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SEE SHEET 2 FOR
INDEX OF SHEETS

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT NO. F 2021(690)

US62 MED CONCRETE
TRAFFIC BARRIER

DESIGN SPEED = 45 MPH
A.D.T. (2018)=2340
A.D.T. (2038)=3697

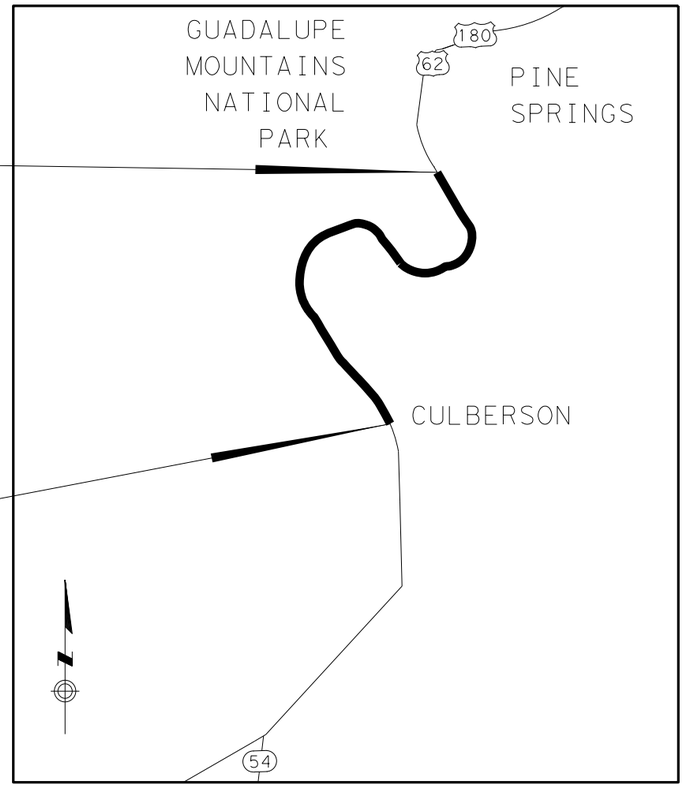
CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		1

NET LENGTH OF ROADWAY= 20,597.28 FT. = 3.901 MI.
NET LENGTH OF BRIDGE = 0 FT. = 0 MI.
NET LENGTH OF PROJECT= 20,597.28 FT. = 3.901 MI.

LIMITS FROM 3.5 MI E OF SH 54 TO 7.42 MI E OF SH 54

FOR THE WORK CONSISTING OF INSTALLING MEDIAN CONCRETE TRAFFIC BARRIER, DRAINAGE IMPROVEMENTS, ILLUMINATION, & PAVEMENT MARKINGS

END PROJECT
CSJ: 0233-02-035
CSJ: 0233-02-037
STA: 193+93.40
RM : 128+0.187
LAT: 31.8717892
LON: -104.8188264



BEGIN PROJECT
CSJ: 0233-02-035
CSJ: 0233-02-037
STA: 10+00.00
RM : 124+0.271
LAT: 31.8424020
LON: -104.8335334

EXCEPTIONS: NONE
EQUATIONS: NONE
RAILROAD CROSSINGS: NONE
TDLR INSPECTION: NOT REQUIRED

REGISTERED ACCESSIBILITY SPECIALIST (RAS) INSPECTION REQUIRED

REQUIRED SIGNS SHALL BE IN ACCORDANCE WITH BC (1)- 14 THRU BC (12)- 14 AND THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, 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, MAY 2012)

STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED
PROFESSIONAL ENGINEER

06/03/2021

FINAL PLANS

CONTRACTOR: _____
TIME CHARGES BEGAN: _____
DATE CONTRACTOR BEGAN WORK: _____
DATE WORK WAS COMPLETED: _____
DATE WORK WAS ACCEPTED: _____
TOTAL DAYS CHARGED: _____
ORIGINAL CONTRACT AMOUNT: $ _____
AMOUNT OF CONTRACT AMENDMENTS: $ _____
FINAL CONTRACT COST: $ _____

_____ 20 _____

_____
AREA ENGINEER

KEY TO COUNTIES

Texas Department of Transportation

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RECOMMENDED FOR LETTING: 6/4/2021
DocuSigned by: Eduardo Perales, P.E.
2778CAEE5F7A4C6...
SAFETY REVIEW COMMITTEE CHAIRMAN

RECOMMENDED FOR LETTING: 6/4/2021
DocuSigned by: L. Raul Ortega Jr., P.E.
0F0D3B67C2...
DISTRICT DIRECTOR OF TRANSPORTATION PLANNING AND DEVELOPMENT

APPROVED FOR LETTING: 6/4/2021
DocuSigned by:
7A68C5EA0D...
DISTRICT ENGINEER

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STATE OF TEXAS
SANTIAGO CASTANEDA
92904
LICENSED
PROFESSIONAL ENGINEER

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED WITH A "AC*" HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

NAME

06/04/2021
DATE

STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED
PROFESSIONAL ENGINEER

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED WITH A "LP*" HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

NAME

06/04/2021
DATE

STATE OF TEXAS
MARICRUZ SAENZ
108338
LICENSED
PROFESSIONAL ENGINEER

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED WITH A "*" HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

NAME P.E.

06/04/2021
DATE

US 62 MED CONCRETE TRAFFIC BARRIER
GENERAL

INDEX OF SHEETS

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Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		2

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GUADALUPE MOUNTAINS NATIONAL PARK

PINE SPRINGS

62
180

GUADALUPE CANYON RD

PRIVATE ROAD

END PROJECT

CSJ: 0233-02-035
CSJ: 0233-02-037
STA: 193+93.40
RM : 128+0.187
LAT: 31.8717892
LON: -104.8188264

62
180

BEGIN PROJECT

CSJ: 0233-02-035
CSJ: 0233-02-037
STA: 10+00.00
RM : 124+0.271
LAT: 31.8717892
LON: -104.8335334

CULBERSON

STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED
PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER

GENERAL

PROJECT LAYOUT

SHEET 1 OF 1

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Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		3

General Notes:

Tests to be in accordance with the Department's Standard Test Methods

Table 1
Compaction Requirements for Base Courses

ITEM	DESCRIPTION	OUTSIDE ROADWAY COURSE DENSITY
132[1,2,3]	EMBANKMENT(FINAL)(DENSITY CONTROL) (TY A)	SEE BELOW

1. **To a depth of 6 in. below natural ground scarify and compact to a 95% minimum.**
2. **From natural ground to 24 in. below finished subgrade, 98% minimum compaction.**
3. **From 24 in. below finished subgrade to finished subgrade, 100% minimum compaction.**

Table 2
Basis of Estimate

ITEM	DESCRIPTION	RATE
3076	DENSE-GRADED HOT-MIX ASPHALT TY-C SAC-A PG64-22	4 IN = 440 LBS/SY
3076	TACK COAT	0.15/SY
310	PRIME COAT (AE-P)	0.20 GAL/SY
247	FL BS (CMP IN PLC)(TY A GR 5) (6")	6.0 INCHES CMP IN PLC

1. **Deviation from the rates shown will require approval.**
2. **Tack Coat to be applied to each layer as directed by the Engineer. Rate shown is based on the desired residual application of 0.10 GAL/SY.**

General Requirements

Maintain the entire project area in a neat and orderly manner throughout the duration of the work. Remove all construction litter and undesirable vegetation within the right of way inside the project limits. This work will be subsidiary to the various bid items.

Become familiar with project site prior to submitting bids.

Where nighttime work is approved, provide adequate lighting for the entire work site as directed. This will be considered subsidiary to the various bid items.

Comply with all Occupational Safety & Health Administration (OSHA) and United States Environmental Protection Agency (EPA) regulations as well as all local and State requirements.

Refer to the various traffic control plan project overview sheets for the proposed sequence of work. Changes will not be permitted, except as approved in writing by the Engineer.

Electronic copies of earthwork cross-sections are available for copying, at bidding Contractor's expense, at the Area Engineer's office. Horizontal and vertical alignment data and design roadway cross-section data are available in print or electronic format upon request.

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

Ricardo Romero Ricardo.Romero@txdot.gov

Aldo Madrid Aldo.Madrid@txdot.gov

Contractor questions will be accepted through email, phone, and in person by the above individuals.

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

https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/

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

Item 4 – Scope of Work

Provide vehicular and pedestrian access at all times, including Saturdays, Sundays, and holidays. This access includes, but is not limited to, driveways, streets, parking areas, and walkways. This shall be considered subsidiary to the various bid items.

Schedule and perform all work to assure proper drainage during the course of construction operations. All labor, tools, equipment and supervision required, to ensure drainage, removal, and handling of water shall be considered incidental work.

Repair any existing pavement, utilities, structures, etc., damaged as a result of construction operations, at no additional cost to the Department.

Maintain all Contract items until final acceptance of the project.

Plan datum for this project is NAD 83 for horizontal and NAVD 88 for elevation based.

Item 5 – Control of the Work

The Department will furnish horizontal and vertical reference points. Contractor must verify horizontal and vertical reference points with conventional survey methods before proceeding with construction activities. Verification must be submitted for review and approval to the Department's R.P.L.S. prior to start of construction. Any discrepancies not reported will be at no additional cost to the Department.

Keep traveled surfaces used in hauling operations clear and free of dirt or other material.

Existing pavement, utilities, structures, etc. damaged as a result of the operations will be repaired at no additional cost to the Department.

Protect from damage and destruction all areas of the right of way, which are not included in the actual limits of the proposed construction areas. Exercise care to prevent damage to trees, vegetation, and other natural features.

Protect trees, shrubs, and other landscape features from abuse, marring, or damage within the actual construction and/or fenced protection areas designated for preservation. Restore any area disturbed or damaged to a condition "as good as" or "better than" prior to start of construction operation. This work will be at the Contractor's expense.

Item 7 – Legal Relations and Responsibilities

Comply with all requirements of the Environmental Permits Issues and Commitments (EPIC) Sheet.

Dispose of all waste materials in compliance with Local, State, and Federal regulations. Submit list of all approved waste sites to the Engineer for review.

Do not discharge any liquid pollutant from vehicles onto the roadside. Immediately clean spills and dispose in compliance with local, state, and federal regulations to the satisfaction of the Engineer at no additional cost to the Department.

Occupational Safety & Health Administration (OSHA) regulations prohibit operations that bring people or equipment within 10 ft. of an energized electrical line. Where workers and/or equipment may be close to an energized electrical line, notify the electrical power company and make all necessary adjustments to ensure the safety of workers near the energized line.

No significant traffic generator events identified.

Item 8 – Prosecution and Progress

Working days will be calculated in accordance with Section 8.3.1., "**Standard** Workweek."

This project to be completed in 365 calendar days in accordance with Section 8.3.1.5, "Calendar Day." **Weekend work activities can be directed by the Engineer when the location dictates immediate corrective action governed by the 24-hour notification requirement for emergency repairs only.**

The Contractor must provide enough manpower and equipment to accomplish the required work under this contract during the hours agreed upon by the Contractor and Engineer. Failure to do so will constitute grounds for a Noncompliance Penalty.

Work must be performed within 72 hours of notification from the designated Area Office Maintenance Supervisor.

A Noncompliance Penalty will be assessed for each instance the Contractor is in noncompliance. A noncompliance instance is defined by any of the following:

1. Contractor fails to begin work at the specified time and/or location(s);
2. Contractor fails to complete work by the time agreed upon with the Engineer;
3. Contractor does not have all the necessary resources (i.e. personnel, equipment, and material) to fulfill the requirement of the Item(s) called out at the specified time and/or location(s).

The Noncompliance Penalty will be deducted from any money due or to become due for any completed Item(s) or work. The Noncompliance Penalty will be assessed as follows: $1,000 per instance, per location.

At the discretion of the Engineer, failure to comply with contract requirements will be grounds for default as per Item 8.7.1.

Contractor work activities will be limited to the allowed lane closure times defined as daytime hours of 9 A.M. to 4 P.M. Monday through Friday or nighttime hours of 9 P.M. to 6 A.M. Sunday through Thursday, unless otherwise directed by the Engineer.

Create and maintain a CPM schedule.
Submit baseline schedule and obtain approval prior to beginning construction. The monthly progress payment will be held if the monthly update is not submitted.

Provide a Project Schedule Summary Report on a monthly basis along with the monthly progress schedule

Item 9 – Measurement and Payment

Submit Material on Hand (MOH) payment requests at least **two (2)** working days before the end of the month for payment consideration on that month's estimate.

Item 100 – Preparing Right of Way

Refer to Specification for a list of items covered under this Item. All existing metal beam guard fence, guardrail end treatments, terminal anchor sections, and concrete riprap called out in the plans to be removed will be paid under this Item.

This Item shall cover all items requiring removal as directed by the Engineer not governed otherwise by individual removal pay items elsewhere in the plans.

Item 104 – Removing Concrete

All work items required to saw-cut the existing concrete sidewalks, driveways, curb and gutter, etc. as shown on the plans, or as directed is considered subsidiary to this Item.

Item 110 – Excavation

All work items required to saw-cut the existing pavement, concrete sidewalks, driveways, etc., as shown in the plans, or as directed, will be considered subsidiary to this Item.

To eliminate all drop-off conditions, construct tapers as directed. This work will not be paid for directly but will be considered subsidiary to pertinent bid items.

Excavate to finish subgrade. Scarify subgrade to a uniform depth at least 6 in. below finish subgrade elevation in areas where base or pavement structure will be placed on subgrade. Manipulate and compact subgrade in accordance with Section 132.3.4., "Compaction Methods." Compact to 100% relative density in accordance with Section 132.3.4.2., "Density Control."

Item 247 – Flexible Base

Maintain moisture during compaction as directed by the Engineer. Determine the moisture content of the material in accordance with Tex-115-E or Tex-103-E as directed by the Engineer.

A 20-ton vibratory padfoot roller will be required for compaction of lifts 10 inches or greater.

Item 310 – Prime Coat

Prepare and treat existing or newly constructed surface with a bituminous material as provided or as directed by the Engineer. Apply blotter material as required.

Cure prime coat on the cement-stabilized material for at least 48 hr. prior to beginning hot-mix asphalt placement operations.

Item 340 – Dense-Graded Hot-Mix Asphalt (Small Quantity)

Provide aggregates with a Surface Aggregate Classification (SAC) of "A" for all surface mixes. Provide aggregates with a minimum SAC of B for all other layers unless otherwise shown on the plans.

In place of typical tack materials shown in Table 18 under Item 300, use a tracking resistant asphalt interlayer (TRAIL) material as a tack coat. Approved TRAIL products are found on TxDOT's Material Producer List under Asphalt Interlayer (Tracking Resistant) through http://www.txdot.gov/business/resources/materials.html.

Supply Warm-Mix Asphalt (WMA) under this Item.

When Reclaimed Asphalt Pavement (RAP) is used in the production of hot-mix asphaltic concrete, use fractionated RAP. Do not exceed 10.0% of Fractionated RAP on surface mixtures.

Use of RAS is not allowed for any mixtures.

Substitute PG Binders (grade dumping) will not be allowed for any mixtures.

Obtain the current version of the templates at http://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/forms/site-manager.html. Submit electronically to the Engineer.

Design the mixture at 50 gyrations (Ndesign).

Do not cover with asphaltic material, any existing survey monuments, manholes, or valve covers, etc. Adjustments will be done in coordination with the respective utility owners.

Place a string line or other suitable marking to ensure smooth, neat lines, or as directed. Provide smooth transitions to existing driveways and intersections.

Place longitudinal joints approximately 6 in. from the broken striping, or as directed, to avoid placing under the wheel path.

Operate the spreading and finishing machine at a uniform forward speed consistent with the plant production rate, hauling capability, and roller train capacity to result in a continuous operation. The speed will be slow enough, so that stopping between trucks is not ordinarily required. If the Engineer determines non-uniform delivery of material is affecting the HMA placement, the Engineer may require the paving operations to cease until acceptable methods are employed to minimize starting and stopping of the paver.

Item 400 – Excavation and Backfill for Structures

The trench bottom for pre-cast concrete pipe will not require undercutting, nor cement-stabilized backfill, unless otherwise directed.

Item 401 – Flowable Backfill

Mix design is to be approved prior to all applications.

Item 464 – Reinforced Concrete Pipe

Use Class III circular pipe for all proposed reinforced concrete, unless otherwise shown on the plans.

Use rubber gaskets as jointing material for concrete pipes.

Concrete collars will be paid under Item 420, “Concrete Substructure,” as shown on the plans.

Coordinate locations of all utilities and corresponding sequence of work. Repair any damage to existing utilities to the satisfaction of the Engineer and the utility owner at no additional cost to the Department.

Item 465 – Junction Boxes, Manholes, and Inlets

Field verify all low-point locations prior to their construction. Obtain approval for any necessary adjustment.

Where inlets may be exposed above the natural ground upon completion, place embankment around them to drain as directed. All such work will be considered subsidiary to this Item.

Coordinate the storm sewer construction with the Traffic Control Plan sequencing. Where applicable, modify Stage I portion of junction boxes, manholes, and inlets, as directed.

Coordinate all inlet locations and elevations with the project cross-sections and verify prior to their construction.

Place pedestrian fence around all incomplete junction boxes, inlets and manholes to protect pedestrians in the surrounding area, as directed. This work will be considered subsidiary to this Item.

Item 480 – Cleaning Existing Culverts

This Item will be paid for by the cubic yard and the volume of material to be removed will be computed by the method of average ends areas in its original position. Material removed at the entrance or exit of the culvert in order to gain access to or facilitate the function of the structure, will also be paid for by the cubic yard (average end method).

Dispose of excess material in accordance with applicable federal, state, and local regulations, or place on right of way, as directed.

Hauling and disposal of the excavated materials will not be paid for directly, but will be subsidiary to this Item.

Item 502 – Barricades, Signs, and Traffic Handling

Prior to beginning construction, the Engineer will approve the routing of traffic and sequence of work.

Additional signs and barricades, placed as directed, will be considered subsidiary to this Item.

In accordance with Section 7.2.6.1, designate, in writing, a Contractor Responsible Person (CRP) and a CRP alternate to take full responsibility for the set-up, maintenance, and necessary corrective measures of the traffic control plan. The CRP or CRP alternate must be present at site and implement the initial set up of every traffic control phase/stage, at each location, and/or each call out, for the entire duration of the project.

At the written request of the Engineer, immediately remove the CRP or CRP alternate from the project if, in the opinion of the Engineer, is not competent, not present at initial TCP set-ups, or does not perform in a proper, skillful, or safe manner. These individuals shall not be reinstated without written consent of the Engineer.

CRP and CRP alternate must be trained using Department approved training. Provide a copy of the certificate of completion to the Engineer for project records. Refer to Table 1 for Department approved Training.

Table 1

Contractor Responsible Person and Alternate

Provider	Course Number	Course Title	Duration	Notes
American Traffic Safety Services Association	TCS	Traffic Control Supervisor	2 days	
National Highway Institute	133112 133113	Design and Operation of Work Zone Traffic Control Work Zone Traffic Control for Maintenance Operations	1 day 1 day	Both courses are required to meet minimum required training.
Texas Engineering Extension Services	133112A	Design and Operation of Work Zone Traffic Control	3 days	
University of Texas Arlington Division for Enterprise Development	WKZ421	Traffic Control Supervisor	16 hours	Contact UTA for training needs.

All contractor workers involved with the traffic control implementation and maintenance must participate and complete a Department approved training course. Provide a copy of the certificate of completion to the Engineer for project records. Refer to Table 2 for Department approved training.

Table 2

Other Work Zone Personnel

Provider	Course Number	Course Title	Duration	Notes
American Traffic Safety Services Association	TCT	Traffic Control Technician	1 day	
Texas Engineering Extension Services	HWS002	Work Zone Traffic Control	16 hours	Identical to HWS-410. Counts for 3 year CRP requirement.
National Highway Institute	133116	Maintenance of Traffic for Technicians	5 hours	Web based
National Highway Institute	134109-I	Maintenance Training Series: Basics of Work Zone Traffic Control	1 hour	Free, Web based
University of Texas at Arlington, Division for Enterprise Development	WKZ100	Work Zone Safety: Temporary Traffic Control	4 hours	Note name change. Free, Web based
TxDOT/AGC Joint Development	N/A	Safe Workers Awareness Highway Construction Work Zone Hazards	16 minutes 18 minutes	Videos available through AGC of Texas offices. English & Spanish
AGC America	N/A	Highway Work Zone Safety Training	1 day	
Texas Engineering Extension Service	HWS400	Temporary Traffic Control Worker	4 hours	Contact TEEX, if interested in course
TxDOT/AGC Joint Development	N/A	Work Zone Fundamentals	10 minutes	Videos available through ACT of Texas offices. English & Spanish

Contractor may choose to train workers involved with the traffic control implementation and maintenance with a contractor developed training in lieu of Department approved training. Contractor developed training must be equivalent to the Department approved training shown in Table 2. Provide the Engineer a copy of the course curriculum for pre-approval, prior to conducting the contractor developed training. Provide the Engineer a copy of the log of attendees after training completion for project records.

Existing regulatory signs, route marker auxiliaries, guide signs, and warning signs that must be removed due to widening shall be relocated temporarily and erected on approved supports at locations shown in the plans, or as directed. This work will not be paid for directly, but considered subsidiary to this Item.

Notify the Department officials when major traffic changes are to be made, such as detours. Coordinate with the Department on all traffic changes. Advance notification for the following week's work must be made by 5 P.M. on Wednesdays.

If Law Enforcement Personnel is required by the Engineer, coordinate with local law enforcement as directed or agreed. Complete the weekly tracking form provided by the Department and submit invoices with 5% allowance for Law Enforcement payments by Contractor that agree with the tracking form for payment at the end of each month where approved services were provided.

Provide access to intersecting side roads and driveways at all times, unless otherwise directed.

Any approved change to the sequence of work or TCP, must be signed and sealed by a Contractor's Licensed Professional Engineer assuming full responsibility for any additional barricade signs and devices needed.

Use striping operations to channelize traffic into the newly completed roadway, as directed. Maintain shoulders and median areas in a condition capable of serving as emergency paths, as approved. This work will be subsidiary to this Item.

Use portable changeable message signs (PCMS) to alert public of construction two weeks prior to construction.

Use flaggers when directed. Provide two-way radio communication for all flaggers.

Place and maintain sufficient additional warning signs, beacons, delineators, and barricades to warn and guide the public of all hazards through the construction zone at all times, and as directed.

Use flashing arrow boards on all tapers for each lane closure.

Some signs, barricades, and channelization devices may not be shown at the precise or measured position. Place the barricades, devices, or signs, with approval, in positions to meet field conditions.

Fill any holes left by barricade or sign supports and restore the area to its original condition.

Use Type A flashing warning lights or delineators to mark open excavation, footings, foundations, or other obstructions near lanes that may be open to traffic, as directed.

For additional information pertaining to channelization, signing, spacing details, and flagging procedures required to regulate, warn, and guide traffic through project, refer to the "Barricade and Construction Standards," BC(1)-14 and to the current *Texas Manual on Uniform Traffic Control Devices(TMUTCD).*

Remove or cover signs that do not apply to current conditions at the end of each day's work.

Repair and/or replace all signs damaged by the public or due to weather events.

Safety Contingency

The contractor Force Account "Safety Contingency" that has been established for this project is intended to be utilized for work zone enhancement, to improve the effectiveness of the TCP that could not be foreseen in the project planning and design stage. These enhancements will be mutually agreed upon by the Engineer and the Contractor's Responsible Person based on weekly or more frequent traffic management reviews on the project. The Engineer may choose to use existing bid items if it does not slow the implementation of enhancement.

Item 506 – Temporary Erosion, Sedimentation, and Environmental Controls

Place Best Method Practices (BMP's) in locations as designated in the plans or as directed to meet field conditions.

Place a weatherproof bulletin board containing the Texas Commission on Environmental Quality (TCEQ) required information on the project at a site as directed. Post the following documents:

TCEQ "TPDES Storm Water Program" Construction Site Notice; Primary Construction Site Notices from both Contractor and Department, completed and signed.

Place rain gauge(s) at locations, as designated.

The total disturbed area for this project is 0.0198347 acres. Establish the authorization requirements for Storm Water Discharges for soil disturbed area in this project, all project locations in the Contract, and Contractor Project Specific Locations (PSLs), within one mile of the project limits. Both the Department and the Contractor shall obtain an authorization to discharge storm water from TCEQ for the construction activities shown on the plans. Obtain required authorization from the TCEQ for any Contractor PSLs for construction support activities on or off right of way. When the total area disturbed for all projects in the Contract and PSLs within one mile of the project limits exceeds five acres, provide a copy of the Contractor NOI PSLs on the

right of way to the Engineer (to the appropriate Municipal Separate Storm Sewer System (MS4) Operator when on an Off-system State route).

Best Method Practices (BMP's) may be adjusted to meet field conditions, or as directed. Engineer will verify all locations prior to placement of BMPs. Within the project limits, keep all inlets functional as long as possible to accept storm water as part of the Storm Water Pollution Prevention Plan (SWP3), as directed.

Grading operations will be limited to the catch point of the proposed cross-section.

Item 512 – Portable Concrete Traffic Barrier

Portable Concrete Traffic Barrier will be obtained from Canutillo location at 6496 Doniphan Dr., El Paso, TX 79932. Refer to the TCP Sequence of Work for amount of CTB needed in Phase one. Remaining CTB will be stockpiled in the Facility at US 62/180 (9.2 Mi North of SH 54 Jct.) Pine Springs, TX 88220 for the remaining phases. After project is complete all CTB to be stockpiled back at Canutillo location.

Item 514 – Permanent Concrete Traffic Barrier

Cast Permanent Concrete Traffic Barrier in place using conventional forms or slipforms with an option for the placement of precast concrete sections.

When precast concrete section is the selected option, than the joints between precast Permanent Concrete Traffic Barriers (PCTB) shall be type X joints. Refer to Standard SSCB(2)-10 for more information.

Item 610 – Roadway Illumination Assemblies

Conductor runs in Illumination Layouts contain 5 ft. of slack.

Limitations on Use of the RIP-19 Standard

The Roadway Illumination Pole (RIP-19) Standard Details were developed for installations in locations where the 3-second gust basic maximum wind speed is 110 mph, and where the elevation of the base of the pole is less than (i.e. not more than) 25 ft. above the elevation of surrounding terrain, in accordance with the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, 4th Edition (2001) (AASHTO Design Specifications). For poles to be installed in regions where the maximum basic wind speed exceeds 110 mph or to be mounted more than 25-ft. above the surrounding terrain, provide poles meeting the following requirements:

Submittals. Submit fabrication drawings and calculations sealed by a licensed professional engineer. Follow the electronic shop drawing submittal process (see Guide Electronic Shop Drawing Submittal), to submit fabrication drawings and calculations for approval.

Luminaire Structural Support Requirements. Lighting poles, arms, and anchor bolt assemblies shall have a 25-year design life to resist dead loads, ice loads, and the required basic wind speeds safely at the location of installation in accordance with the current edition of the AASHTO Design Specifications. For transformer base poles, the fabricator shall include transformer base and connecting hardware in calculations and shop drawing submittals. All transformer bases shall have been structurally tested to resist the theoretical plastic moment capacity of the pole. Certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished shall be submitted with the shop drawings. Shop drawings shall show breakaway base model number, and manufacturer's name and logo. Manufacturer's shop drawings shall include the ASTM designations for all materials to be used.

Fabricate steel roadway illumination poles in accordance with Department standards RIP-2021 (Roadway Illumination Poles – RIP (1)-21). Poles fabricated according to RIP-2019 require no shop drawings. Alternate designs to RIP-2019 or the use of aluminum to fabricate poles will require the submission of shop drawings electronically.

For instructions on submitting shop drawings electronically go to the Texas Department of Transportation (TxDOT) home page, http://txdot.gov, Business with TxDOT, Bridge information, Shop drawings. File is titled: Guide to Electronic Shop Drawing Submittal.

Item 618 – Conduit

The location of conduit is diagrammatic and may be varied to meet local conditions upon approval of the Engineer.

When shown on the plans, use underground warning tape in the trench installation of conduit (PVC).

For conduit placement in pavement, an earth-saw may be used provided the cut does not exceed 6 in. Backfill as shown on the trench details in the plans.

For all underground conduit bends of 45°, provide rigid metal conduit. Where the rigid metal conduit is exposed at any point and where rigid metal extends into ground boxes, bond the metal conduit to the grounding conductor with grounding type bushings or by other UL-listed grounding connectors, approved by the Engineer. Rigid metal bends will not be paid for directly but will be considered incidental to the PVC conduit system.

Use rigid metal conduit when crossing bridges or culverts. All clamps, expansion joints, bolts and accessories necessary to install the rigid metal will be subsidiary to this Item.

Backfill roadway and driveway trench with cement-stabilized backfill at the end of each working day. Place an ACP patch at the end of the week or as directed by the Engineer.

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

All bore items shall be directional and shall be paid for under this item. Bore quantities include the distance beneath the roadway plus an additional 2 ft. on either side of the curb, sidewalk, or edge of pavement.

For conduits install by open trench method, backfill the trench as shown on the plans.

Place conduit for fiber optic cable at a minimum of 48 in. below pavement surface. Place all other conduit at a minimum depth of 18 in. below the pavement surface. Place conduit prior to the new pavement construction.

Fit both ends of each raceway with a temporary cap to prevent dirt and debris from entering during construction.

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

When conduit is to be installed where riprap presently exists, take care in breaking the existing riprap for placement of the conduit. Do not break out a greater area that is required for placement of the conduit. Replace broken riprap with Class “C” concrete to the exact slope, pattern, color and thickness of the existing riprap. Replacement of riprap will be subsidiary to this Item.

Item 620 – Electrical Conductors

Use NEC type XHHW for all conductors.

Insulate grounding conductors with a green jacket and neutral conductors with a white jacket.

At every accessible point, bond together the grounding conductors which share the same conduit, junction box, ground box or structure in accordance with the electrical detail sheets and the latest edition of the National Electrical Code.

For both transformer and shoe-base type illumination poles, provide double-pole breakaway fuse holder as shown on the Department’s Materials Producers List under “Roadway Illumination and Electrical Supplies.” category. Fuse holder is shown on the list under Item 610, “Roadway Illumination Assemblies,” and Item 620, “Electrical Conductors.” Provide 10 amp time delay fuses.

Include extra cable length in each ground box or foundation for each run, to provide adequate slack, as provided in the plans or as directed.

Ensure a properly bonded electrical system by running one No. 8 wire between foundations and grounding it at each foundation ground-rod.

Bond metal junction boxes and metal conduit to the circuit grounding conductors in accordance with the National Electrical Code.

Refer to Article 7.18, “Electrical Requirements,” for electrical certification and electrical licensing requirements

The required electrical certifications course is available and is scheduled periodically by Texas Engineering Extension Service (TEEX). Alternatively, Contractors may purchase an entire course for their personnel to be held at a time and location of their choice as negotiated through TEEX. For more information contact:

Texas Engineering Extension Service (TEEX)
TxDOT Electrical System Course
(979) 845-6563

Item 624 – Ground Boxes

Remove all conductors in ground boxes as shown on the plans to be abandoned. Payment for removal of conductors will be subsidiary to this Item.

Item 628 – Electrical Services

Meet at the service locations with representatives of the Department, electrical utility company, and Rio Grande Electric at least four weeks before electric power is needed to finalize exact service pole placement and resolve any issues.

Any electrical costs for connection, test, and operation will be the responsibility of the government agency that will have the final operational control of the items built.

Remove the existing service enclosure and conduit on service poles that are to be reused or abandoned. Payment for removal will be considered subsidiary to this Item.

Item 662 – Work Zone Pavement Markings

In those areas where existing pavement markings are to be covered or removed, field locate and record the existing pavement markings by survey or other approved method by the Engineer as directed. Place final striping on these locations.

Remove and properly dispose of tabs upon completion of the final striping. This work is considered subsidiary to various bid items.

Place tabs as per the Department's Standard sheet TCP (7-1)-13. Place raised pavement markers in accordance with applicable standards and as directed.

Item 666 –Retroreflectorized Pavement Markings

Use a pilot line for final striping and remove pilot line after all striping is complete. Removal will be in accordance with the methods specified in Item 677, "Eliminating Existing Pavement Markings and Markers," and will be subsidiary to this Item.

Air blasting is required as pavement surface preparation.

In those areas where existing pavement markings are to be covered or removed, field locate and record the existing pavement markings by survey or other approved method by the Engineer as directed. Place final striping on these location.

Item 672 – Raised Pavement Markers

Use a pilot line for final striping and remove pilot line after all striping is complete. Removal will be in accordance with the methods specified in Item 677, "Eliminating Existing Pavement Markings and Markers," and will be subsidiary to this Item.

Air blasting is required for pavement surface preparation.

Furnish adhesives that conform to DMS-6100, "Epoxies and Adhesives," and DMS-6130, "Bituminous Adhesive for Pavement Markers," for this Item.

Do not place raised pavement markers when the pavement surface temperature is below 60°F.

Removal of all existing raised pavement markers will be considered subsidiary to the various bid items.

Item 6185 – Truck Mounted Attenuator (TMA) and Trailer Attenuator (TA)

All TMA Operators must participate in a TMA workshop to be conducted by the El Paso District Safety Office, on the proper use of TMAs, prior to working on Department Right of Way (ROW). A certificate of completion will be issued to TMA Operators that successfully complete the TMA workshop. The certificate of completion must be carried by TMA Operators at all times while working on Department right of way.

Acquire the TCP and TMA Operator's certificates of completion prior to the authorization to begin work. No time suspension will be granted and no traffic control work will be allowed without certificates of completion.

Therefore, 3 total shadow vehicles with TMA will be required for this type of work. The contractor will be responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs needed for the project.

The supporting vehicle for the TMA shall have a minimum gross (i.e., ballasted) vehicular weight of 19,000 pounds.

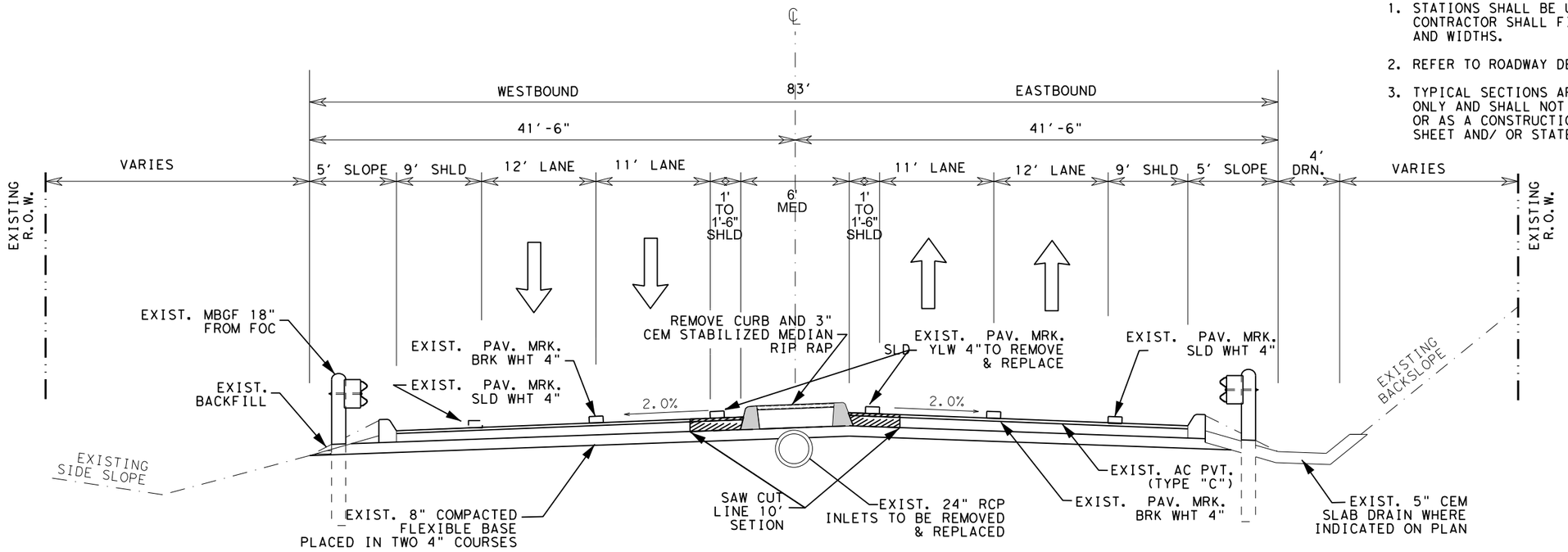
See next sheet for Basis of Estimate for TMAs.

Basis of Estimate for Stationary TMAs				
		TMA(Stationary)		
Phase	Standard	Required	Additional	TOTAL
1,2,3	TCP (2-5)-18	2		2
4	TCP (2-5)-18	1		1

Basis of Estimate for Mobile TMAs			
	TMA(Mobile)		
Standard	Required	Additional	TOTAL
TCP (3-3)-14	3		3

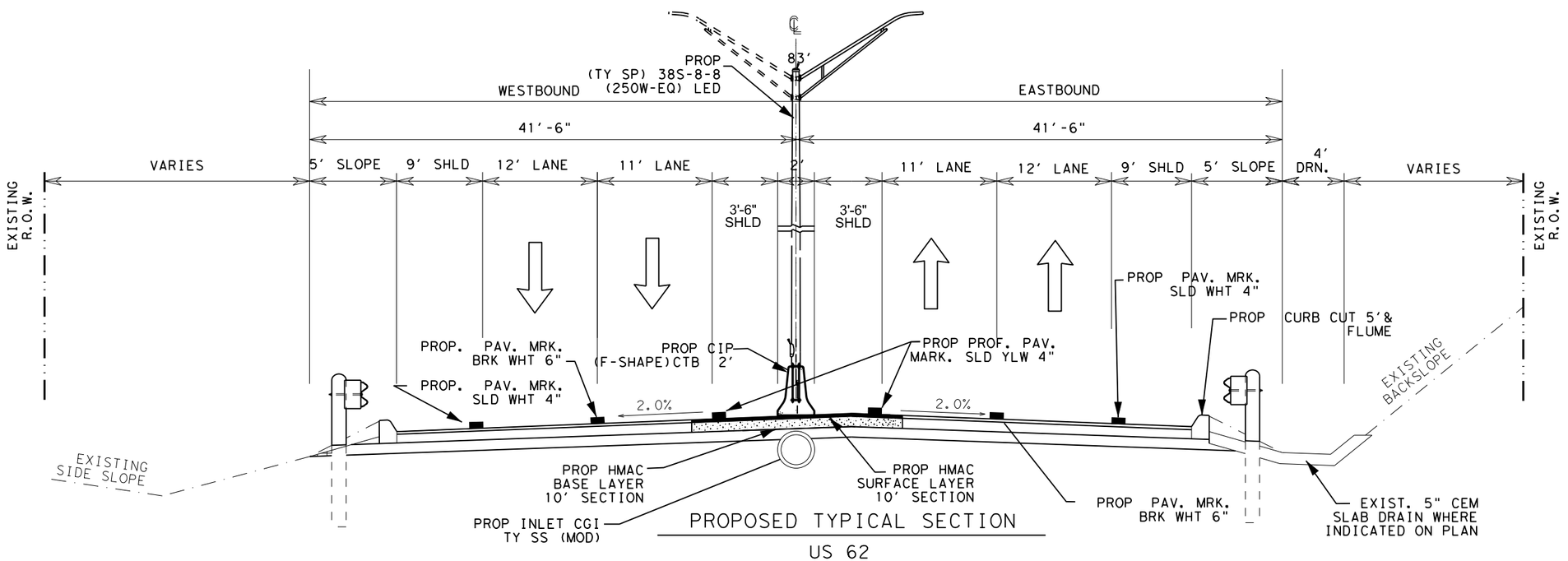
NOTES:

1. STATIONS SHALL BE USED FOR LOCATION PURPOSES ONLY. CONTRACTOR SHALL FIELD VERIFY PAVEMENT LENGTHS AND WIDTHS.
2. REFER TO ROADWAY DETAIL SHEETS FOR FURTHER INFORMATION.
3. TYPICAL SECTIONS ARE FOR GENERAL INFORMATION ONLY AND SHALL NOT BE USED FOR QUANTITY CALCULATIONS OR AS A CONSTRUCTION DETAIL. REFER TO SPECIFIC DETAIL SHEET AND/ OR STATE STANDARDS FOR PROPER CONSTRUCTION.



EXISTING TYPICAL SECTION

US 62
STA 14+66.00 TO STA 188+88.40



PROPOSED TYPICAL SECTION

US 62
STA 15+00 TO STA 188+85.91

STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER

GENERAL

TYPICAL SECTIONS

SHEET 1 OF 1

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		5

DATE: 6/2/2021 8:11:16 PM
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Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0233-02-035 **DISTRICT** El Paso **COUNTY** Culberson
HIGHWAY US 62

				0233-02-035		0233-02-037		TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB							
		PROJECT ID		**A00133678**		**A00176715**			
		COUNTY		**Culberson**		**Culberson**			
		HIGHWAY		**US 62**		**US 62**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL		
	100-6002	PREPARING ROW	STA	8.000				8.000	
	104-6011	REMOVING CONC (MEDIANS)	SY	11,421.000				11,421.000	
	104-6021	REMOVING CONC (CURB)	LF	230.000				230.000	
	105-6046	REMOVING STAB BASE & ASPH PAV (0"-10")	SY	7,901.000				7,901.000	
	247-6388	FL BS (CMP IN PLC)(TY A GR 5)(6")	SY	3,388.000				3,388.000	
	310-6005	PRIME COAT (AE-P)	GAL	4,063.000				4,063.000	
	400-6001	STRUCT EXCAV	CY	1,424.000				1,424.000	
	400-6008	CUT & RESTORE ASPH PAVING	SY	25.000				25.000	
	401-6001	FLOWABLE BACKFILL	CY	799.000				799.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	32.000				32.000	
	420-6009	CL A CONC (COLLAR)	EA	265.000				265.000	
	420-6011	CL B CONC (FLUME)	CY	55.000				55.000	
	464-6003	RC PIPE (CL III)(18 IN)	LF	938.000				938.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	221.000				221.000	
	464-6026	RC PIPE (CL V)(24 IN)	LF	1,400.000				1,400.000	
	465-6237	INLET (RAIL & GRATE) (TY II)	EA	7.000				7.000	
	465-6335	INLET UNDER RAIL (CIP)(COMPL)	EA	29.000				29.000	
	466-6003	HEADWALL (CH - FW - 0) (DIA= 18 IN)	EA	2.000				2.000	
	496-6002	REMOV STR (INLET)	EA	21.000				21.000	
	496-6003	REMOV STR (MANHOLE)	EA	8.000				8.000	
	496-6007	REMOV STR (PIPE)	LF	1,330.000				1,330.000	
	496-6018	REMOVE STR (CONC)	EA	23.000				23.000	
	500-6001	MOBILIZATION	LS	0.500		0.500		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	20.000				20.000	
	506-6001	ROCK FILTER DAMS (INSTALL) (TY 1)	LF	200.000				200.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	200.000				200.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	500.000				500.000	
	506-6045	BIODEG EROSN CONT LOGS (INSTL) (6")	LF	500.000				500.000	
	512-6017	PORT CTB (DES SOURCE)(F-SHAPE)(TY 1)	LF	23,060.000				23,060.000	
	512-6041	PORT CTB (STKPL)(F-SHAPE)(TY 1)	LF	27,860.000				27,860.000	
	512-6105	PCTB MOVE&RESET(F-SHAPE OR SNGL SLPTY1	LF	37,260.000				37,260.000	
	514-6013	PERM CTB (F-SHAPE) (TY 1)	LF	12,855.000				12,855.000	
	514-6014	PERM CTB (F-SHAPE) (TY 2)	LF	640.000				640.000	
	514-6041	PERM CTB (F-SHAPE)(SPL)	LF	185.000				185.000	
	529-6002	CONC CURB (TY II)	LF	11,223.000				11,223.000	
	545-6002	CRASH CUSH ATTEN (DES SOURCE)	EA	2.000				2.000	
	545-6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	6.000				6.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0233-02-035 **DISTRICT** El Paso **COUNTY** Culberson
HIGHWAY US 62

			CONTROL SECTION JOB		**0233-02-035**		**0233-02-037**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00133678**		**A00176715**			
			COUNTY		**Culberson**		**Culberson**			
			HIGHWAY		**US 62**		**US 62**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	545-6004	CRASH CUSH ATTEN (STKPL)		EA	2.000				2.000	
	545-6008	CRASH CUSH ATTEN (INSTL)(L)(N)(70)		EA	6.000				6.000	
	610-6191	IN RD IL (TY SP) 38S-8-8 (250W EQ) LED		EA			64.000		64.000	
	618-6023	CONDT (PVC) (SCH 40) (2")		LF			12,210.000		12,210.000	
	618-6024	CONDT (PVC) (SCH 40) (2") (BORE)		LF			180.000		180.000	
	620-6012	ELEC CONDR (NO.4) INSULATED		LF			41,480.000		41,480.000	
	624-6002	GROUND BOX TY A (122311)W/APRON		EA			6.000		6.000	
	628-6041	ELC SRV TY A 240/480 060(NS)SS(E)GC(O)		EA			3.000		3.000	
	658-6027	INSTL DEL ASSM (D-SY)SZ (BRF)CTB (BI)		EA	112.000				112.000	
	666-6170	REFL PAV MRK TY II (W) 4" (SLD)		LF	1,919.000				1,919.000	
	666-6171	REFL PAV MRK TY II (W) 6" (BRK)		LF	1,147.000				1,147.000	
	666-6287	REF PROF PAV MRK TY I(Y)4"(SLD)(090MIL)		LF	39,669.000				39,669.000	
	666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)		LF	39,143.000				39,143.000	
	666-6306	RE PM W/RET REQ TY I (W)6"(BRK)(100MIL)		LF	9,425.000				9,425.000	
	672-6010	REFL PAV MRKR TY II-C-R		EA	441.000				441.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")		LF	91,182.000				91,182.000	
	678-6001	PAV SURF PREP FOR MRK (4")		LF	78,510.000				78,510.000	
	678-6002	PAV SURF PREP FOR MRK (6")		LF	9,545.000				9,545.000	
	3076-6016	D-GR HMA TY-C SAC-A PG64-22		TON	4,468.000				4,468.000	
	3076-6066	TACK COAT		GAL	3,052.000				3,052.000	
	6185-6002	TMA (STATIONARY)		DAY	380.000				380.000	
	04	PUBLIC UTILITY FORCE ACCT WORK (NON-PARTICIPATING)		LS	1.000		1.000		2.000	
	18	EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)		LS	1.000				1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)		LS	1.000				1.000	

CK:
DW:
CK:
DN:

(0233-02-035) SUMMARY OF TRAFFIC CONTROL ITEMS:

LOCATION	500 6001 MOBILIZATION	502 6002 BARRICADES	512 6017 PORT CTB (DES SOURCE)(F-SHAPE)(TY 1)	512 6041 PORT CTB (STKPL)(F-SHAPE)(TY 1)	512 6105 PCTB MOVE&RESET(F-SHAP E OR SNGL SLPTY1	545 6002 CRASH CUSH ATTEN (DES SOURCE)	545 6003 CRASH CUSH ATTEN (MOVE & RESET)	545 6004 CRASH CUSH ATTEN (STKPL)	666 6170 REFL PAV MRK TY II (W) 4"(SLD)	666 6171 REFL PAV MRK TY II (W) 6"(BRK)	677 6001 ELIM EXT PAV MRK & MRKS 4"	6185 6002 TMA (STATIONARY)
	EA	MO	LF	LF	LF	EA	EA	EA	LF	LF	LF	DAY
TCP PHASE 1, LAYOUT 1 OF 4:	1	20	0		0	1	1		100	98	198	380
TCP PHASE 1, LAYOUT 2 OF 4:	0	0	4,800		4,800							
TCP PHASE 1, LAYOUT 3 OF 4:	0	0	4,800		4,800							
TCP PHASE 1, LAYOUT 4 OF 4:	0	0	1,700		1,700	1	1					
TCP PHASE 2, LAYOUT 1 OF 3:	0	0		4,200	600		1					
TCP PHASE 2, LAYOUT 2 OF 3:	0	0			4,800							
TCP PHASE 2, LAYOUT 3 OF 3:	0	0			1,700		1					
TCP PHASE 3 STAGE 1 LAYOUT 1 OF 6:	0	0			1,700		1					
TCP PHASE 3 STAGE 1 LAYOUT 2 OF 6:	0	0			4,800							
TCP PHASE 3 STAGE 1 LAYOUT 3 OF 6:	0	0			4,800							
TCP PHASE 3 STAGE 1 LAYOUT 4 OF 6:	0	0	9,000		4,800							
TCP PHASE 3 STAGE 1 LAYOUT 5 OF 6:	0	0	2,760		2,760		1		795		861	
TCP PHASE 3 STAGE 1 LAYOUT 6 OF 6:	0	0										
TCP PHASE 3 STAGE 2 LAYOUT 1 OF 6:	0	0		1,700				1				
TCP PHASE 3 STAGE 2 LAYOUT 2 OF 6:	0	0		4,800								
TCP PHASE 3 STAGE 2 LAYOUT 3 OF 6:	0	0		4,800								
TCP PHASE 3 STAGE 2 LAYOUT 4 OF 6:	0	0		4,800								
TCP PHASE 3 STAGE 2 LAYOUT 5 OF 6:	0	0		7,560				1	1,024	1,049	2,073	
TCP PHASE 3 STAGE 2 LAYOUT 6 OF 6:	0	0										
TOTAL	1	20	23,060	27,860	37,260	2	6	2	1,919	1,147	3,132	380

(0233-02-035) SUMMARY OF REMOVAL ITEMS:

LOCATION	100 6001 PREPARING ROW	104 6011 REMOVING CONC (MEDIAN)	105 6046 REMOVING STAB BASE AND ASPH PAV (0"-10")
	STA	SY	SY
REMOVAL LAYOUT 1 OF 8:	1	1,295	855
REMOVAL LAYOUT 2 OF 8:	1	1,608	1,055
REMOVAL LAYOUT 3 OF 8:	1	1,580	1,089
REMOVAL LAYOUT 4 OF 8:	1	1,464	1,204
REMOVAL LAYOUT 5 OF 8:	1	1,595	1,064
REMOVAL LAYOUT 6 OF 8:	1	1,600	1,068
REMOVAL LAYOUT 7 OF 8:	1	1,531	1,104
REMOVAL LAYOUT 8 OF 8:	1	748	462
TOTAL	8	11,421	7,901

(0233-02-035) SUMMARY OF ROADWAY ITEMS:

LOCATION	247 6388 FL BS (CMP IN PLC) (TY A GR 5) (6")	310 6005 PRIME COAT (AE-P)	514 6013 PERM CTB (F-SHAPE)(TY 1)	514 6014 PERM CTB (F-SHAPE)(TY 2)	514 6041 PERM CTB (F-SHAPE)(SPL)	545 6008 CRASH CUSH ATTEN (INSTL)(L)(N)(70)	3076 6016 D-GR HMA TY-C SAC-A PG64-22	3076 6066 TACK COAT
	CY	GAL	LF		LF	EA	TON	GAL
ROADWAY LAYOUT 1 OF 8:	359	430	0	0	0	1	473	323
ROADWAY LAYOUT 2 OF 8:	445	534	835	50	15	0	587	401
ROADWAY LAYOUT 3 OF 8:	445	534	2,148	100	40	2	587	401
ROADWAYLAYOUT 4 OF 8:	538	645	2,270	110	20	0	709	485
ROADWAY LAYOUT 5 OF 8:	445	534	2,265	110	25	0	587	401
ROADWAY LAYOUT 6 OF 8:	509	610	2,263	110	25	0	671	458
ROADWAY LAYOUT 7 OF 8:	445	534	2,084	110	40	2	587	401
ROADWAY LAYOUT 8 OF 8:	202	242	990	50	20	1	267	182
TOTAL	3,388	4,063	12,855	640	185	6	4,468	3,052

(0233-02-035) SUMMARY OF TRAFFIC ITEMS:

LOCATION	658 6287 INSTL DEL ASSM (D-SY) SZ (BRF) CTB (BI)	666 6287 REF PROF PAV MRK TY I(Y)4" (SLD)(090MIL)	666 6303 RE PM W/RET REQ TY I (W)4"(SLD) (100MIL)	666 6306 RE PM W/RET REQ TY I (W)6"(BRK) (100MIL)	672 6010 REFL PAV MRKR TY II-C-R	677 6001 ELIM EXT PAV MRK & MRKS (4")	678 6001 PAV SURF PREP FOR MRK (4")	678 6002 PAV SURF PREP FOR MRK (6")
	EA	LF	LF	LF	EA	LF	LF	LF
PAVEMENT MARKING 1 OF 9:		1,400	2,200	400	0	4,000	3,600	400
PAVEMENT MARKING 2 OF 9:		4,800	4,800	1,075	54	10,675	9,600	1,075
PAVEMENT MARKING 3 OF 9:	11	4,800	4,613	1,080	60	10,316	9,116	1,200
PAVEMENT MARKING 4 OF 9:	28	4,800	4,800	1,200	60	10,800	9,600	1,200
PAVEMENT MARKING 5 OF 9:	14	4,400	4,800	1,200	60	10,400	9,200	1,200
PAVEMENT MARKING 6 OF 9:	14	4,800	4,800	1,200	60	10,800	9,600	1,200
PAVEMENT MARKING 7 OF 9:	18	4,800	4,639	1,200	60	10,639	9,439	1,200
PAVEMENT MARKING 8 OF 9:	18	4,582	4,475	1,200	60	10,257	9,057	1,200
PAVEMENT MARKING 9 OF 9:	9	5,287	4,016	870	27	10,168	9,298	870
TOTAL	112	39,669	39,143	9,425	441	88,055	78,510	9,545

(0233-02-035) SUMMARY OF SWP3 ITEMS:

LOCATION	506 6001 ROCK FILTER DAMS (INSTALL) (TY 1)	506 6011 ROCK FILTER DAM (REMOVE)	506 6043 BODEG EROSN LOGS (REMOVE)	506 6045 BIODEG EROSN LOGS (INSTL) (6")
	LF	LF	LF	LF
SWP3 LAYOUT 1 OF 8:	0	0	70	70
SWP3 LAYOUT 2 OF 8:	20	20	70	70
SWP3 LAYOUT 3 OF 8:	20	20	60	60
SWP3 LAYOUT 4 OF 8:	40	40	70	70
SWP3 LAYOUT 5 OF 8:	40	40	50	50
SWP3 LAYOUT 6 OF 8:	40	40	20	20
SWP3 LAYOUT 7 OF 8:	20	20	70	70
SWP3 LAYOUT 8 OF 8:	20	20	90	90
TOTAL	200	200	500	500

US 62 MED CONCRETE TRAFFIC BARRIER

GENERAL

SUMMARY OF QUANTITIES

SHEET 1 OF 2

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Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0233	02	035	US0062
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		9

DATE: 05/12/2021 06:15 PM
FILE: TxDOT_Sheets_XM.cel

(0233-02-035) SUMMARY OF DRAINAGE BYPASS ITEMS FOR ILLUMINATION LIGHT POLE:					
LOCATION	400	401	420	464	496
	6001	6001	6009	6026	6007
	STRUCT EXCAV	FLOWABLE BACKFILL	CL A CONC (COLLAR)	RC PIPE (CL V) (24 IN)	REMOV STR (PIPE)
	CY	CY	EA	LF	LF
ILLUMINATION LAYOUT 1 OF 8					
ILLUMINATION LAYOUT 2 OF 8					
ILLUMINATION LAYOUT 3 OF 8					
ILLUMINATION LAYOUT 4 OF 8					
ILLUMINATION LAYOUT 5 OF 8					
ILLUMINATION LAYOUT 6 OF 8					
ILLUMINATION LAYOUT 7 OF 8					
ILLUMINATION LAYOUT 8 OF 8					
TOTAL	1,050	630	210	1,400	1,330

(0233-02-037) SUMMARY OF ILLUMINATION ITEMS:						
Location	610	618	618	620	624	628
	6191	6023	6024	6012	6002	6041
	IN RD IL (TY SP) 38S-8-8 (250W EQ) LED	CONDT (PVC) (SCH 40) (2")	CONDT (PVC) (SCH 40) (2 ") (BORE)	ELEC CONDR (NO.4) INSULATED	GROUND BOX TY A (122311) W/APRON	ELC SRV TY A 240/480 060 (INS) SS (E) GC (O)
	EA	LF	LF	LF	EA	EA
ILLUMINATION LAYOUT 1 OF 8	0	0	0	0	0	0
ILLUMINATION LAYOUT 2 OF 8	5	690	60	3,055	2	1
ILLUMINATION LAYOUT 3 OF 8	10	2,460		7,655	0	0
ILLUMINATION LAYOUT 4 OF 8	11	1,780	60	5,795	2	1
ILLUMINATION LAYOUT 5 OF 8	11	1,760	0	7,535	0	0
ILLUMINATION LAYOUT 6 OF 8	11	2,440	60	7,850	2	1
ILLUMINATION LAYOUT 7 OF 8	11	1,980	0	6,165	0	0
ILLUMINATION LAYOUT 8 OF 8	5	1,100	0	3,425	0	0
TOTAL	64	12,210	180	41,480	6	3

US 62 MED CONCRETE TRAFFIC BARRIER

GENERAL

SUMMARY OF QUANTITIES

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CONT	SECT	JOB	HIGHWAY
0233	02	035	US0062
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		10

DATE: 05/12/2021 06:15 PM
FILE: TxDOT_Sheets_XM.cel

(0233-02-035) SUMMARY OF DRAINAGE ITEMS:

SHEET	ROADWAY	STORM DRAIN SYSTEM	400 6001 STRUCT EXCAV	400 6008 CUT & RESTORE ASPH PAVING	401 6001 FLOWABLE BACKFILL	402 6001 TRENCH EXCAVATION PROTECTION	420 6009 CL A CONC (COLLAR)	464 6003 RC PIPE (CL III) (18 IN)	464 6005 RC PIPE (CL III) (24 IN)	**465 6237 INLET (RAIL & GRATE) (TY II)	**465 6335 INLET UNDER RAIL (CIP) (COMPL)	466 6003 HEADWALL (CH - FW - O) (DIA= 18 IN)	496 6002 REMOV STR (INLET)	496 6003 REMOV STR (MANHOLE)
			CY	SY	CY	LF	EA	LF	LF	EA	EA	EA	EA	EA
1	US62/180	SYSTEM A	8		4		5		20		3		2	1
2	US62/180	SYSTEM B	14		6		7		32		4		3	1
3	US62/180	SYSTEM C	24		11		7	45	24	1	3		3	1
4	US62/180	SYSTEM D	9		4		3		21		2		1	1
5	US62/180	SYSTEM E	144	13	66			486		2		1		
6	US62/180	SYSTEM F	12		5		7		28		4		3	1
7	US62/180	SYSTEM G												
8	US62/180	SYSTEM G	18		8		5	31	20	1	2		3	
9	US62/180	SYSTEM H	83	12	38	32		278		2		1		
10	US62/180	SYSTEM I	12		5		7		28		4		3	1
11	US62/180	SYSTEM J	42		19		9	98	30	1	4		2	1
12	US62/180	SYSTEM K	8		3		5		18		3		1	1
		TOTAL CSJ: 0233-02-035	374	25	169	32	55	938	221	7	29	2	21	8

NOTES:

(**) INLET PAY ITEM NUMBERS ARE EQUIVALENT TO ALL PLAN CALL OUTS FOR INLETS AS FOLLOWS:

0465-6237 INLET (RAIL & GRATE) (TY II) = INLET (COMPL) (CGI) (TY SS)

0465-6335 INLET UNDER RAIL (CIP) (COMPL) = INLET (COMPL) (CGI) (TY SS) (MOD)

ANY REFERENCE TO THESE INLETS MUST BE PAID UNDER THE PAY ITEMS DESCRIBED ON THE SUMMARY SHEET.

(0233-02-035) SUMMARY OF DRAINAGE ITEMS:

SHEET	ROADWAY	STATION RANGE	104 6021 REMOVING CONC (CURB)	420 6011 CL B CONC (FLUME)	496 6018 REMOVE STR (CONC)	529 6002 CONC CURB (TY II)
			LF	CY	EA	LF
1	US62/180	BEGIN TO 10+00				
2	US62/180	10+00 TO 22+00	60	4	3	204
3	US62/180	22+00 TO 34+00	20	4	1	887
4	US62/180	34+00 TO 46+00	30	4	4	
5	US62/180	46+00 TO 58+00	25	3	2	
6	US62/180	58+00 TO 70+00	10	4	3	
7	US62/180	70+00 TO 82+00	15	3	2	
8	US62/180	82+00 TO 94+00	5	5	1	825
9	US62/180	94+00 TO 106+00		2		1662
10	US62/180	106+00 TO 118+00	15	2	1	200
11	US62/180	118+00 TO 130+00	10	5		1620
12	US62/180	130+00 TO 142+00		1		2375
13	US62/180	142+00 TO 154+00		1		1546
14	US62/180	154+00 TO 166+00	5	4		1390
15	US62/180	166+00 TO 178+00	5	3	2	514
16	US62/180	178+00 TO 190+00		5	4	
17	US62/180	190+00 TO END	30	5		
18	US62/180	END EXTENSION				
		TOTAL CSJ: 0233-02-035	230	55	23	11223

NO.	REVISION	BY	DATE

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

Texas Department of Transportation © 2021

US 62/180
SUMMARY OF QUANTITIES

SHEET 3 OF 3

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.
CHECKED:	6	TEXAS	F 2021 (690)		US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No. / SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035, ETC. / 11

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LOC NO.	TCP PHASE	PLAN SHEET NUMBER	LOCATION	STA	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION									
															MOVE / RESET		L	L	R	R	S	S
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE/ RESET	FROM LOC.#	N	W	N	W	N	W
#1		#	US 62 CONCRETE TRAFFIC BARRIER MEDIAN	15+00.00	TL-3	UNI							1				x					
#2		#	US 62 CONCRETE TRAFFIC BARRIER MEDIAN	77+59.44	TL-3	UNI							1				x					
#3		#	US 62 CONCRETE TRAFFIC BARRIER MEDIAN	78+72.01	TL-3	UNI							1				x					
#4		#	US 62 CONCRETE TRAFFIC BARRIER MEDIAN	153+98.00	TL-3	UNI							1				x					
#5		#	US 62 CONCRETE TRAFFIC BARRIER MEDIAN	155+66.00	TL-3	UNI							1				x					
#6		#	US 62 CONCRETE TRAFFIC BARRIER MEDIAN	188+60.00	TL-3	UNI							1				x					
#1	PHASE 1	#	US 62 EASTBOUND	STA.10+00	TL-3	UNI							1		1						x	
#2	PHASE 1	#	US 62 WESTBOUND	STA. 70+00	TL-3	UNI							1		1						x	
#3	PHASE 2	#	US 62 EASTBOUND	STA. 52+00	TL-3	UNI									1						x	
#4	PHASE 2	#	US 62 WESTBOUND	STA. 105+00	TL-3	UNI									1						x	
#5	PHASE 3 STAGE 1	#	US 62 EASTBOUND	STA. 99+00	TL-3	UNI									1						x	
#6	PHASE 3 STAGE 1	#	US 62 WESTBOUND	STA. 193+60	TL-3	UNI									1						x	
#7	PHASE 3 STAGE 2	#	US 62 EASTBOUND	STA. 95+00	TL-3	UNI								1							x	
#8	**PHASE 3 STAGE 2**	#	US 62 WESTBOUND	STA. 193+00	TL-3	UNI								1							x	
												TOTALS										

LEGEND:
L=LOW MAINTENANCE
R=REUSABLE
S=SACRIFICIAL
N=NARROW
W=WIDE

FOR DEFINITIONS SEE THE "CRASH CUSHION CATEGORIZATION CHART.PDF" AT THE DESIGN DIVISION (ROADWAY STANDARDS) WEBSITE. USE QUICK LINKS TO ACCESS ATTENUATORS / CRASH CUSHIONS SECTION.
http://www.dot.state.tx.us/insdtdot/orgchart/cmd/cserve/standard/rdwyise.htm

STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED
PROFESSIONAL ENGINEER

06/03/2021

CRASH CUSHION SUMMARY SHEET

FILE: ccss.dgn	DN: TxDOT	CK:		CK:
© TxDOT ©2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	02	035,etc	US 62
	DIST	COUNTY		
	ELP	CULBERSON		
	FEDERAL AID PROJECT			SHEET NO.
	F 2021(690)			12

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DATE: 6/2/2021
FILE: pw:\\txdot.projectwiseonline.com:TXDOT5\Documents\24 - ELP\Design Projects\0233020235\4 - Design\Plan Set\9. Environmental\US62CUL_ENV_EPIC.dgn

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

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

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

1.

2.

☐ No Action Required ☒ Required Action

Action No.

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

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

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

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

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

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

1.

2.

3.

4.

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

Best Management Practices:

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

III. CULTURAL RESOURCES

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

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

IV. VEGETATION RESOURCES

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

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

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

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

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

LIST OF ABBREVIATIONS

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

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):
Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:
* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

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

☐ Yes ☒ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

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

☐ Yes ☒ No

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

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

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

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

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

VII. OTHER ENVIRONMENTAL ISSUES

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

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED PROFESSIONAL ENGINEER

06/03/2021

Texas Department of Transportation — Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-12-2011 (DS)	0233	02	035,etc	US 62
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.	ELP	CULBERSON		13

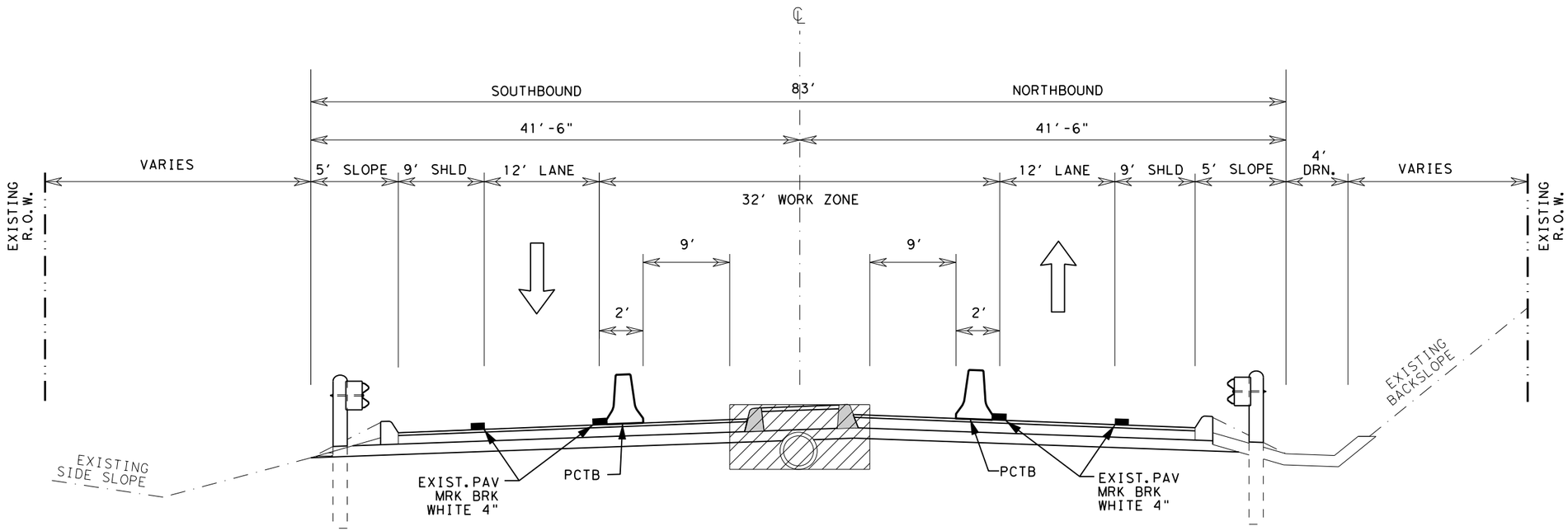
TCP SELECTION TABLE

TYPE OF WORK	STANDARD SHEET	SHEET DESCRIPTION	SHEET DIAGRAM	SUGGESTED USE
INSTALLATION OF PERMANENT CONCRETE BARRIER	TCP(2-5)-18	TCP LONG TERM CLOSURES MULTILANE CONVENTIONAL RDS.	TCP(2-5a)	ONE LANE CLOSURE TO KEEP TRAFFIC AWAY FROM WORK AREA

NOTES:

1. APPLY TRAFFIC CONTROL PLAN SETUP AS DESCRIBED IN THE TCP SELECTION TABLE, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
2. COORDINATE WITH ONGOING CONSTRUCTION PROJECTS PRIOR TO SETTING UP LANE CLOSURES AND BEGINNING WORK.

LEGEND:	
	WORK ZONE



TCP TYPICAL SECTION PHASE 1, PHASE 2
PHASE 3 STAGE 2

US 62
STA 14+66.00 TO STA 188+88.40

STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED
PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER
TRAFFIC CONTROL

TCP TYPICAL SECTION PHASE 1,2,3 STAGE 2

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		14

DATE: 6/2/2021 8:12:35 PM
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CK: | DW: | CK: | DN:

TCP SELECTION TABLE

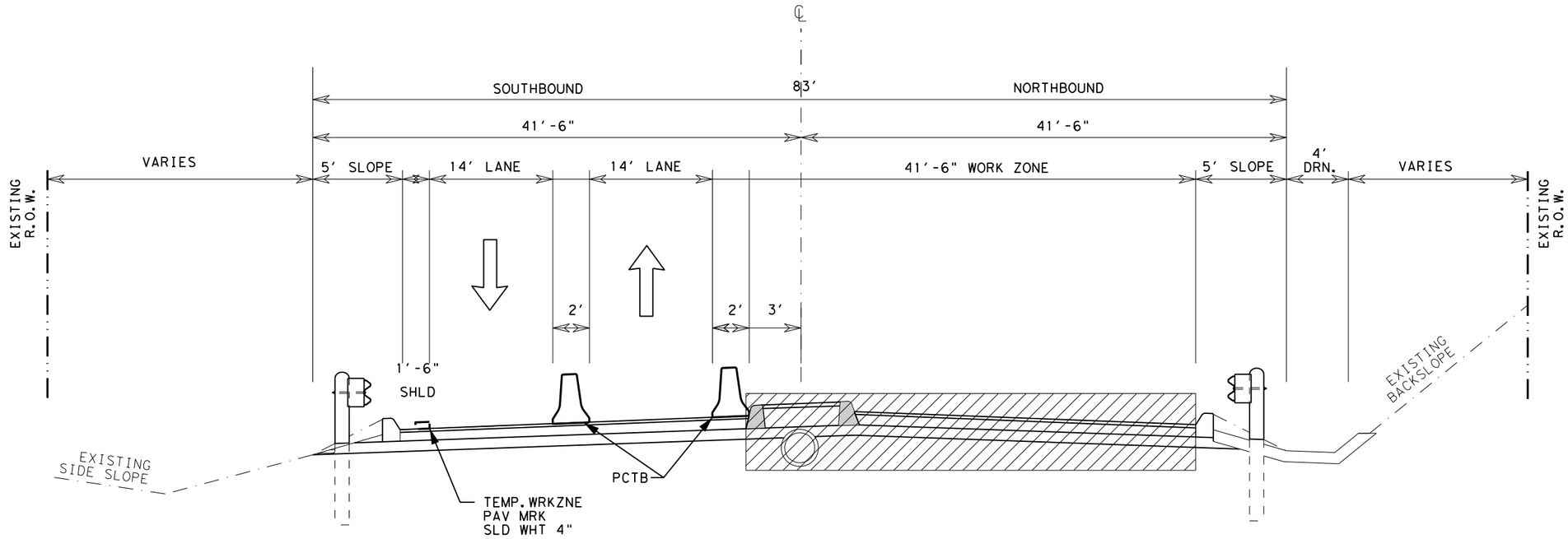
TYPE OF WORK	STANDARD SHEET	SHEET DESCRIPTION	SHEET DIAGRAM	SUGGESTED USE
INSTALLATION OF PERMANENT CONCRETE BARRIER	TCP(2-5)-18	TCP LONG TERM CLOSURES MULTILANE CONVENTIONAL RDS.	TCP(2-5b)	TWO LANES CLOSED TO KEEP TRAFFIC AWAY FROM WORK AREA

NOTES:

1. APPLY TRAFFIC CONTROL PLAN SETUP AS DESCRIBED IN THE TCP SELECTION TABLE, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
2. COORDINATE WITH ONGOING CONSTRUCTION PROJECTS PRIOR TO SETTING UP LANE CLOSURES AND BEGINNING WORK.

