufacturer's shop drawings furnished to the Engineer.
- Concrete shall be class "S" with a minimum compressive strength of 4,000 p.s.i.
- If the cross-slope varies more than 2% over the length of the system, the concrete pad will require leveling. Maximum permissible cross-slope is 8%.
- The installation area should be free from curbs, elevated objects, or depressions.
- The QUAD system should be approximately parallel with the barrier or ϕ of merging barriers.
- Unit width selected should be adequate to protect an errant vehicle travelling at 15 degrees to the roadway from the face or corner of the fixed object.

QUADGUARD II (WIDE) SYSTEM				
Test Level	NO. OF BAYS	UNIT EFFECTIVE LENGTH	PAD LENGTH TYPE A	PAD LENGTH TYPE B
TL-2	3	11'- 8"	12'- 0"	11'- 6"
TL-3	5	17'- 8"	18'- 0"	17'- 6"

Additional bays may be added if special considerations warrant and site conditions will accommodate additional length.

QUAD II (W) units are available in 69" and 90" widths from 3 to 8 bays. Unit width, number of bays, and backup type shall be specified elsewhere in the plans.

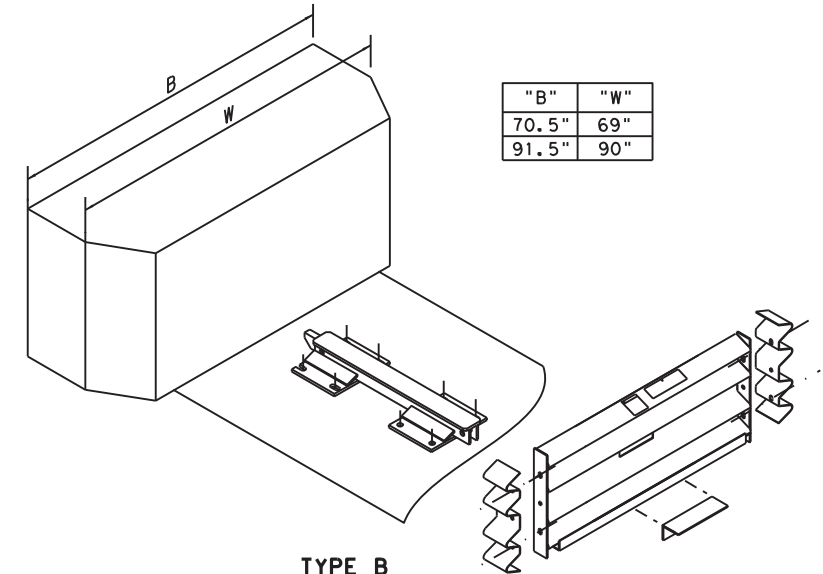


TYPE A
TENSION STRUT BACKUP

TENSION STRUT: Consists of diagonal struts, connections, and accessories, as detailed by the Manufacturer, located at the rear of the QUAD unit. Typical application is for QUAD units attached to double-face quadrail. When used, a 4'-0"x 4'-0"x 3'-0" concrete toe anchor block shall be provided beneath the front portion of the concrete pad, except where the QUAD unit is to be placed on continuously reinforced concrete pavement or bridge deck (7" minimum, 4,000 p.s.i.) or non-reinforced concrete pavement (8" minimum, 4,000 p.s.i.)

Anchorage requirements are as follows:

WITH FOUNDATION TYPE:	ANCHOR WITH:
Minimum six inch portland cement concrete pad	Epoxy anchoring system with 7" studs, 5.5" embedment



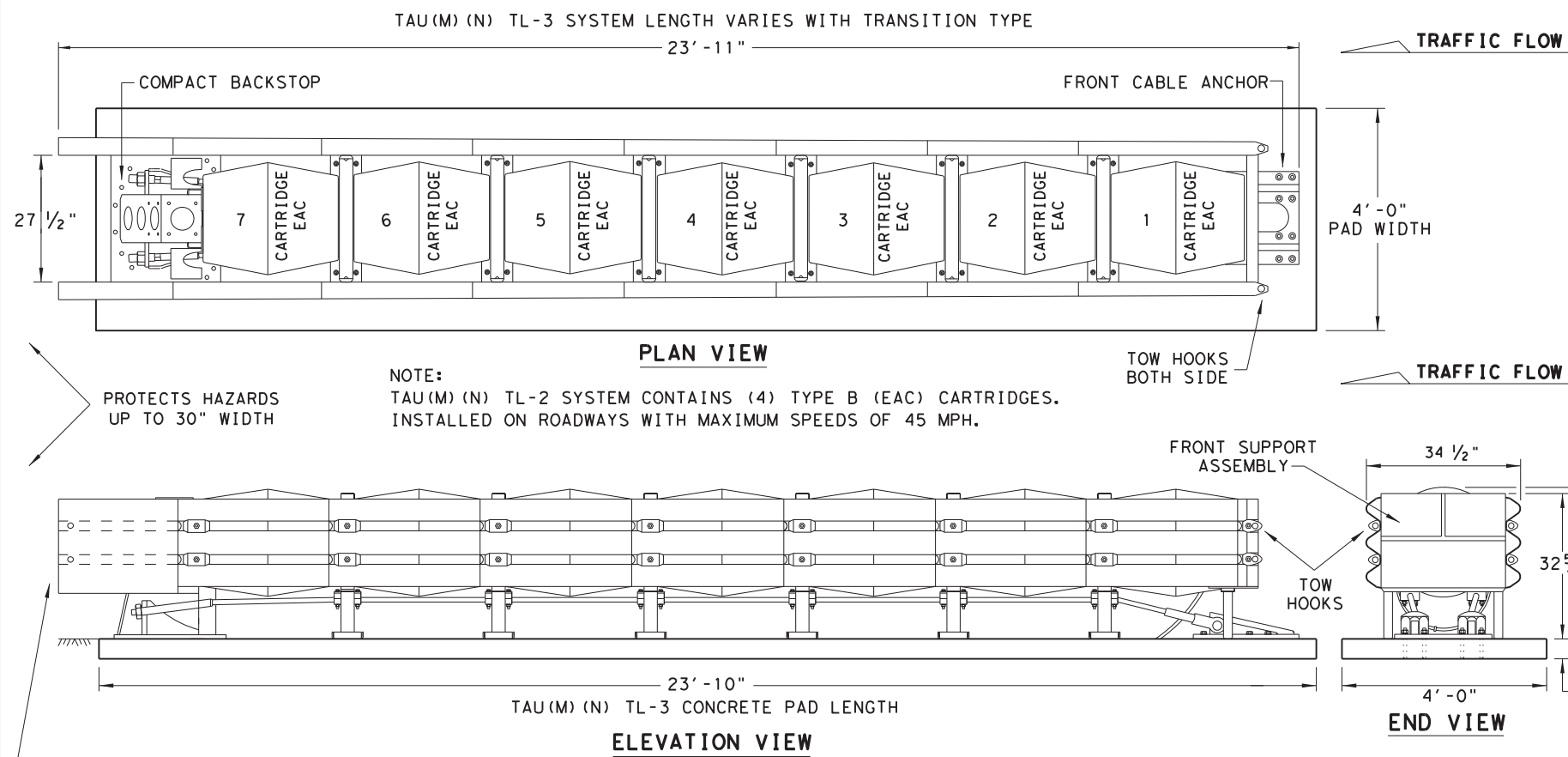
TYPE B
CAST-IN-PLACE CONCRETE BACKUP

CAST-IN-PLACE CONCRETE WALL BACKUP: If cast-in-place structures such as bridge parapets, columns, or special walls are used as backup structures, then intermediate walls shall be provided between the structures and the QUAD unit. Intermediate walls shall be equal in height and width to the QUAD unit and reinforced with a steel cage. A cast-in-place transition section from concrete barrier may be used. Reinforcing steel should transition from the standard barrier section to the standard backup section. Details for the intermediate walls, cast-in-place transition sections, or other modifications will be shown elsewhere in the plans. Concrete wall backups may be used on continuously reinforced concrete pavement or bridge deck (7" minimum, 4,000 p.s.i.) or non-reinforced concrete pavement (8" minimum, 4,000 p.s.i.) In those cases, all vertical steel will be doweled (5 inch minimum) into existing decks or located and placed prior to pouring proposed decks as approved by the Engineer.

REUSABLE

				Design Division Standard	
TRINITY HIGHWAY ENERGY ABSORPTION (QUADGUARD II) (WIDE) QUAD (W) - 17					
FILE: quodw17.dgn	DN: TxDOT	CK: KM	DW: VP	CK: KM	
© TxDOT: FEBRUARY 1998	CONT: 6372	SECT: 50	JOB: 001	HIGHWAY: VAR.	
REVISIONS REVISED 06, 2013 VP REVISED 03, 2015 VP REVISED 03, 2017 KM			DIST: SAT	COUNTY: BEXAR	SHEET NO.: 129

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GENERAL NOTES

- FOR SPECIFIC INFORMATION REGARDING THE INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800. 180 RIVER ROAD, RIO VISTA, CA 94571
- REFER TO THE LATEST (LTS) INSTALLATION INSTRUCTION MANUAL FOR IMPORTANT SAFETY MESSAGES, COMPLETE SYSTEM ASSEMBLY, AND ANCHOR INSTALLATION REQUIREMENTS FOR THE NINE (9) DIFFERENT SITE TRANSITIONS.
- INSTALLATION DETAILS FOR THE COMPACT BACKSTOP, FRONT CABLE ANCHOR AND FOUNDATION OPTIONS ARE SHOWN ON THE INSTALLATION INSTRUCTION MANUAL FURNISHED TO THE ENGINEER.
- CONCRETE SHALL BE CLASS "S" WITH A MINIMUM COMPRESSIVE STRENGTH OF 4,000 P.S.I.
- IF THE CROSS-SLOPES VARIES MORE THAN 2% OVER THE LENGTH OF THE SYSTEM, THE CONCRETE PAD WILL REQUIRE LEVELING. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%
- THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
- THE TAU(M) (N) SYSTEM SHOULD BE APPROXIMATELY PARALLEL WITH THE BARRIER OR CENTER LINE OF MERGING BARRIERS.
- THIS DRAWING REPRESENTS THE UNIVERSAL TAU(M) (N) TL-3 SYSTEM, A RE-DIRECTIVE NON-GATING CRASH CUSHION THAT CAN PROTECT HAZARDS UP TO 30-INCHES IN WIDTH. ALSO AVAILABLE IN TL-2 CONFIGURATION.

NOTE:
TAU(M) (N) TL-2 SYSTEM CONTAINS (4) TYPE B (EAC) CARTRIDGES.
INSTALLED ON ROADWAYS WITH MAXIMUM SPEEDS OF 45 MPH.

NOTE:
PAD THICKNESS VARIES - SEE FOUNDATION OPTIONS

NOTES:
TRANSITIONS AND ATTACHMENTS TO VARIOUS BARRIER SHAPES, RAILINGS AND BI-DIRECTIONAL TRAFFIC FLOWS ARE AVAILABLE. SEE MANUFACTURER'S INSTALLATION INSTRUCTIONS MANUAL FOR ADDITIONAL TRANSITION DETAILS.

NOTE:
CONCRETE FOUNDATION PAD LENGTH VARIES WITH TL-3 AND TL-2 SYSTEMS, SEE SYSTEM & FOUNDATION LENGTH TABLE.

BILL OF MATERIALS FOR TAU(M) (N) TL-3 & TL-2 SYSTEMS		QUANTITIES	
PART NUMBER	PART DESCRIPTION	TL-3 SYSTEM	TL-2 SYSTEM
BSI-1708019-00	SLIDING PANEL GALVANIZED TAU(M) (N)	14	8
BSI-1708030-00	END PANEL, THRIE BEAM, GALV, TAU(M) (N)	2	2
BSI-1706001-00	CABLE ASSEMBLY, 7 BAY, TAU(M) (N)	2	-
BSI-1805036-00	CABLE ASSEMBLY, 4 BAY, TAU(M) (N)	-	2
BSI-1708018-00	FRONT CABLE ANCHOR	1	1
BSI-1707034-00	COMPACT BACKSTOP	1	1
B030703	MIDDLE SUPPORT ASSEMBLY	6	3
B030704	FRONT SUPPORT	1	1
B010722	ENERGY ABSORBING CARTRIDGE, TYPE B	7	4
K001005	TAU-II FRONT SUPPORT LEG KIT	1	1
BSI-1709083-KT	TETHER KIT (INCLUDES ALL HARDWARE)	1	1
BSI-1809041-KT	SLIDER KIT (INCLUDES ALL HARDWARE)	7	4
BSI-1808033-KT	CABLE GUIDE KIT (INCLUDES ALL HARDWARE)	6	3
BSI-1809040-KT	TOW HOOK KIT (INCLUDES ALL HARDWARE)	1	1
BSI-1808034-KT	DELINEATION BRACKET KIT (INCLUDES ALL HARDWARE)	1	1
BSI-1808035-KT	END PANEL MOUNT KIT (INCLUDES ALL HARDWARE)	1	1
BSI-1808036-KT	CONCRETE ANCHORING KIT	1	1
SEE NOTE	HIGH REFLECTIVE DECAL	1	1
ECN 3883	INSTALLATION AND INSTRUCTIONS MANUAL	1	1

FOUNDATION OPTIONS
6" REINFORCED CONCRETE
8" UNREINFORCED CONCRETE
ASPHALT OVER CONCRETE WITH MINIMUM 6" EMBEDMENT IN CONCRETE
* 6" ASPHALT OVER 6" COMPACT SUBBASE
* 8" MINIMUM ASPHALT

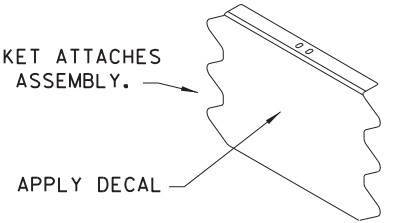
SYSTEM & FOUNDATION LENGTH TABLE	
SYSTEM LENGTH	FOUNDATION LENGTH
TL-2 = 15'-5"	TL-2 = 15'-4"
TL-3 = 23'-11"	TL-3 = 23'-10"

* NOTE:
REQUIRES AN ASPHALT ANCHORAGE PACKAGE: INCLUDES ADDITIONAL BRACES FOR THE FRONT CABLE ANCHOR AND THE COMPACT BACKSTOP, AND ASPHALT HARDWARE KIT. THE TL-3 ASPHALT CONFIGURATION ALSO REQUIRES NESTED SLIDER PANELS AND SHIMS AT THE LAST TWO BAYS. SEE MANUFACTURER'S INSTALLATION INSTRUCTION MANUAL FOR DETAILS.

NOTE:
SEE MANUFACTURER'S INSTALLATION INSTRUCTION MANUAL FOR FOUNDATION SPECIFICATIONS THAT INCLUDE, STONE AGGREGATE MIX, COMPRESSION STRENGTH, STEEL SIZE, ANCHOR SIZE, AND EMBEDMENT DEPTH.

* * NOTE:
ENGINEER OR CONTRACTOR SHALL COORDINATE WITH THE MANUFACTURER FOR THE CORRECT DECAL PER TRAFFIC FLOW, LEFT, RIGHT OR BOTH-SIDES.

NOTE:
DELINEATION BRACKET ATTACHES TO FRONT SUPPORT ASSEMBLY.



DELINEATION BRACKET

NOTE:
APPLY A HIGH REFLECTIVE DECAL TO THE DELINEATION BRACKET. DELINEATION DECAL ORIENTATION IS SHOWN ON THE CONSTRUCTION PLAN SET AND SHALL BE IN ACCORDANCE WITH THE TEXAS MUTCD FOR (TRAFFIC CONTROL DEVICES). DECALS ARE AVAILABLE FOR TRAFFIC FLOW ON THE LEFT-SIDE, BOTH -SIDES AND RIGHT-SIDE.

NOTES:
UPGRADE KITS ARE AVAILABLE TO RETROFIT EXISTING NCHRP 350 TAU-II SYSTEMS TO MASH COMPLIANT SYSTEMS. SEE MANUFACTURER'S PRODUCT INFORMATION.

THE TAU(M) (N) UNIDIRECTIONAL SYSTEM IS FREE STANDING AND IS NOT REQUIRED TO BE CONNECTED TO THE HAZARD.

TRANSITIONS TO GUARD FENCE, BRIDGE RAILS AND ROADSIDE BARRIERS SHALL BE IN ACCORDANCE WITH TxDOT'S POLICY.

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE UNIVERSAL TAU(M) (N) SYSTEM, IT IS NOT INTENDED TO REPLACE THE INSTALLATION INSTRUCTION MANUAL.

REUSABLE

Texas Department of Transportation

Design Division Standard

LINDSAY TRANSPORTATION SOLUTIONS

UNIVERSAL CRASH CUSHION (MASH TL-3 & TL-2)

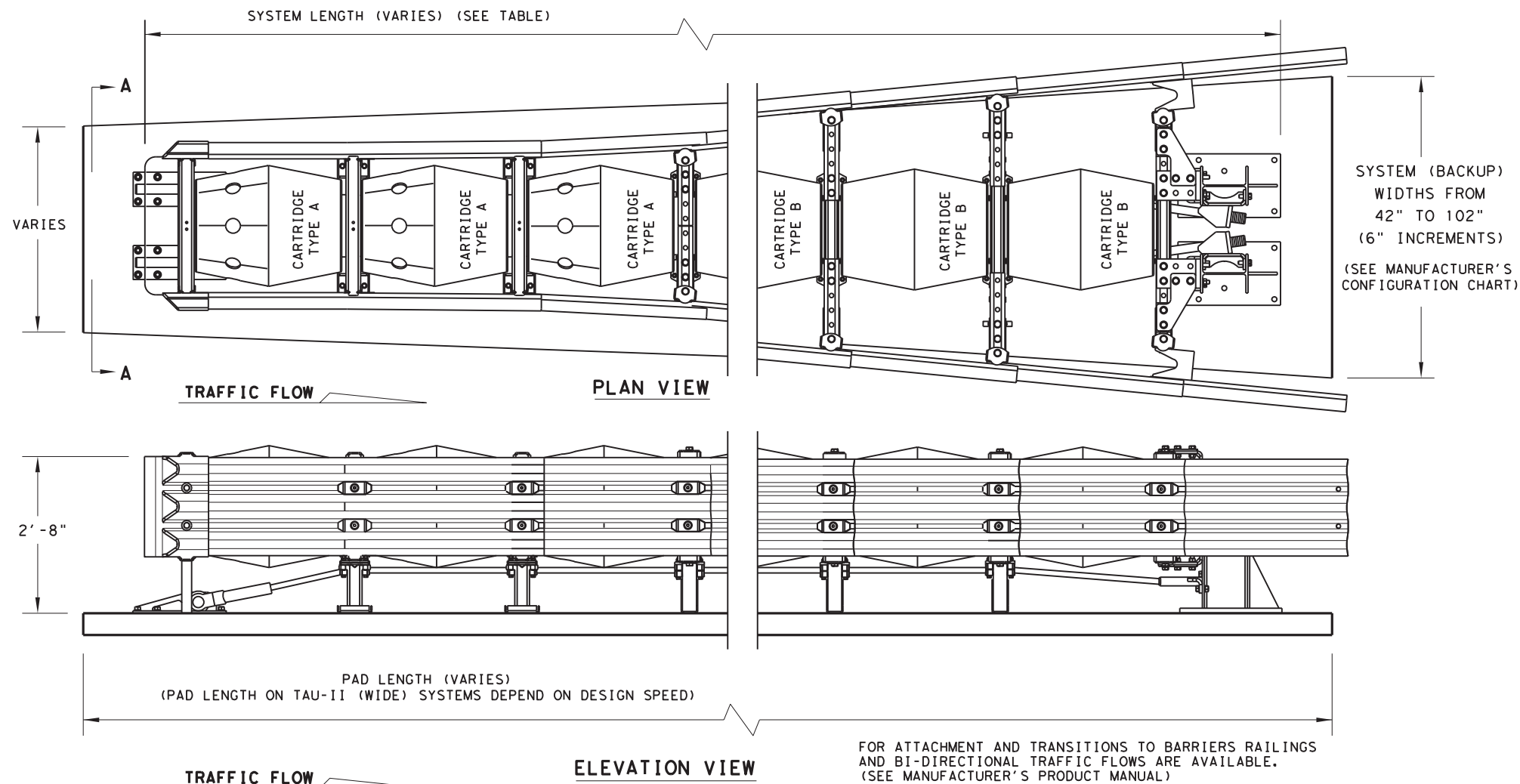
TAU(M) (N) - 19

FILE: tau19.dgn	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: APRIL 2019	CONT: 6372	SECT: 50	JOB: 001	HIGHWAY: VAR.
REVISIONS	DIST: SAT	COUNTY: BEXAR	SHEET NO. 130	

DATE: FILE:

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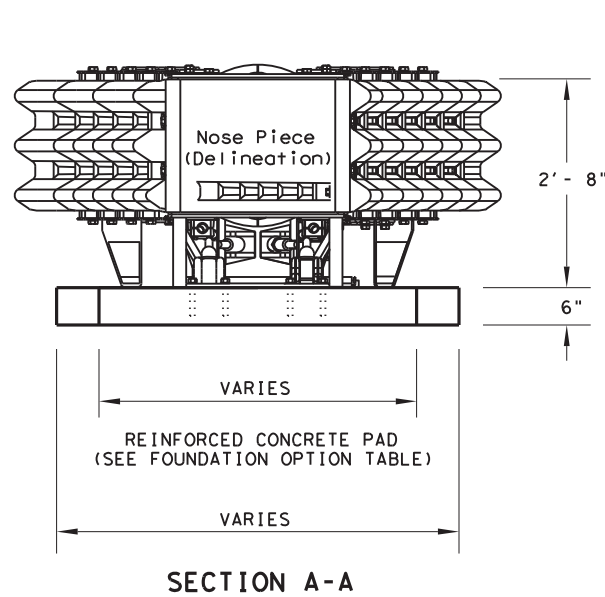
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- ### GENERAL NOTES
- For specific information regarding installation and technical guidance of the system, contact: Lindsay Transportation Solutions - Barrier Systems, Inc. at (707) 374-6800, 180 River Road, Rio Vista, CA 94571
 - Refer to installation manual and configuration chart for specific system assembly and element orientation.
 - For unusual locations see the manufacturer's configuration chart. If the configuration chart does not offer a system suitable for the location a special design, or design details made be required, contact the manufacturer for further information.
 - For bi-directional traffic, appropriate transition panels will be required.
 - Additional details for the backup support options, transition options and foundation options will be shown on the manufacturer's shop drawings furnished to the Engineer.
 - Concrete shall be class "S" with a minimum compressive strength of 4,000 p.s.i.
 - Maximum permissible cross-slope is 8%.
 - The installation area should be free from curbs, elevated objects, or depressions.
 - The TAU-II system should be approximately parallel with the barrier or $\frac{1}{2}$ of merging barriers.

BILL OF MATERIAL		
PRODUCT CODE	QTY	DESCRIPTION
B030704	1	FRONT SUPPORT
B030703	TBD	MIDDLE SUPPORT
TBD	TBD	XL BULKHEAD
TBD	TBD	XXL BULKHEAD
TBD	TBD	XXXL BULKHEAD
TBD	TBD	XXXXL BULKHEAD
TBD	1	BACKUP SUPPORT
TBD	1	FRONT CABLE ANCHOR
TBD	1	NOSE
B010202	TBD	SLIDING PANEL
B010659	1	END PANEL
K001003	TBD	SLIDER ASSEMBLY KIT
B010802	TBD	ENERGY ABSORBING CARTRIDGE, TYPE A
B010722	TBD	ENERGY ABSORBING CARTRIDGE, TYPE B
TBD	2	CABLE
K001031	TBD	LATERAL SUPPORT KIT
K001004	TBD	CABLE GUIDE KIT
K001005	2	FRONT SUPPORT LEG KIT
TBD	1	ANCHORING PACKAGE
K001013	1	NOSE ATTACHING HARDWARE

(TBD) = To Be Determined, depending on Backup Width, Backup Type and System Length. (See manufacturer's product manual)



FOUNDATION OPTIONS
6" REINFORCED CONCRETE
8" UNREINFORCED CONCRETE
ASPHALT OVER CONCRETE WITH MINIMUM 6" EMBEDMENT IN CONCRETE

FOR STEEL PLACEMENT IN CONCRETE FOUNDATIONS. SEE MANUFACTURER'S PRODUCT MANUAL.

TAU-II (WIDE) SYSTEM LENGTHS			
SYSTEM WIDTH	TL-2	TL-3	70 MPH
42"	14' - 4"	28' - 5"	31' - 3"
48"	14' - 4"	28' - 5"	31' - 3"
54"	14' - 4"	28' - 5"	31' - 3"
60"	11' - 5"	28' - 5"	31' - 3"
66"	11' - 5"	25' - 7"	28' - 5"
72"	11' - 5"	25' - 7"	25' - 7"
78"	11' - 5"	25' - 7"	25' - 7"
84"	11' - 5"	25' - 7"	25' - 7"
90"	11' - 5"	25' - 7"	25' - 7"
96"	11' - 5"	25' - 7"	25' - 7"
102"			25' - 7"

NOTE: SYSTEM LENGTHS ARE +/- 2"

BACKUP SUPPORT
WIDE FLANGE BACKUP (STAND ALONE)

TRANSITION OPTIONS
VERTICAL WALL
CONCRETE TRAFFIC BARRIER
W-BEAM GUARDRAIL
THREE BEAM GUARDRAIL

TRANSITION TYPES ARE SHOWN ELSEWHERE ON THE PLANS, (I.E. ATTENUATOR LOCATION DETAILS OR IN THE GENERAL NOTES).

FOR BI-DIRECTIONAL TRANSITION PANEL AND END SHOE DETAILS, SEE MANUFACTURER'S PRODUCT MANUAL.



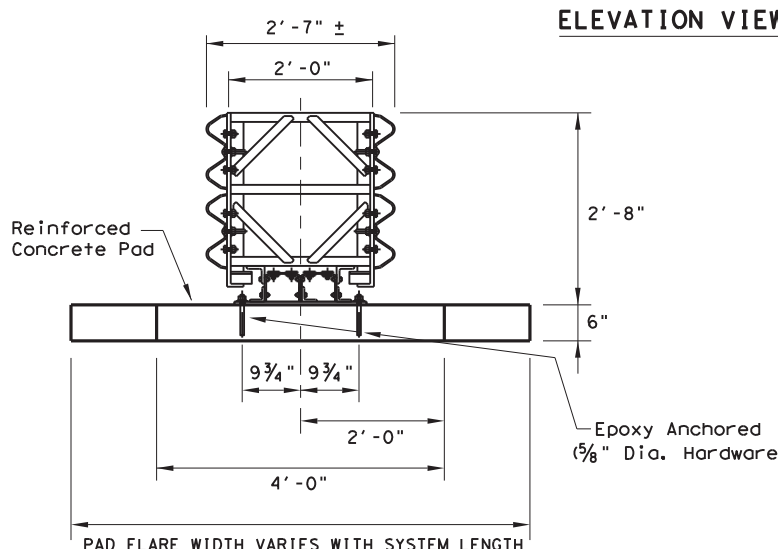
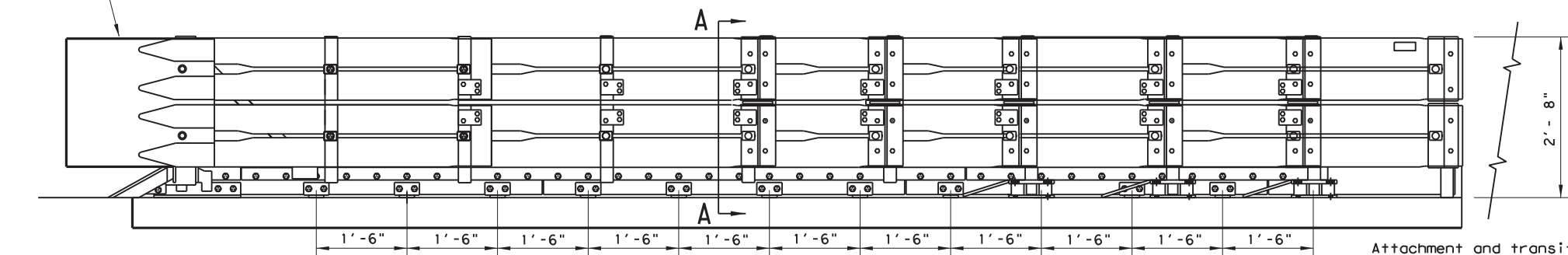
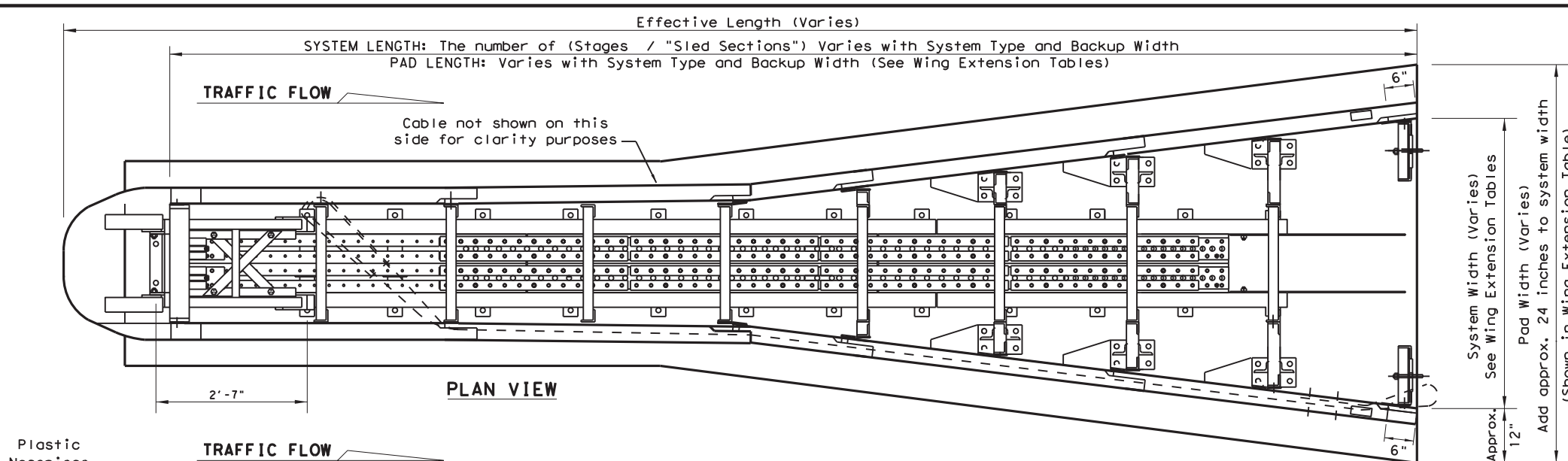
LTS-BARRIER SYSTEMS CRASH CUSHION (WIDE UNIT) TAU-II (W) - 16

REUSABLE

FILE: tauiiw16.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL
©TxDOT: September 2005	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
REVISED 06, 2013 (VP)	DIST	COUNTY	SHEET NO.	
REVISED 03, 2016 (VP)	SAT	BEXAR	131	

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TYPE (WIDE)	TEST LEVEL
FASTRACC (4 Stage System)	70
TRACC (3 Stage System)	TL-3
SHORTTRACC (2 Stage System)	TL-2

NOTE: The Stage System refers to number of replaceable "sled sections" that could be replaced independently.

Effective Length (Varies)
 SYSTEM LENGTH: The number of (Stages / "Sled Sections") Varies with System Type and Backup Width
 PAD LENGTH: Varies with System Type and Backup Width (See Wing Extension Tables)

Wide-FASTRACC WING EXTENSIONS				
NUMBER OF WING EXTENSIONS	WIDTH	SYSTEM LENGTH	EFFECTIVE LENGTH	Wide-FASTRACC EXTENSION PART NUMBER (LEFT# / RIGHT#)
0 (BASE UNIT)	71"	25'-11"	27'-11"	
1	78"	28'-3"	30'-3"	33940
2	85"	30'-7"	32'-7"	33941 / 33942
3	92"	32'-11"	34'-11"	33943 / 33944
4	99"	35'-2"	37'-2"	33945 / 33946
5	106"	37'-6"	39'-6"	33947 / 33948
6	113"	39'-10"	41'-10"	33949 / 33950
7	120"	42'-2"	44'-2"	33951 / 33952
8	127"	44'-5"	46'-5"	33953 / 33954
9	134"	46'-9"	48'-9"	33955 / 33956
10	141"	49'-1"	51'-1"	33957 / 33958
10+				CONSULT TRINITY SALES PERSON

Wide-TRACC WING EXTENSIONS				
NUMBER OF WING EXTENSIONS	WIDTH	SYSTEM LENGTH	EFFECTIVE LENGTH	Wide-TRACC EXTENSION PART NUMBER (LEFT# / RIGHT#)
0 (BASE UNIT)	58"	21'	23'	
1	65"	23'-4"	25'-4"	33940
2	72"	25'-8"	27'-8"	33941 / 33942
3	79"	28'	30'	33943 / 33944
4	86"	30'-4"	32'-4"	33945 / 33946
5	92"	32'-8"	34'-8"	33947 / 33948
6	99"	35'	37'	33949 / 33950
7	106"	37'-4"	39'-4"	33951 / 33952
8	113"	39'-8"	41'-8"	33953 / 33954
9	120"	42'	44'	33955 / 33956
10	127"	44'-4"	46'-4"	33957 / 33958
10+				CONSULT TRINITY SALES PERSON

Wide-SHORTTRACC WING EXTENSIONS				
NUMBER OF WING EXTENSIONS	WIDTH	SYSTEM LENGTH	EFFECTIVE LENGTH	Wide-SHORTTRACC EXTENSION PART NUMBER (LEFT# / RIGHT#)
0 (BASE UNIT)	39"	15'	17'	
1	46"	17'-4"	19'-4"	33940
2	53"	18'-9"	20'-9"	33941 / 33942
3	60"	21'-1"	23'-1"	33943 / 33944
4	66"	23'-5"	25'-5"	33945 / 33946
5	73"	25'-8"	27'-8"	33947 / 33948
6	80"	28'-1"	30'-1"	33949 / 33950
7	87"	30'-4"	32'-4"	33951 / 33952
8	94"	32'-7"	34'-7"	33953 / 33954
9	101"	34'-11"	36'-11"	33955 / 33956
10	108"	37'-3"	39'-3"	33957 / 33958
10+				CONSULT TRINITY SALES PERSON

Attachment and transitions to other shapes, barriers railings and bi-directional traffic flows are available. (See manufacturer's product manual).

BACKUP SUPPORT OPTIONS	
SQUARE CONCRETE BACKUP	
CONCRETE BARRIER (CTB) BACKUP	
SINGLE SLOPE CONCRETE BARRIER(SSCB)	
GUARDRAIL BACKUP (BASE-PLATED POST)	
GUARDRAIL BACKUP (DRIVEN POST)	

TRANSITION OPTIONS	
VERTICAL WALL	
MODIFIED (CTB) TO VERTICAL WALL	
CONCRETE BARRIER (CTB)	
GUARDRAIL (W-BEAM)	
GUARDRAIL (THRIE-BEAM)	

FOR BI-DIRECTIONAL TRANSITION PANEL DETAILS (SEE MANUFACTURER'S PRODUCT MANUAL).

BACKUP AND TRANSITION TYPES ARE SHOWN ELSEWHERE ON THE PLANS, (I.E. ATTENUATOR LOCATION DETAILS OR IN THE GENERAL NOTES).

FOUNDATION OPTIONS	
6" REINFORCED CONCRETE	
8" UNREINFORCED CONCRETE	
3" MIN. ASPHALT OVER 3" MIN. CONCRETE	
6" ASPHALT OVER 6" COMPACT SUBBASE	
8" MINIMUM ASPHALT	

FOR STEEL PLACEMENT IN CONCRETE FOUNDATIONS, (SEE MANUFACTURER'S PRODUCT MANUAL).

REUSABLE

GENERAL NOTES

- For specific information regarding installation and technical guidance of the system, contact: Trinity Highway at 1(888)323-6374, 2525 N. Stemmons Freeway - Dallas, TX 75207
- Contact the company for: Custom widths from 31" up to 57" wide, and transition panels for bi-directional traffic applications.
- Details of components for the WideTRACC, Backups and re-inforcing details will be shown on the manufacturer's shop drawings furnished to the Engineer.
- Concrete shall be class "S" with a min. compressive strength 4,000 p.s.i.
- If the cross-slope varies more than 2% over the length of the system, the concrete pad will require leveling. Maximum permissible cross-slope 8%.
- The installation area should be free from curbs, elevated objects, or depressions.
- The WideTRACC system should be approximately parallel with the barrier or ϕ of merging barriers.
- The Unit shown is flared on both sides, but can be flared on a single side either left or right. The flares will effect the length and width of the system. (See Wing Extension Tables)

Wide-TRACC - BILL OF MATERIAL				
PART #	FAST TRACC QTY	TRACC QTY	SHORT TRACC QTY	DESCRIPTION
25937A	1			WIDFASTRACC UNIT ASSEMBLY
25939A		1		WIDETRACC UNIT ASSEMBLY
25997A			1	WIDESHORTTRACC UNIT ASSEMBLY
3310G	4	4	4	5/8" LOCKWASHER
4372G	4	4	4	5/8" FLATWASHER
4451G	4	4	4	5/8" DIA X 6" EXP. WEDGE ANCHOR
6531B	1	1	1	PLASTIC NOSEPIECE
6668B	4	4	4	REFLECTIVE SHEETING

ANCHOR HARDWARE (CONCRETE BASE)				
5204B	72	50	18	5/8" DIA X 7-1/16" THD ANCHOR STUD
4372G	72	50	18	5/8" FLATWASHER
3310G	72	50	18	5/8" LOCKWASHER
3361G	72	50	18	5/8" HEX NUT
5206B	6	4	2	Adhesive, Hilti Hit HY-150

ANCHOR HARDWARE (ASPHALT BASE)				
6380G	72	50	18	5/8" Dia x 18" Thd Anchor Stud
4372G	72	50	18	5/8" Flatwasher
3310G	72	50	18	5/8" Lockwasher
3361G	72	50	18	5/8" HEX NUT
5206B	15	11	4	ADHESIVE, HILTI HIT HY-150

ANCHOR HARDWARE (OPTIONAL ITEMS, AS NEEDED)				
5207B	A/R	A/R	A/R	NOZZLE, MIXER, HILTI HIT HY-150
5208B	A/R	A/R	A/R	EXT. TUBE, MIXER, HILTI HIT HY-150
5205B	A/R	A/R	A/R	DISPENSER GUN, HILTI HIT HY-150
5209B	A/R	A/R	A/R	DRILL BIT, 1/2", HILTI SDS

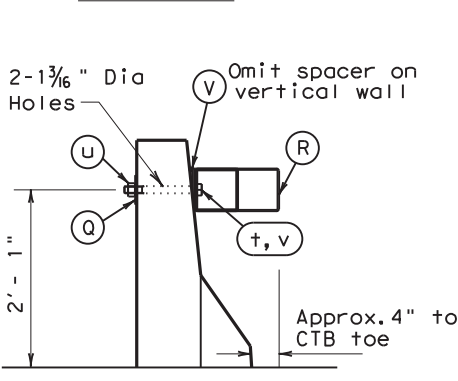
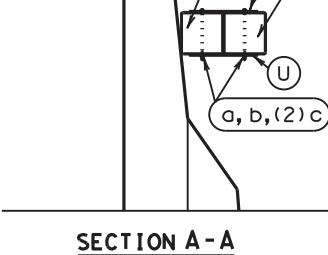
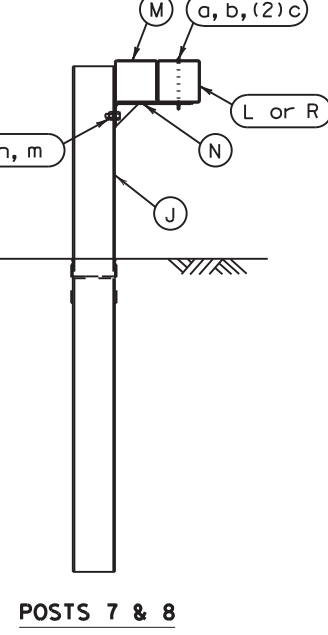
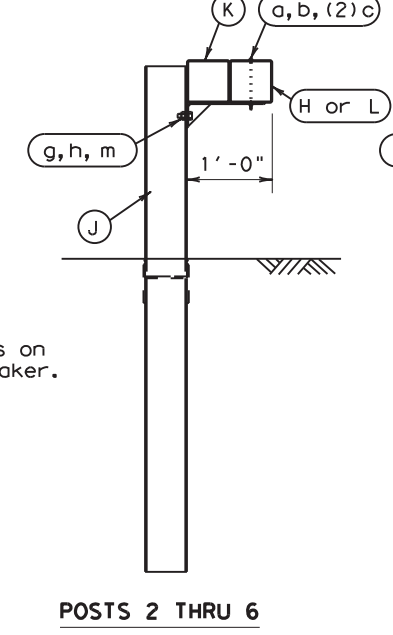
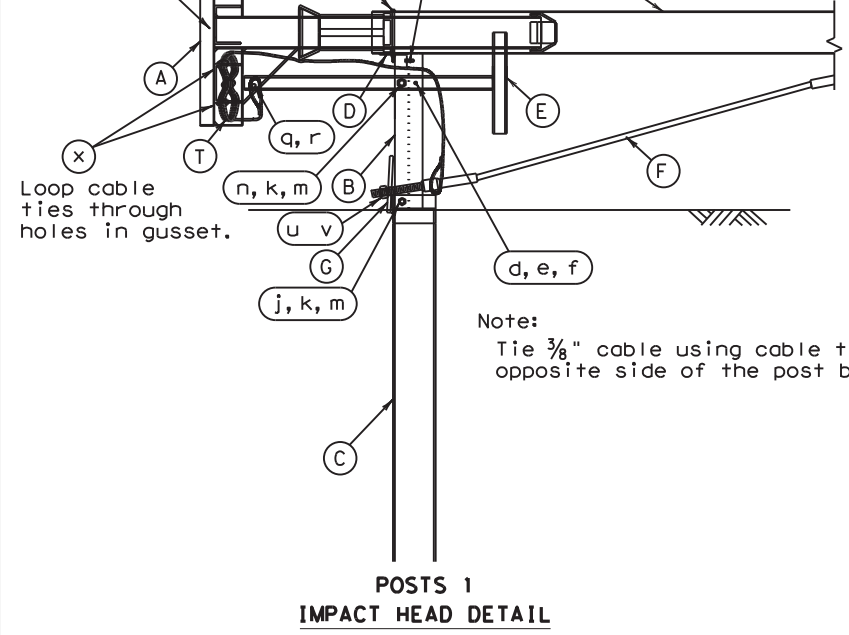
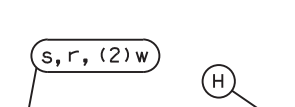
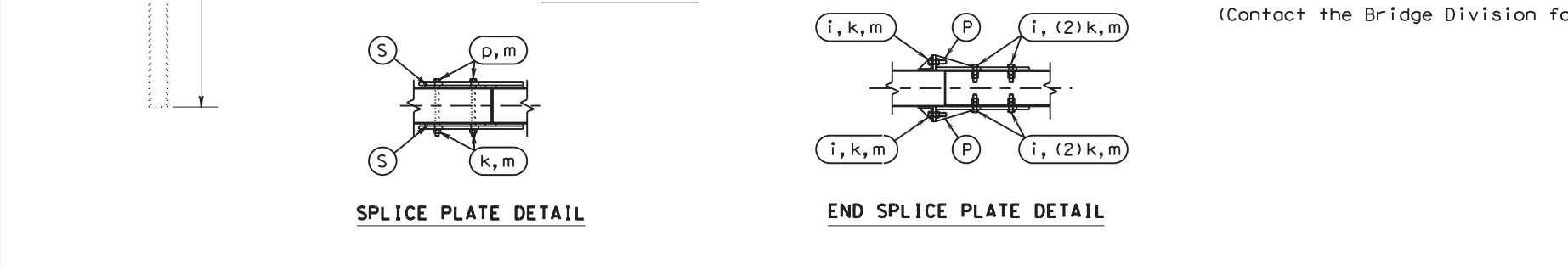
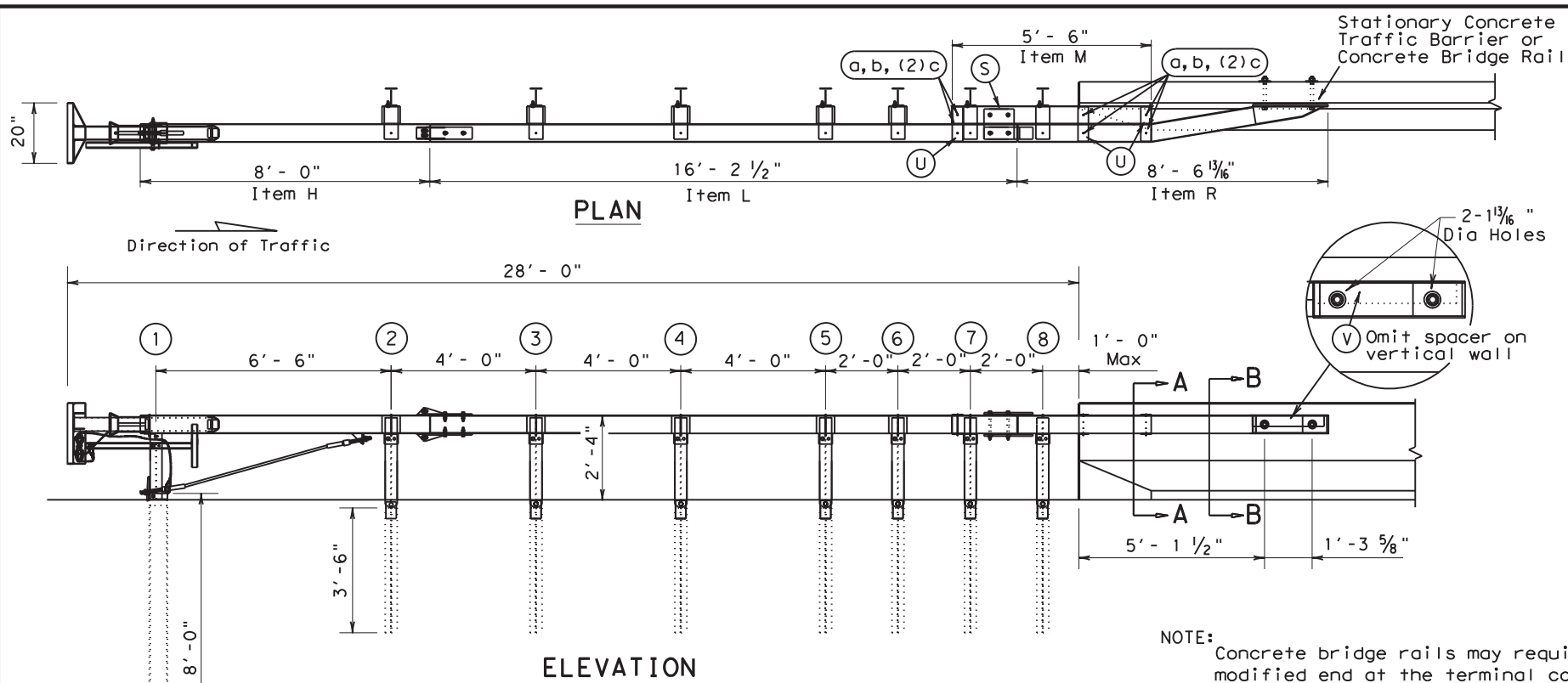
Texas Department of Transportation *Design Division Standard*

**TRINITY HIGHWAY
 CRASH CUSHION
 (WIDE UNIT)
 TRACC (W) - 16**

FILE: traccw16.dgn	DN: TxDOT	CK: KM	DW: VP	CR: VP
© TxDOT February 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
REVISED 06, 2013 (VP)	DIST	COUNTY	SHEET NO.	
REVISED 03, 2016 (VP)	SAT	BEXAR	132	

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GENERAL NOTES

- For specific information regarding installation and technical guidance of the system, contact: Road Systems, Inc., at (330)346-0721, 3616 Old Howard County Airport, Big Springs, TX 79720
- Due to the Single-Sided design, the BEAT-SSCC is not appropriate for use at locations where backside hits towards the rigid concrete barrier are possible, e.g. In gore areas, or in narrow median locations where backside opposite direction hits are likely.
- All bolts, nuts, cable assemblies, cable anchors, bearing plate, tubing, post, impact heads, and other steel components shall be galvanized, unless otherwise noted.
- The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
- When site conditions permit, posts may be driven. The lower section of post #1 should not be driven with the upper post section attached. If posts are placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
- If rock excavation is encountered, see manufacturer's installation booklet for installation recommendations.
- Post shall not be set full depth in concrete.
- The appropriate connection of the SSCC to the stationary rigid structure is a critical component to insure proper performance of the system. The length of the 1" bolts used to attach the system to the rigid structure will vary with the wall thickness and will need to be determined in the field.
- The approach area in front of the SSCC and the area within the system itself shall be free of fixed obstacles greater than 4 inches in height and have a fill slope or a cut slope of 1V:10H or flatter.
- Unless otherwise shown in the plans, SSCC rail placed in the vicinity of curbs shall be blocked out so that the face of curb is located directly below the face of rail. The steel posts shall be installed at the proper ground elevation above the gutter pan or roadway surface. Curbs located along or in front of the SSCC system shall not be greater than 4 inches in height.
- An object marker shall be installed on the front of the impact head as detailed on D & OM(VIA).

NOTE: Concrete bridge rails may require a modified end at the terminal connection. (Contact the Bridge Division for details.)

ITEM	QTY	DESCRIPTION
A	1	Box-Beam Impact Head
B	1	Upper End Post (A1) W6 x 9 x 1'-9 1/2" LG.
C	1	Lower End Post (A4) W6 x 15 x 8'-0" LG.
D	1	Support Bracket (B1) L4 x 2 x 4" LG.
E	1	Post Breaker (A2) Welded TS2 x 2 x 1/4"
F	1	Cable Anchor Assembly
G	1	Cable Anchor Bearing Plate
H	1	End Tube Rail (A5) x 8'-0" LG.
J	7	Steel Breakaway Post W6 x 9 x 6'-0" LG.
K	5	Support Bracket w/ Blockout (A9) TS6 x 6 w/ Bent PL.
L	1	Second Rail (A11) x 16'-2 1/2" LG.
M	1	Transition Blockout (A6) x 5'-6" LG.
N	2	Trans. Support Bracket (A10) 3/8" Bent PL. w/ Gusset
P	2	End Section Splice Plate (A3) - Detail Below
Q	2	1" Square Washer (B10) PL 4 x 4 x 1/4"
R	1	Anchor Rail (A13) x 8'-6 13/16" LG.
S	2	Splice Plate (A12) PL 10 x 10 x 3/8" Detail Below
T	1	3/8" GALV. Cable x 20'-0" (A14)
U	6	Tie Plate (C10) PL 11 1/2" x 3 1/2" x 3/8"
V	1	Spacer (D10) (OMIT ON VERTICAL WALL)
HARDWARE		
a	14	3/8" x 7 1/2" Hex Bolt (A449)
b	14	3/8" Hex Nut
c	28	3/8" Washer
d	1	1/4" x 3" Hex Bolt (A449)
e	1	1/4" Hex Nut
f	1	1/4" Washer
g	7	3/8" x 1 1/2" Bolt (A307)
h	7	3/8" Recess Nut
i	8	3/8" x 2" Hex Bolt (A325 or A449)
j	1	3/8" x 8" Hex Bolt (A325 or A449)
k	18	3/8" Hex Nut
m	25	3/8" Washer
n	1	3/8" x 3" Hex Bolt (A325 or A449)
p	4	3/8" x 9" Hex Bolt (A325 or A449)
q	1	1/2" x 5" Hex Bolt (A325 or A449)
r	2	1/2" Hex Nut
s	1	1/2" x 2" Hex Bolt (A307, A325 or A449)
t	2	1" x 10" Hex Bolt (A325 or A449) (Length Varies w/Wall Sect)
u	4	1" Hex Nut (2H Heavy Hex Nut)
v	4	1" Washer Structural Washer
w	2	1/2" Washer
x	2	Cable Tie
y	1	Object Marker

Texas Department of Transportation

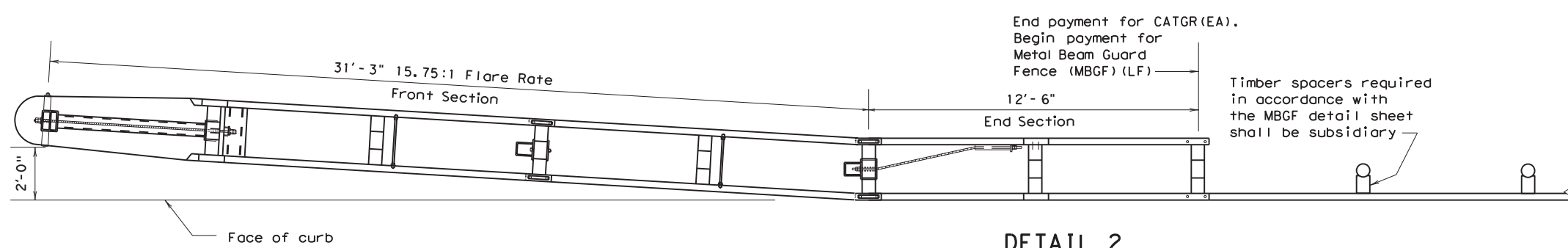
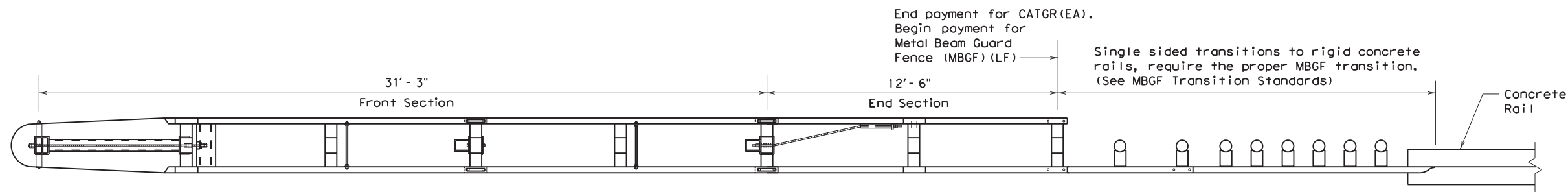
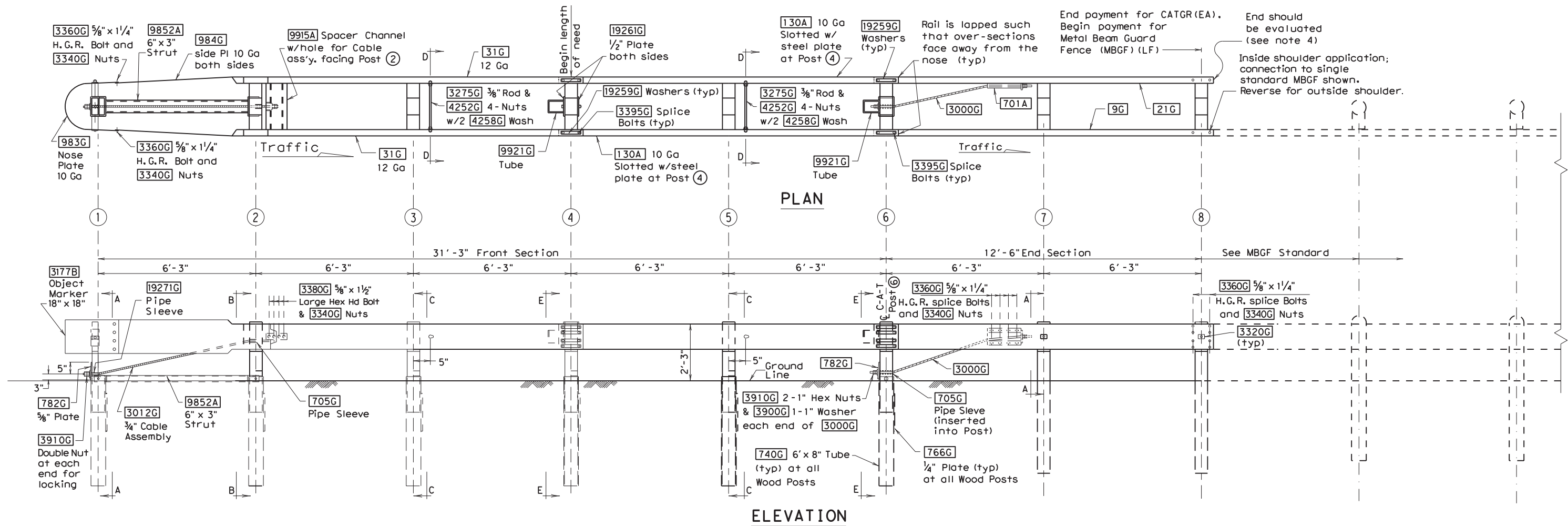
Design Division Standard

ROAD SYSTEMS INC
CRASH CUSHION
(BEAT)
SSCC-16

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REVISIONS	6372	50	OOI	VAR.
REVISED 03, 2016 (VP)	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR		133

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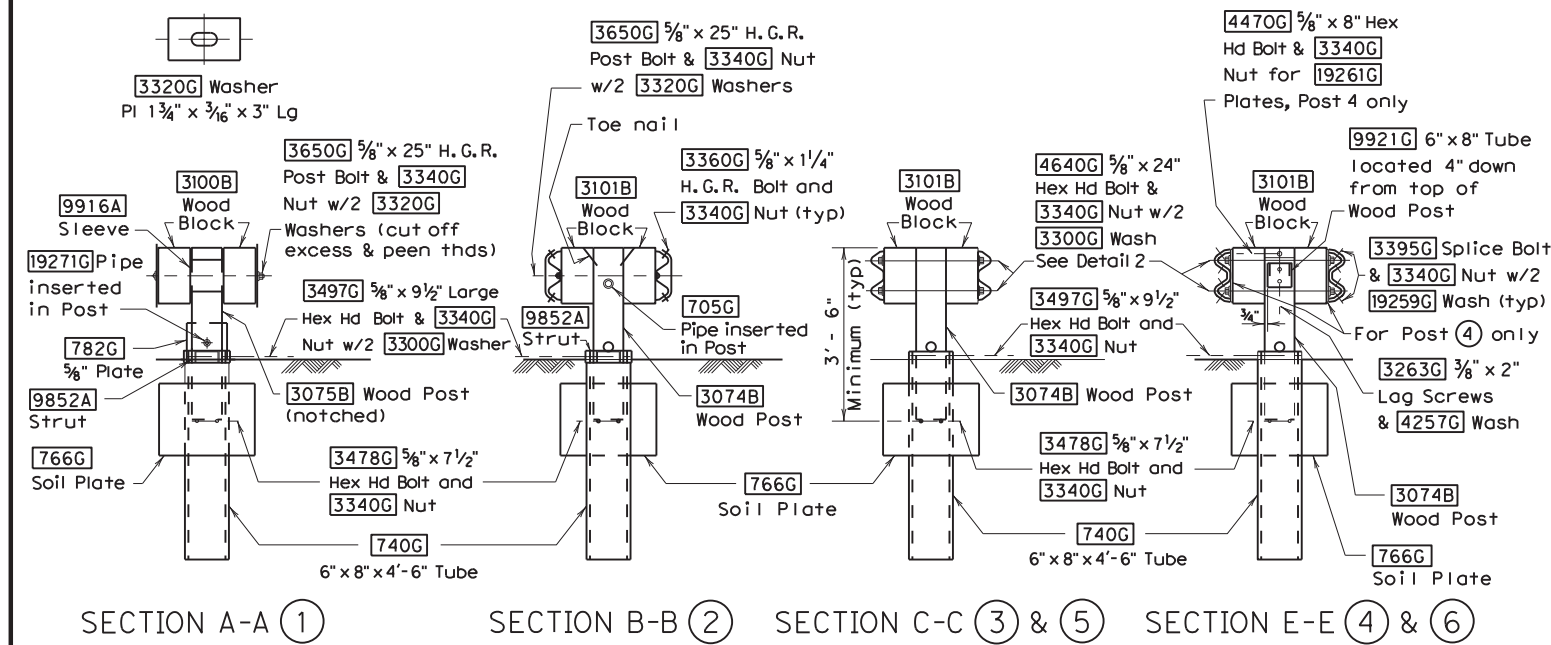
SHEET 1 OF 2

		Design Division Standard	
TRINITY HIGHWAY ENERGY ABSORPTION CRASH CUSHION (GUARDRAIL) CATGR (2) - 17			
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© TxDOT: 1997	CONT: 6372	SECT: 50	JOB: 001
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REVISED 03, 2015 VP	DIST: SAT	COUNTY: BEXAR	SHEET NO.: 136
REVISED 03, 2017 KM			

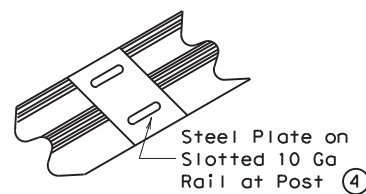
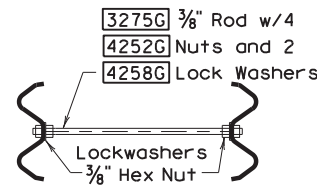
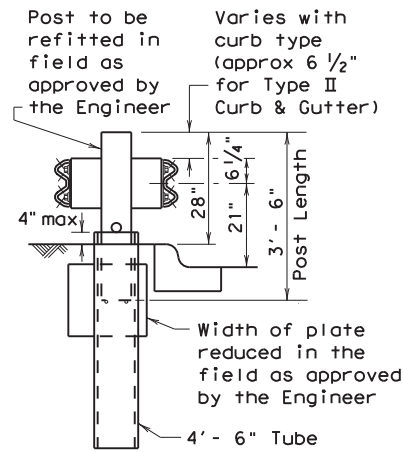
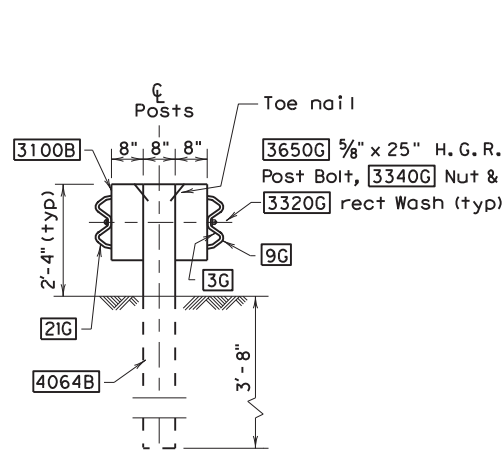
SACRIFICIAL

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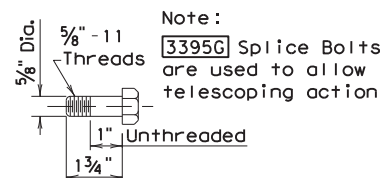
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Note:
There are no Rail to Post attachments for Posts (3), (5), & (6)



DETAIL 1



3395G SPLICE BOLT

CATGR GUARDRAIL TERMINAL (POSTS 1-6) BILL OF MATERIALS

Mfr Code #	QTY	DESCRIPTION
983G	1	Nose Plate x 10 GA
984G	2	Side Plate x 10 GA
31G	2	"W" Beam 12 GA x 13'-6 1/2"
130A	2	"W" Beam 10 GA x 13'-6 1/2"
9852A	1	Channel Strut x 6'-6"
740G	6	Steel Foundation Tube
766G	6	Soil Plate 18" x 24"
3075B	1	Wood Post 5 1/2" x 7 1/2" (Notched) (Post 1)
3074B	5	Wood Post 5 1/2" x 7 1/2" (Post 2 - 6)
3100B	2	Wood Block 5 1/2" x 7 1/2" (Post 1)
3101B	10	Wood Block 5 1/2" x 7 1/2" (Post 2 - 6)
9916A	1	Sleeve (Post 1)
9915A	1	Spacer Channel (Post 2)
9921G	2	Steel Tube (Post 4 & 6)
19271G	1	Pipe Sleeve (Post 1)
705G	1	Pipe Sleeve (Post 2)
19261G	2	Post Plate (Post 4)
782G	1	Bearing Plate (Post 1)
3012G	1	Cable Assembly (From Post 1 to 2)
3275G	2	3/8" Restraint Rod (Post 3 & 5)
19259G	32	Plate Washer (Post 4 & 6)

HARDWARE

3263G	4	3/8" x 2" Lg Lag Screw
4252G	8	3/8" Hex Nut
4258G	4	3/8" Lock Washer
4257G	4	3/8" Flat Washer
3320G	4	Rectangular Washer
3395G	32	5/8" x 1 3/4" H.H. Splice Bolt
3650G	2	5/8" x 25" Lg H.G.R. Bolt
4640G	8	5/8" x 24" Lg H.H. Bolt
3478G	13	5/8" x 7 1/2" Lg H.H. Bolt
3380G	8	5/8" x 1 1/2" Lg H.H. Bolt
3360G	16	5/8" x 1 1/4" Lg H.G.R. Bolt
3340G	85	5/8" H.G.R. Nut
3300G	8	5/8" Flat Washer
3497G	6	5/8" x 9 1/2" Lg H.H. Bolt
3910G	4	1" Hex Nut
3900G	2	1" Flat Washer

DELINEATOR

3177B	1	Object Marker (18" x 18") (Cut to fit)
-------	---	--

CATGR GUARDRAIL TERMINAL (POSTS 7-8) BILL OF MATERIALS

Mfr Code #	QTY	DESCRIPTION
4064B	2	Wood Post 5 1/2" x 7 1/2" x 6'
3101B	4	Wood Block 5 1/2" x 7 1/2"
21G	1	"W" Beam Guard Rail (12 Ga)
9G	1	"W" Beam Guard Rail (12 Ga)
701A	1	Bracket
782G	1	Bearing Plate (Post 6)
705G	1	Pipe Sleeve (Post 6)
3000G	1	Cable Assembly (from Post 6 to Rail)
3320G	2	Rectangular Washer

HARDWARE

3360G	24	5/8" x 1 1/4" H.G.R. Splice Bolt
3400G	4	5/8" x 25" H.G.R. Post Bolt
3380G	8	5/8" x 1 1/2" Hex Hd Bolt
3340G	28	5/8" H.G.R. Nut
3300G	8	5/8" Washer
3910G	4	1" Hex Nut
3900G	2	1" Washer

GENERAL NOTES

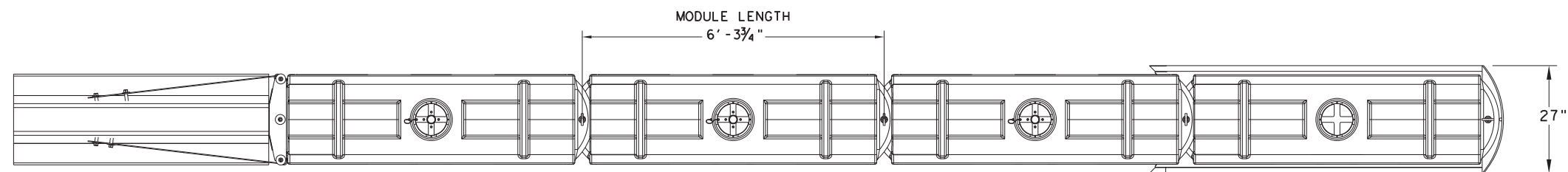
- For specific information regarding installation and technical guidance of the system, contact: Trinity Highway at 1(888)323-6374, 70 W. Madison St. Suite 2350, Chicago, IL 60602
- Crown will be widened to accommodate the CAT system. The crown should extend at least 3 feet beyond the inside face of rail. The ground line at posts should be an extension of the roadway surface crown.
- All bolts, nuts, washers, cable assemblies, cable anchors, post tubes, backup plates, and soil plates shall be galvanized.
- The exposed end segment of an "End Section" should be evaluated as a potential obstacle in the determination of the need of MGBF for the opposing direction of traffic.
- If a "single sided" transition is required, (as shown in Detail 3) the proper MGBF transition standards are required.
- For placement at curb sections, the height from gutter pan to post bolt will be 21", and the front section shall be flared (See Detail 2).
- The wood blockouts shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.
- Either 6" x 8" or 5 1/2" x 7 1/2" wood blocks may be used at posts 1 through 8 as supplied by the manufacturer.
- An object marker shall be installed on the front of the terminal as detailed on the D&M(VIA).

SHEET 2 OF 2

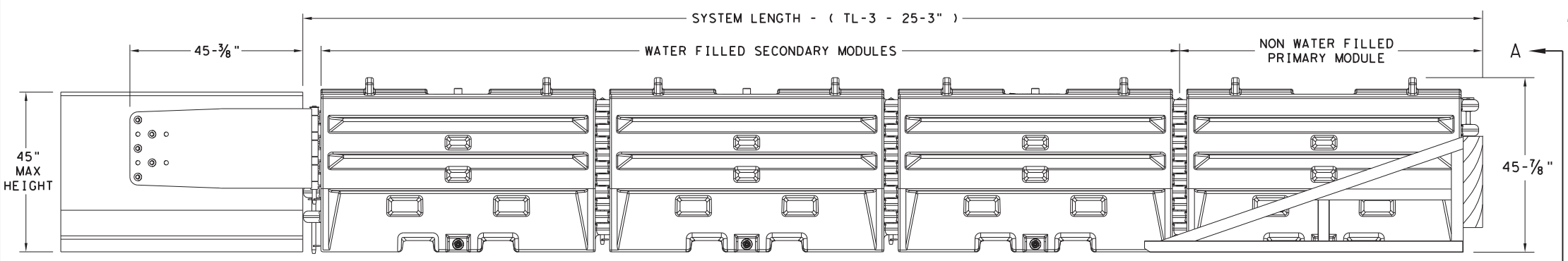
		Design Division Standard	
TRINITY HIGHWAY ENERGY ABSORPTION CRASH CUSHION (GUARDRAIL)			
CATGR (2) - 17			
FILE: catgr17.dgn	DN: TxDOT	CK: KM	DW: KM
© TxDOT: 1997	CONT	SECT	JOB
REVISIONS	6372	50	OOI
REVISED 03, 2016 VP	DIST	COUNTY	SHEET NO.
REVISED 03, 2017 KM	SAT	BEXAR	137

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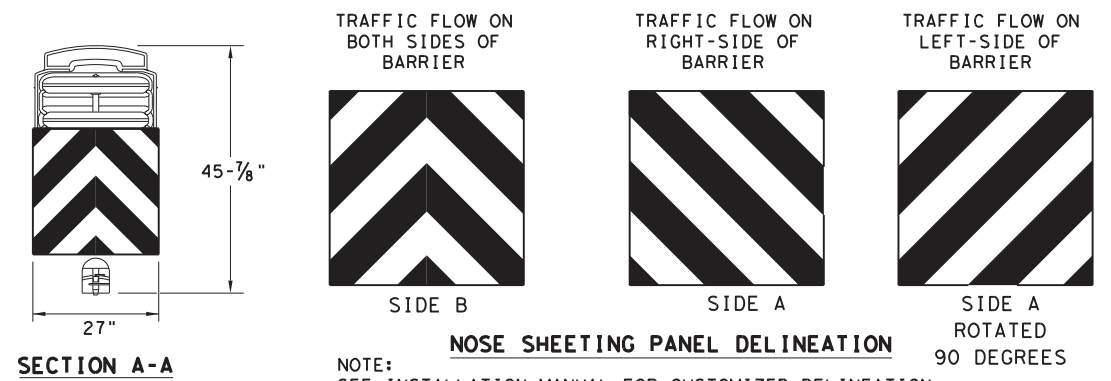
PLAN VIEW



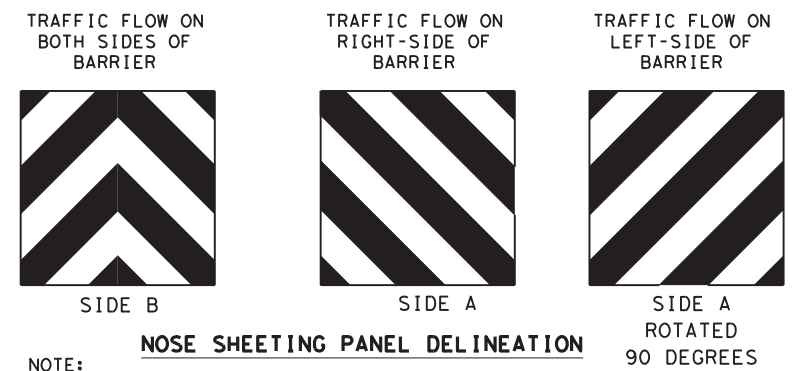
ELEVATION VIEW

GENERAL NOTES

1. REFER TO THE INSTALLATION MANUAL FOR SPECIFIC SYSTEM ASSEMBLY AND MODULE ORIENTATION. FOR ADDITIONAL INFORMATION, CONTACT TRAFFIX, INC. AT (949) 361-5663.
2. THE SLED SYSTEM IS A MASH APPROVED TEST LEVEL 3 (TL-3) CRASH CUSHION APPROVED FOR USE IN TEMPORARY WORK ZONES. THE SLED SYSTEM IS A NON-REDIRECTIVE, GATING CRASH CUSHION THAT DOES NOT NEED TO BE ATTACHED TO THE GROUND AND CAN BE INSTALLED ON CONCRETE, ASPHALT, GRAVEL OR COMPACTED SOIL.
3. MAXIMUM PERMISSIBLE CROSS SLOPE IS 8° (DEGREES) (14%).
4. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
5. THE SLED SYSTEM CAN BE ATTACHED TO:
 - CONCRETE BARRIER, TEMPORARY OR PERMANENT, 45" MAXIMUM HEIGHT
 - STEEL BARRIER
 - PLASTIC BARRIER
 - CONCRETE BRIDGE ABUTMENTS
 - W-BEAM GUARD RAIL
 - THRIE BEAM GUARD RAIL



SECTION A-A

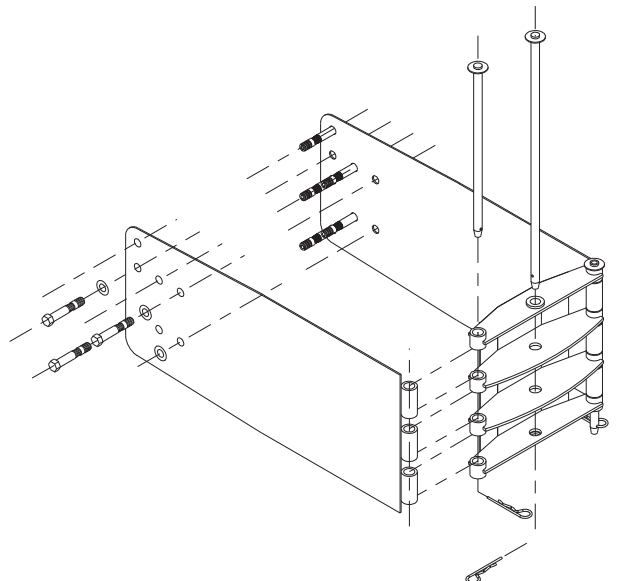


NOSE SHEETING PANEL DELINEATION

NOTE: SEE INSTALLATION MANUAL FOR CUSTOMIZED DELINEATION NOSE SHEETING FOR DECAL PLACEMENT.

TEST LEVEL	NUMBER OF SECONDARY MODULES	SYSTEM LENGTH
TL-3	3	25' 3"

BILL OF MATERIAL		
PART NUMBER	DESCRIPTION	QTY: TL-3
45131	TRANSITION FRAME, GALVANIZED	1
45150	TRANSITION PANEL, GALVANIZED	2
45147-CP	TRANSITION SHORT DROP PIN W/ KEEPER PIN, GALVANIZED	2
45148-CP	TRANSITION LONG DROP PIN W/ KEEPER PIN, GALVANIZED	1
45050	ANCHOR BOLTS	9
12060	WASHER, 3/4" ID X 2" OD	9
45044-Y	SLED YELLOW WATER FILLED MODULE	3
45044-YH	SLED YELLOW "NO FILL" MODULE	1
45044-S	CIS (CONTAINMENT IMPACT SLED), GALVANIZED	1
45043-CP	T-PIN W/ KEEPER PIN	4
18009-B-I	FILL CAP W/ "DRIVE BY" FLOAT INDICATOR	3
45033-RC-B	DRAIN PLUG	3
45032-DPT	DRAIN PLUG REMOVAL TOOL	1



SLED TRANSITION COMPONENTS FOR ATTACHMENT TO CMB

NOTE: SEE MANUFACTURER'S INSTALLATION MANUAL FOR FURTHER DETAILS.

TRANSITION OPTIONS
SLED TRANSITION TO CONCRETE TRAFFIC BARRIER (TEMPORARY OR PERMANENT)
SLED TRANSITION TO STEEL TRAFFIC BARRIER (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO PLASTIC TRAFFIC BARRIER (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO W-BEAM OR THRIE BEAM GUARD RAIL (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO CONCRETE BRIDGE ABUTMENT

NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE SLED, IT IS NOT INTENDED TO REPLACE THE INSTALLATION INSTRUCTIONS MANUAL.

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Design Division Standard

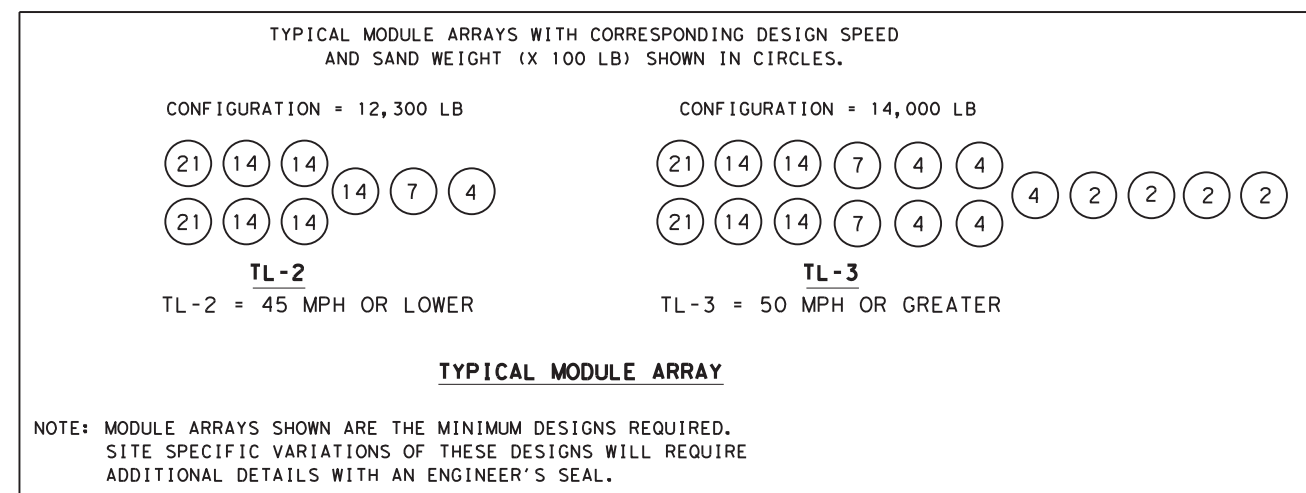
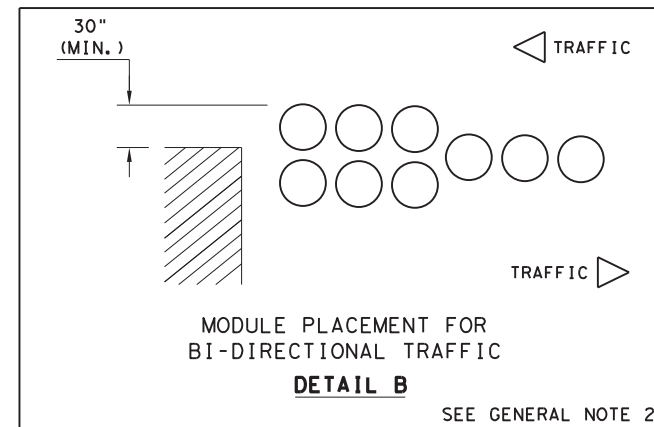
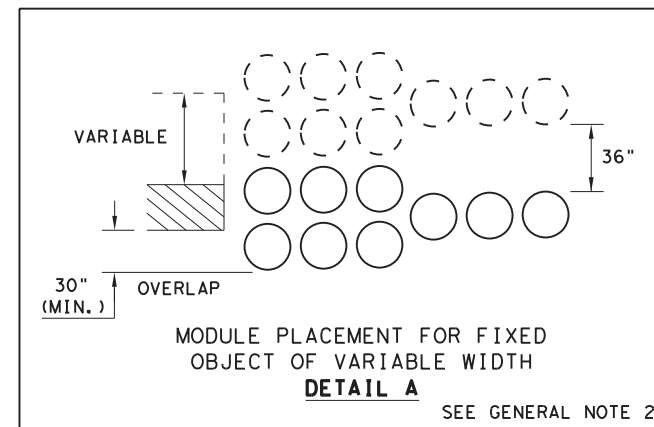
SLED CRASH CUSHION TL-3 MASH COMPLIANT (TEMPORARY, WORK ZONE) SLED-19

FILE: sled19.dgn	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: DECEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
DIST	COUNTY		SHEET NO.	
SAT	BEXAR		138	

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DATE:
FILE:

SITE CONDITIONS AND PLACEMENT GUIDELINES		
CONDITION	RECOMMENDATION	ILLUSTRATION
1. ANGLE OF ARRAY IN RELATION TO CENTER LINE OF OBSTACLE	NOT RECOMMENDED FOR MORE THAN 10°	
2. MODULE SPACING: MODULE TO FIXED OBJECT MODULE TO MODULE	12" TO 24" SEE DIAGRAM	
3. BI-DIRECTIONAL TRAFFIC	OFFSET ARRAY TO AVOID REAR CORNER MODULE SNAGGING, POTENTIAL BY TRAFFIC IN THE UPSTREAM DIRECTION OF FLOW.	SEE (DETAIL B) SHOWING BI-DIRECTIONAL TRAFFIC
4. "COFFIN" CORNER	SHIELD 30" MINIMUM OUTSIDE OF FIXED OBJECT	
5. SLOPING SITES: LATERAL AND LONGITUDINAL FOR MORE INFORMATION READ GENERAL NOTE: 7	1:10 MAXIMUM (V: H:)	
6. CURB: RAISED ISLAND:	NO MORE THAN 4" HIGH (REMOVE IF POSSIBLE)	
7. FOUNDATION PADS:	FLAT SURFACE: CONCRETE OR ASPHALT	
8. MAINTENANCE:	KEEP SITE CLEAR OF TRASH, ROAD DEBRIS, ETC	
9. SAND DENSITIES	100 LBS / CF	
10. VANDALISM	CHECK PERIODICALLY FOR DAMAGES, GRAFFITI.	



GENERAL NOTES

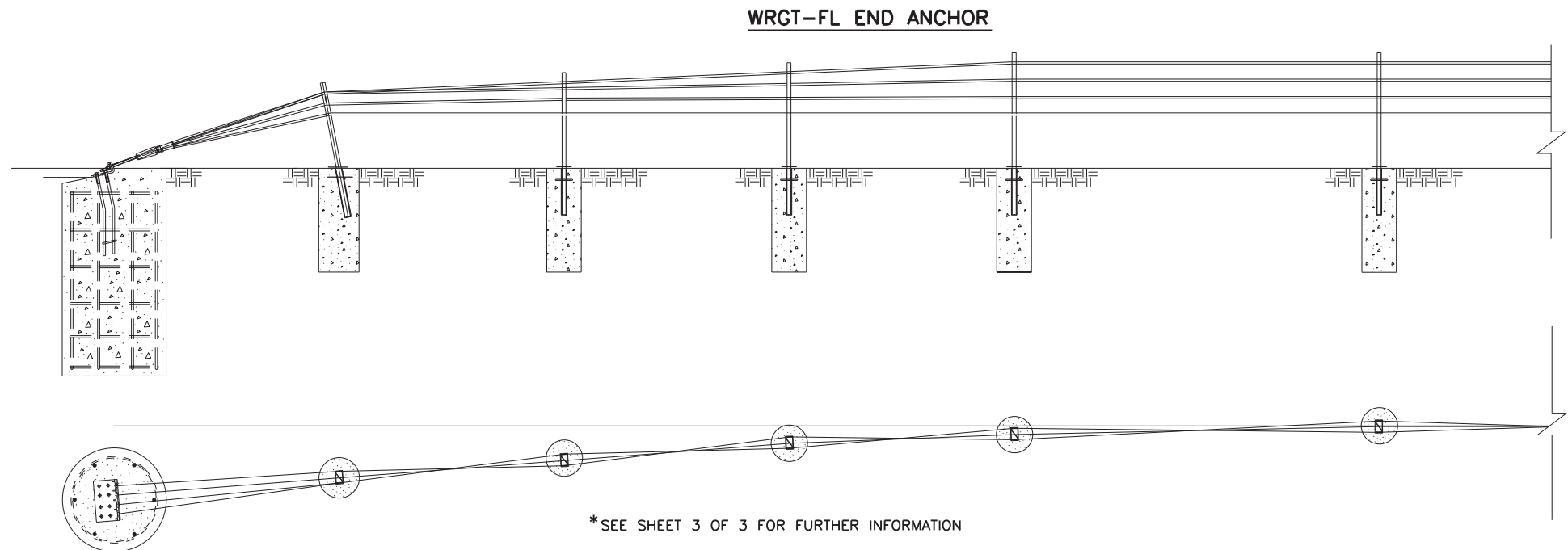
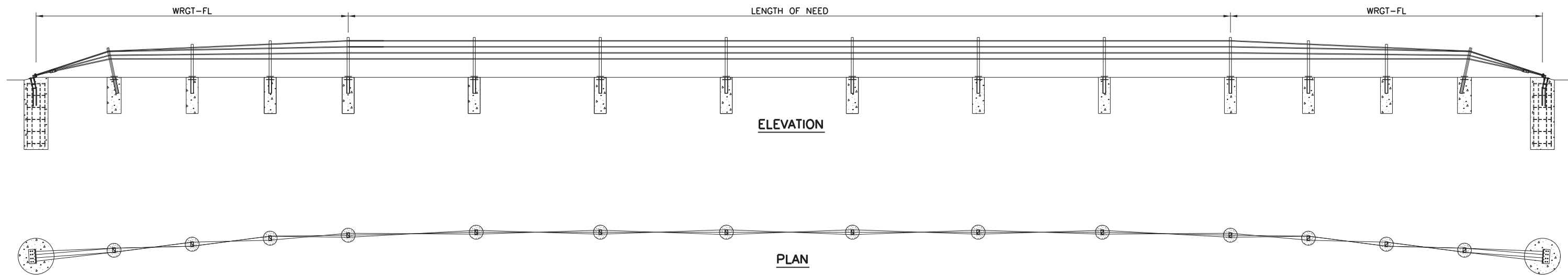
- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE AVAILABLE MASH COMPLIANT SYSTEMS, CONTACT: Traffix DEVICES, INC. AT (949) 361-5663 OR PSS INNOVATIONS, INC. AT (800) 662-6338.
- REAR MODULES SHOULD OVERLAP THE HAZARDOUS FIXED OBJECT IN WIDTH ON EACH SIDE BY A MINIMUM OF 30 INCHES. SEE DETAILS A, B.
- BARRIERS CAN BE INSTALLED AT ANY DISTANCE FROM THE SHOULDER, AT ROADSIDE AND MEDIAN LOCATIONS FROM ZERO FT UP TO 30 FT, DEPENDING UPON THE LOCATION OF THE HAZARDOUS FIXED OBJECT.
- ANGLING THE BARRIER TOWARDS ON-COMING TRAFFIC IS SUGGESTED, 3-DEGREES UP TO 10-DEGREES DEPENDING ON SPACE AVAILABLE.
- WHENEVER POSSIBLE, CURBS 4 INCHES AND HIGHER SHOULD BE REMOVED FROM THE HAZARDOUS SITES. HOWEVER, WHEN REMOVAL IS NOT POSSIBLE, MODULES CAN BE SEPARATED ALONG THE BARRIER AXIS TO FIT THE SITUATION.
- LONGITUDINAL SPACING OF MODULES MAY BE INCREASED WHERE SPACE PERMITS, E.G., 2 FT UP TO 3 FT SPACING OF SELECTED MODULES MAY PERMIT THE DESIGNER TO USE ALL THE SPACE ALLOCATED FOR AN ENERGY-ABSORBING BARRIER.
- THE ENTIRE AREA OF THE CRASH CUSHION INSTALLATION AND APPROACHES SHALL BE GRADED SO THAT THE MAXIMUM SLOPE DOES NOT EXCEED 1V:10H VERTICALLY OR HORIZONTALLY IN ANY DIRECTION.
- WHERE REQUIRED, SUPPORT PADS, CONCRETE, ASPHALT, ETC, WILL BE MEASURED AND PAID FOR IN ACCORDANCE WITH PERTINENT BID ITEMS.
- Traffix DEVICES AND PSS INNOVATIONS SAND BARREL SYSTEMS HAVE BEEN ASSESSED AS MASH COMPLIANT.

SACRIFICIAL

		Design Division Standard	
VEHICLE IMPACT ATTENUATOR SAND FILLED PLASTIC MODULES MASH TL-3 & TL-2 VIA (SFPM) - 19			
FILE: v1asfpm19.dgn	DN: TxDOT	CK: KM	DW: VP
© TxDOT: DECEMBER 2019	CONT: 6372	SECT: 50	JOB: 001
REVISIONS	DIST: COUNTY		SHEET NO.
	SAT BEXAR		139

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ROPE TENSION TABLE		
ROPE TEMP (°F)	TENSION (LBS)	TENSION (kN)
0	5700	25.4
5	5550	24.7
10	5400	24.0
15	5250	23.4
20	5100	22.7
25	4950	22.0
30	4800	21.4
35	4650	20.74
40	4500	20.0
45	4350	19.3
50	4200	18.7
55	4050	18.0
60	3900	17.3
65	3750	16.7
70	3600	16.0
75	3450	15.3
80	3300	14.7
85	3150	14.0
90	3000	13.3
95	2850	12.7
100	2700	12.0
105	2550	11.3
110	2400	10.7
115	2250	10.0
120	2100	9.3
125	1950	8.7
130	1800	8.0
135	1650	7.3
140	1500	6.7

GENERAL NOTES:

- BRIFEN DRAWINGS, SPECIFICATIONS, AND PRODUCT MANUAL SHOULD BE REVIEWED PRIOR TO STARTING AN INSTALLATION. FOR ADDITIONAL INFORMATION OR QUESTIONS, CONTACT BRIFEN USA, INC. AT 1-866-427-4336.
- THE BRIFEN WRSF HAS BEEN SUCCESSFULLY TESTED TO NCHRP 350 TL-4 CONDITIONS ON SLOPES 6:1 OR FLATTER AND NCHRP 350 TL-3 CONDITIONS ON SLOPES 4:1 TO 6:1.
- THE POST SPACING SHALL BE DETERMINED BY THE SPECIFYING AGENCY. POST SPACING MAY BE DECREASED TO AVOID OBSTRUCTIONS OR UTILITIES. IN NO EVENT SHALL THE POST SPACING EXCEED 21'-0".
- BRIFEN WRSF SHALL BE PLACED ON A SMOOTH SURFACE, WITHOUT HUMPS, DROP-OFFS, HOLES, ETC THAT WOULD INTERFERE WITH THE STABILITY OF THE ERRANT VEHICLE. GRADING, FILL AND COMPACT MAY BE REQUIRED TO ASSURE THAT ROPES ARE INSTALLED AT THE DESIGN HEIGHT.
- THE WRGT-FL END ANCHOR HAS BEEN SUCCESSFULLY TESTED TO NCHRP 350 TL-3 CONDITIONS. THE LENGTH OF NEED BEGINS 31'-0" FROM THE END ANCHOR. POSTS A THROUGH POST B3, SPACED 6'-6" APART, HAVE WEAKENED CUTS AT THE GROUND THAT SHALL FACE THE ANCHOR.
- ANCHOR AND LINE POST DIMENSIONS AND STEEL REINFORCEMENT WILL BE DETERMINED ON PROJECT SPECIFIC SOIL CLASSIFICATION, PROPERTIES AND TEMPERATURE EXTREMES. CONTACT BRIFEN USA, INC. FOR ADDITIONAL INFORMATION.
- ALL REINFORCEMENT AND CONCRETE FOR THE ANCHORS AND LINE POSTS PROVIDED BY OTHERS.
- REINFORCEMENT AND CONCRETE PROPERTIES SHALL MEET AGENCY SPECIFICATIONS.
- FOR PLACEMENT NEAR GUARDRAIL OR OTHER OBSTACLES CONTACT BRIFEN USA, INC. FOR ADDITIONAL DRAWINGS AND SUPPORT.
- TAPER RATES FOR THE BRIFEN WRSF ARE AS FOLLOWS:
HORIZONTAL: 25:1 MAXIMUM, 50:1 PREFERABLE
VERTICAL: 25:1 MAXIMUM, 50:1 PREFERABLE

*ROPE TENSION: ± 20% AFTER 2-WEEK INTERVAL

SHEET 1 OF 3



**BRIFEN
WIRE ROPE SAFETY FENCE
(TL-4)**

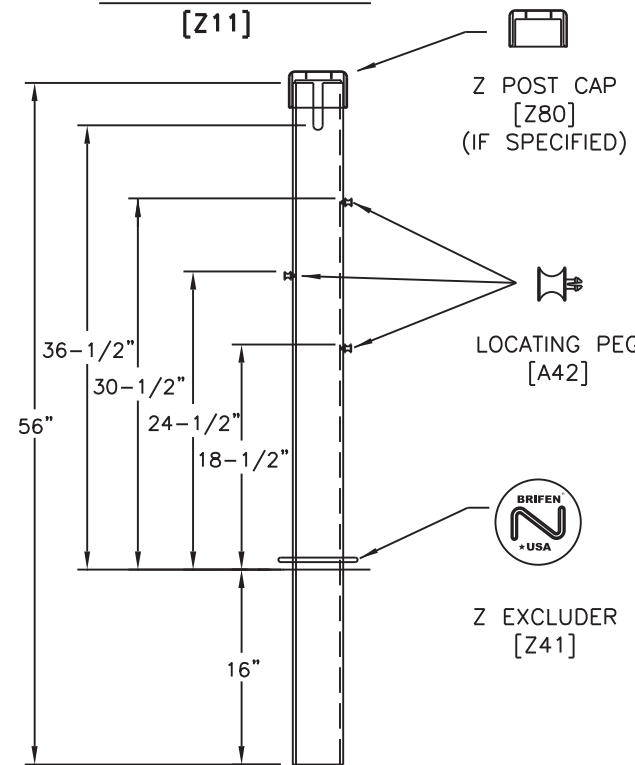
BRIFEN(TL4) - 14

FILE: brifent1414.dgn	DN: TxDOT	CK: RM	DW: VP	CK:
© TxDOT: MARCH 2014	CONT: 6372	SECT: 50	JOB: 001	HIGHWAY: VAR
REVISIONS		DIST: SAT	COUNTY: BEXAR	SHEET NO.: 140

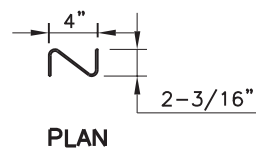
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DATE: FILE:

LINE POST ASSEMBLY [Z11]



ELEVATION

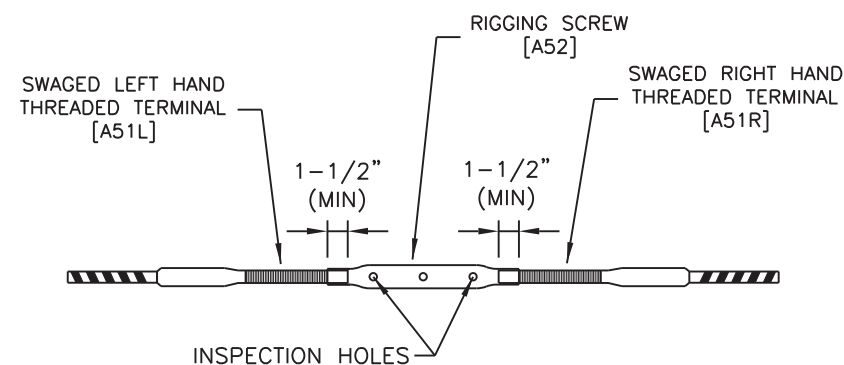


PLAN

NOTES SPECIFIC TO LINE POST ASSEMBLY

1. ROPE HEIGHTS SHALL BE $\pm 1"$ TO GROUND LINE.
2. POST SHALL BE $\pm 4"$ FROM VERTICAL PLUMB.
3. POST CAPS SHALL BE USED IF SPECIFIED.
4. REFLECTORS SHALL BE SPACED ACCORDING TO AGENCY SPECIFICATIONS.
5. REFLECTORS CAN BE PLACED ON THE POST CAP OR POST.

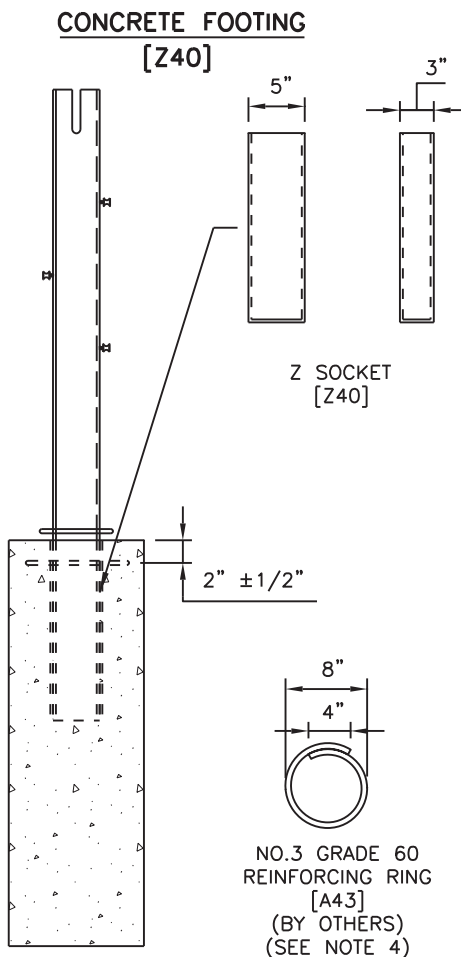
ROPE CONNECTION DETAIL



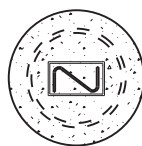
NOTES SPECIFIC TO ROPE CONNECTION DETAIL

1. THE WIRE ROPE TERMINALS SHALL BE THREADED A MINIMUM OF 1-1/2" INTO RIGGING SCREW.
2. AFTER FINAL TENSIONING, THE TERMINALS SHALL BE VISIBLE IN THE INSPECTION HOLES.

SOCKET ASSEMBLY



ELEVATION

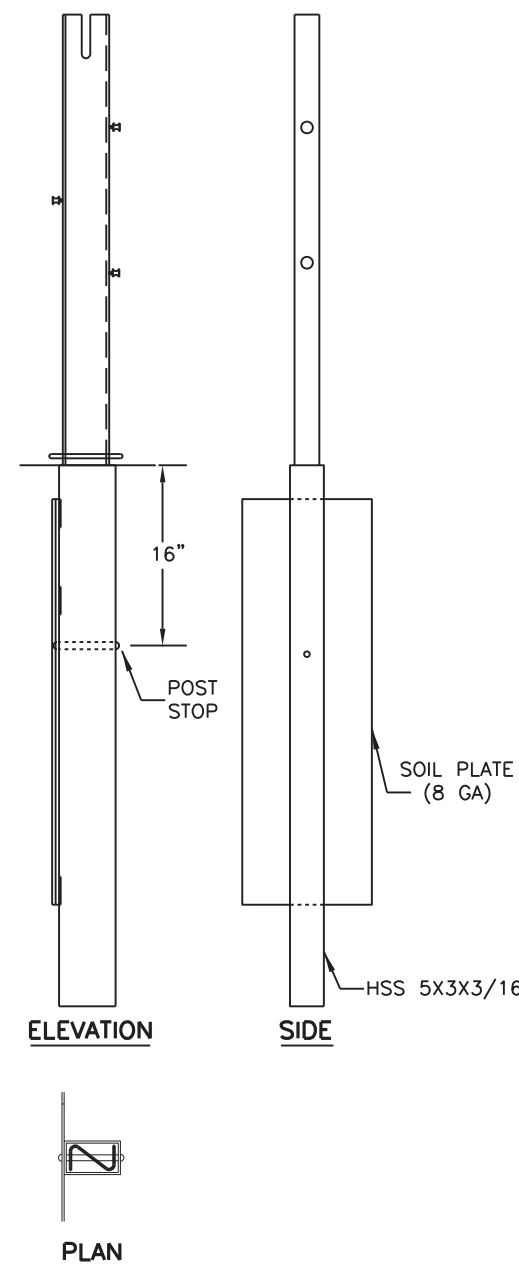


PLAN

NOTES SPECIFIC TO CONCRETE FOOTING

1. SIZE OF FOOTING WILL BE DETERMINED BY SOIL CONDITIONS, FOUNDATION TYPE AND PROJECT CONDITIONS.
2. CONCRETE BASED ON AGENCY SPECIFICATIONS.
3. CONCRETE BY OTHERS.
4. REINFORCING RING (BY OTHERS) WILL BE USED ACCORDING TO FOUNDATION SIZE AND TYPE. THE REINFORCING RING MAY BE OMITTED IF THE FOOTING IS PLACED IN A CONTINUOUS CONCRETE MOW STRIP.
5. FOOTING SHALL BE FLUSH WITH THE GROUND LINE, TO A MAXIMUM OF 1 INCH BELOW OR ABOVE GROUND LINE.
6. SOCKET SHALL BE $\pm 2^\circ$ OF VERTICAL PLUMB.

DRIVE SOCKET [Z44]



ELEVATION

SIDE

PLAN

NOTES SPECIFIC TO DRIVE SOCKETS

1. SIZE OF SOIL PLATE WILL BE DETERMINED BY SOIL CONDITIONS AND PROJECT CONDITIONS.
2. THE SOIL PLATE SHALL BE PARALLEL TO ROADWAY AND CAN FACE TOWARD OR AWAY FROM THE TRAVEL LANE.
3. FOOTING SHALL BE FLUSH WITH THE GROUND LINE, TO A MAXIMUM OF 1 INCH BELOW OR ABOVE GROUND LINE.
4. SOCKET SHALL BE $\pm 2^\circ$ OF VERTICAL PLUMB.
5. SOCKETS SHALL BE DRIVEN IN A MANNER TO NOT DISTORT OR DESTROY THE TOP OF SOCKET TO A DEGREE THAT PLACES THE SOCKET OR LINE POST OUT OF CONSTRUCTION TOLERANCES.

GENERAL NOTES:

1. BRIFEN DRAWINGS, SPECIFICATIONS, AND PRODUCT MANUAL SHOULD BE REVIEWED PRIOR TO STARTING AN INSTALLATION. FOR ADDITIONAL INFORMATION OR QUESTIONS, CONTACT BRIFEN USA, INC. 1-866-427-4336.
2. THE BRIFEN WRSF HAS BEEN SUCCESSFULLY TESTED TO NCHRP 350 TL-4 CONDITIONS ON SLOPES 6:1 OR FLATTER AND NCHRP 350 TL-3 CONDITIONS ON SLOPES 4:1 TO 6:1.
3. THE POST SPACING SHALL BE DETERMINED BY THE SPECIFYING AGENCY. POST SPACING MAY BE DECREASED TO AVOID OBSTRUCTIONS OR UTILITIES. IN NO EVENT SHALL THE POST SPACING EXCEED 21'-0".
4. BRIFEN WRSF SHALL BE PLACED ON A SMOOTH SURFACE, WITHOUT HUMPS, DROP-OFFS, HOLES, ETC THAT WOULD INTERFERE WITH THE STABILITY OF THE ERRANT VEHICLE. GRADING, FILL AND COMPACTION MAY BE REQUIRED TO ASSURE THAT ROPES ARE INSTALLED AT THE DESIGN HEIGHT.

SHEET 2 OF 3



BRIFEN
WIRE ROPE SAFETY FENCE
(TL-4)

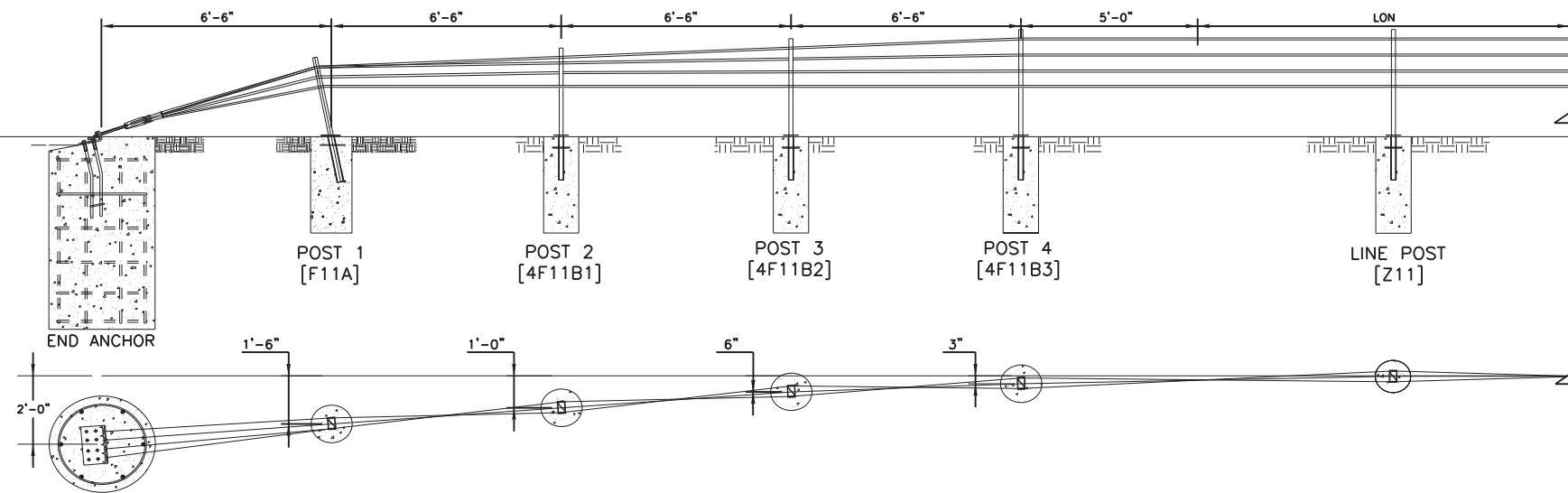
BRIFEN(TL4) - 14

FILE: brifent1414.dgn	DN: TxDOT	CK: RM	DW: VP	CK:
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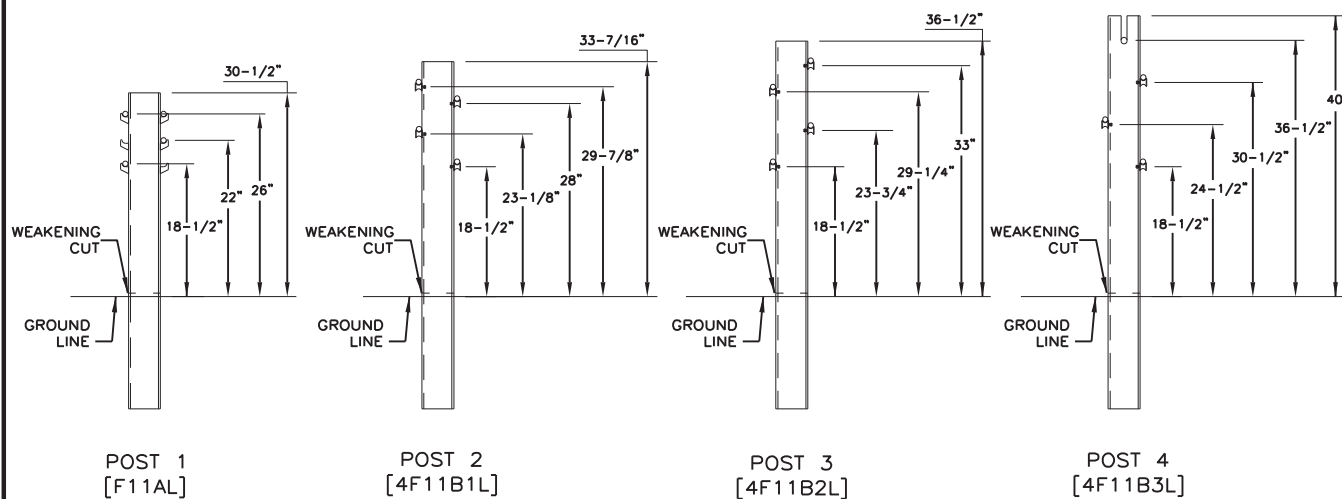
WRGT-FL END ANCHOR LAYOUT



GENERAL NOTES:

1. BRIFEN DRAWINGS, SPECIFICATIONS, AND PRODUCT MANUAL SHOULD BE REVIEWED PRIOR TO STARTING AN INSTALLATION. FOR ADDITIONAL INFORMATION OR QUESTIONS, CONTACT BRIFEN USA, INC. AT 1-866-427-4336.
2. THE WRGT-FL END ANCHOR HAS BEEN SUCCESSFULLY TESTED TO NCHRP 350 TL-3 CONDITIONS. THE LENGTH OF NEED BEGINS 31'-0" FROM THE END ANCHOR. POSTS A THROUGH POST B3, SPACED 6'-6" APART, HAVE WEAKENED CUTS AT THE GROUND THAT SHALL FACE THE ANCHOR.
3. ANCHOR AND LINE POST DIMENSIONS AND STEEL REINFORCEMENT WILL BE DETERMINED ON PROJECT SPECIFIC SOIL CLASSIFICATION, PROPERTIES AND TEMPERATURE EXTREMES. CONTACT BRIFEN USA, INC. FOR ADDITIONAL INFORMATION.
4. ALL REINFORCEMENT AND CONCRETE FOR THE ANCHORS AND LINE POSTS PROVIDED BY OTHERS.
5. REINFORCEMENT AND CONCRETE PROPERTIES SHALL MEET AGENCY SPECIFICATIONS.
6. FOR PLACEMENT NEAR GUARDRAIL OR OTHER OBSTACLES CONTACT BRIFEN USA, INC. FOR ADDITIONAL DRAWINGS AND SUPPORT.

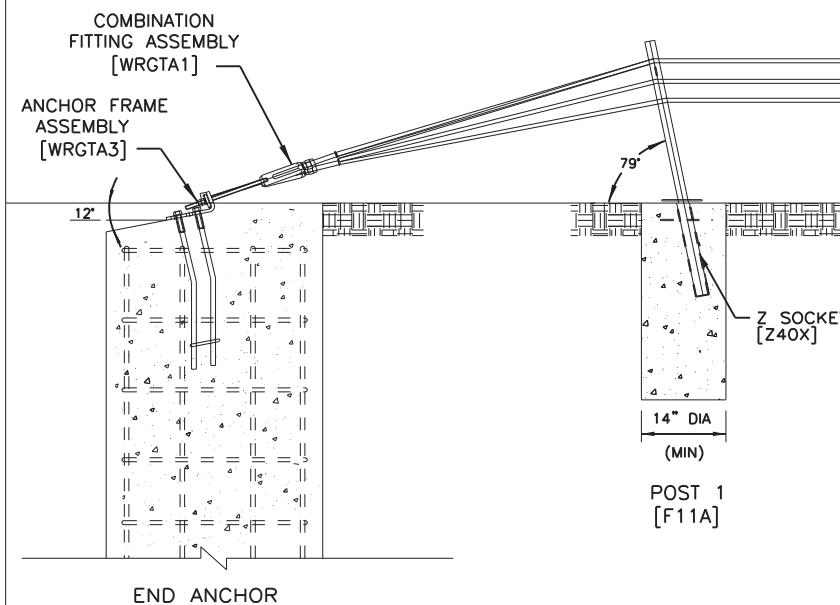
WRGT-FL POST DETAILS



NOTES SPECIFIC TO WRGT-FL POST DETAIL

1. ROPE HEIGHTS SHALL BE $\pm 1"$ TO GROUND LINE.
2. POST SHALL BE $\pm 4"$ FROM VERTICAL PLUMB.
3. POST CAPS SHALL BE USED IF SPECIFIED.
4. REFLECTORS SHALL BE SPACED ACCORDING TO AGENCY SPECIFICATIONS.
5. REFLECTORS CAN BE PLACED ON THE POST CAP OR POST.
6. Z EXCLUDER (Z41) SHALL BE USED.
7. POST A & SOCKET SHALL BE PLACED $79^\circ (\pm 4^\circ)$ TOWARD END ANCHOR FROM THE HORIZONTAL PLANE.
8. POST A SOCKET SHALL BE PLACED IN 14" (MIN) CONCRETE FOUNDATION. DEPTH TO BE DETERMINED FROM SOIL CONDITIONS AND PROJECT CONDITIONS.
9. FOUNDATIONS FOR POST 2 THRU 4 SHALL BE THE SAME AS THE LINE POST ASSEMBLY'S FOR THE PROJECT.
10. WEAKENED CUTS SHALL FACE END ANCHOR.

END ANCHOR DETAILS

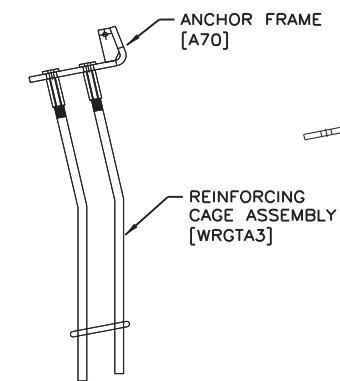


NOTES SPECIFIC TO END ANCHOR DETAIL

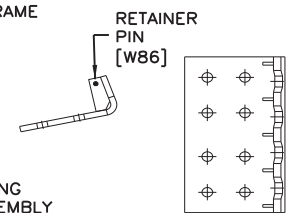
1. THE END ANCHOR ASSEMBLY SHALL BE PLACED 12" (+3", -1") BELOW HORIZONTAL PLANE.
2. POST 1 & SOCKET SHALL BE PLACED $79^\circ (\pm 4^\circ)$ TOWARD END ANCHOR FROM THE HORIZONTAL PLANE.
3. POST 1 SOCKET SHALL BE PLACED IN 14" (MIN) CONCRETE FOUNDATION. DEPTH TO BE DETERMINED FROM SOIL CONDITIONS AND PROJECT CONDITIONS.

END ANCHOR COMPONENTS

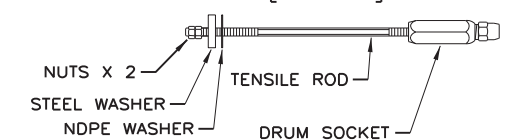
ANCHOR FRAME ASSEMBLY



ANCHOR FRAME [A70]



COMBINATION FITTING [WRGTA1]



SHEET 3 OF 3



Design
Division
Standard

BRIFEN WIRE ROPE SAFETY FENCE (TL-4)

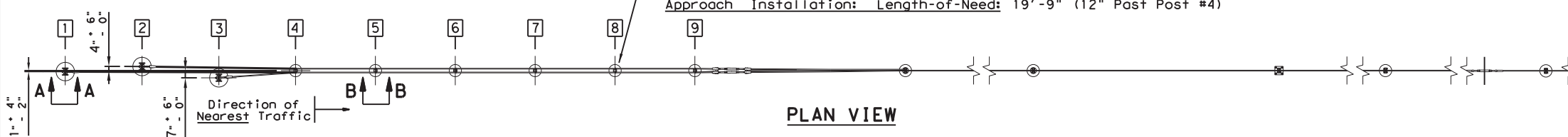
BRIFEN(TL4) - 14

FILE: brifent1414.dgn	DN: TxDOT	CK: RM	DW: VP	CK:
© TxDOT: MARCH 2014	CONT: 6372	SECT: 50	JOB: 001	HIGHWAY: VAR.
REVISIONS	DIST: SAT	COUNTY: BEXAR	SHEET NO. 142	

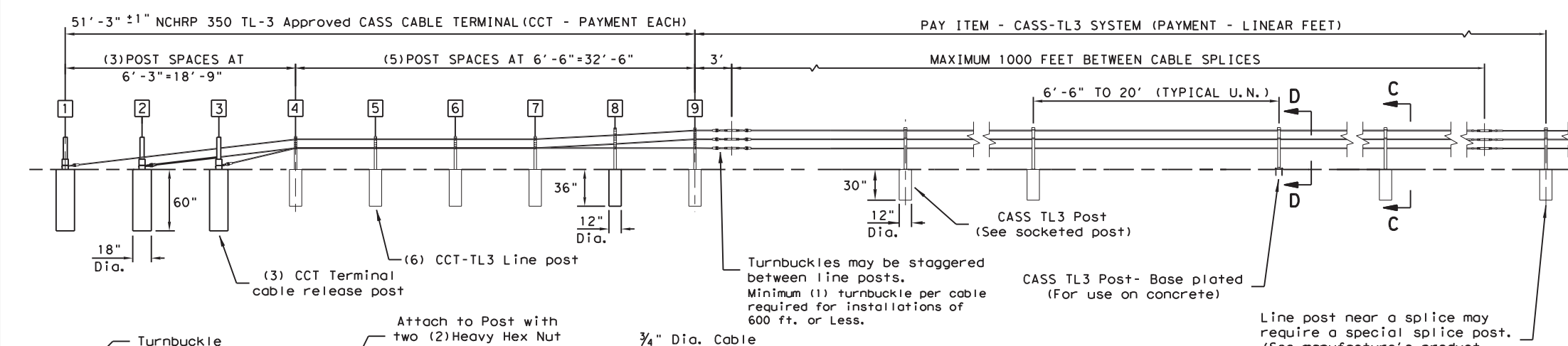
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Preferred Installation: Locate post #2 away from nearest traffic. System has been successfully tested with opposite installation.

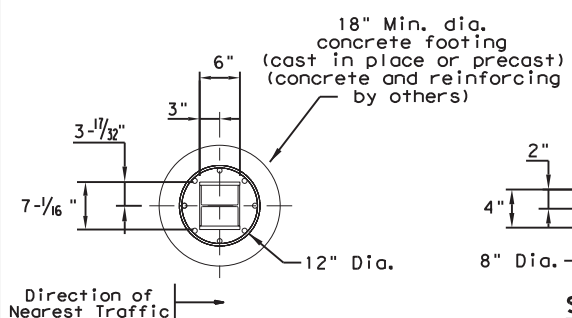
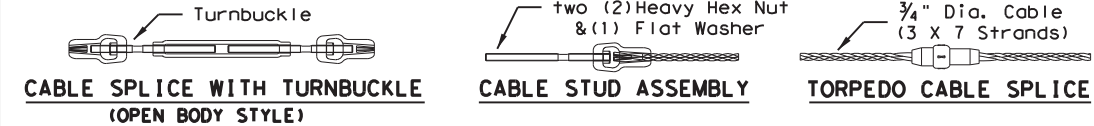
Length-of-Need Cass Cable Terminal (CCT):
Departure Installation: Length-of-Need: 44'-9" (At Post #8)
Approach Installation: Length-of-Need: 19'-9" (12" Past Post #4)



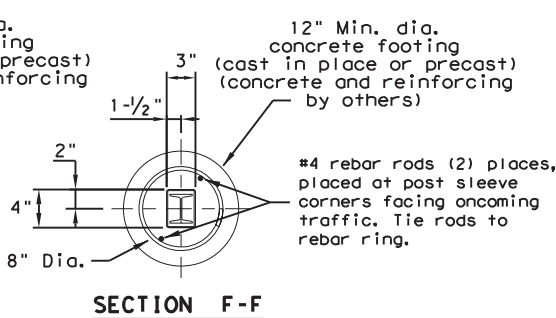
PLAN VIEW



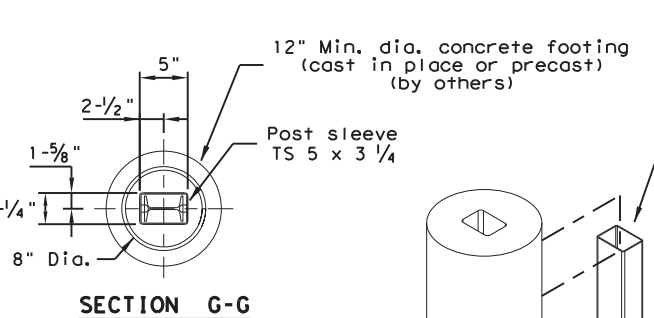
ELEVATION VIEW (TYPICAL LAY-OUT)



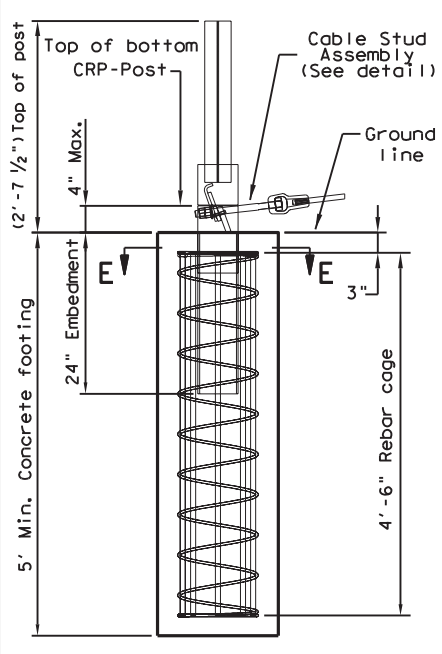
SECTION E-E



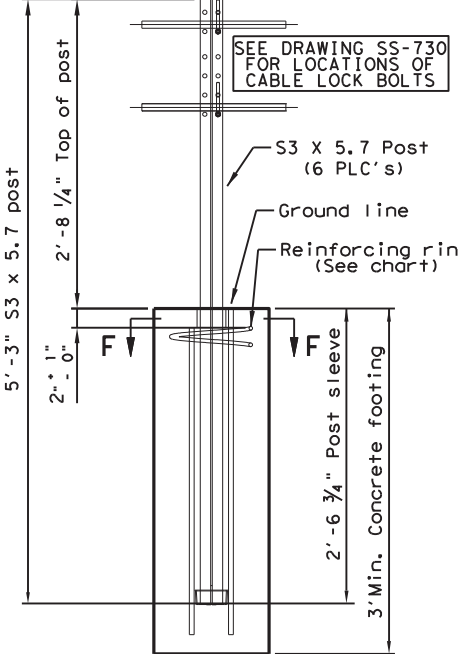
SECTION F-F



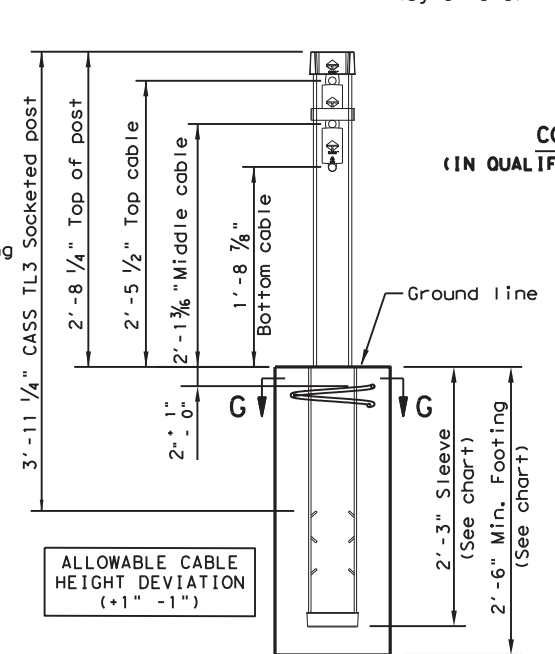
SECTION G-G



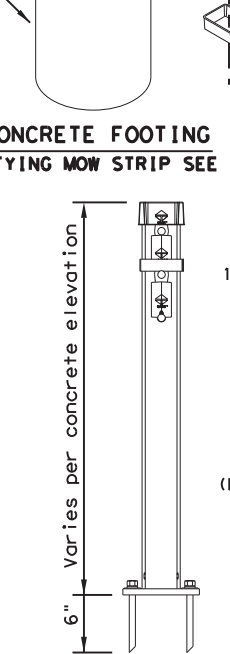
VIEW A-A (CABLE RELEASE POST 1-3)



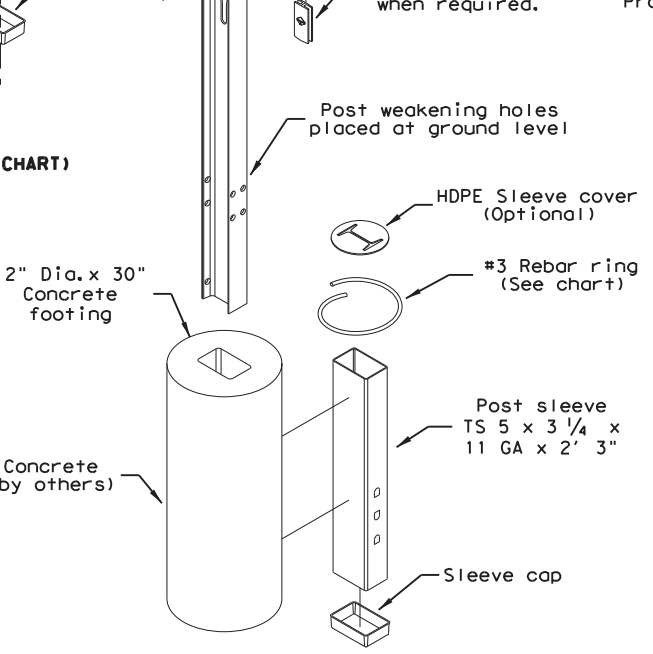
VIEW B-B (TERMINAL LINE POST 4-7)



SECTION C-C (SOCKETED POST)



SECTION D-D (BASE PLATED POST)



STANDARD POST & CONCRETE FOOTING (SOCKETED POST)

- GENERAL NOTES**
- This drawing is a general overview of CASS TL-3 Barrier System. See SS-730 (latest version) for specific details of CASS cable terminal (CCT) and cable safety system (CASS) requirements, proper installation, options and specification.
 - CASS is designed for bi-directional traffic flows and can be installed on either side of the median. Contact Trinity (800-527-6050) or consult the design, installation, or repair manual(s) for additional information.
 - All concrete for CASS footings shall be TxDOT class A. If class A or stronger concrete is utilized for the mowstrip, please see chart below for allowable footing depth and sleeve deviations.
 - All posts shall be socketed unless otherwise specified. All cables shall be pre-stretched unless otherwise specified.
 - For payment see Special Specification "Cable Barrier System".
 - CASS TL-3 shall be installed on shoulders or medians with slopes of 6:1 or flatter without obstructions, depressions, etc. That may significantly affect the stability of an errant vehicle. Grading of site and/or appropriate fill materials may be required. The designer/installer shall "Flatten" or "Round" various topographical inconsistencies that could interfere with the ability of the installer to consistently maintain the design height (in relation to the terrain) of the cables. Please consult manual(s) and/or TxDOT Memo(s) for installations in "Ditch Sections".
 - CASS TL-3 post spacing may be modified to avoid obstacles that conflict with the installation of CASS TL-3 line posts or to reduce deflection on radiuses. No post space can exceed the maximum post TxDOT space limit of 20'. Reducing or increasing post spacing affects deflection. CASS TL-3 may be laterally transferred at a rate not to exceed 30:1.
 - Post foundations may be drilled through existing pavement. Please see line post foundation chart for minimum footing requirements in various applications.
 - For aesthetic purposes Trinity recommends all sleeves, driven posts, and lower cable release posts to be installed reasonably plumb (approximately 1/8" per foot).
 - CASS TL-3 shall be installed in well-drained, compacted, NCHRP Report 350 Standard soil. If soil does not meet this classification, if solid rock/concrete is encountered below grade or if soil is susceptible to severe freeze/thaw cycles, please contact Trinity about alternate footing design(s). Trinity suggests the use of "Mow strips" for erosion prevention and ease of maintenance / installation.
 - See the Texas MUTCD for proper "Barrier" Delineation.

MOW STRIP DETAIL*		CONCRETE FOOTING CHART			
MOW STRIP	DEPTH	WIDTH	FOOTING	TUBE SLEEVE	REBAR RING
NONE			30" Min.	27" Min.	YES
HMA	6" Min.	3' Min.	27" Min.	15" Min.	NO
HMA	8" Min.	3' Min.	24" Min.	15" Min.	NO
RC	3" Min.	3' Min.	24" Min.	15" Min.	NO

Chart does not apply to Terminal Posts 1 thru 9.
 * Mow strip or pavement.
 HMA = Hot Mix Asphalt (Not Recycled Asphalt Pavement).
 RC = Reinforced Concrete (TxDOT Class A Minimum).

Trinity Highway Products, LLC.
 2525 Stemmons Freeway
 Dallas, TX 75207
 Phone: (800) 644-7976
 Product. INFO@TRIN.NET

CABLE TENSION CHART

FAHRENHEIT DEGREES	PRE-STRETCHED LB / FORCE
-10	7300
0	7000
10	6600
20	6300
30	6000
40	5600
50	5300
60	5000
70	4600
80	4300
90	4000
100	3600
110	3300
120	3000
130	2700
140	2500
150	2300

Allowable deviation from chart in tangent sections: +800, -200 pounds/force. Cable tension readings are typically higher in curved cable sections.

Texas Department of Transportation
TRINITY CABLE SAFETY SYSTEM (TL-3)
CASS (TL3) - 14

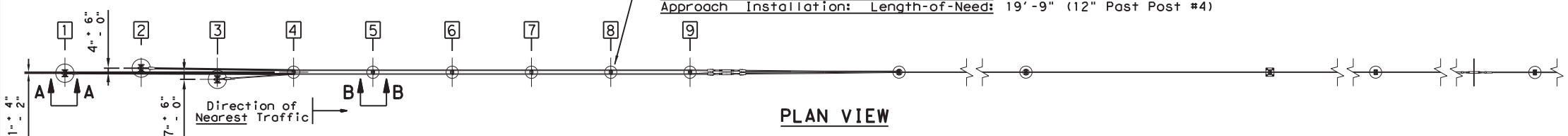
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©TxDOT: MARCH 2014	CONT: 6372	SECT: 50	JOB: 001	HIGHWAY: VAR.
REVISIONS				
DIST: SAT	COUNTY: BEXAR			SHEET NO.: 143

DATE: FILE:

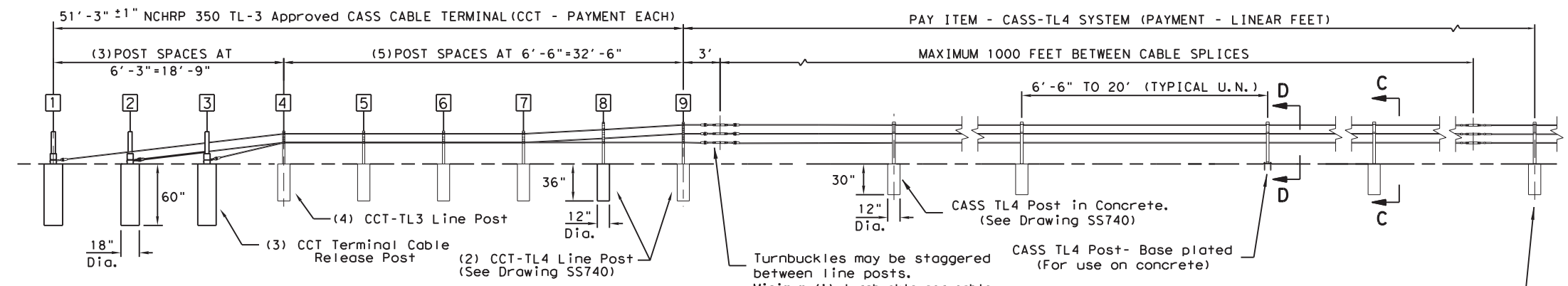
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Preferred Installation: Locate post #2 away from nearest traffic. System has been successfully tested with opposite installation.

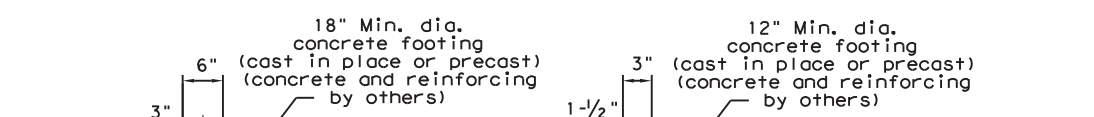
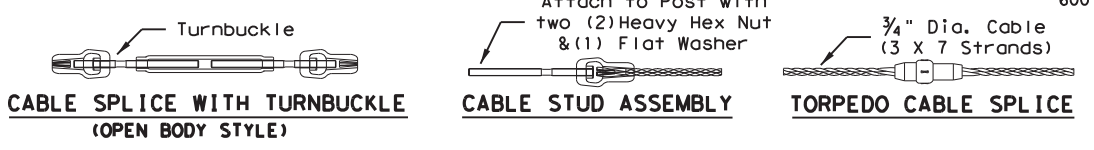
Length-of-Need Cass Cable Terminal (CCT):
Departure Installation: Length-of-Need: 44'-9" (At Post #8)
Approach Installation: Length-of-Need: 19'-9" (12" Post Post #4)



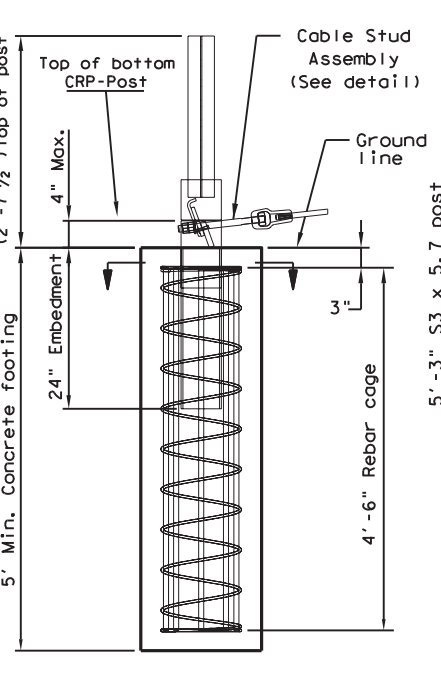
PLAN VIEW



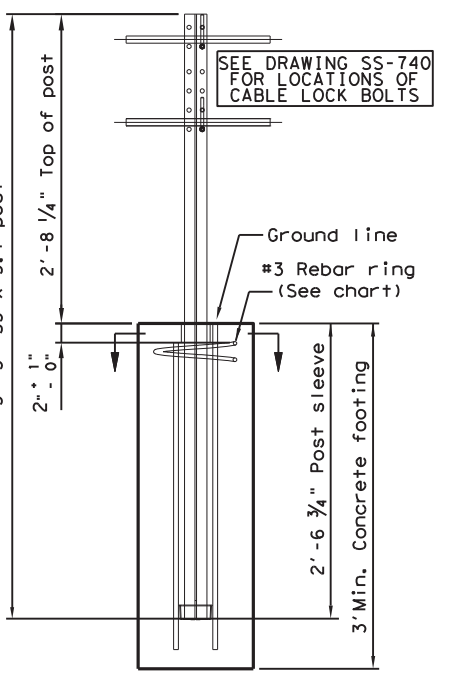
ELEVATION VIEW (TYPICAL LAY-OUT)



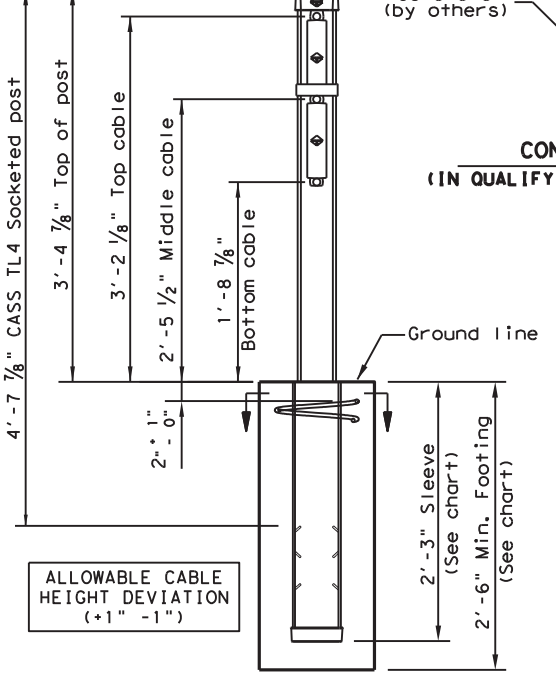
SECTION E-E
SECTION F-F
SECTION G-G



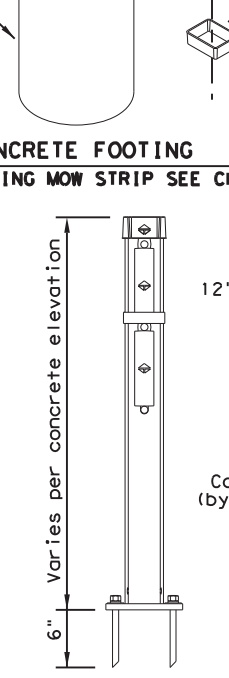
VIEW A-A (CABLE RELEASE POST 1-3)



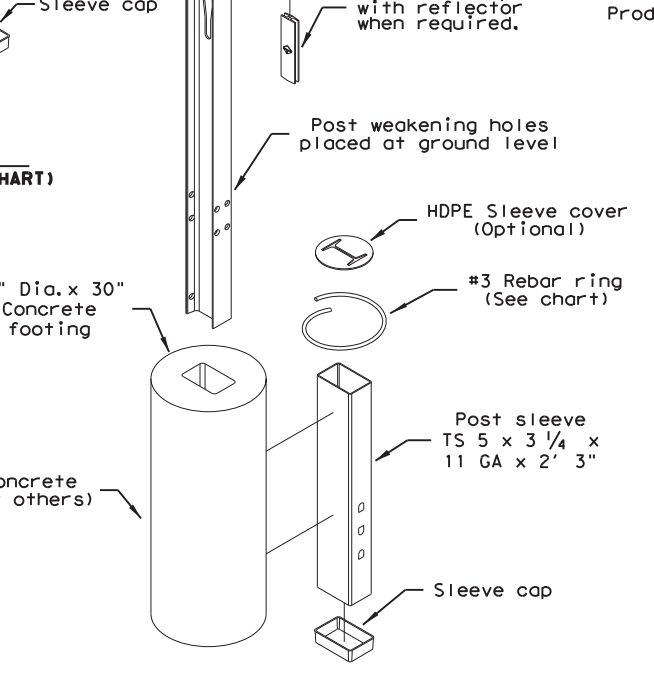
VIEW B-B (TERMINAL LINE POST 4-7)



SECTION C-C (SOCKETED POST)



SECTION D-D (BASE PLATED POST)



STANDARD POST & CONCRETE FOOTING (SOCKETED POST)

- GENERAL NOTES**
- This drawing is a general overview of CASS TL-4 Barrier System. See SS-740 (latest version) for specific details of CASS cable terminal (CCT) and cable safety system (CASS) requirements, proper installation, options and specification.
 - CASS is designed for bi-directional traffic flows and can be installed on either side of the median. Contact Trinity (800-527-6050) or consult the design, installation, or repair manual(s) for additional information.
 - All concrete for CASS footings shall be TxDOT class A. If class A or stronger concrete is utilized for the mowstrip, please see chart below for allowable footing depth and sleeve deviations.
 - All posts shall be socketed unless otherwise specified. All cables shall be pre-stretched unless otherwise specified.
 - For payment see Special Specification "Cable Barrier System".
 - CASS-TL4 shall be installed on shoulders or medians with slopes of 6:1 or flatter without obstructions, depressions, etc. That may significantly affect the stability of an errant vehicle. Grading of site and/or appropriate fill materials may be required. The designer/installer shall "Flatten" or "Round" various topographical inconsistencies that could interfere with the ability of the installer to consistently maintain the design height (in relation to the terrain) of the cables. Please consult manual(s) and/or TxDOT Memo(s) for installations in "Ditch Sections".
 - CASS TL-4 post spacing may be modified to avoid obstacles that conflict with the installation of cass-tl4 line posts or to reduce deflection on radiuses. No post space can exceed the maximum post TxDOT space limit of 20'. Reducing or increasing post spacing affects deflection. CASS TL-4 may be laterally transferred at a rate not to exceed 30:1.
 - Post foundations may be drilled through existing pavement. Please see line post foundation chart for minimum footing requirements in various applications.
 - For aesthetic purposes Trinity recommends all sleeves, driven posts, and lower cable release posts to be installed reasonably plumb (approximately 1/8" per foot).
 - CASS TL-4 shall be installed in well-drained, compacted, NCHRP Report 350 Standard soil. If soil does not meet this classification, if solid rock/concrete is encountered below grade or if soil is susceptible to severe freeze/thaw cycles, please contact Trinity about alternate footing design(s). Trinity suggests the use of "Mow strips" for erosion prevention and ease of maintenance / installation.
 - See the Texas MUTCD for proper "Barrier" Delineation.

MOW STRIP DETAIL*		CONCRETE FOOTING CHART			
MOW STRIP	DEPTH	WIDTH	FOOTING TUBE	SLEEVE	REBAR RING
NONE			30" Min.	27" Min.	YES
HMA	6" Min.	3' Min.	27" Min.	15" Min.	NO
HMA	8" Min.	3' Min.	24" Min.	15" Min.	NO
RC	3" Min.	3' Min.	24" Min.	15" Min.	NO

Chart does not apply to Terminal Posts 1 thru 9.
 * Mow strip or pavement.
 HMA = Hot Mix Asphalt (Not Recycled Asphalt Pavement).
 RC = Reinforced Concrete (TxDOT Class A Minimum).

Trinity Highway Products, LLC.
 2525 Stemmons Freeway
 Dallas, TX 75207
 Phone: (800) 644-7976
 Product: INFO@TRIN.NET

CABLE TENSION CHART	
FAHRENHEIT DEGREES	PRE-STRETCHED LB / FORCE
-10	7300
0	7000
10	6600
20	6300
30	6000
40	5600
50	5300
60	5000
70	4600
80	4300
90	4000
100	3600
110	3300
120	3000
130	2700
140	2500
150	2300

Allowable deviation from chart in tangent sections: +800, -200 pounds/force. Cable tension readings are typically higher in curved cable sections.

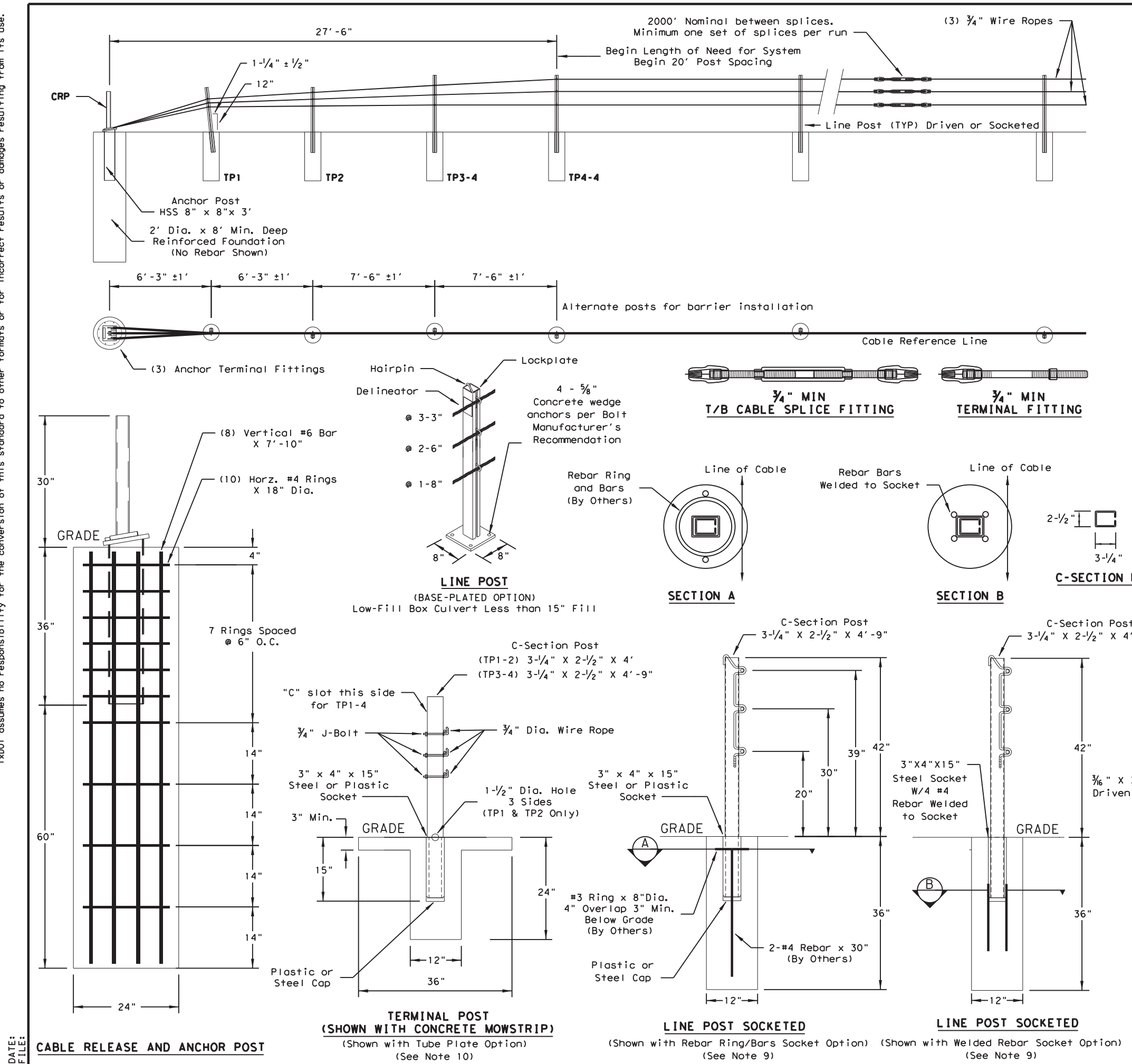
Texas Department of Transportation
TRINITY CABLE SAFETY SYSTEM (TL-4)
CASS (TL4) - 14

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Design Division Standard

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GENERAL NOTES

- For additional information contact Gibraltar, Inc. at 1-800-495-8957, 830-798-5444, or see the manufacturer's product manual.
- All concrete shall be CLASS A.
- The Cable Barrier System shall be installed on shoulders or on medians with slopes of 6:1 or flatter. If installed on slopes steeper than 6:1 up to 4:1 the TL-4 system performs as a TL-3 and Gibraltar must be contacted for various guidelines related to placement.
- The Cable Barrier System is accepted by the FHWA Test Level - 4.
- See the Texas MUTCD for proper "Barrier" delineation.
- Rock Clause: Where solid rock is encountered:
 - For socketed post, continue digging 12" diameter, 15" deep into rock or the required plan depth, whichever comes first.
 - For driven post, core drill a 4" diameter hole 18" deep into rock or the required plan depth, whichever comes first.
 - For Anchor post, continue digging 24" diameter, 30" deep into rock or the required plan depth, whichever comes first.
- Tolerances:
 - * LP = 3" out of plumb, at top
 - * Cable height = 1"
 - * Anchor Post = 5" off of Cable Reference Line
- The Gibraltar cable barrier system shall be installed in NCHRP Report 350 standard compacted soil. Soil must be well drained.
- All non-welded rebar by others.
- Minimum recommended line post foundation.
 - Without mowstrip, 36" Deep x 12" diameter foundations with #3 rebar ring x 8" diameter with two #4 rebar vertical bars 30" long
 - With 4" minimum depth hot mix asphalt, 30" deep x 12" diameter foundations with #3 rebar ring x 8" diameter with two #4 rebar vertical bars 30" long.
 - With 3" minimum depth concrete mowstrip, 24" deep x 12" diameter foundations. (No rebar required)
 - Direct drive post 42" deep.

Temperature (°F)	Tension
-10 °F	8000
0 °F	7600
10 °F	7200
20 °F	6800
30 °F	6400
40 °F	6000
50 °F	5600
60 °F	5200
70 °F	4800
80 °F	4400
90 °F	4000
100 °F	3600
110 °F	3200

Deflection	Post Spacing
8'-0"	20 FT
7'-0"	12 FT
6'-8"	10 FT

* Allowable Deviation from Chart +/- 10%

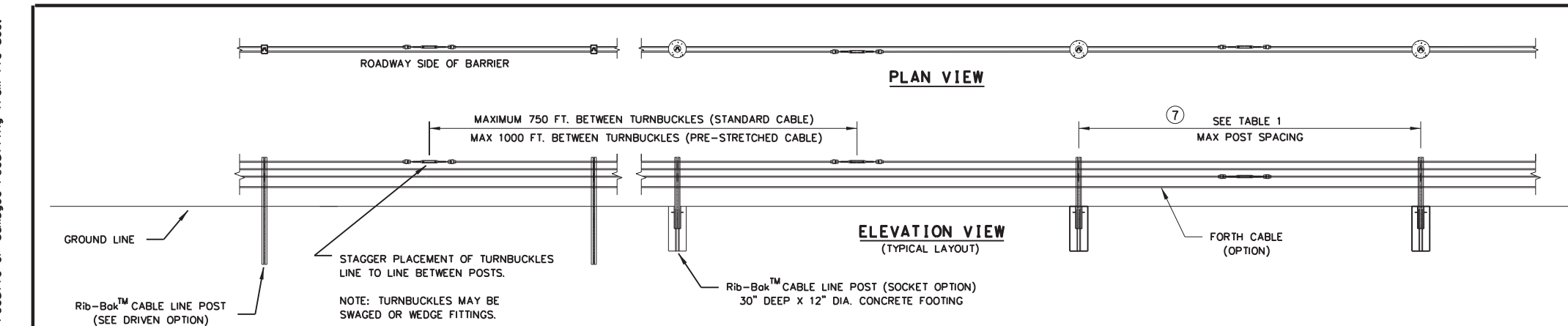
Texas Department of Transportation
GIBRALTAR CABLE BARRIER SYSTEM (TL-4)
GBRL TR (TL4) - 14

FILE: gbrl tr t1414.dgn	DN: TxDOT	CK: RM	DW: VP	CK:
© TxDOT: March 2014	CONT: 6372	SECT: 50	JOB: 001	HIGHWAY: VAR.
REVISIONS	DIST: SAT	COUNTY: BEXAR	SHEET NO. 146	

Design Division Standard

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- GENERAL NOTES**
- FOR ADDITIONAL INFORMATION CONTACT YOUR DISTRIBUTOR OR NUCOR STEEL MARION, INC. AT (603) 430-9350.
 - FOR PAYMENT SEE SPECIAL SPECIFICATION "CABLE BARRIER SYSTEM".
 - FOR ADDITIONAL INFORMATION SEE THE MANUFACTURER'S PRODUCT MANUAL.
 - THE NU-CABLE SYSTEM IS DESIGNED FOR BI-DIRECTIONAL TRAFFIC FLOWS. SEE THE MANUFACTURER'S PRODUCT MANUAL FOR PLACEMENT ADJACENT TO GUARDRAIL END TREATMENTS.
 - THE NU-CABLE SYSTEM SHALL BE INSTALLED ON SHOULDERS OR MEDIANS WITH SLOPES OF 6:1 OR FLATTER WITHOUT OBSTRUCTIONS, DEPRESSIONS, ETC. THAT MAY SIGNIFICANTLY AFFECT THE STABILITY OF AN ERRANT VEHICLE.
 - THE NU-CABLE SYSTEM MAY BE INSTALLED ON EITHER SIDE OF THE ROADWAY. Rib-Bok™ CABLE LINE POSTS MAY BE SOCKETED OR DRIVEN DESIGN.
 - THE TL-3 THREE-CABLE AND FOUR-CABLE FOR 6:1 SLOPES CAN USE EITHER A 4# /LF OR 5# /LF POST. SEE TABLE # 1 FOR POST SIZE PER SPACING.
 - SEE (TABLE 2) FOR TENSION AMOUNT AT SPECIFIC CABLE TEMPERATURE FOR INITIAL INSTALLATION.
 - SEE (TABLE 3) FOR TENSION AMOUNT AT SPECIFIC CABLE TEMPERATURE FOR MAINTENANCE.
 - FOURTH (LOWEST) CABLE IS OPTIONAL. SEE PROJECT SPECIFICATIONS FOR REQUIREMENT OF FOURTH CABLE.
 - CONSULT YOUR PROJECT PLAN SHEET AND CABLE BARRIER SPECIFICATIONS FOR DESIRED SOCKET MATERIAL.
 - ALL FOUNDATION DESIGNS ARE BASED ON NCHRP 350 STRONG (S1) SOIL. CONSULT THE MANUFACTURER FOR SPECIFIC FOUNDATION DESIGN IF SOIL TYPES DIFFER.

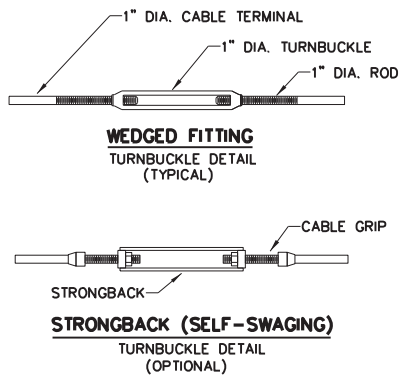
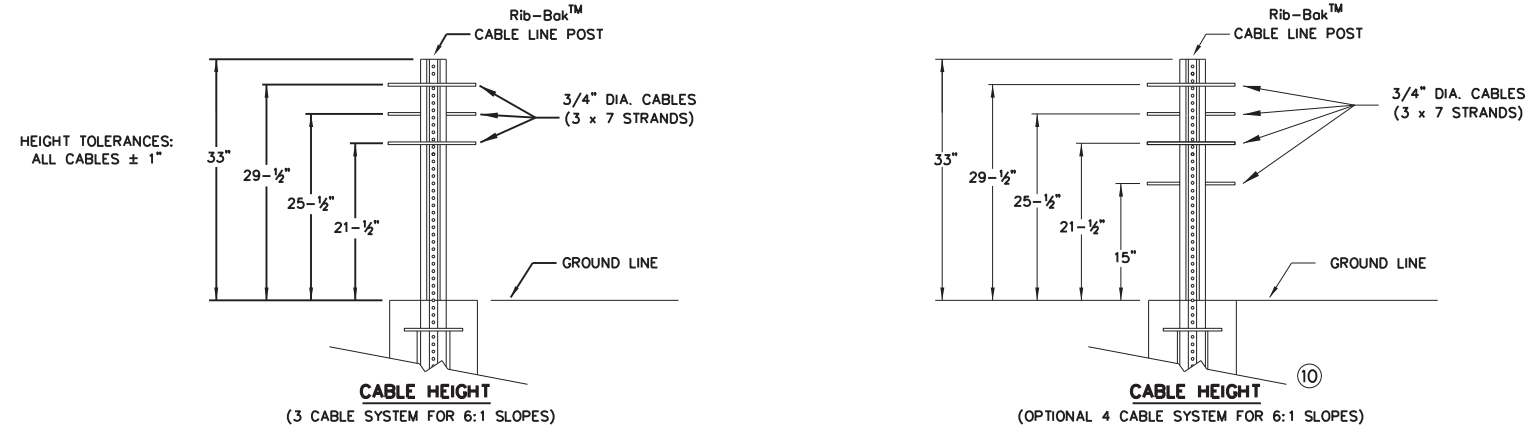


TABLE 1

POST SIZE TABLE	
POST SPACING	POST SIZE
0' - 17'-6"	4# / LF X 4' OR 6' POST
17'-6" - 20'	5# / LF X 4' POST

POST SPACING IS PER 8 FOOT DEFLECTION REQUIREMENTS. CONSULT PRODUCT MANUAL IF GREATER DEFLECTION IS PERMISSIBLE.

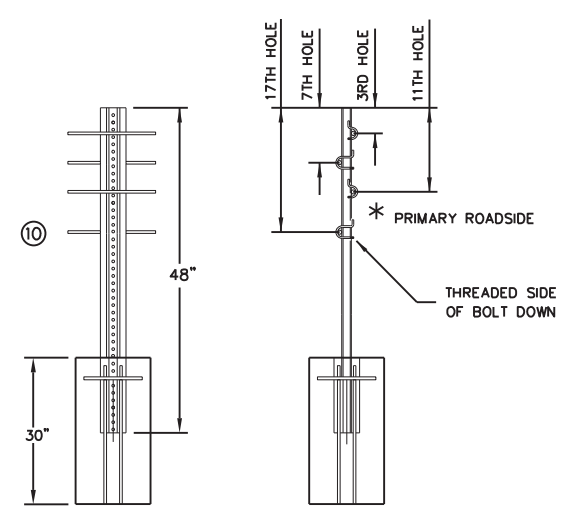
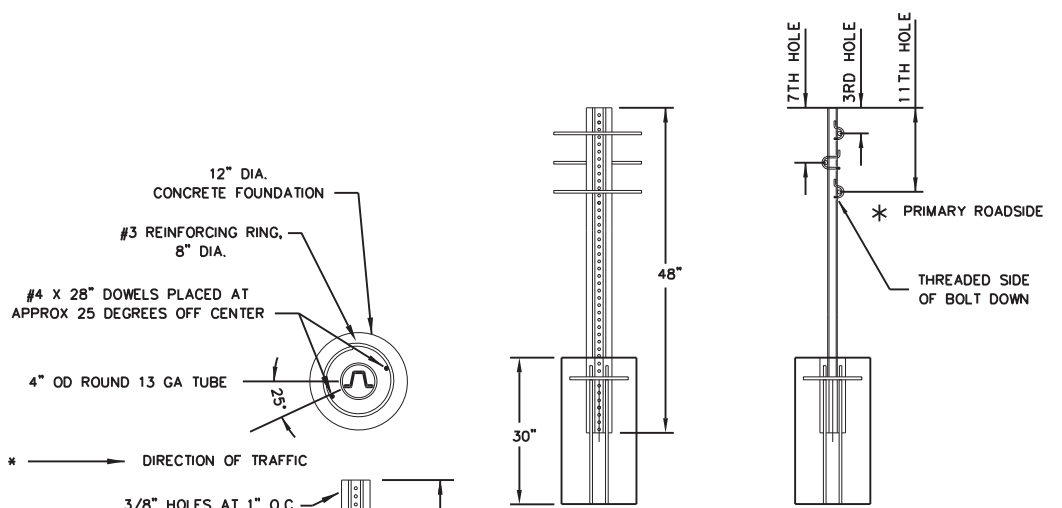
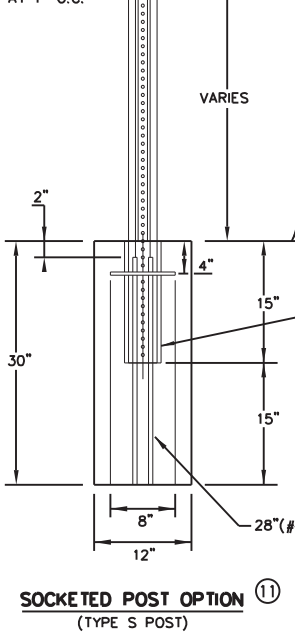


TABLE 2

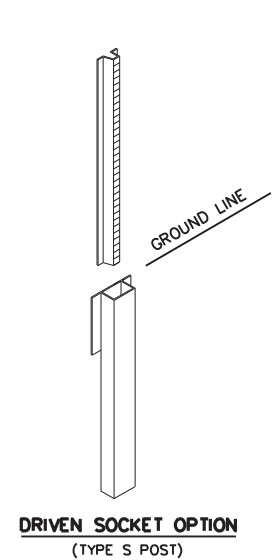
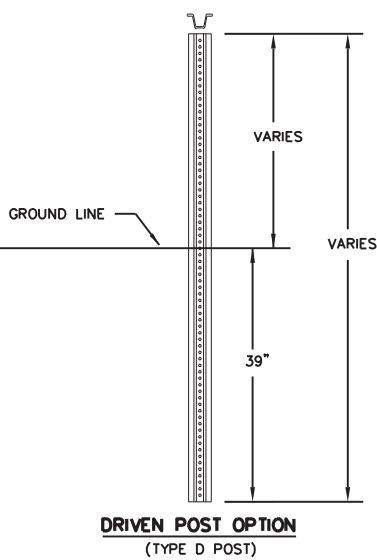
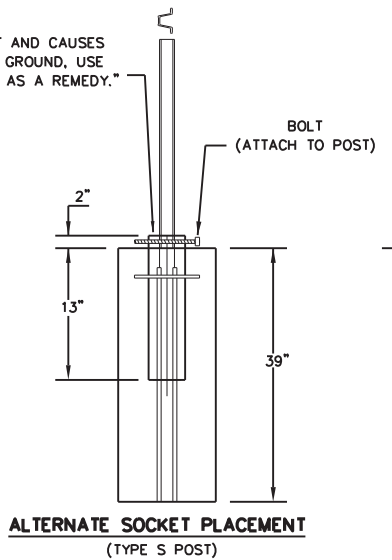
CABLE TENSION CHART	
INITIAL INSTALL	
F	LBF
120	4624
110	4986
100	5350
90	5713
80	6077
70	6440
60	7167
50	7894
40	8619
30	9346
20	10073
10	10800
0	11525
-10	12252
-20	12979
-30	13706

TABLE 3

CABLE TENSION CHART	
MAINTENANCE	
F	LBF
120	4021
110	4336
100	4652
90	4968
80	5284
70	5600
60	6232
50	6864
40	7495
30	8127
20	8759
10	9391
0	10022
-10	10654
-20	11286
-30	11918



WHEN GRADING IS INSUFFICIENT AND CAUSES CABLES TO LIFT POST OUT OF GROUND, USE "ALTERNATE SOCKET PLACEMENT AS A REMEDY."



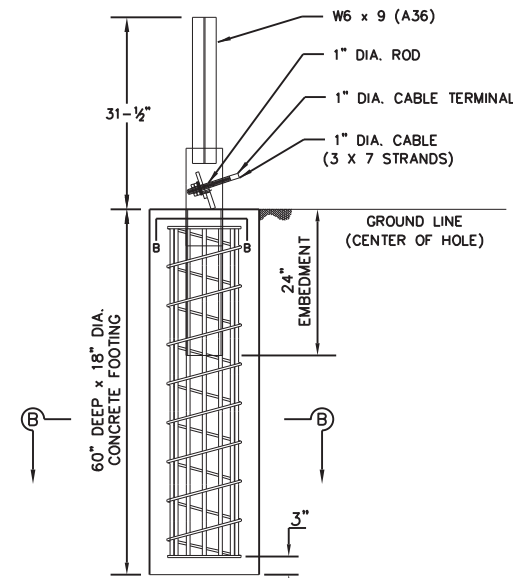
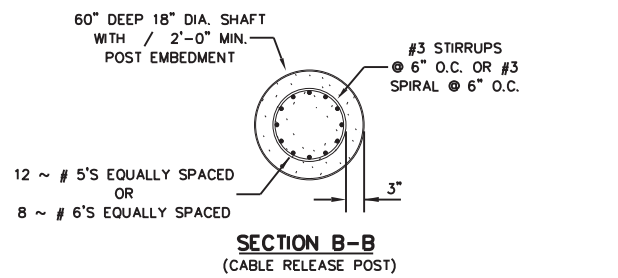
SHEET 1 OF 2

Texas Department of Transportation
NU-CABLE BARRIER SYSTEM (TL-3)
(3 OR 4 CABLE)
NU-CABLE (TL3) - 14

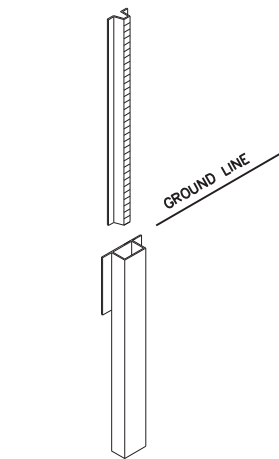
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	DIST:	COUNTY:	SHEET NO.	
	SAT	BEXAR	147	

DATE:
FILE:

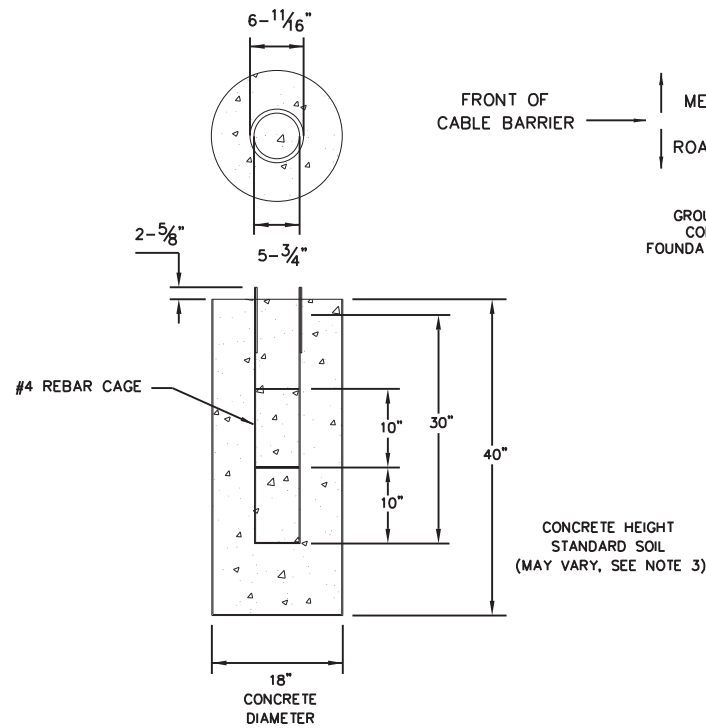
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DETAIL A - CRP IN CONCRETE FOOTING (3000 PSI MIN CONCRETE)



DRIVEN SOCKET OPTION



NU-TEN CONCRETE FOOTING DETAIL

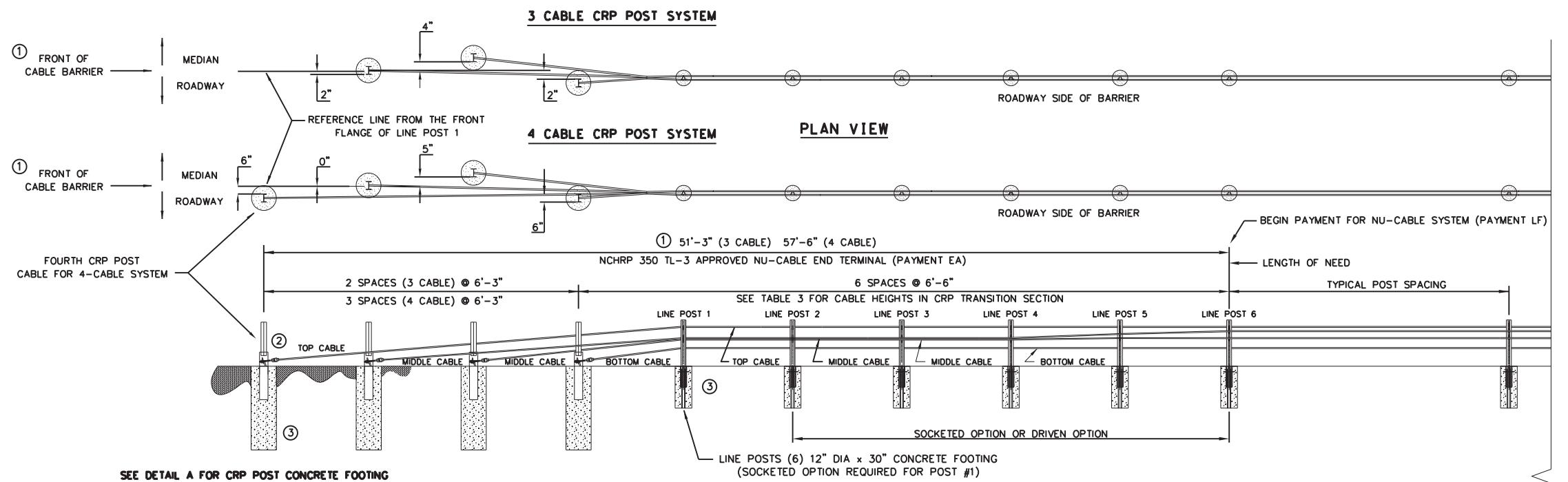
TABLE 4

CRP END TERMINAL CABLE HEIGHTS - TL-3- THREE CABLE						
	LP 1	LP 2	LP 3	LP 4	LP 5	LP 6
TOP CABLE	28"	28"	28"	28"	30"	30"
MIDDLE CABLE	22"	22"	22"	23"	25"	25"
BOTTOM CABLE	19"	19"	19"	20"	20"	21"
CRP END TERMINAL CABLE HEIGHTS - TL-3- FOUR CABLE 6:1						
	LP 1	LP 2	LP 3	LP 4	LP 5	LP 6
TOP CABLE	28"	28"	28"	28"	30"	30"
UPPER-MIDDLE CABLE	22"	22"	22"	23"	25"	25"
BOTTOM-MIDDLE CABLE	19"	19"	19"	20"	20"	21"
BOTTOM CABLE	15"	15"	15"	15"	15"	15"

REFER TO SHEET 1 OF 2 FOR LENGTH OF NEED CABLE HEIGHTS.

NOTES:

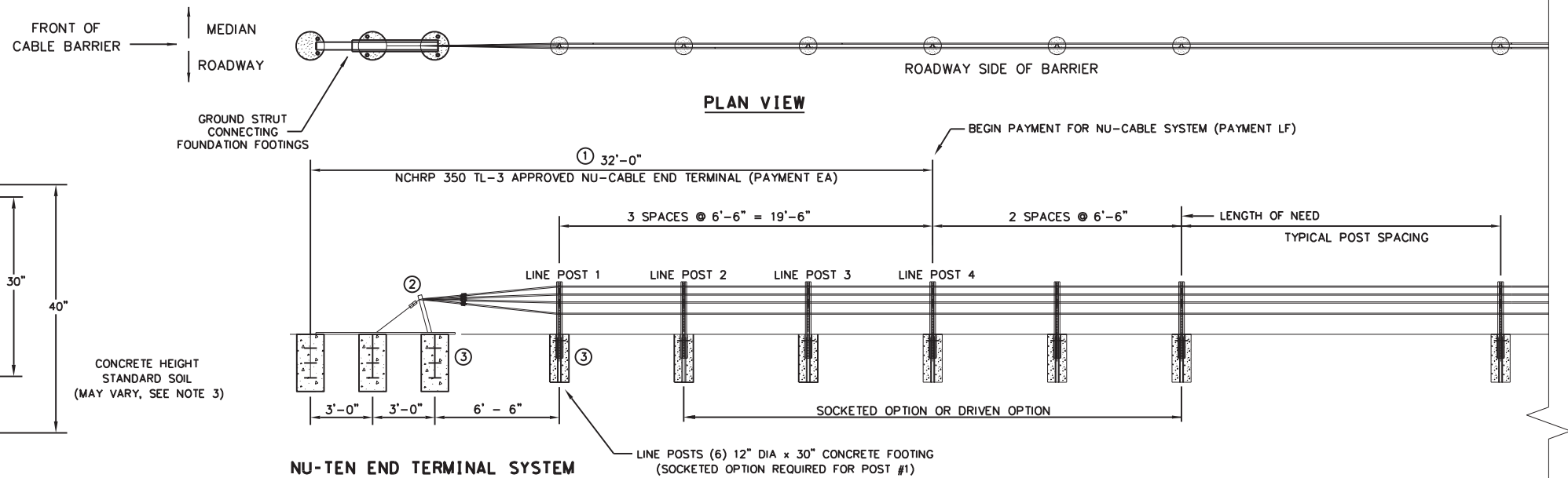
1. THE OPPOSING END TREATMENTS ON A PARTICULAR RUN ARE MIRRORED IN THEIR LAYOUT. SYSTEM PAYMENT IS PER EACH (EA). REFER TO PROJECT SPECIFICATIONS FOR ADDITIONAL PAYMENT INFORMATION.
2. REFER TO INSTALLATION MANUAL FOR CABLE END ASSEMBLY DETAIL.
3. ALL FOUNDATION DESIGNS ARE BASED ON NCHRP 350 STRONG (S1) SOIL. CONSULT THE MANUFACTURER FOR SPECIFIC FOUNDATION DESIGNS IF SOIL TYPES DIFFER.
4. SEE TABLE 2 CABLE HEIGHTS IN CRP TRANSITION SECTION.



SEE DETAIL A FOR CRP POST CONCRETE FOOTING

CRP POST END TERMINAL SYSTEMS (3 AND 4 CABLE)

ELEVATION VIEW



NU-TEN END TERMINAL SYSTEM

ELEVATION VIEW

SHEET 2 OF 2

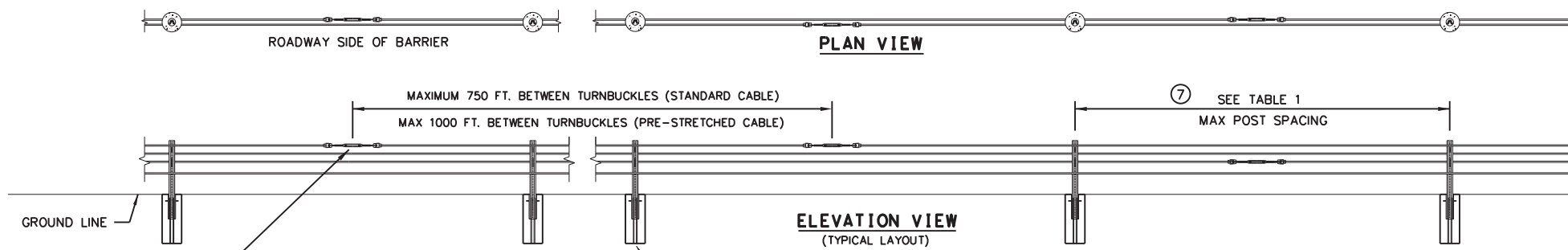
Texas Department of Transportation
NU-CABLE BARRIER SYSTEM (TL-3) (3 OR 4 CABLE)
NU-CABLE (TL3) - 14

FILE:	DN:	CK:	DW:	CK:
© TxDOT:	CONT:	SECT:	JOB:	HIGHWAY:
REVISIONS:	6372	50	001	VAR.
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	SAT	BEXAR	148	

DATE:
FILE:

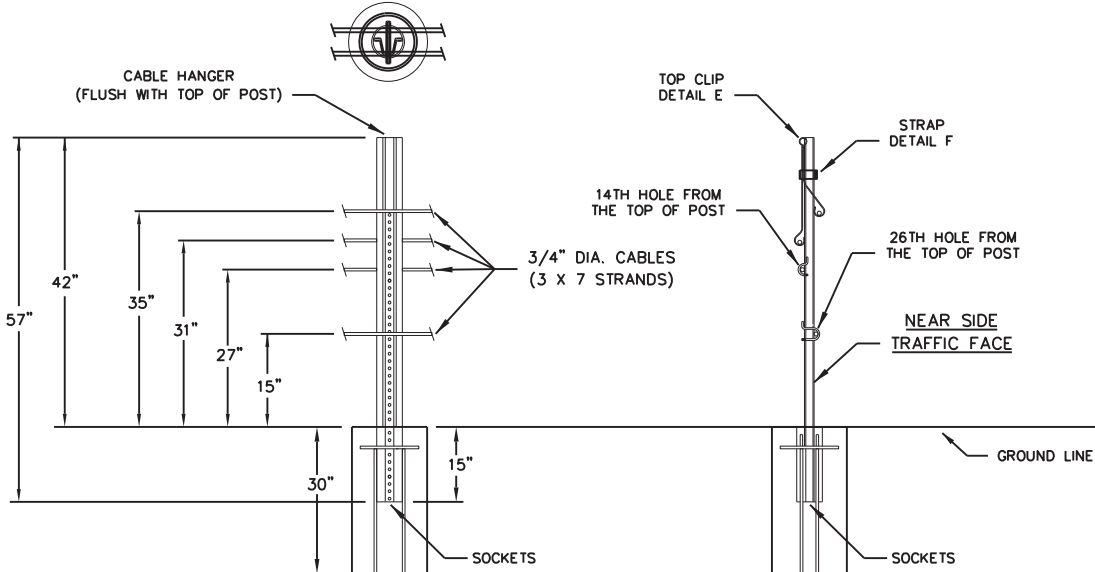
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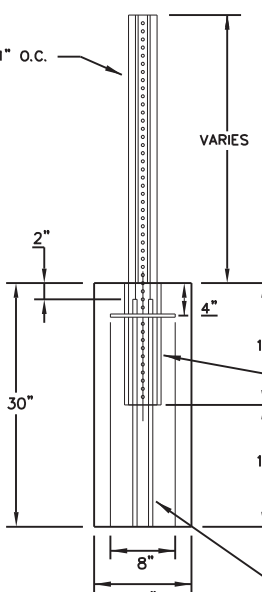
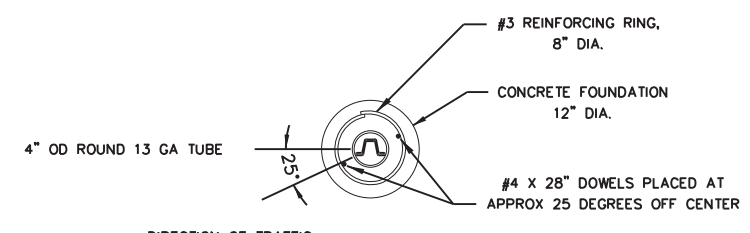
NOTE: TURNBUCKLES MAY BE SWAGED OR WEDGE FITTINGS.

NOTE: CABLE HEIGHTS ARE TO THE MIDDLE OF THE CABLE.
 HEIGHT TOLERANCES:
 ALL CABLES: ± 1"

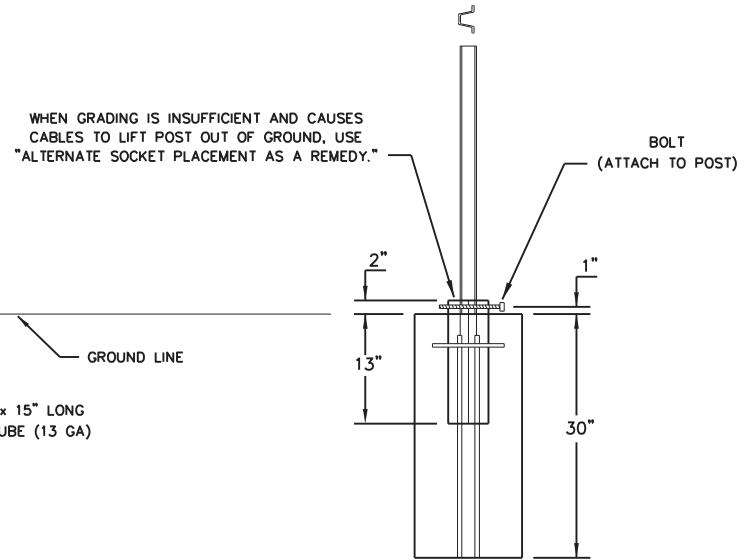


LENGTH OF NEED POSTS
 MEDIAN CONFIGURATION

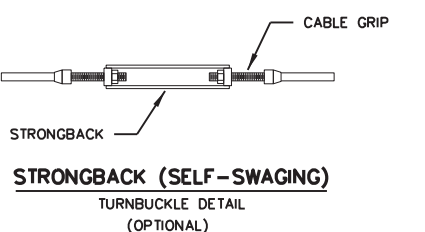
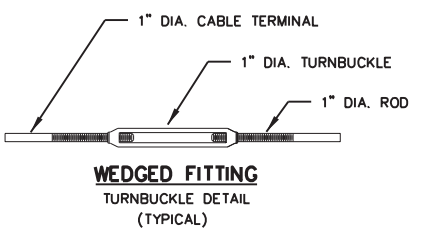
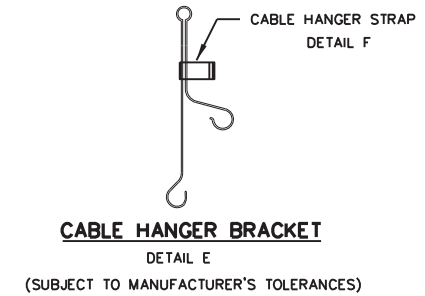
INSTALLATION DETAIL
 4 CABLE 6:1



11) SOCKETED POST OPTION
 (TYPE S POST)



ALTERNATE SOCKET PLACEMENT
 (TYPE S POST)



GENERAL NOTES

- FOR ADDITIONAL INFORMATION CONTACT YOUR DISTRIBUTOR OR NUCOR STEEL MARION, INC. AT (740) 383-4011.
- FOR PAYMENT SEE SPECIAL SPECIFICATION "CABLE BARRIER SYSTEM".
- FOR ADDITIONAL INFORMATION SEE THE MANUFACTURER'S PRODUCT MANUAL.
- THE NU-CABLE SYSTEM IS DESIGNED FOR BI-DIRECTIONAL TRAFFIC FLOWS. SEE THE MANUFACTURER'S PRODUCT MANUAL FOR PLACEMENT ADJACENT TO GUARDRAIL END TREATMENTS.
- THE NU-CABLE SYSTEM SHALL BE INSTALLED ON MEDIANS WITH SLOPES OF 6:1 OR FLATTER WITHOUT OBSTRUCTIONS, DEPRESSIONS, ETC; THAT MAY SIGNIFICANTLY AFFECT THE STABILITY OF AN ERRANT VEHICLE.
- THE NU-CABLE SYSTEM MAY BE INSTALLED ON EITHER SIDE OF THE ROADWAY. Rib-Bok™ CABLE LINE POSTS MAY BE SOCKETED OR DRIVEN DESIGN.
- THE TL-4 FOR 6:1 SLOPES CAN USE 4# / LF POST. SEE TABLE #1 FOR POST SIZE PER SPACING.
- SEE (TABLE 2) FOR TENSION AMOUNT AT SPECIFIC CABLE TEMPERATURE FOR INITIAL INSTALLATION.
- SEE (TABLE 3) FOR TENSION AMOUNT AT SPECIFIC CABLE TEMPERATURE FOR MAINTENANCE.
- FOURTH (LOWEST) CABLE IS NOT OPTIONAL ON THE TL-4 SYSTEM.
- CONSULT YOUR PROJECT PLAN SHEETS AND CABLE BARRIER SPECIFICATIONS FOR DESIRED SOCKET MATERIAL.
- ALL FOUNDATION DESIGNS ARE BASED ON NCHRP 350 STRONG (S1) SOIL. CONSULT THE MANUFACTURER FOR SPECIFIC FOUNDATION DESIGN IF SOIL TYPES DIFFER.

7) TABLE 1

POST SIZE TABLE	
POST SPACING	POST SIZE
0' - 17'-6"	4# / LF X 4' OR 6' POST
17'-6" - 20'	5# / LF X 4' POST

POST SPACING IS PER 8 FOOT DEFLECTION REQUIREMENTS. CONSULT PRODUCT MANUAL IF GREATER DEFLECTION IS PERMISSIBLE.

8) TABLE 2

CABLE TENSION CHART	
INITIAL INSTALL	
F	LBF
120	4624
110	4986
100	5350
90	5713
80	6077
70	6440
60	7167
50	7894
40	8619
30	9346
20	10073
10	10800
0	11525
-10	12252
-20	12979
-30	13706

9) TABLE 3

CABLE TENSION CHART	
MAINTENANCE	
F	LBF
120	4021
110	4336
100	4652
90	4968
80	5284
70	5600
60	6232
50	6864
40	7495
30	8127
20	8759
10	9391
0	10022
-10	10654
-20	11286
-30	11918

SHEET 1 OF 2

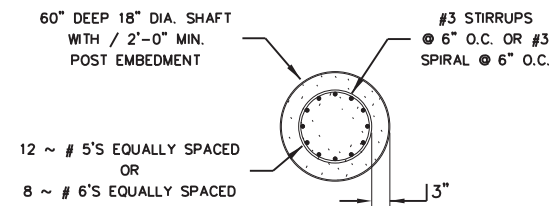
Design Division Standard

NU-CABLE BARRIER SYSTEM
 (TL-4)
 (4 CABLE)

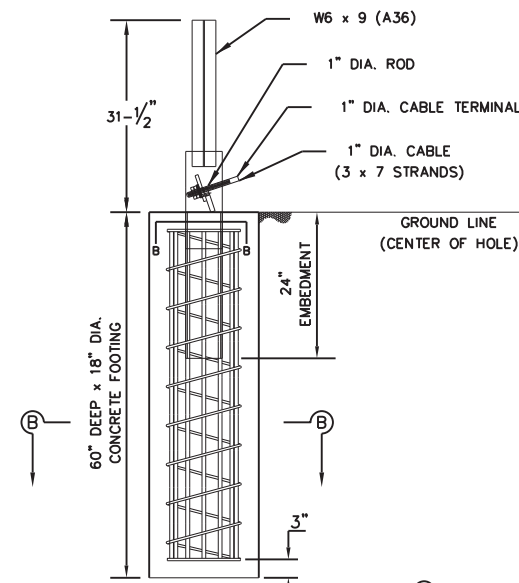
NU-CABLE (TL4) - 14

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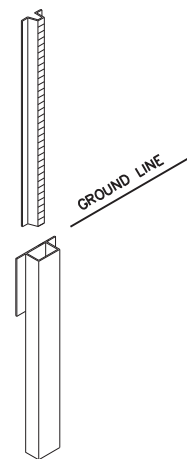
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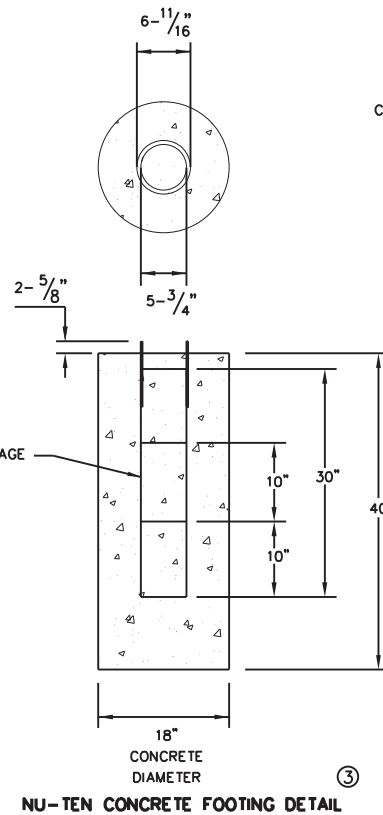
SECTION B-B
(CABLE RELEASE POST)



DETAIL A - CRP IN CONCRETE FOOTING
(3000 PSI MIN CONCRETE)



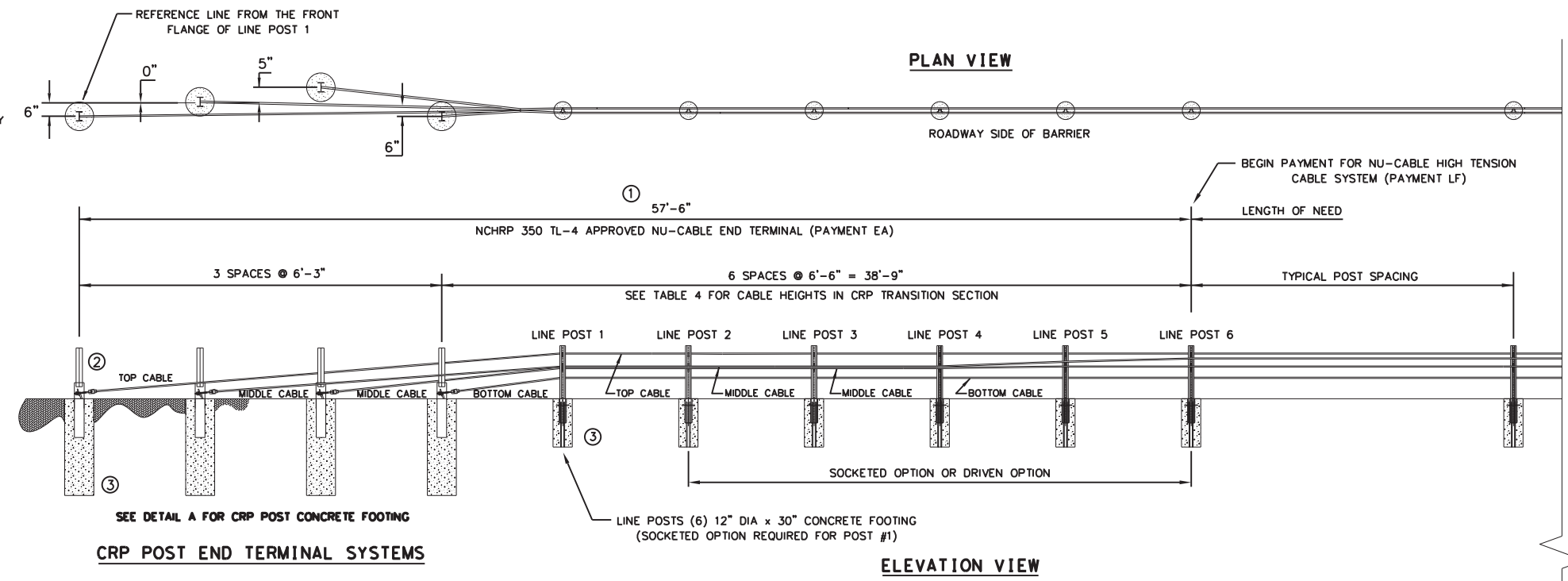
DRIVEN SOCKET OPTION



NU-TEN CONCRETE FOOTING DETAIL

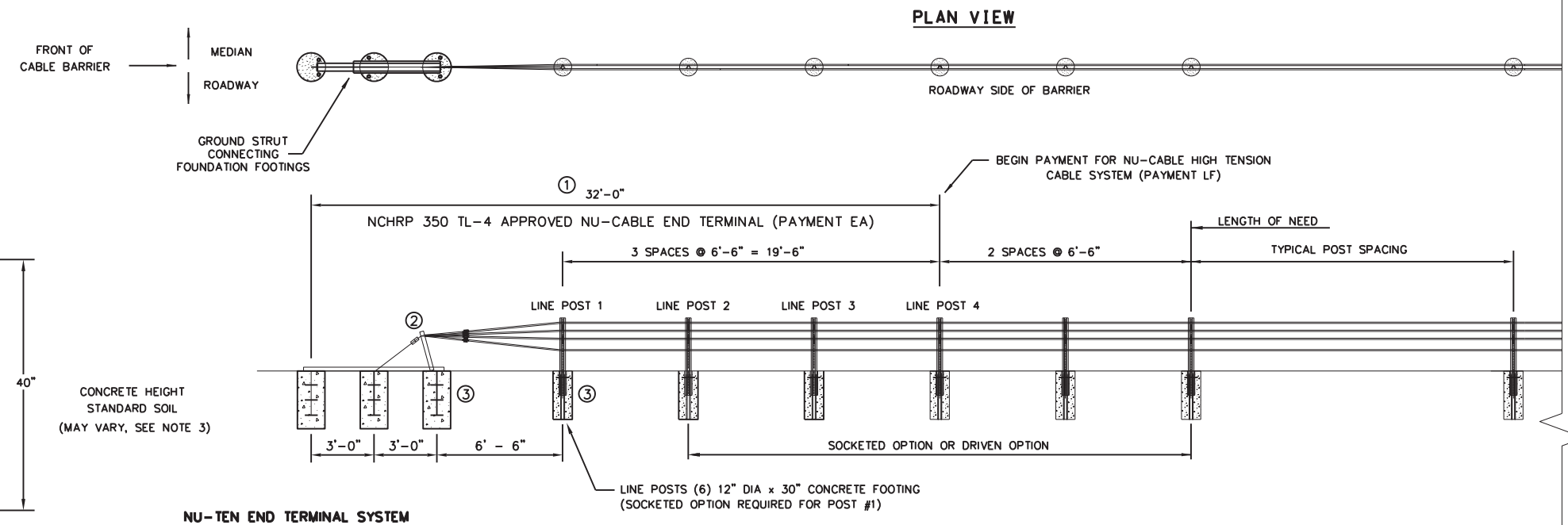
TABLE 4

CRP END TERMINAL CABLE HEIGHTS - TL-4						
	LP 1	LP 2	LP 3	LP 4	LP 5	LP 6
TOP CABLE	34"	34"	34"	34"	34"	34"
UPPER-MIDDLE CABLE	27"	27"	27"	27"	28"	31"
BOTTOM-MIDDLE CABLE	24"	24"	24"	24"	24"	24"
BOTTOM CABLE	15"	15"	15"	15"	15"	15"



CRP POST END TERMINAL SYSTEMS

① THE OPPOSING END TREATMENTS ON A PARTICULAR RUN ARE MIRRORED IN THEIR LAYOUT.



NU-TEN END TERMINAL SYSTEM

NOTES

1. THE OPPOSING END TREATMENTS ON A PARTICULAR RUN ARE MIRRORED IN THEIR LAYOUT. SYSTEM PAYMENT IS PER EACH (EA). REFER TO PROJECT SPECIFICATIONS FOR ADDITIONAL PAYMENT INFORMATION
2. REFER TO INSTALLATION MANUAL FOR CABLE END ASSEMBLY DETAIL.
3. ALL FOUNDATION DESIGNS ARE BASED ON NCHRP 350 STRONG (S1) SOIL. CONSULT THE MANUFACTURER FOR SPECIFIC FOUNDATION DESIGNS IF SOIL TYPES DIFFER.
4. SEE TABLE 4 CABLE HEIGHTS IN CRP TRANSITION SECTION.

SHEET 2 OF 2



NU-CABLE BARRIER SYSTEM (TL-4) (4 CABLE)

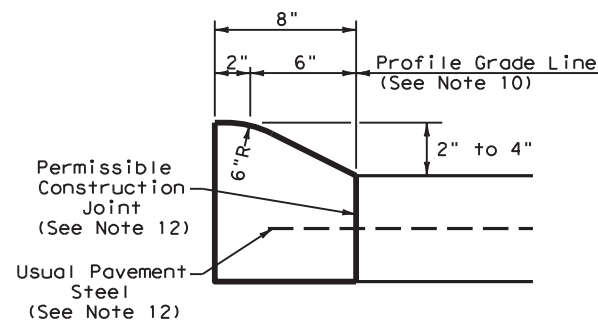
NU-CABLE (TL4) - 14

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	SAT	BEXAR	150	

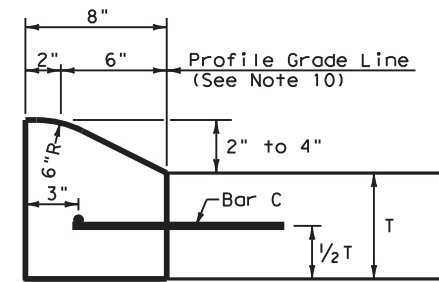
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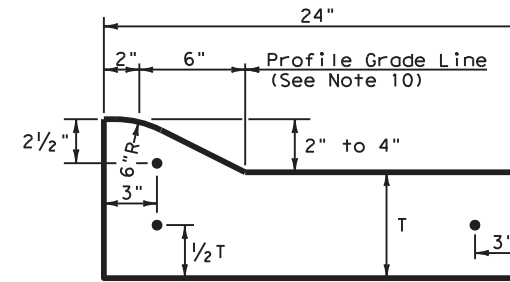
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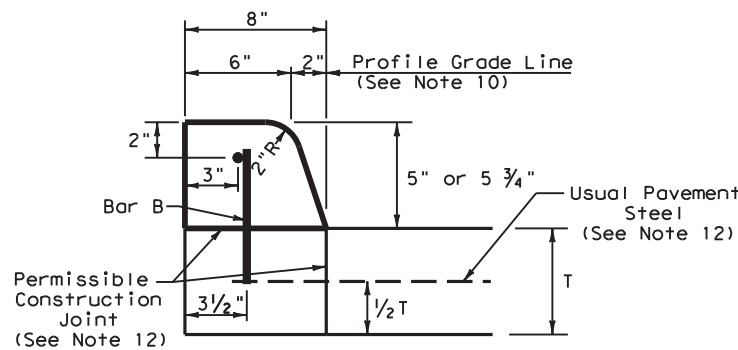
TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



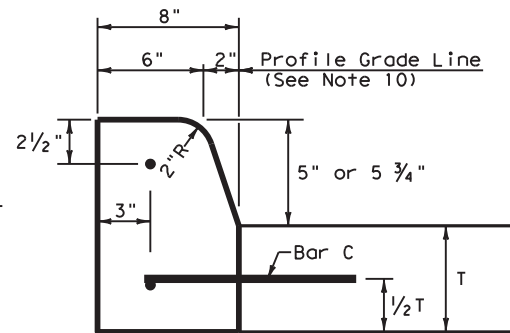
TYPE I CURB
2" - 4" HEIGHT



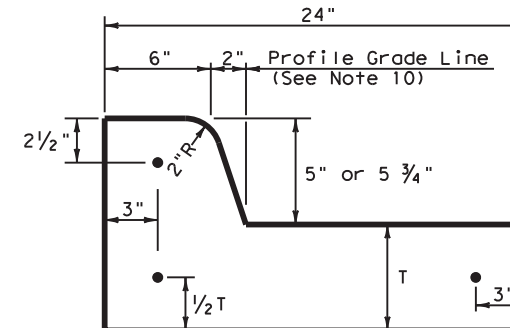
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



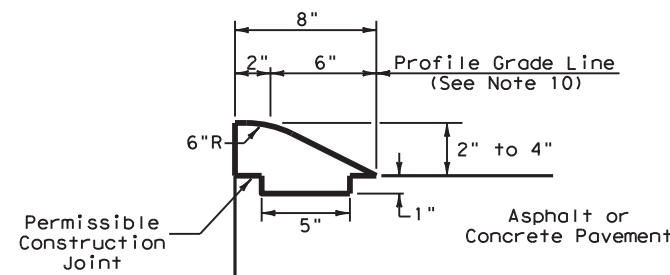
TYPE II CURB (MONOLITHIC)
5" - 5 3/4" HEIGHT



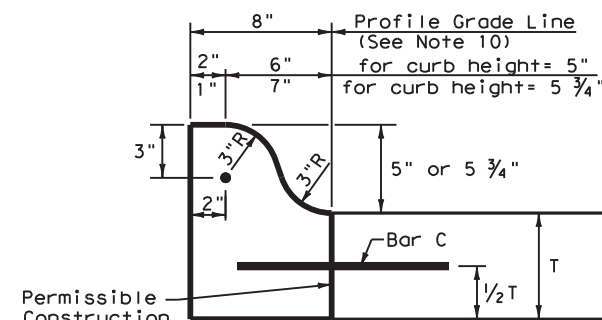
TYPE II CURB
5" - 5 3/4" HEIGHT



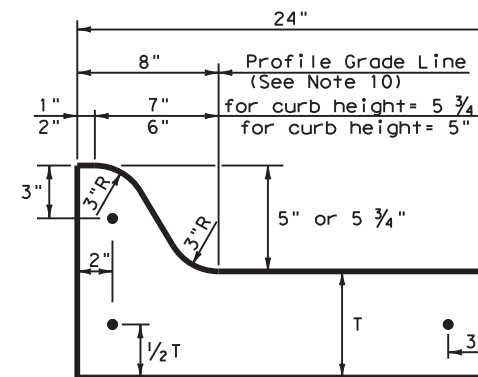
TYPE II CURB AND GUTTER
5" - 5 3/4" HEIGHT



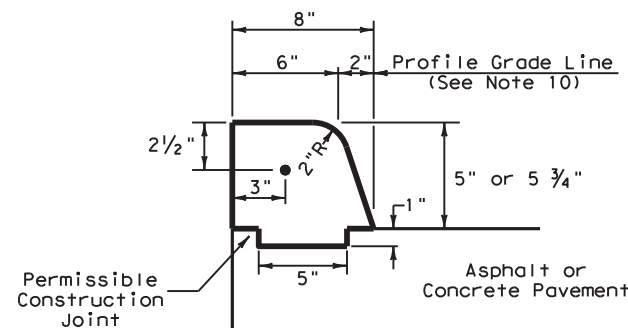
TYPE III CURB (KEYED)
2" - 4" HEIGHT



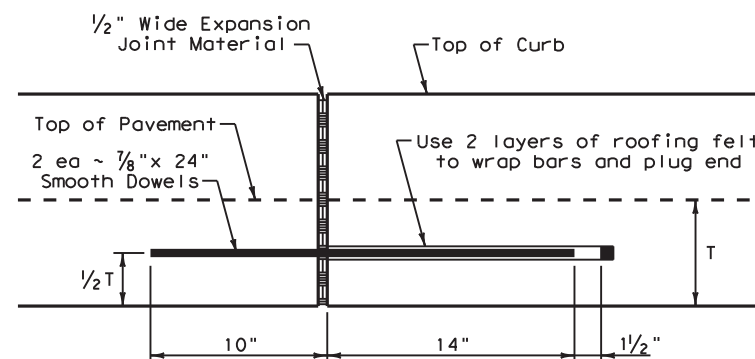
TYPE IIIa CURB
5" - 5 3/4" HEIGHT



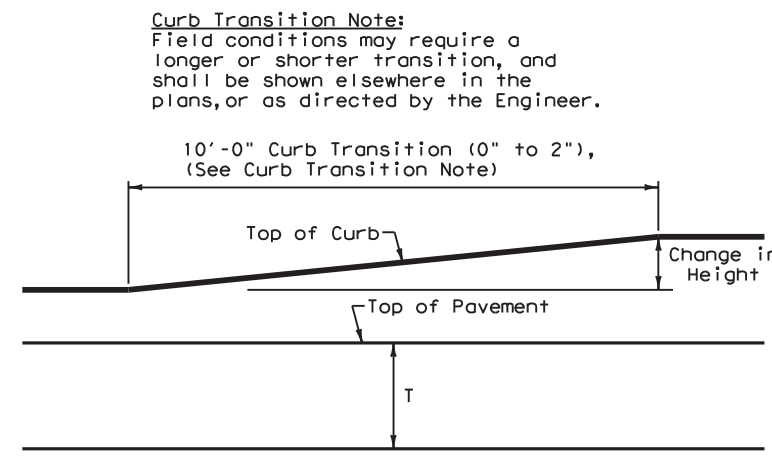
TYPE IIIa CURB AND GUTTER
5" - 5 3/4" HEIGHT



TYPE IV CURB (KEYED)
5" - 5 3/4" HEIGHT



EXPANSION JOINT DETAIL

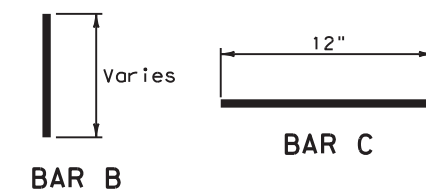


CURB TRANSITION

Note: To be paid for as Highest Curb

General Notes

- All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
- Concrete shall be Class A.
- When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Producer List (MPL), maintained by TxDOT, Construction Division.
- Round exposed sharp edges with a rounding tool, to a minimum radius of 1/4 inch.
- All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
- Where concrete curb is placed on existing concrete pavement, the pavement shall be drilled and the reinforcing bars grouted in place.
- Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
- Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C-C.
- Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
- Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
- One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
- When vertical permissible construction joints are used, resulting in a longitudinal construction joint in the pavement, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans for longitudinal construction joints. Reinforcing steel for curb section shall then conform to that required for concrete curb.

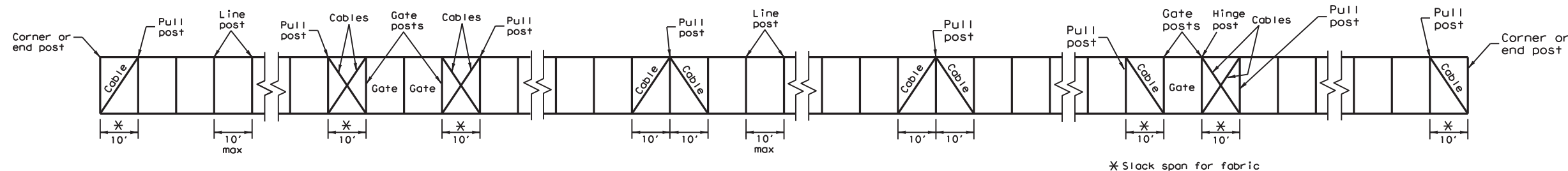


Curb Transition Note:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.

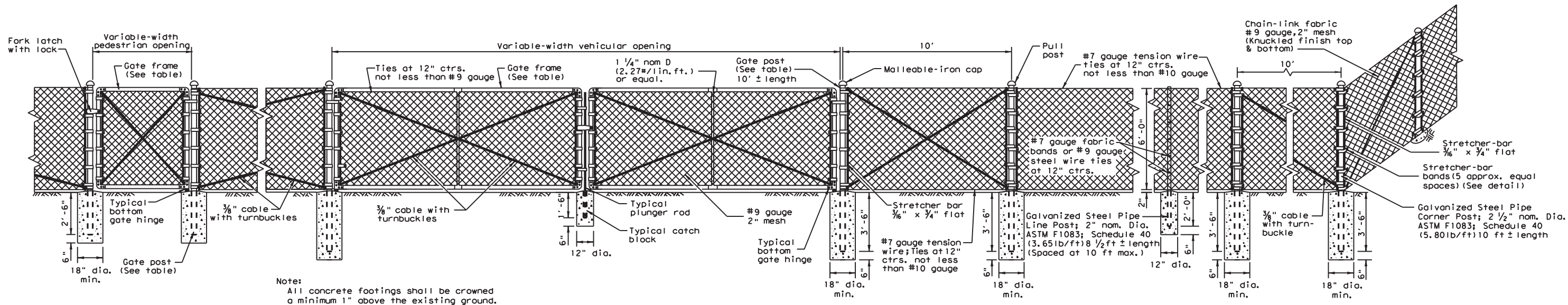
				Design Division Standard	
CONCRETE CURB AND GUTTER CCCG-12					
FILE: ccog12.dgn	DN: TxDOT	CK: AM	DW: VP	CK: VP	
© TxDOT: 1995	CONT	SECT	JOB	HIGHWAY	
REVISIONS	6372	50	OOI	VAR.	
UPDATED 2012 - VP	DIST	COUNTY	SHEET NO.		
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TYPICAL CABLE AND POST ARRANGEMENT



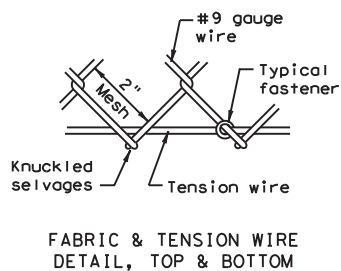
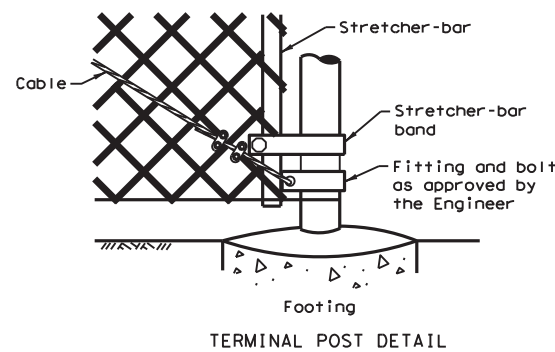
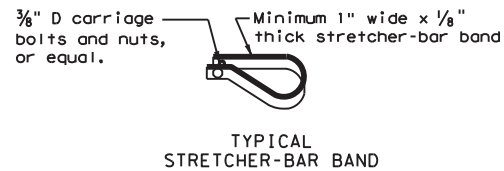
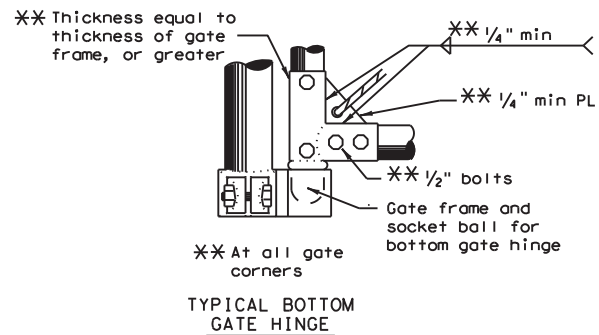
Note:
All concrete footings shall be crowned a minimum 1" above the existing ground.

CHAIN-LINK BARRIER FENCE (6 FT.)

Foundation designs shown are "minimums" for a 6 ft. fence. Taller fences may require larger foundation designs.

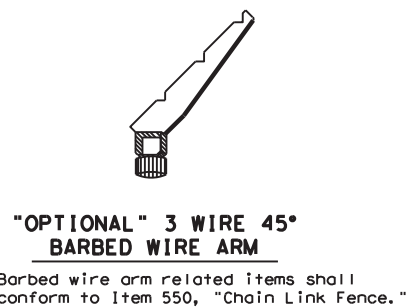
GENERAL NOTES

1. Items hereon shall conform to Item 550, "Chain Link Fence."
2. Typical installation plan may vary as shown elsewhere on the plans or as directed by the Engineer. Location of gates shown elsewhere on plans.
3. Gate-frame members shall be bolted, at frame corners, to joint fittings with four 1/2" bolts per joint.
4. All cable connections are to be made with two 3/8" cable clamps.
5. All pull posts and end posts and their foundations shall have the same respective dimensions as those shown for corner post.
6. All pull post shall be furnished with two stretcher bars.
7. One end of each turnbuckle may be attached directly to fittings with a clevis.
8. Concrete footings are to be crowned at the top to shed water.



GATE (TYPES AND SIZES)	
Single Inclusive	Double Inclusive
Up to 6'	Up to 12'
Over 6' to 12'	Over 12' to 26'
Over 12' to 18'	Over 26' to 36'
Over 18'	Over 36'

GATE FRAME (WEIGHT)		GATE POST (WEIGHT)	
SIZE	WT./LIN. FT.	SIZE	WT./LIN. FT.
1 1/2" nom dia. or equal	2.72 Lbs.	2 1/2" nom dia. or equal	5.79 Lbs.
		3 1/2" nom dia. or equal	9.11 Lbs.
		6" nom dia.	18.97 Lbs.
		8" nom dia.	24.70 Lbs.



Design Division Standard

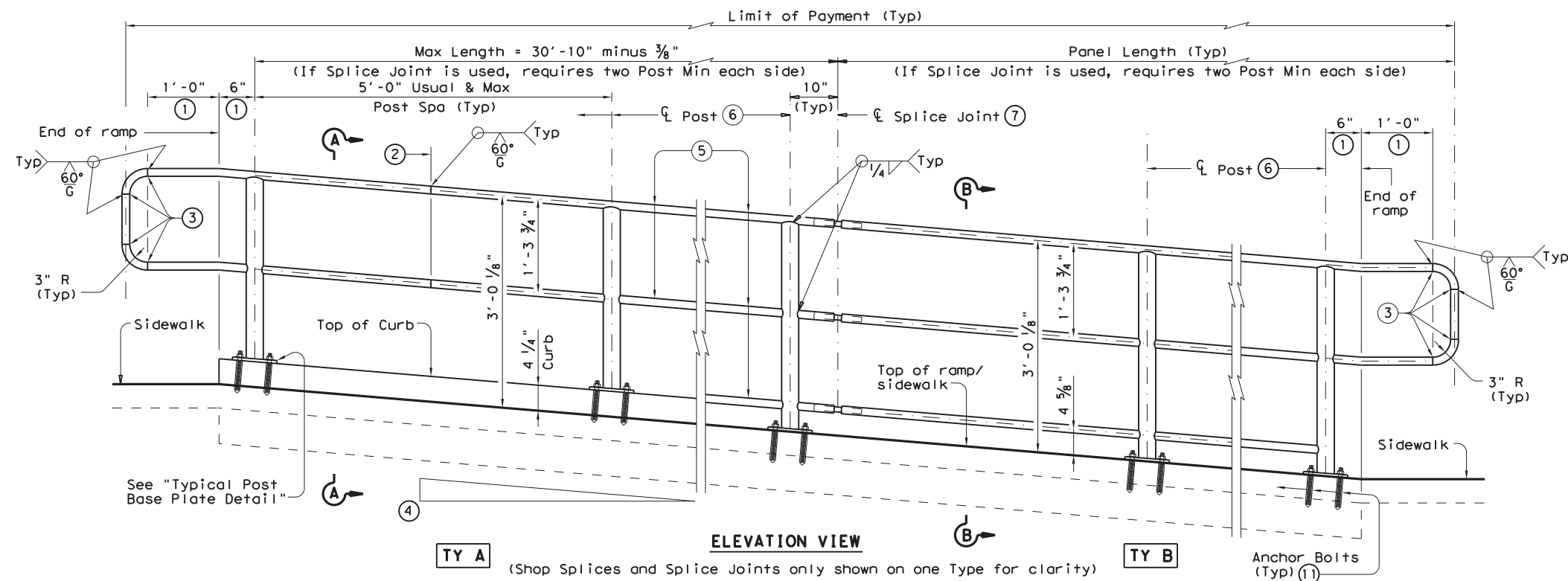
CHAIN LINK FENCE

CLF-10

FILE: clf10.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
© TxDOT 1996	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	OOI	VAR.
	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	152	

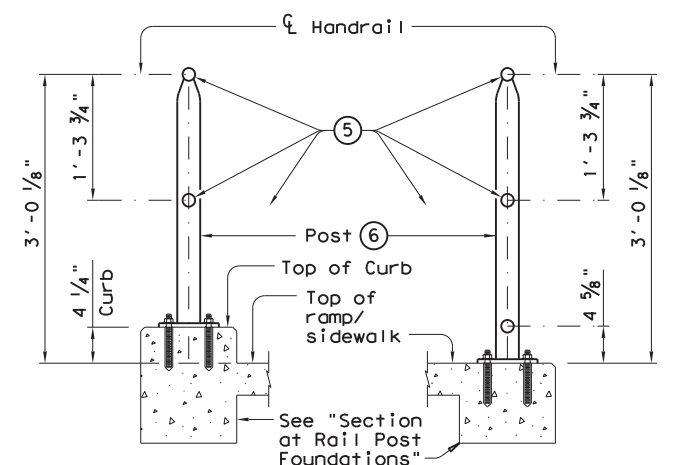
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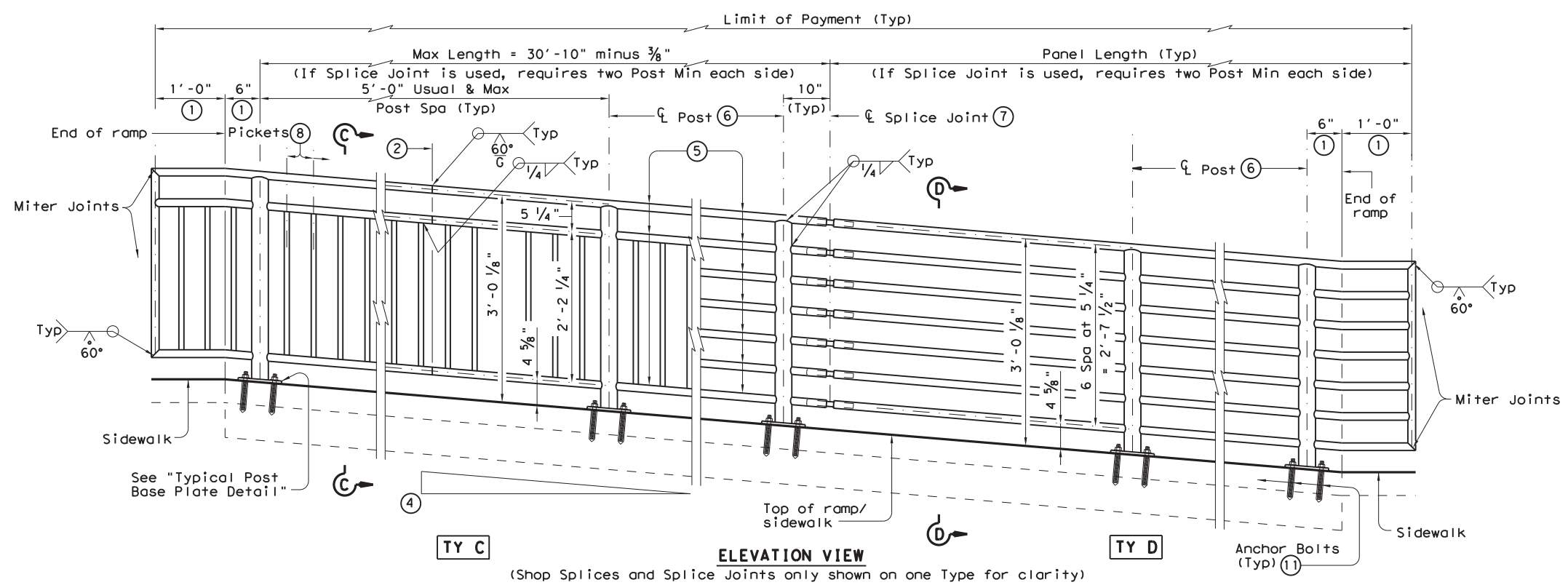


TY A (Shop Splices and Splice Joints only shown on one Type for clarity) **TY B**

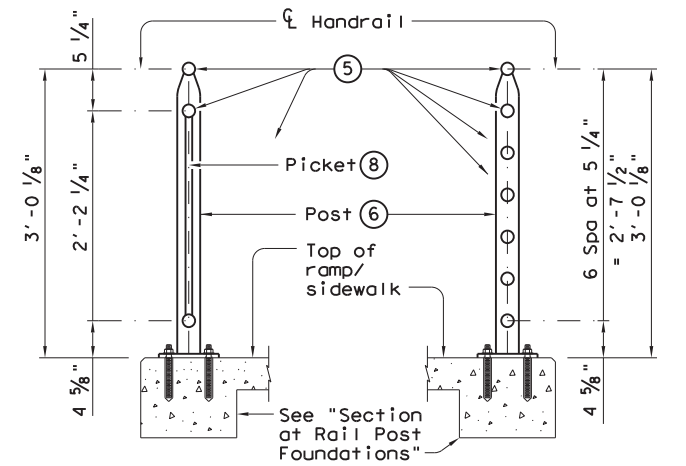
RECOMMENDED USAGE ⑨ ⑩	
Dropoff Height/Condition	Recommended Rail Options
< 30" dropoff	TY A, TY B, TY C, or TY D
≥ 30" dropoff, or along Bike Path	TY E or TY F



SECTION A-A (Showing Handrail TY A) **SECTION B-B** (Showing Handrail TY B)



TY C (Shop Splices and Splice Joints only shown on one Type for clarity) **TY D**



SECTION C-C (Showing Handrail TY C) **SECTION D-D** (Showing Handrail TY D)

- ① Parallel to ground.
- ② One shop splice per panel is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.
- ③ Shop splice is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.
- ④ See Ramp Details located elsewhere in plans for ramp slope and dimensions. Maximum ramp slope will not exceed 8.3 percent. Level landing required for each 30" rise if grade exceeds 5 percent.
- ⑤ 1 1/2" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ramp / sidewalk. Provide holes as needed in 1 1/2" Dia. pipe for galvanizing drainage and venting.
- ⑥ 2 1/2" Dia. Standard Pipe (2.875" O.D., 0.203" wall thickness). See "Post Mount Detail" for crimping and trimming post to fit Dia. of top rail. Provide holes as needed in post for galvanizing drainage and venting. Plumb all posts.
- ⑦ See "Handrail Fabrication Details" for Splice Joints.
- ⑧ 1/4" Dia. Round Bar equal spacing at 4 1/2" Max. Plumb all pickets.
- ⑨ When needed for accessibility (grade > 5 percent) or as needed for pedestrian safety.
- ⑩ Not to be used on bridges.
- ⑪ See "General Notes" for anchor bolt information.

SHEET 1 OF 3



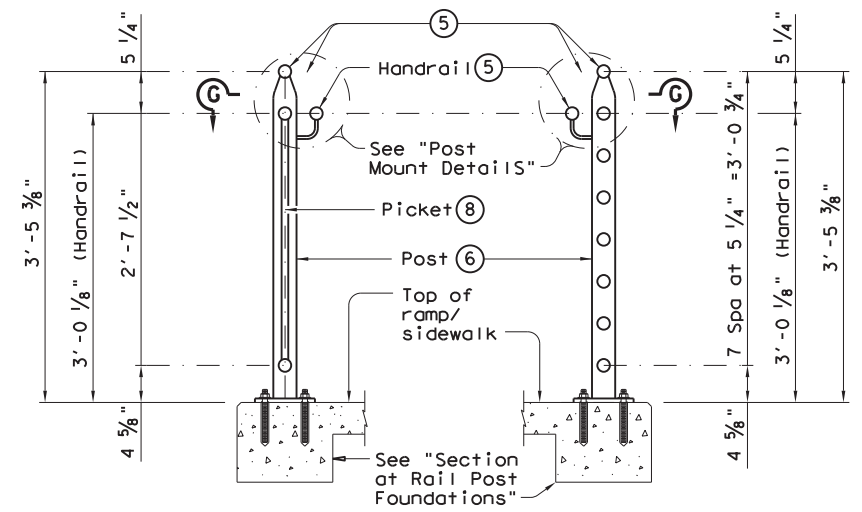
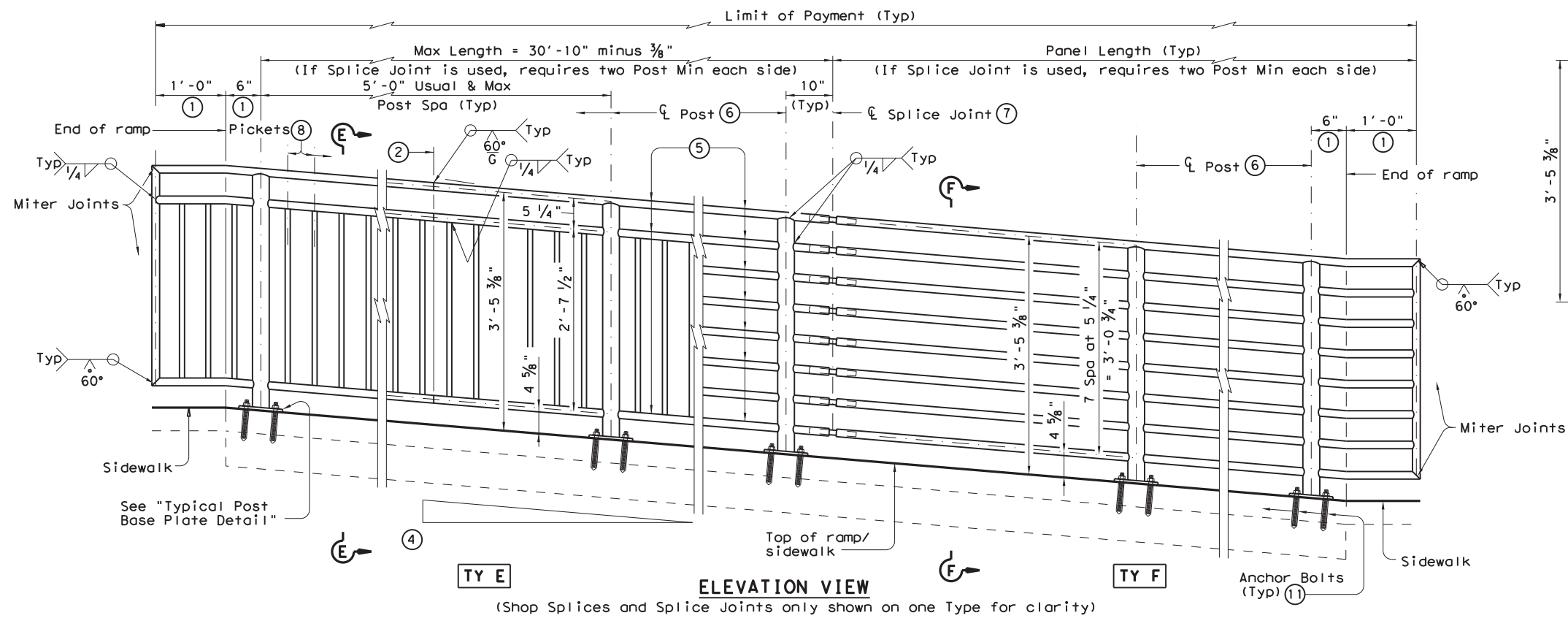
PEDESTRIAN HANDRAIL DETAILS

PRD-13

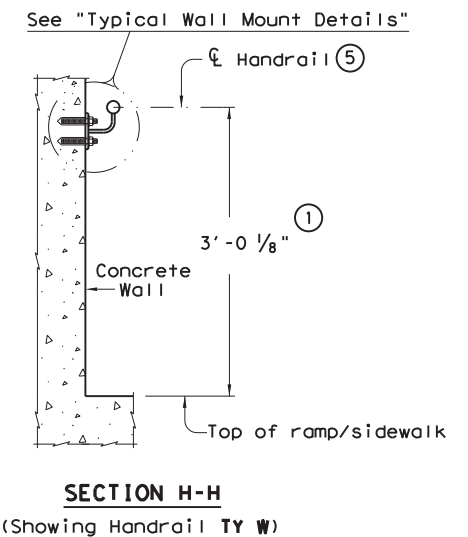
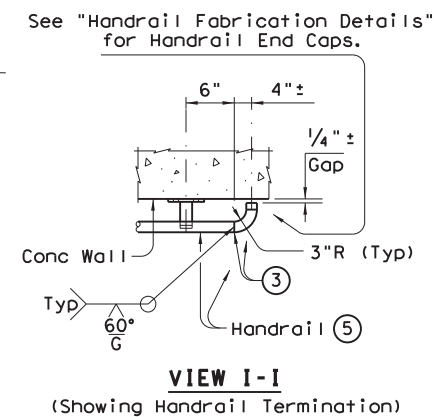
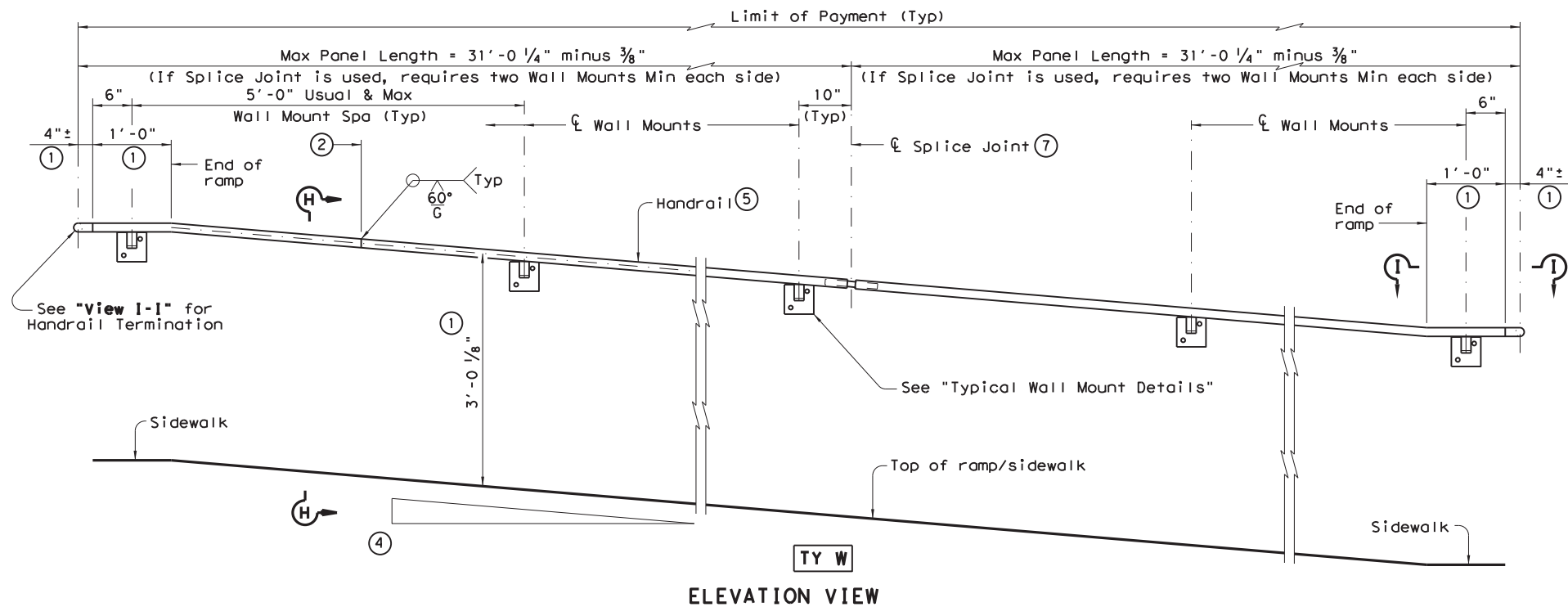
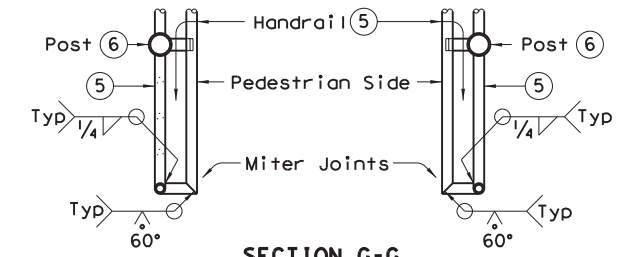
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© TxDOT December 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
REVISED MAY, 2013 (VP)	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	153	

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DATE:
FILE:



SECTION G-G
(Showing Handrail Termination)



- ① Parallel to ground.
- ② One shop splice per panel is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.
- ③ Shop splice is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.
- ④ See Ramp Details located elsewhere in plans for ramp slope and dimensions. Maximum ramp slope will not exceed 8.3 percent. Level landing required for each 30" rise if grade exceeds 5 percent.
- ⑤ 1 1/2" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ramp / sidewalk. Provide holes as needed in 1 1/2" Dia. pipe for galvanizing drainage and venting.
- ⑥ 2 1/2" Dia. Standard Pipe (2.875" O.D., 0.203" wall thickness). See "Post Mount Detail" for crimping and trimming post to fit Dia. of top rail. Provide holes as needed in post for galvanizing drainage and venting. Plumb all posts.
- ⑦ See "Handrail Fabrication Details" for Splice Joints.
- ⑧ 1/2" Dia. Round Bar equal spacing at 4 1/2" Max. Plumb all pickets.
- ⑪ See "General Notes" for anchor bolt information.

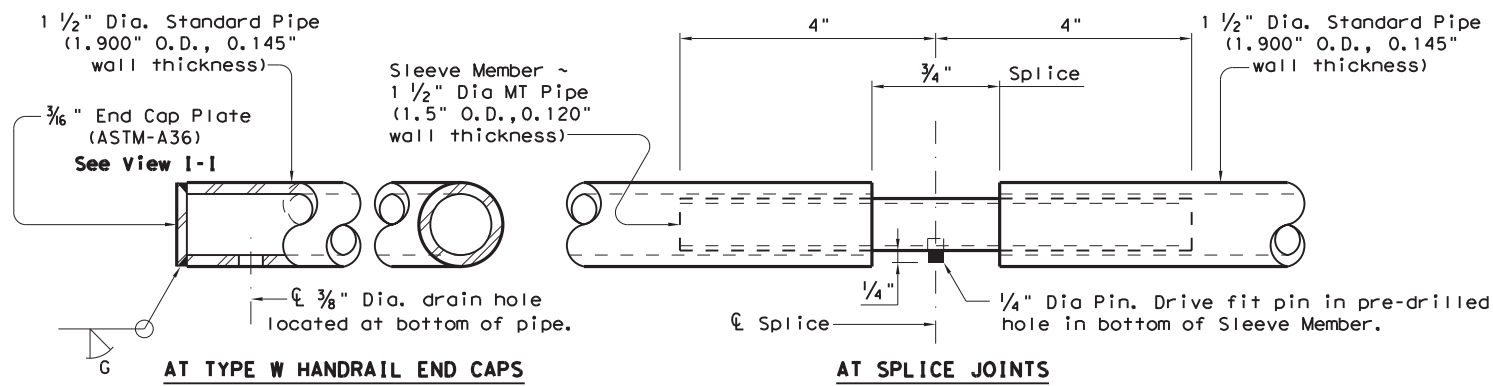
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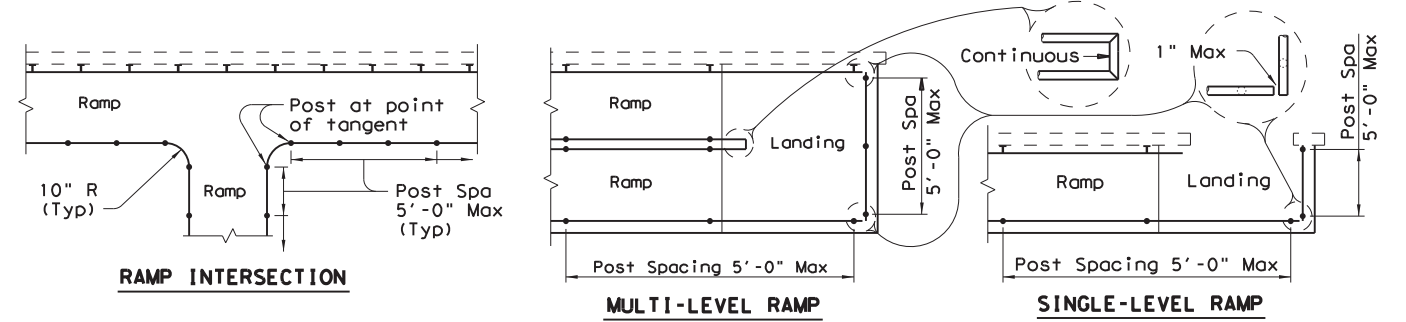
**PEDESTRIAN HANDRAIL
DETAILS
PRD-13**

FILE: prd13.dgn	DN: TxDOT	CK: AM	DW: JTR	CK: CGL
© TxDOT December 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
REVISED MAY, 2013 (VP)	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	154	

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HANDRAIL FABRICATION DETAILS



PLAN SHOWING RAIL AT RAMP CONDITIONS

GENERAL NOTES

Designed according to ADAAG, Texas Accessibility Standards, Uniform Building Code, and AASHTO LRFD Specifications.

Handrail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

Pipe will conform to ASTM-A53 Grade B or A500 Grade B. Steel plates and steel bars will conform to ASTM-A36. Mechanical tubing (MT) will conform to ASTM A513 Grade 1015 or higher. Galvanize all steel components except reinforcing steel unless noted otherwise.

Concrete for foundations will be in accordance with Item 531 "Sidewalks". All reinforcing steel must be Grade 60. Bar laps, where required, will be as follows: Uncoated #4 = 1'-5" Epoxy coated #4 = 2'-1"

When the plans require painted steel, follow the requirements for painting galvanized steel in Item 446, "Cleaning and Painting Steel". Sleeve Members will receive galvanization and only get field painted after installation unless directed otherwise by Engineer.

Epoxy Anchor bolts for wall mount and post base plate will be 5/8" Dia. ASTM A36 threaded rods with one hex nut and one hardened steel washer at each bolt. 3/8" Dia. threaded rod embedment depth for wall mounts is 3 1/2" and embedment depth for post base plate is 5".

Embed threaded rods into concrete with a Type III (Class C) epoxy meeting the requirements of DMS-6100, "Epoxyes and Adhesives". Mix and dispense adhesive with the manufacturer's static mixing nozzle/dual cartridge system. Core drill holes (percussion drilling not permitted).

At the contractor's option the post base plate anchor bolts may be cast with the Ramp/Sidewalk (See Cast-in-Place Anchor Bolt Options).

Optional cast-in-place anchor bolts will be 5/8" Dia ASTM A307 Grade A bolts (or A36 threaded rods with one tack welded hex nut each) with one hex nut and one hardened steel washer at each bolt. Embedment depth of cast-in-place bolt will be 8" for post base plate.

Handrails and any wall or other surface adjacent to them will be free of any sharp or abrasive elements.

Submit shop drawings to the Engineer unless otherwise noted. For curved handrail applications, fabricate the handrail to the curve if radius is less than 600 ft. Shop drawings are required when rail is fabricated to the curve.

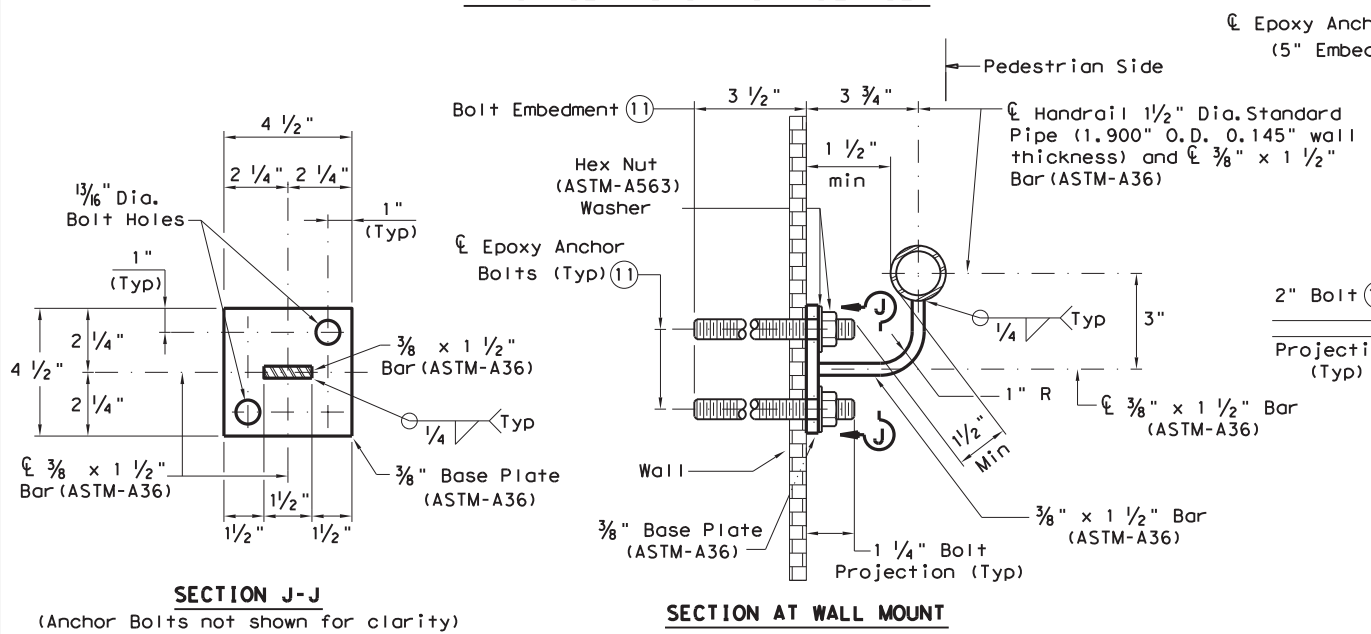
For all handrails, erection drawings will be submitted to the Engineer for approval to ensure proper installation.

Drawings will show handrail mount locations with bolts setting, spacing, ramp slope, and/or splice joint locations, and handrail lengths with identification showing where each handrail goes on the layout.

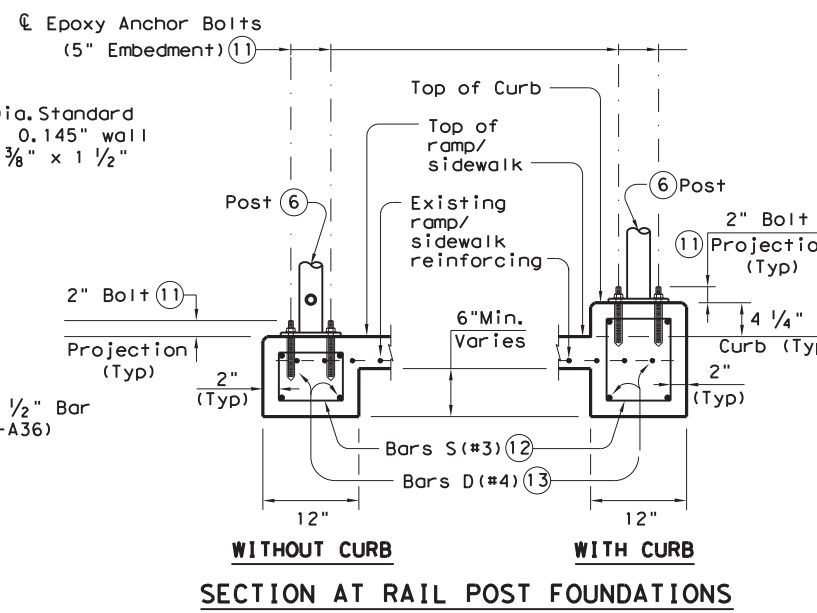
Payment for concrete sidewalks or curb ramps will be paid for in accordance with Item 531 "Sidewalks".

Payment for all items shown is to be included in unit price bid in accordance with Item 450 "Railing" of the type specified.

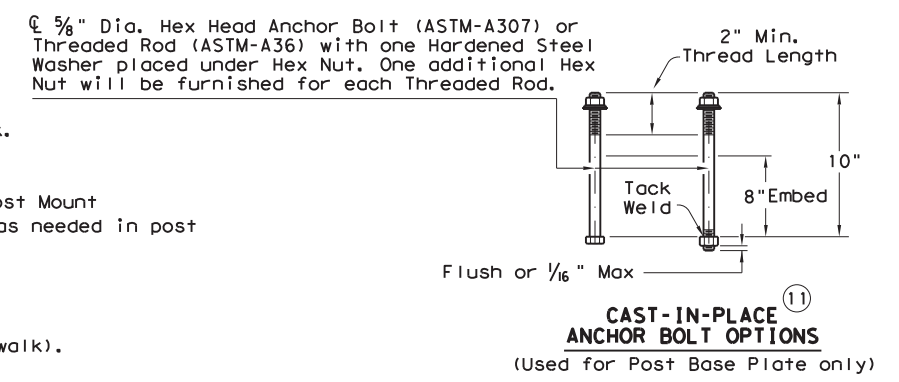
All exposed edges will be rounded or chamfered to approximately 1/8" by grinding.



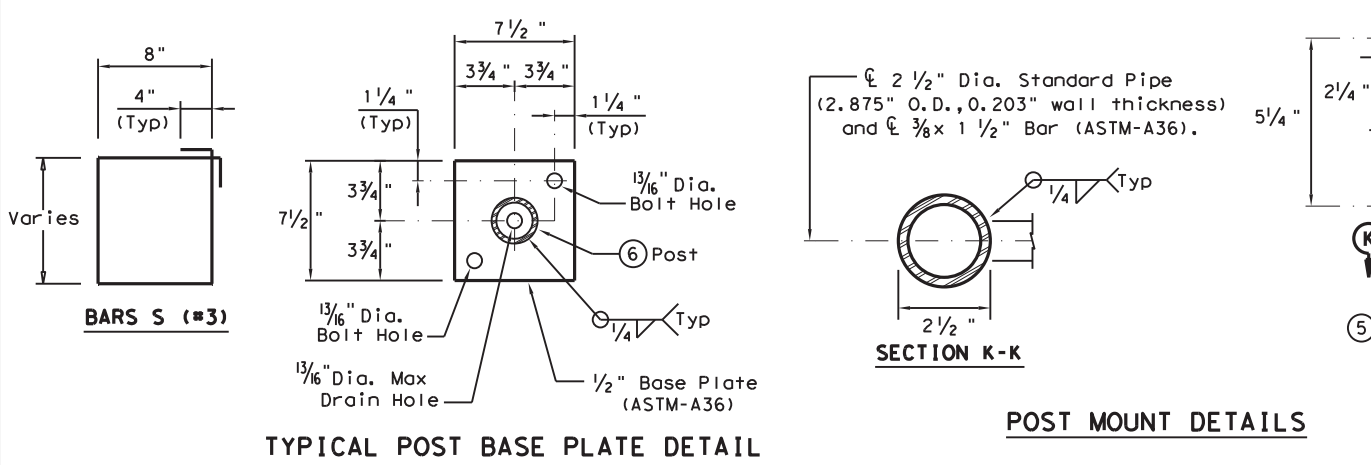
TYPICAL WALL MOUNT DETAILS



SECTION AT RAIL POST FOUNDATIONS



- (5) 1 1/2" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ramp/sidewalk. Provide holes as needed in 1 1/2" Dia. pipe for galvanizing drainage and venting.
- (6) 2 1/2" Dia. Standard Pipe (2.875" O.D., 0.203" wall thickness). Plumb all posts. See "Post Mount Detail" for crimping and trimming post to fit the diameter of top rail. Provide holes as needed in post for galvanizing drainage and venting.
- (11) See "General Notes" for anchor bolt information.
- (12) Bars S (#3) spaced at 12" Max (Spaced 3" from outside edge of overall length of Ramp/Sidewalk).
- (13) Provide 1 1/2" end cover to Bars D (#4) from outside edge of overall length of Ramp/Sidewalk.



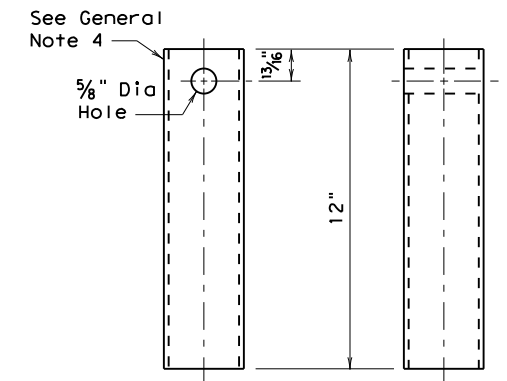
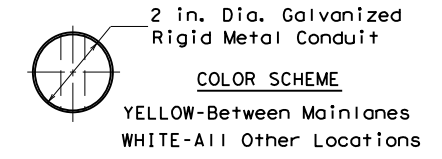
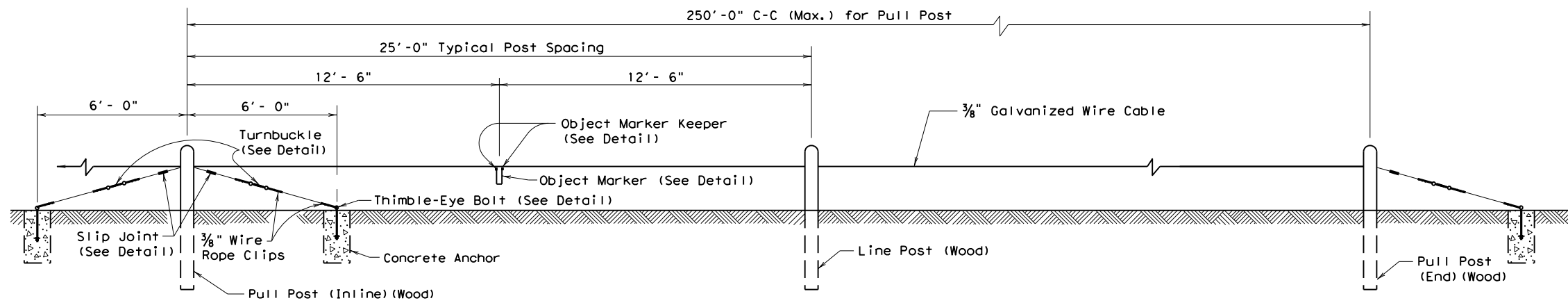
ELEVATION

		Design Division Standard	
<h2>PEDESTRIAN HANDRAIL DETAILS</h2> <h3>PRD-13</h3>			
FILE: prd13.dgn	DN: TxDOT	CK: AM	DW: JTR
© TxDOT December 2006	CONT: 6372	SECT: 50	JOB: 001
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REVISED MAY, 2013 (VP)	DIST: SAT	COUNTY: BEXAR	SHEET NO.: 155

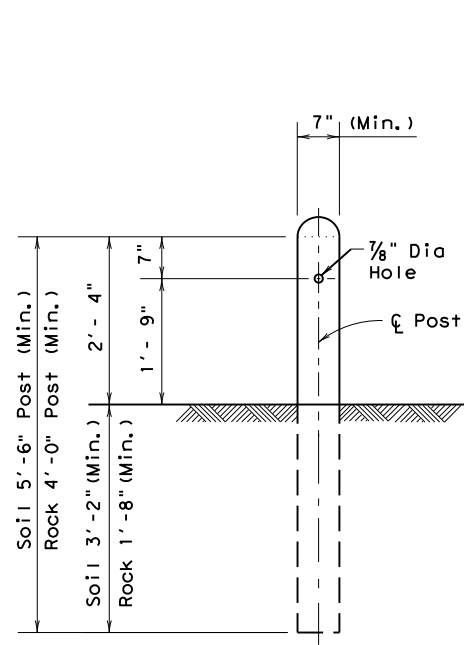
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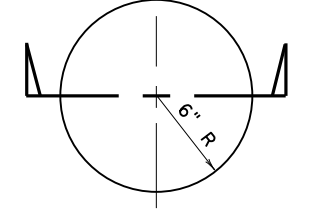
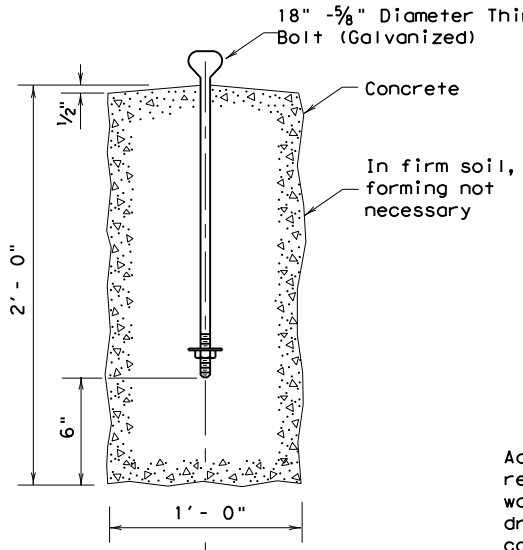
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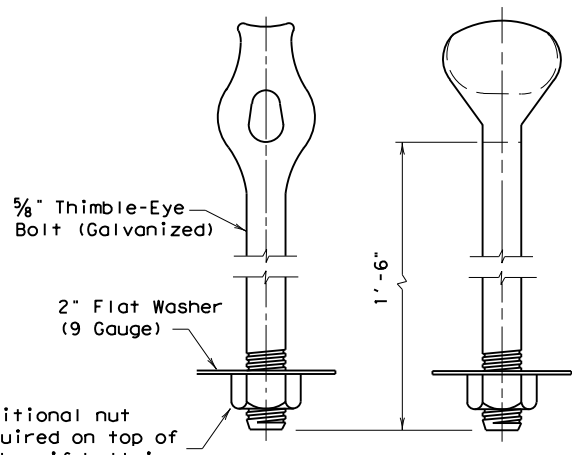
WOOD POST & CABLE UNIT



WOOD POST DETAIL

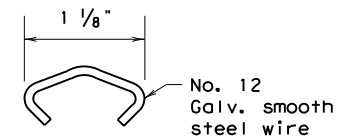


CONCRETE ANCHOR DETAILS



THIMBLE-EYE BOLT DETAILS

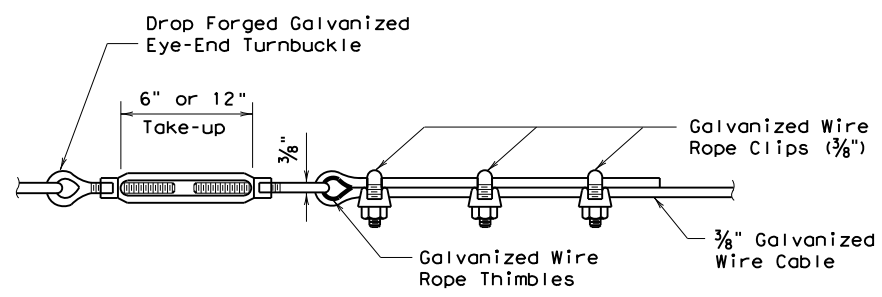
Clamp keepers on both sides of Reflector as shown above.



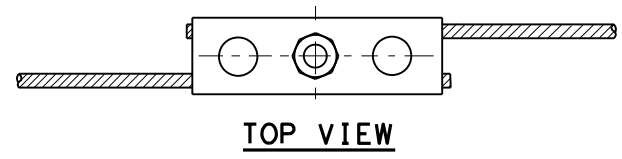
OBJECT MARKER KEEPER DETAIL

GENERAL NOTES

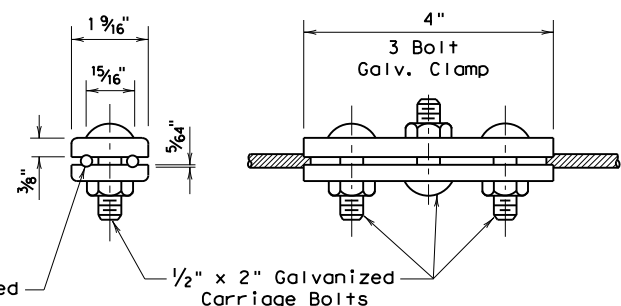
1. Furnish Class "B" or better concrete in accordance with Item 421, "Hydraulic Cement Concrete". Cure concrete anchors at least five (5) days before attaching the cable.
2. Furnish galvanized cable fittings in accordance with the Item 445, Galvanizing.
3. Furnish posts meeting the requirements of DMS 7200, "Timer Posts and Blocks for Metal Beam Guard Fence." Do not use painted timber posts.
4. Cover the entire surface of object marker (reflector) with a reflectorized sheeting material conforming to Departmental Material Specification DMS 8300, "Sign Face Materials", Type C.
5. Furnish cable conforming to ASTM designation A475.



WIRE CABLE CONNECTION (at turnbuckles & eyebolts) DETAIL



TOP VIEW



SIDE VIEW

SLIP JOINT DETAIL

Texas Department of Transportation
Maintenance Division

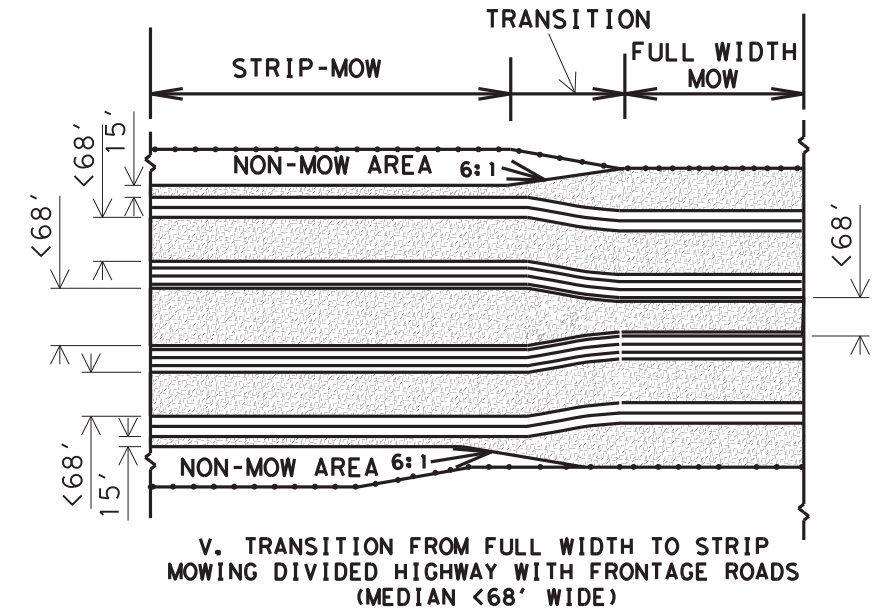
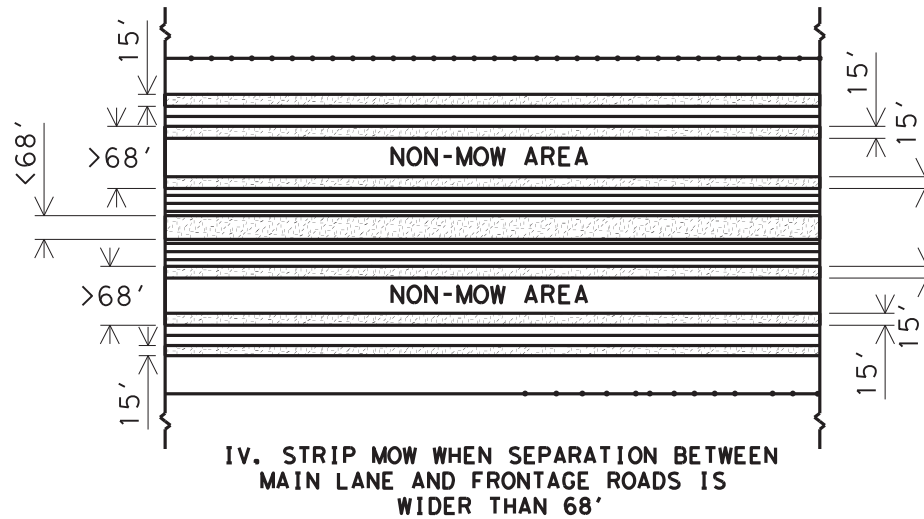
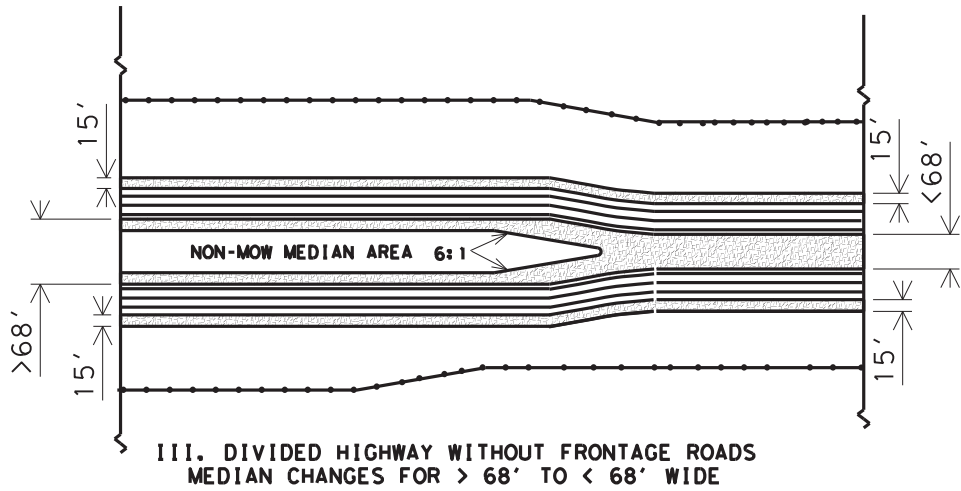
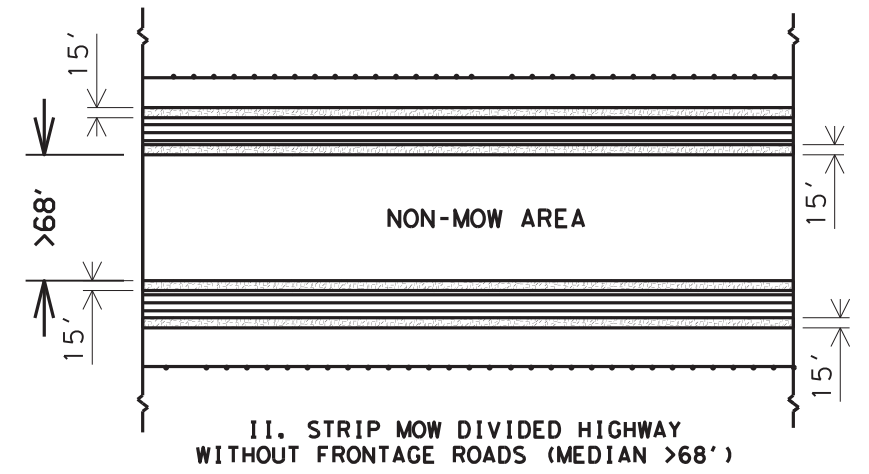
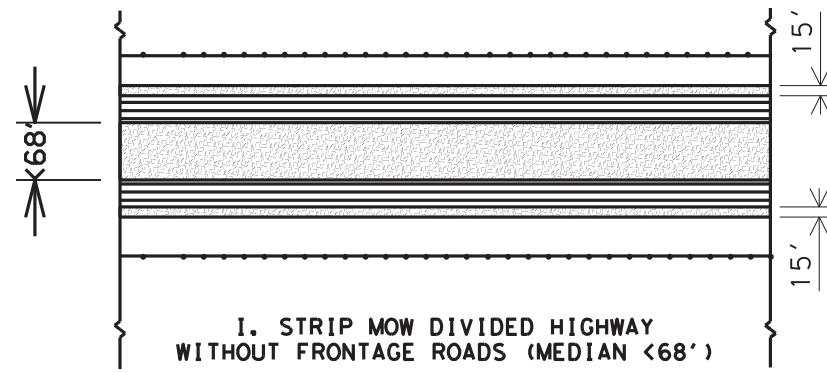
POST & CABLE FENCE

PCF-05

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© TxDOT FEB. 2005	DIST	FED REG	FEDERAL AID PROJECT		SHEET
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2/02 Rev. Design Div. PCF-99	COUNTY	CONT	SECT	JOB	HIGHWAY
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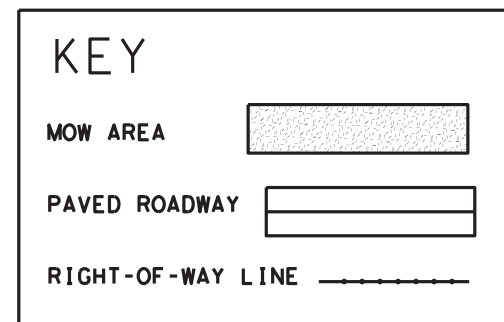
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49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	



GENERAL NOTES:

- MOW THE ENTIRE WIDTH OF MEDIANS AND OUTER SEPARATIONS (AREAS BETWEEN MAIN LANES, RAMPS, AND FRONTAGE ROAD) EXCEPT FOR NON-MOW AREAS.
- MOW FULL-WIDTH ALL MEDIANS AND OUTER SEPARATIONS 68' OR LESS FROM PAVEMENT EDGE TO PAVEMENT EDGE.
- FOR MEDIANS AND OUTER SEPARATIONS GREATER THAN 68' MOW A 15' ALONG EACH PAVEMENT EDGE.
- NON-MOW AREAS IN MEDIANS & OUTER SEPARATIONS WILL BE CONSIDERED THE AREA IN MEDIANS AND OUTER SEPARATIONS GREATER THAN 68' BETWEEN THE 15' STRIP MOW AREAS.
- OTHER NON-MOW AREA'S WILL BE SHOWN ELSEWHERE ON PLANS OR MARKED ON THE RIGHT OF WAY.



 *Texas Department of Transportation*
 Maintenance Division
 Standard Plans

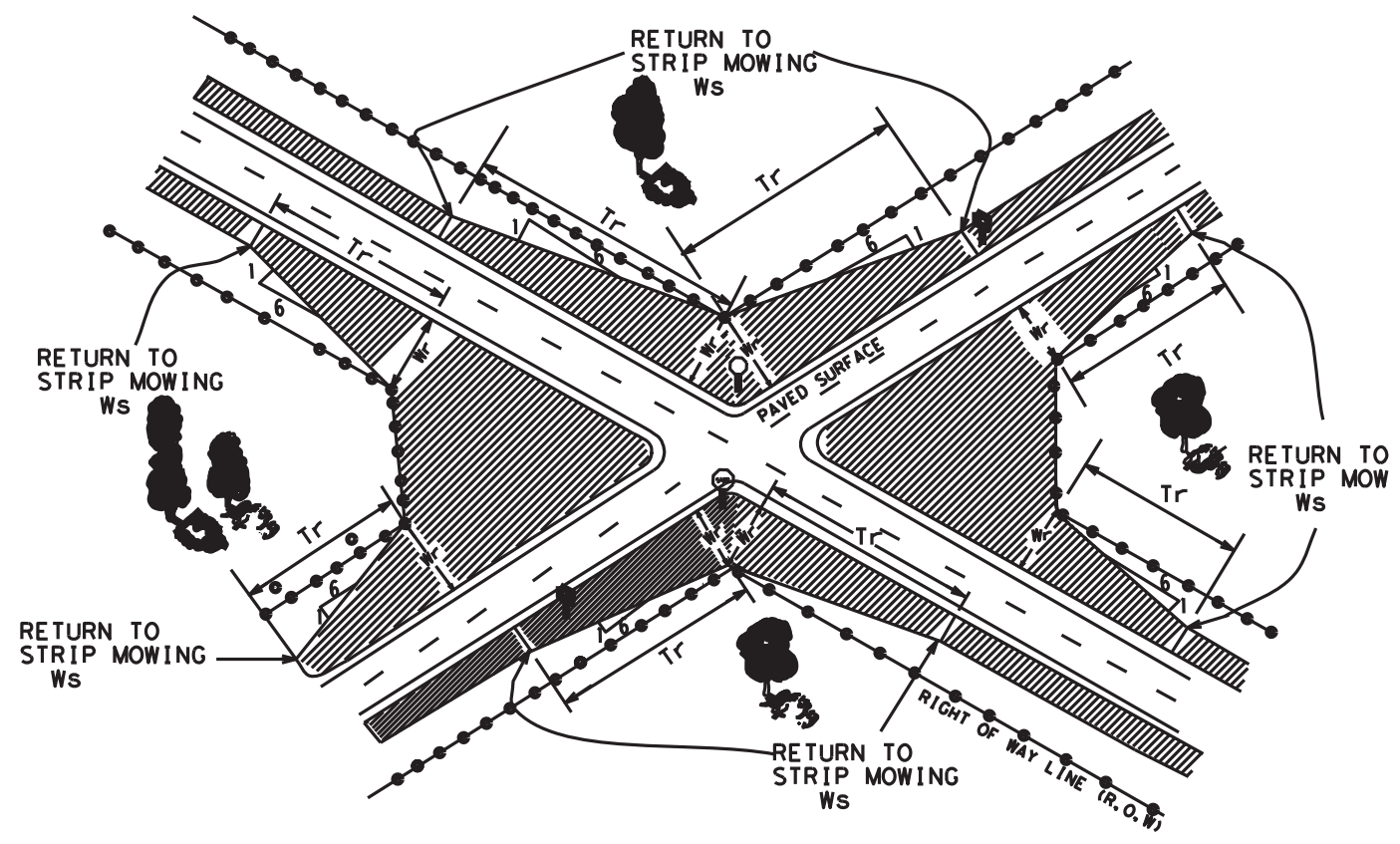
STRIP MOWING
 (DIVIDED HIGHWAYS)
 STRIP-MOW-D-04

SHEET 1 OF 1

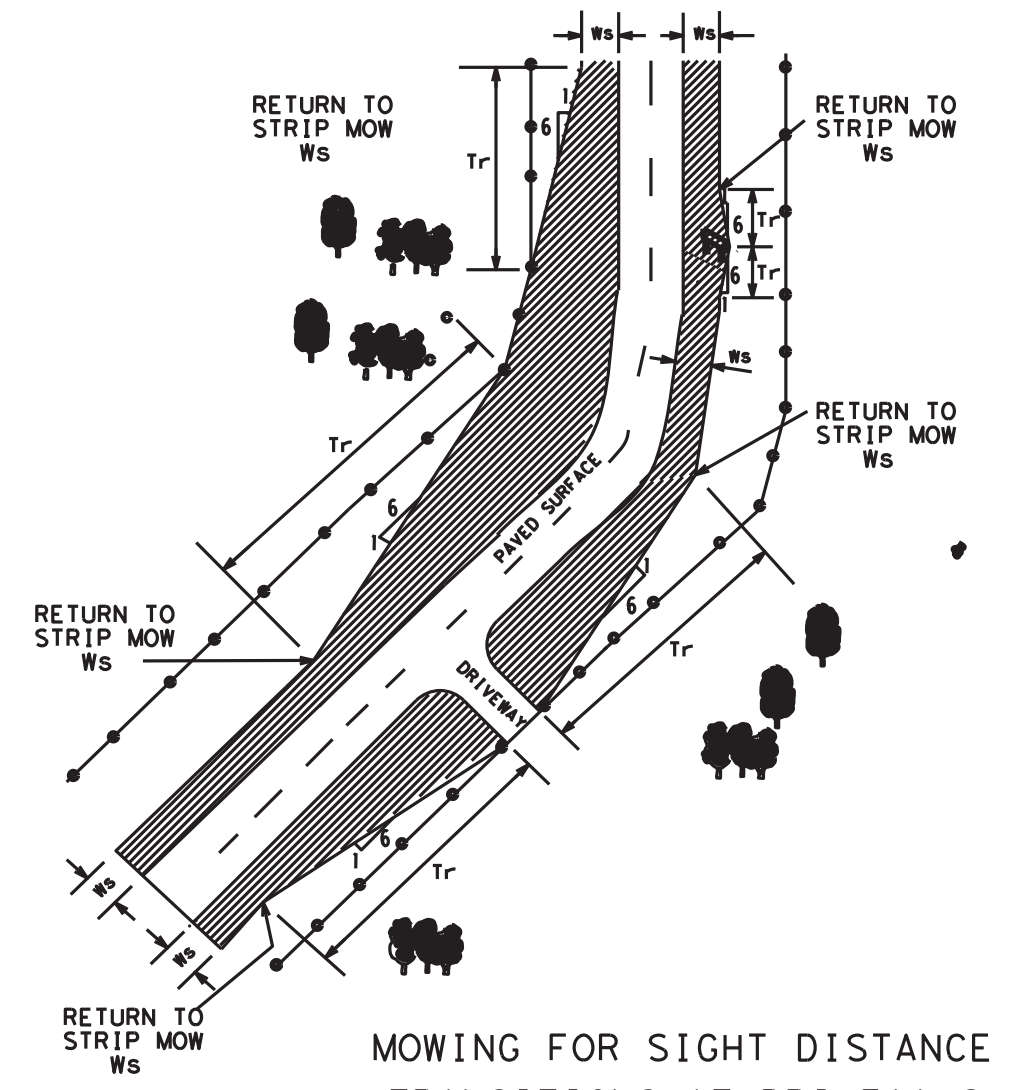
NOT TO SCALE

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REVISED:	6/03/2004	COUNTY			CONTROL	SECTION	JOB	HIGHWAY			
REVISED:		BEXAR			6372	50	001	VAR.			

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MOWING FOR SIGHT DISTANCE
WITH TRANSITION FROM INTERSECTION
BACK TO STRIP MOWING



MOWING FOR SIGHT DISTANCE
TRANSITIONS AT DRIVEWAYS,
SIGNS, AND CURVES

GENERAL NOTES:

1. THE NORMAL WIDTH FOR STRIP MOWING IS 15' UNLESS OTHERWISE SHOWN ON THE PLANS.
2. MOW TO THE R.O.W. LINE IN FRONT OF BUSINESSES, RESIDENCES, CHURCHES, OR CULTIVATED FIELDS UNLESS OTHERWISE SHOWN ON THE PLANS.
3. TRANSITION FOR SIGHT DISTANCE TO R.O.W LINE OR AROUND SIGNS AS SHOWN ON THIS SHEET UNLESS OTHERWISE SHOWN ON THE PLANS.

