

WPAP-Exception Request

SL 1 at Skunk Hollow Creek

CSJ: 3136-01-200

Travis County

August 2023

Texas Department of Transportation
Austin District

Environmental Section
Shane Rotter

Recharge and Transition Zone Exception Request Form Checklist

- ^x **Edwards Aquifer Application Cover Page (TCEQ-20705)**
- ^x **General Information Form (TCEQ-0587)**
 - Attachment A - Road Map
 - Attachment B - USGS / Edwards Recharge Zone Map
 - Attachment C - Project Description
- ^x **Geologic Assessment Form (TCEQ-0585), if necessary**
 - Attachment A - Geologic Assessment Table (TCEQ-0585-Table)
 - Comments to the Geologic Assessment Table
 - Attachment B - Soil Profile and Narrative of Soil Units
 - Attachment C - Stratigraphic Column
 - Attachment D - Narrative of Site Specific Geology
 - Site Geologic Map(s)
 - Table or list for the position of features' latitude/longitude (if mapped using GPS)
- ^x **Recharge and Transition Zone Exception Request Form (TCEQ-0628)**
 - Attachment A - Nature of Exception
 - Attachment B - Documentation of Equivalent Water Quality Protection
- ^x **Temporary Stormwater Section (TCEQ-0602), if necessary**
 - Attachment A - Spill Response Actions
 - Attachment B - Potential Sources of Contamination
 - Attachment C - Sequence of Major Activities
 - Attachment D - Temporary Best Management Practices and Measures
 - Attachment E - Request to Temporarily Seal a Feature (if sealing a feature)
 - Attachment F - Structural Practices
 - Attachment G - Drainage Area Map
 - Attachment H - Temporary Sediment Pond(s) Plans and Calculations
 - Attachment I - Inspection and Maintenance for BMPs
 - Attachment J - Schedule of Interim and Permanent Soil Stabilization Practices
- **Permanent Stormwater Section (TCEQ-0600), if necessary**
 - Attachment A - 20% or Less Impervious Cover Waiver, if project is multi-family residential, a school, or a small business and 20% or less impervious cover is proposed for the site
 - Attachment B - BMPs for Upgradient Stormwater
 - Attachment C - BMPs for On-site Stormwater
 - Attachment D - BMPs for Surface Streams
 - Attachment E - Request to Seal Features, if sealing a feature

Attachment F - Construction Plans

Attachment G - Inspection, Maintenance, Repair and Retrofit Plan

Attachment H -Pilot-Scale Field Testing Plan, if BMPs not based on Complying with the Edwards Aquifer Rules: Technical Guidance for BMPs

Attachment I -Measures for Minimizing Surface Stream Contamination

- **Agent Authorization Form (TCEQ-0599), if application submitted by agent**
- **Fee Application Form (TCEQ-0574)**
- **Check Payable to the “Texas Commission on Environmental Quality”**
- ^X **Core Data Form (TCEQ-10400)**

Texas Commission on Environmental Quality

Edwards Aquifer Application Cover Page

Our Review of Your Application

The Edwards Aquifer Program staff conducts an administrative and technical review of all applications. The turnaround time for administrative review can be up to 30 days as outlined in 30 TAC 213.4(e). Generally administrative completeness is determined during the intake meeting or within a few days of receipt. The turnaround time for technical review of an administratively complete Edwards Aquifer application is 90 days as outlined in 30 TAC 213.4(e). Please know that the review and approval time is directly impacted by the quality and completeness of the initial application that is received. In order to conduct a timely review, it is imperative that the information provided in an Edwards Aquifer application include final plans, be accurate, complete, and in compliance with [30 TAC 213](#).

Administrative Review

1. [Edwards Aquifer applications](#) must be deemed administratively complete before a technical review can begin. To be considered administratively complete, the application must contain completed forms and attachments, provide the requested information, and meet all the site plan requirements. The submitted application and plan sheets should be final plans. Please submit one full-size set of plan sheets with the original application, and half-size sets with the additional copies.

To ensure that all applicable documents are included in the application, the program has developed tools to guide you and web pages to provide all forms, checklists, and guidance. Please visit the below website for assistance: <http://www.tceq.texas.gov/field/eapp>.

2. This Edwards Aquifer Application Cover Page form (certified by the applicant or agent) must be included in the application and brought to the administrative review meeting.
3. Administrative reviews are scheduled with program staff who will conduct the review. Applicants or their authorized agent should call the appropriate regional office, according to the county in which the project is located, to schedule a review. The average meeting time is one hour.
4. In the meeting, the application is examined for administrative completeness. Deficiencies will be noted by staff and emailed or faxed to the applicant and authorized agent at the end of the meeting, or shortly after. Administrative deficiencies will cause the application to be deemed incomplete and returned.

An appointment should be made to resubmit the application. The application is re-examined to ensure all deficiencies are resolved. The application will only be deemed administratively complete when all administrative deficiencies are addressed.

5. If an application is received by mail, courier service, or otherwise submitted without a review meeting, the administrative review will be conducted within 30 days. The applicant and agent will be contacted with the results of the administrative review. If the application is found to be administratively incomplete, it can be retrieved from the regional office or returned by regular mail. If returned by mail, the regional office may require arrangements for return shipping.
6. If the geologic assessment was completed before October 1, 2004 and the site contains “possibly sensitive” features, the assessment must be updated in accordance with the *Instructions to Geologists* (TCEQ-0585 Instructions).

Technical Review

1. When an application is deemed administratively complete, the technical review period begins. The regional office will distribute copies of the application to the identified affected city, county, and groundwater conservation district whose jurisdiction includes the subject site. These entities and the public have 30 days to provide comments on the application to the regional office. All comments received are reviewed by TCEQ.
2. A site assessment is usually conducted as part of the technical review, to evaluate the geologic assessment and observe existing site conditions. The site must be accessible to our staff. The site boundaries should be

clearly marked, features identified in the geologic assessment should be flagged, roadways marked and the alignment of the Sewage Collection System and manholes should be staked at the time the application is submitted. If the site is not marked the application may be returned.

3. We evaluate the application for technical completeness and contact the applicant and agent via Notice of Deficiency (NOD) to request additional information and identify technical deficiencies. There are two deficiency response periods available to the applicant. There are 14 days to resolve deficiencies noted in the first NOD. If a second NOD is issued, there is an additional 14 days to resolve deficiencies. If the response to the second notice is not received, is incomplete or inadequate, or provides new information that is incomplete or inadequate, the application must be withdrawn or will be denied. Please note that because the technical review is underway, whether the application is withdrawn or denied **the application fee will be forfeited**.
4. The program has 90 calendar days to complete the technical review of the application. If the application is technically adequate, such that it complies with the Edwards Aquifer rules, and is protective of the Edwards Aquifer during and after construction, an approval letter will be issued. Construction or other regulated activity may not begin until an approval is issued.

Mid-Review Modifications

It is important to have final site plans prior to beginning the permitting process with TCEQ to avoid delays.

Occasionally, circumstances arise where you may have significant design and/or site plan changes after your Edwards Aquifer application has been deemed administratively complete by TCEQ. This is considered a “Mid-Review Modification”. Mid-Review Modifications may require redistribution of an application that includes the proposed modifications for public comment.

If you are proposing a Mid-Review Modification, two options are available:

- If the technical review has begun your application can be denied/withdrawn, your fees will be forfeited, and the plan will have to be resubmitted.
- TCEQ can continue the technical review of the application as it was submitted, and a modification application can be submitted at a later time.

If the application is denied/withdrawn, the resubmitted application will be subject to the administrative and technical review processes and will be treated as a new application. The application will be redistributed to the affected jurisdictions.

Please contact the regional office if you have questions. If your project is located in Williamson, Travis, or Hays County, contact TCEQ’s Austin Regional Office at 512-339-2929. If your project is in Comal, Bexar, Medina, Uvalde, or Kinney County, contact TCEQ’s San Antonio Regional Office at 210-490-3096

Please fill out all required fields below and submit with your application.

1. Regulated Entity Name: SL 1 at Skunk Hollow Creek					2. Regulated Entity No.:					
3. Customer Name: Texas Department of Transportation					4. Customer No.: CN600803456					
5. Project Type: (Please circle/check one)		New			Modification			Extension		Exception
6. Plan Type: (Please circle/check one)		WPAP	CZP	SCS	UST	AST	EXP	EXT	Technical Clarification	Optional Enhanced Measures
7. Land Use: (Please circle/check one)		Residential		Non-residential			8. Site (acres):		7	
9. Application Fee:					10. Permanent BMP(s):			Equivalent water quality protection		
11. SCS (Linear Ft.):		N/A			12. AST/UST (No. Tanks):			N/A		
13. County:		Travis			14. Watershed:			Barton Creek		

Application Distribution

Instructions: Use the table below to determine the number of applications required. One original and one copy of the application, plus additional copies (as needed) for each affected incorporated city, county, and groundwater conservation district are required. Linear projects or large projects, which cross into multiple jurisdictions, can require additional copies. Refer to the “Texas Groundwater Conservation Districts within the EAPP Boundaries” map found at:

http://www.tceq.texas.gov/assets/public/compliance/field_ops/eapp/EAPP%20GWCD%20map.pdf

For more detailed boundaries, please contact the conservation district directly.

Austin Region			
County:	Hays	Travis	Williamson
Original (1 req.)	—	_x_	—
Region (1 req.)	—	_x_	—
County(ies)	—	_x_	—
Groundwater Conservation District(s)	<input type="checkbox"/> Edwards Aquifer Authority <input type="checkbox"/> Barton Springs/ Edwards Aquifer <input type="checkbox"/> Hays Trinity <input type="checkbox"/> Plum Creek	<input checked="" type="checkbox"/> Barton Springs/ Edwards Aquifer	NA
City(ies) Jurisdiction	<input type="checkbox"/> Austin <input type="checkbox"/> Buda <input type="checkbox"/> Dripping Springs <input type="checkbox"/> Kyle <input type="checkbox"/> Mountain City <input type="checkbox"/> San Marcos <input type="checkbox"/> Wimberley <input type="checkbox"/> Woodcreek	<input checked="" type="checkbox"/> Austin <input type="checkbox"/> Bee Cave <input type="checkbox"/> Pflugerville <input type="checkbox"/> Rollingwood <input type="checkbox"/> Round Rock <input type="checkbox"/> Sunset Valley <input type="checkbox"/> West Lake Hills	<input type="checkbox"/> Austin <input type="checkbox"/> Cedar Park <input type="checkbox"/> Florence <input type="checkbox"/> Georgetown <input type="checkbox"/> Jerrell <input type="checkbox"/> Leander <input type="checkbox"/> Liberty Hill <input type="checkbox"/> Pflugerville <input type="checkbox"/> Round Rock

San Antonio Region					
County:	Bexar	Comal	Kinney	Medina	Uvalde
Original (1 req.)	—	—	—	—	—
Region (1 req.)	—	—	—	—	—
County(ies)	—	—	—	—	—
Groundwater Conservation District(s)	<input type="checkbox"/> Edwards Aquifer Authority <input type="checkbox"/> Trinity-Glen Rose	<input type="checkbox"/> Edwards Aquifer Authority	<input type="checkbox"/> Kinney	<input type="checkbox"/> EAA <input type="checkbox"/> Medina	<input type="checkbox"/> EAA <input type="checkbox"/> Uvalde
City(ies) Jurisdiction	<input type="checkbox"/> Castle Hills <input type="checkbox"/> Fair Oaks Ranch <input type="checkbox"/> Helotes <input type="checkbox"/> Hill Country Village <input type="checkbox"/> Hollywood Park <input type="checkbox"/> San Antonio (SAWS) <input type="checkbox"/> Shavano Park	<input type="checkbox"/> Bulverde <input type="checkbox"/> Fair Oaks Ranch <input type="checkbox"/> Garden Ridge <input type="checkbox"/> New Braunfels <input type="checkbox"/> Schertz	NA	<input type="checkbox"/> San Antonio ETJ (SAWS)	NA

I certify that to the best of my knowledge, that the application is complete and accurate. This application is hereby submitted to TCEQ for administrative review and technical review.

Shane Rotter

Print Name of Customer/Authorized Agent



Signature of Customer/Authorized Agent

Date 8/1/2023

****FOR TCEQ INTERNAL USE ONLY****

Date(s) Reviewed:		Date Administratively Complete:	
Received From:		Correct Number of Copies:	
Received By:		Distribution Date:	
EAPP File Number:		Complex:	
Admin. Review(s) (No.):		No. AR Rounds:	
Delinquent Fees (Y/N):		Review Time Spent:	
Lat./Long. Verified:		SOS Customer Verification:	
Agent Authorization Complete/Notarized (Y/N):		Fee Check:	Payable to TCEQ (Y/N):
Core Data Form Complete (Y/N):			Signed (Y/N):
Core Data Form Incomplete Nos.:			Less than 90 days old (Y/N):

General Information Form

Texas Commission on Environmental Quality

For Regulated Activities on the Edwards Aquifer Recharge and Transition Zones and Relating to 30 TAC §213.4(b) & §213.5(b)(2)(A), (B) Effective June 1, 1999

To ensure that the application is administratively complete, confirm that all fields in the form are complete, verify that all requested information is provided, consistently reference the same site and contact person in all forms in the application, and ensure forms are signed by the appropriate party.

Note: Including all the information requested in the form and attachments contributes to more streamlined technical reviews.

Signature

To the best of my knowledge, the responses to this form accurately reflect all information requested concerning the proposed regulated activities and methods to protect the Edwards Aquifer. This **General Information Form** is hereby submitted for TCEQ review. The application was prepared by:

Print Name of Customer/Agent: Shane Rotter

Date: 8/1/2023

Signature of Customer/Agent:



Project Information

1. Regulated Entity Name: SL 1 at Skunk Hollow Creek
2. County: Travis
3. Stream Basin: Barton Creek
4. Groundwater Conservation District (If applicable): Barton Springs/Edwards Aquifer CD
5. Edwards Aquifer Zone:
 Recharge Zone
 Transition Zone
6. Plan Type:
 WPAP
 SCS
 Modification
 AST
 UST
 Exception Request

7. Customer (Applicant):

Contact Person: William Semora Jr., P.E.

Entity: TxDOT

Mailing Address: 9725 S IH 35

City, State: Austin, TX

Zip: 78744

Telephone: (512)-292-2401

FAX: _____

Email Address: William.Semora@txdot.gov

8. Agent/Representative (If any):

Contact Person: Shane Rotter

Entity: TXDOT

Mailing Address: 7901 N IH 35

City, State: Austin, TX

Zip: 78753

Telephone: 512-415-8257

FAX: _____

Email Address: shane.rotter@txdot.gov

9. Project Location:

- The project site is located inside the city limits of Austin.
- The project site is located outside the city limits but inside the ETJ (extra-territorial jurisdiction) of _____.
- The project site is not located within any city's limits or ETJ.

10. The location of the project site is described below. The description provides sufficient detail and clarity so that the TCEQ's Regional staff can easily locate the project and site boundaries for a field investigation.

The proposed project is located where the NB frontage road of SL 1 crosses over Skunk Hollow Creek, just NE of Bartons Bluff Ln.

11. **Attachment A – Road Map.** A road map showing directions to and the location of the project site is attached. The project location and site boundaries are clearly shown on the map.
12. **Attachment B - USGS / Edwards Recharge Zone Map.** A copy of the official 7 ½ minute USGS Quadrangle Map (Scale: 1" = 2000') of the Edwards Recharge Zone is attached. The map(s) clearly show:
- Project site boundaries.
 - USGS Quadrangle Name(s).
 - Boundaries of the Recharge Zone (and Transition Zone, if applicable).
 - Drainage path from the project site to the boundary of the Recharge Zone.
13. **The TCEQ must be able to inspect the project site or the application will be returned.** Sufficient survey staking is provided on the project to allow TCEQ regional staff to locate the boundaries and alignment of the regulated activities and the geologic or manmade features noted in the Geologic Assessment.

Survey staking will be completed by this date: Marked by existing SL 1 roadway and survey stakes along creek portion of the project

14. **Attachment C – Project Description.** Attached at the end of this form is a detailed narrative description of the proposed project. The project description is consistent throughout the application and contains, at a minimum, the following details:

- Area of the site
- Offsite areas
- Impervious cover
- Permanent BMP(s)
- Proposed site use
- Site history
- Previous development
- Area(s) to be demolished

15. Existing project site conditions are noted below:

- Existing commercial site
- Existing industrial site
- Existing residential site
- Existing paved and/or unpaved roads
- Undeveloped (Cleared)
- Undeveloped (Undisturbed/Uncleared)
- Other: _____

Prohibited Activities

16. I am aware that the following activities are prohibited on the Recharge Zone and are not proposed for this project:

- (1) Waste disposal wells regulated under 30 TAC Chapter 331 of this title (relating to Underground Injection Control);
- (2) New feedlot/concentrated animal feeding operations, as defined in 30 TAC §213.3;
- (3) Land disposal of Class I wastes, as defined in 30 TAC §335.1;
- (4) The use of sewage holding tanks as parts of organized collection systems; and
- (5) New municipal solid waste landfill facilities required to meet and comply with Type I standards which are defined in §330.41(b), (c), and (d) of this title (relating to Types of Municipal Solid Waste Facilities).
- (6) New municipal and industrial wastewater discharges into or adjacent to water in the state that would create additional pollutant loading.

17. I am aware that the following activities are prohibited on the Transition Zone and are not proposed for this project:

- (1) Waste disposal wells regulated under 30 TAC Chapter 331 (relating to Underground Injection Control);
- (2) Land disposal of Class I wastes, as defined in 30 TAC §335.1; and
- (3) New municipal solid waste landfill facilities required to meet and comply with Type I standards which are defined in §330.41 (b), (c), and (d) of this title.

Administrative Information

18. The fee for the plan(s) is based on:

- For a Water Pollution Abatement Plan or Modification, the total acreage of the site where regulated activities will occur.
- For an Organized Sewage Collection System Plan or Modification, the total linear footage of all collection system lines.
- For a UST Facility Plan or Modification or an AST Facility Plan or Modification, the total number of tanks or piping systems.
- A request for an exception to any substantive portion of the regulations related to the protection of water quality.
- A request for an extension to a previously approved plan.

19. Application fees are due and payable at the time the application is filed. If the correct fee is not submitted, the TCEQ is not required to consider the application until the correct fee is submitted. Both the fee and the Edwards Aquifer Fee Form have been sent to the Commission's:

- TCEQ cashier
- Austin Regional Office (for projects in Hays, Travis, and Williamson Counties)
- San Antonio Regional Office (for projects in Bexar, Comal, Kinney, Medina, and Uvalde Counties)

20. Submit one (1) original and one (1) copy of the application, plus additional copies as needed for each affected incorporated city, groundwater conservation district, and county in which the project will be located. The TCEQ will distribute the additional copies to these jurisdictions. The copies must be submitted to the appropriate regional office.

21. No person shall commence any regulated activity until the Edwards Aquifer Protection Plan(s) for the activity has been filed with and approved by the Executive Director.

Recharge and Transition Zone Exception Request Form

Texas Commission on Environmental Quality

30 TAC §213.9 Effective June 1, 1999

To ensure that the application is administratively complete, confirm that all fields in the form are complete, verify that all requested information is provided, consistently reference the same site and contact person in all forms in the application, and ensure forms are signed by the appropriate party.

Note: Including all the information requested in the form and attachments contributes to more streamlined technical reviews.

Signature

To the best of my knowledge, the responses to this form accurately reflect all information requested concerning the proposed regulated activities and methods to protect the Edwards Aquifer. This **Recharge and Transition Zone Exception Request Form** is hereby submitted for TCEQ review and executive director approval. The request was prepared by:

Print Name of Customer/Agent: Shane Rotter

Date: 8/1/2023

Signature of Customer/Agent:



Regulated Entity Name: SL 1 at Skunk Hollow Creek

Exception Request

- Attachment A - Nature of Exception.** A narrative description of the nature of each exception requested is attached. All provisions of 30 TAC §213 Subchapter A for which an exception is being requested have been identified in the description.
- Attachment B - Documentation of Equivalent Water Quality Protection.** Documentation demonstrating equivalent water quality protection for the Edwards Aquifer is attached.

Administrative Information

- Submit one (1) original and one (1) copy of the application, plus additional copies as needed for each affected incorporated city, groundwater conservation district, and county in which the project will be located. The TCEQ will distribute the additional copies to these jurisdictions. The copies must be submitted to the appropriate regional office.
- The applicant understands that no exception will be granted for a prohibited activity in Chapter 213.
- The applicant understands that prior approval under this section must be obtained from the executive director for the exception to be authorized.

Temporary Stormwater Section

Texas Commission on Environmental Quality

for Regulated Activities on the Edwards Aquifer Recharge Zone and Relating to 30 TAC §213.5(b)(4)(A), (B), (D)(I) and (G); Effective June 1, 1999

To ensure that the application is administratively complete, confirm that all fields in the form are complete, verify that all requested information is provided, consistently reference the same site and contact person in all forms in the application, and ensure forms are signed by the appropriate party.

Note: Including all the information requested in the form and attachments contributes to more streamlined technical reviews.

Signature

To the best of my knowledge, the responses to this form accurately reflect all information requested concerning the proposed regulated activities and methods to protect the Edwards Aquifer. This **Temporary Stormwater Section** is hereby submitted for TCEQ review and executive director approval. The application was prepared by:

Print Name of Customer/Agent: Shane Rotter

Date: 8/1/2023

Signature of Customer/Agent:



Regulated Entity Name: SL 1 at Skunk Hollow Creek

Project Information

Potential Sources of Contamination

Examples: Fuel storage and use, chemical storage and use, use of asphaltic products, construction vehicles tracking onto public roads, and existing solid waste.

1. Fuels for construction equipment and hazardous substances which will be used during construction:

The following fuels and/or hazardous substances will be stored on the site: _____

These fuels and/or hazardous substances will be stored in:

- Aboveground storage tanks with a cumulative storage capacity of less than 250 gallons will be stored on the site for less than one (1) year.

- Aboveground storage tanks with a cumulative storage capacity between 250 gallons and 499 gallons will be stored on the site for less than one (1) year.
- Aboveground storage tanks with a cumulative storage capacity of 500 gallons or more will be stored on the site. An Aboveground Storage Tank Facility Plan application must be submitted to the appropriate regional office of the TCEQ prior to moving the tanks onto the project.
- Fuels and hazardous substances will not be stored on the site.
- 2. **Attachment A - Spill Response Actions.** A site specific description of the measures to be taken to contain any spill of hydrocarbons or hazardous substances is attached.
- 3. Temporary aboveground storage tank systems of 250 gallons or more cumulative storage capacity must be located a minimum horizontal distance of 150 feet from any domestic, industrial, irrigation, or public water supply well, or other sensitive feature.
- 4. **Attachment B - Potential Sources of Contamination.** A description of any activities or processes which may be a potential source of contamination affecting surface water quality is attached.

Sequence of Construction

- 5. **Attachment C - Sequence of Major Activities.** A description of the sequence of major activities which will disturb soils for major portions of the site (grubbing, excavation, grading, utilities, and infrastructure installation) is attached.
 - For each activity described, an estimate (in acres) of the total area of the site to be disturbed by each activity is given.
 - For each activity described, include a description of appropriate temporary control measures and the general timing (or sequence) during the construction process that the measures will be implemented.
- 6. Name the receiving water(s) at or near the site which will be disturbed or which will receive discharges from disturbed areas of the project: Barton Creek

Temporary Best Management Practices (TBMPs)

Erosion control examples: tree protection, interceptor swales, level spreaders, outlet stabilization, blankets or matting, mulch, and sod. Sediment control examples: stabilized construction exit, silt fence, filter dikes, rock berms, buffer strips, sediment traps, and sediment basins. Please refer to the Technical Guidance Manual for guidelines and specifications. All structural BMPs must be shown on the site plan.

- 7. **Attachment D – Temporary Best Management Practices and Measures.** TBMPs and measures will prevent pollution of surface water, groundwater, and stormwater. The construction-phase BMPs for erosion and sediment controls have been designed to retain sediment on site to the extent practicable. The following information is attached:

- A description of how BMPs and measures will prevent pollution of surface water, groundwater or stormwater that originates upgradient from the site and flows across the site.
 - A description of how BMPs and measures will prevent pollution of surface water or groundwater that originates on-site or flows off site, including pollution caused by contaminated stormwater runoff from the site.
 - A description of how BMPs and measures will prevent pollutants from entering surface streams, sensitive features, or the aquifer.
 - A description of how, to the maximum extent practicable, BMPs and measures will maintain flow to naturally-occurring sensitive features identified in either the geologic assessment, TCEQ inspections, or during excavation, blasting, or construction.
8. The temporary sealing of a naturally-occurring sensitive feature which accepts recharge to the Edwards Aquifer as a temporary pollution abatement measure during active construction should be avoided.
- Attachment E - Request to Temporarily Seal a Feature.** A request to temporarily seal a feature is attached. The request includes justification as to why no reasonable and practicable alternative exists for each feature.
 - There will be no temporary sealing of naturally-occurring sensitive features on the site.
9. **Attachment F - Structural Practices.** A description of the structural practices that will be used to divert flows away from exposed soils, to store flows, or to otherwise limit runoff discharge of pollutants from exposed areas of the site is attached. Placement of structural practices in floodplains has been avoided.
10. **Attachment G - Drainage Area Map.** A drainage area map supporting the following requirements is attached:
- For areas that will have more than 10 acres within a common drainage area disturbed at one time, a sediment basin will be provided.
 - For areas that will have more than 10 acres within a common drainage area disturbed at one time, a smaller sediment basin and/or sediment trap(s) will be used.
 - For areas that will have more than 10 acres within a common drainage area disturbed at one time, a sediment basin or other equivalent controls are not attainable, but other TBMPs and measures will be used in combination to protect down slope and side slope boundaries of the construction area.
 - There are no areas greater than 10 acres within a common drainage area that will be disturbed at one time. A smaller sediment basin and/or sediment trap(s) will be used in combination with other erosion and sediment controls within each disturbed drainage area.

- There are no areas greater than 10 acres within a common drainage area that will be disturbed at one time. Erosion and sediment controls other than sediment basins or sediment traps within each disturbed drainage area will be used.
11. **Attachment H - Temporary Sediment Pond(s) Plans and Calculations.** Temporary sediment pond or basin construction plans and design calculations for a proposed temporary BMP or measure have been prepared by or under the direct supervision of a Texas Licensed Professional Engineer. All construction plans and design information must be signed, sealed, and dated by the Texas Licensed Professional Engineer. Construction plans for the proposed temporary BMPs and measures are attached.
- N/A
12. **Attachment I - Inspection and Maintenance for BMPs.** A plan for the inspection of each temporary BMP(s) and measure(s) and for their timely maintenance, repairs, and, if necessary, retrofit is attached. A description of the documentation procedures, recordkeeping practices, and inspection frequency are included in the plan and are specific to the site and/or BMP.
13. All control measures must be properly selected, installed, and maintained in accordance with the manufacturer's specifications and good engineering practices. If periodic inspections by the applicant or the executive director, or other information indicate a control has been used inappropriately, or incorrectly, the applicant must replace or modify the control for site situations.
14. If sediment escapes the construction site, off-site accumulations of sediment must be removed at a frequency sufficient to minimize offsite impacts to water quality (e.g., fugitive sediment in street being washed into surface streams or sensitive features by the next rain).
15. Sediment must be removed from sediment traps or sedimentation ponds not later than when design capacity has been reduced by 50%. A permanent stake will be provided that can indicate when the sediment occupies 50% of the basin volume.
16. Litter, construction debris, and construction chemicals exposed to stormwater shall be prevented from becoming a pollutant source for stormwater discharges (e.g., screening outfalls, picked up daily).

Soil Stabilization Practices

Examples: establishment of temporary vegetation, establishment of permanent vegetation, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of trees, or preservation of mature vegetation.

17. **Attachment J - Schedule of Interim and Permanent Soil Stabilization Practices.** A schedule of the interim and permanent soil stabilization practices for the site is attached.

18. Records must be kept at the site of the dates when major grading activities occur, the dates when construction activities temporarily or permanently cease on a portion of the site, and the dates when stabilization measures are initiated.
19. Stabilization practices must be initiated as soon as practicable where construction activities have temporarily or permanently ceased.

Administrative Information

20. All structural controls will be inspected and maintained according to the submitted and approved operation and maintenance plan for the project.
21. If any geologic or manmade features, such as caves, faults, sinkholes, etc., are discovered, all regulated activities near the feature will be immediately suspended. The appropriate TCEQ Regional Office shall be immediately notified. Regulated activities must cease and not continue until the TCEQ has reviewed and approved the methods proposed to protect the aquifer from any adverse impacts.
22. Silt fences, diversion berms, and other temporary erosion and sediment controls will be constructed and maintained as appropriate to prevent pollutants from entering sensitive features discovered during construction.



TCEQ Core Data Form

For detailed instructions on completing this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission (If other is checked please describe in space provided.)		
<input checked="" type="checkbox"/> New Permit, Registration or Authorization (Core Data Form should be submitted with the program application.)		
<input type="checkbox"/> Renewal (Core Data Form should be submitted with the renewal form)	<input type="checkbox"/> Other	
2. Customer Reference Number (if issued)	Follow this link to search for CN or RN numbers in Central Registry**	3. Regulated Entity Reference Number (if issued)
CN 600803456		RN

SECTION II: Customer Information

4. General Customer Information		5. Effective Date for Customer Information Updates (mm/dd/yyyy)		
<input type="checkbox"/> New Customer <input type="checkbox"/> Update to Customer Information <input type="checkbox"/> Change in Regulated Entity Ownership <input type="checkbox"/> Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)				
<i>The Customer Name submitted here may be updated automatically based on what is current and active with the Texas Secretary of State (SOS) or Texas Comptroller of Public Accounts (CPA).</i>				
6. Customer Legal Name (If an individual, print last name first: eg: Doe, John)			<i>If new Customer, enter previous Customer below:</i>	
Texas Department of Transportation				
7. TX SOS/CPA Filing Number	8. TX State Tax ID (11 digits)		9. Federal Tax ID (9 digits)	10. DUNS Number (if applicable)
11. Type of Customer:		<input type="checkbox"/> Corporation	<input type="checkbox"/> Individual	Partnership: <input type="checkbox"/> General <input type="checkbox"/> Limited
Government: <input type="checkbox"/> City <input type="checkbox"/> County <input type="checkbox"/> Federal <input type="checkbox"/> Local <input checked="" type="checkbox"/> State <input type="checkbox"/> Other		<input type="checkbox"/> Sole Proprietorship	<input type="checkbox"/> Other:	
12. Number of Employees			13. Independently Owned and Operated?	
<input type="checkbox"/> 0-20 <input type="checkbox"/> 21-100 <input type="checkbox"/> 101-250 <input type="checkbox"/> 251-500 <input checked="" type="checkbox"/> 501 and higher			<input type="checkbox"/> Yes <input type="checkbox"/> No	
14. Customer Role (Proposed or Actual) – as it relates to the Regulated Entity listed on this form. Please check one of the following				
<input type="checkbox"/> Owner <input checked="" type="checkbox"/> Operator <input type="checkbox"/> Owner & Operator <input type="checkbox"/> Other: <input type="checkbox"/> Occupational Licensee <input type="checkbox"/> Responsible Party <input type="checkbox"/> VCP/BSA Applicant				
15. Mailing Address:	9725 S IH 35			
	City	Austin	State	TX
	ZIP	78744	ZIP + 4	
16. Country Mailing Information (if outside USA)			17. E-Mail Address (if applicable)	
			william.semora@txdot.gov	
18. Telephone Number		19. Extension or Code		20. Fax Number (if applicable)

SECTION III: Regulated Entity Information**21. General Regulated Entity Information** (If "New Regulated Entity" is selected, a new permit application is also required.)
 New Regulated Entity Update to Regulated Entity Name Update to Regulated Entity Information

The Regulated Entity Name submitted may be updated, in order to meet TCEQ Core Data Standards (removal of organizational endings such as Inc, LP, or LLC).

22. Regulated Entity Name (Enter name of the site where the regulated action is taking place.)

SL 1 at Skunk Hollow Creek

23. Street Address of the Regulated Entity:(No PO Boxes)

SL 1 NB Frontage Rd, Approx. 150 ft NE of Bartons Bluff Ln

City

Austin

State

TX

ZIP

78746

ZIP + 4**24. County**

Travis

If no Street Address is provided, fields 25-28 are required.

25. Description to**Physical Location:**

SL 1 NB Frontage Rd, Approx. 150 ft NE of Bartons Bluff Ln

26. Nearest City**State****Nearest ZIP Code**

Austin

TX

78746

Latitude/Longitude are required and may be added/updated to meet TCEQ Core Data Standards. (Geocoding of the Physical Address may be used to supply coordinates where none have been provided or to gain accuracy).

27. Latitude (N) In Decimal:

30.25829

28. Longitude (W) In Decimal:

-97.79701

Degrees

Minutes

Seconds

Degrees

Minutes

Seconds

29. Primary SIC Code**30. Secondary SIC Code****31. Primary NAICS Code****32. Secondary NAICS Code**

(4 digits)

(4 digits)

(5 or 6 digits)

(5 or 6 digits)

33. What is the Primary Business of this entity? (Do not repeat the SIC or NAICS description.)

Roadways

34. Mailing

9725 S IH 35

Address:**City**

Austin

State

TX

ZIP

78744

ZIP + 4**35. E-Mail Address:**

william.semora@txdot.gov

36. Telephone Number**37. Extension or Code****38. Fax Number** (if applicable)

(512) 292-2401

() -

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.


<input type="checkbox"/> Dam Safety	<input type="checkbox"/> Districts	<input checked="" type="checkbox"/> Edwards Aquifer	<input type="checkbox"/> Emissions Inventory Air	<input type="checkbox"/> Industrial Hazardous Waste
<input type="checkbox"/> Municipal Solid Waste	<input type="checkbox"/> New Source Review Air	<input type="checkbox"/> OSSF	<input type="checkbox"/> Petroleum Storage Tank	<input type="checkbox"/> PWS
<input type="checkbox"/> Sludge	<input type="checkbox"/> Storm Water	<input type="checkbox"/> Title V Air	<input type="checkbox"/> Tires	<input type="checkbox"/> Used Oil
<input type="checkbox"/> Voluntary Cleanup	<input type="checkbox"/> Wastewater	<input type="checkbox"/> Wastewater Agriculture	<input type="checkbox"/> Water Rights	<input type="checkbox"/> Other:

SECTION IV: Preparer Information

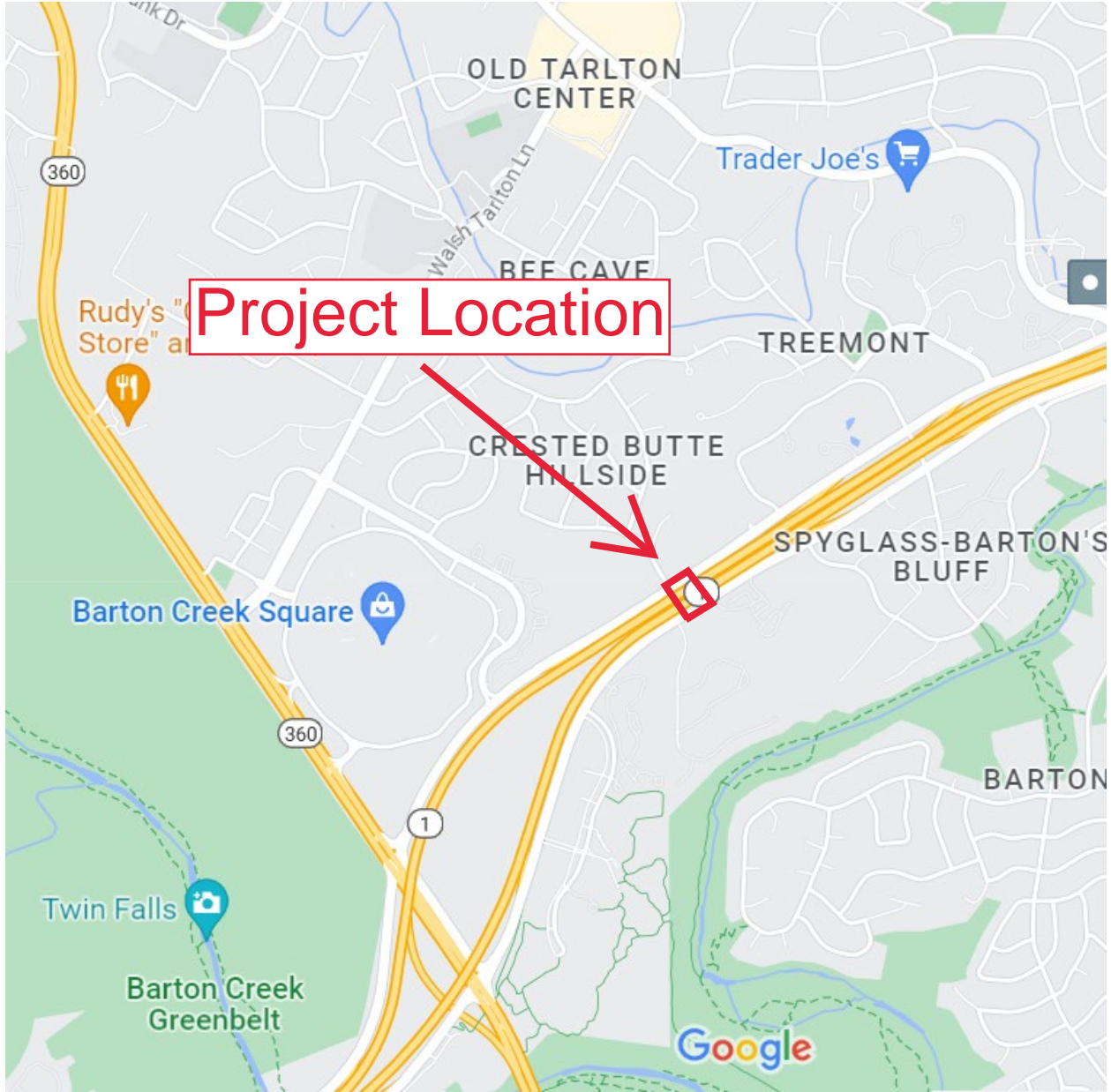
40. Name:	Shane Rotter			41. Title:	Environmental Specialist
42. Telephone Number	43. Ext./Code	44. Fax Number	45. E-Mail Address		
(512) 415-8257		() -	shane.rotter@txdot.gov		

SECTION V: Authorized Signature

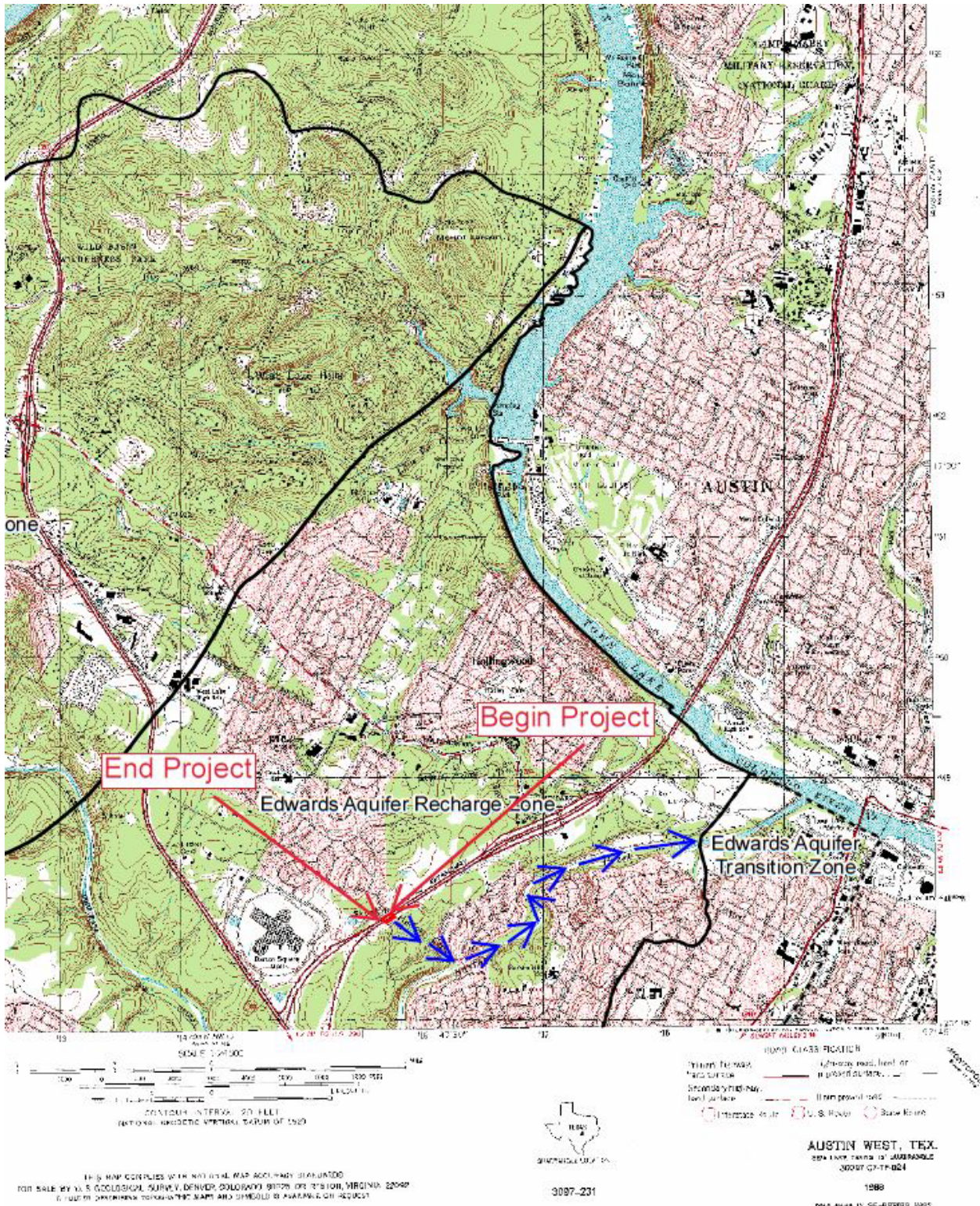
46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

Company:	TXDOT		Job Title:	Environmental Specialist	
Name (In Print):	Shane Rotter			Phone:	(512) 415- 8257
Signature:				Date:	8/1/2023

Attachment A – Road Map



Attachment B - USGS / Edwards Recharge Zone Map



THIS MAP COMPLIES WITH NATIONAL MAP ACT AND IS UNCLASSIFIED
 FOR SALE BY U.S. GEOLOGICAL SURVEY, DENVER, COLORADO 80263 OR ITS STATION, VIRGINIA, 22092
 U.S. GOVERNMENT PRINTING OFFICE: 1988 O-500-000

3087-231

AUSTIN WEST, TEX.
 DATE 1988
 1988
 DMR 6449 BY SE-68898 V222

GENERAL INFORMATION FORM (TCEQ-0587) – ATTACHMENTS

Attachment A – Road Map (Attached)

Attachment B – Edwards Aquifer Recharge Zone Map (Attached)

Attachment C – Project Narrative

The proposed project is located on SL 1 (Mopac) where the NB frontage road meets Skunk Hollow Creek. This project involves repair and replacement of an existing large diameter storm drain culvert pipe which has rusted thru with age and is now allowing stormwater to undermine the fill material surrounding the pipe. The project will not increase impervious cover. The proposed repairs will not result in increased loading to the Aquifer or surface streams. The repairs are proposed within the SL 1 right-of-way (ROW) that was previously disturbed. There are no known sensitive features located in the vicinity of the proposed project right-of-way (ROW).

BACKGROUND:

A search of TXDOT's internal files and the TCEQ Central Registry indicates the existence of one previously permitted project at this specific location (Loop 1 Sidewalks, CSJ 3136-01-153, EAPP No. 11-08070301, RN105571541). This previous project involved the construction of a shared use path (SUP / sidewalk) along the NB frontage road of Sl 1 between Rolling Wood Dr (Andrew Zilker Rd) and Tuscan Terrace. This previous sidewalk project passes directly thru the project area for the project proposed within this application. Additionally, there currently is a nearby ongoing project (Barton Skyway Ramp Relief, CSJ 3136-01-193, EAPP No. 11003063, RN107123077) happening along this stretch of SL 1, but only along the SB section of the road. This project involves the addition of an auxiliary lane and adjustment of some ramps.

GEOLOGIC ASSESSMENT FORM (TCEQ-0585) – ATTACHMENTS

Attachment A, B, C, D, Site Geologic Map(s), Table/List of position of features

Per previous conversation with Kevin Smith (Edwards Aquifer Sr. Engineer) at TCEQ, the geologic assessment, contained within the approved WPAP for the ongoing nearby project along the SB frontage road of SL 1 (Barton Skyway Ramp Relief, CSJ 3136-01-193, EAPP No. 11003063, RN107123077), would be permissible to use for the same purposes within this application. The aforementioned geologic assessment encompasses the entire project area proposed in this application. This geologic assessment identified one feature (MPS-33) within or nearby to the proposed project area. Feature MPS-33 is identified as a "Non-karst Closed Depression" and was, in fact, caused by the previously discussed non-karst-related failure of the large diameter storm drain culvert, which will be repaired and replaced as part of the proposed project contained within this application. This geologic assessment is provided in its entirety as an attachment to this document, and contains all necessary attachments and requirements (Attachment A, B, C, D, Site Geologic Map(s), Table/List of position of features).

RECHARGE AND TRANSITION ZONE EXCEPTION REQUEST FORM (TCEQ-0628) – ATTACHMENTS

Attachment A – Nature of Exception

The proposed project will result in no net increase of impervious cover. The proposed repairs will not result in increased loading to the Aquifer or surface streams; therefore, an exception to the requirement to construct permanent BMPs is requested with proposed equivalent water quality protection as explained in Attachment B below.

Attachment B – Documentation of Equivalent Water Quality Protection

Equivalent water quality protection will be maintained due to no new impervious cover being proposed. Existing areas of grass within the project area, even if they were not officially permitted as a VFS in a previous EAPP, will be replaced at the end of construction. These grassy areas are and will continue to be maintained by TxDOT with good vegetation cover. If any sensitive features are encountered during construction, TCEQ will be notified in accordance with Edwards Aquifer Rule requirements. TxDOT will also implement its void protocols consistent with TCEQ requirements.

TEMPORARY STORMWATER SECTION (TCEQ-0602) – ATTACHMENTS

Attachment A – Spill Response Actions

The TxDOT Austin District Office has a spill coordinator that ensures maintenance forces are informed of spill response procedures, and that all spills are cleaned up immediately according to established procedures. Notification to appropriate local, state and federal authorities occurs as required. When a liquid hydrocarbon or hazardous material spill occurs on roadways, TxDOT provides assistance by applying sand or other absorbent agents, sweeping the material, hauling it to a storage location, and covering the material until it can be removed by the responsible party. If the material is spilled on the edge of the roadway, the policy is to inform the responsible party (trucking company, insurance, individual, etc.) of their responsibility to remove the material and any contaminated soil. Depending on the degree of spill, the responsible party must hire a company to handle the cleanup and test the soil to assure that the spill is cleaned up according to TCEQ standards. Additionally, TxDOT will work with local first responders as necessary to mitigate impact of spills by attempting to prevent migration of the spill. If the spill is caused by someone unknown to TxDOT or someone that is not responsive, the TxDOT Austin District Office takes whatever actions are necessary to clean up the spill. Depending on the type of spill, this may include hiring a professional environmental company to clean up the affected area or TxDOT will clean up the spill with its own maintenance forces if the resources and capacities are available.

Specifics of This Project:

The proposed project is located wholly on the Edwards Aquifer Recharge Zone. There are no known sensitive geologic or manmade features located immediately downgradient of this project. Stormwater runoff from the project will ultimately flow downgradient to Skunk Hollow Creek, a tributary to Barton Creek. Given the relatively small project area, coupled with its proximity to the creek, spill flow paths will generally flow towards Skunk Hollow Creek. Hydrocarbon and other non-miscible, low-density materials spilled within the drainage areas to this section of roadway would flow down-gradient along the same aforementioned path.

Attachment B – Potential Sources of Contamination

- Exposed soils during excavation, grading, grubbing and construction.
- Vehicle tracking onto roadway.
- Topsoil stripping and stockpiling.
- Leaks/spills from construction vehicles.

Attachment C – Sequence of Major Activities

Sequence of Construction (From plan sheet 12)

1. Install advance warning signs for the entire project.
2. Install work zone channelizing devices as shown in the plans.
3. Install SWP3 controls within the limits of the project.
4. Construct storm drain system and structural lining.
5. Clean up, replace grass/permanent erosion control and seeding.
6. Install erosion controls according to SW3P. (0.05-ac)

Attachment D – Temporary Best Management Practices and Measures

- Upgradient stormwater runoff will flow across the site via existing overland flow and grass ditches.
- Sediment control BMPs will be installed prior to earthwork activity. This will ensure that stormwater runoff from soil disturbed areas will flow through a sediment control BMP prior to entering a stormwater conveyance and leaving the site.
- BMPs will and measures will prevent pollutants from entering surface streams or the aquifer by being installed prior to earthwork activity, proper inspection, maintenance and repair until all disturbed soils are stabilized. There are no known sensitive features in the vicinity of the project.
- There are no known sensitive features in the vicinity of the project.
- See also the Environmental Permits, Issues and Commitments plan sheet for additional details on BMPs and measures.

Attachment E – Request to Temporarily Seal a Feature

N/A

Attachment F – Structural Practices

Structural practices include installing silt fencing and rock filter dams.

Attachment G – Drainage Area Map

Drainage can be followed on the Typical Sections plan sheet (sheet 47).

Attachment H – Temporary Sediment Pond Plan and Calculations

N/A

Attachment I – Inspection and Maintenance for BMPs

Inspection, maintenance and repair of temporary BMPs will be in accordance with the SW3P which includes inspections weekly and after measurable rain events. Maintenance and repair of temporary BMPs will occur as soon as is practicable consistent with the SW3P.

Silt Fence –

- (1) Inspect fencing weekly, and after 0.5” rain events.
- (2) Remove sediment when buildup reaches 6 inches.
- (3) Replace any torn fabric or install a second line of fencing parallel to the torn section.
- (4) Replace or repair any sections crushed or collapsed in the course of construction activity.

Attachment J – Schedule of Interim and Permanent Soil Stabilization Practices

Stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased. Where the initiation of stabilization measures by the 14th day after construction activity temporary or permanently cease is precluded by weather conditions, stabilization measures shall be initiated as soon as practicable.

Where construction activity on a portion of the site is temporarily ceased, and earth disturbing activities will be resumed within 21 days, temporary stabilization measures do not have to be initiated on that portion of site. In areas experiencing droughts where the initiation of stabilization measures by the 14th day after construction activity has temporarily or permanently ceased is precluded by seasonal arid conditions, stabilization measures shall be initiated as soon as practicable.



CENTRAL TEXAS REGIONAL
MOBILITY AUTHORITY

Geological Assessment

Barton Skyway Ramp Relief, Austin (Travis
County) Texas

(CSJ 3136-01-193)

June 2021

Contact Information

Revision History

The following table shows the revision history for this document.

Effective Date Month Year	Reason for and Description of Change
June 2021	Draft released for review
April 2022	Final version issued, unchanged

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I. Introduction

A. Purpose

This narrative Geologic Assessment accompanies the Texas Commission on Environmental Quality (TCEQ) Geologic Assessment Form TCEQ-0585 (Appendix A) completed for the Barton Skyway Ramp Relief project (project) from Barton Skyway to State Loop 360 (SL 360) in Travis County, Texas (Figure 1). The project lies within the recharge zone of the Barton Springs Segment (BSS) of the Edwards Aquifer. The Project Area includes approximately 220.2 acres of existing right-of-way (ROW) of State Loop 1 (MoPac Expressway or MoPac). This assessment covers the entire area (colored red) shown in the report figures although the project activities will occur along the southbound portion of the ROW.

The Project Area lies within the Balcones Fault Zone (BFZ), which is a major geologic expression of a structural hinge that bisects the State from the Dallas area in north Texas to the border with Mexico near Del Rio (Figure 2, Project Photo 1 in Appendix B). The geologic faults in the BFZ reflect the stresses of this hinge. About two miles west of the project, the Mount Bonnell Fault is the major break along the fault zone. It has a stratigraphic displacement of approximately 400 feet in the BSS. Other faults have displacements in the tens of feet but can be as high as 120 feet. Faults within the BFZ are no longer seismically active. Strata are generally displaced downward towards the Gulf Coast as a result of normal faulting.

Mass grading of soil and drainage system alterations have occurred during previous roadway construction. The Project Area lies entirely within the Barton Creek watershed where the elevation ranges from approximately 568 to 685 feet above mean sea level. The Lower Colorado River is a hydrologic divide that separates the BSS from the northern segment of the Edwards Aquifer.

B. Previous Geologic Assessments

Previous geologic assessments were reviewed that include the Project Area. The first is a geologic assessment of two bicycle and pedestrian bridge projects that was completed in portions of the Project Area. One project was the bridge over Barton Creek and the other was over SL 360 (HDR 2013). The results section of this report details how the 22 identified features included in the above geological assessment were evaluated. The second report is a draft geologic assessment (Zara Environmental 2016) from an earlier version of the MoPac South project. The results section of this report contains an explanation of all of features noted in the draft MoPac South geologic assessment. Additionally, a karst feature and stormwater vulnerability survey (SWCA Environmental Consultants 2002) conducted in all the TxDOT ROW within the City of Austin was reviewed.

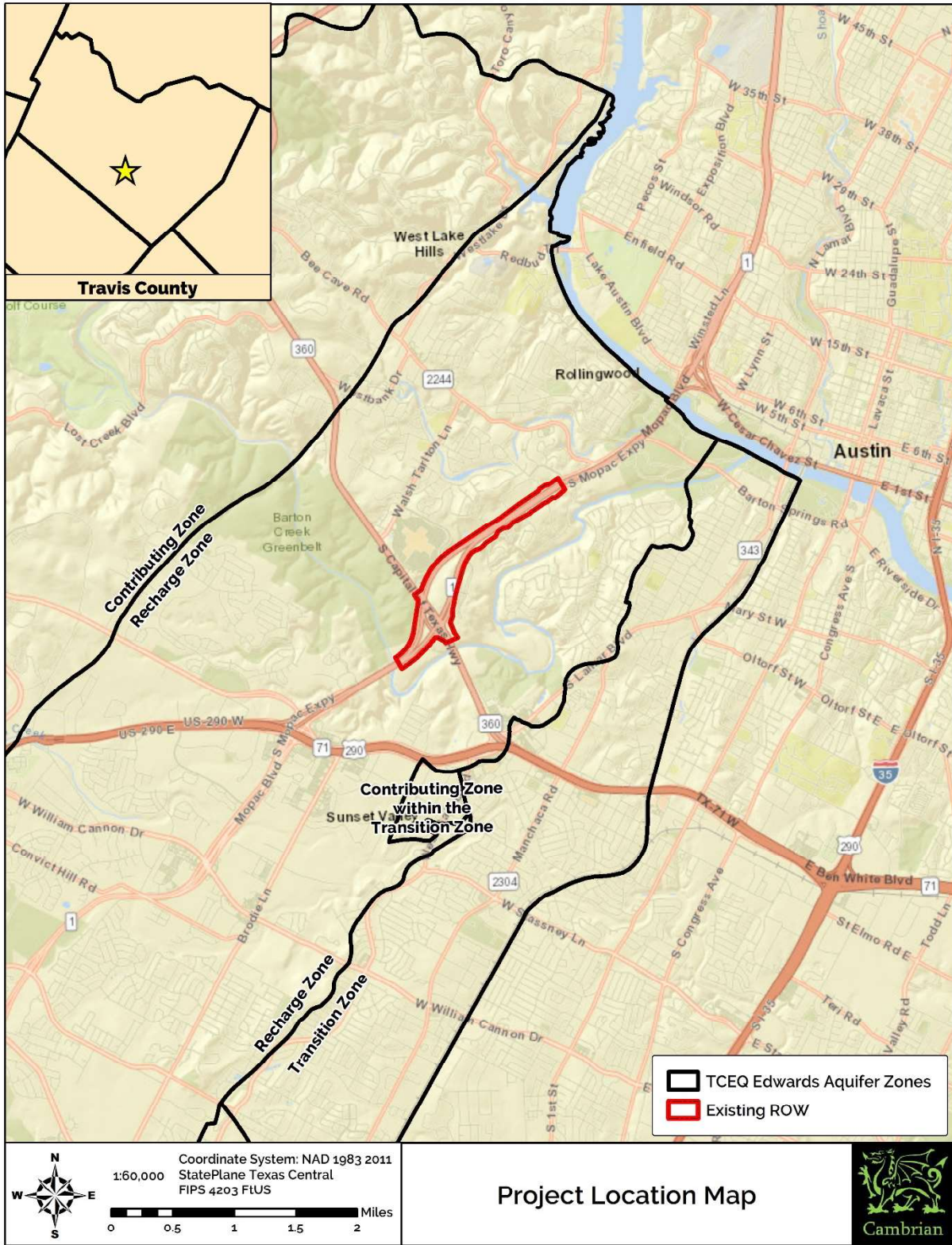


Figure 1. Project location map.

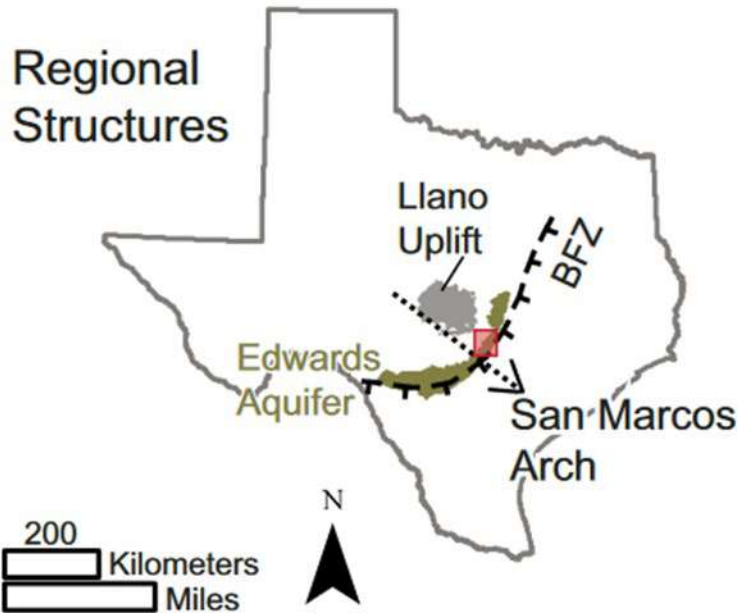


Figure 2. Regional Geologic and Structural Features (Hunt et al. 2019). Location of the Edwards Aquifer (olive green) in Texas along the Balcones Fault Zone (BFZ). The Barton Springs Segment of the Edwards Aquifer is marked by a red box on the north side of the San Marcos Arch.

C. Methodology

Cambrian Environmental Registered Professional Geoscientists (Texas Licenses #s 1350, 3863 and 10791) and two karst technicians conducted a karst feature field survey in the Project Area between January and April 2020. The pedestrian survey was completed by walking parallel transects spaced approximately 50 feet apart as directed by the TCEQ in the *Instructions to Geologists for Geologic Assessments on the Edwards Aquifer Recharge/Transition Zones (Rev. 10-01-04)*. Closer spacing was used where vegetation inhibited clear observation. All potential karst features, including depressions, holes, and animal burrows, were carefully examined for evidence of subsurface extent. A number of techniques were used for this effort including probing with a digging implement to determine the thickness and consistency of fill material and feeling for the presence of air flow, which may indicate the presence of a sub-surface void space. Other techniques included making observations of any notable characteristics of the feature site such as the presence of various types of vegetation or a semi-circular burrow mound produced by the activities of small mammals. The locations of discovered features were recorded with a handheld GPS unit. Feature locations were then correlated with features identified in previous assessments using GPS coordinates and compared using photo documentation.

Additionally, the locations of known karst features and caves were reviewed from available literature and databases. The main source of cave information was the City of Austin Watershed Protection Department karst feature database (COA 2020). In addition to various published geologic maps of the project, ArcGIS files of the City of Austin Geologic Map of the Austin Area (COA 2014) were reviewed. These files were used to create field maps to aid in site-specific geological interpretation.

II. Results

A. Soils

Soil units in the Project Area are shallow, undulating to steep, and predominantly occur over limestone. Half of the Project Area is covered by the Brackett-Rock outcrop complex (BID) soil unit. Other soils occurring in the Project Area are mapped within Crawford clay (CrB), Tarrant soils (TaD), Tarrant and Speck soils (TcA), Speck stony clay loam (SsC), Brackett-Rock outcrop-Real complex (BoF), Gravel pits (GP), Tarrant-Rock outcrop complex (TdF), and the Volente silty clay loam (VoD) soil units (Figure 3; USDA NRCS 2014; USDA 1972).

The Crawford and Speck soil series are within the “D” classification of the hydrologic soil groups. The “D” soils have a very slow infiltration rate (very high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high-water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious cover. These soils have a very slow rate of water transmission.

The Brackett, Tarrant, and Volente soil series are within the “C” classification of the hydrologic soil groups. Type “C” soils have slow infiltration rates when thoroughly wet. These consist chiefly of soils in which a layer impedes the downward movement of water or soils that are moderately fine to fine textured. These soils have a slow rate of water transmission.

B. Geology

Bedrock units in the Project Area are all Cretaceous age sedimentary rocks (limestone, marl, and clay) that were deposited in a marine shelf or shelf-margin environment. The lithology underlying the Project Area consists of the lower Cretaceous age Edwards Group which consists of the Kainer and Person Formations, and the Georgetown Formation, as well as the upper Cretaceous Del Rio Clay and Buda Limestone Formations. The general geology and stratigraphy of the project are graphically shown in Figures 4 and 5.

The Kainer Formation of the Edwards Group contains limestone, dolomitic limestone and chert occurs throughout the formation. The thickness ranges between 270 to 335 feet (Hunt et al. 2019; Blome 2005). The Kainer is divided into hydrostratigraphic units (Basal Nodular, Dolomitic, Kirschberg Evaporite, and Grainstone members). The Walnut Formation is equivalent to or indistinguishable from the Basal Nodular member in Travis County. There are few caves developed in the massively-bedded Basal Nodular. The Dolomitic member consists of a resistant wackestone with isolated chert nodules. Caves developed in the Dolomitic typically are formed along bedding planes. Caves are extensively developed in the Kirschberg Evaporite member. The Kirschberg consists of an evaporitic limestone, pulverulite and either chert beds or nodules. Few caves are developed in the Grainstone member, which consists of light-colored miloloid grainstone and chert beds. Much of Kainer Formation is fossiliferous; typified by rudistid-rich mudstones and wackestones that grade into intertidal and supratidal dolomitic mudstones with evaporites and miliolid grainstones. Other fossil groups include oysters and gastropods (Blome 2005).

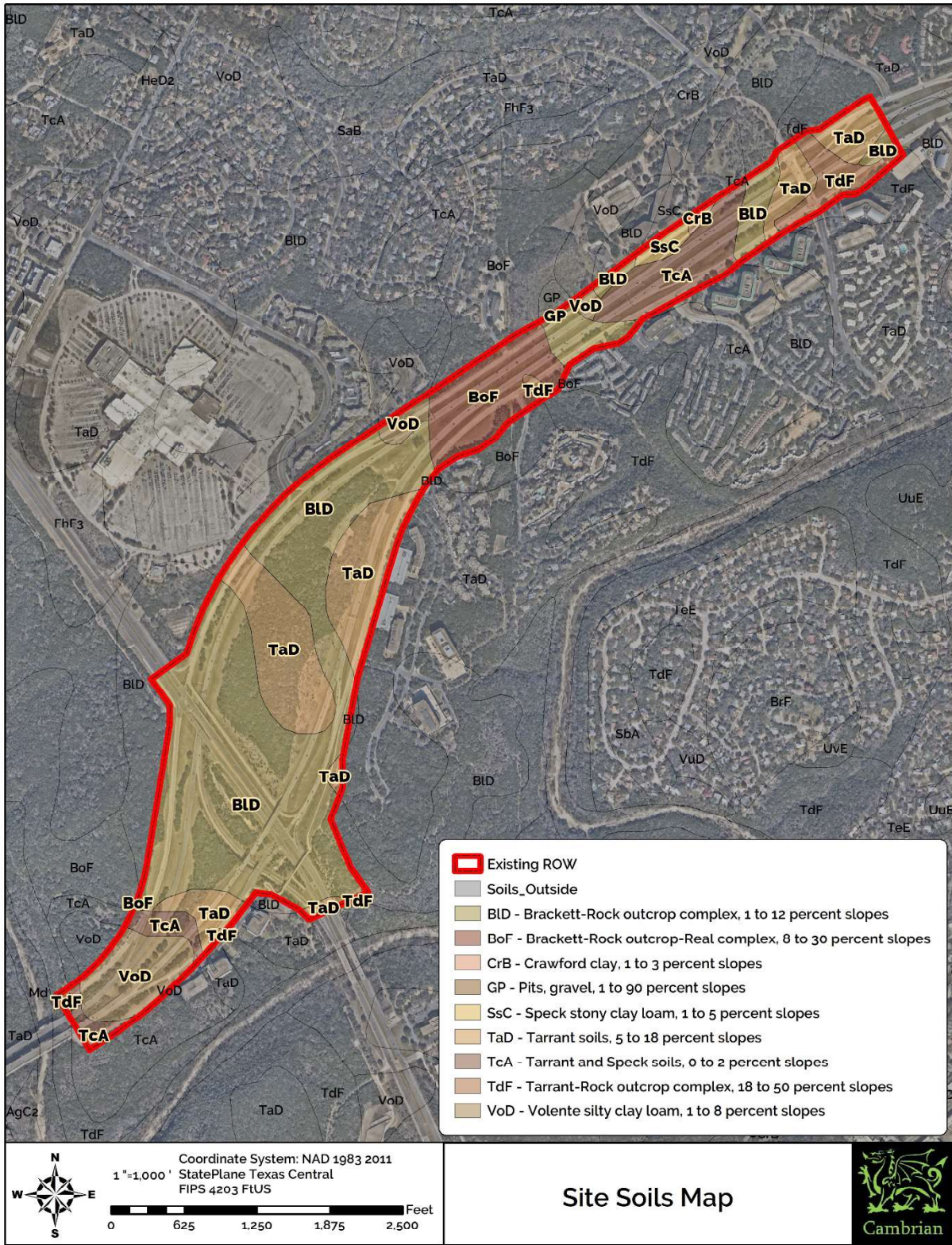


Figure 3. Soils of the Project Area.

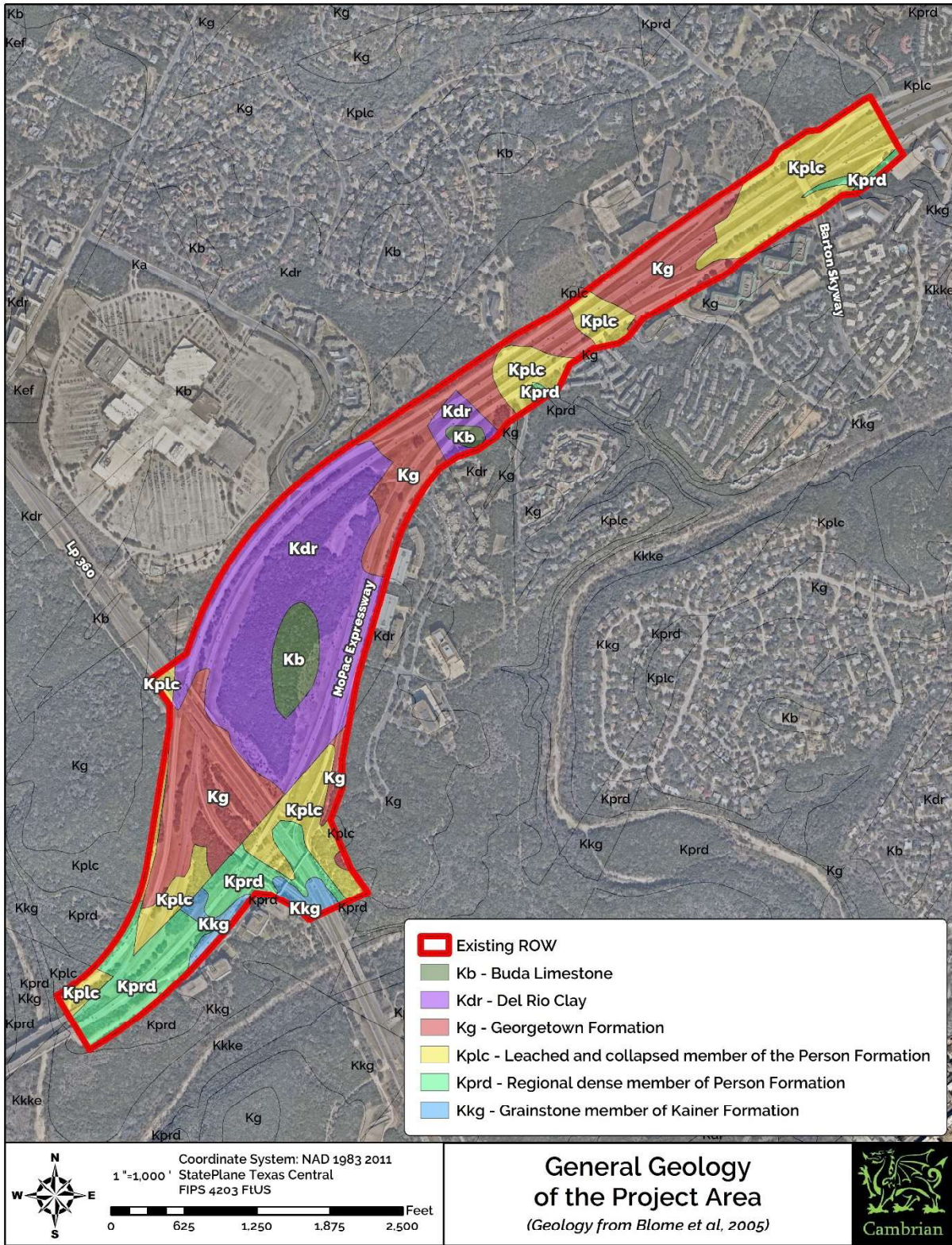


Figure 4. General Geology of the Project Area.

<i>Period</i>	<i>Stratigraphic Unit</i>		<i>Thickness (ft)</i>		
<i>Quaternary</i>	<i>Alluvium (Qal)</i>		<i>10-30</i>		
	<i>Navarro and Taylor Groups (Knt)</i>		<i>600</i>		
<i>Upper Cretaceous</i>	<i>Austin Group (Ka)</i>		<i>275</i>		
	<i>Eagle Ford Group (Kef)</i>		<i>40</i>		
	<i>Buda Limestone (Kb)</i>		<i>40</i>		
	<i>Del Rio Clay (Kdr)</i>		<i>60</i>		
	<i>Georgetown Fm. (Kg)</i>		<i>50</i>		
<i>Lower Cretaceous</i>	<i>Edwards Aquifer</i>	<i>Edwards Group</i>	<i>Person Fm.</i> <i>50–170 feet thick</i>	<i>Cyclic and Marine mbr (Kpcm)</i>	<i>0-70</i>
			<i>Leached and Collapsed (Kplc)</i>	<i>30-80</i>	
	<i>Regional Dense mbr (Kprd)</i>		<i>20</i>		
	<i>Edwards Group</i>	<i>Kainer Fm.</i> <i>270–335 feet thick</i>	<i>Grainstone mbr (Kkg)</i>	<i>45-60</i>	
			<i>Kirschberg Evaporite mbr (Kkke)</i>	<i>65-75</i>	
			<i>Dolomitic mbr (Kkd)</i>	<i>110-150</i>	
			<i>Basal Nodular/Walnut Fm. (Kkbn)</i>	<i>50</i>	
	<i>Upper Glen Rose mbr (Kgru)</i>		<i>450</i>		

Figure 5. Stratigraphic Column. Shaded areas represent lithologies underlying the project. Abbreviations from Blome 2005. Stratigraphic nomenclature and thickness from Hunt et al. 2019 and Small et al. 1996.

The Person Formation contains grainstone and crystalline limestone, and the thickness ranges between 50 and 170 feet (Hunt et al. 2019; Blome 2005). The Person is further divided into hydrostratigraphic units (Regional Dense, Leached and Collapsed, and Cyclic and Marine members). The dense carbonate mudstone of the Regional Dense member is not known to form caves. The undivided porous and permeable Leached and Collapsed members consist of light-colored wackestone, although burrowed mudstones, grainstones, and intervals of crystalline limestone also can be found (Hauwert, 2009). The Cyclic and Marine member is not mapped in the Project Area due to erosion prior to deposition of the Georgetown (Hauwert 2009). Common fossils of the Person Formation include pelecypods, gastropods, and rudistids (Blome 2005).

The Georgetown Formation is the uppermost unit of the Edwards Aquifer. It is included in the Edwards Aquifer because well drillers historically have considered the Georgetown the top of the Edwards Aquifer (Small et al., 1996). The Georgetown Formation is up to 50 feet thick (Hunt et al. 2019) and can be seen along the ramp from southbound MoPac to southbound SL 360 where the beds are folded in the Loop 1 Syncline (Project Photo 2), and along the north end of the Project Area (Project Photo 3). The Georgetown was deposited in a more open, shallow marine environment (Hunt et al. 2019), and is generally more fossiliferous than the Kainer or Person Formations. It is reddish-brown and gray to light-tan, marly limestone with biomicritic texture; commonly contains the brachiopod *Waconella wacoensis*, *pectins*, as well as the mollusks *Kingena wacoensis* and *Gryphaea washitaensis* (Blome 2005). Karst features are uncommon in the Georgetown Formation.

The Del Rio Clay is a predominantly a mudstone formation that averages about 60 feet thick in the BSS. It is a bluish clay that weathers to an olive-green color, and commonly contains fossil “rams horns” (*Ilymatogyra Arietina*). The low permeability clay forms a seal above the Edwards Aquifer. The Del Rio Clay is easily erodible and, especially on steep slopes, can cause construction problems related to shrinking and swelling clays.

The Buda Limestone has an average thickness of 40 feet in the BSS. It is generally a hard, fine grained limestone but the lower part of the formation can be marly. Blocks of Buda Limestone can become detached and move downslope which can contribute to slope failure of the Del Rio Clay. A large area of Del Rio Clay with a thin Buda Limestone cap is located north of the project’s separated mainlanes, north of the MoPac/SL 360 intersection.

A search was made for water wells located within the Project Area using the groundwater data viewer hosted by the Texas Water Development Board. None were found in the database and no water wells were found during the pedestrian survey. See Appendix C for a distribution of geologic units based on Blome et al. 2005. The most prominent units are the Del Rio Clay (32%), the Georgetown Formation (28%) and the Leached and Collapsed member (23%) of the Edwards Group. Regulatory boundaries on the maps are according to TCEQ 2005. Lithologic descriptions for outcropping units originate primarily from Small et al. 1996, Blome et al. 2005, and Hauwert 2009 who use the Dunham carbonate rock classification system. Field identification is hampered by previous land disturbance with the ROW.

C. Hydrologic Assessment

Recharge into the karstic Edwards Aquifer primarily occurs in areas where the Kainer, Person and Georgetown Formations are exposed at the surface. The majority of recharge in the BSS occurs in the main stream channels of creeks. Less recharge occurs on the uplands and along tributaries compared to the main streams (see Hunt et al. 2019 for the recharge range in terms of fraction of total recharge). The conditions for recharge are dependent on the amount of storage in the aquifer. Groundwater levels beneath the project range from 458 to 491 feet above mean sea level based on high flow aquifer conditions (BSEACD 2020). Comparison of land surface and water table elevations in the Project Area reveals they are separated by approximately 100 to 200 feet.

Karst features are commonly formed along joints, fractures, and bedding plane surfaces in the Kainer and Person Formations. The Kirschberg Evaporite member is extensively cavernous and the undivided Leached and Collapsed member has extensive lateral cave development. Surface karst recharge features are less common in the Georgetown Formation but caves can be encountered where excavation breaches the underlying Leached and Collapsed member (ex. Barton Skyway and Spyglass caves were sealed in the late 1990's). Recharge does not occur where the Del Rio and Buda Formations are exposed. Recharge is not expected to occur beneath impervious surfaces (pavement) as these areas have a high runoff potential.

Seven karst features occur in the Project Area, including sinkholes and solution enlarged fractures: MPS-7, MPS-19, MPS-20, MPS-21, MPS-22, MPS-23, and MPS-32 (Appendices C and D). Of these seven, two features were determined to be sensitive with a potential for rapid recharge according to TCEQ guidance: MPS-7 (solution cavity) and MPS-19 (solution enlarged fracture). Sensitive feature MPS-7 has a drainage basin of about 1 acre and is located between the MoPac mainlanes south of SL 360. Feature MPS-19 drains less than 1 acre and is located on an isolated pinnacle east of the MoPac northbound mainlanes within the SL 360 ROW. The sensitive features are outside the expected limits of construction for the project.

Eight geologic faults, labeled as F-4 through F-9, F-14 and F-17, are mapped crossing the Project Area (Blome 2005). Fault segments have variable lengths from hundreds to thousands of feet long. Faults were measured based on mapped segments and the lengths rounded to the nearest 100 feet. The lengths themselves do not indicate any particular sensitivity although all mapped faults are considered primary, meaning that they are prominent and mappable. Mapped faults are associated with bedrock damage zones that can be filled with variable materials influencing fluid transmissivity. Although most faults are poorly exposed in the Project Area, the F-14 fault trace and associated fractures can be observed in the roadcuts along both sides of the ramp between southbound MoPac and southbound SL 360. The fault may also be observed on the top of the slope north of SL 360 between the northbound mainlanes and the frontage road. No other faults were observed during the pedestrian survey.

Utility potholes, which are manmade excavations for the purpose of locating utility lines, are classified as non-karst closed depressions. Project utility information may be obtained by request but an assessment is beyond the scope of this report. Should any karst features be discovered during the construction phase of the project, they should be reported to TCEQ to determine the appropriate mitigation measures.

D. Data Review

A review of previously identified natural and manmade features was conducted of the geologic assessment for the MoPac South project (Cambrian Environmental 2020). Appendix D provides a reference to reconcile the feature numbers for the features in the Project Area. For reference, features identified as MP-001 through MP-014 in a draft geologic assessment (Zara Environmental 2016) from an earlier version of the MoPac South project were reconciled with field observations for this assessment. Feature MP-001, a sensitive fractured rock outcrop is located in the bed of Slaughter Creek which is not within the Project Area. Non-sensitive features MP-002 through MP-005 were removed during previous construction activities and they are outside the Project Area. Therefore MP-001 through MP-005 are not included in the feature descriptions for this geological assessment. Features MP-006 through MP-014 were evaluated in the field and re-numbered as features MPS-1 through MPS-9, respectively. Within this data set only MPS-6 and MPS-7 occur within the Project Area.

Twenty-two features (MBB-1 through MBB-22) identified in the MoPac bicycle and pedestrian bridge geologic assessment were re-numbered beginning with identifier MPS-10. However, due to the following circumstances, these features are not consecutively renumbered. Three of the previously identified features are outside the ROW (non-sensitive features MBB-7, MBB-8 and MBB-19) are therefore excluded from the updated MoPac South report. Two features (MBB-9, MBB-10) were not located during the pedestrian survey although the locations are included on the geologic map for reference. Four numbered faults (MBB-13, MBB-15, MBB-16 and MBB-17) are numbered separately as mapped faults crossing the project (Cambrian Environmental 2020). One drilled hole (MBB-18) was not located and was likely filled by construction of the bike ped bridge over SL 360. Therefore, within this data set features MPS-18 through MPS-23, MPS-27, MPS-28, MPS-30 through MPS-33 occur within the Project Area.

A data review for known karst features adjacent to the ROW was conducted. The geologic map (Appendix C) includes known features within 500 feet of the ROW along MoPac (COA, 2010). Notable features in the vicinity of the Project Area include Jones Sink, Five Pocket Cave and Spyglass Cave. South of the Project Area, Jones Sink is located in the bed of Barton Creek within the Kirschberg member approximately 500 feet southwest of the Project Area and 325 feet downstream of the existing bicycle and pedestrian bridge over Barton Creek. A 1999 dye injection into Jones Sink initially reached Cold Springs in 5 days (Hauwert et al. 2004). The injection point at Jones Sink was called “*Site A MoPac Bridge*” in the above study. On the north end of the project, Five Pocket Cave and Spyglass Cave (sealed after being encountered during construction) are known to contain endemic karst invertebrates. Hobo Hotel Cave is identified in the karst feature database as being located within the Project Area at the entrance of the Barton Creek Greenbelt. However, no cave was observed at this location during the pedestrian survey, and the feature is believed to be sealed. An alternate location is shown on the south bank of Barton Creek although no feature was found at this location during the pedestrian survey for MoPac South (Cambrian Environmental, 2020). Cave maps for these features were not available, although a dimensional analysis of 28 cave maps located within a mile of the MoPac ROW south of the Project Area showed that 86% have longest segments that are less than 100 feet (TxDOT, 2014).

III. Conclusion

This geologic assessment covers the entire ROW of the Barton Skyway Ramp Relief project limits. The Project Area is underlain primarily by the Del Rio Clay, Georgetown Formation and the Leached and Collapsed Member of the Edwards Group. The Leached and Collapsed member is known for extensive cavern development. The majority of recharge to the Edwards Aquifer occurs within the channels of major creeks (e.g., Barton Creek).

Eight features, including sinkholes and solution enlarged fractures, have a karst origin. Of these, two features were determined to be sensitive with a potential for rapid recharge according to TCEQ guidance: MPS-7 (solution cavity) and MPS-19 (solution enlarged fractures). These sensitive features occur southeast of the project activities within separate drainage areas such that they will not be affected by the project.

Geologic faults are poorly exposed with the exception of the F-14 fault trace near MoPac and SL 360. Faults are unlikely to rapidly transmit fluid to the subsurface.

IV. Literature Cited

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V. Appendices

**Appendix A:
TCEQ Geologic Assessment Form and Table**

Geologic Assessment

Texas Commission on Environmental Quality

For Regulated Activities on The Edwards Aquifer Recharge/transition Zones and Relating to 30 TAC §213.5(b)(3), Effective June 1, 1999

To ensure that the application is administratively complete, confirm that all fields in the form are complete, verify that all requested information is provided, consistently reference the same site and contact person in all forms in the application, and ensure forms are signed by the appropriate party.

Note: Including all the information requested in the form and attachments contributes to more streamlined technical reviews.

Signature

To the best of my knowledge, the responses to this form accurately reflect all information requested concerning the proposed regulated activities and methods to protect the Edwards Aquifer. My signature certifies that I am qualified as a geologist as defined by 30 TAC Chapter 213.

Print Name of Geologist: Heather Beatty,
PG

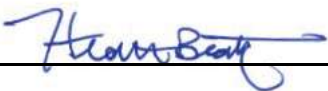
Telephone: 512-470-4013

Fax: _____

Date: 16 June 2021

Representing: Cambrian Environmental (Tx Geo Firm #50484) (Name of Company and TBPG or TBPE registration number)

Signature of Geologist:



Regulated Entity Name: Barton Skyway Ramp Relief



Project Information

1. Date(s) Geologic Assessment was performed: January 13, 2020; March 24, 2020; April 1, 7, 8; and June 12, 2020

2. Type of Project:

WPAP
 SCS

AST
 UST

3. Location of Project:

Recharge Zone
 Transition Zone

Contributing Zone within the Transition Zone

4. **Attachment A - Geologic Assessment Table.** Completed Geologic Assessment Table (Form TCEQ-0585-Table) is attached.
5. Soil cover on the project site is summarized in the table below and uses the SCS Hydrologic Soil Groups* (Urban Hydrology for Small Watersheds, Technical Release No. 55, Appendix A, Soil Conservation Service, 1986). If there is more than one soil type on the project site, show each soil type on the site Geologic Map or a separate soils map.

Table 1 - Soil Units, Infiltration Characteristics and Thickness

Soil Name	Group*	Thickness(feet)
see next page		

* Soil Group Definitions (Abbreviated)

- A. Soils having a high infiltration rate when thoroughly wetted.
- B. Soils having a moderate infiltration rate when thoroughly wetted.
- C. Soils having a slow infiltration rate when thoroughly wetted.
- D. Soils having a very slow infiltration rate when thoroughly wetted.

6. **Attachment B – Stratigraphic Column.** A stratigraphic column showing formations, members, and thicknesses is attached. The outcropping unit, if present, should be at the top of the stratigraphic column. Otherwise, the uppermost unit should be at the top of the stratigraphic column.
7. **Attachment C – Site Geology.** A narrative description of the site specific geology including any features identified in the Geologic Assessment Table, a discussion of the potential for fluid movement to the Edwards Aquifer, stratigraphy, structure(s), and karst characteristics is attached.
8. **Attachment D – Site Geologic Map(s).** The Site Geologic Map must be the same scale as the applicant's Site Plan. The minimum scale is 1": 400'
 Applicant's Site Plan Scale: 1" = 100'
 Site Geologic Map Scale: 1" = 200'
 Site Soils Map Scale (if more than 1 soil type): 1" = 1000'
9. Method of collecting positional data:
 - Global Positioning System (GPS) technology.
 - Other method(s). Please describe method of data collection: _____
10. The project site and boundaries are clearly shown and labeled on the Site Geologic Map.
11. Surface geologic units are shown and labeled on the Site Geologic Map.

Soil Unit Name and Description	Group	Thickness (ft)
BID - Brackett-Rock outcrop complex, 1 to 12 percent slopes	C	0.8 - 1.7
BoF - Brackett-Rock outcrop-Real complex, 8 to 30 percent slopes	C	0.8 - 1.7
CrB - Crawford clay, 1 to 3 percent slopes	D	2.0 - 2.7
GP - Pits, gravel, 1 to 90 percent slopes	None	None
SsC - Speck stony clay loam, 1 to 5 percent slopes	C	1.2 - 1.5
TaD - Tarrant soils, 5 to 18 percent slopes	C	0.3 - 1.2
TcA - Tarrant and Speck soils, 0 to 2 percent slopes	C	0.3 - 1.2
TdF - Tarrant-Rock outcrop complex, 18 to 50 percent slopes	D	0.3 - 1.2
VoD - Volente silty clay loam, 1 to 8 percent slopes	C	2.8 - 4.2

Table 1, Form TCEQ-0585 (Rev. 02-11-15)

12. Geologic or manmade features were discovered on the project site during the field investigation. They are shown and labeled on the Site Geologic Map and are described in the attached Geologic Assessment Table.
- Geologic or manmade features were not discovered on the project site during the field investigation.
13. The Recharge Zone boundary is shown and labeled, if appropriate.
14. All known wells (test holes, water, oil, unplugged, capped and/or abandoned, etc.): If applicable, the information must agree with Item No. 20 of the WPAP Application Section.
- There are _____ (#) wells present on the project site and the locations are shown and labeled. (Check all of the following that apply.)
- The wells are not in use and have been properly abandoned.
- The wells are not in use and will be properly abandoned.
- The wells are in use and comply with 16 TAC Chapter 76.
- There are no wells or test holes of any kind known to exist on the project site.

Administrative Information

15. Submit one (1) original and one (1) copy of the application, plus additional copies as needed for each affected incorporated city, groundwater conservation district, and county in which the project will be located. The TCEQ will distribute the additional copies to these jurisdictions. The copies must be submitted to the appropriate regional office.

GEOLOGIC ASSESSMENT TABLE			PROJECT NAME: Barton Skyway Ramp Relief																
LOCATION			FEATURE CHARACTERISTICS								EVALUATION		PHYSICAL SETTING						
1A	1B'	1C'	2A	2B	3	4			5	5A	6	7	8A	8B	9	10	11		12
FEATURE ID	LATITUDE	LONGITUDE	FEATURE TYPE	POINTS	FORMATION	DIMENSIONS (FEET)			TREND (DEGREES)	DENSITY (NO/FT)	APERTURE (FEET)	INFILL	RELATIVE INFILTRATION RATE	TOTAL	SENSITIVITY		CATCHMENT AREA (ACRES)		TOPOGRAPHY
						X	Y	Z	DIP (DEGREES)	<40					>40	<1.0	>1.0		
MPS-6	30.254792°	-97.801800°	CD	5	Kdr	9	7	2	N/A	0	N/A	N/A	O,F	19	24	X		X	Hillside
MPS-7	30.247087	-97.805636	SC	20	Kprd	3.8	3.6	7	45	10	N/A	N/A	N,O,F	25	55		X	X	Hillside
MPS-18	30.245460°	-97.805800°	O	5	Kkg	2.5	2.5	<1	N/A	0	N/A	N/A	N,O	5	10	X		X	Drainage
MPS-19	30.246830°	-97.804000°	SF	20	Kkic	27	1.5	1.3	140	0	1/50	1.5	N,F	25	45		X	X	Hilltop
MPS-20	30.247010°	-97.804900°	SC	20	Kprd	8	1	3	25	10	1/10	0.1	N	5	35	X		X	Cliff
MPS-21	30.247360°	-97.803200°	SF	20	Kkic	2	2	1.5	N/A	0	N/A	N/A	O,F	5	25	X		X	Hillside
MPS-22	30.246991°	-97.804458°	SF	20	Kkic	0.4	10	2	122	0	1/25	N/A	N,O	5	25	X		X	Cliff
MPS-23	30.247060°	-97.804400°	SF	20	Kkic	0.5	10	2.5	125	0	1/25	N/A	N,O,V	5	25	X		X	Cliff
MPS-27	30.263260°	-97.790480°	CD	5	Kkic	2	2	1	N/A	0	N/A	N/A	N,O	5	10	X		X	Hillside
MPS-28	30.262599°	-97.788403°	CD	5	Kkic	1.5	1.5	1	N/A	0	N/A	N/A	O	5	10	X		X	Hillside
MPS-30	30.249685°	-97.806204°	CD	5	Kg	1.3	1.3	1	N/A	0	N/A	N/A	C,O	5	10	X		X	Hillside
MPS-31	30.249600°	-97.806105°	CD	5	Kg	3.5	2.5	1	N/A	0	N/A	N/A	C,O	5	10	X		X	Hillside
MPS-32	30.247718°	-97.806459°	SC	20	Kplc	1.5	0.8	1.3	N/A	0	N/A	N/A	V,O	15	35	X		X	Hillside
MPS-33	30.258305°	-97.797072°	CD	5	Kplc	32	32	15	N/A	0	N/A	N/A	X	10	15	X		X	Hillside

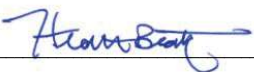
* DATUM: WGS84

2A TYPE	TYPE	2B POINTS
C	Cave	30
SC	Solution cavity	20
SF	Solution-enlarged fracture(s)	20
F	Fault	20
O	Other natural bedrock features	5
MB	Manmade feature in bedrock	30
SW	Swallow hole	30
SH	Sinkhole	20
CD	Non-karst closed depression	5
Z	Zone, clustered or aligned features	30

8A INFILLING	
N	None, exposed bedrock
C	Coarse - cobbles, breakdown, sand, gravel
O	Loose or soft mud or soil, organics, leaves, sticks, dark colors
F	Fines, compacted clay-rich sediment, soil profile, gray or red colors
V	Vegetation. Give details in narrative description
FS	Flowstone, cements, cave deposits
X	Other materials

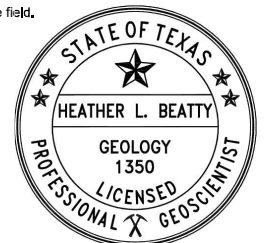
12 TOPOGRAPHY	
	Cliff, Hilltop, Hillside, Drainage, Floodplain, Streambed

I have read, I understand, and I have followed the Texas Commission on Environmental Quality's Instructions to Geologists. The information presented here complies with that document and is a true representation of the conditions observed in the field. My signature certifies that I am qualified as a geologist as defined by 30 TAC Chapter 213.



Date: June 16, 2021

Sheet 1 of 2



Appendix B: Project Photos



Project Photo 1. Fault lines of the Balcones Fault Zone are expressed in sets that reflect adjustments within damage zones. There is an angular contrast between vertical drill scars and slashed fracture lines. This image is facing northeast along the ramp from southbound MoPac to southbound SL 360 (towards South Lamar Boulevard). On the left side of the photo, strata are dipping northwest towards the Loop 1 Syncline (Detail in Project Photo 2). This fault crosses the Project Area from 550 feet south of Tuscan Terrace to 820 feet north of Barton Creek at a 45° trend and has a displacement of 40 feet.