LEGEND:

	WORK ZONE



TCP TYPICAL SECTION PHASE 3 STAGE 2

US 62
STA 100+00.00 TO STA 189+00.00

STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER
TITLE

TCP TYPICAL SECTION PHASE 3 STAGE 1

SHEET 2 OF 2

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		15

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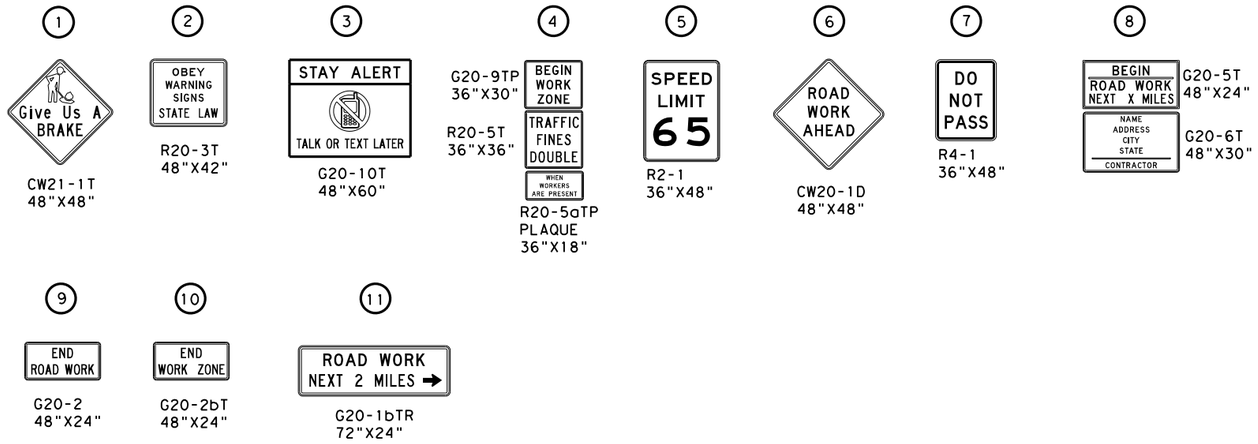
DN: DW: CK: CK:

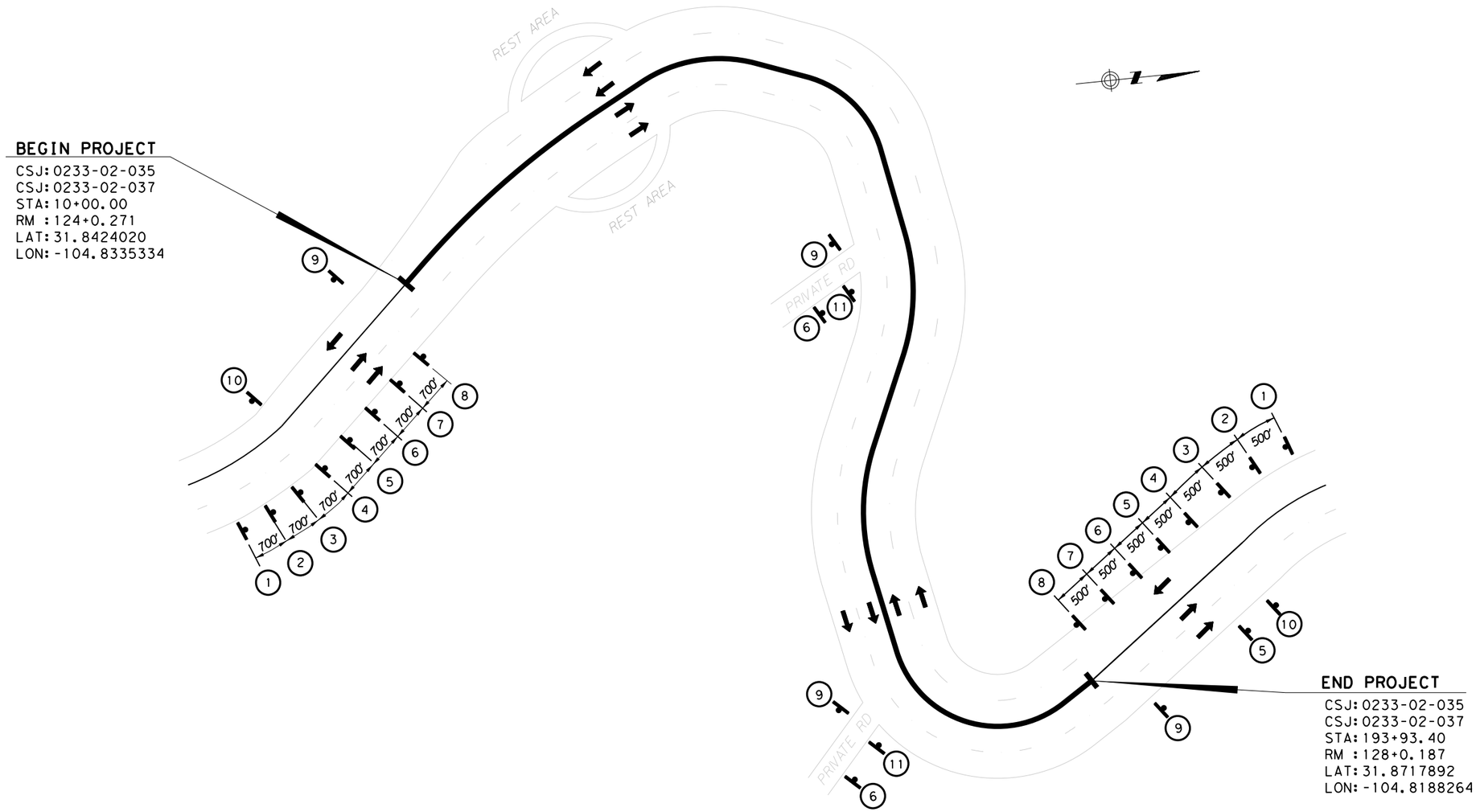


NOTES:

1. PLACE PROJECT LIMIT SIGNS AT LOCATIONS SHOWN AS FIELD CONDITIONS PERMIT. SIGNS WILL REMAIN FOR THE DURATION OF THE PROJECT OR AS DIRECTED.
2. COVER OR REMOVE ANY EXISTING SIGNS WHICH ARE IN CONFLICT WITH ANY CONSTRUCTION SIGNS.
3. FOR "X" DISTANCE REFER TO BC STANDARDS FOR MINIMUM SPACING OF CONSTRUCTION WARNING AND CROSSROAD SIGNS.
4. SEE WZ (BRK)-13 STANDARD FOR "GIVE US A BRAKE" SIGN INFORMATION.
5. PROVIDE AND MAINTAIN ALL BARRICADES, WARNING SIGNS, FLASHING LIGHTS AND TRAFFIC CONTROL DEVICES IN CONFORMANCE WITH TXDOT BC AND TCP STANDARDS, AND THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

LEGEND

- CONSTRUCTION WARNING SIGN
- TRAFFIC FLOW



STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED
PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC CONTROL

TRAFFIC CONTROL PLAN LINE DIAGRAM

NOT TO SCALE SHEET 1 OF 1

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		16

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SEQUENCE OF WORK

GENERAL

CONSULT TRAFFIC CONTROL PLAN TYPICAL SECTIONS FOR ROADWAY WIDTHS.

FOR TRAFFIC CONTROL QUANTITIES SEE SUMMARY OF QUANTITIES

PHASE I PERMANENT CONCRETE BARRIER, PAVEMENT MARKINGS & DRAINAGE

1. INSTALL TRAFFIC CONTROL DEVICES PER APPLICABLE TCP STANDARD FOR THE SPECIFIC CONSTRUCTION OPERATION
2. INSTALL APPLICABLE SWP3 ITEMS AS SHOWN IN PLANS OR AS DIRECTED BY THE ENGINEER.
3. BETWEEN STATIONS 11+00 AND 63+00 REMOVE RAISED CONCRETE MEDIAN, ASPHALT, STABLIZED BASE, AND YELLOW SHOULDER PAVEMENT MARKINGS AS PER PLANS.
4. INSTALL PROPOSED DRAINAGE IMPROVEMENTS WITHIN PHASE ONE LIMITS AS PER PLANS, STANDARDS, AND SPECIFICATIONS.
5. INSTALL DRILL SHAFT FOR ILLUMINATION, CONDUIT AND CONDUCTOR, AND GROUND BOXES AS PER PLANS, STANDARDS, AND SPECIFICATIONS.
6. INSTALL STABILIZED BASE AND PERMINANT CONCRETE BARRIER AS PER PLANS, STANDARDS, AND SPECIFICATIONS.
7. INSTALL ILLUMINATION ASSEMBLIES AS PER PLANS, STANDARDS AND SPECIFICATIONS.
8. INSTALL PROPOSED ASPHALT AND INSIDE YELLOW PAVMENT MARKING AS PER PLANS, STANDARDS, AND SPECS.
9. UPON COMPLETION OF CONSTRUCTION PHASE, CLEANUP PHASE ONE PROJECT LIMIT AND REMOVE TRAFFIC CONTROL DEVICES FOLLOWING ACCEPTANCE OF THE JOB.
10. AFTER COMPLETION, REMOVAL OF ALL REMAINING EXISTING PAVEMENT MARKINGS WITHIN CONSTRUCTION PHASE MAY COMMENCE. REMOVAL AND PLACEMENT SHALL BE A MOBILE OPERATION UTILIZING TCP (3-3)-14. WORK TO BE DONE DURING NON-PEAK HOURS, NIGHT WORK IS AUTHORIZED AT THE DISCRETION OF THE AREA ENGINEER.

PHASE II PERMANENT CONCRETE BARRIER, PAVEMENT MARKINGS & DRAINAGE

1. INSTALL TRAFFIC CONTROL DEVICES PER APPLICABLE TCP STANDARD FOR THE SPECIFIC CONSTRUCTION OPERATION
2. INSTALL APPLICABLE SWP3 ITEMS AS SHOWN IN PLANS OR AS DIRECTED BY THE ENGINEER.
3. BETWEEN STATIONS 63+00 AND 100+00 REMOVE RAISED CONCRETE MEDIAN, ASPHALT, STABLIZED BASE, AND YELLOW SHOULDER PAVEMENT MARKINGS AS PER PLANS.
4. INSTALL PROPOSED DRAINAGE IMPROVEMENTS WITHIN PHASE TWO LIMITS AS PER PLANS, STANDARDS, AND SPECIFICATIONS.
5. INSTALL DRILL SHAFT FOR ILLUMINATION, CONDUIT AND CONDUCTOR, AND GROUND BOXES AS PER PLANS, STANDARDS, AND SPECIFICATIONS.
6. INSTALL STABILIZED BASE AND PERMINANT CONCRETE BARRIER AS PER PLANS, STANDARDS, AND SPECIFICATIONS.
7. INSTALL ILLUMINATION ASSEMBLIES AS PER PLANS, STANDARDS AND SPECIFICATIONS.
8. INSTALL PROPOSED ASPHALT AND INSIDE YELLOW PAVMENT MARKING AS PER PLANS, STANDARDS, AND SPECS.
9. UPON COMPLETION OF CONSTRUCTION PHASE, CLEANUP PHASE TWO PROJECT LIMIT AND REMOVE TRAFFIC CONTROL DEVICES FOLLOWING ACCEPTANCE OF THE JOB.
10. AFTER COMPLETION, REMOVAL OF ALL REMAINING EXISTING PAVEMENT MARKINGS WITHIN CONSTRUCTION PHASE MAY COMMENCE. REMOVAL AND PLACEMENT SHALL BE A MOBILE OPERATION UTILIZING TCP (3-3)-14. WORK TO BE DONE DURING NON-PEAK HOURS, NIGHT WORK IS AUTHORIZED AT THE DISCRETION OF THE AREA ENGINEER.

PHASE III STAGE 1 DRAINAGE OUTFALLS, PAVEMENT MARKINGS

1. INSTALL TRAFFIC CONTROL DEVICES PER APPLICABLE TCP STANDARD FOR THE SPECIFIC CONSTRUCTION OPERATION
2. INSTALL APPLICABLE SWP3 ITEMS AS SHOWN IN PLANS OR AS DIRECTED BY THE ENGINEER.
3. BETWEEN STATIONS 100+00 AND 189+00 REMOVE RAISED CONCRETE MEDIAN, ASPHALT, STABLIZED BASE, AND PAVEMENT MARKINGS AS PER PLANS.
4. INSTALL PROPOSED DRAINAGE OUTFALLS WITHIN PHASE THREE LIMITS AS PER PLANS, STANDARDS, AND SPECIFICATIONS.
5. INSTALL STABILIZED BASE AS PER PLANS, STANDARDS, AND SPECIFICATIONS.
6. INSTALL PROPOSED ASPHALT AND ALL NORTHBOUND PAVMENT MARKING AS PER PLANS, STANDARDS, AND SPECS.
8. UPON COMPLETION OF CONSTRUCTION PHASE, CLEANUP PHASE THREE PROJECT LIMIT AND REMOVE TRAFFIC CONTROL DEVICES FOLLOWING ACCEPTANCE OF THE JOB.
7. AFTER COMPLETION, REMOVAL OF ALL REMAINING EXISTING PAVEMENT MARKINGS WITHIN CONSTRUCTION PHASE MAY COMMENCE. REMOVAL AND PLACEMENT SHALL BE A MOBILE OPERATION UTILIZING TCP (3-3)-14. WORK TO BE DONE DURING NON-PEAK HOURS, NIGHT WORK IS AUTHORIZED AT THE DISCRETION OF THE AREA ENGINEER.

PHASE III STAGE 2 PERMANENT CONCRETE BARRIER, PAVEMENT MARKINGS & DRAINAGE

1. INSTALL TRAFFIC CONTROL DEVICES PER APPLICABLE TCP STANDARD FOR THE SPECIFIC CONSTRUCTION OPERATION
2. INSTALL APPLICABLE SWP3 ITEMS AS SHOWN IN PLANS OR AS DIRECTED BY THE ENGINEER.
3. BETWEEN STATIONS 100+00 AND 189+00 REMOVE RAISED CONCRETE MEDIAN, ASPHALT, STABLIZED BASE, AND PAVEMENT MARKINGS AS PER PLANS.
4. INSTALL PROPOSED DRAINAGE IMPROVEMENTS WITHIN PHASE THREE LIMITS AS PER PLANS, STANDARDS, AND SPECIFICATIONS.
5. INSTALL DRILL SHAFT FOR ILLUMINATION, CONDUIT AND CONDUCTOR, AND GROUND BOXES AS PER PLANS, STANDARDS, AND SPECIFICATIONS.
6. INSTALL STABILIZED BASE AND PERMINANT CONCRETE BARRIER AS PER PLANS, STANDARDS, AND SPECIFICATIONS.
7. INSTALL ILLUMINATION ASSEMBLIES AS PER PLANS, STANDARDS AND SPECIFICATIONS.
8. INSTALL PROPOSED ASPHALT AND ALL NORTHBOUND PAVMENT MARKING AS PER PLANS, STANDARDS, AND SPECS.
9. UPON COMPLETION OF CONSTRUCTION PHASE, CLEANUP PHASE THREE PROJECT LIMIT AND REMOVE TRAFFIC CONTROL DEVICES FOLLOWING ACCEPTANCE OF THE JOB.
10. AFTER COMPLETION, REMOVAL OF ALL REMAINING EXISTING PAVEMENT MARKINGS WITHIN CONSTRUCTION PHASE MAY COMMENCE. REMOVAL AND PLACEMENT SHALL BE A MOBILE OPERATION UTILIZING TCP (3-3)-14. WORK TO BE DONE DURING NON-PEAK HOURS, NIGHT WORK IS AUTHORIZED AT THE DISCRETION OF THE AREA ENGINEER.

PHASE 4 CONCRETE CURB CUTS FLUMES AND TRAFFIC ITEMS

1. INSTALL TRAFFIC CONTROL DEVICES PER APPLICABLE TCP STANDARD FOR THE SPECIFIC CONSTRUCTION OPERATION
2. INSTALL APPLICABLE SWP3 ITEMS AS SHOWN IN PLANS ORAS DIRECTED BY THE ENGINEER.
3. BETWEEN STATIONS 10+00 AND 189+00 MAKE CURB CUTS AND REMOVE FLUMES AS PER PLANS, SPECIFICATION AND STANDARDS.
4. INSTALL CURB AND FLUMES AS PER PLANS, SPECIFICATIONS AND STANDARDS.
5. INSTALL SIGNAGE, MBGF REFLECTORS AS PER PLANS, SPECIFICATIONS AND STANDARDS.

STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC CONTROL

TRAFFIC CONTROL PLAN SEQUENCE OF WORK

SHEET 1 OF 1

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CONT	SECT	JOB	HIGHWAY
0233	02	035, etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		17

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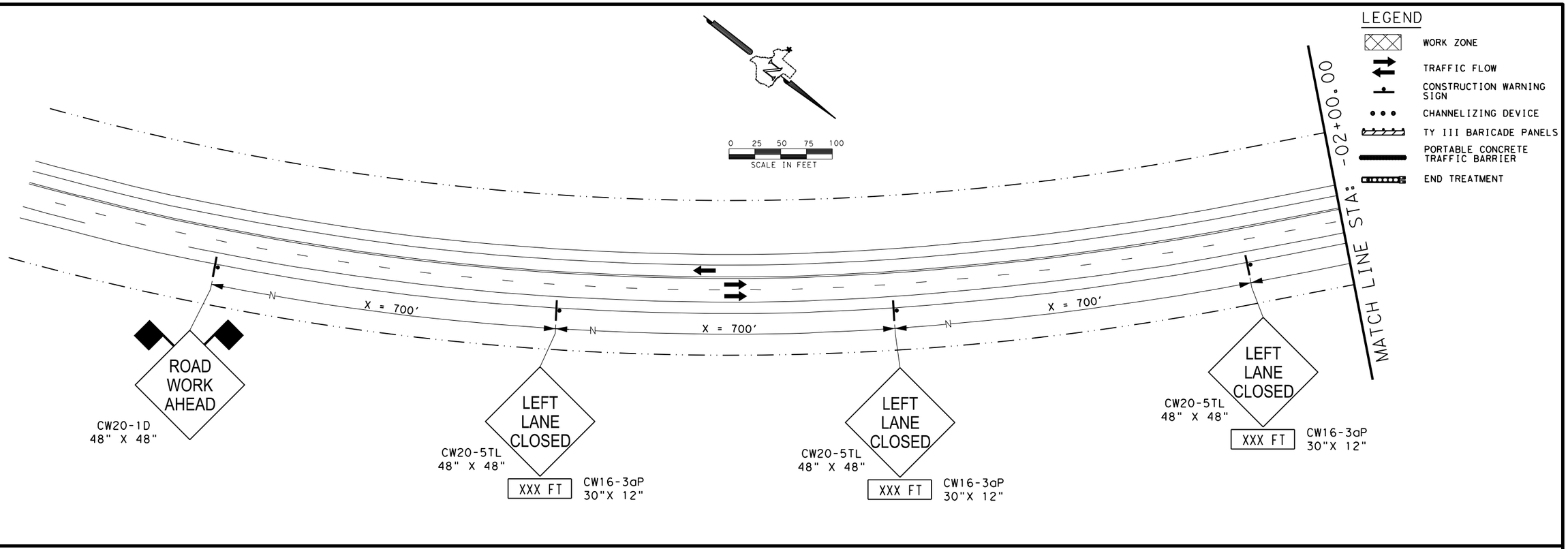
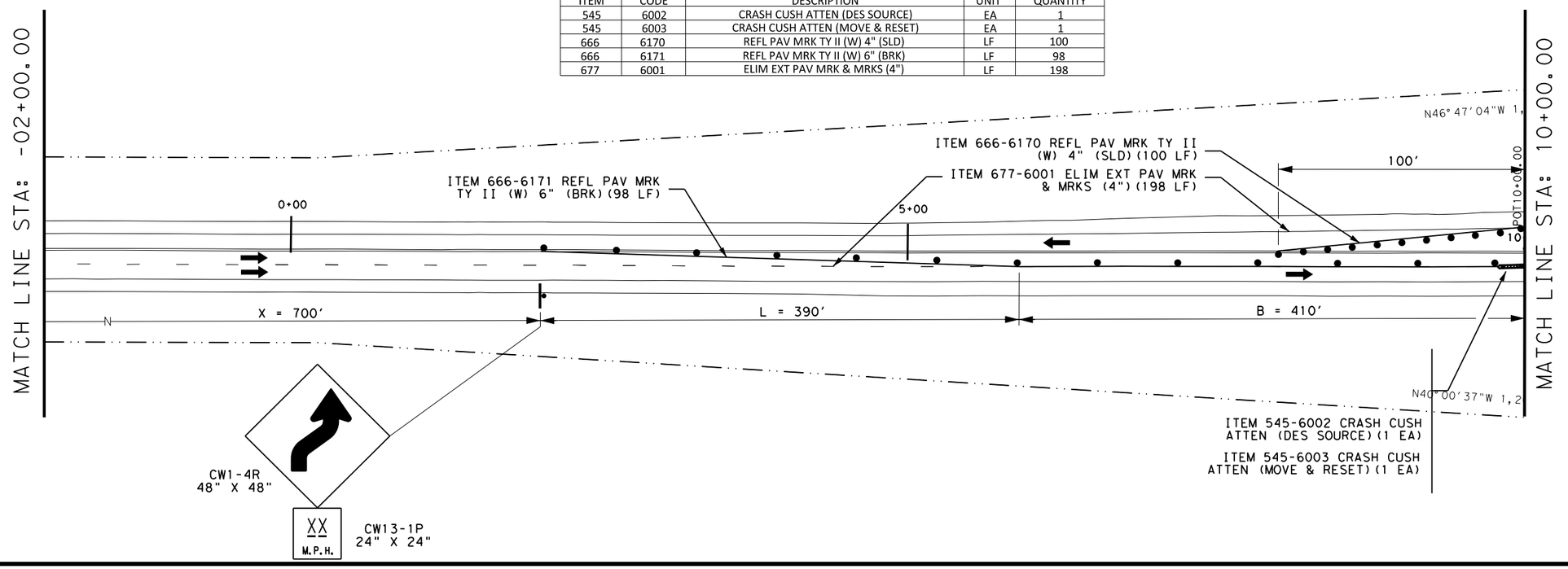


ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
545	6002	CRASH CUSH ATTEN (DES SOURCE)	EA	1
545	6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	1
666	6170	REFL PAV MRK TY II (W) 4" (SLD)	LF	100
666	6171	REFL PAV MRK TY II (W) 6" (BRK)	LF	98
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	198



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06/30/2021

US 62 MED CONCRETE TRAFFIC BARRIER
TRAFFIC CONTROL PLAN

TRAFFIC CONTROL PLAN PHASE 1

BEGIN PROJECT TO STA. 10+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		18

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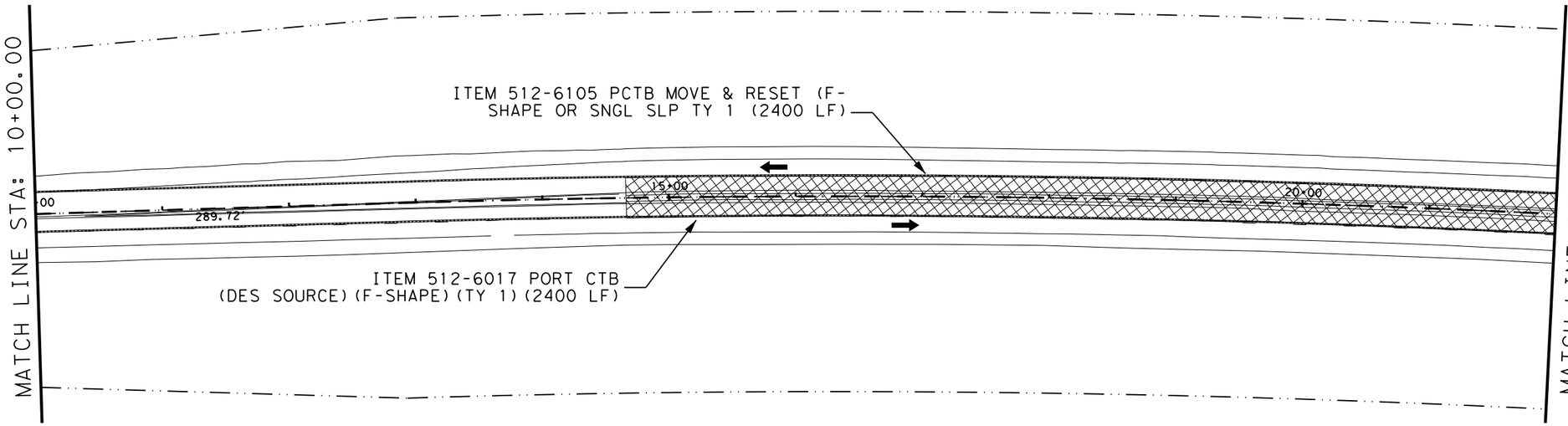
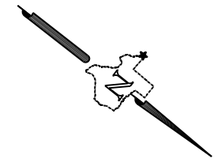


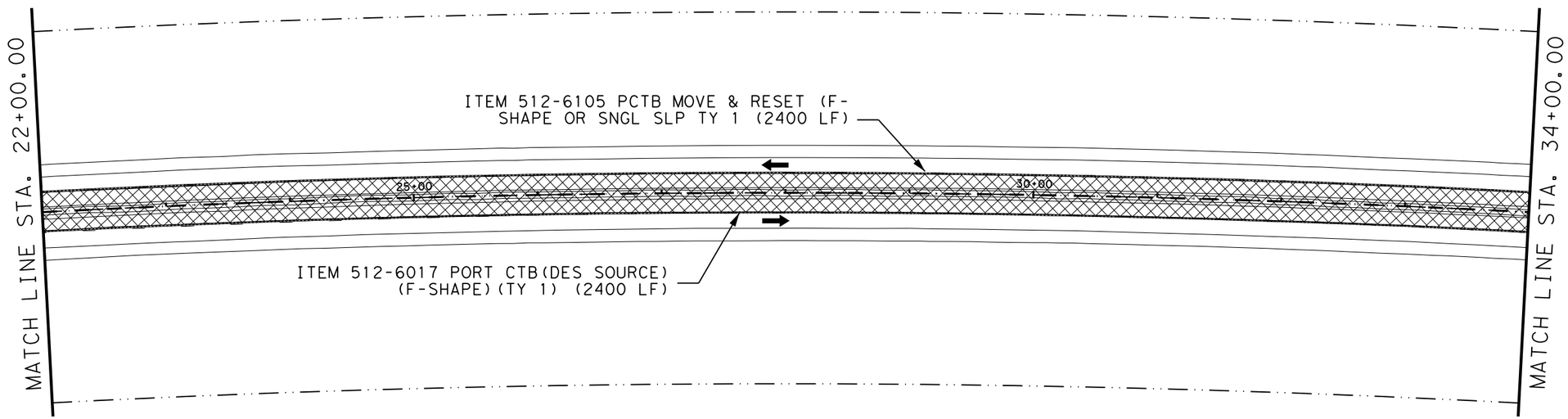
LEGEND

- WORK ZONE
- TRAFFIC FLOW
- CONSTRUCTION WARNING SIGN
- CHANNELIZING DEVICE
- TY III BARICADE PANELS
- PORTABLE CONCRETE TRAFFIC BARRIER
- END TREATMENT



0 25 50 75 100
SCALE IN FEET

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
512	6017	PORT CTB (DES SOURCE)(F-SHAPE)(TY 1)	LF	4800
512	6105	PCTB MOVE & RESET (F-SHAPE OR SNGL SLP TY 1	LF	4800



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06/30/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC CONTROL PLAN

TRAFFIC CONTROL PLAN PHASE 1

STA. 10+00.00 TO STA. 34+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		19

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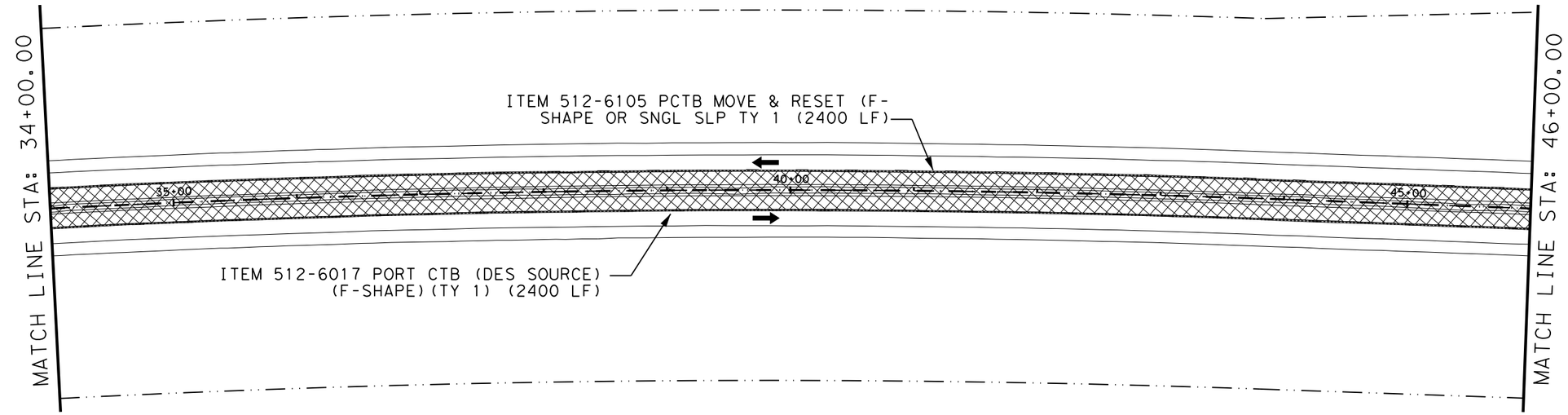
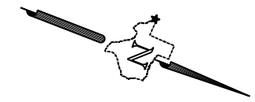


LEGEND

- WORK ZONE
- TRAFFIC FLOW
- CONSTRUCTION WARNING SIGN
- CHANNELIZING DEVICE
- TY III BARICADE PANELS
- PORTABLE CONCRETE TRAFFIC BARRIER
- END TREATMENT



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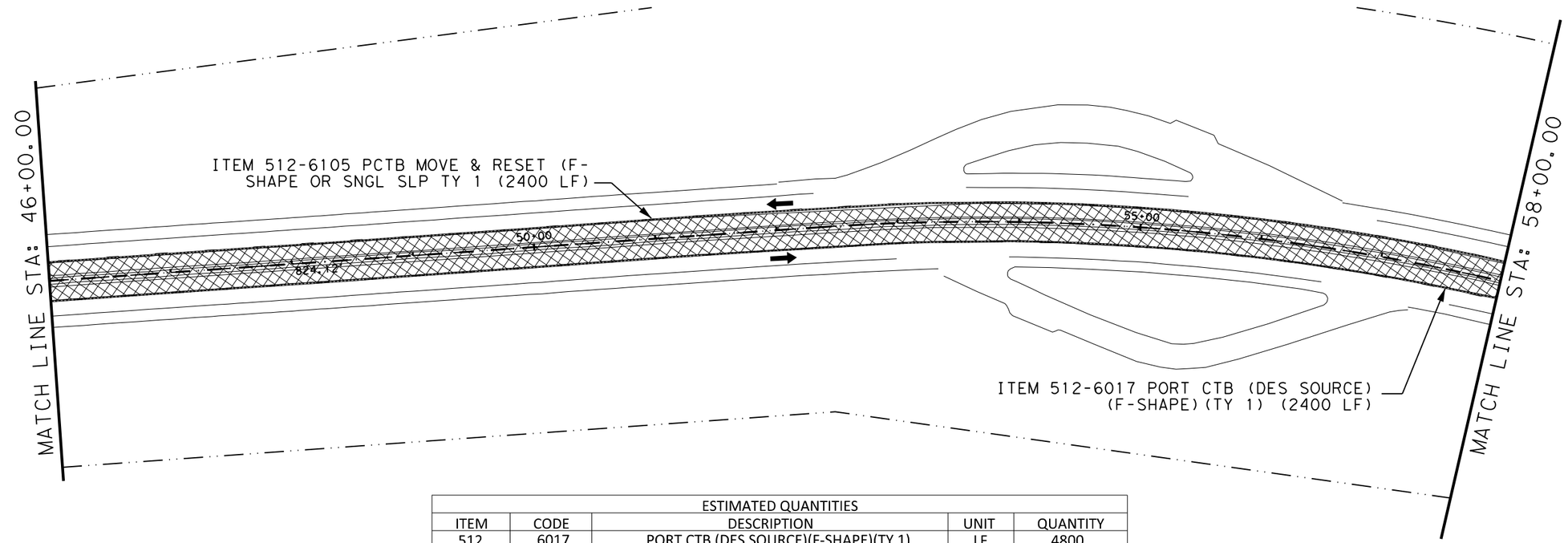
SCALE IN FEET



ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
512	6017	PORT CTB (DES SOURCE)(F-SHAPE)(TY 1)	LF	4800
512	6105	PCTB MOVE & RESET (F-SHAPE OR SNGL SLP TY 1	LF	4800

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US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC CONTROL PLAN

TRAFFIC CONTROL PLAN PHASE 1

STA. 34+00.00 TO STA. 58+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		20

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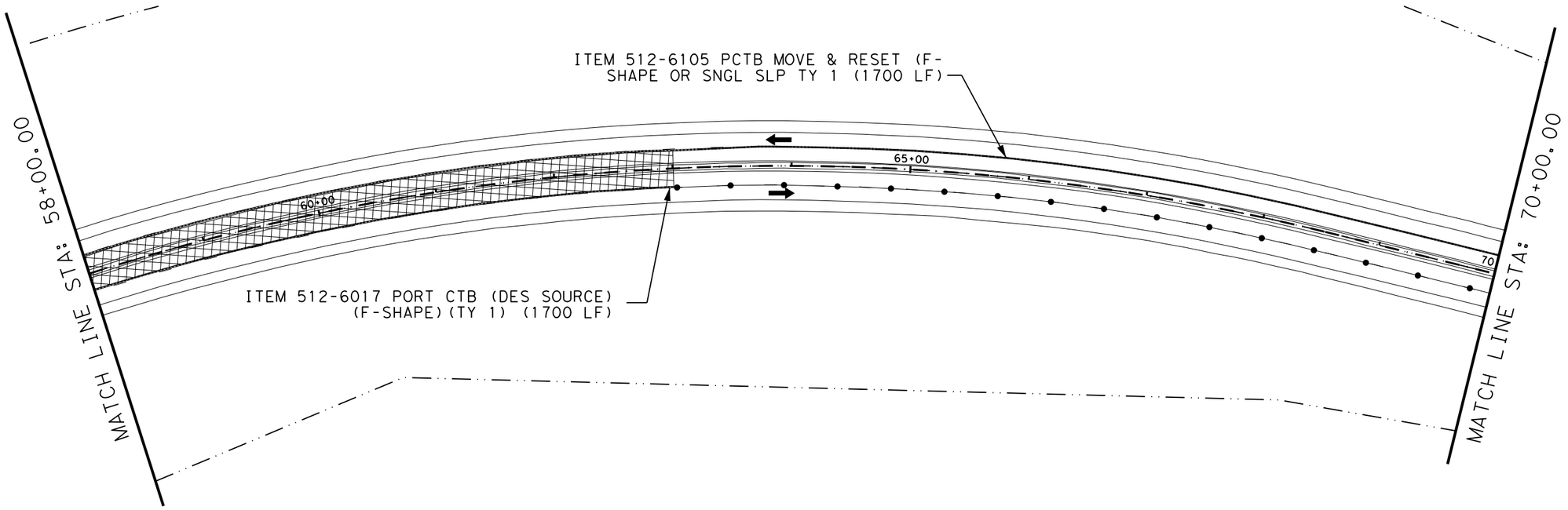
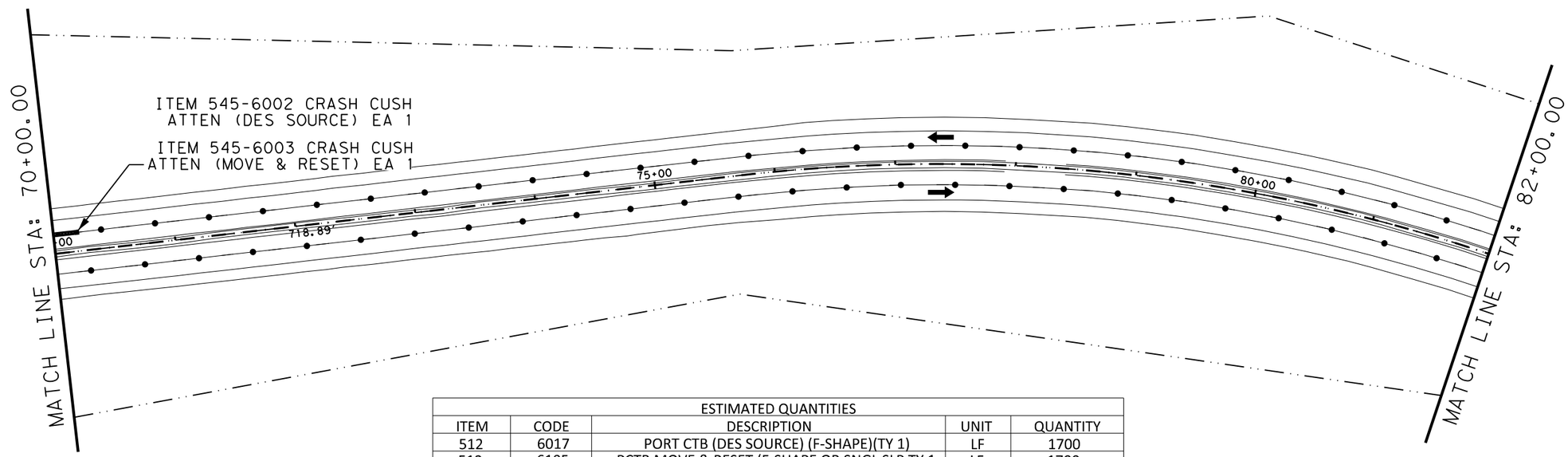


LEGEND

- WORK ZONE
- TRAFFIC FLOW
- CONSTRUCTION WARNING SIGN
- CHANNELIZING DEVICE
- TY III BARICADE PANELS
- PORTABLE CONCRETE TRAFFIC BARRIER
- END TREATMENT



ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
512	6017	PORT CTB (DES SOURCE) (F-SHAPE)(TY 1)	LF	1700
512	6105	PCTB MOVE & RESET (F-SHAPE OR SNGL SLP TY 1	LF	1700
545	6002	CRASH CUSH ATTEN (DES SOURCE)	EA	1
545	6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	1

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US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC CONTROL PLAN

TRAFFIC CONTROL PLAN PHASE 1

STA. 58+00.00 TO STA. 82+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		21

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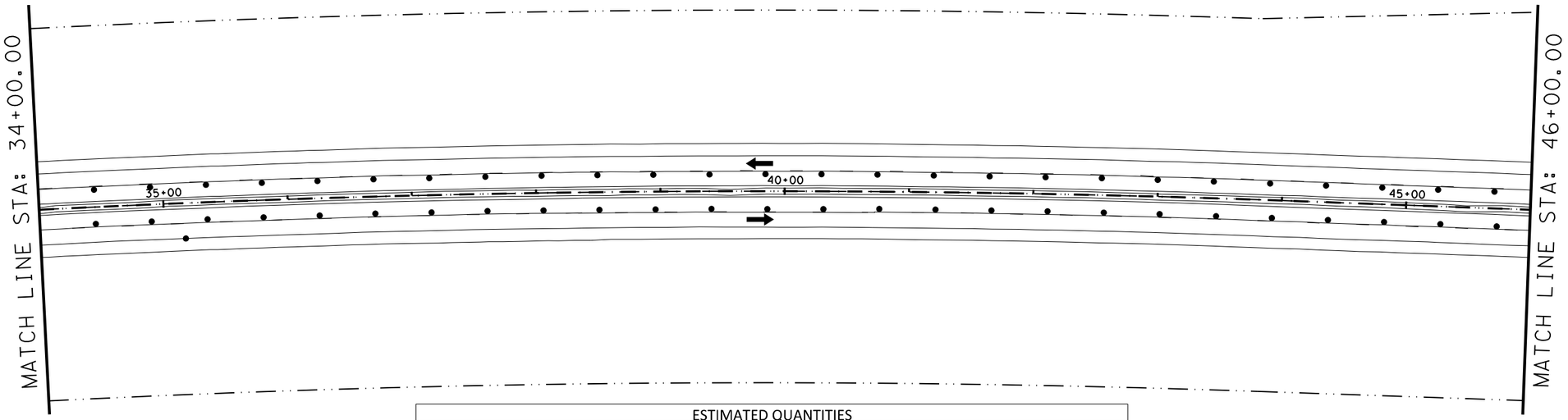


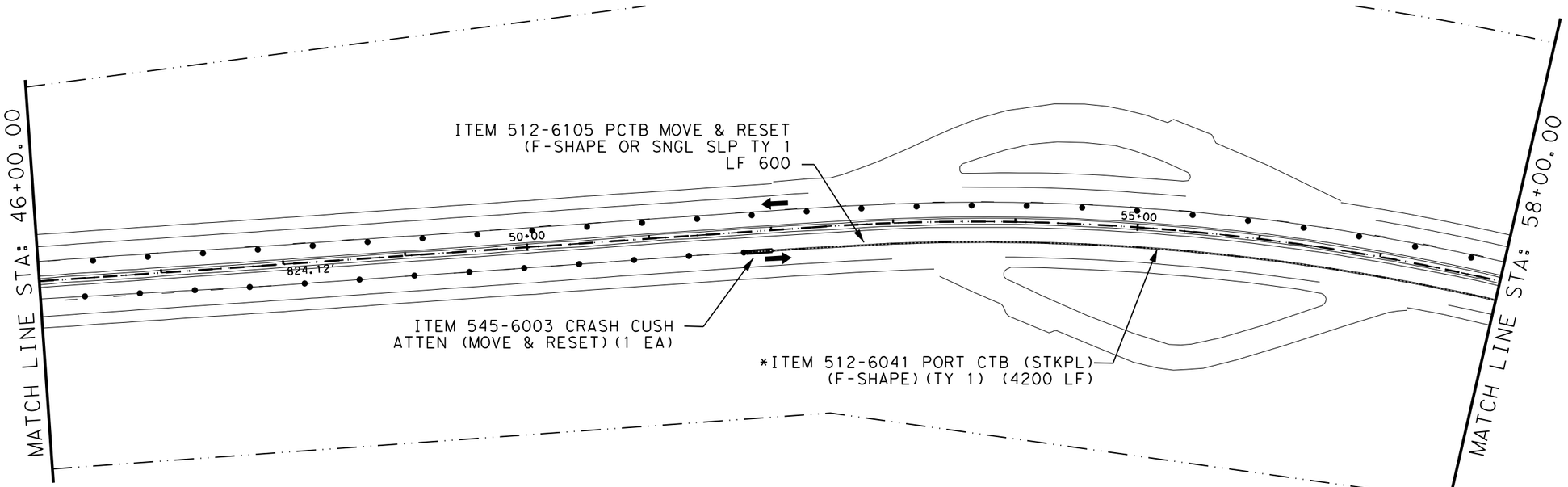
LEGEND

- WORK ZONE
- TRAFFIC FLOW
- CONSTRUCTION WARNING SIGN
- CHANNELIZING DEVICE
- TY III BARICADE PANELS
- PORTABLE CONCRETE TRAFFIC BARRIER
- END TREATMENT

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
* 512	6041	PORT CTB (STKPL)(F-SHAPE)(TY 1)	LF	4200
545	6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	1

* NOTE: THESE QUANTITIES ARE TO BE STOCK PILED AT THE PINE SPRINGS OFFICE

0 25 50 75 100
SCALE IN FEET



ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
512	6105	PCTB MOVE & RESET (F-SHAPE OR SNGL SLP TY 1	LF	600

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US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC CONTROL PLAN

TRAFFIC CONTROL PLAN PHASE 2

STA. 34+00.00 TO STA. 58+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		22

DATE: 6/30/2021 7:50:52 AM
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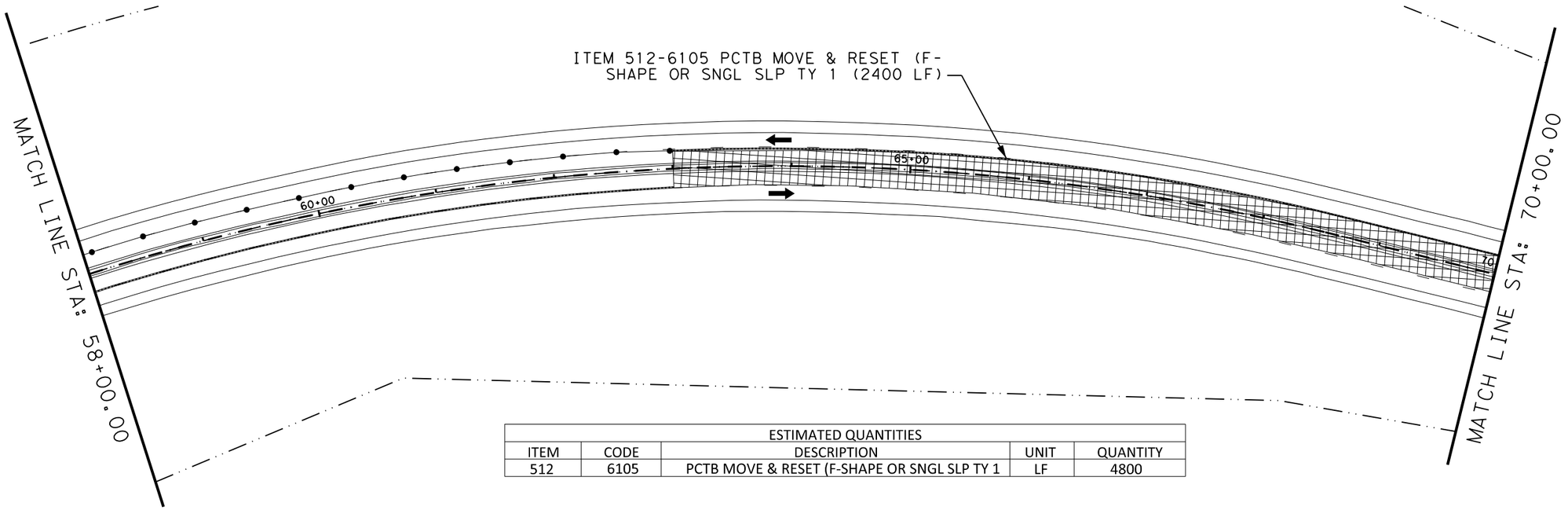
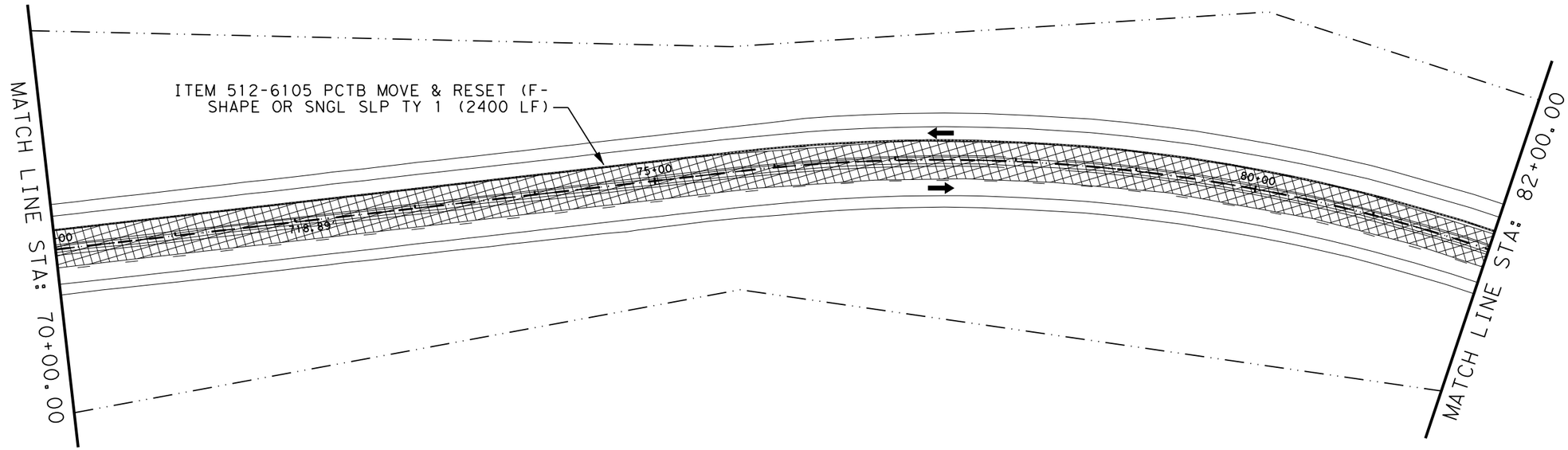


ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
512	6105	PCTB MOVE & RESET (F-SHAPE OR SNGL SLP TY 1	LF	4800

LEGEND

- WORK ZONE
- TRAFFIC FLOW
- CONSTRUCTION WARNING SIGN
- CHANNELIZING DEVICE
- TY III BARICADE PANELS
- PORTABLE CONCRETE TRAFFIC BARRIER
- END TREATMENT

0 25 50 75 100
SCALE IN FEET



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06/30/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC CONTROL PLAN

TRAFFIC CONTROL PLAN PHASE 2

STA. 58+00.00 TO STA. 82+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		23

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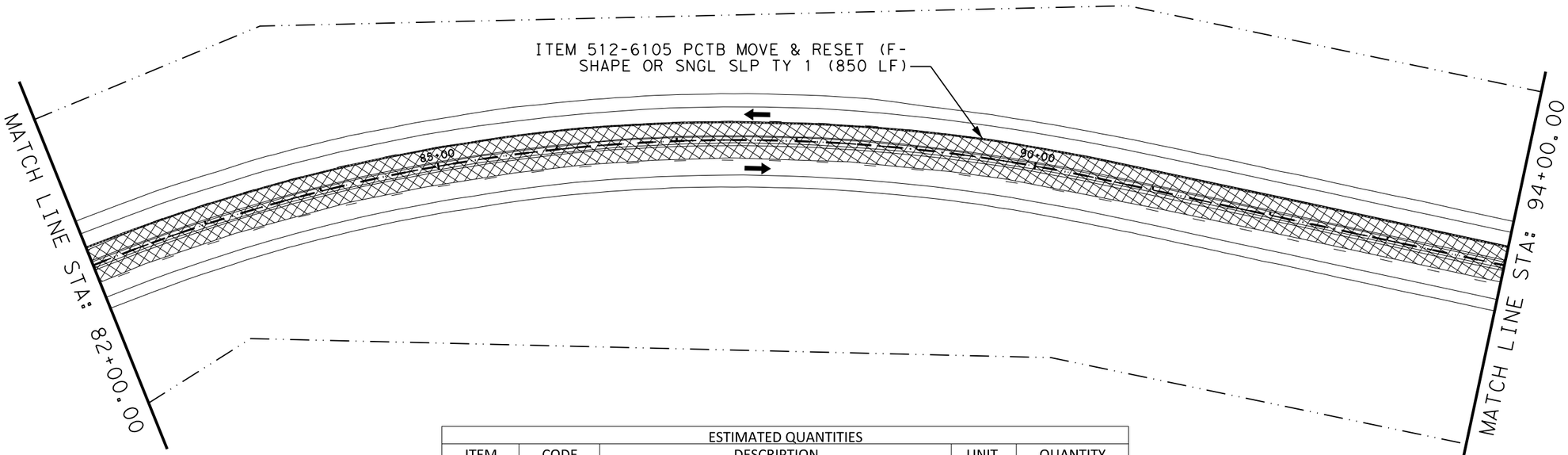
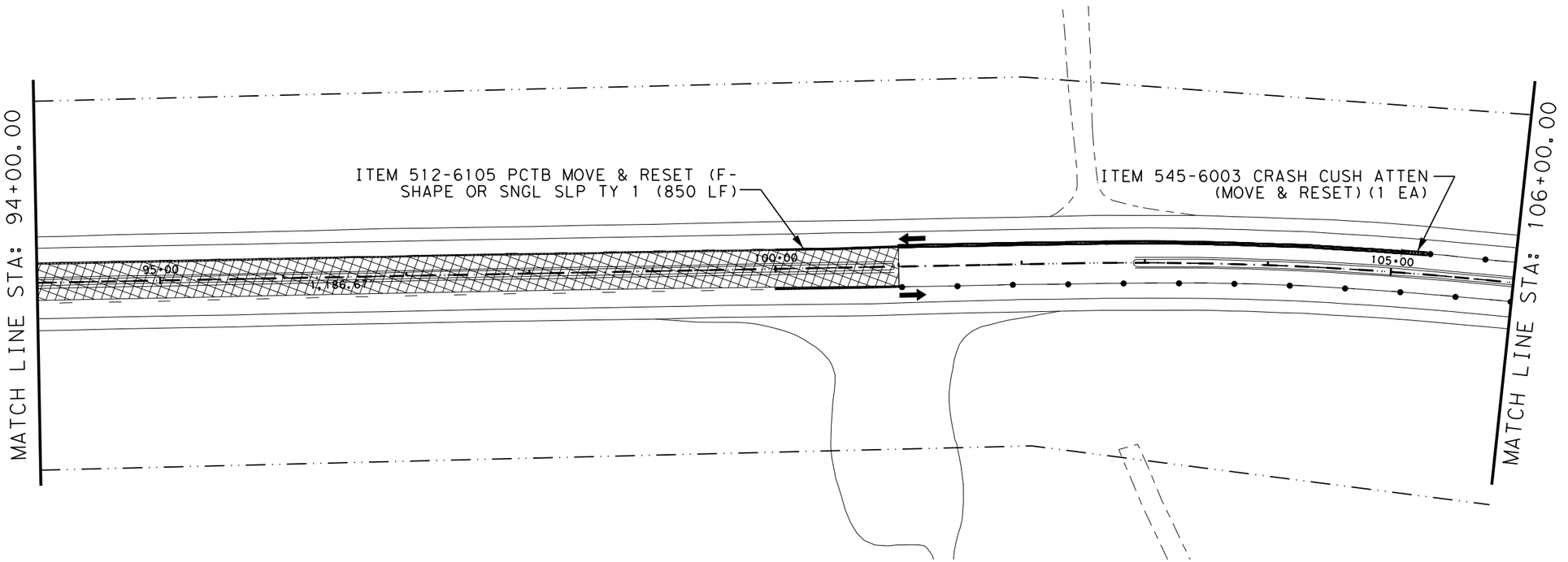


LEGEND

- WORK ZONE
- TRAFFIC FLOW
- CONSTRUCTION WARNING SIGN
- CHANNELIZING DEVICE
- TY III BARICADE PANELS
- PORTABLE CONCRETE TRAFFIC BARRIER
- END TREATMENT

0 25 50 75 100
SCALE IN FEET

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
512	6105	PCTB MOVE & RESET (F-SHAPE OR SNGL SLP TY 1	LF	1700
545	6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	1



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06/30/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC CONTROL PLAN

TRAFFIC CONTROL PLAN PHASE 2

STA. 82+00.00 TO STA. 106+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		24

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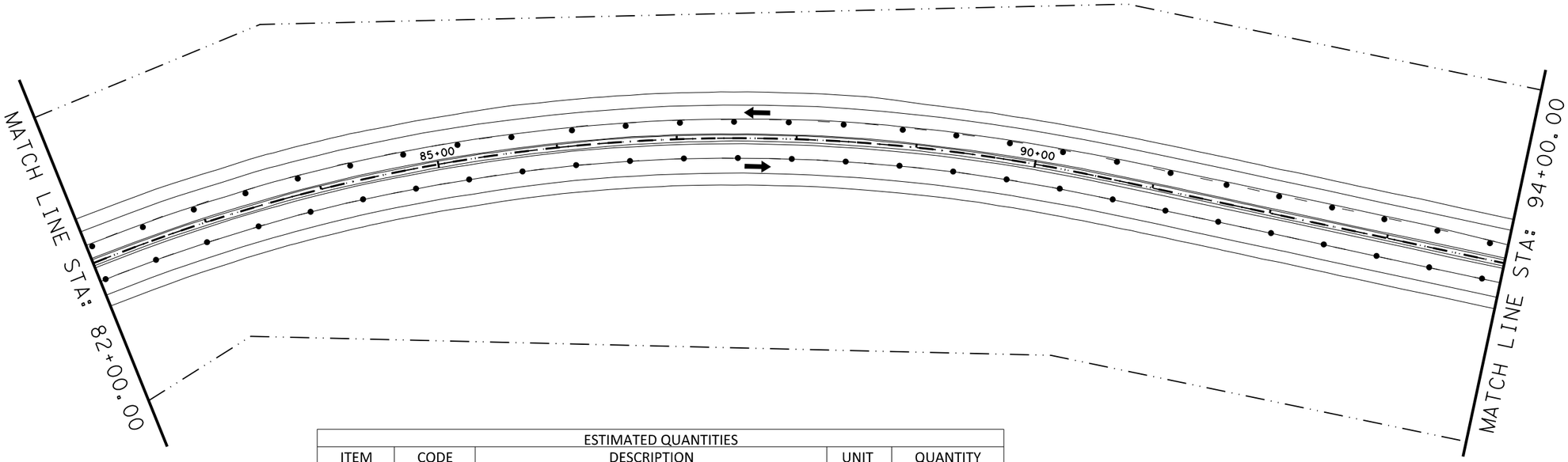
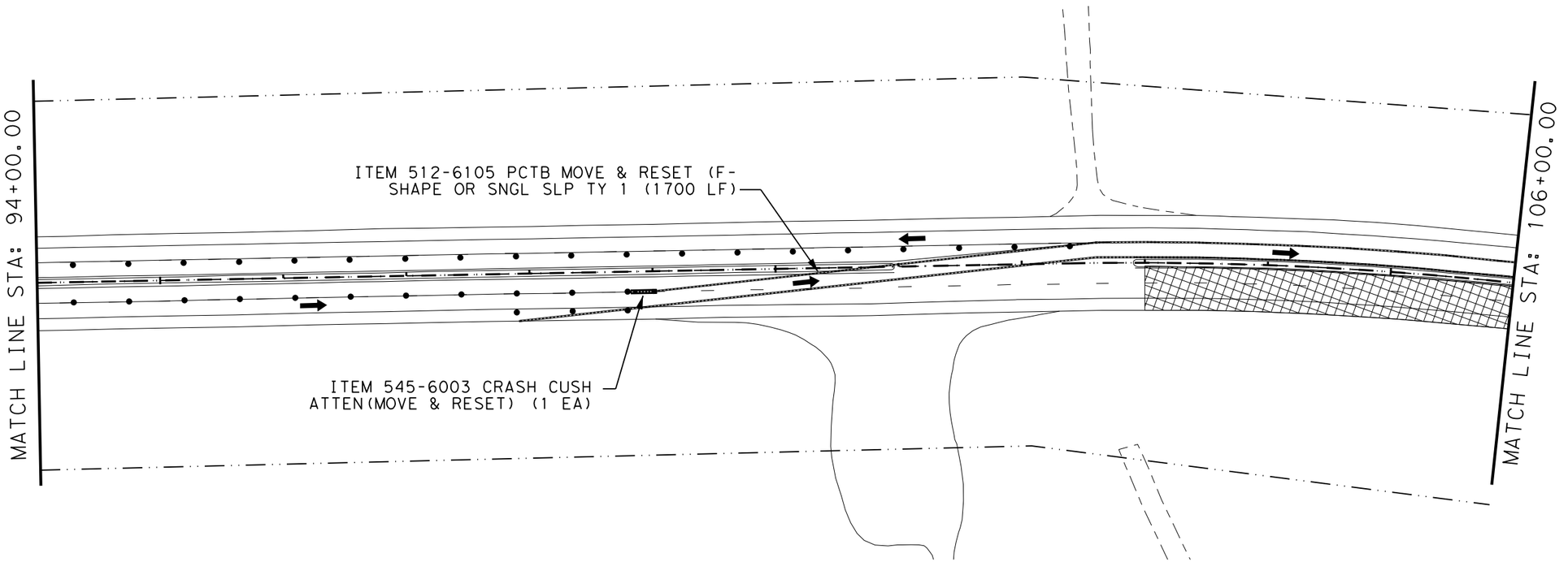


LEGEND

- WORK ZONE
- TRAFFIC FLOW
- CONSTRUCTION WARNING SIGN
- CHANNELIZING DEVICE
- TY III BARICADE PANELS
- PORTABLE CONCRETE TRAFFIC BARRIER
- END TREATMENT

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
512	6105	PCTB MOVE & RESET (F-SHAPE OR SNGL SLP TY 1	LF	1700
545	6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	1

0 25 50 75 100
SCALE IN FEET



STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED
PROFESSIONAL ENGINEER

06/30/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC CONTROL PLAN

TRAFFIC CONTROL PLAN PHASE 3 STAGE 1

STA. 82+00.00 TO STA. 106+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		25

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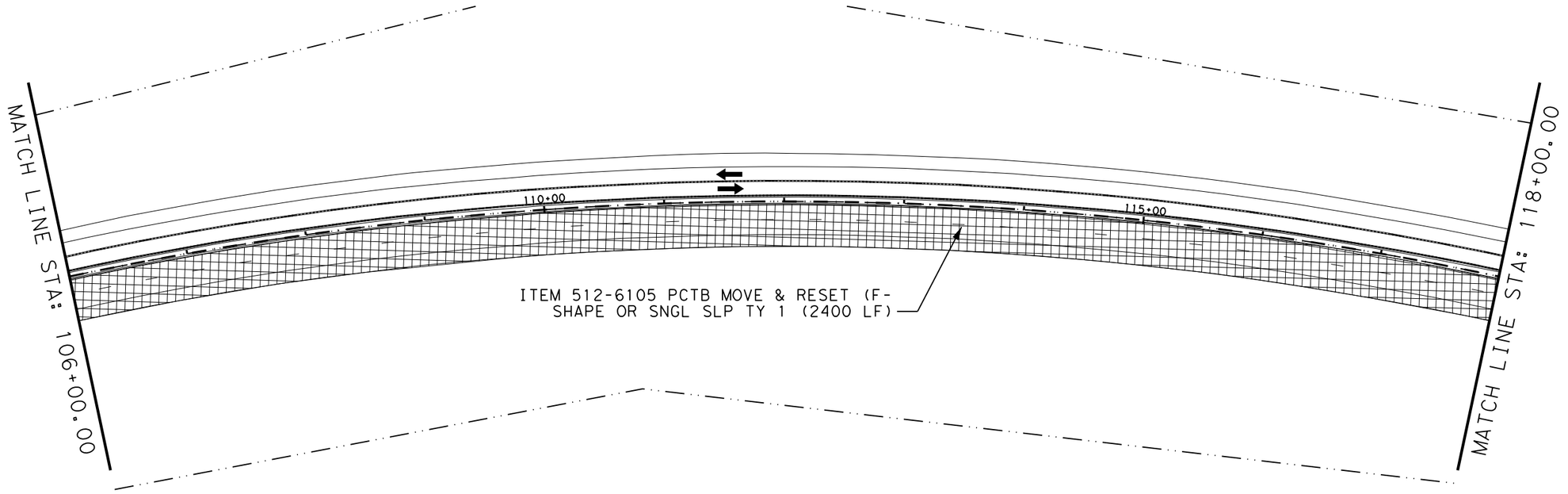
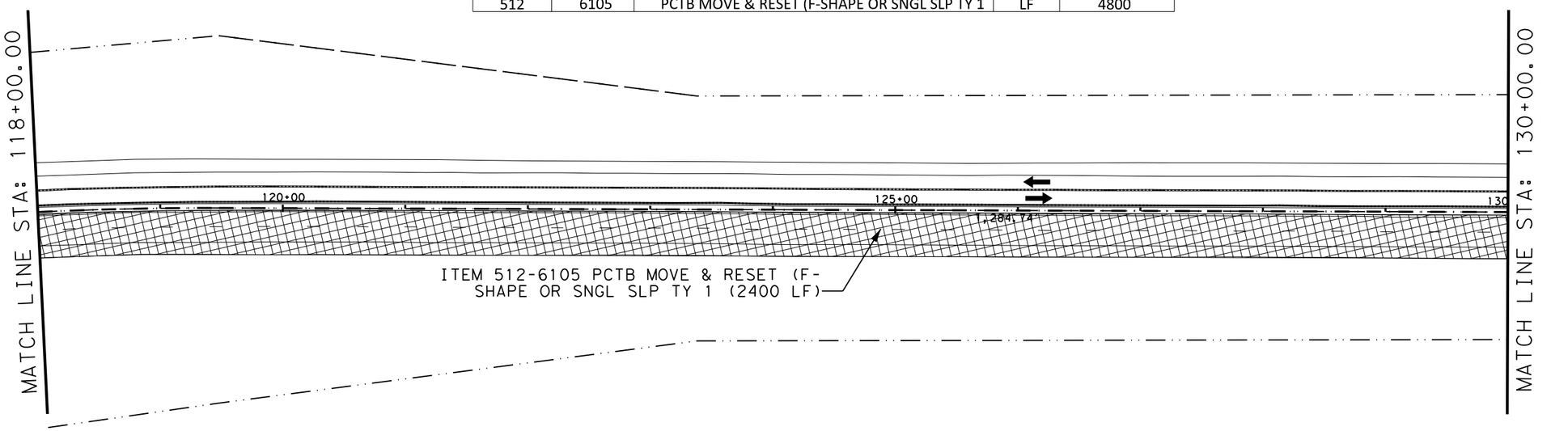


LEGEND

- WORK ZONE
- TRAFFIC FLOW
- CONSTRUCTION WARNING SIGN
- CHANNELIZING DEVICE
- TY III BARICADE PANELS
- PORTABLE CONCRETE TRAFFIC BARRIER
- END TREATMENT

0 25 50 75 100
SCALE IN FEET

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
512	6105	PCTB MOVE & RESET (F-SHAPE OR SNGL SLP TY 1	LF	4800



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06/30/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC CONTROL PLAN

TRAFFIC CONTROL PLAN PHASE 3 STAGE 1

STA. 106+00.00 TO STA. 130+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		26

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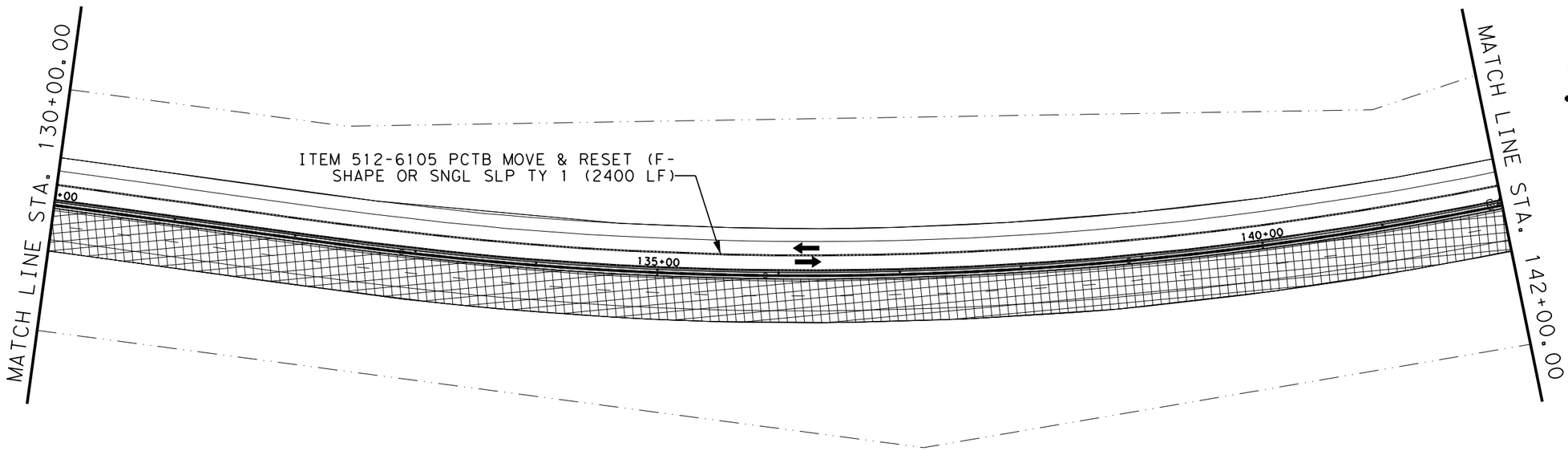
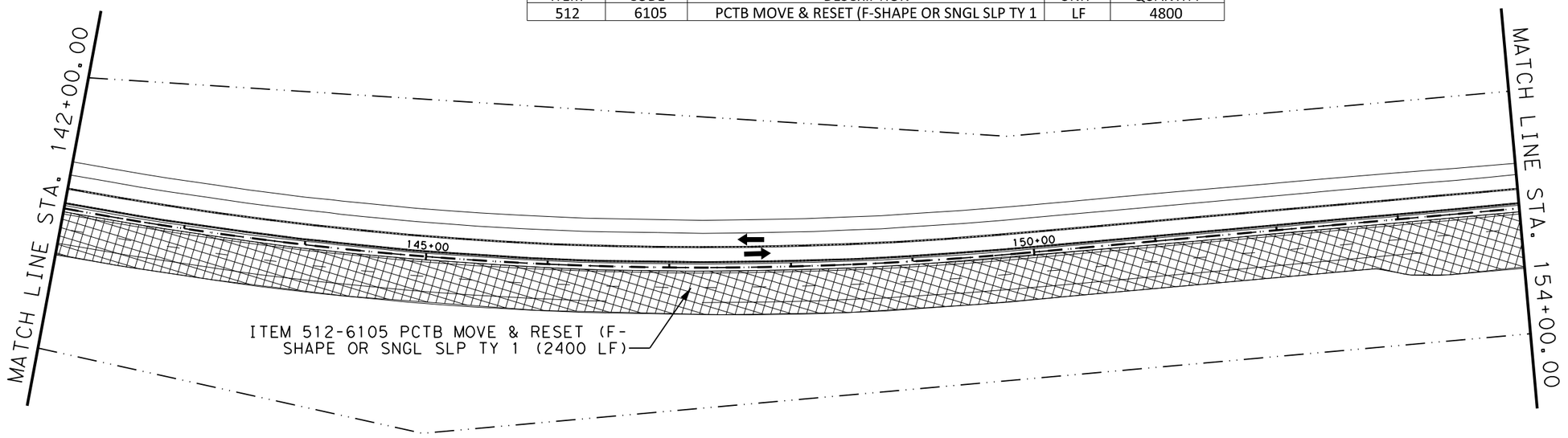


LEGEND

- WORK ZONE
- TRAFFIC FLOW
- CONSTRUCTION WARNING SIGN
- CHANNELIZING DEVICE
- TY III BARICADE PANELS
- PORTABLE CONCRETE TRAFFIC BARRIER
- END TREATMENT

0 25 50 75 100
SCALE IN FEET

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
512	6105	PCTB MOVE & RESET (F-SHAPE OR SNGL SLP TY 1	LF	4800



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06/30/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC CONTROL PLAN

TRAFFIC CONTROL PLAN PHASE 3 STAGE 1

STA. 130+00.00 TO STA. 154+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		27

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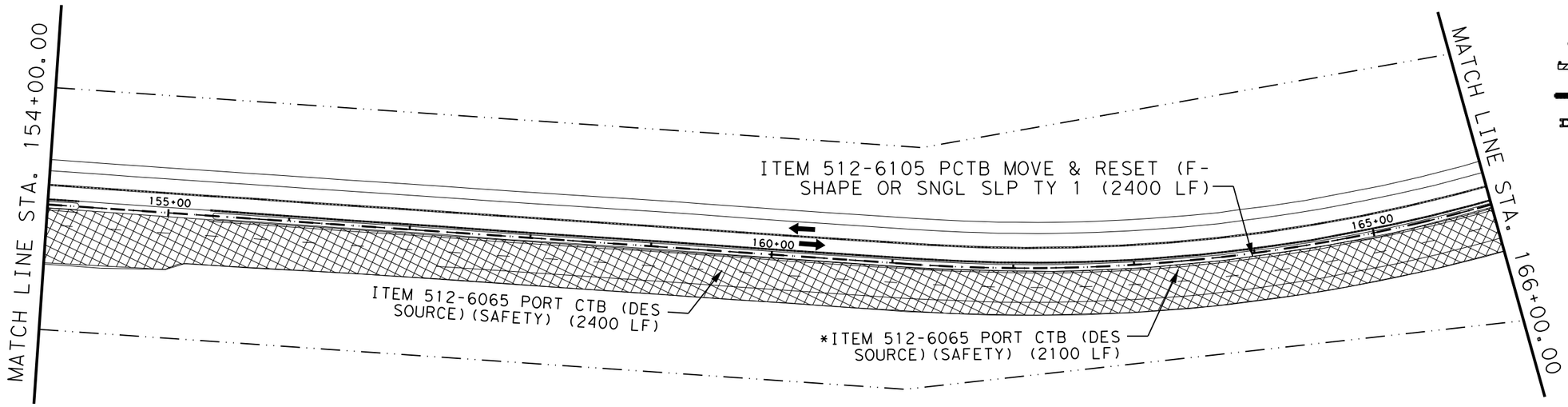


LEGEND

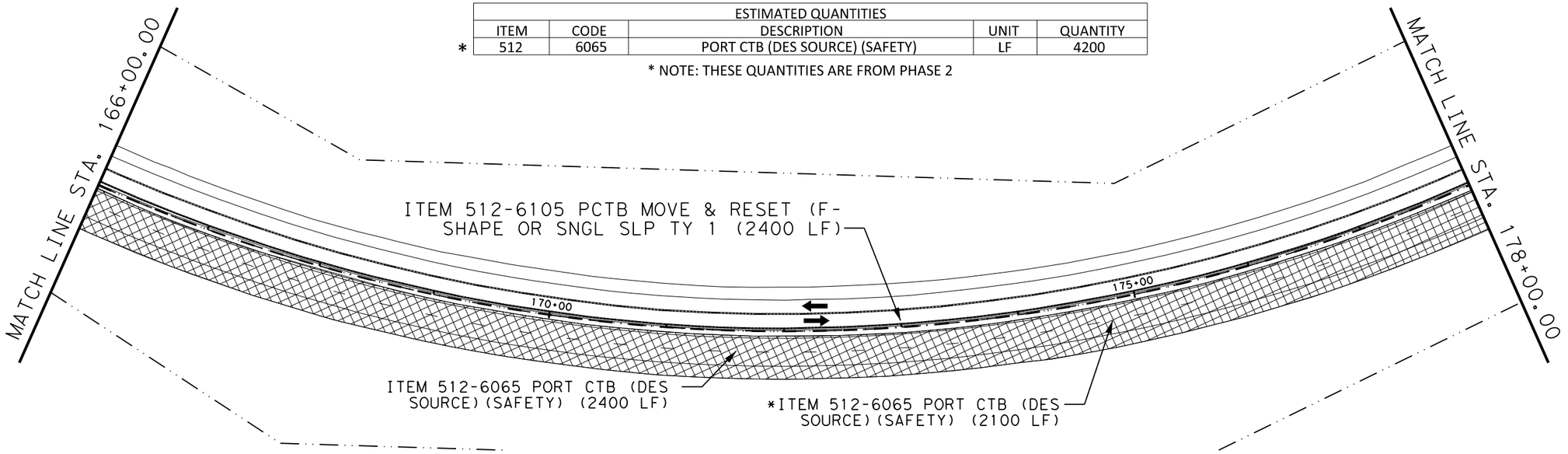
- WORK ZONE
- TRAFFIC FLOW
- CONSTRUCTION WARNING SIGN
- CHANNELIZING DEVICE
- TY III BARICADE PANELS
- PORTABLE CONCRETE TRAFFIC BARRIER
- END TREATMENT

0 25 50 75 100
SCALE IN FEET

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
512	6105	PCTB MOVE & RESET (F-SHAPE OR SNGL SLP TY 1	LF	4800
512	6065	PORT CTB (DES SOURCE) (SAFETY)	LF	4800

ESTIMATED QUANTITIES					
	ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
*	512	6065	PORT CTB (DES SOURCE) (SAFETY)	LF	4200

* NOTE: THESE QUANTITIES ARE FROM PHASE 2



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US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC CONTROL PLAN

TRAFFIC CONTROL PLAN PHASE 3 STAGE 1

STA. 154+00.00 TO STA. 178+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		28