	RIGHT OF WAY LINE
	MOWING LOCATION
W_r	R.O.W. WIDTH (AT START OF TRANSITION)
W_s	STRIP MOWING WIDTH
T_r	TRANSITION

STRIP MOWING NON-DIVIDED HIGHWAYS

STRIP-MOW-ND-04

SHEET 1 OF 1 NOT TO SCALE

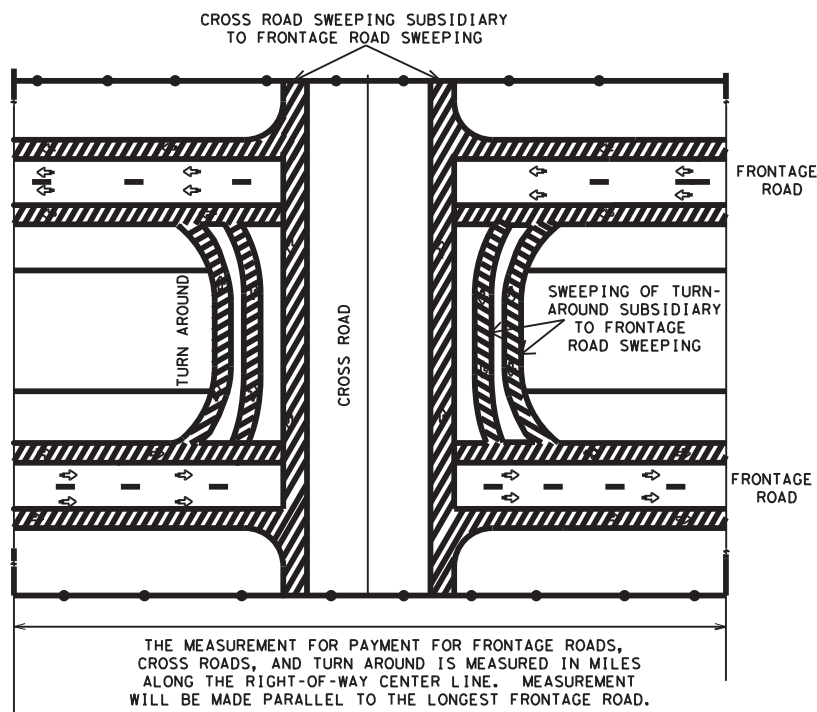
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REVISED:	5/18/2004	LJB				COUNTY	CONTROL	SECTION	JOB	HIGHWAY	
REVISED:						BEXAR	6372	50	001	VAR.	

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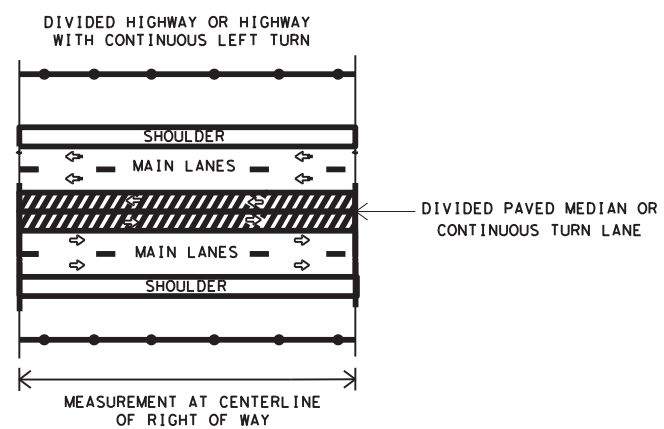
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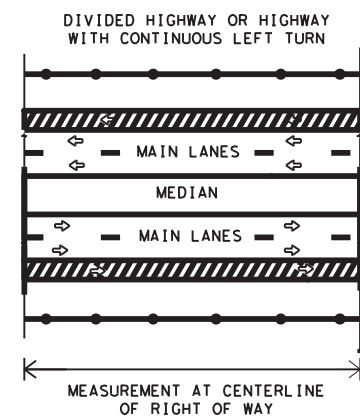
FRONTAGE ROAD SWEEPING



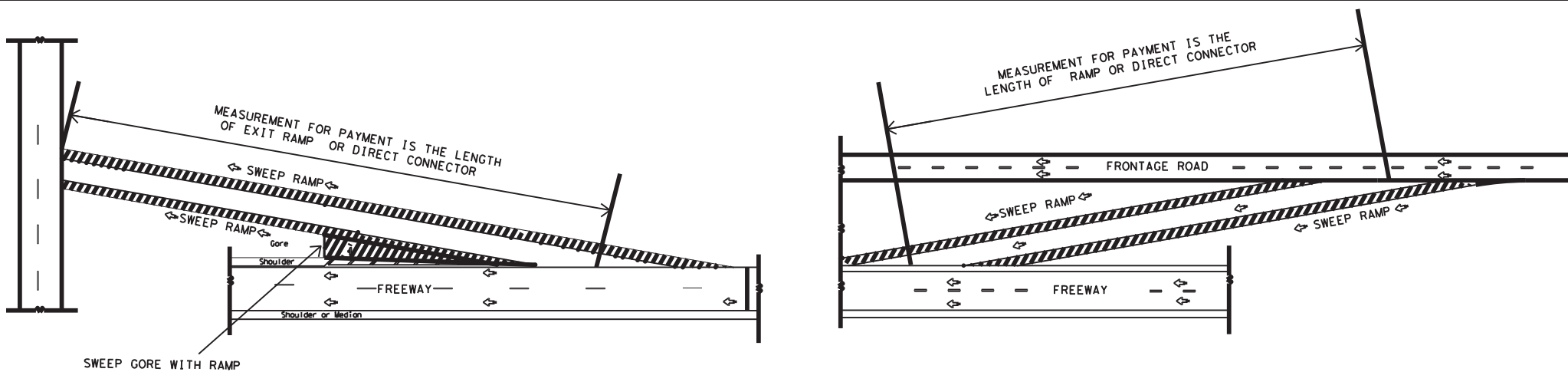
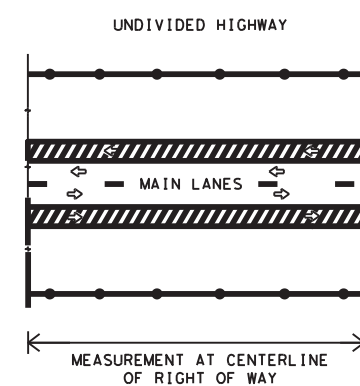
CENTER MEDIAN SWEEPING



OUTSIDE MAIN LANE SWEEPING

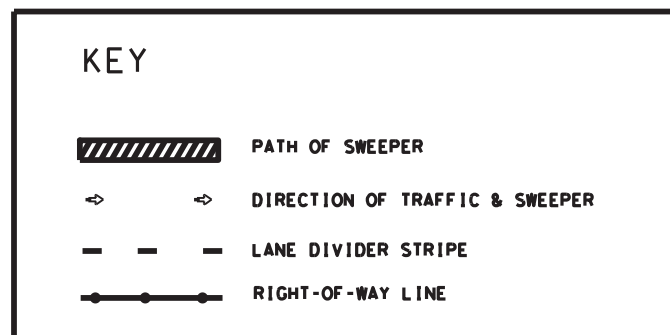


OUTSIDE MAIN LANE SWEEPING



RAMPS OR DIRECT CONNECTORS

PAYMENT ITEM	NORMAL NUMBER OF PASSES OF THE SWEEPER	MEASUREMENT OF CENTER LINE MILES	OTHER AREAS SUBSIDIARY TO PAYMENT ITEM
SWEEPING (CENTER MEDIAN)	2	OF RIGHT OF WAY	NONE
SWEEPING (OUTSIDE MAIN LANE)	2	OF RIGHT OF WAY	NONE
SWEEPING (ONE FRONTAGE ROAD)	2	OF RIGHT OF WAY	CROSS ROADS & TURN AROUNDS
SWEEPING (TWO FRONTAGE ROADS)	4	OF RIGHT OF WAY	CROSS ROADS & TURN AROUNDS
SWEEPING (RAMP)	2	OF RAMP	GORE AREA
SWEEPING (DIRECT CONNECTOR)	2	OF CONNECTOR	GORE AREA



Texas Department of Transportation
 Maintenance Division
 Standard Plans

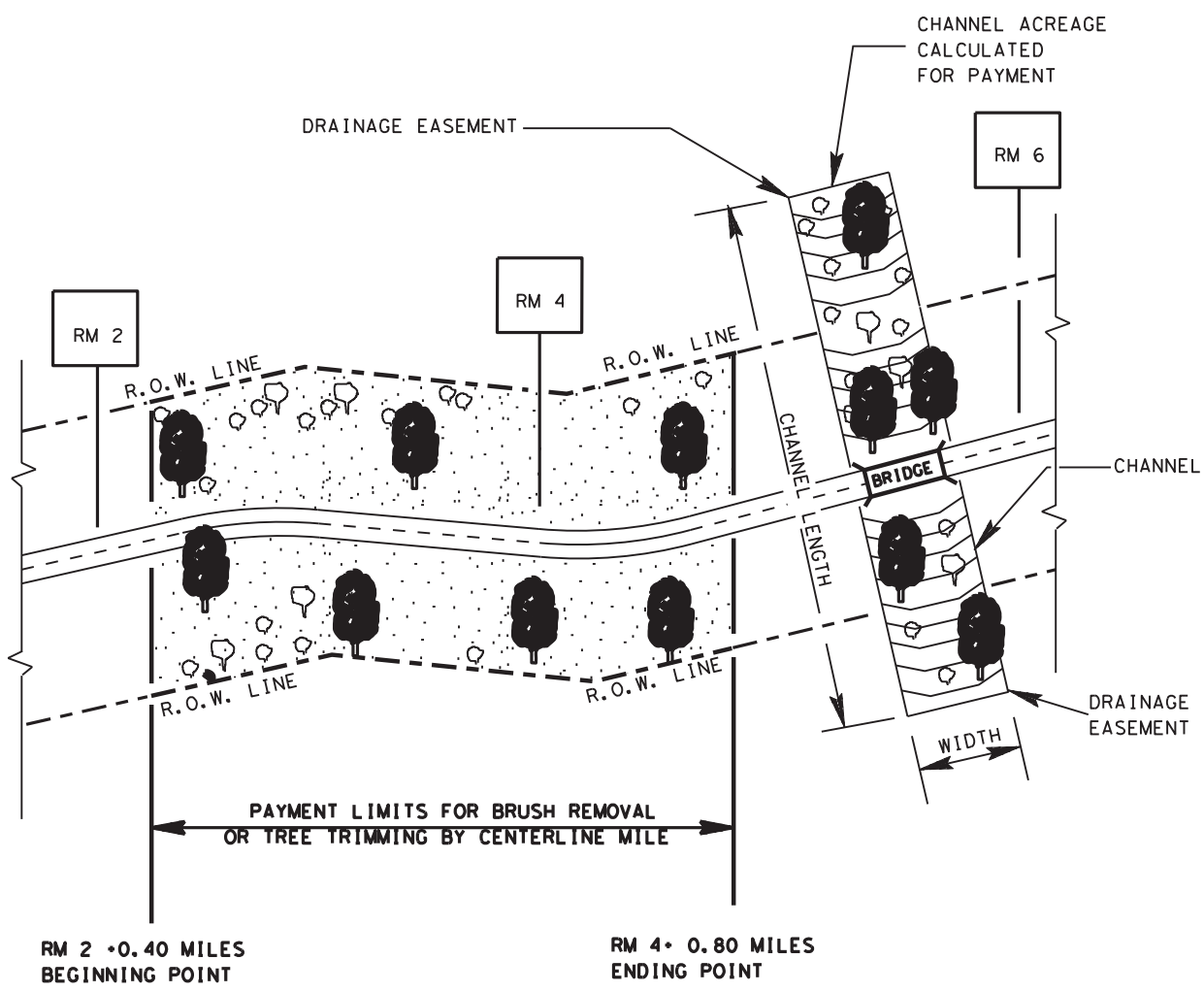
SWEEPING HIGHWAYS

SWEEP - 04

SHEET 1 OF 1 NOT TO SCALE

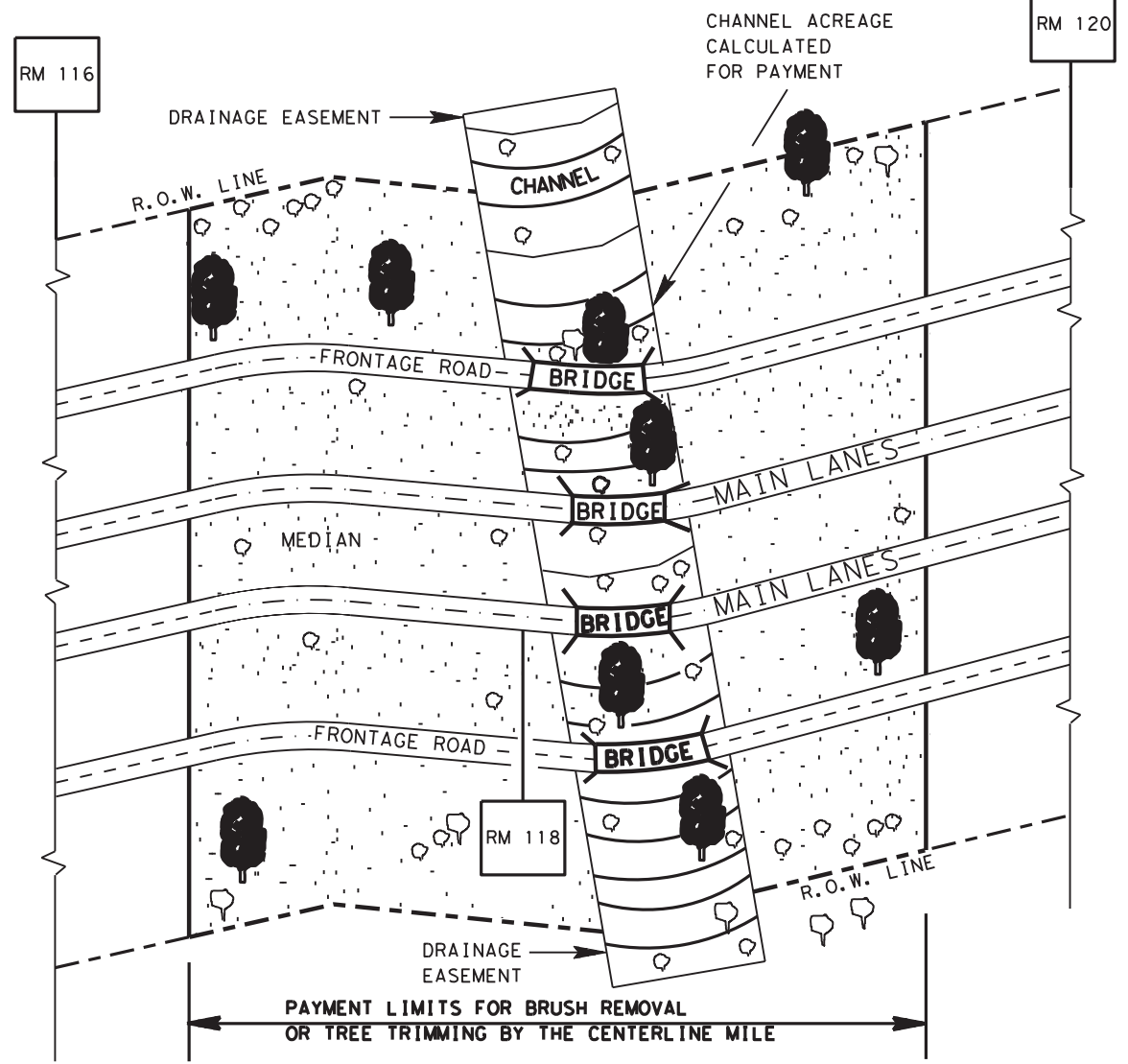
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©TxDOT MAY 2004	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT		SHEET
REVISED:	SAT	6			159
REVISED:	COUNTY		CONTROL	SECTION	JOB
REVISED:	BEXAR		6372	50	001 VAR.

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BRUSH REMOVED TO WITHIN 1" OF GROUND <4" DIAMETER TRUNK IS DEFINED AS BRUSH UNLESS OTHERWISE DIRECTED

EXAMPLE: UNDIVIDED HIGHWAY



BRUSH REMOVED TO WITHIN 1" OF GROUND <4" DIAMETER TRUNK IS DEFINED AS BRUSH UNLESS OTHERWISE DIRECTED

EXAMPLE: DIVIDED HIGHWAY WITH FRONTAGE ROADS

GENERAL NOTES:

TREE TRIMMING AND BRUSH REMOVAL

1. PAYMENT BY THE CENTERLINE MILE IS MADE TO THE NEAREST 1/100 (0.01) MILE.
2. LIMITS OF WORK ARE SHOWN AS DISTANCES FROM REFERENCE MARKERS (RM).
3. PAY ITEMS BY THE CENTERLINE MILE INCLUDE ALL TREE TRIMMING OR BRUSH REMOVAL IN THE RIGHT OF WAY ON BOTH SIDES OF THE HIGHWAY. FOR DIVIDED HIGHWAYS, THE MEDIAN IS INCLUDED. FOR HIGHWAYS WITH FRONTAGE ROADS, THE AREAS BETWEEN THE FRONTAGE ROADS AND MAIN LANES, AND THE AREAS OUTSIDE OF THE FRONTAGE ROADS ARE INCLUDED.
4. BRUSH REMOVAL AND TREE TRIMMING UNDER BRIDGES, IN AND ALONG CHANNELS AND EASEMENTS ARE PAID FOR BY THE ACRE FOR AREAS DESIGNATED ON THE PLANS.

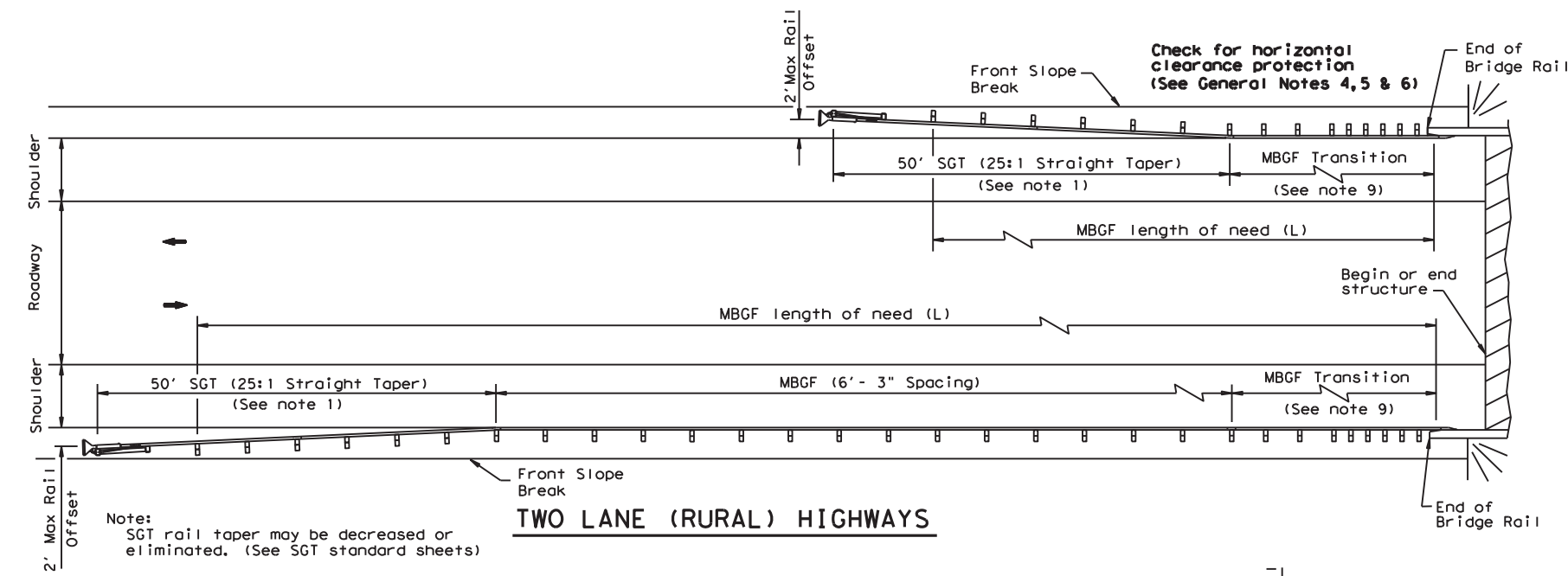
LEVELS DISPLAYED
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TREE AND BRUSH REMOVAL
 TRB-15(2)

NOT TO SCALE		DRAWN: JEO		CHECKED: DM/LJB		DW: -		CK: -		NEG NO.:	
FILE: TRB-15(2).DGN		MODIFIED:		STATE DISTRICT		FEDERAL REGION		FEDERAL AID PROJECT		SHEET	
© TxDOT APRIL 2015		LJB SAT		6						160	
REVISED: 5/13/2004		LJB		SAT		6					
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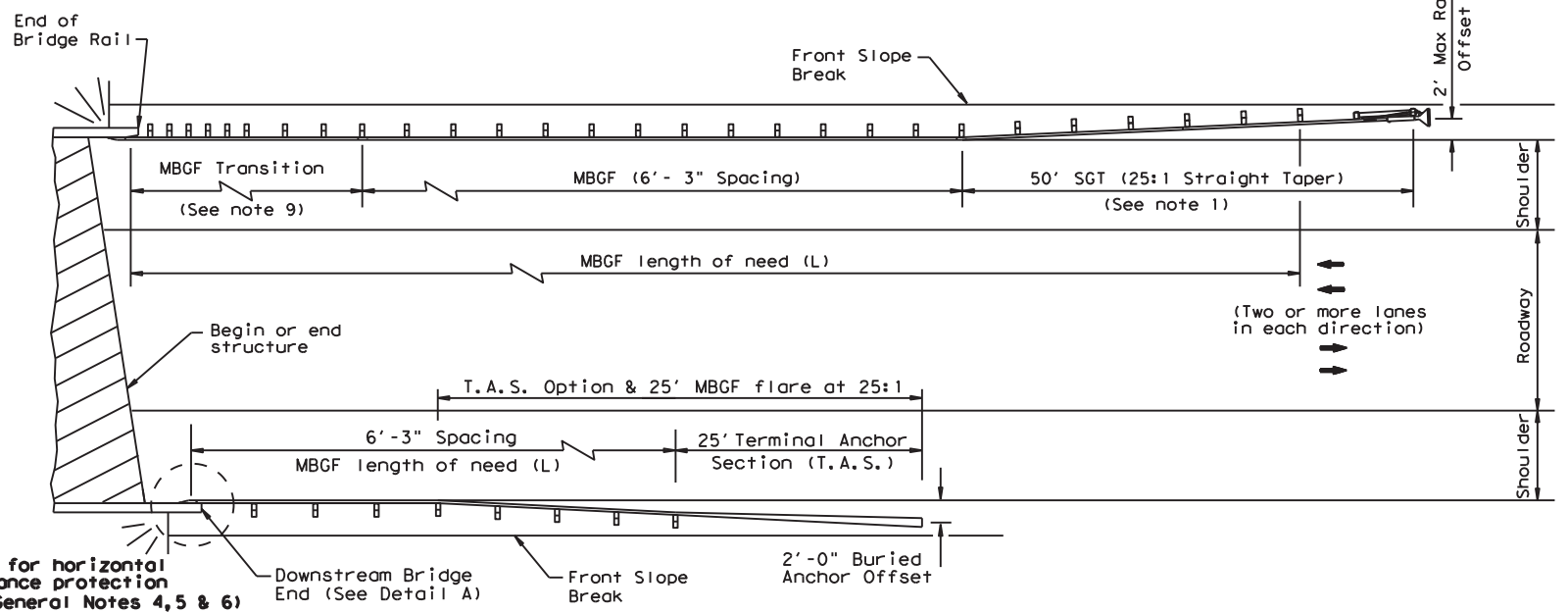
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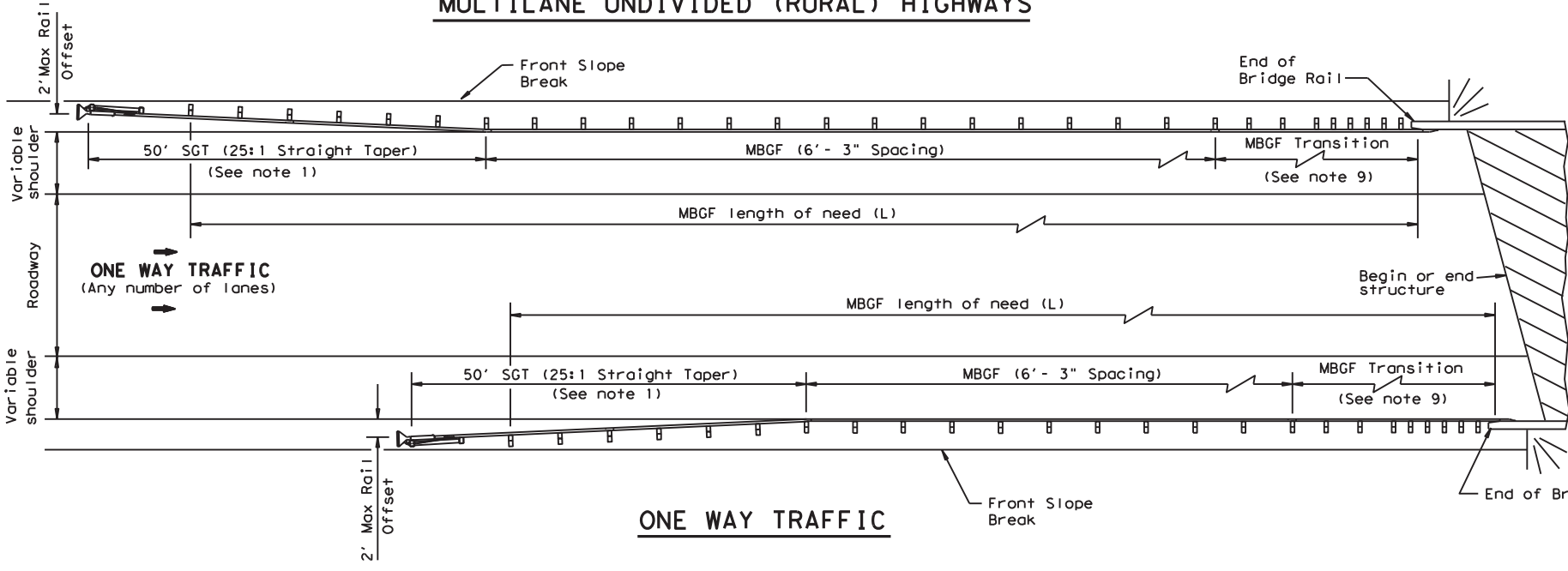


TWO LANE (RURAL) HIGHWAYS

Note:
SGT rail taper may be decreased or eliminated. (See SGT standard sheets)



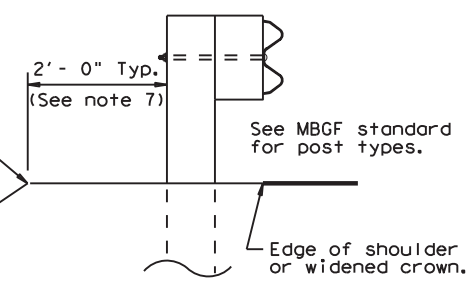
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



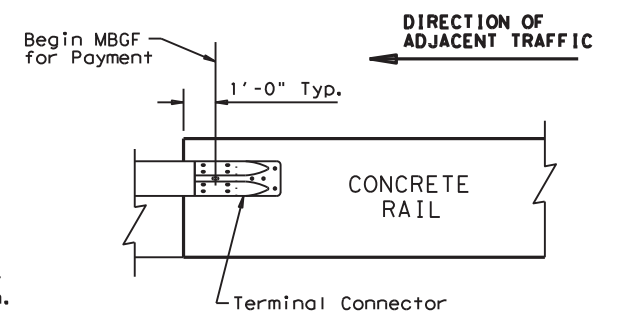
ONE WAY TRAFFIC

GENERAL NOTES

1. For more detail: See MBGF, SGT, and MBGF Transition standard sheets.
2. Quantities of metal beam guard fence (MBGF) at individual bridge ends are shown elsewhere in plans.
3. Use average daily traffic (ADT) for the current year to determine MBGF length of need in accordance with the Roadway Design Manual unless otherwise specified. Where significant traffic volume growth is anticipated on low volume (0-750 ADT) highways, use length determinations for the higher volume category.
4. MBGF may not be required to shield departure end of bridge unless other obstacles within the horizontal clearance limits or opposing traffic indicate a MBGF consideration.
5. Terminal anchor sections (TAS) are only for downstream end anchorage use, outside the horizontal clearance area of opposing traffic.
6. Direct connection of MBGF (at 6'-3" post spacing without transition) to concrete rail are only for downstream rail connections outside the horizontal clearance area of opposing traffic. (See Detail A)
7. The crown shall be widened to accommodate MBGF. Typically the "front slope" break should be 2'-0" from the back of the MBGF post. This applies to new construction on new alignment or where existing roadway cross section is to be widened to increase roadway width. This does not apply to rehabilitation work where existing roadway crown width is to be retained (See Typical Cross Section at MBGF).
8. For restrictive bridge widths: The MBGF should be properly transitioned from the existing bridge rail to the adjoining MBGF (See MBGF Transition Standards). Metal beam guard fence at these bridge location(s) shall be flared at the rate of 25:1 or flatter, and be of the length necessary to locate the terminal end at the 2 ft. "maximum" offset from the shoulder edge.
9. Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.



TYPICAL CROSS SECTION AT MBGF



DETAIL A

All rail elements shall be lapped in the direction of adjacent traffic.

ONLY FOR USE IN MAINTENANCE REPAIRS.

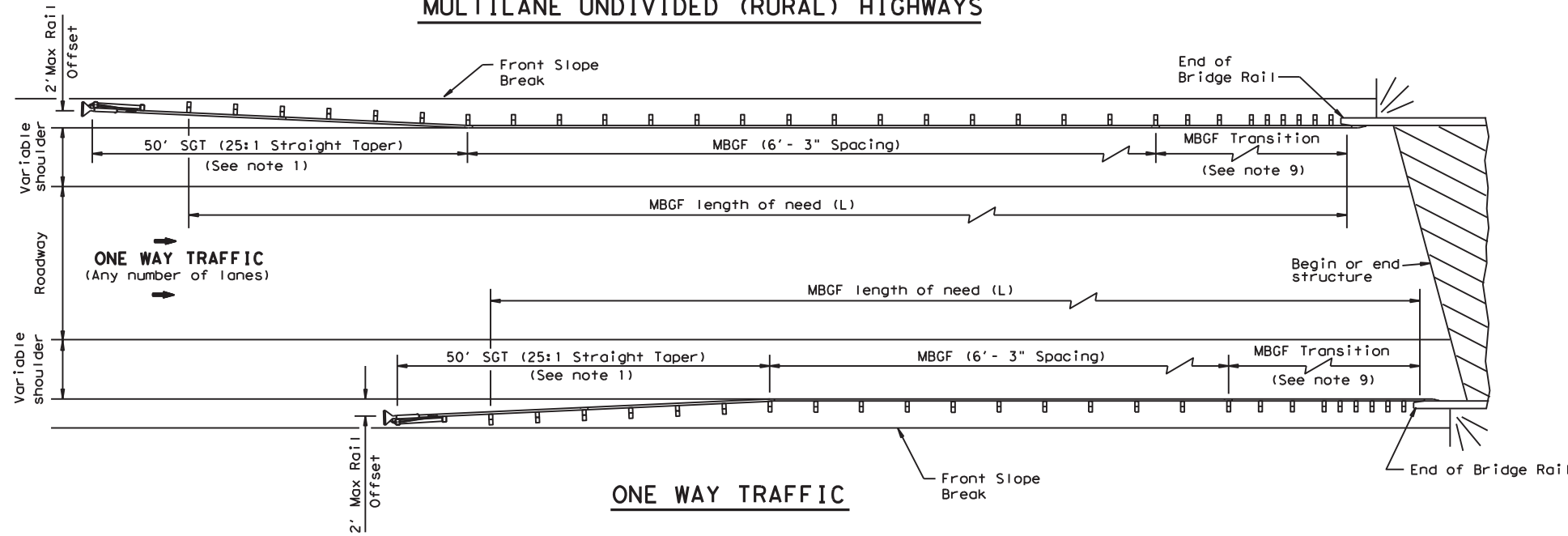
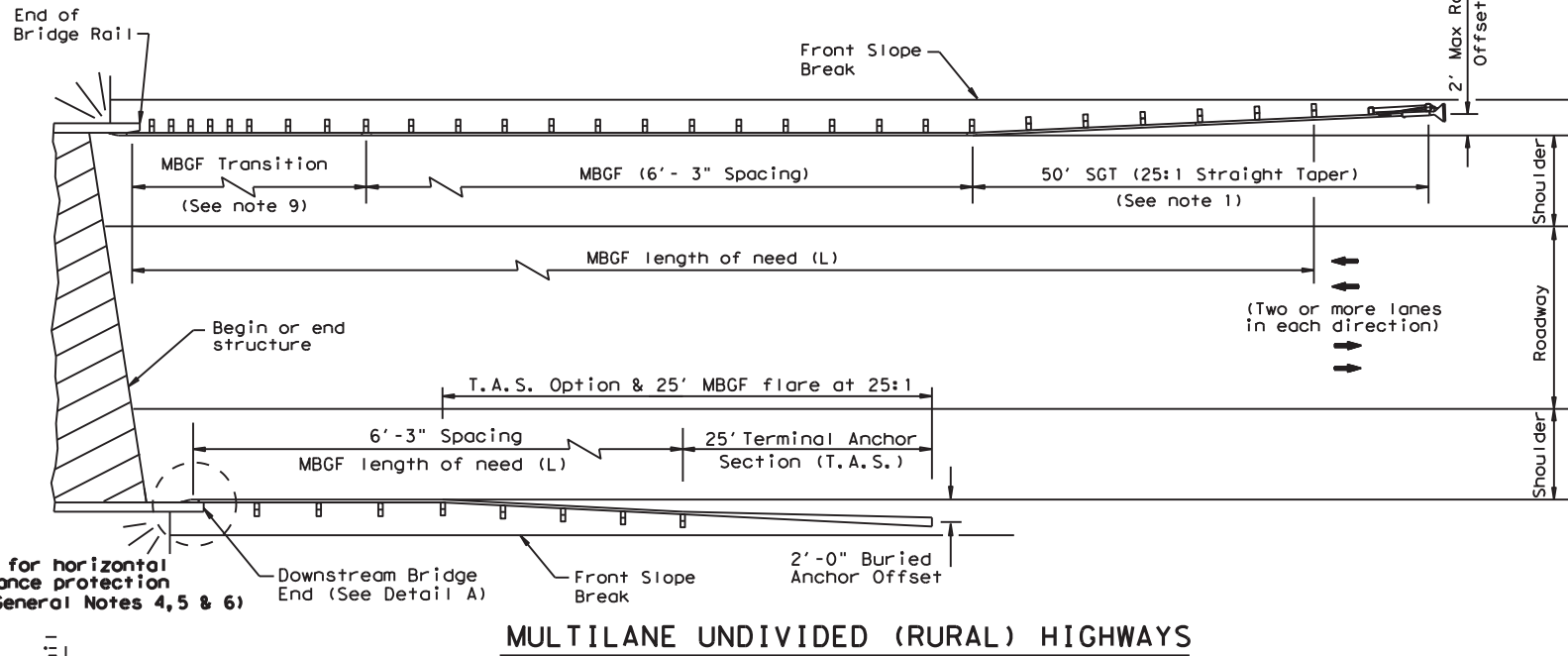
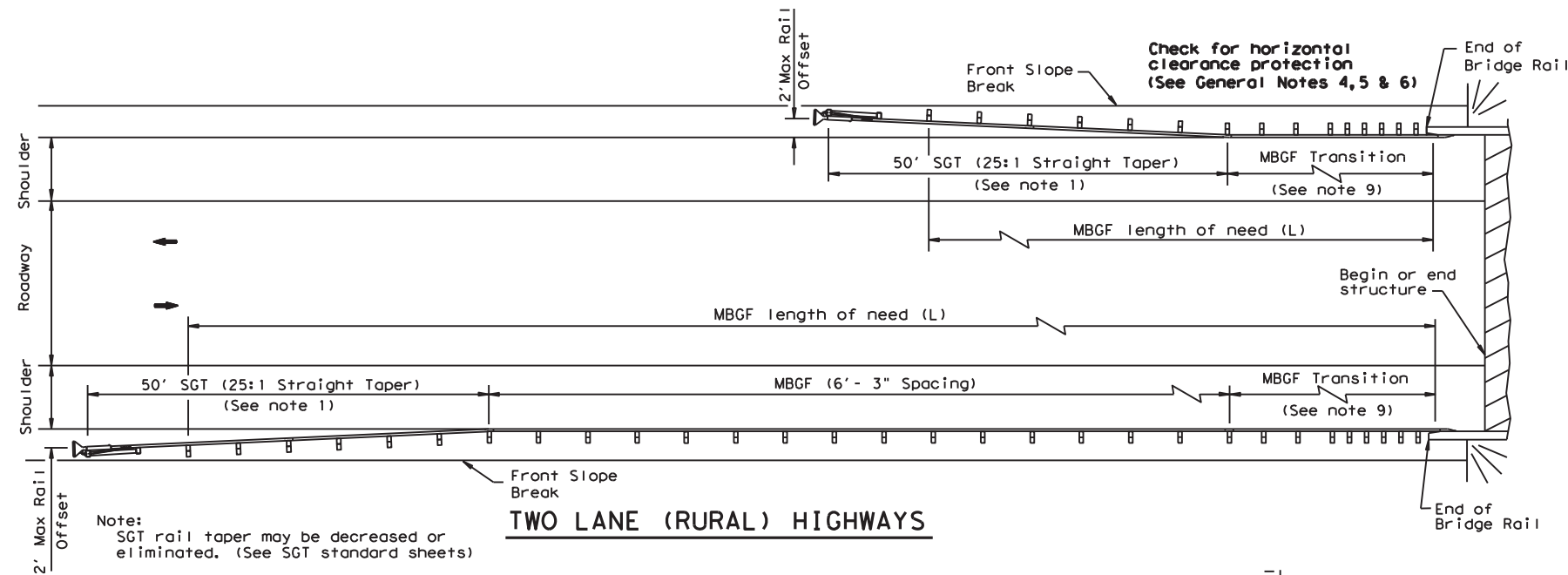


**BRIDGE END DETAILS
(28" METAL BEAM GUARD FENCE
APPLICATIONS TO RIGID RAILS)
BED (28) - 19**

FILE: bed2819.dgn	DN: TxDOT	CK: KM	DW: BD	CK: VP
© TxDOT NOVEMBER 2019	CONT: 6372	SECT: 50	JOB: 001	HIGHWAY: VAR.
REVISIONS	DIST: SAT	COUNTY: BEXAR	SHEET NO. 161	

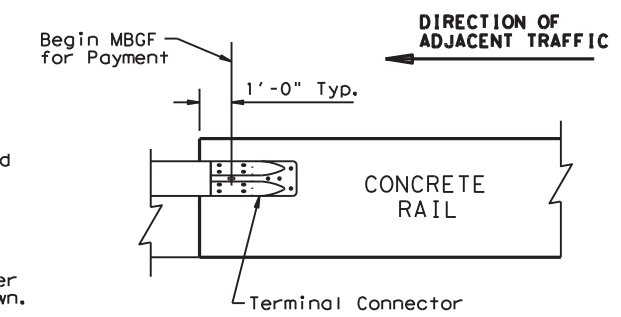
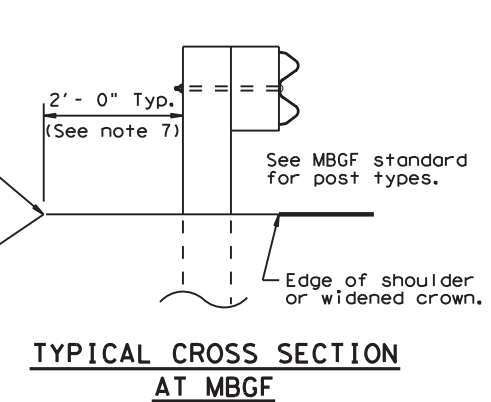
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GENERAL NOTES

1. For more detail: See MBSG, SGT, and MBSG Transition standard sheets.
2. Quantities of metal beam guard fence (MBSG) at individual bridge ends are shown elsewhere in plans.
3. Use average daily traffic (ADT) for the current year to determine MBSG length of need in accordance with the Roadway Design Manual unless otherwise specified. Where significant traffic volume growth is anticipated on low volume (0-750 ADT) highways, use length determinations for the higher volume category.
4. MBSG may not be required to shield departure end of bridge unless other obstacles within the horizontal clearance limits or opposing traffic indicate a MBSG consideration.
5. Terminal anchor sections (TAS) are only for downstream end anchorage use, outside the horizontal clearance area of opposing traffic.
6. Direct connection of MBSG (at 6'-3" post spacing without transition) to concrete rail are only for downstream rail connections outside the horizontal clearance area of opposing traffic. (See Detail A)
7. The crown shall be widened to accommodate MBSG. Typically the "front slope" break should be 2'-0" from the back of the MBSG post. This applies to new construction on new alignment or where existing roadway cross section is to be widened to increase roadway width. This does not apply to rehabilitation work where existing roadway crown width is to be retained (See Typical Cross Section at MBSG).
8. For restrictive bridge widths: The MBSG should be properly transitioned from the existing bridge rail to the adjoining MBSG (See MBSG Transition Standards). Metal beam guard fence at these bridge location(s) shall be flared at the rate of 25:1 or flatter, and be of the length necessary to locate the terminal end at the 2 ft. "maximum" offset from the shoulder edge.
9. Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.



All rail elements shall be lapped in the direction of adjacent traffic.

Texas Department of Transportation
 Design Division Standard

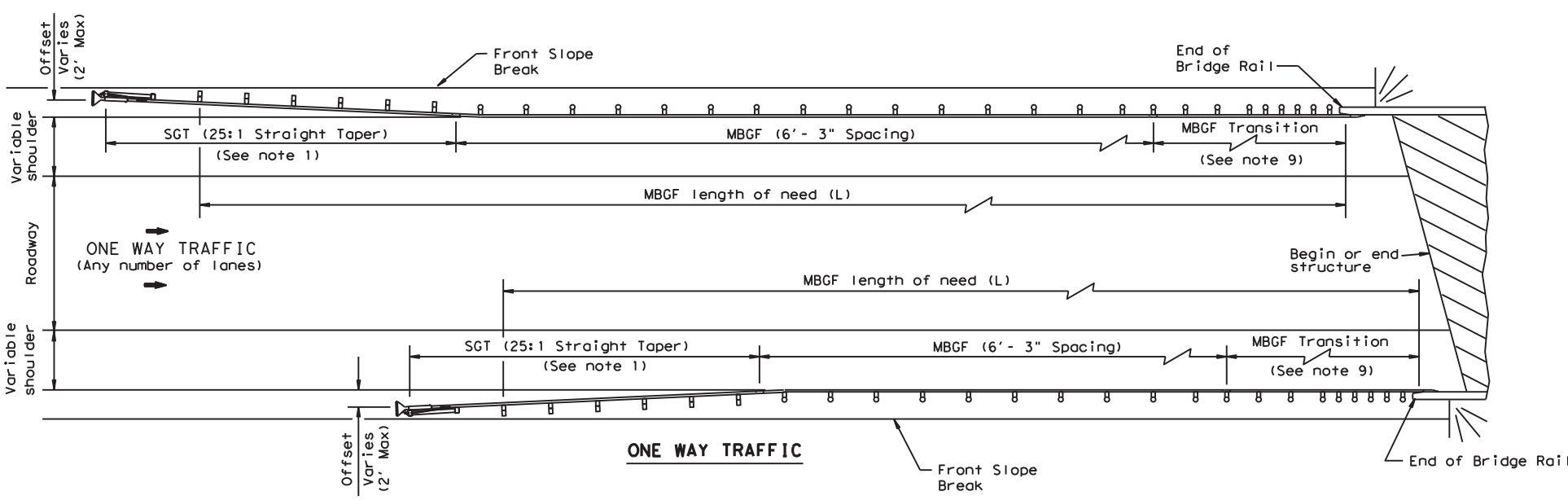
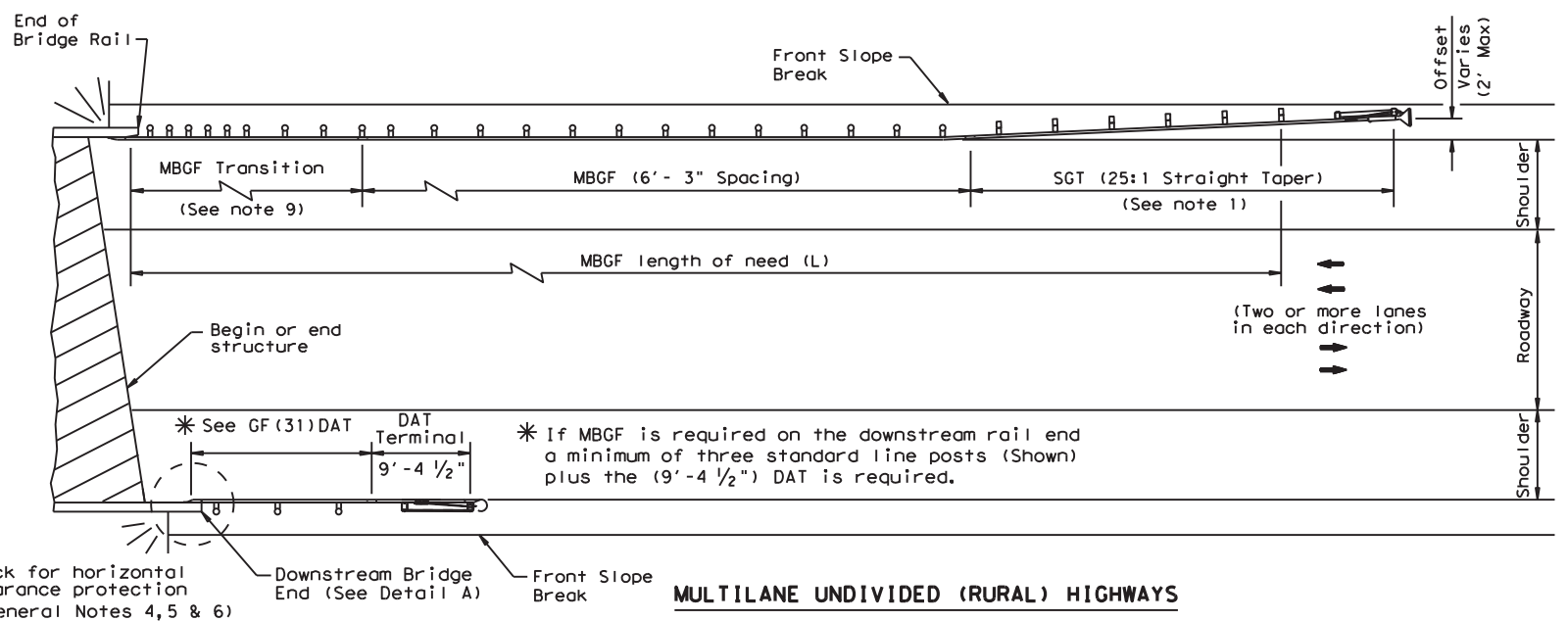
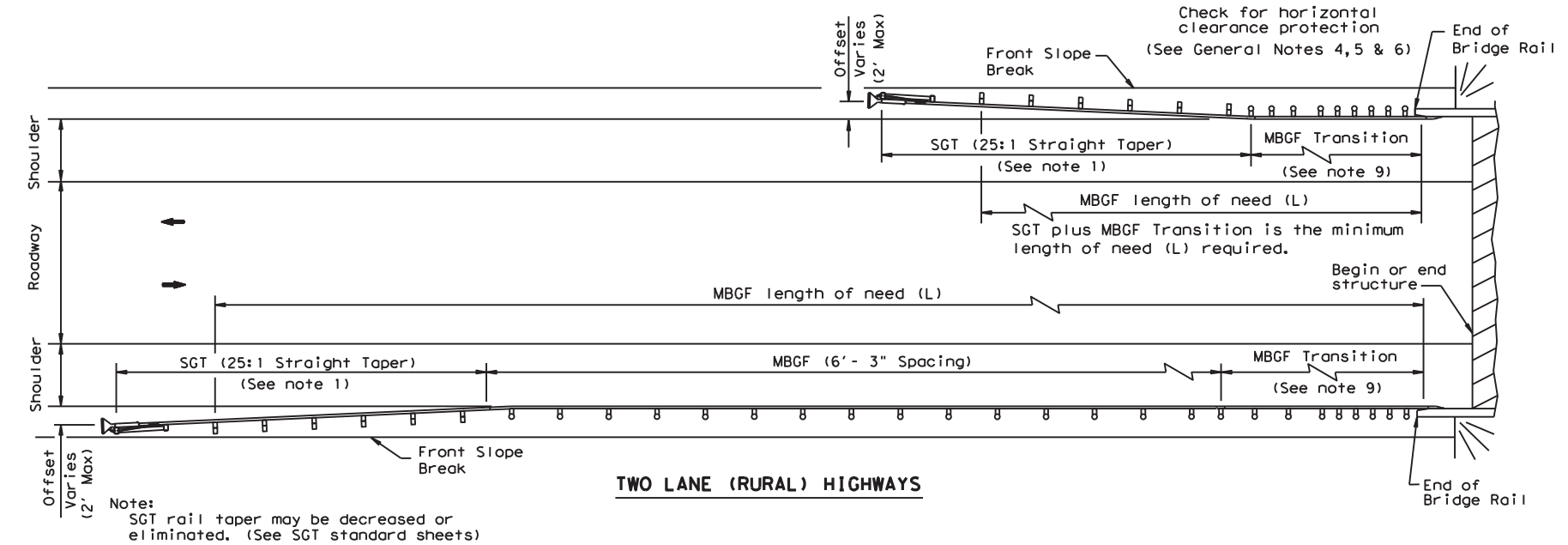
BRIDGE END DETAILS
 (28" Metal Beam Guard Fence Applications to Rigid Rails)

BED (28) - 11

FILE: bed2811.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
© TxDOT December 2001	CONT	SECT	JOB	HIGHWAY
12-2011	6372	50	001	VAR.
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	SAT	BEXAR	162	

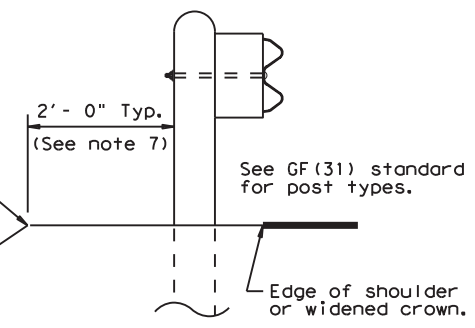
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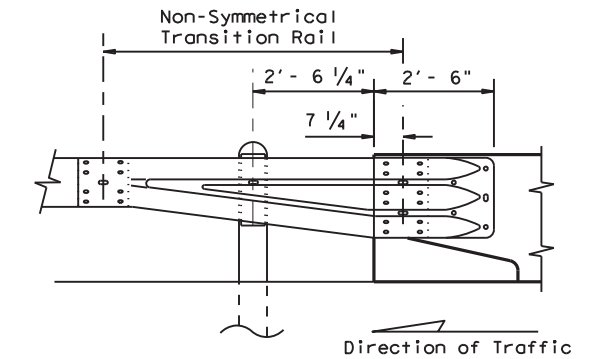


GENERAL NOTES

1. For more detail: See GF(31), SGT()31, GF(31)TR, and GF(31)TL2 standard sheets.
2. Quantities of metal beam guard fence (MBSGF) at individual bridge ends are as shown in the plans.
3. Use average daily traffic (ADT) for the current year to determine MBSGF length of need in accordance with the Roadway Design Manual unless otherwise specified. Where significant traffic volume growth is anticipated on low volume (0-750 ADT) highways, use length determinations for the higher volume category.
4. MBSGF may not be required to shield departure end of bridge unless other obstacles within the horizontal clearance limits or opposing traffic indicate a MBSGF consideration.
5. Downstream anchor terminals (DAT) are only for downstream end anchorage use, outside the horizontal clearance area of opposing traffic.
6. Direct connection of MBSGF to concrete rails are only for downstream rail connections outside the horizontal clearance area of opposing traffic. (This requires a minimum of three standard line posts plus the DAT terminal, See Detail A)
7. The crown shall be widened to accommodate MBSGF. Typically the "front slope" break should be 2'- 0" from the back of the MBSGF post. This applies to new construction on new alignment or where existing roadway cross section is to be widened to increase roadway width. This does not apply to rehabilitation work where existing roadway crown width is to be retained (See Typical Cross Section at MBSGF).
8. For restrictive bridge widths: The MBSGF should be properly transitioned from the existing bridge rail to the adjoining MBSGF (See MBSGF Transition Standards). Metal beam guard fence at these bridge locations(s) shall be flared at the rate of 25:1 or flatter, and be of the length necessary to locate the terminal end at the 2 ft. "maximum" offset from the shoulder edge in the approach direction.
9. Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.



TYPICAL CROSS SECTION AT MBSGF



DETAIL A
Showing Downstream Rail Attachment

Texas Department of Transportation
Design Division Standard

BRIDGE END DETAILS
(Metal Beam Guard Fence Applications to Rigid Rails)

BED-11

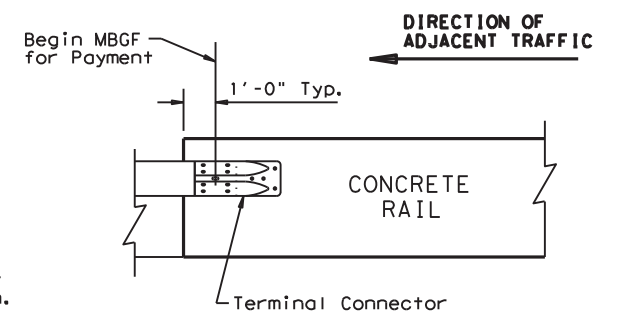
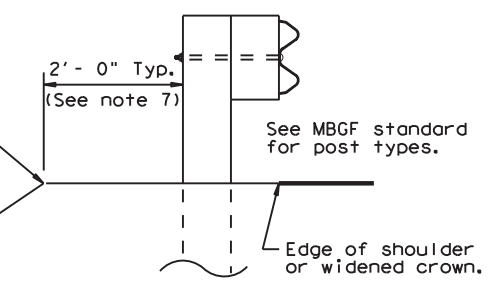
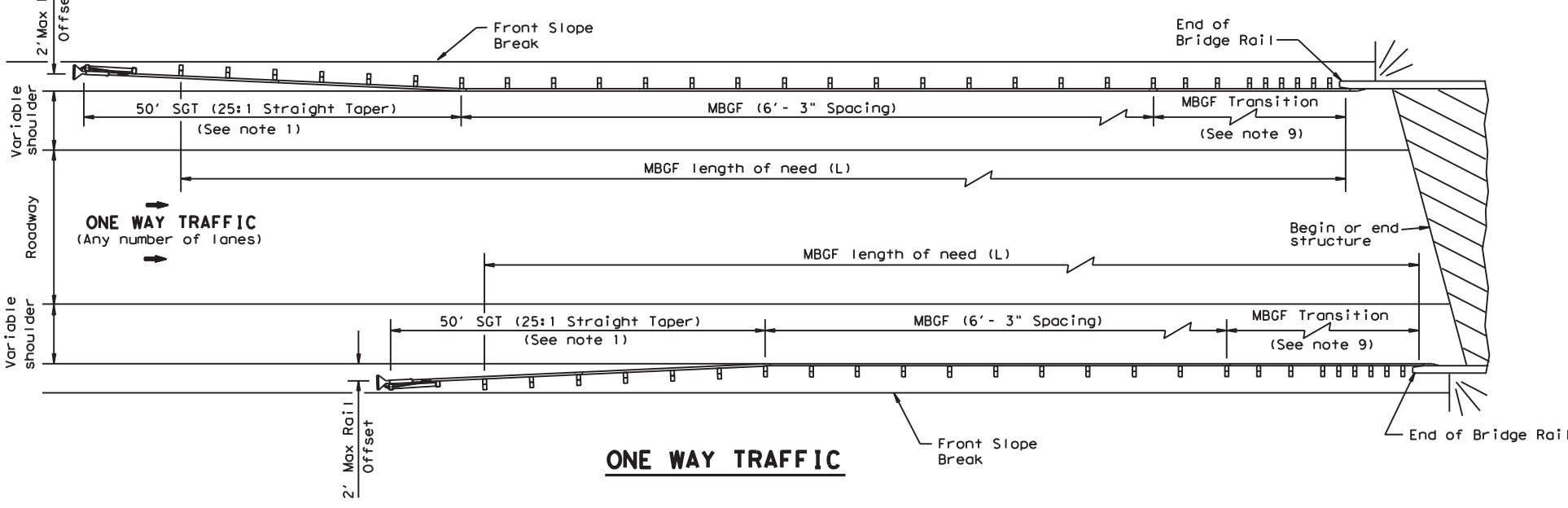
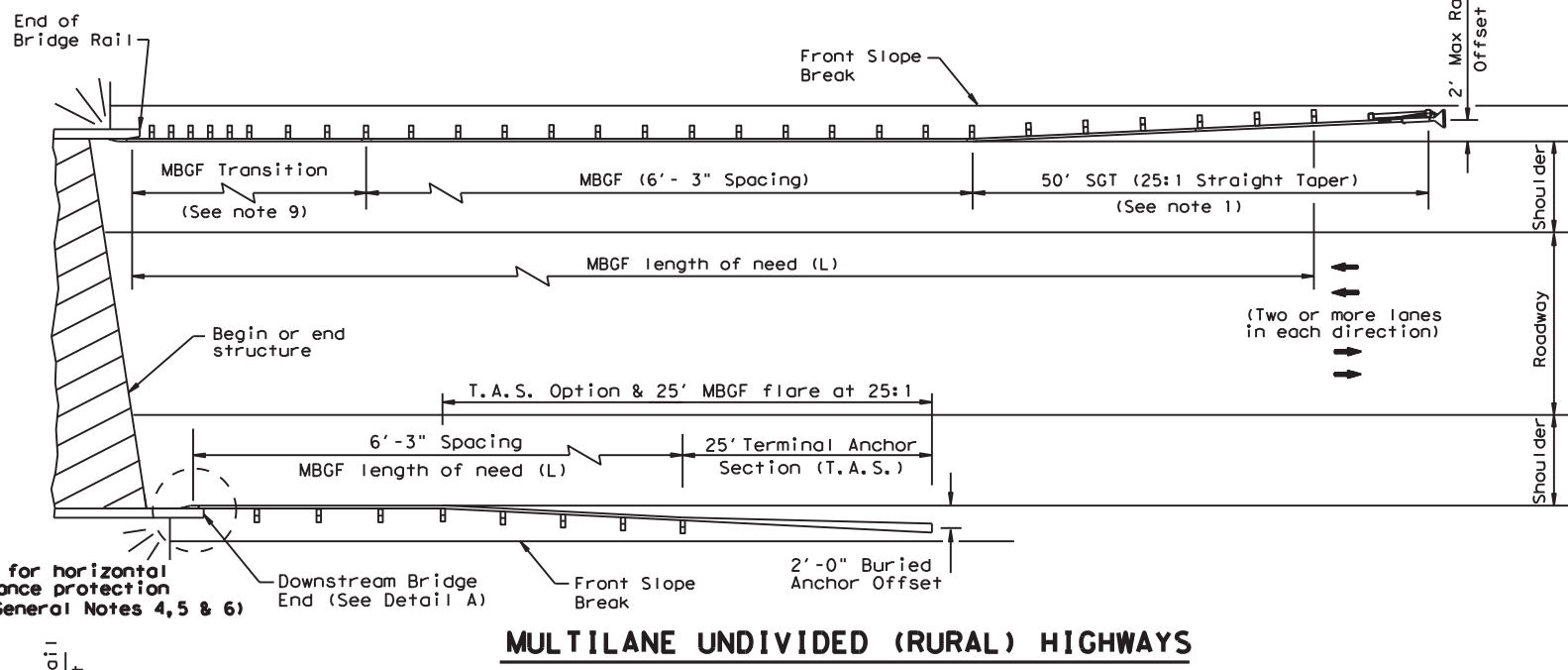
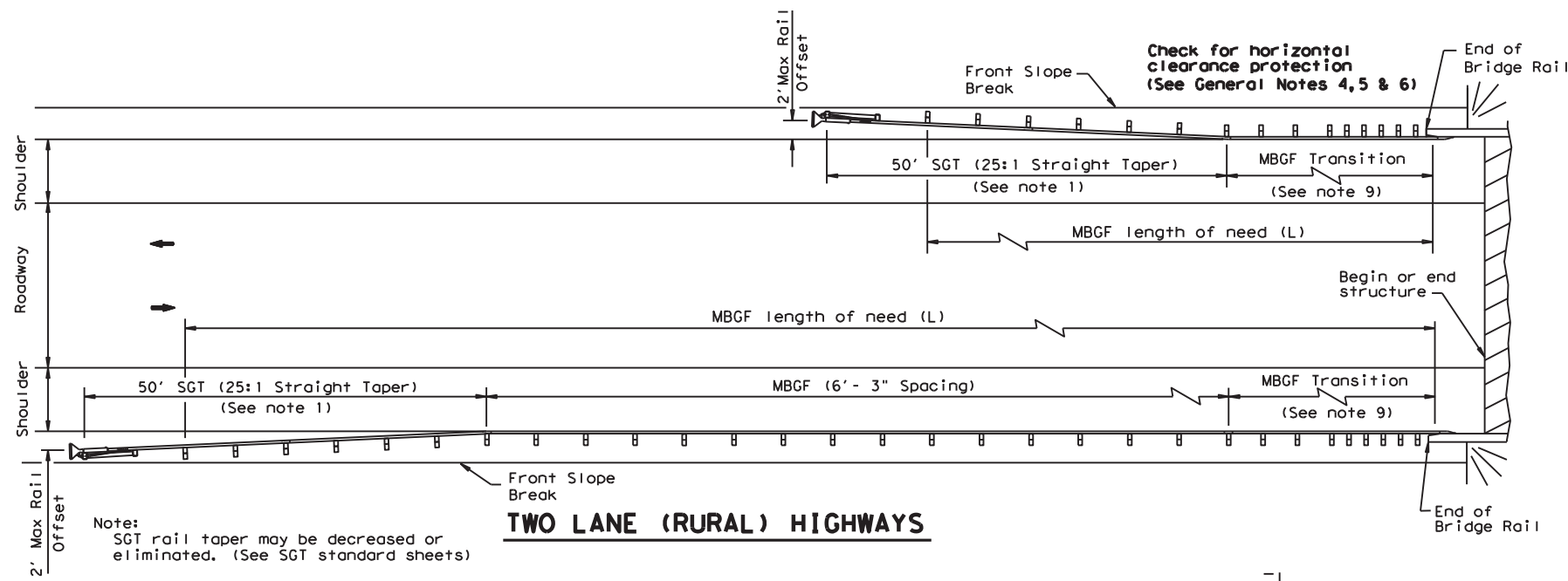
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	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	163	

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LEVELS DISPLAYED	
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GENERAL NOTES

1. For more detail: See MBGF, SGT, and MBGF Transition standard sheets.
2. Quantities of metal beam guard fence (MBGF) at individual bridge ends are shown elsewhere in plans.
3. Use average daily traffic (ADT) for the current year to determine MBGF length of need in accordance with the Roadway Design Manual unless otherwise specified. Where significant traffic volume growth is anticipated on low volume (0-750 ADT) highways, use length determinations for the higher volume category.
4. MBGF may not be required to shield departure end of bridge unless other obstacles within the horizontal clearance limits or opposing traffic indicate a MBGF consideration.
5. Terminal anchor sections (TAS) are only for downstream end anchorage use, outside the horizontal clearance area of opposing traffic.
6. Direct connection of MBGF (at 6'-3" post spacing without transition) to concrete rail are only for downstream rail connections outside the horizontal clearance area of opposing traffic. (See Detail A)
7. The crown shall be widened to accommodate MBGF. Typically the "front slope" break should be 2'-0" from the back of the MBGF post. This applies to new construction on new alignment or where existing roadway cross section is to be widened to increase roadway width. This does not apply to rehabilitation work where existing roadway crown width is to be retained (See Typical Cross Section at MBGF).
8. For restrictive bridge widths: The MBGF should be properly transitioned from the existing bridge rail to the adjoining MBGF (See MBGF Transition Standards). Metal beam guard fence at these bridge location(s) shall be flared at the rate of 25:1 or flatter, and be of the length necessary to locate the terminal end at the 2 ft. "maximum" offset from the shoulder edge.
9. Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.



DETAIL A

All rail elements shall be lapped in the direction of adjacent traffic.

Texas Department of Transportation
Design Division (Roadway)

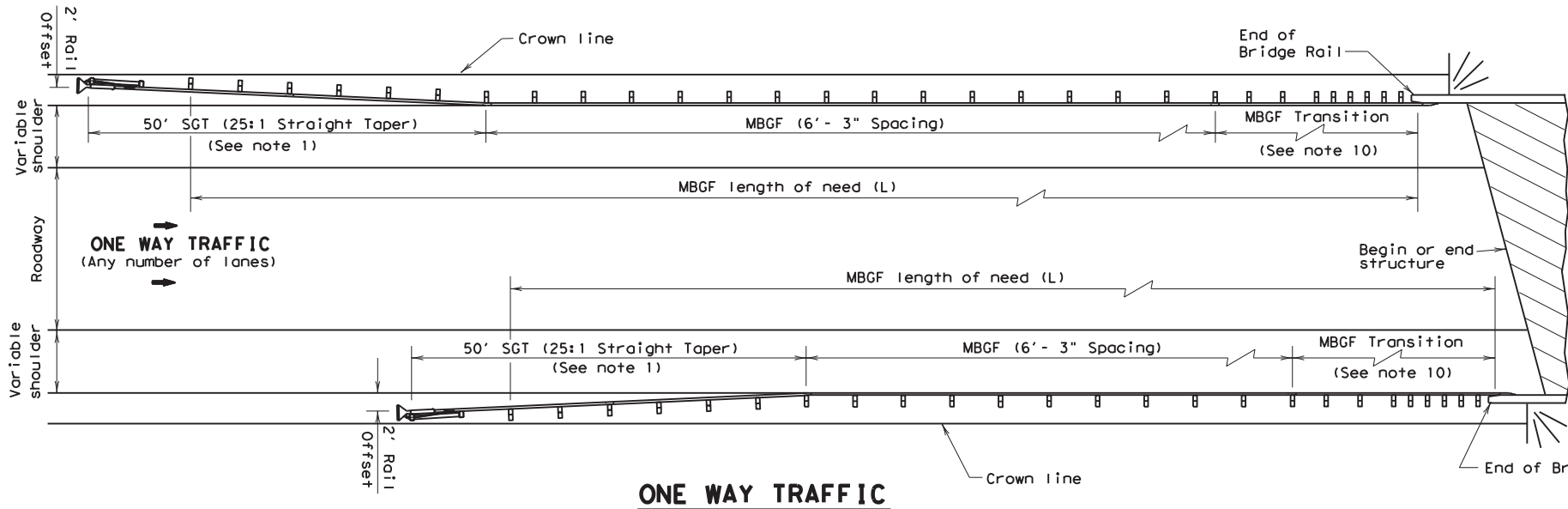
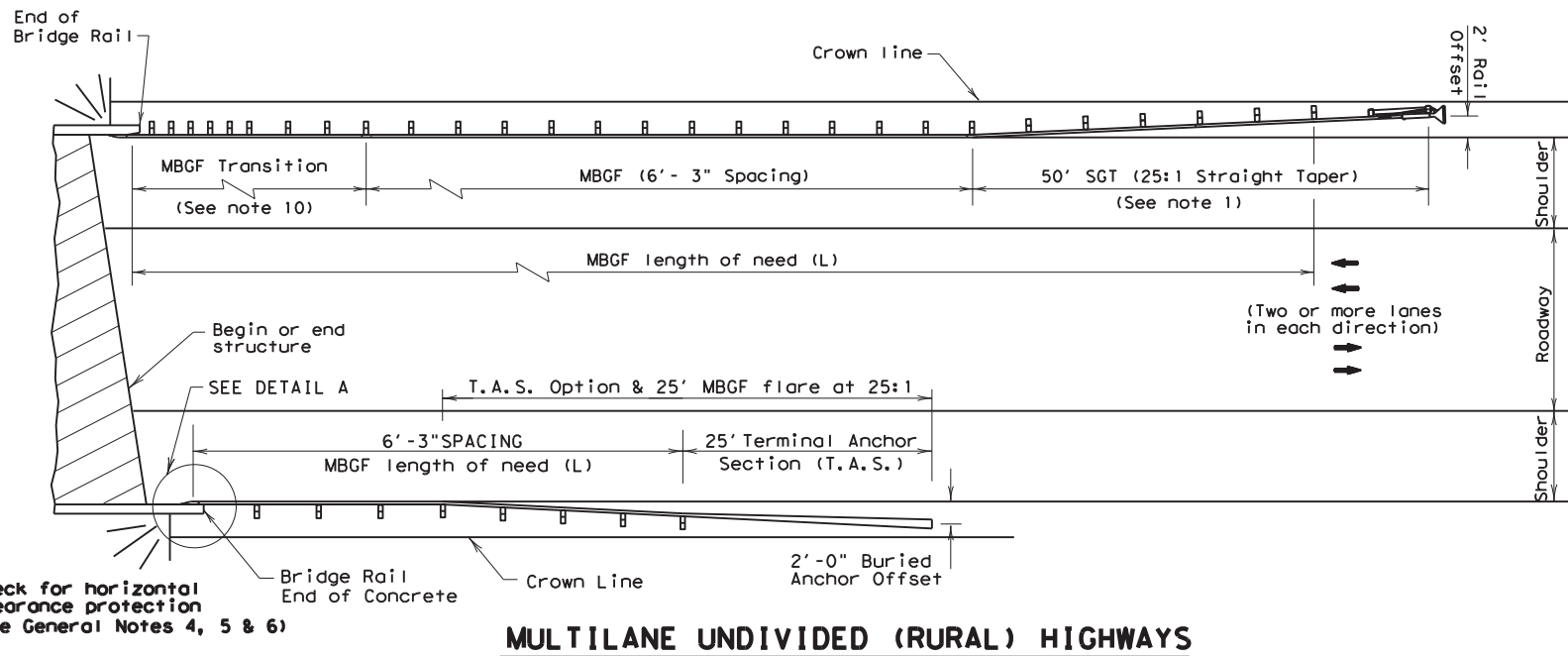
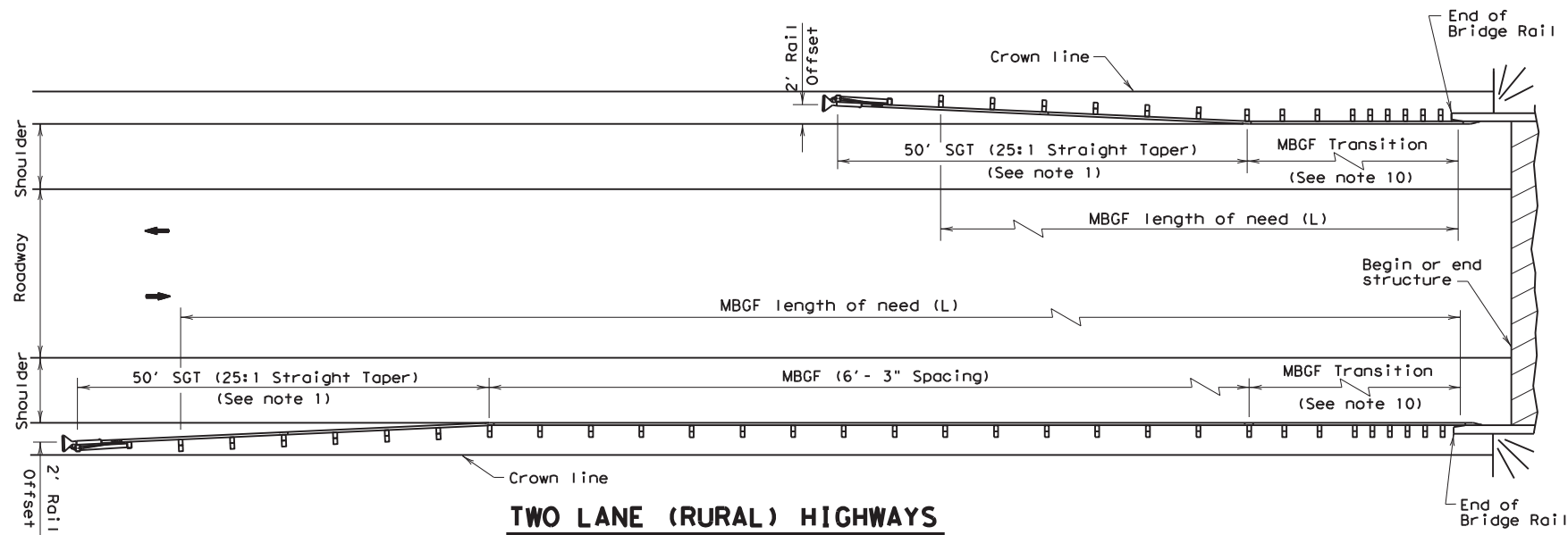
BRIDGE END DETAILS
(Metal Beam Guard Fence Applications to Rigid Rails)

BED-09

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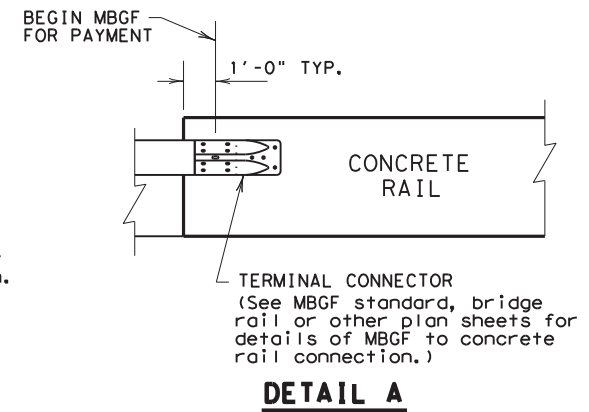
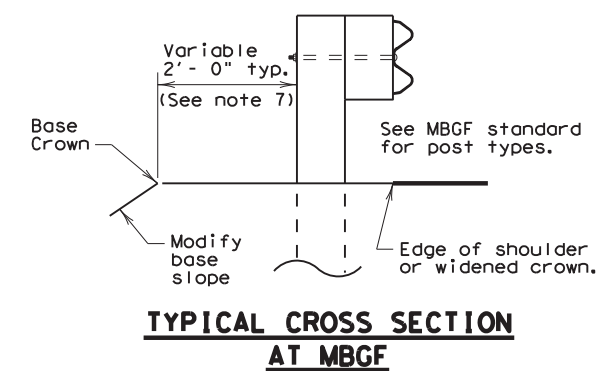
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LEVELS DISPLAYED	
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GENERAL NOTES

1. For more detail: See MBGF, SGT, and MBGF transition standard sheets.
2. Quantities of metal beam guard fence (MBGF) at individual bridge ends are shown elsewhere in plans.
3. Use average daily traffic (ADT) for the current year to determine MBGF length of need in accordance with the Roadway Design Manual unless otherwise specified. Where significant traffic volume growth is anticipated on low volume (0-750 ADT) highways, use length determinations for the higher volume category.
4. MBGF may not be required to shield departure end of bridge unless other obstacles within the horizontal clearance limits or opposing traffic indicate a MBGF consideration.
5. Terminal anchor sections (T.A.S) are only for downstream end anchorage usage outside the horizontal clearance area of opposing traffic.
6. Direct connection of MBGF (at 6'-3" post spacing without transition) to concrete rail is only for downstream rail connections outside the horizontal clearance area of opposing traffic.
7. The crown will be widened to accommodate MBGF. Typically the crown line should be 2'-0" from the back of the MBGF post. This applies to new construction on new alignment or where existing roadway cross section is to be widened to increase roadway width. This does not apply to rehabilitation work where existing roadway crown width is to be retained (See Typical Cross Section at MBGF).
8. For restrictive width bridges, a 25' tangent section of MBGF should connect to the wingwall. The adjoining MBGF that lies within the roadway (Lanes & Shoulder area) crown should be flared at the rate of 25:1 (Longitudinal : Lateral). Length at these bridges should be determined as stated above or the length necessary to locate the terminal end at a 2'-0" offset from shoulder edge, whichever is greater.
9. Variations in post spacings and/or the use of spacer blocks or shims may be required by the Engineer in order to accommodate the required rail connection to existing structures.
10. Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.



Texas Department of Transportation
Design Division (Roadway)

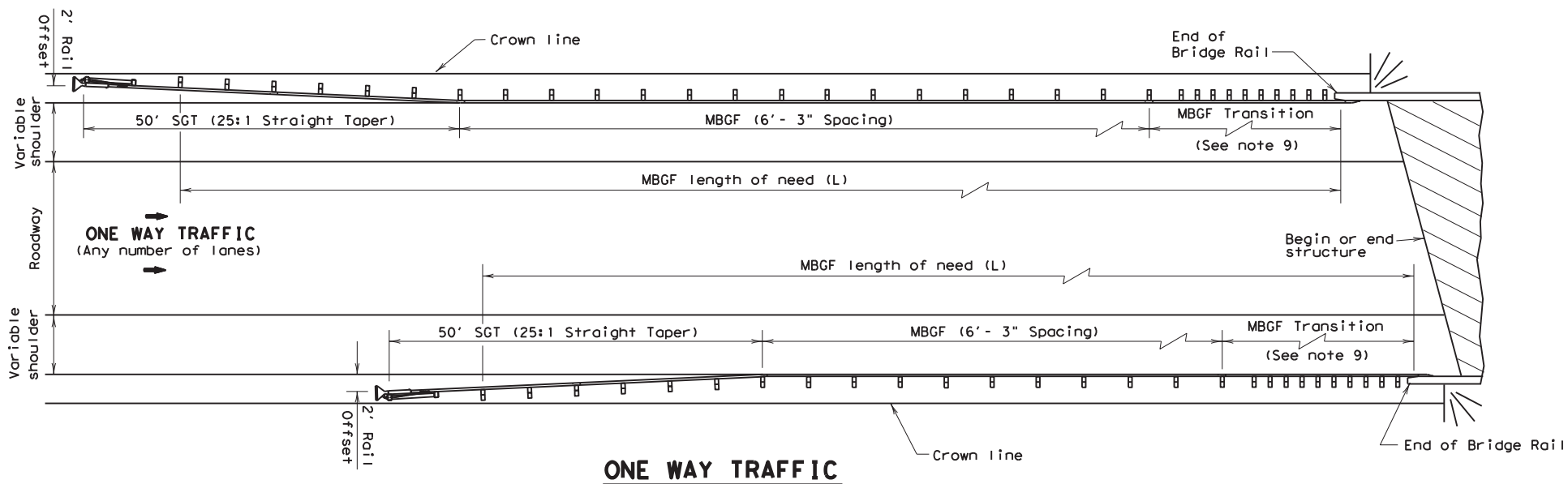
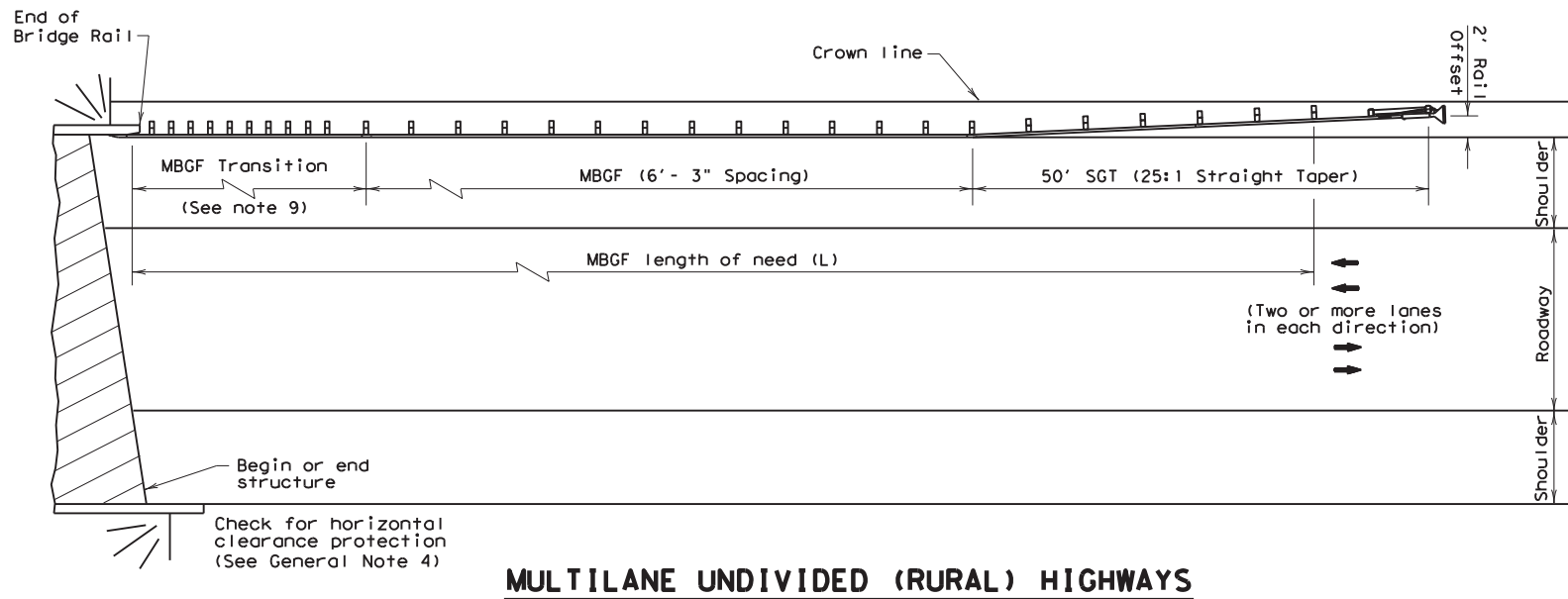
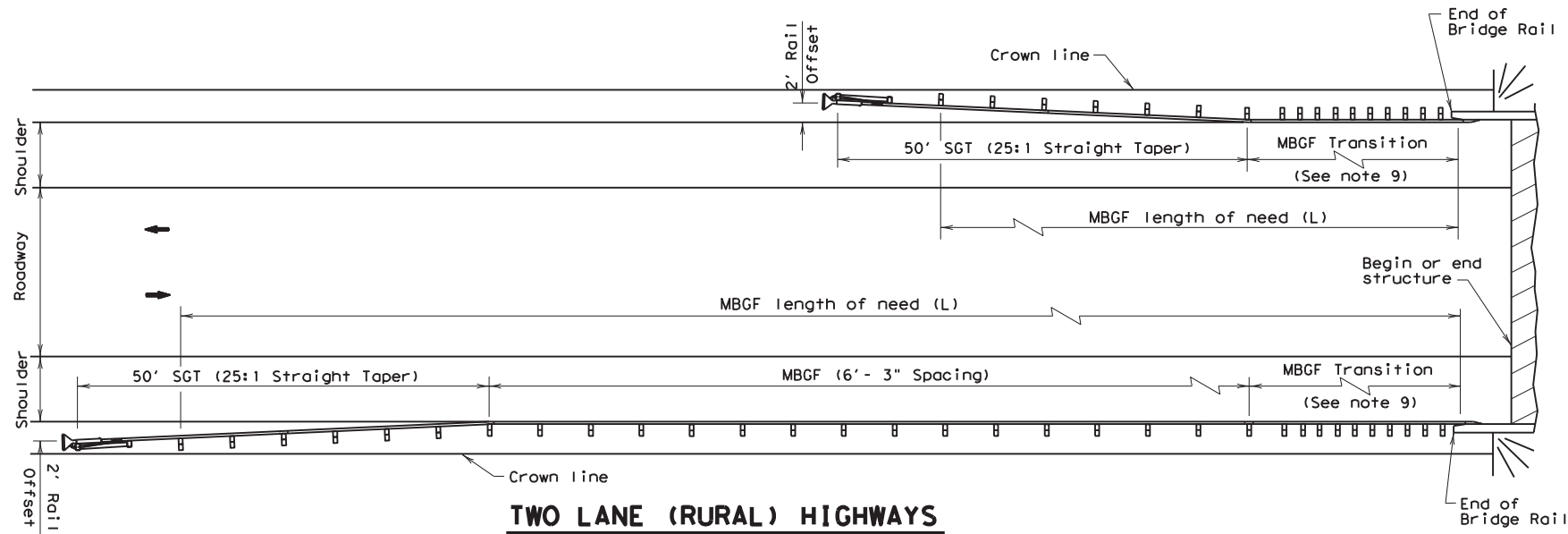
BRIDGE END DETAILS

BED-03

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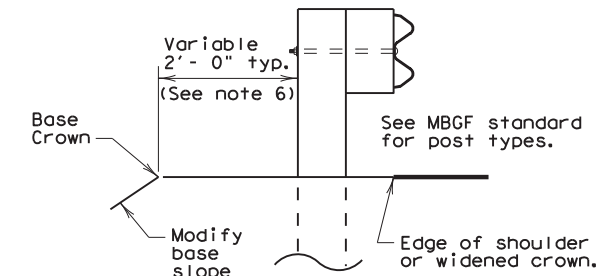
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LEVELS DISPLAYED	
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GENERAL NOTES

1. For more detail: See MBGF, SGT, and MBGF transition standard sheets.
2. Quantities of metal beam guard fence (MBGF) at individual bridge ends are shown elsewhere in plans.
3. Use average daily traffic (ADT) for the current year to determine MBGF length of need in accordance with the Roadway Design Manual unless otherwise specified. Where significant traffic volume growth is anticipated on low volume (0-750 ADT) highways, use length determinations for the higher volume category.
4. MBGF may not be required to shield departure end of bridge unless other obstacles within the horizontal clearance limits or opposing traffic indicate a MBGF consideration.
5. Terminal anchor sections (T.A.S) are only for downstream end anchorage usage outside the horizontal clearance area of opposing traffic.
6. The crown will be widened to accommodate MBGF. Typically the crown line should be 2'-0" from the back of the MBGF post. This applies to new construction on new alignment or where existing roadway cross section is to be widened to increase roadway width. This does not apply to rehabilitation work where existing roadway crown width is to be retained (See Typical Cross Section at MBGF).
7. For restrictive width bridges, a 25' tangent section of MBGF should connect to the wingwall. The adjoining MBGF that lies within the roadway (Lanes & Shoulder area) crown should be flared at the rate of 25:1 (Longitudinal : Lateral). Length at these bridges should be determined as stated above or the length necessary to locate the terminal end at a 2'-0" offset from shoulder edge, whichever is greater.
8. Variations in post spacings and/or the use of spacer blocks or shims may be required by the Engineer in order to accommodate the required rail connection to existing structures.
9. Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.



Texas Department of Transportation
Design Division (Roadway)

BRIDGE END DETAILS

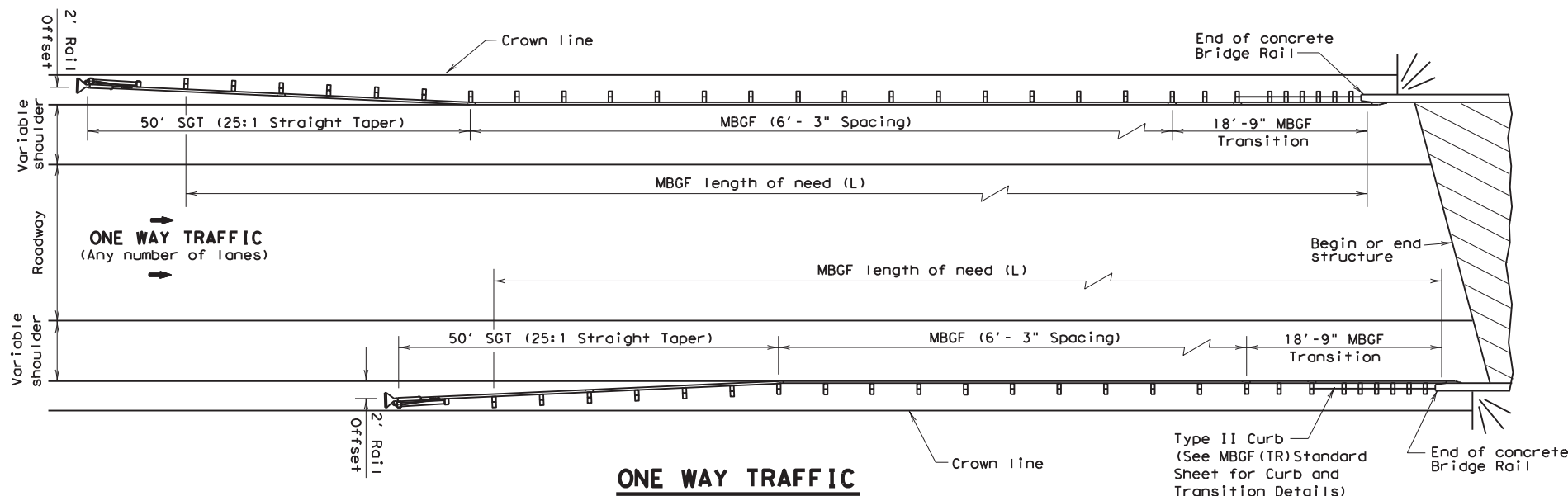
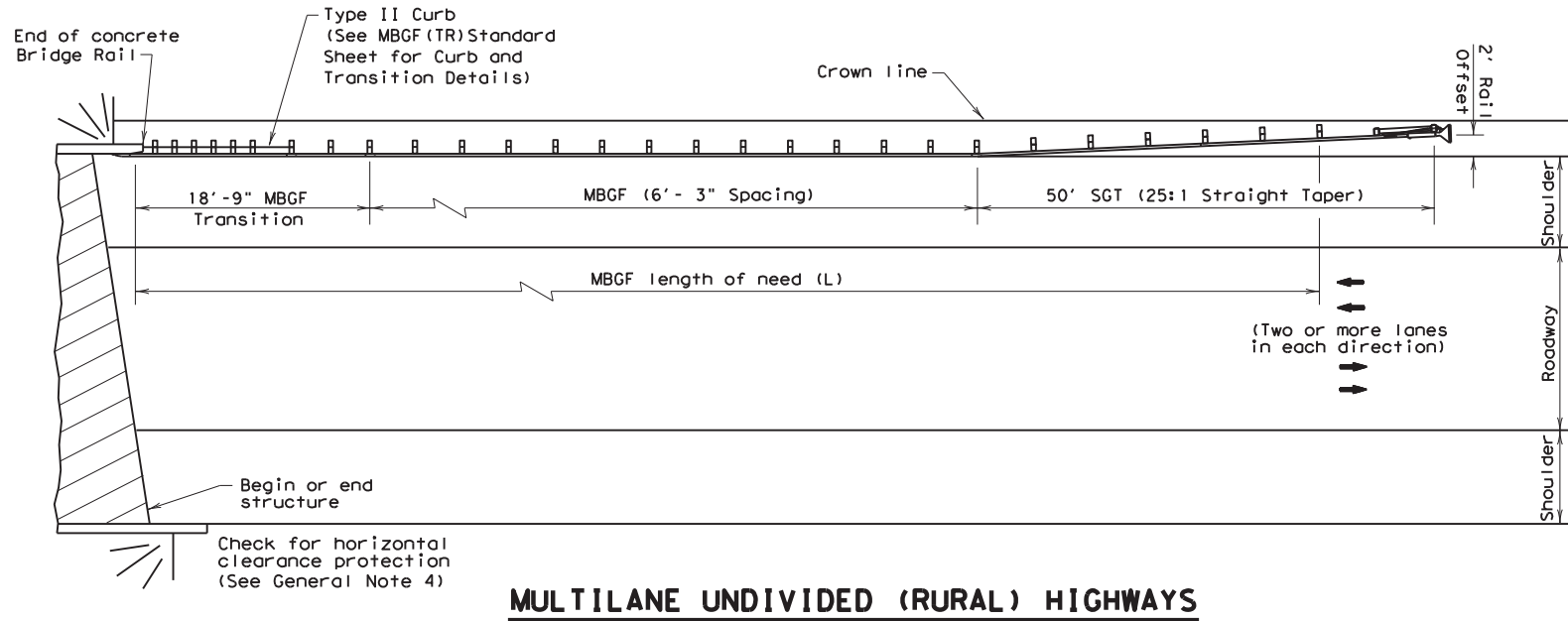
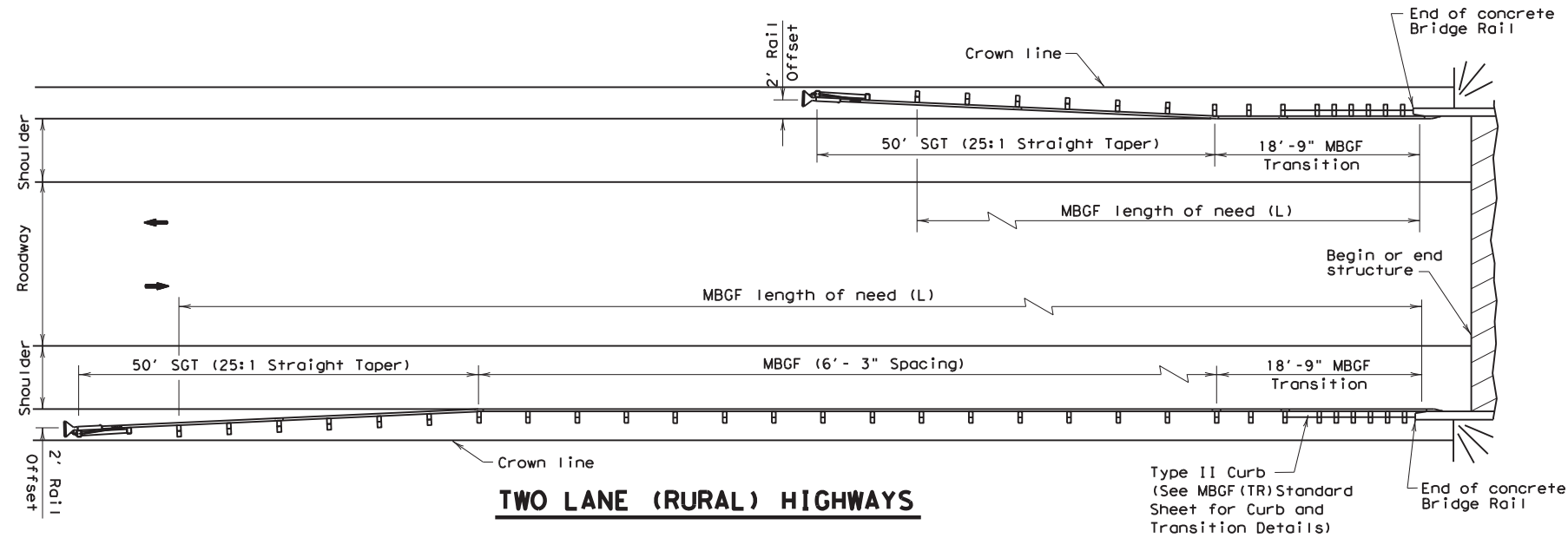
BED-02

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REVISIONS		COUNTY	BEXAR	CONTROL	6372	SECT	50	JOB	001	HIGHWAY	VAR.

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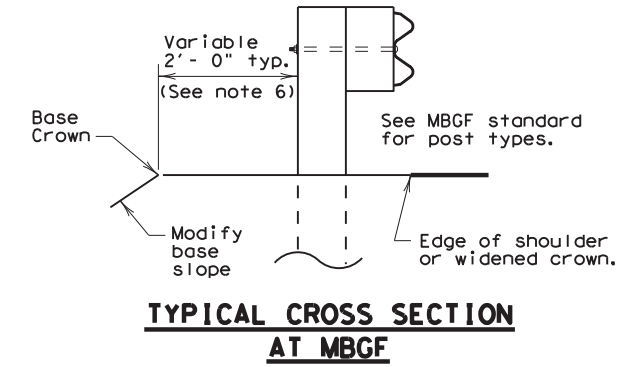
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GENERAL NOTES

1. For more detail: See MBSG, MBSG (TR) and SGT standard sheets.
2. Quantities of metal beam guard fence (MBSG) at individual bridge ends are shown elsewhere in plans.
3. Use average daily traffic (ADT) for the current year to determine MBSG length of need in accordance with the Roadway Design Manual unless otherwise specified. Where significant traffic volume growth is anticipated on low volume (0-750 ADT) highways, use length determinations for the higher volume category.
4. MBSG may not be required to shield departure end of bridge unless other obstacles within the horizontal clearance limits or opposing traffic indicate a MBSG consideration.
5. Terminal anchor sections (T.A.S) are only for downstream end anchorage usage outside the horizontal clearance area of opposing traffic.
6. The crown will be widened to accommodate MBSG. Typically the crown line should be 2'-0" from the back of the MBSG post. This applies to new construction on new alignment or where existing roadway cross section is to be widened to increase roadway width. This does not apply to rehabilitation work where existing roadway crown width is to be retained (See Typical Cross Section at MBSG).
7. For restrictive width bridges, a 25' tangent section of MBSG should connect to the wingwall. The adjoining MBSG that lies within the roadway (Lanes & Shoulder area) crown should be flared at the rate of 25:1 (Longitudinal : Lateral). Length at these bridges should be determined as stated above or the length necessary to locate the terminal end at a 2'-0" offset from shoulder edge, whichever is greater.
8. Variations in post spacings and/or the use of spacer blocks or shims may be required by the Engineer in order to accommodate the required rail connection to existing structures.



Texas Department of Transportation
Design Division (Roadway)

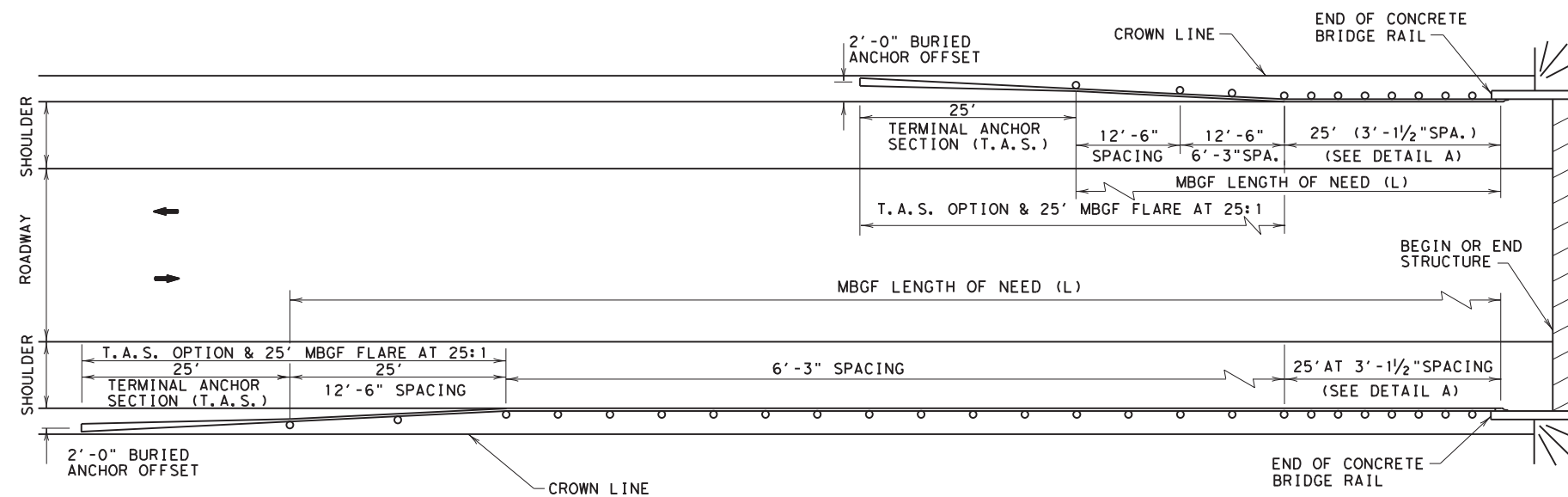
BRIDGE END DETAILS

BED-01

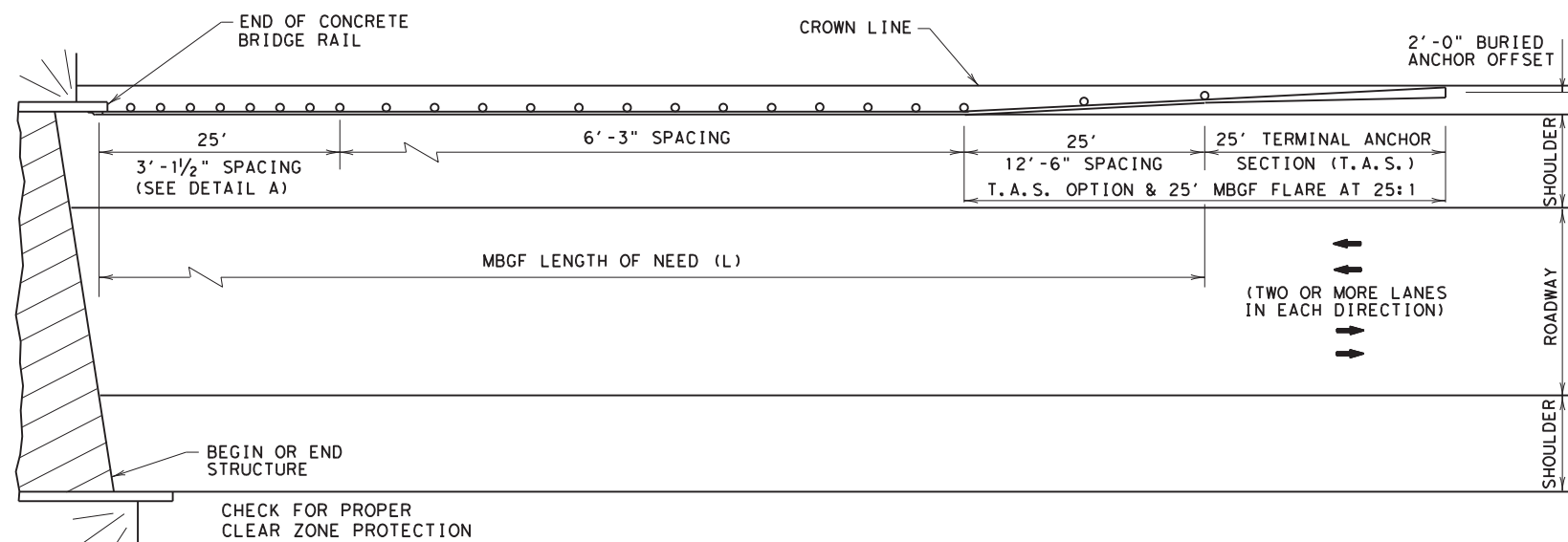
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REVISIONS		COUNTY:	BEXAR	CONTROL:	6372	SECT:	50	JOB:	001	HIGHWAY:	VAR.

GENERAL NOTES

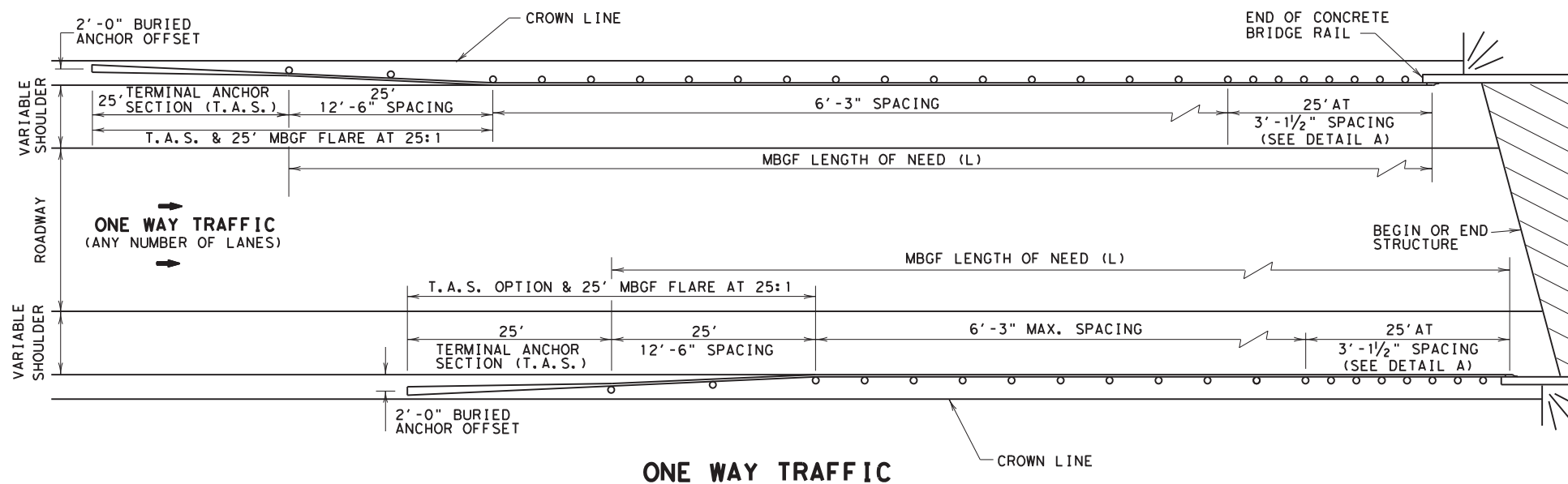
- FOR METAL BEAM GUARD FENCE DETAILS, SEE MBGF PLAN SHEET.
- QUANTITIES OF METAL BEAM GUARD FENCE (MBGF) AT INDIVIDUAL BRIDGE ENDS ARE SHOWN ELSEWHERE IN PLANS.
- USE AVERAGE DAILY TRAFFIC (ADT) FOR THE CURRENT YEAR TO DETERMINE MBGF LENGTH OF NEED IN ACCORDANCE WITH THE DESIGN MANUAL UNLESS OTHERWISE SPECIFIED. WHERE SIGNIFICANT TRAFFIC VOLUME GROWTH IS ANTICIPATED ON LOW VOLUME (0-750 ADT) HIGHWAYS USE LENGTH DETERMINATIONS FOR THE HIGHER VOLUME CATEGORY.
- WHERE LENGTH (L) OF MBGF USED IS 50 FEET, POST SPACING SHALL BE AS DETAILED HEREON (SEE PLAN LAYOUT FOR TWO LANE (RURAL) HIGHWAYS, LEFT SIDE OF TRAFFIC APPROACHING BRIDGE). WHERE LENGTH (L) OF MBGF IS 75' OR MORE, POST SPACING SHALL BE 3'-1 1/2" FOR THE 25' SECTION ADJACENT TO THE BRIDGE, 12'-6" FOR THE 25' SECTION ADJACENT TO THE T.A.S., AND 6'-3" FOR REMAINING INTERVENING LENGTH. WHEN T6 BRIDGE RAIL IS USED, THE MIN. MBGF POST SPACING SHALL BE 6'-3".
- MBGF MAY NOT BE REQUIRED TO SHIELD DEPARTURE END OF BRIDGE UNLESS OTHER HAZARDS WITHIN THE CLEAR ZONE WARRANT MBGF. WHERE INSTALLED ON THE DEPARTURE END, 6'-3" POST SPACING IS ACCEPTABLE THROUGHOUT THE PLACEMENT LENGTH INCLUDING ADJACENT TO BRIDGE END.
- WHEN SPECIFIED, THE T.A.S. AND TYPICALLY ADJACENT 25' MBGF SHOULD BE FLARED FROM THE SHOULDER EDGE AT 25:1 TO PROVIDE A 2' USUAL OFFSET TO BURIED ANCHOR. THE 6'-3" POST SPACING SHALL BE MAINTAINED TO THE LENGTH OF NEED WHEN END TREATMENTS OTHER THAN T.A.S. ARE USED.
- THE CROWN WILL BE WIDENED TO ACCOMMODATE MBGF. TYPICALLY THE CROWN LINE SHOULD BE 2 FEET FROM THE BACK OF THE MBGF POST. THIS APPLIES TO NEW CONSTRUCTION ON NEW ALIGNMENT OR WHERE EXISTING ROADWAY CROSS SECTION IS TO BE WIDENED TO INCREASE ROADWAY WIDTH. THIS DOES NOT APPLY TO REHABILITATION WORK WHERE EXISTING ROADWAY CROWN WIDTH IS TO BE RETAINED (SEE TYPICAL CROSS SECTION).
- FOR RESTRICTIVE WIDTH BRIDGES, A 25-FOOT TANGENT SECTION OF MBGF SHOULD CONNECT TO THE WINGWALL. THE ADJOINING MBGF THAT LIES WITHIN THE ROADWAY (LANES & SHOULDER AREA) CROWN SHOULD BE FLARED AT THE RATE OF 25:1 (LONGITUDINAL; LATERAL). LENGTH ON THESE BRIDGES SHOULD BE DETERMINED AS STATED ABOVE OR THE LENGTH NECESSARY TO LOCATE THE BURIED ANCHOR AT A 2-FOOT OFFSET FROM SHOULDER EDGE, WHICHEVER IS GREATER.
- VARIATIONS IN POST SPACINGS AND/OR THE USE OF SPACER BLOCKS OR SHIMS MAY BE REQUIRED BY THE ENGINEER IN ORDER TO ACCOMMODATE THE REQUIRED RAIL CONNECTION TO EXISTING STRUCTURES.



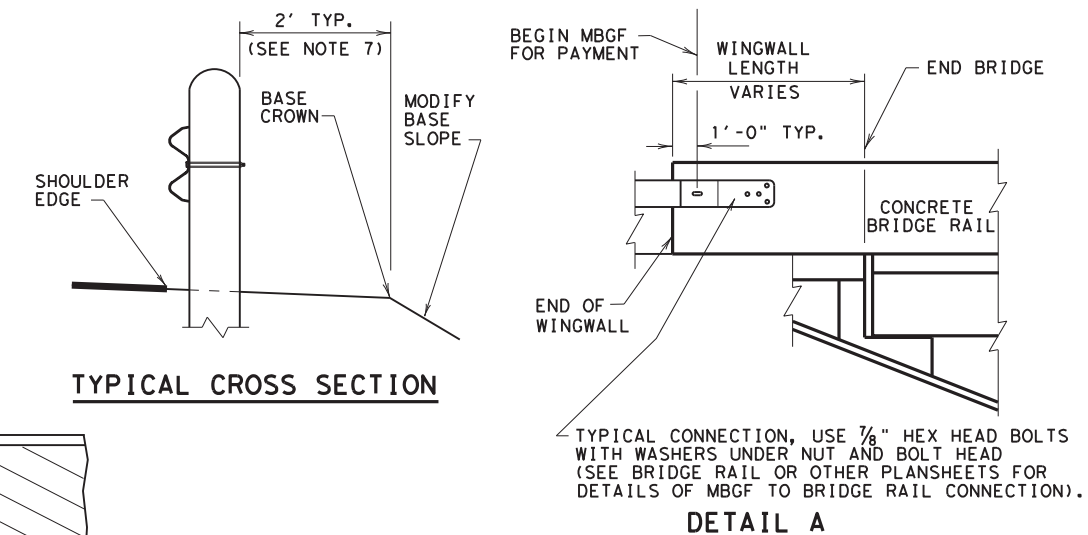
TWO LANE (RURAL) HIGHWAYS



MULTILANE UNDIVIDED (RURAL) HIGHWAYS



ONE WAY TRAFFIC



TYPICAL CROSS SECTION

DETAIL A



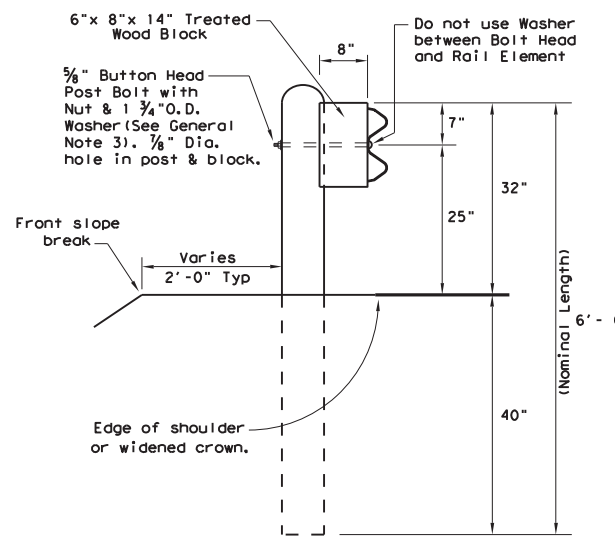
TEXAS DEPARTMENT OF TRANSPORTATION

**BRIDGE END DETAILS
"USE FOR REPAIRS ONLY"
BED-91**

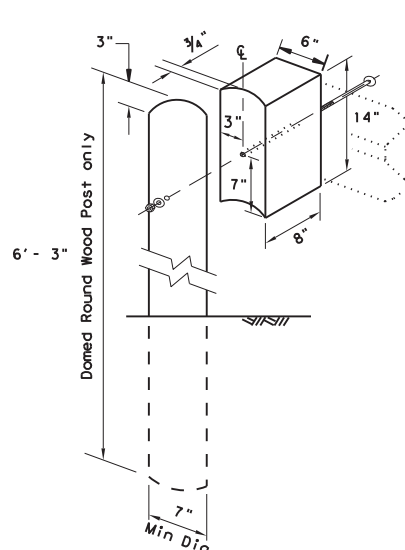
© TxDOT SEPTEMBER 1991		FED. RD. DIV. NO.	STATE	RMC PROJECT NO.	SHEET NO.
REVISIONS		6	TEX		168
STATE DIST. NO.	COUNTY	CONT.	SECT.	JOB	HIGHWAY NO.
15	BEXAR	6372	50	001	VAR.

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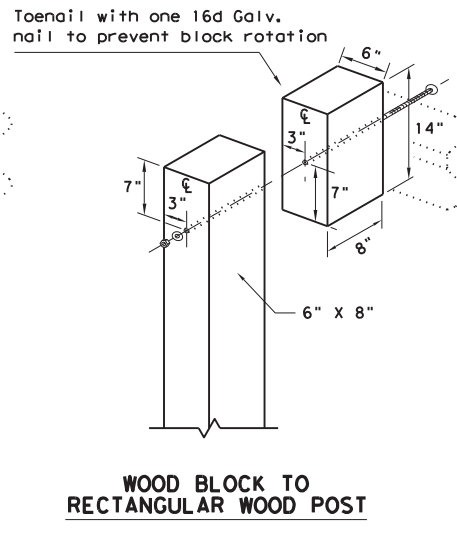
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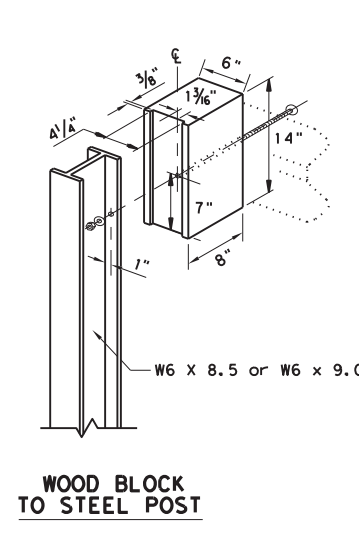
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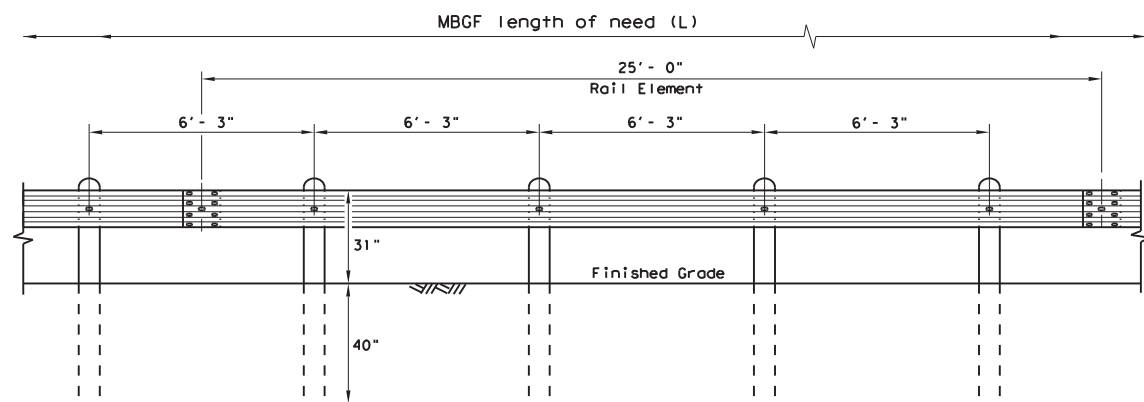
WOOD BLOCK TO ROUND WOOD POST



WOOD BLOCK TO RECTANGULAR WOOD POST



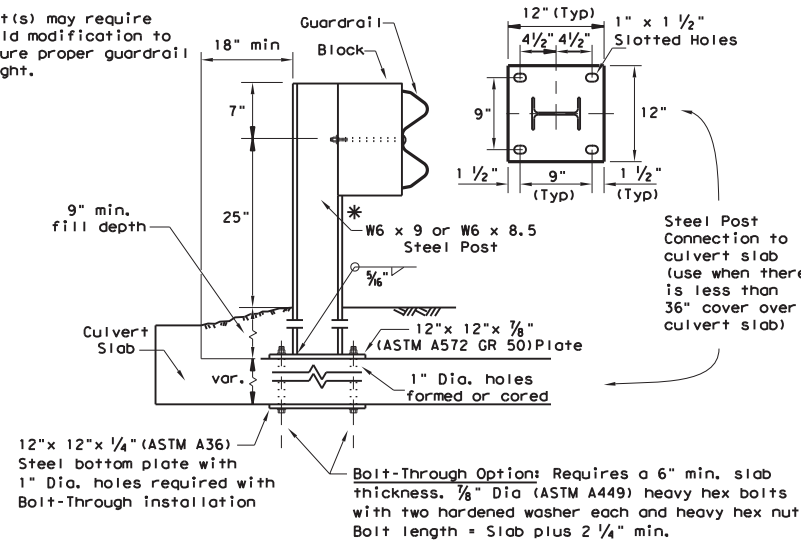
WOOD BLOCK TO STEEL POST



ELEVATION MID-SPAN RAIL SPLICE

Showing a 25' - 0" section of W-Beam rail, 12' - 6" rail sections may also be supplied (See General Note 2)

Direction of Traffic

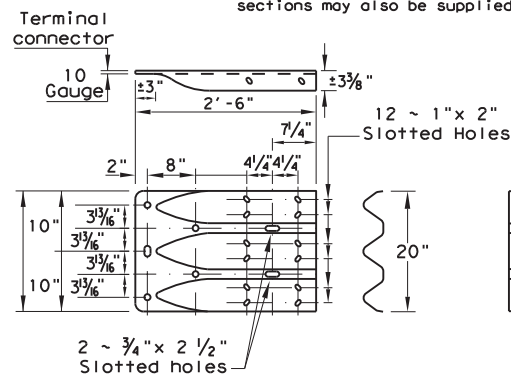


LOW FILL CULVERT POST

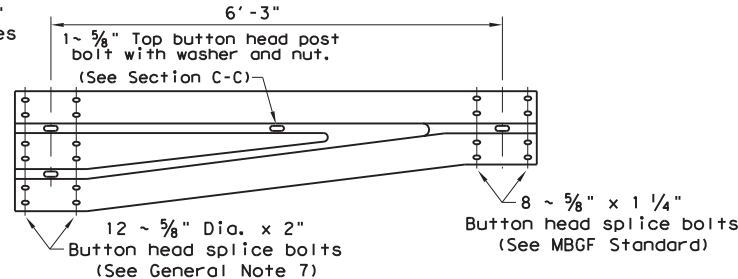
Culverts of 25 ft. or less, see GF(31)LS standard for "Long Span" option.

Epoxy Note: Epoxy Anchor Option: This option may only be used if the culvert slab is 8" min. thick. Threaded anchor rods must be 3/8" 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, "Epoxyes 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.

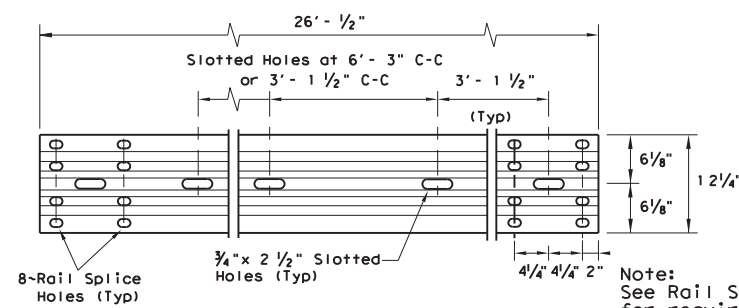
- GENERAL NOTES**
- The type of post (round wood post, rectangular wood post, or steel post) will be as shown in the plans. The exact position of MBGF shall be shown in the plans or as directed by the Engineer. Steel posts to be galvanized in accordance with Item 445, "Galvanizing."
 - Rail element shall 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' - 1/2" 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 (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and Type A (1 3/4" O.D.) washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 3/8" x 1 1/4" (or 2" long at triple rail splices) with a 5/8" double recessed nut (ASTM A563). Thrie beam "connection" 7/8" dia. (ASTM A325) hex bolts shall be of sufficient length to extend through the full thickness of the rail, washers, and nuts.
 - 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.
 - If solid rock is encountered within 0 to 18" of the finished grade, drill a 22" dia. hole, or drill two 12" dia. front to back overlapping holes, 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 a cohesionless material.
 - Posts shall not be set in concrete, of any depth.
 - Special fabrication will be required at installations having a curvature of less than 150 ft. radius.
 - Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or 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 posts and/or blocks.
 - For posts located partially or wholly between precast box culvert units, the use of a cast-in-place concrete closure between boxes is required. See Detail "A" on Bridge Standard SCP-MD.



THRIE-BEAM TERMINAL CONNECTION (SEE GENERAL NOTES 6 & 7 FOR REQUIRED HARDWARE)

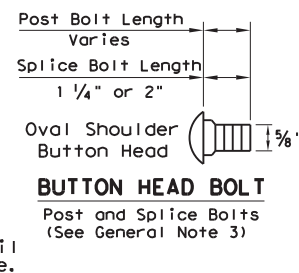


NON-SYMMETRICAL TRANSITION TO W-BEAM (10 GAUGE)

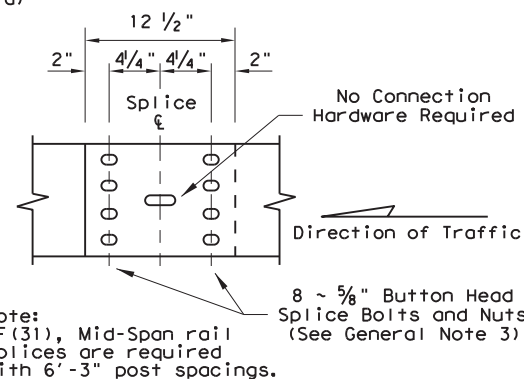


ELEVATION 25' - 0" (NOM.) W-BEAM SECTION

12' - 6" RAIL SECTIONS MAY ALSO BE SUPPLIED (SEE GENERAL NOTE 2)

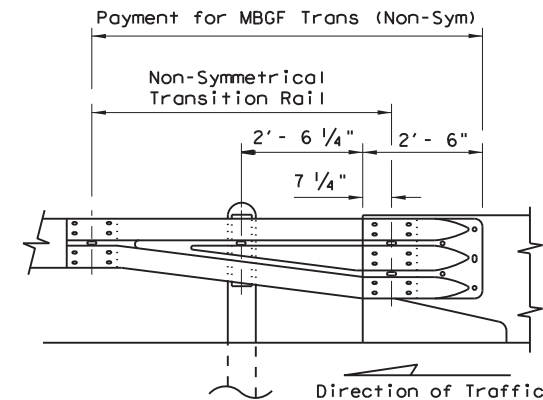


BUTTON HEAD BOLT Post and Splice Bolts (See General Note 3)



MID-SPAN RAIL SPLICE DETAIL

Note: GF(31), Mid-Span rail splices are required with 6'-3" post spacings.



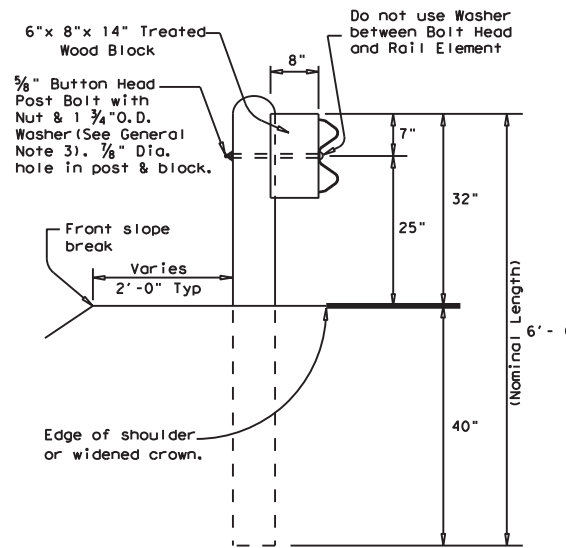
Note: All rail elements shall be lapped in the direction of adjacent traffic.

DOWNSTREAM RAIL ATTACHMENT

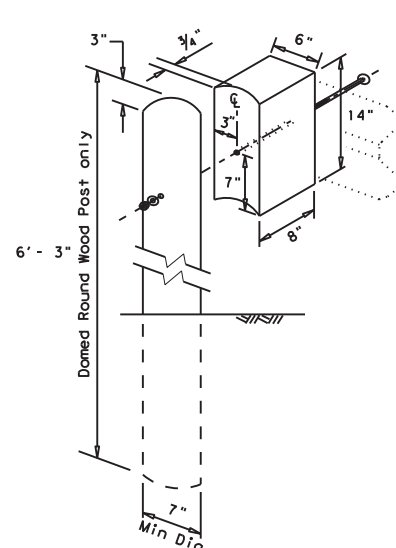
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	DIST: SAT	COUNTY: BEXAR	SHEET NO.: 169

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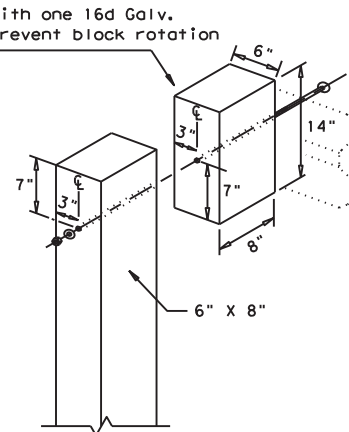
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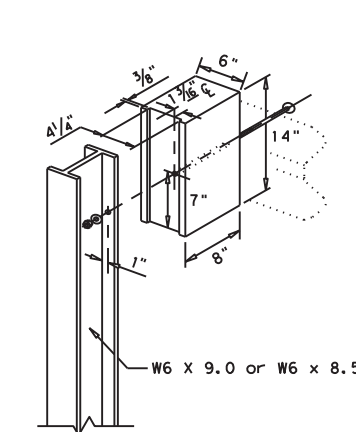
TYPICAL POST



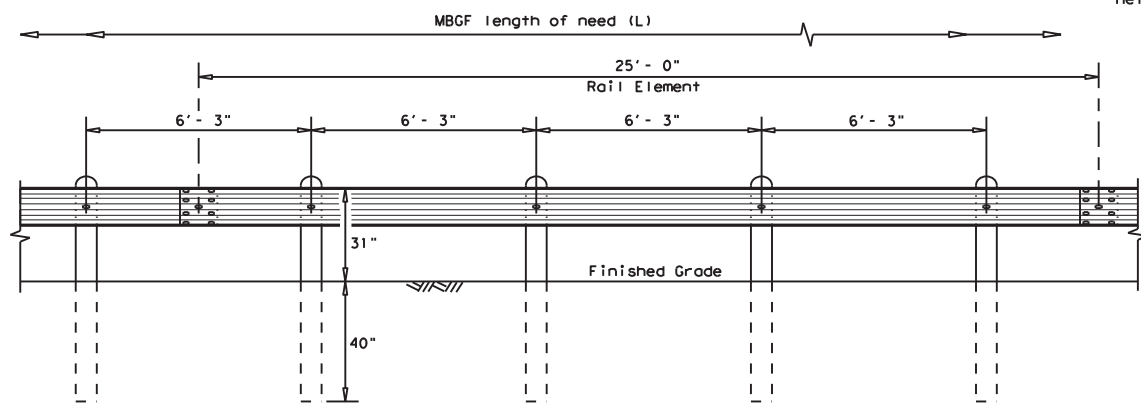
WOOD BLOCK TO ROUND WOOD POST



WOOD BLOCK TO RECTANGULAR WOOD POST



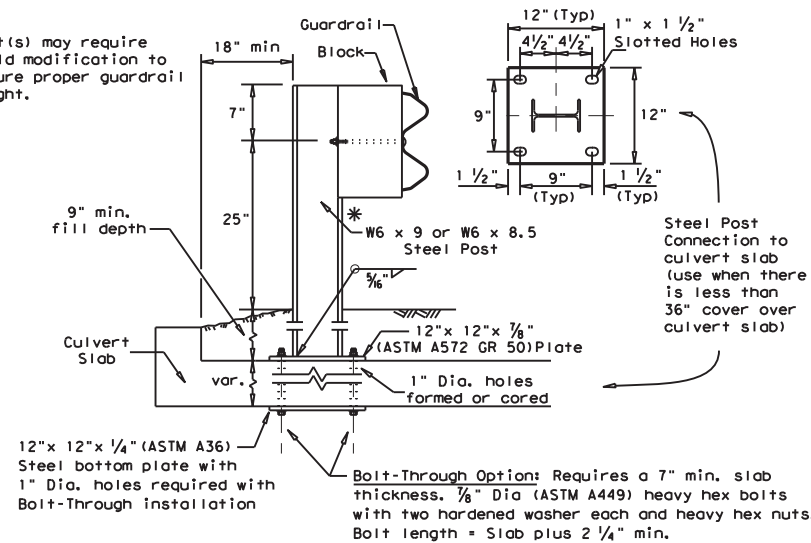
WOOD BLOCK TO STEEL POST



ELEVATION MID-SPAN RAIL SPLICE

Showing a 25'-0" section of W-Beam rail, 12'-6" rail sections may also be supplied (See General Note 2)

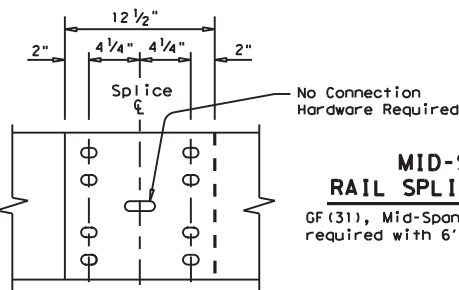
Direction of Traffic



LOW FILL CULVERT POST

For use on culverts up to 50 ft. in length. Culverts of 25 ft. or less, See GF(31)LS standard for "Long Span" option.

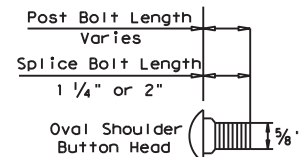
Epoxy Note:
Epoxy Anchor Option: This option may only be used if the culvert slab is 8" min. thick. Threaded anchor rods must be 3/8" Dia. ASTM A449 or A193 Grade B7 with heavy hex nut, and one hardened washer each. Embed anchor rods 6" with Hilti HIT RE 500 epoxy adhesive. Other Type III Class C epoxy adhesives meeting the requirements of DMS-6100, "Epoxyes 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.



MID-SPAN RAIL SPLICE DETAIL

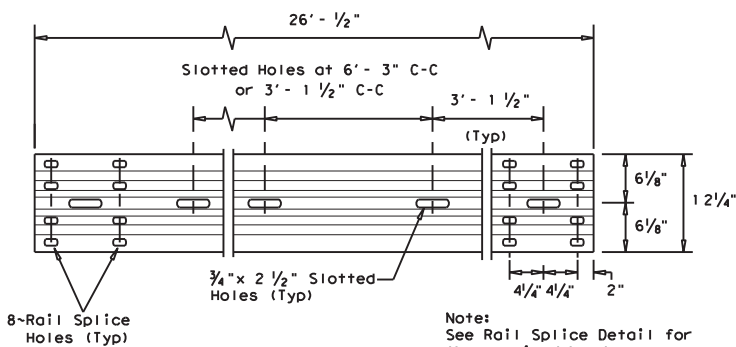
GF(31), Mid-Span rail splices are required with 6'-3" post spacings.

8 - 5/8" Button Head Splice Bolts and Nuts (See General Note 3)



BUTTON HEAD BOLT

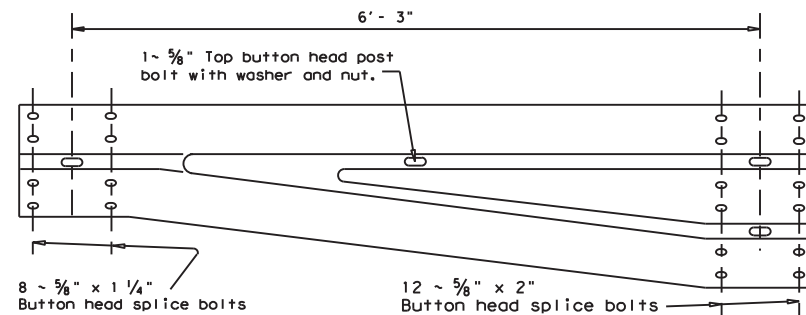
Post and Splice Bolts (See General Note 3)



ELEVATION 25'-0" (NOM.) W-BEAM SECTION

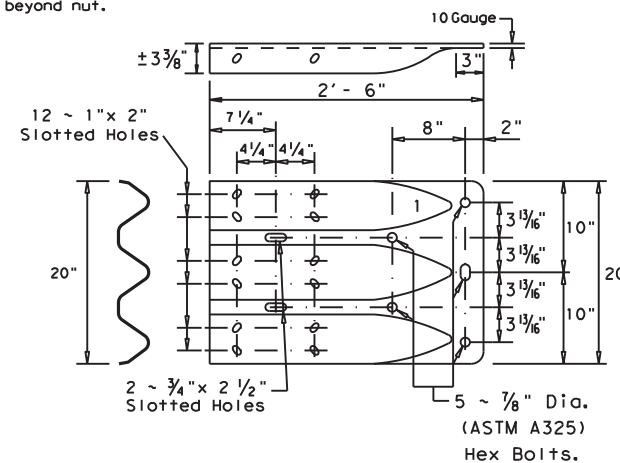
12'-6" rail sections may also be supplied (See General Note 2)

Note: See Rail Splice Detail for the required hardware.



NON-SYMMETRICAL TRANSITION FROM W-BEAM TO CONCRETE RAIL (10 GA.)

(See GF(31)DAT for Downstream Connection to Concrete Rail)



THREE-BEAM TERMINAL CONNECTION (10 GA.)

(See General Note 3 for required hardware)

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 MBSGF shall be shown in the plans or as directed by the Engineer. Steel posts to be galvanized in accordance with Item 445, "Galvanizing."
- Rail element 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 (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and Type A (1 3/4" O.D.) washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 5/8" x 1 1/4" (or 2" long at triple rail splices) with a 5/8" double recessed nut (ASTM A563). Thrie beam "connection" 3/8" dia. (ASTM A325) hex bolts shall be of sufficient length to extend through the full thickness of the rail, washers, and nuts.
- 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.
- If solid rock is encountered within 0 to 18" of the finished grade, drill a 22" dia. hole, or drill two 12" dia. front to back overlapping holes, 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 may be less. Any excess post length, after meeting these depths, may be field cut to ensure proper guardrail mounting height. Backfill with a cohesionless material.
- Posts shall not be set in concrete, of any depth.
- Special fabrication will be required at installations having a curvature of less than 150 ft. radius.
- Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or 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 posts and/or blocks.
- For posts located partially or wholly between precast box culvert units, the use of a cast-in-place concrete closure between boxes is required. See Detail "A" on Bridge Standard SCP-MD.

Texas Department of Transportation
Design Division Standard

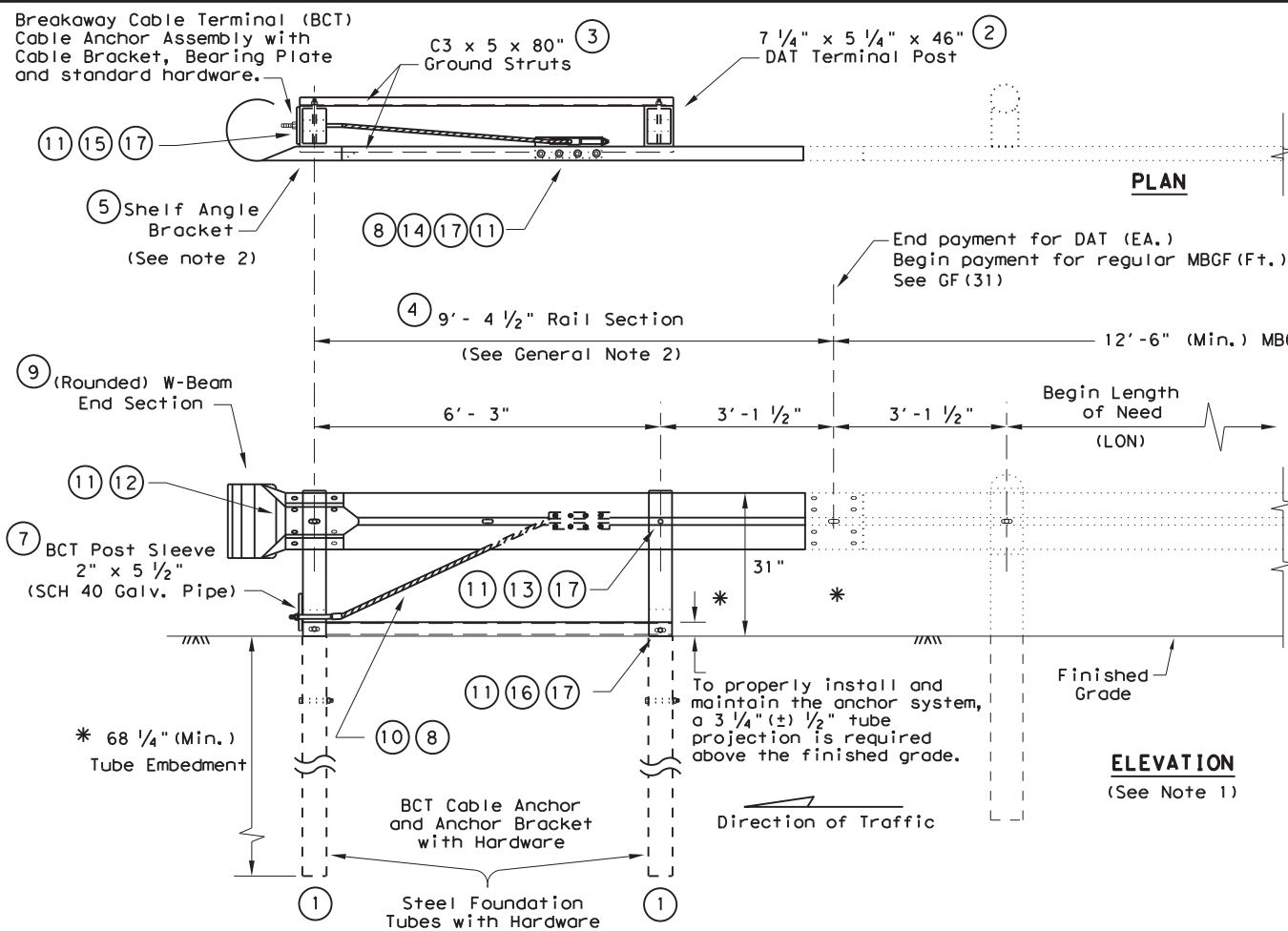
METAL BEAM GUARD FENCE

GF(31)-11

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© TxDOT December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	OOI	VAR.
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	SAT	BEXAR	170	

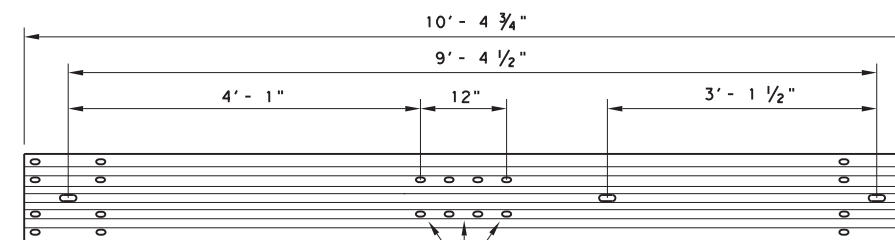
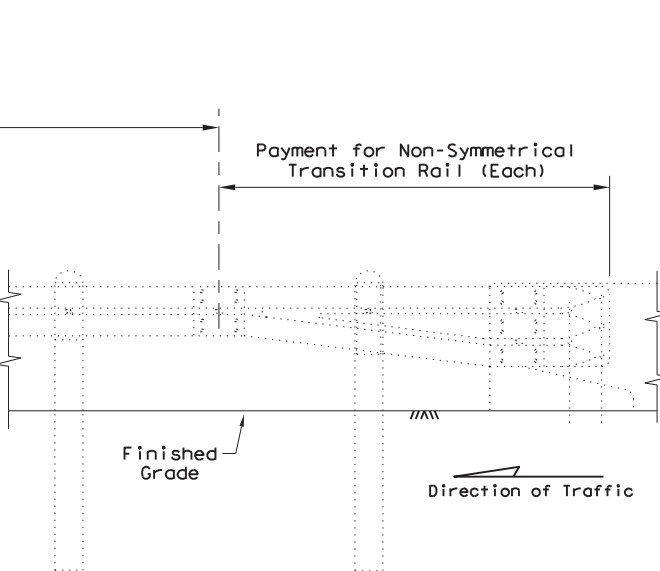
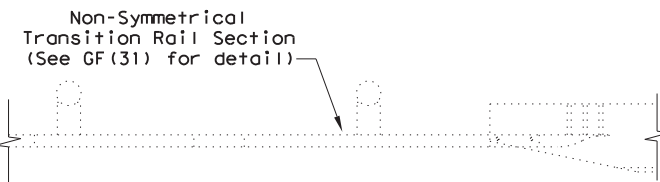
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DATE: FILE:

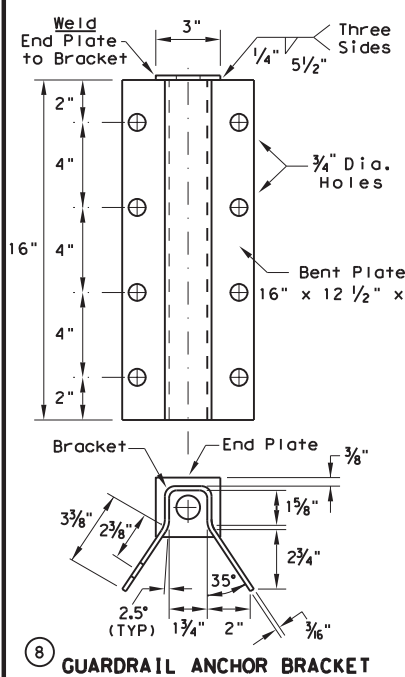


DOWNSTREAM ANCHOR TERMINAL (DAT)

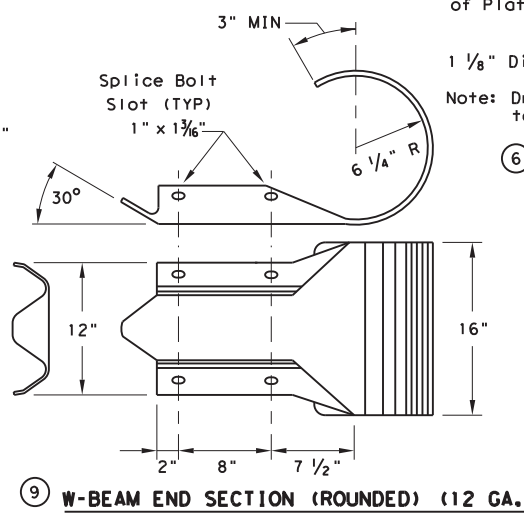
Only for downstream use, when located outside the horizontal clearance area of opposing traffic.



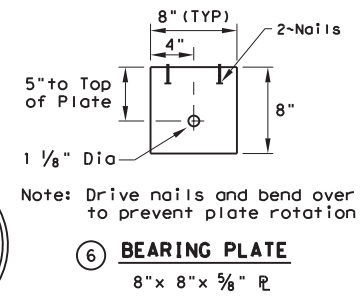
④ TERMINAL RAIL ELEMENT FOR DAT



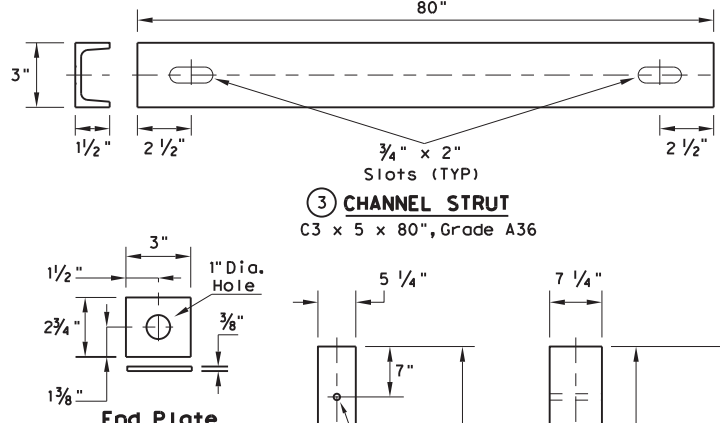
⑧ GUARDRAIL ANCHOR BRACKET



⑨ W-BEAM END SECTION (ROUNDED) (12 GA.)

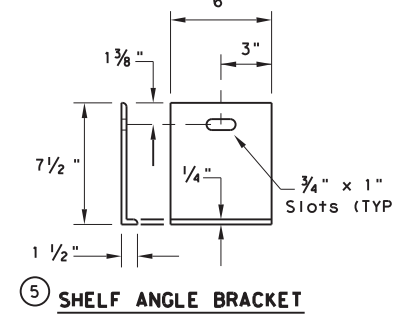


⑥ BEARING PLATE

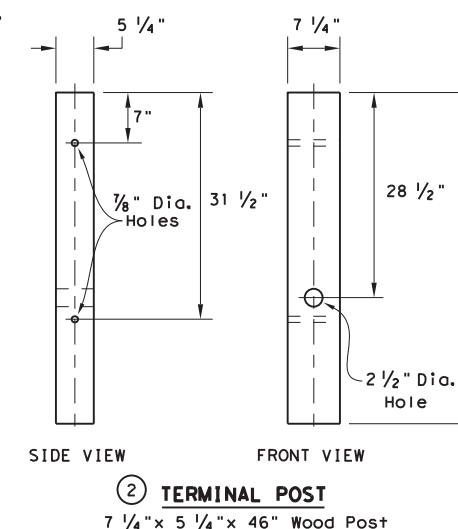


③ CHANNEL STRUT

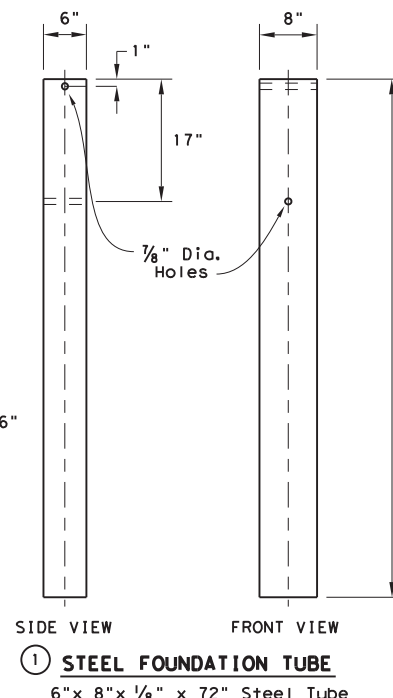
End Plate



⑤ SHELF ANGLE BRACKET



② TERMINAL POST



① STEEL FOUNDATION TUBE

GENERAL NOTES

1. The detail shown is the minimum Length of Need (LON) for a 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

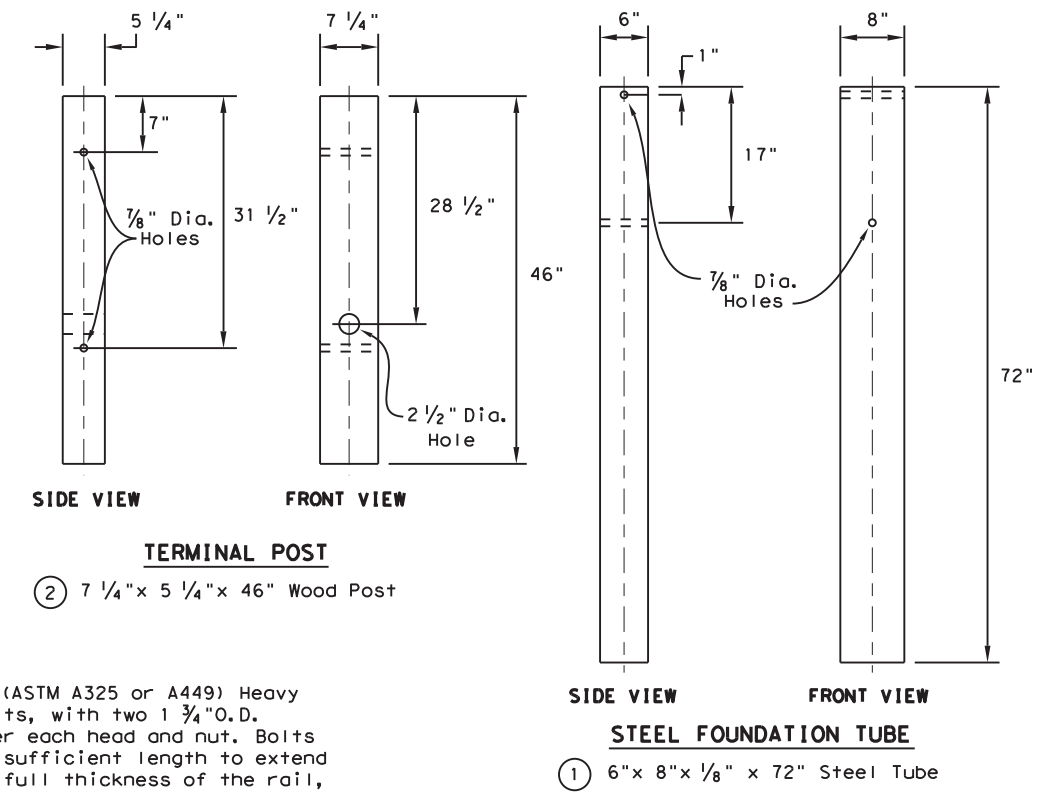
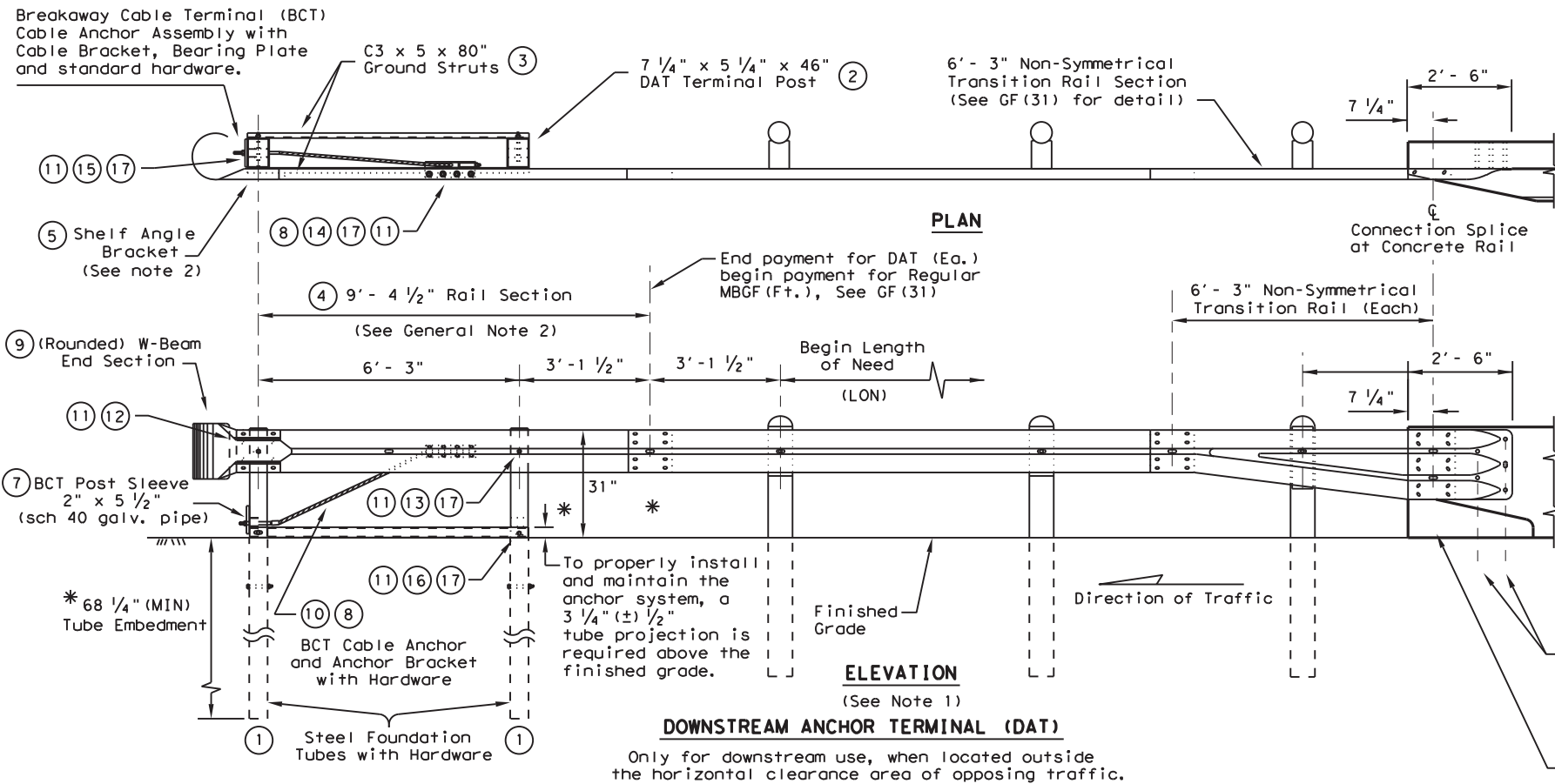
If a mow strip is required with the DAT installation the leave-out area around the steel foundation tubes and the two channel struts may be omitted. This will require a full pour at the foundation tubes.

#	(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

Texas Department of Transportation
METAL BEAM GUARD FENCE
 (Downstream Anchor Terminal)
GF (31) DAT-14

FILE: gf31dat14.dgn	DN: TxDOT	CK: AM	DW: VP	CK: CGL
© TxDOT: December 2011	CONT: 6372	SECT: 50	JOB: 001	HIGHWAY: VAR.
REVISIONS	DIST: SAT	COUNTY: BEXAR	SHEET NO.: 171	

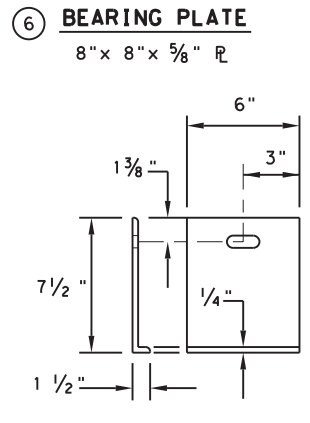
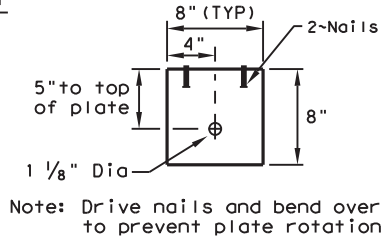
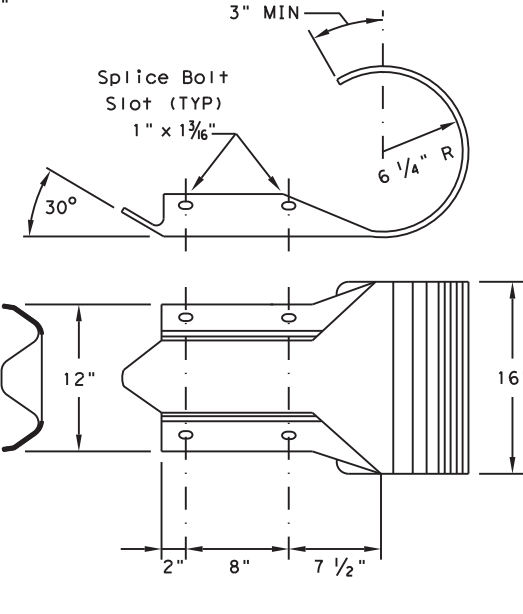
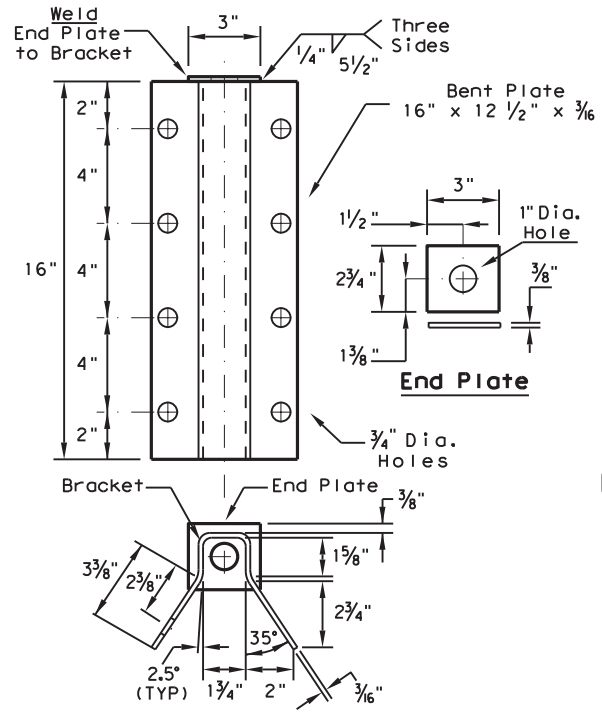
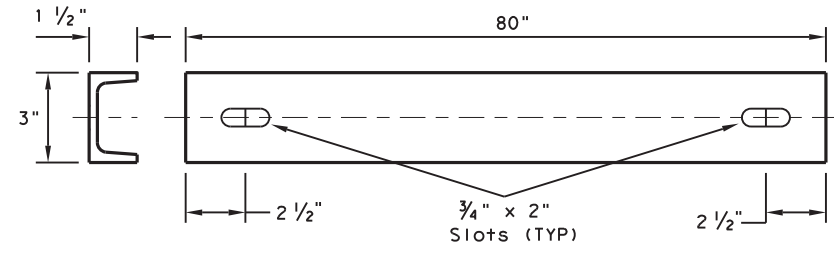
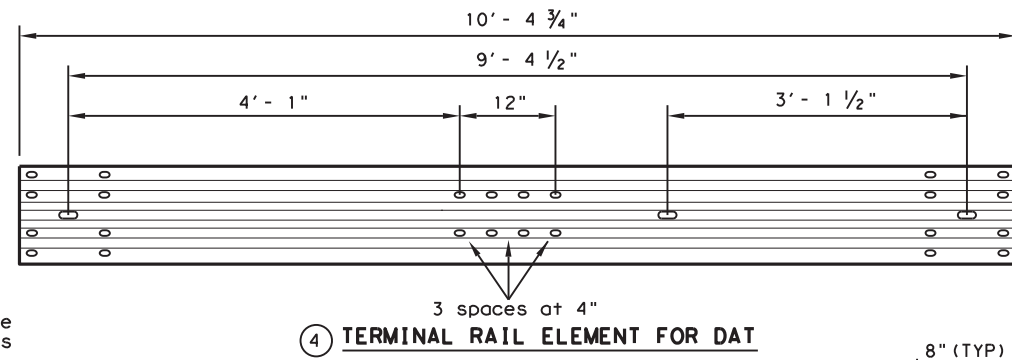
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5 - 7/8" Dia. (ASTM A325 or A449) Heavy Hex Head Bolts, with two 1 3/4" O.D. washers under each head and nut. Bolts shall be of sufficient length to extend through the full thickness of the rail, washer, and nut. Install with bolt heads on traffic face.

Chamfer required on concrete rails that extend beyond the face of the guardrail transition.

Terminal Connection Note
To ensure a stable connection, (12) Rectangular Washers (FWR03) are required under the recessed nuts at the Terminal Connection splice.



8 GUARDRAIL ANCHOR BRACKET 9 W-BEAM END SECTION (ROUNDED) (12 GA.) 5 SHELF ANGLE BRACKET

3 CHANNEL STRUT
C3 x 5 x 80", Grade A36

GENERAL NOTES

- The DAT detail shown is the minimum Length of Need (LON) for a DAT connected to a concrete rail.
- The rail section at the end post is supported by the Shelf Angle Bracket. The rail element is not attached to the end post.
- The foundation tubes shall not project more than 3 3/4" above the finished grade.
- All hardware for DAT shall be ASTM A307 unless otherwise shown.
- 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

Texas Department of Transportation
Design Division Standard

**METAL BEAM GUARD FENCE
(Downstream Anchor Terminal)**

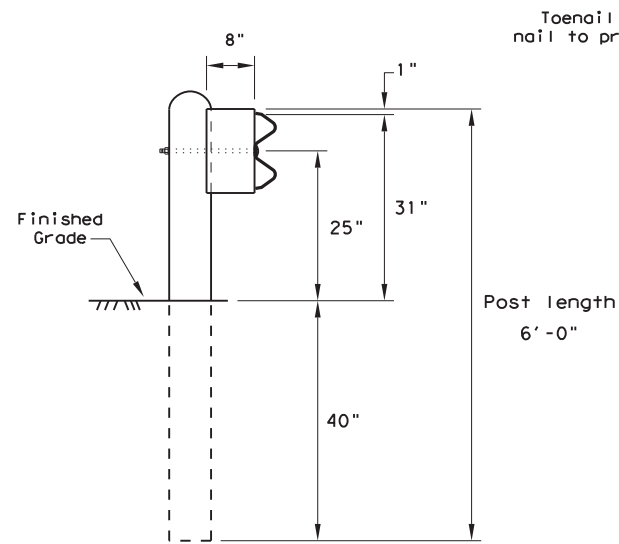
GF(31)DAT-11

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© TxDOT December 2011	CONT: 6372	SECT: 50	JOB: 001	HIGHWAY: VAR.
REVISIONS	DIST: SAT	COUNTY: BEXAR	SHEET NO. 172	

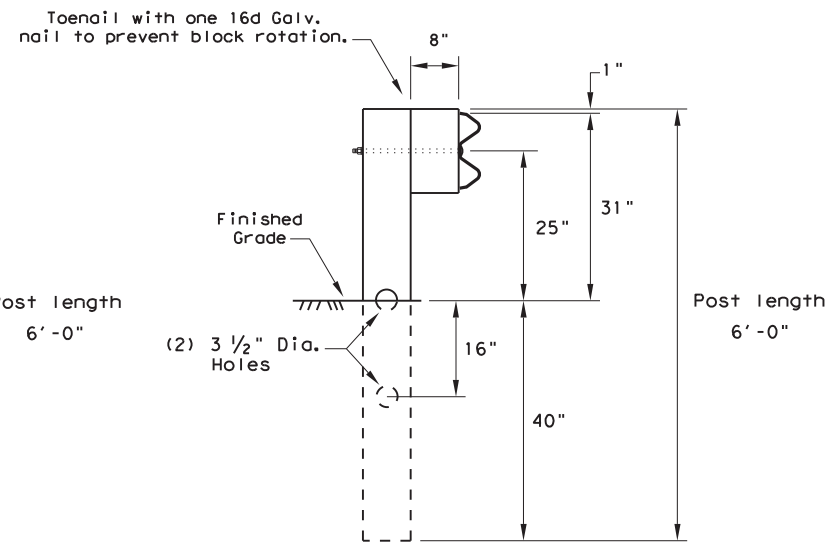
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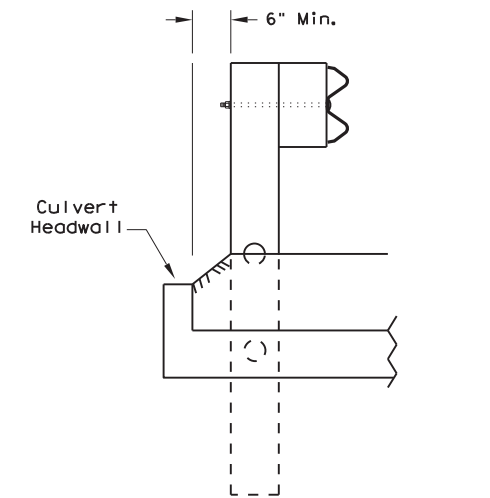


Standard Line Post Installation



**Rectangular CRT Post
(6" x 8" x 6' Long)**

(6) CRT required.
See Elevation Detail for locations.

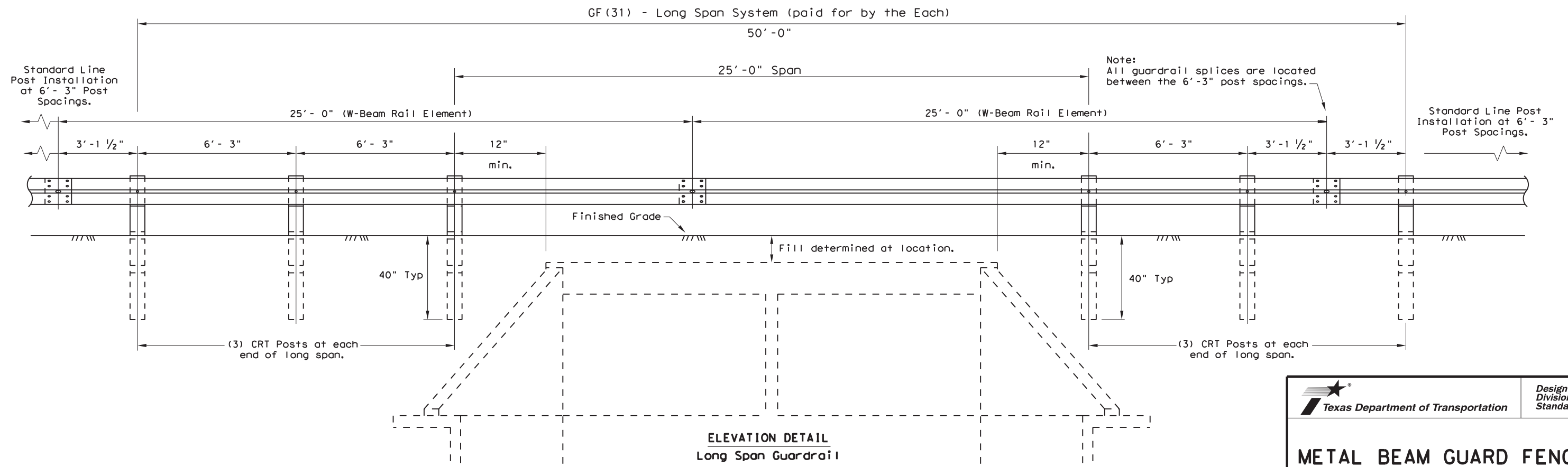


**Lateral Offset Between the
Guardrail and the Culvert Headwall**

GENERAL NOTES

1. The type of line post (round wood post, rectangular wood post, or steel post) will be as shown in the plans. The exact position of the transitions shall be as shown in the plans or as directed by the Engineer. Steel posts to be galvanized in accordance with Item 445, "Galvanizing."
2. Rail element shall meet all requirements of Item 540, "Metal Beam Guard Fence" except as modified on the plans. The Contractor may furnish rail elements of 12 1/2 or 25 foot nominal lengths.
3. Rail post holes are offset 3'- 1 1/2" from standard guardrail to accommodate the midspan splicing.
4. Button head post bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and no more than 3/4" beyond it. Button head splice bolts (ASTM A307) are 5/8" x 1 1/4" with a 5/8" double recessed nut (ASTM A563). Galvanized fittings (bolts, nuts, and washers) shall be in accordance with Item, "Metal For Structures". Fittings shall be subsidiary to the bid item requiring construction of transition.
5. Where solid rock is encountered or where shown on the plans, the diameter of the holes shall be approximately 12 inches, the backfilling shall be with a cohesionless material, and embedment depth shall be 1' - 6" or more as directed by the Engineer.
6. Posts shall not be set in concrete, of any depth.
7. Refer to GF(31) Standard Sheet for additional details.

NOTE: Field drilled holes shall be repaired in accordance with Item 445, "Galvanizing".
Flame cutting of holes in guardrail shall not be permitted.



**ELEVATION DETAIL
Long Span Guardrail**



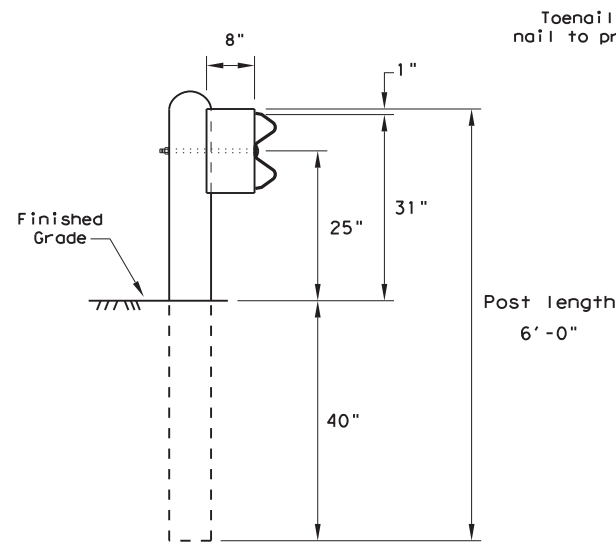
**METAL BEAM GUARD FENCE
(LONG SPAN)**

GF (31) LS-17

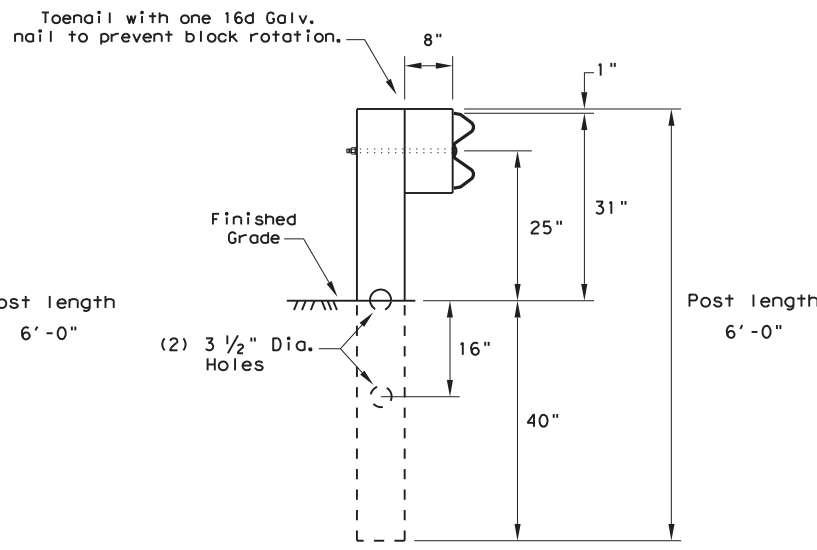
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Revised 12, 2017 CL	6372	50	001	VAR
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	SAT	BEXAR	173	

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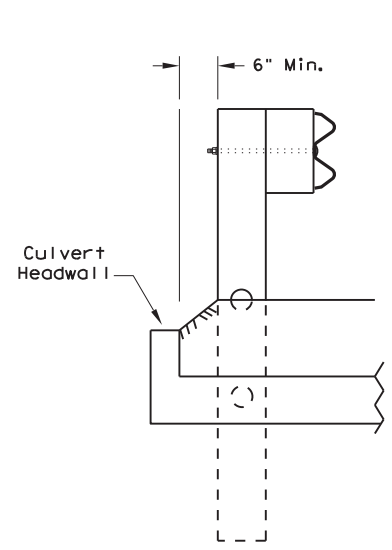
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Standard Line Post Installation



**Rectangular CRT Post
(6" x 8" x 6' Long)**
(6) CRT required.
See Elevation Detail for locations.

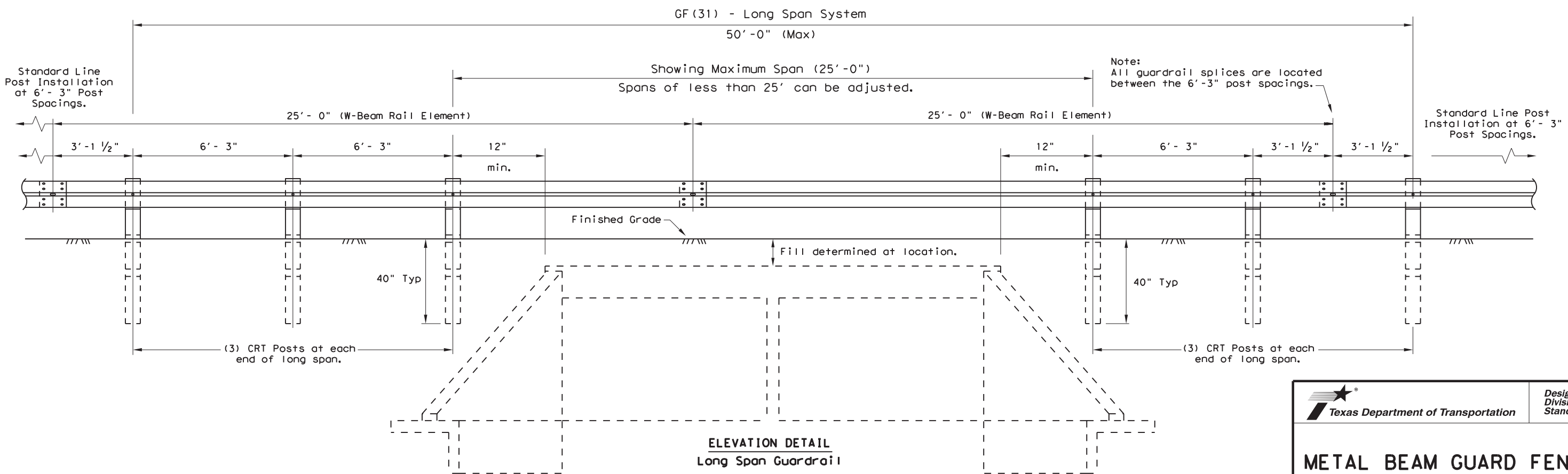


**Lateral Offset Between the
Guardrail and the Culvert Headwall**

GENERAL NOTES

1. The type of line post (round wood post, rectangular wood post, or steel post) will be as shown in the plans. The exact position of the transitions shall be as shown in the plans or as directed by the Engineer. Steel posts to be galvanized in accordance with Item 445, "Galvanizing."
2. Rail element shall meet all requirements of Item 540, "Metal Beam Guard Fence" except as modified on the plans. The Contractor may furnish rail elements of 12 1/2 or 25 foot nominal lengths.
3. Rail post holes are offset 3' - 1 1/2" from standard guardrail to accommodate the midspan splicing.
4. Button head post bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and no more than 3/4" beyond it. Button head splice bolts (ASTM A307) are 5/8" x 1 1/4" with a 5/8" double recessed nut (ASTM A563). Galvanized fittings (bolts, nuts, and washers) shall be in accordance with Item, "Metal For Structures". Fittings shall be subsidiary to the bid item requiring construction of transition.
5. Where solid rock is encountered or where shown on the plans, the diameter of the holes shall be approximately 12 inches, the backfilling shall be with a cohesionless material, and embedment depth shall be 1' - 6" or more as directed by the Engineer.
6. Posts shall not be set in concrete, of any depth.
7. Refer to GF(31) Standard Sheet for additional details.

NOTE: Field drilled holes shall be repaired in accordance with Item 445, "Galvanizing".
Flame cutting of holes in guardrail shall not be permitted.

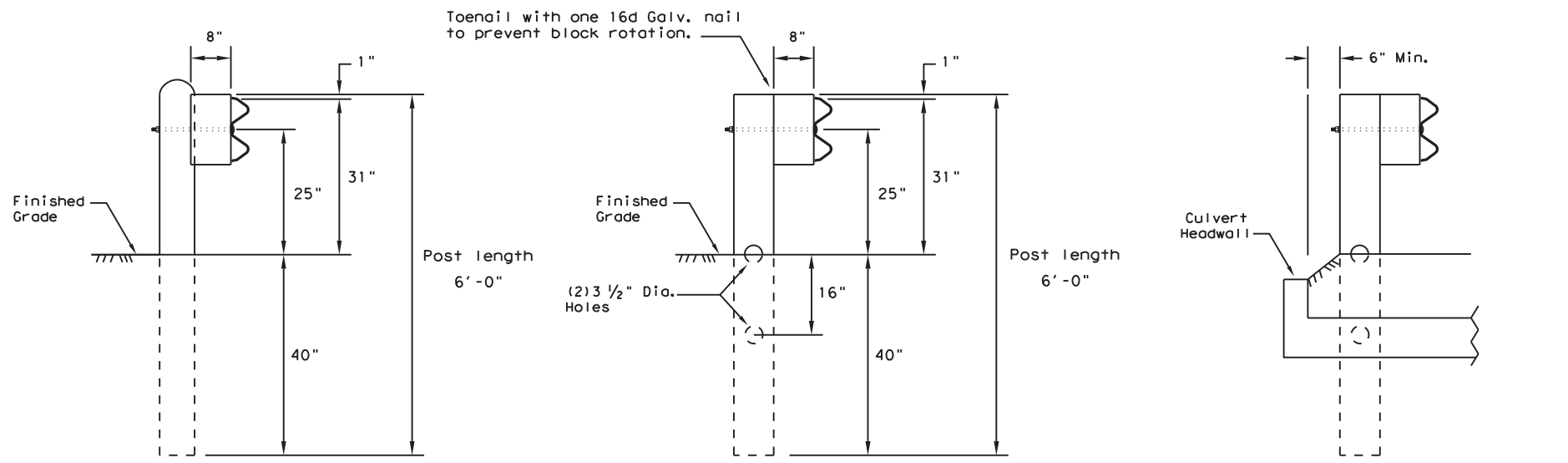


**ELEVATION DETAIL
Long Span Guardrail**

		Design Division Standard	
METAL BEAM GUARD FENCE (LONG SPAN)			
GF (31) LS-14			
FILE: gf31ls14.dgn	DN: TxDOT	CK: AM	DW: VP
© TxDOT: December 2011	CONT: 6372	SECT: 50	JOB: 001
REVISIONS		HIGHWAY: VAR.	
DIST: SAT	COUNTY: BEXAR	SHEET NO.: 174	

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 FILE: _____



Standard Line Post Installation

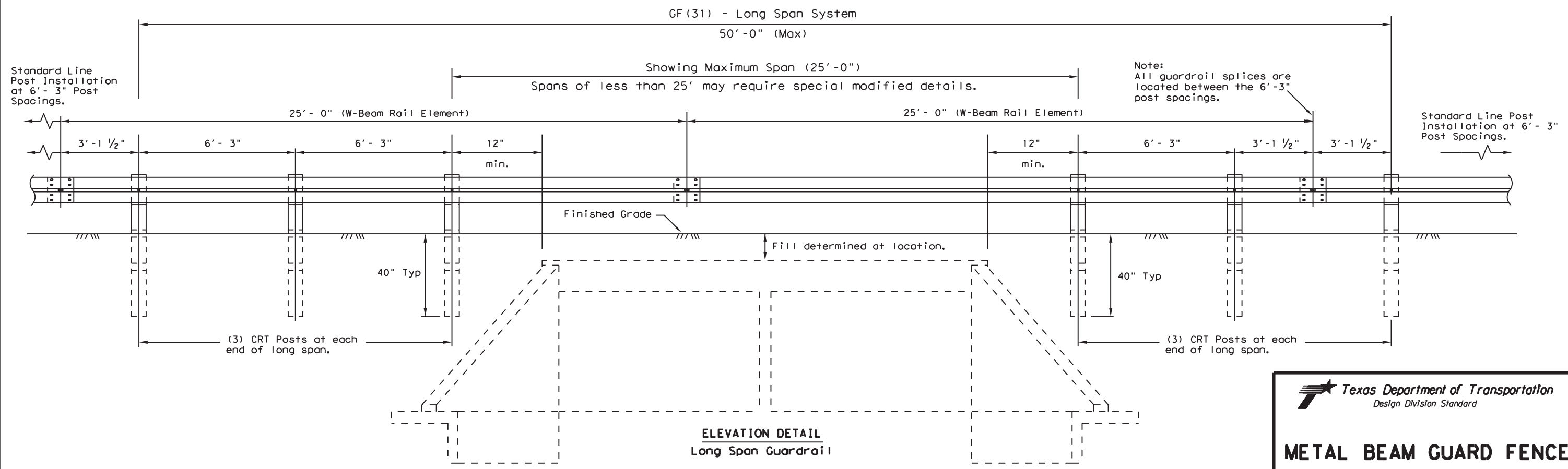
Rectangular CRT Post (6" x 8" x 6' Long)
 (6) CRT required.
 See Elevation Detail for locations.

Lateral Offset Between the Guardrail and the Culvert Headwall

GENERAL NOTES

1. The type of line post (round wood post, rectangular wood post, or steel post) will be as shown in the plans. The exact position of the transitions shall be as shown in the plans or as directed by the Engineer. Steel posts to be galvanized in accordance with Item 445, "Galvanizing."
2. Rail element shall meet all requirements of Item 540, "Metal Beam Guard Fence" except as modified on the plans. The Contractor may furnish rail elements of 12 1/2 or 25 foot nominal lengths.
3. Rail post holes are offset 3'- 1 1/2" from standard guardrail to accommodate the midspan splicing.
4. Button head post bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and no more than 3/4" beyond it. Button head splice bolts (ASTM A307) are 5/8" x 1 1/4" with a 5/8" double recessed nut (ASTM A563). Galvanized fittings (bolts, nuts, and washers) shall be in accordance with Item, "Metal For Structures". Fittings shall be subsidiary to the bid item requiring construction of transition.
5. Where solid rock is encountered or where shown on the plans, the diameter of the holes shall be approximately 12 inches, the backfilling shall be with a cohesionless material, and embedment depth shall be 1' - 6" or more as directed by the Engineer.
6. Posts shall not be set in concrete, of any depth.
7. Refer to GF(31) Standard Sheet for additional details.

NOTE: Field drilled holes shall be repaired in accordance with Item 445, "Galvanizing".
 Flame cutting of holes in guardrail shall not be permitted.

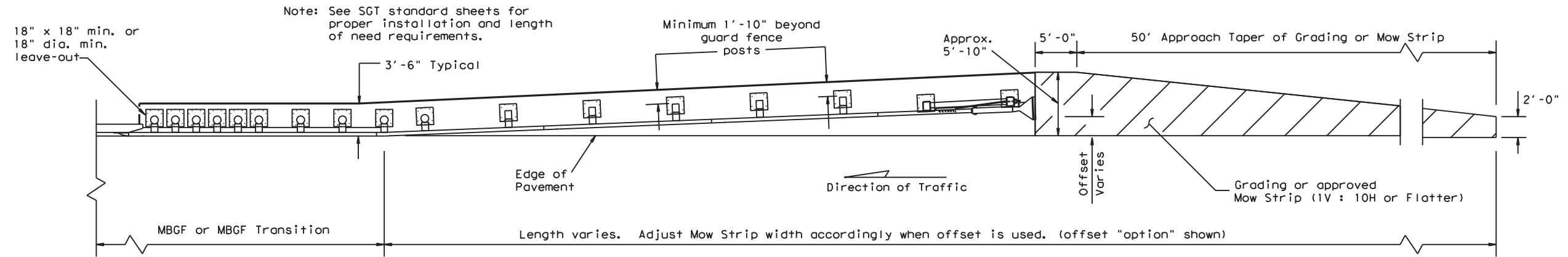


Texas Department of Transportation
 Design Division Standard

METAL BEAM GUARD FENCE (LONG SPAN)
GF(31)LS-11

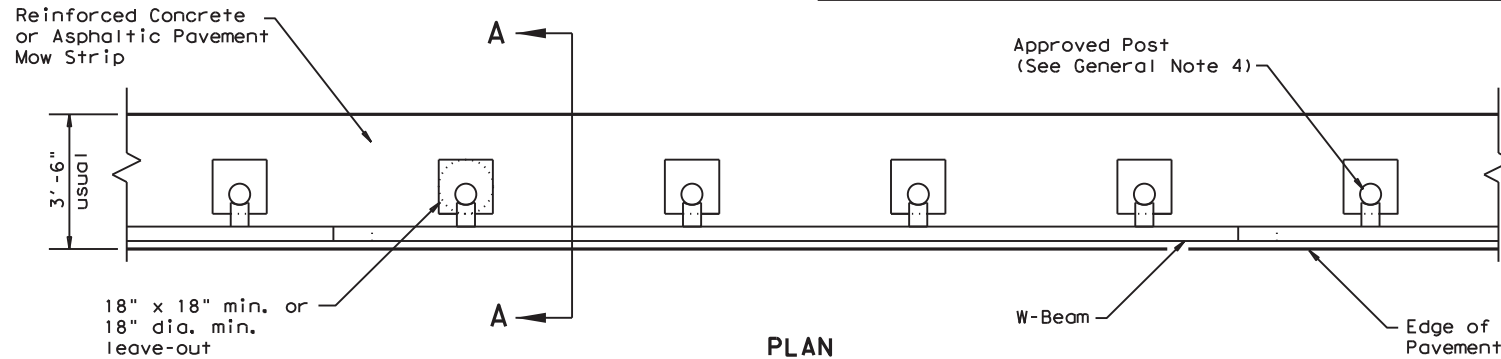
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© TxDOT December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
DIST	COUNTY		SHEET NO.	
SAT	BEXAR		175	

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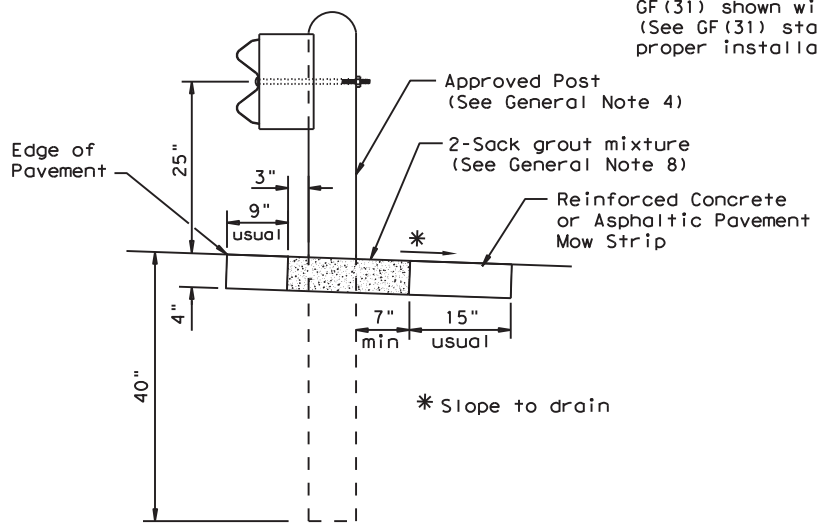
GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS

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.



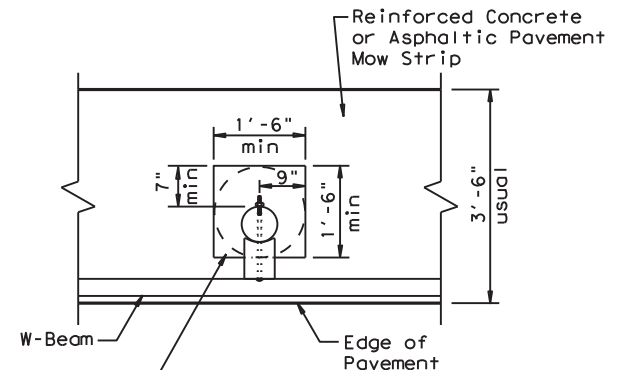
PLAN

GF(31) shown with Mow Strip
 (See GF(31) standard sheet for proper installation)



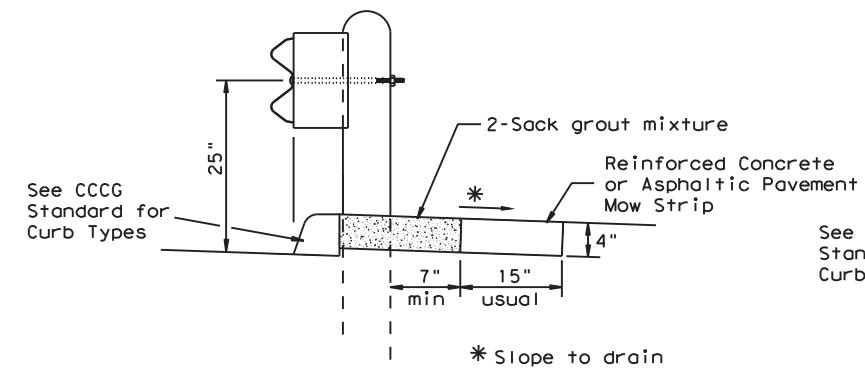
SECTION A-A

Typical



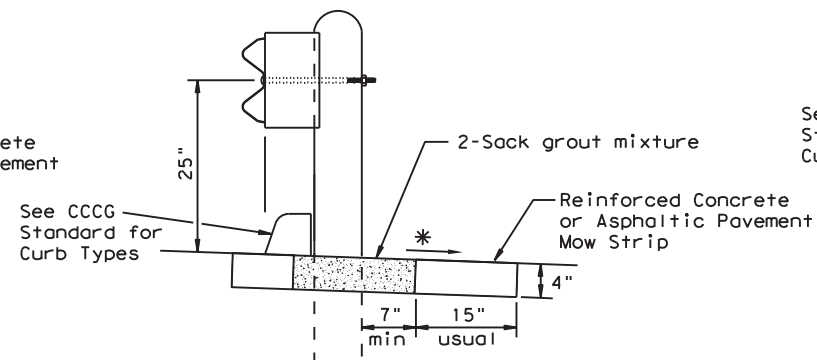
MOW STRIP DETAIL

Reinforced Concrete or Asphaltic Pavement Mow Strip with 18\"/>
 or 18\"/>
 dia. minimum leave-out.



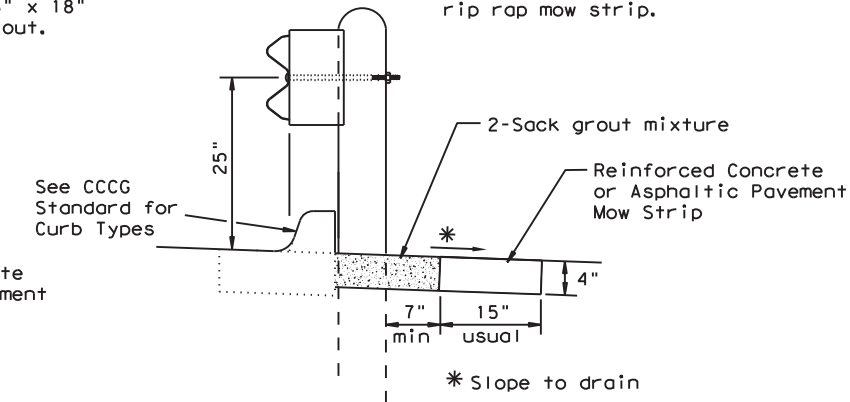
CURB OPTION (1)

This option will increase the post embedment through out the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

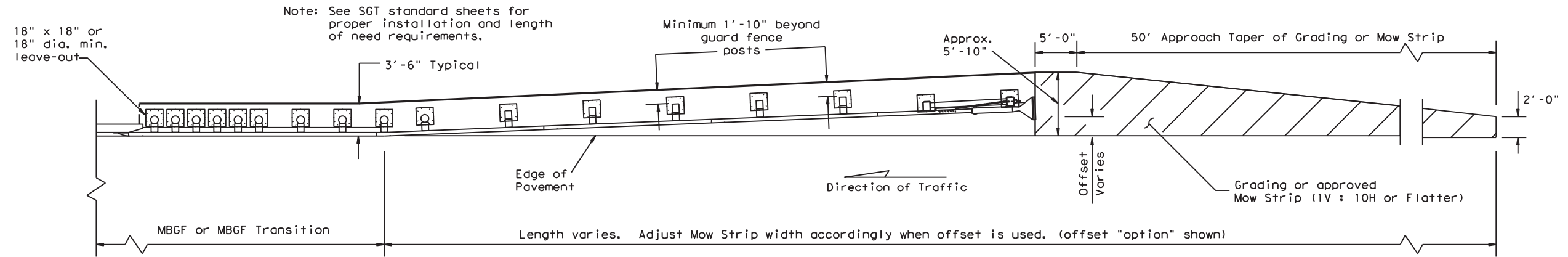
GENERAL NOTES

1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments (See SGT standards for proper SGT installation).
2. Mow strips shall be asphaltic pavement or reinforced concrete (wire mesh or synthetic fiber), as shown on the plans and will be paid for under the pertinent bid item. Asphaltic pavement shall meet the requirements of the item, and be placed in accordance with the pertinent bid item as shown in the plans. 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\"/>

		Design Division Standard	
<h2>METAL BEAM GUARD FENCE (MOW STRIP)</h2> <h3>GF (31)MS-17</h3>			
FILE: gf31ms17.dgn	DN: TxDOT	CK: KM	DW: TXDOT
©TxDOT December 2011	CONT	SECT	JOB
Revised 12, 2017 KM	6372	50	OO1
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	SAT	BEXAR	176

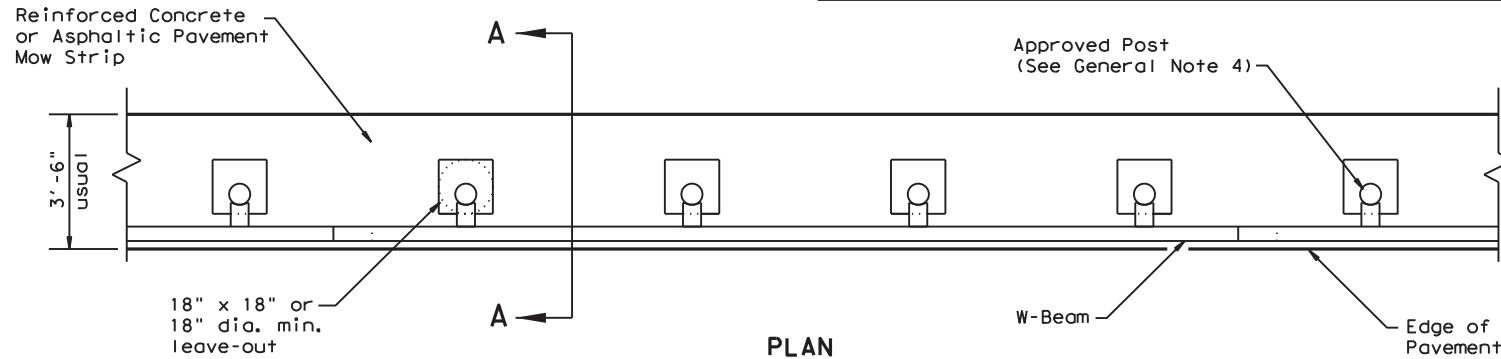
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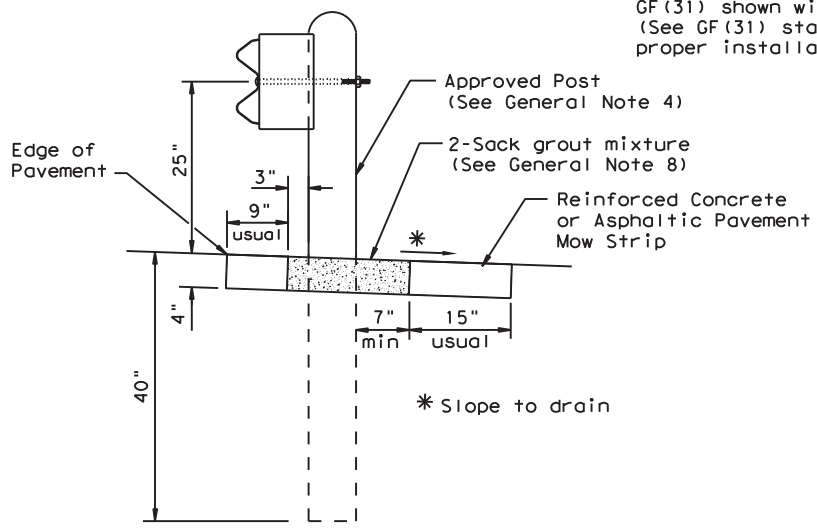
GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS

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.



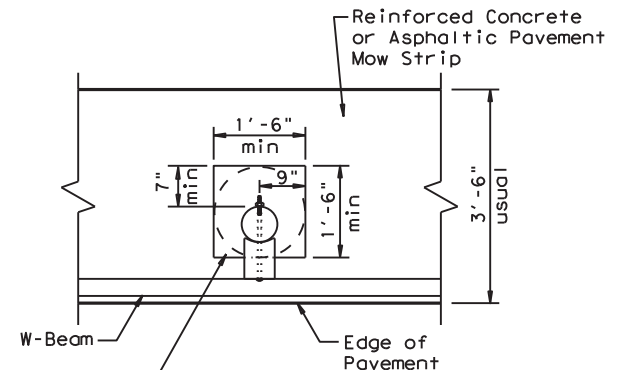
PLAN

GF(31) shown with Mow Strip
 (See GF(31) standard sheet for proper installation)



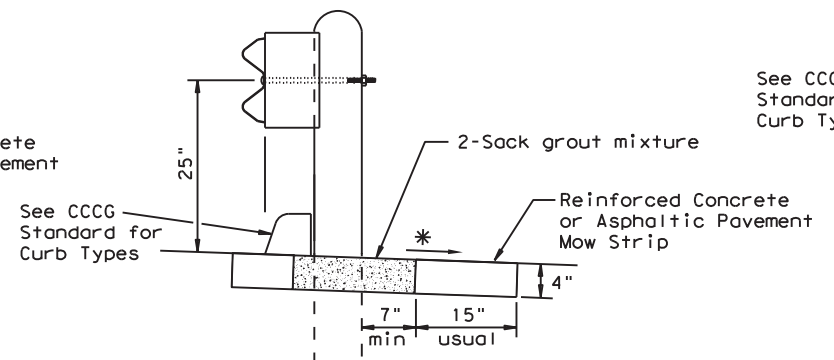
SECTION A-A

Typical



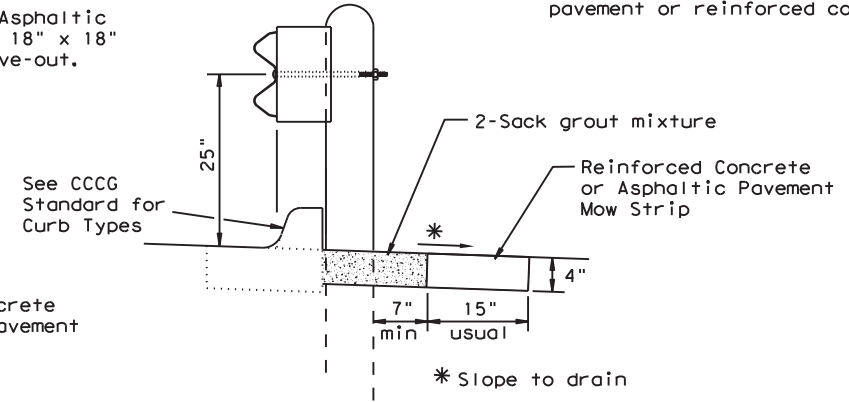
MOW STRIP DETAIL

Reinforced Concrete or Asphaltic Pavement Mow Strip with 18\"/>
 or 18\"/>
 dia. minimum leave-out.

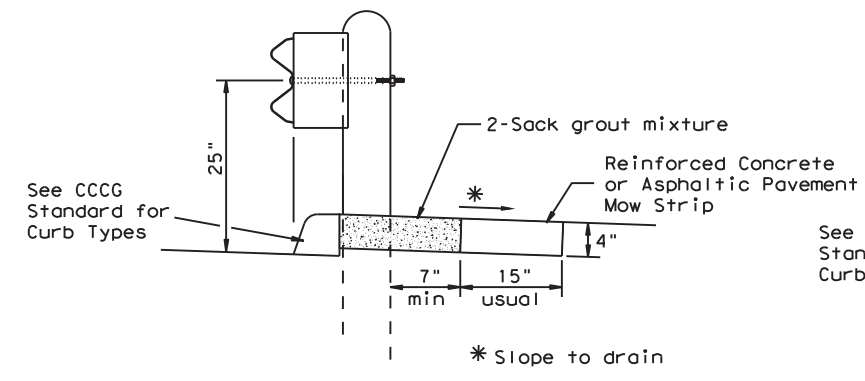


CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)



CURB OPTION (1)

This option will increase the post embedment through out the system.

GENERAL NOTES

1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments (See SGT standards for proper SGT installation).
2. Mow strips shall be asphaltic pavement or reinforced concrete (wire mesh or synthetic fiber), as shown on the plans and will be paid for under the pertinent bid item. Asphaltic pavement shall meet the requirements of the item, and be placed in accordance with the pertinent bid item as shown in the plans. 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. The type of approved post will be as shown in the plans. See the applicable standard sheets for additional details and information.
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 asphaltic pavement or reinforced concrete will include leave-outs for the posts.
8. The leave-outs shall be filled with no more than a 2-sack grout mixture and placed in accordance with Section 421.2.F, "Mortar and Grout." Payment for furnishing and placing the grout mixture will be subsidiary to the pay item of asphaltic pavement or reinforced concrete.

Texas Department of Transportation
 Design Division Standard

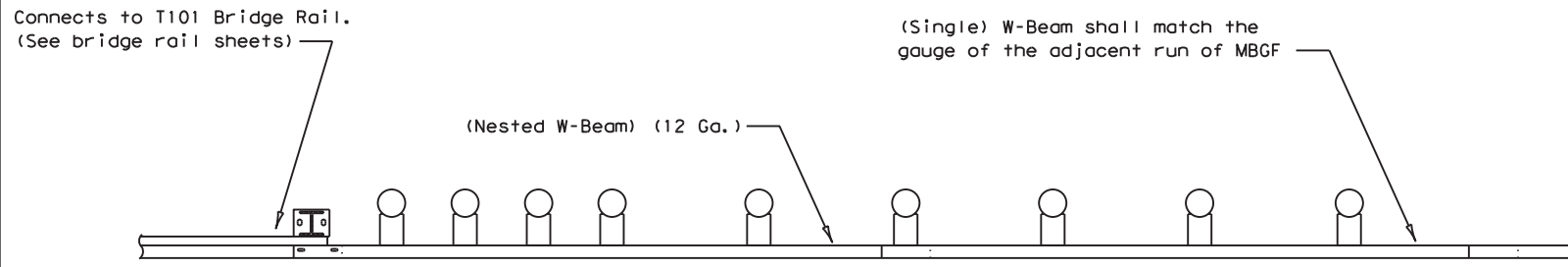
METAL BEAM GUARD FENCE
(MOW STRIP)
GF (31)MS-11

FILE: gf31ms11.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
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REVISIONS	6372	50	001	VAR.
DIST	COUNTY		SHEET NO.	
SAT	BEXAR		177	

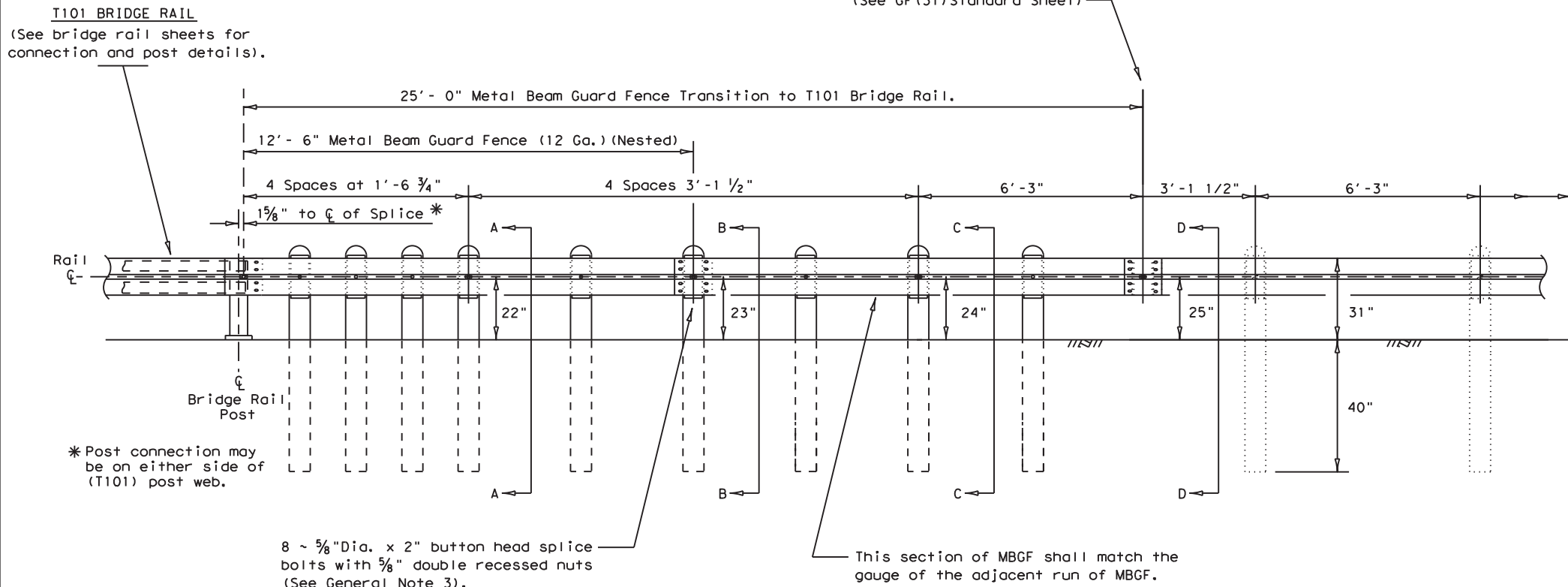
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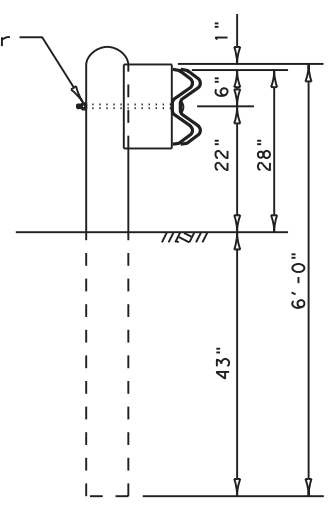


PLAN VIEW

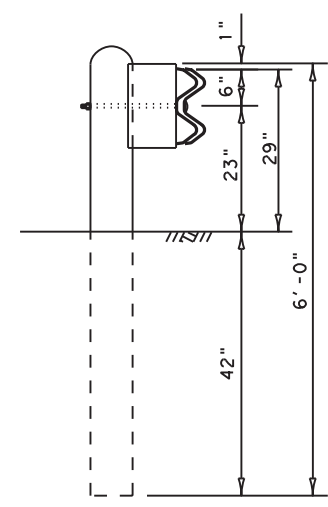


ELEVATION VIEW

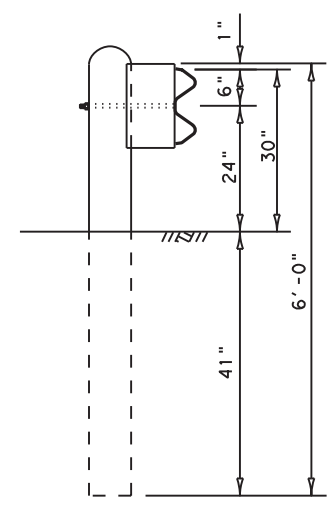
5/8" Button head post bolt with nut & washer (See General Note 3)



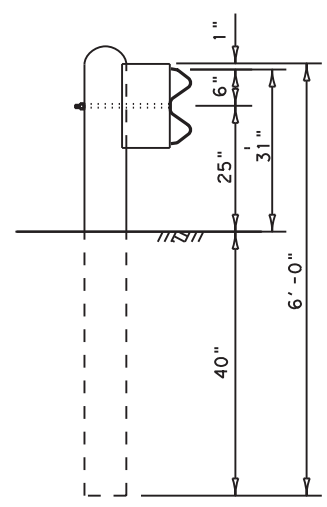
SECTION A-A



SECTION B-B



SECTION C-C



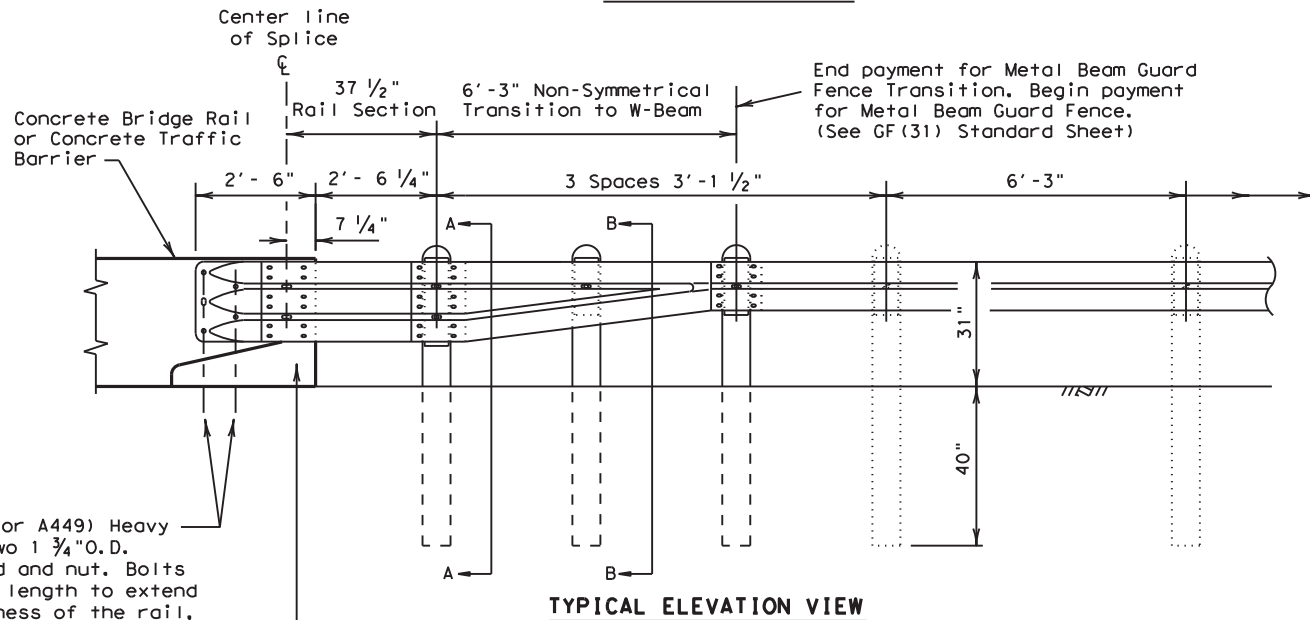
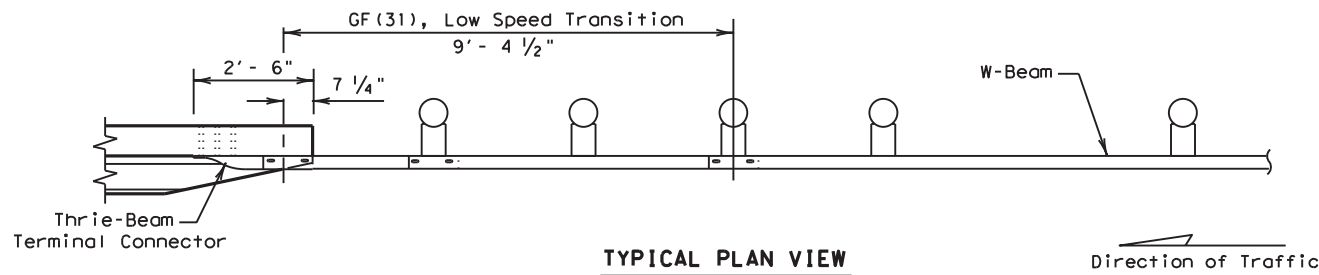
SECTION D-D

GENERAL NOTES

1. The type of post (round wood post, rectangular wood post, or steelpost) will be shown elsewhere in the plans. The exact position of transitions shall be shown elsewhere in the plans or as directed by the Engineer.
2. Rail element shall meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified on the plans.
3. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and the Type A 1 3/4" O.D. washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 5/8" x 2" (at triple rail splices) with a 5/8" double recessed nuts (ASTM A563).
4. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item requiring construction of the transition.
5. Crown will be widened to accommodate transitions.
6. If solid rock is encountered. See the GF(31)standard sheet for proper installation guidance.
7. Posts shall not be set in concrete.
8. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or 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 can furnish composite material posts and/or blocks.
9. Refer to GF(31) and TYPE T101 Standard Sheet for additional details.

		Design Division Standard	
METAL BEAM GUARD FENCE TRANSITION (T101) GF (31) T101-13			
FILE: gf31+10113	DN: AM	CK: AM	DW: VP
© TxDOT January 2013	CONT 6372	SECT 50	JOB 001
REVISIONS	SAT		COUNTY BEXAR
			SHEET NO. 178

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5 - 7/8" Dia. (ASTM A325 or A449) Heavy Hex Head Bolts, with two 1 3/4" O.D. washers under each head and nut. Bolts shall be of sufficient length to extend through the full thickness of the rail, washer, and nut. Install with bolt heads on traffic face.

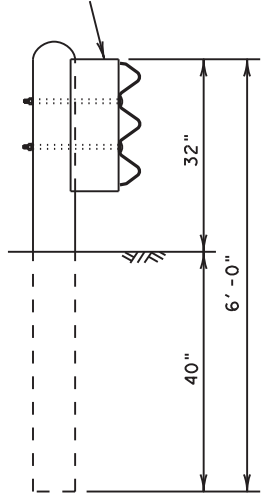
Chamfer required on concrete rails that extend beyond the face of the guardrail transition.

TERMINAL CONNECTION NOTE

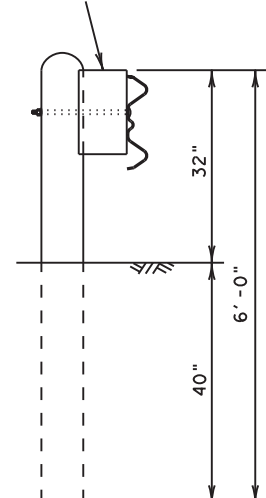
To ensure a stable connection, (12) Rectangular Washers (FWR03) are required under the recessed nuts at the Terminal Connection splice.

This post location requires a Thrie-Beam Block (6" x 8" x 22" Nom).

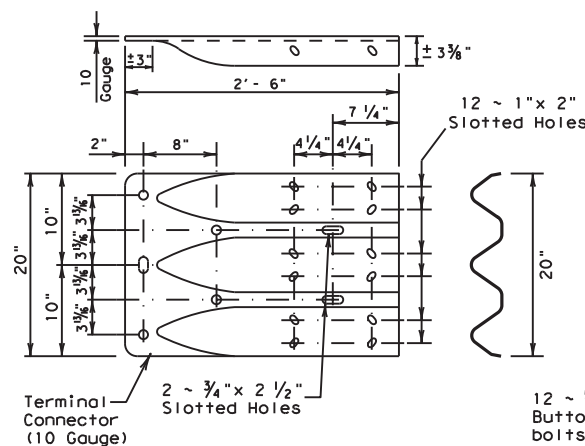
Standard Block (6" x 8" x 14" Nom)



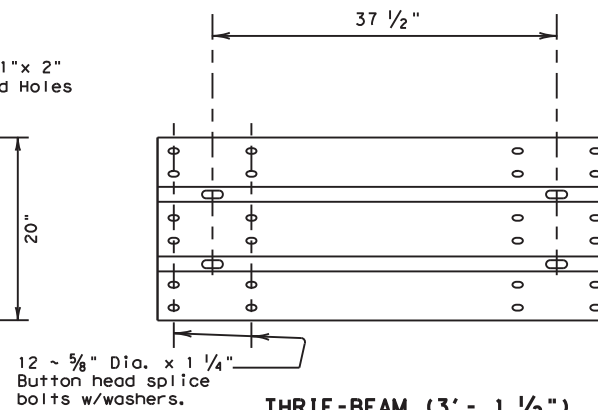
SECTION A-A



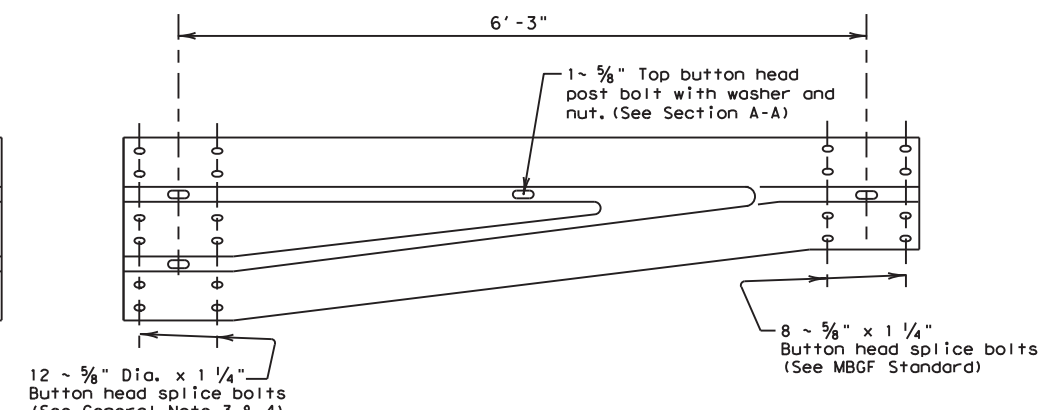
SECTION B-B



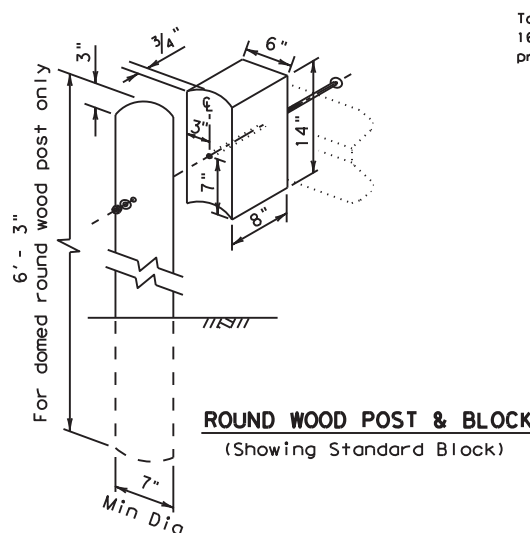
THRIE-BEAM TERMINAL CONNECTION (See Terminal Connection Note)



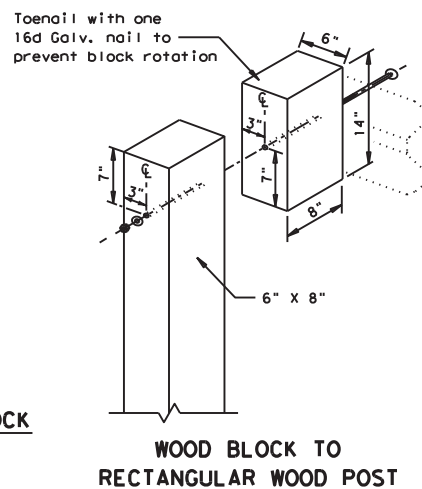
THRIE-BEAM (3'-1 1/2") (10 GA.) ELEMENT SECTION



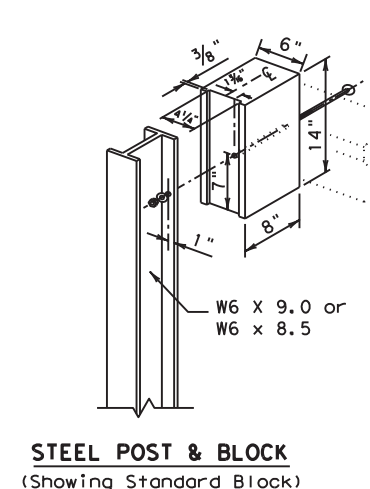
NON-SYMMETRICAL (10 GA.) TRANSITION SECTION



ROUND WOOD POST & BLOCK (Showing Standard Block)



WOOD BLOCK TO RECTANGULAR WOOD POST



STEEL POST & BLOCK (Showing Standard Block)

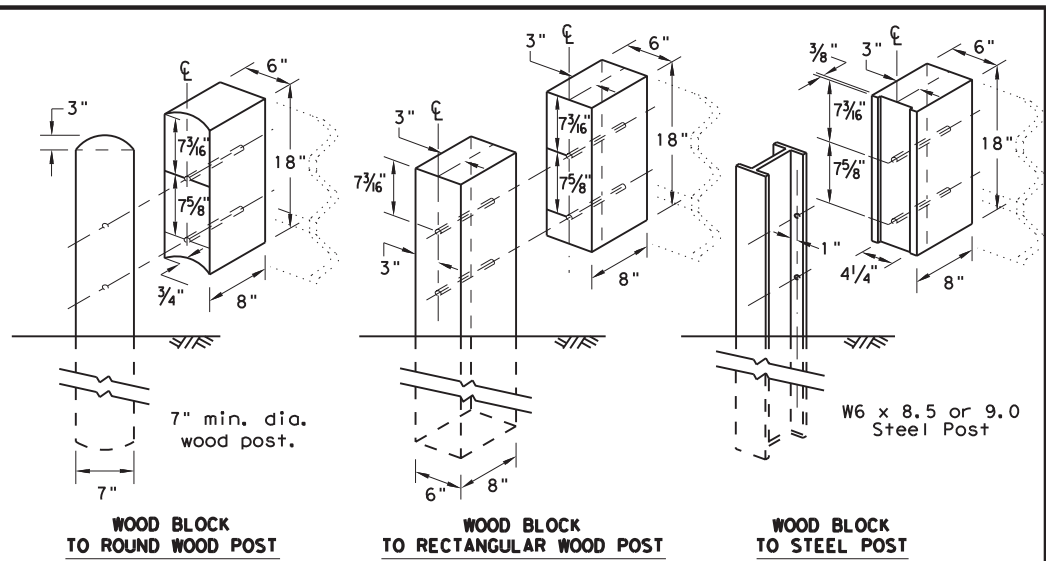
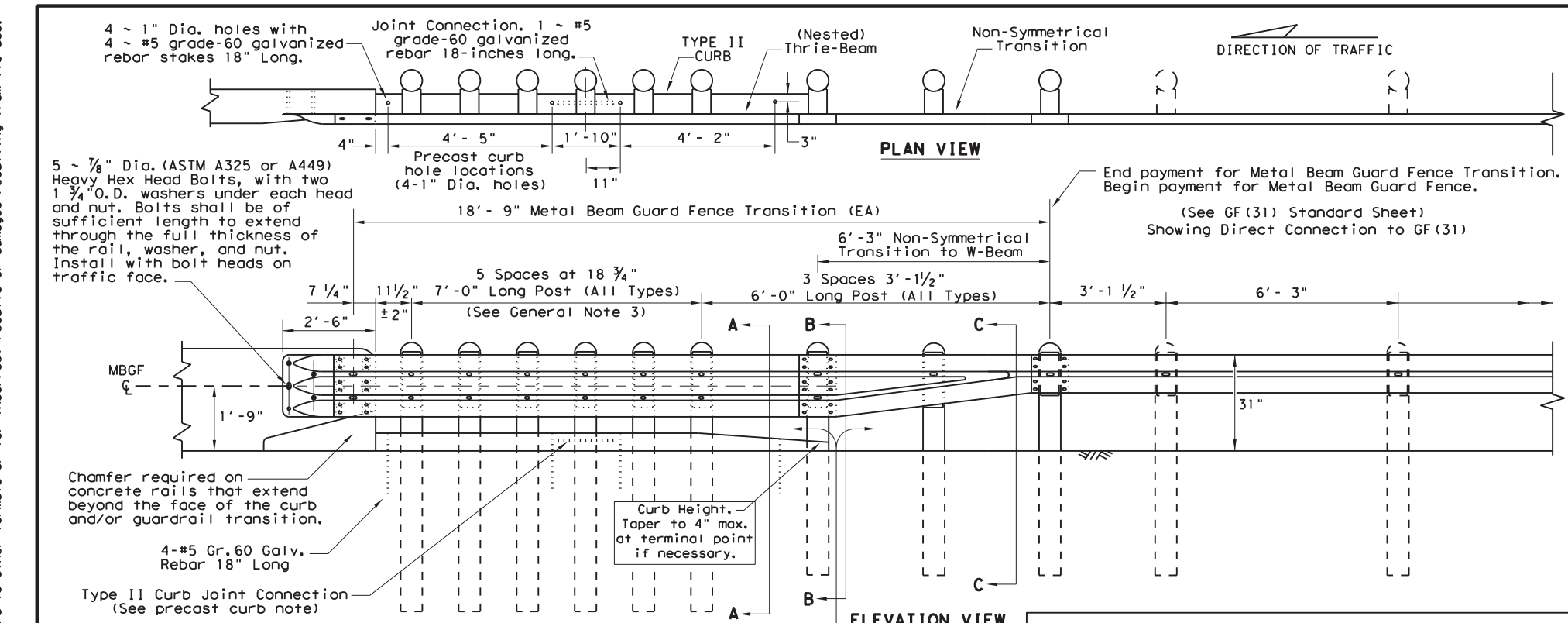
GENERAL NOTES

1. The type of post (round wood post, rectangular wood post, or steel post) will be as shown in the plans. The exact position of transitions shall be as shown in the plans or as directed by the Engineer.
2. Rail element shall meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified in the plans.
3. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut and Type A 1 3/4" O.D. washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 5/8" x 1 1/4" with 5/8" double recessed nuts (ASTM A563).
4. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item requiring construction of the transition.
5. Crown will be widened to accommodate transitions.
6. If solid rock is encountered. See the GF(31) standard sheet for the proper installation guidance.
7. Posts shall not be set in concrete, of any depth.
8. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or 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 can furnish composite material posts and/or blocks.
9. Refer to GF(31) standard sheet for additional details.

DATE: FILE:

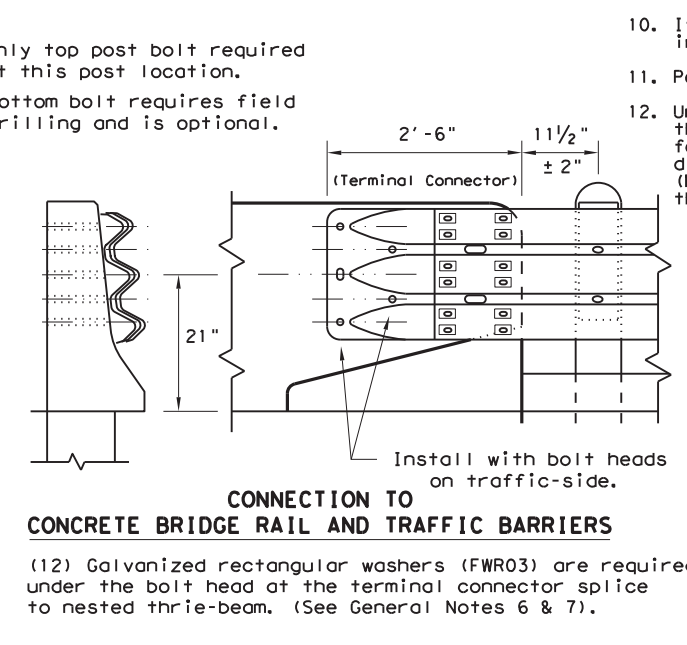
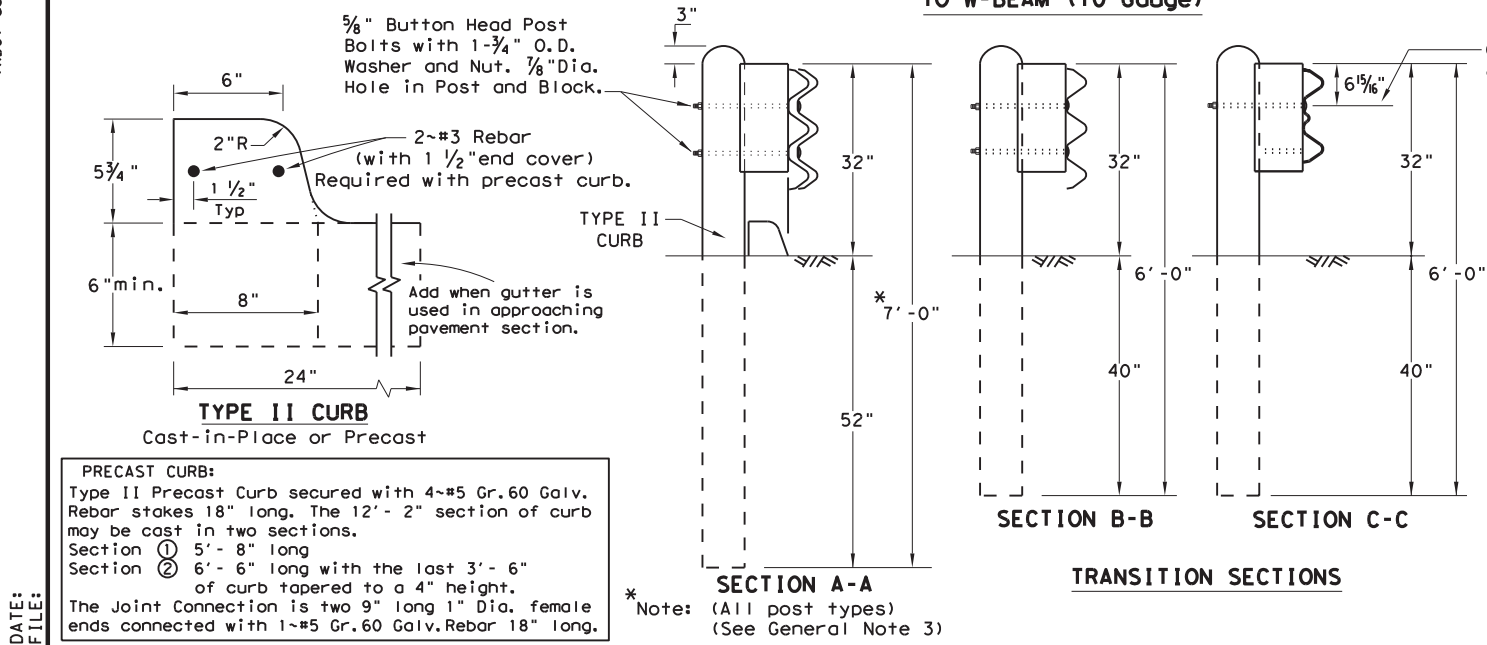
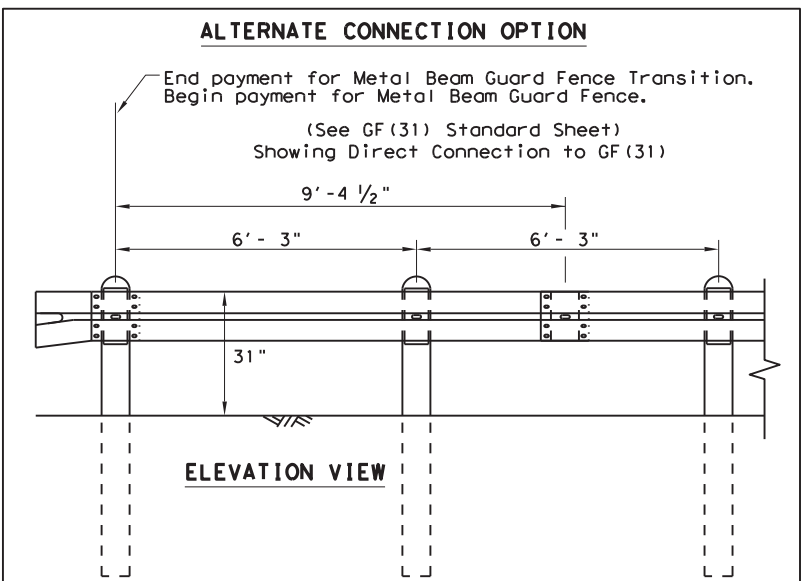
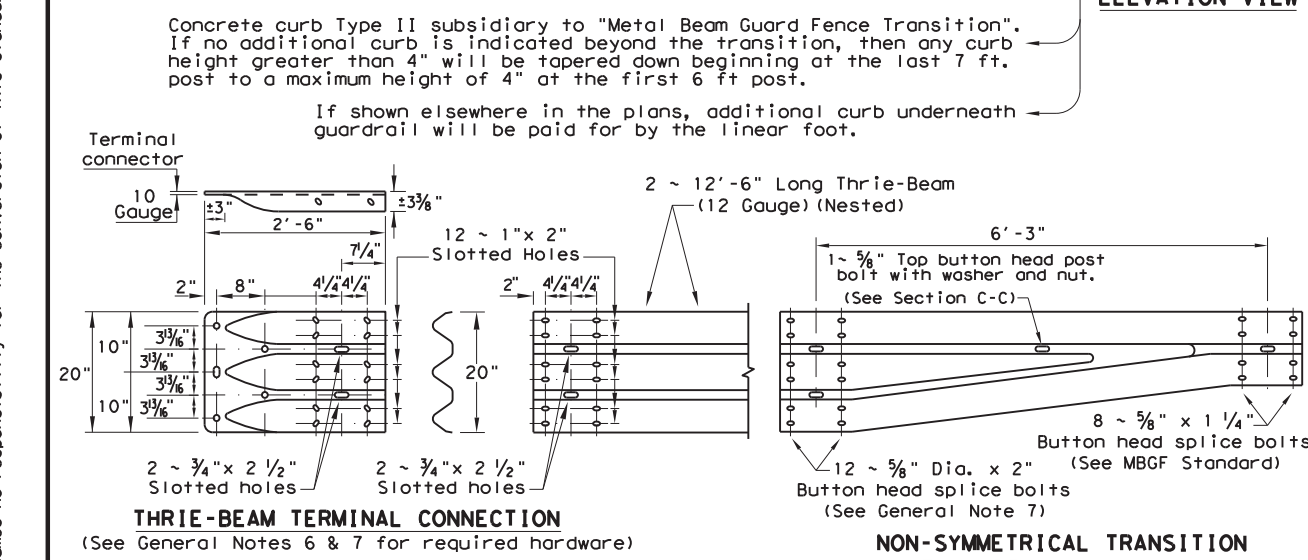
		Design Division Standard	
METAL BEAM GUARD FENCE TRANSITION (TL-2) (Low Speed Transition) GF(31) TL2-11			
FILE: gf31+211.dgn	DN: TxDOT	CK: AM	DW: BD
© TxDOT December 2011	CONT: 6372	SECT: 50	JOB: 001
REVISIONS	SAT	COUNTY: BEXAR	SHEET NO.: 179

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GENERAL NOTES

- Concrete curb may be cast-in-place or precast as shown on this sheet. When used in conjunction with thrie-beam guard fence transitions, curb shall be Type II (Typically 5-3/4" height above surface; See CCGG standard sheet) unless otherwise shown in the plans. 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.
- Contact the Design Division for drainage cut out options needed within the curb section of the transition.
- The type of post (round wood post, rectangular wood post or steel post) will be as shown in the plans.
- 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.
- Rail element 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.
- Unless otherwise shown in the plans, transitions shall be placed with the block face in front of or directly above the curb face.
- Galvanized washers used with the 5/8" dia. post bolts shall be Type A 1-3/4" O.D. washers. The (12) plate washers (FWR03) required at the terminal connector splice.
- Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) 5/8" dia. x 2" (at triple rail splices) with 5/8" double recessed nuts.
- 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 transitions.
- If solid rock is encountered. See the MGBF standard sheet for the proper installation guidance.
- Posts shall not be set in concrete.
- Unless otherwise shown in the plans, a composite material (post or block) that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for (post or block) of similar dimensions. TxDOT's Construction Division maintains a Material Producer List (MPL) for producers of materials conforming to DMS-7210. Only producers on the MPL can furnish composite material posts and/or blocks.



Design Division Standard

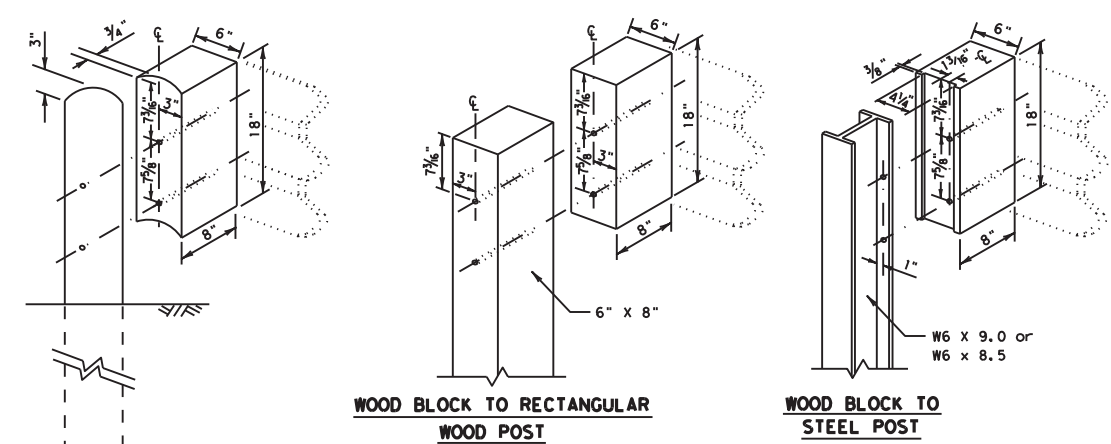
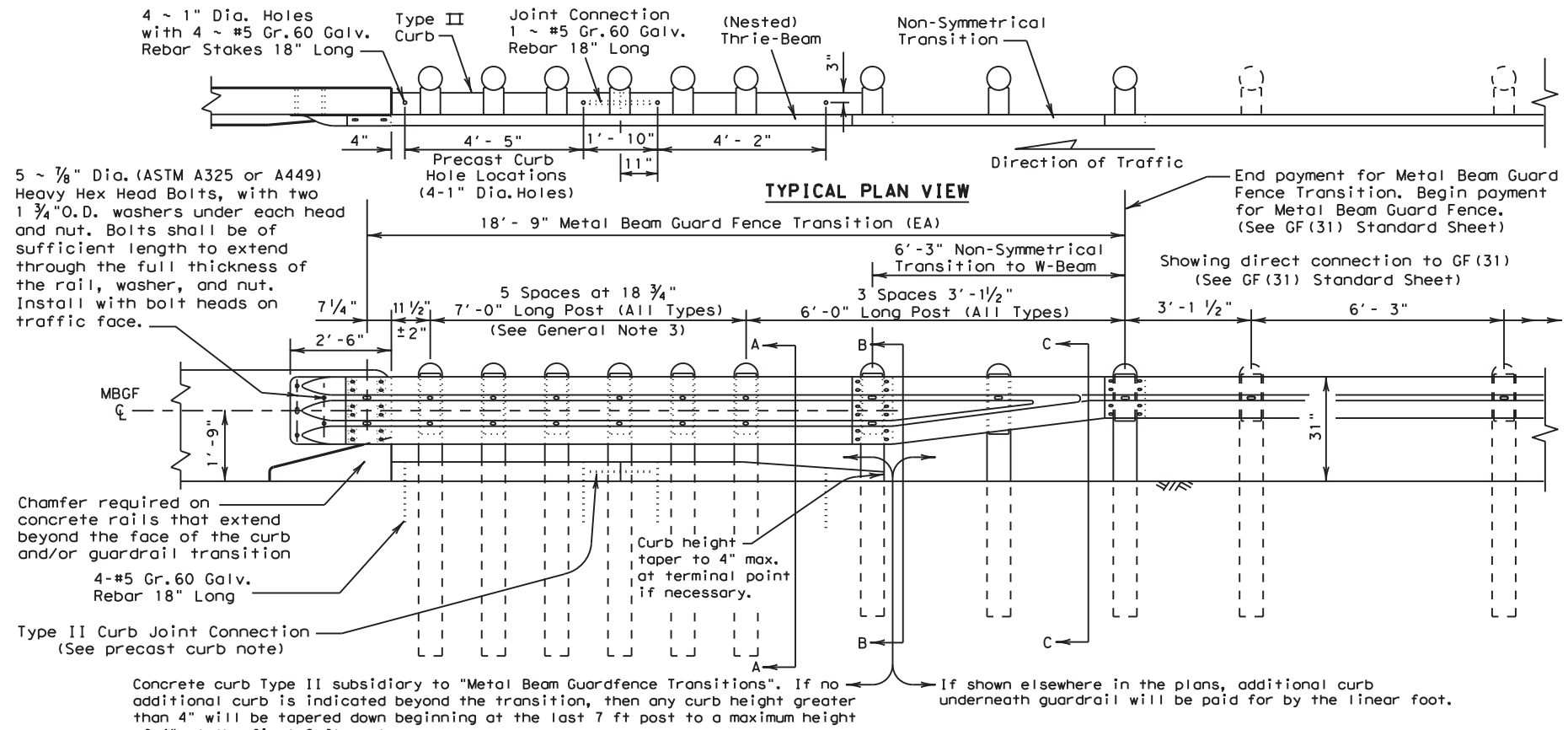
METAL BEAM GUARD FENCE TRANSITION (Thrie-Beam Transition) GF (31) TR-14

FILE: gf31tr14.dgn	DN: TxDOT	CK: AM	DW: VP	CK: CGL
© TxDOT: December 2011	CONT: 6372	SECT: 50	JOB: OOI	HIGHWAY: VAR.
REVISIONS	DIST: SAT	COUNTY: BEXAR	SHEET NO. 180	

DATE: FILE:

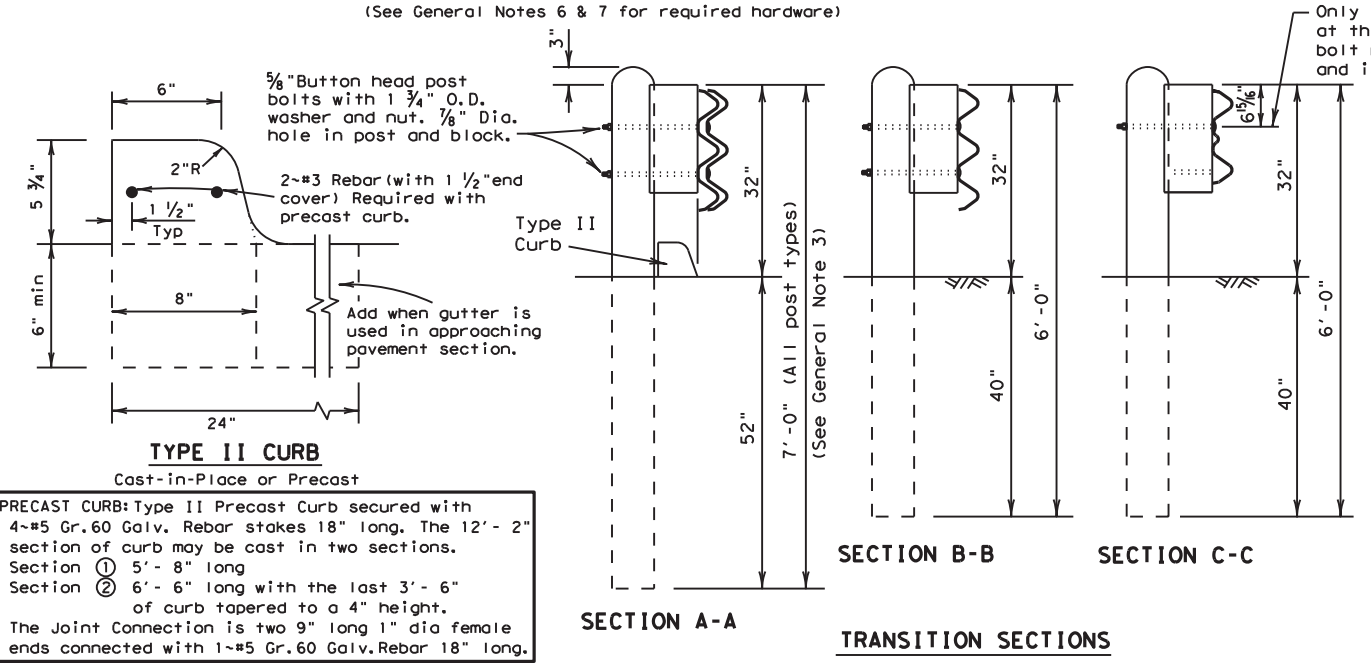
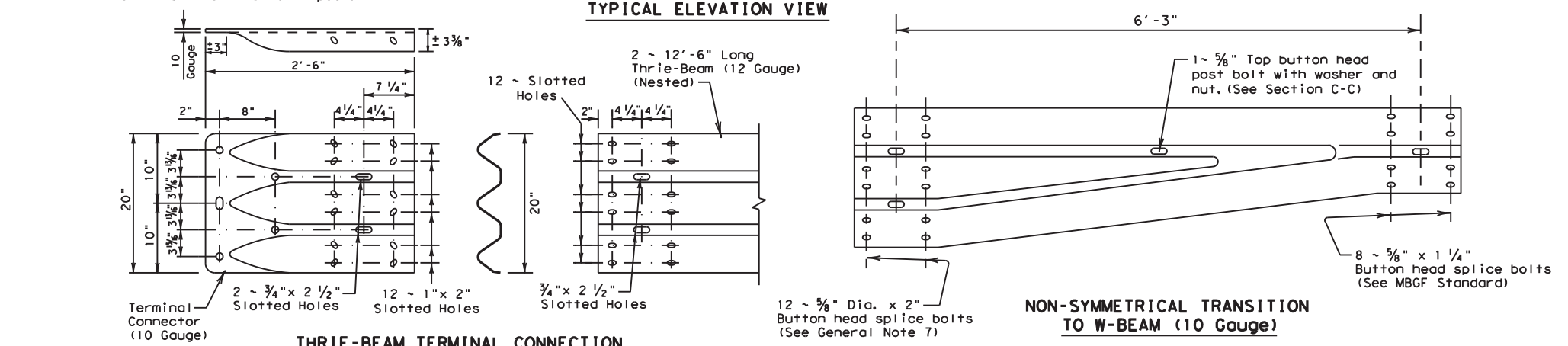
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DATE: FILE:



GENERAL NOTES

- Concrete curb may be cast-in-place or precast as shown on this sheet. When used in conjunction with thrie-beam guard fence transitions, curb shall be Type II (Typically 5 3/4" height above surface; See CCCG standard sheet) unless otherwise shown in the plans. 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.
- Contact the Design Division for drainage cut options needed within the curb section of the transition.
- The type of post (round wood post, rectangular wood post or steel post) will be as shown in the plans.
- 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.
- Rail element 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.
- Unless otherwise shown in the plans, transitions shall be placed with the block face in front of or directly above the curb face.
- Galvanized washers used with the 5/8" dia. post bolts shall be Type A 1 3/4" O.D. washers. The (12) plate washers (FWR03) required at the terminal connector splice.
- Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut, (ASTM A563) and washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) 5/8" Dia. x 2" (at triple rail splices) with 5/8" double recessed nuts.
- 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 transitions.
- If solid rock is encountered. See the MBGF standard sheet for the proper installation guidance.
- Posts shall not be set in concrete.
- Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or 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 can furnish composite material posts and/or blocks.



Texas Department of Transportation
Design Division Standard

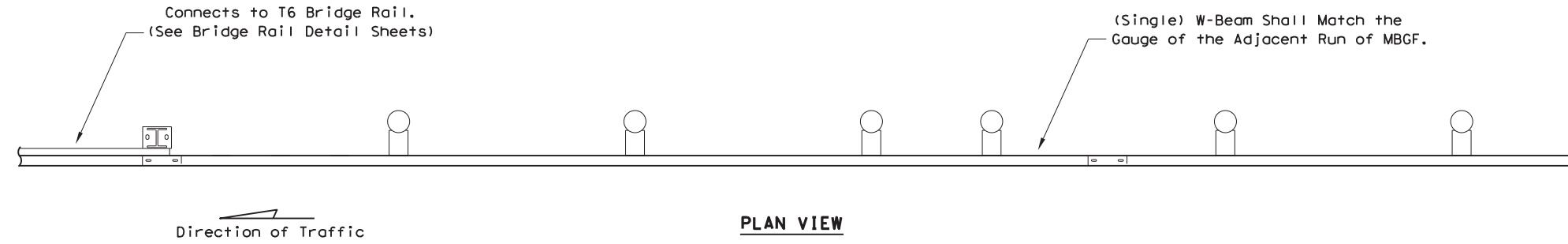
METAL BEAM GUARD FENCE TRANSITION (Thrie-Beam Transition) GF(31) TR-11

FILE: gf31tr11.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
© TxDOT December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	181	

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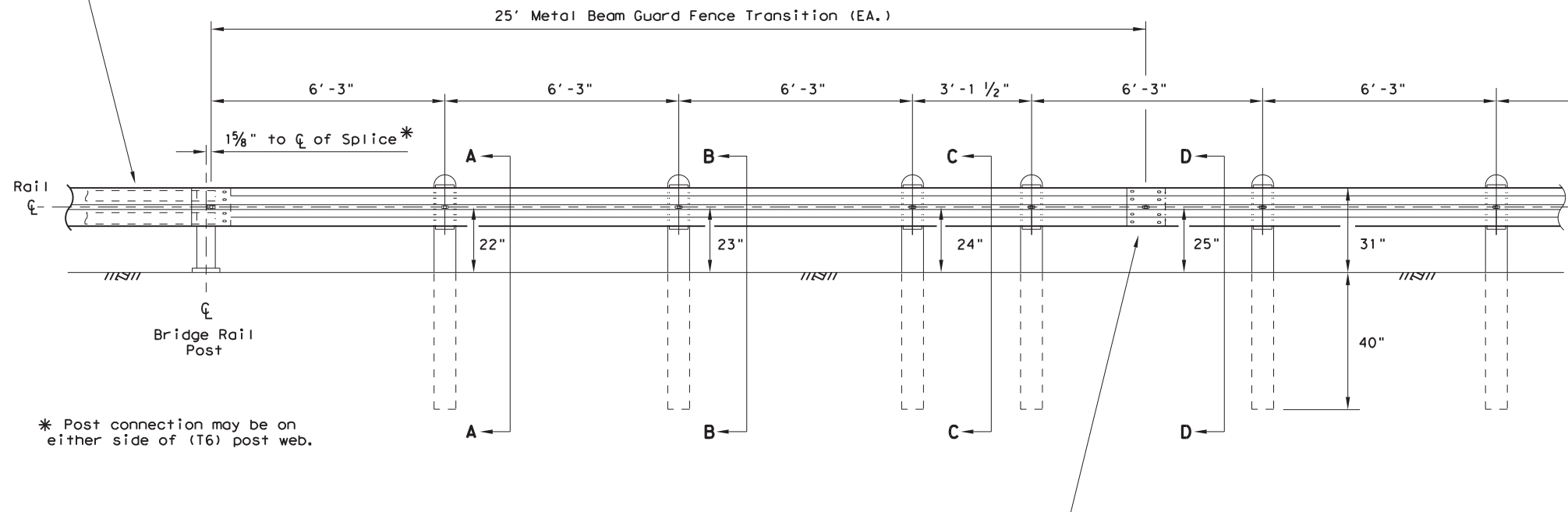
GENERAL NOTES

1. The type of post (round wood post, rectangular wood post, or steelpost) will be shown elsewhere in the plans. The exact position of transitions shall be shown elsewhere in the plans or as directed by the Engineer.
2. Rail element shall meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified on the plans.
3. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and the Type A 1 3/4" O.D. washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 5/8" x 1 1/4" with 5/8" double recessed nuts (ASTM A563).
4. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item requiring construction of the transition.
5. Crown will be widened to accommodate transitions.
6. If solid rock is encountered. See the GF(31) standard sheet for proper installation guidance.
7. Posts shall not be set in concrete.
8. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or 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 can furnish composite material posts and/or blocks.
9. Refer to GF(31) and T6 Standard Sheet for additional details.



PLAN VIEW

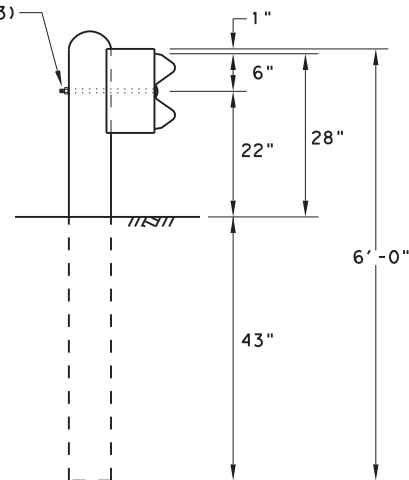
T6 BRIDGE RAIL
(See Bridge Rail Sheets for Connection and Post Details).



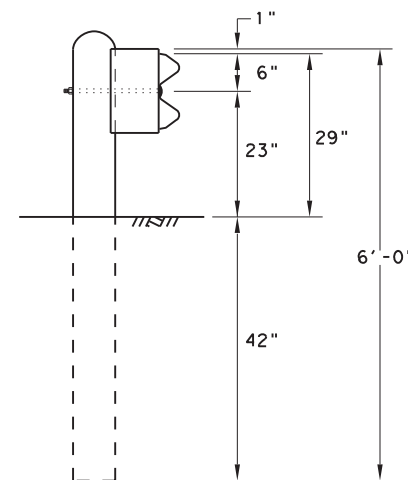
ELEVATION VIEW

* Post connection may be on either side of (T6) post web.

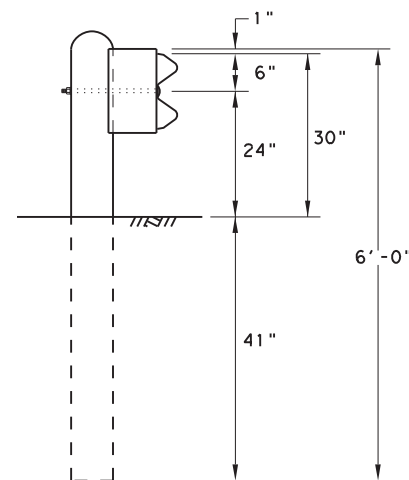
5/8" Button head post bolt with nut & washer
(See General Note 3)



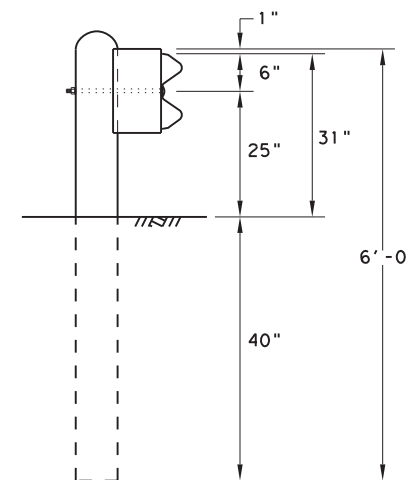
SECTION A-A



SECTION B-B



SECTION C-C



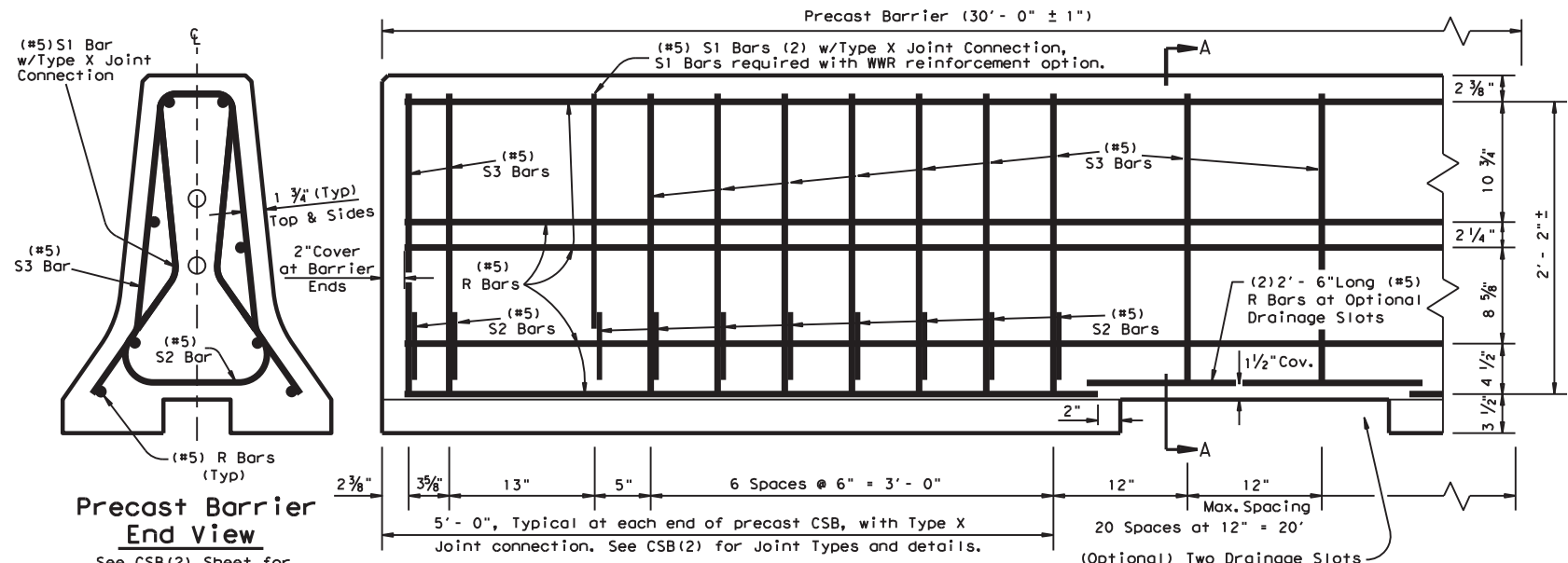
SECTION D-D

DATE:
FILE:

		Design Division Standard	
METAL BEAM GUARD FENCE TRANSITION (T6) GF (31) T6-14			
FILE: gf31t614.dgn	DN: TxDOT	CK: AM	DW: VP
© TxDOT: APRIL 2014	CONT: 6372	SECT: 50	JOB: 001
REVISIONS	DIST: SAT		COUNTY: BEXAR
			SHEET NO.: 182

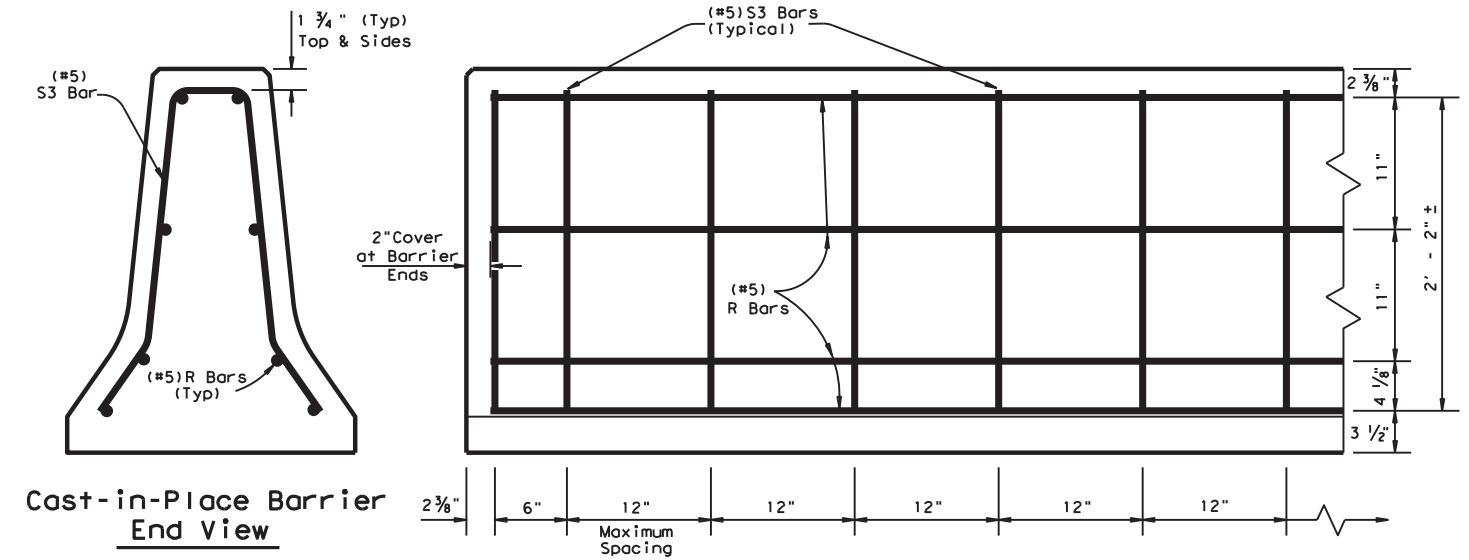
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LEVELS DISPLAYED



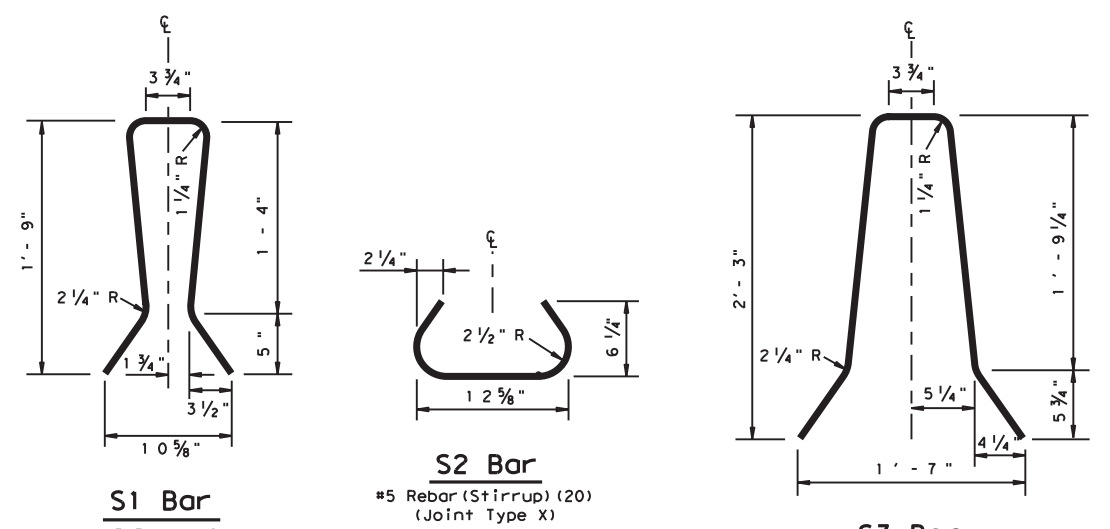
Reinforcement for Precast Concrete Safety Barrier (Type 1)

Showing reinforcement for Joint Type X, See CSB(2) for Joint Types and connection details.



Reinforcement for Cast-in-Place Concrete Safety Barrier (Type 1)

Showing reinforcement for CSB. Expansion joints to be placed every 100 ft. or less.



Note:
Two S1 Bars are required with the use of WWR reinforcement option. The S1 Bars may need a slight modification to fit within the WWR cage, as directed by the Engineer.

General Notes

- Concrete shall be Class C or H.
- Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
- Precast barrier length shall be 30 ft.
- Joint connection systems, grout, etc. as shown are considered subsidiary.
- Conduit trough and drainage slots may be omitted, as shown elsewhere or as directed by the Engineer.
- Cast-in-place barrier may be slip formed. Additional reinforcement may be tack welded to the upper two-thirds of the reinforcement cage to provide bracing. Do not weld to M bars or anchor bolts.

Approximate Per L.F. Quantities

	Precast	C.I.P
Concrete	CY. 0.108	0.108
Rebar	LB. 17.03	14.00

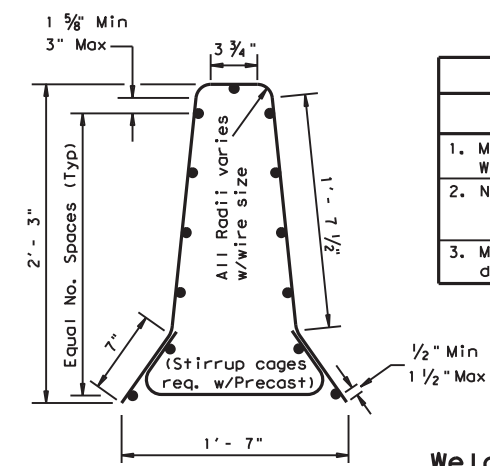
For Contractor's information only
Weight of one Precast 30 ft. unit = Approx. 7 Tons

General Notes

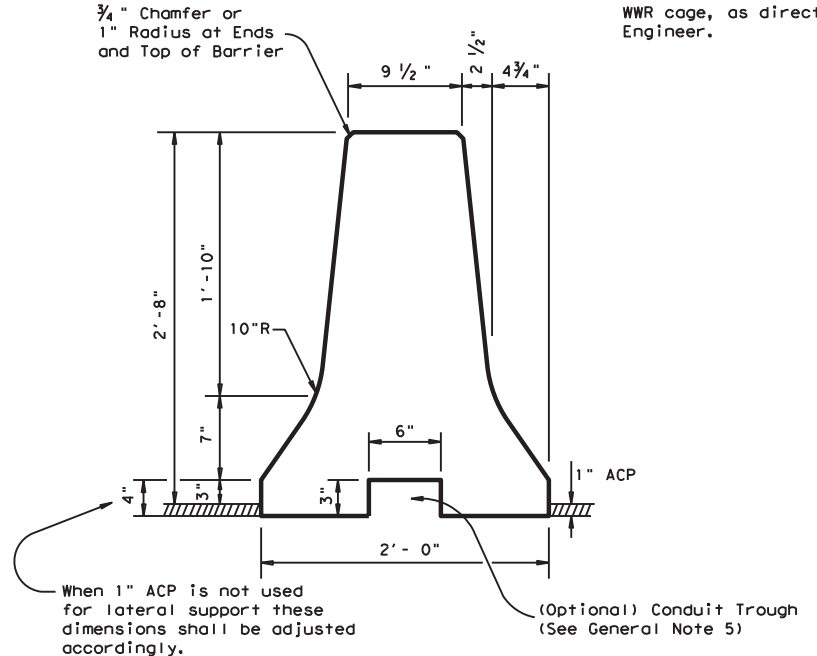
- Deformed Welded Wire Reinforcement shall conform to ASTM A497.
- Welded wire cage may require a slight adjustment to accommodate the Type X connection pipes. As directed by the Engineer.
- Deformed welded wire reinforcement (WWR) may be used as an option to conventional reinforcement. Combinations of reinforcing steel and WWR or configurations of WWR other than shown will be permitted when conditions in the table are satisfied and the dimension from the end of section to first welded wire does not exceed 3".

Welded Wire Reinforcement (WWR) Table		
DESCRIPTION	LONGITUDINAL WIRE	VERTICAL WIRE
1. Min. (Cumulative Total) Wire Area	Match R Bars (in ² /ft.)	Match S Bars (in ² /ft.)
2. Number of Wires Minimum Maximum	No. of Wires 9 13	(Stirrup cages required at ends of Precast CSB)
3. Maximum wire size differential	The smaller wire shall have an area of 40% or more of the larger wire.	

Welded Wire Reinforcement (WWR) Option for Bars S and R (Precast or Cast-in-Place)



Concrete Safety Barrier



Section A-A

Steel Placement at Drainage Slot (If drainage slots are required)

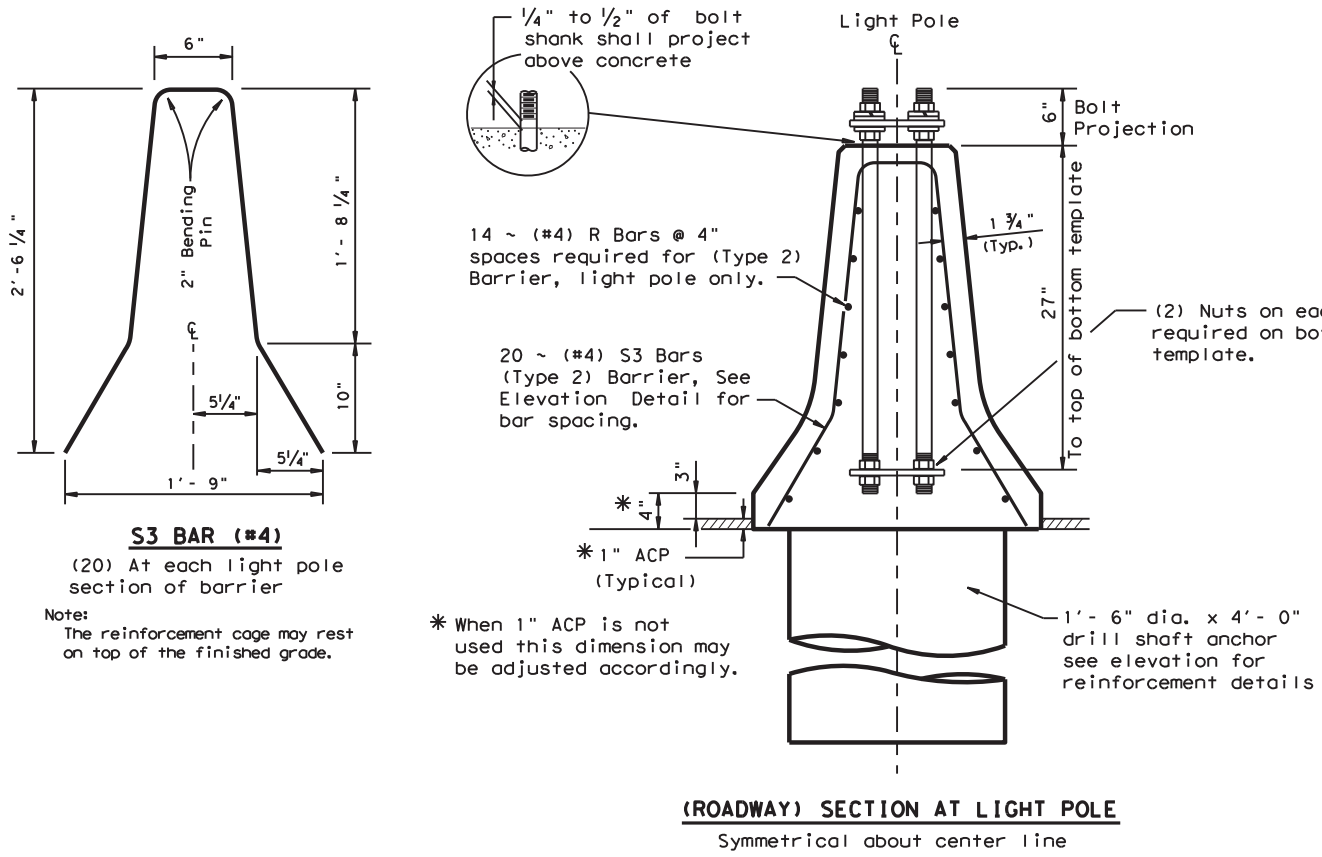
Texas Department of Transportation
Design Division (Roadway)

CONCRETE SAFETY BARRIER (F-SHAPE)
REINFORCEMENT FOR PRECAST AND CAST-IN-PLACE BARRIER (TYPE 1)
CSB(1)-04

FILE: csb104.dgn	DN: TxDOT	CK: AM	DW: BGD	CK:
© TxDOT December 2004	DIST	RMC PROJECT		SHEET
REVISIONS	SAT			183
COUNTY	CONTROL	SECT	JOB	HIGHWAY
BEVAR	6372	50	001	VAR.