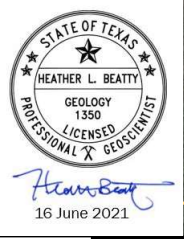
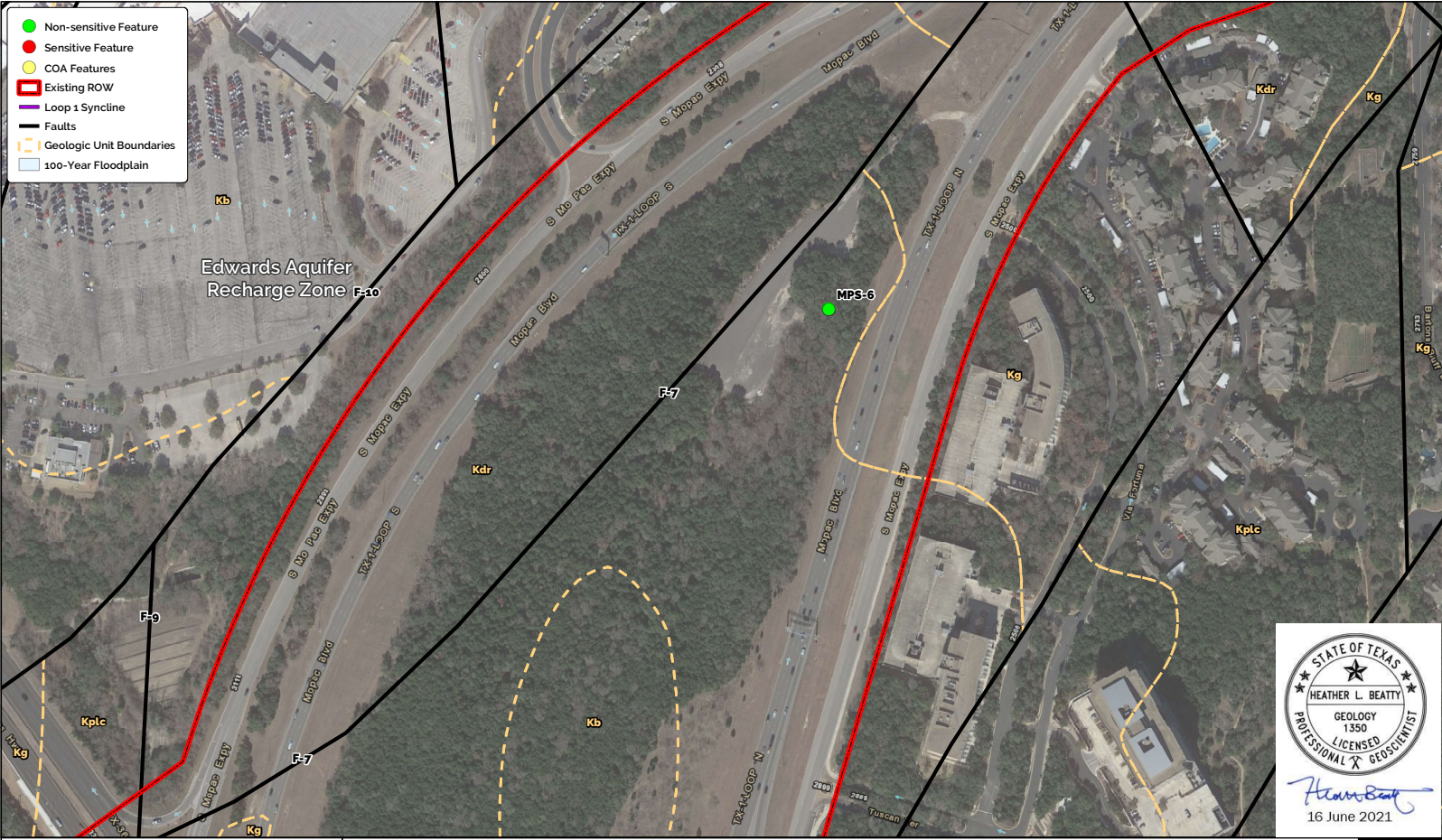


Project Photo 2. The Loop 1 Syncline is an expression of downward folded bedding in the Georgetown Formation. Folded beds can be seen along the ramp from southbound Mopac to southbound State Loop 360. The hinge line of the sinkhole is shown as a purple line on the geologic map (COA 2014).



Project Photo 3. Exposure of the Georgetown Formation (gray bedrock in foreground) between the southbound mainlanes and the frontage road.

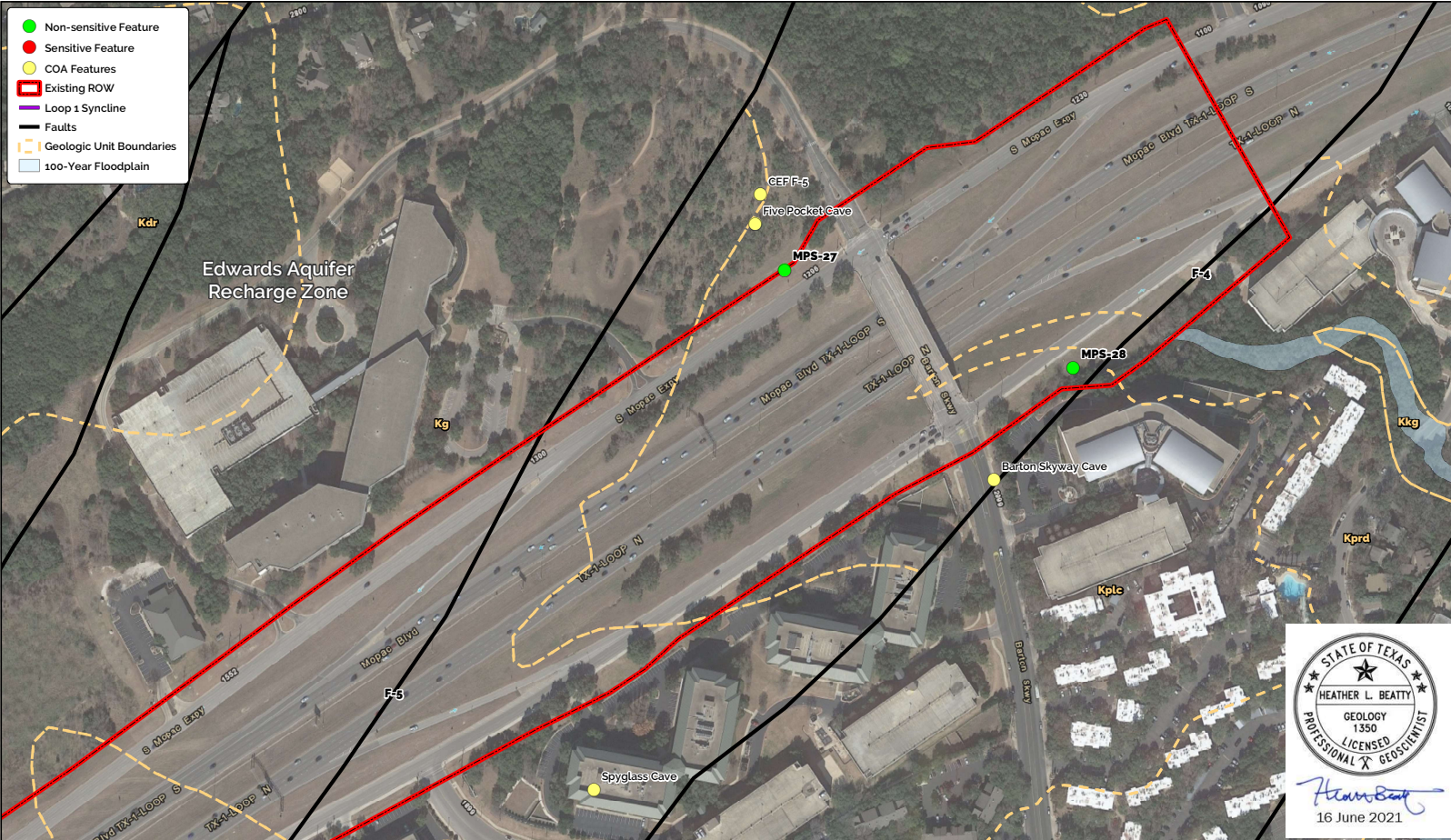
**Appendix C:
Site Geologic Map**



Coordinate System: NAD 1983 2011
 StatePlane Texas Central
 FIPS 4203 FIPS
 1"=200'
 Feet
 0 125 250 375 500
 (Geology from Blome et al, 2005)



Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors



STATE OF TEXAS
 HEATHER L. BEATTY
 GEOLOGY
 1350
 LICENSED
 PROFESSIONAL GEOSCIENTIST
Heather Beatty
 16 June 2021

Coordinate System: NAD 1983 2011
 StatePlane Texas Central
 FIPS 4203 FIPS
 1"=200'
 Feet
 0 125 250 375 500
 (Geology from Blome et al, 2005)

Geology of the Project Area
 Page 5 of 5



Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors

**Appendix D:
Feature List, Photos and Descriptions**

Features identified within the Project Area with equivalent feature numbers as a previous geologic assessment. The Geologic Assessment Table (Appendix C) contains coordinates for these features. Faults are not included for simplicity. NB=northbound, SB=southbound, ML=mainlanes, FR=frontage road.

Feature Identification	Previous GA Feature Identification ¹	Feature type and setting	Recharge Sensitivity
MPS-6	MP-011	Non-karst depression on a hillside adjacent to the MoPac NBML	Not sensitive
MPS-7	MP-012	Sinkhole between the MoPac ML south of Lp 360	Sensitive
MPS-18	MBB-11	Non-karst bedrock feature at a cross drainage structure outside the MoPac NBFR	Not sensitive
MPS-19	MBB-12	Solution enlarged fracture on isolated pinnacle east of the MoPac NBML within Lp 360 ROW	Sensitive
MPS-20	MBB-14	Solution cavity in roadcut east of MoPac NBML at Lp 360	Not sensitive
MPS-21	MBB-20	Non-karst depression east of the MoPac NBML	Not sensitive
MPS-22	MBB-21	Solution cavity in roadcut along the MoPac NBFR at Lp 360	Not sensitive
MPS-23	MBB-22	Solution cavity in roadcut along the MoPac NBFR at Lp 360	Not sensitive
MPS-27	No equivalent feature	Non-karst depression at the edge of the ROW adjacent to the MoPac SBFR	Not sensitive
MPS-28	No equivalent feature	Non-karst depression adjacent to the MoPac NBFR	Not sensitive
MPS-30	No equivalent feature	Non-karst depression south of Lp 360	Not sensitive
MPS-31	No equivalent feature	Non-karst depression south of Lp 360	Not sensitive
MPS-32	No equivalent feature	Solution cavity between the MoPac ML south of Lp 360	Not sensitive
MPS-33	No equivalent feature	Depression/human induced sinkhole (not a natural feature) related to pipe collapse along the NBFR north of Lp 360	Not sensitive

¹ Zara Environmental (2016)

MPS-6 NON-KARST CLOSED DEPRESSION. This feature is a previously excavated closed depression in the Del Rio Clay. The depression is 9 feet by 7 feet by 2 feet deep. The depression was previously identified as “MP-011” in the draft MoPac South report cited in the Previous Geologic Assessments section of this report. Limestone cobbles observed within the depression likely originated upslope (i.e., Buda Limestone fragments were transported downslope). The feature is not sensitive and was not re-excavated.



Feature Photo MPS-6 Non-karst Closed Depression. The depression is formed in the Del Rio Clay.

MPS-7 SOLUTION CAVITY. This previously excavated karst feature formed in the Leached and Collapsed Member of the Person Formation. The cavity opening is 46 by 43 inches across and 7 feet deep. Rock dissolution was focused along a 45° fracture trend. The feature was previously identified as “MP-012” in the draft MoPac South report cited in the Previous Geologic Assessments section of this report. The feature was not excavated as rock floor was reached during previous excavation work. The feature is considered sensitive to recharge.



Feature Photo MPS-7 Solution Cavity. Remnant plastic tarp and plywood covers from a previous investigation are present near the opening.

MPS-18 OTHER NATURAL BEDROCK FEATURE. This feature is located below a stormwater outfall outside the northbound frontage road and was described in a previous geologic assessment as a solution enlarged fracture. It is now being classified as an other natural bedrock feature because no fractured rock was observed. Debris from a recent vehicle crash may have obscured fractured rock. The feature was previously identified as “MBB-11” in the draft MoPac South report cited in the Previous Geologic Assessments section of this report.

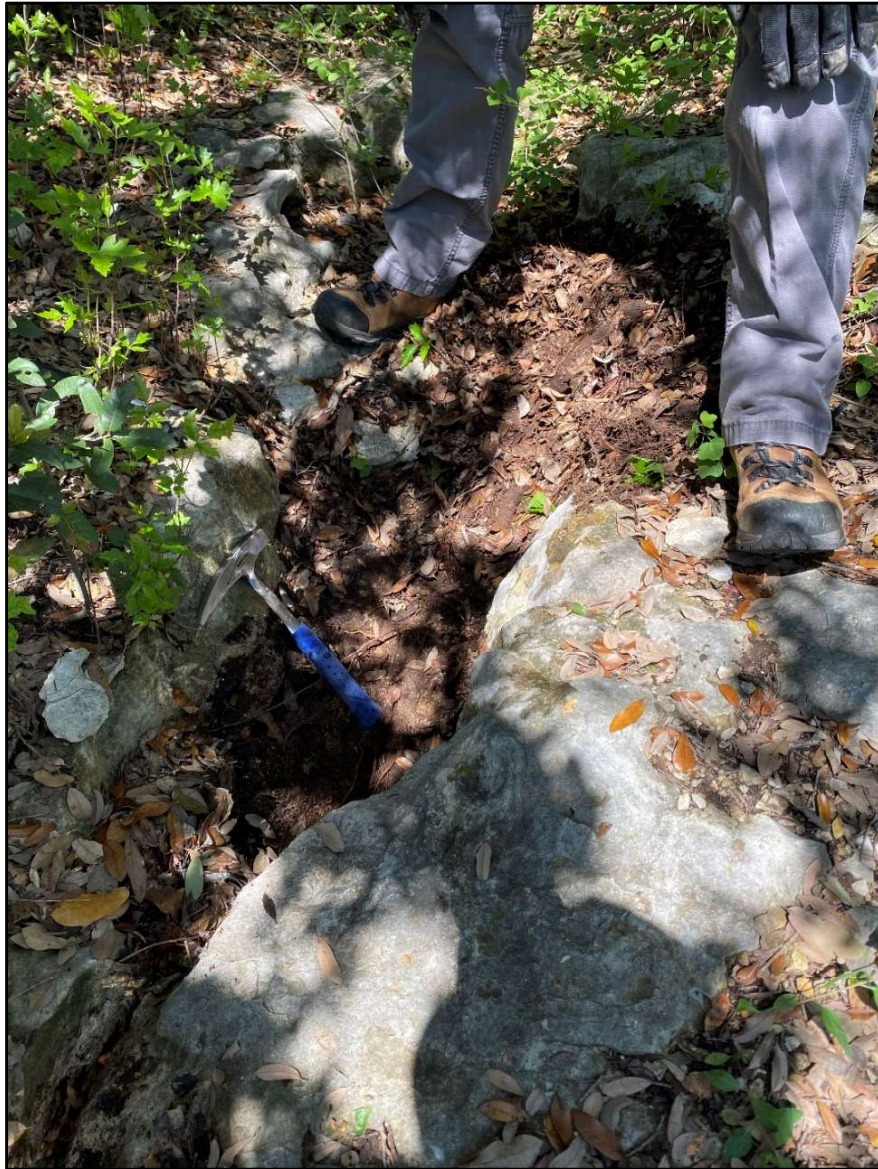


Feature Photo MPS-18 Other natural bedrock features. The image shows rock slabs that are likely not in place. The fractured rock reported at this location was not observed.

MPS-19 SOLUTION ENLARGED FRACTURE. The fracture is 27 feet long, extending to the west edge of the pinnacle between the southbound MoPac frontage road and the taper of the ramp from southbound MoPac to southbound State Loop 360. The width ranges between 12 and 18 inches. The depth is at least 15 inches but could extend further as the leaves and soil filling the fracture are loose. The feature was previously identified as “MBB-12” in the draft MoPac South report cited in the Previous Geologic Assessments section of this report. The feature is rated as sensitive.

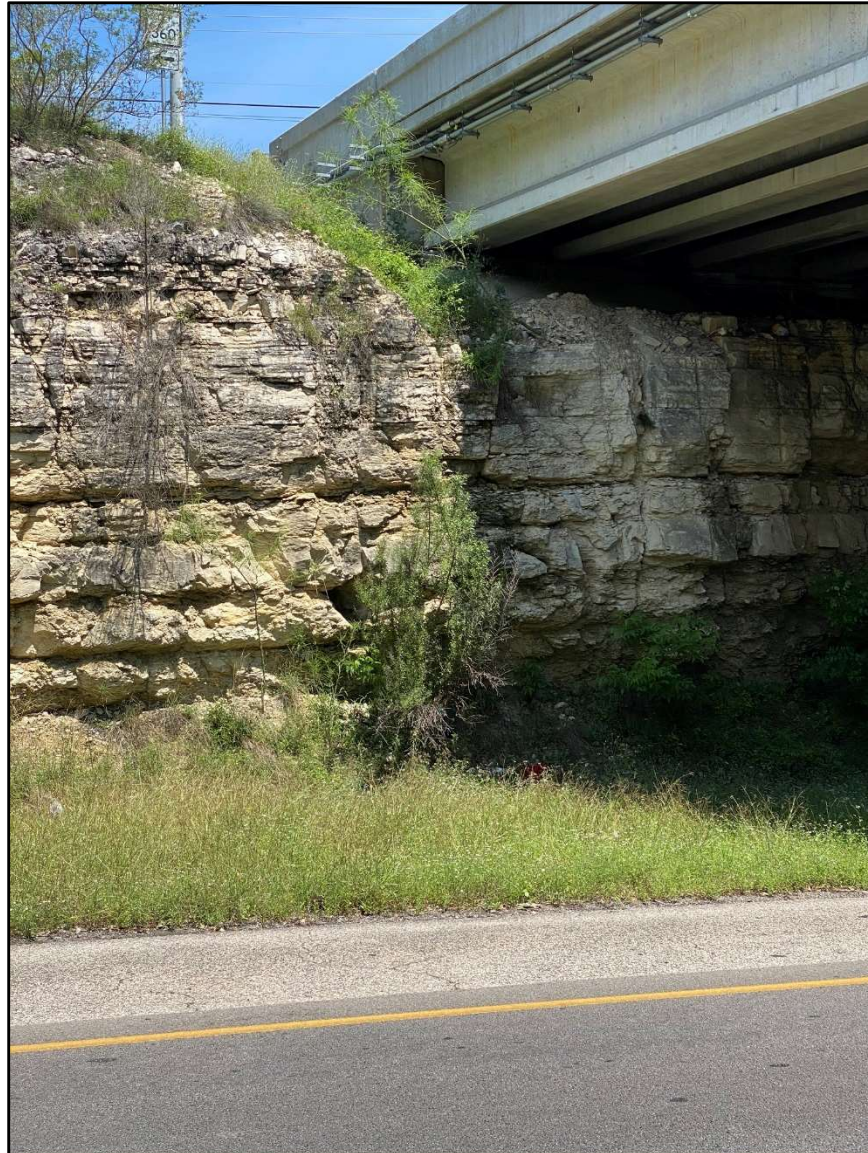


Feature Photo MPS-19 Solution Enlarged Fracture (Photo 1 of 2). The 27-foot long fracture is situated on top of a pinnacle. The fracture is partly covered with leaves. It runs between the two limestone slabs in the lower part of the image, to the right of the person standing for scale.



Feature Photo MPS-19 Solution Enlarged Fracture (Photo 2 of 2). The hammer is for scale at the widest part of the fracture (18 inches). The depth is at least 15 inches but could extend further as the leaves and soil filling the fracture are loose.

MPS-20 SOLUTION CAVITY. This feature consists of a solution cavity along a cliff face. The one-foot diameter solution cavity is associated with a fracture that trends 25°. The cavity extends approximately 3 feet into the cliff face. It is about 5 feet above the flow line at the base of the cliff making the recharge potential low. The feature was previously identified as “MBB-14” (a solution enlarged fracture containing a cavity) in the draft MoPac South report cited in the Previous Geologic Assessments section of this report. The feature is non-sensitive and was not excavated.



Feature Photo MPS-20 Solution Enlarged Fracture (Photo 1 of 2). This feature consists of a fracture with a solution cavity along a cliff face.



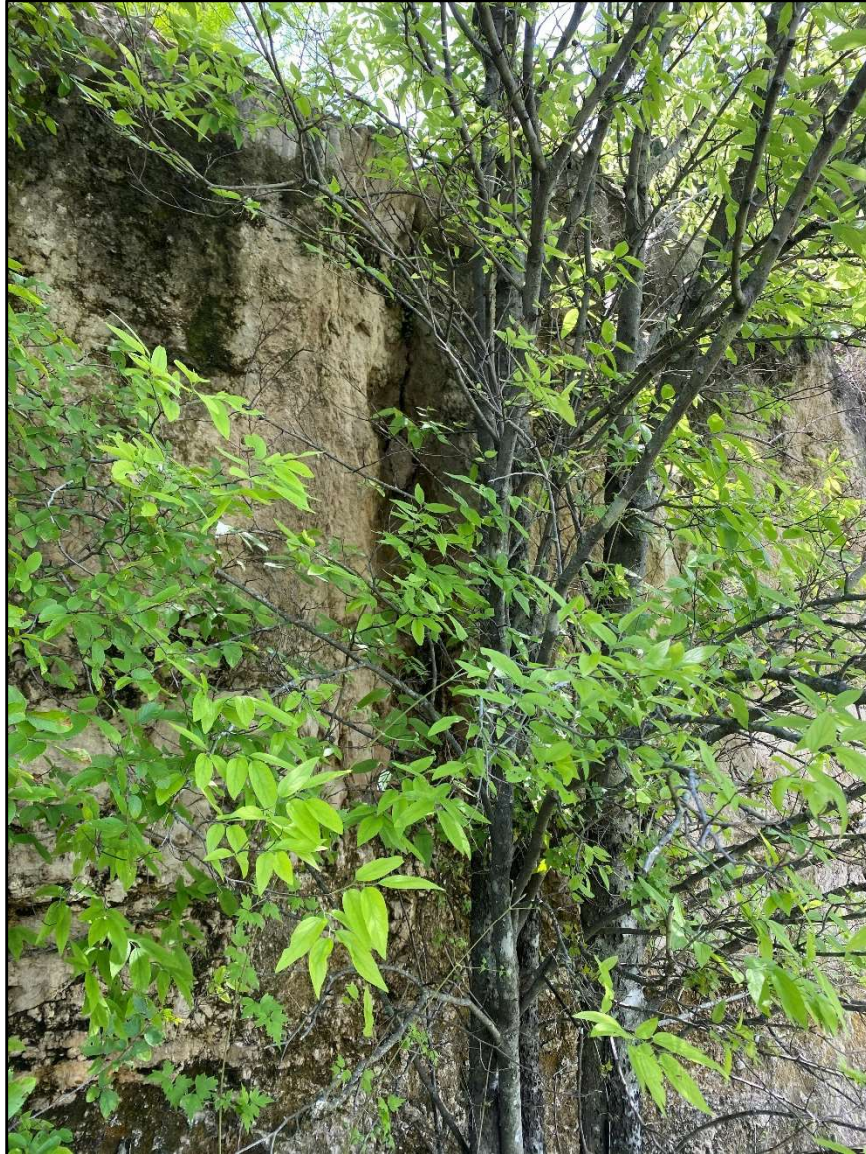
Feature Photo MPS-20 Solution Enlarged Fracture (Photo 2 of 2). The solution cavity associated with this fracture (center of image) is about 5 feet above the flow line at the base of the cliff.

MPS-21 NON-KARST CLOSED DEPRESSION. This feature consists of a closed depression located north of State Loop 360 adjacent to a utility pole above the bicycle and pedestrian bridge abutment. The depression is 22 feet by 16 feet and 2 feet deep. The bottom has an intact soil floor. Isolated bedrock slabs are on the margins indicate that the depression is the result of grading. The feature was previously identified as “MBB-20” in the draft MoPac South report cited in the Previous Geologic Assessments section of this report. The feature is non-sensitive and was not excavated.



Feature Photo MPS-21 Closed Depression. Facing north at the shallow depression.

MPS-22 SOLUTION ENLARGED FRACTURE. This is a prominent fracture (southwest of MPS-23) exposed in a 100-foot wide cliff face along the west side of a pinnacle. The feature was previously identified as “MBB-21” in the draft MoPac South report cited in the Previous Geologic Assessments section of this report. The previous feature coordinates placed it within the transmission tower pad. Based on the description and photo comparison, the feature is located on the west pinnacle face. The feature is non-sensitive and was not excavated.



Feature Photo MPS-22 Solution enlarged fracture. The fracture is obscured by trees.

MPS-23 SOLUTION ENLARGED FRACTURE. This feature is a prominent vertical fracture (one of eight including MPS-22) exposed in the center a 100-foot wide cliff face along the west side of a pinnacle. A tree is growing in the soil infill.



Feature Photo MPS-23 Solution Enlarged Fracture (Photo 1 of 2). Facing east at the cliff face. Southbound State Loop 360 is to the left.



Feature Photo MPS-23 Solution Enlarged Fracture (Photo 2 of 2). The fracture was enlarged from chemical dissolution and physical (tree root growth) processes.

MPS-27 NON-KARST CLOSED DEPRESSION. This feature consists of a collapse associated with a utility line. The depression is 24 inches by 12 inches. There is a small opening that extended 24 inches deep. No in place bedrock was observed.



Feature Photo MPS-27 Non-karst Closed Depression.

MPS-28 NON-KARST CLOSED DEPRESSION. This feature consists of three utility potholes likely associated with fiber optic installation outside of the northbound frontage road between Spyglass Drive and RM 2244. The sides of the hole had a smooth edge consistent with a hole dug with a shovel and no in place bedrock was observed.



Feature Photo MPS-28 Non-karst Closed Depression. Group of three utility potholes each about 18 inches in diameter. No bedrock exposures were present.

MPS-30 NON-KARST CLOSED DEPRESSION. This feature consists of a manmade excavation that is 16 inches in diameter and one foot deep. There was no in place bedrock observed. The hole is aligned with an existing electric transmission line.



Feature Photo MPS-30 Non-karst Closed Depression. This closed depression is likely related to the existing utility line. No bedrock exposures are present.

MPS-31 NON-KARST CLOSED DEPRESSION. This feature consists of a manmade excavation that is 3.5 feet by 2.5 feet and one foot deep. There was no in place bedrock observed. The hole is aligned with an existing electric transmission line.



Feature Photo MPS-31 Non-karst Closed Depression. This closed depression is likely related to the existing utility line. No bedrock exposures are present within the depression.

MPS-32 SOLUTION CAVITY. This feature consists of a solution cavity rimmed with limestone on three sides, measuring 1.5 feet by 0.8 feet. The feature was filled with dark loose organic-rich soil. The depth of probing reached 1.3 feet. The feature was excavated 8 to 10 inches which revealed abundant tree roots within the loose soil infill indicating that the soil has a long residence time.



Feature Photo MPS-32 Solution Cavity.

MPS-33 NON-KARST CLOSED DEPRESSION. The depression formed suddenly (first observed on 7 April 2020), and the ground surface surrounding it has since been restored. The depression that formed was a non-karst, human induced sinkhole within fill material situated over a stormwater culvert. The depression was adjacent to the northbound frontage road approximately 160 feet north of Bartons Bluff. It formed suddenly following a rain event during the first four days of April 2020. The visible depression was 17 feet in diameter but the feature extended under the pavement and was approximately 32 feet in diameter in total and at least 15 feet deep. A 40-foot long pavement patch along the left lane of the northbound frontage road indicates that the land surface had previously changed and, according to the maintenance crew responding to the hazard, a repair was made in the spring of 2019. The top of a 96-inch diameter culvert structure (a corrugated galvanized metal pipe) is approximately 35 feet below the ground surface. The feature is situated within a former topographic low at a sharp bend in an unnamed tributary to Barton Creek.



Feature Photo MPS-33 Non-karst Closed Depression (Photo 1 of 3). Traffic barriers were in place surrounding the hazard. Photo taken on April 8, 2020.



Feature Photo MPS-33 Non-karst Closed Depression (Photo 2 of 3). The depression was not excavated or probed due to the risk of further collapse. Photo taken on April 8, 2020.



Feature Photo MPS-33 Non-karst Closed Depression (Photo 3 of 3). The land surface surrounding the depression was subsequently restored.

CONT	SECT	JOB	HIGHWAY
3136	01	200	SL 1
DIST	COUNTY		SHEET NO.
AUS	TRAVIS		1

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT NUMBER

CSJ 3136-01-200
SL 1 AT SKUNK HOLLOW CREEK
TRAVIS COUNTY

NET LENGTH OF ROADWAY = 507.76 FT.= 0.096 MI.
NET LENGTH OF BRIDGE = 0.00 FT.= 0.000 MI.
NET LENGTH OF PROJECT = 507.76 FT.= 0.096 MI.

LIMITS FROM: 150' NORTH BARTON BLUFF LANE
TO: -

FOR THE CONSTRUCTION OF: CULVERT AND STORM DRAINAGE
CONSISTING OF: REPAIR EXISTING CULVERT INFRASTRUCTURE AND
REHABILITATION OF ROADWAY.

DESIGN SPEED = 65 MPH (ARTERIAL)
= 45 MPH (COLLECTOR)
AADT (2041) = 181,089 (MAIN LANES)
AADT (2021) = 129,349 (MAIN LANES)
AADT (2041) = 10,051 (NBFR)
AADT (2021) = 7,179 (NBFR)
AADT (2041) = 6,167 (SBFR)
AADT (2021) = 4,405 (SBFR)

FINAL PLANS

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

PLANS PREPARED BY:



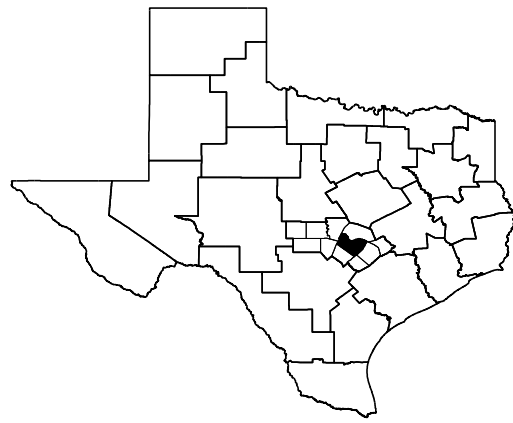
AUSTIN | SAN ANTONIO | HOUSTON | FORT WORTH | DALLAS
10801 N MOPAC EXPY, BLDG 3, STE 200 | AUSTIN, TX 78759 | 512.454.8711
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801



Dennis K. Seal
DENNIS K. SEAL, P. E.
DATE: 6/13/2023

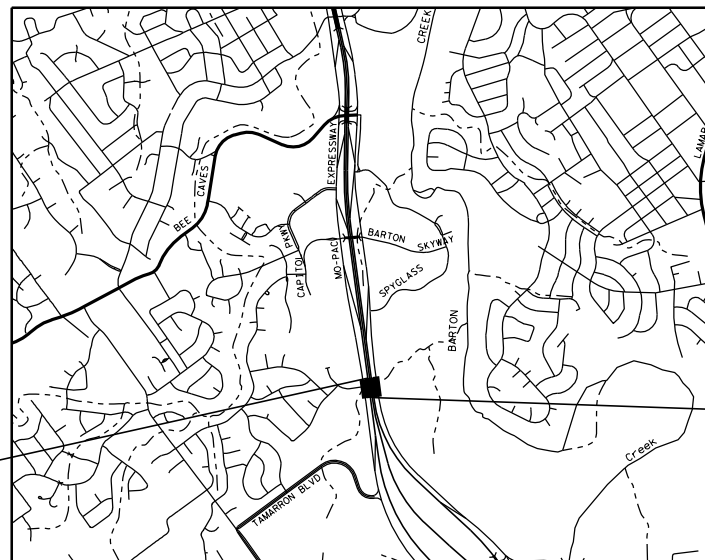
AECOM
AECOM Technical Services Inc.- 3580

13640 Briarwick Drive
Bldg A Suite 200
Austin, Texas 78729



INDEX OF SHEETS

SEE SHEET 2 FOR INDEX OF SHEETS



BEGIN PROJECT
CSJ: 3136-01-200
SL1
STA: 10706+06.00
REF MRKR: 440+1.546
MILE PT: 17.478
DFO: 17.254

END PROJECT
CSJ: 3136-01-200
SL1
STA: 10711+13.76
REF MRKR: 440+1.546
MILE PT: 17.478
DFO: 17.254

NOT TO SCALE
EXCEPTIONS: NONE
EQUATIONS: NONE
RAILROAD CROSSINGS: NONE

SUBMITTED FOR LETTING:

LOCAL PUBLIC AGENCY

SUBMITTED FOR LETTING:

AREA ENGINEER

CORRECT:

CONSULTING ENG. (TBPE FIRM REG. F-)

RECOMMENDED FOR LETTING:

DISTRICT DESIGN ENGINEER

APPROVED FOR LETTING:

DIRECTOR OF TRANSPORTATION PLANNING & DEVELOPMENT

DATE: 6/13/2023 9:51:06 AM
FILE: P:\125145102\Design\Civil\General\1254502\title.dgn

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION ON NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, JULY 2022).



Plotted on: 6/13/2023

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SHEET NO DESCRIPTION

GENERAL

- 1 TITLE SHEET
- 2 INDEX SHEET
- 3 GENERAL NOTES
- 4 ESTIMATE AND QUANTITIES
- 5 PROJECT LAYOUT
- 6 TYPICAL SECTIONS
- 7 HORIZONTAL ALIGNMENT DATA SHEET
- 8-9 SURVEY CONTROL SHEET
- 10 BASE BID SUMMARY OF QUANTITIES
- 11 ALTERNATE BID SUMMARY OF QUANTITIES

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- 59 66" CMP STRUCTURAL LINING DETAILS
- 60 96" CMP STRUCTURAL LINING DETAILS
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- 65 * PJB
- 66 * PDD
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- 83 * EC (3) - 16
- 84-86 * EC (9) - 16
- 87-88 * TRB-15
- 89-90 BORING LOGS

THE STANDARD SHEETS SPECIFICALLY SHOWN WITH PRECEDING (*), HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.


APPROVAL



Dennis K. Seal
 DENNIS K. SEAL, P.E.


6/13/2023
 DATE

REV. NO.	DATE	DESCRIPTION	BY



PAPE-DAWSON ENGINEERS

AUSTIN | SAN ANTONIO | HOUSTON | FORT WORTH | DALLAS
 10801 N MOPAC EXPY, BLDG 3, STE 200 | AUSTIN, TX 78759 | 512.454.8711
 TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801



Texas Department of Transportation
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SL 1 AT SKUNK CREEK

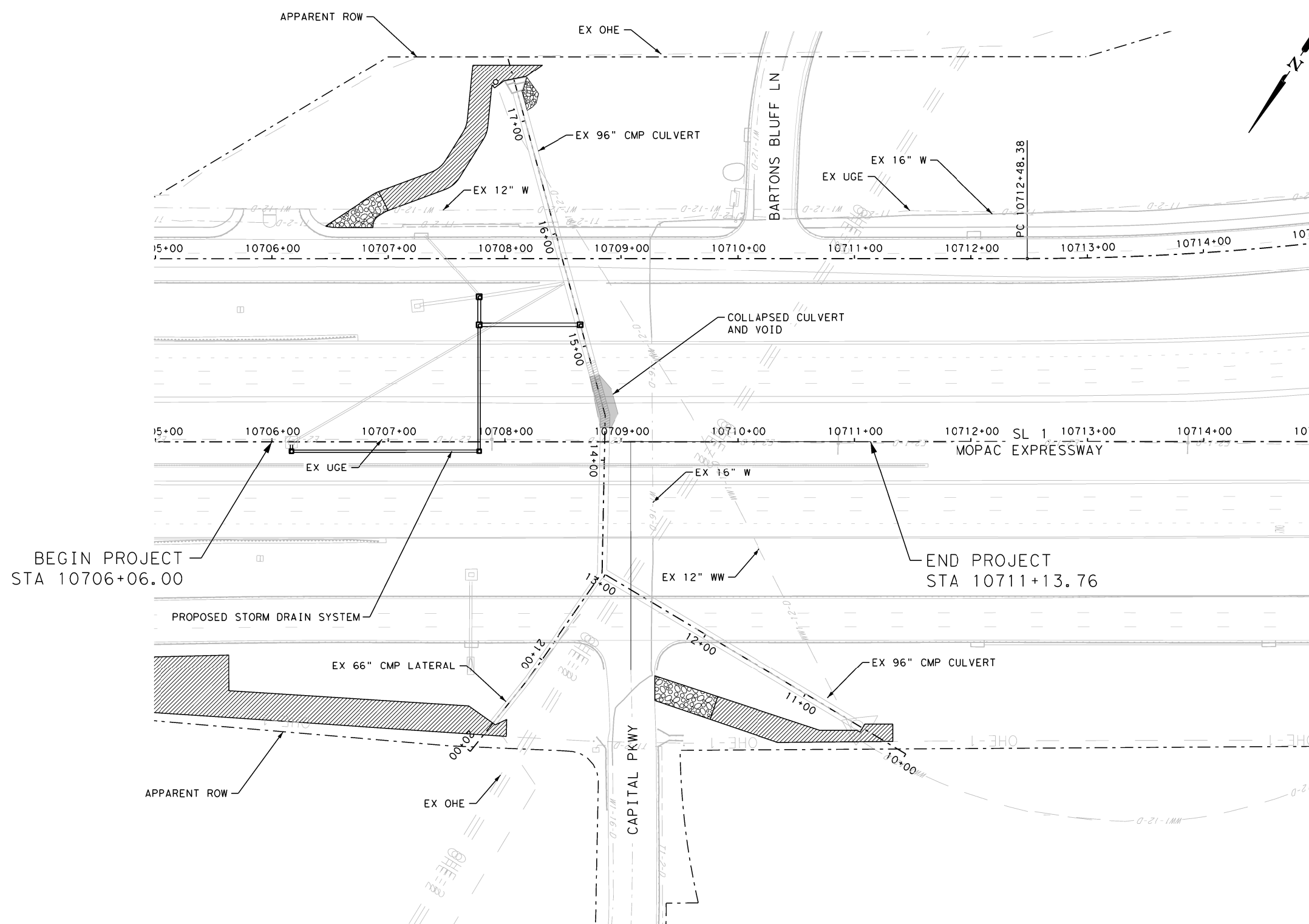
INDEX OF SHEETS

SHEET 1 OF 1

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DWG:	DIST.:	COUNTY:	CONT. NO.:	SECT. NO.:	JOB NO.:	SHEET NO.:
CHK DWG:	AUS	TRAVIS	3136	01	200	2

Plotted on: 6/13/2023

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LEGEND

- TRAFFIC FLOW ARROW
- PROPOSED FEATURE
- EXIST ROW
- EXIST FEATURE
- EXIST VOID

NOTES

1. CONTRACTOR TO PLACE SAND BAGS AT FRONT FACE OF CURB BEFORE ACCESS TO CULVERTS TO PREVENT DAMAGE TO CURB

DESIGN

ANDRES MORALES, P.E.

 6/13/2023

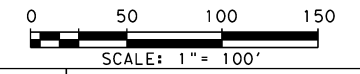
 DATE

APPROVAL

DENNIS K. SEAL, P.E.

 6/13/2023

 DATE



REV. NO.	DATE	DESCRIPTION	BY

PAPE-DAWSON ENGINEERS

AUSTIN | SAN ANTONIO | HOUSTON | FORT WORTH | DALLAS
 10801 N MOPAC EXPY, BLDG 3, STE 200 | AUSTIN, TX 78759 | 512.454.8711
 TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801

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SL 1 AT SKUNK CREEK

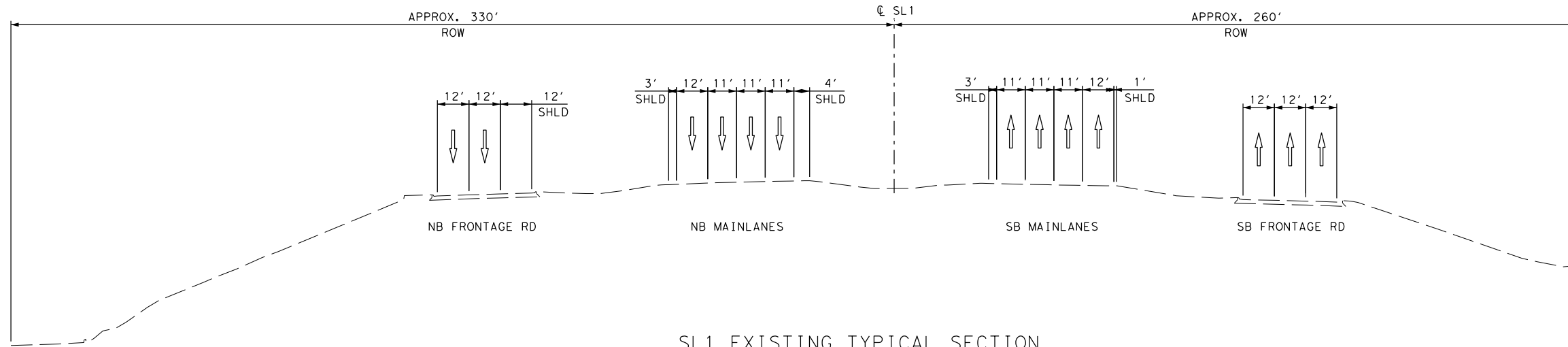
PROJECT LAYOUT

SHEET 1 OF 1

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CHK DGN:	6	TEXAS	---	SL 1		
DWG:	DIST.:	COUNTY:	CONT. NO.:	SECT. NO.:	JOB NO.:	SHEET NO.:
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Plotted on: 6/13/2023

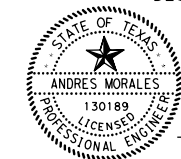
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SL1 EXISTING TYPICAL SECTION

STA 10708+00
N. T. S.

DESIGN



Andres Morales
ANDRES MORALES, P.E.

6/13/2023
DATE

APPROVAL



Dennis K. Seal
DENNIS K. SEAL, P.E.

6/13/2023
DATE

REV. NO.	DATE	DESCRIPTION	BY



AUSTIN | SAN ANTONIO | HOUSTON | FORT WORTH | DALLAS
10801 N MOPAC EXPY, BLDG 3, STE 200 | AUSTIN, TX 78759 | 512.454.8711
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801



SL 1 AT SKUNK CREEK

TYPICAL SECTIONS

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.:	STATE:	FEDERAL AID PROJECT NO.:	HIGHWAY NO.:
CHK DGN:	6	TEXAS	---	SL 1
DWG:	DIST.:	COUNTY:	CONT. NO.:	SECT. NO.:
CHK DWG:	AUS	TRAVIS	3136	01
			JOB NO.:	SHEET NO.:
			200	6

Plotted on: 6/13/2023

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CL SL1

Beginning chain SL1_CL description
Feature: Geom_Centerline

Point 33 N 10,069,326.76 E 3,099,605.10 Sta 10683+29.08

Course from 33 to 34 S 56° 15' 52.74" W Dist 3,461.76

Point 34 N 10,067,404.24 E 3,096,726.26 Sta 10717+90.83

Ending chain SL1_CL description

CL EXIST 96" CMP

<* 1 Describe Chain CULVERT_K

Chain CULVERT_K contains:
24 25 26 27

Beginning chain CULVERT_K description
Feature: Geom_Secondary

Point 24 N 10,067,986.84 E 3,097,115.30 Sta 10+00.00

Course from 24 to 25 N 87° 11' 21.43" E Dist 303.13

Point 25 N 10,068,001.70 E 3,097,418.06 Sta 13+03.13

Course from 25 to 26 S 32° 35' 28.07" E Dist 135.20

Point 26 N 10,067,887.79 E 3,097,490.88 Sta 14+38.32

Course from 26 to 27 S 49° 01' 16.04" E Dist 316.93

Point 27 N 10,067,679.96 E 3,097,730.15 Sta 17+55.26

Ending chain CULVERT_K description

CL EXIST 66" CMP

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Chain CULVERT_K_LAT contains:
28 29 30

Beginning chain CULVERT_K_LAT description
Feature: Geom_Secondary

Point 28 N 10,068,192.37 E 3,097,427.11 Sta 20+00.00

Course from 28 to 29 S 5° 02' 02.06" W Dist 79.32

Point 29 N 10,068,113.35 E 3,097,420.15 Sta 20+79.32

Course from 29 to 30 S 1° 04' 24.72" W Dist 111.67

Point 30 N 10,068,001.70 E 3,097,418.06 Sta 21+90.99

Ending chain CULVERT_K_LAT description

DESIGN



Andres Morales
ANDRES MORALES, P.E.

6/13/2023
DATE

APPROVAL



Dennis K. Seal
DENNIS K. SEAL, P.E.

6/13/2023
DATE

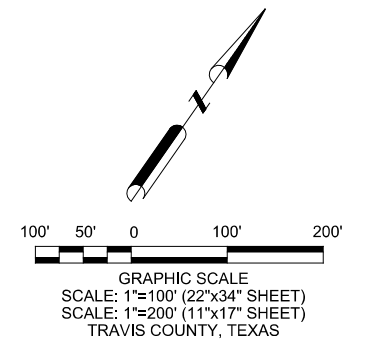
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 AUSTIN SAN ANTONIO HOUSTON FORT WORTH DALLAS 10801 N MOPAC EXPY, BLDG 3, STE 200 AUSTIN, TX 78759 512.454.8711 TEXAS ENGINEERING FIRM #470 TEXAS SURVEYING FIRM #10028801			
 ©2023			
SL 1 AT SKUNK CREEK HORIZONTAL ALIGNMENT DATA SHEET			
DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.
CHK DGN:	6	TEXAS	---
DWG:	DIST.	COUNTY	CONT. NO.
CHK DWG:	AUS	TRAVIS	3136
			SECT. NO.
			01
			JOB NO.
			200
			HIGHWAY NO.
			SL 1
			SHEET NO.
			7

PROJECT CONTROL - HORIZONTAL AND VERTICAL VALUES

CENTRAL ZONE	SURFACE VALUES			DESCRIPTION
PT#	NORTHING	EASTING	ELEV.	
CP-227-1103	10068093.42	3098087.84	612.85'	TxDOT 3-1/4" ALUM DISK IN CONC.
CP-227-1104	10068367.82	3097783.71	614.16'	TxDOT 3-1/4" ALUM DISK IN CONC.
CP-227-1105	10067394.57	3096518.86	630.52'	TxDOT 3-1/4" ALUM DISK IN CONC.
CP-227-1106	10067256.44	3096918.39	649.05'	TxDOT 3-1/4" ALUM DISK IN CONC.

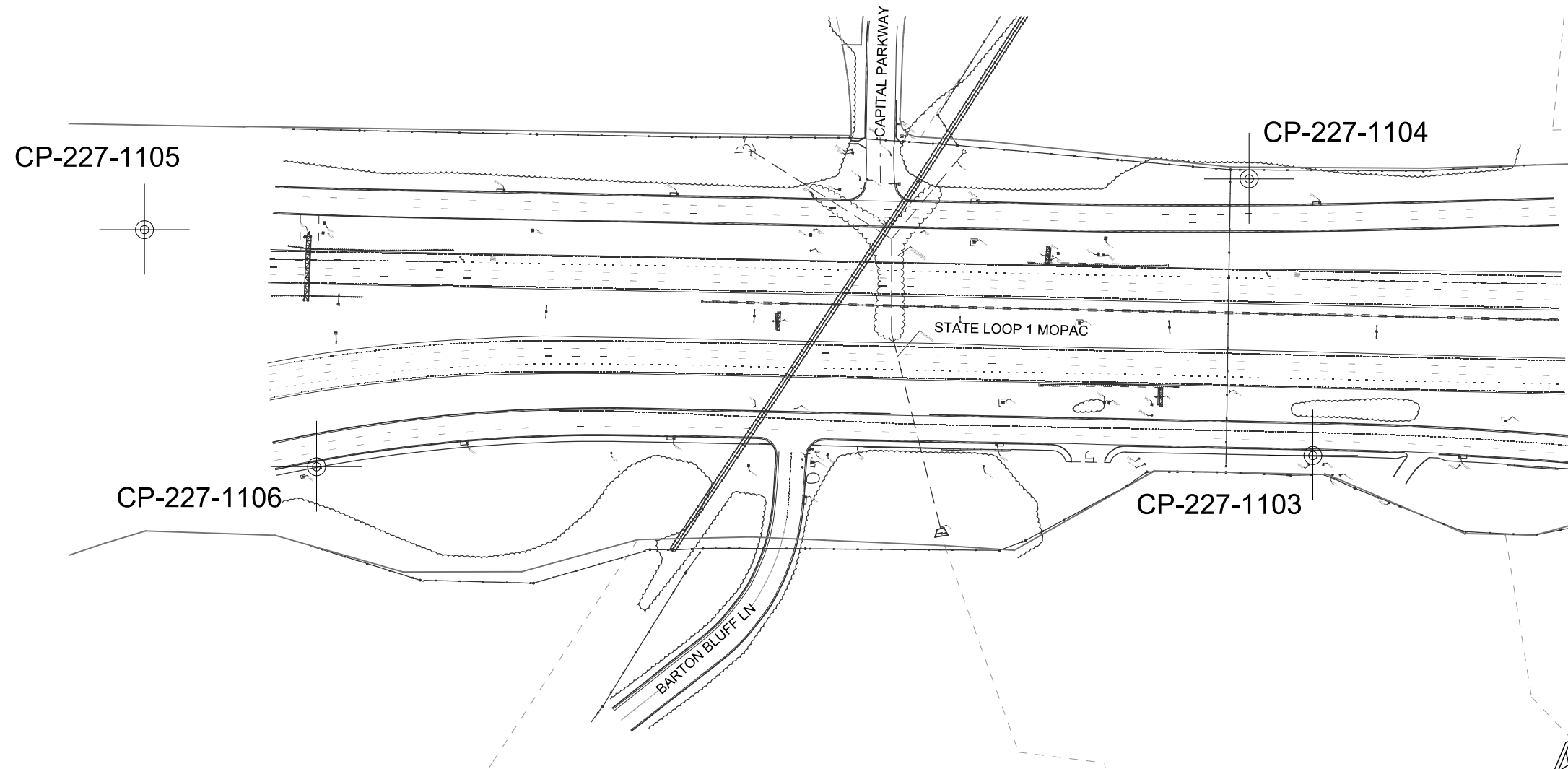
PROJECT CONTROL - HORIZONTAL AND VERTICAL VALUES

CENTRAL ZONE	GRID VALUES			DESCRIPTION
PT#	NORTHING	EASTING	ELEV.	
CP-227-1103	10067086.71	3097778.06	612.86'	TxDOT 3-1/4" ALUM DISK IN CONC.
CP-227-1104	10067361.08	3097473.96	614.16'	TxDOT 3-1/4" ALUM DISK IN CONC.
CP-227-1105	10066387.93	3096209.24	630.52'	TxDOT 3-1/4" ALUM DISK IN CONC.
CP-227-1106	10066249.81	3096608.73	649.05'	TxDOT 3-1/4" ALUM DISK IN CONC.



NOTES:

- ALL DISTANCES AND COORDINATES SHOWN HEREIN ARE U.S. SURVEY FEET AND REFERENCED TO THE STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM OF 1983(2011 ADJ), TEXAS CENTRAL ZONE NO. 4203.
- ALL COORDINATES ARE SURFACE VALUES AND MAY BE CONVERTED TO GRID VALUES BY DIVIDING BY A COMBINED ADJUSTMENT FACTOR OF 1.000100.
- ALL HORIZONTAL CONTROL SHOWN HEREIN WAS ESTABLISHED USING GPS STATIC OBSERVATIONS WITH REFERENCE TO THE FOLLOWING CORS NETWORK STATIONS:
TXBU - BURNET TxDOT CORS ARP
TXSM - SAN MARCOS TxDOT CORS ARP
TXBS - BASTROP TxDOT CORS ARP
SAM2 - SAM AUSTIN CORS ARP
- ALL VERTICAL DATA SHOWN HEREIN IS REFERENCED TO NGS BENCHMARK M-323 USING VERTICAL DATUM NAVD 83, GEOID 18.
- FIELD INFORMATION SHOWN HEREIN IS BASED ON AERIAL PHOTOGRAMATRY AND LIDAR, AND AN "ON-THE-GROUND" SURVEY PERFORMED BY COBB, FENDLEY & ASSOCIATES, INC. FROM NOVEMBER, 2022 THROUGH DECEMBER, 2022.



SURVEYOR CERTIFICATION

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.

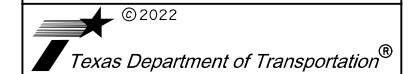
David A. McKinnon
 DAVID A. MCKINNON
 RPLS #6994
 DATE: 06/06/2023



SKUNK HOLLOW CREEK AT MOPAC
 TRAVIS COUNTY
 CSJ:3136-01-200
 CFA JOB No. 2206-166-01
 DATE: DECEMBER, 2022
 CONTRACT No. 48-81DP5002
 WA No. 11

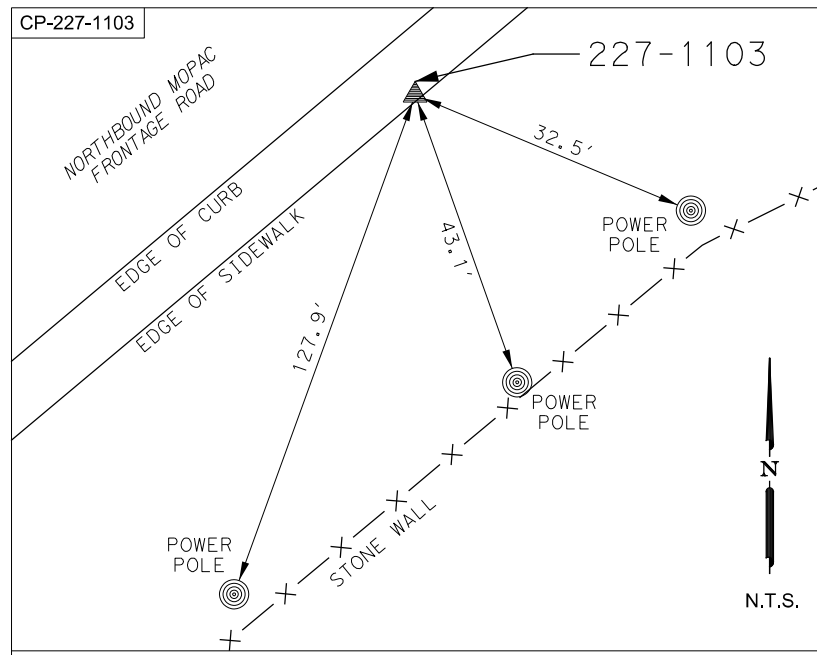
UNIT OF MEASUREMENT: US SURVEY FEET		
REVISION	DESCRIPTION	DATE

CobbFendley
 TBPELS FIRM REGISTRATION NO. F-274 /
 LAND SURVEYING FIRM NO. 10046700
 505 East Huntland Drive, Suite 100
 Austin, Texas 78752
 512.834.9798 | fax 512.834.9553 | www.cobbhendley.com
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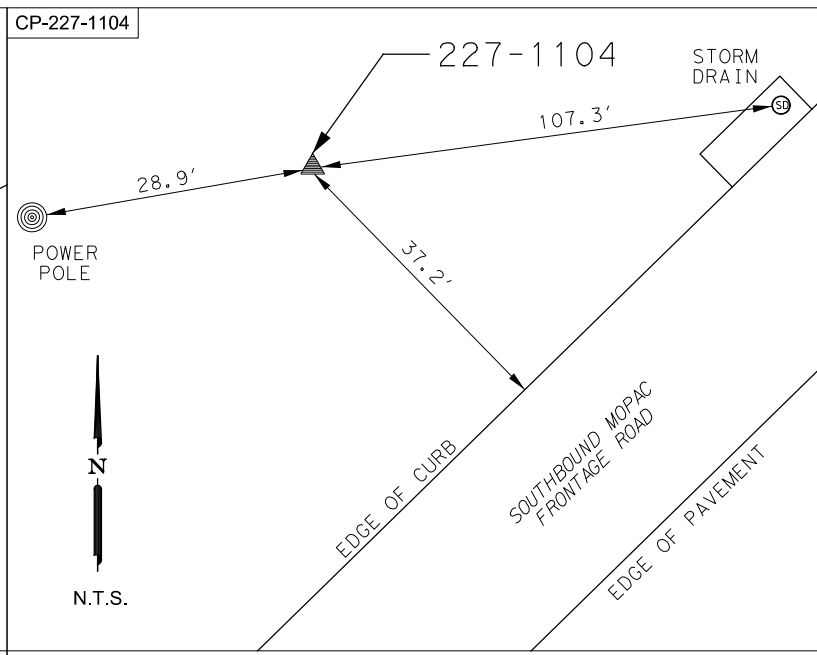
SKUNK HOLLOW CREEK
 SURVEY CONTROL
 INDEX SHEET

DS#	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.	HIGHWAY NO.			
CR	XX	X	TEXAS	SL1			
DR#	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
CR	XX	AUS	TRAVIS	3136	01	200	8



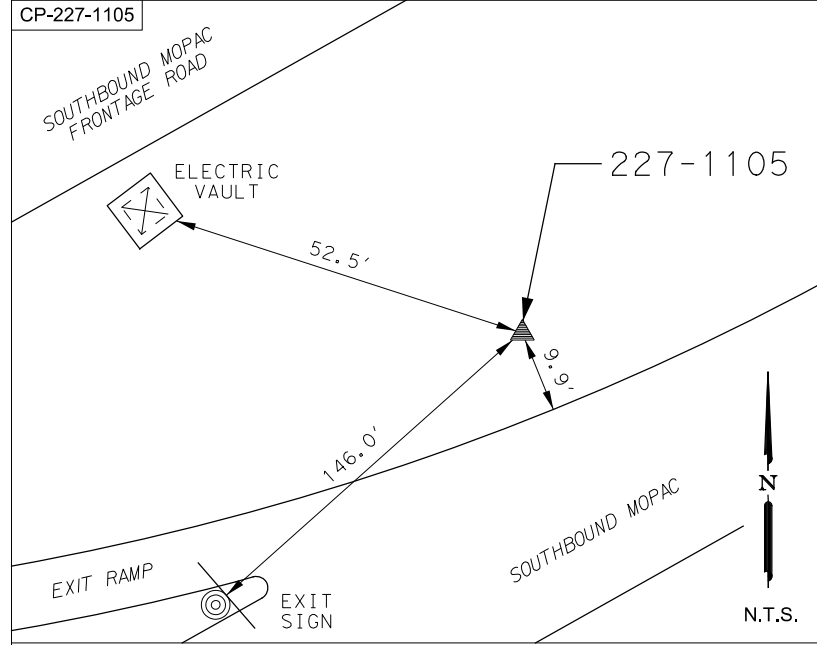
CP-227-1103
A 3-1/4" ALUMINUM DISK IN CONCRETE ON THE EDGE OF THE SIDEWALK SET IN THE EAST RIGHT-OF-WAY OF LOOP 1 MOPAC, APPROXIMATELY 754' NORTH OF THE INTERSECTION OF BARTON BLUFF LN & MOPAC FRONTAGE ROAD.

SURFACE COORDINATES		LAT./LON.	GRID COORDINATES	
NORTHING:	10068093.42	30° 15' 32.52684"N	NORTHING:	10067086.71
EASTING:	3098087.84	97° 47' 43.54919"W	EASTING:	3097778.06
ELEVATION:	612.85'		ELEVATION:	612.85'



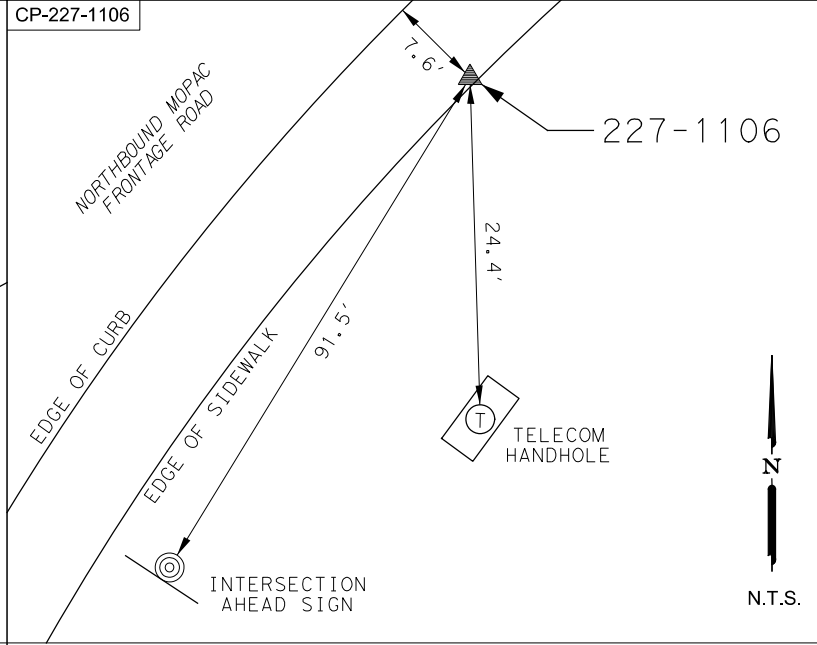
CP-227-1104
A 3-1/4" ALUMINUM DISK IN CONCRETE SET IN THE WEST RIGHT-OF-WAY OF LOOP 1 MOPAC, APPROXIMATELY 0.46 MILES SOUTH OF THE INTERSECTION OF BARTON SKYWAY & MOPAC FRONTAGE ROAD.

SURFACE COORDINATES		LAT./LON.	GRID COORDINATES	
NORTHING:	10068367.82	30° 15' 35.31069"N	NORTHING:	10067361.08
EASTING:	3097783.71	97° 47' 46.94442"W	EASTING:	3097473.96
ELEVATION:	614.16'		ELEVATION:	614.16'



CP-227-1105
A 3-1/4" ALUMINUM DISK IN CONCRETE SET NEAR THE WEST RIGHT-OF-WAY OF LOOP 1 MOPAC, APPROXIMATELY 0.20 MILES SOUTH OF THE INTERSECTION OF CAPITAL PARKWAY & MOPAC FRONTAGE ROAD.

SURFACE COORDINATES		LAT./LON.	GRID COORDINATES	
NORTHING:	10067394.57	30° 15' 25.96567"N	NORTHING:	10066387.93
EASTING:	3096518.86	97° 48' 01.61454"W	EASTING:	3096209.24
ELEVATION:	630.52'		ELEVATION:	630.52'




CP-227-1106
A 3-1/4" ALUMINUM DISK IN CONCRETE SET IN THE SIDEWALK ON THE EAST RIGHT-OF-WAY OF LOOP 1 MOPAC, APPROXIMATELY 650' NORTH OF VIA FORTUNA RD.

SURFACE COORDINATES		LAT./LON.	GRID COORDINATES	
NORTHING:	10067256.44	30° 15' 24.50880"N	NORTHING:	10066249.81
EASTING:	3096918.39	97° 47' 57.09640"W	EASTING:	3096608.73
ELEVATION:	649.05'		ELEVATION:	649.05'

- NOTES:
- ALL DISTANCES AND COORDINATES SHOWN HEREIN ARE U.S. SURVEY FEET AND REFERENCED TO THE STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM OF 1983(2011 ADJ), TEXAS CENTRAL ZONE NO. 4203.
 - ALL COORDINATES ARE SURFACE VALUES AND MAY BE CONVERTED TO GRID VALUES BY DIVIDING BY A COMBINED ADJUSTMENT FACTOR OF 1.000100.
 - ALL HORIZONTAL CONTROL SHOWN HEREIN WAS ESTABLISHED USING GPS STATIC OBSERVATIONS WITH REFERENCE TO THE FOLLOWING CORS NETWORK STATIONS:
TXBU - BURNET TXDOT CORS ARP
TXSM - SAN MARCOS TXDOT CORS ARP
TXBS - BASTROP TXDOT CORS ARP
SAM2 - SAM AUSTIN CORS ARP
 - ALL VERTICAL DATA SHOWN HEREIN IS REFERENCED TO NGS BENCHMARK M-323 USING VERTICAL DATUM NAVD 88, GEOID 18.
 - FIELD INFORMATION SHOWN HEREIN IS BASED ON AERIAL PHOTOGRAMATRY AND LIDAR, AND AN "ON-THE-GROUND" SURVEY PERFORMED BY COBB, FENDLEY & ASSOCIATES, INC. FROM NOVEMBER, 2022 THROUGH DECEMBER, 2022.

SURVEYOR CERTIFICATION
THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.


DAVID A. MCKINNON
RPLS #6994

06/06/2023
DATE:



UNIT OF MEASUREMENT: US SURVEY FEET

REVISION	DESCRIPTION	DATE

CobbFendley
TBPELS FIRM REGISTRATION NO. F-274 / LAND SURVEYING FIRM NO. 10046700
505 East Huntland Drive, Suite 100
Austin, Texas 78752
512.834.9798 | fax 512.834.9553 | www.cobbfendley.com

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Texas Department of Transportation

SKUNK HOLLOW CREEK
HORIZONTAL & VERTICAL CONTROL SHEET

DS#	XX	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.	HIGHWAY NO.		
CR	XX	X	TEXAS		SL1		
DR#	JC	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CR	XX	AUS	TRAVIS	3136	01	200	9

SKUNK HOLLOW CREEK AT MOPAC
TRAVIS COUNTY
CSJ:3136-01-200
CFA JOB No. 2206-166-01
DATE: DECEMBER, 2022
CONTRACT No. 48-8IDP5002
WA No. 11

DATE: 06/06/2023
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 PLOTTER: HP DesignJet T1100e

Plotted on: 6/13/2023

Design File name: P:\125\45\02\Design\Civil\Summary\1254502sum01.dgn

ITEM	0500-6001	0502-6001	0512-6089	0512-6091	0545-6019	0545-6005	6001-6002
TCP	MOBILIZATION	BARRICADES, SIGNS AND TRAFFIC HANDLING	PTB (FRN & INSTL) (SSCB OR CSB) (TY 1) OR (STL)	PTB (REMOVE) (SSCB OR CSB) (TY 1) OR (STL)	CRASH CUSH ATTN (INSTL) (S) (N)	CRASH CUSH ATTN (REMOVE)	PORTABLE CHANGEABLE MESSAGE SIGN
	LS	MO	LF	LF	EA	EA	EA
TRAFFIC CONTROL PLAN OVERALL LAYOUT	1	6	1340	1340	4	4	2
TOTALS	1	6	1340	1340	4	4	2

ITEM	0401-6001	0402-6001	0432-6037	0464-6005	0464-6008	0465-6005	0465-6006	0476-6013
DRAINAGE	FLOWABLE BACKFILL	TRENCH EXCAVATION PROTECTION	RIPRAP (STONE PROTECTION) (36 IN)	RC PIPE (CL III) (24 IN)	RC PIPE (CL III) (36 IN)	JCTBOX (COMPL) (PJB) (3FTX3FT)	JCTBOX (COMPL) (PJB) (4FTX4FT)	JACK BOR OR TUN PIPE (24 IN) (RC) (CL III)
	CY	LF	CY	LF	LF	EA	EA	LF
STORM DRAIN PLAN AND PROFILE	736	296	20	213	83	2	3	70
TOTALS	736	296	20	213	83	2	3	70


ITEM	0476-6XX1	0476-6XXX	0480-6002	7016-60XX
DRAINAGE	JACK BOR OR TUN PIPE (48") (TUNNEL LINING)	JACK BOR OR TUN PIPE (78") (TUNNEL LINING)	CLEAN EXIST CULVERTS	CASING (STEEL) (18 IN) (BORED)
	LF	LF	CY	LF
STORM DRAIN PLAN AND PROFILE	166	683	30	32
TOTALS	166	683	30	32

ITEM	0160-6003	0164-6035	0168-6001	0169-6003	0506-6003	0506-6011	0506-6020	0506-6024	0506-6038	0506-6039	0506-6041	0506-6043
SW3P	FURNISHING AND PLACING TOPSOIL (4")	DRILL SEEDING (PERM) (RURAL) (CLAY)	VEGETATIVE WATERING	SOIL RETENTION BLANKETS (CL)	ROCK FILTER DAMS (INSTALL) (TY 3)	ROCK FILTER DAMS (REMOVE)	CONSTRUCTION EXITS (INSTALL) (TY)	CONSTRUCTION EXITS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (12")	BIODEG EROSN CONT LOGS (REMOVE)
	SY	SY	MG	SY	LF	LF	SY	SY	LF	LF	LF	LF
SW3P LAYOUT	2400	2400	37	2400	30	30	333	333	519	519	40	40
TOTALS	2400	2400	37	2400	30	30	333	333	519	519	40	40

ITEM	0666-6141	0666-6321
SIGNING AND PAVEMENT MARKING	REFL PAV MRK TY I (Y) 12" (SLD) (100MIL)	RE PM W/RET REQ TY I (Y) 6" (SLD) (100MIL)
	LF	LF
SIGNING AND PAVEMENT MARKING PLAN	119	100
TOTALS	119	100


ITEM	0100-6002	0110-6001	0132-6003	0351-6011	0529-6008
ROADWAY	PREPARING ROW	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (ORD COMP) (TY B)	FLEXIBLE PAVEMENT STRUCTURE REPAIR (18")	CONC CURB & GUTTER (TY II)
	STA	CY	CY	SY	LF
ROADWAY PLAN	4	100	100	133	100
TOTALS	4	100	100	133	100

REV. NO.	DATE	DESCRIPTION	BY



PAPE-DAWSON ENGINEERS

AUSTIN | SAN ANTONIO | HOUSTON | FORT WORTH | DALLAS
10801 N MOPAC EXPY, BLDG 3, STE 200 | AUSTIN, TX 78759 | 512.454.8711
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801



Texas Department of Transportation
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SL 1 AT SKUNK CREEK

BASE BID

SUMMARY OF QUANTITIES

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.:	STATE:	FEDERAL AID PROJECT NO.:	HIGHWAY NO.:		
CHK DGN:	6	TEXAS	---	SL 1		
DWG:	DIST.:	COUNTY:	CONT. NO.:	SECT. NO.:	JOB NO.:	SHEET NO.:
CHK DWG:	AUS	TRAVIS	3136	01	200	10

Plotted on: 6/13/2023

Design File name: P:\125\45\02\Design\Civil\Summary\1254502sum02.dgn

ITEM	0500-6001	0502-6001	0512-6089	0512-6091	0545-6019	0545-6005	6001-6002
TCP	MOBILIZATION	BARRICADES, SIGNS AND TRAFFIC HANDLING	PTB (FRN & INSTL) (SSCB OR CSB) (TY 1) OR (STL)	PTB (REMOVE) (SSCB OR CSB) (TY 1) OR (STL)	CRASH CUSH ATTN (INSTL) (S) (N)	CRASH CUSH ATTN (REMOVE)	PORTABLE CHANGEABLE MESSAGE SIGN
	LS	MO	LF	LF	EA	EA	EA
TRAFFIC CONTROL PLAN OVERALL LAYOUT	1	6	1340	1340	4	4	2
TOTALS	1	6	1340	1340	4	4	2

ITEM	0401-6001	0402-6001	0432-6037	0464-6005	0464-6008	0465-6005	0465-6006	0476-6013
DRAINAGE	FLOWABLE BACKFILL	TRENCH EXCAVATION PROTECTION	RIPRAP (STONE PROTECTION) (36 IN)	RC PIPE (CL III) (24 IN)	RC PIPE (CL III) (36 IN)	JCTBOX (COMPL) (PJB) (3FTX3FT)	JCTBOX (COMPL) (PJB) (4FTX4FT)	JACK BOR OR TUN PIPE (24 IN) (RC) (CL III)
	CY	LF	CY	LF	LF	EA	EA	LF
STORM DRAIN PLAN AND PROFILE	736	296	20	213	83	2	3	70
TOTALS	736	296	20	213	83	2	3	70


ITEM	0431-6	0431-6	0476-6	0480-6002	7016-6
DRAINAGE	PNEUMATICALLY PLACED CONC (66" PIPE LINER)	PNEUMATICALLY PLACED CONC (96" PIPE LINER)	JACK BOR OR TUN PIPE (96") (TUNNELL LINING)	CLEAN EXIST CULVERTS	CASING STEEL (18 IN) (BORED)
	SF	SF	CY	LF	LF
STORM DRAIN PLAN AND PROFILE	2868	15155	80	30	32
TOTALS	2868	15155	80	30	32

ITEM	0160-6003	0164-6035	0168-6001	0169-6003	0506-6003	0506-6011	0506-6020	0506-6024	0506-6038	0506-6039	0506-6041	0506-6043
SW3P	FURNISHING AND PLACING TOPSOIL (4")	DRILL SEEDING (PERM) (RURAL) (CLAY)	VEGETATIVE WATERING	SOIL RETENTION BLANKETS (CL)	ROCK FILTER DAMS (INSTALL) (TY 3)	ROCK FILTER DAMS (REMOVE)	CONSTRUCTION EXITS (INSTALL) (TY)	CONSTRUCTION EXITS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (12")	BIODEG EROSN CONT LOGS (REMOVE)
	SY	SY	MG	SY	LF	LF	SY	SY	LF	LF	LF	LF
SW3P LAYOUT	2400	2400	37	2400	30	30	333	333	519	519	40	40
TOTALS	2400	2400	37	2400	30	30	333	333	519	519	40	40

ITEM	0666-6141	0666-6321
SIGNING AND PAVEMENT MARKING	REFL PAV MRK TY I (Y) 12" (SLD) (100MIL)	RE PM W/RET REQ TY I (Y) 6" (SLD) (100MIL)
	LF	LF
SIGNING AND PAVEMENT MARKING PLAN	119	100
TOTALS	119	100


ITEM	0100-6002	0110-6001	0132-6003	0351-6011	0529-6008
ROADWAY	PREPARING ROW	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (ORD COMP) (TY B)	FLEXIBLE PAVEMENT STRUCTURE REPAIR (18")	CONC CURB & GUTTER (TY II)
	STA	CY	CY	SY	LF
ROADWAY PLAN	4	100	100	133	100
TOTALS	4	100	100	133	100

REV. NO.	DATE	DESCRIPTION	BY



PAPE-DAWSON ENGINEERS

AUSTIN | SAN ANTONIO | HOUSTON | FORT WORTH | DALLAS
 10801 N MOPAC EXPY, BLDG 3, STE 200 | AUSTIN, TX 78759 | 512.454.8711
 TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801



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SL 1 AT SKUNK CREEK
**ALTERNATE BID
 SUMMARY OF QUANTITIES**

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.	HIGHWAY NO.		
CHK DGN:	6	TEXAS	---	SL 1		
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	AUS	TRAVIS	3136	01	200	11

Plotted on: 6/13/2023

Design File name: P:\125\45\02\Design\Civil\TCP\1254502_tcp_narr.dgn

SEQUENCE OF WORK:

1. INSTALL ADVANCE WARNING SIGNS FOR THE ENTIRE PROJECT
2. INSTALL WORKZONE CHANNELIZING DEVICES AS SHOWN IN THE PLANS
3. INSTALL SW3P FEATURES WITHIN THE PHASE LIMITS AS SHOWN IN THE PLANS
4. CONSTRUCT STORM DRAIN SYSTEM AND STRUCTURAL LINING
5. CLEAN UP, PERMANENT EROSION CONTROL, AND SEEDING

NOTES:

1. LANE CLOSURES ALONG FRONTAGE ROADS FOR DAILY CONSTRUCTION STAGING WILL BE IN ACCORDANCE WITH TCP (1-50)-18.
2. WHEN OPEN EXCAVATION FOR BORE PITS AND STORM DRAINS ARE LEFT OPEN, CTB WILL BE USED ON SHOULDER TO SEPARATE TRAFFIC FROM OPEN EXCAVATION.
3. LANE CLOSURES TO PLACE CTB ALONG MOPAC MAINLANES WILL BE AT NIGHT IN ACCORDANCE WITH TCP(6-10)-12.

SPECIAL NOTICE TO CONTRACTOR

THIS IS A UNIQUE "TIME IS OF THE ESSENCE PROJECT". THE EXISTING 96" CMP CROSS CULVERT K HAS COLLAPSED UNDER THE MEDIAN AND THE OUTSIDE LANE OF NB SL 1. APPROXIMATELY 80' OF THE CMP HAS UNSPIRALED. A LARGE VOID HAS BEEN CREATED AT THE COLLAPSE. APPROXIMATELY 420' OF THE 96" CMP HAS NO INVERT. THE PIPE SECTION THAT HAS NO INVERT IS FROM THE "Y" CONNECTION OF THE EXISTING 66" CMP TO THE OUTFALL. LIKEWISE, THE ENTIRE 165' OF EXISTING 66" CMP ALSO HAS NO INVERT.

THE SCOPE OF THIS PROJECT IS TO STRUCTURAL LINE THE INTACT PORTION OF 96" CMP AND 66" CMP AND TO TUNNEL LINE THE COLLAPSED PORTION OF THE 96" CMP. THE PLANS ALLOW THE STRUCTURAL LINING OF BOTH PIPES WITH EITHER TUNNEL LINER PLATE IN ACCORDANCE WITH ITEM 476 OR WITH PNEUMATICALLY PLACED CONCRETE IN ACCORDANCE WITH ITEM 431. BOTH STRUCTURAL LINING OPTIONS WILL BE APPROVED BY THE ENGINEER PRIOR TO INSTALLATION. THE STRUCTURAL LINING OF THESE PIPES WILL DECREASE THE DIAMETER OF THE PIPE THUS DECREASING FLOW CAPACITY. TO MAINTAIN AS MUCH HYDRAULIC CAPACITY AS POSSIBLE IT IS A REQUIREMENT THAT THE MANNING'S COEFFICIENT OF THE STRUCTURAL LINER BE NO MORE THAN 0.012. THIS MAY REQUIRE A COMPOSITE OF STRUCTURAL LINER AND A COATING OF THE STRUCTURAL LINER TO MEET THE MANNING'S COEFFICIENT REQUIREMENT. ANY COATING OF THE STRUCTURAL LINER TO DECREASE MANNING'S COEFFICIENT WILL BE APPROVED BY THE ENGINEER AND WILL BE SUBSIDIARY TO STRUCTURAL LINING BID ITEMS 476 AND 431.

THE LARGE VOID AT THE COLLAPSE PIPE AND ANY OTHER VOIDS AROUND THE 96" AND 66" CMPS WILL BE FILLED WITH FLOWABLE FILL. THE CONTRACTOR WILL PROVIDE A MEANS TO ASSURE PROPER FILLING OF VOIDS TO THE ENGINEER FOR APPROVAL PRIOR TO FILLING OF VOIDS.

THE EXISTING PIPE WAS PLACED ON BEDDING MATERIAL OVER NATIVE ROCK. APPROXIMATELY 1' TO 1.5' WIDTH OF THE INVERT IS MISSING WITH A VOID DEPTH OF 0' TO 1.5'. PRIOR TO PLACEMENT OF STRUCTURAL LINER, THE INVERT WILL BE FILLED TO GRADE WITH FLOWABLE FILL. ALL LABOR AND INCIDENTALS ASSOCIATED WITH INVERT REPAIR WILL BE CONSIDERED SUBSIDIARY.

THE EXISTING 36" CMP RISER OUTFALLING INTO THE 96" CMP NEAR THE NBRF HAS COLLAPSED. A NEW 18" RISER, ITEM 7016 - CASING, WILL BE INSTALLED UPSTREAM OF THE EXISTING RISER. TO ASSURE APPROPRIATE PLACEMENT OF THE RISER INTO THE 96" PIPE THE CONTRACTOR WILL DRILL A PILOT HOLE INTO THE 96" CMP ADJUSTING IF NEEDED PRIOR TO DRILLING FOR THE NEW RISER PIPE. THE CONNECTION OF THE NEW RISER TO THE STRUCTURAL LINER WILL BE DESIGNED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER.

ONCE THE NEW RISER HAS BEEN INSTALLED AND CONNECTED TO THE NEW STORM DRAIN, THE CONTRACTOR WILL CLOSE THE 36" OPENING INTO THE 96" CMP (LINE J-K14) AND THEN UNCOVER AND UNCAP THE EXISTING BURIED INLET (J-K14). FLOWABLE FILL WILL THEN BE PLACED FILLING THE 36" RISER AND VOIDS AROUND THE RISER. THE CONTRACTOR IS TO BE AWARE THAT A REOCCURRING SINK HOLE FORMS ADJACENT TO THE EXISTING STANDPIPE. THIS SINK HOLE OCCURS FROM THE EROSION OF SOIL CAUSED BY THE OUTFALL OF STORM WATER INTO THE RISER FROM THE EXISTING 18" AND 30" RCP. THE CONTRACTOR IS TO PERFORM A SAFETY/RISK ASSESSMENT BEFORE MOVING EQUIPMENT AND PERSONNEL IN TO PERFORM THE WORK TO UNCOVER, UNCAP, AND FILL THE EXISTING STANDPIPE AND VOIDS AROUND STANDPIPE. THE LABOR AND INCIDENTALS ASSOCIATED WITH UNCOVERING AND UNCAPPING THE BURIED INLET WILL BE CONSIDERED SUBSIDIARY.

THE PLANS DEPICT ACCESS PATHS DOWN STEEP FILL SLOPES TO THE CULVERT ENDS. THE FILL SLOPES ARE VEGETATED WITH BRUSH AND SMALL TREES. REMOVAL OF BRUSH AND SMALL TREES AND CONSTRUCTION OF ACCESS PATHS WILL BE CONSIDERED SUBSIDIARY TO ITEM 100 - PREPARING ROW. AT THE COMPLETION OF THE WORK THE FILL SLOPES WILL BE GRADED BACK TO THEIR ORIGINAL SHAPE, TOPSOIL PLACED, SEEDED, AND SOIL RETENTION BLANKETS INSTALLED.

DESIGN



Andres Morales
ANDRES MORALES, P.E.

6/13/2023
DATE

APPROVAL



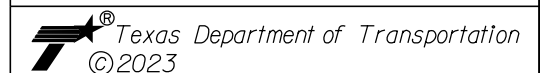
Dennis K. Seal
DENNIS K. SEAL, P.E.

6/13/2023
DATE

REV. NO.	DATE	DESCRIPTION	BY



AUSTIN | SAN ANTONIO | HOUSTON | FORT WORTH | DALLAS
10801 N MOPAC EXPY, BLDG 3, STE 200 | AUSTIN, TX 78759 | 512.454.8711
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801



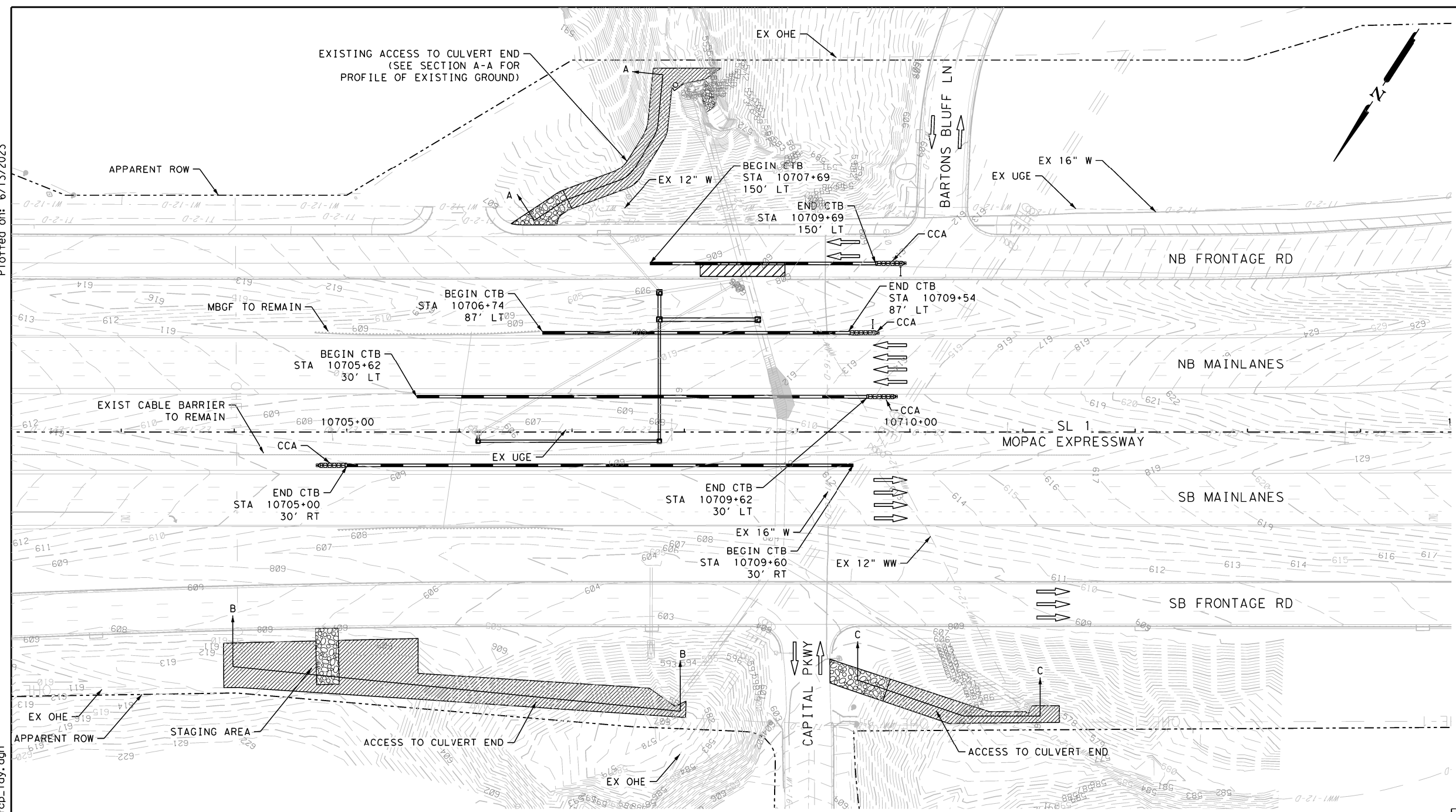
SL 1 AT SKUNK CREEK

TCP NARRATIVE AND SPECIAL NOTICE TO CONTRACTOR






DGN:	FED. RD. DIV. NO.:	STATE:	FEDERAL AID PROJECT NO.:			HIGHWAY NO.:
CHK DGN:	6	TEXAS	---			SL 1
DWG:	DIST.:	COUNTY:	CONT. NO.:	SECT. NO.:	JOB NO.:	SHEET NO.:
CHK DWG:	AUS	TRAVIS	3136	01	200	12

Plotted on: 6/13/2023

Design File name: P:\12545\02\Design\Civil\TCP\1254502tcp_lay.dgn



LEGEND

-  CUT & RESTORE PAVEMENT
-  TYPE III BARRICADE
-  CONCRETE TRAFFIC BARRIER
-  CRASH CUSHION ATTENUATOR
-  TRAFFIC FLOW ARROWS

NOTES:

1. FOR ADDITIONAL DETAILS SEE TxDOT STANDARD SHEETS.
2. EXISTING FEATURES ARE SHOWN SCREENED BACK.
3. CONTRACTOR TO MAINTAIN POSITIVE DRAINAGE AT ALL TIMES.
4. SIGNING FOR SHOULDER CLOSURE WITH CTB WILL BE IN COMPLIANCE WITH TCP (5-1b)-18.

DESIGN

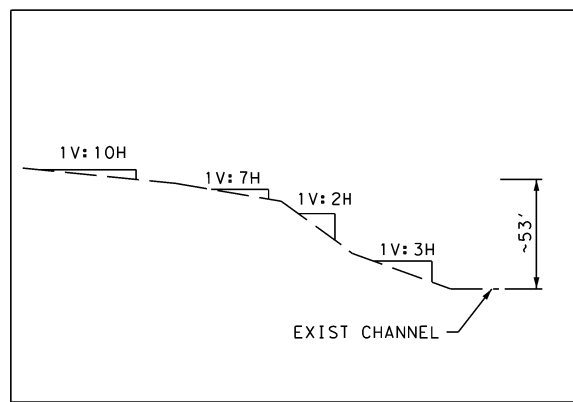
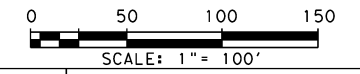


Andres Morales
 ANDRES MORALES, P.E.
 DATE: 6/13/2023

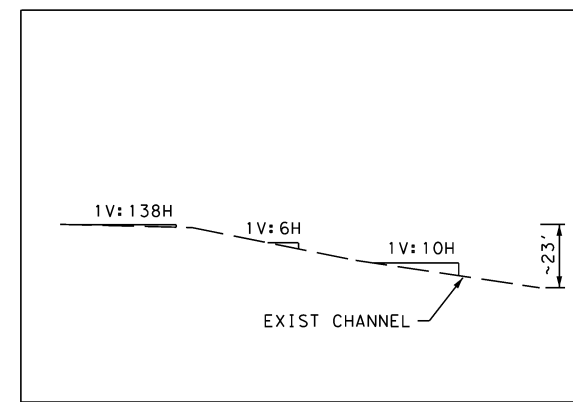
APPROVAL



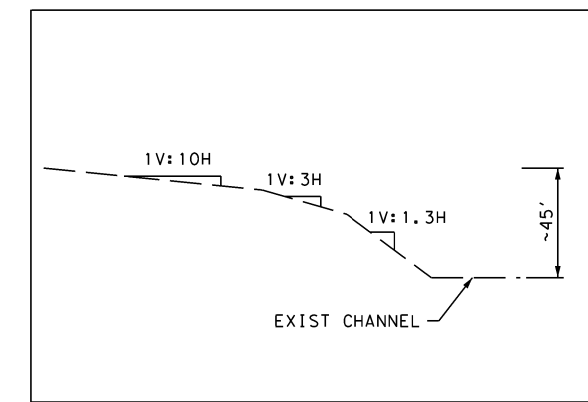
Dennis K. Seal
 DENNIS K. SEAL, P.E.
 DATE: 6/13/2023



SECTION A-A
 (N. T. S.)



SECTION B-B
 (N. T. S.)



SECTION C-C
 (N. T. S.)