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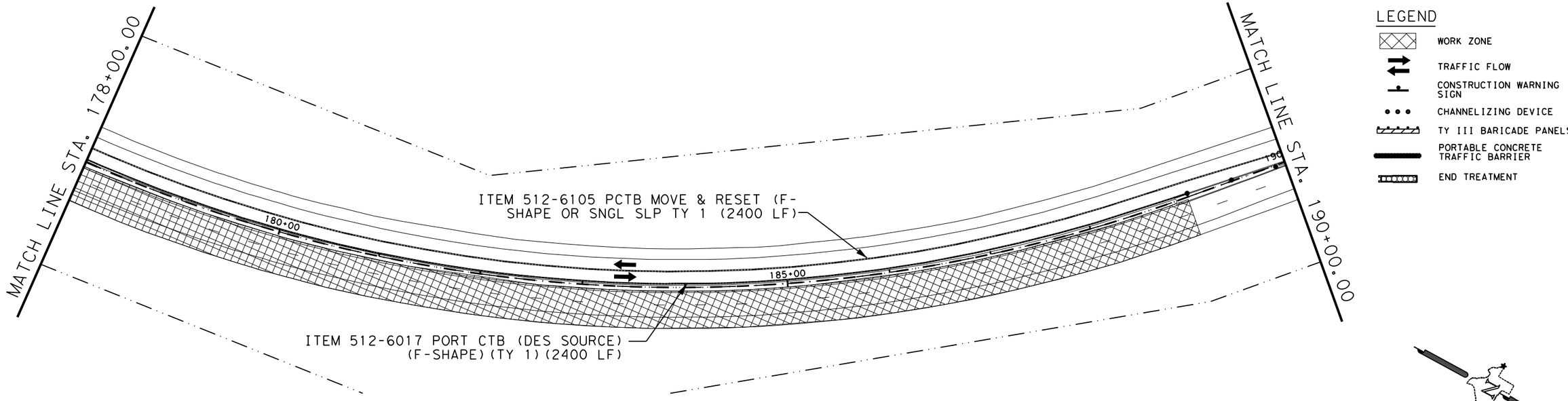
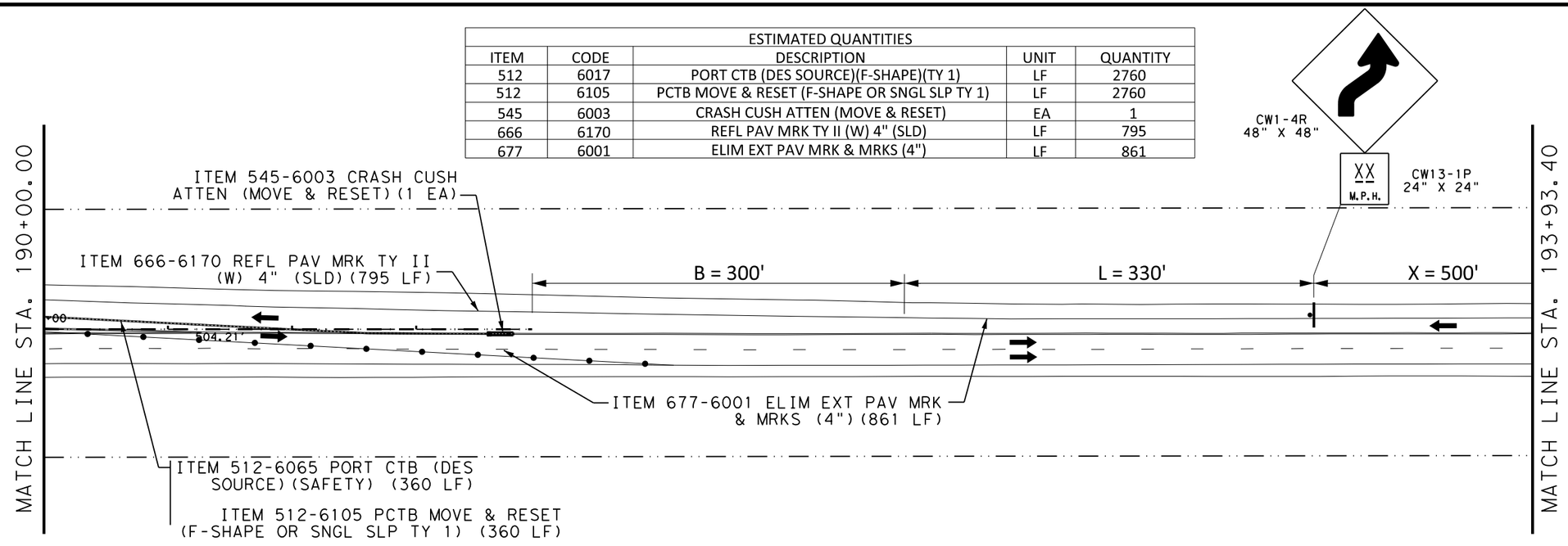


ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
512	6017	PORT CTB (DES SOURCE)(F-SHAPE)(TY 1)	LF	2760
512	6105	PCTB MOVE & RESET (F-SHAPE OR SNGL SLP TY 1)	LF	2760
545	6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	1
666	6170	REFL PAV MRK TY II (W) 4" (SLD)	LF	795
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	861



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06/30/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC CONTROL PLAN

TRAFFIC CONTROL PLAN PHASE 3 STAGE 1

STA. 178+00.00 TO STA. 193+93.40

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		29

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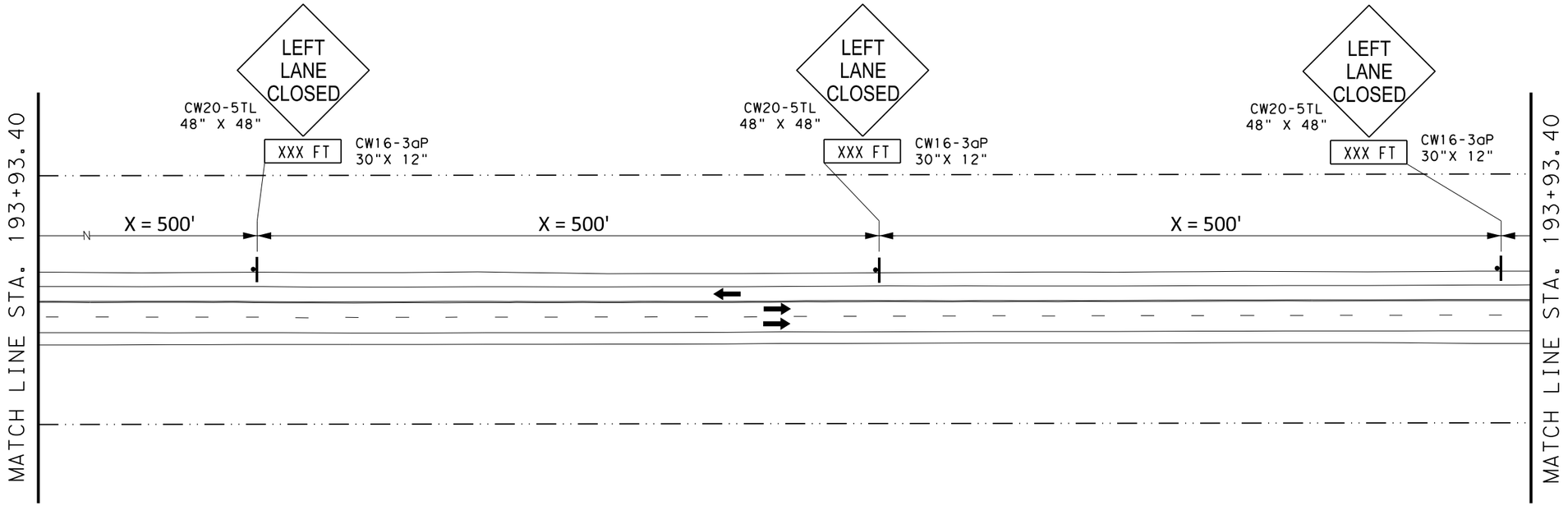
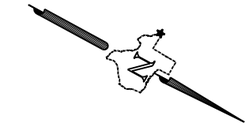


LEGEND

- WORK ZONE
- TRAFFIC FLOW
- CONSTRUCTION WARNING SIGN
- CHANNELIZING DEVICE
- TY III BARICADE PANELS
- PORTABLE CONCRETE TRAFFIC BARRIER
- END TREATMENT



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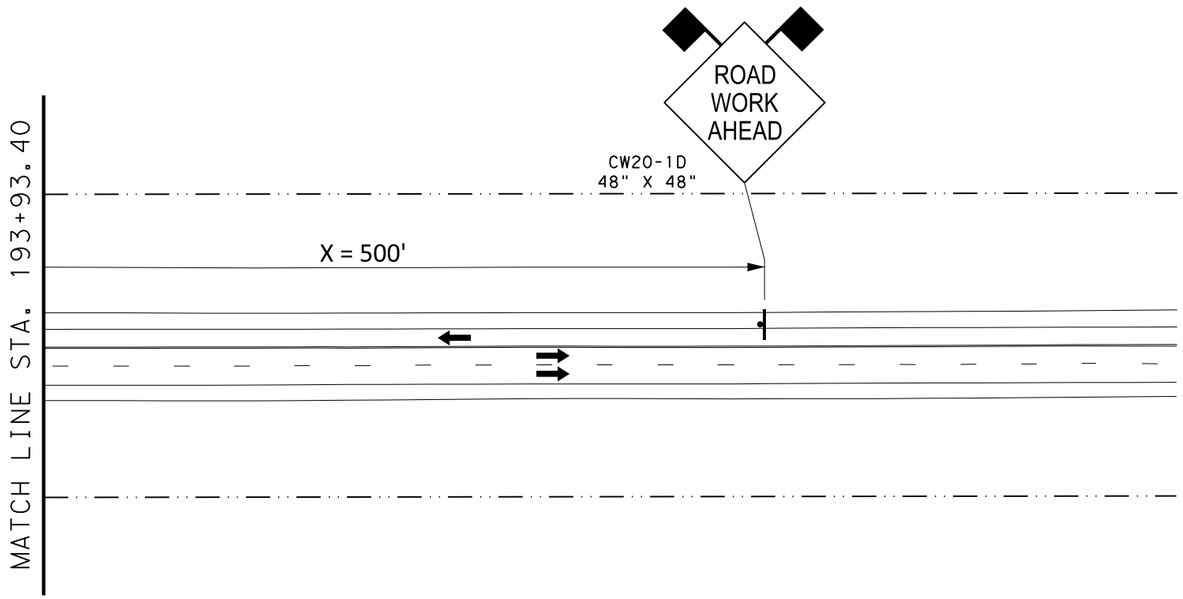
SCALE IN FEET



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US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC CONTROL PLAN

TRAFFIC CONTROL PLAN PHASE 3 STAGE 1

STA. 193+93.40 TO END

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CONT	SECT	JOB	HIGHWAY
0233	02	035, etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		30

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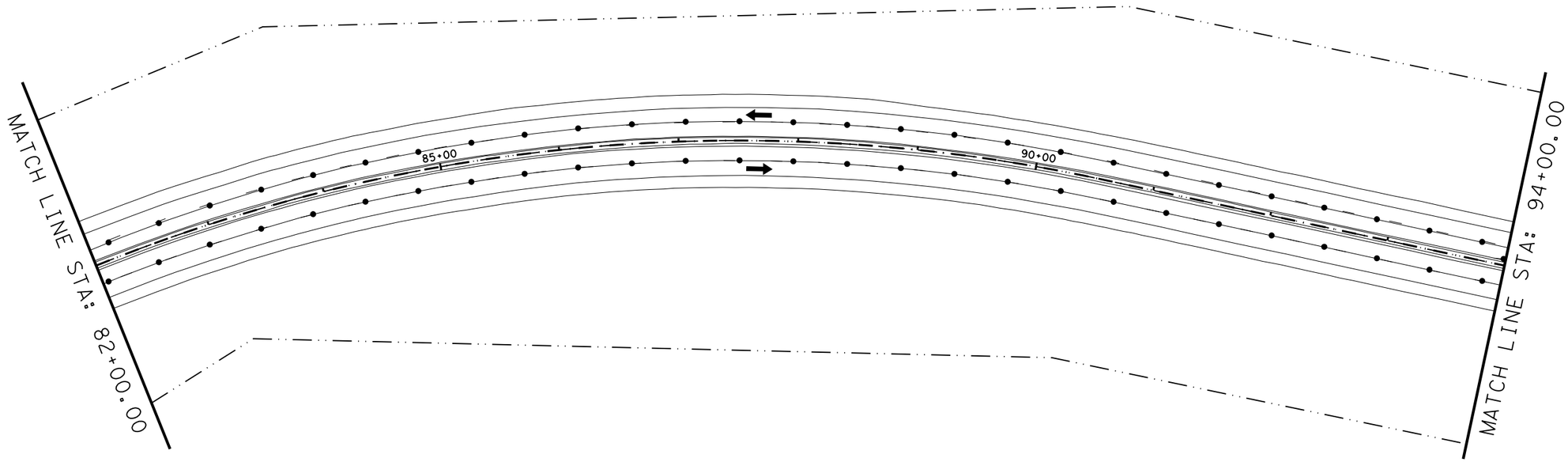
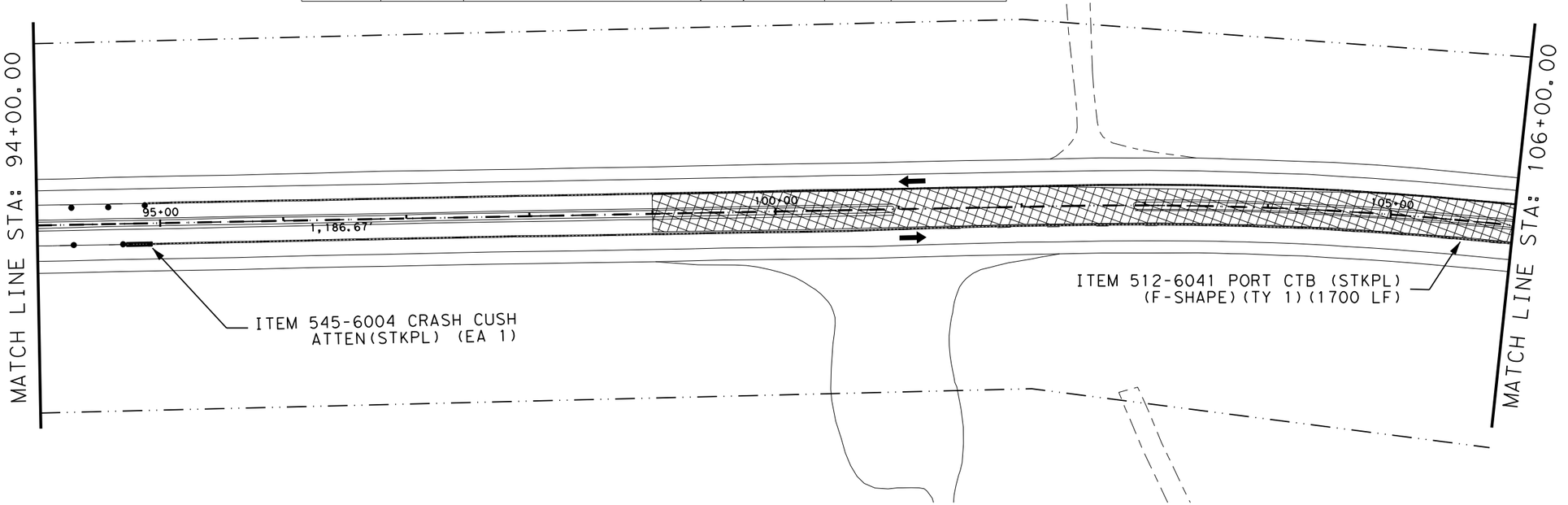


LEGEND

- WORK ZONE
- TRAFFIC FLOW
- CONSTRUCTION WARNING SIGN
- CHANNELIZING DEVICE
- TY III BARICADE PANELS
- PORTABLE CONCRETE TRAFFIC BARRIER
- END TREATMENT

0 25 50 75 100
SCALE IN FEET

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
512	6041	PORT CTB (STKPL)(F-SHAPE)(TY 1)	LF	1700
545	6004	CRASH CUSH ATTEN (STKPL)	EA	1



STATE OF TEXAS
LEVI L. PAVIA
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06/30/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC CONTROL PLAN

TRAFFIC CONTROL PLAN PHASE 3 STAGE 2

STA. 82+00.00 TO STA. 106+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		31

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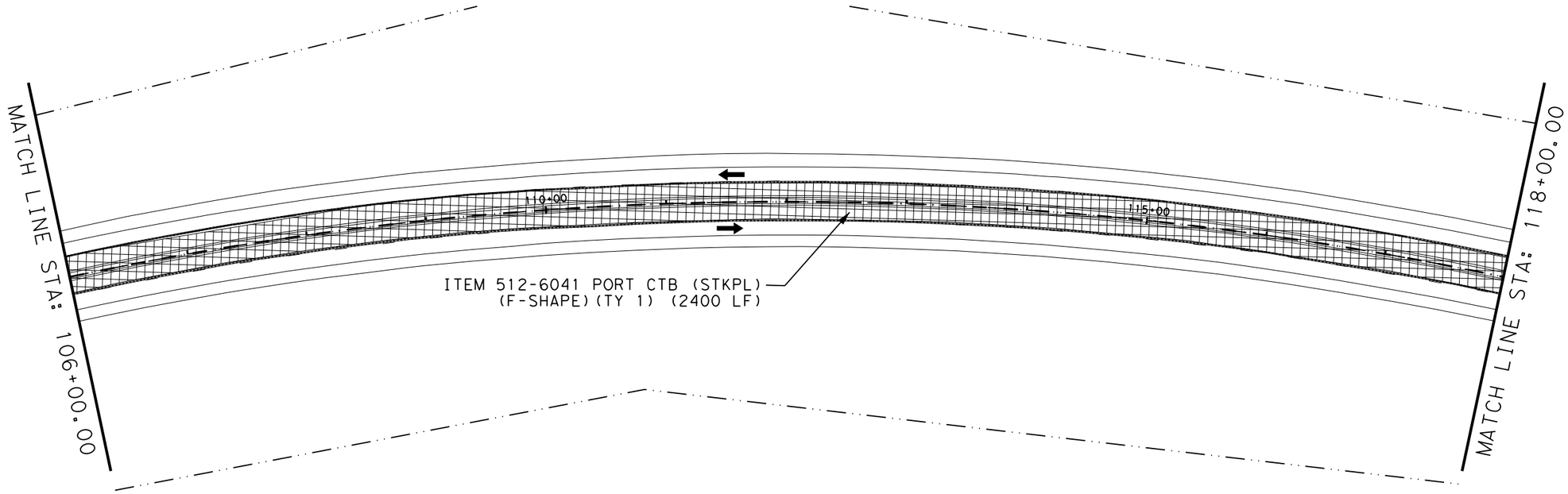
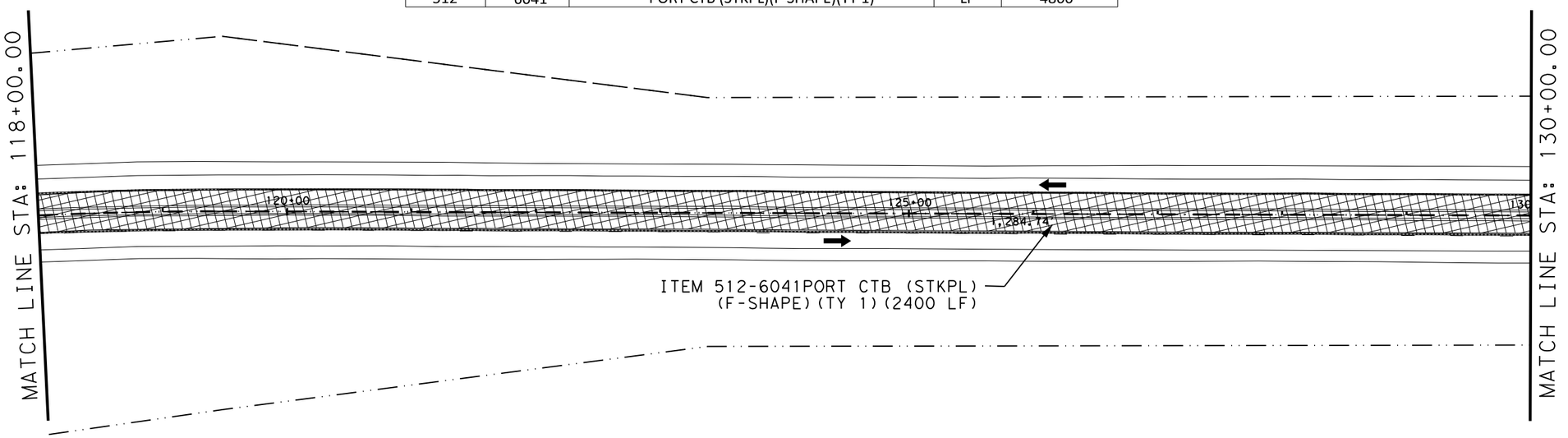


LEGEND

- WORK ZONE
- TRAFFIC FLOW
- CONSTRUCTION WARNING SIGN
- CHANNELIZING DEVICE
- TY III BARICADE PANELS
- PORTABLE CONCRETE TRAFFIC BARRIER
- END TREATMENT

0 25 50 75 100
SCALE IN FEET

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
512	6041	PORT CTB (STKPL)(F-SHAPE)(TY 1)	LF	4800



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LEVI L. PAVIA
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06/30/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC CONTROL PLAN

TRAFFIC CONTROL PLAN PHASE 3 STAGE 2

STA. 106+00.00 TO STA. 130+00.00

SHEET 2 OF 6

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CONT	SECT	JOB	HIGHWAY
0233	02	035, etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		32

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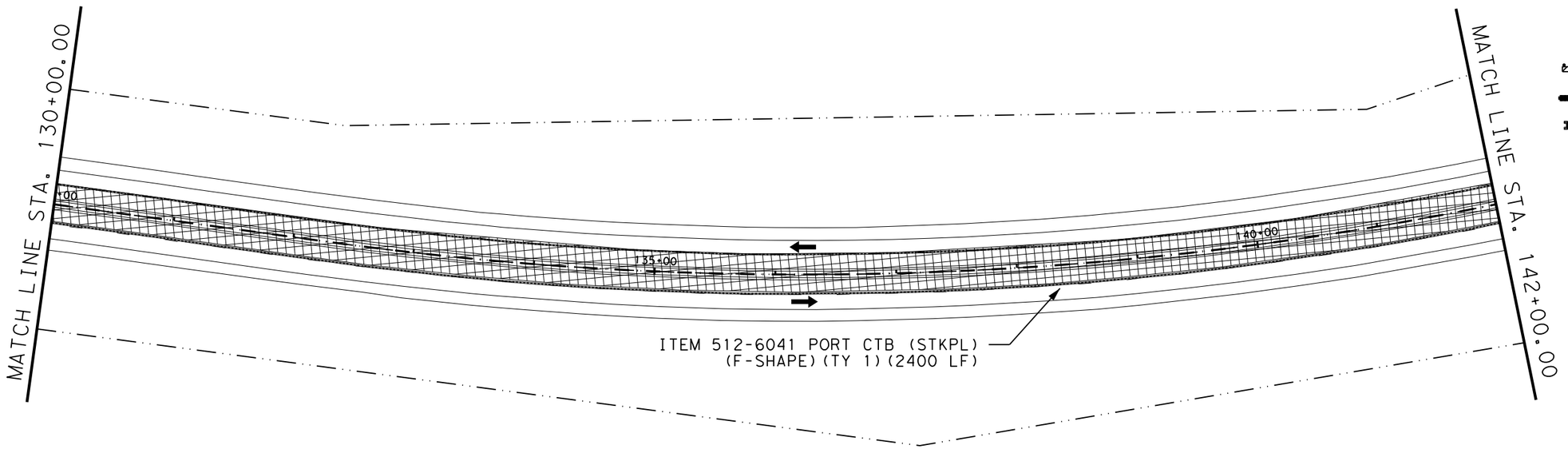
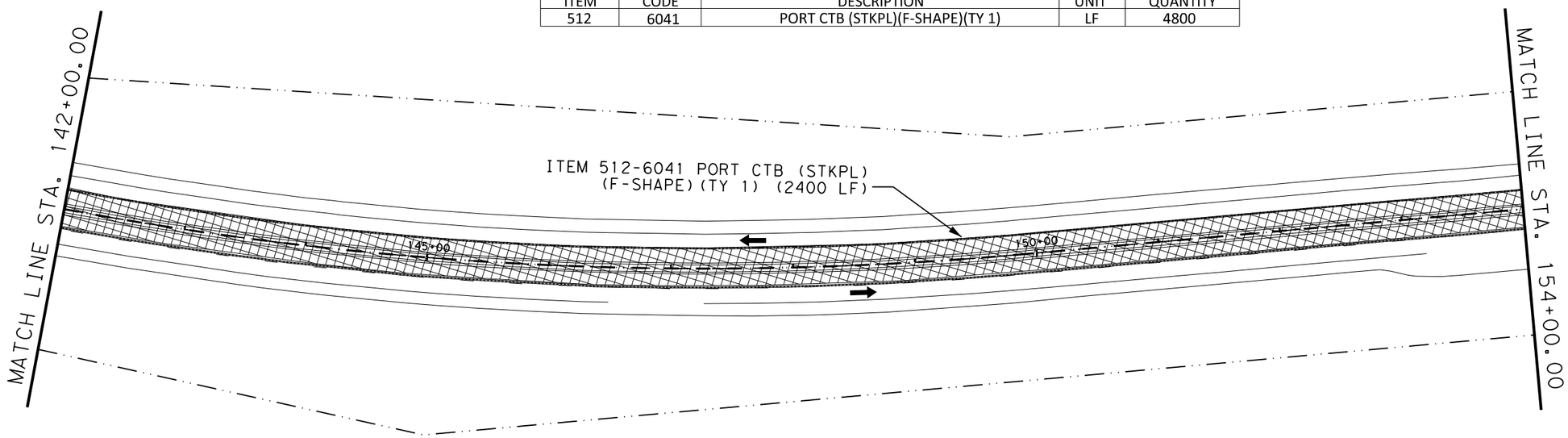


LEGEND

- WORK ZONE
- TRAFFIC FLOW
- CONSTRUCTION WARNING SIGN
- CHANNELIZING DEVICE
- TY III BARICADE PANELS
- PORTABLE CONCRETE TRAFFIC BARRIER
- END TREATMENT

0 25 50 75 100
SCALE IN FEET

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
512	6041	PORT CTB (STKPL)(F-SHAPE)(TY 1)	LF	4800



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US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC CONTROL PLAN

TRAFFIC CONTROL PLAN PHASE 3 STAGE 2

STA. 130+00.00 TO STA. 154+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		33

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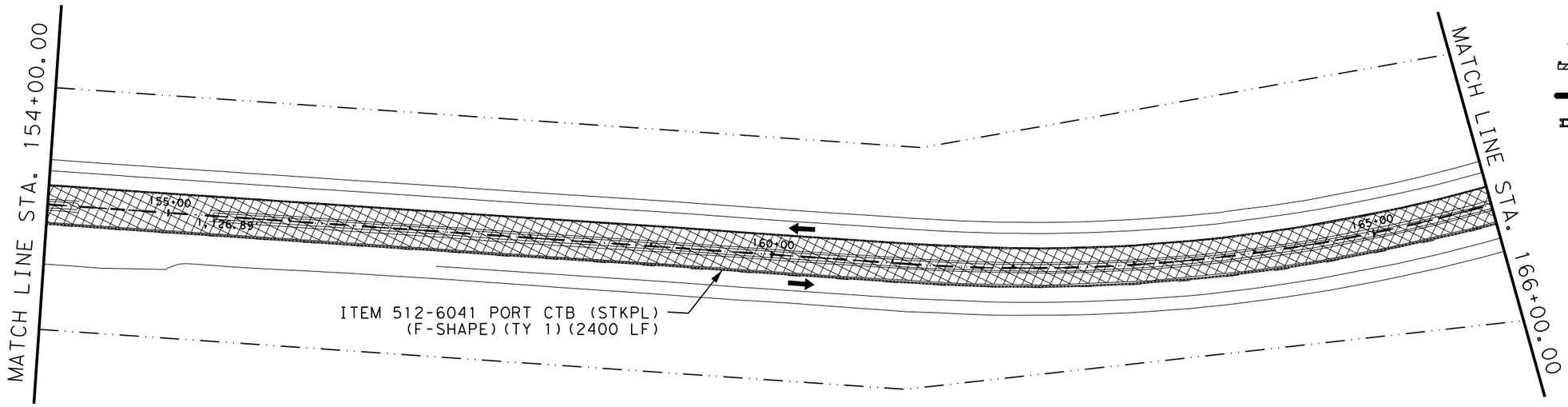
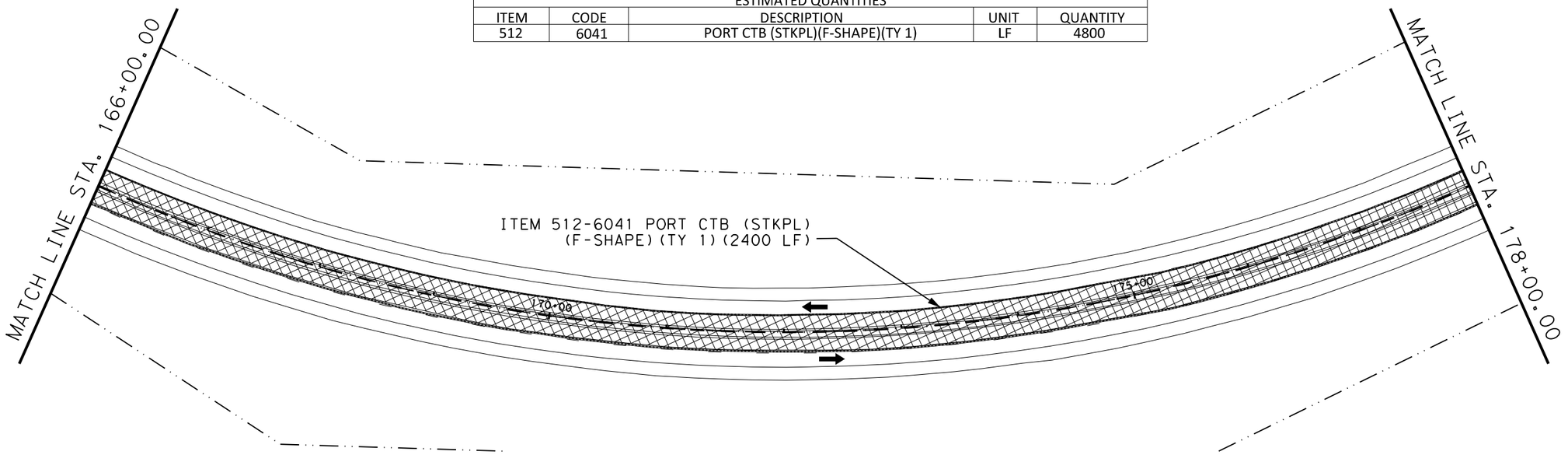


LEGEND

- WORK ZONE
- TRAFFIC FLOW
- CONSTRUCTION WARNING SIGN
- CHANNELIZING DEVICE
- TY III BARICADE PANELS
- PORTABLE CONCRETE TRAFFIC BARRIER
- END TREATMENT

0 25 50 75 100
SCALE IN FEET

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
512	6041	PORT CTB (STKPL)(F-SHAPE)(TY 1)	LF	4800



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06/30/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC CONTROL PLAN

TRAFFIC CONTROL PLAN PHASE 3 STAGE 2

STA. 154+00.00 TO STA. 178+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		34

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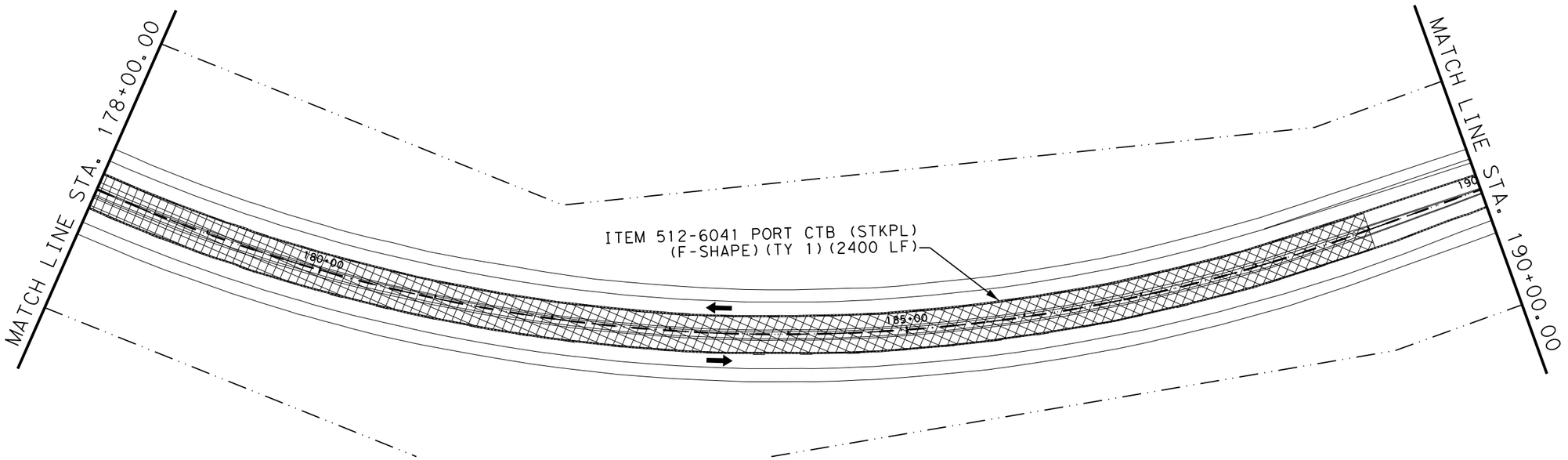


LEGEND

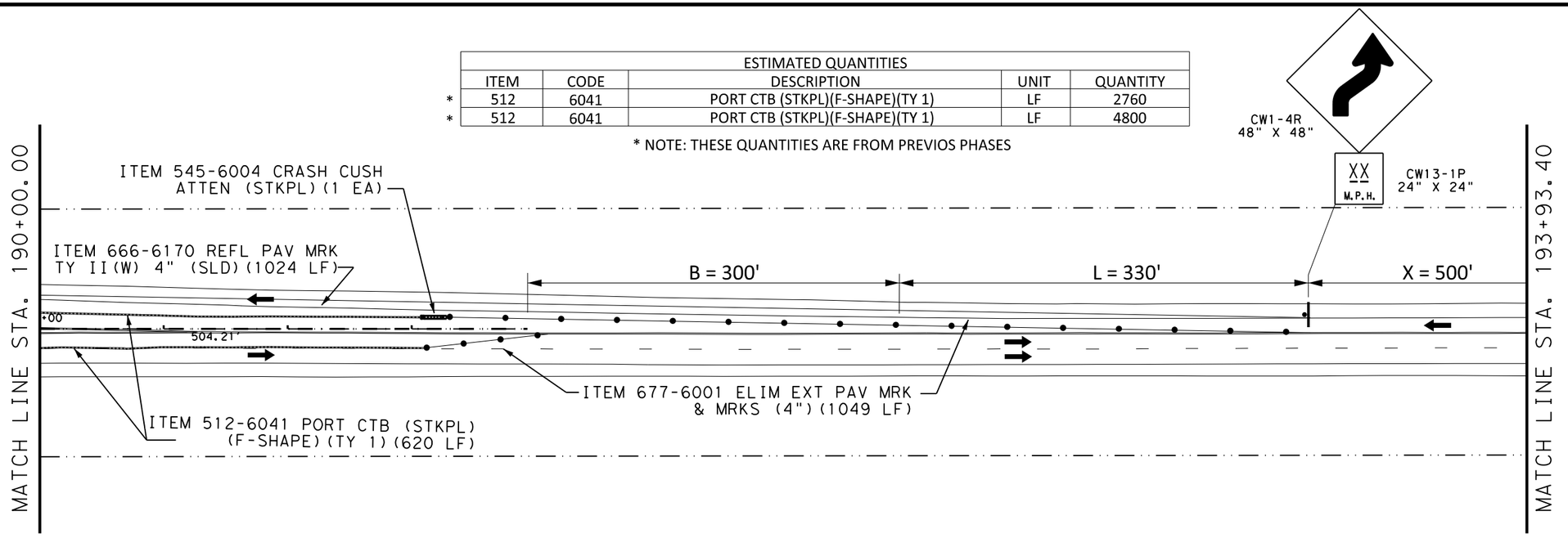
- WORK ZONE
- TRAFFIC FLOW
- CONSTRUCTION WARNING SIGN
- CHANNELIZING DEVICE
- TY III BARICADE PANELS
- PORTABLE CONCRETE TRAFFIC BARRIER
- END TREATMENT

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
512	6041	PORT CTB (STKPL)(F-SHAPE)(TY 1)	LF	7560
545	6004	CRASH CUSH ATTEN (STKPL)	EA	1
666	6170	REFL PAV MRK TY II (W) 4" (SLD)	LF	1024
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	1049

0 25 50 75 100
SCALE IN FEET

ESTIMATED QUANTITIES					
	ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
*	512	6041	PORT CTB (STKPL)(F-SHAPE)(TY 1)	LF	2760
*	512	6041	PORT CTB (STKPL)(F-SHAPE)(TY 1)	LF	4800

* NOTE: THESE QUANTITIES ARE FROM PREVIOS PHASES



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US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC CONTROL PLAN

TRAFFIC CONTROL PLAN PHASE 3 STAGE 2

STA. 178+00.00 TO STA. 193+93.40

SHEET 5 OF 6

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CONT	SECT	JOB	HIGHWAY
0233	02	035, etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		35

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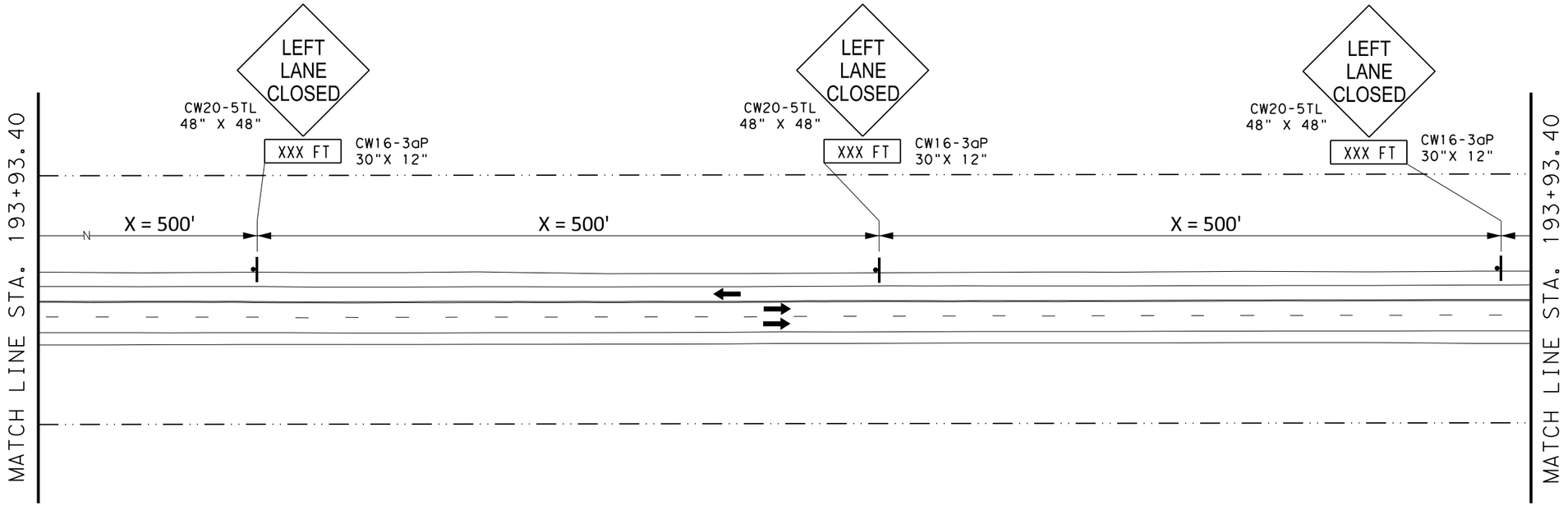
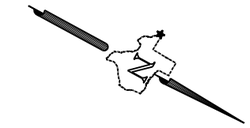


LEGEND

- WORK ZONE
- TRAFFIC FLOW
- CONSTRUCTION WARNING SIGN
- CHANNELIZING DEVICE
- TY III BARICADE PANELS
- PORTABLE CONCRETE TRAFFIC BARRIER
- END TREATMENT



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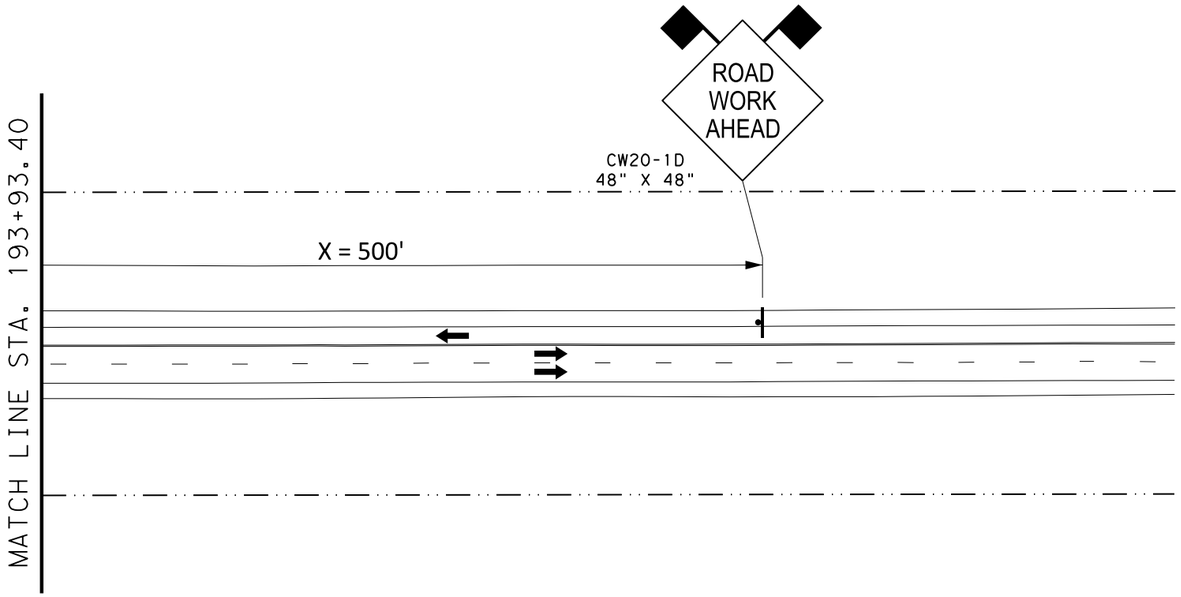
SCALE IN FEET



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TRAFFIC CONTROL PLAN PHASE 3 STAGE 2

STA. 193+93.40 TO END

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		36

DATE: 6/30/2021 8:10:31 AM
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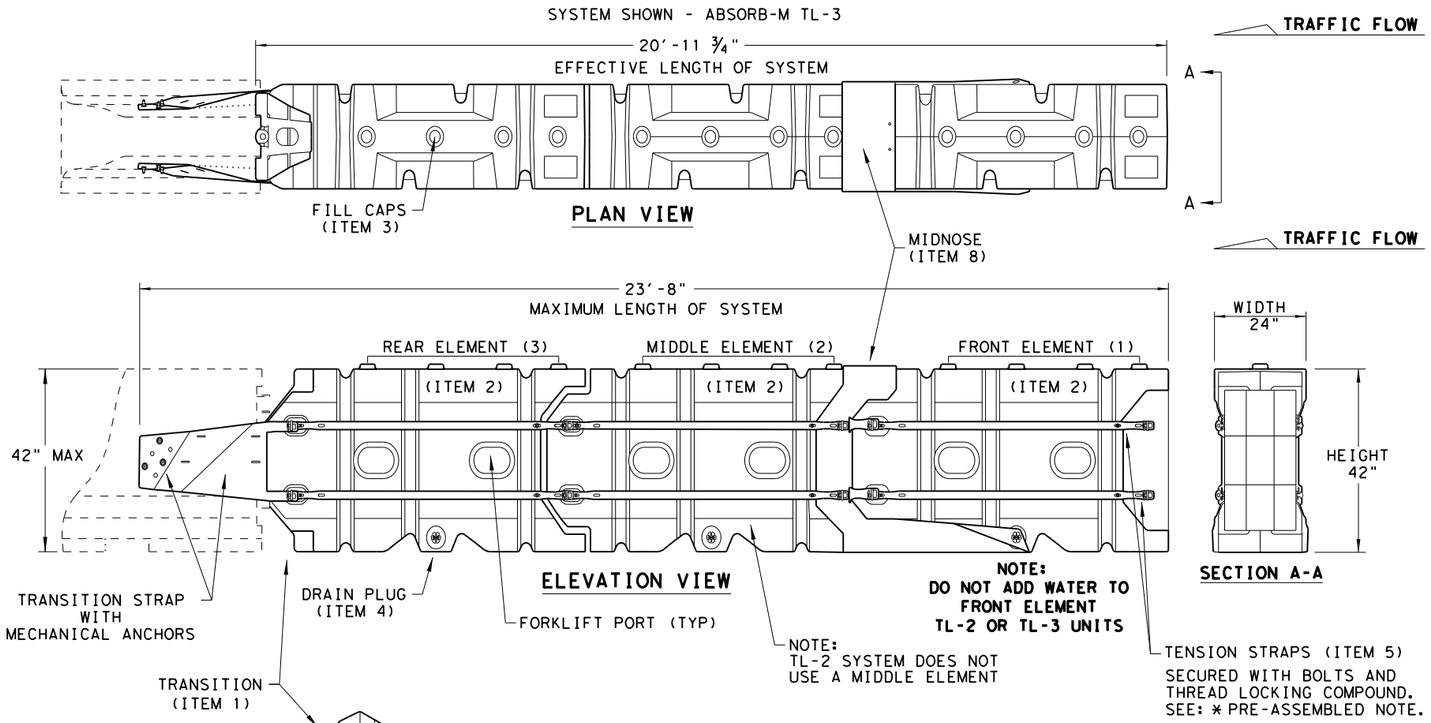
SYSTEM SHOWN - ABSORB-M TL-3



THE ABSORB-M IS A NON-REDIRECTIVE, GATING, CRASH CUSHION DESIGNED TO MEET THE LATEST TL-3 & TL-2 MASH REQUIREMENTS.

THE SYSTEM IS DESIGNED TO ACCOMMODATE A VARIETY OF F-SHAPE AND SINGLE SLOPE CONCRETE BARRIERS. CONTACT THE MANUFACTURER FOR GUIDANCE REGARDING OTHER ALLOWABLE SHAPES.

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"

NOTE:
CROSS SLOPES OF UP TO 8% (OR 1:12 SLOPE) CAN BE ACCOMMODATED WITH STANDARD HARDWARE SHOWN WITHIN THE INSTRUCTIONS MANUAL. FOR SLOPES WITH EXCESS OF 8% (OR 1:12) CONTACT, LINDSAY TRANSPORTATION SOLUTIONS.

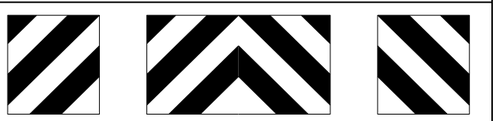
GENERAL NOTES

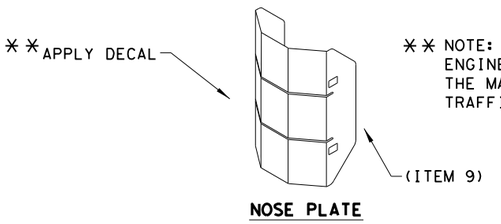
1. FOR SPECIFIC INFORMATION REGARDING THE INSTALLATION AND TECHNICAL GUIDANCE, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800. 180 RIVER ROAD, RIO VISTA, CA 94571
2. THE ABSORB-M SYSTEM IS ONLY APPROVED FOR USE IN (TEMPORARY WORK ZONE) LOCATIONS.
3. THE ABSORB-M 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.
4. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
5. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
6. THE ABSORB-M SHOULD BE LOCATED APPROXIMATELY PARALLEL WITH THE BARRIER.
7. THE USE OF THE ABSORB-M IS RESTRICTED TO A BARRIER HEIGHT OF UP TO 42 INCHES.
8. DO NOT ADD WATER TO FRONT ELEMENT (TL-2 OR TL-3 UNIT).

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

DELINEATION DECAL PLACEMENT GUIDE





NOSE PLATE

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

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:
THIS STANDARD IS A BASIC REPRESENTATION OF THE ABSORB-M, IT IS NOT INTENDED TO REPLACE THE INSTALLATION INSTRUCTIONS MANUAL.

SACRIFICIAL

Texas Department of Transportation — 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	CK:
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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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-03 7-13 9-07 8-14 5-10 5-21	0233	02	035,etc	US 62
	DIST	COUNTY		SHEET NO.
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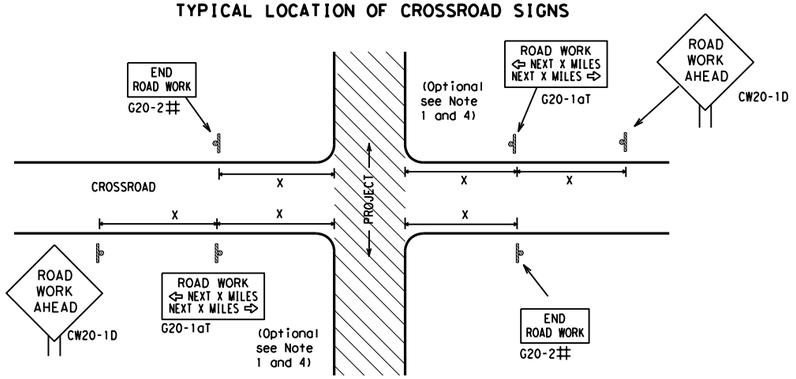
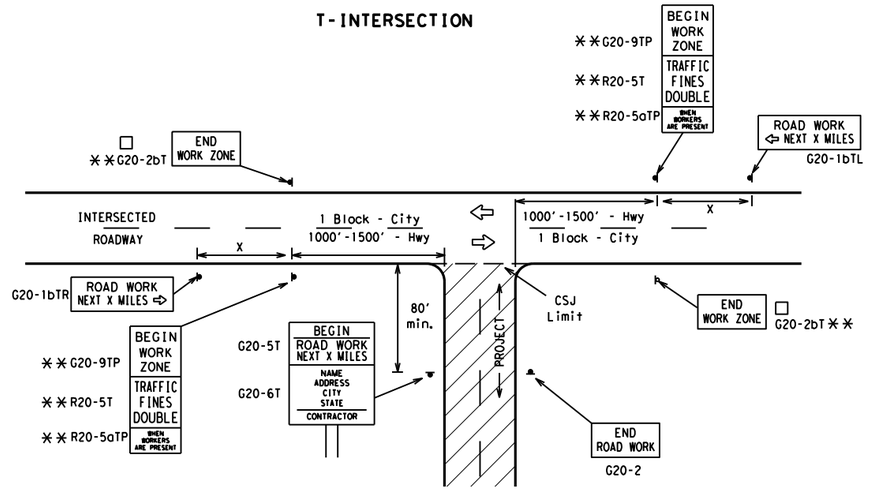
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

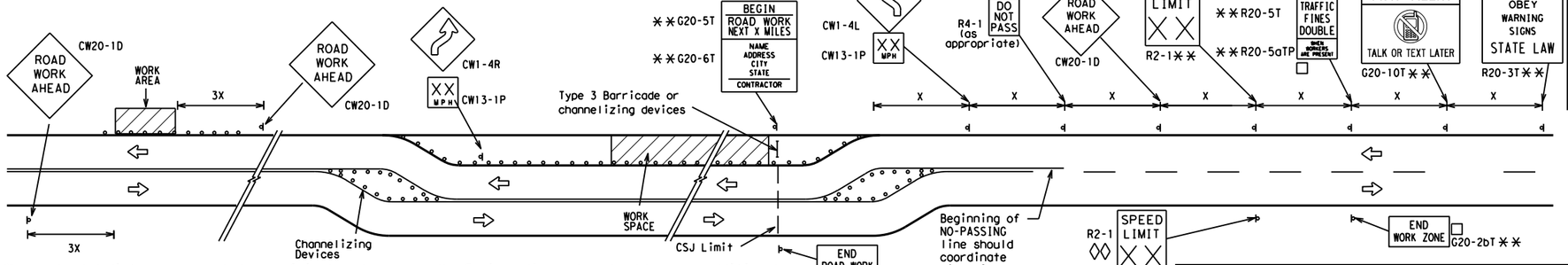
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

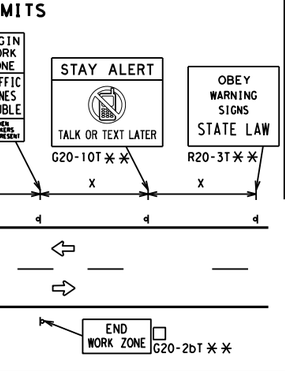
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

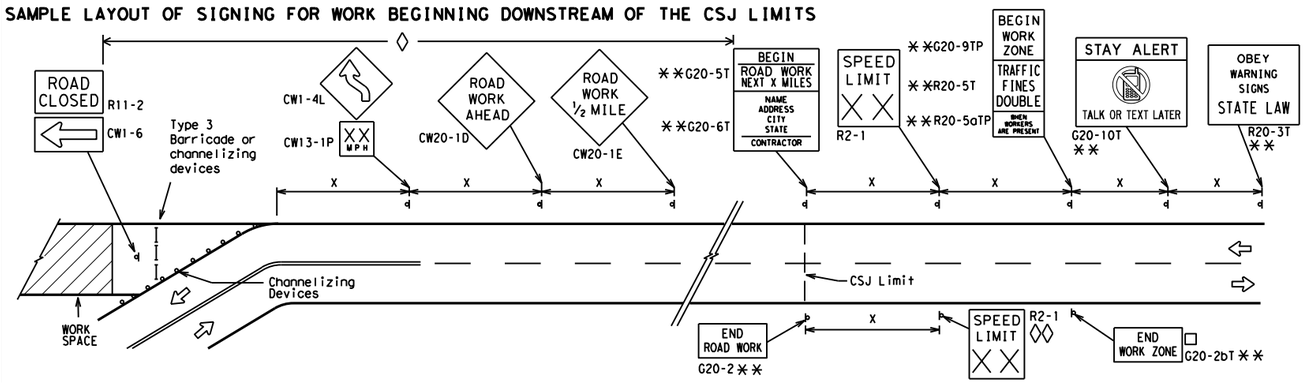


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



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



NOTES

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

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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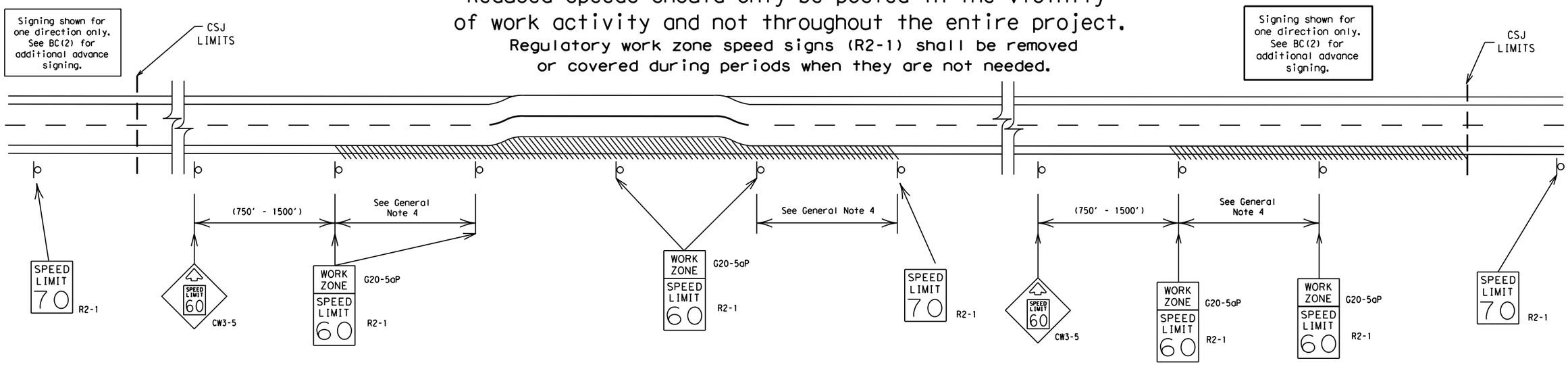
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ELP	CULBERSON		39

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

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BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		40

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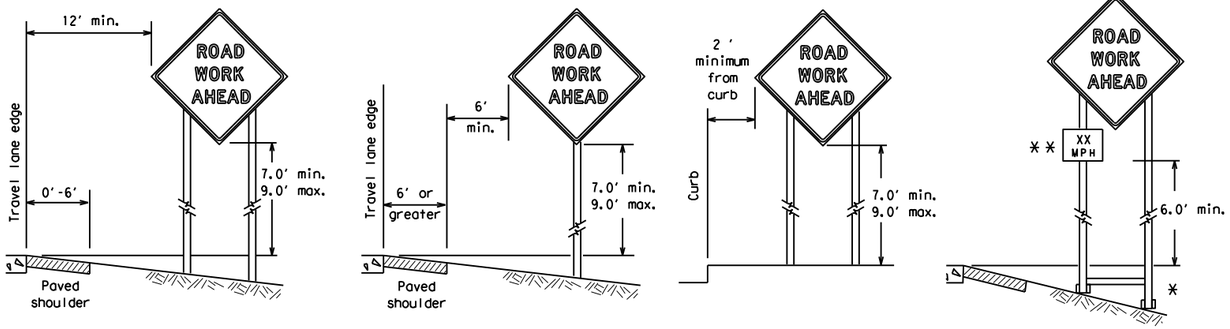
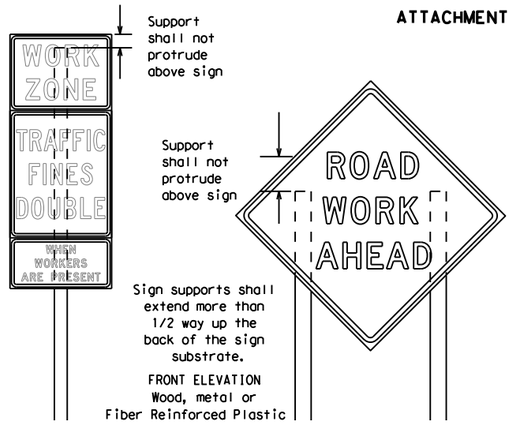
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

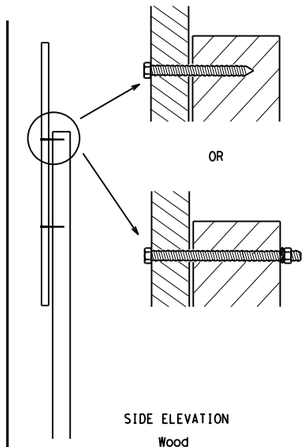


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





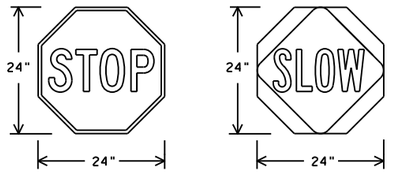
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

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BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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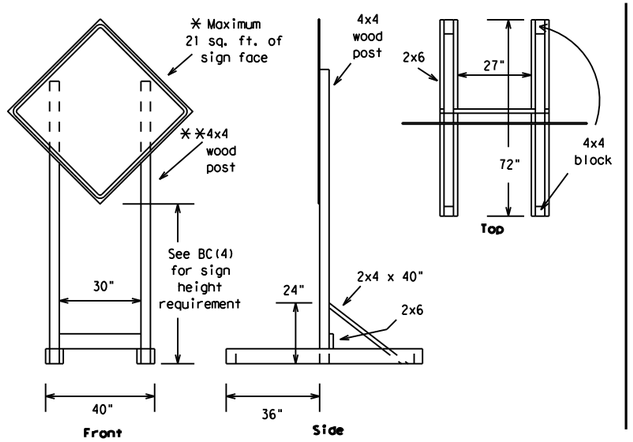
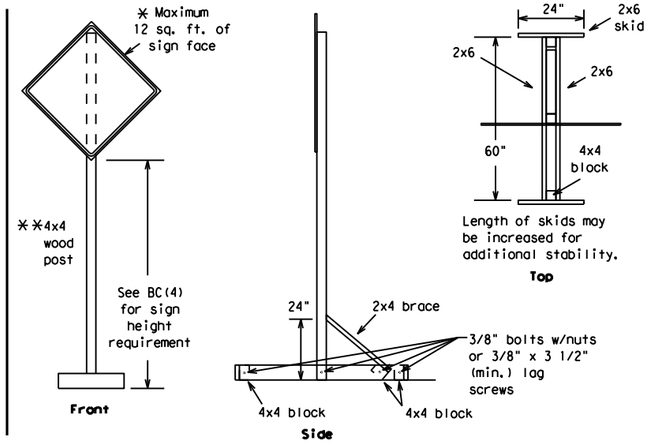
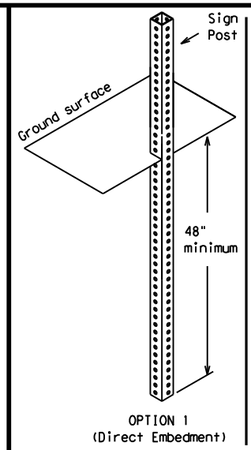
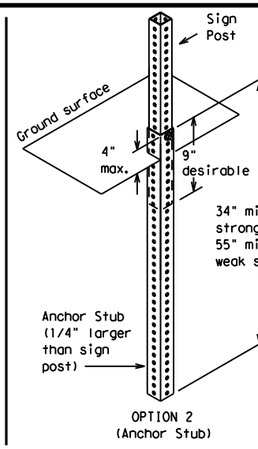


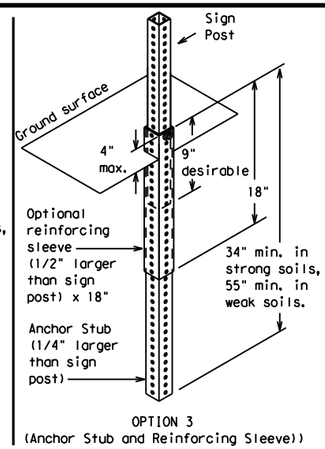


SKID MOUNTED WOOD SIGN SUPPORTS

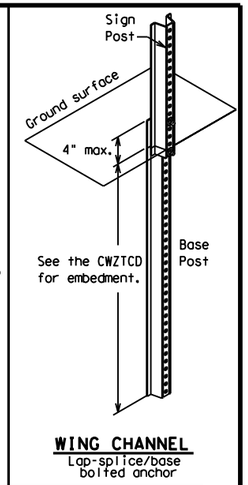
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS







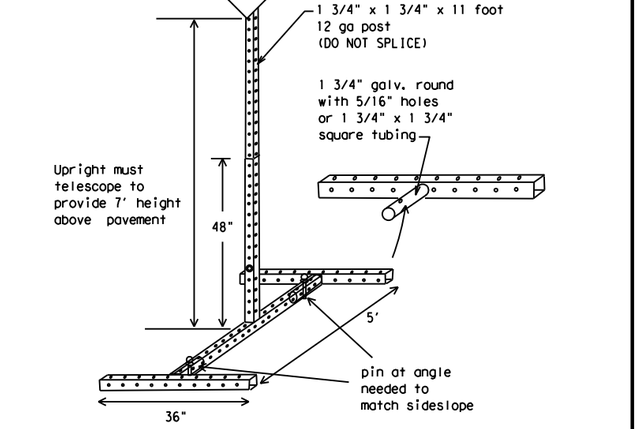
PERFORATED SQUARE METAL TUBING

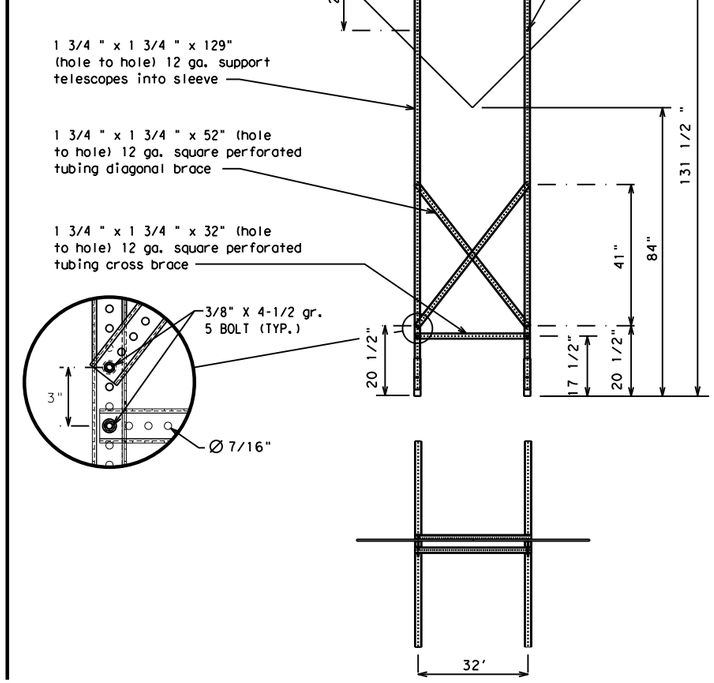


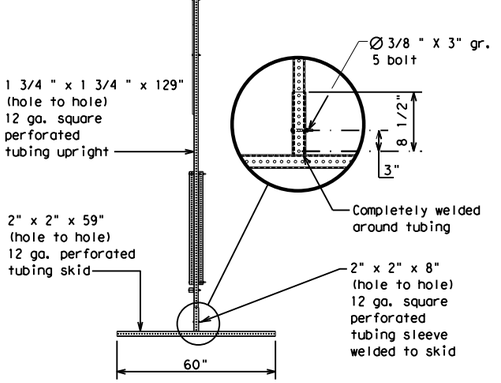
WING CHANNEL
Lap-splice/base bolted anchor

GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

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Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

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

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

Phase 2: Possible Component Lists

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

1. Only 1 or 2 phases are to be used on a PCMS.
2. The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
3. A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
4. A Location Phase is necessary only if a distance or location is not included in the first phase selected.
5. If two PCMS are used in sequence, they must be separated by a minimum of 1000 ft. Each PCMS shall be limited to two phases, and should be understandable by themselves.
6. For advance notice, when the current date is within seven days of the actual work date, calendar days should be replaced with days of the week. Advance notification should typically be for no more than one week prior to the work.

WORDING ALTERNATIVES

1. The words RIGHT, LEFT and ALL can be interchanged as appropriate.
2. Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
3. EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
4. Highway names and numbers replaced as appropriate.
5. ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
6. AHEAD may be used instead of distances if necessary.
7. FT and MI, MILE and MILES interchanged as appropriate.
8. AT, BEFORE and PAST interchanged as needed.
9. Distances or AHEAD can be eliminated from the message if a location phase is used.