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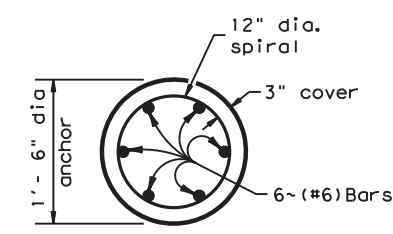
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Schedule of reinforcement for each 10 foot cast-in-place section at light poles (excluding anchorage)

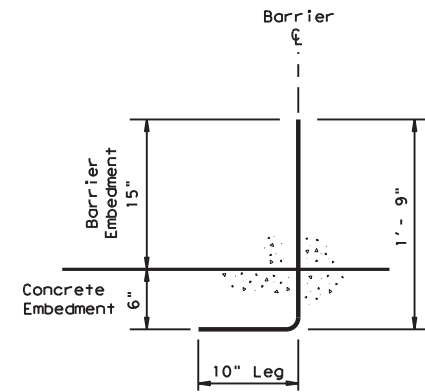
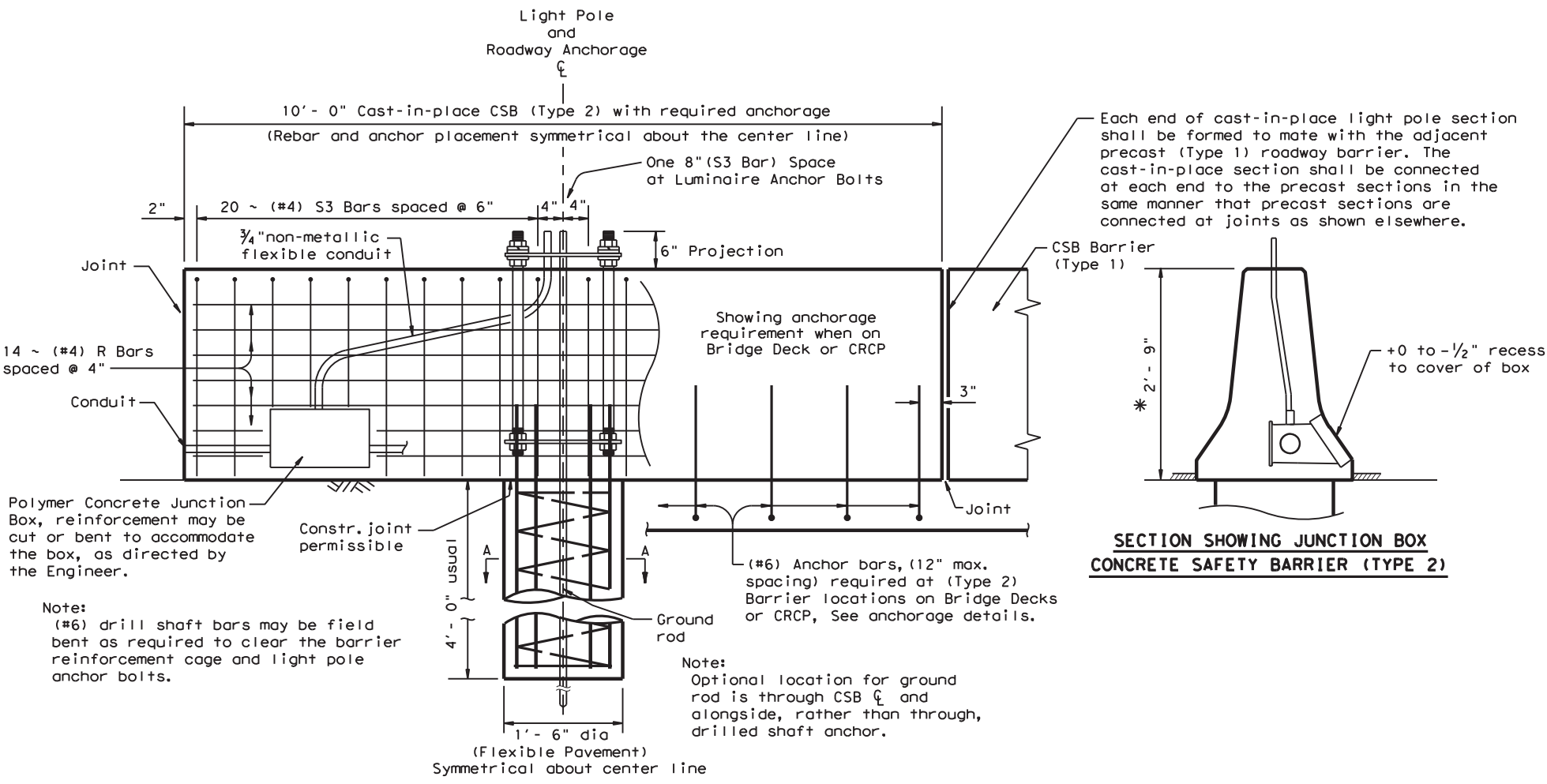
BAR	SIZE	QUANTITY
S3	#4	20
R	#4	14

Welded Wire Reinforcement (WWR) IS NOT APPROVED FOR USE WITH (TYPE 2) BARRIER.



SECTION A-A

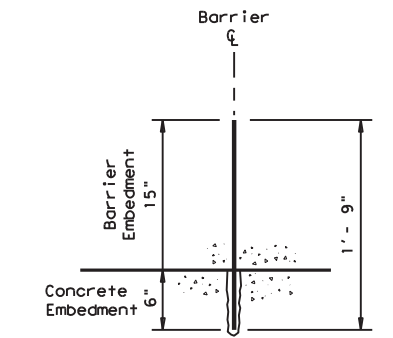
- GENERAL NOTES**
- All concrete shall be Class C, unless otherwise specified in the plans.
 - Anchor bolts, ground rods, junction box, rigid metal conduit, and non-metallic flexible conduit, when required, shall not be paid for directly, but will be considered subsidiary to the various bid items.
 - For proper installation and material requirements for the anchor bolts and light pole, see Traffic Operations RIP standard sheets.
 - Junction boxes shall be polymer concrete, and shall be mounted flush (+0, - 1/2") with concrete surface. For details and material requirements on barrier junction box, see DMS-11030.
 - Install 12 AWG stranded conductors from load side of fused breakaway connector to luminaire. Fused breakaway connectors shall be installed as required on Traffic Operations RID Sheets. Typically fused breakaway connectors are installed in the barrier junction box adjacent to each light pole. By direction of the Engineer, the fused breakaway connectors may be installed at the pole's hand hole. In this case, the 3/4" flexible non-metallic conduit from the junction box to the pole will be increased in size up to 1 1/4" to accommodate the branch circuit conductors.
 - Anchor bolts and their assemblies shall be in accordance with Item 449, "Anchor Bolts" High-Strength Steel or Alloy Steel. Galvanization requirements for anchor bolts are shown on RIP sheets.
 - The required anchorage for Type 2 barrier (drill shaft, standard or optional concrete anchorage) shall not be paid for directly, but is subsidiary to Item 514, "Permanent Concrete Traffic Barrier."



STANDARD "CONCRETE" ANCHORAGE

(#6) Bar
 Concrete Pavement / Bridge Deck Anchorage:
 Cast-in-Place or Slip-Formed Barrier

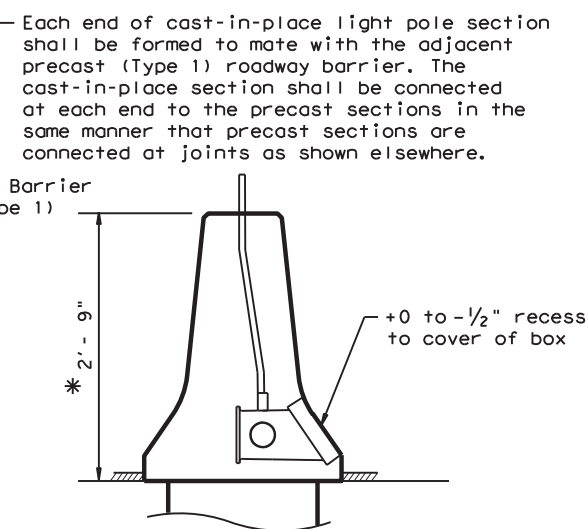
Standard Anchorage Note:
 10" leg may be oriented 90 degrees in any direction about the barrier centerline.



"OPTIONAL" EPOXY ANCHORAGE

(#6) Bar
 Type III, Class C Epoxy
 Concrete Pavement / Bridge Deck Anchorage:
 Cast-in-Place or Slip-Formed Barrier

Epoxy Note:
 If epoxy coated anchor bars are required, the lower 6" of the bars must not be epoxy coated.



SECTION SHOWING JUNCTION BOX CONCRETE SAFETY BARRIER (TYPE 2)

ELEVATION SHOWING THE REQUIRED REINFORCEMENT AND ANCHORAGE OF (TYPE 2) BARRIER

The "Drilled Shaft Anchor" is the required anchorage for (Type 2) barrier on roadways with Flexible Pavement. The #6 Anchor Bars (Shown) is the required anchorage for (Type 2) barrier on Bridge Decks and CRCP.

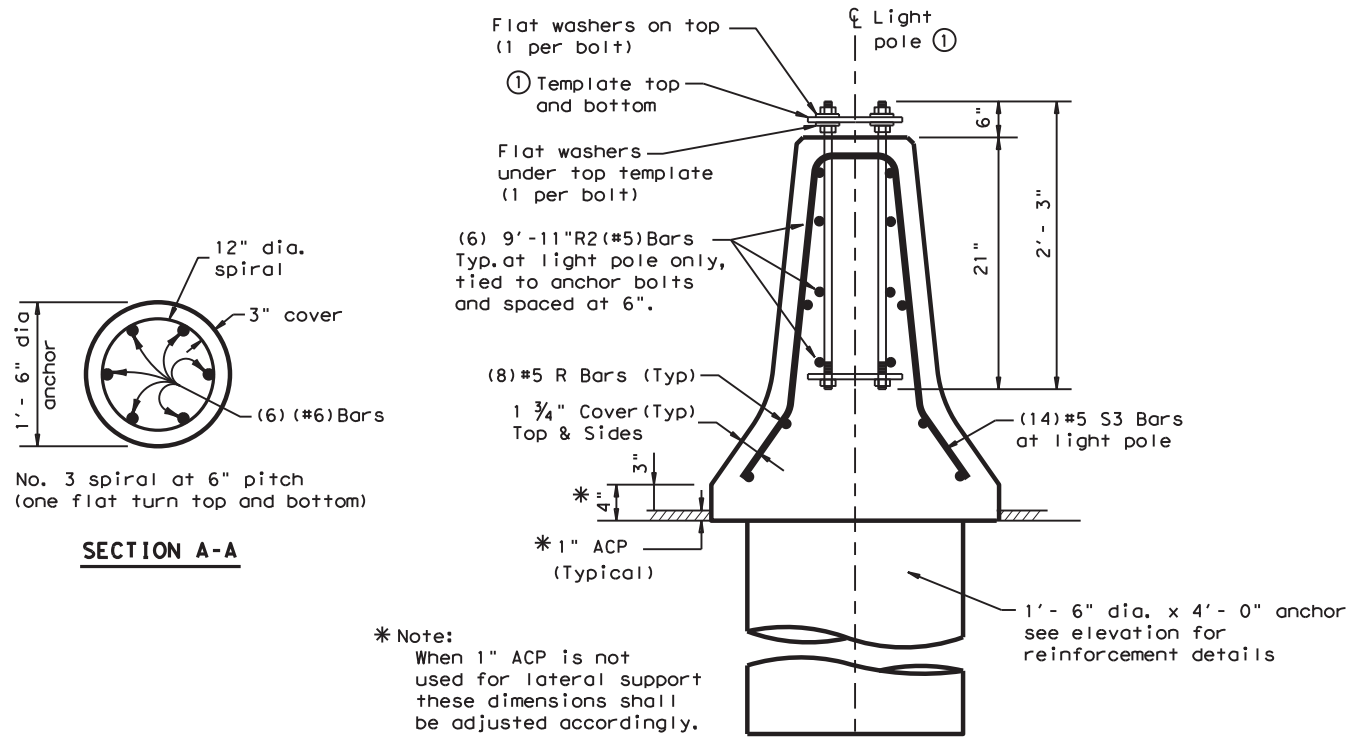
Texas Department of Transportation
 Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)
 CAST-IN-PLACE (TYPE 2)
 AT LIGHT POLE
CSB(4) - 10

FILE: csb410.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
© TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	184	

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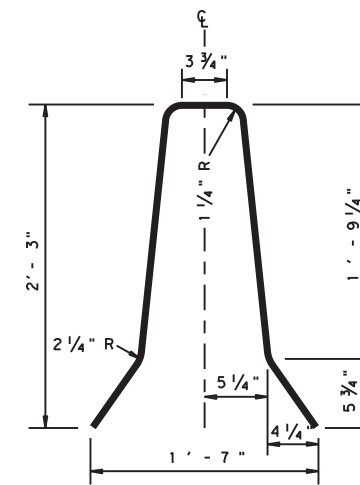
LEVELS DISPLAYED	
1	



Schedule of reinforcement for each 10 foot cast-in-place section at light poles (excluding anchor)

BAR	SIZE	QUANTITY
S3	#5	14
R	#5	8
R2	#5	6

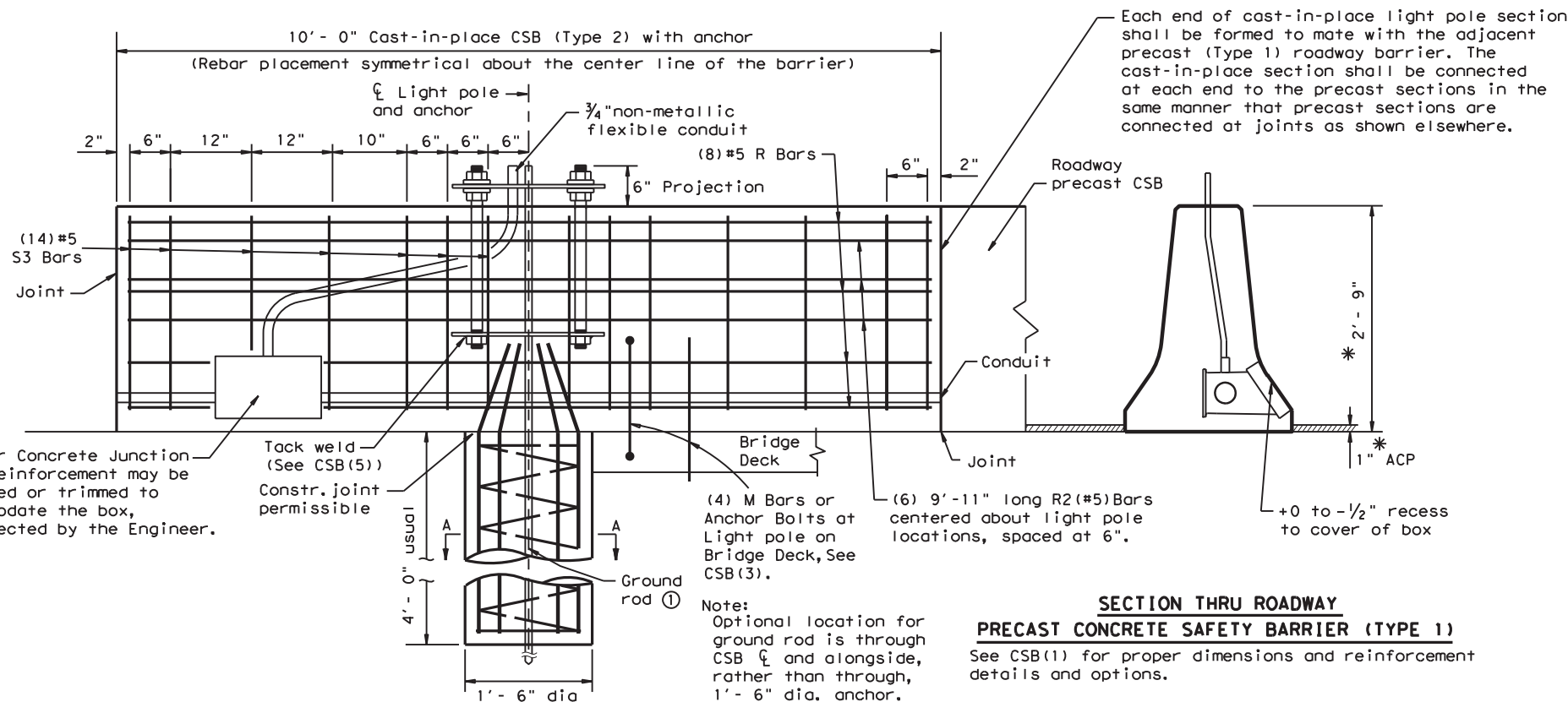
Note: (6) (#5) R2 Bars 9'-11" long required at all light pole locations.



S3 BAR (#5)
(14) At each light pole section of barrier

GENERAL NOTES

- All concrete for Concrete Safety Barrier (CSB), including anchor, shall be Class C or H.
- Anchor bolts, ground rods, drilled shaft anchor, junction box and rigid metal conduit when required shall not be paid for directly, but will be considered subsidiary to the various bid items.
- See CSB(3) for anchorage of light pole section on a bridge deck.
- Junction boxes shall be polymer concrete, and shall be mounted flush (+0, - 1/2") with concrete surface of CSB.
- In line fuse holder shall be installed as required on RID Sheets. Typically fuse holders are installed in the barrier junction box adjacent to each light pole. By direction of the Engineer, the fuse holder may be installed at the poles hand hole. In this case, the 3/4" flexible non-metallic from the junction box to the pole will be increased in size up to 1 1/4" to accommodate the Branch circuit conductors. Conductors shall not be reduced in size to #12 AWG, except on the load side of the fuse holder.
- Anchor bolts and their assemblies shall be in accordance with Item 449, "Anchor Bolts" High-Strength Steel or Alloy Steel. Galvanization in accordance with required specification for anchor bolts is shown on CSB(5).



**SECTION THRU ROADWAY
PRECAST CONCRETE SAFETY BARRIER (TYPE 1)**
See CSB(1) for proper dimensions and reinforcement details and options.

Note: Field bend shaft bars as required to the inside of the CSB reinforcement and clear conduit. (Roadway Anchorage)
ELEVATION OF TREATMENT AT LIGHT POLE
Symmetrical about center line

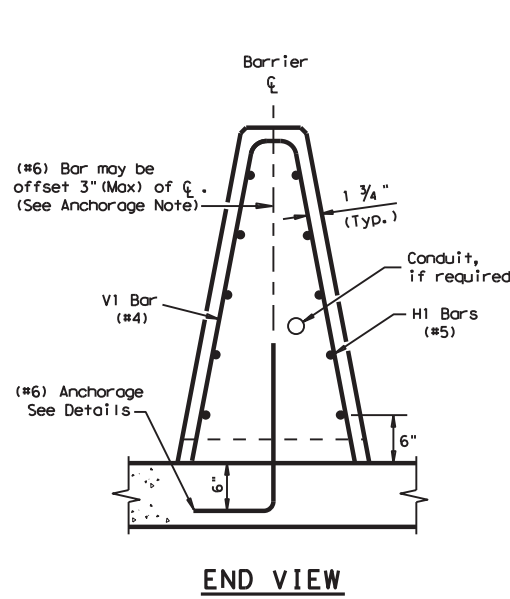
Texas Department of Transportation
Design Division (Roadway)

CONCRETE SAFETY BARRIER (F-SHAPE)
CAST-IN-PLACE BARRIER AT LIGHT POLE (TYPE 2)
CSB(4) - 04

FILE: csb404.dgn	DN: TxDOT	CK: AM	DW: BGD	CK:
© TxDOT December 2004	RMC PROJECT			SHEET
REVISIONS	SAT			185
COUNTY	CONTROL	SECT	JOB	HIGHWAY
BEXAR	6372	50	001	VAR.

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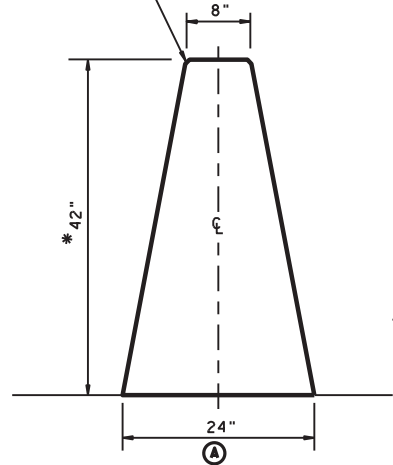
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END VIEW

CAST-IN-PLACE (CIP) BARRIER
 Barrier is Symmetrical About the Center Line

Top edges of CIP barrier shall have a 3/4" chamfer or tooling radius.

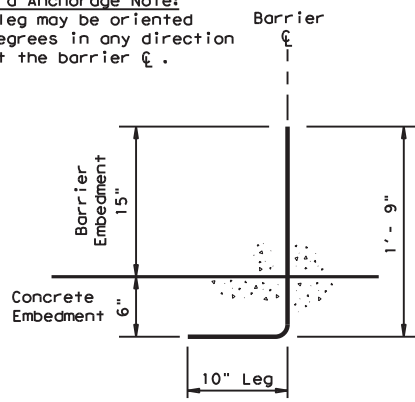


SINGLE SLOPE CONCRETE BARRIER (SSCB) (42")

* Barrier height (IN.)	Dimensions (IN.)		
	A	B	C
42	24	40 1/4	20 1/2
48	26 1/4	46 1/4	22 3/4
54	28 1/2	52 1/4	25 1/6

* (SSCB) (42") Barrier height may be increased to 48" or 54". This would increase the barrier and reinforcement dimensions accordingly.

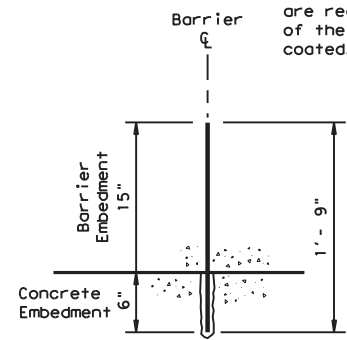
Standard Anchorage Note:
 10" leg may be oriented 90 degrees in any direction about the barrier centerline.



STANDARD ANCHORAGE

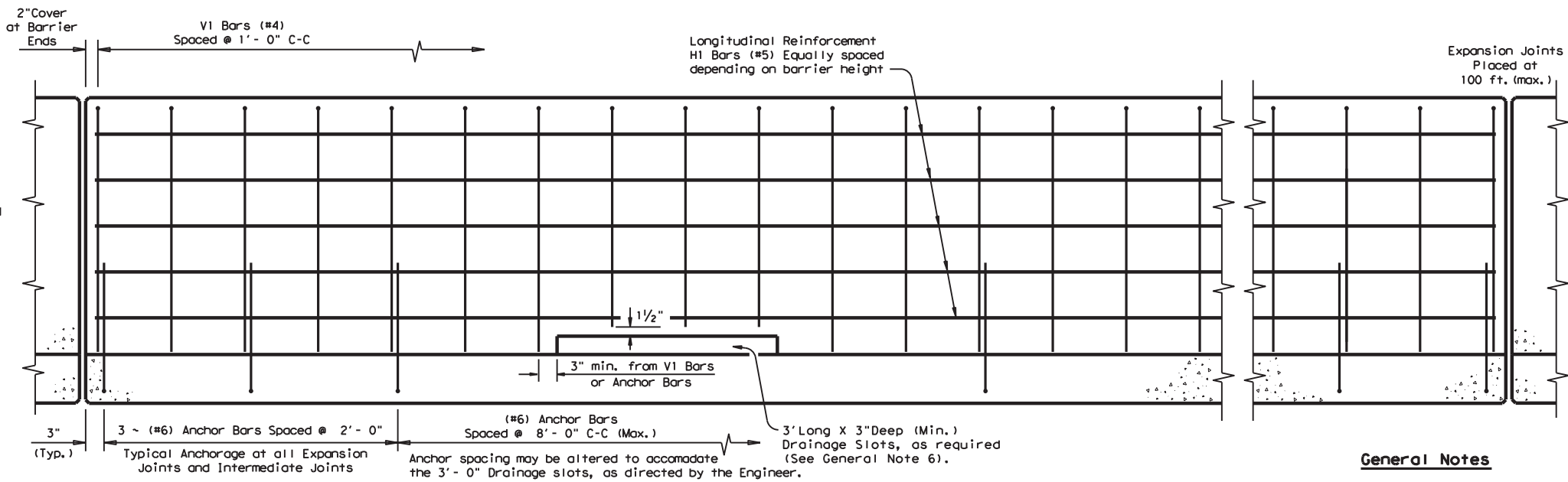
(#6) Bar
 Concrete Pavement / Bridge Deck Anchorage:
 Cast-in-Place or Slip-Formed Barrier
 (See General Notes 2)

Epoxy Note:
 If epoxy coated anchor bars are required, the lower 6" of the bars must not be epoxy coated.



"OPTIONAL" EPOXY ANCHORAGE

(#6) Bar
 Type III, Class C Epoxy
 Concrete Pavement / Bridge Deck Anchorage:
 Cast-in-Place or Slip-Formed Barrier
 (See General Notes 2 and 4)



ELEVATION VIEW

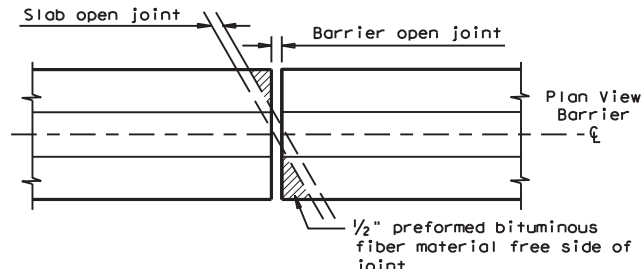
Cast-in-Place (SSCB) on Bridge Decks or Continuously Reinforced Concrete Pavement (CRCP) (Showing Reinforcement and Anchor Placement)

BARRIER PLACEMENT OVER (CRCP) JOINTS

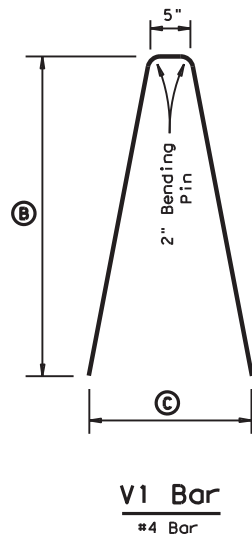
Barrier may be cast over a "Longitudinal" CRCP joint.

CRCP Joints (with or without tiebars): Two layers of 30# roofing felt or 1/2" preformed bituminous fiber material.

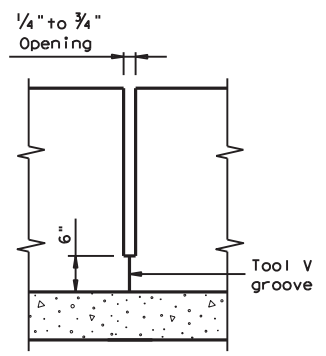
Barrier Anchorage Note: Anchorage must be located at least 3" from a longitudinal joint.



BARRIER OVER TRANSVERSE OPEN JOINT



V1 Bar
 #4 Bar

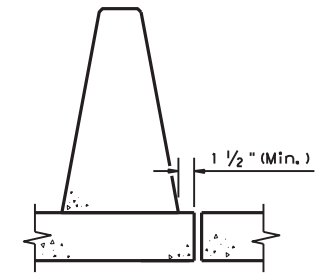


INTERMEDIATE JOINT DETAIL

Place at all Bent C's, without expansion joints and spaced at 33 ft. (max.), 10 ft. (min).

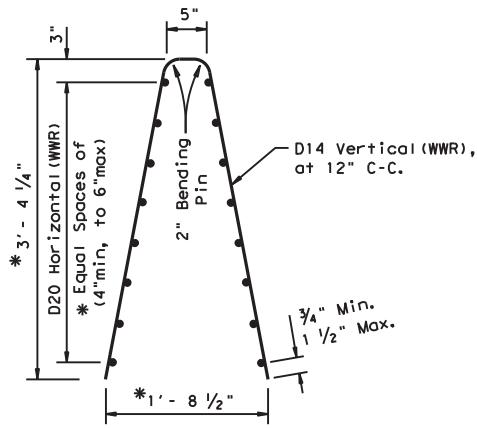
EXPANSION JOINT PLACEMENT

Place at all transverse joints or 100 ft. (max.), 10 ft. (min).



MINIMUM EDGE DISTANCE FROM LONGITUDINAL JOINT

Barrier placement over a longitudinal bridge joint is not recommended.



Welded Wire Reinforcement (WWR) Option for Bars V1 and H1

(WWR) General Notes

- Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
- Welded wire cage may be cut and bent to accommodate the drainage slots, as directed by the Engineer.
- Welded wire splice locations shall have a "minimum" splice lap length of 12".
- Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".

General Notes

- Concrete shall be Class C. Unless otherwise specified in the plans.
- Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615. If the bridge slab requires epoxy "coated" reinforcement, the barrier and/or anchorage may require the same, if shown elsewhere in the plans.
- These details cover barrier per Item 514, "Permanent Concrete Traffic Barrier".
- Anchorage: The "Optional" Epoxy Anchor system shall be embedded 6" with a Type III, Class C Epoxy anchorage system. Follow the manufacturer's directions for installing the epoxied anchor bars. All anchorage shown is the minimum required, and considered subsidiary to the bid item.
- Top edges of CIP barrier shall have a 3/4" chamfer or tooling radius.
- Drainage slot locations (12'-0", C-C Min. Spacing) are shown elsewhere, or as directed by the Engineer. Drainage slot heights on the SSCB may be increased to a maximum of 5 inches, without geometric changes to the barrier face.
- Cast-in-place barrier may be slip formed. Bracing may be tied or tack welded to the reinforcement cage to provide cage stability. Do not weld to anchor bars. The reinforcement cage may rest on the top of the finished grade.
- For locations where lighting is required, see the SSCB(4) sheet for the proper reinforcement and anchorage.

Cast-in-Place (CIP) or Slip-Formed (SSCB)

Cast-in-Place barrier may be connected to precast SSCB. Joint connection "Types" may be used in Cast-in-Place barrier, to match the precast barrier connection. (See required connection "Type" elsewhere in the plans)

The weight of Cast-in-Place (SSCB)42" is approx. 717 lbs per ft.

Texas Department of Transportation
 Design Division Standard

SINGLE SLOPE CONCRETE BARRIER
CAST-IN-PLACE (TYPE 1)
(BRIDGE DECK or CRCP)
SSCB(1)-10

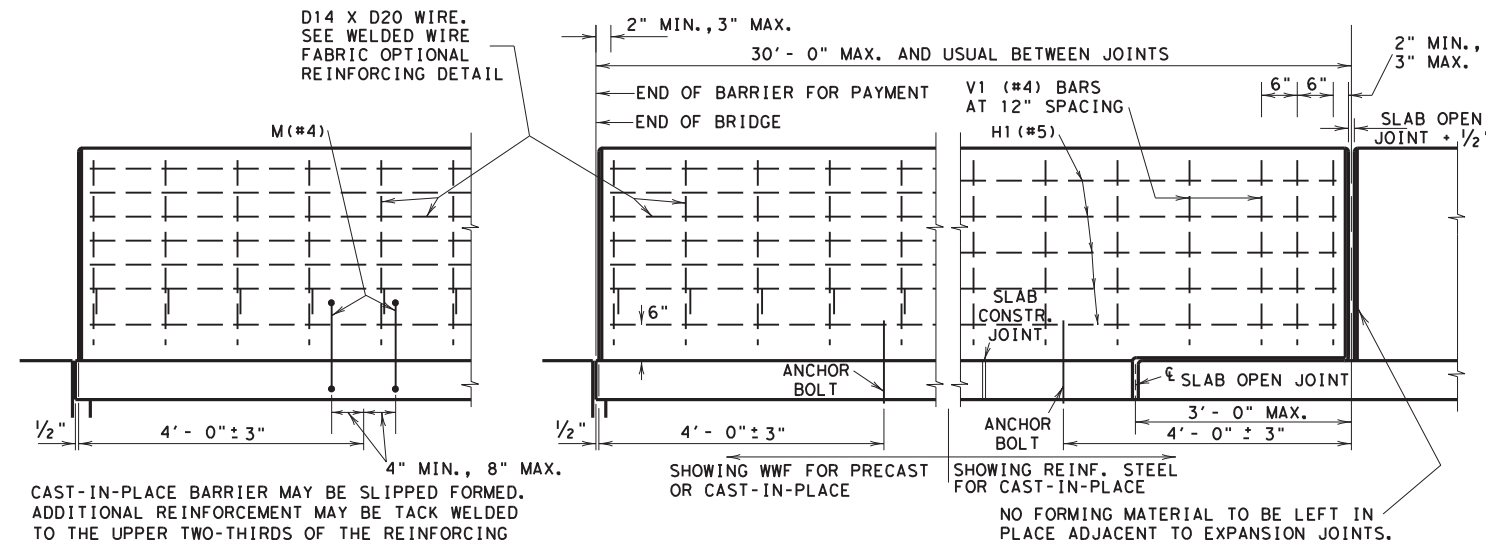
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REVISIONS				
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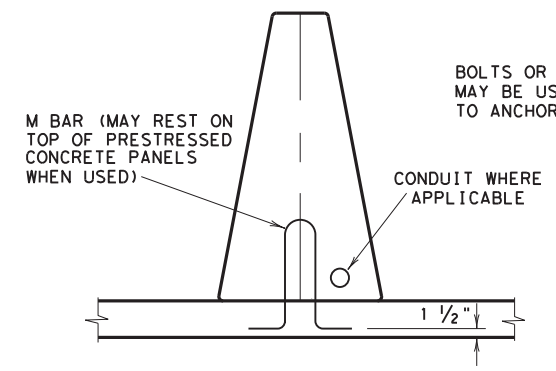
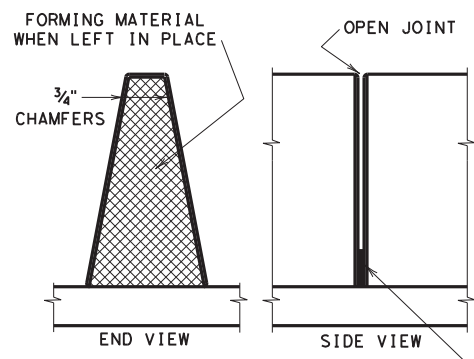
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GENERAL NOTES

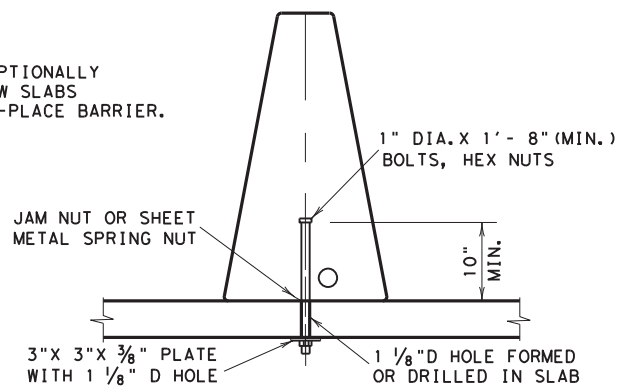
- ALL CONCRETE, REINFORCEMENT, ANCHOR BOLTS, BLOCKING, GROUT, ETC., AS SHOWN ARE CONSIDERED AS PART OF THE BARRIER FOR PAYMENT.
- CONCRETE FOR BARRIER SHALL BE CLASS A, C OR H. ALL REINFORCING STEEL SHALL BE GRADE 60, UNLESS OTHERWISE SPECIFIED.
- WELDED WIRE FABRIC (WWF) MADE IN ACCORDANCE WITH ASTM A497 MAY BE USED AS AN OPTION TO THE CONVENTIONAL REINFORCEMENT FOR PRECAST OR CAST-IN-PLACE BARRIER WITH THE EXCEPTION THAT ONLY CONVENTIONAL REINFORCEMENT MAY BE USED FOR LIGHT POLE SECTIONS. THESE SECTIONS SHALL BE CAST-IN-PLACE WITH LENGTH, SHAPE, ANCHORAGE, AND REINFORCEMENT AS DETAILED ON SHEET SSSC (4).
- CAST-IN-PLACE BARRIER MAY BE SLIPPED FORMED. ADDITIONAL REINFORCEMENT MAY BE TACK WELDED TO THE UPPER TWO-THIRDS OF THE REINFORCING CAGE TO PROVIDE BRACING. DO NOT WELD TO M BARS OR ANCHOR BOLTS.
- GROUT FOR PRECAST BARRIERS SHALL CONSIST OF TWO PARTS SAND AND ONE PART CEMENT. LATEX ADHESIVE MAY BE ADDED TO THE GROUT IF DIRECTED BY THE ENGINEER. WOOD OR OTHER MATERIAL APPROVED BY THE ENGINEER SHALL BE USED FOR BLOCKING. ENOUGH FIRM BLOCKING MUST BE USED TO PROPERLY ALIGN AND GRADE THE BARRIER SECTIONS. AT OTHER LOCATIONS, ANY SUITABLE MATERIAL MAY BE USED TO RETAIN THE GROUT.
- JOINTS SHALL BE LOCATED NEAR ENDS OF SPANS, AT ENDS OF LIGHT POLE SECTIONS AND AT INTERVALS IN BETWEEN AS NECESSARY TO MAINTAIN 30 FT. MAXIMUM AND 15 FT. MINIMUM SECTION LENGTHS. WHEN BARRIER IS CAST-IN-PLACE, A JOINT SHALL BE PLACED AT INTERIOR SUPPORTS OF CONTINUOUS UNITS. JOINT OPENINGS SHALL BE 1/2 INCH MINIMUM AND 1 INCH MAXIMUM OR 1/2 INCH WIDER THAN ADJACENT OPEN SLAB JOINTS. MATERIAL USED IN FORMING JOINTS MAY BE LEFT IN PLACE IF IT IS COMPRESSIBLE AND LIGHT IN COLOR. WHERE PORTIONS OF BARRIERS PROJECT OVER ADJACENT SPANS, SIMILAR MATERIALS MAY ALSO BE USED TO PROVIDE 3/4 INCH NOMINAL CLEARANCE.
- ANCHOR BOLTS AND ASSOCIATED NUTS, WASHERS, AND PLATES FOR THE BARRIER TO SLAB ATTACHMENT SHALL BE GALVANIZED. ANCHOR BOLT ASSEMBLIES SHALL CONFORM TO ITEM 449, MILD STEEL ANCHOR BOLTS OR A36 THREADED ROD WITH TACK WELDED NUTS (0.906 INCH MIN. DIA. WITH ROLLED THREADS). DRILLED ANCHORAGE HOLES SHALL BE INSTALLED WITH ROTARY TYPE EQUIPMENT; PERCUSSION DRILLING DISALLOWED. SPALLS IN THE BOTTOM OF THE SLAB EXCEEDING 1/2" FROM THE EDGE OF THE HOLE SHALL BE PATCHED.
- THE CENTERLINE AXIS OF THE BARRIER SHALL BE VERTICAL EXCEPT WHERE THE SLAB IS SUPERELEVATED IN WHICH CASE IT SHALL BE NORMAL TO THE CROSS SLOPE UNLESS OTHERWISE SHOWN IN THE PLANS OR DIRECTED BY THE ENGINEER.
- THE MAXIMUM OFFSET FROM THE CENTER OF THE BARRIER TO THE TRUE CIRCULAR CENTERLINE SHALL BE ONE INCH FOR PRECAST SEGMENTS INSTALLED ON HORIZONTAL CURVES. IF THIS WOULD REQUIRE SEGMENT LENGTHS OF LESS THAN 15 FEET, THEN THE BARRIER SHALL BE CAST-IN-PLACE TO THE CORRECT RADIUS.
- SHOP DRAWINGS ARE NOT REQUIRED FOR THIS BARRIER.
- ANCHORAGE SYSTEMS EQUAL TO OR STRONGER THAN THOSE SHOWN MAY BE USED PROVIDED THE DETAILS OF SUCH SYSTEMS ARE SUBMITTED TO AND APPROVED BY THE ENGINEER PRIOR TO PLACEMENT.



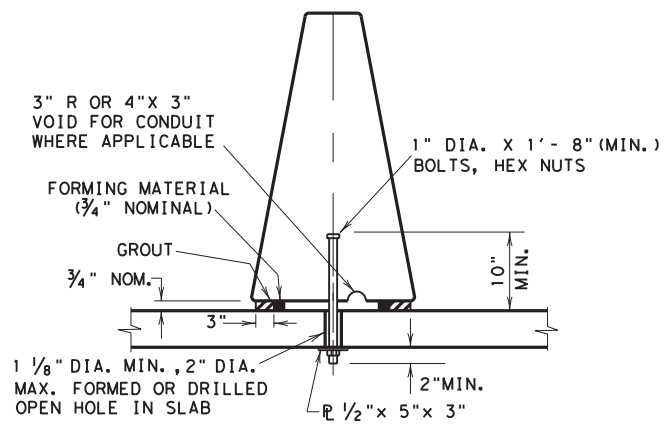
ELEVATION OF TRAFFIC BARRIER



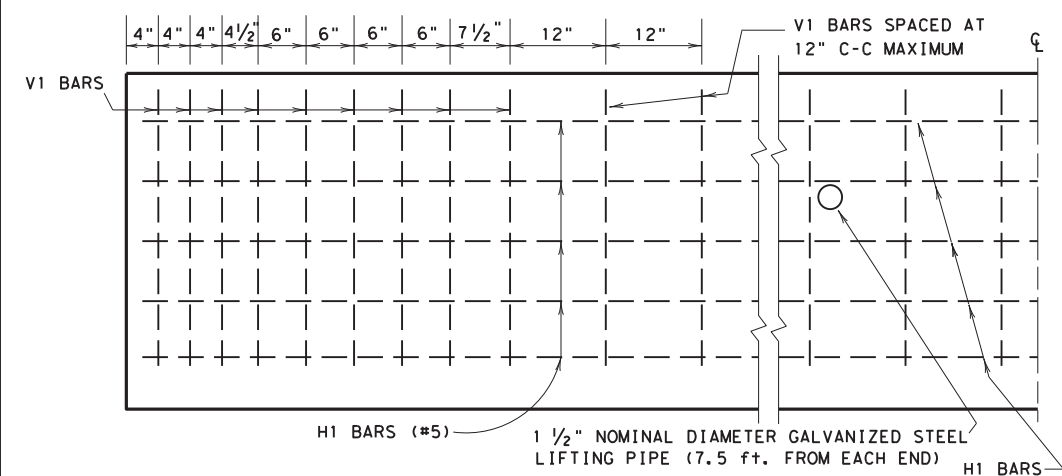
CAST-IN-PLACE ON NEW SLABS



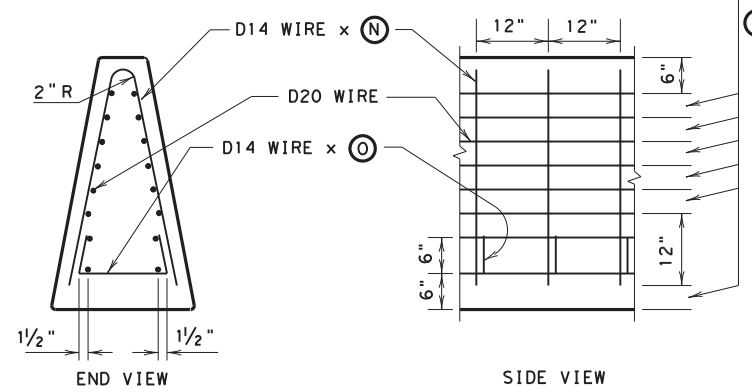
CAST-IN-PLACE ON NEW OR EXISTING SLABS



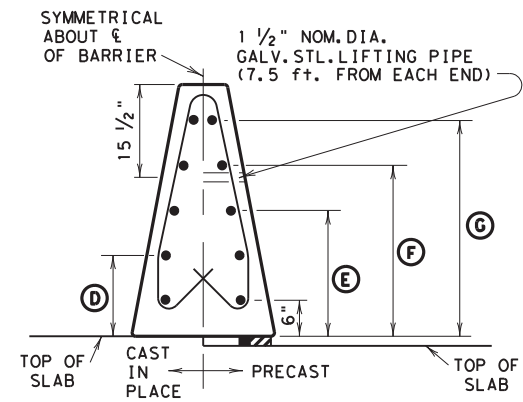
PRECAST ON NEW OR EXISTING SLABS



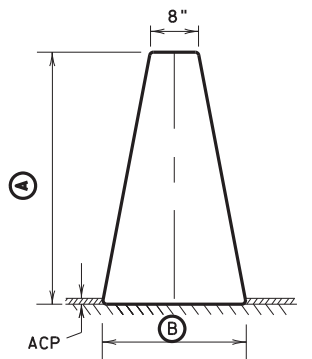
ELEVATION SHOWING REINFORCING FOR PRECAST
(SYMMETRICAL ABOUT BARRIER MIDPOINT)



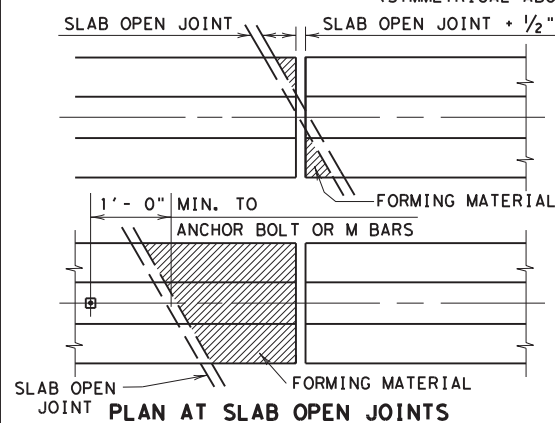
WELDED WIRE FABRIC OPTIONAL REINFORCING
(PRECAST OR CAST-IN-PLACE)



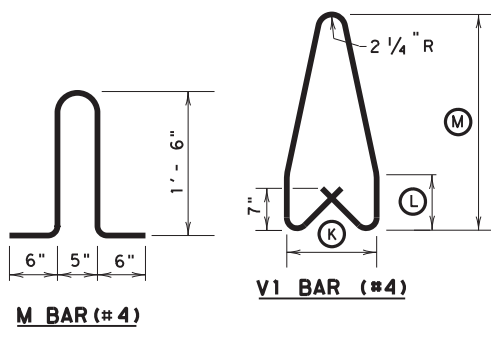
TYPICAL SECTION
(CONVENTIONAL REINFORCING)



TYPICAL SECTION
(GEOMETRICS)



PLAN AT SLAB OPEN JOINTS



REINFORCING DETAILS

BARRIER HEIGHT (IN.)	DIMENSIONS (IN.)															
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
42	42	24	33 1/2	13 1/2	21	28 1/2	36	15	9 1/4	33 1/4	15	9 1/4	36	72	28	4
48	48	26 3/2	39 1/2	15	24	33	42	17 1/4	10 3/4	39 1/4	17 1/4	10 3/4	42	84	31 1/2	5
54	54	28 3/6	45 1/2	16 1/2	27	37 1/2	48	19 1/2	12 1/4	45 1/4	19 1/2	12 1/4	48	96	34 3/4	6

R = Radius
D = Diameter

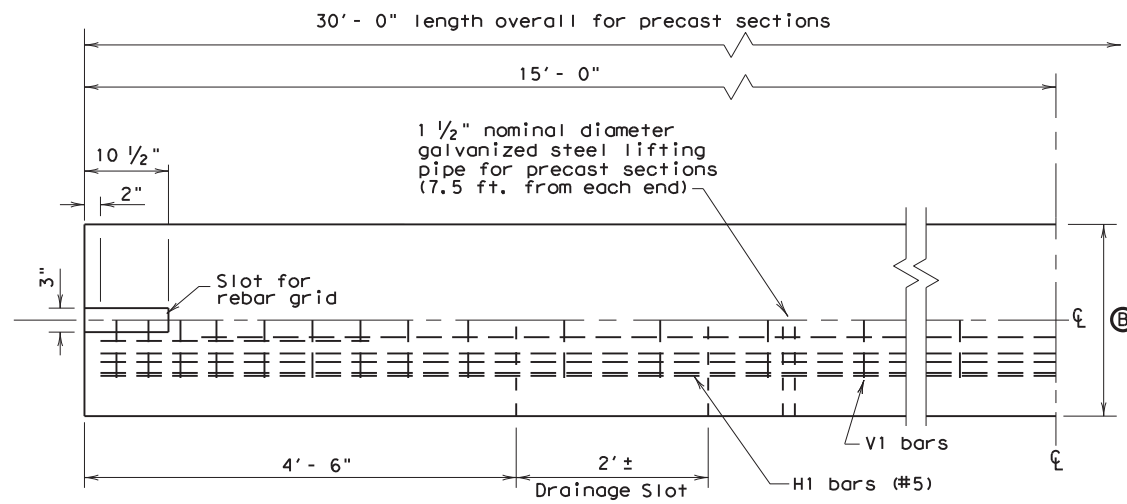
Texas Department of Transportation
Design Division (Roadway)

SINGLE SLOPE CONCRETE BARRIER
TYPE 1
(BRIDGE)
SSCB(1)-99

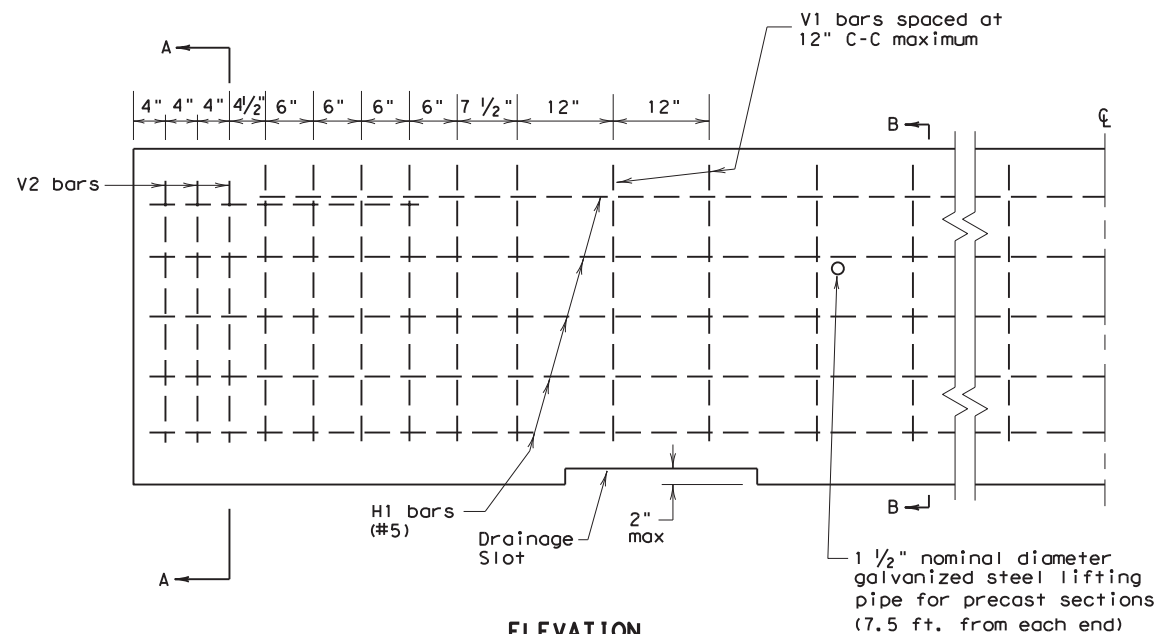
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BEXAR	6372	50	001	VAR.

GENERAL NOTES

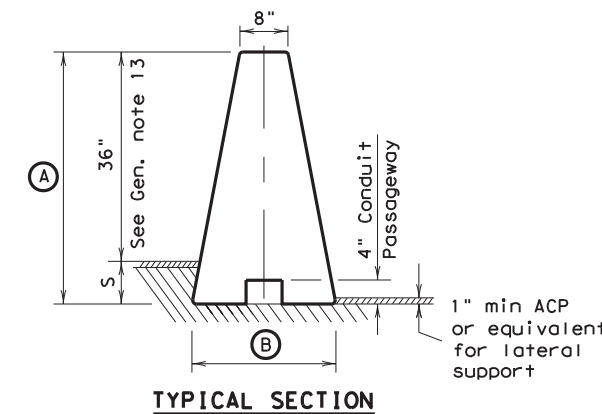
1. Precast barrier length shall be 30 feet (± 1 ") unless otherwise specified in the plans. Cast-in-place or slip-formed barrier shall have an intermediate barrier joint at a maximum spacing of 100 feet unless otherwise directed by the Engineer. Refer to the intermediate barrier joint detail. Cast-in-place or slip-formed barrier will have the vertical V1 bars placed at 12" C-C maximum except near joints. The narrower vertical bar spacing at the ends of each barrier segment, as shown in the elevation view, will be required at the joints. The V2 bars shown in the elevation view will be replaced by V1 bars for cast-in-place or slip-form construction.
2. The usual temporary installation will require the placement of the rebar grid in the ungrouted slot. The usual permanent installation using precast barrier will connect the barrier segments with the rebar grid placed in the slot and grouted in place.
3. When installed in a permanent roadway location, the end connections of the precast barrier shall be grouted with a mixture of two parts sand and one part cement with enough water to make the mixture plastic. Grouting shall be done in a manner that will assure a smooth surface at the joint.
4. All concrete shall be class C or H, unless otherwise specified.
5. All reinforcing steel shall be Grade 60, unless otherwise specified.
6. Each precast barrier to be installed in a temporary location shall be delivered with a rebar grid.
7. Chamfer top and end edges $\frac{3}{4}$ inch.
8. Unless otherwise shown in the plans, the Contractor has the option of placing either precast or cast-in-place permanent concrete barrier. Cast-in-place barrier may be slip-formed. Additional reinforcement may be tack welded to the upper two-thirds of the reinforcing cage to provide bracing. Lifting pipe, rebar grid and slot shall be omitted for cast-in-place or slip-form construction.
9. Bar splices for roadway barrier shall be a minimum of 24 times the nominal diameter of the bar.
10. Welded wire fabric may be used as an option to conventional reinforcement for precast or cast-in-place barrier. Welded wire fabric shall be made in accordance with ASTM A 497.
11. Conduit will be provided only when called for elsewhere in the plans. The position of the conduit or conduit passageway may be adjusted to facilitate construction, subject to approval of the Engineer.
12. Transitions to barrier height, as needed, shall be determined by the Engineer. Changes in barrier height should not normally exceed 2 inches per 30 feet. Vertical steel shall be uniformly transitioned throughout the variation in barrier height as directed by the Engineer.
13. A 36 inch minimum height differential between top of barrier and top of ACP shall be required at placement in order to allow for up to 6 inches of future overlays while maintaining a 30 inch minimum future effective height of barrier. Total minimal barrier height for design is therefore dictated by allowance for future overlays plus existing stairstep dimension "S". Minimums typically rounded to 42", 48" or 54" to facilitate precasting.



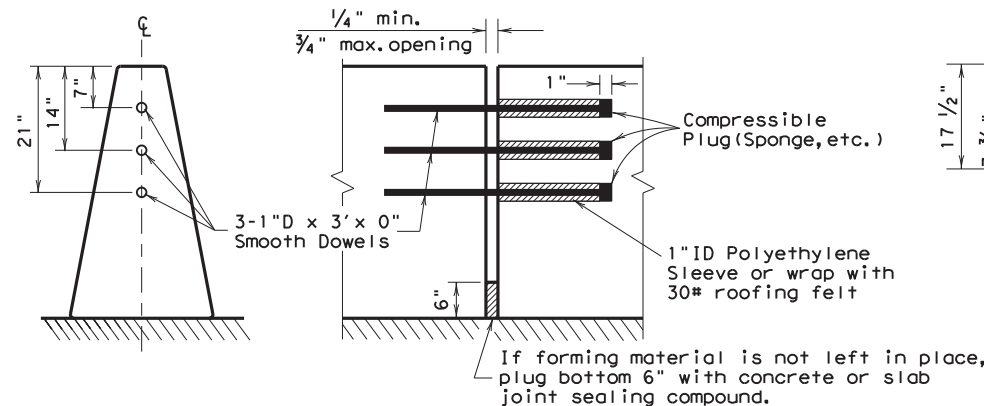
PLAN VIEW
(SYMMETRICAL ABOUT CENTER LINE)



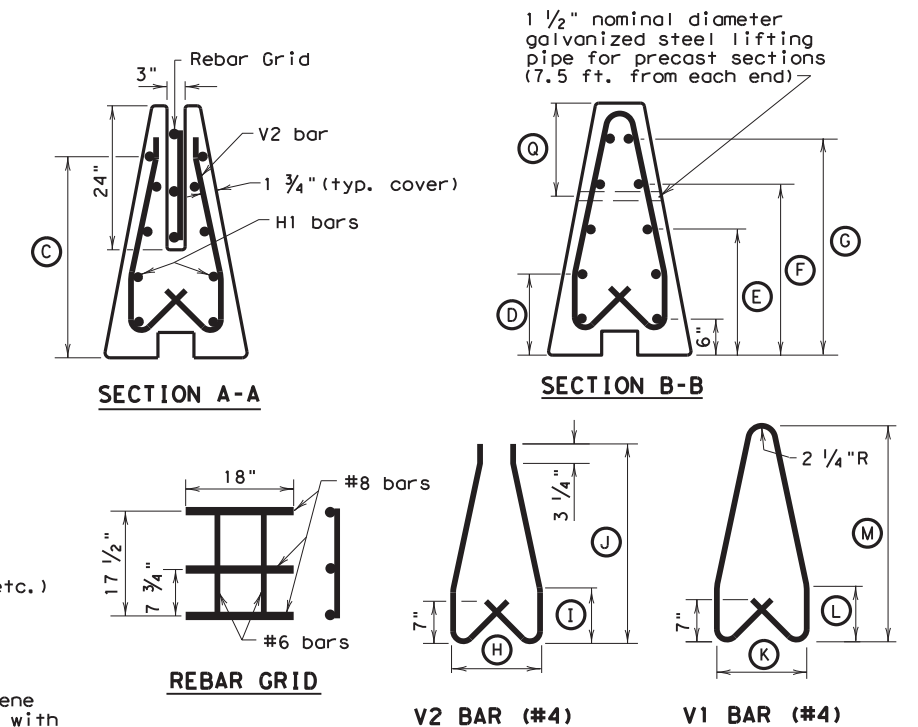
ELEVATION
(SYMMETRICAL ABOUT CENTERLINE)



TYPICAL SECTION

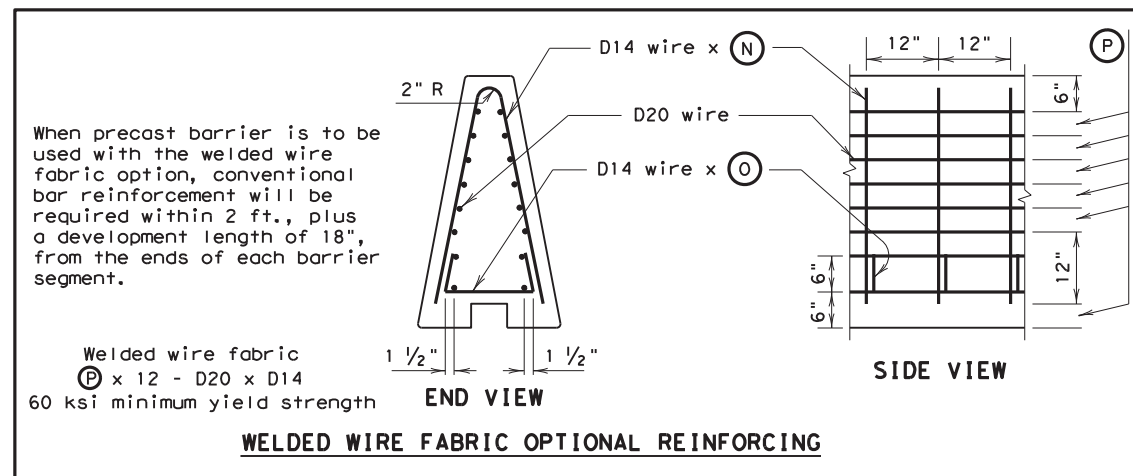


INTERMEDIATE BARRIER JOINT DETAIL (cast-in-place or slip-formed sections)



REINFORCING DETAILS

R = Radius
D = Diameter



WELDED WIRE FABRIC OPTIONAL REINFORCING

Barrier Height	DIMENSIONS (inches)																
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
42	24	33 1/2	13 1/2	21	28 1/2	36	15	9 1/4	33 1/4	15	9 1/4	36	72	28	4	15 1/2	
48	26 3/32	39 1/2	15	24	33	42	17 1/4	10 3/4	39 1/4	17 1/4	10 3/4	42	84	31 1/2	5	17	
54	28 3/16	45 1/2	16 1/2	27	37 1/2	48	19 1/2	12 1/4	45 1/4	19 1/2	12 1/4	48	96	34 3/4	6	18 1/2	

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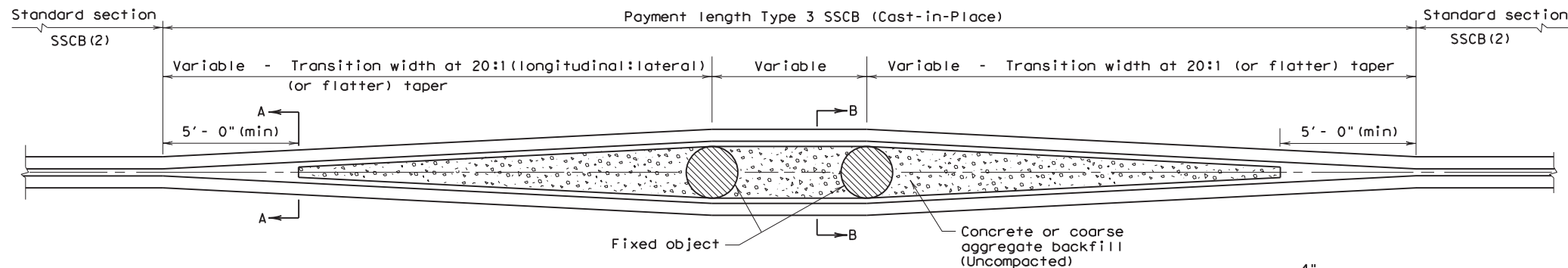
LEVELS DISPLAYED	
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Texas Department of Transportation
 Design Division (Roadway)

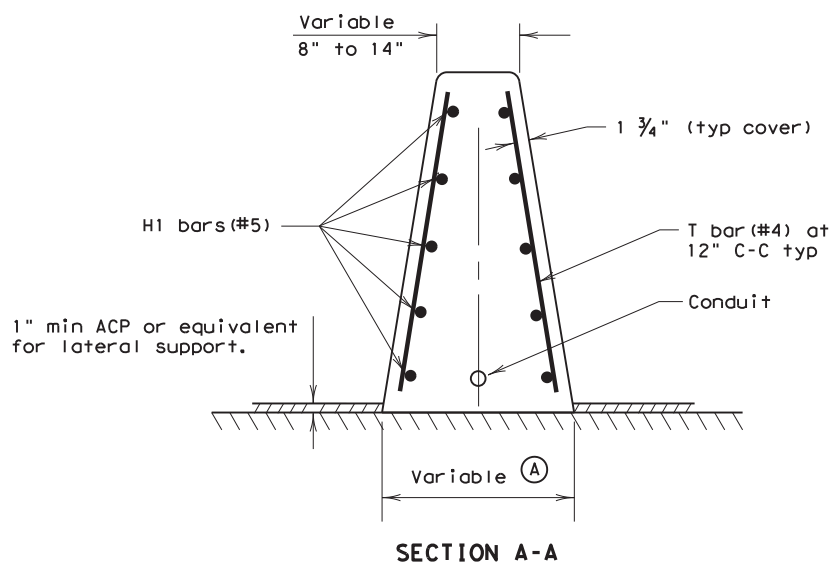
SINGLE SLOPE CONCRETE BARRIER TYPE 2

SSCB (2) - 00A

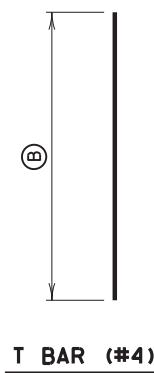
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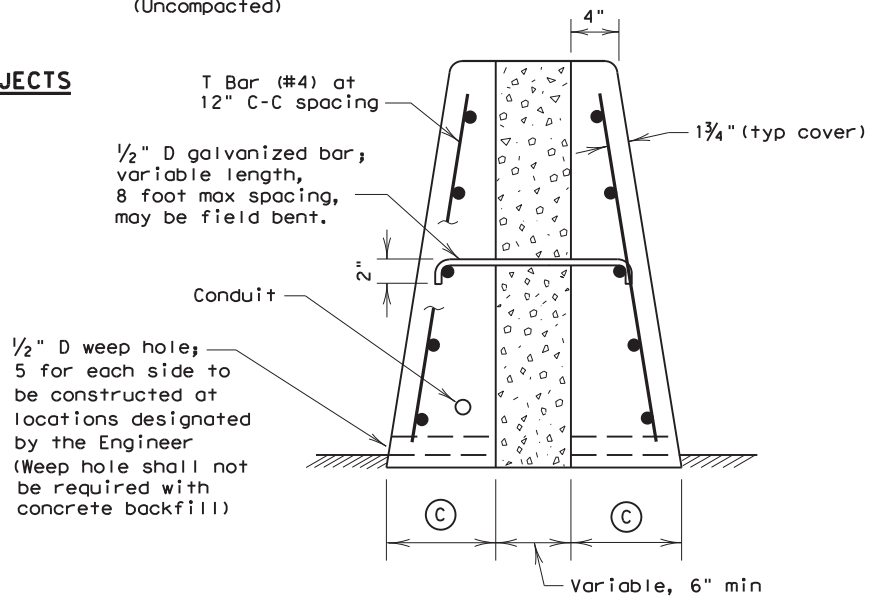
**PLAN VIEW
BARRIER AT FIXED OBJECTS**



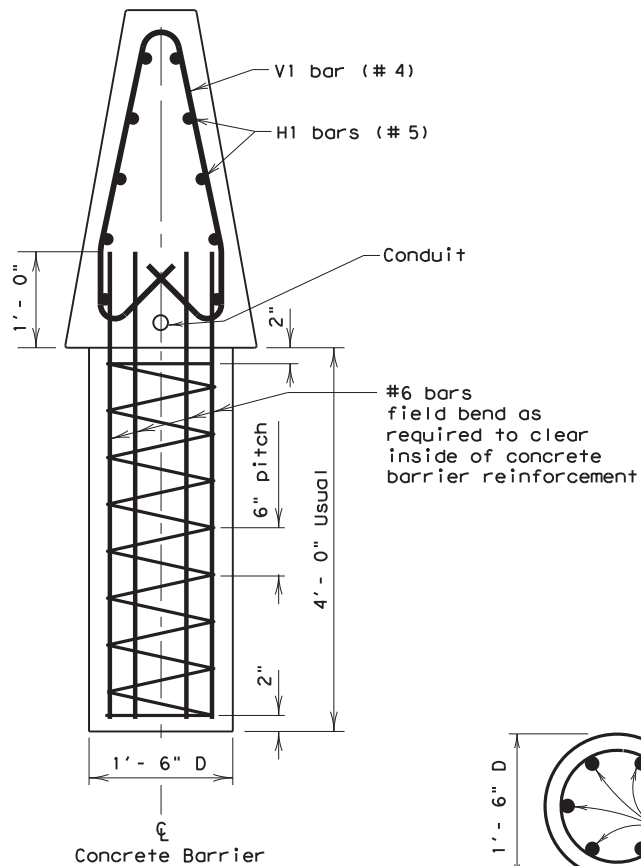
SECTION A-A



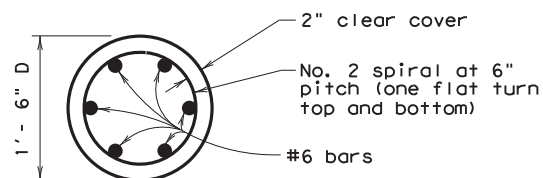
T BAR (#4)



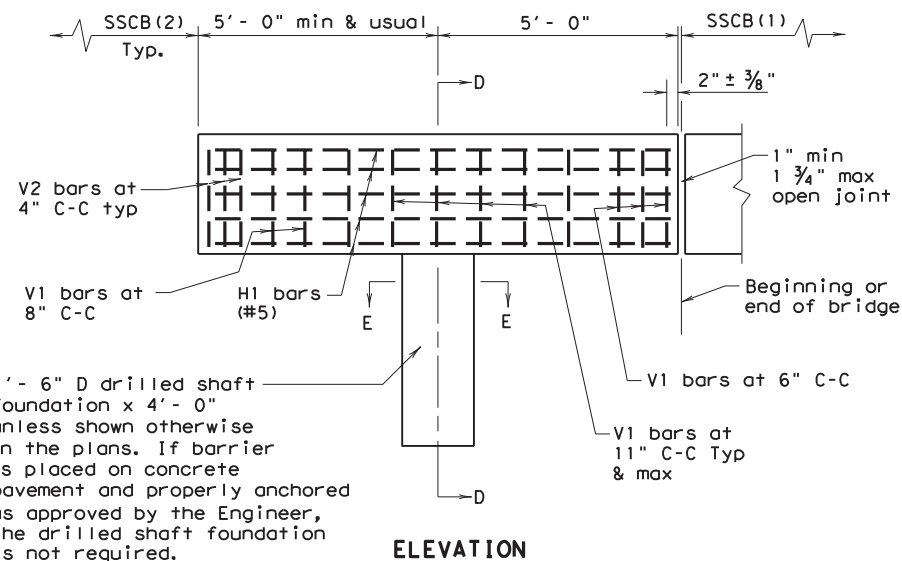
SECTION B-B



ANCHOR DETAIL - SECTION D-D



SECTION E-E



**ELEVATION
ANCHOR OR TERMINAL BARRIER**

Barrier height (IN.)	Dimensions (IN.)		
	(A)	(B)	(C)
42	24-30	36	12
48	26 ⁹ / ₃₂ - 32 ⁹ / ₃₂	42	13 ⁹ / ₁₆
54	28 ⁹ / ₁₆ - 34 ⁹ / ₁₆	48	14 ⁹ / ₃₂

GENERAL NOTES

1. Bid price per linear foot of SSCB, including terminal and anchor sections, shall include all of the concrete, reinforcement, drilled shaft foundations, conduit and aggregate or concrete backfill.
2. Connection with precast SSCB shall be made with rebar grid and slot as shown in SSCB(2).
3. See SSCB(2) for additional notes and details.
4. Outside face dimensions and slopes for Type 3 Barrier are the same as shown on SSCB(2).
5. Transverse reinforcement for Type 3 Barrier at Fixed Objects shall be as detailed hereon in sections A-A and B-B. Details for V1 and V2 bars for Type 3 Anchor or Terminal Barrier are as shown on SSCB(2).
6. Placement of longitudinal reinforcing shall be as detailed on SSCB(2).
7. Dimensions for Type 3 Anchor or Terminal Barrier sections are the same as detailed on SSCB(2).

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LEVELS DISPLAYED	
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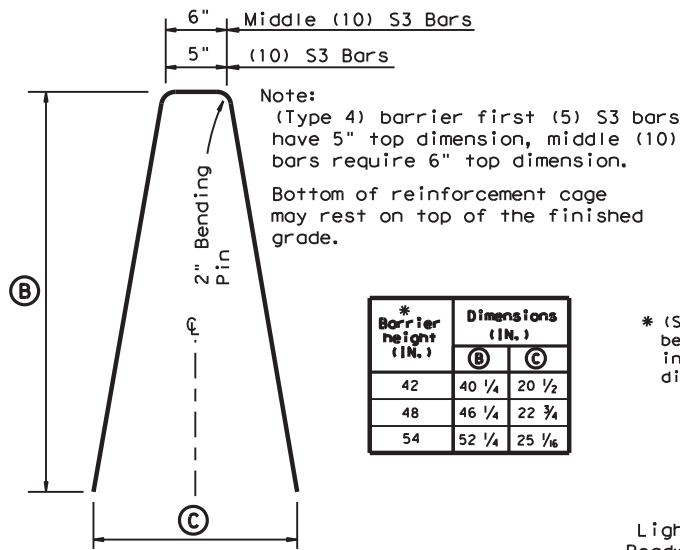
Texas Department of Transportation
Design Division (Roadway)
**SINGLE SLOPE
CONCRETE BARRIER
TYPE 3
CAST-IN-PLACE
(AT BRIDGE ENDS OR
MEDIAN OBSTRUCTIONS)
SSCB(3) - 02**

FILE: sscb302.dgn	DW: GTH	CK: GTH	DW: BGD	CK: TGM
© TxDOT MAY 1992	DIST	RMC PROJECT	SHEET	
REVISIONS	SAT	189		
COUNTY	CONTROL	SECT	JOB	HIGHWAY
BEXAR	6372	50	001	VAR.

R = Radius
D = Diameter

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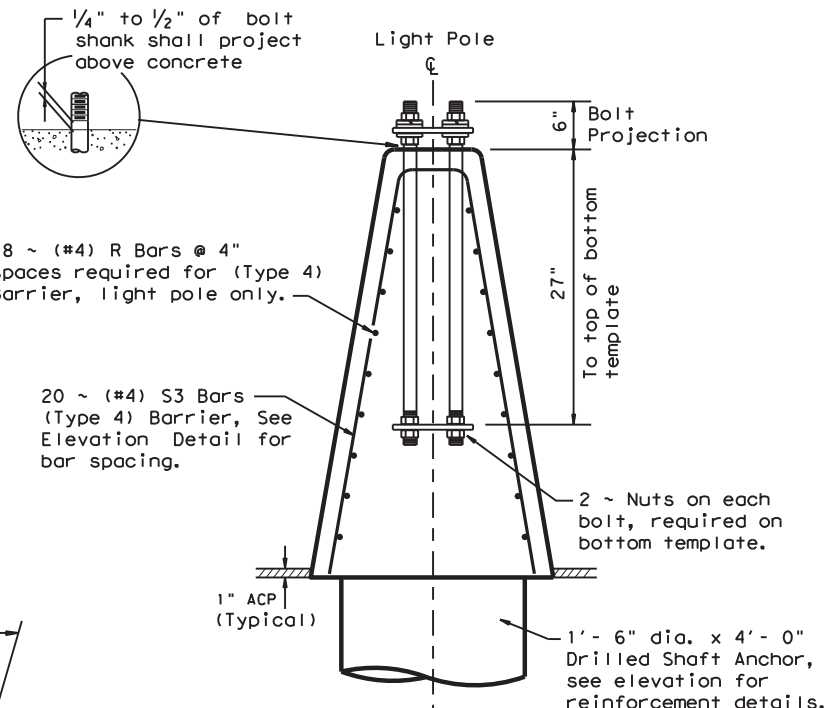


Schedule of reinforcement for each 10 foot cast-in-place section at light poles (excluding anchorage)

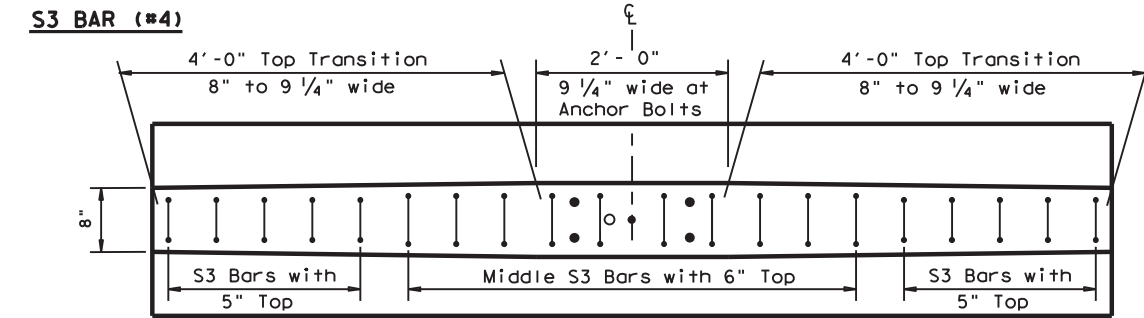
BAR	SIZE	QUANTITY
S3	#4	20
R	#4	18

Welded Wire Reinforcement (WWR) IS NOT APPROVED FOR USE WITH (TYPE 4) BARRIER.

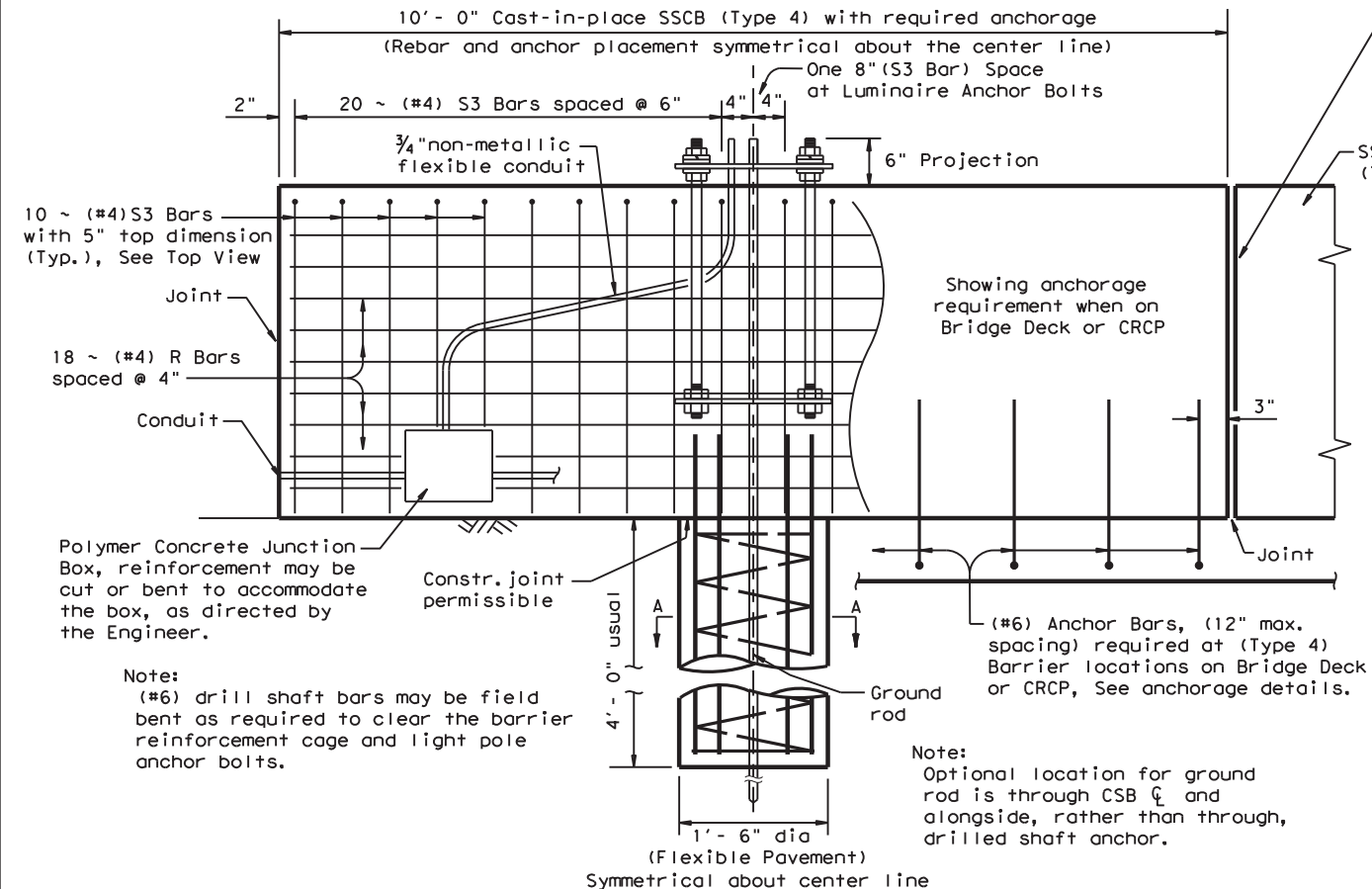
* (SSCB) (42") (Type 4) Barrier height may be increased to 48" or 54". This would increase the barrier and reinforcement dimensions accordingly.



(ROADWAY) SECTION AT LIGHT POLE
 Symmetrical about center line

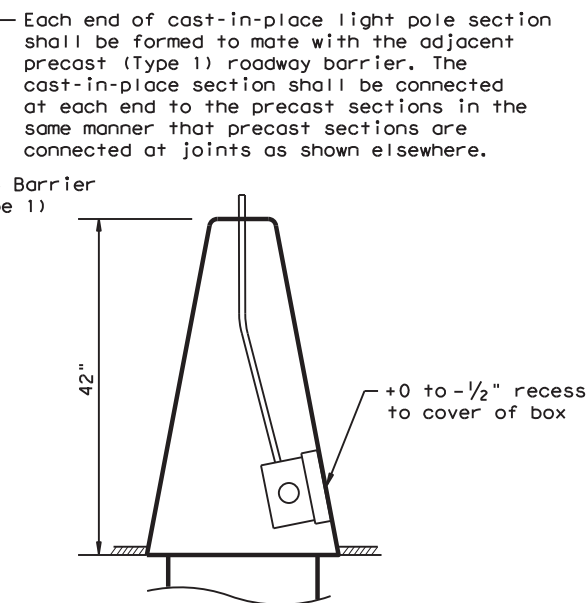


Note: Top of barrier transitions from 8" to 9 1/4" to clear anchor bolts.
 BARRIER (TYPE 4) TOP VIEW
 Showing S3 Bars and top dimension.

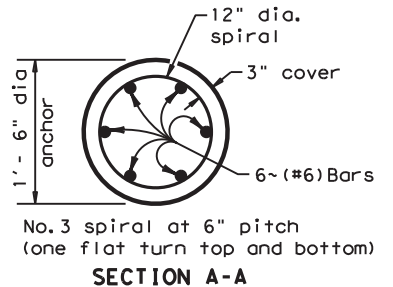


ELEVATION SHOWING THE REQUIRED REINFORCEMENT AND ANCHORAGE FOR (TYPE 4) BARRIER

The "Drilled Shaft Anchor" is the required anchorage for (Type 4) barrier on roadways with Flexible Pavement. The #6 Anchor Bars (Shown) is the required anchorage for (Type 4) barrier on Bridge Decks and CRCP.

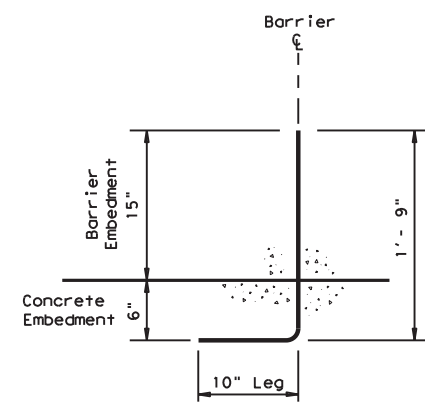


SECTION SHOWING JUNCTION BOX CONCRETE SAFETY BARRIER (TYPE 4)



GENERAL NOTES

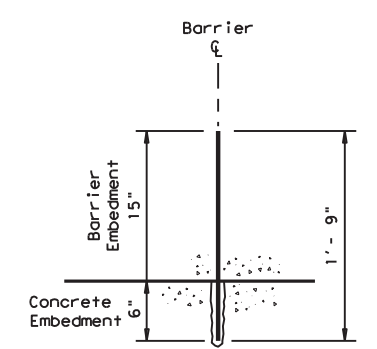
- All concrete shall be Class C.
- Anchor bolts, ground rods, junction box, rigid metal conduit, and non-metallic flexible conduit, when required, shall not be paid for directly, but will be considered subsidiary to the various bid items.
- For proper installation and material requirements for the anchor bolts and light pole, see Traffic Operations RIP standard sheets.
- Junction boxes shall be polymer concrete, and shall be mounted flush (+0, - 1/2") with concrete surface. For details and material requirements on barrier junction box, see DMS-11030.
- Install 12 AWG stranded conductors from load side of fused breakaway connector to luminaire. Fused breakaway connectors shall be installed as required on Traffic Operations RID Sheets. Typically fused breakaway connectors are installed in the barrier junction box adjacent to each light pole. By direction of the Engineer, the fused breakaway connectors may be installed at the pole's hand hole. In this case, the 3/4" flexible non-metallic conduit from the junction box to the pole will be increased in size up to 1 1/4" to accommodate the branch circuit conductors.
- Anchor bolts and their assemblies shall be in accordance with Item 449, "Anchor Bolts" High-Strength Steel or Alloy Steel. Galvanization requirements for anchor bolts are shown on RIP sheets.
- The required anchorage for Type 4 barrier (drill shaft, standard or optional concrete anchorage) shall not be paid for directly, but is subsidiary to Item 514, "Permanent Concrete Traffic Barrier."



STANDARD "CONCRETE" ANCHORAGE

(#6) Bar
 Concrete Pavement / Bridge Deck Anchorage: Cast-in-Place or Slip-Formed Barrier

Standard Anchorage Note:
 10" leg may be oriented 90 degrees in any direction about the barrier centerline.



"OPTIONAL" EPOXY ANCHORAGE

(#6) Bar
 Type III, Class C Epoxy
 Concrete Pavement / Bridge Deck Anchorage: Cast-in-Place or Slip-Formed Barrier

Epoxy Note:
 If epoxy coated anchor bars are required, the lower 6" of the bars must not be epoxy coated. Follow the manufacturer's directions for installing the epoxied anchor bars.

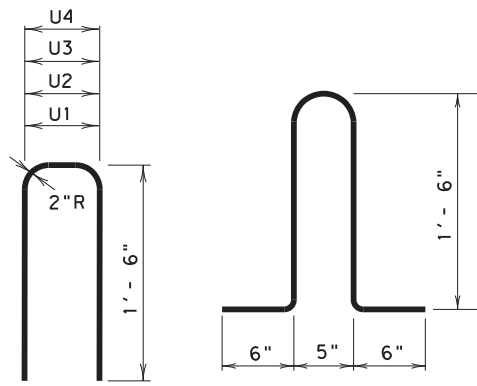
Texas Department of Transportation
 Design Division Standard

SINGLE SLOPE CONCRETE BARRIER
 CAST-IN-PLACE (TYPE 4)
 AT LIGHT POLE
 SSCB (4) - 10

FILE: sscb410.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
© TxDOT December 2010	CONT: 6372	SECT: 50	JOB: 001	HIGHWAY: VAR.
REVISIONS	DIST: SAT	COUNTY: BEXAR	SHEET NO. 190	

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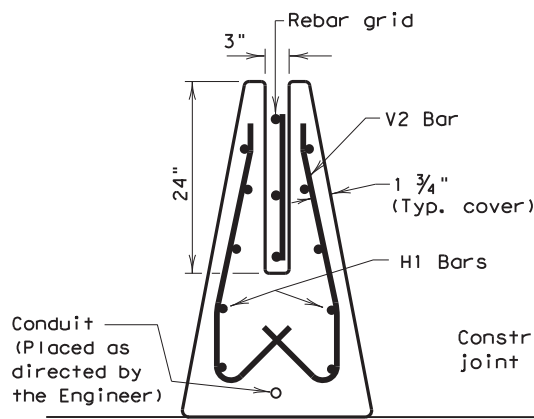
LEVELS DISPLAYED
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BARS U (1-4) #4

BARS M (#4)

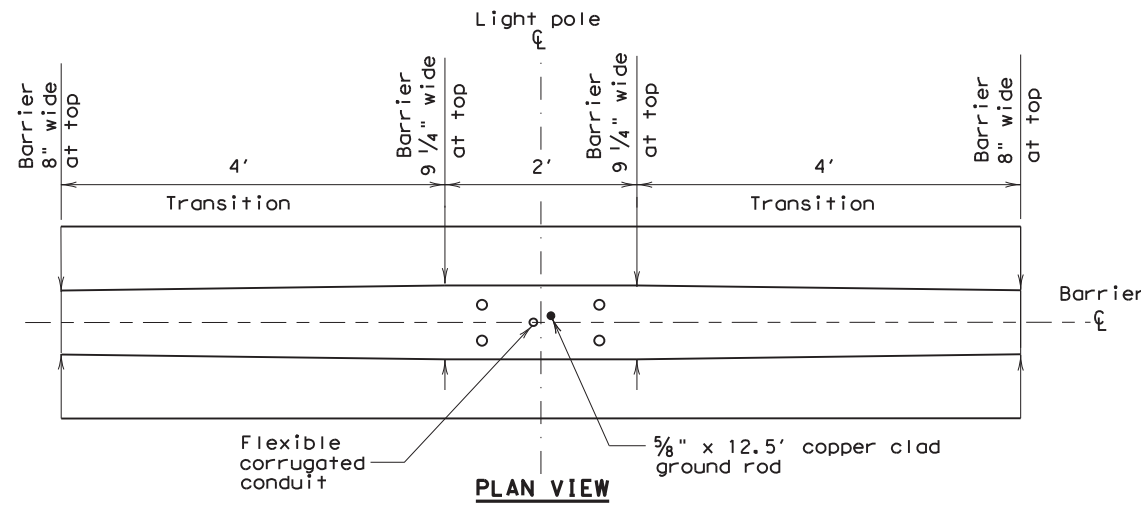
* See SSCB(1) for reinforcement details and placement on bridge sections. See SSCB(2) for reinforcement details and placement on roadway sections.



END SECTION

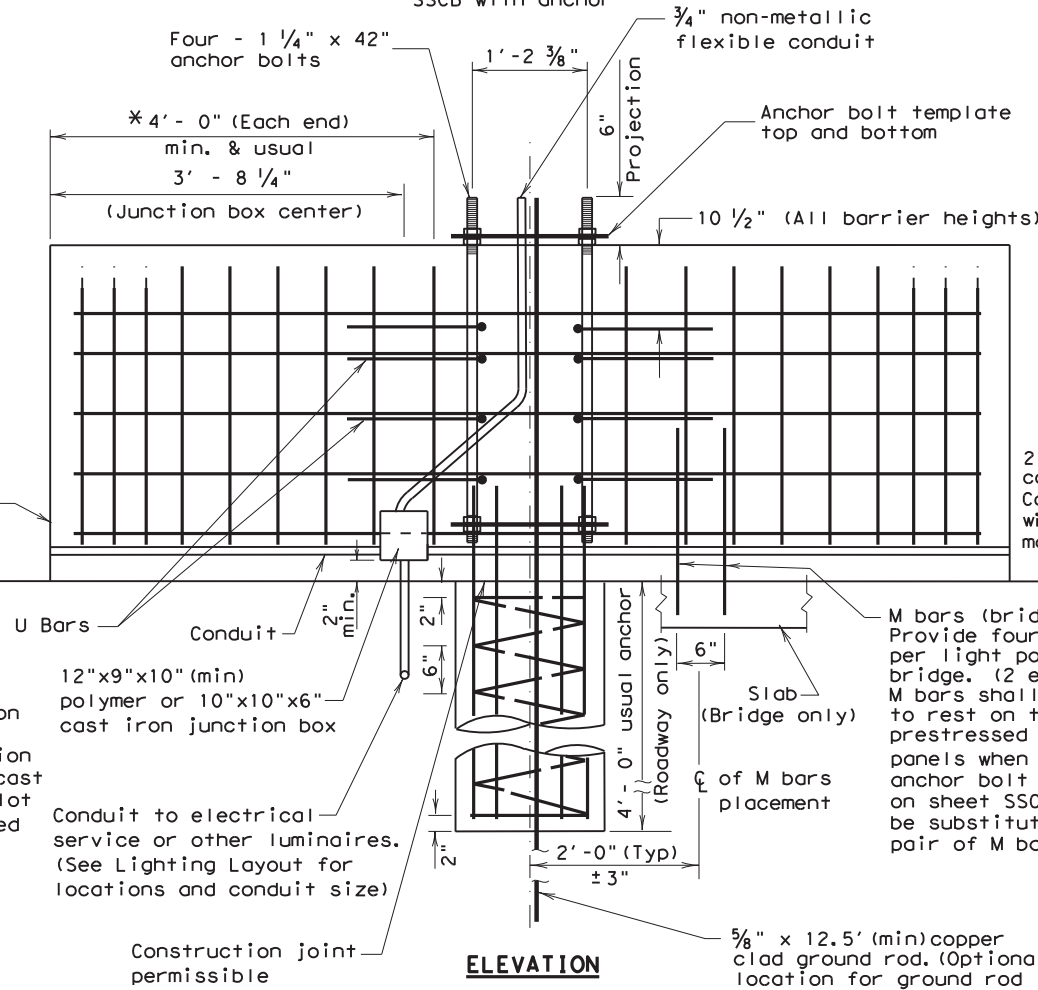
(ADJACENT TO PRECAST ROADWAY SECTIONS ONLY)

Each end of cast-in-place luminaire section shall be formed to mate with the precast concrete barrier. The cast-in-place section shall be connected at each end to the precast sections as shown above. Rebar grid and slot will be omitted when this barrier is placed on bridge or adjacent to cast-in-place roadway barrier.



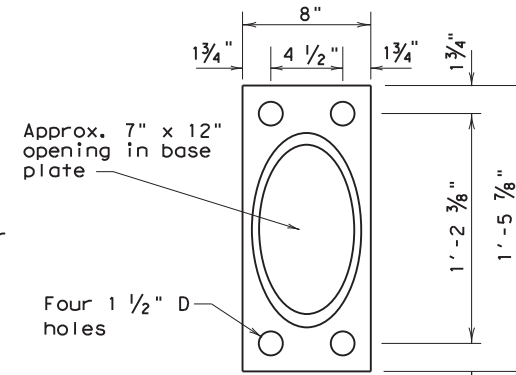
PLAN VIEW

10'-0" Cast-In-Place SSCB with anchor



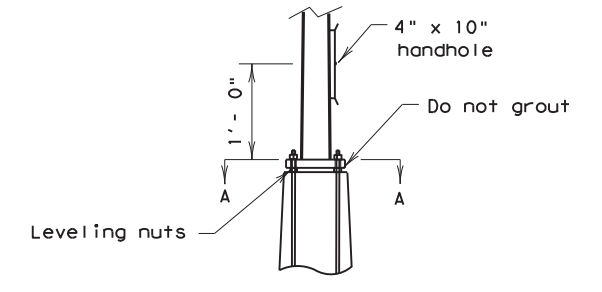
ELEVATION

10'-0" Cast-In-Place SSCB with anchor



SECTION A-A

Shape of pole may be elliptical or polygonal

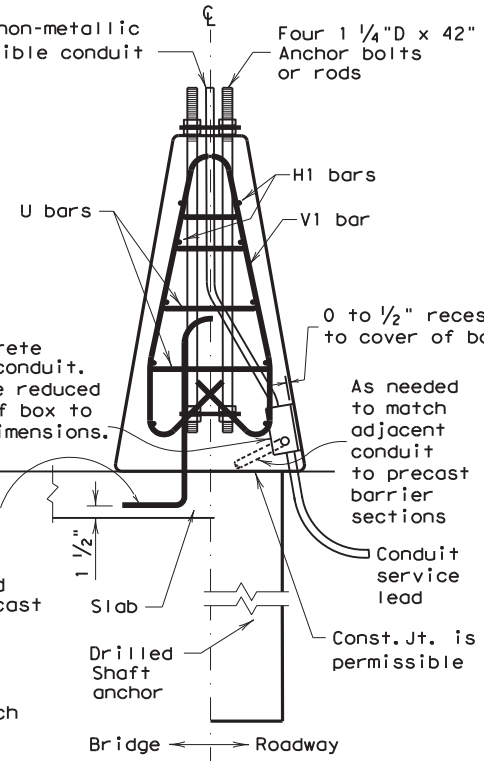


POLE DETAIL

Four 1/4" anchor bolts (ASTM A193 Grade B7 with the top threaded not less than 6 inches) or anchor rods (ASTM A321). The top end of the bolts or rods shall be galvanized not less than 8 inches and furnished with nuts (ASTM A563, Grade DH, galvanized, heavy hex) and flat and lock washers and templates. The length of the bolt or rod is specified in the table below.

GENERAL NOTES

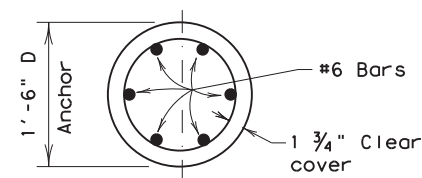
1. Poles on bridge barrier shall be grounded using a ground rod near the wing wall and grounding conductor to each pole. The 1'-6" diameter anchor shall be omitted on bridge barrier. Anchorage on bridges shall be provided using four M bars as detailed hereon.
2. Anchor bolts, ground rods, drilled shaft anchor, junction box and rigid metal conduit as shown shall not be paid for directly, but will be considered subsidiary to the various bid items.
3. Use special pole designation Roadway Illumination Assemblies. Example: (TY SP48S-8-8) (.4kW), where length of arm is 8 feet. (See RID standard)
4. All conduit bends shall be in accordance with the National Electric Code.
5. Junction box shall be cast iron or polymer concrete, and shall be mounted flush (-0,+1/2") with concrete surface of CTB. Cast iron boxes shall have a grounding stud or lug and shall be grounded. See ED(1) standard for types.
6. Alternate forming methods may be used only with the prior approval of the Engineer.



TYPICAL SECTION

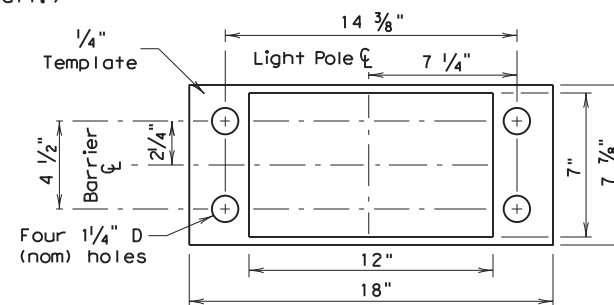
Barrier height (in.)	Dimensions (in.)					Anchor Bolts
	U1	U2	U3	U4		
42	6 1/4	7 1/2	10 3/4	14	42	
48	6 1/4	8 1/4	12	16 1/4	48	
54	6 1/4	8 7/8	13 3/8	18 1/2	54	

For other barrier requirements and reinforcement dimensions see SSCB(2)



ANCHOR SECTION

MW 30 spiral at 6" pitch (One flat turn top and bottom.)



ANCHOR BOLT TEMPLATE DETAIL

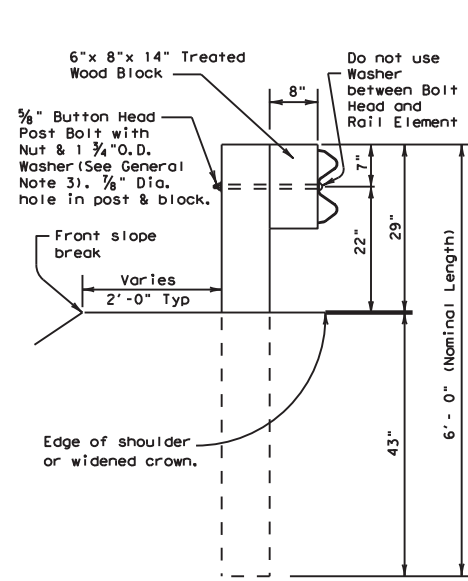
R = Radius
D = Diameter

Texas Department of Transportation
 Design Division (Roadway)
SINGLE SLOPE CONCRETE BARRIER
TYPE 4
 CAST-IN-PLACE
 (BRIDGE AND ROADWAY WITH ILLUMINATION)
SSCB (4) - 00

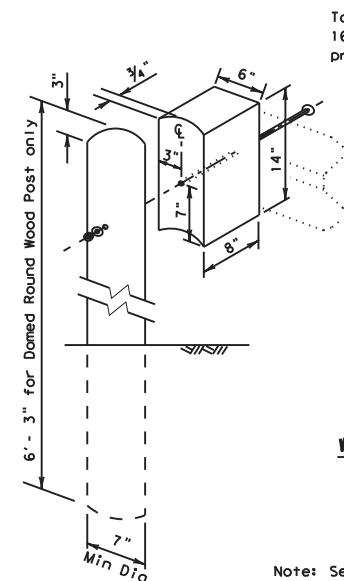
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© TxDOT MAY 1992		DIST	RMC PROJECT	
REVISIONS		SAT	SHEET 191	
		COUNTY	CONTROL	SECT
		BEXAR	6372	50
		JOB	OOI	VAR.

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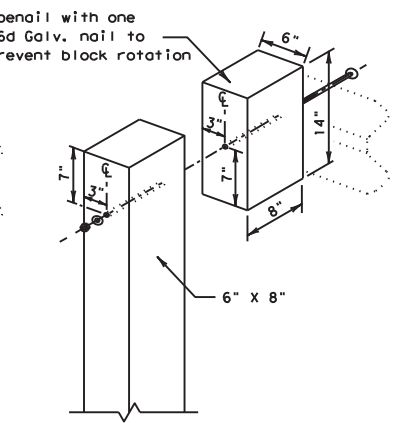
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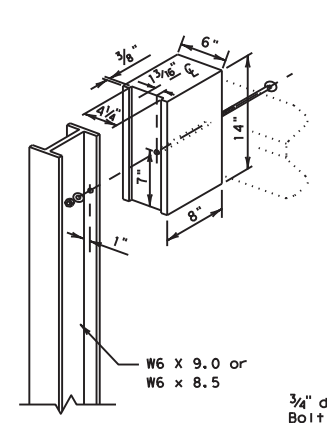
TYPICAL POST



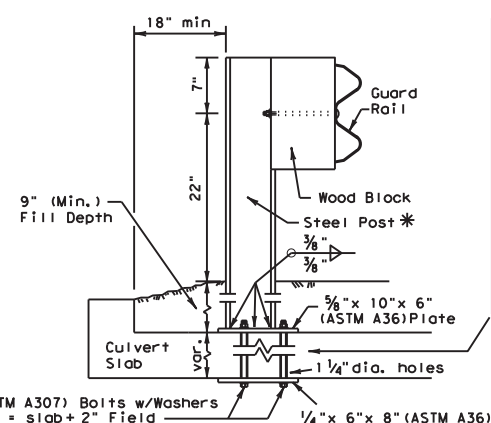
WOOD BLOCK TO ROUND WOOD POST



WOOD BLOCK TO RECTANGULAR WOOD POST

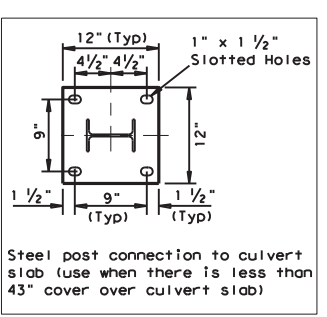


WOOD BLOCK TO STEEL POST

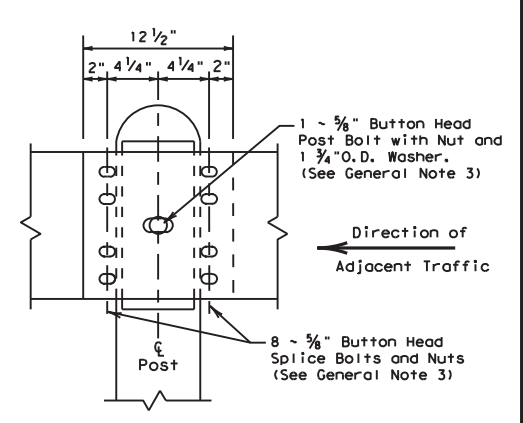


3/4" dia. (ASTM A307) Bolts w/Washers
Bolt length = slab + 2" Field clip topside washers if necessary to clear weld. Direction of bolt placement is upward.

LOW FILL CULVERT POST FOR USE ON NON-BRIDGE CLASS CULVERTS ONLY



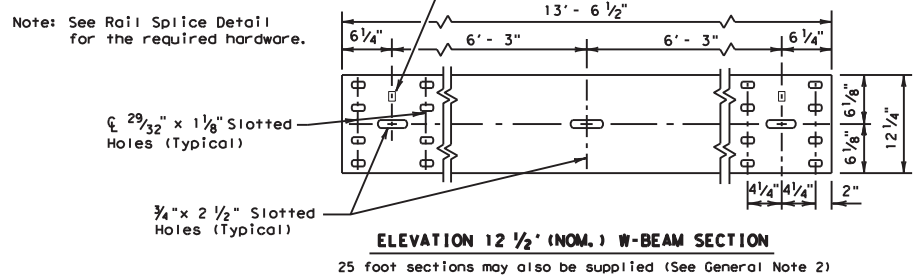
* Post(s) may require field modifications to ensure proper guardrail height.



RAIL SPLICE DETAIL

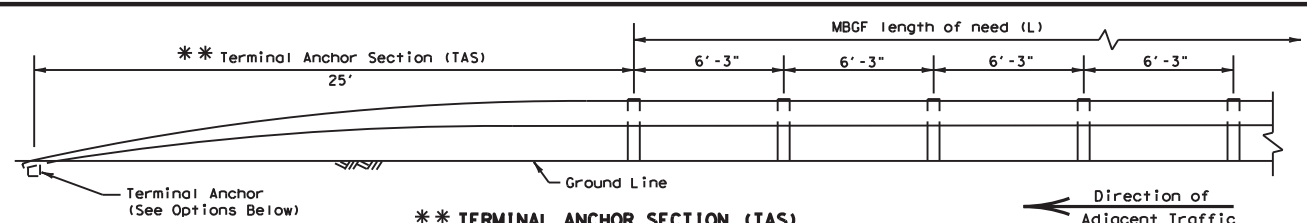
GENERAL NOTES

- The type of post (round wood post, rectangular wood post, or steel post) will be shown elsewhere in the plans. The exact position of MBGF shall be shown elsewhere in the plans or as directed by the Engineer. Steel posts to be galvanized in accordance with Item 445, "Galvanizing."
- Rail element shall meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified on the plans. The Contractor may furnish rail elements of 12 1/2 or 25 foot nominal lengths.
- Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and Type A (1 3/4" O.D.) washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 3/8" x 1 1/4" (or 2" long at triple rail splices) with a 3/8" double recessed nut (ASTM A563).
- 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 slope rate of not more than 1V:10H.
- 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 block. Rail placed over curbs shall be installed so that the post bolt is located approximately 21 inches above the gutter pan or roadway surface.
- If solid rock is encountered within 0 to 18" of the finished grade, drill a 22" dia. hole, 24" into the rock, or drill two 12" dia. front to back overlapping holes, 24" into the rock or to the standard embedment depth, whichever is less. Any excess post length, after meeting these depths, may be field cut to ensure proper guardrail mounting height. Backfill with a cohesionless material.
- Posts shall not be set in concrete, of any depth.
- Special fabrication will be required at installations having a curvature of less than 150 ft. radius.
- The terminal anchor section (TAS) post shall be set in Class A concrete (unless otherwise shown in the plans) in accordance with Item 421, "Hydraulic Cement Concrete." Concrete shall be subsidiary to the bid item requiring construction of the terminal anchor section (TAS). Terminal anchor post to be galvanized in accordance with Item 445, "Galvanizing."
- Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or blocks of similar dimensions. The Construction Division, TxDOT maintains a Material Producer List (MPL) for the producers of materials conforming to DMS-7210. Only producers on the MPL can furnish composite material posts and/or blocks.



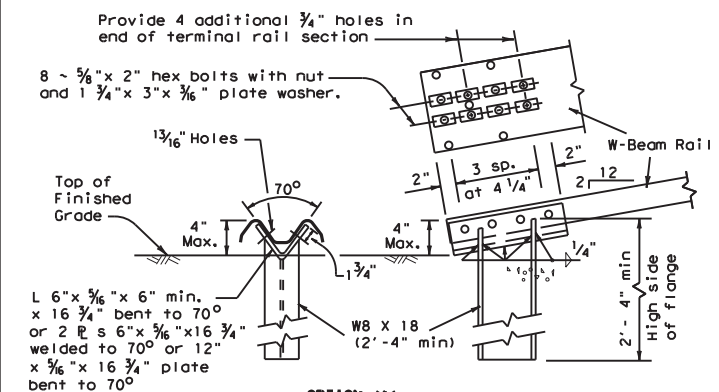
ELEVATION 12 1/2' (NOM.) W-BEAM SECTION

25 foot sections may also be supplied (See General Note 2)



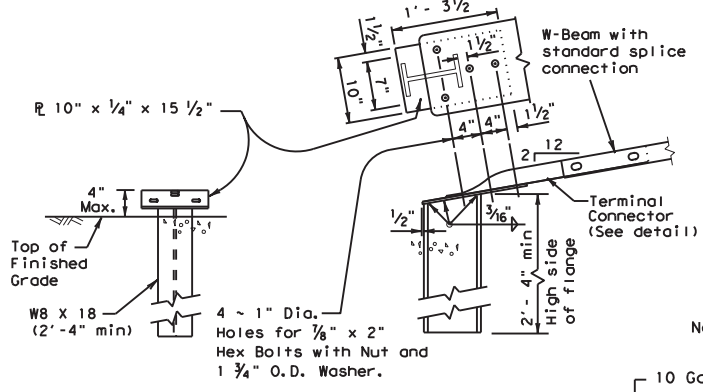
TERMINAL ANCHOR SECTION (TAS)

Terminal anchor sections are only for downstream use, when located outside the horizontal clearance area of opposing traffic.



OPTION (1)

Note: This anchor post requires four additional 3/4 inch holes (shop or field) in the rail member with eight 3/8 inch hex bolts with nut and plate washer.

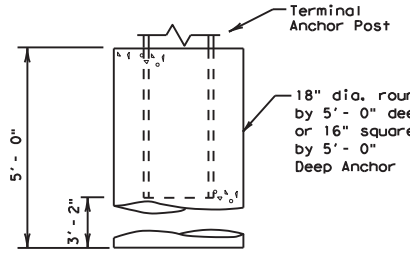


OPTION (2)

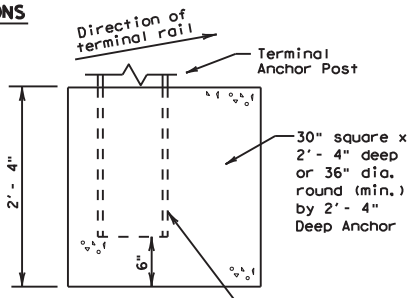
Note: This anchor post requires the use of the 10 ga. terminal connector with four 3/8 inch hex bolts with nut and washer.

TERMINAL ANCHOR POST OPTIONS

Notes:
Either concrete anchor may be used with either post option above. No construction joint is allowed in the concrete anchor. Terminal rail may be bolted to post and in twist position prior to placing concrete anchor. If concrete anchor is precast, the area should be compacted as directed by the Engineer, when placed in the field.

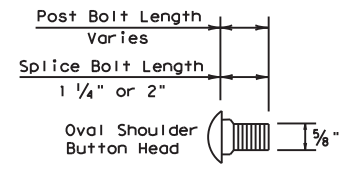


TERMINAL CONCRETE ANCHOR OPTIONS



TERMINAL CONNECTOR

For connection hardware to concrete rails, see the MBGF transition standards.



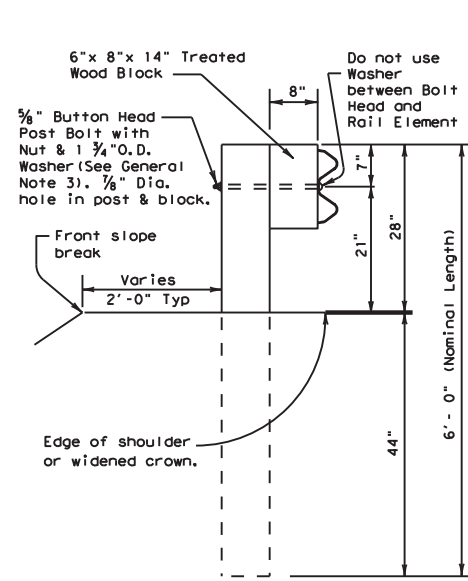
BUTTON HEAD BOLT Post and Splice Bolts (See General Note 3)

Texas Department of Transportation
Design Division Standard

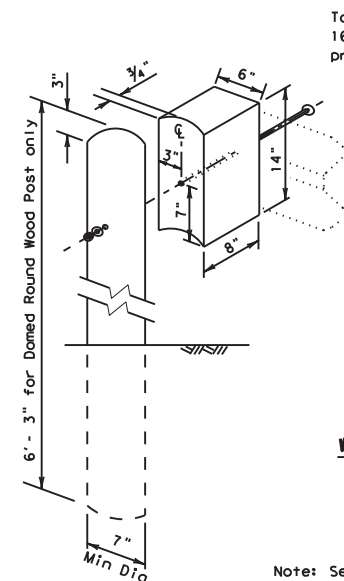
METAL BEAM GUARD FENCE

MBGF - 11

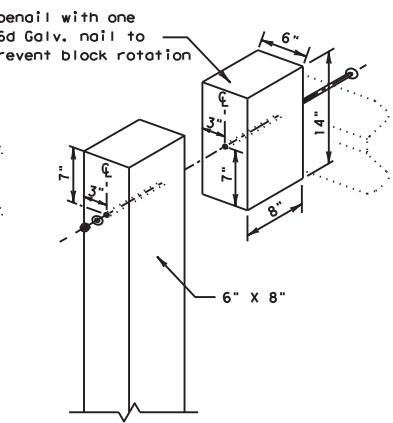
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©TxDOT July 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
12-2011	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	193	



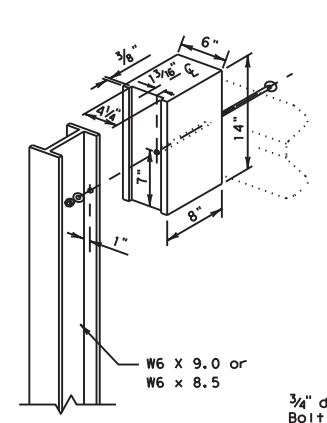
TYPICAL POST



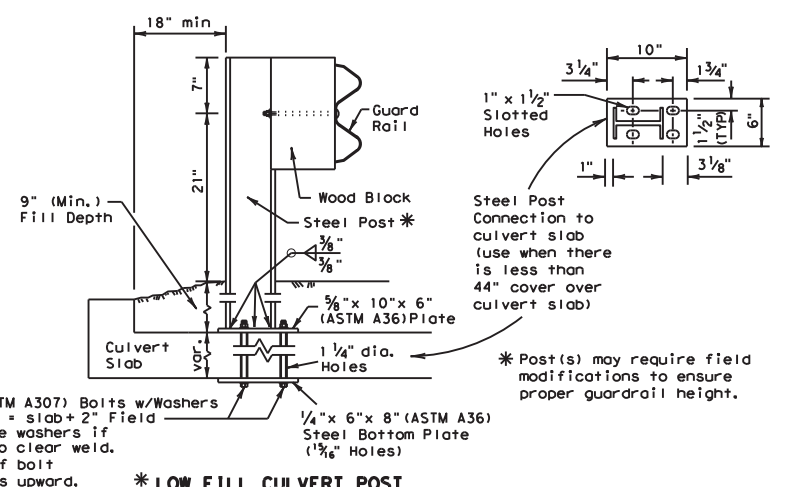
WOOD BLOCK TO ROUND WOOD POST



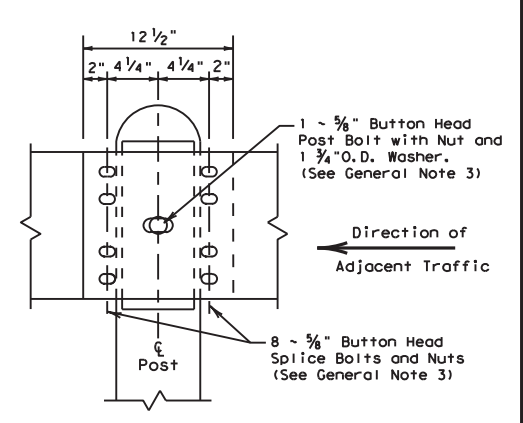
WOOD BLOCK TO RECTANGULAR WOOD POST



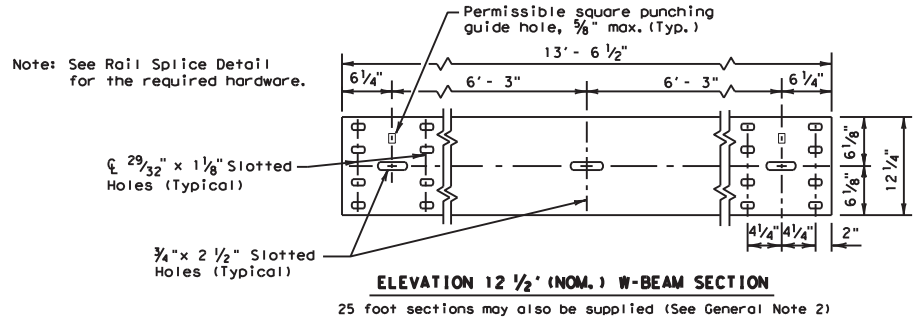
WOOD BLOCK TO STEEL POST



*** LOW FILL CULVERT POST FOR USE ON NON-BRIDGE CLASS CULVERTS ONLY**



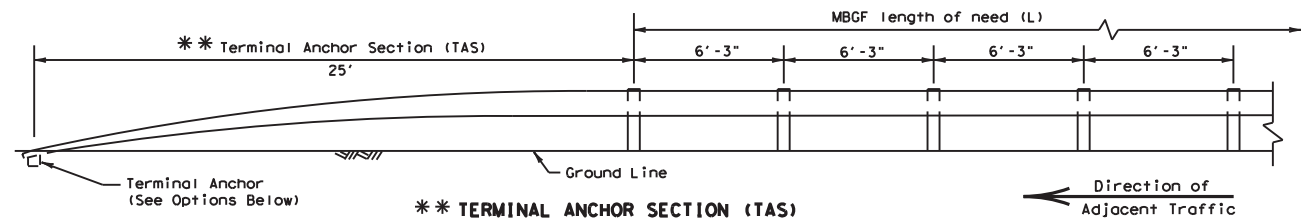
RAIL SPLICE DETAIL



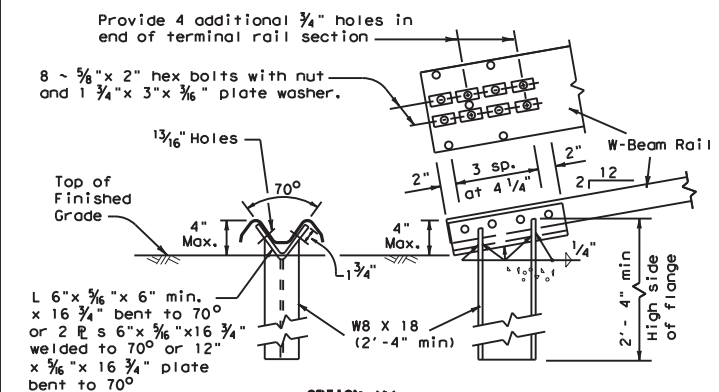
ELEVATION 12 1/2' (NOM.) W-BEAM SECTION
25 foot sections may also be supplied (See General Note 2)

GENERAL NOTES

- The type of post (round wood post, rectangular wood post, or steel post) will be shown elsewhere in the plans. The exact position of MBSF shall be shown elsewhere in the plans or as directed by the Engineer. Steel posts to be galvanized in accordance with Item 445, "Galvanizing."
- Rail element shall meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified on the plans. The Contractor may furnish rail elements of 12 1/2 or 25 foot nominal lengths.
- Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and Type A (1 3/4" O.D.) washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 3/8" x 1 1/4" (or 2" long at triple rail splices) with a 3/8" double recessed nut (ASTM A563).
- 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 slope rate of not more than 1V:10H.
- 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 block. Rail placed over curbs shall be installed so that the post bolt is located approximately 21 inches above the gutter pan or roadway surface.
- If solid rock is encountered within 0 to 18" of the finished grade, drill a 22" dia. hole, 24" into the rock, or drill two 12" dia. front to back overlapping holes, 24" into the rock or to the standard embedment depth, whichever is less. Any excess post length, after meeting these depths, may be field cut to ensure proper guardrail mounting height. Backfill with a cohesionless material.
- Posts shall not be set in concrete, of any depth.
- Special fabrication will be required at installations having a curvature of less than 150 ft. radius.
- The terminal anchor section (TAS) post shall be set in Class A concrete (unless otherwise shown in the plans) in accordance with Item 421, "Hydraulic Cement Concrete." Concrete shall be subsidiary to the bid item requiring construction of the terminal anchor section (TAS). Terminal anchor post to be galvanized in accordance with Item 445, "Galvanizing."
- Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or 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 can furnish composite material posts and/or blocks.

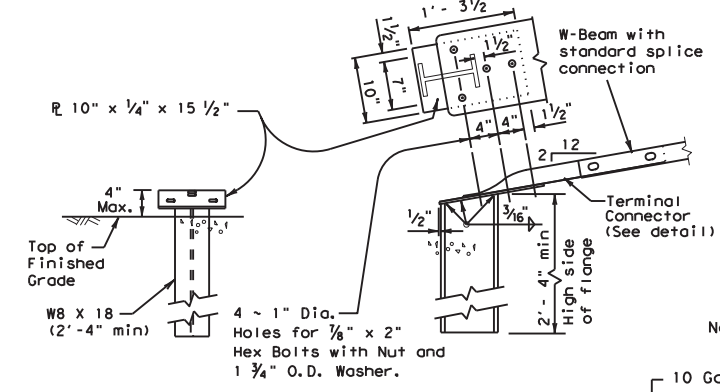


**** TERMINAL ANCHOR SECTION (TAS)**
Terminal anchor sections are only for downstream use, when located outside the horizontal clearance area of opposing traffic.



OPTION (1)

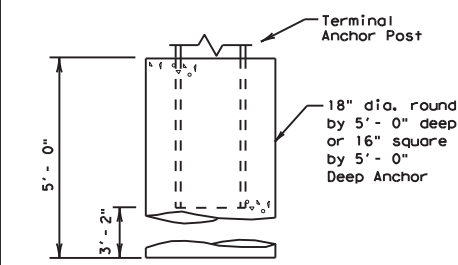
Note: This anchor post requires four additional 3/4" holes (shop or field) in the rail member with eight 3/8" hex bolts with nut and plate washer.



OPTION (2)

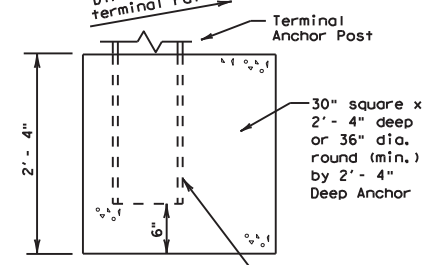
Note: This anchor post requires the use of the 10 ga. terminal connector with four 3/8" hex bolts with nut and washer.

TERMINAL ANCHOR POST OPTIONS
(See General Note 11)

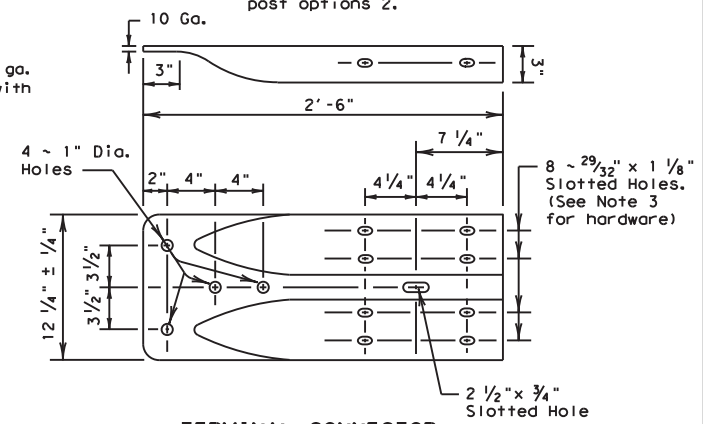


TERMINAL CONCRETE ANCHOR OPTIONS
(See General Note 11)

Notes:
Either concrete anchor may be used with either post option above.
No construction joint is allowed in the concrete anchor.
Terminal rail may be bolted to post and in twist position prior to placing concrete anchor.
If concrete anchor is precast, the area should be compacted as directed by the Engineer, when placed in the field.



Place face of post approx. on center of anchor



TERMINAL CONNECTOR

For connection hardware to concrete rails, see the MBSF transition standards.

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LEVELS DISPLAYED	1
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Texas Department of Transportation
Design Division (Roadway)

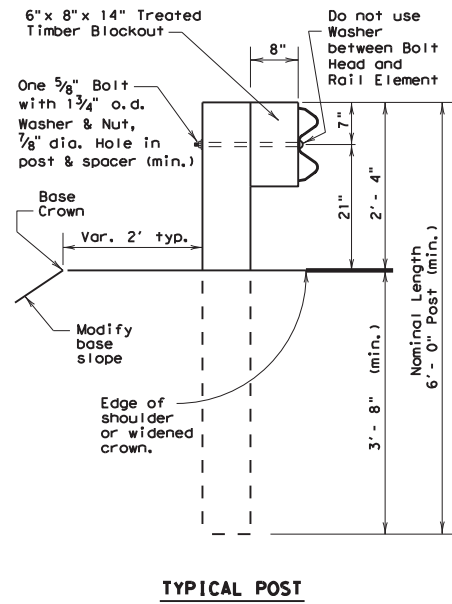
METAL BEAM GUARD FENCE

MBSF-09

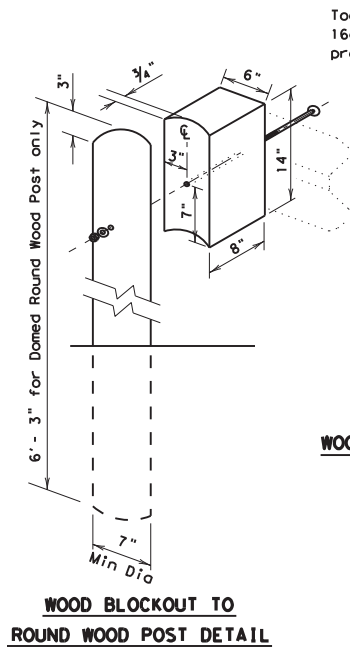
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© TxDOT	JULY 1994	DIST	FEDERAL AID PROJECT		SHEET
REVISIONS	SAT			194	
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	BEXAR	6372	50	001	VAR.

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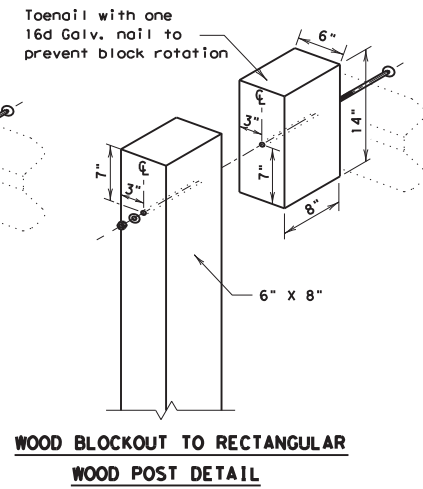
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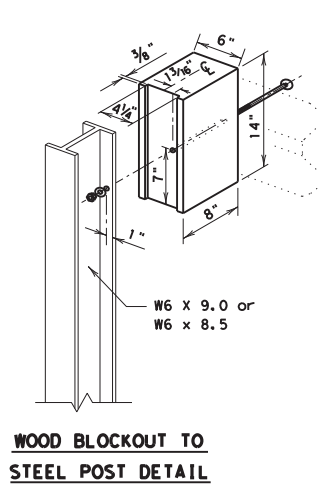
TYPICAL POST



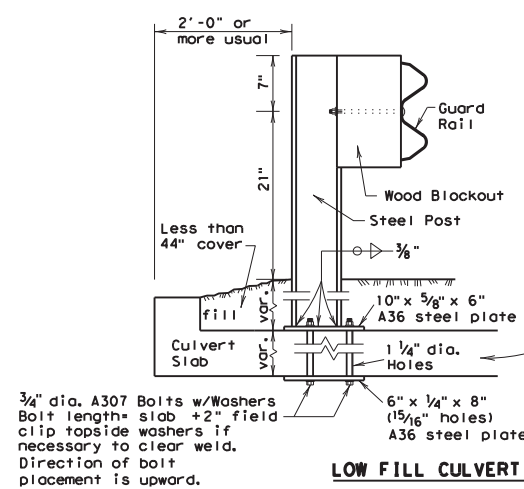
WOOD BLOCKOUT TO ROUND WOOD POST DETAIL



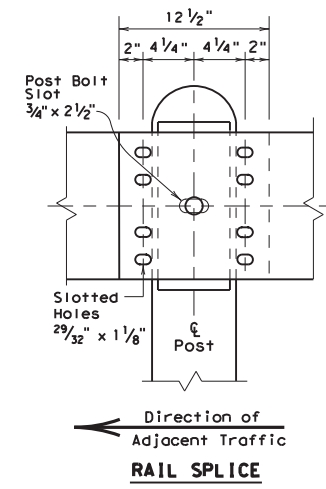
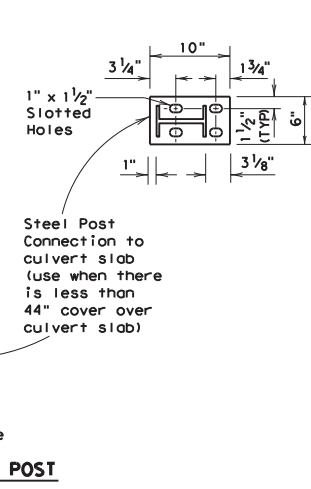
WOOD BLOCKOUT TO RECTANGULAR WOOD POST DETAIL



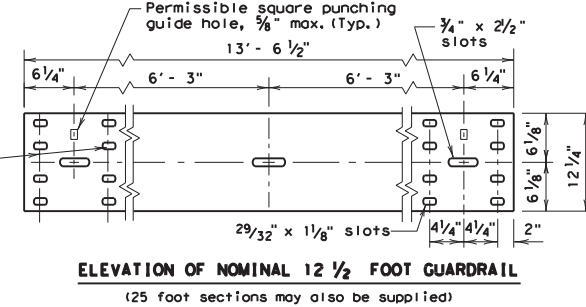
WOOD BLOCKOUT TO STEEL POST DETAIL



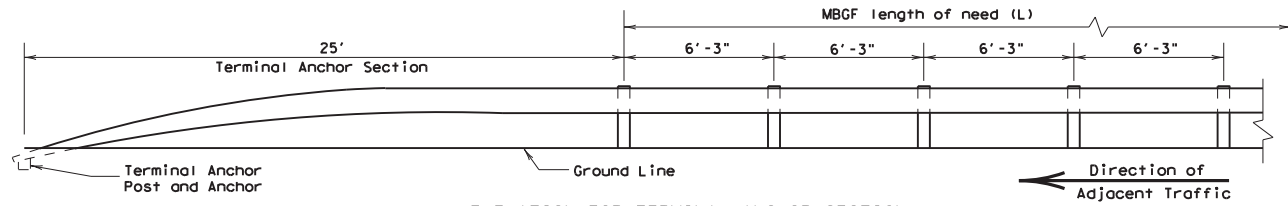
LOW FILL CULVERT POST MOUNTING OPTION



RAIL SPLICE

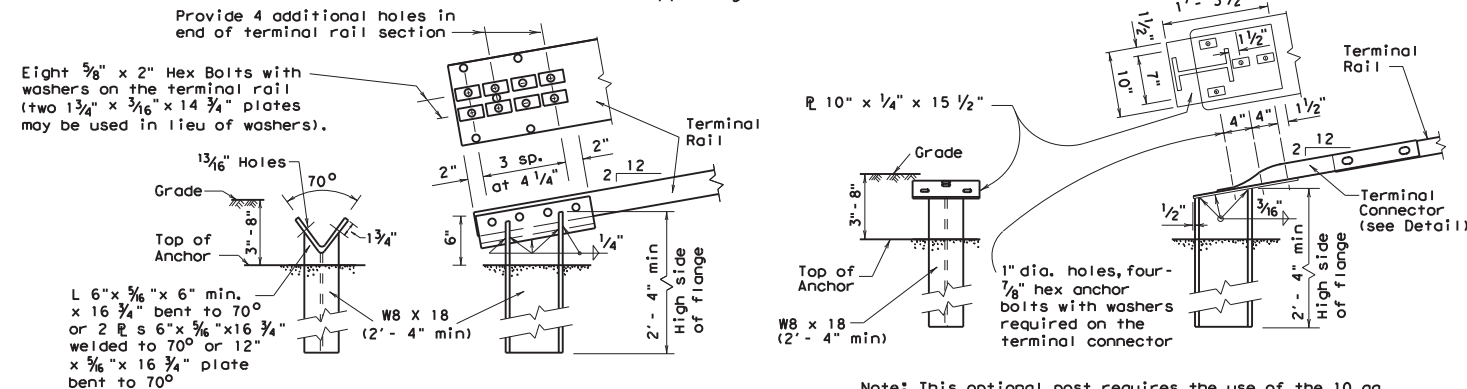


ELEVATION OF NOMINAL 12 1/2 FOOT GUARDRAIL (25 foot sections may also be supplied)

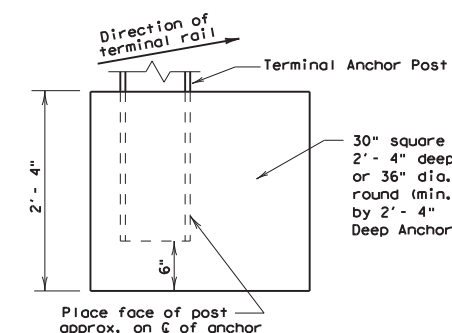


ELEVATION FOR TERMINAL ANCHOR SECTION

(Terminal anchor sections are only for downstream guardrail end anchorage usage outside the horizontal clearance area of opposing traffic)

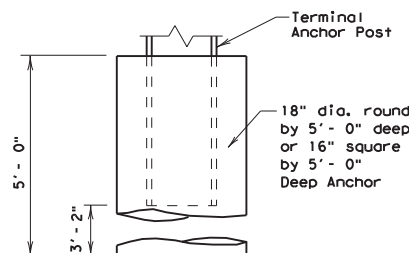


TERMINAL ANCHOR POST OPTIONS

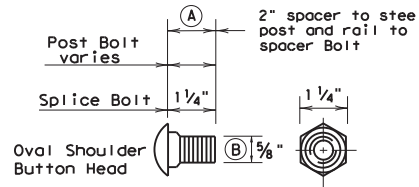


TERMINAL CONCRETE ANCHOR OPTIONS

Notes:
Either post may be used with either anchor.
No construction joint is allowed in the concrete anchor.
Terminal rail may be bolted to post and in twist position prior to placing concrete anchor.
If concrete anchor is precast, the area should be compacted as directed by the Engineer, when placed in the field.



TERMINAL CONNECTOR



CONNECTOR DETAIL

- (A) 1 1/4 inch spacer to steel post hex bolt, 2 inch rail to spacer button head bolt.
- (B) 7/8 inch hex bolts required for terminal connector

- The exact position of guard fence shall be as shown elsewhere on the plans or as directed by the Engineer. Guard fence shall be transitioned to a smooth connection with other guard fence or structure railing as shown elsewhere on plans.
- Rail element shall meet all requirements of AASHTO M-180 except as modified on the plans. The terminal connectors 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 Terminal Connector prior to ordering of materials.
- Unless otherwise shown in the plans, guard fence placed in the vicinity of curbs shall be blocked out so that the face of curb is located directly below or behind the face of the blockout. Rail placed over curbs shall be installed so that the post bolt is located approximately 21-inches above the gutter pan or roadway surface.
- Unless otherwise shown in the plans, MBGF shall be placed with the face of rail directly above the shoulder edge (or curbface) except for upstream end treatments.
- At the option of the Contractor, the rail elements for the guard fence may be furnished in either 12 1/2 or 25 foot nominal lengths with post bolt slots for connection to posts.
- The terminal anchor post shall be set in Class "A" concrete in (unless otherwise shown on plans) in accordance with Item, "Portland Cement Concrete". Concrete shall be subsidiary to the bid item requiring construction of the terminal rail section and anchorage system.
- An anchor other than to a terminal anchor post shall consist of a connection similar to the rail splice or similar to the terminal connector.
- Galvanized washers used with the eight 5/8 inch splice bolts and nuts that are provided for terminal connectors and/or terminal anchor posts shall be 1 3/4 x 3 x 3/16, or 1 inch i.d. and 2 inch o.d. x 0.134 (ANSI B27.2) narrow Type A plain washers.
- Special fabrication will be required at installations having a curvature of less than 150' radius.
- Button head post bolts (A307) shall be of sufficient length to extend through the full thickness of the nut and no more than 3/4 inch beyond it. Button head splice bolts (A307) are 5/8 x 1 1/4 inch with a 5/8 inch double recessed nut. Fittings (bolts, nuts, and washers) shall be in accordance with Item, Metal for Structures". Fittings shall be subsidiary.
- Crown will be widened to accommodate guard fence.
- If guardrail is placed on a side slope away from the pavement edge, then the slope rate between the edge of the pavement and the face of the barrier will be 1V:10H or flatter.
- Posts shall not be set full depth in concrete.
- Where solid rock is encountered or where shown on the plans, the diameter of the holes shall be approximately 12 inches, the backfilling shall be with a cohesionless material, and embedment depth shall be 1'-6" or more as directed by the Engineer.
- Unless otherwise directed by the Engineer, a composite material post and/or blockout from the Department approved list of suppliers may be substituted for a post and/or blockout of similar dimensions. The list of approved suppliers of posts and blockouts will be maintained by the Construction Division, TxDOT.

Texas Department of Transportation
Design Division (Roadway)

METAL BEAM GUARD FENCE

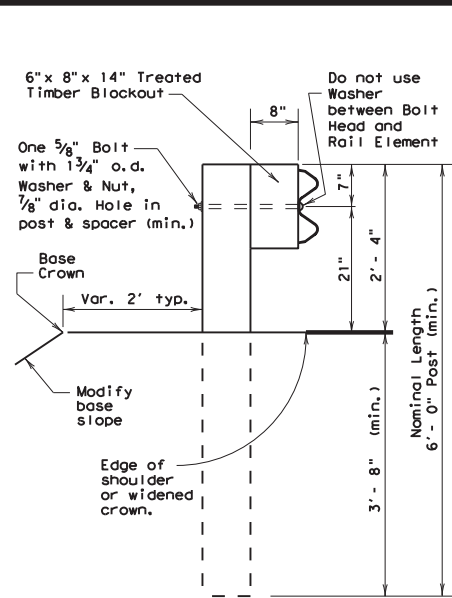
MBGF-03

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© TxDOT JULY 1994	DIST	FED REG	RMC PROJECT	SHEET	
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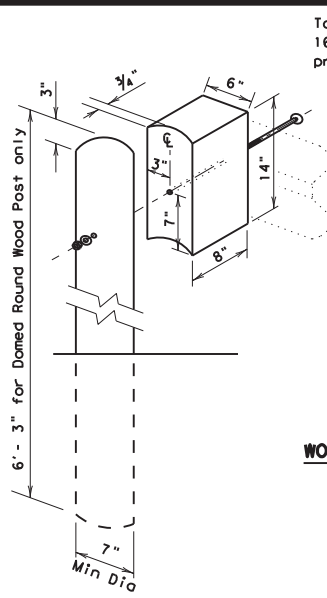
R = Radius
D = Diameter

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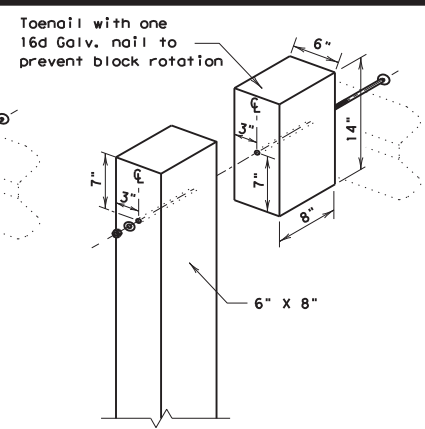
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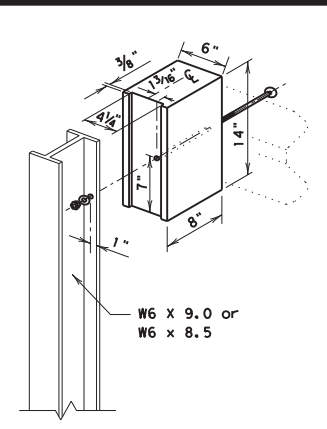
TYPICAL POST



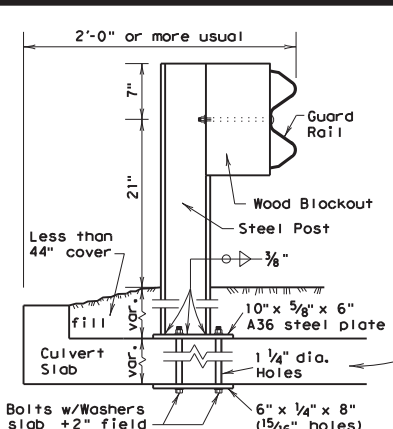
WOOD BLOCKOUT TO ROUND WOOD POST DETAIL



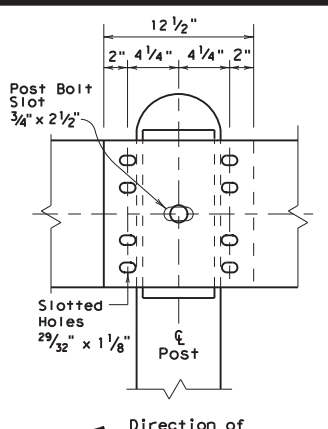
WOOD BLOCKOUT TO RECTANGULAR WOOD POST DETAIL



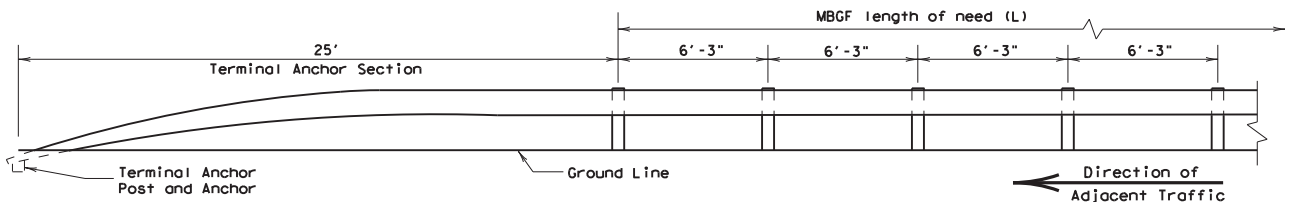
WOOD BLOCKOUT TO STEEL POST DETAIL



LOW FILL CULVERT POST MOUNTING OPTION

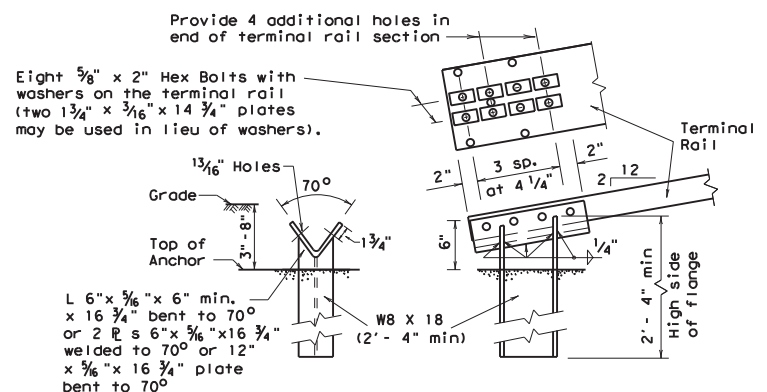


RAIL SPLICE



ELEVATION FOR TERMINAL ANCHOR SECTION

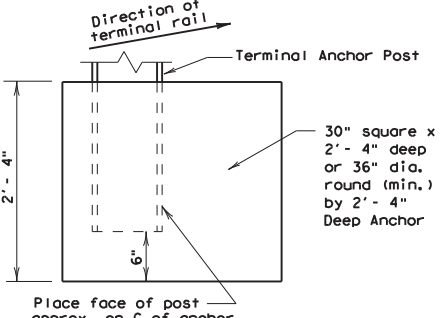
(Terminal anchor sections are only for downstream guardrail end anchorage usage outside the horizontal clearance area of opposing traffic)



TERMINAL ANCHOR POST OPTIONS

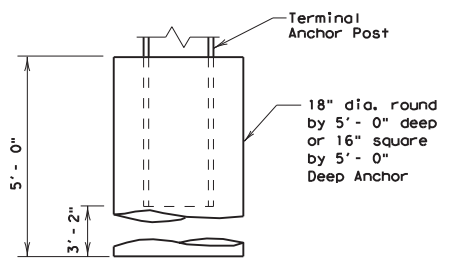
Note: This post requires four additional holes (shop or field) in the terminal rail member with eight 5/8" bolts and washer plates as shown for attachment.

Note: This optional post requires the use of the 10 ga. terminal connector with four 7/8" hex bolts for attachment to the anchor post.

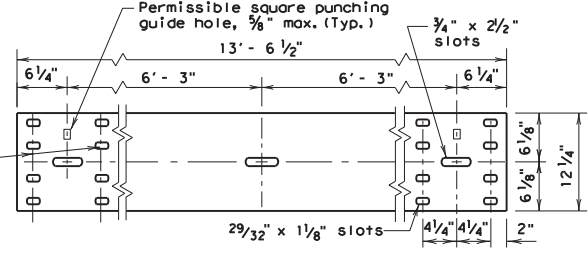


Notes: Either post may be used with either anchor. No construction joint is allowed in the concrete anchor. Terminal rail may be bolted to post and in twist position prior to placing concrete anchor. If concrete anchor is precast, the area should be compacted as directed by the Engineer, when placed in the field.

TERMINAL CONCRETE ANCHOR OPTIONS



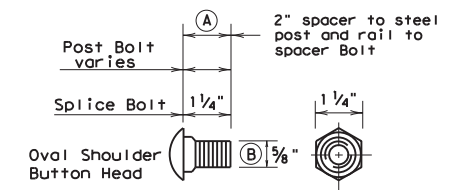
TERMINAL CONNECTOR



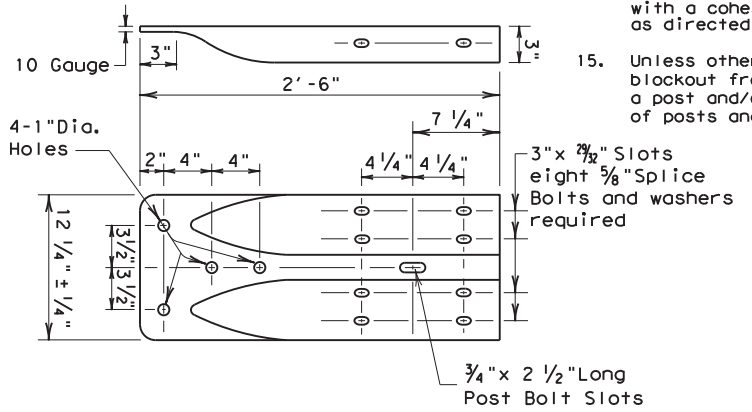
ELEVATION OF NOMINAL 12 1/2 FOOT GUARD RAIL

(25 foot sections may also be supplied)

- (A) 1 1/4" spacer to steel post hex bolt, 2" rail to spacer button head bolt.
- (B) 1/8" hex bolts required for terminal connector



CONNECTOR DETAIL



GENERAL NOTES

- The exact position of guard fence shall be as shown elsewhere on the plans or as directed by the Engineer. Guard fence shall be transitioned to a smooth connection with other guard fence or structure railing as shown elsewhere on plans.
- Rail element shall meet all requirements of AASHTO M-180 except as modified on the plans. The terminal connectors 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 Terminal Connector prior to ordering of materials.
- Unless otherwise shown in the plans, guard fence placed in the vicinity of curbs shall be blocked out so that the face of curb is located directly below or behind the face of the blockout. Rail placed over curbs shall be installed so that the post bolt is located approximately 21-inches above the gutter pan or roadway surface.
- Unless otherwise shown in the plans, MBGF shall be placed with the face of rail directly above the shoulder edge (or curbface) except for upstream end treatments.
- At the option of the Contractor, the rail elements for the guard fence may be furnished in either 12 1/2 or 25 foot nominal lengths with post bolt slots for connection to posts.
- The terminal anchor post shall be set in Class "A" concrete in (unless otherwise shown on plans) in accordance with Item, "Portland Cement Concrete". Concrete shall be subsidiary to the bid item requiring construction of the terminal rail section and anchorage system.
- An anchor other than to a terminal anchor post shall consist of a connection similar to the rail splice or similar to the terminal connector.
- Galvanized washers used with the eight 5/8" splice bolts and nuts that are provided for terminal connectors and/or terminal anchor posts shall be 1 3/4" x 3" x 3/16", or 1" i.d. and 2" o.d. x 0.134" (ANSI B27.2) narrow Type A plain washers.
- Special fabrication will be required at installations having a curvature of less than 150' radius.
- Button head post bolts (A307) shall be of sufficient length to extend through the full thickness of the nut and no more than 3/4" beyond it. Button head splice bolts (A307) are 5/8" x 1 1/4" with a 5/8" double recessed nut. Fittings (bolts, nuts, and washers) shall be in accordance with Item, Metal for Structures". Fittings shall be subsidiary.
- Crown will be widened to accommodate guard fence.
- If guardrail is placed on a side slope away from the pavement edge, then the slope rate between the edge of the pavement and the face of the barrier will be 1V:10H or flatter.
- Posts shall not be set full depth in concrete.
- Where solid rock is encountered or where shown on the plans, the diameter of the holes shall be approximately 12 inches, the backfilling shall be with a cohesionless material, and embedment depth shall be 1'-6" or more as directed by the Engineer.
- Unless otherwise directed by the Engineer, a composite material post and/or blockout from the Department approved list of suppliers may be substituted for a post and/or blockout of similar dimensions. The list of approved suppliers of posts and blockouts will be maintained by the Construction Division, TxDOT.

Texas Department of Transportation
Design Division (Roadway)

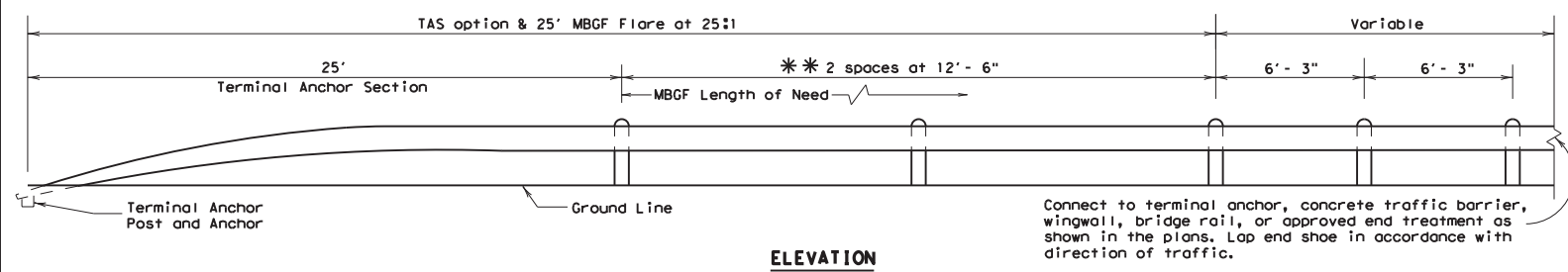
METAL BEAM GUARD FENCE

MBGF-01

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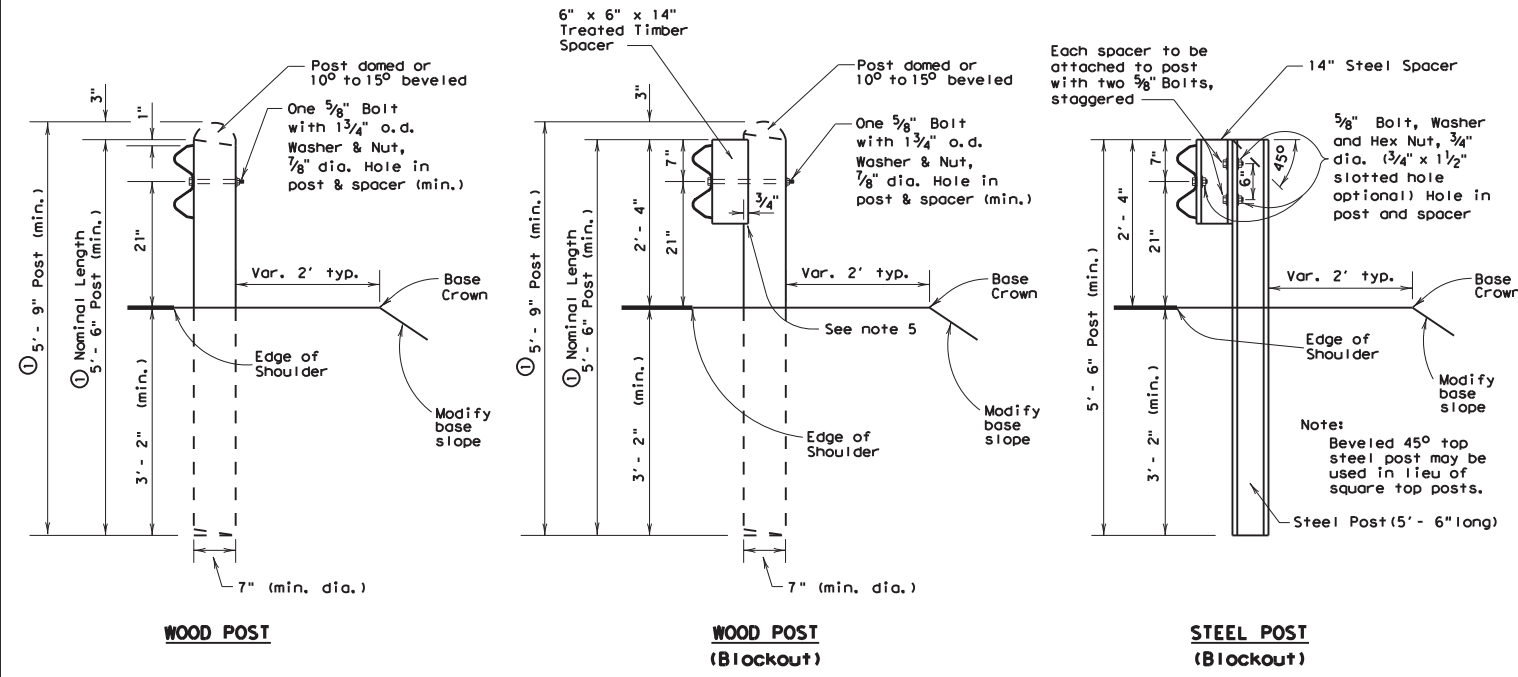
R = Radius
D = Diameter

** Post spacing of 6'-3" may be used on the downstream (from a traffic flow standpoint) end of MBGF placed on roadways with one-way traffic operations.



ELEVATION

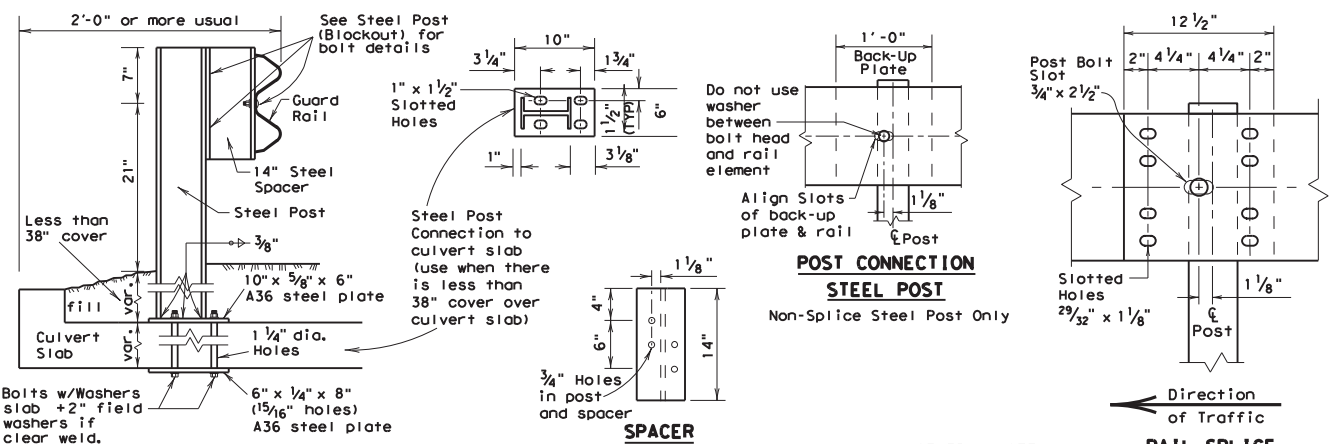
Note ①: Where a nominal length of 6'-0" is specified as acceptable elsewhere in the plans, these dimensions shall be increased by 0'-6". The additional length should be specified only on roadways where future ACP overlays and adjustments of the rail height on the same posts are likely.



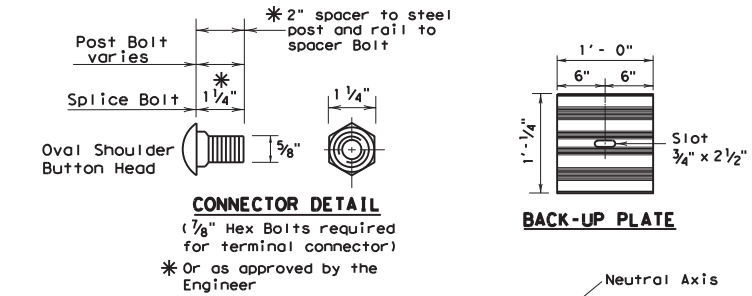
WOOD POST

WOOD POST (Blockout)

STEEL POST (Blockout)



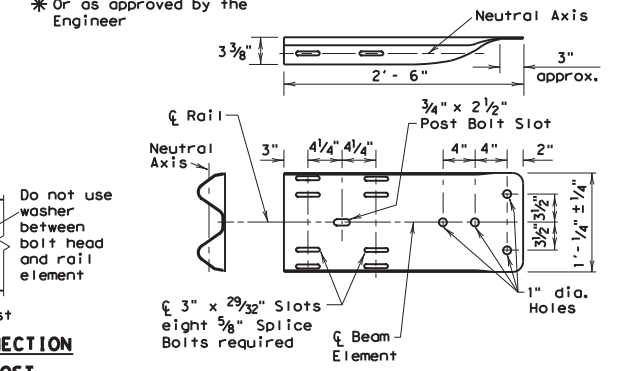
LOW FILL CULVERT POST MOUNTING OPTION



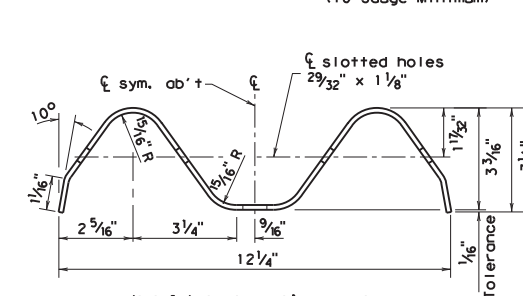
CONNECTOR DETAIL

POST CONNECTION WOOD POST

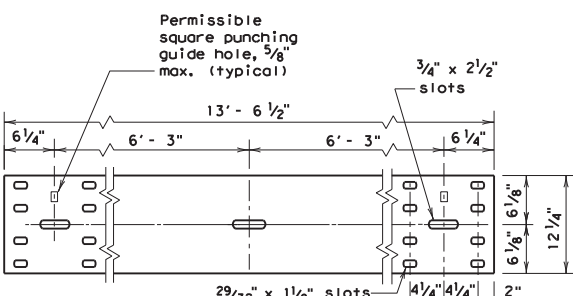
BACK-UP PLATE



TERMINAL CONNECTOR (10 Gauge Minimum)



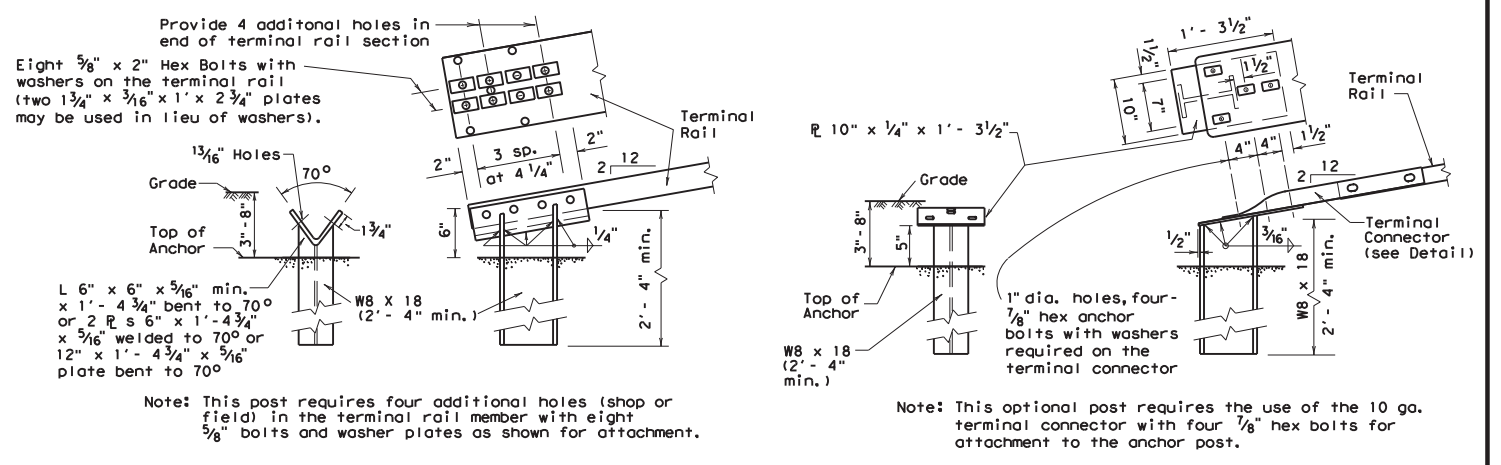
SECTION THRU GUARD RAIL



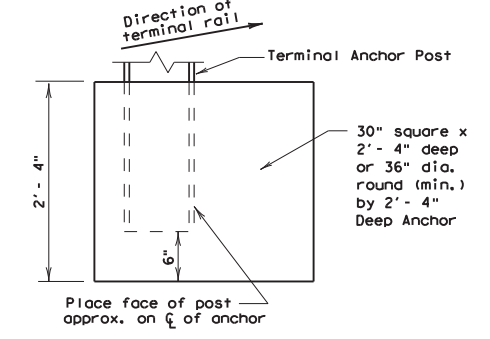
ELEVATION OF NOMINAL 12 1/2 FOOT GUARD RAIL

(25 foot sections may also be supplied)

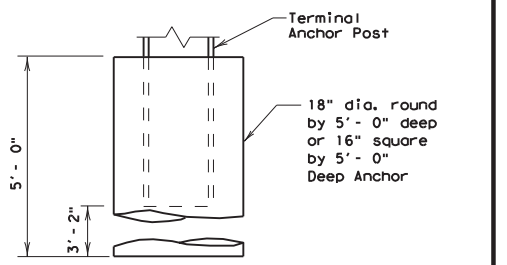
- GENERAL NOTES**
- The exact position of guard fence shall be as shown elsewhere on the plans or as directed by the Engineer. Guard fence shall be transitioned to a smooth connection with other guard fence or structure railing as shown elsewhere on plans.
 - Unless otherwise shown in the plans, guard fence placed in the vicinity of curbs shall be blocked out so that the face of curb is located directly below or behind the face of rail. Rail placed over curbs shall be installed so that the post bolt is located approximately 21-inches above the gutter pan or roadway surface.
 - Unless otherwise shown in the plans, MBGF shall be placed with the face of rail directly above the shoulder edge for curbface except the 25' Terminal Anchor Section and adjacent 25' or MBGF shall be flared at 25:1 (longitudinal) to provide a 2' offset between buried anchor and shoulder edge for curbface. Flaring the 25' Terminal Anchor and adjacent 25' MBGF is optional for one-way traffic conditions on the downstream end of guard fence.
 - At the option of the Contractor, the rail elements for the guard fence may be furnished in either 12 1/2' or 25' foot nominal lengths with post bolt slots for connection to posts.
 - Timber posts may be beveled from 10 to 15 degrees on the top of both ends with high side of top of post placed toward the roadway or they may be domed. When blackout guard fence is specified elsewhere in the plans, a 6' x 6' x 14' treated timber spacer of yellow pine shall be used with wood posts. When "blocked out" the upper portion of the post shall be notched 3/4" to provide flat surface for timber spacer. A tolerance of ±1/8" will be permitted on the notched portion of the post. Routing the timber spacer may be used in lieu of notching the post. The depth of routing shall be 3/4" at the center of radius ±1/8".
 - Steel posts shall be blocked out. Steel posts and spacers shall meet the requirements of ASTM A-36 (W6 x 9.0 or W6 x 8.5). Bolt holes shall be approximately centered between web and edge of flange of spacers and posts.
 - Post spacing will be 6'-3" except that the first post will be 25' from the terminal anchor post and the next two posts spaced at 12'-6" with a minimum of 8 posts adjacent to structures spaced at 3'-1 1/2" and posts adjacent to Type 16 bridge rail are spaced at 6'-3". Post spacing adjacent to structures may vary as shown on bridge rail details or as directed by the Engineer.
 - The upper 10" (minimum) of the terminal anchor post and all steel fittings thereon shall be galvanized.
 - The terminal anchor post shall be set in Class "A" concrete in (unless otherwise shown on plans) in accordance with Item, "Portland Cement Concrete". Concrete shall be subsidiary to the bid item requiring construction of the terminal rail section and anchorage system.
 - An anchor other than to a terminal anchor post shall consist of a connection similar to the rail splice or similar to the terminal connector.
 - Back-up plates shall be provided at intermediate (non-splice) steel posts. Back-up plates shall conform to the materials and galvanizing requirements specified for the rail element, and shall be of the same nominal thickness as the rail element used.
 - Washers used with the eight 5/8" splice bolts and nuts that are provided for terminal connectors and/or terminal anchor posts shall be 1 1/4" x 3" x 3/16", or 1" t.d. and 2" o.d. x 0.134" (ANSI B27.2) narrow Type A plain washers.
 - The 10 gauge terminal connectors must be used with the optional terminal anchor post. Either anchor post may be used with either concrete anchor.
 - Welded steel posts and spacers shall meet the requirements of ASTM A-36. The flange width and thickness, web thickness, and depth of welded posts and spacers shall equal or exceed the dimensions of a standard rolled W6 x 8.5 or W6 x 9.0.
 - Special fabrication will be required at installations having a curvature of less than 150' radius.
 - Bolts shall be of sufficient length to extend through the full thickness of the nut and no more than 3/4" beyond it. (Button head bolts may be used instead of hex bolts when specified by the Engineer.) Fittings (bolts, nuts, and washers) shall be in accordance with Item, "Metal For Structures". Fittings shall be subsidiary to the bid item requiring construction of MBGF or Terminal Anchor Section.
 - Crown will be widened to accommodate guard fence.
 - Where solid rock is encountered or where shown on the plans, the diameter of the holes approximately 12 inches, the backfilling shall be with a cohesionless material, and embedment depth shall be 1'-6" or more as directed by the Engineer. Timber posts shall not be set in concrete.



TERMINAL ANCHOR POST OPTIONS



TERMINAL CONCRETE ANCHOR OPTIONS



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Texas Department of Transportation
 Design Division (Roadway)

METAL BEAM GUARD FENCE

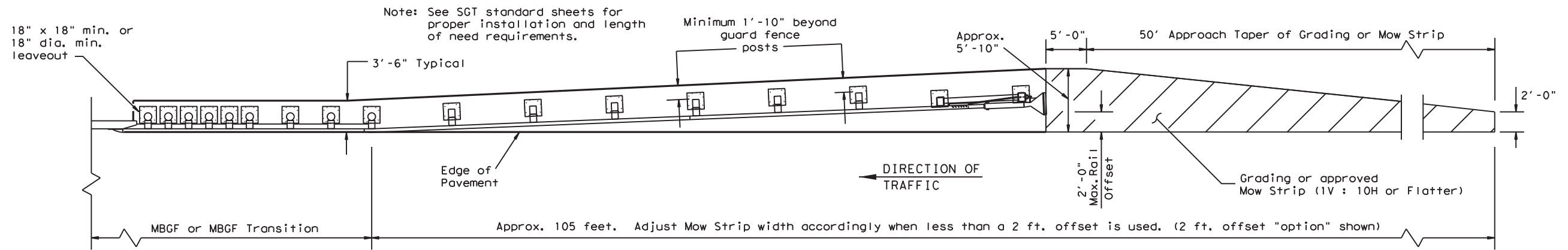
"USE FOR REPAIRS ONLY"

MBGF-94

TXDOT JULY 1994	DR- TGM	CR- TGM	DR- BGD	CR-	NEG NO. AG
MODIFICATIONS		STATE DISTRICT	FEDERAL REGION	RMC PROJECT	
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BEXAR		6372	50	001	VAR.

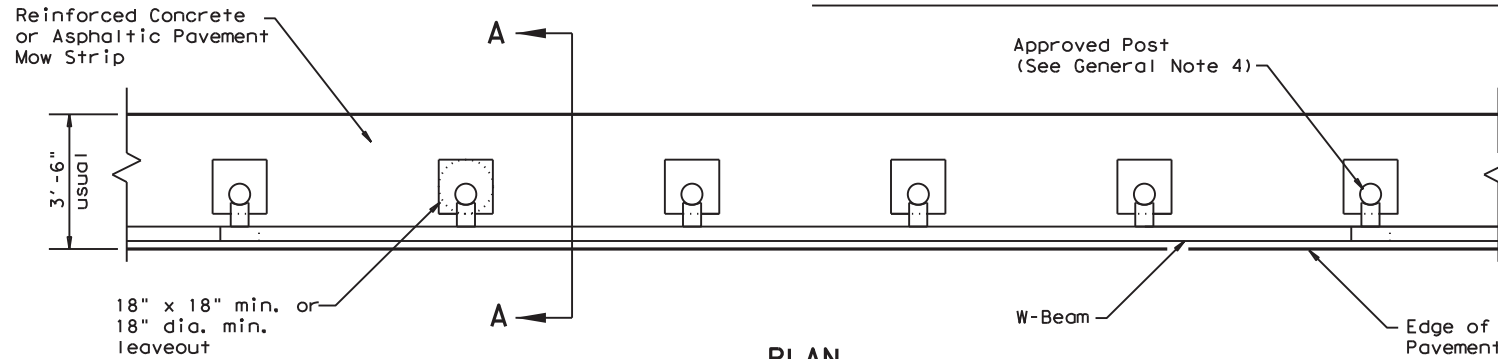
DISCLAIMER: THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. TXDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.

DATE: FILE:



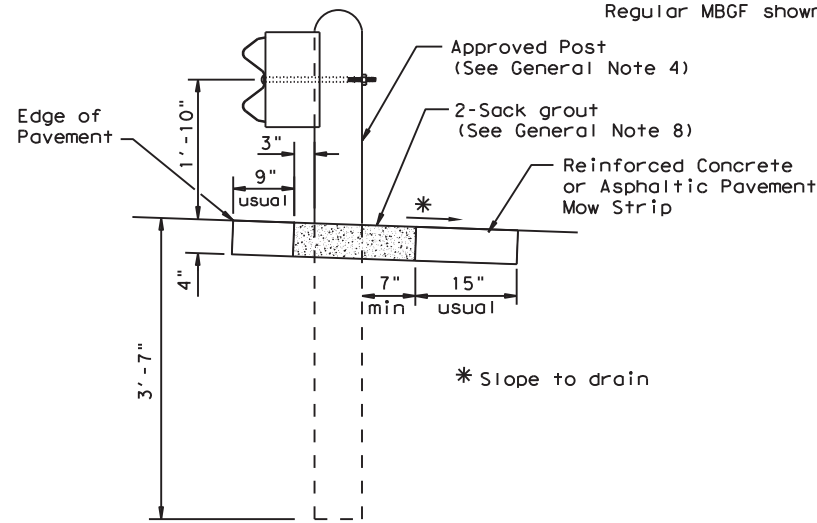
GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS

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.



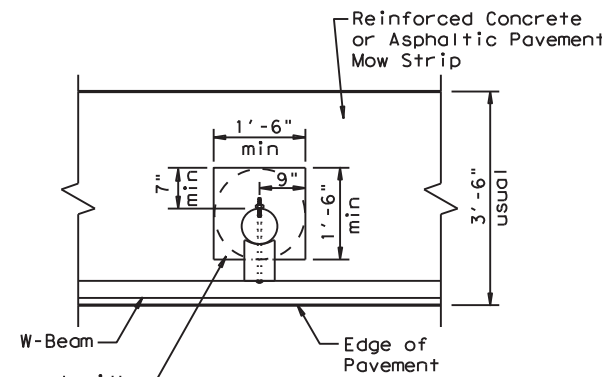
PLAN

Regular MBGF shown with Mow Strip



SECTION A-A

Typical

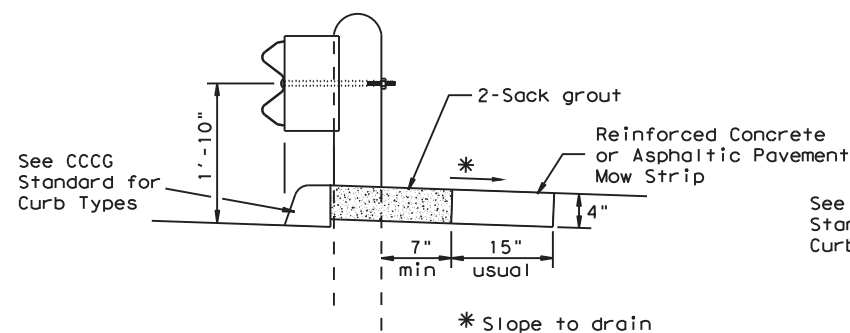


MOW STRIP DETAIL

Reinforced Concrete or Asphaltic Pavement Mow Strip with 18" x 18" or 18" dia. minimum leaveout.

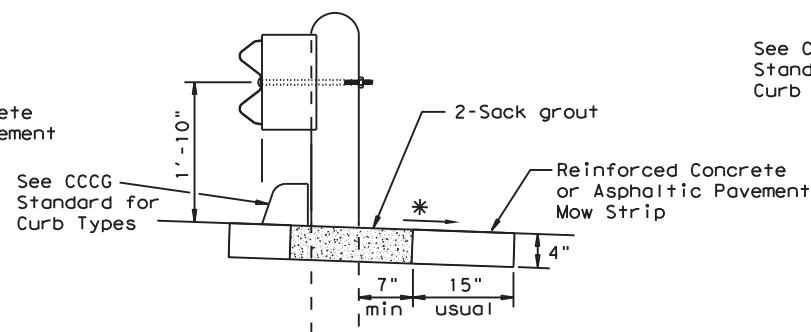
GENERAL NOTES

- This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments (See SGT standards for proper SGT installation).
- Mow strips shall be asphaltic pavement or reinforced concrete (wire mesh or synthetic fiber), as shown on the plans and will be paid for under the pertinent bid item of work. Asphaltic pavement shall meet the requirements of the item, and be placed in accordance with the pertinent bid item as shown on the plans. 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.
- The leaveout behind the post shall be a minimum of 7".
- The type of approved post will be shown elsewhere in the plans. See the applicable standard sheets for additional details and information.
- 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.
- Depth of mow strip will be 4".
- The limits of payment for asphaltic pavement or reinforced concrete will include leaveouts for posts.
- The leave-outs shall be filled with no more than a 2-sack grout mixture (1 part cement, 5 parts water, and 14 parts sand by volume) with a 28-day compressive strength of approximately 120 psi or less. Provide grout of 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 rip rap mow strip.



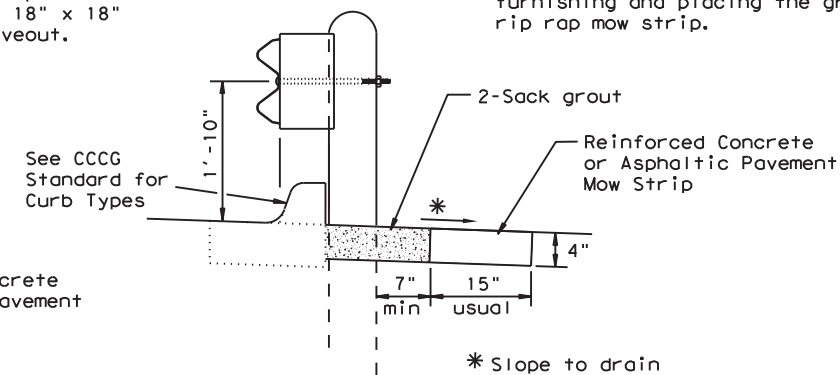
CURB OPTION (1)

This option will increase the post embedment through out the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

ONLY FOR USE IN MAINTENANCE REPAIRS.

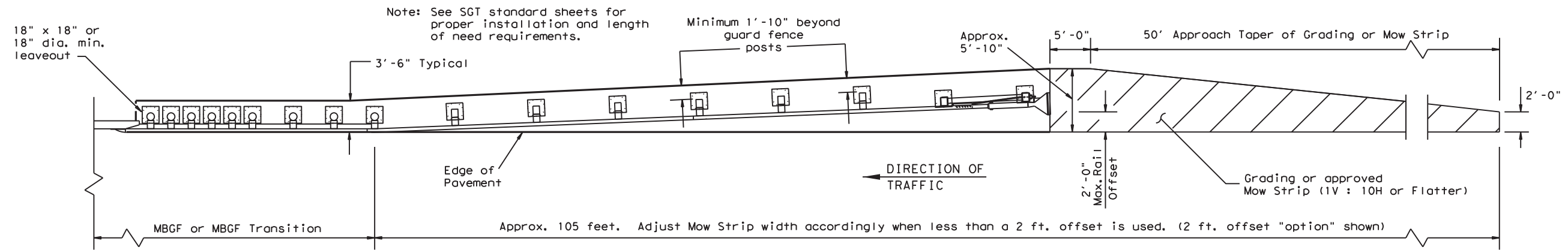


METAL BEAM GUARD FENCE (MOW STRIP)

MBGF (MS) - 19

FILE: mbgfms19.dgn	DN: TXDOT	CK: KM	DW: TXDOT	CK: CL
© TXDOT NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
DIST	COUNTY		SHEET NO.	
SAT	BEXAR		199	

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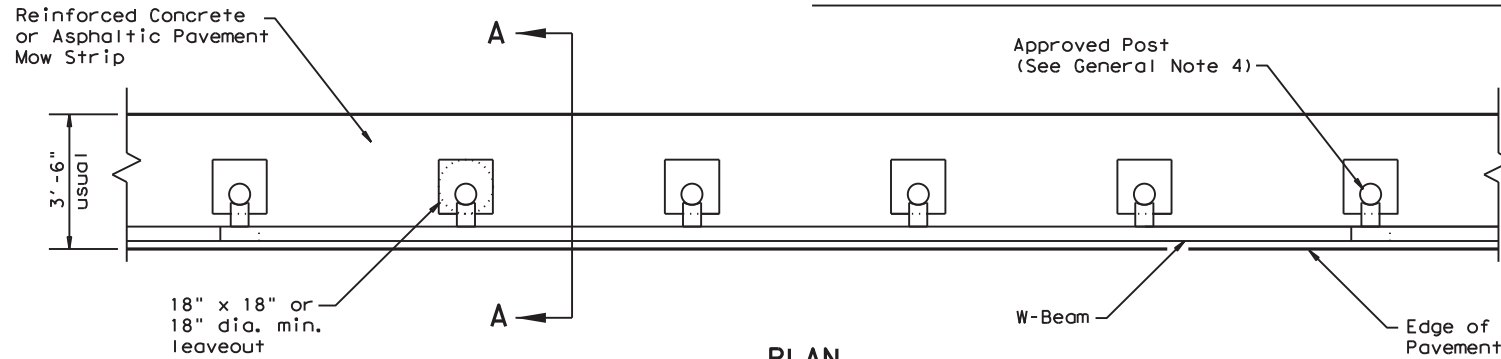


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS

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.

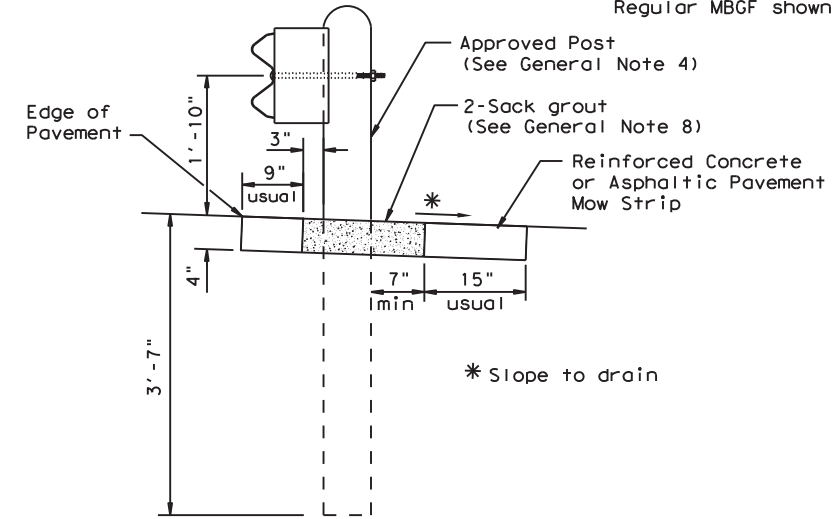
GENERAL NOTES

1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments (See SGT standards for proper SGT installation).
2. Mow strips shall be asphaltic pavement or reinforced concrete (wire mesh or synthetic fiber), as shown on the plans and will be paid for under the pertinent bid item of work. Asphaltic pavement shall meet the requirements of the item, and be placed in accordance with the pertinent bid item as shown on the plans. 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 leaveout behind the post shall be a minimum of 7".
4. The type of approved post will be shown elsewhere in the plans. See the applicable standard sheets for additional details and information.
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. Depth of mow strip will be 4".
7. The limits of payment for asphaltic pavement or reinforced concrete will include leaveouts for post.
8. The leaveouts shall be filled with no more than a 2-sack grout mixture and placed in accordance with Section 421.2.F, "Mortar and Grout." Payment for furnishing and placing the grout mixture will be considered subsidiary to the pay item of asphaltic pavement or reinforced concrete.



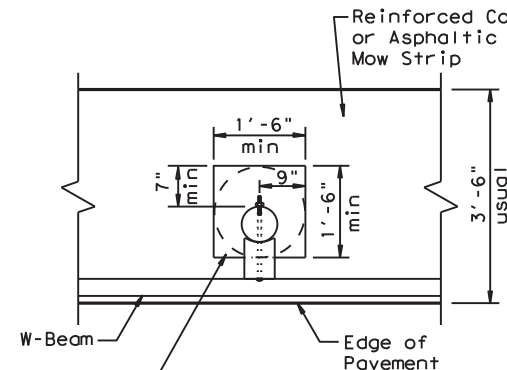
PLAN

Regular MBEF shown with Mow Strip



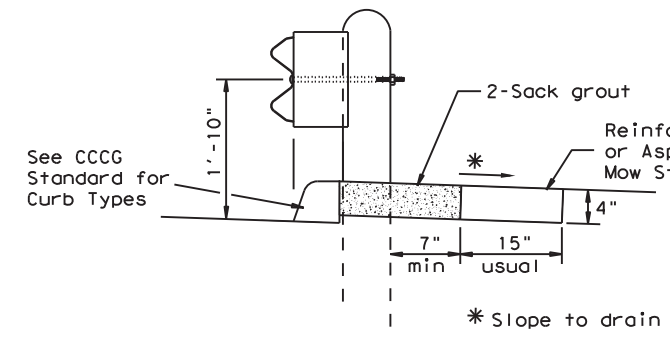
SECTION A-A

Typical



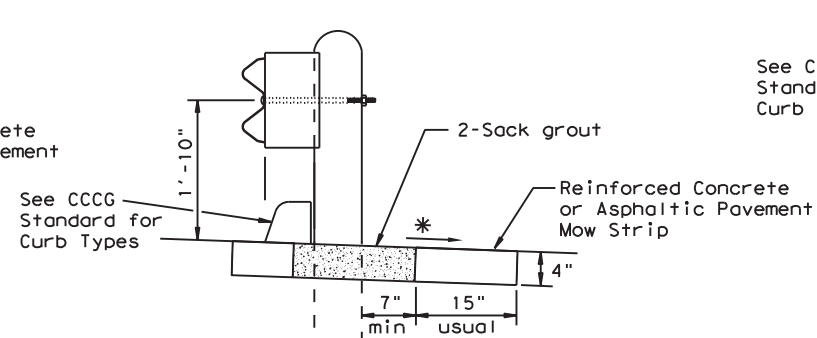
MOW STRIP DETAIL

Reinforced Concrete or Asphaltic Pavement Mow Strip with 18" x 18" or 18" dia. minimum leaveout.



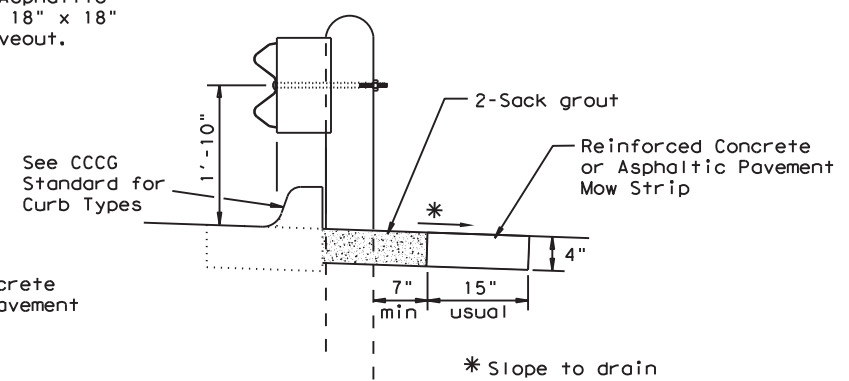
CURB OPTION (1)

This option will increase the post embedment through out the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

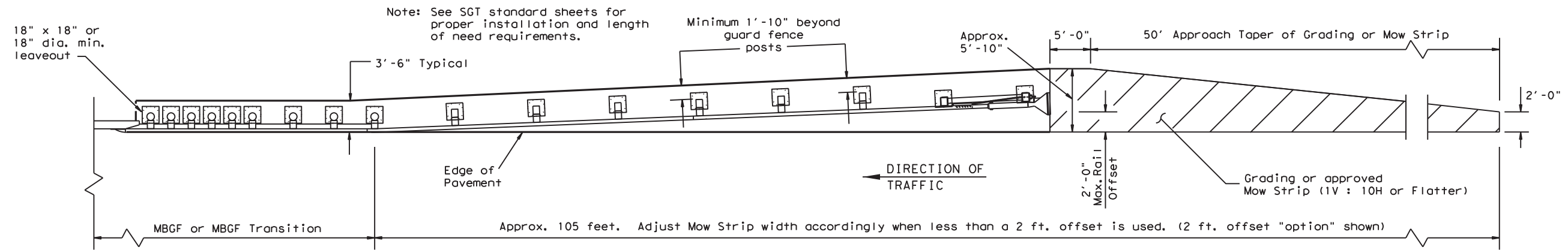


METAL BEAM GUARD FENCE (MOW STRIP) MBEF (MS) - 11

FILE: mbgfms11.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
© TxDOT April 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	OOI	VAR.
12-2011	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	200	

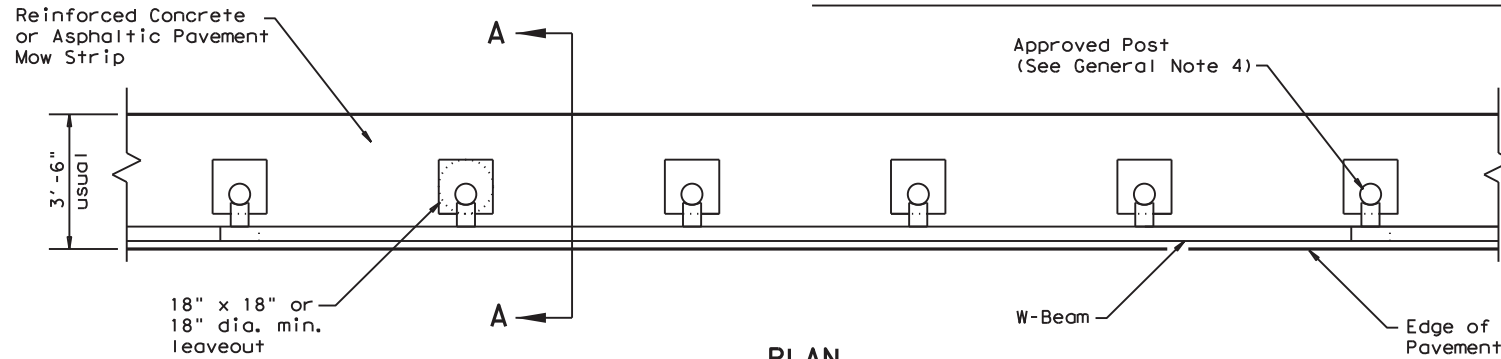
DATE:
FILE:

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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.

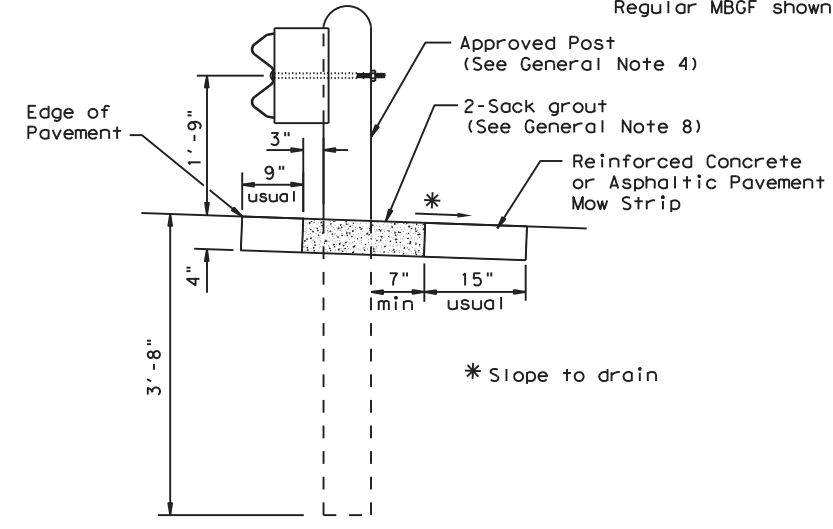


PLAN

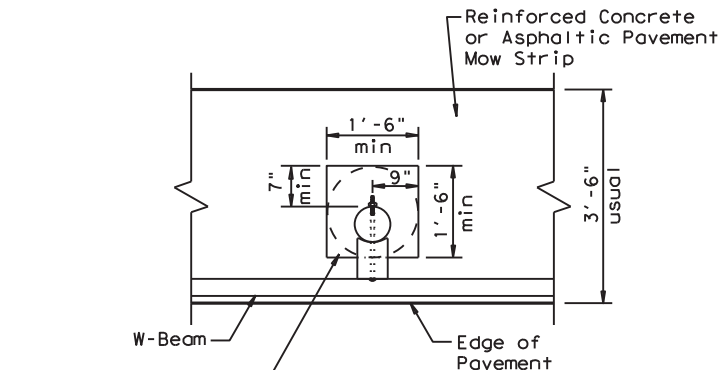
Regular MBGF shown with Mow Strip

GENERAL NOTES

1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments (See SGT standards for proper SGT installation).
2. Mow strips shall be asphaltic pavement or reinforced concrete (wire mesh or synthetic fiber), as shown on the plans and will be paid for under the pertinent bid item of work. Asphaltic pavement shall meet the requirements of the item, and be placed in accordance with the pertinent bid item as shown on the plans. 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 leaveout behind the post shall be a minimum of 7".
4. The type of approved post will be shown elsewhere in the plans. See the applicable standard sheets for additional details and information.
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. Depth of mow strip will be 4".
7. The limits of payment for asphaltic pavement or reinforced concrete will include leaveouts for post.
8. The leaveouts shall be filled with no more than a 2-sack grout mixture and placed in accordance with Section 421.2.F, "Mortar and Grout." Payment for furnishing and placing the grout mixture will be considered subsidiary to the pay item of asphaltic pavement or reinforced concrete.



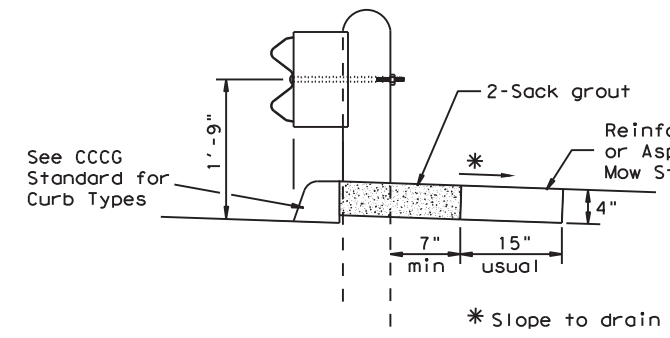
SECTION A-A
Typical



MOW STRIP DETAIL

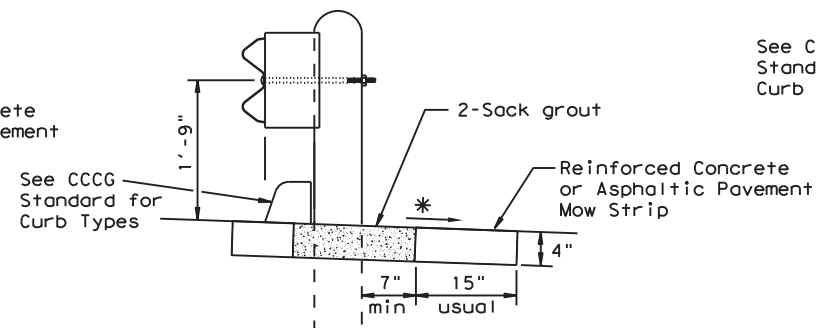
Reinforced Concrete or Asphaltic Pavement Mow Strip with 18" x 18" or 18" dia. minimum leaveout.

Fill leaveout with 2-Sack grout. (See General Note 8)



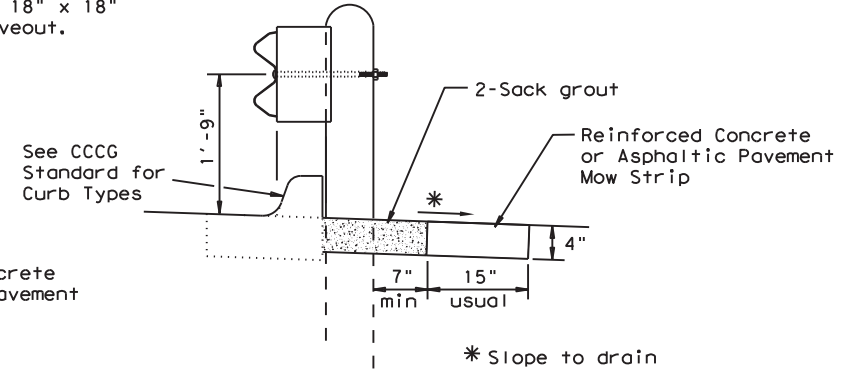
CURB OPTION (1)

This option will increase the post embedment through out the system.



CURB OPTION (2)

Curb shown on top of mow strip



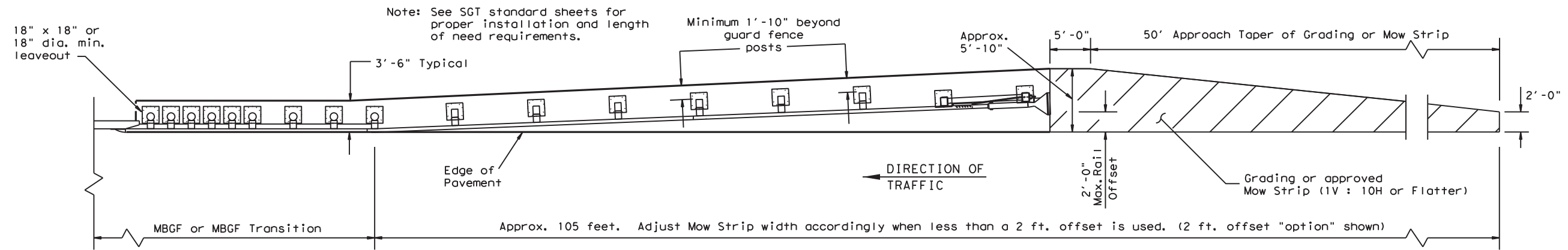
CURB OPTION (3)

Texas Department of Transportation
 Design Division Standard

METAL BEAM GUARD FENCE
(MOW STRIP)
MBGF (MS) - 10

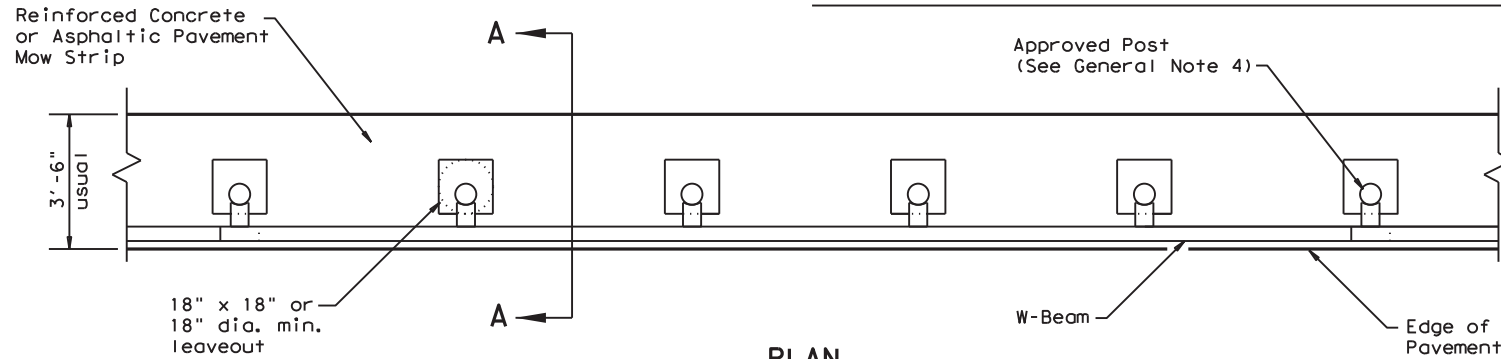
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© TxDOT April 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	201	

DATE: FILE:



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.

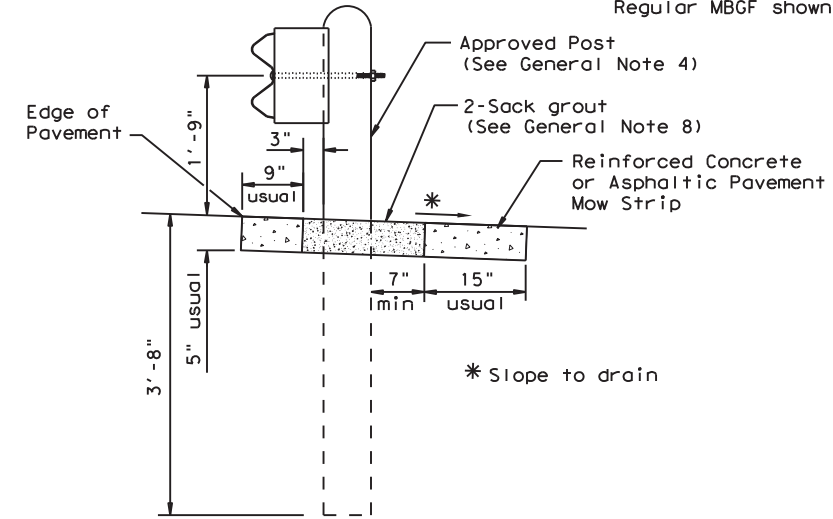


PLAN

Regular MBGF shown with Mow Strip

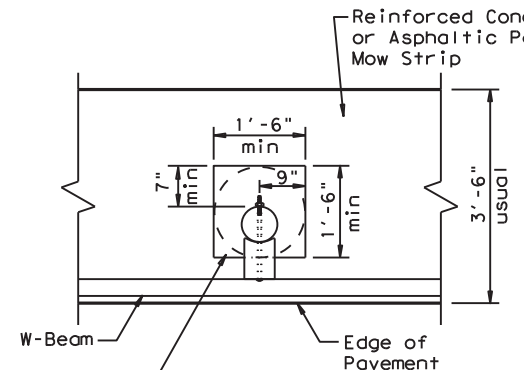
GENERAL NOTES

1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments (See SGT standards for proper SGT installation).
2. Mow strips shall be asphaltic pavement or reinforced concrete as shown on the plans and will be paid for under the pertinent bid item of work. Asphaltic pavement shall meet the requirements of and be placed in accordance with the pertinent bid item as shown on the plans. Reinforced concrete shall be placed in accordance with Item 432, "Riprap".
3. The leaveout behind the post shall be a minimum of 7".
4. The type of approved post will be shown elsewhere in the plans. See the applicable standard sheets for additional details and information.
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. Depth of mow strip may vary, (5" usual, 8" maximum).
7. The limits of payment for asphaltic pavement or reinforced concrete will include leaveouts for post.
8. The leaveouts shall be filled with no more than a 2-sack grout mixture and placed in accordance with Section 421.2.F, "Mortar and Grout." Payment for furnishing and placing the grout mixture will be considered subsidiary to the pay item of asphaltic pavement or reinforced concrete.



SECTION A-A

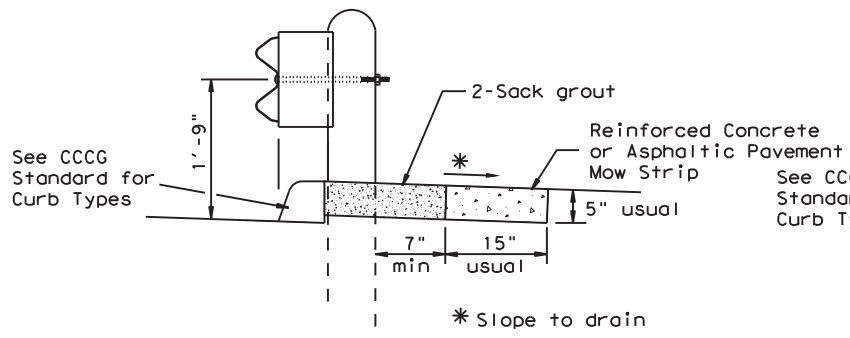
Typical



MOW STRIP DETAIL

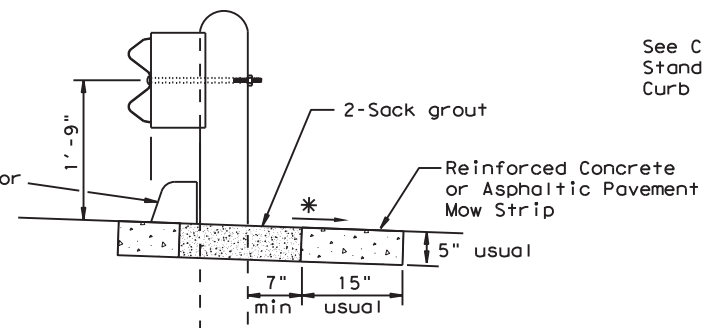
Fill leaveout with 2-Sack grout. (See General Note 8)

Reinforced Concrete or Asphaltic Pavement Mow Strip with 18" x 18" or 18" dia. minimum leaveout.



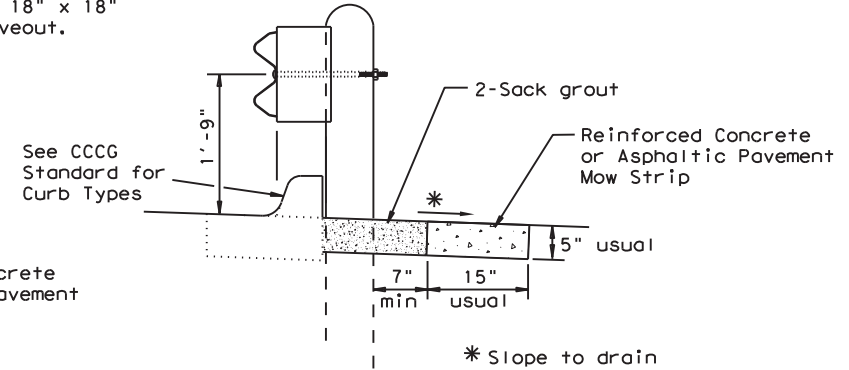
CURB OPTION (1)

This option will increase the post embedment through out the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

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LEVELS DISPLAYED	
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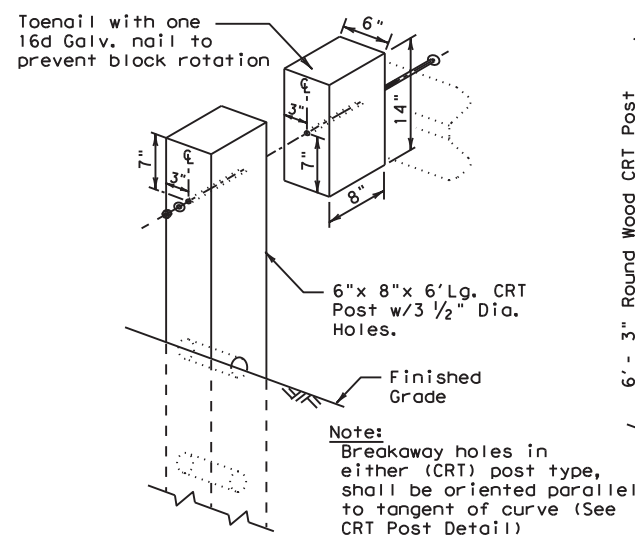
Texas Department of Transportation
 Design Division (Roadway)

METAL BEAM GUARD FENCE
 (MOW STRIP)
 MBGF (MS) - 09

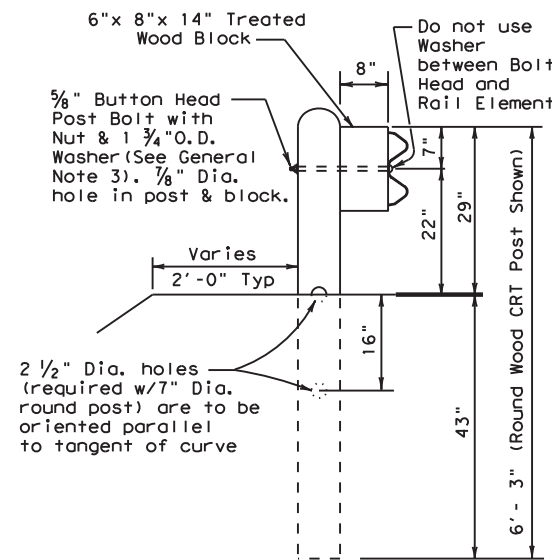
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© TxDOT April 2003	DIST	FEDERAL AID PROJECT		SHEET
REVISIONS	SAT			202
	COUNTY	CONTROL	SECT	JOB
	BEXAR	6372	50	001
				VAR.

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DATE: FILE:

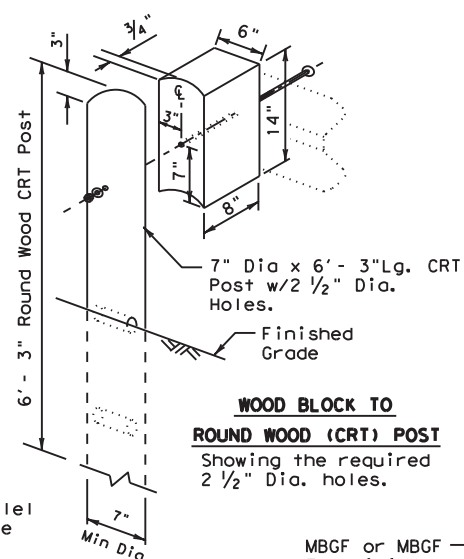


WOOD BLOCK TO RECTANGULAR WOOD (CRT) POST
Showing the required 3 1/2" Dia. holes.

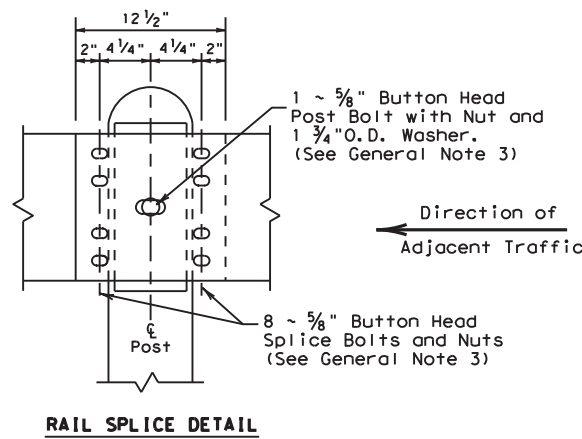


(CRT) POST DETAIL CONTROLLED RELEASE TERMINAL POST

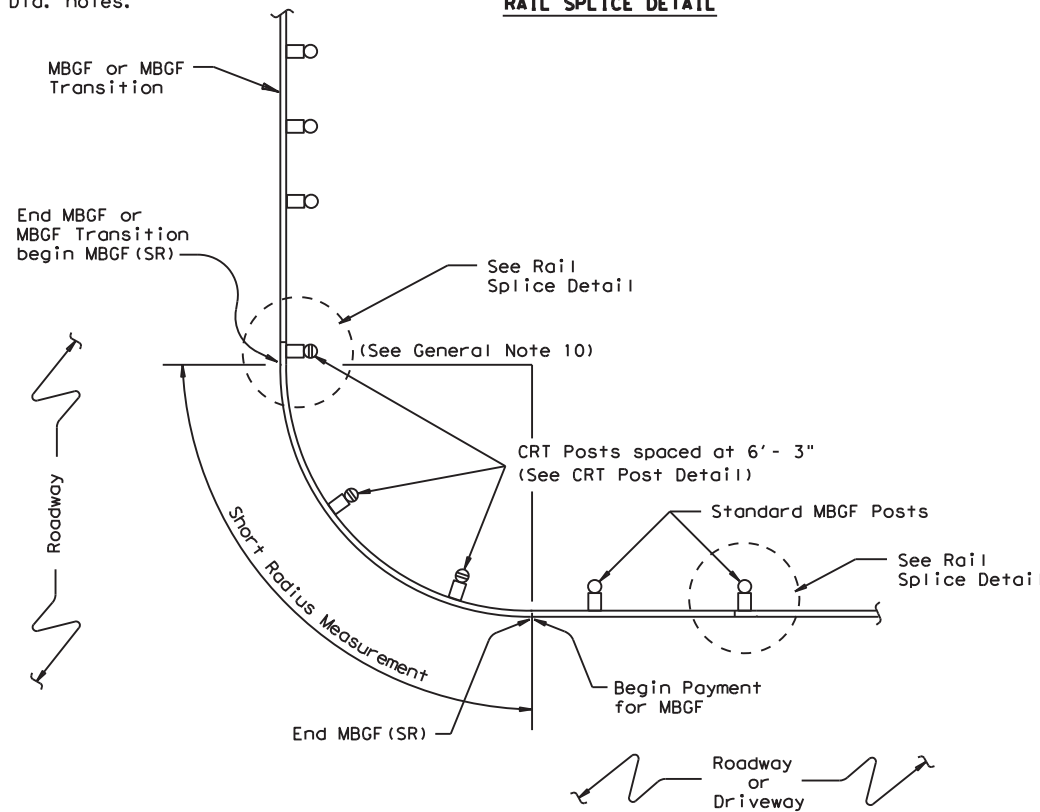
Two or more wood CRT post(s) are required at any radius installation located at intersecting roadways or driveways.



WOOD BLOCK TO ROUND WOOD (CRT) POST
Showing the required 2 1/2" Dia. holes.



RAIL SPLICE DETAIL

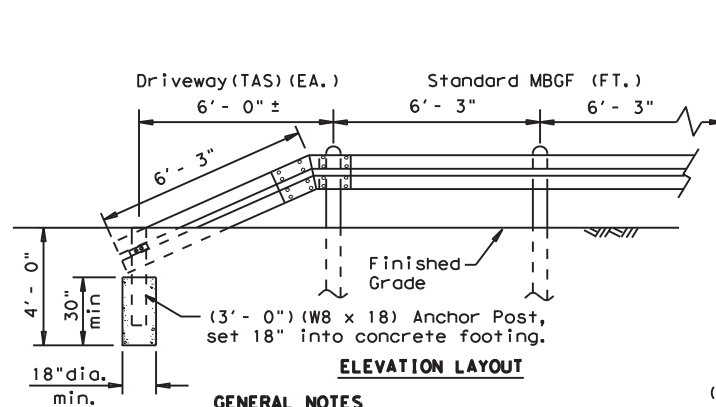


PLAN VIEW SHOWING TYPICAL RADIUS

The required radius is shown elsewhere on the plans.

GENERAL NOTES

- The type of (CRT) post (round wood post, or rectangular wood post) will be shown elsewhere in the plans. The exact position of MBGF shall be shown elsewhere in the plans or as directed by the Engineer.
- Steel posts are not permitted at CRT post positions.
- Rail element shall meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified on the plans. The Contractor may furnish rail elements of 12 1/2 or 25 foot nominal lengths.
- Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and Type A (1 3/4" O.D.) washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 5/8" x 1 1/4" (or 2" long at triple rail splices) with a 3/8" double recessed nut (ASTM A563).
- 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 slope rate of not more than 1V:10H.
- 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 block. Rail placed over curbs shall be installed so that the post bolt is located approximately 21 inches above the gutter pan or roadway surface.
- If solid rock is encountered within 0 to 18" of the finished grade, drill a 22" dia. hole, 24" into the rock, or drill two 12" dia. front to back overlapping holes, 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 is less. Any excess post length, after meeting these depths, may be field cut to ensure proper guardrail mounting height. Backfill with a cohesionless material.
- Guardrail posts shall not be set in concrete, of any depth.
- Special rail fabrication will be required at installations having a curvature of less than 150 ft. radius. The required radius shall be shown on the plans.
- The terminal anchor section (TAS) post shall be set in Class A concrete (unless otherwise shown in the plans) in accordance with Item 421, "Hydraulic Cement Concrete." Concrete shall be subsidiary to the bid item requiring construction of the terminal anchor section (TAS). Terminal anchor post to be galvanized in accordance with Item 445, "Galvanizing."
- Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or 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 can furnish composite material posts and/or blocks.



ELEVATION LAYOUT

GENERAL NOTES

- The "Driveway" Terminal Anchor Section is ONLY to be used within driveway locations, where the ROW is limited and a standard 25 ft. (TAS) Terminal Anchor Section, is too long.
- Terminal anchor post shall be set in Class A concrete.
- All steel shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."

"DRIVEWAY" TERMINAL ANCHOR SECTION

Only for use within driveway locations, where a standard (TAS) Terminal Anchor Section can not be installed.

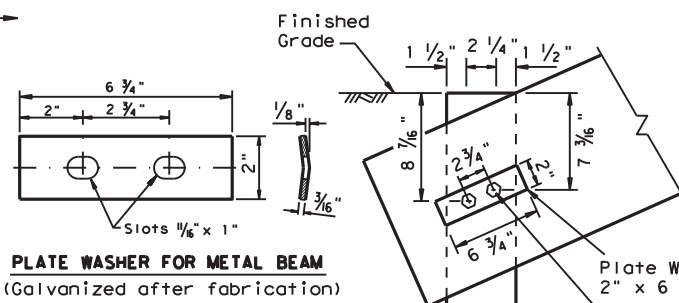
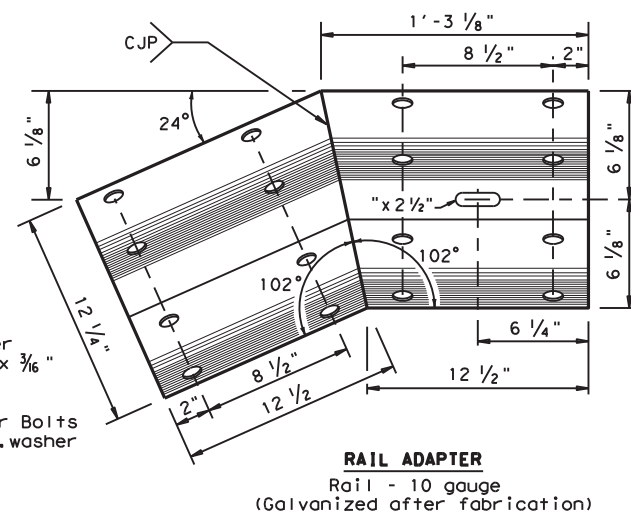


PLATE WASHER FOR METAL BEAM
(Galvanized after fabrication)

ANCHOR POST



RAIL ADAPTER
Rail - 10 gauge
(Galvanized after fabrication)

ONLY FOR USE IN MAINTENANCE REPAIRS OR HIGHLY CONSTRAINED SITE CONDITIONS.

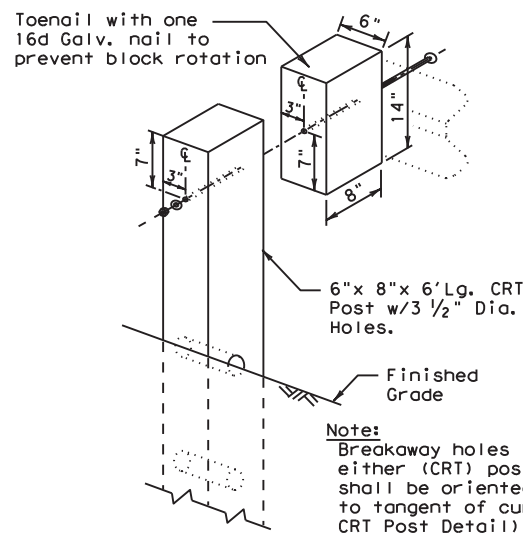


METAL BEAM GUARD FENCE (SHORT RADIUS) MBGF (SR) - 19

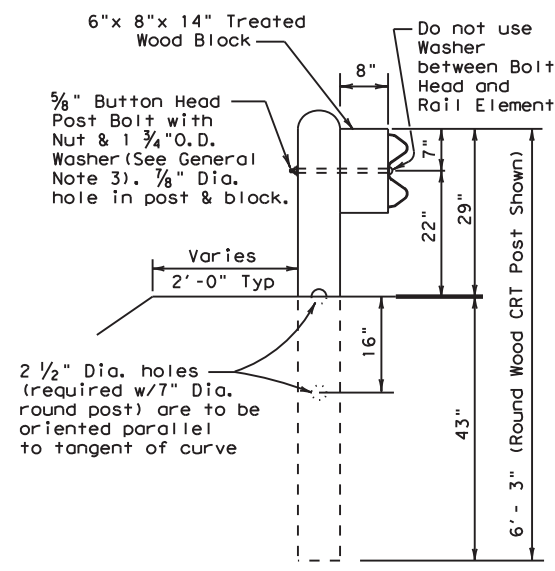
FILE: mbgfsr19.dgn	DN: TxDOT	CK: KM	DW: BD	CK: VP
© TxDOT NOVEMBER 2019 REVISIONS	CONT	SECT	JOB	HIGHWAY
	6372	50	001	VAR.
	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	203	

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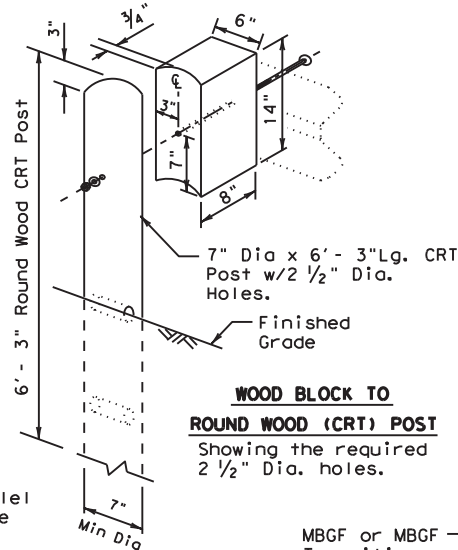
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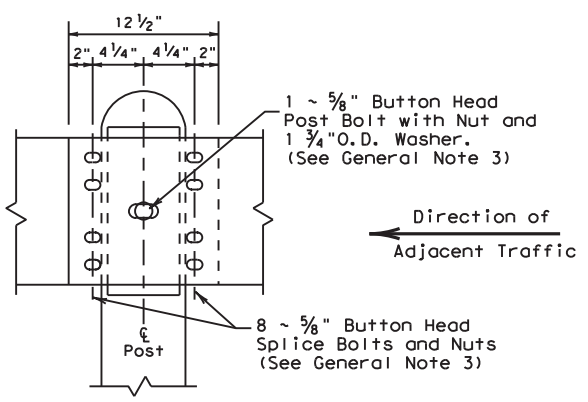
WOOD BLOCK TO RECTANGULAR WOOD (CRT) POST
 Showing the required 3 1/2" Dia. holes.



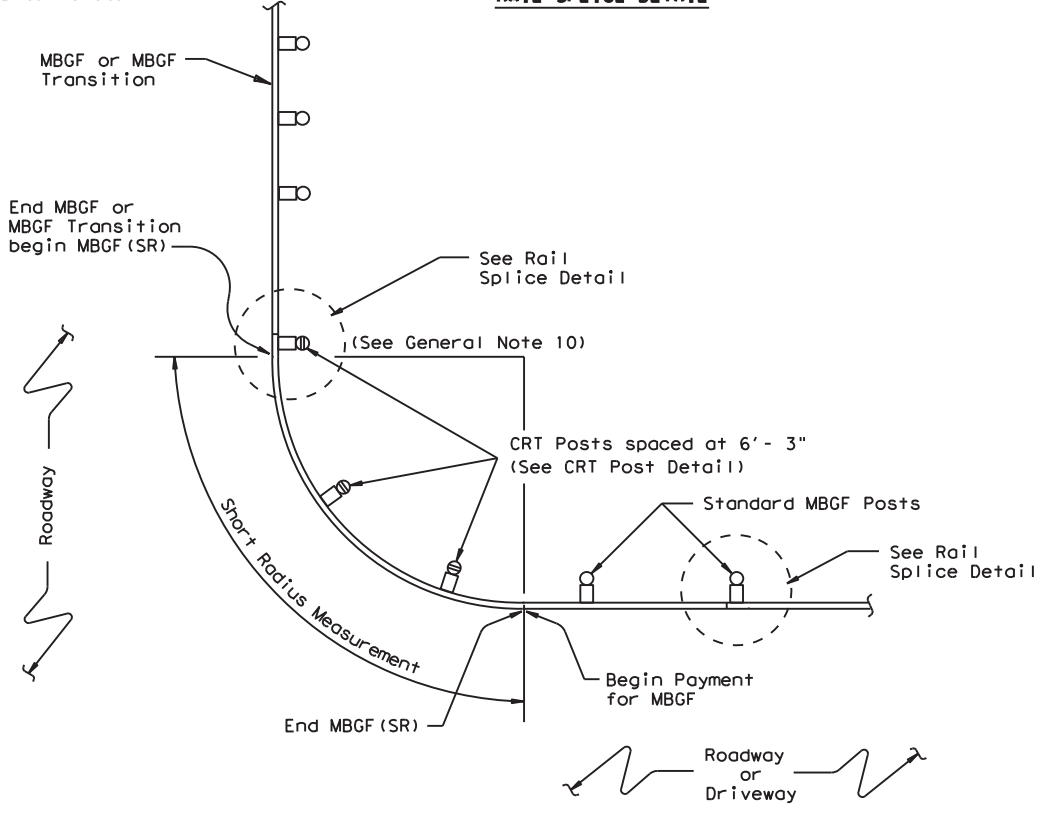
(CRT) POST DETAIL CONTROLLED RELEASE TERMINAL POST
 Two or more wood CRT post(s) are required at any radius installation located at intersecting roadways or driveways.



WOOD BLOCK TO ROUND WOOD (CRT) POST
 Showing the required 2 1/2" Dia. holes.



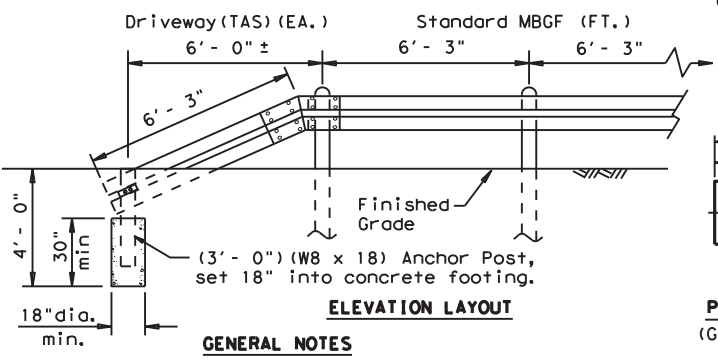
RAIL SPLICE DETAIL



PLAN VIEW SHOWING TYPICAL RADIUS
 The required radius is shown elsewhere on the plans.

GENERAL NOTES

1. The type of (CRT) post (round wood post, or rectangular wood post) will be shown elsewhere in the plans. The exact position of MBGF shall be shown elsewhere in the plans or as directed by the Engineer.
2. Steel posts are not permitted at CRT post positions.
3. Rail element shall meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified on the plans. The Contractor may furnish rail elements of 12 1/2 or 25 foot nominal lengths.
4. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and Type A (1 3/4" O.D.) washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 5/8" x 1 1/4" (or 2" long at triple rail splices) with a 3/8" double recessed nut (ASTM A563).
5. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item.
6. Crown shall be widened to accommodate the Metal Beam Guard Fence.
7. The lateral approach to the guard fence, shall have a slope rate of not more than 1V:10H.
8. Unless otherwise shown in the plans, guard fence placed in the vicinity of curbs shall be positioned so that the face of curb is located directly below or behind the face of the block. Rail placed over curbs shall be installed so that the post bolt is located approximately 21 inches above the gutter pan or roadway surface.
9. If solid rock is encountered within 0 to 18" of the finished grade, drill a 22" dia. hole, 24" into the rock, or drill two 12" dia. front to back overlapping holes, 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 is less. Any excess post length, after meeting these depths, may be field cut to ensure proper guardrail mounting height. Backfill with a cohesionless material.
10. Guardrail posts shall not be set in concrete, of any depth.
11. Special rail fabrication will be required at installations having a curvature of less than 150 ft. radius. The required radius shall be shown on the plans.
12. The terminal anchor section (TAS) post shall be set in Class A concrete (unless otherwise shown in the plans) in accordance with Item 421, "Hydraulic Cement Concrete." Concrete shall be subsidiary to the bid item requiring construction of the terminal anchor section (TAS). Terminal anchor post to be galvanized in accordance with Item 445, "Galvanizing."
13. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or 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 can furnish composite material posts and/or blocks.



ELEVATION LAYOUT

- GENERAL NOTES**
1. The "Driveway" Terminal Anchor Section is ONLY to be used within driveway locations, where the ROW is limited and a standard 25 ft. (TAS) Terminal Anchor Section, is too long.
 2. Terminal anchor post shall be set in Class A concrete.
 3. All steel shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."

"DRIVEWAY" TERMINAL ANCHOR SECTION

Only for use within driveway locations, where a standard (TAS) Terminal Anchor Section can not be installed.

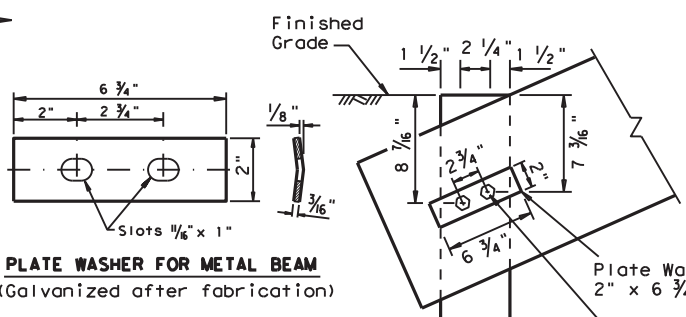
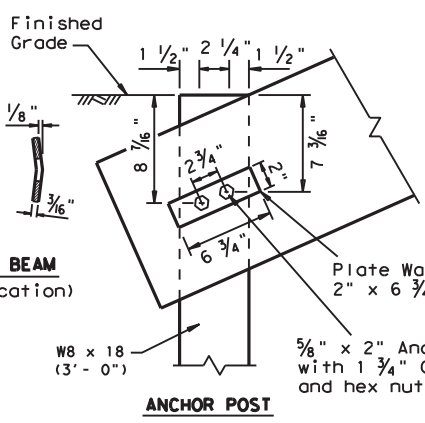
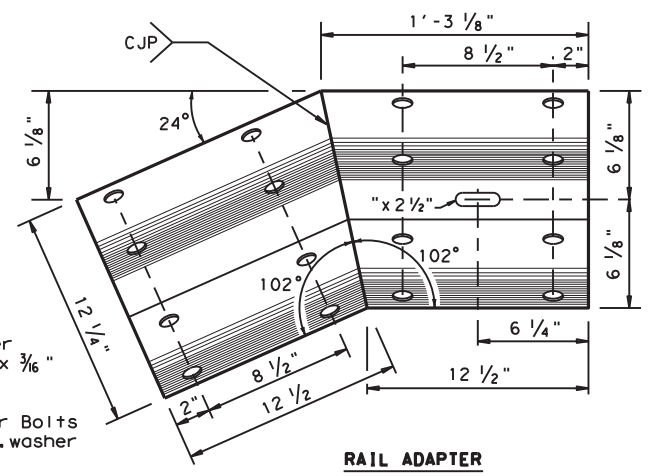


PLATE WASHER FOR METAL BEAM
 (Galvanized after fabrication)



ANCHOR POST

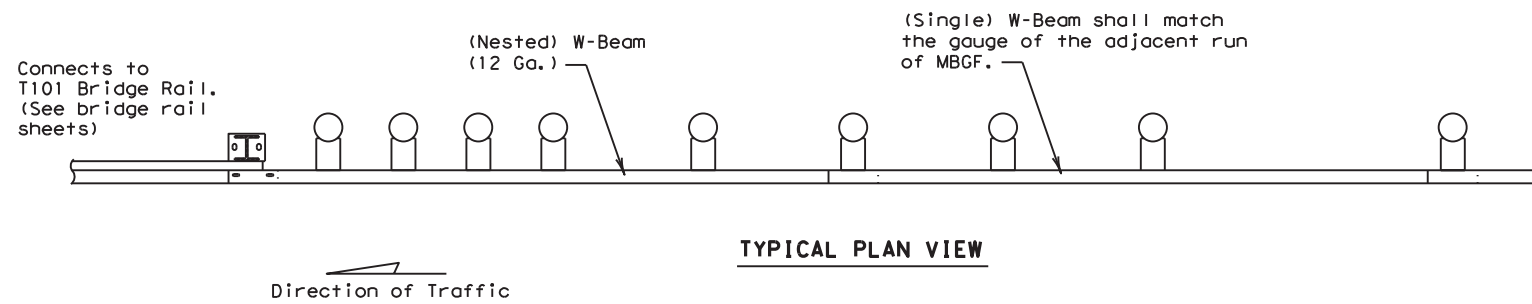


RAIL ADAPTER
 Rail - 10 gauge
 (Galvanized after fabrication)

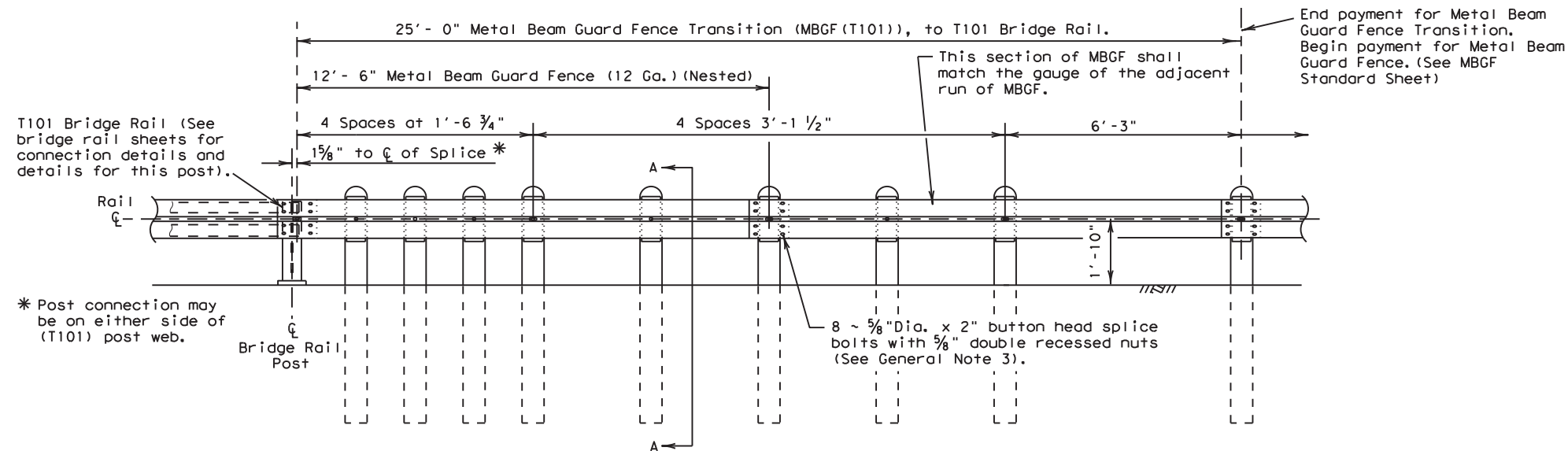
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METAL BEAM GUARD FENCE (SHORT RADIUS)			
MBGF (SR) - 11			
FILE: mbgfsr11.dgn	DN: TxDOT	CK: AM	DW: BD
© TxDOT June 2010	CONT SECT	JOB	HIGHWAY
REVISIONS	6372 50	OOI	VAR.
12-2011	DIST	COUNTY	SHEET NO.
	SAT	BEXAR	204

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FILE:



TYPICAL PLAN VIEW

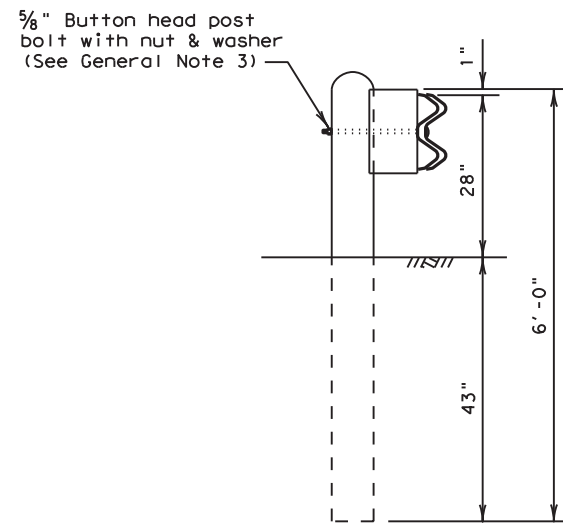


TYPICAL ELEVATION VIEW

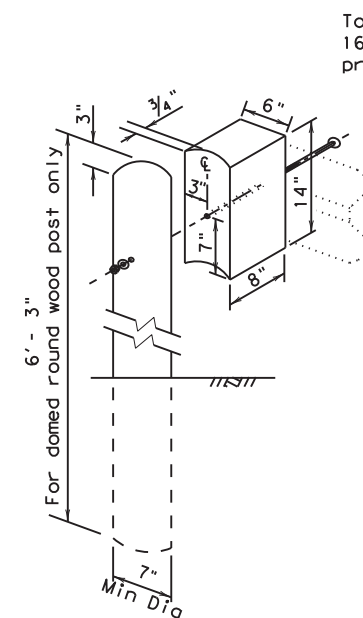
* Post connection may be on either side of (T101) post web.

GENERAL NOTES

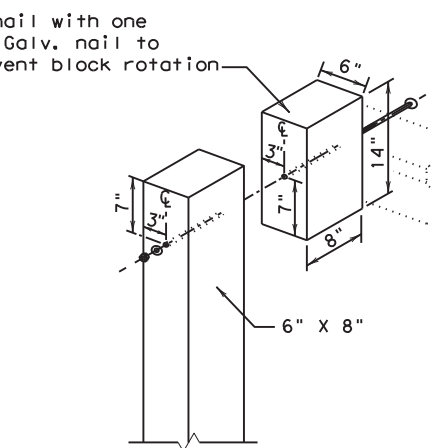
1. The type of post (round wood post, rectangular wood post, or steel post) will be shown elsewhere in the plans. The exact position of transitions shall be shown elsewhere in the plans or as directed by the Engineer.
2. Rail element shall meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified on the plans.
3. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and the Type A 1 3/4" O.D. washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 5/8" x 2" (at triple rail splices) with a 5/8" double recessed nuts (ASTM A563).
4. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item requiring construction of the transition.
5. Crown will be widened to accommodate transitions.
6. If solid rock is encountered. See the MBGF standard sheet for proper installation guidance.
7. Posts shall not be set in concrete.
8. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or 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 can furnish composite material posts and/or blocks.
8. Refer to MBGF Standard Sheet for additional details.



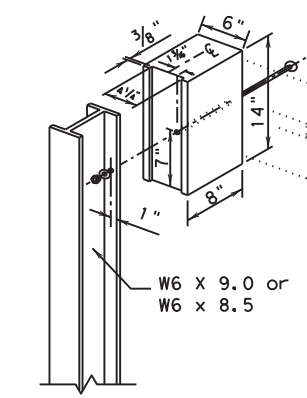
SECTION A-A



WOOD BLOCK TO ROUND WOOD POST



WOOD BLOCK TO RECTANGULAR WOOD POST



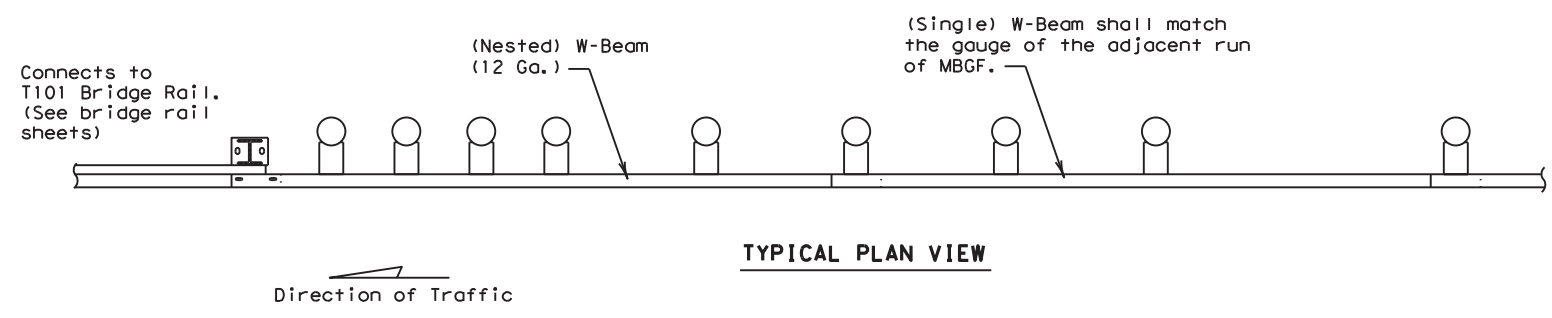
WOOD BLOCK TO STEEL POST

ONLY FOR USE IN MAINTENANCE REPAIRS.

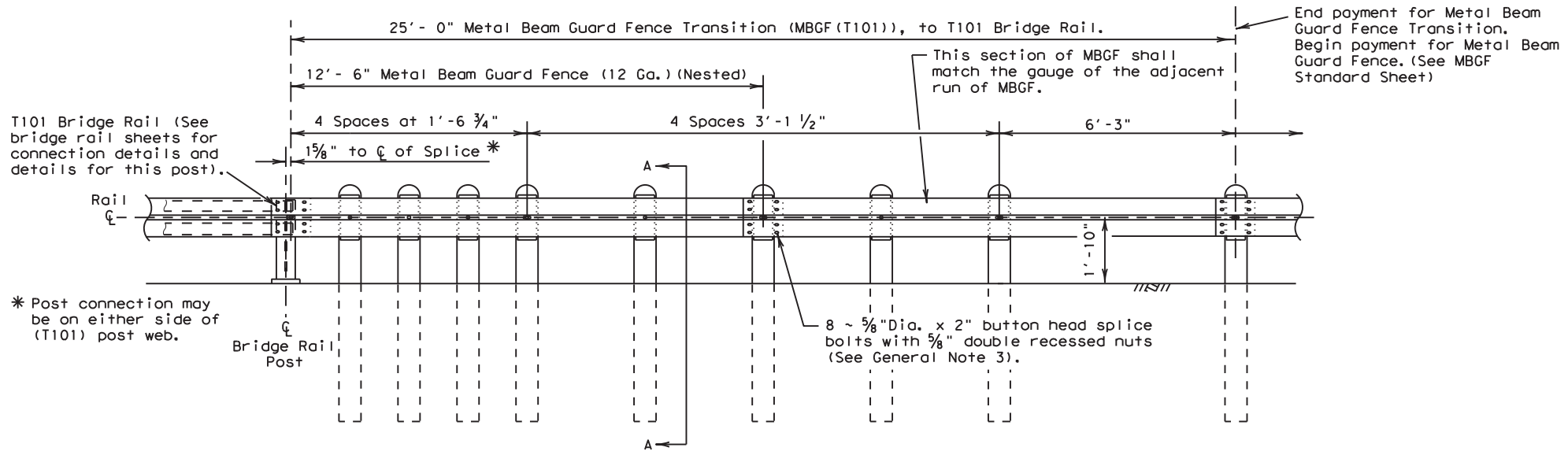
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METAL BEAM GUARD FENCE TRANSITION (T101) (T101 BRIDGE RAIL) MBGF (T101) - 19			
FILE: mbgft10119.dgn	DN: TxDOT	CK: KM	DW: BD
© TxDOT NOVEMBER 2019	CONT: 6372	SECT: 50	JOB: 001
REVISIONS	SAT		HIGHWAY: VAR
	DIST: BEXAR	COUNTY: BEXAR	SHEET NO.: 205

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DATE: FILE:



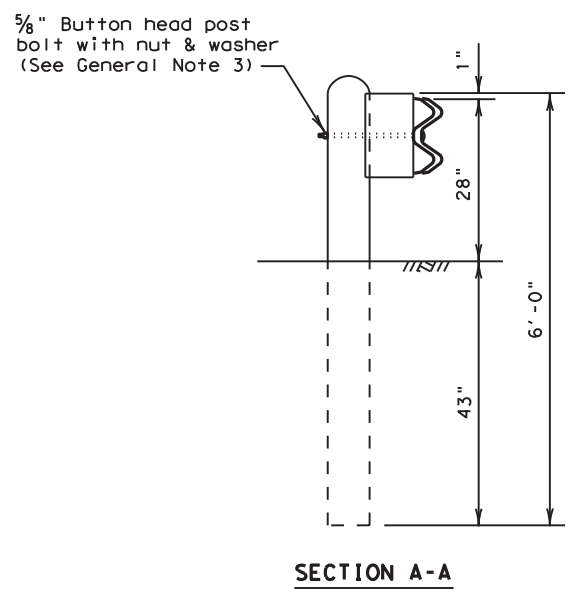
TYPICAL PLAN VIEW



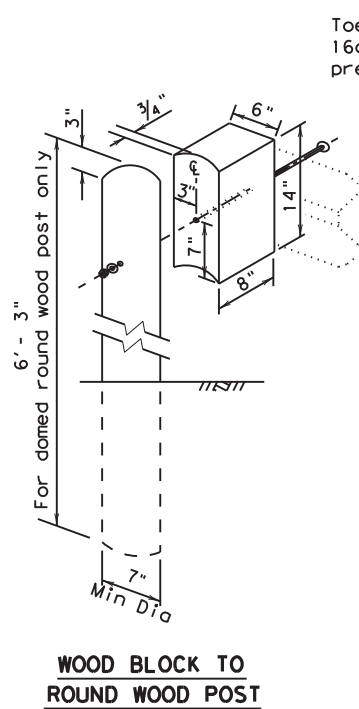
TYPICAL ELEVATION VIEW

GENERAL NOTES

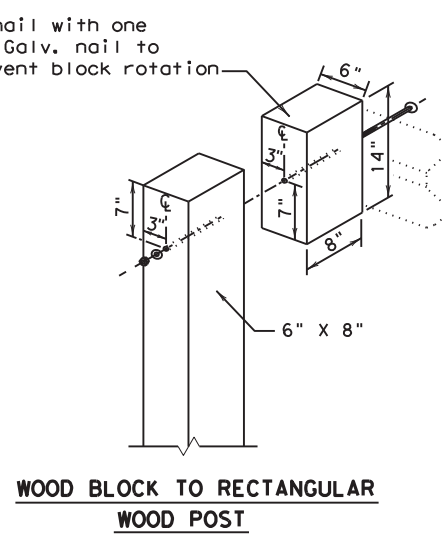
1. The type of post (round wood post, rectangular wood post, or steel post) will be shown elsewhere in the plans. The exact position of transitions shall be shown elsewhere in the plans or as directed by the Engineer.
2. Rail element shall meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified on the plans.
3. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and the Type A 1 3/4" O.D. washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 5/8" x 2" (at triple rail splices) with a 5/8" double recessed nuts (ASTM A563).
4. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item requiring construction of the transition.
5. Crown will be widened to accommodate transitions.
6. If solid rock is encountered. See the MBGF standard sheet for proper installation guidance.
7. Posts shall not be set in concrete.
8. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or 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 can furnish composite material posts and/or blocks.
8. Refer to MBGF Standard Sheet for additional details.



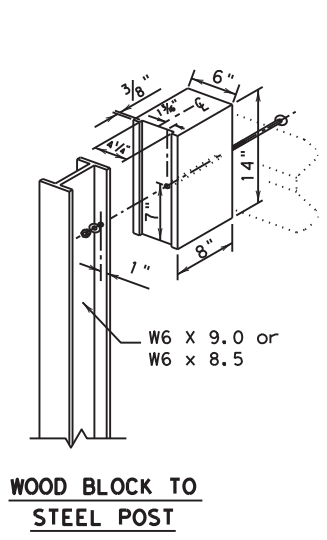
SECTION A-A



WOOD BLOCK TO ROUND WOOD POST



WOOD BLOCK TO RECTANGULAR WOOD POST

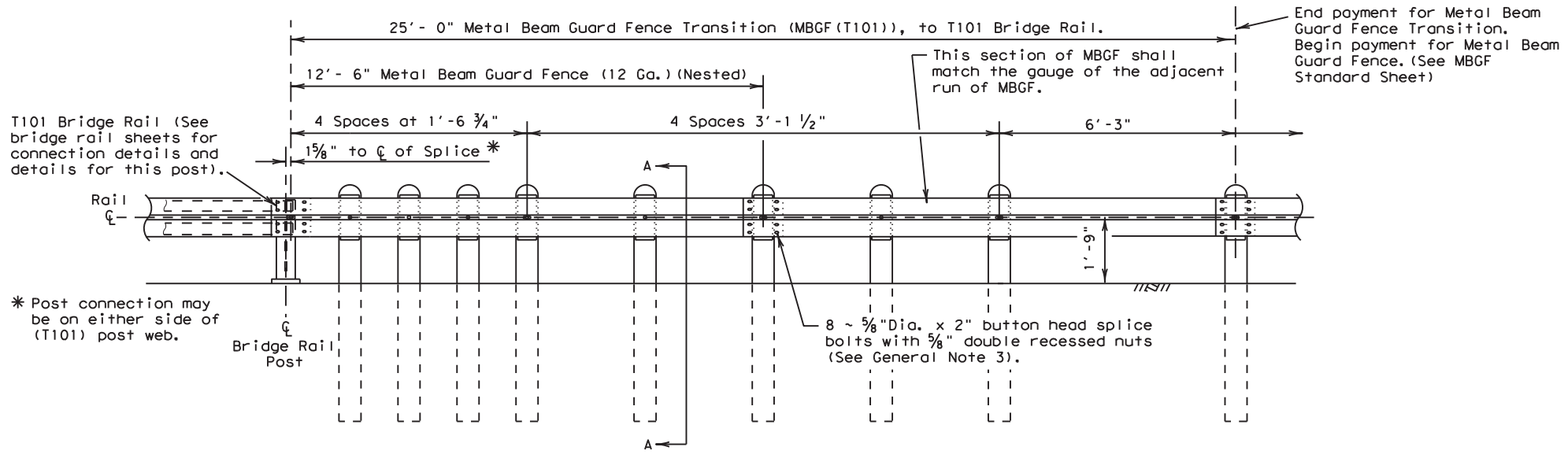
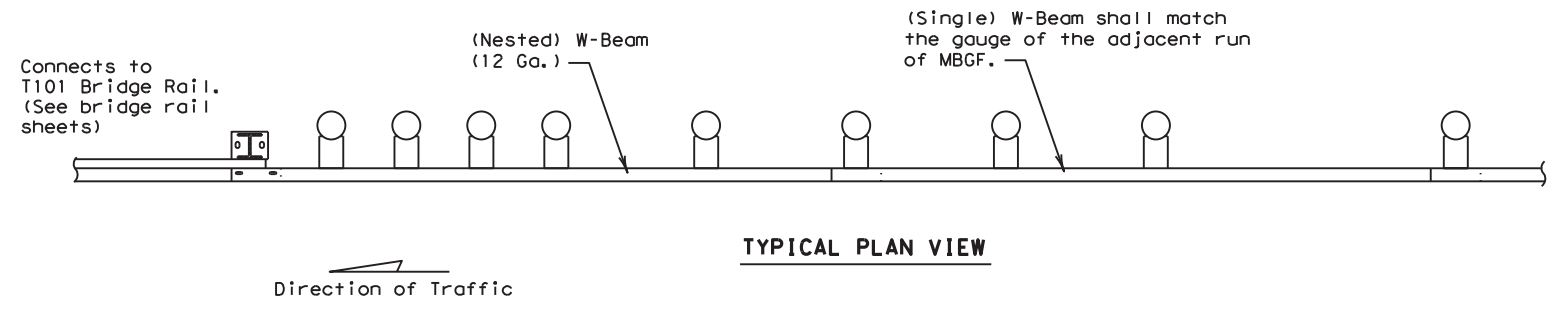


WOOD BLOCK TO STEEL POST

Texas Department of Transportation
Design Division Standard

**METAL BEAM GUARD FENCE
TRANSITION (T101)
(T101 Bridge Rail)
MBGF (T101) - 11**

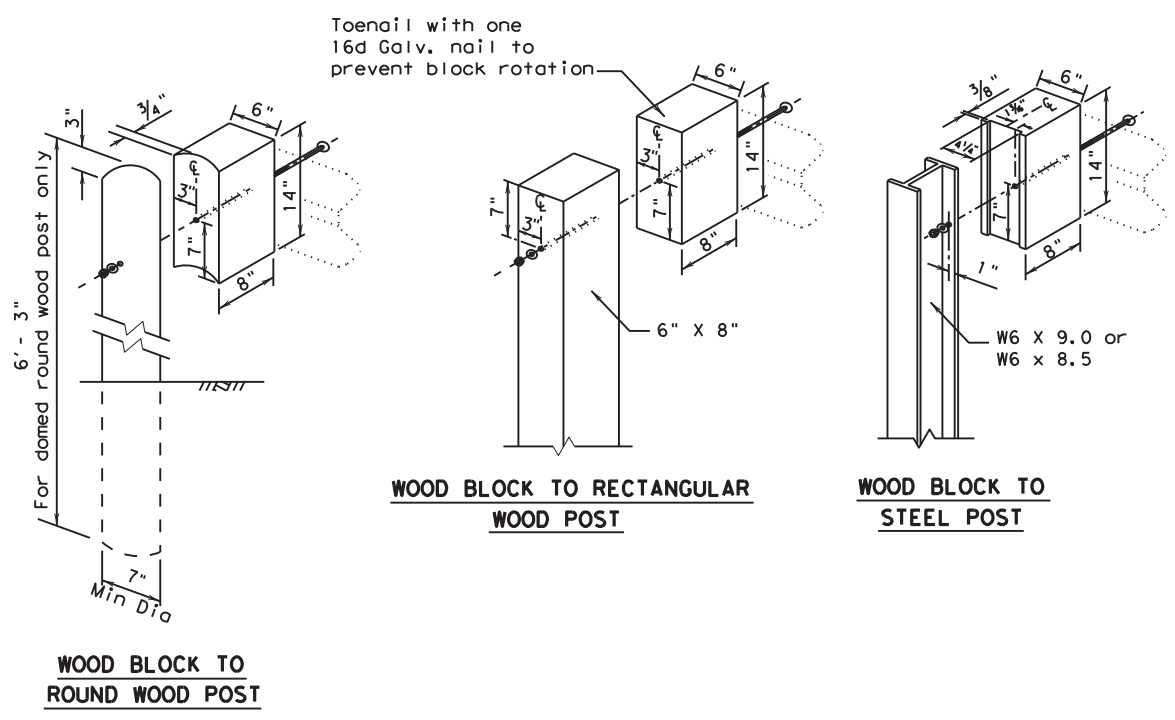
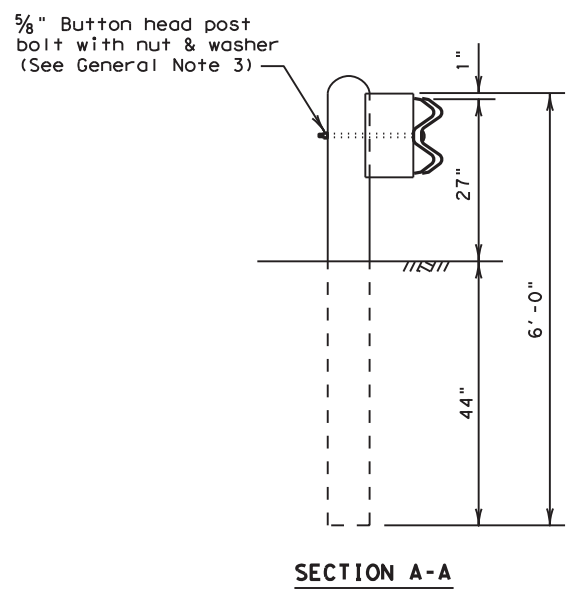
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© TxDOT December 2001	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
12-2011	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	206	



GENERAL NOTES

1. The type of post (round wood post, rectangular wood post, or steel post) will be shown elsewhere in the plans. The exact position of transitions shall be shown elsewhere in the plans or as directed by the Engineer.
2. Rail element shall meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified on the plans.
3. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and the Type A 1 3/4" O.D. washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 5/8" x 2" (at triple rail splices) with a 5/8" double recessed nuts (ASTM A563).
4. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item requiring construction of the transition.
5. Crown will be widened to accommodate transitions.
6. If solid rock is encountered. See the MBGF standard sheet for proper installation guidance.
7. Posts shall not be set in concrete.
8. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or 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 can furnish composite material posts and/or blocks.
8. Refer to MBGF Standard Sheet for additional details.

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Texas Department of Transportation

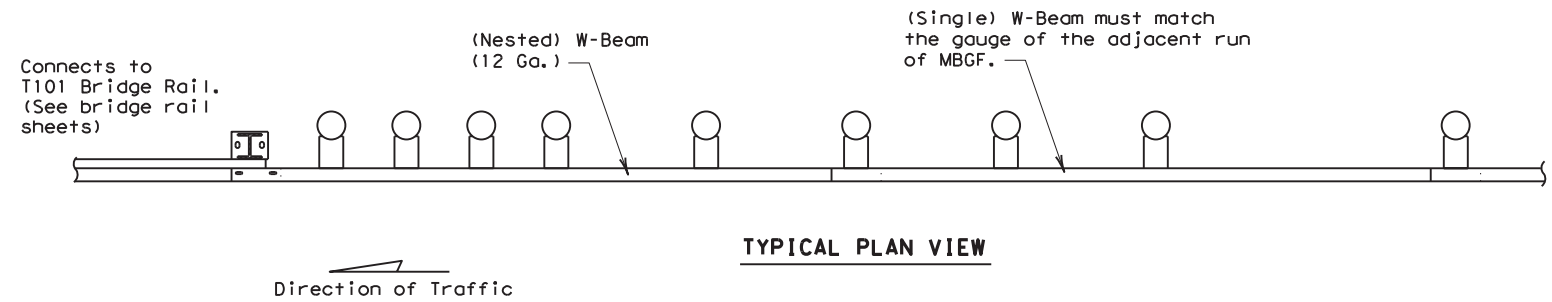
 Design Division (Roadway)

METAL BEAM GUARD FENCE TRANSITION (T101)

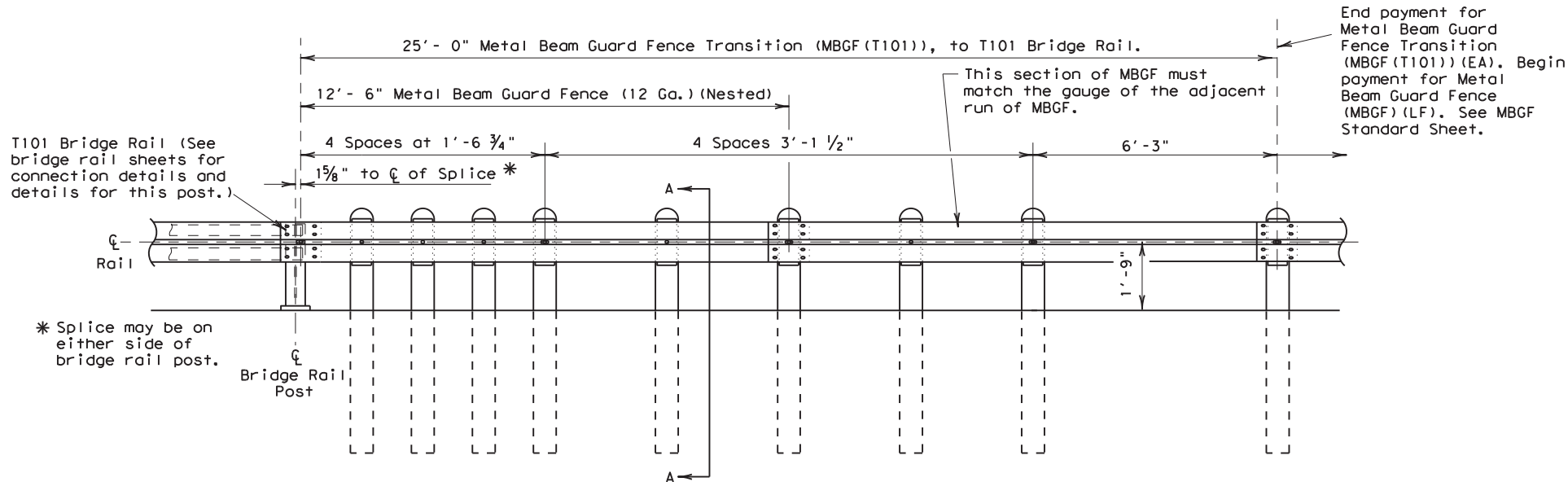
 (T101 Bridge Rail)

MBGF (T101) -09

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© TxDOT December 2001		FEDERAL AID PROJECT		SHEET
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BEXAR	6372	50	001	VAR.



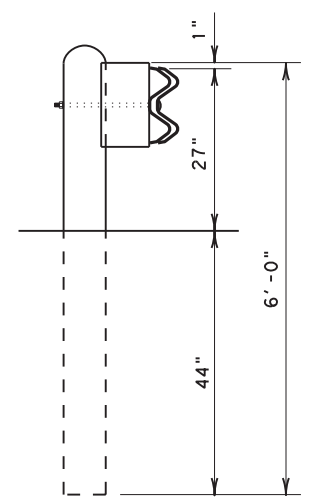
TYPICAL PLAN VIEW



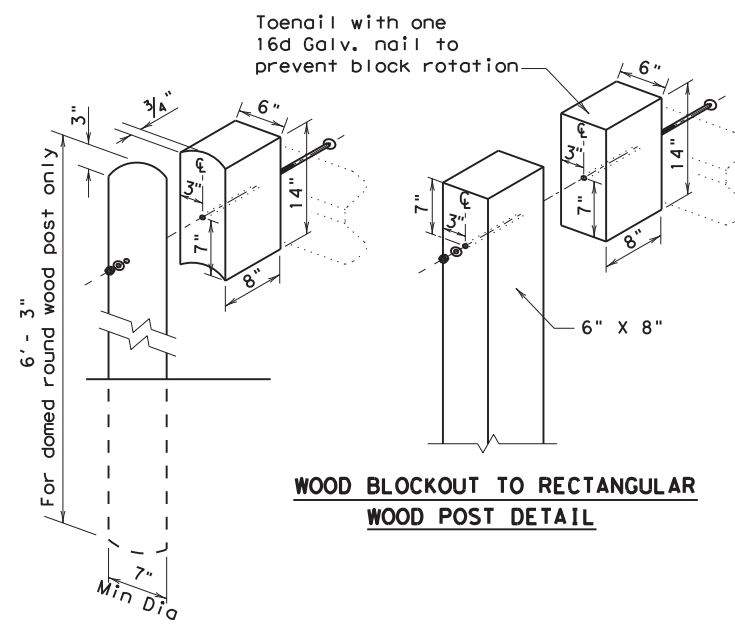
TYPICAL ELEVATION VIEW

- GENERAL NOTES**
1. The type of post (round wood post, rectangular wood post, or steel post) will be shown elsewhere in the plans. The exact position of transitions shall be shown elsewhere in the plans or as directed by the Engineer.
 2. Rail element shall meet all requirements of AASHTO M-180 except as modified on the plans.
 3. Button head post bolts (A307) shall be of sufficient length to extend through the full thickness of the nut and no more than 3/4" beyond it. Button head splice bolts (A307) are 5/8" x 1 1/4" with a 5/8" double recessed nut. Galvanized fittings (bolts, nuts, and washers) shall be in accordance with Item, "Metal For Structures". Fittings shall be subsidiary to the bid item requiring construction of transition.
 4. Crown will be widened to accommodate transitions.
 5. Where solid rock is encountered or where shown on the plans, the diameter of the holes shall be approximately 12 inches, the backfilling shall be with a cohesionless material, and embedment depth shall be 1'-6" or more as directed by the Engineer.
 6. Posts shall not be set full depth in concrete.
 7. Unless otherwise directed by the Engineer, a composite material post and/or blockout from the Department approved list of suppliers may be substituted for a post and/or blockout of similar dimensions. The list of approved suppliers of posts and blockouts will be maintained by the Construction Division, TxDOT.
 8. Refer to MBGF Standard Sheet for additional details.

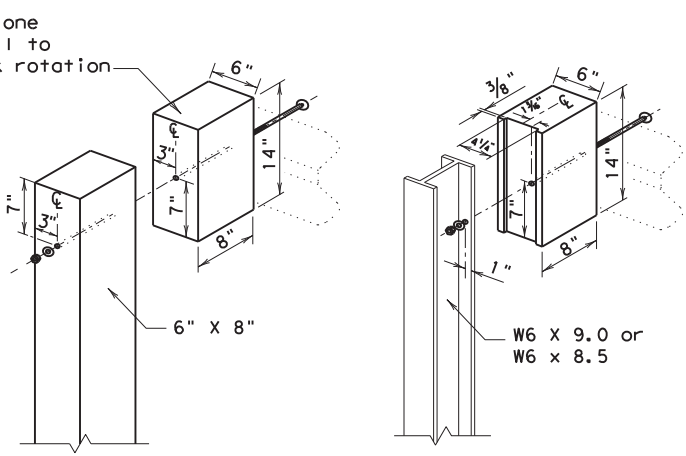
* Splice may be on either side of bridge rail post.



SECTION A-A



WOOD BLOCKOUT TO ROUND WOOD POST DETAIL



WOOD BLOCKOUT TO RECTANGULAR WOOD POST DETAIL

WOOD BLOCKOUT TO STEEL POST DETAIL

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LEVELS DISPLAYED	
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Texas Department of Transportation
Design Division (Roadway)

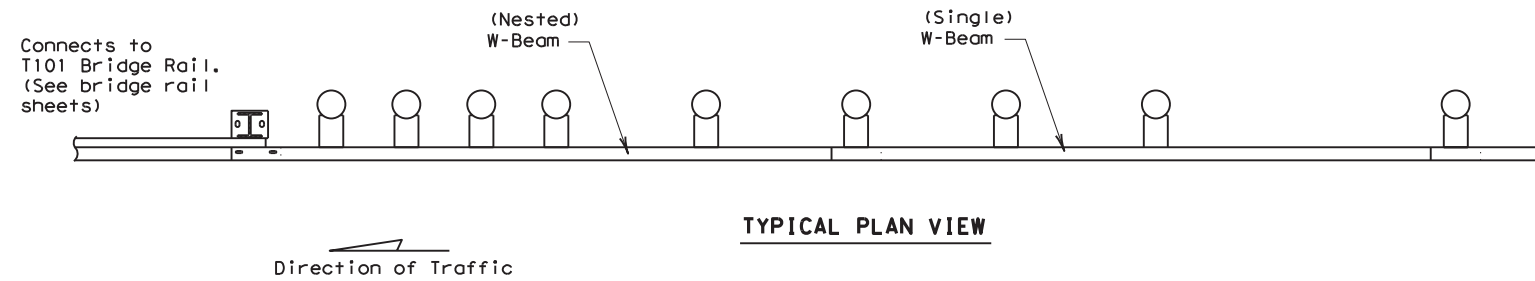
METAL BEAM GUARD FENCE TRANSITION (T101)
(For T101 Bridge Rail)

MBGF (T101) -05

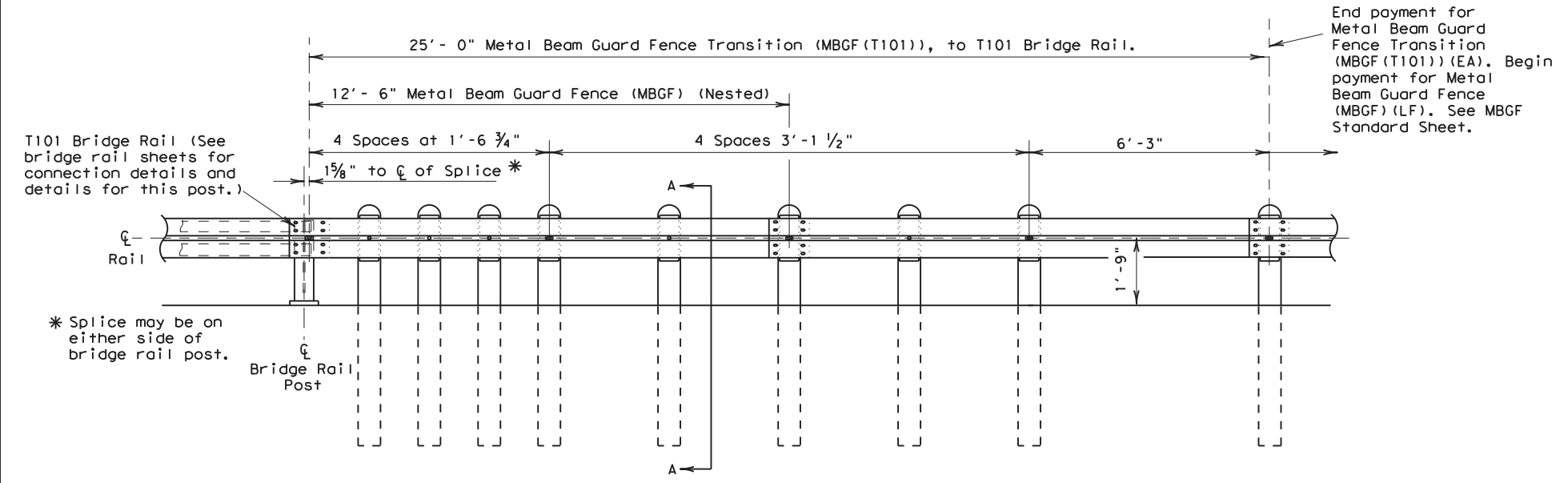
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© TxDOT December 2001		DIST		FEDERAL AID PROJECT
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GENERAL NOTES

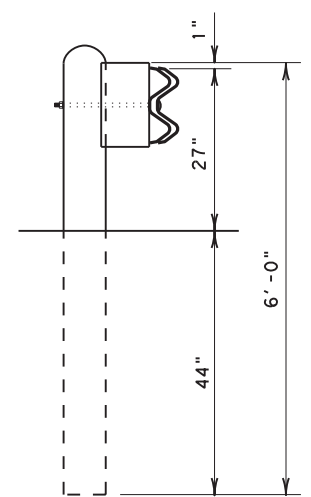
1. The type of post (round wood post, rectangular wood post, or steel post) will be shown elsewhere in the plans. The exact position of transitions shall be shown elsewhere in the plans or as directed by the Engineer.
2. Rail element shall meet all requirements of AASHTO M-180 except as modified on the plans.
3. Button head post bolts (A307) shall be of sufficient length to extend through the full thickness of the nut and no more than $\frac{3}{4}$ " beyond it. Button head splice bolts (A307) are $\frac{5}{8}$ " x $1\frac{1}{4}$ " with a $\frac{5}{8}$ " double recessed nut. Galvanized fittings (bolts, nuts, and washers) shall be in accordance with Item, "Metal For Structures". Fittings shall be subsidiary to the bid item requiring construction of transition.
4. Crown will be widened to accommodate transitions.
5. Where solid rock is encountered or where shown on the plans, the diameter of the holes shall be approximately 12 inches, the backfilling shall be with a cohesionless material, and embedment depth shall be 1'-6" or more as directed by the Engineer.
6. Posts shall not be set full depth in concrete.
7. Unless otherwise directed by the Engineer, a composite material post and/or blockout from the Department approved list of suppliers may be substituted for a post and/or blockout of similar dimensions. The list of approved suppliers of posts and blockouts will be maintained by the Construction Division, TxDOT.
8. Refer to MBGF Standard Sheet for additional details.