REV. NO.	DATE	DESCRIPTION	BY

Pape-Dawson Engineers
 AUSTIN | SAN ANTONIO | HOUSTON | FORT WORTH | DALLAS
 10801 N MOPAC EXPY, BLDG 3, STE 200 | AUSTIN, TX 78759 | 512.454.8711
 TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801

Texas Department of Transportation
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SL 1 AT SKUNK CREEK
TRAFFIC CONTROL PLAN
OVERALL LAYOUT

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.:	STATE:	FEDERAL AID PROJECT NO.:	HIGHWAY NO.:
CHK DGN:	6	TEXAS	---	SL 1
DWG:	DIST.:	COUNTY:	CONT. NO.:	SECT. NO.:
CHK DWG:	AUS	TRAVIS	3136	01
				JOB NO.:
				200
				SHEET NO.:
				13

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

WORKER SAFETY NOTES:



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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

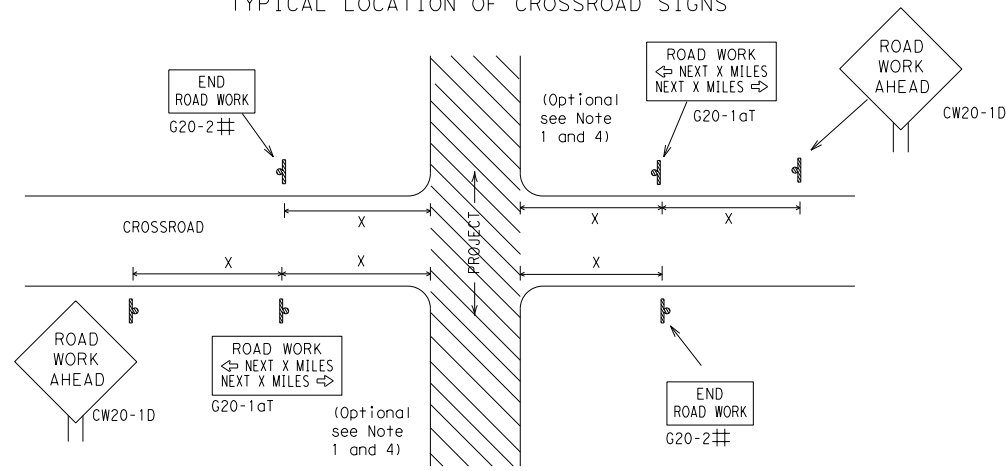
THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT http://www.txdot.gov
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)
TEXAS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

SHEET 1 OF 12

			
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS			
BC (1) - 21			
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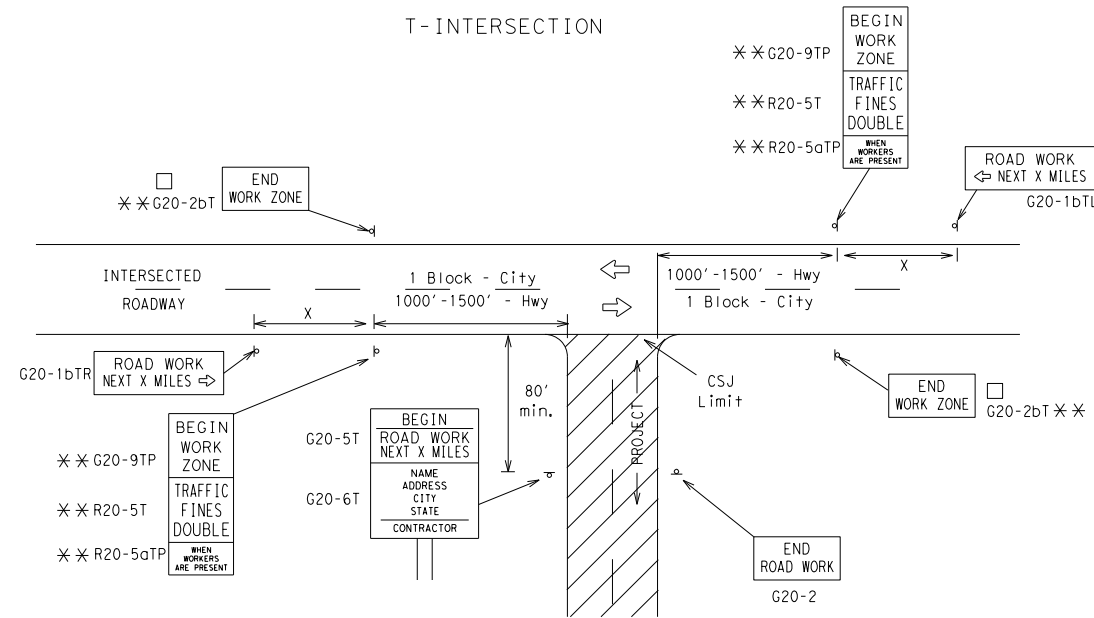
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TYPICAL LOCATION OF CROSSROAD SIGNS



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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

Sign Number or Series	SIZE		SPACING	
	Conventional Road	Expressway/Freeway	Posted Speed MPH	Sign Δ Spacing "x" Feet (Apprx.)
CW20 ⁴	48" x 48"	48" x 48"	30	120
CW21			35	160
CW22			40	240
CW23			45	320
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"	50	400
			55	500 ²
			60	600 ²
			65	700 ²
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"	70	800 ²
			75	900 ²
			80	1000 ²
			*	*

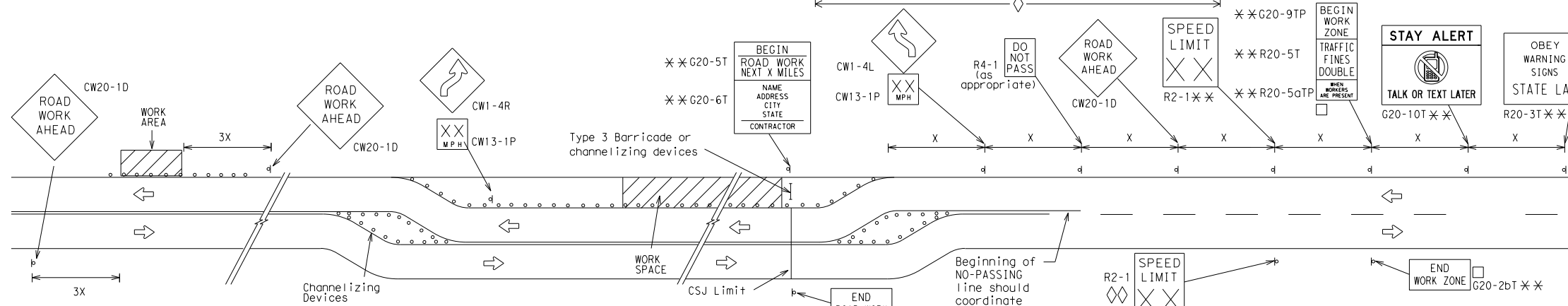
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

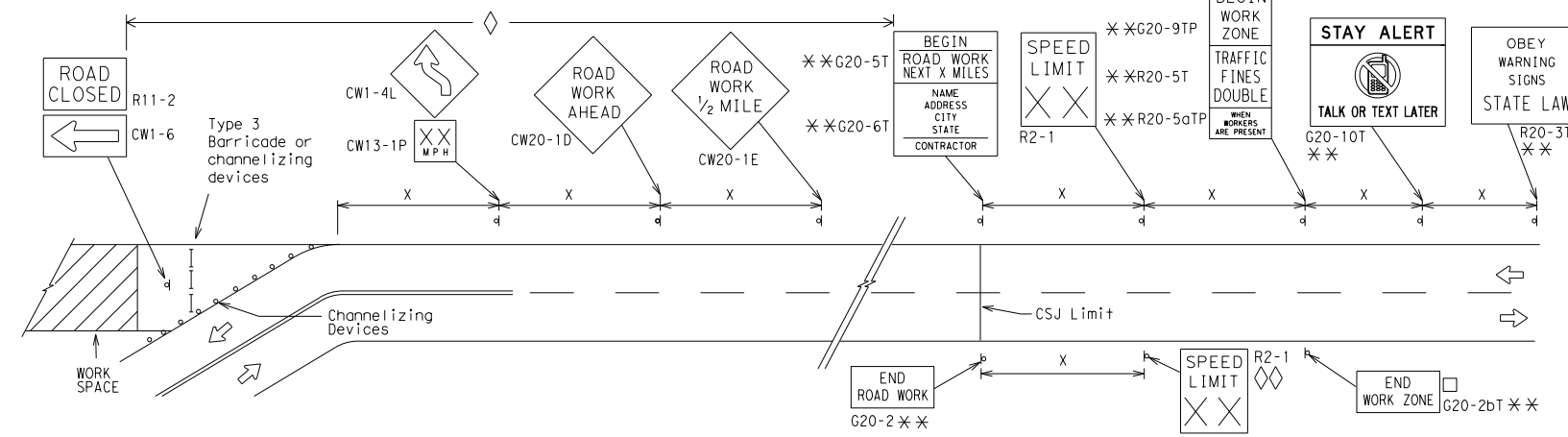
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

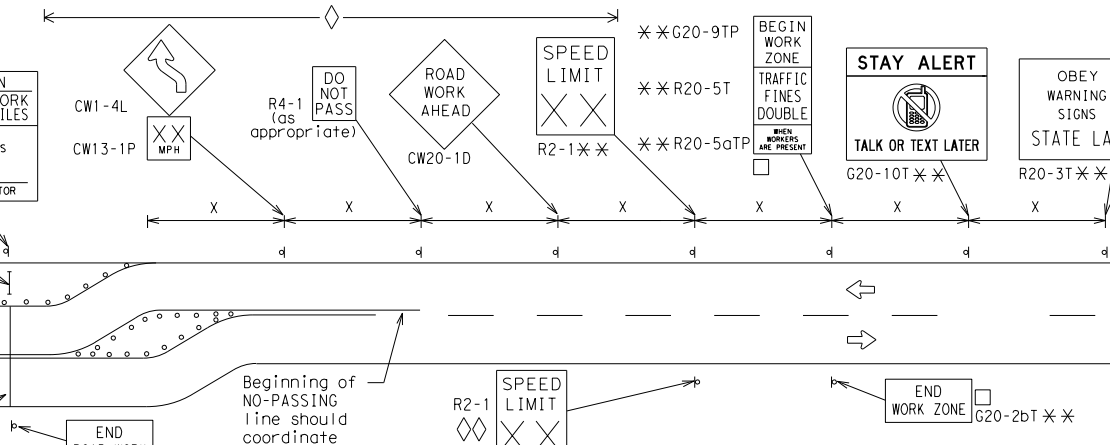


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

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



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



NOTES

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

LEGEND

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

SHEET 2 OF 12



BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC (2) - 21

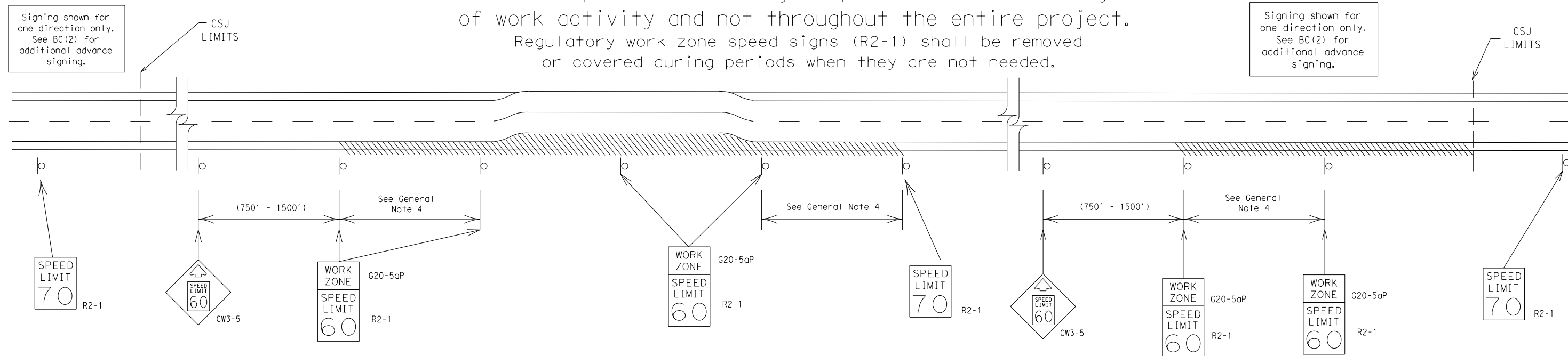
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TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

- 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



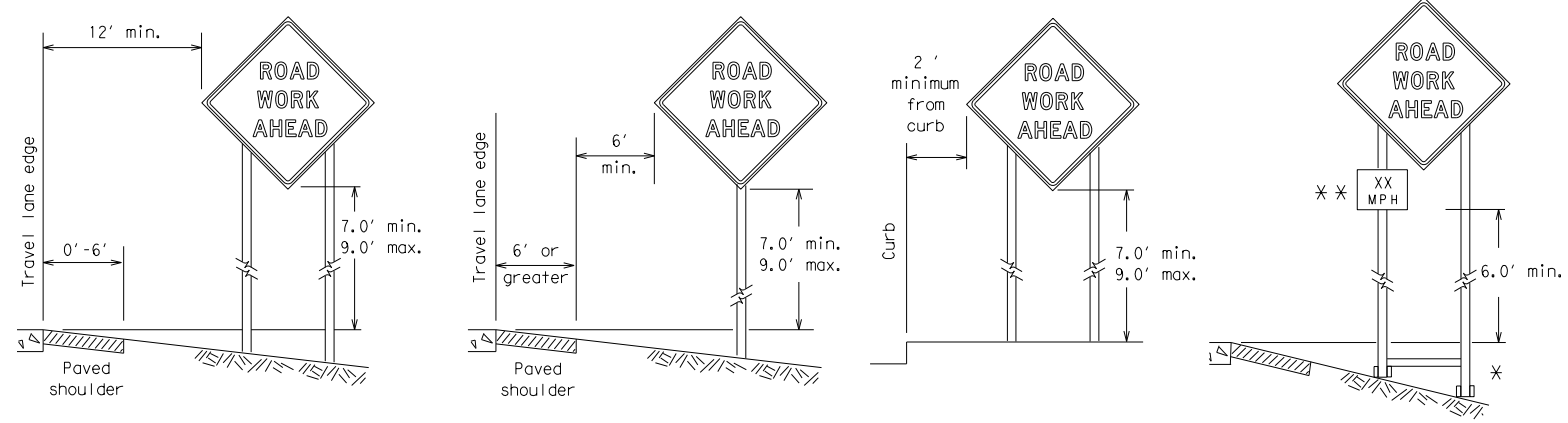
BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC (3) - 21

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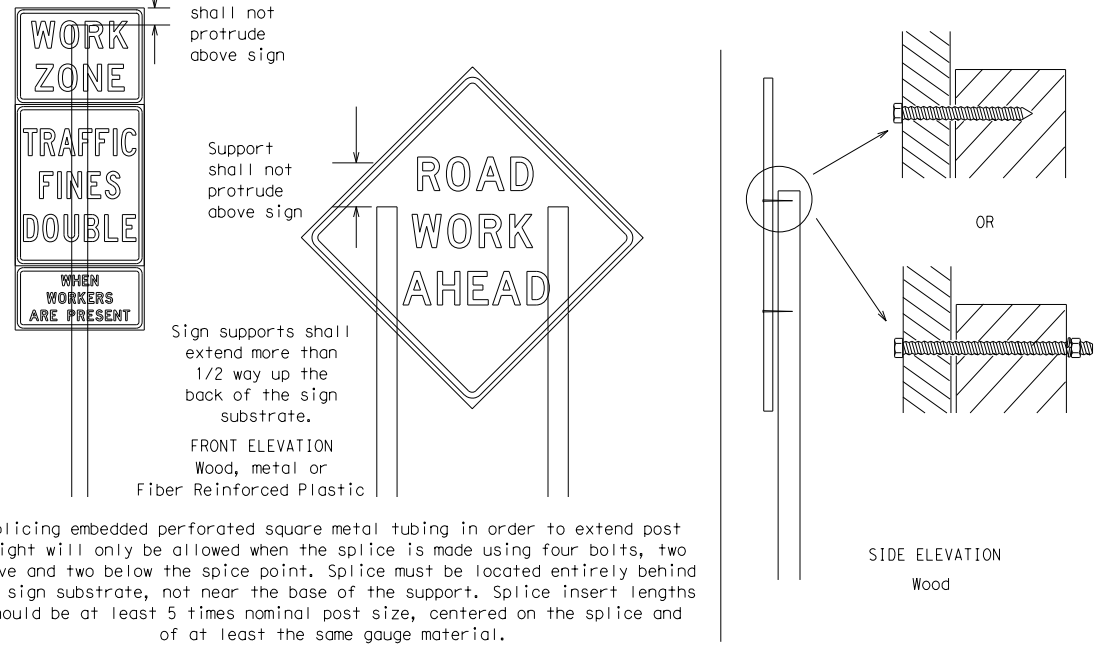
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



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

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

ATTACHMENT FOR SIGN SUPPORTS



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.

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

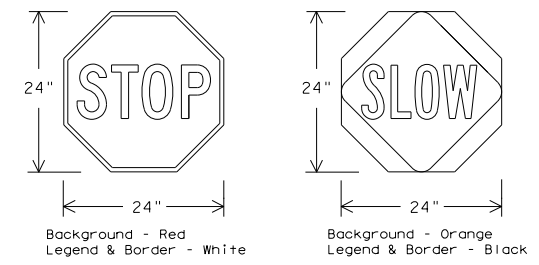
- Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
- The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
- Rock, concrete, iron, steel or other solid objects shall not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

FLAGS ON SIGNS

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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



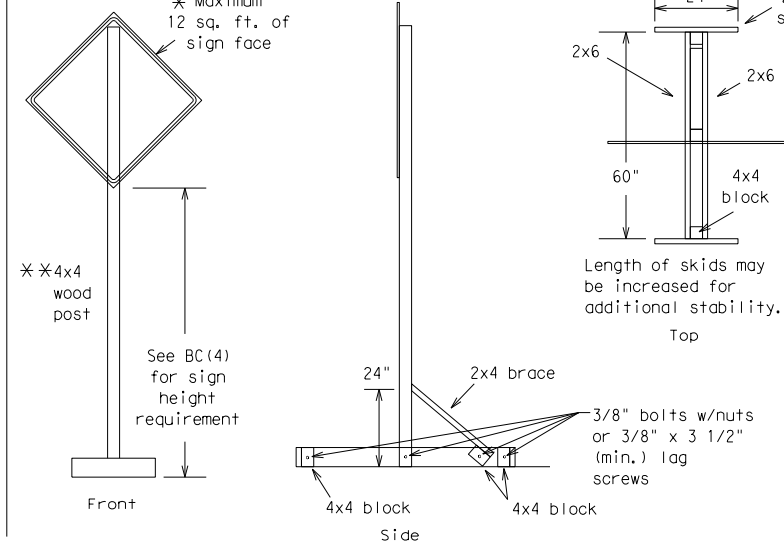
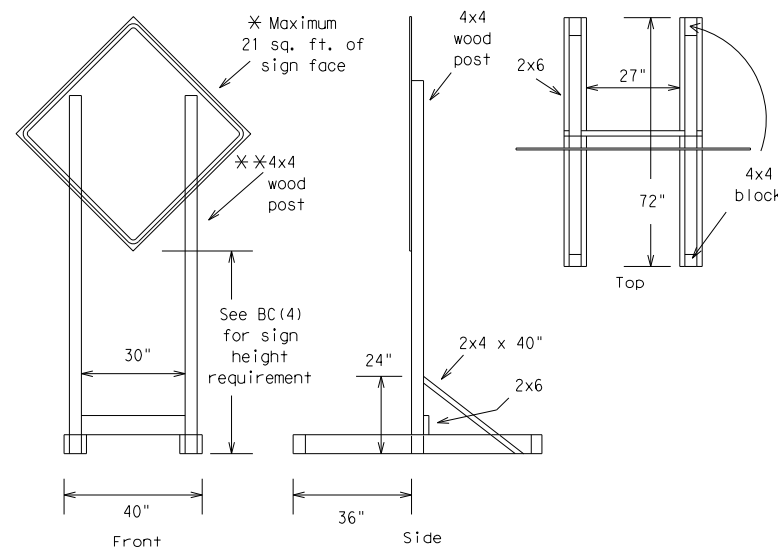
BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC (4) - 21

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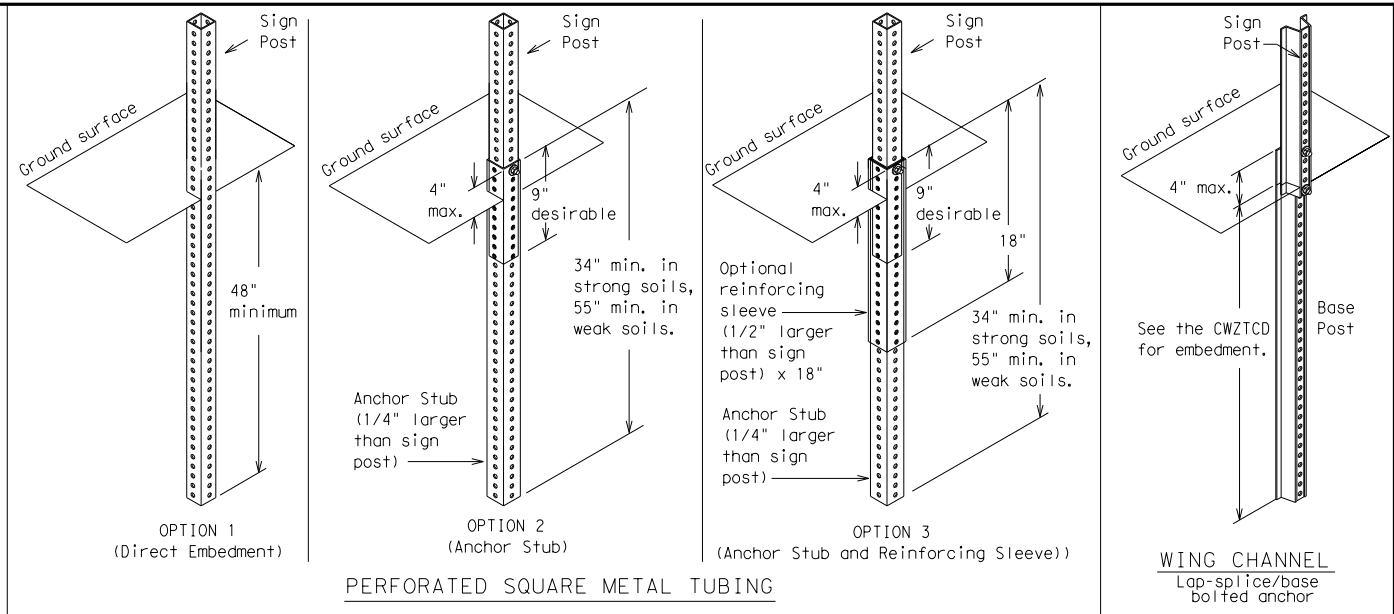
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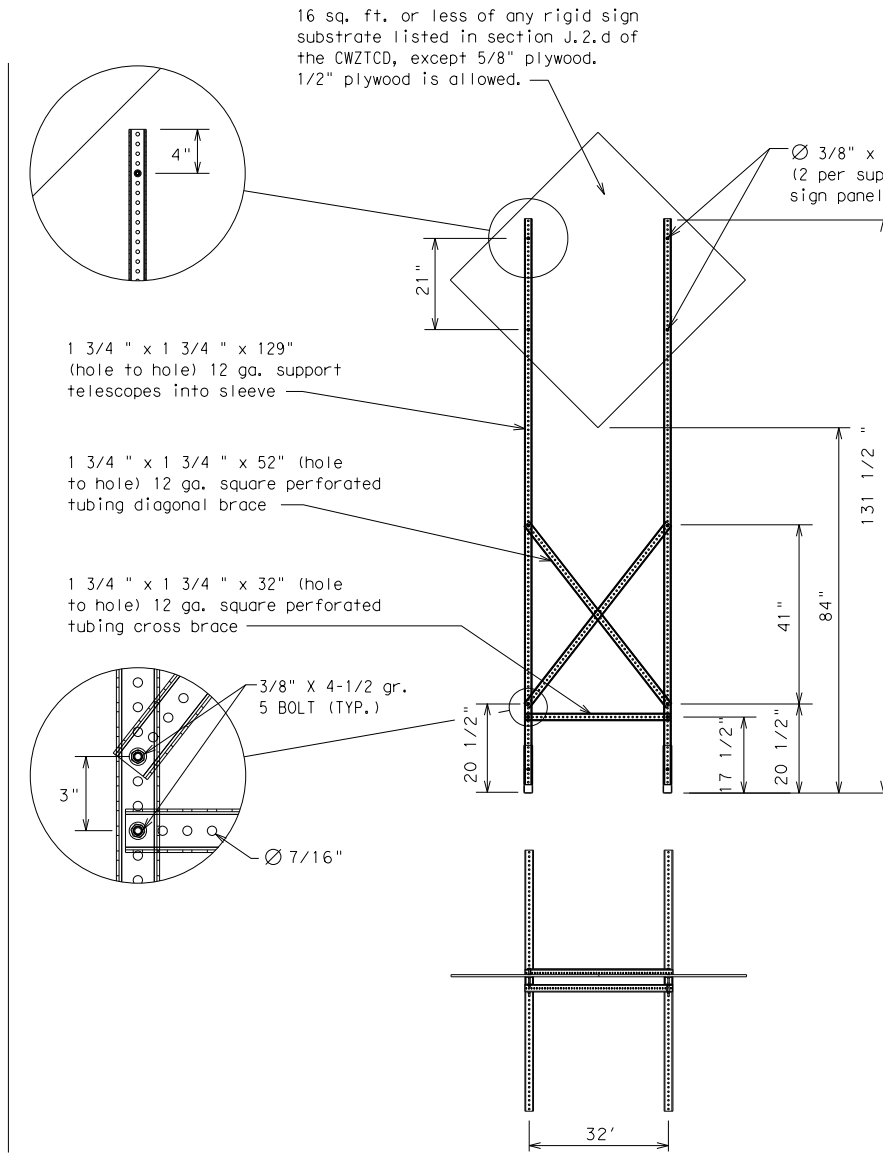
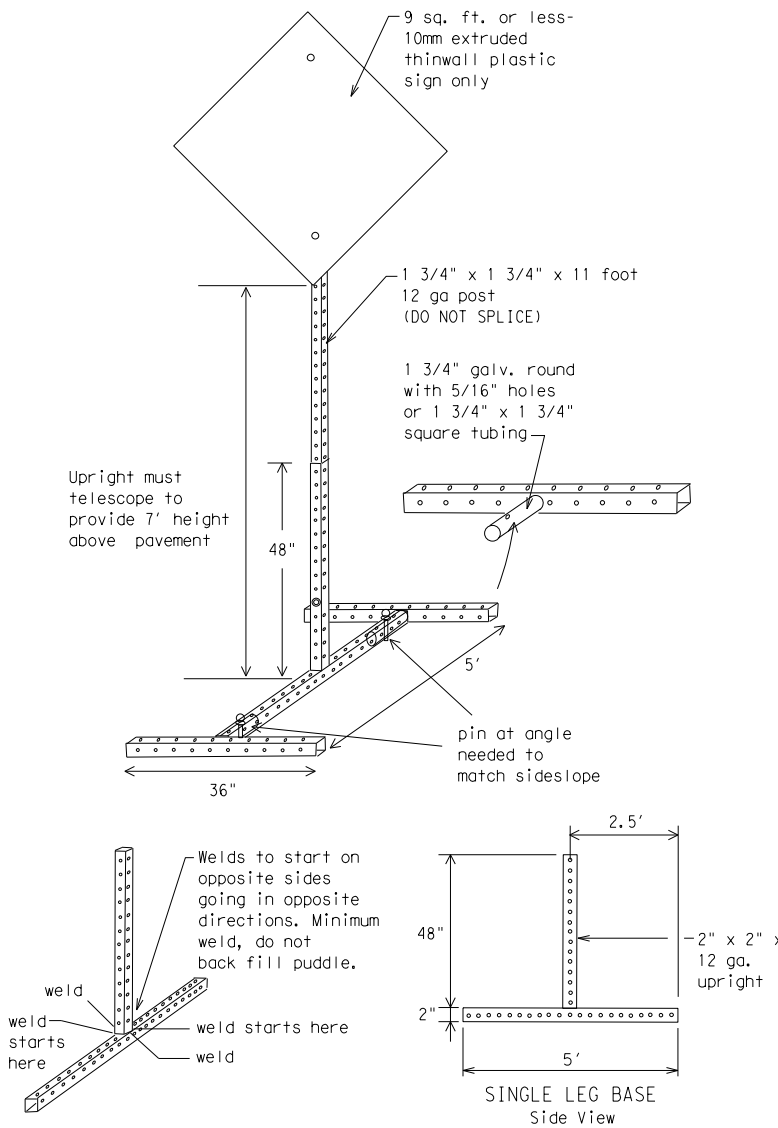
SKID MOUNTED WOOD SIGN SUPPORTS

* 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

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

- 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) - 21

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©TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
REVISIONS		3136	01	200	SL 1				
9-07	8-14	DIST	COUNTY	SHEET NO.					
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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

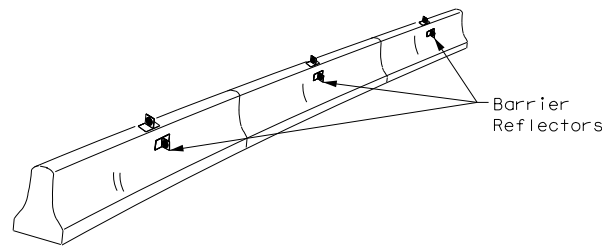
Roadway designation # IH-number, US-number, SH-number, FM-number

<h3>BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)</h3>			
<h2>BC (6) - 21</h2>			
FILE:	bc-21.dgn	DN:	TxDOT
© TxDOT	November 2002	CONT:	3136
REVISIONS		SECT:	01
9-07	8-14	JOB:	200
7-13	5-21	HIGHWAY:	SL 1
		DIST:	AUS
		COUNTY:	TRAVIS
		SHEET NO.:	19

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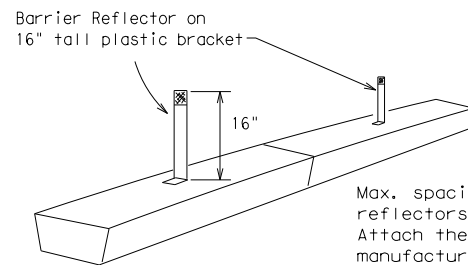
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors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



CONCRETE TRAFFIC BARRIER (CTB)

- Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without damaging the reflector. The Barrier Reflector mounted on the side of the CTB shall be located directly below the reflector mounted on top of the barrier, as shown in the detail above.
- Where CTB separates two-way traffic, three barrier reflectors shall be mounted on each section of CTB. The reflector unit on top shall have two yellow reflective faces (Bi-Directional) while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
- When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
- Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
- Maximum spacing of Barrier Reflectors is forty (40) feet.
- Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
- Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
- Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
- Single slope barriers shall be delineated as shown on the above detail.

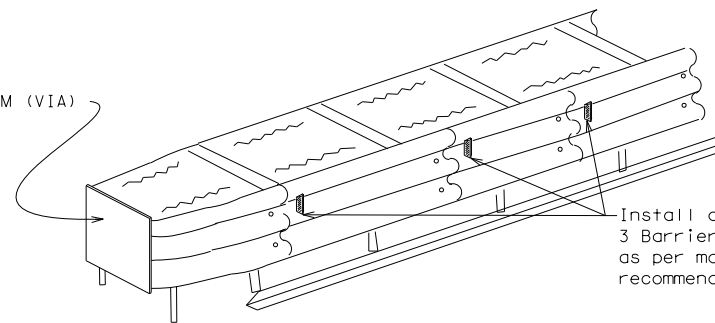


LOW PROFILE CONCRETE BARRIER (LPCB)

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

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 the appropriate crashworthy standards as defined in the Manual for Assessing Safety Hardware (MASH). Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS

WARNING LIGHTS

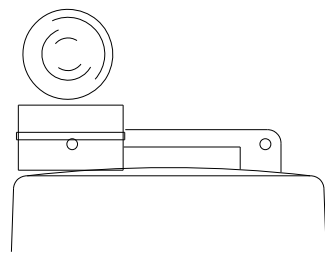
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type B_{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

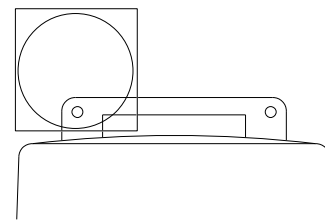
- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing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



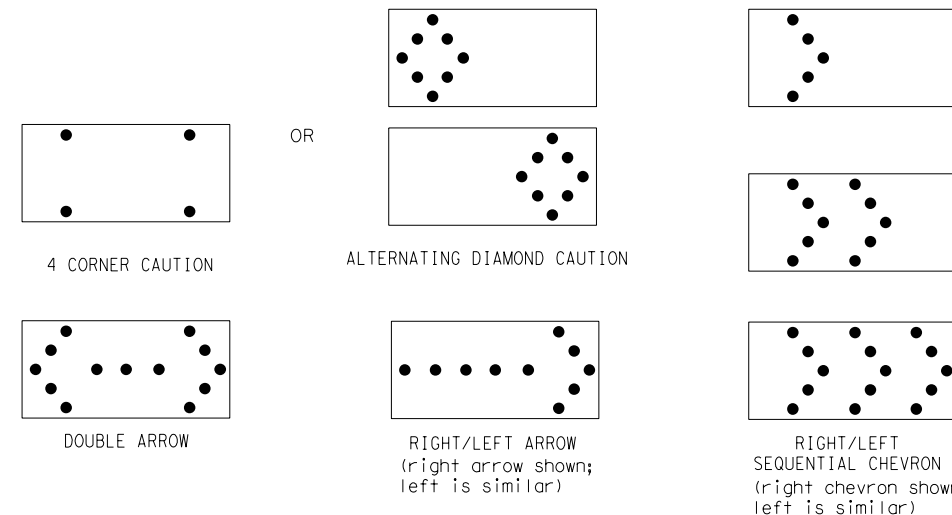
Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



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

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation
 Traffic Safety Division Standard

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

BC(7)-21

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©TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
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9-07	8-14	DIST	COUNTY	SHEET NO.					
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GENERAL NOTES

- For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
- For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent sections by vertical panels, or 42" two-piece cones. In tangent sections, one-piece cones may be used with the approval of the Engineer but only if personnel are present on the project at all times to maintain the cones in proper position and location.
- For short term stationary work zones on freeways, drums are the preferred channelizing device but may be replaced in tapers, transitions and tangent sections by vertical panels, two-piece cones or one-piece cones as approved by the Engineer.
- Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
- The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

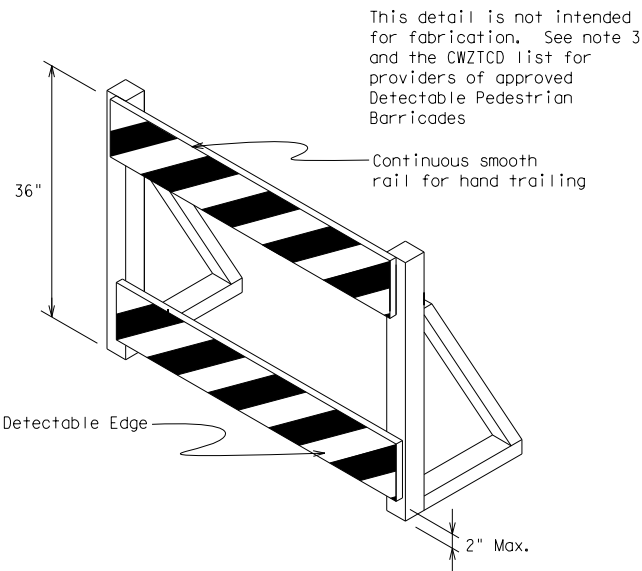
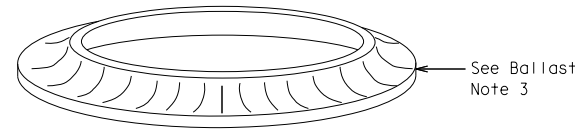
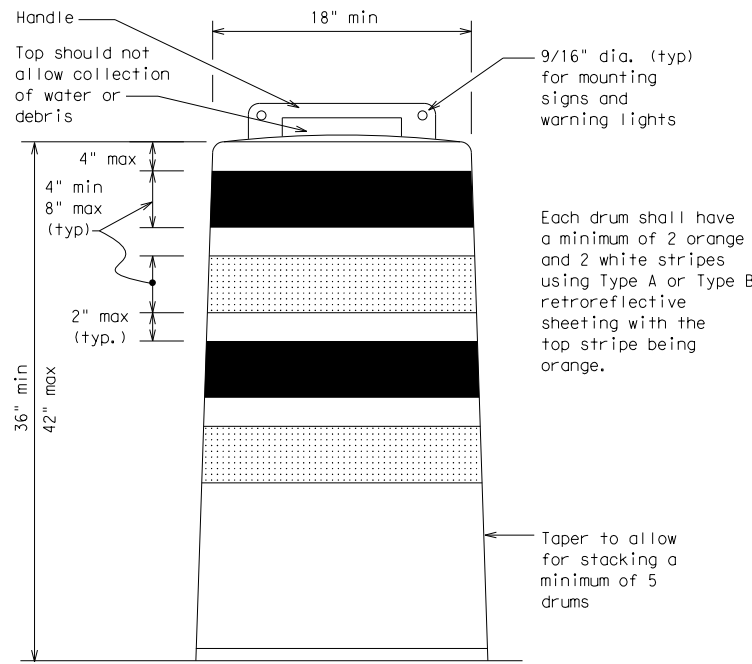
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
- Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelization devices or sign supports.
- Drums shall present a profile that is a minimum of 18 inches in width at the 36 inch height when viewed from any direction. The height of drum unit (body installed on base) shall be a minimum of 36 inches and a maximum of 42 inches.
- The top of the drum shall have a built-in handle for easy pickup and shall be designed to drain water and not collect debris. The handle shall have a minimum of two widely spaced 9/16 inch diameter holes to allow attachment of a warning light, warning reflector unit or approved compliant sign.
- The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectorized space between any two adjacent stripes shall not exceed 2 inches in width.
- Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
- Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
- Drum body shall have a maximum unballasted weight of 11 lbs.
- Drum and base shall be marked with manufacturer's name and model number.

RETROREFLECTIVE SHEETING

- The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
- The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

BALLAST

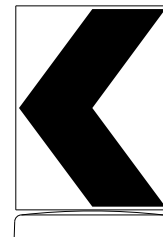
- Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
- Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral crumb rubber base or a solid rubber base.
- Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
- The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
- When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
- Ballast shall not be placed on top of drums.
- Adhesives may be used to secure base of drums to pavement.



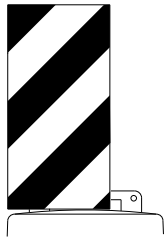
This detail is not intended for fabrication. See note 3 and the CWZTCD list for providers of approved Detectable Pedestrian Barricades

DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

SHEET 8 OF 12

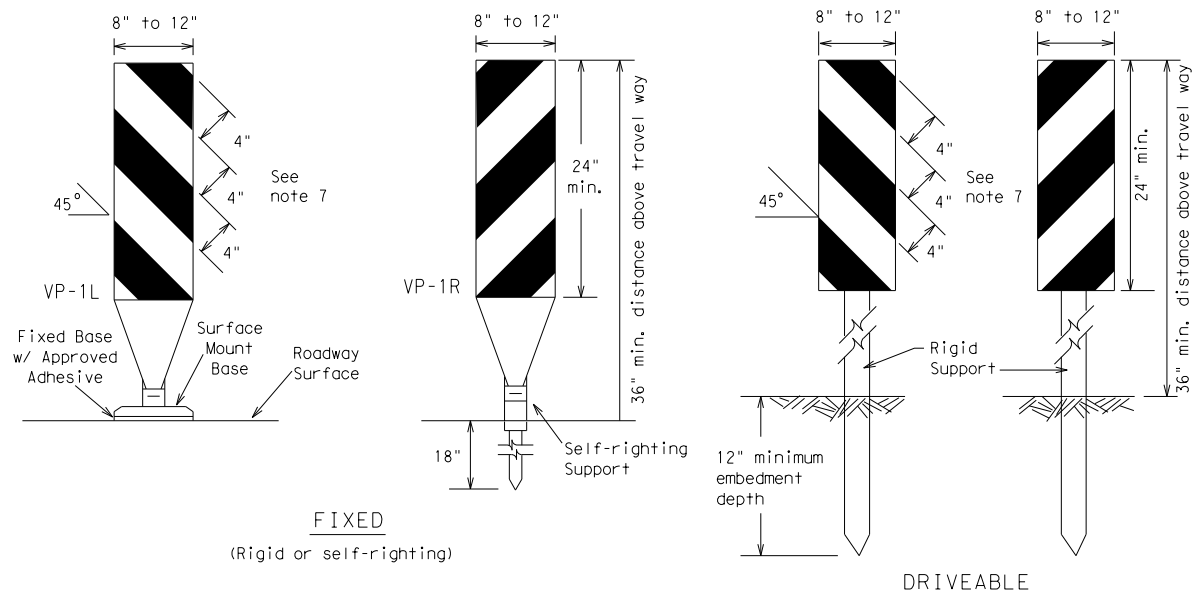


BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (8) - 21

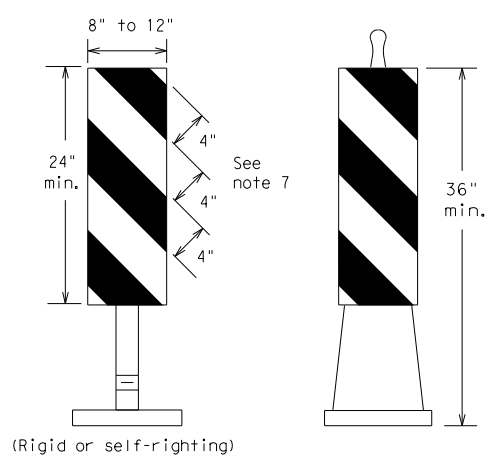
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© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
REVISIONS		3136	01	200	SL 1				
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9-07	5-21	AUS	TRAVIS	21					
7-13									

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FIXED
(Rigid or self-righting)

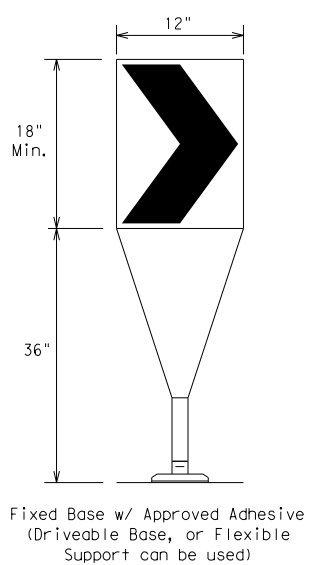
DRIVEABLE



PORTABLE

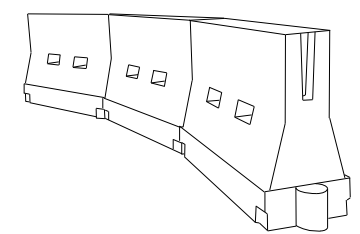
VERTICAL PANELS (VPs)

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



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

CHEVRONS



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

GENERAL NOTES

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

Posted Speed	Formula	Minimum Desirable Taper Lengths * X			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'	

*X 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



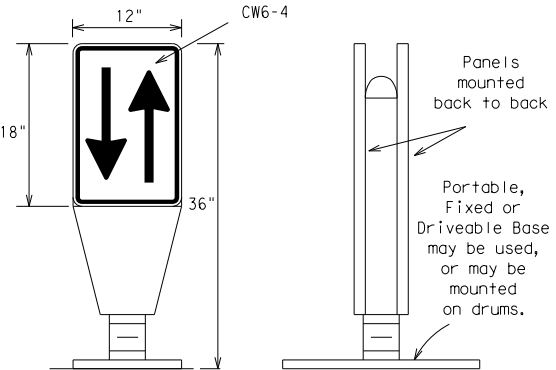
BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9) - 21

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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



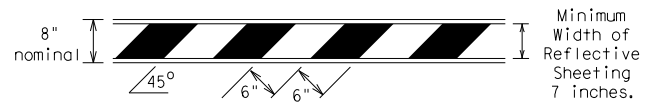
- Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base 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.

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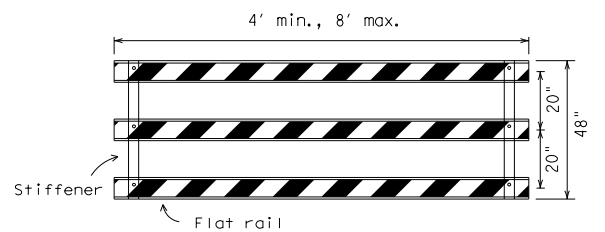
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



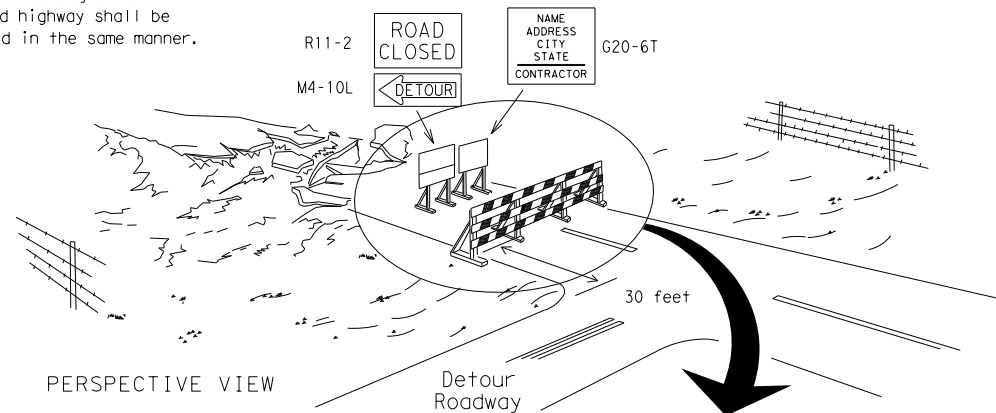
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

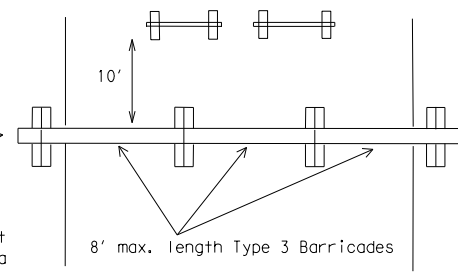
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

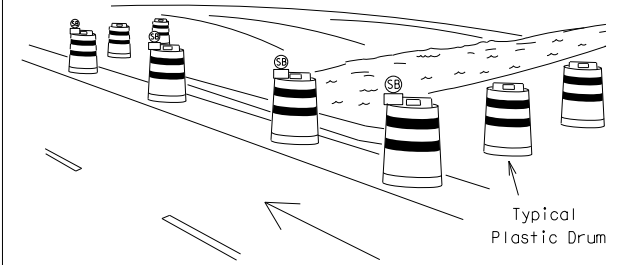
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



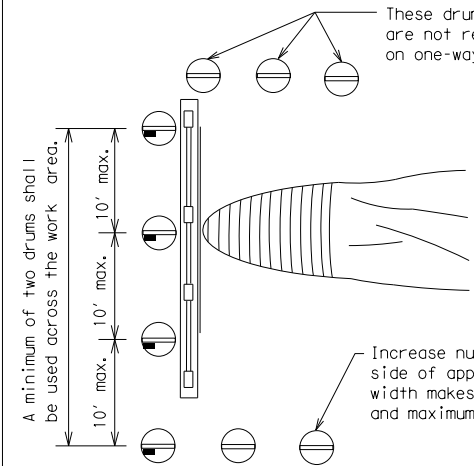
PLAN VIEW

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

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

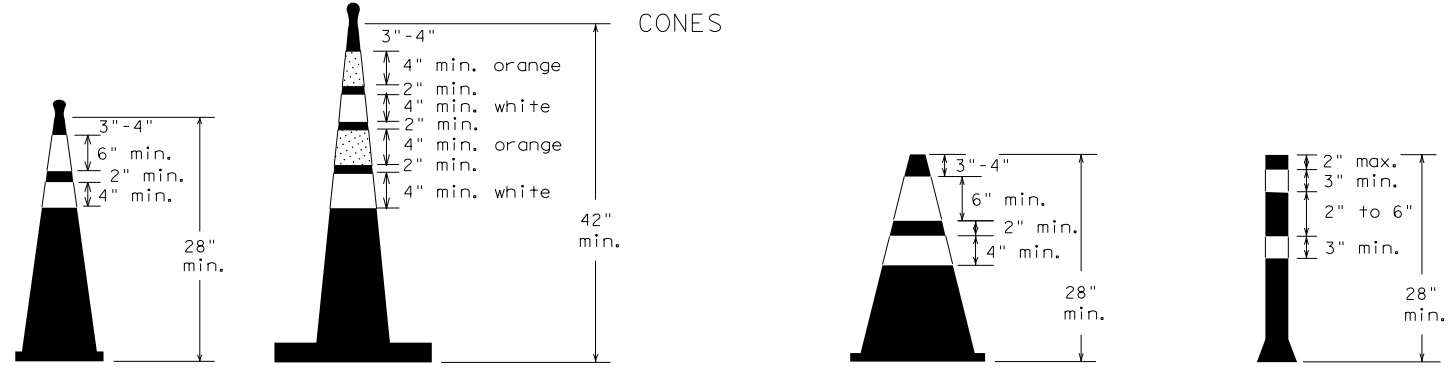


PLAN VIEW

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

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



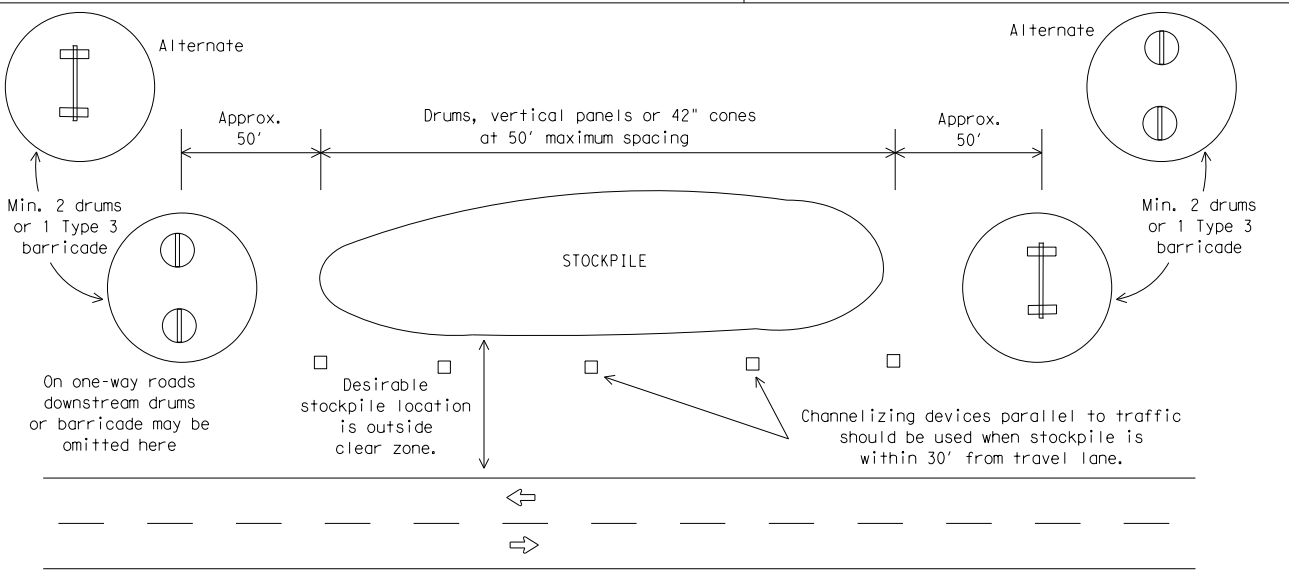
Two-Piece cones

One-Piece cones

Tubular Marker

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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES



BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (10) - 21

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7-13 5-21	AUS	TRAVIS	23	

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

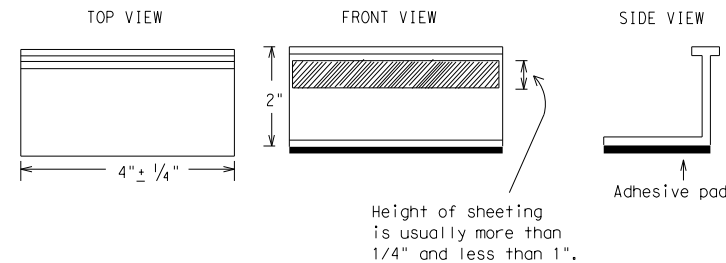
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

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SHEET 11 OF 12

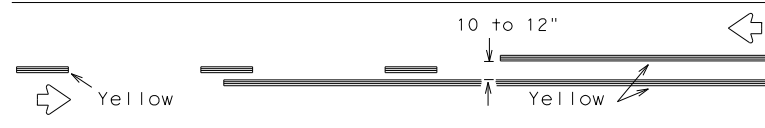


BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

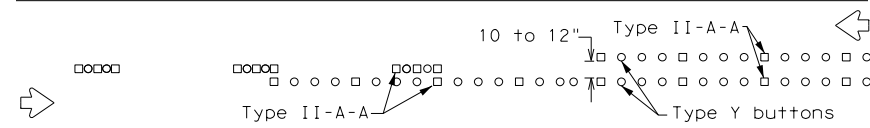
BC(11)-21

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©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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1-02 7-13	AUS	TRAVIS	24	
11-02 8-14				

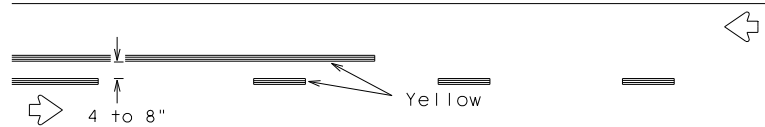
PAVEMENT MARKING PATTERNS



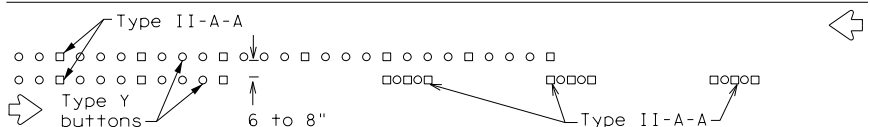
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



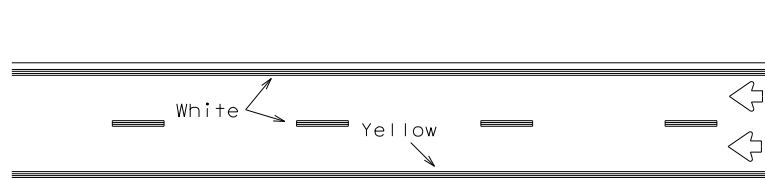
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



RAISED PAVEMENT MARKERS - PATTERN B

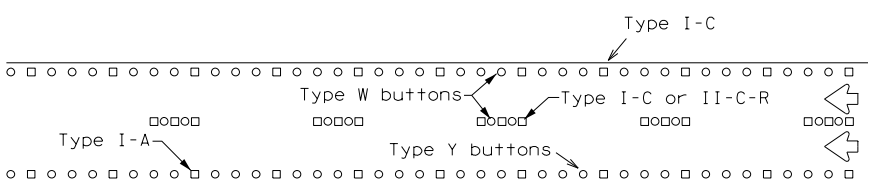
Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer. Prefabricated markings may be substituted for reflectorized pavement markings.

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

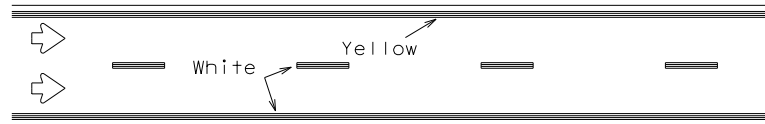


REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectorized pavement markings.

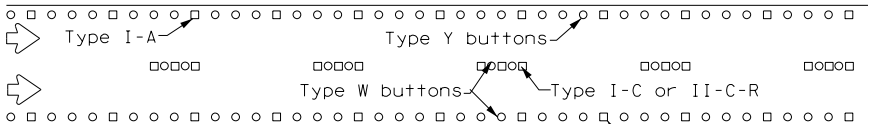


RAISED PAVEMENT MARKERS



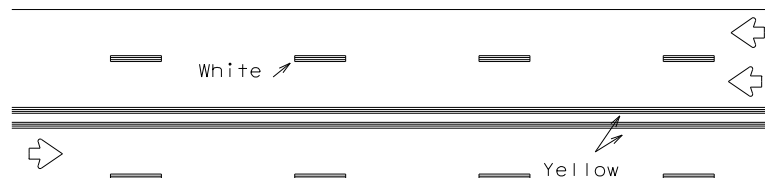
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectorized pavement markings.



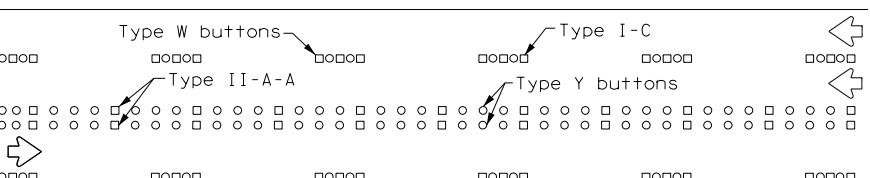
RAISED PAVEMENT MARKERS

EDGE & LANE LINES FOR DIVIDED HIGHWAY



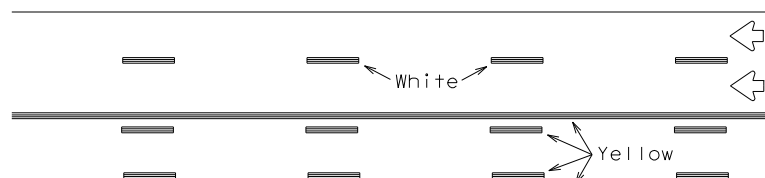
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectorized pavement markings.



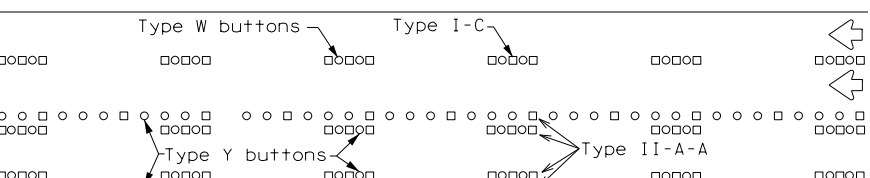
RAISED PAVEMENT MARKERS

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

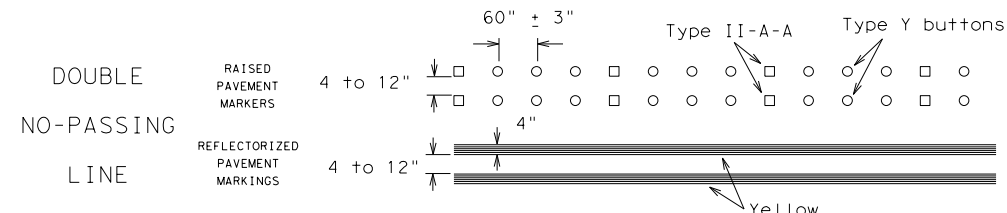
Prefabricated markings may be substituted for reflectorized pavement markings.



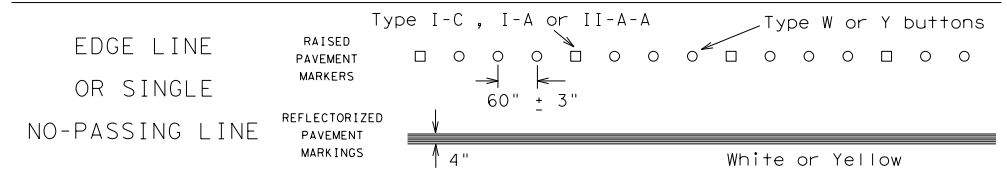
RAISED PAVEMENT MARKERS

TWO-WAY LEFT TURN LANE

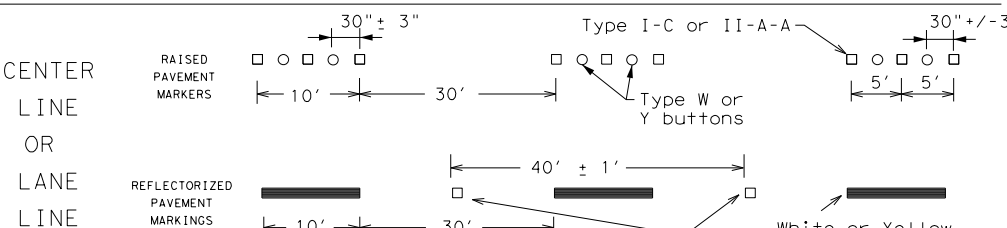
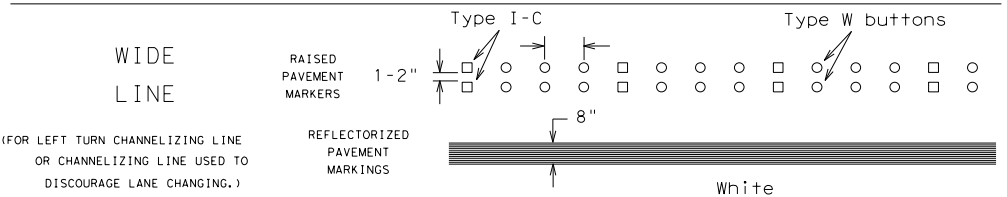
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



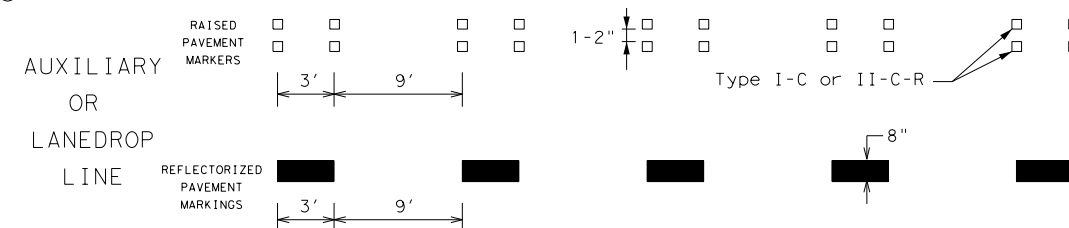
SOLID LINES



WIDE LINE

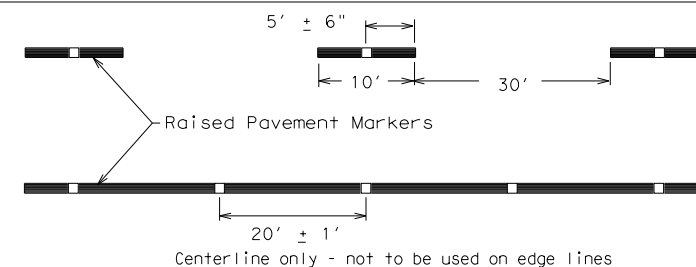


BROKEN LINES



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

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BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

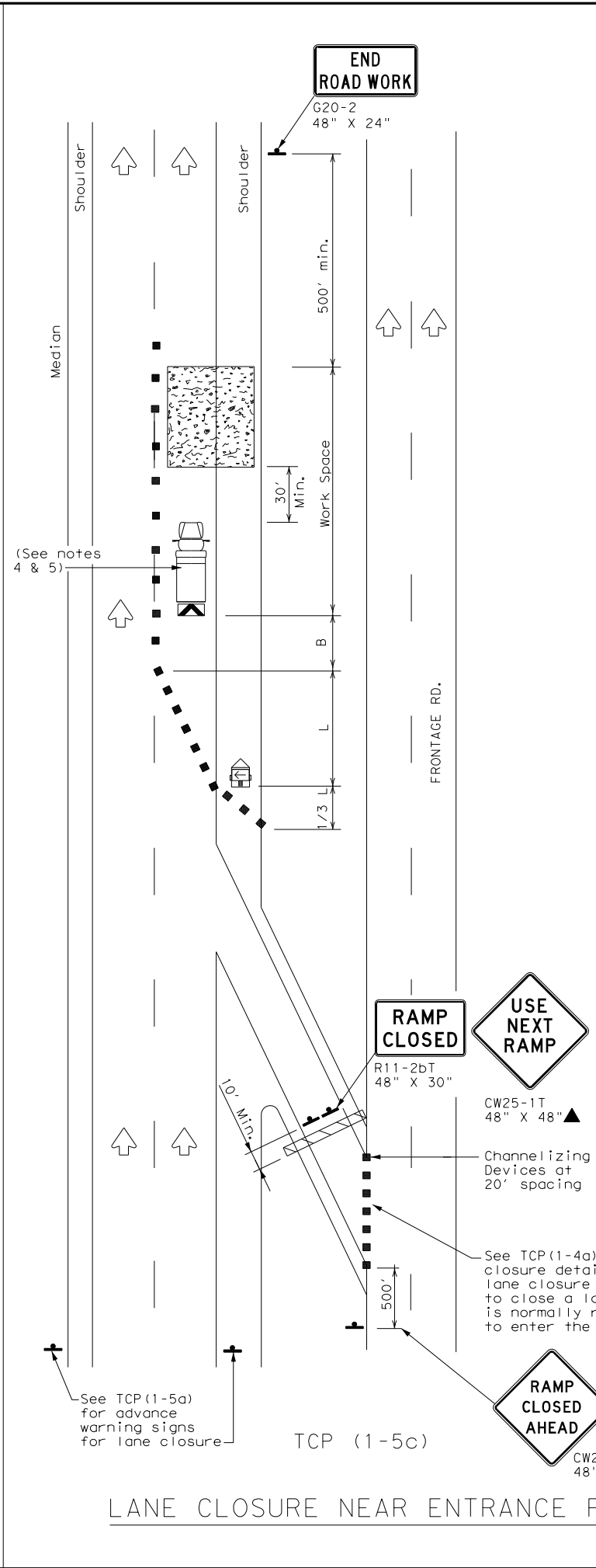
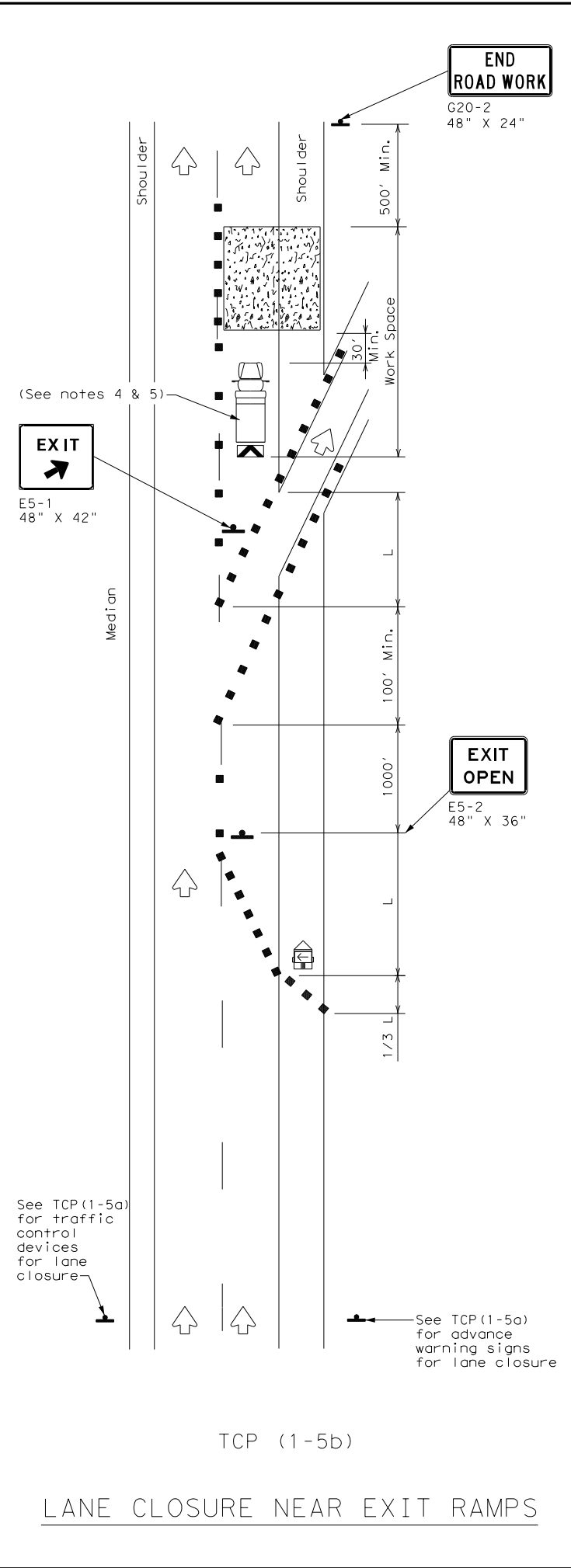
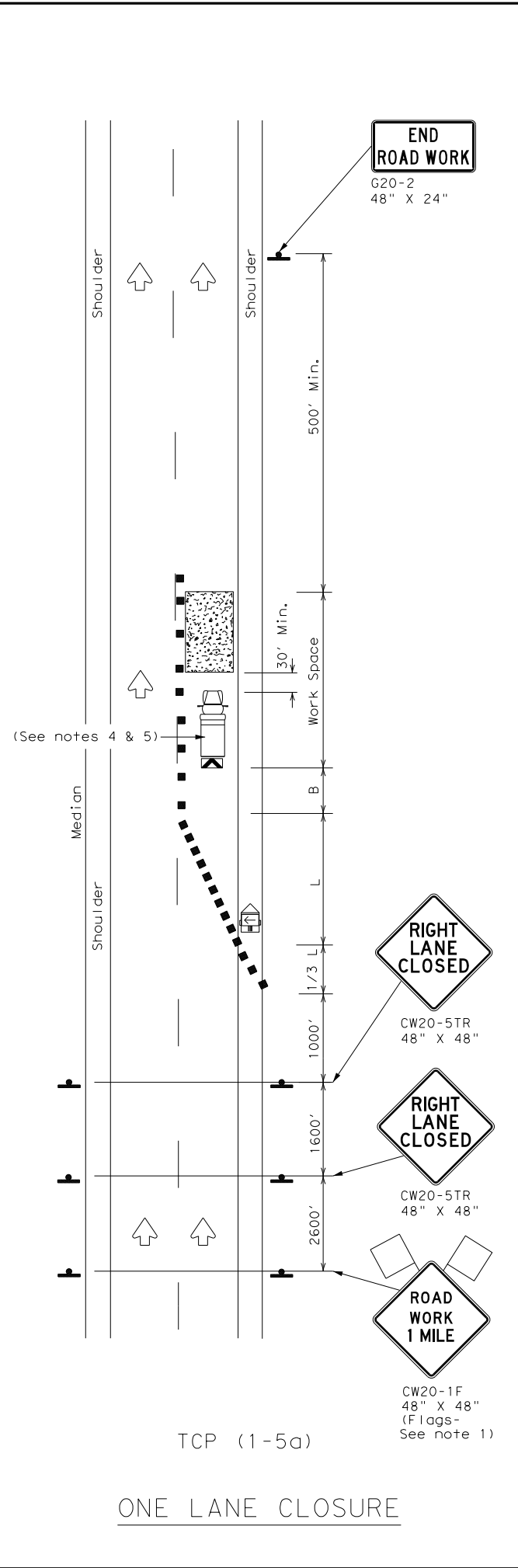
BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	3136	01	200	SL 1
1-97 9-07 5-21	DIST	COUNTY	SHEET NO.	
2-98 7-13	AUS	TRAVIS	25	
11-02 8-14				

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

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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.

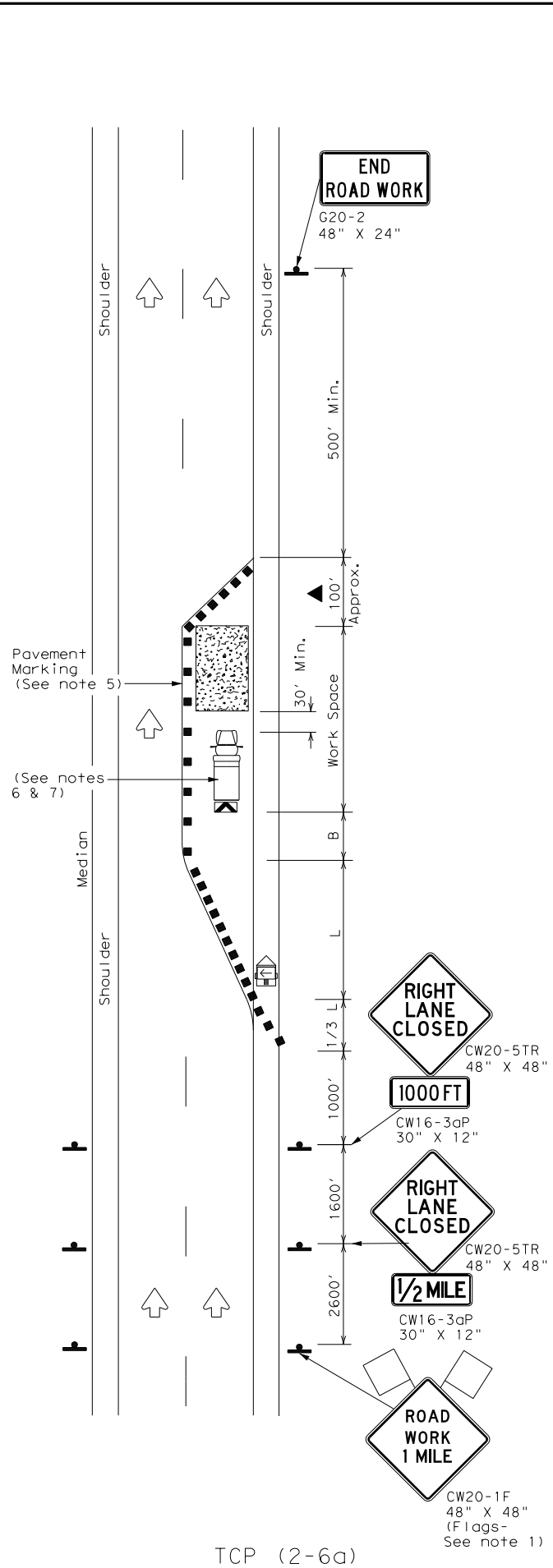
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
LANE CLOSURES FOR
DIVIDED HIGHWAYS
TCP (1-5) - 18

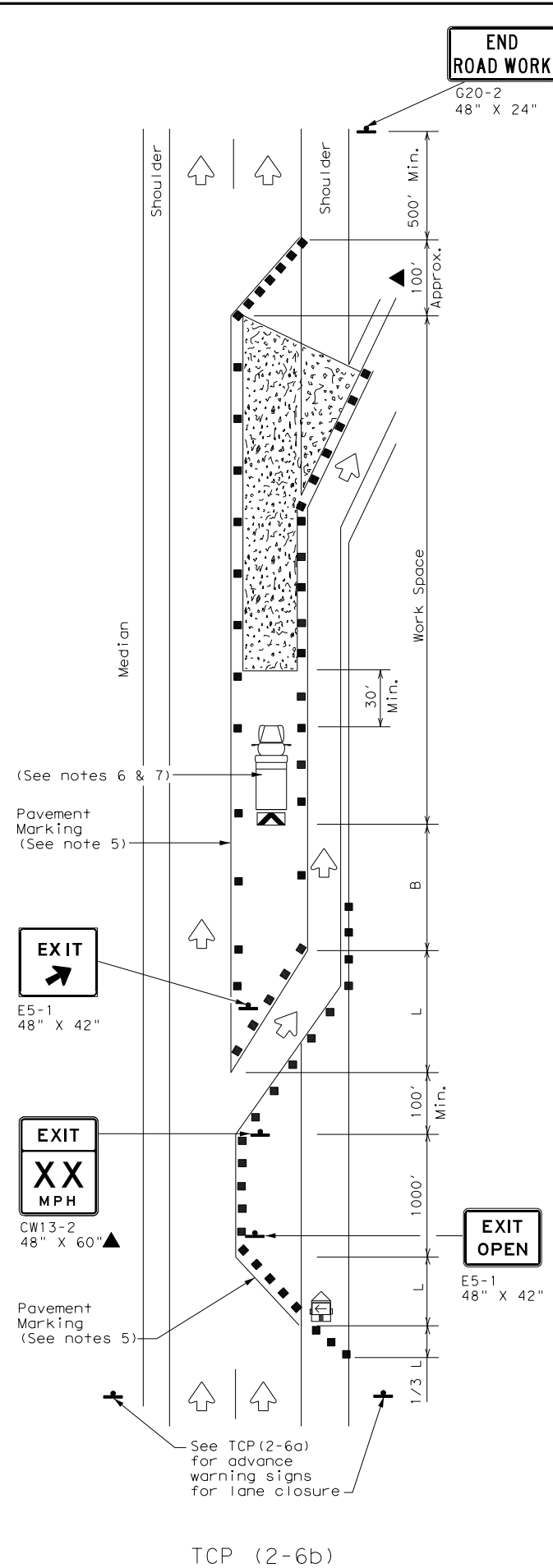
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© TxDOT February 2012	CON:	SECT:	JOB:	HIGHWAY:
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	AUS	TRAVIS	26	

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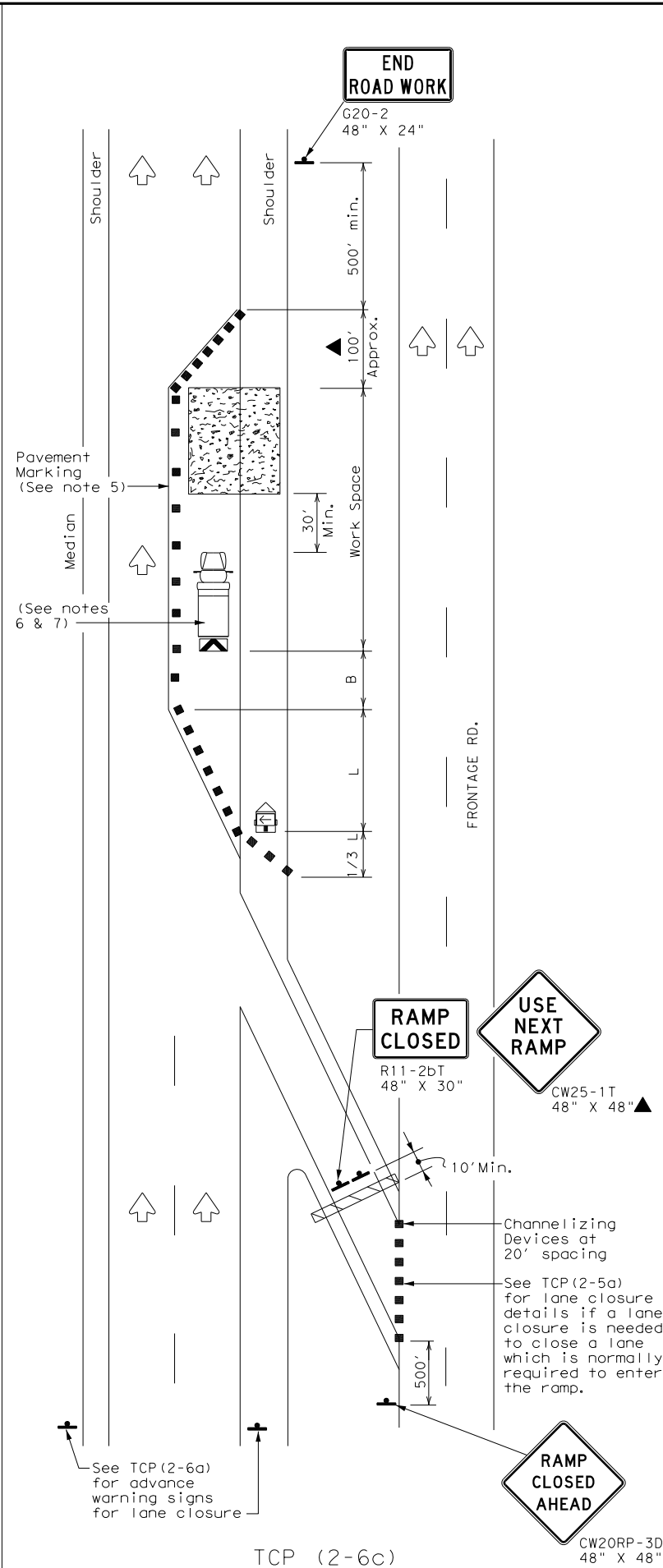
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TCP (2-6a)
ONE LANE CLOSURE



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



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

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

Posted Speed X	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.
- 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.

Texas Department of Transportation
 Traffic Operations Division Standard

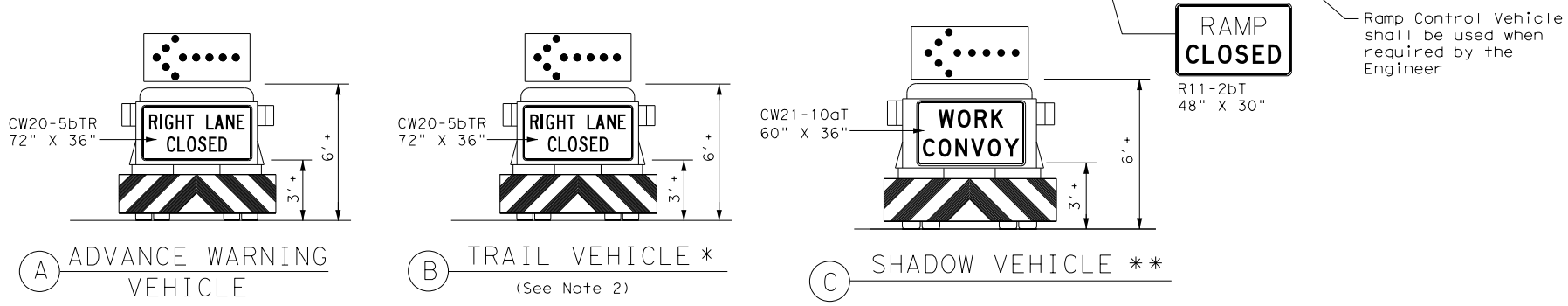
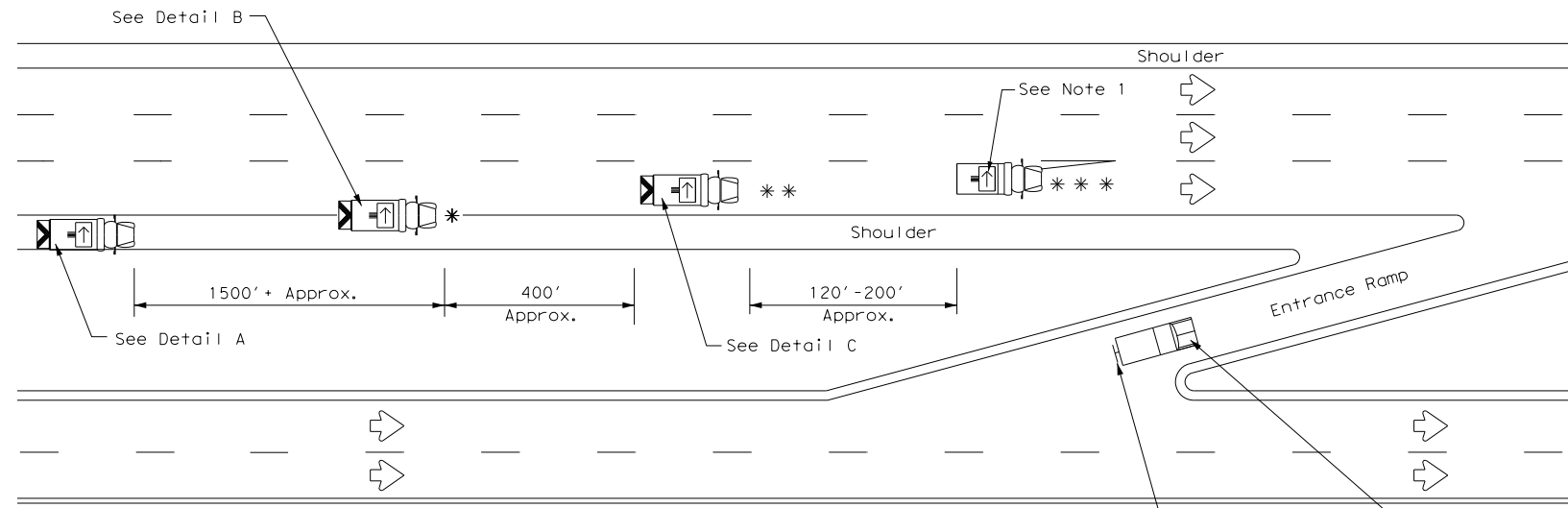
**TRAFFIC CONTROL PLAN
 LANE CLOSURES ON
 DIVIDED HIGHWAYS**

TCP (2-6) - 18

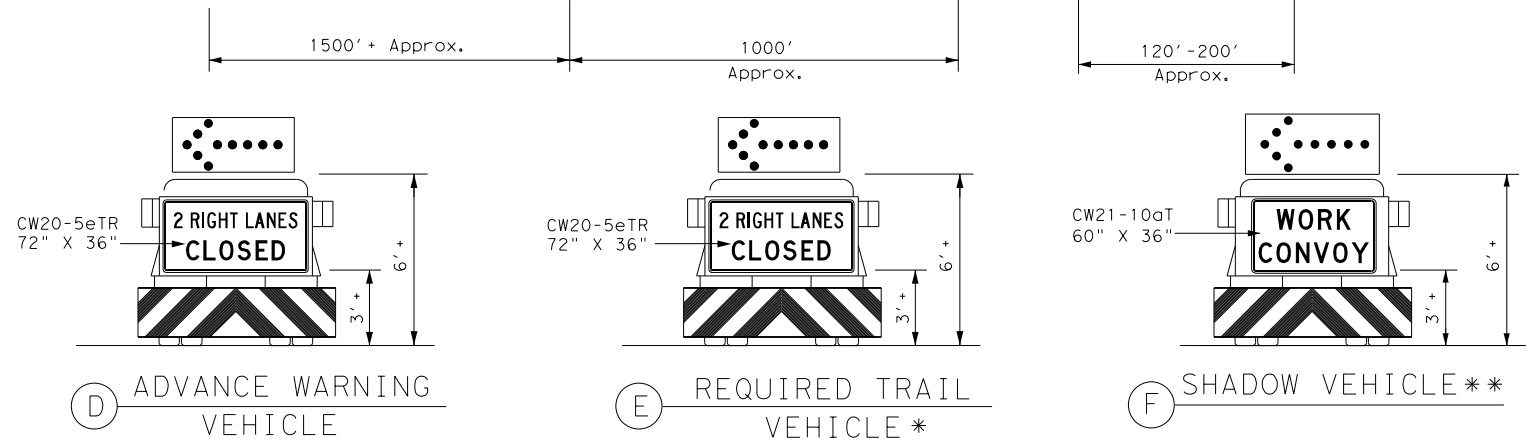
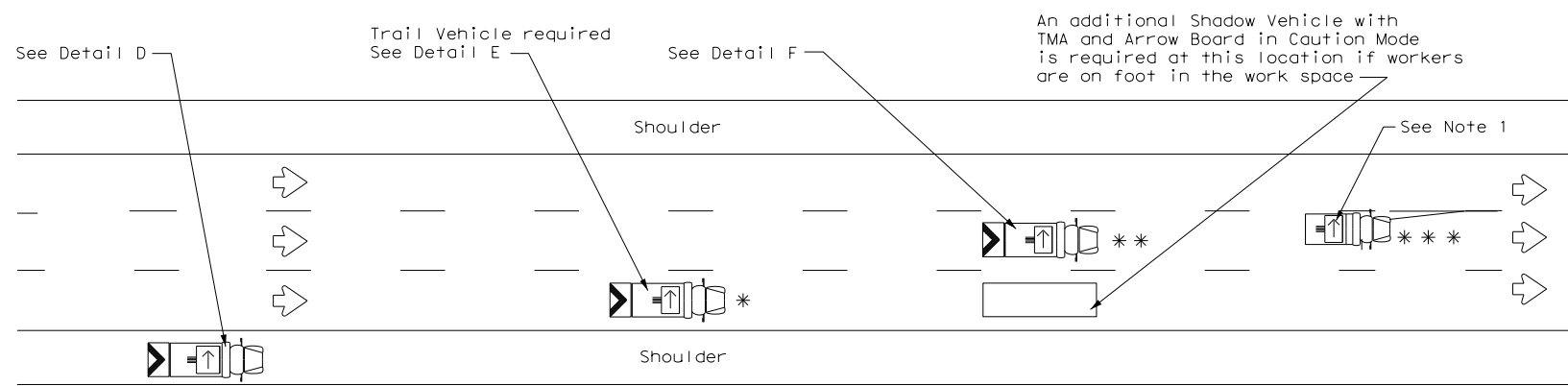
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© TxDOT December 1985	CON:	SECT:	JOB:	HIGHWAY:
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2-94 4-98	DIST:	COUNTY:	SHEET NO.:	
8-95 2-12	AUS	TRAVIS	27	
1-97 2-18				

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 FILE: P:\125\45\02\Design\Civil\Standards\TCP\tcp3-2.dgn



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



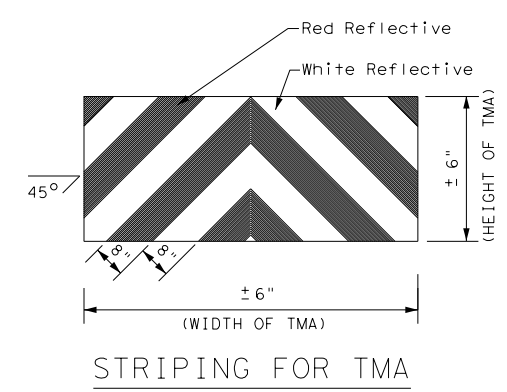
INTERIOR LANE CLOSURE ON MULTI-LANE DIVIDED HIGHWAY - TCP (3-2b)

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.

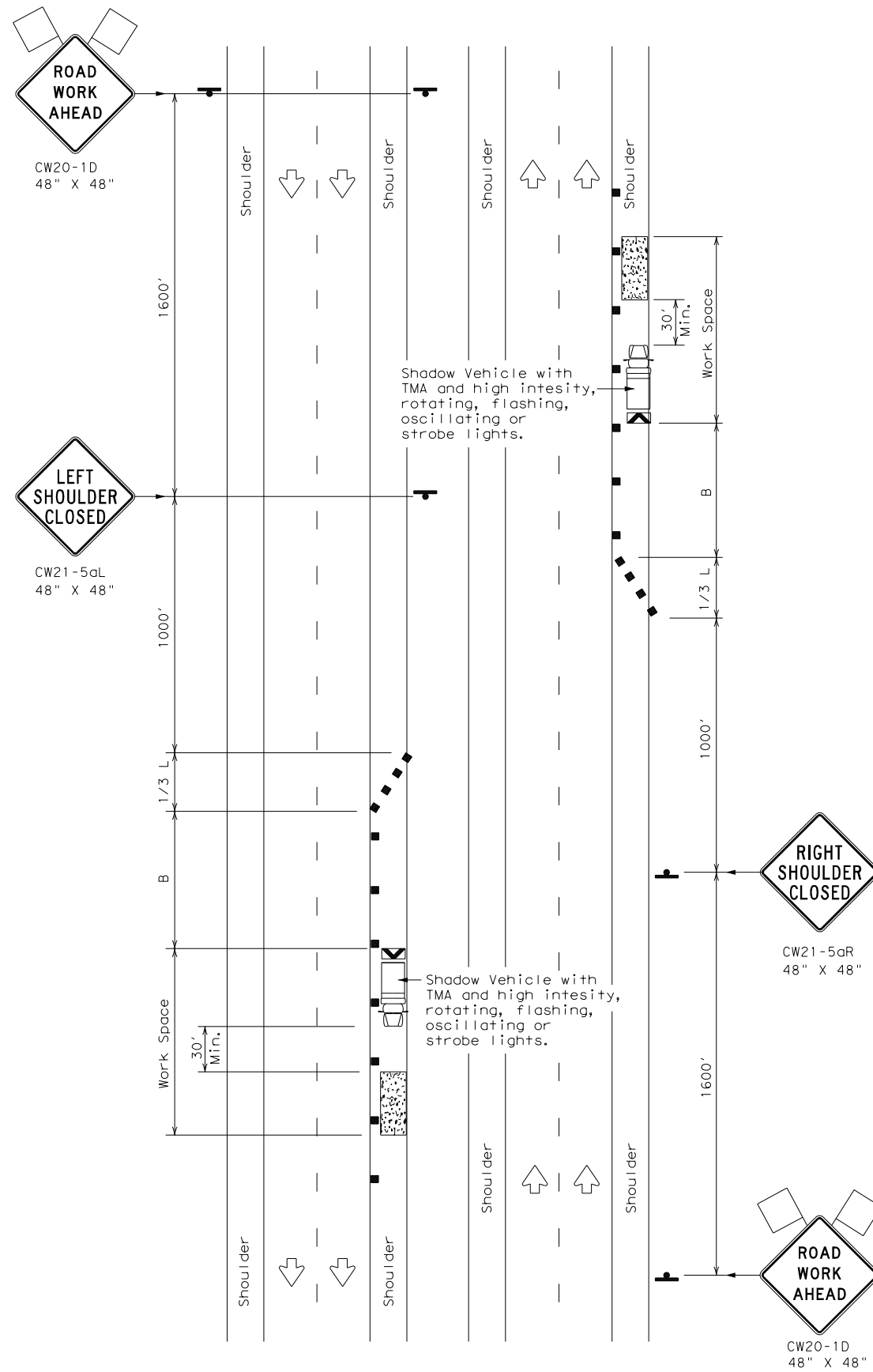


STRIPING FOR TMA

TRAFFIC CONTROL PLAN MOBILE OPERATIONS DIVIDED HIGHWAYS			
TCP (3-2) - 13			
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© TxDOT December 1985	CONT	SECT	JOB
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8-95 7-13	AUS	TRAVIS	28
1-97			

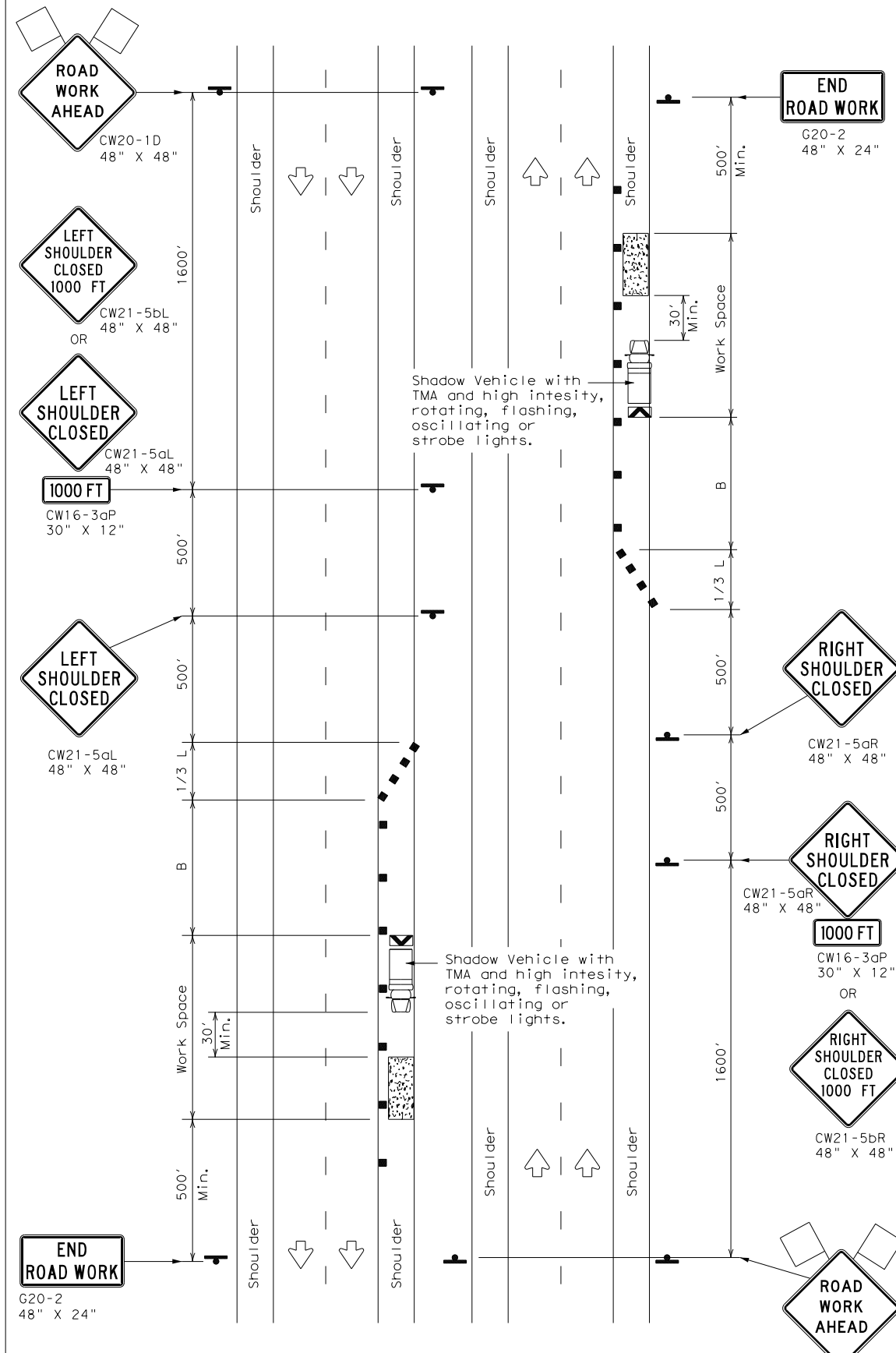
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DATE: 6/13/2023 9:52:10 AM
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TCP (5-1a)

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		325'	365'	390'	45'	90'	195'
50	L = WS	500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

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

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	TCP (5-1a)	TCP (5-1b)	TCP (5-1b)	

GENERAL NOTES

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



TRAFFIC CONTROL PLAN
 SHOULDER WORK FOR
 FREEWAYS / EXPRESSWAYS

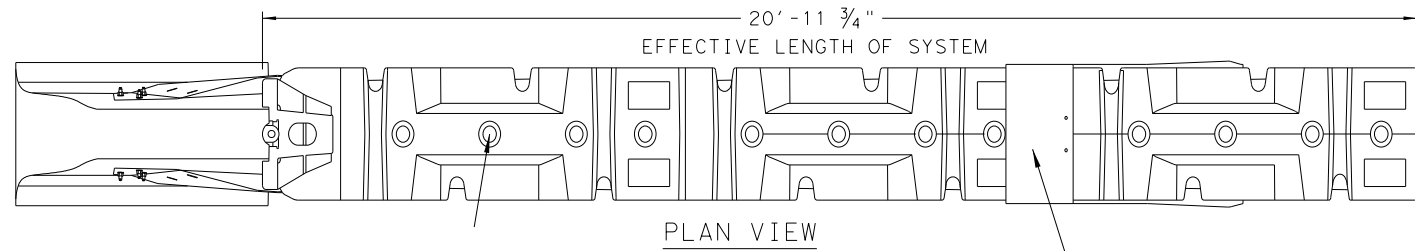
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© TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
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	AUS	TRAVIS	29	

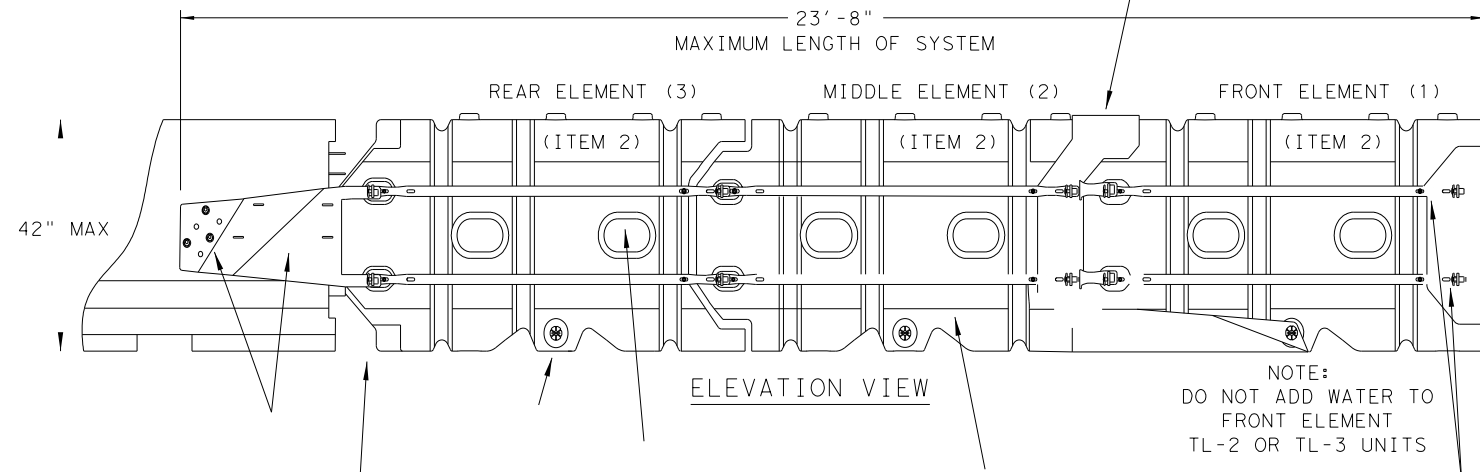
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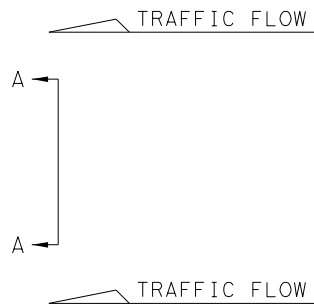
SYSTEM SHOWN - ABSORB-M TL-3



PLAN VIEW

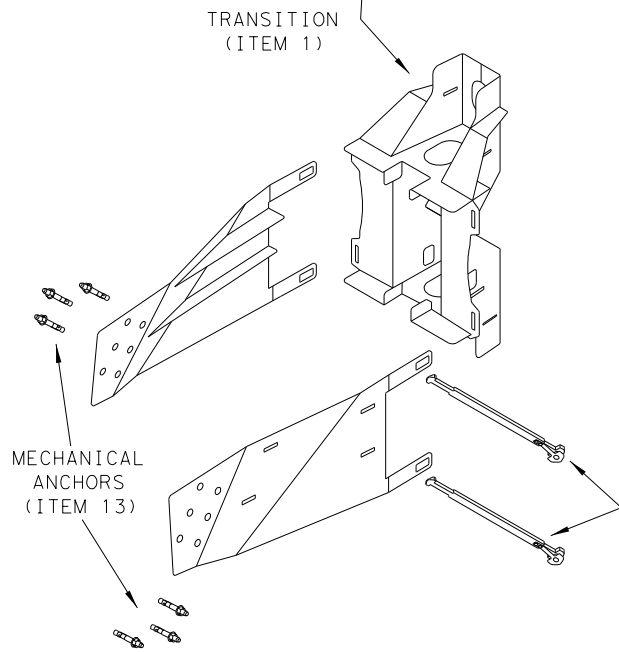


ELEVATION VIEW



SECTION A-A

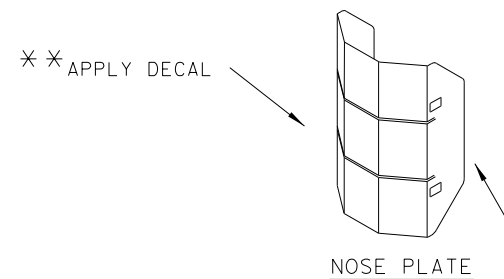
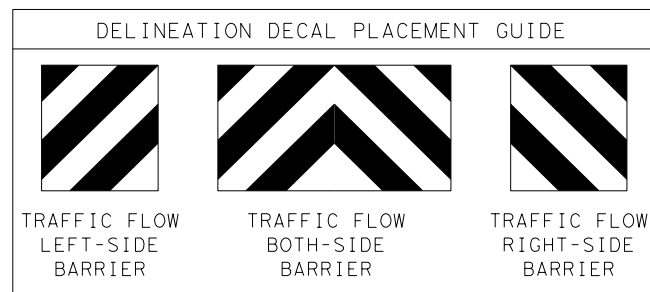
NOTE:
DO NOT ADD WATER TO
FRONT ELEMENT
TL-2 OR TL-3 UNITS



TEST LEVEL	NUMBER OF ELEMENTS	EFFECTIVE LENGTH	MAXIMUM LENGTH
TL-2	2	14' - 7 3/4"	17' - 4"
TL-3	3	20' - 11 3/4"	23' - 8"

BILL OF MATERIALS (BOM) ABSORB-M TL-3 & TL-2 SYSTEMS			QTY	QTY
ITEM #	PART NUMBER	PART DESCRIPTION	TL-2 SYSTEM	TL-3 SYSTEM
1	BSI-1809036-00	TRANSITION-(GALV)	1	1
2	BSI-1808002-00	PRE-ASSEMBLED ABSORBING (ELEMENTS)	2	3
3	BSI-4004598	FILL CAPS	8	12
4	BSI-4004599	DRAIN PLUGS	2	3
5	BSI-1809053-00	TENSION STRAP-(GALV)	8	12
6	BSI-2001998	C-SCR FH 3/8-16 X 1 1/2 GR5 PLT	8	12
7	BSI-2001999	C-SCR FH 3/8-16 X 1 GR5 PLT	8	12
8	BSI-1809035-00	MIDNOSE-(GALV)	1	1
9	BSI-1808014-00	NOSE PLATE	1	1
10	BSI-1809037-00	TRANSITION STRAP (LEFT-HAND)-(GALV)	1	1
11	BSI-1809038-00	TRANSITION STRAP (RIGHT-HAND)-(GALV)	1	1
12	BSI-1808005-00	PIN ASSEMBLY	8	10
13	BSI-2002001	ANC MECH 5/8-11X5 (GALV)	6	6
14	ABSORB-M	INSTALLATION AND INSTRUCTIONS MANUAL	1	1

* COMPONENTS PRE-ASSEMBLED WITH ELEMENT ASSEMBLY



NOTE:
APPLY A HIGH REFLECTIVE DECAL TO THE NOSE PLATE.
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.