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

FULL MATRIX PCMS SIGNS

1. When Full Matrix PCMS signs are used, the character height and legibility/visibility requirements shall be maintained as listed in Note 15 under "PORTABLE CHANGEABLE MESSAGE SIGNS" above.
2. When symbol signs, such as the "Flagger Symbol"(CW20-7) are represented graphically on the Full Matrix PCMS sign and, with the approval of the Engineer, it shall maintain the legibility/visibility requirement listed above.
3. When symbol signs are represented graphically on the Full Matrix PCMS, they shall only supplement the use of the static sign represented, and shall not substitute for, or replace that sign.
4. A full matrix PCMS may be used to simulate a flashing arrow board provided it meets the visibility, flash rate and dimming requirements on BC(7), for the same size arrow.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

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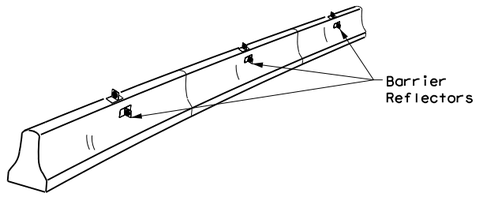
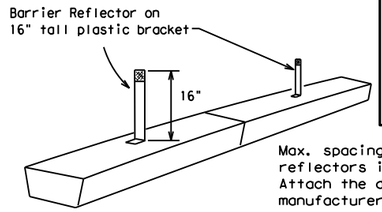
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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



CONCRETE TRAFFIC BARRIER (CTB)

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

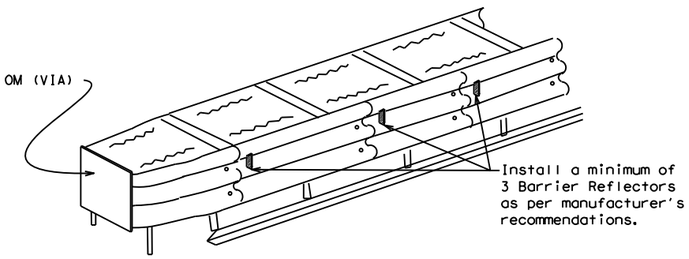


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

LOW PROFILE CONCRETE BARRIER (LPCB)

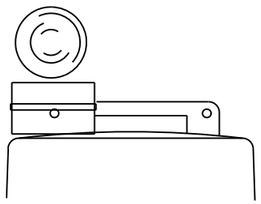


DELINEATION OF END TREATMENTS

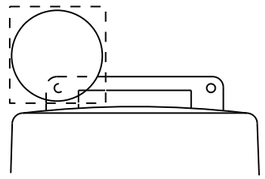
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

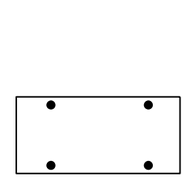
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

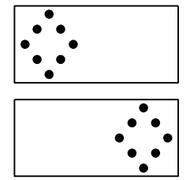
Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

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

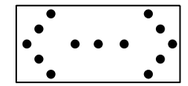


4 CORNER CAUTION

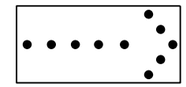
OR



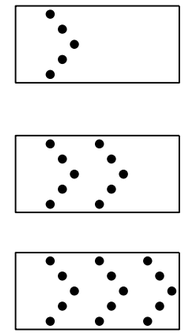
ALTERNATING DIAMOND CAUTION



DOUBLE ARROW



RIGHT/LEFT ARROW
(right arrow shown; left is similar)



RIGHT/LEFT SEQUENTIAL CHEVRON
(right chevron shown; left is similar)

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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

SHEET 7 OF 12

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

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REVISIONS	0233	02	035,etc	US 62
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ELP	CULBERSON		44

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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

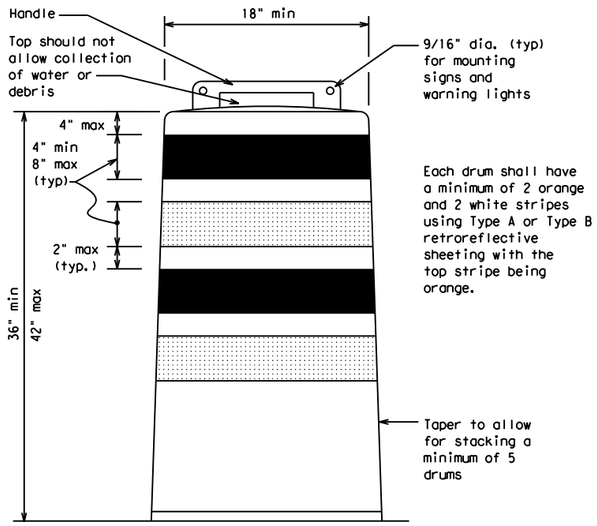
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

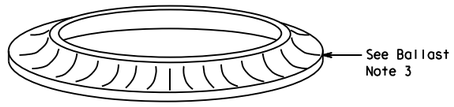
RETROREFLECTIVE SHEETING

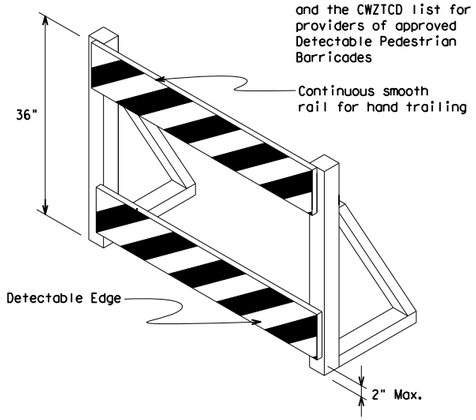
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

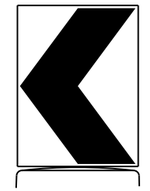




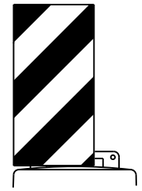


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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REVISIONS	0233	02	035,etc	US 62
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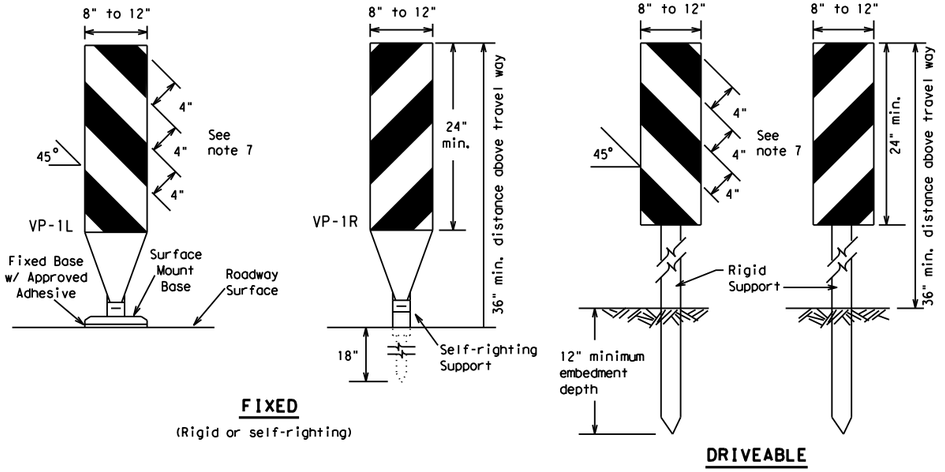
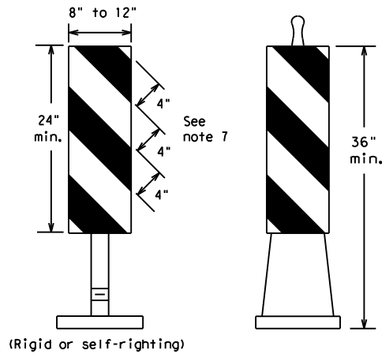


FIXED
(Rigid or self-righting)

DRIVEABLE

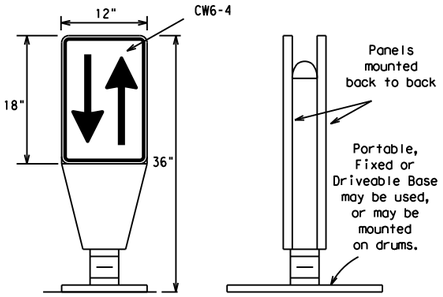


(Rigid or self-righting)

PORTABLE

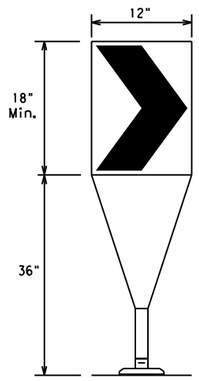
VERTICAL PANELS (VPs)

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



1. Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
2. The OTLD may be used in combination with 42" cones or VPs.
3. Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
4. The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



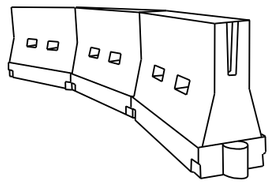
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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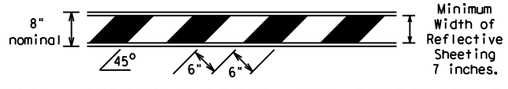
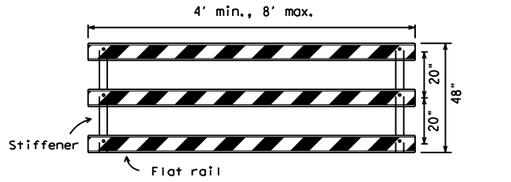
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



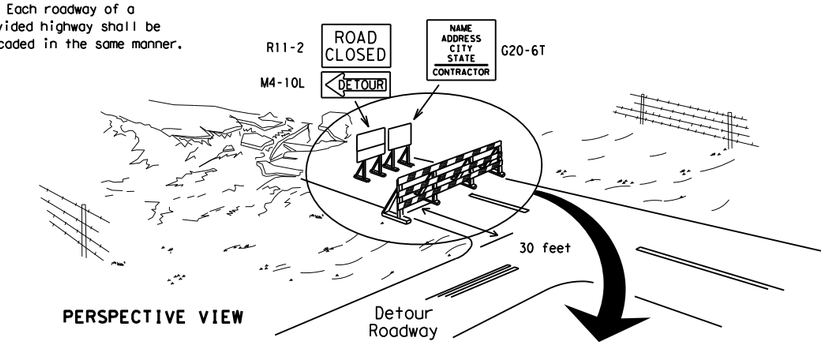
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

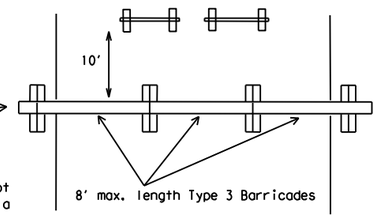
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

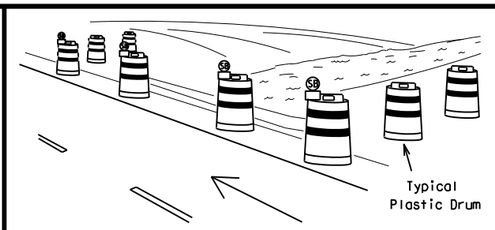
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

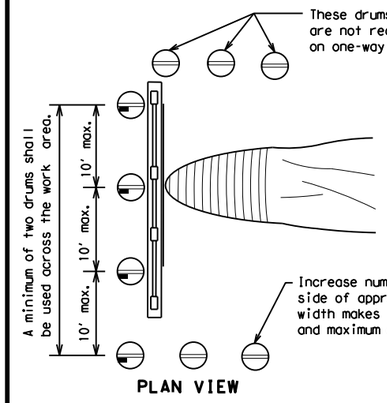
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

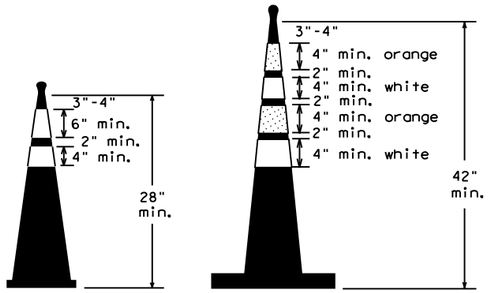
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



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

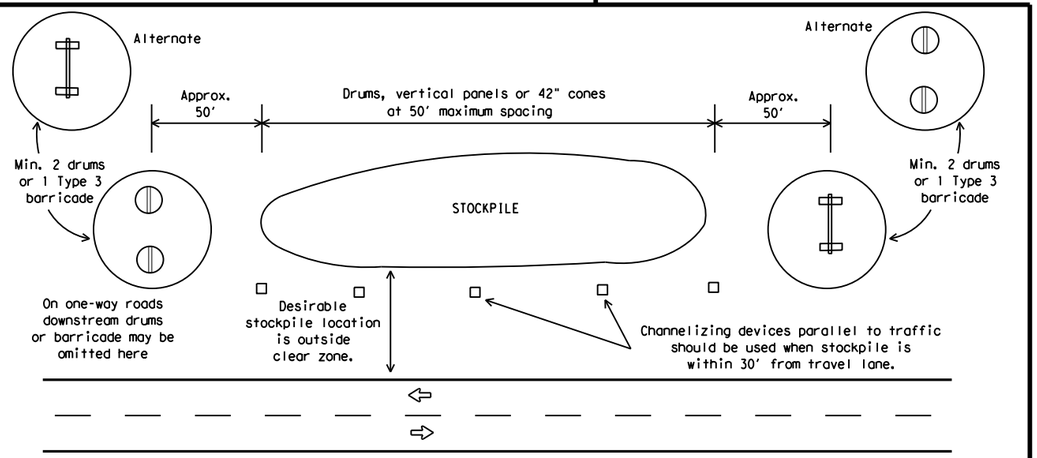
PLAN VIEW

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

SHEET 10 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

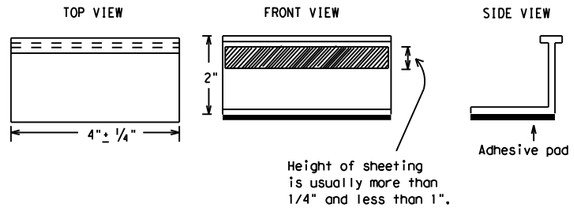
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

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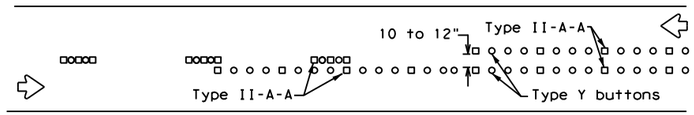
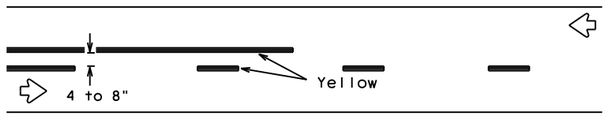
PAVEMENT MARKING PATTERNS

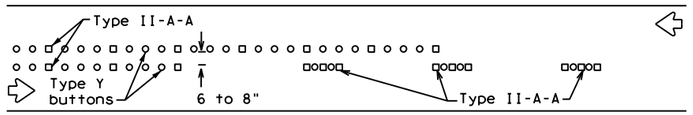
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



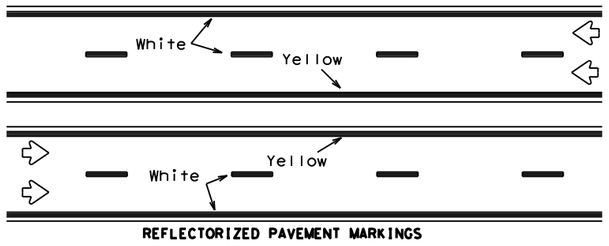
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



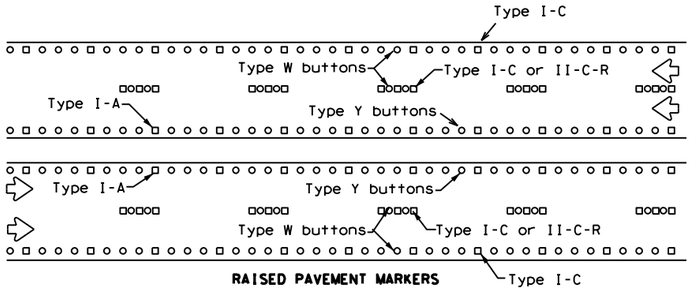
RAISED PAVEMENT MARKERS - PATTERN B

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

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



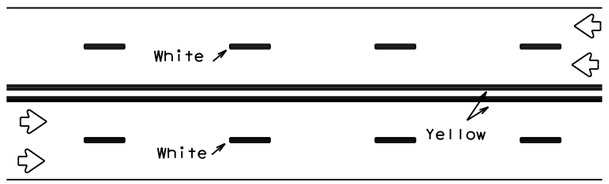
REFLECTORIZED PAVEMENT MARKINGS



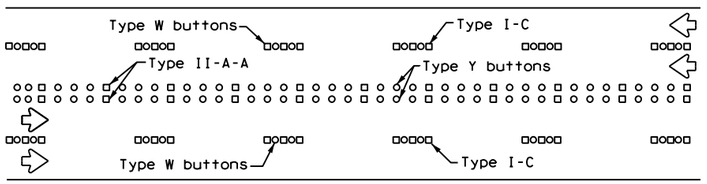
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



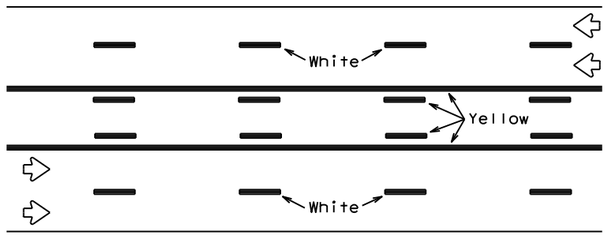
REFLECTORIZED PAVEMENT MARKINGS



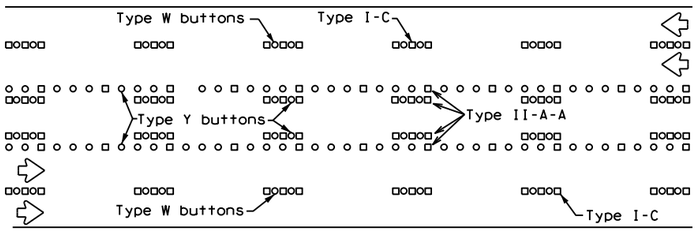
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

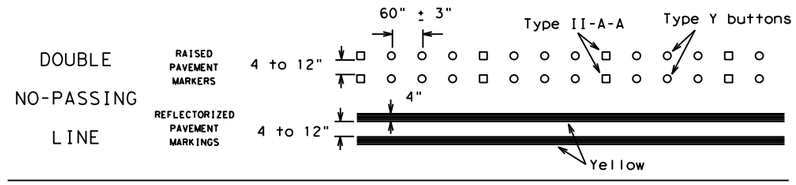
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

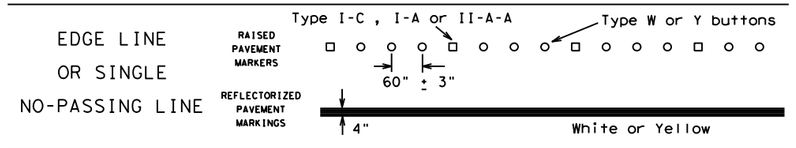
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

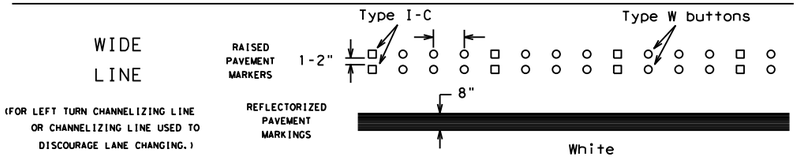


EDGE LINE OR SINGLE NO-PASSING LINE



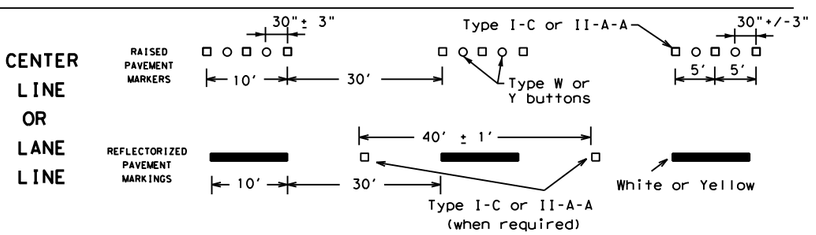
WIDE LINE

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

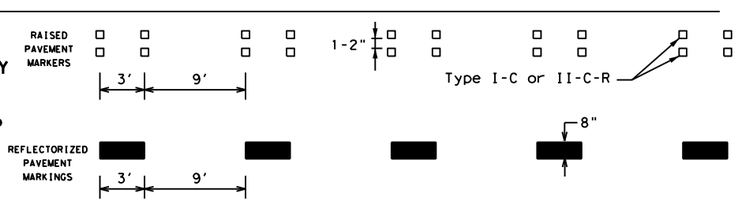


BROKEN LINES

CENTER LINE OR LANE LINE

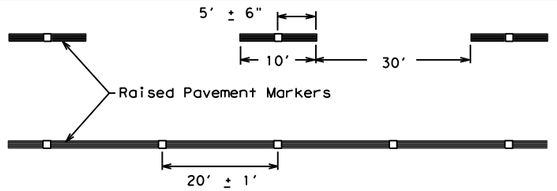


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

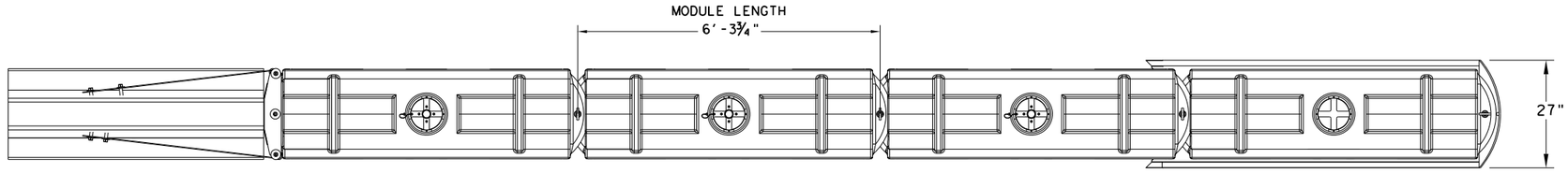
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

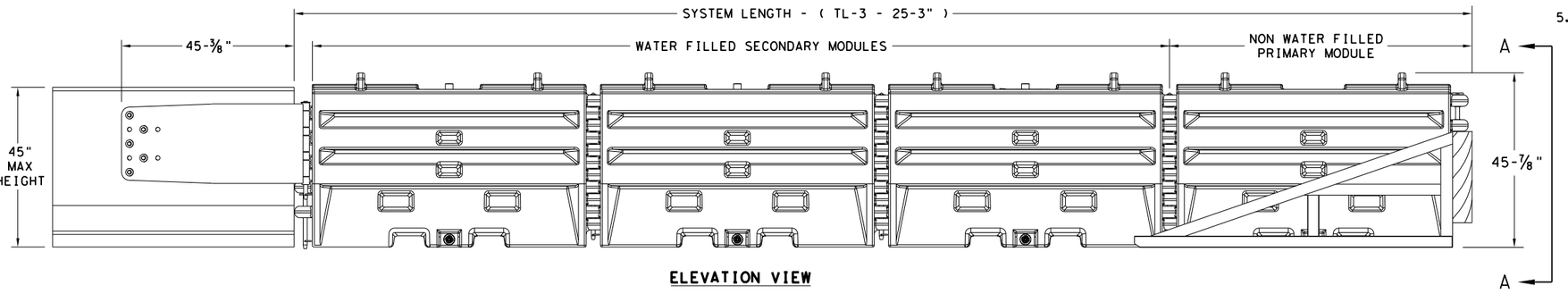
BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	0233	02	035,etc	US 62
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		49

106



PLAN VIEW



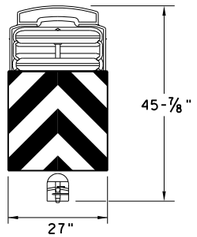
ELEVATION VIEW

GENERAL NOTES

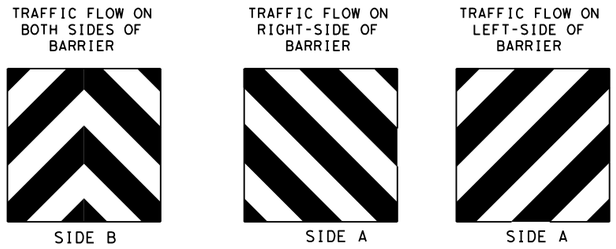
1. REFER TO THE INSTALLATION MANUAL FOR SPECIFIC SYSTEM ASSEMBLY AND MODULE ORIENTATION. FOR ADDITIONAL INFORMATION, CONTACT TRAFFIX, INC. AT (949) 361-5663.
2. THE SLED SYSTEM IS A MASH APPROVED TEST LEVEL 3 (TL-3) CRASH CUSHION APPROVED FOR USE IN TEMPORARY WORK ZONES. THE SLED SYSTEM IS A NON-REDIRECTIVE, GATING CRASH CUSHION THAT DOES NOT NEED TO BE ATTACHED TO THE GROUND AND CAN BE INSTALLED ON CONCRETE, ASPHALT, GRAVEL OR COMPACTED SOIL.
3. MAXIMUM PERMISSIBLE CROSS SLOPE IS 8° (DEGREES) (14%).
4. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
5. THE SLED SYSTEM CAN BE ATTACHED TO:

- CONCRETE BARRIER, TEMPORARY OR PERMANENT, 45" MAXIMUM HEIGHT
- STEEL BARRIER
- PLASTIC BARRIER
- CONCRETE BRIDGE ABUTMENTS
- W-BEAM GUARD RAIL
- THRIE BEAM GUARD RAIL

TEST LEVEL	NUMBER OF SECONDARY MODULES	SYSTEM LENGTH
TL-3	3	25' 3"

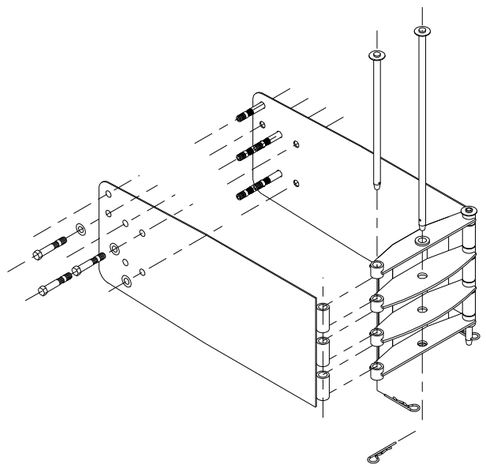


SECTION A-A



NOSE SHEETING PANEL DELINEATION

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



SLED TRANSITION COMPONENTS FOR ATTACHMENT TO CMB

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

TRANSITION OPTIONS
SLED TRANSITION TO CONCRETE TRAFFIC BARRIER (TEMPORARY OR PERMANENT)
SLED TRANSITION TO STEEL TRAFFIC BARRIER (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO PLASTIC TRAFFIC BARRIER (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO W-BEAM OR THRIE BEAM GUARD RAIL (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO CONCRETE BRIDGE ABUTMENT

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

SACRIFICIAL

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

Texas Department of Transportation — Design Division Standard

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

FILE: sled19.dgn	DN: TxDOT	CK: KM	DW: VP	CK:
©TxDOT: DECEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	02	035,etc	US 62
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		50

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DATE: 6/2/2021
FILE: pw:\\txdot.projectwiseonline.com:TXDOT5\Documents\24 - ELP\Design Projects\023302035\4 - Design\Plan Set\2. TCP\TCP STANDARDS\sled19.dgn

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DATE: 6/2/2021 8:17:41 PM
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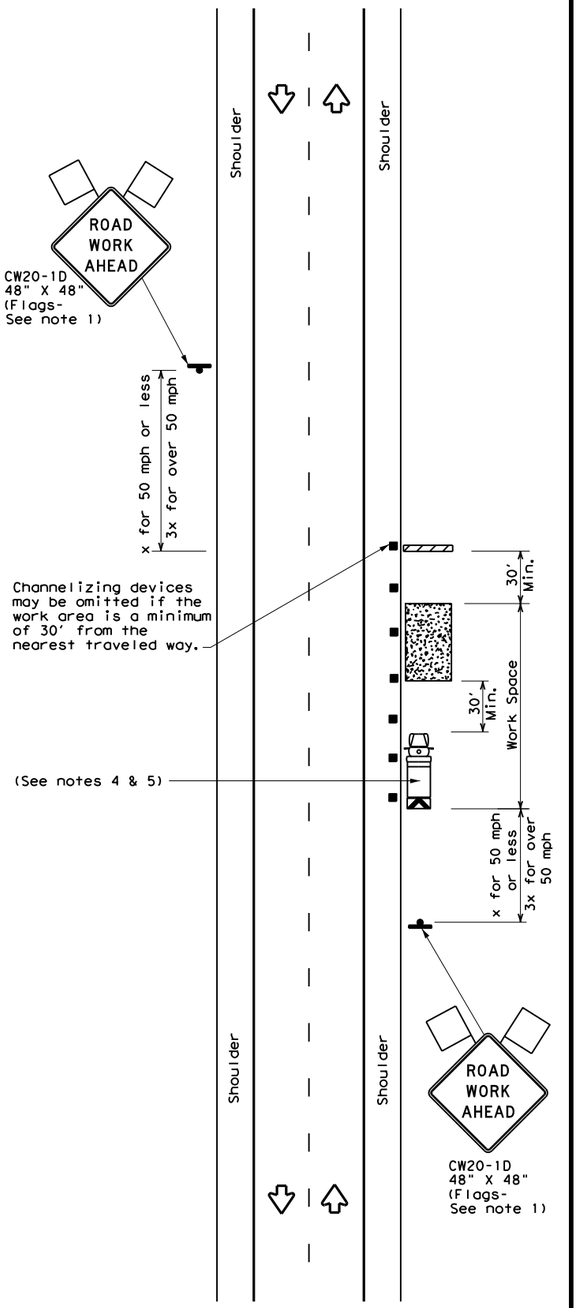
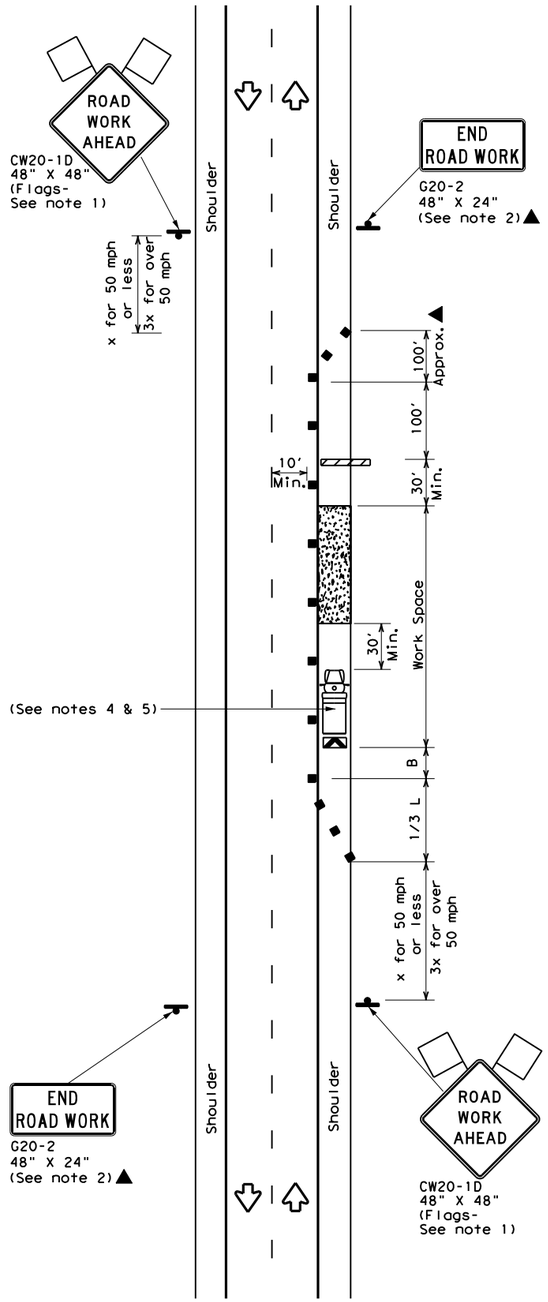


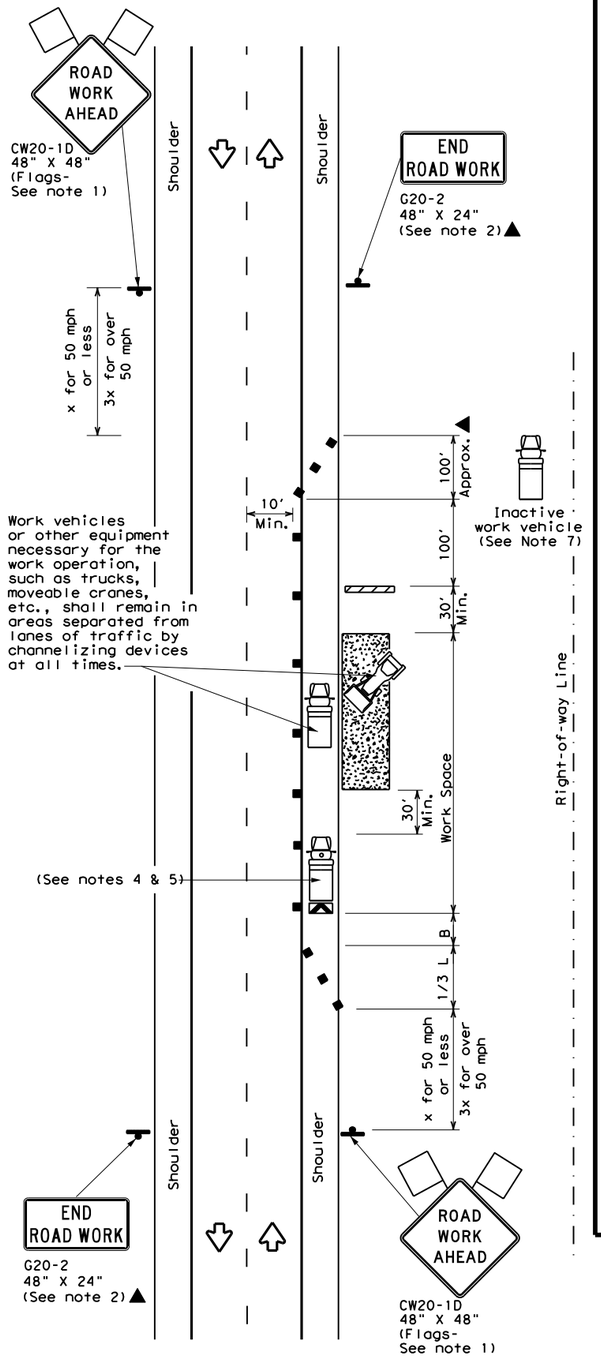
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
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

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated in the plans, or for routine maintenance work, when approved by the Engineer.
3. Stockpiled material should be placed a minimum of 30 feet from nearest traveled way.
4. 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.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
6. See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
7. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
8. CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	02	035,etc	US 62
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	ELP	CULBERSON		51
1-97 2-18				

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DATE: 6/2/2021 8:17:53 PM
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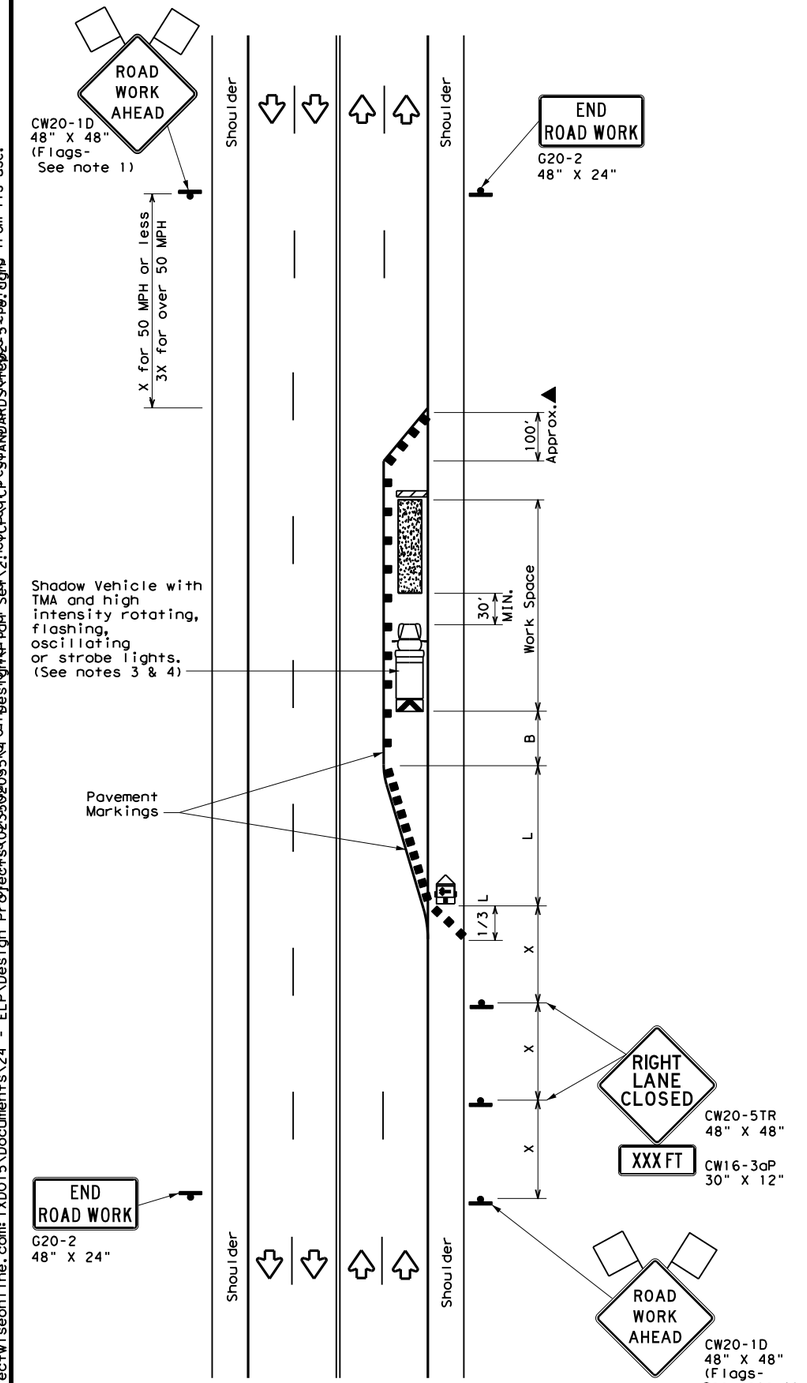
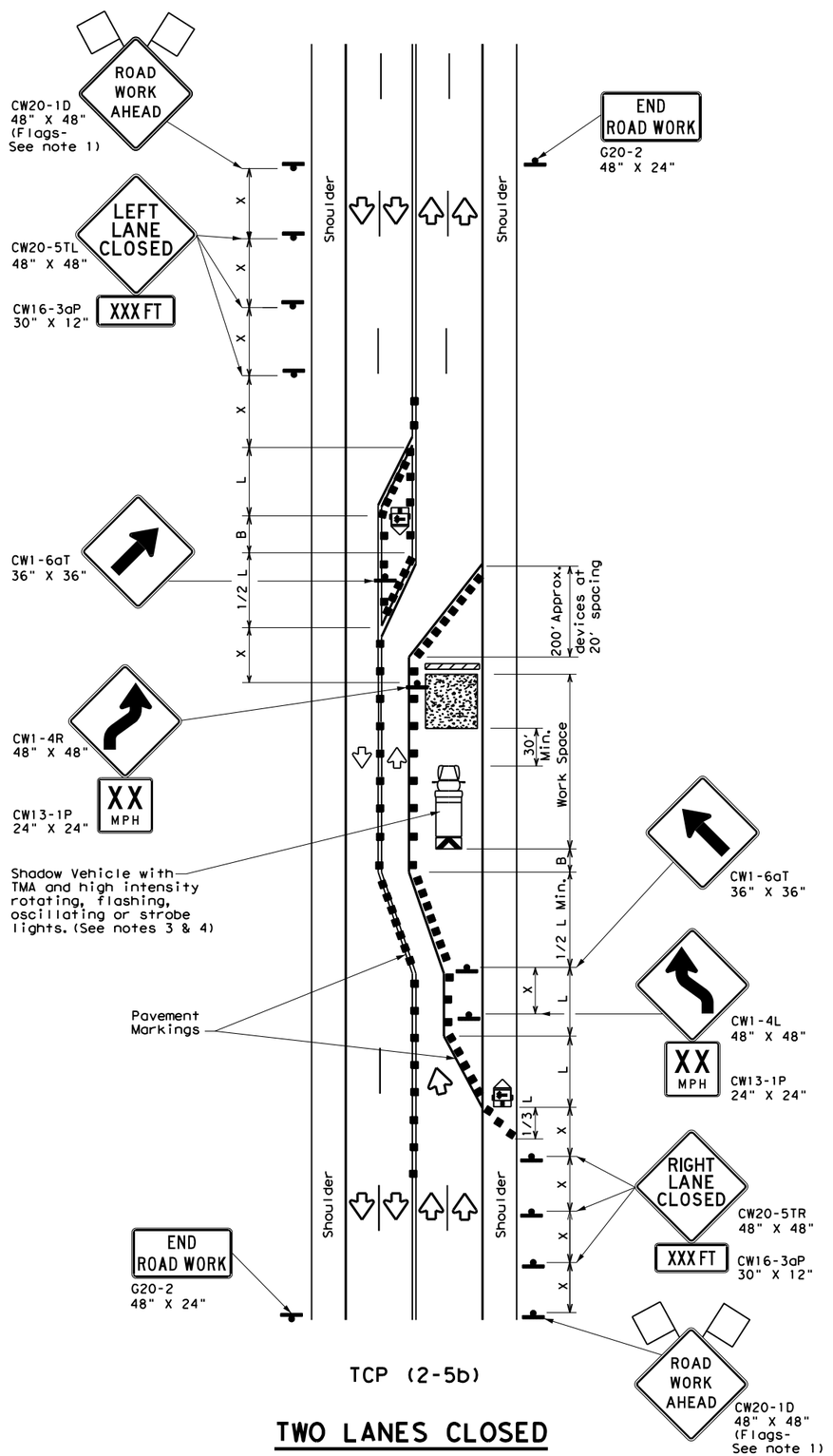


TCP (2-5a)

ONE LANE CLOSED



TCP (2-5b)

TWO LANES CLOSED

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. 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.
3. 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 eposure 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 substitutued for the Shadow Vehicle and TMA.
4. 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.
5. The downstream taper is optional. When used, it should be 100 feet approximately per lane, with channelizing devices spaced at 20 feet.

TCP (2-5a)

6. If this TCP is used for a left lane closure, CW20-5TL "LEFT LANE CLOSED" signs shall be used and channelizing devices shall be placed on the centerline to protect the work space from opposing traffic, with the arrow board placed in the closed lane near the end of the merging taper.

TCP (2-5b)

7. Conflicting pavement markings shall be removed for long-term projects.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LONG TERM LANE CLOSURES MULTILANE CONVENTIONAL RDS.

TCP(2-5)-18

FILE: tcp2-5-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 2-12	0233	02	035,etc	US 62
1-97 3-03	DIST	COUNTY		SHEET NO.
4-98 2-18	ELP	CULBERSON		52

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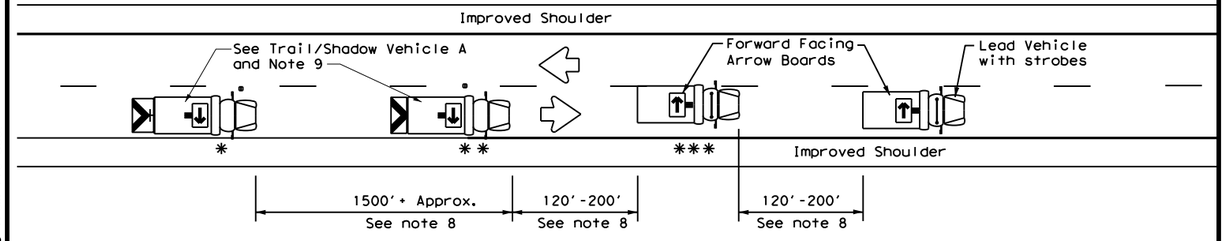
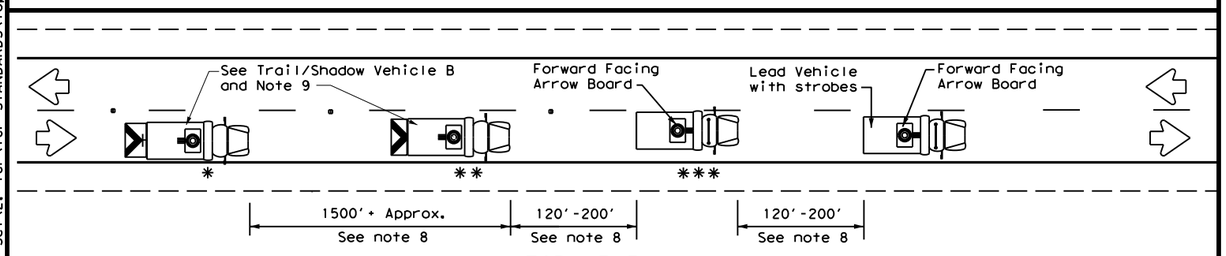


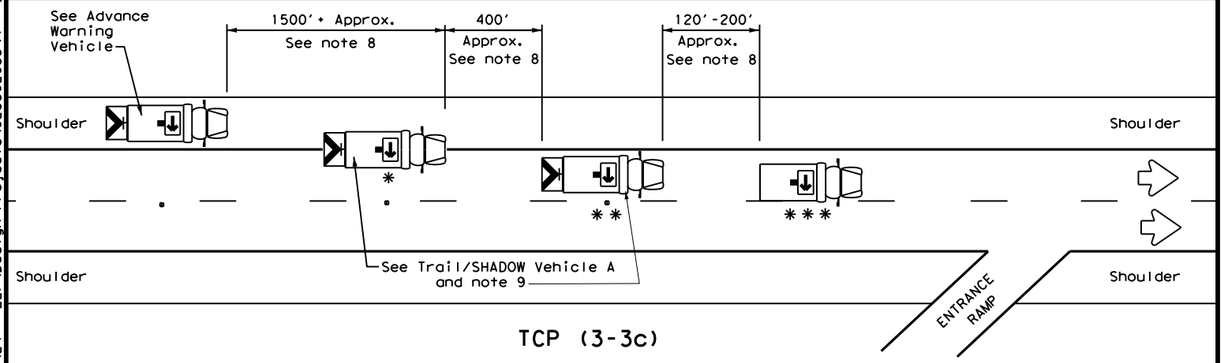
TCP (3-3a)

TWO LANE HIGHWAY WITH PAVED SHOULDERS (WORK ON TRAVEL LANE)



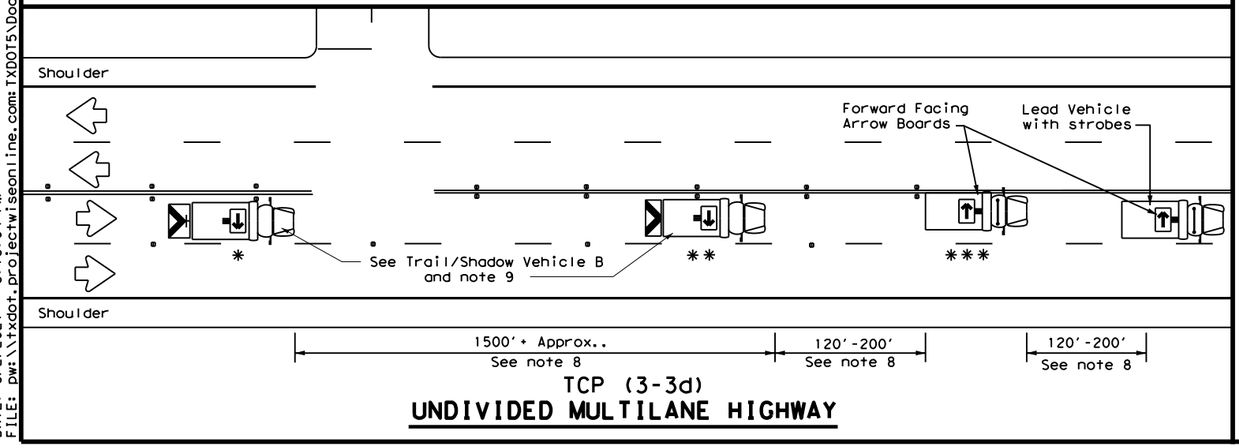
TCP (3-3b)

TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS (WORK ON TRAVEL LANE)



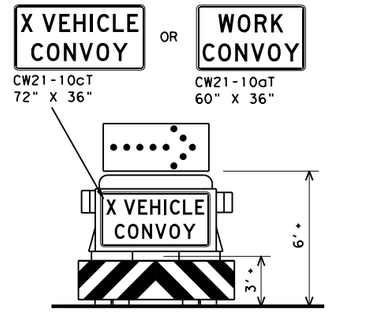
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



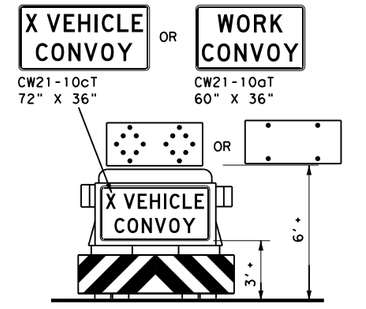
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



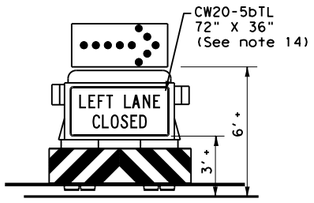
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

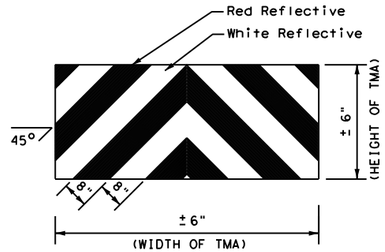


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used on two way roads the WORK vehicle must have an arrow board. For divided roadways, the arrow board on the WORK vehicle is optional based on the type of work being performed. The Engineer will determine if the LEAD vehicle and/or TRAIL vehicle are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. 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.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE, ADVANCE WARNING and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the 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 and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. X VEHICLE CONVOY (CW21-10cT) or WORK CONVOY (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" x 48" diamond shaped WORK CONVOY (CW21-10T) or X VEHICLE CONVOY (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The X VEHICLE CONVOY sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. For divided highways with two or three lanes in one direction, the appropriate LEFT LANE CLOSED (CW20-5bTL), RIGHT LANE CLOSED (CW20-5bTR), or CENTER LANE CLOSED (CW20-5dT) sign should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or 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 may 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.
11. A double arrow shall not be displayed on the arrow board on the Advance Warning Vehicle.
12. For divided highways with three or four lanes in each direction, use TCP(3-2).
13. Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
14. The Advance Warning Vehicle may straddle the edgeline when Shoulder width makes it necessary.
15. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a DO NOT PASS (R4-1) sign should be placed on the back of the rearmost protection vehicle.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL

TCP(3-3)-14

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	02	035,etc	US 62
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	ELP	CULBERSON		53
1-97 7-14				

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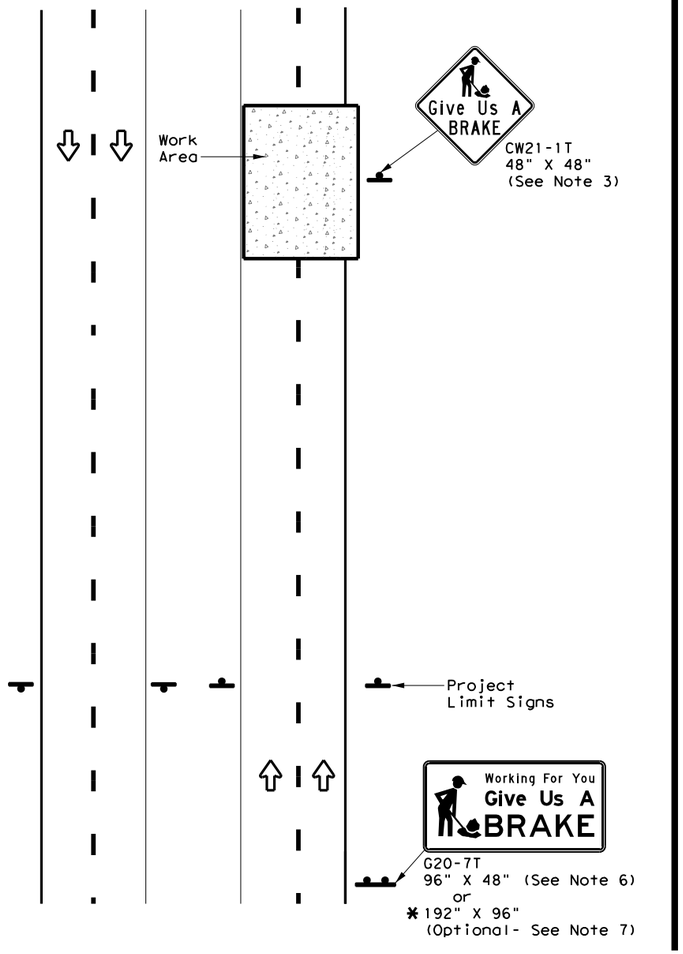
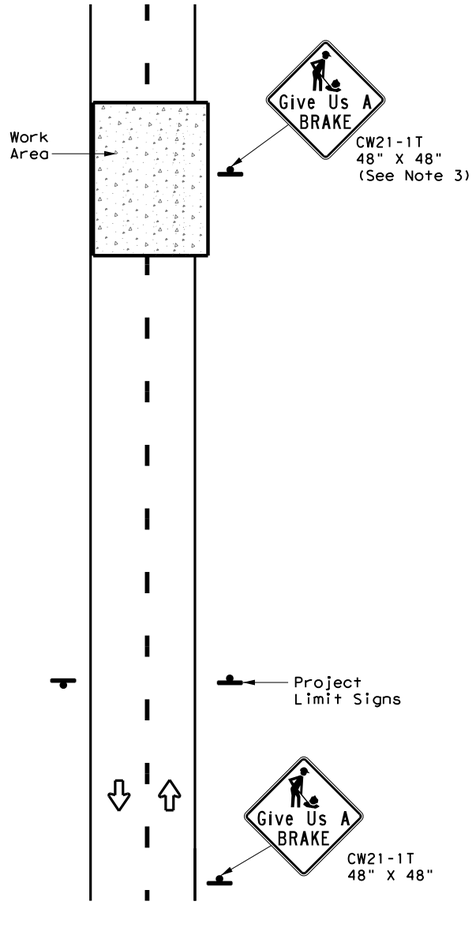


DIVIDED HIGHWAY



UNDIVIDED HIGHWAY

SIGNS ARE SHOWN FOR ONE DIRECTION OF TRAVEL

* When the optional larger WORKING FOR YOU GIVE US A BRAKE (G20-7T) 192" x 96" sign is required, the locations shall be noted elsewhere in the plans.

SUMMARY OF LARGE SIGNS

BACKGROUND COLOR	SIGN DESIGNATION	SIGN	SIGN DIMENSIONS	REFLECTIVE SHEETING	SQ FT	GALVANIZED STRUCTURAL STEEL			DRILLED SHAFT 24" DIA. (LF)
						Size	(LF) ①	(LF) ②	
Orange	G20-7T	Working For You Give Us A BRAKE	96" X 48"	Type B_{FL} or C_{FL}	32	▲	▲	▲	▲
Orange	G20-7T	Working For You Give Us A BRAKE	192" X 96"	Type B_{FL} or C_{FL}	128	W8x18	16	17	12

▲ See Note 6 Below

LEGEND	
	Sign
	Large Sign
	Traffic Flow

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PLYWOOD SIGN BLANKS	DMS-7100
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

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

GENERAL NOTES

1. See BC and SMD sheets for additional sign support details.
2. Sign locations shall be approved by the Engineer.
3. For projects more than two miles in length, Give Us a BRAKE signs should be repeated halfway through the project. The Give Us a Brake (CW21-1T) may be used for this purpose.
4. Work zone speed limits are sometimes used in conjunction with GIVE US A BRAKE signing. See BC(3) for location and spacing of construction speed zone signing when required.
5. Give Us a Brake (CW21-1T) signs and supports shall be considered subsidiary to Item 502, "Barricades, Signs and Traffic Handling."
6. The 96" X 48" Working For You Give Us A BRAKE (G20-7T) may use a 1/2" or 5/8" plywood substrate or 0.125" aluminum sheeting substrate and may be supported by two 4" x 6" wood posts with drilled holes for breakaway as per BC(5) and will be subsidiary to Item 502.
7. The Working For You Give Us A BRAKE (G20-7T) 192" X 96" sign shall be paid for under the following specification items:
   Item 636 - Aluminum Signs
   Item 647 - Large Roadside Sign Supports and Assemblies.
   Item 416 - Drilled Shaft Foundations
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.

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE "GIVE US A BRAKE" SIGNS

WZ(BRK)-13

FILE: wzbrk-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	02	035,etc	US 62
6-96 5-98 7-13	DIST	COUNTY		SHEET NO.
8-96 3-03	ELP	CULBERSON		54

116

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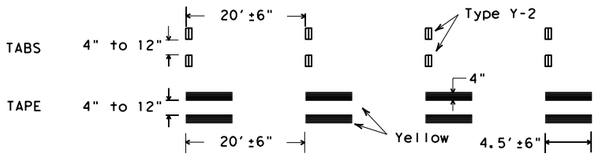
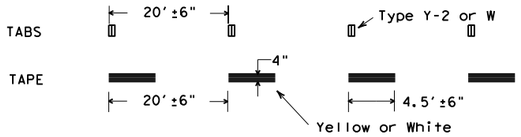
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

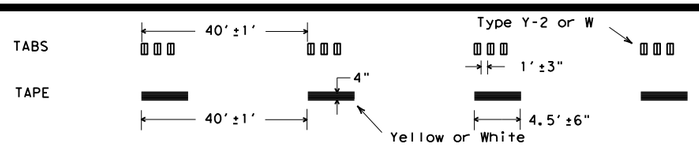


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



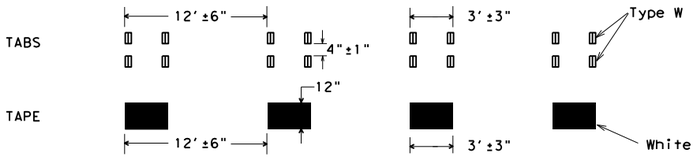
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

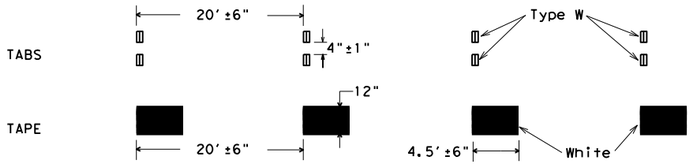


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



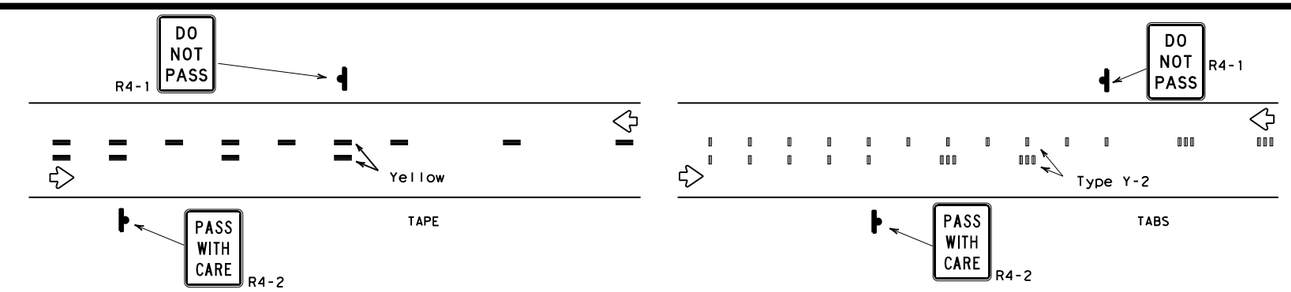
NOTES:

1. Short term pavement markings may be prefabricated markings (stick down tape) or temporary flexible-reflective roadway marker tabs unless otherwise specified elsewhere in plans.
2. Short term pavement markings shall NOT be used to simulate edge lines.
3. Dimensions indicated on this sheet are typical and approximate. Variations in size and height may occur between markers or devices made by manufacturers, by as much as 1/4 inch, unless otherwise noted.
4. Temporary flexible-reflective roadway marker tabs will require normal maintenance replacement when used on roadways with an ADT per lane of up to 7500 vehicles with no more than 10% truck mix. When roadways exceed these values, additional maintenance replacement of devices should be planned.
5. No segment of roadway open to traffic shall remain without permanent pavement markings for a period greater than 14 calendar days. The Contractor will be responsible for maintaining short term pavement markings until permanent pavement markings are in place. When the Contractor is responsible for placement of permanent pavement markings, no segment of roadway shall remain without permanent pavement markings for a period greater than 14 calendar days unless weather conditions prohibit placement. Permanent pavement markings shall be placed as soon as weather permits.
6. For two lane, two-way roadways, DO NOT PASS signs shall be erected to mark the beginning of sections where passing is prohibited and PASS WITH CARE signs shall be erected to mark the beginning of sections where passing is permitted. Signs shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and may be used to indicate the limits of no-passing zones for up to 14 calendar days. Permanent pavement markings should then be placed.
7. For low volume two lane, two-way roadways of 4000 ADT or less, no-passing lines may be omitted when approved by the Engineer. DO NOT PASS and PASS WITH CARE signs shall be erected (see note 6).
8. For exit gores where a lane is being dropped place wide gore markings or retroreflective channelizing devices to guide motorist through the exit. If channelizing devices are to be used it should be noted elsewhere in the plans. One piece cones are not allowed for this purpose.

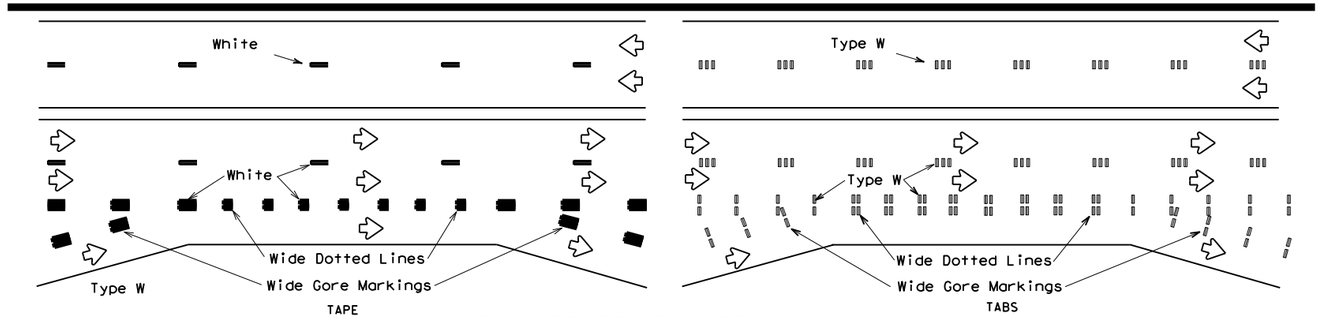
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

1. Temporary flexible-reflective roadway marker tabs detailed on this sheet will be designated Type Y-2 (two amber reflective surfaces with yellow body); Type Y (one amber reflective surface with yellow body); and Type W (one white or silver reflective surface with white body). Additional details may be found on BC(11).
2. Tabs shall meet requirements of Departmental Material Specification DMS-8242.
3. When dry, tabs shall be visible for a minimum distance of 200 feet during normal daylight hours and when illuminated by automobile low-beam head light at night, unless sight distance is restricted by roadway geometrics.
4. No two consecutive tabs nor four tabs per 1000 feet of line shall be missing or fail to meet the visual performance requirements of Note 3.

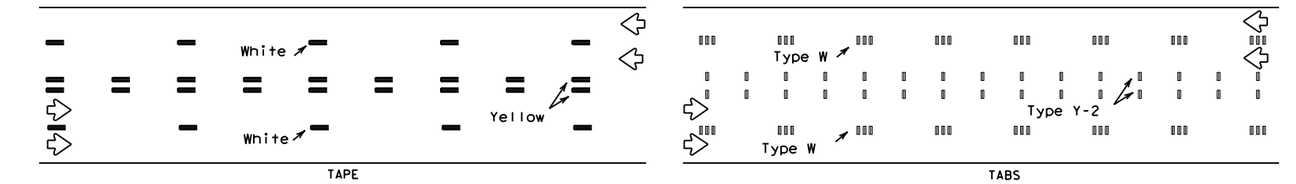
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



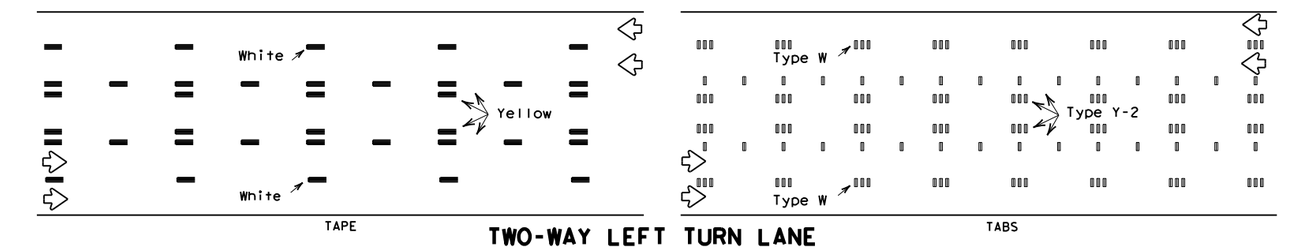
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



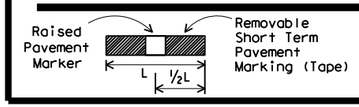
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



If raised pavement markers are used to supplement REMOVABLE short term markings, the markers shall be applied to the top of the tape at the approximate mid length of the tape. This allows an easier removal of raised markers and tape.

PREFABRICATED PAVEMENT MARKINGS

1. Temporary Removable Prefabricated Pavement Markings shall meet the requirements of DMS-8241.
2. Non-removable Prefabricated Pavement Markings shall meet the requirements of either DMS-8240 "Permanent Prefabricated Pavement Markings" or DMS-8243 "Temporary Costruction-Grade Prefabricated Pavement Markings."

RAISED PAVEMENT MARKERS

1. All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and DMS-4200.

DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS) & MATERIAL PRODUCER LISTS (MPL)

1. DMSs referenced above can be found along with embedded links to their respective MPLs at the following website:
   http://www.txdot.gov/business/contractors_consultants/material_specifications/default.htm

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

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©TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS		0233	02	035,etc	US 62
1-97		DIST	COUNTY		SHEET NO.
3-03		ELP	CULBERSON		55
7-13					

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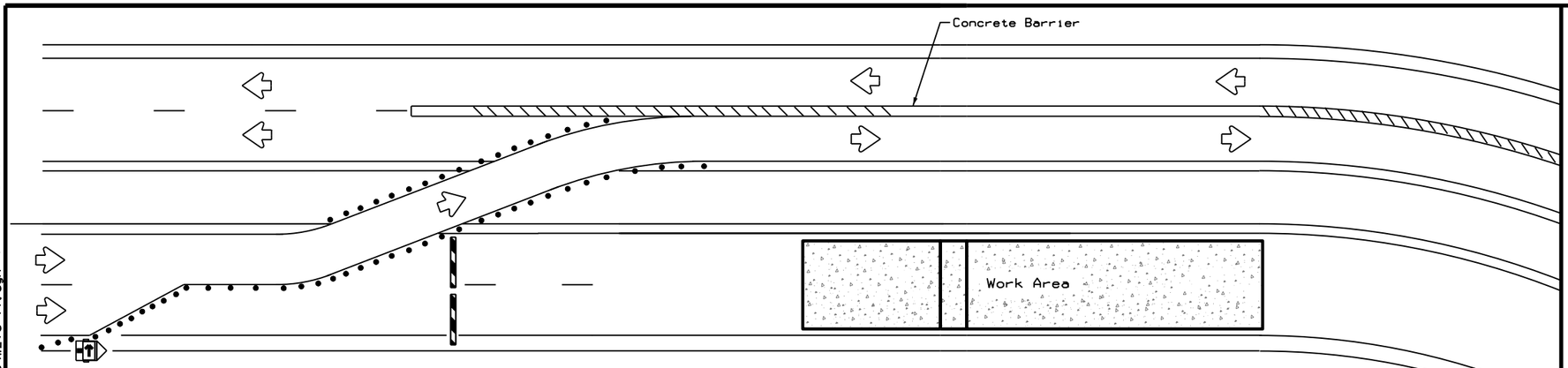


NOTES:

1. Length of Safety Glare screen will be specified elsewhere in the plans.
2. The cumulative nominal length of the modular safety glare screen units shall equal the length of the individual sections of temporary concrete traffic barrier on which they are installed so the joint between barrier sections will not be spanned by any one safety glare screen unit.
3. Screen Panel/blades will be designed such that reflective sheeting conforming with Departmental Material Specification DMS-8300, Sign Face Materials, Type B or C Yellow, minimum size of 2 inches by 12 inches can be attached to the edge of the panel/blade. The sheeting shall be attached to one glare screen panel/blade per section of concrete barrier not to exceed a spacing of 30 feet. Barrier reflectors are not necessary when panel/blades are installed with reflective sheeting as described.
4. Payment for these devices will be under statewide Special Specification "Modular Glare Screens for Headlight Barrier."
5. This detail is only intended to show types of locations where Glare Screens would be appropriate. Required signing and other devices shall be as shown elsewhere in the plans.

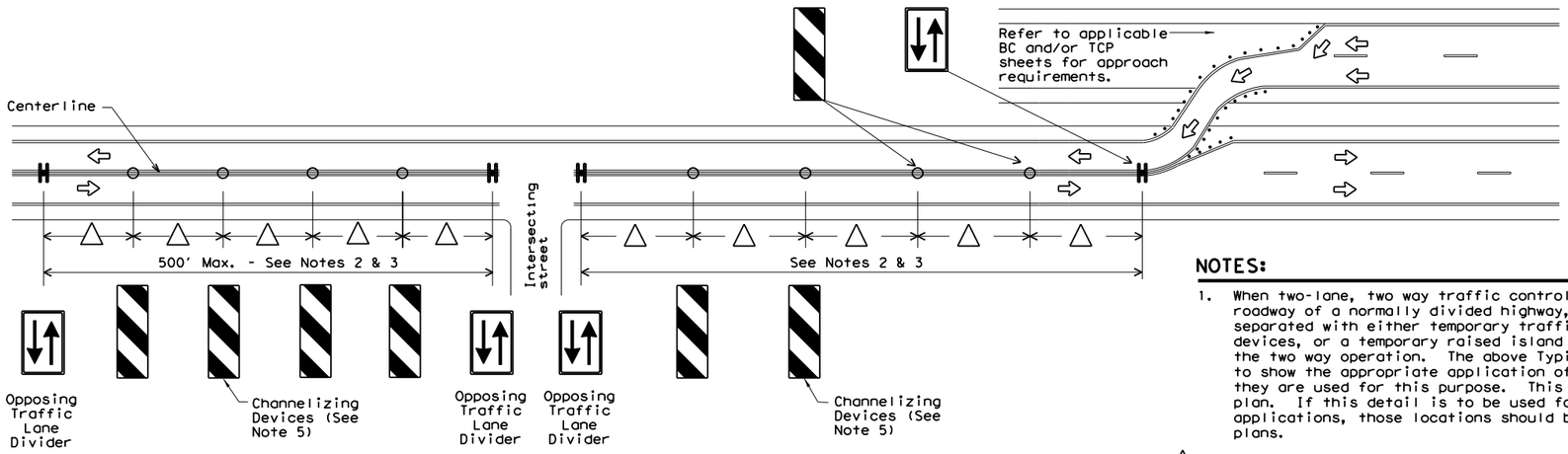
BARRIER DELINEATION WITH MODULAR GLARE SCREENS

LEGEND	
	Type 3 Barricade
• • •	Channelizing Devices
	Trailer Mounted Flashing Arrow Board
	Sign
\\\\	Safety glare screen

DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
DELINEATORS AND OBJECT MARKERS	DMS-8600
MODULAR GLARE SCREENS FOR HEADLIGHT BARRIER	DMS-8610

Only pre-qualified products shall be used. A copy of the Compliant Work Zone Traffic Control Devices List" CWZTCD)describes pre-qualified products and their sources and may be found at the following web address:

http://www.txdot.gov/business/resources/producer-list.html



VERTICAL PANELS & OPPOSING TRAFFIC LANE DIVIDERS (OTLD) SEPARATING TWO-WAY TRAFFIC ON NORMALLY DIVIDED HIGHWAYS

NOTES:

1. When two-lane, two way traffic control must be maintained on one roadway of a normally divided highway, opposing traffic shall be separated with either temporary traffic barriers, channelizing devices, or a temporary raised island throughout the length of the two way operation. The above Typical Application is intended to show the appropriate application of channelizing devices when they are used for this purpose. This is not a traffic control plan. If this detail is to be used for other types of roads or applications, those locations should be stated elsewhere in the plans.

△2. Space devices according to the Tangent Spacing shown on the Device Spacing table on BC(9) but not exceeding 100'.

3. Every fifth device should be an OTLD except when spaced closer to accommodate an intersection. An OTLD should be the first device on each side of intersecting streets or roads.
4. Locations where surface mount bases with adhesives or self-righting devices will be required in order to maintain them in their proper position should be noted elsewhere in the plans.
5. Channelizing devices are to be vertical panels, 42" cones or tubular markers that are at least 36" tall. Tubular markers used to separate traffic should have a rubber base weighing at least 30 pounds. Tubular markers that are 42" tall or more shall have four bands of reflective material as detailed for 42" cones on BC(10). Tubular markers less than 42" but at least 36" tall shall have three bands of 3" wide white reflective material spaced 2" apart. Reflective material shall meet DMS-8300, Type A.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TYPICAL DETAILS

WZ(TD)-17

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	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		56

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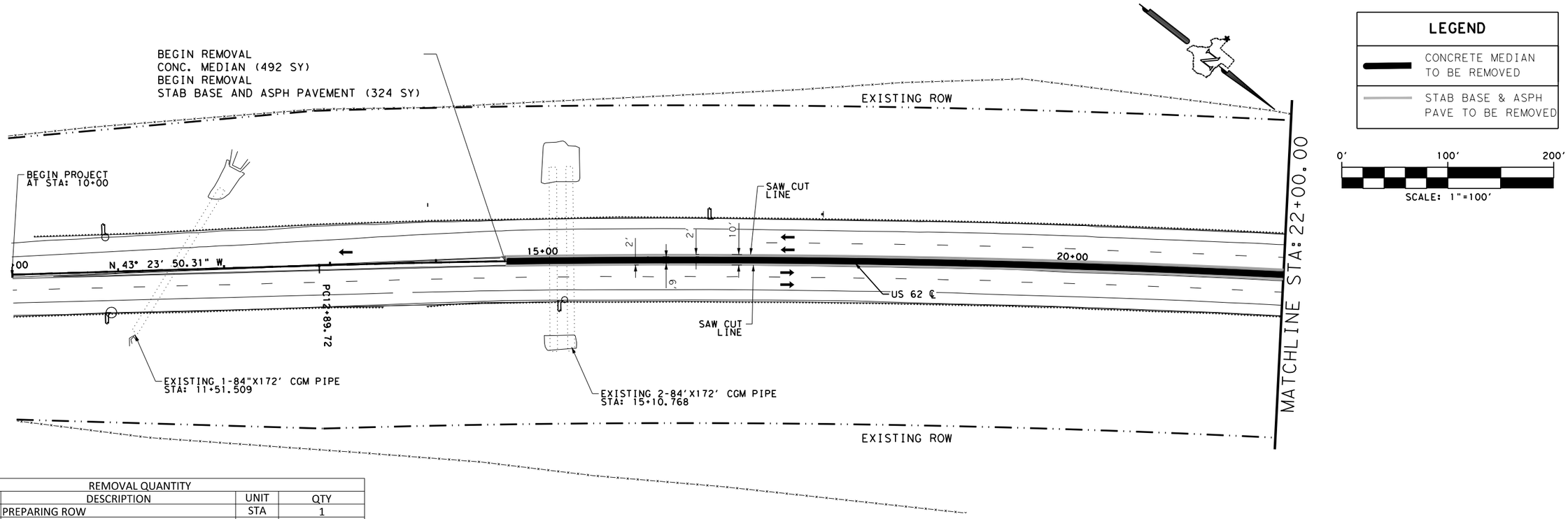

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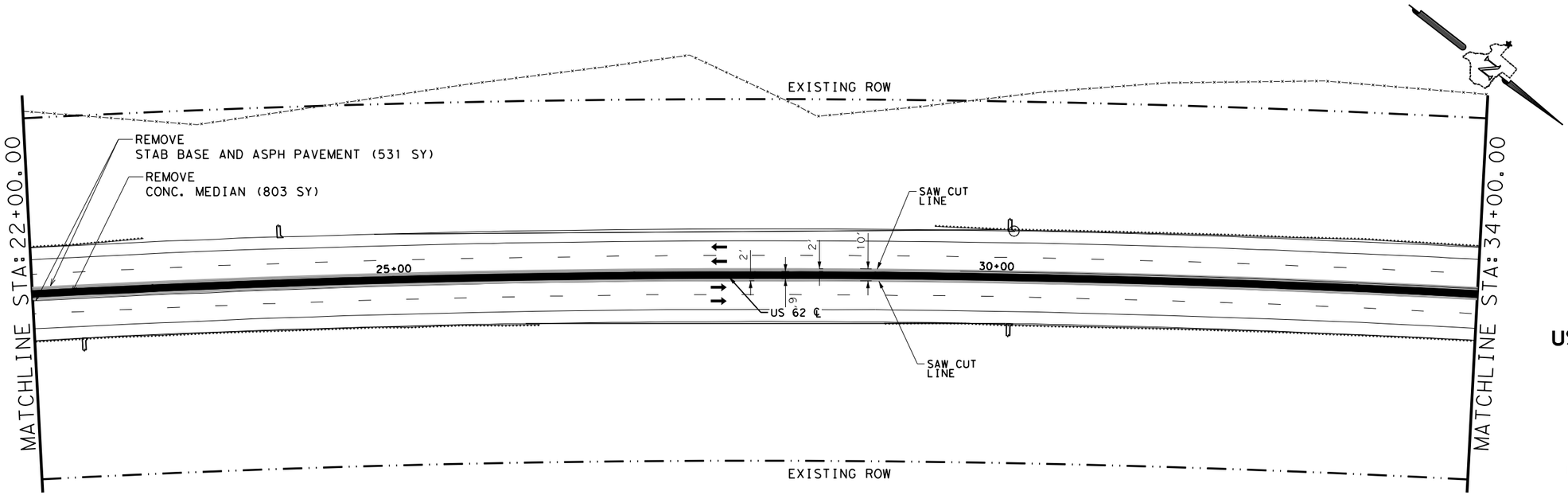
105	6046	REMOVING STAB BASE & ASPH PAV (0"-10")	SY	855



GENERAL NOTES:

1. REMOVAL OF FLUMES AND CURB CUTS SEE DRAINAGE AREA MAP SHEETS
2. REMOVAL OF INLETS, MANHOLES SEE DRAINAGE PLAN AND PROFILE SHEETS
3. FOLLOW TCP PHASING FOR PAVEMENT MARKINGS REMOVAL.

STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED
PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER
ROADWAY

REMOVAL LAYOUT
BEGIN PROJECT TO STA. 34+00.00

SHEET 1 OF 8

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		57

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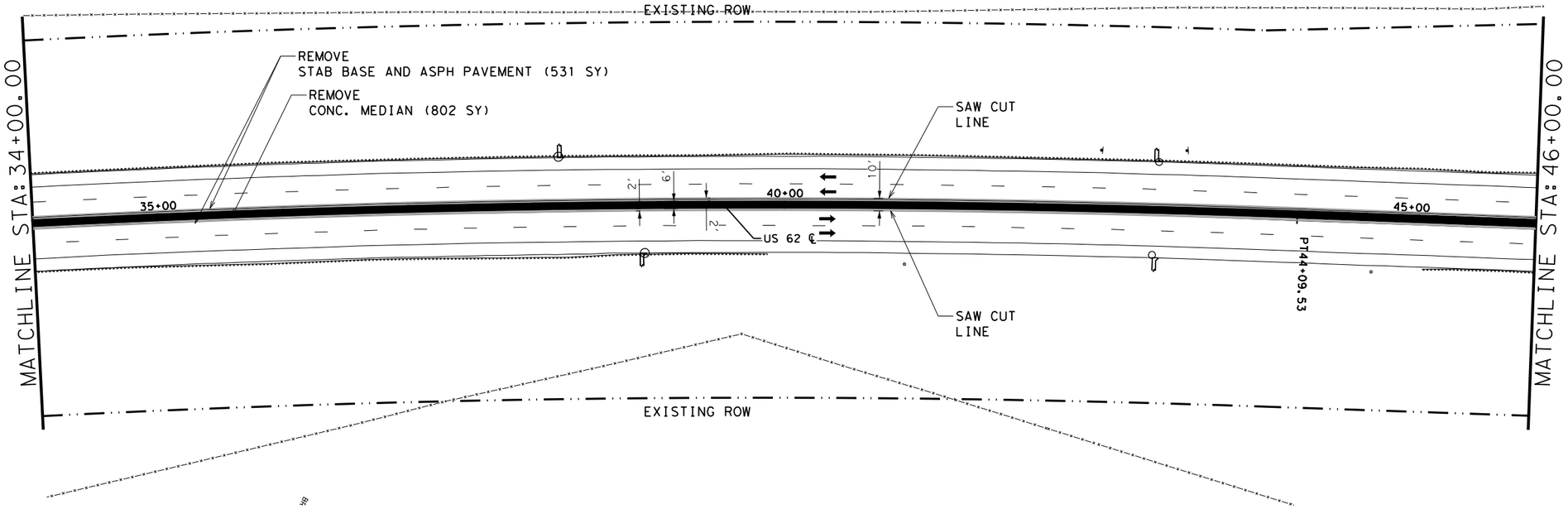

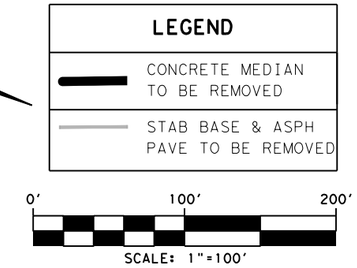

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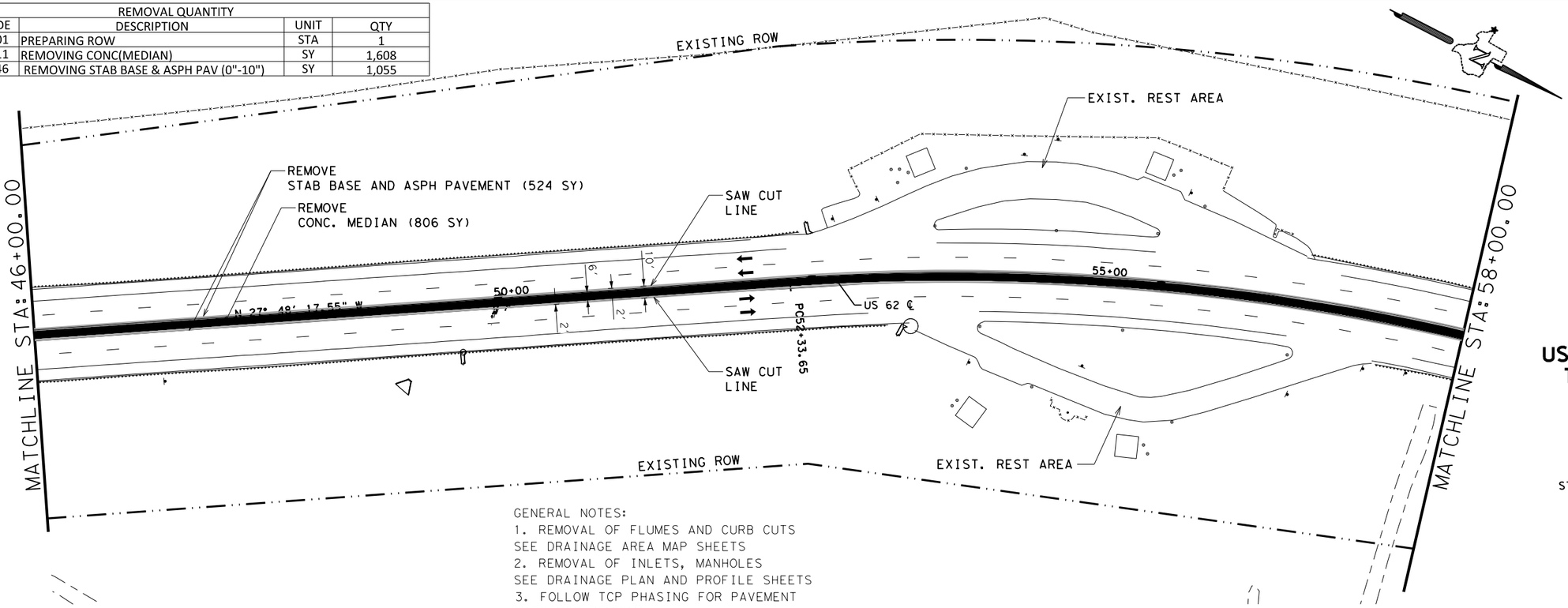
105	6046	REMOVING STAB BASE & ASPH PAV (0"-10")	SY	1,055



GENERAL NOTES:
1. REMOVAL OF FLUMES AND CURB CUTS
SEE DRAINAGE AREA MAP SHEETS
2. REMOVAL OF INLETS, MANHOLES
SEE DRAINAGE PLAN AND PROFILE SHEETS
3. FOLLOW TCP PHASING FOR PAVEMENT
MARKINGS REMOVAL.

STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED
PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER
ROADWAY

REMOVAL LAYOUT
STA. 34+00.00 TO STA. 58+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		58

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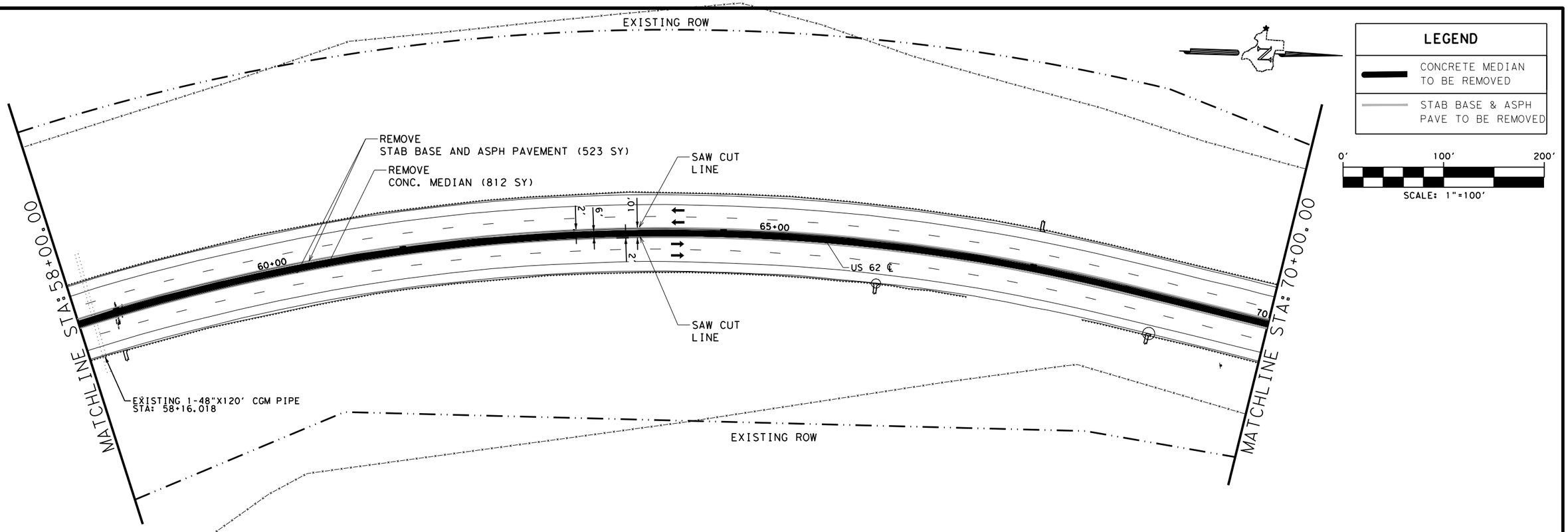
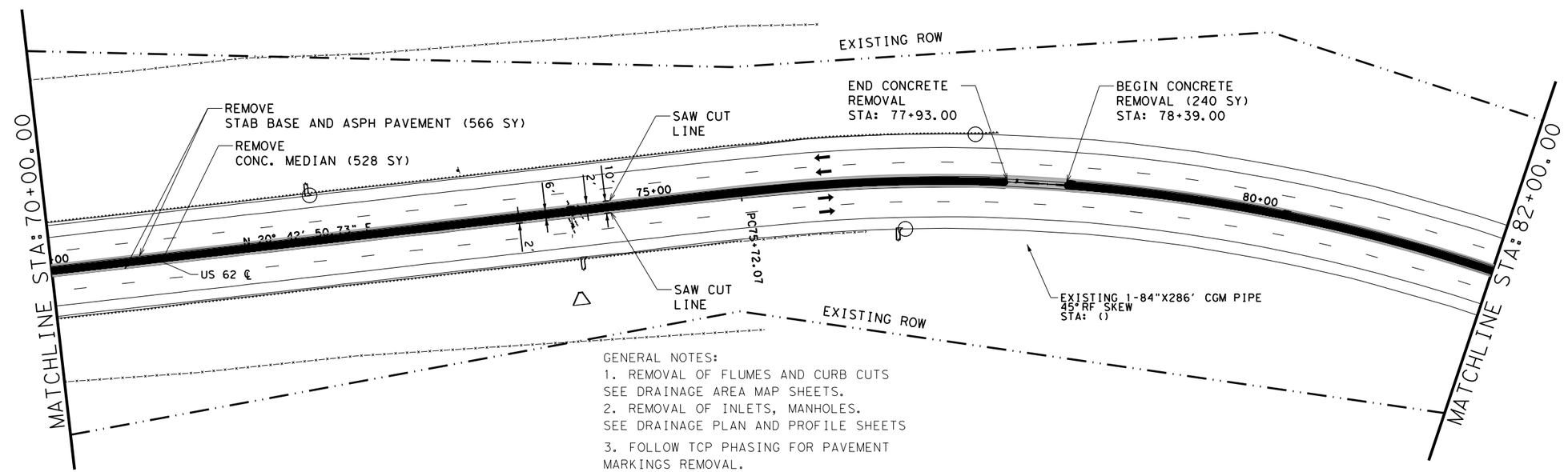


REMOVAL QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
100	6001	PREPARING ROW	STA	1
104	6011	REMOVING CONC(MEDIAN)	SY	1,580
105	6046	REMOVING STAB BASE & ASPH PAV (0"-10")	SY	1,089



GENERAL NOTES:
1. REMOVAL OF FLUMES AND CURB CUTS SEE DRAINAGE AREA MAP SHEETS.
2. REMOVAL OF INLETS, MANHOLES. SEE DRAINAGE PLAN AND PROFILE SHEETS
3. FOLLOW TCP PHASING FOR PAVEMENT MARKINGS REMOVAL.

STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED
PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER
ROADWAY

REMOVAL LAYOUT
STA. 58+00.00 TO STA. 82+00.00

SHEET 3 OF 8

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CONT	SECT	JOB	HIGHWAY
0233	02	035, etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		59

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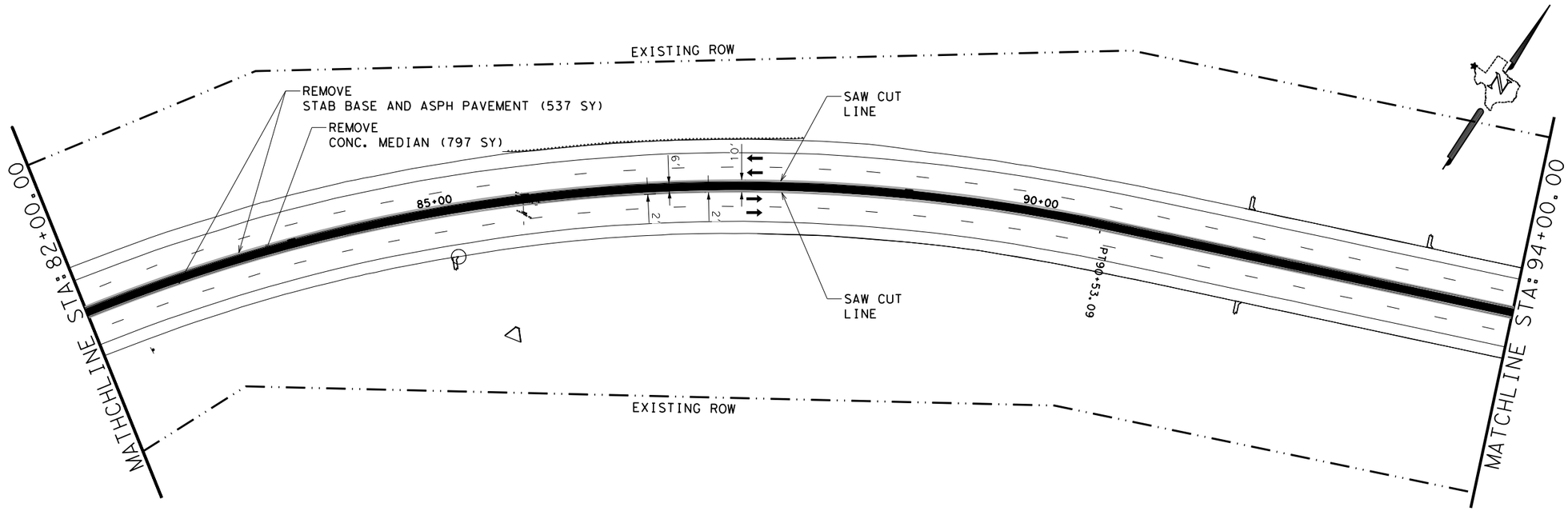
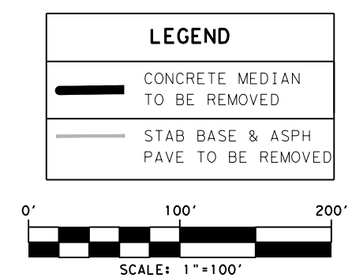
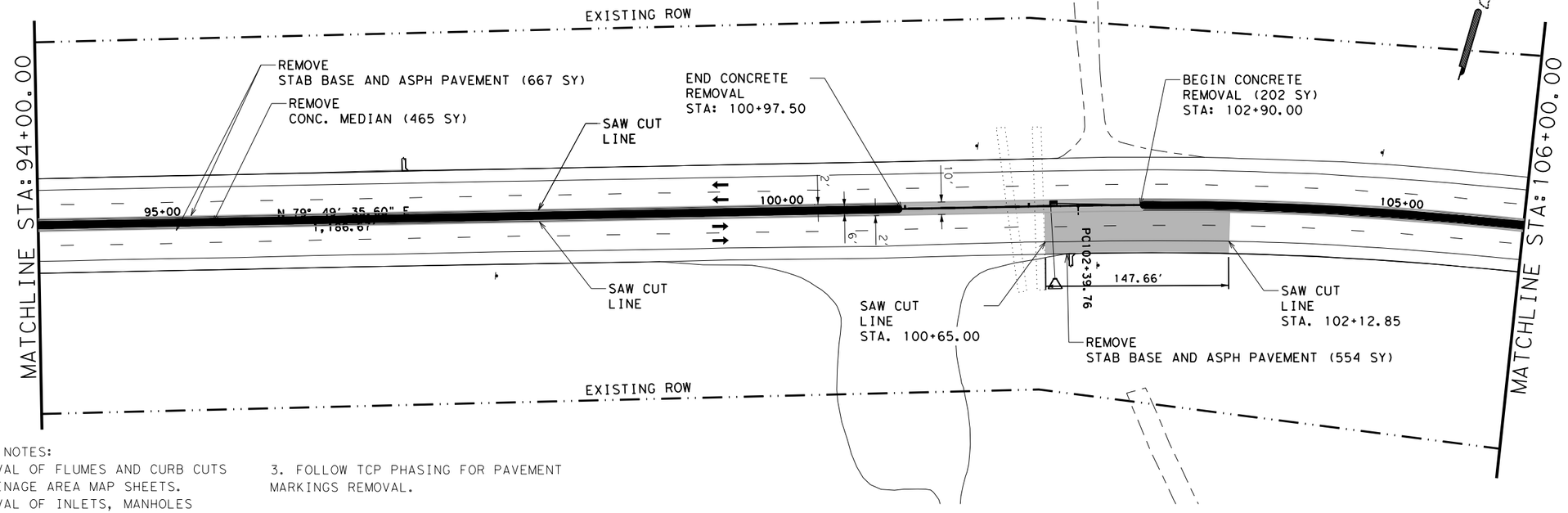




REMOVAL QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
100	6001	PREPARING ROW	STA	1
104	6011	REMOVING CONC(MEDIAN)	SY	1,464
105	6046	REMOVING STAB BASE & ASPH PAV (0"-10")	SY	1,204



GENERAL NOTES:
1. REMOVAL OF FLUMES AND CURB CUTS SEE DRAINAGE AREA MAP SHEETS.
2. REMOVAL OF INLETS, MANHOLES SEE DRAINAGE PLAN AND PROFILE SHEETS.
3. FOLLOW TCP PHASING FOR PAVEMENT MARKINGS REMOVAL.

STATE OF TEXAS
LEVI L. PAVIA
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PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER
ROADWAY

REMOVAL LAYOUT
STA. 82+00.00 TO STA.106+00.00

SHEET 4 OF 8

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		60

DATE: 6/2/2021 8:20:08 PM
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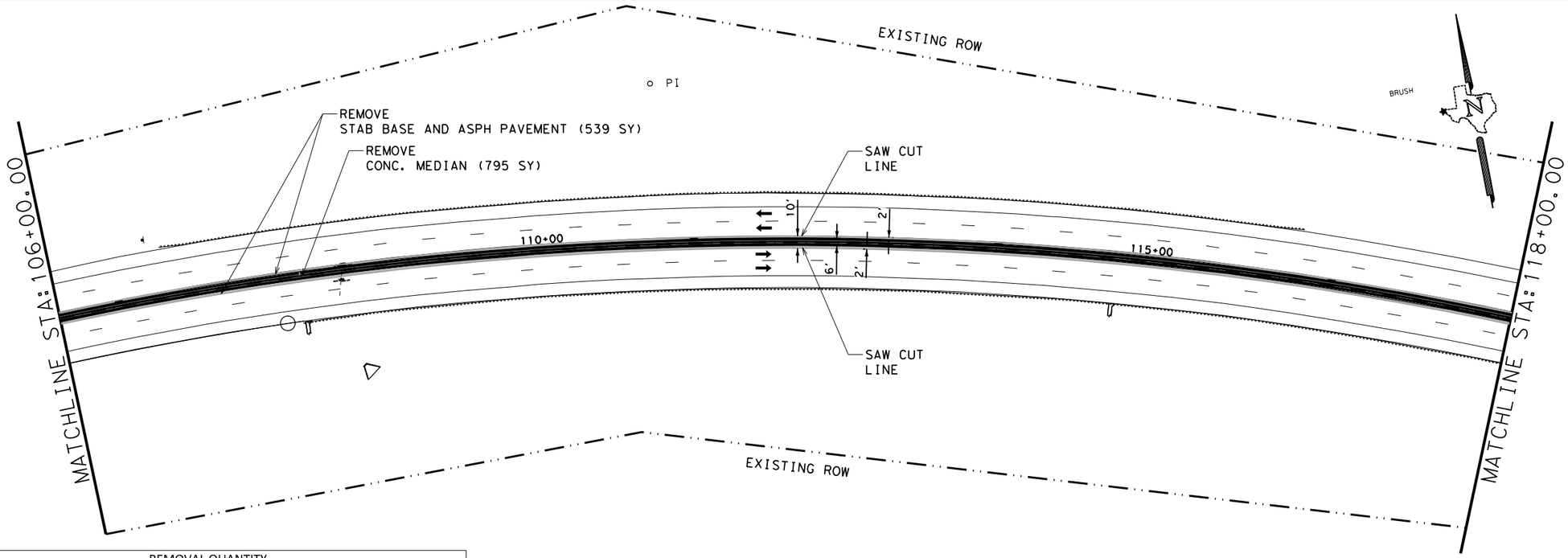


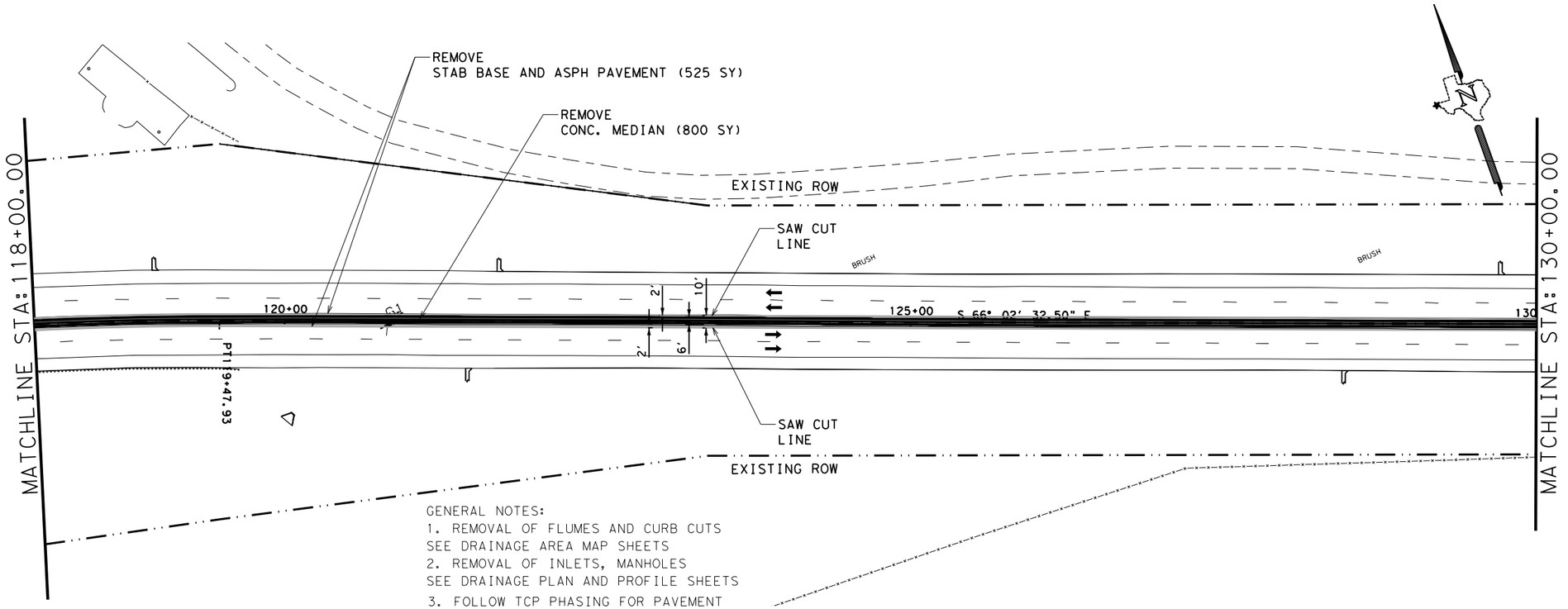
REMOVAL QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
100	6001	PREPARING ROW	STA	1
104	6011	REMOVING CONC(MEDIAN)	SY	1,595
105	6046	REMOVING STAB BASE & ASPH PAV (0"-10")	SY	1,064

LEGEND

- CONCRETE MEDIAN TO BE REMOVED
- STAB BASE & ASPH PAVE TO BE REMOVED

0' 100' 200'

SCALE: 1"=100'



GENERAL NOTES:

1. REMOVAL OF FLUMES AND CURB CUTS SEE DRAINAGE AREA MAP SHEETS
2. REMOVAL OF INLETS, MANHOLES SEE DRAINAGE PLAN AND PROFILE SHEETS
3. FOLLOW TCP PHASING FOR PAVEMENT MARKINGS REMOVAL.

STATE OF TEXAS
LEVI L. PAVIA
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LICENSED
PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER

ROADWAY

REMOVAL LAYOUT

STA. 106+00.00 TO STA. 130+00.00

SHEET 5 OF 8

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CONT	SECT	JOB	HIGHWAY
0233	02	035, etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		61

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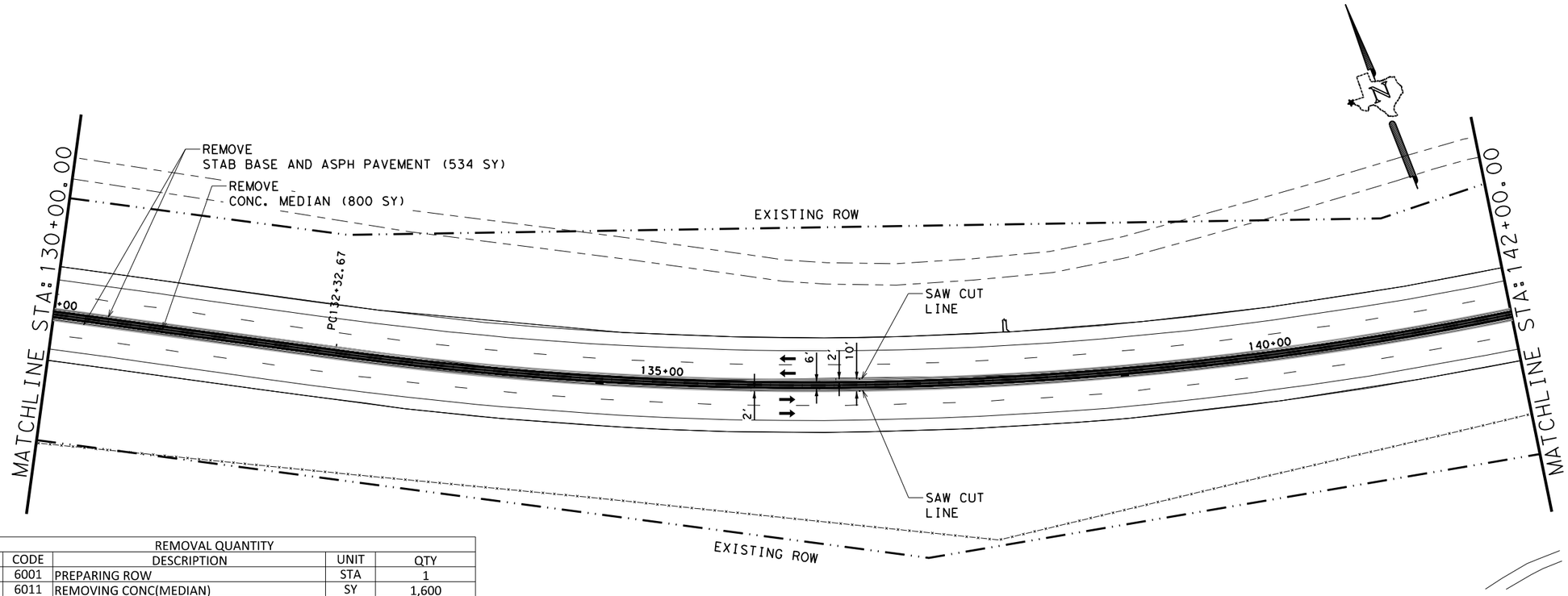


REMOVAL QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
100	6001	PREPARING ROW	STA	1
104	6011	REMOVING CONC(MEDIAN)	SY	1,600
105	6046	REMOVING STAB BASE & ASPH PAV (0"-10")	SY	1,067

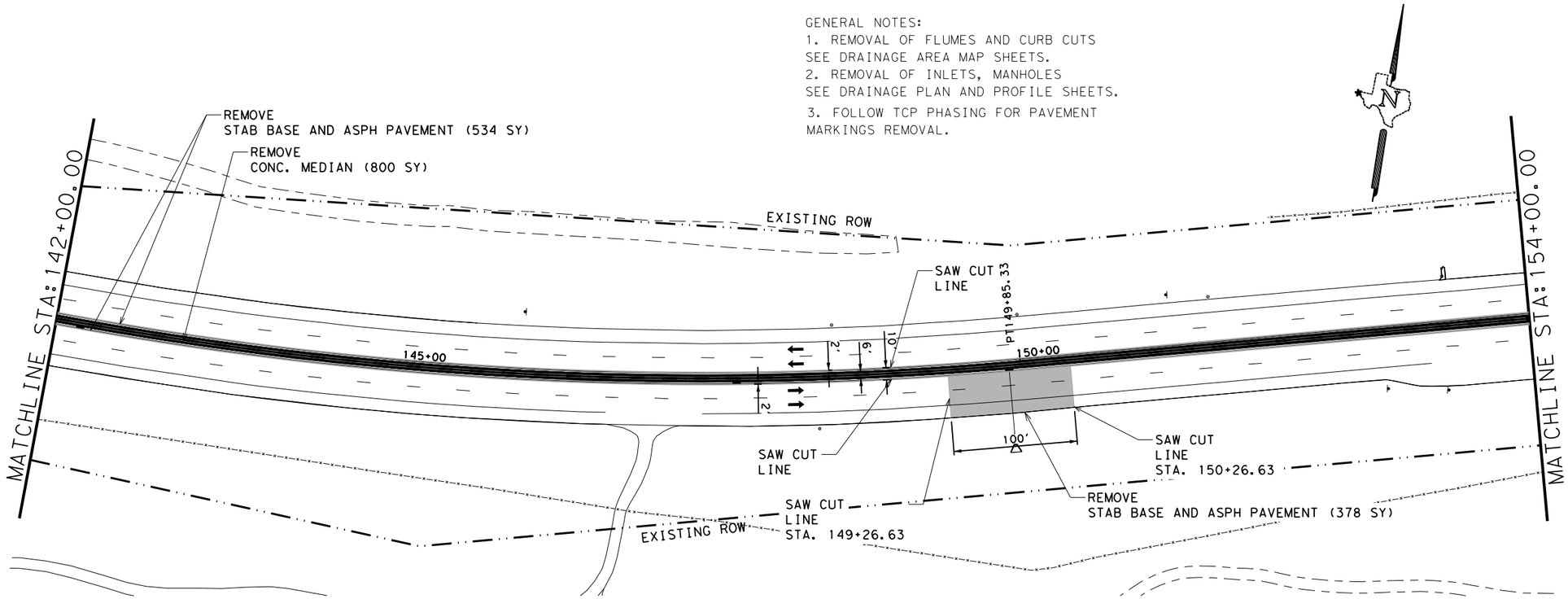
LEGEND

- CONCRETE MEDIAN TO BE REMOVED
- STAB BASE & ASPH PAVE TO BE REMOVED

0' 100' 200'

SCALE: 1"=100'

GENERAL NOTES:
1. REMOVAL OF FLUMES AND CURB CUTS SEE DRAINAGE AREA MAP SHEETS.
2. REMOVAL OF INLETS, MANHOLES SEE DRAINAGE PLAN AND PROFILE SHEETS.
3. FOLLOW TCP PHASING FOR PAVEMENT MARKINGS REMOVAL.



STATE OF TEXAS
LEVI L. PAVIA
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LICENSED
PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER
ROADWAY

REMOVAL LAYOUT
STA. 130+00.00 TO STA. 154+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		62

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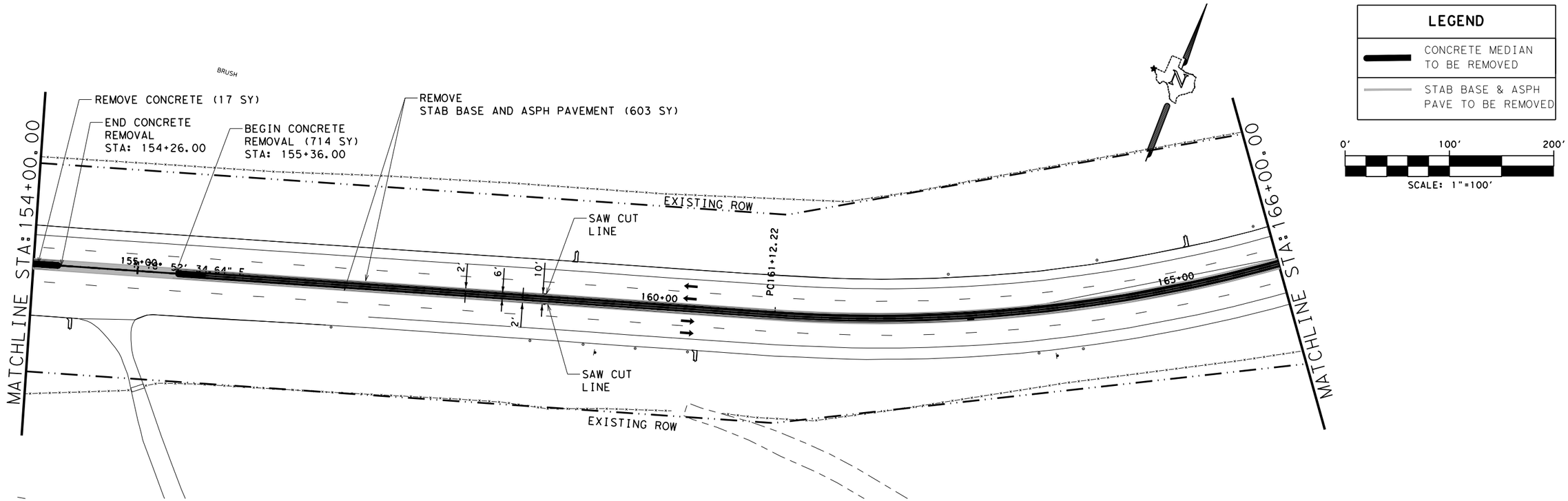
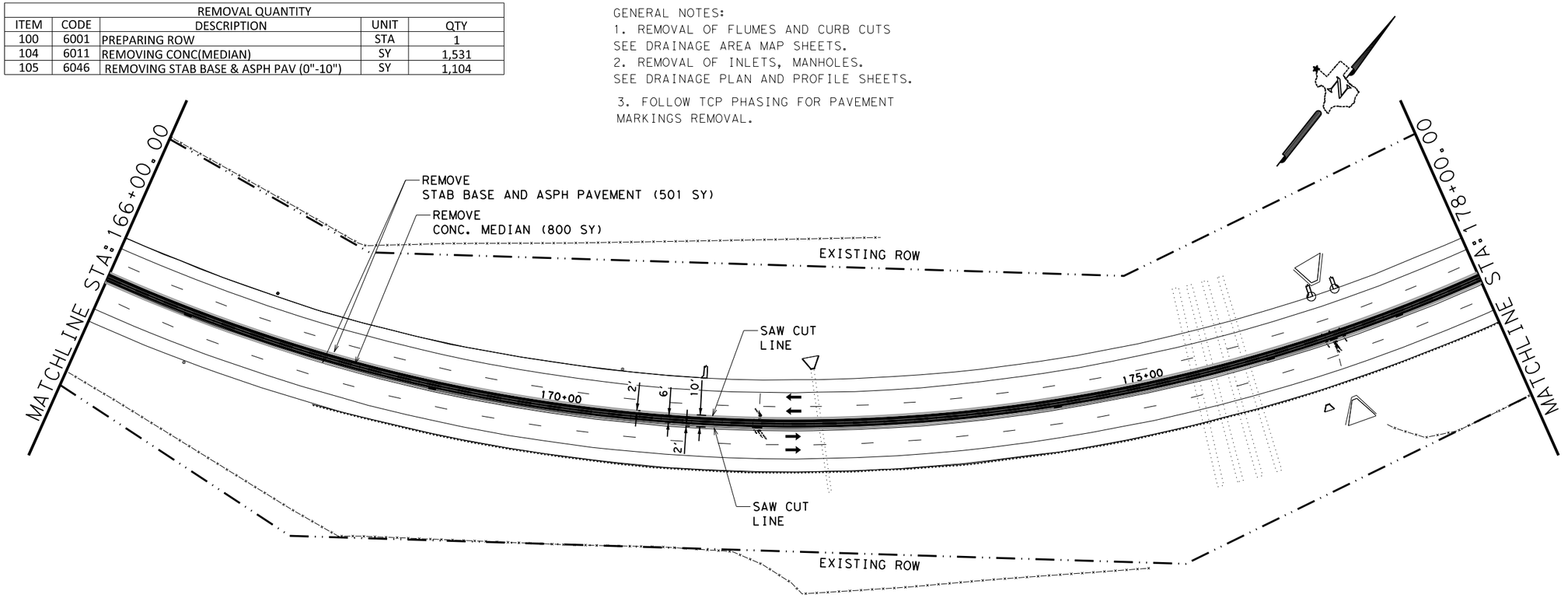


REMOVAL QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
100	6001	PREPARING ROW	STA	1
104	6011	REMOVING CONC(MEDIAN)	SY	1,531
105	6046	REMOVING STAB BASE & ASPH PAV (0"-10")	SY	1,104

GENERAL NOTES:
1. REMOVAL OF FLUMES AND CURB CUTS SEE DRAINAGE AREA MAP SHEETS.
2. REMOVAL OF INLETS, MANHOLES. SEE DRAINAGE PLAN AND PROFILE SHEETS.
3. FOLLOW TCP PHASING FOR PAVEMENT MARKINGS REMOVAL.



STATE OF TEXAS
LEVI L. PAVIA
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06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER
ROADWAY

REMOVAL LAYOUT
STA. 154+00.00 TO STA. 178+00.00

SHEET 7 OF 8

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CONT	SECT	JOB	HIGHWAY
0233	02	035, etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		63

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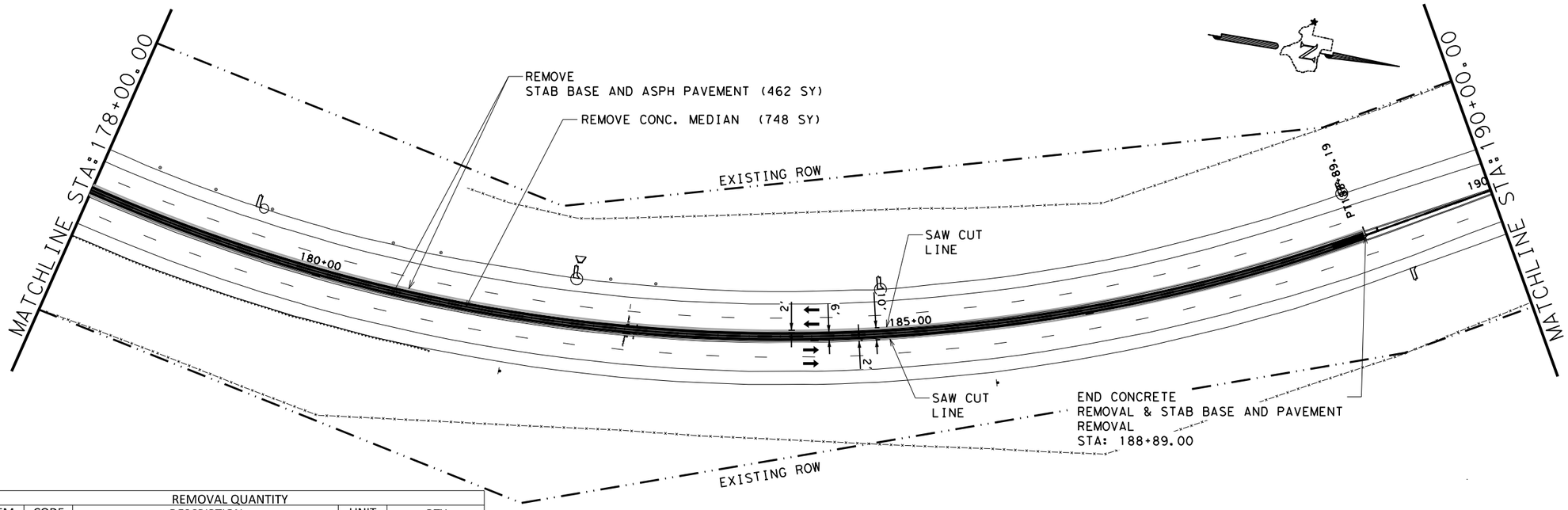


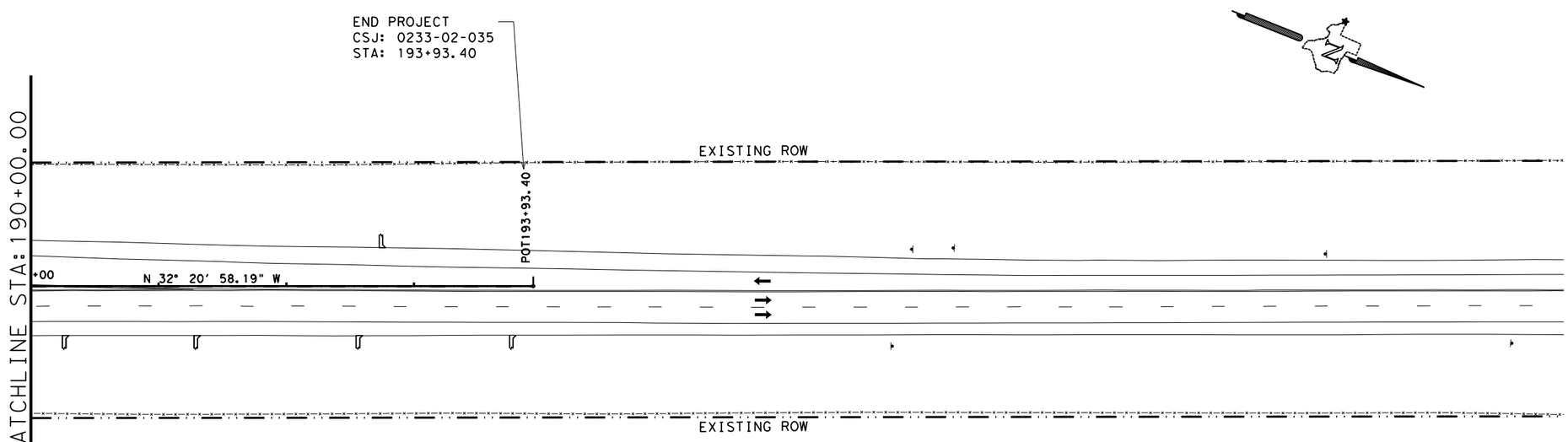
LEGEND

- CONCRETE MEDIAN TO BE REMOVED
- STAB BASE & ASPH PAVE TO BE REMOVED

0' 100' 200'

SCALE: 1"=100'

REMOVAL QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
100	6001	PREPARING ROW	STA	1
104	6011	REMOVING CONC(MEDIAN)	SY	748
105	6046	REMOVING STAB BASE & ASPH PAV (0"-10")	SY	462



GENERAL NOTES:

1. REMOVAL OF FLUMES AND CURB CUTS
SEE DRAINAGE AREA MAP SHEETS
2. REMOVAL OF INLETS, MANHOLES.
SEE DRAINAGE PLAN AND PROFILE SHEETS.
3. FOLLOW TCP PHASING FOR PAVEMENT MARKINGS REMOVAL.

STATE OF TEXAS
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06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER
ROADWAY

REMOVAL LAYOUT
STA. 178+00.00 TO END PROJECT

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		64

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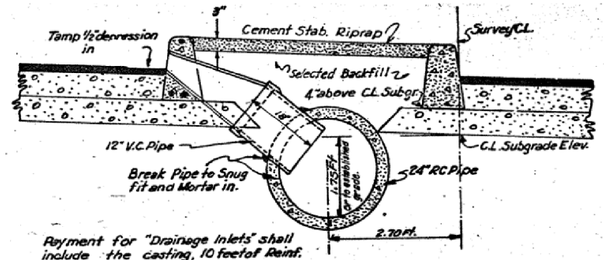
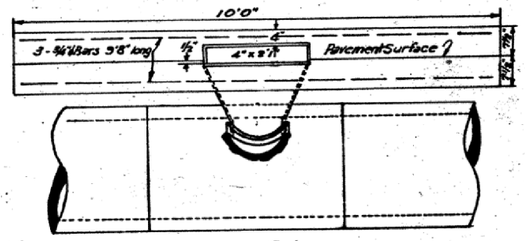
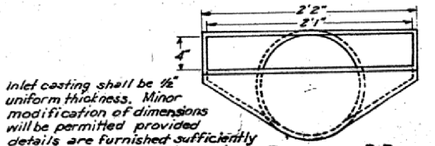


SECTION A-A

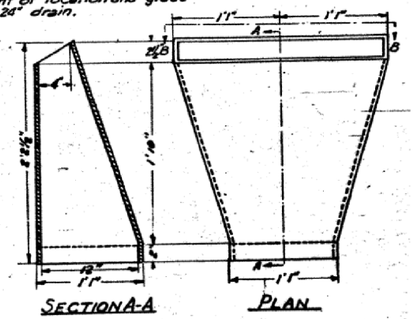


ELEVATION

DRAINAGE INLET ON CURVES

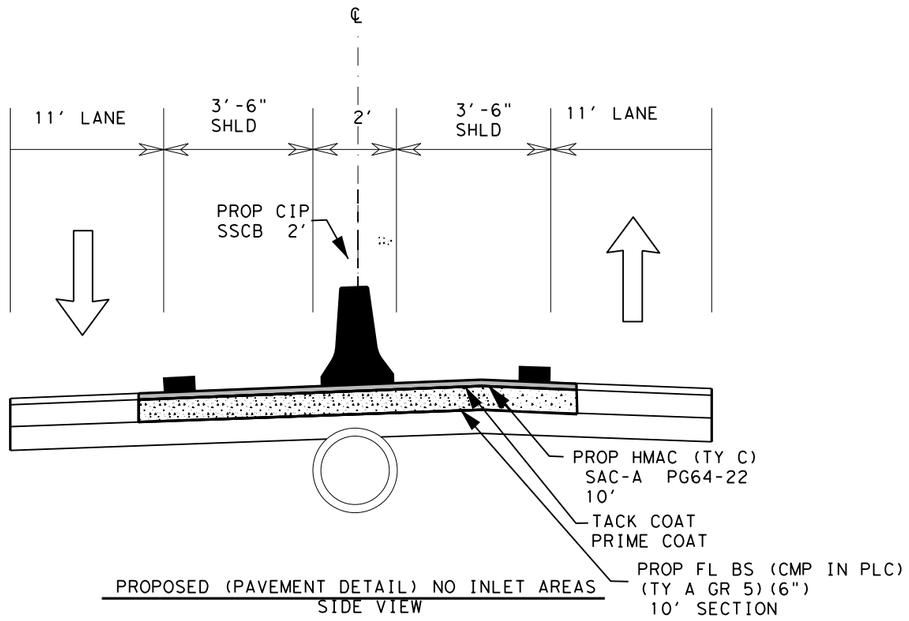


ELEVATION B-B

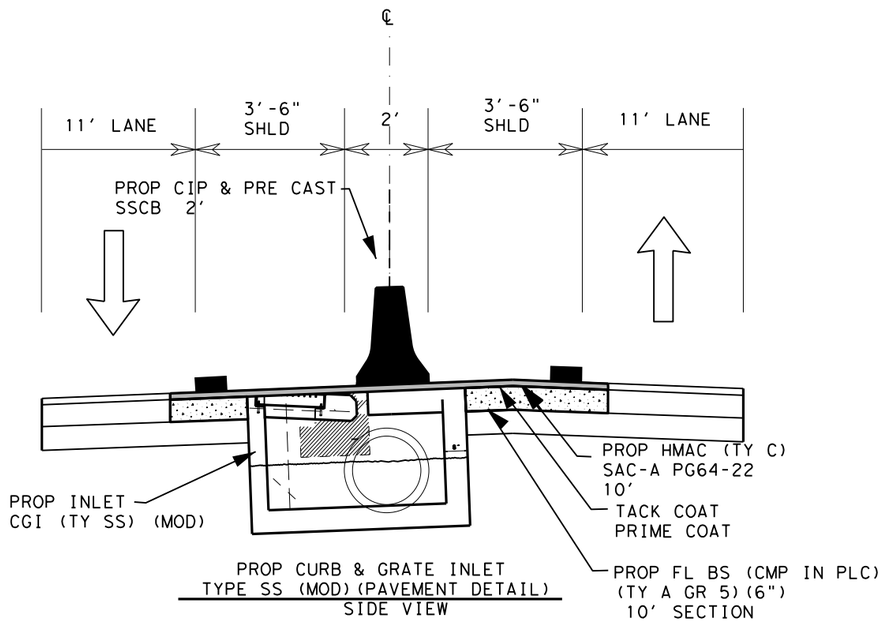


IRON CASTING FOR INLET.

EXISTING CURB INLET DETAIL



PROPOSED (PAVEMENT DETAIL) NO INLET AREAS
SIDE VIEW



PROP CURB & GRATE INLET TYPE SS (MOD) (PAVEMENT DETAIL)
SIDE VIEW

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06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER

ROADWAY

PAVEMENT DETAIL

SHEET 1 OF 1

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		65

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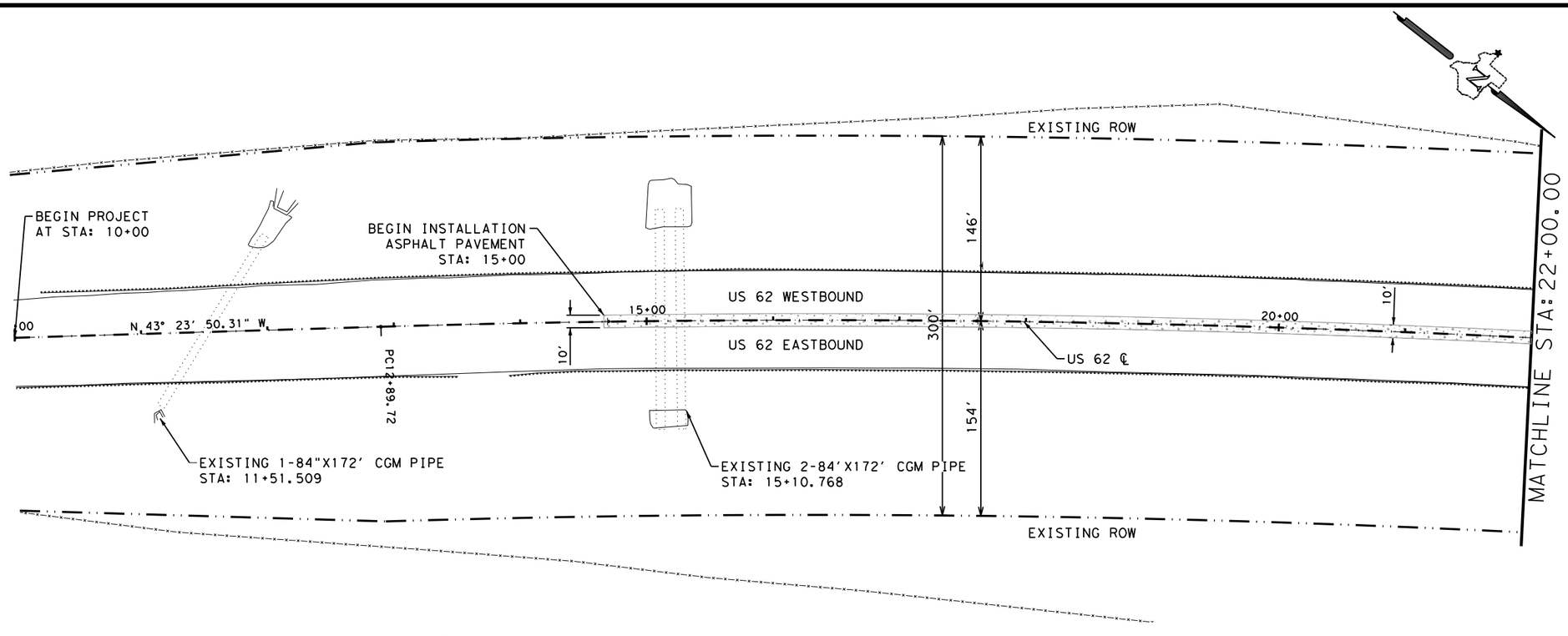
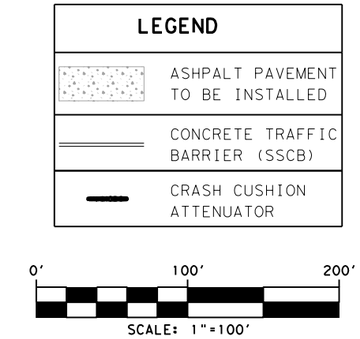
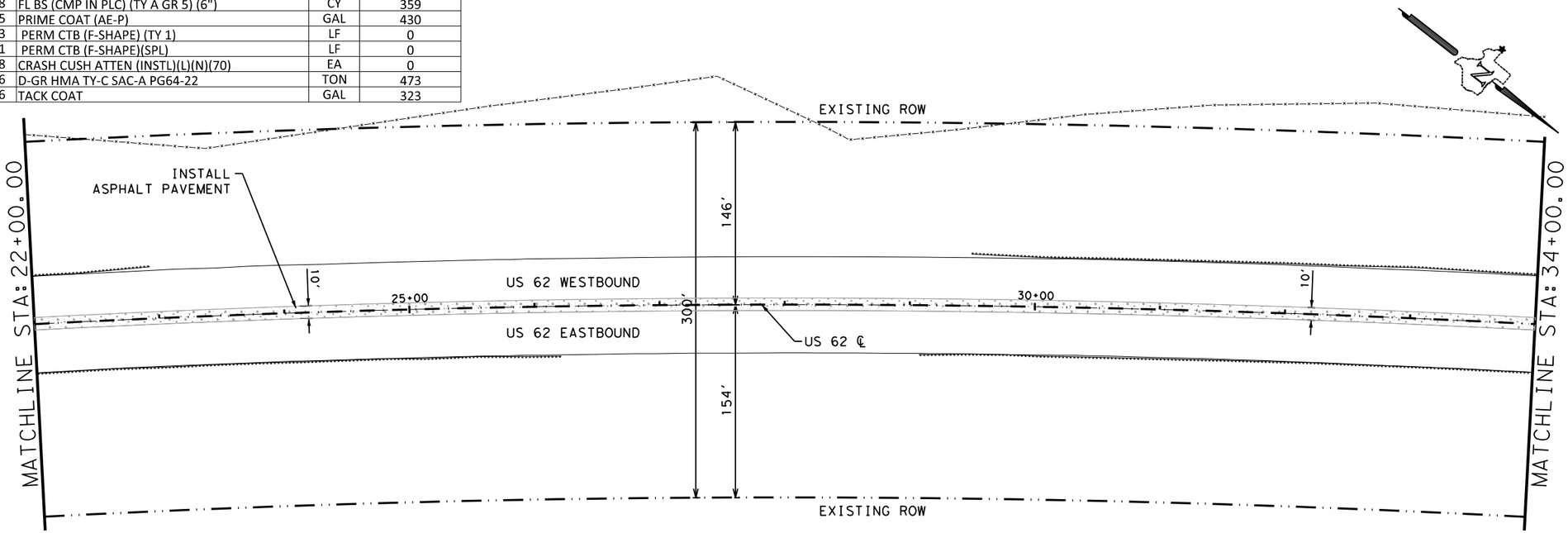




ROADWAY QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
247	6388	FL BS (CMP IN PLC) (TY A GR 5) (6")	CY	359
310	6005	PRIME COAT (AE-P)	GAL	430
514	6013	PERM CTB (F-SHAPE) (TY 1)	LF	0
514	6041	PERM CTB (F-SHAPE)(SPL)	LF	0
545	6008	CRASH CUSH ATTEN (INSTL)(L)(N)(70)	EA	0
3076	6016	D-GR HMA TY-C SAC-A PG64-22	TON	473
3076	6066	TACK COAT	GAL	323



GENERAL NOTES:

1. INSTALLATION OF CONCRETE BARRIRE SHALL FOLLOW TXDOT STANDARDS CSB(2)-13.
2. TYPE X JOINT INSTALLATION SHALL BE USED FOR F-SHAPE CONCRETE TRAFFIC BARRIER.
3. CONCTRACTOR TO INSTALL 10' SECTION OF PCTB (F-SHAPE) (TY 2) AT ILLUMINATION LIGHT POLE LOCATIONS.

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER
ROADWAY

PLAN LAYOUT
BEGIN PROJECT TO STA. 34+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		66

DATE: 6/2/2021 8:21:23 PM
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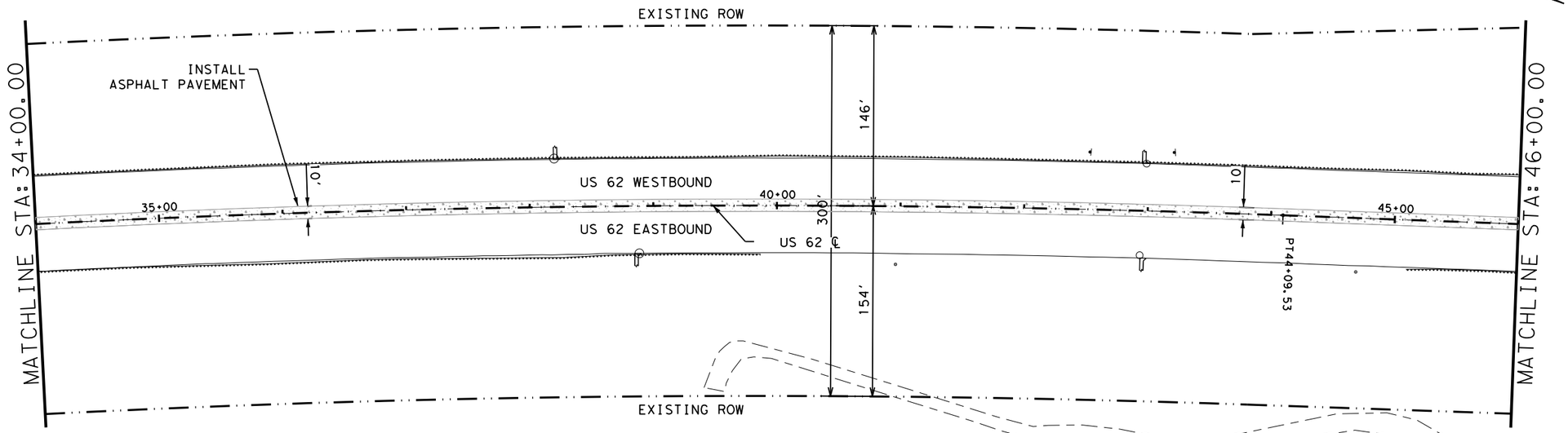
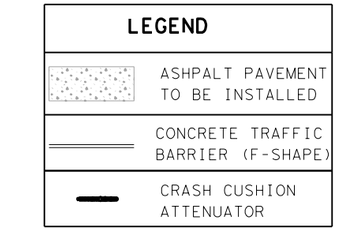
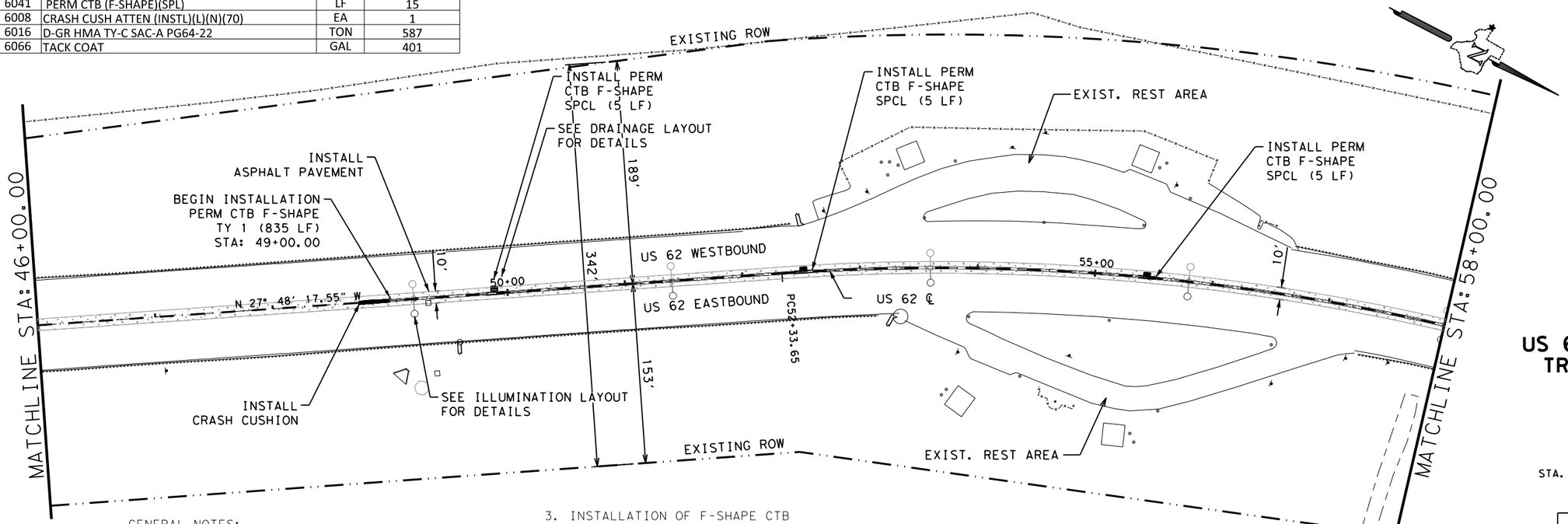




ROADWAY QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
247	6388	FL BS (CMP IN PLC) (TY A GR 5) (6")	CY	445
310	6005	PRIME COAT (AE-P)	GAL	534
514	6013	PERM CTB (F-SHAPE) (TY 1)	LF	835
514	6014	PERM CTB (F-SHAPE) (TY 2)	LF	50
514	6041	PERM CTB (F-SHAPE)(SPL)	LF	15
545	6008	CRASH CUSH ATTEN (INSTL)(L)(N)(70)	EA	1
3076	6016	D-GR HMA TY-C SAC-A PG64-22	TON	587
3076	6066	TACK COAT	GAL	401



GENERAL NOTES:

1. INSTALLATION OF CONCRETE BARRIER SHALL FOLLOW TXDOT STANDARDs CSB(2)-13.
2. TYPE X JOINT INSTALLATION SHALL BE USED FOR F-SHAPE CONCRETE TRAFFIC BARRIER.
3. INSTALLATION OF F-SHAPE CTB SPECIAL) SHALL BE USED AT DRAINAGE INLETS LOCATIONS ONLY.
4. CONCTRACTOR TO INSTALL 10' SECTION OF PCTB (F-SHAPE) (TY 2) AT ILLUMINATION LIGHT POLE LOCATIONS.

STATE OF TEXAS
LEVI L. PAVIA
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LICENSED PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER

ROADWAY

PLAN LAYOUT

STA. 34+00.00 TO STA. 58+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		67

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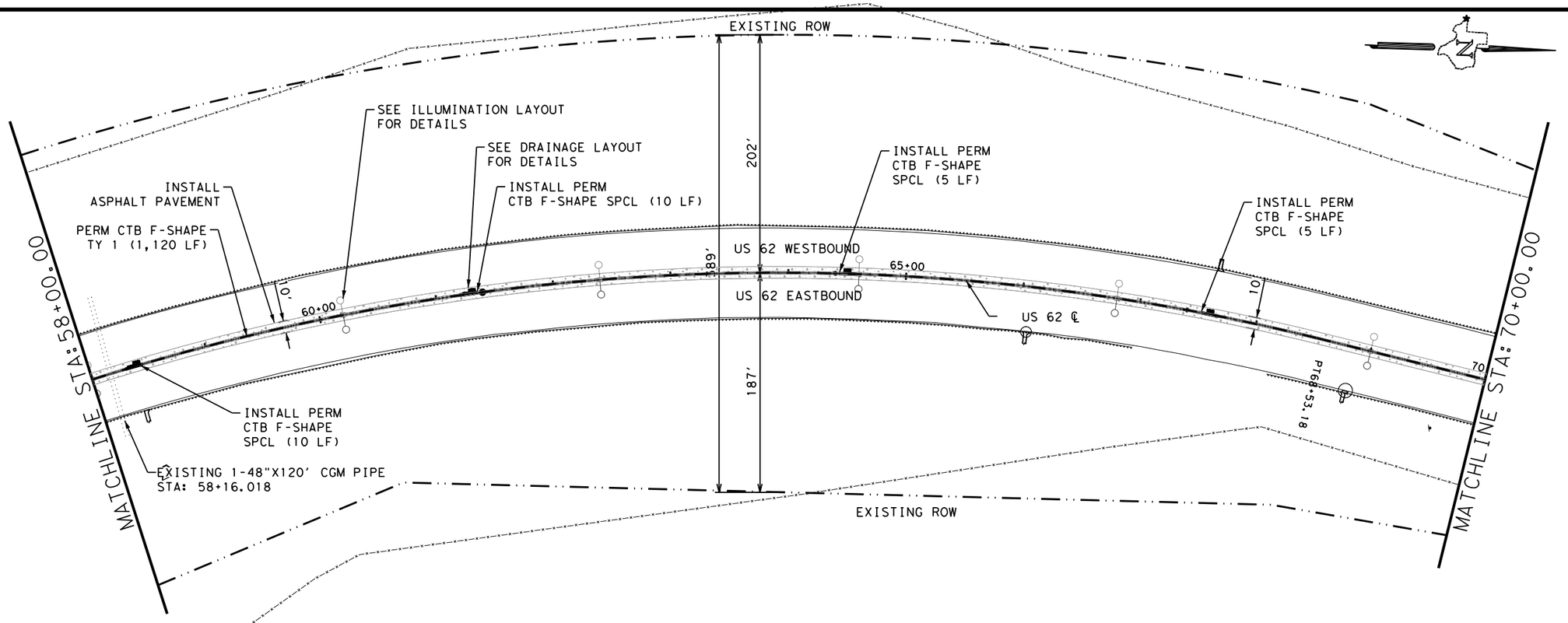
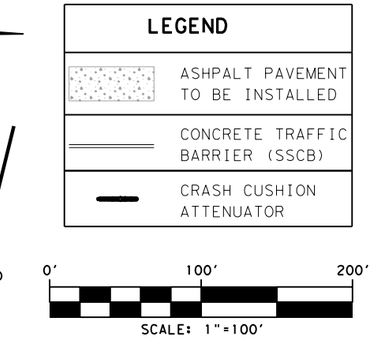
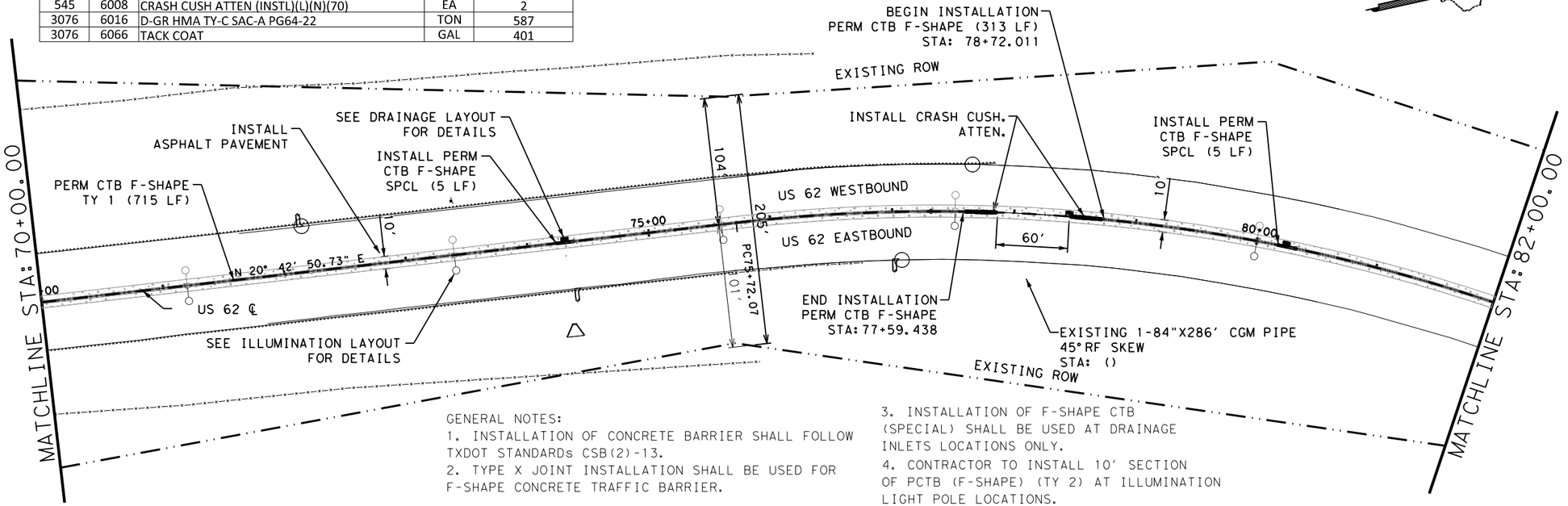




ROADWAY QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
247	6388	FL BS (CMP IN PLC) (TY A GR 5) (6")	CY	445
310	6005	PRIME COAT (AE-P)	GAL	534
514	6013	PERM CTB (F-SHAPE) (TY 1)	LF	2,148
514	6014	PERM CTB (F-SHAPE) (TY 2)	LF	100
514	6041	PERM CTB (F-SHAPE)(SPL)	LF	40
545	6008	CRASH CUSH ATTEN (INSTL)(L)(N)(70)	EA	2
3076	6016	D-GR HMA TY-C SAC-A PG64-22	TON	587
3076	6066	TACK COAT	GAL	401



GENERAL NOTES:

1. INSTALLATION OF CONCRETE BARRIER SHALL FOLLOW TXDOT STANDARDs CSB(2)-13.
2. TYPE X JOINT INSTALLATION SHALL BE USED FOR F-SHAPE CONCRETE TRAFFIC BARRIER.
3. INSTALLATION OF F-SHAPE CTB (SPECIAL) SHALL BE USED AT DRAINAGE INLETS LOCATIONS ONLY.
4. CONTRACTOR TO INSTALL 10' SECTION OF PCTB (F-SHAPE) (TY 2) AT ILLUMINATION LIGHT POLE LOCATIONS.

STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER

ROADWAY

PLAN LAYOUT

STA. 58+00.00 TO STA. 82+00.00

SHEET 3 OF 8

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CONT	SECT	JOB	HIGHWAY
0233	02	035, etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		68

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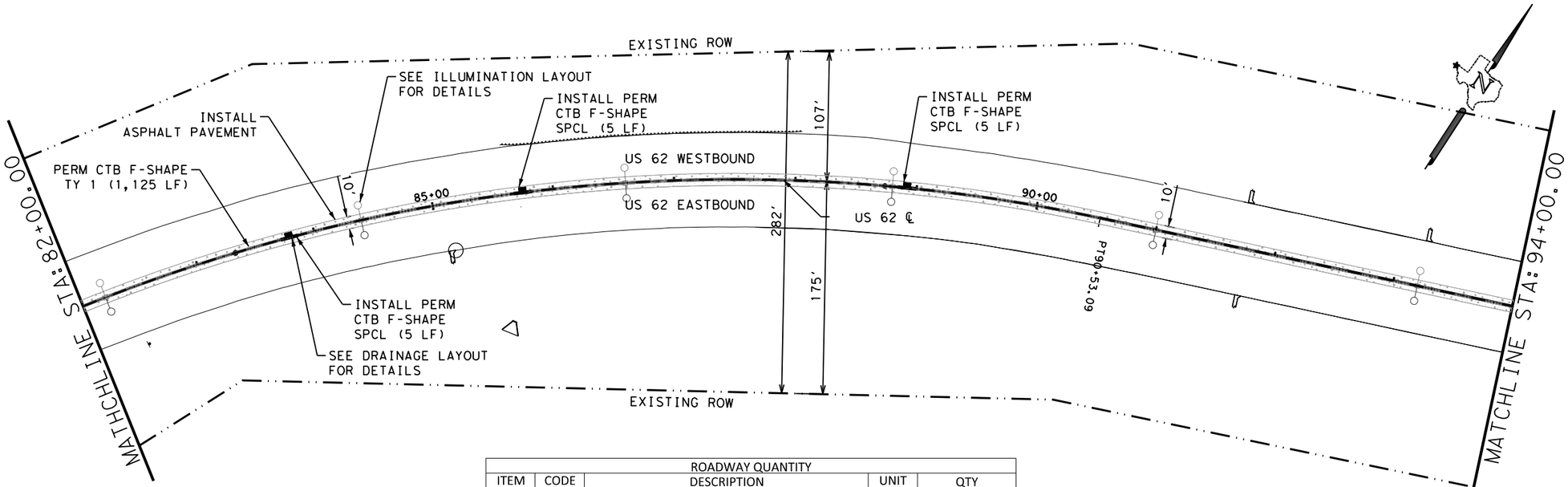


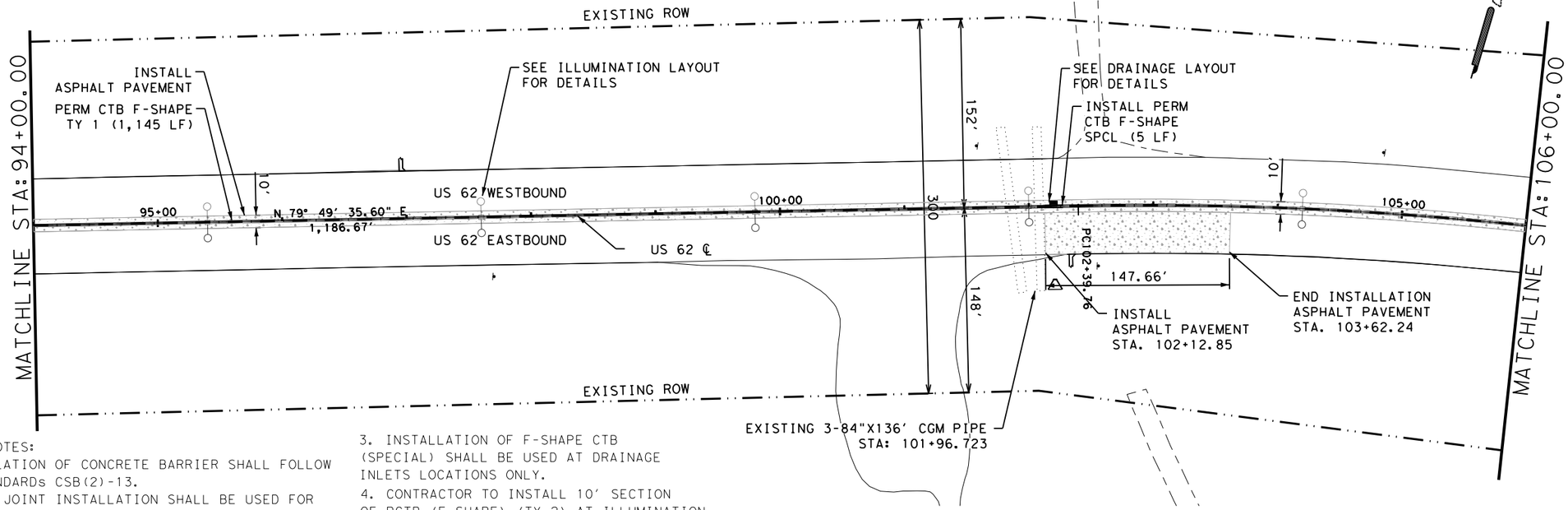
ROADWAY QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
247	6388	FL BS (CMP IN PLC) (TY A GR 5) (6")	CY	538
310	6005	PRIME COAT (AE-P)	GAL	645
514	6013	PERM CTB (F-SHAPE) (TY 1)	LF	2,270
514	6014	PERM CTB (F-SHAPE) (TY 2)	LF	110
514	6041	PERM CTB (F-SHAPE)(SPL)	LF	20
545	6008	CRASH CUSH ATTEN (INSTL)(L)(N)(70)	EA	0
3076	6016	D-GR HMA TY-C SAC-A PG64-22	TON	709
3076	6066	TACK COAT	GAL	485

LEGEND

- ASHPALT PAVEMENT TO BE INSTALLED
- CONCRETE TRAFFIC BARRIER (SSCB)
- CRASH CUSHION ATTENUATOR

0' 100' 200'

SCALE: 1"=100'



GENERAL NOTES:

1. INSTALLATION OF CONCRETE BARRIER SHALL FOLLOW TXDOT STANDARDs CSB(2)-13.
2. TYPE X JOINT INSTALLATION SHALL BE USED FOR F-SHAPE CONCRETE TRAFFIC BARRIER.
3. INSTALLATION OF F-SHAPE CTB (SPECIAL) SHALL BE USED AT DRAINAGE INLETS LOCATIONS ONLY.
4. CONTRACTOR TO INSTALL 10' SECTION OF PCTB (F-SHAPE) (TY 2) AT ILLUMINATION LIGHT POLE LOCATIONS.

STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER

ROADWAY

PLAN LAYOUT

STA. 82+00.00 TO STA.106+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		69

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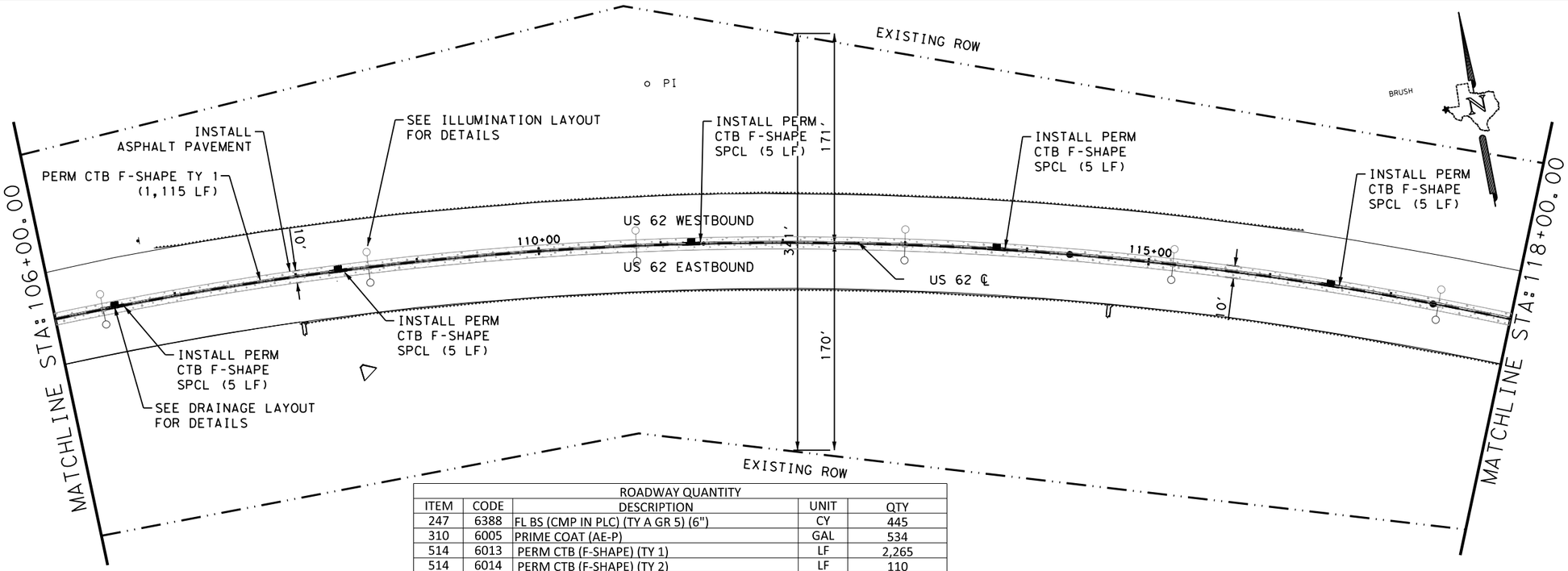


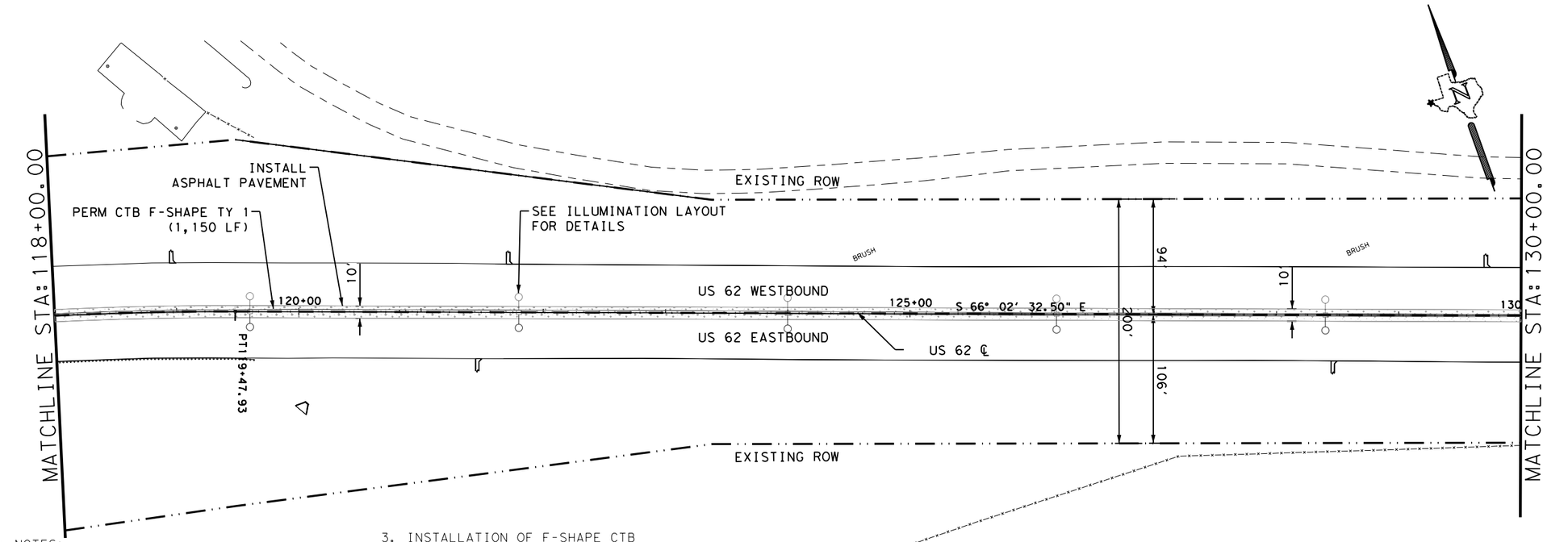
ROADWAY QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
247	6388	FL BS (CMP IN PLC) (TY A GR 5) (6")	CY	445
310	6005	PRIME COAT (AE-P)	GAL	534
514	6013	PERM CTB (F-SHAPE) (TY 1)	LF	2,265
514	6014	PERM CTB (F-SHAPE) (TY 2)	LF	110
514	6041	PERM CTB (F-SHAPE)(SPL)	LF	25
545	6008	CRASH CUSH ATTEN (INSTL)(L)(N)(70)	EA	0
3076	6016	D-GR HMA TY-C SAC-A PG64-22	TON	587
3076	6066	TACK COAT	GAL	401

LEGEND

- ASHPALT PAVEMENT TO BE INSTALLED
- CONCRETE TRAFFIC BARRIER (SSCB)
- CRASH CUSHION ATTENUATOR

0' 100' 200'

SCALE: 1"=100'



GENERAL NOTES:

1. INSTALLATION OF CONCRETE BARRIER SHALL FOLLOW TXDOT STANDARDs CSB(2)-13.
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STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER

ROADWAY

PLAN LAYOUT

STA. 106+00.00 TO STA. 130+00.00

SHEET 5 OF 8

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		70

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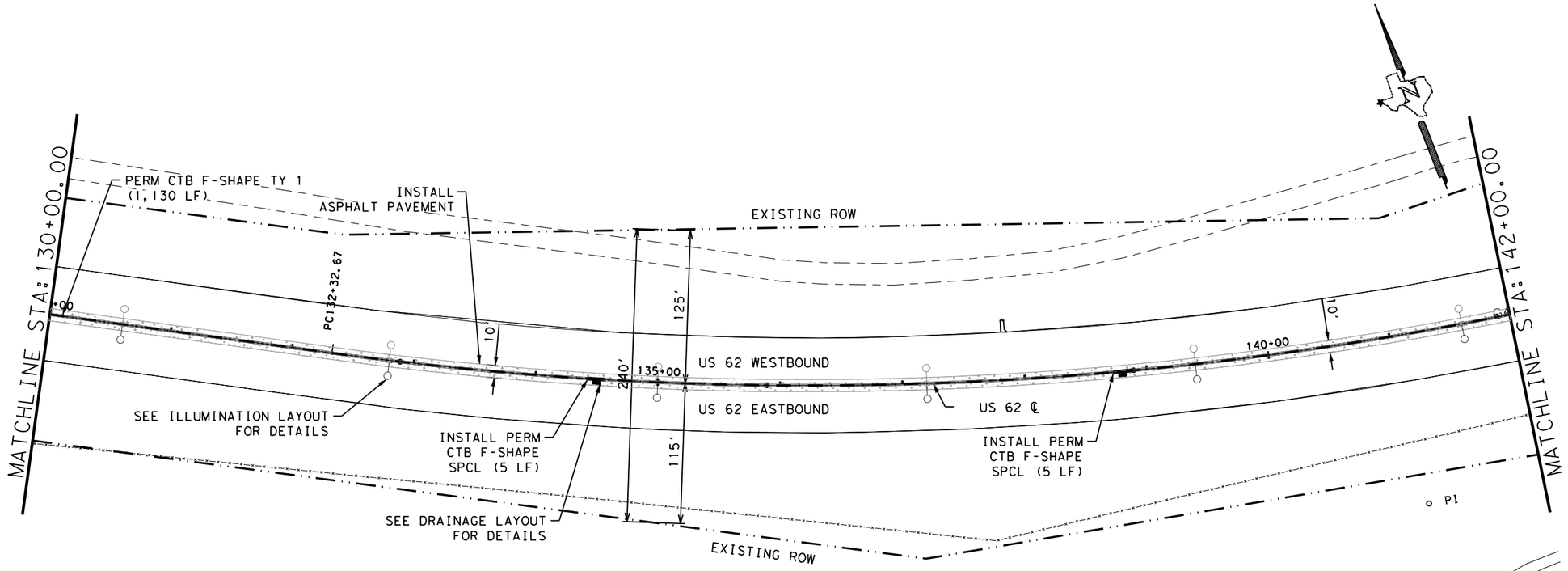

LEGEND

- ASHPALT PAVEMENT TO BE INSTALLED
- CONCRETE TRAFFIC BARRIER (SSCB)
- CRASH CUSHION ATTENUATOR

0′ 100′ 200′

SCALE: 1"=100′

ROADWAY QUANTITY

ITEM	CODE	DESCRIPTION	UNIT	QTY
247	6388	FL BS (CMP IN PLC) (TY A GR 5) (6")	CY	509
310	6005	PRIME COAT (AE-P)	GAL	610
514	6013	PERM CTB (F-SHAPE) (TY 1)	LF	2,263
514	6014	PERM CTB (F-SHAPE) (TY 2)	LF	110
514	6041	PERM CTB (F-SHAPE)(SPL)	LF	25
545	6008	CRASH CUSH ATTEN (INSTL)(L)(N)(70)	EA	0
3076	6016	D-GR HMA TY-C SAC-A PG64-22	TON	671
3076	6066	TACK COAT	GAL	458

GENERAL NOTES:

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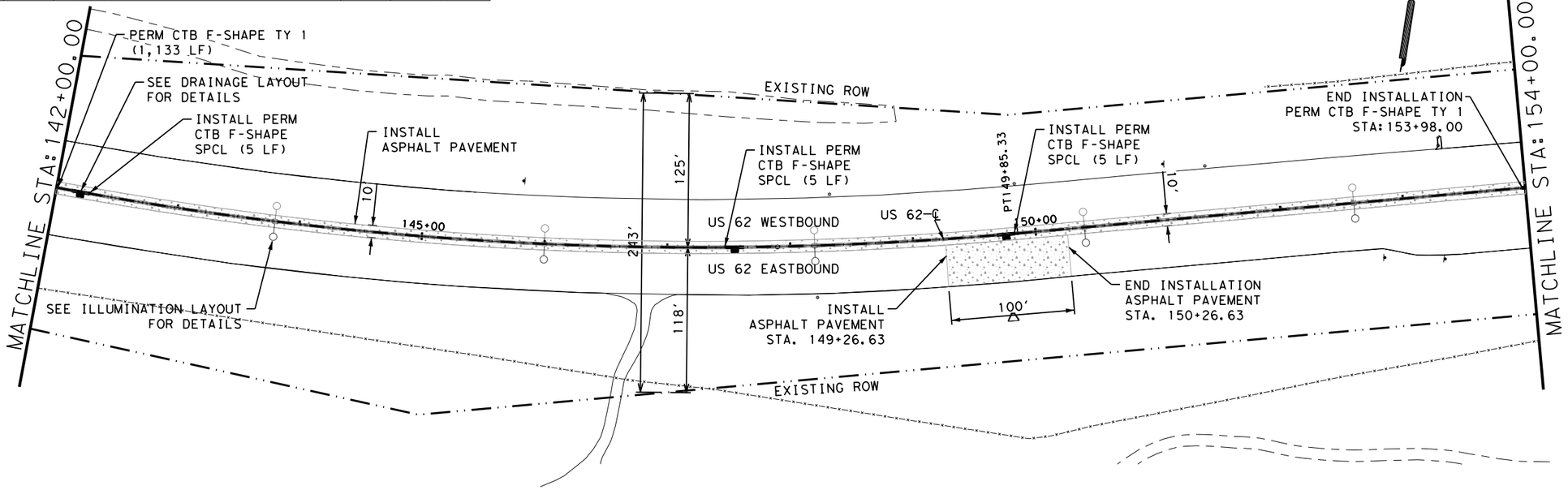
4. CONTRACTOR TO INSTALL 10′ SECTION OF PCTB (F-SHAPE) (TY 2) AT ILLUMINATION LIGHT POLE LOCATIONS.



STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED
PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER

ROADWAY

PLAN LAYOUT

STA. 130+00.00 TO STA. 154+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		71

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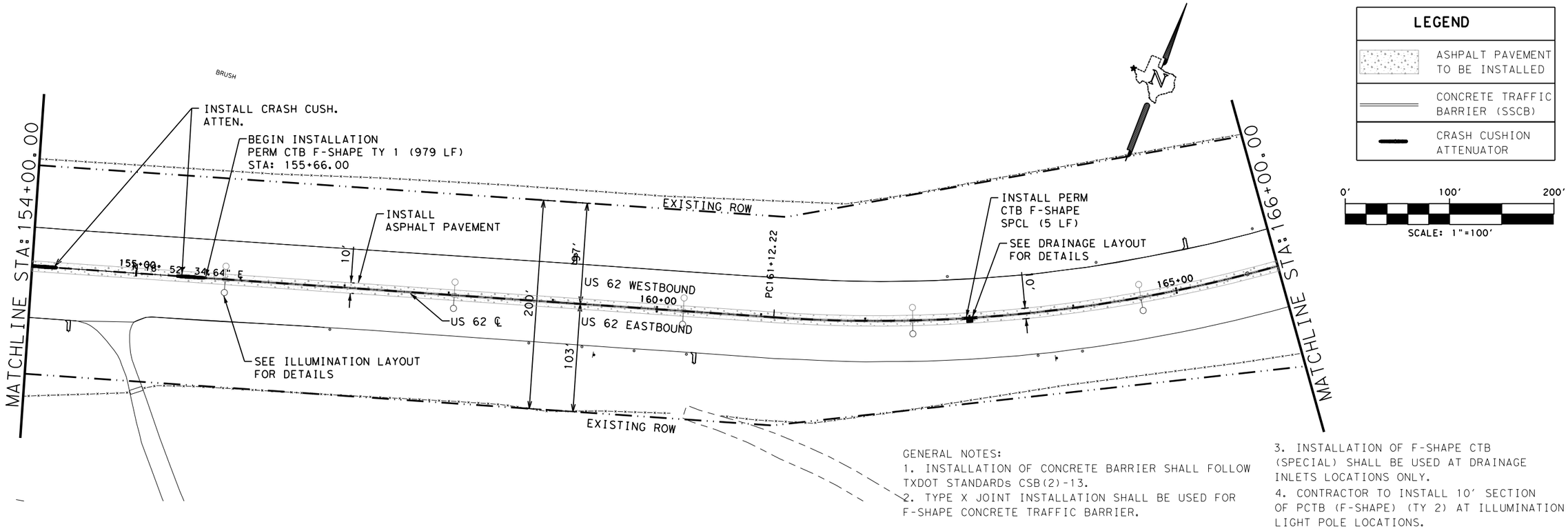

GENERAL NOTES:
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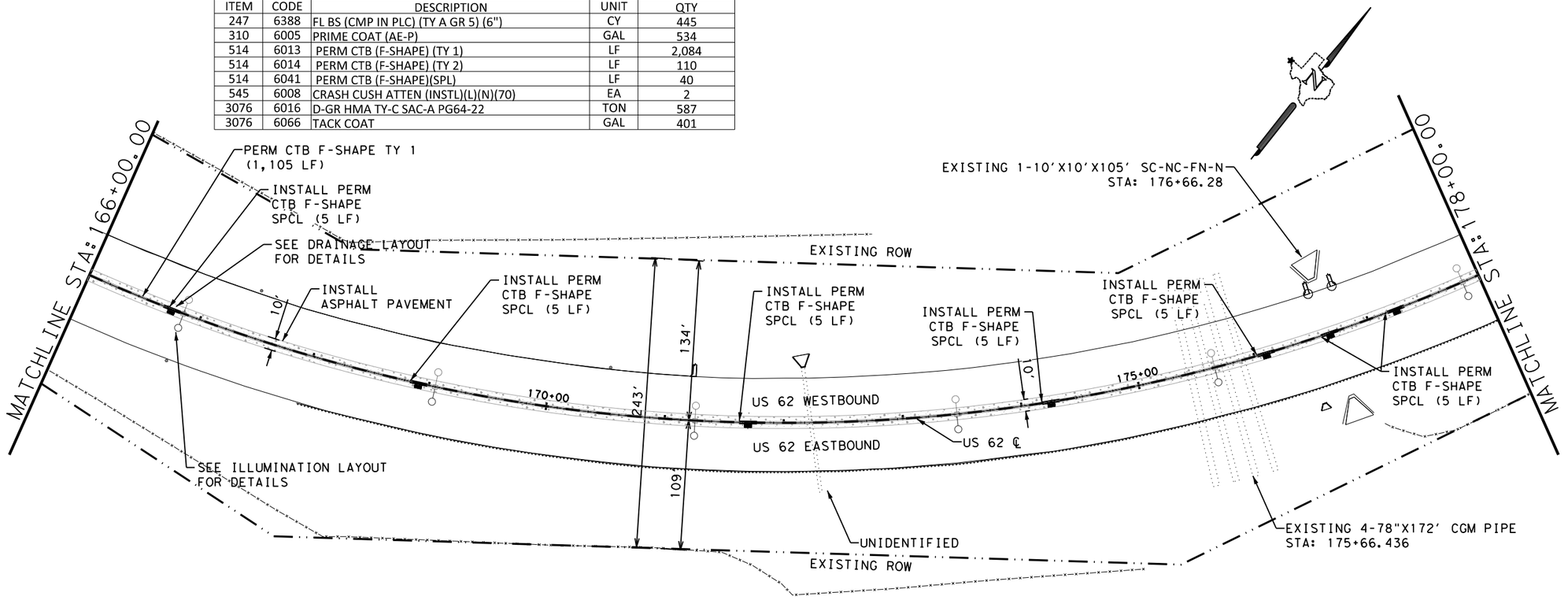
ROADWAY QUANTITY

ITEM	CODE	DESCRIPTION	UNIT	QTY
247	6388	FL BS (CMP IN PLC) (TY A GR 5) (6")	CY	445
310	6005	PRIME COAT (AE-P)	GAL	534
514	6013	PERM CTB (F-SHAPE) (TY 1)	LF	2,084
514	6014	PERM CTB (F-SHAPE) (TY 2)	LF	110
514	6041	PERM CTB (F-SHAPE)(SPL)	LF	40
545	6008	CRASH CUSH ATTEN (INSTL)(L)(N)(70)	EA	2
3076	6016	D-GR HMA TY-C SAC-A PG64-22	TON	587
3076	6066	TACK COAT	GAL	401



STATE OF TEXAS
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127908
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06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER
ROADWAY

PLAN LAYOUT
STA. 154+00.00 TO STA. 178+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		72

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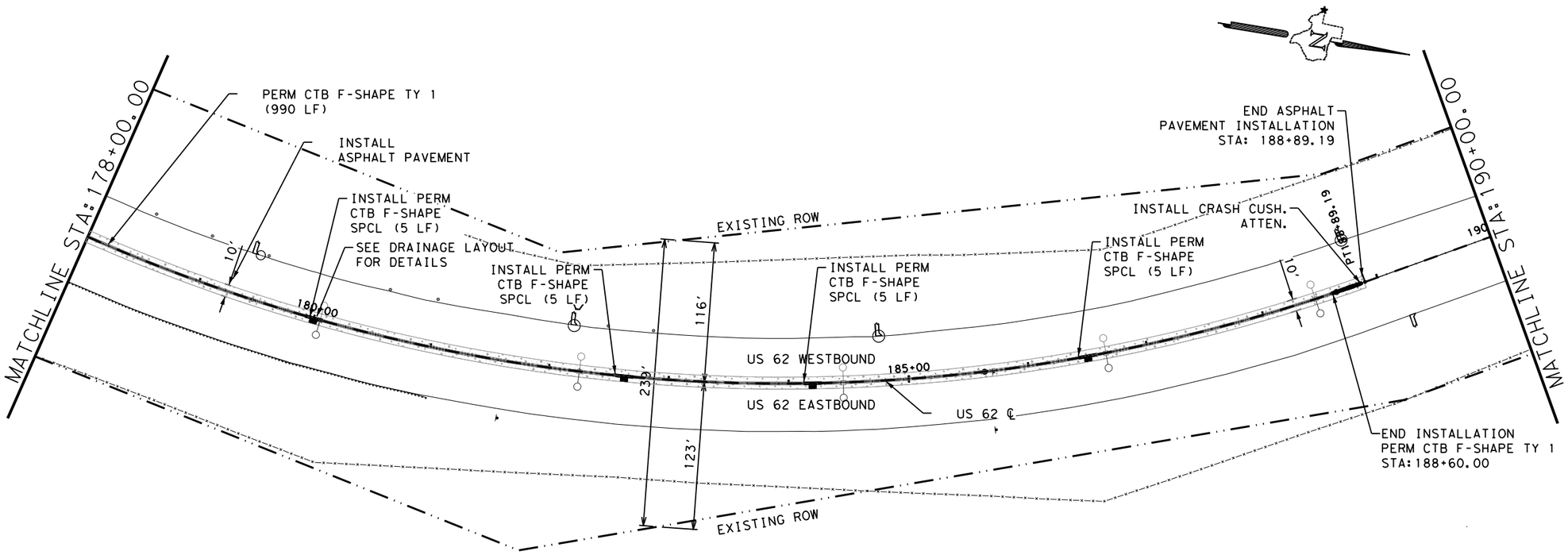


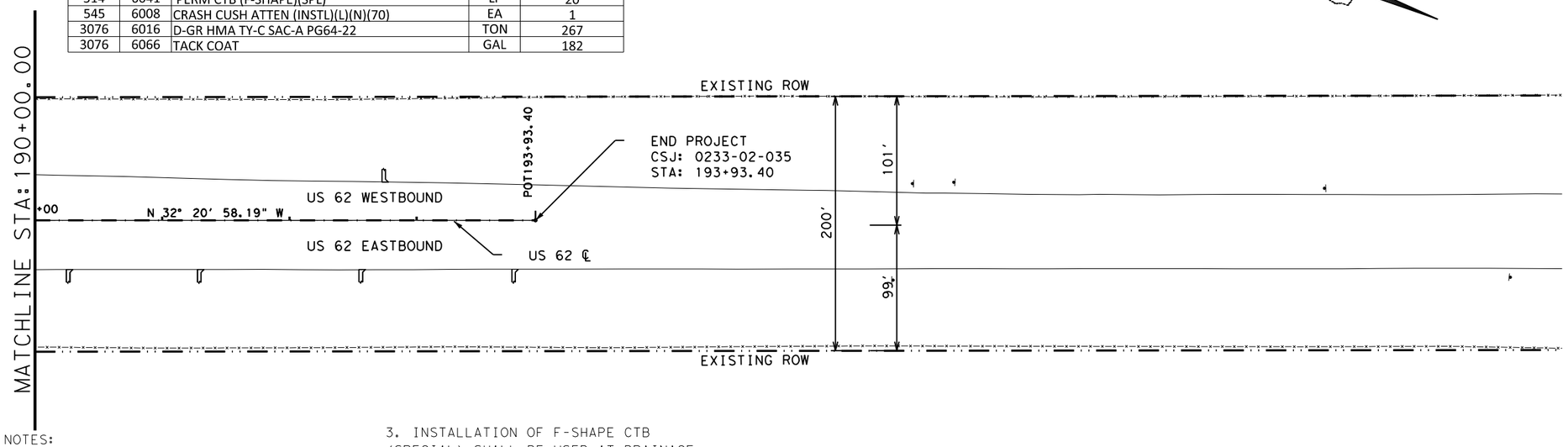
LEGEND

- ASHPALT PAVEMENT TO BE INSTALLED
- CONCRETE TRAFFIC BARRIER (SSCB)
- CRASH CUSHION ATTENUATOR

0' 100' 200'

SCALE: 1"=100'

ROADWAY QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
247	6388	FL BS (CMP IN PLC) (TY A GR 5) (6")	CY	202
310	6005	PRIME COAT (AE-P)	GAL	242
514	6013	PERM CTB (F-SHAPE) (TY 1)	LF	990
514	6014	PERM CTB (F-SHAPE) (TY 2)	LF	50
514	6041	PERM CTB (F-SHAPE)(SPL)	LF	20
545	6008	CRASH CUSH ATTEN (INSTL)(L)(N)(70)	EA	1
3076	6016	D-GR HMA TY-C SAC-A PG64-22	TON	267
3076	6066	TACK COAT	GAL	182



GENERAL NOTES:

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STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED
PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER

ROADWAY

PLAN LAYOUT

STA. 178+00.00 TO END PROJECT

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		73

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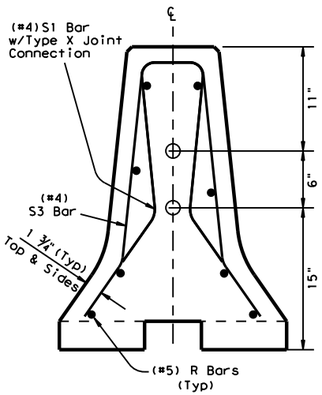
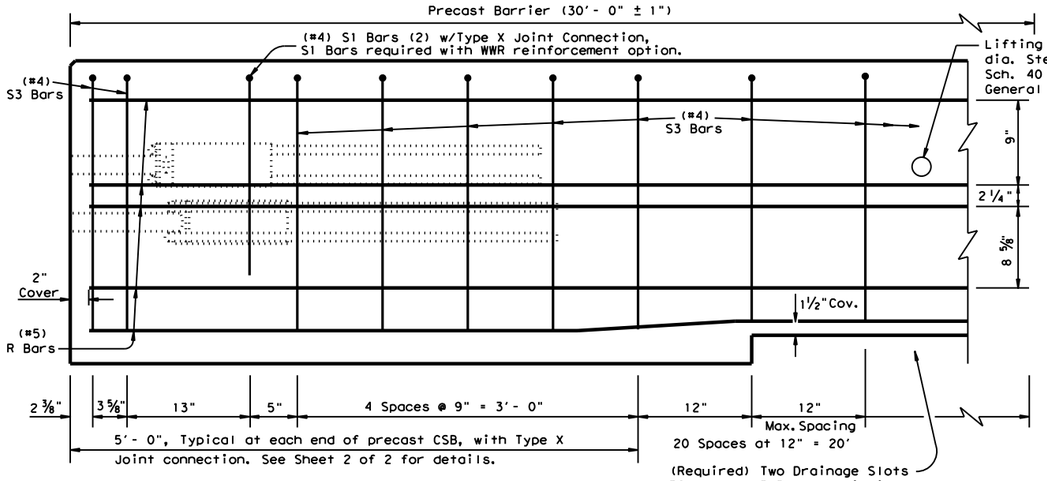


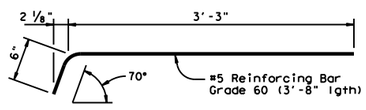
End View Precast Barrier

See sheet 2 of 3 for Joint connection Type X



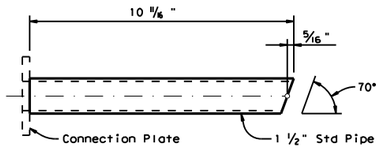
Reinforcement for Precast (CSB) Concrete Safety Barrier (Type 1)

Showing reinforcement for Joint Type X



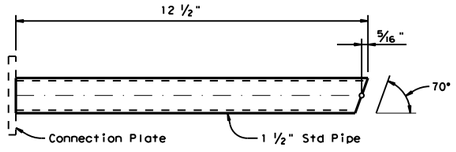
DEFORMED BAR ANCHOR DETAILS

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



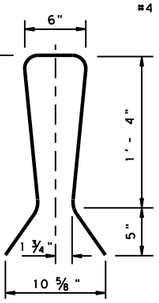
UPPER CONNECTION PIPE DETAILS

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



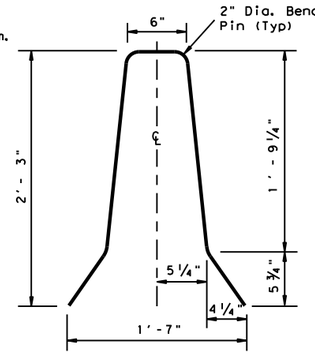
LOWER CONNECTION PIPE DETAILS

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



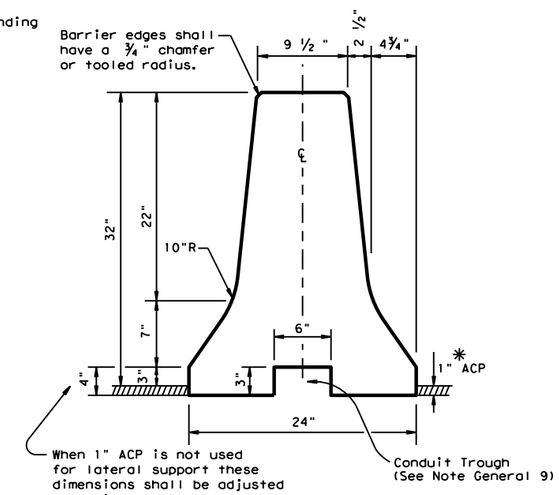
S1 Bar

#4 Bar (2)
(Joint Type X)



S3 Bar

#4 Bar

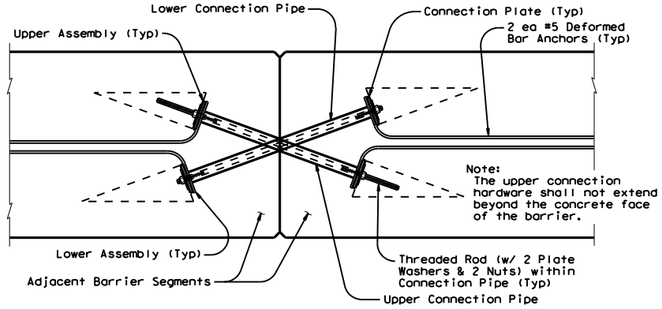


Concrete Safety Barrier

✱ 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

1. Concrete shall be Class H with a minimum compressive strength of 3,600 psi.
2. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
3. Precast barrier length shall be 30 ft. unless otherwise specified on the plans.
4. All precast barrier edges shall have a ¾" chamfer or tooled radius.
5. All concrete, reinforcement, joint connection systems, grout etc. as shown, are considered as part of the barrier payment.
6. All steel assemblies for joint shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
7. 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.
8. 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.
9. Conduit trough when required shall be shown elsewhere on the plans, or as directed by the Engineer.



TYPE X JOINT INSTALLATION DETAIL

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

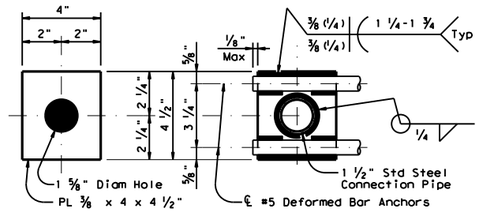
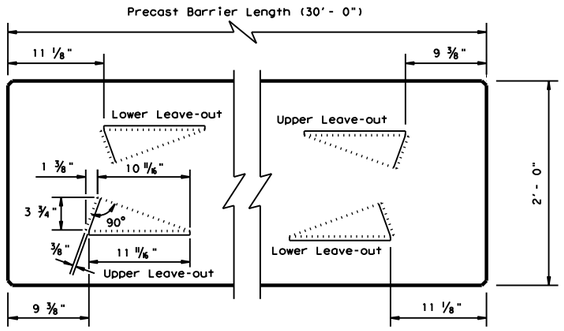


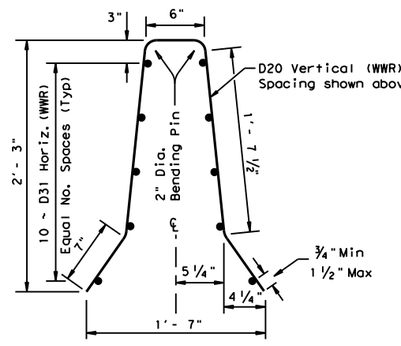
PLATE DIMENSIONS WELDING DETAILS

CONNECTION PLATE DETAILS

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



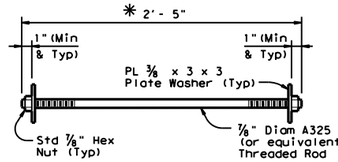
BARRIER PLAN AT END JOINTS



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

(WWR) General Notes

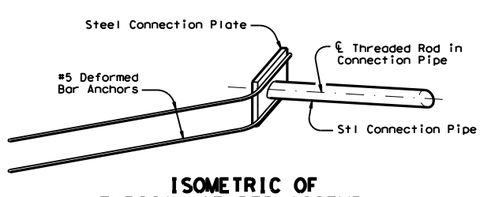
1. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
2. Welded wire cage may be cut or bent to accommodate the Type X joint connection and drainage slots, as directed by the Engineer.
3. All reinforcement shall comply with Item 440, "Reinforcing Steel."
4. Combinations of reinforcing 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 ⅜ 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.

SHEET 1 OF 2

Texas Department of Transportation | Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

PRECAST BARRIER (TYPE 1)

CSB(1)-10

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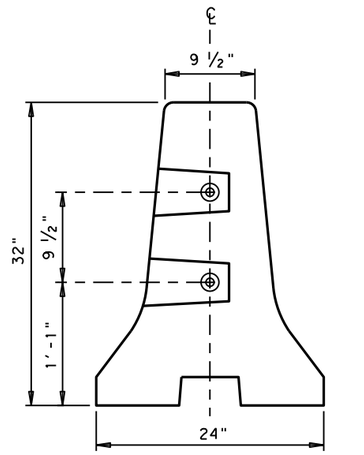
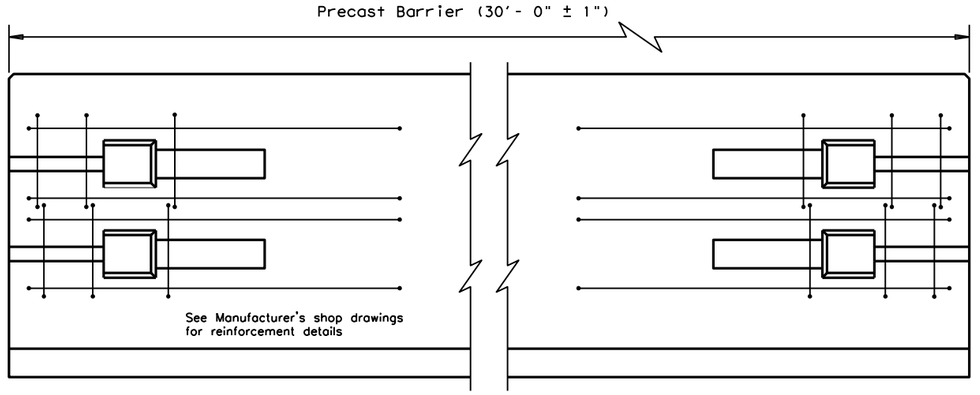
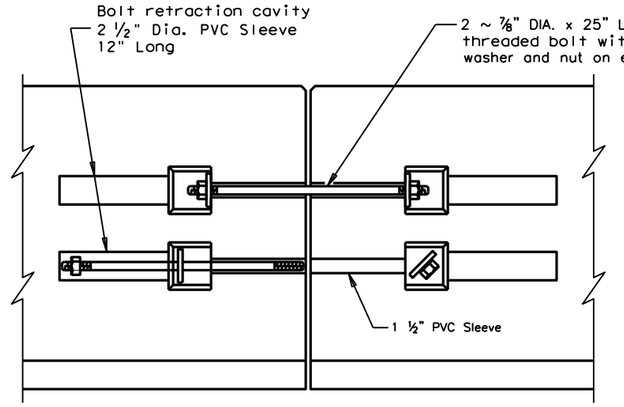


END VIEW (CSB) QUICK-BOLT
QUICK-BOLT POCKET LOCATIONS

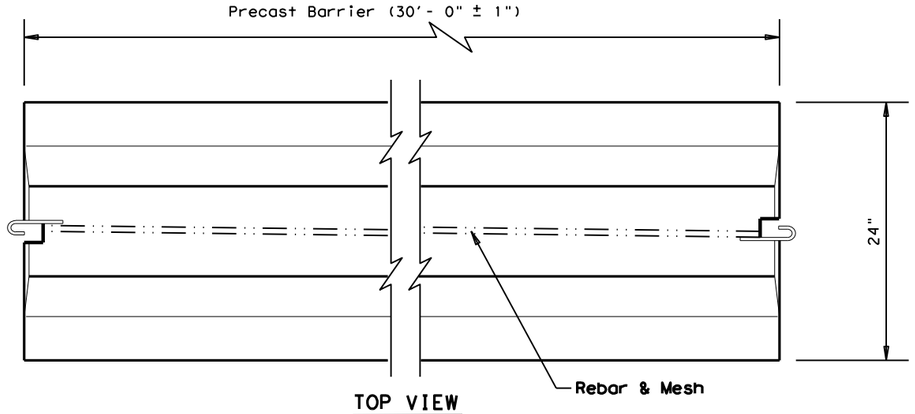


ELEVATION (CSB) QUICK-BOLT
See Manufacturer's shop drawing for additional details

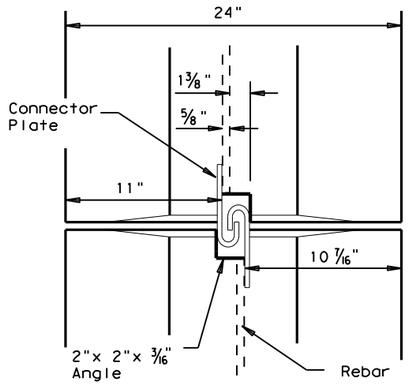


ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

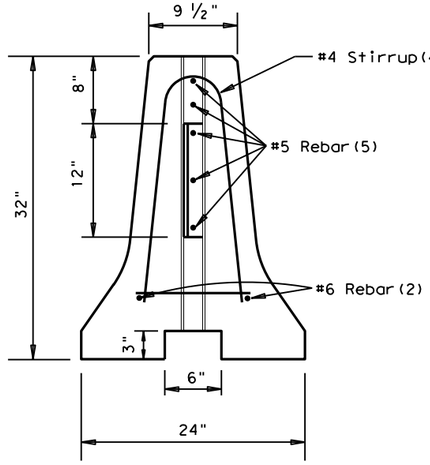
Joint Connection (Type Q)



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



VIEW FROM ABOVE
J-J HOOK CONNECTION



END VIEW
J-J HOOK CONNECTION

Joint Connection (Type J)

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.

Texas Department of Transportation | Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

PRECAST BARRIER
(TYPE 1)

CSB(1)-10

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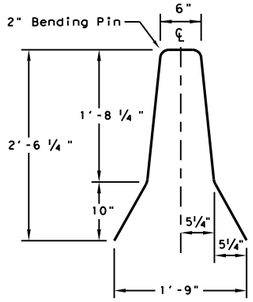
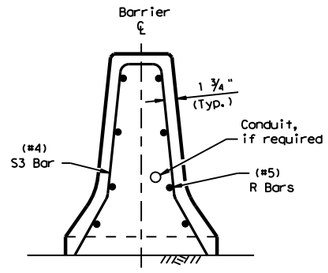
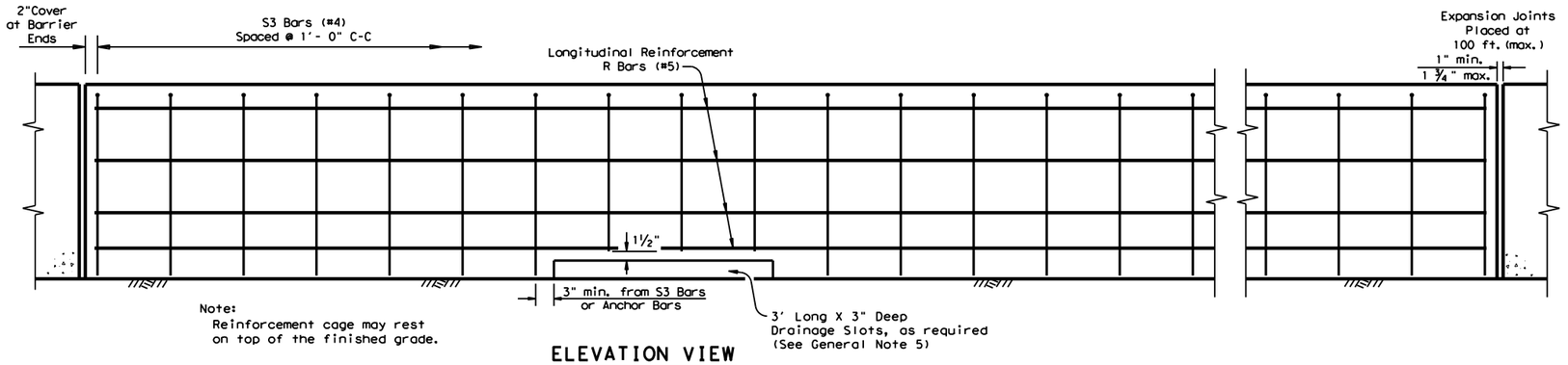


S3 Bar
(#4) Bar



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

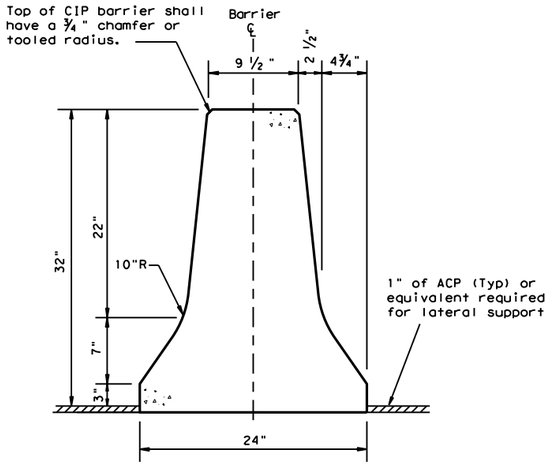


Note:
Reinforcement cage may rest on top of the finished grade.

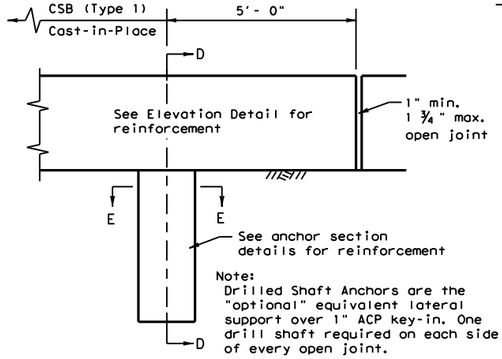
ELEVATION VIEW
Cast-in-Place (CSB) on Flexible Pavement

GENERAL NOTES

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

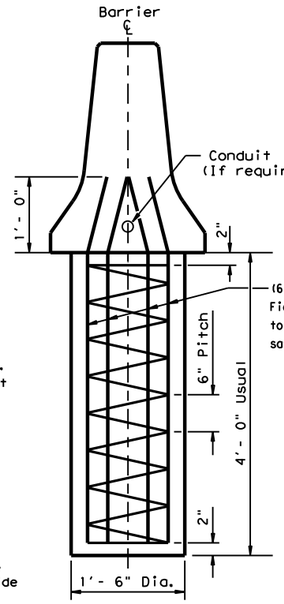


CONCRETE SAFETY BARRIER (CSB)

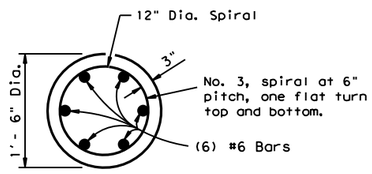


Note:
Drilled Shaft Anchors are the "optional" equivalent lateral support over 1" ACP key-in. One drill shaft required on each side of every open joint.

DRILLED SHAFT ANCHOR
LOCATION DETAIL



SECTION D-D
DRILLED SHAFT ANCHOR



SECTION E-E
DRILLED SHAFT ANCHOR
See drilled shaft anchor location detail

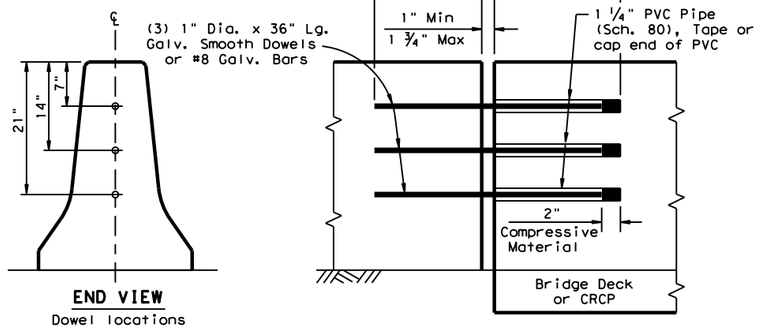
Cast-In-Place or Slip-Formed (CSB)

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

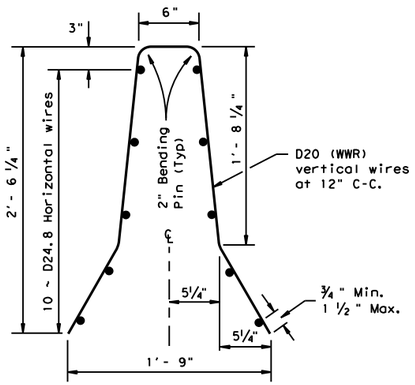
The weight of Cast-in-Place (CSB)(F-Shape) is approx. 440 lbs per ft.

EXPANSION JOINT (Dowel Location)

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



END VIEW
Dowel locations



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

(WWR) General Notes

1. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
2. The welded wire cage at the drainage slots may be cut or bent to accommodate the edge and top clearances, as directed by the Engineer.
3. The welded wire splice locations shall have a "minimum" splice lap length of 12".
4. 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".

Texas Department of Transportation

Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)
CAST-IN-PLACE (TYPE 1) (FLEXIBLE PAVEMENT)
CSB(2)-13

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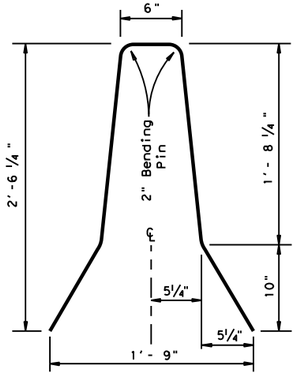
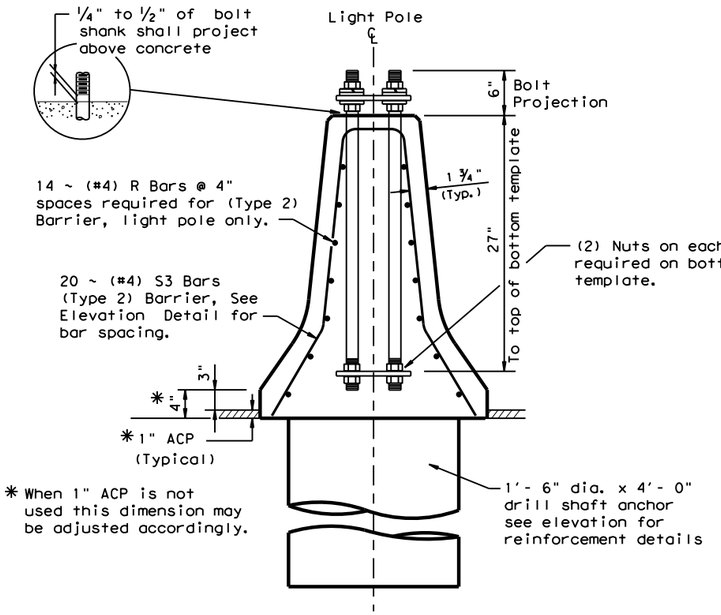


S3 BAR (#4)

(20) At each light pole section of barrier

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



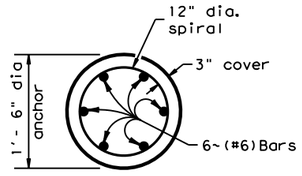
(ROADWAY) SECTION AT LIGHT POLE

Symmetrical about center line

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

BAR	SIZE	QUANTITY
S3	#4	20
R	#4	14

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

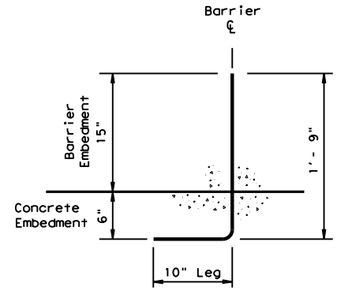


No.3 spiral at 6" pitch (one flat turn top and bottom)

SECTION A-A

GENERAL NOTES

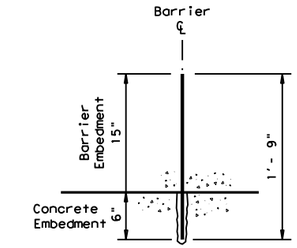
1. All concrete shall be Class C, unless otherwise specified in the plans.
2. Anchor bolts, junction box, non-metallic flexible conduit, and bonding to steel shall not be paid for directly, but will be subsidiary to the various bid items.
3. For proper installation and material requirements for the anchor bolts and light pole, see Traffic Engineering RIP standard sheets.
4. Junction boxes shall be polymer concrete, and shall be mounted flush (+0, - 1/2") with concrete surface. For details and material requirements on barrier junction box, see DMS-11030.
5. Install 12 AWG stranded conductors from load side of fused breakaway connector to luminaire. Fused breakaway connectors shall be installed as required on Traffic Engineering RID Sheets. Typically fused breakaway connectors are installed in the barrier junction box adjacent to each light pole. If fused breakaway connectors are installed in the pole's handhole, increase the size of the 3/4" flexible non-metallic conduit according to the NEC as needed to accomodate the branch circuit conductors.
6. Anchor bolts and their assemblies shall be in accordance with Item 449, "Anchor Bolts" High-Strength Steel or Alloy Steel. Galvanization requirements for anchor bolts are shown on RIP sheets.
7. The required anchorage for Type 2 barrier (drill shaft, standard or optional concrete anchorage) shall not be paid for directly, but is subsidiary to Item 514, "Permanent Concrete Traffic Barrier."
8. Bond anchor bolt to rebar cage with #6 bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. The bonded steel in the foundation creates a concrete encased grounding electrode which replaces the ground rod.



STANDARD "CONCRETE" ANCHORAGE

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

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

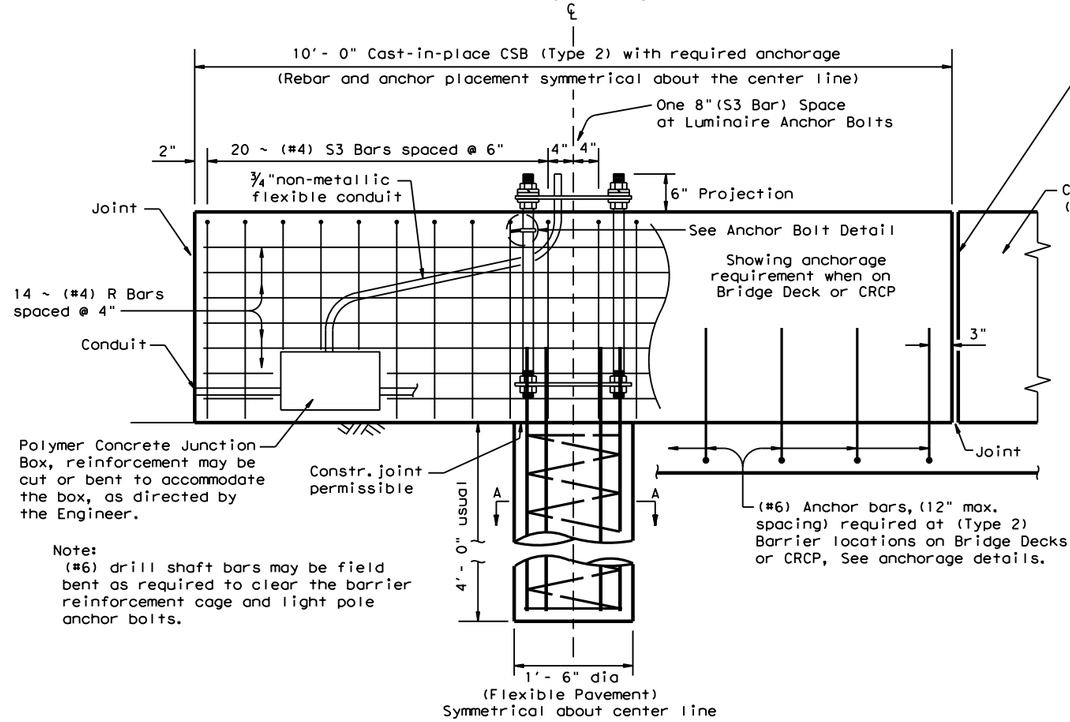


"OPTIONAL" EPOXY ANCHORAGE

(#6) Bar
Type III, Class C Epoxy

Concrete Pavement / Bridge Deck Anchorage: Cast-in-Place or Slip-Formed Barrier

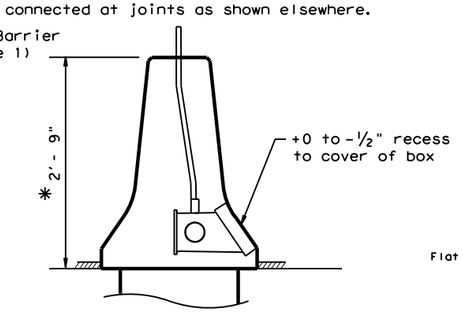
Epoxy Note:
If epoxy coated anchor bars are required, the lower 6" of the bars must not be epoxy coated.



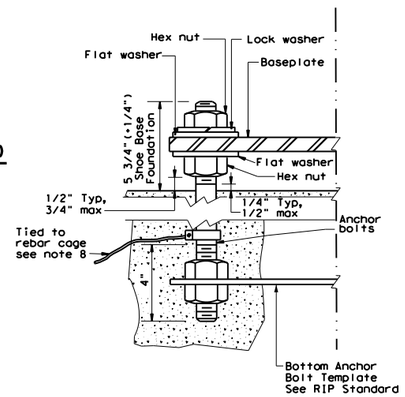
ELEVATION SHOWING THE REQUIRED REINFORCEMENT AND ANCHORAGE OF (TYPE 2) BARRIER

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

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



SECTION SHOWING JUNCTION BOX CONCRETE SAFETY BARRIER (TYPE 2)



ANCHOR BOLT DETAIL

Texas Department of Transportation

Design Division Standard

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

CSB(4)-19

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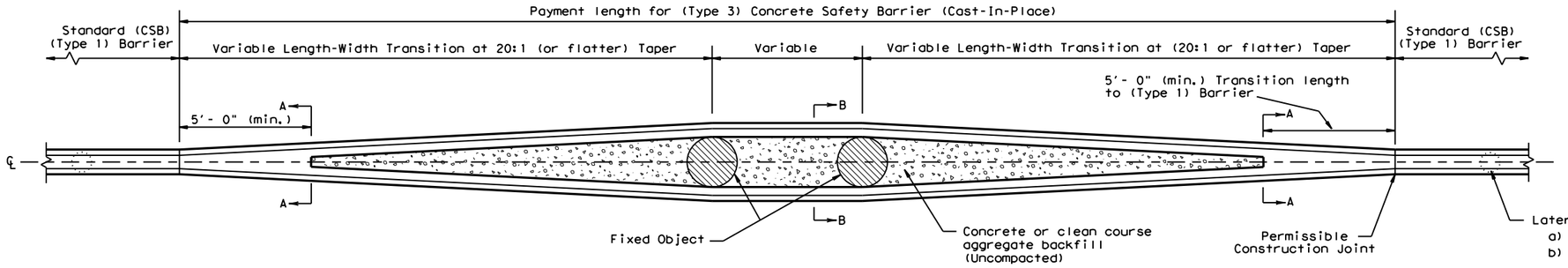
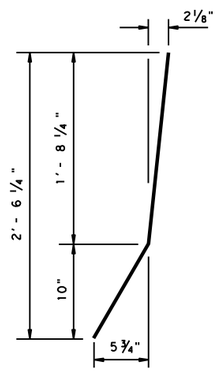
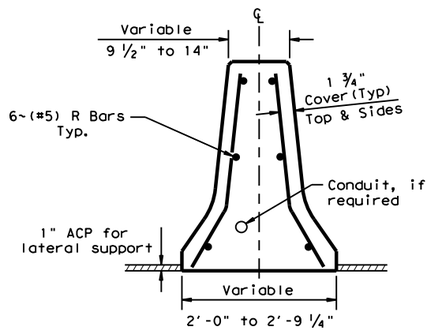


PLAN (TYPE 3) BARRIER

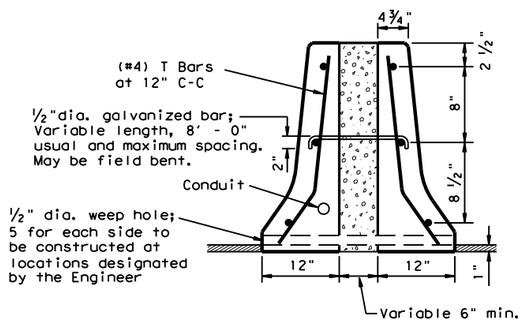


(#4) T Bar



SECTION A-A
TYPE 3 BARRIER

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



SECTION B-B
TYPE 3 BARRIER

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

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

(WWR) General Notes

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

GENERAL NOTES

1. Axis of concrete barrier shall be vertical, except where roadway is superelevated, then axis shall be normal to roadway surface.
2. All steel that requires galvanizing shall be in accordance with Item 445, "Galvanizing."
3. Unless otherwise shown in the plans the contractor has the option of placing either precast or cast-in-place (Type 1) CSB.
4. Bid price per liner foot of (Type 1) CSB and (Type 3) CSB, including terminal and anchor sections, shall include all of the concrete, reinforcement, drilled shaft foundations and aggregate backfill.
5. All concrete shall be Class C.
6. Longitudinal and vertical bars for roadway barrier shall conform to ASTM A615 (Grade 60), unless otherwise specified.
7. At construction joints the longitudinal bars shall extend beyond the joint so that bar splices will be a minimum of two feet from the construction joint.
8. Welded wire reinforcement (WWR) may be used as an option to conventional reinforcement and shall meet area requirement for the (Type 3) R and T bars.
9. Any method devised by the contractor and approved by the Engineer that will assure the longitudinal steel for (Type 1) CSB and (Type 3) CSB will be positioned ± ½inch as dimensioned will be satisfactory.
10. Conduit to be provided only when called for elsewhere in the plans. Position of conduit may be adjusted to facilitate construction subject to the approval of the Engineer.
11. See CSB(4) standard for barrier with illumination.

Texas Department of Transportation

Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

CAST-IN-PLACE
(TYPE 3)
AT FIXED OBJECTS

CSB(6)-10

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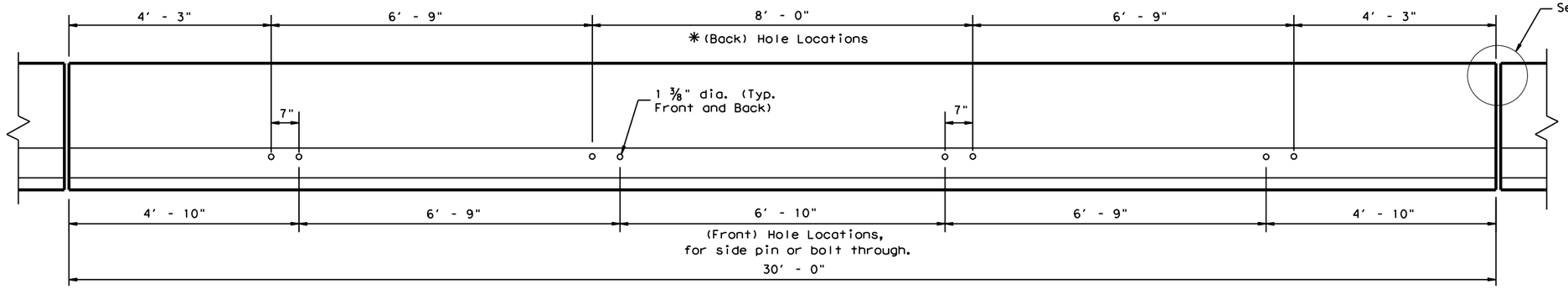
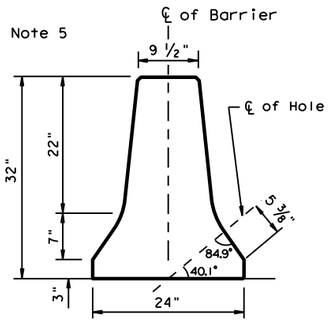
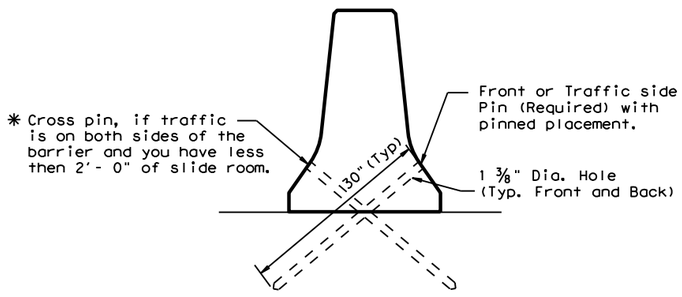


DETAIL 1

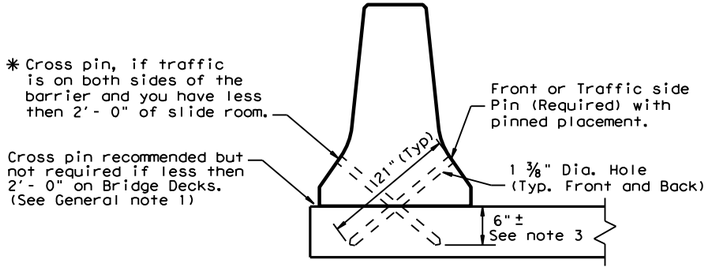


HOLE LOCATION DETAIL



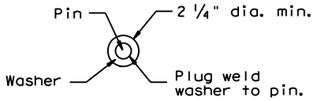
DETAIL 2

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

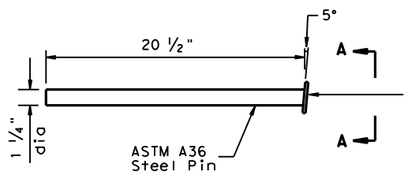


DETAIL 3

Bridge Deck or CRCP
(21" pin required)



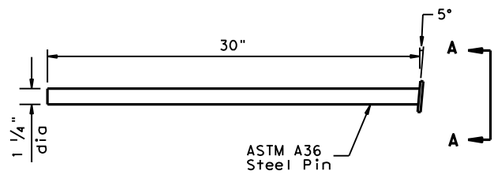
VIEW A-A



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

(21") PIN DETAIL

See Detail 3

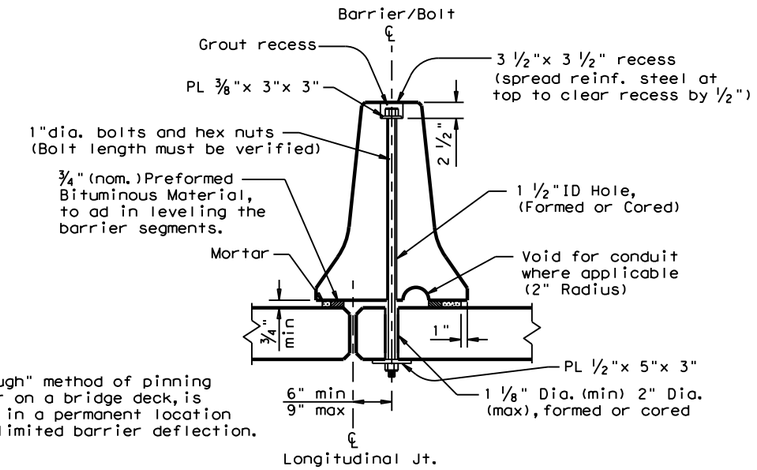


(30") PIN DETAIL

See Detail 2

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.



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.

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

Texas Department of Transportation

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	CK:
© TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	02	035,etc	US 62
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		79

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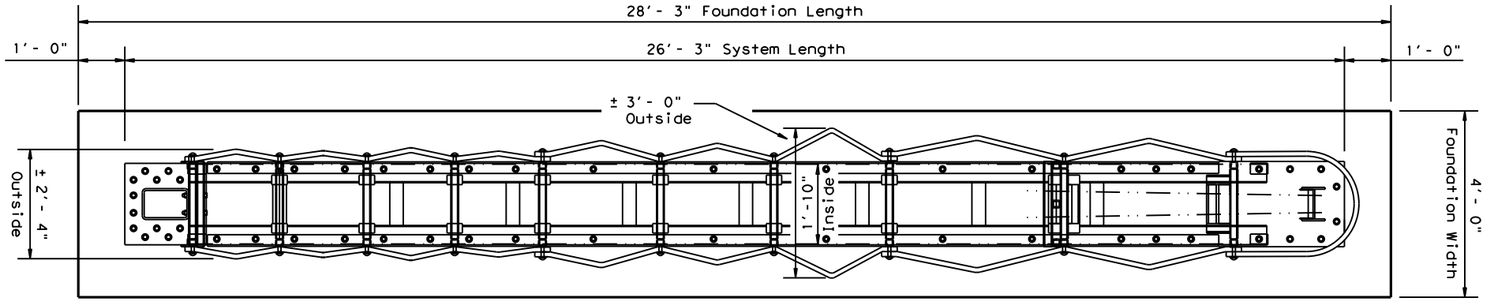
DATE: 6/2/2021
FILE: pw:\\txdot.projectwiseonline.com:TXDOT5\Documents\24 - ELP\Design Projects\0233020035\4 - Design\Plan Set\3. Roadway\Roadway Standards\heart16.dgn

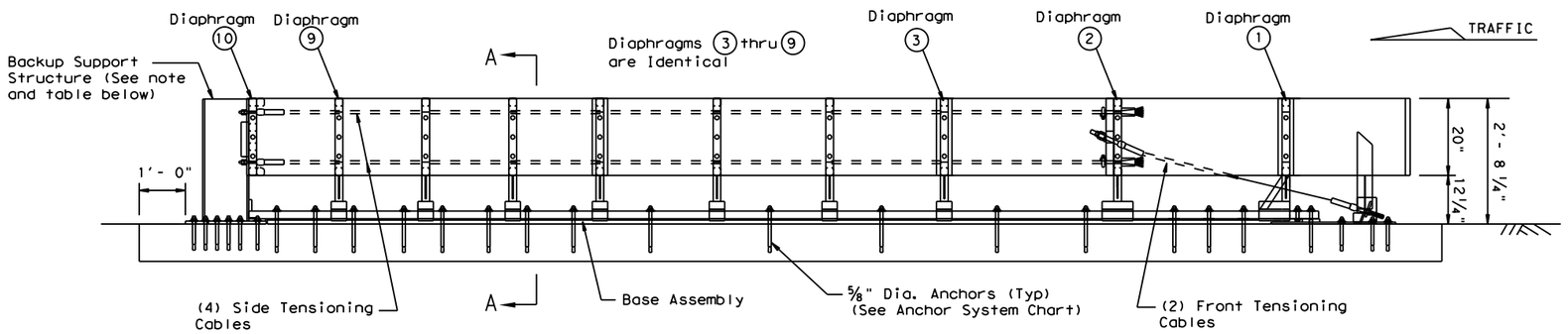
PLAN VIEW

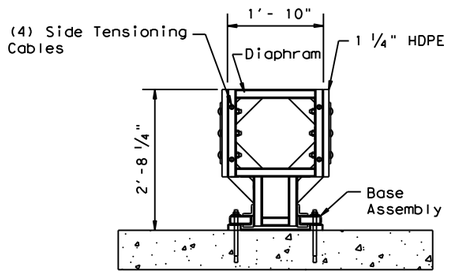


NOTE:
BACKUP SUPPORT SHOWN IS THE STEEL POST OPTION. THE HEART SYSTEM MAY BE CONNECTED WITH RECTANGULAR CROSS SECTIONS SUCH AS: PIERS, PARAPETS AND CONCRETE TRAFFIC BARRIERS.

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

ELEVATION VIEW





SECTION A-A

ANCHOR SYSTEM CHART
On Concrete: 10" Bolts used on base rails, 7 ½" Bolts used on base plates.
On Asphalt: 18" Bolts used on base rails and base plates.

HEART (NARROW) SYSTEM		
TEST LEVEL	SYSTEM LENGTH	PAD LENGTH
TL-2	13′- 9 ½"	15′- 9 ½"
TL-3	26′- 3"	28′- 3"
70	28′- 9"	30′- 9"

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

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

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

BACKUP SUPPORT OPTIONS
Steel Post Backup (Shown)
Rectangular Concrete Backup (18" Width Max.)
Concrete Barrier (CTB) Backup
Single Slope Concrete Barrier (SSCB)

TRANSITION OPTIONS
THE HEART SYSTEM IS APPROVED FOR USE AT BI-DIRECTIONAL SITES, ADDITIONAL HARDWARE IS REQUIRED. (SEE MANUFACTURER'S PRODUCT MANUAL)

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

GENERAL NOTES

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

LOW MAINTENANCE

Texas Department of Transportation — Design Division Standard

TRINITY HIGHWAY
HEART HYBRID ENERGY ABSORBING TERMINAL
HEART-16

FILE: heart16.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP
© TxDOT: March 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED 06,2013 (VP) REVISED 03,2016 (VP)	0233	02	035,etc	US 62
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		80

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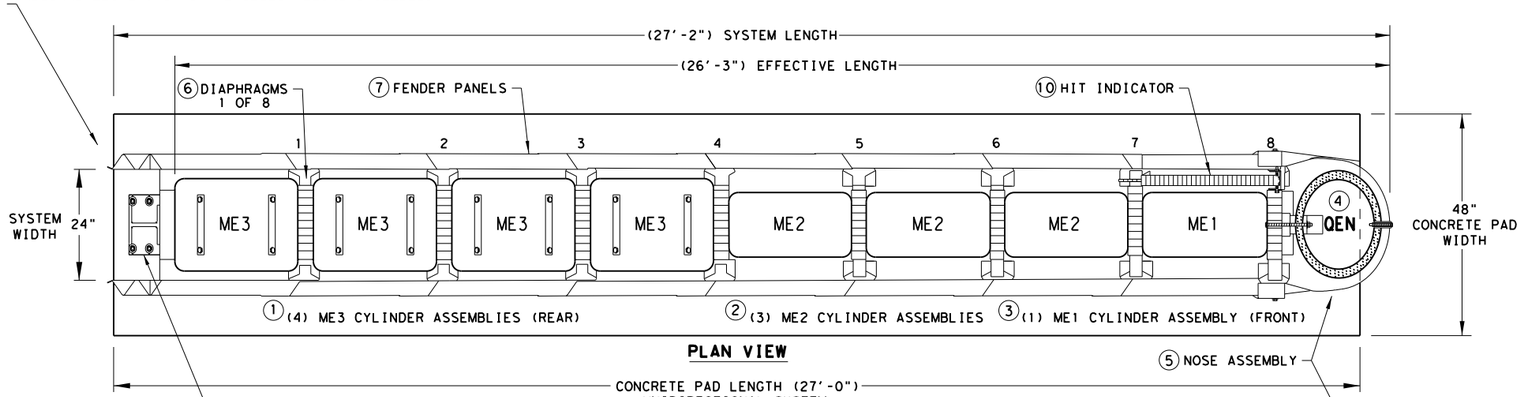
DATE: 6/2/2021
FILE: pw:\\txdot.projectwiseonline.com:TXDOT5\Documents\24 - ELP\Design Projects\0233020354 - Design\Plan Set\3. Roadway\Roadway Standards\qgelitem10n20.dgn

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

QUADGUARD ELITE M10 24" WIDE (8 BAY) SYSTEM



PLAN VIEW

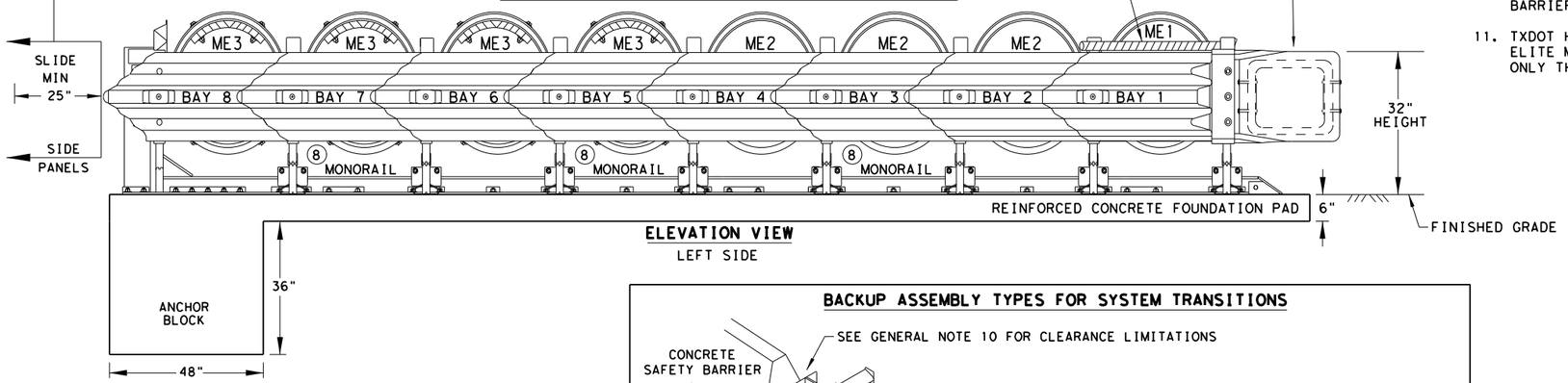
⑨ SHOWN WITH TENSION STRUT BACKUP ASSEMBLY

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

④ QEN CYLINDER INSTALLED INSIDE OF NOSE BELT ASSEMBLY ⑤

NOTE:
HIT INDICATOR WILL RAISE UPON IMPACT.