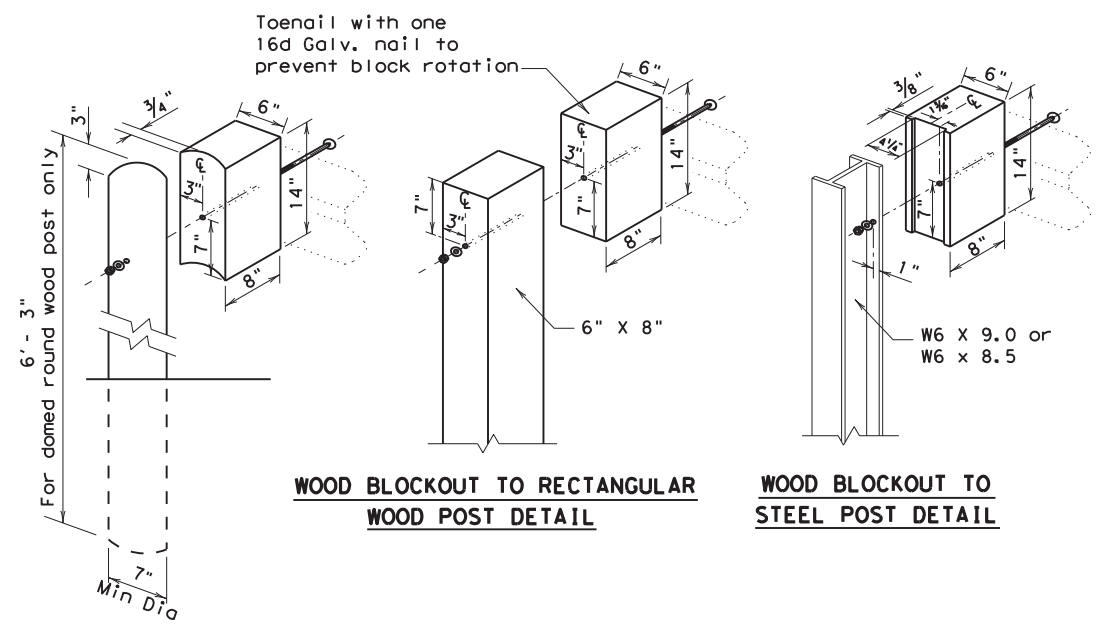
TYPICAL PLAN VIEW



TYPICAL ELEVATION VIEW



SECTION A-A



WOOD BLOCKOUT TO RECTANGULAR WOOD POST DETAIL

WOOD BLOCKOUT TO STEEL POST DETAIL

WOOD BLOCKOUT TO ROUND WOOD POST DETAIL

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LEVELS DISPLAYED
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Texas Department of Transportation
 Design Division (Roadway)

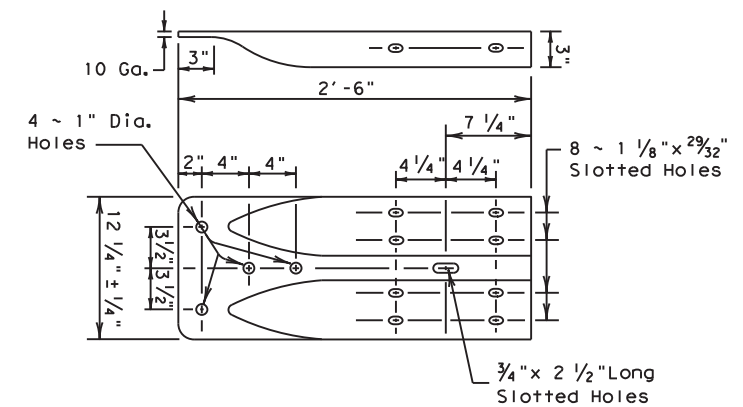
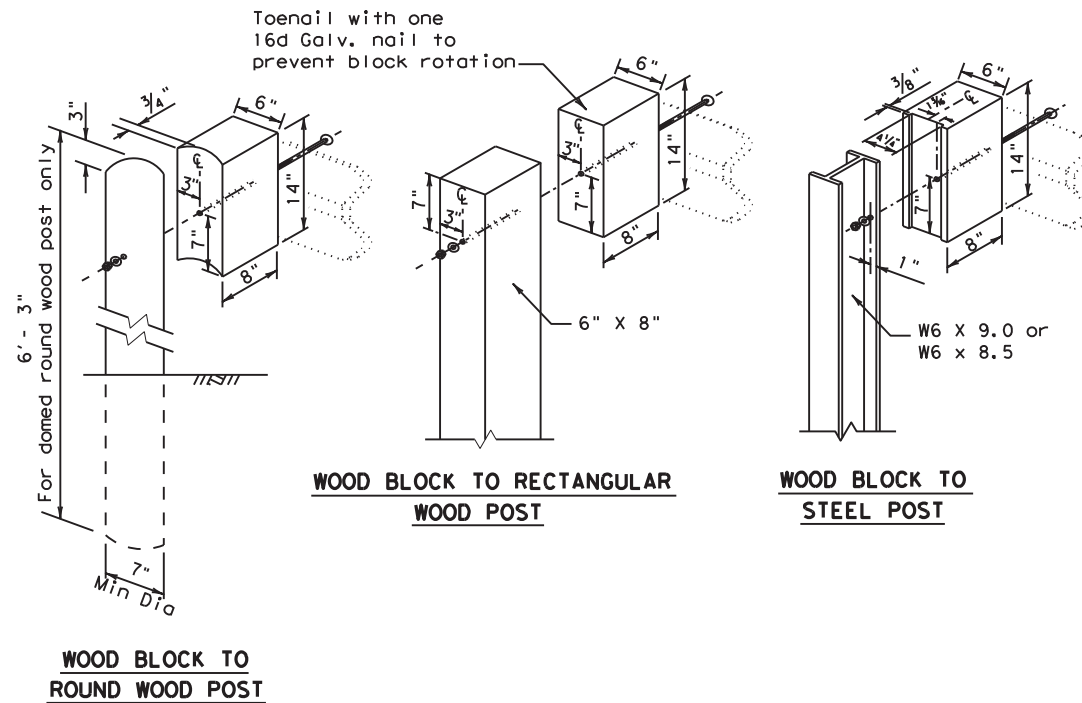
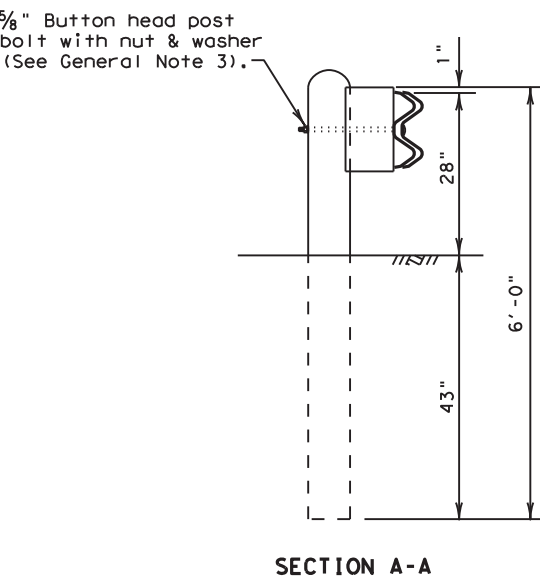
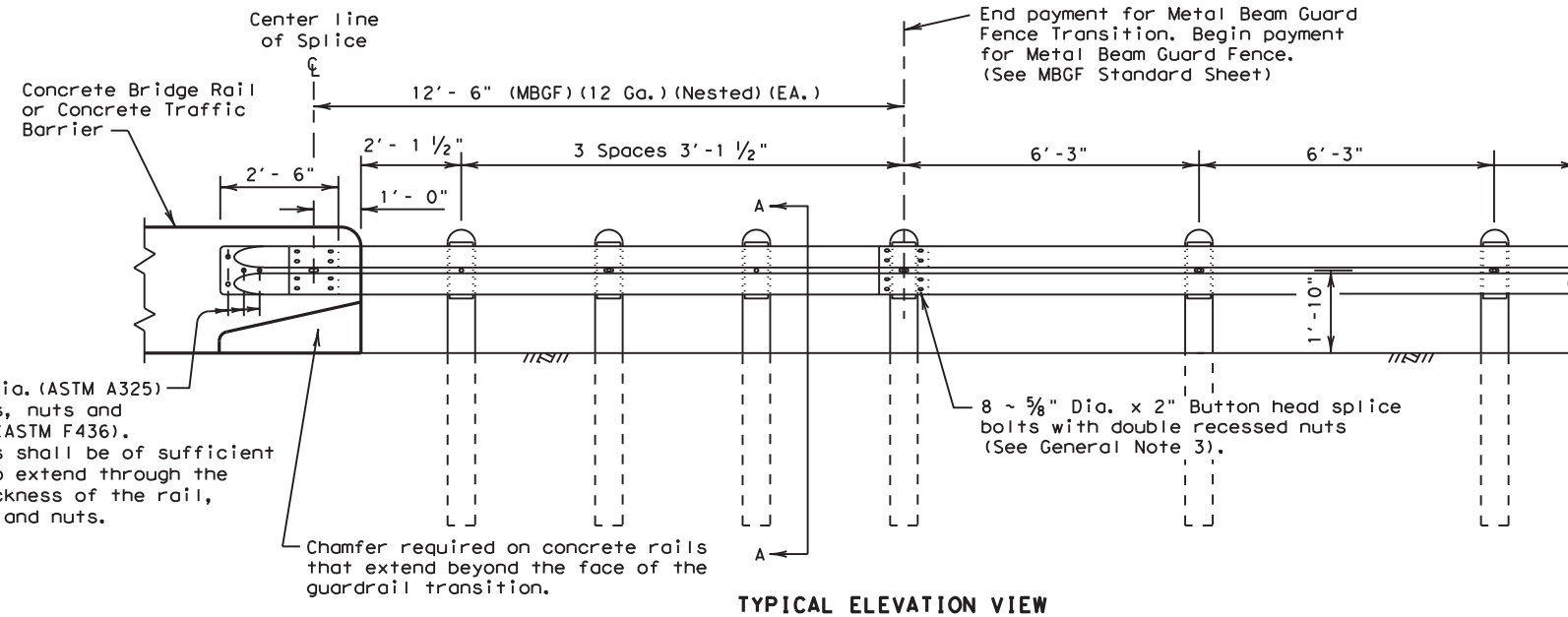
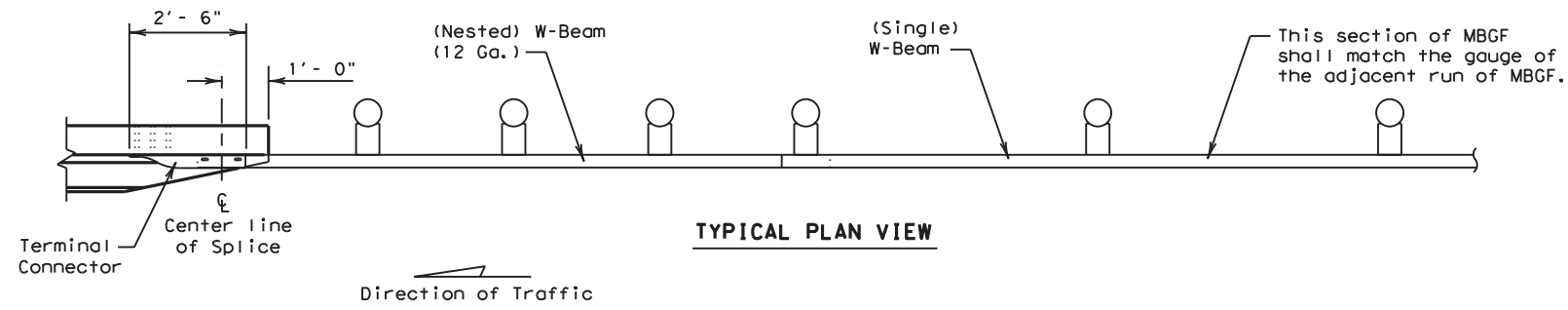
METAL BEAM GUARD FENCE TRANSITION (T101)
 (For T101 Bridge Rail)

MBGF (T101) - 01

FILE: mbgft101.dgn	DN: MAM	CK: MAM	DW: BGD	CR:
© TxDOT DECEMBER 2001	DIST	FED REG	RMC PROJECT	SHEET
REVISIONS	SAT	6		209
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				VAR.

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DATE:
FILE:



TERMINAL CONNECTOR

FOR USE WITH MBGF CONNECTIONS TO CONCRETE BRIDGE RAILS AND TRAFFIC BARRIERS

GENERAL NOTES

1. The type of post (round wood post, rectangular wood post, or steel post) will be shown elsewhere in the plans. The exact position of transitions shall be shown elsewhere in the plans or as directed by the Engineer.
2. Rail element shall meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified on the plans.
3. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut and Type A 1 3/4" O.D. washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 3/8" x 2" (at triple rail splices) with 3/8" double recessed nuts (ASTM A563).
4. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item requiring construction of the transition.
5. Crown will be widened to accommodate transitions.
6. If solid rock is encountered. See the MBGF standard sheet for the proper installation guidance.
7. Posts shall not be set in concrete.
8. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or 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 can furnish composite material posts and/or blocks.
9. Refer to MBGF standard sheet for additional details.

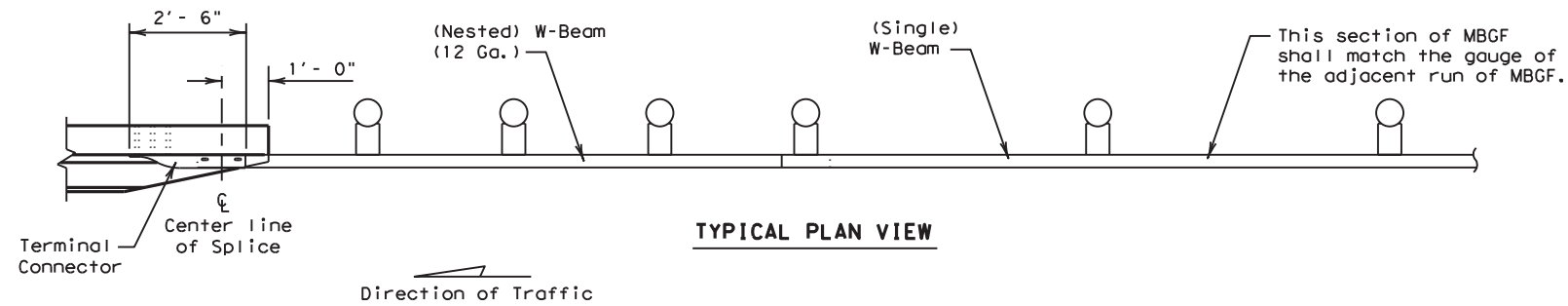
ONLY FOR USE IN MAINTENANCE REPAIRS.



METAL BEAM GUARD FENCE TRANSITION (TL2)
(Low Speed Transition)

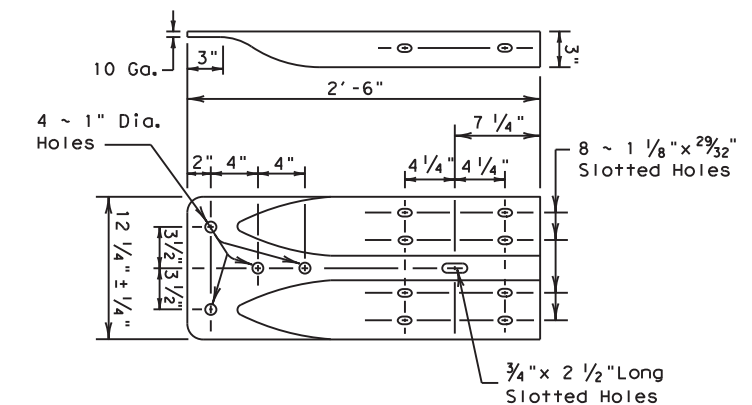
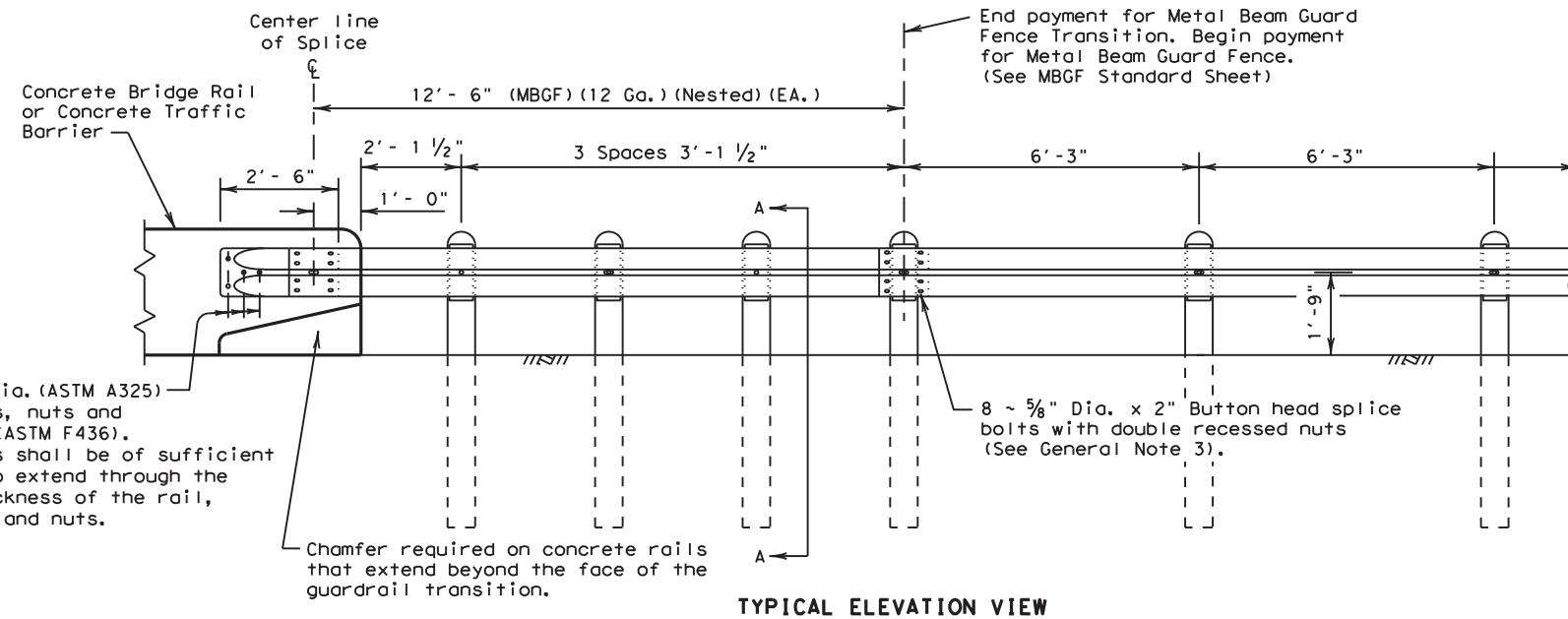
MBGF (TL2) - 19

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© TxDOT NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	OOI	VAR.
DIST	COUNTY		SHEET NO.	
SAT	BEXAR		210	



GENERAL NOTES

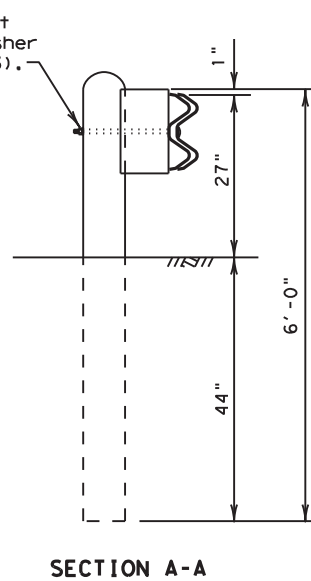
1. The type of post (round wood post, rectangular wood post, or steel post) will be shown elsewhere in the plans. The exact position of transitions shall be shown elsewhere in the plans or as directed by the Engineer.
2. Rail element shall meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified on the plans.
3. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut and Type A 1 3/4" O.D. washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 3/8" x 2" (at triple rail splices) with 3/8" double recessed nuts (ASTM A563).
4. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item requiring construction of the transition.
5. Crown will be widened to accommodate transitions.
6. If solid rock is encountered. See the MBGF standard sheet for the proper installation guidance.
7. Posts shall not be set in concrete.
8. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or 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 can furnish composite material posts and/or blocks.
9. Refer to MBGF standard sheet for additional details.



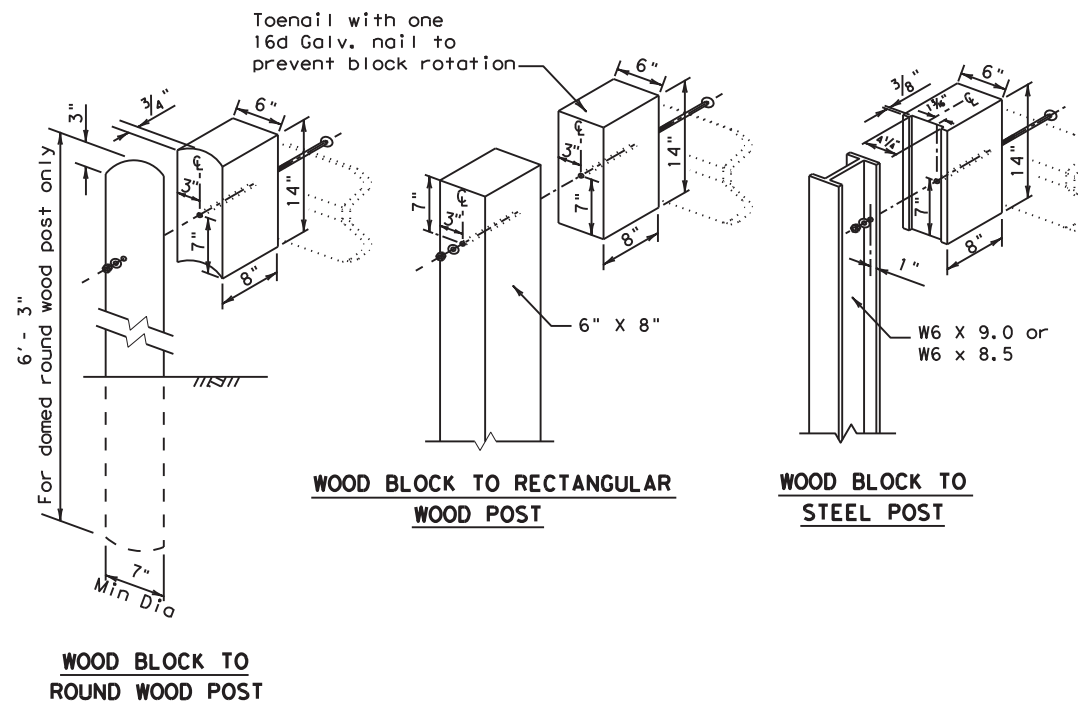
TERMINAL CONNECTOR

FOR USE WITH MBGF CONNECTIONS TO CONCRETE BRIDGE RAILS AND TRAFFIC BARRIERS

4 ~ 7/8" Dia. (ASTM A325) hex bolts, nuts and washers (ASTM F436). hex bolts shall be of sufficient length to extend through the full thickness of the rail, washers, and nuts.



SECTION A-A



WOOD BLOCK TO RECTANGULAR WOOD POST

WOOD BLOCK TO STEEL POST

WOOD BLOCK TO ROUND WOOD POST

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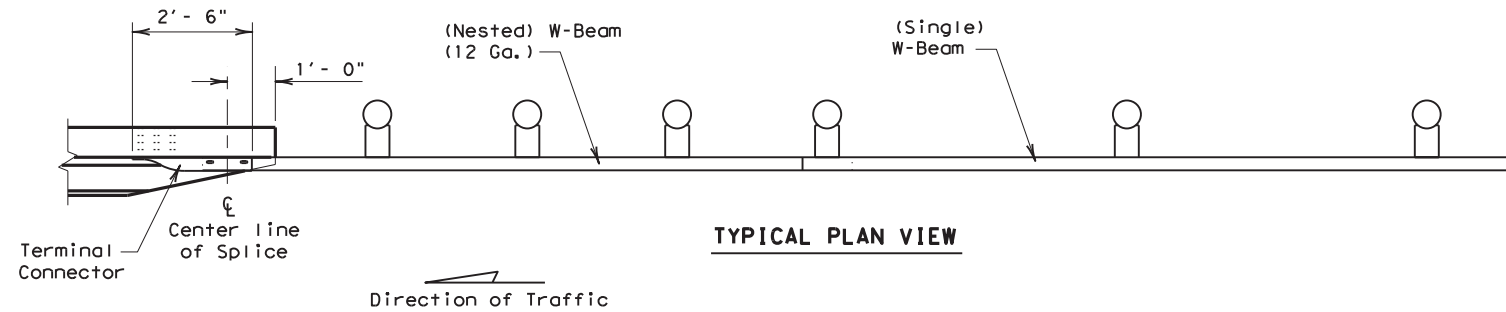
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Texas Department of Transportation
Design Division (Roadway)

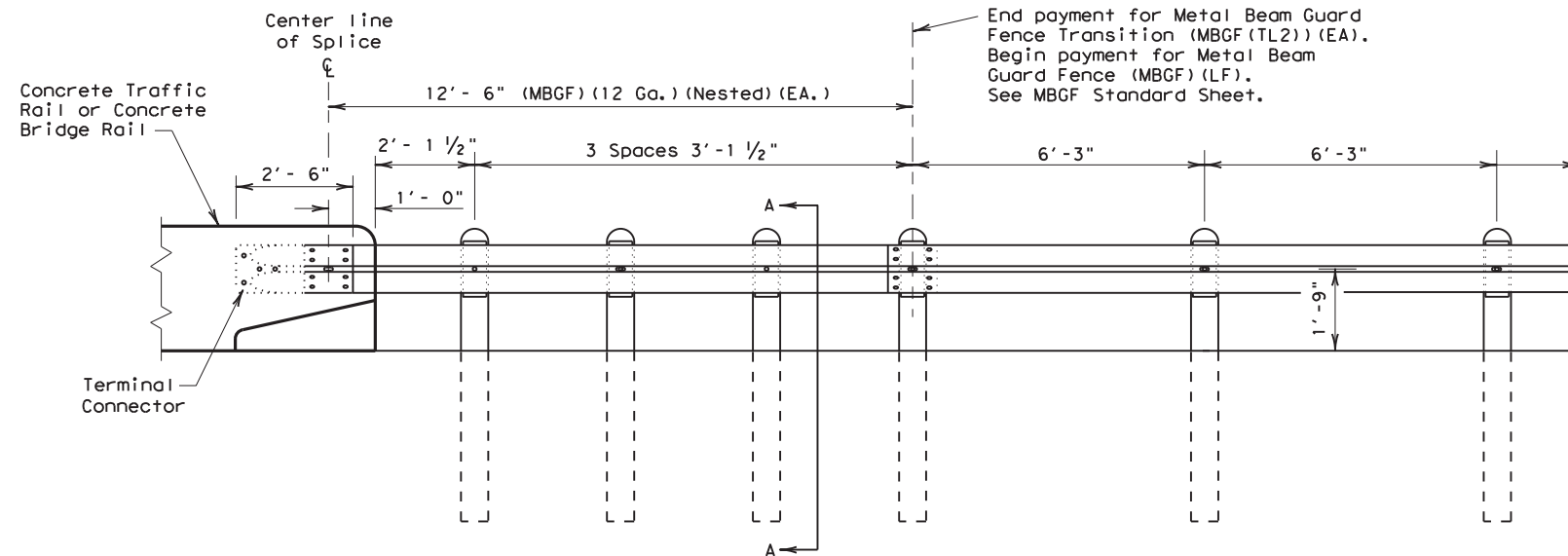
METAL BEAM GUARD FENCE TRANSITION (TL2)
(Low Speed Transition)

MBGF (TL2) -09

FILE#	mbgt1209dgn	DN#	TxDOT	CK#	AM	DW#	BGD	CK#
REVISIONS	SAT	DIST	FEDERAL AID PROJECT				SHEET	211
		COUNTY	CONTROL	SECT	JOB	HIGHWAY		
		BEXAR	6372	50	001	VAR.		



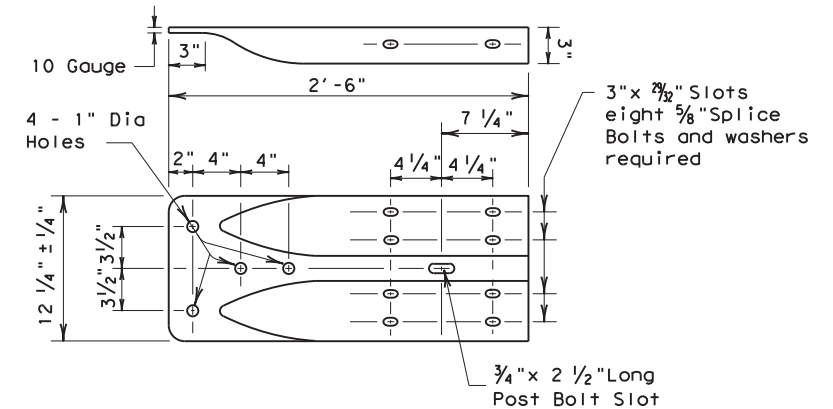
TYPICAL PLAN VIEW



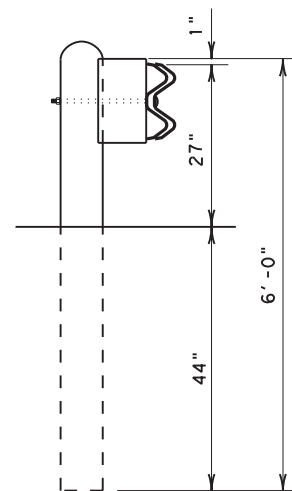
TYPICAL ELEVATION VIEW

GENERAL NOTES

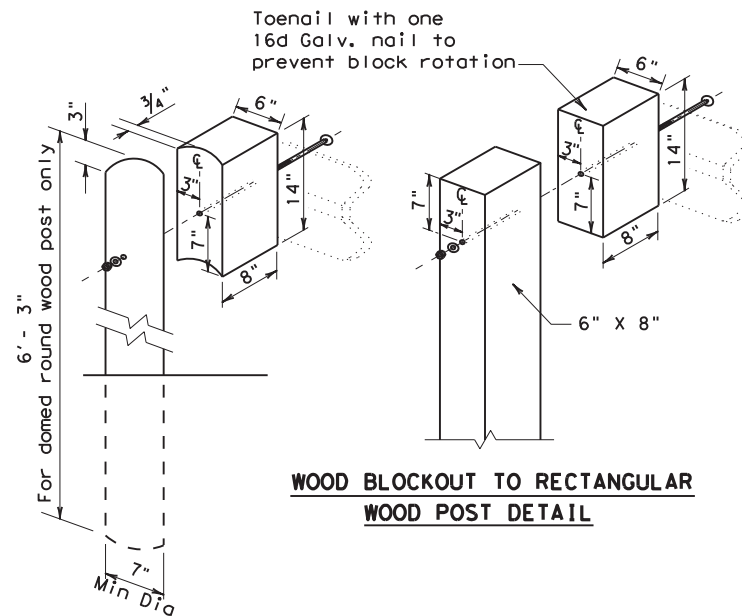
1. The type of post (round wood post, rectangular wood post, or steel post) will be shown elsewhere in the plans. The exact position of transitions shall be shown elsewhere in the plans or as directed by the Engineer.
2. Rail element shall meet all requirements of AASHTO M-180 except as modified on the plans.
3. Button head post bolts (A307) shall be of sufficient length to extend through the full thickness of the nut and no more than 3/4" beyond it. Button head splice bolts (A307) are 5/8" x 1 1/4" with a 5/8" double recessed nut. Galvanized fittings (bolts, nuts, and washers) shall be in accordance with Item, "Metal For Structures". Fittings shall be subsidiary to the bid item requiring construction of transition.
4. Crown will be widened to accommodate transitions.
5. Where solid rock is encountered or where shown on the plans, the diameter of the holes shall be approximately 12 inches, the backfilling shall be with a cohesionless material, and embedment depth shall be 1'-6" or more as directed by the Engineer.
6. Posts shall not be set full depth in concrete.
7. Unless otherwise directed by the Engineer, a composite material post and/or blockout from the Department approved list of suppliers may be substituted for a post and/or blockout of similar dimensions. The list of approved suppliers of posts and blockouts will be maintained by the Construction Division, TxDOT.
8. Refer to MBGF Standard Sheet for additional details.



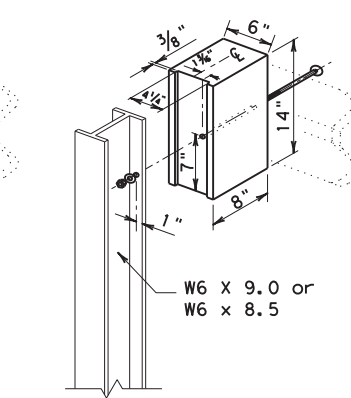
TERMINAL CONNECTOR



SECTION A-A



WOOD BLOCKOUT TO RECTANGULAR WOOD POST DETAIL



WOOD BLOCKOUT TO STEEL POST DETAIL

WOOD BLOCKOUT TO ROUND WOOD POST DETAIL

The use of this railing is restricted to design speeds of 45 mph or less.

Texas Department of Transportation
Design Division (Roadway)

METAL BEAM GUARD FENCE TRANSITION (TL2)
(Low Speed Transition)

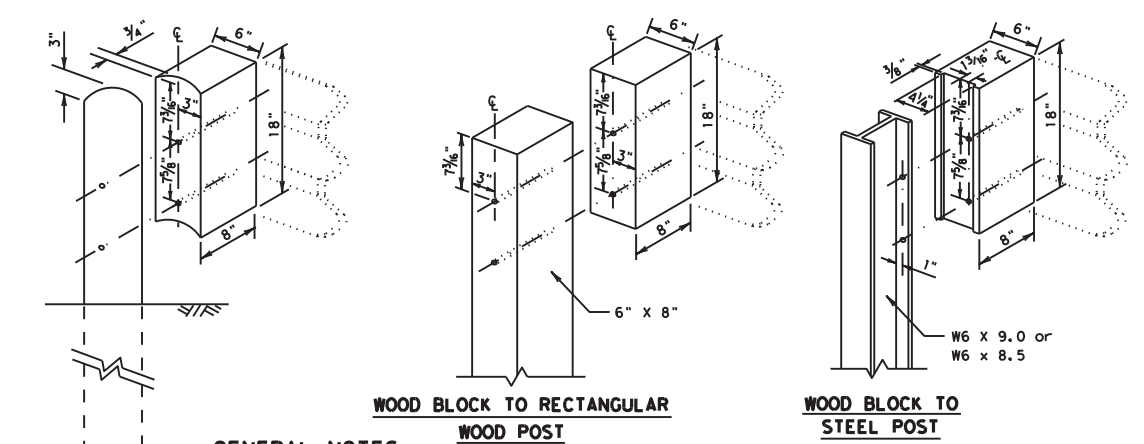
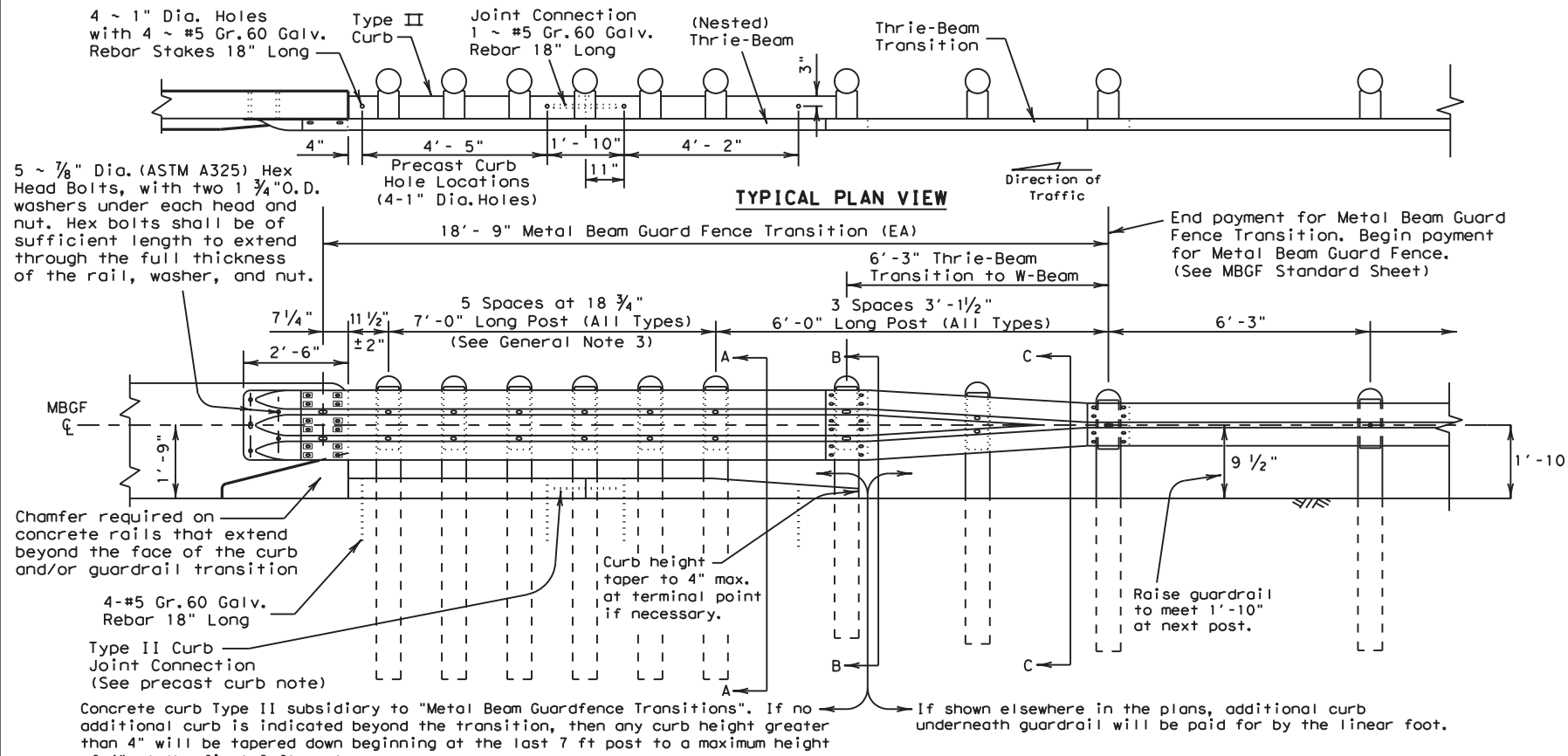
MBGF (TL2) -05

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© TxDOT April 2003		DIST		FEDERAL AID PROJECT
REVISIONS		SAT		SHEET 212
COUNTY	CONTROL	SECT	JOB	HIGHWAY
BEXAR	6372	50	001	VAR.

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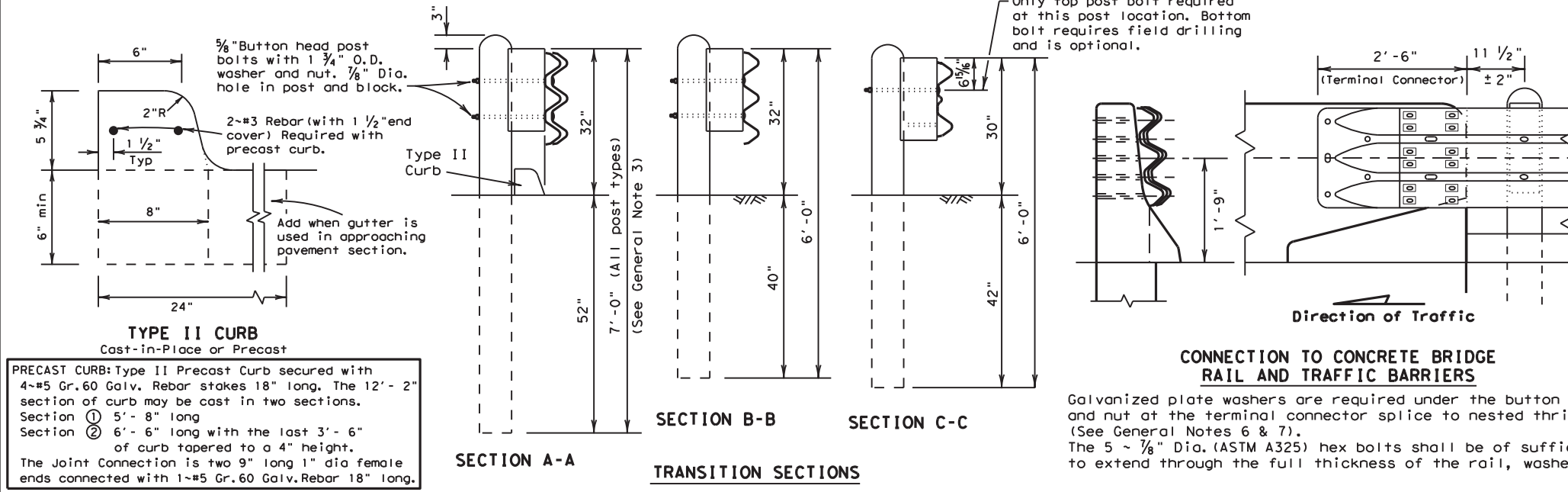
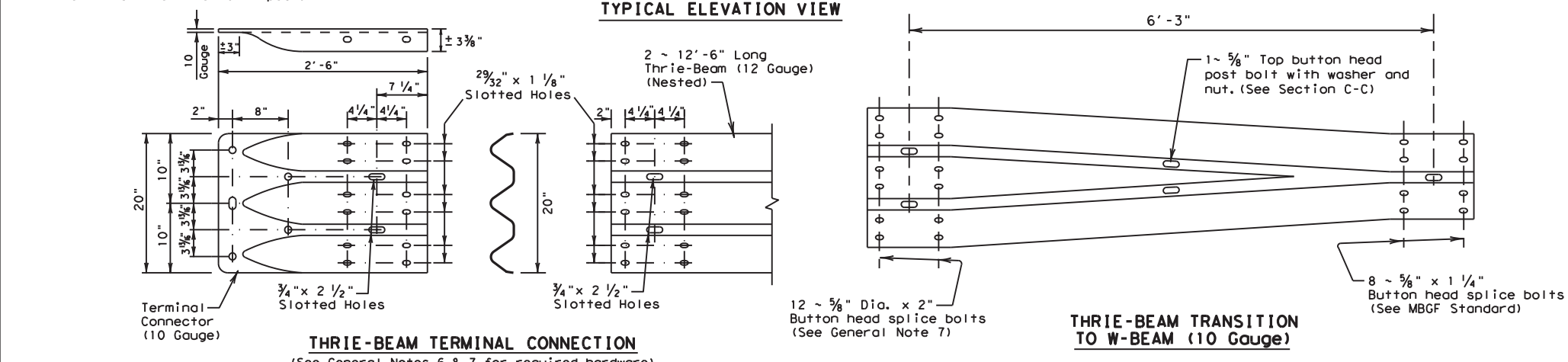
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DATE: 11/16/2020 3:44:55 AM
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GENERAL NOTES

- Concrete curb may be cast-in-place or precast as shown on this sheet. When used in conjunction with thrie-beam guard fence transitions, curb shall be Type II (Typically 5 3/4" height above surface; See CCCG standard sheet) unless otherwise shown in the plans. 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.
- Contact the Design Division for drainage cut options needed within the curb section of the transition.
- The type of post (round wood, rectangular wood or steel) will be shown elsewhere in the plans.
- 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.
- Rail element 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.
- Unless otherwise shown in the plans, transitions shall be placed with the block face in front of or directly above the curb face.
- Galvanized washers used with the 5/8" dia. post bolts shall be Type A 1 3/4" O.D. washers. The (24) plate washers required at the terminal connector splice are 1 3/4" x 3" x 3/16" plate washers with a 1/16" x 1" hole.
- Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) 5/8" Dia. x 2" (at triple rail splices) with 5/8" double recessed nuts.
- 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 transitions.
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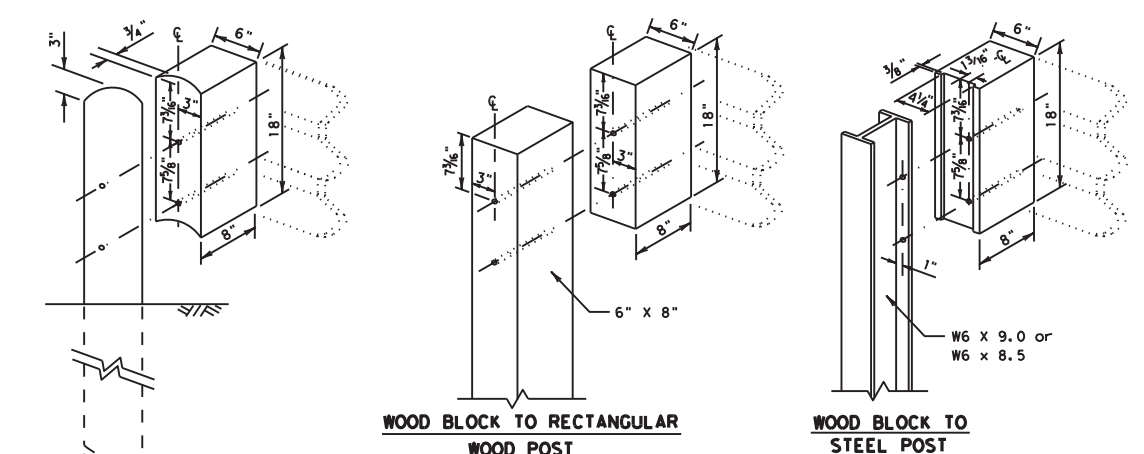
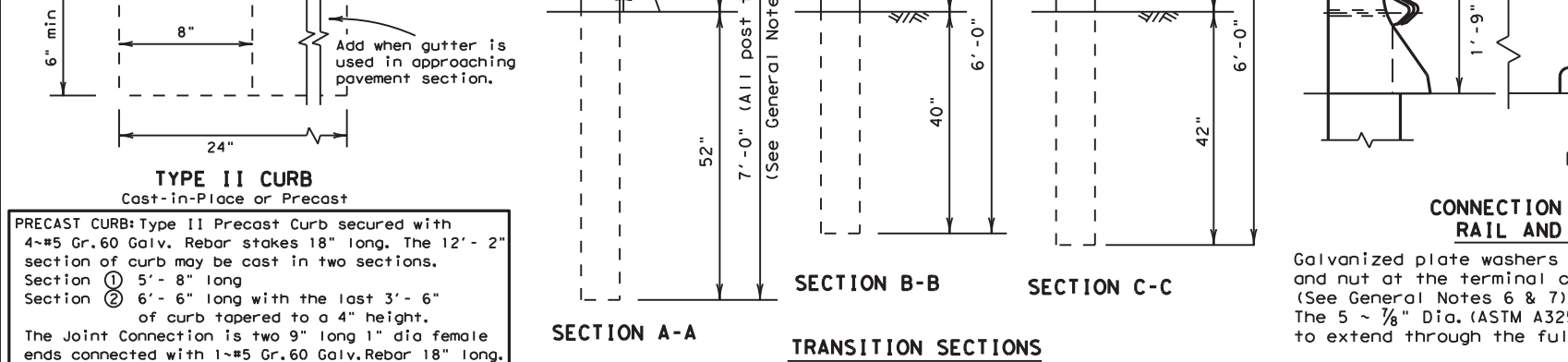
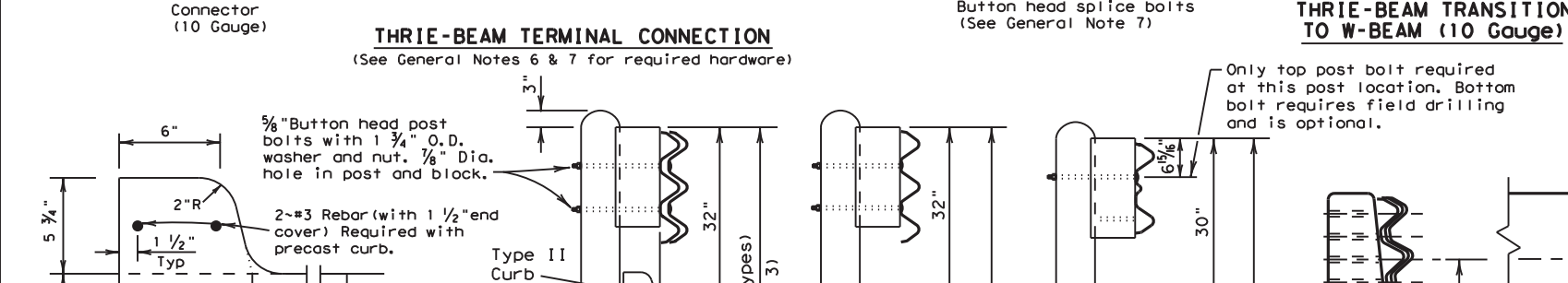
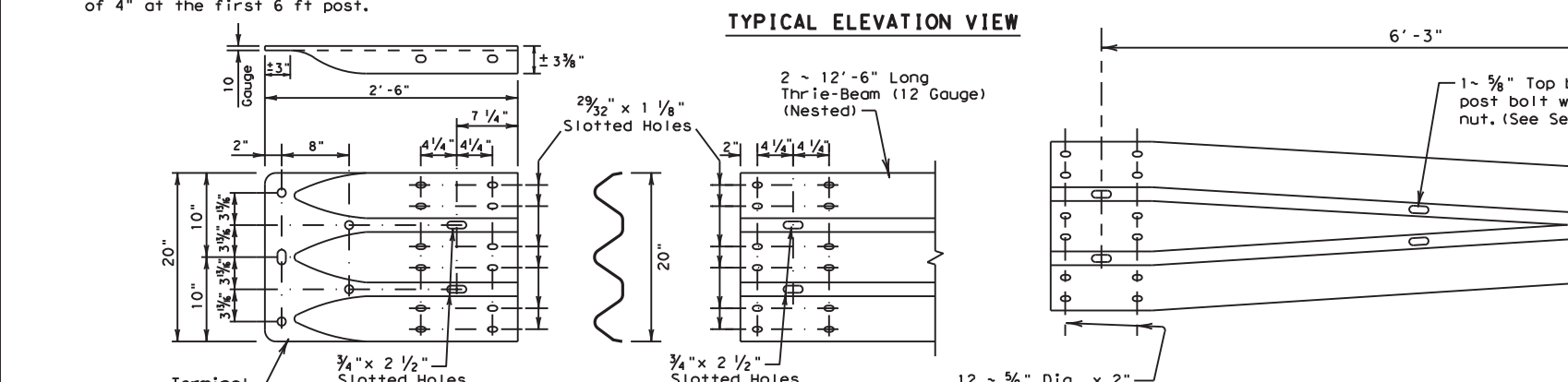
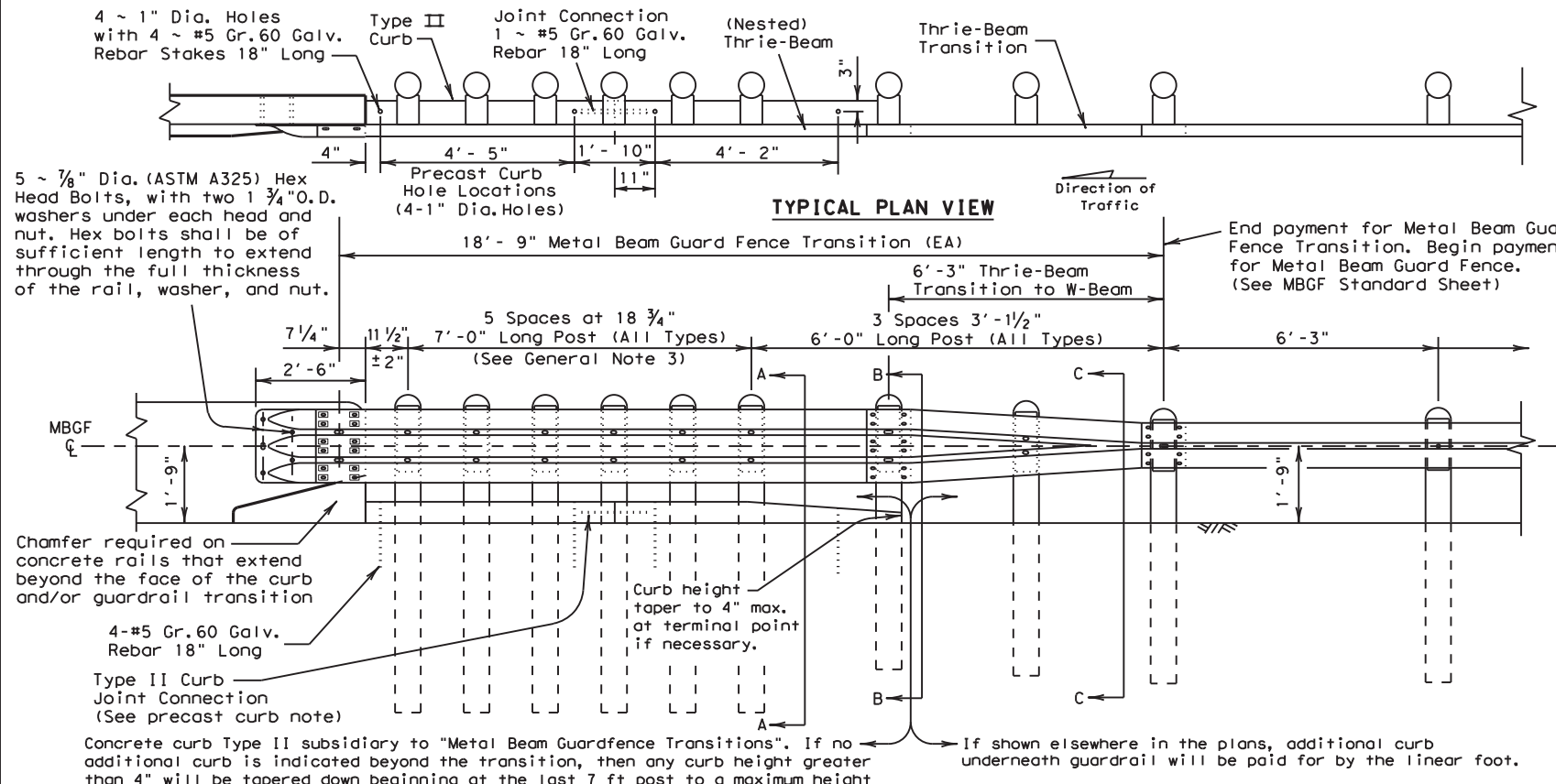
Texas Department of Transportation
 Design Division Standard

METAL BEAM GUARD FENCE TRANSITION
(Thrie-Beam Transition)
MBGF (TR) - 11

FILE: mbgftr11.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
© TxDOT December 2001	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
12-2011	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	214	

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LEVELS DISPLAYED	
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 - Contact the Design Division for drainage cut options needed within the curb section of the transition.
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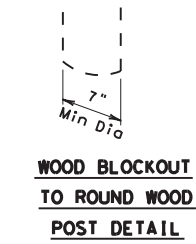
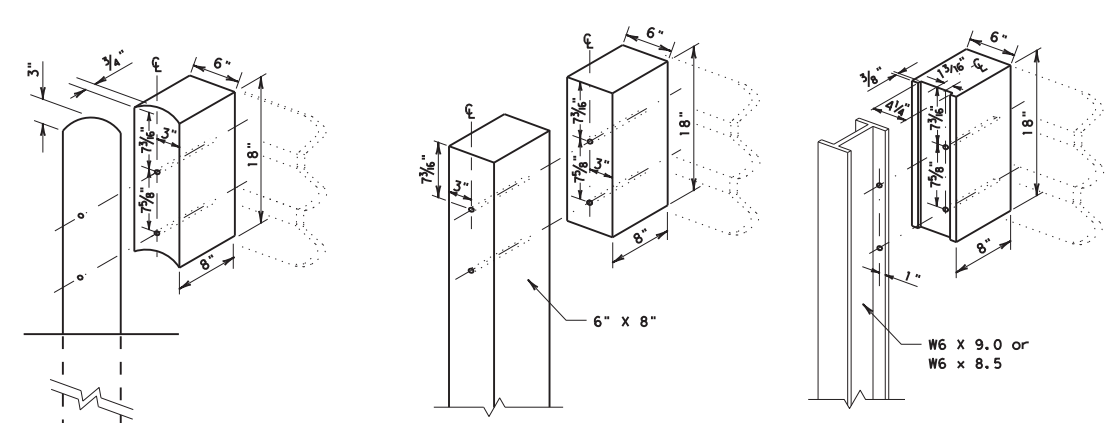
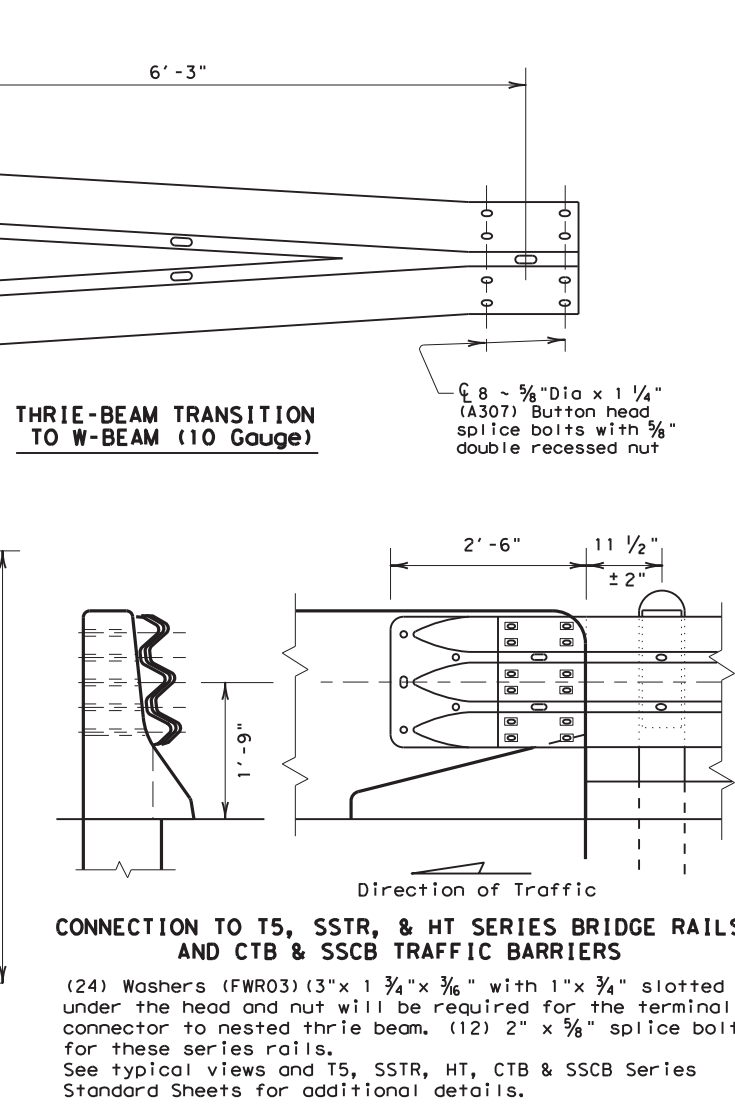
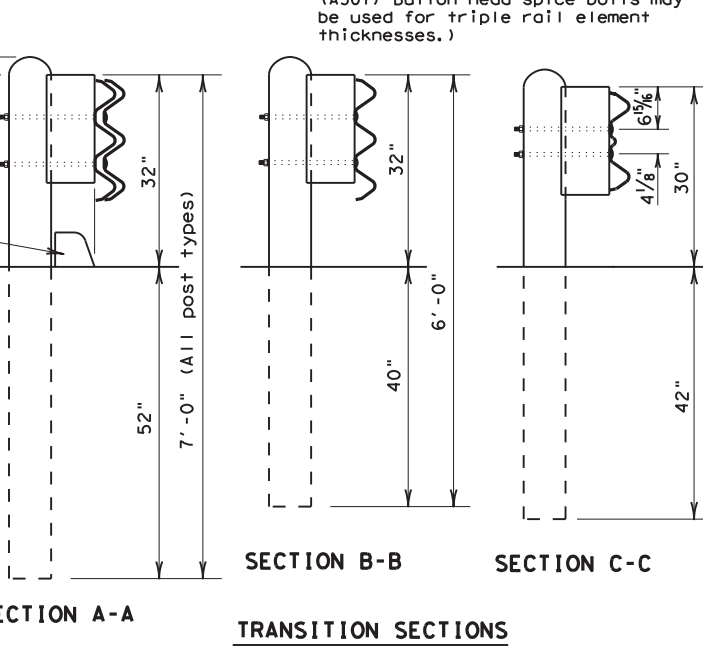
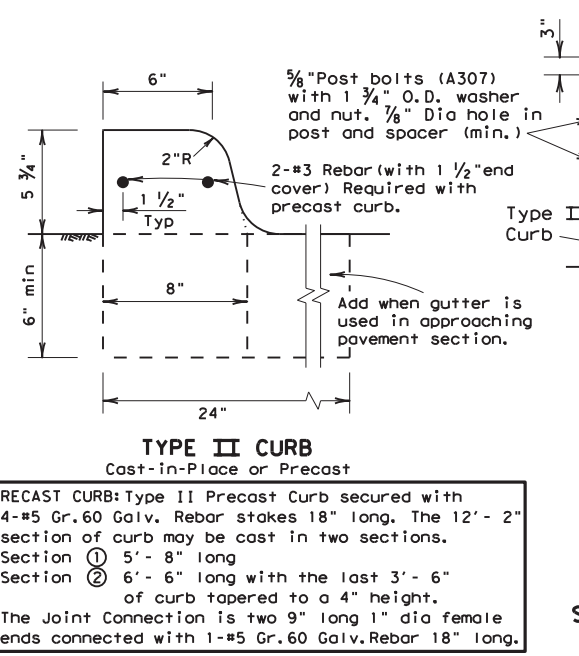
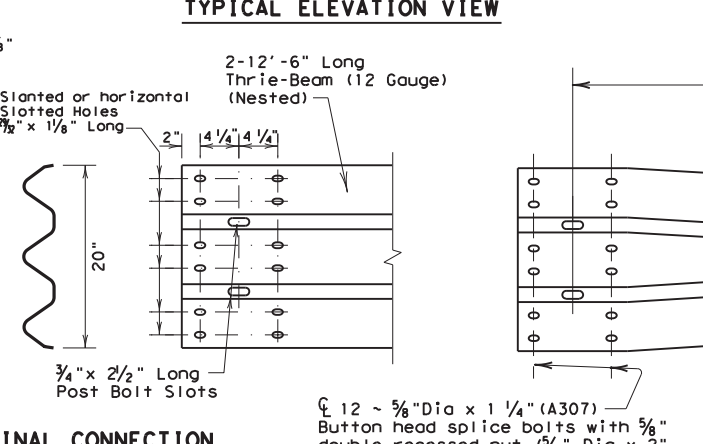
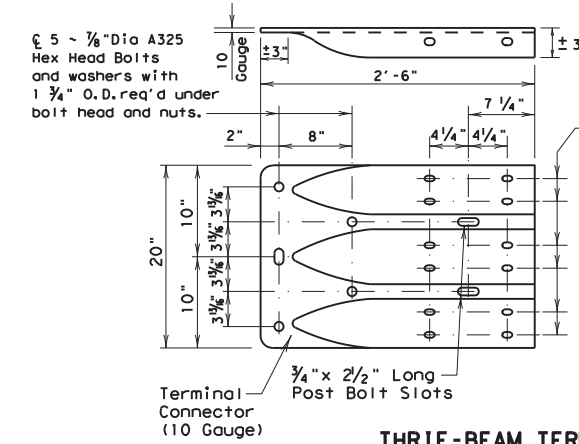
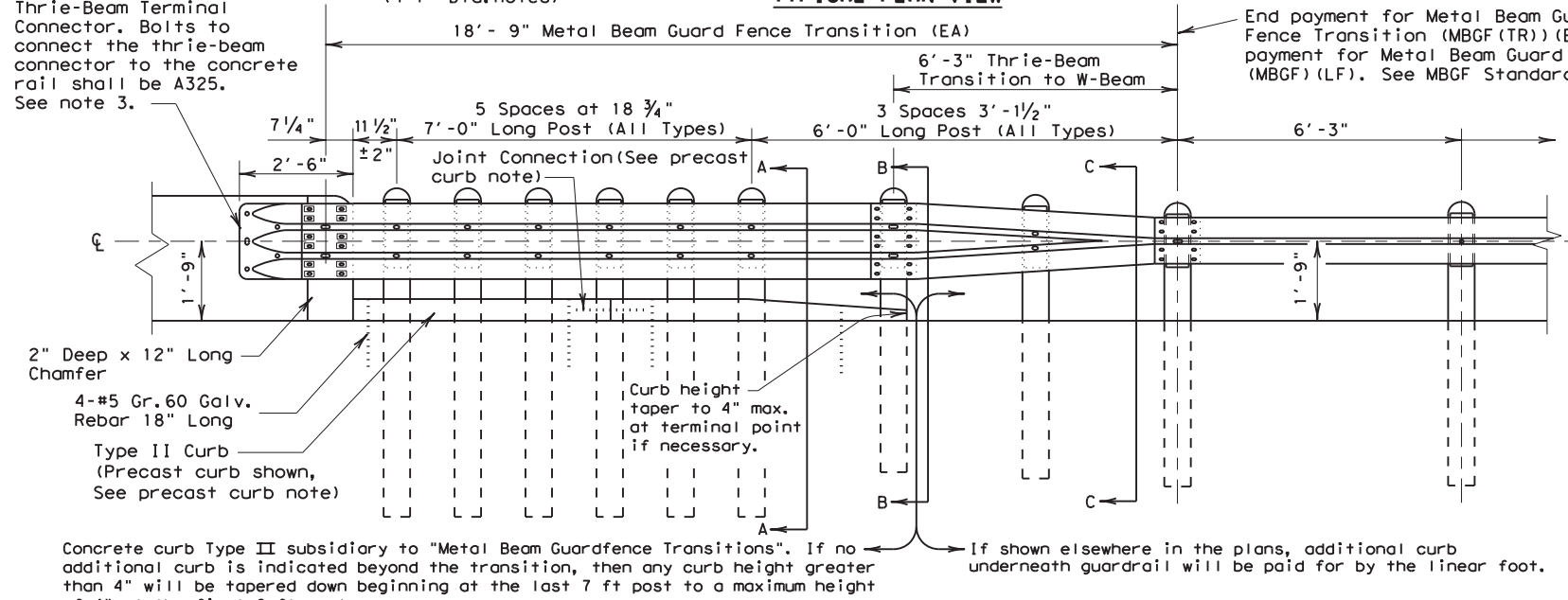
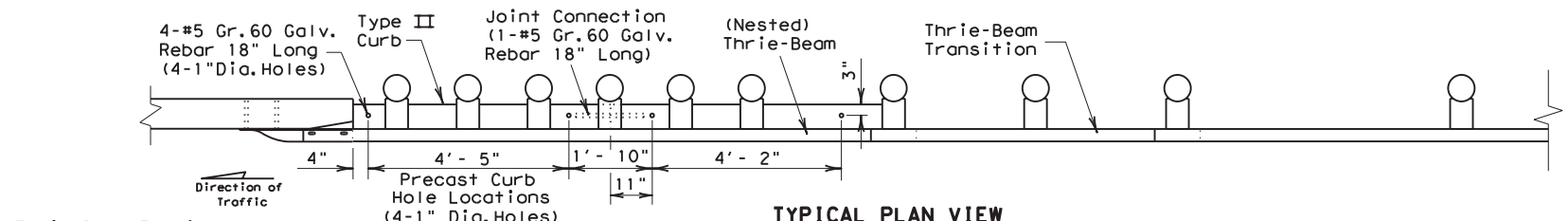
Texas Department of Transportation
Design Division (Roadway)

METAL BEAM GUARD FENCE TRANSITION (Thrie-Beam Transition) MBSG (TR) -09

FILE: mbgftr09.dgn	DN: MAM	CK: MAM	DW: BGD	CK:
© TxDOT December 2001	DIST	FEDERAL AID PROJECT	SHEET	
REVISIONS	SAT	215		
COUNTY	CONTROL	SECT	JOB	HIGHWAY
BEXAR	6372	50	001	VAR.

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LEVELS DISPLAYED	
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 - The type of post (round wood post, rectangular wood post, or steel post) will be shown elsewhere in the plans. The exact position of transitions shall be shown elsewhere in the plans or as directed by the Engineer. See MBGF standard sheet for additional details and information.
 - Rail element shall meet all requirements of AASHTO M-180 except as modified on the plans. The 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 Terminal Connector prior to ordering of materials.
 - Unless otherwise shown in the plans, transitions shall be placed with the blockout face in front of or directly above the curb face.
 - Galvanized washers used with the 5/8" splice bolts and nuts that are provided for terminal connectors shall be (FWR03) (3" x 1 3/4" x 3/16" with 1" x 3/4" slotted hole).
 - Button head post bolts (A307) shall be of sufficient length to extend through the full thickness of the nut and no more than 3/4" beyond it. Button head splice bolts (A307) are 5/8" x 1 1/4" with a 3/8" double recessed nut. Galvanized fittings (bolts, nuts, and washers) shall be in accordance with Item, "Metal For Structures". Fittings shall be subsidiary to the bid item requiring construction of transition.
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 - Refer to MBGF Standard Sheet for additional details.

If connecting to existing Bridge Rails. Contact the Bridge Division for proper retrofit details.

Texas Department of Transportation
Design Division (Roadway)

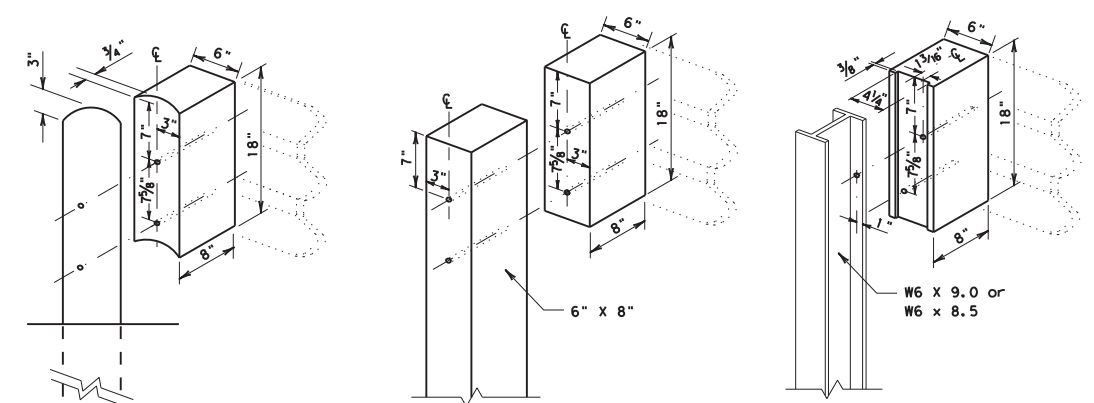
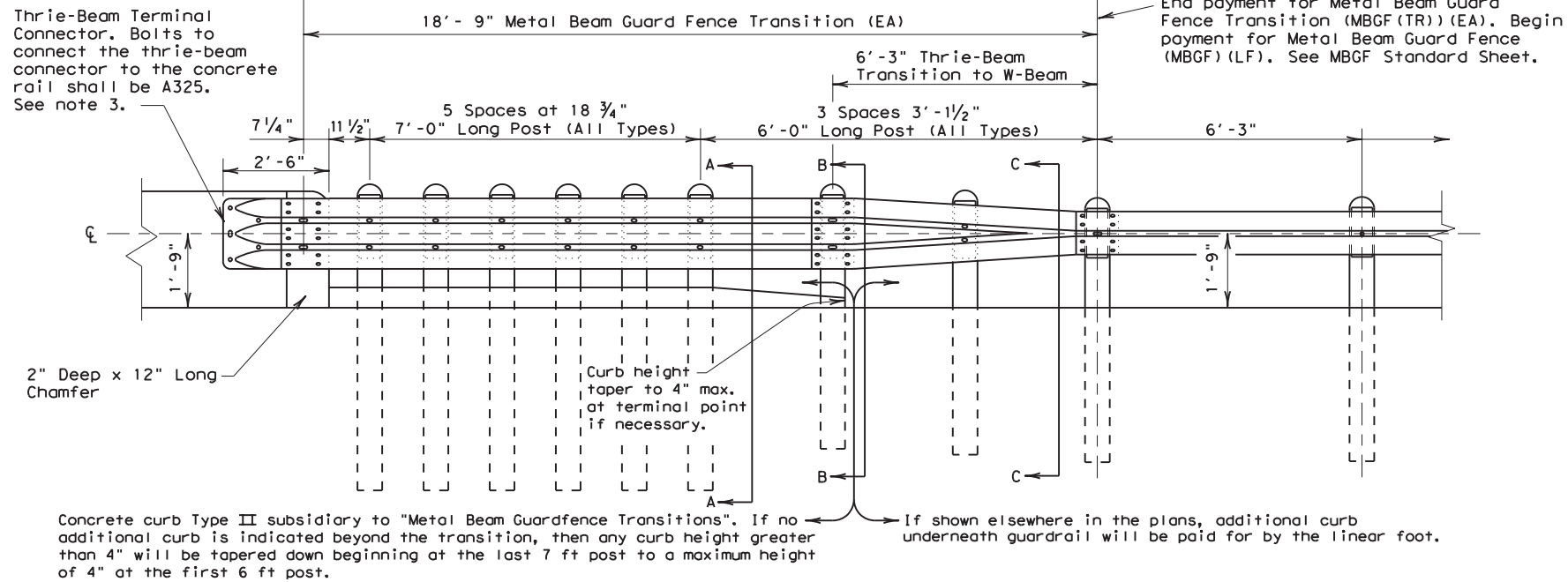
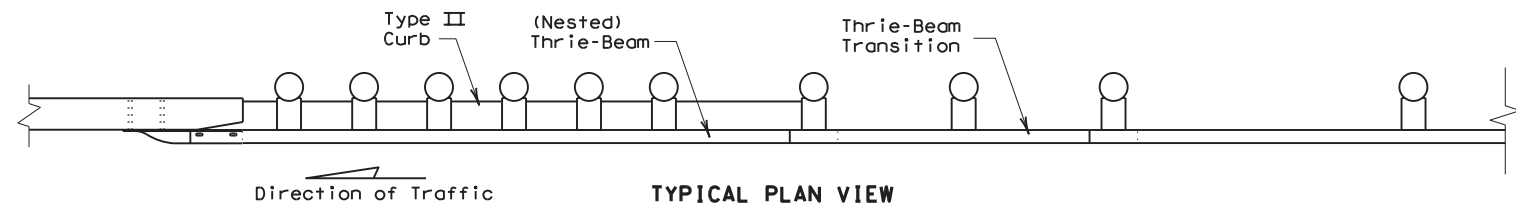
METAL BEAM GUARD FENCE TRANSITION

MBGF (TR) -05

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© TxDOT December 2001		DIST		FEDERAL AID PROJECT
REVISIONS		SAT		SHEET
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		216		VAR.
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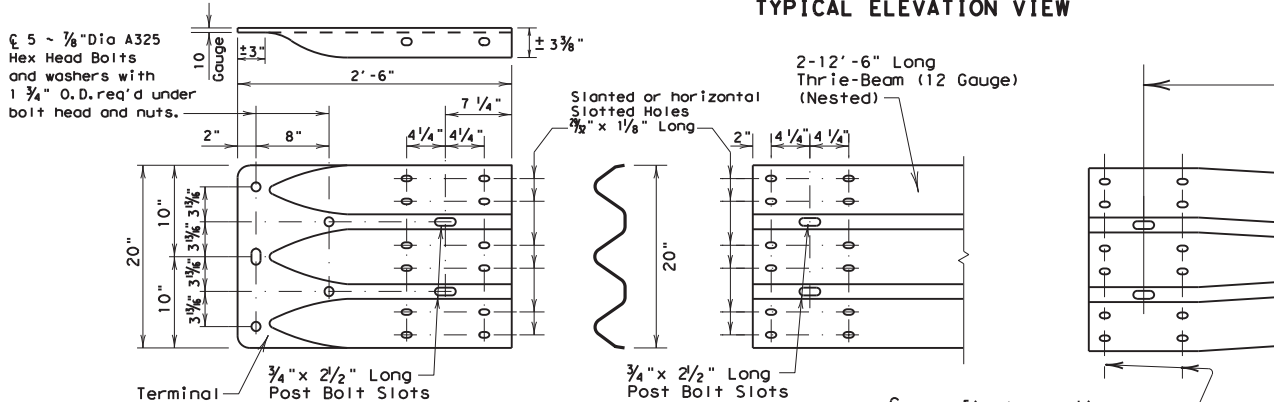
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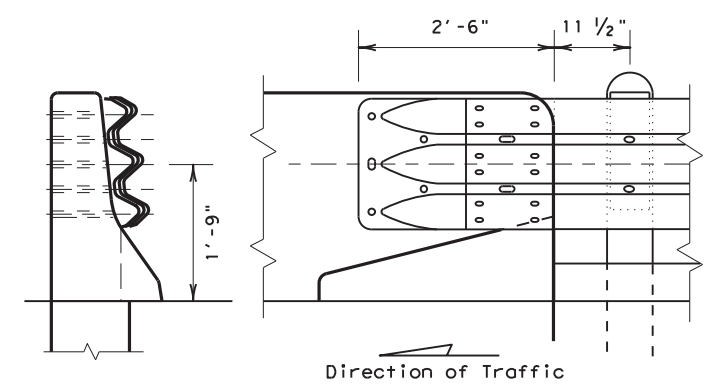
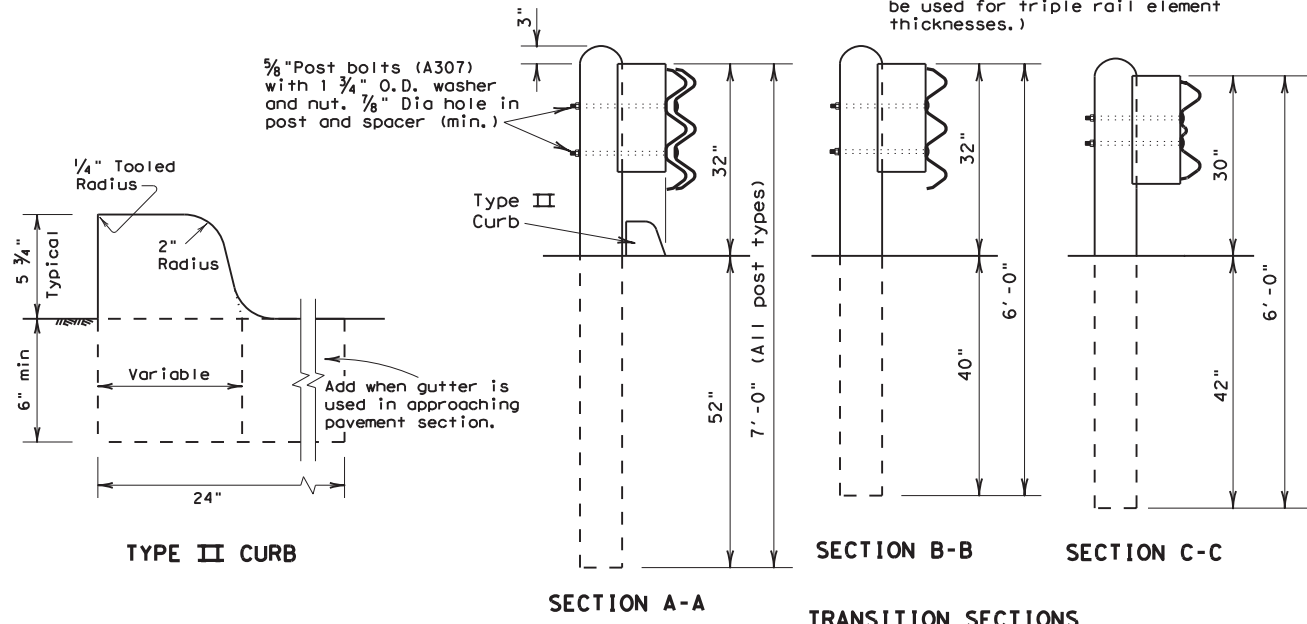
GENERAL NOTES

- Concrete curbs used in conjunction with thrie-beam guardfence transitions shall be Type II (typically 5 3/4" height above surface; see CCG standard sheet) unless otherwise shown in the plans. If other curb heights are shown in the plans in conjunction with the transition, this curb height may be from 4" to 8" with a relatively vertical face.
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- Unless otherwise shown in the plans, transitions shall be placed with the blockout face in front of or directly above the curbface.
- Galvanized washers used with the 5/8" splice bolts and nuts that are provided for terminal connectors shall be (FWR03) (3"x 1 3/4"x 3/16" with 1"x 3/4" slotted hole).
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THRIE-BEAM TERMINAL CONNECTION

THRIE-BEAM TRANSITION TO W-BEAM (10 Gauge)



CONNECTION TO T5, SSTR, & HT SERIES BRIDGE RAILS AND CTB & SSCB TRAFFIC BARRIERS

Washers (FWR03) (3"x 1 3/4"x 3/16" with 1"x 3/4" slotted hole) under the head and nut will be required for the terminal connector to nested thrie beam splice bolts for these series rails. See typical views and T5, SSTR, HT, CTB & SSCB Series Standard Sheets for additional details.

Texas Department of Transportation
Design Division (Roadway)

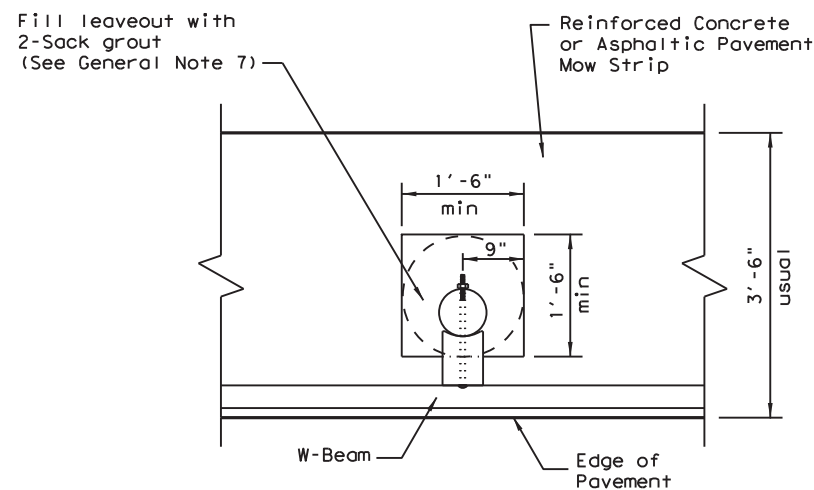
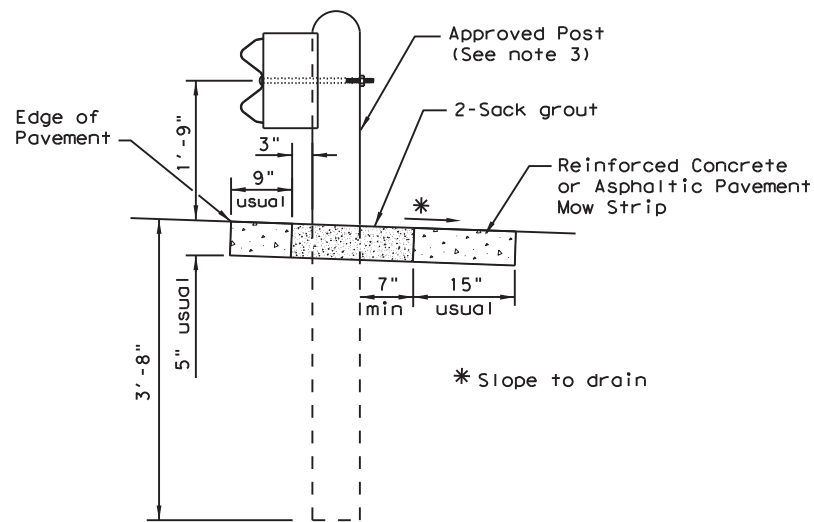
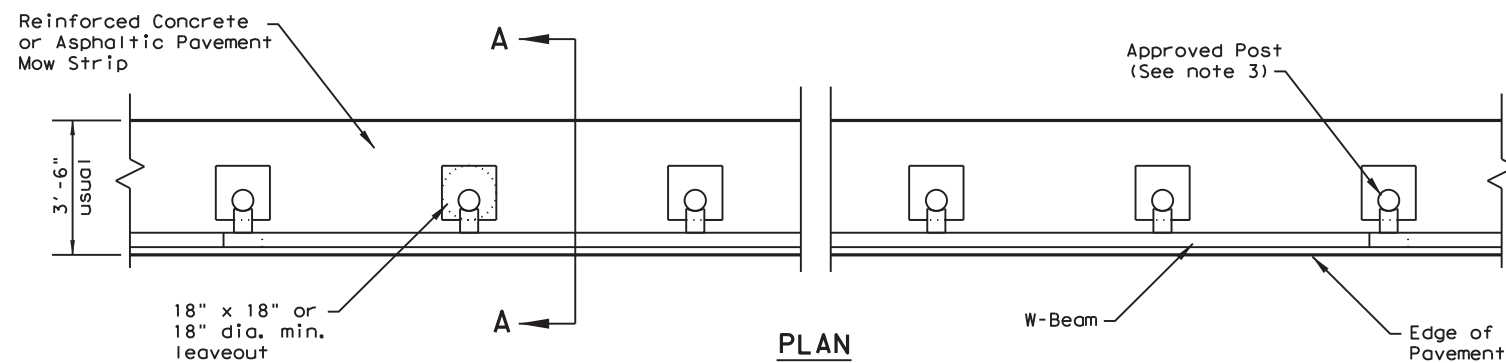
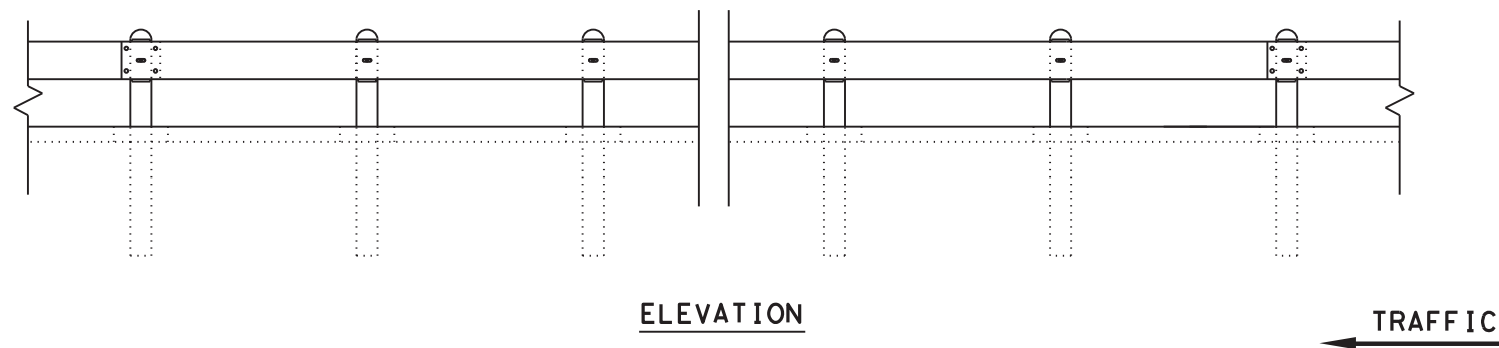
METAL BEAM GUARD FENCE TRANSITION

MBGF (TR) -02

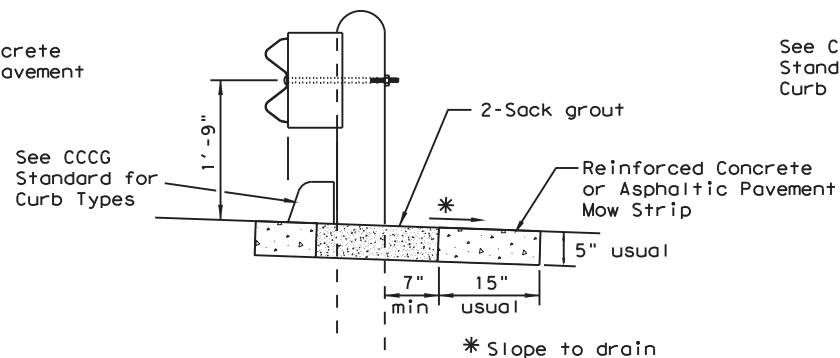
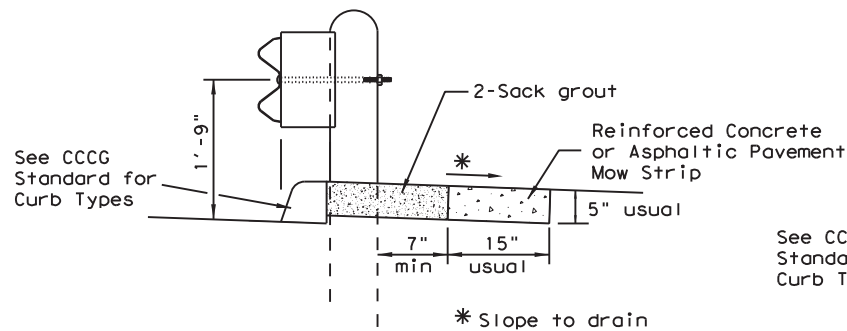
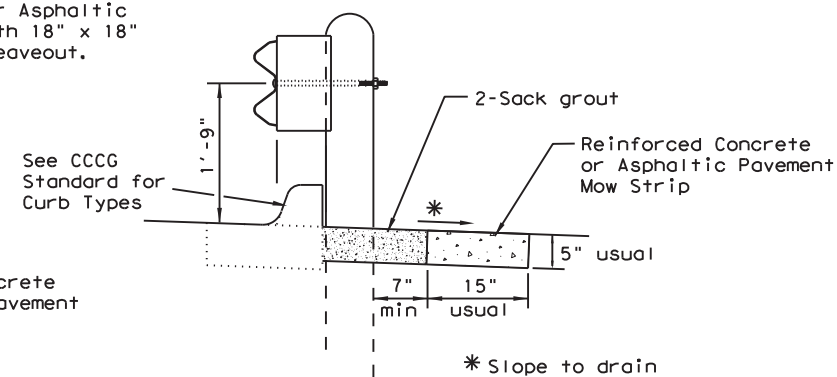
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REVISIONS	SAT	6		218
	COUNTY	CONTROL	SECT	JOB
	BEXAR	6372	50	001
				VAR.

GENERAL NOTES

1. Mow strips shall be asphaltic pavement or concrete riprap as shown on the plans and will be paid for under the pertinent bid item of work. Asphaltic pavement shall meet the requirements of and be placed in accordance with the pertinent bid item as shown on the plans. Concrete riprap shall be placed in accordance with Item 432, "Riprap".
2. The leaveout behind the post shall be a minimum of 7".
3. The type of approved post will be shown elsewhere in the plans. See the applicable standard sheets for additional details and information.
4. Other curb placement options may be used. Curbs are not considered part of the mow strip and will be paid for under other pertinent bid item.
5. Depth of mow strip may vary, (5" usual, 8" maximum).
6. The limits of payment for asphaltic pavement or concrete riprap will include leaveouts for post.
7. The leave outs shall be filled with no more than a 2-sack grout mixture and placed in accordance with Section 421.2(8), "Mortar and Grout". Payment for furnishing and placing the grout mixture will be considered subsidiary to the pay item of asphaltic pavement or concrete riprap.



Reinforced Concrete or Asphaltic Pavement Mow Strip with 18" x 18" or 18" dia. minimum leaveout.



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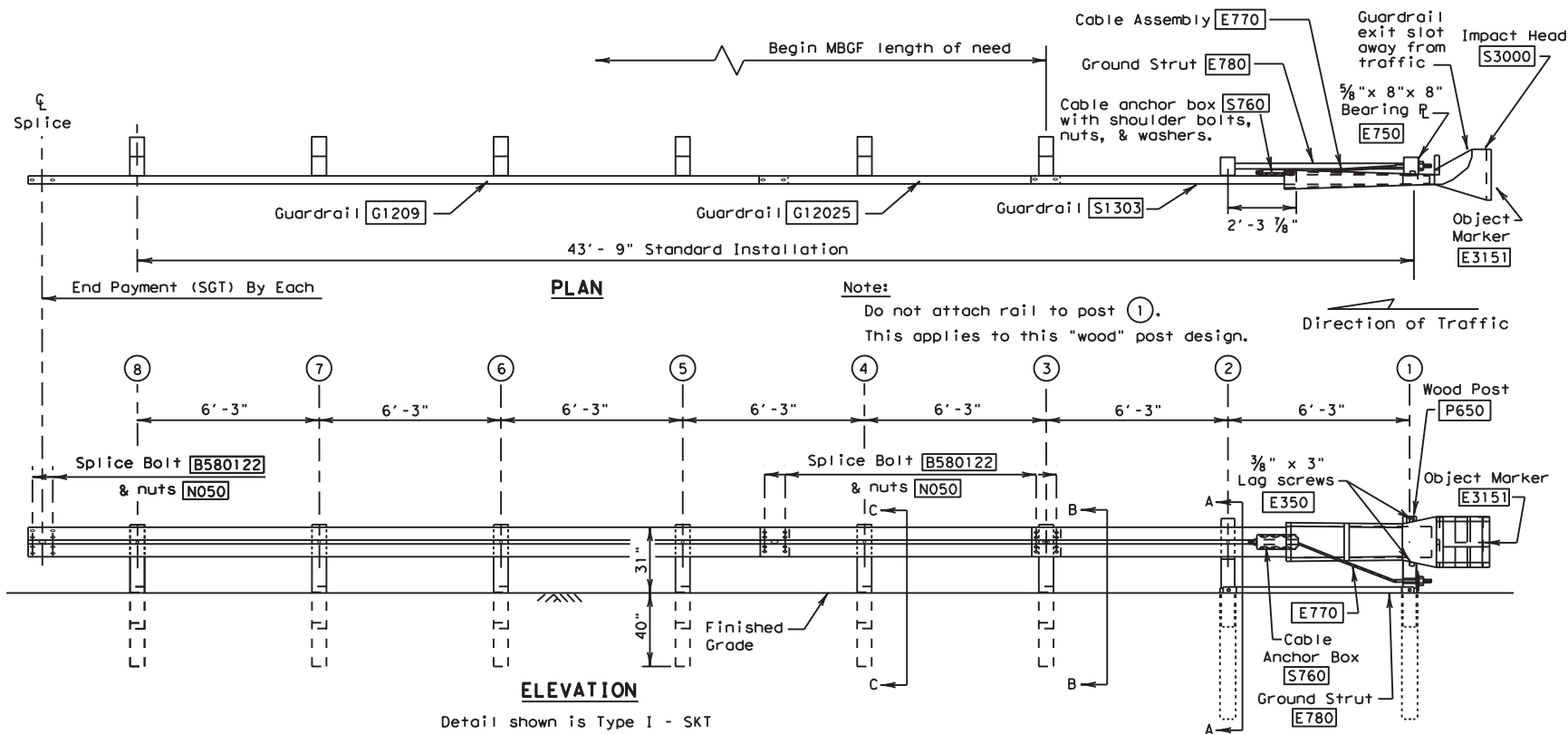
MOW STRIP

MS-03

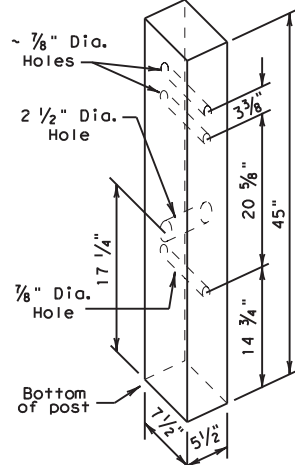
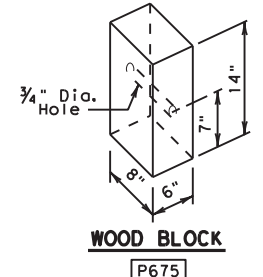
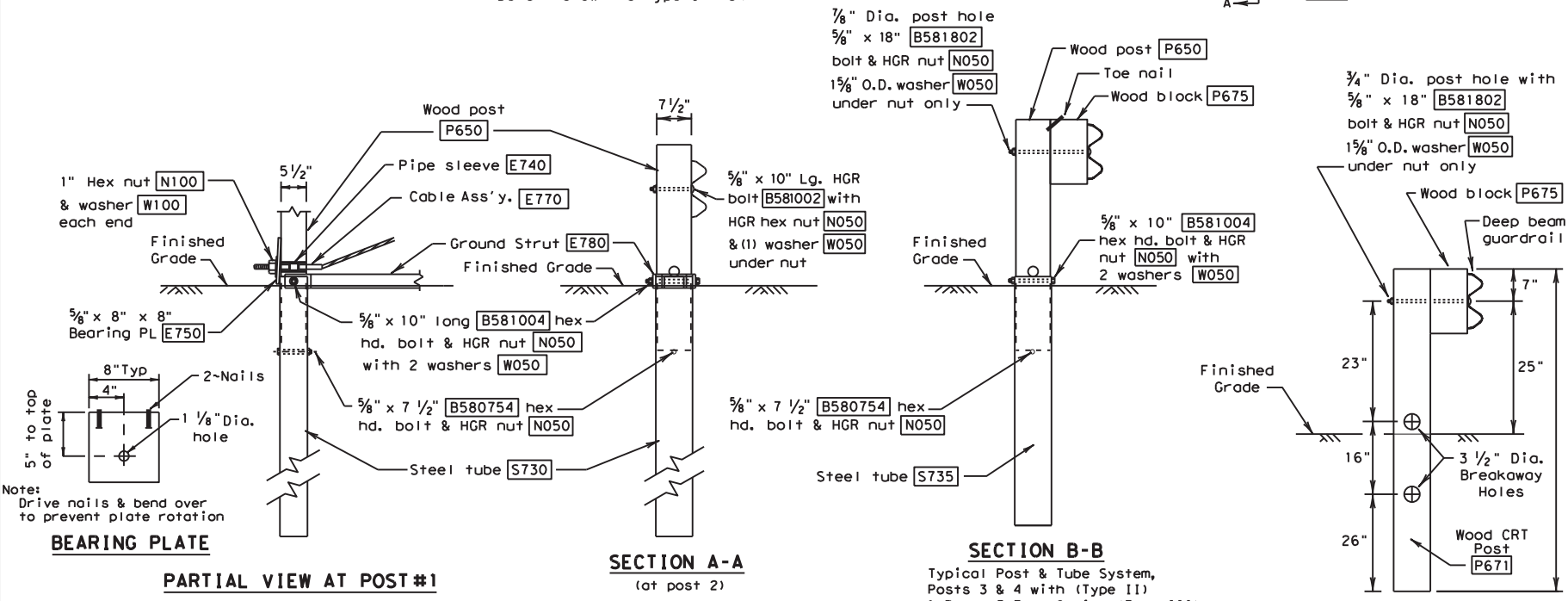
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DATE: FILE:



Detail shown is Type I - SKT



All measurements should be taken from bottom of posts.

UNIVERSAL WOOD POST (P650)

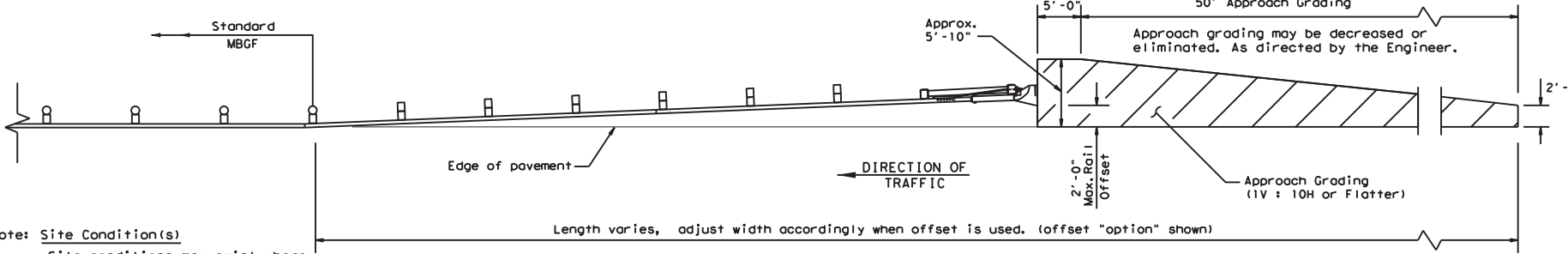
POST & TUBE OPTIONS	
Type I	post ① thru ②
Type II	post ① thru ④
Type III	post ① thru ⑧

GENERAL NOTES

- For additional information contact: Interstate Steel Inc. (432) 263-3725
- The Type of SGT unit will be specified elsewhere in the plans. The numbers in the circles indicate post position. The Type of SGT unit chosen is a maintenance consideration and does not affect the systems performance.

Post & Tube Options		Post Only	
Type I Posts	① thru ②	Posts	③ thru ⑧
Type II Posts	① thru ④	Posts	⑤ thru ⑧
Type III Posts	① thru ⑧		None
- SGT's placed within the "minimum" 150 ft. radius, shall be installed straight. Standard rail elements may be installed within the radius, without special fabrication.
- All bolts, nuts cable assemblies, cable anchors, steel tubes & bearing plates shall be galvanized.
- A flare rate of 25:1 may be used over the first 50 ft. of the system to prevent the terminal head from encroaching the shoulder. The flare may be decreased or eliminated for specific installations, if directed by the Engineer.
- The steel tubes shall not protrude more than 4 inches above ground. Site grading may be necessary to meet this requirement.
- The steel tubes may be driven with an approved driving head. They shall not be driven with the wood post in the tube. If the steel tubes are placed in drilled holes, the backfill material must be satisfactorily compacted to prevent tube settlement.
- If solid rock is encountered. See the Manufacturer's installation manual for the proper installation guidance.
- The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
- The wood blocks shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks. The bearing plate on the front post shall also be "toe nailed" to prevent rotation.
- For curb installations, the soil tubes and posts shall be installed at the proper ground elevation behind the curb. The posts will then require field drilling new holes to accommodate the rail to post connection bolt to maintain the proper height of the rail above the gutter pan. The excess post length above the rail will be removed if directed by the Engineer.
- An object marker shall be installed on the front of the impact head as detailed on D&OM(VIA).

Item #	POST & TUBE OPTIONS			BILL OF MATERIAL	
	Type I	Type II	Type III	DESCRIPTION	
S1303	1	1	1	Guardrail (12 Ga.)	12'- 6" SKT
G12025	1	1	1	Guardrail (12 Ga.)	9'- 4 1/2"
G1209	1	1	1	Guardrail (12 Ga.)	25'- 0"
S730	2	2	2	Steel Tube - 6" x 8" x 72"	x 1/8" min. or 3/16"
S735	0	2	6	Steel Tube - 6" x 8" x 54"	x 1/8" min. or 3/16"
P650	2	4	8	Wood Posts - 5 1/2" x 7 1/2" x 45"	
P671	6	4	0	Wood CRT Posts - 6" x 8" x 72"	
P675	6	6	6	Wood Block - 6" x 8" x 14"	
E740	1	1	1	Pipe Sleeve - 2" Std. Pipe x 5 1/2"	
E750	1	1	1	Bearing Plate - 5/8" x 8" x 8"	
S760	1	1	1	Cable Anchor Box	
E770	1	1	1	Cable Assembly	
E780	1	1	1	Ground Strut	
S3000	1	1	1	Impact Head	
HARDWARE					
B580754	2	4	8	5/8" x 7 1/2" Hex Hd. Bolt	
B581004	2	4	8	5/8" x 10" Hex Hd. Bolt (Top of Tubes)	
W050	11	15	23	3/8" Washers	
B581002	1	1	1	5/8" x 10" HGR Post Bolt (Post 2)	
B580122	16	16	16	3/8" x 1 1/4" HGR Splice Bolt	
B581802	6	6	6	5/8" x 18" HGR Post Bolt (Posts ③ thru ⑧)	
N050	35	39	47	3/8" HGR Nut (24-Spl, Varies-Posts, 2-Strut)	
E350	2	2	2	3/8" x 3" Lag Screw	
N100	2	2	2	1" Hex Nut (Anchor Cable)	
W100	2	2	2	1" Washer (Anchor Cable)	
SB12A	8	8	8	Cable Anchor Box Shoulder Bolts	
N012A	8	8	8	1/2" Structural Nut	
W012A	8	8	8	1/2" Structural Washer	
E3151	1	1	1	Object Marker - (18" x 18")	



APPROACH GRADING AT GUARDRAIL END TREATMENTS

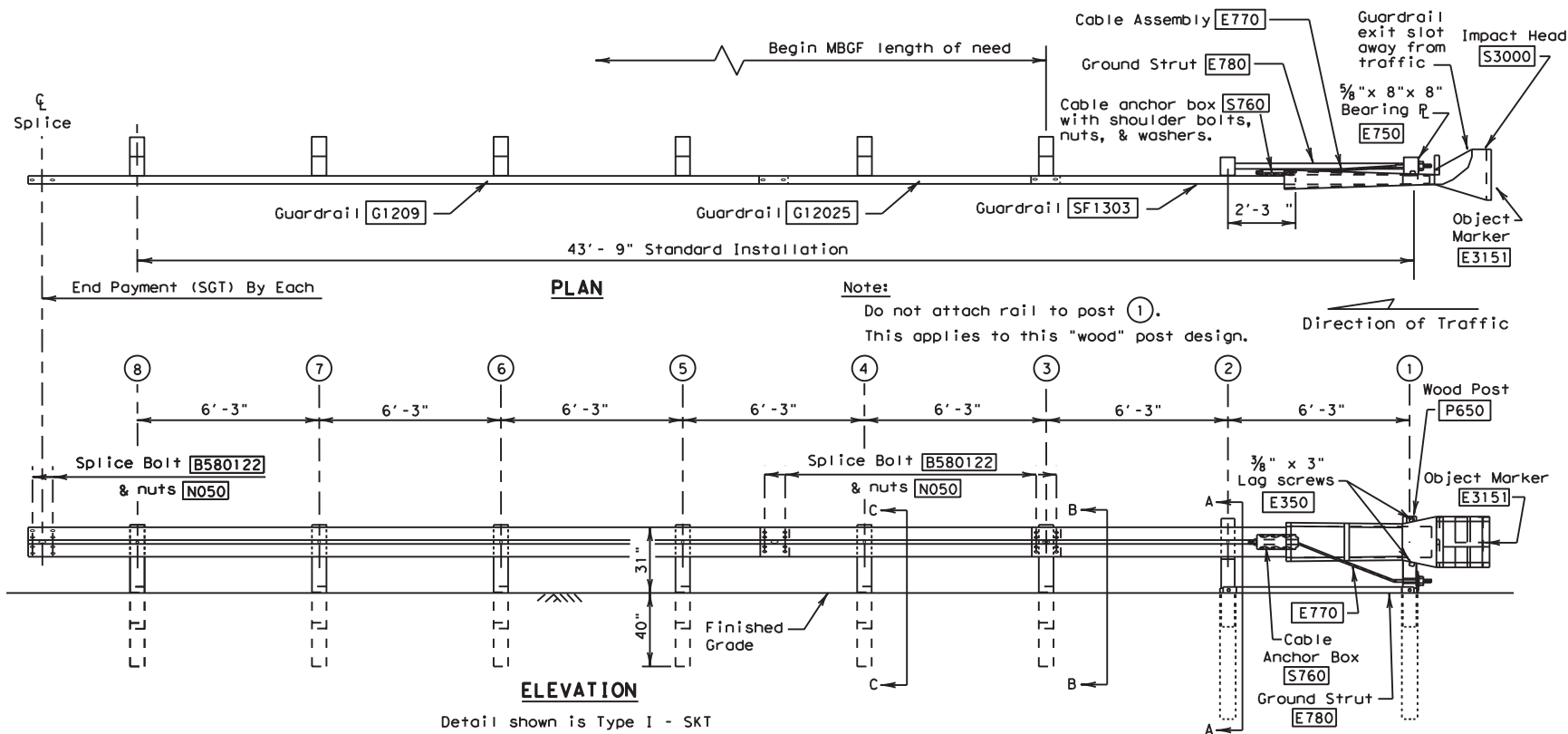
Design Division Standard

SINGLE GUARDRAIL TERMINAL (SKT-31) (WOOD POST)
SGT (8) 31-14

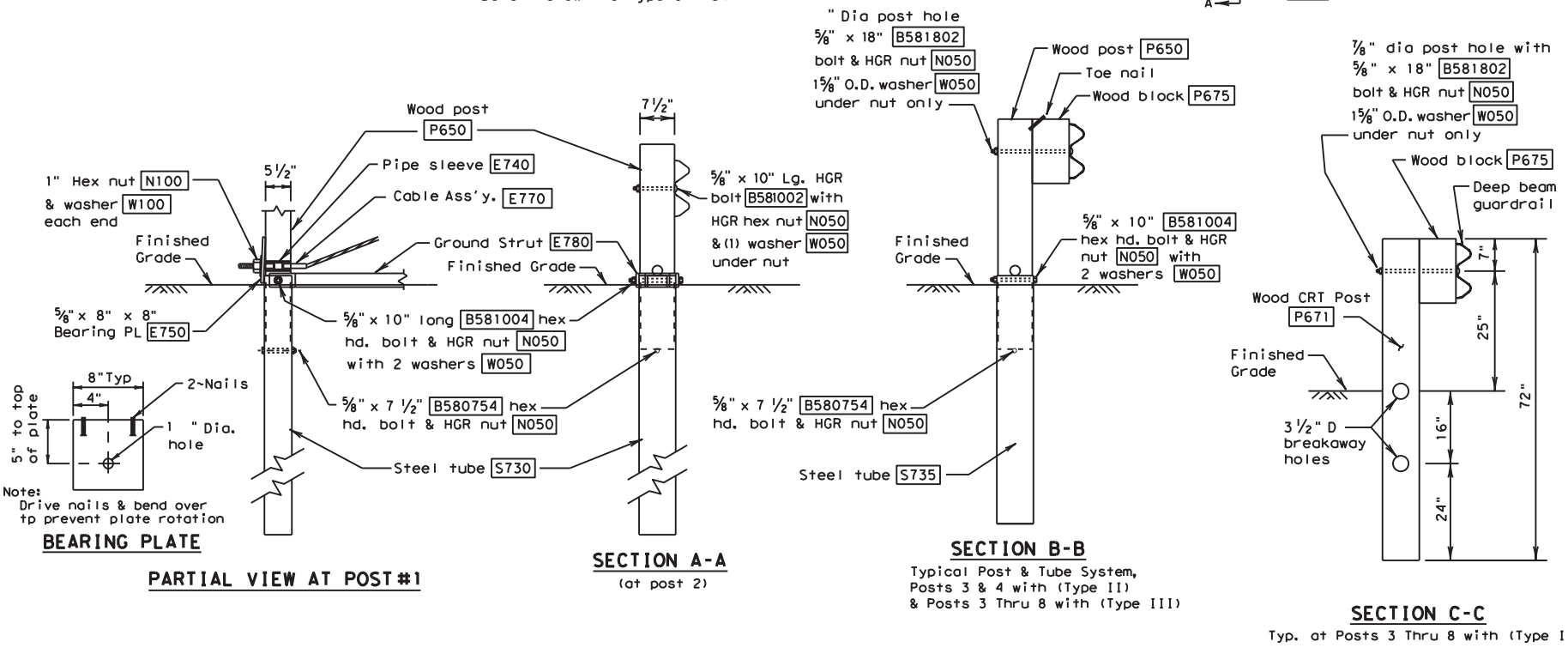
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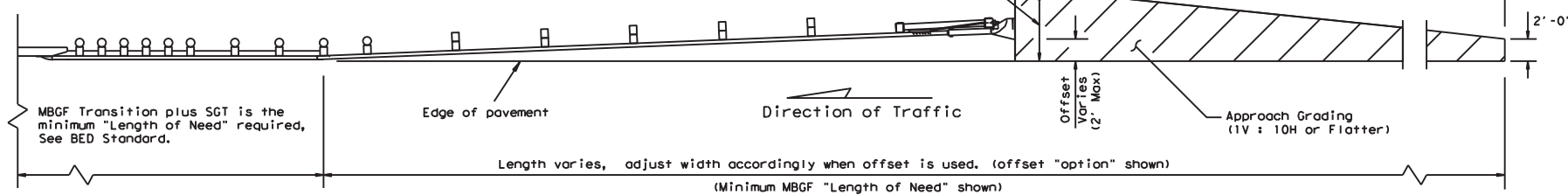
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Detail shown is Type I - SKT



Note: Site Condition(s)
Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.



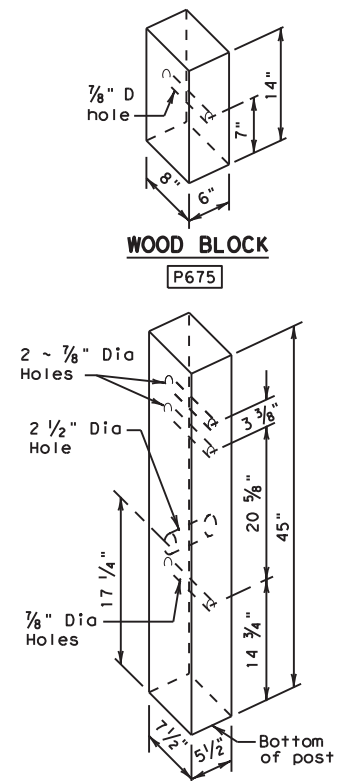
GRADING AT GUARDRAIL END TREATMENTS

GENERAL NOTES

- For additional information contact: Interstate Steel Inc., (432) 263-3725.
- The Type of SGT unit will be specified elsewhere in the plans. Numbers in circles indicate post position. The Type of SGT unit chosen is a maintenance consideration and does not affect the systems performance.

Post & Tube Options		Post Only	
Type I Posts	① thru ②	Posts ③ thru ⑧	
Type II Posts	① thru ④	Posts ⑤ thru ⑧	
Type III Posts	① thru ⑧		
- SGT's placed within the "minimum" 150 ft. radius, shall be installed straight. Standard rail elements may be installed within the radius, without special fabrication.
- All bolts, nuts cable assemblies, cable anchors, steel tubes & bearing plates shall be galvanized.
- A flare rate of 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 steel tubes shall not protrude more than 4 inches above ground. Site grading may be necessary to meet this requirement.
- The steel tubes may be driven with an approved driving head. They shall not be driven with the wood post in the tube. If the steel tubes are placed in drilled holes, the backfill material must be satisfactorily compacted to prevent tube settlement.
- If solid rock is encountered. See the Manufacturer's installation manual for the proper installation guidance.
- The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
- The wood blocks shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks. The bearing plate on the front post shall also be "toe nailed" to prevent rotation.
- For curb installations, the soil tubes and posts shall be installed at the proper ground elevation behind the curb. The posts will then require field drilling new holes to accommodate the rail to post connection bolt to maintain the proper height of the rail above the gutter pan. The excess post length above the rail will be removed as directed by the Engineer.
- An object marker shall be installed on the front of the impact head as detailed on D&OM(VIA).
- A special site evaluation should be considered, prior to using this end treatment where there is less than 25 feet between the outlet side of the end treatment and any adjacent driving lane.

Code #	POST & TUBE OPTIONS			DESCRIPTION
	Type I Qty.	Type II Qty.	Type III Qty.	
S1303	1	1	1	Guardrail (12 Ga.) 12'- 6" SKT Panel
G12025	1	1	1	Guardrail (12 Ga.) 9'- 4 1/2"
G1209	1	1	1	Guardrail (12 Ga.) 25'- 0"
S730	2	2	2	Steel Tube - 6" x 8" x 72" x 1/8"
S735	0	2	6	Steel Tube - 6" x 8" x 54" x 1/8"
P650	2	4	8	Wood Post - 5 1/2" x 7 1/2" x 45"
P671	6	4	0	Wood CRT Posts - 6" x 8" x 72"
P675	6	6	6	Wood Block - 6" x 8" x 14"
E740	1	1	1	Pipe Sleeve - 2" Std. Pipe x 5 1/2"
E750	1	1	1	Bearing Plate - 5/8" x 8" x 8"
S760	1	1	1	Cable Anchor Box
E770	1	1	1	Cable Assembly
E780	1	1	1	Ground Strut
S3000	1	1	1	Impact Head
B580754	2	4	8	5/8" x 7 1/2" Hex Hd. Bolt
B581004	2	4	8	5/8" x 10" Hex Hd. Bolt (Top of Tubes)
W050	11	15	21	5/8" Washers
B581002	1	1	1	5/8" x 10" HGR Post Bolt (Post 2)
B580122	24	24	24	5/8" x 1 1/4" HGR Splice Bolt
B581802	6	6	6	5/8" x 18" HGR Post Bolt (Posts ③ thru ⑧)
N050	33	37	45	5/8" HGR Nut (16-Spl, 7-Posts, 2-Strut)
E350	2	2	2	3/8" x 3" Lag Screw
N100	2	2	2	1" Hex Nut (Anchor Cable)
W100	2	2	2	1" Washer (Anchor Cable)
SB58A	8	8	8	Cable Anchor Box Shoulder Bolts
N055A	8	8	8	1/2" A325 Structural Nut
W050A	16	16	16	1/2" A325 Structural Washer
E3151	1	1	1	Object Marker - (18" x 18")



All measurements should be taken from bottom of posts.

UNIVERSAL WOOD POST

P650

POST & TUBE OPTIONS	
Type I post	① thru ②
Type II post	① thru ④
Type III post	① thru ⑧

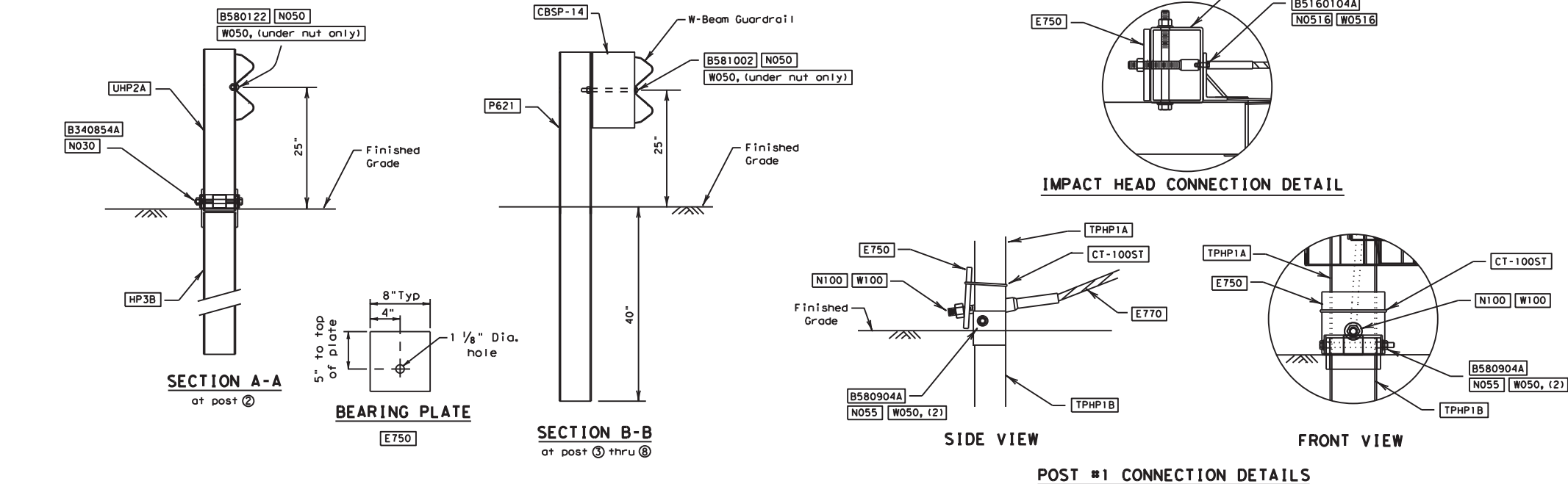
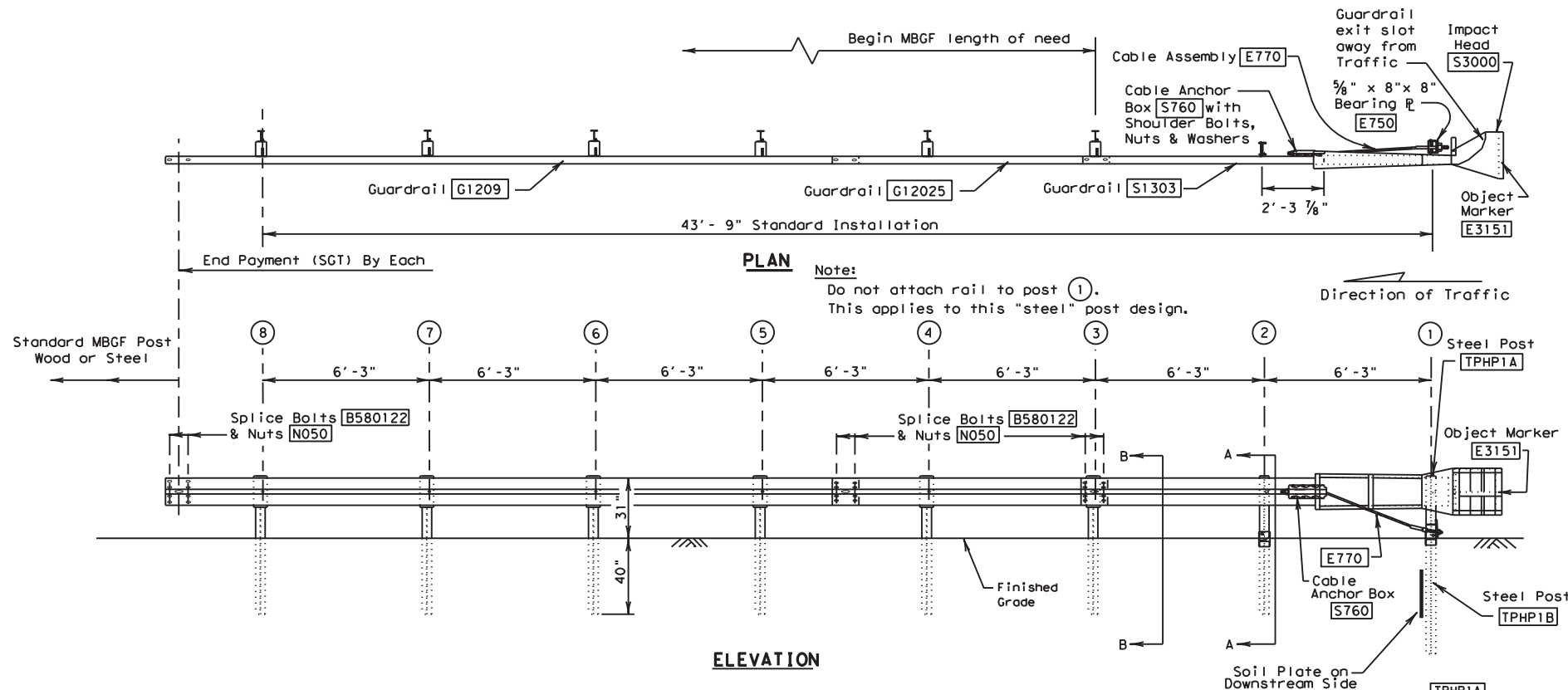
Texas Department of Transportation
Design Division Standard

SINGLE GUARDRAIL TERMINAL (SKT-31) (WOOD POST) SGT (8) 31-11

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REVISIONS	SAT	COUNTY: BEXAR	SHEET NO.: 222	

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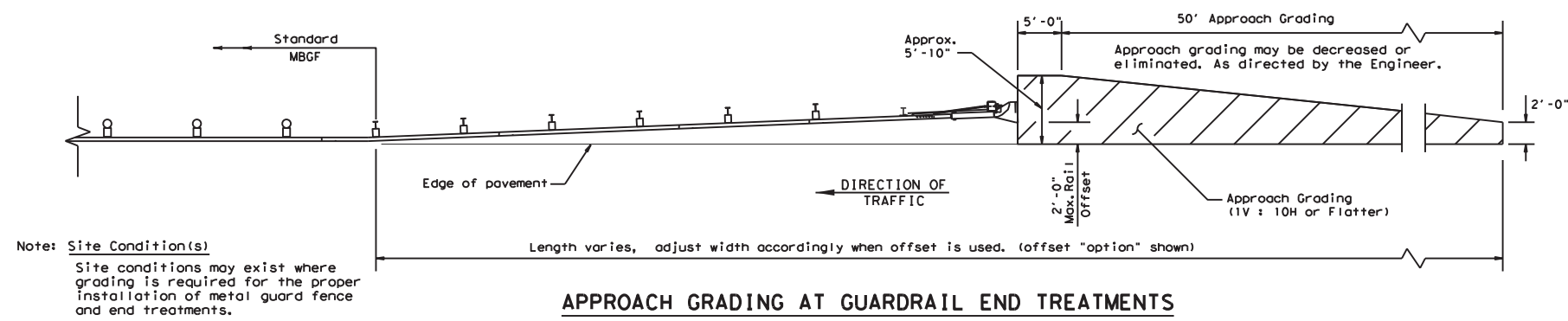
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GENERAL NOTES

- For additional information contact: Interstate Steel Inc., (432) 263-3725.
- All bolts, nuts cable assemblies, cable anchors, steel posts & bearing plates shall be galvanized.
- SGT's placed within the "minimum" 150 ft. radius, shall be installed straight. Standard rail elements may be installed within the radius without special fabrication.
- A flare rate of 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 lower sections of the post shall not protrude more than 4 inches above finished ground. Site grading may be necessary to meet this requirement.
- The lower section of the steel posts should not be driven with the upper post attached. If the post is placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
- If solid rock is encountered. See manufacturer's installation manual for the proper installation guidance.
- The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
- Hinge bolts shall not be set below finished grade. At curb locations the posts shall be installed at the proper grade elevation behind the curb. The posts will then require field drilling new holes to accommodate the rail to post connection bolt to maintain the proper height of the rail above the gutter pan. The excess post length above the rail will be removed as directed by the Engineer.
- An object marker shall be installed on the front of the impact head as detailed on D&OM(VIA).

ITEM NO.	QTY	BILL OF MATERIALS
S1303	1	GUARDRAIL (12 GA) 12' - 6" SKT Panel
G12025	1	GUARDRAIL (12 GA) 9' - 4 1/2"
G1209	1	GUARDRAIL (12 GA) 25' - 0"
TPHP1A	1	FIRST POST ASSEMBLY TOP, TUBE
TPHP1B	1	FIRST POST ASSEMBLY BOTTOM, 6' - 0"
UHP2A	1	SECOND POST ASSEMBLY TOP
HP3B	1	SECOND POST ASSEMBLY BOTTOM, 3' - 5 1/8"
P621	6	STANDARD STEEL LINE POST 6' - 0" (POST 3 THRU 8)
E750	1	BEARING PLATE
S760	1	CABLE ANCHOR BOX
E770	1	BCT CABLE ANCHOR ASSEMBLY
CT-100ST	1	CABLE TIE - STEEL
CBSP-14	6	ROUTED BLOCK
S3000	1	IMPACT HEAD
HARDWARE		
B580122	25	3/8" Dia. x 1 1/4" SPLICE BOLT
B580904A	1	3/8" Dia. x 9" HEX BOLT GR. 5
B340854A	1	3/4" Dia. x 8 1/2" HEX BOLT GR. 5
B581002	6	3/8" Dia. x 10" H.G.R. BOLT (Post 3 thru 8)
N055	1	3/8" Dia. HEX NUT (Post 1 only)
N050	31	3/8" Dia. H.G.R. NUT (at splices & at Post 2 thru 8)
W050	9	H.G.R. WASHER (At Post 1(2) & 2 thru 8)
N100	2	1" ANCHOR CABLE HEX NUT
W100	2	1" ANCHOR CABLE WASHER
B5160104A	2	3/16" x 1" HEX BOLT, GR. 5
N0516	2	3/16" HEX NUT
W0516	4	3/16" WASHER
SB12A	8	CABLE ANCHOR BOX SHOULDER BOLT
N030	1	3/4" HEX NUT
N012A	8	1/2" STR. NUT
W012A	8	1/2" STR. WASHER
E3151	1	OBJECT MARKER (18" x 18")



APPROACH GRADING AT GUARDRAIL END TREATMENTS

Texas Department of Transportation
SINGLE GUARDRAIL TERMINAL (SKT-31) (STEEL POST) SGT (8S) 31-14

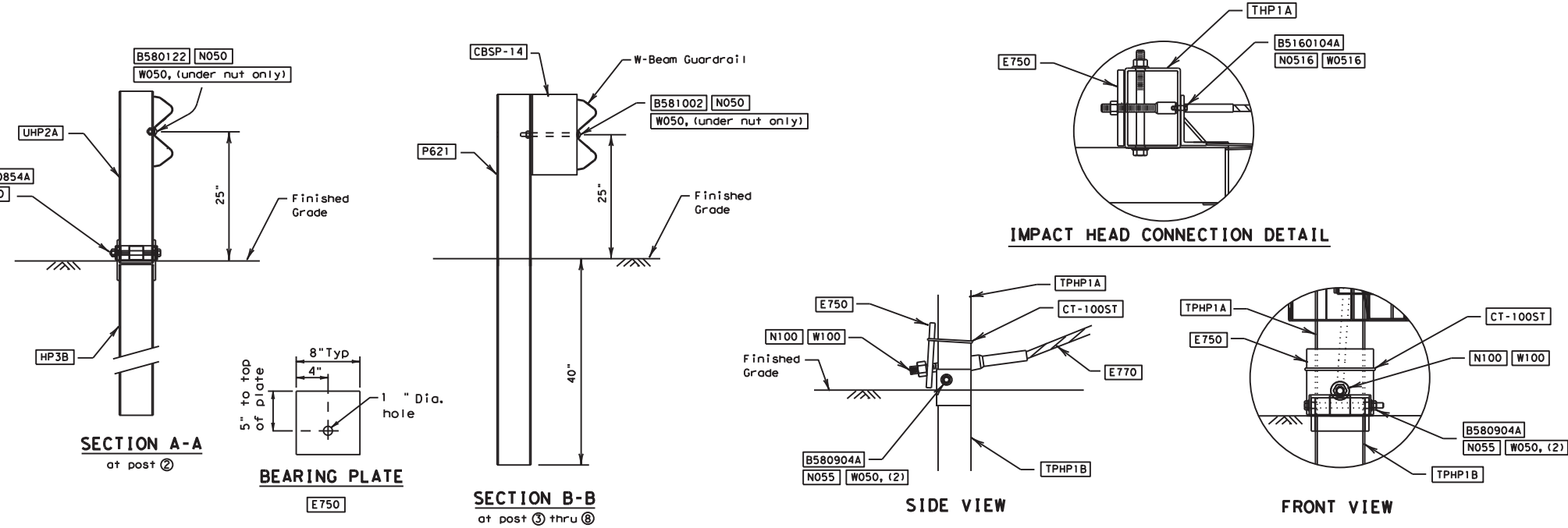
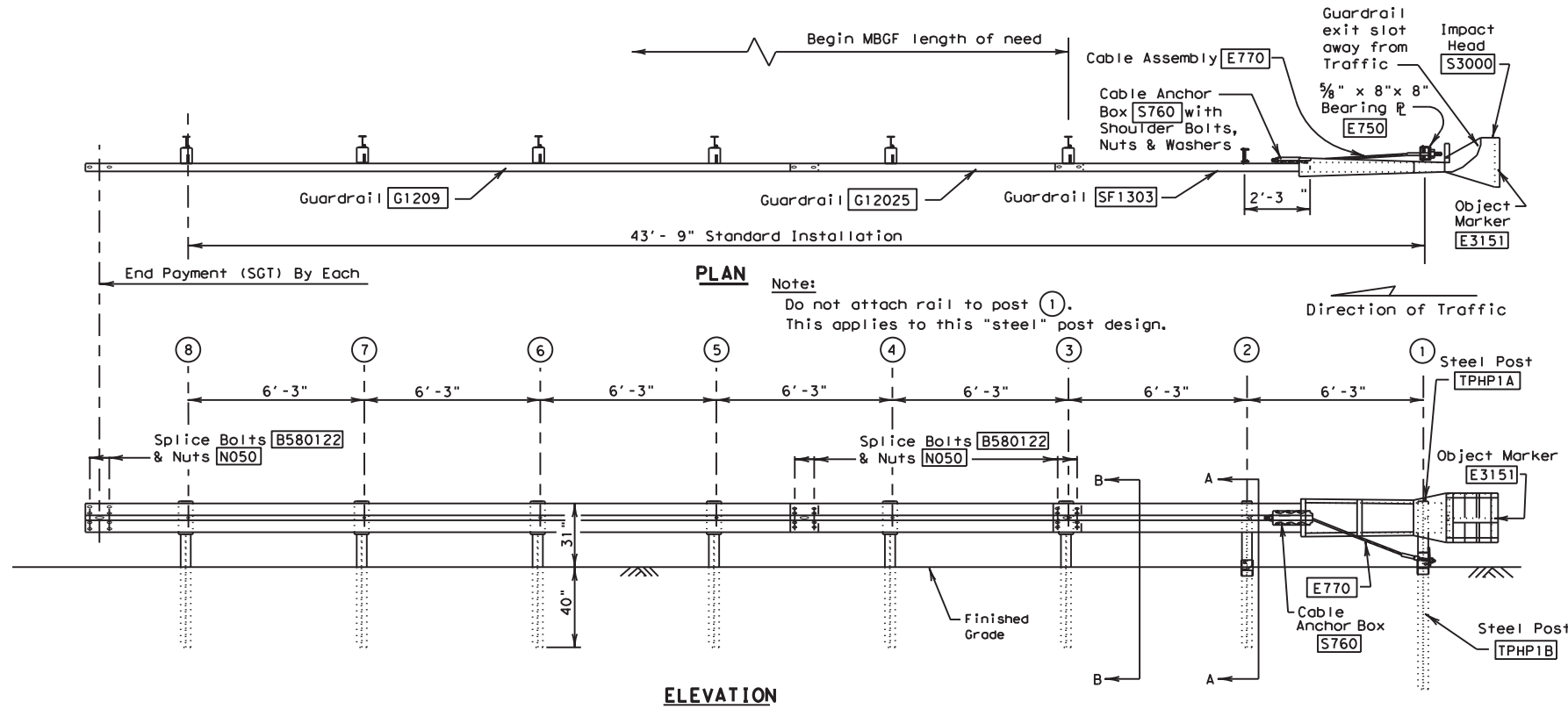
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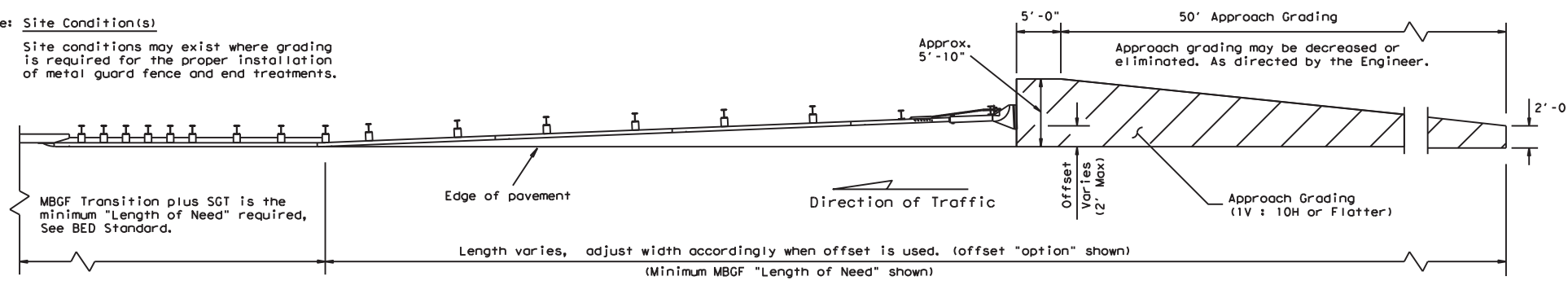
GENERAL NOTES

- For additional information contact: Interstate Steel Inc., (432) 263-3725.
- All bolts, nuts cable assemblies, cable anchors, steel posts & bearing plates shall be galvanized.
- SGT's placed within the "minimum" 150 ft. radius, shall be installed straight. Standard rail elements may be installed within the radius without special fabrication.
- A flare rate of 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 lower sections of the post shall not protrude more than 4 inches above finished ground. Site grading may be necessary to meet this requirement.
- The lower section of the steel posts should not be driven with the upper post attached. If the post is placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
- If solid rock is encountered. See manufacturer's installation manual for the proper installation guidance.
- The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
- Hinge bolts shall not be set below finished grade. At curb locations the posts shall be installed at the proper grade elevation behind the curb. The posts will then require field drilling new holes to accommodate the rail to post connection bolt to maintain the proper height of the rail above the gutter pan. The excess post length above the rail will be removed as directed by the Engineer.
- An object marker shall be installed on the front of the impact head as detailed on D&OM(VIA).
- A special site evaluation should be considered, prior to using this end treatment where there is less than 25 feet between the outlet side of the end treatment and any adjacent driving lane.



ITEM NO.	QTY	BILL OF MATERIALS
S1303	1	GUARDRAIL (12 GA) 12' - 6" SKT Panel
G12025	1	GUARDRAIL (12 GA) 9' - 4 1/2"
G1209	1	GUARDRAIL (12 GA) 25' - 0"
TPHP1A	1	FIRST POST ASSEMBLY TOP, TUBE
TPHP1B	1	FIRST POST ASSEMBLY BOTTOM, 6' - 0"
UHP2A	1	SECOND POST ASSEMBLY TOP
HP3B	1	SECOND POST ASSEMBLY BOTTOM, 6' - 0"
P621	6	STANDARD STEEL LINE POST 6' - 0" (POST 3 THRU 8)
E750	1	BEARING PLATE
S760	1	CABLE ANCHOR BOX
E770	1	BCT CABLE ANCHOR ASSEMBLY
CT-100ST	1	CABLE TIE - STEEL
CBSP-14	6	ROUTED BLOCK
S3000	1	IMPACT HEAD
B580122	25	5/8" Dia. x 1 1/4" SPLICE BOLT
B580904A	1	5/8" Dia. x 9" HEX BOLT GR. 5
B340854A	1	3/4" Dia. x 8 1/2" HEX BOLT GR. 5
B581002	6	5/8" Dia. x 10" H.G.R. BOLT (Post 3 thru 8)
N055	1	5/8" Dia. HEX NUT (Post 1 only)
N050	31	5/8" Dia. H.G.R. NUT (at splices & at Post 1 thru 8)
W050	9	H.G.R. WASHER (At Post 2 thru 8)
N100	2	1" ANCHOR CABLE HEX NUT
W100	2	1" ANCHOR CABLE WASHER
B5160104A	2	5/8" x 1" HEX BOLT, GR. 5
N0516	2	5/8" HEX NUT
W0516	4	5/8" WASHER
SB58A	8	CABLE ANCHOR BOX SHOULDER BOLT
N030	1	3/4" HEX NUT
N055A	8	1/2" A325 STR. NUT
W050A	16	1 1/8" OD x 3/8" ID A325 STR. WASHER
E3151	1	OBJECT MARKER (18" x 18")

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 AT GUARDRAIL END TREATMENTS

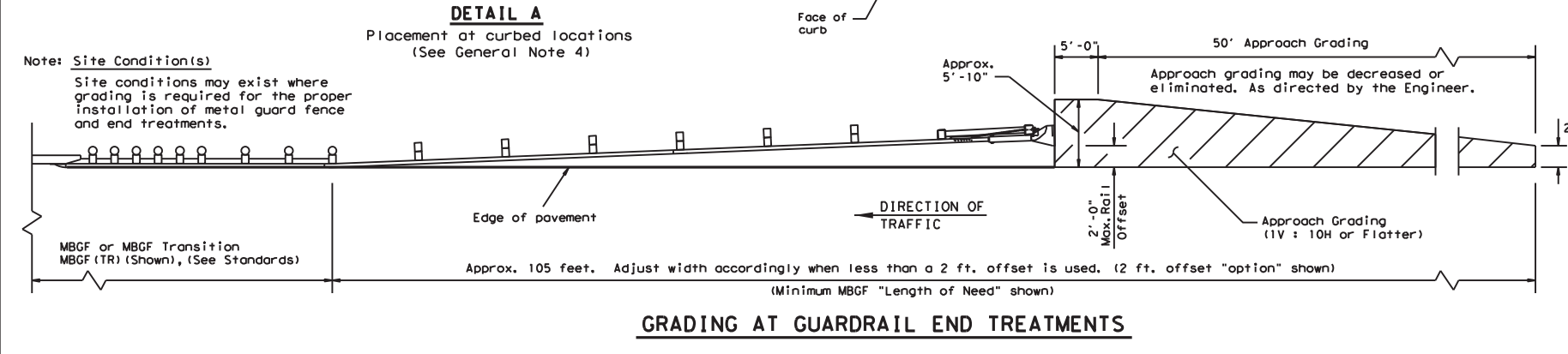
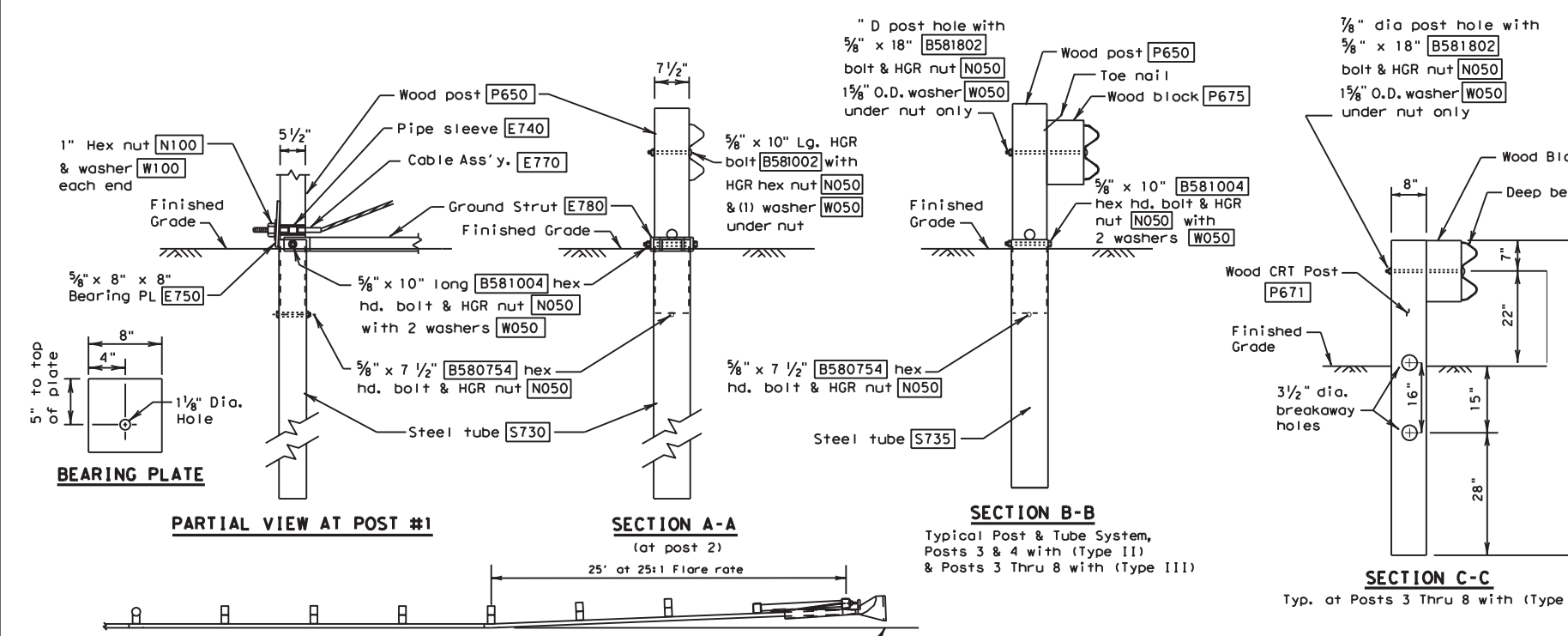
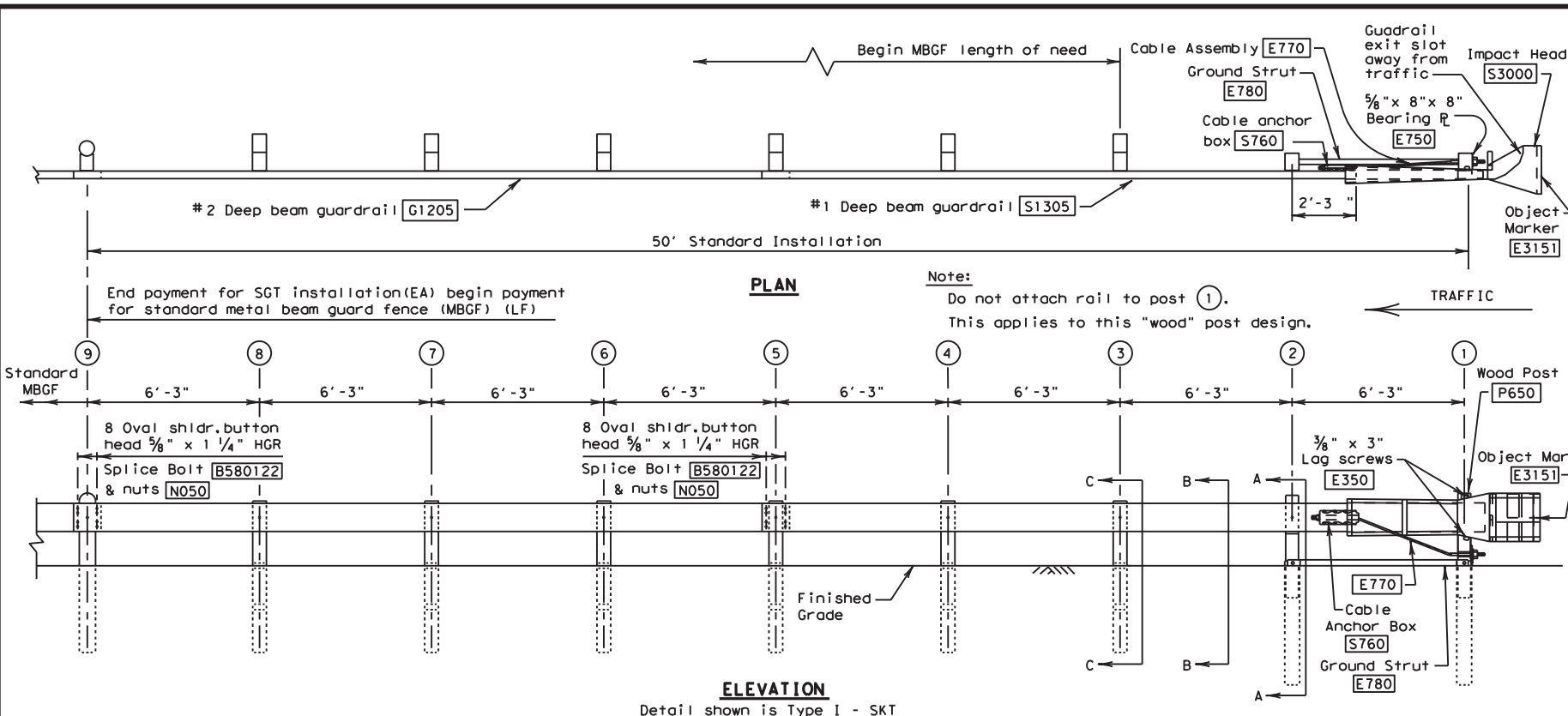
Texas Department of Transportation
Design Division Standard

SINGLE GUARDRAIL TERMINAL
(SKT-31)
(STEEL POST)
SGT (8S) 31-11

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REVISIONS	DIST: SAT	COUNTY: BEXAR	SHEET NO. 224	

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DATE: FILE:



- GENERAL NOTES**
- The Type of SGT unit will be specified elsewhere in the plans. Numbers in circles indicate post position. The Type of SGT unit chosen is a maintenance consideration and does not affect the systems performance.

Post & Tube Options		Post Only	
Type I Posts	① thru ②	Posts ③ thru ⑧	
Type II Posts	① thru ④	Posts ⑤ thru ⑧	
Type III Posts	① thru ⑧	None	
 - SGT's placed within the "minimum" 150 ft. radius, shall be installed straight. Standard rail elements may be installed within the radius, without special fabrication.
 - All bolts, nuts cable assemblies, cable anchors, steel tubes & bearing plates shall be galvanized.
 - At non-curbed locations, a flare rate of 25:1 may be used over the first 50 ft. of the system 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. At curbed locations, a flare rate of 25:1 shall be used beginning at post number 5 and ending at post number 1.
 - The steel tubes shall not protrude more than 4 inches above ground. Site grading may be necessary to meet this requirement.
 - The steel tubes may be driven with an approved driving head. They shall not be driven with the wood post in the tube. If the steel tubes are placed in drilled holes, the backfill material must be satisfactorily compacted to prevent tube settlement.
 - If solid rock is encountered. See the Manufacturer's installation manual for the proper installation guidance.
 - The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
 - The wood blocks shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.
 - For curb installations, the soil tubes and posts shall be installed at the proper ground elevation behind the curb. The posts will then require field drilling new holes to accommodate the rail to post connection bolt to maintain the proper height of the rail above the gutter pan. The excess post length above the rail will be removed if directed by the Engineer.
 - An object marker shall be installed on the front of the impact head as detailed on D&OM(VIA).
 - A special site evaluation should be considered, prior to using this end treatment where there is less than 25 feet between the outlet side of the end treatment and any adjacent driving lane.

Code #	POST & TUBE OPTIONS			BILL OF MATERIAL	
	Type I Qty.	Type II Qty.	Type III Qty.	DESCRIPTION	
S1305	1	1	1	#1 Deep Beam Guardrail (12 Ga.)	
G1205	1	1	1	#2 Deep Beam Guardrail (12 Ga.)	
S730	2	2	2	Steel Tube - 6" x 8" x 72" x 3/16" or 1/8" min	
S735	0	2	6	Steel Tube - 6" x 8" x 54" x 3/16" or 1/8" min	
P650	2	4	8	Wood Posts - 5 1/2" x 7 1/2" x 45"	
P671	6	4	0	Wood CRT Posts - 6" x 8" x 72"	
P675	6	6	6	Wood Block - 6" x 8" x 14"	
E740	1	1	1	Pipe Sleeve - 2" Std. Pipe x 5 1/2"	
E750	1	1	1	Bearing Plate - 5/8" x 8" x 8"	
S760	1	1	1	Cable Anchor Box	
E770	1	1	1	Cable Assembly	
E780	1	1	1	Ground Strut	
S3000	1	1	1	Impact Head	
HARDWARE					
B580754	2	4	8	5/8" x 7 1/2" Hex Hd. Bolt	
B581004	2	4	8	5/8" x 10" Hex Hd. Bolt (Top of Tubes)	
W050	11	15	23	3/8" Washers	
B581002	1	1	1	5/8" x 10" HGR Post Bolt (Post 2)	
B580122	16	16	16	5/8" x 1 1/4" HGR Splice Bolt	
B581802	6	6	6	5/8" x 18" HGR Post Bolt (Posts ③ thru ⑧)	
N050	27	31	39	5/8" HGR Nut (16-Spl, 8-Posts, 2-Strut)	
E350	2	2	2	3/8" x 3" Lag Screw	
N100	2	2	2	1" Hex Nut (Anchor Cable)	
W100	2	2	2	1" Washer (Anchor Cable)	
SB58A	8	8	8	Cable Anchor Box Shoulder Bolts	
N055A	8	8	8	1/2" A325 Structural Nut	
W050A	16	16	16	1/2" A325 Structural Washer	
E3151	1	1	1	Object Marker - (18" x 18")	

WOOD BLOCK
P675

WOOD POST
P650

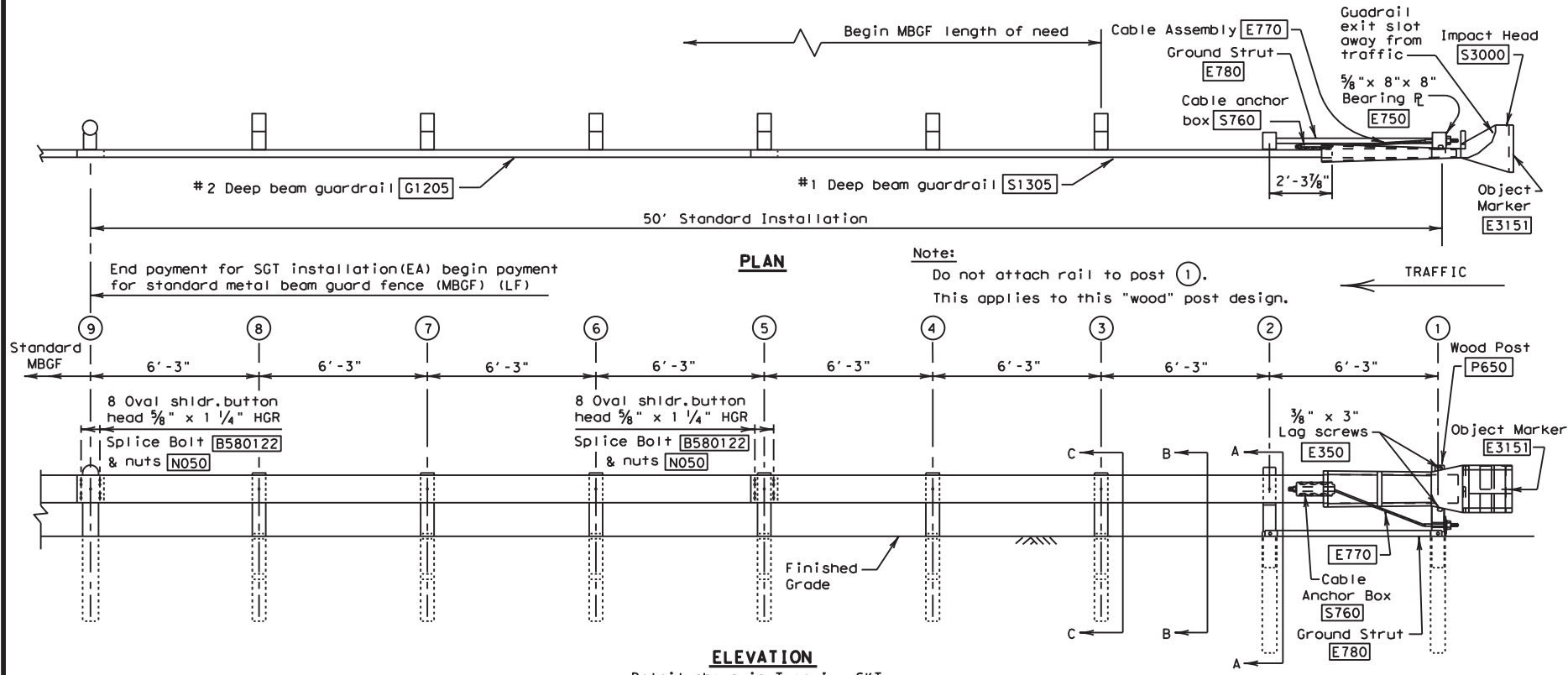
All measurements should be taken from bottom of posts.

POST & TUBE OPTIONS	
Type I post	① thru ②
Type II post	① thru ④
Type III post	① thru ⑧

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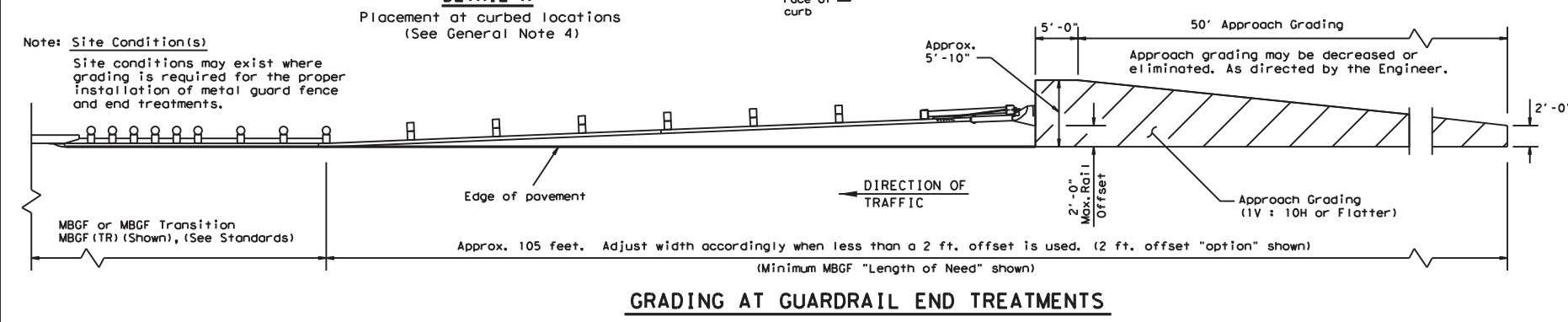
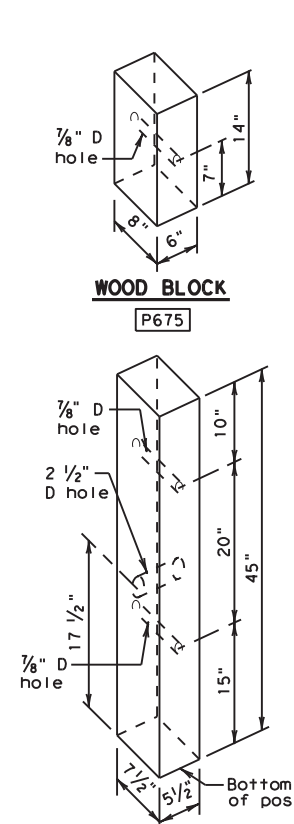
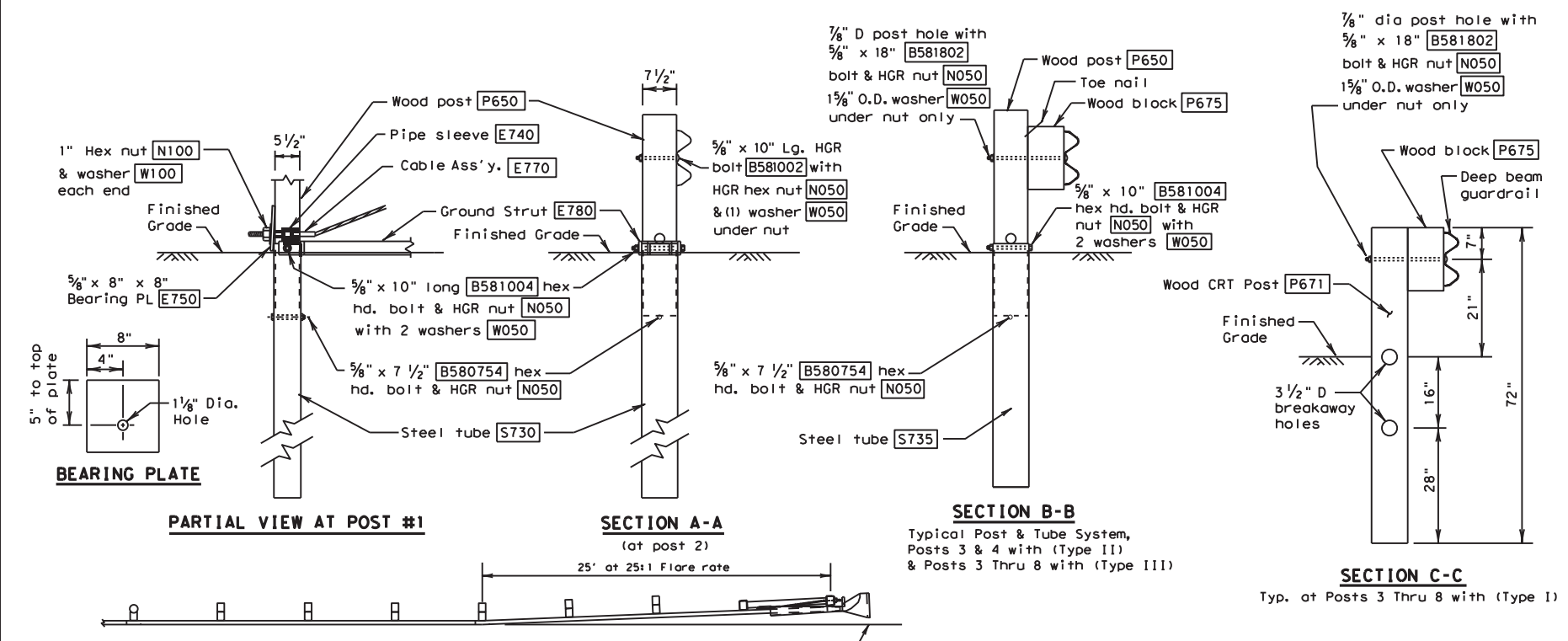
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LEVELS DISPLAYED



- GENERAL NOTES**
- The Type of SGT unit will be specified elsewhere in the plans. Numbers in circles indicate post position. The Type of SGT unit chosen is a maintenance consideration and does not affect the systems performance.

Post & Tube Options		Post Only	
Type I Posts	① thru ②	Posts ③ thru ⑧	
Type II Posts	① thru ④	Posts ⑤ thru ⑧	
Type III Posts	① thru ⑧	None	
 - SGT's placed within the "minimum" 150 ft. radius, shall be installed straight. Standard rail elements may be installed within the radius, without special fabrication.
 - All bolts, nuts cable assemblies, cable anchors, steel tubes & bearing plates shall be galvanized.
 - At non-curbed locations, a flare rate of 25:1 may be used over the first 50 ft. of the system 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. At curbed locations, a flare rate of 25:1 shall be used beginning at post number 5 and ending at post number 1.
 - The steel tubes shall not protrude more than 4 inches above ground. Site grading may be necessary to meet this requirement.
 - The steel tubes may be driven with an approved driving head. They shall not be driven with the wood post in the tube. If the steel tubes are placed in drilled holes, the backfill material must be satisfactorily compacted to prevent tube settlement.
 - If solid rock is encountered. See the Manufacturer's installation manual for the proper installation guidance.
 - The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
 - The wood blocks shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.
 - For curb installations, the soil tubes and posts shall be installed at the proper ground elevation behind the curb. The posts will then require field drilling new holes to accommodate the rail to post connection bolt to maintain the proper height of the rail above the gutter pan. The excess post length above the rail will be removed if directed by the Engineer.
 - An object marker shall be installed on the front of the impact head as detailed on D&OM(VIA).
 - A special site evaluation should be considered, prior to using this end treatment where there is less than 25 feet between the outlet side of the end treatment and any adjacent driving lane.



Code #	POST & TUBE OPTIONS			DESCRIPTION
	Type I Qty.	Type II Qty.	Type III Qty.	
S1305	1	1	1	#1 Deep Beam Guardrail (12 Ga.)
G1205	1	1	1	#2 Deep Beam Guardrail (12 Ga.)
S730	2	2	2	Steel Tube - 6" x 8" x 72" x 3/16" or 1/8" min
S735	0	2	6	Steel Tube - 6" x 8" x 54" x 3/16" or 1/8" min
P650	2	4	8	Wood Posts - 5 1/2" x 7 1/2" x 45"
P671	6	4	0	Wood CRT Posts - 6" x 8" x 72"
P675	6	6	6	Wood Block - 6" x 8" x 14"
E740	1	1	1	Pipe Sleeve - 2" Std. Pipe x 5 1/2"
E750	1	1	1	Bearing Plate - 5/8" x 8" x 8"
S760	1	1	1	Cable Anchor Box
E770	1	1	1	Cable Assembly
E780	1	1	1	Ground Strut
S3000	1	1	1	Impact Head
HARDWARE				
B580754	2	4	8	5/8" x 7 1/2" Hex Hd. Bolt
B581004	2	4	8	5/8" x 10" Hex Hd. Bolt (Top of Tubes)
W050	11	15	23	3/8" Washers
B581002	1	1	1	5/8" x 10" HGR Post Bolt (Post 2)
B580122	16	16	16	5/8" x 1 1/4" HGR Splice Bolt
B581802	6	6	6	5/8" x 18" HGR Post Bolt (Posts ③ thru ⑧)
N050	27	31	39	5/8" HGR Nut (16-Spl, 8-Posts, 2-Strut)
E350	2	2	2	3/8" x 3" Lag Screw
N100	2	2	2	1" Hex Nut (Anchor Cable)
W100	2	2	2	1" Washer (Anchor Cable)
SB58A	8	8	8	Cable Anchor Box Shoulder Bolts
N055A	8	8	8	1/2" A325 Structural Nut
W050A	16	16	16	1/2" A325 Structural Washer
E3151	1	1	1	Object Marker - (18" x 18")

All measurements should be taken from bottom of posts.

WOOD POST
P650

POST & TUBE OPTIONS	
Type I	post ① thru ②
Type II	post ① thru ④
Type III	post ① thru ⑧

Texas Department of Transportation
Design Division (Roadway)

SINGLE GUARDRAIL TERMINAL
(SKT 350) (WOOD POST)

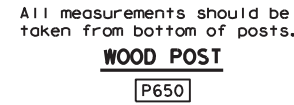
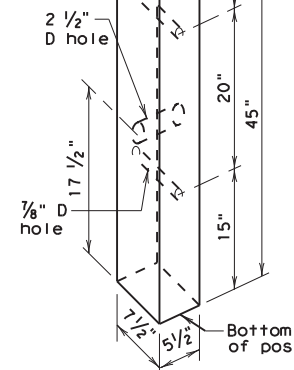
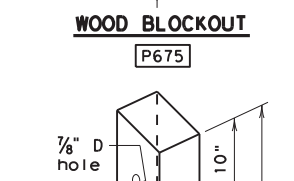
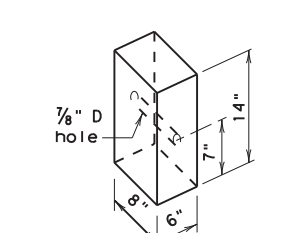
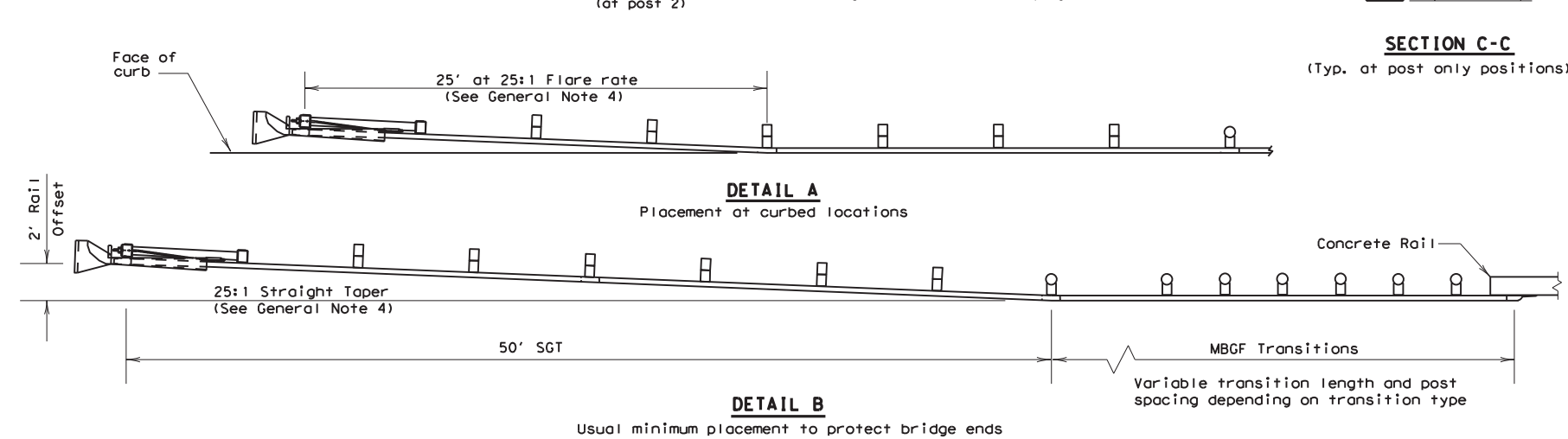
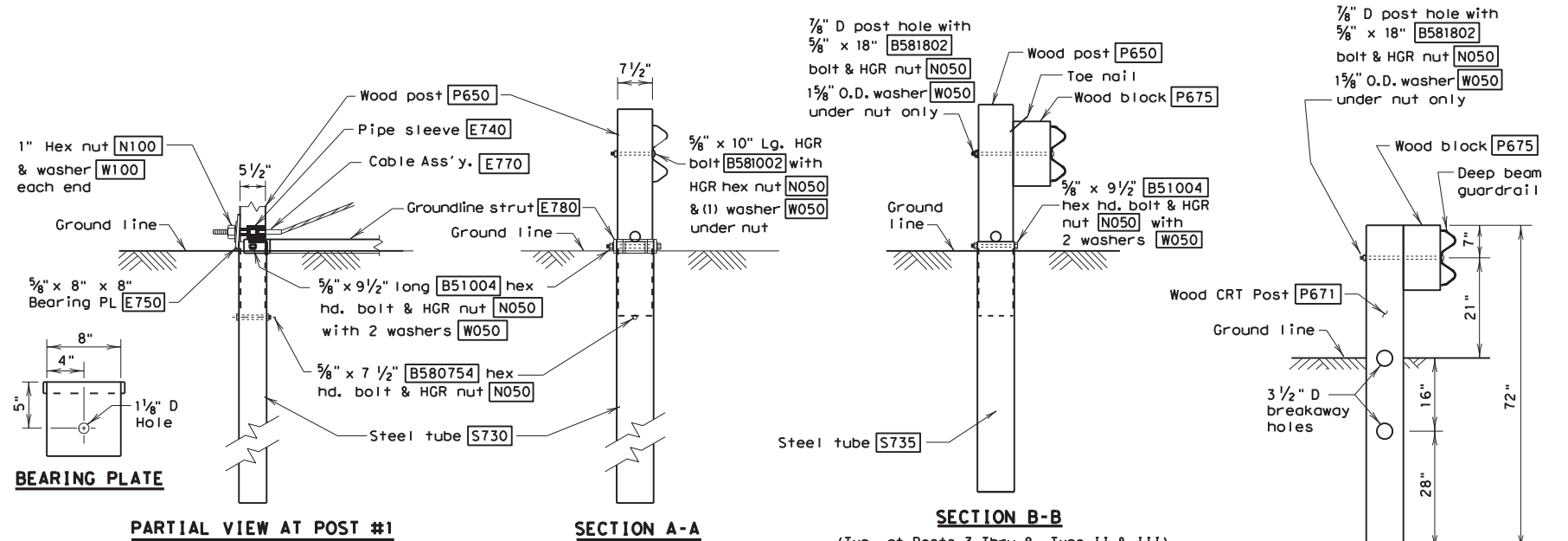
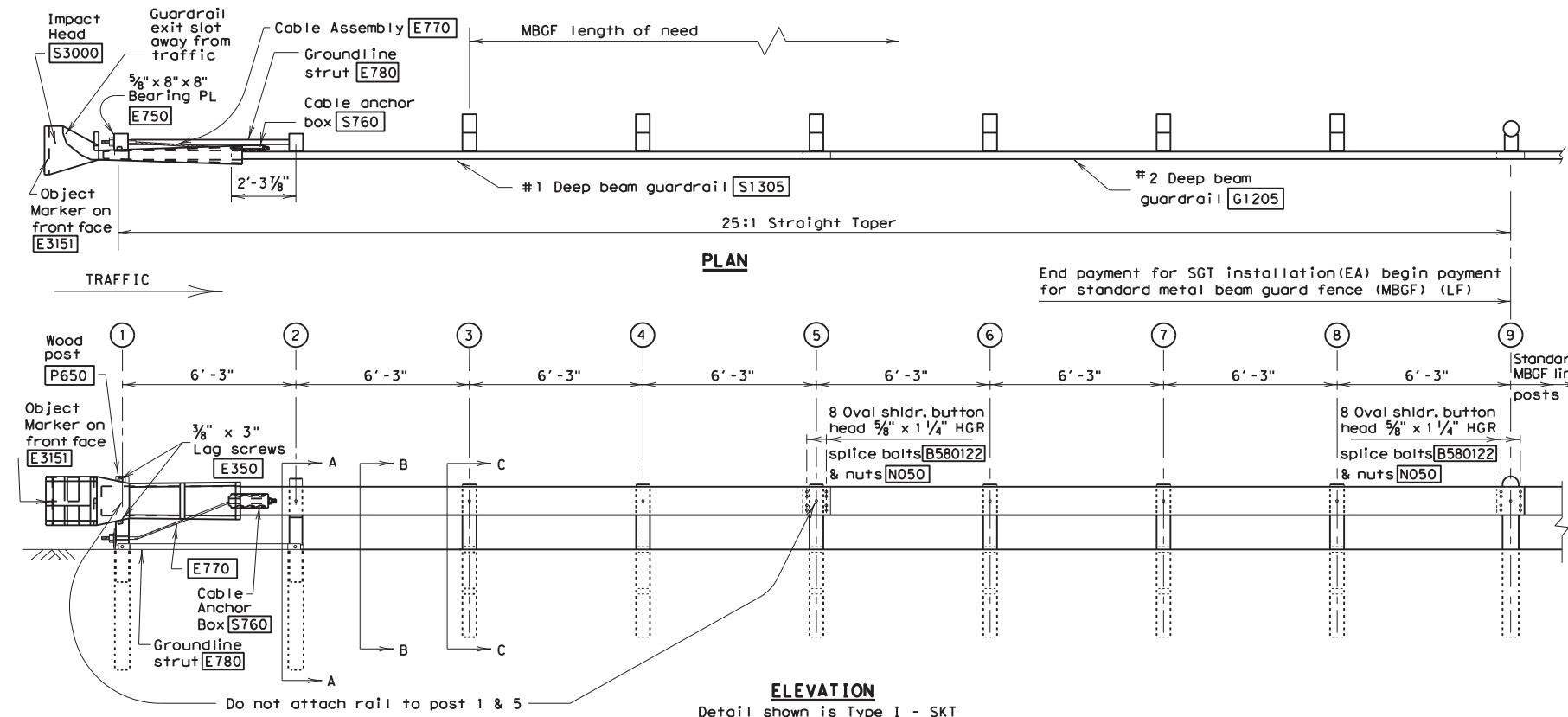
SGT (8) -09

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REVISIONS	SAT			226
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				VAR.

GENERAL NOTES

- The Type of SGT unit will be specified elsewhere in the plans. Numbers in circles indicate post position. The Type of SGT unit chosen is a maintenance consideration and does not affect the systems performance.

Post & Tube Options		Post Only	
Type I Posts	① thru ②	Posts ③ thru ⑧	
Type II Posts	① thru ④	Posts ⑤ thru ⑧	
Type III Posts	① thru ⑧	None	
- If the SGT system must be placed on a radius, the minimum radius is 150 feet.
- All bolts, nuts cable assemblies, cable anchors, steel tubes & bearing plates shall be galvanized.
- For non-curb installations, the MBGF will be flared at a rate of 25:1 over the first 50 foot of the system 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. A 25:1 flare rate will be used at curb sections, beginning at post number 5 and ending at post number one.
- The steel tubes shall not protrude more than 4 inches above ground. Site grading may be necessary to meet this requirement.
- The steel tubes may be driven with an approved driving head. They shall not be driven with the wood post in the tube. If the steel tubes are placed in drilled holes, the backfill material must be satisfactorily compacted to prevent tube settlement.
- When rock excavation is encountered, a 12 inch diameter post hole, 20 inches into the rock may be used if approved by the Engineer. Granular material will be placed in the bottom of the hole approximately 2 1/2 inches deep to provide drainage. The steel tube sleeves will be field cut to not less than 20 inches in length, placed in the hole and backfilled with adequately compacted material excavated from the hole.
- The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
- The wood blockouts shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.
- For curb installations, the soil tubes and posts shall be installed at the proper ground elevation behind the curb. The posts will then require field drilling new holes to accommodate the rail to post connection bolt to maintain the proper height of the rail above the gutter pan. The excess post length above the rail will be removed if directed by the Engineer.
- An object marker shall be installed on the front of the impact head as detailed on D&OM(VIA).
- A special site evaluation should be considered, prior to using this end treatment where there is less than 25 feet between the outlet side of the end treatment and any adjacent driving lane.



Code #	POST & TUBE OPTIONS			DESCRIPTION
	Type I Qty.	Type II Qty.	Type III Qty.	
S1305	1	1	1	#1 Deep Beam Guardrail (12 Ga.)
G1205	1	1	1	#2 Deep Beam Guardrail (12 Ga.)
S730	2	2	2	Steel Tube - 6" x 8" x 72" x 3/16" or 1/8" min
S735	0	2	6	Steel Tube - 6" x 8" x 54" x 3/16" or 1/8" min
P650	2	4	8	Wood Posts - 5 1/2" x 7 1/2" x 45"
P671	6	4	0	Wood CRT Posts - 6" x 8" x 72"
P675	6	6	6	Wood Blockouts - 6" x 8" x 14"
E740	1	1	1	Pipe Sleeve - 2" Std. Pipe x 5 1/2"
E750	1	1	1	Bearing Plate - 5/8" x 8" x 8"
S760	1	1	1	Cable Anchor Box
E770	1	1	1	Cable Assembly
E780	1	1	1	Groundline Strut
S3000	1	1	1	Impact Head
HARDWARE				
B580754	2	2	2	5/8" x 7 1/2" Hex Hd. Bolt
B51004	2	4	8	5/8" x 9 1/2" Hex Hd. Bolt (Top of Tubes)
W050	11	15	23	5/8" Washers
B581002	1	1	1	5/8" x 10" HGR Post Bolt (Post 2)
B580122	16	16	16	5/8" x 1 1/4" HGR Splice Bolt
B581802	6	6	6	5/8" x 18" HGR Post Bolt (Posts ③ thru ⑧)
N050	27	29	33	5/8" HGR Nut (16-Spl, 7-Posts, 2-Strut)
E350	2	2	2	3/8" x 3" Lag Screw
N100	2	2	2	1" Hex Nut (Anchor Cable)
W100	2	2	2	1" Washer (Anchor Cable)
SB58A	8	8	8	Cable Anchor Box Shoulder Bolts
N055A	8	8	8	1/2" A325 Structural Nut
W050A	16	16	16	1/2" A325 Structural Washer
E3151	1	1	1	Object Marker - (18" x 18")

All measurements should be taken from bottom of posts.



POST & TUBE OPTIONS	
Type I post	① thru ②
Type II post	① thru ④
Type III post	① thru ⑧

R = Radius
D = Diameter

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LEVELS DISPLAYED
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Texas Department of Transportation
Design Division (Roadway)

SINGLE GUARDRAIL TERMINAL

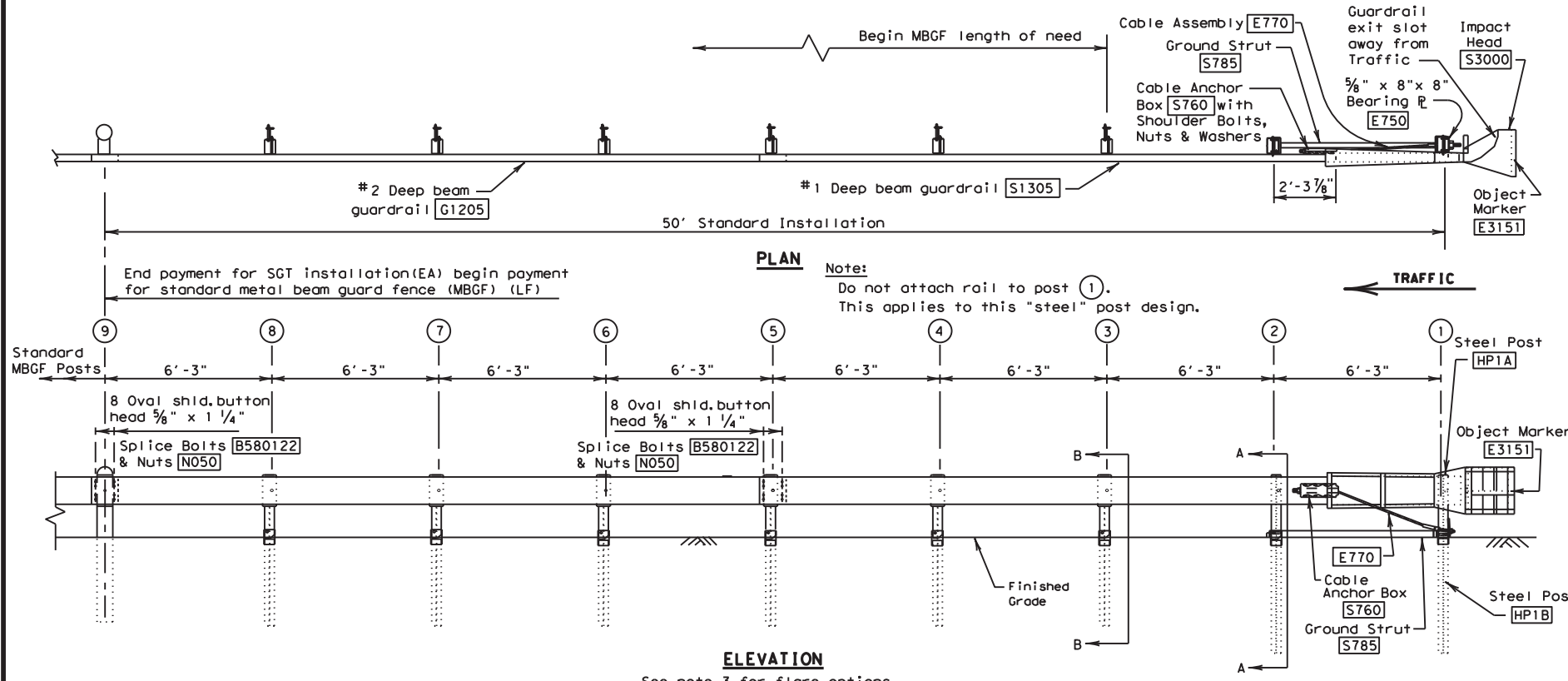
(SKT 350) (WOOD POST)

SGT (8) - 03A

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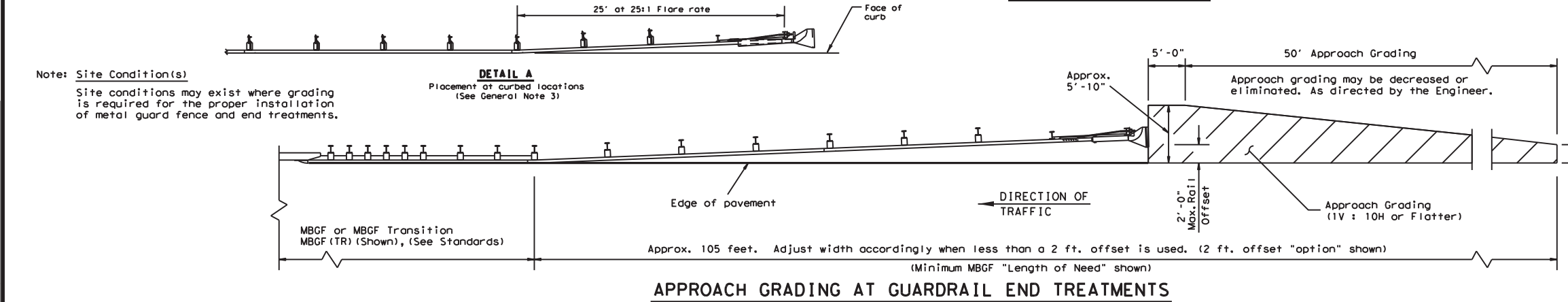
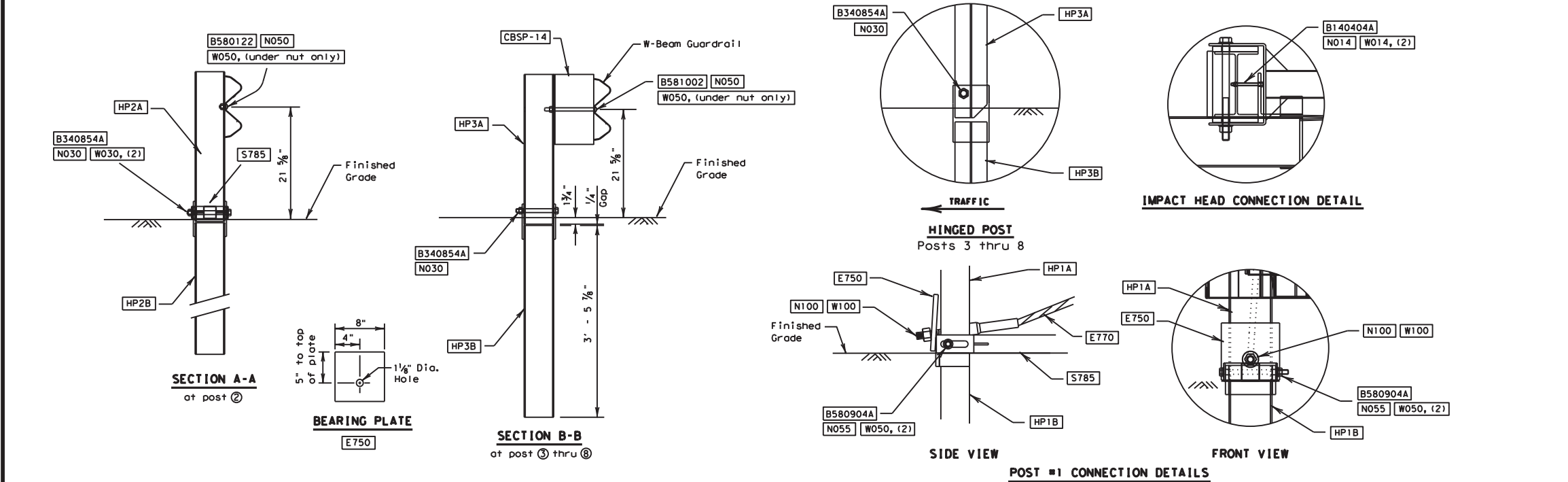
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LEVELS DISPLAYED	
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- GENERAL NOTES**
- All bolts, nuts cable assemblies, cable anchors, steel posts & bearing plates shall be galvanized.
 - SGT's placed within the "minimum" 150 ft. radius, shall be installed straight. Standard rail elements may be installed within the radius without special fabrication.
 - At non-curb locations, a flare rate of 25:1 may be used over the first 50 ft. of the system 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. At curbed locations, a flare rate of 25:1 shall be used beginning at post number 5 and ending at post number 1.
 - The lower sections of the post shall not protrude more than 4 inches above finished ground. Site grading may be necessary to meet this requirement.
 - The lower section of the steel posts should not be driven with the upper post attached. If the post is placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
 - If solid rock is encountered. See manufacturer's installation manual for the proper installation guidance.
 - The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
 - Hing bolts shall not be set below finished grade. At curb locations the posts will then require field drilling new holes to accommodate the rail to post connection bolt to maintain the proper height of the rail above the gutter pan. The excess post length above the rail will be removed if directed by the Engineer.
 - An object marker shall be installed on the front of the impact head as detailed on D&OM(VIA).
 - A special site evaluation should be considered, prior to using this end treatment where there is less than 25 feet between the outlet side of the end treatment and any adjacent driving lane.

ITEM NO.	QTY	BILL OF MATERIALS
S3000	1	IMPACT HEAD
S1305	1	W-BEAM GUARDRAIL END SECTION - 12 GA., 25'
G1205	1	W-BEAM GUARDRAIL - 12 GA., 25'
HP1A	1	FIRST POST ASSEMBLY TOP, 2' - 4 3/8"
HP1B	1	FIRST POST ASSEMBLY BOTTOM, 6' - 0"
HP2A	1	SECOND POST ASSEMBLY TOP, 2' - 6 3/8"
HP2B	1	SECOND POST ASSEMBLY BOTTOM, 6' - 0"
HP3A	6	HINGED LINE POST TOP, 2' - 5 3/8"
HP3B	6	HINGED LINE POST BOTTOM, 3' - 5 3/8"
E750	1	BEARING PLATE
S760	1	CABLE ANCHOR BOX
E770	1	BCT CABLE ANCHOR ASSEMBLY
S785	1	GROUND STRUT (SPECIAL FOR HINGED POST)
CBSP-14	6	ROUTED BLOCK
HARDWARE		
B580122	17	5/8" Dia. x 1/4" SPLICE BOLT, POST #2
B580904A	1	5/8" Dia. x 9" HEX BOLT GR. 5
B340854A	7	3/4" Dia. x 8 1/2" HEX BOLT GR. 5
B581002	6	5/8" Dia. x 10" H.G.R. BOLT (Posts 3 Thru 8)
N055	1	5/8" Dia. HEX NUT (Post 1 only)
N050	23	3/8" Dia. H.G.R. NUT (at splice (16) & at Posts 1 thru 8)
W050	9	H.G.R. WASHER (At Post 1 (2), & Post 2 thru 8)
N100	2	1" ANCHOR CABLE HEX NUT
W100	2	1" ANCHOR CABLE WASHER
B140404A	2	1/4" x 4" HEX BOLT GR. 5
N014	2	1/4" HEX NUT
W014	4	1/4" WASHER
SB58A	8	CABLE ANCHOR BOX SHOULDER BOLT
N030	7	3/4" HEX NUT
N055A	8	1/2" A325 STR. NUT
W030	2	3/4" WASHER
W050A	16	1 1/8" OD x 3/8" ID A325 STR. WASHER
E3151	1	OBJECT MARKER (18" x 18")



Note: Site Condition(s)
Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.

DETAIL A
Placement at curbed locations
(See General Note 3)

Approx. 5'-10"
Approach grading may be decreased or eliminated. As directed by the Engineer.

Approx. 105 feet. Adjust width accordingly when less than a 2 ft. offset is used. (2 ft. offset "option" shown)
(Minimum MBGF "Length of Need" shown)

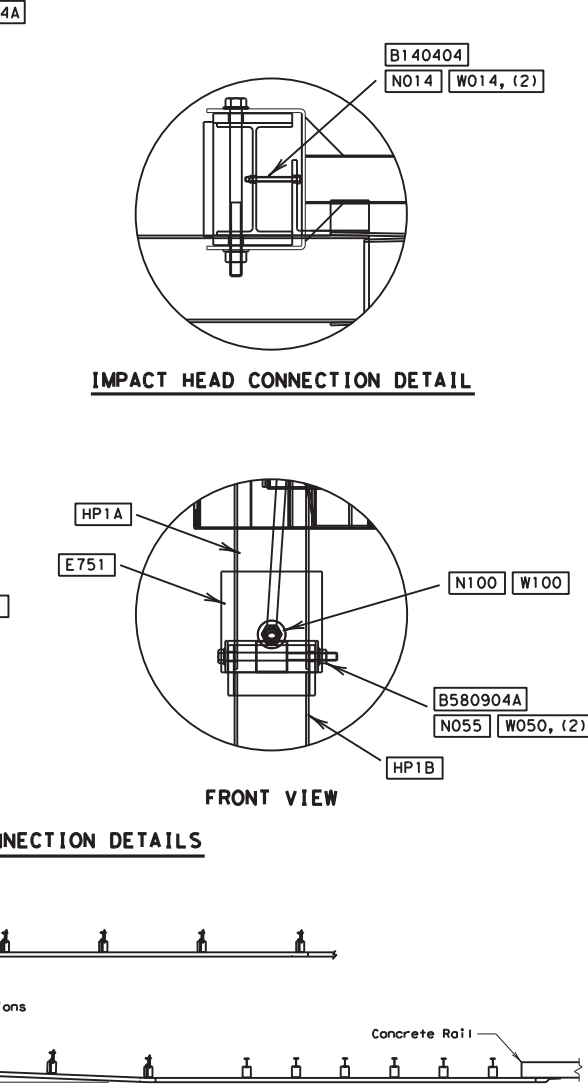
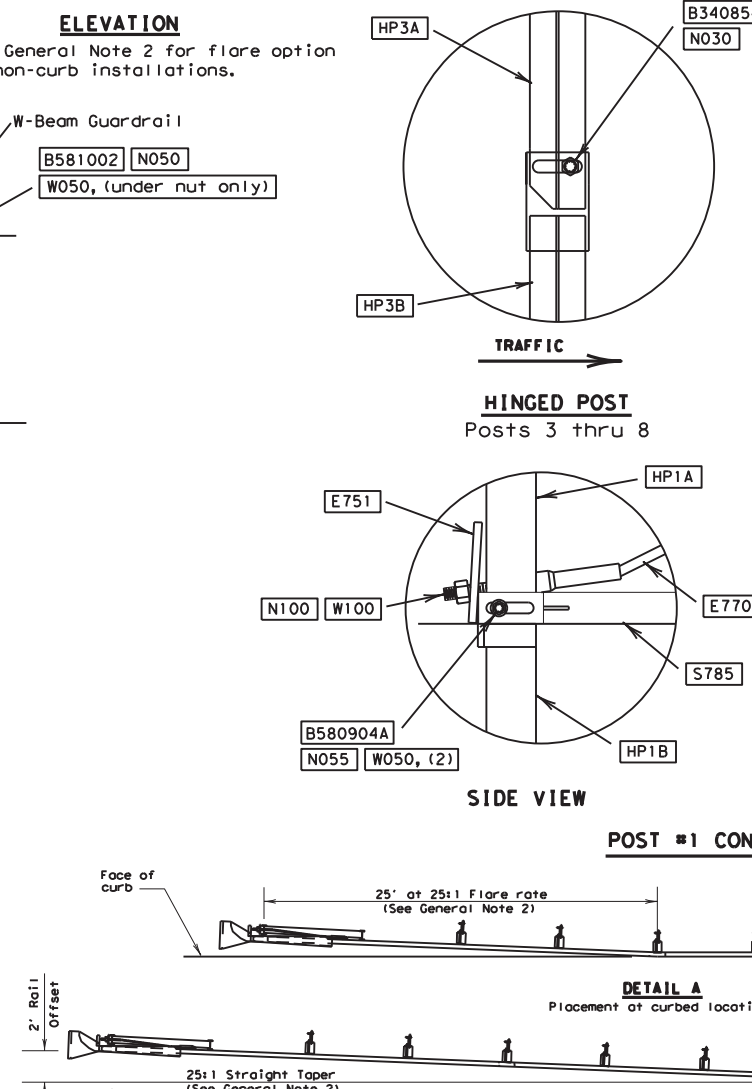
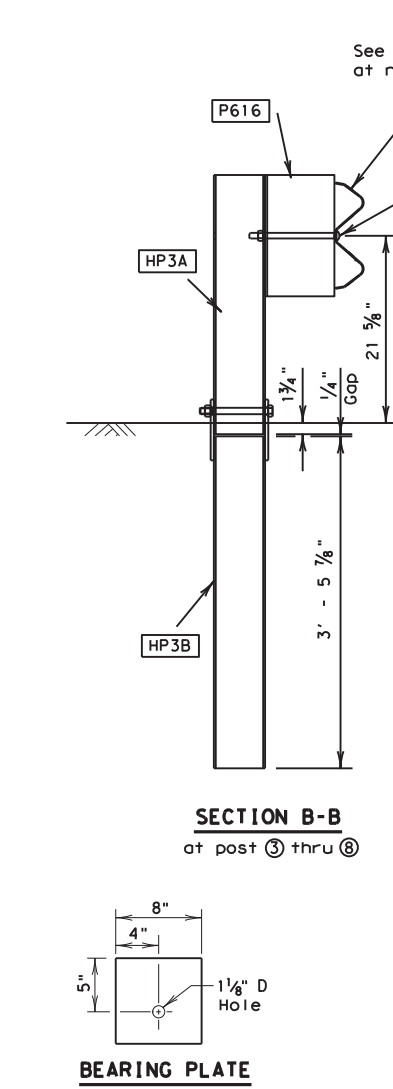
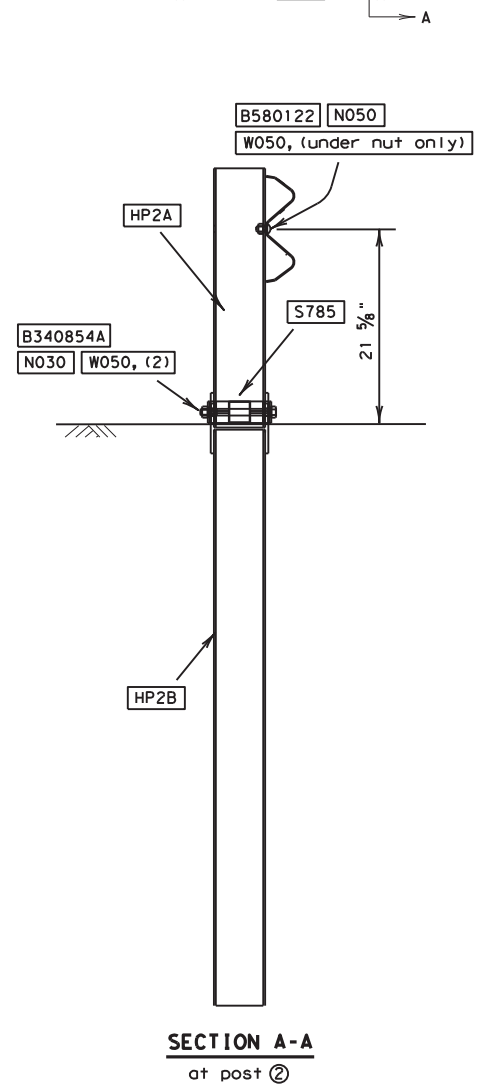
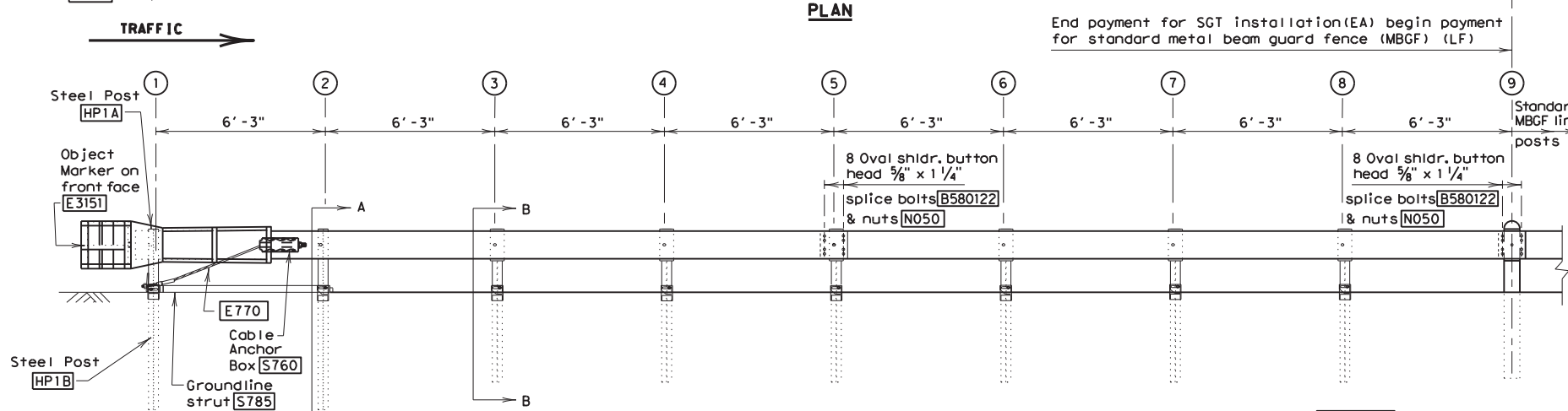
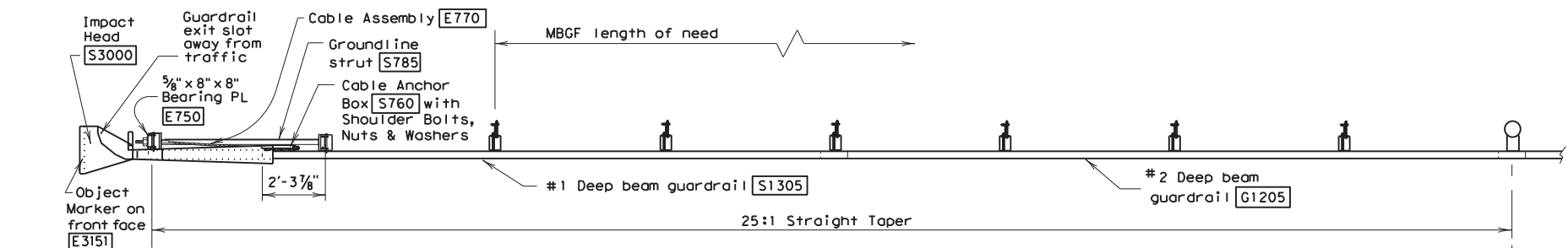
Texas Department of Transportation
Design Division (Roadway)

SINGLE GUARDRAIL TERMINAL
(SKT 350)
(HINGED STEEL POST)
SGT (8)H-09

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© TxDOT February 2003	DISTRICT	FEDERAL AID PROJECT	SHEET
REVISIONS	SAT		228
	COUNTY	CONTROL SECT	JOB HIGHWAY
	BEAR	6372 50	001 VAR.

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LEVELS DISPLAYED	
1	



- GENERAL NOTES**
- All bolts, nuts cable assemblies, steel anchors, steel tubes & bearing plates shall be galvanized.
 - If the SGT system must be placed on a radius, the minimum radius is 150 feet.
 - For non-curb installations, the MGBF will be flared at a rate of 25:1 over the first 50 foot of the system 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. A 25:1 flare rate will be used at curb sections, beginning at post number 5 and ending at post number one.
 - The lower sections of the post shall not protrude more than 4 inches above ground. Site grading may be necessary to meet this requirement.
 - The lower section of Post #1 should not be driven with the upper post attached. If the post is placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
 - When rock excavation is encountered, a 12 inch diameter post hole, 20 inches into the rock may be used if approved by the Engineer. Granular material will be placed in the bottom of the hole approximately 2 $\frac{1}{2}$ inches deep to provide drainage. The steel tube sleeves will be field cut to not less than 20 inches in length, placed in the hole and backfilled with adequately compacted material excavated from the hole.
 - The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
 - For curb installations, the steel posts shall be installed at the proper ground elevation behind the curb. The posts will then require field drilling new holes to accommodate the rail to post connection bolt to maintain the proper height of the rail above the gutter pan. The excess post length above the rail will be removed if directed by the Engineer.
 - An object marker shall be installed on the front of the impact head as detailed on D&M(VIA).
 - A special site evaluation should be considered, prior to using this end treatment where there is less than 25 feet between the outlet side of the end treatment and any adjacent driving lane.

ITEM NO.	QTY	BILL OF MATERIALS
S3000	1	IMPACT HEAD
S1305	1	W-BEAM GUARDRAIL END SECTION - 12 GA., 25'
G1205	1	W-BEAM GUARDRAIL - 12 GA., 25'
HP1A	1	FIRST POST ASSEMBLY TOP, 2' - 4 $\frac{3}{8}$ "
HP1B	1	FIRST POST ASSEMBLY BOTTOM, 6' - 0"
HP2A	1	SECOND POST ASSEMBLY TOP, 2' - 6 $\frac{3}{8}$ "
HP2B	1	SECOND POST ASSEMBLY BOTTOM, 5' - 9 $\frac{3}{4}$ "
HP3A	6	HINGED LINE POST TOP, 2' - 5 $\frac{3}{8}$ "
HP3B	6	HINGED LINE POST BOTTOM, 3' - 5 $\frac{7}{8}$ "
E751	1	BEARING PLATE
S760	1	CABLE ANCHOR BOX
E770	1	BCT CABLE ANCHOR ASSEMBLY
S785	1	GROUND STRUT (SPECIAL FOR HINGED POST)
CBSP-14	6	ROUTED BLOCK
HARDWARE		
B580122	17	$\frac{5}{8}$ " Dia. x $1\frac{1}{4}$ " SPLICE BOLT, POST #2
B580904A	1	$\frac{3}{8}$ " Dia. x 9" HEX BOLT GRD 5
B340854A	7	$\frac{3}{4}$ " Dia. x 8 $\frac{1}{2}$ " HEX BOLT GRD 5
B581002	6	$\frac{5}{8}$ " Dia. x 10" H.G.R. BOLT (Posts 3 Thru 8)
N055	1	$\frac{5}{8}$ " Dia. HEX NUT (Post 1 only)
N050	23	$\frac{5}{8}$ " Dia. H.G.R. NUT (at splice (16) & at Posts 2 thru 8)
W050	9	H.G.R. WASHER (At Post 1 (2), & Post 2 thru 8)
N100	2	1" ANCHOR CABLE HEX NUT
W100	2	1" ANCHOR CABLE WASHER
B140404	2	$\frac{1}{4}$ " x 4" HEX BOLT
N014	2	$\frac{1}{4}$ " HEX NUT
W014	4	$\frac{1}{4}$ " WASHER
SB58A	8	CABLE ANCHOR BOX SHOULDER BOLT
N030	7	$\frac{3}{4}$ " HEX NUT
W050A	16	1 $\frac{1}{8}$ " OD x $\frac{3}{8}$ " ID A325 STR. WASHER
E3151	1	OBJECT MARKER

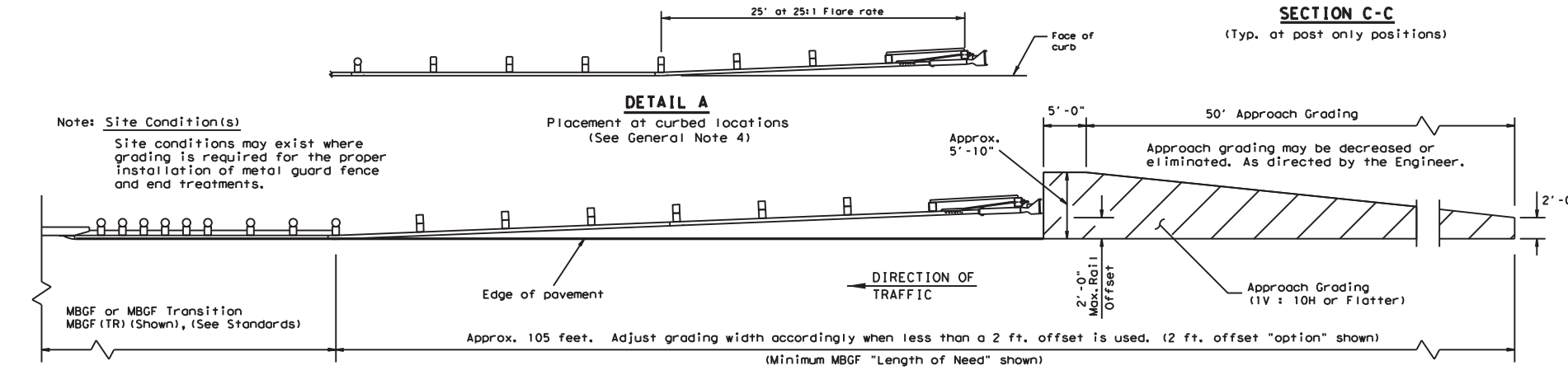
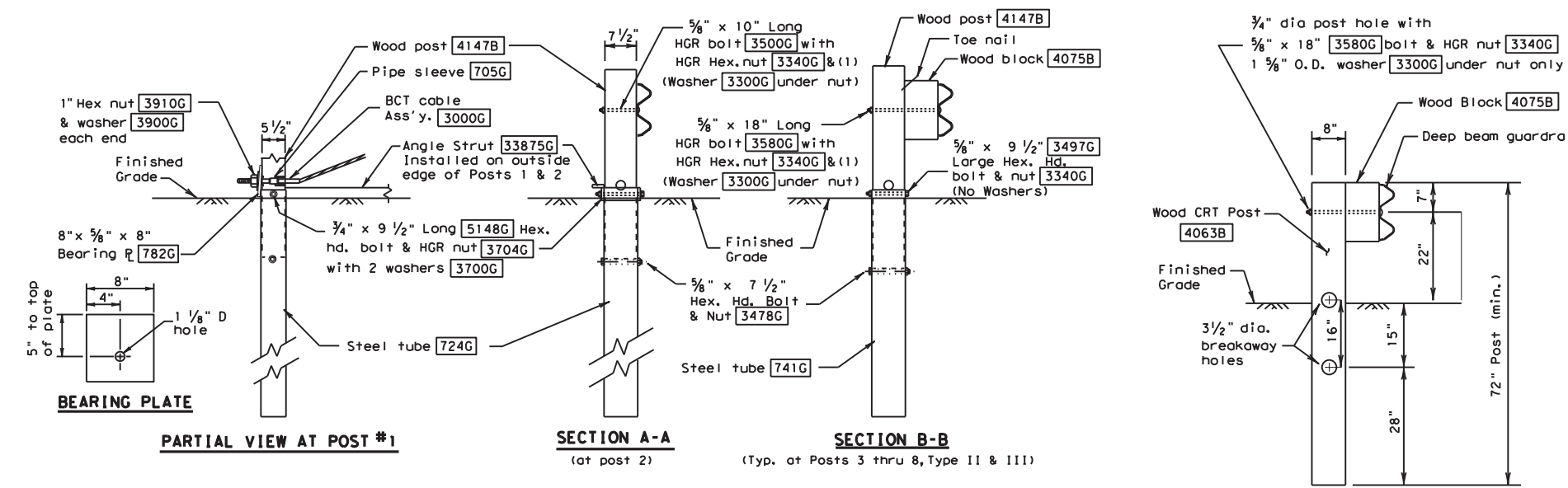
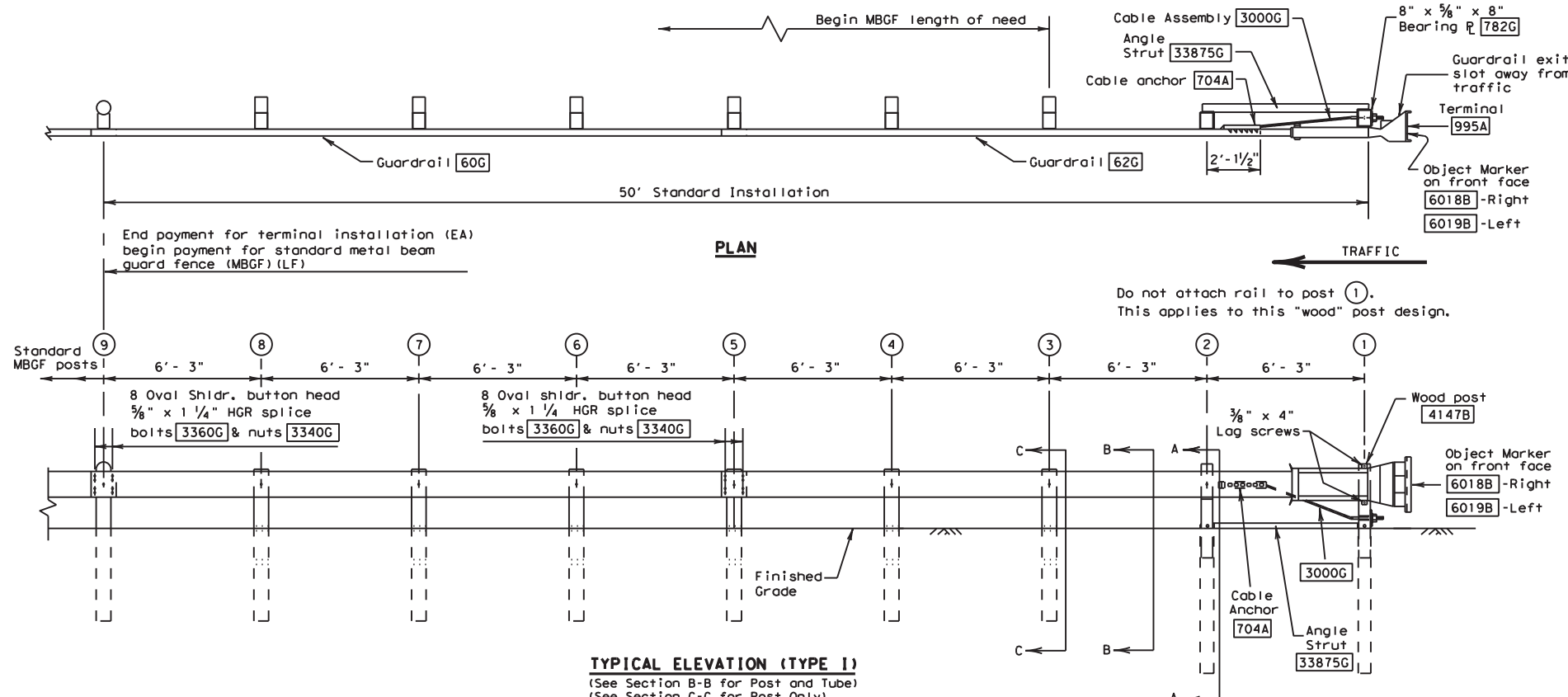
Texas Department of Transportation
Design Division (Roadway)

SINGLE GUARDRAIL TERMINAL
(SKT 350)
(HINGED STEEL POST)
SGT (8)H-05

FILE: sgt8h05.dgn	DW: AM	CK: BGD	CK:
© TxDOT February 2003	DISTRICT	FEDERAL AID PROJECT	
REVISIONS	SAT	SHEET 229	
	COUNTY	CONTROL	SECT JOB HIGHWAY
	BEXAR	6372	50 001 VAR.

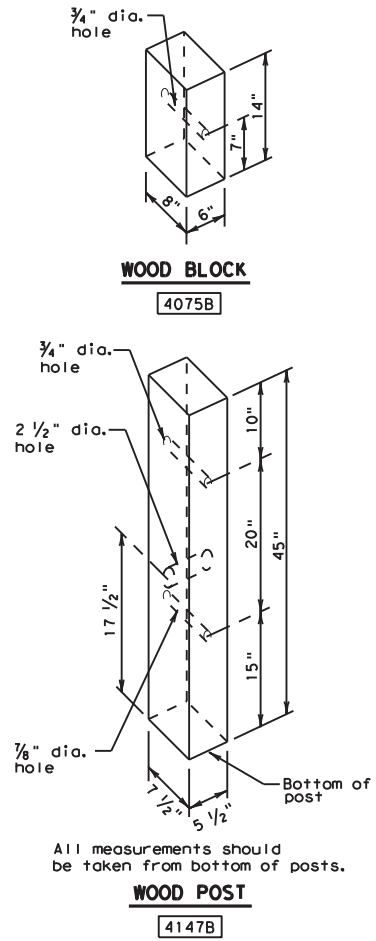
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DATE: FILE:



- GENERAL NOTES**
- The Type of SGT unit will be specified elsewhere in the plans. Numbers in circles indicate post position. The Type of SGT unit chosen is a maintenance consideration and does not affect the systems performance.

Post & Tube Options		Post Only
Type I Posts	① thru ②	Posts ③ thru ⑧
Type II Posts	① thru ④	Posts ⑤ thru ⑧
Type III Posts	① thru ⑧	None
 - SGT's placed within the "minimum" 150 ft. radius, shall be installed straight. Standard rail elements may be installed within the radius, without special fabrication.
 - All bolts, nuts, cable assemblies, cable anchors, steel tubes & bearing plates shall be galvanized.
 - At non-curbed locations, a flare rate of 25:1 may be used over the first 50 ft. of the system 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. At curbed locations, a flare rate of 25:1 shall be used beginning at post number 5 and ending at post number 1.
 - The steel tubes shall not protrude more than 4 inches above ground. Site grading may be necessary to meet this requirement.
 - The steel tubes may be driven with an approved driving head. They shall not be driven with the wood post in the tube. If the steel tubes are placed in drilled holes, the backfill material must be satisfactorily compacted to prevent tube settlement.
 - If solid rock is encountered. See the manufacturer's installation manual for the proper installation guidance.
 - The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
 - The wood blocks shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.
 - For curb installations, the soil tubes and posts shall be installed at the proper ground elevation behind the curb. The posts will then require field drilling new holes to accommodate the rail to post connection bolt to maintain the proper height of the rail above the gutter pan. The excess post length above the rail will be removed if directed by the Engineer.
 - An object marker shall be installed on the front of the impact head as detailed on D&OM(VIA).
 - A special site evaluation should be considered, prior to using this end treatment where there is less than 25 feet between the extrusion side of the end treatment and any adjacent driving lane.



POST & TUBE OPTIONS

Type I Posts	① thru ②
Type II Posts	① thru ④
Type III Posts	① thru ⑧

BILL OF MATERIAL

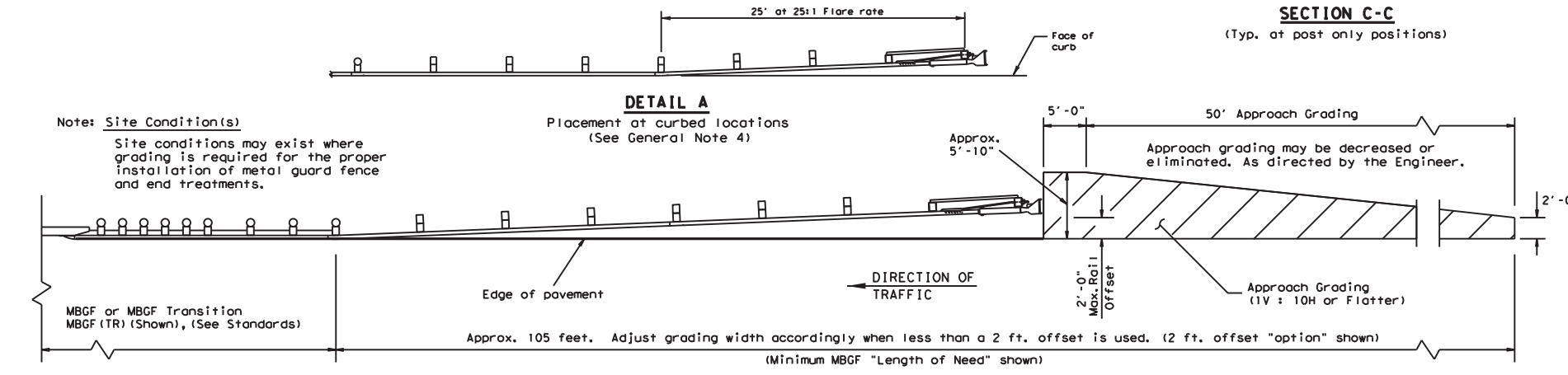
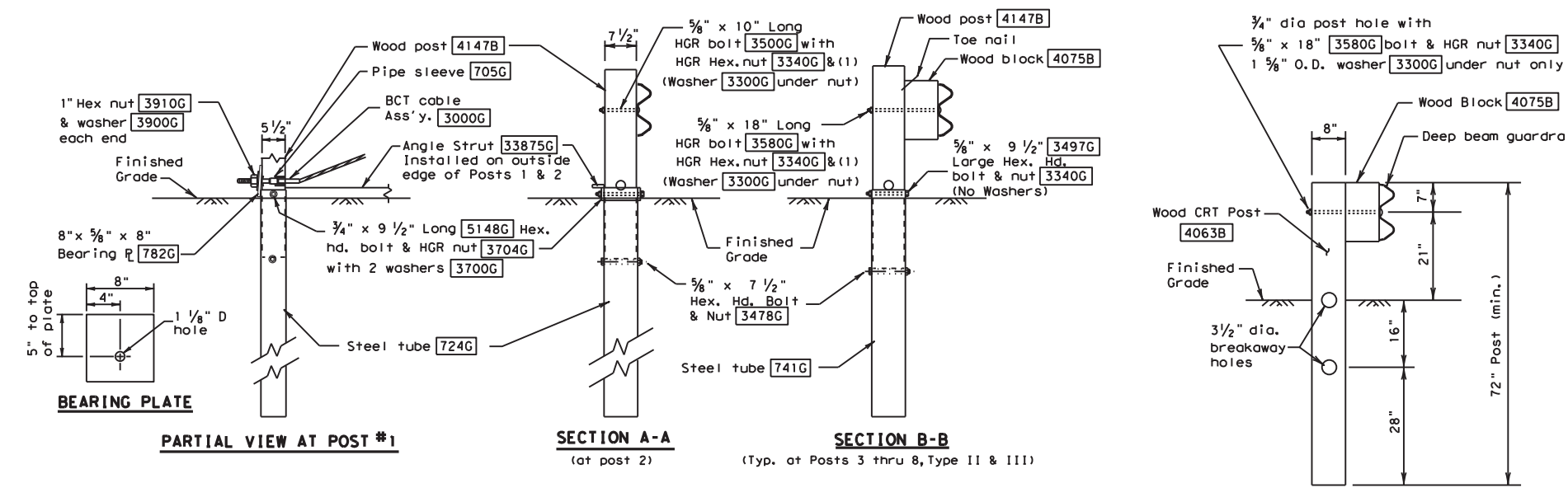
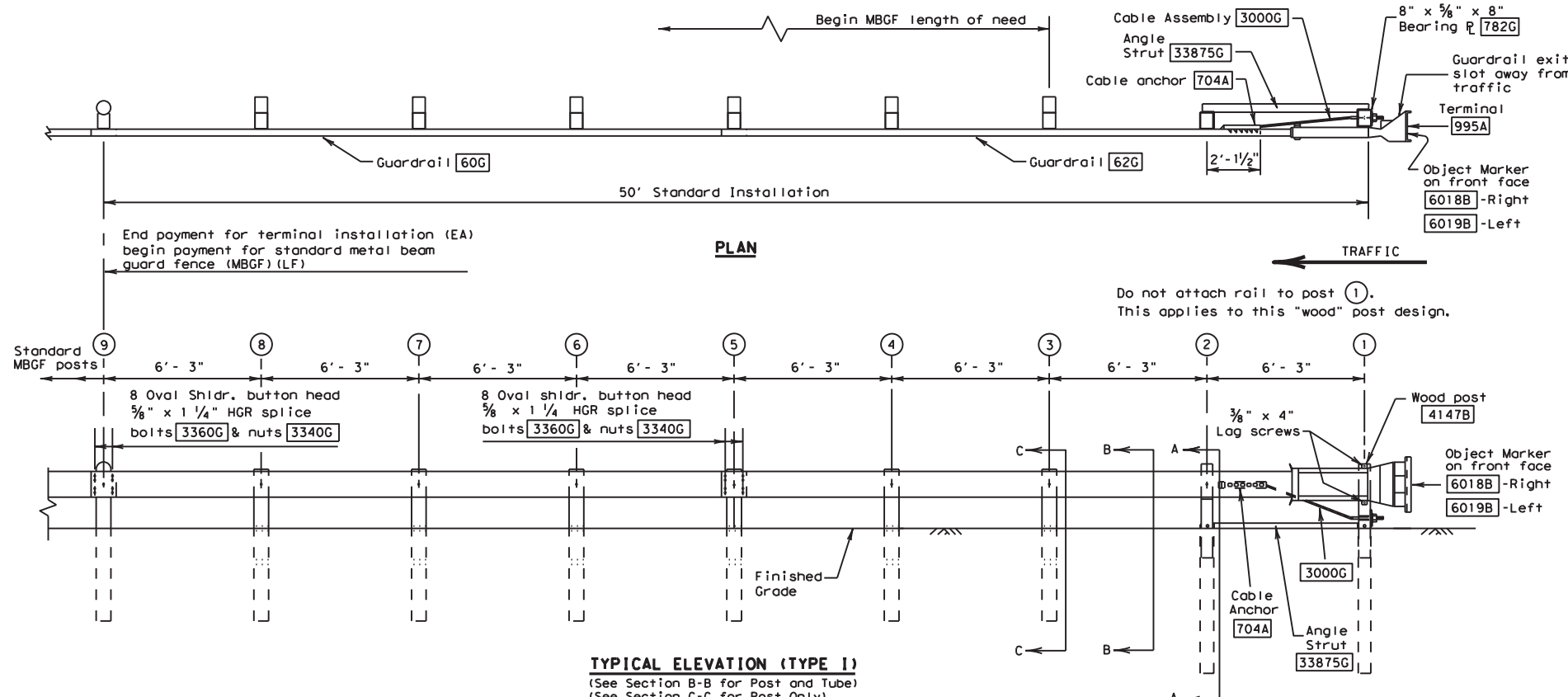
Code #	POST & TUBE OPTIONS			DESCRIPTION
	Type I Qty.	Type II Qty.	Type III Qty.	
62G	1	1	1	#1 Deep Beam Guardrail (12 Gal) at 25'
60G	1	1	1	#2 Deep Beam Guardrail (12 Gal) at 25'
724G	2	2	2	Steel Tube - 6" x 8" x 72" x 1/8" min
741G	0	2	6	Steel Tube - 6" x 8" x 54" x 1/8" min
4147B	2	4	8	Wood Posts - 5 1/2" x 7 1/2" x 45"
4063B	6	4	0	Wood CRT Posts - 6" x 8" x 72"
4075B	6	6	6	Wood Block - 6" x 8" x 14"
705G	1	1	1	Pipe Sleeve - 2" std. pipe x 5 1/2"
782G	1	1	1	Bearing Plate - 8" x 8" x 5/8"
704A	1	1	1	Cable Anchor
3000G	1	1	1	Cable Assembly (3/4" x 78")
33875G	1	1	1	Angle Strut
995A	1	1	1	ET-2000 Plus Guardrail Terminal
HARDWARE				
5148G	2	2	2	3/4" x 9 1/2" Hex Hd (Top of tubes 1&2) A325
3300G	7	7	7	5/8" Washers
3478G	2	4	8	3/8" x 7 1/2" Hex Bolt
3500G	1	1	1	5/8" x 10" Post Bolt (Post 2 of LET)
3580G	6	6	6	5/8" x 18" HGR Post Bolt (posts ③ thru ⑧)
3360G	16	16	16	3/8" x 1 1/4" HGR Splice Bolt
3340G	25	27	31	5/8" HGR Nut (16-spl, 7-posts)
4228G	2	2	2	3/8" x 4" Lag Screw
3910G	2	2	2	1" Hex Nut (Anchor Cable)
3900G	2	2	2	1" Washer (Anchor Cable)
6018B	1	1	1	Right - Object Marker
6019B	1	1	1	Left - Object Marker
3700G	4	4	4	3/4" Washer
3704G	2	2	2	3/4" Heavy Hex Nut
3497G	0	2	6	5/8" x 9 1/2" Hex Hd (Top of Tubes 3-8) A307

Texas Department of Transportation
Design Division Standard
SINGLE GUARDRAIL TERMINAL (ET-2000 PLUS) (WOOD POST) SGT (7) - 11

FILE: sgt712.dgn	DN: TxDOT	CR: AM	DW: BD	CK: VP
© TxDOT April 1997	CONT: 6372	SECT: 50	JOB: OOI	HIGHWAY: VAR.
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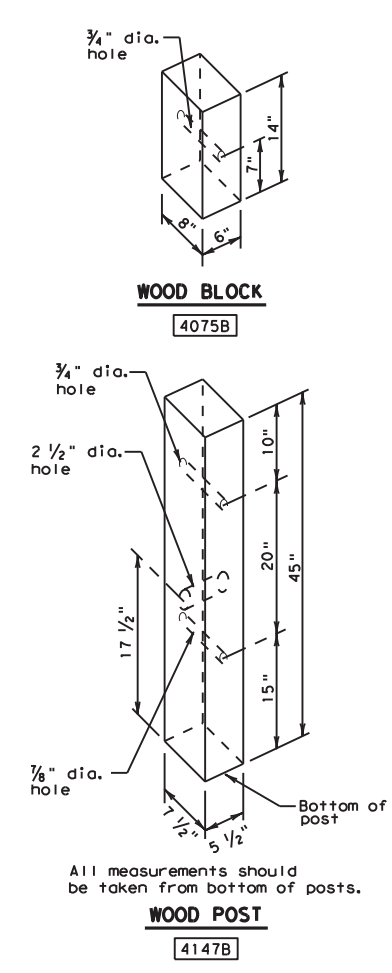
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DATE: FILE:



- GENERAL NOTES**
- The Type of SGT unit will be specified elsewhere in the plans. Numbers in circles indicate post position. The Type of SGT unit chosen is a maintenance consideration and does not affect the systems performance.

Post & Tube Options		Post Only
Type I Posts	① thru ②	Posts ③ thru ⑧
Type II Posts	① thru ④	Posts ⑤ thru ⑧
Type III Posts	① thru ⑧	None
 - SGT's placed within the "minimum" 150 ft. radius, shall be installed straight. Standard rail elements may be installed within the radius, without special fabrication.
 - All bolts, nuts, cable assemblies, cable anchors, steel tubes & bearing plates shall be galvanized.
 - At non-curbed locations, a flare rate of 25:1 may be used over the first 50 ft. of the system 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. At curbed locations, a flare rate of 25:1 shall be used beginning at post number 5 and ending at post number 1.
 - The steel tubes shall not protrude more than 4 inches above ground. Site grading may be necessary to meet this requirement.
 - The steel tubes may be driven with an approved driving head. They shall not be driven with the wood post in the tube. If the steel tubes are placed in drilled holes, the backfill material must be satisfactorily compacted to prevent tube settlement.
 - If solid rock is encountered. See the manufacturer's installation manual for the proper installation guidance.
 - The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
 - The wood blocks shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.
 - For curb installations, the soil tubes and posts shall be installed at the proper ground elevation behind the curb. The posts will then require field drilling new holes to accommodate the rail to post connection bolt to maintain the proper height of the rail above the gutter pan. The excess post length above the rail will be removed if directed by the Engineer.
 - An object marker shall be installed on the front of the impact head as detailed on D&OM(VIA).
 - A special site evaluation should be considered, prior to using this end treatment where there is less than 25 feet between the extrusion side of the end treatment and any adjacent driving lane.



POST & TUBE OPTIONS

Type I Posts	① thru ②
Type II Posts	① thru ④
Type III Posts	① thru ⑧

BILL OF MATERIAL

Code #	POST & TUBE OPTIONS			DESCRIPTION
	Type I Qty.	Type II Qty.	Type III Qty.	
62G	1	1	1	#1 Deep Beam Guardrail (12 Gal) at 25'
60G	1	1	1	#2 Deep Beam Guardrail (12 Gal) at 25'
724G	2	2	2	Steel Tube - 6" x 8" x 72" x 1/8" min
741G	0	2	6	Steel Tube - 6" x 8" x 54" x 1/8" min
4147B	2	4	8	Wood Posts - 5 1/2" x 7 1/2" x 45"
4063B	6	4	0	Wood CRT Posts - 6" x 8" x 72"
4075B	6	6	6	Wood Block - 6" x 8" x 14"
705G	1	1	1	Pipe Sleeve - 2" std. pipe x 5 1/2"
782G	1	1	1	Bearing Plate - 8" x 8" x 5/8"
704A	1	1	1	Cable Anchor
3000G	1	1	1	Cable Assembly (3/4" x 78")
33875G	1	1	1	Angle Strut
995A	1	1	1	ET-2000 Plus Guardrail Terminal

HARDWARE

5148G	2	2	2	3/4" x 9 1/2" Hex Hd (Top of tubes 1&2) A325
3300G	7	7	7	5/8" Washers
3478G	2	4	8	3/8" x 7 1/2" Hex Bolt
3500G	1	1	1	5/8" x 10" Post Bolt (Post 2 of LET)
3580G	6	6	6	5/8" x 18" HGR Post Bolt (posts ③ thru ⑧)
3360G	16	16	16	3/8" x 1 1/4" HGR Splice Bolt
3340G	25	27	31	5/8" HGR Nut (16-spl, 7-posts)
4228G	2	2	2	3/8" x 4" Lag Screw
3910G	2	2	2	1" Hex Nut (Anchor Cable)
3900G	2	2	2	1" Washer (Anchor Cable)
6018B	1	1	1	Right - Object Marker
6019B	1	1	1	Left - Object Marker
3700G	4	4	4	3/4" Washer
3704G	2	2	2	3/4" Heavy Hex Nut
3497G	0	2	6	5/8" x 9 1/2" Hex Hd (Top of Tubes 3-8) A307

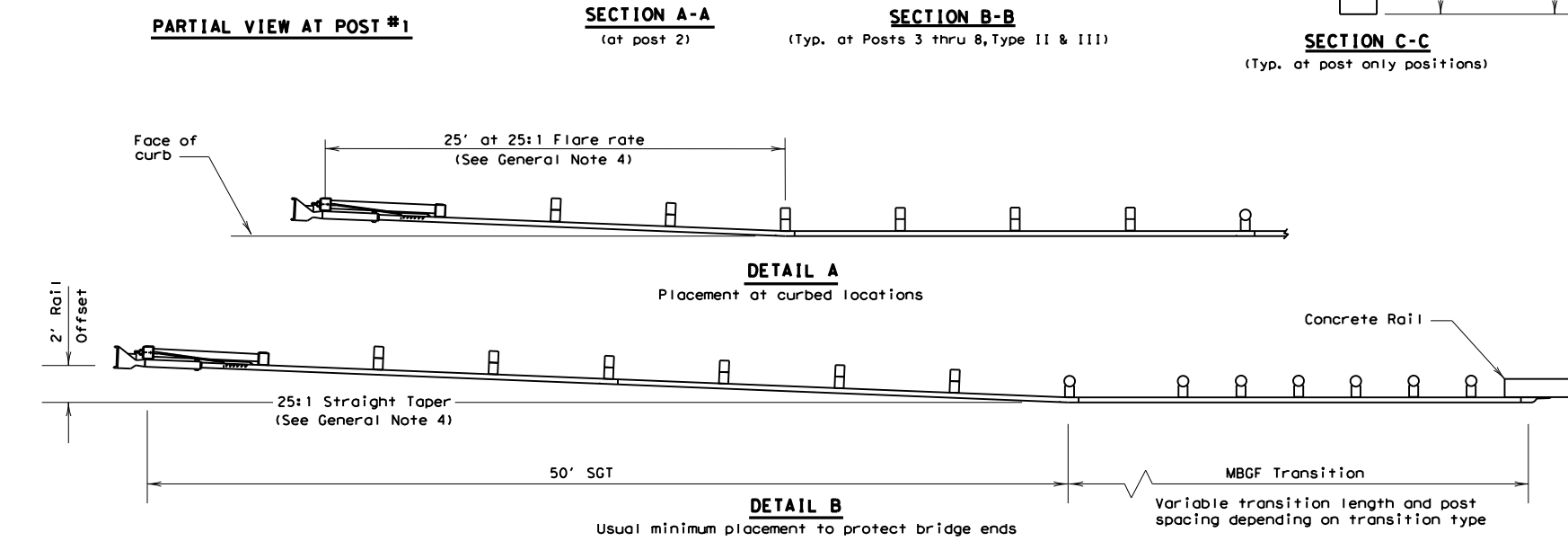
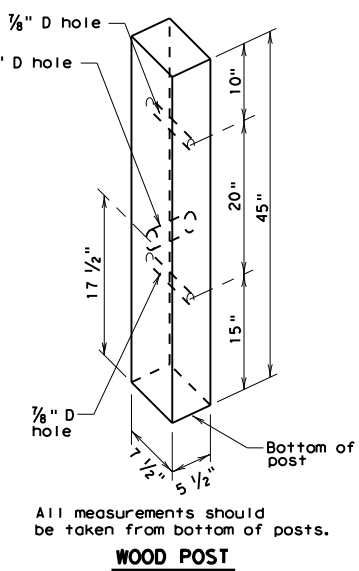
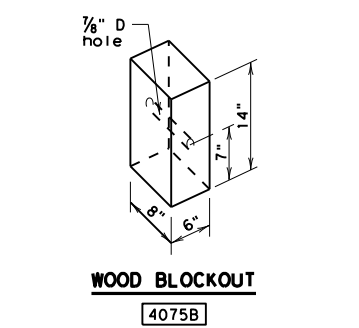
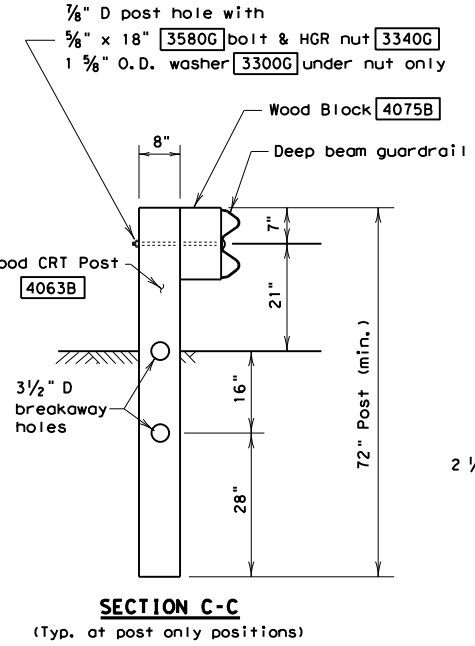
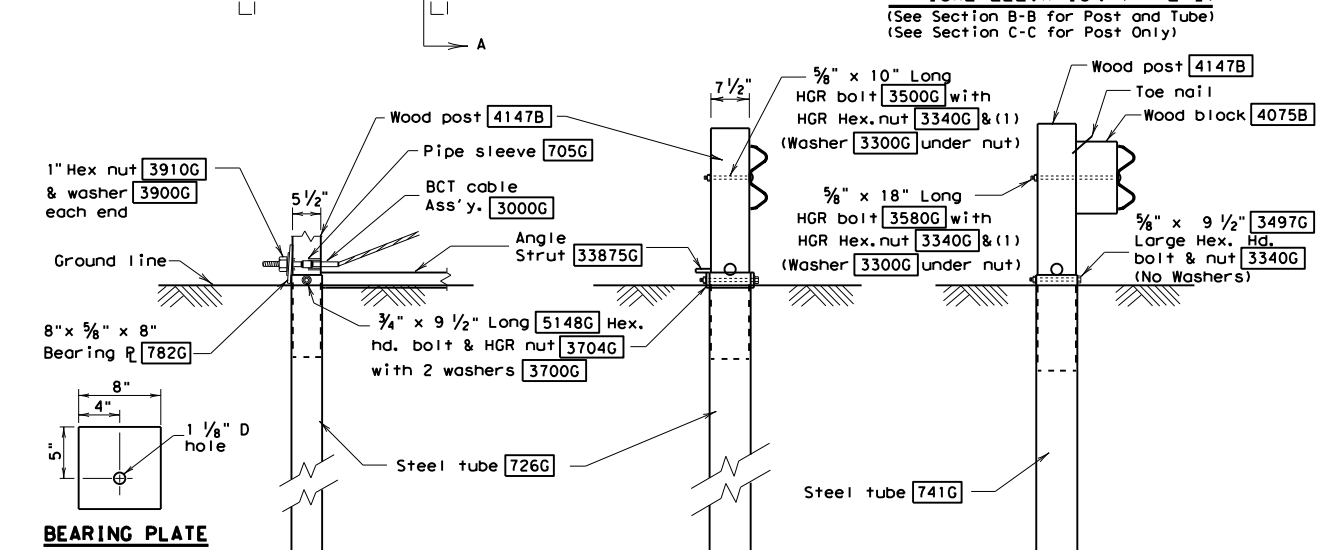
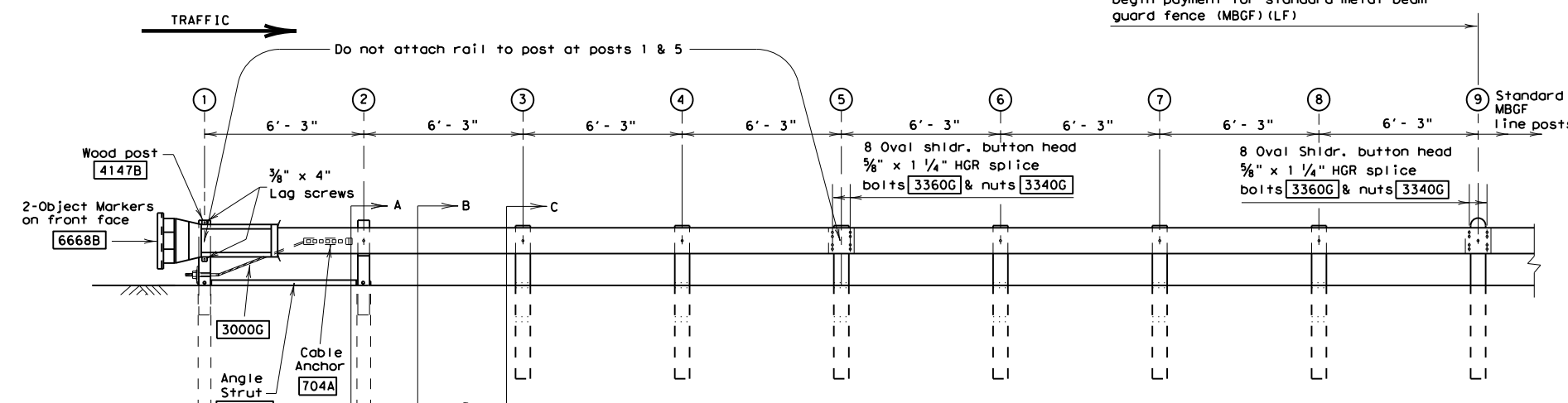
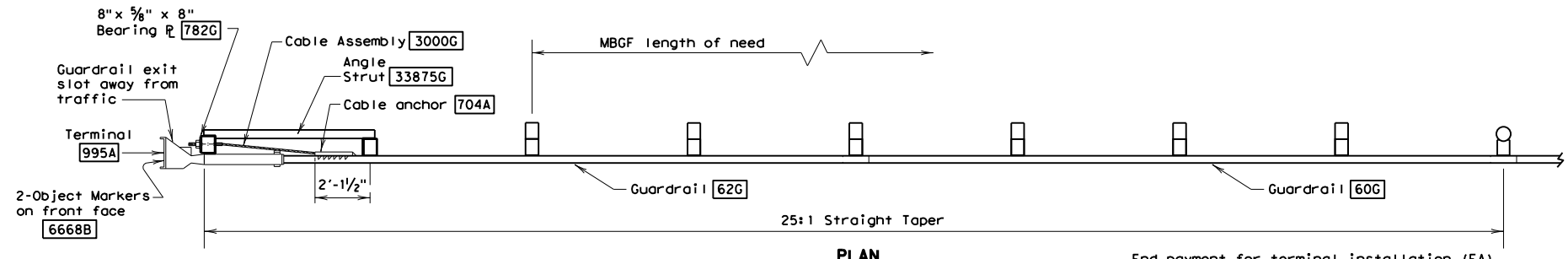
Texas Department of Transportation
 Design Division Standard
SINGLE GUARDRAIL TERMINAL
 (ET-2000 PLUS)
 (WOOD POST)
SGT (7) - 10

FILE: sgt710.dgn	DN: TxDOT	CR: AM	DW: BD	CK:
© TxDOT April 1997	CONT: 6372	SECT: 50	JOB: OOI	HIGHWAY: VAR.
REVISIONS:	SAT	COUNTY: BEXAR	SHEET NO.: 231	

GENERAL NOTES

- The Type of SGT unit will be specified elsewhere in the plans. Numbers in circles indicate post position. The Type of SGT unit chosen is a maintenance consideration and does not affect the systems performance.

Post & Tube Options		Post Only	
Type I	Posts ① thru ②	Posts ③ thru ④	None
Type II	Posts ① thru ④	Posts ⑤ thru ⑥	None
Type III	Posts ① thru ⑥	None	None
- If the SGT system must be placed on a radius, the minimum radius is 150 feet.
- All bolts, nuts, cable assemblies, cable anchors, steel tubes & bearing plates shall be galvanized.
- For non-curb installations, the MGBF will be flared at a rate of 25:1 over the first 50 foot of the system 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. A 25:1 flare rate will be used at curb sections, beginning at post number 5 and ending at post number one.
- The steel tubes shall not protrude more than 4 inches above ground. Site grading may be necessary to meet this requirement.
- The steel tubes may be driven with an approved driving head. They shall not be driven with the wood post in the tube. If the steel tubes are placed in drilled holes, the backfill material must be satisfactorily compacted to prevent tube settlement.
- When rock excavation is encountered, a 12 inch diameter post hole, 20 inches deep may be used if approved by the Engineer. Granular material will be placed in the bottom of the hole approximately 2 1/2 inches deep to provide drainage. The steel tube sleeves will be field cut to 20 inches in length, placed in the hole and backfilled with adequately compacted material excavated from the hole.
- The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
- The wood blockouts shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.
- For curb installations, the soil tubes and posts shall be installed at the proper ground elevation behind the curb. The posts will then require field drilling new holes to accommodate the rail to post connection bolt to maintain the proper height of the rail above the gutter pan. The excess post length above the rail will be removed if directed by the Engineer.
- An object marker shall be installed on the front of the impact head as detailed on D&M(VIA).
- A special site evaluation should be considered, prior to using this end treatment where there is less than 25 feet between the extrusion side of the end treatment and any adjacent driving lane.



BILL OF MATERIAL				
Code #	POST & TUBE OPTIONS			DESCRIPTION
	Type I Qty.	Type II Qty.	Type III Qty.	
62G	1	1	1	#1 Deep Beam Guardrail (12 Ga) at 25'
60G	1	1	1	#2 Deep Beam Guardrail (12 Ga) at 25'
726G	2	2	2	Steel Tube - 6"x 8"x 72"x 1/8" min
741G	0	2	6	Steel Tube - 6" x 8" x 54" x 1/8" min
4147B	2	4	8	Wood Posts - 5 1/2" x 7 1/2" x 45"
4063B	6	4	0	Wood CRT Posts - 6" x 8" x 72"
4075B	6	6	6	Wood Block - 6" x 8" x 14"
705G	1	1	1	Pipe Sleeve - 2" std. pipe x 5 1/2"
782G	1	1	1	Bearing Plate - 8" x 8" x 3/8"
704A	1	1	1	Cable Anchor
3000G	1	1	1	Cable Assembly (3/4" x 78")
33875G	1	1	1	Angle Strut
995A	1	1	1	ET-2000 Plus Guardrail Terminal
HARDWARE				
5148G	2	2	2	3/4" x 9 1/2" Hex Hd (Top of tubes 1&2) A325
3300G	7	7	7	3/8" Washers
3478G	2	2	2	5/8" x 7 1/2" Hex Bolt
3500G	1	1	1	3/8" x 10" Post Bolt (Post 2 of LET)
3580G	6	6	6	5/8" x 18" HGR Post Bolt (posts ③ thru ⑥)
3360G	16	16	16	5/8" x 1 1/4" HGR Splice Bolt
3340G	25	27	31	5/8" HGR Nut (16-spl, 7-posts)
4228G	2	2	2	3/8" x 4" Lag Screw
3910G	2	2	2	1" Hex Nut (Anchor Cable)
3900G	2	2	2	1" Washer (Anchor Cable)
6668B	2	2	2	Object Marker (12" x 12")
3700G	4	4	4	3/4" Washer
3704G	2	2	2	3/4" Heavy Hex Nut
3497G	0	2	6	5/8" x 9 1/2" Hex Hd (Top of Tubes 3-8) A307

POST & TUBE OPTIONS			
Type I	Posts	① thru	②
Type II	Posts	① thru	④
Type III	Posts	① thru	⑥

R = Radius
D = Diameter

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LEVELS DISPLAYED	1
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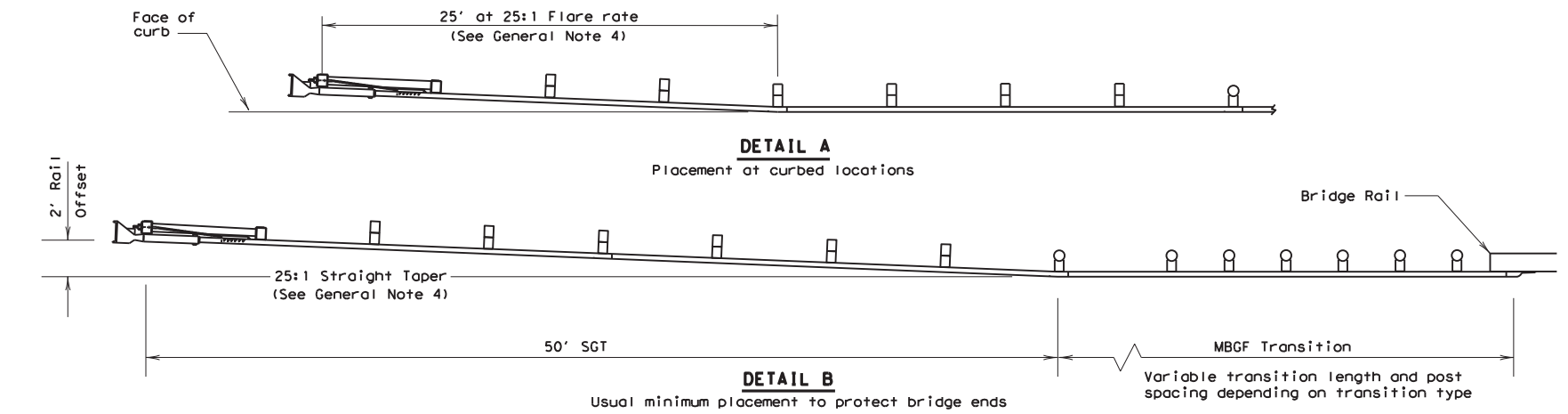
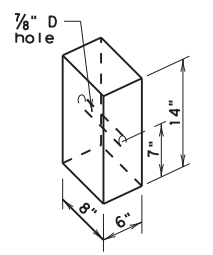
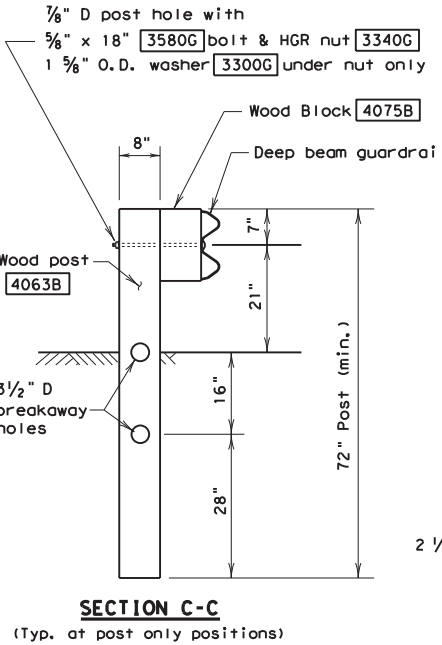
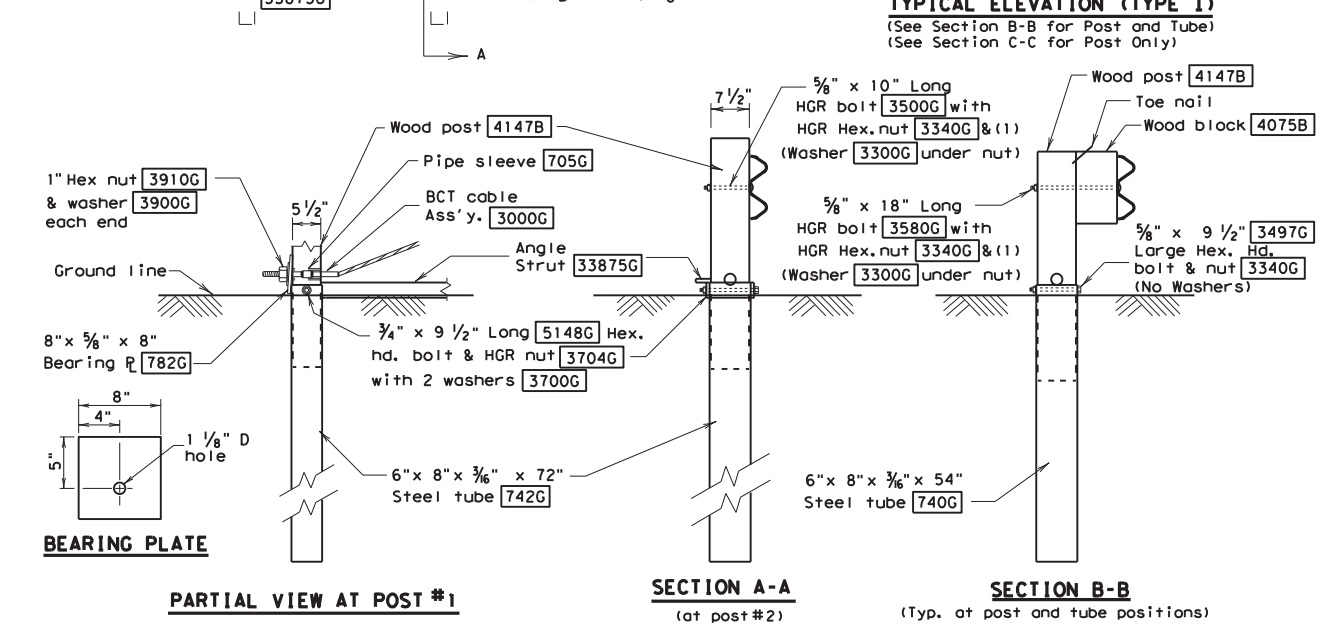
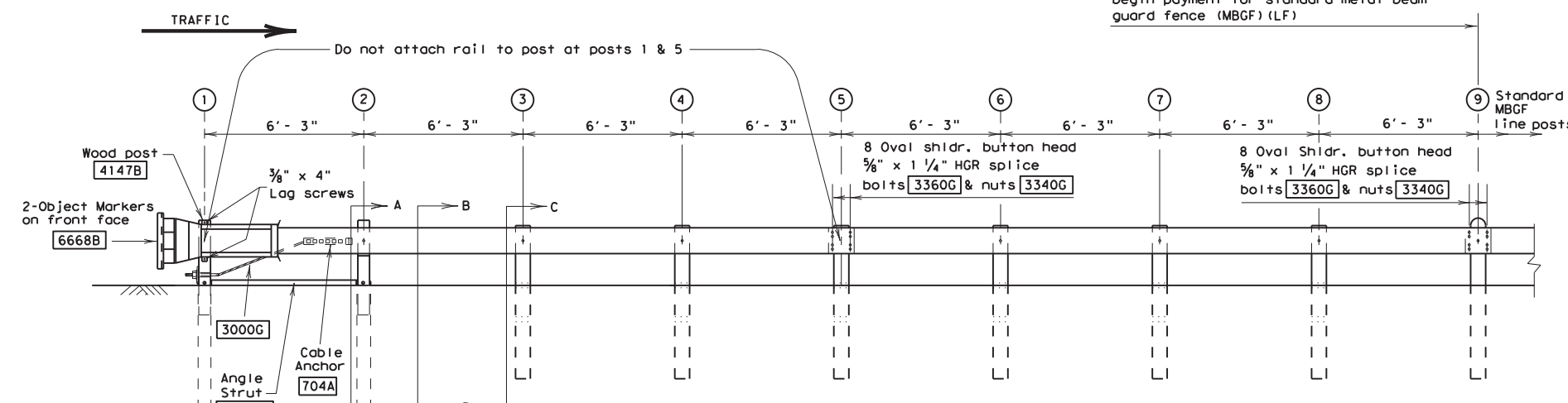
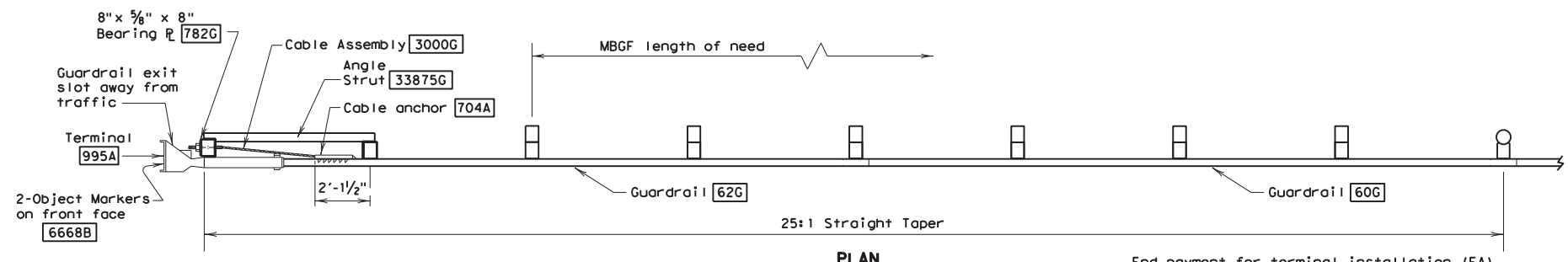
Texas Department of Transportation
 Design Division (Roadway)

SINGLE GUARDRAIL TERMINAL (ET-2000 PLUS) (WOOD POST)

SGT (7) - 03A

FILE: sgt703a.dgn	DN: MAM	CK: MAM	DW: BGD	CK:
© TxDOT APRIL 1997	DIST	FEDERAL AID PROJECT		SHEET
REVISIONS	SAT			233
	COUNTY	CONTROL	SECT	JOB
	BEXAR	6372	50	001
				VAR.

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POST & TUBE OPTIONS		
Type I	Posts	① thru ②
Type II	Posts	① thru ④
Type III	Posts	① thru ⑧

GENERAL NOTES

- The type of SGT unit will be specified elsewhere in the plans. (Numbers in circles indicate post position.)

Post & Tube Options		Post Only
Type I	Posts ① thru ②	Posts ③ thru ⑧
Type II	Posts ① thru ④	Posts ⑤ thru ⑧
Type III	Posts ① thru ⑧	None
- Details shown here are for wood posts. For steel post option, see standard sheet SGT(7)HB.
- All bolts, nuts, cable assemblies, cable anchors, steel tubes & bearing plates shall be galvanized.
- For non-curb installations, the MBGF will be flared at a rate of 25:1 over the first 50 foot of the system 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. A 25:1 flare rate will be used at curb sections, beginning at post number 5 and ending at post number one.
- The steel tubes shall not protrude more than 4 inches above ground. Site grading may be necessary to meet this requirement.
- The steel tubes may be driven with an approved driving head. They shall not be driven with the wood post in the tube. If the steel tubes are placed in drilled holes, the backfill material must be satisfactorily compacted to prevent tube settlement.
- When rock excavation is encountered, a 12 inch diameter post hole, 20 inches deep may be used if approved by the Engineer. Granular material will be placed in the bottom of the hole approximately 2 1/2 inches deep to provide drainage. The steel tube sleeves will be field cut to 20 inches in length, placed in the hole and backfilled with adequately compacted material excavated from the hole.
- The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
- The wood blockouts shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.
- For curb installations, the soil tubes and posts shall be installed at the proper ground elevation behind the curb. The posts will then require field drilling new holes to accommodate the rail to post connection bolt to maintain the proper height of the rail above the gutter pan. The excess post length above the rail will be removed if directed by the Engineer.
- An object marker shall be installed on the front of the impact head as detailed on D&OM(VIA).
- A special site evaluation should be considered, prior to using this end treatment where there is less than 25 feet between the extrusion side of the end treatment and any adjacent driving lane.

BILL OF MATERIAL

Code #	POST & TUBE OPTIONS			DESCRIPTION
	Type I Qty.	Type II Qty.	Type III Qty.	
62G	1	1	1	#1 Deep Beam Guardrail (12 Ga) at 25'
60G	1	1	1	#2 Deep Beam Guardrail (12 Ga) at 25'
742G	2	2	2	Steel Tube - 6"x 8"x 72"x 3/16"
740G	0	2	6	Steel Tube - 6"x 8"x 54"x 3/16"
4147B	2	4	8	Wood Posts - 5 1/2" x 7 1/2" x 45"
4063B	6	4	0	Wood CRT Posts - 6"x 8"x 72"
4075B	6	6	6	Wood Block - 6"x 8"x 14"
705G	1	1	1	Pipe Sleeve - 2" std. pipe x 5 1/2"
782G	1	1	1	Bearing Plate - 8"x 8"x 3/8"
704A	1	1	1	Cable Anchor
3000G	1	1	1	Cable Assembly (3/4" x 78")
33875G	1	1	1	Angle Strut
995A	1	1	1	ET-2000 Plus Guardrail Terminal
HARDWARE				
5148G	2	2	2	3/4" x 9 1/2" Hex Hd (Top of tubes 1&2)A325
3300G	7	7	7	3/8" Washers
3478G	2	2	2	5/8" x 7 1/2" Hex Bolt
3500G	1	1	1	5/8" x 10" Post Bolt (Post 2 of LET)
3580G	6	6	6	5/8" x 18" HGR Post Bolt (posts ③ thru ⑧)
3360G	16	16	16	5/8" x 1 1/4" HGR Splice Bolt
3340G	25	27	31	5/8" HGR Nut (16-spl, 7-posts)
4228G	2	2	2	3/8" x 4" Lag Screw
3910G	2	2	2	1" Hex Nut (Anchor Cable)
3900G	2	2	2	1" Washer (Anchor Cable)
6668B	2	2	2	Object Marker (12" x 12")
3700G	4	4	4	3/4" Washer
3704G	2	2	2	3/4" Heavy Hex Nut
3497G	0	2	6	5/8" x 9 1/2" Hex Hd (Top of Tubes 3-8)A307

Texas Department of Transportation
Design Division (Roadway)

SINGLE GUARDRAIL TERMINAL (ET-2000 PLUS) (WOOD POST) SGT (7) -03

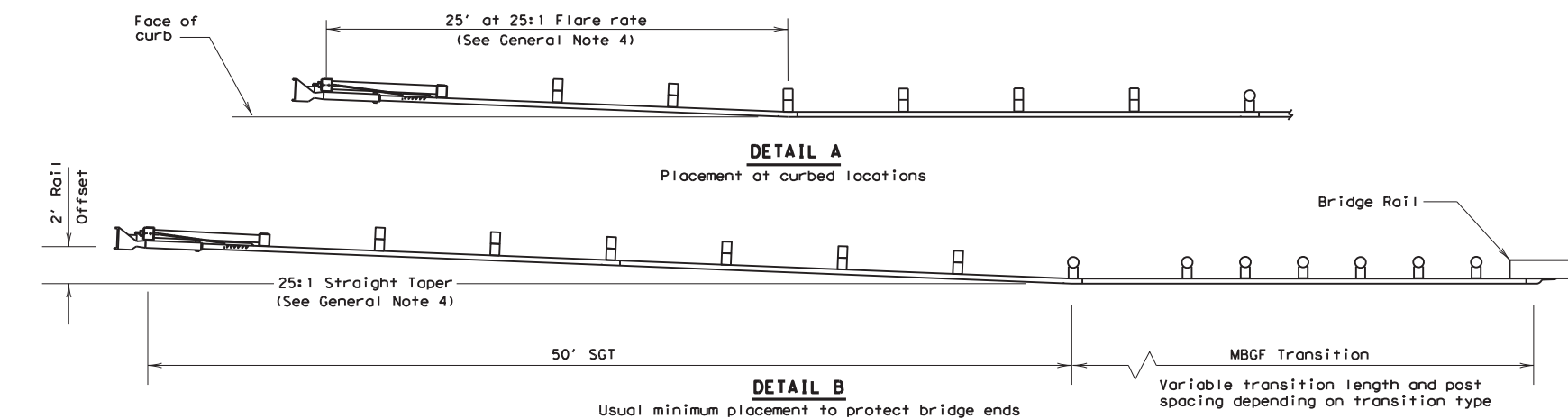
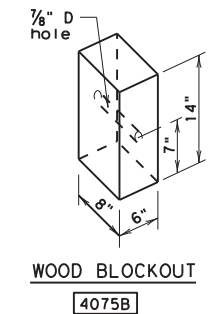
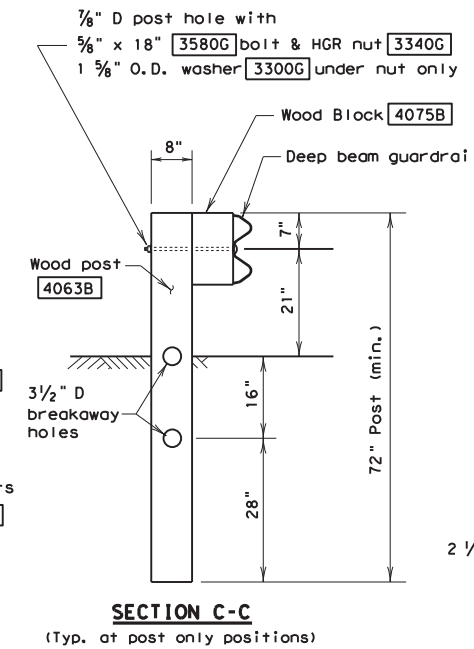
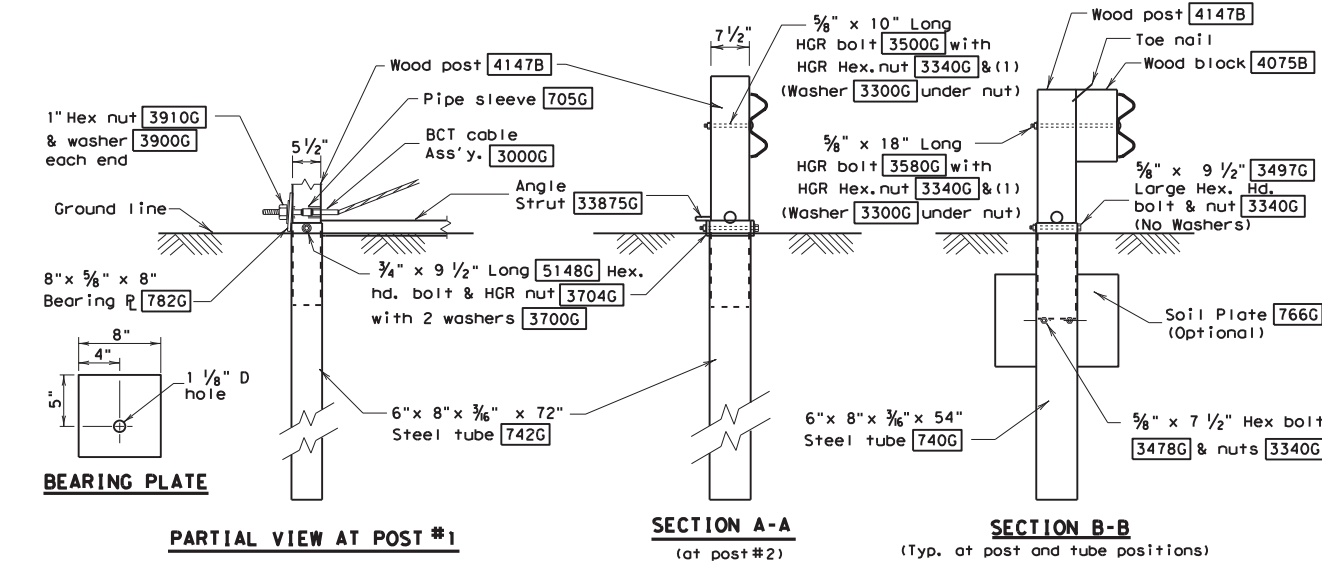
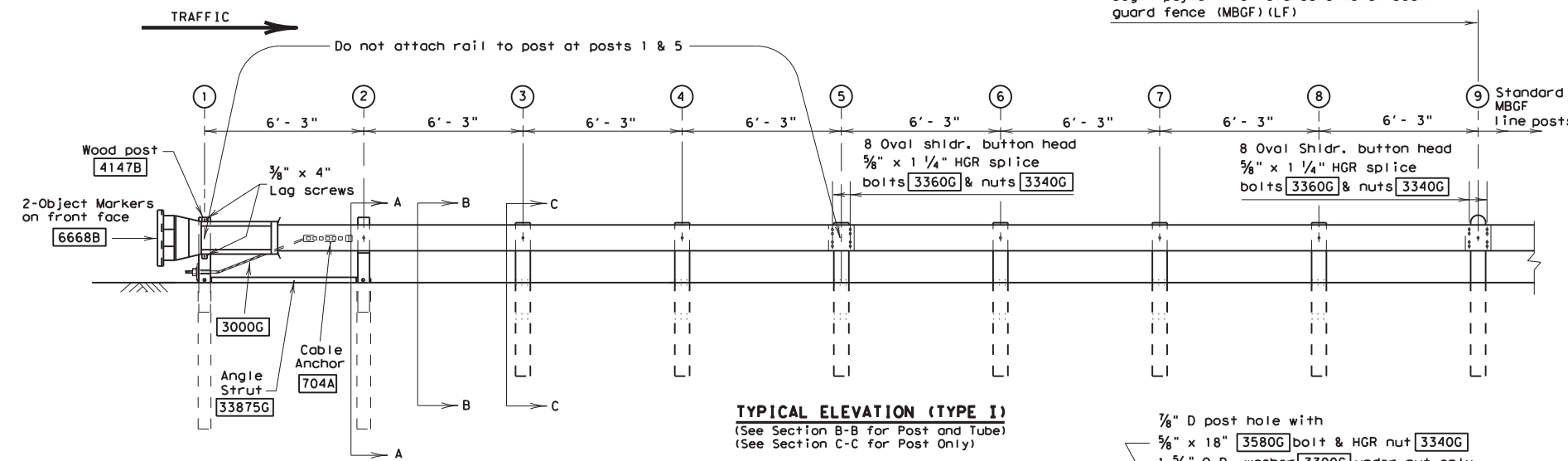
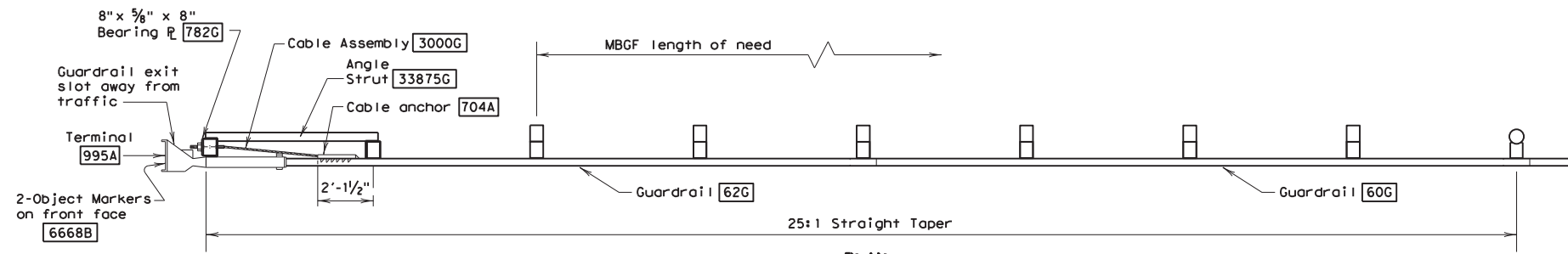
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© TxDOT	APRIL 1997	DIST:	SAT	FED REG:	6	FEDERAL AID PROJECT:		SHEET:	234
REVISIONS:		COUNTY:	BEXAR	CONTROL:	6372	SECT:	50	JOB:	001
		HIGHWAY:							VAR.