** NOTE: (PROVIDED BY OTHERS)
ENGINEER OR CONTRACTOR SHALL COORDINATE WITH THE MANUFACTURER FOR THE CORRECT DECAL PER TRAFFIC FLOW, LEFT, RIGHT OR BOTH-SIDES.

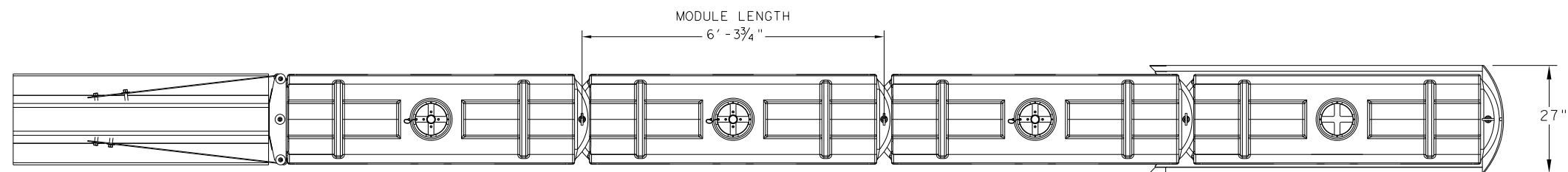
GENERAL NOTES

- FOR SPECIFIC INFORMATION REGARDING THE INSTALLATION AND TECHNICAL GUIDANCE, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800. 180 RIVER ROAD, RIO VISTA, CA 94571
- THE ABSORB-M SYSTEM IS ONLY APPROVED FOR USE IN (TEMPORARY WORK ZONE) LOCATIONS.
- THE ABSORB-M IS A WATER FILLED NON-REDIRECTIVE, GATING CRASH CUSHION THAT DOES NOT NEED TO BE ATTACHED TO A FOUNDATION AND CAN BE INSTALLED ON TOP OF CONCRETE, ASPHALT, OR ANY SURFACE CAPABLE OF BEARING THE WEIGHT OF THE SYSTEM.
- MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
- THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
- THE ABSORB-M SHOULD BE LOCATED APPROXIMATELY PARALLEL WITH THE BARRIER.
- THE USE OF THE ABSORB-M IS RESTRICTED TO A BARRIER HEIGHT OF UP TO 42 INCHES.
- DO NOT ADD WATER TO FRONT ELEMENT (TL-2 OR TL-3 UNIT).

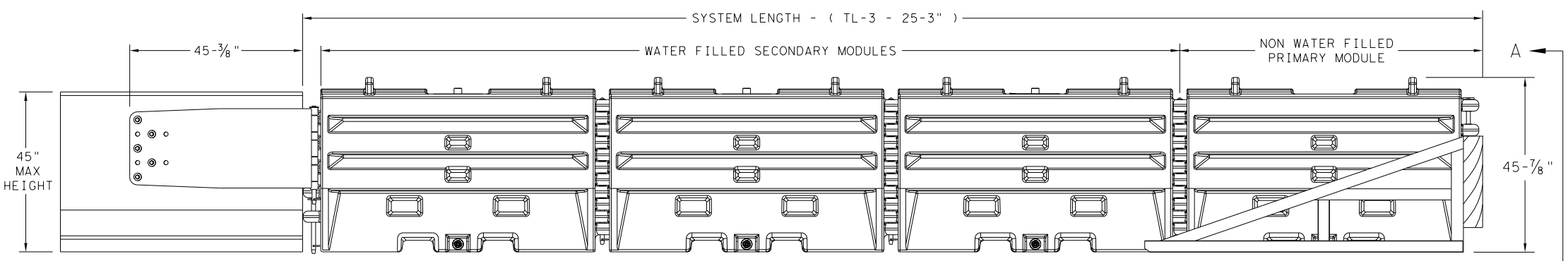
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		Design Division Standard	
LINDSAY TRANSPORTATION SOLUTIONS CRASH CUSHION (MASH TL-3 & TL-2) TEMPORARY - WORK ZONE ABSORB (M) - 19			
FILE: absorbm19	DN: TxDOT	CK: KM	DW: VP
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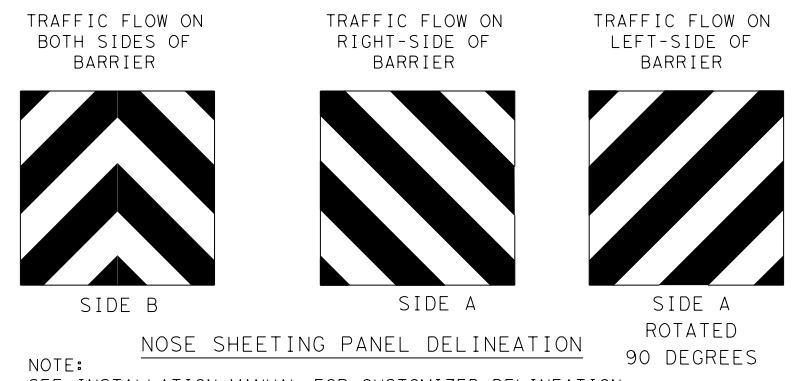
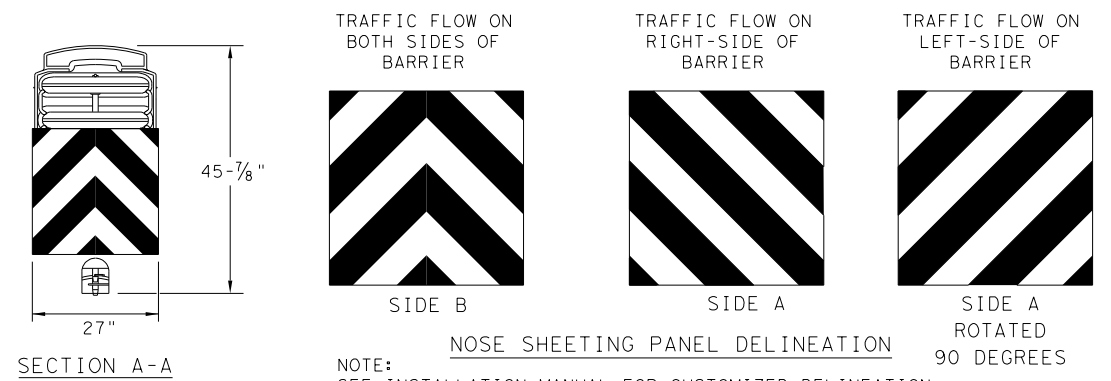


PLAN VIEW



ELEVATION VIEW

- GENERAL NOTES**
- REFER TO THE INSTALLATION MANUAL FOR SPECIFIC SYSTEM ASSEMBLY AND MODULE ORIENTATION. FOR ADDITIONAL INFORMATION, CONTACT TRAFFIX, INC. AT (949) 361-5663.
 - 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.
 - MAXIMUM PERMISSIBLE CROSS SLOPE IS 8° (DEGREES) (14%).
 - THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
 - 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

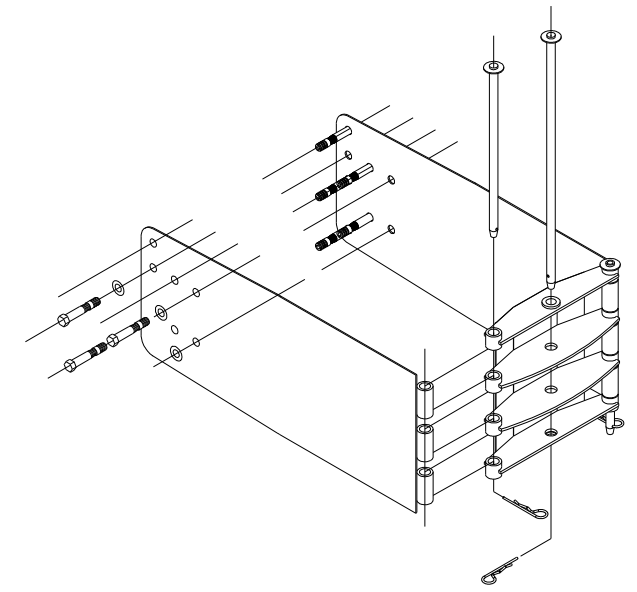


NOTE: SEE INSTALLATION MANUAL FOR CUSTOMIZED DELINEATION NOSE SHEETING FOR DECAL PLACEMENT.

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

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



SLED TRANSITION COMPONENTS FOR ATTACHMENT TO CMB

NOTE: SEE MANUFACTURER'S INSTALLATION MANUAL FOR FURTHER DETAILS.

NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE SLED, IT IS NOT INTENDED TO REPLACE THE INSTALLATION INSTRUCTIONS MANUAL.

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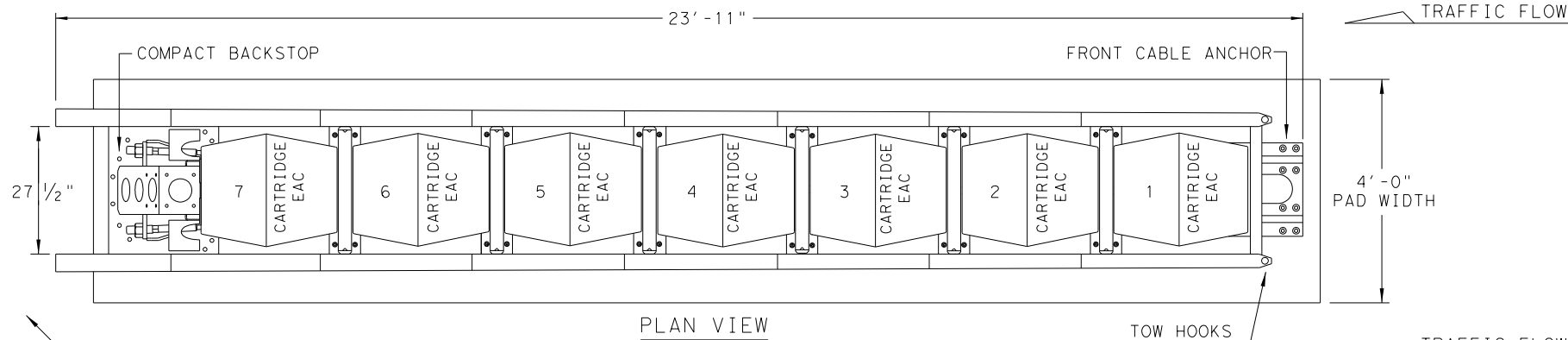
SLED
CRASH CUSHION
TL-3 MASH COMPLIANT
(TEMPORARY, WORK ZONE)
SLED-19

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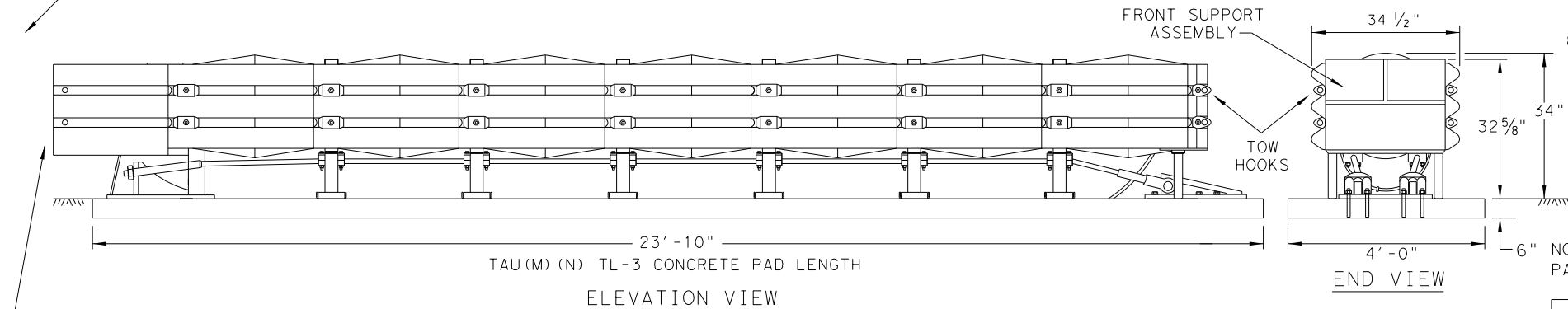
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TAU(M) (N) TL-3 SYSTEM LENGTH VARIES WITH TRANSITION TYPE



NOTE:
 TAU(M) (N) TL-2 SYSTEM CONTAINS (4) TYPE B (EAC) CARTRIDGES,
 INSTALLED ON ROADWAYS WITH MAXIMUM SPEEDS OF 45 MPH.



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.

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.

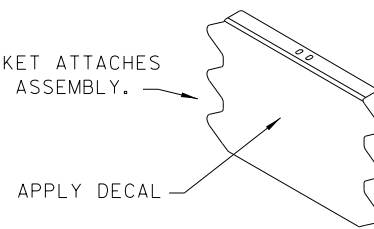
NOTE:
 SEE MANUFACTURER'S INSTALLATION INSTRUCTION MANUAL FOR FOUNDATION
 SPECIFICATIONS THAT INCLUDE, STONE AGGREGATE MIX, COMPRESSION
 STRENGTH, STEEL SIZE, ANCHOR SIZE, AND EMBEDMENT DEPTH.

TRANSITION OPTIONS	
USE THE COMPACT BACKSTOP	VERTICAL WALL
	CONCRETE TRAFFIC BARRIERS
	W-BEAM GUARDRAIL
	THRIE BEAM GUARDRAIL

NOTE:
 FOR BI-DIRECTIONAL TRANSITION PANELS AND BRIDGE RAIL END SHOE
 DETAILS. SEE MANUFACTURER'S INSTALLATION INSTRUCTIONS MANUAL.

* * 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

GENERAL NOTES

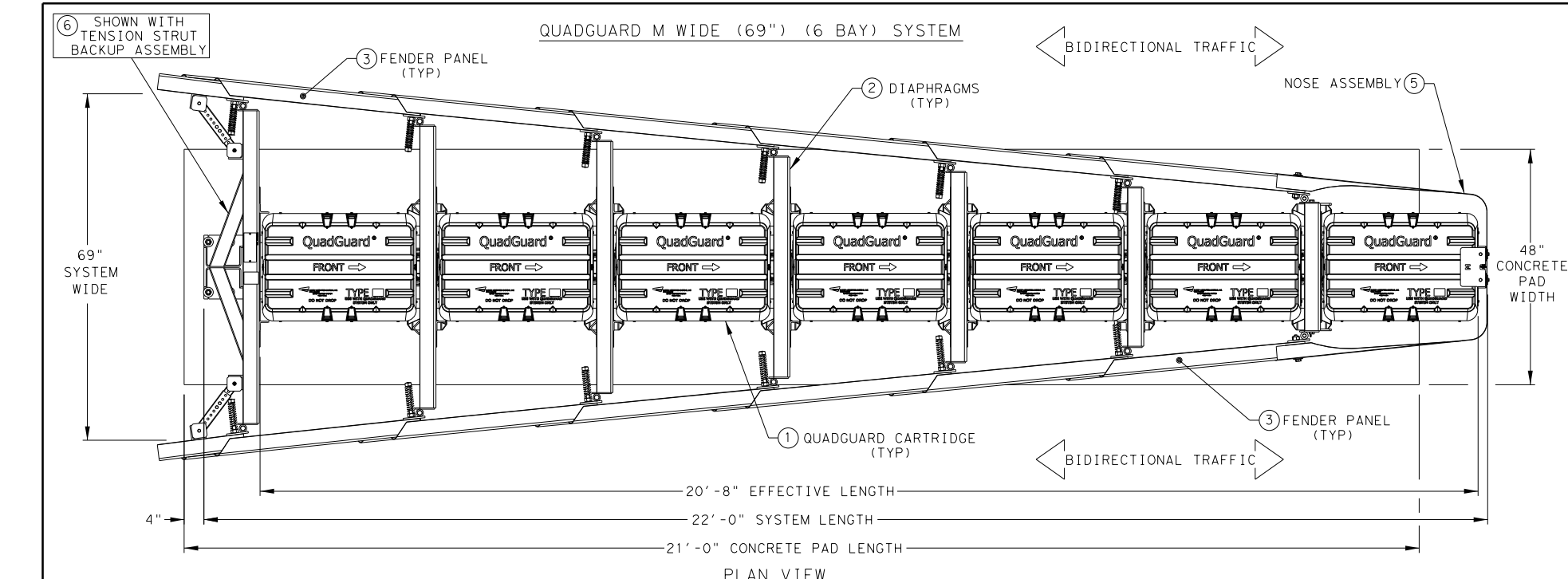
- FOR SPECIFIC INFORMATION REGARDING THE INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800. 180 RIVER ROAD, RIO VISTA, CA 94571
- REFER TO THE LATEST (LTS) INSTALLATION INSTRUCTION MANUAL FOR IMPORANTANT SAFETY 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:
 PAD THICKNESS VARIES - SEE FOUNDATION OPTIONS

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

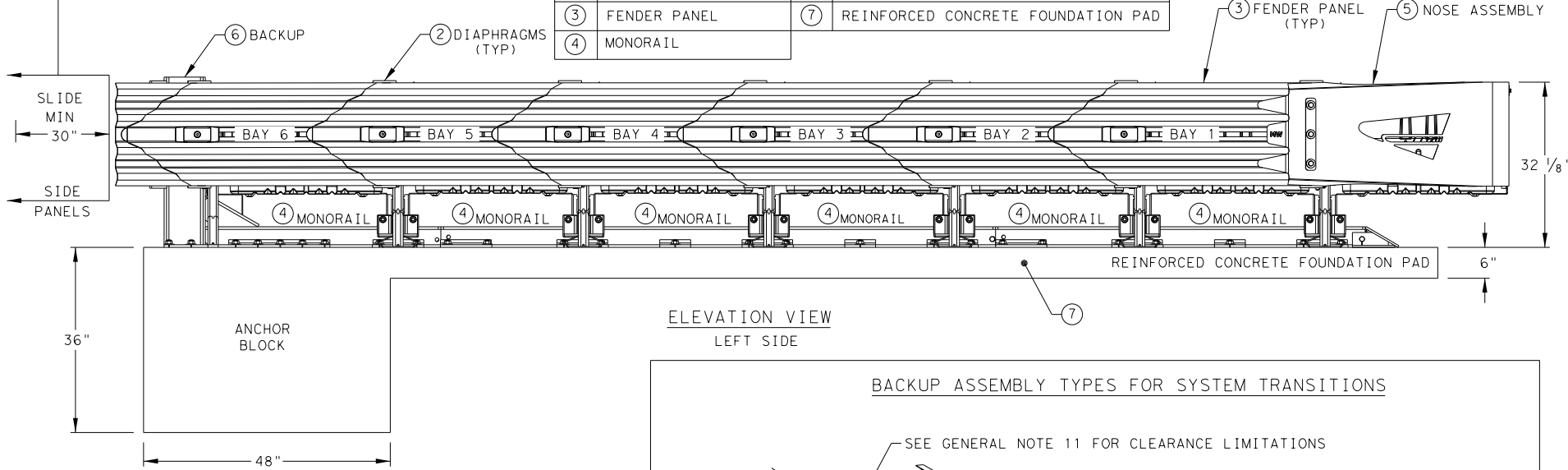
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LINDSAY TRANSPORTATION SOLUTIONS UNIVERSAL CRASH CUSHION (MASH TL-3 & TL-2) TAU(M) (N) - 19			
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KEY	DESCRIPTION	KEY	DESCRIPTION
①	QUADGUARD CARTRIDGE	⑤	NOSE ASSEMBLY
②	DIAPHRAGM	⑥	TYPE OF BACKUP
③	FENDER PANEL	⑦	REINFORCED CONCRETE FOUNDATION PAD
④	MONORAIL		

NOTE: PROVISION SHALL BE MADE FOR REAR FENDER SIDE PANELS TO SLIDE REARWARD UPON IMPACT, 30" 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 M WIDE 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 M WIDE 6-BAY SYSTEM TESTED TO MASH TL-3.

TL-3 MODEL #	QM10069 (627515)	CARTRIDGE TYPES IN BAYS	
BAYS	6	TYPE I	TYPE II
DIAPHRAGMS	6	4	3
WIDTH	69"	REAR	FRONT

BACKUP ASSEMBLY TYPES FOR SYSTEM TRANSITIONS

SEE GENERAL NOTE 11 FOR CLEARANCE LIMITATIONS

⑥ TENSION STRUT BACKUP

SYSTEM TRANSITIONS TYPES	
1	QUAD-BEAM TO W-BEAM RAIL
2	QUAD-BEAM TO THRIE-BEAM RAIL
3	QUAD-BEAM TO CONCRETE SAFETY BARRIER
4	QUAD-BEAM TO SINGLE SLOPE BARRIER
5	QUAD-BEAM TO CONCRETE END SHOE
6	QUAD-BEAM TO CONCRETE BRIDGE RAIL

NOTE: TRANSITION ASSEMBLIES FOR THE QUADGUARD M WIDE TO THRIE-BEAM OR W-BEAM FENCE REQUIRES I-BEAM POSTS: ALL POSTS W6X8.5/9 I-BEAMS (78" 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.

GENERAL NOTES

- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY - ENERGY ABSORPTION INC. AT 1(888)323-6374 OR WEBSITE www.trinityhighway.com.
- SEE THE RECENT QUADGUARD M WIDE PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITATIONS AND THE DRAWING PACKAGE FOR THE SIX (6) BAY WIDE [69"] SYSTEM BEFORE INSTALLING THE QUADGUARD M WIDE AT ANY GIVEN LOCATION.
- COMPONENTS FOR THE QUADGUARD M WIDE BACKUP AND REINFORCING DETAILS ARE SHOWN ON THE QUADGUARD M WIDE PRODUCT DESCRIPTION & ASSEMBLY MANUAL.
- THE INSTALLATION AREA SHOULD BE FREE OF CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
- FOR PERMANENT APPLICATIONS, QUADGUARD M WIDE SHOULD BE ASSEMBLED ON AN EXISTING OR FRESHLY PLACED AND CURED CONCRETE BASE 28MPa [4,000 PSI] MINIMUM. QUADGUARD M WIDE SYSTEM MAY ALSO BE ASSEMBLED ON REINFORCED OR NON-REINFORCED CONCRETE ROADWAY (MINIMUM 8" THICK).
- 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%.
- FOR BI-DIRECTIONAL TRAFFIC: THE LOCATION AND OR WIDTH OF THE QUADGUARD M WIDE IS RESTRICTED. AS BI-DIRECTIONAL TRAFFIC APPROACHES THE REAR OF THE QUADGUARD M WIDE, THE QUADGUARD M WIDE SHOULD NOT EXTEND FURTHER INTO THE TRAFFIC-SIDE OF THE BARRIER THAN THE OBSTACLE. ANY TRANSITION INSTALLED MUST EITHER BE TANGENT TO BOTH QUADGUARD M WIDE 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 M WIDE SYSTEM IS SHIELDING. SEE THE QUADGUARD M WIDE PRODUCT DESCRIPTION & ASSEMBLY MANUAL FOR FURTHER DETAILS.
- THE QUADGUARD M WIDE 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.
- THE WIDE QUADGUARD M WIDE SYSTEM IS ONLY AVAILABLE IN A 69" WIDTH AND HAS A 6-BAY SYSTEM THAT HAS BEEN TESTED TO MASH TEST LEVEL 3.
- IF THE OUTSIDE WIDTH OF OBSTACLE(S) BEING SHIELDED IS 53" OR GREATER, THE OUTSIDE OF OBSTACLE(S) MUST BE CHAMFERED. SEE THE QUADGUARD M WIDE PRODUCT DESCRIPTION & ASSEMBLY MANUAL FOR FURTHER DETAILS.
- SEE THE "QUADGUARD M WIDE SYSTEM PRODUCT MANUAL" FOR A DESCRIPTION OF ITS IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITATIONS BEFORE PLACING A SYSTEM AT A GIVEN SITE. INFORMATION AND COPIES OF ABOVE MANUAL ARE AVAILABLE BY CALLING CUSTOMER SERVICE DEPARTMENT AT (888) 323-6374.

FOUNDATION & ANCHORING REQUIREMENTS	
FOUNDATION TYPES: A & B	
FOUNDATION TYPE: A	REINFORCED CONCRETE PAD OR ROADWAY
FOUNDATION:	6" MINIMUM DEPTH WITH ANCHOR BLOCK (P.C.C.)
ANCHORAGE:	7" STUDS EMBEDDED 5 1/2" - APPROVED ADHESIVE
FOUNDATION TYPE: B	REINFORCED OR NON-REINFORCED CONCRETE PAD OR ROADWAY
FOUNDATION:	8" MINIMUM DEPTH (P.C.C.)
ANCHORAGE:	7" STUDS EMBEDDED 5 1/2" - APPROVED ADHESIVE

KEY:
COMPACTED SUBBASE (C.S.)
PORTLAND CEMENT CONCRETE (P.C.C.)

NOTE: SEE TRINITY'S PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR THE APPROVED ADHESIVE.

TENSION STRUT BACKUP MAY NOT BE USED IN ASPHALT CONCRETE (A.C.). SEE TRINITY'S PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR MORE INFORMATION.

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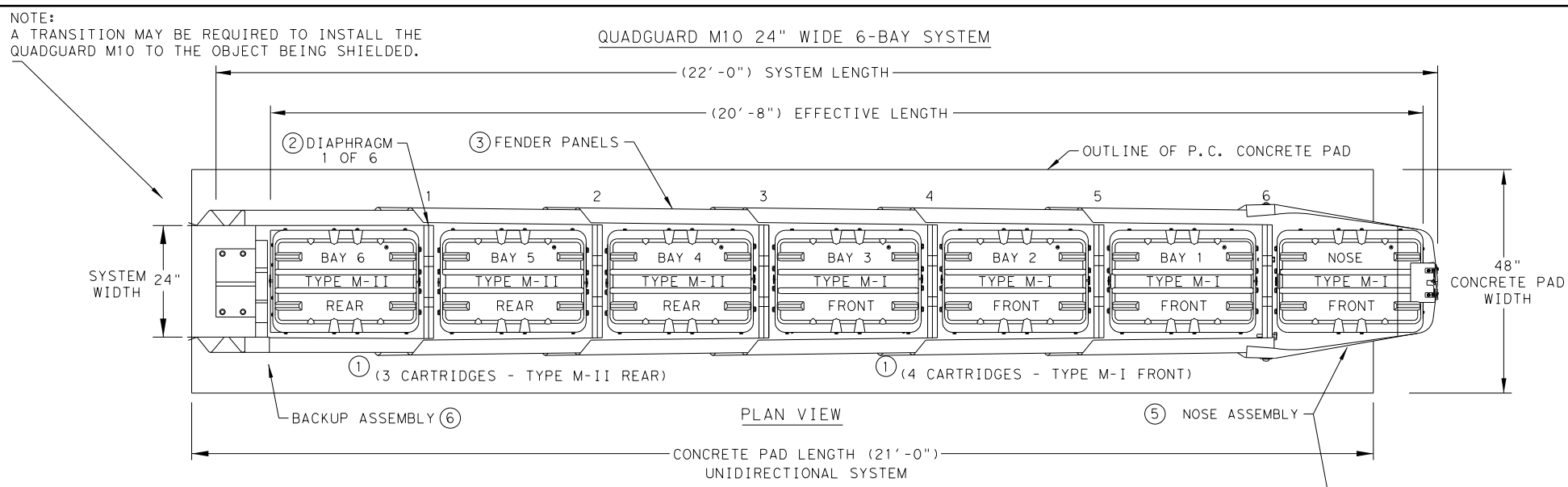
Texas Department of Transportation

TRINITY HIGHWAY ENERGY ABSORPTION QUADGUARD M WIDE (MASH TL-3) QG (M) (W) -21

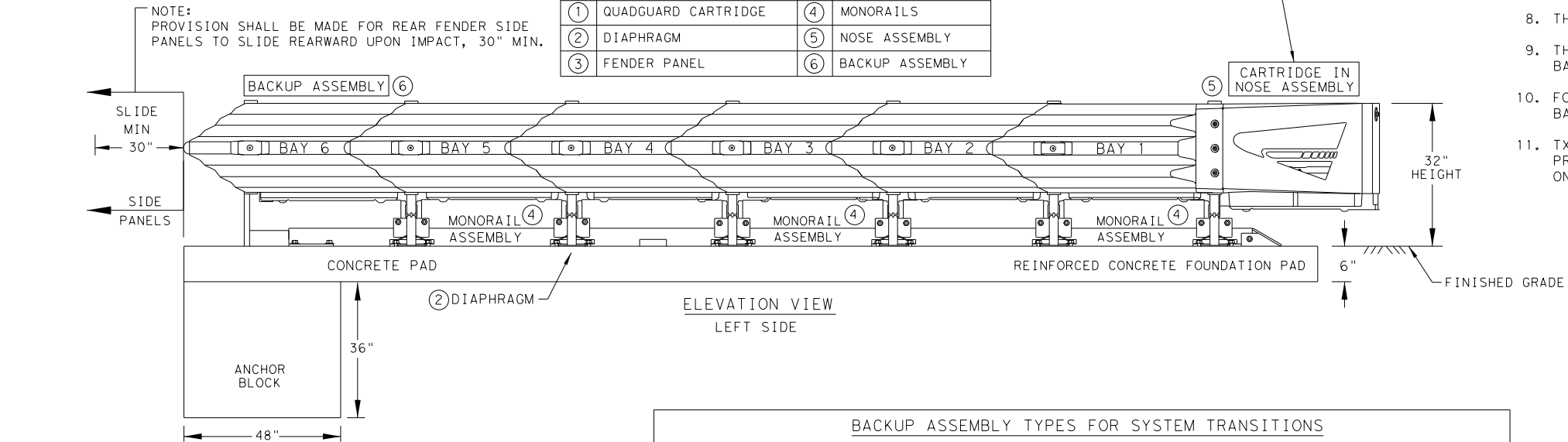
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© TxDOT: JULY 2021	CONT: 3136	SECT: 01	JOB: 200	HIGHWAY: SL 1
REVISIONS	DIST: AUS	COUNTY: TRAVIS	SHEET NO. 33	

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KEY		KEY	
1	QUADGUARD CARTRIDGE	4	MONORAILS
2	DIAPHRAGM	5	NOSE ASSEMBLY
3	FENDER PANEL	6	BACKUP ASSEMBLY



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

NOTE: PROVISION SHALL BE MADE FOR REAR FENDER SIDE PANELS TO SLIDE REARWARD UPON IMPACT, 30" 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 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.

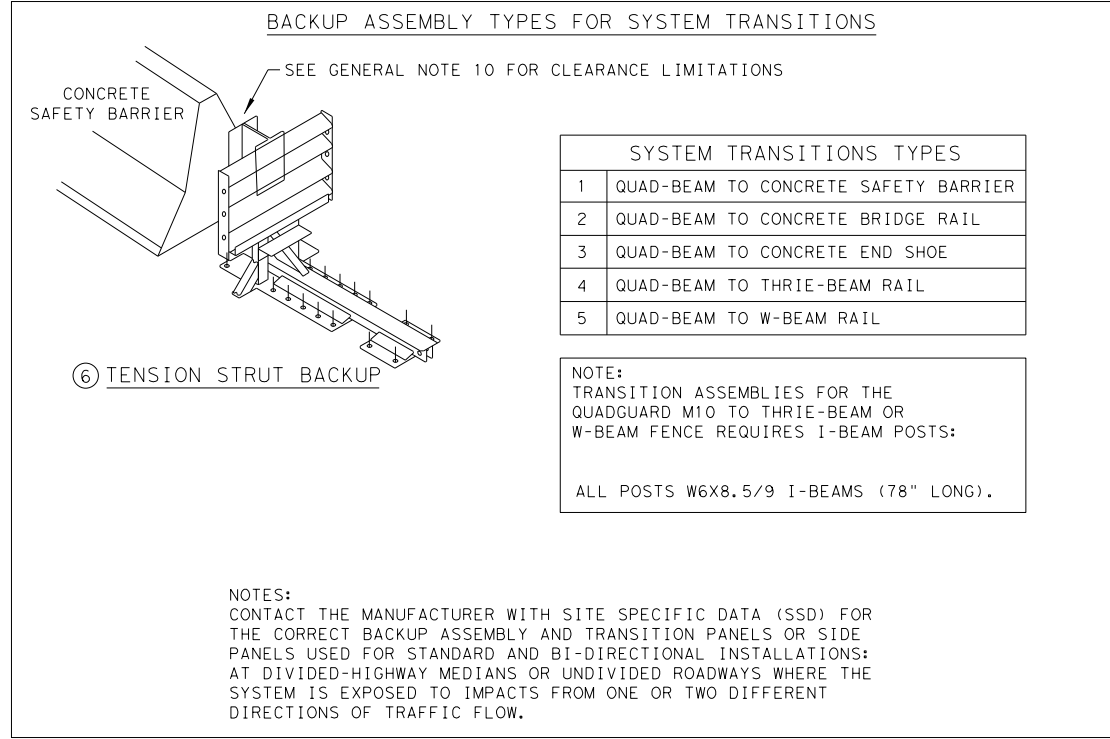
8" NON-REINFORCED CONCRETE PAD MAY NOT REQUIRE AN ANCHOR BLOCK, IF THE PAD IS INSTALLED AGAINST AN IMMOVABLE CONCRETE BACKUP.

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	CARTRIDGE TYPES IN BAYS		
BAYS	6	TYPE-MII	TYPE-MI	TYPE-MI
DIAPHRAGMS	6	3	3	1
WIDTH	24"	REAR	FRONT	NOSE

TL-2 MODEL #	QM7024	CARTRIDGE TYPES IN BAYS		
BAYS	3	TYPE-MII	TYPE-MI	TYPE-MI
DIAPHRAGMS	3	1	2	1
WIDTH	24"	REAR	FRONT	NOSE



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 PLACEMENT OF THE QUADGUARD M10 IS RESTRICTED. AS BI-DIRECTIONAL TRAFFIC APPROACHES THE REAR OF THE QUADGUARD M10 THE CRASH CUSHION MUST BE PLACED SUCH THAT THE TRAFFIC SIDE OF CRASH CUSHION IS AT LEAST AS FAR FROM ADJACENT TRAVEL LANE LINE AS THE TRAFFIC SIDE OF BARRIER/OBJECT BEING SHIELDED.
- 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" - APPROVED ADHESIVE
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.

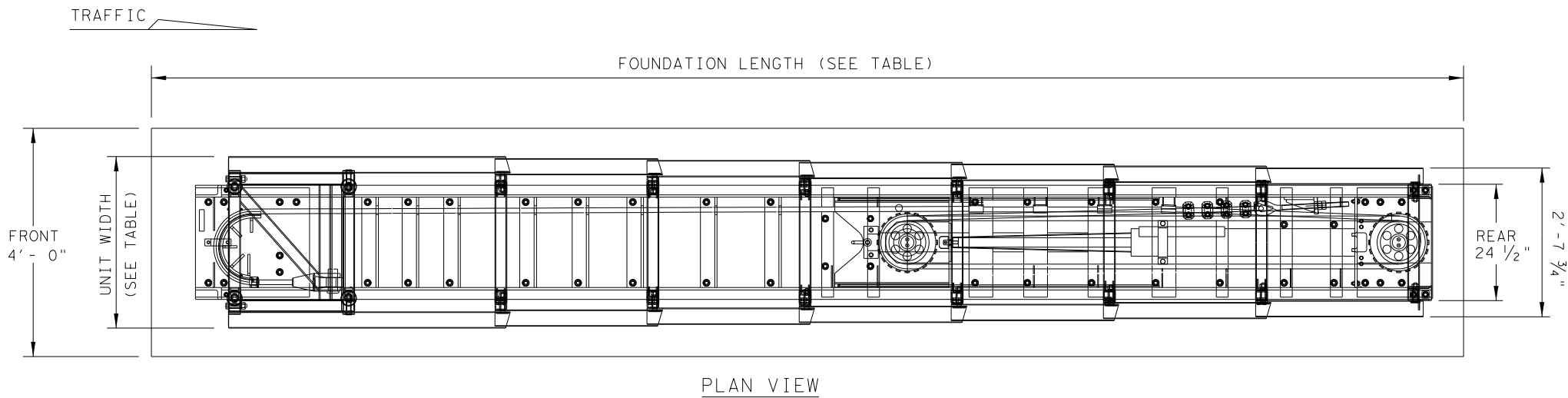
		Design Division Standard	
TRINITY HIGHWAY ENERGY ABSORPTION QUADGUARD M10 (MASH TL-3 & TL-2 NARROW-24" ONLY)			
QUADGUARD (M10) (N) - 20			
FILE: qguardm10n20.dgn	DN: TXDOT	CK: KM	DW: VP
© TXDOT: NOVEMBER 2020	CONT SECT	JOB	HIGHWAY
REVISIONS	3136 01	200	SL 1
	DIST	COUNTY	SHEET NO.
	AUS	TRAVIS	34

NOTE:
 THIS STANDARD IS A BASIC REPRESENTATION OF THE QUADGUARD M10 SYSTEM AND IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

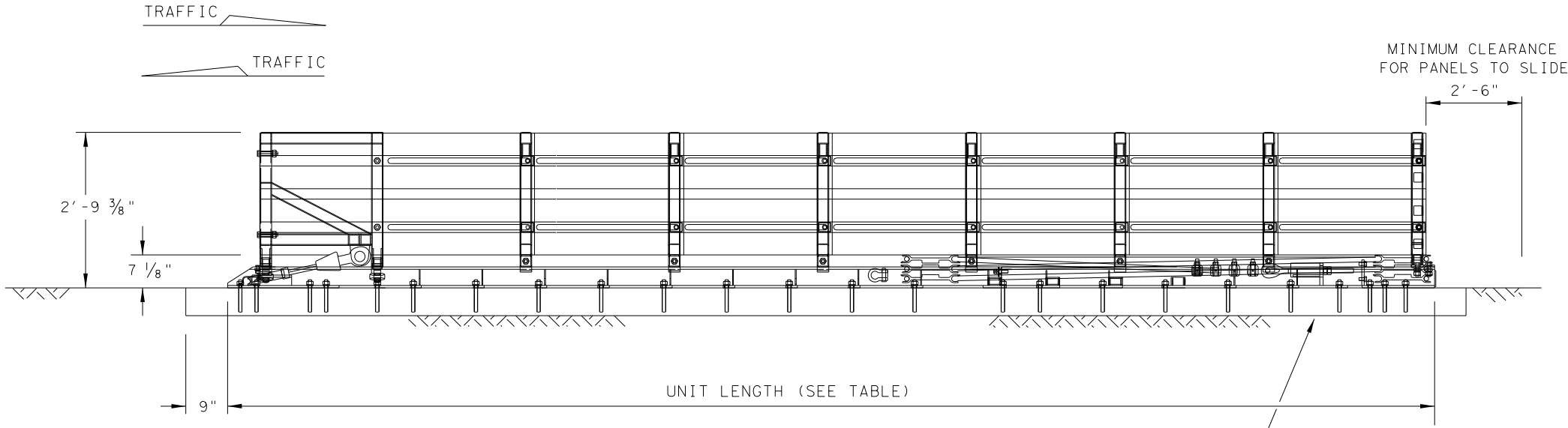
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PLAN VIEW



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.



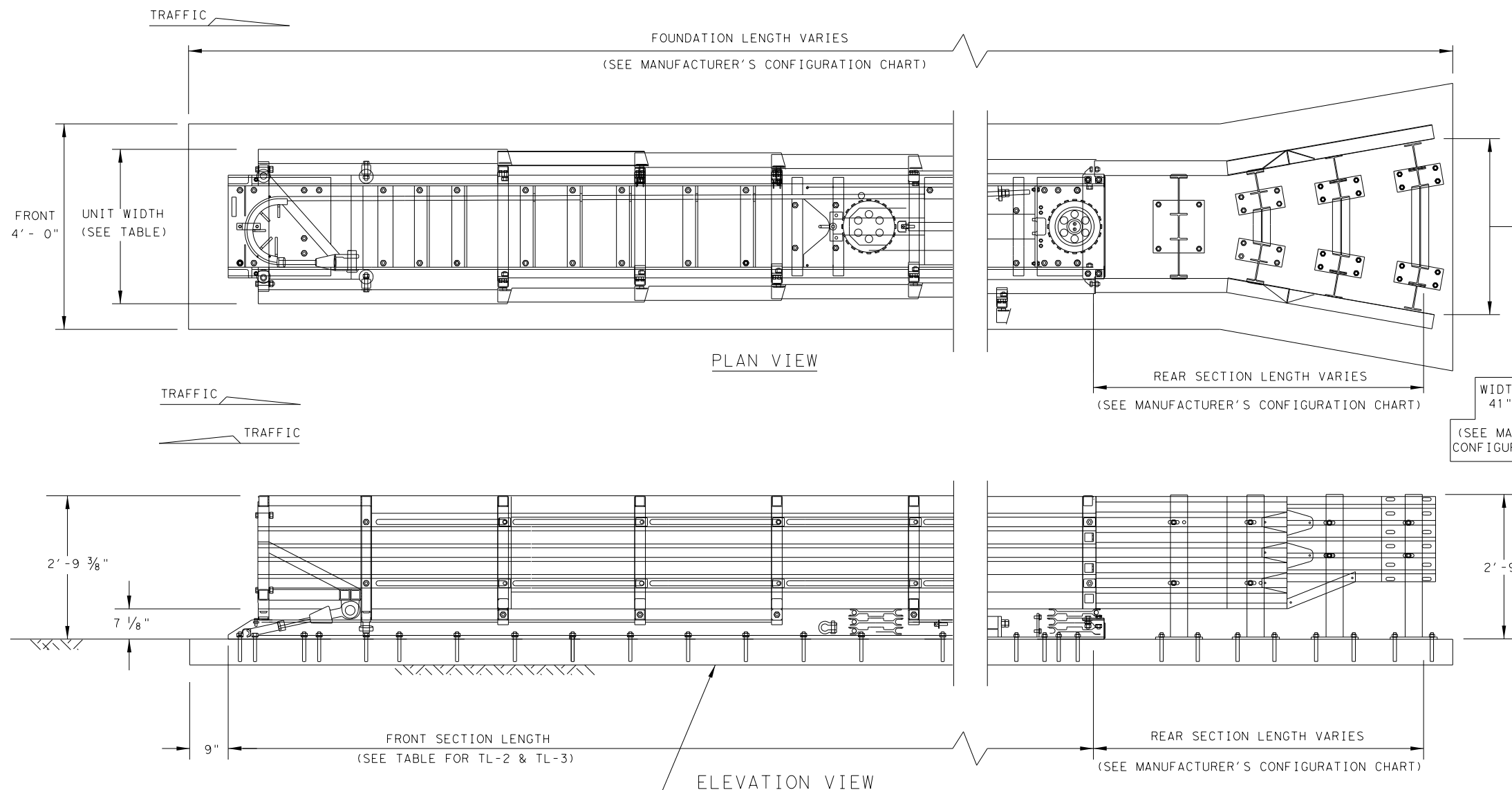
WORK AREA PROTECTION
 CORP
 (SMART-NARROW)
 SMTN(N) - 16

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REVISIONS	3136	01	200	SL 1
REVISED 06, 2013 (VP)	DIST	COUNTY	SHEET NO.	
REVISED 03, 2016 (VP)	AUS	TRAVIS	35	

LOW MAINTENANCE

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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 \mathcal{C} 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"

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
SCI170GM	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"

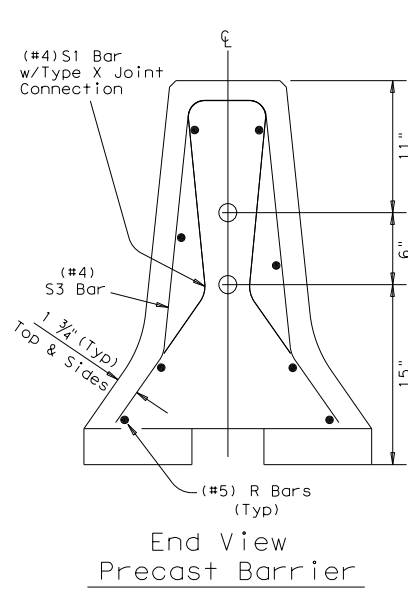
SYSTEM AND PAD LENGTHS VARY DEPENDING ON BACKUP TYPE.

LOW MAINTENANCE

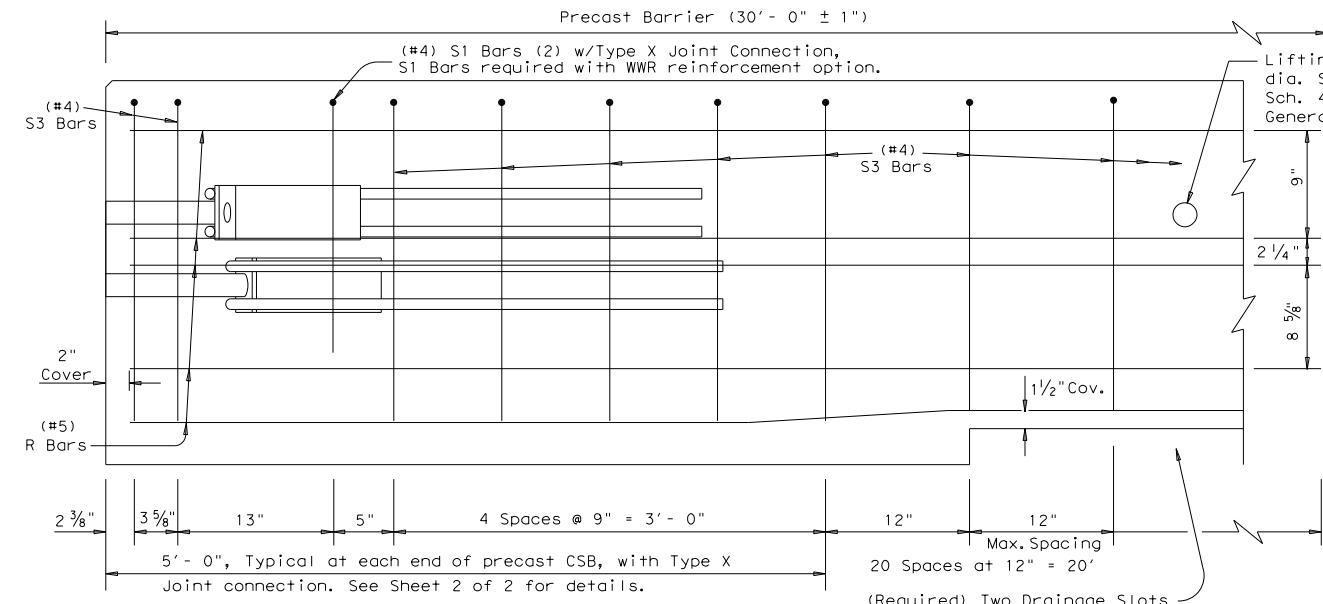
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WORK AREA PROTECTION CORP (SMART-WIDE)					
SMTC(W)-16					
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© TxDOT: FEBRUARY 2006	CONT	SECT	JOB	HIGHWAY	
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REVISED 06, 2013 VP		AUS		TRAVIS	36
REVISED 03, 2016 VP					
REVISED 04, 2018 VP					

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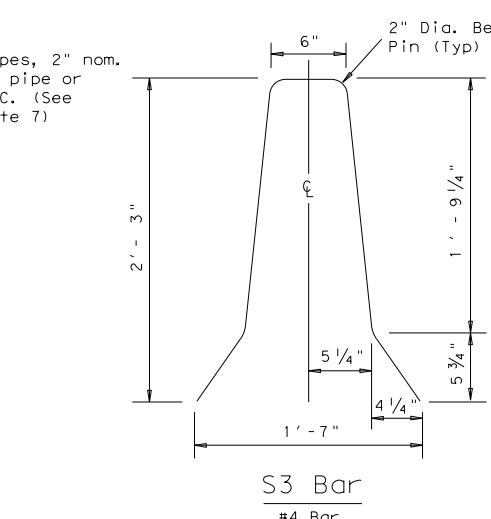
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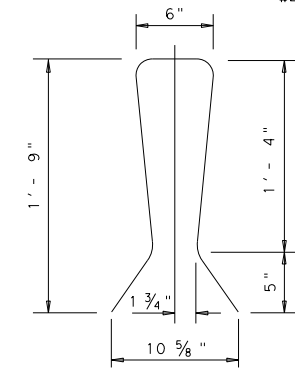
End View Precast Barrier
 See sheet 2 of 3 for Joint connection Type X



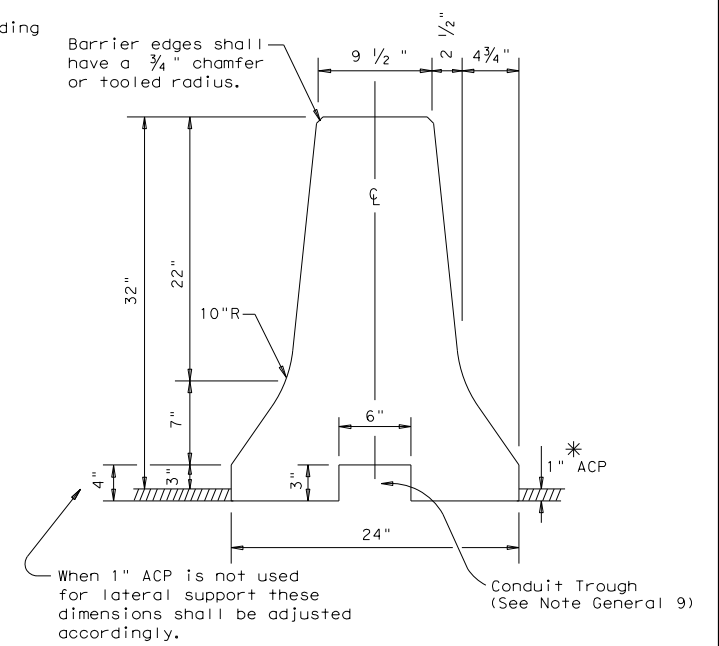
Reinforcement for Precast (CSB) Concrete Safety Barrier (Type 1)
 Showing reinforcement for Joint Type X



S3 Bar
 #4 Bar



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

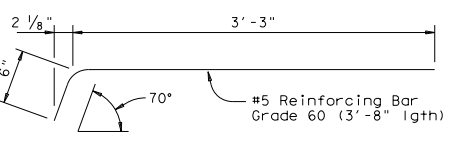


Concrete Safety Barrier

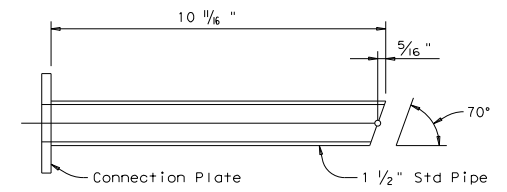
* When 1" ACP is "not" used as lateral support for permanent barrier placement. A permissible method of attaining the equivalent lateral support may be used, See CSB(6) sheet.

GENERAL NOTES

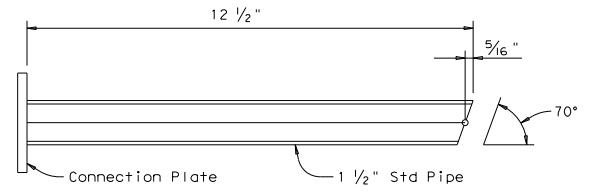
- Concrete shall be Class H with a minimum compressive strength of 3,600 psi.
- Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
- Precast barrier length shall be 30 ft. unless otherwise specified on the plans.
- All precast barrier edges shall have a 3/4" chamfer or tooled 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.



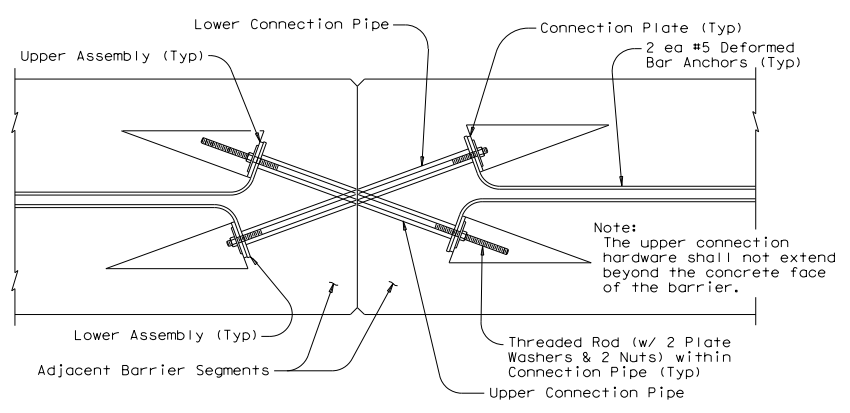
DEFORMED BAR ANCHOR DETAILS
 Two (2) Bars required per assembly. Eight (8) required per joint.



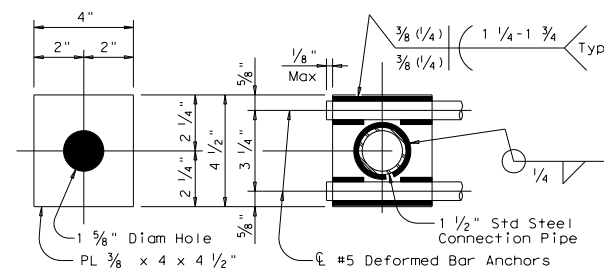
UPPER CONNECTION PIPE DETAILS
 One (1) Steel Pipe required per Upper Assembly. Two (2) required per joint.



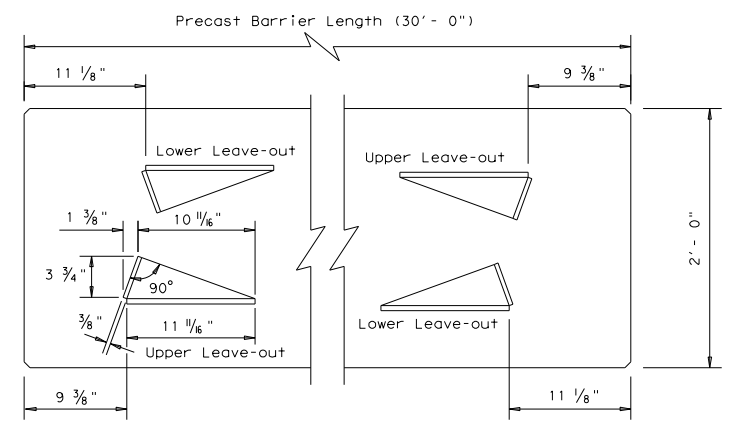
LOWER CONNECTION PIPE DETAILS
 One (1) Steel Pipe required per Lower Assembly. Two (2) required per joint.



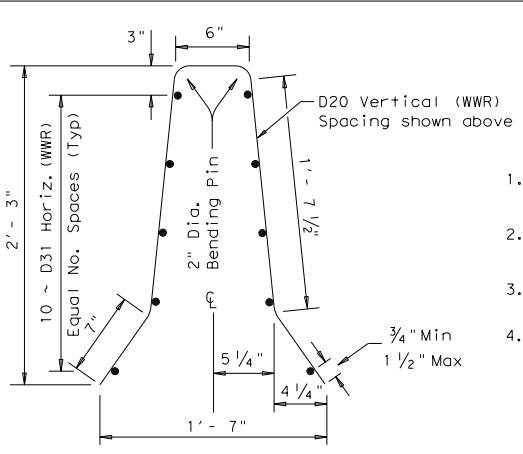
TYPE X JOINT INSTALLATION DETAIL
 Barrier reinforcing and Type X Joint Leave-Out dimensions not shown for clarity.



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.

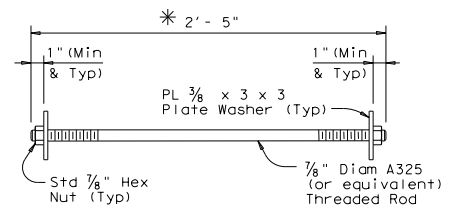


BARRIER PLAN AT END JOINTS



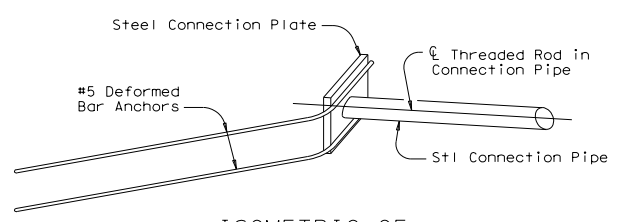
Welded Wire Reinforcement (WWR) Option for Bars R and S3
 (WWR) General Notes

- 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.



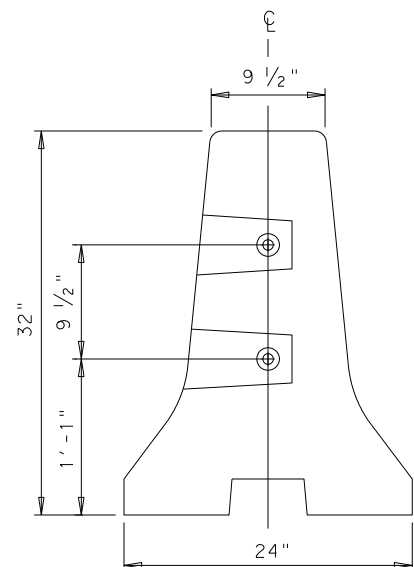
ISOMETRIC OF TYPICAL WELDED ASSEMBLY
 Four (4) [2 Upper & 2 Lower] Assemblies required per joint.

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

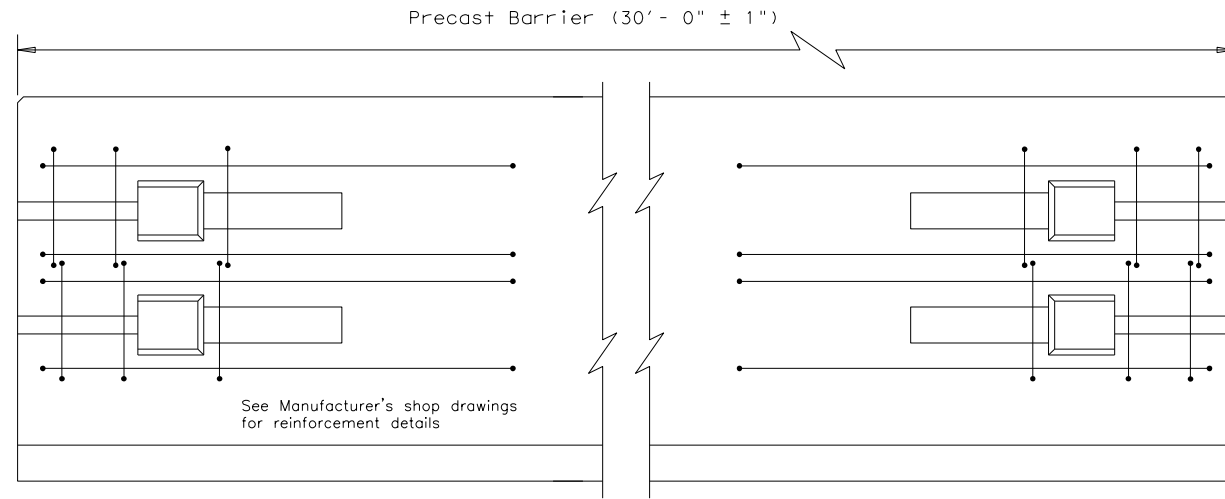
		Design Division Standard	
CONCRETE SAFETY BARRIER (F-SHAPE) PRECAST BARRIER (TYPE 1) CSB(1)-10			
FILE: csb110.dgn	DN: TxDOT	CK: AM	DW: BD
© TxDOT December 2010	CONT: 3136	SECT: 01	JOB: 200
REVISIONS	DIST: AUS	COUNTY: TRAVIS	HIGHWAY: SL 1
			SHEET NO.: 38

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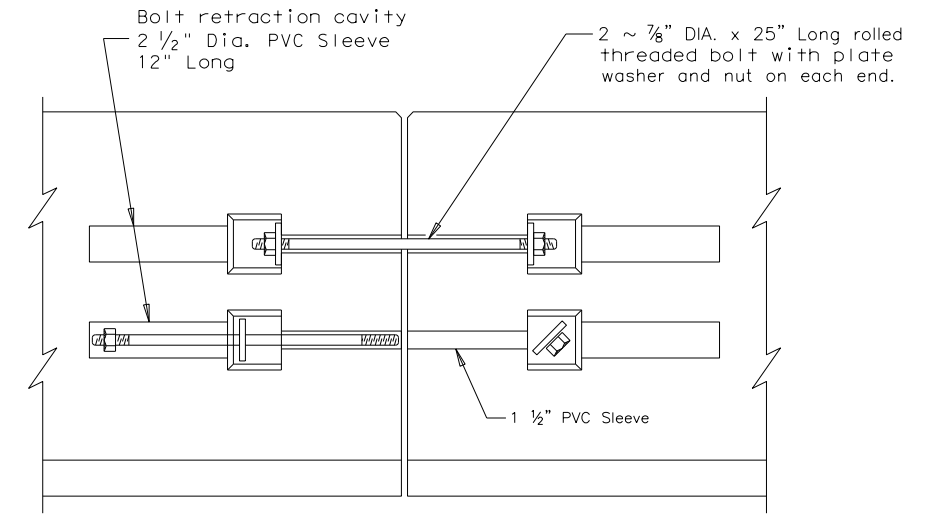
DATE: 6/13/2023 9:52:20 AM
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END VIEW (CSB) QUICK-BOLT
 QUICK-BOLT POCKET LOCATIONS

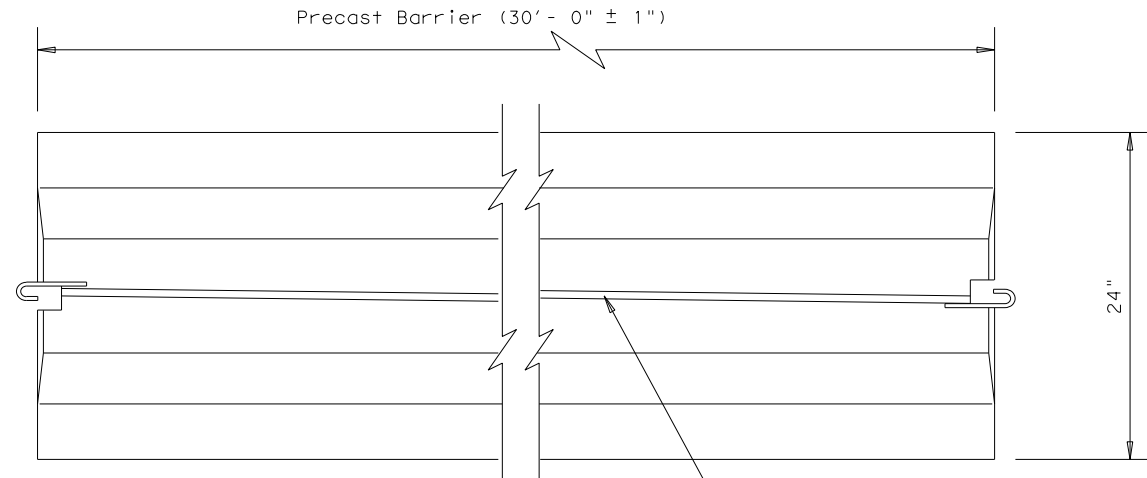


ELEVATION (CSB) QUICK-BOLT
 See Manufacturer's shop drawing for additional details

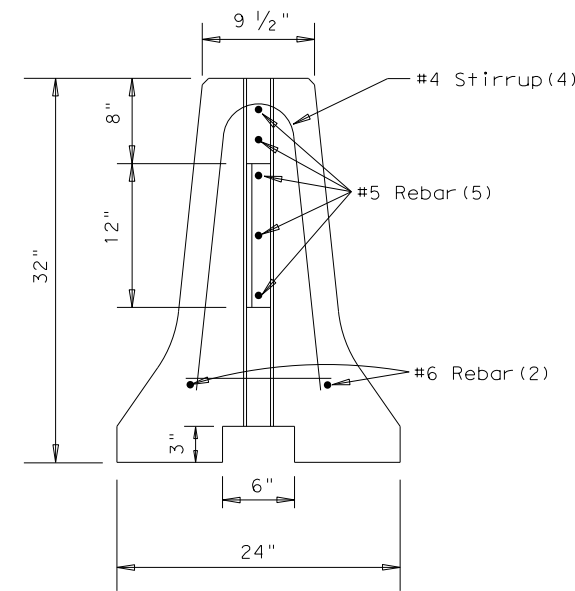


ELEVATION VIEW SHOWING JOINT CONNECTION
 "QUICK-BOLT"

Joint Connection (Type Q)

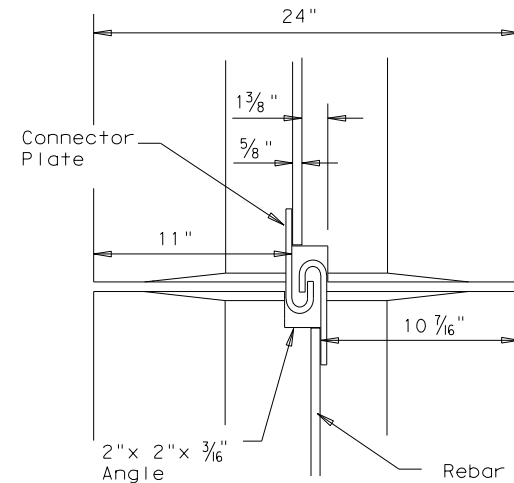


TOP VIEW
 PRECAST (CSB) WITH J-J HOOKS
 See Manufacturer's shop drawing for additional details



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

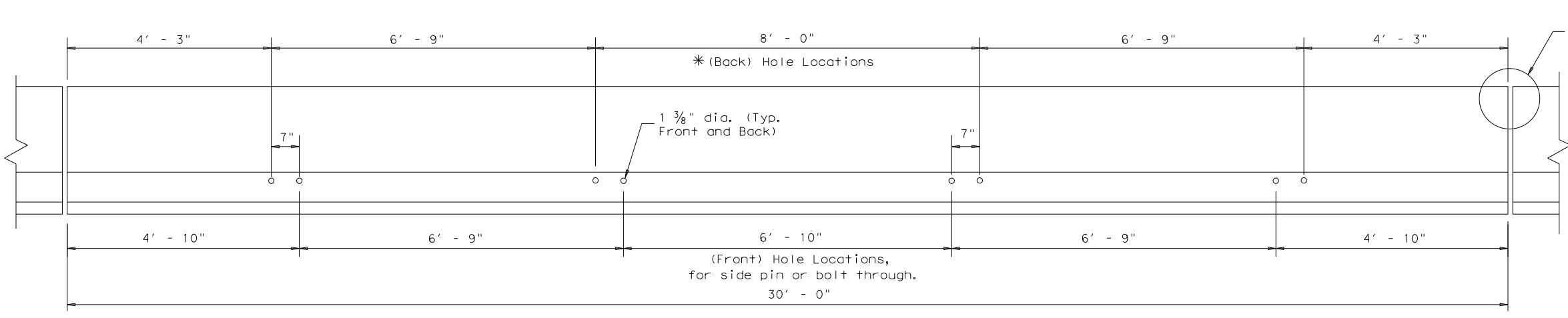
If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.

SHEET 2 OF 2

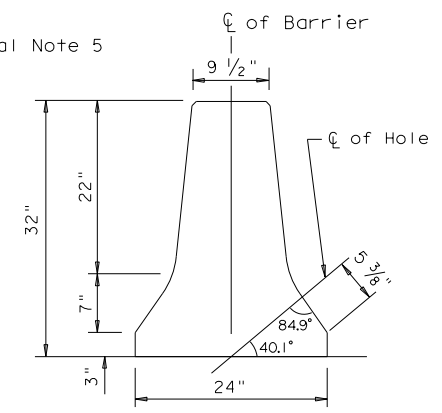
		Design Division Standard	
CONCRETE SAFETY BARRIER (F-SHAPE) PRECAST BARRIER (TYPE 1) CSB(1)-10			
FILE: csb110.dgn	DN: TxDOT	CK: AM	DW: BD
© TxDOT December 2010	CONT	SECT	JOB
REVISIONS	3136	01	200
DIST	COUNTY	SHEET NO.	
AUS	TRAVIS	39	

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DATE: 6/13/2023
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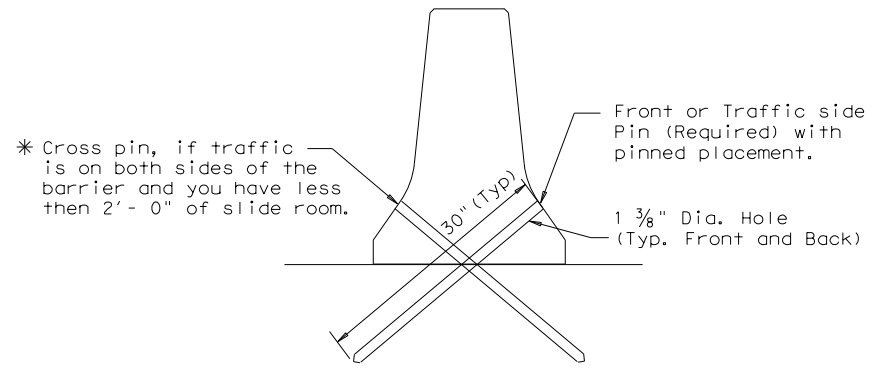
DETAIL 1



HOLE LOCATION DETAIL

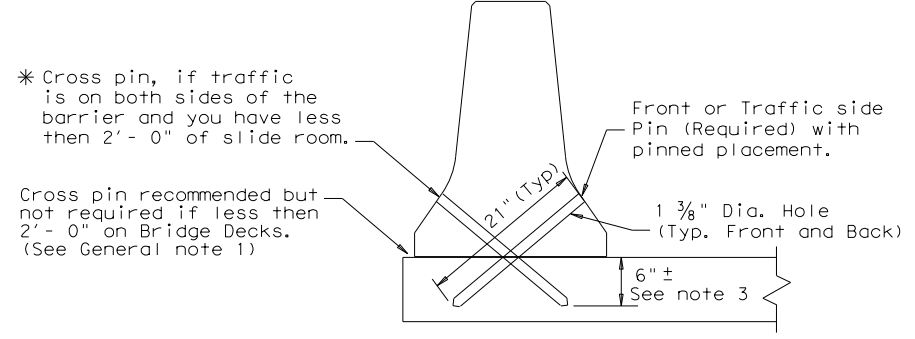
GENERAL NOTES

- 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" 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 CSB(1) standard sheets 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" 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."
- Provide galvanized bolts, nuts, and plate washers. All steel pins shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
- Weight of barrier is approx. 440 lbs per foot.



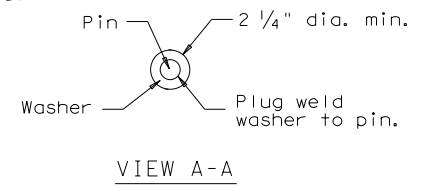
DETAIL 2

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



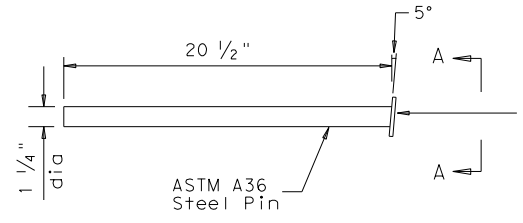
DETAIL 3

Bridge Deck or CRCP (21" pin required)

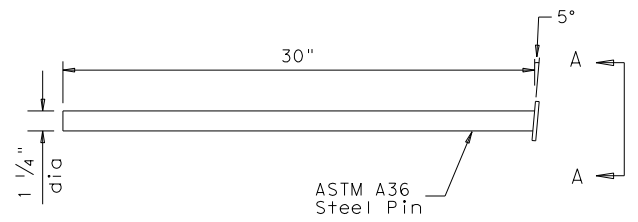


VIEW A-A

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

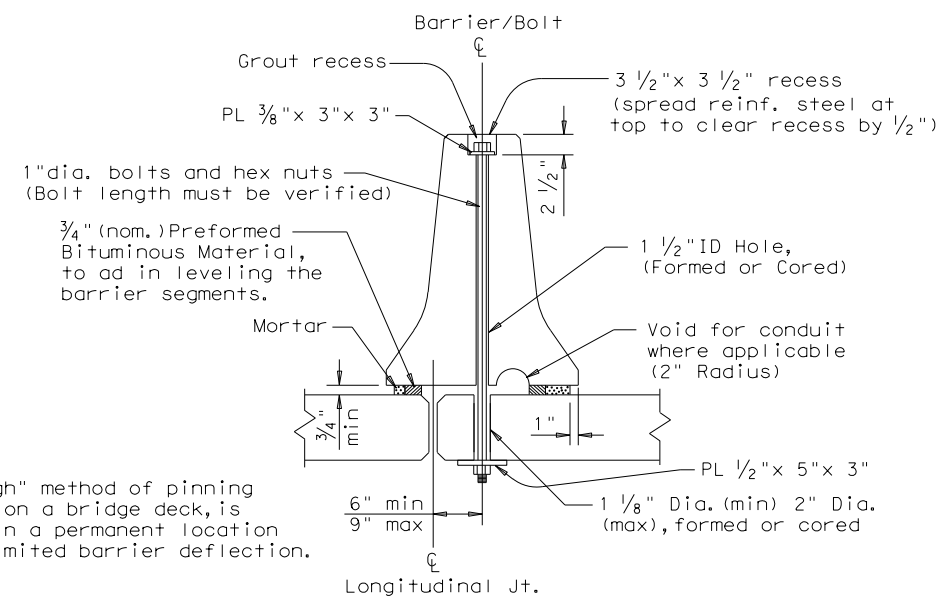


(30") PIN DETAIL
See Detail 2

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

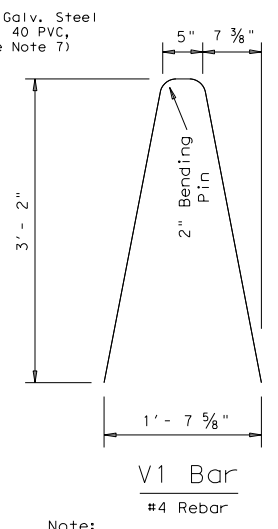
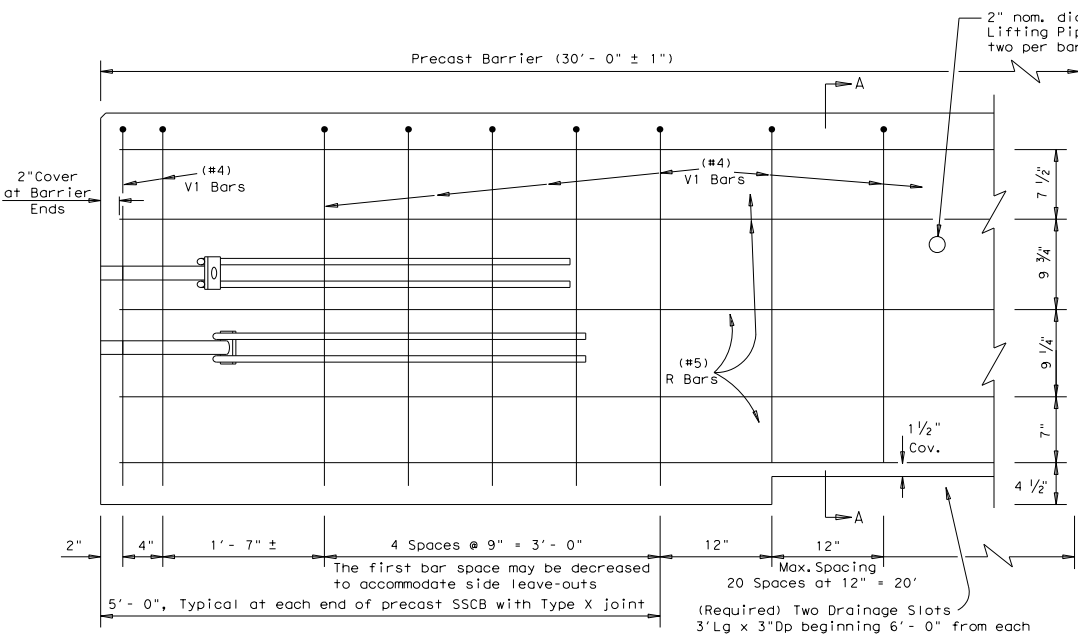
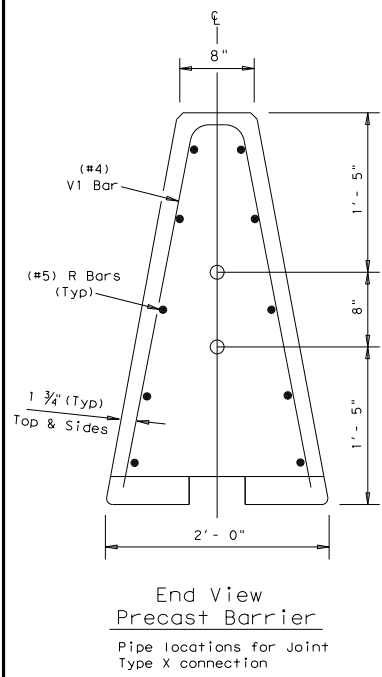
For bolt through locations, use the (Front) hole locations shown on Detail 1.



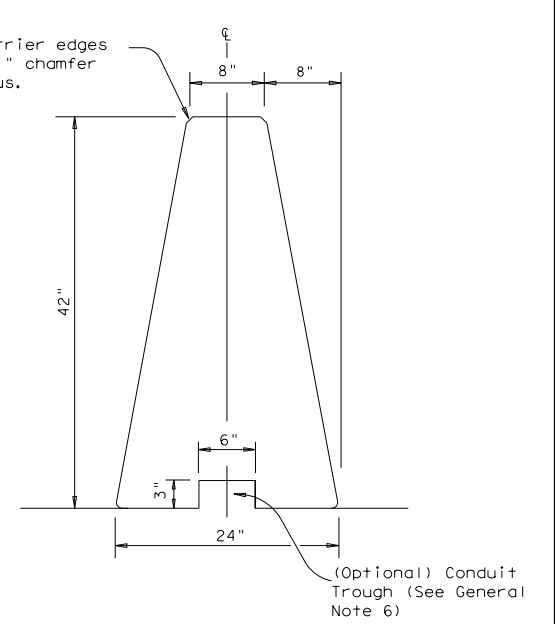
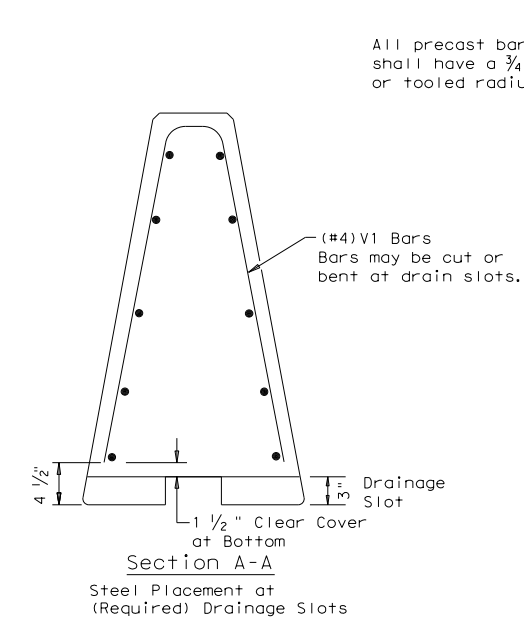
		Design Division Standard	
CONCRETE SAFETY BARRIER (F-SHAPE) PRECAST BARRIER (TYPE 1) PINNED PLACEMENT CSB(7)-10			
FILE: csb710.dgn	DN: TxDOT	CK: AM	DW: BD
© TxDOT December 2010	CONT: 3136	SECT: 01	JOB: 200
REVISIONS			HIGHWAY: SL 1
	DIST: AUS	COUNTY: TRAVIS	SHEET NO.: 40

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DATE: 6/13/2023
 FILE: P:\125\45\02\Design\Civil\Standards\TCP\sscb210.dgn



Note:
 V1 Bars above the drainage slots may be bent to accommodate 1 1/2 inch clear cover as directed by the Engineer.

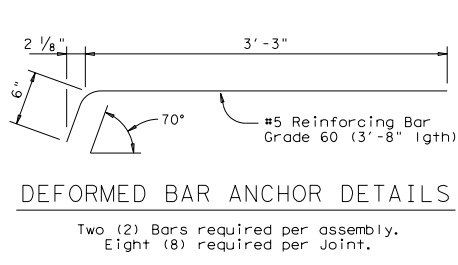


Single Slope Concrete Traffic Barrier
 Precast SSCB barrier may be connected to cast-in-place SSBC. The joint connection "Types" may be used in the cast-in-place barrier, to match the precast barrier connection.

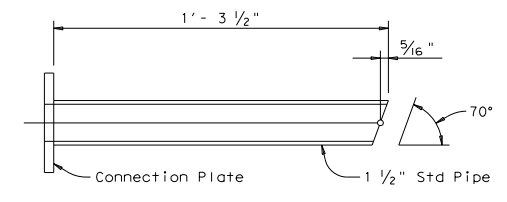
General Notes

- 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 a tooled radius.
- All concrete, reinforcement, joint connection systems, grout etc. as shown, are considered as part of the barrier pavement.
- Conduit trough when required shall be shown elsewhere on the plans, or as directed by the Engineer.
- 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.
- All steel assemblies shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."

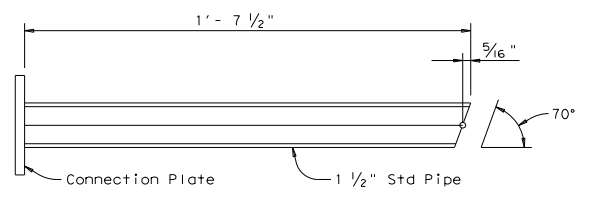
Weight of one precast 30 ft. (SSCB) segment = Approx. 10.5 Tons or 717 lbs per ft.



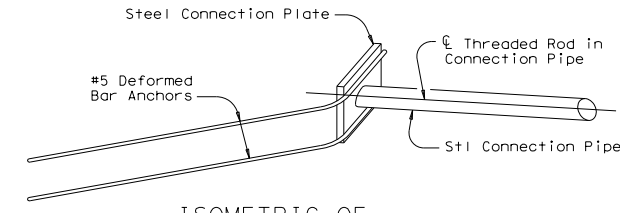
Two (2) Bars required per assembly. Eight (8) required per Joint.



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

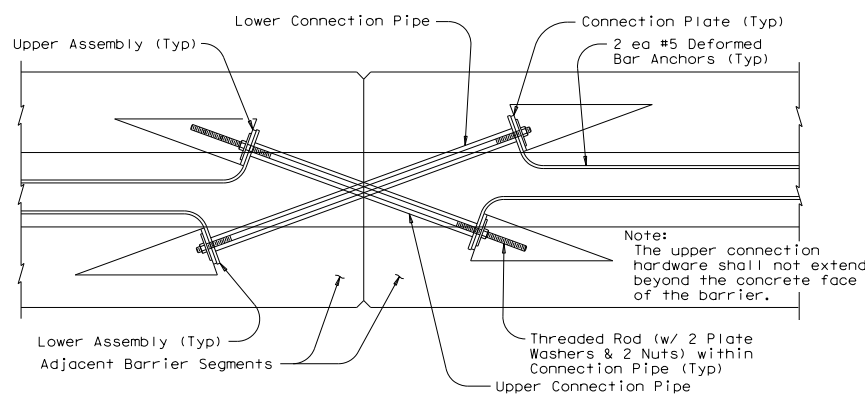


One (1) Steel Pipe required per Lower Assembly. Two (2) required per Joint.



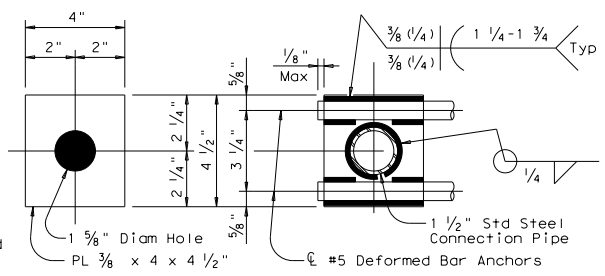
ISOMETRIC OF TYPICAL WELDED ASSEMBLY

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

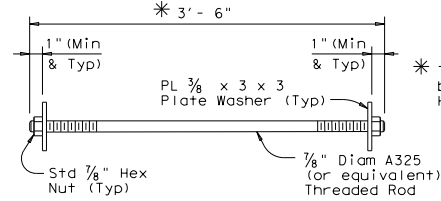


TYPE X JOINT INSTALLATION DETAIL

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



CONNECTION BOLT OR THREADED ROD DETAIL

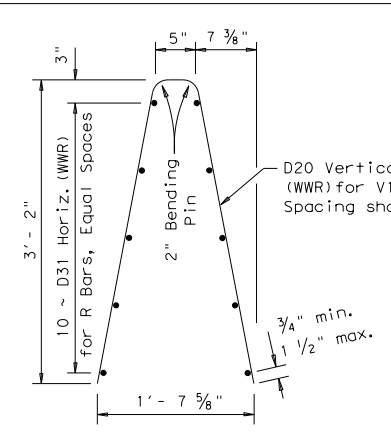


CONNECTION BOLT OR THREADED ROD DETAIL

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.

CONNECTION PLATE DETAILS

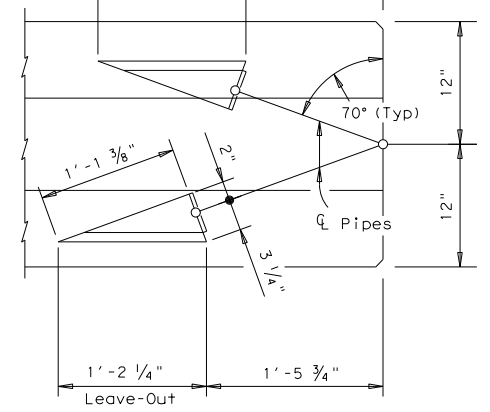
One (1) Plate required per assembly. Four (4) required per Joint. All steel fittings for joint Type X shall be galvanized after fabrication in accordance with Item 445.



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

(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 inches.