NOTE:
PROVISION SHALL BE MADE FOR REAR FENDER SIDE PANELS TO SLIDE REARWARD UPON IMPACT, 25" MIN.



ELEVATION VIEW
LEFT SIDE

NOTES:
CONTACT THE MANUFACTURER WITH SITE SPECIFIC DATA (SSD) FOR CONCRETE PAD AND ANCHOR BLOCK INSTALLATION REQUIREMENTS.

A MANUFACTURER'S DRAWING PACKAGE UNIQUE AND SPECIFIC FOR THE QUADGUARD ELITE M10 FIELD INSTALATION AND INFORMATION REGARDING THE TYPE OF BACKUP ASSEMBLY REQUIRED FOR THE TRANSITION WILL BE PROVIDED BY THE MANUFACTURER TO THE ENGINEER AND INSTALLER.

6" REINFORCED CONCRETE PAD REQUIRES THE INSTALLATION OF AN ANCHOR BLOCK AS SHOWN ON THE MANUFACTURER'S DRAWING PACKAGE.

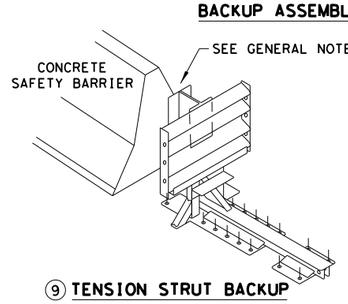
8" NON-REINFORCED CONCRETE PAD MAY NOT REQUIRE AN ANCHOR BLOCK, IF THE PAD IS INSTALLED AGAINST AN IMMOVABLE CONCRETE BACKUP.

CONCRETE PAD AND ANCHOR BLOCK COMBINATIONS SHALL BE CONFIRMED WITH THE MANUFACTURER BASED UPON SITE SPECIFIC DATA (SSD).

NOTE:
THE QUADGUARD ELITE M10 8-BAY, 24" WIDE - NARROW SYSTEM TESTED TO MASH TEST LEVEL 3.

TL-3 MODEL #	QM10024E	CYLINDER TYPES IN BAYS			
BAYS	8	TYPE-ME3	TYPE-ME2	TYPE-ME1	TYPE-QEN
DIAPHRAGMS	8	4	3	1	1
WIDTH	24"	REAR	FRONT		NOSE

BACKUP ASSEMBLY TYPES FOR SYSTEM TRANSITIONS

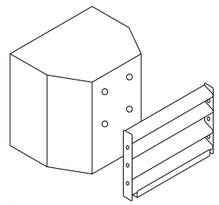


⑨ TENSION STRUT BACKUP

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

NOTE:
TRANSITION ASSEMBLIES FOR THE QUADGUARD ELITE M10 TO THRIE-BEAM OR W-BEAM FENCE REQUIRES I-BEAM POSTS:

ALL POSTS W6X8.5/9 I-BEAMS (78" LONG).



⑨ CONCRETE BACKUP

NOTES:
CONTACT THE MANUFACTURER WITH SITE SPECIFIC DATA (SSD) FOR THE CORRECT BACKUP ASSEMBLY AND TRANSITION PANELS OR SIDE PANELS USED FOR STANDARD AND BI-DIRECTIONAL INSTALLATIONS: AT DIVIDED-HIGHWAY MEDIANS OR UNDIVIDED ROADWAYS WHERE THE SYSTEM IS EXPOSED TO IMPACTS FROM ONE OR TWO DIFFERENT DIRECTIONS OF TRAFFIC FLOW.

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

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY - ENERGY ABSORPTION INC. AT 1(888)323-6374.
2. SEE THE RECENT QUADGUARD ELITE M10 PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITATIONS AND THE DRAWING PACKAGE FOR THE NARROW 24" SYSTEM BEFORE INSTALLING THE QUADGUARD ELITE M10 AT ANY GIVEN LOCATION.
3. FOR BI-DIRECTIONAL TRAFFIC: THE LOCATION AND OR WIDTH OF THE QUADGUARD ELITE M10 IS RESTRICTED. AS BI-DIRECTIONAL TRAFFIC APPROACHES THE REAR OF THE QUADGUARD ELITE M10, THE QUADGUARD ELITE M10 SHOULD NOT EXTEND FURTHER INTO THE TRAFFIC-SIDE OF THE BARRIER THAN THE OBSTACLE. ANY TRANSITION INSTALLED MUST EITHER BE TANGENT TO BOTH QUADGUARD ELITE M10 AND OBSTACLE OR MUST ANGLE TOWARD FIELD SIDE OF THE BARRIER.
4. SYSTEM TRANSITION: APPROPRIATE TRANSITION PANELS OR SIDE PANELS WILL BE REQUIRED FOR PROPER IMPACT PERFORMANCE. THE CORRECT PANEL(S) TO USE WILL DEPEND ON THE DIRECTION OF TRAFFIC FLOW AND WHAT TYPE OF BARRIER OR ROAD FEATURE THE QUADGUARD ELITE M10 SYSTEM IS SHIELDING. SEE THE QUADGUARD ELITE M10 PRODUCT DESCRIPTION & ASSEMBLY MANUAL FOR FURTHER DETAILS.
5. COMPONENTS FOR THE QUADGUARD ELITE (M10) BACKUP AND REINFORCING DETAILS ARE SHOWN ON THE QUADGUARD ELITE M10 PRODUCT DESCRIPTION & ASSEMBLY MANUAL.
6. 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.
7. 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%.
8. THE INSTALLATION AREA SHOULD BE FREE OF CURBS, ELEVATED OBJECTS,OR DEPRESSIONS.
9. THE QUADGUARD ELITE M10 SYSTEM SHOULD BE INSTALLED APPROXIMATELY PARALLEL WITH THE BARRIER.
10. FOR THE TENSION STRUT BACKUP THE DISTANCE BETWEEN THE BACK OF BACKUP AND THE BARRIER WALL SHOULD NOT EXCEED 7" IN ANY CASE.
11. TXDOT HAS ONLY APPROVED THE 24" WIDE QUADGUARD ELITE M10 SYSTEM. THE QUADGUARD ELITE M10 PRODUCT DESCRIPTION AND ASSEMBLY MANUAL INCLUDES SYSTEM WIDTH OF 24". ONLY THE 24" SYSTEM IS ALLOWED TO BE INSTALLED ON TEXAS ROADWAYS.

FOUNDATION & ANCHORING REQUIREMENTS FOUNDATION TYPES: A, B, C, & D	
FOUNDATION TYPE: A	REINFORCED CONCRETE PAD OR ROADWAY
FOUNDATION:	6" MINIMUM DEPTH (P.C.C.)
ANCHORAGE:	7" STUDS EMBEDDED 5 ½" - 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 ½" - APPROVED ADHESIVE
FOUNDATION TYPE: C	ASPHALT OVER SUBBASE
FOUNDATION:	6" MIN. (A.C.) OVER 6" MIN. (C.S.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 ½" - APPROVED ADHESIVE
FOUNDATION TYPE: D	ASPHALT ONLY
FOUNDATION:	8" MIN. (A.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 ½" - 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.

LOW MAINTENANCE

Texas Department of Transportation
Design Division Standard

TRINITY HIGHWAY ENERGY ABSORPTION QUADGUARD ELITE M10 (MASH TL-3)

QGELITE(M10)(N)-20

FILE: qgelitem10n20.dgn	DN: TxDOT	CK: KM	DW: VP	CK: AG
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	02	035,etc	US 62
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		81

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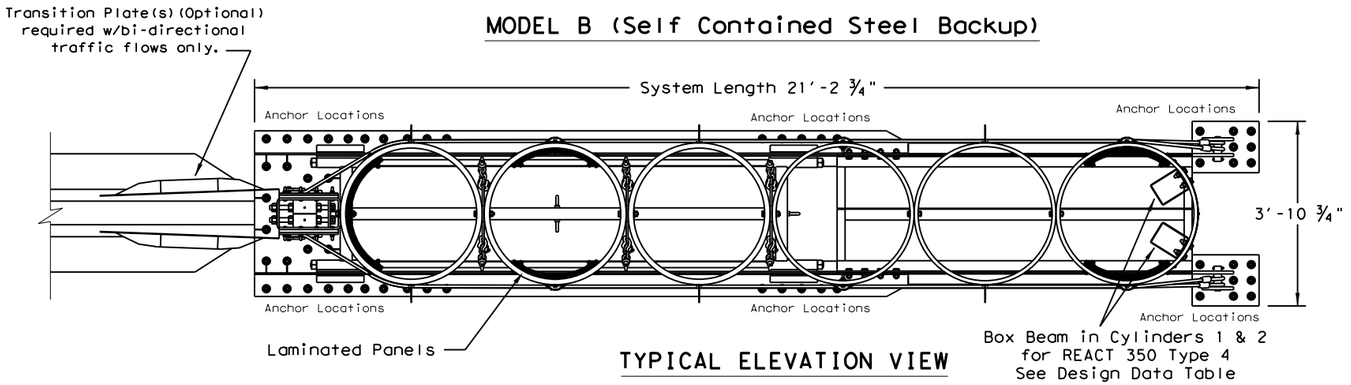
FILE: pw:\\txdot.projectwiseonline.com:TXDOT5\Documents\24 - ELP\Design Projects\0233020354 - Design\Plan Set\3. Roadway\Roadway Standards\reactn16.dgn

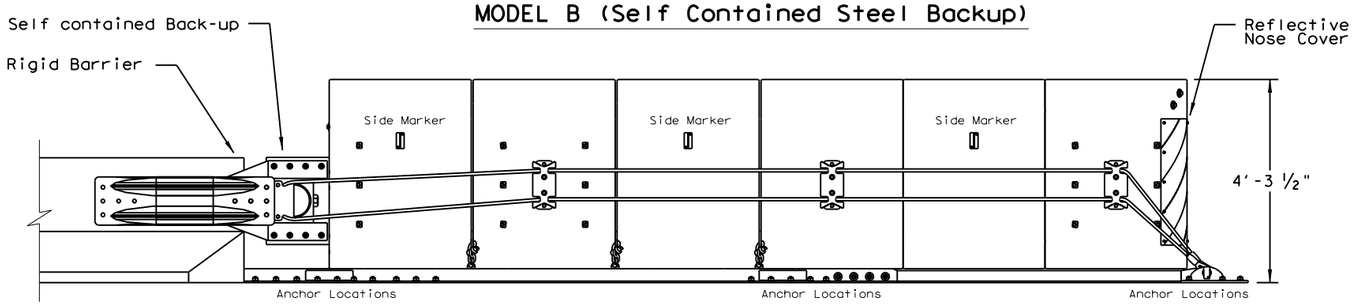
TYPICAL PLAN VIEW

MODEL B (Self Contained Steel Backup)



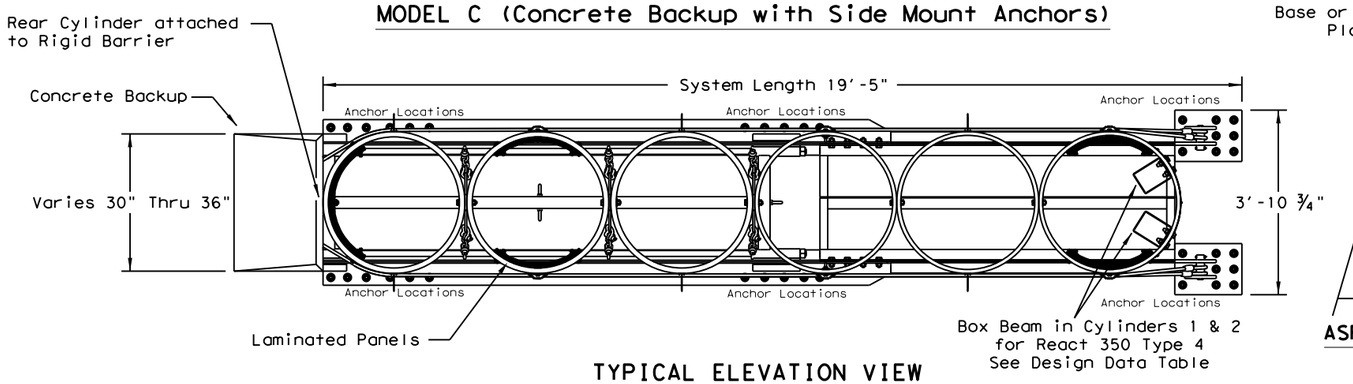
TYPICAL ELEVATION VIEW

MODEL B (Self Contained Steel Backup)



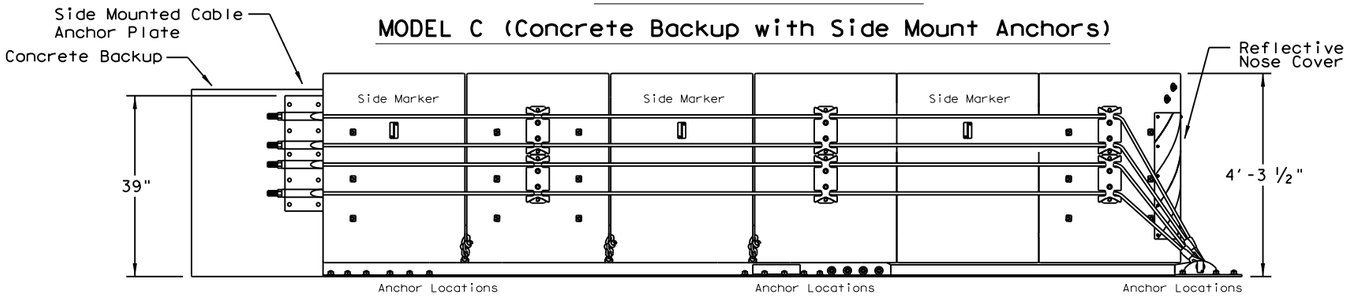
TYPICAL PLAN VIEW

MODEL C (Concrete Backup with Side Mount Anchors)



TYPICAL ELEVATION VIEW

MODEL C (Concrete Backup with Side Mount Anchors)

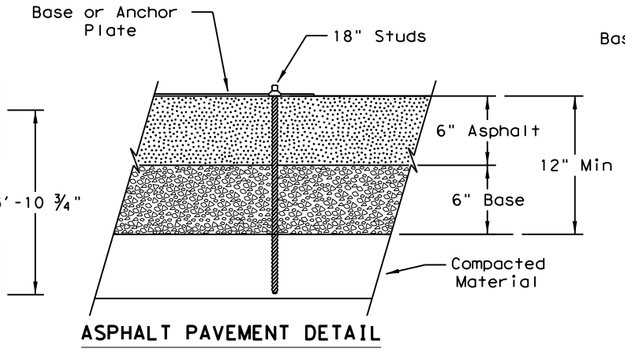


GENERAL NOTES

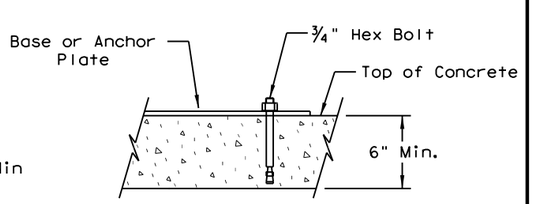
1. For specific information regarding installation and technical guidance of the system, contact: Trinity Highway - Energy Absorption at 1(888)323-6374. 70 W. Madison St. Suite 2350. Chicago, IL 60602
2. The nose of the REACT 350 shall be clad with a plastic wrap with standard delineation adhered to the wrap and shall have a series of side marker reflectors on both sides of the unit. See site plan views for marker and plastic wrap color orientation.
3. All steel components to be hot dipped galvanized except stakes, drive spikes, threaded bolts in backup unit, and wedge fittings on cables.
4. The installation area should be free from curbs, elevated objects, or depressions. If the REACT system is to span expansion joints contact the manufacturer.
5. The REACT system should be approximately parallel with the barrier or ℄ of merging barriers. The maximum permissible cross-slope is 8%.
6. REACT 350 II has laminated panels in cyliners 1, 5, & 6.

DESIGN DATA TABLE FOR REACT 350 AND REACT 350 II				
TYPE	REACT 350 4-B	REACT 350 4-C	REACT 350 II 6-B	REACT 350 II 6-C
Test Level	TL-2	TL-2	TL-3	TL-3
OVERALL LENGTH	15'-3"	13'-9"	21'-3"	19'-5"

FOUNDATION AND ANCHORAGE TABLE FOR REACT 350 AND REACT 350 II			
FOUNDATION TYPE		MINIMUM THICKNESS	ANCHORAGE
A	CONCRETE PAD OR ROADWAY	6"	MP-3 WITH 7" STUDS [5.5" EMBEDMENT]
B	ASPHALT OVER CONCRETE PAVEMENT	6" CONCRETE PAVEMENT	ANCHOR LENGTH REQUIRED IS 7" STUD PLUS ASPHALT THICKNESS
C	ASPHALT OVER BASE	6" ACP + 6" BASE	MP-3 WITH 18" STUDS [16.5" EMBEDMENT]
D	ASPHALT ONLY	8"	MP-3 WITH 18" STUDS [16.5" EMBEDMENT]



ASPHALT PAVEMENT DETAIL



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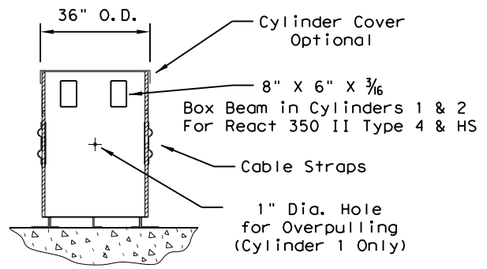


TYPICAL CYLINDER

Texas Department of Transportation

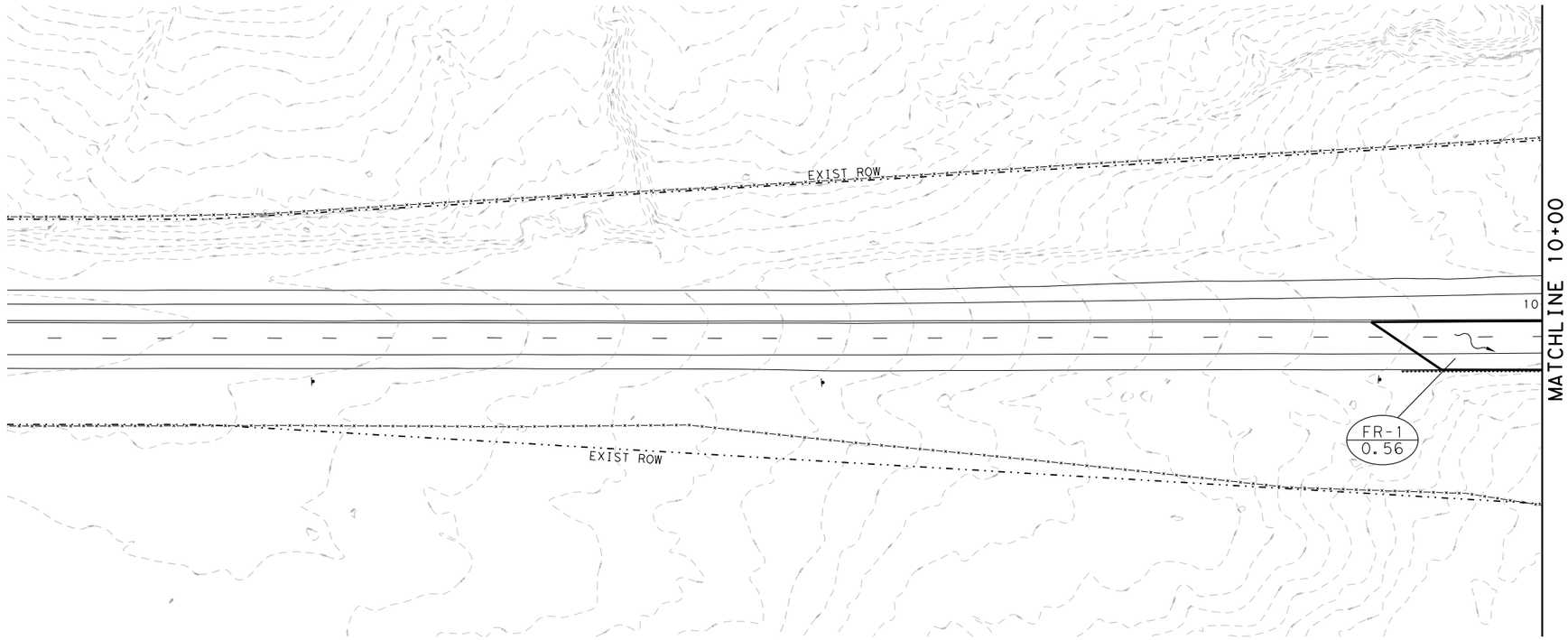
Design Division Standard

TRINITY HIGHWAY ENERGY ABSORPTION (REACT 350 NARROW) (REACT 350 II NARROW)

REACT(N)-16

FILE: reactn16.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	02	035,etc	US 62
REVISED 06,2013 (VP)	DIST	COUNTY		SHEET NO.
REVISED 03,2016 (VP)	ELP	CULBERSON		82

LOW MAINTENANCE



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SCALE: 1" = 100'

LEGEND

A4 / 12.96 — AREA I.D. / AREA IN ACRES

DIRECTION OF FLOW

DRAINAGE AREA BOUNDARY

NOTES:

1. DRAINAGE AREAS SHOWN ON THIS MAP APPLY TO INTERNAL STORM SEWER DESIGN ONLY.
2. CONTOURS ARE SHOWN AT 2' INTERVALS.

SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED PROFESSIONAL ENGINEER
6/1/2021

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
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US 62/180
DRAINAGE AREA MAP

BEGIN PROJECT TO 10+00

SHEET 1 OF 18

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:	6	TEXAS	F 2021(690)		US 62/180	
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035, ETC.	83

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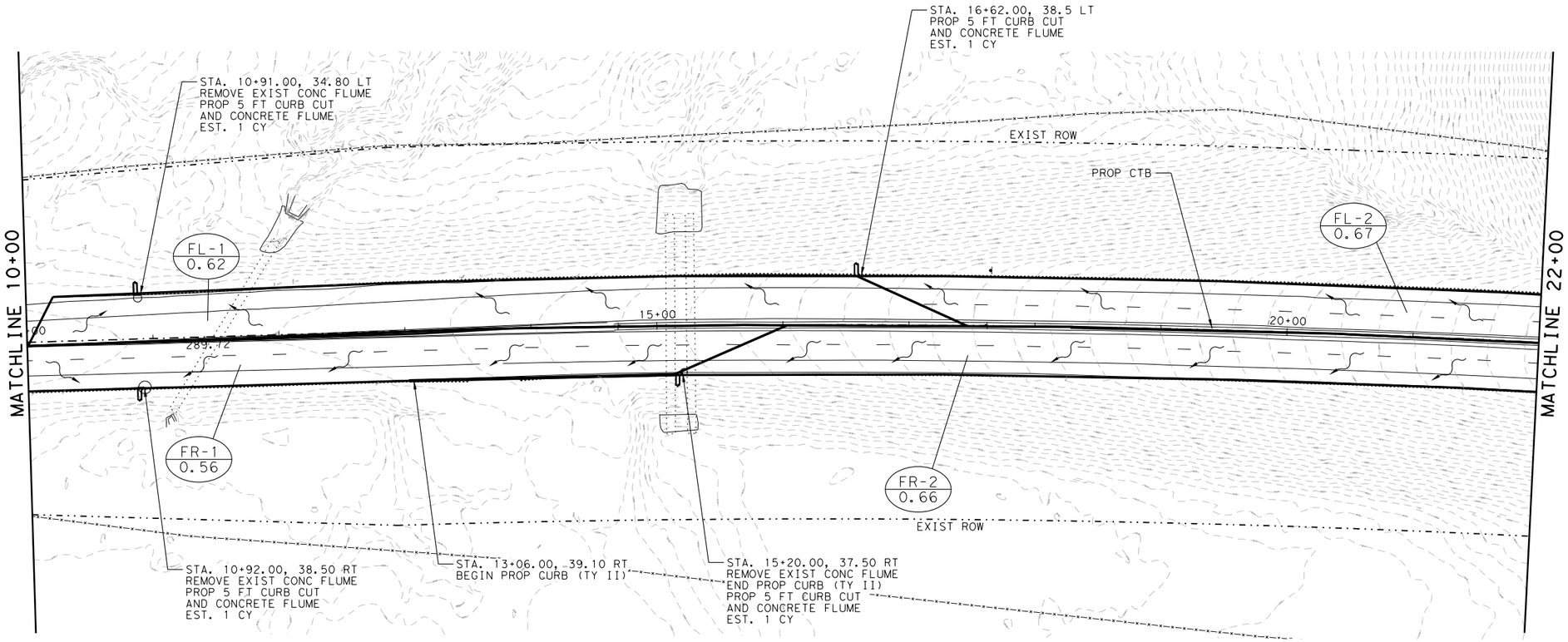

0 50 100

SCALE: 1" = 100'

LEGEND

A4 / 12.96 — AREA I.D. / AREA IN ACRES

DIRECTION OF FLOW

DRAINAGE AREA BOUNDARY

NOTES:

1. DRAINAGE AREAS SHOWN ON THIS MAP APPLY TO INTERNAL STORM SEWER DESIGN ONLY.
2. CONTOURS ARE SHOWN AT 2' INTERVALS.

SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
104 6021	REMOVING CONC (CURB)	LF	60
420 6011	CL B CONC (FLUME)	CY	4
496 6018	REMOV STR (CONC)	EA	3
529 6002	CONC CURB (TY II)	LF	204

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US 62/180
DRAINAGE AREA MAP

STA. 10+00 TO 22+00

SHEET 2 OF 18

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)			US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035, ETC.	84

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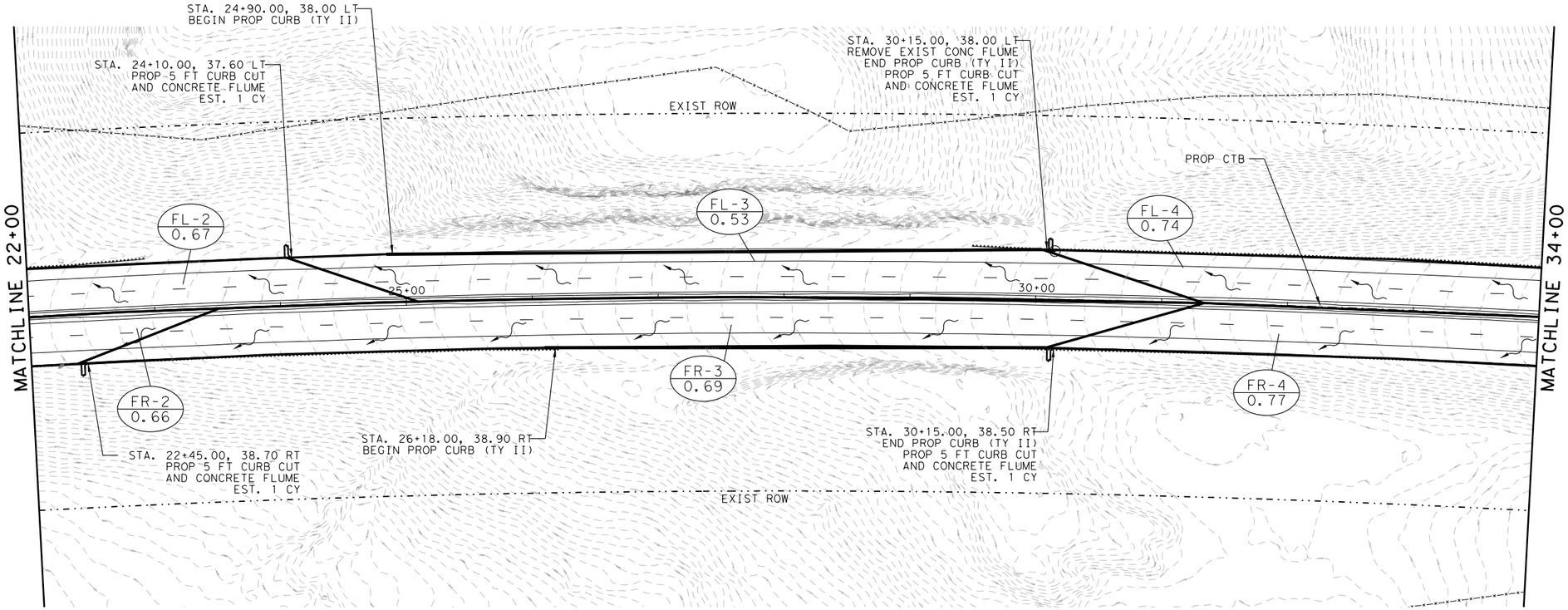

0 50 100

SCALE: 1" = 100'

LEGEND

A4 / 12.96 — AREA I.D. / AREA IN ACRES

DIRECTION OF FLOW

DRAINAGE AREA BOUNDARY

NOTES:

1. DRAINAGE AREAS SHOWN ON THIS MAP APPLY TO INTERNAL STORM SEWER DESIGN ONLY.
2. CONTOURS ARE SHOWN AT 2' INTERVALS.

SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
104 6021	REMOVING CONC (CURB)	LF	20
420 6011	CL B CONC (FLUME)	CY	4
496 6018	REMOV STR (CONC)	EA	1
529 6002	CONC CURB (TY II)	LF	887

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US 62/180
DRAINAGE AREA MAP

STA. 22+00 TO 34+00

SHEET 3 OF 18

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)			US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	85

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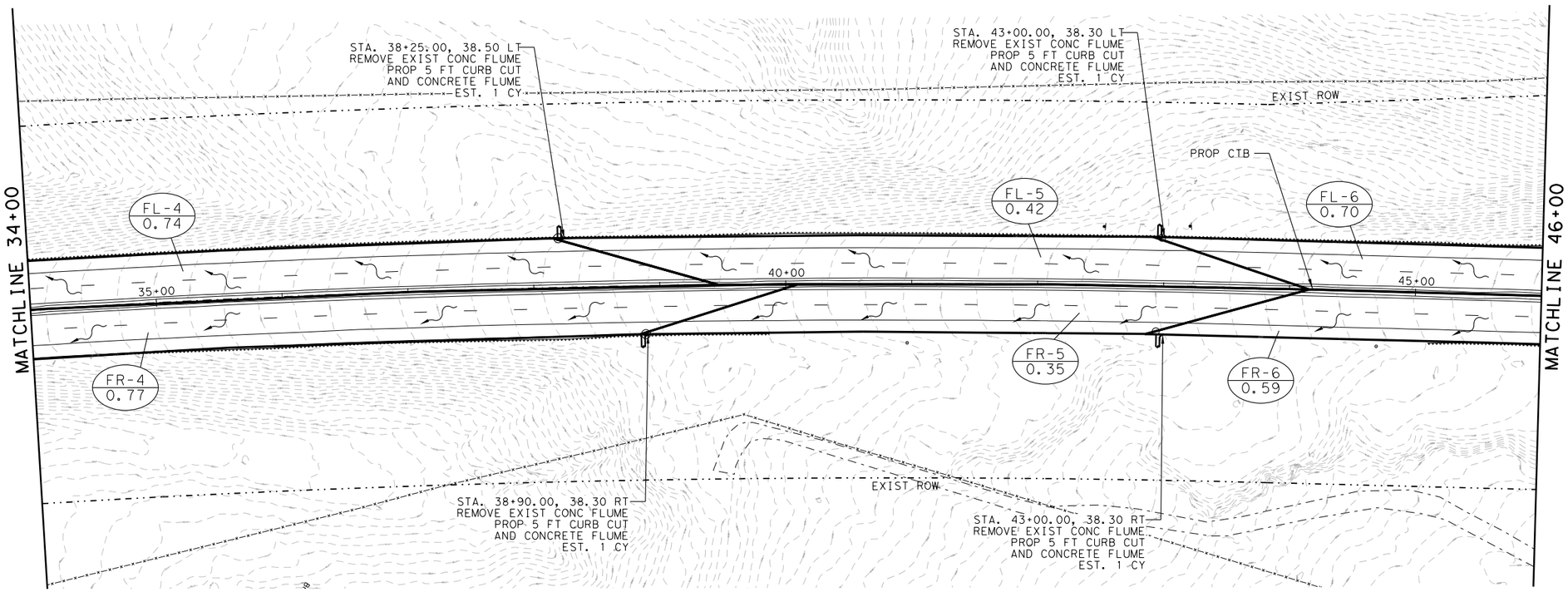

0 50 100

SCALE: 1" = 100'

LEGEND

A4 / 12.96 — AREA I.D. / AREA IN ACRES

DIRECTION OF FLOW

DRAINAGE AREA BOUNDARY

NOTES:

1. DRAINAGE AREAS SHOWN ON THIS MAP APPLY TO INTERNAL STORM SEWER DESIGN ONLY.
2. CONTOURS ARE SHOWN AT 2' INTERVALS.

SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
104 6021	REMOVING CONC (CURB)	LF	30
420 6011	CL B CONC (FLUME)	CY	4
496 6018	REMOV STR (CONC)	EA	4

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6/1/2021

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US 62/180
DRAINAGE AREA MAP

STA. 34+00 TO 46+00

SHEET 4 OF 18

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:	6	TEXAS	F 2021(690)		US 62/180	
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035, ETC.	86

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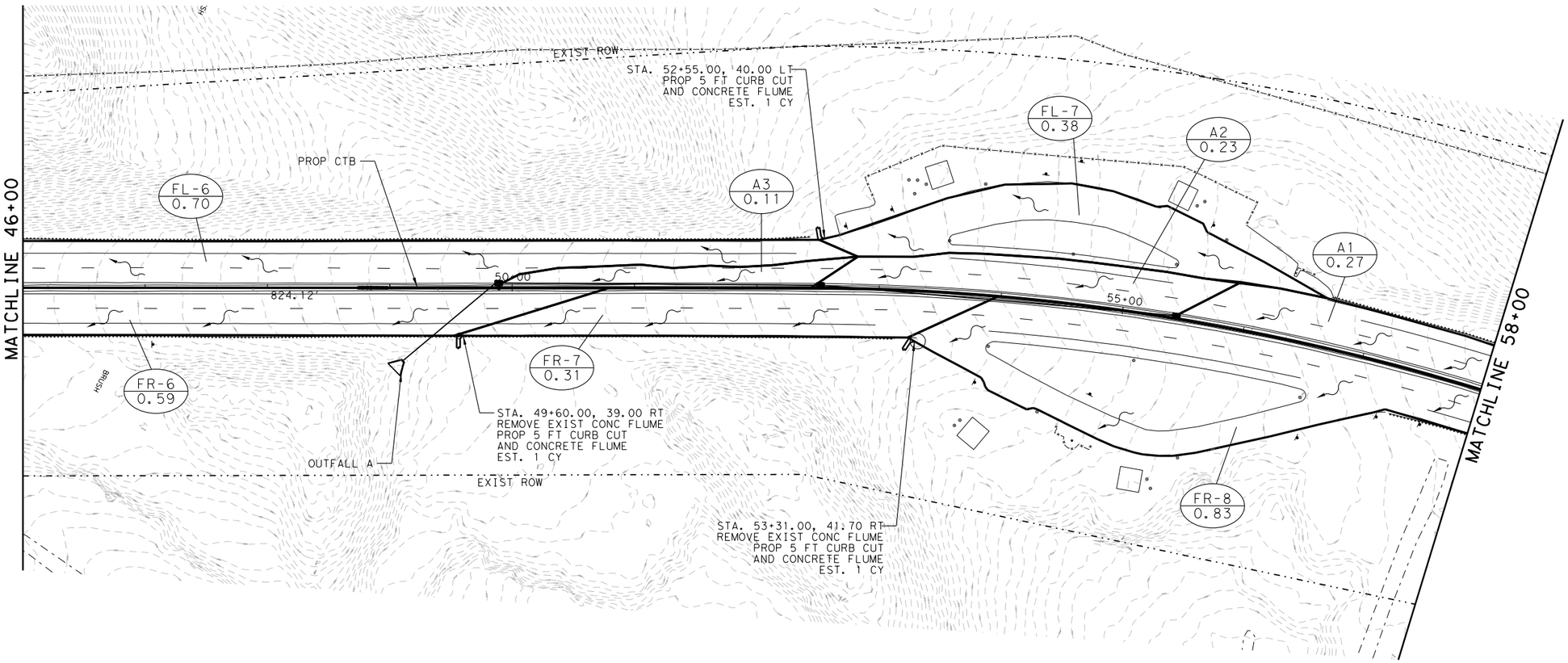
SCALE: 1" = 100'

LEGEND

A4 / 12.96 — AREA I.D. / AREA IN ACRES

DIRECTION OF FLOW

DRAINAGE AREA BOUNDARY



NOTES:

1. DRAINAGE AREAS SHOWN ON THIS MAP APPLY TO INTERNAL STORM SEWER DESIGN ONLY.
2. CONTOURS ARE SHOWN AT 2' INTERVALS.

SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
104 6021	REMOVING CONC (CURB)	LF	25
420 6011	CL B CONC (FLUME)	CY	3
496 6018	REMOV STR (CONC)	EA	2

NO.	REVISION	BY	DATE

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6/1/2021

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US 62/180
DRAINAGE AREA MAP

STA. 46+00 TO 58+00

SHEET 5 OF 18

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)			US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035, ETC.	87

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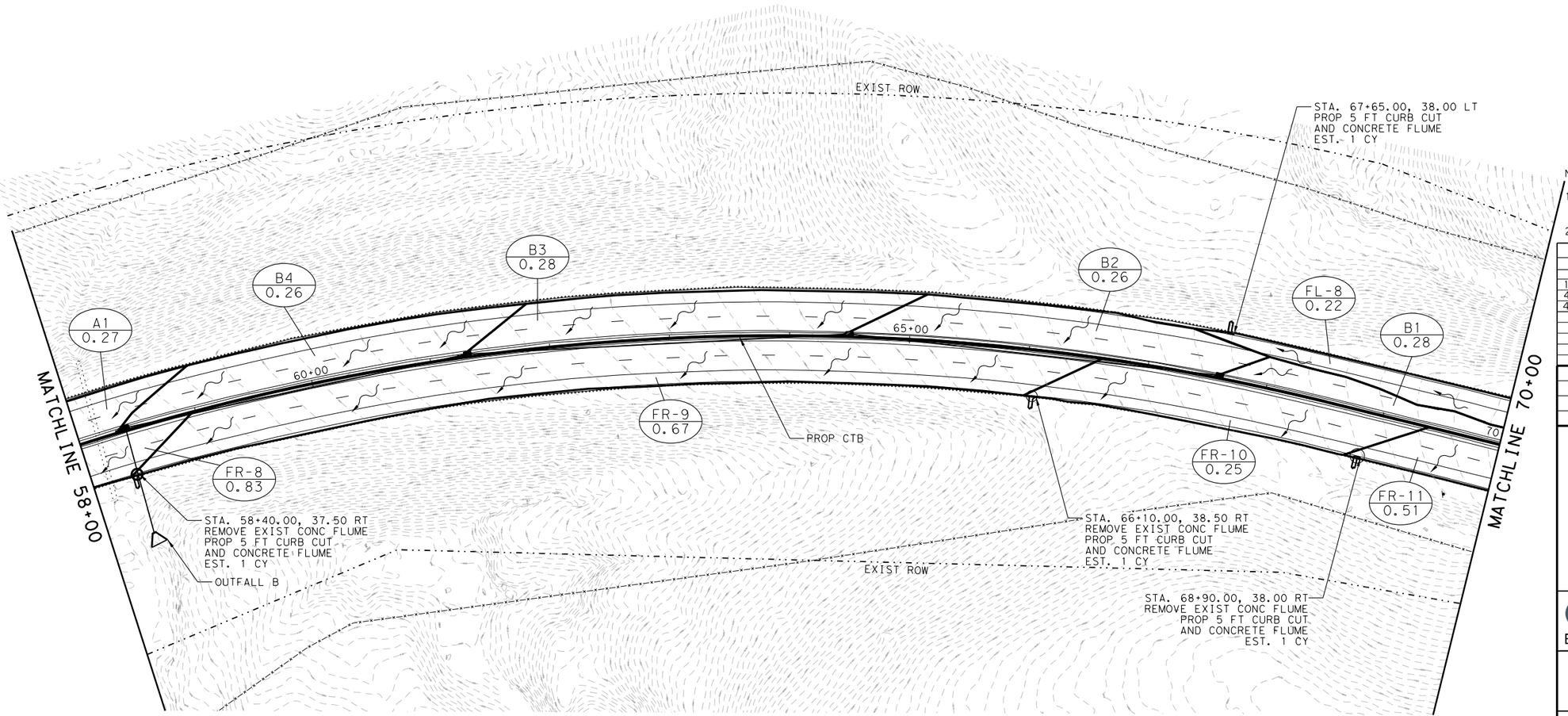
LEGEND

A4 / 12.96 — AREA I.D. / AREA IN ACRES

DIRECTION OF FLOW

DRAINAGE AREA BOUNDARY



NOTES:

1. DRAINAGE AREAS SHOWN ON THIS MAP APPLY TO INTERNAL STORM SEWER DESIGN ONLY.
2. CONTOURS ARE SHOWN AT 2' INTERVALS.

SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
104 6021	REMOVING CONC (CURB)	LF	10
420 6011	CL B CONC (FLUME)	CY	4
496 6018	REMOV STR (CONC)	EA	3

NO.	REVISION	BY	DATE

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88453
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6/1/2021

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US 62/180
DRAINAGE AREA MAP

STA. 58+00 TO 70+00

SHEET 6 OF 18

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)	US 62/180

DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035, ETC.	88

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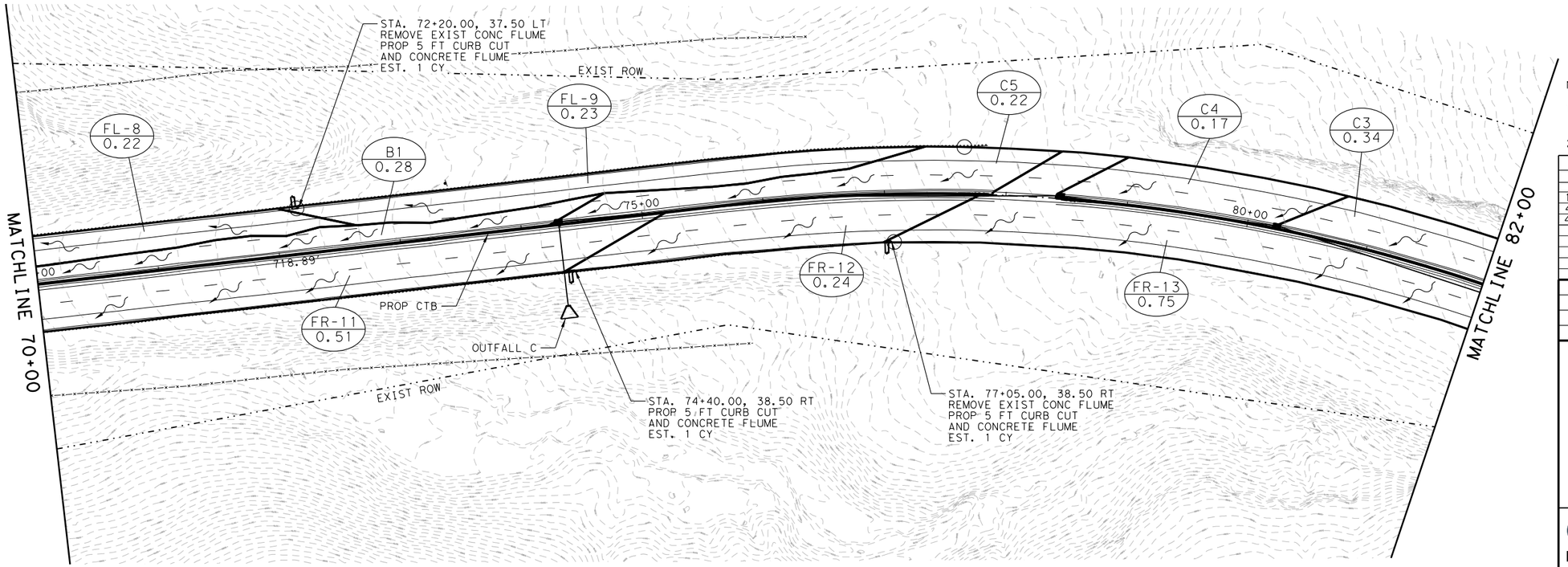
SCALE: 1" = 100'

LEGEND

A4 / 12.96 — AREA I.D. / AREA IN ACRES

DIRECTION OF FLOW

DRAINAGE AREA BOUNDARY



NOTES:

1. DRAINAGE AREAS SHOWN ON THIS MAP APPLY TO INTERNAL STORM SEWER DESIGN ONLY.
2. CONTOURS ARE SHOWN AT 2' INTERVALS.

SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
104 6021	REMOVING CONC (CURB)	LF	15
420 6011	CL B CONC (FLUME)	CY	3
496 6018	REMOV STR (CONC)	EA	2

NO.	REVISION	BY	DATE

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US 62/180
DRAINAGE AREA MAP

STA. 70+00 TO 82+00

SHEET 7 OF 18

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:	6	TEXAS	F 2021(690)		US 62/180	
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
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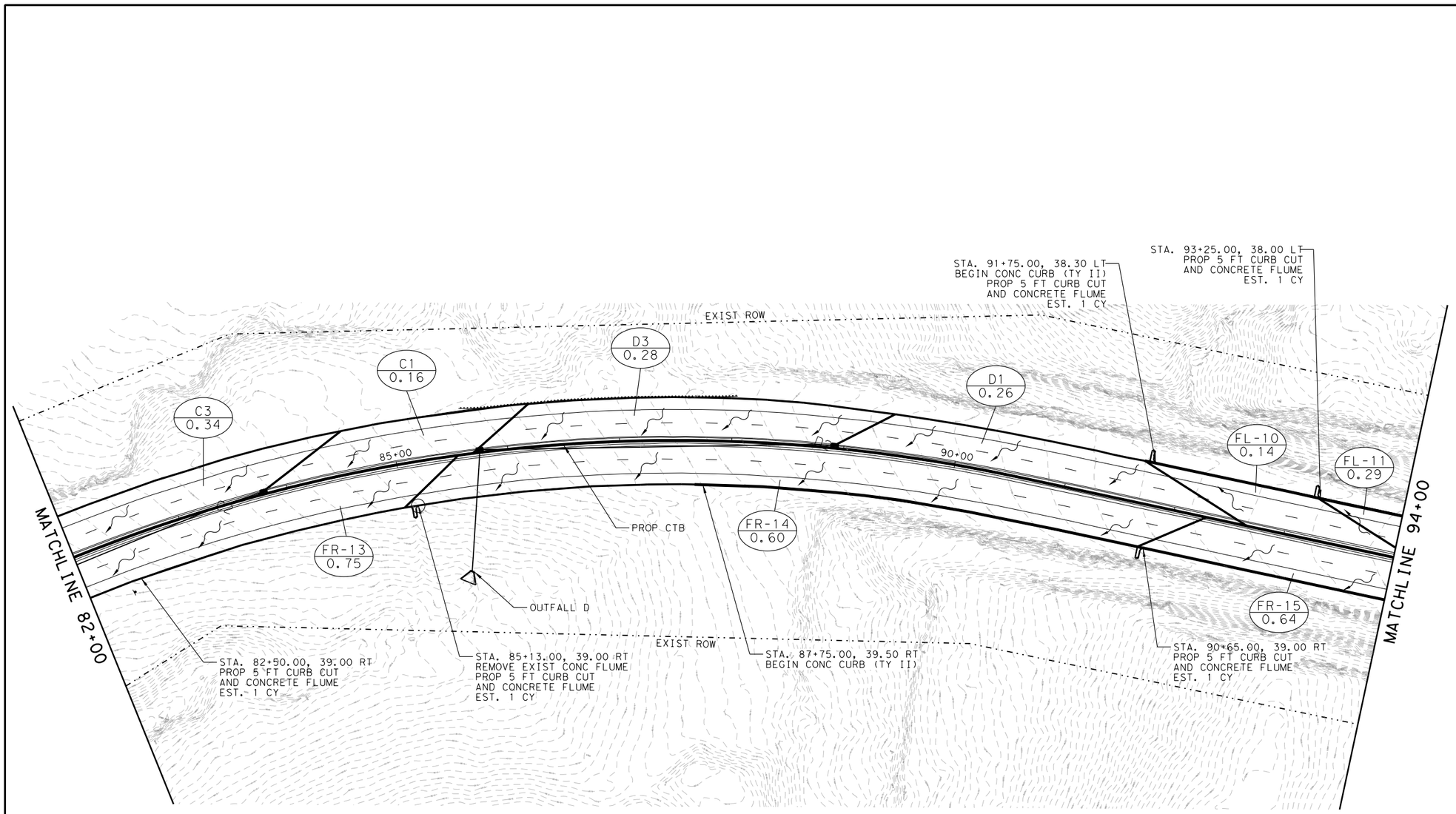

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SCALE: 1" = 100'

LEGEND

A4 / 12.96 — AREA I.D. / AREA IN ACRES

DIRECTION OF FLOW

DRAINAGE AREA BOUNDARY

NOTES:

1. DRAINAGE AREAS SHOWN ON THIS MAP APPLY TO INTERNAL STORM SEWER DESIGN ONLY.
2. CONTOURS ARE SHOWN AT 2' INTERVALS.

SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
104 6021	REMOVING CONC (CURB)	LF	5
420 6011	CL B CONC (FLUME)	CY	5
496 6018	REMOV STR (CONC)	EA	1
529 6002	CONC CURB (TY II)	LF	825

NO.	REVISION	BY	DATE

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US 62/180
DRAINAGE AREA MAP

STA. 82+00 TO 94+00

SHEET 8 OF 18

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)			US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035, ETC.	90

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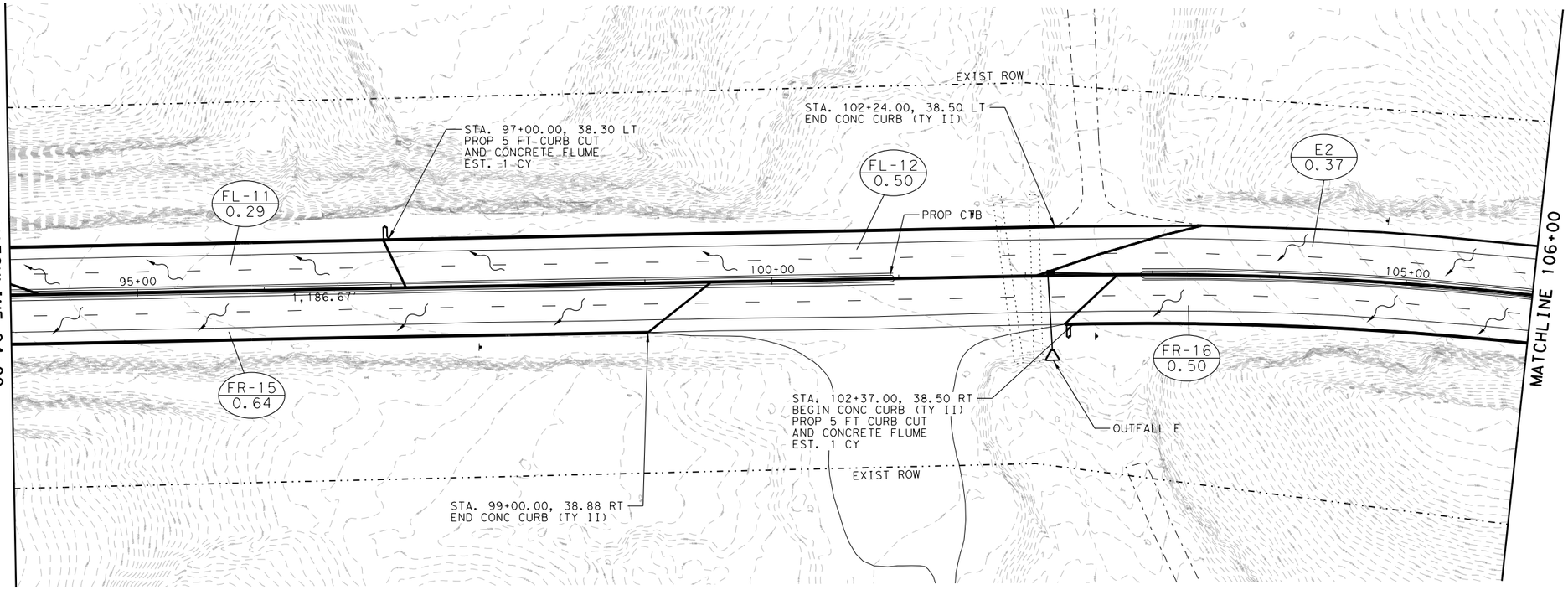

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SCALE: 1" = 100'

LEGEND

A4 / 12.96 — AREA I.D. / AREA IN ACRES

DIRECTION OF FLOW

DRAINAGE AREA BOUNDARY

NOTES:

1. DRAINAGE AREAS SHOWN ON THIS MAP APPLY TO INTERNAL STORM SEWER DESIGN ONLY.
2. CONTOURS ARE SHOWN AT 2' INTERVALS.

SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
420 6011	CL B CONC (FLUME)	CY	2
529 6002	CONC CURB (TY II)	LF	1662

NO.	REVISION	BY	DATE

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US 62/180
DRAINAGE AREA MAP

STA. 94+00 TO 106+00

SHEET 9 OF 18

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)			US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	91

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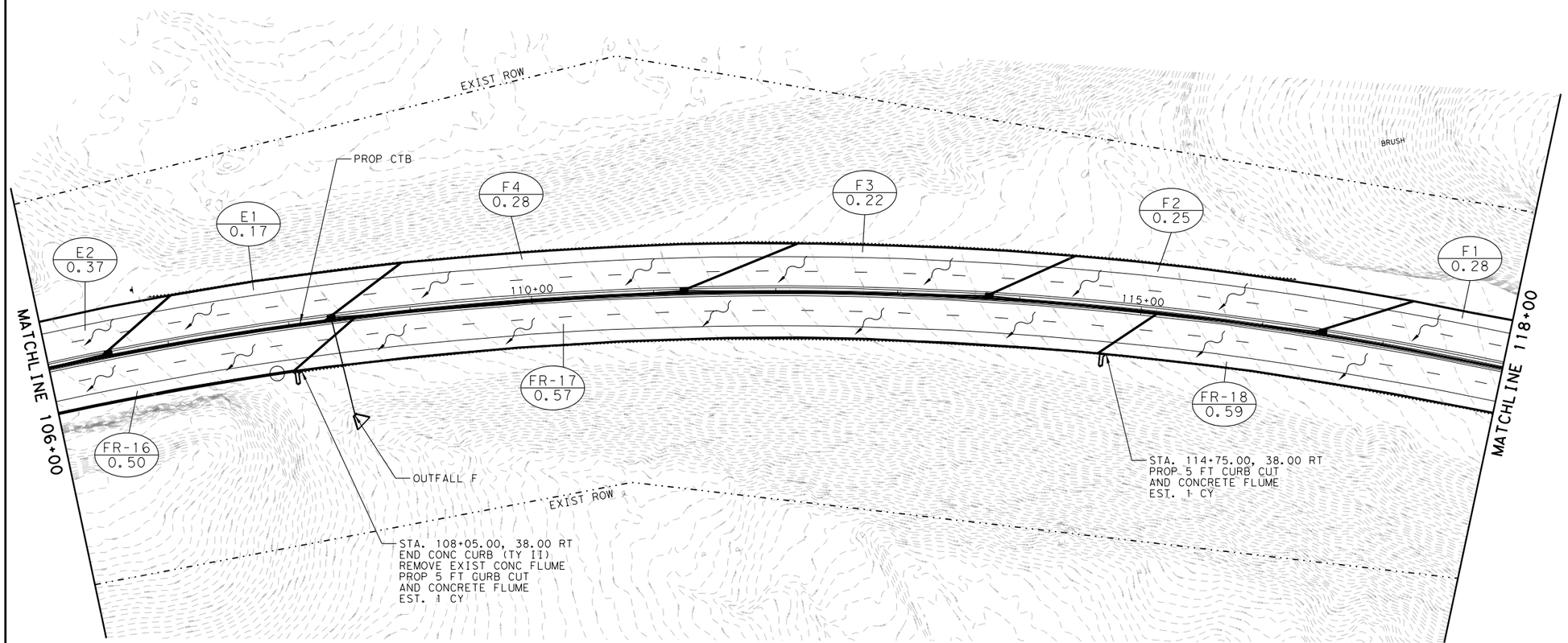

0 50 100

SCALE: 1" = 100'

N

LEGEND

A4 / 12.96 — AREA I.D. / AREA IN ACRES

DIRECTION OF FLOW

DRAINAGE AREA BOUNDARY

NOTES:

1. DRAINAGE AREAS SHOWN ON THIS MAP APPLY TO INTERNAL STORM SEWER DESIGN ONLY.
2. CONTOURS ARE SHOWN AT 2' INTERVALS.

SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
104 6021	REMOVING CONC (CURB)	LF	15
420 6011	CL B CONC (FLUME)	CY	2
496 6018	REMOV STR (CONC)	EA	1
529 6002	CONC CURB (TY II)	LF	200

NO.	REVISION	BY	DATE

STATE OF TEXAS
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US 62/180
DRAINAGE AREA MAP

STA. 106+00 TO 118+00

SHEET 10 OF 18

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)	US 62/180

DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	92

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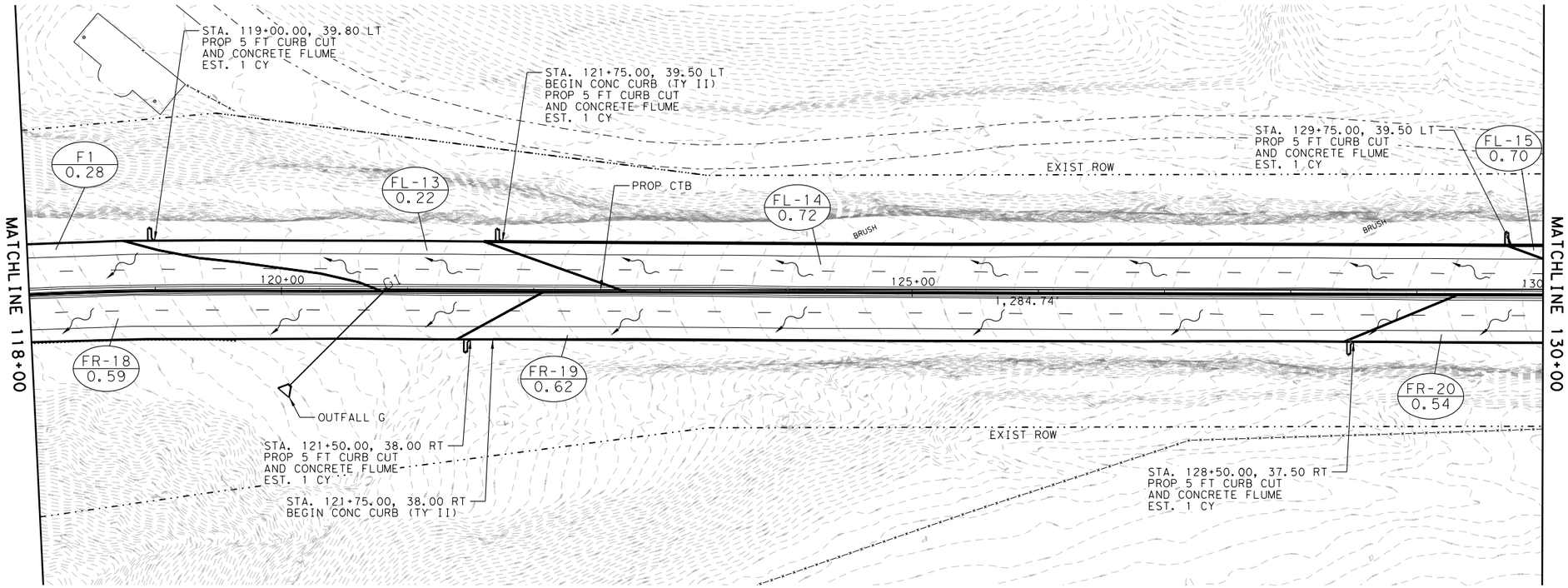

0 50 100

SCALE: 1" = 100'

LEGEND

A4 / 12.96 — AREA I.D. / AREA IN ACRES

DIRECTION OF FLOW

DRAINAGE AREA BOUNDARY

NOTES:

1. DRAINAGE AREAS SHOWN ON THIS MAP APPLY TO INTERNAL STORM SEWER DESIGN ONLY.
2. CONTOURS ARE SHOWN AT 2' INTERVALS.

SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
104 6021	REMOVING CONC (CURB)	LF	10
420 6011	CL B CONC (FLUME)	CY	5
529 6002	CONC CURB (TY II)	LF	1620

NO.	REVISION	BY	DATE

STATE OF TEXAS
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US 62/180
DRAINAGE AREA MAP

STA. 118+00 TO 130+00

SHEET 11 OF 18

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)			US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035, ETC.	93

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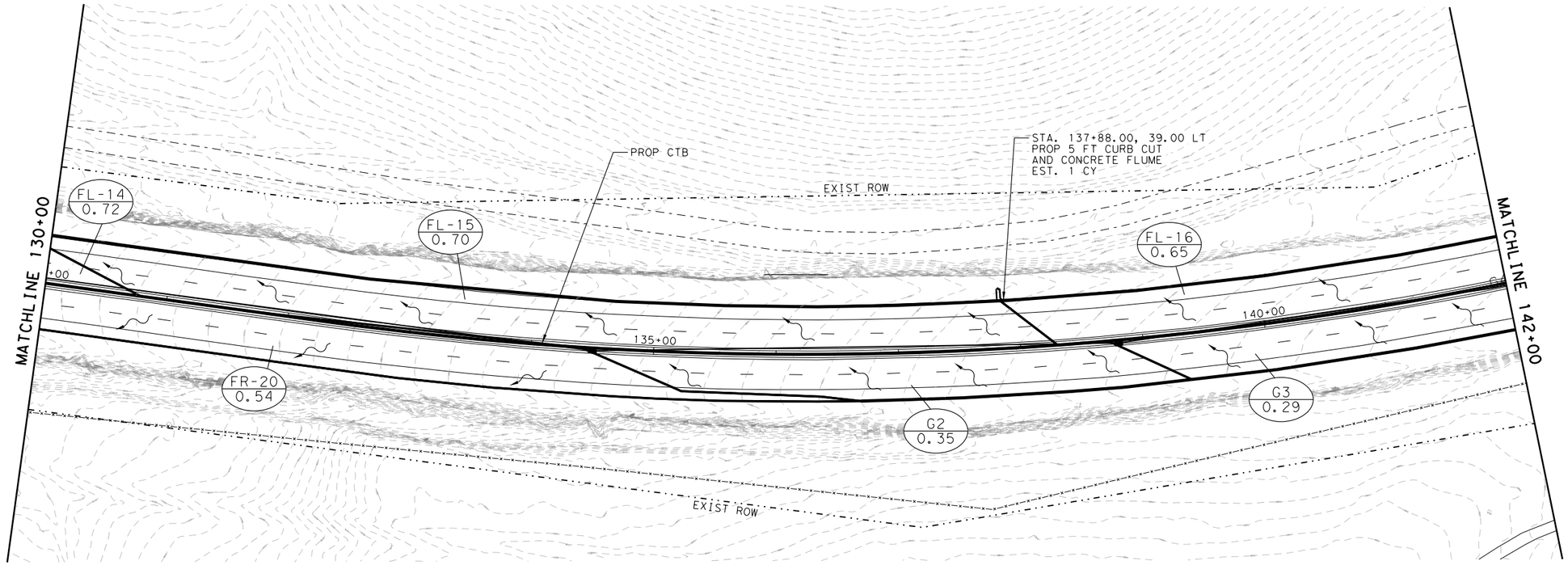

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SCALE: 1" = 100'

LEGEND

A4 / 12.96 — AREA I.D. / AREA IN ACRES

DIRECTION OF FLOW

DRAINAGE AREA BOUNDARY

NOTES:

1. DRAINAGE AREAS SHOWN ON THIS MAP APPLY TO INTERNAL STORM SEWER DESIGN ONLY.
2. CONTOURS ARE SHOWN AT 2' INTERVALS.

SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
420 6011	CL B CONC (FLUME)	CY	1
529 6002	CONC CURB (TY II)	LF	2375

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED
PROFESSIONAL ENGINEER
6/1/2021

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
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US 62/180
DRAINAGE AREA MAP

STA. 130+00 TO 142+00

SHEET 12 OF 18

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:	6	TEXAS	F 2021(690)		US 62/180	
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035, ETC.	94

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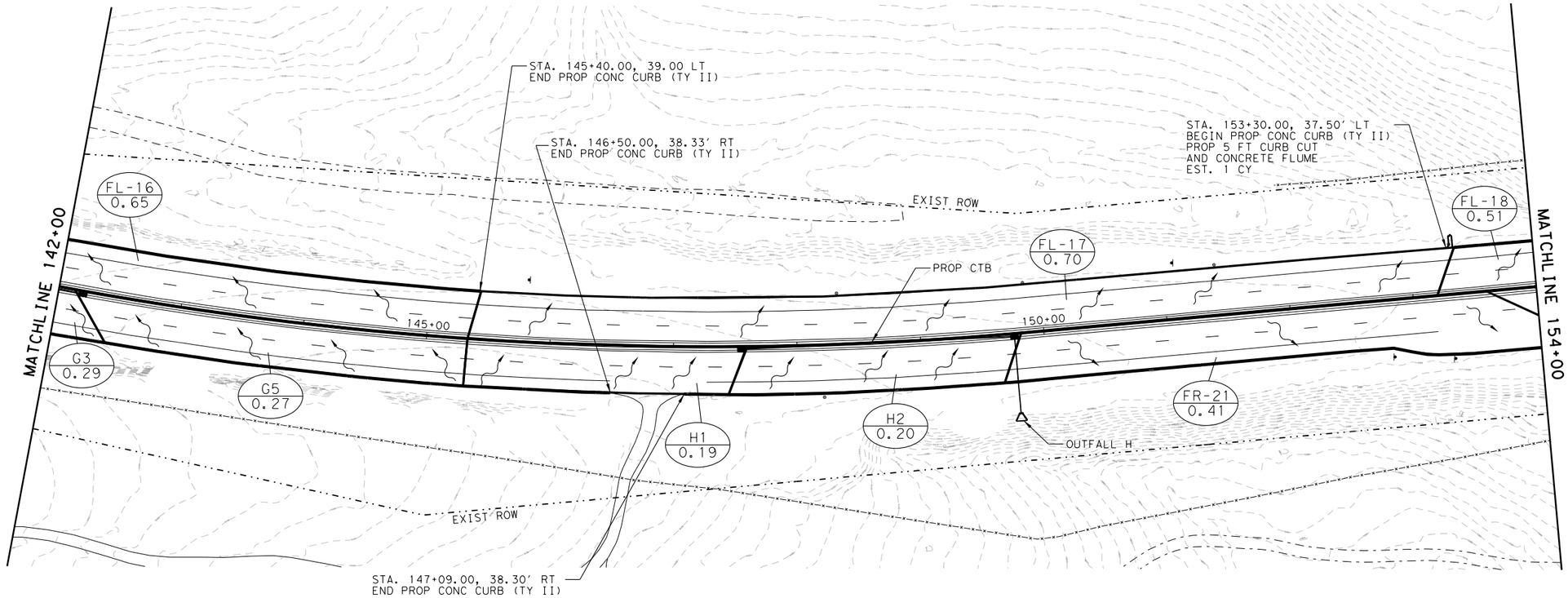

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SCALE: 1" = 100'

LEGEND

A4 / 12.96 — AREA I.D. / AREA IN ACRES

DIRECTION OF FLOW

DRAINAGE AREA BOUNDARY

NOTES:

1. DRAINAGE AREAS SHOWN ON THIS MAP APPLY TO INTERNAL STORM SEWER DESIGN ONLY.
2. CONTOURS ARE SHOWN AT 2' INTERVALS.

SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
420 6011	CL B CONC (FLUME)	CY	1
529 6002	CONC CURB (TY II)	LF	1546

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US 62/180
DRAINAGE AREA MAP

STA. 142+00 TO 154+00

SHEET 13 OF 18

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)			US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	95

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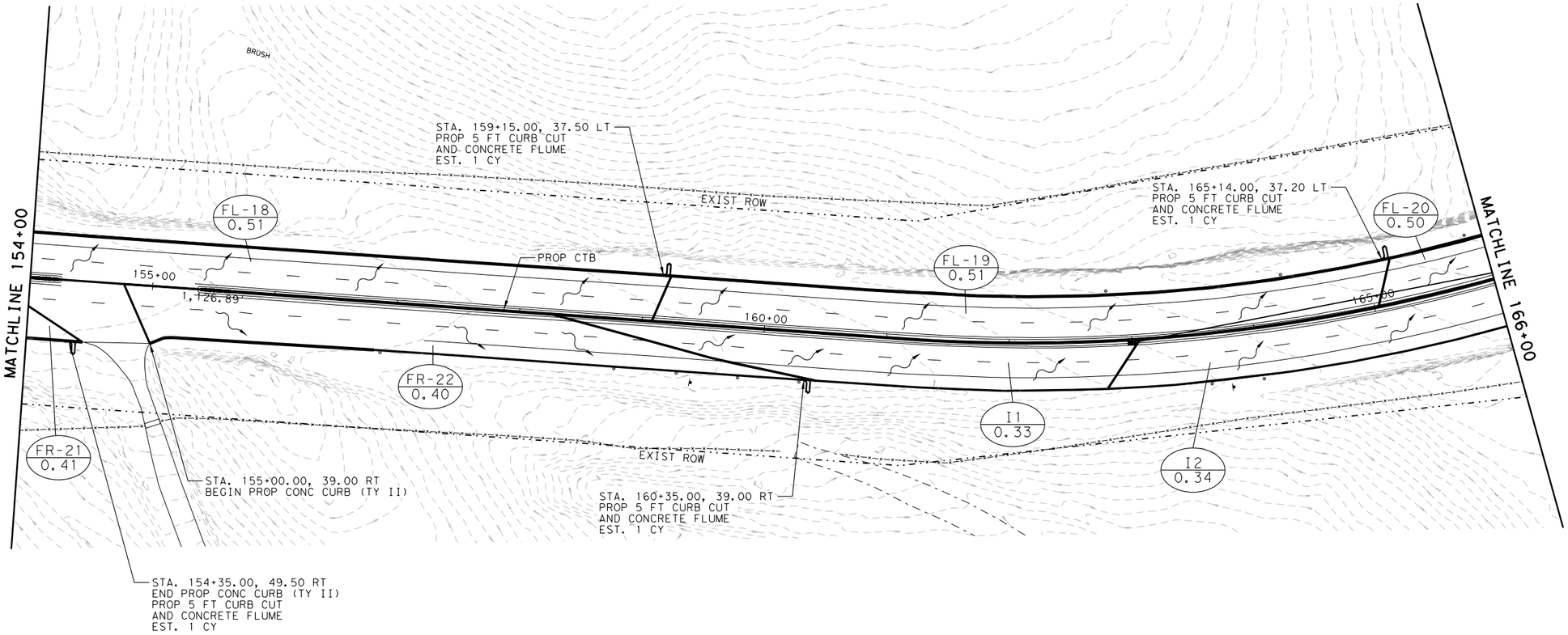

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SCALE: 1" = 100'

LEGEND

A4 / 12.96 — AREA I.D. / AREA IN ACRES

DIRECTION OF FLOW

DRAINAGE AREA BOUNDARY

NOTES:

1. DRAINAGE AREAS SHOWN ON THIS MAP APPLY TO INTERNAL STORM SEWER DESIGN ONLY.
2. CONTOURS ARE SHOWN AT 2' INTERVALS.

SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
104 6021	REMOVING CONC (CURB)	LF	5
420 6011	CL B CONC (FLUME)	CY	4
529 6002	CONC CURB (TY II)	LF	1390

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US 62/180
DRAINAGE AREA MAP

STA. 154+00 TO 166+00

SHEET 14 OF 18

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)			US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035, ETC.	96

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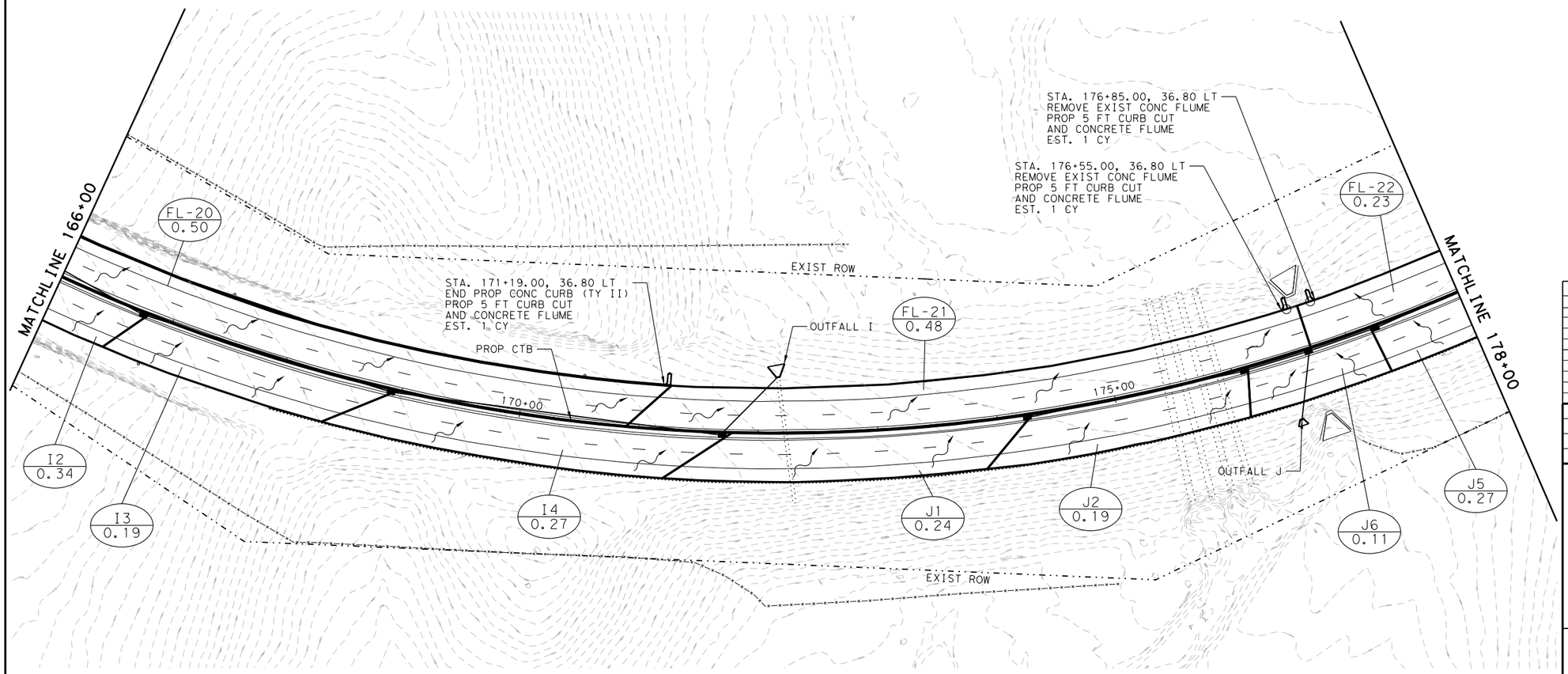