R = Radius
D = Diameter

GENERAL NOTES

- The type of SGT unit will be specified elsewhere in the plans. (Numbers in circles indicate post position.)

Post & Tube Options		Post Only
Type I	Posts ① thru ②	Posts ③ thru ⑧
Type II	Posts ① thru ④	Posts ⑤ thru ⑧
Type III	Posts ① thru ⑧	None
- Wood posts are required with this guardrail end treatment.
- All bolts, nuts, cable assemblies, cable anchors, steel tubes & bearing plates shall be galvanized.
- For non-curb installations, the MBSF will be flared at a rate of 25:1 over the first 50 foot of the system 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. A 25:1 flare rate will be used at curb sections, beginning at post number 5 and ending at post number one.
- The steel tubes shall not protrude more than 4 inches above ground. Site grading may be necessary to meet this requirement.
- The steel tubes may be driven with an approved driving head. They shall not be driven with the wood post in the tube. If the steel tubes are placed in drilled holes, the backfill material must be satisfactorily compacted to prevent tube settlement.
- When rock excavation is encountered, a 12 inch diameter post hole, 20 inches deep may be used if approved by the Engineer. Granular material will be placed in the bottom of the hole approximately 2 1/2 inches deep to provide drainage. The steel tube sleeves will be field cut to 20 inches in length, placed in the hole and backfilled with adequately compacted material excavated from the hole.
- The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
- The wood blockouts shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.
- For curb installations, the soil tubes and posts shall be installed at the proper ground elevation behind the curb. The posts will then require field drilling new holes to accommodate the rail to post connection bolt to maintain the proper height of the rail above the gutter pan. The excess post length above the rail will be removed if directed by the Engineer.
- An object marker shall be installed on the front of the impact head as detailed on D&OM(VIA).
- A special site evaluation should be considered, prior to using this end treatment where there is less than 25 feet between the extrusion side of the end treatment and any adjacent driving lane.



All measurements should be taken from bottom of posts.

POST & TUBE OPTIONS		
Type I	Posts ① thru ②	
Type II	Posts ① thru ④	
Type III	Posts ① thru ⑧	

BILL OF MATERIAL						
Code #	POST & TUBE OPTIONS			DESCRIPTION		
	Type I Qty.	Type II Qty.	Type III Qty.			
62G	1	1	1	#1 Deep Beam Guardrail (12 Ga) at 25'		
60G	1	1	1	#2 Deep Beam Guardrail (12 Ga) at 25'		
742G	2	2	2	Steel Tube - 6"x 8"x 72"x 3/16"		
740G	0	2	6	Steel Tube - 6"x 8"x 54"x 3/16"		
766G	0	2	6	Soil Plate - 18"x 24"x 1/4" - Optional		
4147B	2	4	8	Wood Posts - 5 1/2" x 7 1/2" x 45"		
4063B	6	4	0	Wood CRT Posts - 6"x 8"x 72"		
4075B	6	6	6	Wood Block - 6"x 8"x 14"		
705G	1	1	1	Pipe Sleeve - 2" std. pipe x 5 1/2"		
782G	1	1	1	Bearing Plate - 8"x 8"x 5/8"		
704A	1	1	1	Cable Anchor		
3000G	1	1	1	Cable Assembly (3/4" x 78")		
33875G	1	1	1	Angle Strut		
995A	1	1	1	ET-2000 Plus Guardrail Terminal		
HARDWARE						
5148G	2	2	2	3/4" x 9 1/2" Hex Hd (Top of tubes 1&2)A325		
3300G	7	7	7	5/8" Washers		
3478G	2	14	14	5/8" x 7 1/2" Hex Bolt		
3500G	1	1	1	5/8" x 10" Post Bolt (Post 2 of LET)		
3580G	6	6	6	5/8" x 18" HGR Post Bolt (posts ③ thru ⑧)		
3360G	16	16	16	5/8" x 1 1/4" HGR Splice Bolt		
3340G	25	43	43	5/8" HGR Nut (16-spl, 7-posts, 2 each at tube ③ thru ⑧)		
4228G	2	2	2	3/8" x 4" Lag Screw		
3910G	2	2	2	1" Hex Nut (Anchor Cable)		
3900G	2	2	2	1" Washer (Anchor Cable)		
6668B	2	2	2	Object Marker (12" x 12")		
3700G	4	4	4	3/4" Washer		
3704G	2	2	2	3/4" Heavy Hex Nut		
3497G	0	6	6	5/8" x 9 1/2" Hex Hd (Top of Tubes 3-8)A307		

R = Radius
D = Diameter

Texas Department of Transportation
Design Division (Roadway)

SINGLE GUARDRAIL TERMINAL (ET-2000 PLUS) SGT (7) - 02

FILE: sgt702.dgn	DN: MAM	CK: MAM	DW: BGD	CK:	NEG: R0000
© TxDOT APRIL 1997	DIST	FED REG	RMC PROJECT	SHEET	
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	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	BEXAR	6372	50	001	VAR.

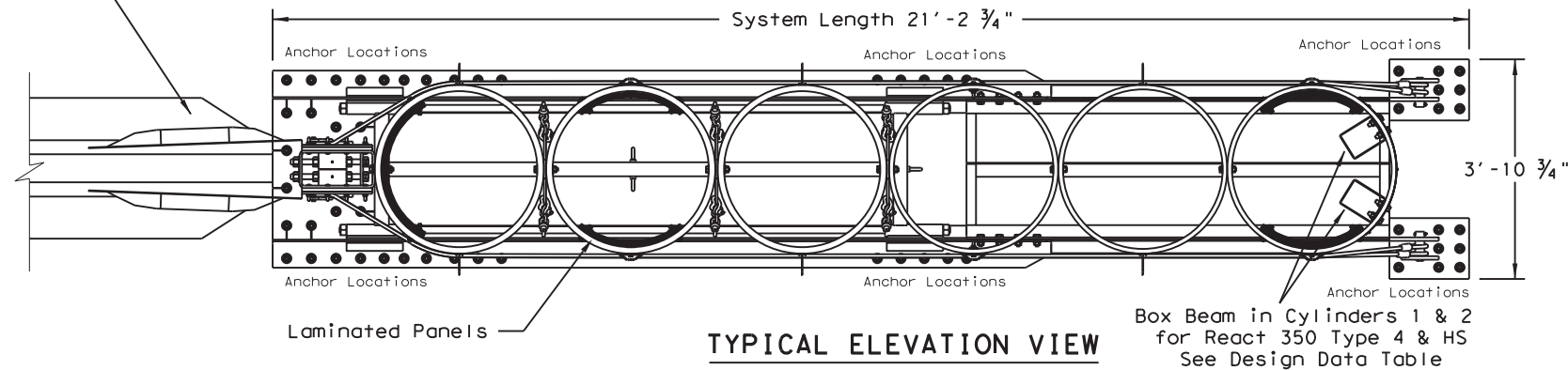
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

LEVELS DISPLAYED	
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TYPICAL PLAN VIEW

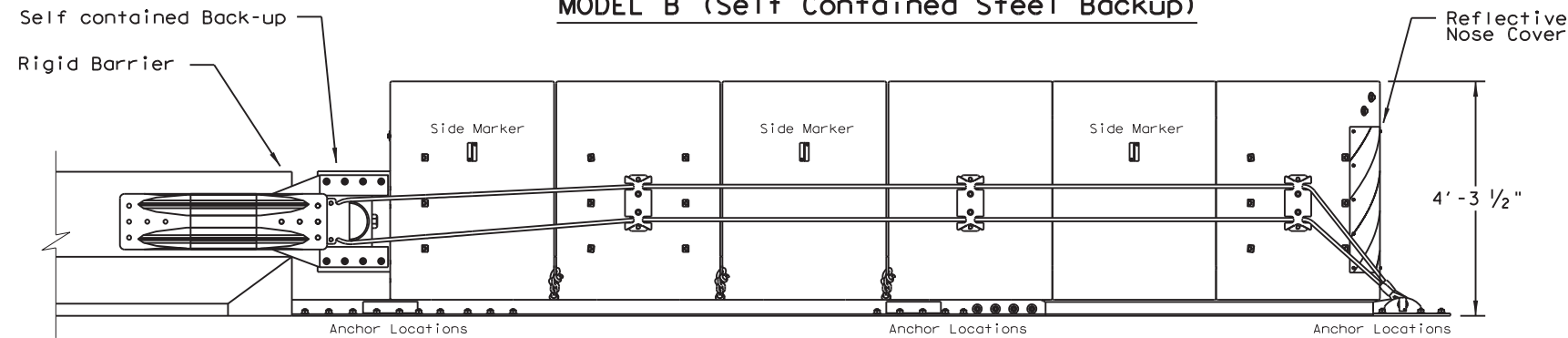
MODEL B (Self Contained Steel Backup)

Transition Plate(s) (Optional) required w/bi-directional traffic flows only.



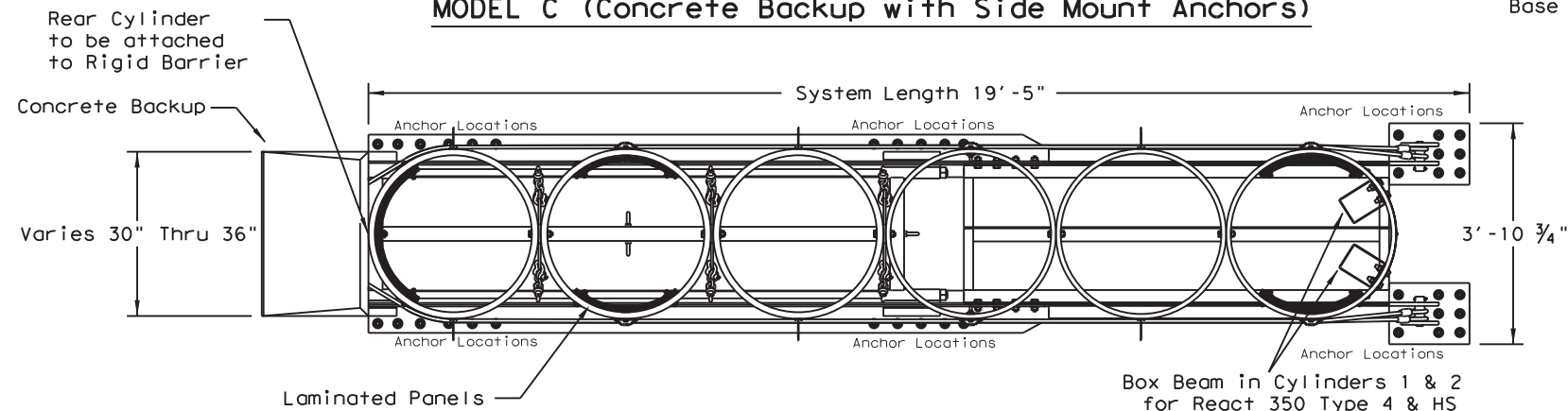
TYPICAL ELEVATION VIEW

MODEL B (Self Contained Steel Backup)



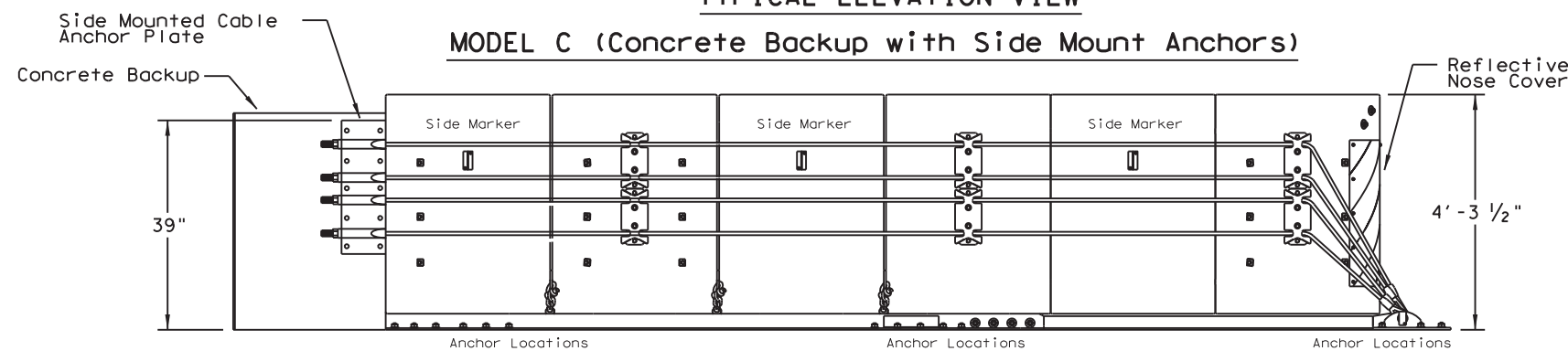
TYPICAL PLAN VIEW

MODEL C (Concrete Backup with Side Mount Anchors)



TYPICAL ELEVATION VIEW

MODEL C (Concrete Backup with Side Mount Anchors)

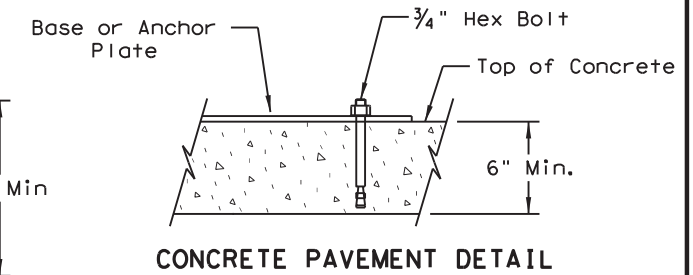
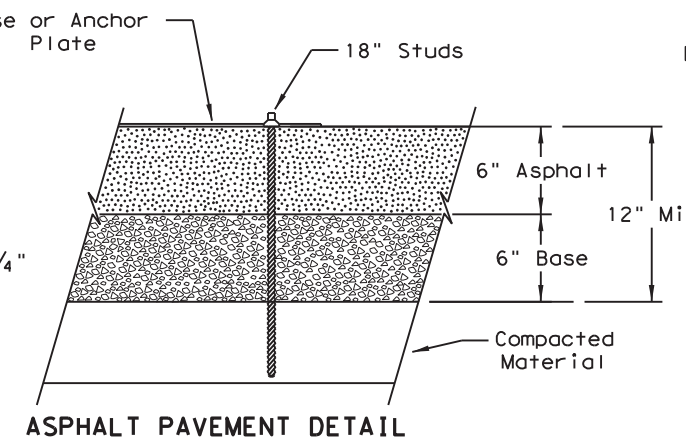


GENERAL NOTES

1. For additional information contact: Trinity Highway Products, LLC. 70 W. Madison St. Suite 2350, Chicago, IL 60602. 1(888)323-6374.
2. The nose of the REACT 350 shall be clad with a plastic wrap with standard delineation adhered to the wrap and shall have a series of side marker reflectors on both sides of the unit. See site plan views for marker and plastic wrap color orientation.
3. All steel components to be hot dipped galvanized except stakes, drive spikes, threaded bolts in backup unit, and wedge fittings on cables.
4. The installation area should be free from curbs, elevated objects, or depressions. If the REACT system is to span expansion joints contact the manufacturer.
5. The REACT system should be approximately parallel with the barrier or $\frac{1}{4}$ of merging barriers. The maximum permissible cross-slope is 8%.
6. REACT 350 II has laminated panels in cylinders 1, 5, & 6.

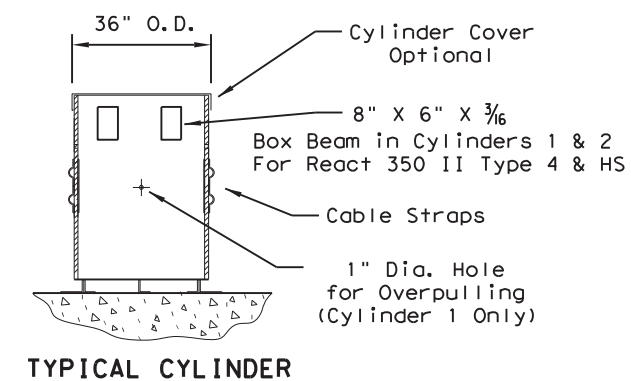
DESIGN DATA TABLE FOR REACT 350 AND REACT 350 II						
TYPE	REACT 350 4-B	REACT 350 4-C	REACT 350 II 6-B	REACT 350 II 6-C	REACT 350 HS-B	REACT 350 HS-C
Test Level	TL-2	TL-2	TL-3	TL-3	70 MPH	70 MPH
OVERALL LENGTH	15'-3"	13'-9"	21'-3"	19'-5"	30'-3"	28'-9"

FOUNDATION AND ANCHORAGE TABLE FOR REACT 350 AND REACT 350 II			
FOUNDATION TYPE		MINIMUM THICKNESS	ANCHORAGE
A	CONCRETE PAD OR ROADWAY	6"	MP-3 WITH 7" STUDS [5.5" EMBEDMENT]
B	ASPHALT OVER CONCRETE PAVEMENT	6" CONCRETE PAVEMENT	ANCHOR LENGTH REQUIRED IS 7" STUD PLUS ASPHALT THICKNESS
C	ASPHALT OVER BASE	6" ACP + 6" BASE	MP-3 WITH 18" STUDS [16.5" EMBEDMENT]
D	ASPHALT ONLY	8"	MP-3 WITH 18" STUDS [16.5" EMBEDMENT]



ASPHALT PAVEMENT DETAIL

CONCRETE PAVEMENT DETAIL



TYPICAL CYLINDER

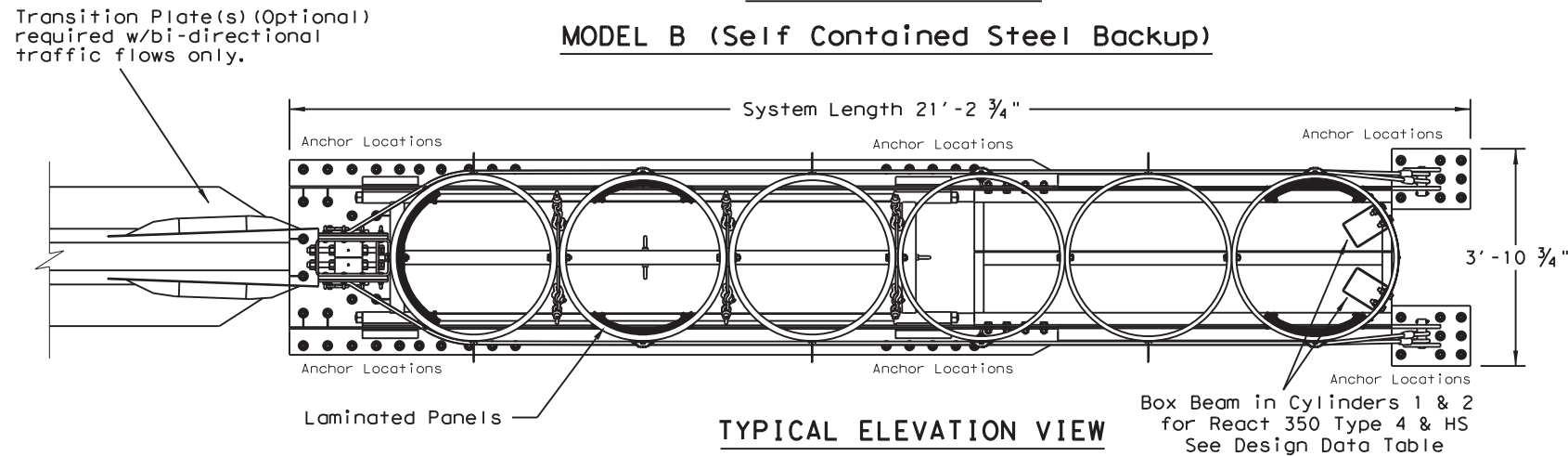
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DATE: FILE:

				Design Division Standard	
REUSABLE ENERGY ABSORBING CRASH TERMINAL (REACT 350 NARROW) (REACT 350 II NARROW) REACT (N) - 13					
FILE: reactn13.dgn	DN: TxDOT	CK: AM	DW: VP	CK:	
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY	
REVISIONS	6372	50	001	VAR.	
	DIST	COUNTY	SHEET NO.		
	SAT	BEXAR	236		

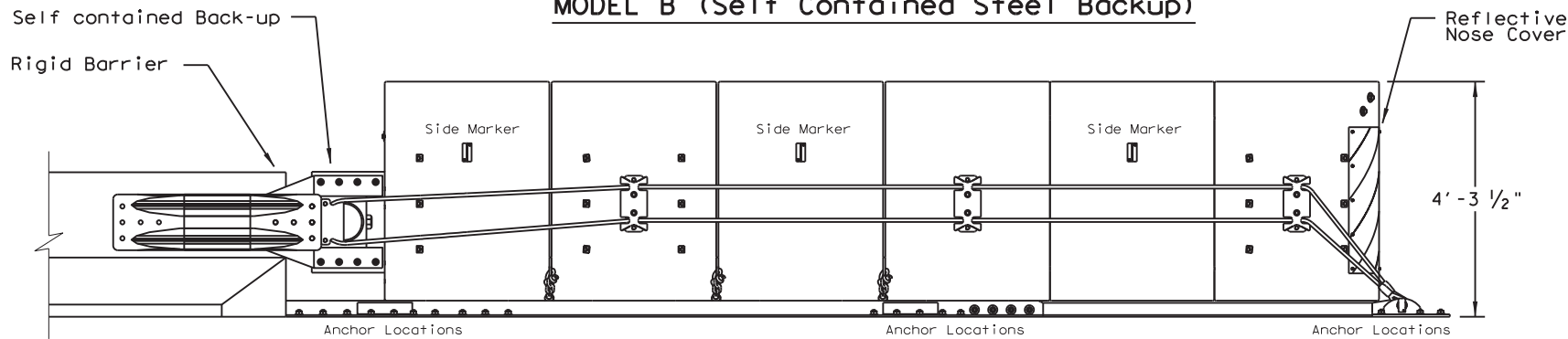
TYPICAL PLAN VIEW

MODEL B (Self Contained Steel Backup)



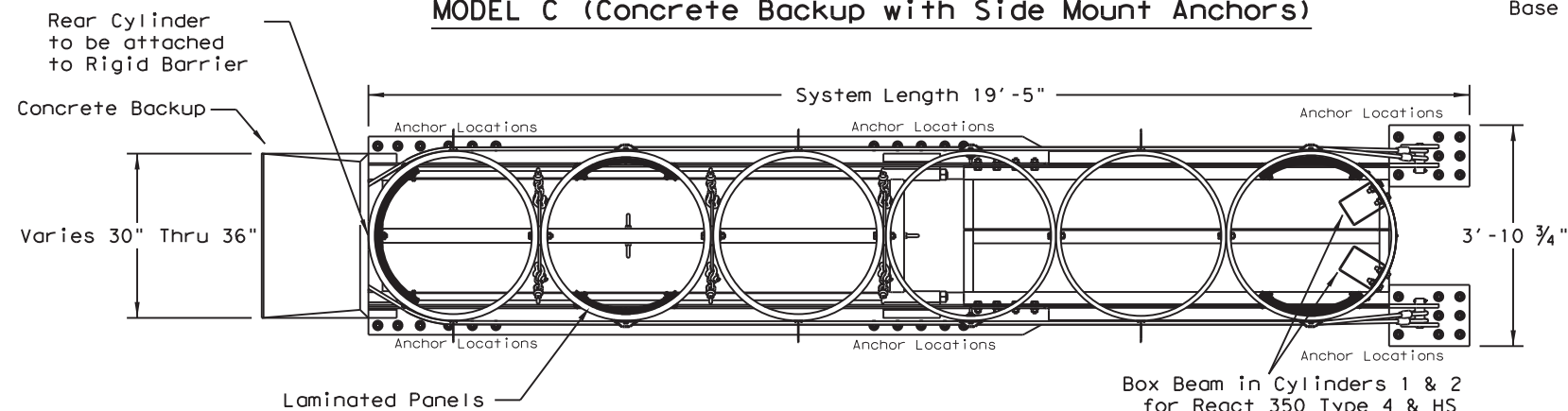
TYPICAL ELEVATION VIEW

MODEL B (Self Contained Steel Backup)



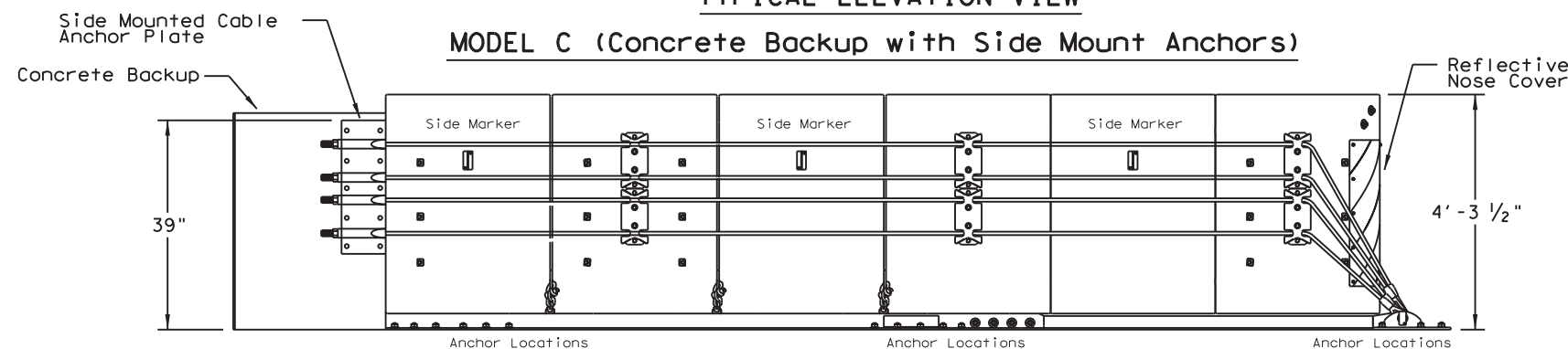
TYPICAL PLAN VIEW

MODEL C (Concrete Backup with Side Mount Anchors)



TYPICAL ELEVATION VIEW

MODEL C (Concrete Backup with Side Mount Anchors)

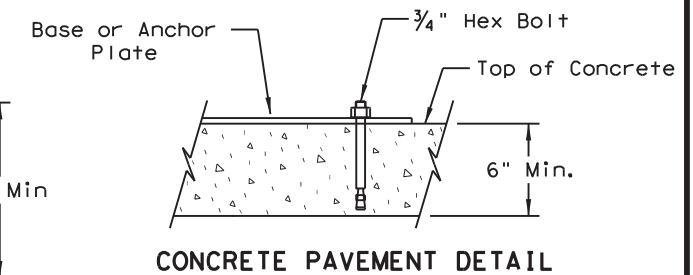
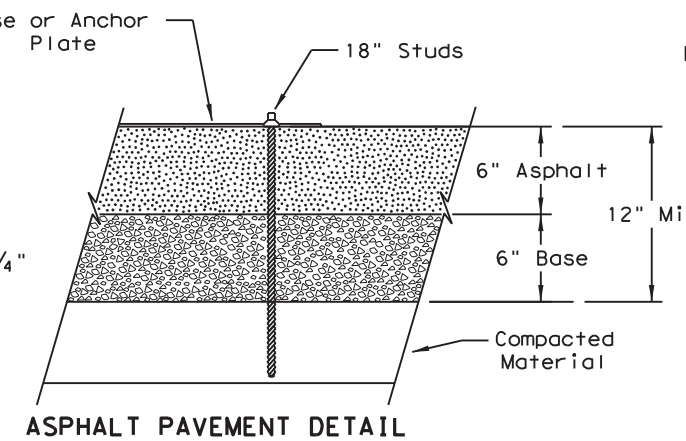


GENERAL NOTES

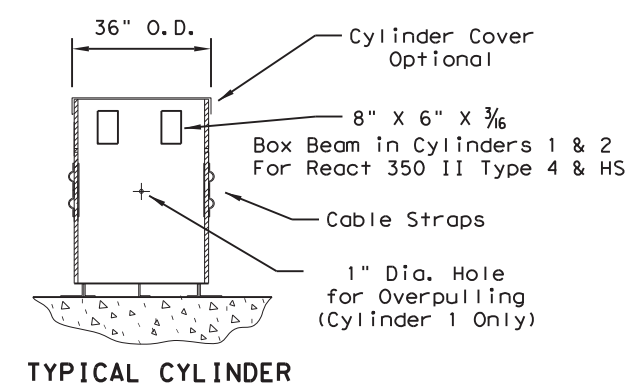
1. For additional information contact: Trinity Highway Products, LLC. 70 W. Madison St. Suite 2350, Chicago, IL 60602. 1(888)323-6374.
2. The nose of the REACT 350 shall be clad with a plastic wrap with standard delineation adhered to the wrap and shall have a series of side marker reflectors on both sides of the unit. See site plan views for marker and plastic wrap color orientation.
3. All steel components to be hot dipped galvanized except stakes, drive spikes, threaded bolts in backup unit, and wedge fittings on cables.
4. The installation area should be free from curbs, elevated objects, or depressions. If the REACT system is to span expansion joints contact the manufacturer.
5. The REACT system should be approximately parallel with the barrier or $\frac{1}{4}$ of merging barriers. The maximum permissible cross-slope is 8%.
6. REACT 350 II has laminated panels in cylinders 1, 5, & 6.

TYPE	REACT 350 4-B	REACT 350 4-C	REACT 350 II 6-B	REACT 350 II 6-C	REACT 350 HS-B	REACT 350 HS-C
DESIGN SPEED	45 MPH	45 MPH	62 MPH	62 MPH	70 MPH	70 MPH
OVERALL LENGTH	15'-3"	13'-9"	21'-3"	19'-5"	30'-3"	28'-9"
OVERALL WEIGHT	2580 lb.	2340 lb.	3340 lb.	3100 lb.	4520 lb.	4280 lb.

FOUNDATION TYPE		MINIMUM THICKNESS	ANCHORAGE
A	CONCRETE PAD OR ROADWAY	6"	MP-3 WITH 7" STUDS [5.5" EMBEDMENT]
B	ASPHALT OVER CONCRETE PAVEMENT	6" CONCRETE PAVEMENT	ANCHOR LENGTH REQUIRED IS 7" STUD PLUS ASPHALT THICKNESS
C	ASPHALT OVER BASE	6" ACP + 6" BASE	MP-3 WITH 18" STUDS [16.5" EMBEDMENT]
D	ASPHALT ONLY	8"	MP-3 WITH 18" STUDS [16.5" EMBEDMENT]



NOTE:
If separate pad is required for REACT, then the pad thickness shall be 6"



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DATE: FILE:

Texas Department of Transportation
Design Division Standard

REUSABLE ENERGY ABSORBING CRASH TERMINAL
(REACT 350 NARROW)
(REACT 350 II NARROW)
REACT (N) - 12

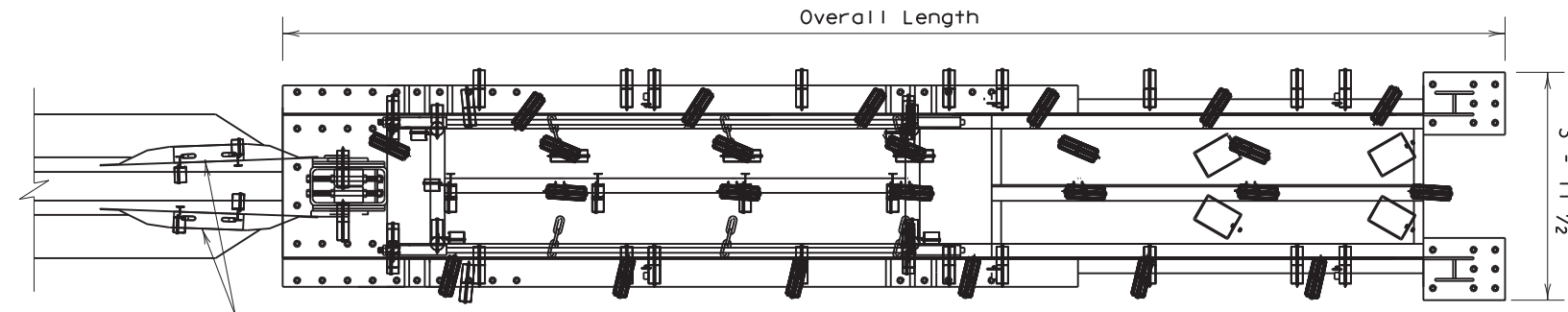
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©TxDOT February 1998	CONT SECT	JOB	HIGHWAY	
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	SAT	BEXAR	237	

GENERAL NOTES

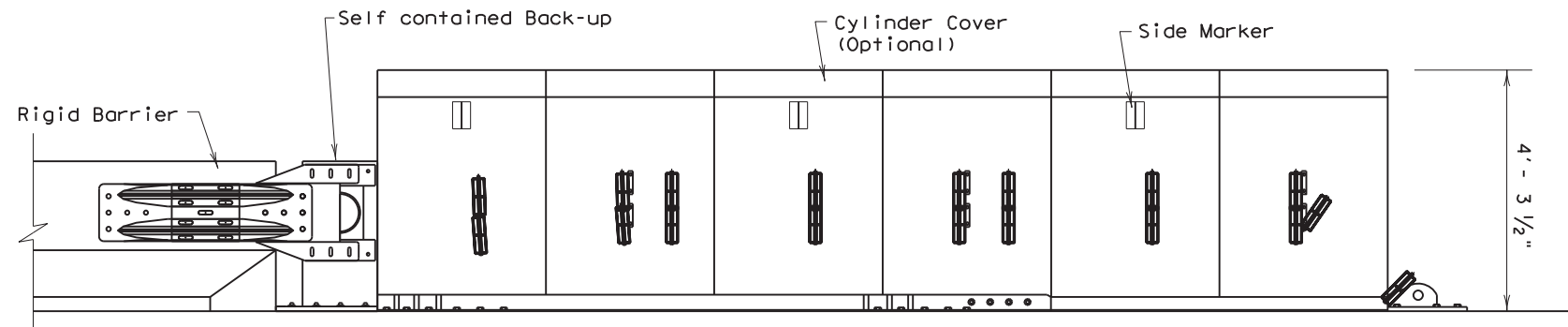
1. The REACT system is manufactured by QUIXOTE TRANSPORTATION SAFETY INC. 35 East Wacker Drive, Suite 1500, Chicago, IL 60601 Phone: 1-888-323-6374. Distributed by CONTRACTORS BARRICADE SERVICE INC. 4110 Long Leaf Lane, Porter, Tx. Phone: (281)360-6098.
2. The nose of the REACT 350 shall be clad with a plastic wrap with standard delineation adhered to the wrap and shall have a series of side marker reflectors on both sides of the unit. See site plan views for marker and plastic wrap color orientation.
3. All steel components to be hot dipped galvanized except stakes, drive spikes, threaded bolts in backup unit, and wedge fittings on cables.
4. The installation area should be free from curbs, elevated objects, or depressions. If the REACT system is to span expansion joints contact the manufacturer.
5. The REACT system should be approximately parallel with the barrier or $\frac{1}{4}$ of merging barriers. The maximum permissible cross-slope is 8%.

DESIGN DATA

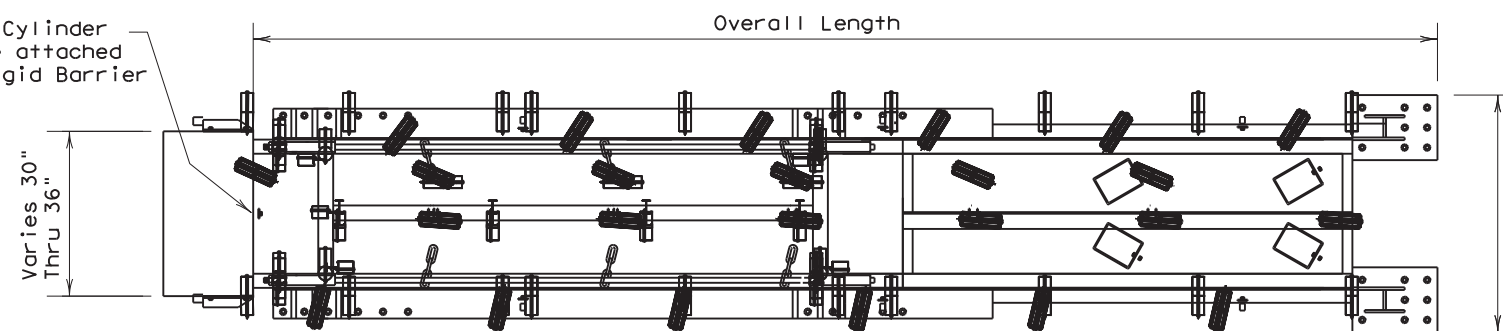
	REACT 350.4-B	REACT 350.4-S	REACT 350.6-B	REACT 350.6-S	REACT 350.9-B	REACT 350.9-S	REACT 350 HS-B	REACT 350 HS-S
DESIGN SPEED	45 MPH	45 MPH	55 MPH	55 MPH	65 MPH	65 MPH	70 MPH	70 MPH
OVERALL LENGTH	15'-3"	13'-9"	21'-3"	19'-9"	30'-3"	28'-9"	30'-3"	28'-9"
OVERALL WEIGHT	2580 lb.	2340 lb.	3340 lb.	3100 lb.	4310 lb.	4070 lb.	4520 lb.	4280 lb.



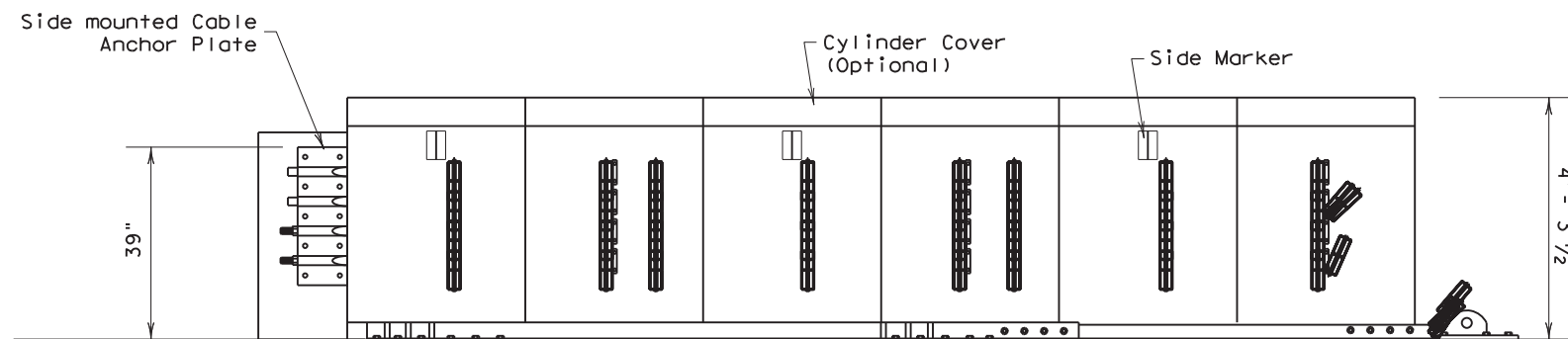
TYPICAL PLAN "B" (Self Contained Backup)
(Cylinder Cover not shown for clarity)



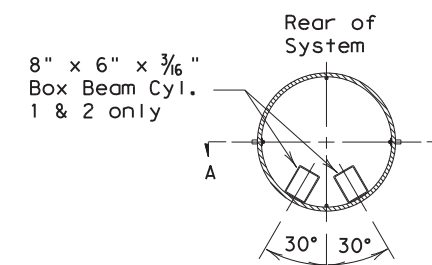
TYPICAL ELEVATION "B"



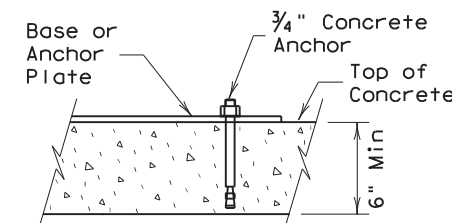
TYPICAL PLAN "S" (Side Mount, Concrete Backup Support)
(Cylinder Cover not shown for clarity)



TYPICAL ELEVATION "S"

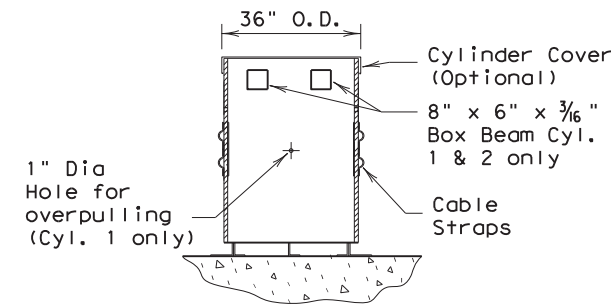


PLAN

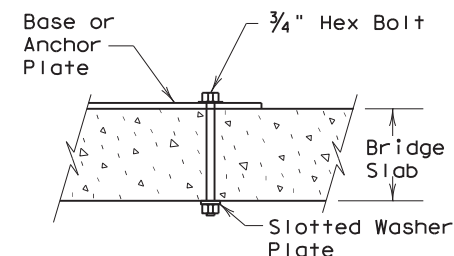


CONCRETE PAVEMENT DETAIL

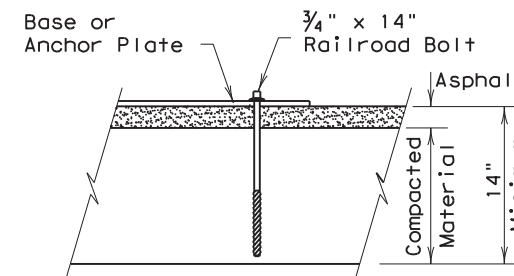
NOTE: If separate pad is required for REACT, then the pad thickness shall be 8"



TYPICAL CYLINDER SECTION A-A



BRIDGE DECK DETAIL



ASPHALT PAVEMENT DETAIL

Min. Asphalt thickness shall be 2"

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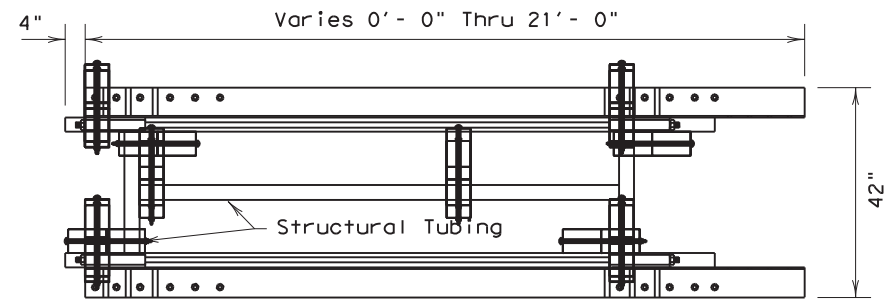
Texas Department of Transportation
Design Division (Roadway)

REUSABLE ENERGY ABSORBING CRASH TERMINAL (NARROW REACT 350)

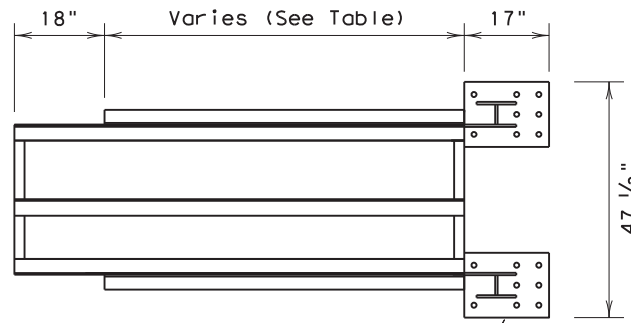
REACT (N) -05

SHEET 1 OF 2

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© TxDOT FEBRUARY 1998	DISTRICT	FEDERAL AID PROJECT		SHEET
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	BEXAR	6372	50	OOI
				VAR.



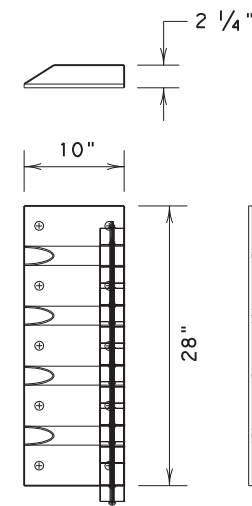
REAR SECTION OF BASE TRACK
(FOR UNITS WITHOUT SELF CONTAINED BACK-UP ONLY) "S"



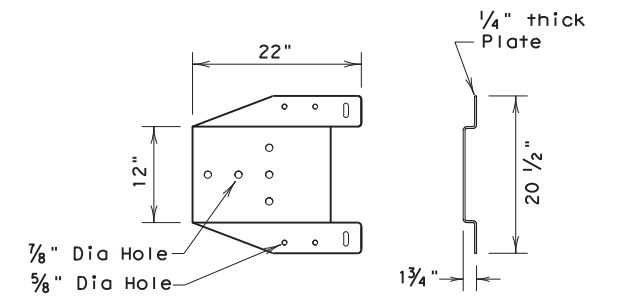
FRONT SECTION OF BASE TRACK

NUMBER OF CYLINDERS	FRONT BASE TRACK LENGTH
4	1'-5"
6	7'-5"
9	16'-5"
11	22'-5"

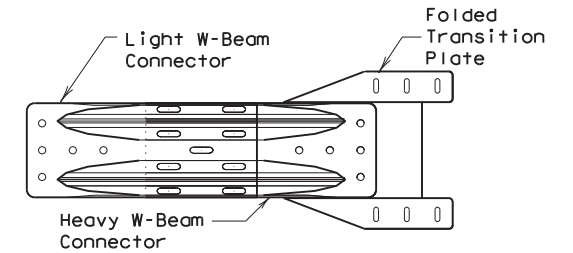
(The Front Section will vary depending on the size of the system)



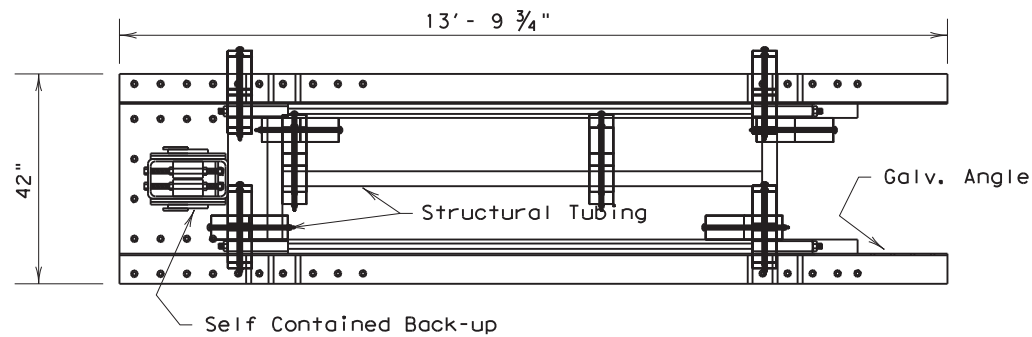
SIDE CABLE ANCHOR PLATE
(FOR UNITS WITHOUT A SELF CONTAINED BACK-UP ONLY)



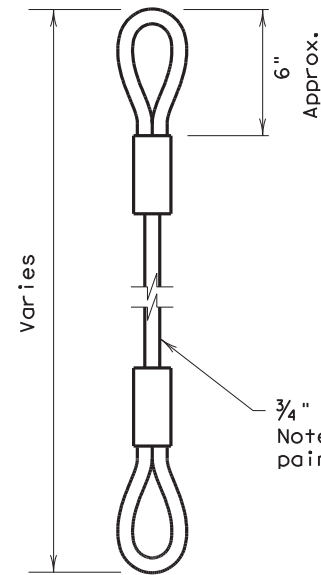
FOLDED TRANSITION PLATE
(For use in transition applications)



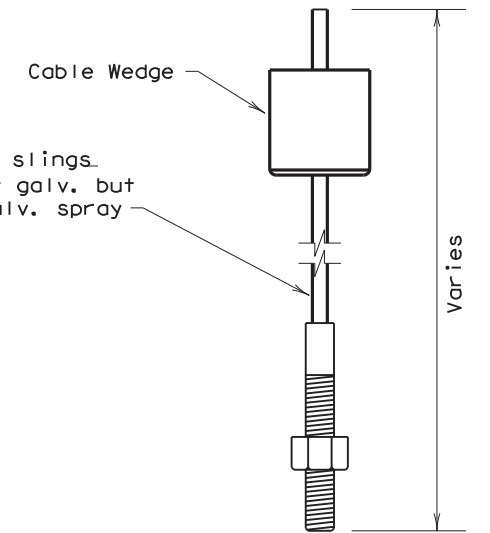
TRANSITION PLATE WITH W-BEAM CONNECTOR
(Connector overlap will vary per traffic direction - Reverse traffic shown)



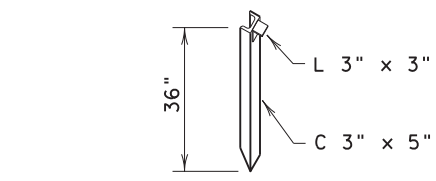
REAR SECTION OF BASE TRACK
(FOR UNITS WITH SELF CONTAINED BACK-UP ONLY) "B"



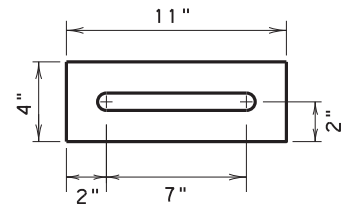
CABLE DETAIL
(FOR UNITS WITH SELF CONTAINED BACK-UP ONLY)



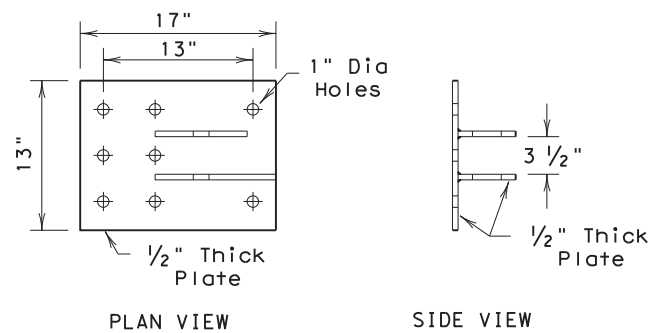
CABLE DETAIL
(FOR UNITS WITH SELF CONTAINED BACK-UP ONLY)



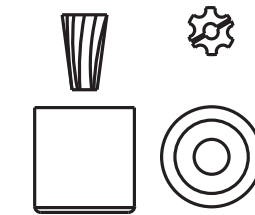
CHANNEL STAKE
(FOR USE W/ ASPHALT PAVEMENT)



FRONT ANCHOR PIN DETAIL

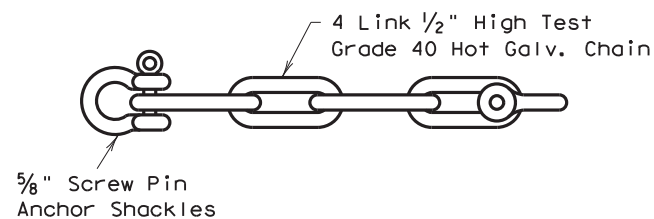
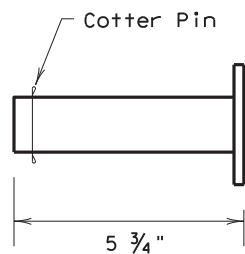


FRONT ANCHOR PLATE DETAIL

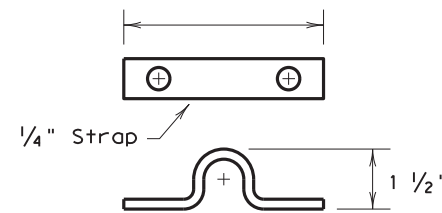


CABLE WEDGE

SLOTTED WASHER PLATE
(FOR BRIDGE DECK APPLICATIONS ONLY)



CHAIN DETAIL



CABLE STRAP

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LEVELS DISPLAYED
1

Texas Department of Transportation
Design Division (Roadway)

REUSABLE ENERGY ABSORBING CRASH TERMINAL
(NARROW REACT 350)
REACT (N) -05

SHEET 2 OF 2

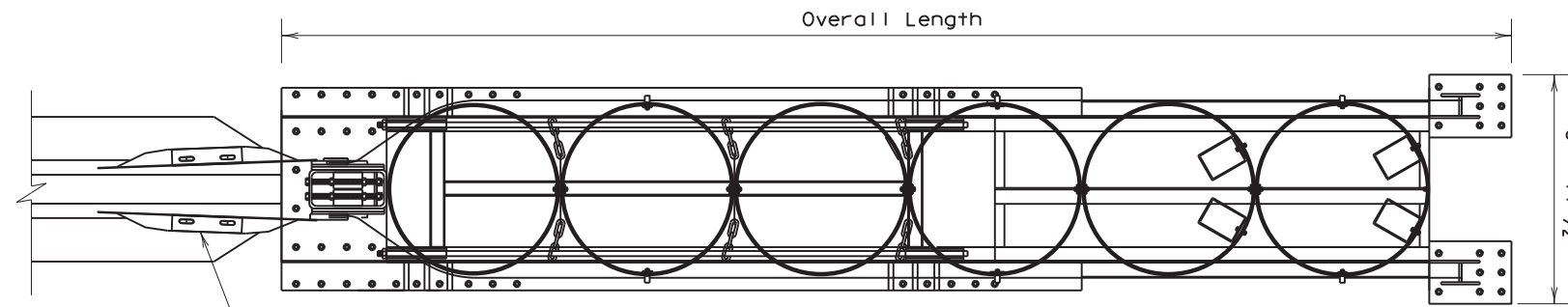
FILE: reactn05.dgn	DN:	CK:	DW: BGD	CK: AM
© TxDOT FEBRUARY 1998	DISTRICT	FEDERAL AID PROJECT		SHEET
REVISIONS	SAT			239
	COUNTY	CONTROL	SECT	JOB
	BEXAR	6372	50	OOI
				VAR.

GENERAL NOTES

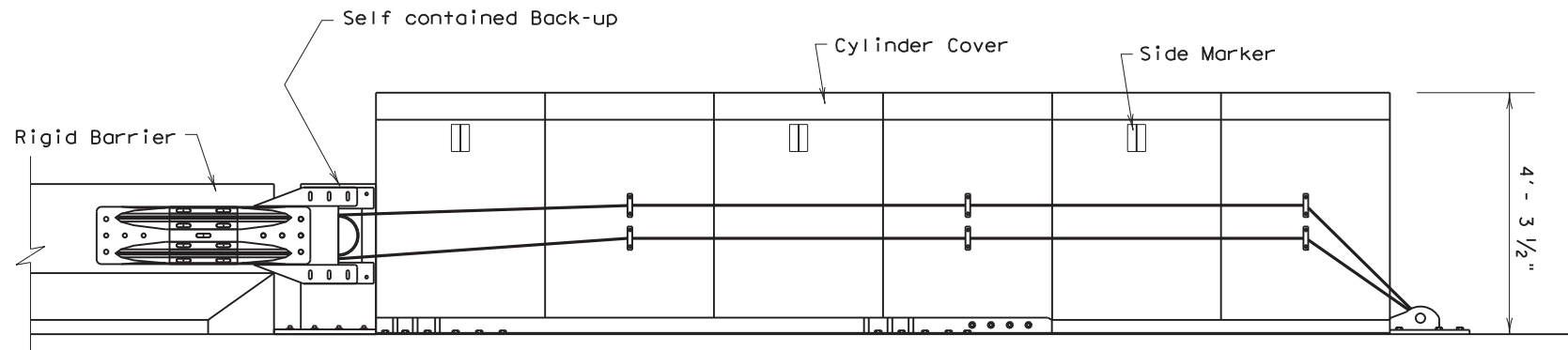
1. The nose of the REACT 350 shall be clad with a plastic wrap with standard delineation adhered to the wrap and shall have a series of side marker reflectors on both sides of the unit. See site plan views for marker and plastic wrap color orientation.
2. All steel components to be hot dipped galvanized except stakes, drive spikes, threaded bolts in backup unit, and wedge fittings on cables.
3. Contact QUIXOTE TRANSPORTATION SAFETY INC. (1-888-323-6374) if the REACT 350 is to span expansion joints.
4. The installation area should be free from curbs, elevated objects, or depressions.

DESIGN DATA

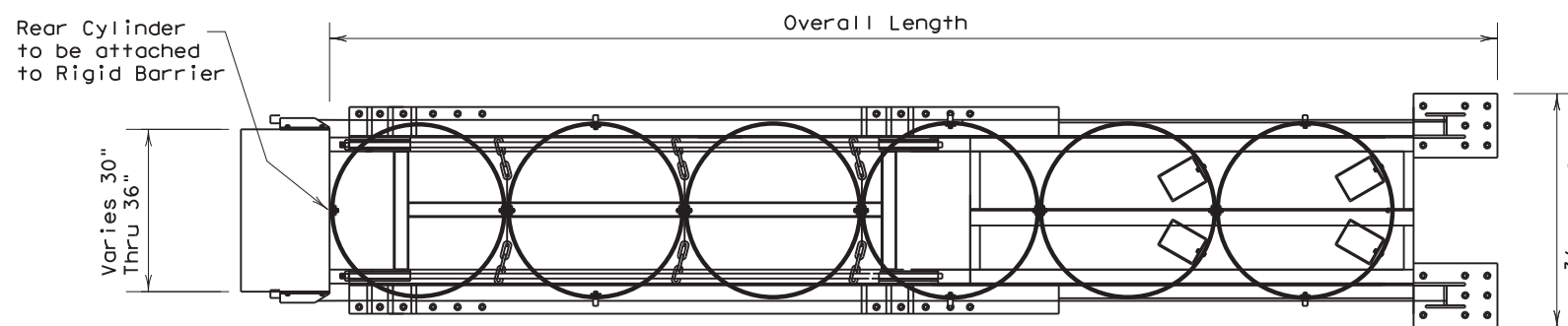
	REACT 350.4-B	REACT 350.4-S	REACT 350.6-B	REACT 350.6-S	REACT 350.9-B	REACT 350.9-S	REACT 350 HS-B	REACT 350 HS-S
DESIGN SPEED	45 MPH	45 MPH	55 MPH	55 MPH	65 MPH	65 MPH	70 MPH	70 MPH
OVERALL LENGTH	15'-3"	13'-9"	21'-3"	19'-9"	30'-3"	28'-9"	30'-3"	28'-9"
OVERALL WEIGHT	2580 lb.	2340 lb.	3340 lb.	3100 lb.	4310 lb.	4070 lb.	4520 lb.	4280 lb.



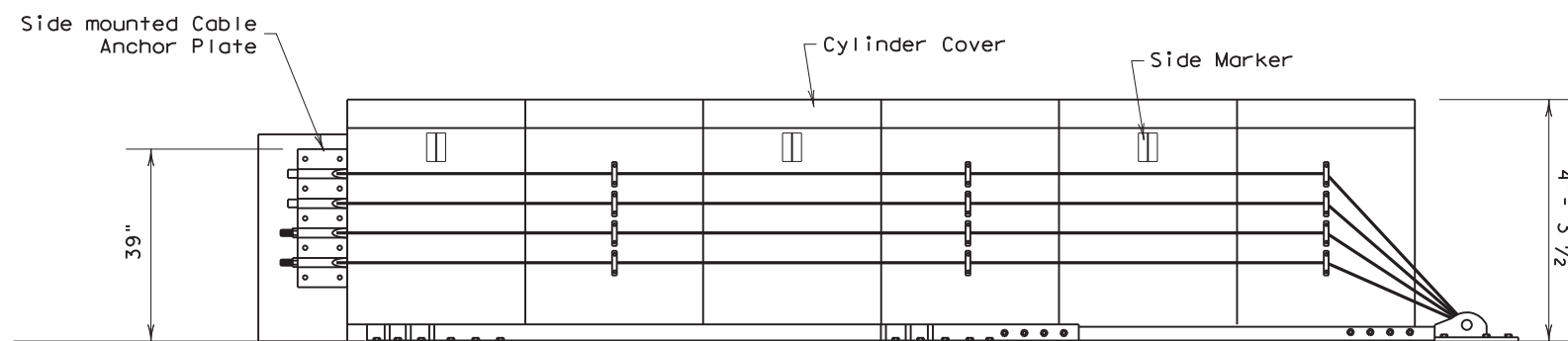
TYPICAL PLAN "B" (Self Contained Backup)
(Cylinder Cover not shown for clarity)



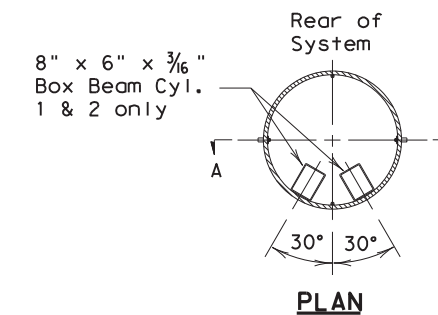
TYPICAL ELEVATION "B"



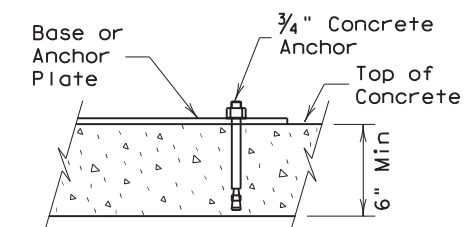
TYPICAL PLAN "S" (Side Mount, Concrete Backup Support)
(Cylinder Cover not shown for clarity)



TYPICAL ELEVATION "S"

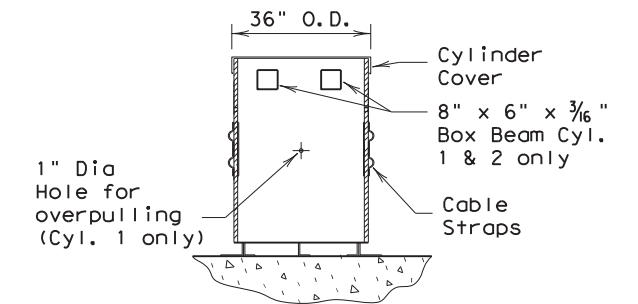


PLAN

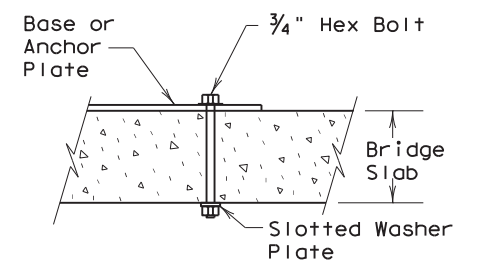


CONCRETE PAVEMENT DETAIL

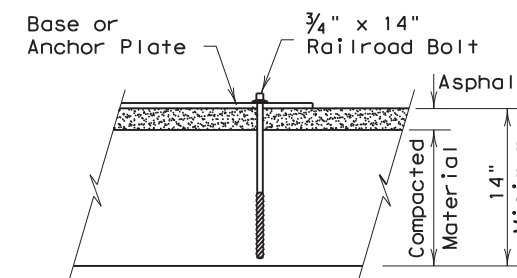
NOTE: If separate pad is required for REACT, then the pad thickness shall be 8"



TYPICAL CYLINDER SECTION A-A



BRIDGE DECK DETAIL



ASPHALT PAVEMENT DETAIL

Min. Asphalt thickness shall be 2"

Texas Department of Transportation
Design Division (Roadway)

**REUSABLE ENERGY ABSORBING
CRASH TERMINAL
(NARROW REACT 350)**

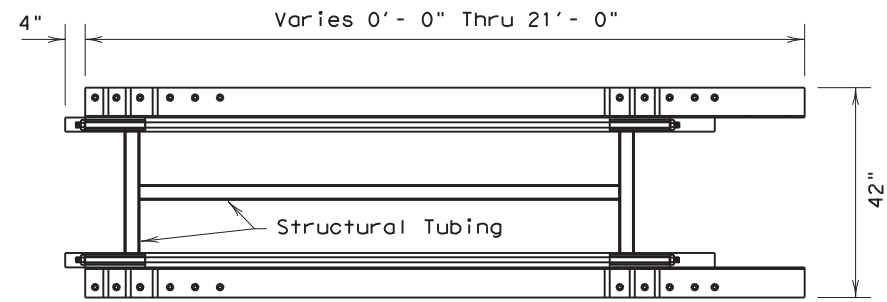
REACT (N) -03

SHEET 1 OF 2

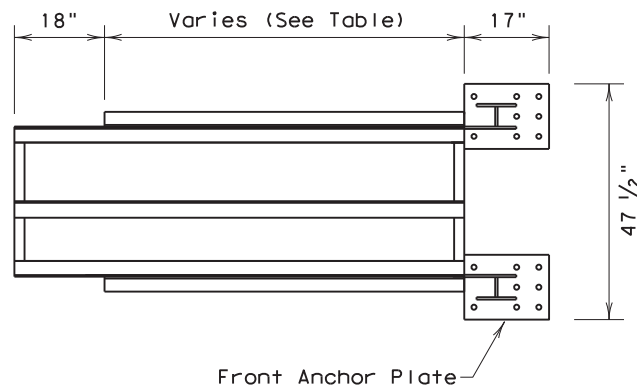
FILE: reactn03.dgn	DN:	CK:	DW: BGD	CK: AM
© TxDOT FEBRUARY 1998	DIST	FED REG	RMC PROJECT	SHEET
REVISIONS	SAT	6		240
	COUNTY	CONTROL	SECT	JOB
	BEXAR	6372	50	001
				VAR.

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LEVELS DISPLAYED	
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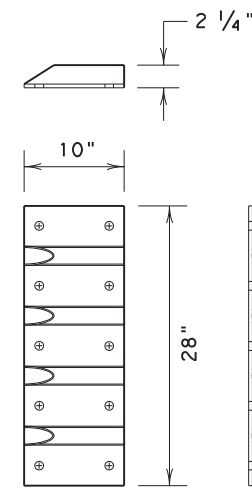
REAR SECTION OF BASE TRACK
(FOR UNITS WITHOUT SELF CONTAINED BACK-UP ONLY) "S"



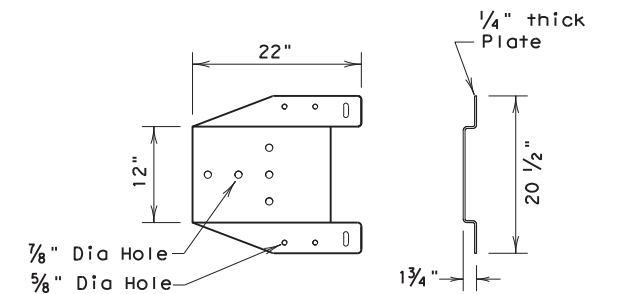
FRONT SECTION OF BASE TRACK

NUMBER OF CYLINDERS	FRONT BASE TRACK LENGTH
4	1'-5"
6	7'-5"
9	16'-5"
11	22'-5"

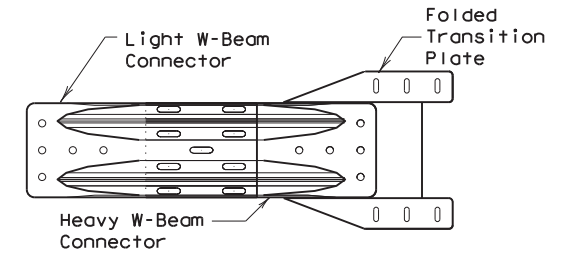
(The Front Section will vary depending on the size of the system)



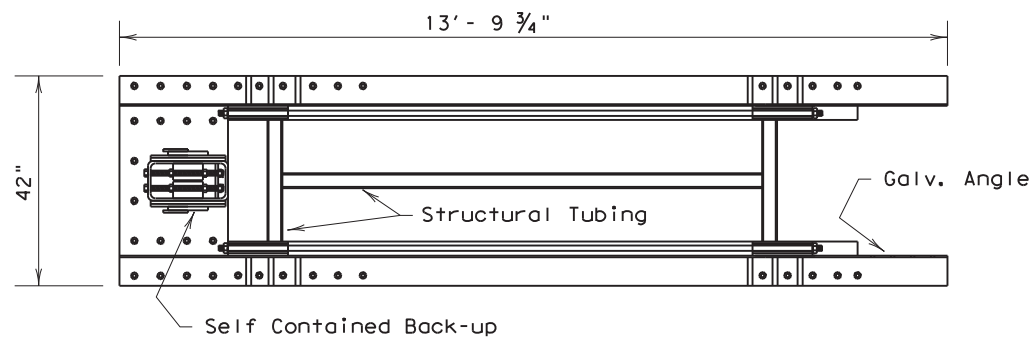
SIDE CABLE ANCHOR PLATE
(FOR UNITS WITHOUT A SELF CONTAINED BACK-UP ONLY)



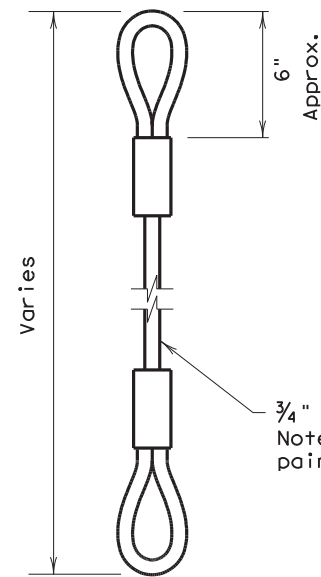
FOLDED TRANSITION PLATE
(For use in transition applications)



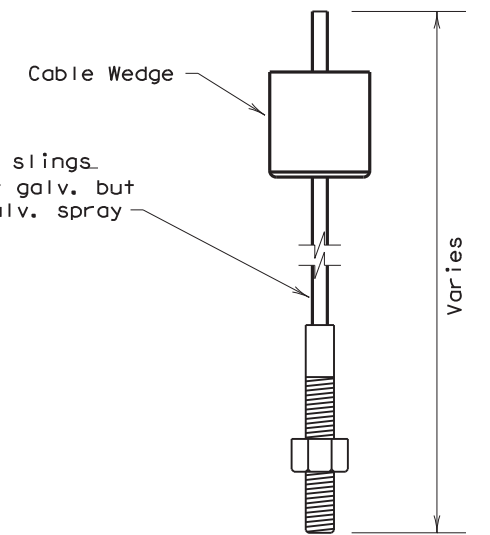
TRANSITION PLATE WITH W-BEAM CONNECTOR
(Connector overlap will vary per traffic direction - Reverse traffic shown)



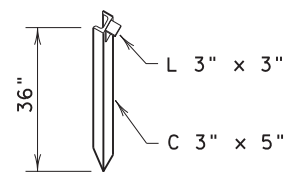
REAR SECTION OF BASE TRACK
(FOR UNITS WITH SELF CONTAINED BACK-UP ONLY) "B"



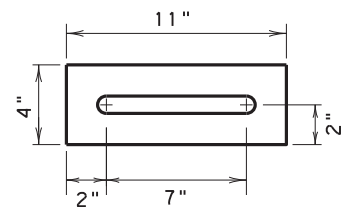
CABLE DETAIL
(FOR UNITS WITH SELF CONTAINED BACK-UP ONLY)



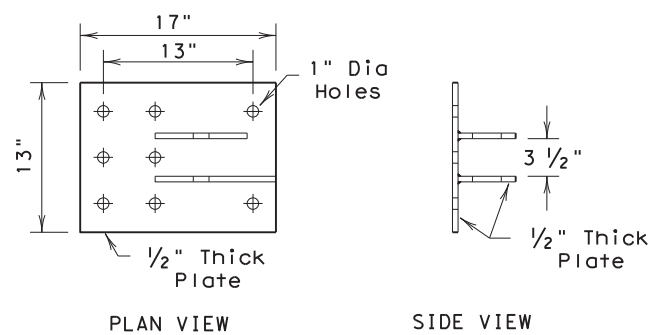
CABLE DETAIL
(FOR UNITS WITH SELF CONTAINED BACK-UP ONLY)



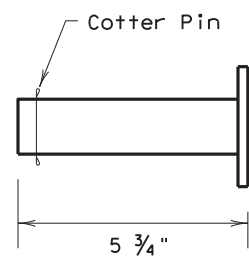
CHANNEL STAKE
(FOR USE W/ ASPHALT PAVEMENT)



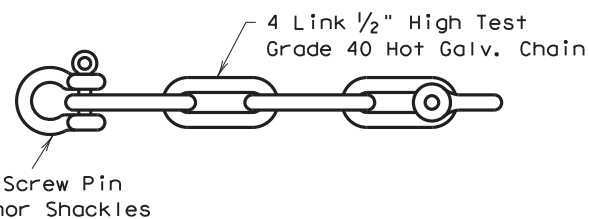
FRONT ANCHOR PIN DETAIL



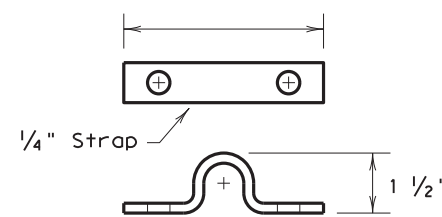
FRONT ANCHOR PLATE DETAIL



SLOTTED WASHER PLATE
(FOR BRIDGE DECK APPLICATIONS ONLY)



CHAIN DETAIL



CABLE STRAP



CABLE WEDGE

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LEVELS DISPLAYED
1

Texas Department of Transportation
Design Division (Roadway)

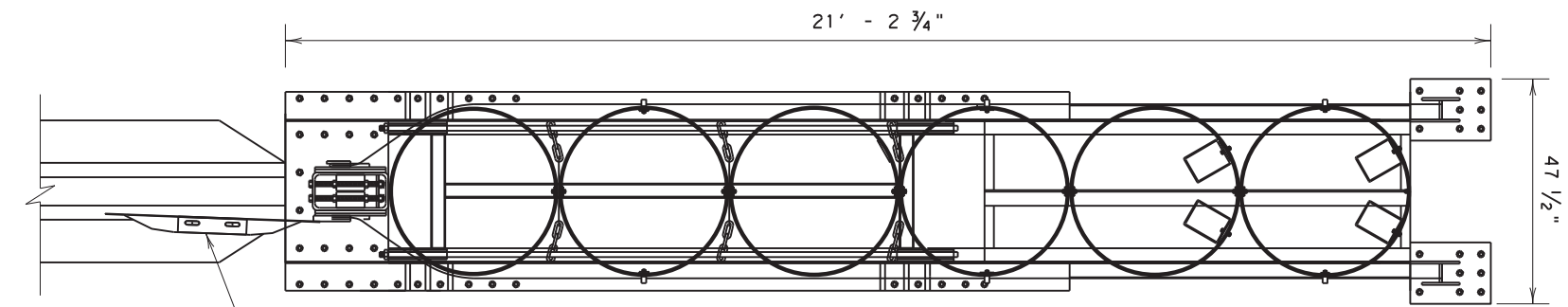
REUSABLE ENERGY ABSORBING CRASH TERMINAL (NARROW REACT 350)
REACT (N) -03

SHEET 2 OF 2

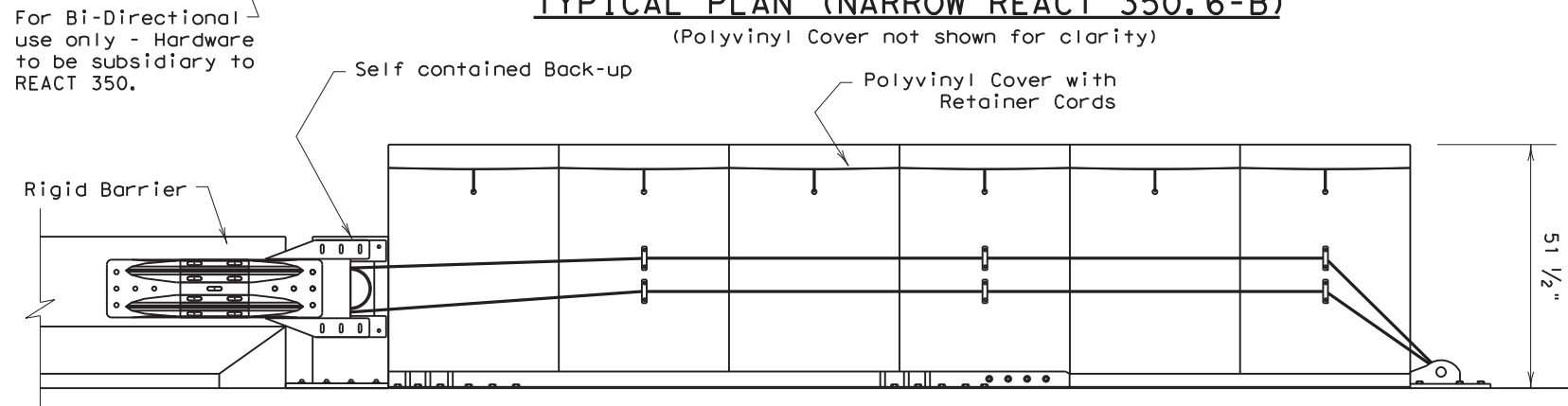
FILE: reactn03.dgn	DN:	CK:	DW: BGD	CK: AM
© TxDOT FEBRUARY 1998	DIST	FED REG	RMC PROJECT	SHEET
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	BEXAR	6372	50	001
				HIGHWAY
				VAR.

GENERAL NOTES

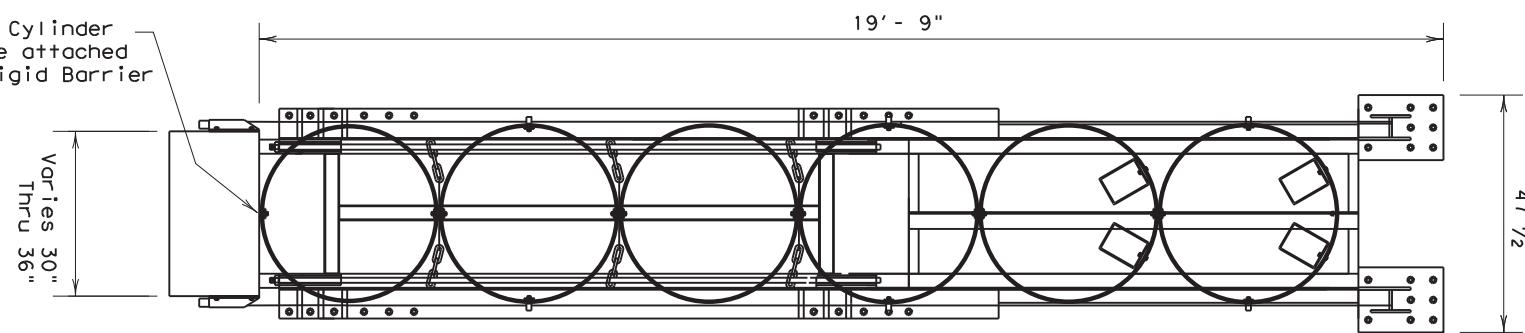
1. All REACT 350 units have self containing back-up units unless otherwise noted.
2. The nose of the REACT 350 shall be clad with a plastic wrap with standard (TEXAS MUTCD) delineation adhered to the wrap and shall have a series of reflectors on both sides of the unit.
3. All steel components to be hot dipped galvanized except stakes, drive spikes, threaded bolts in backup unit, and swedge fittings on cables.
4. Contact ENERGY ABSORPTION SYSTEMS (1-888-323-6374) if REACT 350 is to span expansion joints.
5. The REACT 350 HS-B and 350 HS-S meet NCHRP 350 Test Level 3 and have added capacity for head-on impacts at speeds of up to 70 mph.



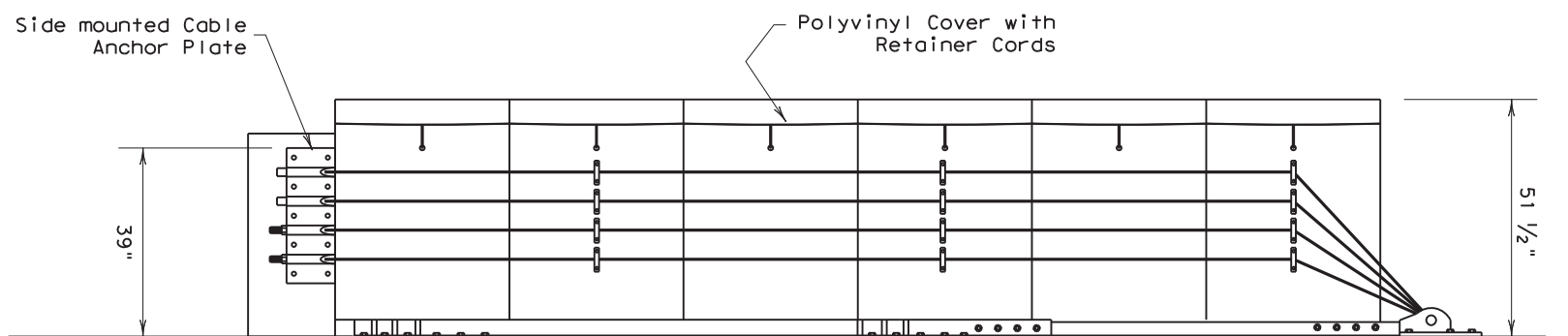
TYPICAL PLAN (NARROW REACT 350.6-B)
(Polyvinyl Cover not shown for clarity)



TYPICAL ELEVATION (NARROW REACT 350.6-B)

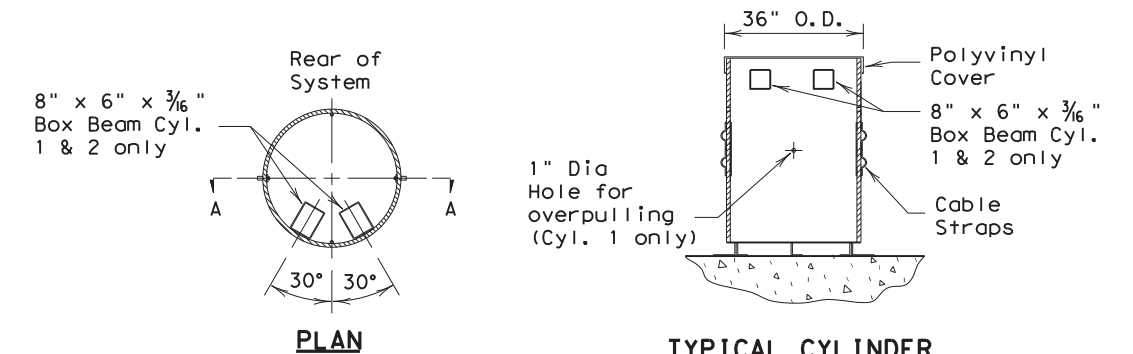


TYPICAL PLAN (NARROW REACT 350.6-S)
(Polyvinyl Cover not shown for clarity)



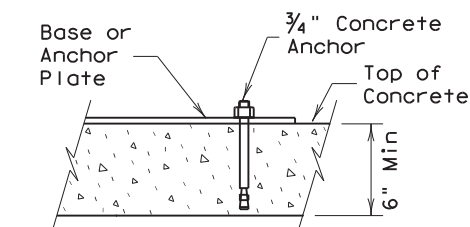
TYPICAL ELEVATION (NARROW REACT 350.6-S)

DESIGN DATA							SEE GEN. NOTE 5	
	REACT 350.4-B	REACT 350.4-S	REACT 350.6-B	REACT 350.6-S	REACT 350.9-B	REACT 350.9-S	REACT 350 HS-B	REACT 350 HS-S
DESIGN SPEED	45 MPH	45 MPH	55 MPH	55 MPH	65 MPH	65 MPH	70 MPH	70 MPH
OVERALL LENGTH	15'-3"	13'-9"	21'-3"	19'-9"	30'-3"	28'-9"	30'-3"	28'-9"
UNIT HEIGHT	4'-3 1/2"	4'-3 1/2"	4'-3 1/2"	4'-3 1/2"	4'-3 1/2"	4'-3 1/2"	4'-3 1/2"	4'-3 1/2"
OVERALL WEIGHT	2580 lb.	2340 lb.	3340 lb.	3100 lb.	4310 lb.	4070 lb.	4520 lb.	4280 lb.



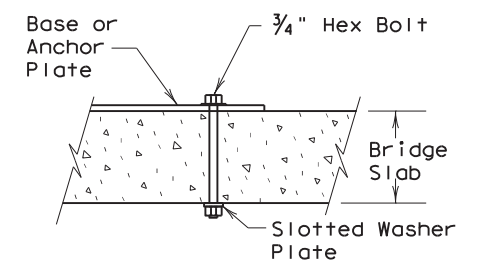
PLAN

TYPICAL CYLINDER SECTION A-A

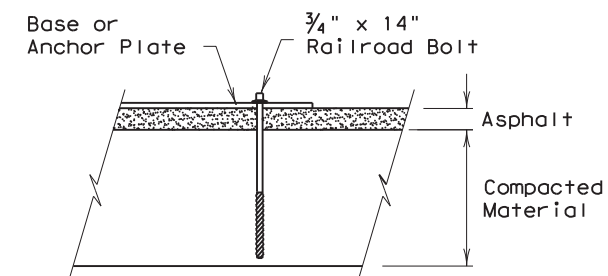


CONCRETE PAVEMENT DETAIL

NOTE: If separate slab is required for REACT, then the slab thickness shall be 8"



BRIDGE DECK DETAIL



ASPHALT PAVEMENT DETAIL

Min. Asphalt thickness shall be 2"

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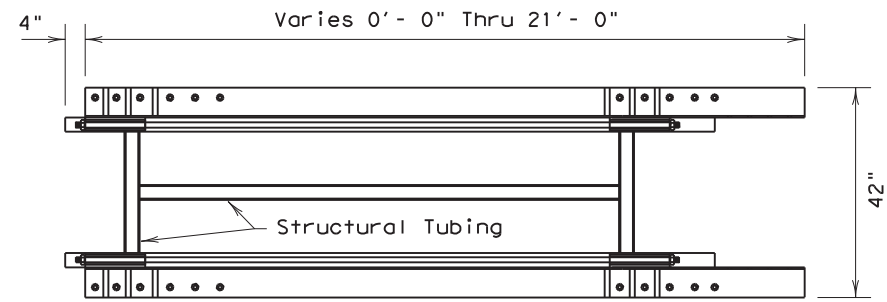
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Texas Department of Transportation
 Design Division (Roadway)

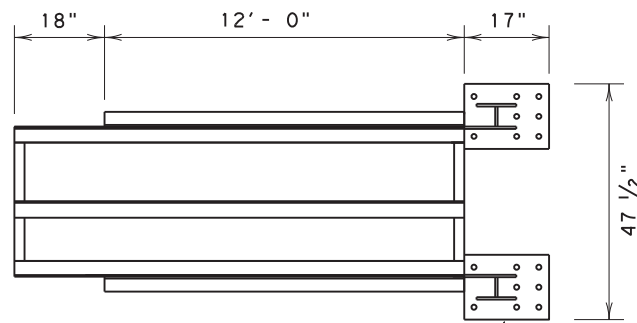
REUSABLE ENERGY ABSORBING CRASH TERMINAL (NARROW REACT 350)
REACT (N) - 00

SHEET 1 OF 2

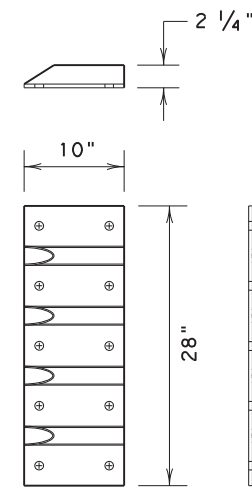
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© TxDOT FEBRUARY 1998	DIST	FED REG	RMC PROJECT	SHEET
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	BEXAR	6372	50	001
				VAR.



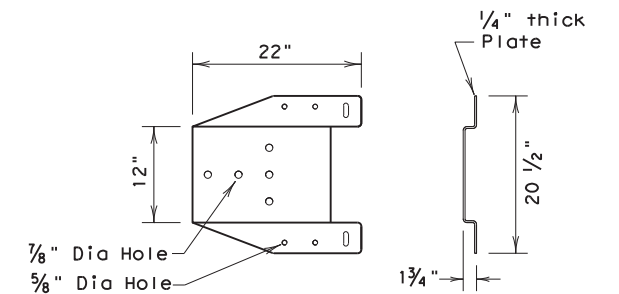
REAR SECTION OF BASE TRACK
(FOR UNITS WITH OUT SELF CONTAINED BACK-UP ONLY)



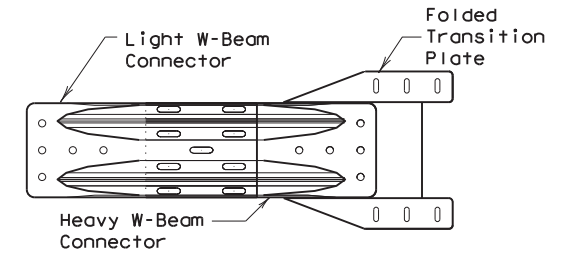
FRONT SECTION OF BASE TRACK



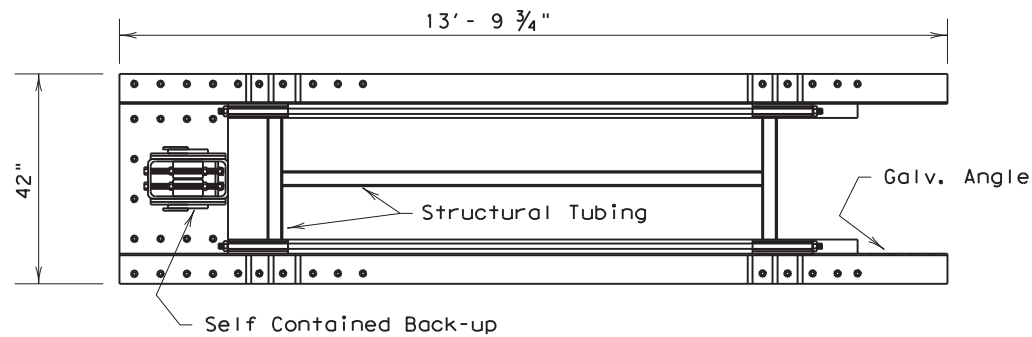
SIDE CABLE ANCHOR PLATE
(FOR UNITS WITHOUT A SELF CONTAINED BACK-UP ONLY)



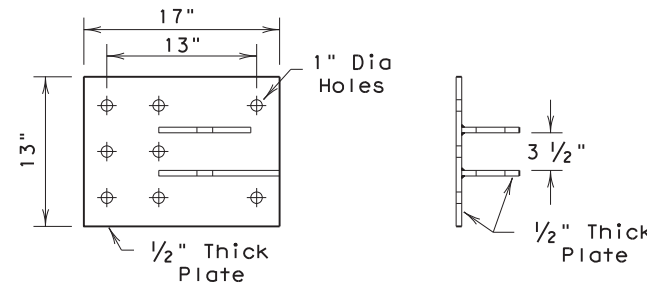
FOLDED TRANSITION PLATE
(For use in transition applications)



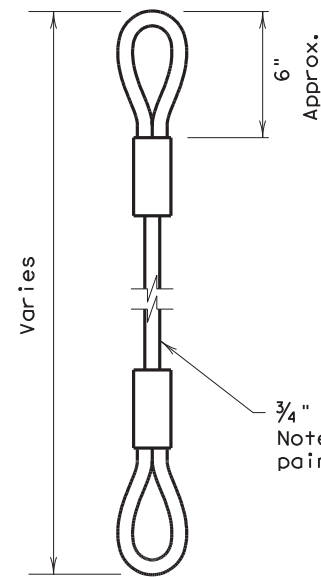
TRANSITION PLATE WITH W-BEAM CONNECTOR
(For two-way traffic operations; one side only)



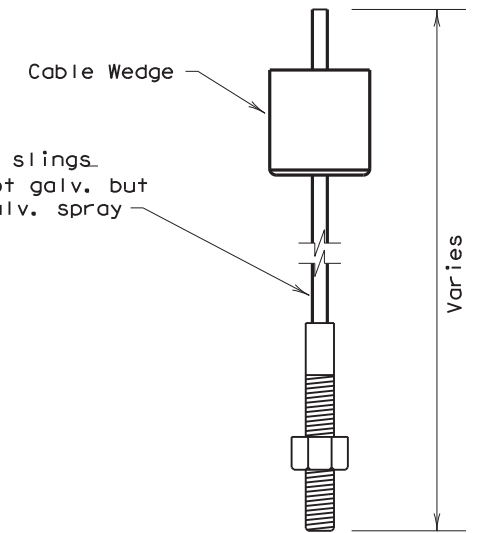
REAR SECTION OF BASE TRACK
(FOR UNITS WITH SELF CONTAINED BACK-UP ONLY)



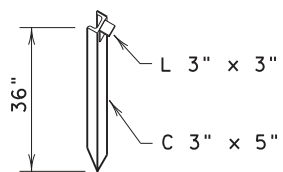
FRONT ANCHOR PLATE DETAIL



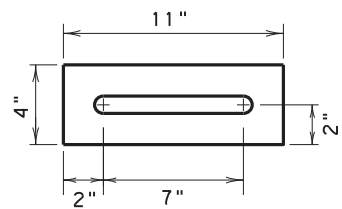
CABLE DETAIL
(FOR UNITS WITH SELF CONTAINED BACK-UP ONLY)



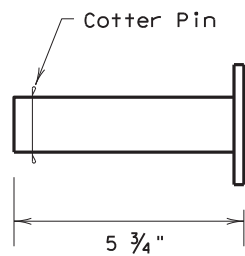
CABLE DETAIL
(FOR UNITS WITH SELF CONTAINED BACK-UP ONLY)



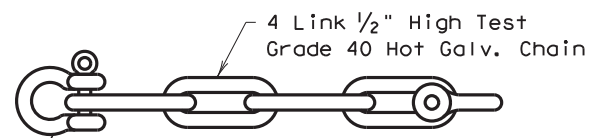
CHANNEL STAKE
(FOR USE W/ASPHALT PAVEMENT)



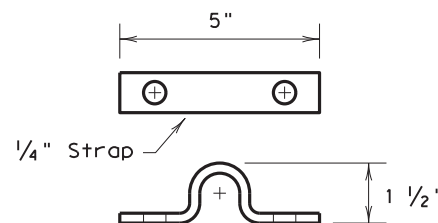
SLOTTED WASHER PLATE
(FOR BRIDGE DECK APPLICATIONS ONLY)



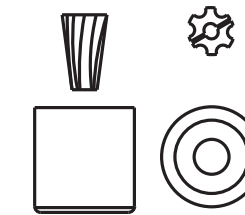
FRONT ANCHOR PIN DETAIL



CHAIN DETAIL



CABLE STRAP



CABLE WEDGE

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LEVELS DISPLAYED
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Texas Department of Transportation
Design Division (Roadway)

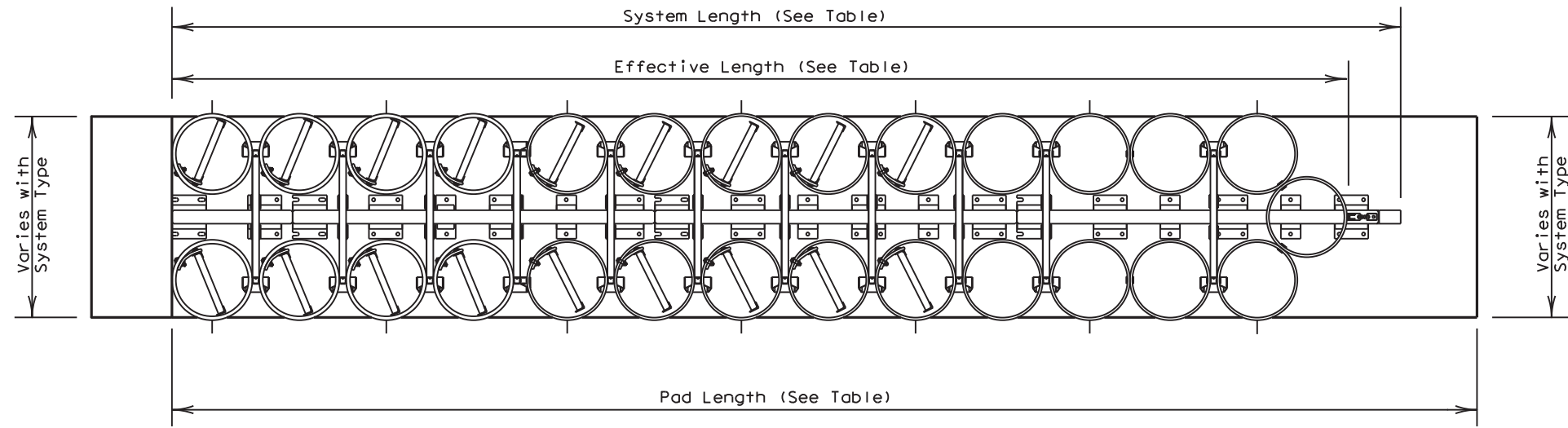
REUSABLE ENERGY ABSORBING CRASH TERMINAL (NARROW REACT 350)
REACT (N) - 00

SHEET 2 OF 2

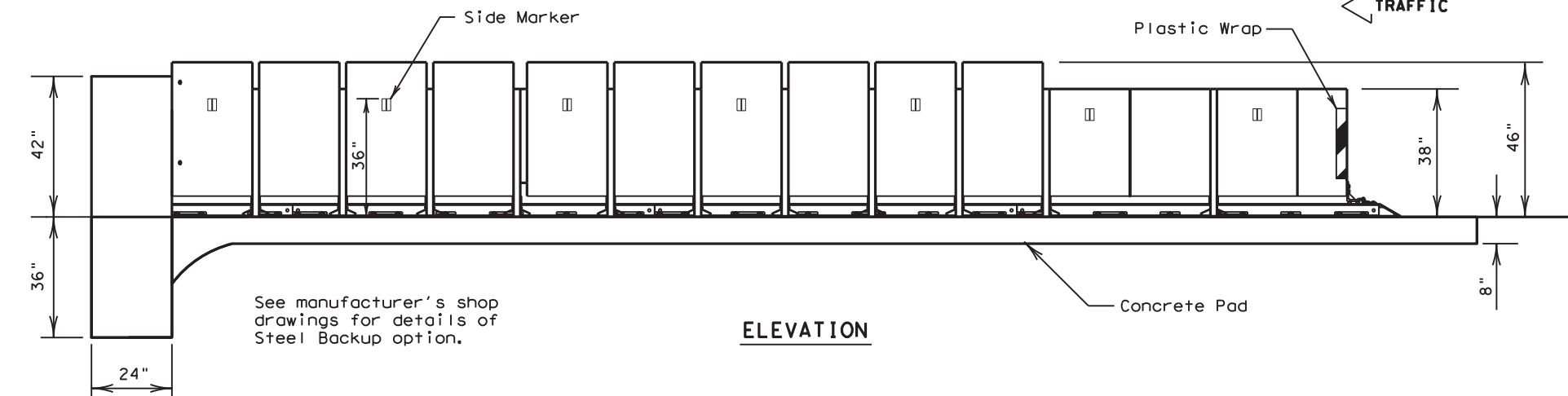
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© TxDOT FEBRUARY 1998	DIST	FED REG	RMC PROJECT	SHEET
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	BEXAR	6372	50	001
				HIGHWAY
				VAR.

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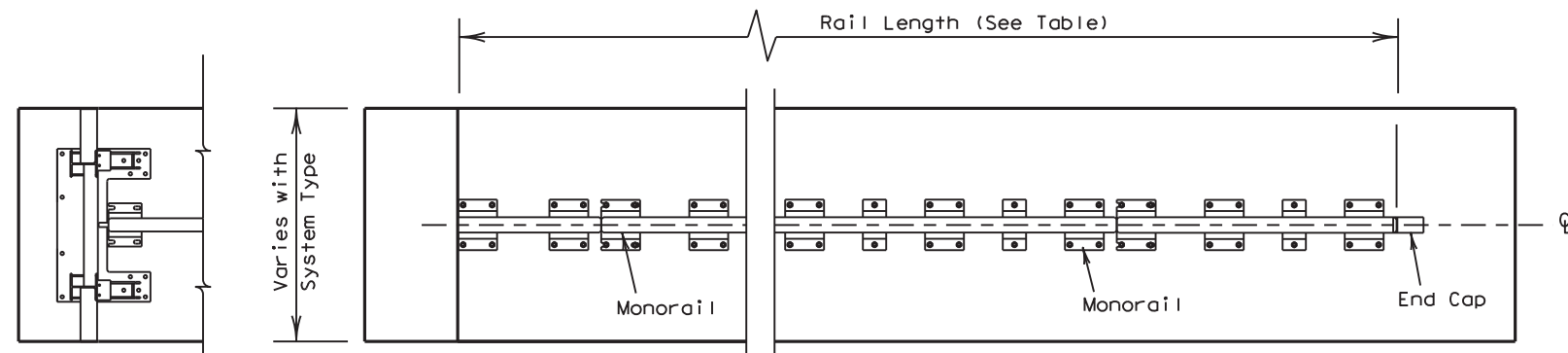
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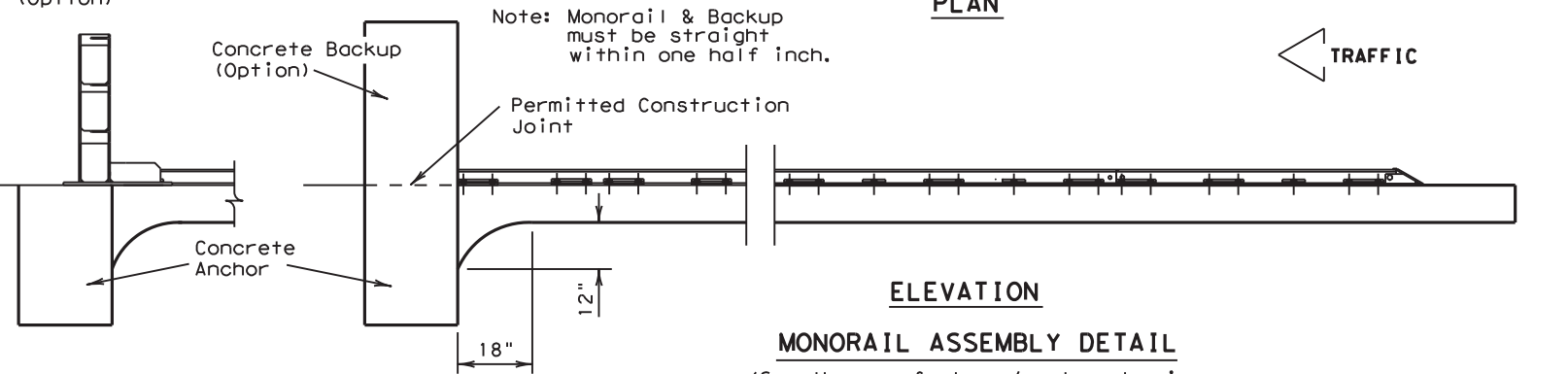
PLAN



ELEVATION



PLAN



ELEVATION

MONORAIL ASSEMBLY DETAIL

(See the manufacturer's shop drawings for monorail hardware installation.)

GENERAL NOTES

1. The nose of the REACT 350 shall be clad with a plastic wrap with standard delineation adhered to the wrap and shall have a series of side marker reflectors on both sides of the unit. See site plan views for marker and plastic wrap color orientation.
2. For additional information contact: Energy Absorption Systems Inc. 35 E. Wacker Dr. Suite 1100 Chicago, IL. 60601. 1(888)323-6374.
3. For bi-directional traffic, appropriate transition details will be as shown on the manufacturer's shop drawings.
4. Details of components for the REACT(W) and backups and reinforcing details will be shown on the manufacturer's shop drawings furnished to the Engineer.
5. If the cross-slope varies more than 2% over the length of the system, the concrete pad will require leveling. Maximum permissible cross-slope is 8%.
6. The installation area should be free from curbs, elevated objects, or depressions.
7. The REACT(W) system should be approximately parallel with the barrier or $\frac{1}{2}$ of merging barriers.
8. All steel components to be hot dipped galvanized except stakes, drive spikes, threaded bolts in backup unit, and wedge fittings on cables.

Wide REACT Systems

System Type	Backup Width	System Length	Effective Length	Pad Length	Rail Length
W60	60"	30'-10"	29'-3"	32'-6"	30'-3 1/4"
W96	96"	34'-9"	32'-10"	35'-6"	33'-3 3/4"
W120	120"	33'-10"	32'-2"	35'-6"	33'-3 3/4"

(See the manufacturer's shop drawings for additional details.)

ANCHOR SYSTEM TYPE

MP-3[®] polyester anchoring system with 7.5" studs, 5.5" embedment

FOUNDATION TYPES

Minimum 8" Reinforced concrete pad (Required reinforcing steel for concrete pad shall be shown on the manufacturer's shop drawings.)

Minimum 8" Non-reinforced concrete roadway (Measuring at least 12' wide by 50' long)

Minimum 7" Concrete deck structure, or

Minimum 6" Reinforced concrete roadway

Texas Department of Transportation
 Design Division Standard

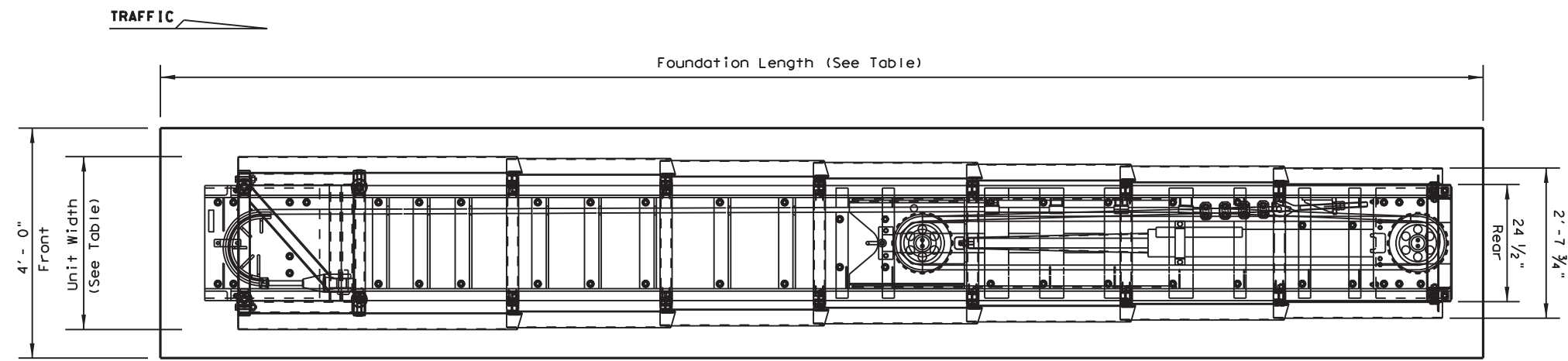
REUSABLE ENERGY ABSORBING
 CRASH TERMINAL
 (WIDE REACT 350)

REACT (W) -03

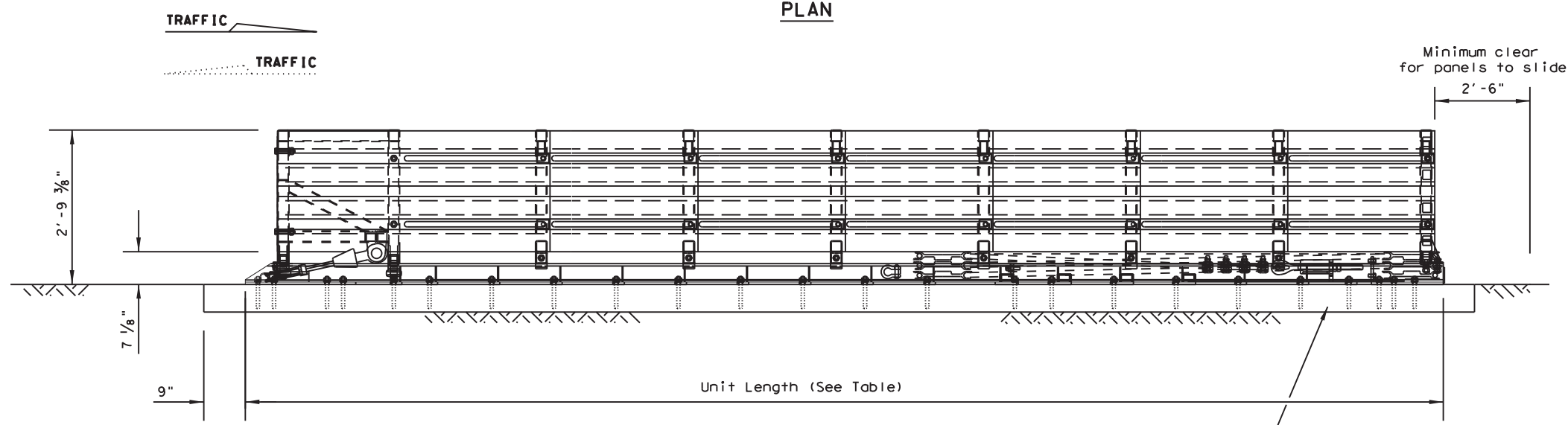
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PLAN



ELEVATION

GENERAL NOTES

1. For additional information contact SCI Products Inc. (717)234-3106.
2. For bi-directional traffic, appropriate transition panels will be required.
3. Additional details for the transition options and foundation options will be shown on the manufacturer's shop drawings furnished to the Engineer.
4. Concrete shall be class "S" with a minimum compressive strength of 4,000 p.s.i.
5. Maximum permissible cross-slope is 8%.
6. The installation area should be free from curbs, elevated objects, or depressions.
7. The SCI100GM & SCI70GM systems should be approximately parallel with the barrier or $\frac{1}{4}$ of merging barriers.

For attachment and transitions to other shapes, barriers, railings and bi-directional traffic flows are available. (See manufacturer's product manual)

NOTE: Side Panels can travel 30" beyond the last terminal brace at the rear of the cushion. All objects that may interfere with this motion can affect performance of and may cause undue damage to the crash cushion.

MODEL	TEST LEVEL	UNIT LENGTH (approx.)	UNIT WIDTH	FOUNDATION LENGTH	OBSTACLE WIDTH
SCI70GM	TL-2	13'-6"	2'-10 5/8"	15'-6 1/4"	24" to 36"
SCI100GM	TL-3	21'-6"	3'-1 1/2"	23'-0"	24" to 36"

System and pad lengths vary depending on backup type.

FOUNDATION OPTIONS
6" Reinforced Concrete (5 1/2" Anchor Embedment)
8" Unreinforced Concrete (5 1/2" Anchor Embedment)
3" Min. Asphalt over 3" Min. Concrete (16 1/2" Anchor Embed.)
6" Asphalt over 6" Compact Subbase (16 1/2" Anchor Embed.)
8" Minimum Asphalt (16 1/2" Anchor Embedment)

For steel placement in concrete foundations, see manufacturer's product manual.

TRANSITION OPTIONS
Concrete Vertical Wall
Concrete Traffic Barriers
Guardrail (W-Beam)
Guardrail (Thrie-Beam)

Transition types are shown elsewhere on the plans (i.e. Attenuator location details or in the general notes).

For bi-directional transition panel and end shoe details, see manufacturer's product manual.

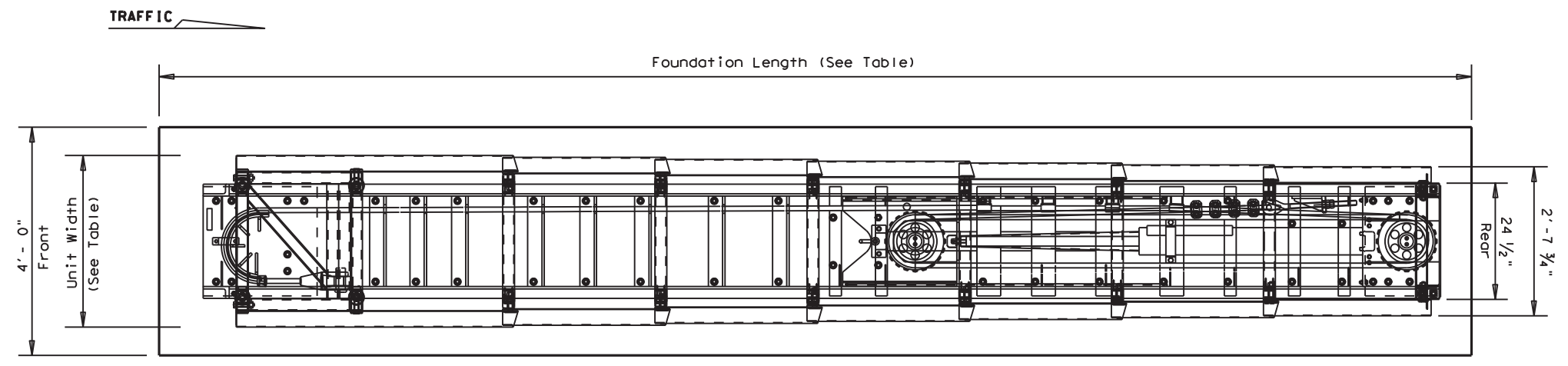
				Design Division Standard	
CRASH CUSHION ATTENUATOR (SMART CUSHION "NARROW") SCI PRODUCTS INC. SMTC (N) - 13					
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REVISED JUNE, 2013 (VP)	DIST	COUNTY	SHEET NO.		
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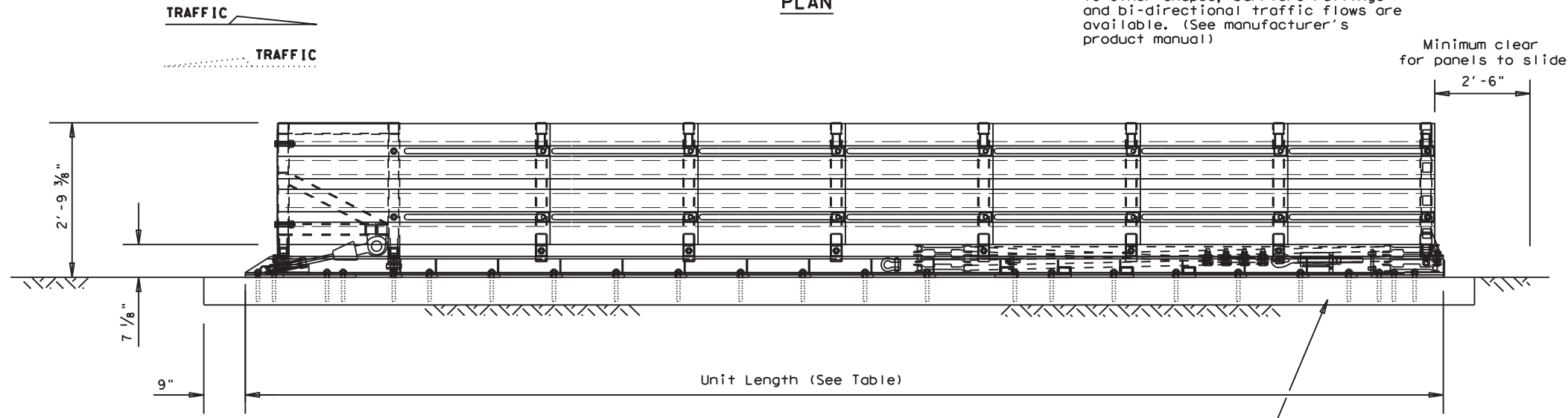
GENERAL NOTES

1. For additional information contact SCI Products Inc. (717)234-3106.
2. For bi-directional traffic, appropriate transition panels will be required.
3. Additional details for the transition options and foundation options will be shown on the manufacturer's shop drawings furnished to the Engineer.
4. Concrete shall be class "S" with a minimum compressive strength of 4,000 p.s.i.
5. Maximum permissible cross-slope is 8%.
6. The installation area should be free from curbs, elevated objects, or depressions.
7. The SCI100GM & SCI70GM systems should be approximately parallel with the barrier or $\frac{1}{4}$ of merging barriers.



PLAN

For attachment and transitions to other shapes, barriers railings and bi-directional traffic flows are available. (See manufacturer's product manual)



ELEVATION

Concrete Pad
 6" reinforced pad shown (See Foundation Options)

For steel placement in concrete foundations, See Manufacturer's drawings

MODEL	DESIGN	UNIT LENGTH (approx.)	UNIT WIDTH	FOUNDATION LENGTH	OBSTACLE WIDTH
SCI70GM	TL-2	13'-8 1/4"	2'-10 5/8"	15'-6 1/4"	24" to 36"
SCI100GM	TL-3	21'-8 1/4"	3'-1 1/2"	23'-0"	24" to 36"

System and pad lengths vary depending on backup type.

FOUNDATION OPTIONS
6" Reinforced Concrete (5 1/2" Anchor Embedment)
8" Unreinforced Concrete (5 1/2" Anchor Embedment)
3" Min. Asphalt over 3" Min. Concrete (16 1/2" Anchor Embed.)
6" Asphalt over 6" Compact Subbase (16 1/2" Anchor Embed.)
8" Minimum Asphalt (16 1/2" Anchor Embedment)

For steel placement in concrete foundations, see manufacturer's product manual.

TRANSITION OPTIONS
Concrete Vertical Wall
Concrete Traffic Barriers
Guardrail (W-Beam)
Guardrail (Thrie-Beam)

Transition types are shown elsewhere on the plans, (i.e. Attenuator location details or in the general notes).

For bi-directional transition panel and end shoe details, see manufacturer's product manual.

NOTE: Side Panels can travel 30" beyond the last terminal brace at the rear of the cushion. All objects that may interfere with this motion can affect performance of and may cause undue damage to the crash cushion.



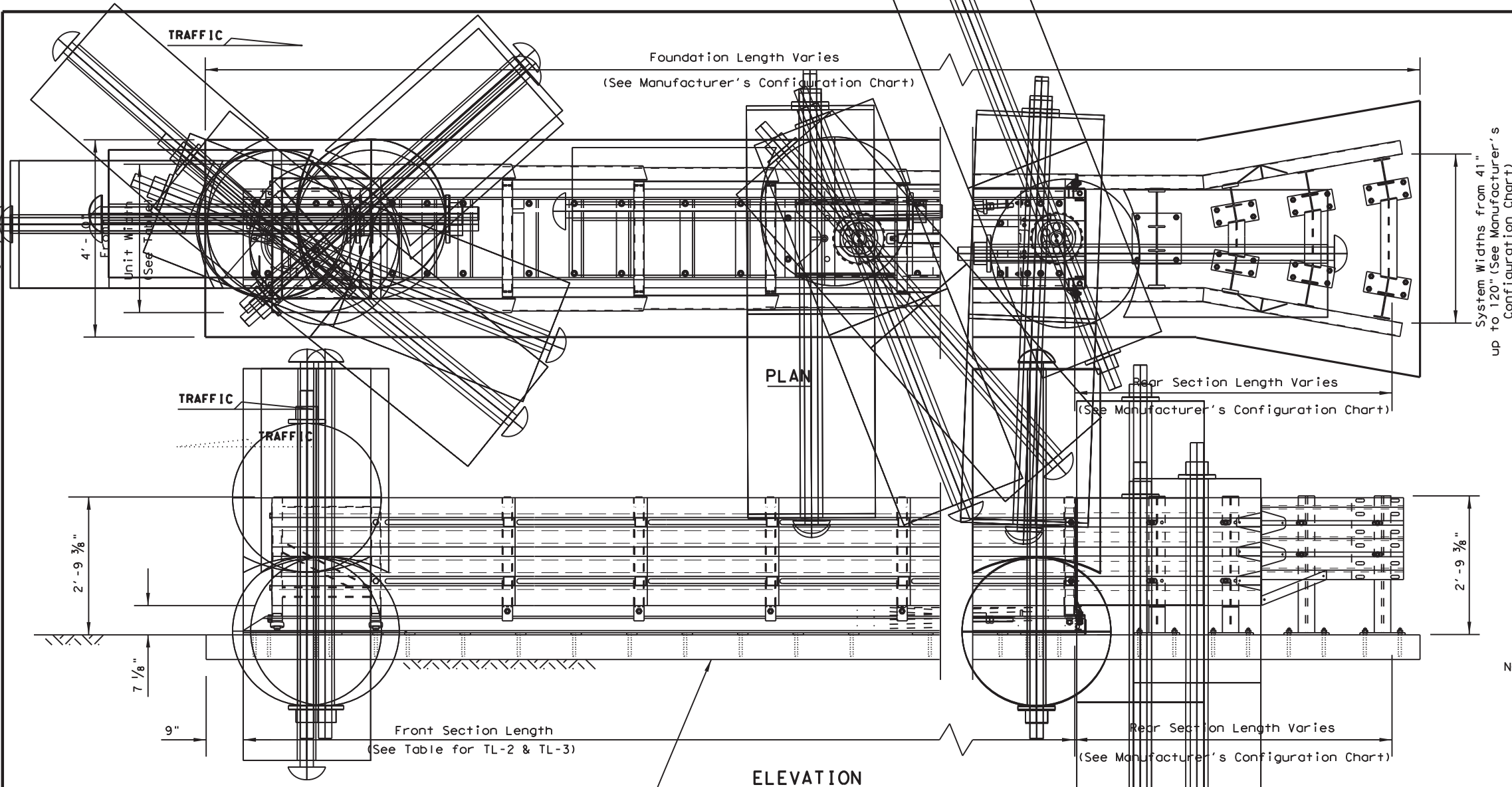
CRASH CUSHION ATTENUATOR
 (SMART CUSHION "NARROW")
 SCI Products Inc.

SMTC (N) -06

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GENERAL NOTES

1. For additional information contact SCI Products Inc. (717)234-3106.
2. For bi-directional traffic, appropriate transition panels will be required.
3. Additional details for the transition options and foundation options will be shown on the manufacturer's shop drawings furnished to the Engineer.
4. Concrete shall be class "S" with a minimum compressive strength of 4,000 p.s.i.
5. Maximum permissible cross-slope is 8%.
6. The installation area should be free from curbs, elevated objects, or depressions.
7. The SCI100GM & SCI70GM systems should be approximately parallel with the barrier or $\frac{1}{2}$ of merging barriers.

For attachment and transitions to other shapes, barriers railings and bi-directional traffic flows are available. (See manufacturer's product manual)

NOTE: Side Panels can travel 30" beyond the last terminal brace at the rear of the cushion. All objects that may interfere with this motion can affect performance of and may cause undue damage to the crash cushion.

6" Reinforced pad shown (See Foundation Options)

FOUNDATION OPTIONS
6" Reinforced Concrete (5 1/2" Anchor Embedment)
8" Unreinforced Concrete (5 1/2" Anchor Embedment)
3" Min. Asphalt over 3" Min. Concrete (16 1/2" Anchor Embedment)
6" Asphalt over 6" Compact Subbase (16 1/2" Anchor Embedment)
8" Minimum Asphalt (16 1/2" Anchor Embedment)

For steel placement in concrete foundations, see manufacturer's product manual.

TRANSITION OPTIONS
Concrete Vertical Wall
Concrete Traffic Barriers
Guardrail (W-Beam)
Guardrail (Thrie-Beam)

Transition types are shown elsewhere on the plans (i.e. Attenuator location details or in the general notes).

For bi-directional transition panel and end shoe details, see manufacturer's product manual.

GORE WIDTH	WIDE TRANSITION LENGTHS	
	TL-2 OVERALL SYSTEM LENGTH	TL-3 OVERALL SYSTEM LENGTH
41"	20'-1"	28'-1"
48"	21'-10"	29'-10"
55"	23'-5"	31'-5"
60"	24'-7"	32'-7"
68"	26'-6"	34'-6"
69"	26'-8"	34'-8"
81"	29'-7"	37'-7"
88"	31'-2"	39'-2"
94"	32'-7"	40'-7"
100"	34'-1"	42'-1"
107"	35'-8"	43'-8"
112"	36'-11"	44'-11"
120"	38'-10"	46'-10"
126"	40'-2"	48'-2"
133"	41'-11"	49'-11"

MODEL (WIDE)	TEST LEVEL	FRONT SECTION LENGTH	UNIT WIDTH	FOUNDATION LENGTH	GORE WIDTH
SCI70GM	TL-2	13'-6"	2'-10 5/8"	OVERALL LENGTH PLUS 1'-6"	41" TO 133"
SCI100GM	TL-3	21'-6"	3'-1 1/2"	OVERALL LENGTH PLUS 1'-6"	41" TO 133"

System and pad lengths vary depending on backup type.

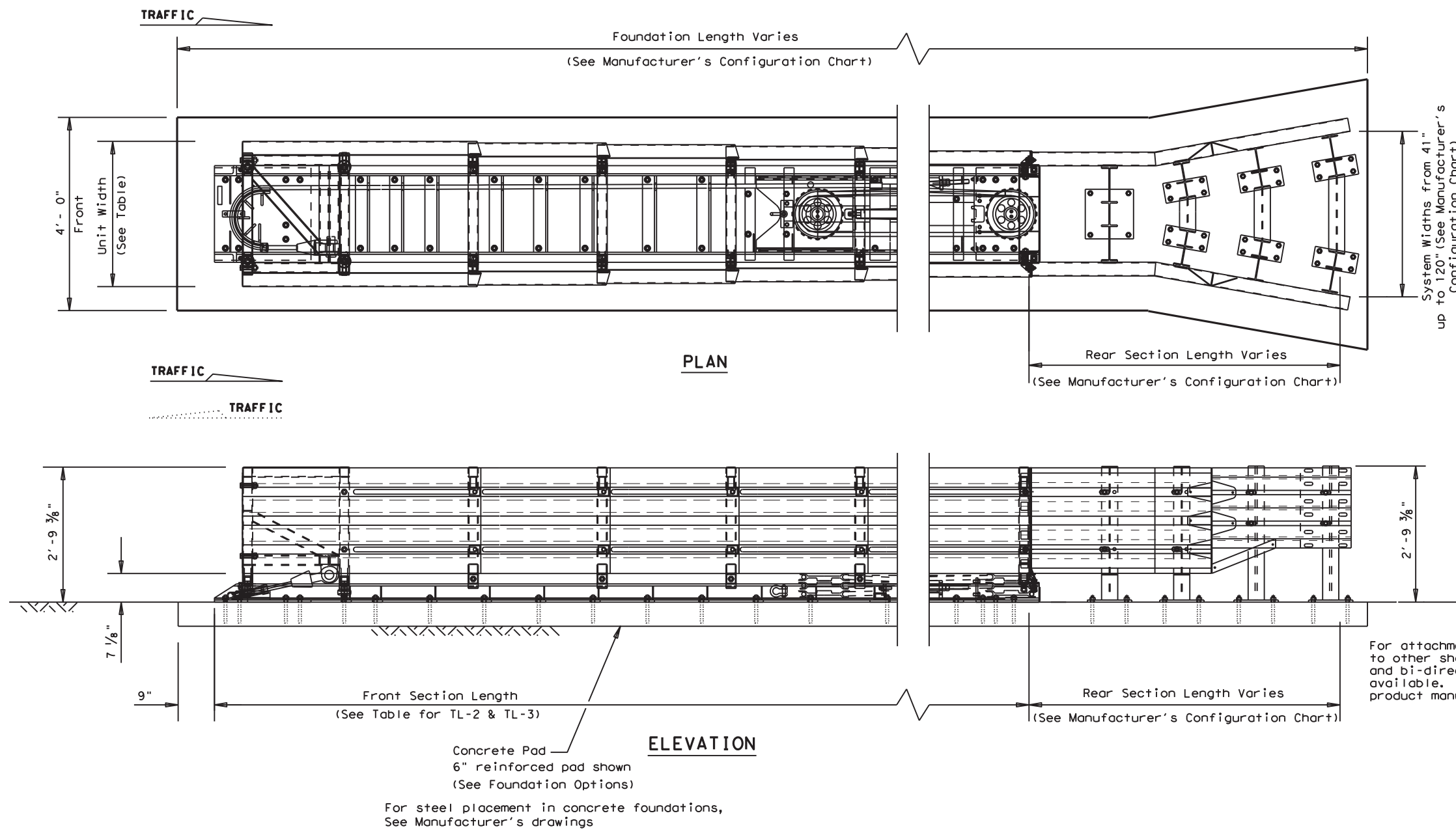
Design Division Standard

CRASH CUSHION ATTENUATOR
(SMART CUSHION "WIDE")
SCI Products Inc.
SMTC (W) - 13

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GENERAL NOTES

1. For additional information contact SCI Products Inc. (717)234-3106.
2. For bi-directional traffic, appropriate transition panels will be required.
3. Additional details for the transition options and foundation options will be shown on the manufacturer's shop drawings furnished to the Engineer.
4. Concrete shall be class "S" with a minimum compressive strength of 4,000 p.s.i.
5. Maximum permissible cross-slope is 8%.
6. The installation area should be free from curbs, elevated objects, or depressions.
7. The SCI100GM & SCI70GM systems should be approximately parallel with the barrier or $\frac{1}{2}$ of merging barriers.

MODEL (WIDE)	DESIGN	FRONT SECTION LENGTH	UNIT WIDTH	FOUNDATION LENGTH	OBSTACLE WIDTH
SCI70GM	TL-2	13'-8 1/4"	Varies	Varies	41" to 120"
SCI100GM	TL-3	21'-8 1/4"	Varies	Varies	41" to 120"

System and pad lengths vary depending on backup type.

FOUNDATION OPTIONS
6" Reinforced Concrete (5 1/2" Anchor Embedment)
8" Unreinforced Concrete (5 1/2" Anchor Embedment)
3" Min. Asphalt over 3" Min. Concrete (16 1/2" Anchor Embed.)
6" Asphalt over 6" Compact Subbase (16 1/2" Anchor Embed.)
8" Minimum Asphalt (16 1/2" Anchor Embedment)

For steel placement in concrete foundations, see manufacturer's product manual.

TRANSITION OPTIONS
Concrete Vertical Wall
Concrete Traffic Barriers
Guardrail (W-Beam)
Guardrail (Thrie-Beam)

Transition types are shown elsewhere on the plans, (i.e. Attenuator location details or in the general notes).

For bi-directional transition panel and end shoe details, see manufacturer's product manual.

NOTE: Side Panels can travel 30" beyond the last terminal brace at the rear of the cushion. All objects that may interfere with this motion can affect performance of and may cause undue damage to the crash cushion.

Texas Department of Transportation
 Design Division Standard

CRASH CUSHION ATTENUATOR
 (SMART CUSHION "WIDE")
 SCI Products Inc.

SMTC (W) -06

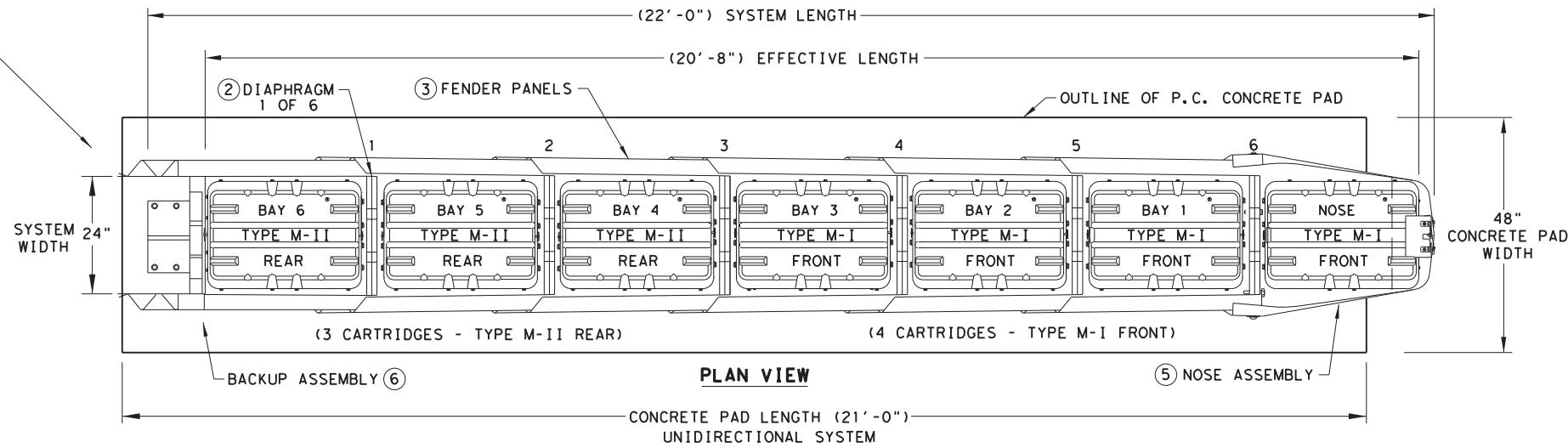
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	SAT	BEXAR	249	

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DATE:
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NOTE:
A TRANSITION MAY BE REQUIRED TO INSTALL THE QUADGUARD M10 TO THE OBJECT BEING SHIELDED.

QUADGUARD M10 24" WIDE SYSTEM



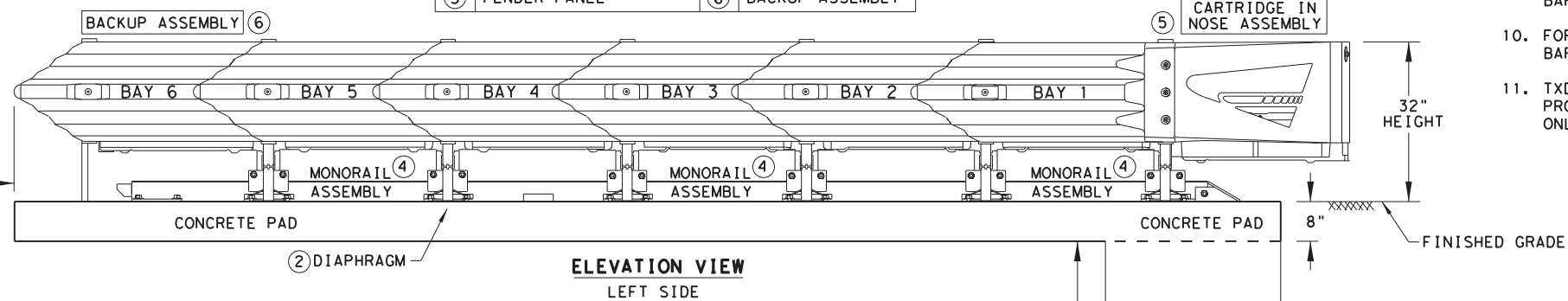
PLAN VIEW

GENERAL NOTES

- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY - ENERGY ABSORPTION INC. AT 1 (888) 323-6374.
- SEE THE RECENT QUADGUARD (M10) PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITATIONS AND THE DRAWING PACKAGE FOR THE NARROW 24" SYSTEM BEFORE INSTALLING THE QUADGUARD(M10) SYSTEM AT ANY GIVEN LOCATION.
- FOR BI-DIRECTIONAL TRAFFIC: THE LOCATION AND OR WIDTH OF THE QUADGUARD(M10) IS RESTRICTED. AS BI-DIRECTIONAL TRAFFIC APPROACHES THE REAR OF THE QUADGUARD (M10), THE QUADGUARD (M10) SHOULD NOT EXTEND FURTHER INTO THE TRAFFIC-SIDE OF THE BARRIER THAN THE OBSTACLE. ANY TRANSITION INSTALLED MUST EITHER BE TANGENT TO BOTH QUADGUARD AND OBSTACLE OR MUST ANGLE TOWARD FIELD SIDE OF THE BARRIER.
- SYSTEM TRANSITION: APPROPRIATE TRANSITION PANELS OR SIDE PANELS WILL BE REQUIRED FOR PROPER IMPACT PERFORMANCE. THE CORRECT PANEL(S) TO USE WILL DEPEND ON THE DIRECTION OF TRAFFIC FLOW AND WHAT TYPE OF BARRIER OR ROAD FEATURE THE QUADGUARD (M10) SYSTEM IS SHIELDING. SEE THE QUADGUARD M10 PRODUCT DESCRIPTION & ASSEMBLY MANUAL FOR FURTHER DETAILS.
- COMPONENTS FOR THE QUADGUARD M10 BACKUP AND REINFORCING DETAILS ARE SHOWN ON THE QUADGUARD (M10) PRODUCT DESCRIPTION & ASSEMBLY MANUAL.
- CONCRETE PAD SHALL BE 6" MIN. REINFORCED 28MPa [4,000 PSI] (P.C.) OR 8" MIN. NON-REINFORCED 28MPa [4,000 PSI] CONCRETE ROADWAY MEASURING AT LEAST 12'-0" WIDE BY 50'-0" LONG. ANCHOR BLOCK IS NOT REQUIRED WHEN USING 8" CONCRETE PAD INSTALLED AGAINST AN IMMOVABLE STRUCTURE, E.G. CONCRETE WALL.
- IF THE CROSS-SLOPE VARIES MORE THAN 2% OVER THE LENGTH OF THE SYSTEM, THE CONCRETE PAD WILL REQUIRE LEVELING. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
- THE INSTALLATION AREA SHOULD BE FREE OF CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
- THE QUADGUARD (M10) SYSTEM SHOULD BE INSTALLED APPROXIMATELY PARALLEL WITH THE BARRIER.
- FOR THE TENSION STRUT BACKUP THE DISTANCE BETWEEN THE BACK OF BACKUP AND THE BARRIER WALL SHOULD NOT EXCEED 7" IN ANY CASE.
- TXDOT HAS ONLY APPROVED THE 24" WIDE QUADGUARD (M10) SYSTEM. THE QUADGUARD (M10) PRODUCT DESCRIPTION AND ASSEMBLY MANUAL INCLUDES SYSTEM WIDTH OF 24". ONLY THE 24" SYSTEM IS ALLOWED TO BE INSTALLED ON TEXAS ROADWAYS.

NOTE:
PROVISION SHALL BE MADE FOR REAR FENDER PANELS TO SLIDE REARWARD UPON IMPACT, 30" MIN.

KEY	KEY
① QUADGUARD CARTRIDGE	④ MONORAIL
② DIAPHRAGM	⑤ NOSE ASSEMBLY
③ FENDER PANEL	⑥ BACKUP ASSEMBLY

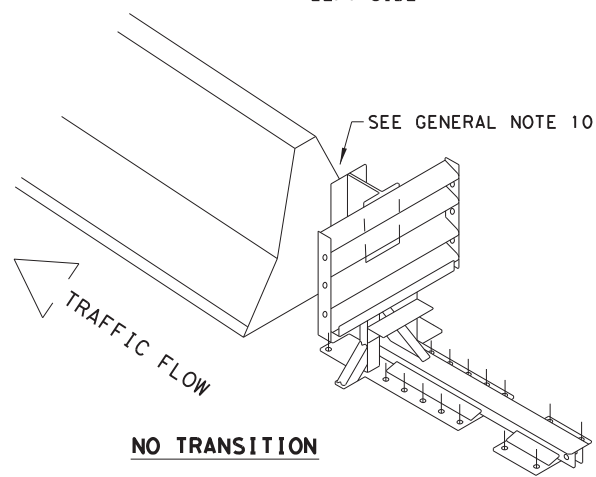


**ELEVATION VIEW
LEFT SIDE**

FOUNDATION & ANCHORING REQUIREMENTS	
FOUNDATION TYPES: A, B, C, & D	
FOUNDATION TYPE: A	REINFORCED CONCRETE PAD OR ROADWAY
FOUNDATION:	6" MINIMUM DEPTH (P.C.C.)
ANCHORAGE:	7" STUDS EMBEDDED 5 1/2" - APPROVED ADHESIVE
FOUNDATION TYPE: B	ASPHALT OVER P.C.C.
FOUNDATION:	3" MIN. (A.C.) OVER 3" MIN. (P.C.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 1/2"
FOUNDATION TYPE: C	ASPHALT OVER SUBBASE
FOUNDATION:	6" MIN. (A.C.) OVER 6" MIN. (C.S.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 1/2" - APPROVED ADHESIVE
FOUNDATION TYPE: D	ASPHALT ONLY
FOUNDATION:	8" MIN. (A.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 1/2" - APPROVED ADHESIVE

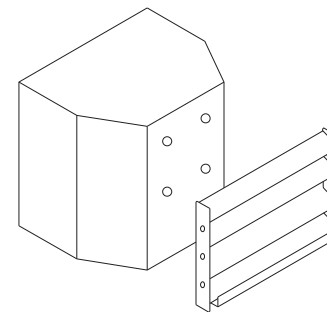
KEY:
ASPHALT CONCRETE (A.C.)
COMPACTED SUBBASE (C.S.)
PORTLAND CEMENT CONCRETE (P.C.C.)

NOTES: SEE MANUAL FOR APPROVED TRINITY HIGHWAY ADHESIVE.
IF THE UNIT IS ANCHORED TO ASPHALTIC CONCRETE, IT SHOULD BE RELOCATED TO FRESH, UNDISTURBED ASPHALT AND RE-ANCHORED AFTER EACH IMPACT TO ENSURE ADEQUATE FUTURE PERFORMANCE. A ZERO CLEARANCE BETWEEN THE BACKUP AND BARRIER WALL IS RECOMMENDED IN NO CASE SHOULD THIS DISTANCE EXCEED 7 INCHES.



TENSION STRUT BACKUP

NOTE:
TENSION STRUT BACKUP MAY BE USED IN CONSTRUCTION ZONES ON ASPHALT CONCRETE (A.C.) FOR TEMPORARY USE.



CONCRETE BACKUP

NOTE:
AN ANCHOR BLOCK IS NOT REQUIRED WITH AN 8" NON-REINFORCED CONCRETE PAD INSTALLED AGAINST AN IMMOVABLE CONCRETE BACKUP. A 6" REINFORCED CONCRETE PAD REQUIRES 48" X 36" ANCHOR BLOCK SHOWN ON MANUFACTURER'S SHOP DRAWINGS. SEE THE QUADGUARD M10 PRODUCT DESCRIPTION & ASSEMBLY MANUAL FOR DIRECTIONS REGARDING CONCRETE PADS.

NOTE:
THE PROPER TRANSITION PANEL OR SIDE PANEL MUST BE USED FOR BI-DIRECTIONAL INSTALLATIONS AT DIVIDED-HIGHWAY MEDIANS OR UNDIVIDED ROADWAYS WHERE THE SYSTEM IS EXPOSED TO IMPACTS FROM TWO DIFFERENT DIRECTIONS OF TRAFFIC FLOW. NCHRP 350 TRANSITIONS HAVE BEEN ACCEPTED FOR USE BY TRINITY HIGHWAY PRODUCTS, LLC AND TXDOT WITH THE MASH QUADGUARD M10 SYSTEM. MASH TRANSITIONS WHEN AVAILABLE FROM TRINITY HIGHWAY WILL BE REFLECTED IN FUTURE QUADGUARD M10 PRODUCT DESCRIPTION ASSEMBLY MANUALS.

SYSTEM TRANSITIONS TYPES	
1	QUAD-BEAM TO CONCRETE END-SHOE
2	QUAD-BEAM TO THRIE-BEAM RAIL
3	QUAD-BEAM TO W-BEAM RAIL

NOTE:
TRANSITION ASSEMBLIES FOR THE QUAD-GUARD TO THRIE-BEAM OR W-BEAM FENCE REQUIRES:

10 (W6X9) I-BEAM POSTS,
POST 1 THRU 4 (84" LONG)
POST 5 THRU 10 (72" LONG)

THE QUADGUARD (M10) (N) 6-BAY 24" WIDE - SYSTEM HAS BEEN TESTED TO MASH TEST LEVEL 3.

MODEL #	BAYS	CARTRIDGES	
QM10024	6	TYPE-MII	TYPE-MI
WIDTH 24"	DIAPHRAGMS	3	4
		REAR	FRONT

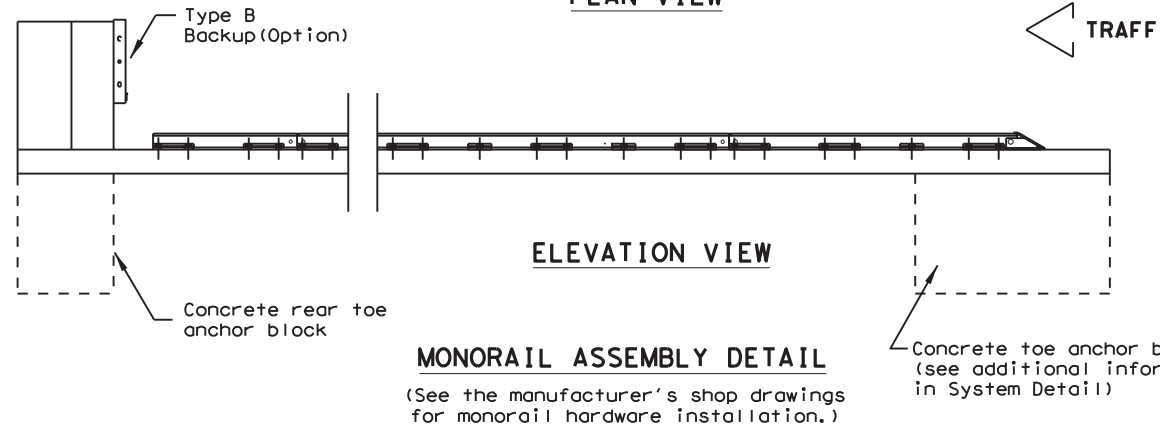
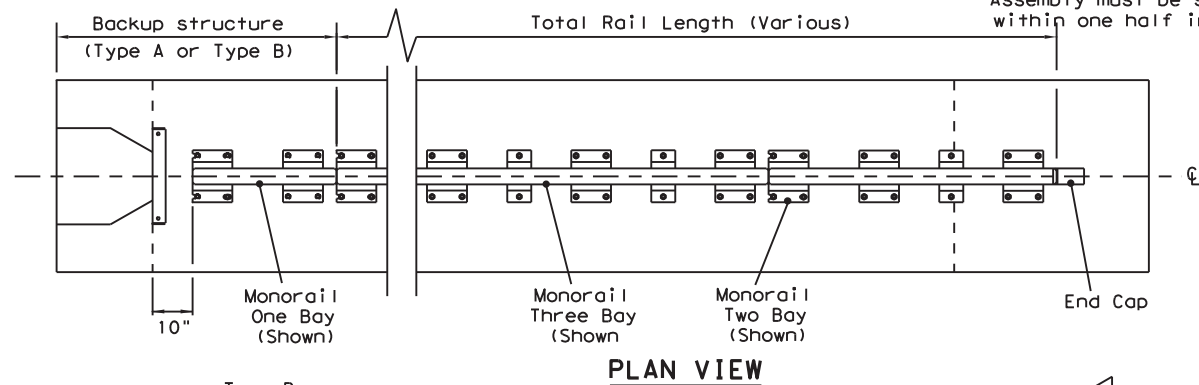
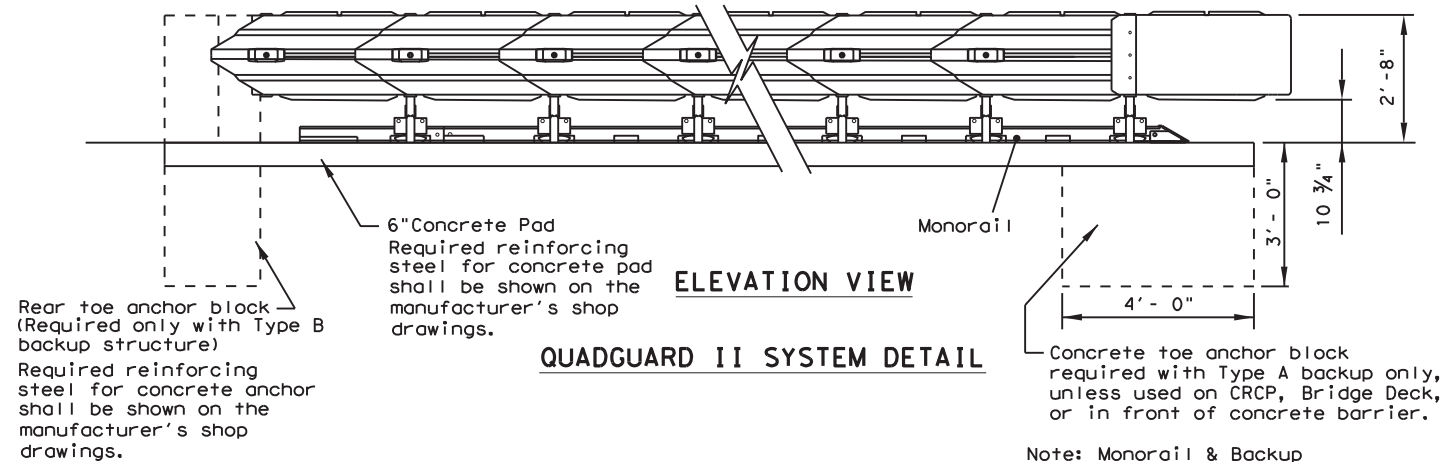
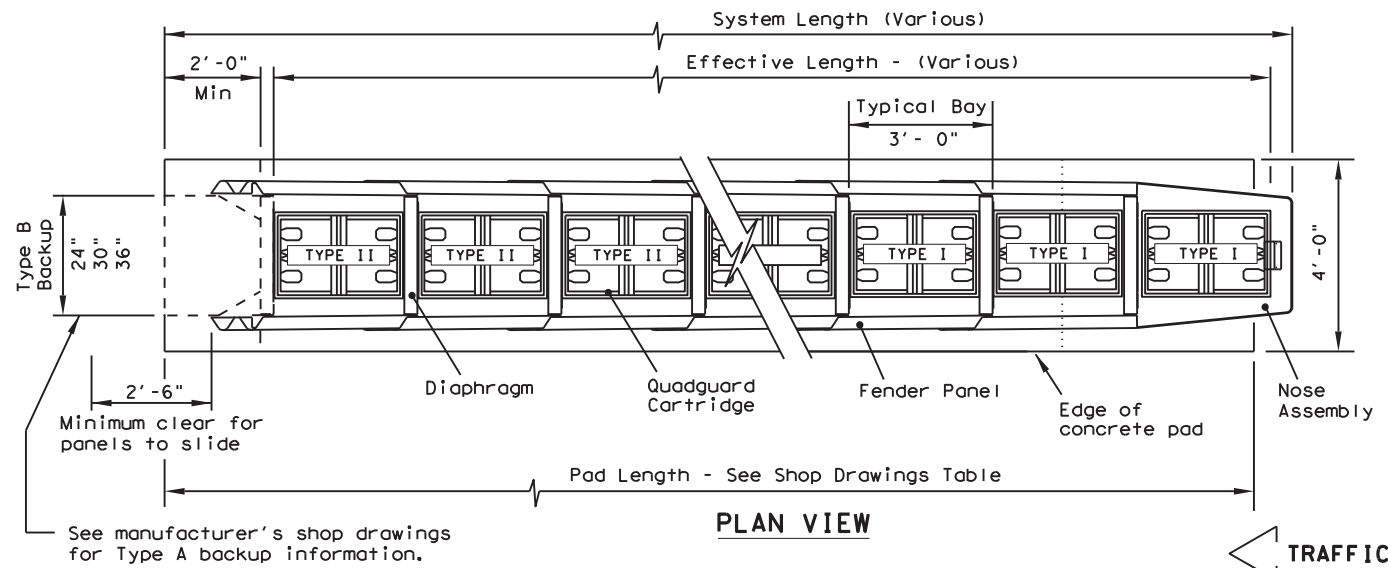
NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE QUADGUARD M10 SYSTEM AND IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

REUSABLE

		Design Division Standard	
TRINITY HIGHWAY ENERGY ABSORPTION QUADGUARD M10 (MASH TL-3 NARROW-24" ONLY)			
QUADGUARD (M10) (N) - 19			
FILE: quadguardm10n19.dgn	DN: TXDOT	CK: KM	DW: VP
© TXDOT: APRIL 2019	CONT SECT	JOB	HIGHWAY
REVISIONS	6372 50	OOI	VAR.
	DIST	COUNTY	SHEET NO.
	SAT	BEXAR	250

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DATE: FILE:

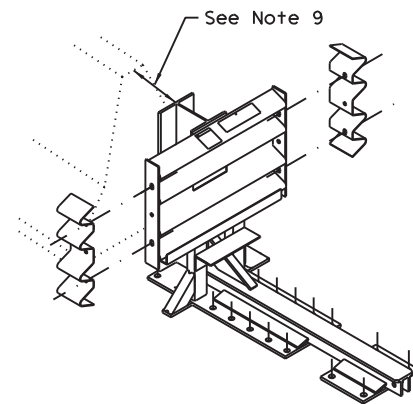


MONORAIL ASSEMBLY DETAIL
 (See the manufacturer's shop drawings for monorail hardware installation.)

QUADGUARD II (NARROW) SYSTEM				
Test Level	NO. OF BAYS	UNIT EFFECTIVE LENGTH	PAD LENGTH TYPE A	PAD LENGTH TYPE B
TL-2	2	8'-8"	9'-0"	8'-6"
TL-3	5	17'-8"	18'-0"	17'-6"

Additional bays may be added if special considerations warrant and site conditions will accommodate additional length.

QUAD II (N) units are available in 24", 30", or 36" widths from 2 to 8 bays. Unit width, number of bays, and backup type shall be specified elsewhere in the plans.



TYPE A TENSION STRUT BACKUP

TENSION STRUT: Consists of diagonal struts, connections, and accessories, as detailed by the Manufacturer, located at the rear of the QUAD unit. Typical application is for QUAD units attached to double-face quadrail. When used, a 4'-0" x 4'-0" x 3'-0" concrete toe anchor block shall be provided beneath the front portion of the concrete pad, except where the QUAD unit is to be placed on continuously reinforced concrete pavement or bridge deck (7" minimum, 4,000 p.s.i.) or non-reinforced concrete pavement (8" minimum, 4,000 p.s.i.)

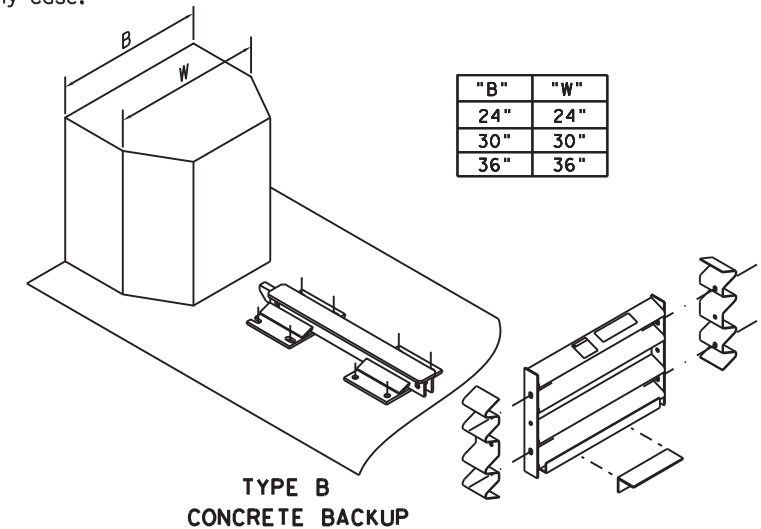
Anchorage requirements are as follows:

WITH FOUNDATION TYPE:	ANCHOR WITH:
Minimum six inch portland cement concrete pad	Epoxy anchoring system with 7" studs, 5.5" embedment
Minimum three inch asphaltic concrete over minimum three inch portland cement concrete	Epoxy anchoring system with 18" studs, 16.5" embedment
Minimum six inch asphaltic concrete over minimum six inch compacted base	Epoxy anchoring system with 18" studs, 16.5" embedment
Minimum eight inch asphaltic concrete	Epoxy anchoring system with 18" studs, 16.5" embedment

If the unit is anchored to asphaltic concrete, it should be relocated to fresh, undisturbed asphalt and re-anchored after each impact to ensure adequate future performance. A zero clearance between the backup and barrier wall is recommended in no case should this distance exceed 7 inches.

GENERAL NOTES

- For specific information regarding installation and technical guidance of the system, contact: Trinity Highway - Energy Absorption at 1(888)323-6374. 70 W. Madison St. Suite 2350. Chicago, IL 60602
- For bi-directional traffic, appropriate transition panels will be required.
- Details of components for the QUAD and backups and reinforcing details will be shown on the manufacturer's shop drawings furnished to the Engineer.
- Concrete shall be class "S" with a minimum compressive strength of 4,000 p.s.i.
- If the cross-slope varies more than 2% over the length of the system, the concrete pad will require levelling. Maximum permissible cross-slope is 8%.
- The installation area should be free from curbs, elevated objects, or depressions.
- The QUAD system should be approximately parallel with the barrier or $\frac{1}{2}$ of merging barriers.
- Unit width selected should be adequate to protect an errant vehicle travelling at 15 degrees to the roadway from the face or corner of the fixed object.
- For the permanent steel backup, (Type A) the distance between the back of backup and the barrier wall should not exceed 7 inches in any case.



TYPE B CONCRETE BACKUP

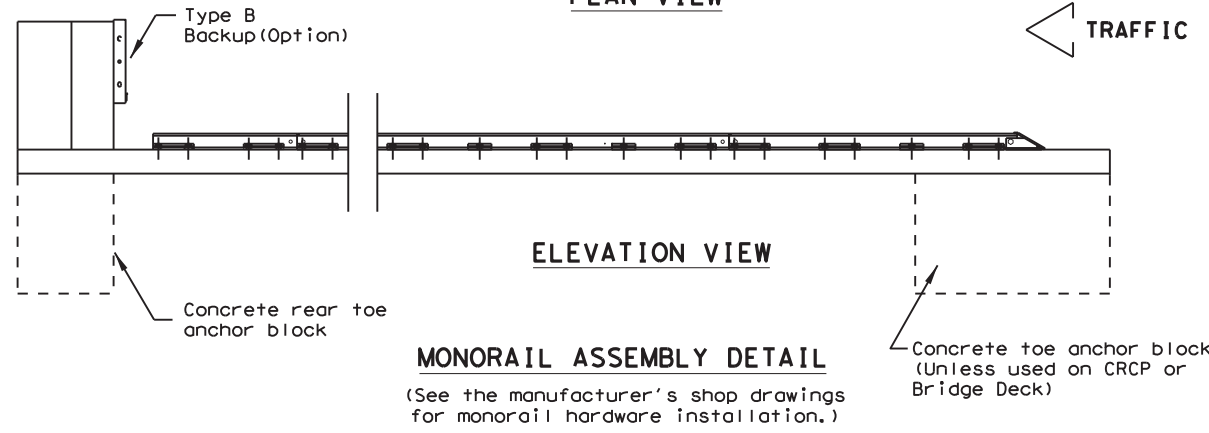
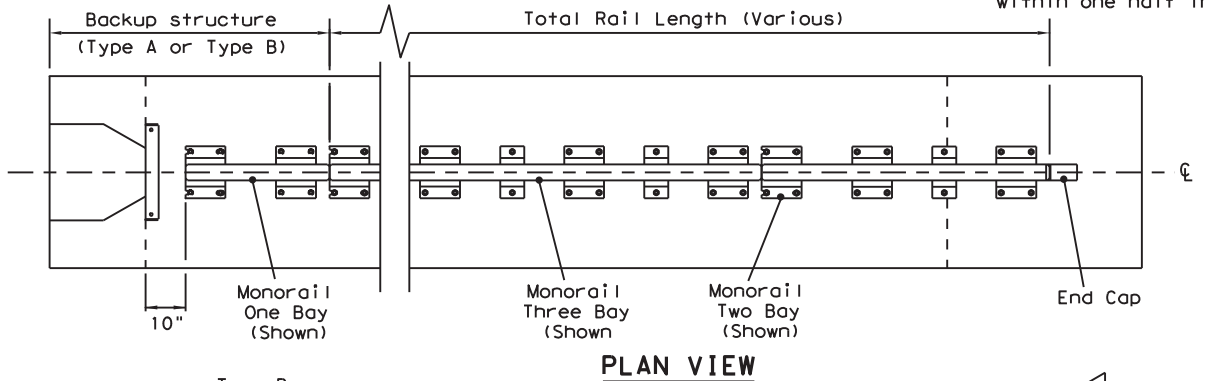
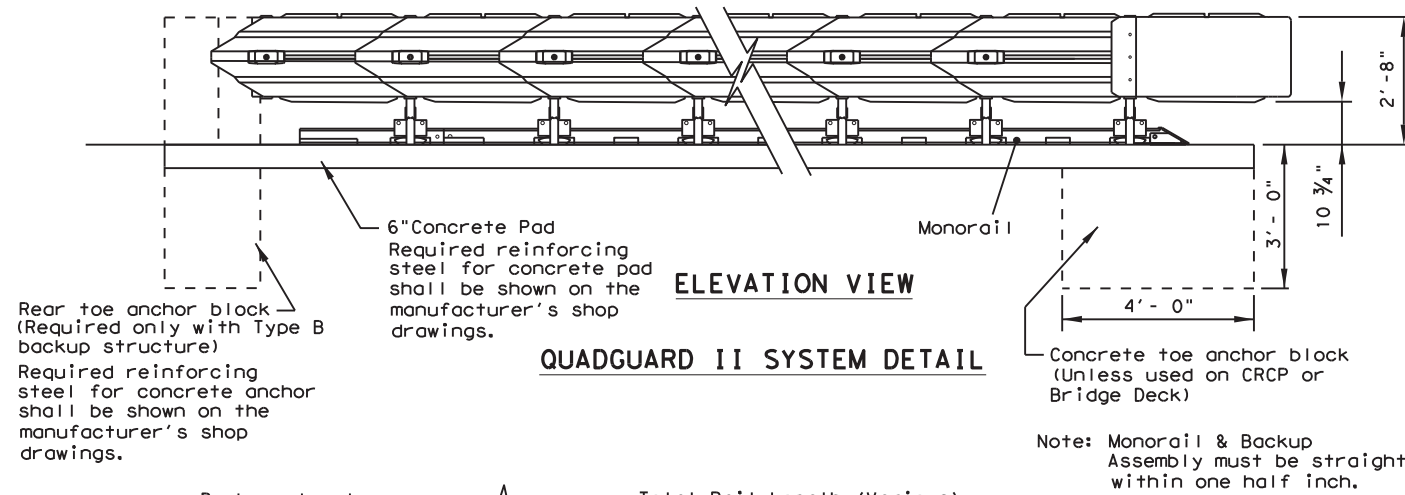
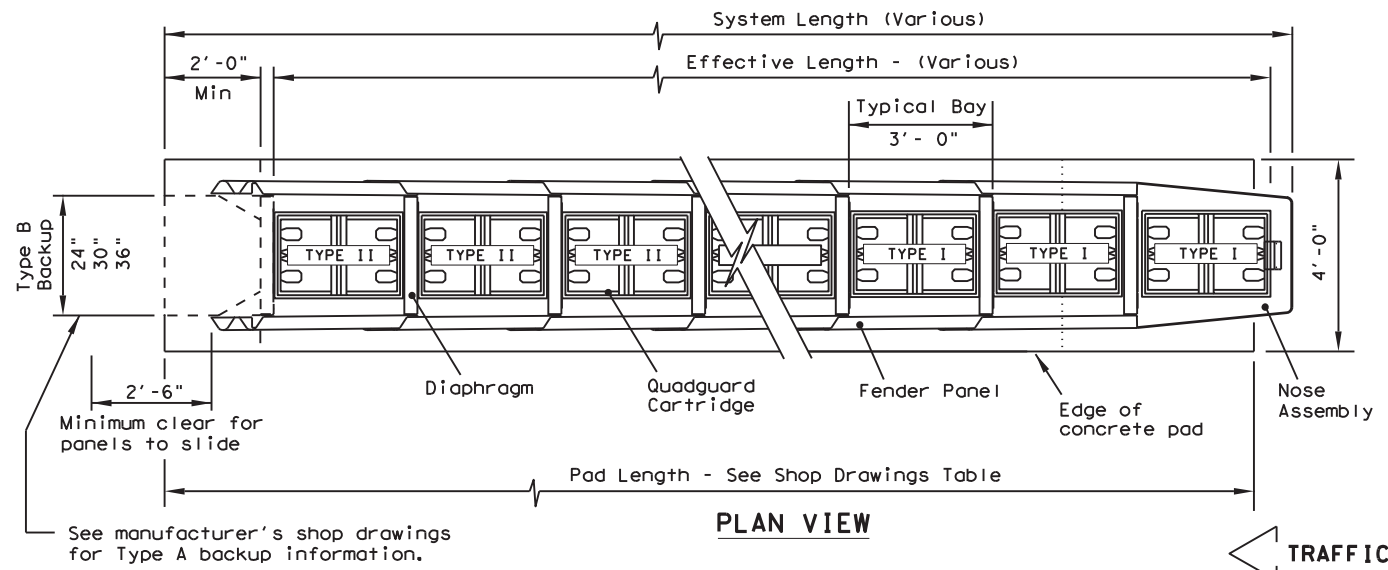
CAST-IN-PLACE CONCRETE WALL BACKUP: If cast-in-place structures such as bridge parapets, columns, or special walls are used as backup structures, then intermediate walls shall be provided between the structures and the QUAD unit. Intermediate walls shall be equal in height and width to the QUAD unit and reinforced with a steel cage. A cast-in-place transition section from concrete barrier may be used. Reinforcing steel should transition from the standard barrier section to the standard backup section. Details for the intermediate walls, cast-in-place transition sections, or other modifications will be shown elsewhere in the plans. Concrete wall backups may be used on continuously reinforced concrete pavement or bridge deck (7" minimum, 4,000 p.s.i.) or non-reinforced concrete pavement (8" minimum, 4,000 p.s.i.) In those cases, all vertical steel will be doweled (5 inch minimum) into existing decks or located and placed prior to pouring proposed decks as approved by the Engineer.

REUSABLE

		Design Division Standard	
TRINITY HIGHWAY ENERGY ABSORPTION (QUADGUARD II) (NARROW)			
QUAD (N) - 17			
FILE: quodn17.dgn	DW: TxDOT	CK: KM	DW: VP
© TxDOT: FEBRUARY 1998	CONT: 6372	SECT: 50	JOB: 001
REVISIONS REVISED 06, 2013 VP REVISED 03, 2015 VP REVISED 03, 2017 KM		HIGHWAY VAR.	
DIST: SAT	COUNTY: BEXAR	SHEET NO.: 251	

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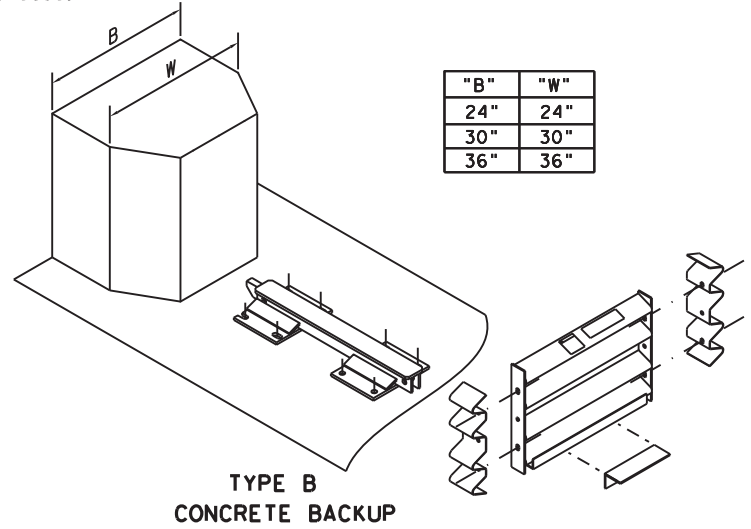
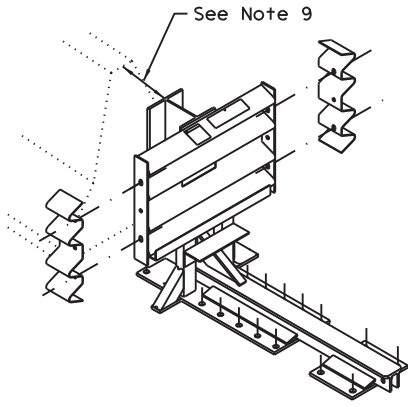
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QUADGUARD II (NARROW) SYSTEM				
Test Level	NO. OF BAYS	UNIT EFFECTIVE LENGTH	PAD LENGTH TYPE A	PAD LENGTH TYPE B
TL-2	2	8'- 8"	9'- 0"	8'- 6"
TL-3	5	17'- 8"	18'- 0"	17'- 6"
70	8	26'- 8"	27'- 0"	26'- 6"

Additional bays may be added if special considerations warrant and site conditions will accommodate additional length.

QUAD II (N) units are available in 24", 30", or 36" widths from 2 to 8 bays. Unit width, number of bays, and backup type shall be specified elsewhere in the plans.



Anchorage requirements are as follows:

WITH FOUNDATION TYPE:	ANCHOR WITH:
Minimum six inch portland cement concrete pad	MP-3 polyester anchoring system with 7" studs, 5.5" embedment
Minimum three inch asphaltic concrete over minimum three inch portland cement concrete	MP-3 polyester anchoring system with 18" studs, 16.5" embedment
Minimum six inch asphaltic concrete over minimum six inch compacted base	MP-3 polyester anchoring system with 18" studs, 16.5" embedment
Minimum eight inch asphaltic concrete	MP-3 polyester anchoring system with 18" studs, 16.5" embedment

If the unit is anchored to asphaltic concrete, it should be relocated to fresh, undisturbed asphalt and re-anchored after each impact to ensure adequate future performance. A zero clearance between the backup and barrier wall is recommended in no case should this distance exceed 7 inches.

GENERAL NOTES

- For specific information regarding installation and technical guidance of the system, contact: Trinity Highway - Energy Absorption at 1(888)323-6374. 70 W. Madison St. Suite 2350. Chicago, IL 60602
- For bi-directional traffic, appropriate transition panels will be required.
- Details of components for the QUAD and backups and reinforcing details will be shown on the manufacturer's shop drawings furnished to the Engineer.
- Concrete shall be class "S" with a minimum compressive strength of 4,000 p.s.i.
- If the cross-slope varies more than 2% over the length of the system, the concrete pad will require levelling. Maximum permissible cross-slope is 8%.
- The installation area should be free from curbs, elevated objects, or depressions.
- The QUAD system should be approximately parallel with the barrier or C of merging barriers.
- Unit width selected should be adequate to protect an errant vehicle travelling at 15 degrees to the roadway from the face or corner of the fixed object.
- For the permanent steel backup, (Type A) the distance between the back of backup and the barrier wall should not exceed 7 inches in any case.

REUSABLE

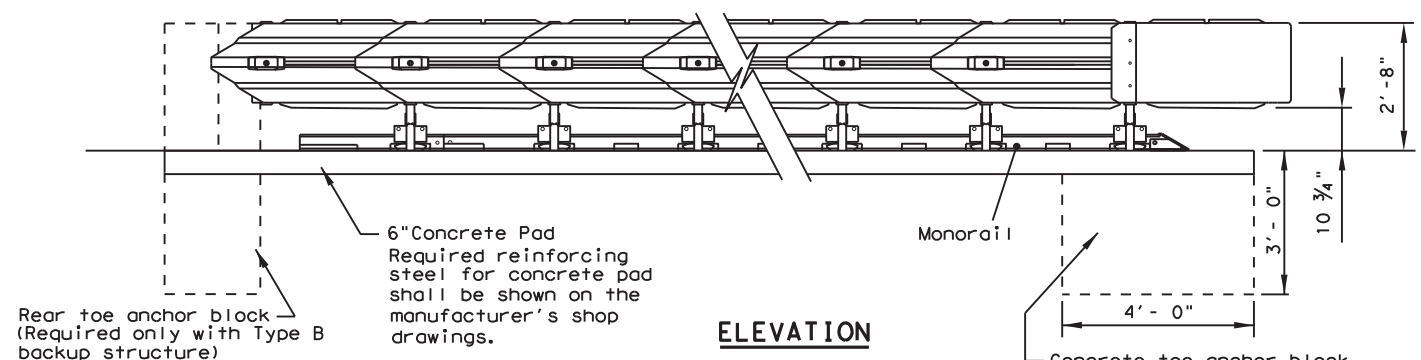
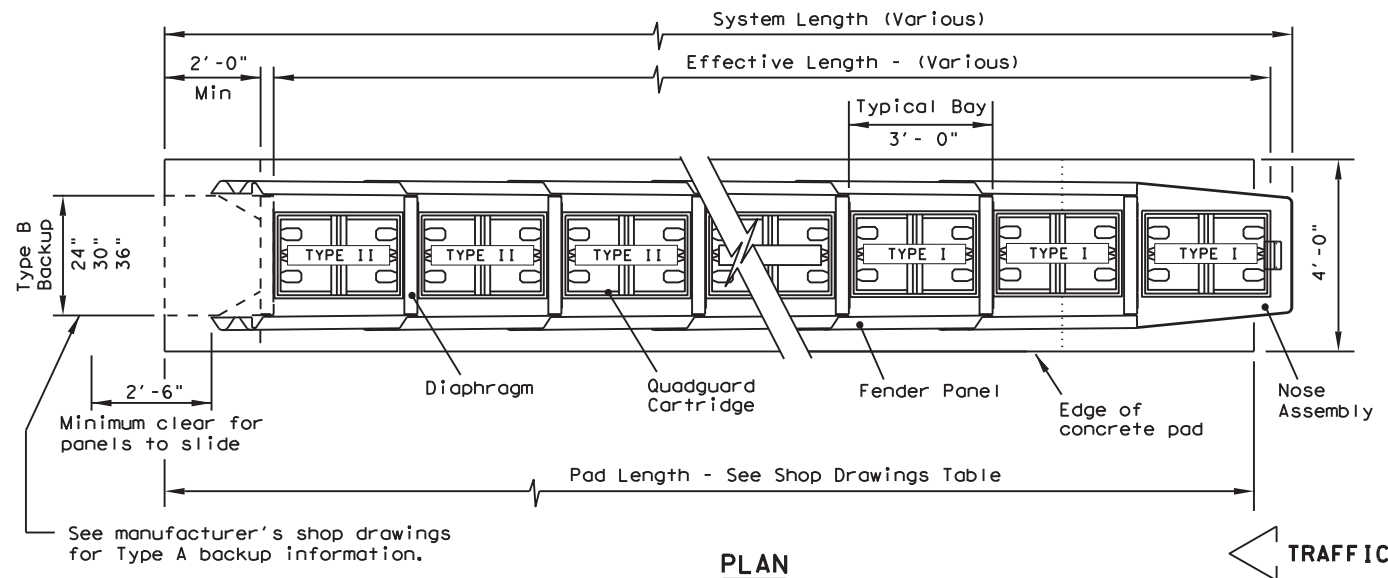
Texas Department of Transportation
TRINITY HIGHWAY ENERGY ABSORPTION (QUADGUARD II) (NARROW)
QUAD (N) - 16

FILE: quadn16.dgn	DW: TxDOT	CK: KM	DW: VP	CK: VP
© TxDOT: February 1998		CONT	SECT	JOB
REVISIONS		6372	50	OOI
REVISED 06, 2013 (VP)				HIGHWAY
REVISED 03, 2016 (VP)		DIST	COUNTY	SHEET NO.
		SAT	BEXAR	252

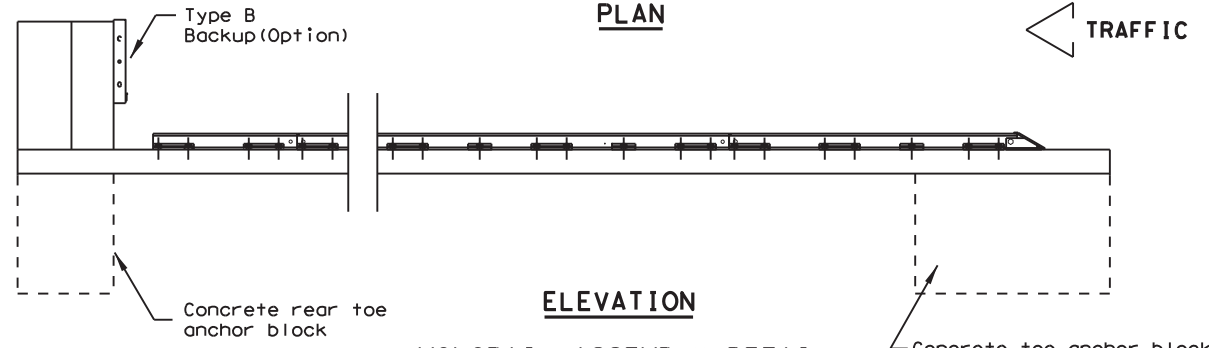
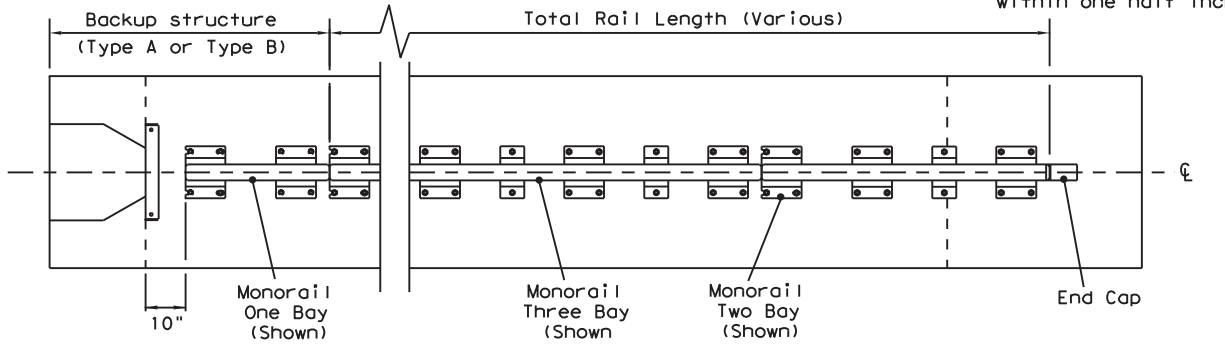
Design Division Standard

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DATE:
FILE:



QUADGUARD II SYSTEM DETAIL



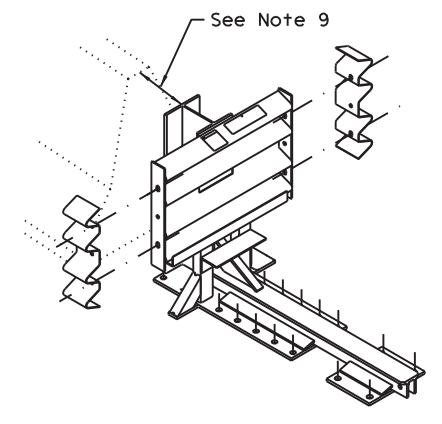
MONORAIL ASSEMBLY DETAIL

(See the manufacturer's shop drawings for monorail hardware installation.)

QUADGUARD II (NARROW) SYSTEM				
Test Level	NO. OF BAYS	UNIT EFFECTIVE LENGTH	PAD LENGTH TYPE A	PAD LENGTH TYPE B
TL-2	2	8'- 8"	9'- 0"	8'- 6"
TL-3	5	17'- 8"	18'- 0"	17'- 6"
70	8	26'- 8"	27'- 0"	26'- 6"

Additional bays may be added if special considerations warrant and site conditions will accommodate additional length.

QUAD II (N) units are available in 24", 30", or 36" widths from 2 to 8 bays. Unit width, number of bays, and backup type shall be specified elsewhere in the plans.



TENSION STRUT: Consists of diagonal struts, connections, and accessories, as detailed by the Manufacturer, located at the rear of the QUAD unit. Typical application is for QUAD units attached to double-face quadrail. When used, a 4'-0" x 4'-0" x 3'-0" concrete toe anchor block shall be provided beneath the front portion of the concrete pad, except where the QUAD unit is to be placed on continuously reinforced concrete pavement or bridge deck (7" minimum, 4,000 p.s.i.) or non-reinforced concrete pavement (8" minimum, 4,000 p.s.i.)

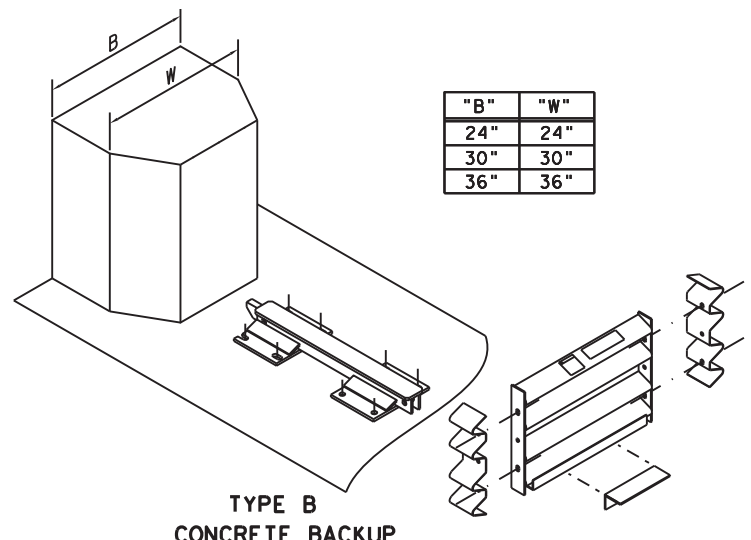
Anchorage requirements are as follows:

WITH FOUNDATION TYPE:	ANCHOR WITH:
Minimum six inch portland cement concrete pad	MP-3 polyester anchoring system with 7" studs, 5.5" embedment
Minimum three inch asphaltic concrete over minimum three inch portland cement concrete	MP-3 polyester anchoring system with 18" studs, 16.5" embedment
Minimum six inch asphaltic concrete over minimum six inch compacted base	MP-3 polyester anchoring system with 18" studs, 16.5" embedment
Minimum eight inch asphaltic concrete	MP-3 polyester anchoring system with 18" studs, 16.5" embedment

If the unit is anchored to asphaltic concrete, it should be relocated to fresh, undisturbed asphalt and re-anchored after each impact to ensure adequate future performance. A zero clearance between the backup and barrier wall is recommended in no case should this distance exceed 7 inches.

GENERAL NOTES

- For additional information contact Energy Absorption Systems Inc. at (888)323-6374.
- For bi-directional traffic, appropriate transition panels will be required.
- Details of components for the QUAD and backups and reinforcing details will be shown on the manufacturer's shop drawings furnished to the Engineer.
- Concrete shall be class "S" with a minimum compressive strength of 4,000 p.s.i.
- If the cross-slope varies more than 2% over the length of the system, the concrete pad will require levelling. Maximum permissible cross-slope is 8%.
- The installation area should be free from curbs, elevated objects, or depressions.
- The QUAD system should be approximately parallel with the barrier or ϕ of merging barriers.
- Unit width selected should be adequate to protect an errant vehicle travelling at 15 degrees to the roadway from the face or corner of the fixed object.
- For the permanent steel backup, (Type A) the distance between the back of backup and the barrier wall should not exceed 7 inches in any case.



CAST-IN-PLACE CONCRETE WALL BACKUP: If cast-in-place structures such as bridge parapets, columns, or special walls are used as backup structures, then intermediate walls shall be provided between the structures and the QUAD unit. Intermediate walls shall be equal in height and width to the QUAD unit and reinforced with a steel cage. A cast-in-place transition section from concrete barrier may be used. Reinforcing steel should transition from the standard barrier section to the standard backup section. Details for the intermediate walls, cast-in-place transition sections, or other modifications will be shown elsewhere in the plans. Concrete wall backups may be used on continuously reinforced concrete pavement or bridge deck (7" minimum, 4,000 p.s.i.) or non-reinforced concrete pavement (8" minimum, 4,000 p.s.i.) In those cases, all vertical steel will be doweled (5 inch minimum) into existing decks or located and placed prior to pouring proposed decks as approved by the Engineer.

Texas Department of Transportation
Design Division Standard

QUADGUARD II SYSTEM (NARROW)

QUAD (N) - 13

FILE: quadh13.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	OOI	VAR.
REVISED JUNE, 2013 (VP)	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	253	

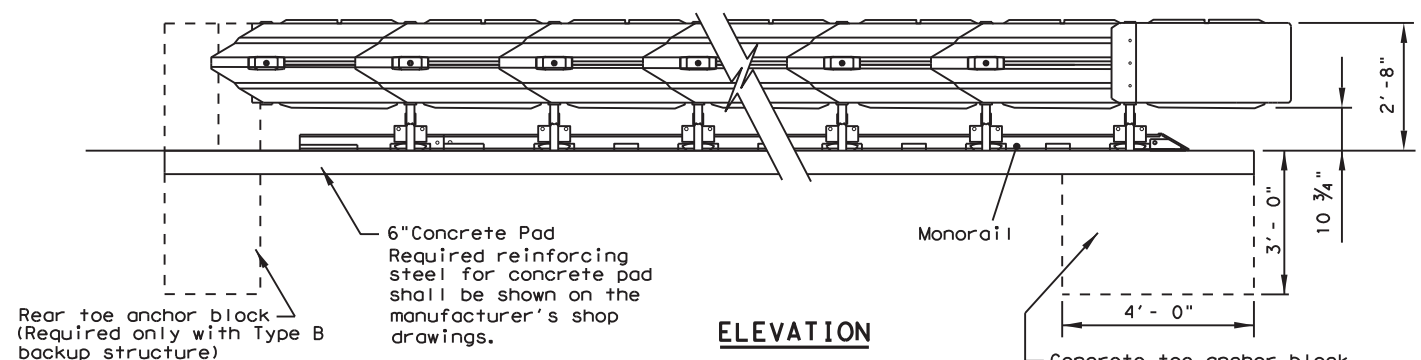
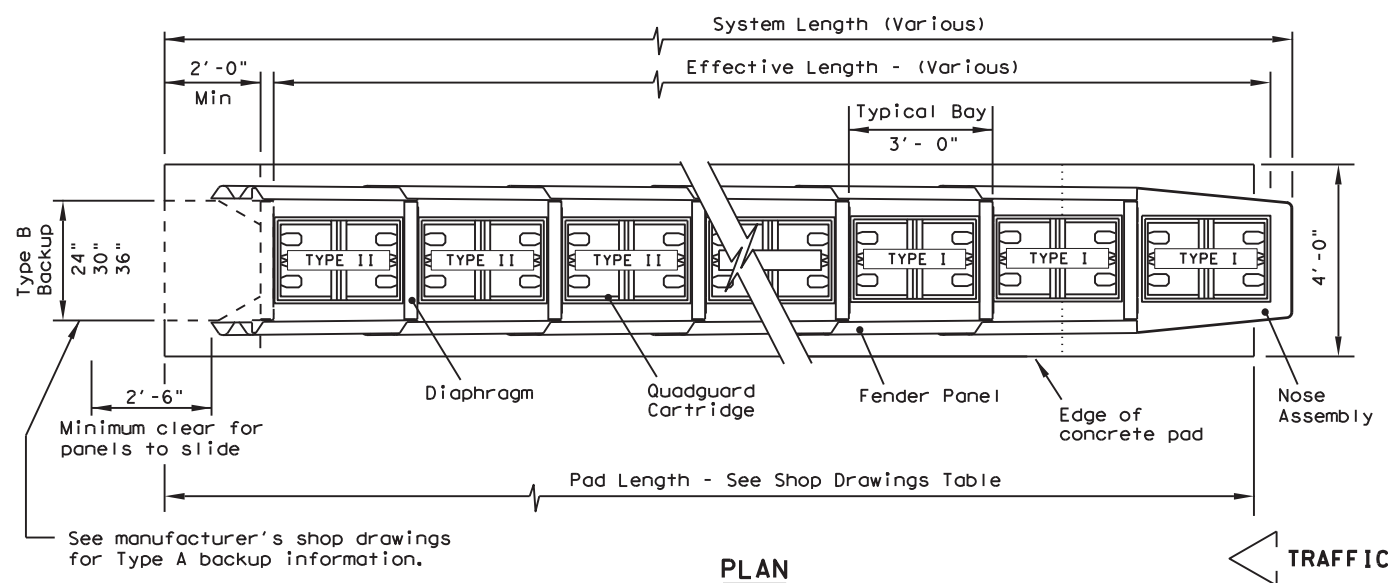
GENERAL NOTES

- For additional information contact Energy Absorption Systems Inc. at (888)323-6374.
- For bi-directional traffic, appropriate transition panels will be required.
- Details of components for the QUAD and backups and reinforcing details will be shown on the manufacturer's shop drawings furnished to the Engineer.
- Concrete shall be class "S" with a minimum compressive strength of 4,000 p.s.i.
- If the cross-slope varies more than 2% over the length of the system, the concrete pad will require levelling. Maximum permissible cross-slope is 8%.
- The installation area should be free from curbs, elevated objects, or depressions.
- The QUAD system should be approximately parallel with the barrier or ϕ of merging barriers.
- Unit width selected should be adequate to protect an errant vehicle travelling at 15 degrees to the roadway from the face or corner of the fixed object.
- For the permanent steel backup, (Type A) the distance between the back of backup and the barrier wall should not exceed 7 inches in any case.

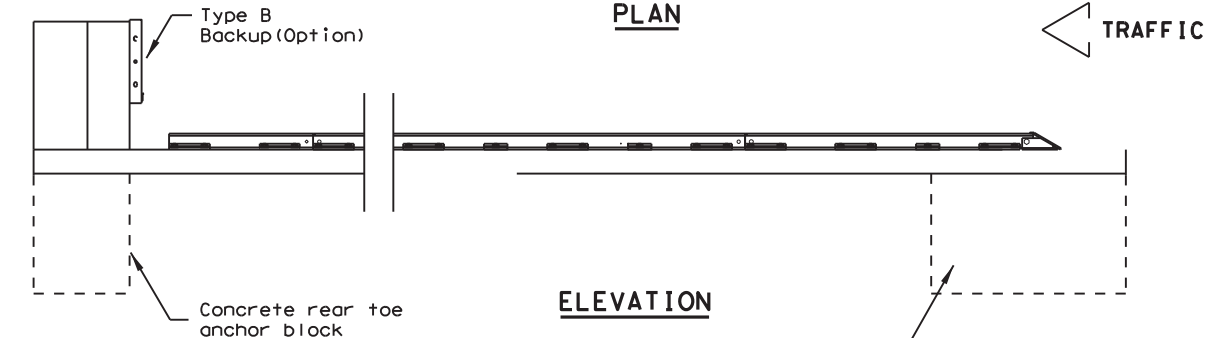
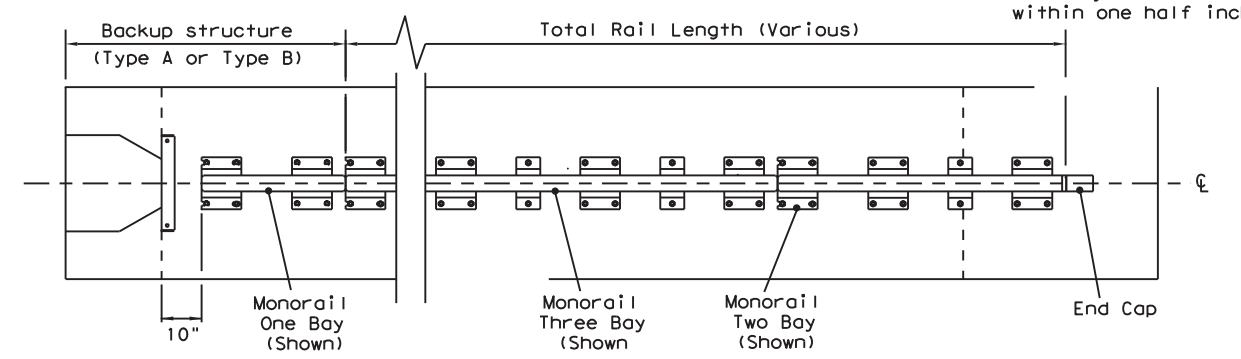
QUADGUARD II (NARROW) SYSTEM				
DESIGN SPEED (MPH)	NO. OF BAYS	UNIT EFFECTIVE LENGTH	PAD LENGTH TYPE A	PAD LENGTH TYPE B
45 OR LESS	2	8'- 8"	9'- 0"	8'- 6"
50	3	11'- 8"	12'- 0"	11'- 6"
55	4	14'- 8"	15'- 0"	14'- 6"
60	5	17'- 8"	18'- 0"	17'- 6"
65	6	20'- 8"	21'- 0"	20'- 6"
70	8	26'- 8"	27'- 0"	26'- 6"

Additional bays may be added if special considerations warrant and site conditions will accommodate additional length.

QUAD(N) units are available in 24", 30", or 36" widths from 3 to 12 bays. Unit width, number of bays, and backup type shall be specified elsewhere in the plans.

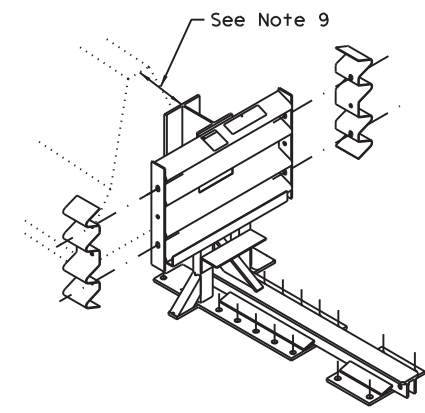


QUADGUARD II SYSTEM DETAIL



MONORAIL ASSEMBLY DETAIL

(See the manufacturer's shop drawings for monorail hardware installation.)



TYPE A TENSION STRUT BACKUP

TENSION STRUT: Consists of diagonal struts, connections, and accessories, as detailed by the Manufacturer, located at the rear of the QUAD unit. Typical application is for QUAD units attached to double-face quadrail. When used, a 4'-0" x 4'-0" x 3'-0" concrete toe anchor block shall be provided beneath the front portion of the concrete pad, except where the QUAD unit is to be placed on continuously reinforced concrete pavement or bridge deck (7" minimum, 4,000 p.s.i.) or non-reinforced concrete pavement (8" minimum, 4,000 p.s.i.)

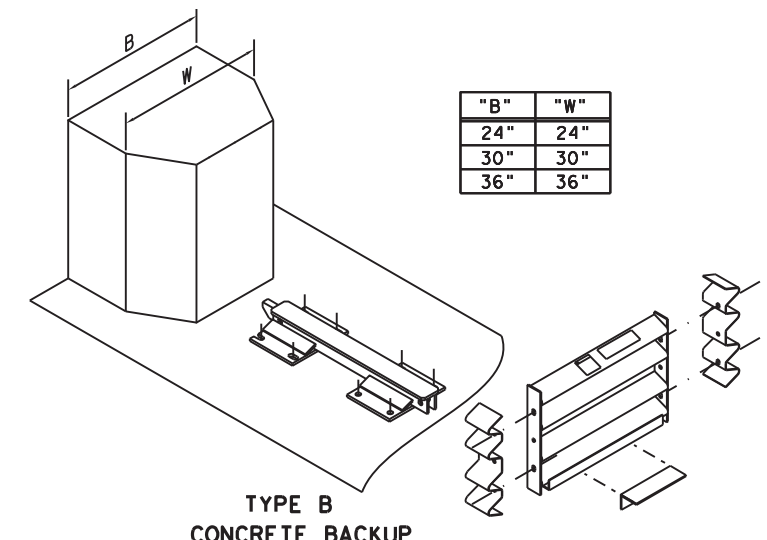
TYPE CZ CONSTRUCTION ZONE UNIT

CONSTRUCTION ZONE UNIT: Details for the components will be included on the manufacturer's shop drawings furnished to the Engineer. (3 to 8 Bay lengths)

Anchorage requirements are as follows: (Type CZ only)

WITH FOUNDATION TYPE:	ANCHOR WITH:
Minimum six inch portland cement concrete pad	MP-3 polyester anchoring system with 7" studs, 5.5" embedment
Minimum three inch asphaltic concrete over minimum three inch portland cement concrete	MP-3 polyester anchoring system with 18" studs, 16.5" embedment
Minimum six inch asphaltic concrete over minimum six inch compacted base	MP-3 polyester anchoring system with 18" studs, 16.5" embedment
Minimum eight inch asphaltic concrete	MP-3 polyester anchoring system with 18" studs, 16.5" embedment

If the unit is anchored to asphaltic concrete, it should be relocated to fresh, undisturbed asphalt and re-anchored after each impact to ensure adequate future performance. A zero clearance between the backup and barrier wall is recommended in no case should this distance exceed 7 inches.



TYPE B CAST-IN-PLACE CONCRETE BACKUP

CAST-IN-PLACE CONCRETE WALL BACKUP: If cast-in-place structures such as bridge parapets, columns, or special walls are used as backup structures, then intermediate walls shall be provided between the structures and the QUAD unit. Intermediate walls shall be equal in height and width to the QUAD unit and reinforced with a steel cage. A cast-in-place transition section from concrete barrier may be used. Reinforcing steel should transition from the standard barrier section to the standard backup section. Details for the intermediate walls, cast-in-place transition sections, or other modifications will be shown elsewhere in the plans. Concrete wall backups may be used on continuously reinforced concrete pavement or bridge deck (7" minimum, 4,000 p.s.i.) or non-reinforced concrete pavement (8" minimum, 4,000 p.s.i.) in those cases, all vertical steel will be doweled (5 inch minimum) into existing decks or located and placed prior to pouring proposed decks as approved by the Engineer.

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.

LEVELS DISPLAYED
1

Texas Department of Transportation
Design Division (Roadway)

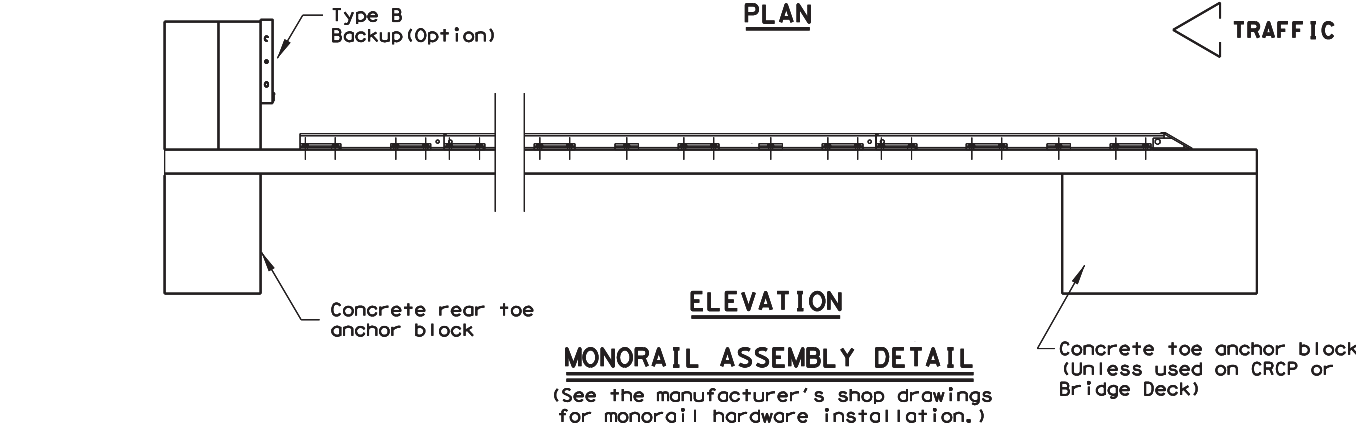
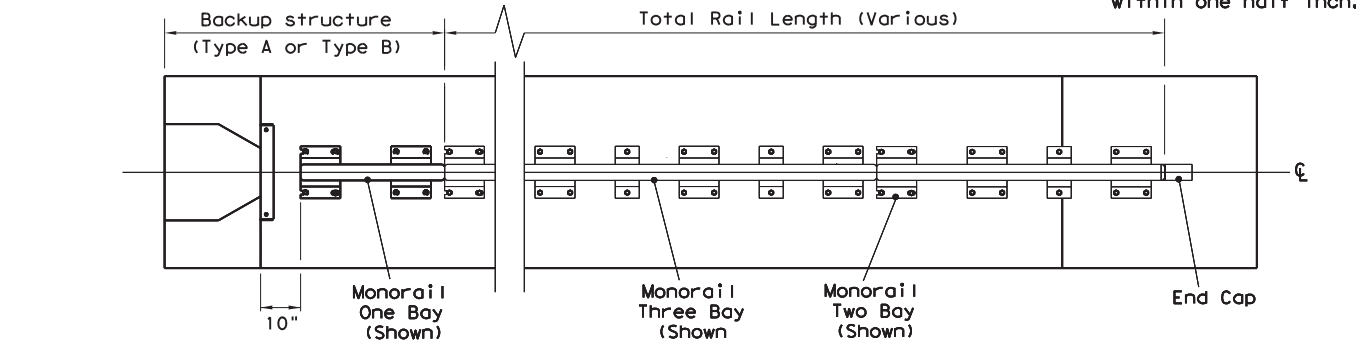
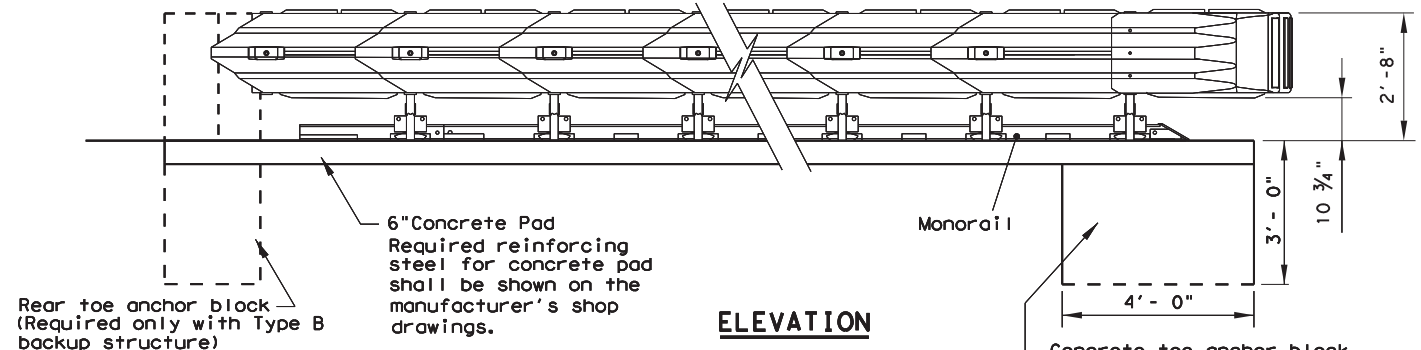
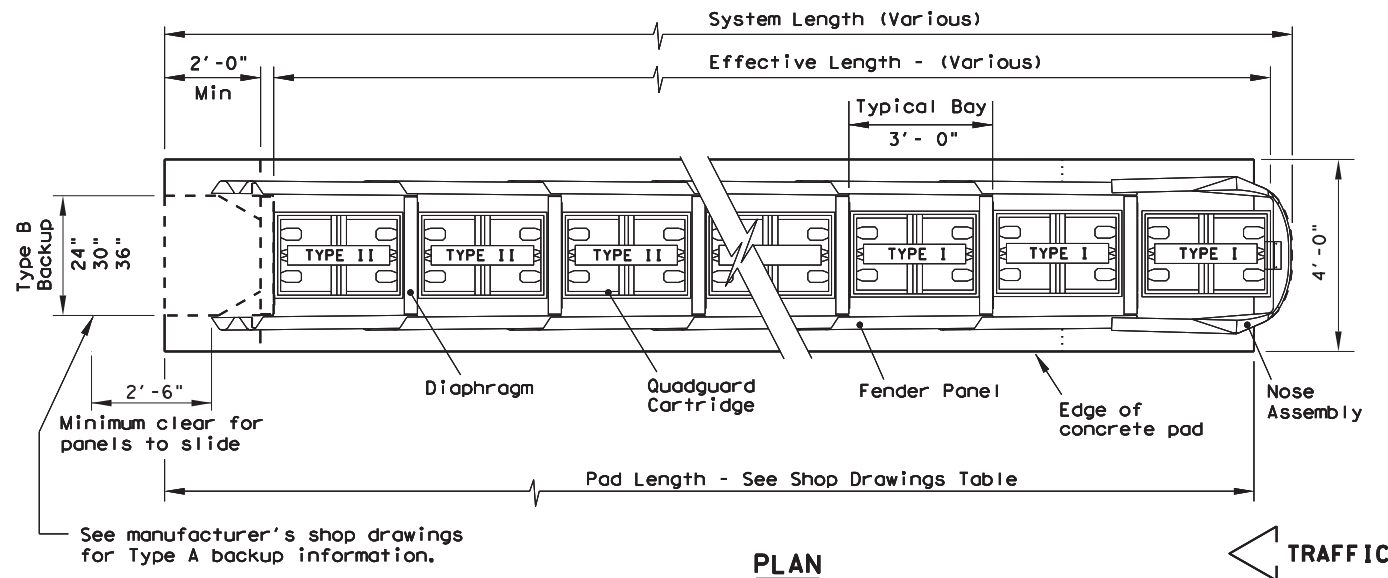
QUADGUARD II SYSTEM (NARROW)

QUAD (N) - 10

FILE: quadr10.dgn	DW: MAM	CK: MAM	DW: BGD	CK:
© TxDOT FEBRUARY 1998		DIST	FEDERAL AID PROJECT	
REVISIONS		SAT	SHEET 254	
		COUNTY	CONTROL	SECT
		BEXAR	6372	50
		JOB	HIGHWAY	
		001	VAR.	

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.

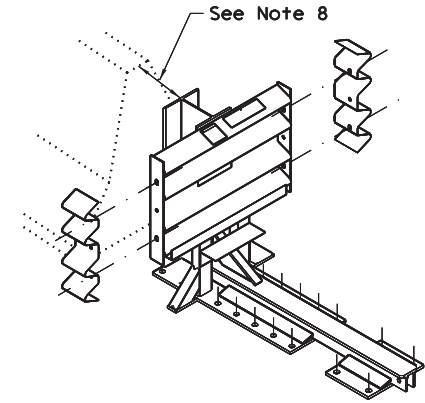
LEVELS DISPLAYED	
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DESIGN SPEED (MPH)	NO. OF BAYS	UNIT EFFECTIVE LENGTH	PAD LENGTH TYPE A	PAD LENGTH TYPE B
45 OR LESS	3	11'- 8"	12'- 0"	11'- 6"
50	4	14'- 8"	15'- 0"	14'- 6"
55	5	17'- 8"	18'- 0"	17'- 6"
60	6	20'- 8"	21'- 0"	20'- 6"
65	7	23'- 8"	24'- 0"	23'- 6"
70	9	29'- 8"	30'- 0"	29'- 6"
75	10	32'- 8"	33'- 0"	32'- 6"

Additional bays may be added if special considerations warrant and site conditions will accommodate additional length.

QUAD(N) units are available in 24", 30", or 36" widths from 3 to 12 bays. Unit width, number of bays, and backup type shall be specified elsewhere in the plans.



TYPE A TENSION STRUT BACKUP

TENSION STRUT: Consists of diagonal struts, connections, and accessories, as detailed by the Manufacturer, located at the rear of the QUAD unit. Typical application is for QUAD units attached to double-face quadrail. When used, a 4'-0"x 4'-0"x 3'-0" concrete toe anchor block shall be provided beneath the front portion of the concrete pad, except where the QUAD unit is to be placed on continuously reinforced concrete pavement or bridge deck (7" minimum, 4,000 p.s.i.) or non-reinforced concrete pavement (8" minimum, 4,000 p.s.i.)

TYPE CZ CONSTRUCTION ZONE UNIT

CONSTRUCTION ZONE UNIT: Details for the components will be included on the manufacturer's shop drawings furnished to the Engineer. (3 to 9 Bay lengths)

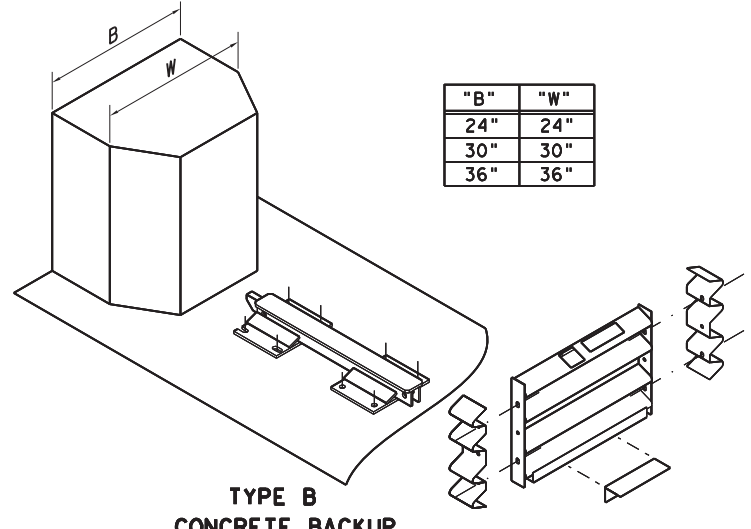
Anchorage requirements are as follows: (Type CZ only)

WITH FOUNDATION TYPE:	ANCHOR WITH:
Minimum six inch portland cement concrete pad	MP-3 polyester anchoring system with 7" studs, 5.5" embedment
Minimum three inch asphaltic concrete over minimum three inch portland cement concrete	MP-3 polyester anchoring system with 18" studs, 16.5" embedment
Minimum six inch asphaltic concrete over minimum six inch compacted base	MP-3 polyester anchoring system with 18" studs, 16.5" embedment
Minimum eight inch asphaltic concrete	MP-3 polyester anchoring system with 18" studs, 16.5" embedment

If the unit is anchored to asphaltic concrete, it should be relocated to fresh, undisturbed asphalt and re-anchored after each impact to ensure adequate future performance. A zero clearance between the backup and barrier wall is recommended in no case should this distance exceed 7 inches.

GENERAL NOTES

- For bi-directional traffic, appropriate transition panels will be required.
- Details of components for the QUAD and backups and reinforcing details will be shown on the manufacturer's shop drawings furnished to the Engineer.
- Concrete shall be class "S" with a minimum compressive strength of 4,000 p.s.i.
- If the cross-slope varies more than 2% over the length of the system, the concrete pad will require levelling. Maximum permissible cross-slope is 8%.
- The installation area should be free from curbs, elevated objects, or depressions.
- The QUAD system should be approximately parallel with the barrier or ϕ of merging barriers.
- Unit width selected should be adequate to protect an errant vehicle travelling at 15 degrees to the roadway from the face or corner of the fixed object.
- For the permanent steel backup, (Type A) the distance between the back of backup and the barrier wall should not exceed 7 inches in any case.



TYPE B CONCRETE BACKUP

CAST-IN-PLACE CONCRETE WALL BACKUP: If cast-in-place structures such as bridge parapets, columns, or special walls are used as backup structures, then intermediate walls shall be provided between the structures and the QUAD unit. Intermediate walls shall be equal in height and width to the QUAD unit and reinforced with a steel cage. A cast-in-place transition section from concrete barrier may be used. Reinforcing steel should transition from the standard barrier section to the standard backup section. Details for the intermediate walls, cast-in-place transition sections, or other modifications will be shown elsewhere in the plans. Concrete wall backups may be used on continuously reinforced concrete pavement or bridge deck (7" minimum, 4,000 p.s.i.) or non-reinforced concrete pavement (8" minimum, 4,000 p.s.i.) In those cases, all vertical steel will be doweled (5 inch minimum) into existing decks or located and placed prior to pouring proposed decks as approved by the Engineer.

Texas Department of Transportation
Design Division (Roadway)

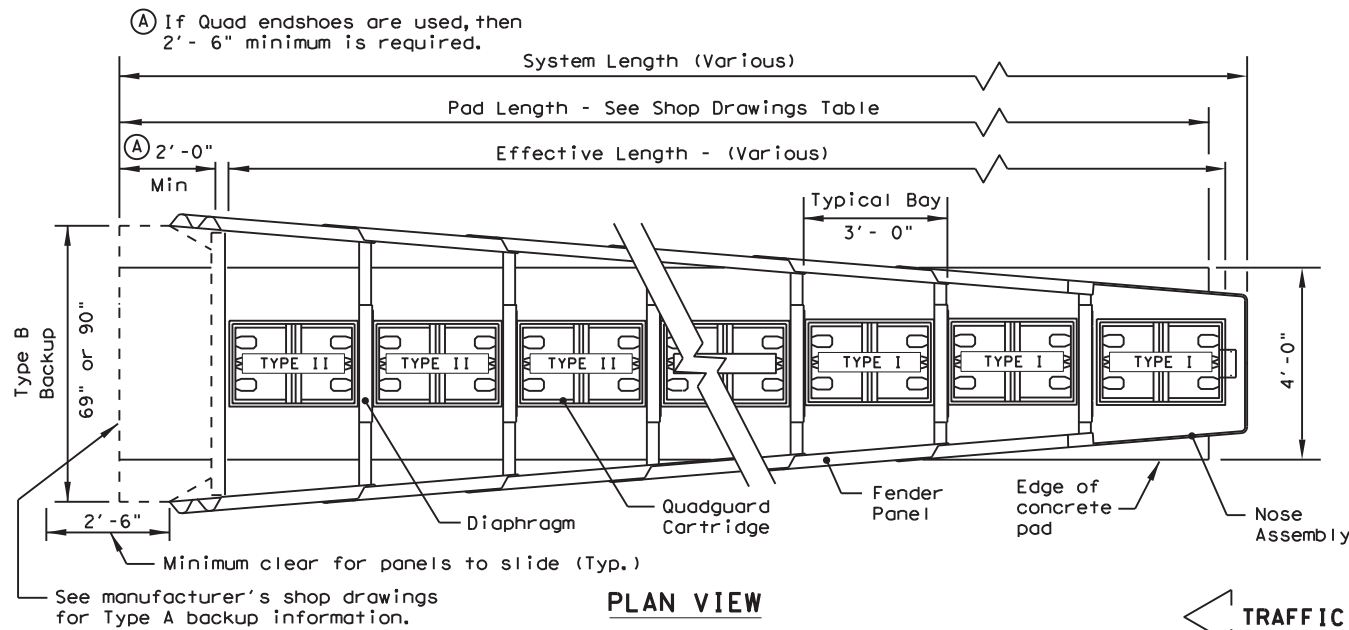
QUADGUARD SYSTEM (NARROW)

QUAD (N) - 99

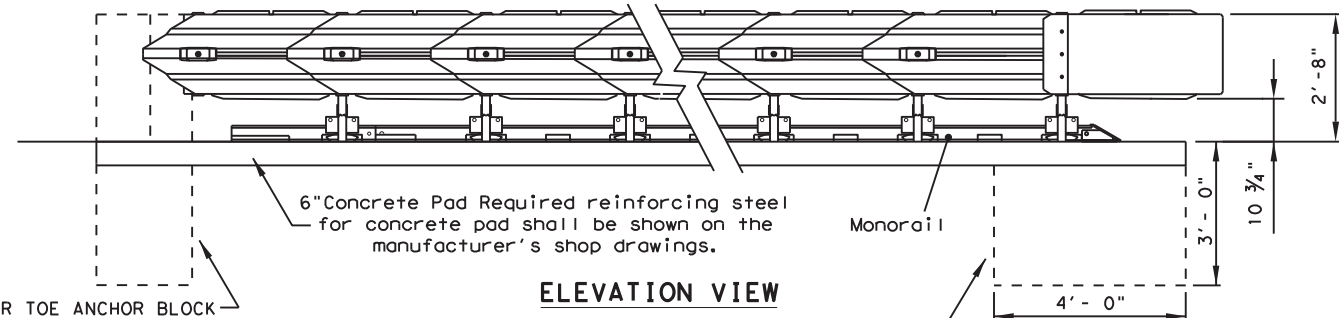
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© TxDOT FEBRUARY 1998	DIST	FEDERAL AID PROJECT		
REVISIONS	SAT	SHEET 255		
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	BEXAR	6372	50	001
				VAR.

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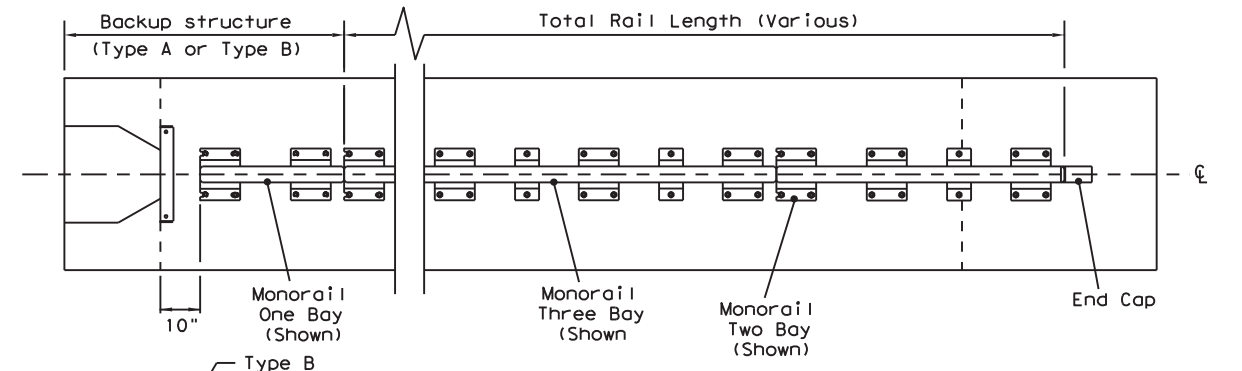
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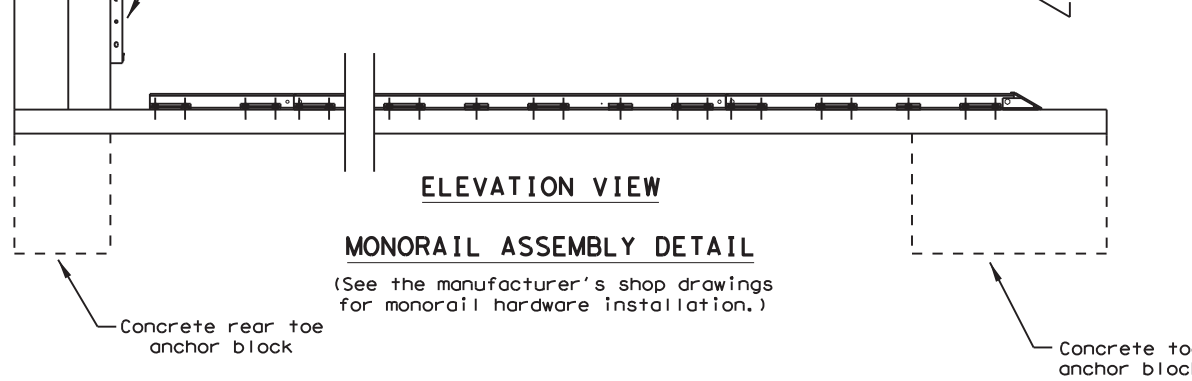
PLAN VIEW



ELEVATION VIEW
 QUADGUARD II SYSTEM DETAIL



PLAN VIEW

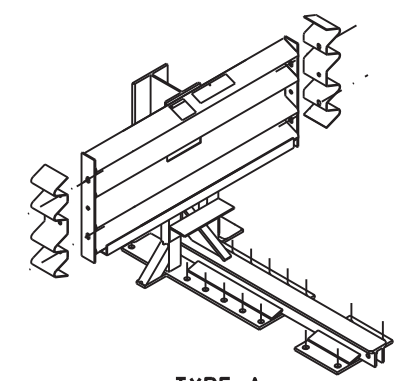


ELEVATION VIEW
 MONORAIL ASSEMBLY DETAIL

QUADGUARD II (WIDE) SYSTEM				
Test Level	NO. OF BAYS	UNIT EFFECTIVE LENGTH	PAD LENGTH TYPE A	PAD LENGTH TYPE B
TL-2	3	11'- 8"	12'- 0"	11'- 6"
TL-3	5	17'- 8"	18'- 0"	17'- 6"
70	8	26'- 8"	27'- 0"	26'- 6"

Additional bays may be added if special considerations warrant and site conditions will accommodate additional length.

QUAD II (W) units are available in 69" and 90" widths from 3 to 8 bays. Unit width, number of bays, and backup type shall be specified elsewhere in the plans.



TYPE A
 TENSION STRUT BACKUP

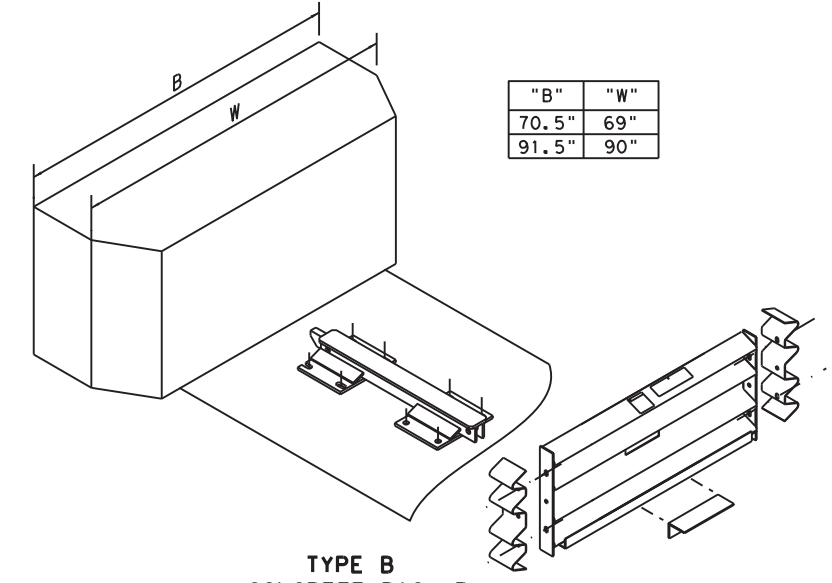
TENSION STRUT: Consists of diagonal struts, connections, and accessories, as detailed by the Manufacturer, located at the rear of the QUAD unit. Typical application is for QUAD units attached to double-face quadrail. When used, a 4'-0"x 4'-0"x 3'-0" concrete toe anchor block shall be provided beneath the front portion of the concrete pad, except where the QUAD unit is to be placed on continuously reinforced concrete pavement or bridge deck (7" minimum, 4,000 p.s.i.) or non-reinforced concrete pavement (8" minimum, 4,000 p.s.i.)

Anchorage requirements are as follows:

WITH FOUNDATION TYPE:	ANCHOR WITH:
Minimum six inch portland cement concrete pad	MP-3 polyester anchoring system with 7" studs, 5.5" embedment

GENERAL NOTES

- For specific information regarding installation and technical guidance of the system, contact: Trinity Highway - Energy Absorption at 1(888)323-6374. 70 W. Madison St. Suite 2350. Chicago, IL 60602
- For bi-directional traffic, appropriate transition panels will be required.
- Details of components for the QUAD and backups and reinforcing details will be shown on the manufacturer's shop drawings furnished to the Engineer.
- Concrete shall be class "S" with a minimum compressive strength of 4,000 p.s.i.
- If the cross-slope varies more than 2% over the length of the system, the concrete pad will require leveling. Maximum permissible cross-slope is 8%.
- The installation area should be free from curbs, elevated objects, or depressions.
- The QUAD system should be approximately parallel with the barrier or ϕ of merging barriers.
- Unit width selected should be adequate to protect an errant vehicle travelling at 15 degrees to the roadway from the face or corner of the fixed object.



TYPE B
 CONCRETE BACKUP

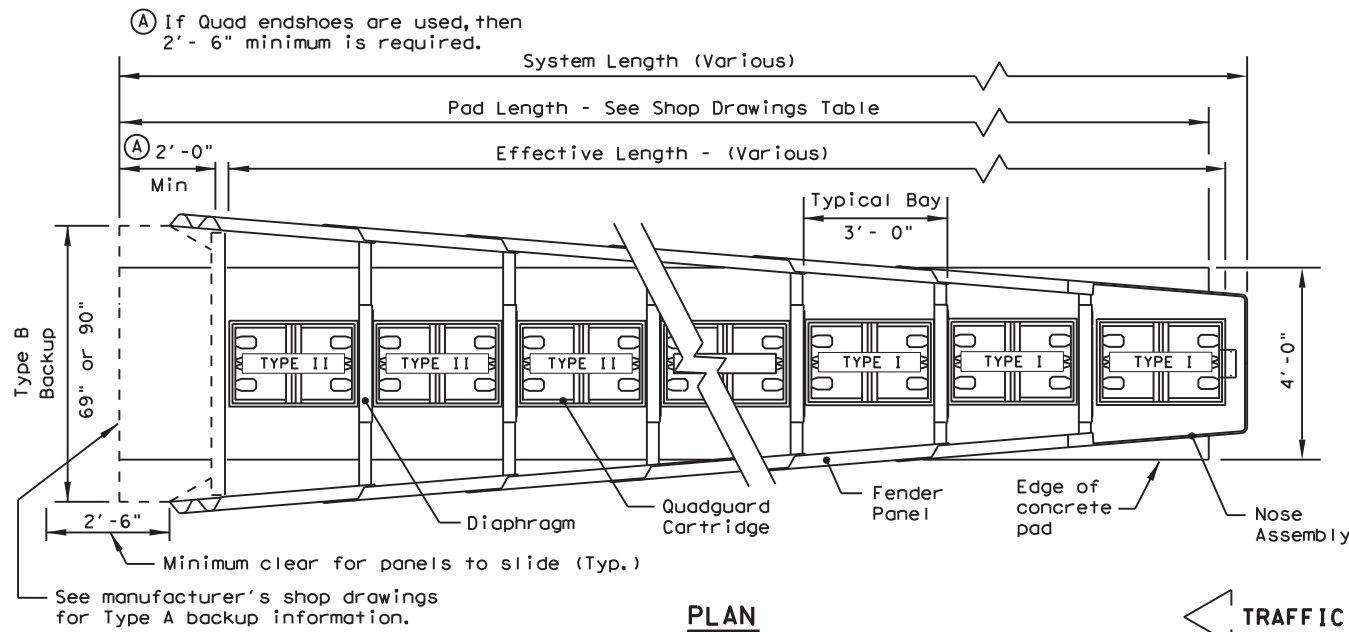
CAST-IN-PLACE CONCRETE WALL BACKUP: If cast-in-place structures such as bridge parapets, columns, or special walls are used as backup structures, then intermediate walls shall be provided between the structures and the QUAD unit. Intermediate walls shall be equal in height and width to the QUAD unit and reinforced with a steel cage. A cast-in-place transition section from concrete barrier may be used. Reinforcing steel should transition from the standard barrier section to the standard backup section. Details for the intermediate walls, cast-in-place transition sections, or other modifications will be shown elsewhere in the plans. Concrete wall backups may be used on continuously reinforced concrete pavement or bridge deck (7" minimum, 4,000 p.s.i.) or non-reinforced concrete pavement (8" minimum, 4,000 p.s.i.) In those cases, all vertical steel will be doweled (5 inch minimum) into existing decks or located and placed prior to pouring proposed decks as approved by the Engineer.

REUSABLE

				Design Division Standard	
TRINITY HIGHWAY ENERGY ABSORPTION (QUADGUARD II) (WIDE) QUAD (W) - 16					
FILE: quadw16.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP	
© TxDOT: February 1998	CONT	SECT	JOB	HIGHWAY	
	6372	50	001	VAR.	
REVISIONS					
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REVISED 03, 2016 (VP)					
DIST	COUNTY			SHEET NO.	
SAT	BEXAR			256	

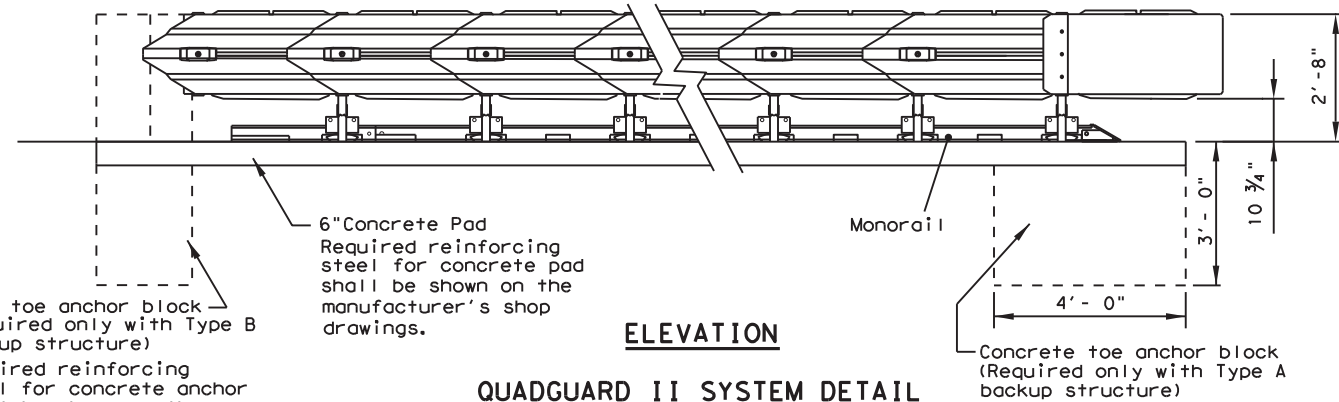
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

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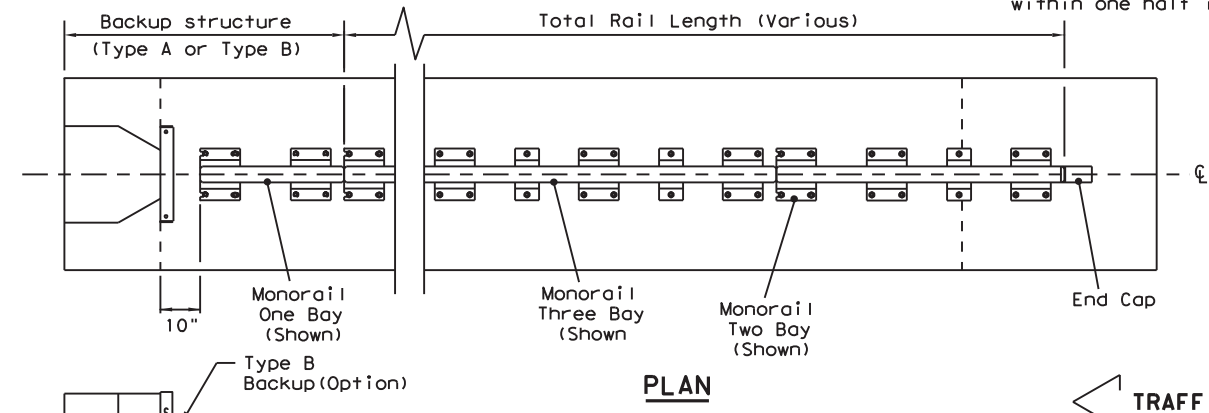
PLAN

TRAFFIC



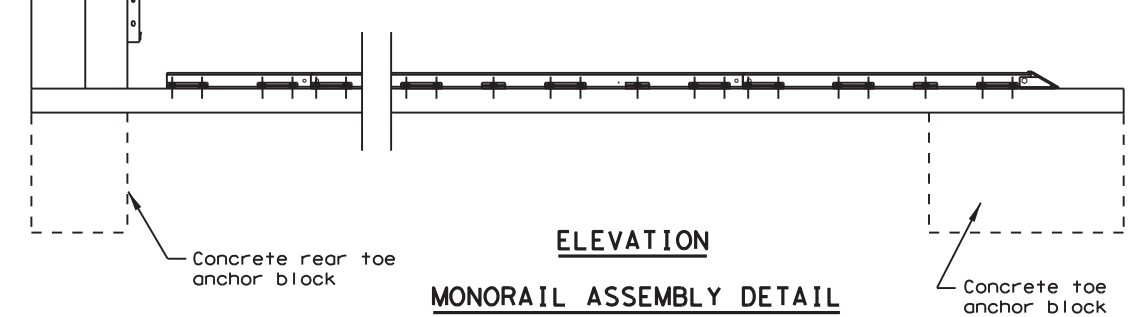
ELEVATION

QUADGUARD II SYSTEM DETAIL



PLAN

TRAFFIC



ELEVATION

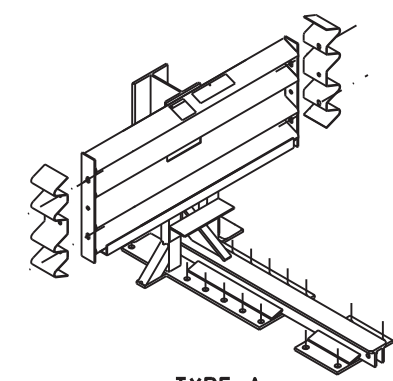
MONORAIL ASSEMBLY DETAIL

(See the manufacturer's shop drawings for monorail hardware installation.)

QUADGUARD II (WIDE) SYSTEM				
Test Level	NO. OF BAYS	UNIT EFFECTIVE LENGTH	PAD LENGTH TYPE A	PAD LENGTH TYPE B
TL-2	3	11'- 8"	12'- 0"	11'- 6"
TL-3	5	17'- 8"	18'- 0"	17'- 6"
70	8	26'- 8"	27'- 0"	26'- 6"

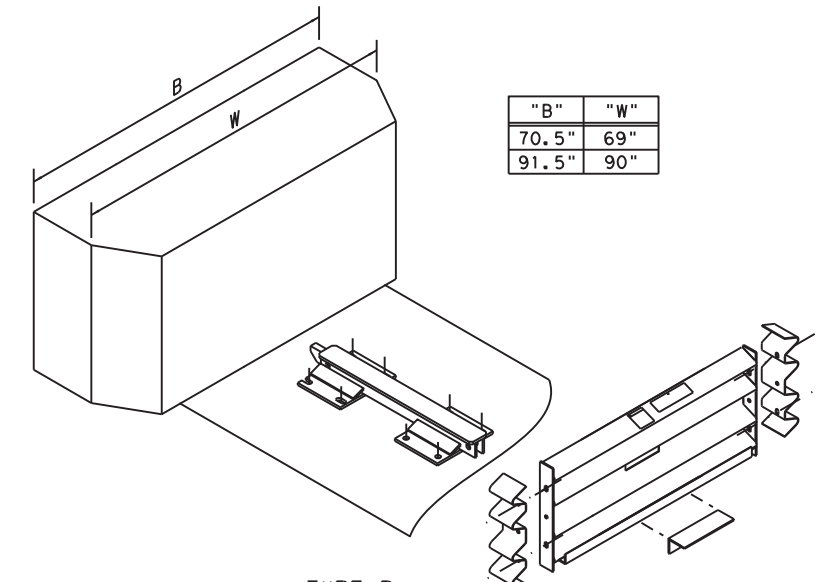
Additional bays may be added if special considerations warrant and site conditions will accommodate additional length.

QUAD II (W) units are available in 69" and 90" widths from 3 to 8 bays. Unit width, number of bays, and backup type shall be specified elsewhere in the plans.



TYPE A TENSION STRUT BACKUP

TENSION STRUT: Consists of diagonal struts, connections, and accessories, as detailed by the Manufacturer, located at the rear of the QUAD unit. Typical application is for QUAD units attached to double-face guardrail. When used, a 4'-0"x 4'-0"x 3'-0" concrete toe anchor block shall be provided beneath the front portion of the concrete pad, except where the QUAD unit is to be placed on continuously reinforced concrete pavement or bridge deck (7" minimum, 4,000 p.s.i.) or non-reinforced concrete pavement (8" minimum, 4,000 p.s.i.)



TYPE B CONCRETE BACKUP

CAST-IN-PLACE CONCRETE WALL BACKUP: If cast-in-place structures such as bridge parapets, columns, or special walls are used as backup structures, then intermediate walls shall be provided between the structures and the QUAD unit. Intermediate walls shall be equal in height and width to the QUAD unit and reinforced with a steel cage. A cast-in-place transition section from concrete barrier may be used. Reinforcing steel should transition from the standard barrier section to the standard backup section. Details for the intermediate walls, cast-in-place transition sections, or other modifications will be shown elsewhere in the plans. Concrete wall backups may be used on continuously reinforced concrete pavement or bridge deck (7" minimum, 4,000 p.s.i.) or non-reinforced concrete pavement (8" minimum, 4,000 p.s.i.) In those cases, all vertical steel will be doweled (5 inch minimum) into existing decks or located and placed prior to pouring proposed decks as approved by the Engineer.

Anchorage requirements are as follows:

WITH FOUNDATION TYPE:	ANCHOR WITH:
Minimum six inch portland cement concrete pad	MP-3 polyester anchoring system with 7" studs, 5.5" embedment

Texas Department of Transportation Design Division Standard

QUADGUARD II SYSTEM (WIDE) QUAD (W) - 13

FILE: quadw13.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	OO1	VAR.
REVISED JUNE, 2013 (VP)	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	257	

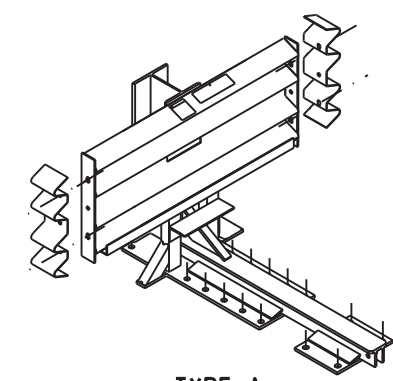
GENERAL NOTES

1. For additional information contact Energy Absorption Systems Inc. at (888)323-6374.
2. For bi-directional traffic, appropriate transition panels will be required.
3. Details of components for the QUAD and backups and reinforcing details will be shown on the manufacturer's shop drawings furnished to the Engineer.
4. Concrete shall be class "S" with a minimum compressive strength of 4,000 p.s.i.
5. If the cross-slope varies more than 2% over the length of the system, the concrete pad will require levelling. Maximum permissible cross-slope is 8%.
6. The installation area should be free from curbs, elevated objects, or depressions.
7. The QUAD system should be approximately parallel with the barrier or ϕ of merging barriers.
8. Unit width selected should be adequate to protect an errant vehicle travelling at 15 degrees to the roadway from the face or corner of the fixed object.

QUADGUARD II (WIDE) SYSTEM				
DESIGN SPEED (MPH)	NO. OF BAYS	UNIT EFFECTIVE LENGTH	PAD LENGTH TYPE A	PAD LENGTH TYPE B
50 OR LESS	3	11'- 8"	12'- 0"	11'- 6"
55	4	14'- 8"	15'- 0"	14'- 6"
60	5	17'- 8"	18'- 0"	17'- 6"
65	6	20'- 8"	21'- 0"	20'- 6"
70	8	26'- 8"	27'- 0"	26'- 6"

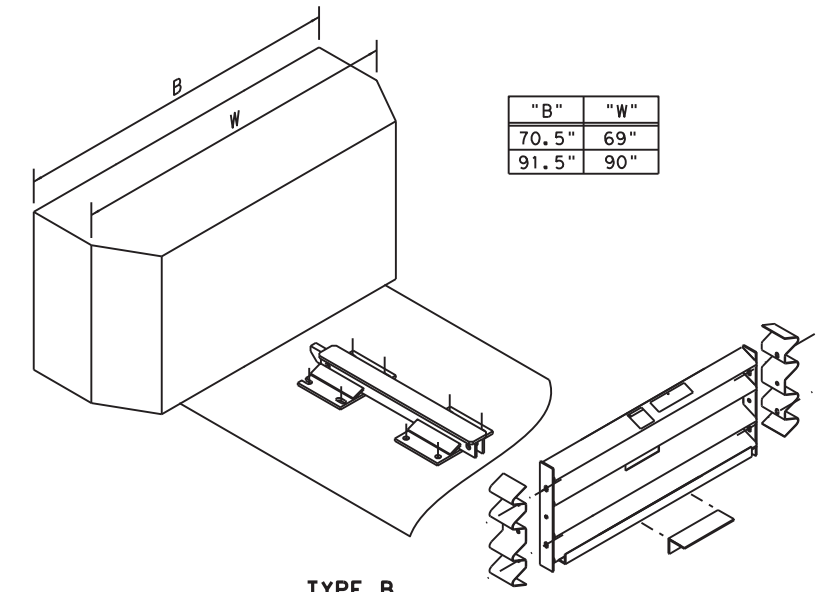
Additional bays may be added if special considerations warrant and site conditions will accommodate additional length.

QUAD(W) units are available in 69" and 90" widths from 3 to 8 bays. Unit width, number of bays, and backup type shall be specified elsewhere in the plans.



TYPE A TENSION STRUT BACKUP

TENSION STRUT: Consists of diagonal struts, connections, and accessories, as detailed by the Manufacturer, located at the rear of the QUAD unit. Typical application is for QUAD units attached to double-face guardrail. When used, a 4'-0"x 4'-0"x 3'-0" concrete toe anchor block shall be provided beneath the front portion of the concrete pad, except where the QUAD unit is to be placed on continuously reinforced concrete pavement or bridge deck (7" minimum, 4,000 p.s.i.) or non-reinforced concrete pavement (8" minimum, 4,000 p.s.i.)

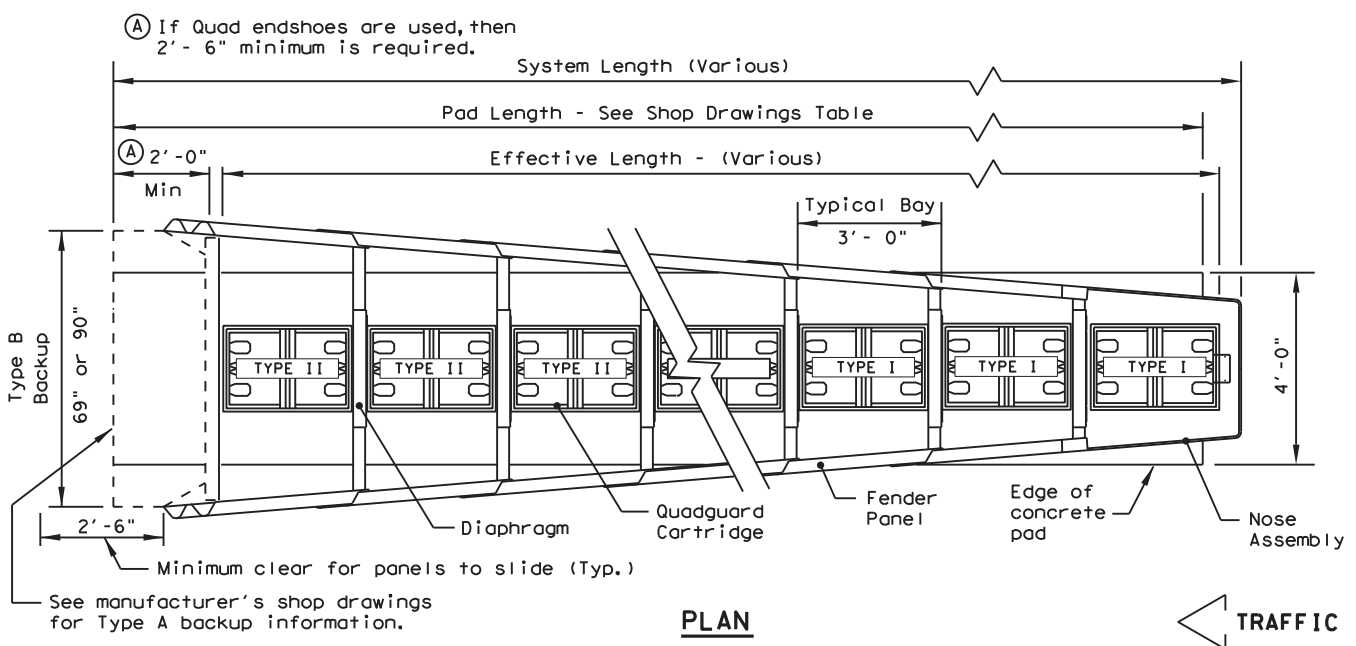


TYPE B CONCRETE BACKUP

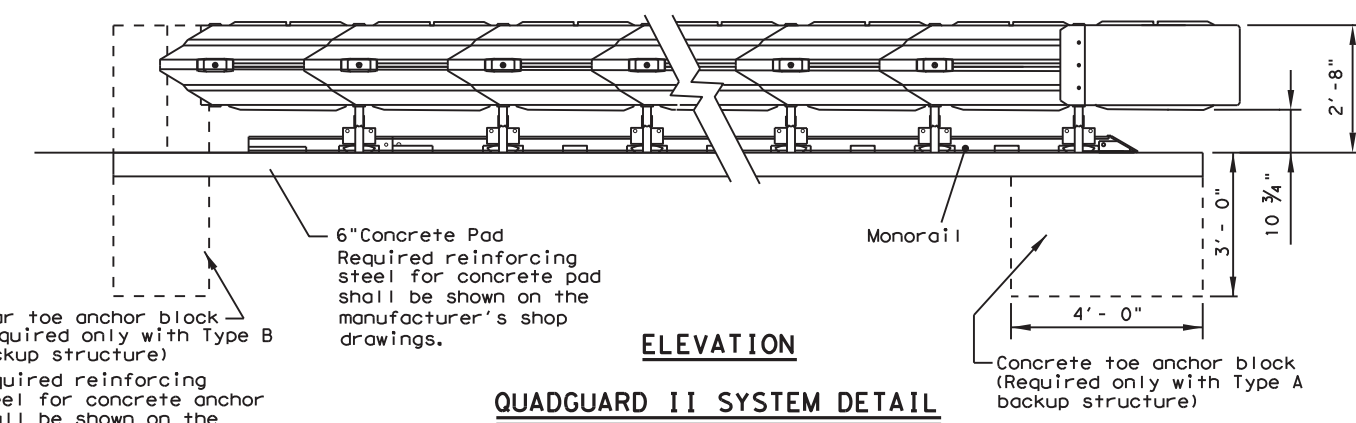
CAST-IN-PLACE CONCRETE WALL BACKUP: If cast-in-place structures such as bridge parapets, columns, or special walls are used as backup structures, then intermediate walls shall be provided between the structures and the QUAD unit. Intermediate walls shall be equal in height and width to the QUAD unit and reinforced with a steel cage. A cast-in-place transition section from concrete barrier may be used. Reinforcing steel should transition from the standard barrier section to the standard backup section. Details for the intermediate walls, cast-in-place transition sections, or other modifications will be shown elsewhere in the plans. Concrete wall backups may be used on continuously reinforced concrete pavement or bridge deck (7" minimum, 4,000 p.s.i.) or non-reinforced concrete pavement (8" minimum, 4,000 p.s.i.) In those cases, all vertical steel will be doweled (5 inch minimum) into existing decks or located and placed prior to pouring proposed decks as approved by the Engineer.

Anchorage requirements are as follows:

WITH FOUNDATION TYPE:	ANCHOR WITH:
Minimum six inch portland cement concrete pad	MP-3 polyester anchoring system with 7" studs, 5.5" embedment

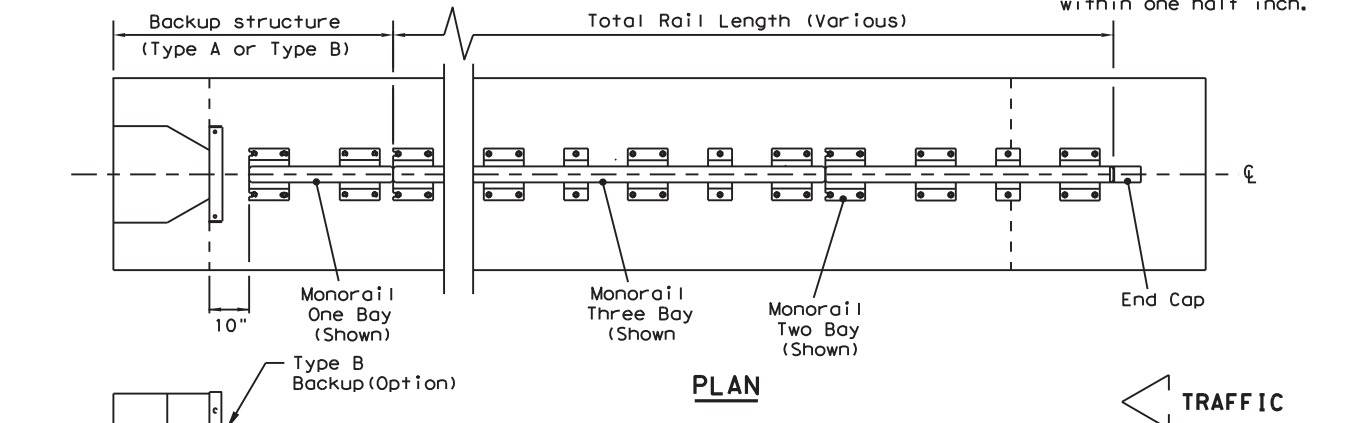


PLAN

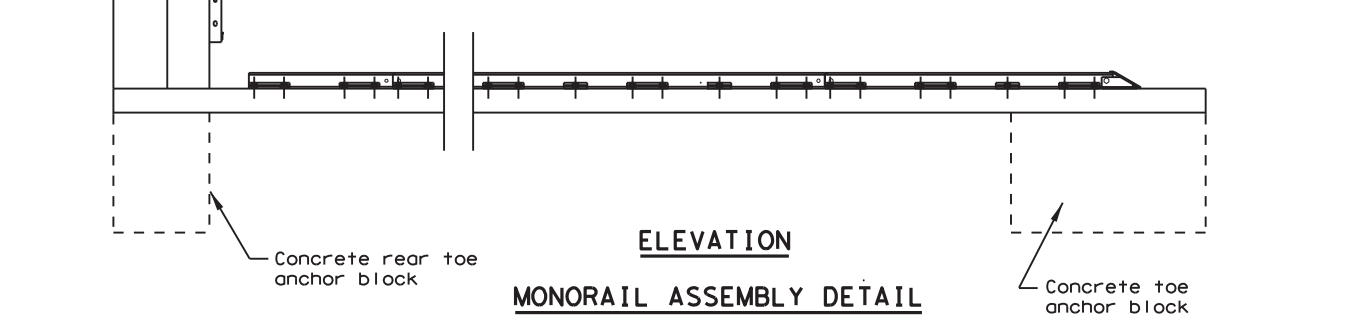


ELEVATION

QUADGUARD II SYSTEM DETAIL



PLAN



ELEVATION

MONORAIL ASSEMBLY DETAIL

(See the manufacturer's shop drawings for monorail hardware installation.)

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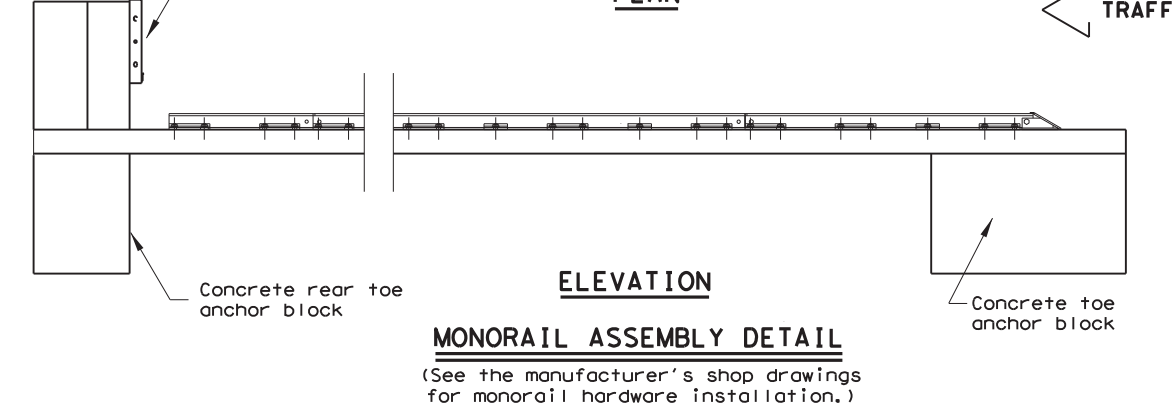
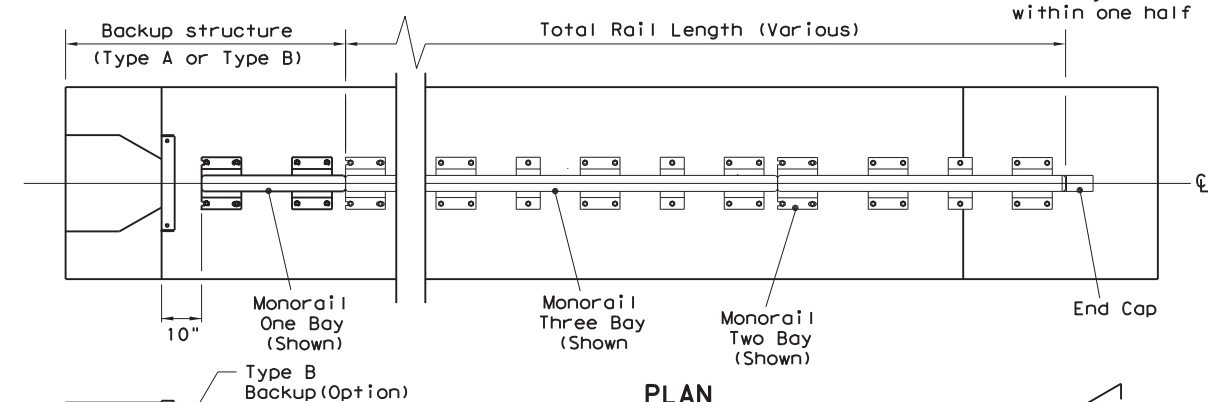
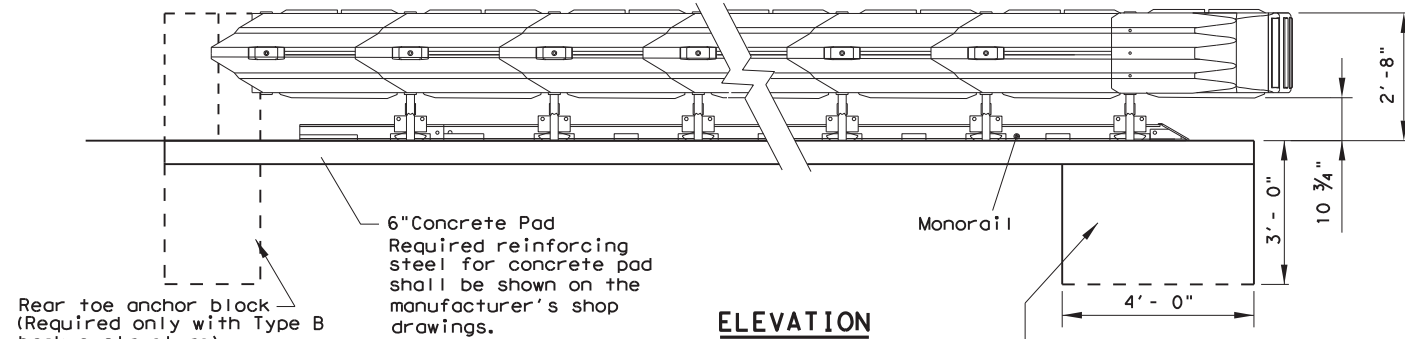
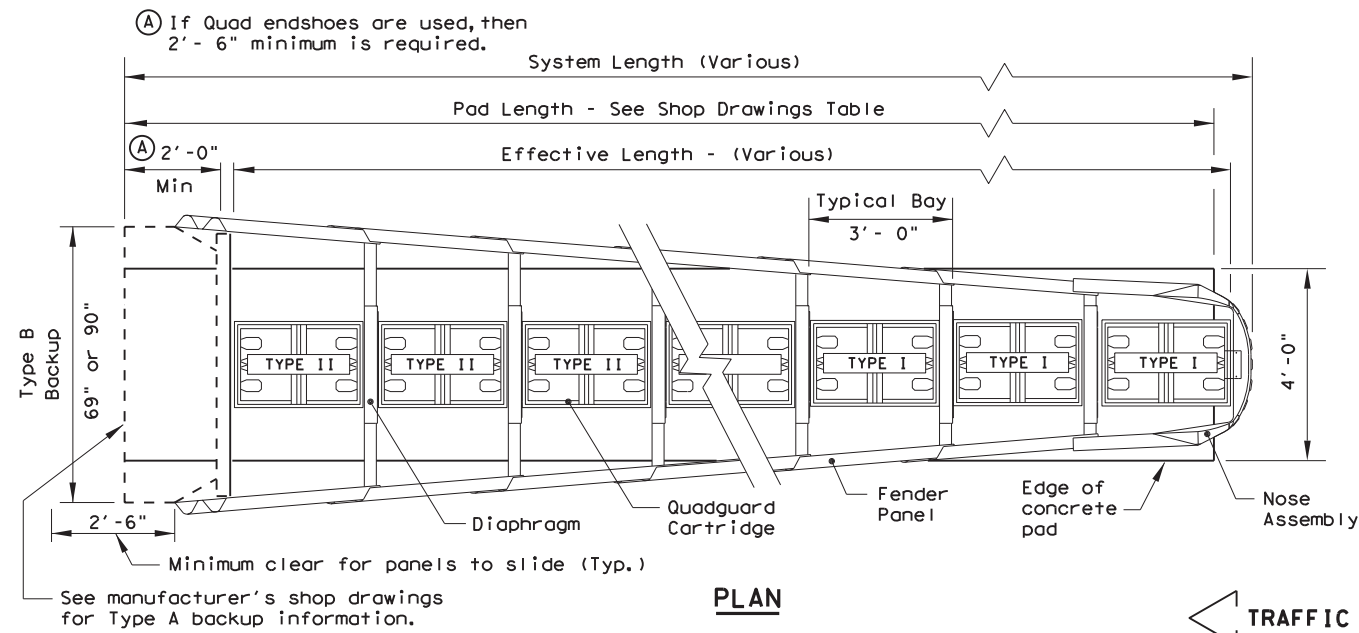
Texas Department of Transportation
 Design Division (Roadway)

QUADGUARD II SYSTEM
(WIDE)
QUAD (W) - 10

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© TxDOT FEBRUARY 1998		DIST	FEDERAL AID PROJECT	
REVISIONS		SAT	SHEET 258	
		COUNTY	CONTROL	SECT
		BEXAR	6372	50
		JOB	HIGHWAY	
		001	VAR.	

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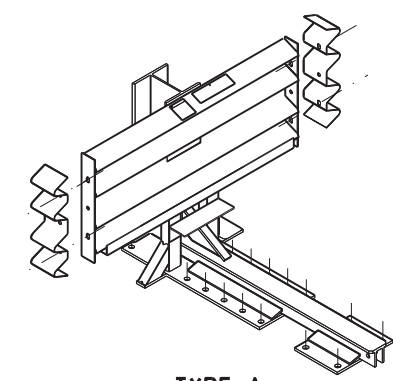
LEVELS DISPLAYED	
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DESIGN SPEED (MPH)	NO. OF BAYS	UNIT EFFECTIVE LENGTH	PAD LENGTH TYPE A	PAD LENGTH TYPE B
45 OR LESS	3	11'-8"	12'-0"	11'-6"
50	4	14'-8"	15'-0"	14'-6"
55	5	17'-8"	18'-0"	17'-6"
60	6	20'-8"	21'-0"	20'-6"
65	7	23'-8"	24'-0"	23'-6"
70	9	29'-8"	30'-0"	29'-6"
75	10	32'-8"	33'-0"	32'-6"

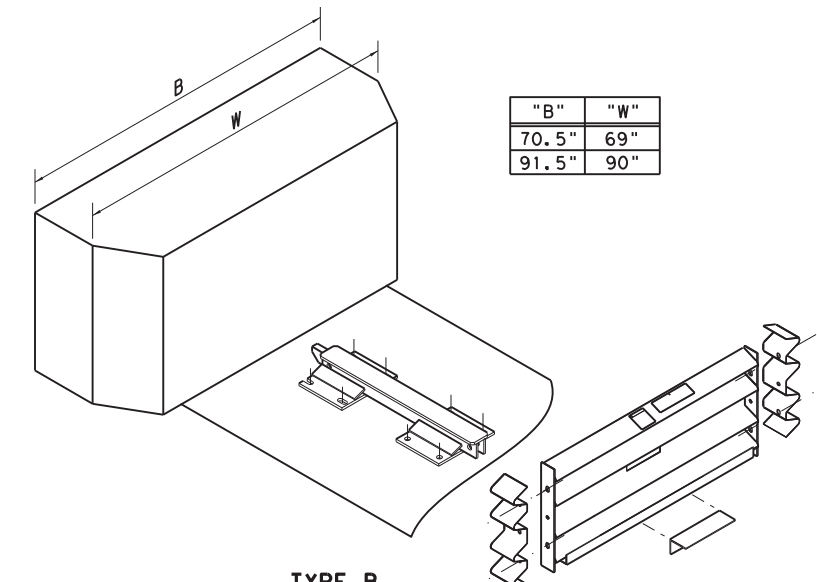
Additional bays may be added if special considerations warrant and site conditions will accommodate additional length.

QUAD(W) units are available in 69" and 90" widths from 3 to 12 bays. Unit width, number of bays, and backup type shall be specified elsewhere in the plans.



TYPE A TENSION STRUT BACKUP

TENSION STRUT: Consists of diagonal struts, connections, and accessories, as detailed by the Manufacturer, located at the rear of the QUAD unit. Typical application is for QUAD units attached to double-face quadrail. When used, a 4'-0"x 4'-0"x 3'-0" concrete toe anchor block shall be provided beneath the front portion of the concrete pad, except where the QUAD unit is to be placed on continuously reinforced concrete pavement or bridge deck (7" minimum, 4,000 p.s.i.) or non-reinforced concrete pavement (8" minimum, 4,000 p.s.i.)



TYPE B CONCRETE BACKUP

CAST-IN-PLACE CONCRETE WALL BACKUP: If cast-in-place structures such as bridge parapets, columns, or special walls are used as backup structures, then intermediate walls shall be provided between the structures and the QUAD unit. Intermediate walls shall be equal in height and width to the QUAD unit and reinforced with a steel cage. A cast-in-place transition section from concrete barrier may be used. Reinforcing steel should transition from the standard barrier section to the standard backup section. Details for the intermediate walls, cast-in-place transition sections, or other modifications will be shown elsewhere in the plans. Concrete wall backups may be used on continuously reinforced concrete pavement or bridge deck (7" minimum, 4,000 p.s.i.) or non-reinforced concrete pavement (8" minimum, 4,000 p.s.i.) In those cases, all vertical steel will be doweled (5 inch minimum) into existing decks or located and placed prior to pouring proposed decks as approved by the Engineer.

Anchorage requirements are as follows:

WITH FOUNDATION TYPE:	ANCHOR WITH:
Minimum six inch portland cement concrete pad	MP-3 polyester anchoring system with 7" studs, 5.5" embedment

GENERAL NOTES

- For bi-directional traffic, appropriate transition panels will be required.
- Details of components for the QUAD and backups and reinforcing details will be shown on the manufacturer's shop drawings furnished to the Engineer.
- Concrete shall be class "S" with a minimum compressive strength of 4,000 p.s.i.
- If the cross-slope varies more than 2% over the length of the system, the concrete pad will require levelling. Maximum permissible cross-slope is 8%.
- The installation area should be free from curbs, elevated objects, or depressions.
- The QUAD system should be approximately parallel with the barrier or centerline of merging barriers.
- Unit width selected should be adequate to protect an errant vehicle travelling at 15 degrees to the roadway from the face or corner of the fixed object.

Texas Department of Transportation
Design Division (Roadway)

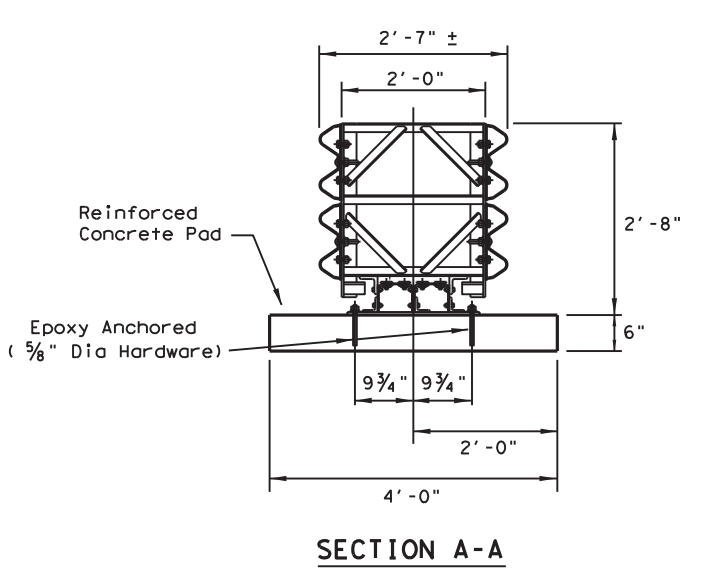
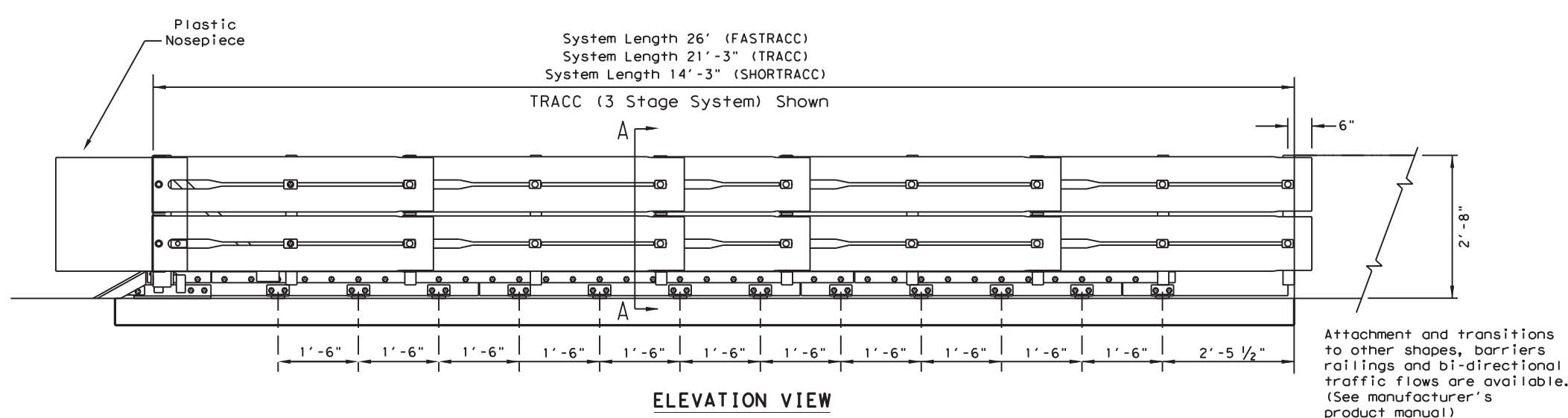
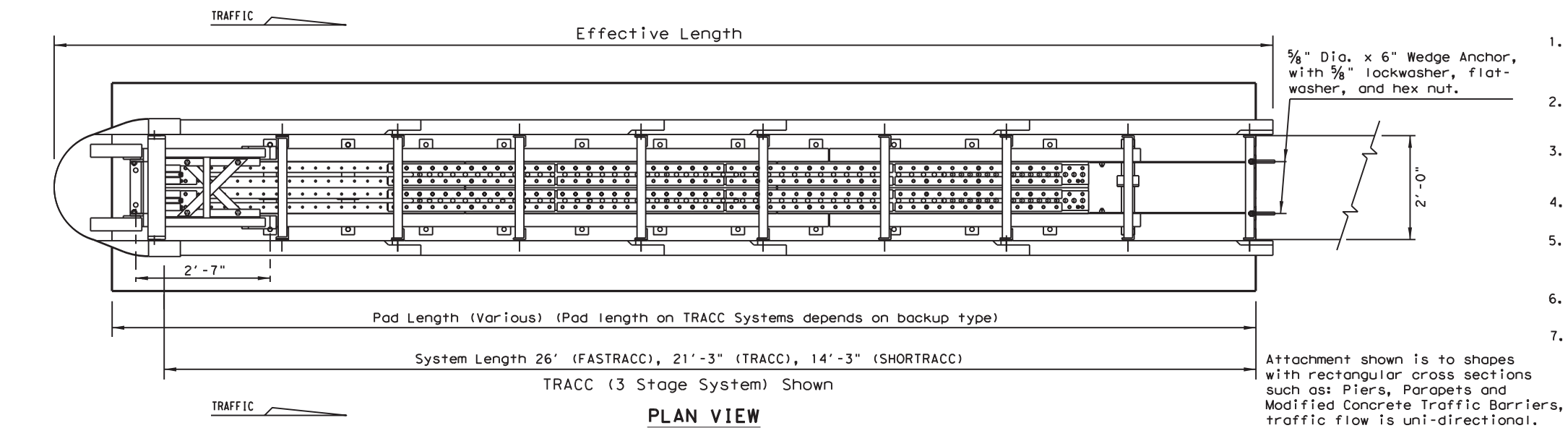
QUADGUARD SYSTEM (WIDE)

QUAD (W) - 99

FILE: quadw99.dgn	DN: MAM	CK: MAM	DW: BGD	CK:
© TxDOT FEBRUARY 1998		DIST	FEDERAL AID PROJECT	
REVISIONS		SAT	SHEET 259	
		COUNTY	CONTROL	SECT
		BEXAR	6372	50
		JOB	HIGHWAY	
		001	VAR.	

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DATE:
FILE:



BACKUP SUPPORT OPTIONS	
Square Concrete Backup	
Concrete Barrier (CTB) Backup	
Single Slope Concrete Barrier (SSCB)	
Guardrail Backup (Base-Plated Post)	
Guardrail Backup (Driven Post)	
TRANSITION OPTIONS	
Vertical Wall	
Modified (CTB) to Vertical Wall	
Concrete Barrier (CTB)	
Guardrail (W-Beam)	
Guardrail (Thrie-Beam)	

For bi-directional transition panel details (See manufacturer's product manual)
Backup and Transition types are shown elsewhere on the plans, (i.e. Attenuator location details or in the general notes).

TYPE (NARROW)	TEST LEVEL	SYSTEM LENGTH	EFFECTIVE LENGTH	PAD LENGTHS
FASTRACC (4 Stage System)	70	26'	27'- 9"	26'- 8"
TRACC (3 Stage System)	TL-3	21'- 3"	23'- 0"	22'- 0" 23'- 0" 24'- 0"
SHORTRACC (2 Stage System)	TL-2	14'- 3"	16'- 0"	15'- 0" 16'- 0" 17'- 0"

The Stage System refers to number of replaceable sled sections that could be replaced independently. Concrete pad length on TRACC & SHORTRACC depends on backup type.

FOUNDATION OPTIONS
6" Reinforced Concrete
8" Unreinforced Concrete
3" Min. Asphalt over 3" Min. Concrete
6" Asphalt over 6" Compact Subbase
8" Minimum Asphalt

For steel placement in concrete foundations (See manufacturer's product manual)

GENERAL NOTES

- For specific information regarding installation and technical guidance of the system, contact: Trinity Highway at 1(888)323-6374, 2525 N. Stemmons Freeway - Dallas, TX 75207
- For bi-directional traffic, appropriate transition panels will be required.
- Details of components for the TRACC and backups and reinforcing details will be shown on the manufacturer's shop drawings furnished to the Engineer.
- Concrete shall be class "S" with a minimum compressive strength of 4,000 p.s.i.
- If the cross-slope varies more than 2% over the length of the system, the concrete pad will require leveling. Maximum permissible cross-slope is 8%.
- The installation area should be free from curbs, elevated objects, or depressions.
- The TRACC system should be approximately parallel with the barrier or ϕ of merging barriers.