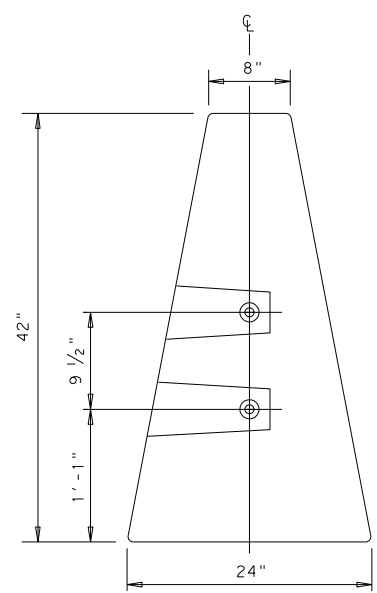


BARRIER PLAN AT JOINT

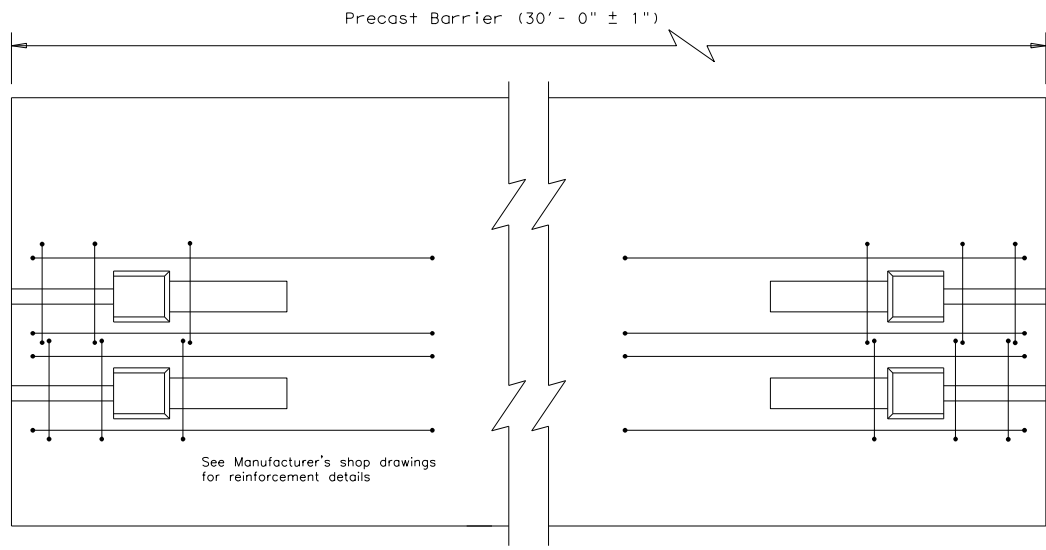
		Design Division Standard	
<h1>SINGLE SLOPE CONCRETE BARRIER</h1> <h2>PRECAST BARRIER (TYPE 1)</h2> <h3>SSCB (2) - 10</h3>			
FILE: sscb210.dgn	DN: TxDOT	CK: AM	DW: BD
© TxDOT December 2010	CONT: 3136	SECT: 01	JOB: 200
REVISIONS			HIGHWAY: SL 1
	DIST: AUS	COUNTY: TRAVIS	SHEET NO.: 41

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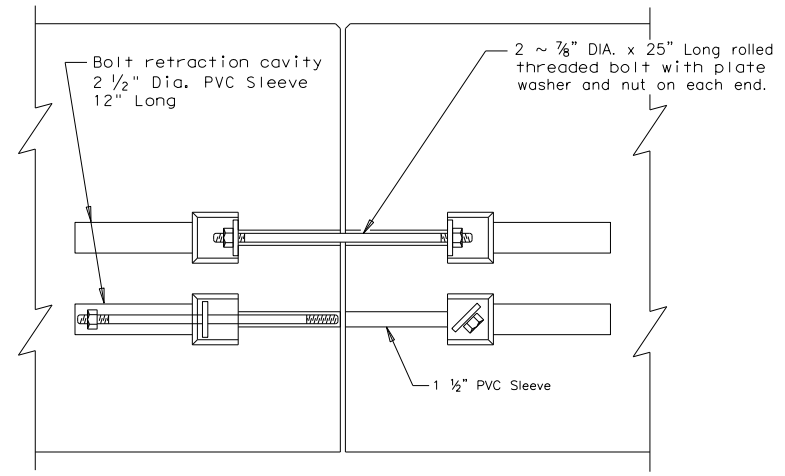
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END VIEW
"QUICK-BOLT" POCKET LOCATIONS

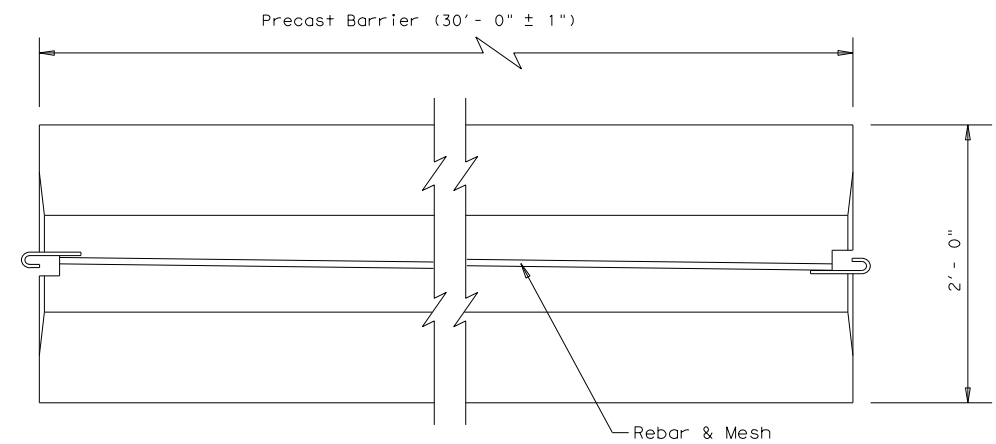


ELEVATION VIEW
"QUICK-BOLT" (SSCB)
See Manufacturer's shop drawing for additional details

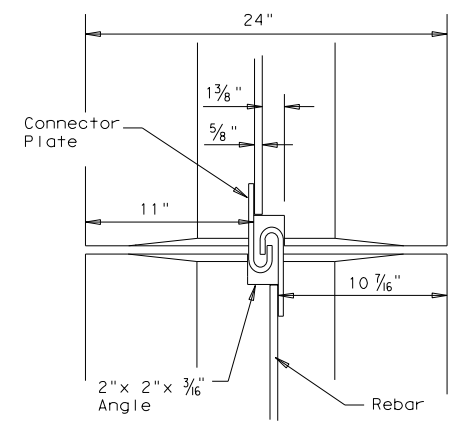


ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

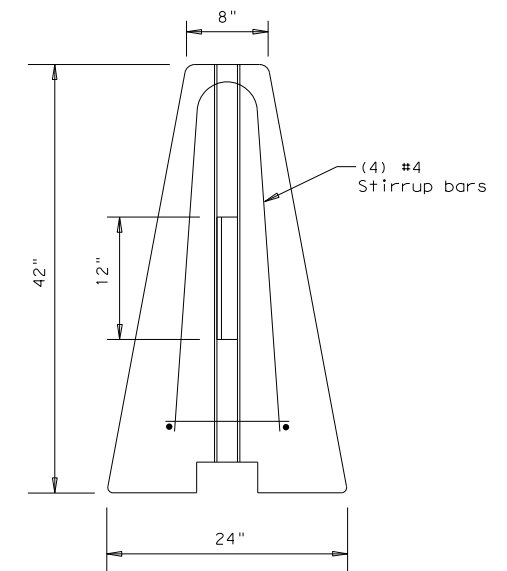
Joint Connection (Type Q)



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



VIEW FROM ABOVE
J-J HOOK CONNECTION



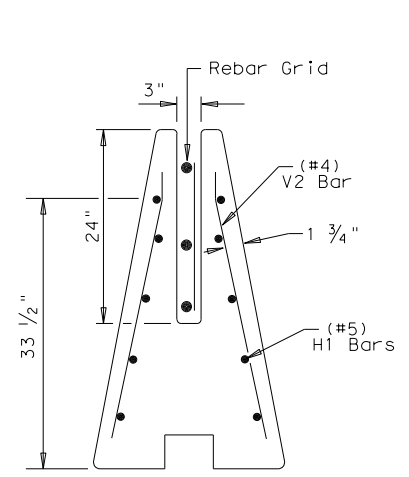
END VIEW

Proprietary Joint Connections (SSCB)

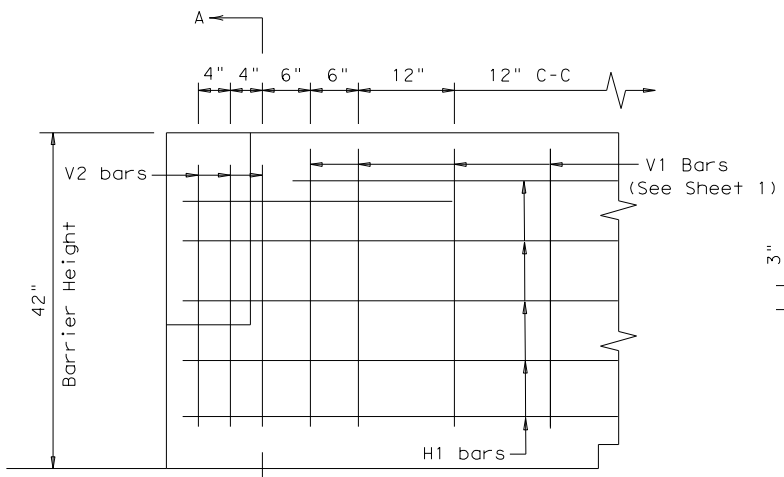
Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

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

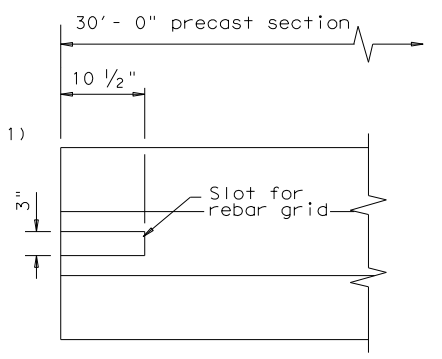
If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.



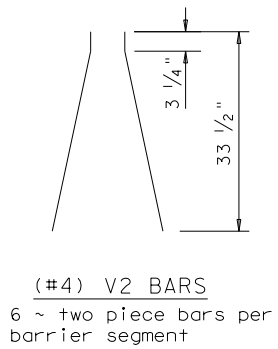
SECTION A-A
Showing (Type R)
Rebar Grid



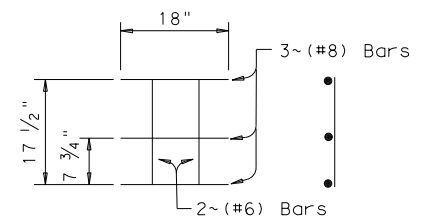
ELEVATION
V1 Bars (See Sheet 1)



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)

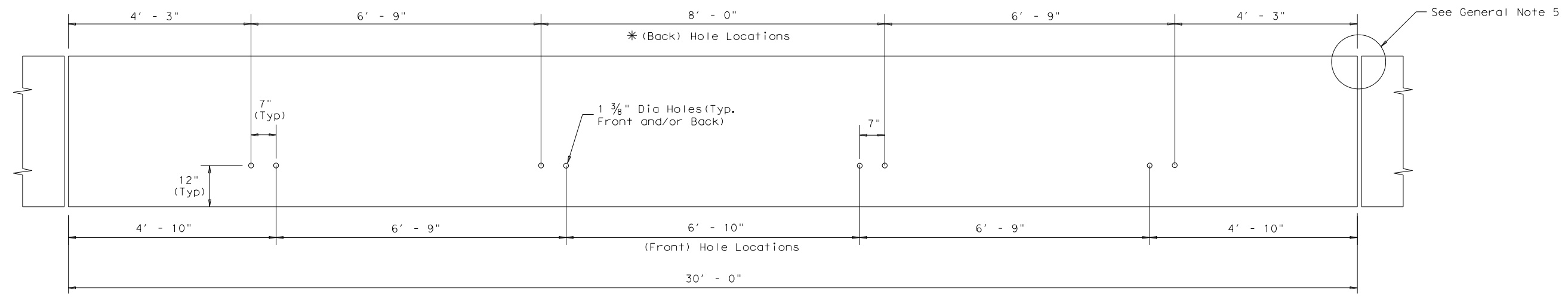


SINGLE SLOPE CONCRETE BARRIER
PRECAST BARRIER (TYPE 1)
SSCB (2) - 10

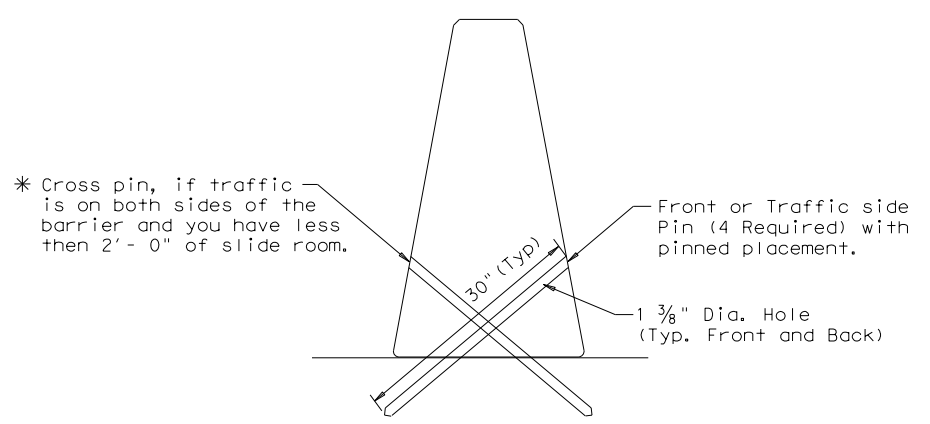
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© TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	3136	01	200	SL 1
DIST	COUNTY		SHEET NO.	
AUS	TRAVIS		42	

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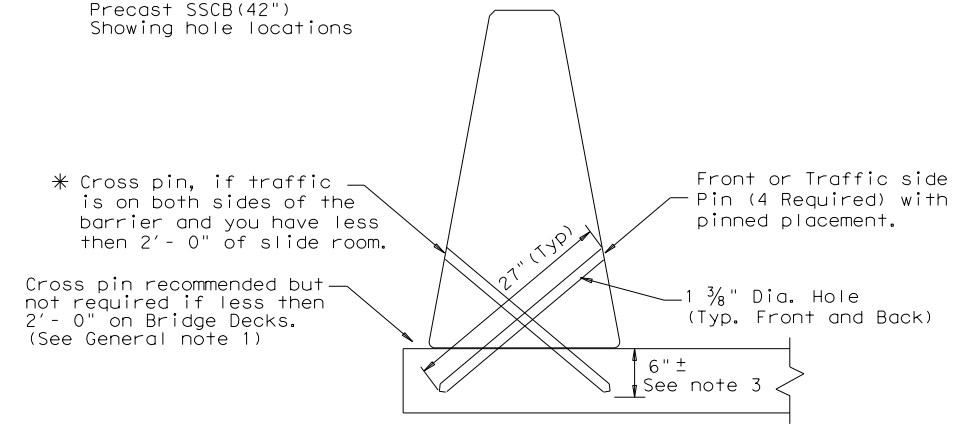
DATE: 6/13/2023
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DETAIL 1
 Precast SSCB (42")
 Showing hole locations



DETAIL 2
 Placement on (ACP)
 Asphalt Conc. Pavement
 or Treated Base Material
 (30" Pin required)

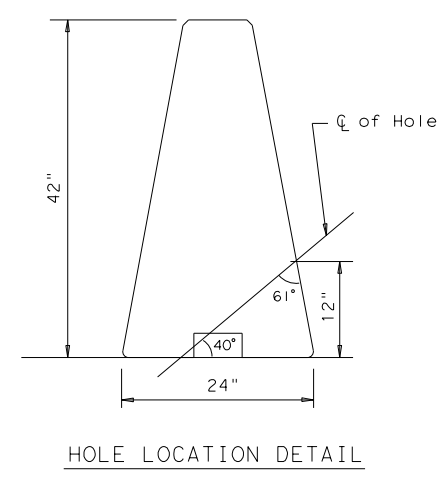


DETAIL 3
 Bridge Deck or CRCP
 (27" Pin required).

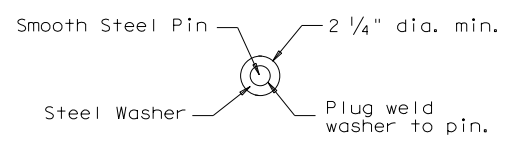
GENERAL NOTES

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 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.
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 SSCB(2) standard sheet 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 in. 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. All steel pins shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
9. Weight of barrier is approx. 700 lbs per foot.

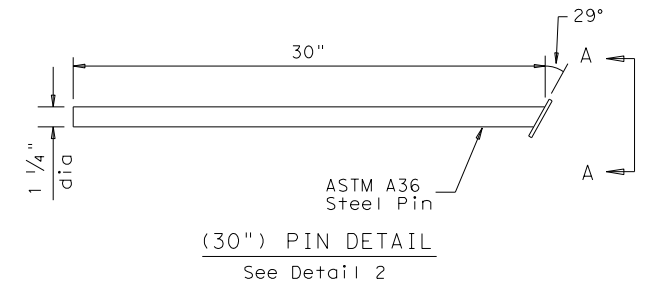
CORE DRILLING EXISTING BARRIER
 Core drilling existing concrete barrier is permitted. Holes shall be drilled with coring or masonry drilling type equipment. Percussion (star) drilling shall not be used. A special drill bit (to cut through existing reinforcing) will likely be required. Spalls in the concrete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



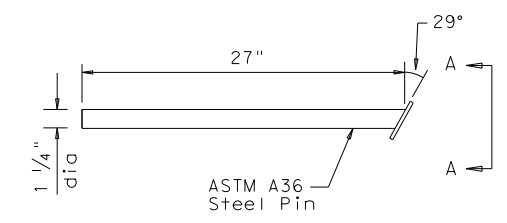
HOLE LOCATION DETAIL



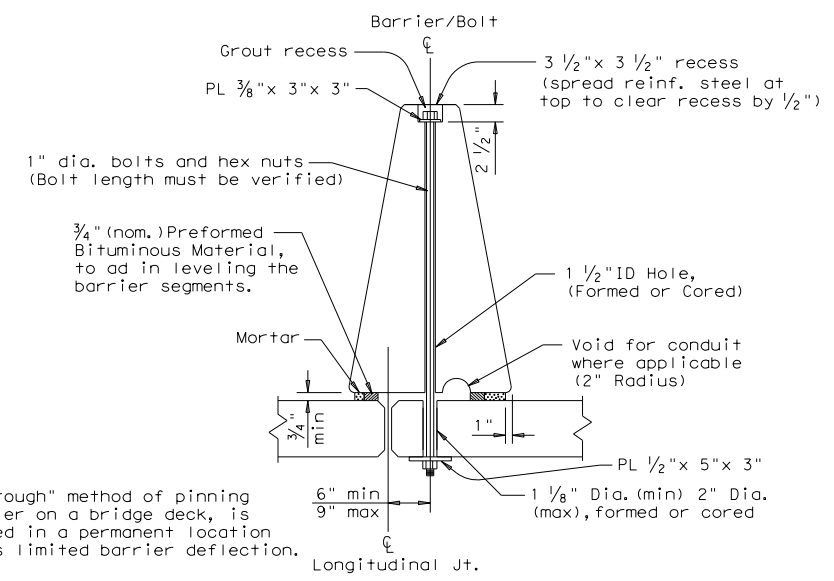
VIEW A-A



(30") PIN DETAIL
 See Detail 2



(27") PIN DETAIL
 See Detail 3



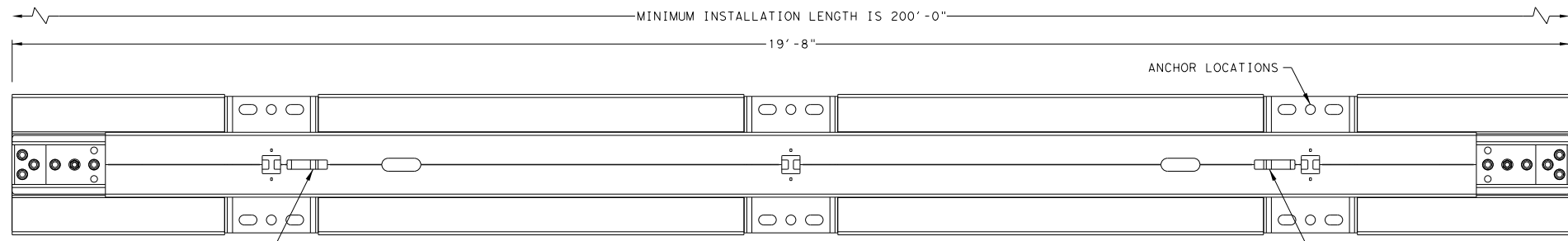
Note:
 The "Bolt Through" method of pinning precast barrier on a bridge deck, is primarily used in a permanent location that requires limited barrier deflection.

PRECAST SSCB (BOLT THROUGH) PLACEMENT OVER LONGITUDINAL EXPANSION JOINT
 For bolt through locations, use the (Front) hole locations shown on Detail 1.

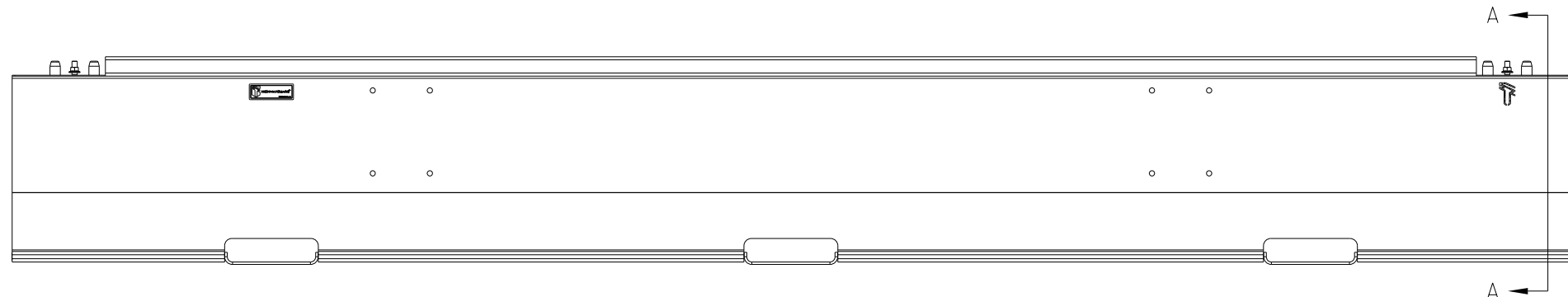
		Design Division Standard	
SINGLE SLOPE CONCRETE BARRIER PRECAST BARRIER (TYPE 1) PINNED PLACEMENT SSCB(5) - 10			
FILE: sscb510.dgn	DN: TxDOT	CK: AM	DW: BD
©TxDOT December 2010	CONT 3136	SECT 01	JOB 200
REVISIONS	HIGHWAY		SL 1
DIST AUS	COUNTY TRAVIS		SHEET NO. 43

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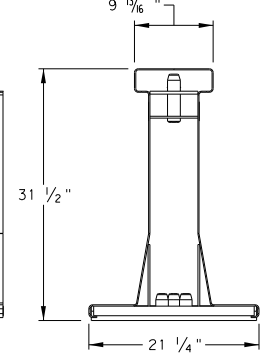
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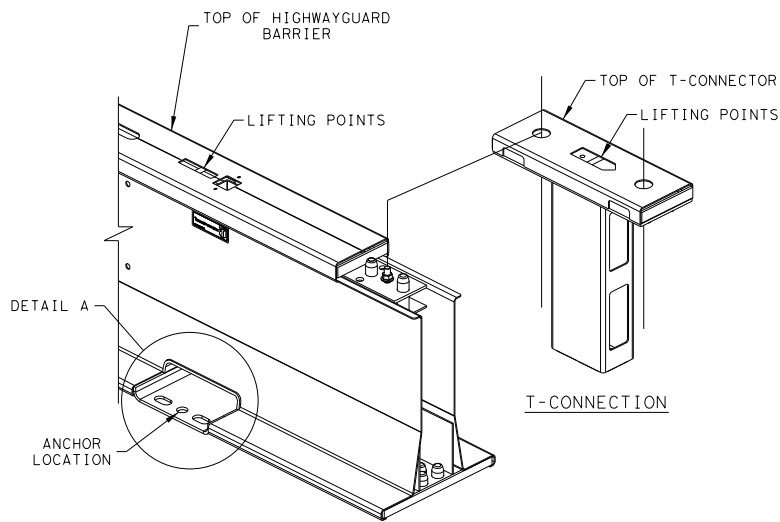
PLAN VIEW



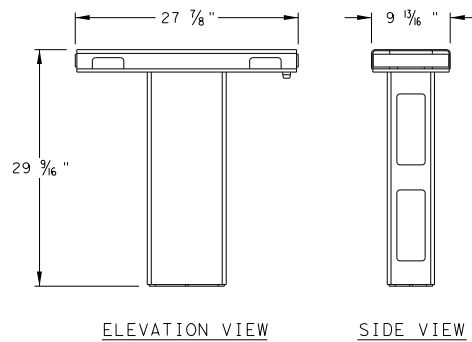
ELEVATION VIEW
LEFT SIDE



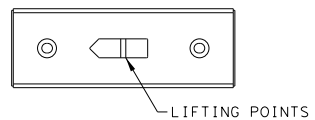
VIEW A-A



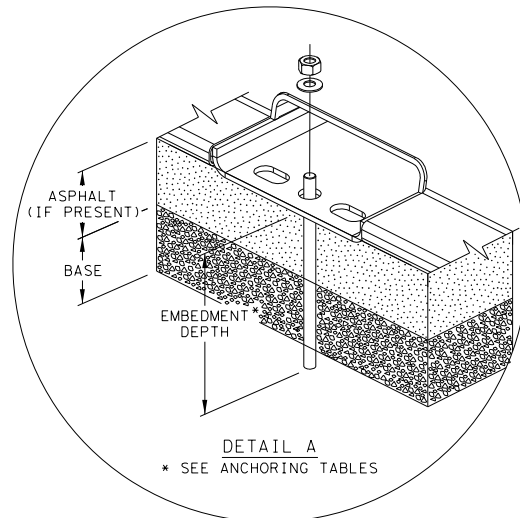
ISOMETRIC VIEW



ELEVATION VIEW SIDE VIEW



PLAN VIEW
T-CONNECTOR DETAILS



DETAIL A
* SEE ANCHORING TABLES

METHOD	DESCRIPTION	APPROX. RADIUS (FT)
1	20FT BARRIER SECTION WITH STANDARD T-CONNECTIONS AT MAXIMUM ANGLE	581
2	20FT BARRIER SECTION WITH 2.5° T-CONNECTION	460
3	20FT BARRIER SECTION WITH 5° T-CONNECTION	230
4	20FT BARRIER SECTION WITH 10° T-CONNECTION	115
5	20FT BARRIER SECTION WITH 10° BARRIER SECTION AND STANDARD T-CONNECTION	135
6	10° BARRIER SECTION WITH STANDARD T-CONNECTIONS	22
7	10° BARRIER SECTION WITH 10° T-SECTION	12

* SEE PRODUCT MANUAL OR CONTACT HIGHWAY CARE LTD. FOR MORE INFORMATION ON ANGLE T-CONNECTORS

STANDARD ANCHORING REQUIREMENTS (ASPHALT) **

	ANCHOR OPTIONS	ANCHOR LENGTH	EMBEDMENT (MIN.)	DRILL DIAMETER
1	1" GALV. RESIN THREADED ANCHOR (WITH 1" GALV. WASHER & NUT)	1'-1"	11 3/4"	1 1/8"
2	1 3/8" GALV. DROP IN PIN (NOT DRIVEN PIN)	1'-2 3/8"	1'-1 3/4"	1 1/4"
3	1" GALV. RESIN THREADED ANCHOR (WITH 1" GALV. WASHER & NUT)	1'-6"	1'-4 1/2"	1 1/4"
4	1" GALV. CHEMICAL THREADED "LEFTY" KELKEN REMOVABLE ANCHOR (WITH 1" GALV. WASHER & NUT)	NA	1'-0"	1 1/4"

** 2" MIN. ASPHALT DEPTH ABOVE AN APPROPRIATELY COMPACTED DGA SUBBASE AND 2" MIN. ASPHALT DEPTH ABOVE A MIN. OF 6" REINFORCED CONCRETE SUBBASE.

NOTE: ANCHORS ARE TO BE POSITIONED A MINIMUM OF 5 3/4" AWAY FROM THE EDGE OF AN EXCAVATION FOR RESIN ANCHORS OR 7 3/4" FOR DROP IN PINS.

STANDARD ANCHORING REQUIREMENTS (CONCRETE) ***

	ANCHOR OPTIONS	ANCHOR LENGTH	EMBEDMENT (MIN.)	DRILL DIAMETER
1	1" GALV. RESIN THREADED ANCHOR (WITH 1" GALV. WASHER & NUT)	9"	6"	1 1/8"
2	1" HILTI HSL-3 MECHANICAL ANCHOR	9 1/4"	***	***
3	1" GALV. CHEMICAL THREADED "LEFTY" KELKEN REMOVABLE ANCHOR (WITH 1" GALV. WASHER & NUT)	NA	6"	1 1/4"
4	1 3/8" GALV. DROP IN PIN (NOT DRIVEN PIN)	1'-2 3/8"	1'-1 3/4"	1 1/4"

*** 7 1/8" MINIMUM REINFORCED CONCRETE DEPTH. 10" MINIMUM UNREINFORCED CONCRETE DEPTH. *** CONTACT: HIGHWAY CARE LTD. FOR SPECIFIC APPLICATION.

NOTE: ANCHORS ARE TO BE POSITIONED A MINIMUM OF 11 7/8" FROM THE EDGE OF THE CONCRETE PAD.


GENERAL NOTES

- THE SYSTEM SHOWN ON THIS DRAWING IS A PROPRIETARY BARRIER TRADED AS HIGHWAYGUARD AND HIGHWAYGUARD LDS AND HAS BEEN DESIGNED AND MANUFACTURED BY HIGHWAY CARE LTD. FOR TECHNICAL ASSISTANCE AND APPLICATION SUPPORT CONTACT AT (888) 323-6374 OR engineering@highwaycare.com
- THE HIGHWAYGUARD HAS BEEN CRASH TESTED TO MASH AND HAS FHWA APPROVAL AS A TL-3 & TL-4 BARRIER. THE DEFLECTION TABLE OUTLINES BASIC SYSTEM PERFORMANCE AND COMPONENT ANCHORING REQUIREMENTS.
- THIS DRAWING PACKAGE PROVIDES THE RELEVANT INFORMATION AND GENERAL GRAPHICS REQUIRED TO IDENTIFY THE COMPONENT PARTS OF HIGHWAYGUARD AND THEIR INCORPORATION AS A WHOLE SYSTEM FOR DEPARTMENTAL STANDARD APPLICATIONS.
- INSTALLATION OF HIGHWAYGUARD BARRIER OR HIGHWAYGUARD LDS BARRIER, NORMALLY STARTS WITH AN END CAP THAT MUST BE PROTECTED WITH A SUITABLE CRASH CUSHION END TREATMENT IF EXPOSED TO ONCOMING TRAFFIC. THE CRASH CUSHION CONNECTIONS ARE NOT DETAILED WITHIN THESE DRAWINGS, PLEASE CONTACT HIGHWAY CARE LTD. FOR MORE DETAILS.
- THE FULL HEIGHT OF HIGHWAYGUARD BARRIER 20FT SEGMENT IS 31.5". EACH SEGMENT IS LOWERED INTO POSITION WITH THE T-CONNECTION ALREADY ATTACHED TO THE END OF THE BARRIER THAT IS BEING JOINED TO THE RUN OF BARRIER. ENSURE ORIENTATION OF T-CONNECTOR ALLOWS ALIGNMENT PINS TO BE LOWERED ONTO NEXT SECTION. THE T-CONNECTOR ALLOWS THE BARRIER FOR ADJUSTMENTS, QUICK INSTALLATION, QUICK REMOVAL AND REPLACEMENT OF DAMAGED BARRIERS. MINIMUM INSTALLATION LENGTH OF HIGHWAYGUARD BARRIER IS 200'-0".
- THERE ARE SEVERAL METHODS OF ACHIEVING RADIUS IN A LENGTH OF HIGHWAYGUARD BARRIER. RADIUS CAN BE ACHIEVED USING VARIOUS T-CONNECTORS AND THUS ALLOWING THE HIGHWAYGUARD BARRIER TO FOLLOW THE DESIRED CURVATURE IN THE INSTALLATION, THESE TYPE OF T-CONNECTORS ARE, 2.5°, 5° AND 10° ANGLES. FOR FURTHER INFORMATION AND ADVICE CONTACT HIGHWAY CARE LTD.
- USING HIGHWAYGUARD BARRIER OR HIGHWAYGUARD BARRIER LDS ON BRIDGE STRUCTURES, POSSIBLE ANCHORING SHOULD TAKE PLACE OFF BRIDGE DECKS. ANY ANCHORING ON BRIDGE DECKS NEEDS TO BE AGREED IN ADVANCE WITH THE TECHNICAL EXPERT RESPONSIBLE FOR THE BRIDGE TO ENSURE IT IS NOT DAMAGED. IF ANCHORING EITHER SIDE OF A BRIDGE DECK EXPANSION JOINT, THEN THIS MOVEMENT MUST BE MIRRORRED IN THE BARRIER. FOR FURTHER INFORMATION AND ADVICE CONTACT HIGHWAY CARE LTD.
- THE HIGHWAYGUARD BARRIER SECTIONS CAN BE EQUIPPED WITH OPTIONAL WHEELSETS THAT ALLOW THE BARRIERS TO BE MANEUVERED WITHOUT LIFTING THE MACHINERY/EQUIPMENT SUCH AS INSTALLING IN TUNNELS OR AREAS WITH OVERHEAD RESTRICTIONS. THE WHEELSETS CAN BE RAISED AND LOWERED FROM THE TOP OF THE BARRIER USING A MANUAL WRENCH AND 1" SOCKET.
- THE HIGHWAYGUARD BARRIER HAS BEEN MASH TESTED, USING 1 3/8" DIA. DROP IN PIN ANCHORS AND EMBEDDED 1'-6" INTO ASPHALT. ALTERNATIVE GROUND EMBEDMENT CONDITIONS MAY BE ACCEPTABLE BUT MIGHT REQUIRE DIFFERENT ANCHOR SOLUTIONS, PLEASE CONTACT HIGHWAY CARE LTD. FOR FURTHER INFORMATION.
- ALL COMPONENTS ARE FULLY GALVANIZED.
- HIGHWAYGUARD BARRIER SYSTEMS SHALL BE ASSEMBLED AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS DETAILED DRAWINGS, PROCEDURES AND SPECIFICATIONS. FOR ANY INSTALLATIONS OUTSIDE OF THE SCOPE OF THESE DRAWINGS, PLEASE CONTACT HIGHWAY CARE LTD. FOR DETAILS.
- FOR ANCHORING LAYOUTS FOR HIGHWAYGUARD AND HIGHWAYGUARD LDS, PLEASE SEE MANUFACTURER'S PRODUCT MANUAL OR CONTACT HIGHWAY CARE LTD. FOR INFORMATION.

HIGHWAYGUARD DEFLECTION TABLE

DESCRIPTION	STANDARD SYSTEM	MINIMUM DEFLECTION SYSTEMS (LDS)
	ONLY ANCHORED AT THE FIRST AND ENDS OF THE BARRIER LENGTH	ANCHORS ARE STAGGERED EVERY 39'-4 1/2"
DEFLECTION AT MASH TL-3	64"	2'-3"
DEFLECTION AT MASH TL-4	71"	2'-7"

NOTE: SEE PRODUCT MANUAL OR CONTACT HIGHWAY CARE LTD. FOR MORE INFORMATION ON ANCHOR REQUIREMENTS FOR THE LENGTH OF BARRIER.



Design Division Standard

HIGHWAYGUARD SYSTEM

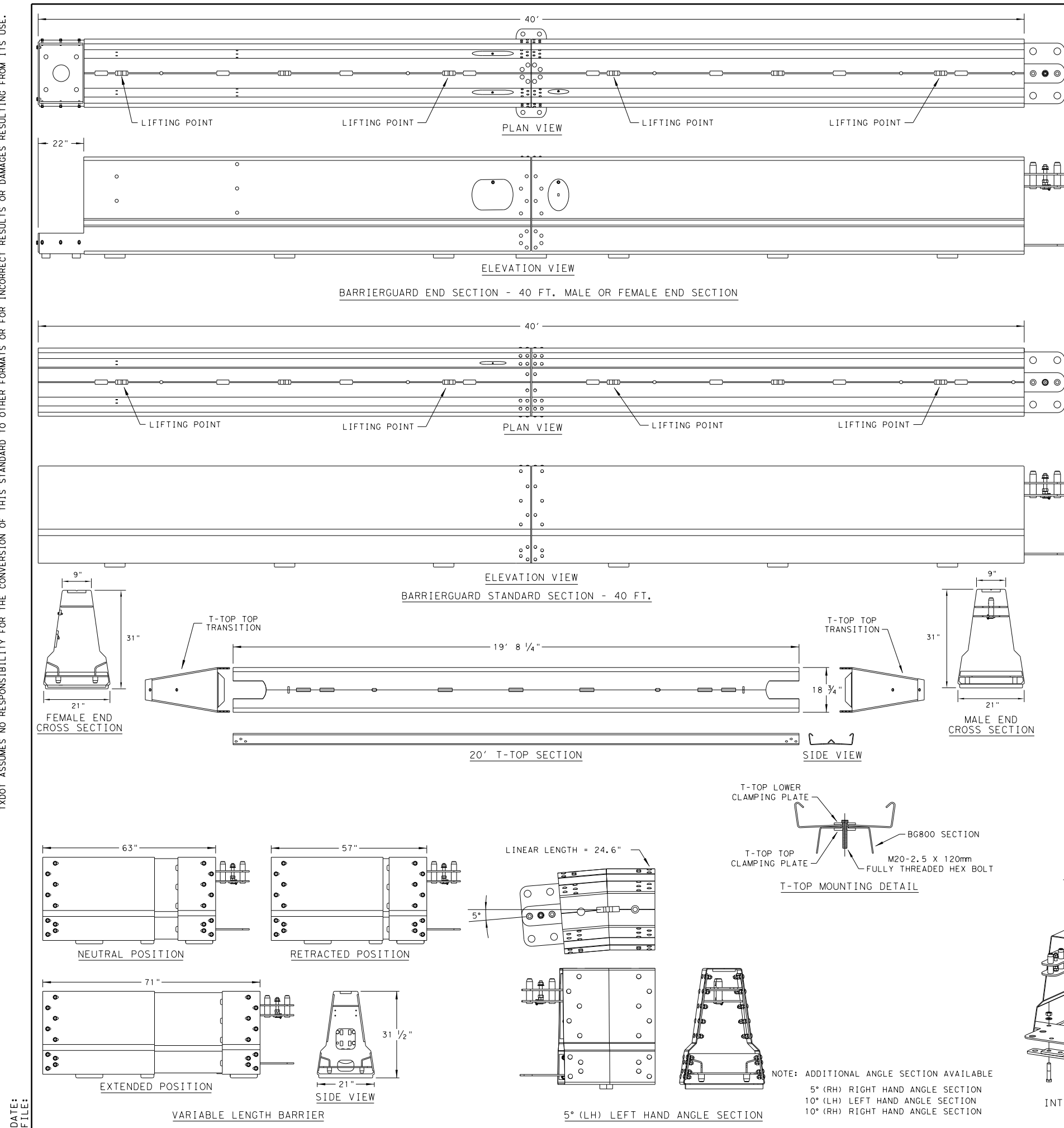
STEEL BARRIER

MASH TL-3 & TL-4

HIGHWAYGUARD-21

FILE: highwayguard21.dgn	DN: TxDOT	CK: KM	DW: SS	CK: XX
© TxDOT: JULY 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	3136	01	200	SL 1
	DIST	COUNTY	SHEET NO.	
	AUS	TRAVIS	44	

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GENERAL NOTES

- THE SYSTEM SHOWN ON THIS DRAWING IS A PROPRIETARY BARRIER TRADED AS BARRIERGUARD 800 AND BARRIERGUARD 800 MDS AND HAS BEEN DESIGNED AND MANUFACTURED BY LAURA METAAL ROAD SAFETY INC. FOR TECHNICAL ASSISTANCE AND APPLICATION SUPPORT CONTACT LEE STUART AT LAURA METAAL ROAD SAFETY INC. AT (702) 664-2009 OR lee.stuart@laura-metaal.com
- THE BARRIERGUARD 800 SYSTEM HAS BEEN CRASH TESTED TO MASH AND HAS FHWA APPROVAL AS A TL-3 BARRIER. THE DEFLECTION TABLE OUTLINES BASIC SYSTEM PERFORMANCE AND COMPONENT ANCHORING REQUIREMENTS.
- THIS DRAWING PACKAGE PROVIDES THE RELEVANT INFORMATION AND GENERAL GRAPHICS REQUIRED TO IDENTIFY THE COMPONENT PARTS OF BARRIERGUARD 800 AND THEIR INCORPORATION AS A WHOLE SYSTEM FOR DEPARTMENTAL STANDARD APPLICATIONS.
- BARRIERGUARD 800 REQUIRES ANCHORING (PINNING) AT EACH END OF THE INSTALLED LENGTH. (INTERMEDIATE ANCHORS CAN BE USED TO REDUCE DEFLECTION).
- INSTALLATION OF BARRIERGUARD 800 OR BARRIERGUARD 800 MDS, NORMALLY STARTS WITH A MALE TERMINAL SECTION AND IS FINISHED WITH A FEMALE TERMINAL SECTION. STANDARD SECTIONS ARE USED BETWEEN THE TERMINAL SECTIONS TO OBTAIN THE REQUIRED LENGTH OF POSITIVE BARRIER PROTECTION.
- THE FULL HEIGHT TERMINAL (FHT) SECTIONS MAY BE CAPPED WITH A FHT COVER, HOWEVER IF EXPOSED TO ON-COMING TRAFFIC THE END SHOULD BE PROTECTED WITH A SUITABLE CRASH CUSHION. THE BARRIERGUARD 800 RANGE IS COMPATIBLE WITH MOST COMMONLY USED CRASH CUSHION END TREATMENTS. FOR DETAILS OF BARRIERGUARD 800 CRASH CUSHION CONNECTIONS THAT ARE NOT DETAILED WITHIN THESE DRAWINGS, PLEASE CONTACT LAURA METAAL ROAD SAFETY INC. FOR MORE DETAILS. THE FULL HEIGHT TERMINAL COVER IS SUITABLE FOR THE "DOWN STREAM" END OF A SYSTEM THAT DOES NOT HAVE EXPOSURE TO ON-COMING TRAFFIC.
- WHEN INSTALLING THE MINIMUM DEFLECTION SYSTEM (MDS), THE SYSTEM CAN BE INSTALLED WITH ADDITIONAL INTERMEDIATE ANCHORS ALONG THE LENGTH OF THE BARRIER RUN AT INTERVALS SHOWN IN THE DEFLECTION TABLE. EACH BARRIER RUN CAN BE MADE UP OF ANY MIXTURE OF THE SYSTEMS BY THE INTRODUCTION OF INTERMEDIATE ANCHORS AND/OR T-TOP AS REQUIRED.
- THERE ARE SEVERAL METHODS OF ACHIEVING RADIUS IN A LENGTH OF BARRIERGUARD 800. RADIUS CAN BE ACHIEVED USING VARIOUS METHODS AND THUS ALLOWING THE BARRIERGUARD TO FOLLOW THE DESIRED CURVATURE IN THE INSTALLATION, THESE METHODS ARE, THE MOVEMENT IN THE QUICKLINK, ADJUSTABLE 20FT. SECTIONS OR SHORT ANGLED SECTIONS WHICH ALLOW A RADIUS AS LOW AS 12FT. FOR FURTHER INFORMATION AND ADVICE CONTACT LAURA METAAL ROAD SAFETY INC.
- A BARRIERGUARD 800 VARIABLE LENGTH BARRIER (VLB) SECTION SHOULD BE USED WHEN BARRIERGUARD 800 OR BARRIERGUARD 800 MDS IS ANCHORED ACROSS A BRIDGE EXPANSION JOINT. IF T-TOP IS TO BE USED IN CONJUNCTION WITH THE VLB, THE T-TOP SHOULD BE USED FOR MINIMUM 40FT ON EITHER SIDE OF THE VLB AND TERMINATED WITH TRANSITIONS. THE VLB SECTION PROVIDES APPROXIMATELY 7in OF EXTENSION AND 7in OF CONTRACTION. MULTIPLE VLB'S CAN BE LINKED TOGETHER TO PROVIDE MORE EXPANSION OR CONTRACTION. THE VLB'S SHOULD BE PLACED IN THE VICINITY OF THE EXPANSION JOINT. THE VLB DOES NOT NEED TO BE PLACED DIRECTLY OVER THE EXPANSION JOINT BUT MUST BE BETWEEN THE NEAREST ANCHORS ON EACH SIDE OF THE JOINT. IT IS RECOMMENDED THAT THE VLB IS PLACED WITHIN 40FT OF THE JOINT.
- THE T-TOP CAN BE INSTALLED EITHER BEFORE OR AFTER THE BARRIERGUARD 800 HAS BEEN FULLY ASSEMBLED AND ANCHORED IN PLACE. T-TOP IS REQUIRED WHEN THE BARRIERGUARD 800 IS USED AS A MDS, ANCHORED EVERY 20FT, GATE SECTIONS AND VARIABLE LENGTH BARRIERS. THE T-TOP SHOULD EXTEND 40FT ON EITHER SIDE OF THESE CONDITIONS AND BE TERMINATED WITH TRANSITIONS.
- THE BARRIERGUARD 800 RANGE HAS BEEN DESIGNED TO BE USED ON AND HAS BEEN TESTED ANCHORED ON ASPHALT, CONCRETE AND COMPACTED SUBBASE. CONTACT LAURA METAAL ROAD SAFETY INC. FOR FURTHER INFORMATION.
- BARRIERGUARD 800 COMPONENTS ARE MANUFACTURED IN SI (METRIC) UNITS. ENGLISH UNITS SHOWN ARE APPROXIMATE. ALL COMPONENTS ARE FULLY GALVANIZED.
- BARRIERGUARD 800 SYSTEMS SHALL BE ASSEMBLED AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS DETAILED DRAWINGS, PROCEDURES AND SPECIFICATIONS. FOR ANY INSTALATIONS OUTSIDE OF THE SCOPE OF THESE DRAWINGS PLEASE CONTACT LAURA METAAL ROAD SAFETY INC. FOR DETAILS.

	STANDARD SYSTEM	MINIMUM DEFLECTION SYSTEMS (MDS)
DESCRIPTION	ONLY ANCHORED AT THE EXTREME ENDS OF THE BARRIER LENGTH	ANCHORED EVERY 20 FT.
DEFLECTION AT MASH TL-3	5'-6"	18 1/2"
T-TOP REQUIREMENTS	NONE REQUIRED	REQUIRED FOR MDS SECTIONS

	RESIN STUD ANCHORS		DRIVEN ANCHORS		Hilti HSL-3 SHALLOW MECHANICAL	
	CONCRETE *	UNREINFORCED CONCRETE *	ASPHALT	ASPHALT	SUBBASE/SOIL	CONCRETE
ANCHOR DIAMETER	1 in.	1 in.	1 in.	1-3/16 in.	5-1/2 in.	× ×
EMBEDMENT DEPTH	6 in.	8 in.	16 in.	16 in.	32 in.	× ×
DRILL DIAMETER	1-1/8 in.	1-1/8 in.	1-1/8 in.	1-3/16 in.	DRIVEN	× ×
PULL OUT CAPACITY (MIN)	17500 lb	17500 lb	N/A	N/A	N/A	× ×
SHEAR CAPACITY (MIN)	25000 lb	25000 lb	N/A	N/A	N/A	× ×

* ALTERNATIVE ANCHORS INCLUDING MECHANICAL ANCHORS FOR CONCRETE MAYBE USED IF THEY MEET THE STRENGTH REQUIREMENTS LISTED, DETAILS WILL BE MANUFACTURER SPECIFIC.
 ** CONTACT: LAURA METAAL ROAD SAFETY INC. FOR SPECIFIC APPLICATION.

Design Division Standard

BARRIERGUARD 800 SYSTEM

STEEL BARRIER

MASH TL-3

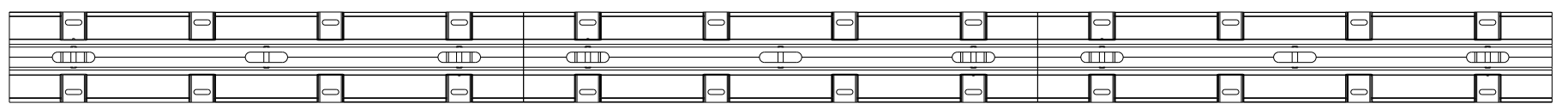
BARRIERGUARD-19

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© TxDOT: JULY 2019	CONT SECT	JOB	HIGHWAY	
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	DIST	COUNTY	SHEET NO.	
	AUS	TRAVIS	45	

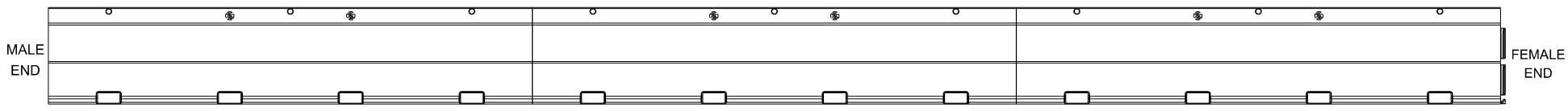
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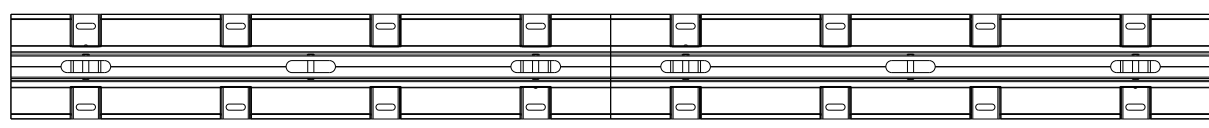
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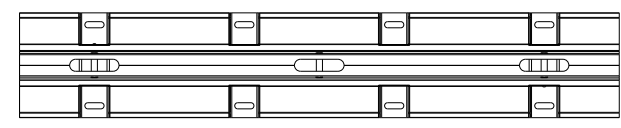
PLAN VIEW



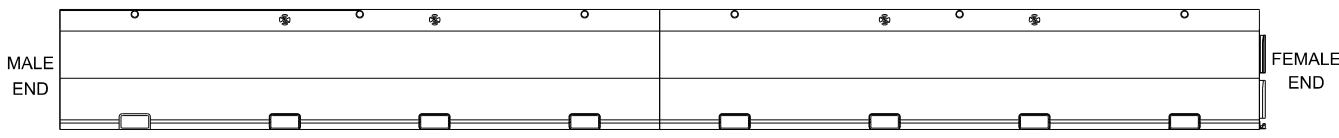
ELEVATION VIEW
 ZONEGUARD STANDARD UNIT x 50'-0"



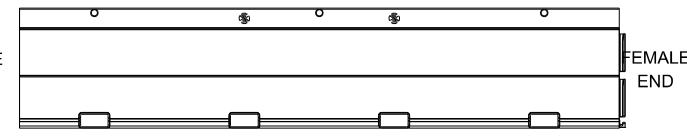
PLAN VIEW



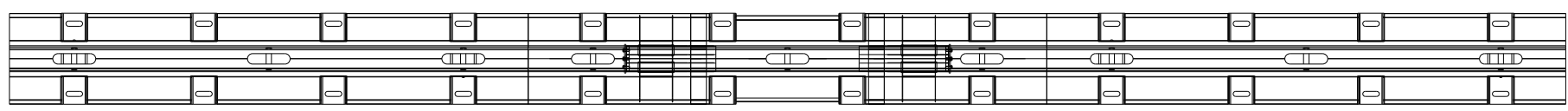
PLAN VIEW



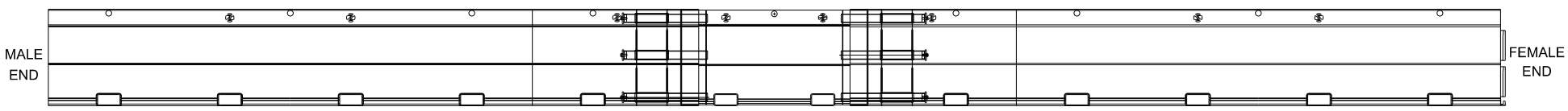
ELEVATION VIEW
 ZONEGUARD STANDARD UNIT x 33'-4"



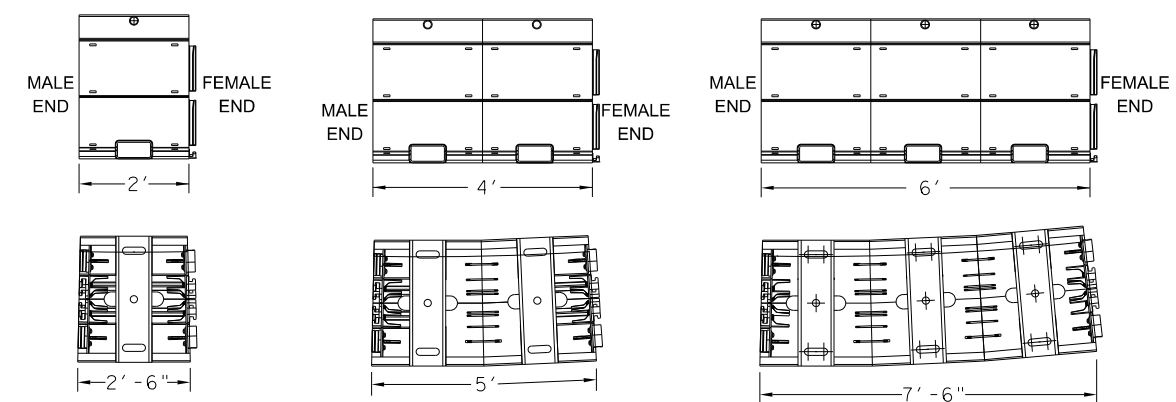
ELEVATION VIEW
 ZONEGUARD STANDARD UNIT x 16'-8"



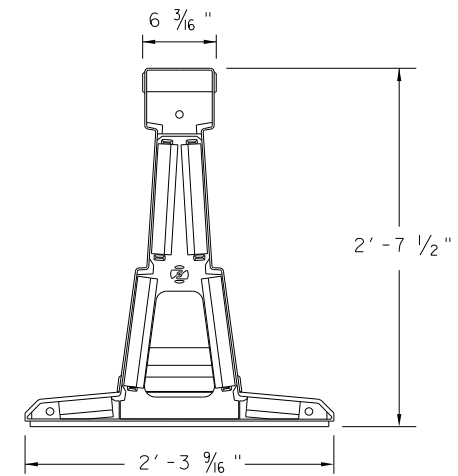
PLAN VIEW



ELEVATION VIEW
 ZONEGUARD EXPANSION UNIT x 46'-5 1/2"
 (SEE GENERAL NOTE 5)



ZONEGUARD RADIUS UNITS



ZONEGUARD TYPICAL SECTION

GENERAL NOTES

- FOR TECHNICAL AND APPLICATION SUPPORT PLEASE CONTACT HILL & SMITH INC. AT 614-340-6294.
- ZONEGUARD HAS BEEN ACCEPTED BY FHWA AS A MASH TL-3 LONGITUDINAL BARRIER.
- STANDARD INSTALLATIONS REQUIRE ANCHORING AT EACH END OF THE RUN. MINIMUM DEFLECTION INSTALLATIONS REQUIRE ANCHORING AT 33'-4 CENTERS. NO MODIFICATIONS ARE NECESSARY OTHER THAN INCREASED ANCHORING.
- 50-0' UNITS CAN BE USED TO ACHIEVE DOWN TO AN 800' RADIUS CURVE. 16'-8" UNITS CAN BE USED TO ACHIEVE CURVES DOWN TO 250' RADIUS. SPECIAL SHORT UNITS (SHOWN) IN 2.5 DEGREE INCREMENTS CAN BE USED TO ACHIEVE DIRECTION CHANGES OR AT A FIXED RADIUS OF 47'-0".
- HILL & SMITH OFFERS AN EXPANSION UNIT THAT CAN BE USED ACROSS A BRIDGE EXPANSION JOINT OR TO ACCOMMODATE THERMAL EXPANSION. THE UNIT IS ANCHORED IN THE MIDDLE, AND ADJUSTED ACCORDING TO THE TEMPERATURE AT THE TIME OF INSTALLATION. THE EXPANSION JOINT CAN BE USED WITH ENGINEER APPROVAL. THE EXPANSION UNIT HAS NOT BEEN ASSESSED TO MASH CRITERIA.
- ANCHOR PINS ARE 1 1/4" DIAMETER. LENGTH IS 1'-8" FOR ASPHALT AND 1'-0" FOR CONCRETE. SEE ANCHORING TABLE FOR ADDITIONAL DETAILS.

	STANDARD INSTALLATION	MINIMUM DEFLECTION INSTALLATION CONCRETE	MINIMUM DEFLECTION INSTALLATION ASPHALT
	FOUR ANCHORS AT END OF THE RUN	TWO ANCHORS (ONE EACH SIDE) EVERY 33'-4"	TWO ANCHORS (ONE EACH SIDE) EVERY 33'-4"
MASH TL-3 DEFLECTION (2270 KG TRUCK @ 25° & 100 KM/HR)	6'-10"	5"	2'-0"

EXPECTED DEFLECTION TABLE

DESCRIPTION	ASPHALT	CONCRETE
1 1/4" PIN ANCHOR	1'-8" LONG, MINIMUM ASPHALT COVER OF 3"	1'-0" LONG, MINIMUM CONCRETE COVER OF 6"
1 1/4" ALL THREAD ANCHOR	-	1'-0" LONG, MINIMUM EMBEDMENT OF 6"

ANCHORING TABLE

ALTERNATE ANCHORING METHODS CERTIFIED BY HILL & SMITH, INC. ARE AVAILABLE PER FHWA APPROVAL LETTER.

Design Division Standard

ZONEGUARD SYSTEM STEEL BARRIER MASH TL-3 ZONEGUARD-19

FILE: zoneguard19	DN: TxDOT	CK: KM	DW: VP	CK: CGL
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REVISIONS	3136	01	200	SL 1
	DIST	COUNTY	SHEET NO.	
	AUS	TRAVIS	46	

Plotted on: 6/13/2023

Design File name: P:\125\45\02\Design\Civil\Drainage\1254502dom-exist.dgn

EXTERIOR DRAINAGE AREA DATA

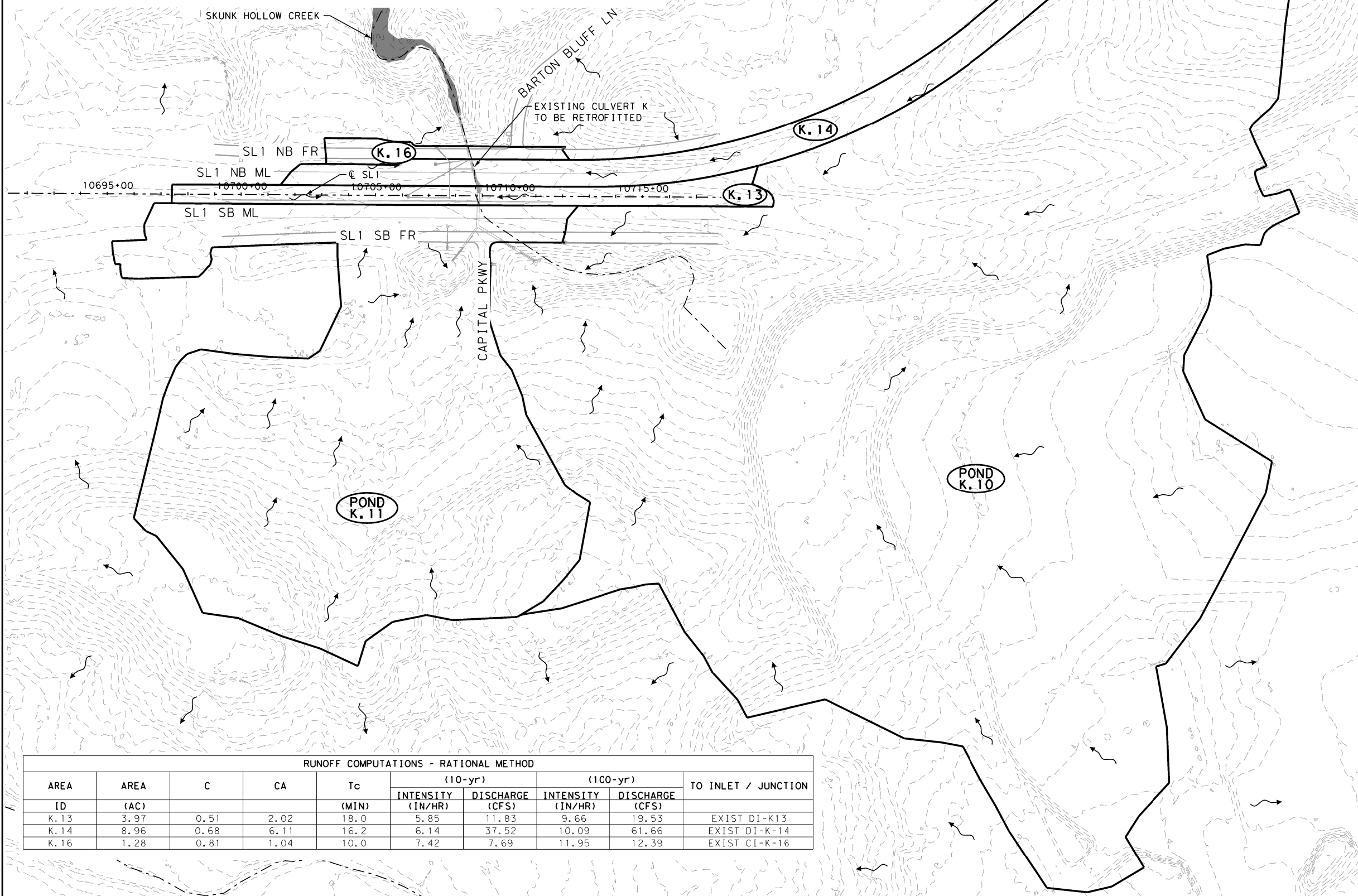
AREA ID	AREA (MI ²)	AREA (AC)	PEAK DISCHARGE (50-YR) (CFS)	PEAK DISCHARGE (100-YR) (CFS)	VOLUME (50-YR) (IN)	VOLUME (100-YR) (IN)
Pond K. 10	0.2234	142.98	748.90	820.3	8.50	10.5
Pond K. 11	0.0691	44.22	286.00	321.1	7.72	9.69
K. 13	0.0062	3.97	30.90	37.5	6.90	8.83
K. 14	0.014	8.96	82.30	96.1	8.92	10.95
K. 16	0.002	1.28	12.70	14.6	9.95	12.02

LEGEND

- DRAINAGE AREA BOUNDARY
- CREEK FLOWPATH
- 100-YR FLOODPLAIN
- 850- EXISTING CONTOUR
- FLOW ARROW
- (X-X) DRAINAGE AREA

NOTES

1. EXISTING AND PROPOSED EXTERIOR DRAINAGE AREA RUNOFF COMPUTED USING SCS METHOD.
2. EXISTING FEATURES ARE SHOWN SCREENED BACK, i.e. FADED.
3. EXISTING 5' CONTOURS DEVELOPED BY LIDAR.
4. NOAA ATLAS 14 UTILIZED FOR INTENSITY CALCULATIONS.
5. CULVERT WAS DESIGNED USING GEOPAK DRAINAGE AND HY-8 FOR 50-YR STORM EVENT.
6. SEE CULVERT K LAYOUT SHEET FOR CULVERT PROFILE.
7. SEE CULVERT K DATA SHEET FOR CULVERT HYDRAULIC CALCULATIONS.
8. PROPOSED RUNOFF CALCULATIONS WERE COMPUTED USING RATIONAL METHOD.
9. STORM DRAIN WAS DESIGNED USING GEOPAK DRAINAGE AND HY-8 FOR 10-YR STORM EVENT.
10. SEE STORM DRAIN COMPUTATION SHEET FOR STORM DRAIN HYDRAULIC CALCULATIONS.



DESIGN

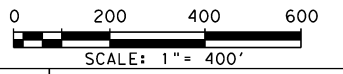


Andres Morales
 ANDRES MORALES, P.E.
 6/13/2023
 DATE

APPROVAL



Dennis K. Seal
 DENNIS K. SEAL, P.E.
 6/13/2023
 DATE



RUNOFF COMPUTATIONS - RATIONAL METHOD

AREA ID	AREA (AC)	C	CA	Tc (MIN)	(10-yr)		(100-yr)		TO INLET / JUNCTION
					INTENSITY (IN/HR)	DISCHARGE (CFS)	INTENSITY (IN/HR)	DISCHARGE (CFS)	
K. 13	3.97	0.51	2.02	18.0	5.85	11.83	9.66	19.53	EXIST DI-K13
K. 14	8.96	0.68	6.11	16.2	6.14	37.52	10.09	61.66	EXIST DI-K-14
K. 16	1.28	0.81	1.04	10.0	7.42	7.69	11.95	12.39	EXIST CI-K-16

REV. NO.	DATE	DESCRIPTION	BY

PAPE-DAWSON ENGINEERS

AUSTIN | SAN ANTONIO | HOUSTON | FORT WORTH | DALLAS
 10801 N MOPAC EXPY, BLDG 3, STE 200 | AUSTIN, TX 78759 | 512.454.8711
 TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801



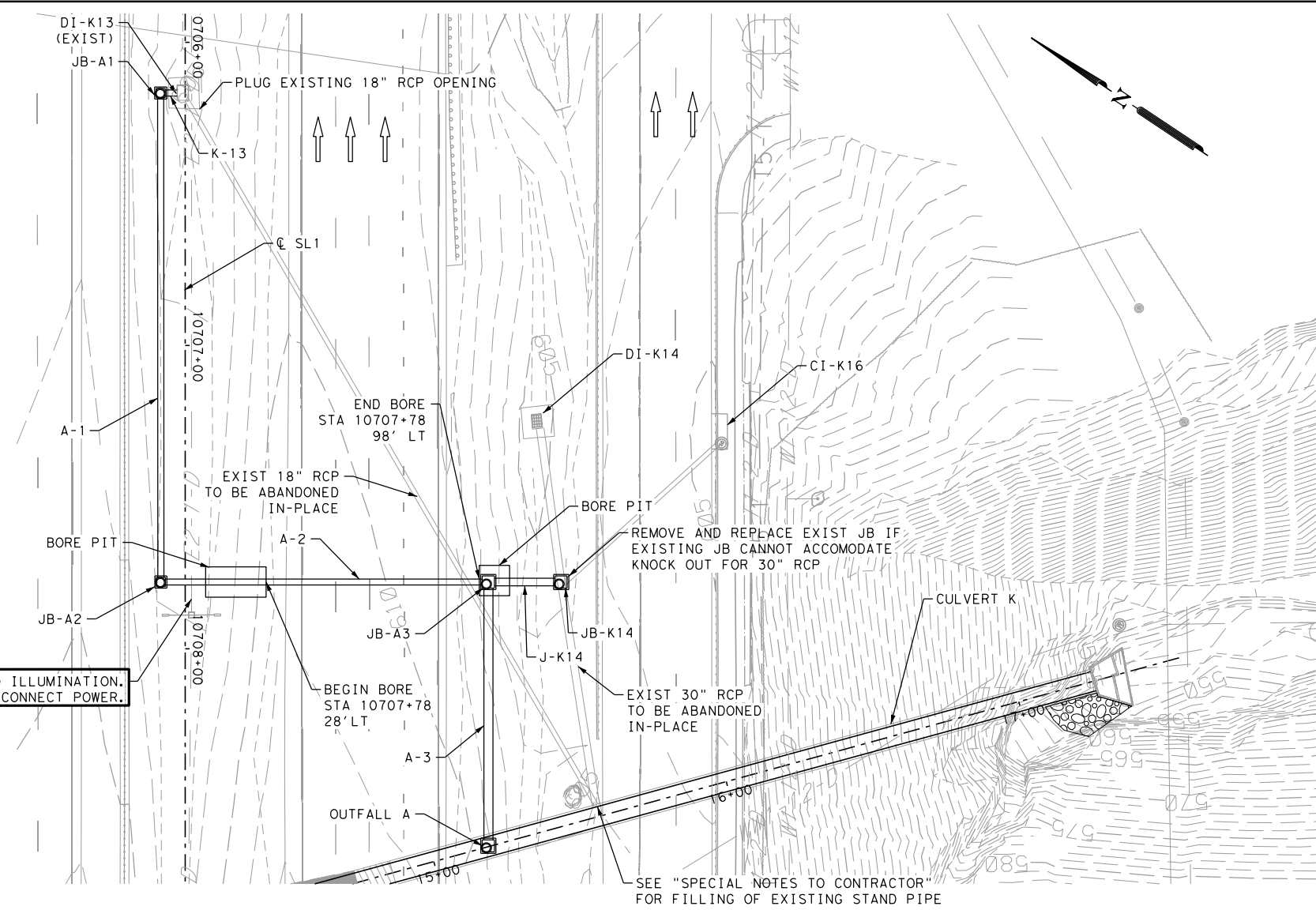
SL 1 AT SKUNK CREEK
OVERALL DRAINAGE AREA MAP

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.:	STATE:	FEDERAL AID PROJECT NO.:	HIGHWAY NO.:		
CHK DGN:	6	TEXAS	---	SL 1		
DWG:	DIST.:	COUNTY:	CONT. NO.:	SECT. NO.:	JOB NO.:	SHEET NO.:
CHK DWG:	AUS	TRAVIS	3136	01	200	47

Plotted on: 6/13/2023

Design File name: P:\125\45\02\Design\Civil\Drainage\1254502drn_1at_layout.dgn



LEGEND

- BOX MANHOLE
- EXISTING CONTOUR
- PROPOSED STORM DRAIN
- EXISTING EOP
- TRAFFIC FLOW ARROW

NOTES

1. ALL RCP IS CLASS III UNLESS OTHERWISE NOTED.
2. STORM SEWER PROFILES CUT ALONG TRUNKLINE.
3. REFER TO MISC DETAIL SHEET FOR POINT CONTROL DETAIL.
4. STORM SEWER LENGTHS SHOWN ARE ACTUAL LENGTHS, WHICH DIFFERS FROM PAY LENGTHS.
5. REFER TO STORM SEWER LATERAL SHEETS FOR PROP STORM DRAIN LATERAL INFORMATION.
6. REFER TO DRAINAGE AREA MAP FOR RUNOFF CALCULATIONS.
7. REFER TO STORM DRAIN COMPUTATION SHEET FOR STORM DRAIN HYDRAULIC CALCULATIONS.
8. STORM DRAIN WAS DESIGNED USING GEOPAK DRAINAGE FOR 10-YR STORM EVENT.
9. EXISTING PIPES AND INLETS LOCATION BASED ON AS-BUILT INFORMATION.

DESIGN



Andres Morales
 ANDRES MORALES, P.E.
 DATE: 6/13/2023

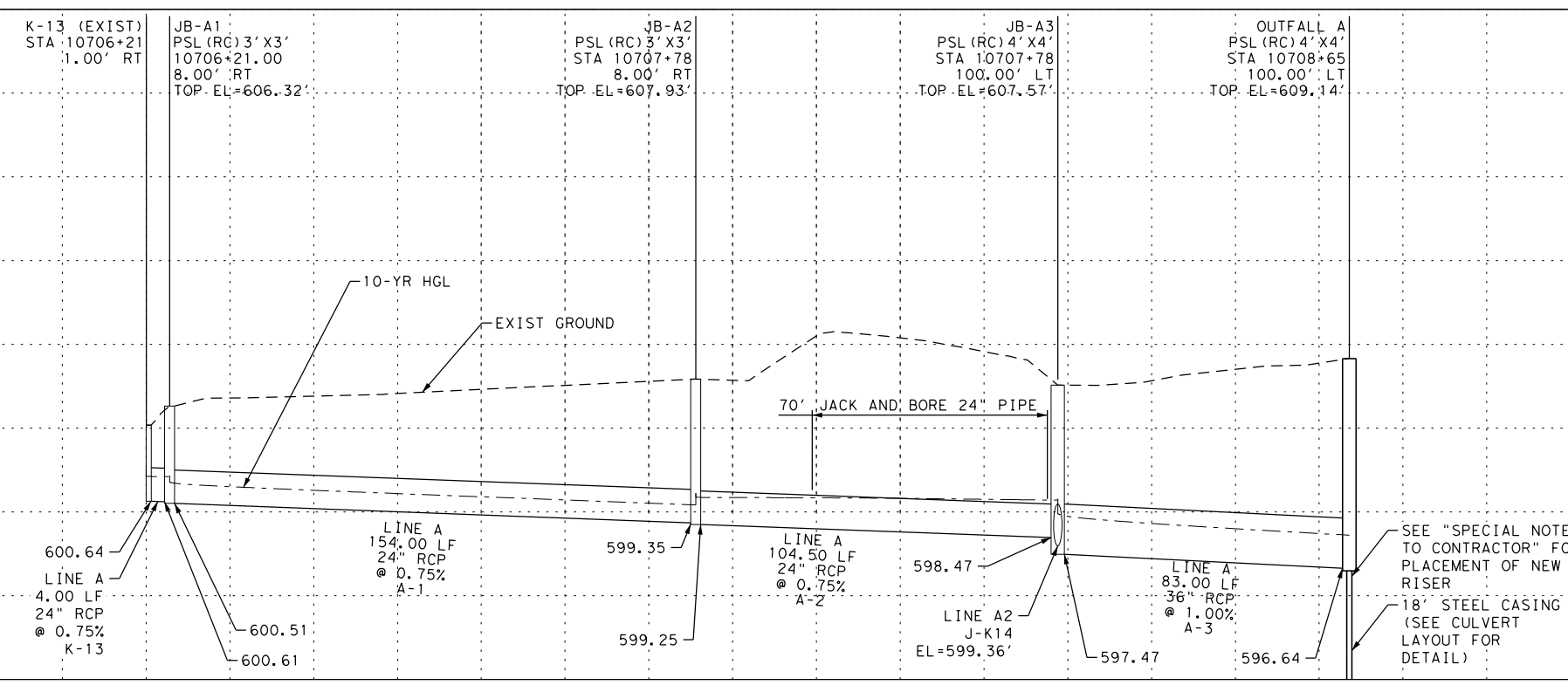
APPROVAL



Dennis K. Seal
 DENNIS K. SEAL, P.E.
 DATE: 6/13/2023



SCALE: PLAN 1" = 50' PROFILE 1" = 10' VERT



REV. NO.	DATE	DESCRIPTION	BY

Pape-Dawson Engineers
 AUSTIN | SAN ANTONIO | HOUSTON | FORT WORTH | DALLAS
 10801 W MOPAC EXPY, BLDG 3, STE 200 | AUSTIN, TX 78759 | 512.454.8711
 TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801

Texas Department of Transportation
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SL 1 AT SKUNK CREEK
 STORM DRAIN
 PLAN AND PROFILE

SHEET 1 OF 1					
CHK DGN:	FED. RD. DIV. NO.:	STATE:	FEDERAL AID PROJECT NO.:	HIGHWAY NO.:	
DWG:	6	TEXAS	---	SL 1	
CHK DWG:	DIST.:	COUNTY:	CONT. NO.:	SECT. NO.:	JOB NO.:
	AUS	TRAVIS	3136	01	200
					SHEET NO.:
					48

STORM DRAIN COMPUTATIONS

LINE ID	LINE	UPSTREAM NODE	DOWNSTREAM NODE	LENGTH (FT)	HYDRAULIC LENGTH (FT)	SLOPE %	SHAPE	MATERIAL	# OF BARRELS	STR SIZE	MANNING'S N	UPSTREAM JUNCTION LOSS (FT)	FRICTION SLOPE (FT)	UNIFORM DEPTH (FT)	ACTUAL DEPTH UPSTREAM (FT)	ACTUAL DEPTH DOWNSTREAM (FT)	VELOCITY (FT/SEC)	HGL UPSTREAM (FT)	HGL DOWNSTREAM (FT)	TC (MIN)	CUMULATIVE AREA (ACRE)	INTENSITY (IN/HR)	DISCHARGE (CFS)	CAPACITY (CFS)
K-13	LINE A	EXIST DI-K13	JB-A1	4.00	7.00	0.75	Circular	Concrete	1	24" RCP	0.012	0.36	0.01	1.07	1.90	1.51	4.67	602.54	602.12	18.0	3.97	5.85	11.83	22.83
A-1	LINE A	JB-A1	JB-A2	154.00	157.00	0.75	Circular	Concrete	1	24" RCP	0.012	0.35	0.01	1.07	1.61	1.07	6.91	602.12	600.42	18.5	3.97	5.85	11.83	22.83
A-2	LINE A	JB-A2	JB-A3	104.50	108.00	0.75	Circular	Concrete	1	24" RCP	0.012	0.20	0.01	1.07	1.85	2.00	3.77	601.10	600.73	18.9	14.21	5.72	11.83	22.83
A-3	LINE A	JB-A3	OUTFALL A	83.00	87.00	0.50	Circular	Concrete	1	36" RCP	0.012	0.74	0.01	2.55	3.00	2.35	8.81	600.73	599.41	19.1	14.21	5.72	52.44	54.96
J-K14	LINE A2	JB-K14	JB-A3	20.00	24.00	0.90	Circular	Concrete	1	30" RCP	0.012	0.97	0.01	2.16	2.50	2.50	8.91	601.94	600.73	18.9	14.21	5.72	43.76	45.35

Plotted on: 6/13/2023

Design File name: P:\125\45\02\Design\Civil\Drainage\1254502drn_strm_data.dgn

DESIGN



Andres Morales
ANDRES MORALES, P.E.

6/13/2023
DATE

APPROVAL



Dennis K. Seal
DENNIS K. SEAL, P.E.

6/13/2023
DATE

REV. NO.	DATE	DESCRIPTION	BY



AUSTIN | SAN ANTONIO | HOUSTON | FORT WORTH | DALLAS
10801 N MOPAC EXPY, BLDG 3, STE 200 | AUSTIN, TX 78759 | 512.454.8711
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801



SL 1 AT SKUNK CREEK
STORM DRAIN
COMPUTATION SHEET

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.:	STATE:	FEDERAL AID PROJECT NO.:	HIGHWAY NO.:
CHK DGN:	6	TEXAS	---	SL 1
DWG:	DIST.:	COUNTY:	CONT. NO.:	SECT. NO.:
CHK DWG:	AUS	TRAVIS	3136	01
			JOB NO.:	SHEET NO.:
			200	49

Plotted on: 6/13/2023

Design File Name: P:\125\45\02\Design\Civil\Drainage\1254502_hds_k10_ex1.st_dgn

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 7 - Summary of Culvert Flows at Crossing: Exist_K10

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CMP 96 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
589.84	25 year	621.90	621.90	0.00	1
603.16	50 year	748.90	748.90	0.00	1
604.30	100 year	820.30	756.89	62.72	9
603.81	Overtopping	753.44	753.44	0.00	Overtopping

Table 8 - Culvert Summary Table: CMP 96

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
25 year	621.90	621.90	589.84	12.791	14.842	4-FFF	4.870	6.337	8.000	14.756	12.372	18.740
50 year	748.90	748.90	603.16	16.310	28.169	4-FFF	5.571	6.872	8.000	24.410	14.899	22.570
100 year	820.30	756.89	604.30	16.550	36.388	4-FFF	5.618	6.901	8.000	25.302	15.058	22.811

.....
 Straight Culvert
 Inlet Elevation (invert): 575.00 ft, Outlet Elevation (invert): 566.95 ft
 Culvert Length: 260.12 ft, Culvert Slope: 0.0310

Table 9 - Downstream Channel Rating Curve (Crossing: Exist_K10)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)
535.10	579.47	12.51	16.12
621.90	581.71	14.76	18.74
748.90	591.36	24.41	22.57
820.30	599.34	32.38	24.72

Tailwater Channel Data - Exist_K10

Tailwater Channel Option: Enter Rating Curve
 Channel Invert Elevation: 566.95 ft

Roadway Data for Crossing: Exist_K10

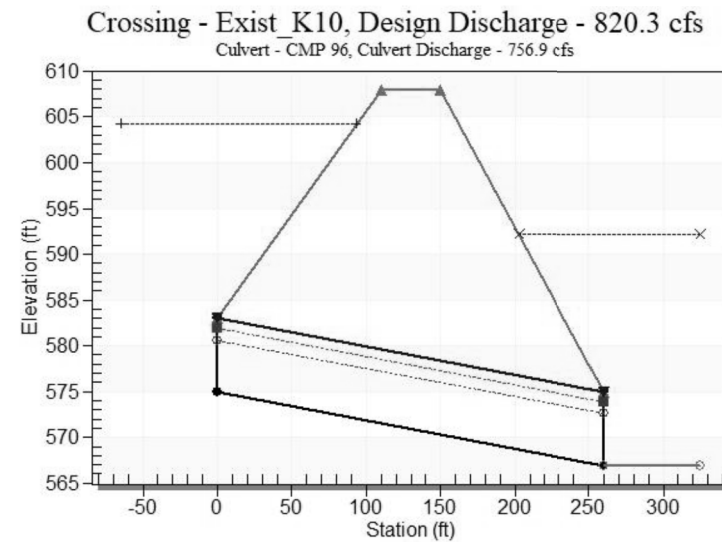
Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	608.00
1	100.00	606.40
2	200.00	604.73
3	300.00	603.81
4	400.00	604.25
5	500.00	605.93
6	600.00	606.54
7	700.00	608.79

Roadway Surface: Paved
 Roadway Top Width: 40.00 ft

Water Surface Profile Plot for Culvert: CMP 96



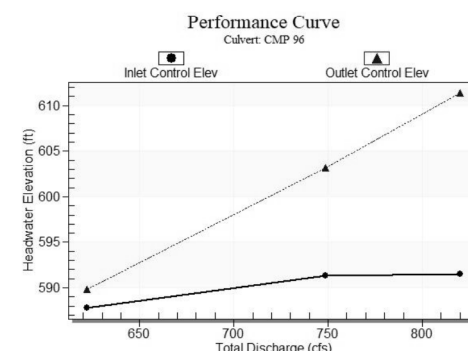
Site Data - CMP 96

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 575.00 ft
 Outlet Station: 260.00 ft
 Outlet Elevation: 566.95 ft
 Number of Barrels: 1

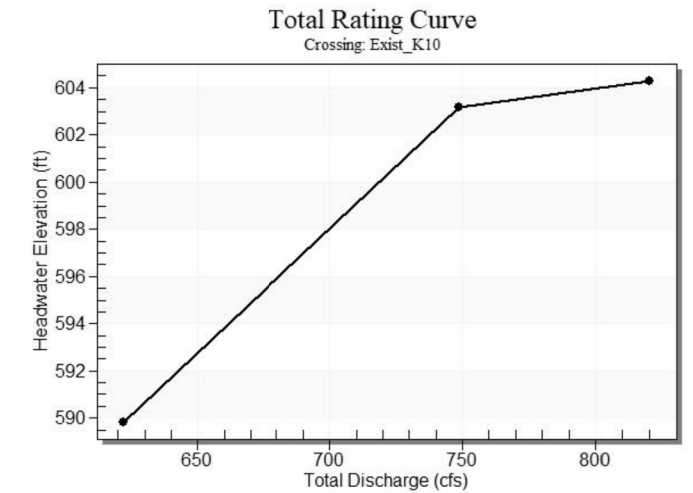
Culvert Data Summary - CMP 96

Barrel Shape: Circular
 Barrel Diameter: 8.00 ft
 Barrel Material: Corrugated Steel
 Embedment: 0.00 in
 Barrel Manning's n: 0.0240
 Culvert Type: Straight
 Inlet Configuration: Mitered to Conform to Slope
 Inlet Depression: None

Culvert Performance Curve Plot: CMP 96



Rating Curve Plot for Crossing: Exist_K10



NOTES:

1. HY-8 V 7.5 USED TO MODEL UPSTREAM HW ELEVATION.
2. GEOPAK DRAINAGE MODEL USED TO CALCULATE ENERGY LOSSES IN THE CULVERT AND DOWNSTREAM CHANNEL RATING CURVE.

DESIGN

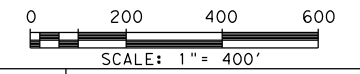
ANDRES MORALES, P.E.

6/13/2023
DATE

APPROVAL

DENNIS K. SEAL, P.E.

6/13/2023
DATE



REV. NO.	DATE	DESCRIPTION	BY

PAPE-DAWSON ENGINEERS

AUSTIN | SAN ANTONIO | HOUSTON | FORT WORTH | DALLAS
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 TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801

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SL 1 AT SKUNK CREEK
**EXISTING K10
 HYDRAULIC DATA SHEET**

SHEET 1 OF 4

DGN:	FED. RD. DIV. NO.:	STATE:	FEDERAL AID PROJECT NO.:	HIGHWAY NO.:
CHK DGN:	6	TEXAS	---	SL 1
DWG:	DIST.:	COUNTY:	CONT. NO.:	SECT. NO.:
CHK DWG:	AUS	TRAVIS	3136	01
			JOB NO.:	SHEET NO.:
			200	50

Plotted on: 6/13/2023

Design File Name: P:\125\45\02\Design\Civil\Drainage\1254502_hds_k10_prop.dgn

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 10 - Summary of Culvert Flows at Crossing: Prop_K10

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Lined 78 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
596.60	25 year	621.90	621.90	0.00	1
604.23	50 year	748.90	707.59	41.10	17
604.43	100 year	820.30	709.19	110.74	8
603.81	Overtopping	704.09	704.09	0.00	Overtopping

Table 11 - Culvert Summary Table: Lined 78

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
25 year	621.90	621.90	596.60	21.597	19.075	4-FFI	3.613	6.162	6.500	14.756	18.741	18.740
50 year	748.90	707.59	604.23	27.001	32.374	4-FFI	3.929	6.295	6.500	21.270	21.324	21.324
100 year	820.30	709.19	604.43	27.108	29.428	4-FFI	3.935	6.450	6.500	21.391	21.372	21.372

.....
 Straight Culvert
 Inlet Elevation (invert): 575.00 ft, Outlet Elevation (invert): 566.95 ft
 Culvert Length: 260.12 ft, Culvert Slope: 0.0310

Table 12 - Downstream Channel Rating Curve (Crossing: Prop_K10)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)
535.10	579.47	12.51	16.12
621.90	581.71	14.76	18.74
748.90	591.36	24.41	22.57
820.30	599.34	32.38	24.72

Tailwater Channel Data - Prop_K10

Tailwater Channel Option: Enter Rating Curve
 Channel Invert Elevation: 566.95 ft

Roadway Data for Crossing: Prop_K10

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

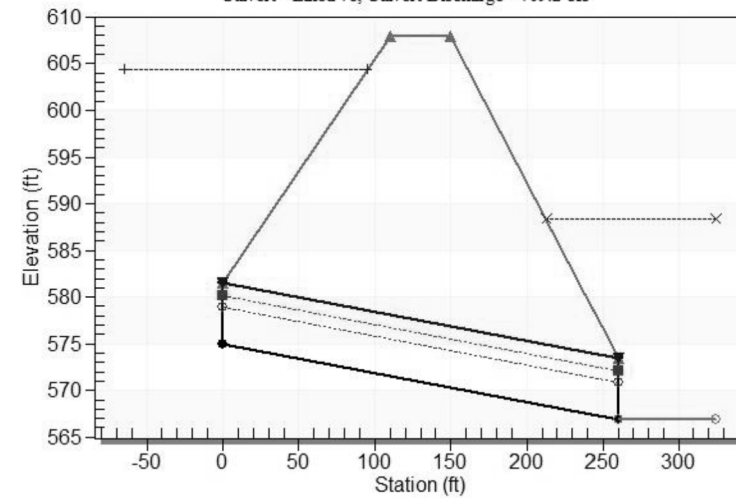
Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	608.00
1	100.00	606.40
2	200.00	604.73
3	300.00	603.81
4	400.00	604.25
5	500.00	605.93
6	600.00	606.54
7	700.00	608.79

Roadway Surface: Paved
 Roadway Top Width: 40.00 ft

Water Surface Profile Plot for Culvert: Lined 78

Crossing - Prop_K10, Design Discharge - 820.3 cfs
 Culvert - Lined 78, Culvert Discharge - 709.2 cfs



Site Data - Lined 78

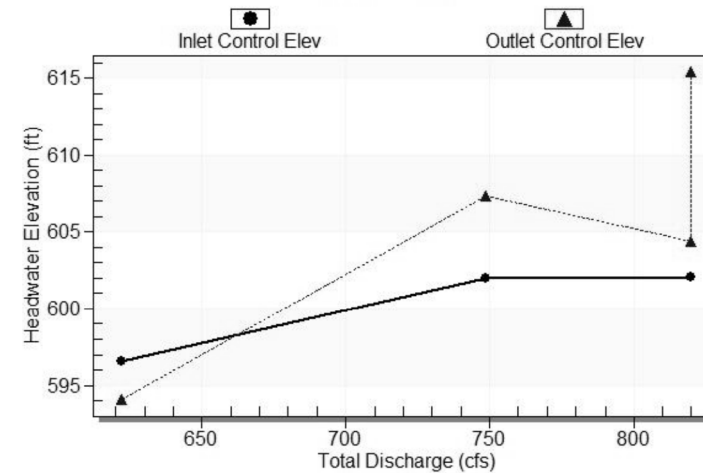
Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 575.00 ft
 Outlet Station: 260.00 ft
 Outlet Elevation: 566.95 ft
 Number of Barrels: 1

Culvert Data Summary - Lined 78

Barrel Shape: Circular
 Barrel Diameter: 6.50 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Culvert Type: Straight
 Inlet Configuration: Mitered to Conform to Slope
 Inlet Depression: None

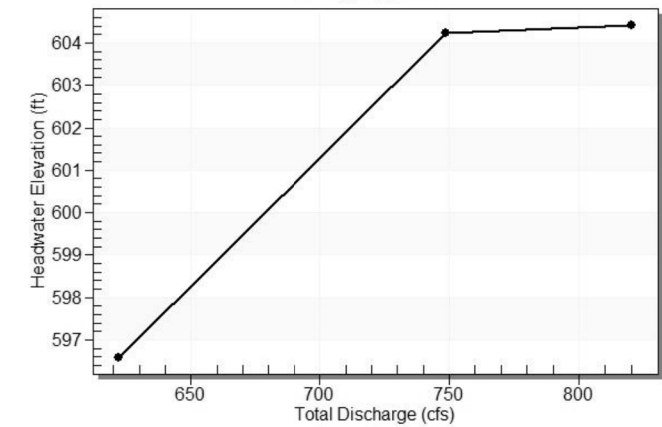
Culvert Performance Curve Plot: Lined 78

Performance Curve
 Culvert Lined 78



Rating Curve Plot for Crossing: Prop_K10

Total Rating Curve
 Crossing: Prop_K10



NOTES:

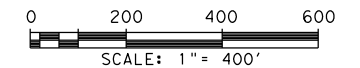
1. HY-8 V 7.5 USED TO MODEL UPSTREAM HW ELEVATION.
2. GEOPAK DRAINAGE MODEL USED TO CALCULATE ENERGY LOSSES IN THE CULVERT AND DOWNSTREAM CHANNEL RATING CURVE.

DESIGN

ANDRES MORALES, P.E. 6/13/2023 DATE

APPROVAL

DENNIS K. SEAL, P.E. 6/13/2023 DATE



REV. NO.	DATE	DESCRIPTION	BY

PAPE-DAWSON ENGINEERS
 AUSTIN | SAN ANTONIO | HOUSTON | FORT WORTH | DALLAS
 10801 N MOPAC EXPY, BLDG 3, STE 200 | AUSTIN, TX 78759 | 512.454.8711
 TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801

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SL 1 AT SKUNK CREEK
**PROPOSED K10
 HYDRAULIC DATA SHEET**

SHEET 2 OF 4

DGN:	FED. RD. DIV. NO.:	STATE:	FEDERAL AID PROJECT NO.:	HIGHWAY NO.:		
CHK DGN:	6	TEXAS	---	SL 1		
DWG:	DIST.:	COUNTY:	CONT. NO.:	SECT. NO.:	JOB NO.:	SHEET NO.:
CHK DWG:	AUS	TRAVIS	3136	01	200	51

Plotted on: 6/13/2023

Design File Name: P:\125\45\02\Design\Civil\Drainage\1254502_hds_K11_ex1.st.dgn

Crossing Discharge Data
Discharge Selection Method: Recurrence

Table 1 - Summary of Culvert Flows at Crossing: Exist_K11

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CMP 66 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
586.11	25 year	213.50	213.50	0.00	1
593.68	50 year	286.00	286.00	0.00	1
602.46	100 year	321.10	321.10	0.00	1
603.81	Overtopping	342.09	342.09	0.00	Overtopping

Table 2 - Culvert Summary Table: CMP 66

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
25 year	213.50	213.50	586.11	7.883	11.107	4-FFr	2.894	4.085	5.900	13.856	8.986	16.990
50 year	286.00	286.00	593.68	10.868	18.683	4-FFr	3.500	4.674	5.900	17.930	12.038	12.038
100 year	321.10	321.10	602.46	12.755	27.464	4-FFr	3.812	4.885	5.900	24.650	13.515	13.515

.....
Straight Culvert
Inlet Elevation (invert): 575.00 ft, Outlet Elevation (invert): 567.95 ft
Culvert Length: 166.15 ft, Culvert Slope: 0.0425
.....