				BILL OF MATERIAL	
PART #	QTY	QTY	QTY	DESCRIPTION	
25936A	1			FASTRACC Unit Assembly	
25980A		1		TRACC Unit Assembly	
25997A			1	SHORTRACC Unit Assembly	
3310G	4	4	4	5/8" Lockwasher	
4451G	4	4	4	5/8" Dia x 6" Wedge Exp. Anchor	
6531B	1	1	1	Plastic Nosepiece	
6668B	4	4	4	Reflective Sheeting	
* ANCHOR HARDWARE (CONCRETE BASE)					
5204G	32	26	18	5/8" Dia x 7 1/2" All Thd. Rod	
3310G	32	26	18	5/8" Lockwasher	
3361G	32	26	18	5/8" Hex Nut	
3300G	32	26	18	5/8" Flat Washer	
5206B	3	3	2	TRACC Adhesive HIT HY150 Kit	
* ANCHOR HARDWARE (ASPHALT BASE)					
6380G	32	26	18	5/8" Dia x 18" All Thd. Rod	
3310G	32	26	18	5/8" Lockwasher	
3361G	32	26	18	5/8" Hex Nut	
3300G	32	26	18	5/8" Flat Washer	
5206B	7	5	4	TRACC Adhesive HIT HY150 Kit	

* See manufacturer's product manual

Texas Department of Transportation Design Division Standard

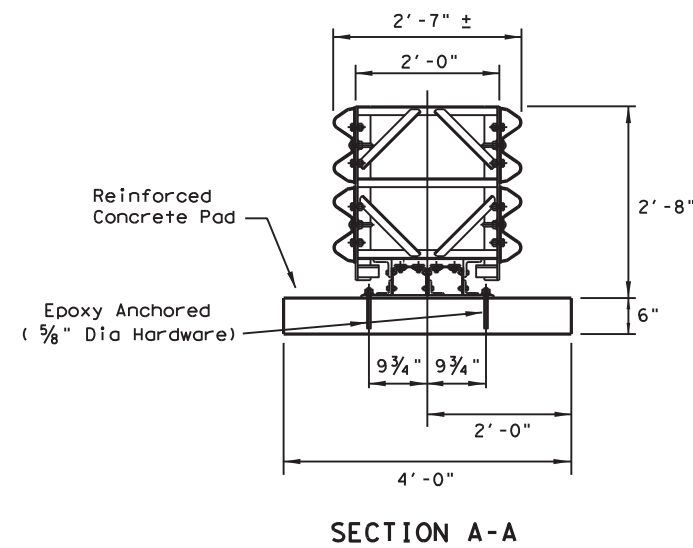
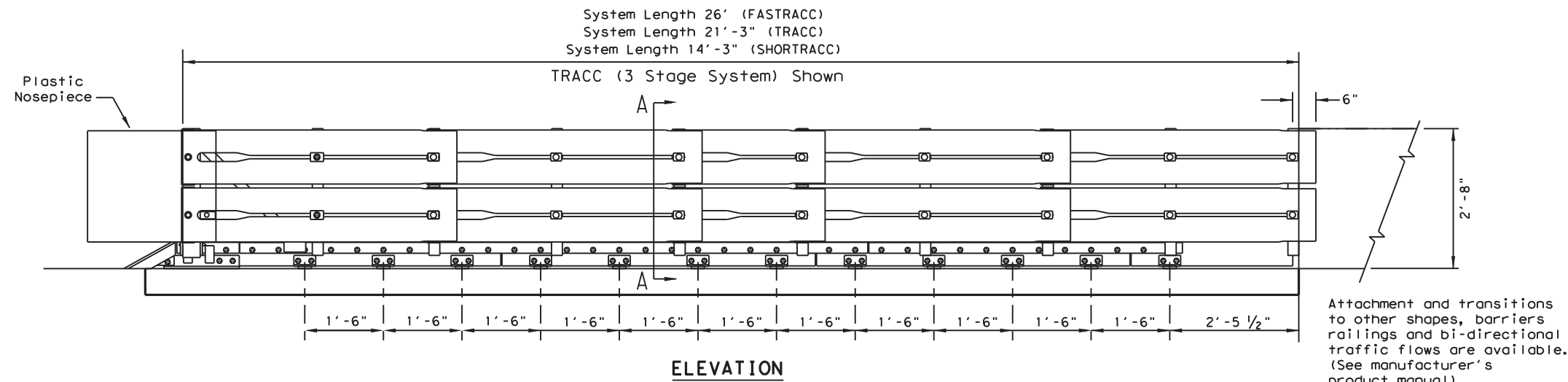
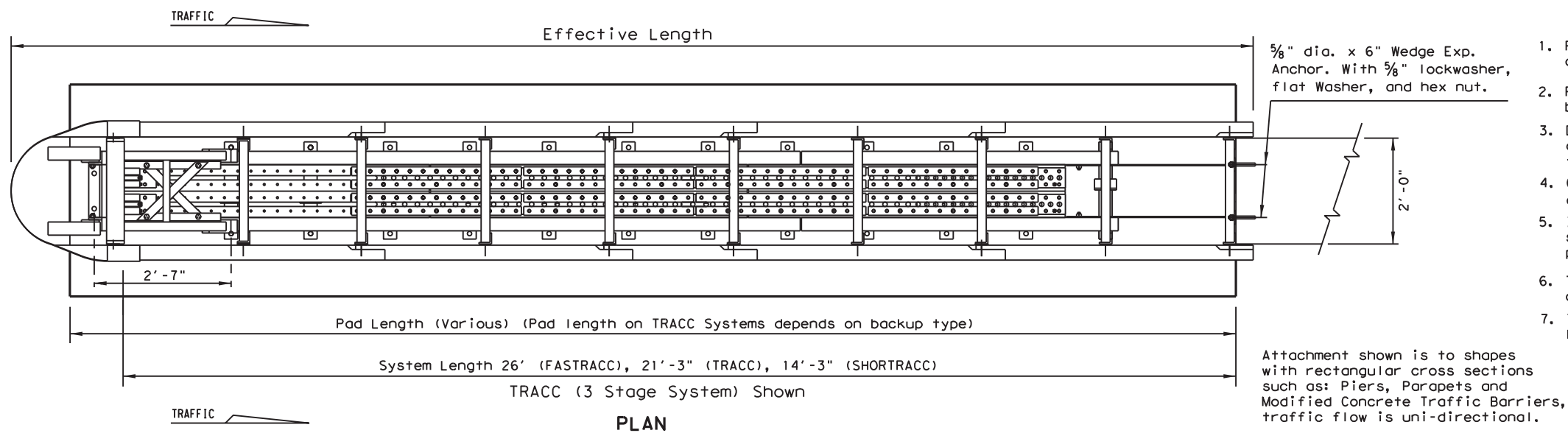
TRINITY HIGHWAY
CRASH CUSHION
(NARROW)
TRACC (N) - 16

FILE: traccn16.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP
© TxDOT: February 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
REVISED 06, 2013 (VP)	DIST	COUNTY	SHEET NO.	
REVISED 03, 2016 (VP)	SAT	BEXAR	260	

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BACKUP SUPPORT OPTIONS	
Square Concrete Backup	
Concrete Barrier (CTB) Backup	
Single Slope Concrete Barrier (SSCB)	
Guardrail Backup (Base-Plated Post)	
Guardrail Backup (Driven Post)	
TRANSITION OPTIONS	
Vertical Wall	
Modified (CTB) to Vertical Wall	
Concrete Barrier (CTB)	
Guardrail (W-Beam)	
Guardrail (Thrie-Beam)	

For bi-directional transition panel details (See manufacturer's product manual)

Backup and Transition types are shown elsewhere on the plans, (i.e. Attenuator location details or in the general notes).

TYPE (NARROW)	TEST LEVEL	SYSTEM LENGTH	EFFECTIVE LENGTH	PAD LENGTHS
FASTRACC (4 Stage System)	70	26'	27'- 9"	26'- 8"
TRACC (3 Stage System)	TL-3	21'- 3"	23'- 0"	22'- 0" 23'- 0" 24'- 0"
SHORTTRACC (2 Stage System)	TL-2	14'- 3"	16'- 0"	15'- 0" 16'- 0" 17'- 0"

The Stage System refers to number of replaceable sled sections that could be replaced independently. Concrete pad length on TRACC & SHORTTRACC depends on backup type.

FOUNDATION OPTIONS
6" Reinforced Concrete
8" Unreinforced Concrete
3" Min. Asphalt over 3" Min. Concrete
6" Asphalt over 6" Compact Subbase
8" Minimum Asphalt

For steel placement in concrete foundations (See manufacturer's product manual)

GENERAL NOTES

- For additional information contact, Trinity Highway Products at 1(800)527-6050.
- For bi-directional traffic, appropriate transition panels will be required.
- Details of components for the TRACC and backups and reinforcing details will be shown on the manufacturer's shop drawings furnished to the Engineer.
- Concrete shall be class "S" with a minimum compressive strength of 4,000 p.s.i.
- If the cross-slope varies more than 2% over the length of the system, the concrete pad will require leveling. Maximum permissible cross-slope is 8%.
- The installation area should be free from curbs, elevated objects, or depressions.
- The TRACC system should be approximately parallel with the barrier or ϕ of merging barriers.

BILL OF MATERIAL				
PART #	QTY	QTY	QTY	DESCRIPTION
25936A	1			FASTRACC Unit Assembly
25980A		1		TRACC Unit Assembly
25997A			1	SHORTTRACC Unit Assembly
3310G	4	4	4	5/8" Lockwasher
4451G	4	4	4	5/8" Dia x 6" Wedge Exp. Anchor
6531B	1	1	1	Plastic Nosepiece
6668B	4	4	4	Reflective Sheeting
* ANCHOR HARDWARE (CONCRETE BASE)				
5204G	32	26	18	5/8" Dia x 7 1/2" All Thd. Rod
3310G	32	26	18	5/8" Lockwasher
3361G	32	26	18	5/8" Hex Nut
3300G	32	26	18	5/8" Flat Washer
5206B	3	3	2	TRACC Adhesive HIT HY150 Kit
* ANCHOR HARDWARE (ASPHALT BASE)				
6380G	32	26	18	5/8" Dia x 18" All Thd. Rod
3310G	32	26	18	5/8" Lockwasher
3361G	32	26	18	5/8" Hex Nut
3300G	32	26	18	5/8" Flat Washer
5206B	7	5	4	TRACC Adhesive HIT HY150 Kit

* See manufacturer's product manual

Texas Department of Transportation Design Division Standard

TRINITY ATTENUATING CRASH CUSHION

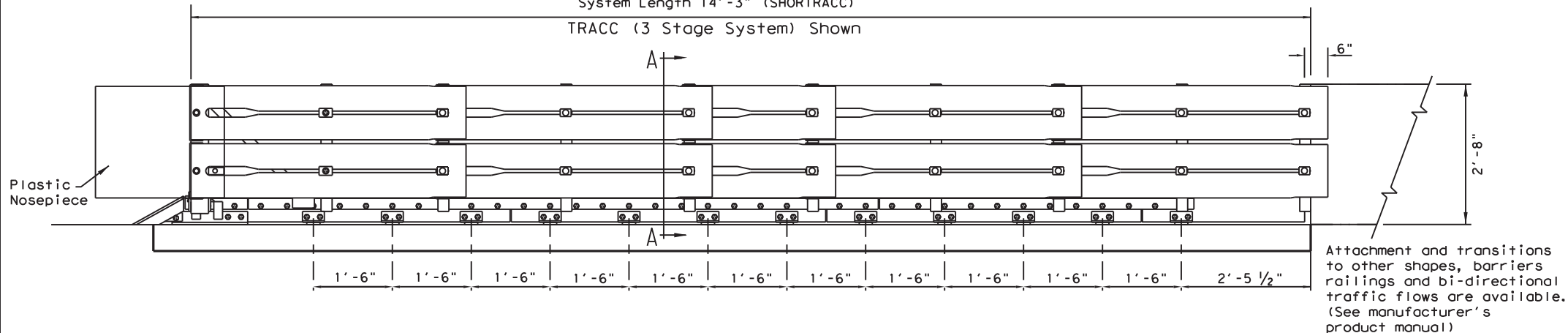
TRACC (N) - 13

FILE: traccn13.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
© TxDOT February 2006	CONT	SECT	JOB	HIGHWAY
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REVISED JUNE, 2013 (VP)	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	261	

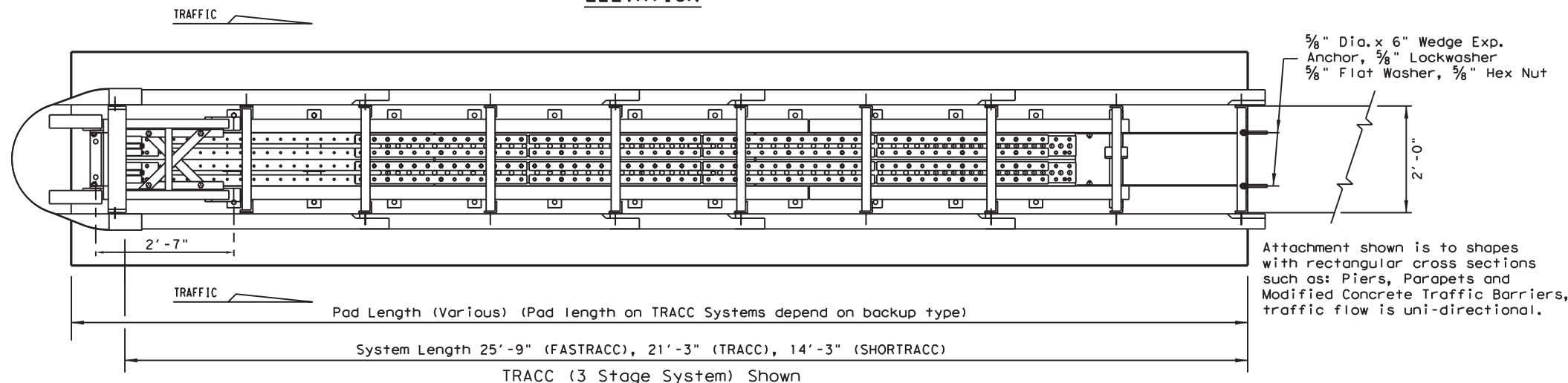
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LEVELS DISPLAYED	
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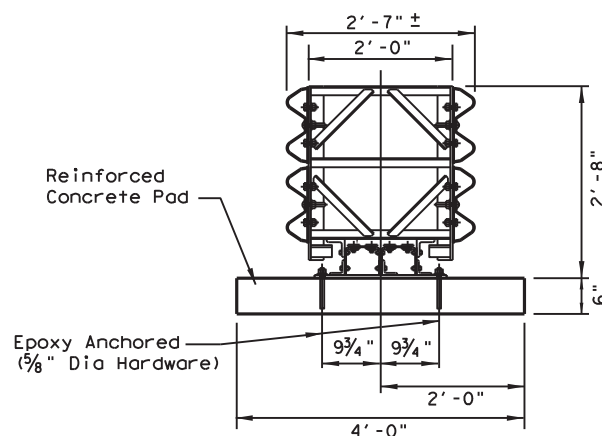
System Length 25'-9" (FASTRACC)
 System Length 21'-3" (TRACC)
 System Length 14'-3" (SHORTTRACC)



ELEVATION



PLAN



SECTION A-A

TYPE (NARROW)	DESIGN SPEED (mph)	SYSTEM LENGTH	PAD LENGTHS
FASTRACC (4 Stage System)	70	25' - 9"	26' - 8"
TRACC (3 Stage System)	50 or greater	21' - 3"	22' - 0" 23' - 0" 24' - 0"
SHORTTRACC (2 Stage System)	45 or less	14' - 3"	15' - 0" 16' - 0" 17' - 0"

The Stage System refers to number of replaceable sled sections that could be replaced independently. Concrete pad length on TRACC & SHORTTRACC depends on backup type.

FOUNDATION OPTIONS
6" Reinforced Concrete
8" Unreinforced Concrete
3" Min. Asphalt over 3" Min. Concrete
6" Asphalt over 6" Compact Subbase
8" Minimum Asphalt

For steel placement in concrete foundations (See manufacturer's product manual)

BACKUP SUPPORT OPTIONS
Square Concrete Backup
Concrete Barrier (CTB) Backup
Single Slope Concrete Barrier (SSCB)
Guardrail Backup (Base-Plated Post)
Guardrail Backup (Driven Post)
TRANSITION OPTIONS
Vertical Wall
Modified (CTB) to Vertical Wall
Concrete Barrier (CTB)
Guardrail (W-Beam)
Guardrail (Thrie-Beam)

Backup and Transition types are shown elsewhere on the plans, (i.e. Attenuator location details or in the general notes).

For bi-directional transition panel details (See manufacturer's product manual)

GENERAL NOTES

- For additional information contact, Trinity Industries Inc. at 1-800-527-6050, Ext. 8249.
- For bi-directional traffic, appropriate transition panels will be required.
- Details of components for the TRACC and backups and reinforcing details will be shown on the manufacturer's shop drawings furnished to the Engineer.
- Concrete shall be class "S" with a minimum compressive strength of 4,000 p.s.i.
- If the cross-slope varies more than 2% over the length of the system, the concrete pad will require leveling. Maximum permissible cross-slope is 8%.
- The installation area should be free from curbs, elevated objects, or depressions.
- The TRACC system should be approximately parallel with the barrier or ϕ of merging barriers.

BILL OF MATERIAL				
PART #	QTY	QTY	QTY	DESCRIPTION
25936A	1			FASTRACC Unit Assembly
25980A		1		TRACC Unit Assembly
25997A			1	SHORTTRACC Unit Assembly
3310G	4	4	4	5/8" Lockwasher
4451G	4	4	4	5/8" Dia x 6" Wedge Exp. Anchor
6531B	1	1	1	Plastic Nosepiece
6668B	4	4	4	Reflective Sheeting
* ANCHOR HARDWARE (CONCRETE BASE)				
5204G	32	26	18	5/8" Dia x 7 1/2" All Thd. Rod
3310G	32	26	18	5/8" Lockwasher
3361G	32	26	18	5/8" Hex Nut
3300G	32	26	18	5/8" Flat Washer
5206B	3	3	2	TRACC Adhesive HIT HY150 Kit
* ANCHOR HARDWARE (ASPHALT BASE)				
6380G	32	26	18	5/8" Dia x 18" All Thd. Rod
3310G	32	26	18	5/8" Lockwasher
3361G	32	26	18	5/8" Hex Nut
3300G	32	26	18	5/8" Flat Washer
5206B	7	5	4	TRACC Adhesive HIT HY150 Kit

* See manufacturer's product manual

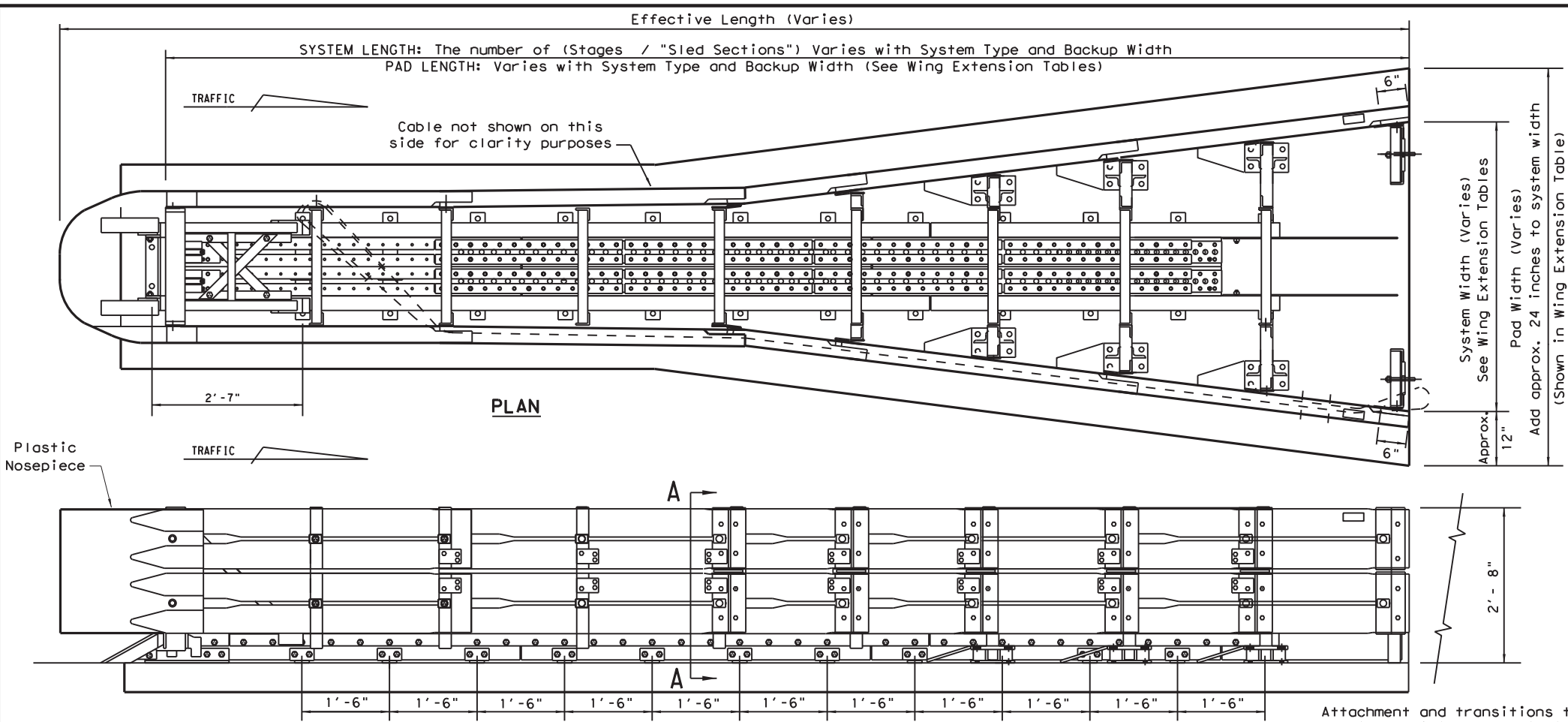
Texas Department of Transportation
 Design Division (Roadway)

**TRINITY ATTENUATING
 CRASH CUSHION**
 (NARROW TRACC Systems)
 (FASTRACC, TRACC, SHORTTRACC)
TRACC (N) -05

FILE: traccn05.dgn	DN:	CK: AM	DW: BGD	CK:
© TxDOT OCTOBER 2001	DISTRICT	RMC PROJECT		SHEET
REVISIONS		SAT		262
COUNTY	CONTROL	SECT	JOB	HIGHWAY
BEXAR	6372	50	001	VAR.

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- ### GENERAL NOTES
- For custom widths, 31 inches to 57 inches wide. Contact Trinity Highway Products at 1(800)527-6050.
 - For bi-directional traffic, appropriate transition panels will be required.
 - Details of components for the WideTRACC and backups and re-inforcing details will be shown on the manufacturer's shop drawings furnished to the Engineer.
 - Concrete shall be class "S" with a minimum compressive strength of 4,000 p.s.i.
 - If the cross-slope varies more than 2% over the length of the system, the concrete pad will require leveling. Maximum permissible cross-slope is 8%.
 - The installation area should be free from curbs, elevated objects, or depressions.
 - The WideTRACC system should be approximately parallel with the barrier or $\frac{C}{2}$ of merging barriers.
 - The Unit shown is flared on both sides, but can be flared on a single side either left or right. The flares will effect the length and width of the system. (See Wing Extension Tables)

Wide-TRACC - BILL OF MATERIAL

PART #	FAST TRACC QTY	TRACC QTY	SHORT TRACC QTY	DESCRIPTION
25937A	1			WideFASTRACC Unit Assembly
25939A		1		WideTRACC Unit Assembly
25997A			1	WideSHORTTRACC Unit Assembly
3310G	4	4	4	5/8" Lockwasher
4372G	4	4	4	5/8" Flatwasher
4451G	4	4	4	5/8" Dia x 6" Exp. Wedge Anchor
6531B	1	1	1	Plastic Nosepiece
6668B	4	4	4	Reflective Sheeting
ANCHOR HARDWARE (CONCRETE BASE)				
5204B	72	50	18	5/8" Dia x 7 1/16" Thd Anchor Stud
4372G	72	50	18	5/8" Flatwasher
3310G	72	50	18	5/8" Lockwasher
3361G	72	50	18	5/8" Hex Nut
5206B	6	4	2	Adhesive, Hilti Hit HY-150
ANCHOR HARDWARE (ASPHALT BASE)				
6380G	72	50	18	5/8" Dia x 18" Thd Anchor Stud
4372G	72	50	18	5/8" Flatwasher
3310G	72	50	18	5/8" Lockwasher
3361G	72	50	18	5/8" Hex Nut
5206B	15	11	4	Adhesive, Hilti Hit HY-150
ANCHOR HARDWARE (OPTIONAL ITEMS, AS NEEDED)				
5207B	A/R	A/R	A/R	Nozzle, Mixer, Hilti Hit HY-150
5208B	A/R	A/R	A/R	Ext. Tube, Mixer, Hilti Hit HY-150
5205B	A/R	A/R	A/R	Dispenser Gun, Hilti Hit HY-150
5209B	A/R	A/R	A/R	Drill Bit, 1/2", Hilti SDS

Attachment and transitions to other shapes, barriers railings and bi-directional traffic flows are available. (See manufacturer's product manual).

BACKUP SUPPORT OPTIONS

- Square Concrete Backup
- Concrete Barrier (CTB) Backup
- Single Slope Concrete Barrier (SSCB)
- Guardrail Backup (Base-Plated Post)
- Guardrail Backup (Driven Post)

TRANSITION OPTIONS

- Vertical Wall
- Modified (CTB) to Vertical Wall
- Concrete Barrier (CTB)
- Guardrail (W-Beam)
- Guardrail (Thrie-Beam)

For bi-directional transition panel details (See manufacturer's product manual). Backup and Transition types are shown elsewhere on the plans, (i.e. Attenuator location details or in the general notes).

FOUNDATION OPTIONS

- 6" Reinforced Concrete
- 8" Unreinforced Concrete
- 3" Min. Asphalt over 3" Min. Concrete
- 6" Asphalt over 6" Compact Subbase
- 8" Minimum Asphalt

For steel placement in concrete foundations, (See manufacturer's product manual).

ELEVATION

Wide-FASTRACC WING EXTENSIONS

NUMBER OF WING EXTENSIONS	WIDTH	SYSTEM LENGTH	EFFECTIVE LENGTH	Wide-FASTRACC EXTENSION PART NUMBER (LEFT# / RIGHT#)
0 (BASE UNIT)	71"	25'-11"	27'-11"	
1	78"	28'-3"	30'-3"	33940
2	85"	30'-7"	32'-7"	33941 / 33942
3	92"	32'-11"	34'-11"	33943 / 33944
4	99"	35'-2"	37'-2"	33945 / 33946
5	106"	37'-6"	39'-6"	33947 / 33948
6	113"	39'-10"	41'-10"	33949 / 33950
7	120"	42'-2"	44'-2"	33951 / 33952
8	127"	44'-5"	46'-5"	33953 / 33954
9	134"	46'-9"	48'-9"	33955 / 33956
10	141"	49'-1"	51'-1"	33957 / 33958
10+				CONSULT TRINITY SALES PERSON

Wide-TRACC WING EXTENSIONS

NUMBER OF WING EXTENSIONS	WIDTH	SYSTEM LENGTH	EFFECTIVE LENGTH	Wide-TRACC EXTENSION PART NUMBER (LEFT# / RIGHT#)
0 (BASE UNIT)	58"	21'	23'	
1	65"	23'-4"	25'-4"	33940
2	72"	25'-8"	27'-8"	33941 / 33942
3	79"	28'	30'	33943 / 33944
4	86"	30'-4"	32'-4"	33945 / 33946
5	92"	32'-8"	34'-8"	33947 / 33948
6	99"	35'	37'	33949 / 33950
7	106"	37'-4"	39'-4"	33951 / 33952
8	113"	39'-8"	41'-8"	33953 / 33954
9	120"	42'	44'	33955 / 33956
10	127"	44'-4"	46'-4"	33957 / 33958
10+				CONSULT TRINITY SALES PERSON

Wide-SHORTTRACC WING EXTENSIONS

NUMBER OF WING EXTENSIONS	WIDTH	SYSTEM LENGTH	EFFECTIVE LENGTH	Wide-SHORTTRACC EXTENSION PART NUMBER (LEFT# / RIGHT#)
0 (BASE UNIT)	39"	15'	17'	
1	46"	17'-4"	19'-4"	33940
2	53"	18'-9"	20'-9"	33941 / 33942
3	60"	21'-1"	23'-1"	33943 / 33944
4	66"	23'-5"	25'-5"	33945 / 33946
5	73"	25'-8"	27'-8"	33947 / 33948
6	80"	28'-1"	30'-1"	33949 / 33950
7	87"	30'-4"	32'-4"	33951 / 33952
8	94"	32'-7"	34'-7"	33953 / 33954
9	101"	34'-11"	36'-11"	33955 / 33956
10	108"	37'-3"	39'-3"	33957 / 33958
10+				CONSULT TRINITY SALES PERSON

SECTION A-A

TYPE (WIDE)	TEST LEVEL
FASTRACC (4 Stage System)	70
TRACC (3 Stage System)	TL-3
SHORTTRACC (2 Stage System)	TL-2

NOTE: The Stage System refers to number of replaceable "sled sections" that could be replaced independently.

Design Division Standard

TRINITY ATTENUATING CRASH CUSHION

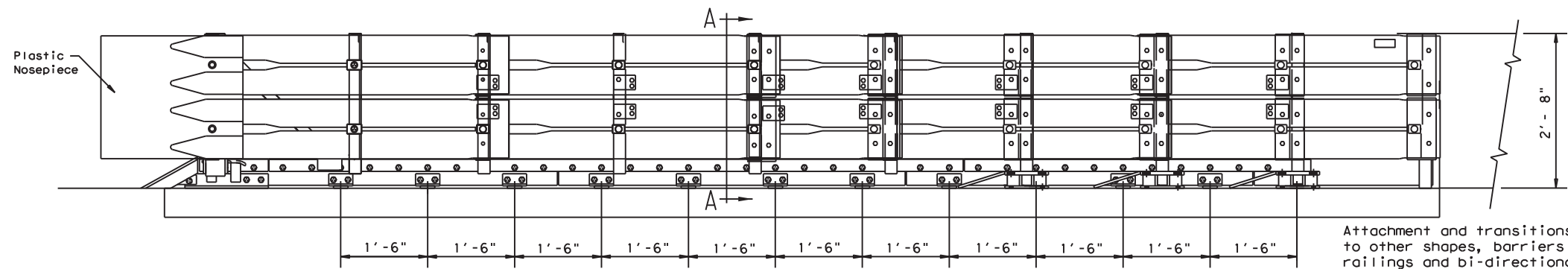
(WIDE TRACC Systems)
(FASTRACC, TRACC, SHORTTRACC)

TRACC (W) - 13

FILE: traccw13.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
© TxDOT February 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
REVISED JUNE, 2013 (VP)	DIST	COUNTY	SHEET NO.	
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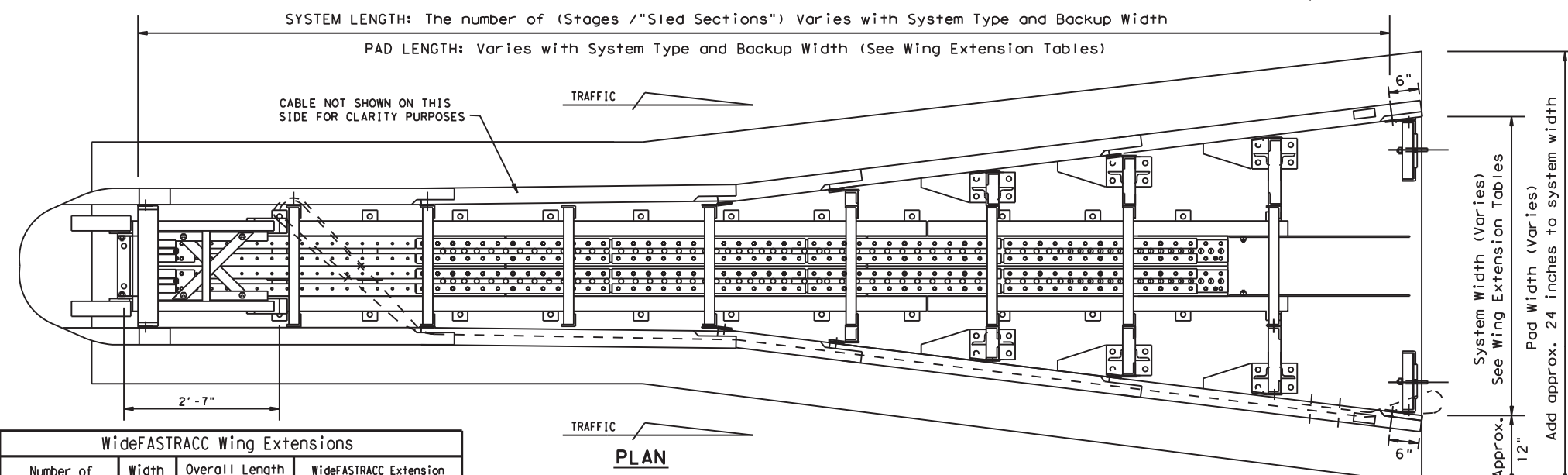
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ELEVATION

Attachment and transitions to other shapes, barriers railings and bi-directional traffic flows are available. (See manufacturer's product manual)



PLAN

SYSTEM LENGTH: The number of (Stages / "Sled Sections") Varies with System Type and Backup Width
 PAD LENGTH: Varies with System Type and Backup Width (See Wing Extension Tables)

System Width (Varies) See Wing Extension Tables
 Pad Width (Varies) Add approx. 24 inches to system width (Shown in Width Extension Table)

NOTE: The Stage System refers to number of replaceable "sled sections" that could be replaced independently. Concrete pad length on the "WIDE" FASTRACC, TRACC & SHORTRACC depends on the System Length & Backup Type.

Number of Wing Extensions	Width inches	Overall Length inches	WideFASTRACC Extension Part Number (Left #/Right #)
0 (BASE UNIT)	71	308	
1	78	336	33940
2	85	364	33941 / 33942
3	92	392	33943 / 33944
4	98	419	33945 / 33946
5	105	447	33947 / 33948
6	112	475	33949 / 33950
7	119	503	33951 / 33952
8	126	530	33953 / 33954
9	133	558	33955 / 33956
10	139	586	33957 / 33958
10*			CONSULT TRINITY SALES PERSON

Number of Wing Extensions	Width inches	Overall Length inches	WideTRACC Extension Part Number (Left #/Right #)
0 (BASE UNIT)	58	252	
1	65	280	33940
2	72	308	33941 / 33942
3	79	336	33943 / 33944
4	86	364	33945 / 33946
5	92	391	33947 / 33948
6	99	419	33949 / 33950
7	106	447	33951 / 33952
8	113	474	33953 / 33954
9	120	502	33955 / 33956
10	127	530	33957 / 33958
10*			CONSULT TRINITY SALES PERSON

Number of Wing Extensions	Width inches	Overall Length inches	WideSHORTRACC Extension Part Number (Left #/Right #)
0 (BASE UNIT)	39	169	
1	46	197	33940
2	53	225	33941 / 33942
3	60	253	33943 / 33944
4	66	281	33945 / 33946
5	73	308	33947 / 33948
6	80	337	33949 / 33950
7	87	364	33951 / 33952
8	94	391	33953 / 33954
9	101	419	33955 / 33956
10	108	447	33957 / 33958
10*			CONSULT TRINITY SALES PERSON

Square Concrete Backup
Concrete Barrier (CTB) Backup
Single Slope Concrete Barrier (SSCB)
Guardrail Backup (Base-Plated Post)
Guardrail Backup (Driven Post)

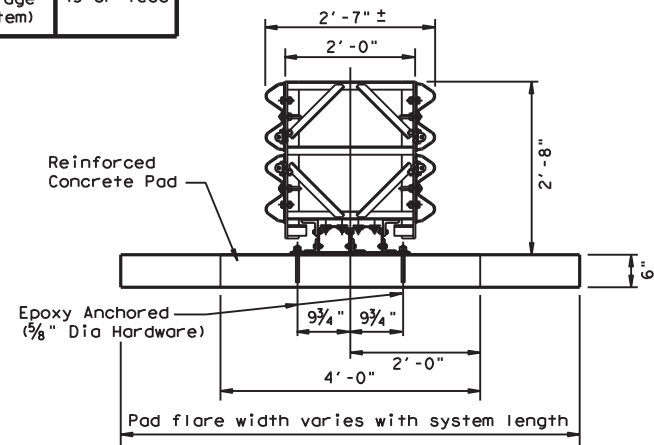
Vertical Wall
Modified (CTB) to Vertical Wall
Concrete Barrier (CTB)
Guardrail (W-Beam)
Guardrail (Thrie-Beam)

Backup and Transition types are shown elsewhere on the plans, (i.e. Attenuator location details or in the general notes). For bi-directional transition panel details (See manufacturer's product manual).

6" Reinforced Concrete
8" Unreinforced Concrete
3" Min. Asphalt over 3" Min. Concrete
6" Asphalt over 6" Compact Subbase
8" Minimum Asphalt

For steel placement in concrete foundations (See manufacturer's product manual)

TYPE (WIDE)	DESIGN SPEED (mph)
FASTRACC (4 Stage System)	70
TRACC (3 Stage System)	50 or greater
SHORTRACC (2 Stage System)	45 or less



SECTION A-A

GENERAL NOTES

- For custom widths, 31 inches to 57 inches wide. Contact Trinity Highway Products at 1(800)527-6050.
- For bi-directional traffic, appropriate transition panels will be required.
- Details of components for the WideTRACC and backups and reinforcing details will be shown on the manufacturer's shop drawings furnished to the Engineer.
- Concrete shall be class "S" with a minimum compressive strength of 4,000 p.s.i.
- If the cross-slope varies more than 2% over the length of the system, the concrete pad will require leveling. Maximum permissible cross-slope is 8%.
- The installation area should be free from curbs, elevated objects, or depressions.
- The WideTRACC system should be approximately parallel with the barrier or $\frac{1}{2}$ of merging barriers.
- The Unit shown is flared on both sides, but can be flared on a single side either left or right. The flares will effect the length and width of the system. (See Wing Extension Tables)

PART #	FAST TRACC QTY	TRACC QTY	SHORT TRACC QTY	DESCRIPTION
25937A	1			WideFASTRACC Unit Assembly
25939A		1		WideTRACC Unit Assembly
25997A			1	WideSHORTRACC Unit Assembly
3310G	4	4	4	5/8" Lockwasher
4372G	4	4	4	5/8" Flatwasher
4451G	4	4	4	5/8" Dia x 6" Exp. Wedge Anchor
6531B	1	1	1	Plastic Nosepiece
6668B	4	4	4	Reflective Sheeting

5204B	72	50	18	5/8" Dia x 7 1/16" Thd Anchor Stud
4372G	72	50	18	5/8" Flatwasher
3310G	72	50	18	5/8" Lockwasher
3361G	72	50	18	5/8" Hex Nut
5206B	6	4	2	Adhesive, Hilti Hit HY-150

6380G	72	50	18	5/8" Dia x 18" Thd Anchor Stud
4372G	72	50	18	5/8" Flatwasher
3310G	72	50	18	5/8" Lockwasher
3361G	72	50	18	5/8" Hex Nut
5206B	15	11	4	Adhesive, Hilti Hit HY-150

5207B	A/R	A/R	A/R	Nozzle, Mixer, Hilti Hit HY-150
5208B	A/R	A/R	A/R	Ext. Tube, Mixer, Hilti Hit HY-150
5205B	A/R	A/R	A/R	Dispenser Gun, Hilti Hit HY-150
5209B	A/R	A/R	A/R	Drill Bit, 1/16", Hilti SDS

Texas Department of Transportation
 Design Division Standard

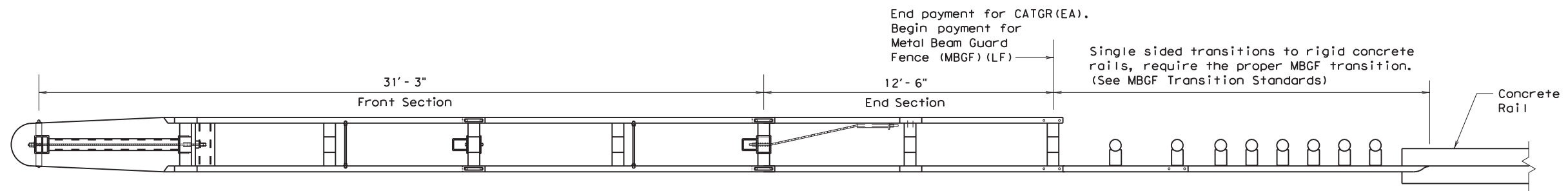
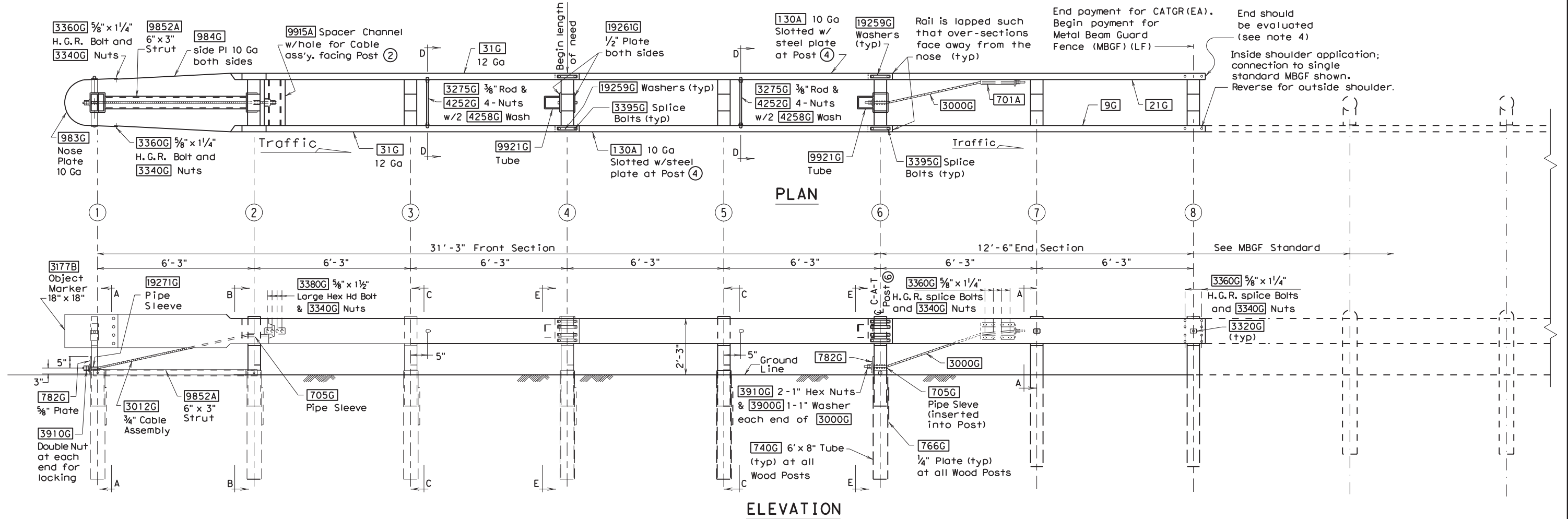
TRINITY ATTENUATING CRASH CUSHION
 (WIDE TRACC Systems)

TRACC (W) -05

FILE: traccw05.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
© TxDOT February 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	OOI	VAR.
	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	264	

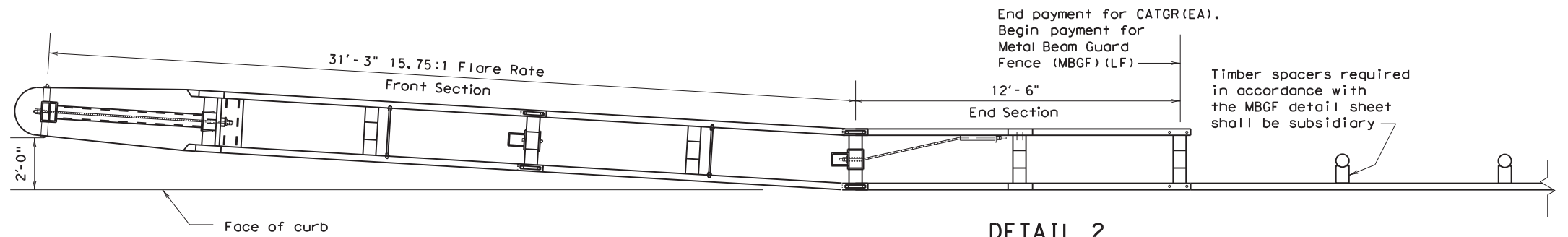
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of units or for the use of this standard in any other project or for any damage or injury resulting from its use.

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DETAIL 3

Usual minimum placement to protect concrete rails



DETAIL 2

Placement at curbed locations

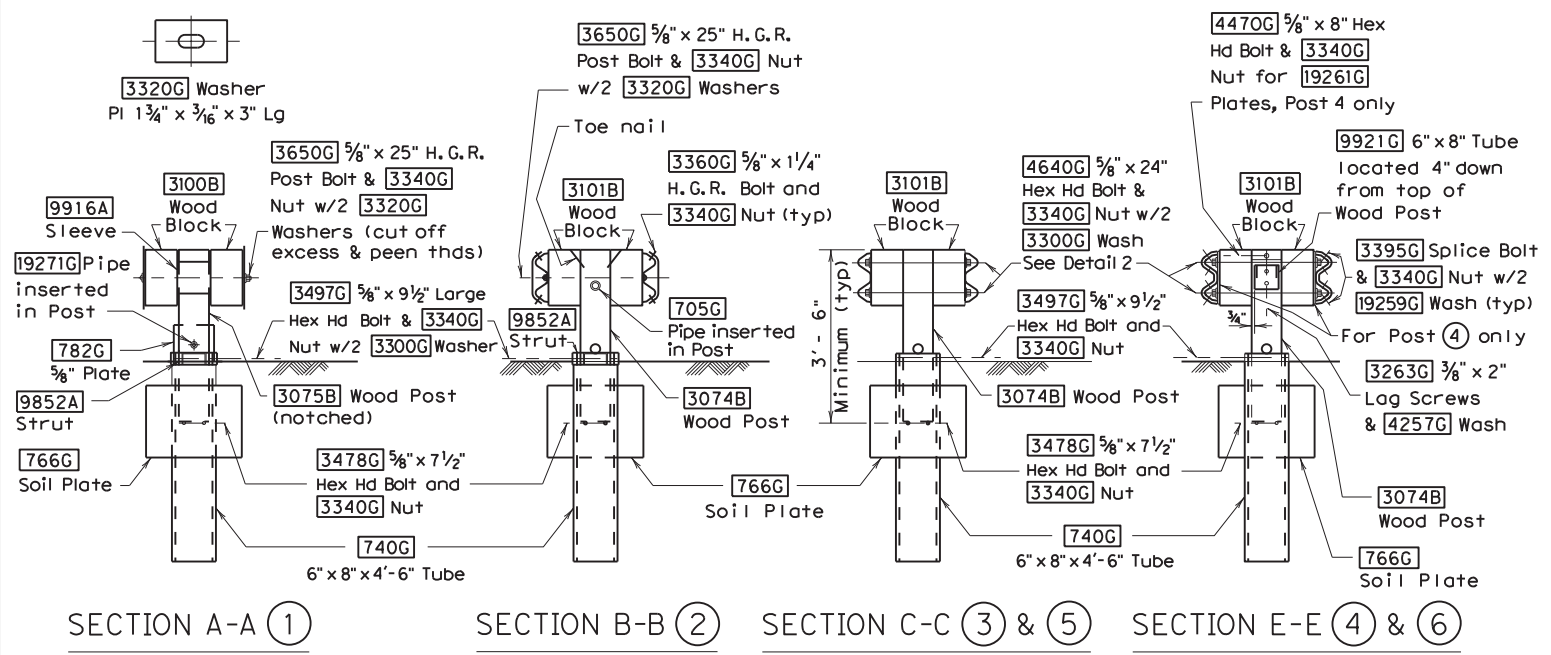
SHEET 1 OF 2

		Design Division Standard	
TRINITY HIGHWAY ENERGY ABSORPTION CRASH CUSHION (GUARDRAIL) CATGR (2) - 16			
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© TxDOT: 1997	CONT: 6372	SECT: 50	JOB: 001
REVISIONS	REVISED 03, 2016 VP		HIGHWAY: VAR
DIST: SAT	COUNTY: BEXAR	SHEET NO.: 265	

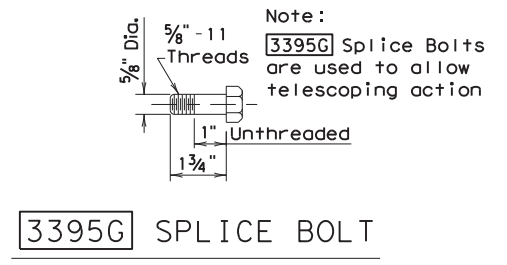
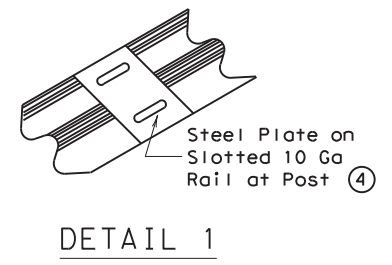
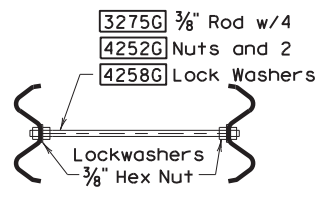
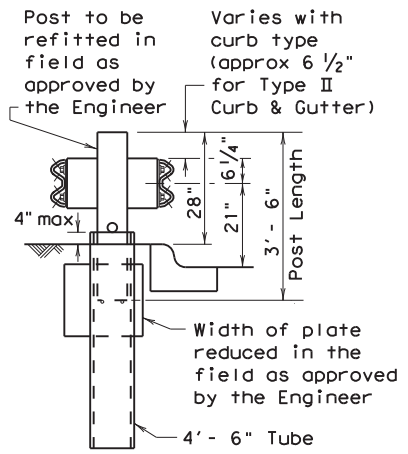
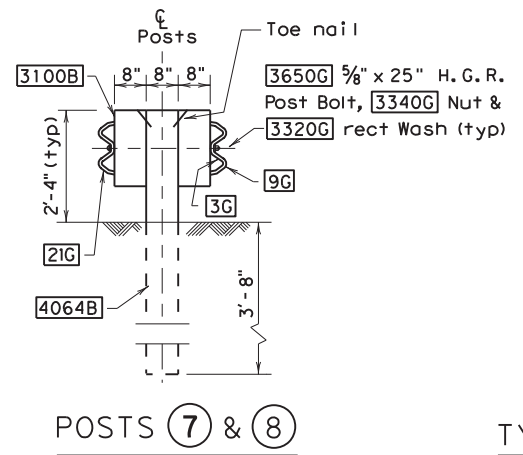
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Note:
 There are no Rail to Post attachments for Posts (3), (5), & (6)



CATGR GUARDRAIL TERMINAL (POSTS 1-6) BILL OF MATERIALS

Mfr Code #	QTY	DESCRIPTION
983G	1	Nose Plate x 10 GA
984G	2	Side Plate x 10 GA
31G	2	"W" Beam 12 GA x 13'-6 1/2"
130A	2	"W" Beam 10 GA x 13'-6 1/2"
9852A	1	Channel Strut x 6'-6"
740G	6	Steel Foundation Tube
766G	6	Soil Plate 18" x 24"
3075B	1	Wood Post 5 1/2" x 7 1/2" (Notched) (Post 1)
3074B	5	Wood Post 5 1/2" x 7 1/2" (Post 2 - 6)
3100B	2	Wood Block 5 1/2" x 7 1/2" (Post 1)
3101B	10	Wood Block 5 1/2" x 7 1/2" (Post 2 - 6)
9916A	1	Sleeve (Post 1)
9915A	1	Spacer Channel (Post 2)
9921G	2	Steel Tube (Post 4 & 6)
19271G	1	Pipe Sleeve (Post 1)
705G	1	Pipe Sleeve (Post 2)
19261G	2	Post Plate (Post 4)
782G	1	Bearing Plate (Post 1)
3012G	1	Cable Assembly (From Post 1 to 2)
3275G	2	3/8" Restraint Rod (Post 3 & 5)
19259G	32	Plate Washer (Post 4 & 6)

HARDWARE		
3263G	4	3/8" x 2" Lg Lag Screw
4252G	8	3/8" Hex Nut
4258G	4	3/8" Lock Washer
4257G	4	3/8" Flat Washer
3320G	4	Rectangular Washer
3395G	32	5/8" x 1 3/4" H.H. Splice Bolt
3650G	2	5/8" x 25" Lg H.G.R. Bolt
4640G	8	5/8" x 24" Lg H.H. Bolt
3478G	13	5/8" x 7 1/2" Lg H.H. Bolt
3380G	8	5/8" x 1 1/2" Lg H.H. Bolt
3360G	16	5/8" x 1 1/4" Lg H.G.R. Bolt
3340G	85	5/8" H.G.R. Nut
3300G	8	5/8" Flat Washer
3497G	6	5/8" x 9 1/2" Lg H.H. Bolt
3910G	4	1" Hex Nut
3900G	2	1" Flat Washer

DELINEATOR		
3177B	1	Object Marker (18" x 18") (Cut to fit)

CATGR GUARDRAIL TERMINAL (POSTS 7-8) BILL OF MATERIALS

Mfr Code #	QTY	DESCRIPTION
4064B	2	Wood Post 5 1/2" x 7 1/2" x 6'
3101B	4	Wood Block 5 1/2" x 7 1/2"
21G	1	"W" Beam Guard Rail (12 Ga)
9G	1	"W" Beam Guard Rail (12 Ga)
701A	1	Bracket
782G	1	Bearing Plate (Post 6)
705G	1	Pipe Sleeve (Post 6)
3000G	1	Cable Assembly (from Post 6 to Rail)
3320G	2	Rectangular Washer

HARDWARE		
3360G	24	5/8" x 1 1/4" H.G.R. Splice Bolt
3400G	4	5/8" x 25" H.G.R. Post Bolt
3380G	8	5/8" x 1 1/2" Hex Hd Bolt
3340G	28	5/8" H.G.R. Nut
3300G	8	5/8" Washer
3910G	4	1" Hex Nut
3900G	2	1" Washer

GENERAL NOTES

- For specific information regarding installation and technical guidance of the system, contact: Trinity Highway - Energy Absorption at 1(888)323-6374. 70 W. Madison St. Suite 2350. Chicago, IL 60602
- Crown will be widened to accommodate the CAT system. The crown should extend at least 3 feet beyond the inside face of rail. The ground line at posts should be an extension of the roadway surface crown.
- All bolts, nuts, washers, cable assemblies, cable anchors, post tubes, backup plates, and soil plates shall be galvanized.
- The exposed end segment of an "End Section" should be evaluated as a potential obstacle in the determination of the need of MGBF for the opposing direction of traffic.
- If a "single sided" transition is required, (as shown in Detail 3) the proper MGBF transition standards are required.
- For placement at curb sections, the height from gutter pan to post bolt will be 21", and the front section shall be flared (See Detail 2).
- The wood blockouts shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.
- Either 6" x 8" or 5 1/2" x 7 1/2" wood blocks may be used at posts 1 through 8 as supplied by the manufacturer.
- An object marker shall be installed on the front of the terminal as detailed on the D&M(VIA).

SHEET 2 OF 2

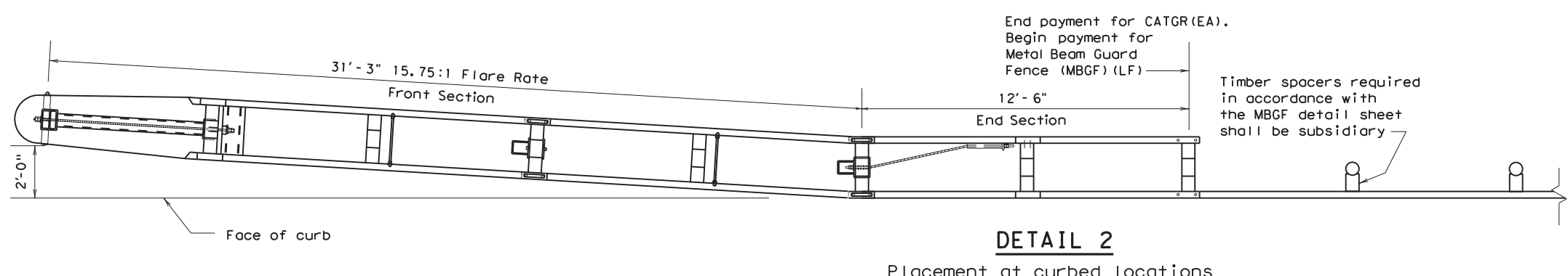
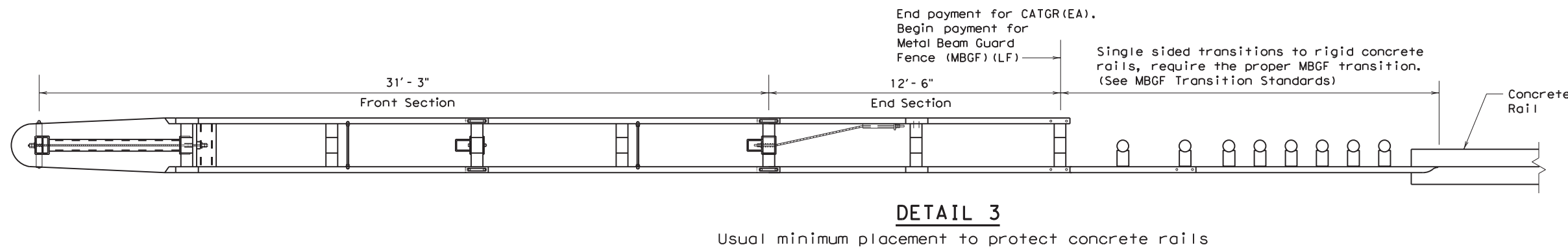
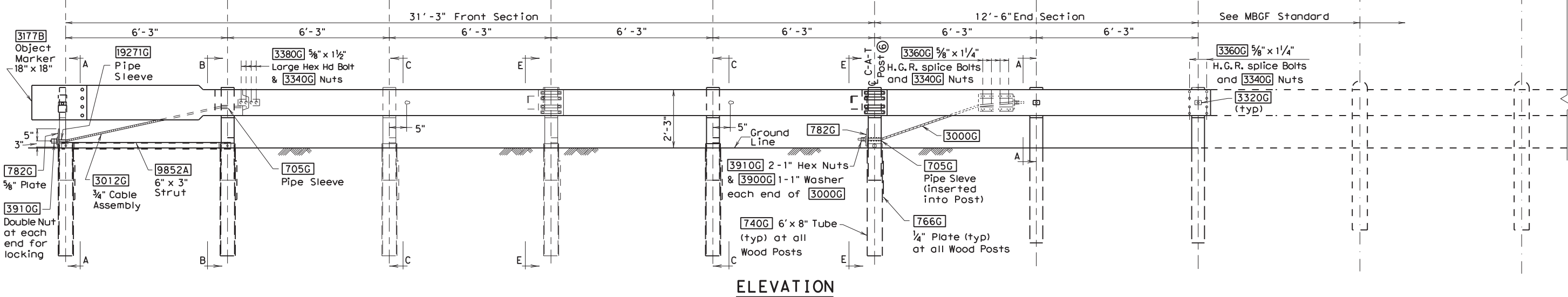
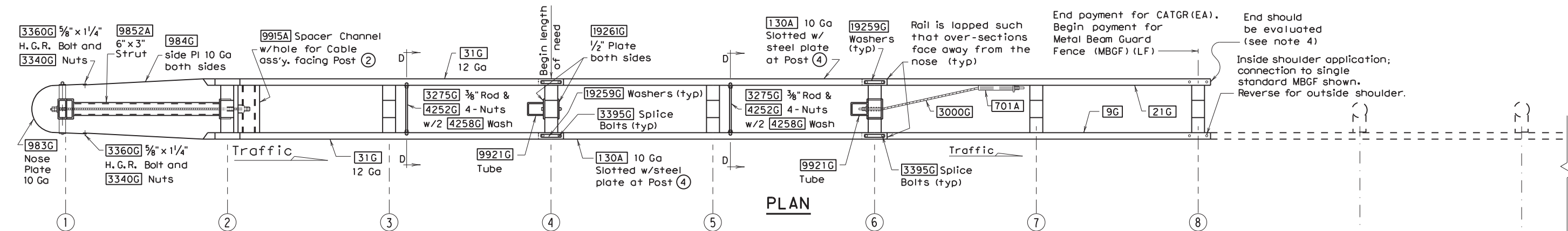
Design Division Standard
TRINITY HIGHWAY ENERGY ABSORPTION CRASH CUSHION (GUARDRAIL)
CATGR (2) - 16

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© TxDOT: 1997	CONT	SECT	JOB	HIGHWAY
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REVISED 03, 2016 VP	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	266	

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DATE:
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SHEET 1 OF 2

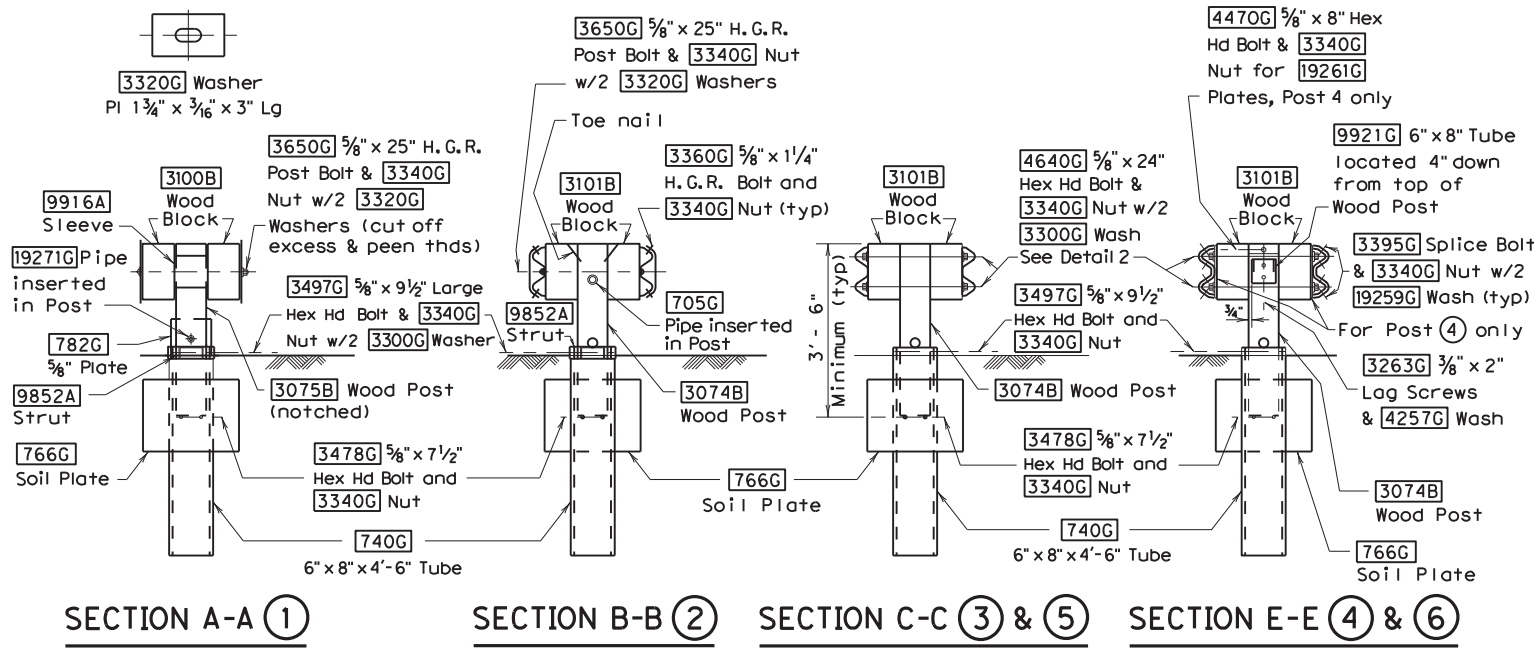
Texas Department of Transportation
Design Division Standard

**CRASH CUSHION
ATTENUATING TERMINAL
(GUARDRAIL)
CATGR(1)-10**

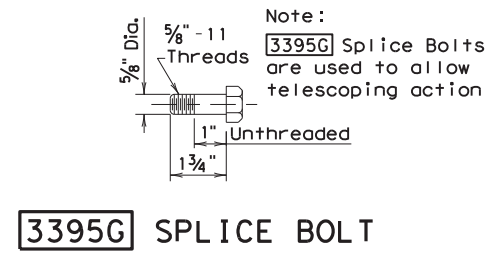
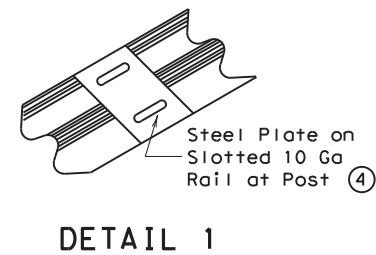
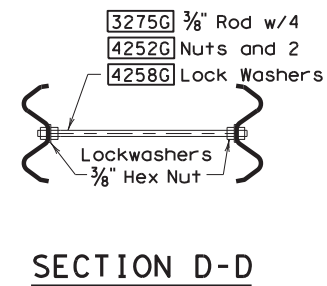
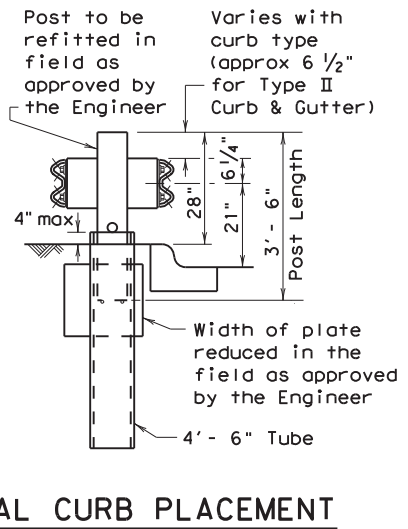
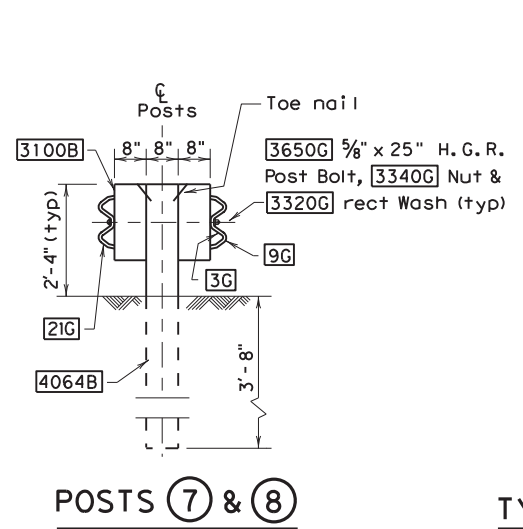
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DIST	COUNTY		SHEET NO.	
SAT	BEXAR		267	

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DATE: FILE:



Note: There are no Rail to Post attachments for Posts (3), (5), & (6)



CATGR GUARDRAIL TERMINAL (POSTS 1-6) BILL OF MATERIALS

Mfr Code #	QTY	DESCRIPTION
983B	1	Nose Plate x 10 GA
984G	2	Side Plate x 10 GA
31G	2	"W" Beam 12 GA x 13'-6 1/2"
130A	2	"W" Beam 10 GA x 13'-6 1/2"
9852A	1	Channel Strut x 6'-6"
740G	6	Steel Foundation Tube
766G	6	Soil Plate 18" x 24"
3075B	1	Wood Post 5 1/2" x 7 1/2" (Notched) (Post 1)
3074B	5	Wood Post 5 1/2" x 7 1/2" (Post 2 - 6)
3100B	2	Wood Block 5 1/2" x 7 1/2" (Post 1)
3101B	10	Wood Block 5 1/2" x 7 1/2" (Post 2 - 6)
9916A	1	Sleeve (Post 1)
9915A	1	Spacer Channel (Post 2)
9921G	2	Steel Tube (Post 4 & 6)
19271G	1	Pipe Sleeve (Post 1)
705G	1	Pipe Sleeve (Post 2)
19261G	2	Post Plate (Post 4)
782G	1	Bearing Plate (Post 1)
3012G	1	Cable Assembly (From Post 1 to 2)
3275G	2	3/8" Restraint Rod (Post 3 & 5)
19259G	32	Plate Washer (Post 4 & 6)
HARDWARE		
3263G	4	3/8" x 2" Lg Lag Screw
4252G	8	3/8" Hex Nut
4258G	4	3/8" Lock Washer
4257G	4	3/8" Flat Washer
3320G	4	Rectangular Washer
3395G	32	5/8" x 1 3/4" H.H. Splice Bolt
3650G	2	5/8" x 25" Lg H.G.R. Bolt
4640G	8	5/8" x 24" Lg H.H. Bolt
3478G	13	5/8" x 7 1/2" Lg H.H. Bolt
3380G	8	5/8" x 1 1/2" Lg H.H. Bolt
3360G	16	5/8" x 1 1/4" Lg H.G.R. Bolt
3340G	85	5/8" H.G.R. Nut
3300G	8	5/8" Flat Washer
3497G	6	5/8" x 9 1/2" Lg H.H. Bolt
3910G	4	1" Hex Nut
3900G	2	1" Flat Washer
DELINEATOR		
3177B	1	Object Marker (18" x 18") (Cut to fit)

CATGR GUARDRAIL TERMINAL (POSTS 7-8) BILL OF MATERIALS

Mfr Code #	QTY	DESCRIPTION
4064B	2	Wood Post 5 1/2" x 7 1/2" x 6'
3101B	4	Wood Block 5 1/2" x 7 1/2"
21G	1	"W" Beam Guard Rail (12 Ga)
9G	1	"W" Beam Guard Rail (12 Ga)
701A	1	Bracket
782G	1	Bearing Plate (Post 6)
705G	1	Pipe Sleeve (Post 6)
3000G	1	Cable Assembly (from Post 6 to Rail)
3320G	2	Rectangular Washer
HARDWARE		
3360G	24	5/8" x 1 1/4" H.G.R. Splice Bolt
3400G	4	5/8" x 25" H.G.R. Post Bolt
3380G	8	5/8" x 1 1/2" Hex Hd Bolt
3340G	28	5/8" H.G.R. Nut
3300G	8	5/8" Washer
3910G	4	1" Hex Nut
3900G	2	1" Washer

GENERAL NOTES

- For additional information contact: Trinity Highway Products, at 1(800)527-6050.
- Crown will be widened to accommodate the CAT system. The crown should extend at least 3 feet beyond the inside face of rail. The ground line at posts should be an extension of the roadway surface crown.
- All bolts, nuts, washers, cable assemblies, cable anchors, post tubes, backup plates, and soil plates shall be galvanized.
- The exposed end segment of an "End Section" should be evaluated as a potential obstacle in the determination of the need of MBGF for the opposing direction of traffic.
- If a "single sided" transition is required, (as shown in Detail 3) the proper MBGF transition standards are required.
- For placement at curb sections, the height from gutter pan to post bolt will be 21", and the front section shall be flared (See Detail 2).
- The wood blockouts shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.
- Either 6" x 8" or 5 1/2" x 7 1/2" wood blocks may be used at posts 1 through 8 as supplied by the manufacturer.
- An object marker shall be installed on the front of the terminal as detailed on the D&M(VIA).

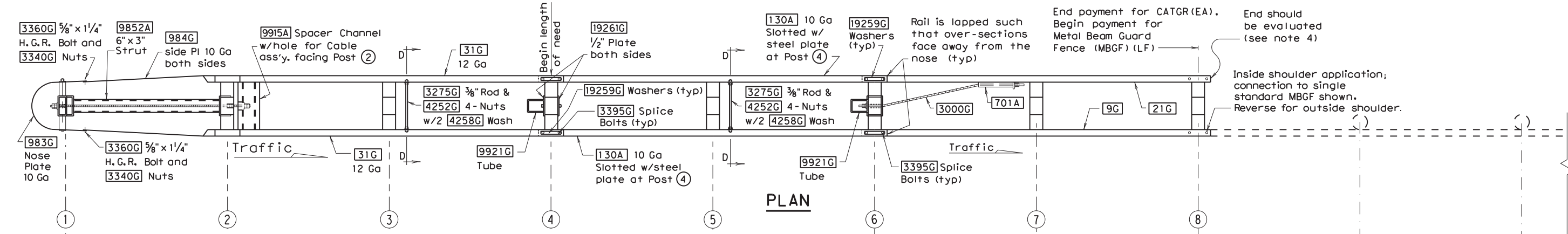


**CRASH CUSHION
ATTENUATING TERMINAL
(GUARDRAIL)
CATGR(2) - 10**

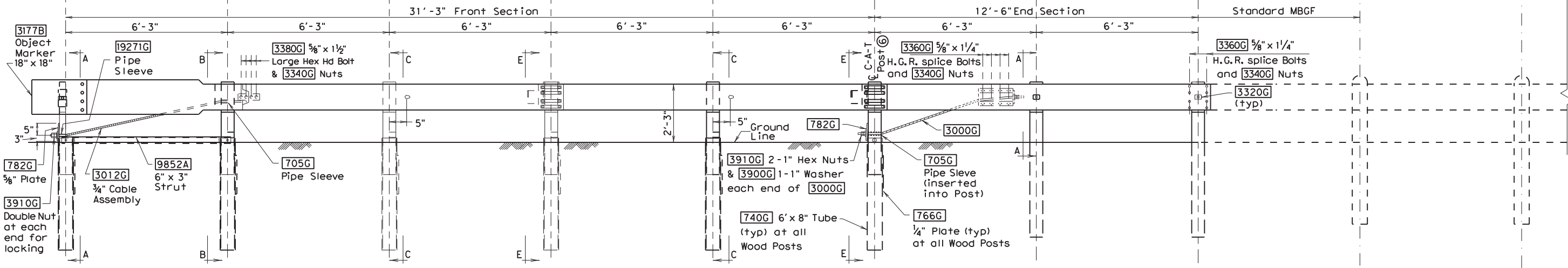
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DIST	COUNTY	SHEET NO.		
SAT	BEXAR	268		

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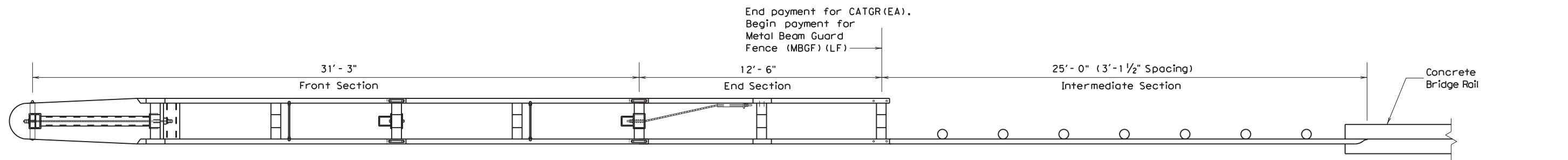
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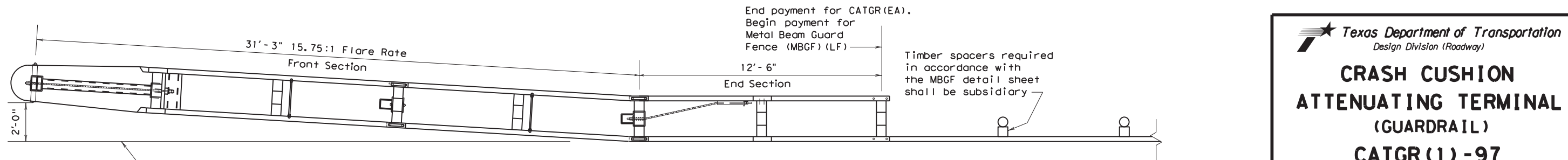


ELEVATION



DETAIL 3

Usual minimum placement to protect bridge ends



DETAIL 2

Placement at curbed locations

Texas Department of Transportation
Design Division (Roadway)

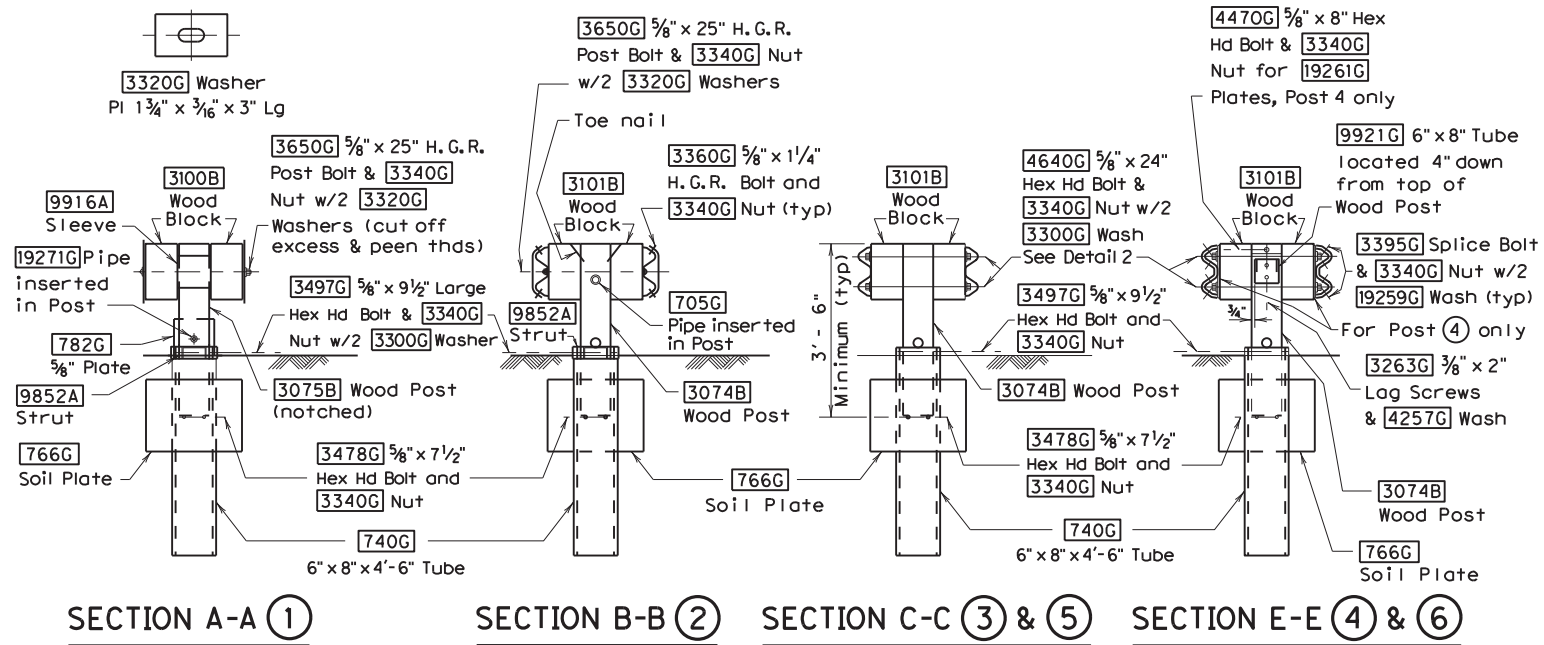
**CRASH CUSHION
ATTENUATING TERMINAL
(GUARDRAIL)
CATGR(1)-97**

Sheet 1 of 2

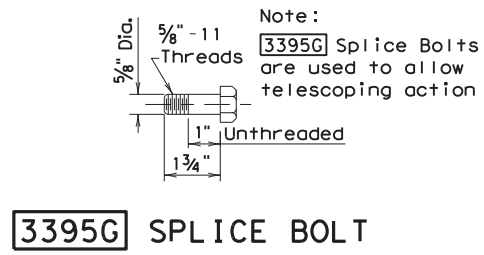
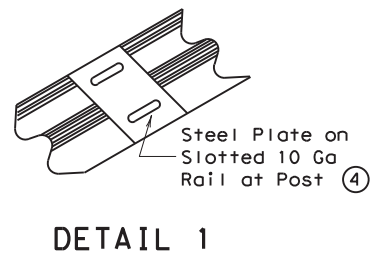
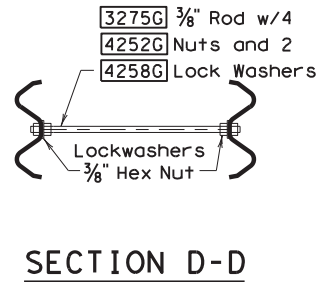
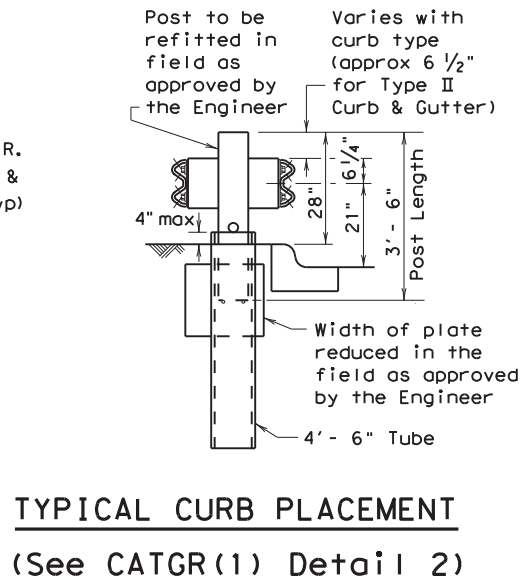
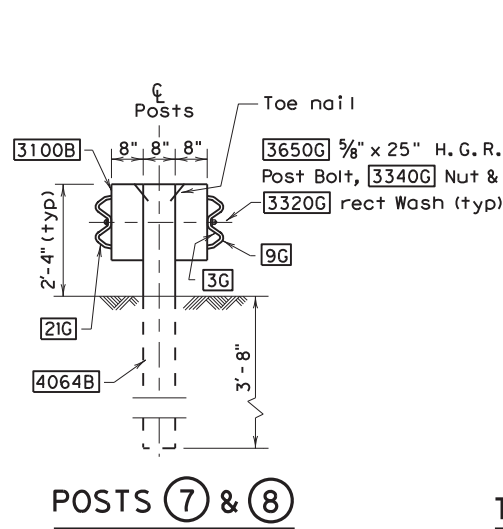
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LEVELS DISPLAYED	
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Note:
There are no Rail to Post attachments for Posts (3), (5), & (6)



CATGR GUARDRAIL TERMINAL (POSTS 1-6) BILL OF MATERIALS

Mfr Code #	QTY	DESCRIPTION
983G	1	Nose Plate x 10 GA
984G	2	Side Plate x 10 GA
31G	2	"W" Beam 12 GA x 13'-6 1/2"
130A	2	"W" Beam 10 GA x 13'-6 1/2"
9852A	1	Channel Strut x 6'-6"
740G	6	Steel Foundation Tube
766G	6	Soil Plate 18" x 24"
3075B	1	Wood Post 5 1/2" x 7 1/2" (Notched) (Post 1)
3074B	5	Wood Post 5 1/2" x 7 1/2" (Post 2 - 6)
3100B	2	Wood Block 5 1/2" x 7 1/2" (Post 1)
3101B	10	Wood Block 5 1/2" x 7 1/2" (Post 2 - 6)
9916A	1	Sleeve (Post 1)
9915A	1	Spacer Channel (Post 2)
9921G	2	Steel Tube (Post 4 & 6)
19271G	1	Pipe Sleeve (Post 1)
705G	1	Pipe Sleeve (Post 2)
19261G	2	Post Plate (Post 4)
782G	1	Bearing Plate (Post 1)
3012G	1	Cable Assembly (From Post 1 to 2)
3275G	2	3/8" Restraint Rod (Post 3 & 5)
19259G	32	Plate Washer (Post 4 & 6)

HARDWARE		
3263G	4	3/8" x 2" Lg Lag Screw
4252G	8	3/8" Hex Nut
4258G	4	3/8" Lock Washer
4257G	4	3/8" Flat Washer
3320G	4	Rectangular Washer
3395G	32	5/8" x 1 3/4" H.H. Splice Bolt
3650G	2	5/8" x 25" Lg H.G.R. Bolt
4640G	8	5/8" x 24" Lg H.H. Bolt
3478G	13	5/8" x 7 1/2" Lg H.H. Bolt
3380G	8	5/8" x 1 1/2" Lg H.H. Bolt
3360G	16	5/8" x 1 1/4" Lg H.G.R. Bolt
3340G	85	5/8" H.G.R. Nut
3300G	8	5/8" Flat Washer
3497G	6	5/8" x 9 1/2" Lg H.H. Bolt
3910G	4	1" Hex Nut
3900G	2	1" Flat Washer

DELINEATOR		
3177B	1	Object Marker (18" x 18") (Cut to fit)

CATGR GUARDRAIL TERMINAL (POSTS 7-8) BILL OF MATERIALS

Mfr Code #	QTY	DESCRIPTION
4064B	2	Wood Post 5 1/2" x 7 1/2" x 6'
3101B	4	Wood Block 5 1/2" x 7 1/2"
21G	1	"W" Beam Guard Rail (12 Ga)
9G	1	"W" Beam Guard Rail (12 Ga)
701A	1	Bracket
782G	1	Bearing Plate (Post 6)
705G	1	Pipe Sleeve (Post 6)
3000G	1	Cable Assembly (from Post 6 to Rail)
3320G	2	Rectangular Washer

HARDWARE		
3360G	24	5/8" x 1 1/4" H.G.R. Splice Bolt
3400G	4	5/8" x 25" H.G.R. Post Bolt
3380G	8	5/8" x 1 1/2" Hex Hd Bolt
3340G	28	5/8" H.G.R. Nut
3300G	8	5/8" Washer
3910G	4	1" Hex Nut
3900G	2	1" Washer

GENERAL NOTES

- Crown will be widened to accommodate the CAT system. The crown should extend at least 3 feet beyond the inside face of rail. The ground line at posts should be an extension of the roadway surface crown.
- All bolts, nuts, washers, cable assemblies, cable anchors, post tubes, backup plates, and soil plates shall be galvanized.
- The exposed end segment of an "End Section" should be evaluated as a potential obstacle in the determination of the need of MBGF for the opposing direction of traffic.
- As a usual minimum, a 25 foot section of MBGF with uniform post spacing at 3'-1.5" beyond the "End Section" is required immediately upstream of attachment to a rigid barrier. See Detail 3.
- For placement at curb sections, the height from gutter pan to post bolt will be 21", and the front section shall be flared (See Detail 2).
- The wood blockouts shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.
- Either 6" x 8" or 5 1/2" x 7 1/2" wood blocks may be used at posts 1 through 8 as supplied by the manufacturer.
- An object marker shall be installed on the front of the terminal as detailed on the D&OM (VIA).

Texas Department of Transportation
Design Division (Roadway)

**CRASH CUSHION
ATTENUATING TERMINAL
(GUARDRAIL)
CATGR(2)-97**

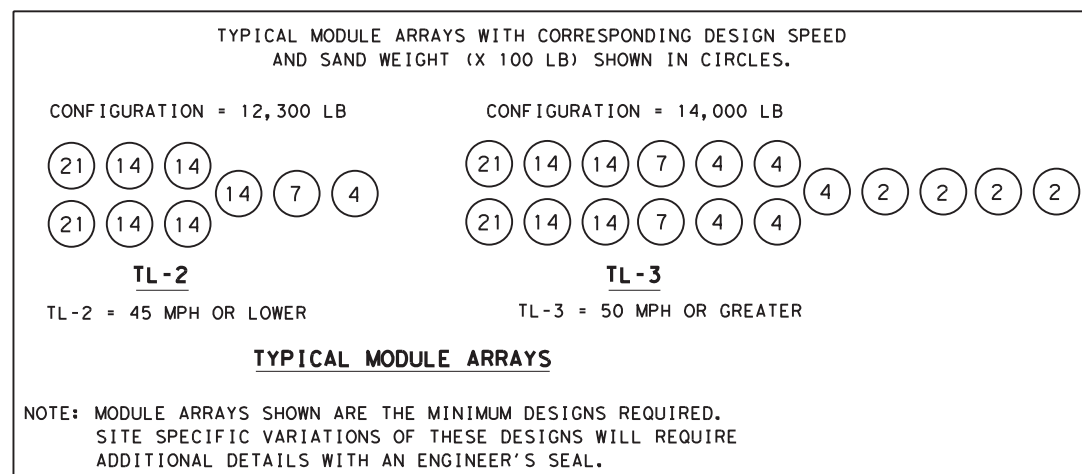
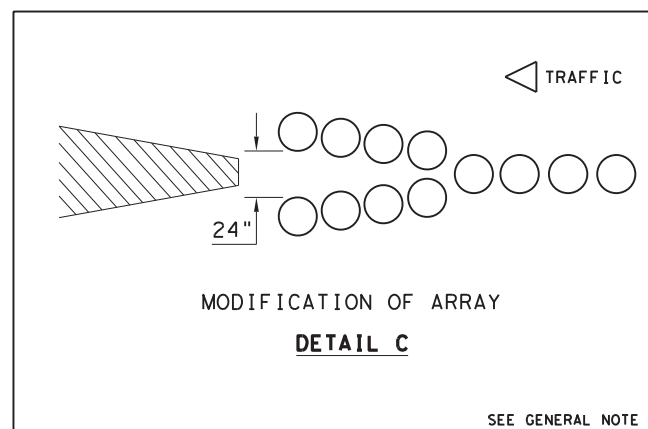
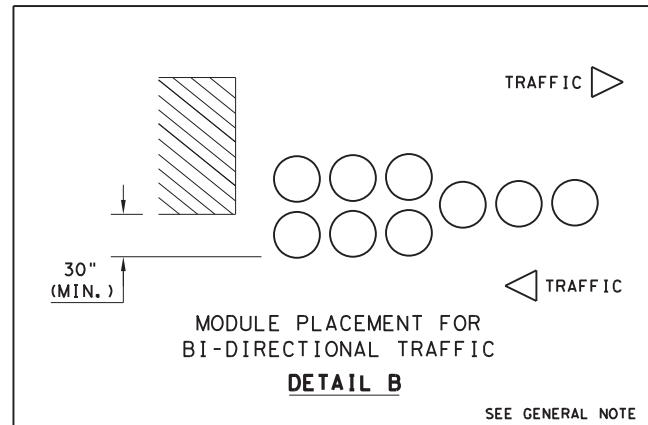
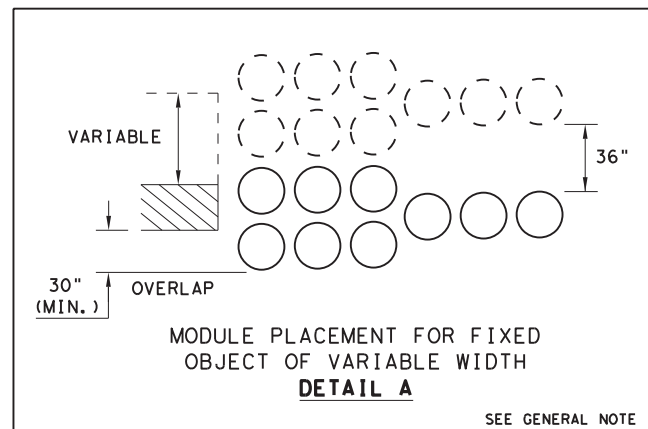
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© TxDOT 1997	DIST	FEDERAL AID PROJECT		
REVISIONS	SAT	SHEET 270		
	COUNTY	CONTROL	SECT	JOB
	BEXAR	6372	50	001
				VAR.

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DATE: FILE:

SITE CONDITIONS AND PLACEMENT GUIDELINES		
CONDITION	RECOMMENDATION	ILLUSTRATION
1. ANGLE OF ARRAY IN RELATION TO CENTER LINE OF OBSTACLE	NOT RECOMMENDED FOR MORE THAN 10°	
2. MODULE SPACING: MODULE TO FIXED OBJECT MODULE TO MODULE	12" TO 24" 6" USUAL	
3. BI-DIRECTIONAL TRAFFIC	OFFSET ARRAY TO AVOID REAR CORNER MODULE SNAGGING, POTENTIAL BY TRAFFIC IN THE UPSTREAM DIRECTION OF FLOW.	SEE (DETAIL B) SHOWING BI-DIRECTIONAL TRAFFIC
4. "COFFIN" CORNER	SHIELD 30" MINIMUM OUTSIDE OF FIXED OBJECT	
5. SLOPING SITES: LATERAL AND LONGITUDINAL FOR MORE INFORMATION READ GENERAL NOTE: 7	1:10 MAXIMUM (V: H:)	
6. CURB: RAISED ISLAND:	NO MORE THAN 4" HIGH (REMOVE IF POSSIBLE)	
7. FOUNDATION PADS:	FLAT SURFACE: CONCRETE OR ASPHALT	
8. MAINTENANCE:	KEEP SITE CLEAR OF TRASH, ROAD DEBRIS, ETC	
9. SAND DENSITIES	100 LBS / CF	
10. VANDALISM	CHECK PERIODICALLY FOR DAMAGES, GRAFFITI.	



GENERAL NOTES

1. REAR MODULES SHOULD OVERLAP THE HAZARDOUS FIXED OBJECT IN WIDTH ON EACH SIDE BY A MINIMUM OF 30 INCHES. SEE DETAILS A, B.
2. MODIFICATION OF ARRAYS: WHEN PROXIMITY OF TRAFFIC LANES EXCLUDE THE USE OF A WIDER BARRIER, THE FRONT OF THE BARRIER MAY RETAIN THE STANDARD WIDTH BUT THE REAR CAN BE WIDENED BY SPACING. SEE DETAILS C.
3. BARRIERS CAN BE INSTALLED AT ANY DISTANCE FROM THE SHOULDER, AT ROADSIDE AND MEDIAN LOCATIONS FROM ZERO FT UP TO 30 FT, DEPENDING UPON THE LOCATION OF THE HAZARDOUS FIXED OBJECT.
4. ANGLING THE BARRIER TOWARDS ON-COMING TRAFFIC IS SUGGESTED, 3-DEGREES UP TO 10-DEGREES DEPENDING ON SPACE AVAILABLE.
5. WHENEVER POSSIBLE, CURBS 4 INCHES AND HIGHER SHOULD BE REMOVED FROM THE HAZARDOUS SITES. HOWEVER, WHEN REMOVAL IS NOT POSSIBLE, MODULES CAN BE SEPARATED ALONG THE BARRIER AXIS TO FIT THE SITUATION.
6. LONGITUDINAL SPACING OF MODULES MAY BE INCREASED WHERE SPACE PERMITS, E.G., 2 FT UP TO 3 FT SPACING OF SELECTED MODULES MAY PERMIT THE DESIGNER TO USE ALL THE SPACE ALLOCATED FOR AN ENERGY-ABSORBING BARRIER.
7. THE ENTIRE AREA OF THE CRASH CUSHION INSTALLATION AND APPROACHES SHALL BE GRADED SO THAT THE MAXIMUM SLOPE DOES NOT EXCEED 1V:10H VERTICALLY OR HORIZONTALLY IN ANY DIRECTION.
8. WHERE REQUIRED, SUPPORT PADS, CONCRETE, ASPHALT, ETC, WILL BE MEASURED AND PAID FOR IN ACCORDANCE WITH PERTINENT BID ITEMS.

SACRIFICIAL

		<i>Design Division Standard</i>	
VEHICLE IMPACT ATTENUATOR SAND FILLED PLASTIC MODULES VIA (SFPM) - 16			
FILE: viasfpm16.dgn	DN: TxDOT	CK: KM	DW: VP
© TxDOT: 2016	CONT: 6372	SECT: 50	JOB: 001
REVISIONS	SAT		COUNTY: BEXAR
			SHEET NO.: 271

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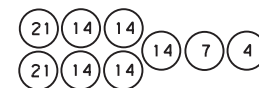
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SITE CONDITIONS AND PLACEMENT GUIDELINES

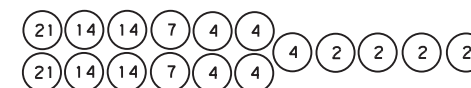
CONDITION	RECOMMENDATIONS	ILLUSTRATION
1. Angle of array in relation to center line of obstacle	Not recommended for more than 10°	
2. Bi-directional traffic	Offset array to avoid rear corner module snagging potential by traffic in the upstream direction of flow	See detail showing bi-directional traffic
3. Module spacing: Module to Module Module to fixed object	6" usual 12" to 24"	
4. "Coffin" corner	Shield 30" min. outside of fixed object	
5. Sloping sites (lateral and longitudinal) (See Gen. Note 6)	1:10 Maximum (V:H)	
6. Curbs and raised islands	No more than 4" high (remove if possible)	
7. Foundation pads	Flat surface: Concrete or Asphalt	
8. Maintenance	Keep site clear of debris and snow	
9. Sand densities	100 LBS/CF	
10. Vandalism	Check periodically for damages	

TYPICAL MODULE ARRAYS WITH CORRESPONDING DESIGN SPEED AND SAND WEIGHT (X 100 LB) shown in circles.

Module arrays shown are the minimum designs required. Site specific variations of these designs will require additional details with an Engineer's seal.



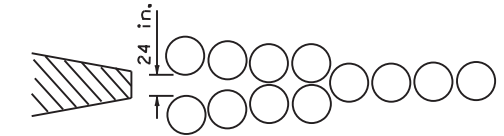
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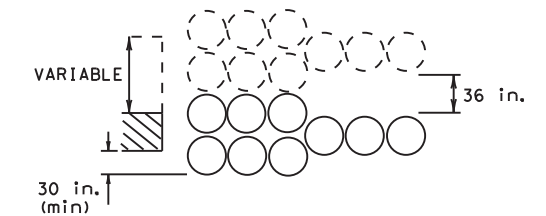
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GENERAL NOTES

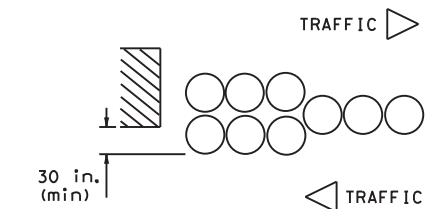
- Rear modules should overlap (in width) the fixed object on each side by a minimum of 30 inches. (See Detail)
- Modification of array: When proximity of traffic lanes exclude the use of a wider barrier. The front of the barrier may retain the standard width, but the rear can be widened by spacing as shown in this diagram.



- Barrier can be placed at any distance from the shoulder both at roadside and in median sites from 0 to 30 feet depending on the location of the hazardous fixed object. Angling of the barrier toward on-coming traffic is suggested from 3 to 10 degrees depending on space available.
- Whenever possible, curbs 4 inches and higher should be removed from hazardous sites. However, when removal is not possible, modules can be separated along the barrier axis to fit the situation.
- Longitudinal spacing of modules may be increased where space permits. For example, A two foot or three foot spacing of some of the modules may permit the design engineer to use all the space allocated for an energy-absorbing barrier.
- The entire area of the crash cushion installation and approaches shall be graded so that the maximum slope does not exceed 1:10 (vertical:horizontal) in any direction.
- Where required, support pads will be measured and paid for in accordance with pertinent bid items.



MODULE PLACEMENT FOR FIXED OBJECT OF VARIABLE WIDTH



MODULE PLACEMENT FOR BI-DIRECTIONAL TRAFFIC

				Design Division Standard	
VEHICLE IMPACT ATTENUATOR (SAND FILLED PLASTIC MODULES) VIA (SFPM) - 13					
FILE: viasfpm13.dgn	DN: TxDOT	CK: AM	DW: BD	CK:	
© TxDOT March 2010	CONT	SECT	JOB	HIGHWAY	
REVISIONS	6372	50	001	VAR.	
REVISED JUNE, 2013 (VP)	DIST	COUNTY	SHEET NO.		
	SAT	BEXAR	272		

SITE CONDITIONS AND PLACEMENT GUIDELINES

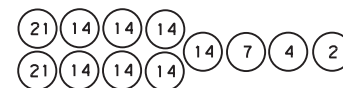
CONDITION	RECOMMENDATIONS	ILLUSTRATION
1. Angle of array in relation to center line of obstacle	Not recommended for more than 10°	
2. Bi-directional traffic	Offset array to avoid rear corner module snagging potential by traffic in the upstream direction of flow	See detail showing bi-directional traffic
3. Module spacing: Module to Module Module to fixed object	6" usual 12" to 24"	
4. "Coffin" corner	Shield 30" min. outside of fixed object	
5. Sloping sites (lateral and longitudinal) (See Gen. Note 6)	1:10 Maximum (V:H)	
6. Curbs and raised islands	No more than 4" high (remove if possible)	
7. Foundation pads	Flat surface: Concrete or Asphalt	
8. Maintenance	Keep site clear of debris and snow	
9. Sand densities	100 LBS/CF	
10. Vandalism	Check periodically for damages	

TYPICAL MODULE ARRAYS WITH CORRESPONDING DESIGN SPEED AND SAND WEIGHT (X 100 LB) shown in circles.

Module arrays shown are the minimum designs required. Site specific variations of these designs will require additional details with an Engineer's seal.



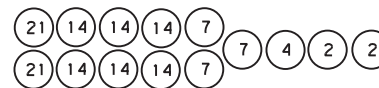
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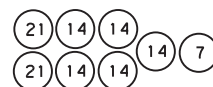
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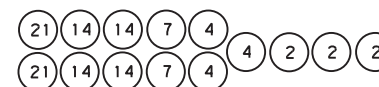
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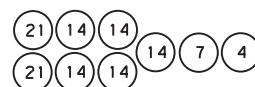
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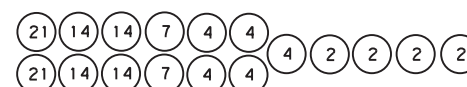
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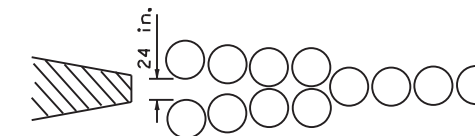
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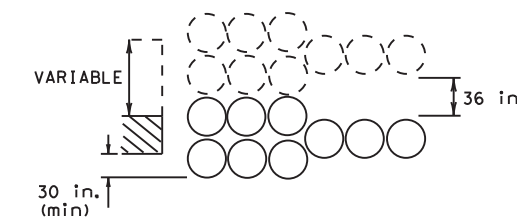
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GENERAL NOTES

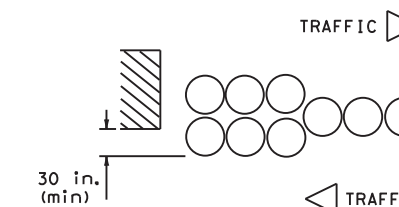
- Rear modules should overlap (in width) the fixed object on each side by a minimum of 30 inches. (See Detail)
- Modification of array: When proximity of traffic lanes exclude the use of a wider barrier. The front of the barrier may retain the standard width, but the rear can be widened by spacing as shown in this diagram.



- Barrier can be placed at any distance from the shoulder both at roadside and in median sites from 0 to 30 feet depending on the location of the hazardous fixed object. Angling of the barrier toward on-coming traffic is suggested from 3 to 10 degrees depending on space available.
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- Longitudinal spacing of modules may be increased where space permits. For example, A two foot or three foot spacing of some of the modules may permit the design engineer to use all the space allocated for an energy-absorbing barrier.
- The entire area of the crash cushion installation and approaches shall be graded so that the maximum slope does not exceed 1:10 (vertical:horizontal) in any direction.
- Where required, support pads will be measured and paid for in accordance with pertinent bid items.



MODULE PLACEMENT FOR FIXED OBJECT OF VARIABLE WIDTH



MODULE PLACEMENT FOR BI-DIRECTIONAL TRAFFIC

Texas Department of Transportation
Design Division Standard

VEHICLE IMPACT ATTENUATOR (SAND FILLED PLASTIC MODULES) VIA (SFPM) - 10

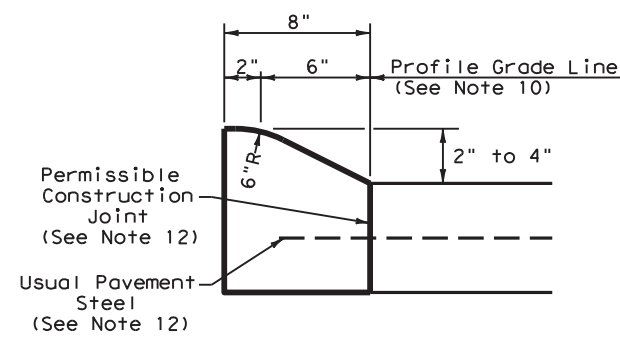
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	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	273	

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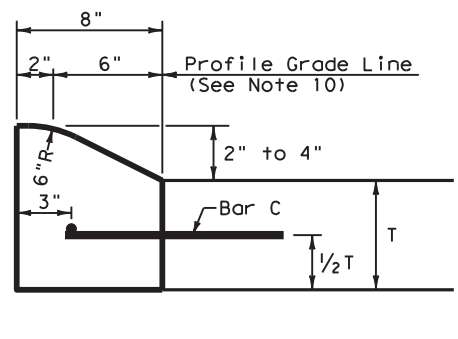
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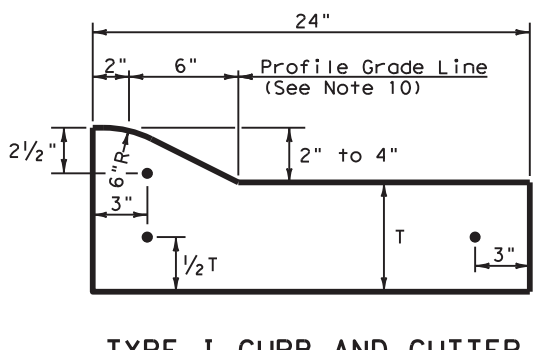
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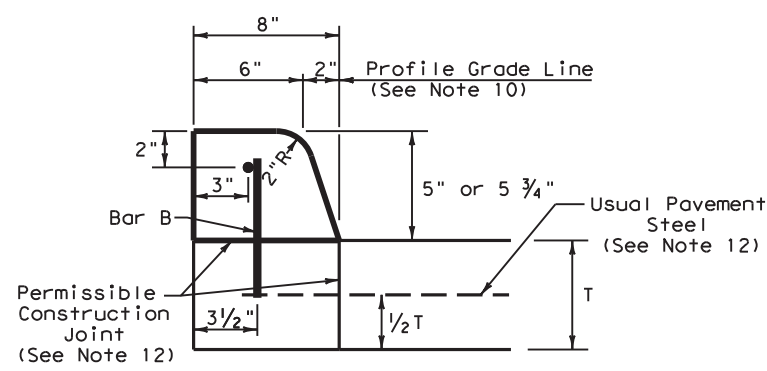
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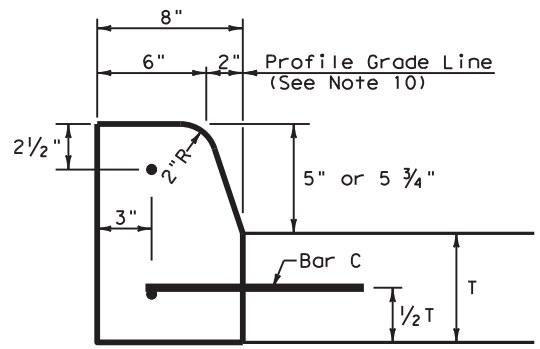
**TYPE I CURB AND GUTTER
2" - 4" HEIGHT**



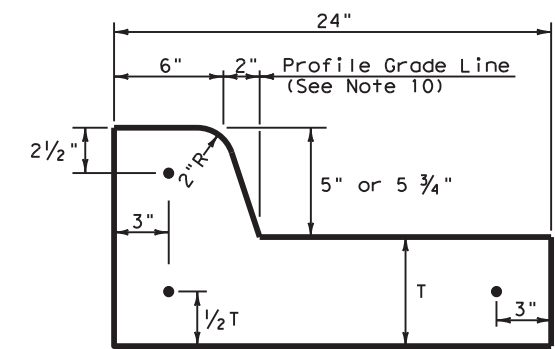
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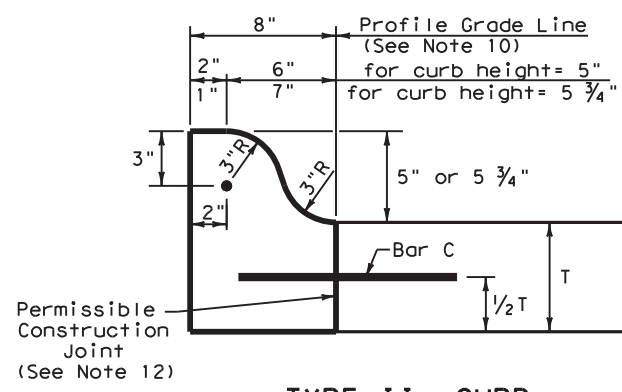
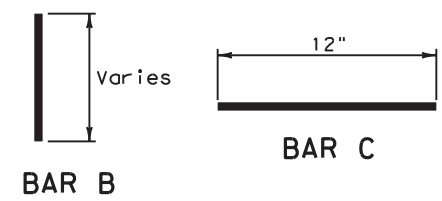
**TYPE II CURB (MONOLITHIC)
5" - 5 3/4" HEIGHT**



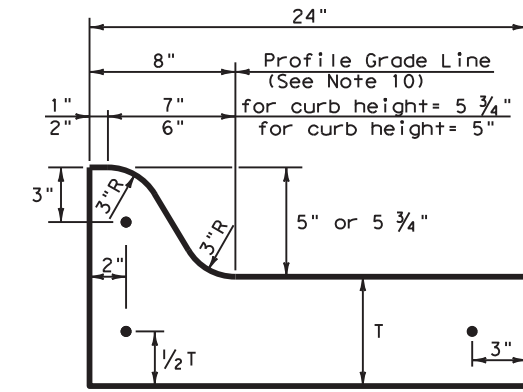
**TYPE II CURB
5" - 5 3/4" HEIGHT**



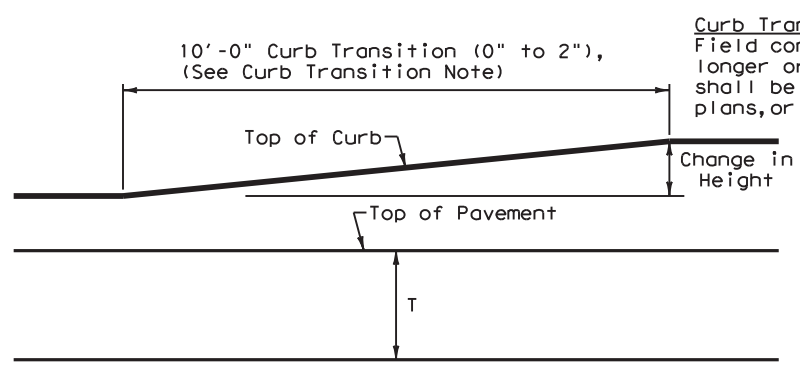
**TYPE II CURB AND GUTTER
5" - 5 3/4" HEIGHT**



**TYPE IIa CURB
5" - 5 3/4" HEIGHT**

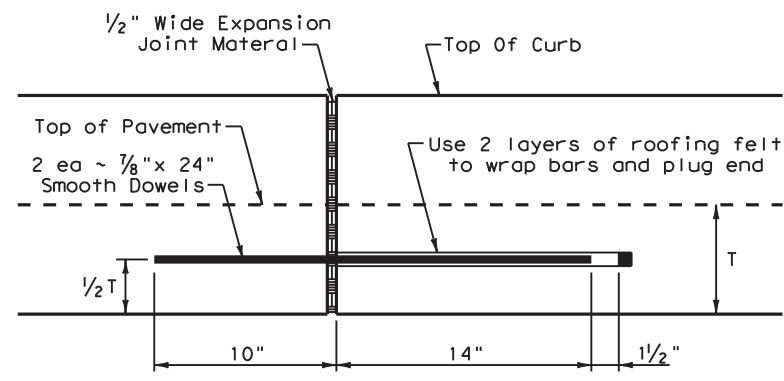


**TYPE IIa CURB AND GUTTER
5" - 5 3/4" HEIGHT**



CURB TRANSITION
Note: To be paid for as Highest Curb

Curb Transition Note:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



EXPANSION JOINT DETAIL

General Notes

1. All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
2. Concrete shall be Class A.
3. When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Producer List (MPL), maintained by TxDOT, Construction Division.
4. Round exposed sharp edges with a rounding tool, to a minimum radius of 1/4 inch.
5. All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
6. Where concrete curb is placed on existing concrete pavement, the pavement shall be drilled and the reinforcing bars grouted in place.
7. Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
8. Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C-C.
9. Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
10. Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
11. One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
12. When vertical permissible construction joints are used, resulting in a longitudinal construction joint in the pavement, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans for longitudinal construction joints. Reinforcing steel for curb section shall then conform to that required for concrete curb.



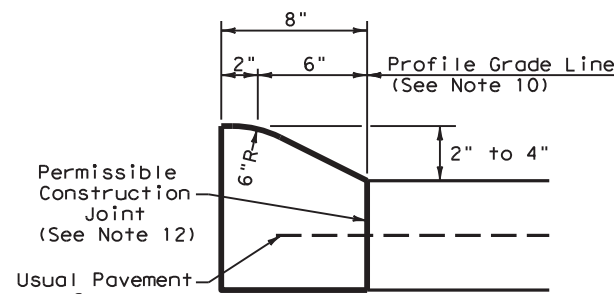
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CCCG-10A

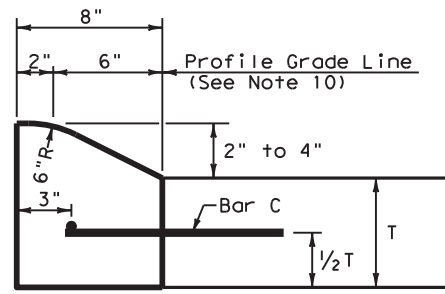
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	SAT	BEXAR	274	

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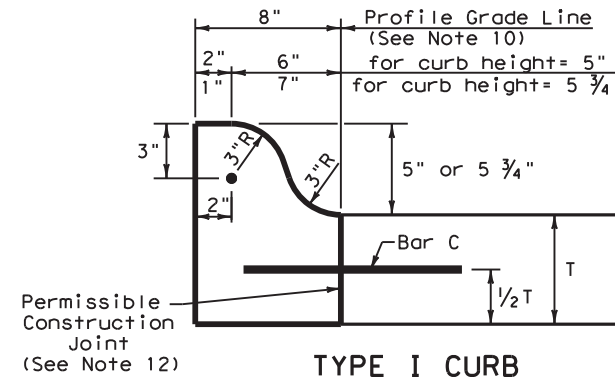
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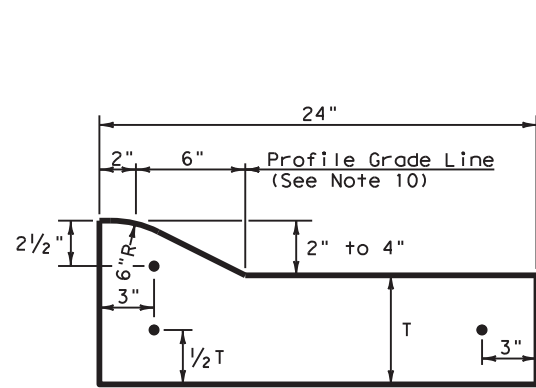
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2" - 4" HEIGHT**



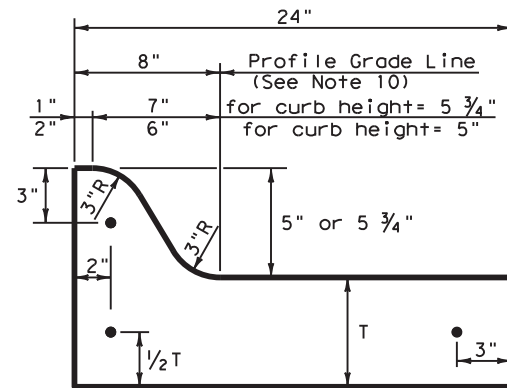
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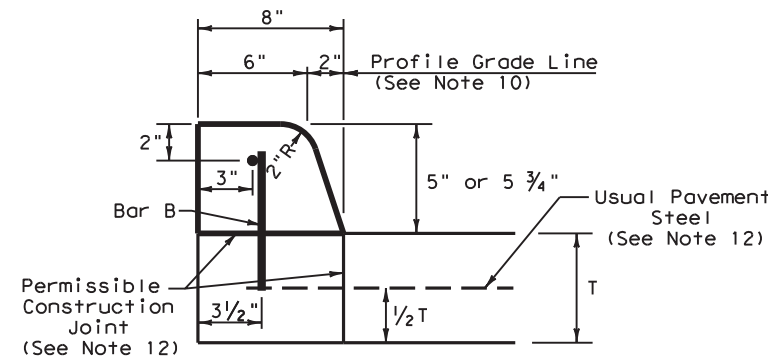
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5" - 5 3/4" HEIGHT**



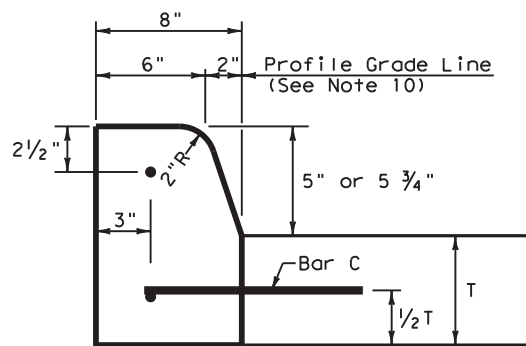
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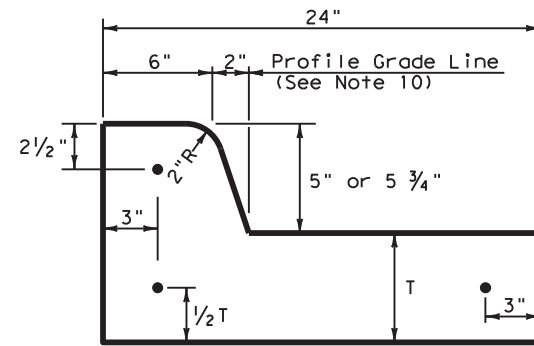
**TYPE I CURB AND GUTTER
5" - 5 3/4" HEIGHT**



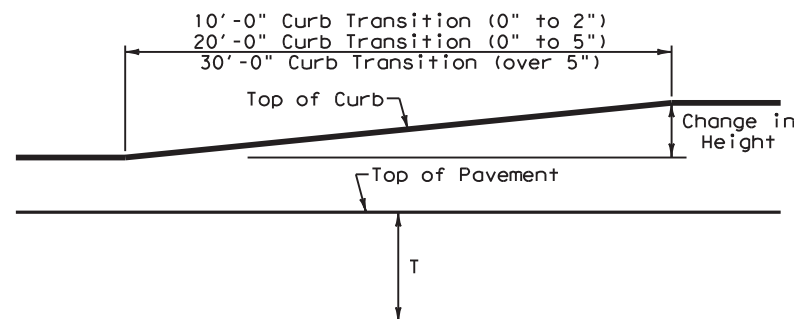
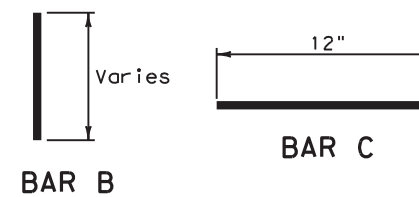
**TYPE II CURB (MONOLITHIC)
5" - 5 3/4" HEIGHT**



**TYPE II CURB
5" - 5 3/4" HEIGHT**

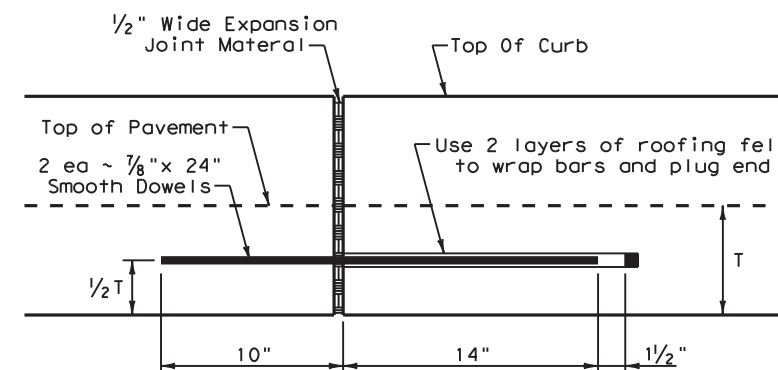


**TYPE II CURB AND GUTTER
5" - 5 3/4" HEIGHT**



CURB TRANSITION

Note: To be paid for as Highest Curb



EXPANSION JOINT DETAIL

General Notes

- All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
- Concrete shall be Class A.
- When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Producer List (MPL), maintained by TxDOT, Construction Division.
- Round exposed sharp edges with a rounding tool, to a minimum radius of 1/4 inch.
- All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
- Where concrete curb is placed on existing concrete pavement, the pavement shall be drilled and the reinforcing bars grouted in place.
- Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
- Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C-C.
- Dimension 'T' shown is the thickness of concrete pavement or flexible base and surface (8" maximum).
- Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
- One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
- When vertical permissible construction joints are used, resulting in a longitudinal construction joint in the pavement, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans for longitudinal construction joints. Reinforcing steel for curb section shall then conform to that required for concrete curb.

Texas Department of Transportation
Design Division (Roadway)

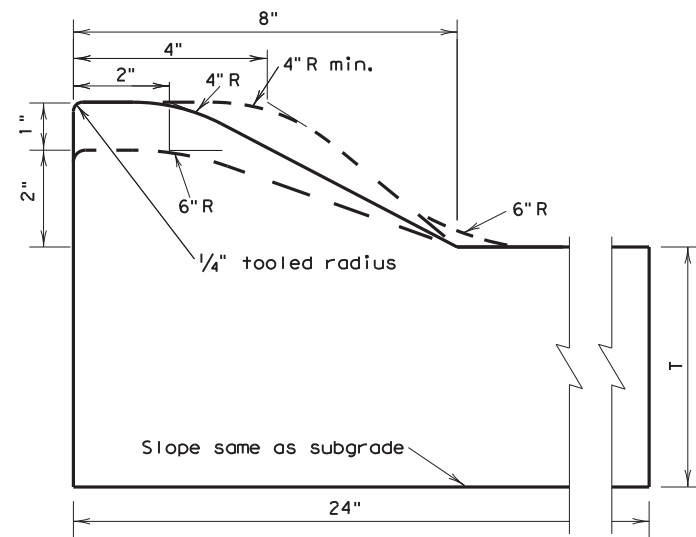
**CONCRETE CURB AND
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CCCG-10

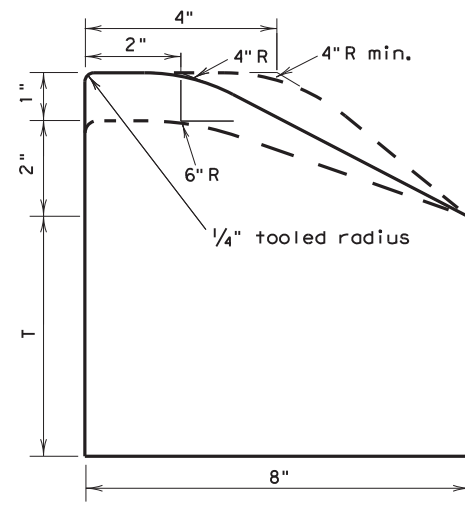
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© TxDOT 1995	DIST	PROJECT		SHEET
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BEXAR	6372	50	001	VAR.

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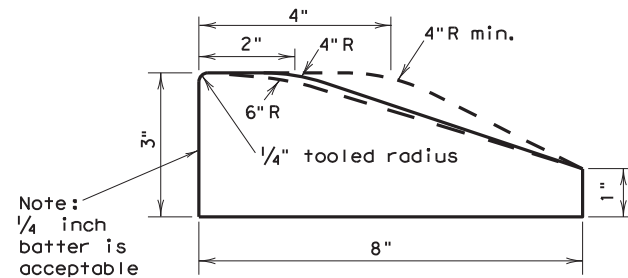
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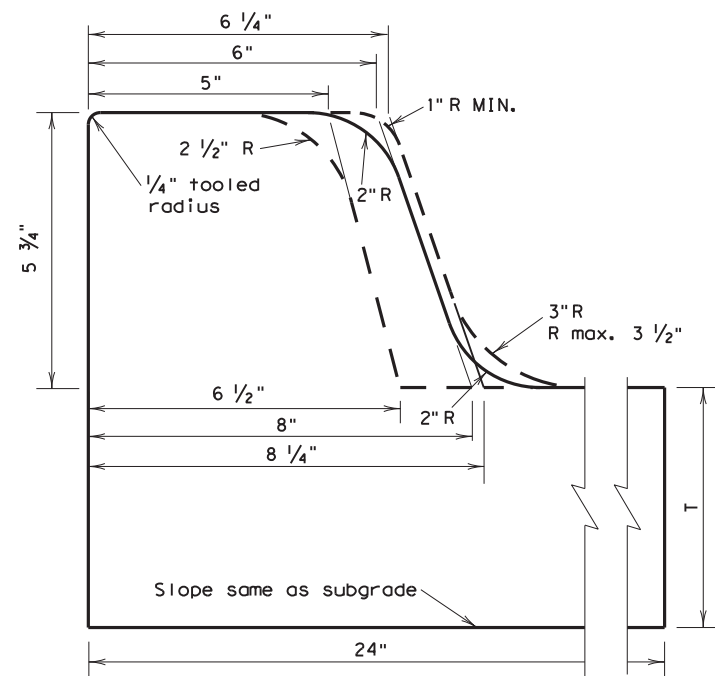
TYPE I CURB AND GUTTER



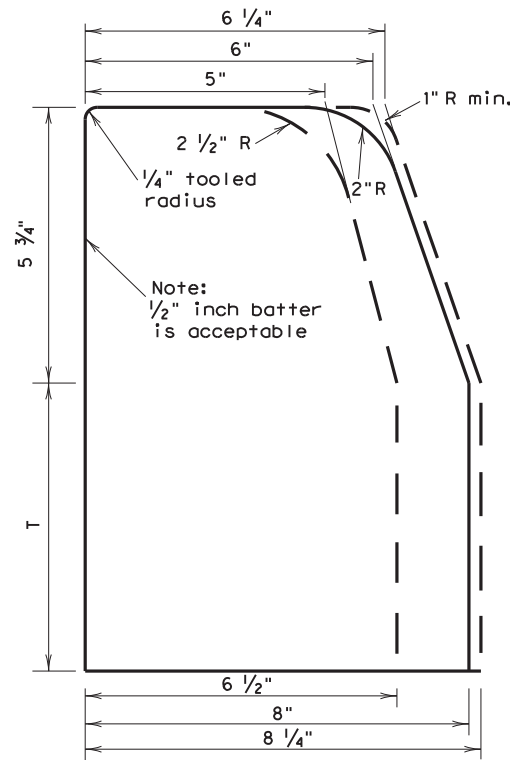
TYPE I CURB



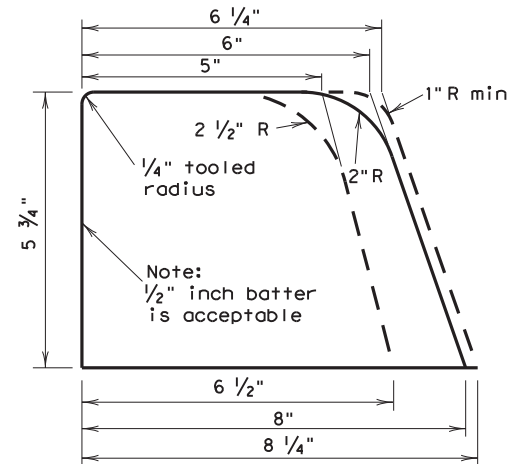
TYPE I MONO CURB OR CURB PLACED ON PAVEMENT



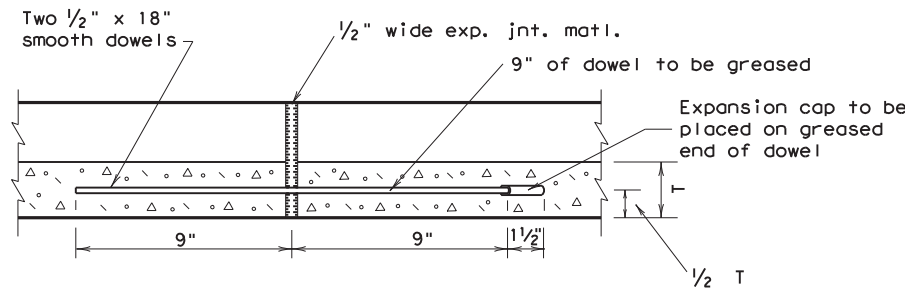
TYPE II CURB AND GUTTER



TYPE II CURB



TYPE II MONO CURB OR CURB PLACED ON PAVEMENT



Longitudinal section thru curb and gutter showing typical expansion joint details.

Reinforcing steel (when used) shall not cross expansion joints. Steel shall be terminated 3" ± 1" from face of the joint.

GENERAL NOTES

- Contractor may use existing forms if the cross section lies within the band shown by dotted lines. If new forms are to be purchased, leased, or constructed they shall conform to the solid line.
- When reinforcing steel is required or placed at contractor's option, one of the following schemes of reinforcement shall be required. The manner of placement and location shall be to the satisfaction of the Engineer.
 - Type I, or Type II, curb and gutter reinforcement shall have longitudinal reinforcing bars as follows: Three #3, two #4, two #5, or one #6.
 - All types of curb (reinf.) shall have one #3 or #4 bar for longitudinal reinforcement.
- Reinforcing bars shall be lapped a minimum of 15".
- When curb or curb and gutter is placed by a separate pour adjacent to or atop concrete pavement, curb or curb and gutter shall be tied to pavement in a manner satisfactory to the engineer with 8-inch long #3 or #4 bars spaced at 5 feet and expansion and/or contraction joints of curb or curb and gutter shall match those of pavement.

When curb and curb and gutter is not constructed adjacent to concrete pavement, the following shall govern:

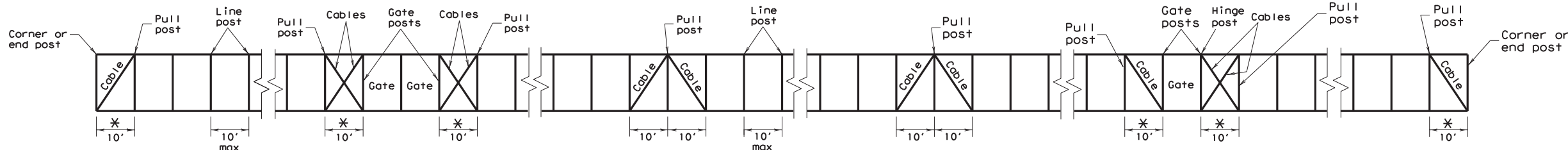
 - Reinforced curb or curb and gutter shall have no contraction joints.
 - Non-reinforced curb or curb and gutter shall have formed, tooled or sawed contraction joints at 10' ±. The depth of these joints shall be sufficient to ensure cracking at the joints.
 - Reinforcing curb or curb and gutter shall have expansion joints at points of curvature and at intervals no greater than 120' in all curves and at structures such as bridges, box culverts, curb inlets, etc.
 - Non-reinforced curb or curb and gutter shall have expansion joints at points of curvature on curves of radius less than 25' and at structures such as bridges, box culverts, curb inlets, etc.
- One-half inch expansion joint material shall be provided where curb or curb gutter is adjacent to sidewalk or riprap.
- Unless otherwise shown, transitions between curbs or curbs and gutters of differing cross section shall be accomplished over a 20 foot length or as approved by the Engineer.
- At contractor's option, dimension "T" may be thickness of pavement structure. In no case shall it be less than 6".
- See the RAMP standard sheet for information on curb ramps and sidewalks crossing driveways.

Texas Department of Transportation
Design Division (Roadway)

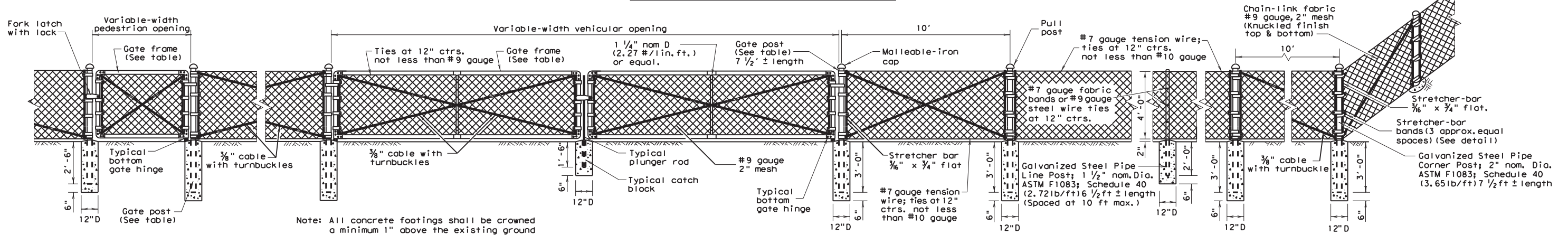
CONCRETE CURB AND CURB AND GUTTER

CCCG-01

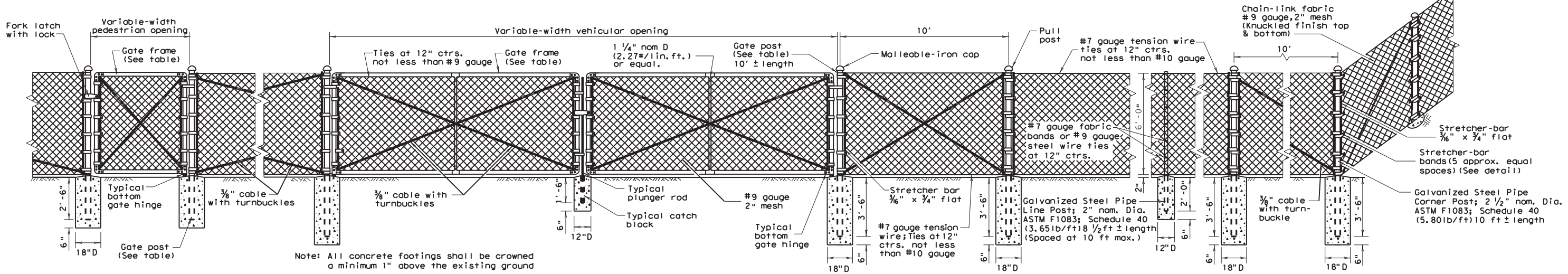
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© TxDOT	1995	FEDERAL AID PROJECT		SHEET					
REVISIONS	SAT	276							
COUNTY	CONTROL	SECT	JOB	HIGHWAY					
BEXAR	6372	50	001	VAR.					



TYPICAL CABLE AND POST ARRANGEMENT



CHAIN-LINK BARRIER FENCE (4 FT.)



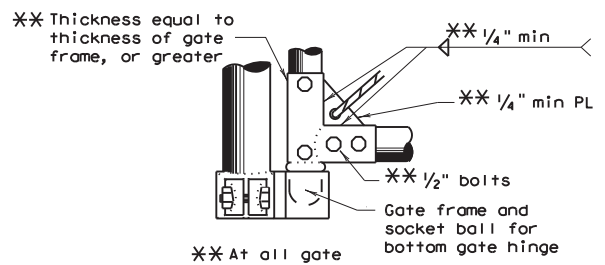
CHAIN-LINK BARRIER FENCE (6 FT.)

GENERAL NOTES

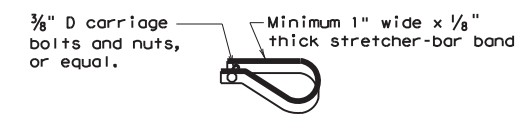
1. Typical installation plan may vary as shown elsewhere on the plans or as directed by the Engineer. Location of gates shown elsewhere on plans.
2. Gate-frame members shall be bolted, at frame corners, to joint fittings with four 1/2" bolts per joint.
3. All cable connections are to be made with two 3/8" cable clamps.
4. All pull posts and end posts and their foundations shall have the same respective dimensions as those shown for corner post.
5. All pull post shall be furnished with two stretcher bars.
6. One end of each turnbuckle may be attached directly to fittings with a clevis.

TABLE OF MINIMUM SIZES & WEIGHTS

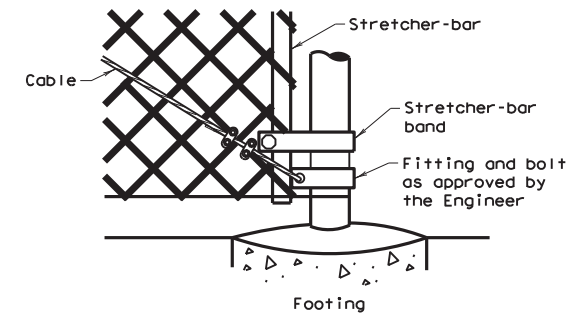
GATE OPENING TYPE		GATE FRAME		GATE POST	
Single Inclusive	Double Inclusive	SIZE	WT./LIN. FT.	SIZE	WT./LIN. FT.
Up to 6'	Up to 12'	1 1/2" nom D	2.72 LBS.	2 1/2" nom D or equal	5.79 LBS.
Over 6' to 12'	Over 12' to 26'	or equal	2.72 LBS.	3 1/2" nom D or equal	9.11 LBS.
Over 12' to 18'	Over 26' to 36'		2.72 LBS.	6" nom D	18.97 LBS.
Over 18'	Over 36'			8" nom D	24.70 LBS.



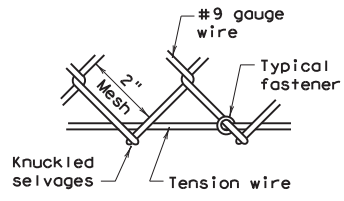
TYPICAL BOTTOM GATE HINGE



TYPICAL STRETCHER-BAR BAND



Terminal Post Detail



Fabric & Tension Wire Detail Top & Bottom

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LEVELS DISPLAYED

1	3	4	15	16	17	18	19	10	11	21	31	41	51	61
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
47	48	49	50	51	52	53	54	55	56	57	58	59	60	61

Texas Department of Transportation
Design Division (Roadway)

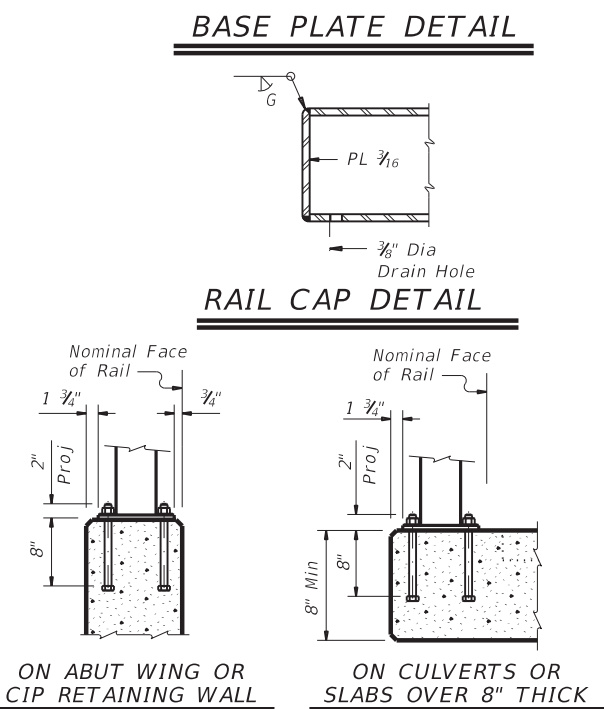
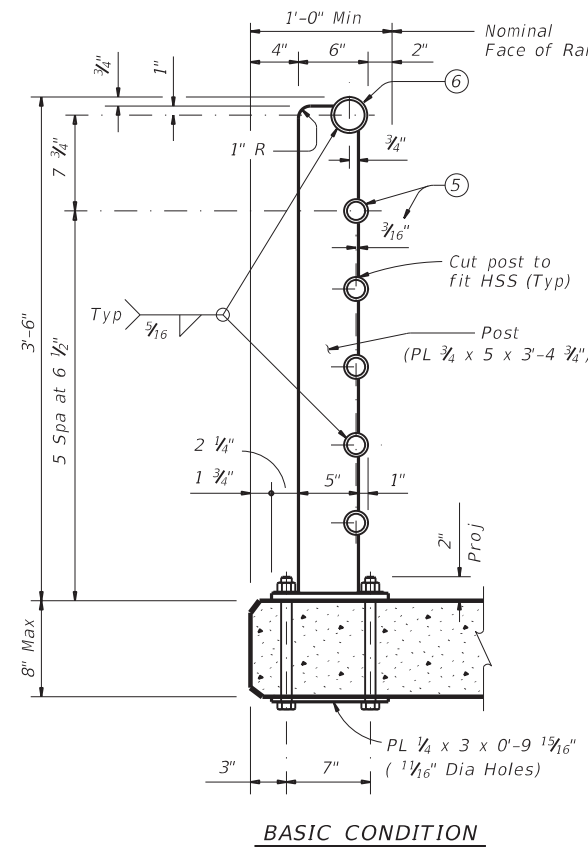
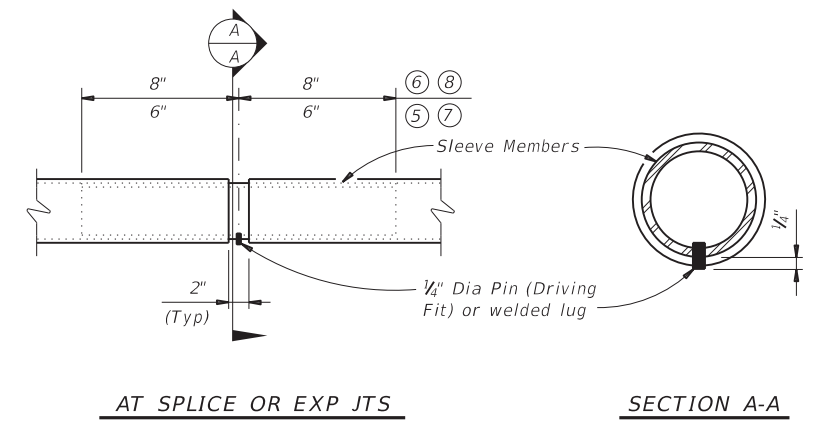
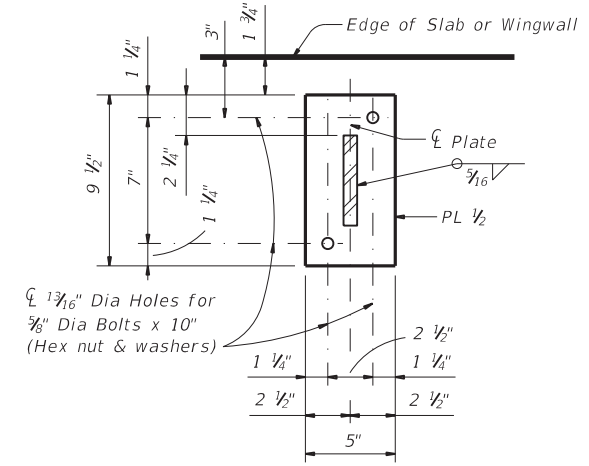
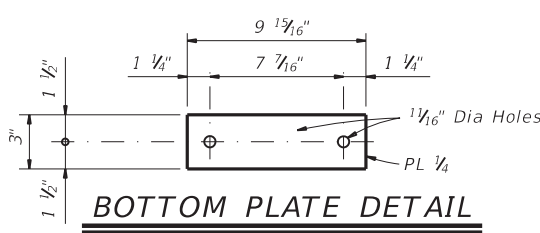
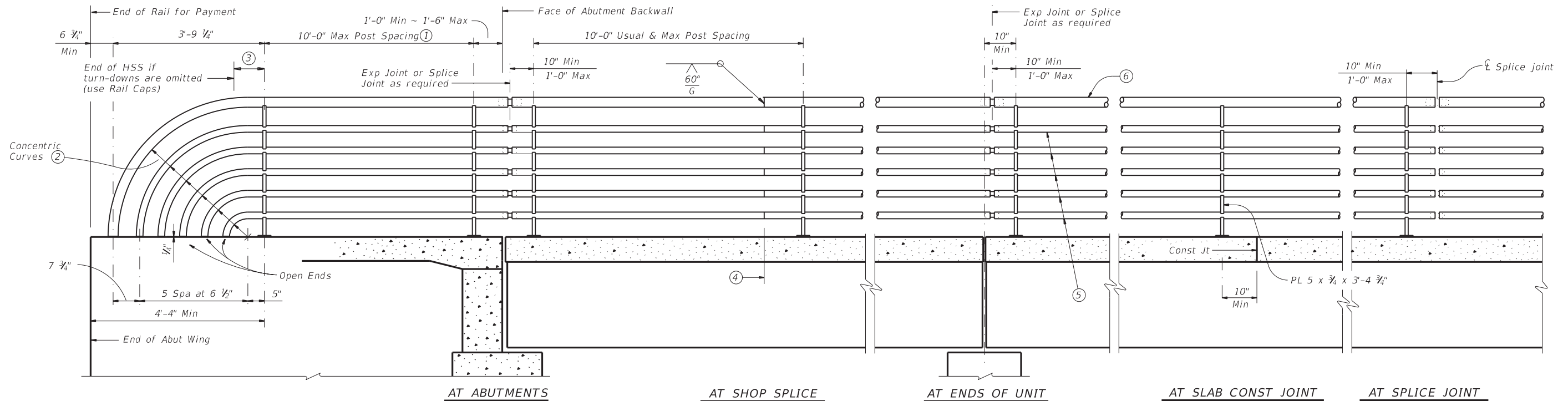
CHAIN-LINK BARRIER FENCE
4 AND 6 FOOT HEIGHT
CLF-00

FILE: CLF00.DGN	DN: HEJ	CK: HEJ	DW: BGD	CK:	NEG:
REVISIONS	SAT	FED REG	RMC PROJECT	SHEET	
	6			277	
COUNTY	CONTROL	SECT	JOB	HIGHWAY	
BEXAR	6372	50	001	VAR.	

R = Radius
D = Diameter

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DATE: FILE:



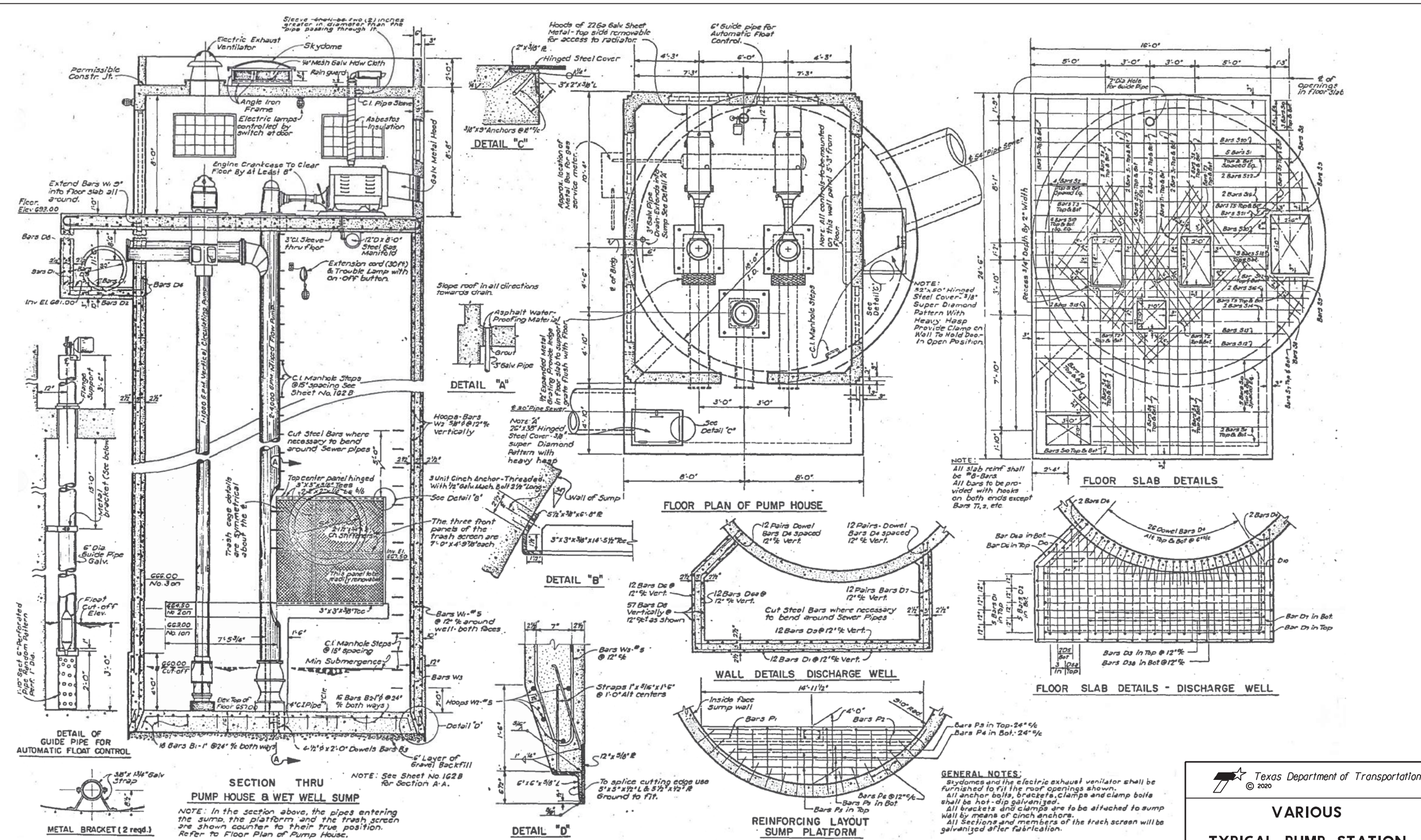
CONSTRUCTION NOTES:
 Panel lengths of railing must be attached to a minimum of three posts except at abutment wingwalls. Face of rail and posts must be vertical transversely unless otherwise approved. Posts must be perpendicular to adjacent roadway grade. Use Type VIII epoxy mortar under post base plates if gaps larger than 1/16\" exist.
 For curved railing applications, fabricate the HSS rails to the radius when the radius is 600' or less. Submit shop drawings for approval when tubes are required to be fabricated to a radius. Shop drawings must be submitted to the Engineer for approval.
 Round or chamfer exposed edges of HSS rail and HSS rail posts to approximately 1/16\" by grinding.

MATERIAL NOTES:
 Provide ASTM-A500 Grade B, A1085 or A53 Grade B for all HSS.
 Provide ASTM-A36 for posts and plates.
 Galvanize all steel components unless otherwise shown.
 Anchor bolts must be 3/8\" Dia ASTM A307 Grade A bolts (or A36 threaded rods with one tack welded hex nut each) with one hex nut and one hardened steel washer at each bolt. Threaded rods may be 0.557\" minimum diameter with rolled threads. Nuts must conform to A563 requirements.

GENERAL NOTES:
 Designed according to AASHTO LRFD Specifications.
 Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.
 Do not use this railing on bridges with expansion joints providing more than 5\" movement.
 For all rails, submit erection drawings showing section lengths, splice locations, rail post spacing and anchor bolt setting for approval.
 Average weight of railing is 30 plf.

- ① Min of 2 posts required on wingwall
- ② Portion of railing with turn-downs to be used or omitted as indicated on Bridge Layout.
- ③ 10\" Min ~ 1'-6\" Max if turn-downs are omitted.
- ④ One shop splice per panel is permitted (with minimum 85 percent penetration). The weld may be square groove or single vee groove. Grind smooth.
- ⑤ HSS 2.375 x 0.154
- ⑥ HSS 3.500 x 0.216
- ⑦ HSS 1.900 x 0.145
- ⑧ HSS 2.875 x 0.203

				Bridge Division Standard	
<h2>PEDESTRIAN RAIL</h2>					
<h3>TYPE PR1</h3>					
FILE: r1std028.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT	
©TxDOT July 2014	CONTRACT: 6372	SECTION: 50	JOB: 001	HIGHWAY: VAR.	
REVISIONS					
	DIST: SAT	COUNTY: BEXAR	SHEET NO.:		278



FOR CONTRACTOR'S INFORMATION ONLY.

Texas Department of Transportation
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VARIOUS TYPICAL PUMP STATION DETAIL

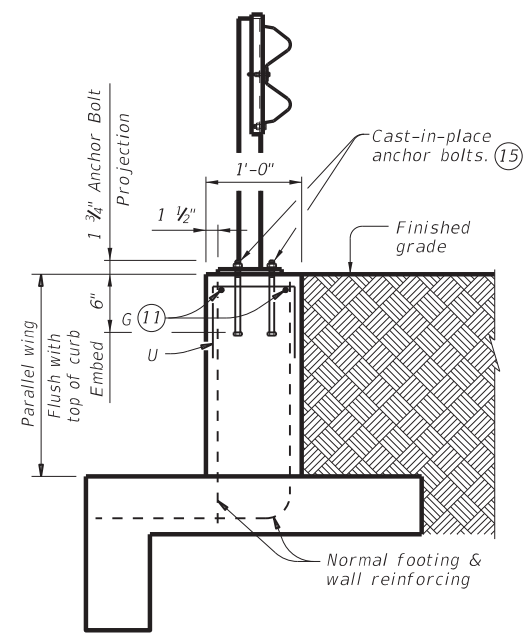
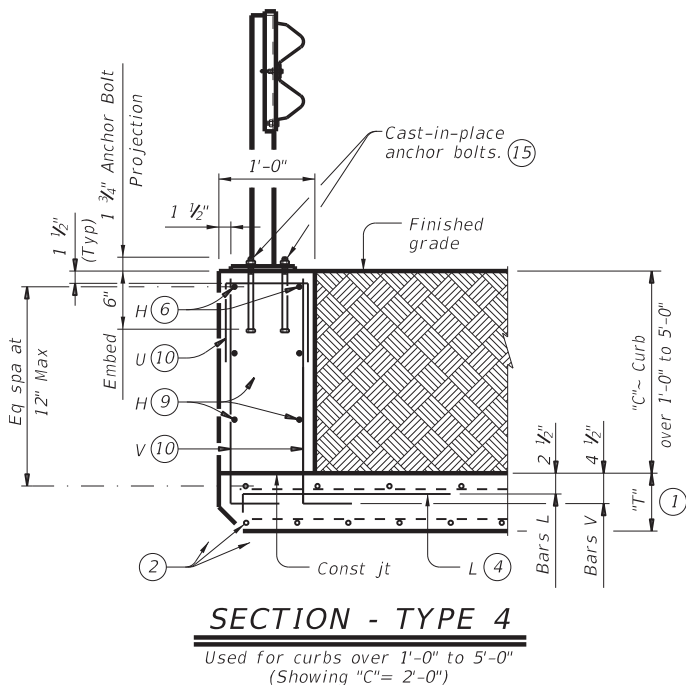
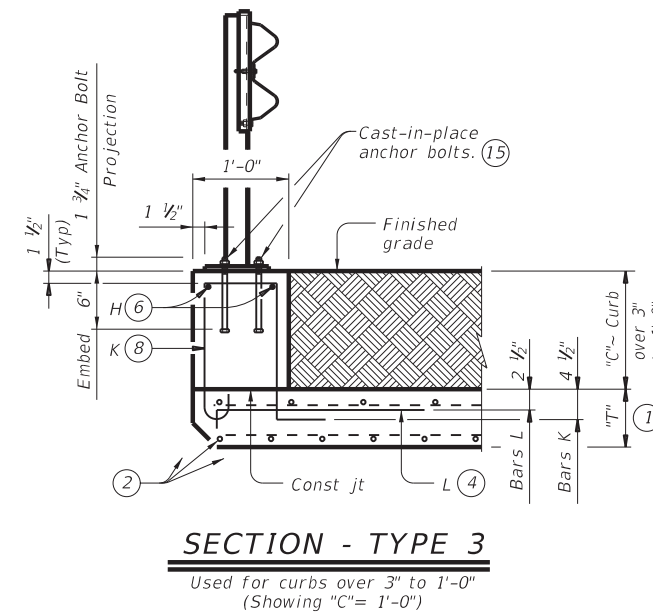
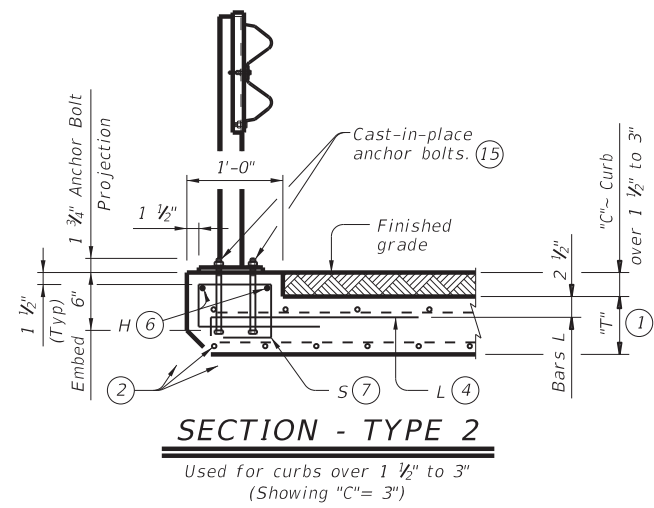
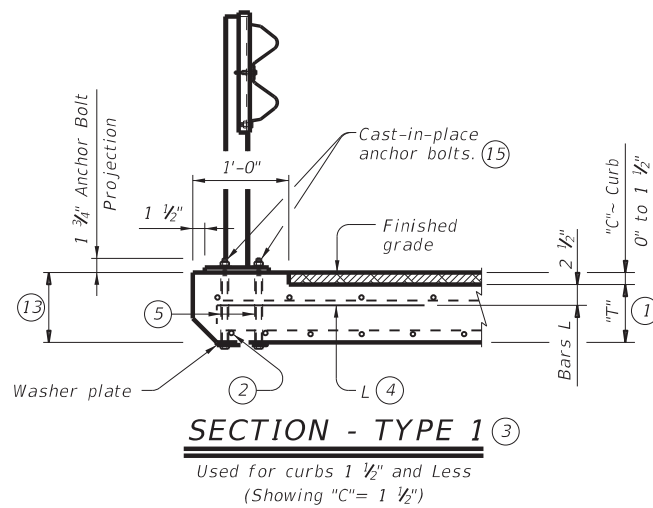
SHEET 01 OF 01

FED. DIV. NO.	PROJECT NUMBER	SHEET NO.	
6	RMC 6372-50-001	280	
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR.

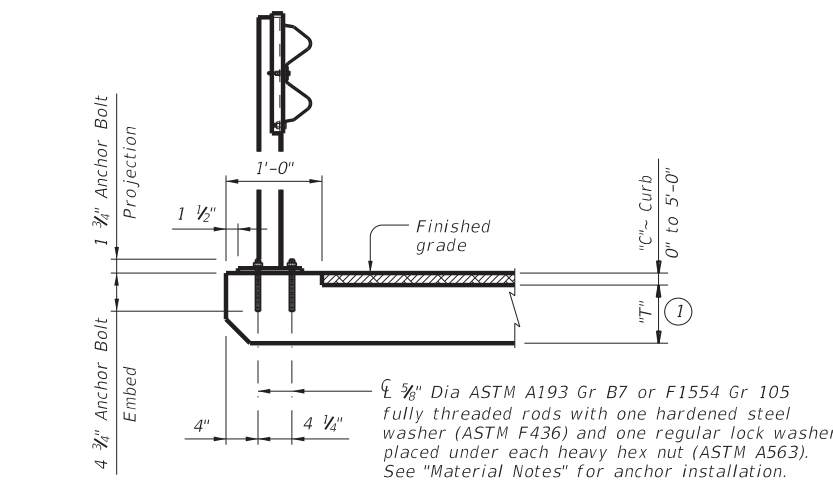
GENERAL NOTES:
 Skydomes and the electric exhaust ventilator shall be furnished to fit the roof openings shown.
 All anchor bolts, brackets, clamps and clamp bolts shall be hot-dip galvanized.
 All brackets and clamps are to be attached to sump wall by means of cinch anchors.
 All sections and members of the trash screen will be galvanized after fabrication.

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.

DATE: FILE:



TYPICAL SECTION THRU PARALLEL WINGWALL (15)
Use with all curb heights shown

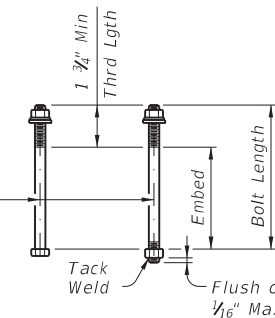


OPTIONAL ADHESIVE ANCHORAGE

Optional adhesive anchor may replace cast-in-place anchor bolts for Type 1 thru Type 4 and on Typical Section Thru Parallel Wingwalls. Reinforcement for optional adhesive anchorage matches details shown for Type 1 thru Type 4 and on Typical Section Thru Parallel Wingwalls.

- 1 "T" is equal to the culvert top slab thickness. For precast boxes with slabs less than 7" thick, see SCP-MD standard for additional details.
- 2 Adjust normal culvert slab bars as necessary to clear obstructions.
- 3 Omit normal culvert curb bars K and H.
- 4 Place bars L as shown. Tilt hook as necessary to maintain cover.
- 5 4 formed holes for anchor bolts at each rail post. See rail standard for information not shown.
- 6 Place normal culvert curb bars H (#4) as shown. Adjust as necessary to clear obstructions.
- 7 Omit normal culvert curb bars K. Place bars S as shown. Tilt bars S as necessary to maintain cover.
- 8 Place normal culvert curb bars K spaced at 12" Max as shown. Tilt bars K as necessary to maintain cover. Refer to box culvert details sheets for bars K details.
- 9 Additional bars H (#4) as required to maintain 12" Max spa.
- 10 At TYPE 4 mountings, replace normal culvert curb bars K with one bar U and two bars V as shown spaced at 12" Max. Adjust length of bars V as necessary to maintain clear cover.
- 11 Adjust parallel wing bars G to positions shown.
- 12 Optional bars L are to be used only for precast box culverts with 3'-0" closure pour.
- 13 If "T" plus "C" is greater than 8", provide reinforcement per TYPE 1 mounting and anchor bolts per TYPE 2 mounting.
- 14 Quantities shown are for Contractor's information only. Quantities are per linear foot of curb length. The values for each section type in table can be interpolated for intermediate values of curb height, "C". Quantity includes bars K (when applicable).
- 15 See "Cast-In-Place & Formed Hole Anchor Bolt Options".

1/4" Dia heavy hex head anchor bolt (ASTM F3125 Gr A325 or A449) or threaded rod (ASTM A193 Gr B7 or F1554 Gr 105) with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563). One additional heavy hex nut must be furnished and tack welded for each threaded rod.



CAST-IN-PLACE & FORMED HOLE ANCHOR BOLT OPTIONS
Applies to T631LS and T631 traffic rails.

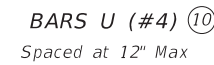
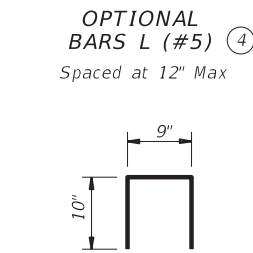
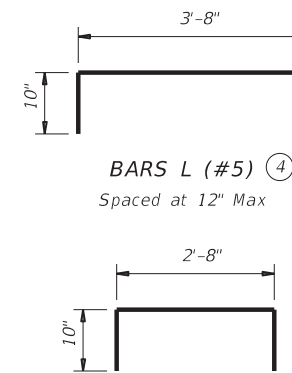
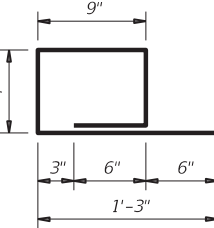
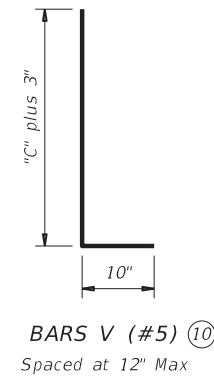


TABLE OF ESTIMATED CURB QUANTITIES (14)			
Curb Height "C"	Section Type	Conc (CY/LF)	Reinf Steel (Lb/LF)
1 1/2"	1	0.005	4.7
3"	2	0.009	8.4
6"	3	0.019	8.9
1'-0"	3	0.037	8.9
1'-6"	4	0.056	14.3
2'-0"	4	0.074	15.4
2'-6"	4	0.093	17.7
3'-0"	4	0.111	18.8
3'-6"	4	0.130	21.2
4'-0"	4	0.148	22.2
4'-6"	4	0.167	24.6
5'-0"	4	0.185	25.6

CONSTRUCTION NOTES:
For vehicle safety, finished grade must be flush with top of curb. Adjust reinforcing as necessary to provide 1 1/4" cover.
At the Contractor's option, anchor bolts may be an adhesive anchor system.
Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.

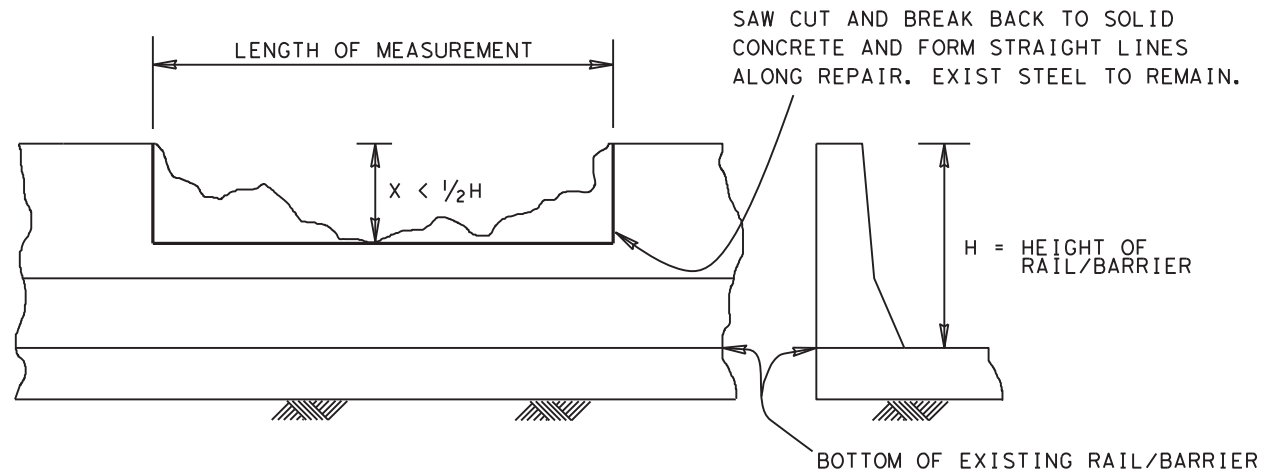
MATERIAL NOTES:
Provide concrete for curb of the same Class and strength as the box culvert top slab.
Galvanize all steel components of steel rail system. Provide Grade 60 reinforcing steel. Galvanize all reinforcing steel if required elsewhere.
Anchor bolts for base plate must be 3/8" Dia ASTM F3125 Gr A325 or A449 bolts (or ASTM A193 Gr B7 or F1554 Gr 105 threaded rods with one tack welded heavy hex nut each) with one hardened steel washer (ASTM F436) and one regular lock washer placed under each heavy hex nut. Nuts must conform to ASTM A563 requirements.
Optional adhesive anchor system must be 3/8" Dia ASTM A193 Gr B7 or F1554 Gr 105 fully threaded rods with one hardened steel washer (ASTM F436) and one regular lock washer placed under each heavy hex nut. Nuts must conform to ASTM A563 requirements. Embed fully threaded rod into slab and/or abutment wingwall using a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 4 3/4". Anchor adhesive chosen must be able to achieve a nominal bond strength in tension of a single anchor, Na, of 8 kips (edge distance must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing."

GENERAL NOTES:
Designed in accordance with AASHTO LRFD Bridge Design Specifications.
See T631LS or T631 rail standard for approved speed restrictions, notes and details not shown.
The curb is considered as part of the box culvert for payment. These details are for use with curbs that are 5'-0" tall and less only. Curb heights that are less than or greater than those shown will require special design.

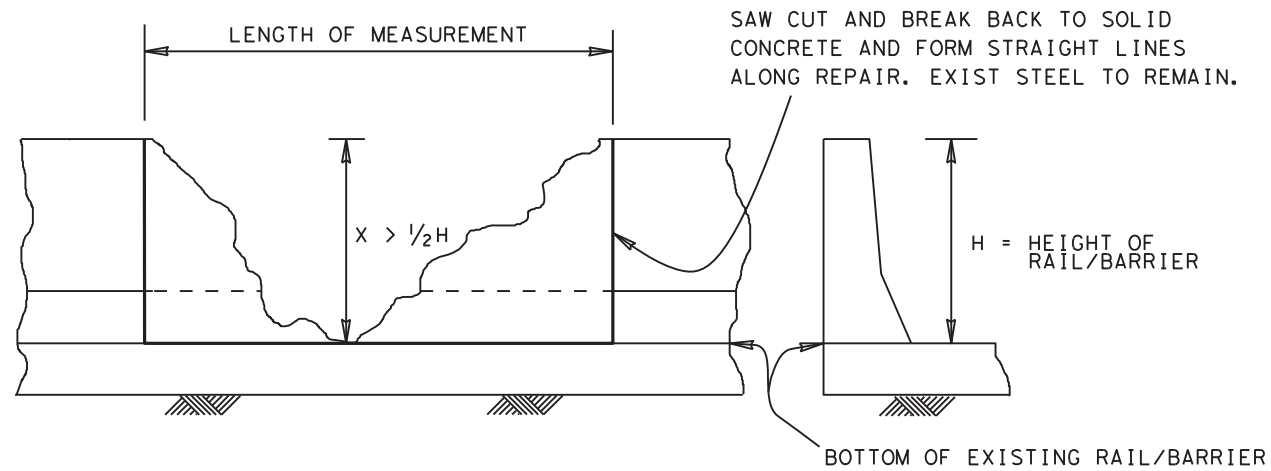
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.

The use of the T631LS rail is restricted to speeds of 45 mph or less.

		Bridge Division Standard	
BOX CULVERT MOUNTING DETAILS FOR TYPE T631LS & T631 RAILS (CURBS 5' TALL AND LESS ONLY)			
T631-CM			
FILE: r1std040-18.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
REVISIONS	CONTRACT	SECTION	JOB
03-18: Updated adhesive anchor notes.	6372	50	OO1
	DIST	COUNTY	SHEET NO.
	SAT	BEXAR	281



CONCRETE RAIL/BARRIER REPAIR DETAIL

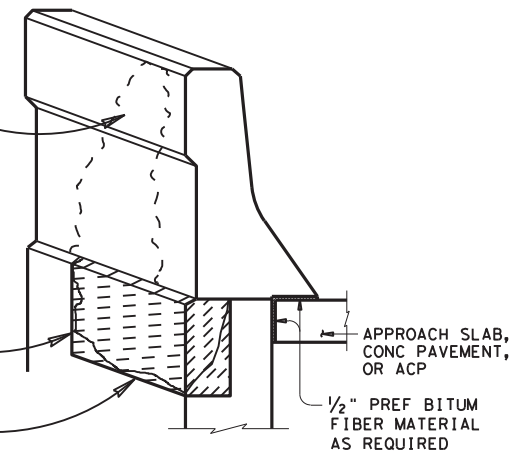


CONCRETE RAIL/BARRIER REPLACEMENT DETAIL

DAMAGED RAIL AREA

REPAIR OF DAMAGED FOUNDATION, FOOTING, BRIDGE DECK, WINGWALL, COPING, ETC. WILL BE PAID FOR UNDER ITEM 429.

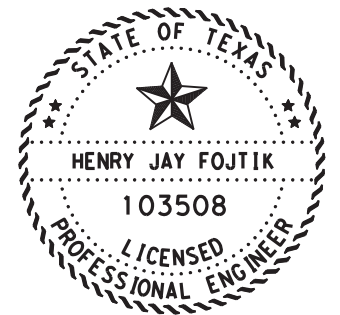
SAW CUT AND BREAK BACK TO SOLID CONCRETE AND FORM STRAIGHT LINES ALONG REPAIR. EXIST STEEL TO REMAIN.



CONCRETE RAIL/BARRIER FOUNDATION REPAIR DETAIL

GENERAL NOTES:

- 1) SAW CUT 1/2 INCH DEEP ALONG THE LAYOUT LINE INTO SOUND CONCRETE. CARE SHALL BE TAKEN NOT TO CUT OR DAMAGE REINFORCING STEEL DURING CONCRETE REMOVAL. ANY DAMAGED REINFORCING STEEL SHALL BE REPLACED WITH NEW REINFORCING STEEL AS DIRECTED BY THE ENGINEER.
- 2) PLACEMENT, SIZE OR TYPE OF REINFORCEMENT SHALL MATCH THE EXISTING REINFORCING, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
- 3) CONCRETE CLASS AND STRENGTH SHALL COMPLY WITH ITEM 429. LAP SPLICE REQUIREMENTS ARE FOUND UNDER ITEM 440 - TABLE 6.
- 4) RAIL/BARRIER DEPICTED IN THESE DETAILS MAY NOT REPRESENT THE TYPE OF RAIL TO BE REPAIRED OR REPLACED. REPAIR OR REPLACE RAIL IN KIND AS ENCOUNTERED IN THE FIELD.



H. J. Fojtik P.E.

11/18/2020

NOT TO SCALE

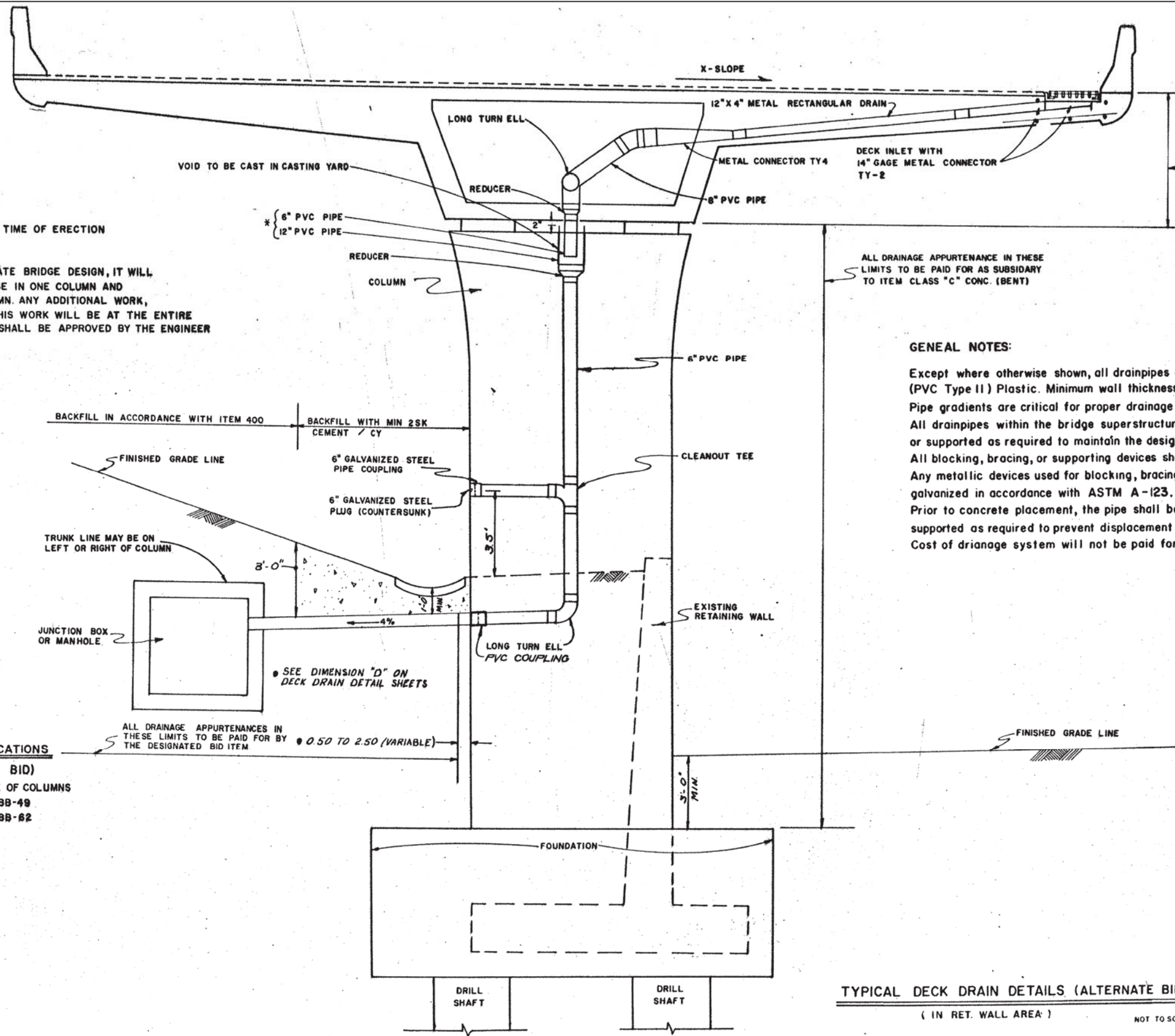


CONCRETE RAIL/BARRIER REPAIR AND REPLACEMENT

SHEET 1 OF 1

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		282
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR

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NOTES

* 6" & 12" PVC TO BE PLACED AND GLUED AT TIME OF ERECTION

IF THE CONTRACTOR ELECTS THE ALTERNATE BRIDGE DESIGN, IT WILL BE HIS RESPONSIBILITY TO PLACE DRAINAGE IN ONE COLUMN AND 1" OR 2" O CONDUIT IN THE OPPOSITE COLUMN. ANY ADDITIONAL WORK, LABER, OR MATERIALS NECESSARY TO DO THIS WORK WILL BE AT THE ENTIRE EXPENSE OF THE CONTRACTOR. THIS WORK SHALL BE APPROVED BY THE ENGINEER

ALL DRAINAGE APPURTENANCE IN THESE LIMITS TO BE PAID FOR AS SUBSIDIARY TO ITEM CLASS "C" CONC. (BENT)

ALL DRAINAGE APPURTENANCE IN THESE LIMITS TO BE PAID FOR AS SUBSIDIARY TO ITEM BRIDGE SUPERSTRUCTURE

GENERAL NOTES:

Except where otherwise shown, all drainpipes and fittings shall be Rigid (PVC Type II) Plastic. Minimum wall thickness = 0.162".
 Pipe gradients are critical for proper drainage operations and must be conformed to. All drainpipes within the bridge superstructure shall be adequately blocked, braced, or supported as required to maintain the design grades. All blocking, bracing, or supporting devices shall be approved by the engineer. Any metallic devices used for blocking, bracing, or supporting shall be hot dip galvanized in accordance with ASTM A-123. Prior to concrete placement, the pipe shall be adequately braced and supported as required to prevent displacement during pouring operations. Cost of drianage system will not be paid for seperately. (See Sheet. ~~100~~)

CLEAN OUT LOCATIONS (ALTERNATE BID)

CLEAN OUTS WILL BE PLACED ON LEFT SIDE OF COLUMNS
 BB-37, BB-39, BB-40, BB-42, BB-44, BB-46, BB-49
 BB-53, BB-55C, BB-58, BB-59, BB-60, BB-61, BB-62
 BB-63, BB-64, BB-65, BB-67

TYPICAL DECK DRAIN DETAILS (ALTERNATE BID)
 (IN RET. WALL AREA) NOT TO SCALE



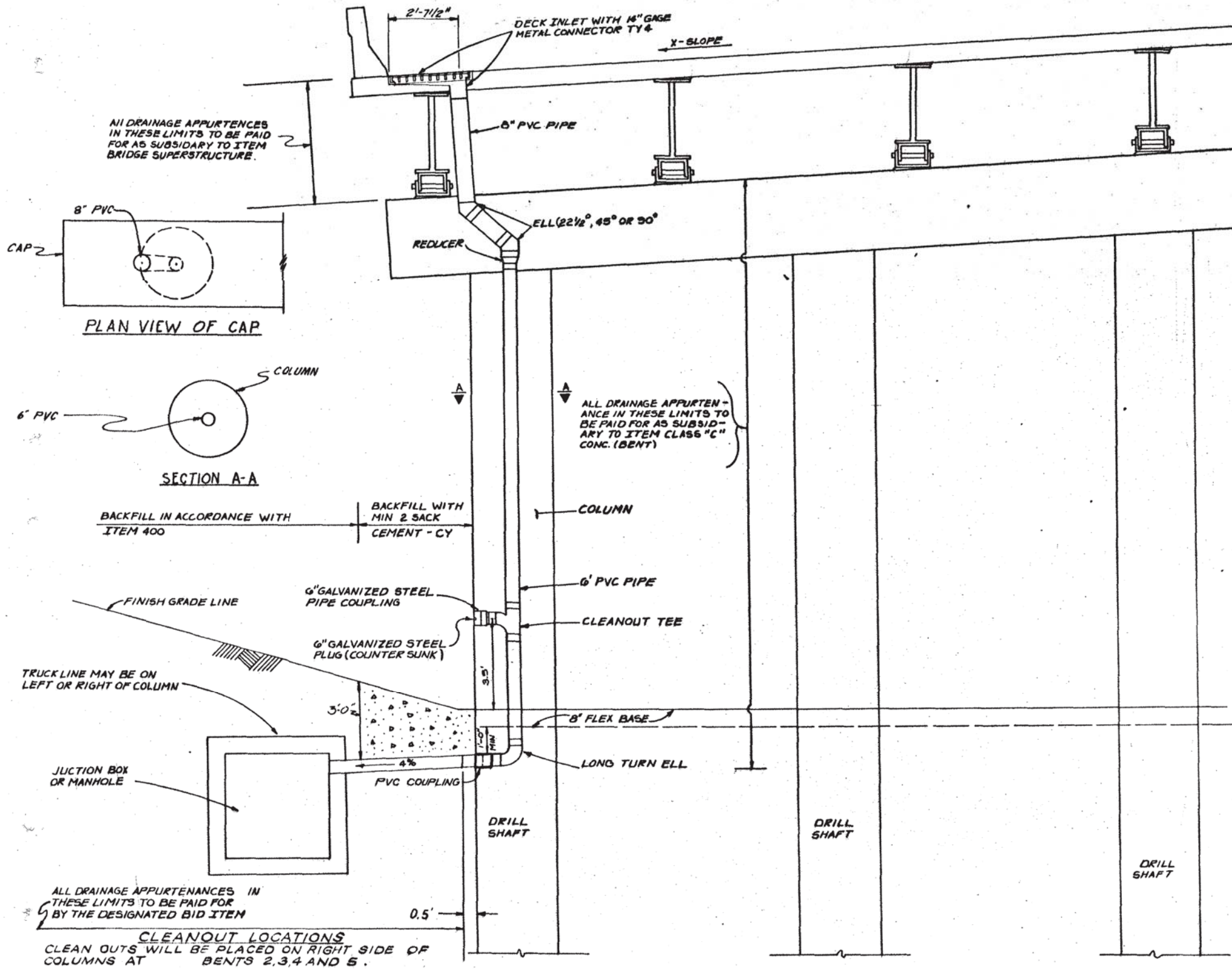
VARIOUS DECK DRAIN DETAILS

SHEET 01 OF 06

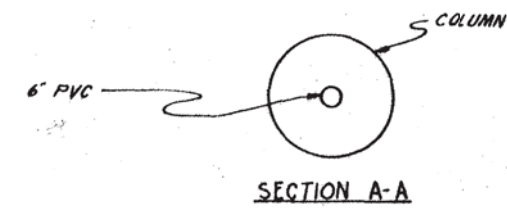
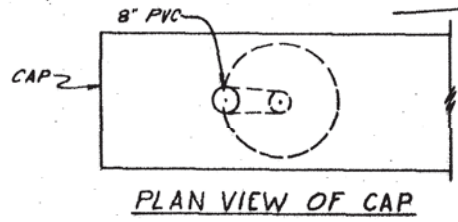
FED. DIV. NO.	PROJECT NUMBER		SHEET NO.
6	RMC 6372-50-001		283
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR.

FOR CONTRACTOR'S INFORMATION ONLY.

TYPE 4 INLET CONNECTOR IS SET 2'-7 1/2" OFF FACE OF THE BRIDGE RAIL TO CENTER OF 8" PVC DRAIN OUTLET, AT COLUMNS SPECIFIED IN PLANS.



ALL DRAINAGE APPURTENANCES IN THESE LIMITS TO BE PAID FOR AS SUBSIDIARY TO ITEM BRIDGE SUPERSTRUCTURE.

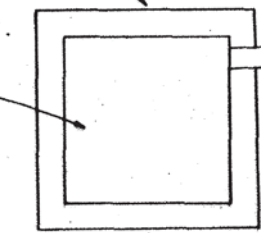


ALL DRAINAGE APPURTENANCE IN THESE LIMITS TO BE PAID FOR AS SUBSIDIARY TO ITEM CLASS "C" CONC. (BENT)

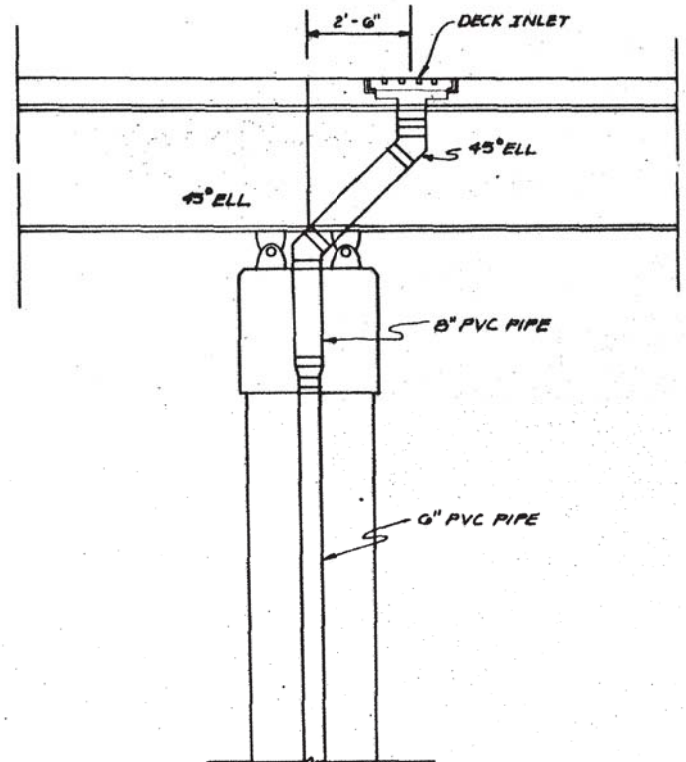
BACKFILL IN ACCORDANCE WITH ITEM 400

BACKFILL WITH MIN 2 SACK CEMENT - CY

FINISH GRADE LINE
TRUCK LINE MAY BE ON LEFT OR RIGHT OF COLUMN



ALL DRAINAGE APPURTENANCES IN THESE LIMITS TO BE PAID FOR BY THE DESIGNATED BID ITEM
CLEANOUT LOCATIONS
CLEAN OUTS WILL BE PLACED ON RIGHT SIDE OF COLUMNS AT BENTS 2,3,4 AND 5.



SECTION SHOWING DECK INLET INSTALLATION @ EXPANSION JOINT

GENERAL NOTES

Except where otherwise shown, all drainpipes and fitting shall be Rigid (PVC Type II) Plastic. Minimum wall thickness = 0.162"
Pipe gradients are critical for proper drainage operations and must be conformed to.
All drainpipes shall be adequately blocked, braced, or supported as required to maintain the design grades.
All blocking, bracing, or supporting devices shall be approved by the engineer.
Any metallic devices used for blocking, bracing, or supporting shall be hot dip galvanized in accordance with ASTM A-123.
Prior to concrete placement, the pipe shall be adequately braced and, supported as required to prevent displacement during pouring operations.
Cost of drainage system will not be paid for separately.

TYPICAL DECK DRAIN DETAILS (STL I-BEAM BRIDGES)

NOT TO SCALE

VARIOUS DECK DRAIN DETAILS			
SHEET 02 OF 06			
FED. DIV. NO.	PROJECT NUMBER		SHEET NO.
6	RMC 6372-50-001		284
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR.

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FOR CONTRACTOR'S INFORMATION ONLY.

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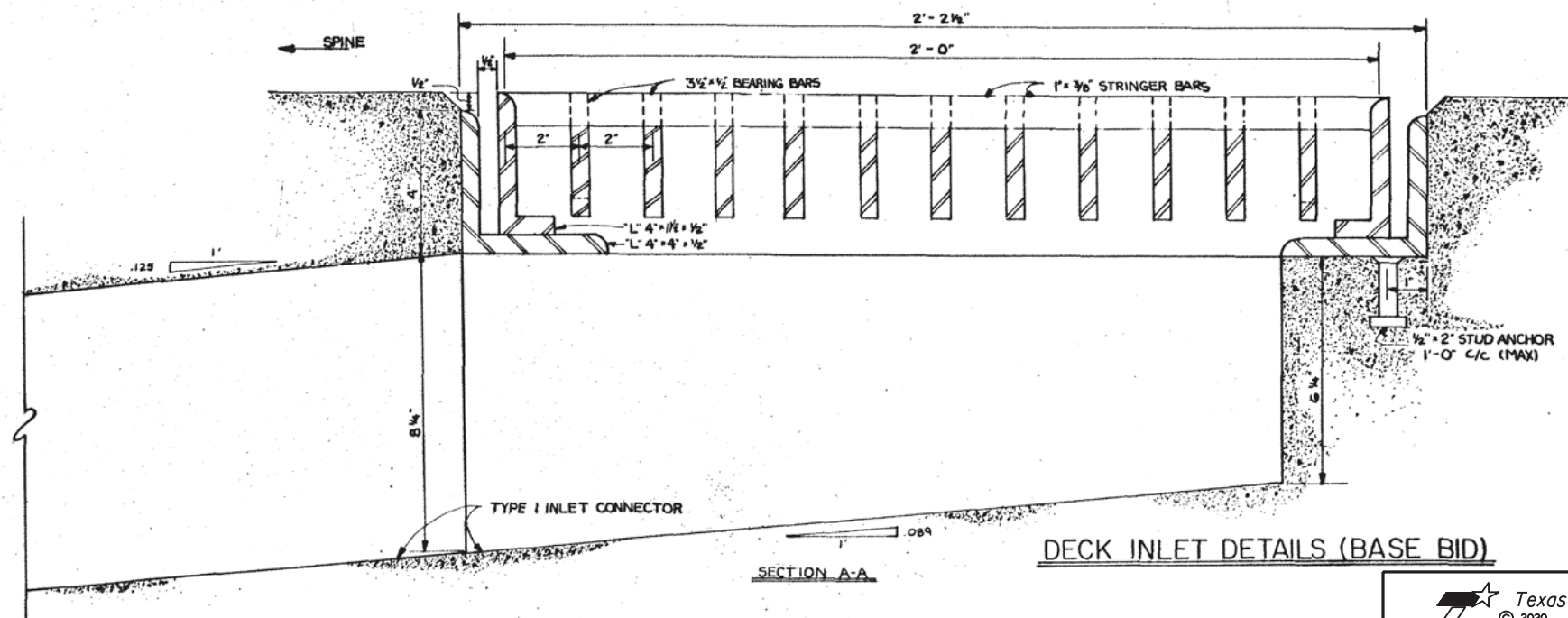
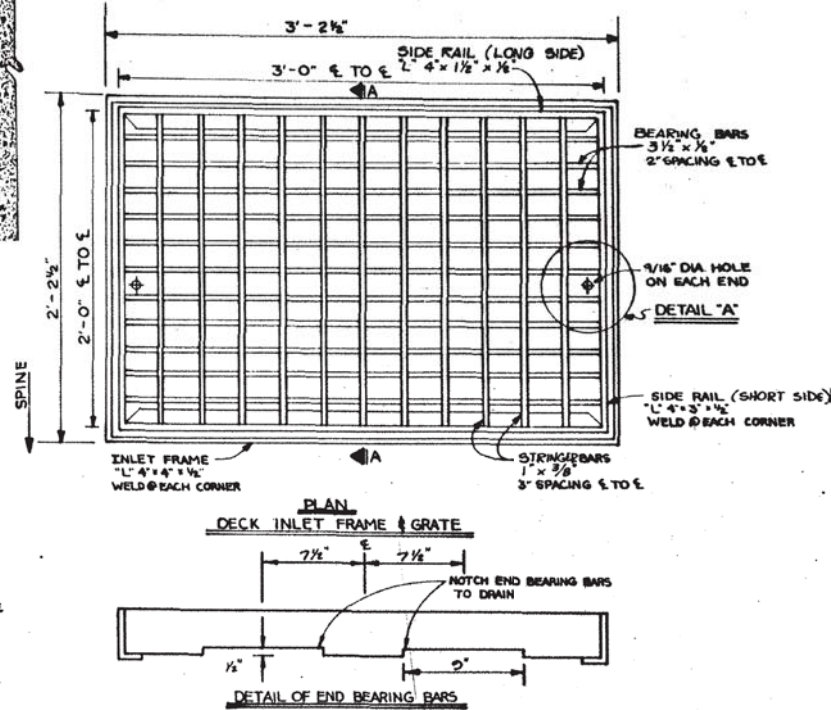
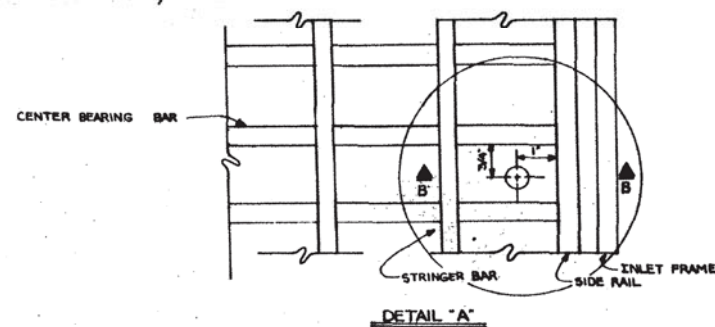
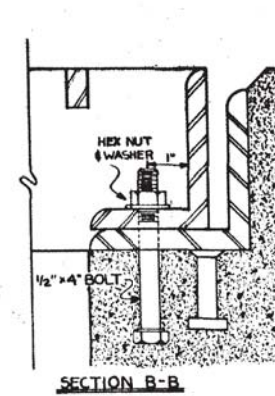
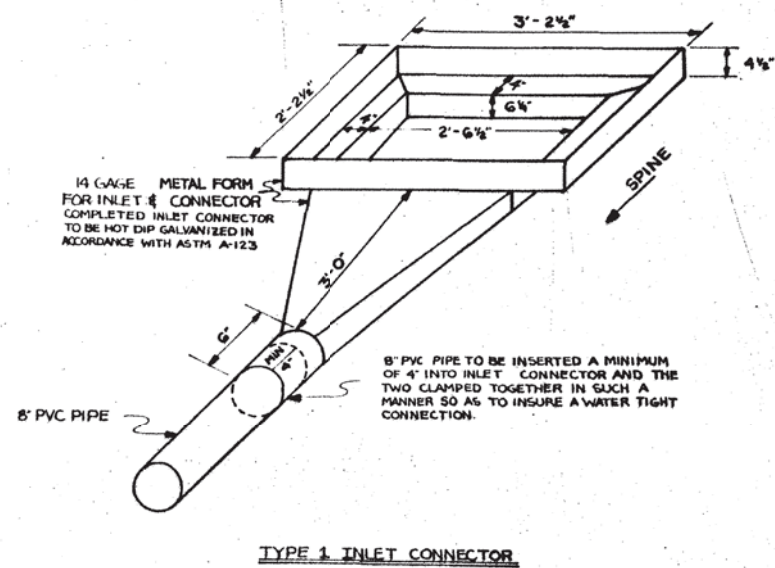
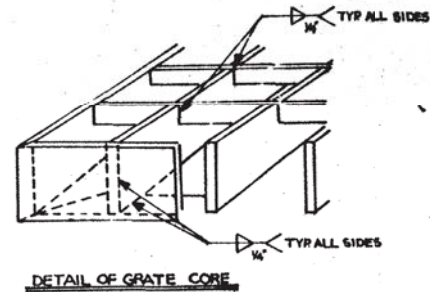
BILL OF MATERIALS FOR ONE DECK FRAME

FRAME L 4" x 4" x 1/2"			TOTAL WEIGHT
NO.	LGTH.	WT.	(LBS)
2	3'-2 1/2"	82	150*
2	2'-2 1/2"	67	

BILL OF MATERIAL FOR ONE DECK GRATE

GRATE DIMEN OUT TO OUT		SIDE RAIL L 4" x 3" x 1/2"			BEAR BAR 3 1/2" x 1/2"			STRINGER 1" x 3/8"			TOTAL WEIGHT
LG.	WG.	NO.	LGTH.	WT.	NO.	LGTH.	WT.	NO.	LGTH.	WT.	(LBS)
3'-1/2"	2'-1/2"	2	3'-0 1/2"	68	11	2'-11 1/2"	194	11	1'-11 1/2"	28	334 *
		2	2'-0 1/2"	45	-	-	-	-	-	-	

* QUANTITIES ARE FOR CONTRACTORS INFORMATION ONLY



FOR CONTRACTORS INFORMATION ONLY.

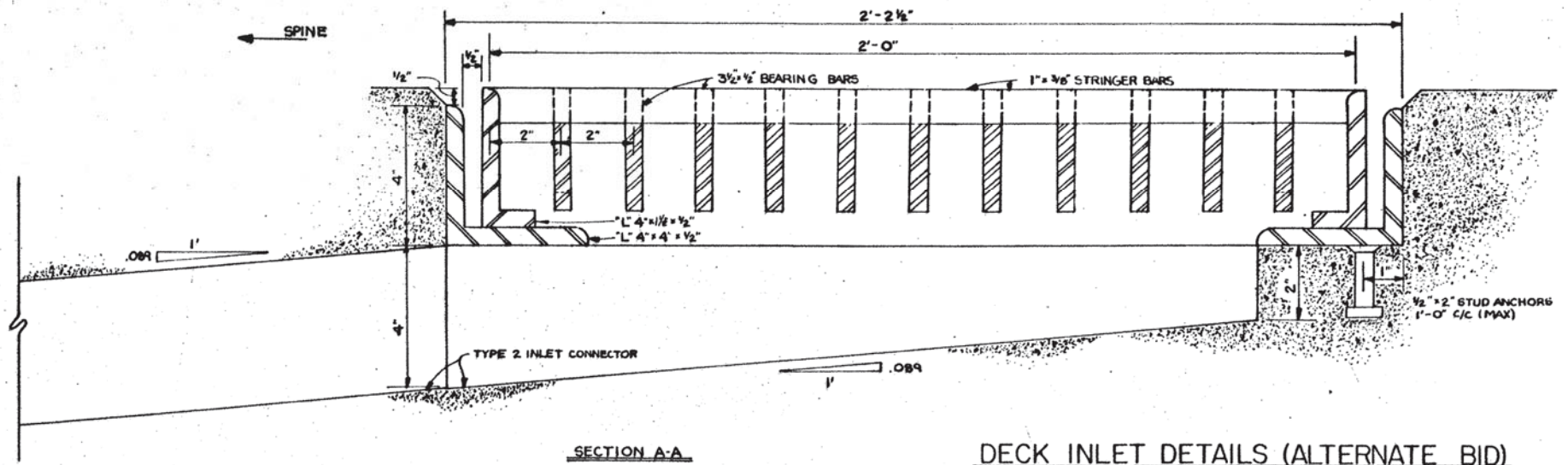
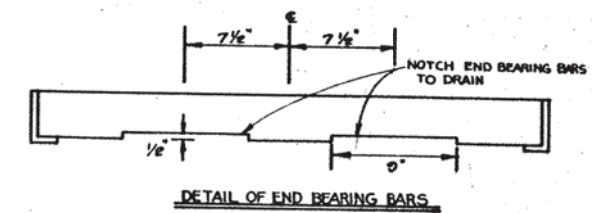
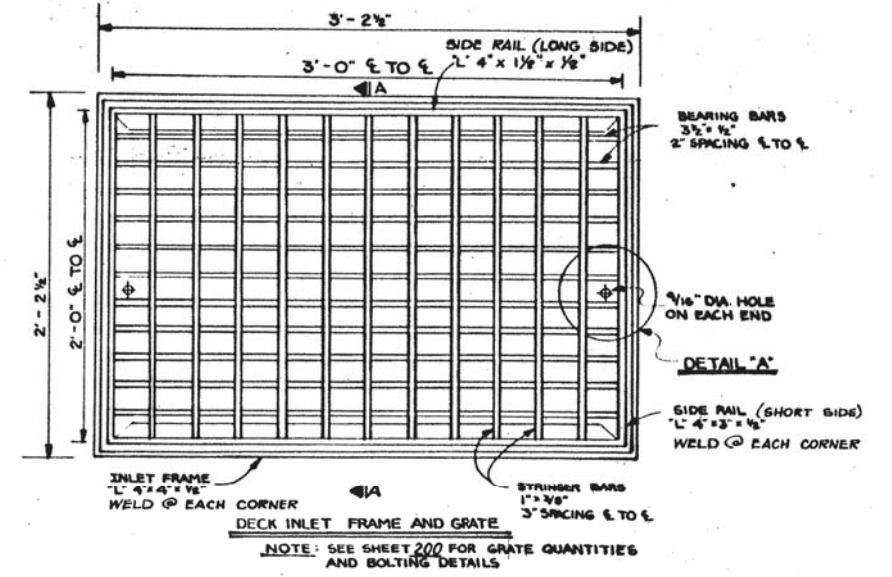
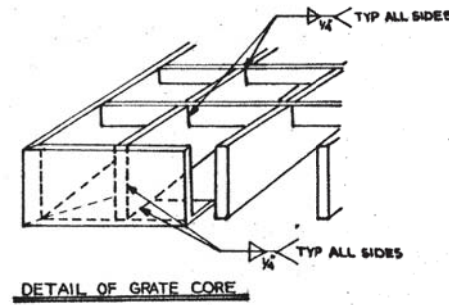
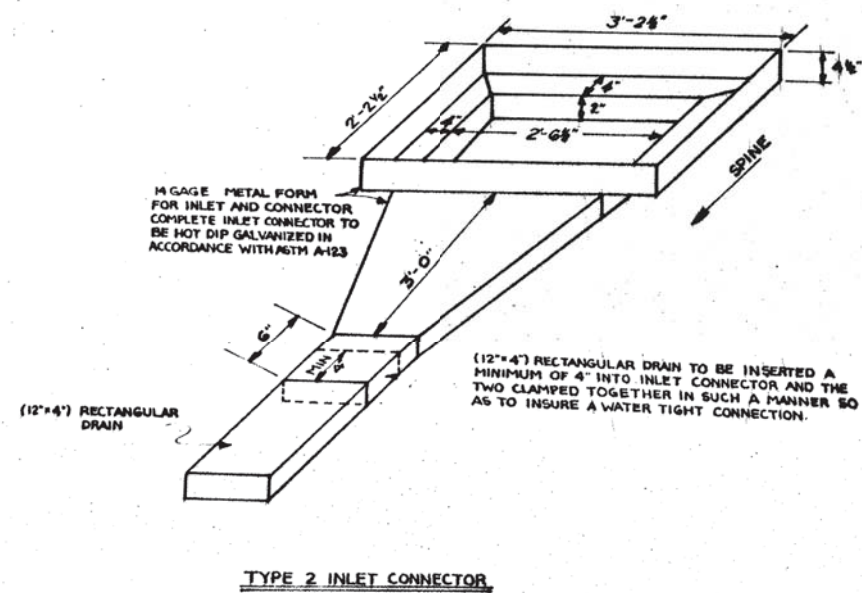
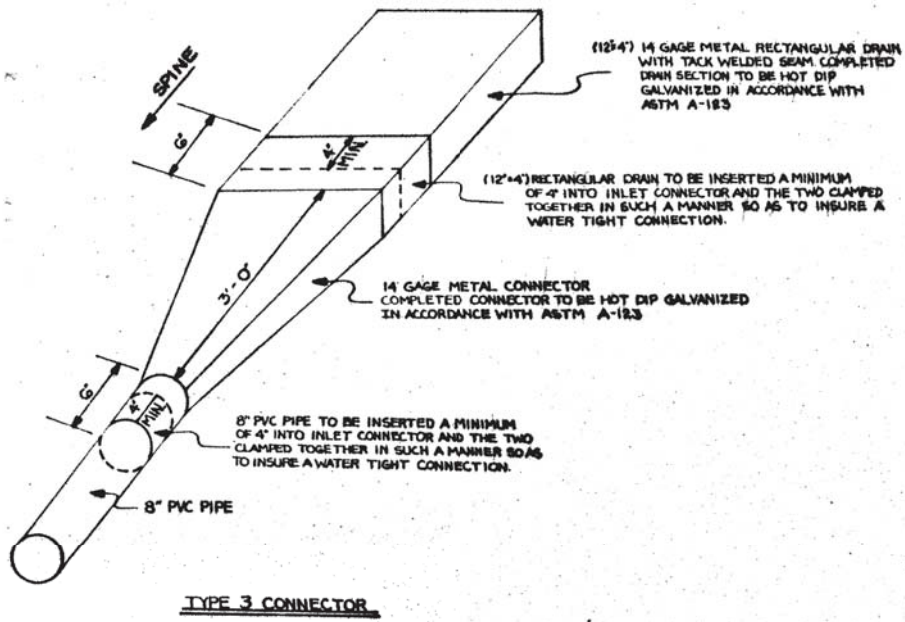


VARIOUS DECK DRAIN DETAILS

SHEET 03 OF 06

FED. DIV. NO.	PROJECT NUMBER	SHEET NO.	
6	RMC 6372-50-001	285	
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR.

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**VARIOUS
DECK DRAIN DETAILS**

SHEET 04 OF 06

FED. DIV. NO.	PROJECT NUMBER		SHEET NO.
6	RMC 6372-50-001		286
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR.

FOR CONTRACTOR'S INFORMATION ONLY.

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BILL OF MATERIALS FOR ONE DECK INLET FRAME

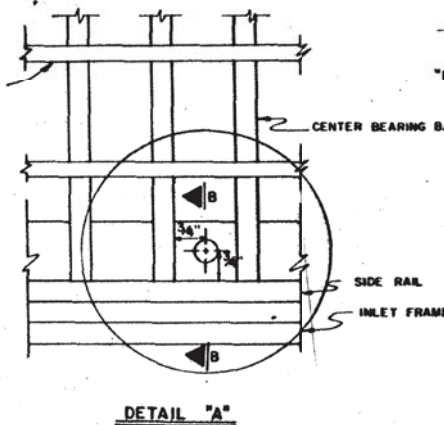
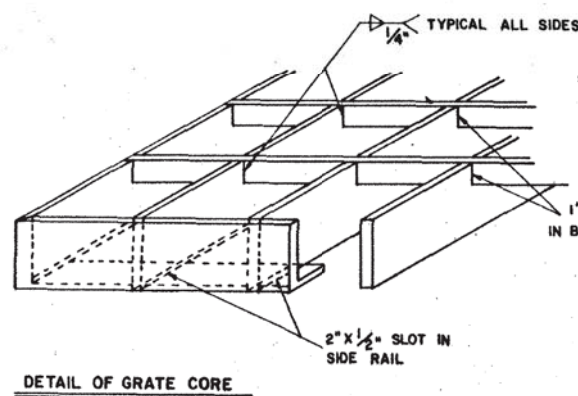
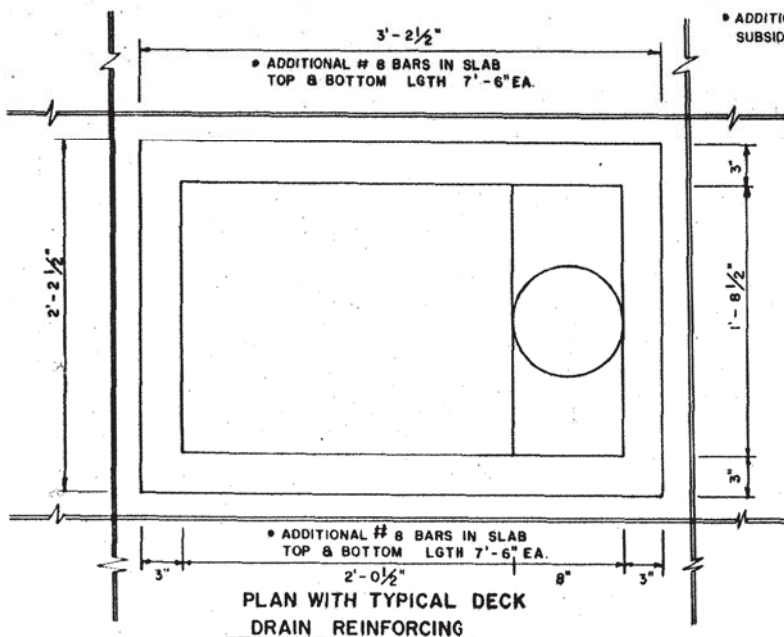
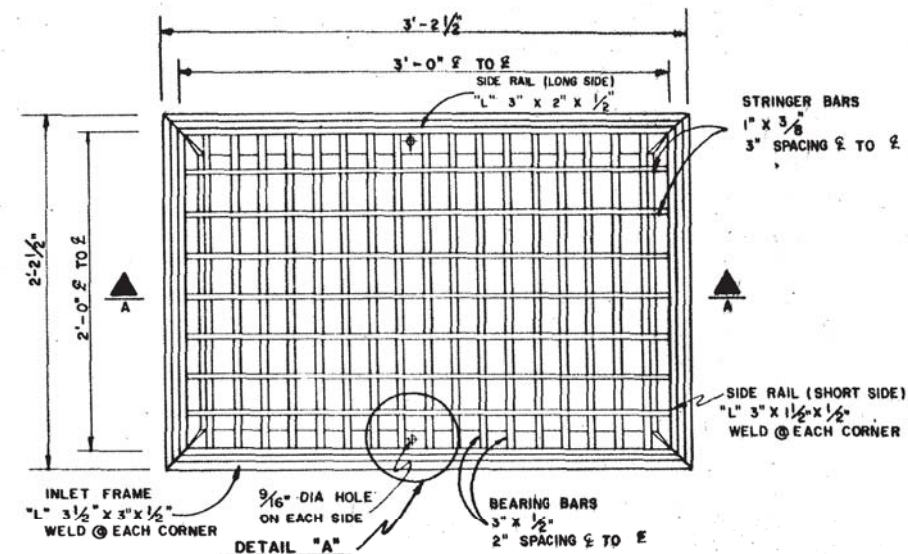
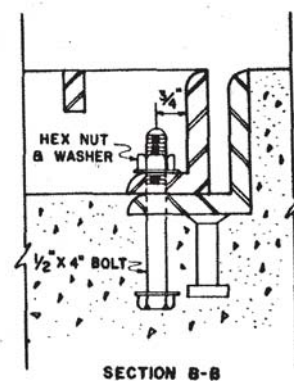
FRAME "L" 3 1/2" x 3" x 1/2" (10.4 lbs/ft)			TOTAL WEIGHT
NO.	LGTH.	WT.	(LBS.)
2	3'-2 1/2"	67	113
2	2'-2 1/2"	46	

BILL OF MATERIALS FOR ONE DECK INLET GRATE

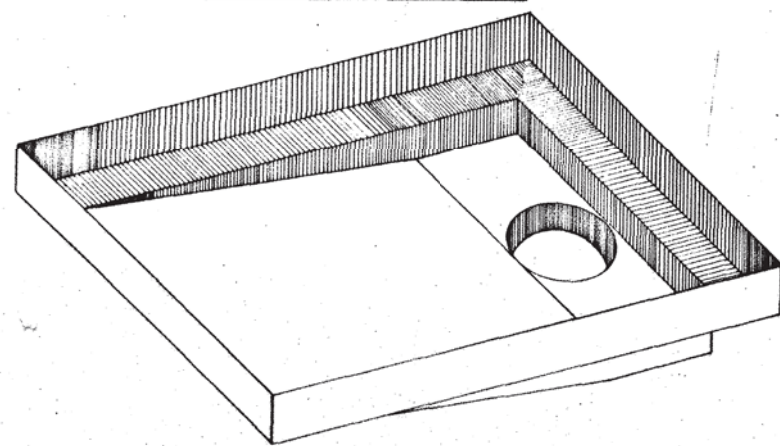
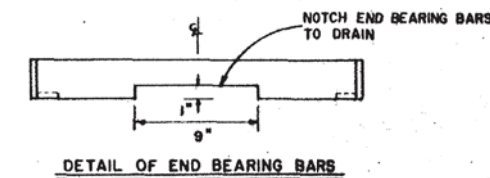
GRATE DIMEN OUT TO OUT		SIDE RAIL "L" 3" x 2" x 1/2" (7.7 lbs/ft)			BEAR BAR 3" x 1/2" (5.95 lbs/ft)			STRINGER BAR 1" x 3/8" (1.28 lbs/ft)			TOTAL WEIGHT
LG.	WG.	NO.	LGTH.	WT.	NO.	LGTH.	WT.	NO.	LGTH.	WT.	(LBS.)
3'-1/2"	2'-1/2"	2	3'-0 1/2"	47	17	1'-11 1/2"	198	7	2'-11 1/2"	27	303
		2	2'-0 1/2"	31							

* QUANTITIES ARE FOR CONTRACTORS INFORMATION ONLY

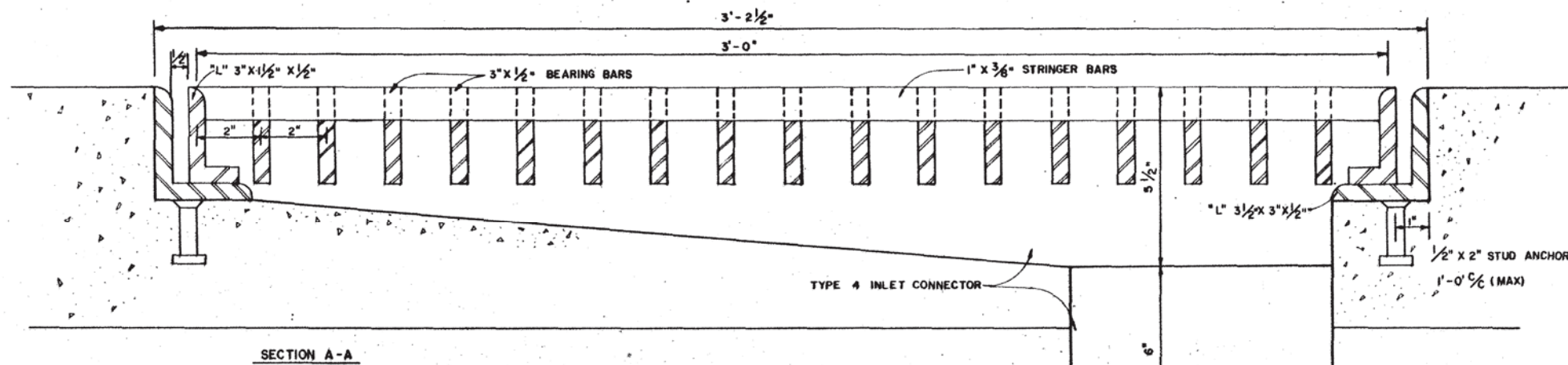
* ADDITIONAL REINFORCING BARS TO BE SUBSIDIARY TO ITEM "BRIDGE SUPERSTRUCTURE"



DECK INLET FRAME AND GRATE



TYPE 4 INLET CONNECTOR



DECK INLET DETAILS (STL I-BEAM BRIDGE)

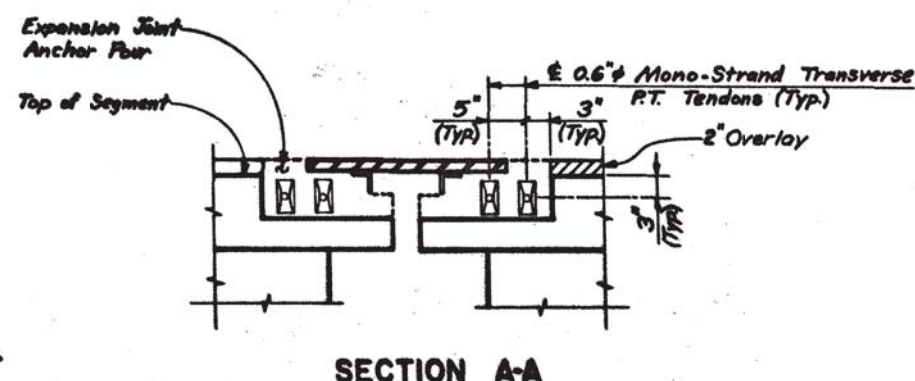
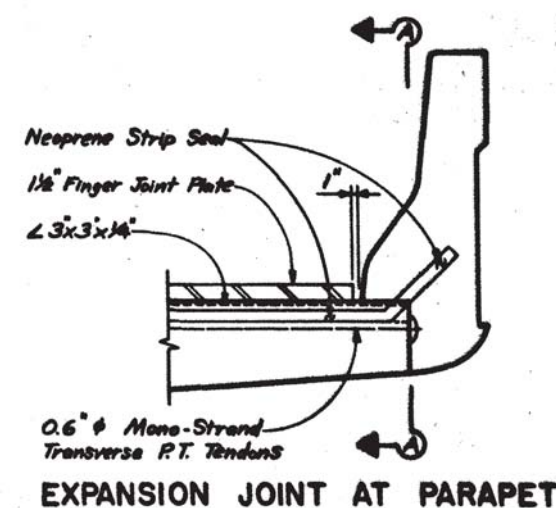
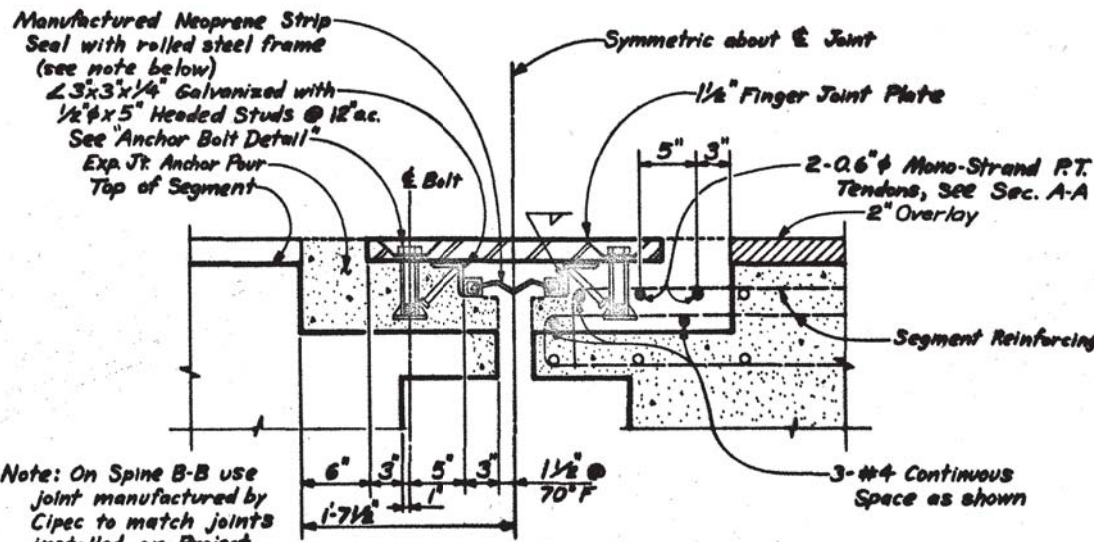


VARIOUS DECK DRAIN DETAILS

SHEET 05 OF 06

FED. DIV. NO.	PROJECT NUMBER	SHEET NO.	
6	RMC 6372-50-001	287	
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR.

FOR CONTRACTORS INFORMATION ONLY.

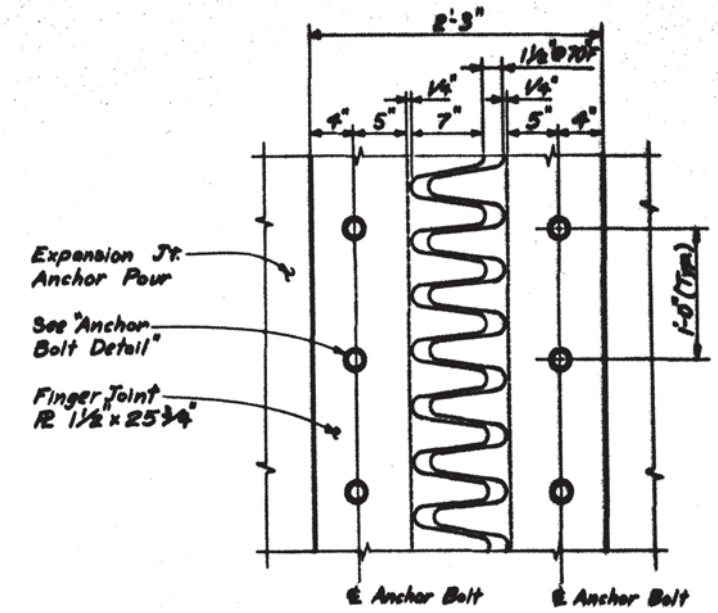


Note: On Spine B-B use joint manufactured by Cipec to match joints installed on Project IA. On other Spines use Cipec joint or approved equal.

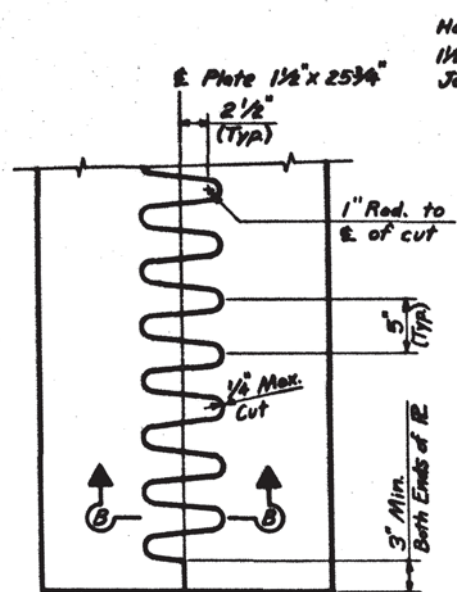
ELEVATION

EXPANSION JOINT AT PARAPET

SECTION A-A

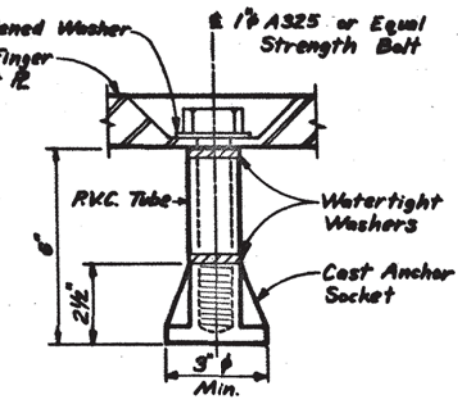


PLAN
FINGER JOINT

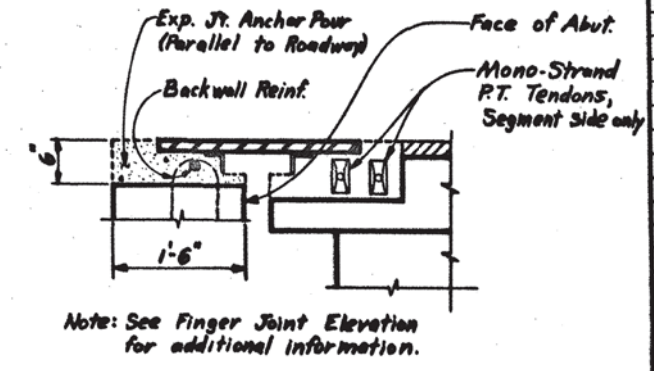


Note: The scroll shall be made by a single cut of a machine guided torch.

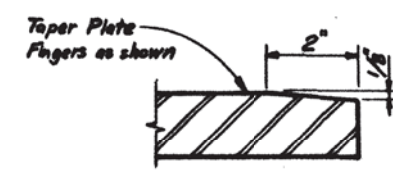
SCROLL DETAIL



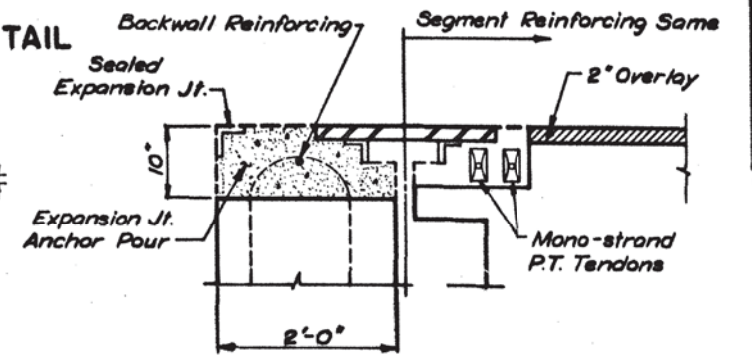
ANCHOR BOLT DETAIL



EXPANSION JOINT AT ABUTMENT



SECTION B-B



EXPANSION JOINT AT TRANSITION BENT

EXPANSION JOINT MOVEMENT	
Location	Total Movement
Pier BB-1A	2.5"
Pier BB-6	4.5"
Pier BB-10	5.5"
Pier BB-17	5.5"
Pier BB-21	4.0"
Pier BB-25	5.1"
Pier BB-31	6.1"
Pier BB-37	6.2"
Pier BB-45	5.6"
Pier BB-50	3.8"
Abut BB-53A	1.4"
Pier CC-1A	2.5"
Pier CC-6	4.5"
Pier CC-10	5.5"
Pier CC-17	7.0"
Pier CC-24	6.6"
Pier CC-30	5.6"
Pier CC-35	5.3"
Pier CC-41	5.7"
Pier CC-48	5.4"
Abut CC-53A	2.4"
Pier DD-1A	2.5"
Pier DD-6	4.5"
Pier DD-10L	5.5"
Pier DD-10R	5.5"
Pier DD-17	7.0"
Pier DD-24L	6.6"
Pier DD-24R	6.6"
Pier DD-30	5.6"
Pier DD-35L	5.3"
Pier DD-35R	5.3"
Pier DD-41	5.7"
Pier DD-48	5.4"
Pier DD-53L	5.8"
Pier DD-53R	5.8"
Pier DD-60	6.4"
Straddle Bent DD-67	6.1"
Pier DD-73	5.7"
Abut DD-79A	2.8"
Abut EE-1A	2.0"
Abut FF-3A	1.0"
Abut HH-1A	2.4"
Abut MM-4A	1.4"
Abut NN-7A	2.9"

Total movement includes displacement due to creep, shrinkage, and temperature (40°F fall & 30°F rise).

EXPANSION JOINT NOTES:

- All dimensions in the longitudinal direction are based on the reference dimension of 3" between the face of segments at the time of erection assuming a 70°F ambient temperature.
- Bolts shall be 1" A325 High Strength Bolts or equivalent Prestressing Bolts torqued to produce a minimum clamping force of 15K. Procedures for applying the proper torque shall be approved by the engineer.
- Finger Joint plates, Bolts, and Edge Angles shall be Hot Dip Galvanized in accordance with A.S.T.M. A123.
- Expansion Joints shall not be set until a minimum of 3 months after the erection of both superstructure units.
- Parapets at the expansion joint shall be cast with 3/4" clearance at an ambient temperature of 70°F.

INSTALLATION NOTES:

- Set grade for 2" overlay at joint.
- Place the Expansion Joint reinforcing and Post Tensioning steel.
- Set the Expansion Joint in place and adjust to proper opening and grade.
- Cast the Expansion Joint anchor place concrete.
- Stress the transverse Post Tensioning.
- Cast parapet with a 3/4" open joint at 70°F.

FOR CONTRACTORS INFORMATION ONLY.

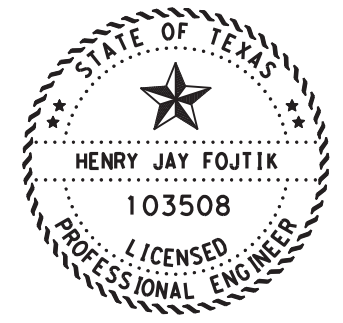
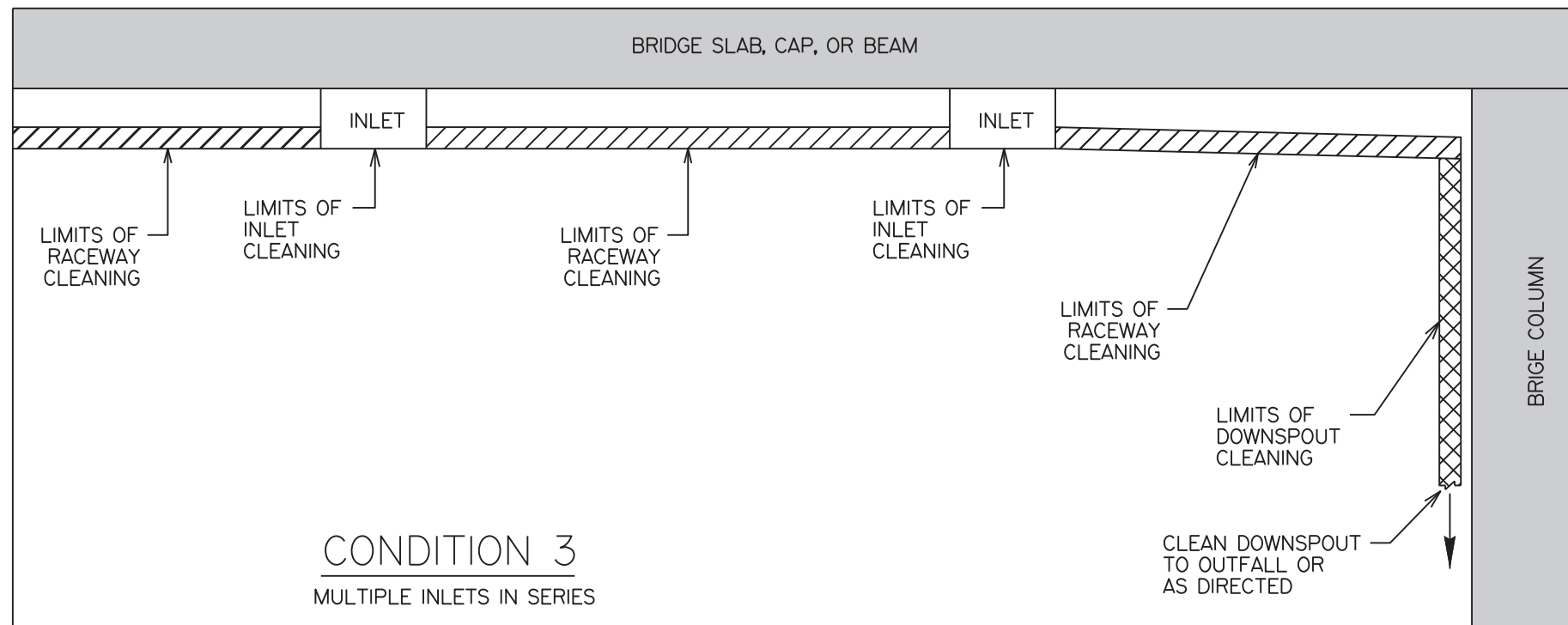
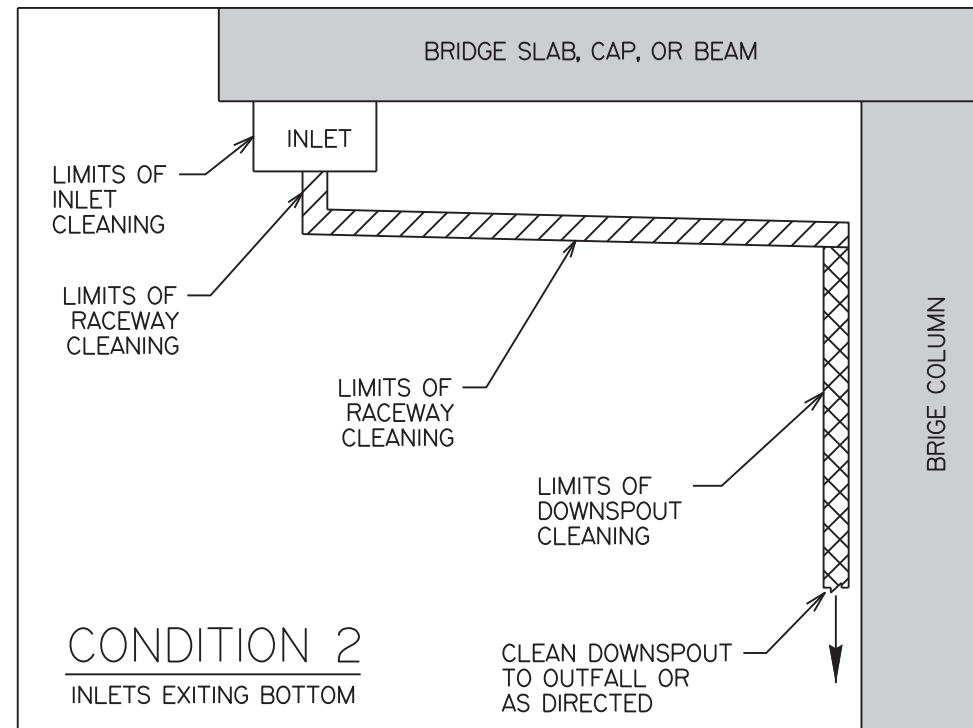
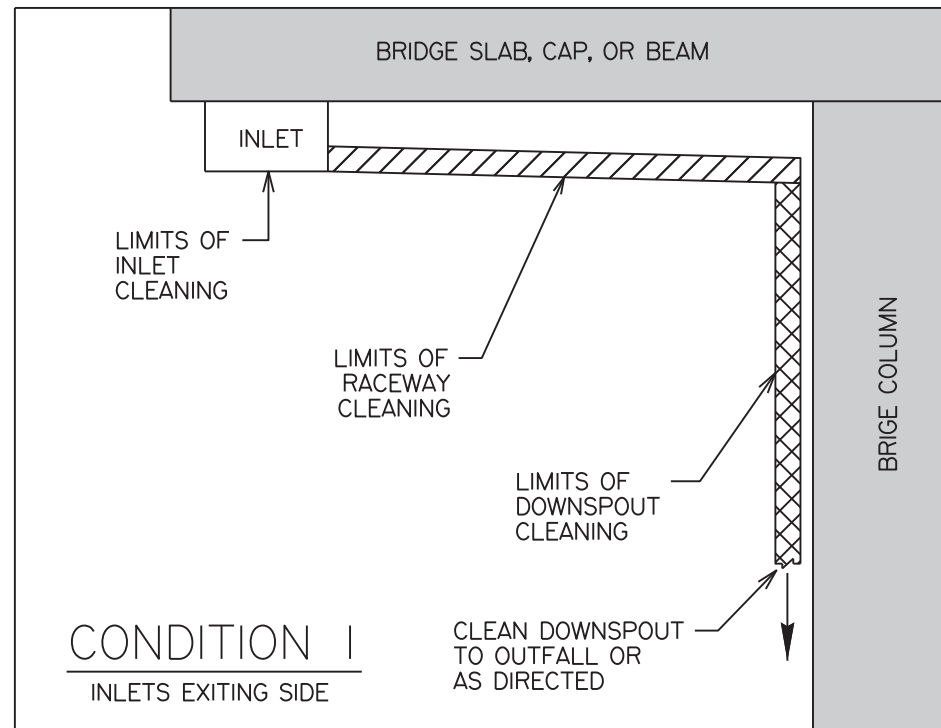
Texas Department of Transportation
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**VARIOUS
DECK DRAIN DETAILS**

SHEET 06 OF 06

FED. DIV. NO.	PROJECT NUMBER	SHEET NO.	
6	RMC 6372-50-001	288	
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR.

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H. J. F. P.E.

11/18/2020

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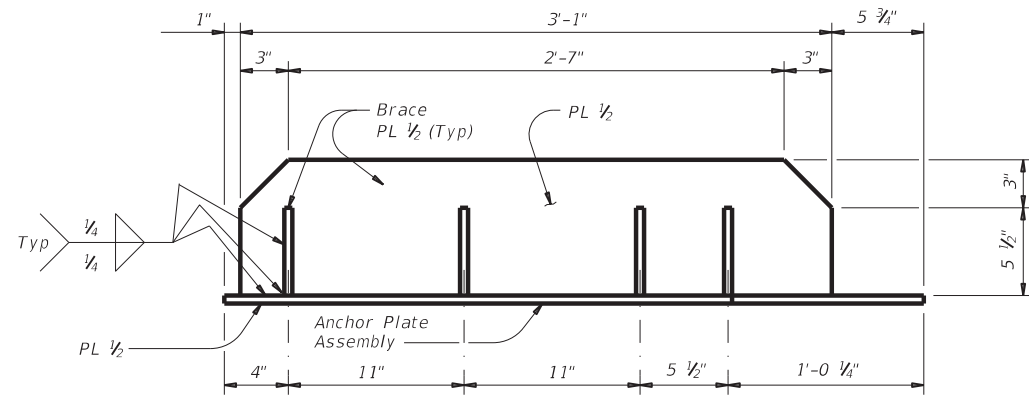
INLET, RACEWAY AND DOWNSPOUT CLEANING DETAILS

SHEET 1 OF 1

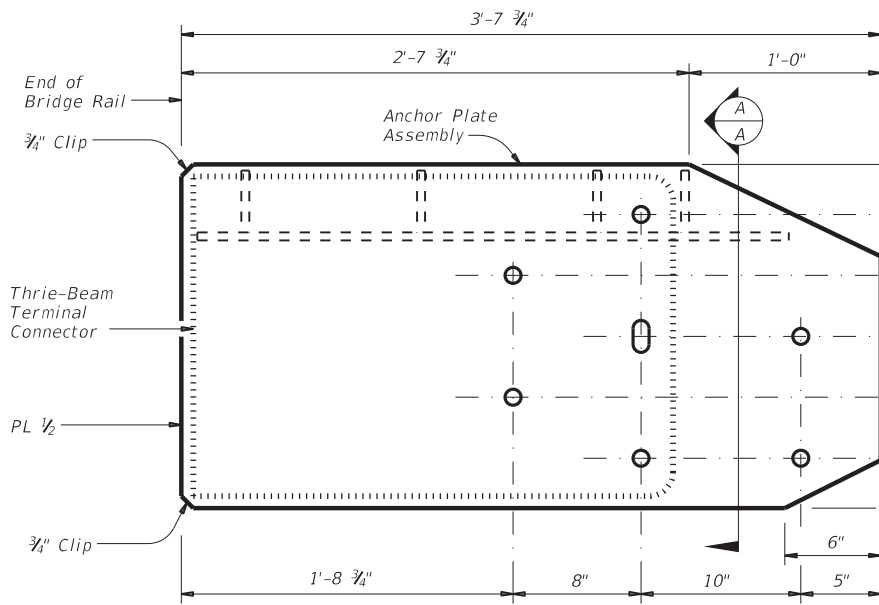
- NOTE: 1) FOR CONDITION 3 WITH MULTIPLE INLETS EXITING BOTTOM, SEE CONDITION 2 FOR LIMITS OF RACEWAY CLEANING.
 2) CONDITION 3 MAY REQUIRE CLEANING OF MORE THAN 2 INLETS AS SHOWN IN DETAIL AS DETERMINED BY THE ENGINEER.
 3) SKETCHES MAY NOT REPRESENT EXACT LAYOUT OR ALIGNMENT OF DRAINAGE SYSTEMS TO BE CLEANED. SKETCHES REPRESENT GENERAL CONDITIONS AND ARE TO BE USED AS GUIDES TO PAY FOR ITEMS OF WORK AS DETERMINED BY THE ENGINEER.

FED. DIV. NO.	PROJECT		SHEET NO.
6	RMC 6372-50-001		289
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR

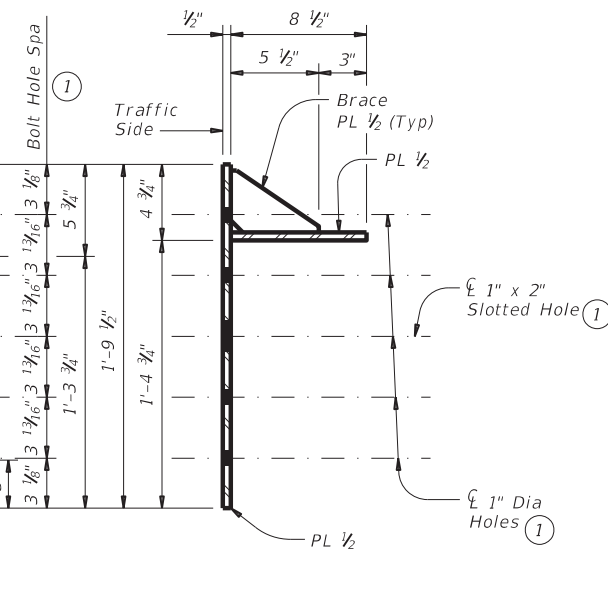
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.



PLAN



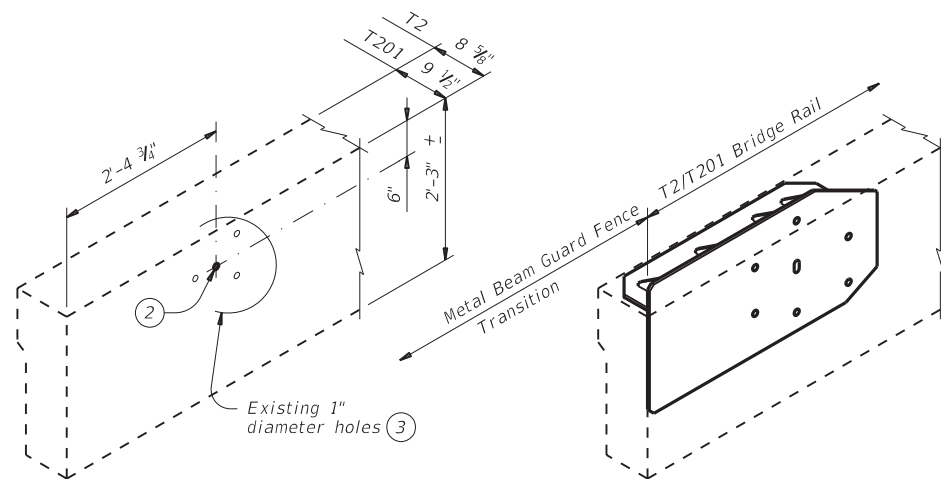
ROADSIDE ELEVATION



SECTION A-A

ANCHOR PLATE DETAILS

Anchor Plate shown is detailed for one end of one side of rail only. For other side, Anchor Plate must be built opposite hand.

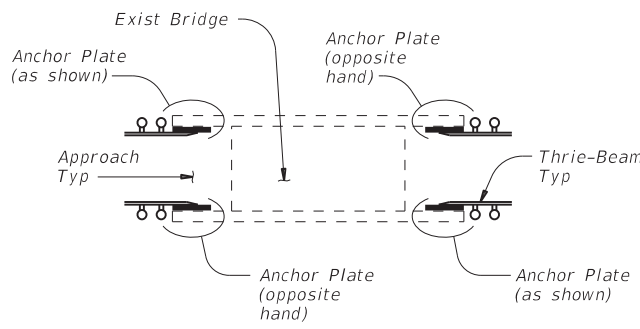


EXISTING PARAPET

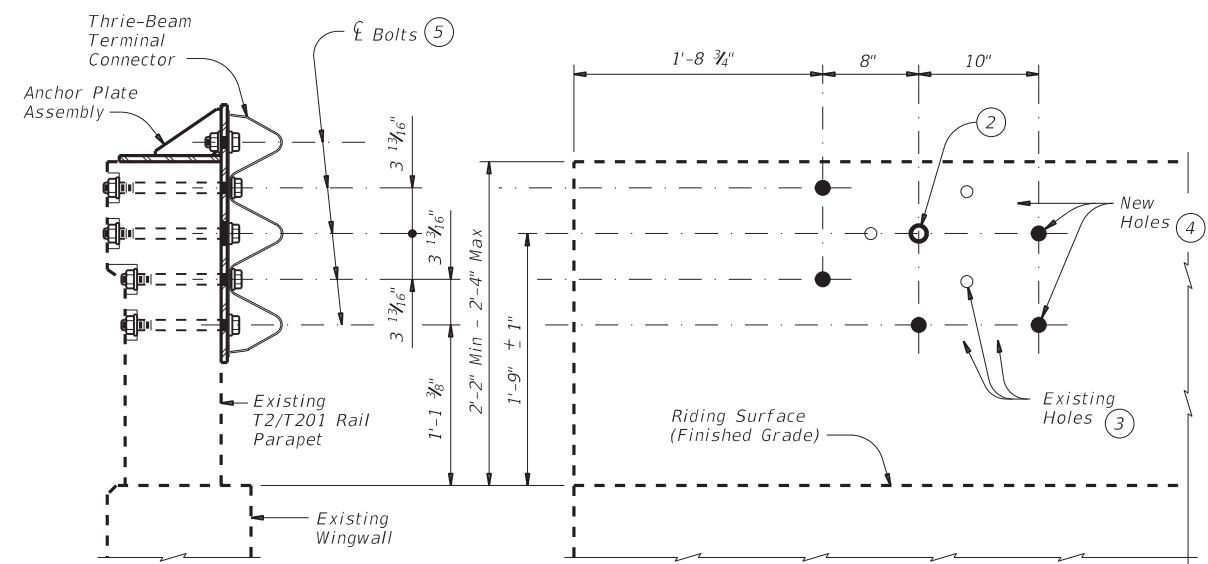
Shown after removal of existing MBGF Transition connector and prior to coring new bolt holes

ANCHOR PLATE PLACEMENT

INSTALLATION DETAILS



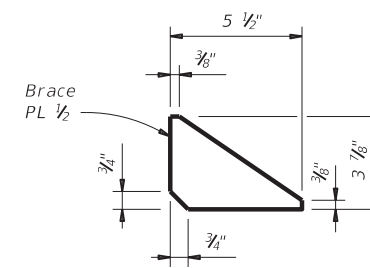
LOCATION DETAILS



SECTION
Showing completed installation

ROADSIDE ELEVATION
Anchor Plate assembly and Thrie-Beam Terminal Connector not shown for clarity

THRIE-BEAM TERMINAL CONNECTION DETAILS



BRACE PLATE DETAIL

CONSTRUCTION NOTES:

Field verify dimensions before commencing work and ordering materials.

On T2 rail remove any MBGF (W-beam) and attachment hardware, from the face of rail if present, prior to installation of new MBGF Transition. Dispose of these materials as directed by the Engineer. Plugging of newly exposed existing bolt holes is not necessary except as stated here in or otherwise indicated on the plans. This work is considered subsidiary to the pertinent bid items.

Attach the MBGF Transition to the existing parapet using the Anchor Plate assembly and the Thrie-Beam Terminal Connection. Splice the Thrie-Beam Terminal Connection and Thrie-Beam with the normal 12 connection bolts. Refer to Metal Beam Guard Fence Transition and Metal Beam Guard Fence detail sheets for additional details and information not shown herein.

MATERIAL NOTES:

Fabricate Anchor Plate assembly with steel conforming to either ASTM A36 or A572 Gr 50. Anchor Plate assembly must be free of burrs, sharp edges and weld splatter. Grind edges and corners to a 1/16" flat or radius. Hot-dip galvanize Anchor Plate assembly in accordance with Item 445, "Galvanizing". Anchor bolts, nuts, and washers must conform to Item 449, "Anchor Bolts".

GENERAL NOTES:

These details are for retrofitting existing rails only, not new construction, with a Thrie-Beam Terminal Connection.

Shop drawings are not required for this installation. Payment for materials, fabrication, and installation of this assembly are to be included in unit price bid in accordance with Item 540 "Mtl Bm Gd Fen Trans (Anchor Plate)".

Estimated weight of a single Anchor Plate assembly, including bolts, nuts, and washers, but not including the Thrie-Beam Terminal Connector = 190 Lbs.

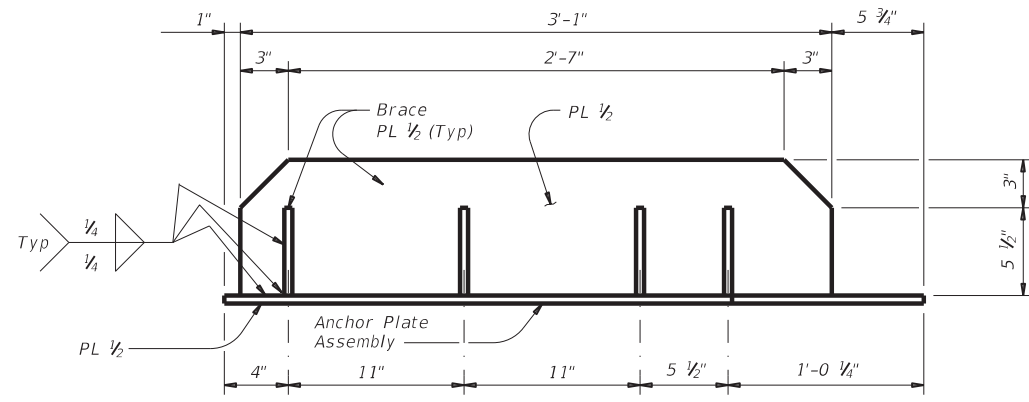
This sheet is intended as a guide in preparing job-specific details to retrofit existing T2 or T201 rails with a Thrie-Beam terminal connector. This sheet may not be used without modification. The details shown may need to be amended if the exact existing conditions are not covered. In all cases, details and notes not required are to be removed or crossed out, "(MOD)" added, and the phrase "(Not to be used as a standard)" removed from the title block. This sheet must be signed, sealed, and dated by a registered Professional Engineer. The effective height of the existing rail (at the Anchor Plate location) above the finished riding surface, as seen by an errant vehicle, must be between 2'-2" and 2'-4". Alternate methods of retrofit must be used for effective heights beyond these limits. Dimensions of existing rail height (traffic side) should be shown. Particular care should be taken in identifying existing rail conditions and providing for proper Anchorage Plate and MBGF transition positioning.

- The Contractor must verify that locations of bolt holes match those in the Thrie-Beam Terminal Connector to be installed in that location, prior to fabrication of Anchor Plate assembly and prior to coring bolt holes in the existing T2/T201 parapet.
- If the existing holes are aligned as expected, use the indicated existing 1" diameter hole in the installation of the Anchor Plate assembly and the Thrie-Beam Terminal Connector.
- If the existing holes are not aligned as expected, holes that cannot be utilized in the installation and are within 3" of a new bolt hole must be filled with epoxy grout prior to coring new holes.
- Drill new 1" diameter holes, each with a 2 1/2" diameter x 1" deep recess, through existing railing parapet. Note that recesses are only required when pedestrian sidewalks are adjacent to back of rail unless directed otherwise by the Engineer. Holes should be perpendicular to the roadside face of the parapet. Drill holes and recesses with coring type equipment. Percussion drilling is not allowed. Patch spalls, when directed by the Engineer, in accordance with Item 429, "Concrete Structure Repair", at the Contractor's expense.
- 7 ~ 7/8" diameter ASTM F3125 Gr A325 Hex Head Anchor Bolts each with 2 ~ 1 3/4" O.D. washers. Place washer under each head and nut. Provide bolts of sufficient length to extend a minimum of 1/2" beyond nut. Cut excess bolt length and paint cut surface with zinc-rich paint if directed by the Engineer.

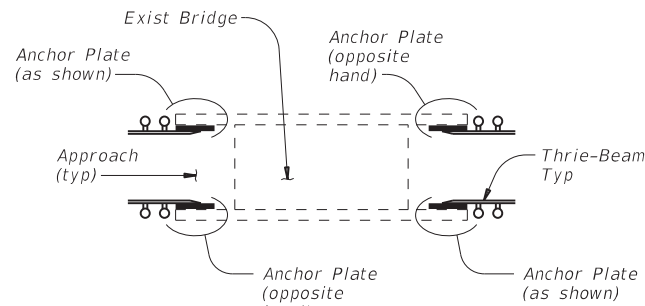
				Bridge Division Standard	
T2/T201 TRANSITION RETROFIT GUIDE					
(NOT TO BE USED AS A STANDARD)					
T2/T201TR-19					
FILE: r1std025-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	
©TxDOT September 2019	CONV	SECT	JOB	HIGHWAY	
REVISIONS	6372	50	001	VAR.	
	DIST	COUNTY	SHEET NO.		
	SAT	BEXAR	290		

DATE: FILE:

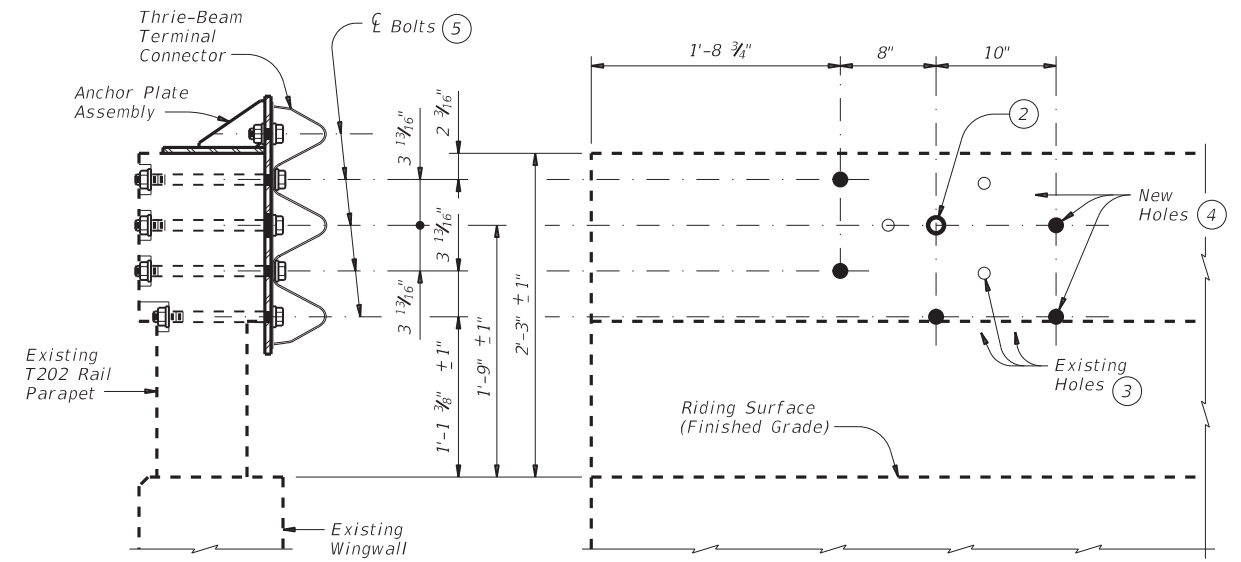
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PLAN



LOCATION DETAILS



SECTION

Showing completed installation

ROADSIDE ELEVATION

Anchor Plate assembly and Thrie-Beam Terminal Connector not shown for clarity

DETAILS OF BOLTS AND HOLES ①

CONSTRUCTION NOTES:

Field verify dimensions before commencing work and ordering materials. Plugging of newly exposed existing bolt holes is not necessary except as stated here in or otherwise indicated on the plans. This work is considered subsidiary to the pertinent bid items.

Attach the MBGF Transition to the existing parapet using the Anchor Plate assembly and the Thrie-Beam Terminal Connector. Splice the Thrie-Beam Terminal Connector to the Thrie-Beam with the normal 12 connection bolts. Refer to Metal Beam Guard Fence Transition and Metal Beam Guard Fence detail sheets for additional details and information not shown herein.

MATERIAL NOTES:

Fabricate Anchor Plate assembly with steel conforming to either ASTM A36 or A572 Gr 50. Anchor Plate assembly must be free of burrs, sharp edges and weld splatter. Grind edges and corners to a 1/16" flat or radius. Hot-dip galvanize Anchor Plate assembly in accordance with Item 445, "Galvanizing". Anchor bolts, nuts, and washers must conform to Item 449, "Anchor Bolts".

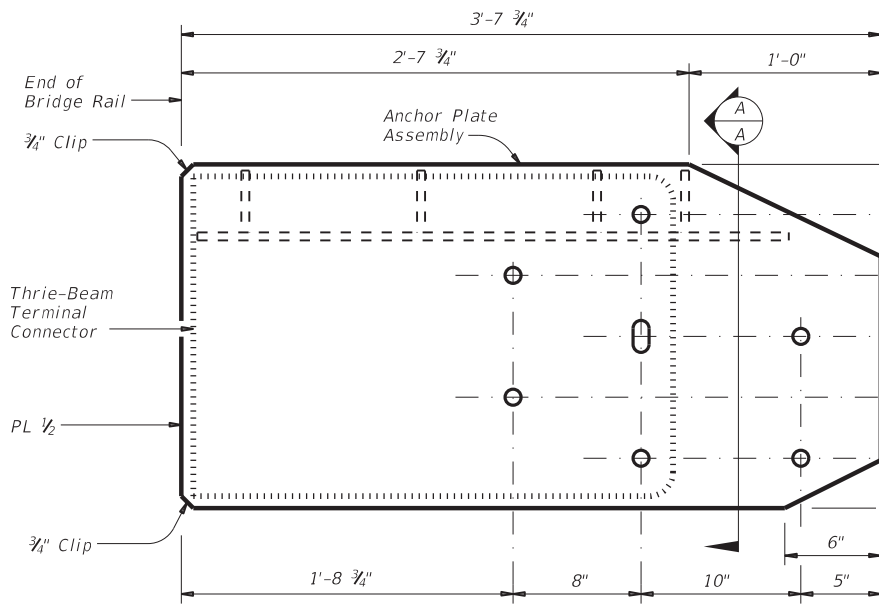
GENERAL NOTES:

These details are for retrofitting existing rails only, not new construction, with a Thrie-Beam Terminal Connection.

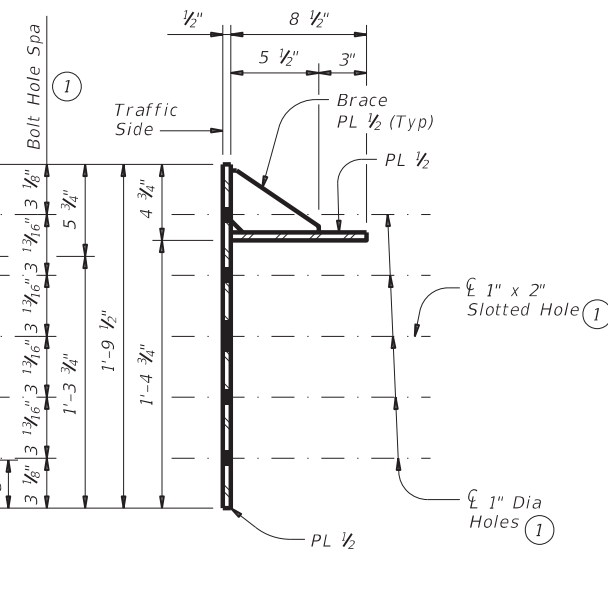
Shop drawings are not required for this installation.

Payment for materials, fabrication, and installation of this assembly are to be included in unit price bid in accordance with Item 540 "Mtl Bm Gd Fen Trans (Anchor Plate)".

Estimated weight of a single Anchor Plate assembly, including bolts, nuts, and washers, but not including the Thrie-Beam Terminal Connector = 190 lbs.



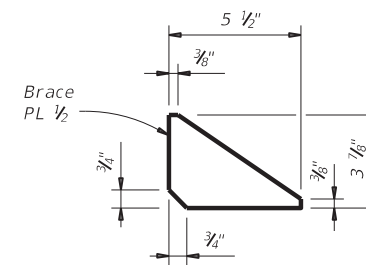
ROADSIDE ELEVATION



SECTION A-A

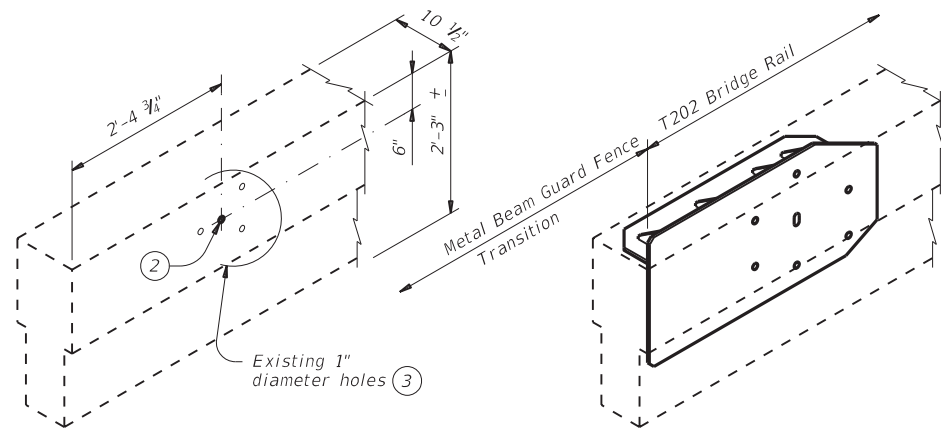
ANCHOR PLATE DETAILS

Anchor Plate shown is detailed for one end of one side of rail only. For other side, Anchor Plate must be built opposite hand.



BRACE PLATE DETAILS

This sheet is intended as a guide in preparing job-specific details to retrofit existing T202 rails with a Thrie-Beam terminal connector. This sheet may not be used without modification. The details shown may need to be amended if the exact existing conditions are not covered. In all cases, details and notes not required are to be removed or crossed out, "(MOD)" added, and the phrase "(Not to be used as a standard)" removed from the title block. This sheet must be signed, sealed, and dated by a registered Professional Engineer. The effective height of the existing rail (at the Anchor Plate location) above the finished riding surface, as seen by an errant vehicle, must be between 2'-2" and 2'-4". Alternate methods of retrofit must be used for effective heights beyond these limits. Dimensions of existing rail height (traffic side) should be shown. Particular care should be taken in identifying existing rail conditions and providing for proper Anchorage Plate and MBGF transition positioning.



EXISTING PARAPET

Shown after removal of existing MBGF Transition connector and prior to coring new bolt holes

ANCHOR PLATE PLACEMENT

INSTALLATION DETAILS

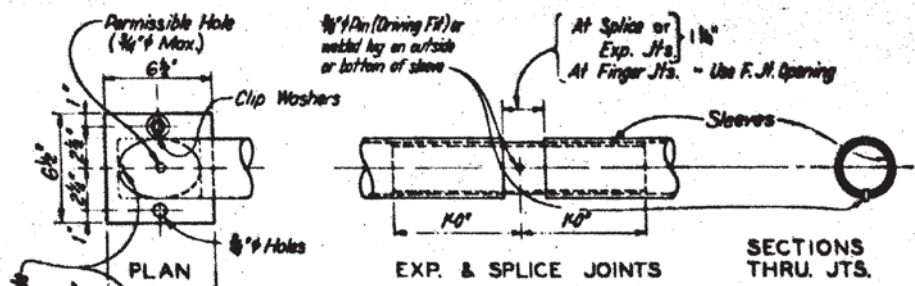
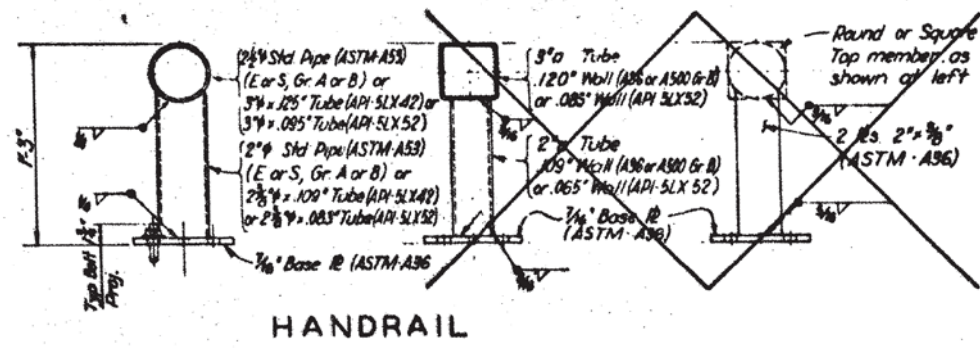
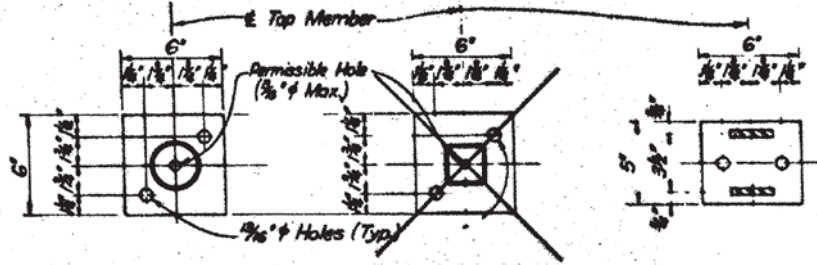
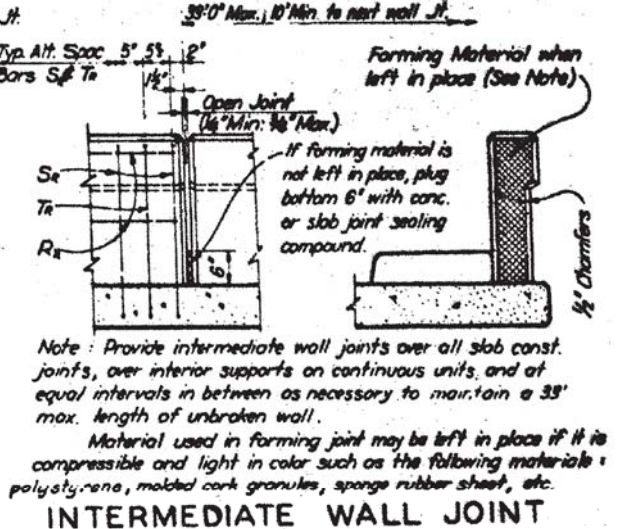
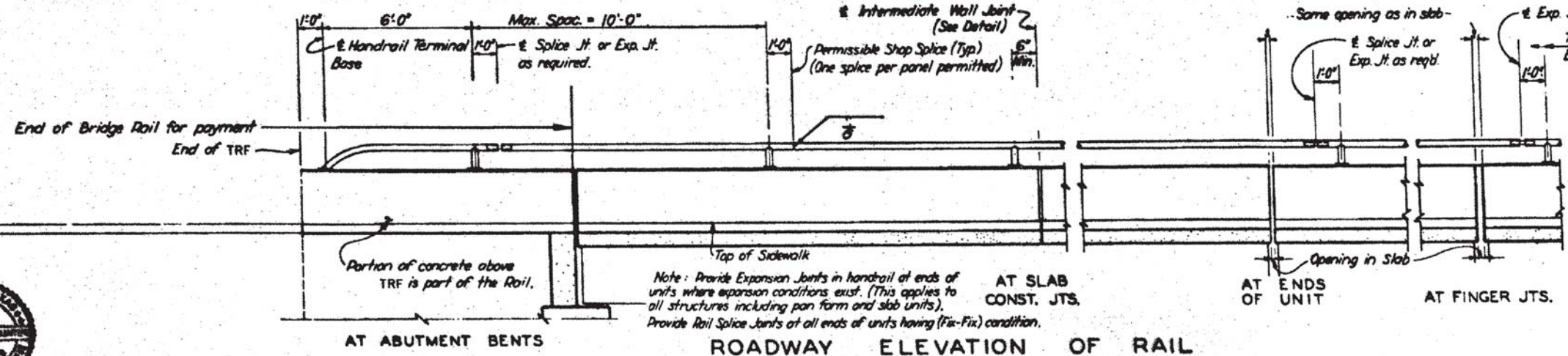
- ① The Contractor must verify that locations of bolt holes match those in the Thrie-Beam Terminal Connector to be installed in that location prior to fabrication of the Anchor Plate assembly and prior to coring bolt holes in the existing T202 parapet.
- ② If the existing holes are aligned as expected, use the indicated existing 1" diameter hole in the installation of the Anchor Plate assembly and the Thrie-Beam Terminal Connector.
- ③ If the existing holes are not aligned as expected, holes that cannot be utilized in the installation and are within 3" of a new bolt hole must be filled with epoxy grout prior to coring new holes.
- ④ Drill new 1" diameter holes, each with a 2 1/2" diameter x 1" deep recess, through existing railing parapet. Recesses are only required when pedestrian sidewalks are adjacent to back of rail unless directed otherwise by the Engineer. Holes should be perpendicular to the roadside face of the parapet. Drill holes and recesses with coring type equipment. Percussion drilling is not allowed. Patch spalls, when directed by the Engineer, in accordance with Item 429, "Concrete Structure Repair", at the contractor's expense.
- ⑤ 7 ~ 7/8" diameter ASTM F3125 Gr A325 Hex Head Anchor Bolts each with 2 ~ 1 3/4" O.D. washers. Place washer under each head and nut. Provide bolts of sufficient length to extend a minimum of 1/2" beyond nut. Cut excess bolt length and paint cut surface with zinc-rich paint if directed by the Engineer.

				Bridge Division Standard	
<h2>T202 TRANSITION RETROFIT GUIDE</h2>					
<p>(NOT TO BE USED AS A STANDARD)</p>					
<h3>T202TR-19</h3>					
FILE: r1std026-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	6372	50	001	VAR.	
	DIST	COUNTY	SHEET NO.		
	SAT	BEXAR	291		

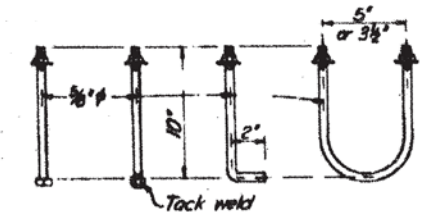
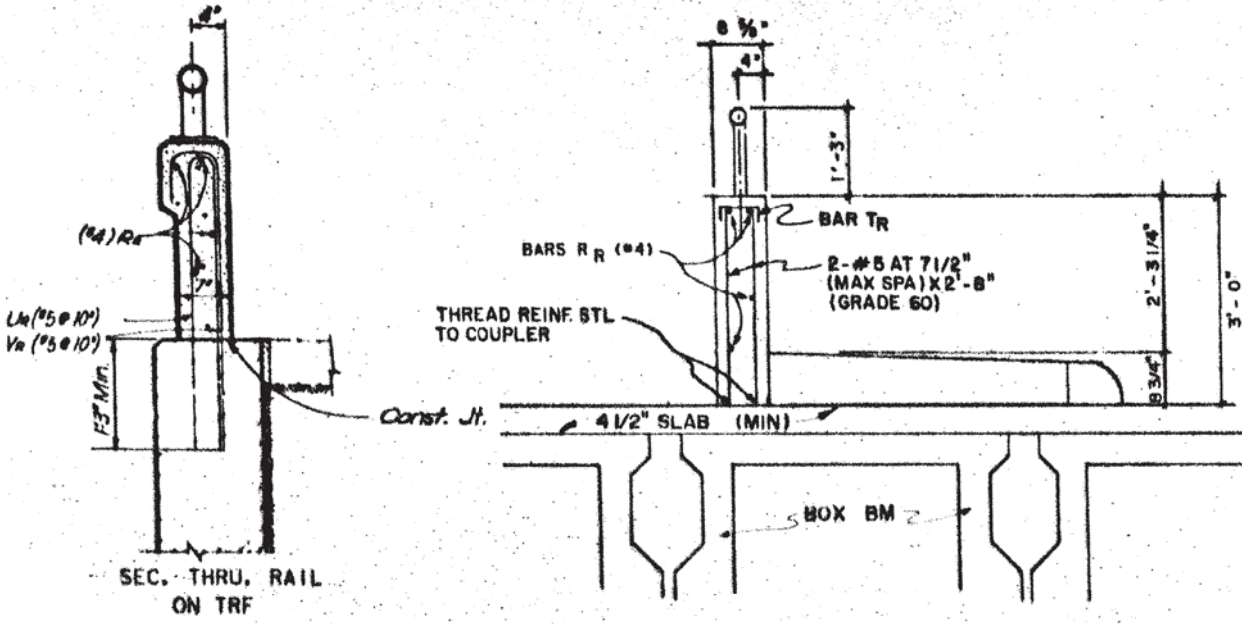
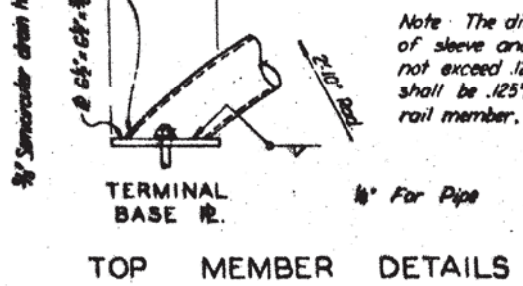
DATE: FILE:



John A. Childs, PE.
7/29/12



Note: The difference between the outside dimension of sleeve and inside dimension of top rail shall not exceed .125". Min. wall thickness of sleeve shall be .125". Material for sleeve equal to that of rail member.



ANCHOR BOLT OPTIONS (For Handrail)
Threaded rods may be .557" minimum diameter with rolled threads.

APPROX. P.L.F. QUANTITIES*	
CONCRETE	C.Y. 0.053
REINF. STEEL	LB. 13.89

*Note: P.L.F. Quantities shown are for concrete and reinforcing steel in railing wall above main slab, including portions of steel bars anchored in slab. These quantities are for Contractor's information only. Cost of furnishing and installing these materials for railing wall to be included in price bid per linear foot of Rail, Type C201.

GENERAL NOTES:
Designed in accordance with AASHTO 1977 Standard and current Interim Specifications.
All parapet concrete and reinforcing, including that embedded in the slab or wingwalls, the terminal connector and the connection to the deep beam guard rail are considered part of Type C201 Railing for payment.
Concrete for railing wall shall be Class "C". Chamfer all exposed corners 1/4" unless otherwise shown.
All steel components except reinforcing shall be galvanized unless otherwise shown in plans.
The face of concrete railing shall be vertical unless otherwise shown in plans. Handrail posts shall be perpendicular to top of concrete. Grout may be used under base plates if necessary.
Whichever of the various handrail options is selected for use shall be used throughout the entire project.
Handrail sections shall be made continuous over not less than two posts nor more than four (except at Abutments).
For railing not requiring shop drawings, erection drawings showing panel lengths, rail post spacing and anchor bolt setting shall be submitted to the Resident Engineer for approval. If railing requires shop and erection drawings, these drawings shall be submitted to the Bridge Engineer for approval. Shop drawings may be submitted as 11" x 18" prints provided they are clearly legible.
Exposed edges of handrail and handrail posts shall be rounded or chamfered to approximately 1/8" by grinding.

RAILS ON HORIZONTAL CURVES

Rad to Face of Rail	Max Chord Lath	Construction or Fabrication
Over 3200'	33'-0"	Construct wall to the required radius or in chords shown.
Over 2000'-3200'	20'-0"	
Over 300'-2000'	10'-0"	Construct wall to the required radius
Thru 300'	0	
Over 2800'	29'-0"	Furnish in straight rail panels
Over 1400'-2800'	14'-6"	
Over 700'-1400'	7'-3"	Bent chord sections or fabricate to the required radius
Thru 700'	0	

Shop drawings will not be required.

Texas Department of Transportation
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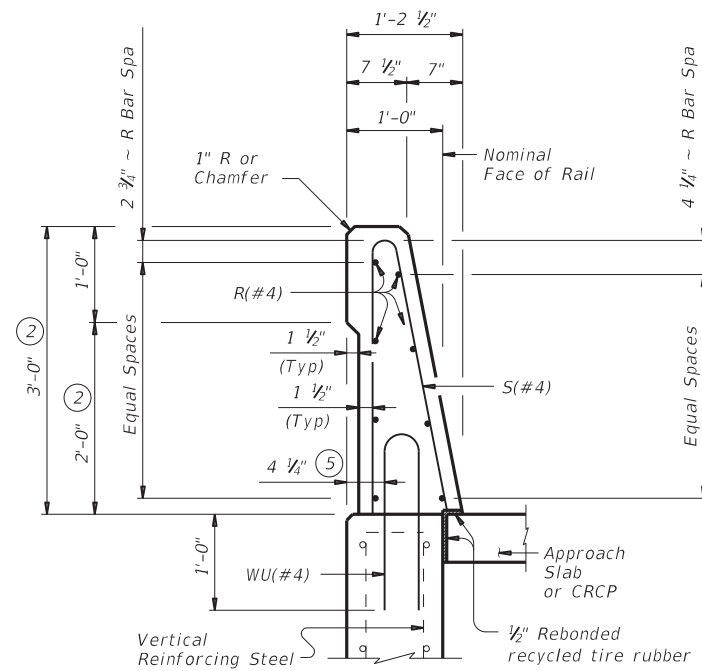
VARIOUS COMBINATION RAIL TYPE C201 (MOD)

SHEET 01 OF 01

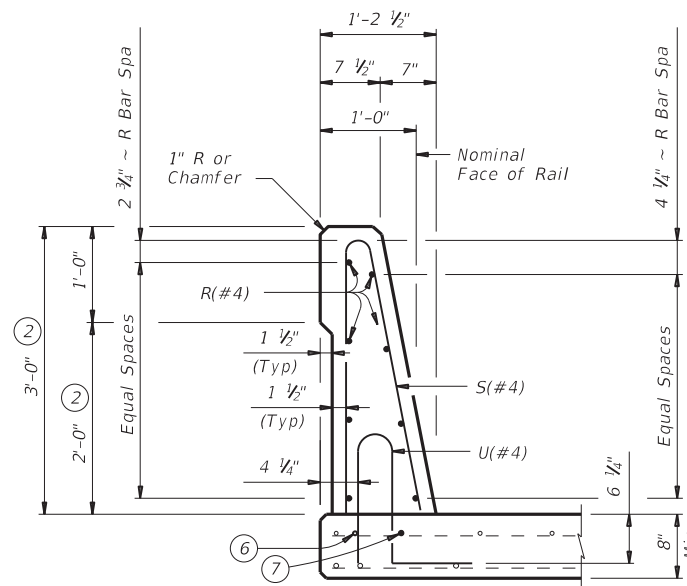
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STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR.

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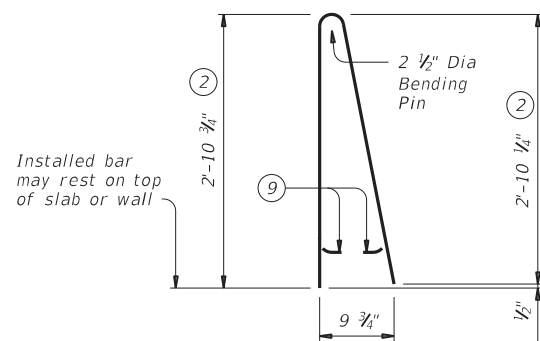


ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS

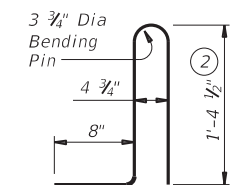


ON BRIDGE SLAB

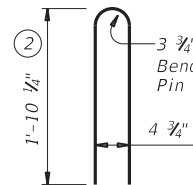
SECTIONS THRU RAIL



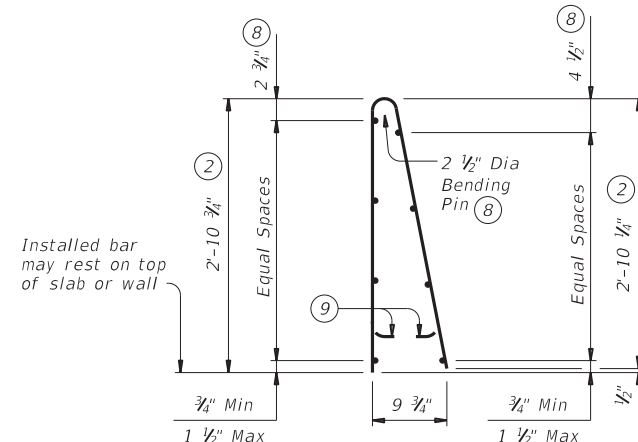
BARS S (#4)



BARS U (#4)



BARS WU (#4)



OPTIONAL WELDED WIRE REINFORCEMENT (WWR)

- ② Increase 2" for structures with Overlay.
- ⑤ 5 1/4" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.
- ⑥ As an aid in supporting reinforcement, additional longitudinal bars may be used in the slab with the approval of the Engineer. Such bars must be furnished at the Contractor's expense.
- ⑦ Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.
- ⑧ No longitudinal wires may be within upper bend.
- ⑨ Bend or cut as required to clear drain slots.
- ⑩ Space U(#4) bars at 4" Max when end region of panel length is less than 6'-0" to side slot drain. Space U(#4) bars at 6" Max when end region of panel length is 6'-0" and greater to side slot drain.

CONSTRUCTION NOTES:

This railing may be constructed by the slipform process when approved by the Engineer, with equipment approved by the Engineer. Provide sensor control for both line and grade. Tack welding to provide bracing for slipform operations is acceptable. Welding may be performed at a minimum spacing of 3 ft between the cage and the anchorage. It is permissible to weld to bars U, WU and S at any location on the cage. If increased bracing is needed, provide additional anchorage devices and weld in the upper two thirds of the cage. Paint welded areas on epoxy coated and/or galvanized reinforcing with an organic zinc rich paint in accordance with Item 445 "Galvanizing".
If rail is slipformed, apply a heavy epoxy bead 1" behind toe of traffic side of rail to concrete deck just prior to slip forming. Provide a 3/8" width x 1/4" tall heavy epoxy bead with Type III, Class C or a Type V epoxy.
The back of railing must be vertical unless otherwise shown in the plans or approved by the Engineer.

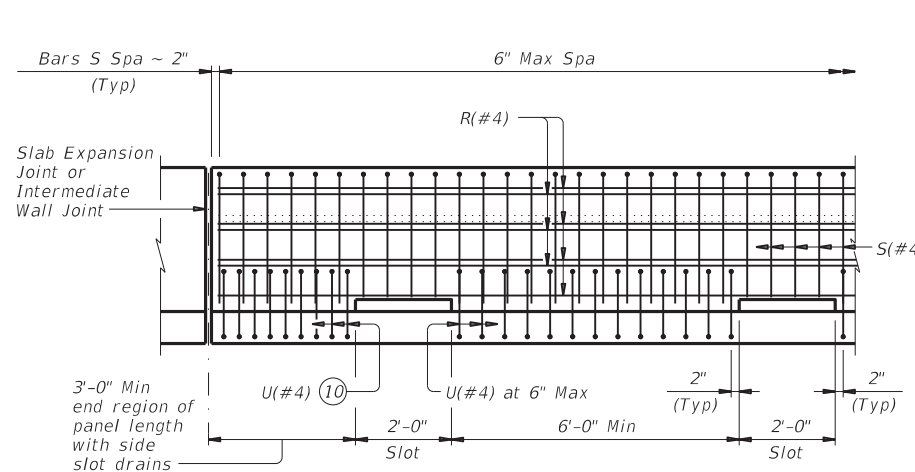
MATERIAL NOTES:

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.
Provide Grade 60 reinforcing steel.
Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.
Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U and WU unless noted otherwise. Deformed WWR (ASTM A1064) may be substituted for Bars R and S, as shown. Combinations of reinforcing steel and WWR or configurations of WWR other than shown are permitted if conditions in the table are satisfied. Provide the same laps as required for reinforcing bars.
Provide bar laps, where required, as follows:
Uncoated or galvanized ~ #4 = 1'-7"
Epoxy coated ~ #4 = 2'-5"

GENERAL NOTES:

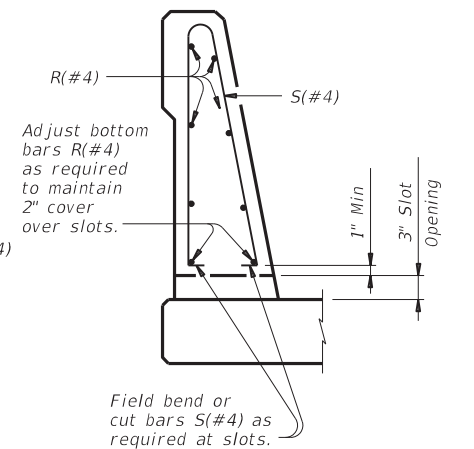
This rail has been successfully evaluated by full-scale crash test to meet MASH TL-4 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.
Do not use this railing on bridges with expansion joints providing more than 5" movement.
Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.
Shop drawings will not be required for this rail.
Average weight of railing with no overlay is 376 pcf.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



OPTIONAL SIDE SLOT DRAIN DETAIL

Note: Side Slot Drains may be used where shown elsewhere on the plans or as directed by the Engineer. Drains should not be placed over railroad tracks, lower roadways, or sidewalks. When this rail is used as a separator between a roadway surface and a sidewalk surface, side drain slots will not be permitted.

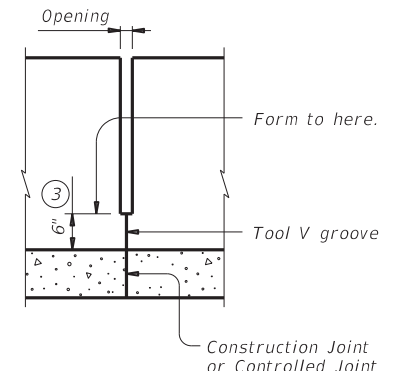
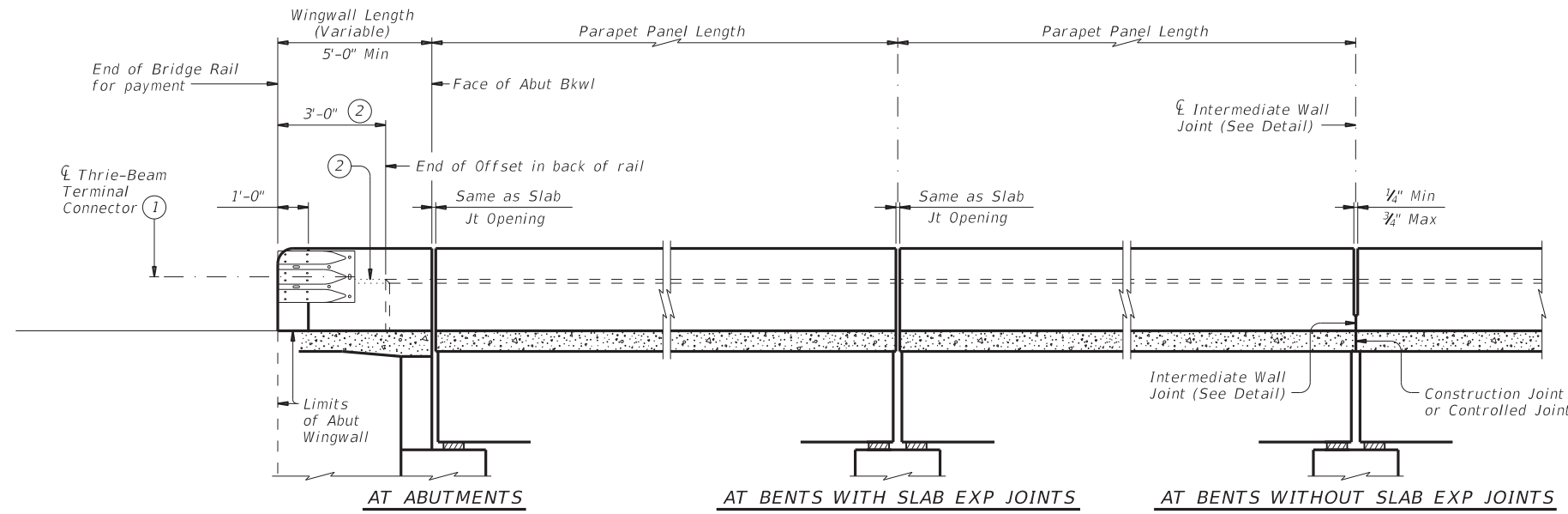


SECTION THRU OPTIONAL SIDE SLOT DRAIN

DESCRIPTION	LONGITUDINAL WIRES	VERTICAL WIRES
Minimum (Cumulative Total) Wire Area	1.067 Sq In.	0.267 Sq In. per Ft
Minimum	No. of Wires	Spacing
Maximum	8	4"
Maximum Wire Size Differential	10	8"
	The smaller wire must have an area of 40% or more of the larger wire.	

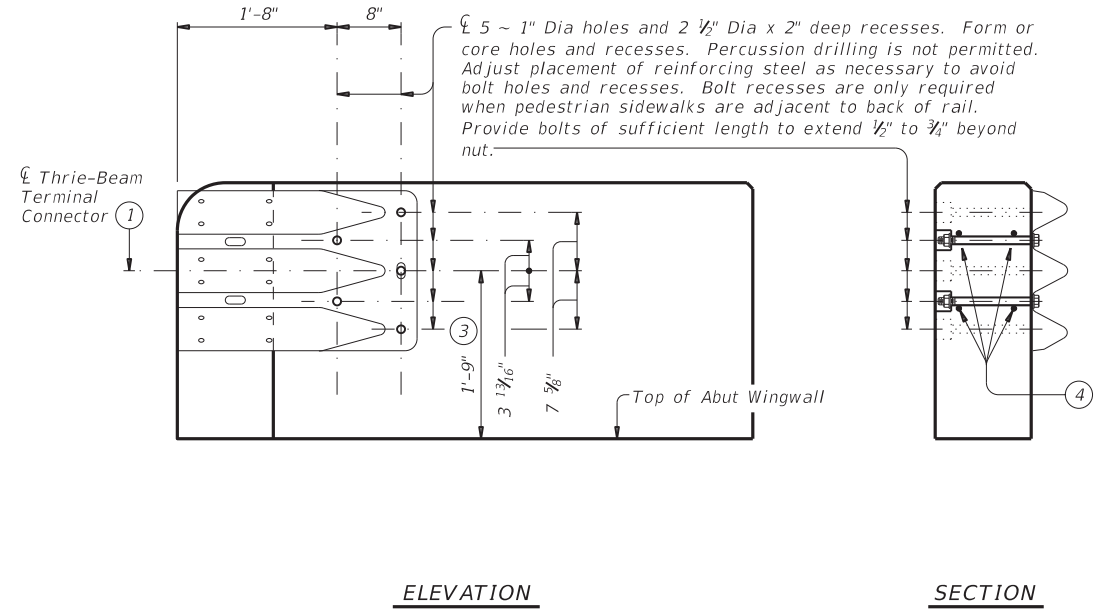
		Bridge Division Standard	
<h2>TRAFFIC RAIL SINGLE SLOPE</h2>			
<h3>TYPE SSTR</h3>			
FILE: r1std014-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT September 2019	CON: 6372	SECT: 50	JOB: 001
REVISIONS	SAT		COUNTY: BEXAR
			SHEET NO.: 294

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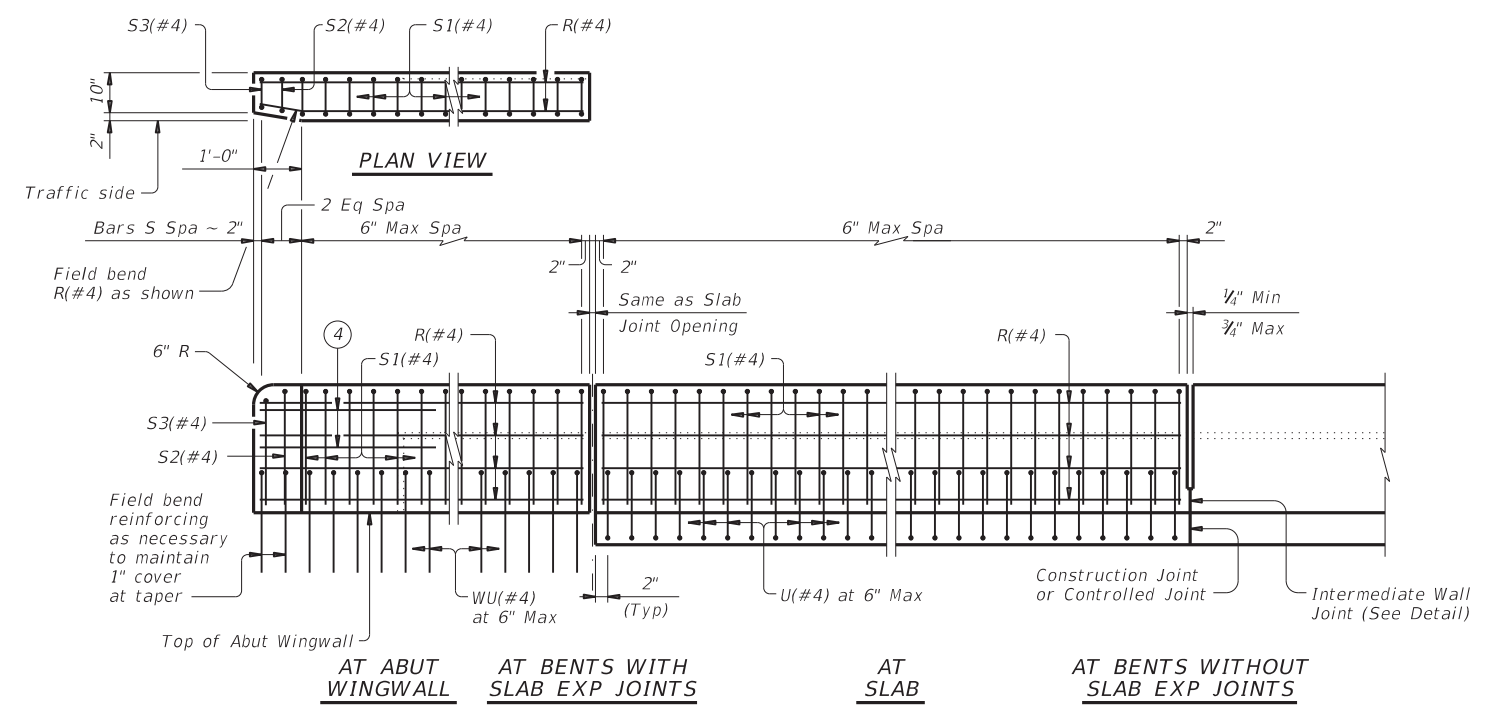


INTERMEDIATE WALL JOINT DETAIL
Provide at all interior bents without slab expansion joints.

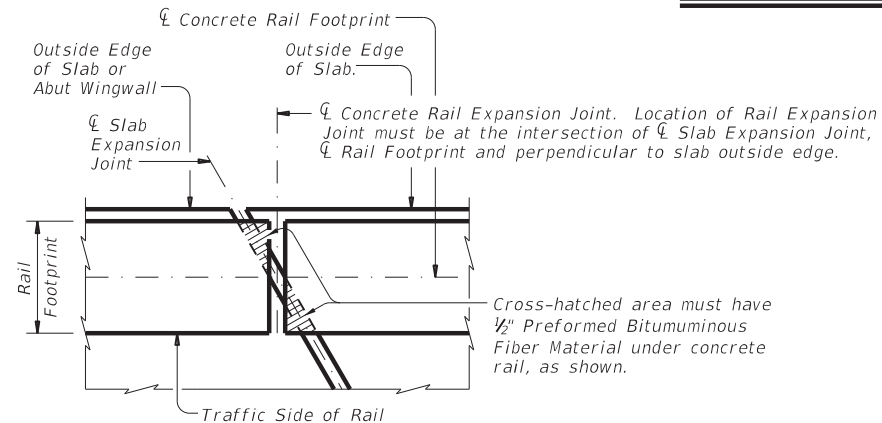
ROADWAY ELEVATION OF RAIL



TERMINAL CONNECTION DETAILS



ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

- ① Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
- ② Back of rail offset may, with Engineer's approval, be continued to the end of the railing.
- ③ Increase 2" for structures with overlay.
- ④ Place 4 additional Bars R(#4) 3'-8" in length inside Bars S(#4) and centered 2'-0" from end of rail when Terminal Connections are required. Field bend as needed.

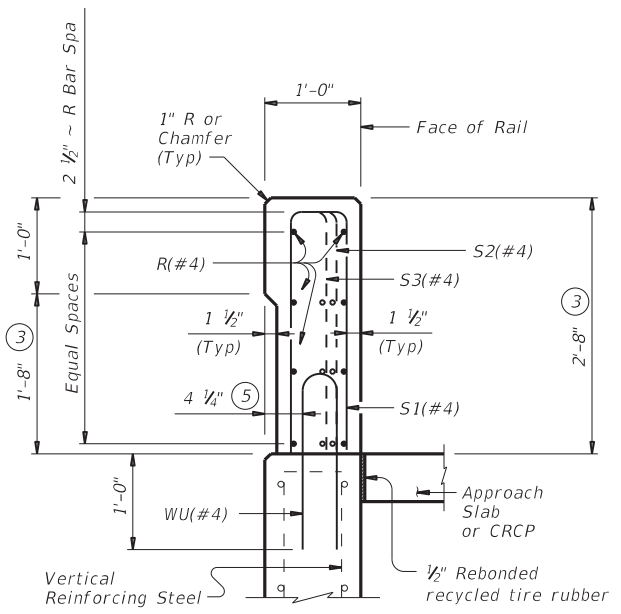
SHEET 1 OF 2

		Bridge Division Standard	
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<h3>TYPE T221</h3>			
FILE: r1std004-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT September 2019	CONT: 6372	SECT: 50	JOB: 001
REVISIONS	COUNTY: BEXAR		HIGHWAY: VAR.
SAT	COUNTY: BEXAR		SHEET NO.: 295

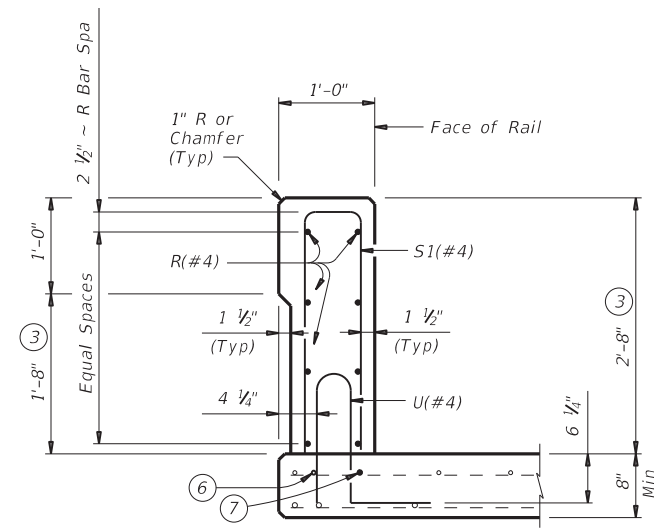
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ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



ON BRIDGE SLAB

SECTIONS THRU RAIL

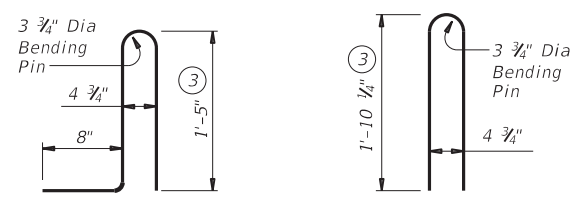
- ③ Increase 2" for structures with overlay.
- ⑤ 5 1/2" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.
- ⑥ As an aid in supporting reinforcement, additional longitudinal bars may be used in the slab with the approval of the Engineer. Such bars will be furnished at the Contractors expense.
- ⑦ Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.
- ⑧ Bend or cut as required to clear drain slots.
- ⑨ No longitudinal wires may be in top center of cage.
- ⑩ Space U(#4) bars at 4" Max when end region of panel length is less than 6'-0" to side slot drain. Space U(#4) bars at 6" Max when end region of panel length is 6'-0" and greater to side slot drain.

CONSTRUCTION NOTES:
 This railing may be constructed by the slipform process when approved by the Engineer, with equipment approved by the Engineer. Provide sensor control for both line and grade. Tack welding to provide bracing for slipform operations is acceptable. Welding may be performed at a minimum spacing of 3 ft between the cage and the anchorage. It is permissible to weld to bars U, WU and S at any location on the cage. If increased bracing is needed, provide additional anchorage devices and weld in the upper two thirds of the cage. Paint welded areas on epoxy coated and/or galvanized reinforcing with an organic zinc rich paint in accordance with Item 445 "Galvanizing".
 If rail is slipformed, apply an heavy epoxy bead 1" behind toe of traffic side of rail to concrete deck just prior to slip forming. Provide a 3/8" width x 1/4" tall heavy epoxy bead with Type III, Class C or a Type V epoxy.
 Face of rail and parapet must be vertical transversely unless otherwise shown in the plans or approved by the Engineer. Chamfer all exposed concrete corners.

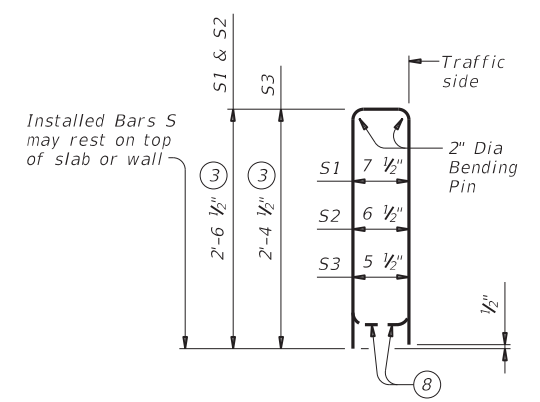
MATERIAL NOTES:
 Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.
 Provide Grade 60 reinforcing steel.
 Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.
 Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U and WU unless noted otherwise. Deformed WWR (ASTM 1064) may be substituted for Bars R and S, as shown. Combinations of reinforcing steel and WWR or configurations of WWR other than shown are permitted if conditions in the table are satisfied. Provide the same laps as required for reinforcing bars.
 Provide bar laps, where required, as follows:
 Uncoated or galvanized ~ #4 = 1'-7"
 Epoxy coated ~ #4 = 2'-5"

GENERAL NOTES:
 This rail has been evaluated and accepted to be of equal strength to railings with like geometry, which have been crash tested to meet MASH TL-3 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.
 Do not use this railing on bridges with expansion joints providing more than 5" movement.
 Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.
 Shop drawings are not required for this rail.
 Average weight of railing with no overlay is 370 plf.

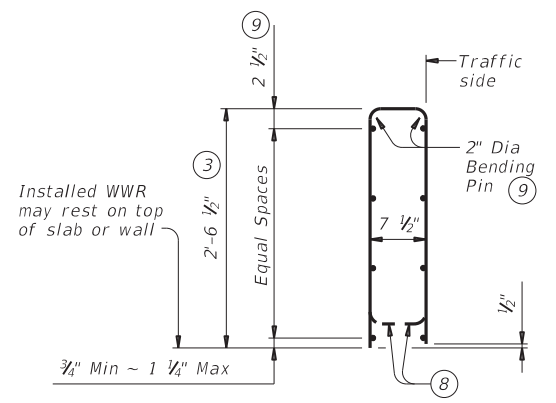
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.



BARS U (#4) BARS WU (#4)

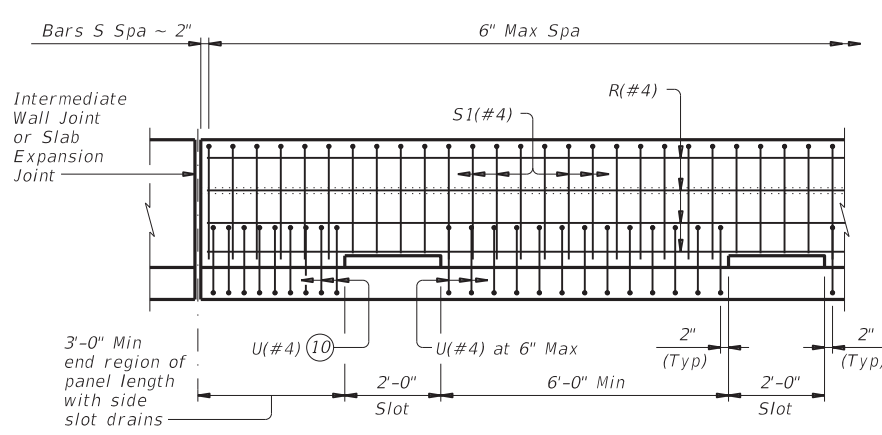


BARS S (#4)



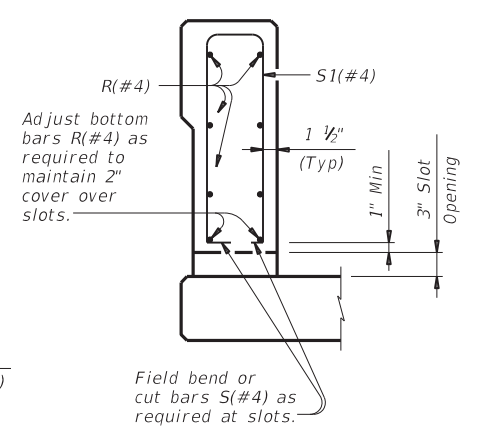
OPTIONAL WELDED WIRE REINFORCEMENT (WWR)

DESCRIPTION	LONGITUDINAL WIRES	VERTICAL WIRES
Minimum (Cumulative Total) Wire Area	1.067 Sq In.	0.267 Sq In. per Ft
Minimum	No. of Wires	Spacing
Maximum	8	4"
Maximum Wire Size Differential	10	8"
	The smaller wire must have an area of 40% or more of the larger wire.	



OPTIONAL SIDE SLOT DRAIN DETAIL

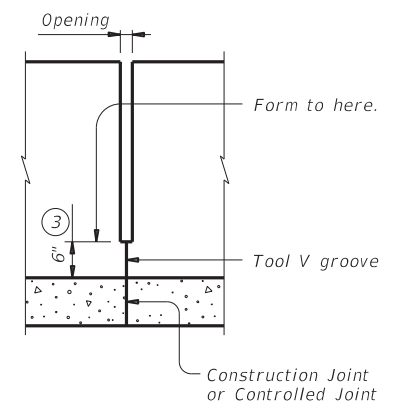
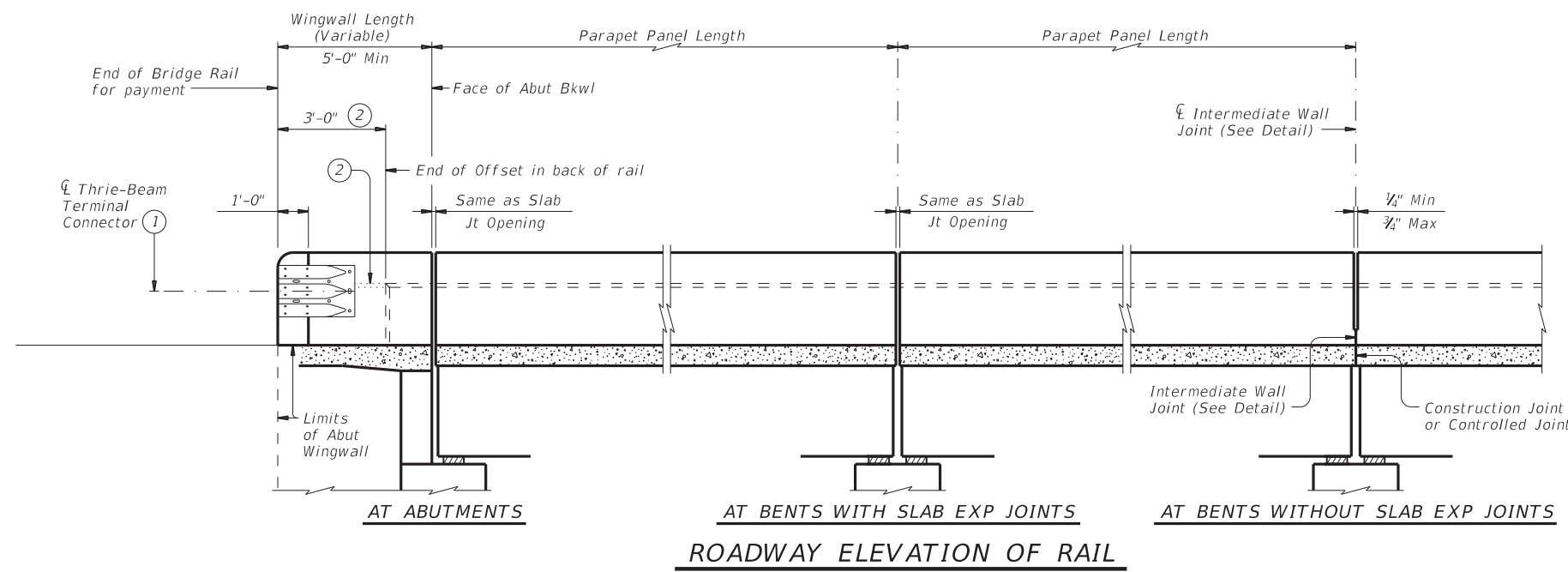
Note: Side Slot Drains may be used where shown elsewhere on the plans or as directed by the Engineer. Drains should not be placed over railroad tracks, lower roadways, or sidewalks. When this rail is used as a separator between a roadway surface and a sidewalk surface, side drain slots will not be permitted.



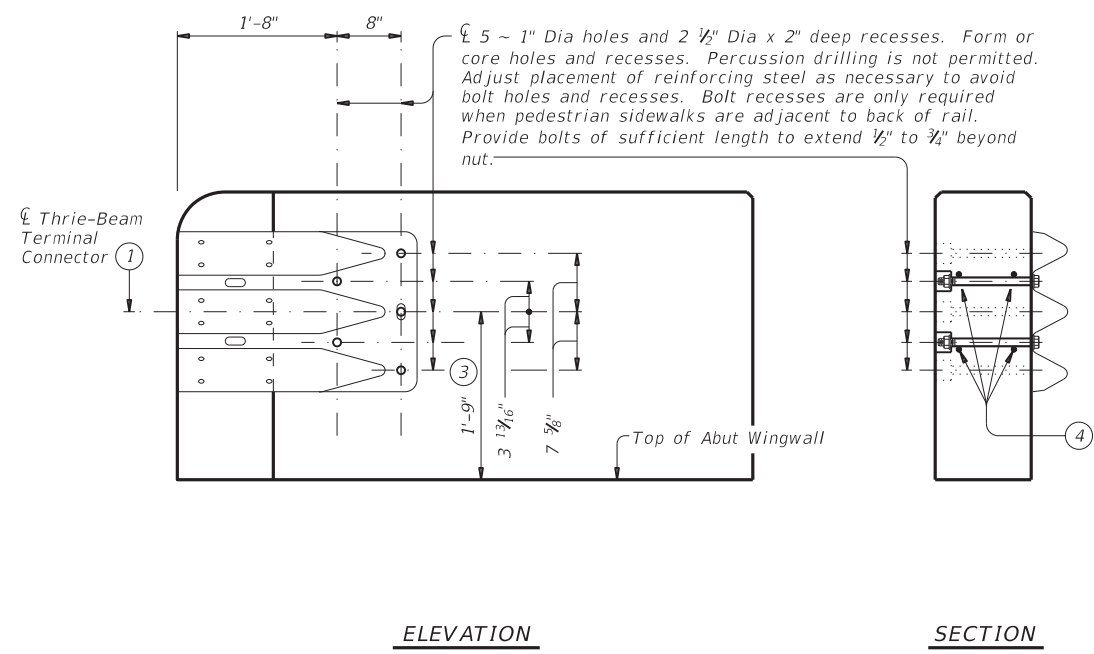
SECTION THRU OPTIONAL SIDE SLOT DRAIN

		Bridge Division Standard	
<h1>TRAFFIC RAIL</h1>			
<h2>TYPE T221</h2>			
FILE: r1std004-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT September 2019	CONTRACT NO. 6372	SECTION NO. 50	JOB NO. 001
REVISIONS			HIGHWAY VAR.
	DIST. SAT	COUNTY BEXAR	SHEET NO. 296

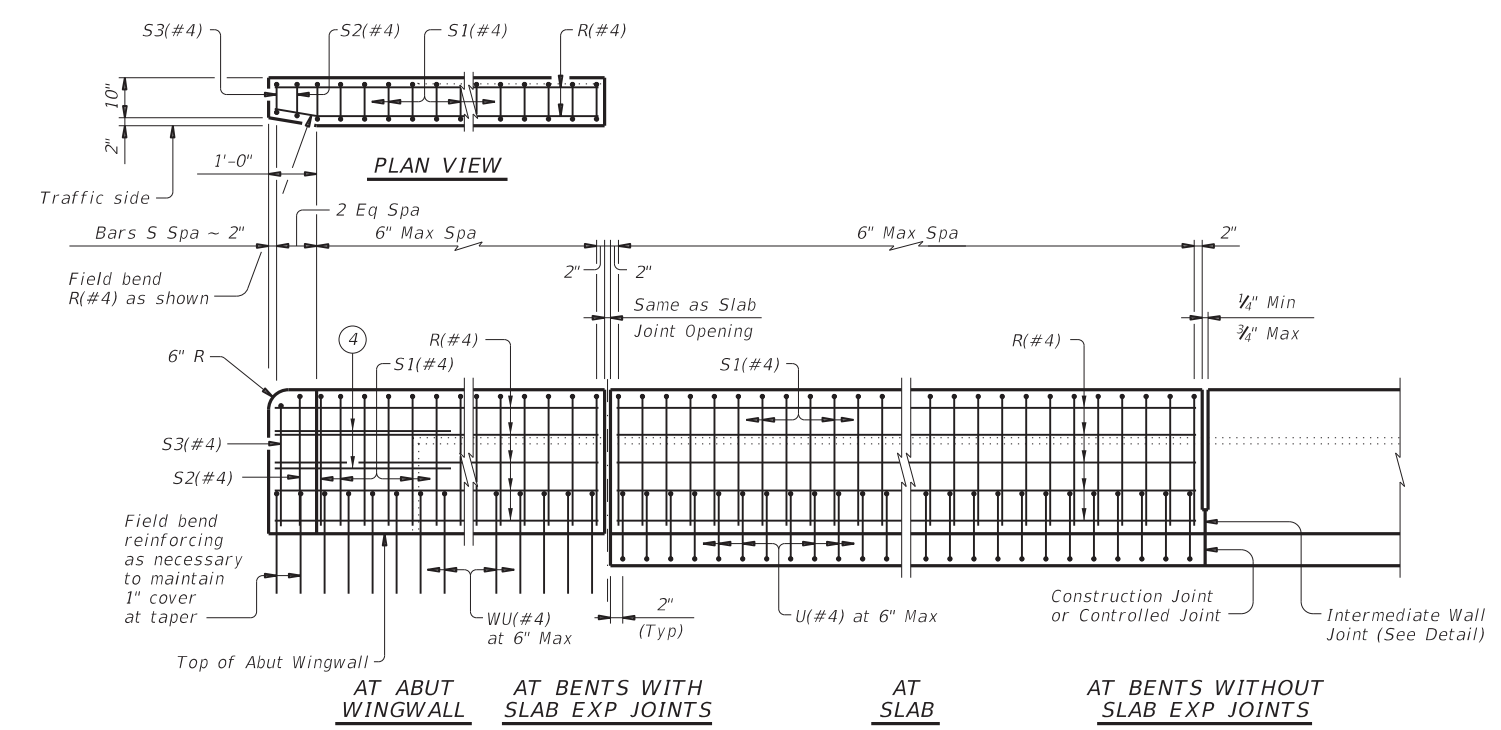
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.



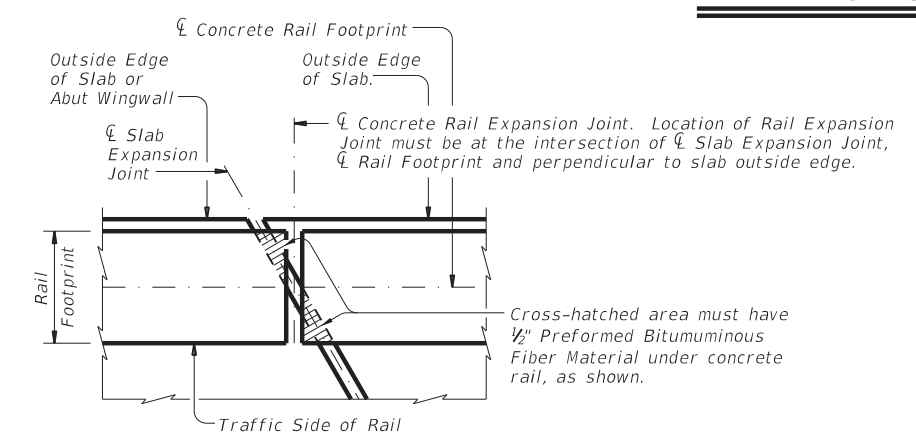
INTERMEDIATE WALL JOINT DETAIL
Provide at all interior bents without slab expansion joints.



TERMINAL CONNECTION DETAILS



ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT



PLAN OF RAIL AT EXPANSION JOINTS
Example showing Slab Expansion Joints without breakbacks.

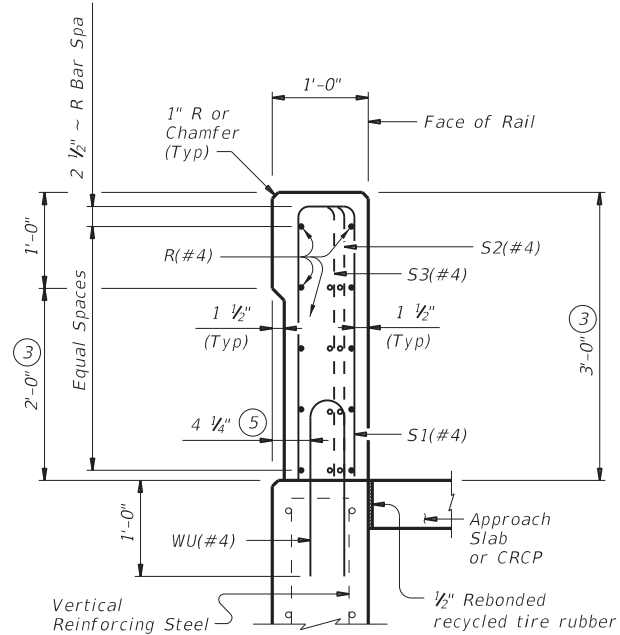
- ① Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
- ② Back of rail offset may, with Engineer's approval, be continued to the end of the railing.
- ③ Increase 2" for structures with overlay.
- ④ Place 4 additional Bars R(#4) 3'-8" in length inside Bars S(#4) and centered 2'-0" from end of rail when Terminal Connections are required. Field bend as needed.

SHEET 1 OF 2

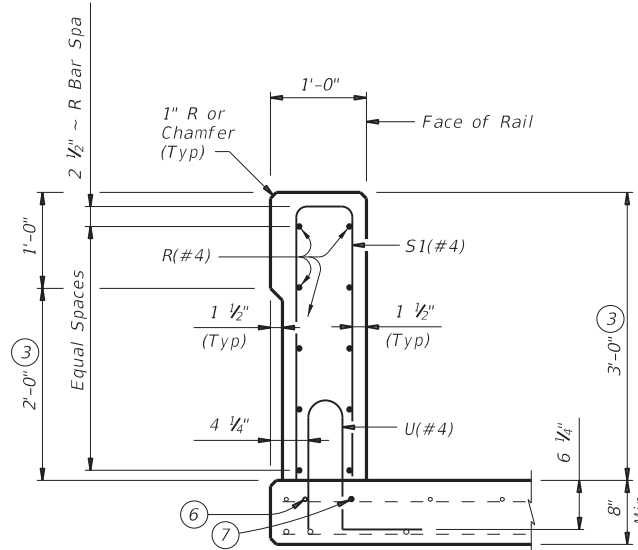
		Bridge Division Standard	
<h2>TRAFFIC RAIL</h2>			
<h3>TYPE T222</h3>			
FILE: r1std003-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT September 2019	CONT: 6372	SECT: 50	JOB: 001
REVISIONS	COUNTY: BEXAR		HIGHWAY: VAR.
SAT	COUNTY: BEXAR		SHEET NO.: 297

DATE: FILE:

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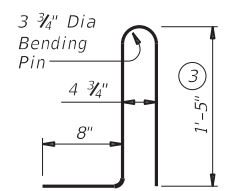


ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS

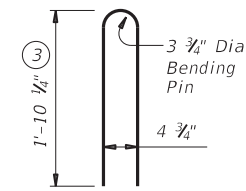


ON BRIDGE SLAB

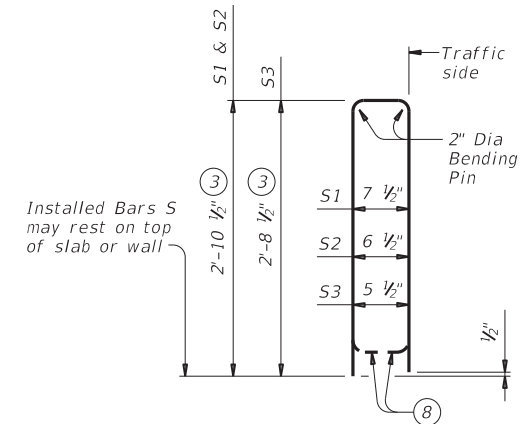
SECTIONS THRU RAIL



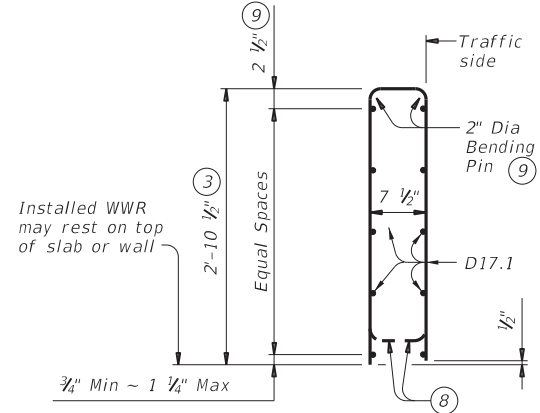
BARS U (#4)



BARS WU (#4)



BARS S (#4)



OPTIONAL WELDED WIRE REINFORCEMENT (WWR)

- ③ Increase 2" for structures with overlay.
- ⑤ 5 1/4" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.
- ⑥ As an aid in supporting reinforcement, additional longitudinal bars may be used in the slab with the approval of the Engineer. Such bars will be furnished at the Contractors expense.
- ⑦ Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.
- ⑧ Bend or cut as required to clear drain slots.
- ⑨ No longitudinal wires may be in top center of cage.
- ⑩ Space U(#4) bars at 4" Max when end region of panel length is less than 6'-0" to side slot drain. Space U(#4) bars at 6" Max when end region of panel length is 6'-0" and greater to side slot drain.

CONSTRUCTION NOTES:

This railing may be constructed by the slipform process when approved by the Engineer, with equipment approved by the Engineer. Provide sensor control for both line and grade. Tack welding to provide bracing for slipform operations is acceptable. Welding may be performed at a minimum spacing of 3 ft between the cage and the anchorage. It is permissible to weld to bars U, WU and S at any location on the cage. If increased bracing is needed, provide additional anchorage devices and weld in the upper two thirds of the cage. Paint welded areas on epoxy coated and/or galvanized reinforcing with an organic zinc rich paint in accordance with Item 445 "Galvanizing".
If rail is slipformed, apply an heavy epoxy bead 1" behind toe of traffic side of rail to concrete deck just prior to slip forming. Provide a 3/8" width x 1/4" tall heavy epoxy bead with Type III, Class C or a Type V epoxy.
Face of rail and parapet must be vertical transversely unless otherwise shown in the plans or approved by the Engineer.
Chamfer all exposed concrete corners.

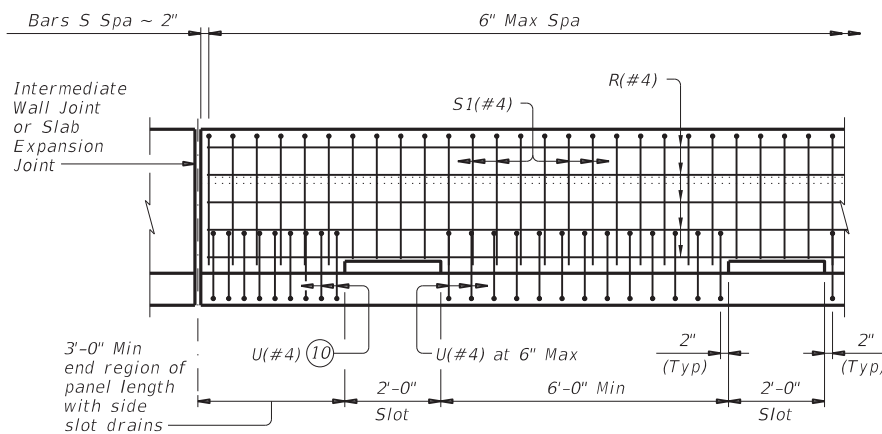
MATERIAL NOTES:

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.
Provide Grade 60 reinforcing steel.
Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.
Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U and WU unless noted otherwise. Deformed WWR (ASTM 1064) may be substituted for Bars R and S, as shown. Provide the same laps as required for reinforcing bars.
Provide bar laps, where required, as follows:
Uncoated or galvanized ~ #4 = 1'-7"
Epoxy coated ~ #4 = 2'-5"

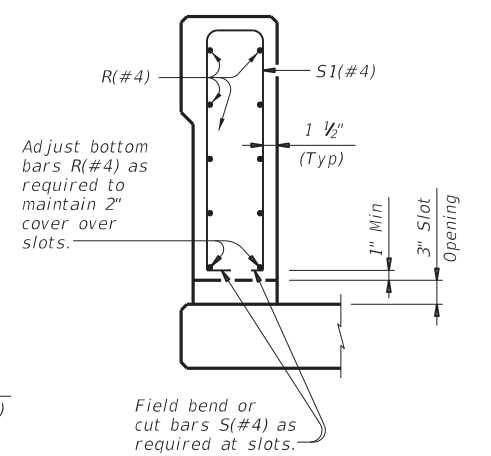
GENERAL NOTES:

This rail has been successfully evaluated by full-scale crash test to meet MASH TL-4 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.
Do not use this railing on bridges with expansion joints providing more than 5" movement.
Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.
Shop drawings are not required for this rail.
Average weight of railing with no overlay is 413 plf.

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.



OPTIONAL SIDE SLOT DRAIN DETAIL



SECTION THRU OPTIONAL SIDE SLOT DRAIN

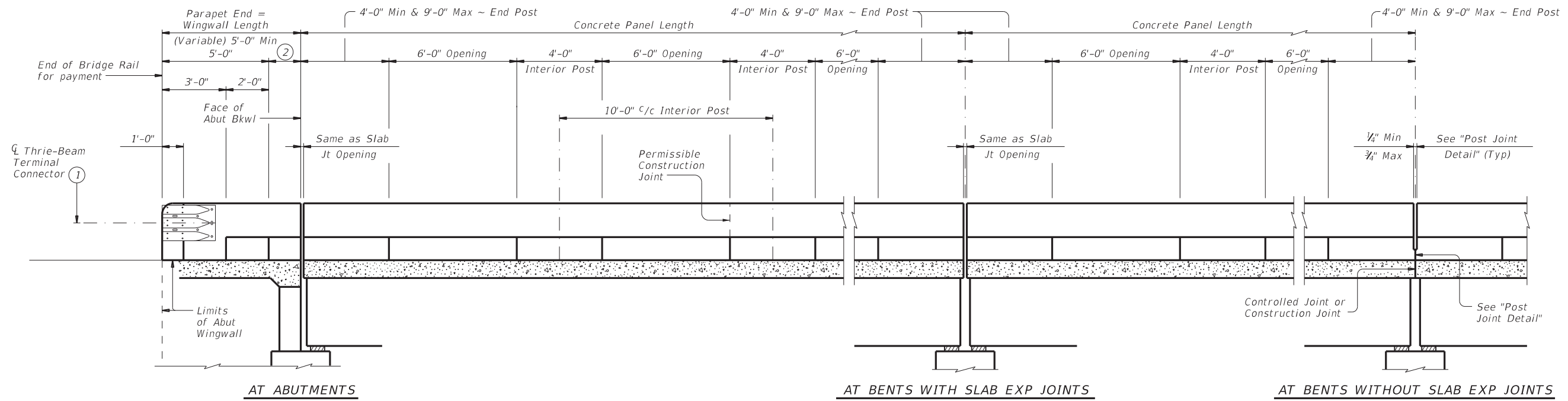
Note: Side Slot Drains may be used where shown elsewhere on the plans or as directed by the Engineer. Drains should not be placed over railroad tracks, lower roadways, or sidewalks. When this rail is used as a separator between a roadway surface and a sidewalk surface, side drain slots will not be permitted.

		Bridge Division Standard	
<h1>TRAFFIC RAIL</h1>			
<h2>TYPE T222</h2>			
FILE: r1std003-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT September 2019	CONV: 6372	SECT: 50	JOB: 001
REVISIONS	HIGHWAY: VAR.		SHEET NO.:
DIST: SAT	COUNTY: BEXAR	SHEET NO. 298	

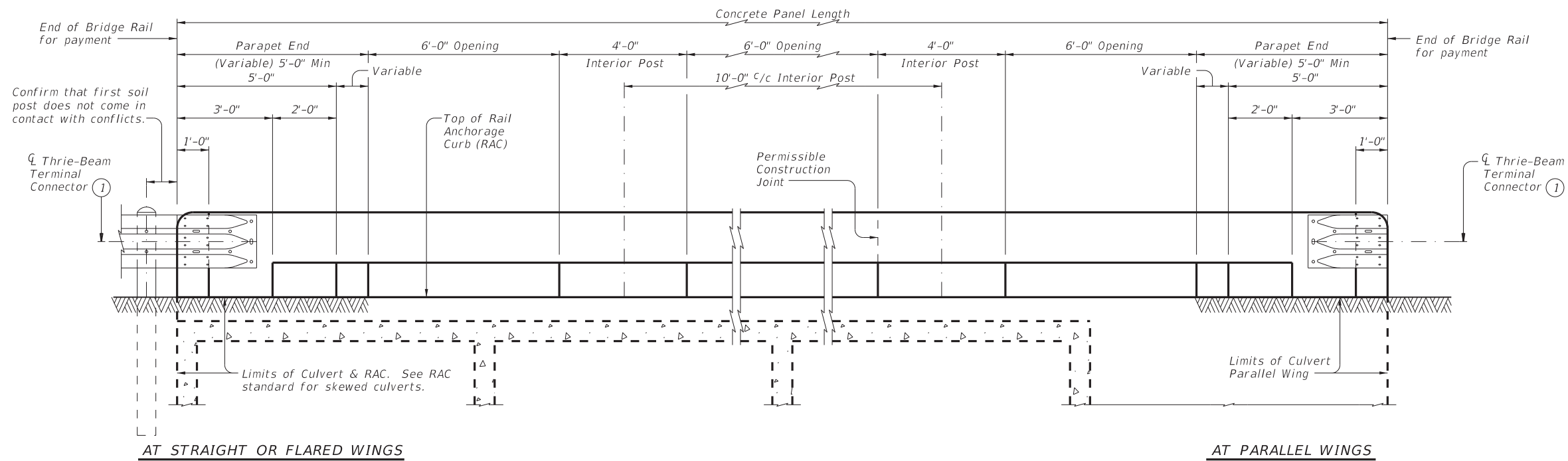
DATE: FILE:

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DATE:
FILE:



ROADWAY ELEVATION OF RAIL ON BRIDGE



ROADWAY ELEVATION OF RAIL ON BOX CULVERTS

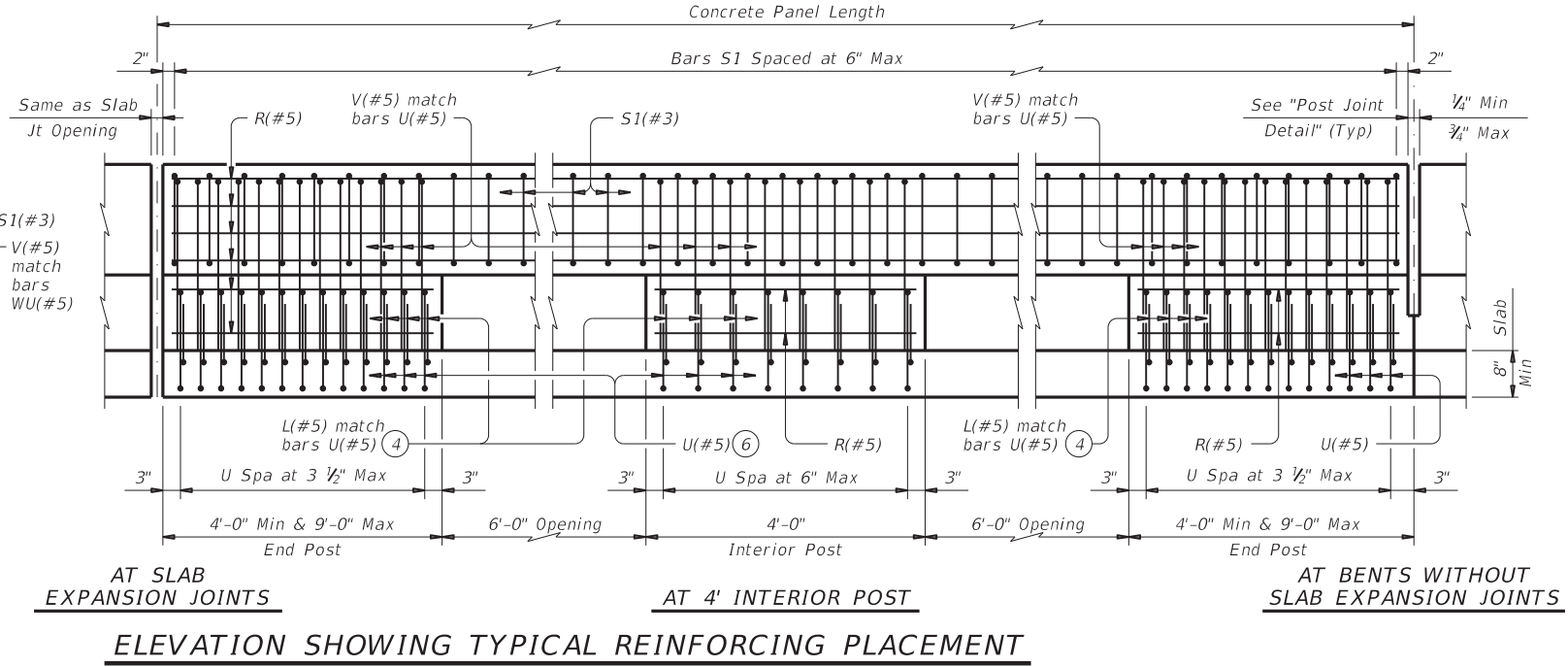
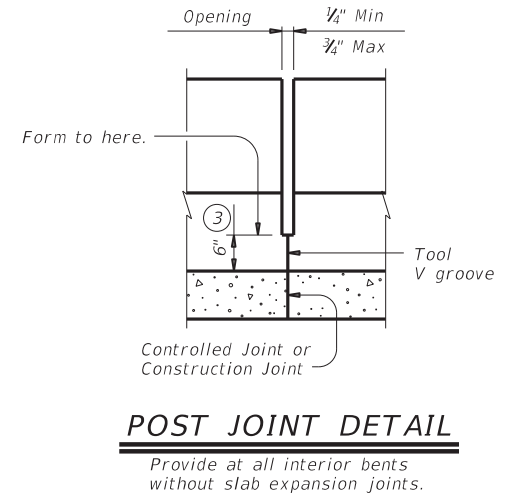
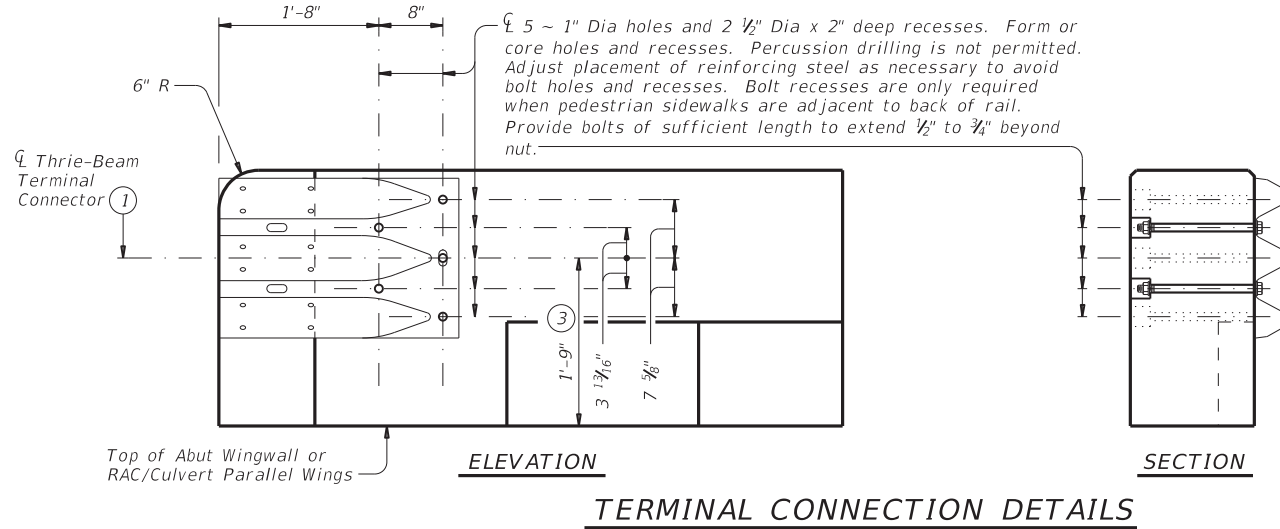
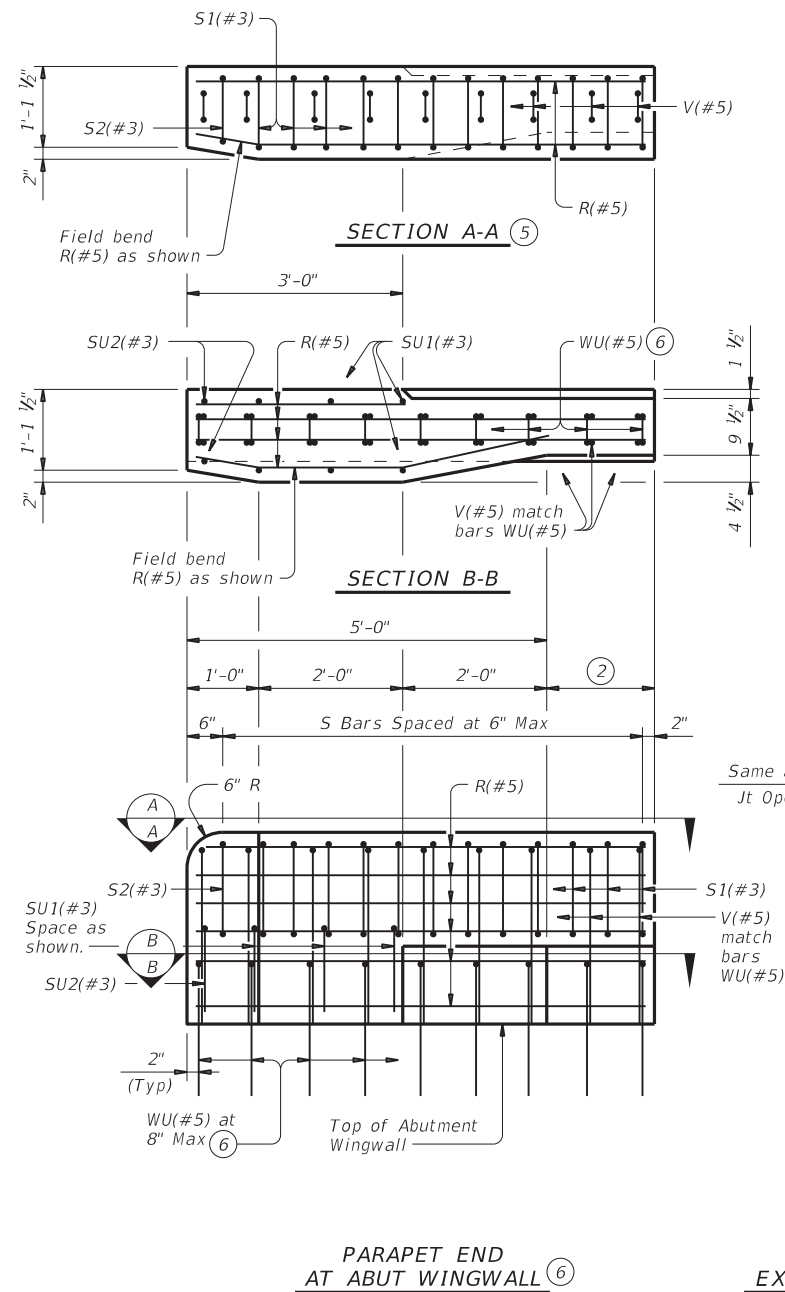
Showing 0° skew culvert. Skewed culverts similar. See RAC standard for details not shown. Vertical joints in concrete rail are not required, unless shown elsewhere.

- ① Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
- ② Wingwall Length minus 5'-0" (Varies)

				Bridge Division Standard	
<h2>TRAFFIC RAIL</h2>					
<h3>TYPE T223</h3>					
FILE: r1std005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES	
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	6372	50	001	VAR.	
	DIST	COUNTY	SHEET NO.		
	SAT	BEXAR	299		

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DATE: FILE:



- ① Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
- ② Wingwall Length minus 5'-0" (Varies)
- ③ Increase 2" for structures with overlay.
- ④ Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.
- ⑤ Bars SU1(#3), SU2(#3) and WU(#5) not shown for clarity.
- ⑥ Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on anchorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.

SHEET 2 OF 3

Texas Department of Transportation Bridge Division Standard

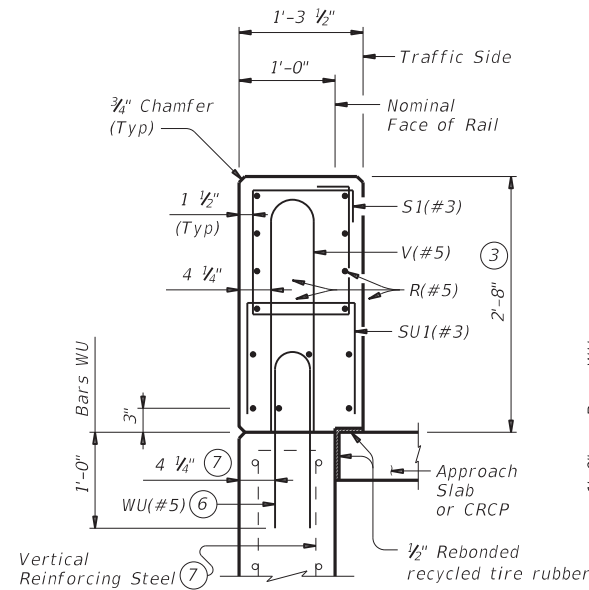
TRAFFIC RAIL

TYPE T223

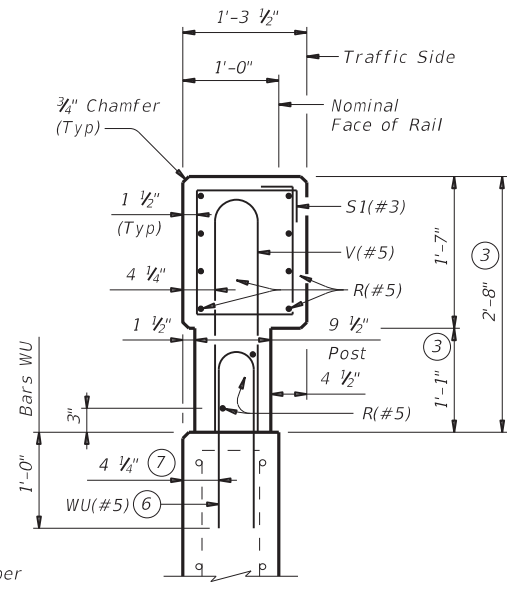
FILE: r1std005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
DIST	COUNTY		SHEET NO.	
SAT	BEXAR		300	

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.

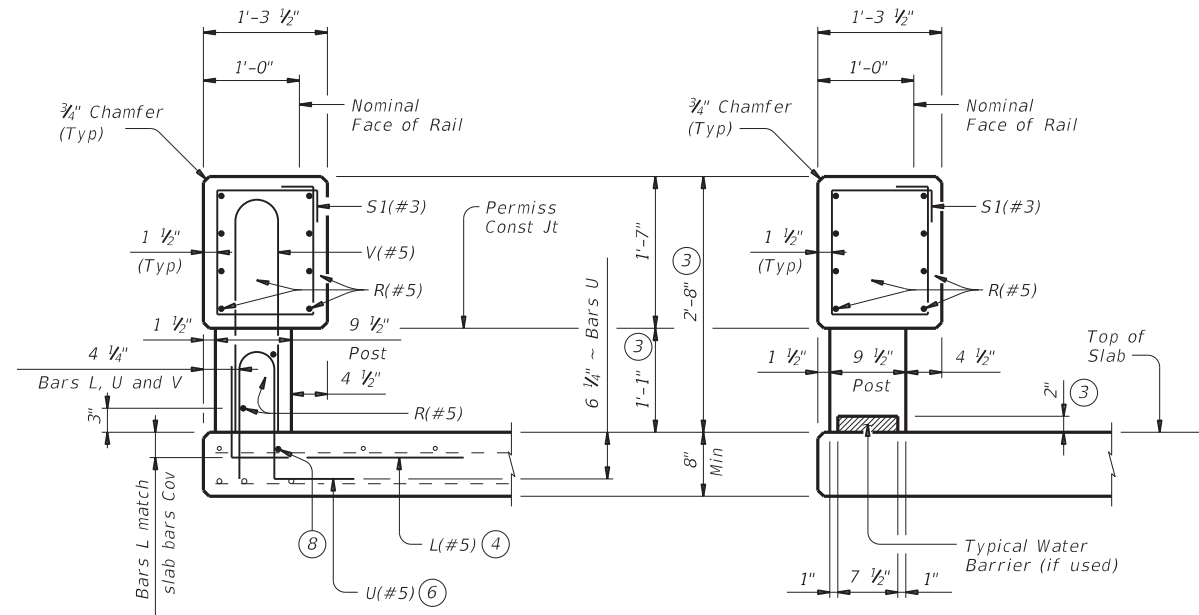
DATE: FILE:



SECTION C-C
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS

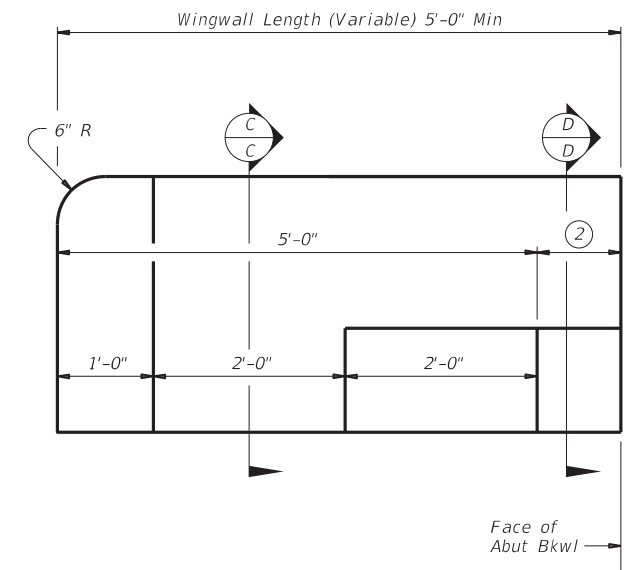


SECTION D-D
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS



AT POST
ON BRIDGE SLAB

AT OPENING
ON BRIDGE SLAB



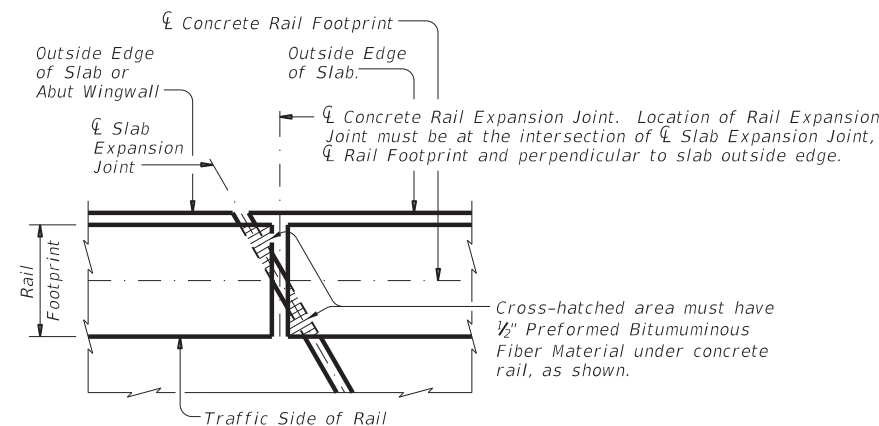
ELEVATION AT
ABUTMENT WINGWALL

Box culvert parallel wings or rail anchorage curb similar.

SECTIONS THRU RAIL

Sections on box culverts similar.

- ② Wingwall Length minus 5'-0" (Varies)
- ③ Increase 2" for structures with overlay.
- ④ Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.
- ⑥ Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on anchorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.
- ⑦ When vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls on traffic side of wall, move the horizontal wingwall/retaining wall reinforcing to the inside of Bars WU where bars conflict.
- ⑧ Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.
- ⑨ At the Contractor's option, Bars V may be replaced by extending Bars U to 2'-5 1/4" above the roadway surface without overlay.



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

CONSTRUCTION NOTES:

Face of rail and parapet must be vertical transversely unless otherwise shown in the plans or approved by the Engineer.
Provide water barriers at openings draining onto undercrossing roadways and sidewalks. They may be cast-in-place or precast in convenient lengths and bonded to the bridge deck with an approved epoxy cement.
Chamfer all exposed corners.

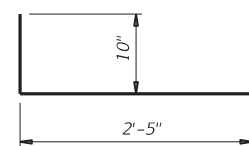
MATERIAL NOTES:

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.
Provide Grade 60 reinforcing steel.
Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.
Deformed Welded Wire Reinforcing (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U, V, and WU unless noted otherwise. Provide the same laps as required for reinforcing bars.
Provide bar laps, where required, as follows:
Uncoated or galvanized ~ #5 = 2'-0"
Epoxy coated ~ #5 = 3'-0"

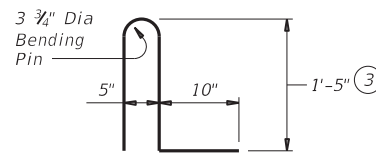
GENERAL NOTES:

This rail has been evaluated by full-scale crash test to meet MASH TL-3 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can be used for speeds of 45 mph and less.
Do not use this railing on bridges with expansion joints providing more than 5" movement.
Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.
Shop drawings are not required for this rail.
Average weight of railing with no overlay is 358 plf.

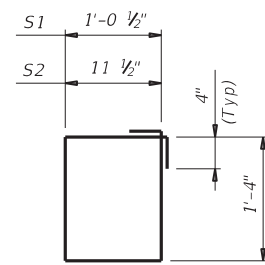
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.



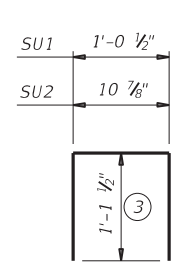
BARS L (#5)



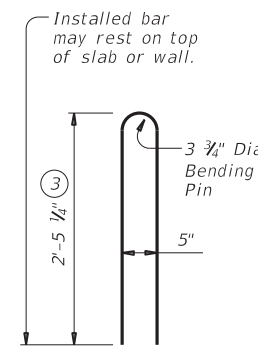
BARS U (#5) ⑨



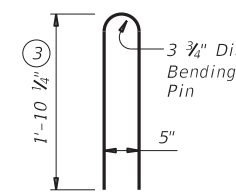
BARS S (#3)



BARS SU (#3)



BARS V (#5) ⑨

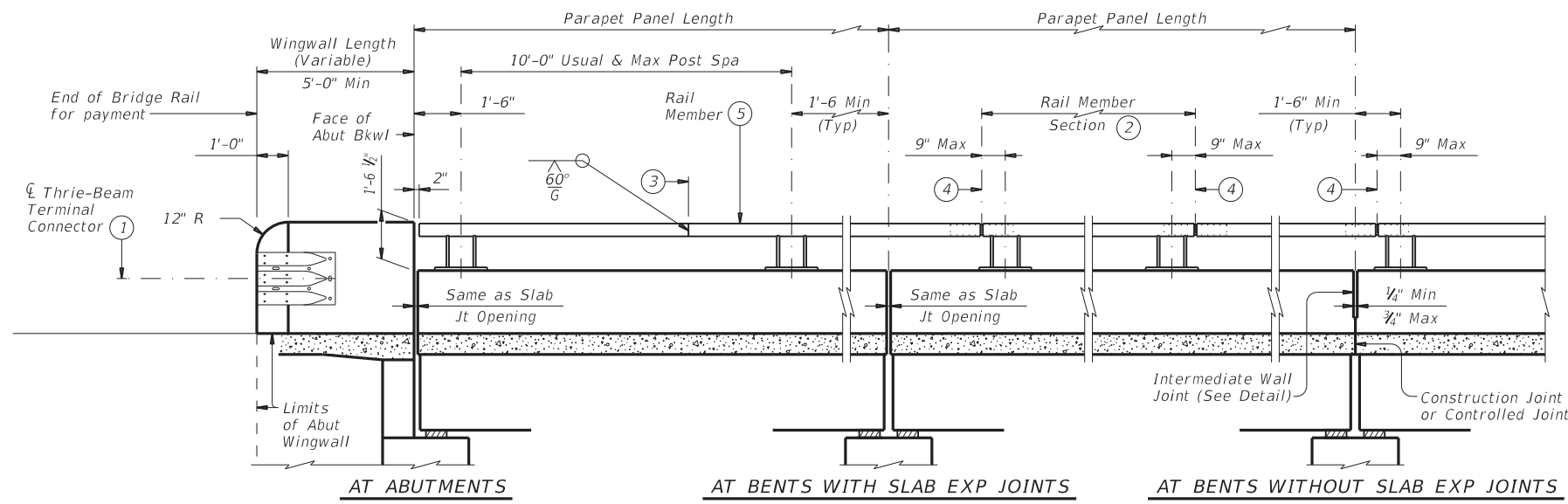


BARS WU (#5)

		Bridge Division Standard	
<h1>TRAFFIC RAIL</h1>			
<h2>TYPE T223</h2>			
FILE: r1std005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT September 2019	CONT: 6372	SECT: 50	JOB: 001
REVISIONS	COUNTY: BEXAR		SHEET NO.: 301

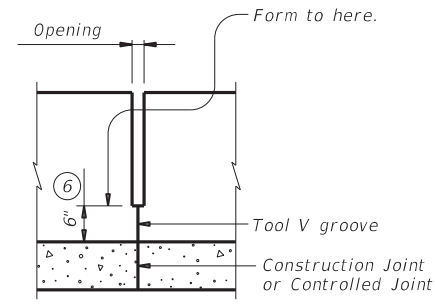
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: FILE:



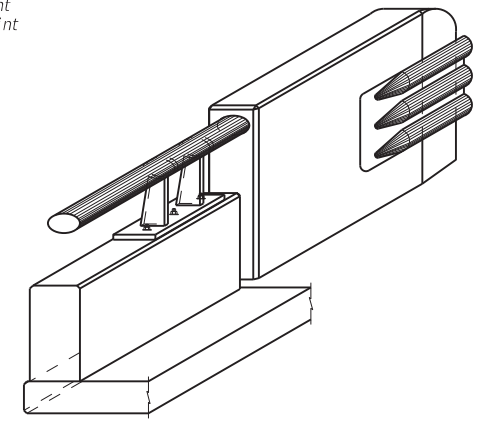
ROADWAY ELEVATION OF RAIL

(Rail Member showing Elliptical Tube Option, Rectangular Tube Option similar).



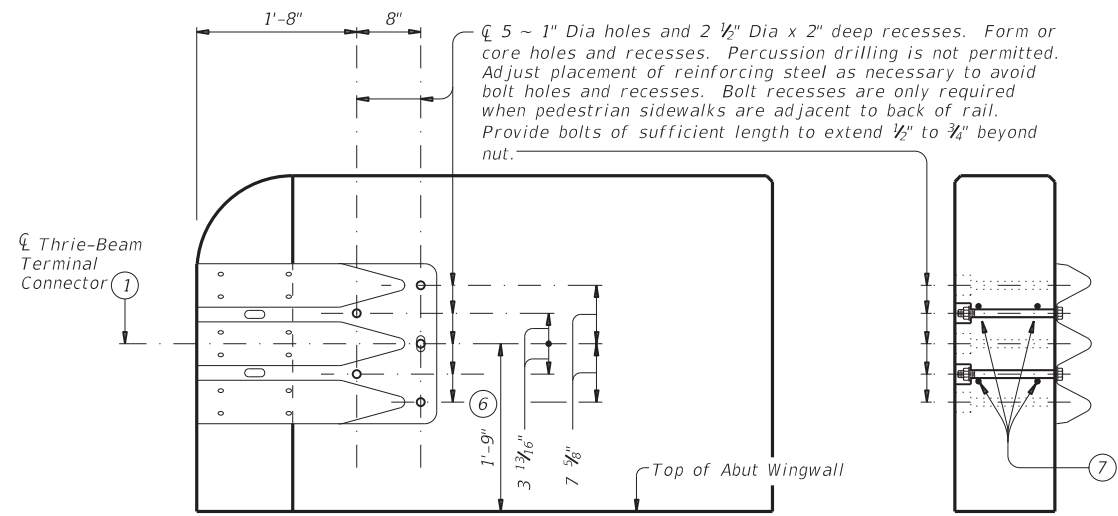
INTERMEDIATE WALL JOINT DETAIL

Provide at all interior bents without slab expansion joints.

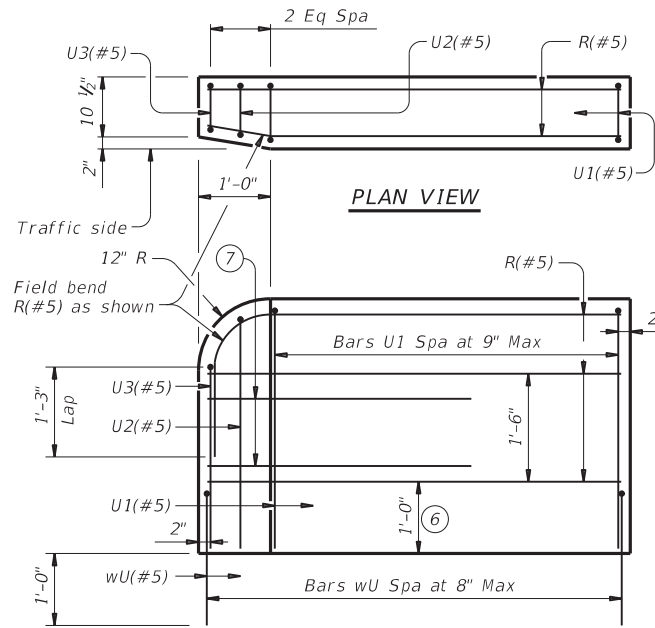


ISOMETRIC VIEW AT END OF BRIDGE

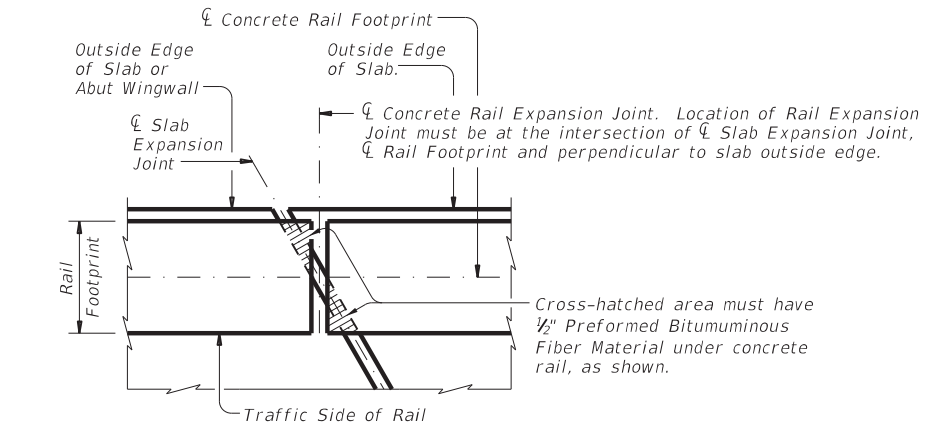
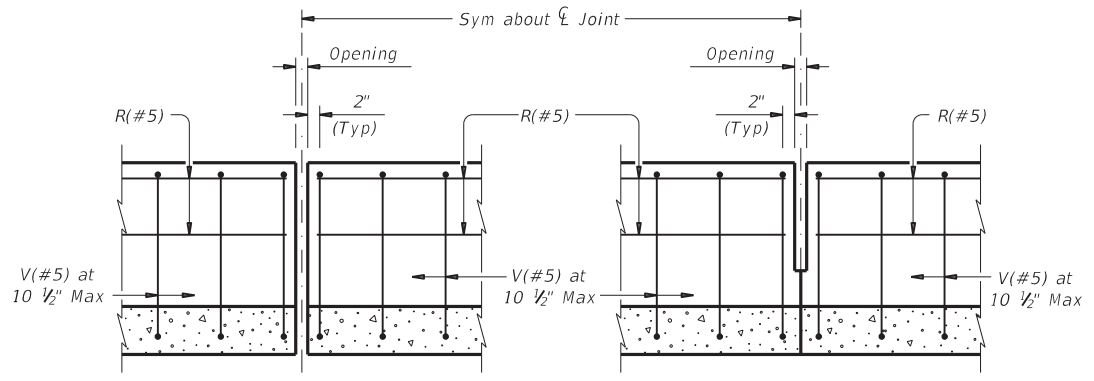
(Rail Member showing Elliptical Tube Option, Rectangular Tube Option similar).



TERMINAL CONNECTION DETAILS



ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

- ① Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
- ② Rail member sections must have at least two posts but not more than four.
- ③ One shop splice per rail member section is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.
- ④ Exp Jt or Splice Jt as required.
- ⑤ Unless directed otherwise by the Engineer, the Fabricator may use the rectangular tube in lieu of the elliptical tube for the rail member.
- ⑥ Increase 2" for structures with overlay.
- ⑦ Place 4 additional Bars R(#5) 3'-8" in length inside Bars U(#5) and centered 2'-0" from end of rail when Terminal Connections are required. Field bend as needed.

SHEET 1 OF 3

		Bridge Division Standard	
--	--	---------------------------------	--

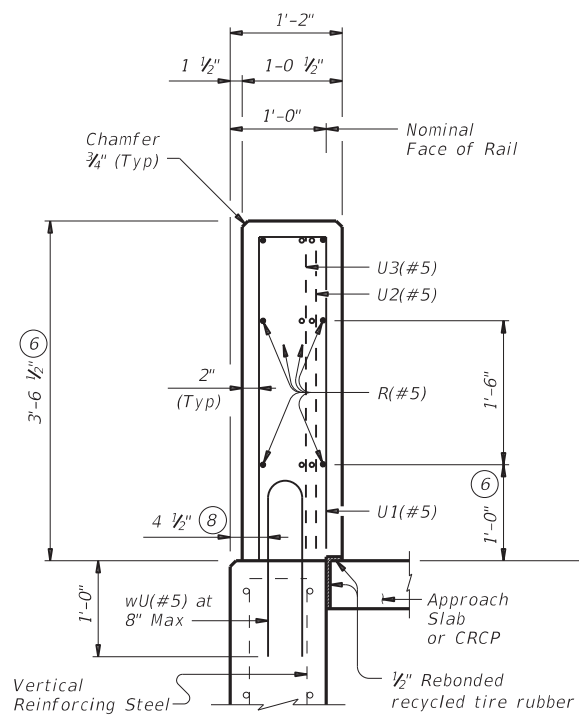
TRAFFIC RAIL

TYPE T402

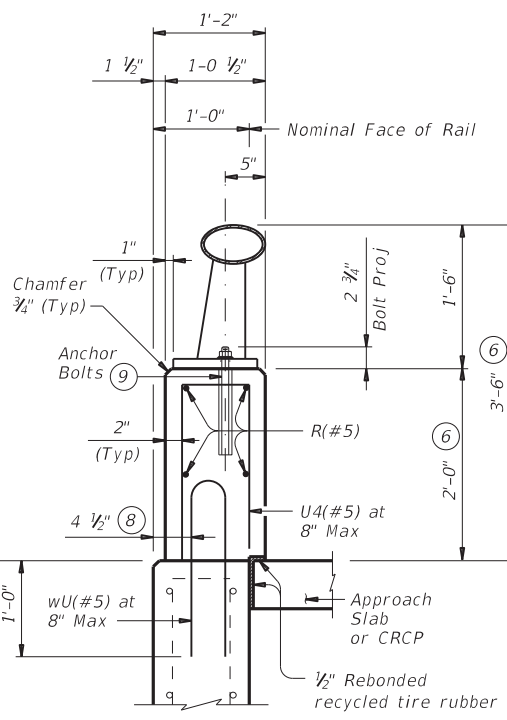
FILE: r1std007-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
DIST	COUNTY		SHEET NO.	
SAT	BEXAR		302	

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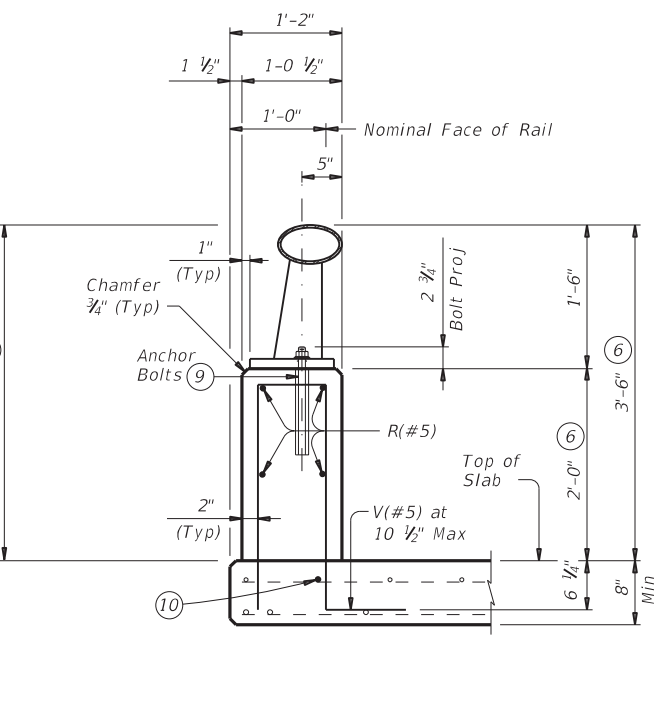
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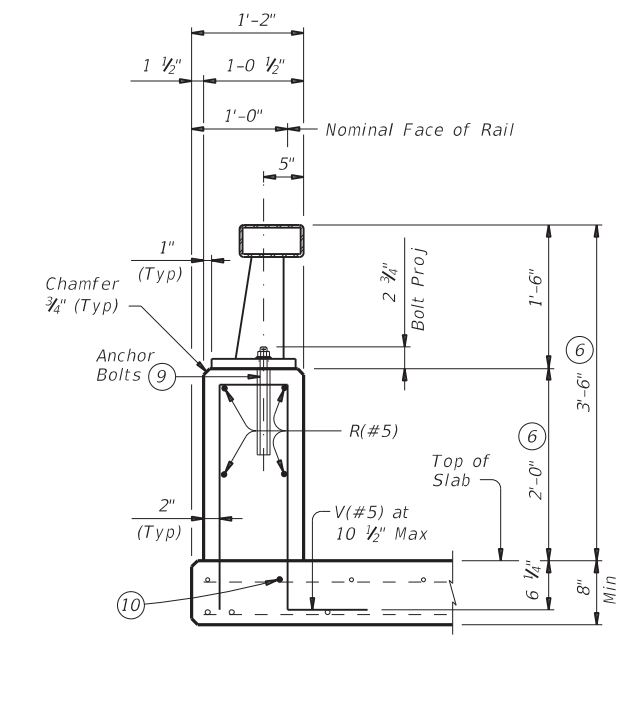
ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



ON CIP RETAINING WALLS (Showing Elliptical Tube Option)

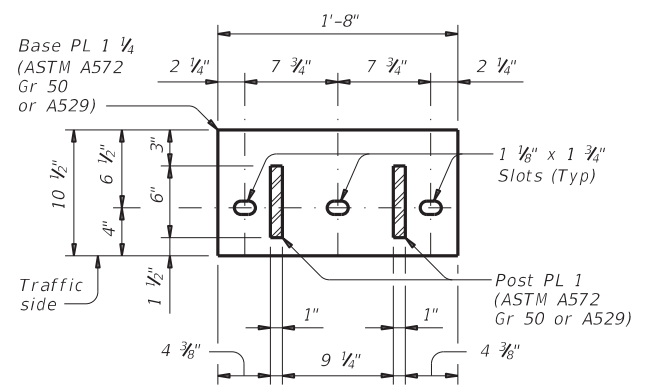


ON BRIDGE SLAB (Showing Elliptical Tube Option)

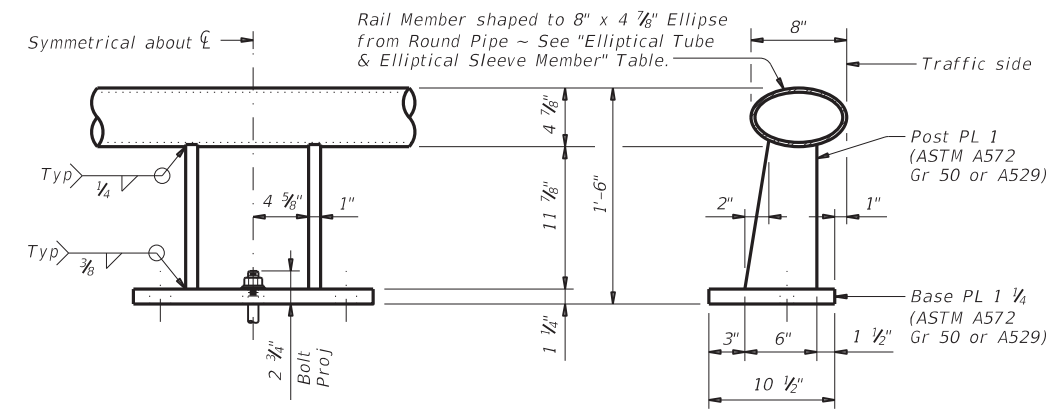


ON BRIDGE SLAB (Showing Rectangular Tube Option)

SECTIONS THRU RAIL ⑤



SECTION THRU POST

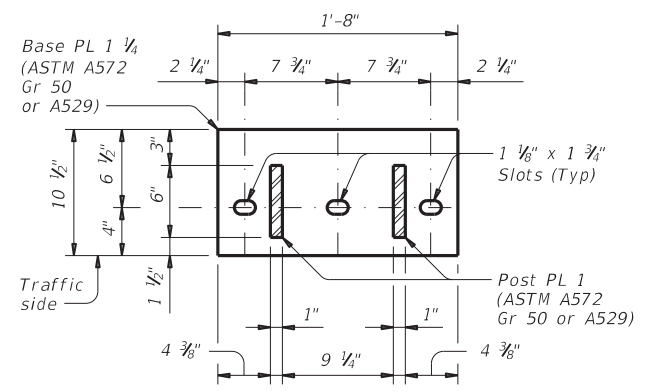


ELEVATION

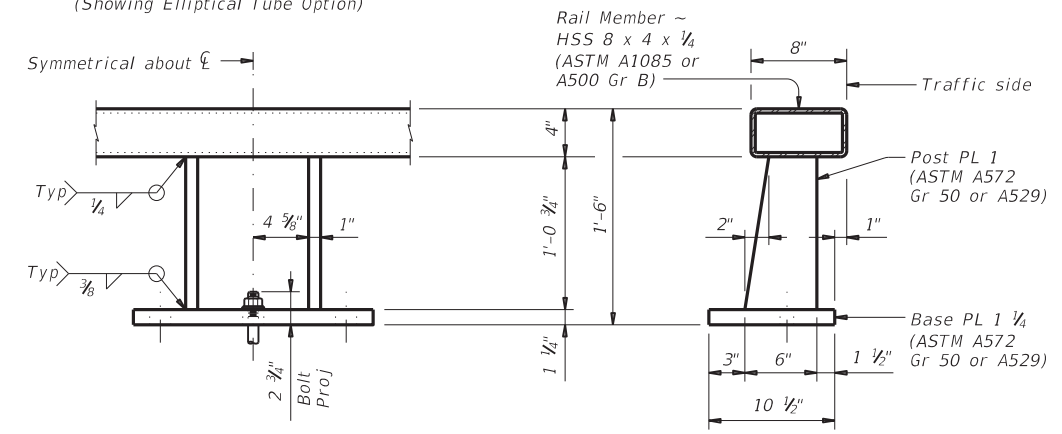
SECTION THRU RAIL

ELLIPTICAL TUBE WITH RAIL POST & ANCHORAGE DETAILS

(Showing Elliptical Tube Option)



SECTION THRU POST



ELEVATION

SECTION THRU RAIL

RECTANGULAR TUBE WITH RAIL POST & ANCHORAGE DETAILS ⑤

(Showing Rectangular Tube Option)

- ⑤ Unless directed otherwise by the Engineer, the Fabricator may use the rectangular tube in lieu of the elliptical tube for the rail member.
- ⑥ Increase 2" for structures with overlay.
- ⑧ 5 1/4" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.
- ⑨ See "Material Notes" for anchor bolt information.
- ⑩ Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.

TRAFFIC RAIL

TYPE T402

FILE: r1std007-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
DIST	COUNTY	SHEET NO.		
SAT	BEXAR	303		

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DATE: FILE:

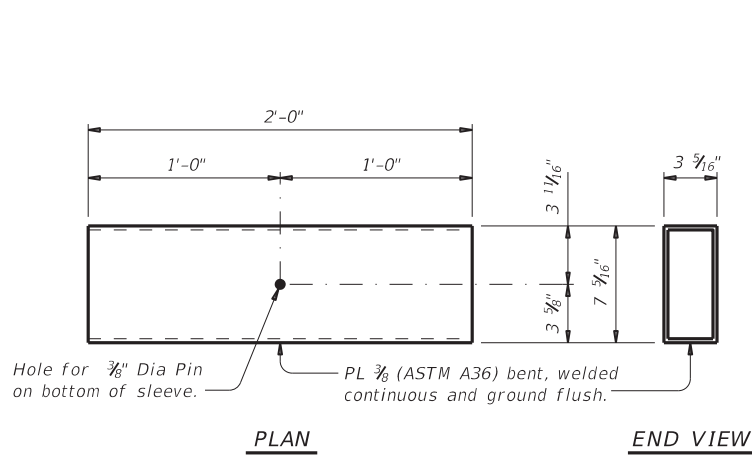
RAIL DATA FOR HORIZONTAL CURVES			
	RADIUS TO FACE OF RAIL	MAX CHORD LENGTH	CONSTRUCT OR FABRICATE
Rail Members	Over 2800'	29'-0"	Straight rail sections
	Over 1400' thru 2800'	14'-6"	To required radius or to chords shown (13)
	Over 700' thru 1400'	7'-3"	To required radius (13)
	Thru 700'	Zero	To required radius (13)

CONSTRUCTION NOTES:
 This rail may be slipformed if approved by the Engineer when adhesive anchor bolts are used. At the Contractor's option anchor bolts may be cast with the parapet (See Cast-in-Place Anchor Bolt Options).
 Slipforming parapet is not allowed if anchor bolts are cast with parapet wall.
 If rail is slipformed, apply an heavy epoxy bead 1" behind toe of traffic side of rail to concrete deck just prior to slip forming. Provide a 3/8" width x 1/4" tall heavy epoxy bead with Type III, Class C or a Type V epoxy.
 Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.
 Rail parapet must be plumb unless otherwise approved. Steel posts must be square to the top of parapet. Use Type VIII epoxy mortar under post base plates if gaps larger than 1/16" exist.
 Cap all ends of tubular steel sections at parapet.
 Rail member sections must have at least two posts but not more than four.
 Round or chamfer all exposed edges of steel components 1/16" by grinding prior to galvanizing. Chamfer all exposed concrete corners.

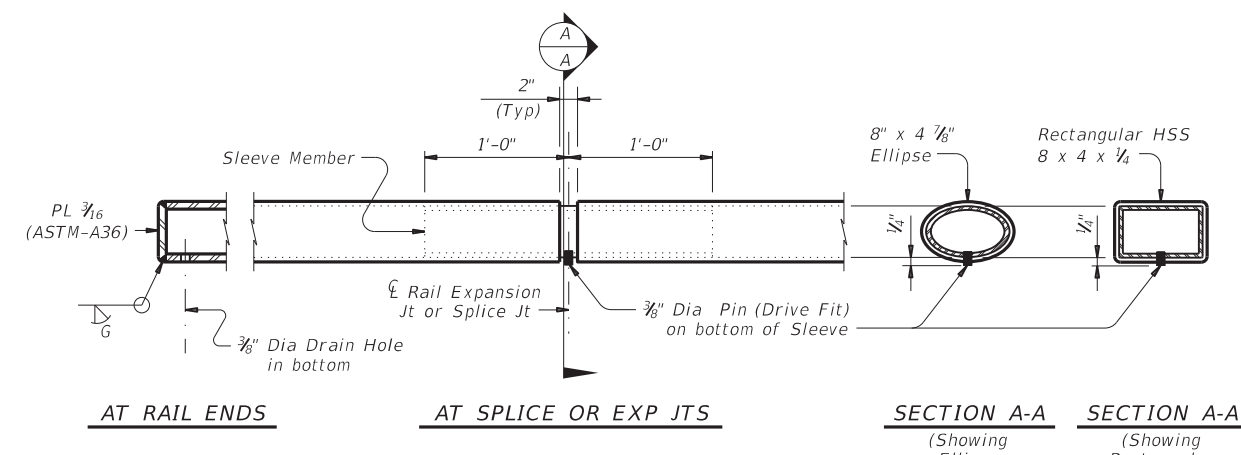
MATERIAL NOTES:
 Galvanize all metal components of steel rail system. Apply additional coatings when shown elsewhere on the plans. When plans require paint over galvanizing, follow the requirements for painting galvanized steel in Item 445, "Galvanizing" and when field painting, Item 446, "Field Cleaning and Painting Steel". Sleeve members and anchor bolts must receive galvanization prior to installation and only field paint after installation unless directed otherwise by Engineer.
 Anchor bolts must be 1/2" Dia ASTM A193 Gr B7 fully threaded rods with heavy hex nuts, one hardened steel washer (ASTM F436), and one (2 1/4" O.D.) steel washer each. Nuts must conform to ASTM A563 requirements. Embed fully threaded rods into parapet wall with a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 8". Anchor adhesive chosen must be able to achieve a nominal bond strength in tension of a single anchor, Na, of 17 kips (edge distance must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".
 Optional cast-in-place anchor bolts must be 3/8" Dia ASTM F3125 Gr A325 or A449 bolts (or A193 Gr B7 or F1554 Gr 105 threaded rods with one tack welded heavy hex nut each) with one heavy hex nut and one hardened steel washer (ASTM F436) plus one (2 1/4" O.D.) steel washer at each bolt. Nuts must conform to ASTM A563 requirements.
 Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.
 Provide Grade 60 reinforcing steel.
 Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.
 Deformed Welded Wire Reinforcement (WWR) ASTM A1064 may be substituted for Bars R, and V, as shown. Provide the same laps as required for reinforcing bars.
 Provide bar laps, where required, as follows:
 Uncoated or galvanized ~ #5 = 2'-0"
 Epoxy coated ~ #5 = 3'-0"

GENERAL NOTES:
 This rail has been evaluated and approved to be of equal strength to railing with like geometry, which have been crash tested to meet MASH TL-4 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.
 Do not use this railing on bridges with expansion joints providing more than 5" movement.
 Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.
 Submit erection drawings showing panel lengths, rail post spacing, and anchor bolt setting, to the Engineer for approval.
 Average weight of railing with no overlay: 343 plf total
 313 plf (Conc)
 30 plf (Steel).

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.



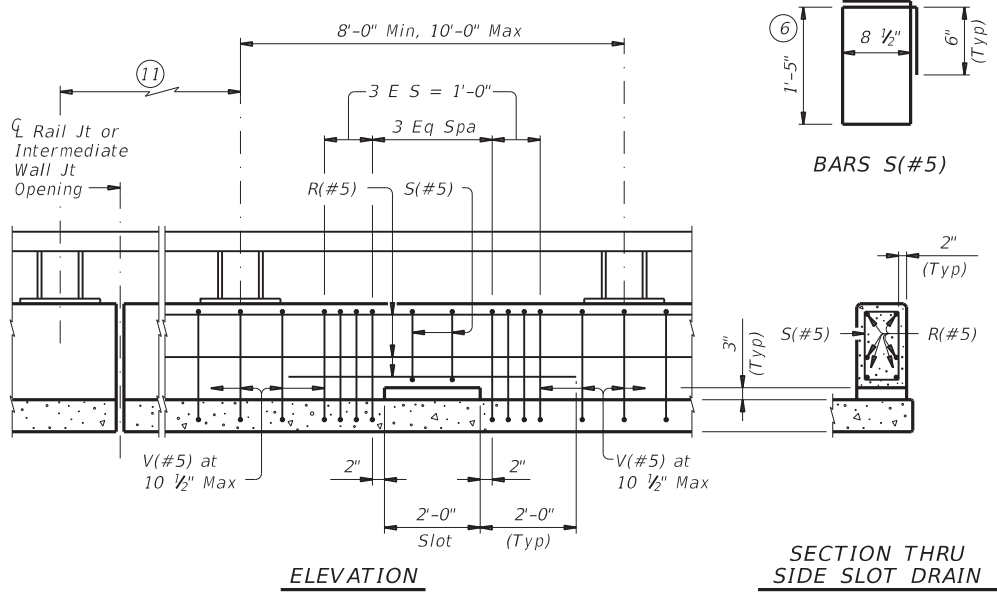
RECTANGULAR TUBE SLEEVE MEMBER DETAIL
 (See Tube Fabrication Detail)



TUBE FABRICATION DETAILS (5)

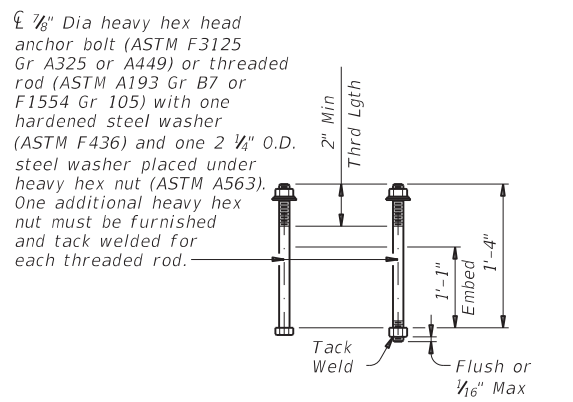
ELLIPTICAL TUBE & ELLIPTICAL SLEEVE MEMBER		
8" x 4 7/8" Ellipse	Elliptical Sleeve Member	
Material	Material	Thickness
6" Dia Std Pipe ASTM A53 E or S Gr B)	ASTM A53 Gr B	0.353"
	ASTM A36 or A500 Gr B	0.339"
	API-5LX52	0.224"
6 3/8" O.D. Pipe x 0.188" API-5LX52	ASTM A53 Gr B	0.339"
	ASTM A36 or A500 Gr B	0.325"
	API-5LX52	0.188"

Notes: Other sections of equal or greater strength are acceptable for elliptical sleeves. The major and minor diameters of the rail member may vary +/- 0.1875" from plan dimension. However, the difference between the outside diameters of the elliptical sleeve and the inside diameters of the rail member must not exceed 0.25 inches.

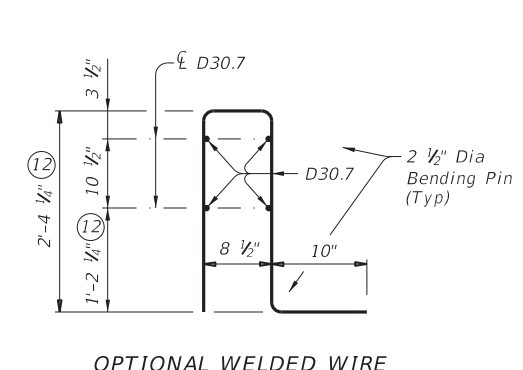
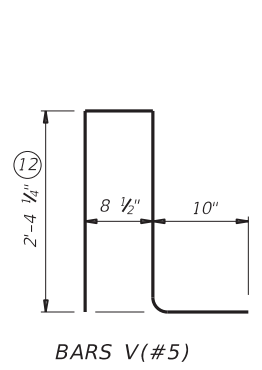
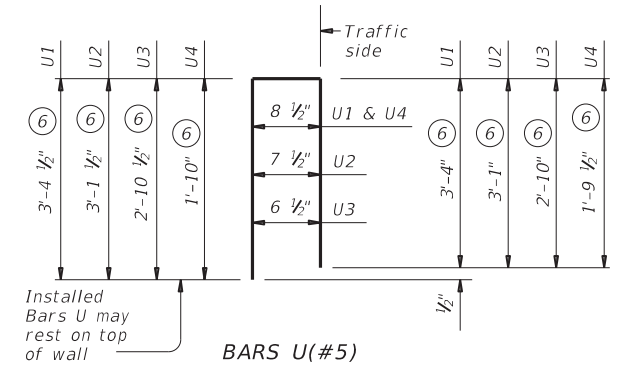


OPTIONAL SIDE SLOT DRAIN DETAILS

Note: Center Side Slot Drains between rail posts within the limits shown. Side Slot Drains may be used where shown elsewhere on the plans or as directed by the Engineer. Do not place drains over railroad tracks, lower roadways, or sidewalks. When this rail is used as a separator between a roadway surface and a sidewalk surface, side drain slots will not be permitted.



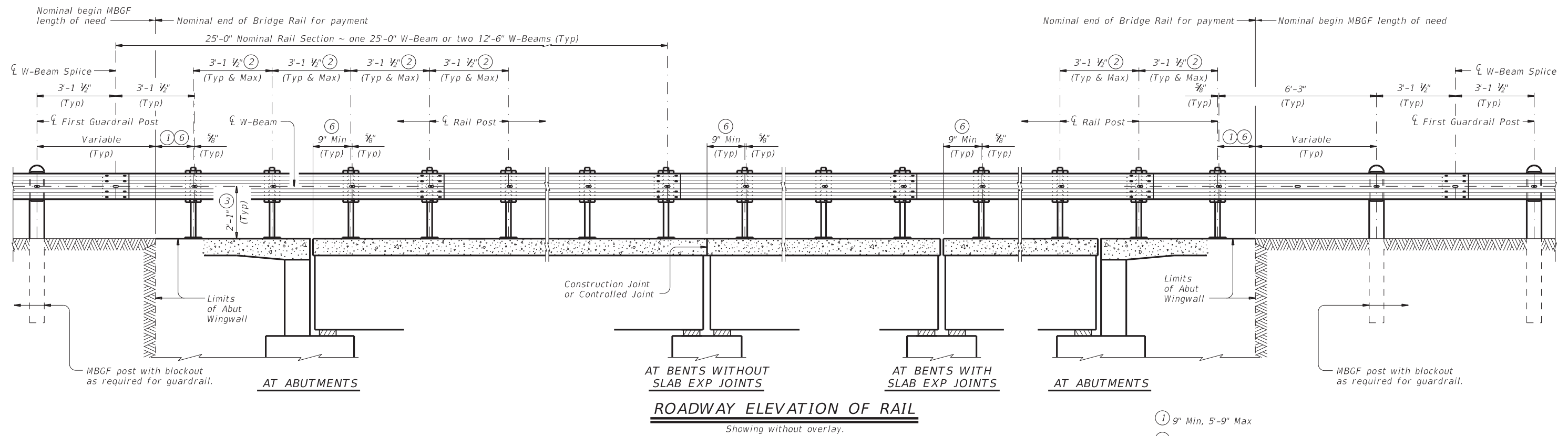
CAST-IN-PLACE ANCHOR BOLT OPTIONS (9)



- (5) Unless directed otherwise by the Engineer, the Fabricator may use the rectangular tube in lieu of the elliptical tube for the rail member.
- (6) Increase 2" for structures with overlay.
- (9) See "Material Notes" for anchor bolt information.
- (11) Slots are not allowed in areas where there is a joint in the concrete parapet between rail post.
- (12) Length shown for 6 1/4" Min bar embedment with no overlay. Adjust as required.
- (13) Shop drawings for approval required for tubular steel sections.

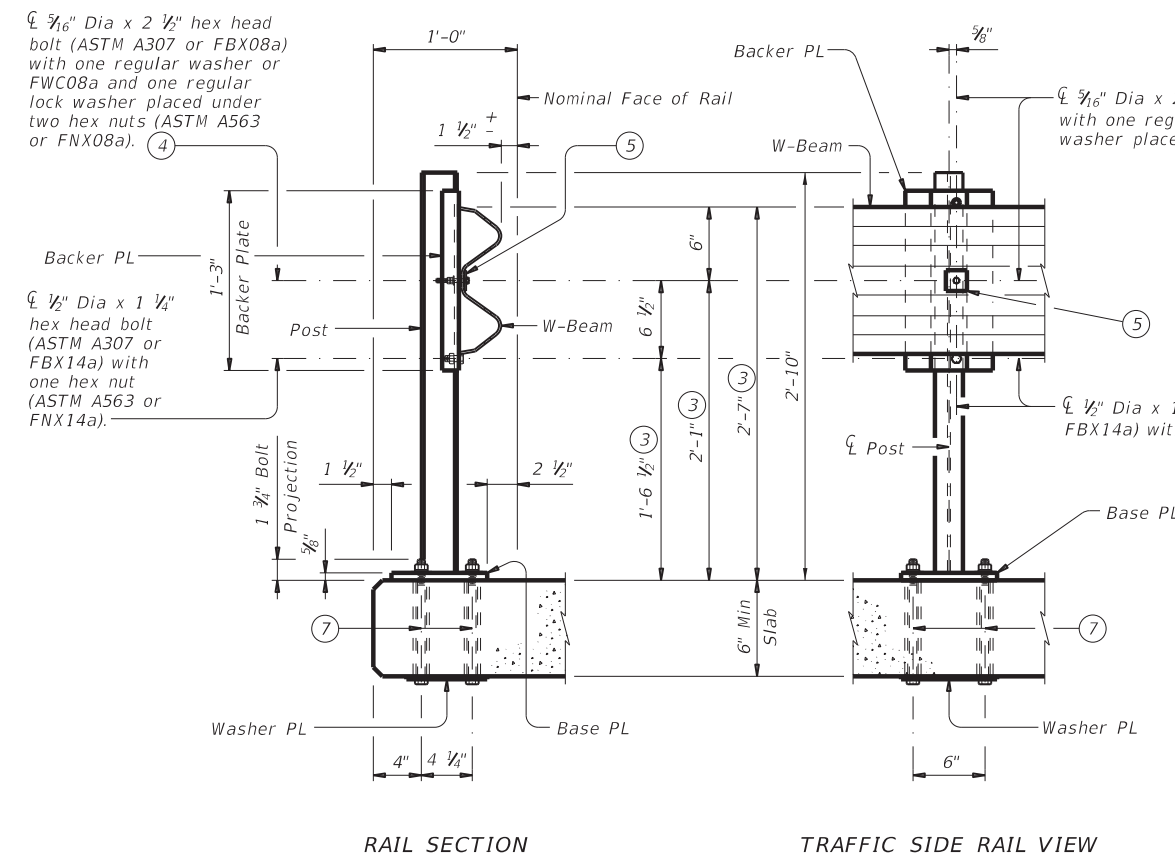
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<h2>TYPE T402</h2>			
FILE: r1std007-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT September 2019	CON: 6372	SECT: 50	JOB: OO1
REVISIONS	SAT	COUNTY: BEXAR	SHEET NO.: 304

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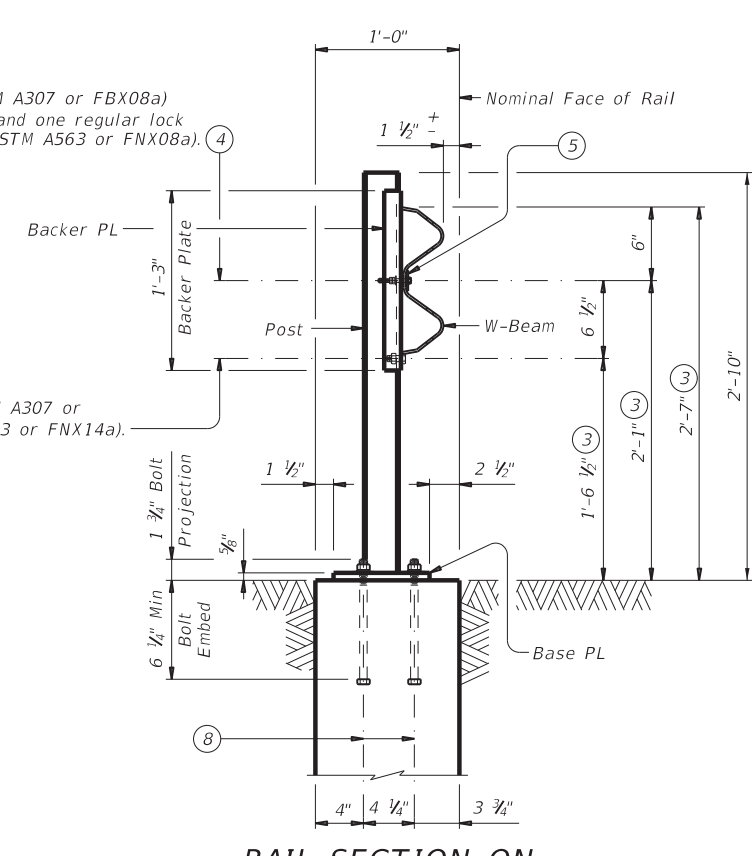


ROADWAY ELEVATION OF RAIL
Showing without overlay.

- ① 9" Min, 5'-9" Max
- ② Maintain 3'-1 1/2" Rail Post spacing wherever possible for use with nominal 25'-0" or 12'-6" W-Beam sections. Symmetry of post spacing on both sides and along the structure is not necessary.
- ③ Increase 2" for structures with overlay.
- ④ Tighten the first hex nut by hand until the top and bottom edges of the W-Beam engage the Backer Plate (Backer Plate should be snug against the post). Then tighten hex nut one revolution with wrench and secure with the second hex nut.
- ⑤ PL 1/8" x 1 3/4" x 1 3/4" with 5/8" Dia Hole centered in PL (ASTM A36). Square Guardrail Washer (FWR01).
- ⑥ The post nearest to a slab joint or end of structure may be shifted up to 9" in order to satisfy the minimum offset dimension. Drill a new 3/4" Dia hole in the centerline of W-beam for shifted post. Paint hole with two coats of zinc-rich paint conforming to the Item "Galvanizing". All other posts must remain on the typical spacing.
- ⑦ 5/8" Dia formed holes for 5/8" Dia heavy hex head anchor bolt (ASTM F3125 Gr A325 or A449) or threaded rod (ATSM A193 Gr B7 or F1554 Gr 105) with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563). One additional heavy hex nut must be furnished and tack welded for each threaded rod. See "Cast-In-Place & Formed Hole Anchor Bolt Options".
- ⑧ 5/8" Dia heavy hex head anchor bolt (ASTM F3125 Gr A325 or A449) or threaded rod (ATSM A193 Gr B7 or F1554 Gr 105) with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563). One additional heavy hex nut must be furnished and tack welded for each threaded rod. See "Cast-In-Place & Formed Hole Anchor Bolt Options".



RAIL SECTION **TRAFFIC SIDE RAIL VIEW**
RAIL DETAILS ON BRIDGE SLAB
Showing without overlay.



RAIL SECTION ON ABUTMENT WINGWALL
Showing without overlay.

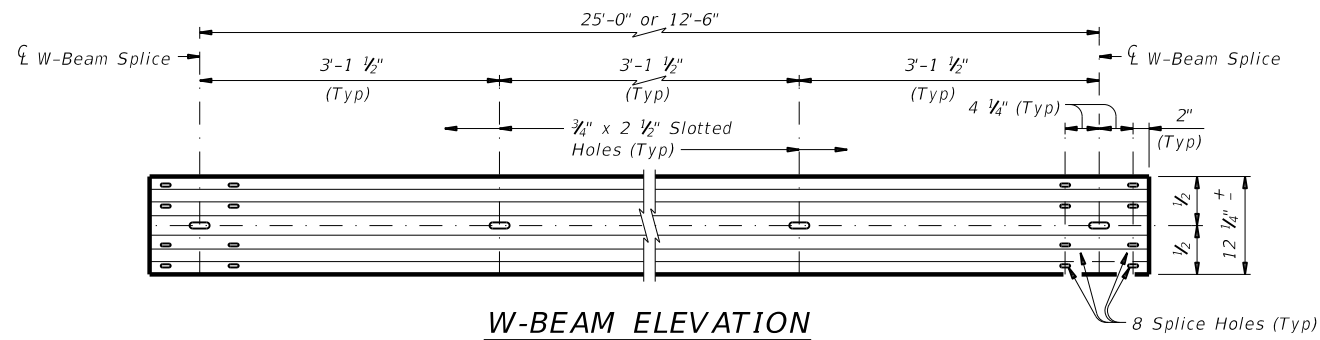
SHEET 1 OF 2

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©TxDOT September 2019	CONTRACT: 6372	SECTION: 50	JOB: 001
REVISIONS			HIGHWAY: VAR.
	DIST: SAT	COUNTY: BEXAR	SHEET NO.: 305

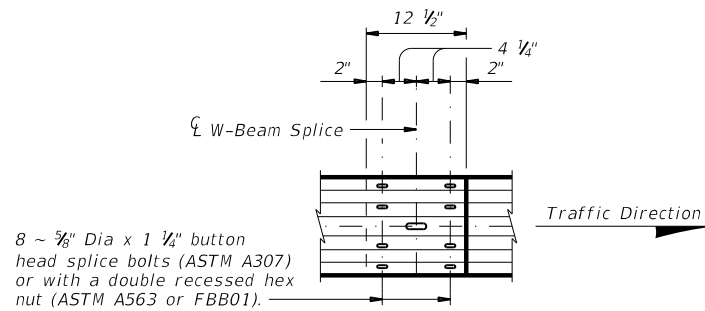
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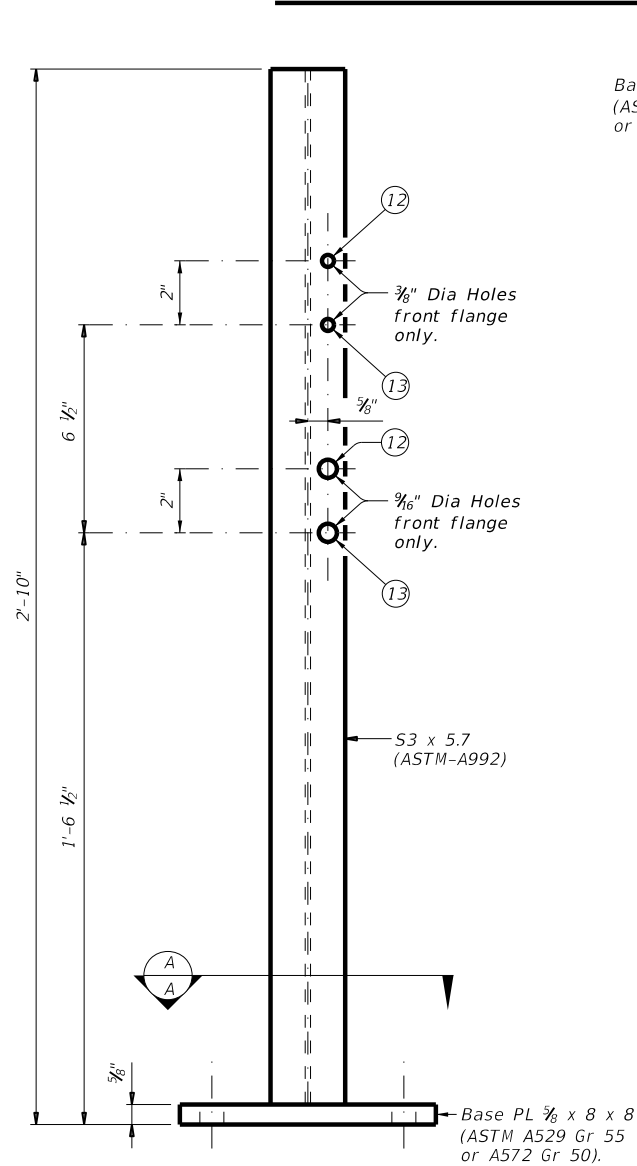
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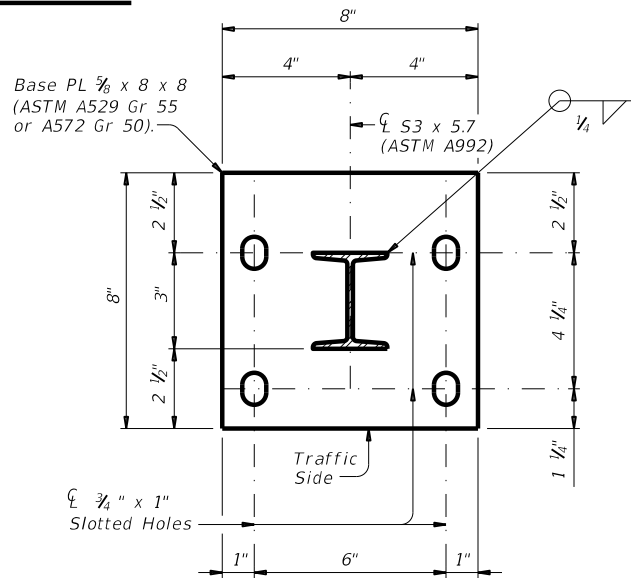
W-BEAM ELEVATION



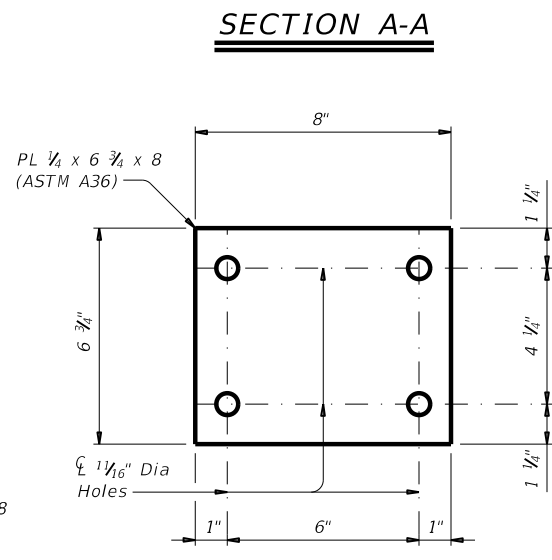
W-BEAM SPLICE ELEVATION



POST ELEVATION

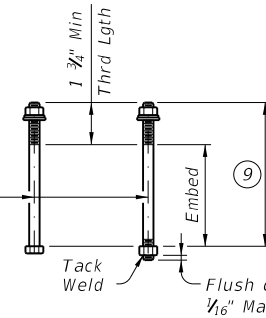


SECTION A-A



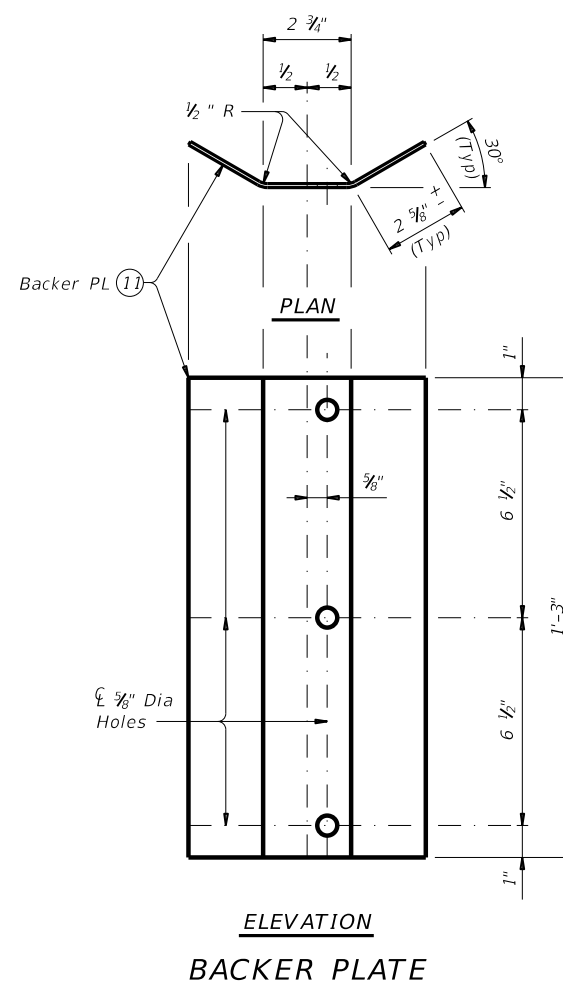
WASHER PLATE DETAIL

3/8" Dia heavy hex head anchor bolt (ASTM F3125 Gr A325 or A449) or threaded rod (ASTM A193 Gr B7 or F1554 Gr 105) with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563). One additional heavy hex nut must be furnished and tack welded for each threaded rod.



CAST-IN-PLACE & FORMED HOLE ANCHOR BOLT OPTIONS ⑨

- ⑨ See "Rail Details On Bridge Slab" and/or "Rail Section On Abutment Wingwall".
- ⑩ See "Material Notes" for anchor bolt information.
- ⑪ Backer PL 1/2" x 8 x 1'-3" (ASTM A1011 CS or SS Gr 33, or A1008 CS or SS Gr 33 (11 Gage acceptable)).
- ⑫ Used for structures with overlay.
- ⑬ Used for structures without overlay.



ELEVATION

BACKER PLATE

MBGF AND END TREATMENT NOTES:

This traffic railing must be anchored by metal beam guard fence (MBGF) and guard fence end treatments. Determine MBGF length of need in accordance with the Roadway Design Manual, unless otherwise specified. The minimum MBGF length of need required for anchoring the railing is 25' of MBGF plus the appropriate end treatment.

CONSTRUCTION NOTES:

Face of rail post must be plumb unless otherwise approved by the Engineer. Post must be perpendicular to adjacent roadway grade. Use epoxy mortar under post base plates if gaps larger than 1/16" exist.

Fully anchored guardrail must be attached to each end of rail. A metal beam guard fence transition is not used with this rail.

At the Contractor's option anchor bolts may be an adhesive anchor system. See "Material Notes".

Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.

It is recommended to show a Rail Layout with rail posts and W-beam splices. Fabricator must submit erection drawings to the Engineer for approval.

Round or chamfer exposed edges of rail post and backer plate to approximately 1/16" by grinding.

Shop drawings are not required for this rail.

MATERIAL NOTES:

Galvanize all steel components.

Anchor bolts for base plate must be 3/8" Dia ASTM F3125 Gr A325 or A449 bolts (or ASTM A193 Gr B7 or F1554 Gr 105 threaded rods with one tack welded heavy hex nut each) with one hardened steel washer (ASTM F436) and one regular lock washer placed under each heavy hex nut. Nuts must conform to ASTM A563 requirements.

Optional adhesive anchorage system must be 3/8" Dia ASTM A193 Gr B7 or F1554 Gr 105 fully threaded rods with one hardened steel washer (ASTM F436) and one regular lock washer placed under each heavy hex nut. Nuts must conform to ASTM A563 requirements. Embed fully threaded rod into slab and/or abutment wingwall using a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 4 3/4". Anchor adhesive chosen must be able to achieve a nominal bond strength in tension of a single anchor, Na, of 8 kips (edge distance must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing."

W-beam must 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" (Nominal) lengths. W-Beam must have slotted holes at 3'-1 1/2".

Some part numbers from the "Task Force 13" Guide to Standardized Highway Barrier Hardware have been furnished for quick reference.

GENERAL NOTES:

This railing has been successfully evaluated by full-scale crash test to meet MASH TL-3 criteria. This railing can be used for speeds of 50 mph and greater.

This rail is designed to deflect approximately 4' to 4'-6" as it contains and redirects the errant vehicle. This rail may not be installed on top of or behind curbs that project above finished grade, on bridges with expansion joints providing more than 5" movement, on retaining walls, or on grade separations and interchanges.

Repairs to impact-damaged post and base plate unit are not permitted. Replace all impact-damaged posts with a new post and base plate unit.

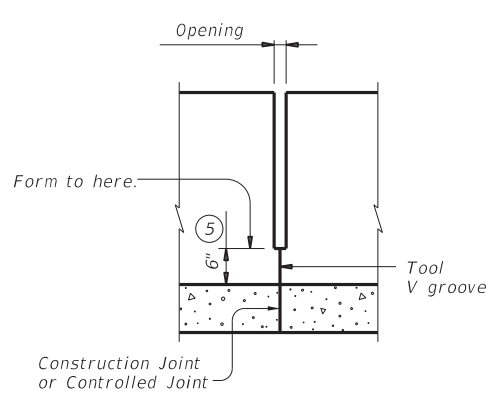
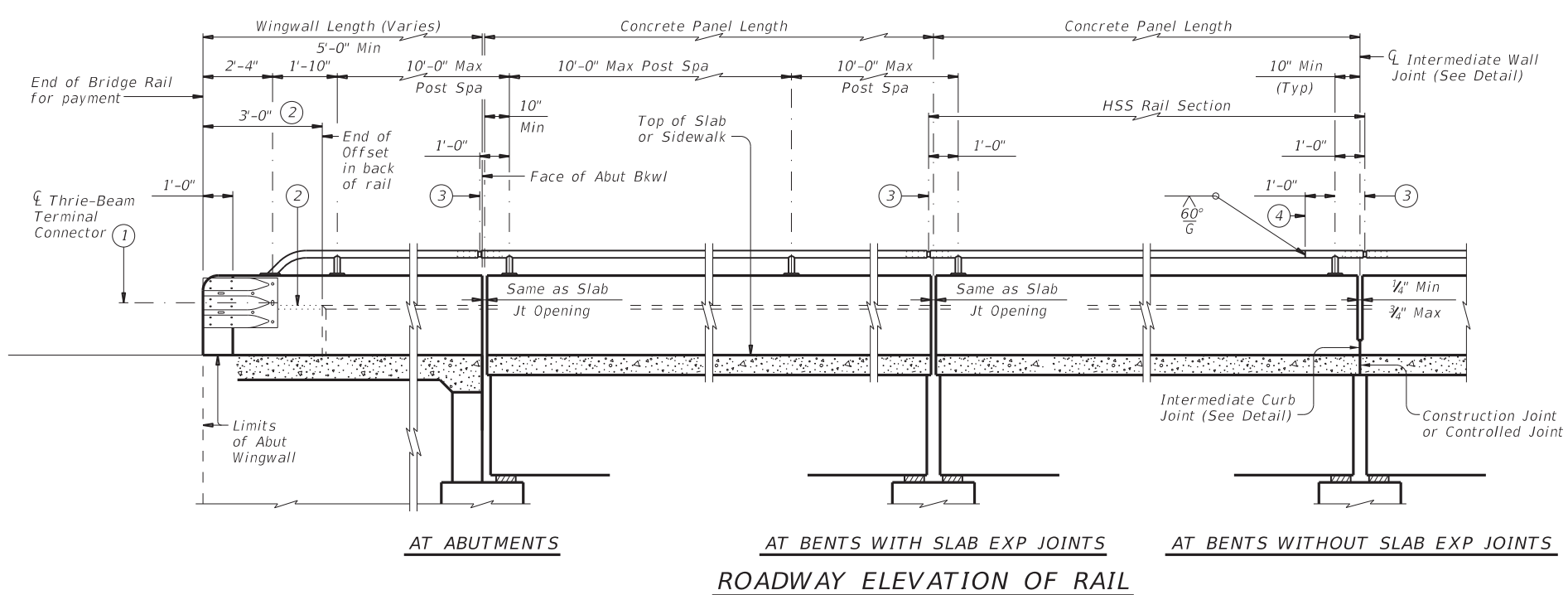
Average weight of railing with no overlay: 20 plf total.

SHEET 2 OF 2

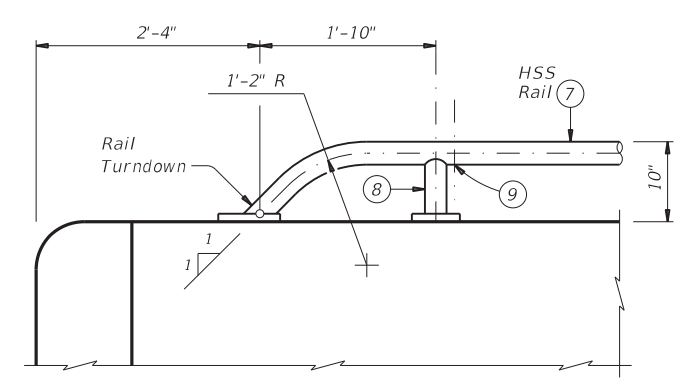
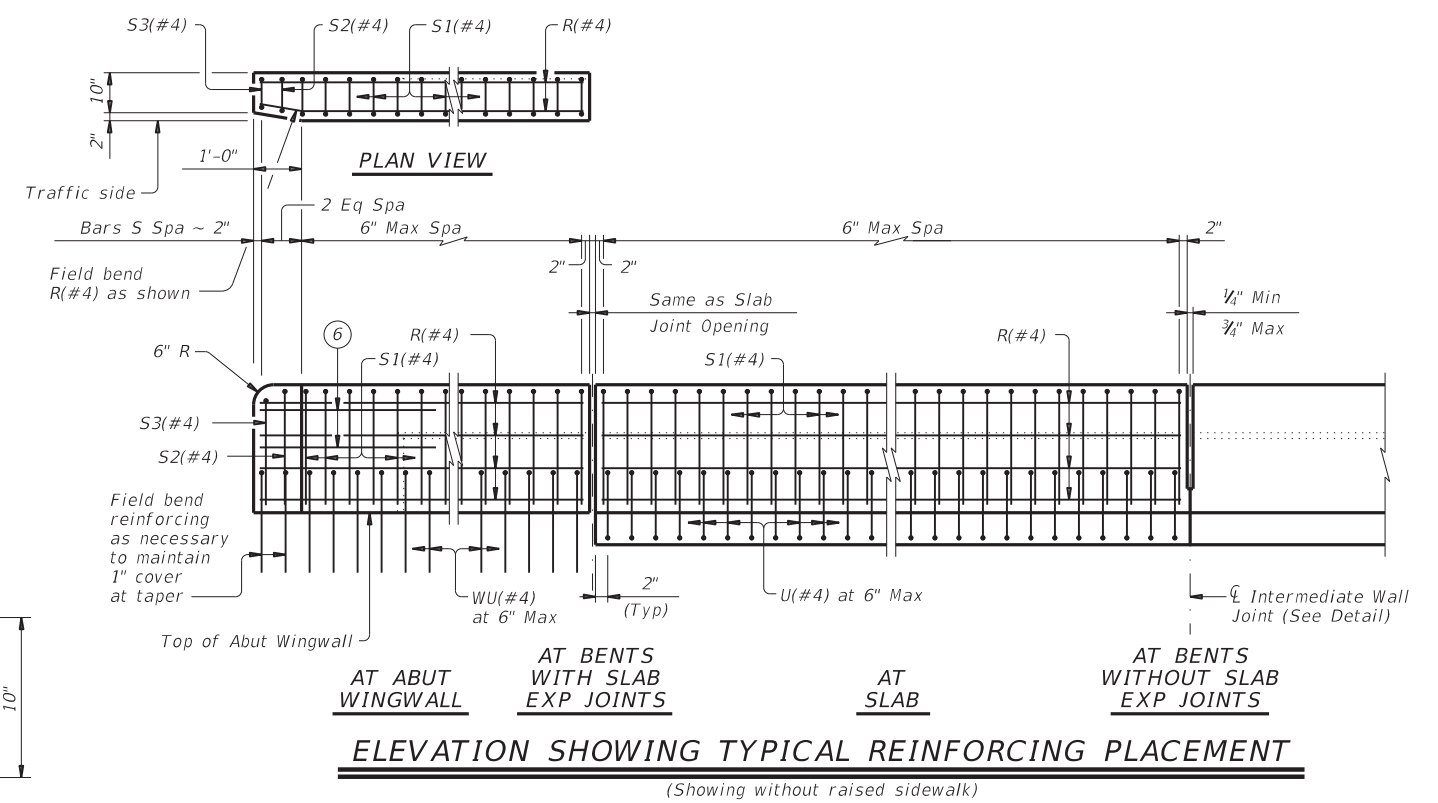
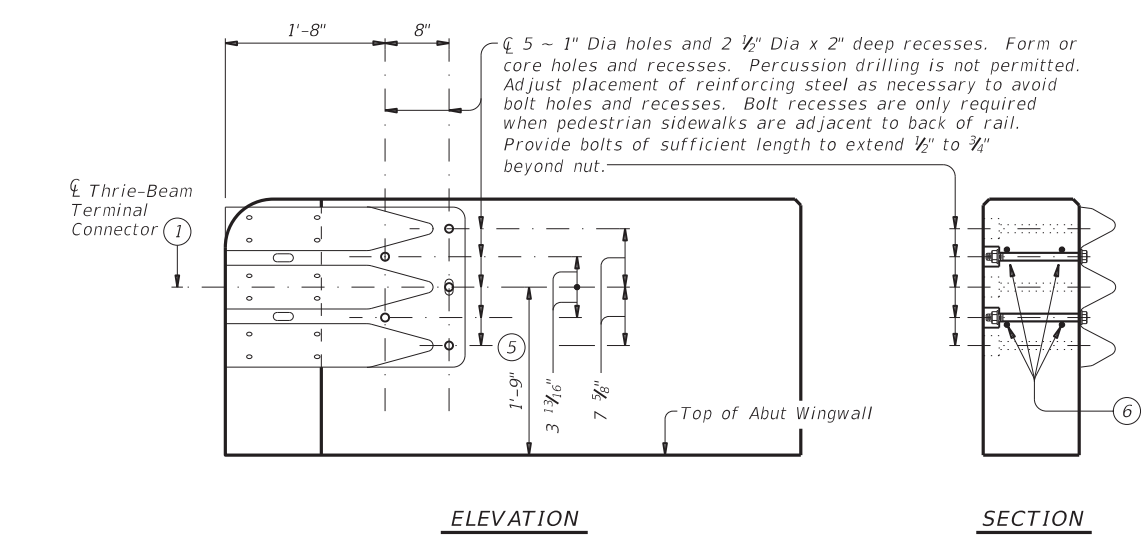
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<h2>TYPE T631</h2>			
FILE: r1std038-19.dgn	DN: TxDOT	CK: AES	DW: JTR
©TxDOT September 2019	CONV	SECT	JOB
REVISIONS	6372	50	001
DIST	COUNTY	SHEET NO.	
SAT	BEXAR	306	

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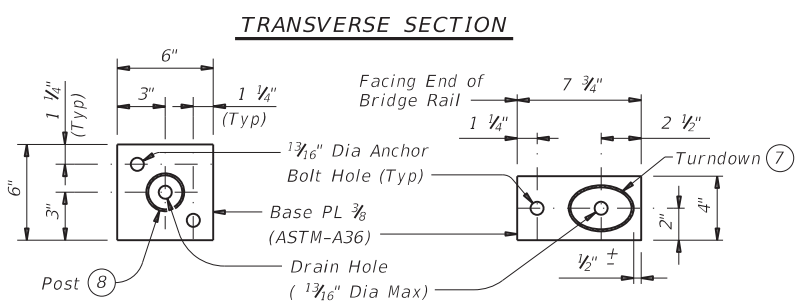
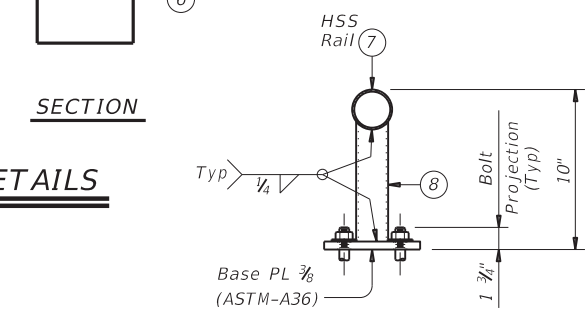
DATE: FILE:



- 1 Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
- 2 Back of rail offset may, with Engineer's approval, be continued to the end of the railing.
- 3 Exp Joint or Splice Joint as required.
- 4 One shop splice per HSS rail section is permitted with minimum 85 percent penetration. The weld may be square groove, or single vee groove. Grind smooth.
- 5 Increase 2" for structures with overlay.
- 6 Place 4 additional Bars R(#4) 3'-8" in length inside Bars S(#4) and centered 2'-0" from end of rail when Terminal Connections are required. Field bend as needed.
- 7 HSS 2.875 x 0.203
- 8 HSS 2.375 x 0.154
- 9 5/8" Dia Hole in bottom of HSS rail (Minimum 1 hole between posts ~ Typ)



Note that at least two anchor points (as shown) are required for the Bridge Rail on the Abutment Wingwall. Longer Wingwalls may require more than two Rail anchorages.

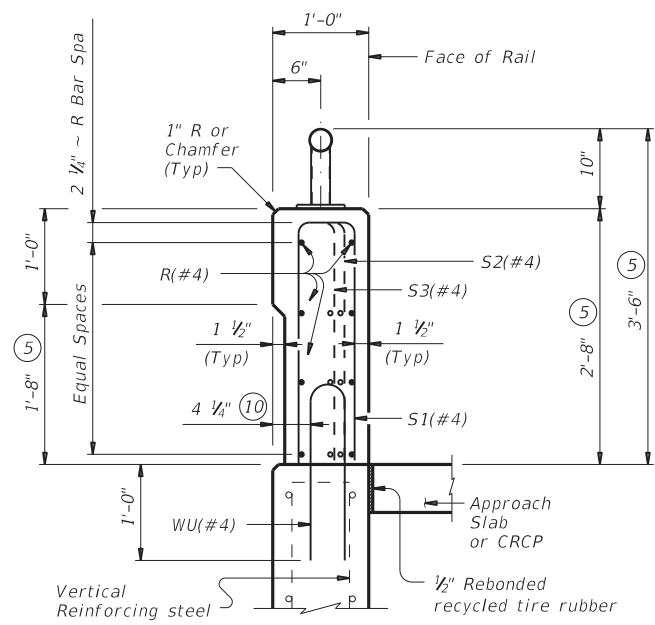


HSS RAIL DETAILS

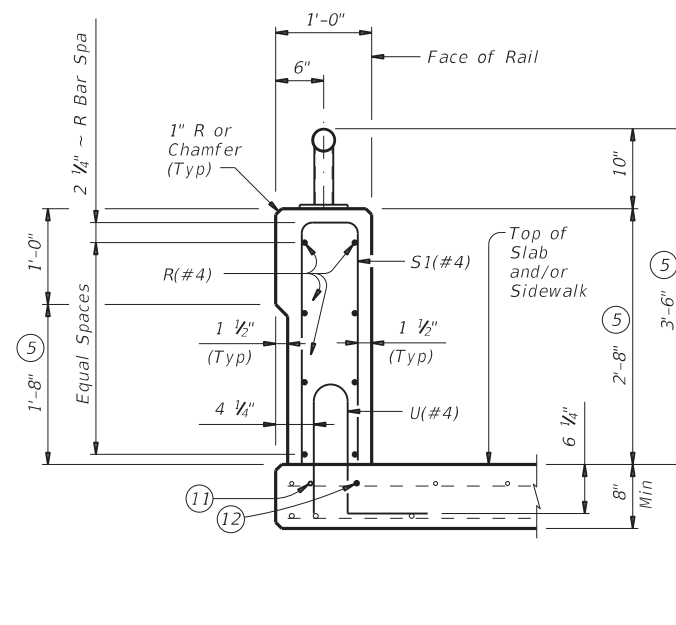
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©TxDOT September 2019	CONV: 6372	SECT: 50	JOB: 001
REVISIONS	SAT		COUNTY: BEXAR
			SHEET NO. 307

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DATE:
FILE:

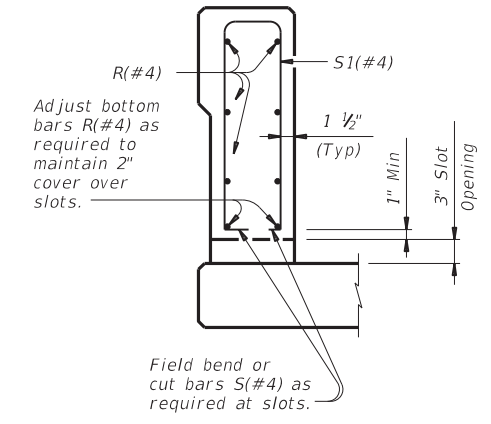


ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS

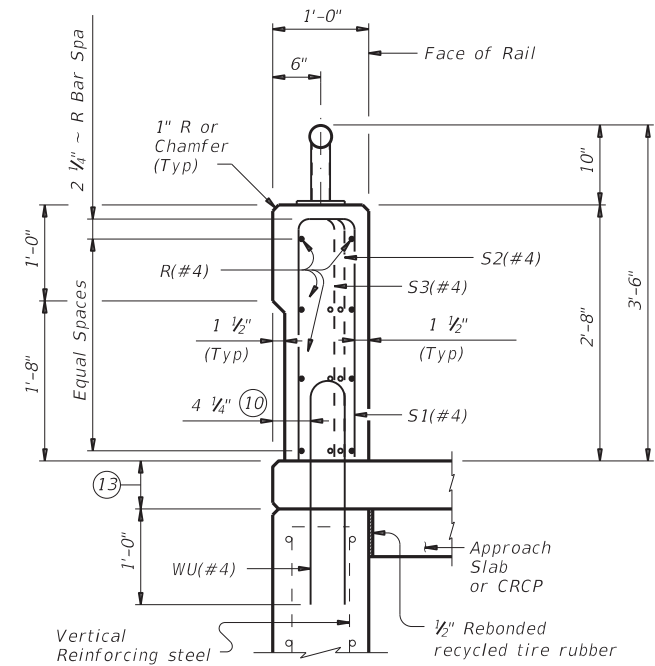


ON BRIDGE SLAB

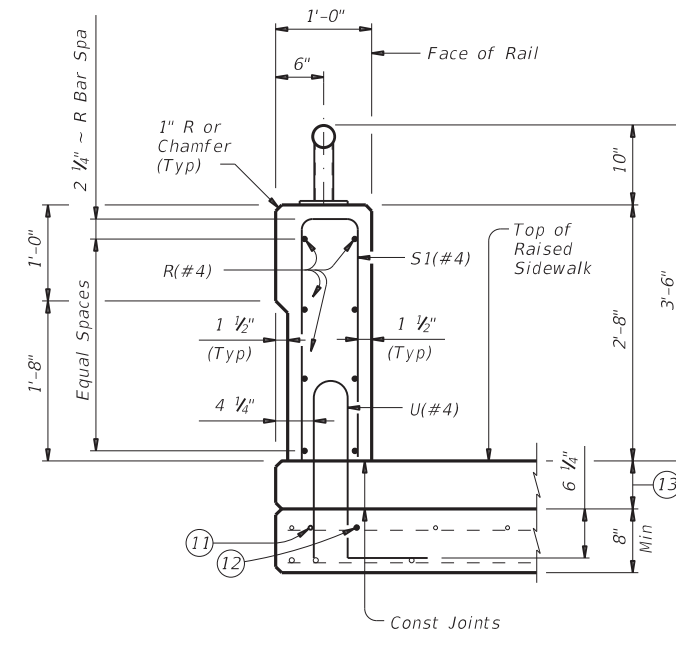
SECTIONS THRU RAIL WITHOUT RAISED SIDEWALK



SECTION THRU
OPTIONAL SIDE SLOT DRAIN

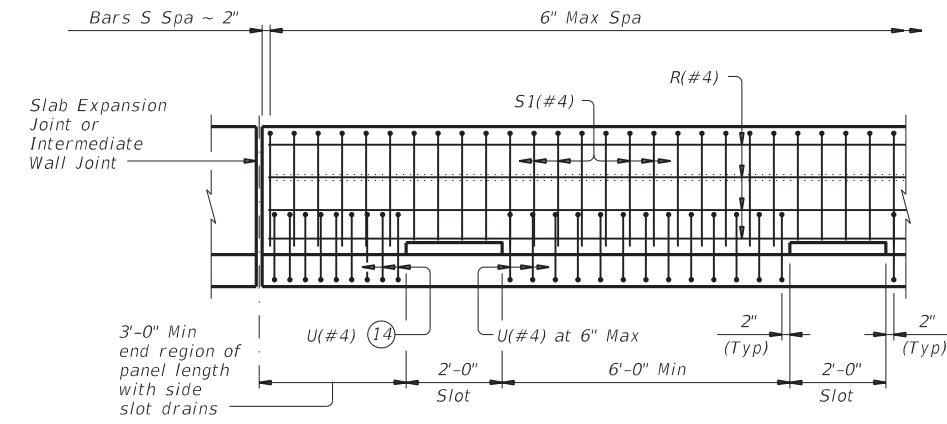


ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS



ON BRIDGE SLAB

SECTIONS THRU RAIL WITH RAISED SIDEWALK



OPTIONAL SIDE SLOT DRAIN DETAIL

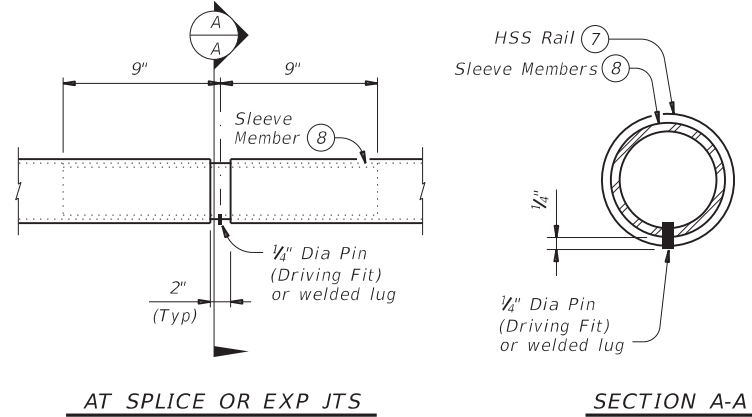
Note: Side Slot Drains may be used where shown elsewhere on the plans or as directed by the Engineer. Drains should not be placed over railroad tracks, lower roadways, or sidewalks. When this rail is used as a separator between a roadway surface and a sidewalk surface, side drain slots will not be permitted.

- ⑤ Increase 2" for structures with overlay.
- ⑩ 5 1/4" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.
- ⑪ As an aid in supporting reinforcement, additional longitudinal bars may be used in the slab with the approval of the Engineer. Such bars must be furnished at the Contractors expense.
- ⑫ Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.
- ⑬ Raised Sidewalk
- ⑭ Space U(#4) bars at 4" Max when end region of panel length is less than 6'-0" to side slot drain. Space U(#4) bars at 6" Max when end region of panel length is 6'-0" and greater to side slot drain.

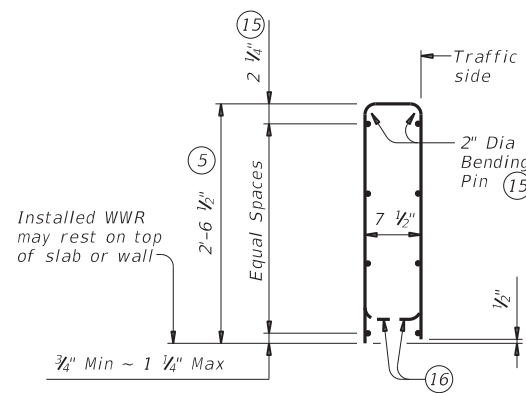
		Bridge Division Standard	
<h2>COMBINATION RAIL</h2>			
<h3>TYPE C221</h3>			
FILE: r1std018-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT September 2019	CONT SECT	JOB	HIGHWAY
REVISIONS	6372 50	001	VAR.
DIST	COUNTY	SHEET NO.	
SAT	BEXAR	308	

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RAIL DATA FOR HORIZONTAL CURVES			
	RADIUS TO FACE OF RAIL	MAX CHORD LENGTH	CONSTRUCT OR FABRICATE
HSS Rail	Over 2800'	29'-0"	Straight rail panels
	Over 1400' thru 2800'	14'-6"	To required radius or to chords shown
	Over 700' thru 1400'	7'-3"	
	Thru 700'	Zero	To required radius



PIPE SPLICE DETAILS



DESCRIPTION	LONGITUDINAL WIRES	VERTICAL WIRES
Minimum (Cumulative Total) Wire Area	1.067 Sq In.	0.267 Sq In. per Ft
Minimum Maximum	No. of Wires 8 10	Spacing 4" 8"
	Maximum Wire Size Differential	The smaller wire must have an area of 40% or more of the larger wire.

CONSTRUCTION NOTES:

This railing may be constructed by the slipform process when approved by the Engineer, with equipment approved by the Engineer and when adhesive anchor bolts are used. Slipforming parapet is not allowed if anchor bolts are cast with parapet wall. Provide sensor control for both line and grade. Tack welding to provide bracing for slipform operations is acceptable. Welding may be performed at a minimum spacing of 3 ft between the cage and the anchorage. It is permissible to weld to bars U, WU and S at any location on the cage. If increased bracing is needed, provide additional anchorage devices and weld in the upper two thirds of the cage. Paint welded areas on epoxy coated and/or galvanized reinforcing with an organic zinc rich paint in accordance with Item 445 "Galvanizing".

If rail is slipformed, apply an heavy epoxy bead 1" behind toe of traffic side of rail to concrete deck just prior to slip forming. Provide a 3/8" width x 1/4" tall heavy epoxy bead with Type III, Class C or a Type V epoxy.

Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.

At the Contractor's option anchor bolts may be cast with the parapet. See "Material Notes".

Face of rail, parapet must be plumb unless otherwise approved by the Engineer. HSS rail posts must be square to the top of parapet. Use epoxy mortar under post base plates if gaps larger than 1/16" exist.

Round or chamfer exposed edges of HSS rail and HSS rail posts to approximately 1/16" by grinding.

HSS rail sections must not include less than two posts, and no more than four (except at Abutments).

Chamfer all parapet exposed corners.

MATERIAL NOTES:

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere. Provide Grade 60 reinforcing steel.

Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized. Provide ASTM A1085 or A500 Gr B or A53 Gr B for all HSS.

Galvanize all metal components of steel rail system. Apply additional coatings when shown elsewhere on the plans. When plans require paint over galvanizing, follow the requirements for painting galvanized steel in Item 445, "Galvanizing" and when field painting, Item 446, "Field Cleaning and Painting Steel". Sleeve members and anchor bolts must receive galvanization prior to installation and only field paint after installation unless directed otherwise by Engineer.

Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U and WU unless noted otherwise. Deformed WWR (ASTM 1064) may be substituted for Bars R and S, as shown. Combinations of reinforcing steel and WWR or configurations of WWR other than that shown are permitted if conditions in the table are satisfied. Provide the same laps as required for reinforcing bars.

Anchor bolts must be 3/8" Dia ASTM A307 Gr A fully threaded rods with one hex nut and one hardened steel washer (ASTM F436) each. Nuts must conform to ASTM A563 requirements. Embed fully threaded rods into parapet wall with a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 3". Anchor adhesive chosen must be able to achieve a nominal bond strength in tension of a single anchor, Na, of 5 kips (edge distance must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".

Optional cast-in-place anchor bolts must be 3/8" Dia ASTM A307 Gr A bolts (or threaded rods with one tack welded hex nut each) with one hex nut and one hardened steel washer (ASTM F436) at each bolt. Nuts must conform to ASTM A563 requirements.

Provide bar laps, where required, as follows:

GENERAL NOTES:

This rail has been evaluated and accepted to be of equal strength to railings with like geometry, which have been crash tested to meet MASH TL-3 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.

Do not use this railing on bridges with expansion joints providing more than 5" movement.

Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

Submit erection drawings showing panel lengths, rail post spacing, and anchor bolt setting to the Engineer for approval.

Average weight of railing with no overlay: 380 plf (total)
370 plf (Conc)
10 plf (Steel)

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

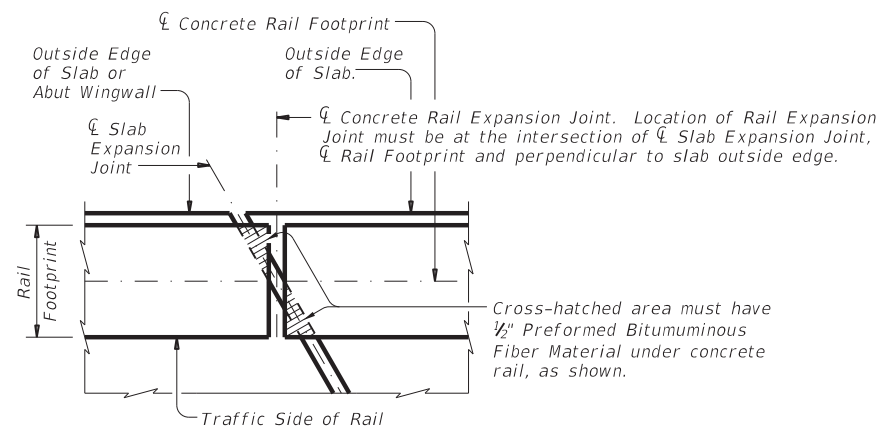
BARS U (#4)

BARS WU (#4)

BARS S (#4)

CAST-IN-PLACE ANCHOR BOLT OPTIONS

- ⑤ Increase 2" for structures with overlay.
- ⑦ HSS 2.875 x 0.203
- ⑧ HSS 2.375 x 0.154
- ⑮ No longitudinal wires may be in top center of cage.
- ⑯ Bend or cut as required to clear drain slots.
- ⑰ For raised sidewalks, add sidewalk height to total bar height. Use sidewalk height at rail's location.
- ⑱ See "Material Notes" for anchor bolt information.



PLAN OF RAIL AT EXPANSION JOINTS

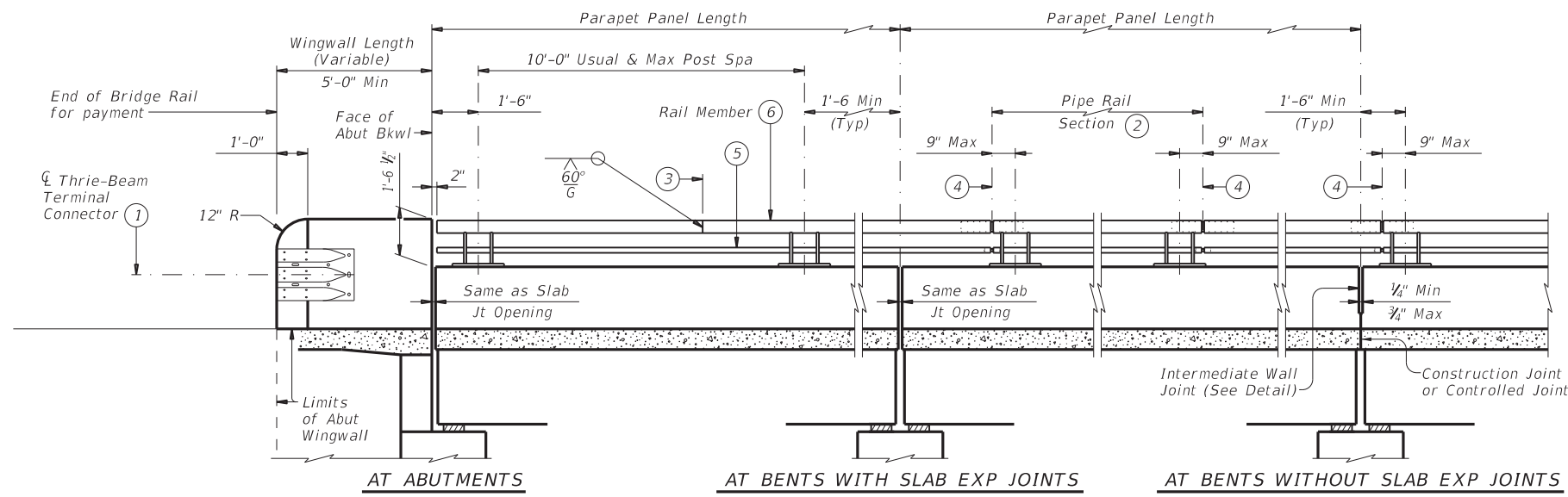
Example showing Slab Expansion Joints without breakbacks.

		Bridge Division Standard	
<h2>COMBINATION RAIL</h2>			
<h3>TYPE C221</h3>			
FILE: r1std018-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT September 2019	CON: 6372	SECT: 50	JOB: 001
REVISIONS	COUNTY: BEXAR		SHEET NO.: 309

DATE: FILE:

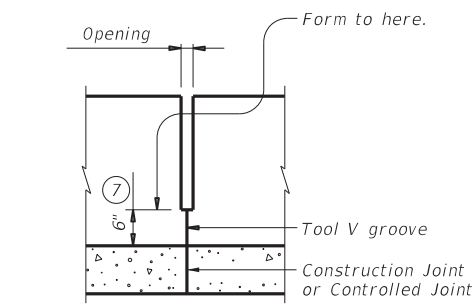
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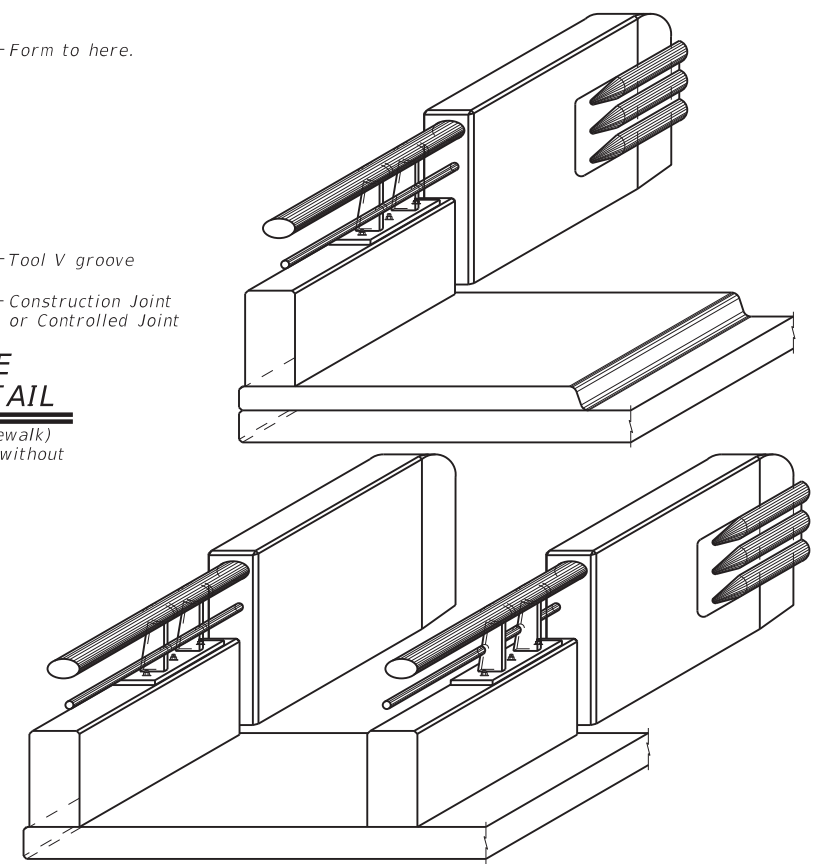
ROADWAY ELEVATION OF RAIL

(Rail Member showing Elliptical Tube Option, Rectangular Tube Option similar).



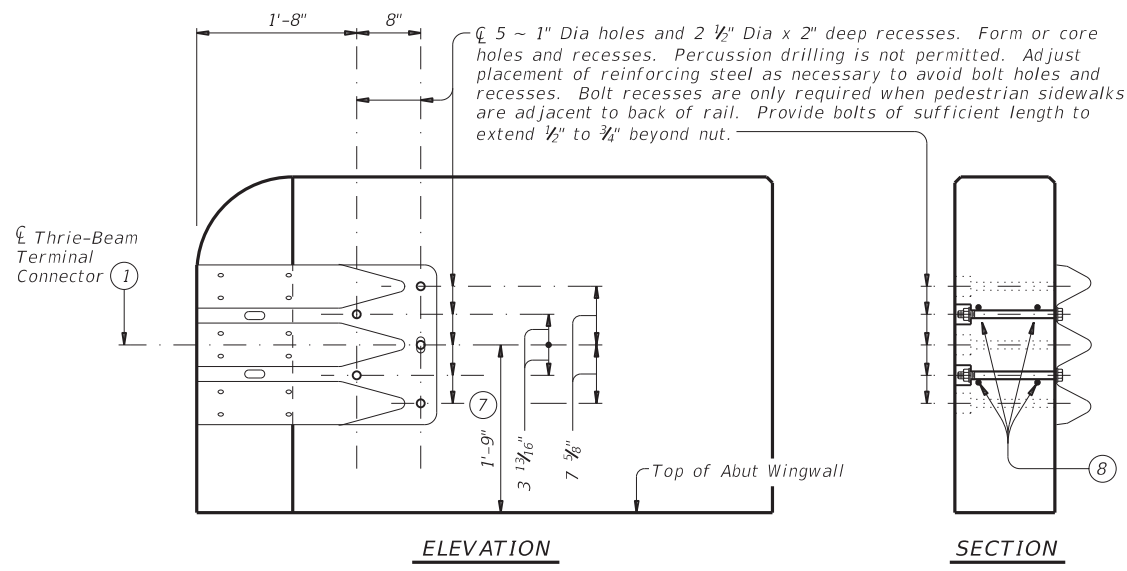
INTERMEDIATE WALL JOINT DETAIL

(Showing without raised sidewalk) Provide at all interior bents without slab expansion joints.

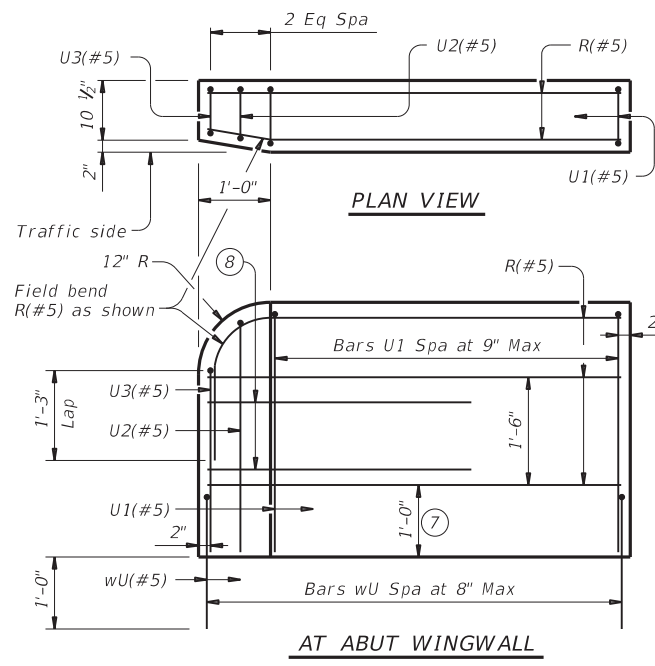


ISOMETRIC VIEWS AT END OF BRIDGE

(Rail Member showing Elliptical Tube Option, Rectangular Tube Option similar).

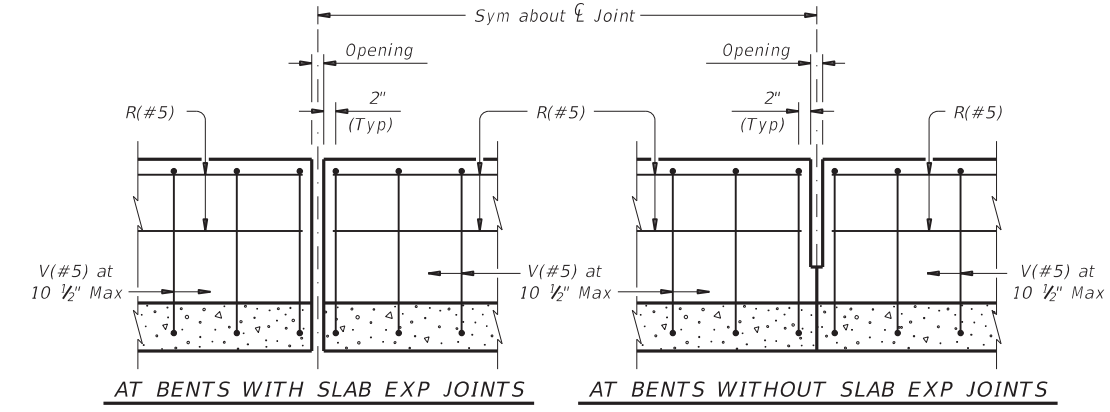


TERMINAL CONNECTION DETAILS



ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT

(Showing without raised sidewalk)



- ① Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
- ② Pipe rail sections must have at least two posts but not more than four.
- ③ One shop splice per pipe rail section is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.
- ④ Exp Jt or Splice Jt as required.
- ⑤ 2" Dia Std Pipe (2.375" O.D., 0.154" wall thickness) (ASTM A53 Gr B, A1085 or A500 Gr B). Placed on either side of steel rail post.
- ⑥ Unless directed otherwise by the Engineer, the Fabricator may use the rectangular tube in lieu of the elliptical tube for the rail member.
- ⑦ Increase 2" for structures with overlay.
- ⑧ Place 4 additional Bars R(#5) 3'-8" in length inside Bars U(#5) and centered 2'-0" from end of rail when Terminal Connections are required. Field bend as needed.

SHEET 1 OF 4



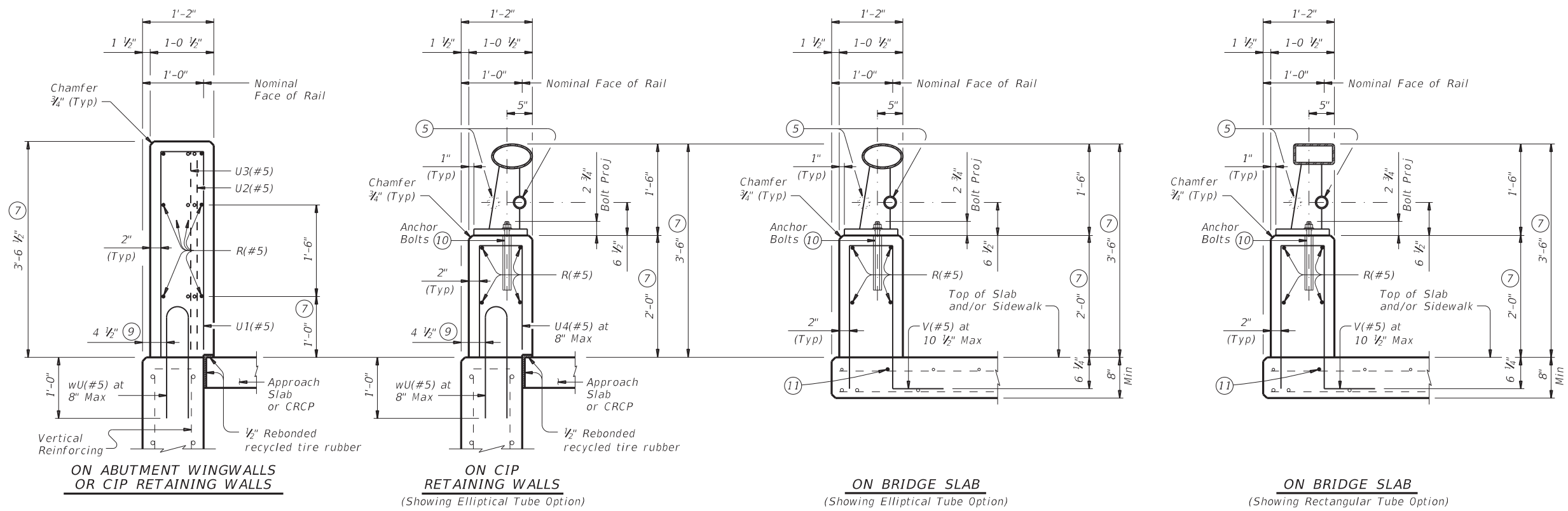
COMBINATION RAIL

TYPE C402

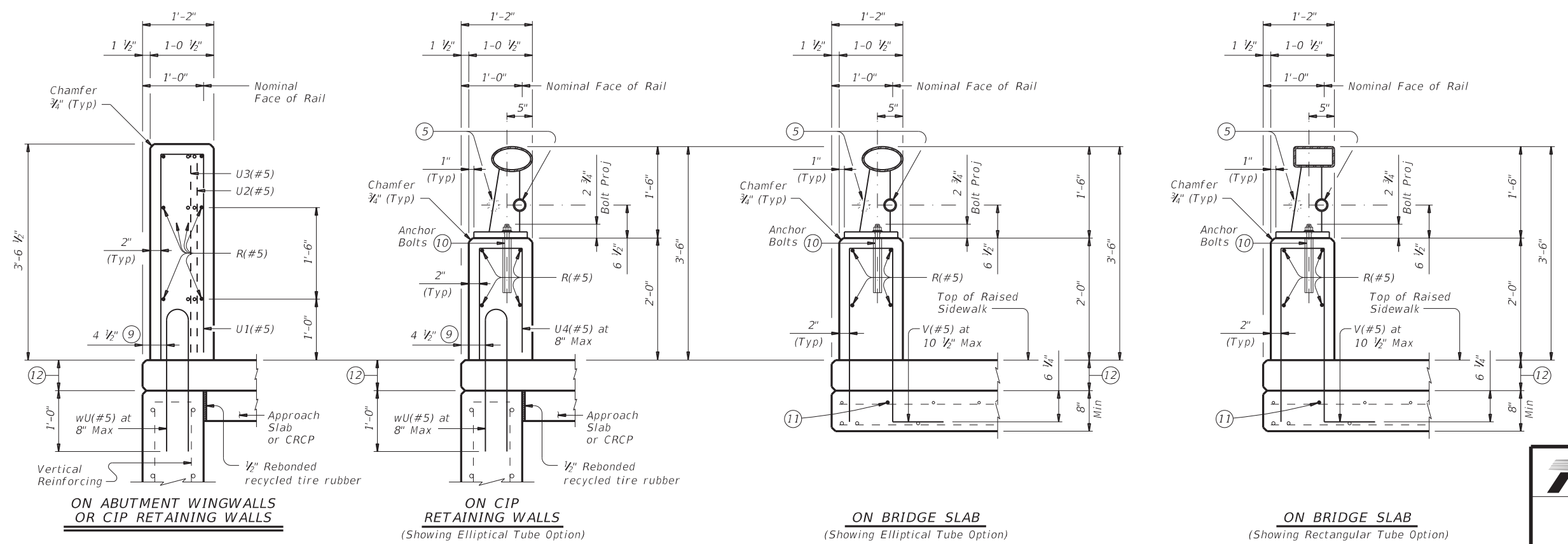
FILE: r1std020-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
DIST	COUNTY		SHEET NO.	
SAT	BEXAR		310	

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SECTIONS THRU RAIL WITHOUT RAISED SIDEWALK ⑥



SECTIONS THRU RAIL WITH RAISED SIDEWALK ⑥

- ⑤ 2" Dia Std Pipe (2.375" O.D., 0.154" wall thickness) (ASTM A53 Gr B, A1085 or A500 Gr B). Placed on either side of steel rail post.
- ⑥ Unless directed otherwise by the Engineer, the Fabricator may use the rectangular tube in lieu of the elliptical tube for the rail member.
- ⑦ Increase 2" for structures with overlay.
- ⑧ 5 1/4" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.
- ⑩ See "Material Notes" for anchor bolt information.
- ⑪ Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.
- ⑫ Raised Sidewalk

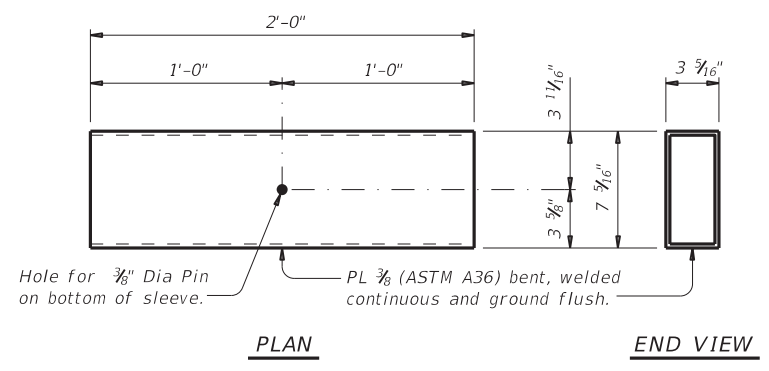
COMBINATION RAIL

TYPE C402

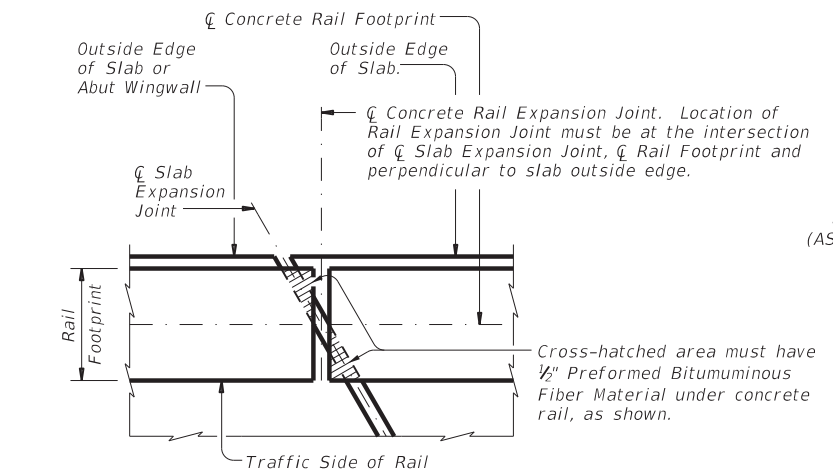
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©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
DIST	COUNTY	SHEET NO.		
SAT	BEXAR	311		

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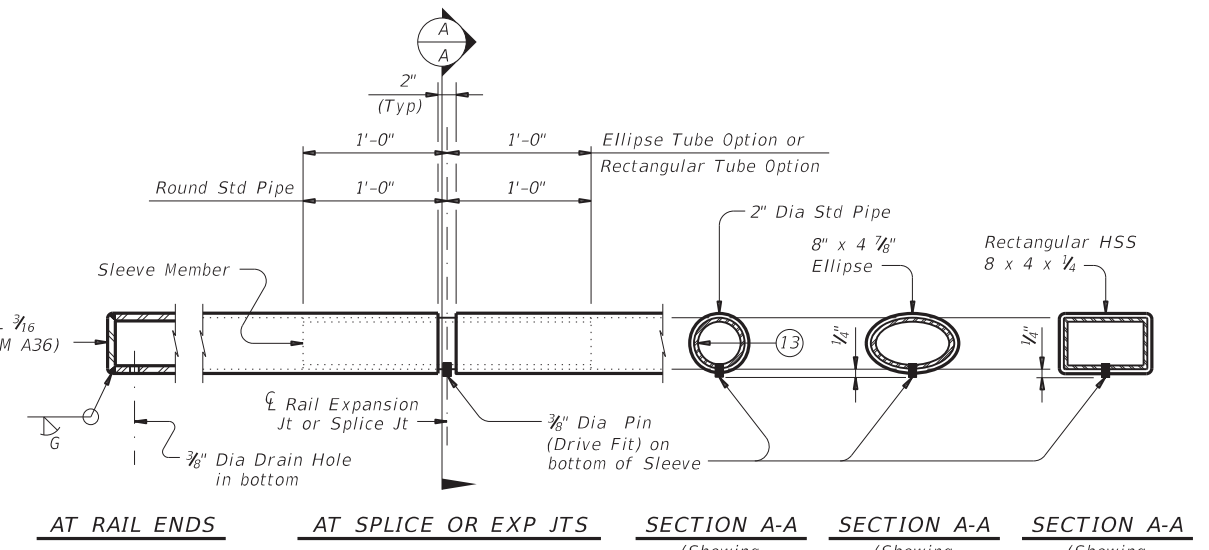
DATE: FILE:



RECTANGULAR TUBE SLEEVE MEMBER DETAIL
(See Tube Fabrication Detail)



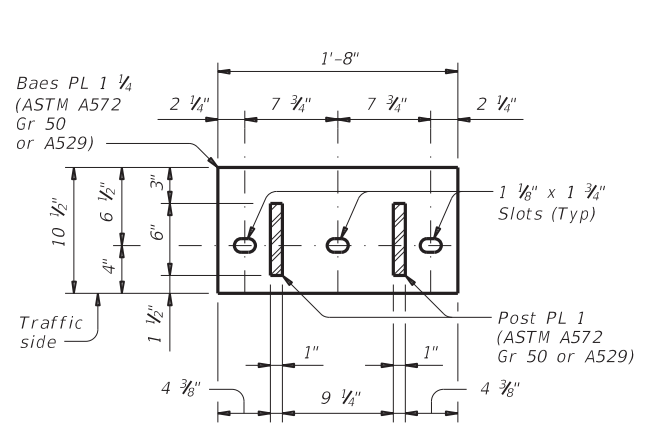
PLAN OF RAIL AT EXPANSION JOINTS
Example showing Slab Expansion Joints without breakbacks.



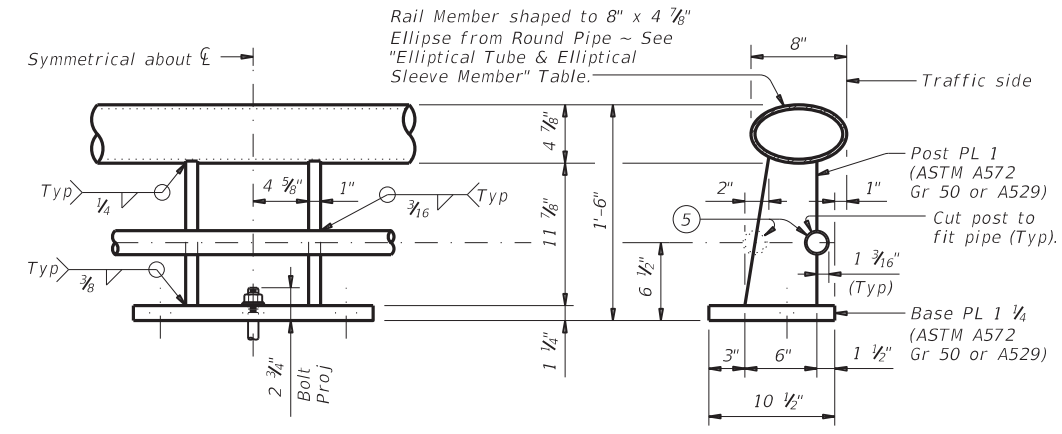
TUBE FABRICATION DETAILS ⑥

ELLIPTICAL TUBE & ELLIPTICAL SLEEVE MEMBER		
8" x 4 7/8" Ellipse	Elliptical Sleeve Member	
Material	Material	Thickness
6" Dia Std Pipe	ASTM A53 Gr B	0.353"
ASTM A53 E or S Gr B)	ASTM A36 or A500 Gr B	0.339"
	API-5LX52	0.224"
6 3/8" O.D. Pipe x 0.188"	ASTM A53 Gr B	0.339"
API-5LX52	ASTM A36 or A500 Gr B	0.325"
	API-5LX52	0.188"

Notes: Other sections of equal or greater strength are acceptable for elliptical sleeves. The major and minor diameters of the rail member may vary +/- 0.1875" from plan dimension. However, the difference between the outside diameters of the elliptical sleeve and the inside diameters of the rail member must not exceed 0.25 inches.



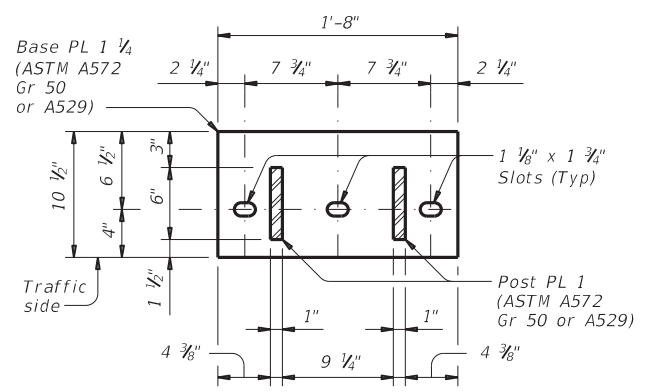
SECTION THRU POST



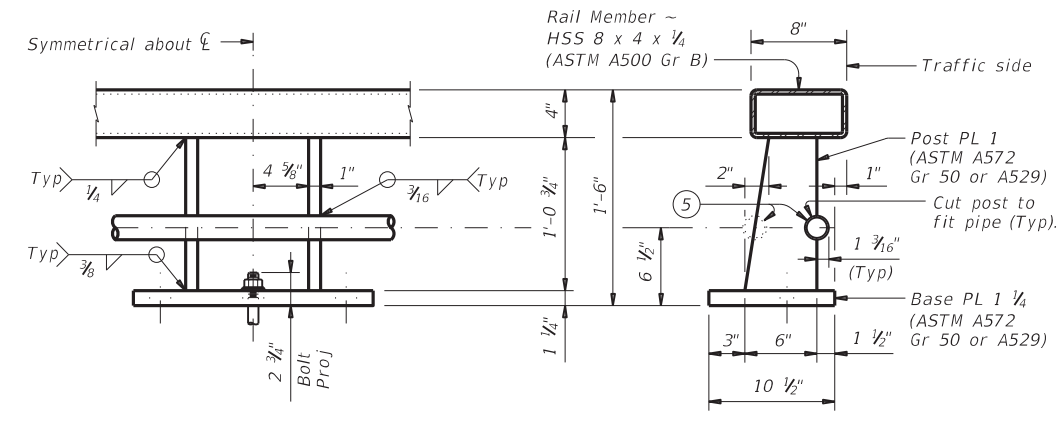
ELEVATION

SECTION THRU RAIL

ELLIPTICAL TUBE WITH RAIL POST & ANCHORAGE DETAILS
(Showing Elliptical Tube Option)



SECTION THRU POST



ELEVATION

SECTION THRU RAIL

RECTANGULAR TUBE WITH RAIL POST & ANCHORAGE DETAILS ⑥
(Showing Rectangular Tube Option)

- ⑤ 2" Dia Std Pipe (2.375" O.D., 0.154" wall thickness) (ASTM A53 Gr B, A1085 or A500 Gr B). Placed on either side of steel rail post.
- ⑥ Unless directed otherwise by the Engineer, the fabricator may use the rectangular tube in lieu of the elliptical tube for the rail member.
- ⑬ Sleeve Member 1 1/2" Dia Std Pipe (1.90" O.D., 0.145" wall thickness) (ASTM A53 Gr B or A500 Gr B).

COMBINATION RAIL

TYPE C402

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REVISIONS	6372	50	001	VAR.
DIST	COUNTY	SHEET NO.		
SAT	BEXAR	312		

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DATE: FILE:

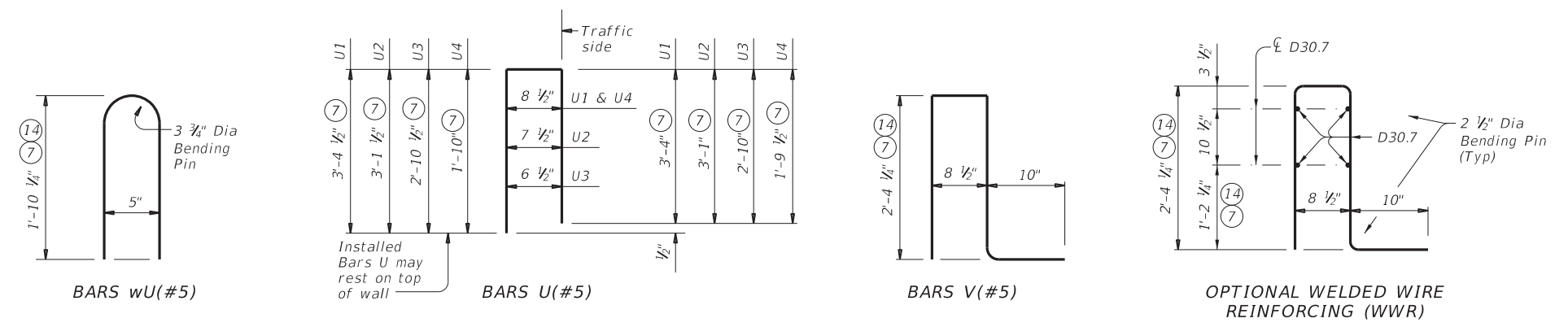
RAIL DATA FOR HORIZONTAL CURVES			
	RADIUS TO FACE OF RAIL	MAX CHORD LENGTH	CONSTRUCT OR FABRICATE
Rail Members	Over 2800'	29'-0"	Straight rail sections
	Over 1400' thru 2800'	14'-6"	To required radius or to chords shown (16)
	Over 700' thru 1400'	7'-3"	To required radius (16)
	Thru 700'	Zero	To required radius (16)

CONSTRUCTION NOTES:
 This rail may be slipformed if approved by the Engineer when adhesive anchor bolts are used.
 At the Contractor's option anchor bolts may be cast with the parapet. See "Material Notes". Slipforming parapet is not allowed if anchor bolts are cast with parapet wall.
 If rail is slipformed, apply an heavy epoxy bead 1" behind toe of traffic side of rail to concrete deck just prior to slip forming. Provide a 3/8" width x 1/4" tall heavy epoxy bead with Type III, Class C or a Type V epoxy.
 Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.
 Rail parapet must be plumb unless otherwise approved. Steel posts must be square to the top of parapet. Use Type VIII epoxy mortar under post base plates if gaps larger than 1/16" exist.
 Cap all ends of tubular steel sections at parapet.
 Pipe rail sections must have at least two posts but not more than four.
 Round or chamfer all exposed edges of steel components 1/16" by grinding prior to galvanizing.
 Chamfer all exposed concrete corners.

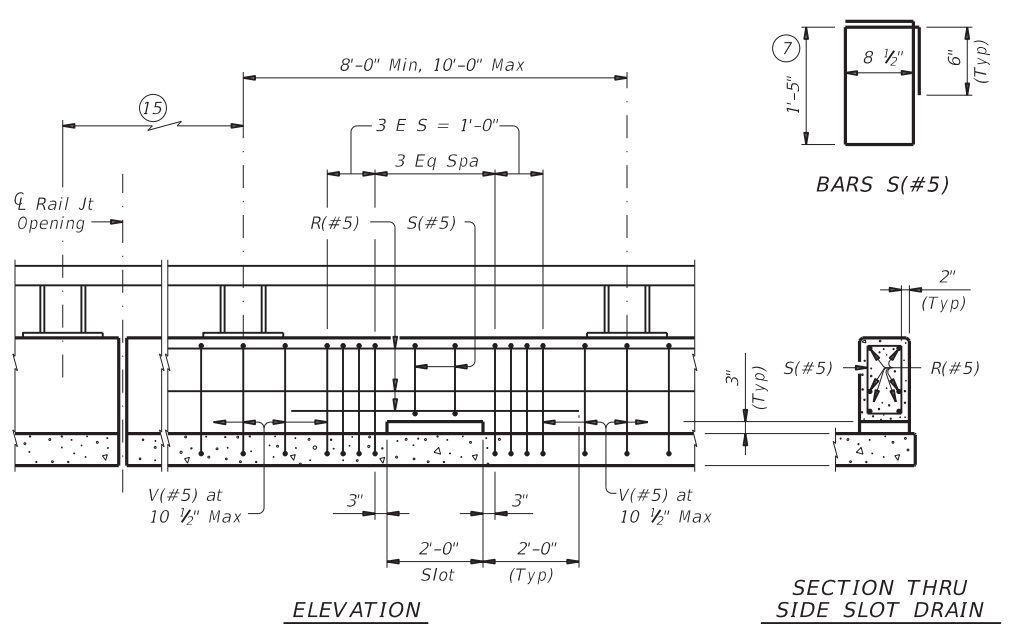
MATERIAL NOTES:
 Galvanize all metal components of steel rail system. Apply additional coatings when shown elsewhere on the plans. When plans require paint over galvanizing, follow the requirements for painting galvanized steel in Item 445, "Galvanizing" and when field painting, Item 446, "Field Cleaning and Painting Steel". Sleeve members and anchor bolts must receive galvanization prior to installation and only field paint after installation unless directed otherwise by Engineer.
 Anchor bolts must be 3/8" Dia ASTM A193 Gr B7 fully threaded rods with heavy hex nuts, one hardened steel washer (ASTM F436), and one (2 1/4" O.D.) steel washer each. Nuts must conform to ASTM A563 requirements. Embed fully threaded rods into parapet wall with a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 8". Anchor adhesive chosen must be able to achieve a nominal bond strength in tension of a single anchor, Na, of 17 kips (edge distance must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing."
 Optional cast-in-place anchor bolts must be 3/8" Dia ASTM F3125 Gr A325 or A449 bolts (or A193 Gr B7 or F1554 Gr 105 threaded rods with one tack welded heavy hex nut each) with one heavy hex nut and one hardened steel washer ASTM F436 plus one (2 1/4" O.D.) steel washer at each bolt. Nuts must conform to ASTM A563 requirements.
 Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.
 Provide Grade 60 reinforcing steel.
 Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.
 Deformed Wire Reinforcement (WWR) ASTM A1064 may be substituted for Bars R, and V, as shown. Provide the same laps as required for reinforcing bars.
 Provide bar laps, where required, as follows: Uncoated or galvanized ~ #5 = 2'-0" Epoxy coated ~ #5 = 3'-0"

GENERAL NOTES:
 This rail has been successfully evaluated by full-scale crash test to meet MASH TL-4 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.
 Do not use this railing on bridges with expansion joints providing more than 5" movement.
 Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.
 Submit erection drawings showing panel lengths, rail post spacing, and anchor bolt setting, to the Engineer for approval.
 Average weight of railing with no overlay: 347 plf total
 313 plf (Conc)
 34 plf (Steel).

Cover dimensions are clear dimensions, unless noted otherwise.
 Reinforcing bar dimensions shown are out-to-out of bar.

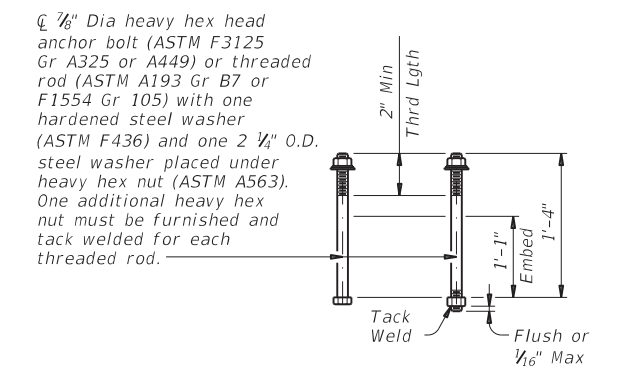


- (7) Increase 2" for structures with overlay.
- (10) See "Material Notes" for anchor bolt information.
- (14) For raised sidewalks, add sidewalk height to total bar height. Use sidewalk height at rail's location.
- (15) Slots are not allowed in areas where there is a joint in the concrete parapet between rail post.
- (16) Shop drawings for approval required for tubular steel sections.



OPTIONAL SIDE SLOT DRAIN DETAILS

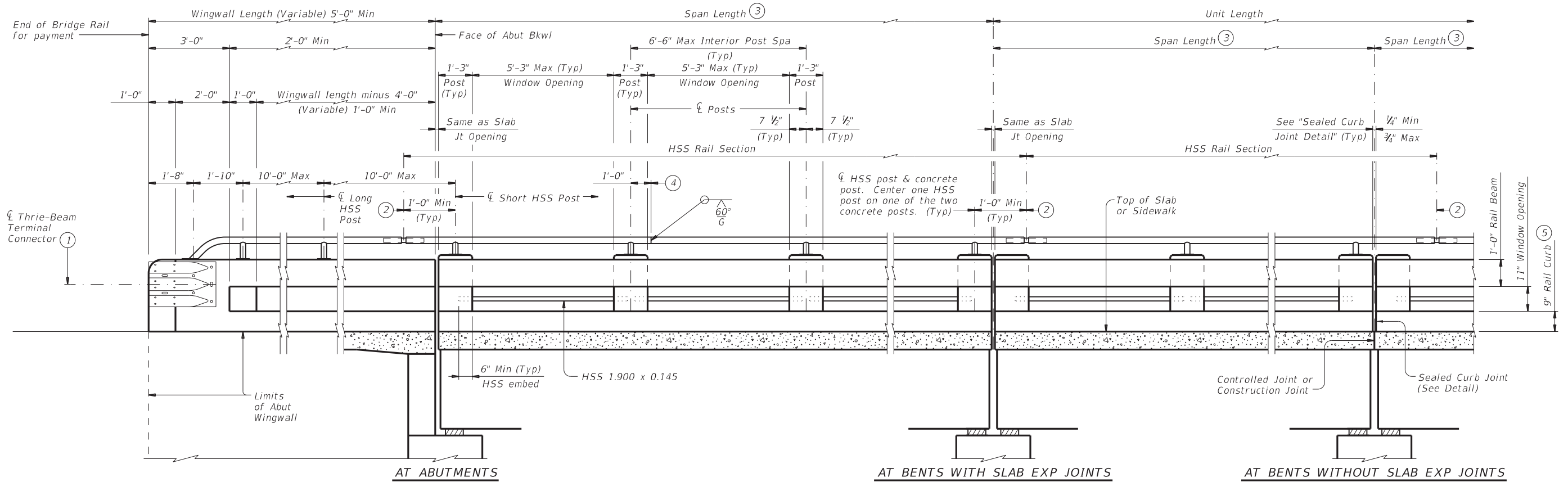
Note: Center Side Slot Drains between rail posts within the limits shown. Side Slot Drains may be used where shown elsewhere on the plans or as directed by the Engineer. Do not place drains over railroad tracks, lower roadways, or sidewalks. When this rail is used as a separator between a roadway surface and a sidewalk surface, side drain slots will not be permitted.



CAST-IN-PLACE ANCHOR BOLT OPTIONS (10)

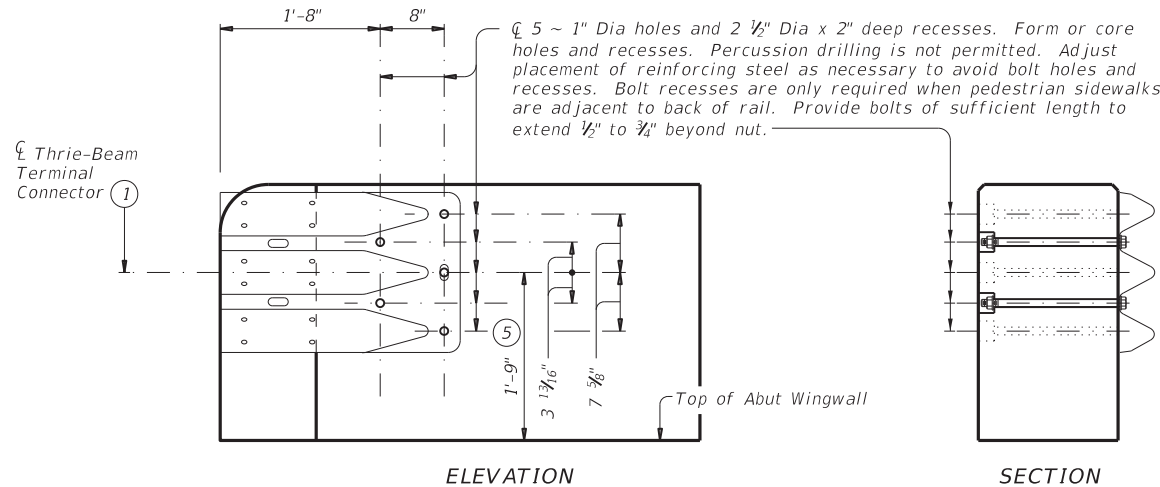
		Bridge Division Standard	
<h1>COMBINATION RAIL</h1>			
<h2>TYPE C402</h2>			
FILE: r1std020-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT September 2019	CON: 6372	SECT: 50	JOB: 001
REVISIONS	COUNTY: BEXAR		SHEET NO.: 313

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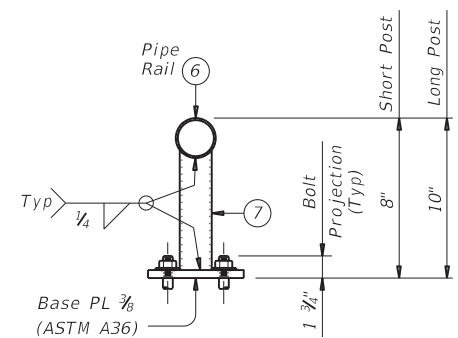
ROADWAY ELEVATION OF RAIL

(Showing without raised sidewalk)

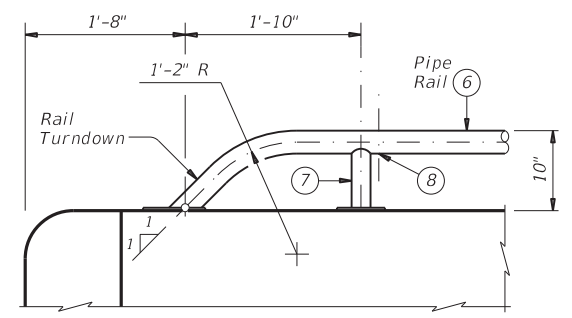


TERMINAL CONNECTION DETAILS

(Special forming details on parapet not shown for clarity. See "Elevation Showing Typical Reinforcing Placement".)

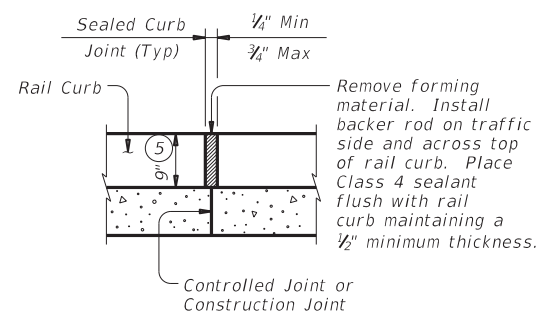


TRANSVERSE SECTION



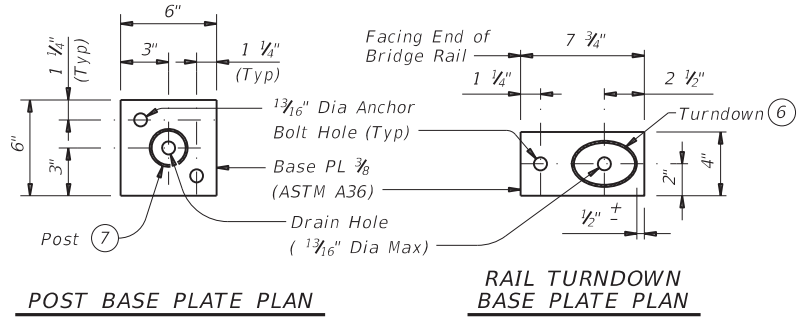
Note that at least two anchor points (as shown) are required for the Bridge Rail on the Abutment Wingwall. Longer Wingwalls may require more than two Rail anchorages.

HSS RAIL TERMINAL DETAIL



SEALED CURB JOINT DETAIL

Provide at all interior bents without slab expansion joints.



POST BASE PLATE PLAN

RAIL TURNDOWN BASE PLATE PLAN

HSS RAIL DETAILS

- 1 Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
- 2 Splice Jt or Exp Jt
- 3 Span length of rail must always have a minimum of three concrete posts. Spans always have a concrete post located at each end of span. Space concrete posts equally within a span unless directed otherwise by the Engineer.
- 4 One shop splice per HSS rail section is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.
- 5 Increase 2" for structures with 2" Max overlay.
- 6 HSS 2.875 x 0.203
- 7 HSS 2.375 x 0.154
- 8 3/8" Dia Hole in bottom of HSS rail (Minimum 1 hole between posts ~ Typ)

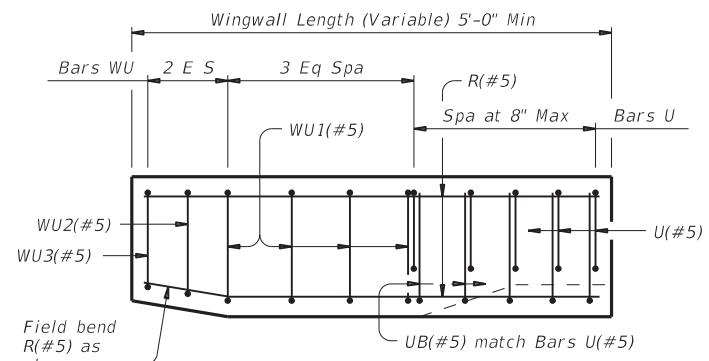
SHEET 1 OF 4

		Bridge Division Standard	
<h1>COMBINATION RAIL</h1>			
<h2>TYPE C66</h2>			
FILE: r1std036-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT September 2019	CON: 6372	SECT: 50	JOB: 001
REVISIONS	SAT		COUNTY: BEXAR
			SHEET NO.: 314

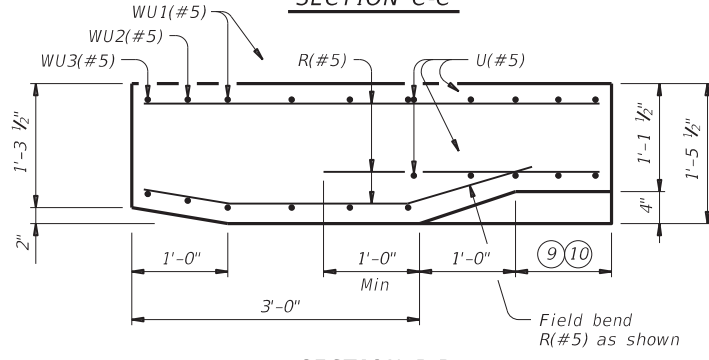
DATE: FILE:

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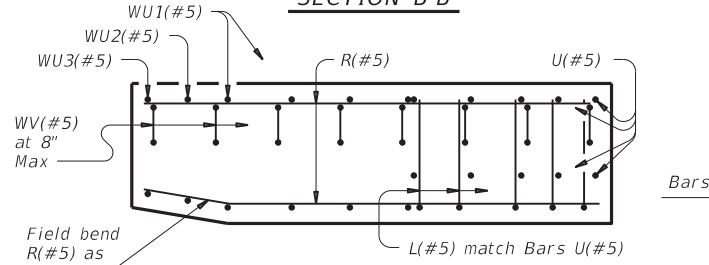
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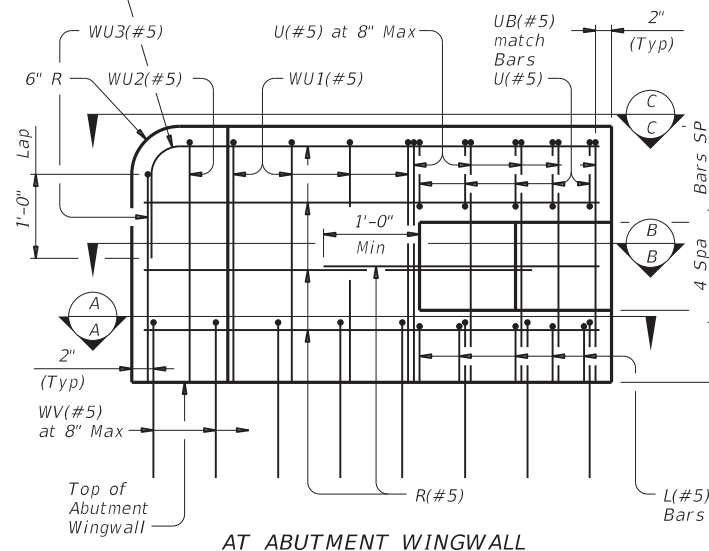
SECTION C-C



SECTION B-B

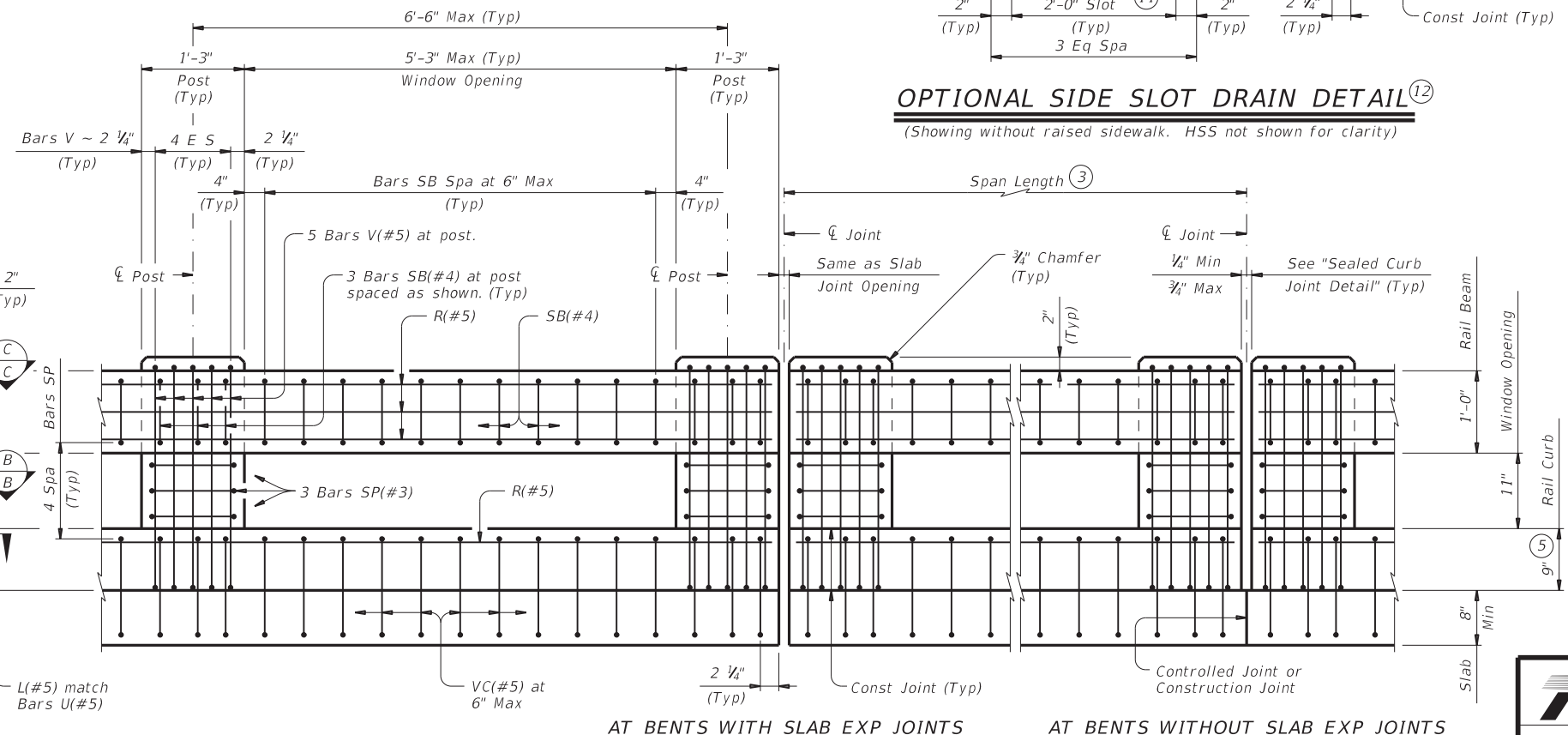


SECTION A-A



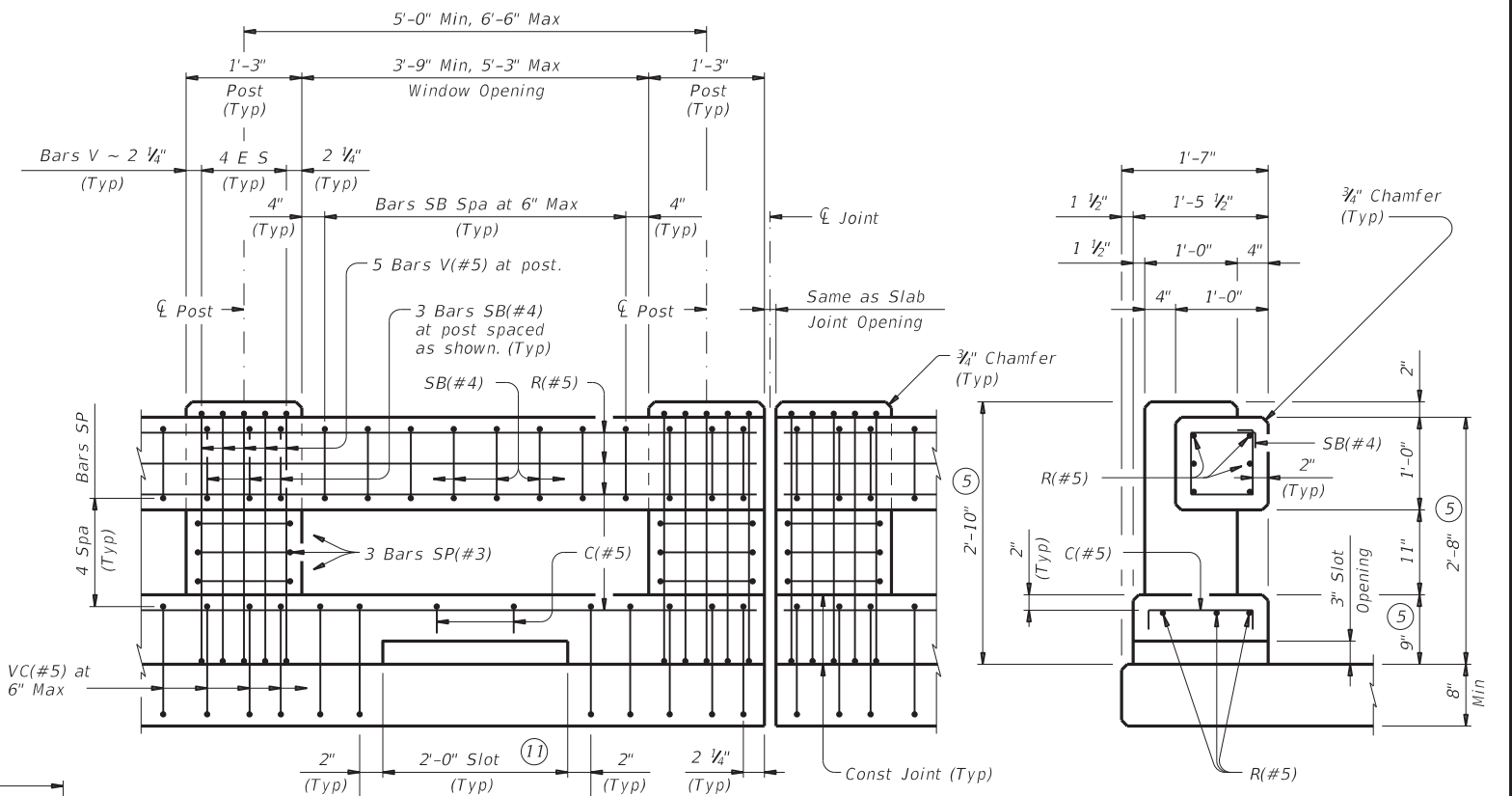
AT ABUTMENT WINGWALL

- ③ Span length of rail must always have a minimum of three concrete posts. Spans always have a concrete post located at each end of span. Space concrete posts equally within a span unless directed otherwise by the Engineer.
- ⑤ Increase 2" for structures with 2" Max overlay.
- ⑨ Wingwall length minus 4'-0" (Variable) 1'-0" Min.
- ⑩ Bars L, U and UB are spaced at 8" Max.
- ⑪ Side Slot Drains must be centered between rail post.
- ⑫ Side Slot Drains must be centered between rail posts within the limits shown. Side Slot Drains may be used where shown elsewhere on the plans or as directed by the Engineer. Do not place drains over railroad tracks, lower roadways, or sidewalks. When this rail is used as a separator between a roadway surface and a sidewalk surface, side drain slots are not permitted.



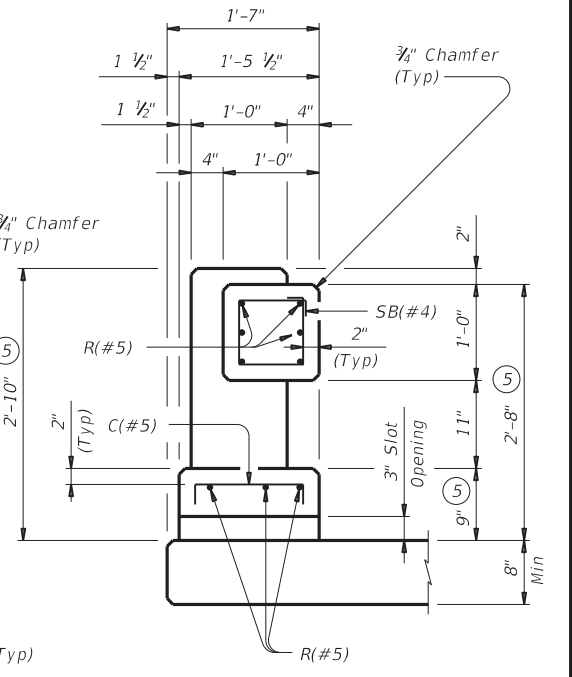
ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT

(Showing without raised sidewalk. HSS not shown for clarity)



OPTIONAL SIDE SLOT DRAIN DETAIL

(Showing without raised sidewalk. HSS not shown for clarity)



SECTION THRU OPTIONAL SIDE SLOT DRAIN

(Showing without raised sidewalk. HSS not shown for clarity)

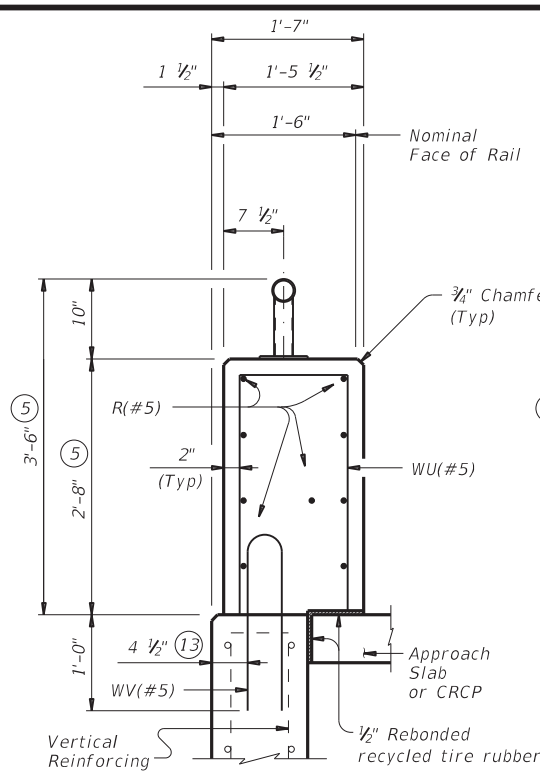
COMBINATION RAIL

TYPE C66

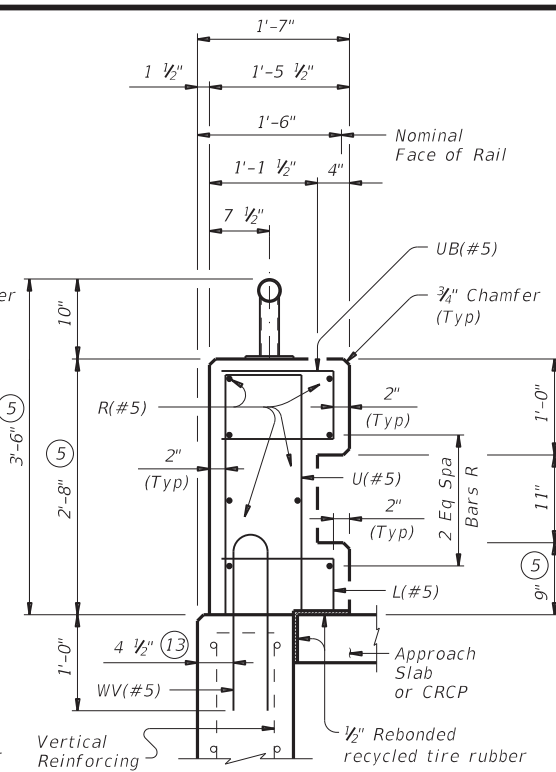
FILE: r1std036-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
DIST	COUNTY	SHEET NO.		
SAT	BEXAR	315		

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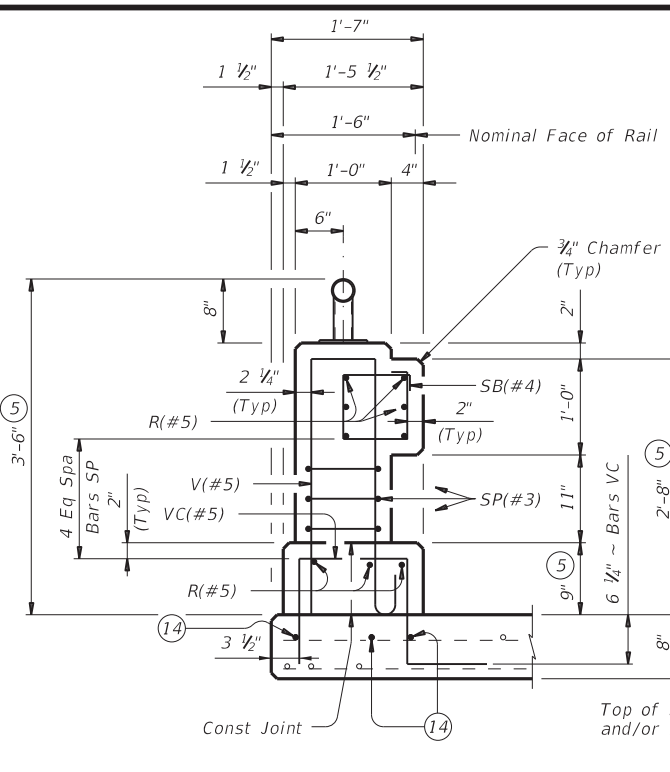
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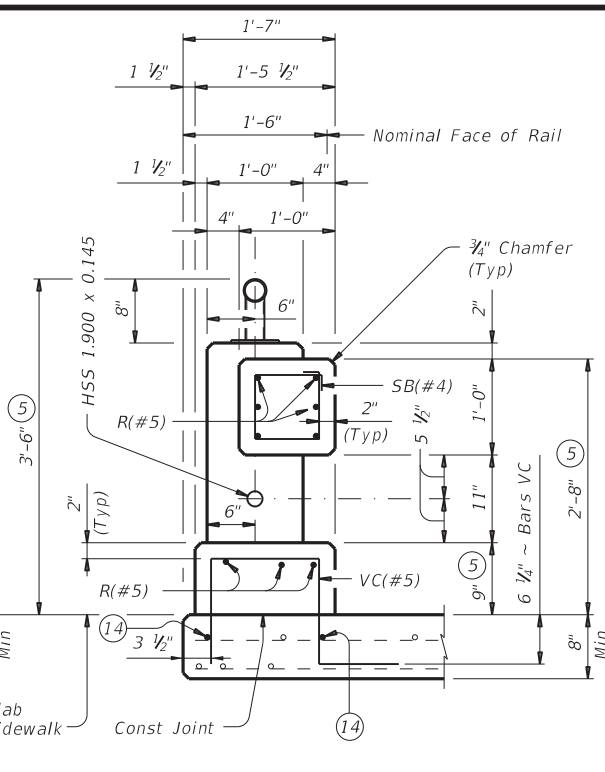
SECTION D-D ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



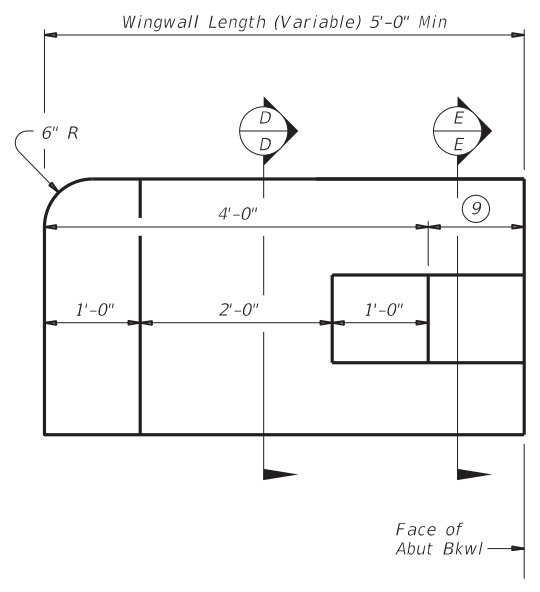
SECTION E-E ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



ON BRIDGE SLAB AT POST

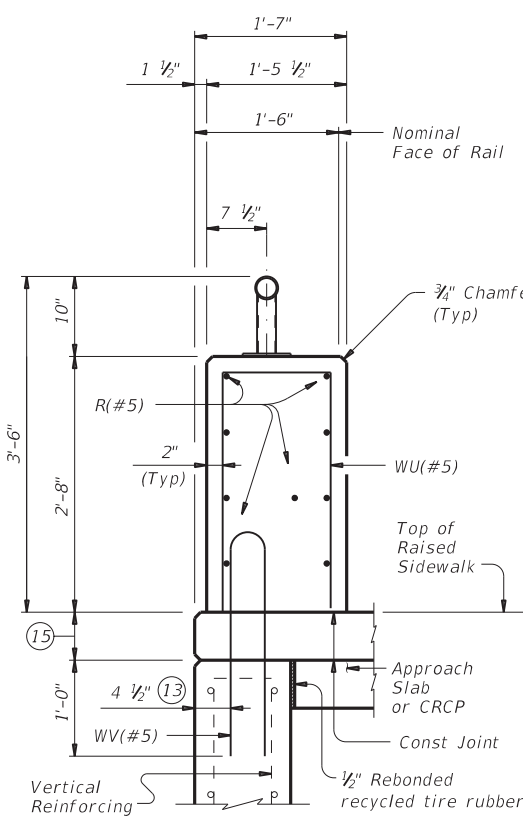


ON BRIDGE SLAB AT WINDOW

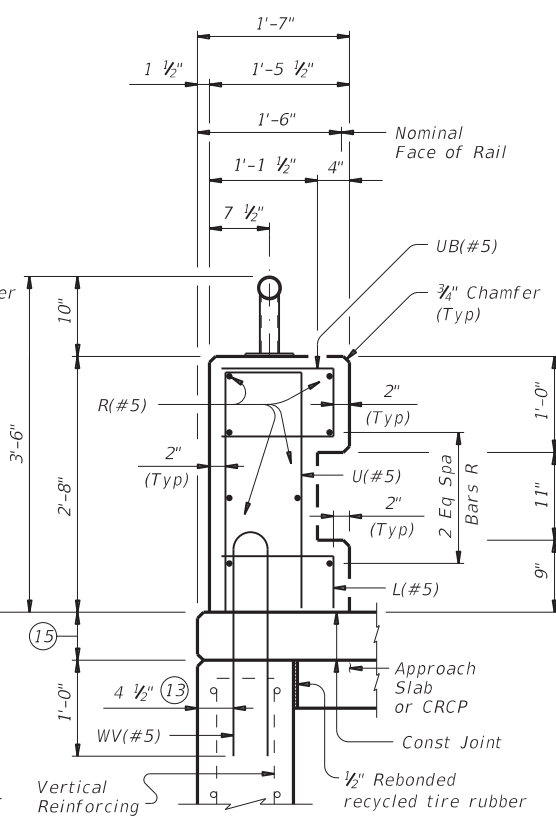


ELEVATION AT ABUTMENT WINGWALL (HSS rail not shown for clarity)

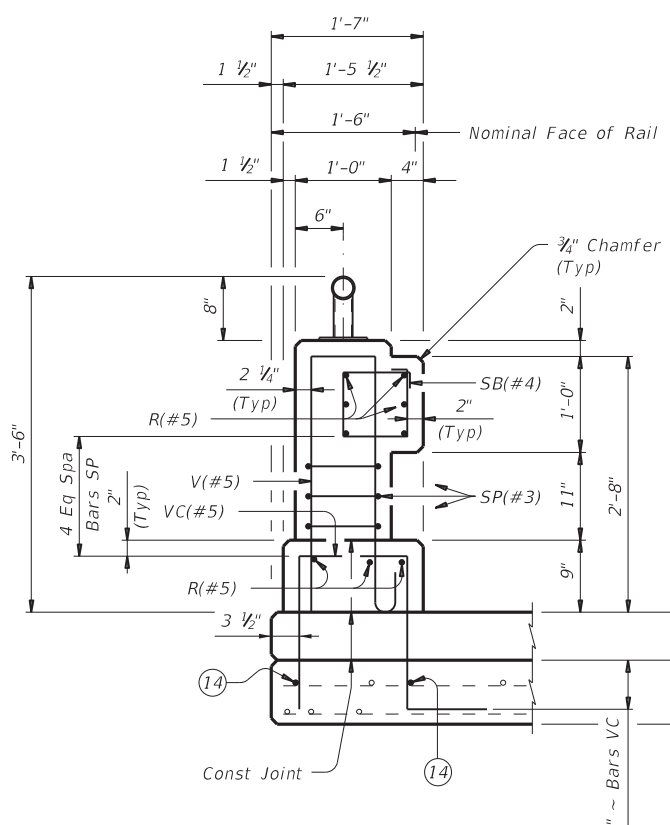
SECTIONS THRU RAIL WITHOUT RAISED SIDEWALK



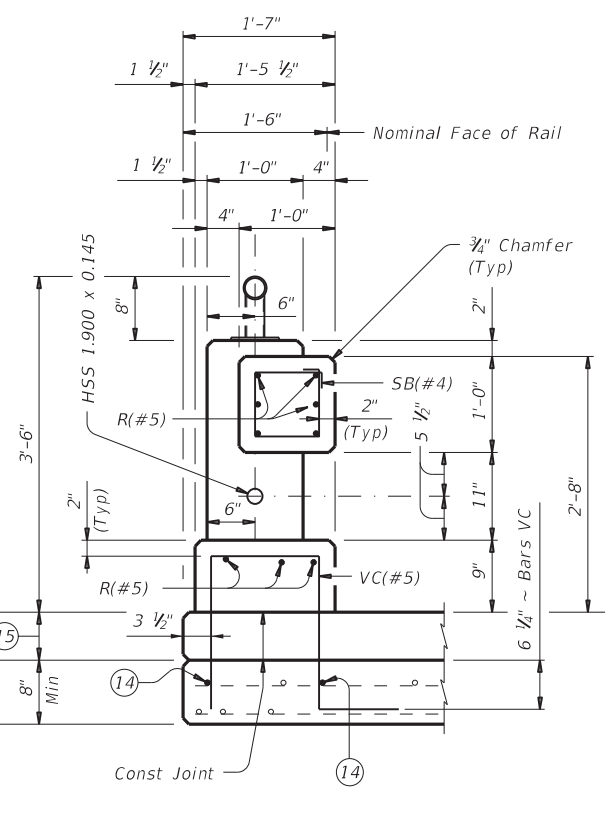
SECTION D-D ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



SECTION E-E ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



ON BRIDGE SLAB AT POST



ON BRIDGE SLAB AT WINDOW

SECTIONS THRU RAIL WITH RAISED SIDEWALK

- ⑤ Increase 2" for structures with 2" Max overlay.
- ⑨ Wingwall length minus 4'-0" (Variable) 1'-0" Min.
- ⑬ 5 1/2" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.
- ⑭ Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.
- ⑮ Raised Sidewalk.

SHEET 3 OF 4

Texas Department of Transportation Bridge Division Standard

COMBINATION RAIL

TYPE C66

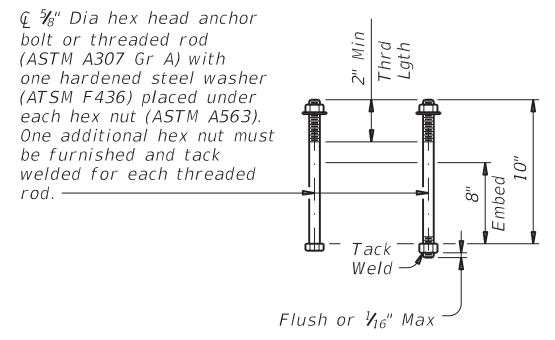
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©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
DIST	COUNTY	SHEET NO.		
SAT	BEXAR	316		

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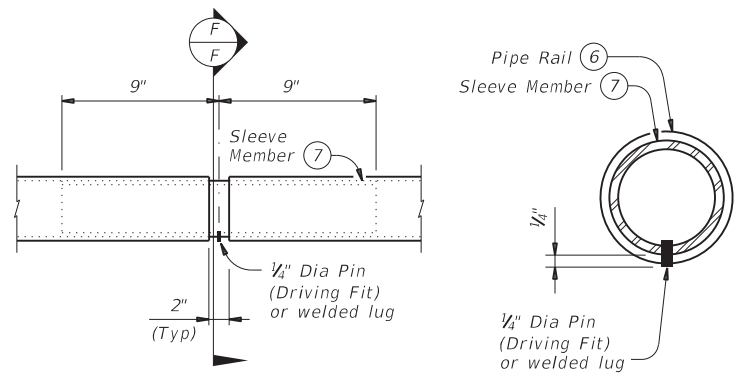
DATE: FILE:

RAIL DATA FOR HORIZONTAL CURVES			
	RADIUS TO FACE OF RAIL	MAX CHORD LENGTH	CONSTRUCT OR FABRICATE
HSS Rail	Over 2800'	29'-0"	Straight rail sections
	Over 1400' thru 2800'	14'-6"	To required radius or to chords shown
	Over 700' thru 1400'	7'-3"	
	Thru 700'	Zero	To required radius

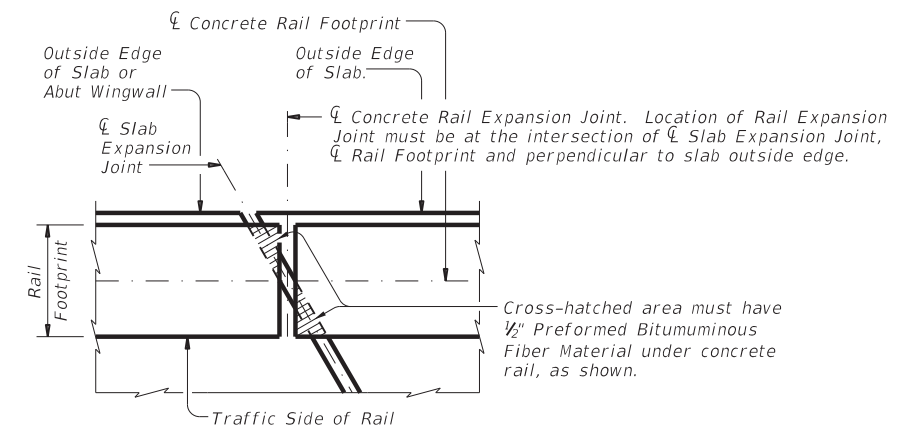
- ⑤ Increase 2" for structures with 2" Max overlay.
- ⑥ HSS 2.875 x 0.203
- ⑦ HSS 2.375 x 0.154
- ⑬ For raised sidewalks, add sidewalk height to total bar height. Use sidewalk height at rail's location.
- ⑰ See "Material Notes" for anchor bolt information.



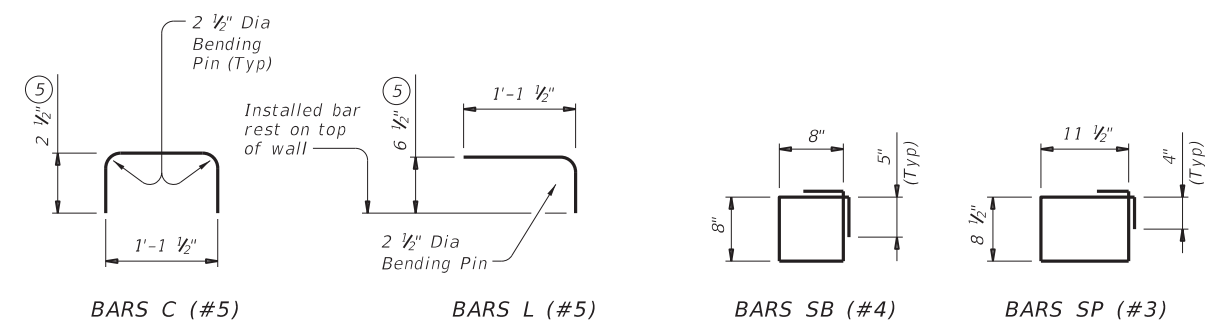
CAST-IN-PLACE ANCHOR BOLT OPTIONS ⑰



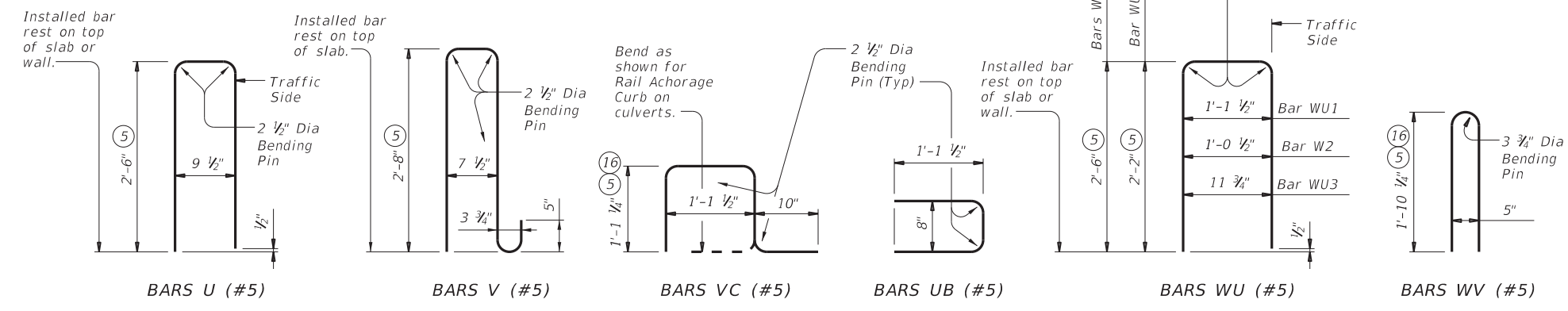
PIPE SPLICE DETAILS



PLAN OF RAIL AT EXPANSION JOINTS
Example showing Slab Expansion Joints without breakbacks.



BARS C (#5) BARS L (#5) BARS SB (#4) BARS SP (#3)



BARS U (#5) BARS V (#5) BARS VC (#5) BARS UB (#5) BARS WU (#5) BARS WV (#5)

CONSTRUCTION NOTES:

Face of rail, posts and parapet must be vertical transversely unless otherwise approved by the Engineer. HSS rail posts and opening end faces must be perpendicular to top of adjacent concrete parapet grade. Use Type VIII epoxy mortar under HSS rail post base plates if gaps larger than 1/16" exist.
 HSS rail sections must include not less than two posts, and no more than five (except at Abutments).
 Round or chamfer exposed edges of HSS rail and HSS rail posts to approximately 1/16" by grinding.
 Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.
 At the Contractor's option anchor bolts may be cast with the parapet (See Cast-in-Place Anchor Bolt Options).
 Clear cover is 2" minimum, unless shown otherwise.
 Chamfer all exposed concrete corners.

MATERIAL NOTES:

Provide Class "S" concrete. Provide Class "S" (HPC) if required elsewhere.
 Provide Grade 60 reinforcing steel.
 Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.
 Provide ASTM A1085, A500 Gr B or A53 Gr B for all HSS.
 Galvanize all metal components of steel rail system. Apply additional coatings when shown elsewhere on the plans. When plans require paint over galvanizing, follow the requirements for painting galvanized steel in Item 445, "Galvanizing" and when field painting, Item 446, "Field Cleaning and Painting Steel". Sleeve members and anchor bolts must receive galvanization prior to installation and only field paint after installation unless directed otherwise by Engineer.
 Anchor bolts must be 3/8" Dia ASTM A307 Gr A fully threaded rods with one hex nut and one hardened steel washer (ASTM F436) each. Nuts must conform to ASTM A563 requirements. Embed fully threaded rods into parapet wall with a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 3". Anchor adhesive chosen must be able to achieve a nominal bond strength in tension of a single anchor, Na, of 5 kips (edge distance must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".
 Optional cast-in-place anchor bolts must be 3/8" Dia ASTM A307 Gr A bolts (or threaded rods with one tack welded hex nut each) with one hex nut and one hardened steel washer (ASTM F436) at each bolt. Nuts must conform to ASTM A563 requirements.
 Provide bar laps, where required, as follows: Uncoated or galvanized ~ #5 = 2'-0" Epoxy coated ~ #5 = 3'-0"

GENERAL NOTES:

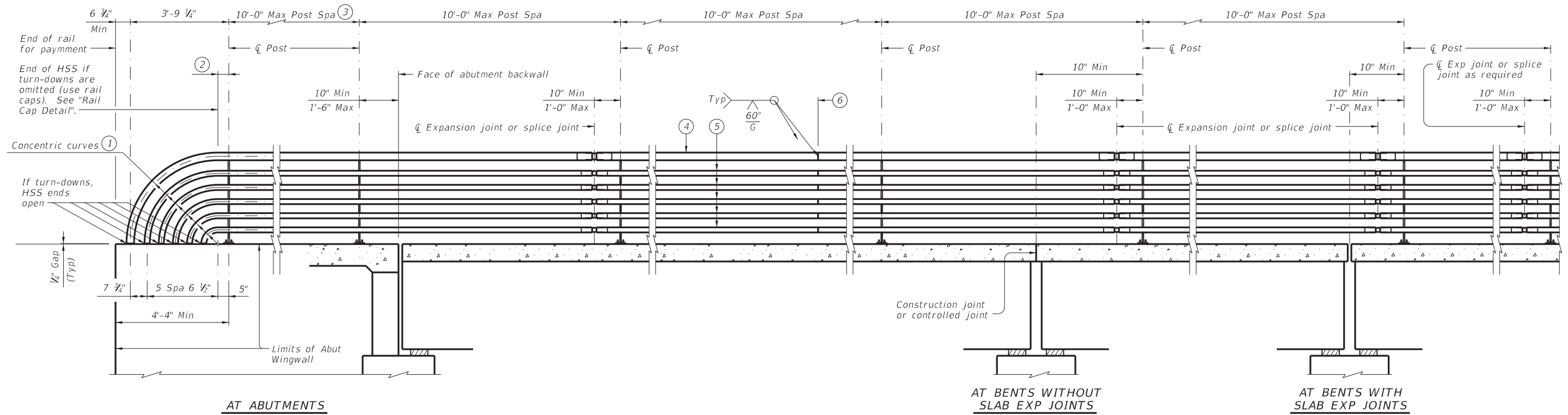
This rail has been successfully evaluated by full-scale crash test to meet MASH TL-3 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.
 This railing cannot be used on bridges with expansion joints providing more than 5" movement.
 Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.
 Submit erection drawings showing panel lengths, HSS rail post spacing, and anchor bolt setting to the Engineer for approval.
 Average weight of railing with no overlay: 366 plf total
 355 plf (Conc)
 11 plf (Steel)

Cover dimensions are clear dimensions, unless noted otherwise.
 Reinforcing bar dimensions shown are out-to-out of bar.

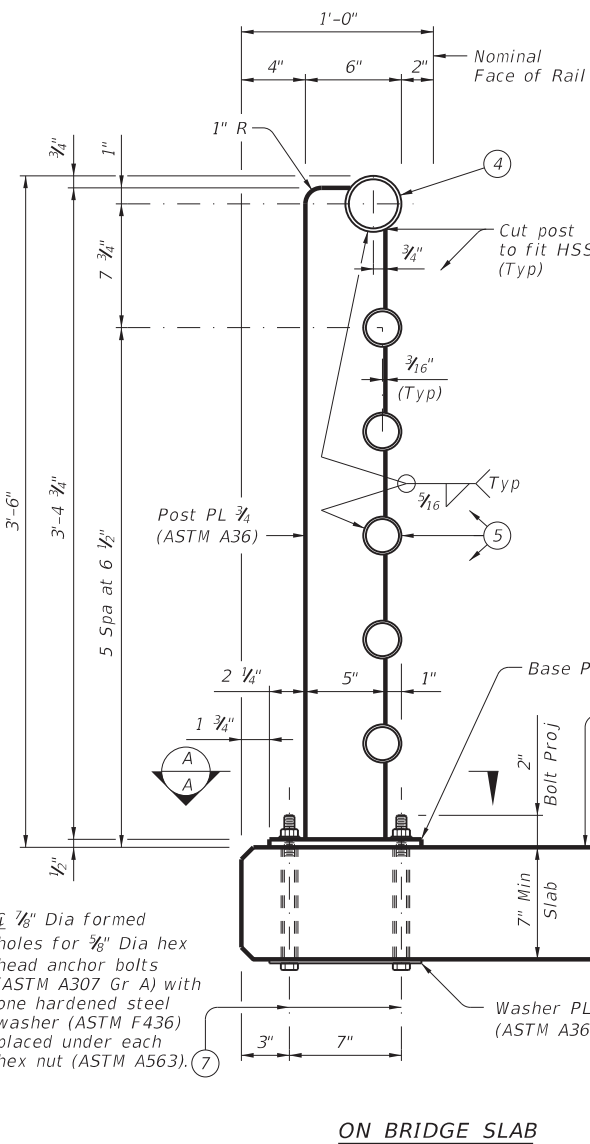
		Bridge Division Standard	
<h2>COMBINATION RAIL</h2>			
<h3>TYPE C66</h3>			
FILE: r1std036-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT September 2019	CONV: 6372	SECT: 50	JOB: OO1
REVISIONS	COUNTY: BEXAR		SHEET NO.: 317

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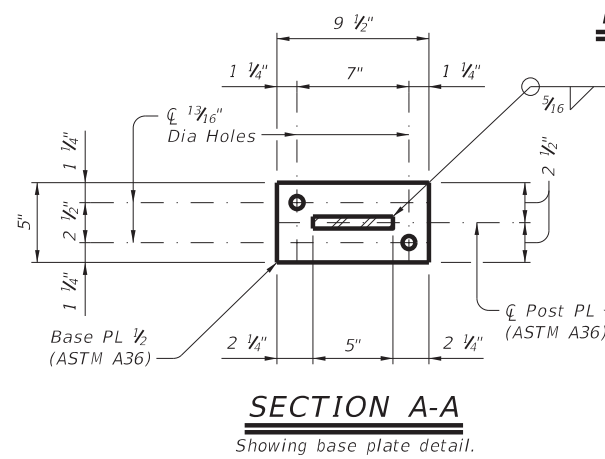
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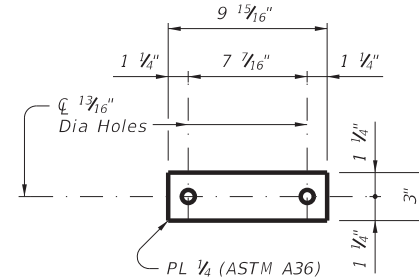
ROADWAY ELEVATION OF RAIL



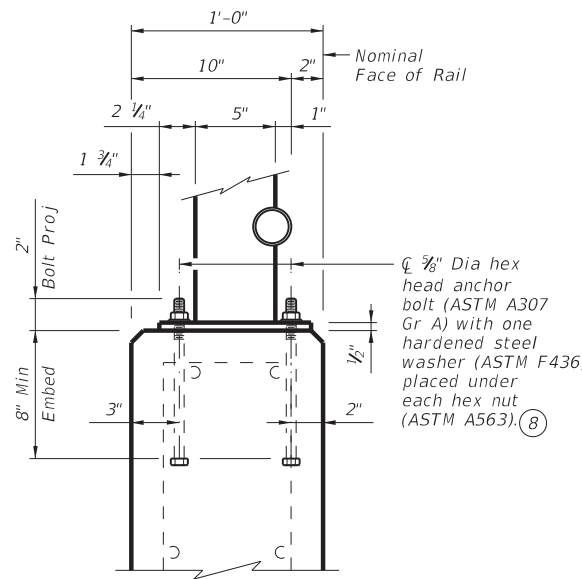
ON BRIDGE SLAB



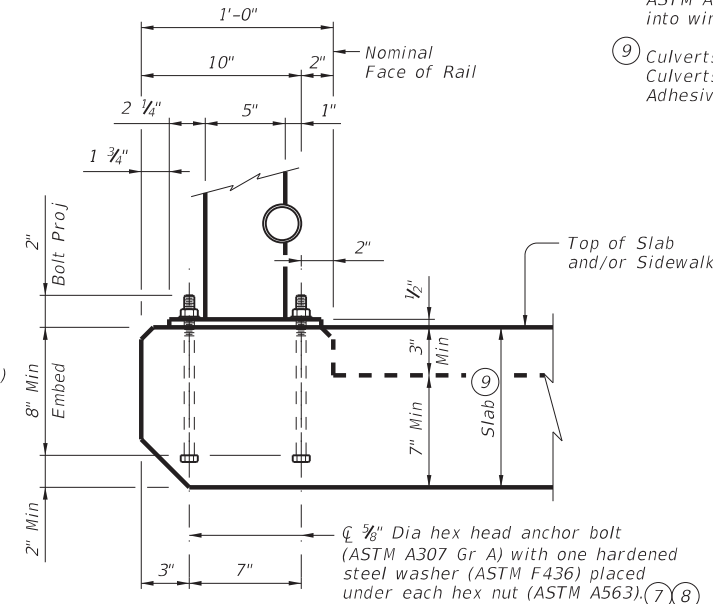
SECTION A-A
Showing base plate detail.



WASHER PLATE DETAIL



**ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS**



ON CULVERTS WITH OR WITHOUT CURBS
Used with 1'-0" Min thick parallel wings on culverts.

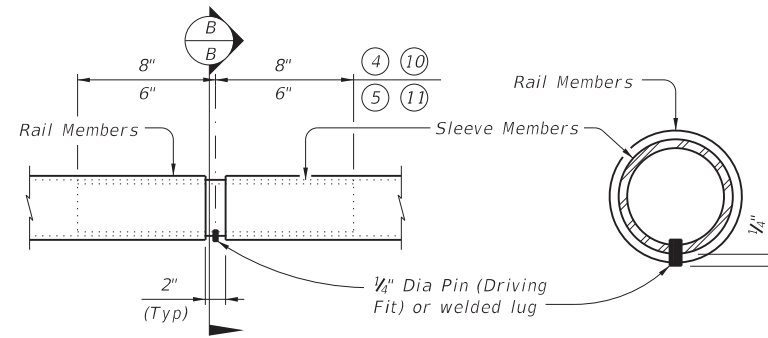
- ① Portion of railing with turn-downs to be used or omitted as indicated on Bridge Layout.
- ② 10" Min ~ 1'-6" Max if turn-downs are omitted.
- ③ Min of 2 posts required on wingwall.
- ④ HSS 3.500 x 0.216 (Rail Member)
- ⑤ HSS 2.375 x 0.154 (Rail Member)
- ⑥ One shop splice per panel is permitted (with minimum 85 percent penetration). The weld may be square groove or single vee groove. Grind smooth.
- ⑦ At Contractor's option, adhesive anchors may be used. Adhesive anchors must be 5/8" Dia ASTM A307 Grade A fully threaded rods. Minimum adhesive anchor embedment depth is 5" into slabs or culverts without curbs. See "Material Notes" for adhesive anchor requirements.
- ⑧ At Contractor's option, adhesive anchors may be used. Adhesive anchors must be 5/8" Dia ASTM A307 Grade A fully threaded rods. Minimum adhesive anchor embedment depth is 7" into wingwalls or culverts with curbs. See "Material Notes" for adhesive anchor requirements.
- ⑨ Culverts without curbs for cast-in-place anchor bolts require a 10" Min slab thickness. Culverts with curbs for cast-in-place anchor bolts require a curb plus slab thickness of 10" Min. Adhesive anchors may be used with a 7" Min slab thickness or culverts with curbs.

SHEET 1 OF 2

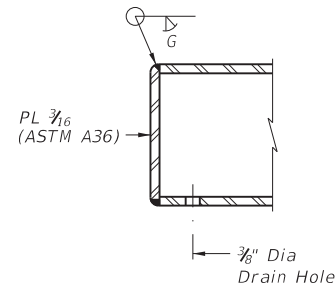
		Bridge Division Standard	
<h1>PEDESTRIAN RAIL</h1>			
<h2>TYPE PR11</h2>			
FILE: r1std028-19.dgn	DN: TAR	CK: TBE	DW: JTR
©TxDOT September 2019	CONT SECT	JOB	HIGHWAY
REVISIONS	6372 50	001	VAR.
DIST	COUNTY	SHEET NO.	
SAT	BEXAR	318	

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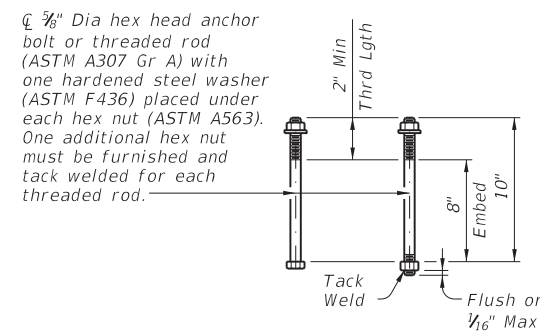
DATE:
FILE:



AT SPLICES OR EXP JTS SECTION B-B
PIPE SPLICE DETAIL



RAIL CAP DETAIL



CAST-IN-PLACE & FORMED HOLE ANCHOR BOLT OPTIONS

- ④ HSS 3.500 x 0.216 (Rail Member)
- ⑤ HSS 2.375 x 0.154 (Rail Member)
- ⑩ HSS 2.875 x 0.203 (Sleeve Member)
- ⑪ HSS 1.900 x 0.145 (Sleeve Member)

CONSTRUCTION NOTES:

Panel lengths of railing must be attached to a minimum of three posts except at abutment wingwalls.
At the Contractor's option anchor bolts may be an adhesive anchorage system. See "Material Notes".
Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.
Face of rail and posts must be vertical transversely unless otherwise approved. Posts must be perpendicular to adjacent roadway grade. Use Type VIII epoxy mortar under post base plates if gaps larger than 1/16" exist.
For curved railing applications, fabricate the HSS rail to the radius when the radius is 600' or less. Submit shop drawings for approval when tubes are required to be fabricated to a radius. Shop drawings must be submitted to the Engineer for approval.
Round or chamfer all exposed edges of steel components 1/16" by grinding prior to galvanizing.

MATERIAL NOTES:

Provide ASTM A500 Gr B, A1085 or A53 Gr B for all HSS.
Galvanize all metal components of steel rail system. Apply additional coatings when shown elsewhere on the plans. When plans require paint over galvanizing, follow the requirements for painting galvanized steel in Item 445, "Galvanizing" and when field painting, Item 446, "Field Cleaning and Painting Steel". Sleeve members and anchor bolts must receive galvanization prior to installation and only field paint after installation unless directed otherwise by Engineer.
Anchor bolts must be 3/8" Dia ASTM A307 Gr A with one hardened steel washer (ASTM F436) placed under each hex nut or ASTM A307 Gr A threaded rods with one tack welded hex nut each and with one hex nut with one hardened steel washer (ASTM F436) each. Nuts must conform to ASTM A563 requirements.
Optional adhesive anchorage system must be 3/8" Dia ASTM A307 Gr A fully threaded rods with one hex nut and one hardened steel washer (ASTM F436). Nuts must conform to ASTM A563 requirements. Embed fully threaded rods into slab, wingwalls, or culvert curbs using a Type III, Class C, D, E, or F anchor adhesive. Anchor adhesive chosen must be able to achieve a nominal bond strength in tension, Na, of a single anchor of 10 kips (edge distance must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".

GENERAL NOTES:

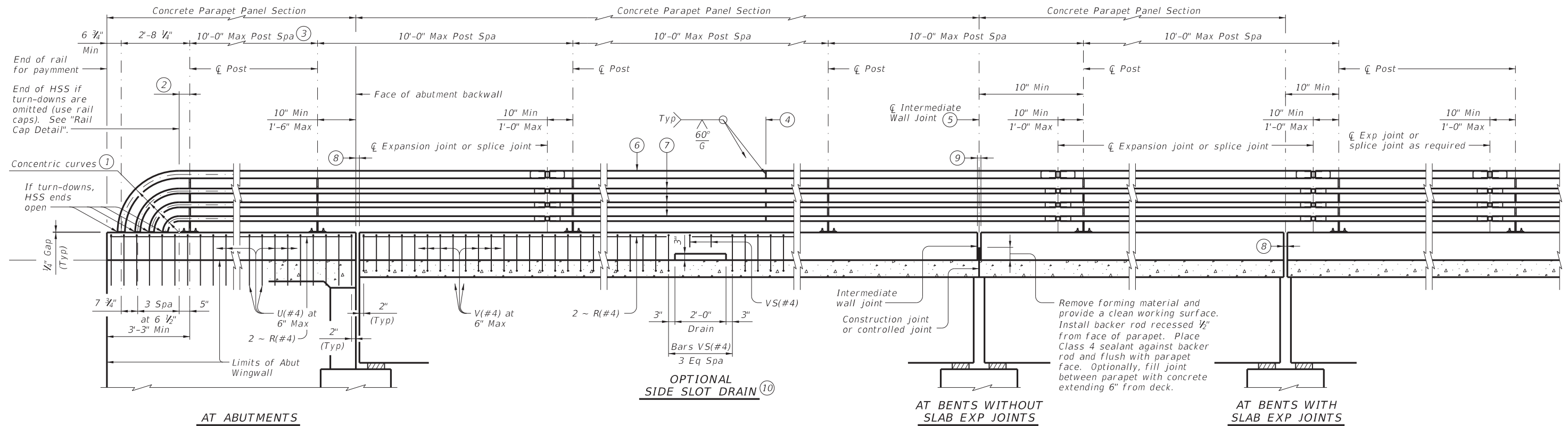
Designed according to AASHTO LRFD Specifications.
Do not use this railing on bridges with expansion joints providing more than 5" movement.
Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.
For all rails, submit erection drawings showing section lengths, splice locations, rail post spacing and anchor bolt setting for approval. Average weight of railing is 30 plf.