Table 3 - Downstream Channel Rating Curve (Crossing: Exist_K11)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)
177.20	579.47	11.62	14.10
213.50	581.71	13.86	16.99
286.00	585.78	17.93	12.04
321.10	592.50	24.65	13.52

Tailwater Channel Data - Exist_K11

Tailwater Channel Option: Enter Rating Curve
Channel Invert Elevation: 567.85 ft

Roadway Data for Crossing: Exist_K11

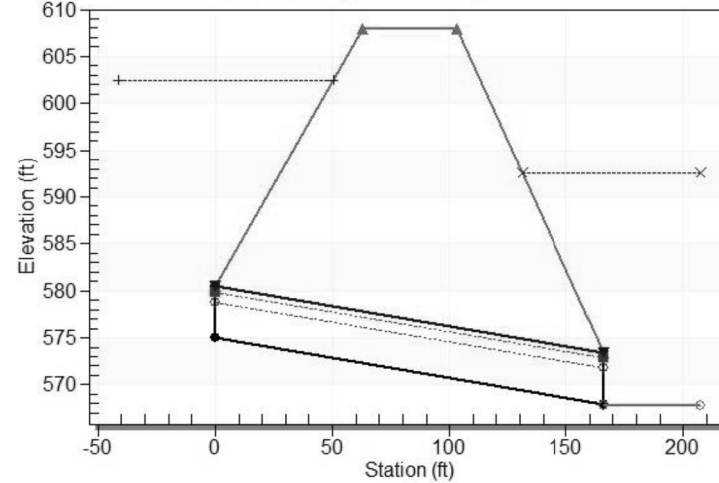
Roadway Profile Shape: Irregular Roadway Shape (coordinates)
Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	608.00
1	100.00	606.40
2	200.00	604.73
3	300.00	603.81
4	400.00	604.25
5	500.00	605.93
6	600.00	606.54
7	700.00	608.79

Roadway Surface: Paved
Roadway Top Width: 40.00 ft

Water Surface Profile Plot for Culvert: CMP 66

Crossing - Exist_K11, Design Discharge - 321.1 cfs
Culvert - CMP 66, Culvert Discharge - 321.1 cfs



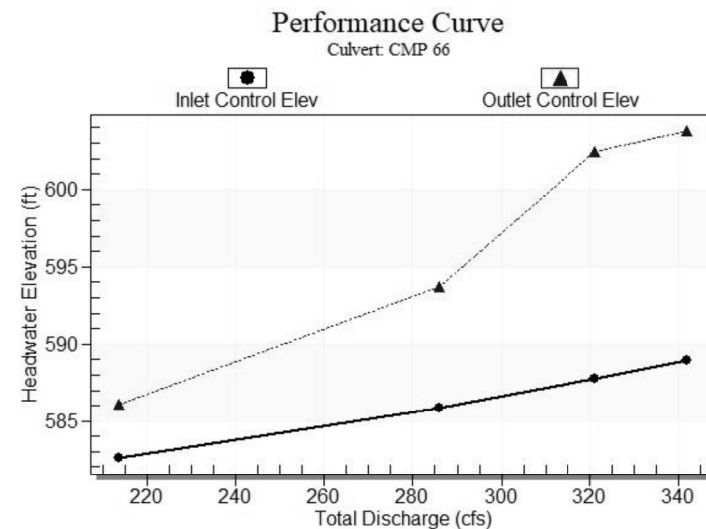
Site Data - CMP 66

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 575.00 ft
Outlet Station: 166.00 ft
Outlet Elevation: 567.95 ft
Number of Barrels: 1

Culvert Data Summary - CMP 66

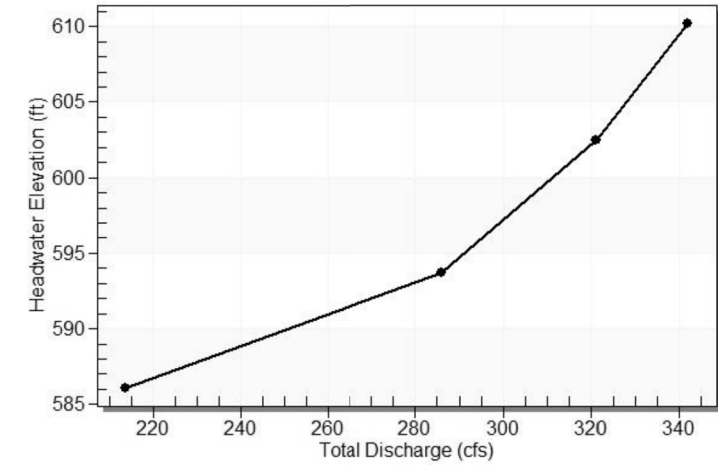
Barrel Shape: Circular
Barrel Diameter: 5.50 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Mitered to Conform to Slope
Inlet Depression: None

Culvert Performance Curve Plot: CMP 66



Rating Curve Plot for Crossing: Exist_K11

Total Rating Curve
Crossing: Exist_K11



NOTES:

1. HY-8 V 7.5 USED TO MODEL UPSTREAM HW ELEVATION.
2. GEOPAK DRAINAGE MODEL USED TO CALCULATE ENERGY LOSSES IN THE CULVERT AND DOWNSTREAM CHANNEL RATING CURVE.

DESIGN

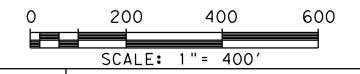


Andres Morales
ANDRES MORALES, P.E.
6/13/2023
DATE

APPROVAL



Dennis K. Seal
DENNIS K. SEAL, P.E.
6/13/2023
DATE



REV. NO.	DATE	DESCRIPTION	BY

AUSTIN | SAN ANTONIO | HOUSTON | FORT WORTH | DALLAS
10801 N MOPAC EXPY, BLDG 3, STE 200 | AUSTIN, TX 78759 | 512.454.8711
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801

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SL 1 AT SKUNK CREEK
**EXISTING K11
HYDRAULIC DATA SHEET**

SHEET 3 OF 4

DGN:	FED. RD. DIV. NO.:	STATE:	FEDERAL AID PROJECT NO.:	HIGHWAY NO.:
CHK DGN:	6	TEXAS	---	SL 1
DWG:	DIST.:	COUNTY:	CONT. NO.:	SECT. NO.:
CHK DWG:	AUS	TRAVIS	3136	01
			JOB NO.:	SHEET NO.:
			200	52

Plotted on: 6/13/2023

Design File Name: P:\125\45\02\Design\Civil\Drainage\1254502_hds_k11_prop.dgn

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 4 - Summary of Culvert Flows at Crossing: Prop_K11

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Lined 48 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
588.12	25 year	213.50	213.50	0.00	1
602.87	50 year	286.00	286.00	0.00	1
604.19	100 year	321.10	290.28	30.52	13
603.81	Overtopping	289.06	289.06	0.00	Overtopping

Table 5 - Culvert Summary Table: Lined 48

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
25 year	213.50	213.50	588.12	11.919	13.116	4-FFF	2.154	4.119	4.500	13.856	13.424	16.990
50 year	286.00	286.00	602.87	19.204	27.868	4-FFF	2.575	4.288	4.500	23.510	17.983	22.760
100 year	321.10	290.28	604.19	19.714	29.195	4-FFF	2.600	4.500	4.500	24.482	18.251	23.100

.....
 Straight Culvert
 Inlet Elevation (invert): 575.00 ft, Outlet Elevation (invert): 567.95 ft
 Culvert Length: 166.15 ft, Culvert Slope: 0.0425

Table 6 - Downstream Channel Rating Curve (Crossing: Prop_K11)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)
177.20	579.47	11.62	14.10
213.50	581.71	13.86	16.99
286.00	591.36	23.51	22.76
321.10	599.34	31.49	25.55

Tailwater Channel Data - Prop_K11

Tailwater Channel Option: Enter Rating Curve
 Channel Invert Elevation: 567.85 ft

Roadway Data for Crossing: Prop_K11

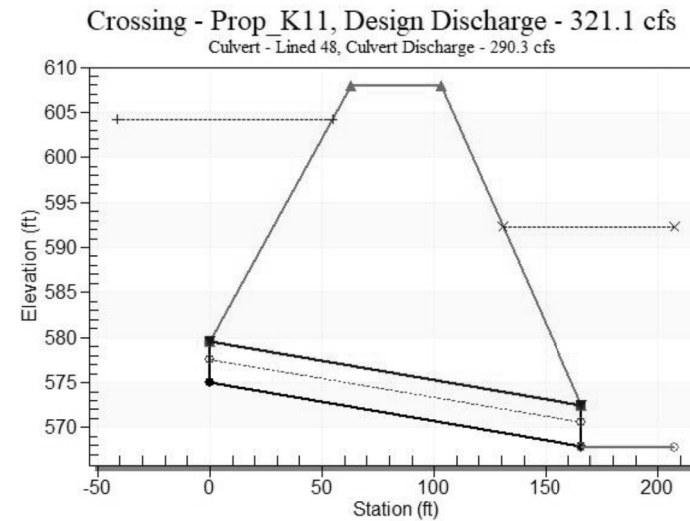
Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

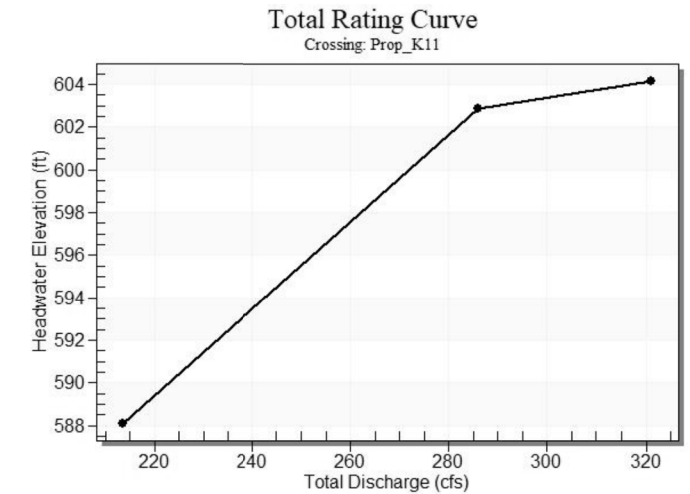
Coord No.	Station (ft)	Elevation (ft)
0	0.00	608.00
1	100.00	606.40
2	200.00	604.73
3	300.00	603.81
4	400.00	604.25
5	500.00	605.93
6	600.00	606.54
7	700.00	608.79

Roadway Surface: Paved
 Roadway Top Width: 40.00 ft

Water Surface Profile Plot for Culvert: Lined 48



Rating Curve Plot for Crossing: Prop_K11



NOTES:

1. HY-8 V 7.5 USED TO MODEL UPSTREAM HW ELEVATION.
2. GEOPAK DRAINAGE MODEL USED TO CALCULATE ENERGY LOSSES IN THE CULVERT AND DOWNSTREAM CHANNEL RATING CURVE.

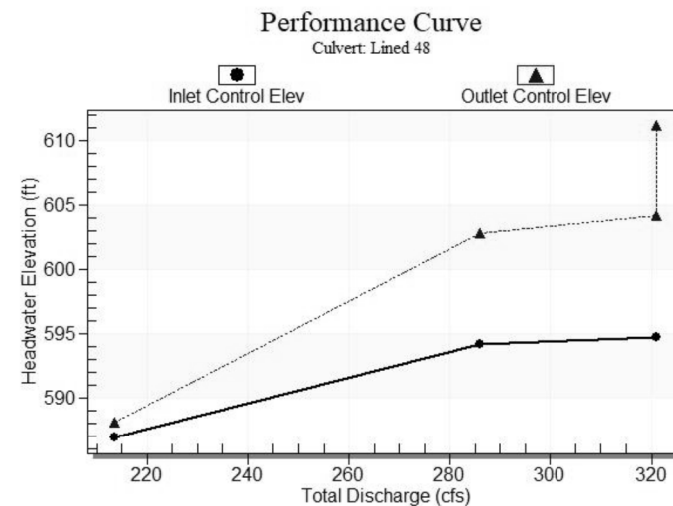
Site Data - Lined 48

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 575.00 ft
 Outlet Station: 166.00 ft
 Outlet Elevation: 567.95 ft
 Number of Barrels: 1


Culvert Data Summary - Lined 48

Barrel Shape: Circular
 Barrel Diameter: 4.50 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Culvert Type: Straight
 Inlet Configuration: Mitered to Conform to Slope
 Inlet Depression: None


Culvert Performance Curve Plot: Lined 48

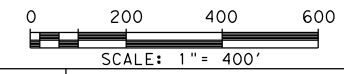


DESIGN

 *Andres Morales*
 ANDRES MORALES, P.E. 6/13/2023
 DATE


APPROVAL

 *Dennis K. Seal*
 DENNIS K. SEAL, P.E. 6/13/2023
 DATE



REV. NO.	DATE	DESCRIPTION	BY

PAPE-DAWSON ENGINEERS
 AUSTIN | SAN ANTONIO | HOUSTON | FORT WORTH | DALLAS
 10801 N MOPAC EXPY, BLDG 3, STE 200 | AUSTIN, TX 78759 | 512.454.8711
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SL 1 AT SKUNK CREEK
**PROPOSED K11
 HYDRAULIC DATA SHEET**

SHEET 4 OF 4

CHK DGN:	DON:	FED. RD. DIV. NO.:	STATE:	FEDERAL AID PROJECT NO.:	HIGHWAY NO.:	
		6	TEXAS	---	SL 1	
CHK DWG:	DIST.:	COUNTY:	CONT. NO.:	SECT. NO.:	JOB NO.:	SHEET NO.:
	AUS	TRAVIS	3136	01	200	53

Plotted on: 6/13/2023

Design File name: P:\12545\02\Design\Civil\Drainage\1254502drn_hds.dgn

50-YR EXISTING CULVERT K COMPUTATIONS

LINE ID	LINE ID	UPSTREAM NODE	DOWNSTREAM NODE	LENGTH (FT)	HYDRAULIC LENGTH (FT)	SLOPE %	MATERIAL	# OF BARRELS	STR SIZE	MANNING'S N	UPSTREAM JUNCTION LOSS (FT)	FRICTION SLOPE (FT)	UNIFORM DEPTH (FT)	ACTUAL DEPTH UPSTREAM (FT)	ACTUAL DEPTH DOWNSTREAM (FT)	VELOCITY (FT/SEC)	HGL UPSTREAM (FT)	HGL DOWNSTREAM (FT)	DISCHARGE (CFS)	CAPACITY (CFS)
K10	CULVERT K	K10	J-K10B	260.06	260.06	3.10	Aluminum	1	96" CMP	0.024	3.45	0.03	5.72	8.00	8.00	14.90	595.21	585.78	748.90	935.02
K11	CULVERT K	K11	J-K10B	165.80	165.80	4.25	Aluminum	1	66" CMP	0.024	2.25	0.04	3.60	5.50	5.50	12.04	592.14	585.78	286.00	403.38
J-K10B	CULVERT K	J-K10B	J-K10-BEND	135.21	135.21	4.36	Aluminum	1	96" CMP	0.024	5.11	0.04	6.59	8.00	8.00	20.59	585.78	574.74	1034.90	1109.19
J-K10BEND	CULVERT K	J-K10-BEND	J-K10C	117.91	117.91	4.28	Aluminum	1	96" CMP	0.024	1.36	0.04	6.66	8.00	8.00	20.59	574.74	568.21	1034.90	1099.46
J-K10C	CULVERT K	J-K10C	OUT_CULV	169.79	169.79	4.28	Aluminum	1	96" CMP	0.024	2.23	0.05	8.00	8.00	7.72	23.35	568.21	556.47	1160.80	1099.46
K13	LAT1	DI-K13	J-K10C	273.53	275.28	2.47	Concrete	1	18" RCP	0.012	4.75	0.06	1.50	1.50	1.50	17.49	621.55	596.50	30.90	19.23
K14	LAT2	DI_K14	J-K14	50.72	53.97	0.99	Concrete	1	30" RCP	0.012	4.37	0.03	2.50	2.50	2.50	16.77	613.23	604.18	82.30	47.46
J-K14	LAT2	J-K14	J-K10C	76.49	77.99	13.07	Concrete	1	30" RCP	0.012	2.00	0.13	1.38	2.50	1.63	28.06	604.18	591.13	95.00	172.83
K16	LAT2-1	CI-K16	J-K14	70.82	73.57	0.97	Concrete	1	18" RCP	0.012	0.80	0.01	1.50	1.50	1.50	7.19	605.89	604.18	12.70	12.08

100-YR EXISTING CULVERT K COMPUTATIONS

LINE ID	LINE	UPSTREAM NODE	DOWNSTREAM NODE	LENGTH (FT)	HYDRAULIC LENGTH (FT)	SLOPE %	MATERIAL	# OF BARRELS	STR SIZE	MANNING'S N	UPSTREAM JUNCTION LOSS (FT)	FRICTION SLOPE (FT)	UNIFORM DEPTH (FT)	ACTUAL DEPTH UPSTREAM (FT)	ACTUAL DEPTH DOWNSTREAM (FT)	VELOCITY (FT/SEC)	HGL UPSTREAM (FT)	HGL DOWNSTREAM (FT)	DISCHARGE (CFS)	CAPACITY (CFS)
K10	CULVERT K	K10	J-K10B	260.06	260.06	3.10	Aluminum	1	96" CMP	0.024	4.14	0.03	6.19	8.00	8.00	16.32	603.80	592.49	820.30	935.02
K11	CULVERT K	K11	J-K10B	165.80	165.80	4.25	Aluminum	1	66" CMP	0.024	2.84	0.04	3.92	5.50	5.50	13.52	600.49	592.49	321.10	403.38
J-K10B	CULVERT K	J-K10B	J-K10-BEND	135.21	135.21	4.36	Aluminum	1	96" CMP	0.024	6.22	0.05	8.00	8.00	8.00	22.71	592.49	579.05	1141.40	1109.19
J-K10BEND	CULVERT K	J-K10-BEND	J-K10C	117.91	117.91	4.28	Aluminum	1	96" CMP	0.024	1.65	0.05	8.00	8.00	8.00	22.71	579.05	571.11	1141.40	1099.46
J-K10C	CULVERT K	J-K10C	OUT_CULV	169.79	169.79	4.28	Aluminum	1	96" CMP	0.024	2.86	0.06	8.00	8.00	7.81	25.81	571.11	556.56	1289.60	1099.46
K13	LAT1	DI-K13	J-K10C	273.47	275.23	2.47	Concrete	1	18" RCP	0.012	7.00	0.09	1.50	1.50	1.50	21.22	633.39	596.50	37.50	19.23
K14	LAT2	DI_K14	J-K14	50.72	53.97	0.99	Concrete	1	30" RCP	0.012	5.96	0.04	2.50	2.50	2.50	19.58	617.58	604.88	96.10	47.46
J-K14	LAT2	J-K14	J-K10C	76.49	77.99	13.07	Concrete	1	30" RCP	0.012	2.68	0.13	1.53	2.50	1.79	29.49	604.88	591.29	110.70	172.83
K16	LAT2-1	CI-K16	J-K14	70.82	73.57	0.97	Concrete	1	18" RCP	0.012	1.06	0.01	1.50	1.50	1.50	8.26	607.15	604.88	14.60	12.08

50-YR PROPOSED CULVERT K COMPUTATIONS

LINE ID	LINE	UPSTREAM NODE	DOWNSTREAM NODE	LENGTH (FT)	HYDRAULIC LENGTH (FT)	SLOPE %	MATERIAL	# OF BARRELS	STR SIZE	MANNING'S N	UPSTREAM JUNCTION LOSS (FT)	FRICTION SLOPE (FT)	UNIFORM DEPTH (FT)	ACTUAL DEPTH UPSTREAM (FT)	ACTUAL DEPTH DOWNSTREAM (FT)	VELOCITY (FT/SEC)	HGL UPSTREAM (FT)	HGL DOWNSTREAM (FT)	DISCHARGE (CFS)	CAPACITY (CFS)
K10	CULVERT K	K10	J-K10B	260.06	260.06	3.10	Concrete	1	78" RCP	0.012	7.92	0.03	4.20	6.50	6.50	22.57	603.80	591.36	748.90	1074.93
K11	CULVERT K	K11	J-K10B	165.80	165.80	4.25	Concrete	1	48" RCP	0.012	8.05	0.04	2.94	4.00	4.00	22.76	605.01	591.36	286.00	345.09
J-K10B	CULVERT K	J-K10B	J-K10-BEND	135.21	135.21	4.36	Concrete	1	78" RCP	0.012	11.24	0.04	4.70	6.50	6.50	31.19	591.36	575.63	1034.90	1275.16
J-K10BEND	CULVERT K	J-K10-BEND	J-K10C	117.91	117.91	4.28	Concrete	1	78" RCP	0.012	3.11	0.04	4.73	6.50	6.50	31.19	575.63	568.60	1034.90	1263.97
J-K10C	CULVERT K	J-K10C	OUT_CULV	169.79	169.79	4.28	Concrete	1	78" RCP	0.012	5.37	0.04	5.26	6.50	5.96	36.43	568.60	555.46	1160.80	1263.97

100-YR PROPOSED CULVERT K COMPUTATIONS

LINE ID	LINE	UPSTREAM NODE	DOWNSTREAM NODE	LENGTH (FT)	HYDRAULIC LENGTH (FT)	SLOPE %	MATERIAL	# OF BARRELS	STR SIZE	MANNING'S N	UPSTREAM JUNCTION LOSS (FT)	FRICTION SLOPE (FT)	UNIFORM DEPTH (FT)	ACTUAL DEPTH UPSTREAM (FT)	ACTUAL DEPTH DOWNSTREAM (FT)	VELOCITY (FT/SEC)	HGL UPSTREAM (FT)	HGL DOWNSTREAM (FT)	DISCHARGE (CFS)	CAPACITY (CFS)
K10	CULVERT K	K10	J-K10B	260.06	260.06	3.10	Concrete	1	78" RCP	0.012	9.50	0.03	4.48	6.50	6.50	24.72	614.26	599.34	820.30	1074.93
K11	CULVERT K	K11	J-K10B	165.80	165.80	4.25	Concrete	1	48" RCP	0.012	10.15	0.04	3.29	4.00	4.00	25.55	616.54	599.34	321.10	345.09
J-K10B	CULVERT K	J-K10B	J-K10-BEND	135.21	135.21	4.36	Concrete	1	78" RCP	0.012	13.64	0.04	5.12	6.50	6.50	34.40	599.34	580.23	1141.40	1275.16
J-K10BEND	CULVERT K	J-K10-BEND	J-K10C	117.91	117.91	4.28	Concrete	1	78" RCP	0.012	3.79	0.04	5.17	6.50	6.50	34.40	580.23	571.68	1141.40	1263.97
J-K10C	CULVERT K	J-K10C	OUT_CULV	169.79	169.79	4.28	Concrete	1	78" RCP	0.012	6.93	0.05	6.50	6.50	6.50	38.86	571.68	556.00	1289.60	1263.97



Andres Morales
ANDRES MORALES, P.E.
DATE

6/13/2023



Dennis K. Seal
DENNIS K. SEAL, P.E.
DATE

6/13/2023

REV. NO.	DATE	DESCRIPTION	BY



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TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801

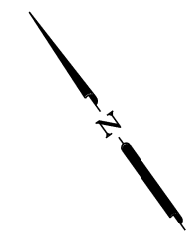
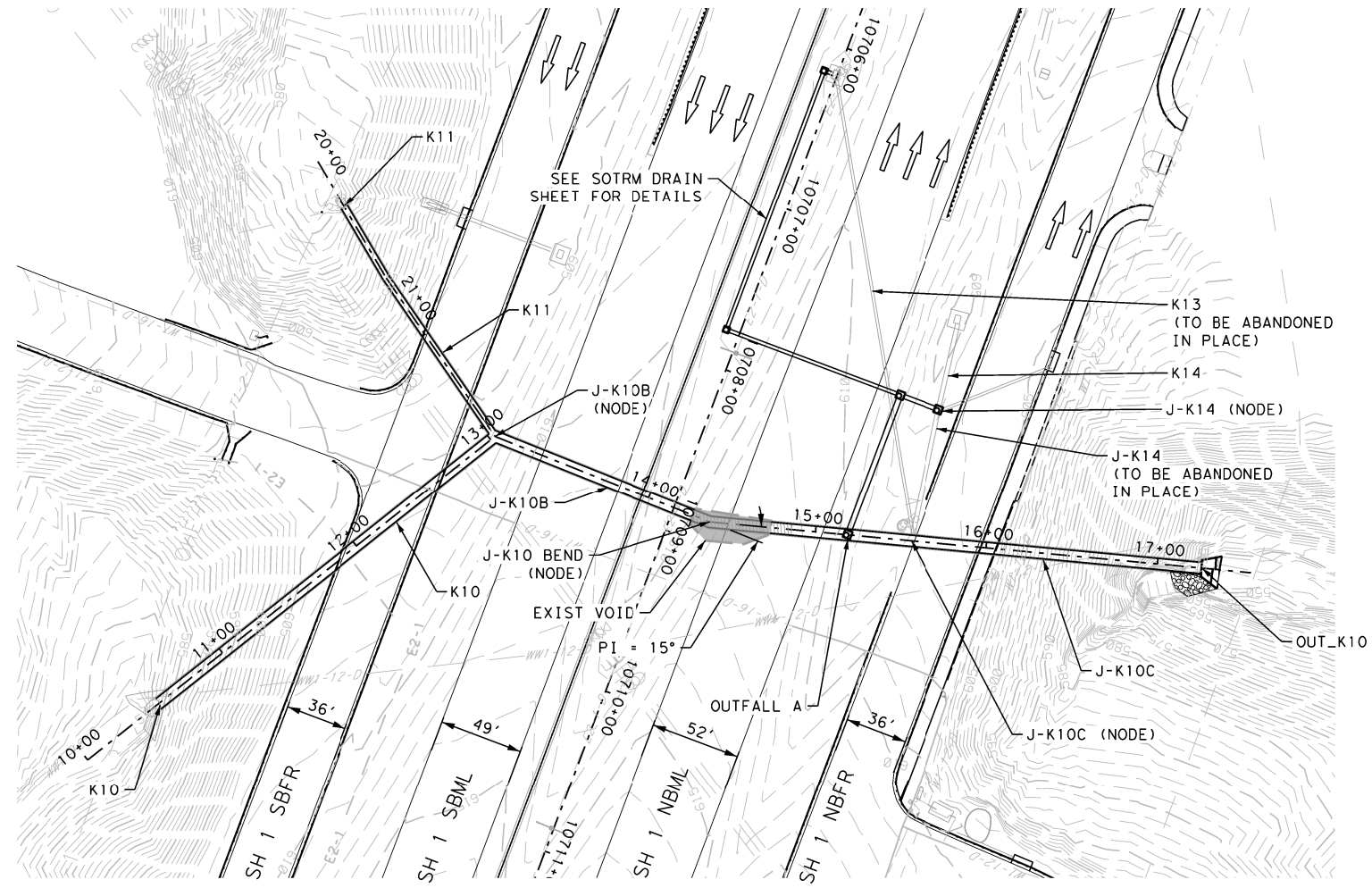


SL 1 AT SKUNK CREEK
CULVERT K
HYDRAULIC DATA

SHEET 1 OF 1


DGN:	FED. RD. DIV. NO.:	STATE:	FEDERAL AID PROJECT NO.:	HIGHWAY NO.:		
CHK DGN:	6	TEXAS	---	SL 1		
DWG:	DIST.:	COUNTY:	CONT. NO.:	SECT. NO.:	JOB NO.:	SHEET NO.:
CHK DWG:	AUS	TRAVIS	3136	01	200	54

Plotted on: 6/13/2023




- LEGEND**
- EXISTING DRAINAGE STRUCTURE
 - 850- EXISTING CONTOUR
 - == PROPOSED STORM DRAIN
 - EXISTING EOP
 - ← TRAFFIC FLOW ARROW
 - █ EXISTING VOID
 - EXISTING STRUCTURES ARE SHOWN SCREENED BACK
- NOTES**
- SEE PERTINENT STRUCTURE LAYOUT OR PROFILE FOR ADDITIONAL DETAILS OF EACH STRUCTURE.

DESIGN


 ANDRES MORALES, P.E.
 6/13/2023 DATE

APPROVAL


 DENNIS K. SEAL, P.E.
 6/13/2023 DATE

0 50 100 150

PLAN SCALE: 1" = 100' PROF SCALE: 1" = 100' HORZ
 PROF SCALE: 1" = 20' VERT

REV. NO.	DATE	DESCRIPTION	BY

Pape-Dawson ENGINEERS

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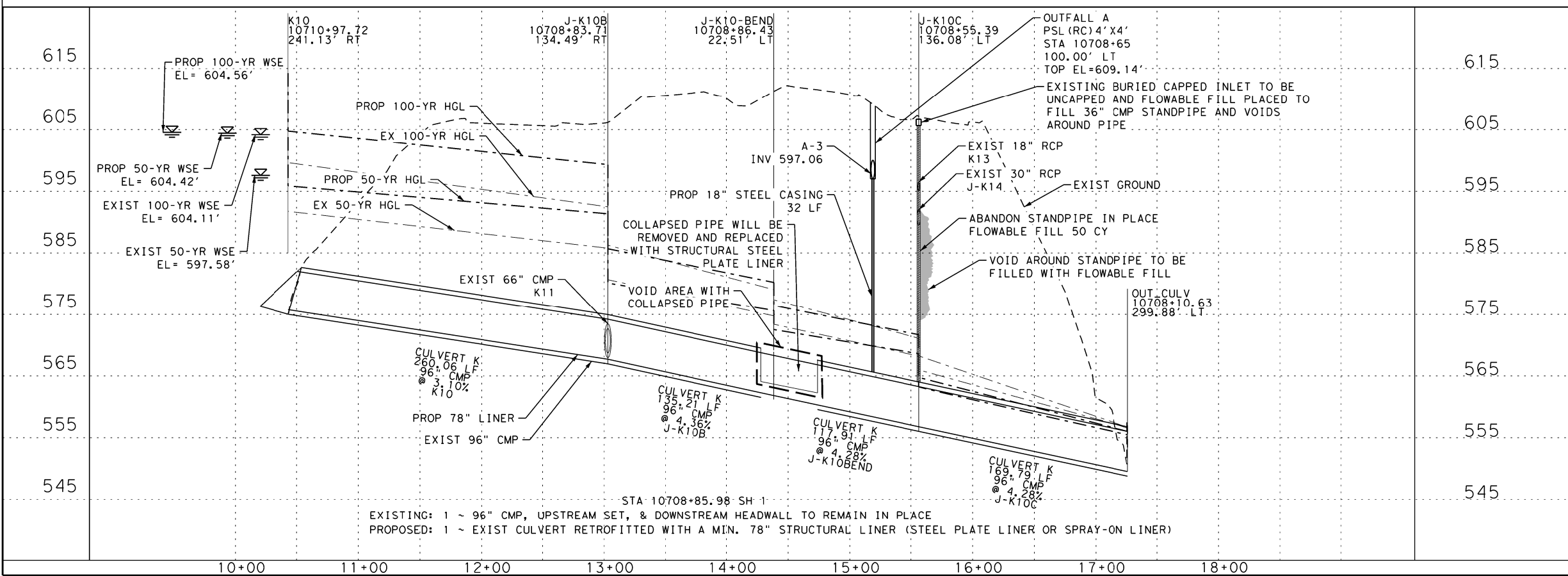
SL 1 AT SKUNK CREEK

CULVERT K LAYOUT

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.:	STATE:	FEDERAL AID PROJECT NO.:	HIGHWAY NO.:
CHK DGN:	6	TEXAS	---	SL 1
DWG:	DIST.:	COUNTY:	CONT. NO.:	SECT. NO.:
CHK DWG:	AUS	TRAVIS	3136	01
			200	55

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Plotted on: 6/13/2023

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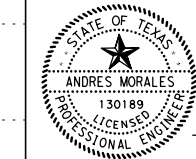
LEGEND

- EXISTING GROUND
- HGL

NOTES

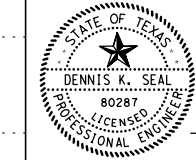
1. ALL RCP IS CLIII UNLESS OTHERWISE NOTED.
2. REFER MISC DETAIL SHEET FOR POINT CONTROL DETAIL.
3. REFERENCE STORM DRAIN PLAN AND PROFILE AND CULVERT K LAYOUT SHEETS FOR MORE INFORMATION.
4. STORM SEWER PROFILES CUT ALONG TRUNKLINE.
5. STORM SEWER LENGTHS SHOWN ARE ACTUAL LENGTHS, WHICH DIFFERS FROM PAY LENGTHS.
6. REFER TO INTERIOR DRAINAGE AREA MAP FOR RUNOFF CALCULATIONS.
7. REFER TO STORM DRAIN DATA SHEET FOR STORM DRAIN HYDRAULIC CALCULATIONS.
8. STORM DRAIN WAS DESIGNED USING GEOPAK DRAINAGE FOR 10-YR STORM EVENT.
9. CULVERT WAS DESIGNED USING GEOPAK DRAINAGE & HY-8 FOR 50-YR STORM EVENT.

DESIGN



Andres Morales
 ANDRES MORALES, P.E.
 6/13/2023
 DATE

APPROVAL



Dennis K. Seal
 DENNIS K. SEAL, P.E.
 6/13/2023
 DATE

REV. NO.	DATE	DESCRIPTION	BY



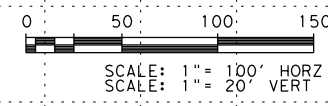
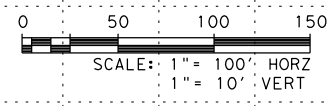
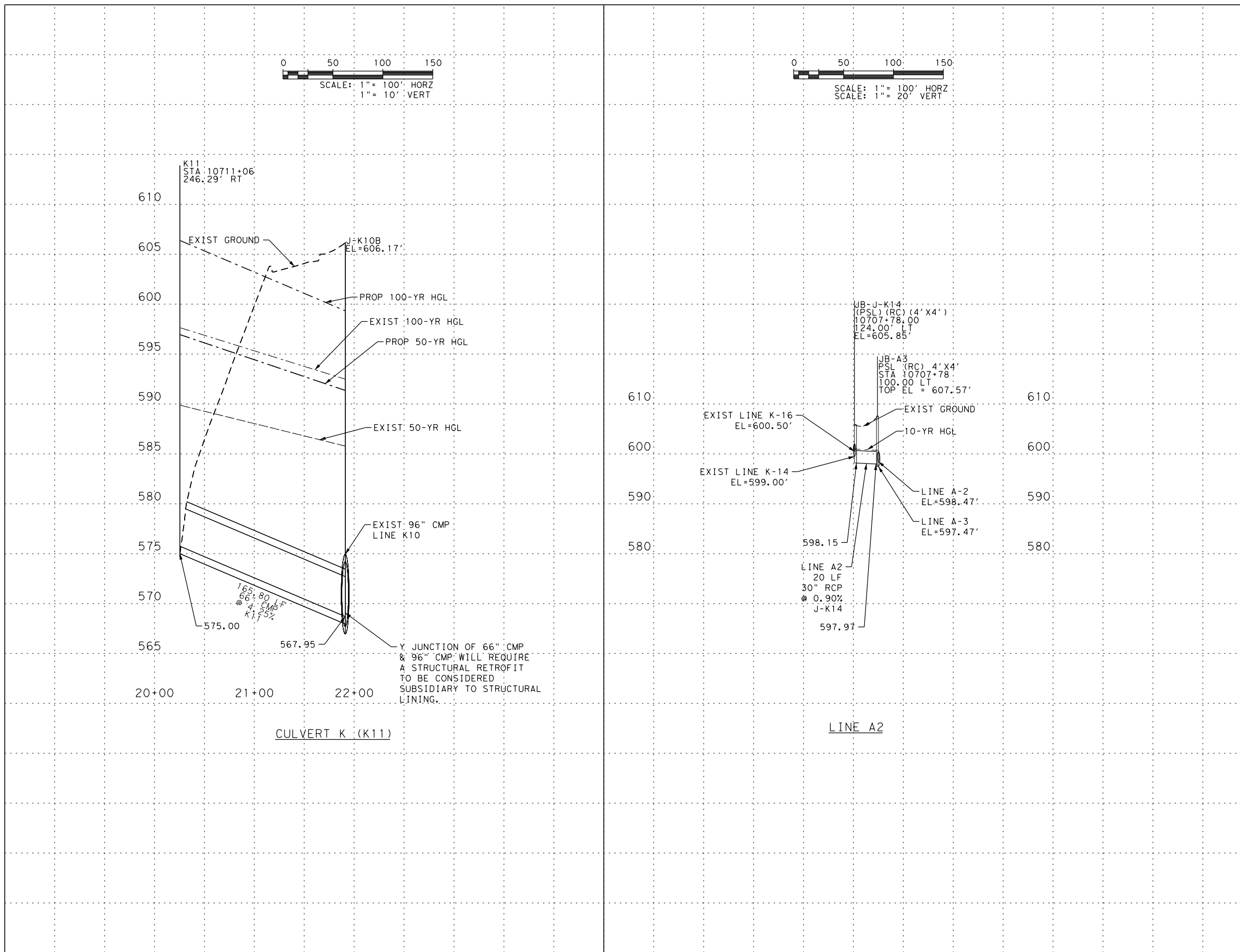
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 TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801



SL 1 AT SKUNK CREEK
 STORM SEWER
 LATERALS

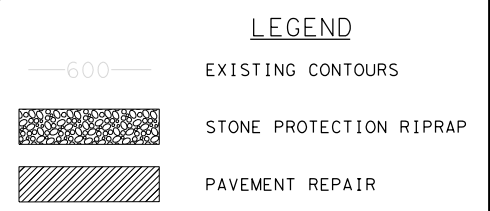
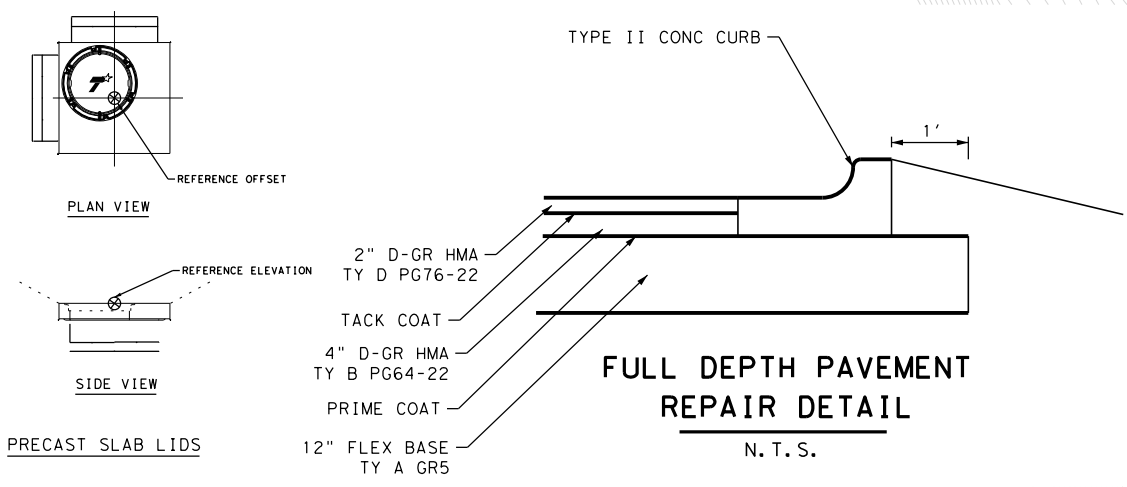
SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.:	STATE:	FEDERAL AID PROJECT NO.:	HIGHWAY NO.:
CHK DGN:	6	TEXAS	---	SL 1
DWG:	DIST.:	COUNTY:	CONT. NO.:	SECT. NO.:
CHK DWG:	AUS	TRAVIS	3136	01
			JOB NO.:	SHEET NO.:
			200	56



Plotted on: 6/13/2023

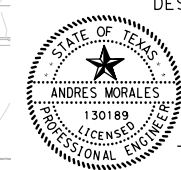
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NOTES

1. AT THE COMPLETION OF THE ABANDONMENT OF THE EXISTING 36" CMP RISER THE CONTRACTOR WILL COMPLETE FULL DEPTH REPAIR OF THE OUTSIDE FRONTAGE ROAD LANE.

DESIGN

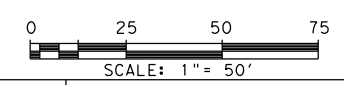


Andres Morales
ANDRES MORALES, P.E.
DATE: 6/13/2023

APPROVAL



Dennis K. Seal
DENNIS K. SEAL, P.E.
DATE: 6/13/2023



REV. NO.	DATE	DESCRIPTION	BY



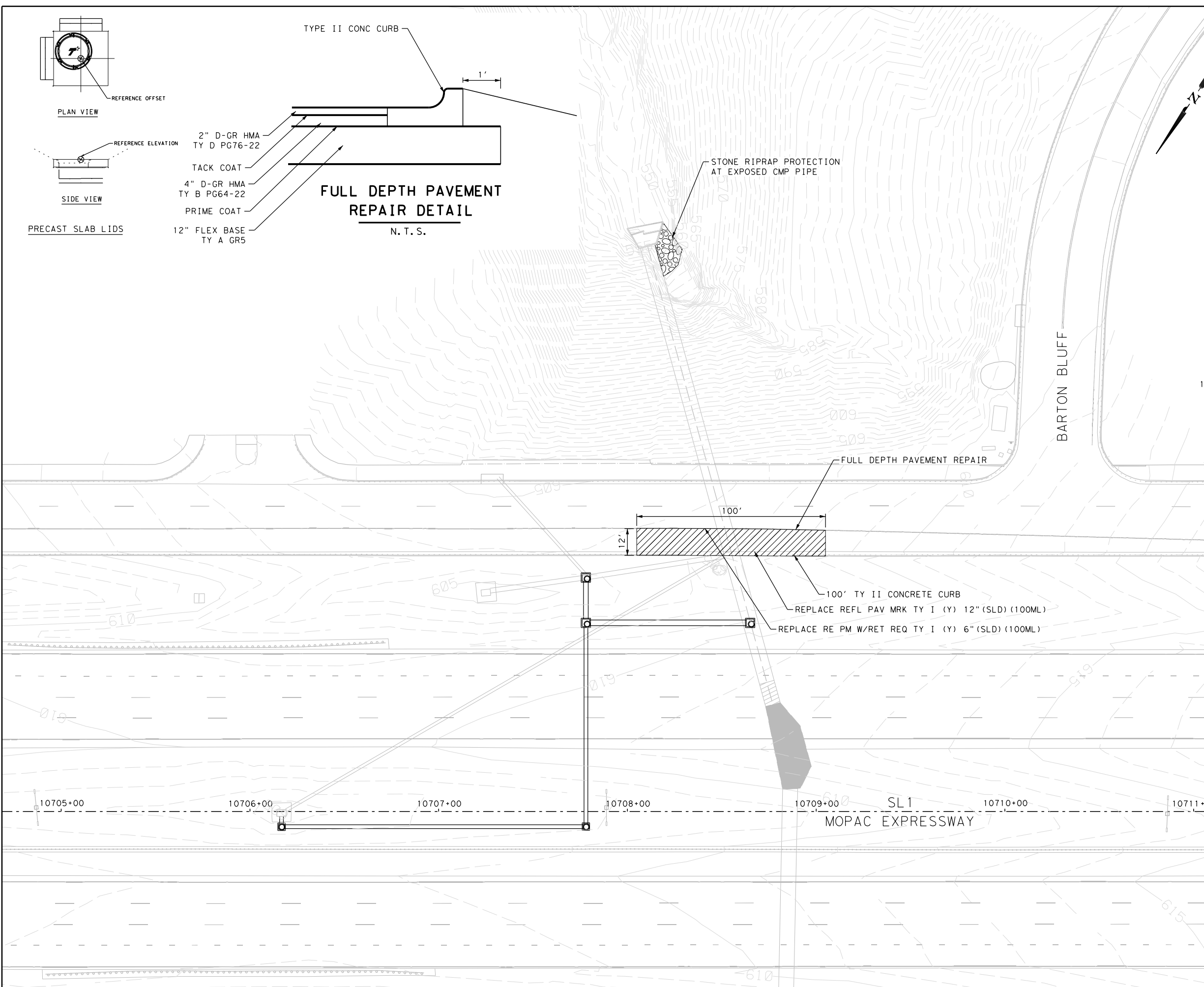
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SL 1 AT SKUNK CREEK

MISC DETAILS

DGN:	FED. RD. DIV. NO.:	STATE:	FEDERAL AID PROJECT NO.:	HIGHWAY NO.:
CHK DGN:	6	TEXAS	---	SL 1
DWG:	DIST.:	COUNTY:	CONT. NO.:	SECT. NO.:
CHK DWG:	AUS	TRAVIS	3136	01
			200	57

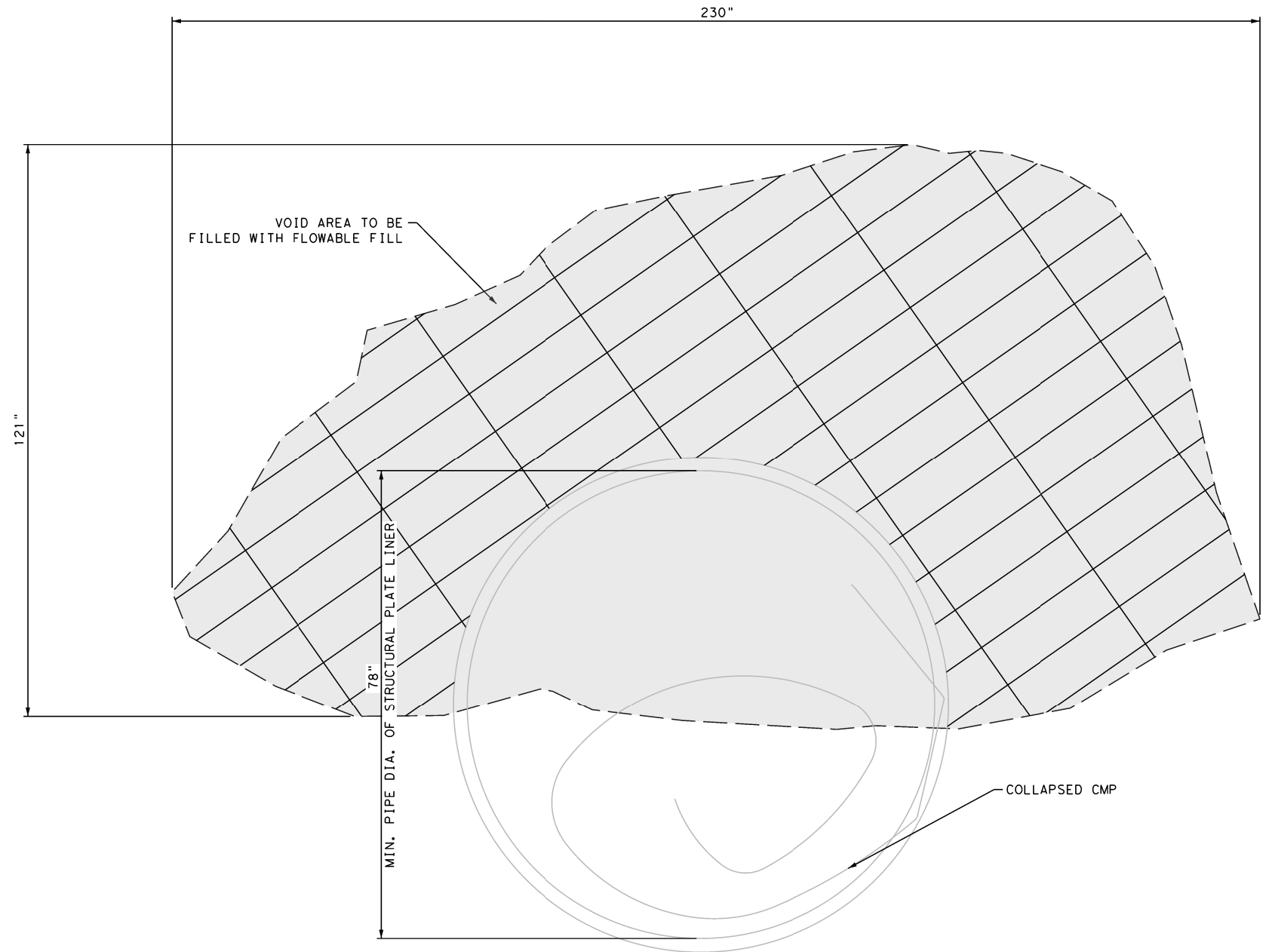


Plotted on: 6/13/2023

Design File name: P:\125\45\02\Design\Civil\Drainage\1254502_void_typ.dgn

LEGEND

- PROPOSED FEATURE
- EXIST FEATURE
- ▨ FLOWABLE FILL
- ◻ EXIST VOID



STRUCTURAL PLATE LINER TYPICAL THROUGH VOID AREA
N. T. S.



PHOTO OF COLLAPSED
CMP IN VOID AREA

DESIGN



Andres Morales
ANDRES MORALES, P.E.
DATE

6/13/2023

APPROVAL



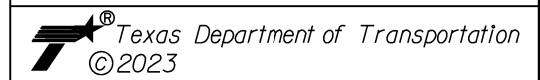
Dennis K. Seal
DENNIS K. SEAL, P.E.
DATE

6/13/2023

REV. NO.	DATE	DESCRIPTION	BY



AUSTIN | SAN ANTONIO | HOUSTON | FORT WORTH | DALLAS
10801 N MOPAC EXPY, BLDG 3, STE 200 | AUSTIN, TX 78759 | 512.454.8711
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801



SL 1 AT SKUNK CREEK

CMP VOID AREA DETAIL

SHEET 1 OF 1

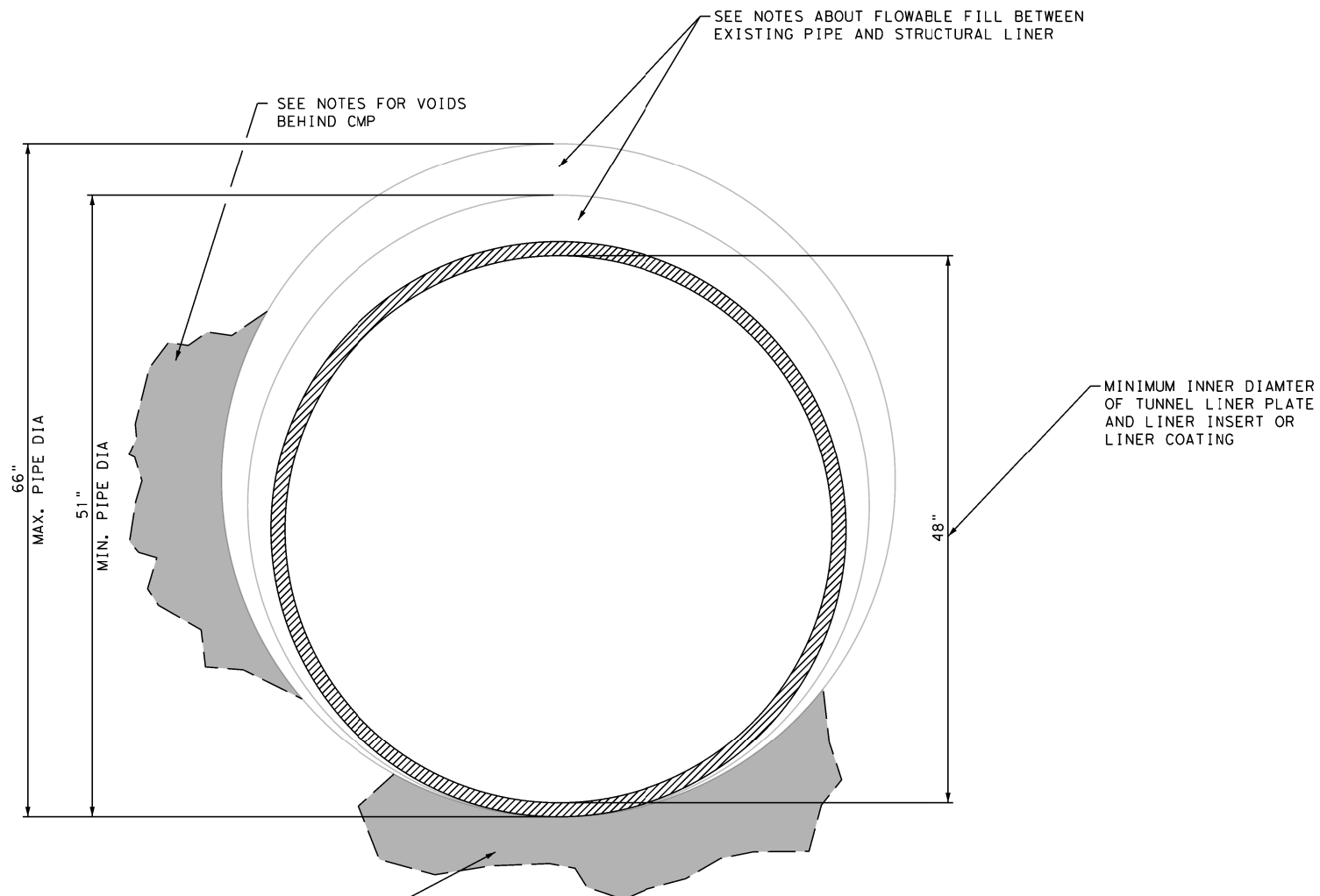
DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.	HIGHWAY NO.		
CHK DGN:	6	TEXAS	---	SL 1		
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	AUS	TRAVIS	3136	01	200	58

NOTES: STRUCTURAL PLATE LINING OF VOID AREA

1. A STRUCTURAL PLATE LINER WILL BE INSTALLED THROUGH THE VOID AREA WITH A FINISHED INSIDE DIAMETER OF NO LESS THAN 78" WITH A MANNINGS COEFFICIENT OF NO MORE THAN 0.012.
2. VOID AREA WILL BE FILLED WITH FLOWABLE FILL OR OTHER APPROVED FILL MATERIAL.

Plotted on: 6/13/2023

Design File name: P:\125\45\02\Design\Civil\Drainage\1254502_cmp_66.dgn



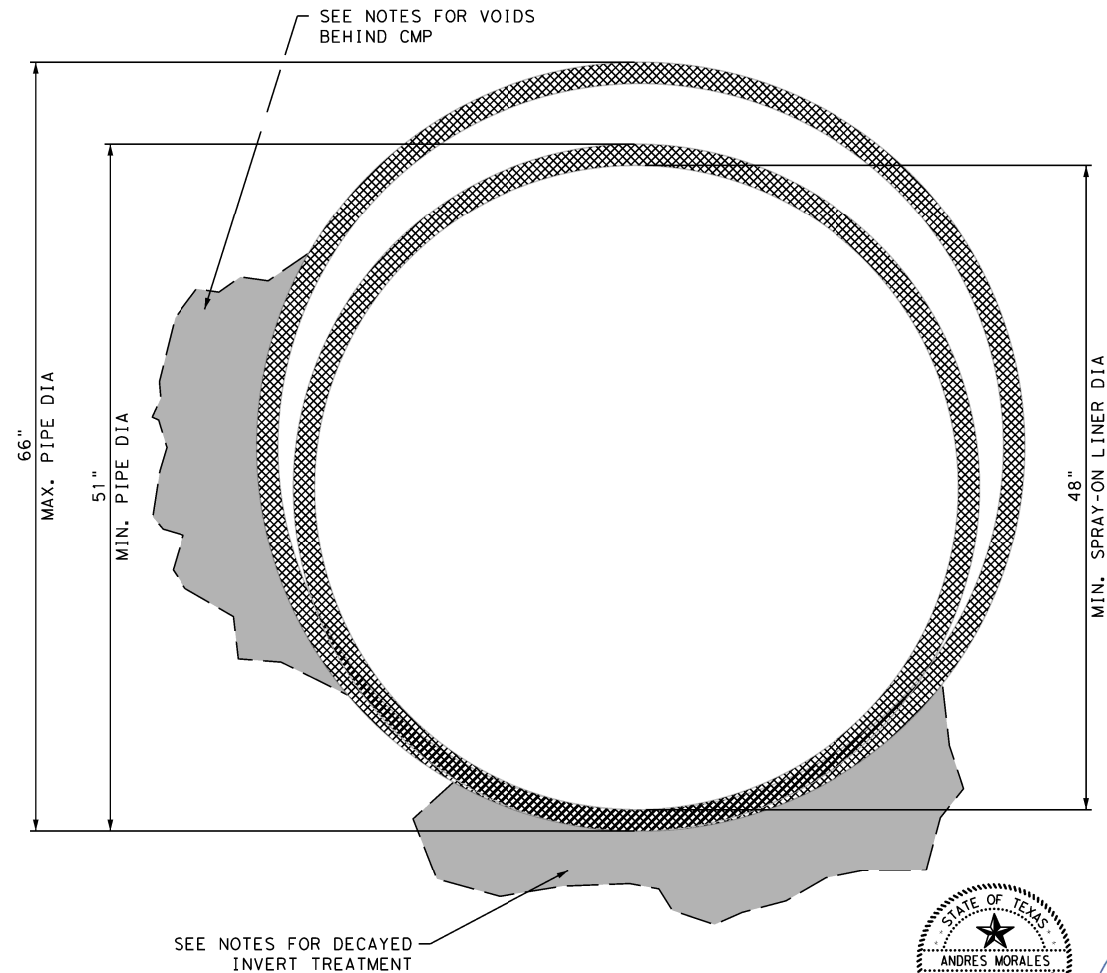
STRUCTURAL PLATE LINING OPTION
N. T. S.

NOTES - STRUCTURAL PLATE LINING OPTION

1. ALL SPACE BETWEEN EXISTING PIPE AND STRUCTURAL LINER WILL BE FILLED WITH FLOWABLE FILL
2. THE INVERT OF THE EXISTING PIPE IS TOTALLY DECAYED AND MISSING. THE INVERT WILL BE CLEANED AND FILLED WITH FLOWABLE FILL BEFORE PLACING STRUCTURAL LINER
3. THE INSIDE OF THE FINISHED LINER WILL HAVE A MANNINGS COEFFICIENT OF NO MORE THAN 0.012.
4. THE INSIDE DIAMETER OF THE FINISHED LINER WILL BE NO LESS THAN 48".
5. THERE ARE SOME VOIDS BEHIND THE EXISTING CMP. VOIDS BEHIND THE EXISTING CMP WILL BE FILLED WITH FLOWABLE FILL.

NOTES - STRUCTURAL SPRAY-ON OR CIPP LINING OPTION

1. THE INVERT OF THE EXISTING PIPE IS TOTALLY DECAYED AND MISSING. THE INVERT WILL BE CLEANED AND FILLED WITH FLOWABLE FILL BEFORE PLACING STRUCTURAL LINER
2. THE INSIDE OF THE FINISHED LINER WILL HAVE A MANNINGS COEFFICIENT OF NO MORE THAN 0.012.
3. THE INSIDE DIAMETER OF THE FINISHED LINER WILL BE NO LESS THAN 48".
4. THERE ARE SOME VOIDS BEHIND THE EXISTING CMP. VOIDS BEHIND THE EXISTING CMP WILL BE FILLED WITH FLOWABLE FILL.



STRUCTURAL SPRAY-ON OR CIPP LINING OPTION
N. T. S.

LEGEND

- PROPOSED FEATURE
- EXIST FEATURE
- ▨ LINER PLATE/ LINER COATING
- ▩ SPRAY ON LINING
- EXIST VOID

DESIGN

INTERIM REVIEW
DOCUMENT INCOMPLETE. NOT INTENDED FOR PERMIT, BIDDING OR CONSTRUCTION.
ENGINEER: BRIAN A. ALLEN
P. E. SERIAL NO: 123374
DATE: 6/13/2023

APPROVAL

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DOCUMENT INCOMPLETE. NOT INTENDED FOR PERMIT, BIDDING OR CONSTRUCTION.
ENGINEER: DENNIS K. SEAL
P. E. SERIAL NO: 80287
DATE: 6/13/2023



Andres Morales
ANDRES MORALES, P. E.
6/13/2023
DATE



Dennis K. Seal
DENNIS K. SEAL, P. E.
6/13/2023
DATE

REV. NO.	DATE	DESCRIPTION	BY

PAPE-DAWSON ENGINEERS
AUSTIN | SAN ANTONIO | HOUSTON | FORT WORTH | DALLAS
10801 N MOPAC EXPY, BLDG 3, STE 200 | AUSTIN, TX 78759 | 512.454.8711
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801

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SL 1 AT SKUNK CREEK

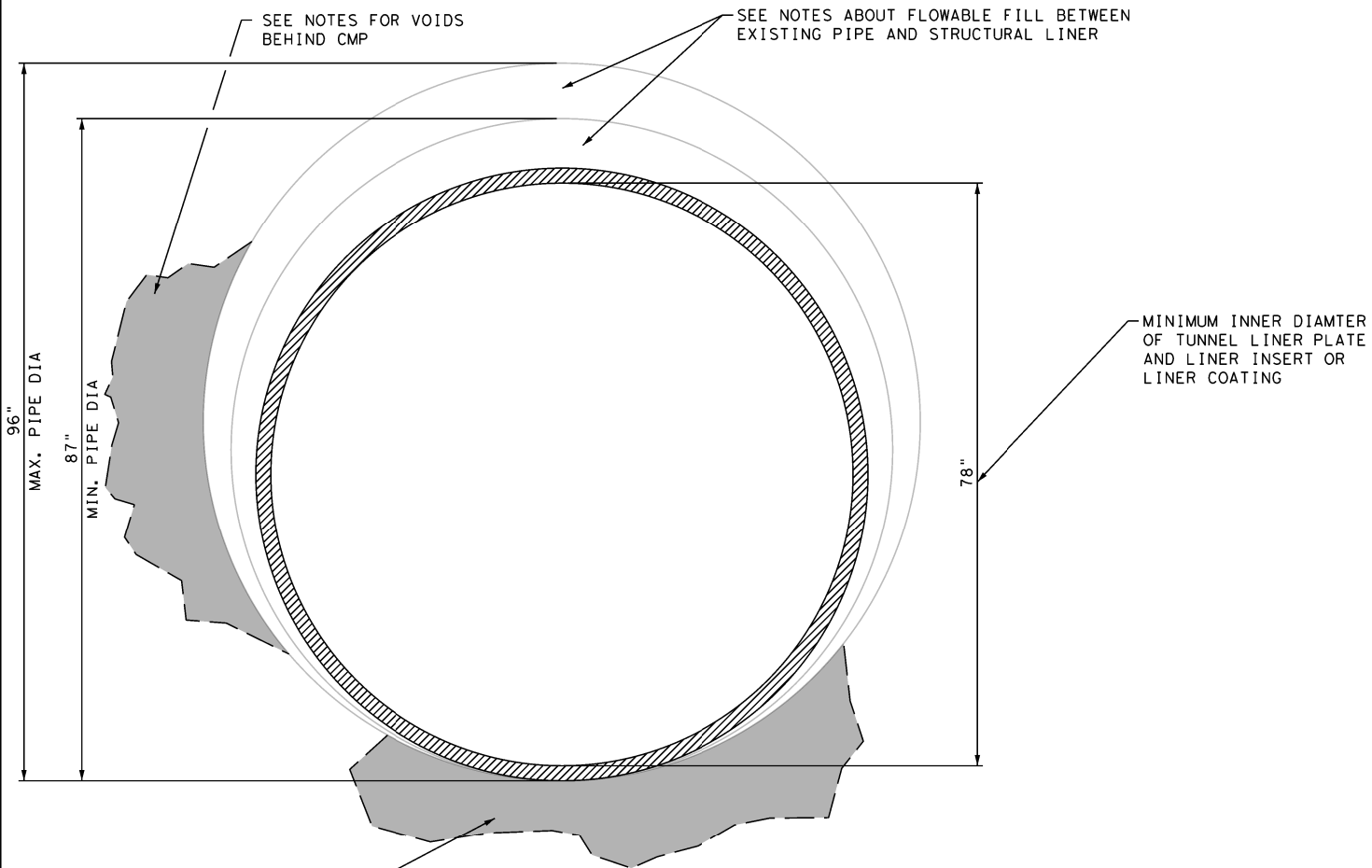
66" CMP STRUCTURAL LINING DETAILS

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.:	STATE:	FEDERAL AID PROJECT NO.:	HIGHWAY NO.:		
CHK DGN:	6	TEXAS	---	SL 1		
DWG:	DIST.:	COUNTY:	CONT. NO.:	SECT. NO.:	JOB NO.:	SHEET NO.:
CHK DWG:	AUS	TRAVIS	3136	01	200	59

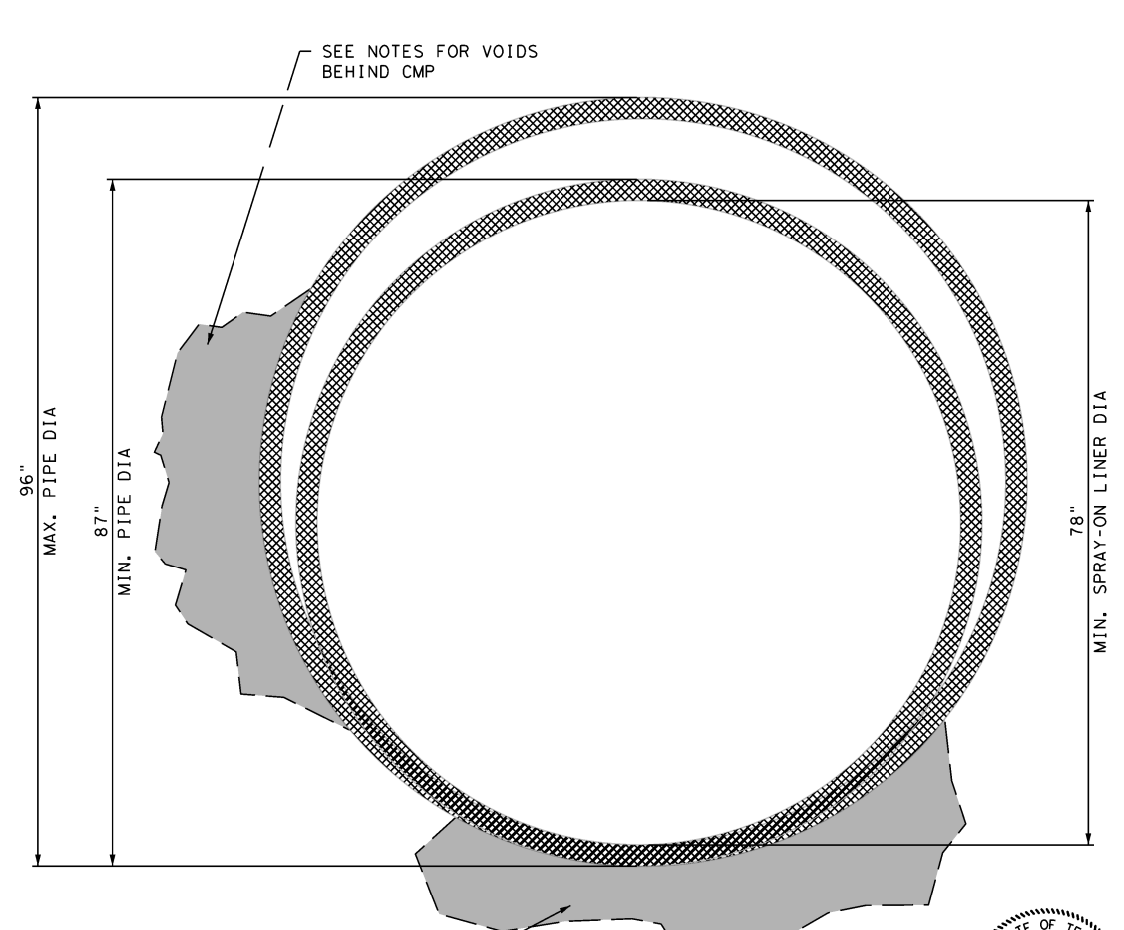
Plotted on: 6/13/2023

Design File name: P:\125445\02\Design\Civil\Drainage\1254502_cmp_96.dgn



SEE NOTES FOR DECAYED INVERT TREATMENT

STRUCTURAL PLATE LINING OPTION
N. T. S.



SEE NOTES FOR DECAYED INVERT TREATMENT

STRUCTURAL SPRAY-ON LINING OPTION
N. T. S.



Andres Morales
ANDRES MORALES, P.E.

6/13/2023
DATE



Dennis K. Seal
DENNIS K. SEAL, P.E.

6/13/2023
DATE

LEGEND

- PROPOSED FEATURE
- EXIST FEATURE
- ▨ LINER PLATE/ LINER COATING
- ▩ SPRAY ON LINING
- EXIST VOID

NOTES - STRUCTURAL PLATE LINING OPTION

1. ALL SPACE BETWEEN EXISTING PIPE AND STRUCTURAL LINER WILL BE FILLED WITH FLOWABLE FILL
2. THE INVERT OF THE EXISTING PIPE IS TOTALLY DECAYED AND MISSING. THE INVERT WILL BE CLEANED AND FILLED WITH FLOWABLE FILL BEFORE PLACING STRUCTURAL LINER
3. THE INSIDE OF THE FINISHED LINER WILL HAVE A MANNINGS COEFFICIENT OF NO MORE THAN 0.012.
4. THE INSIDE DIAMETER OF THE FINISHED LINER WILL BE NO LESS THAN 78".
5. THERE ARE SOME VOIDS BEHIND THE EXISTING CMP. VOIDS BEHIND THE EXISTING CMP WILL BE FILLED WITH FLOWABLE FILL.

NOTES - STRUCTURAL SPRAY-ON LINING OPTION

1. THE INVERT OF THE EXISTING PIPE IS TOTALLY DECAYED AND MISSING. THE INVERT WILL BE CLEANED AND FILLED WITH FLOWABLE FILL BEFORE PLACING STRUCTURAL LINER
2. THE INSIDE OF THE FINISHED LINER WILL HAVE A MANNINGS COEFFICIENT OF NO MORE THAN 0.012.
3. THE INSIDE DIAMETER OF THE FINISHED LINER WILL BE NO LESS THAN 78".
4. THERE ARE SOME VOIDS BEHIND THE EXISTING CMP. VOIDS BEHIND THE EXISTING CMP WILL BE FILLED WITH FLOWABLE FILL.

DESIGN

INTERIM REVIEW
DOCUMENT INCOMPLETE. NOT INTENDED FOR PERMIT, BIDDING OR CONSTRUCTION.
ENGINEER: BRIAN A. ALLEN
P.E. SERIAL NO: 123374
DATE: 6/13/2023

APPROVAL

INTERIM REVIEW
DOCUMENT INCOMPLETE. NOT INTENDED FOR PERMIT, BIDDING OR CONSTRUCTION.
ENGINEER: DENNIS K. SEAL
P.E. SERIAL NO: 80287
DATE: 6/13/2023

REV. NO.	DATE	DESCRIPTION	BY

PAPE-DAWSON ENGINEERS
AUSTIN | SAN ANTONIO | HOUSTON | FORT WORTH | DALLAS
10801 N MOPAC EXPY, BLDG 3, STE 200 | AUSTIN, TX 78759 | 512.454.8711
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801

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SL 1 AT SKUNK CREEK

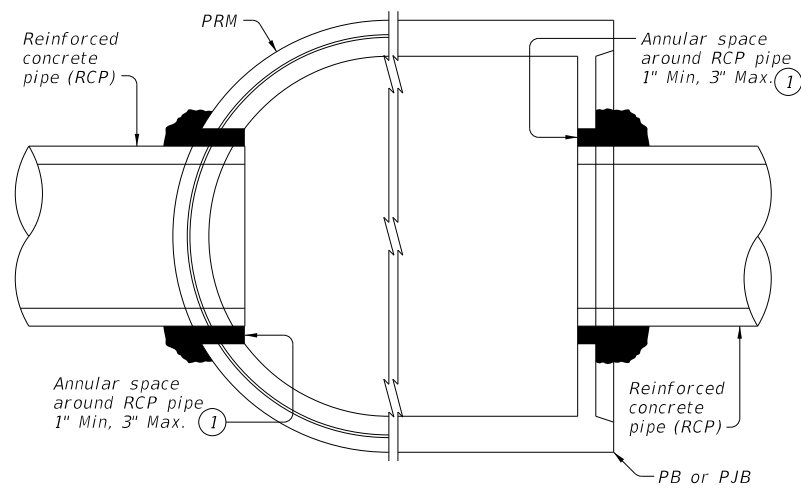
96" CMP STRUCTURAL LINING DETAILS

SHEET 1 OF 1

CHK DGN:	FED. RD. DIV. NO:	STATE	FEDERAL AID PROJECT NO.	HIGHWAY NO.
	6	TEXAS	---	SL 1
CHK DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.
	AUS	TRAVIS	3136	01
			JOB NO.	SHEET NO.
			200	60

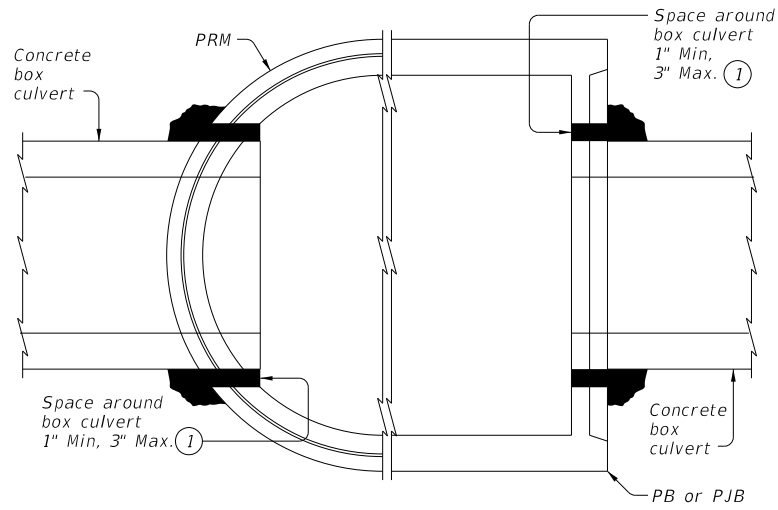
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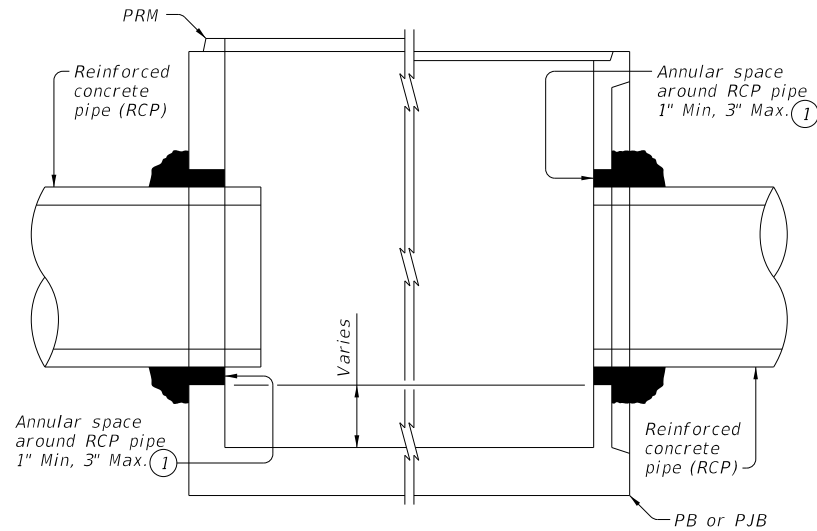
PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE
 PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

TYPICAL HALF PLAN



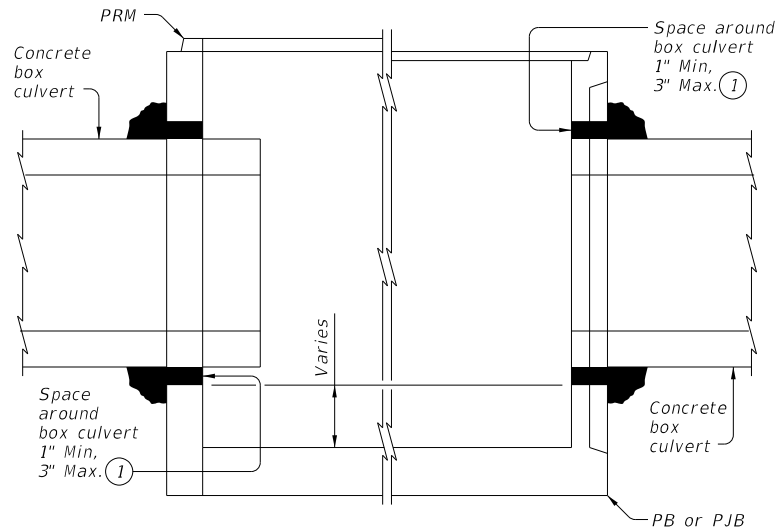
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 PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

TYPICAL HALF PLAN



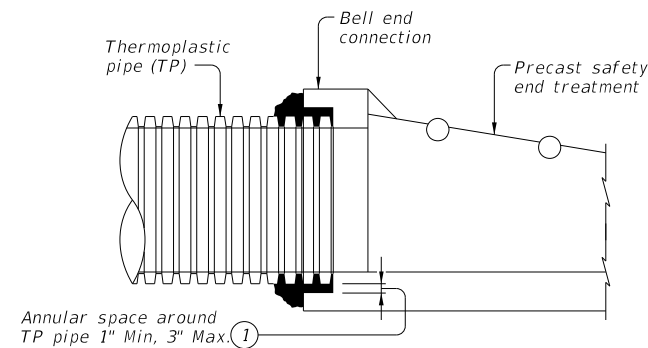
PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE
 PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

TYPICAL HALF ELEVATION



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE
 PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

TYPICAL HALF ELEVATION



TYPICAL PARTIAL ELEVATION OF PRECAST SAFETY END TREATMENTS

Showing square PSET for parallel drainage, cross drainage shown similar.

① Completely fill the void between the precast structure and the connecting pipe or box with cementitious grouts and mortars in accordance with DMS-4675 "Cementitious Grouts and Mortars for Miscellaneous Application".

CONSTRUCTION NOTES:

Do not grout rubber gasket joints without Manufacturer's recommendations.
 Do not use bricks, masonry blocks, native stone, or similar materials in conjunction with grouted connections when filling void spaces around pipes or box culverts.

MATERIAL NOTES:

Provide grouted connections in accordance with DMS-4675 "Cementitious Grouts and Mortars for Miscellaneous Application".

GENERAL NOTES:

See applicable standards for notes and details not shown:
 Precast Base (PB)
 Precast Junction Box (PJB)
 Precast Round Manhole (PRM)
 Precast Safety End Treatments C/D Square (PSET-SC)
 Precast Safety End Treatments P/D Square (PSET-SP)
 Provide Concrete Box Culverts in accordance with Item 462 "Concrete Box Culverts and Drains".
 Provide Reinforced Concrete Pipe (RCP) in accordance with Item 464 "Reinforced Concrete Pipe".
 Provide Thermoplastic Pipe (TP) in accordance with Special Specification Thermoplastic Pipe.
 Payment for grouted connections is considered subsidiary to other bid items.



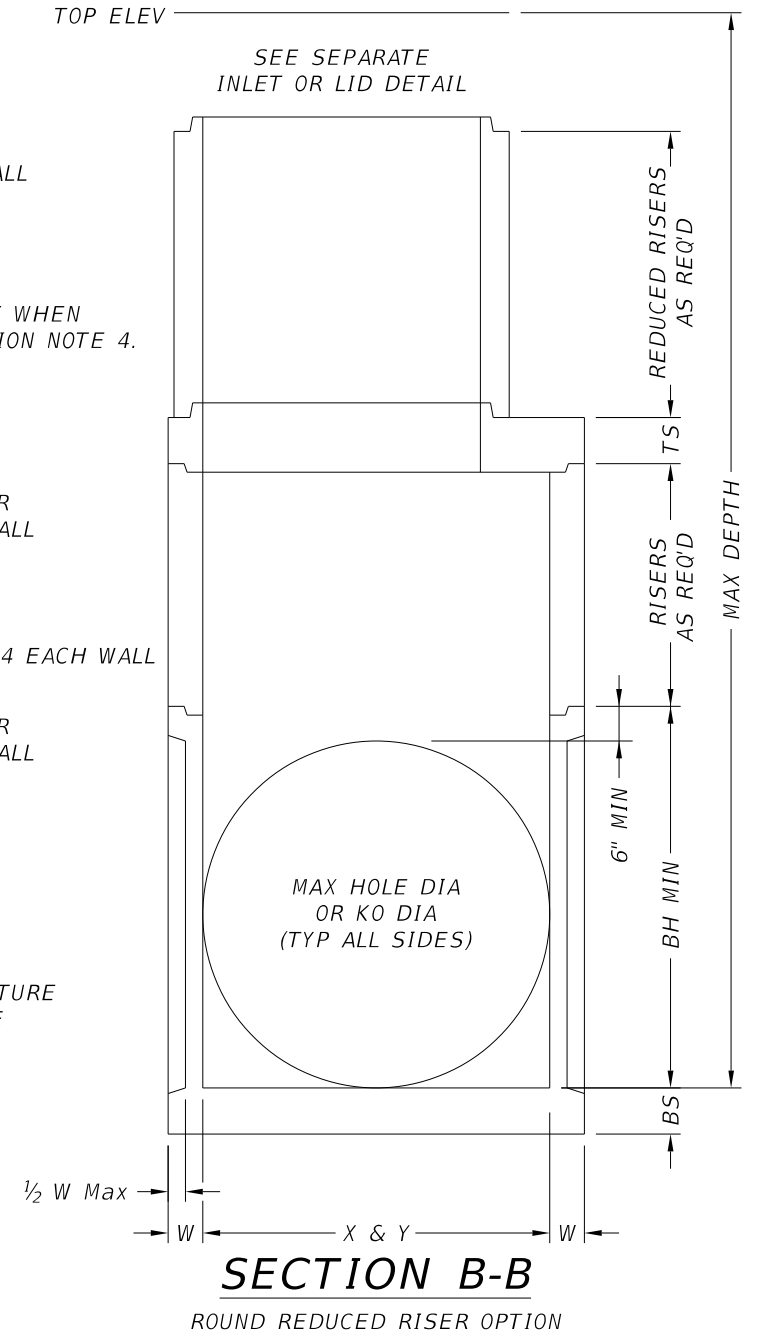
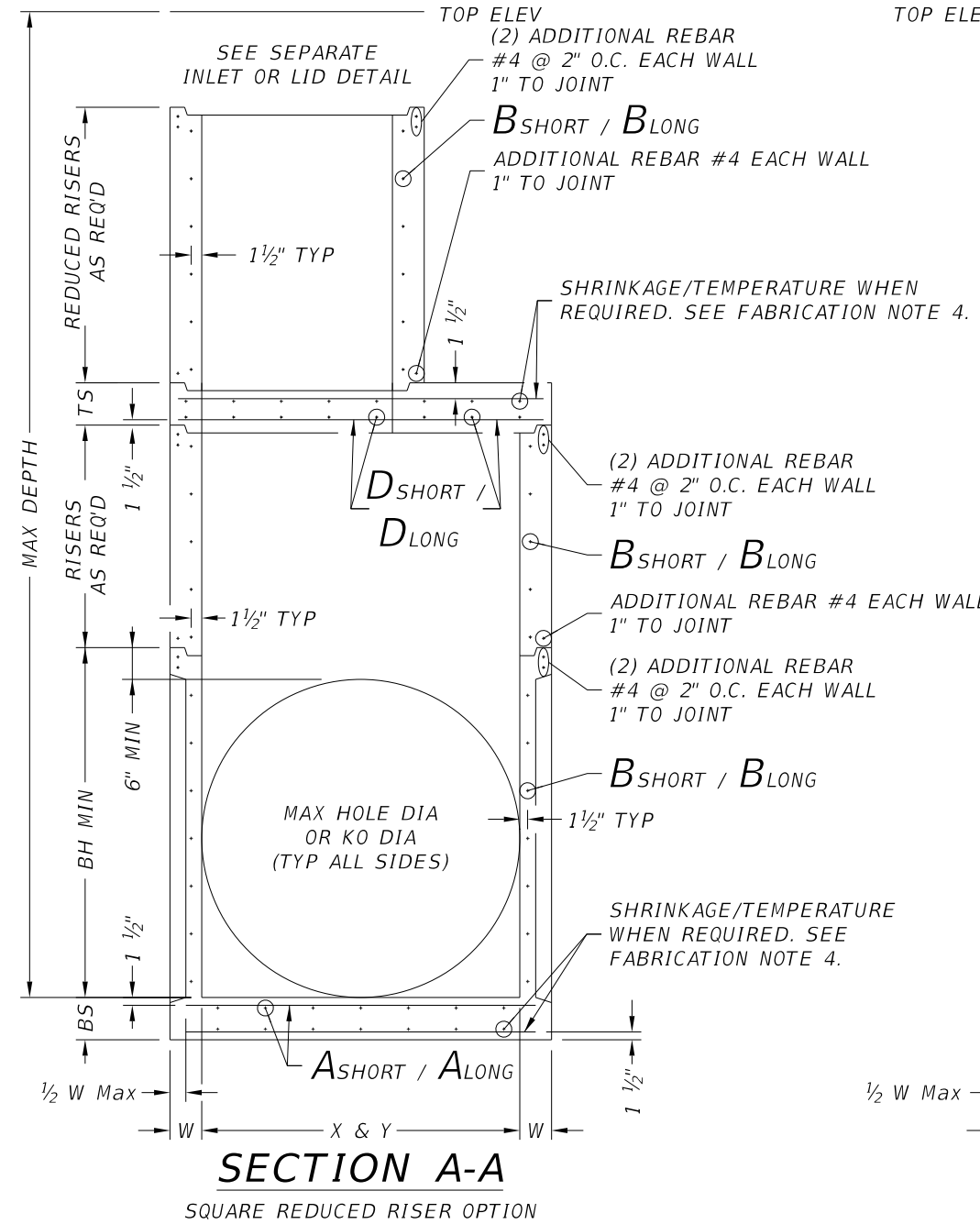
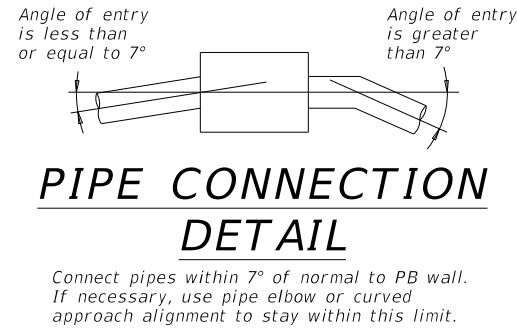
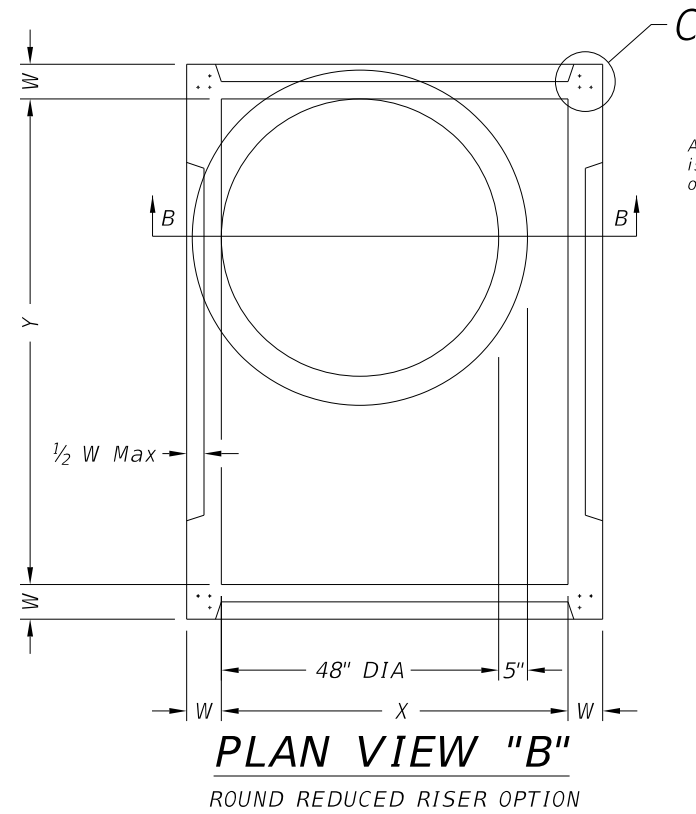
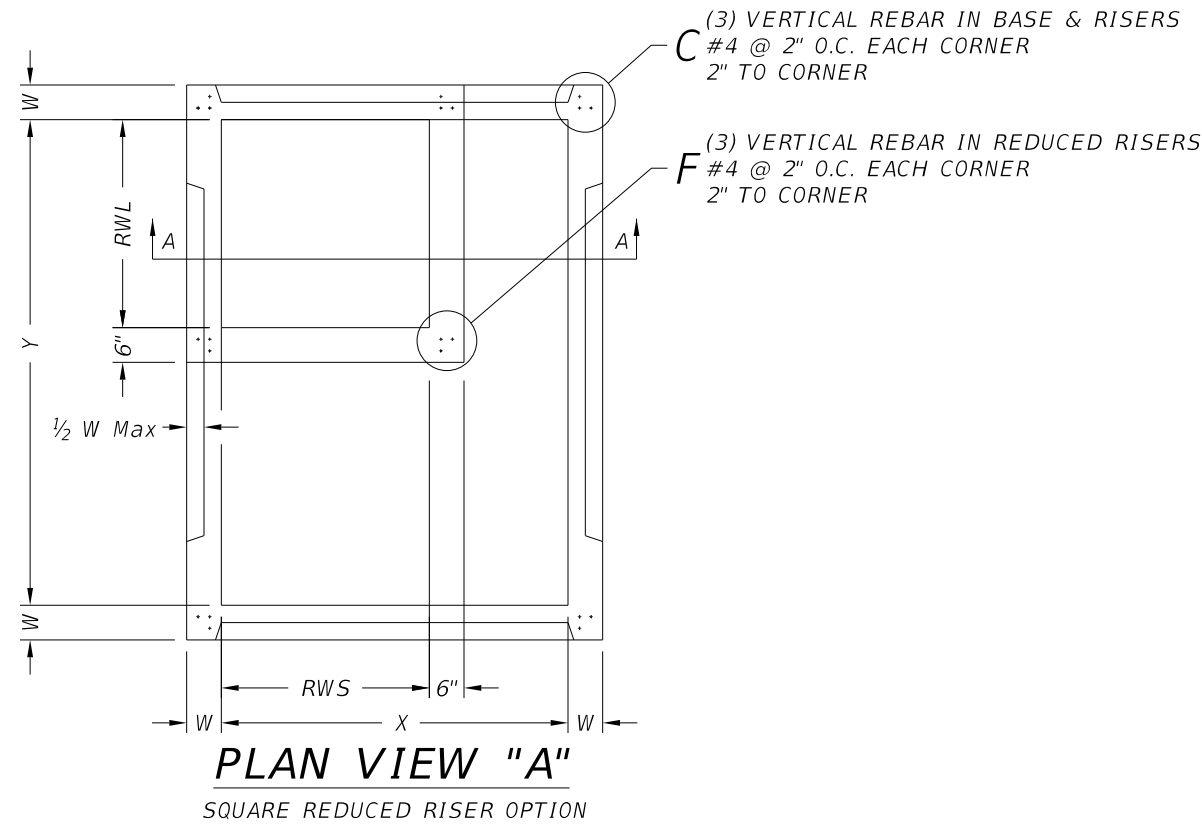
PIPE AND BOX GROUTED CONNECTIONS FOR PRECAST STRUCTURES

PBGC

FILE: pbgcstd1-20.dgn	DN: TxDOT	CK: TAR	DW: JTR	CK: TAR
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3136	01	200	SL 1
	DIST	COUNTY	SHEET NO.	
	AUS	TRAVIS	61	

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FABRICATION NOTES:

1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Provide typical clear cover of 1 1/2" to reinforcing steel at interior or exterior walls.
4. Walls or slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing steel. Provide steel area = 0.11 in²/ft each way.
5. No substitution is allowed for vertical and horizontal #4 bars in corners.
6. Manufacture base and risers to nearest 3" increment.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is 3/4".
8. Provide lifting devices in conformance with Manufacturer's recommendations.
9. See sheet PDD for sizes, dimensions, and reinforcing steel not shown.

INSTALLATION NOTES:

1. If required elsewhere. Inverts (benching) to be provided by Contractor. Concrete or mortar used for invert is subsidiary to specified inlet or manhole.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or 1/2 the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. For rigid pipe, cut hole in thin wall panel (KO) 4" Max, 2" Min larger than pipe OD.
5. For flexible pipe, consult boot/seal Manufacturer's specification for placement tolerance and hole size. Center pipe in hole and install boot/seal per Manufacturer's specification.

GENERAL NOTES:

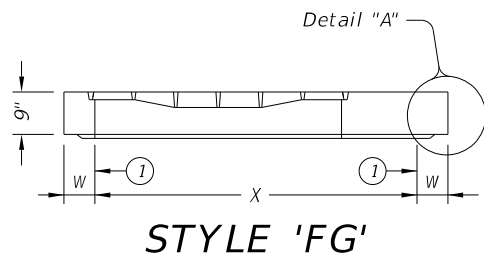
1. Precast Base consists of base slab, base unit, risers (as required), reducing slab (as required), and reduced risers (as required). See sheet PDD for sizes.
2. Designed according to ASTM C913.
3. Payment for precast base is subsidiary to the specified inlet, per Item 465, "Junction Boxes, Manholes, and Inlets."

Cover dimensions are clear dimensions, unless noted otherwise.