SHEET 2 OF 2

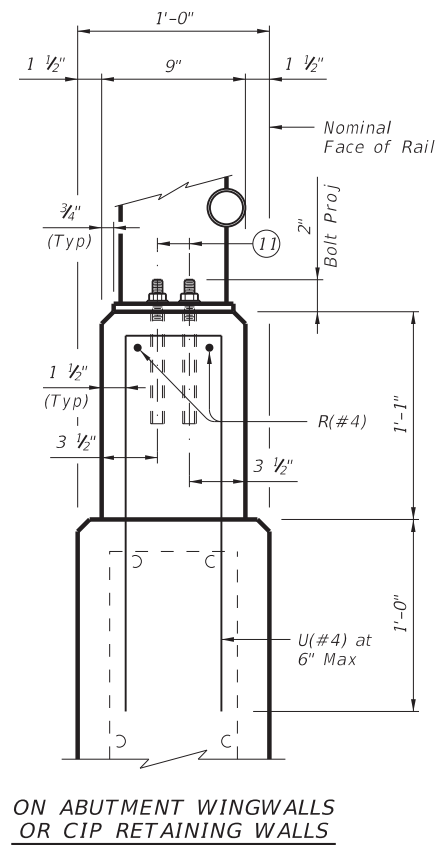
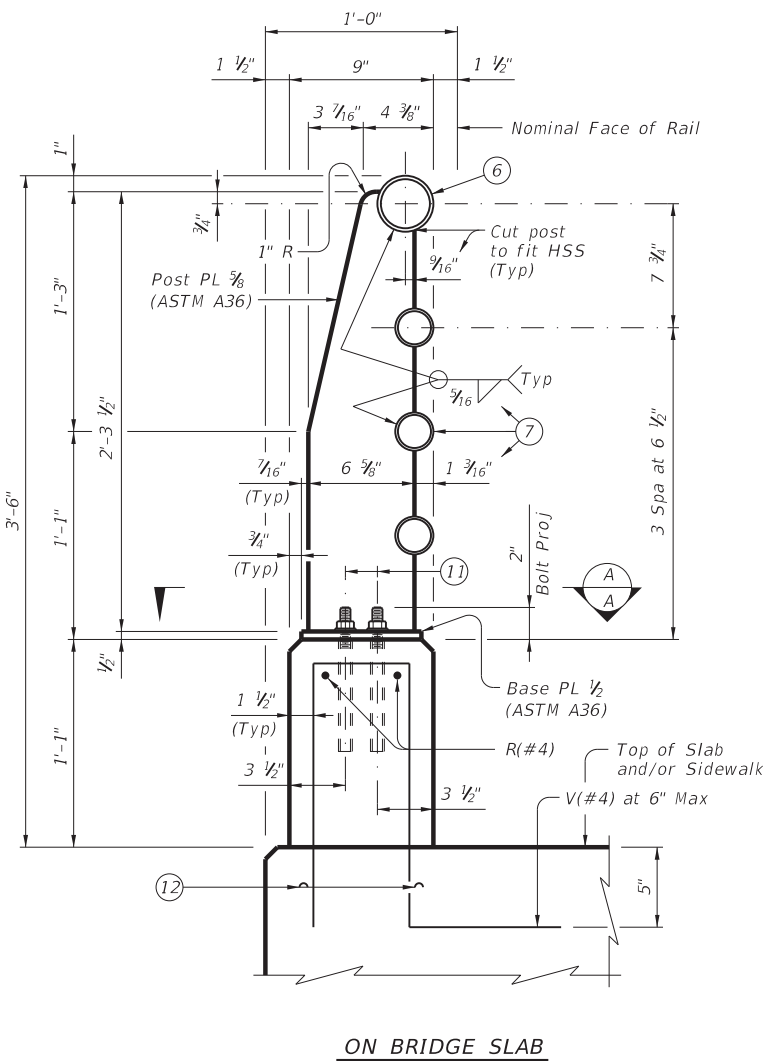
		Bridge Division Standard	
<h1>PEDESTRIAN RAIL</h1>			
<h2>TYPE PR11</h2>			
FILE: r1std028-19.dgn	DN: TAR	CK: TBE	DW: JTR
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REVISIONS	COUNTY: BEXAR		SHEET NO.: 319

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DATE: FILE:

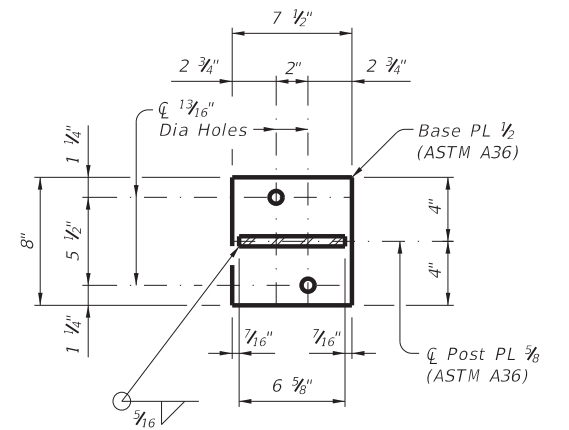


ROADWAY ELEVATION OF RAIL



SECTIONS THRU RAIL

- ① Portion of railing with turn-downs to be used or omitted as indicated on Bridge Layout.
- ② 10" Min ~ 1'-6" Max if turn-downs are omitted.
- ③ Min of 2 posts required on wingwall.
- ④ One shop splice per panel is permitted (with minimum 85 percent penetration). The weld may be square groove or single vee groove. Grind smooth.
- ⑤ Provide at all interior bents without slab expansion joints.
- ⑥ HSS 3.500 x 0.216 (Rail Member)
- ⑦ HSS 2.375 x 0.154 (Rail Member)
- ⑧ Same as slab joint opening. (5" Max Expansion Joint)
- ⑨ Opening 1/4" Min, 3/4" Max.
- ⑩ Drains may be used where shown elsewhere on the plans or as directed by the Engineer. Do not place drains over railroad tracks, lower roadways, or sidewalks. When side slot drains are used, provide 3'-0" Min clear spacing between drains slots and ϕ bents or joint locations with a 8'-0" Min clear spacing between drain slots.
- ⑪ ϕ anchor bolts. See "Material Notes" for anchor bolt information.
- ⑫ Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.



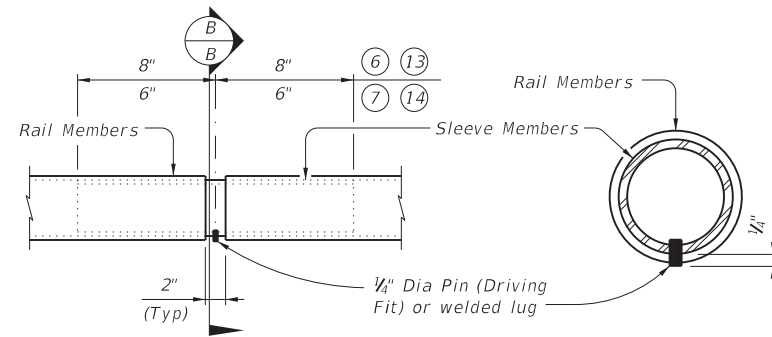
SECTION A-A
Showing base plate detail.

SHEET 1 OF 2

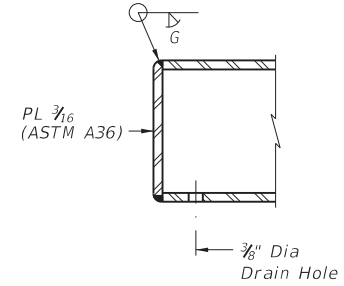
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<h2>TYPE PR22</h2>			
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REVISIONS	6372 50	001	VAR.
DIST	COUNTY	SHEET NO.	
SAT	BEXAR	320	

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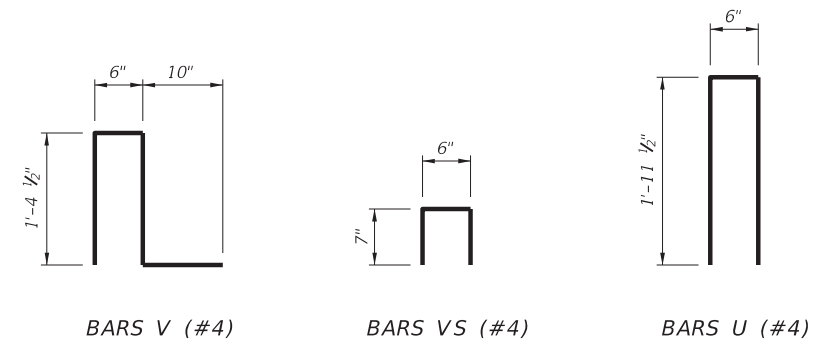


AT SPLICES OR EXP JTS
PIPE SPLICE DETAIL

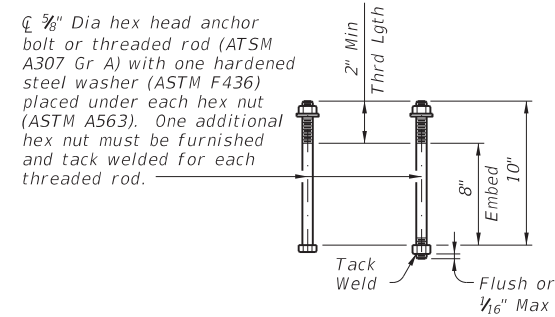


RAIL CAP DETAIL

- ⑥ HSS 3.500 x 0.216 (Rail Member)
- ⑦ HSS 2.375 x 0.154 (Rail Member)
- ⑬ HSS 2.875 x 0.203 (Sleeve Member)
- ⑭ HSS 1.900 x 0.145 (Sleeve Member)



BARS V (#4) BARS VS (#4) BARS U (#4)



CAST-IN-PLACE ANCHOR BOLT OPTIONS

CONSTRUCTION NOTES:
 This rail may be slip-formed if approved by the Engineer when epoxy adhesive anchor bolts are used.
 Slip-forming parapet is not allowed if anchor bolts are cast with parapet wall.
 If rail is slip-formed, apply a heavy epoxy bead 1" behind toe of traffic side of rail to concrete deck just prior to slip forming. Provide a 3/8" width x 1/4" tall heavy epoxy bead with Type III, Class C or a Type V epoxy.
 At the Contractor's option anchor bolts may be cast with the parapet. See "Material Notes".
 Panel lengths of railing must be attached to a minimum of three posts except on abutment wingwalls.
 Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.
 Face of rail, posts and parapet must be vertical transversely unless otherwise approved. Rail posts must be perpendicular to top of adjacent concrete parapet grade. Use Type VIII epoxy mortar under post base plates if gaps larger than 1/16" exist.
 For curved railing applications, fabricate the HSS rail to the radius when the radius is 60' or less. Submit shop drawings for approval when tubes are required to be fabricated to a radius. Shop drawings must be submitted to the Engineer for approval.
 Round or chamfer all exposed edges of steel components 1/16" by grinding prior to galvanizing.
 Chamfer all exposed concrete corners.

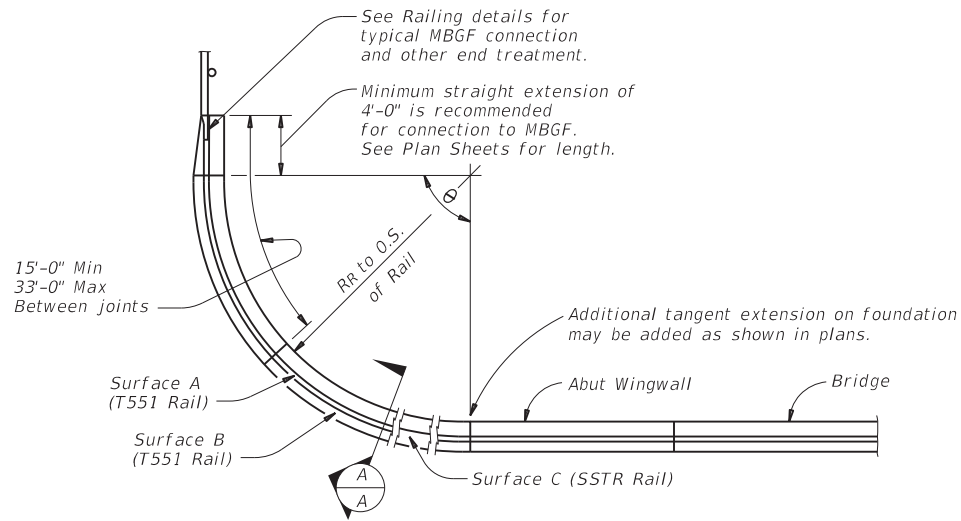
MATERIAL NOTES:
 Provide ASTM A500 Gr B, A1085 or A53 Gr B for all HSS.
 Galvanize all metal components of steel rail system. Apply additional coatings when shown elsewhere on the plans. When plans require paint over galvanizing, follow the requirements for painting galvanized steel in Item 445, "Galvanizing" and when field painting, Item 446, "Field Cleaning and Painting Steel". Sleeve members and anchor bolts must receive galvanization prior to installation and only field paint after installation unless directed otherwise by Engineer.
 Anchor bolts must be 5/8" Dia ASTM A307 Gr A fully threaded rods with one hex nut and one hardened steel washer (ASTM F436). Nuts must conform to ASTM A563 requirements. Embed fully threaded rods into parapet using a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 7". Anchor adhesive chosen must be able to achieve a nominal bond strength in tension of a single anchor, Na, 8.5 kips (edge distance must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".
 Optional cast-in-place anchor bolts must be 5/8" Dia ASTM A307 Gr A with one hardened steel washer (ASTM F436) placed under each hex nut or ASTM A307 Gr A threaded rods with one tack welded hex nut each and with one hex nut with one hardened steel washer (ASTM F436) each. Nuts must conform to ASTM A563 requirements.
 Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.
 Epoxy coat or galvanize all reinforcing if slab bars are epoxy coated or galvanized.
 Provide Grade 60 reinforcing steel.
 Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U, and V unless noted otherwise.
 Provide bar laps, where required, as follows:
 Uncoated or galvanized ~ #4 = 1'-7"
 Epoxy coated ~ #4 = 2'-5"

GENERAL NOTES:
 Designed according to AASHTO LRFD Specifications.
 Do not use this railing on bridges with expansion joints providing more than 5" movement.
 Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.
 For all rails, submit erection drawings showing section lengths, splice locations, rail post spacing and anchor bolt setting for approval.
 Average weight of railing: 146 plf ~ total
 122 plf ~ Conc (with no Overlay)
 24 plf ~ Steel

Cover dimensions are clear dimensions, unless noted otherwise.
 Reinforcing bar dimensions shown are out-to-out of bar.

		Bridge Division Standard	
PEDESTRIAN RAIL			
TYPE PR22			
FILE: r1std029-19.dgn	DN: TAR	CK: TBE	DW: JTR
©TxDOT September 2019	CONTRACT: 6372	SECTION: 50	JOB: 001
REVISIONS	DATE: SAT	COUNTY: BEXAR	SHEET NO: 321

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.



PLAN OF CURVED T551 OR SSTR RAILING AT BRIDGE ENDS

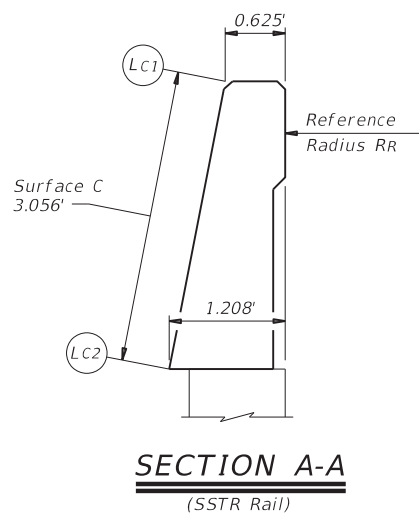
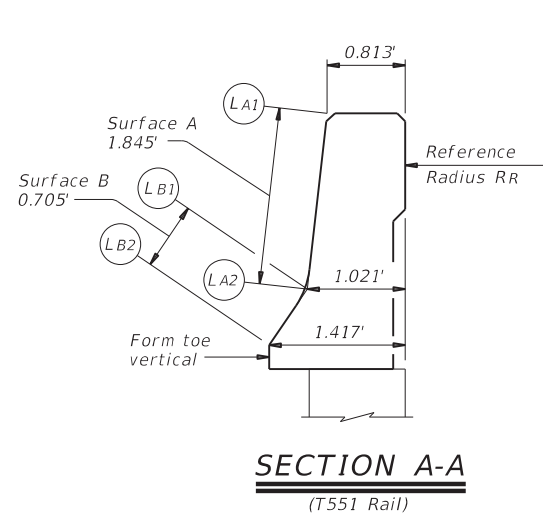
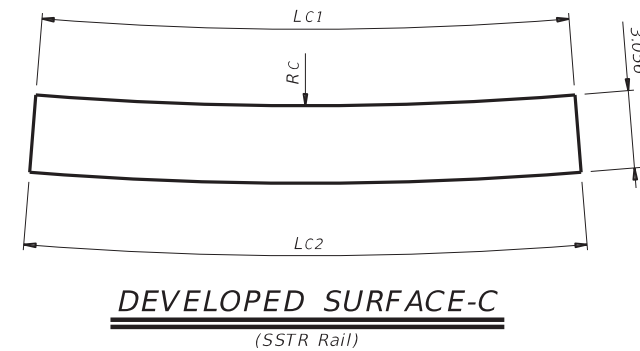
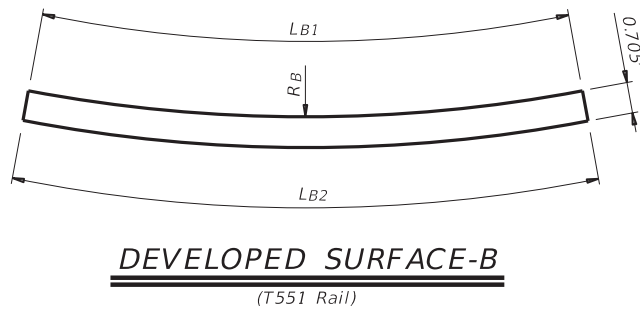
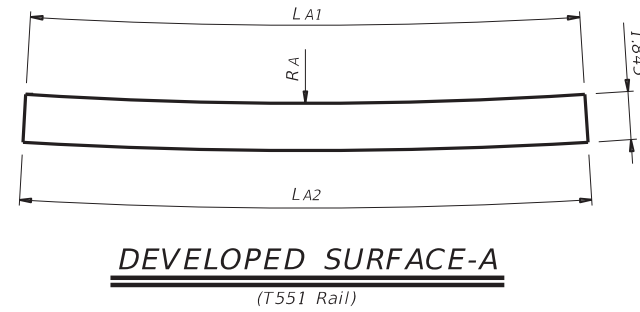


TABLE OF DEVELOPED SURFACES
DIMENSIONS FOR $\theta = 90^\circ$

Reference Radius RR (ft) to back of Rail	T551 RAIL						SSTR RAIL		
	Radius RA ft	Arc Length		Radius RB ft	Arc Length		Radius RC ft	Arc Length	
		LA1 ft	LA2 ft		LB1 ft	LB2 ft		LC1 ft	LC2 ft
10	95.76	16.99	17.31	19.63	17.31	17.93	55.66	16.69	17.61
15	140.04	24.84	25.17	28.54	25.17	25.79	81.86	24.54	25.46
20	184.32	32.69	33.02	37.44	33.02	33.64	108.05	32.40	33.31
25	228.60	40.55	40.87	46.35	40.87	41.50	134.25	40.25	41.17
30	272.88	48.40	48.73	55.25	48.73	49.35	160.44	48.11	49.02

$RA = 8.8560(RR + 0.813')$ $RB = 1.7811(RR + 1.021')$ $RC = 5.2389(RR + 0.625')$
 $LA1 = 1.5708(RR + 0.813')$ $LB1 = 1.5708(RR + 1.021')$ $LC1 = 1.5708(RR + 0.625')$
 $LA2 = 1.5708(RR + 1.021')$ $LB2 = 1.5708(RR + 1.417')$ $LC2 = 1.5708(RR + 1.208')$

The linear ratio may be used to obtain the above arc length dimensions for included θ angles other than 90° . The dimensions are intended as an aid in constructing forms for curved SSTR & Type T551 Railing.

Example: For $RR = 10'$ & $80^\circ \sim LA1 = 16.99(\theta/90)$

GENERAL NOTES:

See Railing standards for details not shown.
 The primary use of the curved railing detail is to avoid the necessity of curved MBGF at the ends of bridges adjacent to grade intersections.
 The associated bridge railing will be paid for by the linear foot which includes the concrete and reinforcement.

DESIGN GUIDANCE:

The use of curved rail sections at bridge ends must be appropriate for the speed and site conditions.

Bridge Division Standard

TRAFFIC RAIL
DEVELOPED SURFACES
FOR T551 & SSTR
BRIDGE RAILS

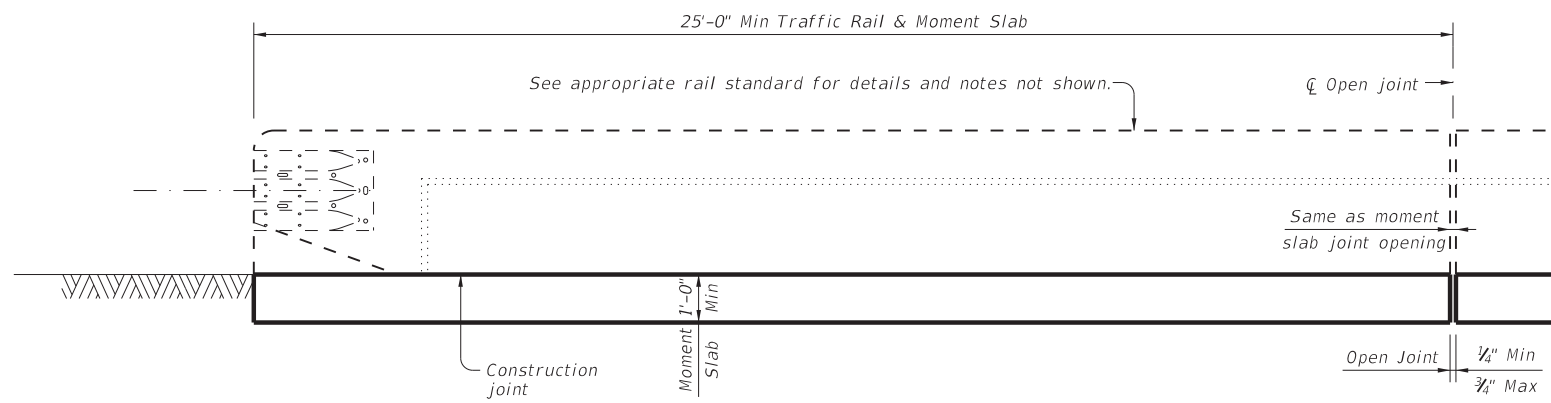
TRDS

FILE: r1std048-20.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT July 2020	CONT: 6372	SECT: 50	JOB: 001	HIGHWAY: VAR.
REVISIONS	DIST: SAT		COUNTY: BEXAR	SHEET NO: 322

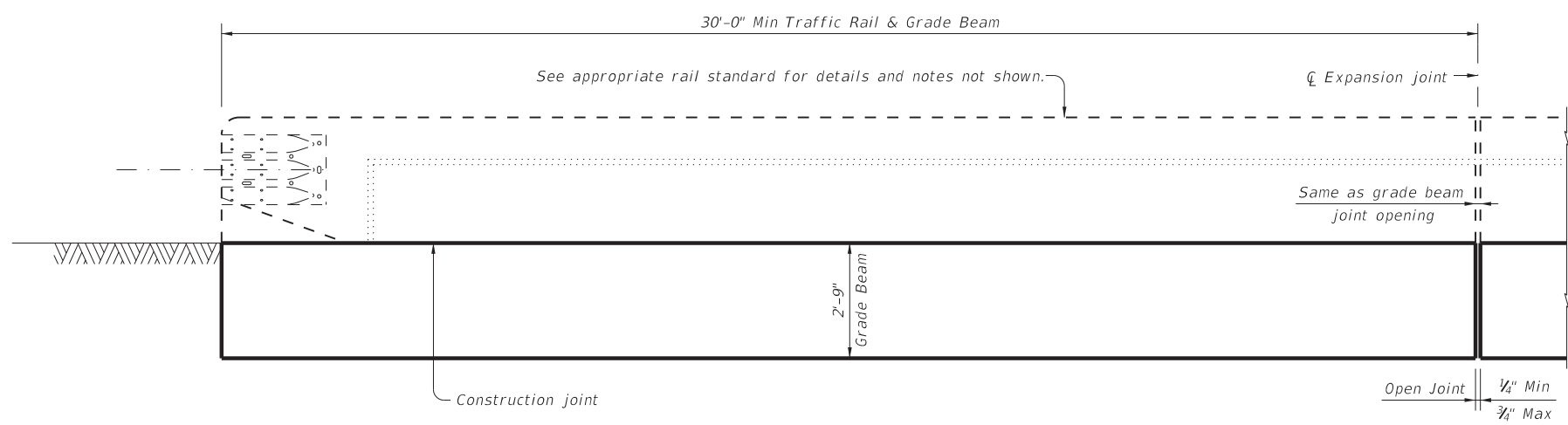
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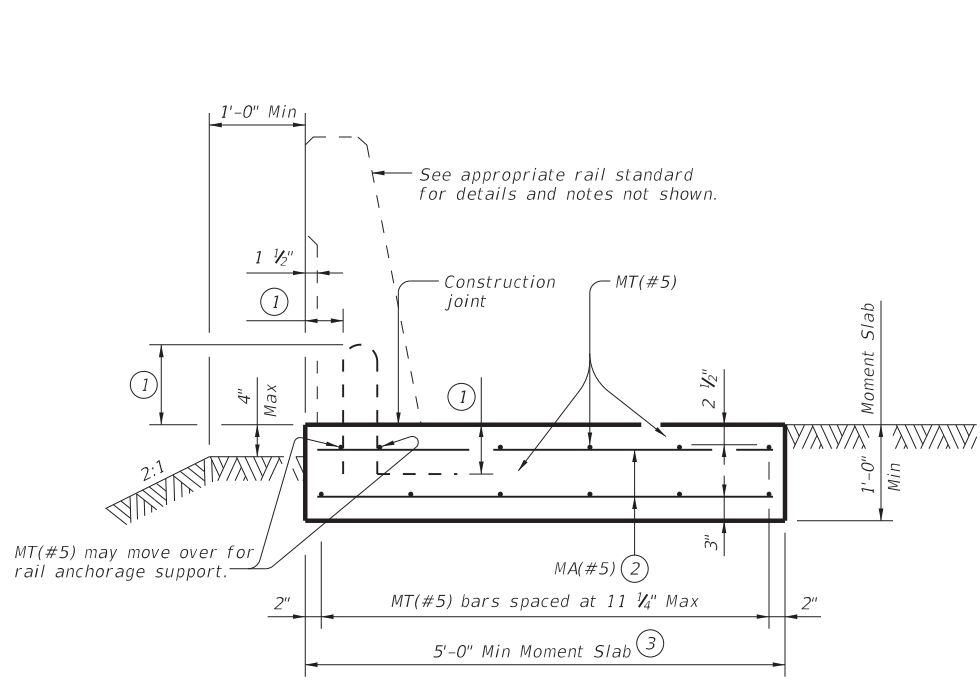
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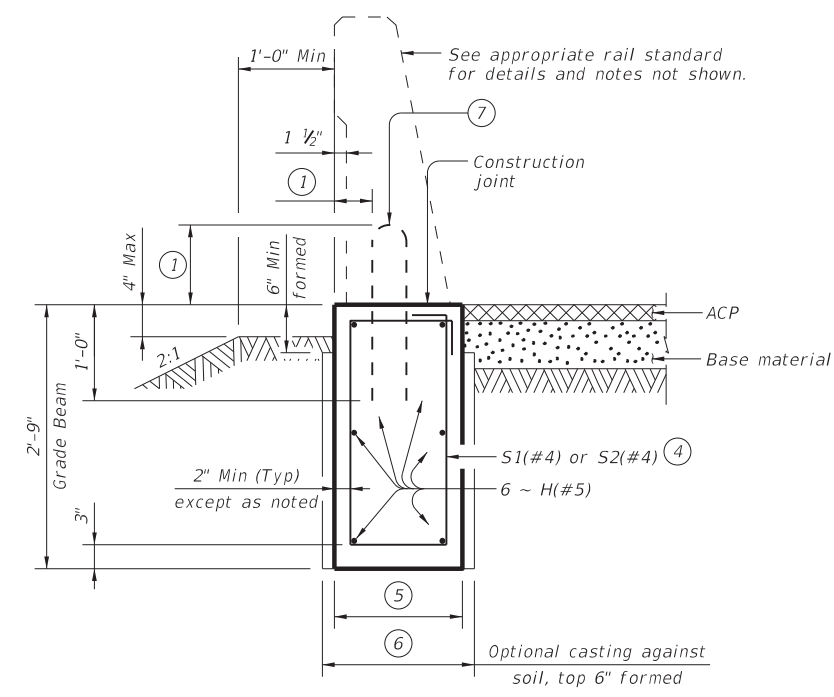
ROADWAY ELEVATION OF TRAFFIC RAIL ON MOMENT SLAB (TRF-MS)
 (Showing SSTR rail other rails are similar. Reinforcing not shown for clarity.)



ROADWAY ELEVATION OF TRAFFIC RAIL ON GRADE BEAM (TRF-GB)
 (Showing SSTR rail other rails are similar. Reinforcing not shown for clarity.)

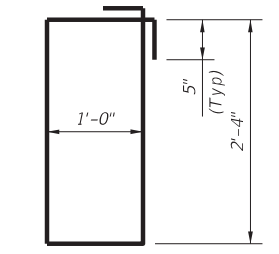


SECTION OF TRAFFIC RAIL ON MOMENT SLAB (TRF-MS)
 (Showing SSTR rail other rails are similar.)

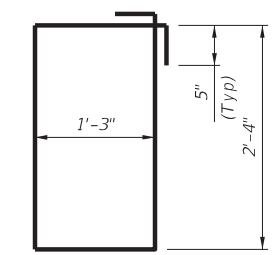


SECTION OF TRAFFIC RAIL ON GRADE BEAM (TRF-GB)
 (Showing SSTR rail other rails are similar.)

- ① See applicable bridge rail standard.
- ② MA(#5) space longitudinally along moment slab at 12" Max. (Spaced 2 1/2" longitudinally from outside edge of moment slab).
- ③ Approximate moment slab concrete = 0.19 CY/LF and reinforcement = 22.4 LB/LF.
- ④ S1(#4) or S2(#4) spaced longitudinally along grade beam at 8" Max. (Spaced 2 1/2" longitudinally from outside edge of grade beam).
- ⑤ Use bar S1(#4) with 1'-4" grade beam width and bridge rail types: All rails except for T224, C412, T66, C66, T80HT and T80SS. Approximate grade beam concrete = 0.14 CY/LF and reinforcement = 13.8 LB/LF. Use bar S2(#4) with 1'-7" grade beam width and bridge rail types: T66 and C66. Approximate grade beam concrete = 0.16 CY/LF and reinforcement = 14.2 LB/LF.
- ⑥ 1'-6" for bridge rail types: All rails except for T224, C412, T66, C66, T80HT and T80SS. 1'-9" bridge rail types: T66 and C66.
- ⑦ Modify reinforcing on standard bridge rail anchorage if necessary by extending rail anchorage 12" Min, vertically into traffic rail



BARS S1(#4)



BARS S2(#4)

CONSTRUCTION NOTES:
 Align moment slab (TRF-MS) or grade beam (TRF-GB) open joints with rail open joints maintaining no less than minimum rail length. Provide moment slab (TRF-MS) or grade beam (TRF-GB) with open joints at no greater than 100' spacing unless otherwise shown on the plans or approved by the Engineer.

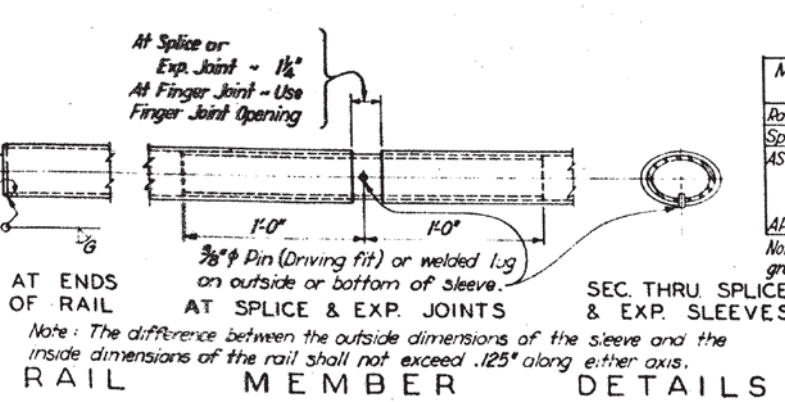
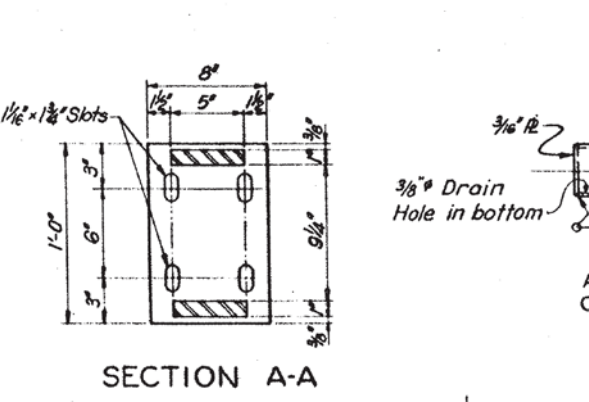
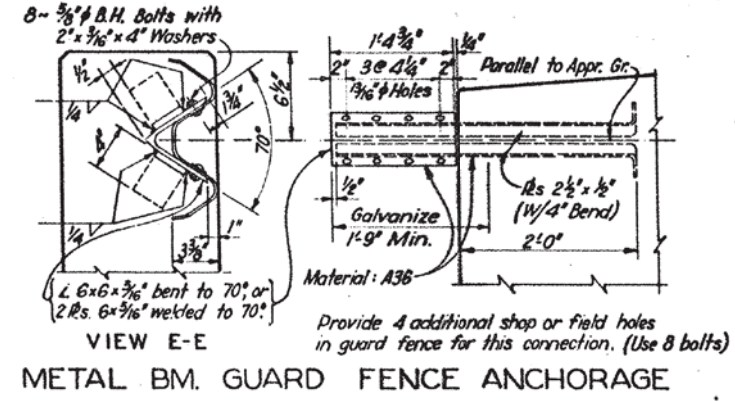
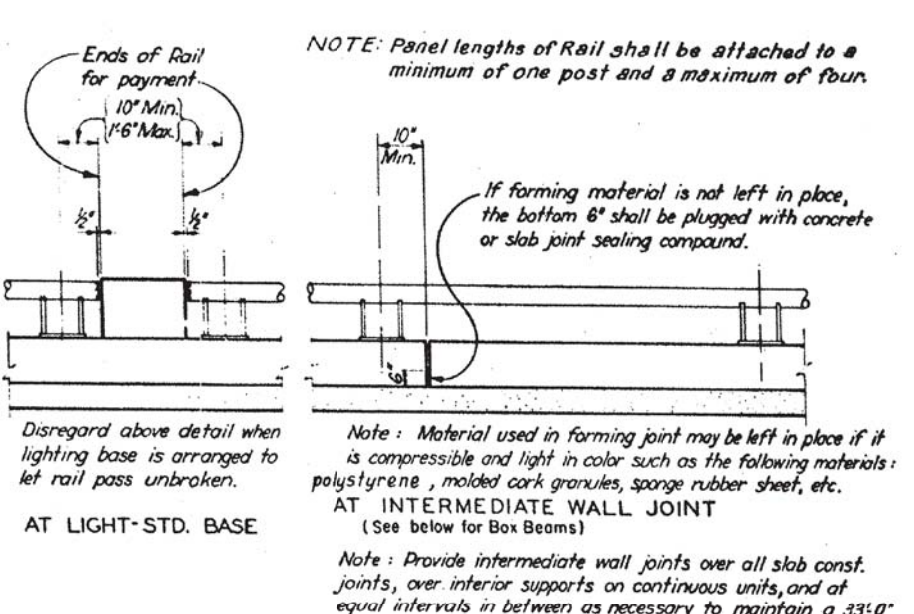
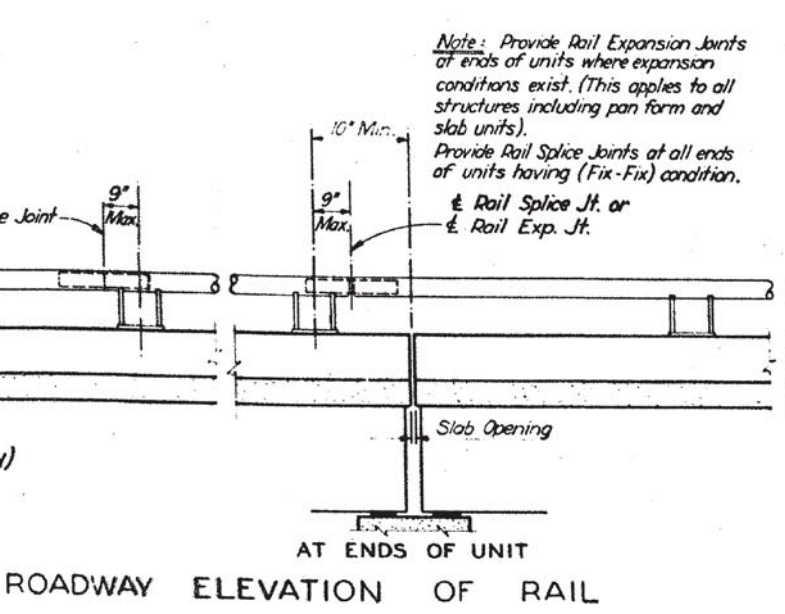
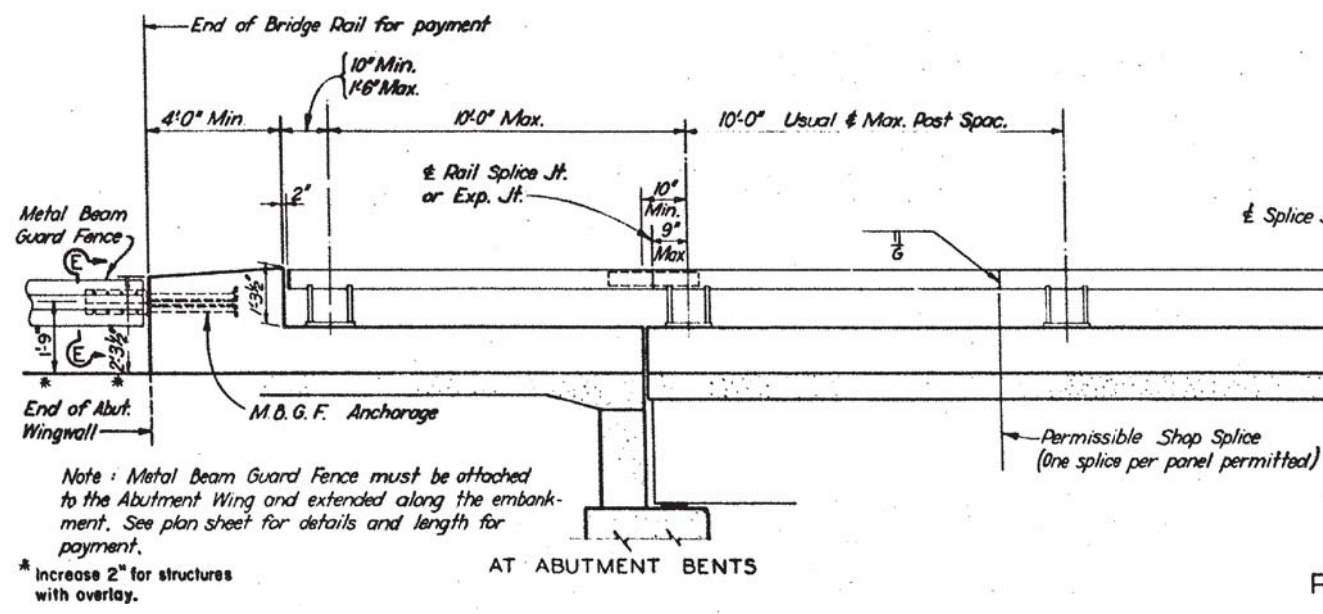
MATERIAL NOTES:
 Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere. Provide Grade 60 reinforcing steel. Epoxy coat or galvanize all reinforcing steel if required elsewhere. Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for bars S1(#4), S2(#4) and H(#5) unless noted otherwise. Provide the same laps as required for reinforcing bars. Provide bar laps, where required, as follows:
 Uncoated or galvanized ~ #5 = 2'-4"
 Epoxy coated ~ #5 = 3'-6"

GENERAL NOTES:
 Use of these details will result in a moment slab (TRF-MS) or grade beam (TRF-GB) foundation that is acceptable for traffic rails which are MASH TL-2, TL-3, or TL-4 compliant. See elsewhere in the plans for selected options between moment slab (TRF-MS) and/or grade beam (TRF-GB). The foundation design resistance is based on the current AASHTO bridge railing requirements with the assumption of fair to good soil support conditions. Poor soil conditions will require suitably deeper and/or wider foundations. See appropriate rail standard for details and notes not shown. This detail is intended for use as a guide to unusual railing anchorage situations but may be included in the plans, modified as necessary to apply to specific installations required on the project. Payment for moment slab (TRF-MS) and/or grade beam (TRF-GB) will be by Class "C" concrete or Class "C" (HPC) concrete for rail foundations. The associated bridge railing will be paid for by the linear foot which includes the concrete and reinforcement. Excavation will be subsidiary to other items.

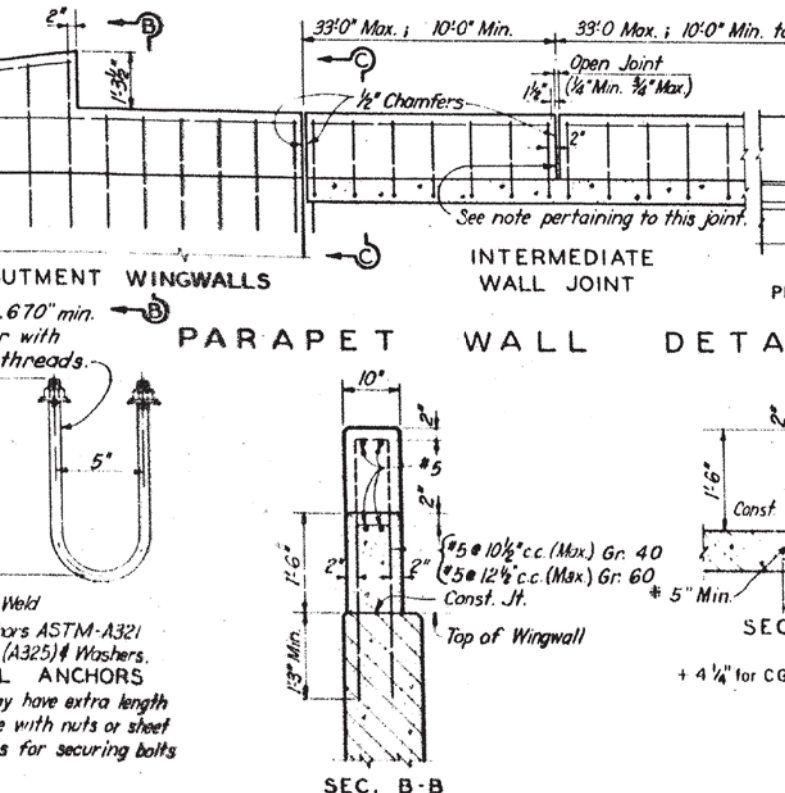
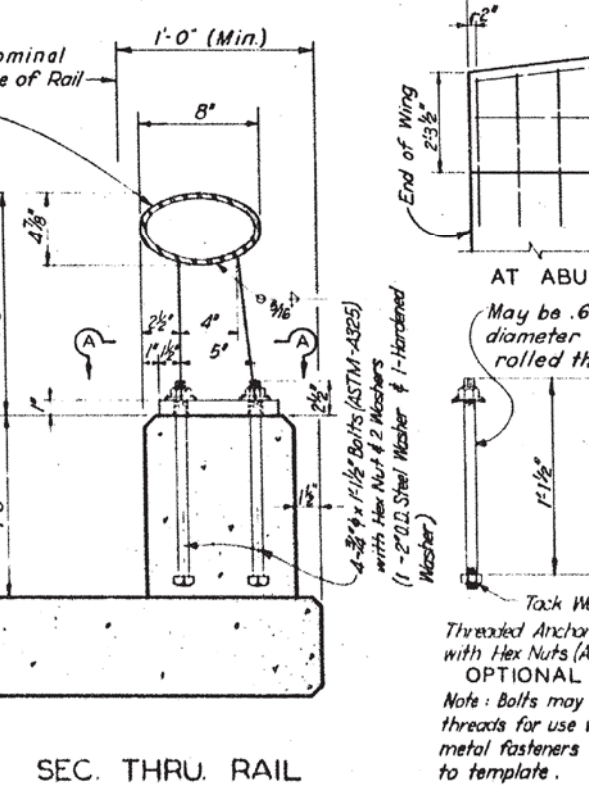
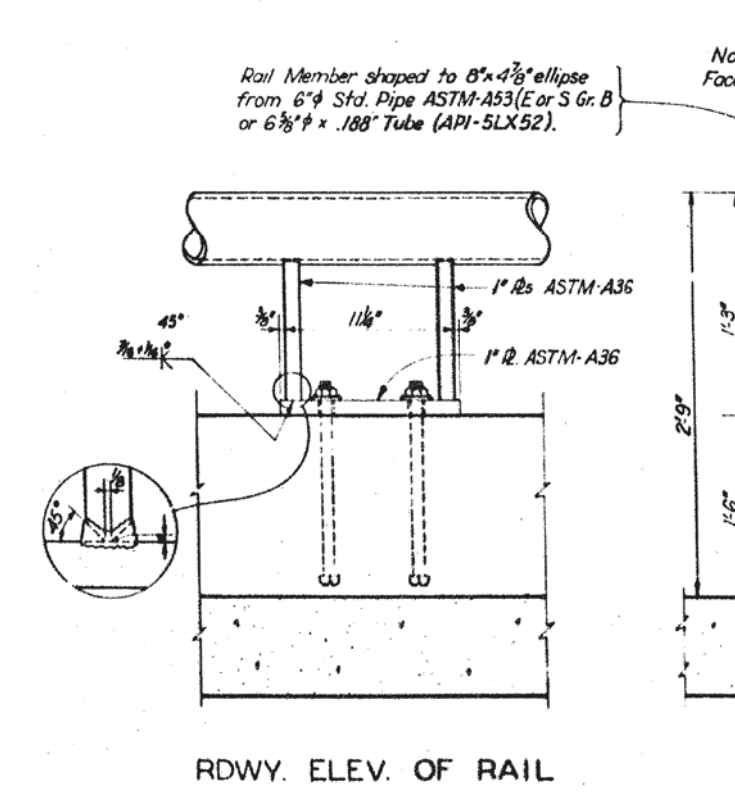
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.

		Bridge Division Standard	
TRAFFIC RAIL FOUNDATIONS FOR MASH TL-2, TL-3 & TL-4 BRIDGE RAILS			
TRF			
FILE: r1std027-20.dgn	DN: TxDOT	CK: TAR	DW: JTR
©TxDOT September 2019	CONV: 6372	SECT: 50	JOB: 001
REVISIONS	07-20: Added moment slab with rail foundation lengths.		HIGHWAY: VAR.
DIST: SAT	COUNTY: BEXAR	SHEET NO: 323	

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GENERAL NOTES:
 Designed according to AASHTO 1977 Standard and current Interim Specifications.
 All open ends of the rail shall be capped.
 The face of concrete railing shall be vertical unless otherwise shown in plans. Rail posts shall be perpendicular to top of concrete. Grout may be under base plates if necessary.
 Anchor bolts shall be 3/4" Dia. ASTM A325 Bolts for A321 threaded rods with tack welded nuts. Threaded rods may be 0.670" min. dia. with rolled threads. Each bolt shall have a hardened steel washer and a 2" plain steel washer. Nuts shall conform to A563 requirements and shall be tapped after galvanizing. Bolts and nuts shall have Class 2A and 2B fit tolerances.
 For railing not requiring shop drawings, erection drawings showing panel lengths, rail post spacing and anchor bolt setting shall be submitted to the Resident Engineer for approval. If railing requires shop and erection drawings, these drawings shall be submitted to the Bridge Engineer for approval.
 Shop drawings may be submitted as 11" X 18" prints provided they are clearly legible.
 All steel components except reinforcing shall be galvanized unless otherwise shown in plans.



RAILS ON HORIZONTAL CURVES		
Rad. to face of rail	Max. Chord Lgth.	Fabrication
Over 1910'	20'-0"	Furnish in straight rail panels
Over 950' - 1910'	10'-0"	
Over 300' - 950'	10'-0"	Bevel weld or bend chord sections of rail member & sleeves or fabricate to the required radius
Thru 300'	0	Fabricate to the required radius

FOR CONTRACTOR'S INFORMATION ONLY.

Threaded Anchors ASTM-A321 with Hex Nuts (A325) & Washers. OPTIONAL ANCHORS
 Note: Bolts may have extra length threads for use with nuts or sheet metal fasteners for securing bolts to template.

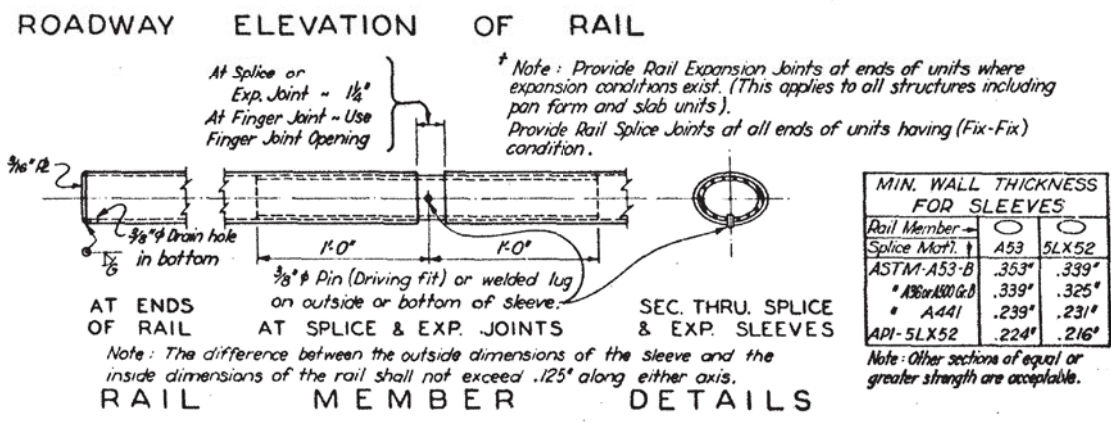
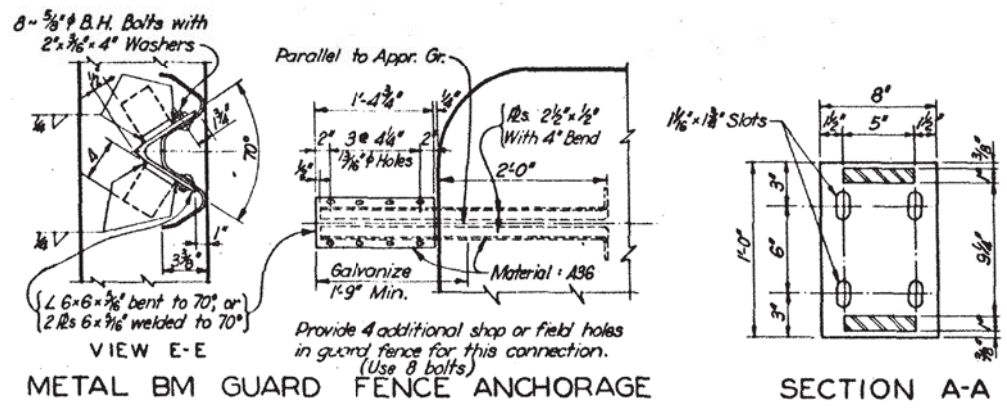
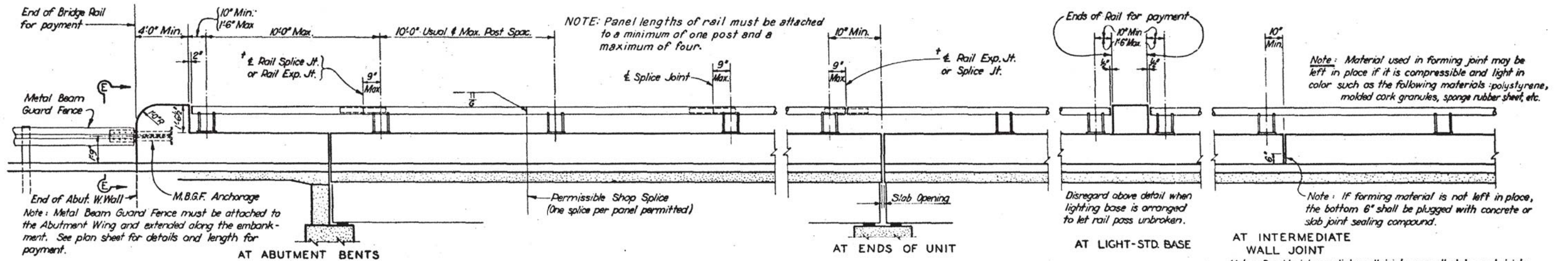
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VARIOUS TRAFFIC RAIL TYPE T4

SHEET 01 OF 01

FED. DIV. NO.	PROJECT NUMBER	SHEET NO.	
6	RMC 6372-50-001	324	
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR.

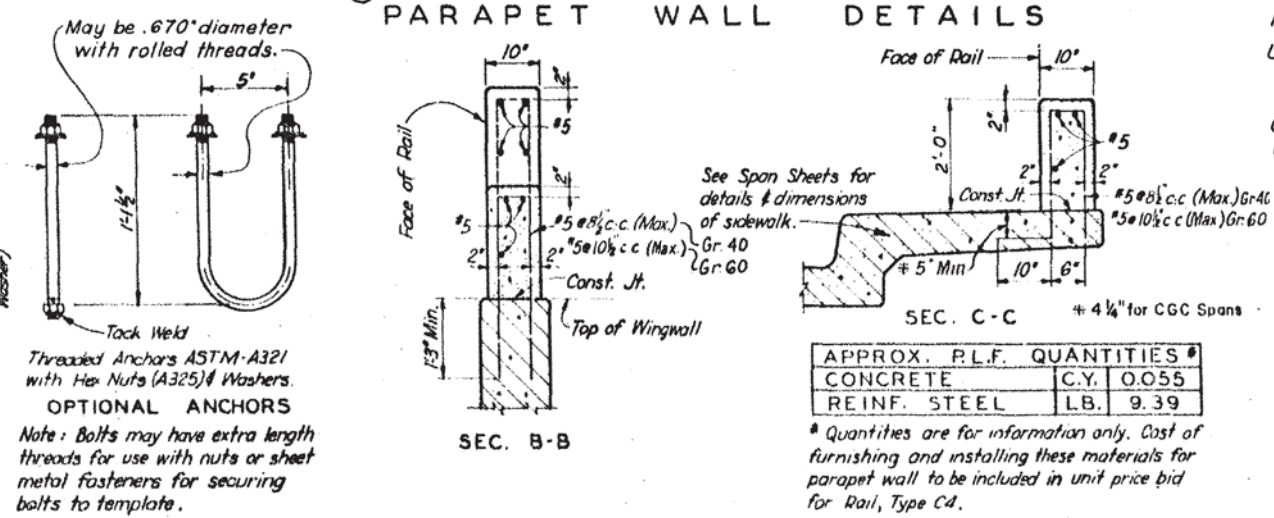
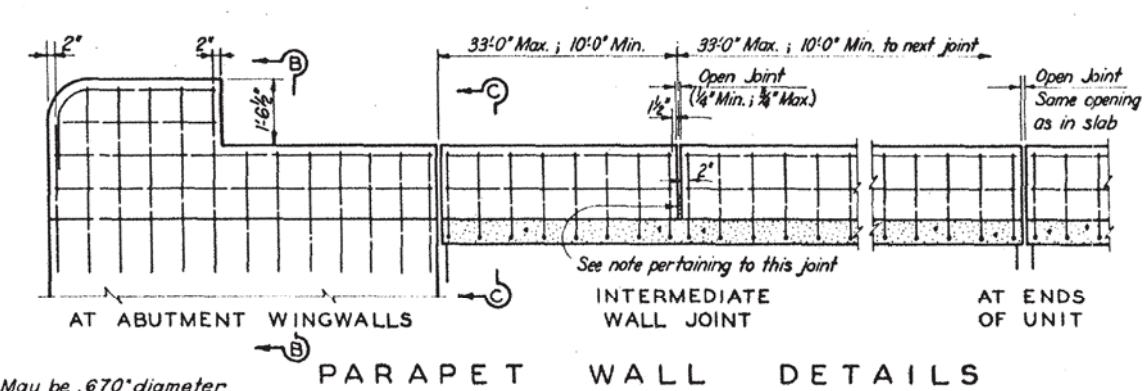
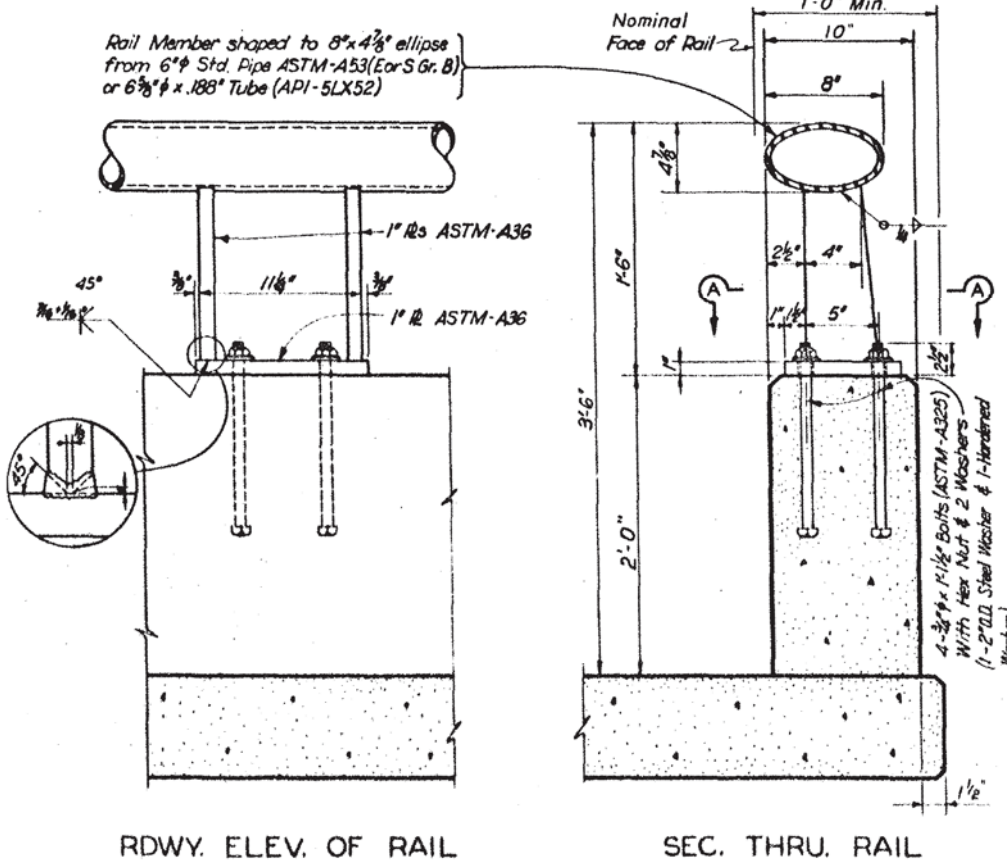
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RAILS ON HORIZONTAL CURVES

Rad. to face of rail	Max. Chord Lgth.	Fabrication
Over 1910'	20'0"	Furnish in straight rail panels
Over 950' - 1910'	10'0"	Bevel weld or bend chord sections of rail member & sleeves or fabricate to the req'd. rad.
Over 300' - 950'	10'0"	Bevel weld or bend chord sections of rail member & sleeves or fabricate to the req'd. rad.
Thru. 300'	0	Fabricate to the required radius

Shop drawings will not be required.



GENERAL NOTES:
 Designed according to A.A.S.H.T.O. 1977 Standard and current Interim Specifications.
 All open ends of rail shall be capped.
 The face of concrete railing shall be vertical unless otherwise shown in plans. Rail posts shall be perpendicular to top of concrete. Grout may be used under base plates if necessary.
 Nuts shall conform to A563 requirements and shall be tapped after galvanizing. Bolts and nuts shall have Class 2A and 2B fit tolerances.
 All steel components except reinforcing shall be galvanized unless otherwise shown in plans.
 For railing not requiring shop drawings, erection drawings showing panel lengths, rail post spacing and anchor bolt setting shall be submitted to the Resident Engineer for approval. If railing requires shop and erection drawings, these drawings shall be submitted to the Bridge Engineer for approval. Shop drawings may be submitted as 11" x 18" prints provided they are clearly legible.
 Unit bid price for Rail Type C4 includes: Concrete Parapet Wall and Wing Terminal Wall, Metal Railing, Posts, Connectors, Anchor Bolts and M.B.G.F. Anchorage. Concrete for parapet wall shall be Class C. Chamfer all exposed corners 3/4" unless otherwise shown.

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VARIOUS COMBINATION RAIL TYPE C4

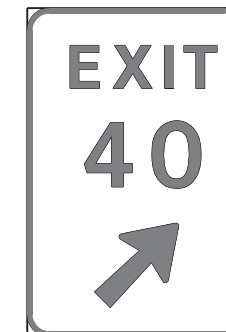
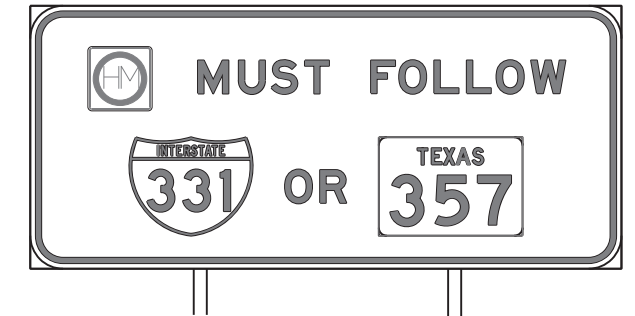
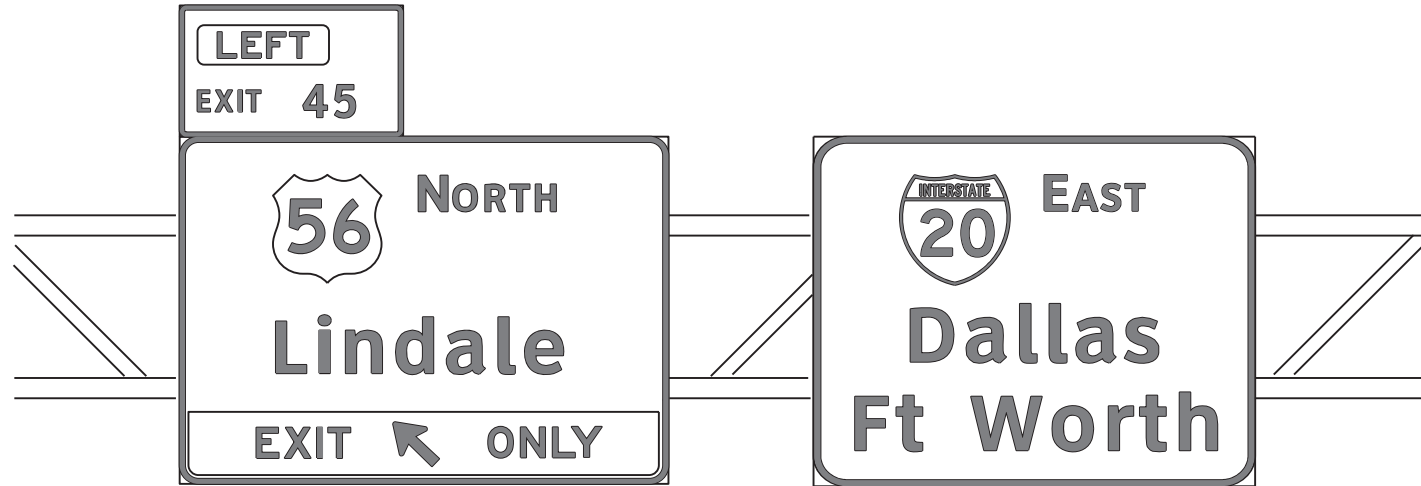
SHEET 01 OF 01

FED. DIV. NO.	PROJECT NUMBER	SHEET NO.	
6	RMC 6372-50-001	326	
STATE	DIST.	COUNTY	
TEXAS	SAT	BEXAR	
CONT.	SECT.	JOB	HIGHWAY NO.
6372	50	001	VAR.

FOR CONTRACTORS INFORMATION ONLY.

REQUIREMENTS FOR OVERHEAD AND LARGE GROUND-MOUNTED SIGNS

TYPICAL EXAMPLES



GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign summary sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Black legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod, or F). White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white FHWA lettering, when not specified in the SHSD or in the plans.

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

3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be cut-out white sheeting applied to colored background sheeting.
6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius need not be trimmed or rounded if fabricated from an extruded material.
7. Sign substrate for ground-mounted signs shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative. Sign substrate for overhead signs shall be any material that meets DMS-7110. Exit Number Panels attached above the parent sign shall be made with the same substrate and sheeting as the parent sign.
8. Mounting details of attachments to parent sign face are shown on Standard Plan Sheet TSR(5). Mounting details of exit number panels above parent sign are shown in the "SMD series" Standard Plan Sheets.
9. Background sheeting shall be applied to the substrate per sheeting manufacturer's recommendations. Sheeting will not be allowed to bridge the horizontal gap between panels.
10. Cut all legend, symbols, borders, and direct applied sign attachments at panel joints.

DEPARTMENTAL MATERIAL SPECIFICATIONS

ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

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

<http://www.txdot.gov/>

SHEETING REQUIREMENTS

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

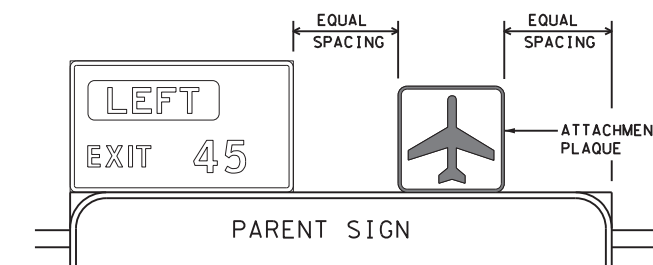
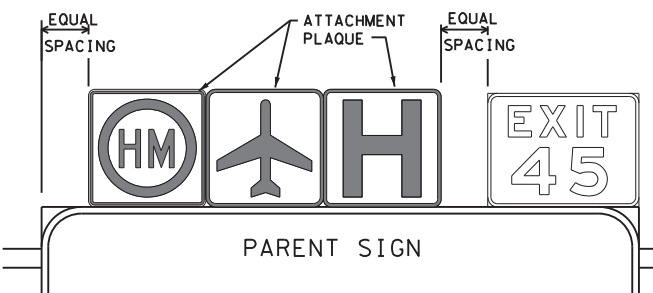
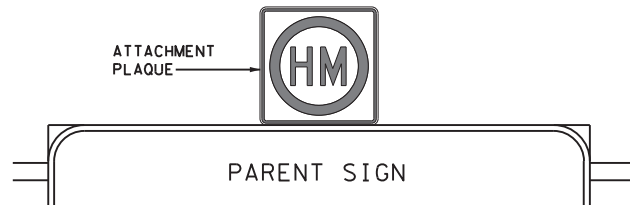
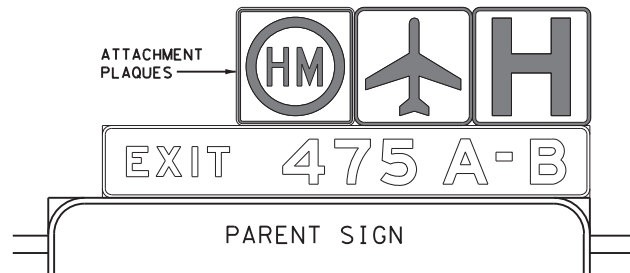
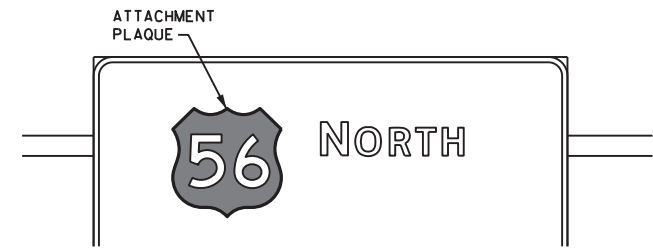
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DATE: FILE:

				Traffic Operations Division Standard	
<h2>TYPICAL SIGN REQUIREMENTS</h2> <h3>TSR(1) - 13</h3>					
FILE:	fsl1-13.dgn	DN:	TxDOT	CK:	TxDOT
©TxDOT	October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS		6372	50	001	VAR.
12-03	7-13	DIST	COUNTY	SHEET NO.	
9-08		SAT	BEXAR	327	

REQUIREMENTS FOR ATTACHMENTS TO OVERHEAD AND LARGE GROUND MOUNTED SIGNS

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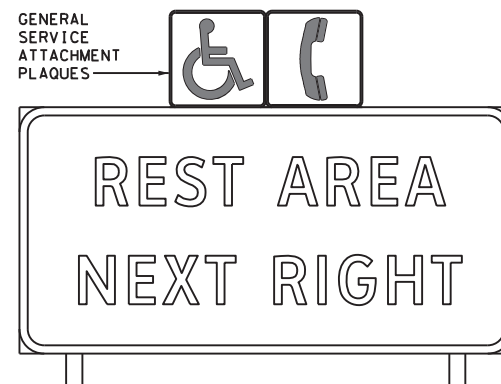
TYPICAL EXAMPLES

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

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

GENERAL NOTES

- Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
- Route Marker legends (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod, or F).
- Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
- Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
- White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
- Colored legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to white background sheeting, or combination thereof.
- Route markers and other attachments within the parent sign face shall be direct applied unless otherwise specified in the plans. Attachments not direct applied shall use 0.063 inch thick one piece sheet aluminum signs (Type A).
- General Service Plaques shall be 0.080 inch thick and Routing Plaques shall be 0.100 inch thick.
- The priority for Routing Plaques shall be (left to right) Hazardous Material, Airport then Hospital. See examples for mounting location.
- Mounting details of attachments to parent signs face are shown on Standard Plan Sheet TSR(5). Mounting details of sign plaque attachments above and below parent sign are shown in the "SMD series" Standard Plan Sheets.
- Plaques shall be horizontally centered at the top of the parent sign. If an exit number panel exists, the plaque shall be centered between the edge of the parent sign and the edge of the exit number panel. The plaque may be placed above the exit number panel when there is insufficient space.



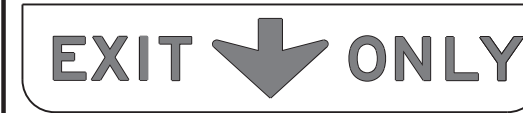
REQUIREMENTS FOR EXIT ONLY AND LEFT EXIT PANELS

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

SHEETING REQUIREMENTS FOR OVERHEAD EXIT PANELS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLUORESCENT YELLOW	TYPE B _{FL} OR C _{FL} SHEETING
LEGEND	BLACK	ACRYLIC NON-REFLECTIVE FILM

GENERAL NOTES

- Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD). Individual panel sizes shown in the plans may be adjusted to fit actual parent sign sizes if necessary.
- Exit Panel legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets E Series.
- Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
- Black legend shall be applied by screening process or cut-out acrylic non-reflective black film to yellow background sheeting, or combination thereof.
- Exit Only and Left Exit panels within the parent sign face shall be direct applied unless otherwise specified in the plans. Panels not direct applied shall use 0.063 inch thick one piece sheet aluminum signs (Type A).
- Mounting details of Exit Only and Left Exit panel attachments to parent signs face are shown on Standard Plan Sheet TSR(5).



TYPICAL EXAMPLES

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

<http://www.txdot.gov/>

DATE:
FILE:

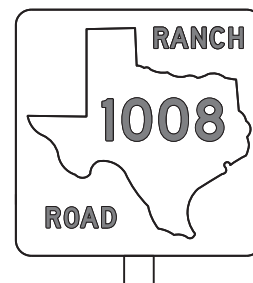
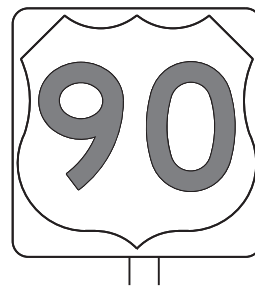
<h2>TYPICAL SIGN REQUIREMENTS</h2>			
<h3>TSR(2) - 13</h3>			
FILE: tsr2-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT October 2003	CONT: 6372	SECT: 50	JOB: 001
REVISIONS			HIGHWAY: VAR.
12-03 7-13	DIST: SAT	COUNTY: BEXAR	SHEET NO.: 328
9-08			

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DATE: FILE:

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

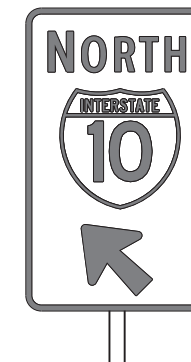
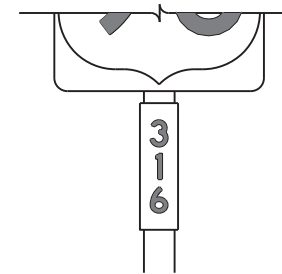
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

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

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



TYPICAL EXAMPLES

GENERAL NOTES

- Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
- White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

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

- Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).
- Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
- Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.
- Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.
- Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
- Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

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

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

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website:
<http://www.txdot.gov/>

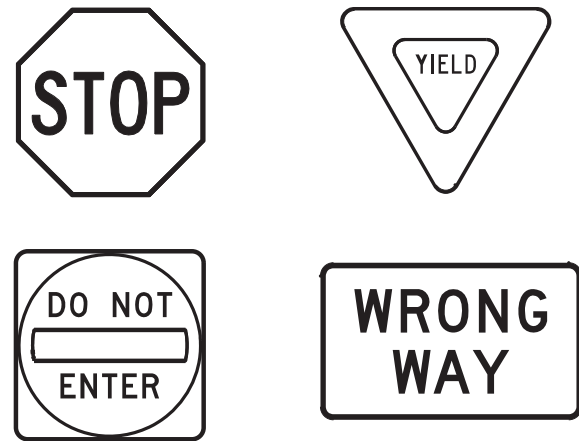
Texas Department of Transportation	<i>Traffic Operations Division Standard</i>
<h3>TYPICAL SIGN REQUIREMENTS</h3> <h4>TSR(3) - 13</h4>	
FILE: tsr3-13.dgn © TxDOT October 2003 12-03 7-13 9-08	DN: TxDOT CONT: 6372 SECT: 50 DIST: SAT CK: TxDOT JOB: 001 COUNTY: BEXAR HIGHWAY: VAR. SHEET NO.: 329

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REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

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



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

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

REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

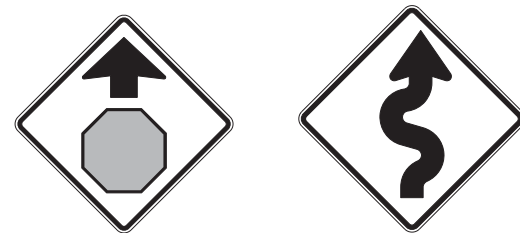
(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



TYPICAL EXAMPLES

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

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

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

REQUIREMENTS FOR SCHOOL SIGNS



TYPICAL EXAMPLES

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

GENERAL NOTES

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

ALUMINUM SIGN BLANKS THICKNESS

Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

DEPARTMENTAL MATERIAL SPECIFICATIONS

ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

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

<http://www.txdot.gov/>



TYPICAL SIGN REQUIREMENTS

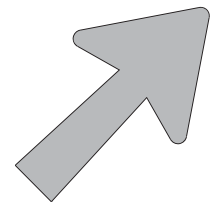
TSR(4) - 13

FILE:	tsr4-13.dgn	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CR:	TxDOT
© TxDOT	October 2003	CONT	SECT	JOB	HIGHWAY				
REVISIONS		6372	50	001	VAR.				
12-03	7-13	DIST	COUNTY	SHEET NO.					
9-08		SAT	BEXAR	330					

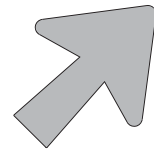
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ARROW DETAILS

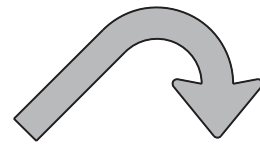
for Large Ground-Mounted and Overhead Guide Signs



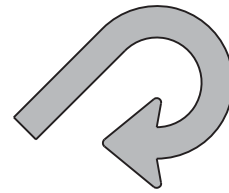
Type A



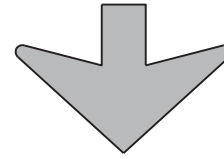
Type B



E-3



E-4



Down Arrow

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

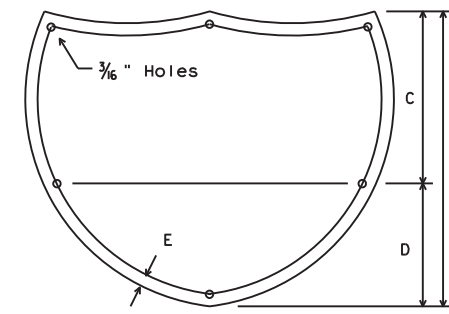
CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

NOTE

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

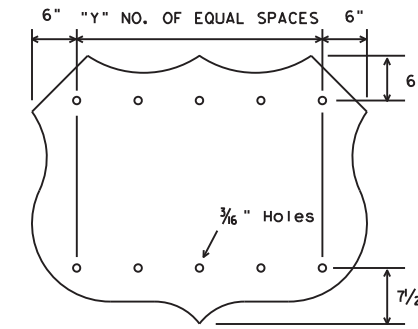
The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website:
<http://www.txdot.gov/>

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



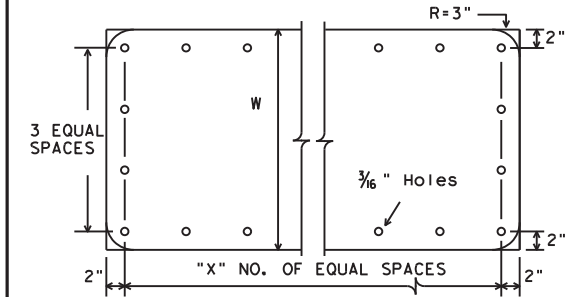
INTERSTATE ROUTE MARKERS

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



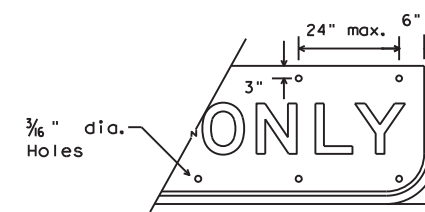
U.S. ROUTE MARKERS

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



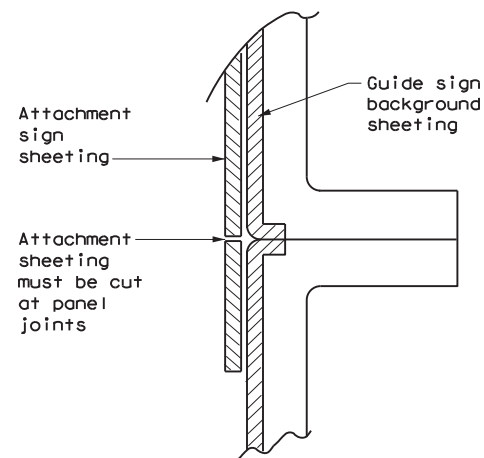
STATE ROUTE MARKERS

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

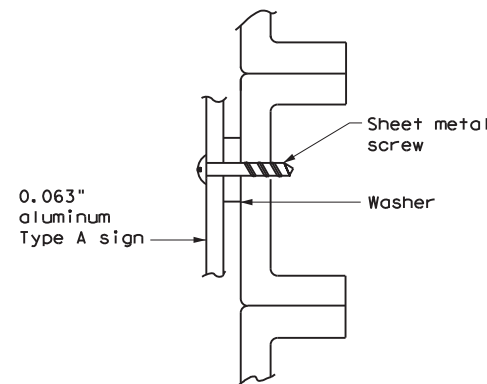


EXIT ONLY PANEL

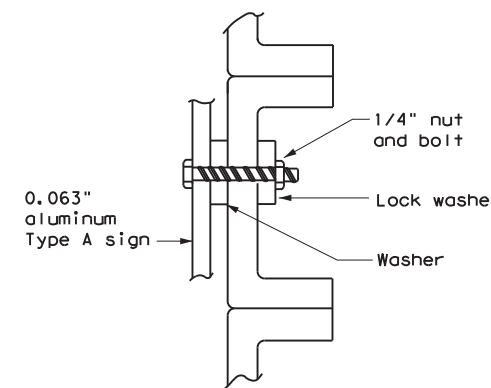
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



DIRECT APPLIED ATTACHMENT



SCREW ATTACHMENT

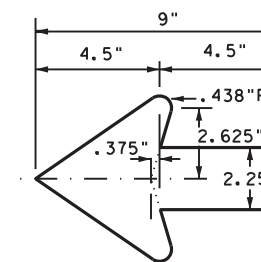


NUT/BOLT ATTACHMENT

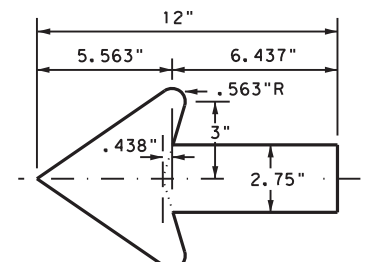
NOTE:

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

ARROW DETAILS for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.



Standard arrow to be used with 8 inch letters.



TYPICAL SIGN REQUIREMENTS

TSR (5) - 13

FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	OOI	VAR.
12-03 7-13	DIST	COUNTY	SHEET NO.	
9-08	SAT	BEXAR	331	

DATE:
FILE:

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DATE: FILE:

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS				DELINEATORS				D & OM DESCRIPTIVE CODES	
DEVICE	SIZE 1	SIZE 2	SIZE 3	SIZE 4	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 BRF = 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 DIRECTION If Required BI = Bi-Directional BR = Bi-Directional with red on back
						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		POST TYPE WC YFLX, WFLX WC YFLX, WFLX		MOUNT TYPE GND GND, SRF GND GND, SRF	

OBJECT MARKERS								D & OM DESCRIPTIVE CODES	
DEVICE	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)	INSTL OM ASSM (OM-XX) (XXXX)XXX (XX) 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) 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
		OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	
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	
POST TYPE TWT		POST TYPE WC WC WFLX			POST TYPE TWT			POST TYPE TWT	
MOUNT TYPE WAS, WAP		MOUNT TYPE GND GND GND, SRF			MOUNT TYPE WAS, WAP			MOUNT TYPE WAS, WAP	

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

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 	
SHEETING Yellow, White, Red NOTE 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) 60" x 30" (Expressway & Freeway)		
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).						



DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CR: TXDOT
© TXDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
10-09 3-15	DIST	COUNTY	SHEET NO.	
4-10 7-20	SAT	BEXAR	332	

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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
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.		

TYPE OF BARRIER MOUNTS	
GUARD FENCE ATTACHMENT	
GF 1	GF 2

CONCRETE TRAFFIC BARRIER (CTB)	

GENERAL NOTES
1. Place delineators on a section of roadway at a consistent distance from the edge of pavement. 2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction. 3. 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. 4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation. 5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface. 6. 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.

		Traffic Safety Division Standard	
<h2>DELINEATOR & OBJECT MARKER INSTALLATION</h2> <h3>D & OM(2)-20</h3>			
FILE: dom2-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT August 2004	CONT	SECT	JOB
REVISIONS	6372	50	OOI
10-09 3-15	DIST	COUNTY	SHEET NO.
4-10 7-20	SAT	BEXAR	333

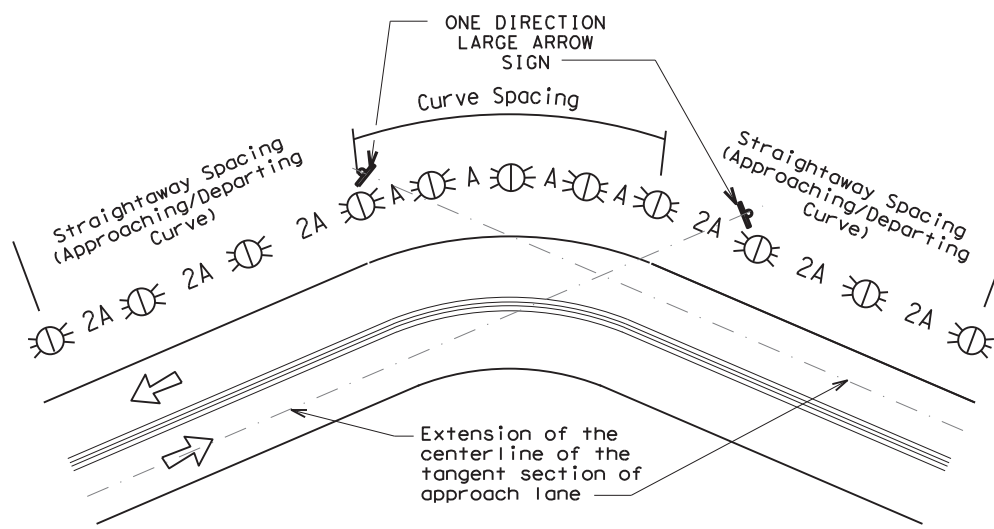
DATE: FILE:

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MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

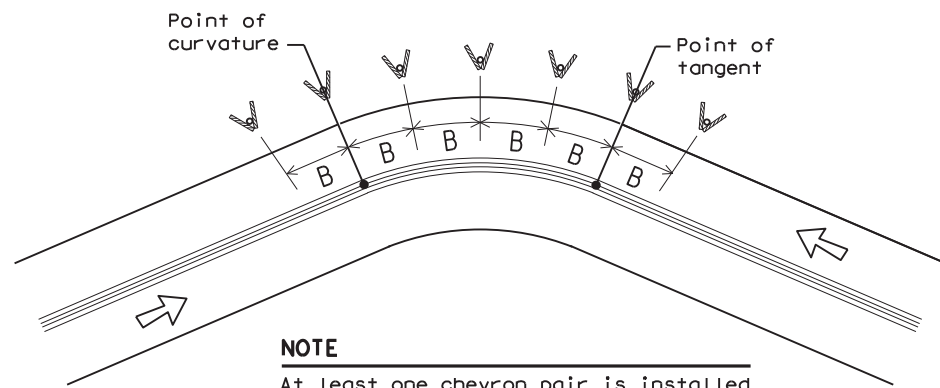
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN				
Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	—
2	2865	160	320	—
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN			
Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp. Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete) and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100' max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100' max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

- Unless indicated otherwise, 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.
- Barrier reflectors may be used to replace required delineators.
- Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND

	Bi-directional Delineator
	Delineator
	Sign



DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

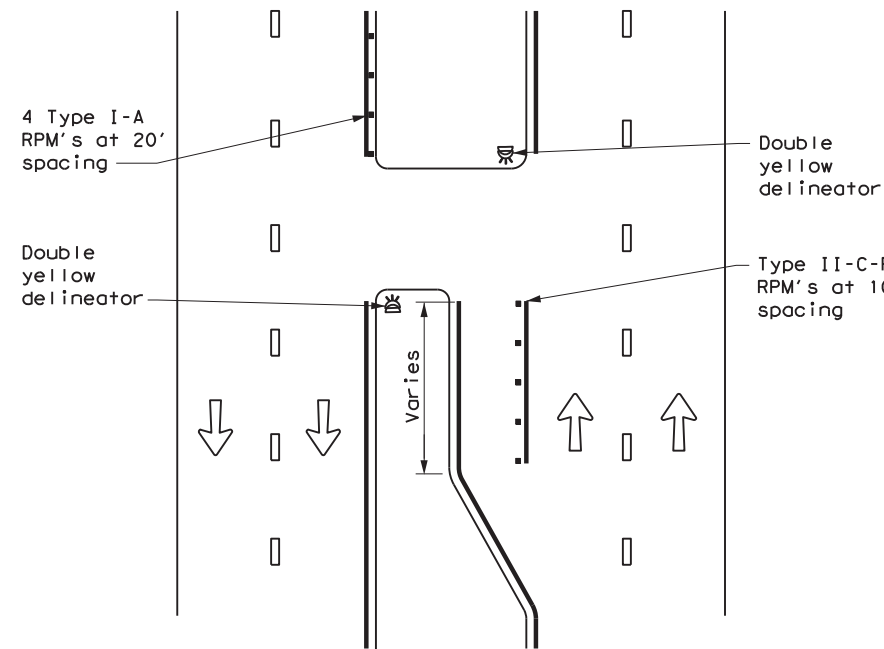
D & OM(3)-20

FILE: dom3-20.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT	CR: TxDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
3-15 8-15	DIST	COUNTY	SHEET NO.	
8-15 7-20	SAT	BEXAR	334	

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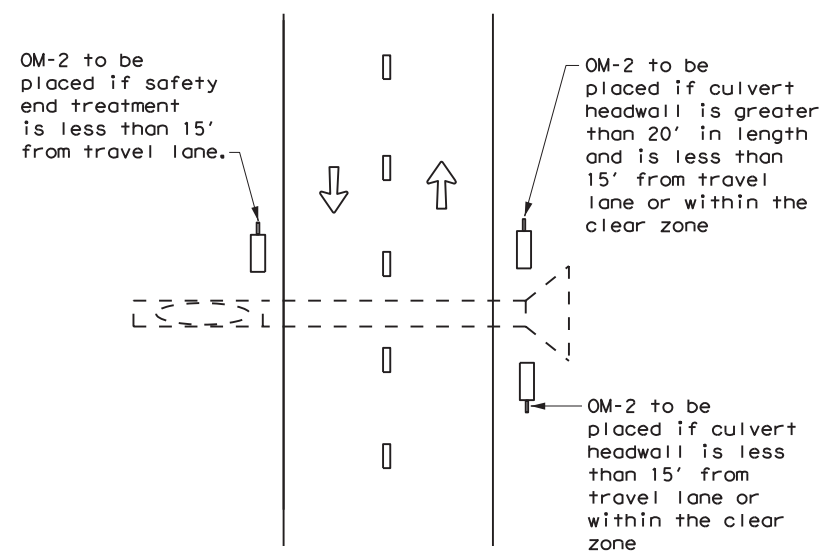
DATE:
FILE:

CROSSOVERS



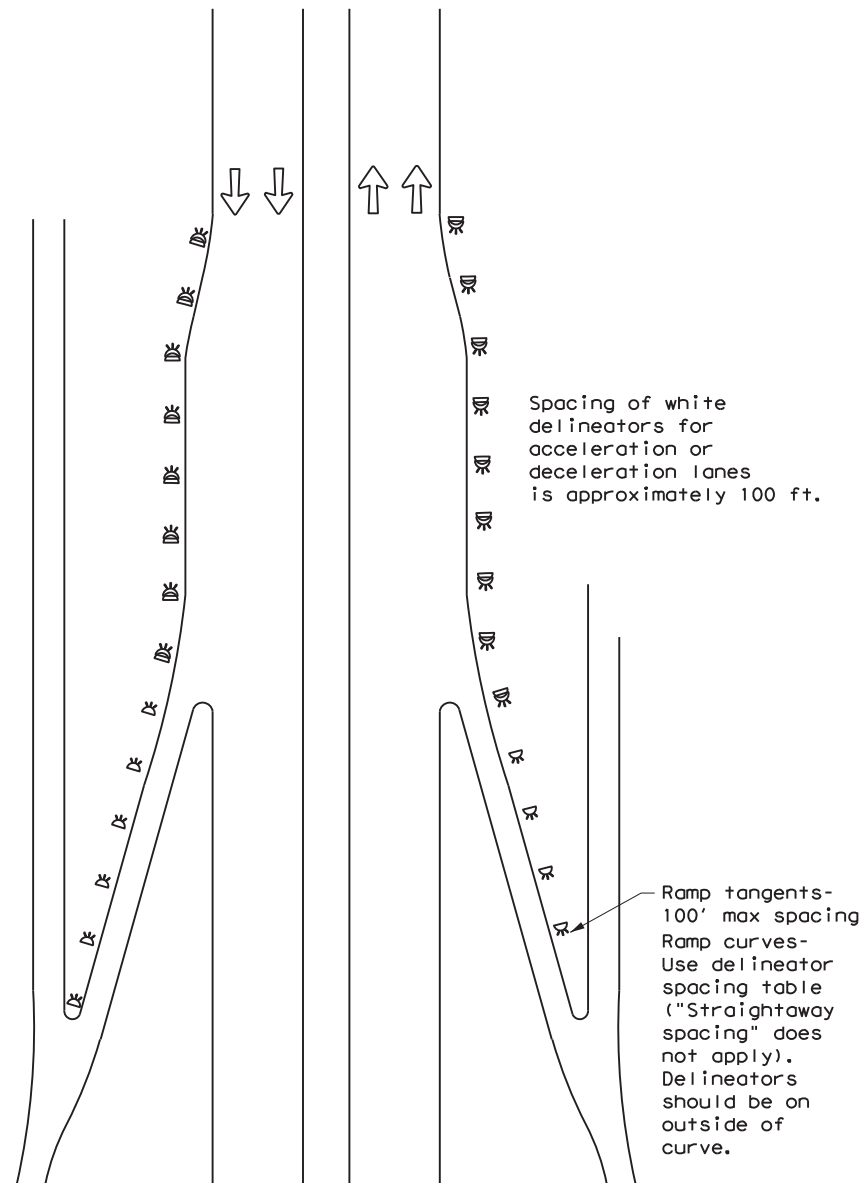
DETAIL 1

FOR CULVERTS WITHOUT MBGF



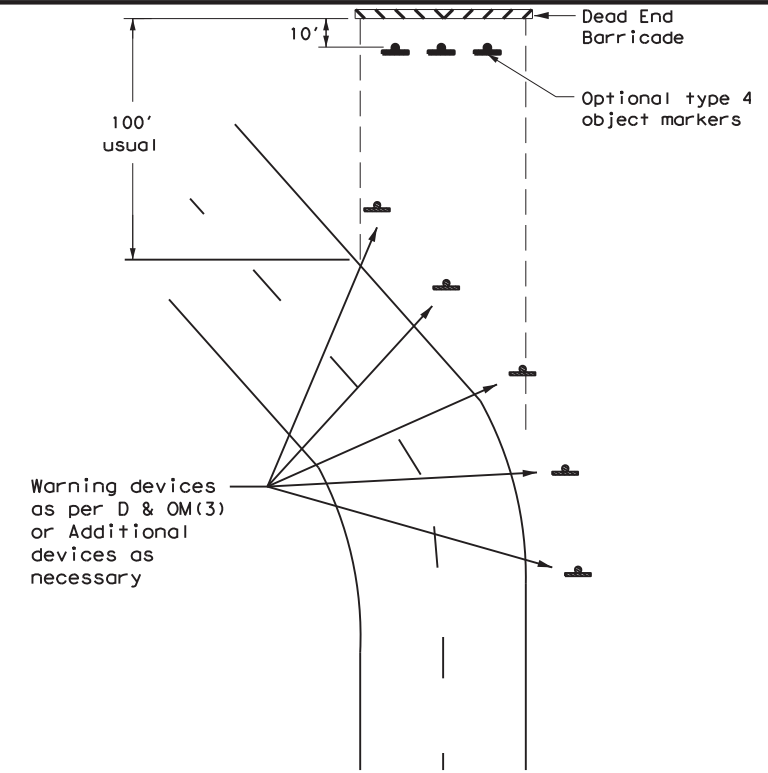
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



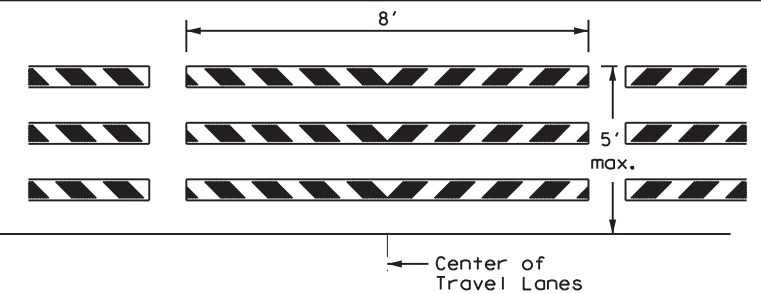
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND	
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

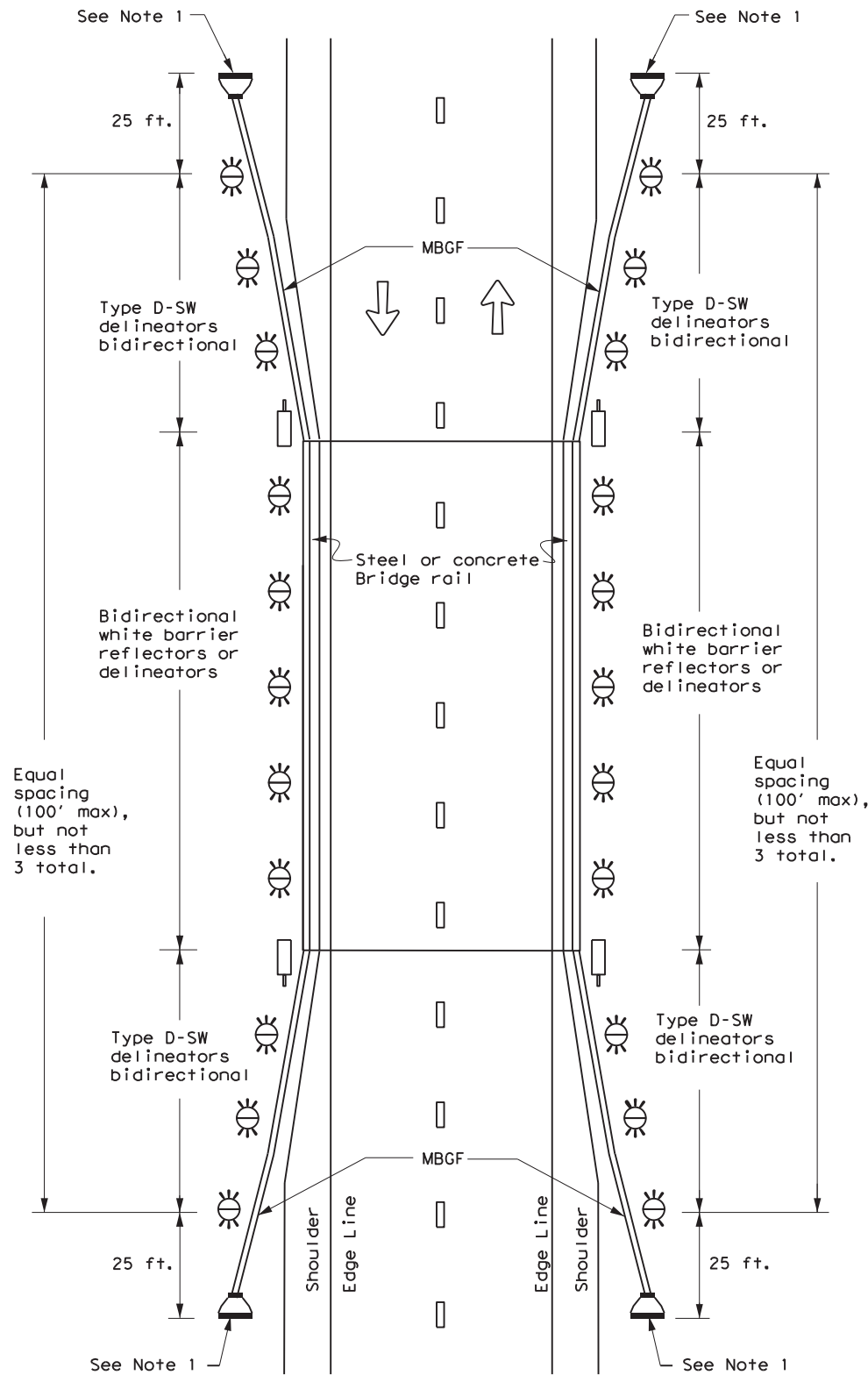


DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4) -20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	OW: TXDOT	CR: TXDOT
© TXDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	OOI	VAR.
3-15	DIST	COUNTY	SHEET NO.	
7-20	SAT	BEXAR	335	

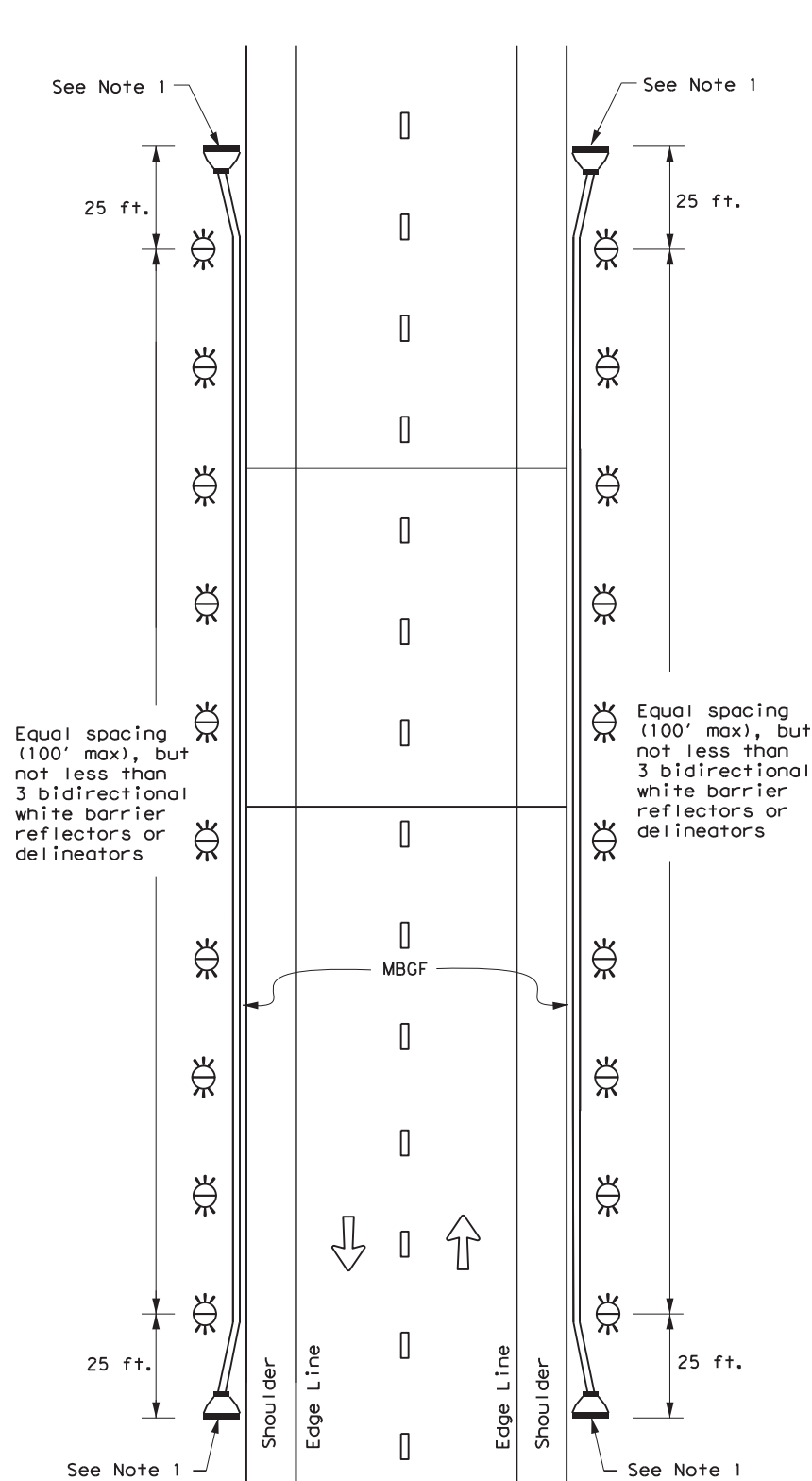
**TWO-WAY, TWO LANE ROADWAY
WITH REDUCED WIDTH APPROACH RAIL**



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

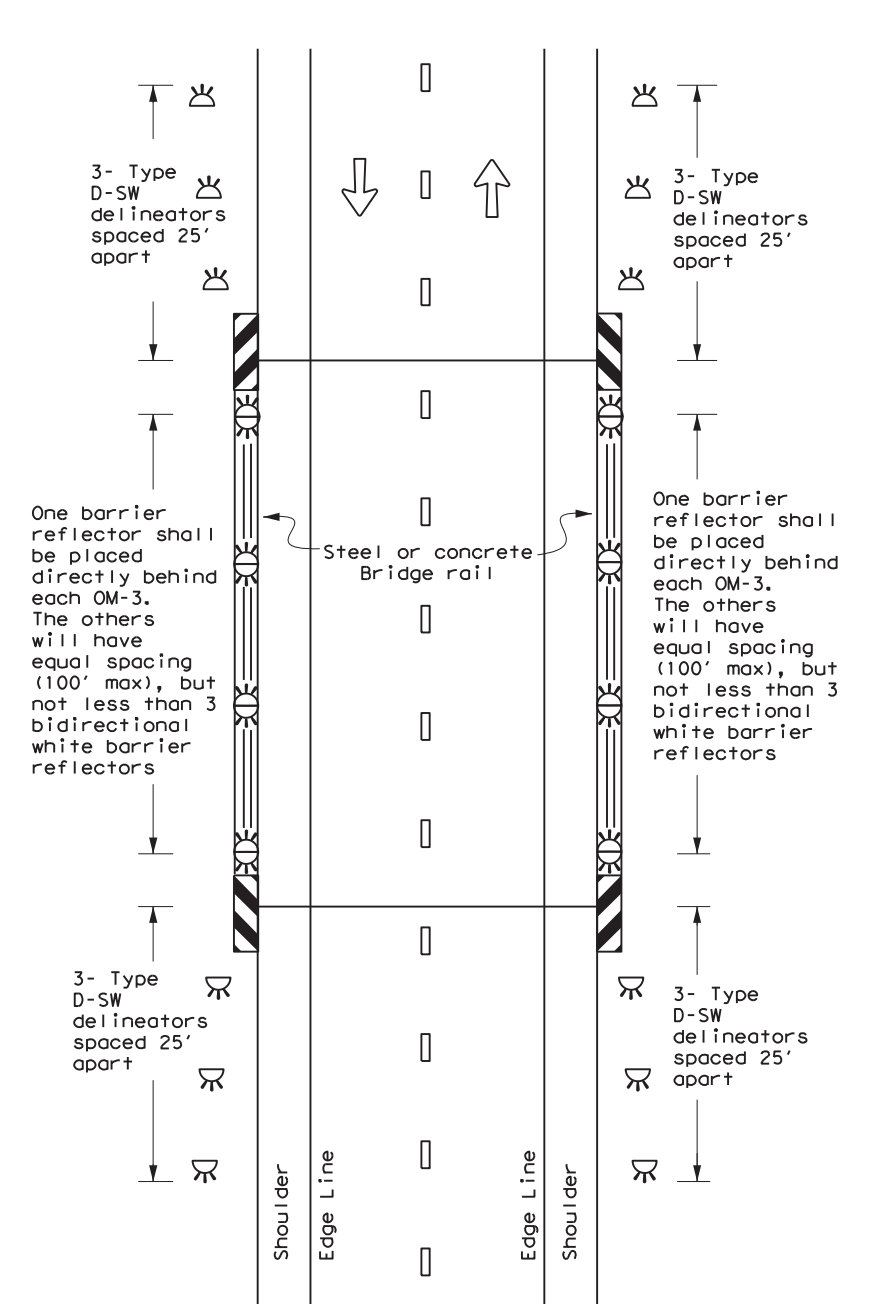
**TWO-WAY, TWO LANE ROADWAY
WITH METAL BEAM GUARD FENCE (MBGF)**



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

**TWO-WAY, TWO LANE ROADWAY
BRIDGE WITH NO APPROACH RAIL**



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow



**DELINEATOR &
OBJECT MARKER
PLACEMENT DETAILS**

D & OM(5)-20

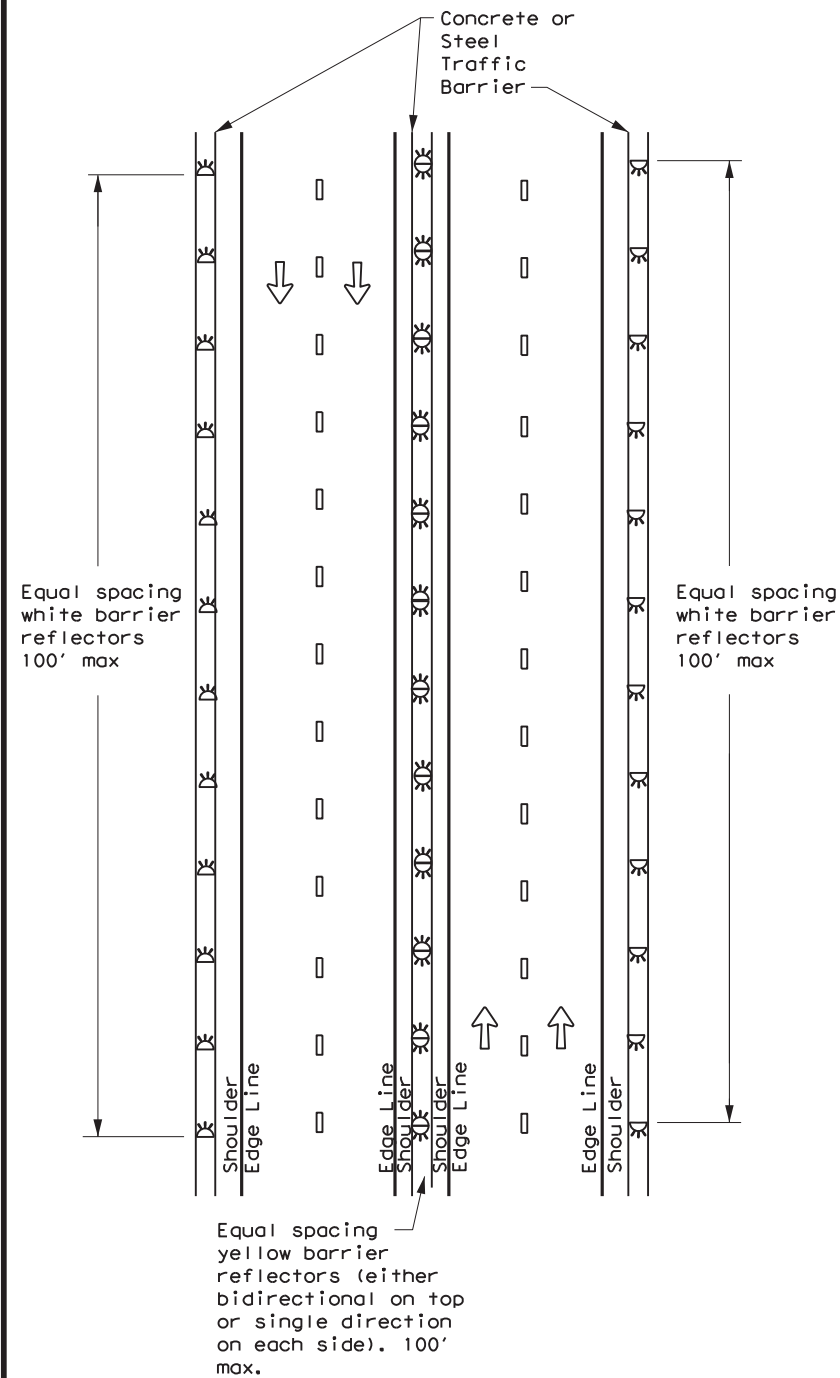
FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
7-20	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	336	

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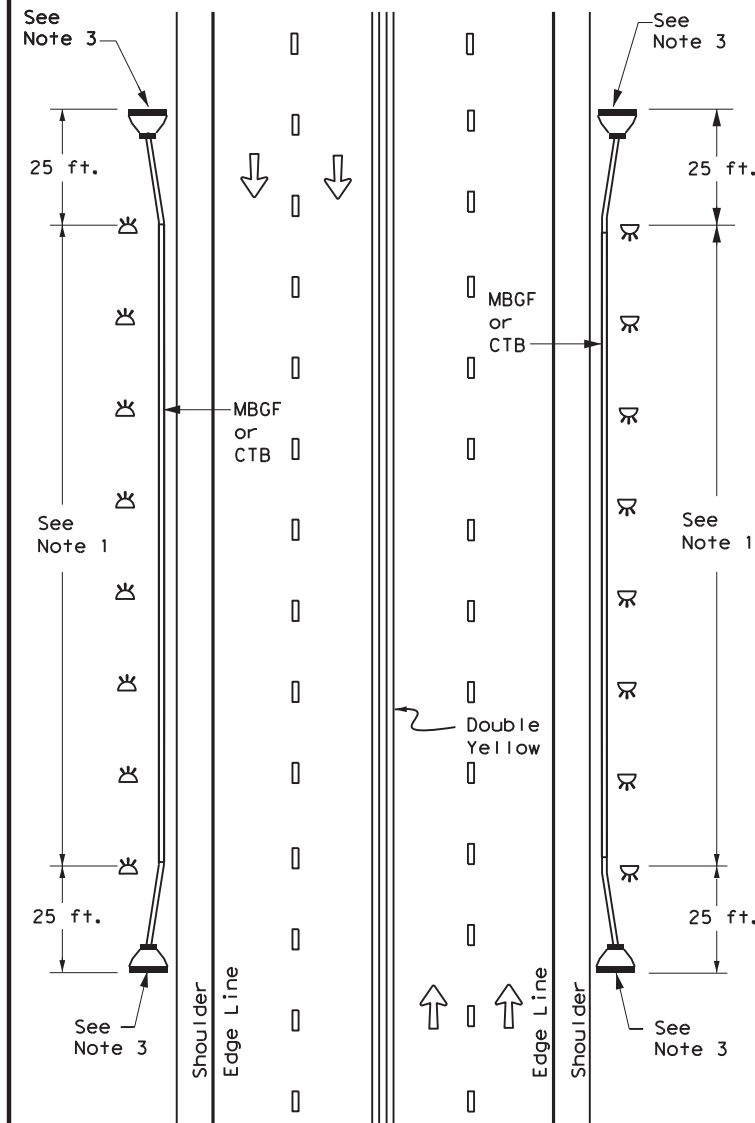
DATE:
FILE:

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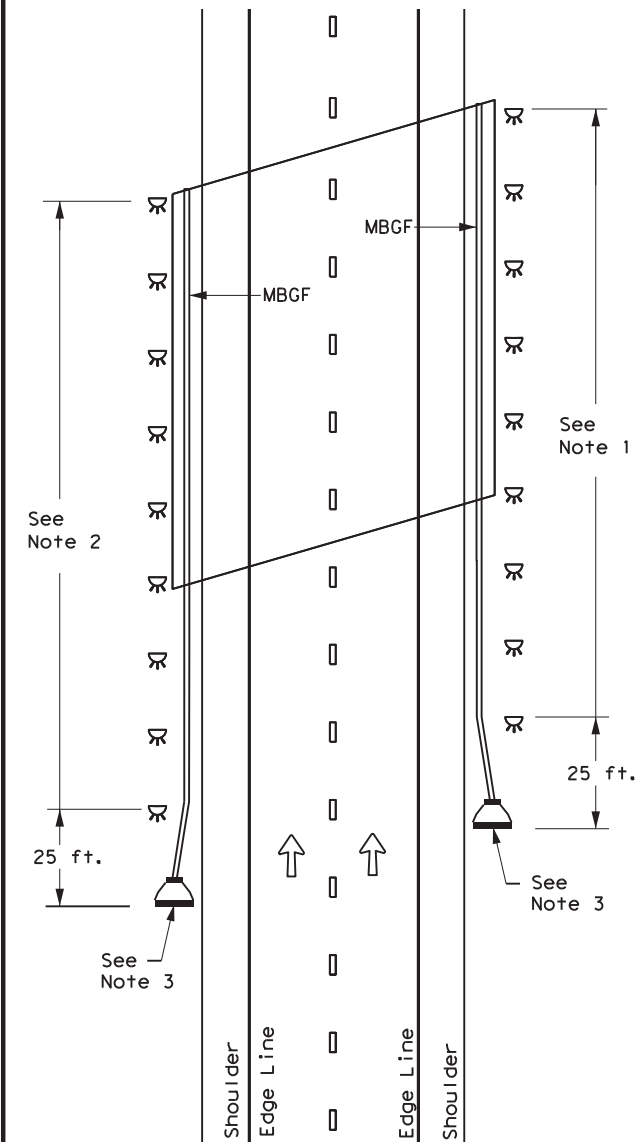
CONTINUOUS CONCRETE OR STEEL BARRIER



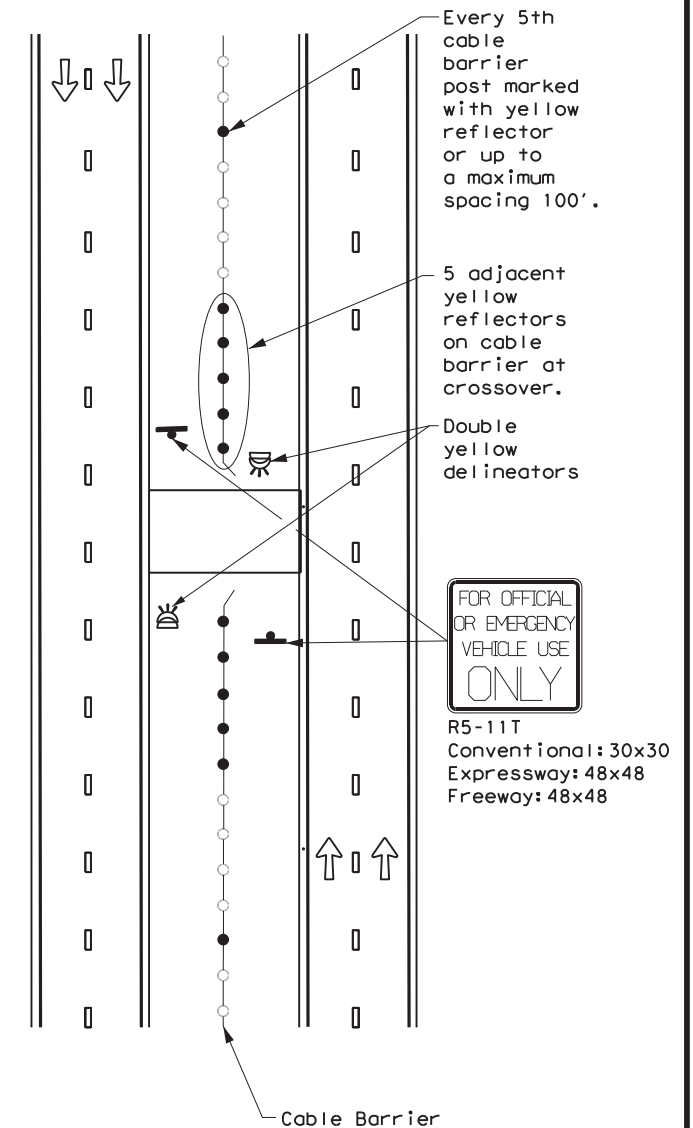
MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



EMERGENCY CROSSOVER



NOTES

1. Equal spacing (100' max), but not less than 3 single directional white barrier reflectors or delineators. On Continuous Barrier, equal spacing (100' max.)
2. Equal spacing (100' max), but not less than 3 single directional yellow barrier reflectors or delineators.
3. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow



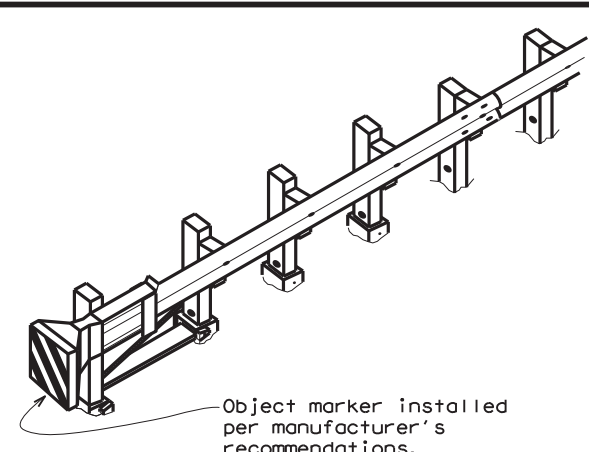
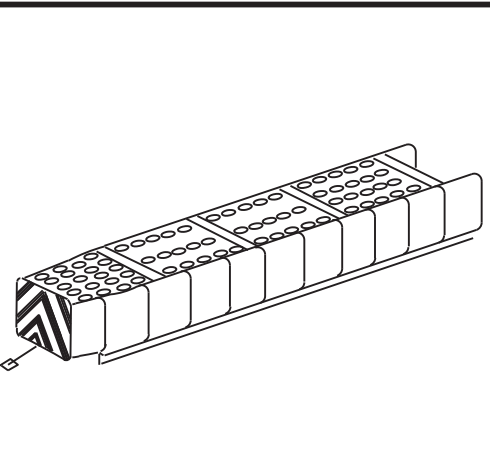
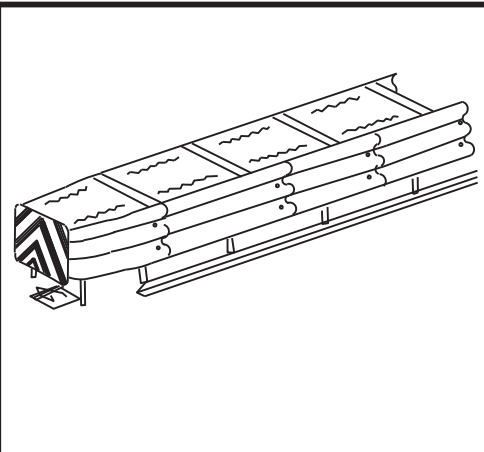
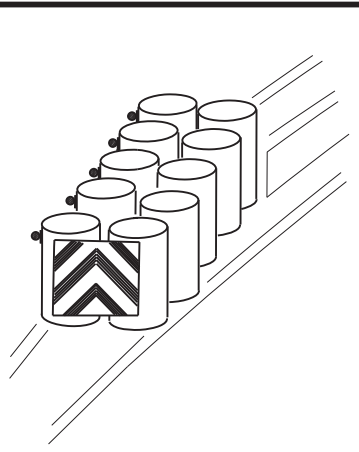
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(6)-20

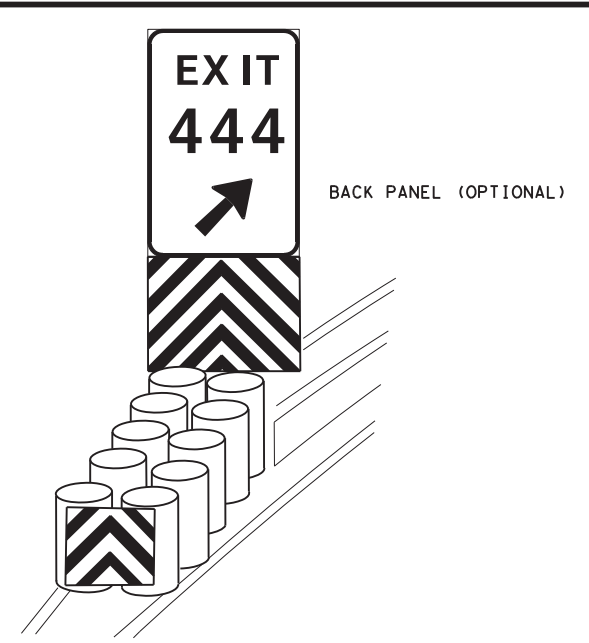
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© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	6372	50	001	VAR.
7-20	DIST	COUNTY	SHEET NO.	
	SAT	BEXAR	337	

DATE:
FILE:

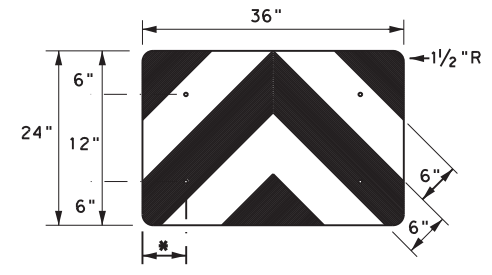
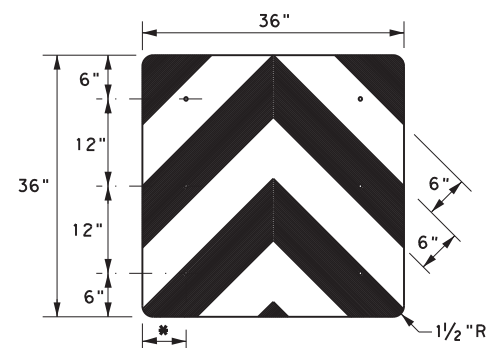
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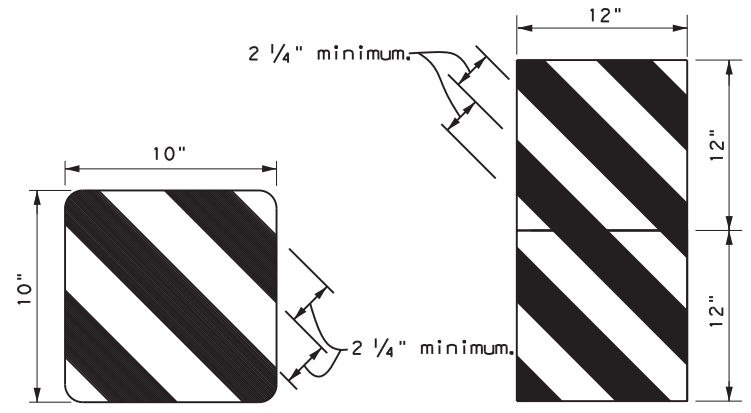
Object marker installed per manufacturer's recommendations.



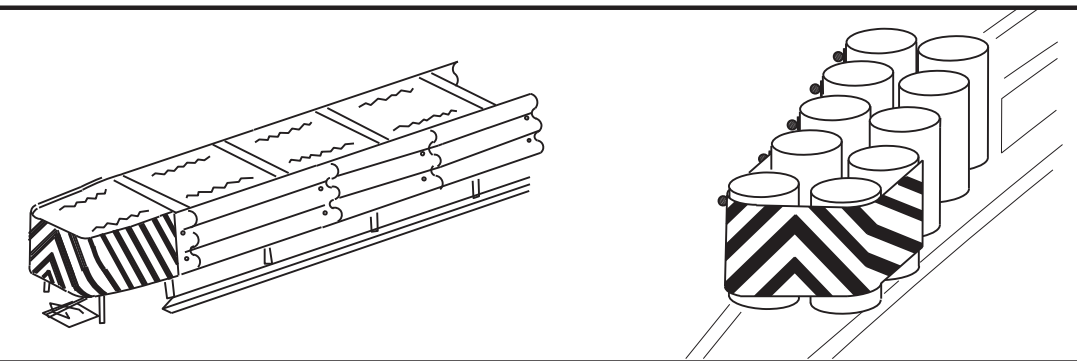
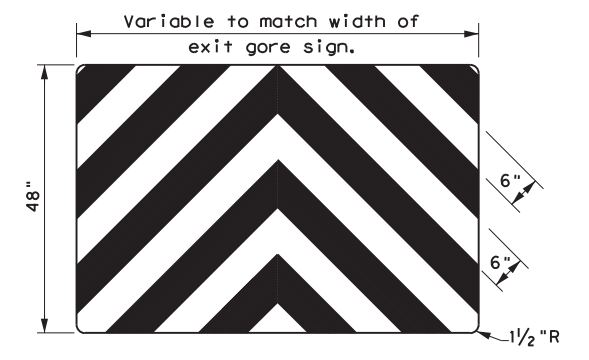
BACK PANEL (OPTIONAL)



* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer



OBJECT MARKERS SMALLER THAN 3 FT²

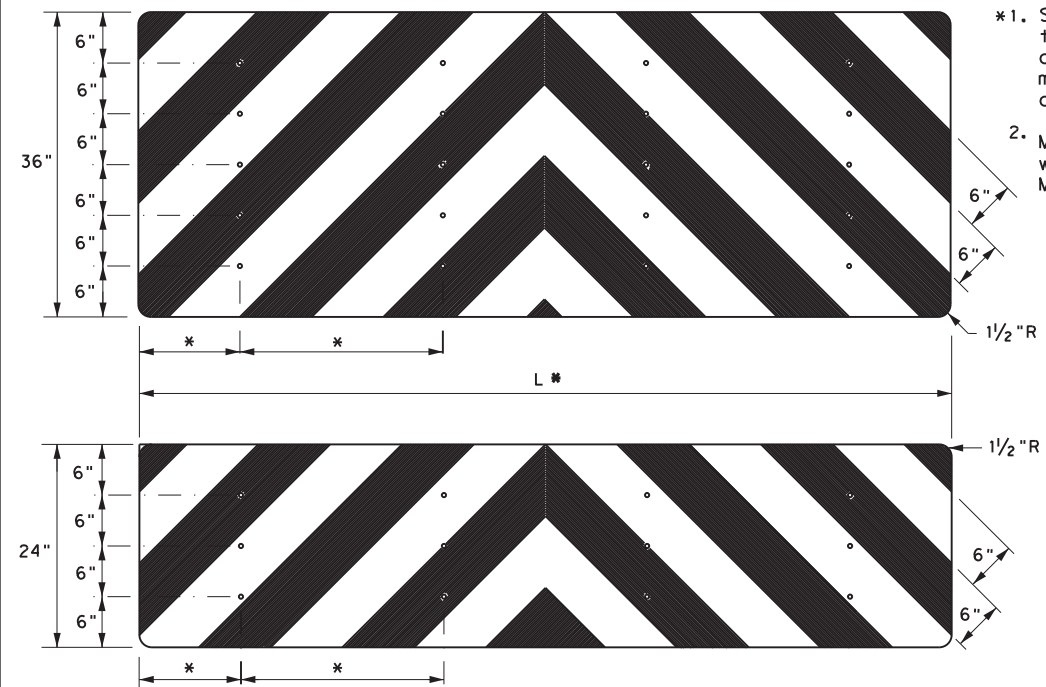


NOTES

- Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.
- Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.
- Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 1/4".
- Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.
- Object Marker at nose of attenuator is subsidiary to the attenuator.
- See D & OM (1-4) for required barrier reflectors.

NOTES

- Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturer's recommendation, or as directed by the Engineer.
- Mounting should be flush with top of attenuator. Minimum size 96" x 24".



DATE:
FILE:

		Traffic Safety Division Standard	
DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS D & OM(VIA) -20			
FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT
© TXDOT December 1989	CONT: 6372	SECT: 50	JOB: 001
REVISIONS		HIGHWAY: VAR.	
4-92 8-04		DIST: SAT	COUNTY: BEXAR
8-95 3-15			SHEET NO.: 338
4-98 7-20			
20G			

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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)

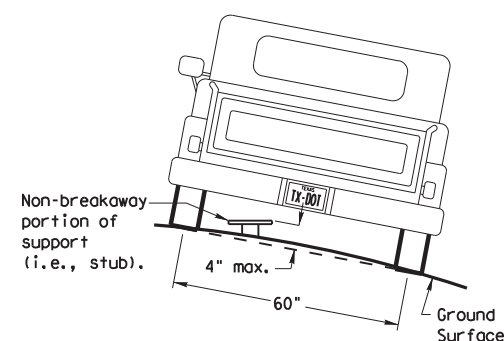
Anchor Type

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))

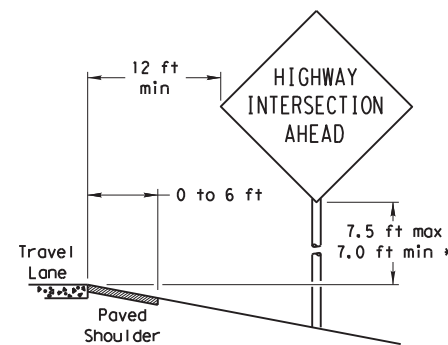
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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).

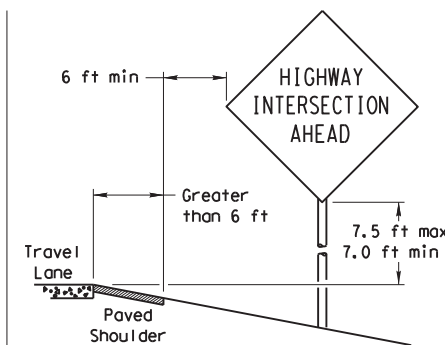
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

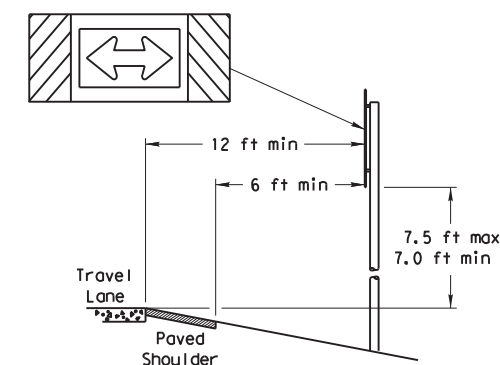
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



GREATER THAN 6 FT. WIDE

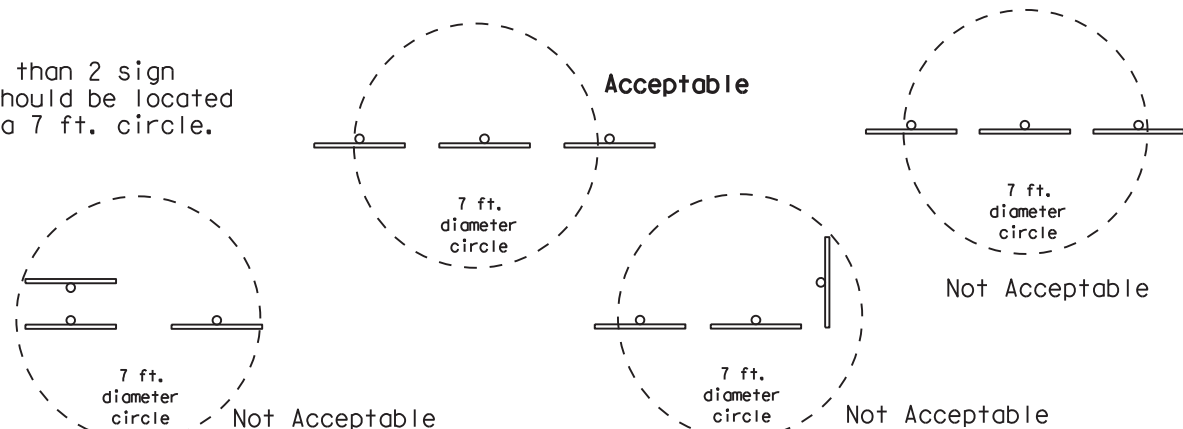
When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

T-INTERSECTION

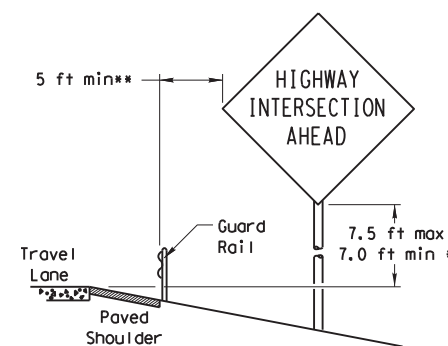


When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.

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

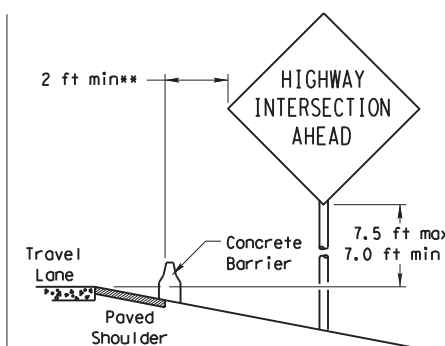


BEHIND BARRIER

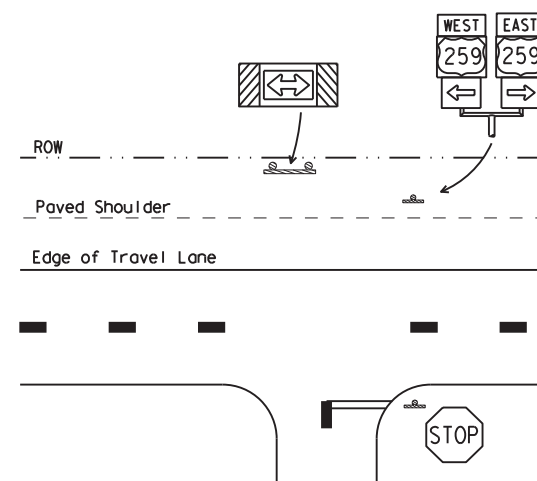


BEHIND GUARDRAIL

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



BEHIND CONCRETE BARRIER



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

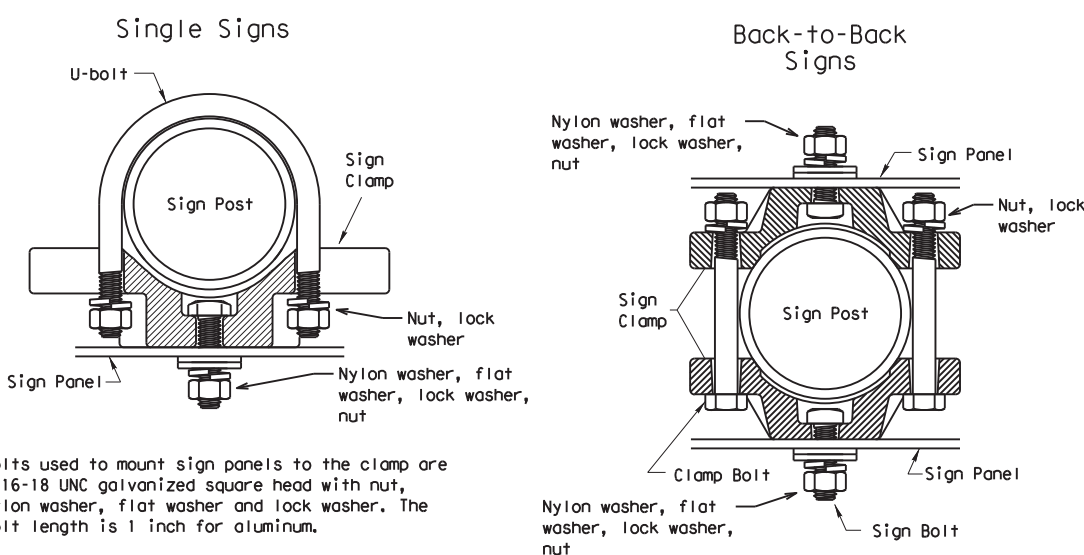
- (1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or
- (2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

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>

TYPICAL SIGN ATTACHMENT DETAIL



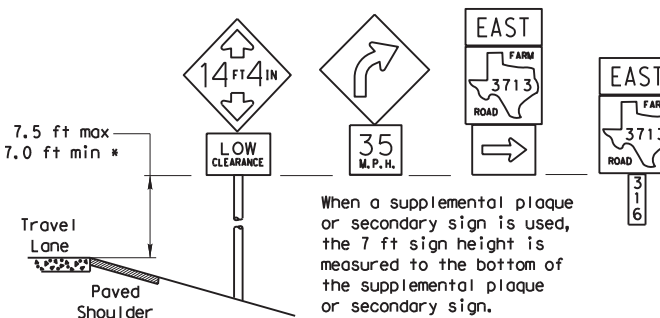
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

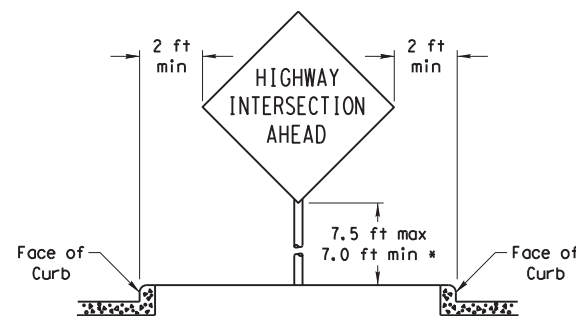
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES

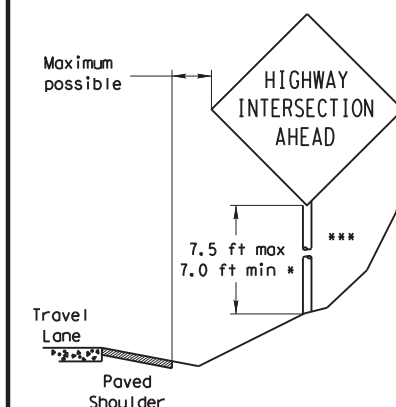


When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

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.

Texas Department of Transportation
 Traffic Operations Division

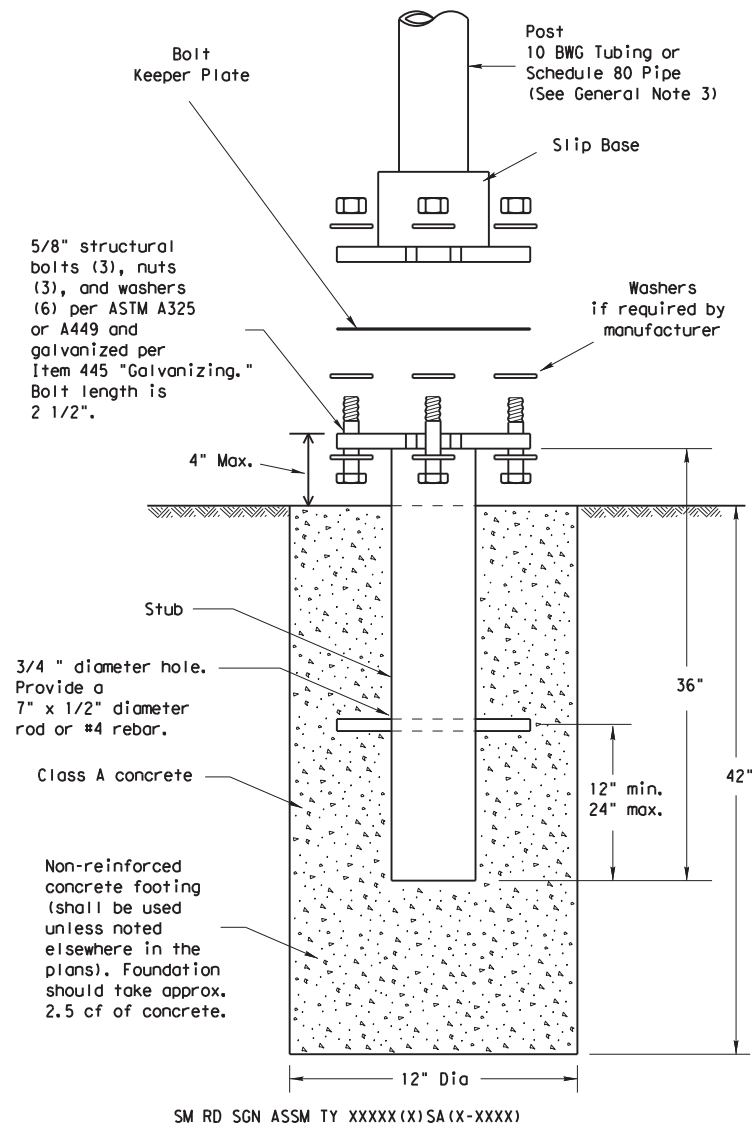
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD (GEN) - 08

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9-08	REVISIONS	CON: 637250	SECT: 001	JOB: HIGHWAY
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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

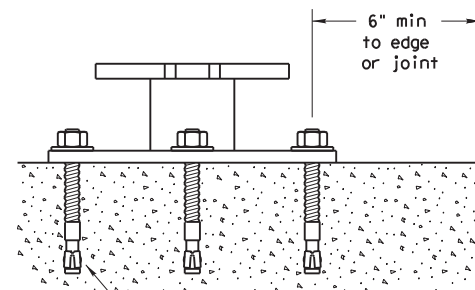
Foundation

- 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



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.

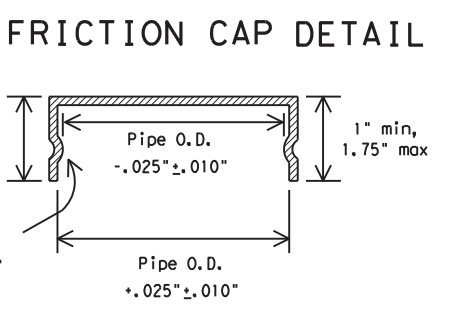
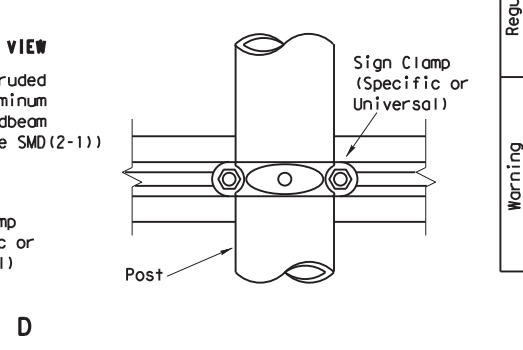
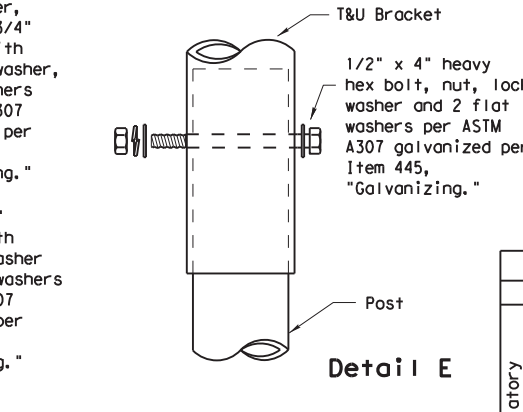
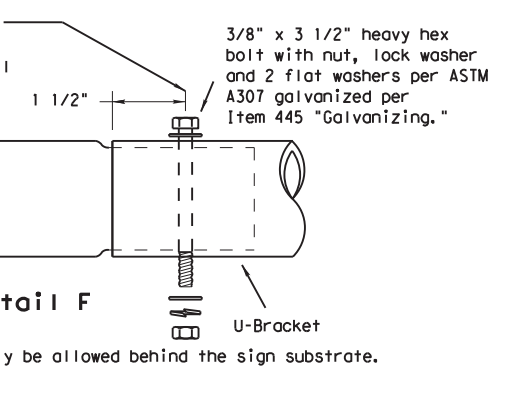
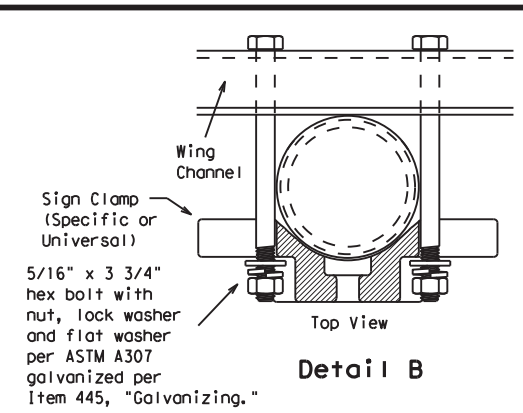
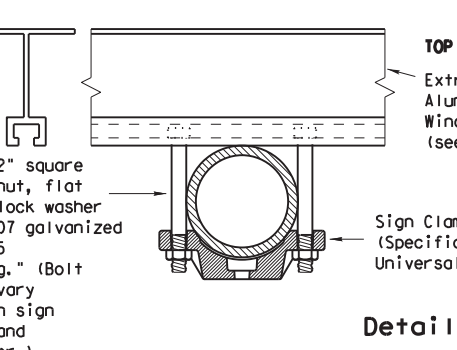
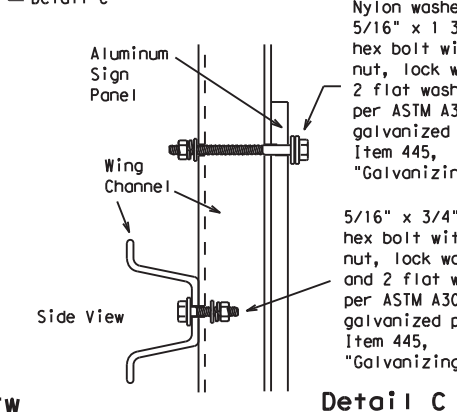
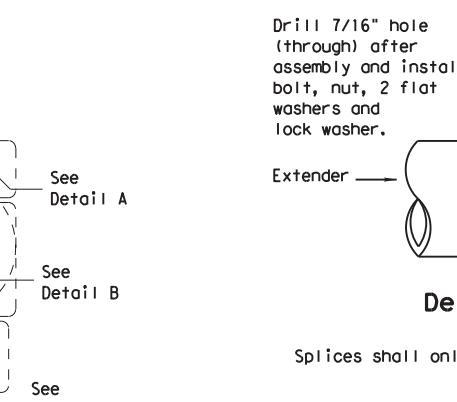
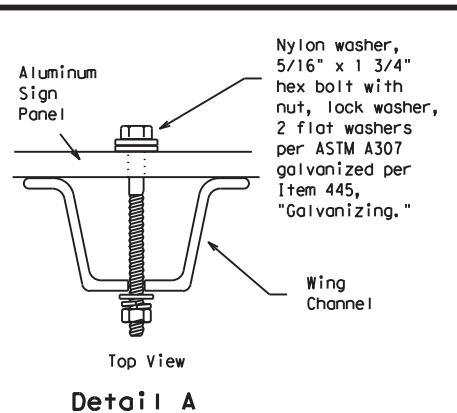
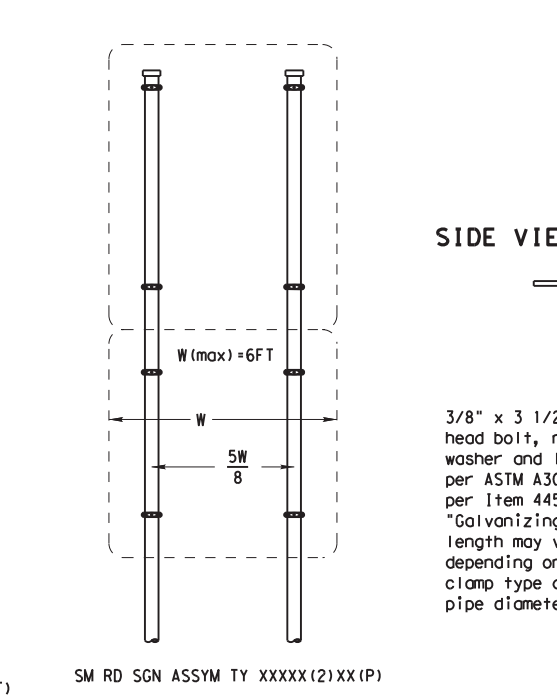
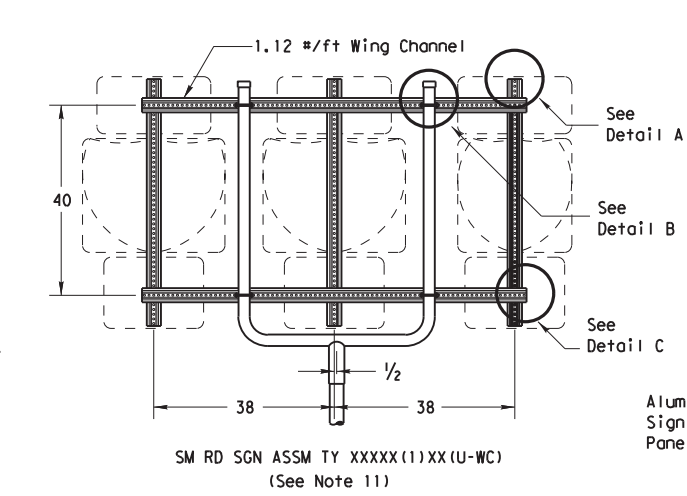
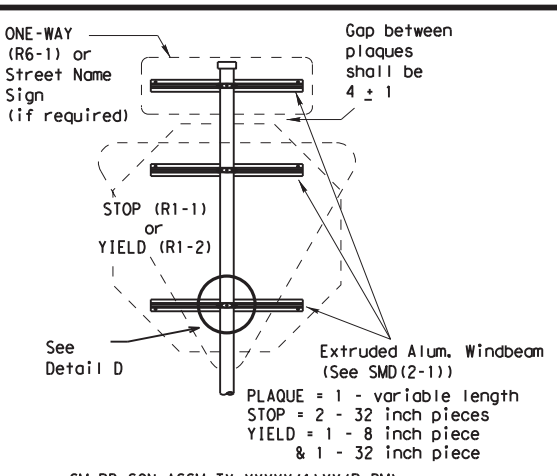
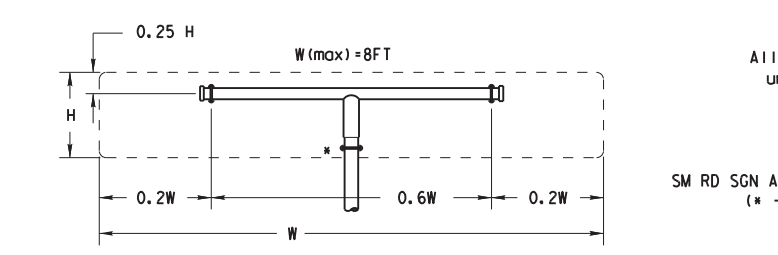
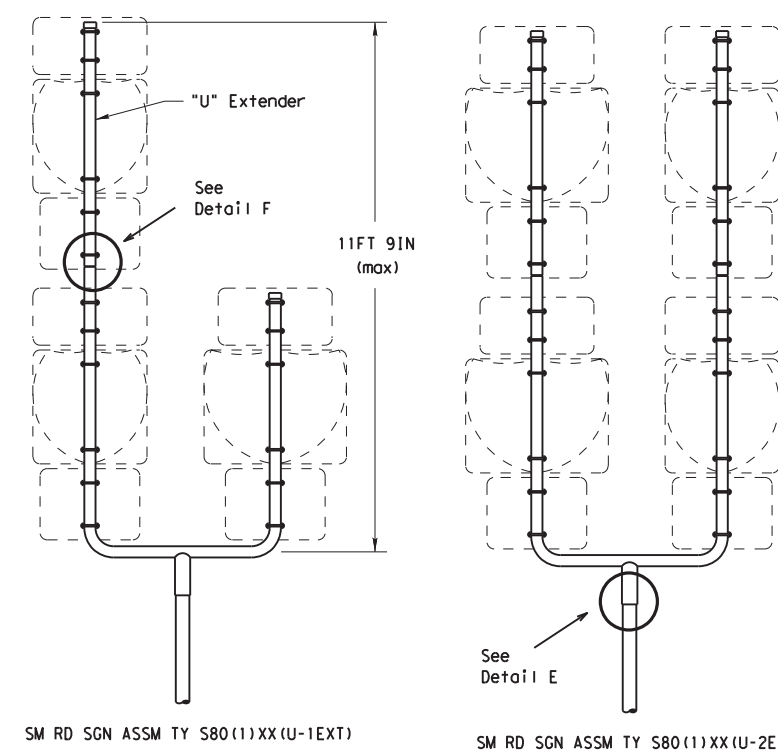
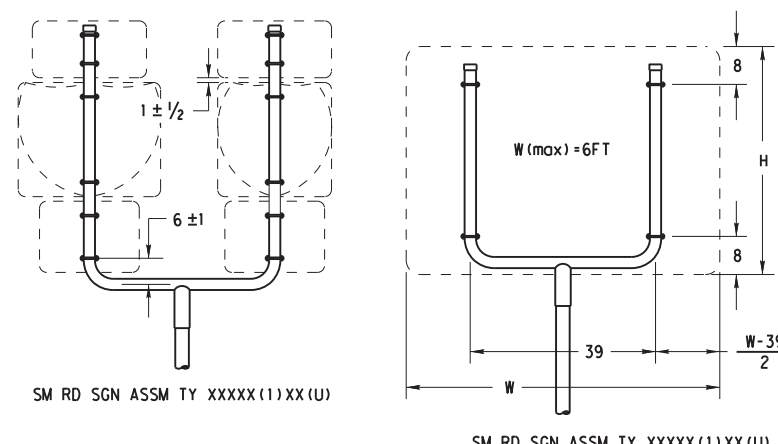
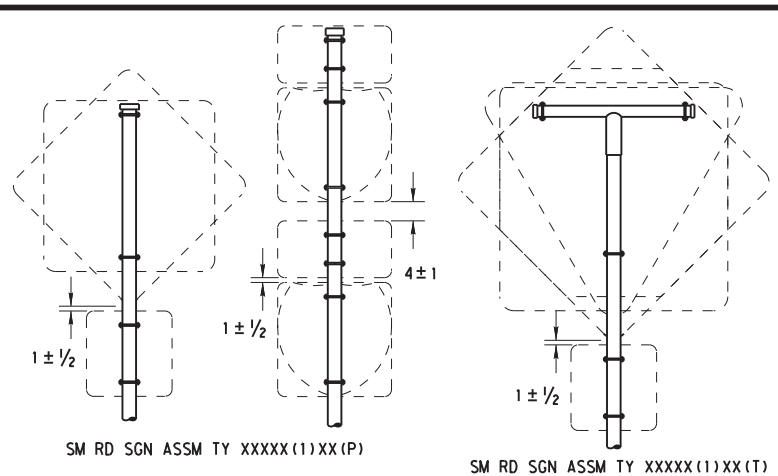
Texas Department of Transportation
 Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

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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)
Warning	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	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 XXXXX(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.

Texas Department of Transportation
Traffic Operations Division

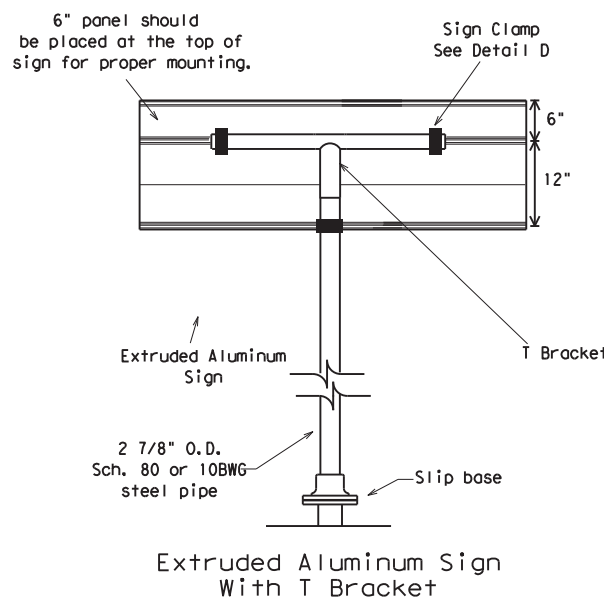
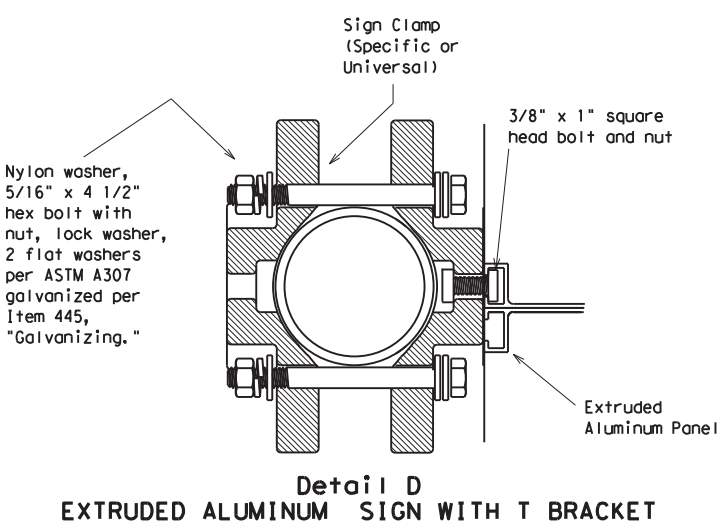
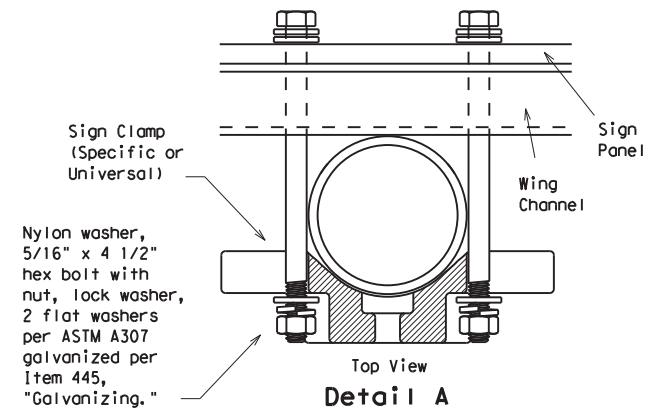
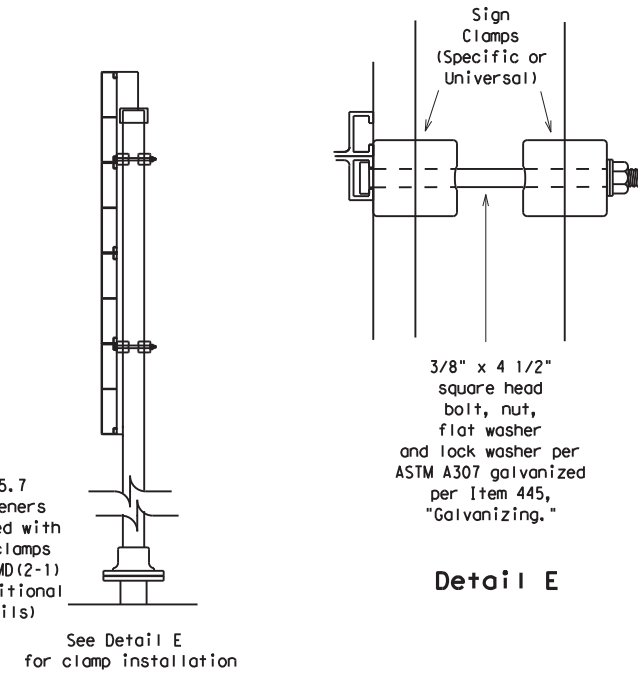
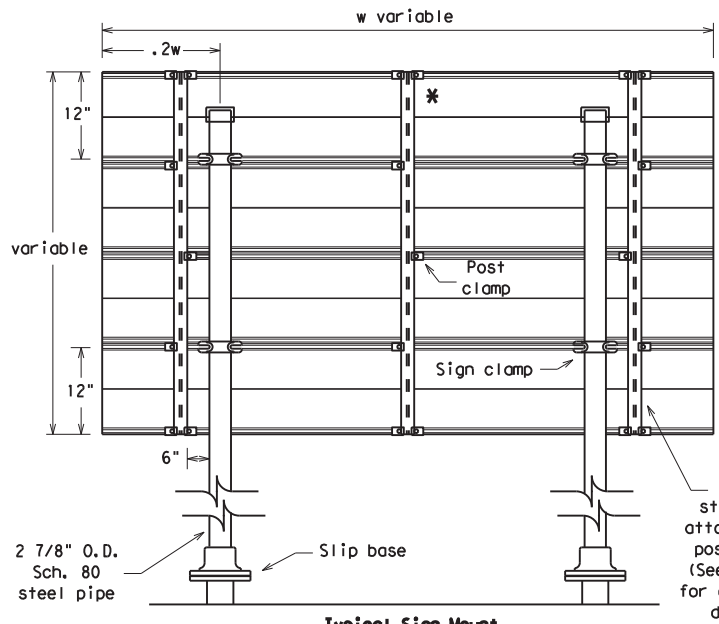
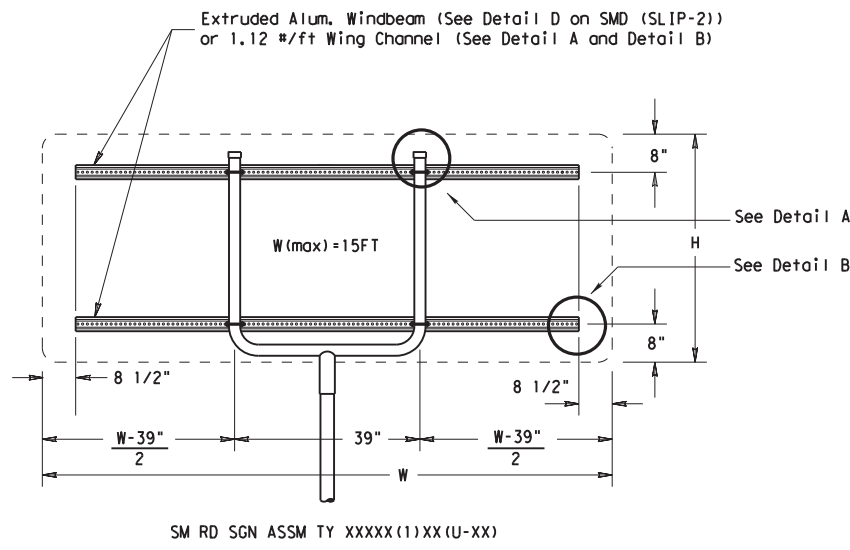
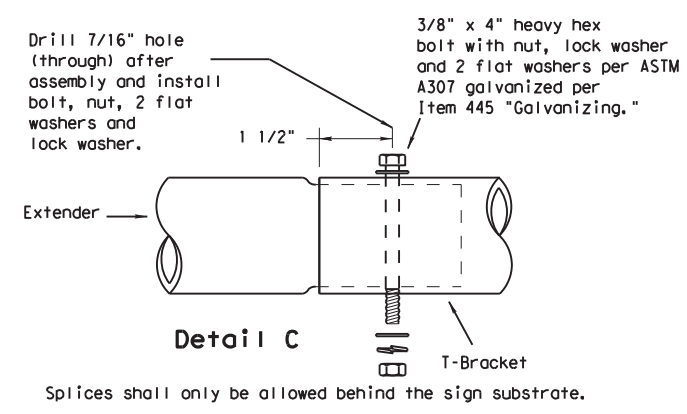
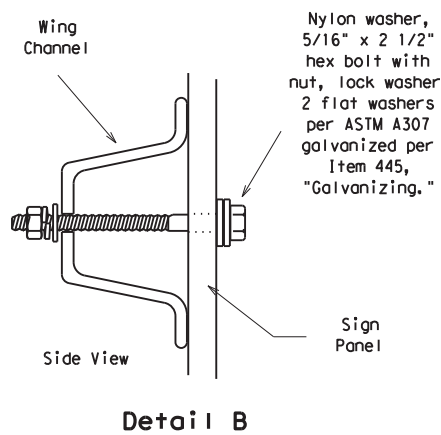
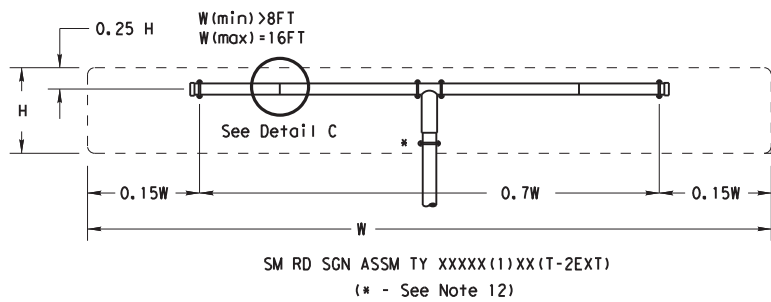
SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM
SMD(SLIP-2)-08

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		SAT	BEXAR		341

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Use Extruded Alum. Windbeam as stiffeners See SMD (2-1) for additional details
See Detail E for clamp installation

GENERAL NOTES:

- | 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 |
- 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.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- 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.
- Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
- 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.
- 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.
- Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
- 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."
- Sign blanks shall be the sizes and shapes shown on the plans.
- Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
- Post open ends shall be fitted with Friction Caps.

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)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
Warning	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)

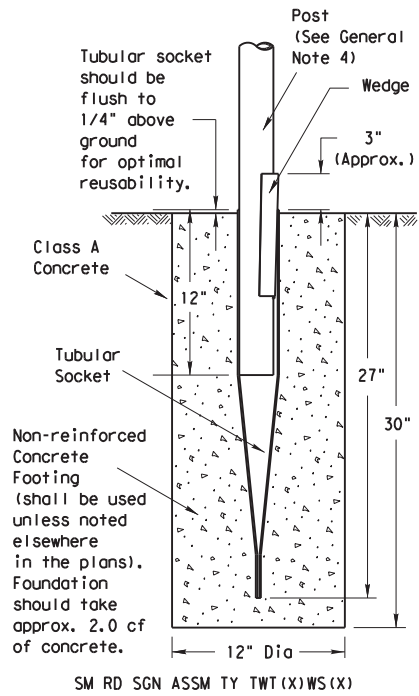


**SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM
SMD (SLIP-3) -08**

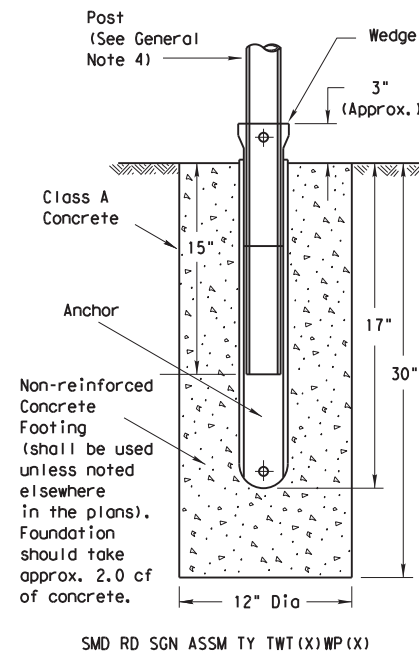
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		DIST	COUNTY		SHEET NO.
		SAT	BEXAR		342

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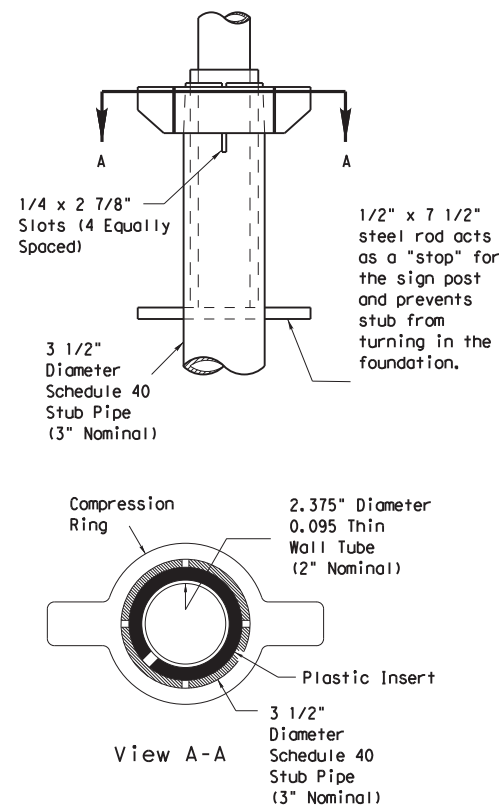
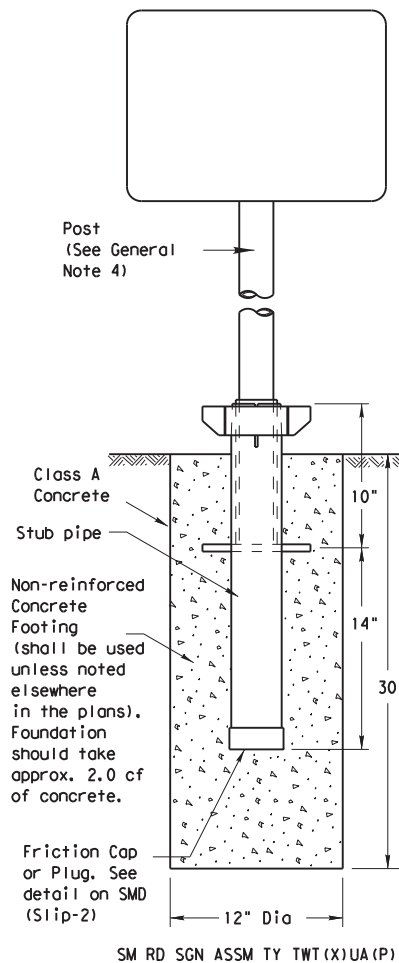
Wedge Anchor Steel System



Wedge Anchor High Density Polyethylene (HDPE) System

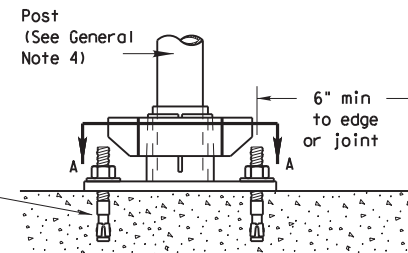


Universal Anchor System with Thin-Walled Tubing Post

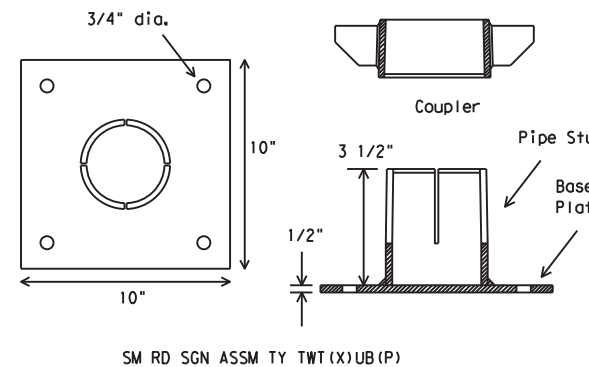


Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt Down Universal Anchor System. The insert should be approx. 10" long and cover the tubing from just above the top of the stub pipe to the bottom of the sign post when using the Universal Anchor System. The insert should be cut to approx. 4 1/2" when used with the Bolt Down Universal Anchor System.

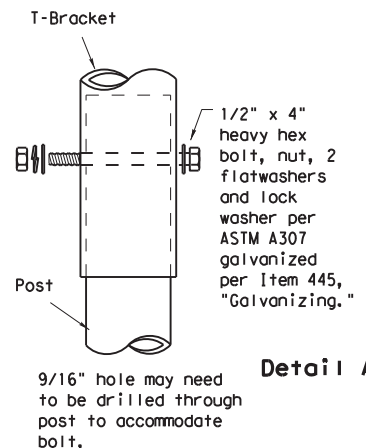
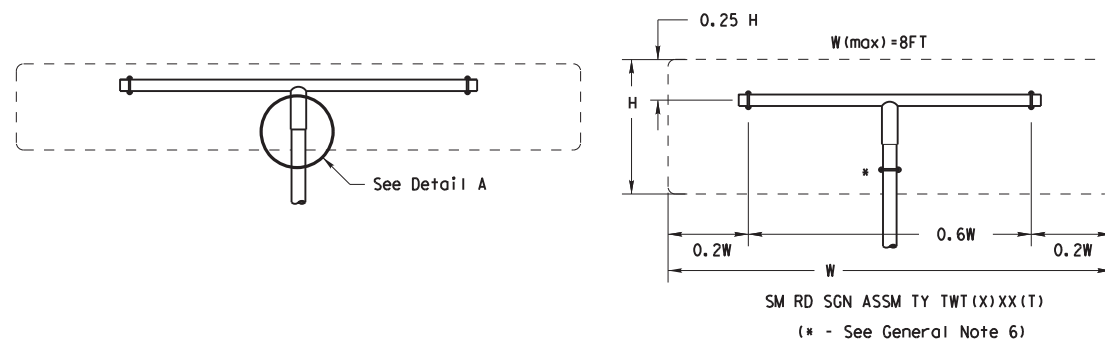
5/8" diameter Concrete Anchor - 4 places (embed a min. of 3 3/8" and torque to min. of 50 ft-lbs). Anchor may be expansion or adhesive type.



Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxy and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.



Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post



NOTE
The devices shall be installed per manufacturer's recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

- The Wedge Anchor System and the Universal Anchor System with thin wall tubing post may be used to support up to 10 square feet of sign area.
- The tubular socket, wedge and prefabricated T-bracket shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to the approval of the TxDOT Traffic Standards Engineer.
- Except for posts (13 BWG Tubing), clamps, nuts and bolts, all components shall be prequalified. A list of prequalified vendors may be obtained from the Material Producer List web page. The website address is: http://www.txdot.gov/business/producer_list.htm
- Material used as post with this system shall conform to the following specifications:
13 BWG Tubing (2.375" outside diameter) (TWT)
0.095" nominal wall thickness
Seamless or electric-resistance welded steel tubing
Steel shall be HSLA 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
18% minimum elongation in 2"
Wall thickness (uncoated) shall be within the range of .083" to .099"
Outside diameter (uncoated) shall be within the range of 2.369" to 2.381"
Galvanization per ASTM 123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
- Sign blanks shall be the sizes and shapes shown on the plans.
- Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- See the Traffic Operations Division website for detailed drawings of sign clamps and Wedge Anchor System components. The website address is: <http://www.txdot.gov/publications/traffic.htm>

WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

- Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
- 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. Place concrete into hole until it is approximately flush with the ground. Concrete shall be Class A.
- Insert tubular socket into concrete until top of socket is approximately 1/4" above the concrete footing.
- Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer.
- Attach the sign to the sign post.
- Insert the sign post into socket and align sign face with roadway.
- Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

- Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
- Insert base post in hole to depths shown and backfill hole with concrete.
- Level and plumb the base post using a torpedo level and allow concrete adequate time to set. The bottom of the slots provided in the stub pipe shall remain above the top of the concrete foundation.
- Attach the sign to the sign post.
- Install plastic insert around bottom of post.
- Insert sign post into base post. Lower until the post comes to rest on steel rod.
- Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
- Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

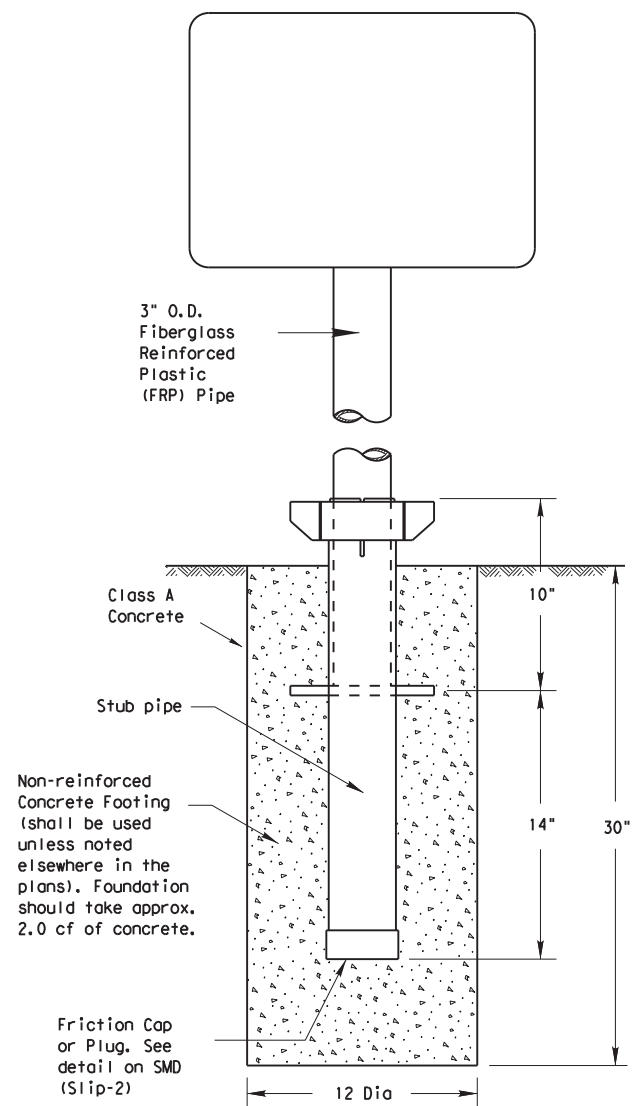
Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST SMD (TWT) -08

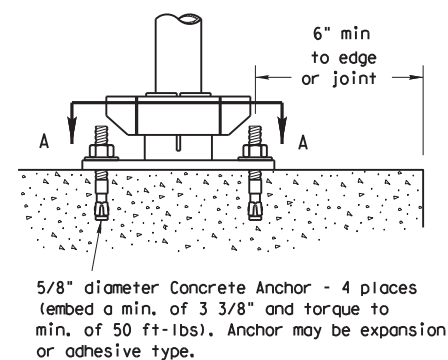
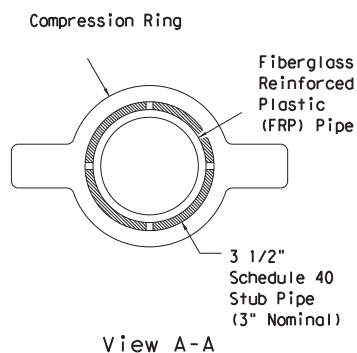
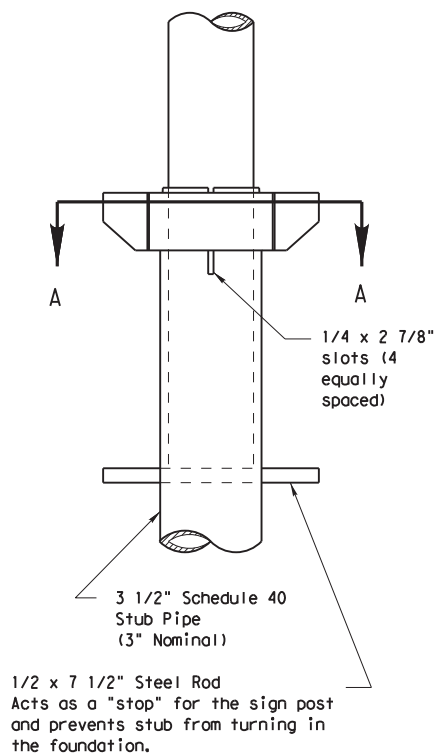
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9-08	REVISIONS	CONT	SECT	HIGHWAY
		637250	001	VAR.
		DIST	COUNTY	SHEET NO.
		SAT	BEXAR	343

Universal Anchor System with Fiberglass Reinforced Plastic (FRP) Post

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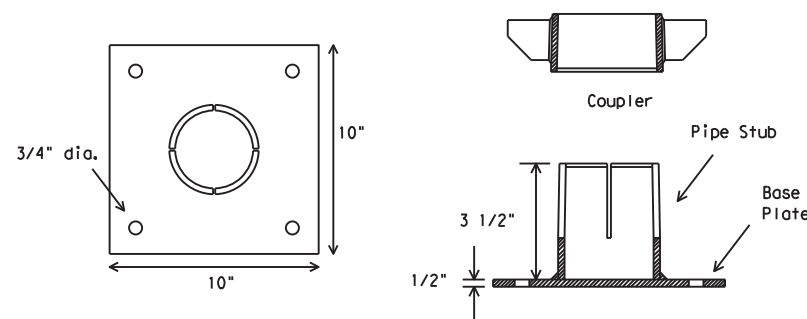


SM RD SGN ASSM TY FRP(X)UA(P)



Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxy and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.

BOLT-DOWN DETAILS



SM RD SGN ASSM TY FRP(X)UB(P)

GENERAL NOTES:

- FRP sign supports for a single type sign support may be used for signs up to and including 16 square feet. Dual post installation may be used for signs up to and including 32 square feet.
- All nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing."
- See the Traffic Operations Division website for detailed drawings of sign clamps. The website address is: <http://www.txdot.gov/publications/traffic.htm>

FRP POST REQUIREMENTS

- Materials shall conform to the requirements of Departmental Material Specification DMS-4410 and will be furnished in a yellow or gray color as specified elsewhere in the plans.
- Thickness of FRP sign support is 0.125" + 0.031", - 0.0".
- FRP sign supports are prequalified by the Traffic Operations Division. Prequalification procedures are obtained by writing:
Texas Department of Transportation
Traffic Operations Division
125 East 11th Street
Austin, Texas 78701-2483

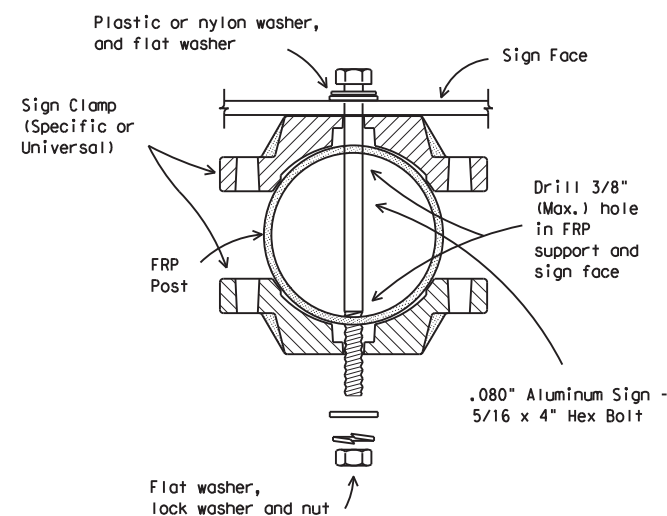
UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURES

- Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
- 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.
- Insert base post in foundation hole to depths shown and fill hole with concrete. Cut base post from bottom and ensure a minimum of 18" embedment if installed in solid rock.
- Level and plumb the base post with coupler using a torpedo level and let concrete set a minimum of 4 days, unless otherwise directed by Engineer. Bottom of base post slots shall be above the concrete footing.
- Attach sign to FRP post.
- Insert sign post into base post. Lower until the post comes to rest on the steel rod.
- Use hammer to ensure the coupler is firmly seated. Top of coupler should be level with top of base post in most instances.
- Check sign to ensure there is no twist. If loose, increase the tightening of coupler.

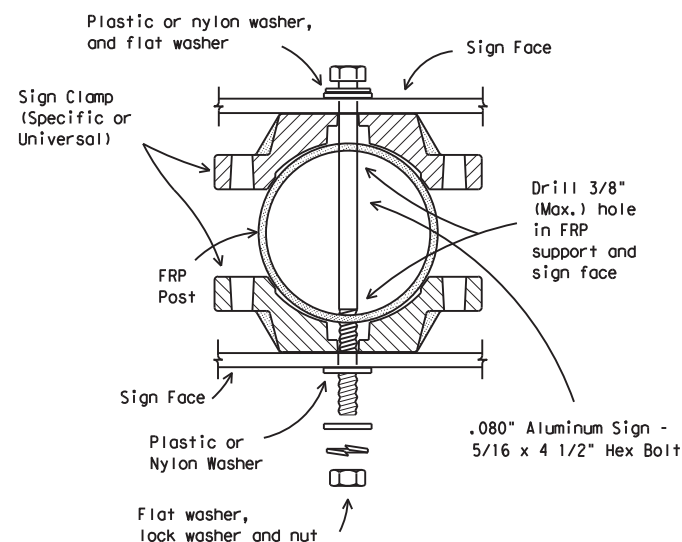
BOLT DOWN SIGN SUPPORT

- Position base plate with coupler on existing concrete.
- Drill holes into concrete and insert the 5/8" diameter bolts with wedge anchors, and tighten nuts.
- Attach sign to FRP post.
- Insert bottom of sign post into pipe stub.
- Use hammer to ensure the coupler is firmly seated. Top of coupler should be level with top of base post in most instances.
- Check sign to ensure there is no twist. If loose, increase the tightening of coupler.

Typical Sign Mounting Detail for FRP Support with Single Sign



Typical Sign Mounting Detail for FRP Support with Back-to-Back Signs



Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS UNIVERSAL ANCHOR SYSTEM WITH FRP POST

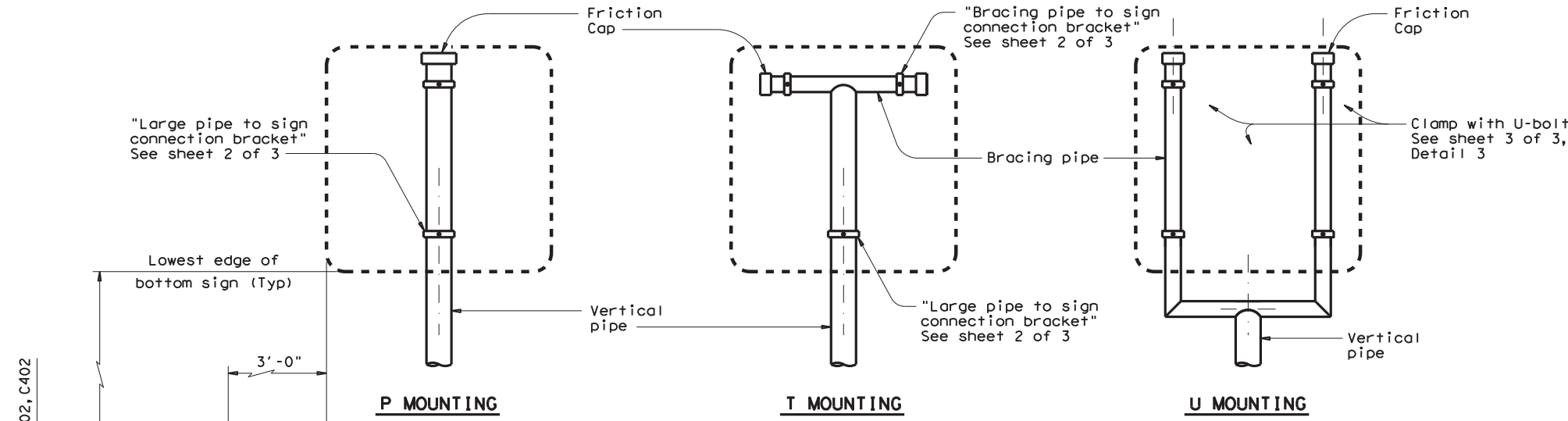
SMD (FRP) -08

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		637250		OOI	VAR.
		DIST	COUNTY		SHEET NO.
		SAT	BEXAR		344

DATE:
FILE:

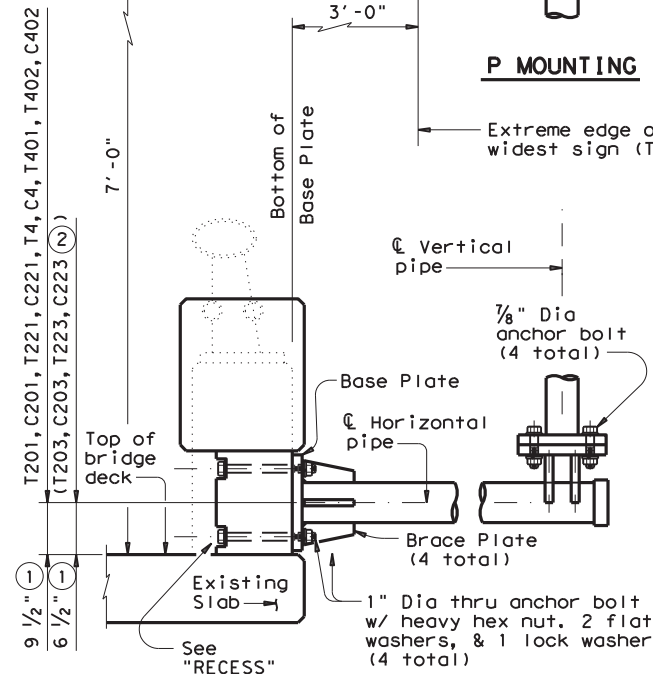
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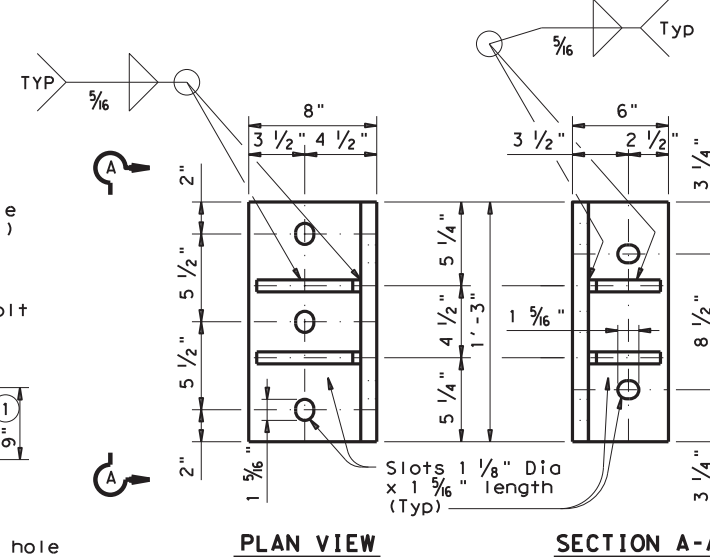
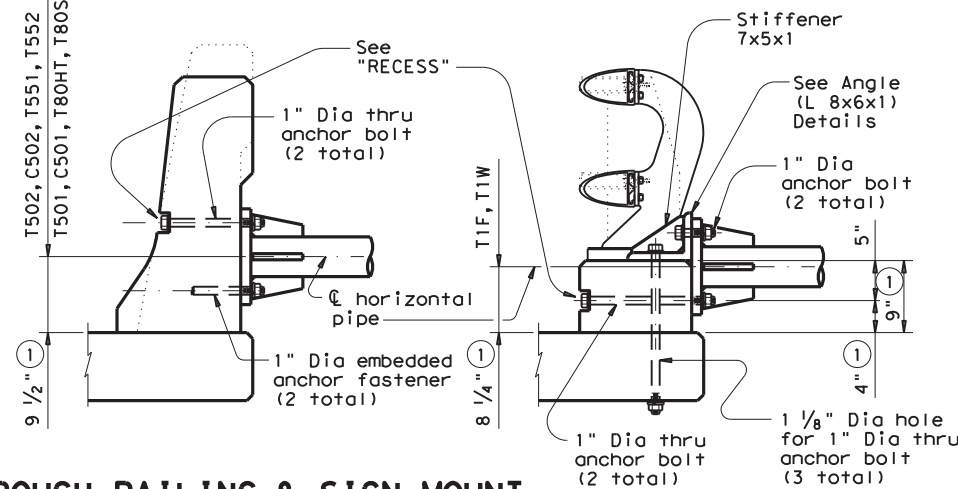


VARIOUS SIGN ATTACHMENTS

(Mounting NOT deviated from SHSD)

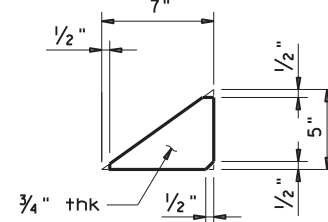


LONGITUDINAL SECTION THROUGH RAILING & SIGN MOUNT



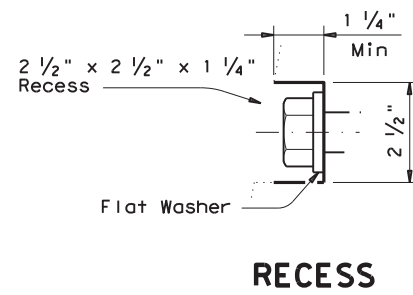
PLAN VIEW

SECTION A-A



STIFFENER

ANGLE (L 8x6x1) DETAILS



RECESS

- ① Increase 2" for structure with overlay.
- ② Attached at center post.

PIPE SIZE AND THICKNESS			
Pipe Placement Design Wind Speed	Horizontal	Vertical	Bracing
90 mph	5" X-Strong (.375")	4" X-Strong (.337")	2 1/2" Standard (.203")
130 mph	6" X-Strong (.432")	5" X-Strong (.375")	3" X-Strong (.300")

GENERAL NOTES:

Design conforms to 2013 AASHTO Standard Specifications for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design 3-second gust wind speeds of 90 mph and 130 mph with a 1.14 gust factor, and a wind importance factor of 1.0 (50-year mean recurrence interval) for the supporting structures. For mounting connection between sign panel and pipe, wind importance factors of 0.71 and 0.54, for 90 mph and 130 mph winds, respectively, are applied to adjust the wind speeds to a 10-year mean recurrence interval.

See standard sheet WV & IZ(LTS2013) for the boundaries of each design wind zone. All mounting shall be based on 130 mph wind speed design except when located in 90 mph wind zone. Maximum panel area is 30 sq. ft. Maximum design height is 50 ft, with design height defined as the distance between natural ground (average elevation of surrounding terrain) and the center of sign(s) at the mounting location.

Material for pipe shall be ASTM A53 Grade B, or A501. Structural steel plates shall be ASTM A36, A572 Grade 50, or A588. Bolts used to connect pipe and mounting bracket, and wind beam to sign panel shall be ASTM A307. Anchor bolts shall be ASTM A325 or A193 B7. Each anchor bolt shall be provided with 2 flat washers, 1 lock washer, and 1 heavy hex nut. All parts shall be galvanized in accordance with Standard Specifications Item 445, "Galvanizing".

Attach horizontal pipe at least 2'-0" from the edge of any nearby drain slot.

Contractor shall verify applicable field dimensions before fabrication. Holes drilled through the railing parapet wall shall be drilled with rotary (coring or masonry drill) type equipment. Percussion (star) drilling shall not be allowed. Anchorage for pipe attached to rail shall be placed using an anchoring system approved by the engineer. Installation of anchor fasteners including hole depth, diameter and material shall be in accordance with the manufacturers' recommendation.

Each embedded anchor fastener shall resist an allowable design loading (after applying the reduction factors of bolt spacing and bolt edge distance) of:

	130 mph	90 mph
Tension	12.5 kips	7.5 kips
Shear	9.0 kips	5.0 kips

Each anchoring system shall provide a capacity to resist the required tension and shear acting simultaneously.

For sign connection to mounting, shop drill holes on sign blank in accordance with the current Standard Highway Sign Designs for Texas (SHSD). Additional hole(s) needed to meet a stipulated-type mounting may be field drilled. For multi-sign or back-to-back signs mounting, the engineer shall determine the proper type which ensures each individual mounting meets requirements.

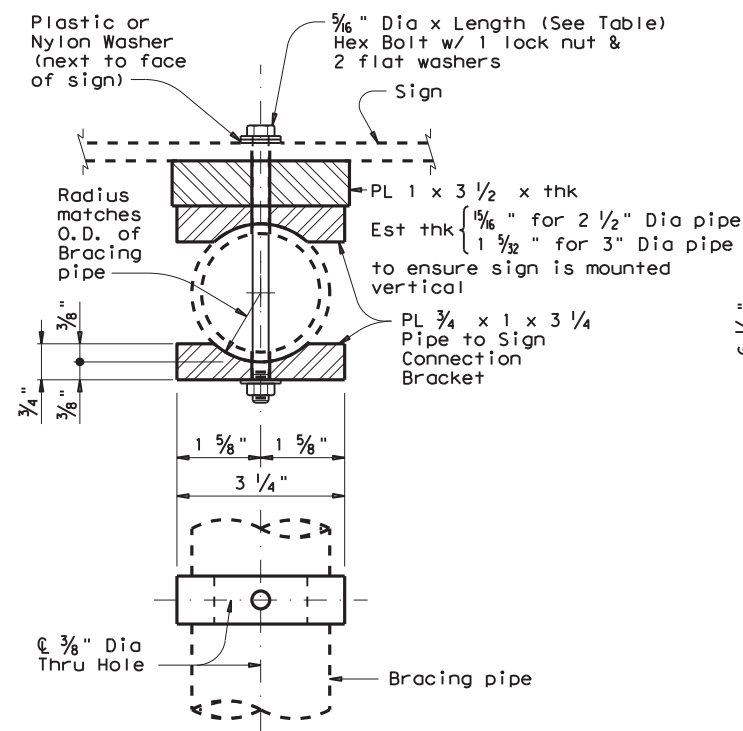
Refer to Standard sheets SMD(GEN), SMD(SLIP-2 and SMD(2-1) for details not covered here.

SHEET 1 OF 3

		Traffic Operations Division Standard	
<h2>BRIDGE RAILING SIGN MOUNT DETAILS</h2>			
<h3>SMD(BR-1)-14</h3>			
FILE: smdbr-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT August 2014	CONT	SECT	JOB
REVISIONS	637250	001	HIGHWAY
	DIST	COUNTY	SHEET NO.
	SAT	BEXAR	345

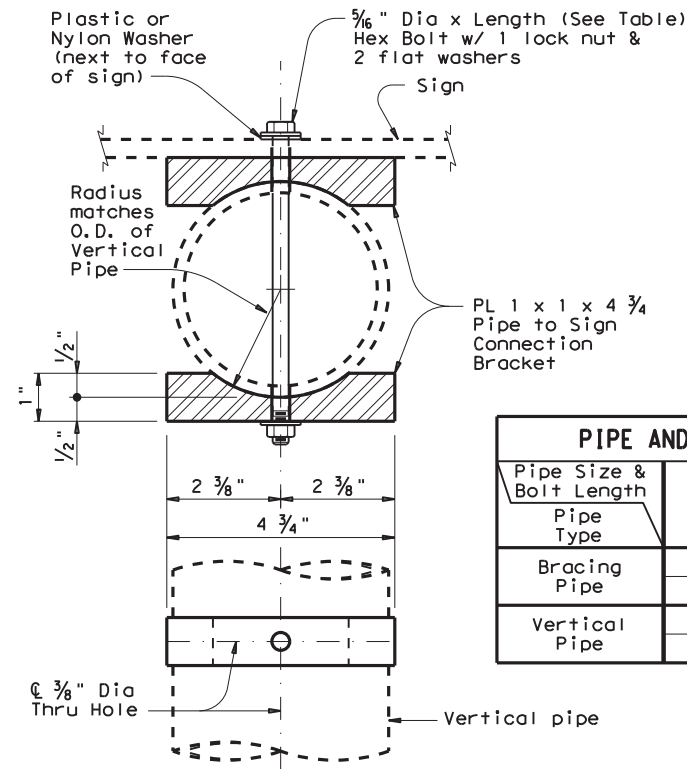
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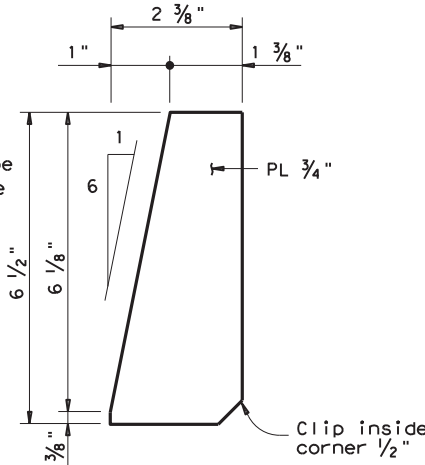
BRACING PIPE TO SIGN CONNECTION BRACKET DETAILS

(Showing T Mounting)

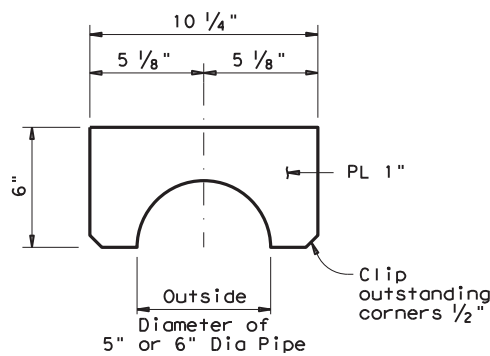


LARGE PIPE TO SIGN CONNECTION BRACKET DETAILS

(Showing P or T Mounting)

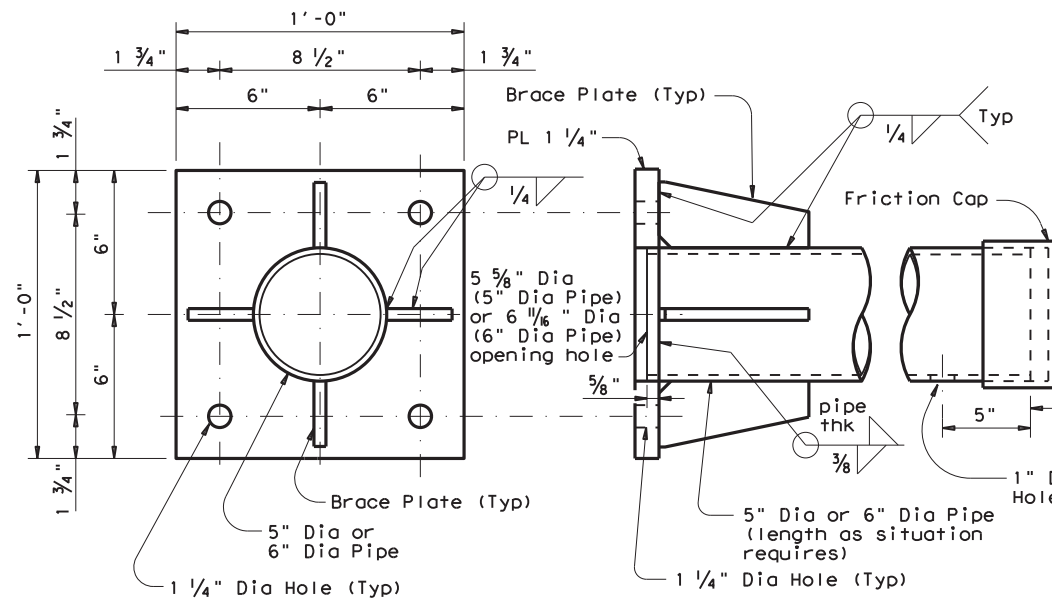


BRACE PLATE DETAILS

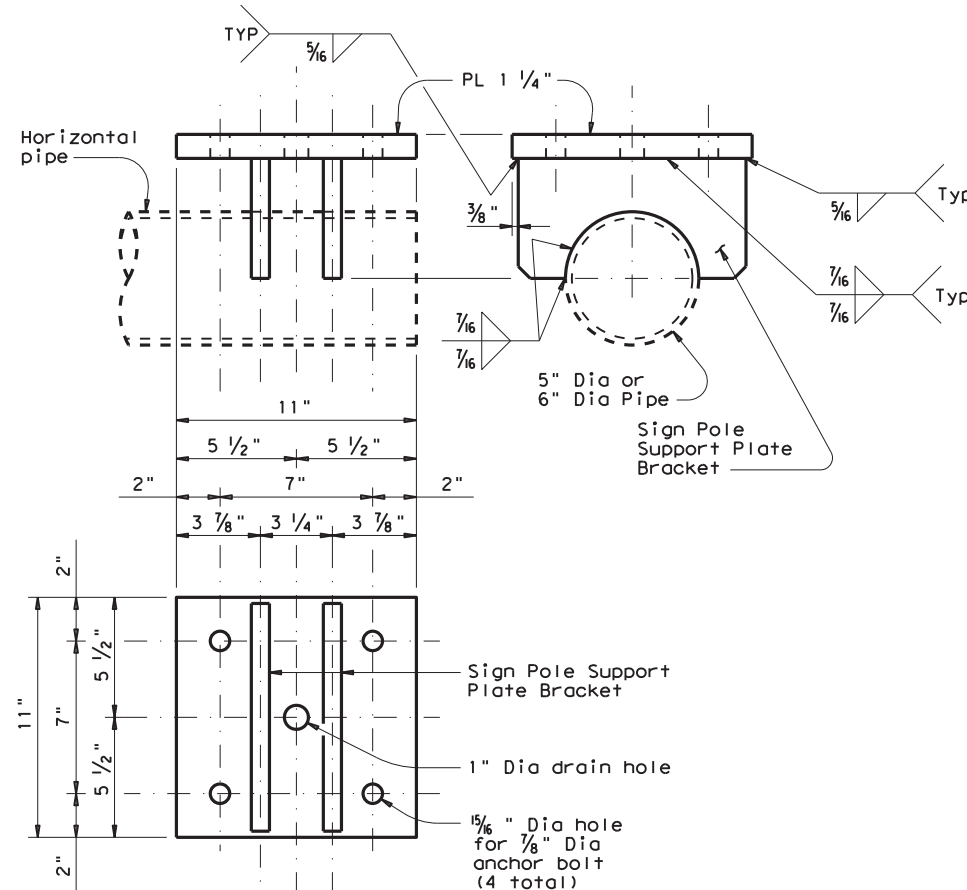


SIGN POLE SUPPORT PLATE BRACKET DETAILS

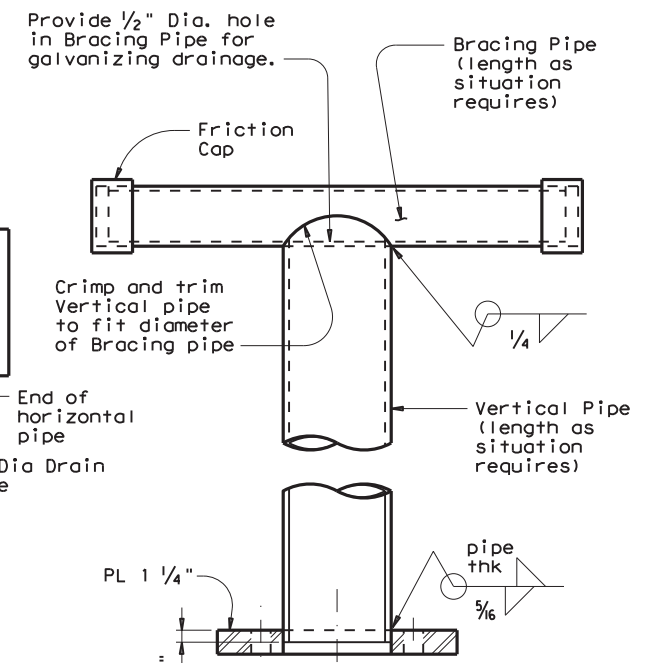
PIPE AND BOLT SPECIFICATIONS		
Pipe Size & Bolt Length	Nominal Pipe Dia (in.)	Bolt Length (in.)
Bracing Pipe	2 1/2	6
Vertical Pipe	3	7
Vertical Pipe	4	7
Vertical Pipe	5	8



BASE PLATE DETAILS



SIGN POLE SUPPORT PLATE DETAILS



SIGN POLE & POLE BASE PLATE DETAILS

(Showing only T Mounting)

SHEET 2 OF 3



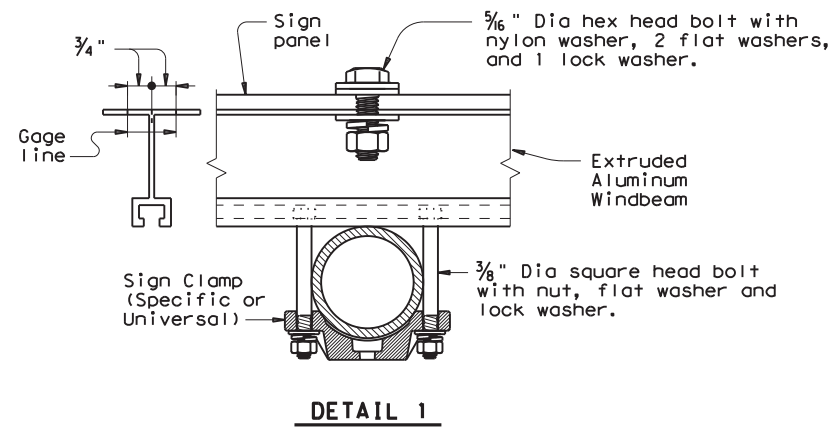
BRIDGE RAILING SIGN MOUNT DETAILS

SMD (BR-2) - 14

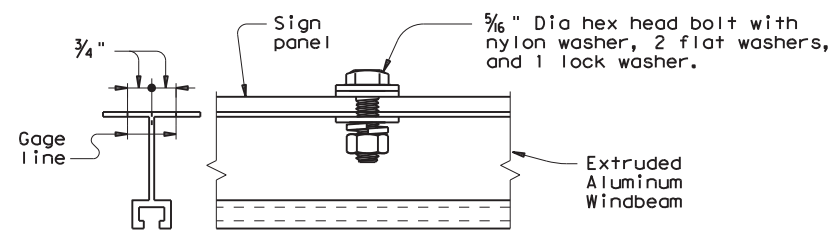
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DIST	COUNTY	SHEET NO.		
SAT	BEXAR	346		

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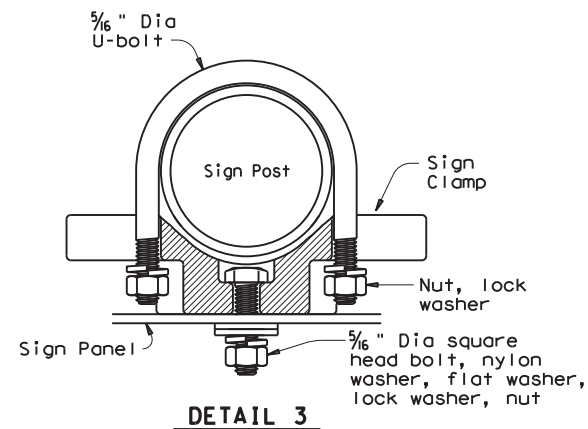
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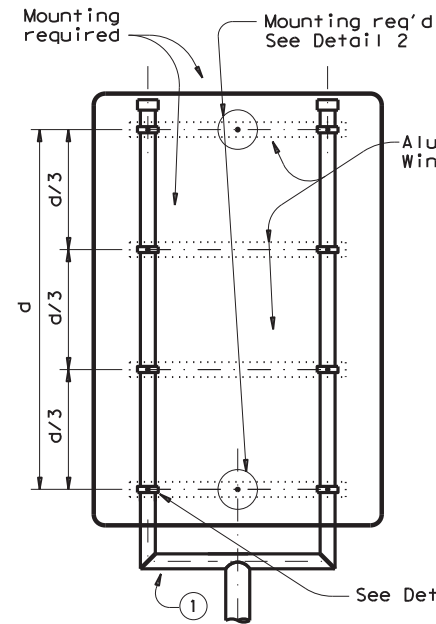
DETAIL 1



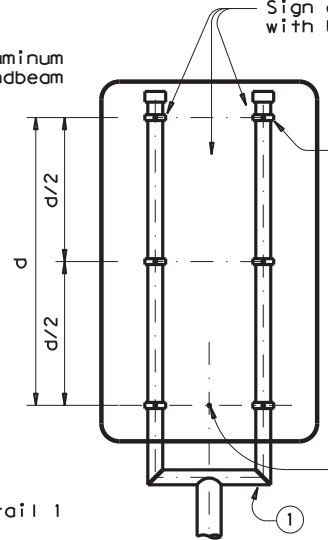
DETAIL 2



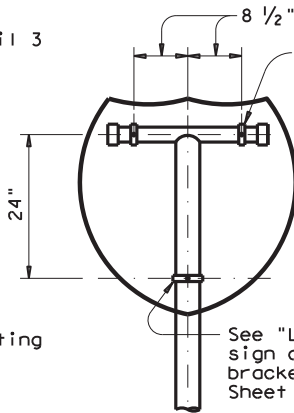
DETAIL 3



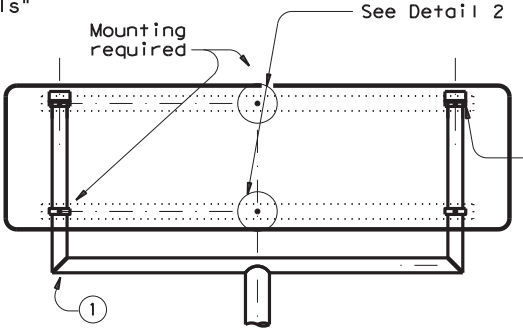
TYPE 4



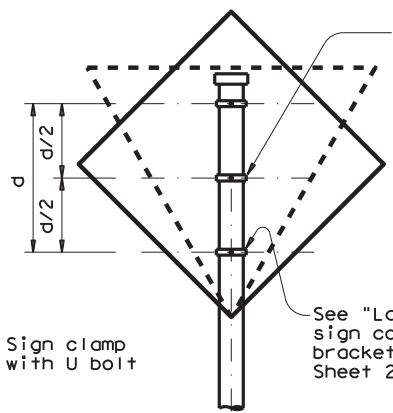
TYPE 32



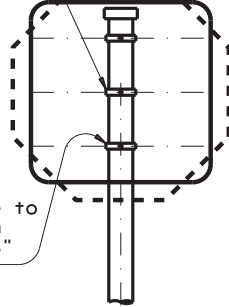
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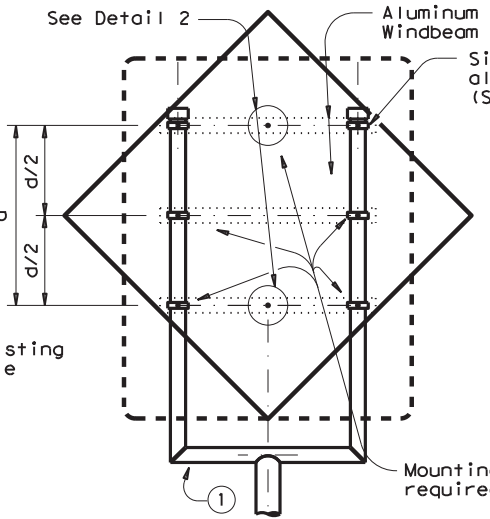
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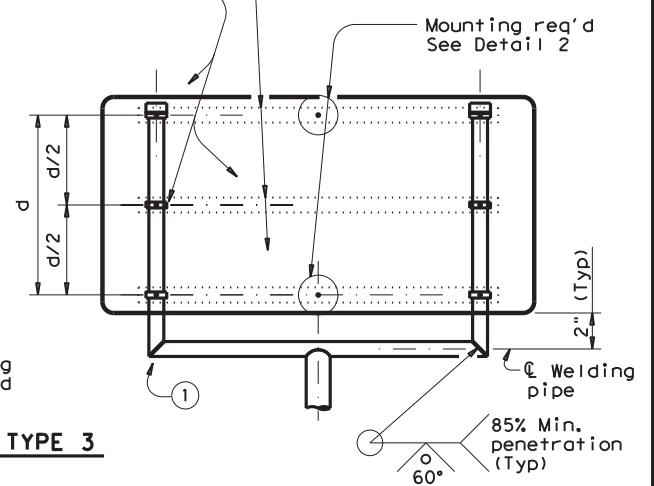
TYPE 1



TYPE 2



TYPE 3



Notes: 1. Drill holes in addition to the hole pattern of the Standard Highway Sign Designs for Texas (SHSD) at specified locations to meet a stipulated-type mounting indicated in the parenthesis ().
 2. "Blank" in the above table indicates all other signs excluded from stipulated mounting shall be mounted in accordance with SHSD.

① In lieu of welding, the Fabricator may bend bracing pipe elbows if the following conditions are met:
 a. Spacing between vertical bracing pipes is equal to or greater than 2'-6".
 b. Bending radius is 12".
 c. The distance between the lowest clamp and centerline of horizontal bent pipe is 13" max.

SIGN SHAPE	SQUARE			HORIZONTAL RECTANGLE			VERTICAL RECTANGLE			DIAMOND			OCTAGON			EQUILATERAL TRIANGLE			INTERSTATE SHIELD	PENTAGON (SCHOOL)		
	P	T	U	P	T	U	P	T	U	P	T	U	P	T	U	P	T	U	P	P	T	
Type of Sign Mounting on SHSD																						
Design Wind Speed																						
90 mph					(Type 23) 60"x48"			(Type 3) 72"x36" 78"x36"			(Type 2) 36"x48" (Type 32) 36"x60" 36"x72" 42"x60" 48"x54" 48"x60" 48"x72" (Type 3) 48"x84"			(Type 3) 60"x60"						(Type Special) 45"x36"		
130 mph	(Type 1) 30"x30" 36"x36"	(Type 3) 48"x48"		(Type 1) 36"x24" 36"x30"	(Type 23) 48"x42" 54"x42" 60"x30" 66"x36" 84"x24"			(Type 3) 72"x36" 78"x36"	(Type 1) 30"x36" 30"x42"		(Type 3) 36"x48" 36"x60" 36"x72" 42"x60" 48"x54" 48"x60"	(Type 3) 48"x60"	(Type 1) 36"x36"	(Type 3) 48"x48" 60"x60"			(Type 1) 48"x48"			(Type Special) 36"x36" 45"x36"		

SHEET 3 OF 3

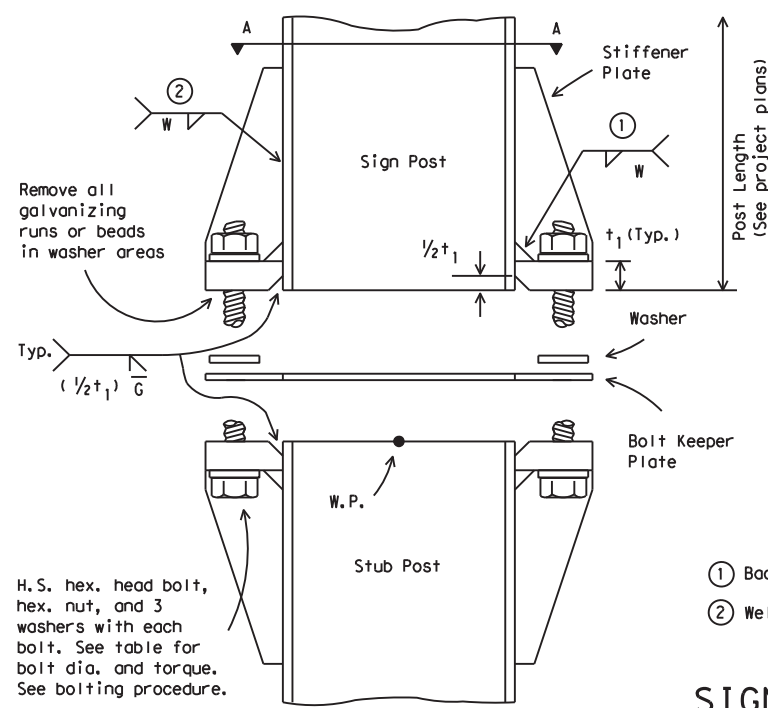
Texas Department of Transportation
Traffic Operations Division Standard

BRIDGE RAILING SIGN MOUNT DETAILS

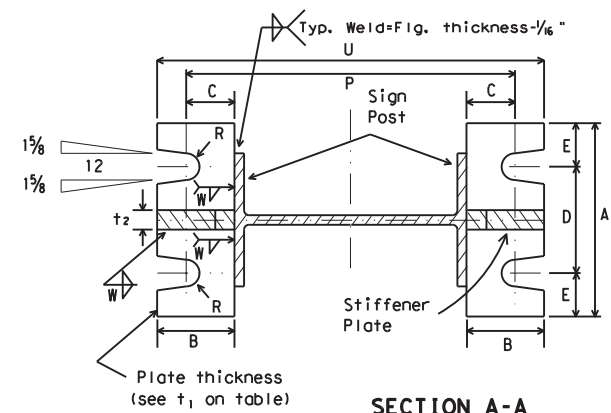
SMD (BR-3) - 14

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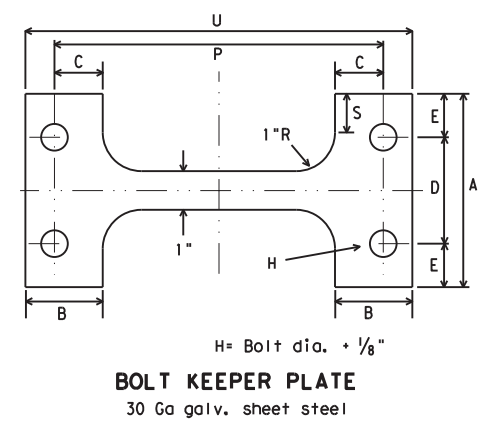
ELEVATION



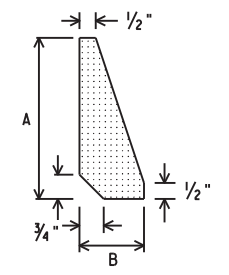
SECTION A-A

- ① Back up weld to be made before installing stiffener plate
- ② Weld W may be continued across clips to seal joint

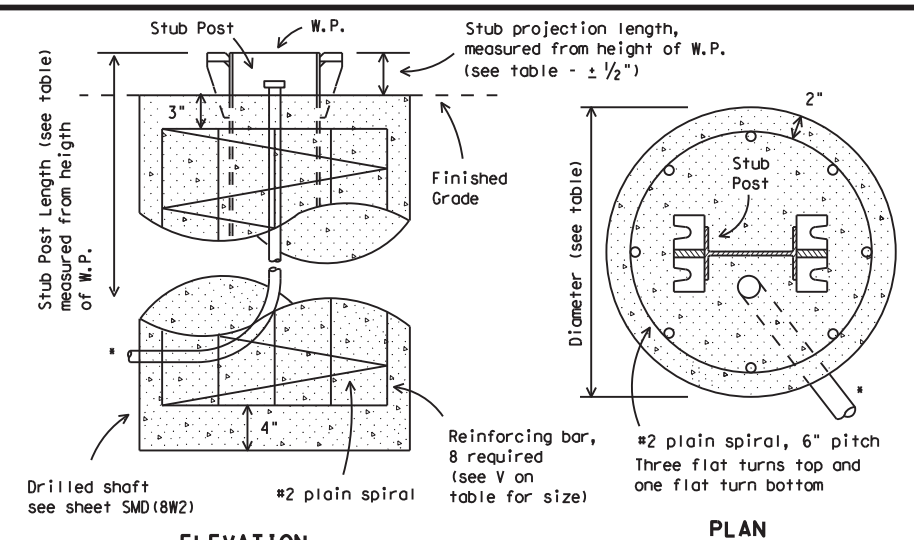
SIGN POST AND STUB POST
(For W Shapes)



BOLT KEEPER PLATE
30 Ga galv. sheet steel

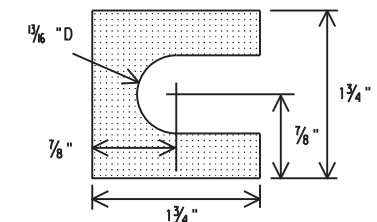


STIFFENER PLATE
DETAIL



FOUNDATION DETAIL

*Note: For signs with electrical apparatus, see ED(10) for conduit required in foundation.



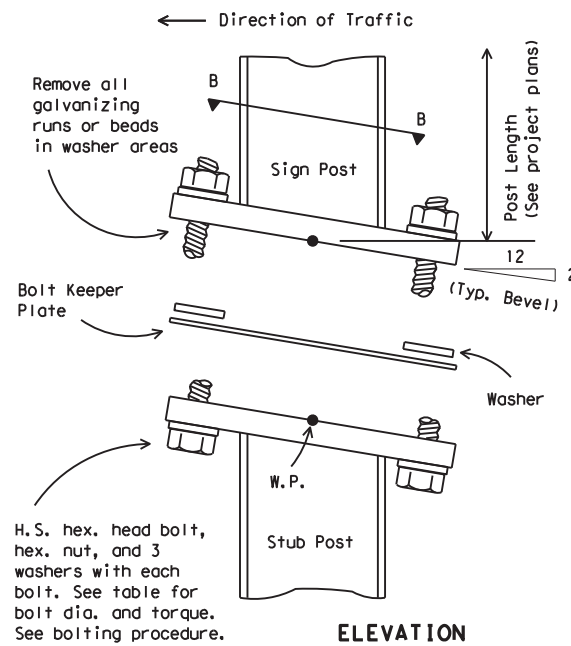
SHIM DETAIL

Furnish two .012\"+ thick and two .032\"+ thick shims per post. Shims shall be fabricated from brass shim stock or strip conforming to ASTM B36.

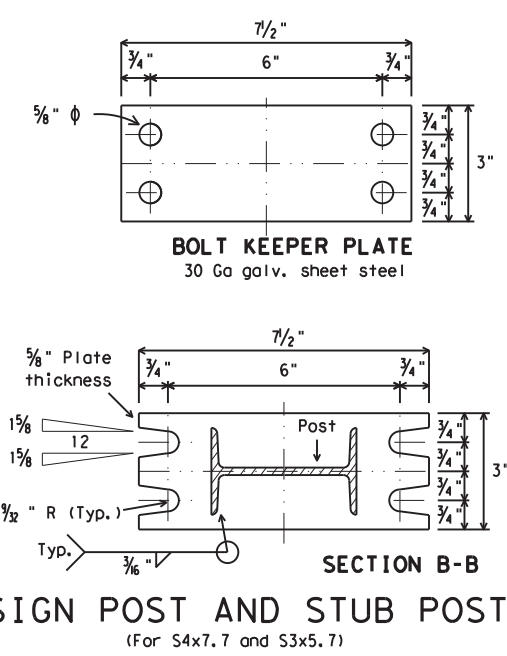
- BOLTING PROCEDURE FOR ASSEMBLY OF BASE CONNECTION:**
1. Assemble sign post, BOLT KEEPER PLATE and stub post with bolts and three flat washers per bolt as shown.
 2. Shim as required to plumb post.
 3. Tighten all bolts the maximum possible with a 12 to 15 inch wrench to clean bolt threads and to bed washers and shims.
 4. Loosen each bolt in sequence and retighten bolts in a systematic order to the prescribed torque. Do not over-tighten.
 5. To prevent nut loosening, burr threads of bolt at junction with nut using a center punch.

Dimensions Post Size	Base Connection Data Table										Perforated Fuse Plate Data Table							Bolt Keeper Data			Foundation Data								
	Bolt Size & Torque	A	B	C	D	E	t ₁	t ₂	W	R	F	G	J	K	M	d ₁	d ₂	t ₃	Bolt Dia.	Wt. (ea.) (lbs.)	Bolt length	P	S	U	Stub length	Stub projection	Dr. Shaft diameter	Bar V Size	
W6x9	5/8" φ × 2 3/4"										4 1/4"	2"	4"	2 1/4"	1"	9/16"	3/4"	1/4"	1/2"	1.01	1 1/2"	8 3/8"		9 7/8"	2'-0"	3"			#5
W6x12	440-450 inch pounds	5"	2"	1 1/4"	2 3/4"	1 1/8"	3/4"	1/2"	1/4"	11/32"	5"	2 1/2"	6"	3 1/2"	1 1/2"	1/16"	1/4"	3/8"	5/8"	2.51	2 1/4"	8 1/2"	1"	10"	2'-0"	3"			#5
W6x15	36-38 foot pounds										5"	2 1/2"	5 1/4"	2 3/4"	1 1/4"	1/16"	1/16"	3/8"	5/8"	2.26	2 1/4"	10 5/8"		12 1/8"	2'-6"	3"			#6
W8x18											5 1/2"	2 1/2"	5 1/4"	2 3/4"	1 1/4"	13/16"	1"	1/2"	3/4"	3.35	2 1/4"	11"		12 3/4"	3'-0"	2 1/2"			#7
W8x21	3/4" φ × 3 1/2"										6"	3"	5 3/4"	2 3/4"	1 3/8"	13/16"	1 1/8"	1/2"	3/4"	4.03	2 1/4"	12 7/8"	1 1/2"	14 5/8"	3'-0"	2 1/2"			#8
W10x22	740-750 inch pounds	6"	2 1/4"	1 3/8"	3 1/2"	1 1/4"	1"	3/4"	5/16"	13/32"	6"	3"	6 1/2"	3 1/2"	1 5/8"	13/16"	1 5/16"	1/2"	3/4"	4.47	2 1/4"	15"		16 3/4"	3'-0"	2 1/2"			#9
W10x26	62-63 foot pounds										6"	3"	6 1/2"	3 1/2"	1 5/8"	13/16"	1 5/16"	1/2"	3/4"	4.47	2 1/4"	15"		16 3/4"	3'-0"	2 1/2"			#10
W12x26											6"	3"	6 1/2"	3 1/2"	1 5/8"	13/16"	1 5/16"	1/2"	3/4"	4.47	2 1/4"	15"		16 3/4"	3'-0"	2 1/2"			#11
S3x5.7	1/2" φ × 2 1/2"	See Detail Below										3 3/4"	1 1/2"	2 5/8"	1 1/2"	5/8"	9/16"	3/8"	1/4"	1/2"	0.60	1 1/2"	See Detail Below			3'-3 1/2"	3/2"	12"	Non-reinforced
S4x7.7	440-450 inch pounds	See Detail Below										3 3/4"	1 1/2"	2 5/8"	1 1/2"	5/8"	9/16"	3/8"	1/4"	1/2"	0.60	1 1/2"	See Detail Below			3'-3 1/2"	3/2"	12"	Non-reinforced

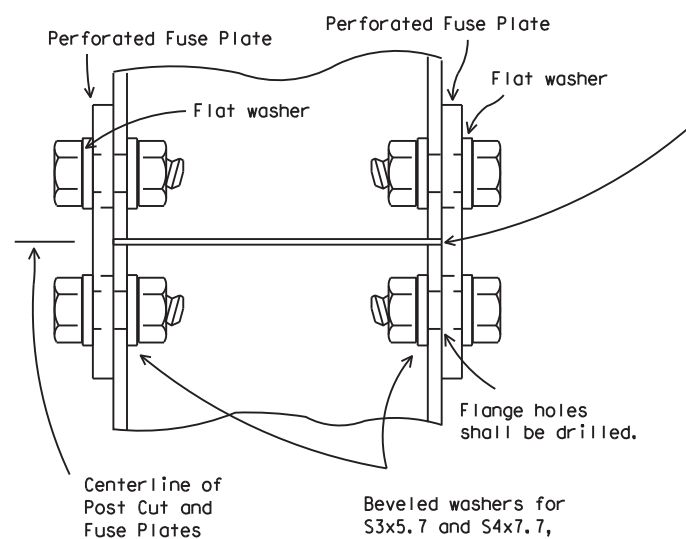
③ Foundation design shall be Type G Mount, see SMD (TY G).



ELEVATION



SIGN POST AND STUB POST
(For S4x7.7 and S3x5.7)



DETAIL "A"

PERFORATED FUSE PLATE DETAIL

Use H.S. hex head bolts, hex head nut and bevel or flat washer (where req'd) under nut. All holes shall be drilled, sub-punched and reamed. All plate cuts shall preferably be saw cuts. However, flame cutting will be permitted provided all edges are ground. Metal projecting beyond the plane of the plate face will not be permitted. Steel fuse plates shall conform to the requirements of ASTM A36. ASTM A572 Grade 50 or ASTM A588 may be substituted for A36 at the option of the fabricator. Mill test reports shall be submitted for Fuse Plates. Steel used shall have an ultimate tensile strength not to exceed 80 KSI. For alternative Fuse Plate contact Traffic Operations Division.

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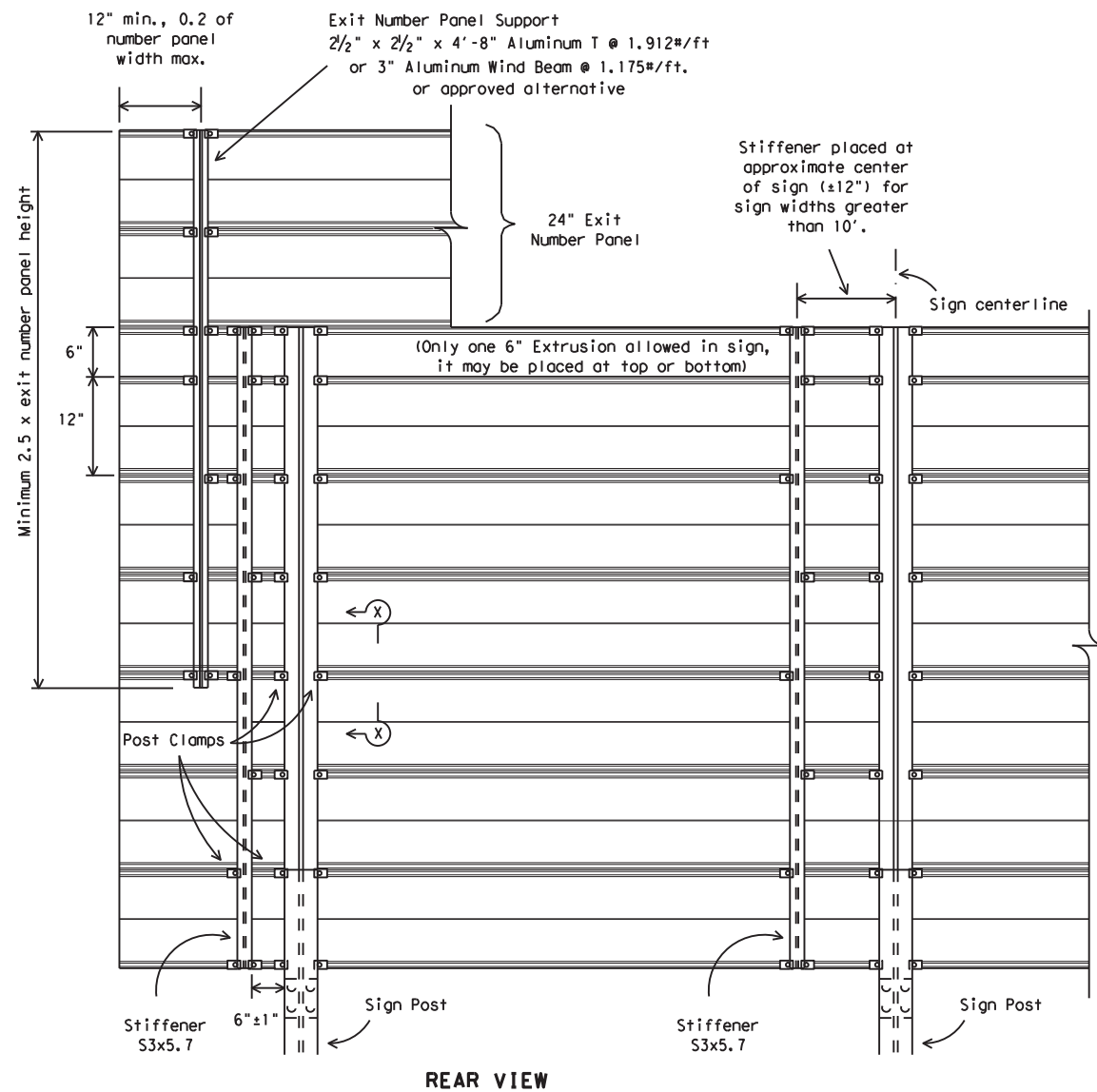
**SIGN MOUNTING DETAILS-
LARGE ROADSIDE SIGNS
FOUNDATION & STUB**

SMD(2-2)-08

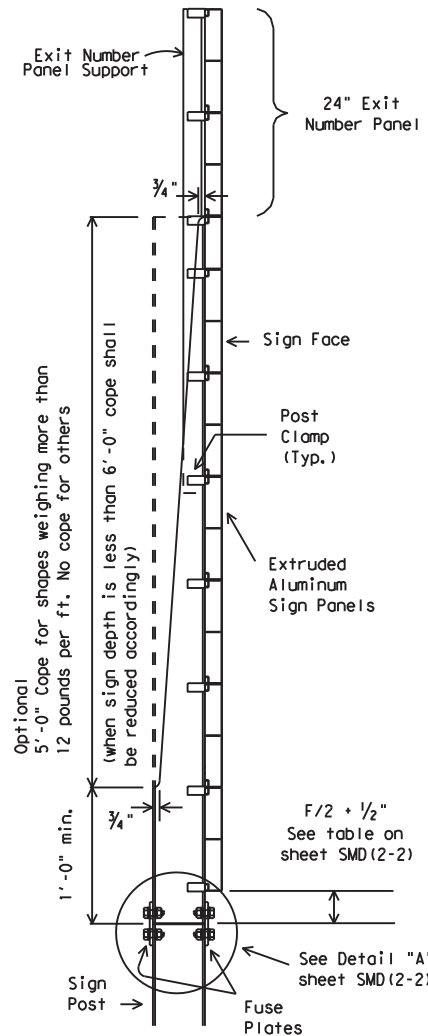
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9-08		637250		001	VAR.
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		SAT	BEXAR	349	

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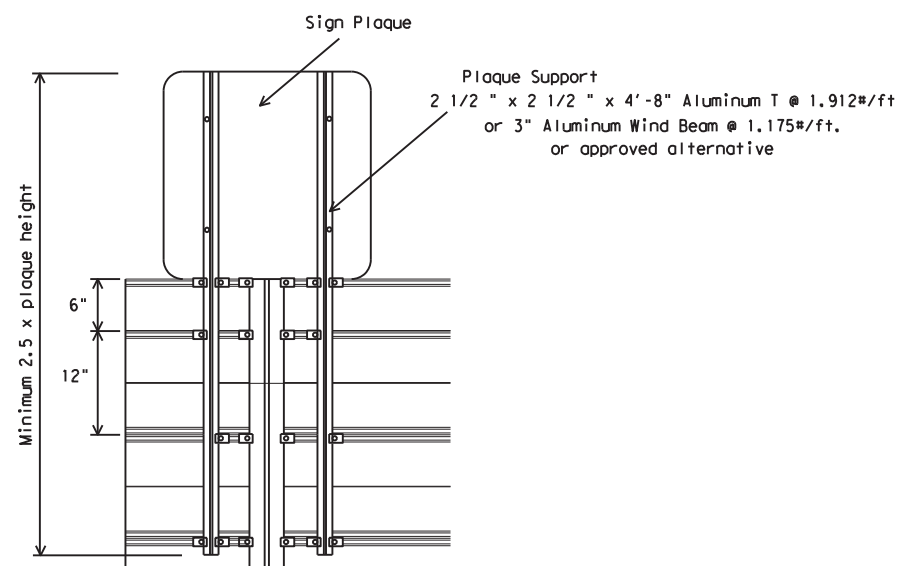
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REAR VIEW
ALUMINUM PARENT SIGN & EXIT NUMBER PANEL MOUNTING DETAILS

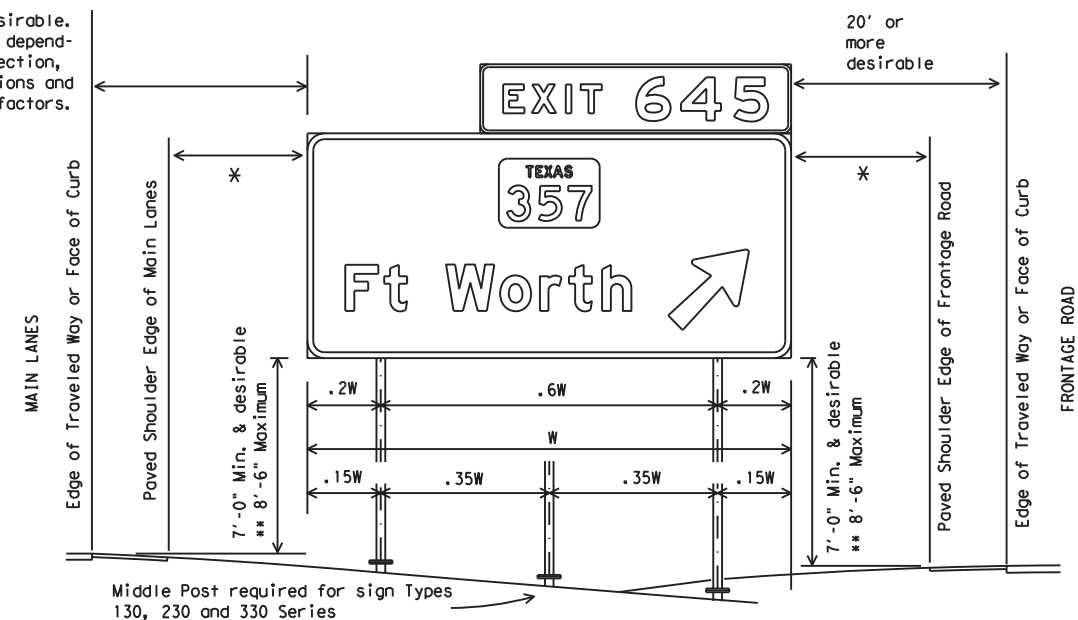


SIDE VIEW



SIGN PLAQUE MOUNTING DETAIL TO ALUMINUM PARENT SIGN

30' or more desirable. May be reduced depending on cross section, viewing conditions and other related factors.



TYPICAL SIGN INSTALLATION AND LOCATION

LATERAL CLEARANCE NOTES:

Lateral clearances of signs mounted on median side of main lanes are the same as shown above where space will permit.

Where a sign is to be located behind guardrail, an allowable minimum clearance of five feet may be used, measured from the face of the guardrail to the near edge of sign.

* - 6' minimum and desirable may be used only in areas of limited lateral clearance and when approved by the Engineer.

POST SPACING NOTES:

Post spacing on a two post sign may vary a maximum of plus or minus 10% of total sign width to fit field conditions.

Post spacing on a three post sign may vary a maximum of plus or minus 5% of total sign width to fit field conditions.

SIGN HEIGHT NOTES:

** The 8' 6" maximum may be exceeded when placing signs on extreme slopes. In these conditions, a 7' minimum from natural ground to bottom of sign must be maintained.

DEPARTMENTAL MATERIAL SPECIFICATIONS

ALUMINUM SIGN BLANKS	DMS-7110
SIGN HARDWARE	DMS-7120

GENERAL NOTES:

- Exit number panel shall be mounted to the right hand side of the parent sign for right exits and to the left hand side for left exits. The number panel shall be mounted with two uprights so its right edge is even with the right edge of the parent sign or vice-versa for left hand exits.
- Exit number panel support shall be symmetrical about number panel centerline.
- Exit number panel support shall be ASTM A36 structural steel galvanized after fabrication, or ASTM B221 aluminum alloy 6061-T6 or approved alternative.
- All bolts, nuts and washers shall be galvanized per ASTM Designation: B695 Class 50, or A153 Class C or D.
- Posts, parent sign panels, and exit number panels shall comply with notes on sheets SMD(2-1) and SMD(2-2).
- Signs (such as exit number panels) attached above a parent sign shall be made of the same type material as the parent sign. General Service and Routing signs may be fabricated from flat sheet aluminum.
- Exit number panel support and other connection hardware required to fasten exit number panel to parent sign shall be subsidiary to "Aluminum Signs" or "Fiberglass Signs."
- For fiberglass sign installation details, see manufacturer's recommendations.



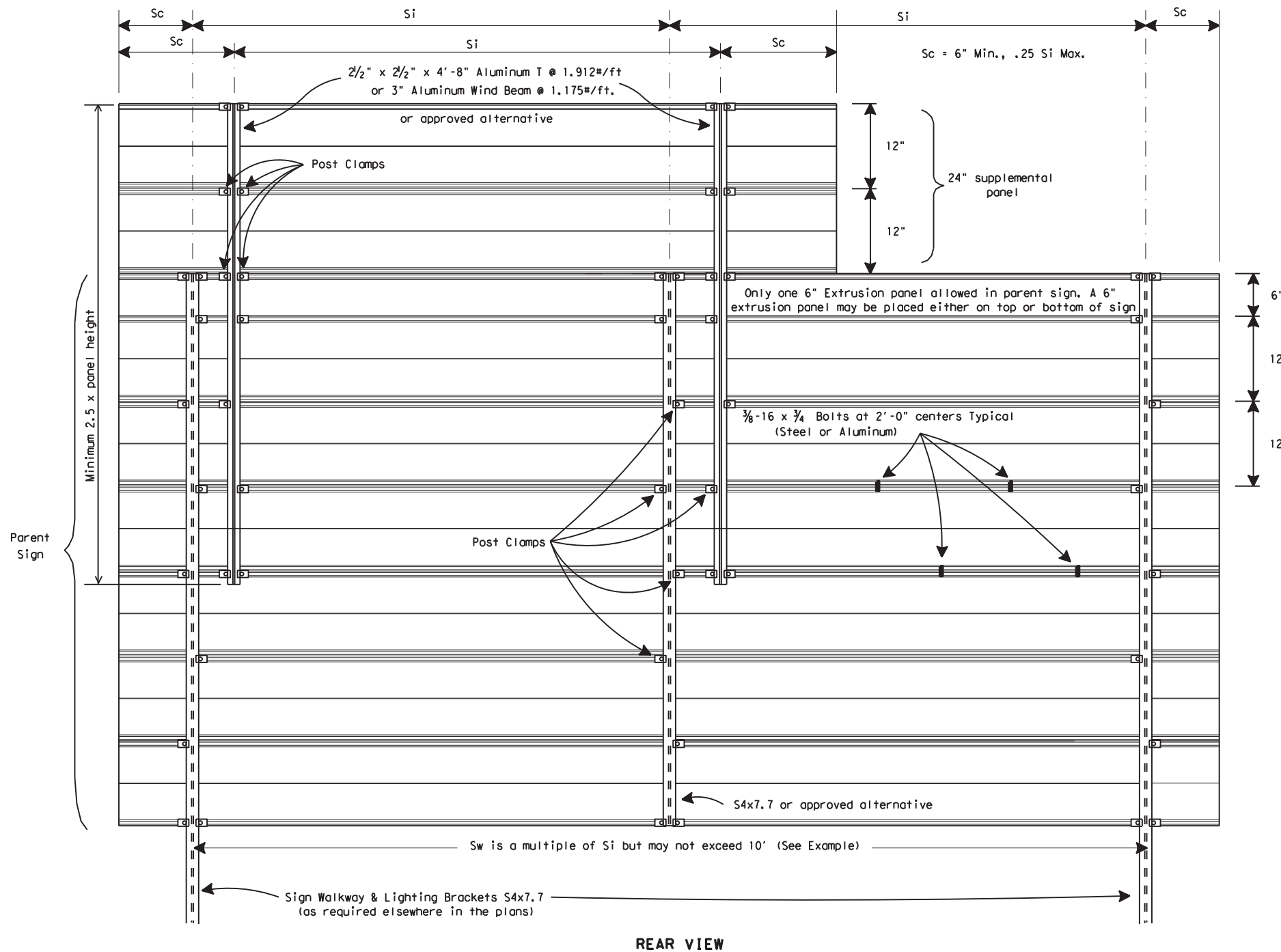
SIGN MOUNTING DETAILS-
LARGE ROADSIDE SIGNS

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		DIST. SAT	COUNTY BEXAR	SHEET NO. 350

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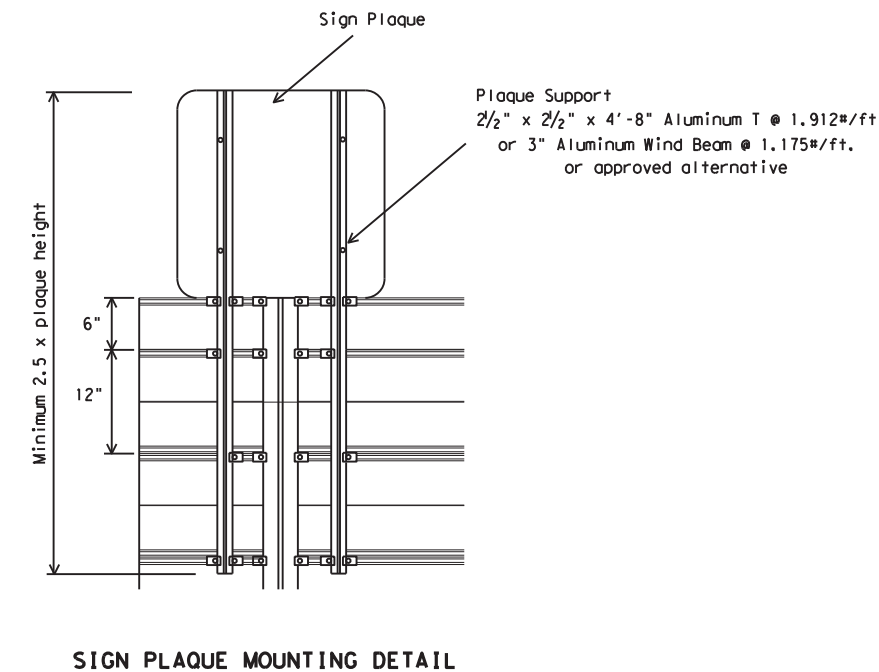
DATE:
FILE:



EXAMPLES (FOR DETERMINING Si and Sw)

NO.	ZONE	"d"	EXIT PANEL	WALKWAY	Si	Sw	COMMENT
1	1	15.0	YES	YES	4.5	9.0	Sw=2x(Si)
2	2	14.0	YES	NO	7.5	7.5	Sw = Si
3	1	15.0	NO	NO	8.5	8.5	Sw = Si
4	3	14.0	NO	YES	10.0	10.0	Sw = Si

Values shown for Si are maximum values. Si may be varied for different sign lengths and Truss mounting conditions. Sw should not exceed two times Si (Max.) or 10 feet.



"d" Deepest Sign in Group (Ft.)	MAXIMUM SIGN SUPPORT SPACING "Si" (FEET)																			
	EXTRUDED ALUMINUM SIGN PANELS																			
	WITH EXIT NUMBER PANELS								WITHOUT EXIT NUMBER PANELS											
	WITH WALKWAYS				WITHOUT WALKWAYS				WITH WALKWAYS				WITHOUT WALKWAYS							
WIND ZONE	WIND ZONE	WIND ZONE	WIND ZONE	WIND ZONE	WIND ZONE	WIND ZONE	WIND ZONE	WIND ZONE	WIND ZONE	WIND ZONE	WIND ZONE	WIND ZONE	WIND ZONE	WIND ZONE	WIND ZONE	WIND ZONE				
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
15	4.5	7	8	10	5	7	8	10	7	8	9	10	8.5	10	10	10				
14	6	7.5	9.5	10	6	7.5	9.5	10	8	9	10	10	10	10	10					
13	7.5	9	10	10	7.5	9	10	10	9	10	10	10	10	10	10					
12	8.5	10	10	10	8.5	10	10	10	10	10	10	10	10	10	10					
11 or less	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10					

For fiberglass sign installations, see manufacturer's recommendations.

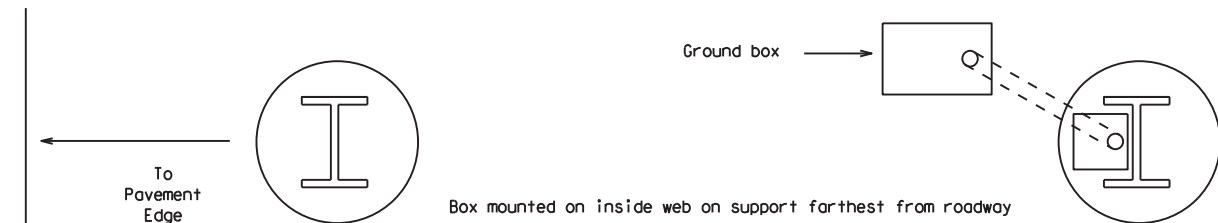


**SIGN MOUNTING DETAILS-
OVERHEAD SIGNS
EXTRUDED ALUMINUM
SMD (2-4) -08**

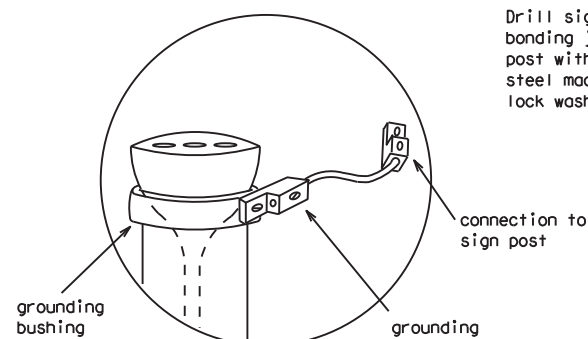
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		DIST	COUNTY	SHEET NO.
		SAT	BEXAR	351

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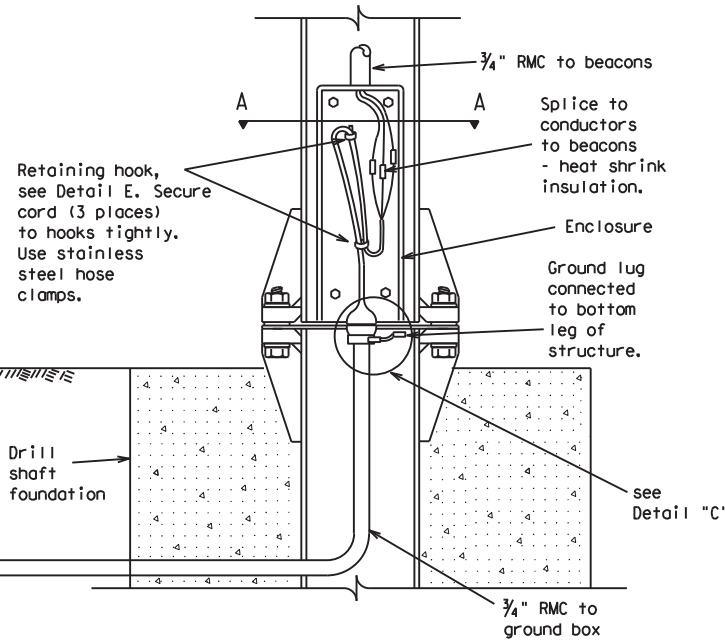
PLAN VIEW



DETAIL C

⚠ Pull connector down tight against conduit then clamp in ground box. See Detail "D"

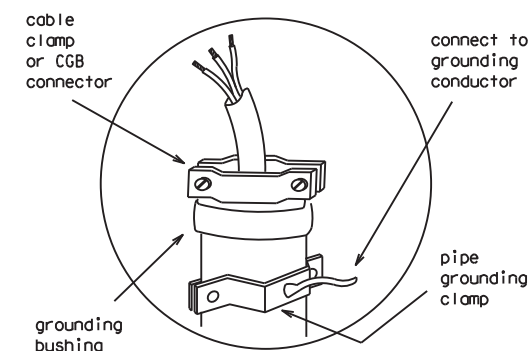
Drill sign post - structure leg, terminate bonding jumper with listed connector to post with a 10-24 (3/16") min. stainless steel machine screw, nut, flat washer and lock washer made wrench tight.



ELECTRICAL CONNECTION DETAIL

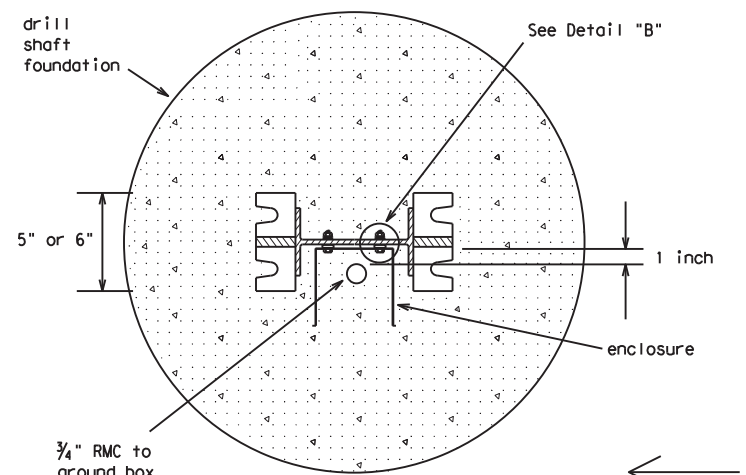
Enclosure cover not shown for clarity
Detail shows channel greater than 4 inches.
Less than 4 inches similar, see Detail A.

Use RMC E11s, provide grounding bushings. Terminate bonding jumper to ground rod and equipment grounding conductors.



DETAIL D

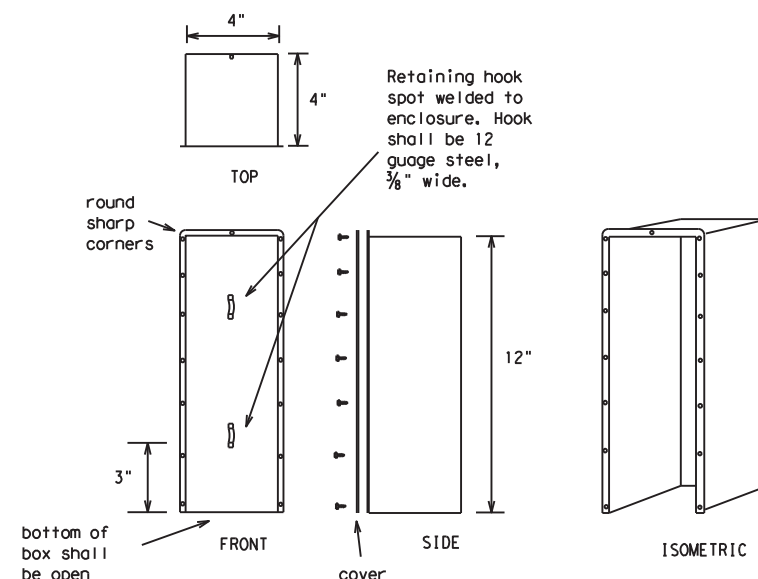
Pull cable so opposite end connector is tight against conduit end, clamp cable at top of conduit as shown.



SECTION A-A

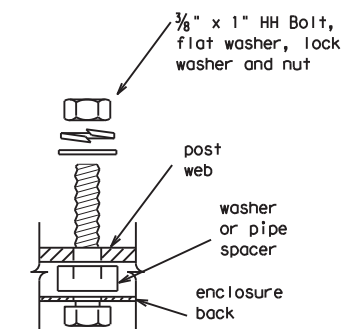
Stub-post connection
conduit, bolts and enclosure
(cover not shown)

direction of traffic



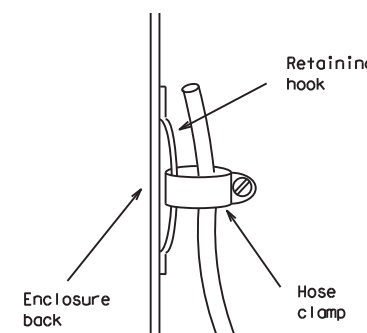
ENCLOSURE

make from 12 gauge galvanized sheet metal



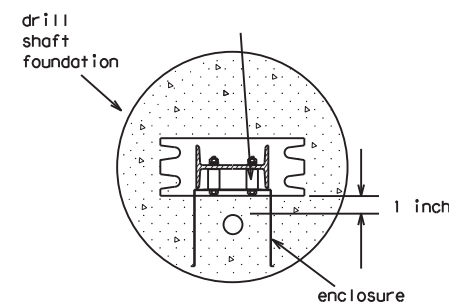
DETAIL B

enclosure connection
(4 places)
(use 2 inch bolt for
3 and 4 inch channels)



DETAIL E

steel pipe spacer
(1" for 3" channel,
1/4" for 4" channel)
See detail B



DETAIL A

Stub-post connection
conduit, bolts and enclosure
for 3 and 4 inch channel
(cover not shown)

direction of traffic

NOTES:

- Breakaway connector shall be rated for 300 VAC, 30 amps and shall be waterproof. Connector shall be a three pole (two line conductors and neutral) polarized elastomer connector made from thermosetting synthetic polymer which remains flexible over the temperature range of -40 degrees C to 90 degrees C. The pins on the connector shall be overmolded 1/4" from the face of the connector toward the tips of the pins with the same material used in the construction of the connector body. This overmolding of the pins shall provide a non-conductive double taper which prevents the intrusion of water into the connection when the connectors are fully engaged. The pin receptors shall have current carrying barrels recessed 1/2" from the face of the connector and surrounded by beryllium copper spring sleeves. The plug/receptacle combination shall be listed by an approved testing facility (UL or Factory Mutual) as suitable for outdoor use and shall have passed a rain test and a watertight (immersion) test as approved by the Engineer.
- The female connector shall be integrally molded to a 13' length of type 50 cord containing three number 10 or number 8 AWG conductors. The male connector shall be integrally molded to a 20' length of Type 50 cord containing three number 10 or number 8 AWG conductors. Cord conductors shall have colored insulation, two black and one white, or shall be taped or painted to be two black and one white. Tape or paint marking shall cover entire exposed length. The contractor shall make a brochure submittal on cord connectors. Breakaway connector and cord shall not be paid for separately, but shall be subsidiary to the various items.
- The contractor shall install in-line waterproof fuseholders for each line conductor in the ground box. Fuses shall be fast-acting 5 amp (Bussman KTK5, Gould ATM5, Littelfuse KLK5 or equal).
- ⚠ Conduit shall convert to 3/4" liquidtight flexible metallic conduit below the fuse plate or knee joint and shall revert to 3/4" RMC above the fuse plate or knee joint. The length of liquidtight flexible metal conduit shall not exceed 6'.
- Ground rod clamp shall be Blackburn GG 5/8H, Weaver W5.8 or equal.
- Ground rod to be driven to a depth to leave between 2 to 4 inches of rod above the gravel placed under the ground box. See ED(2) standard sheet for ground box details.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS-
LARGE ROADSIDE SIGNS
ELECTRICAL CONNECTION

SMD(2-6)-01

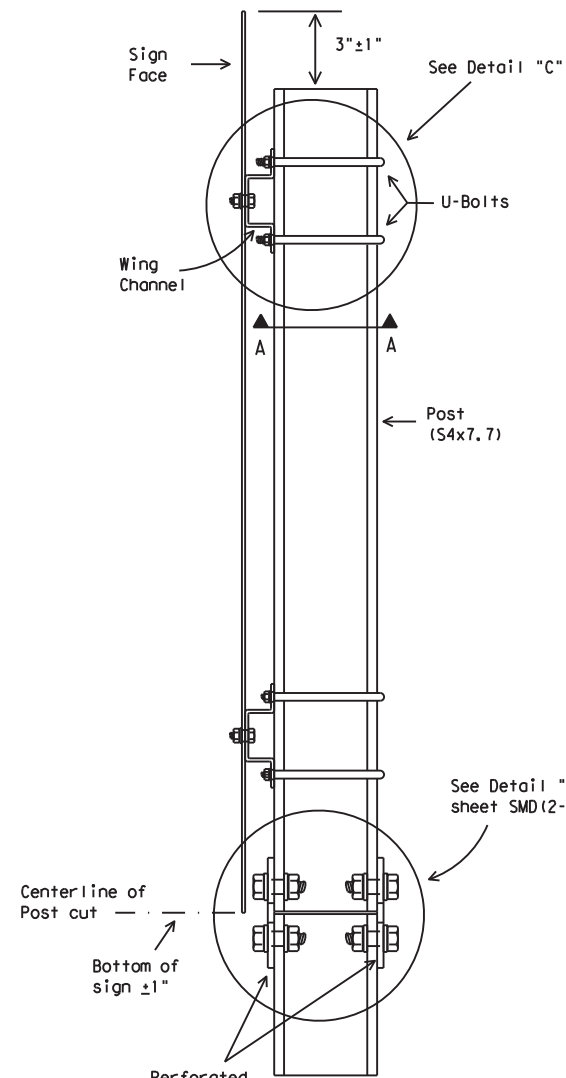
11-01 Revision

- ⚠ Liquidtight conduit size corrected.
- ⚠ Editing of minor notes.

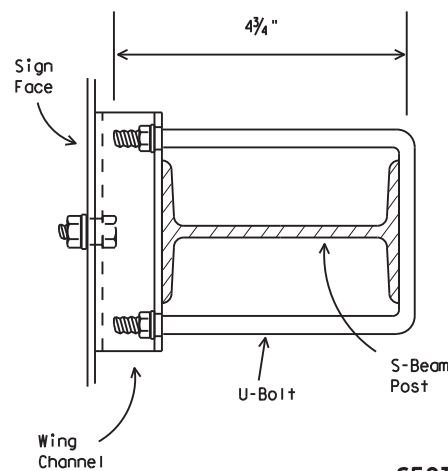
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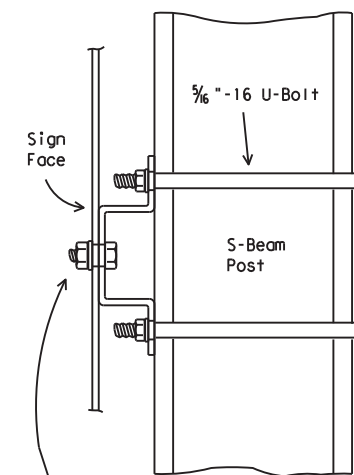
WING CHANNEL CLAMP DETAIL FOR TYPE G MOUNT



SIDE VIEW

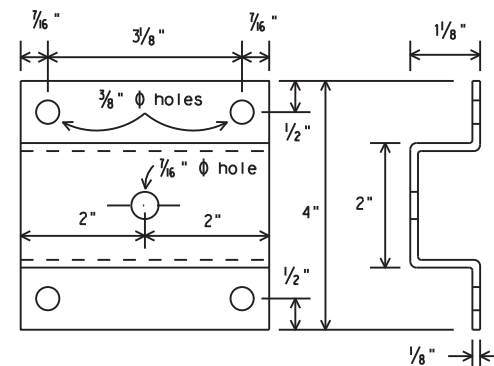


SECTION A-A



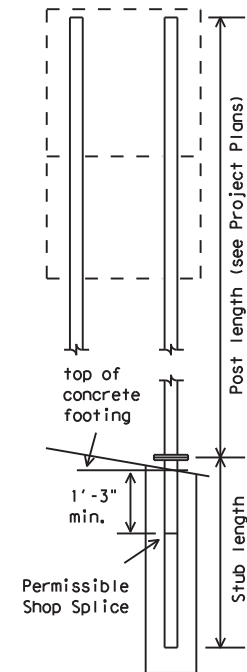
DETAIL "C"

Galvanized steel or aluminum self-locking hex. head nut. 3/8" - 16 x 3/4" hex. head bolt for sheet metal. 3/8" - 16 x 1 1/4" hex. head bolt for plywood. 3/8" galvanized medium washer.



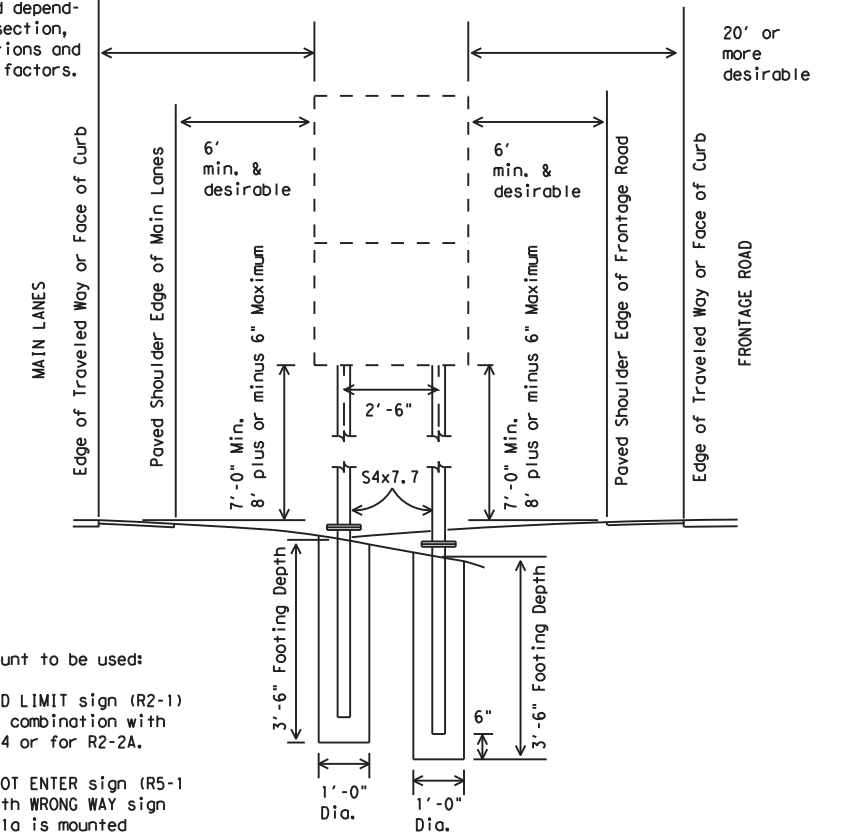
WING CHANNEL

Wing channel, 4" width x 1/8" depth x 1/8" thickness, shall be aluminum (ASTM B221 6061-T6 or B308 6061-T6), galvanized steel (ASTM A36) or stainless steel (ASTM A167 type 304, No. 2B finish).



The weight of one S4x7.7 post is equal to 112.2 lbs. plus 7.7 lbs./ft x (post length in feet minus 10 ft). The weight of 112.2 lbs. includes 10 feet of post length, post foundation stub, related connection plates, friction fuse plate, and all high strength bolts, nuts and washers.

30' or more desirable. May be reduced depending on cross section, viewing conditions and other related factors.



This type mount to be used:

- (1) For SPEED LIMIT sign (R2-1) when used in combination with R2-2 and R2-4 or for R2-2A.
- (2) For DO NOT ENTER sign (R5-1) when used with WRONG WAY sign (R5-1a). R5-1a is mounted above R5-1.

DEPARTMENTAL MATERIAL SPECIFICATIONS
SIGN HARDWARE

DMS-7120

GENERAL NOTES:

- Design conforms with AASHTO Specifications for the design and construction of structural supports for highway signs.
- Materials and fabrication shall conform to the requirements of the Department material specifications.
- Structural steel shall be "Low-Alloy Steel" for non-bridge structures per Item 442, "Metal For Structures."
- Parts shall be saw cut either before galvanizing and the galvanized cut cleaned of zinc build-up, or saw cut after galvanizing and the cut surface repaired per Item 445, "Galvanizing." (Cut surface will not be treated until plate is installed and all bolts fully tightened.)



SIGN MOUNTING DETAILS, TYPE G SUPPORT

SMD(TY G)-08

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