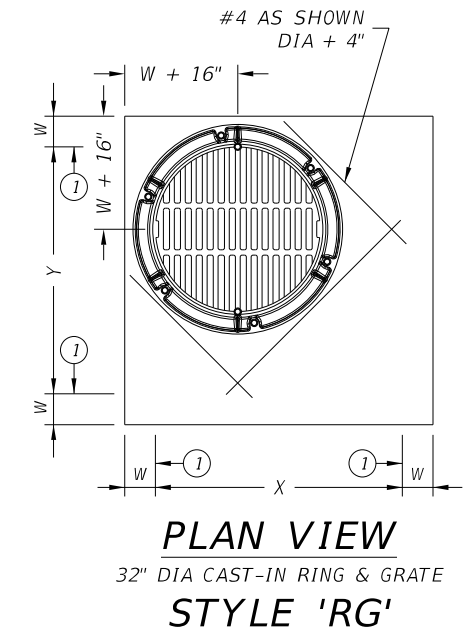
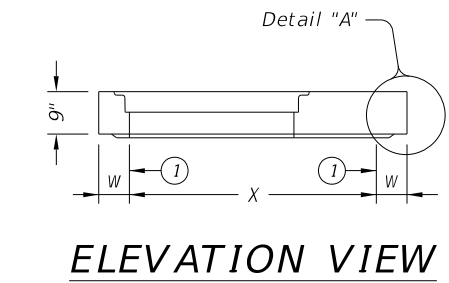
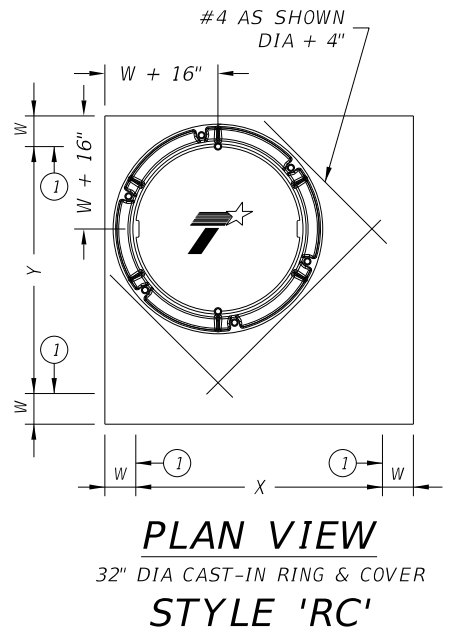
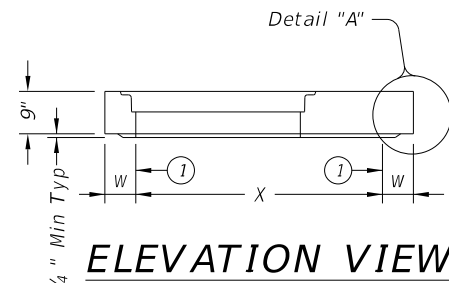
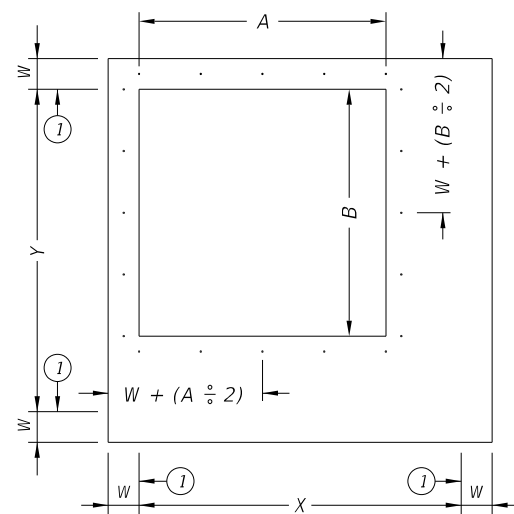
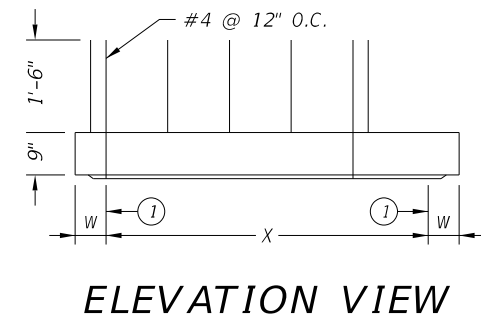
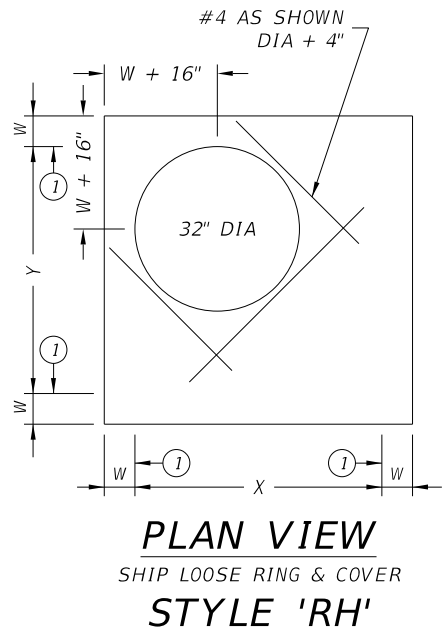
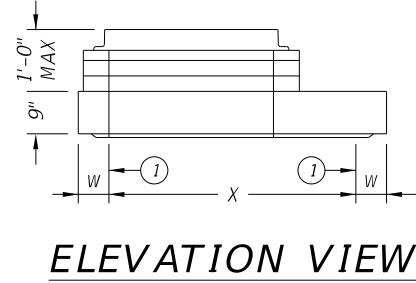
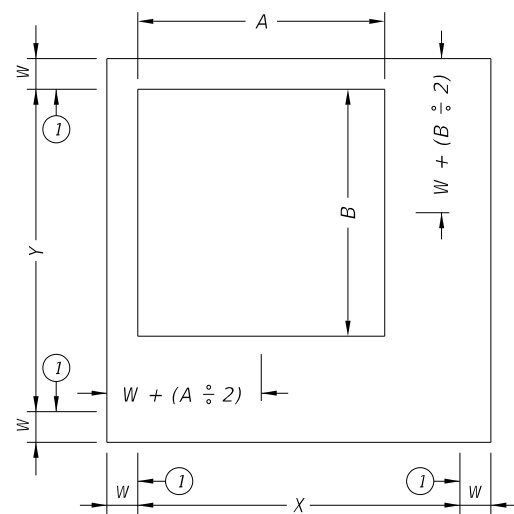
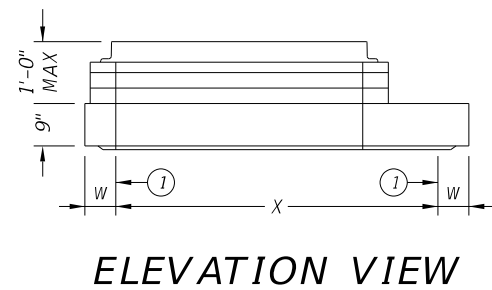
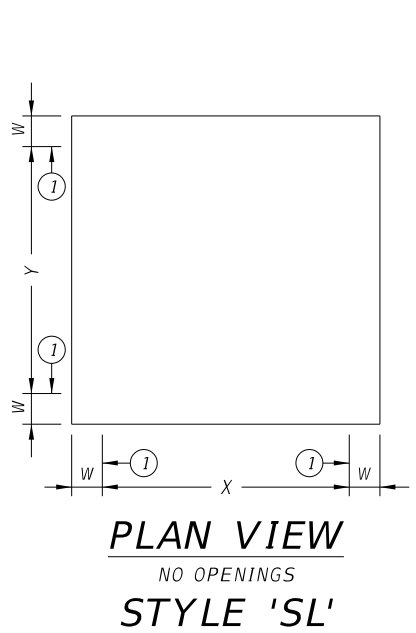
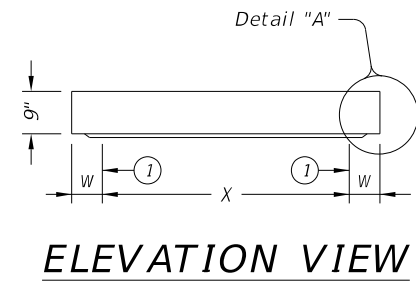
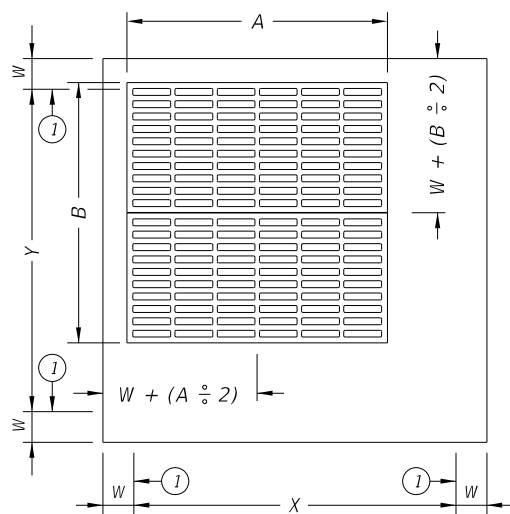
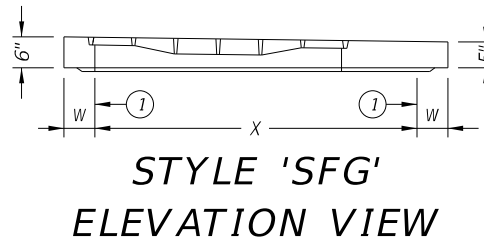
HL93 LOADING		Bridge Division Standard	
PRECAST BASE			
PB			
FILE: prest01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT February 2020	CONTRACT: 3136	SECTION: 01	JOB: 200
REVISIONS			HIGHWAY: SL 1
	DIST: AUS	COUNTY: TRAVIS	SHEET NO.: 62

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ORIENT TAPER TO CORRESPOND WITH ROADWAY CROSS-SLOPE.



① Matches inside face of wall of precast base or riser below inlet.

HL93 LOADING SHEET 1 OF 2



PRECAST SLAB LID

PSL

FILE: prestd05-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3136	01	200	SL 1
DIST	COUNTY		SHEET NO.	
AUS	TRAVIS		63	

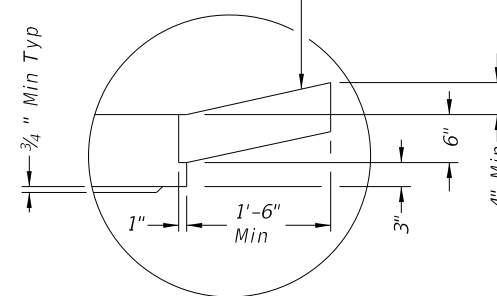
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FILE: P:\125\45\02\Des\ign\Civi\Standards\Drainage\prest05-20.dgn

Style	Size (X x Y)	W ②	A x B (nominal)	Short Span Reinf Steel Area	Long Span Reinf Steel Area
SL	3'x3'	6"	n/a	0.37 in ² /ft	0.37 in ² /ft
RH,RC,RG,SH,S1,FG	3'x3'	6"	3'x3' or 32" Dia	0.37 in ² /ft	0.37 in ² /ft
SFG	3'x3'	6"	3'x3'	0.32 in ² /ft	0.32 in ² /ft
SL	4'x4'	6"	n/a	0.34 in ² /ft	0.34 in ² /ft
RH,RC,RG,SH,S1,FG	4'x4'	6"	3'x3' or 32" Dia	0.41 in ² /ft	0.41 in ² /ft
SH,S1,FG	4'x4'	6"	4'x4'	0.41 in ² /ft	0.41 in ² /ft
SFG	4'x4'	6"	4'x4'	0.32 in ² /ft	0.32 in ² /ft
SL	3'x5'	6"	n/a	0.39 in ² /ft	0.39 in ² /ft
RH,RC,RG,SH,S1,FG	3'x5'	6"	3'x3' or 32" Dia	0.48 in ² /ft	0.48 in ² /ft
SH,S1,FG	3'x5'	6"	3'x5'	0.48 in ² /ft	0.48 in ² /ft
SFG	3'x5'	6"	3'x5'	0.32 in ² /ft	0.32 in ² /ft
SL	4'x5'	6"	n/a	0.42 in ² /ft	0.42 in ² /ft
RH,RC,RG,SH,S1,FG	4'x5'	6"	3'x3' or 32" Dia	0.42 in ² /ft	0.42 in ² /ft
SH,S1,FG	4'x5'	6"	4'x4'	0.63 in ² /ft	0.63 in ² /ft
SH,S1,FG	4'x5'	6"	3'x5'	0.66 in ² /ft	0.66 in ² /ft
SL	5'x5'	6"	n/a	0.36 in ² /ft	0.36 in ² /ft
RH,RC,RG,SH,S1,FG	5'x5'	6"	3'x3' or 32" Dia	0.43 in ² /ft	0.43 in ² /ft
SH,S1,FG	5'x5'	6"	4'x4'	0.63 in ² /ft	0.63 in ² /ft
SH,S1,FG	5'x5'	6"	3'x5'	0.63 in ² /ft	0.63 in ² /ft
SL	5'x6'	6"/8"	n/a	0.48 in ² /ft	0.48 in ² /ft
RH,RC,RG,SH,S1,FG	5'x6'	6"/8"	3'x3' or 32" Dia	0.48 in ² /ft	0.48 in ² /ft
SH,S1,FG	5'x6'	6"/8"	4'x4'	0.60 in ² /ft	0.60 in ² /ft
SH,S1,FG	5'x6'	6"/8"	3'x5'	0.60 in ² /ft	0.60 in ² /ft
SL	6'x6'	6"/8"	n/a	0.43 in ² /ft	0.43 in ² /ft
RH,RC,RG,SH,S1,FG	6'x6'	6"/8"	3'x3' or 32" Dia	0.56 in ² /ft	0.56 in ² /ft
SH,S1,FG	6'x6'	6"/8"	4'x4'	0.56 in ² /ft	0.56 in ² /ft
SH,S1,FG	6'x6'	6"/8"	3'x5'	0.59 in ² /ft	0.59 in ² /ft
SL	8'x8'	8"/10"	n/a	0.45 in ² /ft	0.45 in ² /ft
RH,RC,RG,SH,S1,FG	8'x8'	8"/10"	3'x3' or 32" Dia	0.45 in ² /ft	0.45 in ² /ft
SH,S1,FG	8'x8'	8"/10"	4'x4'	0.45 in ² /ft	0.45 in ² /ft
SH,S1,FG	8'x8'	8"/10"	3'x5'	0.45 in ² /ft	0.45 in ² /ft

② See sheet PDD for corresponding wall thickness (W) of base unit or riser.

Construct cast-in-place reinforced concrete apron, when shown elsewhere in plans. Use Class "A" concrete. Apron is subsidiary to PSL. Apron is 1'-6" Min width around precast zone drain.



DETAIL "A"

(Reinforcing not shown for clarity)
When an apron is to be cast around PSL, use detail above to create an apron ledge on all 4 sides.

FABRICATION NOTES:

1. Locate penetration (Style 'RH'), ring and cover (Style 'RC'), ring and grate (Style 'RG'), and frame and grate (Style 'FG') in a corner. Only one penetration is allowed per slab lid.
2. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
3. Provide Grade 60 reinforcing steel or equivalent area of WWR.
4. Provide clear cover of 3/4" to reinforcing from lower outside shoulder of slab for structural reinforcement, and 2" from top of slab for shrinkage and temperature reinforcement. Place short span reinforcing closest to surface.
5. Slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing. Provide steel area = 0.11 in²/ft each way.
6. No substitution is allowed for diagonal #4 bars around openings.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is 3/4".
8. Provide lifting devices in conformance with Manufacturer's recommendations.

INSTALLATION NOTES:

1. Precast slab lids are intended for direct traffic and may be placed in roadway.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or 1/2 the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. Initial installation of grade adjustment rings for Styles 'RH' and 'SH' is limited to 1'-0" Max as shown.
5. Grade adjustment rings for Styles 'RH' and 'SH' may be increased to 2'-0" Max when future construction affects final grade of structure. Make adjustments greater than 2'-0" with additional risers. Adjustments can be made up to Max depth shown on sheet PDD. Structure must be evaluated if Max depth will be exceeded.
6. Orient long dimension of grate slots perpendicular to traffic, unless noted otherwise on plans.

GENERAL NOTES:

1. Designed according to ASTM C913.
2. Payment for lid is per Item 465, "Junction Boxes, Manholes, and Inlets" by type, style, size, and opening size (when applicable).

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

SHEET 2 OF 2



PRECAST SLAB LID

PSL

FILE: prest05-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3136	01	200	SL 1
	DIST	COUNTY	SHEET NO.	
	AUS	TRAVIS	64	

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Size	MAX DEPTH = 15 ft. to top of BASE SLAB											MAX DEPTH = 25 ft. to top of BASE SLAB											Min Height (See Gen Note 3)	Max HOLE DIA (See Fab Note 2)	Max KO DIA (See Fab Note 2)
	Base Slab			Base Unit or Riser Walls			Below Grade Slab (w/PJB) Reducing Slab (w/PB)					Base Slab			Base Unit or Riser Walls			Below Grade Slab (w/PJB) Reducing Slab (w/PB)							
	Short Span Reinf. Steel Area	Long Span Reinf. Steel Area	Thickness	Short Span Reinf. Steel Area	Long Span Reinf. Steel Area	Thickness	Reduced Riser Size	Short Span Reinf. Steel Area	Long Span Reinf. Steel Area	Thickness	Short Span Reinf. Steel Area	Long Span Reinf. Steel Area	Thickness	Short Span Reinf. Steel Area	Long Span Reinf. Steel Area	Thickness	Reduced Riser Size	Short Span Reinf. Steel Area	Long Span Reinf. Steel Area	Thickness	RWSxRWL or ID	Dshort			
X x Y	Ashort	Along	BS	Bshort	Blong	W	RWSxRWL or ID	Dshort	Dlong	TS	Ashort	Along	BS	Bshort	Blong	W	RWSxRWL or ID	Dshort	Dlong	TS	BH MIN	HOLE DIA	KO DIA		
ft.	in ² /ft	in ² /ft	in.	in ² /ft	in ² /ft	in.	ft. **	in ² /ft	in ² /ft	in.	in ² /ft	in ² /ft	in.	in ² /ft	in ² /ft	in.	ft. **	in ² /ft	in ² /ft	in.	ft.	in.	in.		
Precast Junction Box (PJB)	3x3	0.23	0.23	6	0.19	0.19	6	N/A	0.37	0.37	9	0.29	0.29	6	0.24	0.24	6	N/A	0.37	0.37	9	3.5	36	36	
	4x4	0.29	0.29	6	0.24	0.24	6	N/A	0.41	0.41	9	0.47	0.47	6	0.38	0.38	6	N/A	0.41	0.41	9	4.5	48	48	
	3x5	0.29	0.18	6	0.19	0.35	6	N/A	0.48	0.48	9	0.39	0.18	6	0.23	0.59	6	N/A	0.48	0.48	9	3.5	36/60	36/60	
	4x5	0.36	0.18	6	0.22	0.34	6	N/A	0.42	0.42	9	0.53	0.26	6	0.39	0.59	6	N/A	0.42	0.42	9	4.5	48/60	48/60	
	5x5	0.36	0.36	6	0.34	0.34	6	N/A	0.43	0.43	9	0.62	0.62	6	0.59	0.59	6	N/A	0.43	0.43	9	5.5	60	60	
	5x6	0.27	0.27	9	0.34	0.45	6	N/A	0.48	0.48	9	0.47	0.45	9	0.38	0.54	8	N/A	0.48	0.48	9	5.5	60/72	60/72	
	6x6	0.27	0.27	9	0.45	0.45	6	N/A	0.56	0.56	9	0.52	0.52	9	0.54	0.54	8	N/A	0.56	0.56	9	6.5	72	72	
	8x8	0.46	0.46	9	0.51	0.51	8	N/A	0.45	0.45	12	0.87	0.87	9	0.59	0.59	10	N/A	0.45	0.45	12	8.5	96	72	
Precast Base (PB)	3x3	0.23	0.23	6	0.19	0.19	6	N/A	N/A	N/A	N/A	0.29	0.29	6	0.24	0.24	6	N/A	N/A	N/A	N/A	3.5	36	36	
	4x4	0.29	0.29	6	0.24	0.24	6	N/A	N/A	N/A	N/A	0.47	0.47	6	0.38	0.38	6	N/A	N/A	N/A	N/A	4.5	48	48	
	3x5	0.29	0.18	6	0.19	0.35	6	3x3	0.30	0.34	9	0.39	0.18	6	0.23	0.59	6	3x3	0.40	0.40	9	3.5	36/60	36/60	
	4x5	0.36	0.18	6	0.22	0.34	6	3x3	0.30	0.30	9	0.53	0.26	6	0.39	0.59	6	3x3	0.46	0.37	9	4.5	48/60	48/60	
	4x5	0.36	0.18	6	0.22	0.34	6	4x4	0.30	0.30	9	0.53	0.26	6	0.39	0.59	6	4x4	0.39	0.39	9	4.5	48/60	48/60	
	4x5	0.36	0.18	6	0.22	0.34	6	48"	0.39	0.39	9	0.53	0.26	6	0.39	0.59	6	48"	0.47	0.47	9	4.5	48/60	48/60	
	4x5	0.36	0.18	6	0.22	0.34	6	3x5	0.33	0.40	9	0.53	0.26	6	0.39	0.59	6	3x5	0.48	0.48	9	4.5	48/60	48/60	
	5x5	0.36	0.36	6	0.34	0.34	6	3x3	0.34	0.34	9	0.62	0.62	6	0.59	0.59	6	3x3	0.53	0.53	9	5.5	60	60	
	5x5	0.36	0.36	6	0.34	0.34	6	4x4	0.36	0.36	9	0.62	0.62	6	0.59	0.59	6	4x4	0.64	0.64	9	5.5	60	60	
	5x5	0.38	0.38	6	0.34	0.34	6	48"	0.36	0.36	9	0.62	0.62	6	0.59	0.59	6	48"	0.64	0.64	9	5.5	60	60	
	5x5	0.36	0.36	6	0.34	0.34	6	3x5	0.34	0.40	9	0.62	0.62	6	0.59	0.59	6	3x5	0.53	0.53	9	5.5	60	60	
	5x6	0.31	0.31	9	0.34	0.45	6	3x3	0.34	0.34	9	0.47	0.45	9	0.38	0.54	8	3x3	0.61	0.50	9	5.5	60/72	60/72	
	5x6	0.27	0.27	9	0.34	0.45	6	4x4	0.36	0.45	9	0.47	0.45	9	0.38	0.54	8	4x4	0.74	0.57	9	5.5	60/72	60/72	
	5x6	0.29	0.29	9	0.34	0.45	6	48"	0.36	0.45	9	0.47	0.45	9	0.38	0.54	8	48"	0.74	0.57	9	5.5	60/72	60/72	
	5x6	0.29	0.29	9	0.34	0.45	6	3x5	0.45	0.45	9	0.47	0.45	9	0.38	0.54	8	3x5	0.61	0.61	9	5.5	60/72	60/72	
	6x6	0.29	0.29	9	0.45	0.45	6	3x3	0.41	0.41	9	0.52	0.52	9	0.54	0.54	8	3x3	0.74	0.74	9	6.5	72	72	
	6x6	0.27	0.27	9	0.45	0.45	6	4x4	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	4x4	0.87	0.87	9	6.5	72	72	
	6x6	0.29	0.29	9	0.45	0.45	6	48"	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	48"	0.87	0.87	9	6.5	72	72	
	6x6	0.29	0.29	9	0.45	0.45	6	3x5	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	3x5	0.87	0.87	9	6.5	72	72	
	8x8	0.52	0.52	9	0.51	0.51	8	3x3	0.61	0.61	12	0.91	0.91	9	0.70	0.70	10	3x3	0.85	0.85	12	8.5	96	72	
8x8	0.52	0.52	9	0.51	0.51	8	4x4	0.70	0.70	12	0.87	0.87	9	0.70	0.70	10	4x4	1.01	1.01	12	8.5	96	72		
8x8	0.52	0.52	9	0.51	0.51	8	48"	0.70	0.70	12	0.87	0.87	9	0.70	0.70	10	48"	1.01	1.01	12	8.5	96	72		
8x8	0.52	0.52	9	0.51	0.51	8	3x5	0.70	0.85	12	0.87	0.87	9	0.70	0.70	10	3x5	1.01	1.01	12	8.5	96	72		

** Unless otherwise indicated.


FABRICATION NOTES:

- Maximum spacing of reinforcement is 8".
- At manufacturer's option, provide cast or cored holes or thin wall panels (KO) to the maximum diameter shown for each. When no penetration is required, it is acceptable to provide a wall with no sectional reduction.

GENERAL NOTES:

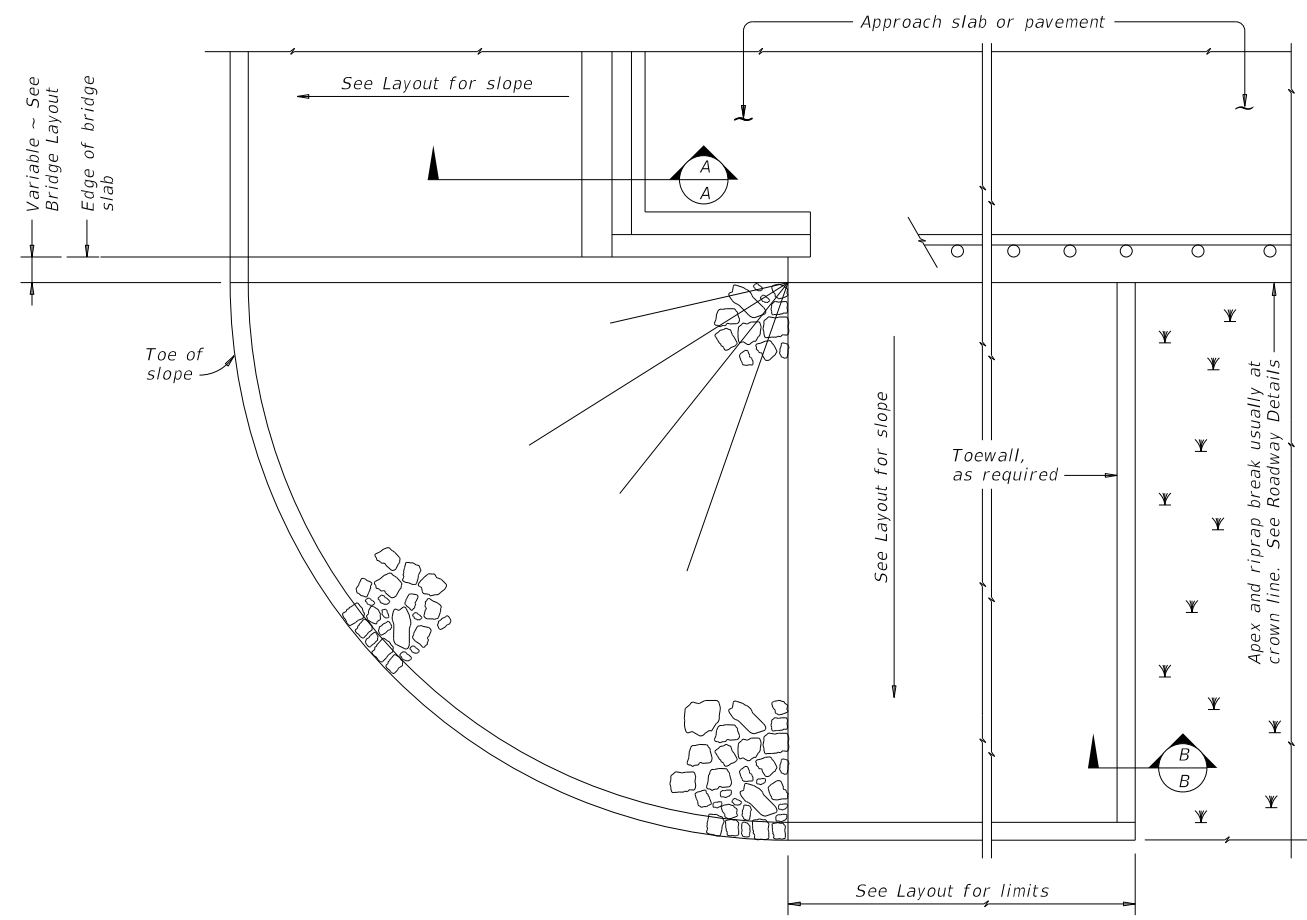
- Precast Junction Box consists of base slab, base unit, risers (as required), and below grade slab. See sheet PJB for details.
- Precast Base consists of base slab, base unit, risers (as required), reducing slab (as required), and reduced risers (as required). See sheet PB for details.
- Min Height shown is for stock base units. Use stock base units whenever practical. Smaller height base units can be used in special installation circumstances, when noted elsewhere in the plans. Absolute minimum height of base units is 2'-6".

HL93 LOADING

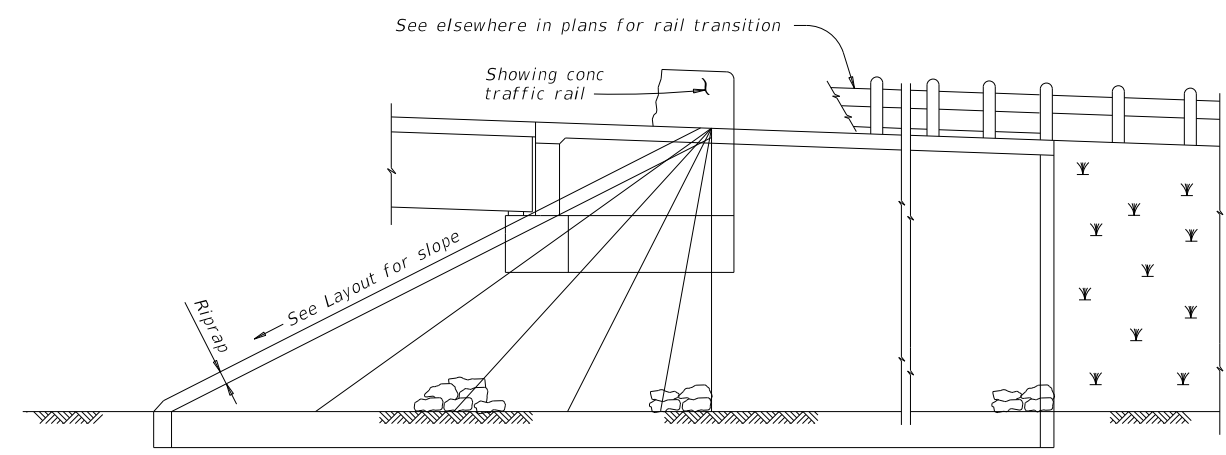
		Bridge Division Standard	
<h2>DESIGN DATA FOR PRECAST BASE AND JUNCTION BOX</h2>			
<h3>PDD</h3>			
FILE: prestid10-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT February 2020	CONT	SECT	HIGHWAY
REVISIONS	3136	01	200
DIST	COUNTY		SHEET NO.
AUS	TRAVIS		66

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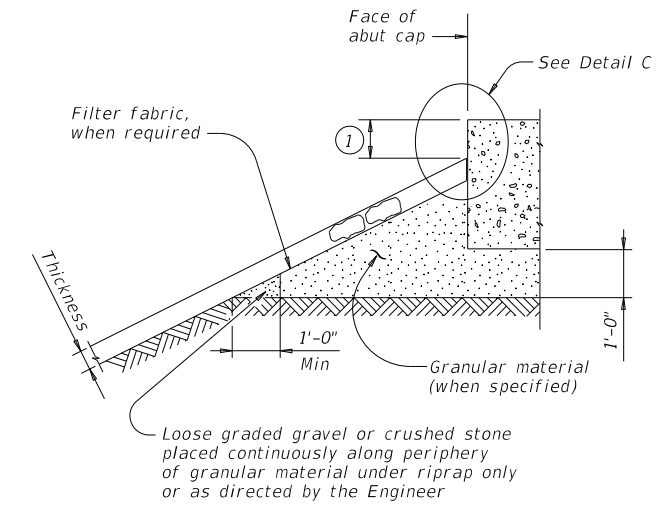
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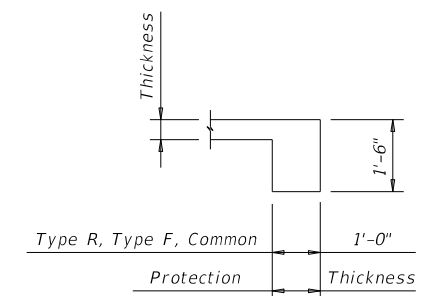
PLAN



ELEVATION

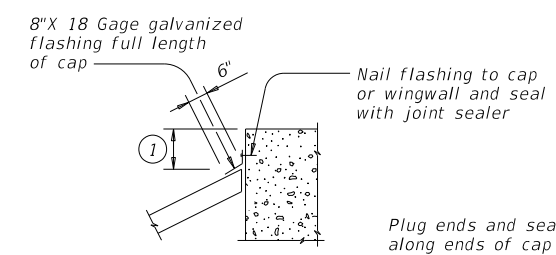


SECTION A-A AT CAP

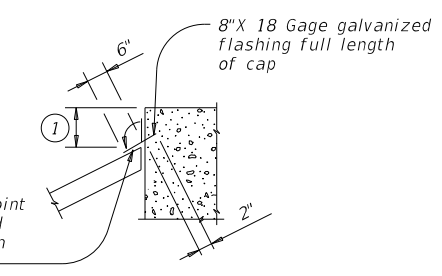


SECTION B-B

Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".



CAP OPTION A



CAP OPTION B

DETAIL C

① Top of cap to top of riprap dimension varies as directed by the Engineer. Provide 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

GENERAL NOTES:
 Refer to Item 432, "Riprap" for stone size and gradation, and construction details. See Layout for limits and thickness of riprap specified.
 See elsewhere in plans for locations and details of shoulder drains.

SHEET 1 OF 2

		Bridge Division Standard	
<h1>STONE RIPRAP</h1>			
<h2>SRR</h2>			
FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH
©TxDOT April 2019	CONTRACT NO. 3136	SECTION 01	JOB NO. 200
REVISIONS		HIGHWAY SL 1	
DIST. AUS	COUNTY TRAVIS	SHEET NO. 67	

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DATE: 6/13/2023 9:54:27 AM
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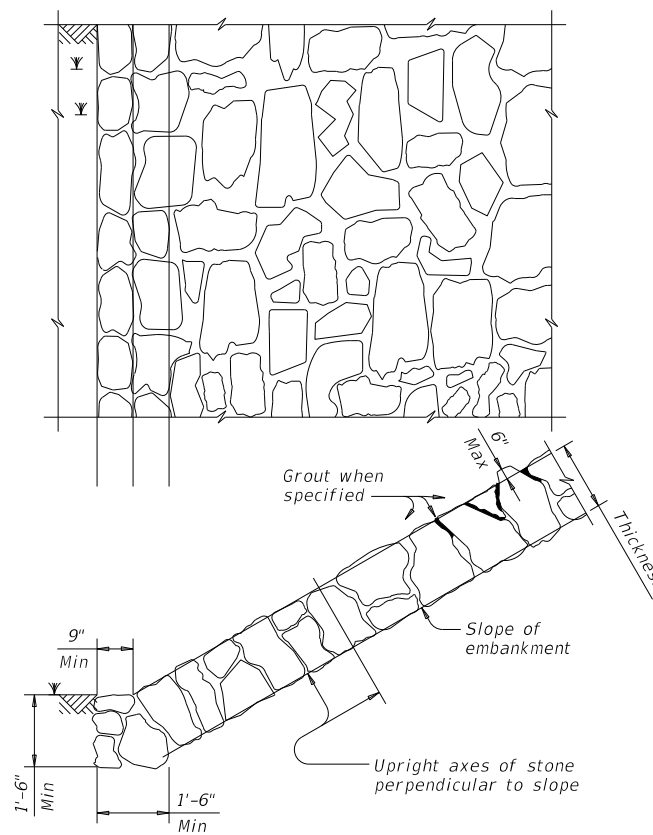


FIGURE 1 ~ TYPE R STONE RIPRAP
dry or grouted

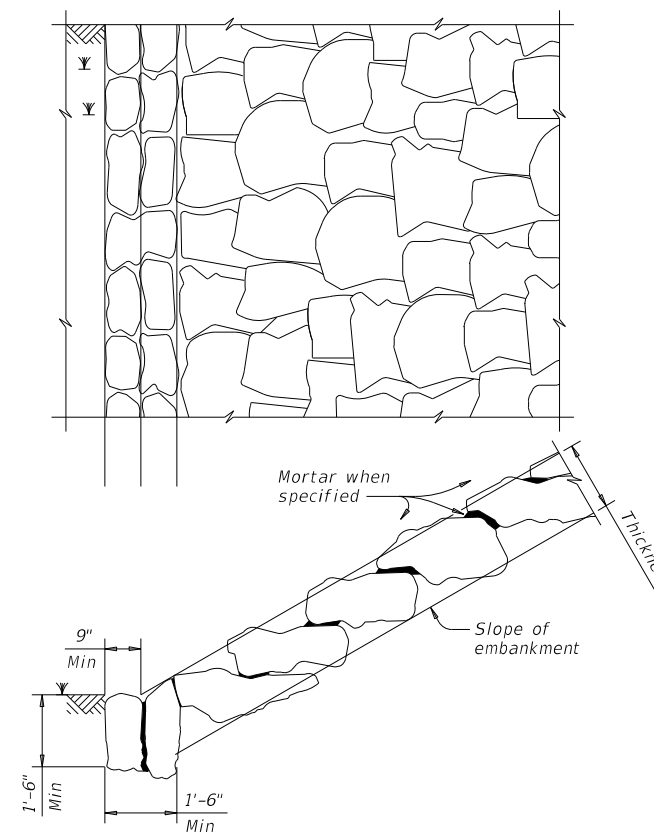


FIGURE 2 ~ TYPE F STONE RIPRAP
dry or mortared

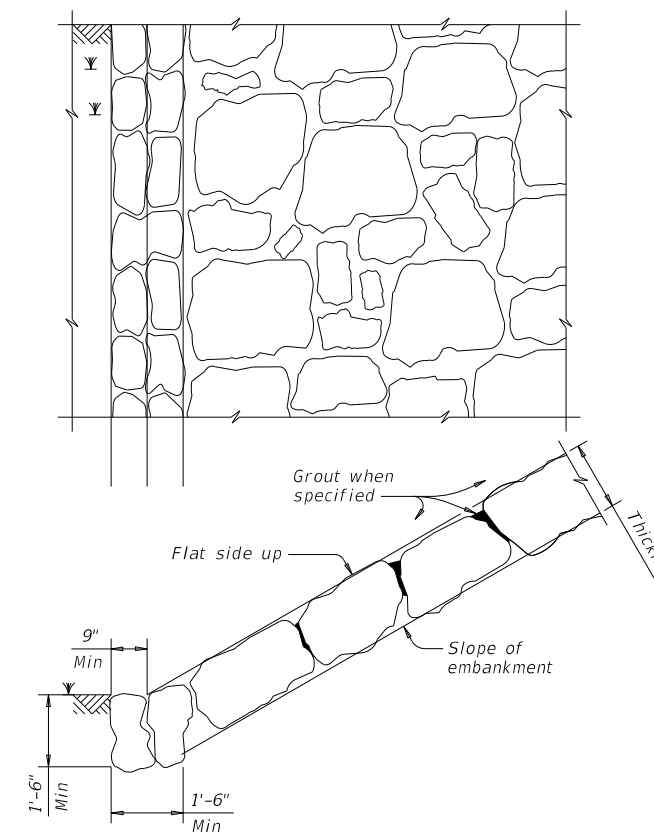


FIGURE 3 ~ TYPE F STONE RIPRAP
grouted

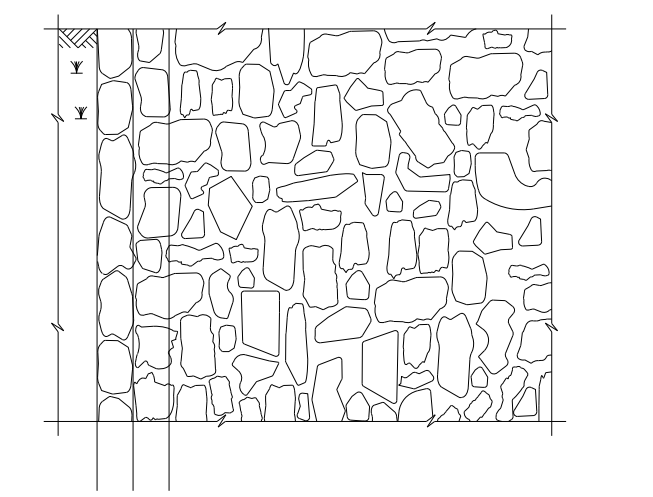


FIGURE 4 ~ COMMON STONE RIPRAP
dry or grouted

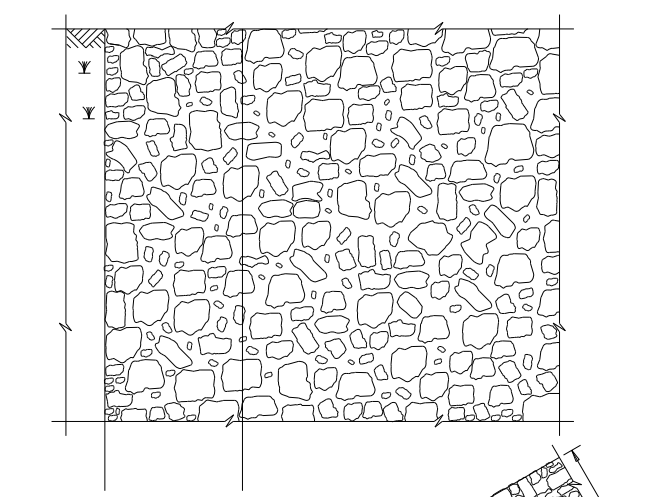
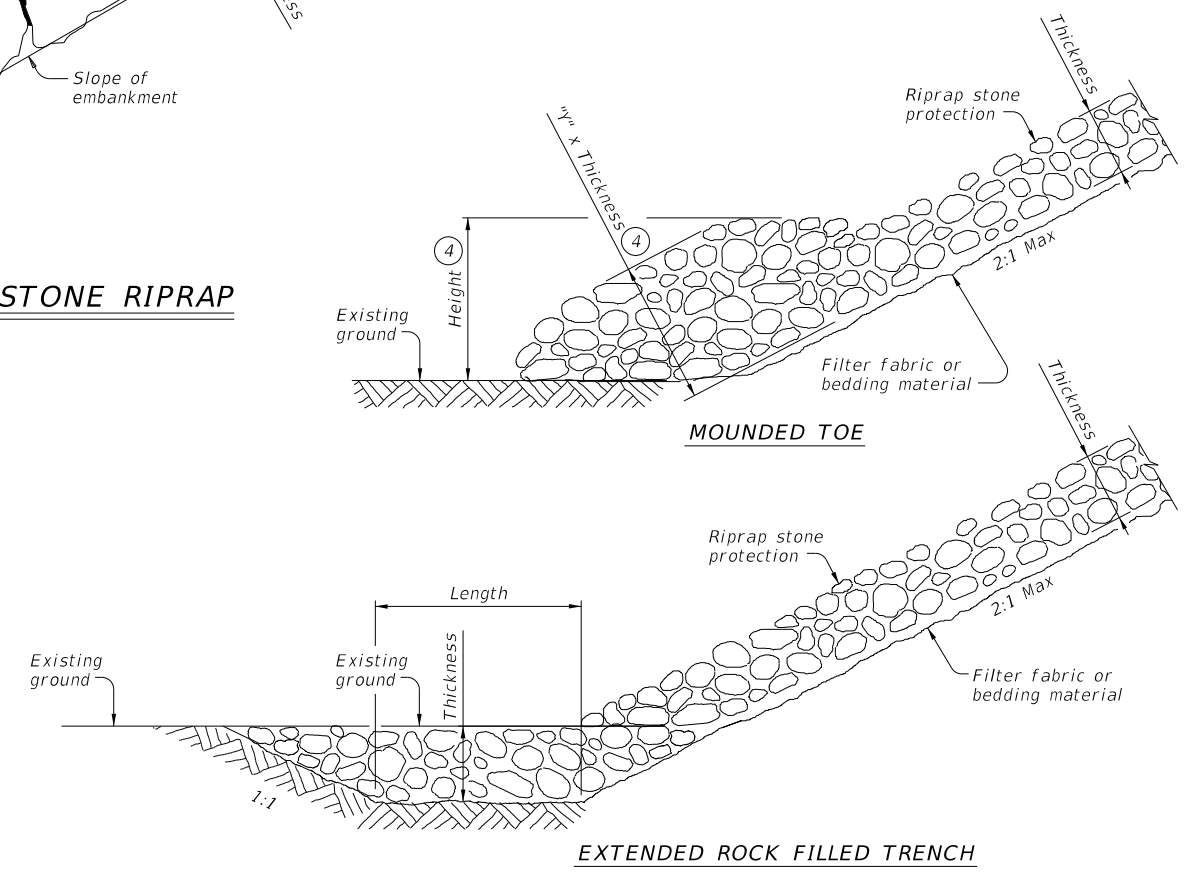


FIGURE 5 ~ PROTECTION STONE RIPRAP

- ② Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.
- ③ Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.
- ④ "Y" and Height need to be defined. See layout or detail sheet for values if this option is used.
- ⑤ List Stone Protection as size (XX inch) and thickness (YY inch) on the layout.
Example: Riprap (Stone Protection) XX inch, Thickness = YY inch.



PROTECTION STONE RIPRAP TOE OPTIONS ⑤

SHEET 2 OF 2



STONE RIPRAP

SRR

FILE: srr\stdel-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	3136	01	200	SL 1
	DIST	COUNTY	SHEET NO.	
	AUS	TRAVIS	68	

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DATE: FILE:

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1.
2.
 No Action Required Required Action

Action No.

- Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
- Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
- Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
- When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

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

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

- No Permit Required
 Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
 Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
 Individual 404 Permit Required
 Other Nationwide Permit Required: NWP# 3

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

- Skunk Hollow Creek and Tributary
-
-
-

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
<input type="checkbox"/> Temporary Vegetation	<input checked="" type="checkbox"/> Silt Fence	<input type="checkbox"/> Vegetative Filter Strips
<input type="checkbox"/> Blankets/Matting	<input checked="" type="checkbox"/> Rock Berm	<input type="checkbox"/> Retention/Irrigation Systems
<input type="checkbox"/> Mulch	<input type="checkbox"/> Triangular Filter Dike	<input type="checkbox"/> Extended Detention Basin
<input type="checkbox"/> Sodding	<input type="checkbox"/> Sand Bag Berm	<input type="checkbox"/> Constructed Wetlands
<input type="checkbox"/> Interceptor Swale	<input type="checkbox"/> Straw Bale Dike	<input type="checkbox"/> Wet Basin
<input type="checkbox"/> Diversion Dike	<input type="checkbox"/> Brush Berms	<input type="checkbox"/> Erosion Control Compost
<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Mulch Filter Berm and Socks
<input type="checkbox"/> Mulch Filter Berm and Socks	<input checked="" type="checkbox"/> Mulch Filter Berm and Socks	<input type="checkbox"/> Compost Filter Berm and Socks
<input type="checkbox"/> Compost Filter Berm and Socks	<input type="checkbox"/> Compost Filter Berm and Socks	<input type="checkbox"/> Vegetation Lined Ditches
	<input type="checkbox"/> Stone Outlet Sediment Traps	<input type="checkbox"/> Sand Filter Systems
	<input type="checkbox"/> Sediment Basins	<input type="checkbox"/> Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

- No Action Required Required Action

Action No.

-
-
-
-

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical. Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

- No Action Required Required Action

Action No.

- Vegetation removal should not occur during bird nesting season unless approved in advance by TxDOT Austin District environmental staff.
-
-
-

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

- No Action Required Required Action

Action No.

- The proposed construction work will not remove active bird nests from trees, ground and structures during migratory bird nesting season (March 1 - September 15). Vegetation removal should not occur during bird nesting season unless approved in advance by TxDOT Austin District environmental staff. If the contractor needs to perform vegetation clearing during nesting season, a qualified biologist shall conduct a survey to determine if active nests are present. If present, the contractor shall maintain a buffer zone around the nest(s) as directed by the biologist. The buffer zone will be protected from clearing and disturbance until such time as the biologist has determined that the nest(s) is no longer active.

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

BMP: Best Management Practice	SPCC: Spill Prevention Control and Countermeasure
CGP: Construction General Permit	SW3P: Storm Water Pollution Prevention Plan
DSHS: Texas Department of State Health Services	PCN: Pre-Construction Notification
FHWA: Federal Highway Administration	PSL: Project Specific Location
MOA: Memorandum of Agreement	TCEQ: Texas Commission on Environmental Quality
MOU: Memorandum of Understanding	TPDES: Texas Pollutant Discharge Elimination System
MS4: Municipal Separate Stormwater Sewer System	TPWD: Texas Parks and Wildlife Department
MBTA: Migratory Bird Treaty Act	TxDOT: Texas Department of Transportation
NOT: Notice of Termination	T&E: Threatened and Endangered Species
NWP: Nationwide Permit	USACE: U.S. Army Corps of Engineers
NOI: Notice of Intent	USFWS: U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used. Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act. Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:

- * Dead or distressed vegetation (not identified as normal)
- * Trash piles, drums, canister, barrels, etc.
- * Undesirable smells or odors
- * Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

- Yes No

If "No", then no further action is required.

If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

- Yes No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

- No Action Required Required Action

Action No.

-
-
-


VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

- No Action Required Required Action

Action No.


- The project is located on the Edwards Aquifer Recharge Zone. A TCEQ Water Pollution Abatement Plan Exception (WPAP-EXP) was obtained for the project.
- Comply with the WPAP-EXP approval letter.
- Maintain copies of the WPAP-EXP and WPAP-EXP Approval Letter onsite or immediately available during construction.
- If any sensitive feature is encountered during construction, implement the Void Mitigation and Protection Measure AND Void Discovery Protocol on the Void Mitigation Notes plan sheets.

		Design Division Standard		
<h2>ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS</h2> <h1>EPIC</h1>				
FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
12-12-2011 1051 REVISIONS	3136	01	200	SL 1
05-07-14 ADDED NOTE SECTION IV.	DIST	COUNTY	SHEET NO.	
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	AUS	TRAVIS	69	

The following TCEQ requirements (Form TCEQ-0592, Rev. 7/15/15) are applicable to all work in the recharge zone of the Edwards Aquifer in Hays, Travis and/or Williamson Counties and must be adhered to by the Contractor and all Subcontractors:

1. A written notice of construction must be submitted to the TCEQ regional office at least 48 hours prior to the start of any regulated activities. This notice must include:
 - the name of the approved project;
 - the activity start date; and
 - the contact information of the prime contractor.
2. All contractors conducting regulated activities associated with this project must be provided with complete copies of the approved Water Pollution Abatement Plan (WPAP) and the TCEQ letter indicating the specific conditions of its approval. During the course of these regulated activities, the contractors are required to keep on-site copies of the approved plan and approval letter.
3. If any sensitive feature(s) (caves, solution cavity, sink hole, etc.) is discovered during construction, all regulated activities near the sensitive feature must be suspended immediately. The appropriate TCEQ regional office must be immediately notified of any sensitive features encountered during construction. Construction activities may not be resumed until the TCEQ has reviewed and approved the appropriate protective measures in order to protect any sensitive feature and the Edwards Aquifer from potentially adverse impacts to water quality.
4. No temporary or permanent hazardous substance storage tank shall be installed within 150 feet of a water supply source, distribution system, well, or sensitive feature.
5. Prior to beginning any construction activity, all temporary erosion and sedimentation (E&S) control measures must be properly installed and maintained in accordance with the approved plans and manufacturers specifications. If inspections indicate a control has been used inappropriately, or incorrectly, the applicant must replace or modify the control for site situations. These controls must remain in place until the disturbed areas have been permanently stabilized.
6. Any sediment that escapes the construction site must be collected and properly disposed of before the next rain event to ensure it is not washed into surface streams, sensitive features, etc.
7. Sediment must be removed from the sediment traps or sedimentation basins not later than when it occupies 50% of the basin's design capacity.
8. Litter, construction debris, and construction chemicals exposed to stormwater shall be prevented from being discharged offsite.
9. All spoils (excavated material) generated from the project site must be stored on-site with proper E&S controls. For storage or disposal of spoils at another site on the Edwards Aquifer Recharge Zone, the owner of the site must receive approval of a water pollution abatement plan for the placement of fill material or mass grading prior to the placement of spoils at the other site.
10. If portions of the site will have a temporary or permanent cease in construction activity lasting longer than 14 days, soil stabilization in those areas shall be initiated as soon as possible prior to the 14th day of inactivity. If activity will resume prior to the 21st day, stabilization measures are not required. If drought conditions or inclement weather prevent action by the 14th day, stabilization measures shall be initiated as soon as possible.
11. The following records shall be maintained and made available to the TCEQ upon request:
 - the dates when major grading activities occur;
 - the dates when construction activities temporarily or permanently cease on a portion of the site; and
 - the dates when stabilization measures are initiated.
12. The holder of any approved Edward Aquifer protection plan must notify the appropriate regional office in writing and obtain approval from the executive director prior to initiating any of the following:
 - A. any physical or operational modification of any water pollution abatement structure(s), including but not limited to ponds, dams, berms, sewage treatment plants, and diversionary structures;
 - B. any change in the nature or character of the regulated activity from that which was originally approved or a change which would significantly impact the ability of the plan to prevent pollution of the Edwards Aquifer;
 - C. any development of land previously identified as undeveloped in the original water pollution abatement plan.

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TCEQ REGIONAL OFFICE				
Austin Regional Office 12100 Park 35 Circle Bldg A, Room 179 Austin, Texas 78753 Phone: (512) 339-2929 Fax: (512) 339-3795				
				Austin District Standard
TCEQ REQUIREMENTS FOR THE RECHARGE ZONE OF THE EDWARDS AQUIFER				
TCEQ-RZ-19 (AUS)				
©TxDOT 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	3136	01	200	SL 1
01/10/14: REQUIREMENTS AND ADDRESS UPDATED	DIST	COUNTY		SHEET NO.
01/21/16: REQUIREMENTS UPDATED	AUS	TRAVIS		70
09/24/19: UPDATED RELEASE YEAR				

VOIDS DEFINITION

- VOID GREATER THAN SIX INCHES ACROSS IN ANY DIRECTION AND/OR
- VOID IS GREATER THAN ONE SQUARE FOOT ALONG ANY PLANE AND/OR
- VOID BLOWS AIR AND/OR
- VOID CONTINUALLY RECEIVES WATER DURING A RAIN EVENT AND/OR
- VOID HAS WATER FLOWING THROUGH OR OUT OF IT AND/OR

GENERAL NOTES

1. USING EXPLOSIVES IS NOT ALLOWED.
2. THE PROJECT AREA IS A KNOWN KARST AREA. FRACTURED MATERIAL, BOULDERS, UNDERGROUND VOIDS, GROUNDWATER, UNSTABLE MATERIAL, AND DRASTICALLY VARYING STRATA CAN BE EXPECTED. THE CONTRACTOR SHALL WORK WITH TXDOT AND TXDOT'S PARTNERS TO ALLOW ACCESS AND ON-SITE MONITORING OF EXCAVATION.
3. THE VOID MITIGATION DETAILS ARE EXAMPLES. IMPLEMENTATION OF THE APPROVED MITIGATION PLAN SHOULD USE THE REFERENCED BID ITEMS.
4. CONCRETE USED FOR VOID MITIGATION SHALL BE 3,000 PSI IN ACCORDANCE WITH ITEM 420 CLASS A CONC (MISC). QUANTITIES UNDER 4 CY MAY BE HAND MIXED ON SITE USING 5,000 PSI RATED BAG MIX CONCRETE.
5. 3 IN. x 5 IN. ROCK SHALL BE IN ACCORDANCE WITH ITEM 506. LARGE ROCK > 1 FT. SHALL BE IN ACCORDANCE WITH 12 IN. ROCK PER ITEM 432.
6. FILTER FABRIC AND EROSION LOGS WILL BE IN ACCORDANCE WITH ITEM 506.
7. IMPERMEABLE LINER WILL BE IN ACCORDANCE WITH ITEM 5056. THE EDGE OF THE LINER SHALL BE ANCHORED IN A 6 IN. WIDE BY 18 IN. DEEP TRENCH.
8. STEEL CASING, USED FOR DRILL SHAFT CONSTRUCTION, SHALL BE IN ACCORDANCE WITH ITEM 416.
9. AGGREGATE OR OTHER BACKFILL WILL BE PAID FOR BY OVERRUN OF EXISTING EMBANKMENT ITEM. FILTER FABRIC OVER THE AGGREGATE IS SUBSIDIARY. SANDBAGS SHALL BE PAID USING SANDBAGS FOR EROSION CONTROL. THE SANDBAGS SHALL BE POLYPROPYLENE AND FILLED WITH PEA GRAVEL. CONNECTOR PIPE SHALL BE PAID USING PIPE (PVC) (SCH 80) (6 IN).
10. IF A SINGLE VOID IMPACT CAUSES DELAYS BY MORE THAN 20 WORKING DAYS, DELAY WILL BE CONSIDERED FOR THE IMPACT BEYOND THE INITIAL 20 DAYS. IF THE ACCUMULATION OF VOID IMPACTS CAUSE DELAYS BY MORE 40 WORKING DAYS, DELAY WILL BE CONSIDERED FOR THE IMPACT BEYOND THE 40 DAYS. OVERHEAD, BARRICADES AND DELAYS WILL BE EVALUATED AND PAID IN ACCORDANCE WITH THE CONTRACT. IMPACTS WILL NOT BE CONSIDERED IMPACT AFTER A RESPONSE PROCEDURE IS PROVIDED. ALL DELAYS CAUSED BY A VOID AND THE DURATION FOR IMPLEMENTATION OF A RESPONSE ARE NON-COMPENSABLE FOR LABOR, EQUIPMENT, STANDBY, MOBILIZATIONS, AND COST ESCALATIONS.

VOID MITIGATION AND PROTECTION MEASURES

REFER TO VOID MITIGATION DETAILS FOR ADDITIONAL INFORMATION. VOID MITIGATION DETAILS ARE TO BE APPROVED BY GEOSCIENTIST AND THE TCEQ (IF APPLICABLE) PRIOR TO IMPLEMENTATION.

1. IN THE EVENT THAT UNKNOWN KARST VOIDS ARE ENCOUNTERED, WORK AT THAT LOCATION WILL BE HALTED IMMEDIATELY AND THE FEATURE WILL BE INSPECTED PROMPTLY BY TXDOT.
2. WHEN REQUIRED, TXDOT WILL INSPECT ALL VOIDS TO DETERMINE THE POTENTIAL OF THE FEATURES TO PROVIDE SUITABLE HABITAT FOR ENDANGERED KARST INVERTEBRATES. WORK AT THAT LOCATION WILL NOT RESUME UNTIL AUTHORIZATION TO DISTURB THE FEATURE HAS BEEN OBTAINED. REFER TO THE EPIC SHEET FOR ADDITIONAL INFORMATION FOR THREATENED OR ENDANGERED SPECIES.

TXDOT WILL INSPECT ALL VOIDS TO DETERMINE THE APPROPRIATE VOID MITIGATION PLAN.
3. ADDITIONAL EXCAVATION OF THE VOID MAY BE REQUIRED BY TXDOT OR THE GEOSCIENTIST TO FULLY EVALUATE THE VOID AND/OR MITIGATION PLAN PREPERATION. TXDOT APPROVAL IS REQUIRED PRIOR THE EXCAVATION. THIS WORK IS SUBSIDIARY.

VOID DISCOVERY PROTOCOL


IF A VOID IS DISCOVERED, THE FOLLOWING PROTOCOL WILL BE FOLLOWED:

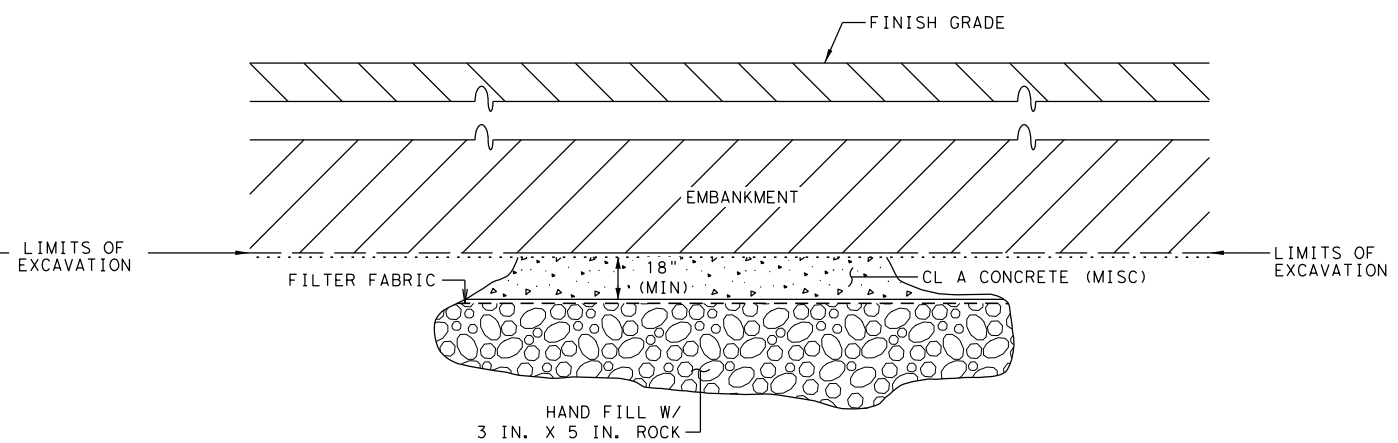
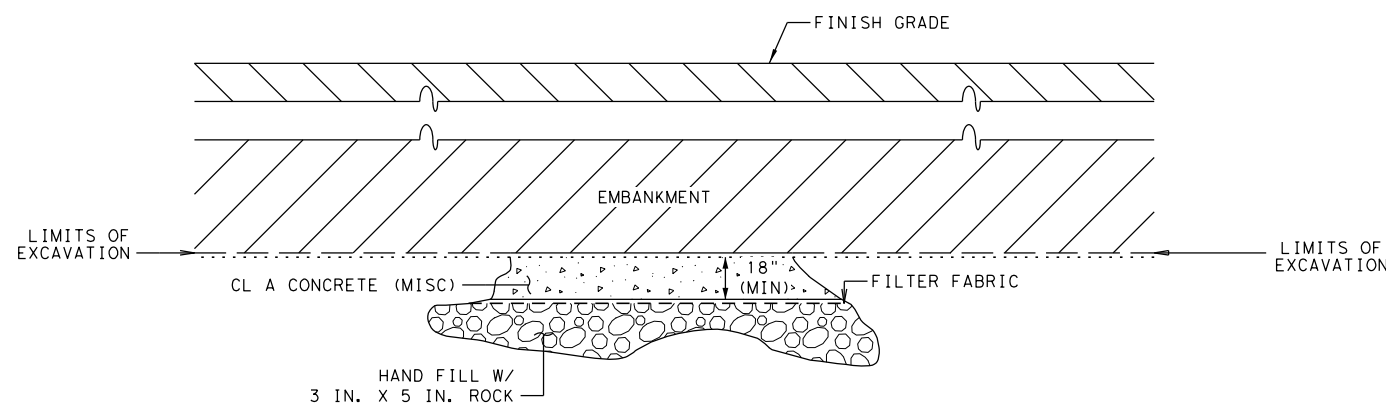
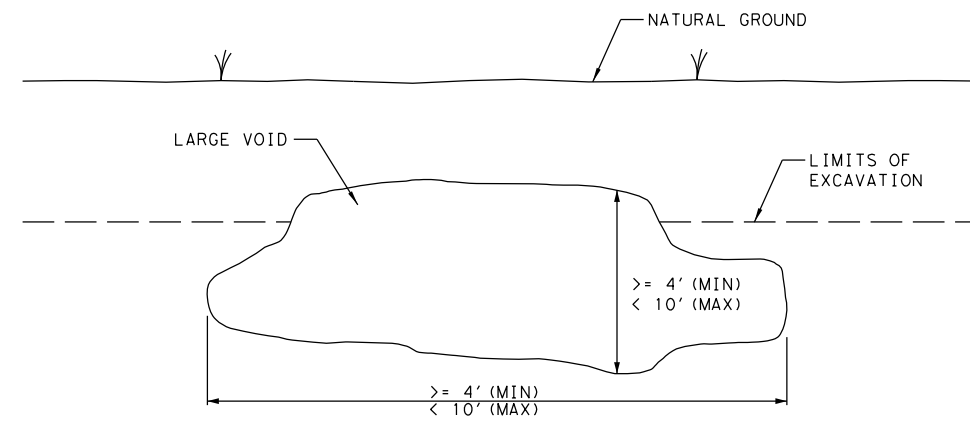
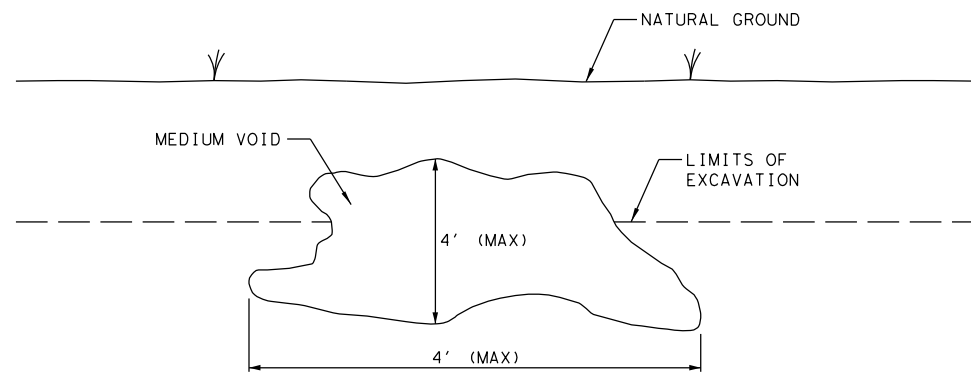
1. ALL VOIDS REQUIRE AN EMAIL NOTIFICATION TO TXDOT DESIGNATED REPRESENTATIVE WITHIN 2 HOURS OF DISCOVERY. THE EMAIL WILL REQUIRE LOCATION INFORMATION (STATION, LATITUDE & LONGITUDE), DATES OF DISCOVERY, VIDEO/PICTURE DOCUMENTATION, SIZE, ETC. CONTRACTOR SHALL SUPPLY A CAMERA AND DIGITAL PICTURE/VIDEO DOCUMENTATION OF ALL VOIDS AND PROVIDE A MEASUREMENT OF THE SIZE OF THE VOID. FOR VOIDS THAT CANNOT BE SAFELY EXPLORED, ANOTHER DEVICE SHALL BE PROVIDED TO DOCUMENT THE VOID. CONTACT THE DISTRICT CONSTRUCTION OFFICE FOR AN EXAMPLE EMAIL THAT SHALL BE FOLLOWED. THIS WORK IS SUBSIDIARY.
2. ALL ACTIVITY WITHIN A 50-FOOT RADIUS OF THE VOID SHALL STOP. BLOCK TRAFFIC FROM DRIVING NEAR THE VOID AND PREVENT CONSTRUCTION EQUIPMENT FROM OPERATING IN THE VICINITY OF THE VOID USING BARRELS, ORANGE CONSTRUCTION FENCE OR OTHER APPROVED HIGHLY VISIBLE BARRIER.
3. A DRY VOID THAT IS LESS THAN 1 CF IN VOLUME OR LESS THAN 6 IN. IN ALL DIRECTIONS WILL NOT REQUIRE ACTION BEYOND NOTIFICATION. TXDOT SHALL BE NOTIFIED IMMEDIATELY VIA EMAIL AND PHONE WHEN A VOID IS FOUND THAT REQUIRES ACTION. TXDOT WILL RESPOND WITHIN 6 BUSINESS DAYS FROM TIME OF EMAIL NOTIFICATION TO PROVIDE GUIDANCE TO THE CONTRACTOR.
4. COVER THE VOID TO PREVENT CONTAMINATION AND CHANGES IN AMBIENT CONDITIONS (TARPS AND PLYWOOD, OR SIMILAR MATERIALS ARE APPROPRIATE AS AVAILABLE). WHERE COVERING THE VOID IS NOT FEASIBLE, CONTRACTOR SHALL OBTAIN APPROVAL FROM TXDOT OF ALTERNATE TEMPORARY PROTECTION MEASURES. BIODEGRADABLE EROSION CONTROL LOG (BECL) SHOULD WRAP THE SURFACE PERIMETER OF THE VOID. TEMPORARY PROTECTIONS SHOULD REMAIN IN PLACE UNTIL FINAL MITIGATION AND PROTECTION MEASURES ARE APPROVED AND IN PLACE. AN EARTHEN BERM WILL BE MAINTAINED ON THE UP-GRADIENT SIDE OF VOID TO PREVENT ANY CONSTRUCTION RUNOFF FROM ENTERING ANY PART OF THE FEATURE WHICH MAY REMAIN. THIS WORK IS SUBSIDIARY.
5. WHEN REQUIRED TXDOT SHALL IMMEDIATELY NOTIFY THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ) AUSTIN REGIONAL OFFICE.
6. TXDOT WILL PROVIDE FOR THE EVALUATION OF THE VOID A QUALIFIED GEOSCIENTIST LICENSED BY THE TEXAS BOARD OF PROFESSIONAL GEOSCIENTISTS OR BY A PROFESSIONAL ENGINEER WHO QUALIFIES TO PRACTICE GEOSCIENCE ACCORDING TO THE TEXAS BOARD OF PROFESSIONAL GEOSCIENTISTS.
7. WHEN REQUIRED TXDOT WILL SUBMIT AND OBTAIN APPROVAL OF AN ENCOUNTERED FEATURE MITIGATION PLAN TO THE TCEQ AUSTIN REGION OFFICE.
8. WORK SHOULD CEASE IN THE AREA UNTIL ASSESSMENT OF THE VOID CAN BE COMPLETED, TCEQ APPROVES THE ENCOUNTERED FEATURE MITIGATION PLAN AND MITIGATION IS COMPLETED. WHEN THE VOID IS OUTSIDE TCEQ JURISDICTION, TXDOT WILL APPROVE THE ENCOUNTERED FEATURE MITIGATION PLAN.

VOIDS RELATED TO DRILLED SHAFTS, SOIL NAILS, ROCK NAILS AND OTHER SIMILAR FUNCTIONS

1. SUBMIT INSTALLATION PLAN FOR REVIEW NO LATER THAN 2 MONTHS BEFORE CONSTRUCTION.
2. THE USE OF DRILLING FLUIDS, UNDERWATER PLACEMENT, OR SLURRY METHOD WILL NOT BE ALLOWED IF A VOID IS EXPOSED DURING DRILLING OF SHAFTS OR NAILS. THE CONTRACTOR SHALL USE APPROPRIATE INDUSTRY APPROVED METHODS TO PROVIDE A PRODUCT IN COMPLIANCE WITH THE SPECIFICATIONS. ADDITIONAL TIME OR COMPENSATION WILL NOT BE ALLOWED FOR USE OF ALTERNATE METHODS OR CASING INSTALLATION.
3. DURING NON-WORK HOURS OPEN HOLES SHALL BE PROTECTED FOR SAFETY AND COVERED. SHAFTS SHALL BE SURROUNDED BY EROSION CONTROL LOGS AT AN OFFSET OF 10' FROM THE EDGE OF THE OPENING. THIS WORK IS SUBSIDIARY
4. VIDEO DOCUMENTATION SHALL BE CONDUCTED OF A DRILL SHAFT ONCE EXCAVATION IS COMPLETE AND PRIOR TO PLACING REINFORCEMENT. SUFFICIENT LIGHTING SHALL ACCOMPANY THE VIDEO CAMERA TO ENSURE THE SHAFT AND VOIDS ARE VISIBLE. THIS WORK IS SUBSIDIARY.
5. CONCRETE USED TO FILL THE VOIDS WILL BE PAID USING CLASS A CONC (MISC) ITEM BUT WILL USE THE CLASS OF CONCRETE AS REQUIRED BY THE SPECIFICATION. QUANTITY OF CONCRETE WILL BE BASED ON VISUAL INSPECTION PROVIDED BY THE CONTRACTOR. IF VISUAL INSPECTION IS UNABLE TO DETERMINE THE SIZE OF THE VOID THE CONCRETE FOR PAYMENT WILL BE MEASURED AS THE ADDITIONAL CONCRETE BEYOND THE AMOUNT REQUIRED TO PLACE A CLEAN SHAFT PLUS 10 PERCENT WASTE.
6. THE USE OF PERMANENT CASING SHALL BE IN ACCORDANCE WITH ITEM 416. MATERIAL COST FOR CASING THAT REMAINS WILL BE PAID BY INVOICE FROM SUPPLIER WITH MARK UP IN ACCORDANCE WITH MATERIAL FOR ITEM 9.7. ADDITIONAL LABOR, EQUIPMENT, TIME, ETC. FOR INSTALLATION OF THE CASING WILL NOT BE COMPENSABLE.
7. ADDITIONAL NAIL LENGTH WILL BE PAID BY OVERRUN OF EXISTING BID ITEM. ALTERNATE NAIL TYPE COST WILL BE PAID BY INVOICE FROM SUPPLIER WITH MARK UP IN ACCORDANCE WITH MATERIAL FOR ITEM 9.7. LABOR, EQUIPMENT, ADDITIONAL TIME, ETC. WILL NOT BE COMPENSABLE.
8. CORE HOLES ARE REQUIRED FOR ALL DRILLED SHAFTS.

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			Austin District Standard	
<h2 style="margin: 0;">VOID MITIGATION NOTES</h2> <h3 style="margin: 0;">VMD-18 (AUS)</h3>				
SHEET 1 OF 7				
©TXDOT 2023	CONT	SECT	JOB	HIGHWAY
	3136	01	200	SL 1
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		71



ROADWAY/S.U.P. GRADING OPERATIONS
 MEDIUM (DRY VOID)
 (<4' IN ANY DIRECTION)
 (1 CF < 64 CF)

ROADWAY/S.U.P. GRADING OPERATIONS
 LARGE (DRY VOID)
 (>=4' <10' ANY DIRECTION)
 (64 CF < 1000 CF)

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VOID MITIGATION
 DETAILS


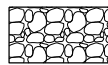


VMD-18 (AUS)

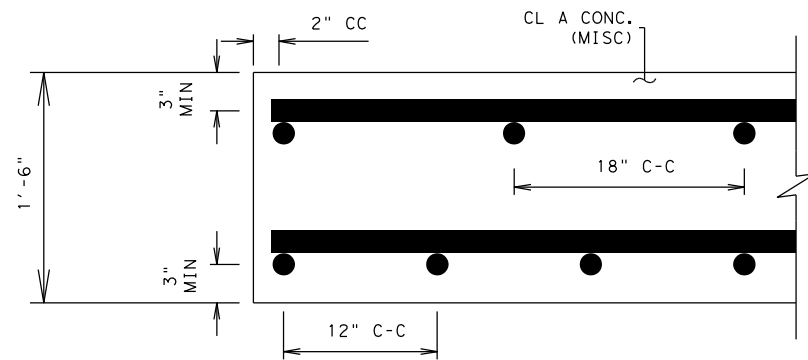
SHEET 2 OF 7

©TxDOT 2023	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		72

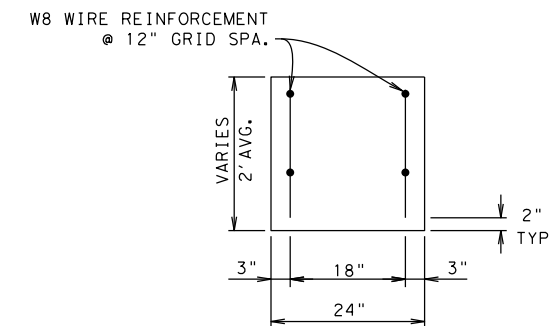
SCALE (IN FEET):
0 5

LEGEND

-  CLASS A CONC. (MISC)
-  3 IN. x 5 IN. ROCK
-  LARGE ROCK (\geq 1 FT)
-  SHOTCRETE



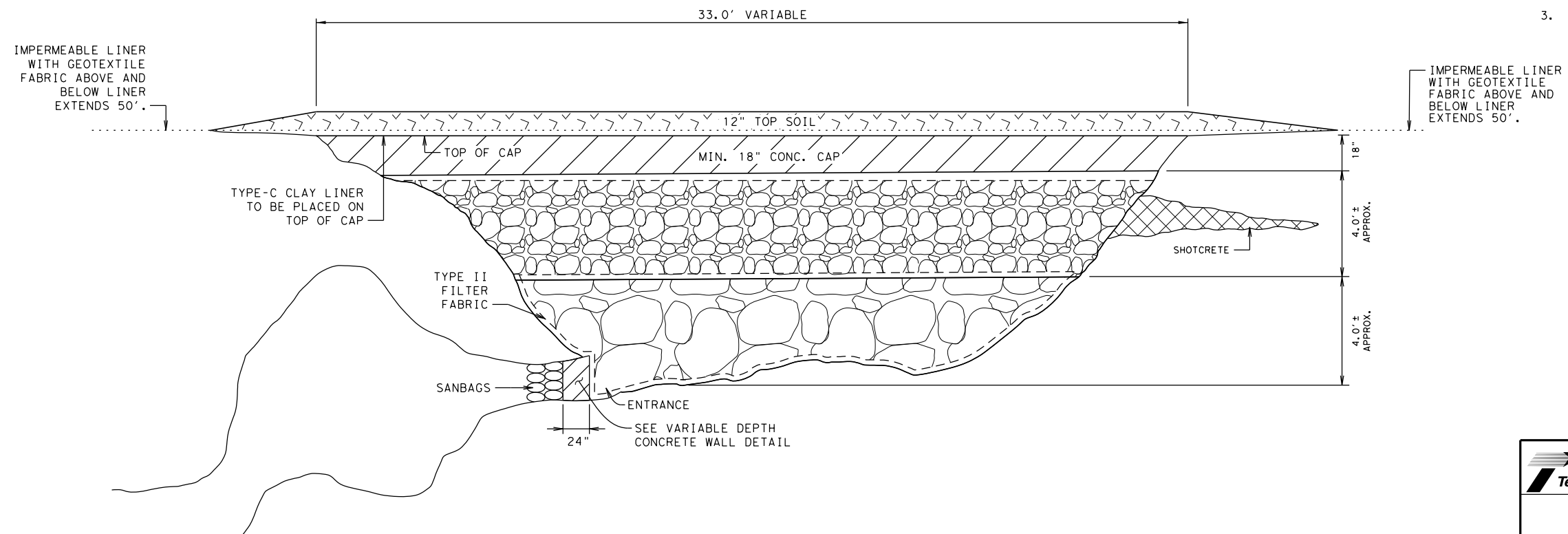
REINFORCING DETAIL



VARIABLE DEPTH CONCRETE WALL

NOTE:

1. CONCRETE WALL AND CONCRETE CAP SHALL BE PAID USING CLASS A CONC. (MISC).
2. SHOTCRETE WILL BE PAID USING CLASS A CONC. (MISC).
3. THE 12 IN. TOPSOIL AND LINER MAY NOT BE APPLICABLE IF THE VOID IS NOT IN A POND.



ELEVATION OF VOID IN A POND

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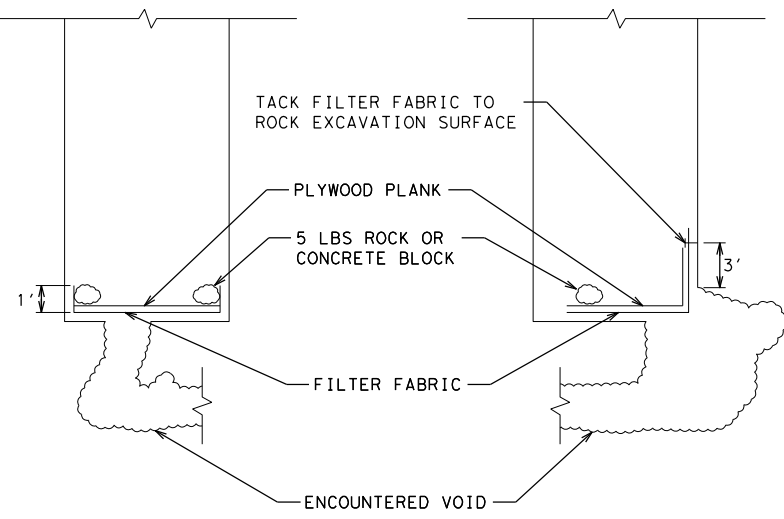


VOID MITIGATION
DETAILS

VMD-18 (AUS)

SHEET 3 OF 7

©TxDOT 2023	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY	SHEET NO.	
	AUS	TRAVIS	73	



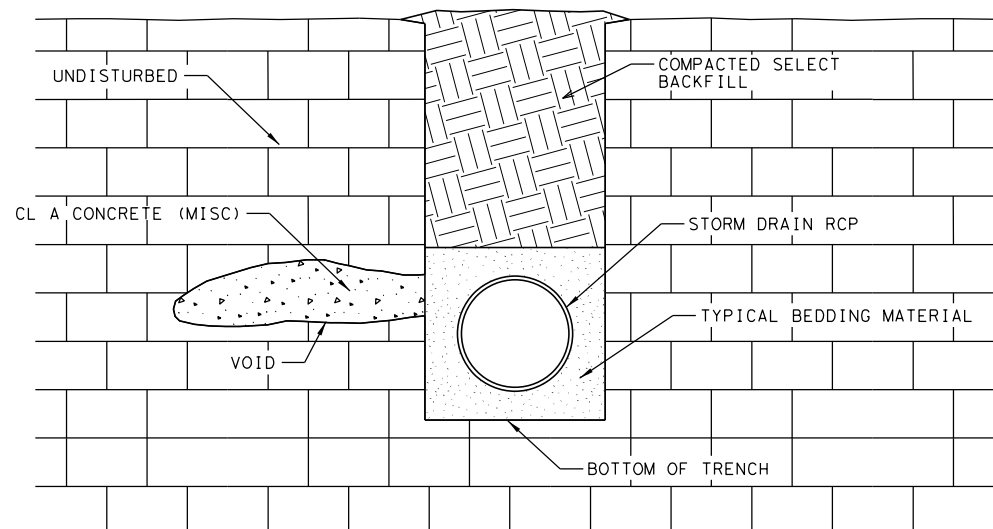
**TEMPORARY PROTECTION
VOID AT BOTTOM OF TRENCH**

NOTES:

1. PLACE TEMPORARY PROTECTION WITHIN TRENCH TO COVER VOID AS INDICATED. FABRIC SHALL EXTEND A MINIMUM OF 3 IN. BEYOND EDGE OF VOID. PLACE A PLYWOOD PLANK (MINIMUM 0.75 IN. THICK) OVER FABRIC. PLANK AND FABRIC SHALL BE WEIGHTED AS REQUIRED BY 5 LBS ROCK OR CONCRETE BLOCK TO SECURE FILTER FABRIC.
2. TEMPORARY PROTECTION SHALL BE IN PLACE AT ALL TIMES THAT CONSTRUCTION OPERATIONS ARE NOT IN ACTUAL PROGRESS.
3. CONSTRUCTION OPERATIONS WITHIN 50' SHALL NOT PROGRESS DURING OCCURRENCE OF RAIN TO ALLOW FOR PROTECTION OF VOID DURING A RAIN EVENT.
4. LOCALIZED EROSION MEASURES (SILT FENCE, EROSION CONTROL LOG OR TRIANGULAR FILTER DIKES) SHALL BE INSTALLED ALONG THE TRENCH TO ENSURE THAT LOOSE SPOILS OR RUNOFF DO NOT ENTER THE TRENCH OR AFFECT PERFORMANCE OF TEMPORARY PROTECTION. USE EARTHEN BERN TO DIVERT WATER AWAY FROM THE TRENCH.
5. SPECIAL CARE SHALL BE TAKEN TO ENSURE THAT EROSION CONTROL MEASURES REQUIRED ALONG THE TRENCH ARE MAINTAINED, CLEANED AND FULLY FUNCTIONAL.
6. FILTER FABRIC AND ROCK OR CONCRETE BLOCKS AND PLYWOOD PLANK SHALL BE REMOVED FROM THE TRENCH WHEN PERMANENT VOID MITIGATION MEASURES ARE INSTALLED.

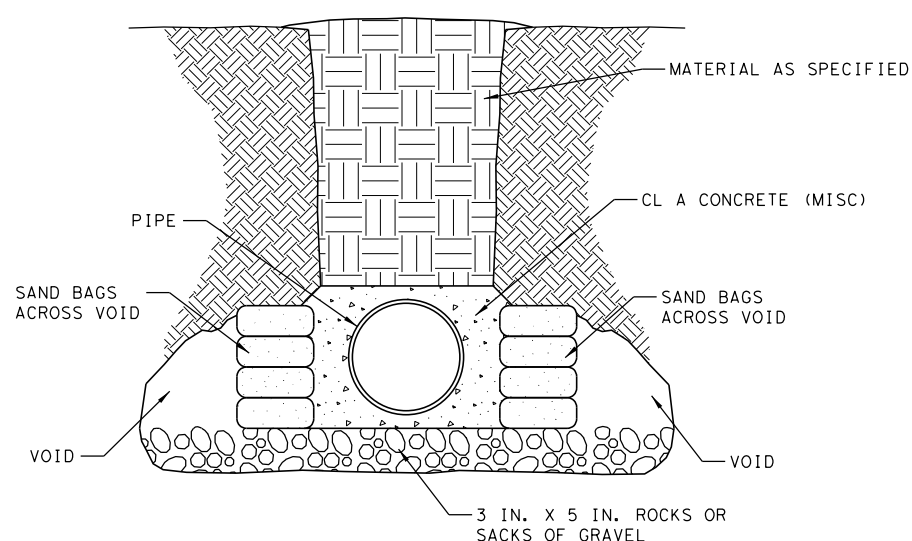
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Texas Department of Transportation			Austin District Standard	
<h2 style="margin: 0;">VOID MITIGATION DETAILS</h2> <h3 style="margin: 0;">VMD-18 (AUS)</h3>				
SHEET 4 OF 7				
©TxDOT 2023	CONT	SECT	JOB	HIGHWAY
	3136	01	200	SL 1
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		74



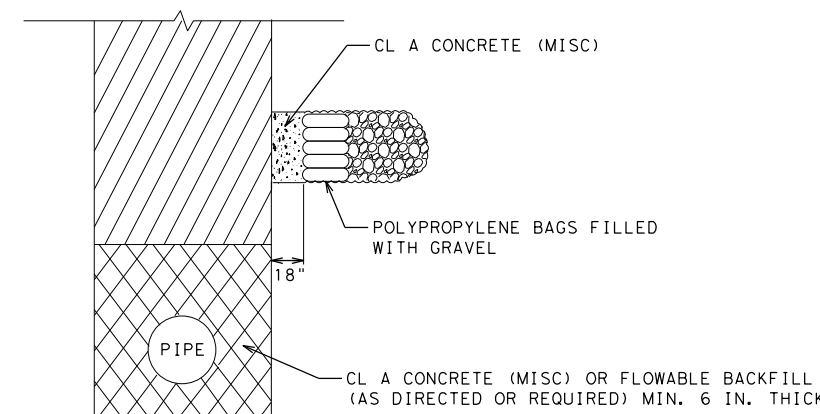
TRENCHING OPERATIONS
SMALL/MEDIUM (DRY VOID)
(<64 CF)

VOID IS EITHER LARGER THAN SIX (6) INCHES IN AT LEAST ONE DIRECTION OR IS LOCATED WITHIN THE LEVEL OF THE PIPE EMBEDMENT. ALL ROCK WITHIN AND SURROUNDING THE VOID IS SOUND.



TRENCHING OPERATIONS
LARGE (DRY VOID)
(64 CF < 1,000 CF)

VOID INTERSECTS THE PLANE OF THE TRENCH FLOOR AND ANY OPENING IN TRENCH FLOOR IS GREATER THAN FOUR (4) FEET IN ANY DIRECTION, OR THE TRENCH FLOOR IS UNSTABLE.

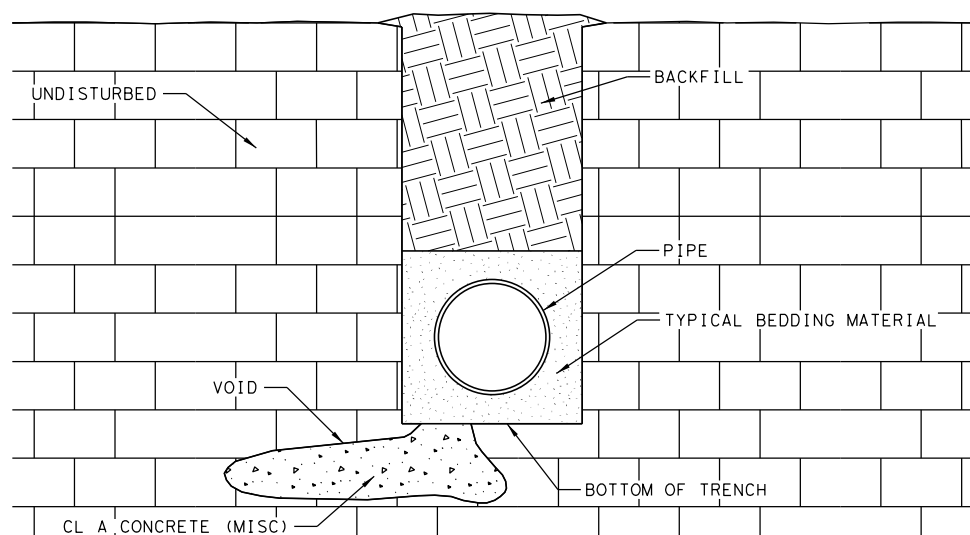


TRENCHING OPERATIONS
LARGE (DRY VOID)
(64 CF < 1,000 CF)

VOID IS ABOVE THE PLANE OF THE TRENCH FLOOR

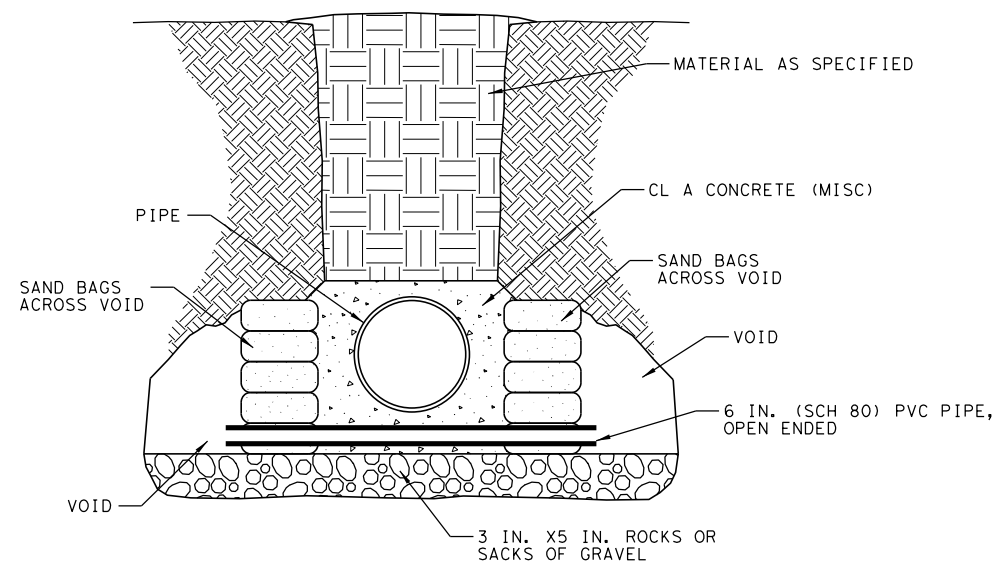
GENERAL NOTE:

1. ALL PIPES SHALL BE ENCASED WITH CLASS A CONCRETE THAT EXTENDS 5' BEYOND THE EDGE OF THE VOID IN ALL DIRECTIONS. THE CONCRETE SHALL PROVIDE 6 IN. COVER AROUND THE PIPE.



TRENCHING OPERATIONS
SMALL/MEDIUM (DRY VOID)
(<64 CF)

VOID INTERSECTS THE PLANE OF THE TRENCH FLOOR AND IS LESS THAN FOUR (4) FEET IN ANY DIRECTION. ALL ROCK WITHIN AND SURROUNDING THE VOID IS SOUND.



TRENCHING OPERATIONS
LARGE (WET VOID)
(64 CF < 1,000 CF)

VOID INTERSECTS THE PLANE OF THE TRENCH FLOOR AND ANY OPENING IN TRENCH FLOOR IS GREATER THAN FOUR (4) FEET IN ANY DIRECTION, OR THE TRENCH FLOOR IS UNSTABLE.

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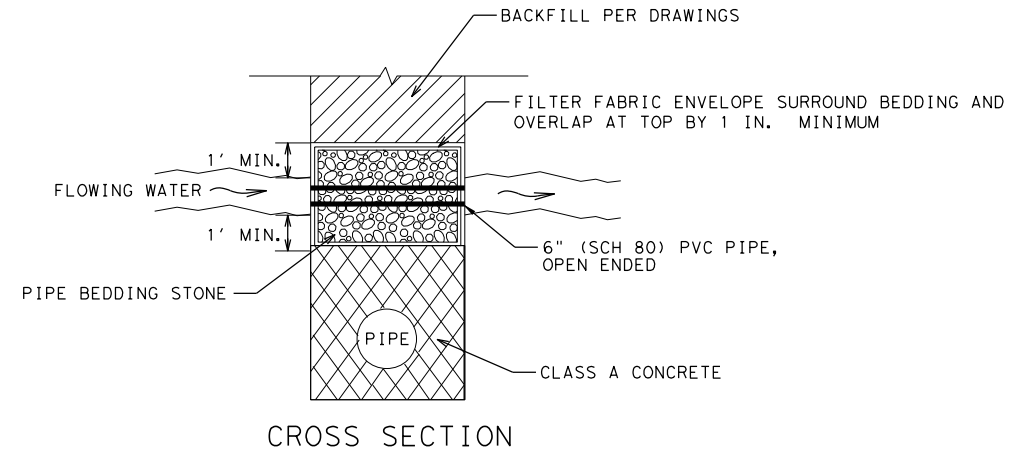
**VOID MITIGATION
DETAILS**

VMD-18 (AUS)

SHEET 5 OF 7

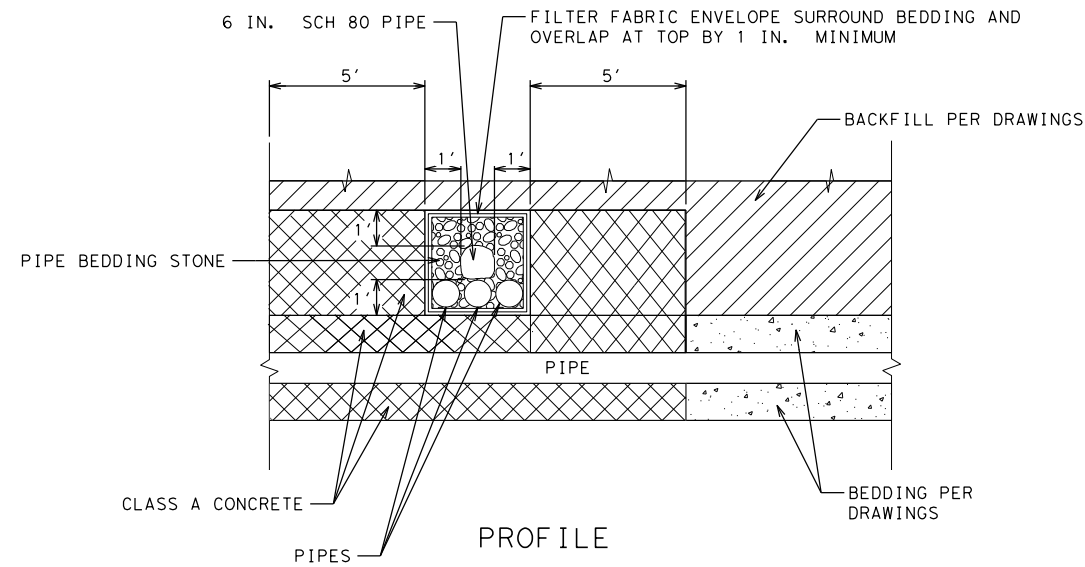
©TxDOT 2023	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY	SHEET NO.	
	AUS	TRAVIS	75	

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GENERAL NOTE:

1. ALL PIPES SHALL BE ENCASED WITH CLASS A CONCRETE THAT EXTENDS 5' BEYOND THE EDGE OF THE VOID IN ALL DIRECTIONS. THE CONCRETE SHALL PROVIDE 6 IN. COVER AROUND THE PIPE.



TRENCHING OPERATIONS
 GROUNDWATER ABOVE
 BEDDING MATERIAL

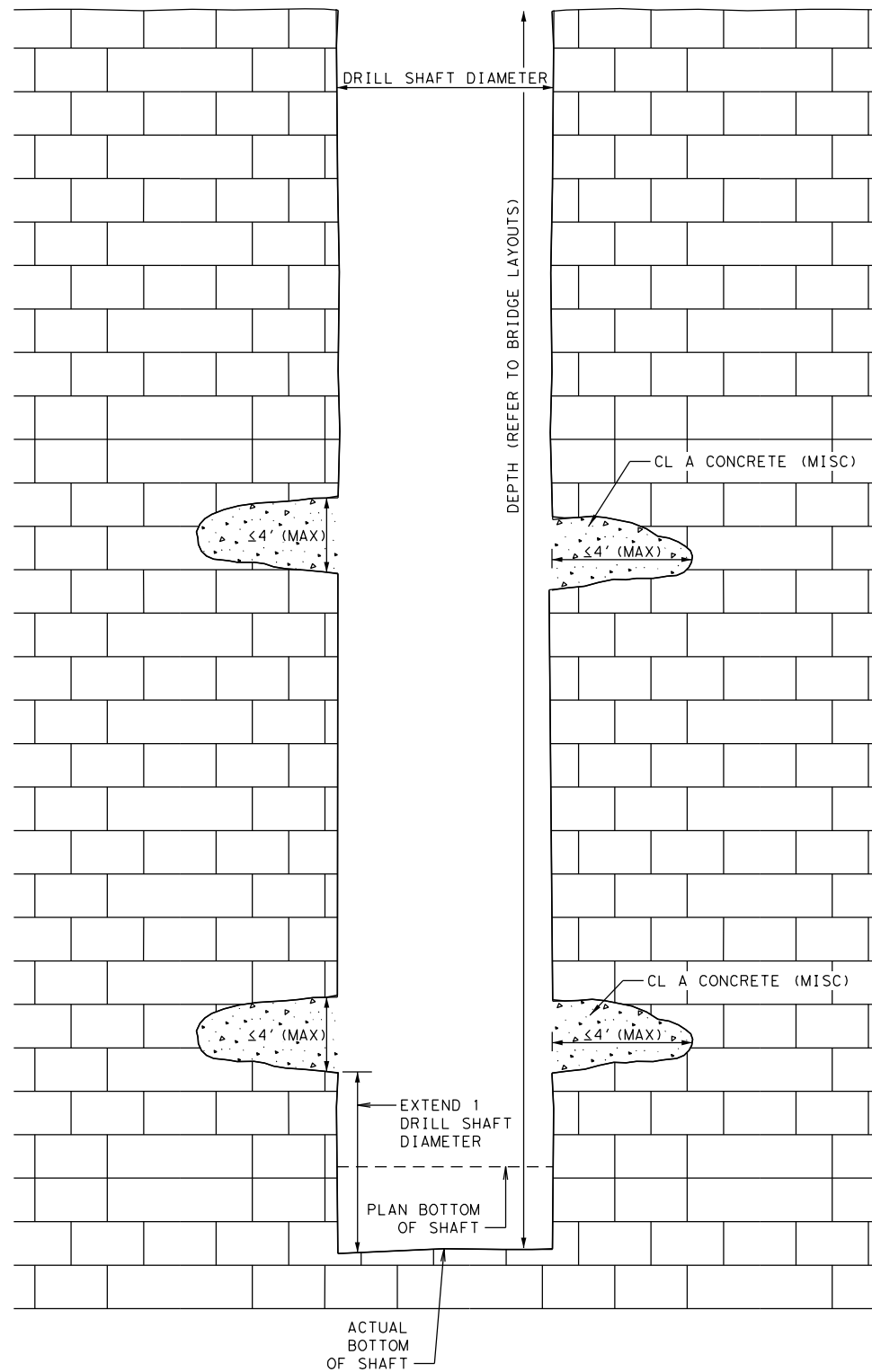
VOID MITIGATION
 DETAILS

VMD-18 (AUS)

SHEET 6 OF 7

©TxDOT 2023	CONT	SECT	JOB	HIGHWAY
	3136	01	200	SL 1
	DIST	COUNTY	SHEET NO.	
	AUS	TRAVIS	76	

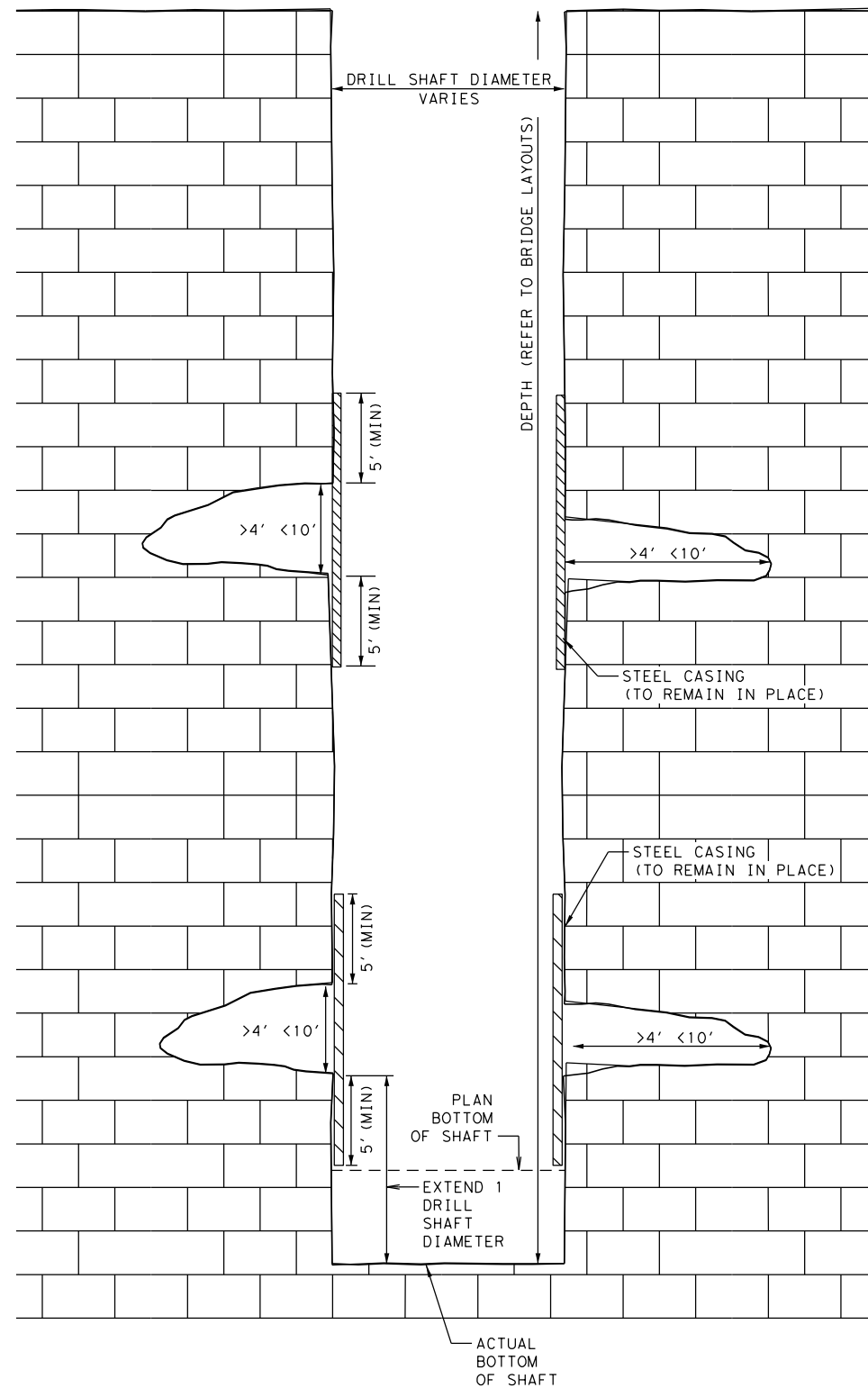
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DRILL SHAFT OPERATIONS
 SMALL/MEDIUM (DRY VOID)
 (≤4' IN ANY DIRECTION)

CONCRETE FOR THE VOID SHALL BE PLACED CONTINUOUSLY WITH THE SHAFT

WHERE VOIDS ARE ENCOUNTERED, DRILL SHAFT LENGTHS MAY NEED TO BE INCREASED. APPROVAL FROM THE ENGINEER OF RECORD IS REQUIRED TO COMPLETE CONSTRUCTION OF THE DRILLED SHAFT.



DRILL SHAFT OPERATIONS
 LARGE (DRY VOID)
 (>4' <10' IN ANY DIRECTION)

WHERE VOIDS ARE ENCOUNTERED, DRILL SHAFT LENGTHS MAY NEED TO BE INCREASED. APPROVAL FROM THE ENGINEER OF RECORD IS REQUIRED TO COMPLETE CONSTRUCTION OF THE DRILL SHAFT.

NOTES:

1. STEEL CASING WILL BE USED FOR DRILL SHAFT CONSTRUCTION THAT ENCOUNTERS LARGE VOIDS, SO AS TO ALLOW A MINIMUM AMOUNT OF CONCRETE TO ENTER THE VOID.
2. STEEL CASING SHOULD EXTEND A MINIMUM OF FIVE FEET FROM THE EDGE OF THE VOID.
3. AS PART OF THE DRILL SHAFT INSTALLATION PLAN, CONTRACTOR SHALL PROVIDE MEANS AND METHODS FOR ANCHORING THE CASING.
4. REFER TO GENERAL NOTES FOR ADDITIONAL INFORMATION.
5. STEEL CASING MAYBE EXTENDED TO THE TOP OF THE SHAFT. THE ENTIRE LENGTH OF CASING INSTALLED IN A SHAFT WILL BE COMPENSATED IN ACCORDANCE WITH THE VOID MITIGATION NOTES.

**VOID MITIGATION
 DETAILS**

VMD-18 (AUS)

SHEET 7 OF 7

©TxDOT 2023	CONT	SECT	JOB	HIGHWAY
	3136	01	200	SL 1
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		77

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with TxDOT policy for projects disturbing less than 1 acre of soil, and not part of a larger common plan of development.

For all projects with any soil disturbing activities, TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office. If no field office is available, then this SWP3 shall be kept at the appropriate TxDOT Area Office.

This SWP3 is consistent with requirements specified in applicable stormwater plans, and the project's environmental permits, issues, and commitments (EPICs).

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):

3136-01-200

1.2 PROJECT LIMITS:

From: BARTON BLUFF LANE

To: _____

1.3 PROJECT COORDINATES:

BEGIN: (Lat) 30.25866, (Long) -97.79719

END: (Lat) 30.25866, (Long) -97.79719

1.4 TOTAL PROJECT AREA (Acres): APPROX. 7 AC

1.5 TOTAL AREA TO BE DISTURBED (Acres): 0.6 AC

1.6 NATURE OF CONSTRUCTION ACTIVITY:

REHABILITATE EXISTING 96" CMP CULVERT

1.7 MAJOR SOIL TYPES:

Soil Type	Description
AgC2	ALTOGA SILTY CLAY, 3 TO 6 PERCENT SLOPES, MODERATELY ERODED
Md	MIXED ALLUVIAL LAND, 0 TO 1 PERCENT SLOPES, FREQUENTLY FLOODED
TdD	ECKRANT VERY STONY CLAY, 5 TO 18 PERCENT SLOPES
TdF	ECKRANT AND SPECK SOILS, 0 TO 2 PERCENT SLOPES

1.8 PROJECT SPECIFIC LOCATIONS (PSLs):

PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

- PSLs determined during preconstruction meeting
- PSLs determined during construction
- No PSLs planned for construction

Type	Sheet #s

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

1.9 CONSTRUCTION ACTIVITIES:

(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.3.)

- Mobilization
- Install sediment and erosion controls
- Blade existing topsoil into windrows, prep ROW, clear and grub
- Remove existing pavement
- Grading operations, excavation, and embankment
- Excavate and prepare subgrade for proposed pavement widening
- Remove existing culverts, safety end treatments (SETs)
- Remove existing metal beam guard fence (MBGF), bridge rail
- Install proposed pavement per plans
- Install culverts, culvert extensions, SETs
- Install mow strip, MBGF, bridge rail
- Place flex base
- Rework slopes, grade ditches
- Blade windrowed material back across slopes
- Revegetation of unpaved areas
- Achieve site stabilization and remove sediment and erosion control measures

Other: _____

Other: _____

Other: _____

1.10 POTENTIAL POLLUTANTS AND SOURCES:

- Sediment laden stormwater from stormwater conveyance over disturbed area
- Fuels, oils, and lubricants from construction vehicles, equipment, and storage
- Solvents, paints, adhesives, etc. from various construction activities
- Transported soils from offsite vehicle tracking
- Construction debris and waste from various construction activities
- Contaminated water from excavation or dewatering pump-out water
- Sanitary waste from onsite restroom facilities
- Trash from various construction activities/receptacles
- Long-term stockpiles of material and waste
- Other: _____
- Other: _____
- Other: _____

1.11 RECEIVING WATERS:

Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

Tributaries	Classified Waterbody
BARTON CREEK (1430)	BARTON CREEK (1430)

* Add (*) for impaired waterbodies with pollutant in ().

1.12 ROLES AND RESPONSIBILITIES: TxDOT

- Development of plans and specifications
- Perform SWP3 inspections
- Maintain SWP3 records and update to reflect daily operations
- Other: _____
- Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

- Day To Day Operational Control
- Maintain schedule of major construction activities
- Install, maintain and modify BMPs
- Other: _____
- Other: _____

STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)



Sheet 1 of 2

FED. RD. DIV. NO.	PROJECT NO.			SHEET NO.
	---			78
STATE	STATE DIST.	COUNTY		
TEXAS		TRAVIS		
CONT.	SECT.	JOB	HIGHWAY NO.	
3136	01	200	SL 1	

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

- Protection of Existing Vegetation
- Vegetated Buffer Zones
- Soil Retention Blankets
- Geotextiles
- Mulching/ Hydromulching
- Soil Surface Treatments
- Temporary Seeding
- Permanent Planting, Sodding or Seeding
- Biodegradable Erosion Control Logs
- Rock Filter Dams/ Rock Check Dams
- Vertical Tracking
- Interceptor Swale
- Riprap
- Diversion Dike
- Temporary Pipe Slope Drain
- Embankment for Erosion Control
- Paved Flumes
- Other: _____
- Other: _____
- Other: _____
- Other: _____

2.2 SEDIMENT CONTROL BMPs:

T / P

- Biodegradable Erosion Control Logs
- Dewatering Controls
- Inlet Protection
- Rock Filter Dams/ Rock Check Dams
- Sandbag Berms
- Sediment Control Fence
- Stabilized Construction Exit
- Floating Turbidity Barrier
- Vegetated Buffer Zones
- Vegetated Filter Strips
- Other: _____
- Other: _____
- Other: _____
- Other: _____

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.3 PERMANENT CONTROLS:

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

- Excess dirt/mud on road removed daily
- Haul roads dampened for dust control
- Loaded haul trucks to be covered with tarpaulin
- Stabilized construction exit
- Other: _____
- Other: _____
- Other: _____
- Other: _____

2.5 POLLUTION PREVENTION MEASURES:

- Chemical Management
- Concrete and Materials Waste Management
- Debris and Trash Management
- Dust Control
- Sanitary Facilities
- Other: _____
- Other: _____
- Other: _____
- Other: _____

2.6 VEGETATED BUFFER ZONES:

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

- Fire hydrant flushings
- Irrigation drainage
- Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- Potable water sources
- Springs
- Uncontaminated groundwater
- Water used to wash vehicles or control dust
- Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

2.8 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.3 of this SWP3 .

2.9 MAINTENANCE:

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.3 of this SWP3.

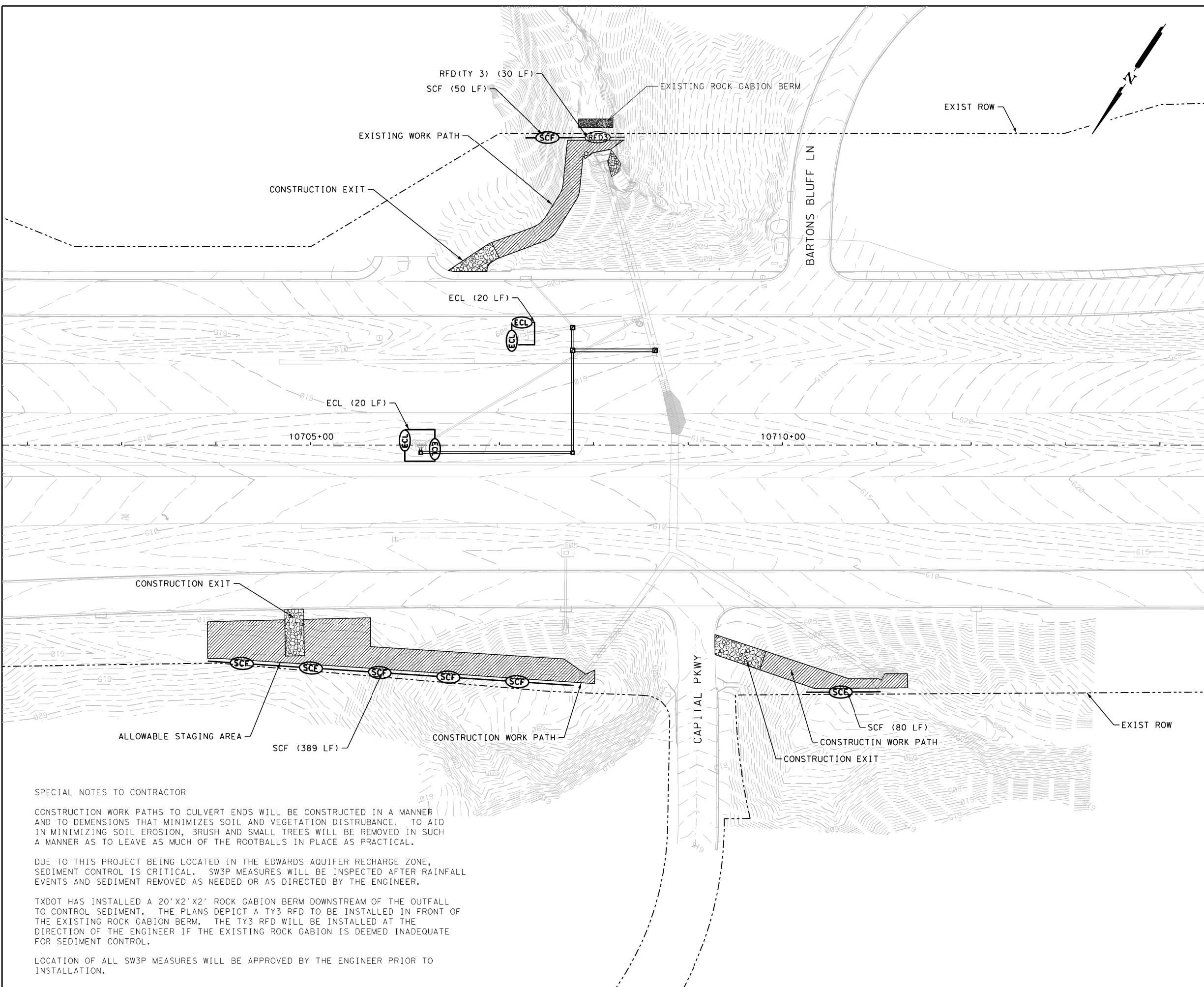
STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)



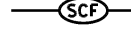




FED. RD. DIV. NO.	PROJECT NO.			SHEET NO.
	---			79
STATE	STATE DIST.	COUNTY		
TEXAS		TRAVIS		
CONT.	SECT.	JOB	HIGHWAY NO.	
3136	01	200	SL 1	

Plotted on: 6/13/2023

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LEGEND

-  SILT FENCE
-  EROSION CONTROL LOG
-  ROCK FILTER DAM
-  CONSTRUCTION EXIT
-  WORK PATH

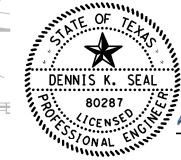
DESIGN



Andres Morales
 ANDRES MORALES, P.E.
 DATE

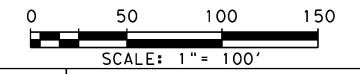
6/13/2023

APPROVAL



Dennis K. Seal
 DENNIS K. SEAL, P.E.
 DATE

6/13/2023



REV. NO.	DATE	DESCRIPTION	BY



AUSTIN | SAN ANTONIO | HOUSTON | FORT WORTH | DALLAS
 10801 N MOPAC EXPY, BLDG 3, STE 200 | AUSTIN, TX 78759 | 512.454.8711
 TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801



SL 1 AT SKUNK CREEK

SW3P LAYOUT

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.:	STATE:	FEDERAL AID PROJECT NO.:	HIGHWAY NO.:		
CHK DGN:	6	TEXAS	---	SL 1		
DWG:	DIST.:	COUNTY:	CONT. NO.:	SECT. NO.:	JOB NO.:	SHEET NO.:
CHK DWG:	AUS	TRAVIS	3136	01	200	80

SPECIAL NOTES TO CONTRACTOR

CONSTRUCTION WORK PATHS TO CULVERT ENDS WILL BE CONSTRUCTED IN A MANNER AND TO DEMENSIONS THAT MINIMIZES SOIL AND VEGETATION DISTURBANCE. TO AID IN MINIMIZING SOIL EROSION, BRUSH AND SMALL TREES WILL BE REMOVED IN SUCH A MANNER AS TO LEAVE AS MUCH OF THE ROOTBALLS IN PLACE AS PRACTICAL.

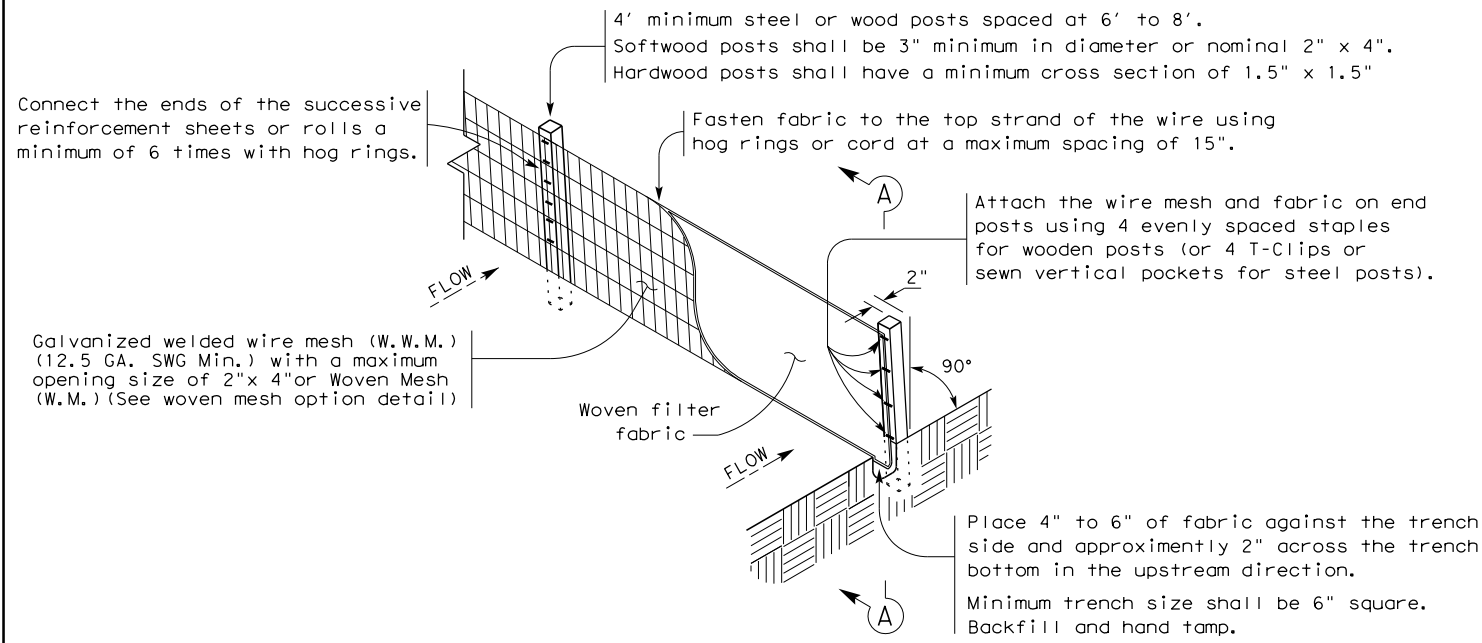
DUE TO THIS PROJECT BEING LOCATED IN THE EDWARDS AQUIFER RECHARGE ZONE, SEDIMENT CONTROL IS CRITICAL. SW3P MEASURES WILL BE INSPECTED AFTER RAINFALL EVENTS AND SEDIMENT REMOVED AS NEEDED OR AS DIRECTED BY THE ENGINEER.

TXDOT HAS INSTALLED A 20'X2'X2' ROCK GABION BERM DOWNSTREAM OF THE OUTFALL TO CONTROL SEDIMENT. THE PLANS DEPICT A TY3 RFD TO BE INSTALLED IN FRONT OF THE EXISTING ROCK GABION BERM. THE TY3 RFD WILL BE INSTALLED AT THE DIRECTION OF THE ENGINEER IF THE EXISTING ROCK GABION IS DEEMED INADEQUATE FOR SEDIMENT CONTROL.

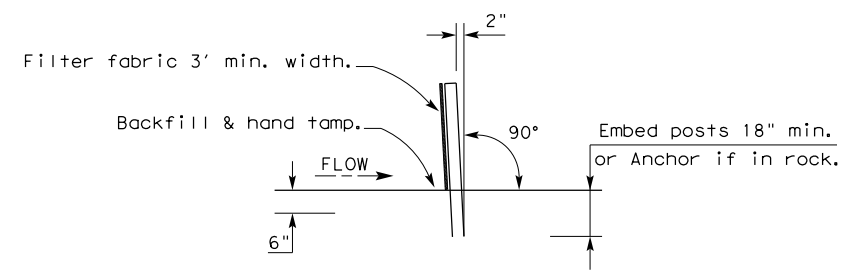
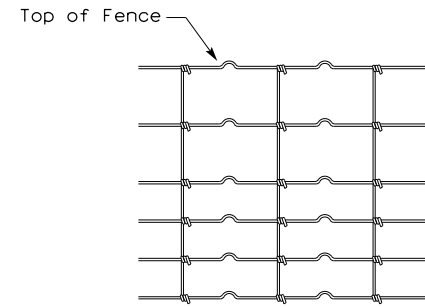
LOCATION OF ALL SW3P MEASURES WILL BE APPROVED BY THE ENGINEER PRIOR TO INSTALLATION.

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TEMPORARY SEDIMENT CONTROL FENCE



HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA. SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

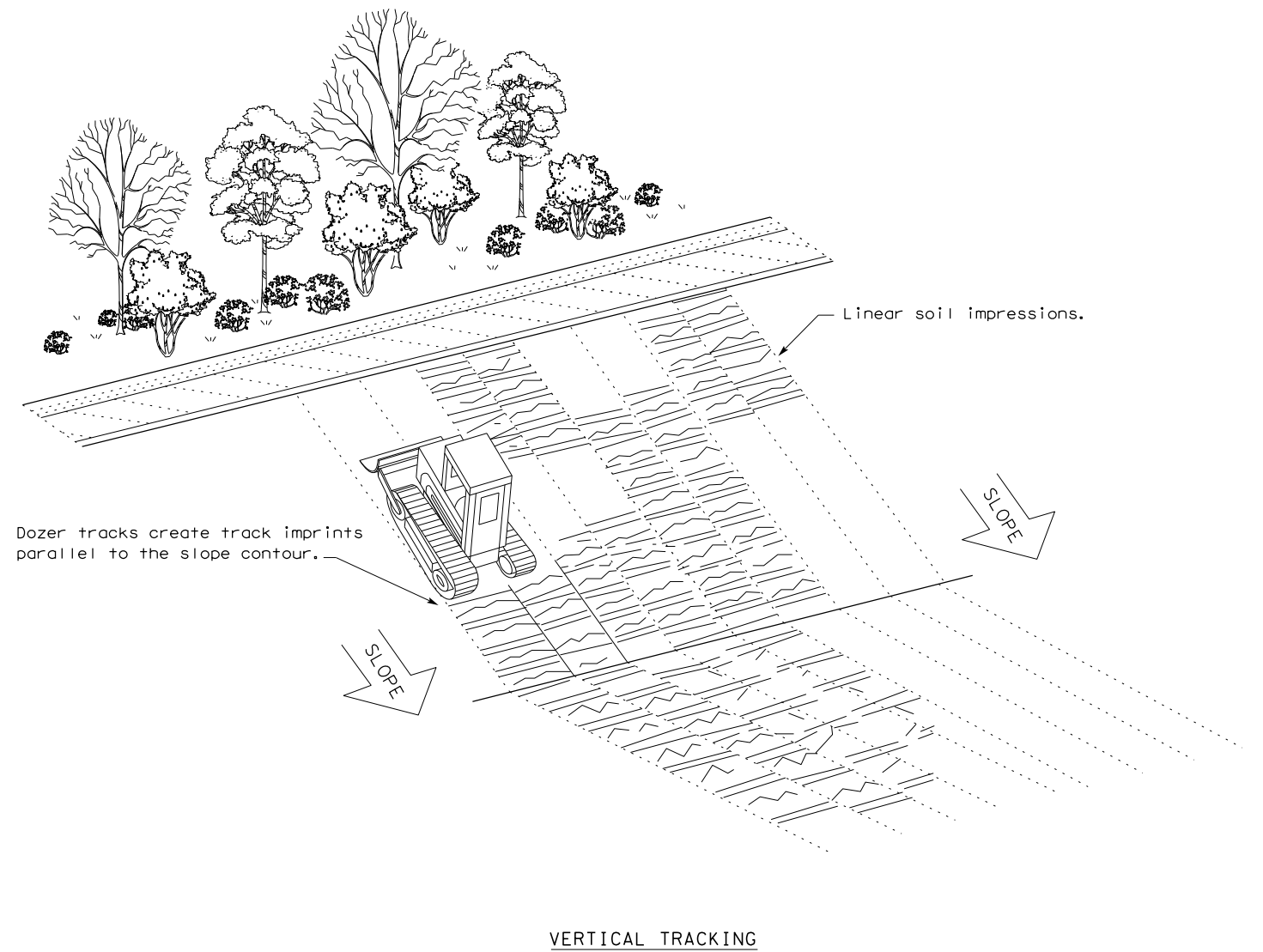
Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT². Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

LEGEND

Sediment Control Fence

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continuous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.

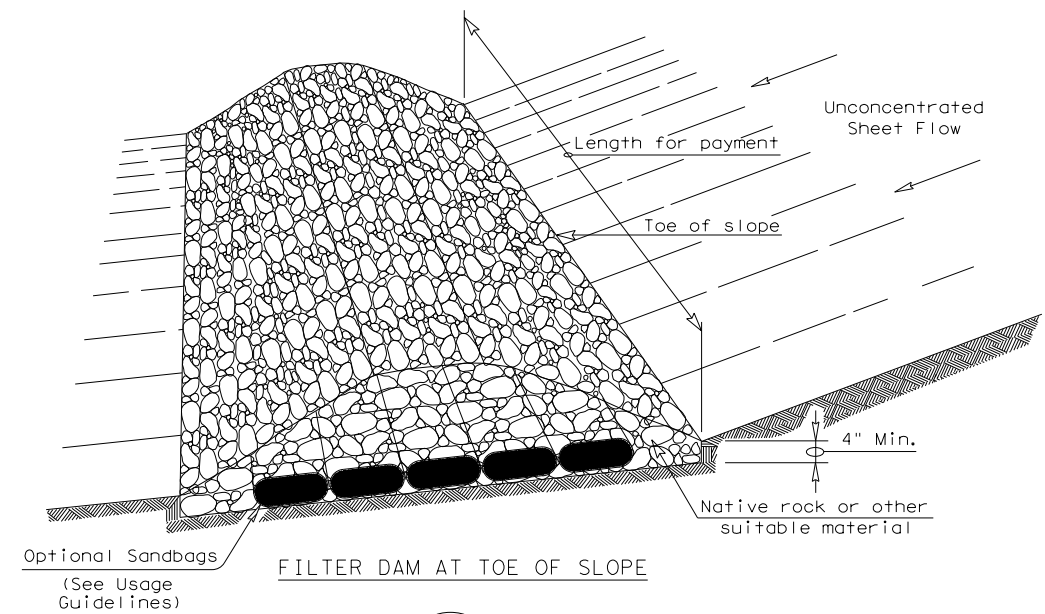


TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES FENCE & VERTICAL TRACKING EC(1) - 16

FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY	SHEET NO.	
	AUS	TRAVIS	81	

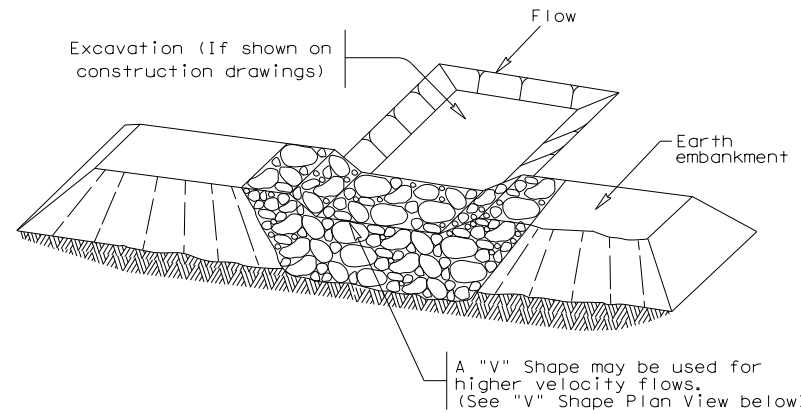
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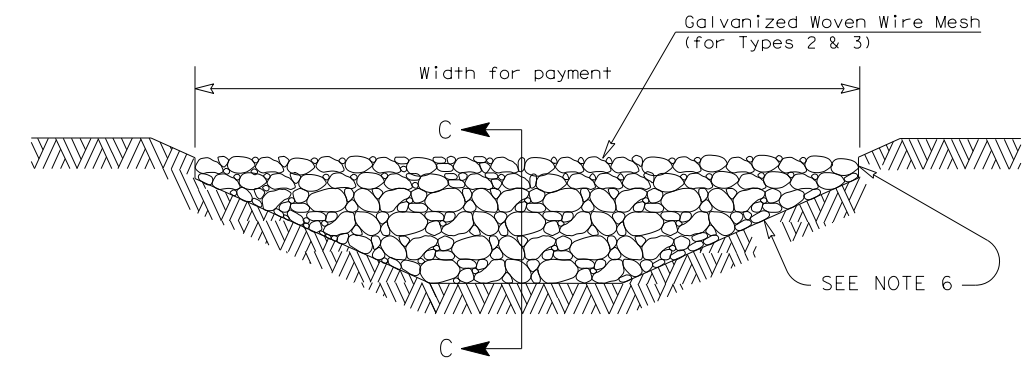
FILTER DAM AT TOE OF SLOPE

(RFD1)



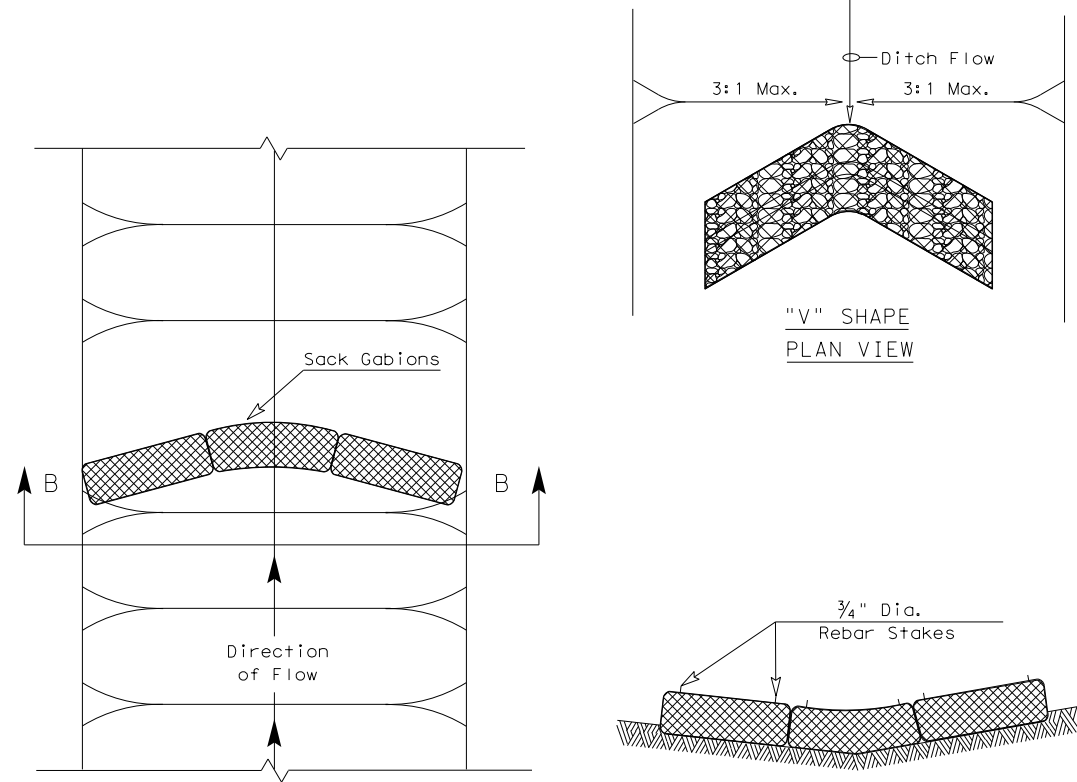
FILTER DAM AT SEDIMENT TRAP

(RFD2) OR (RFD1)

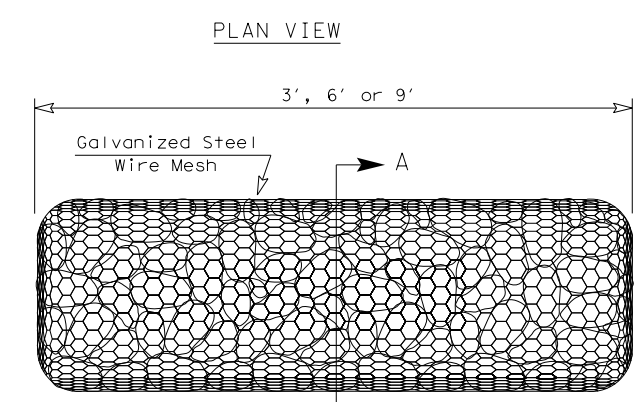


FILTER DAM AT CHANNEL SECTIONS

(RFD3) OR (RFD2) OR (RFD1)

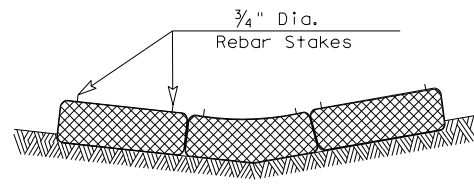


"V" SHAPE PLAN VIEW

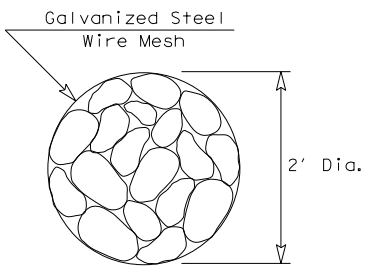


TYPE 4 (SACK GABIONS)

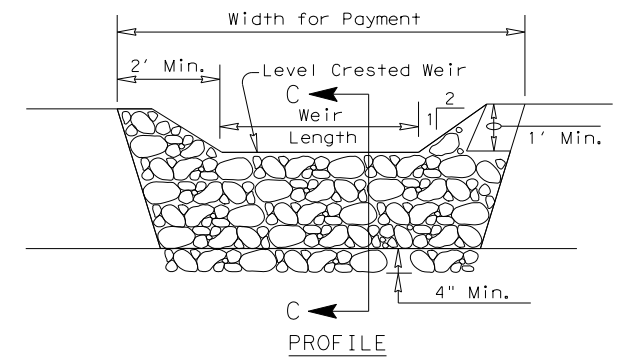
(RFD4)



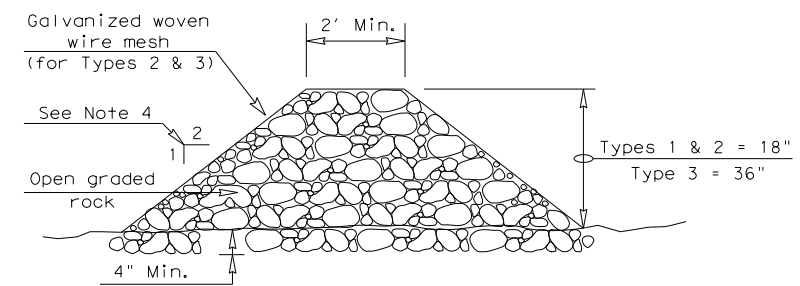
SECTION B-B



SECTION A-A



PROFILE



SECTION C-C

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT² of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximately 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.

GENERAL NOTES

- If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
- Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
- The rock filter dam dimensions shall be as indicated on the SW3P plans.
- Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
- Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
- Filter dams should be embedded a minimum of 4" into existing ground.
- The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
- Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
- Sack Gabions should be staked down with 3/4" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 1/2" x 3 1/4".
- Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
- The guidelines shown hereon are suggestions only and may be modified by the Engineer.

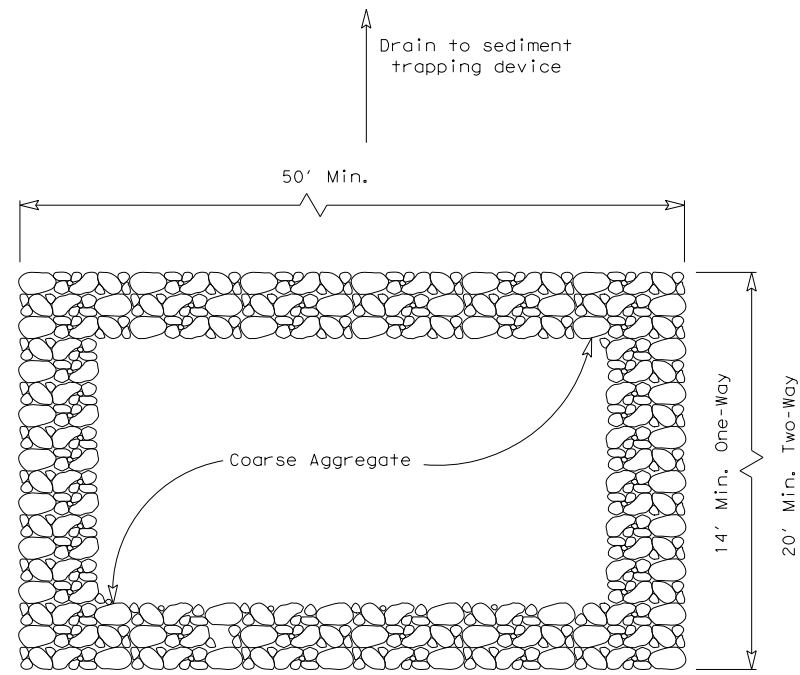
PLAN SHEET LEGEND

- Type 1 Rock Filter Dam (RFD1)
- Type 2 Rock Filter Dam (RFD2)
- Type 3 Rock Filter Dam (RFD3)
- Type 4 Rock Filter Dam (RFD4)

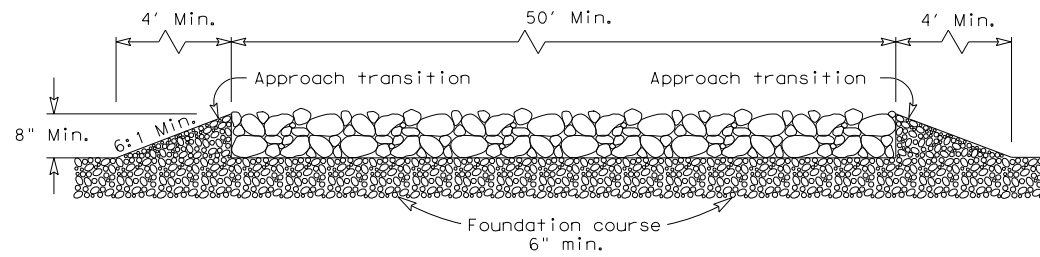
		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES ROCK FILTER DAMS EC(2) - 16			
FILE: ec216	DN: TxDOT	CK: KM	DW: VP
© TxDOT: JULY 2016	CONT: 3136	SECT: 01	JOB: 200
REVISIONS	DIST: AUS	COUNTY: TRAVIS	DN/CK: LS
			HIGHWAY: SL 1
			SHEET NO.: 82

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PLAN VIEW

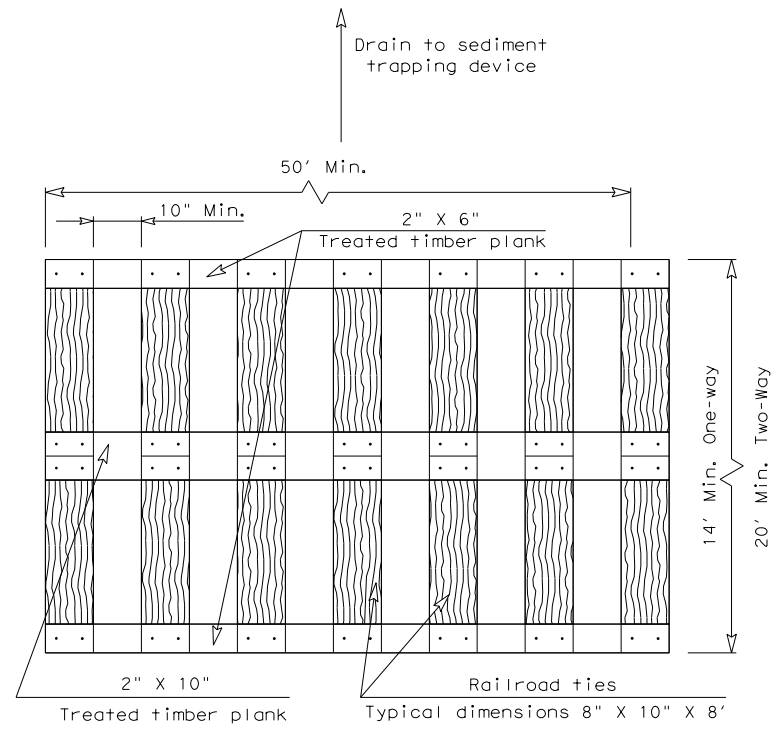


ELEVATION VIEW

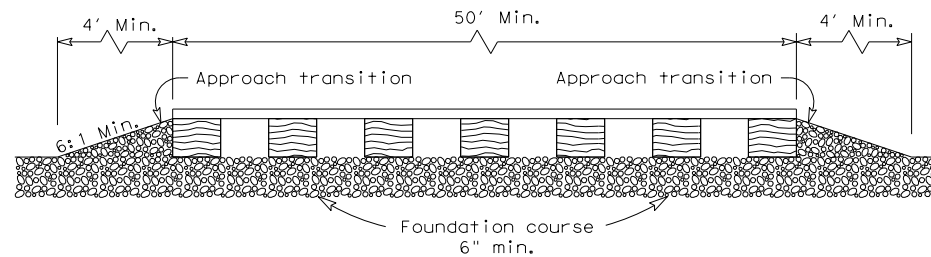
CONSTRUCTION EXIT (TYPE 1)
 ROCK CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

- The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
- The coarse aggregate should be open graded with a size of 4" to 8".
- The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
- The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materials approved by the Engineer.
- The construction exit shall be graded to allow drainage to a sediment trapping device.
- The guidelines shown hereon are suggestions only and may be modified by the Engineer.
- Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.



PLAN VIEW

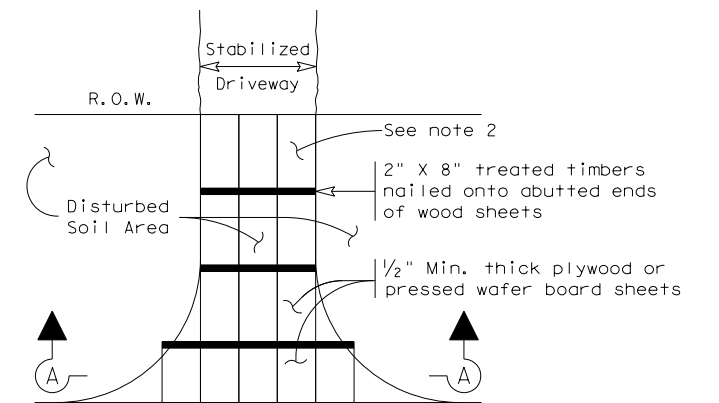


ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)
 TIMBER CONSTRUCTION (LONG TERM)

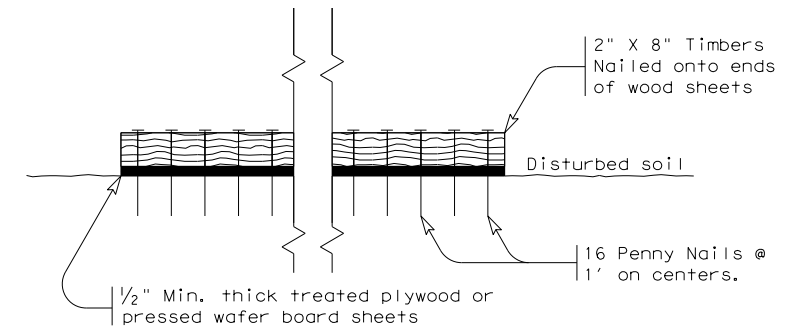
GENERAL NOTES (TYPE 2)

- The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
- The treated timber planks shall be attached to the railroad ties with 1/2" x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
- The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
- The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
- The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
- The construction exit should be graded to allow drainage to a sediment trapping device.
- The guidelines shown hereon are suggestions only and may be modified by the Engineer.
- Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.



Paved Roadway

PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)
 SHORT TERM

GENERAL NOTES (TYPE 3)

- The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
- The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
- The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
- The guidelines shown hereon are suggestions only and may be modified by the Engineer.

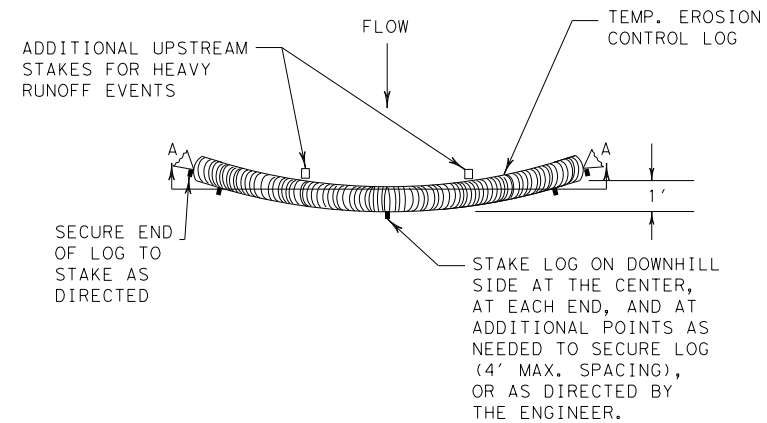


TEMPORARY EROSION,
 SEDIMENT AND WATER
 POLLUTION CONTROL MEASURES
 CONSTRUCTION EXITS
 EC(3)-16

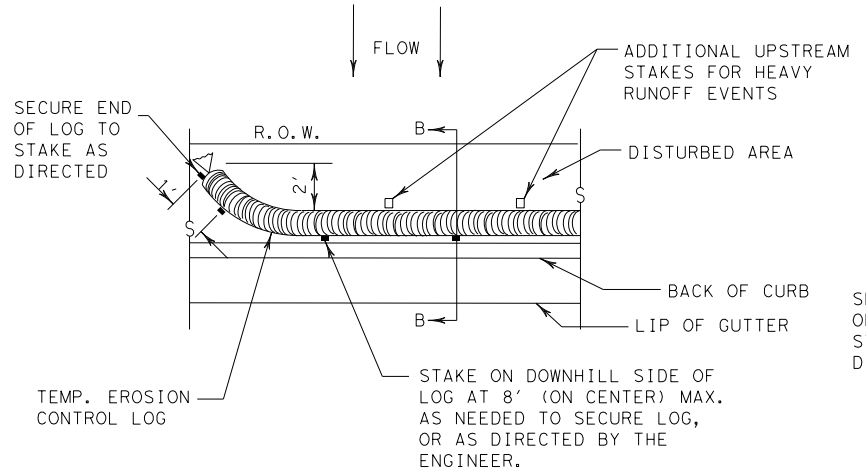
FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	3136	01	200	SL 1
	DIST	COUNTY	SHEET NO.	
	AUS	TRAVIS	83	

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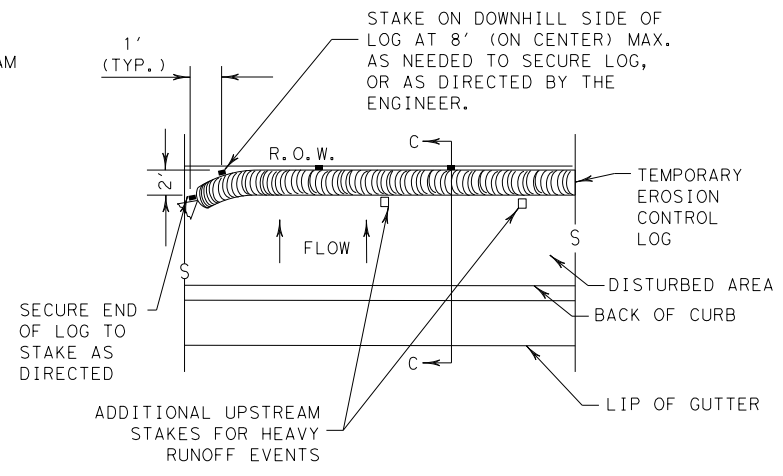
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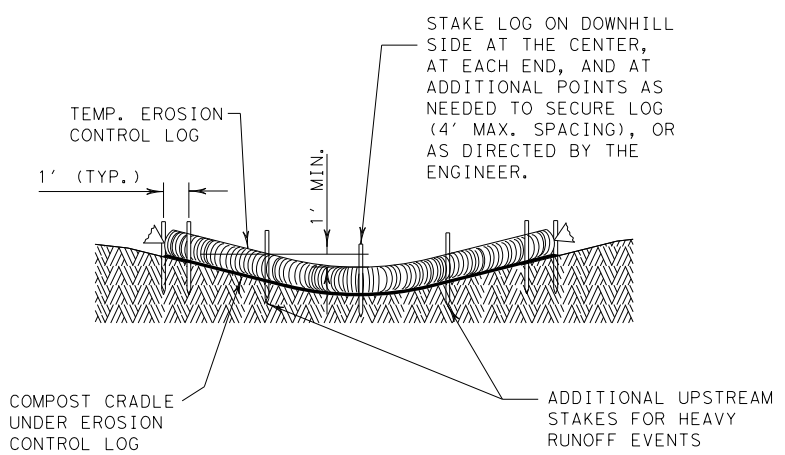
PLAN VIEW



PLAN VIEW



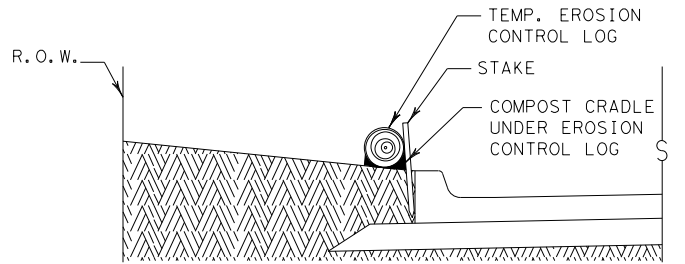
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

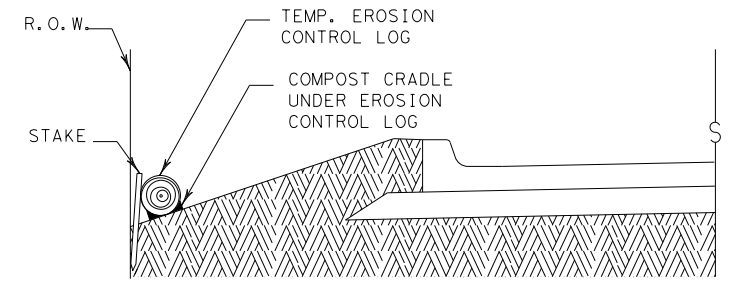
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

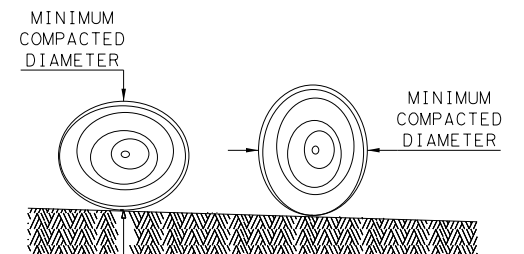
CL-BOC



SECTION C-C

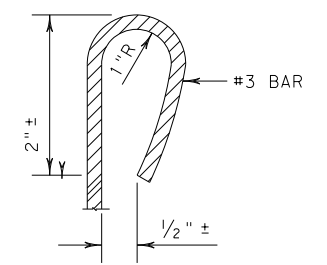
EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

- LEGEND
- CL-D EROSION CONTROL LOG DAM
 - CL-BOC EROSION CONTROL LOG AT BACK OF CURB
 - CL-ROW EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
 - CL-SST EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
 - CL-SSL EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
 - CL-DI EROSION CONTROL LOG AT DROP INLET
 - CL-CI EROSION CONTROL LOG AT CURB INLET
 - CL-GI EROSION CONTROL LOG AT CURB & GRATE INLET



REBAR STAKE DETAIL

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.

GENERAL NOTES:

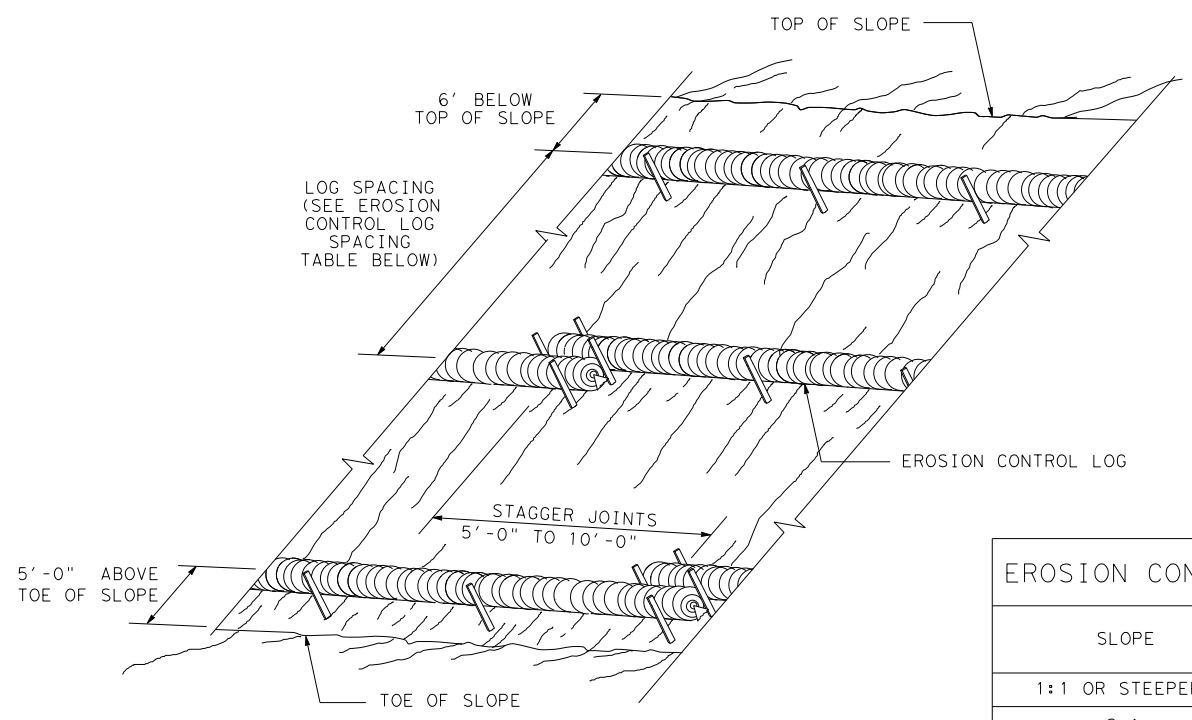
1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.

SHEET 1 OF 3

		Design Division Standard		
<p>TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES</p> <p>EROSION CONTROL LOG</p> <p>EC (9) - 16</p>				
FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	3136	01	200	SL 1
	DIST	COUNTY	SHEET NO.	
	AUS	TRAVIS	84	

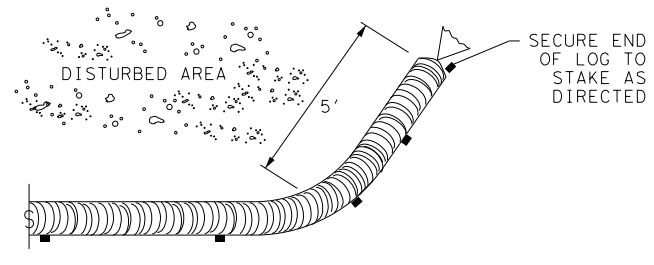
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DATE: 6/13/2023
 FILE: P:\125\45\02\Design\Civil\Standards\SW3P\ec916.dgn



EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

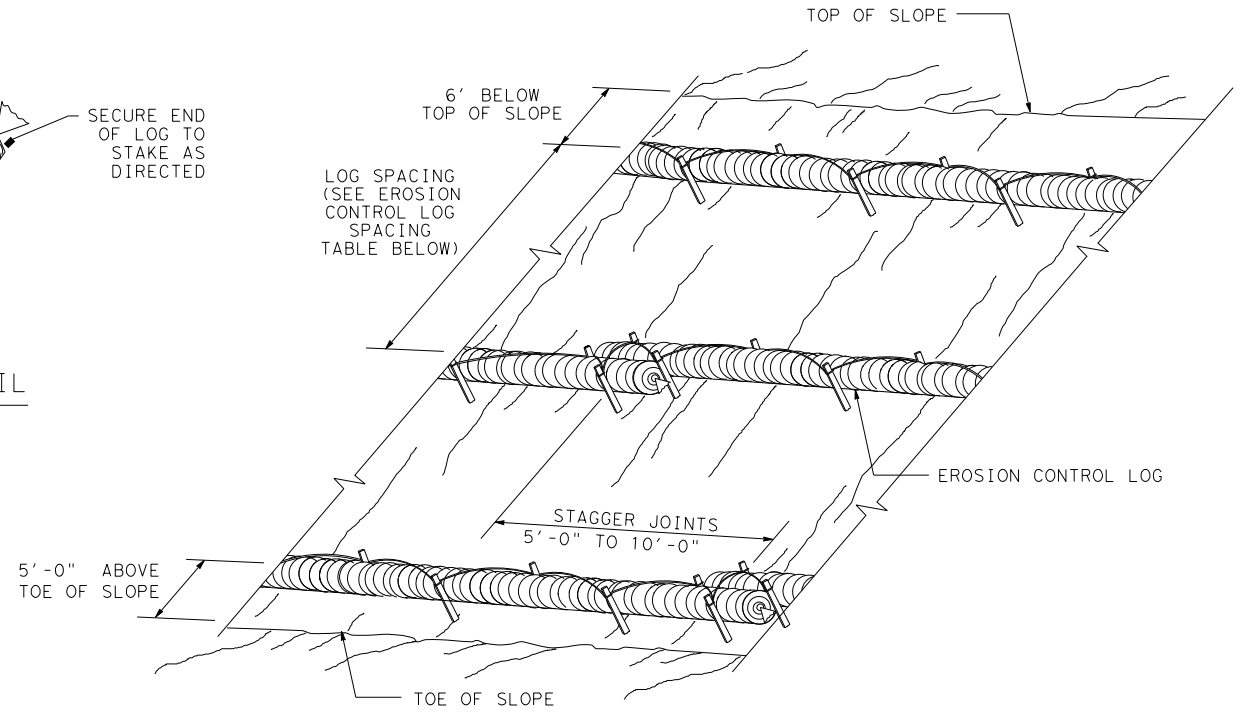
CL-SST



END SECTION RAP DETAIL

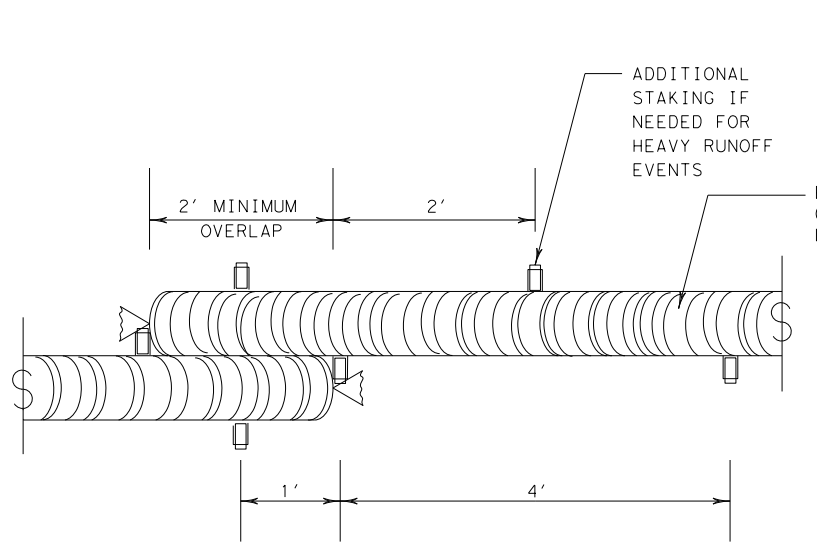
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
 SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
 HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



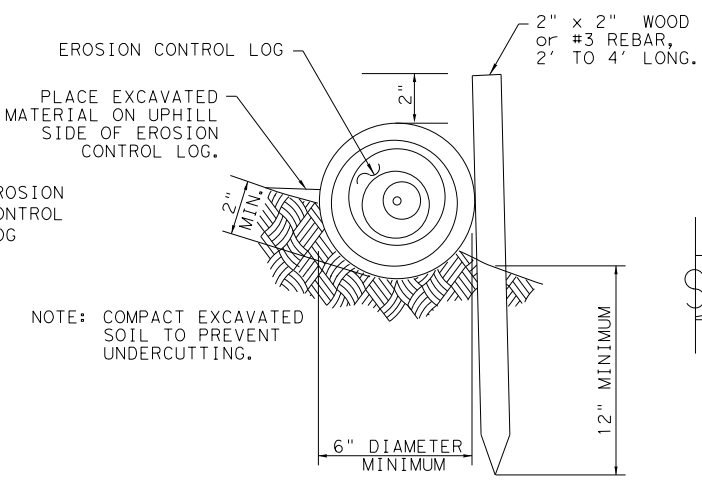
EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL



STAKE AND TRENCHING ANCHORING DETAIL

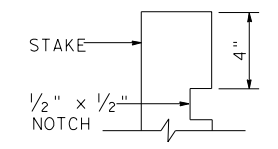
CL-SST



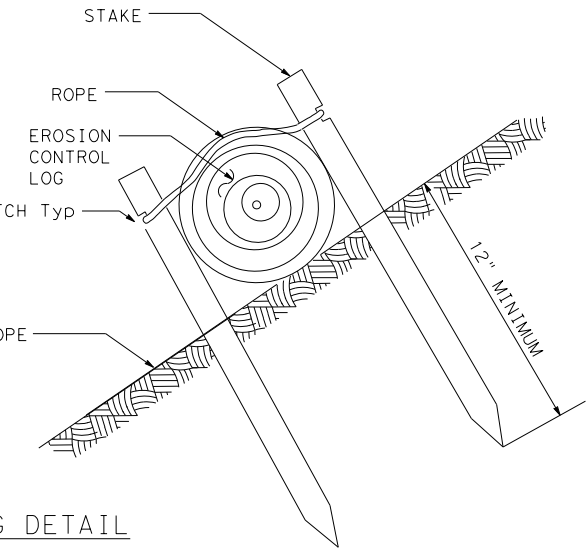
STAKE AND LASHING ANCHORING DETAIL

CL-SSL

TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"



STAKE NOTCH DETAIL

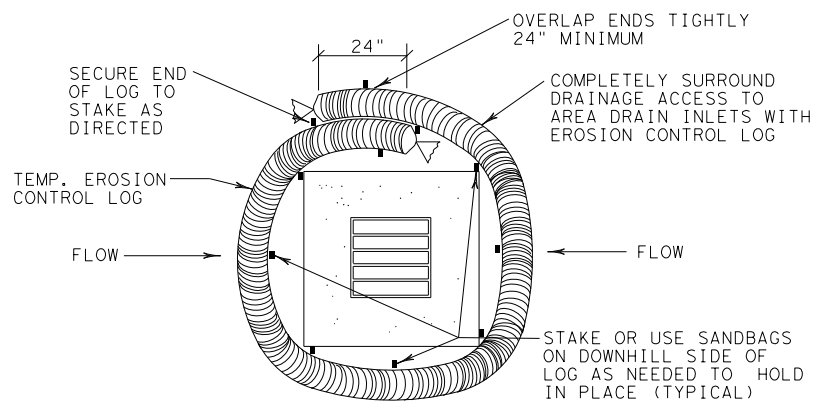


SHEET 2 OF 3

		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES EROSION CONTROL LOG EC (9) - 16			
FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT
© TxDOT: JULY 2016	CONT SECT	JOB	HIGHWAY
REVISIONS	3136 01	200	SL 1
DIST	COUNTY	SHEET NO.	
AUS	TRAVIS	85	

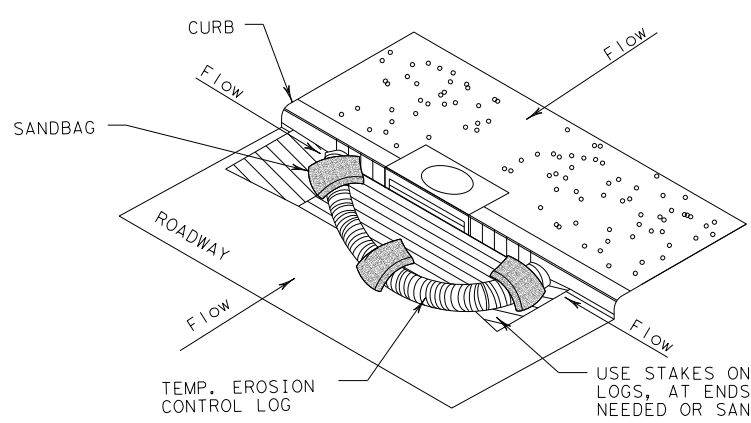
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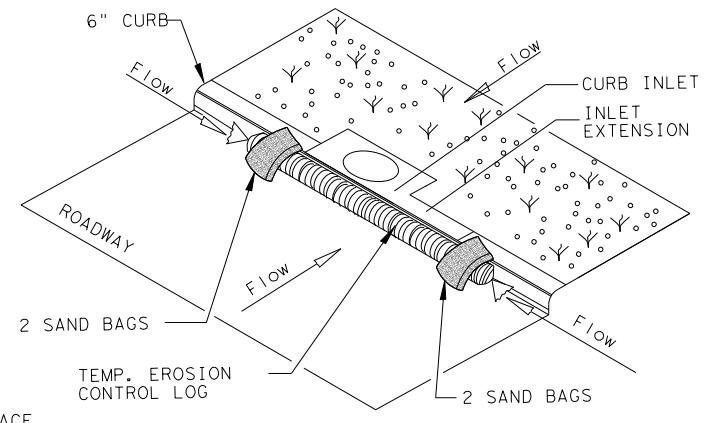
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

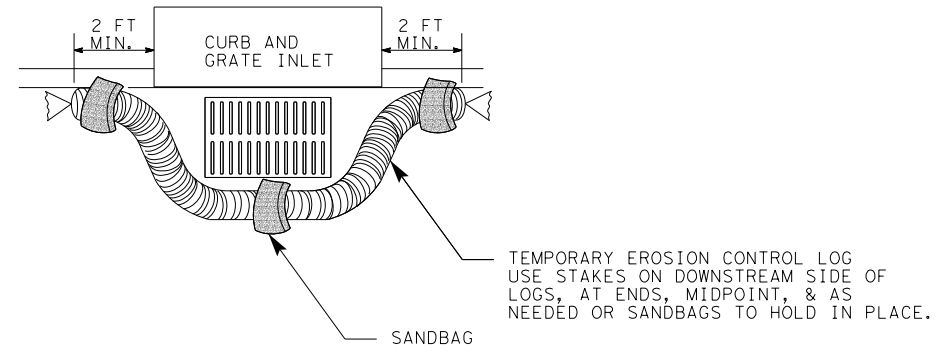
CL-CI



EROSION CONTROL LOG AT CURB INLET

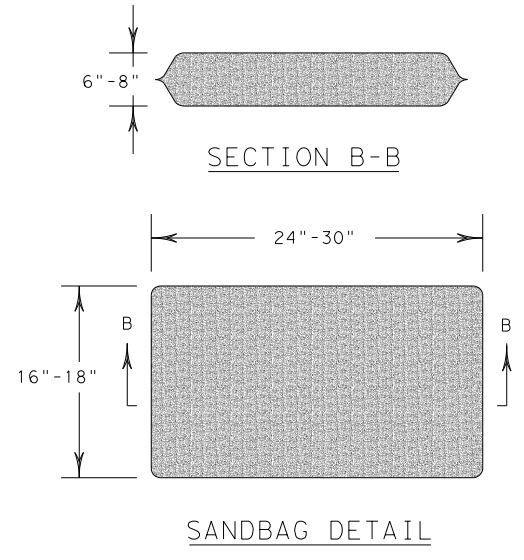
CL-CI

NOTE:
 EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

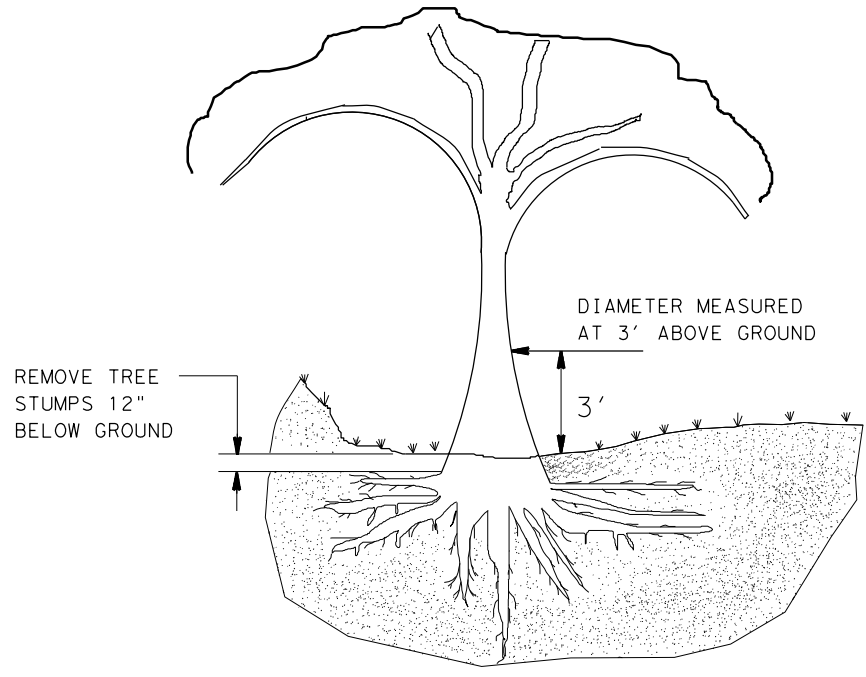


SHEET 3 OF 3

		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES EROSION CONTROL LOG EC (9) - 16			
FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT
© TxDOT: JULY 2016	CONT	SECT	JOB
REVISIONS	3136	01	200
	DIST	COUNTY	SHEET NO.
	AUS	TRAVIS	86

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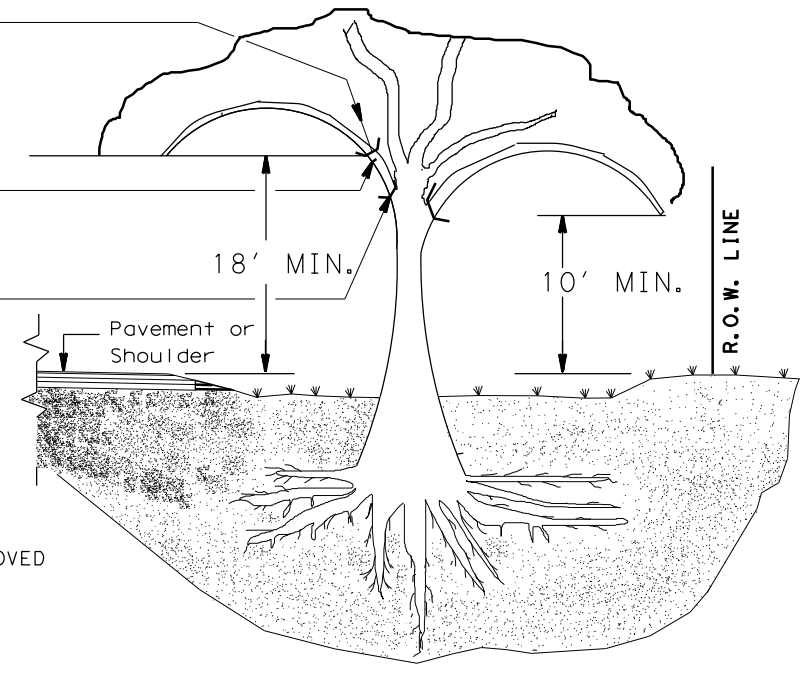
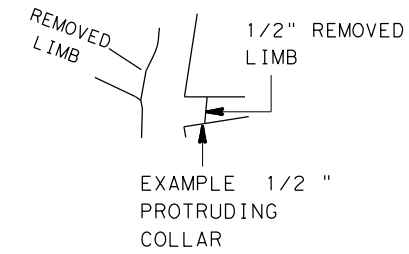


TREE REMOVAL

STEP 1:
 CUT 1/3 WAY THROUGH BOTTOM OF LIMB 8" TO 12" ABOVE MAIN STEM (OR TRUNK).

STEP 2:
 REMOVE LIMB 4" TO 6" BEYOND THE FIRST CUT

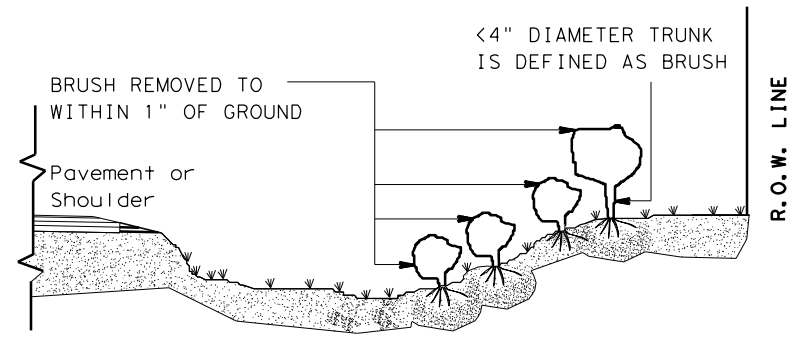
STEP 3:
 REMOVE STUB WITH A SMOOTH CUT SO THAT TRACE COLLAR OF THE REMOVED LIMB PROTRUDES APPROXIMATELY 1/2" FROM THE MAIN STEM



TREE TRIMMING

SUCKERS ARE SMALL BRANCHES THAT OCCUR BENEATH MAIN BRANCHES REMOVE SUCKERS TO HEIGHT OF THE LOWEST MAIN BRANCH

STEPS 1, 2 AND 3 APPLY WHEN REMOVING LIMBS 2" IN DIAMETER OR LARGER.



BRUSH REMOVAL

GENERAL NOTES:

TREE TRIMMING

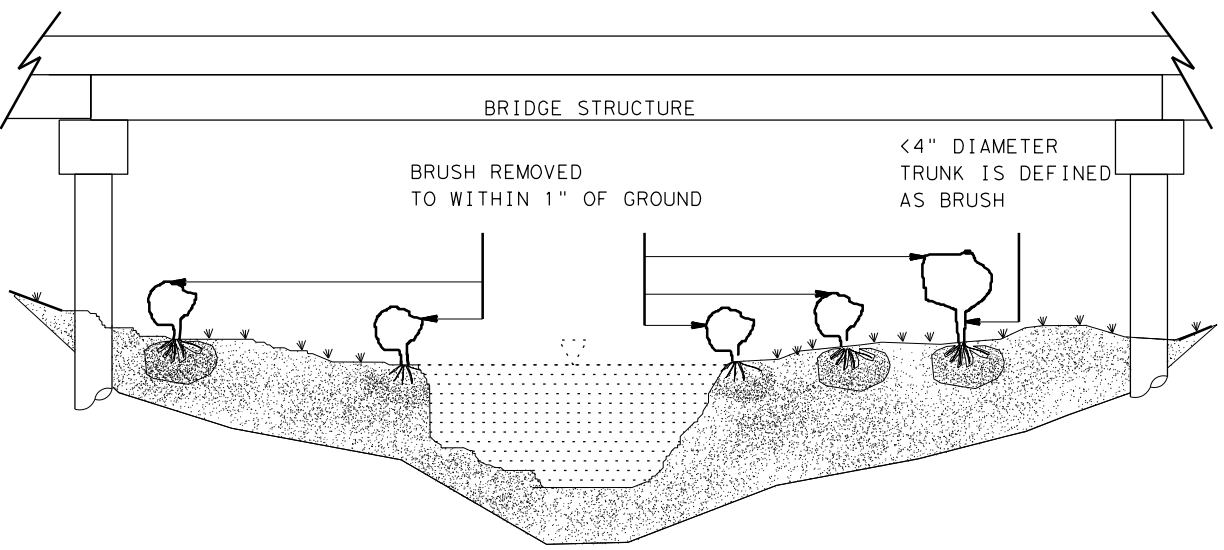
1. TRIM AND REMOVE ALL TREE LIMBS ON THE PAVEMENT SIDE OF THE TRUNK 18' ABOVE THE PAVEMENT OR BRIDGE DECK ELEVATION, UNLESS OTHERWISE SHOWN ON THE PLANS.
2. TRIM AND REMOVE ALL TREE LIMBS BETWEEN THE TRUNK AND R.O.W. LINE 10' ABOVE NATURAL GROUND, TERRAIN OR OTHER STRUCTURE ELEVATION, UNLESS OTHERWISE SHOWN ON THE PLANS.

TREE REMOVAL

3. FOR TREES MARKED FOR REMOVAL, THE DIAMETER OF TREES ARE DETERMINED BY MEASUREMENT OF THE TRUNK CIRCUMFERENCE 3' ABOVE THE GROUND. TREES WITH TRUNKS OF LESS THAN 4" DIAMETER ARE CONSIDERED TO BE BRUSH. TREES WITH MULTIPLE TRUNKS AT THE POINT OF MEASUREMENT ARE MEASURED AND PAID FOR SEPARATELY.
4. MEASUREMENTS FOR PAYMENT OF TREE DIAMETERS ARE DIVIDED INTO THE RANGES SHOWN IN TABLE 1.

TABLE 1 TREE TRUNK SIZE FOR TREE REMOVAL PAYMENT				
PAY ITEM	RANGE FOR PAY ITEMS			
	TRUNK DIAMETER *		TRUNK CIRCUMFERENCE	
	LOWER LIMIT IS GREATER THAN	UPPER LIMIT IS LESS THAN OR EQUAL TO	LOWER LIMIT IS GREATER THAN	UPPER LIMIT IS LESS THAN OR EQUAL TO
752 6005	4	12	12 1/2	37 1/2
752 6006	12	18	37 1/2	56 1/2
752 6007	18	24	56 1/2	75 1/2
752 6008	24	30	75 1/2	94
752 6009	30	36	94	113
752 6010	36	42	113	132
752 6011	42	48	132	151
752 6012	48	60	151	188 1/2
752 6013	60	72	188 1/2	226
752 6019	72	84	226	264
	84	GREATER THAN 84	264	NOT APPLICABLE

*SEE GENERAL NOTE #3.



BRUSH REMOVAL UNDER BRIDGE AND IN CHANNEL



TREE AND BRUSH REMOVAL
 TRB-15(1)

FILE:	DW: JEO	CK: LJB	DW: JEO	CK:
© TxDOT MARCH 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	3136	01	200	SL 1
Revised table 1 to 2014 Specification	DIST	COUNTY	SHEET NO.	
	AUS	TRAVIS	87	

Plotted on: 6/13/2023

Design File Name: P:\125\45\02\Design\Civil\General\1254502bor-ing logs.dgn



WinCore
Version 3.1

DRILLING LOG

1 of 2

County Travis
Highway Loop 1
CSJ 3136-01-200

Hole B-3
Structure Culvert
Station
Offset

District Austin
Date 02/23/23
Grnd. Elev. 609.00 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
607.0			CLAY, stiff, moist, brown to light brown, fat, with sand and grave, trace organics material. [Fill] (CH)							PP = 4.5 tsf
605.0			SAND, slightly compact, moist, light brown, clayey, with gravel. [Fill] (SC)			12.1	37	25		PP = 2.0 tsf Passing No. 200 Sieve = 28%
5		8 (6) 17 (6)	CLAY, soft to stiff, moist, brown, fat, with sand, trace calcareous deposits, gypsum and ferrous stains. [Del Rio Formation] (CH)			18.6	58	39		PP = 3.0 tsf Passing No. 200 Sieve = 81%
10		8 (6) 8 (6)		0	20	23.8	58	42	125	PP = 4.0 tsf Passing No. 200 Sieve = 84%
15		12 (6) 17 (6)		0	15	26.5	65	45	130	PP = 2.5 tsf Passing No. 200 Sieve = 81%
592.0			CLAY, stiff to very stiff, moist, brown, fat, trace gravel and calcareous, with gypsum crystals. [Del Rio Formation] (CH)			21.6	77	56		PP = 4.5+ tsf Passing No. 200 Sieve = 93%
20		16 (6) 20 (6)		0	56	20	61	46	127	PP = 4.5+ tsf Passing No. 200 Sieve = 88%
25		20 (6) 20 (6)				18.7	60	47		PP = 4.5+ tsf Passing No. 200 Sieve = 88%
579.0		22 (6) 50 (4.5)								

Remarks: Groundwater was not encountered during drilling. Split-Spoon values are not standard (170-lb hammer 24-in drop). Boring was advanced by dry drilling techniques to 35 feet and rock coring was performed from 35 to 45 feet. Coordinates are taken from handheld GPS unit and are in Northing and Easting based on the Texas State Plane Coordinate System, Central Zone, NAD 83(93). Elevations are based off Google Earth 2023. Units: US Survey Feet. PP= Pocket Penetrometer (N,E)= (10066937.4, 3097247.6)

Driller: Texas GeoBore Logger: MP Organization: HVJ SCTX
g:\geo\projects\2018\ag 18 10301.1.4 bdot wa11 skunk hollow tributary 96-inch cmp culvert repair, aecom\ginflag 18 10301.1.4_skunk hollow.gpj



WinCore
Version 3.1

DRILLING LOG

2 of 2

County Travis
Highway Loop 1
CSJ 3136-01-200

Hole B-3
Structure Culvert
Station
Offset

District Austin
Date 02/23/23
Grnd. Elev. 609.00 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
574.0		50 (0) 50 (0)	SAND, dense, moist, brown, clayey, trace gravel. [Del Rio Formation] (SC)			8	46	33		SS: 22-28-50/2" Passing No. 200 Sieve = 32%
35			LIMESTONE, very hard, light brown, slightly to moderately weathered, highly fractured, with fossil inclusions. [Georgetown formation]	0	5775	1.4			162	RUN:35-40'; REC:53%; RQD:18%
40		50 (0.5) 50 (0.5)								RUN:40-45'; REC:78%; RQD:34%
564.0		50 (0.5) 50 (0)								

Remarks: Groundwater was not encountered during drilling. Split-Spoon values are not standard (170-lb hammer 24-in drop). Boring was advanced by dry drilling techniques to 35 feet and rock coring was performed from 35 to 45 feet. Coordinates are taken from handheld GPS unit and are in Northing and Easting based on the Texas State Plane Coordinate System, Central Zone, NAD 83(93). Elevations are based off Google Earth 2023. Units: US Survey Feet. PP= Pocket Penetrometer (N,E)= (10066937.4, 3097247.6)

Driller: Texas GeoBore Logger: MP Organization: HVJ SCTX
g:\geo\projects\2018\ag 18 10301.1.4 bdot wa11 skunk hollow tributary 96-inch cmp culvert repair, aecom\ginflag 18 10301.1.4_skunk hollow.gpj

REV. NO.	DATE	DESCRIPTION	BY



AUSTIN | SAN ANTONIO | HOUSTON | FORT WORTH | DALLAS
10801 N MOPAC EXPY, BLDG 3, STE 200 | AUSTIN, TX 78759 | 512.454.8711
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801



SL 1 AT SKUNK CREEK

BORING LOGS

SHEET 1 OF 2

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.	HIGHWAY NO.		
CHK DGN:	6	TEXAS	---	SL 1		
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	AUS	TRAVIS	3136	01	200	89

Plotted on: 6/13/2023

Design File Name: P:\12545\02\Des\civil\General\1254502bor-ing logs.dgn



DRILLING LOG

1 of 2

WinCore
Version 3.1

County Travis
Highway Loop 1
CSJ 3136-01-200

Hole B-4
Structure Culvert
Station
Offset

District Austin
Date 02/24/23
Grnd. Elev. 609.00 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks	
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)		
605.0			CLAY, very soft, moist, brown to light brown, fat, with sand and gravel. [Fill] (CH)							PP = 3.5 tsf	
						20	55	39		PP = 3.5 tsf Passing No. 200 Sieve = 79%	
	5	3 (6) 3 (6)	CLAY, very soft, moist, light brown to brown, lean, with sand, trace gravel, calcareous deposits, and organic content. [Fill] (CL)							PP = 1.5 tsf	
601.0						25.6	45	34		PP = 1.5 tsf Passing No. 200 Sieve = 70%	
599.0	10	32 (6) 30 (6)	CLAY, very stiff, moist, light brown, lean, with sand, calcareous deposits. [Del Rio Formation] (CL)							PP = 4.5+ tsf	
			SAND, dense, moist, light brown, clayey, calcareous deposits and trace limestone fragments. [Del Rio Formation] (SC)								
	15	50 (1) 50 (0.5)				15.8	25	13		PP = 4.5+ tsf Passing No. 200 Sieve = 42%	
589.0	20	50 (0.5) 50 (0.5)	LIMESTONE, very hard, light brown, moderately to highly weathered, highly fractured. [Georgetown Formation]							SS: 50/0"	
										RUN:20-25'; REC:77%; RQD:26%	
	25	50 (0.5) 50 (0)									
						0	7675	2.5		161	RUN:25-30'; REC:98%; RQD:38%
579.0	30	50 (0.5) 50 (0)									

Remarks: Groundwater was not encountered during drilling. Split-Spoon values are not standard (170-lb hammer 24-in drop). Boring was advanced by dry drilling techniques to 20 feet and rock coring was performed from 20 to 45 feet. Coordinates are taken from handheld GPS unit and are in Northing and Easting based on the Texas State Plane Coordinate System, Central Zone, NAD 83(93). Elevations are based off Google Earth 2023. Units: US Survey Feet. (N,E)= (10067027.6, 3097396.8) PP= Pocket Penetrometer

Driller: Texas GeoBore Logger: MP Organization: HVJ SCTX

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DRILLING LOG

2 of 2

WinCore
Version 3.1

County Travis
Highway Loop 1
CSJ 3136-01-200

Hole B-4
Structure Culvert
Station
Offset

District Austin
Date 02/24/23
Grnd. Elev. 609.00 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks	
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)		
			LIMESTONE, very hard, light brown, slightly to highly weathered, heavily fractured, with fossil inclusions. [Georgetown Formation]							RUN:30-35'; REC:87%; RQD:7%	
	35	50 (0.5) 50 (0.5)								-gypsum crystals at 35 feet.	
										RUN:35-40'; REC:67%; RQD:15%	
	40	50 (0.5) 50 (0)									
						0	13950	0.8		168	RUN:40-45'; REC:40%; RQD:23%
564.0	45	50 (1) 50 (0)									

Remarks: Groundwater was not encountered during drilling. Split-Spoon values are not standard (170-lb hammer 24-in drop). Boring was advanced by dry drilling techniques to 20 feet and rock coring was performed from 20 to 45 feet. Coordinates are taken from handheld GPS unit and are in Northing and Easting based on the Texas State Plane Coordinate System, Central Zone, NAD 83(93). Elevations are based off Google Earth 2023. Units: US Survey Feet. (N,E)= (10067027.6, 3097396.8) PP= Pocket Penetrometer

Driller: Texas GeoBore Logger: MP Organization: HVJ SCTX

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REV. NO.	DATE	DESCRIPTION	BY

PAPE-DAWSON ENGINEERS
AUSTIN | SAN ANTONIO | HOUSTON | FORT WORTH | DALLAS
10801 N MOPAC EXPY, BLDG 3, STE 200 | AUSTIN, TX 78759 | 512.454.8711
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028801

Texas Department of Transportation
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SL 1 AT SKUNK CREEK

BORING LOGS

SHEET 2 OF 2

DGN:	FED. RD. DIV. NO.:	STATE:	FEDERAL AID PROJECT NO.:	HIGHWAY NO.:
CHK DGN:	6	TEXAS	---	SL 1
DWG:	DIST.:	COUNTY:	CONT. NO.:	SECT. NO.:
CHK DWG:	AUS	TRAVIS	3136	01
			JOB NO.:	SHEET NO.:
			200	90