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SCALE: 1" = 100'

LEGEND

A4 / 12.96 — AREA I.D. / AREA IN ACRES

DIRECTION OF FLOW

DRAINAGE AREA BOUNDARY

NOTES:

1. DRAINAGE AREAS SHOWN ON THIS MAP APPLY TO INTERNAL STORM SEWER DESIGN ONLY.
2. CONTOURS ARE SHOWN AT 2' INTERVALS.

SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
104 6021	REMOVING CONC (CURB)	LF	5
420 6011	CL B CONC (FLUME)	CY	3
496 6018	REMOV STR (CONC)	EA	2
529 6002	CONC CURB (TY II)	LF	514

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US 62/180
DRAINAGE AREA MAP

STA. 166+00 TO 178+00

SHEET 15 OF 18

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:	6	TEXAS	F 2021(690)		US 62/180	
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	97

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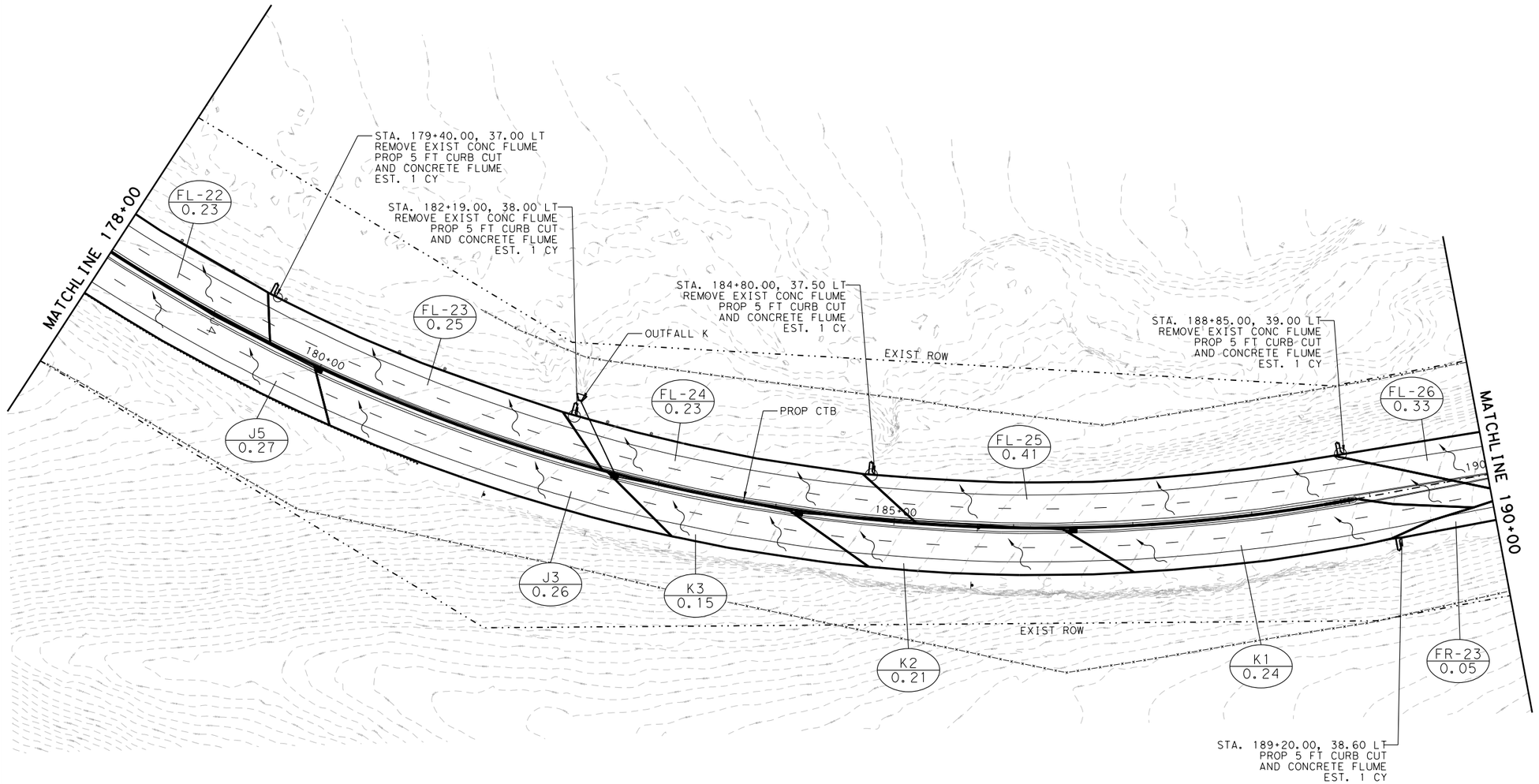

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SCALE: 1" = 100'

LEGEND

A4 / 12.96 — AREA I.D. / AREA IN ACRES

DIRECTION OF FLOW

DRAINAGE AREA BOUNDARY

NOTES:

1. DRAINAGE AREAS SHOWN ON THIS MAP APPLY TO INTERNAL STORM SEWER DESIGN ONLY.
2. CONTOURS ARE SHOWN AT 2' INTERVALS.

SHEET TOTALS			
ITEM	ITEM DESCRIPTION	UNIT	QTY
420 6011	CL B CONC (FLUME)	CY	5
496 6018	REMOV STR (CONC)	CY	4

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US 62/180
DRAINAGE AREA MAP

STA. 178+00 TO 190+00

SHEET 16 OF 18

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)			US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	98

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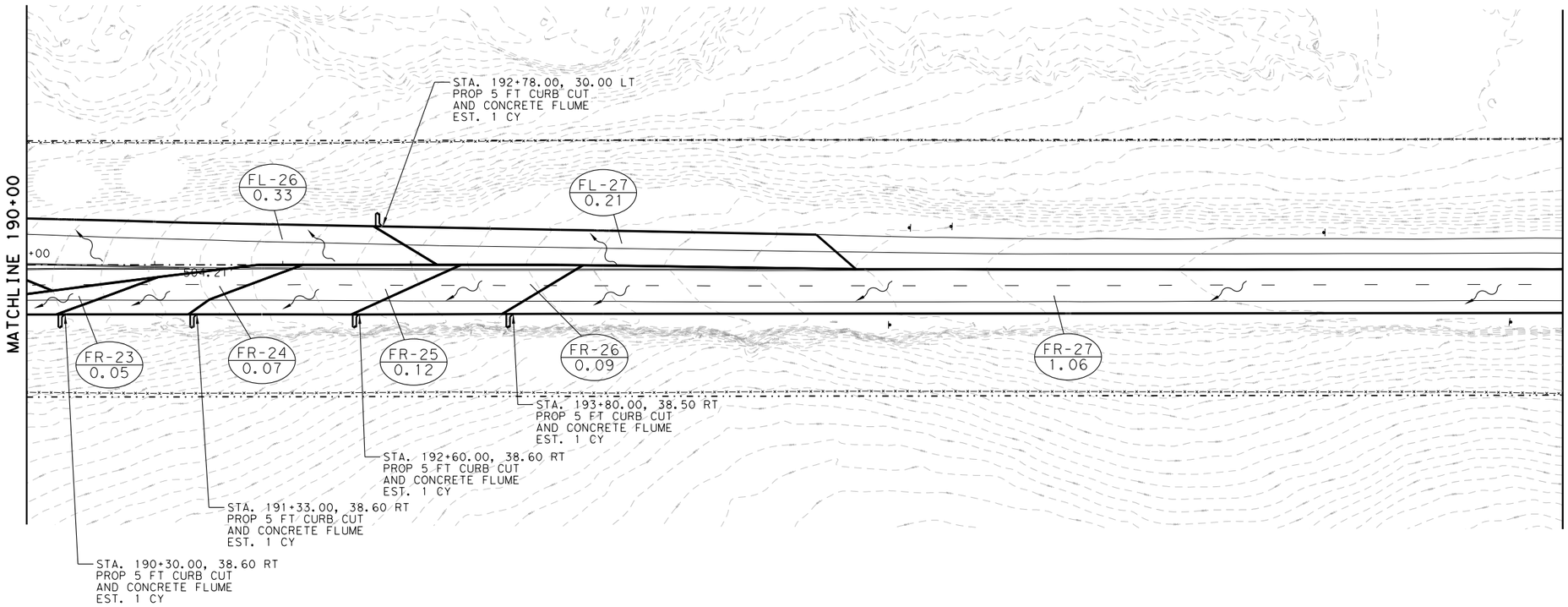
SCALE: 1" = 100'

LEGEND

A4 / 12.96 — AREA I.D. / AREA IN ACRES

DIRECTION OF FLOW

DRAINAGE AREA BOUNDARY



NOTES:

1. DRAINAGE AREAS SHOWN ON THIS MAP APPLY TO INTERNAL STORM SEWER DESIGN ONLY.
2. CONTOURS ARE SHOWN AT 2' INTERVALS.

SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
104 6021	REMOVING CONC (CURB)	LF	30
420 6011	CL B CONC (FLUME)	CY	5

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US 62/180
DRAINAGE AREA MAP

STA. 190+00 TO END PROJECT

SHEET 17 OF 18

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:	6	TEXAS	F 2021(690)		US 62/180	
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035, ETC.	99

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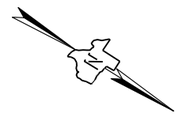
SCALE: 1" = 100'

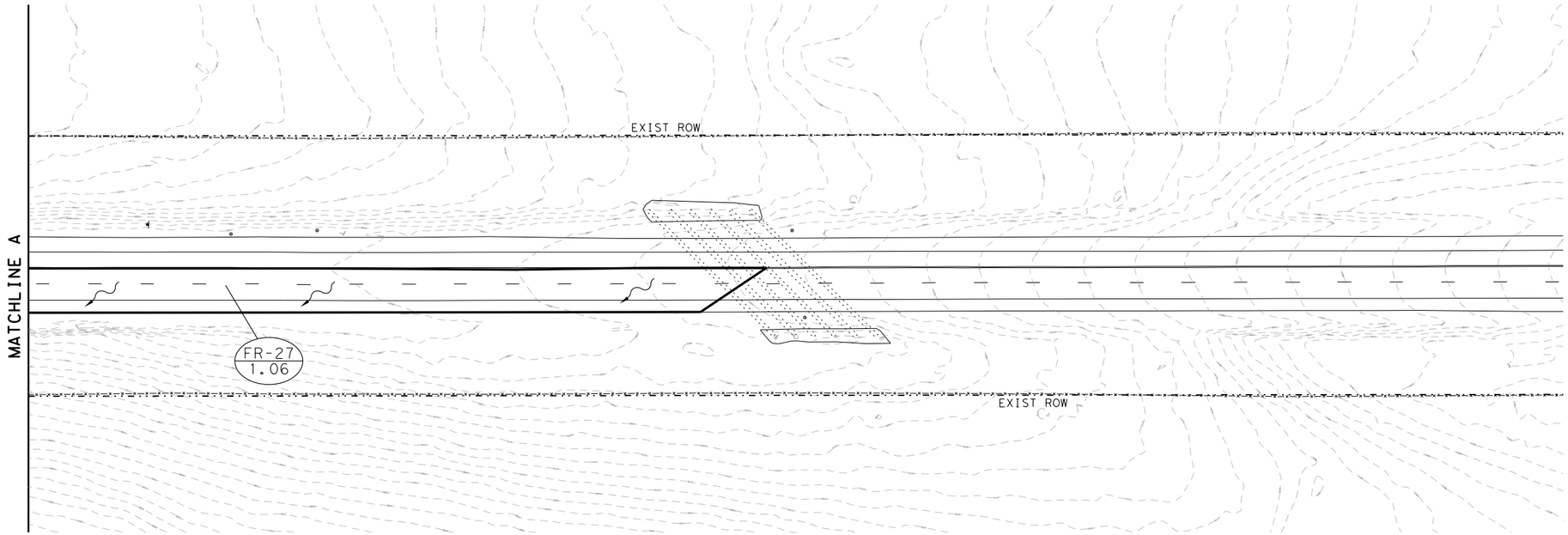


LEGEND

A4 / 12.96 — AREA I.D. / AREA IN ACRES

DIRECTION OF FLOW

DRAINAGE AREA BOUNDARY



NOTES:

1. DRAINAGE AREAS SHOWN ON THIS MAP APPLY TO INTERNAL STORM SEWER DESIGN ONLY.
2. CONTOURS ARE SHOWN AT 2' INTERVALS.

NO.	REVISION	BY	DATE

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US 62/180
DRAINAGE AREA MAP

END PROJECT EXTENSION

SHEET 18 OF 18

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)			US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035, ETC.	100

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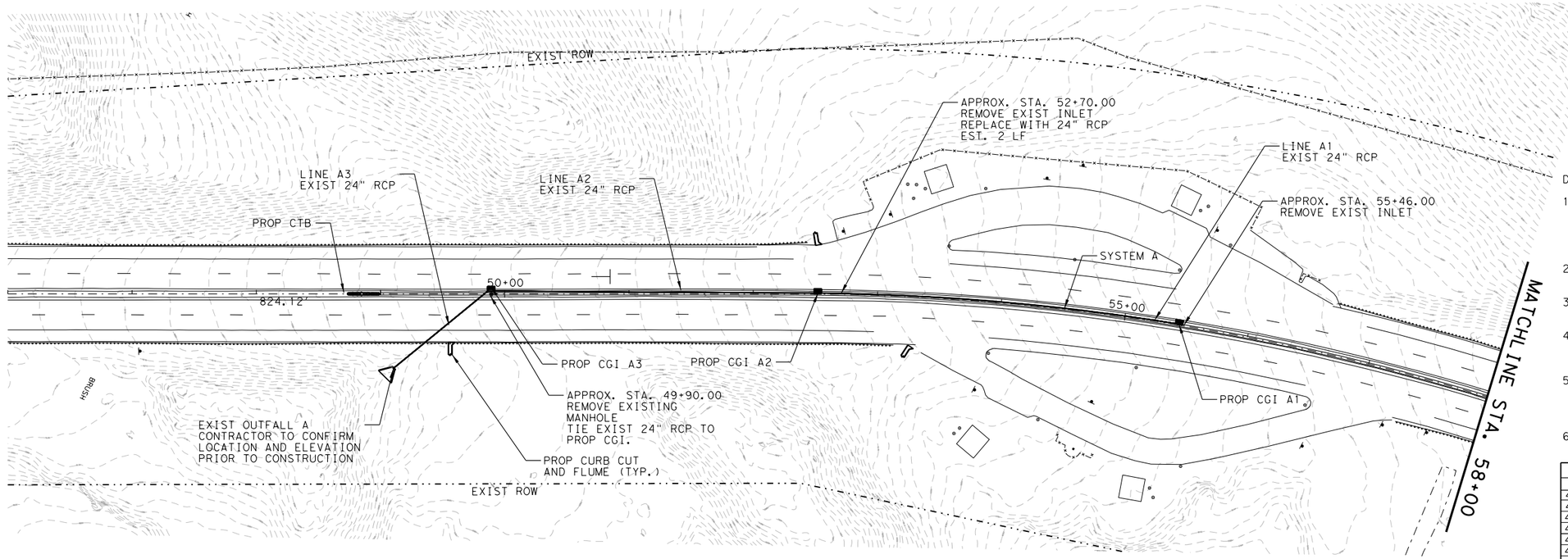


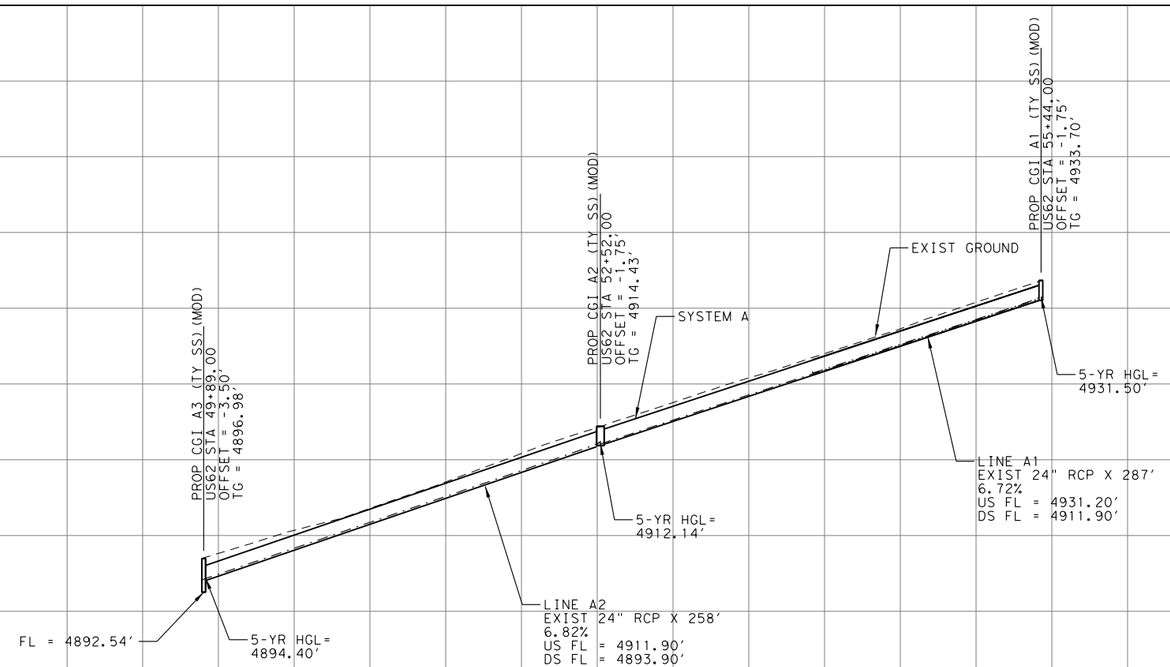
SCALE: 1" = 100' (H)
SCALE: 1" = 20' (V)

DRAINAGE NOTES:

1. THE CONTRACTOR SHALL REFER TO TXDOT SPECIFICATIONS, ITEM 5.6, "COOPERATING WITH UTILITIES" REGARDING REQUIREMENTS FOR COOPERATING WITH UTILITIES BEFORE, DURING AND AFTER CONSTRUCTION.
2. LIMITS OF ALL FLOWABLE FILL QUANTITIES PER DRAINAGE DETAILS SHEET.
3. ALL RCP SHALL BE CLASS III UNLESS SPECIFIED OTHERWISE.
4. A NEGATIVE (-) OFFSET INDICATES LEFT OF THE ALIGNMENT. A POSITIVE OFFSET INDICATES RIGHT OF THE ALIGNMENT.
5. CONTRACTOR TO CONFIRM CONDITION OF EXISTING RCP PIPE. ANY EXISTING RCP THAT EXHIBITS STRUCTURAL FAILURE SHALL BE REPLACED.
6. SEE DRAINAGE AREA MAPS FOR PROPOSED CURB CUT AND FLUME PLACEMENT.

SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
400 6001	STRUCT EXCAV	CY	8
401 6001	FLOWABLE BACKFILL	CY	4
420 6009	CL A CONC (COLLAR)	EA	5
464 6005	RC PIPE (CL III)(24 IN)	LF	20
465	INLET(COMPL)(CGI)(TY SS)(MOD)	EA	3
496 6002	REMOV STR (INLET)	EA	2
496 6003	REMOV STR (MANHOLE)	EA	1



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STATE OF TEXAS
ANDRES M. CARDENAS
88453
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PROFESSIONAL ENGINEER
7/2/2021

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
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DRAINAGE PLAN AND PROFILE
SYSTEM A

SHEET 1 OF 12

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)			US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	101

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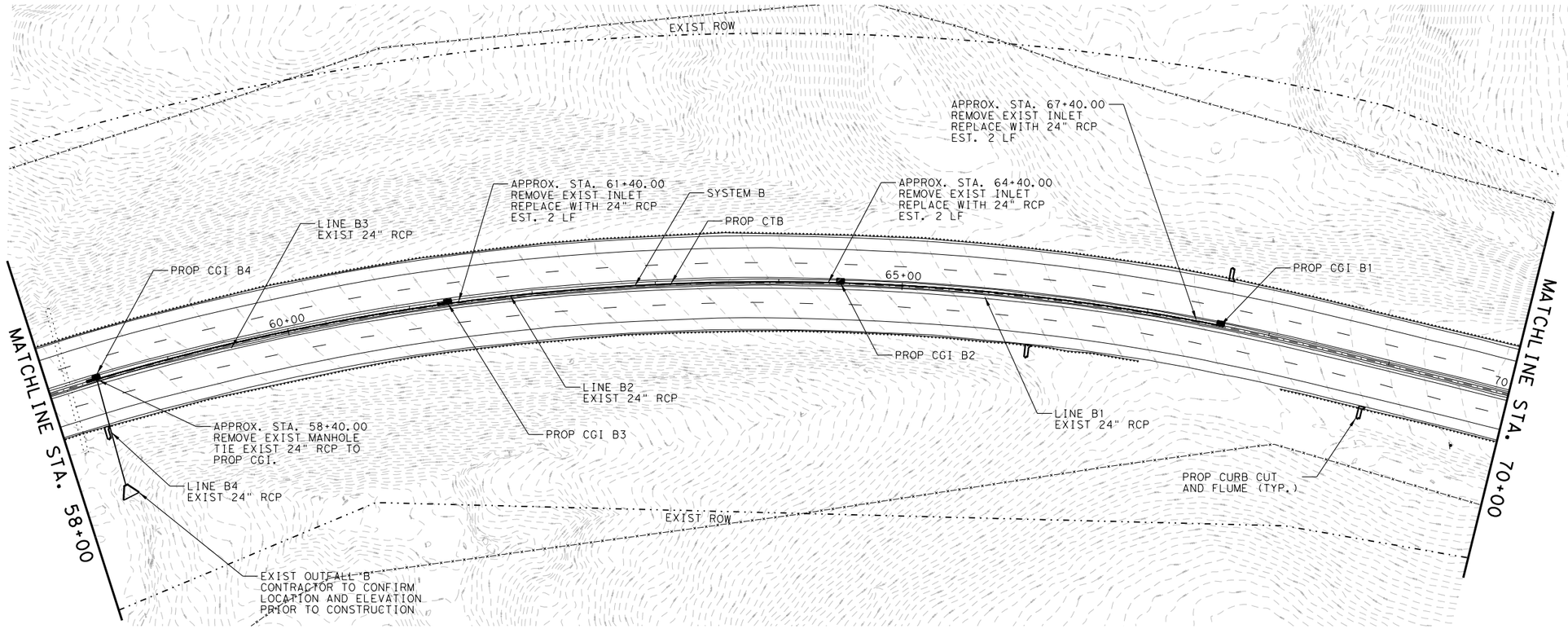

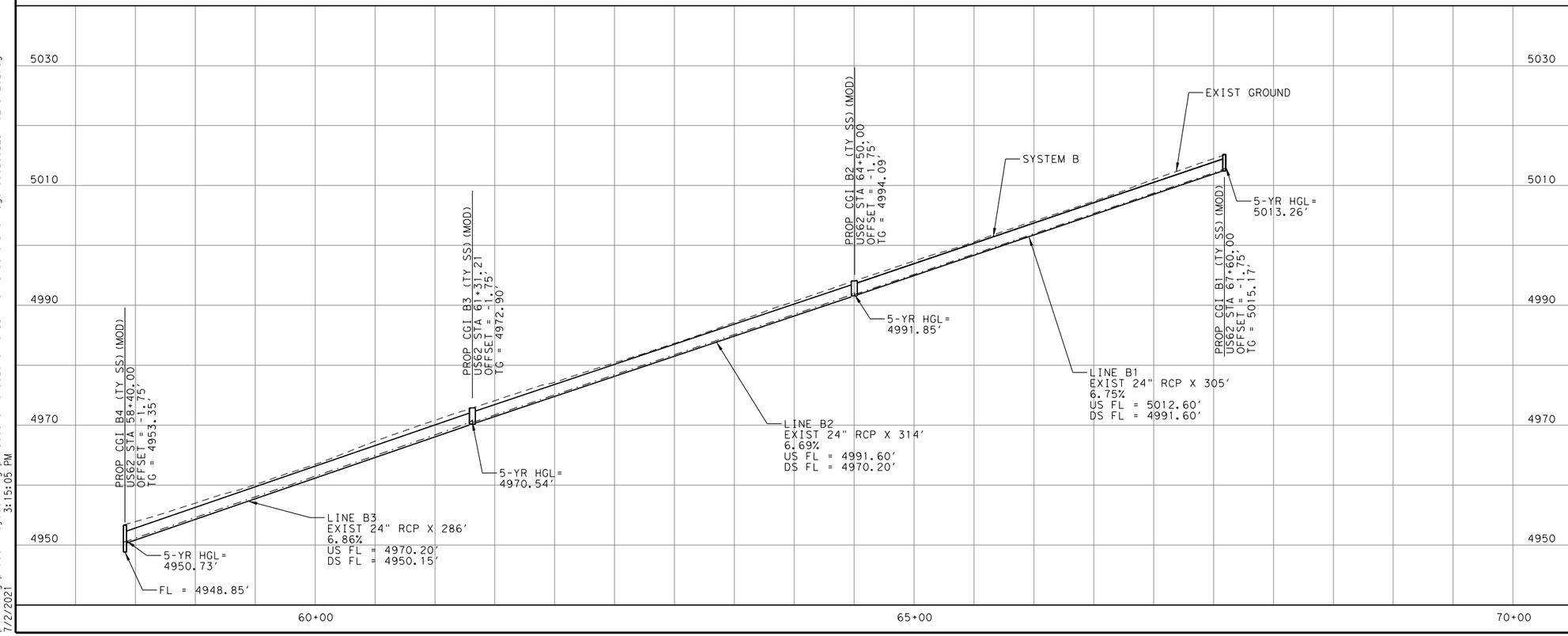

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SCALE: 1" = 100' (H)
SCALE: 1" = 20' (V)

DRAINAGE NOTES:

1. THE CONTRACTOR SHALL REFER TO TXDOT SPECIFICATIONS, ITEM 5.6, "COOPERATING WITH UTILITIES" REGARDING REQUIREMENTS FOR COOPERATING WITH UTILITIES BEFORE, DURING AND AFTER CONSTRUCTION.
2. LIMITS OF ALL FLOWABLE FILL QUANTITIES PER DRAINAGE DETAILS SHEET.
3. ALL RCP SHALL BE CLASS III UNLESS SPECIFIED OTHERWISE.
4. A NEGATIVE (-) OFFSET INDICATES LEFT OF THE ALIGNMENT. A POSITIVE OFFSET INDICATES RIGHT OF THE ALIGNMENT.
5. CONTRACTOR TO CONFIRM CONDITION OF EXISTING RCP PIPE. ANY EXISTING RCP THAT EXHIBITS STRUCTURAL FAILURE SHALL BE REPLACED.
6. SEE DRAINAGE AREA MAPS FOR PROPOSED CURB CUT AND FLUME PLACEMENT.

SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
400 6001	STRUCT EXCAV	CY	14
401 6001	FLOWABLE BACKFILL	CY	6
420 6009	CL A CONC (COLLAR)	EA	7
464 6005	RC PIPE (CL III)(24 IN)	LF	32
465	INLET(COMPL)(CGI)(TY SS)(MOD)	EA	4
496 6002	REMOV STR (INLET)	EA	3
496 6003	REMOV STR (MANHOLE)	EA	1

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
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7/2/2021

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DRAINAGE PLAN AND PROFILE
SYSTEM B

SHEET 2 OF 12

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)	US 62/180

DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	102

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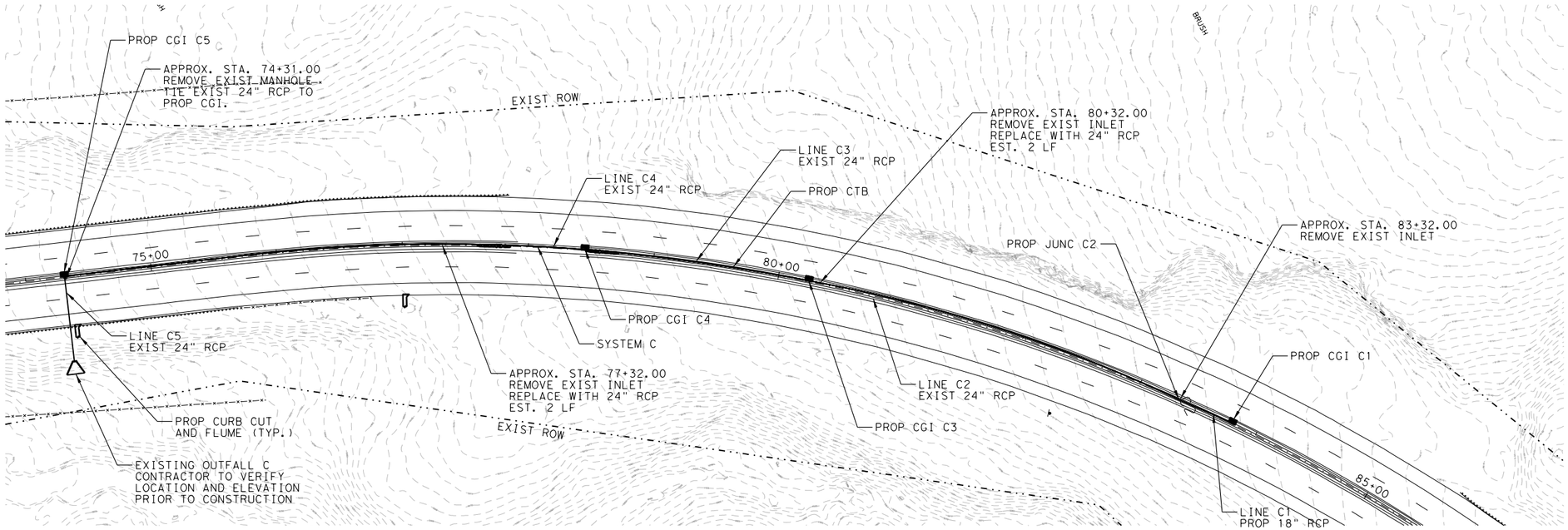

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SCALE: 1" = 100' (H)
SCALE: 1" = 20' (V)

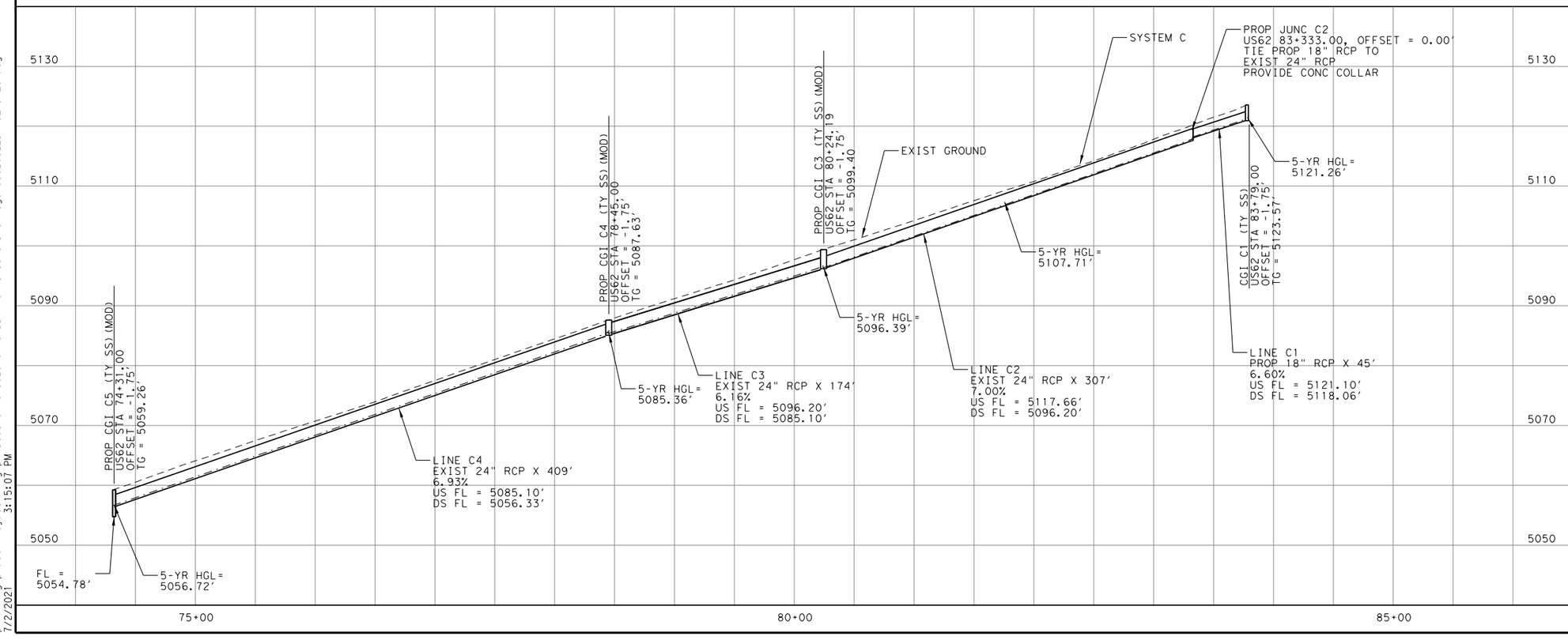
DRAINAGE NOTES:

1. THE CONTRACTOR SHALL REFER TO TXDOT SPECIFICATIONS, ITEM 5.6, "COOPERATING WITH UTILITIES" REGARDING REQUIREMENTS FOR COOPERATING WITH UTILITIES BEFORE, DURING AND AFTER CONSTRUCTION.
2. LIMITS OF ALL FLOWABLE FILL QUANTITIES PER DRAINAGE DETAILS SHEET.
3. ALL RCP SHALL BE CLASS III UNLESS SPECIFIED OTHERWISE.
4. A NEGATIVE (-) OFFSET INDICATES LEFT OF THE ALIGNMENT. A POSITIVE OFFSET INDICATES RIGHT OF THE ALIGNMENT.
5. CONTRACTOR TO CONFIRM CONDITION OF EXISTING RCP PIPE. ANY EXISTING RCP THAT EXHIBITS STRUCTURAL FAILURE SHALL BE REPLACED.
6. SEE DRAINAGE AREA MAPS FOR PROPOSED CURB CUT AND FLUME PLACEMENT.

SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
400 6001	STRUCT EXCAV	CY	24
401 6001	FLOWABLE BACKFILL	CY	11
420 6009	CL A CONC (COLLAR)	EA	7
464 6003	RC PIPE (CL III)(18 IN)	LF	45
464 6005	RC PIPE (CL III)(24 IN)	LF	24
465	INLET (COMPL)(CGI)(TY SS)	EA	1
465	INLET(COMPL)(CGI)(TY SS)(MOD)	EA	3
496 6002	REMOV STR (INLET)	EA	3
496 6003	REMOV STR (MANHOLE)	EA	1

NO.	REVISION	BY	DATE



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DRAINAGE PLAN AND PROFILE
SYSTEM C

SHEET 3 OF 12

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)			US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035, ETC.	103

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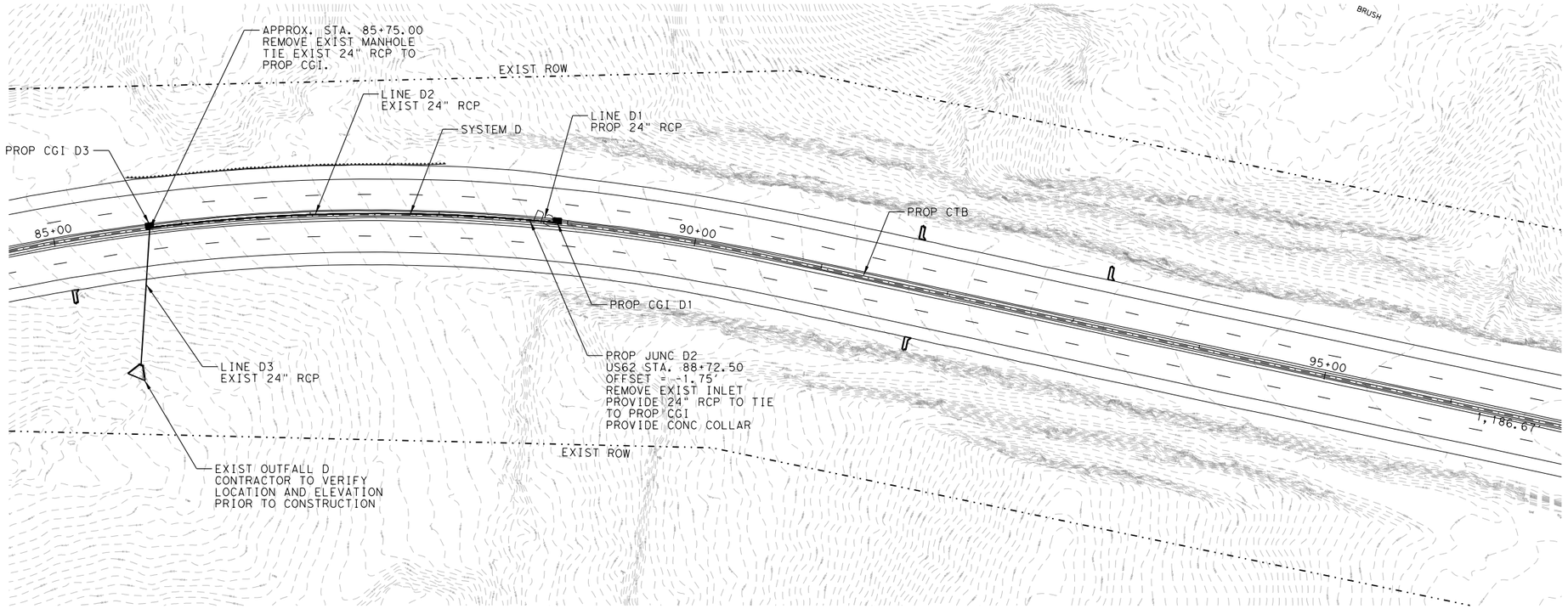

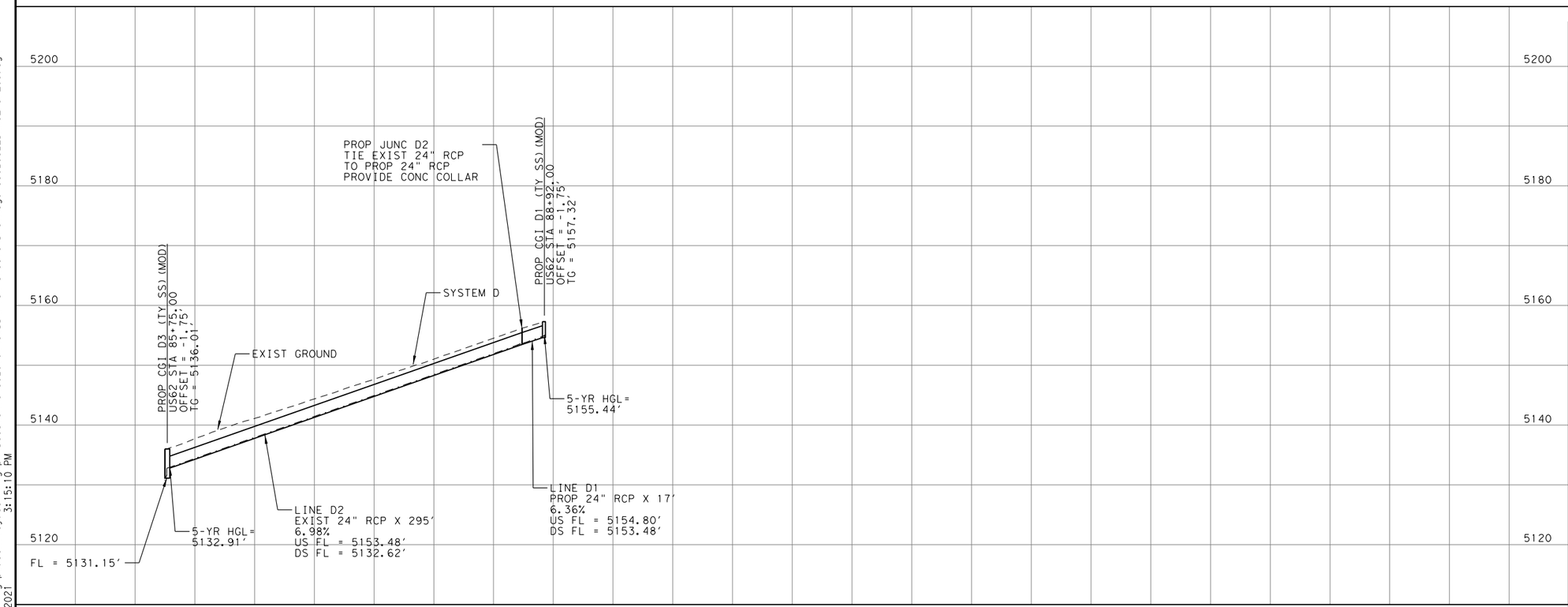

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SCALE: 1" = 100' (H)
SCALE: 1" = 20' (V)

DRAINAGE NOTES:

1. THE CONTRACTOR SHALL REFER TO TXDOT SPECIFICATIONS, ITEM 5.6, "COOPERATING WITH UTILITIES" REGARDING REQUIREMENTS FOR COOPERATING WITH UTILITIES BEFORE, DURING AND AFTER CONSTRUCTION.
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3. ALL RCP SHALL BE CLASS III UNLESS SPECIFIED OTHERWISE.
4. A NEGATIVE (-) OFFSET INDICATES LEFT OF THE ALIGNMENT. A POSITIVE OFFSET INDICATES RIGHT OF THE ALIGNMENT.
5. CONTRACTOR TO CONFIRM CONDITION OF EXISTING RCP PIPE. ANY EXISTING RCP THAT EXHIBITS STRUCTURAL FAILURE SHALL BE REPLACED.
6. SEE DRAINAGE AREA MAPS FOR PROPOSED CURB CUT AND FLUME PLACEMENT.

SHEET TOTALS			
ITEM	ITEM DESCRIPTION	UNIT	QTY
400 6001	STRUCT EXCAV	CY	9
401 6001	FLOWABLE BACKFILL	CY	4
420 6009	CL A CONC (COLLAR)	EA	3
464 6005	RC PIPE (CL III)(24 IN)	LF	21
465	INLET(COMPL)(CGI)(TY SS)(MOD)	EA	2
496 6002	REMOV STR (INLET)	EA	1
496 6003	REMOV STR (MANHOLE)	EA	1

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED
PROFESSIONAL ENGINEER
7/2/2021

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

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DRAINAGE PLAN AND PROFILE
SYSTEM D

SHEET 4 OF 12

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)			US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	104

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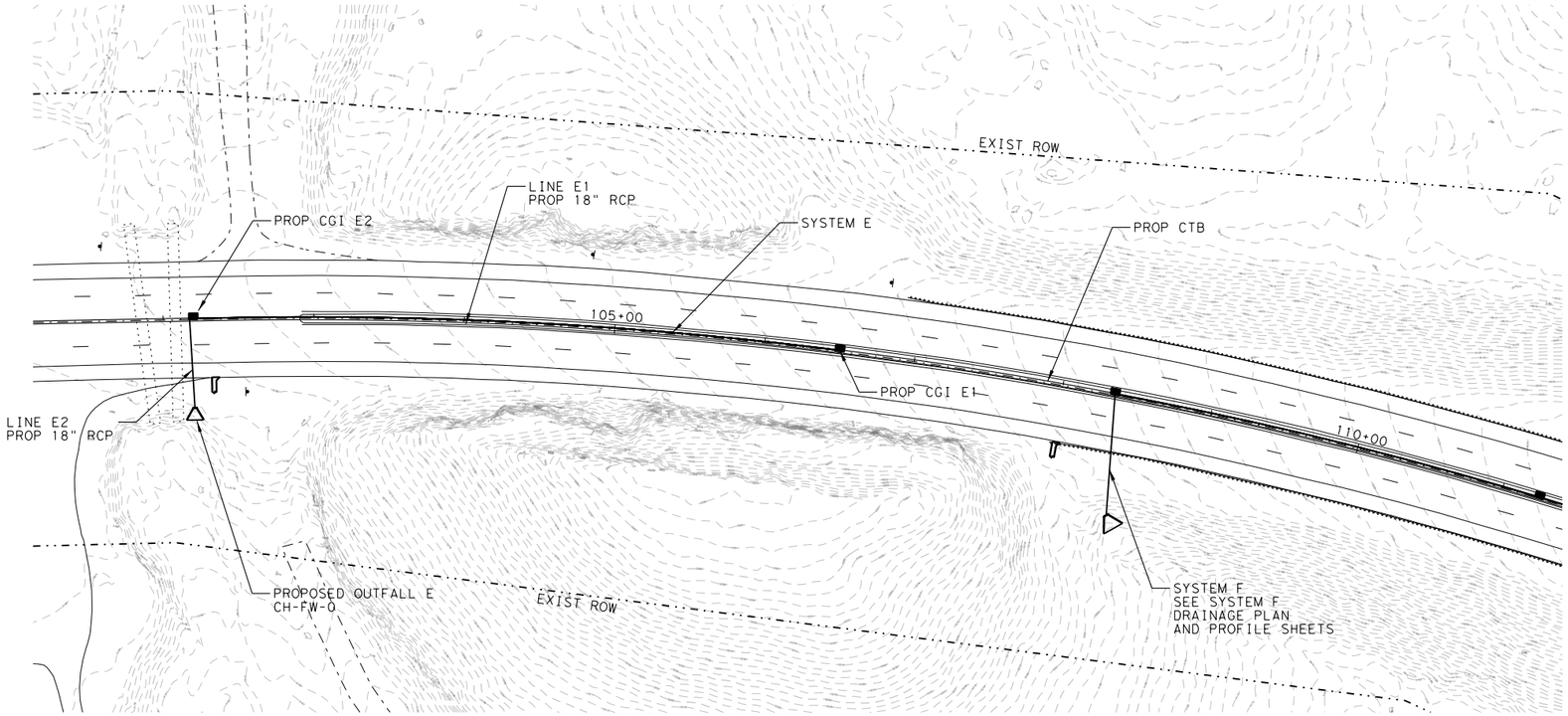

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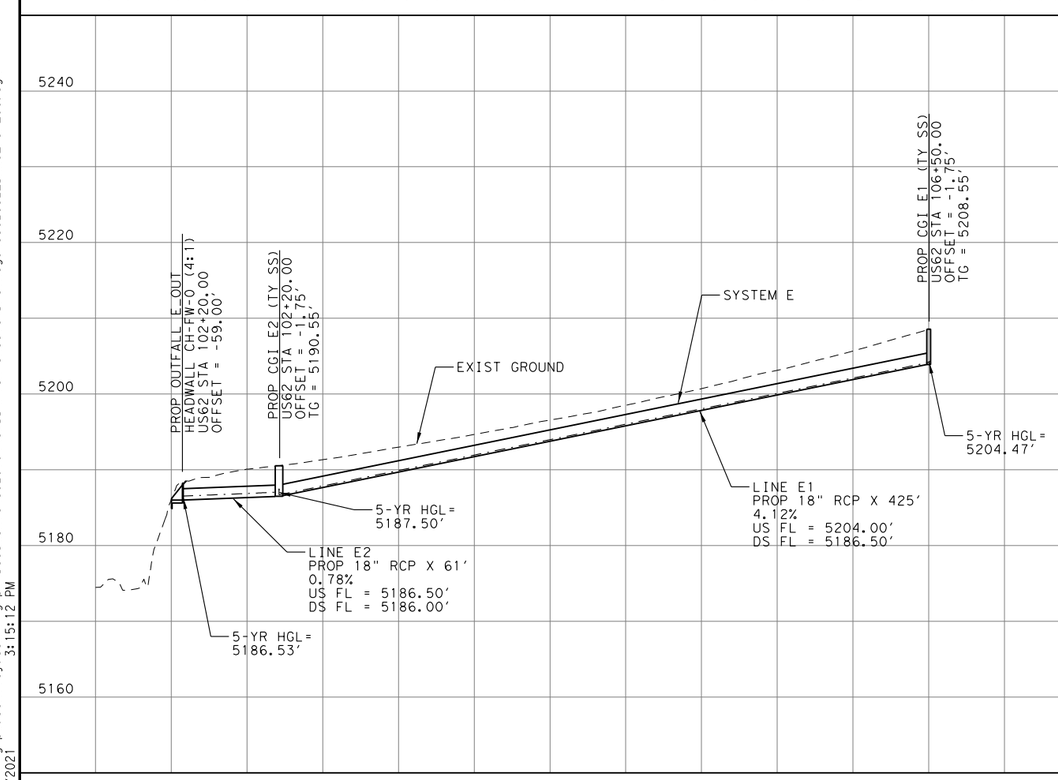
6. SEE DRAINAGE AREA MAPS FOR PROPOSED CURB CUT AND FLUME PLACEMENT.

SHEET TOTALS			
ITEM	ITEM DESCRIPTION	UNIT	QTY
400 6001	STRUCT EXCAV	CY	144
400 6008	CUT & RESTORE ASPH PAVING	SY	13
401 6001	FLOWABLE BACKFILL	CY	66
464 6003	RC PIPE (CL III) (18 IN)	LF	486
465	INLET (COMPL) (CGI) (TY SS)	EA	2
466 6003	HEADWALL (CH-FW-O) (DIA=18 IN)	EA	1



NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED
PROFESSIONAL ENGINEER
7/2/2021

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
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SHEET 5 OF 12

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)			US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	105

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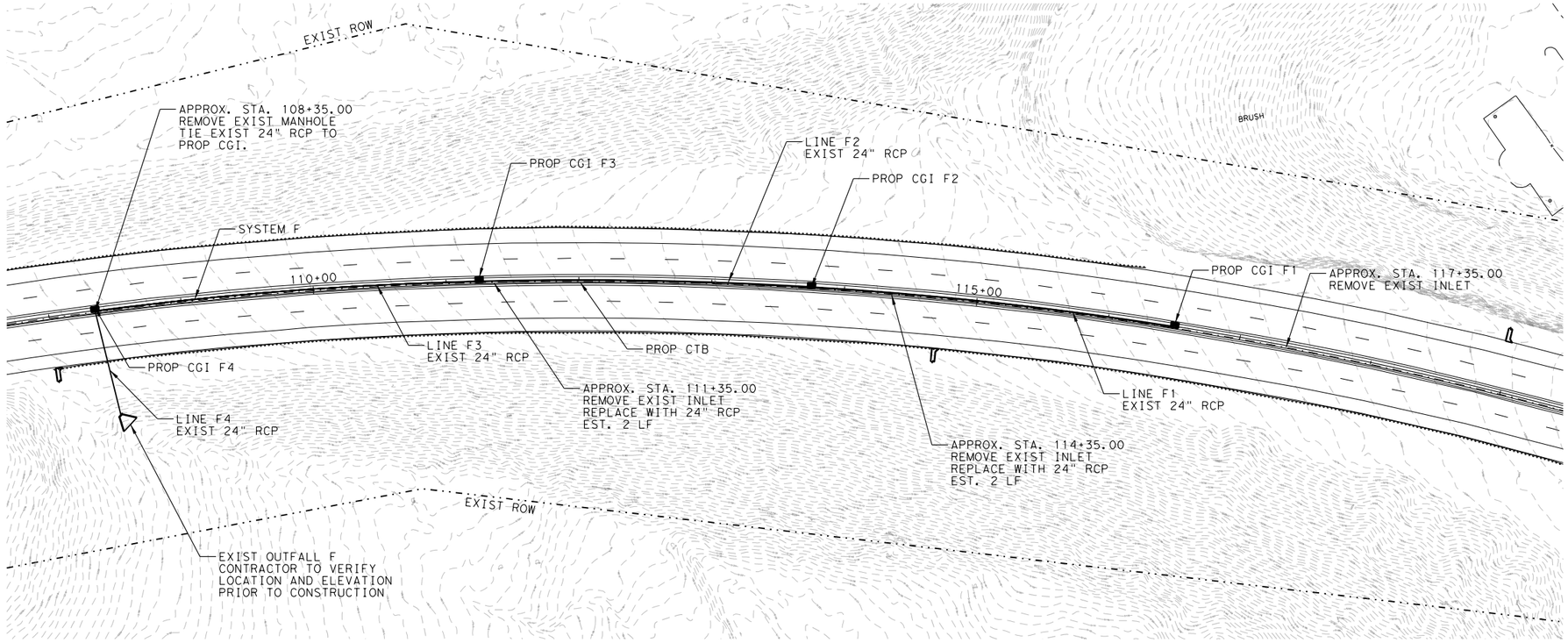

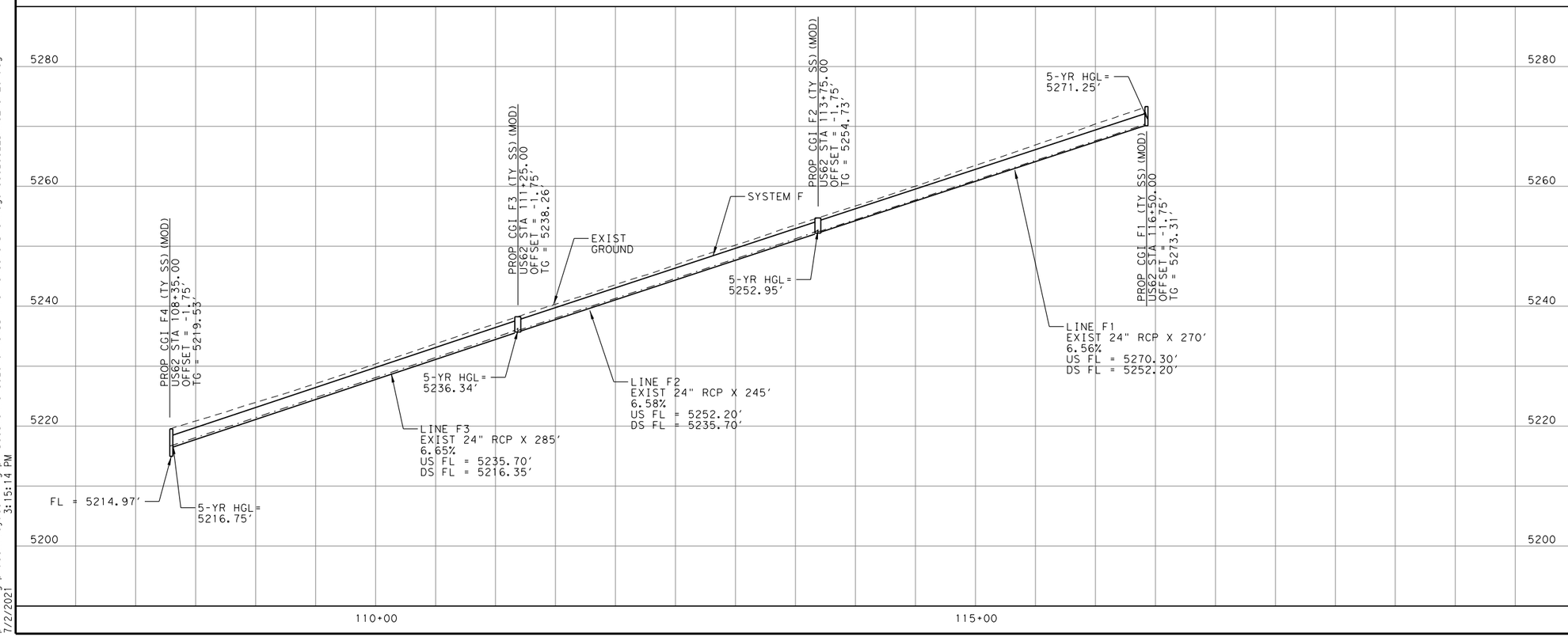

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DRAINAGE NOTES:

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SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
400 6001	STRUCT EXCAV	CY	12
401 6001	FLOWABLE BACKFILL	CY	5
420 6009	CL A CONC (COLLAR)	EA	7
464 6005	RC PIPE (CL III) (24 IN)	LF	28
465	INLET (COMPL) (CGI) (TY SS) (MOD)	EA	4
496 6002	REMOV STR (INLET)	EA	3
496 6003	REMOV STR (MANHOLE)	EA	1

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED
PROFESSIONAL ENGINEER
7/2/2021

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
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SHEET 6 OF 12

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)			US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035, ETC.	106

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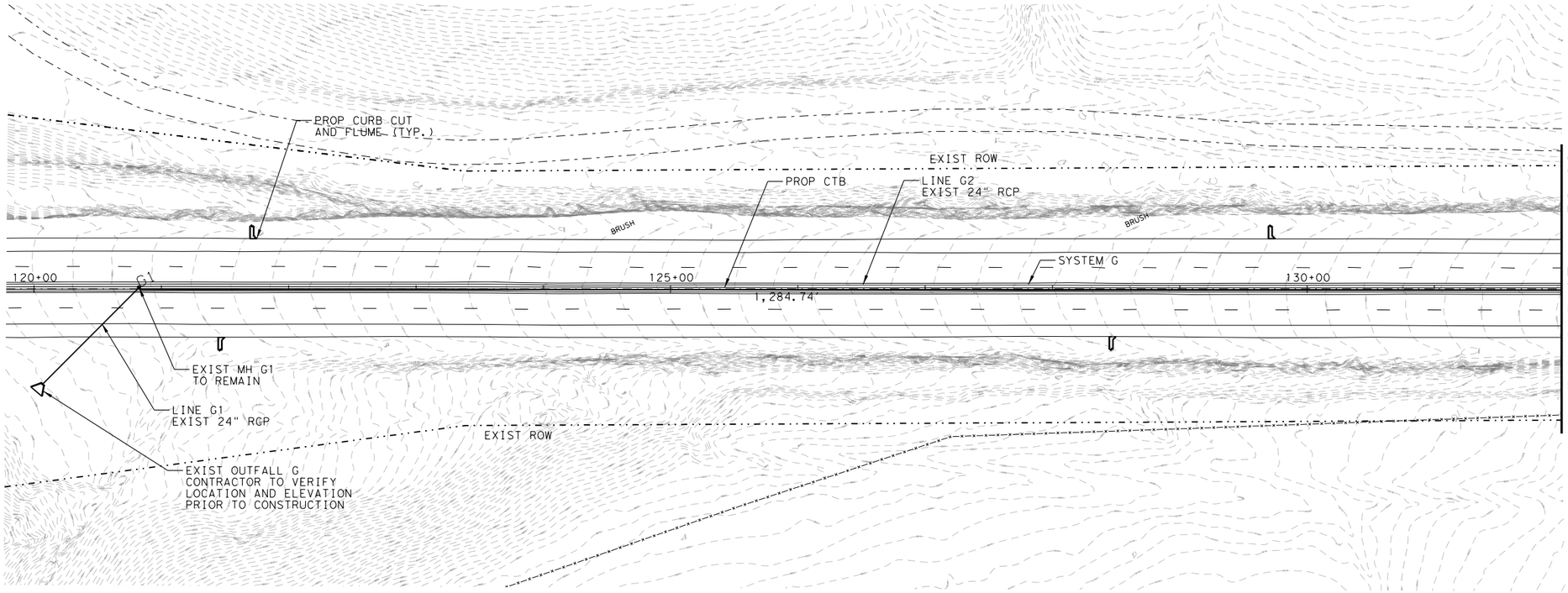

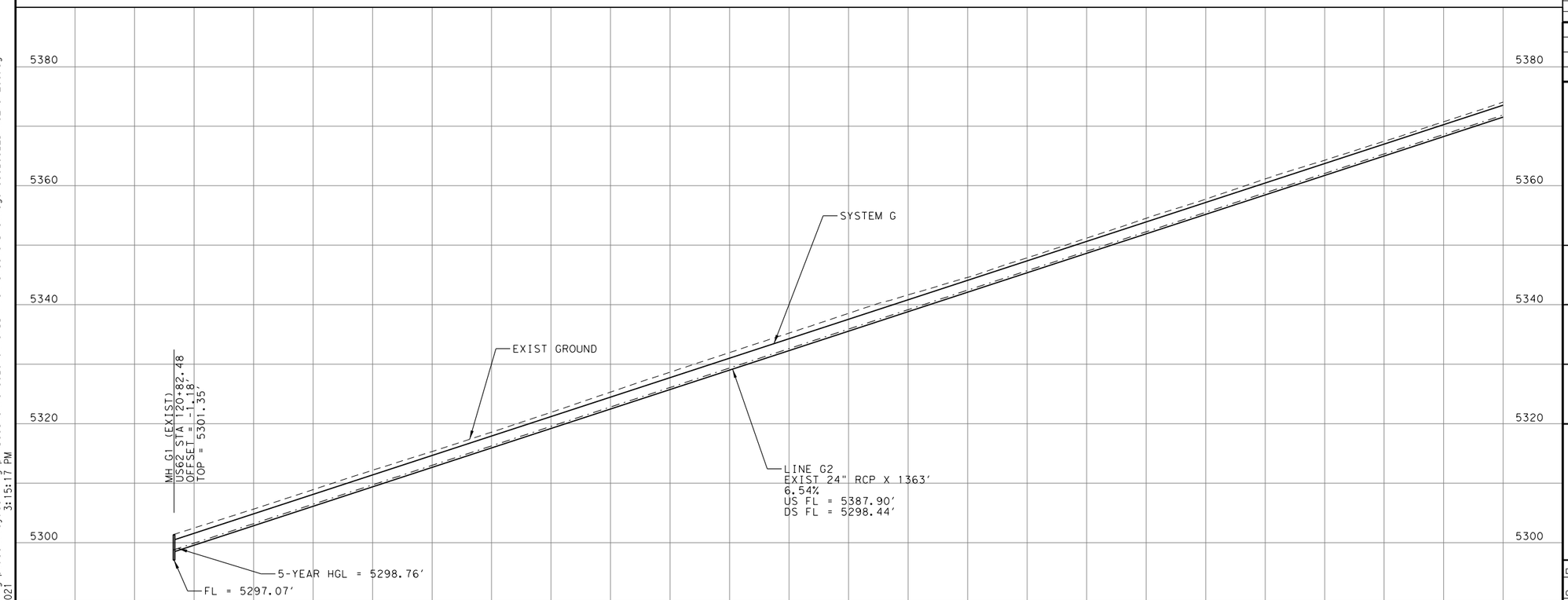

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SCALE: 1" = 100' (H)
SCALE: 1" = 20' (V)

DRAINAGE NOTES:

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6. SEE DRAINAGE AREA MAPS FOR PROPOSED CURB CUT AND FLUME PLACEMENT.

SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED
PROFESSIONAL ENGINEER
7/2/2021

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

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DRAINAGE PLAN AND PROFILE
SYSTEM G

SHEET 7 OF 12

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)		US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No. / SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC. 107

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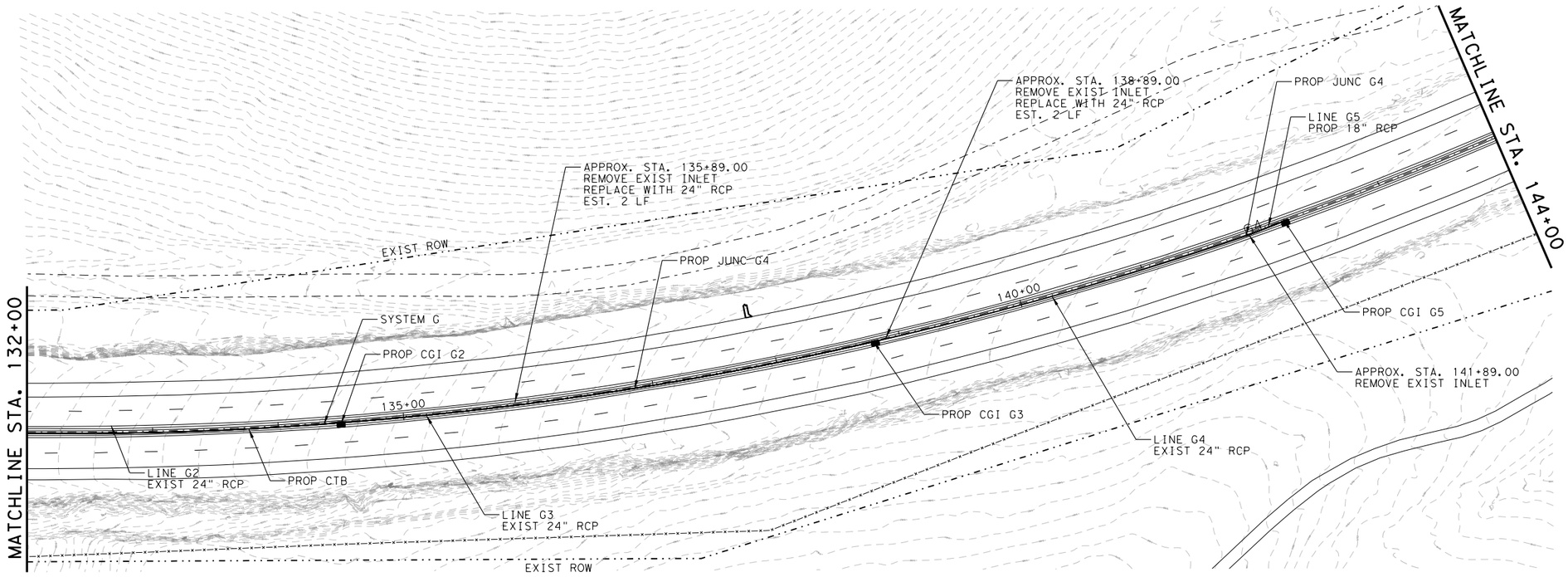

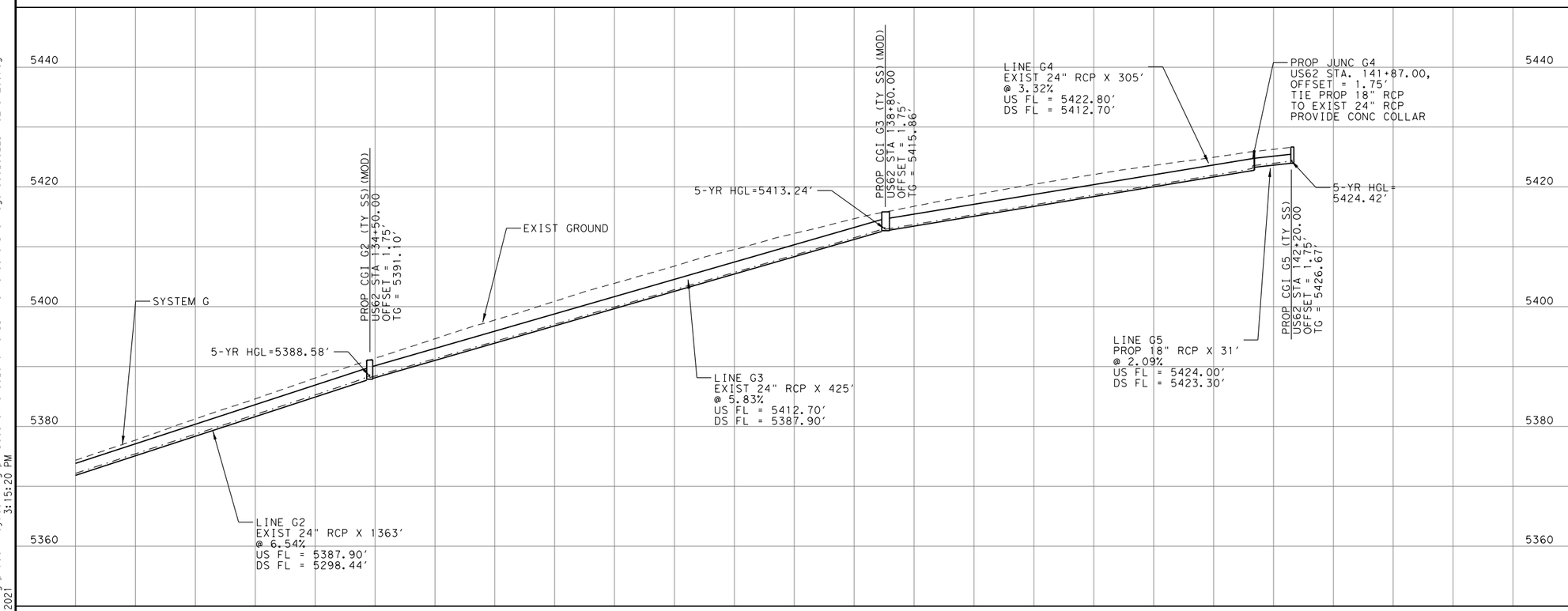

0 50 100

SCALE: 1" = 100' (H)
SCALE: 1" = 20' (V)

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SHEET TOTALS			
ITEM	ITEM DESCRIPTION	UNIT	QTY
400 6001	STRUCT EXCAV	CY	18
401 6001	FLOWABLE BACKFILL	CY	8
420 6009	CL A CONC (COLLAR)	EA	5
464 6003	RC PIPE (CL III)(18 IN)	LF	31
464 6005	RC PIPE (CL III)(24 IN)	LF	20
465	INLET (COMPL)(CGI)(TY SS)	EA	1
465	INLET(COMPL)(CGI)(TY SS)(MOD)	EA	2
496 6002	REMOV STR (INLET)	EA	3

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED
PROFESSIONAL ENGINEER
7/2/2021

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
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SHEET 8 OF 12

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)	US 62/180

DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	108

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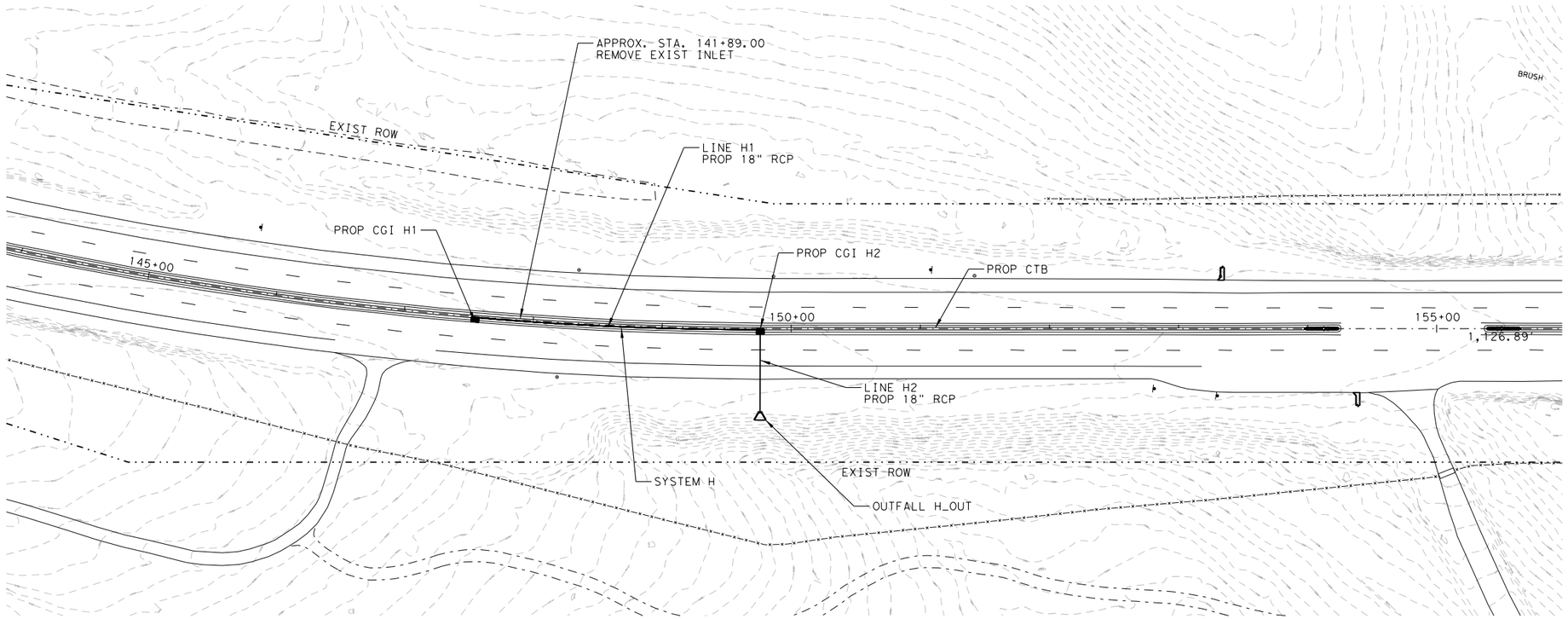

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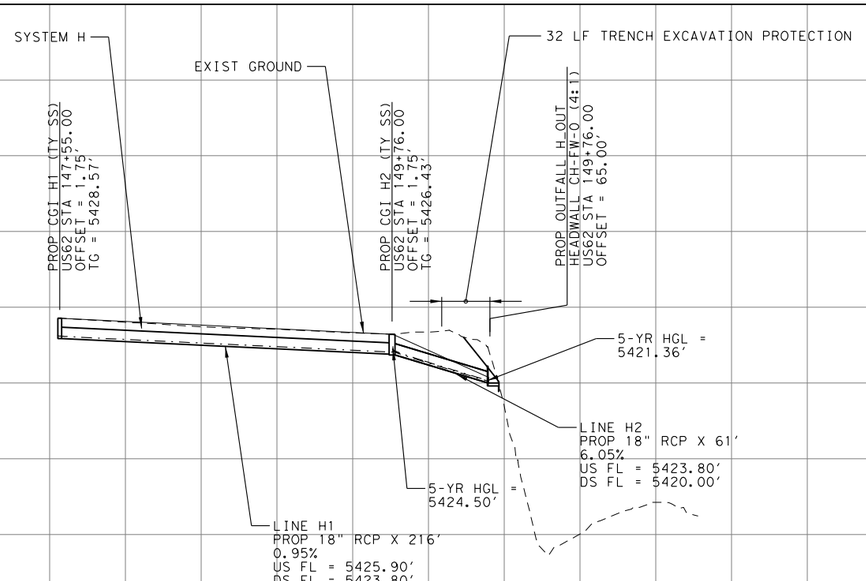
SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
400 6001	STRUCT EXCAV	CY	83
400 6008	CUT & RESTORE ASPH PAVING	SY	12
401 6001	FLOWABLE BACKFILL	CY	38
402 6001	TRENCH EXCAVATION PROTECTION	LF	32
464 6003	RC PIPE (CL III)(18 IN)	LF	278
465	INLET (COMPL)(CGI)(TY SS)	EA	2
466 6003	HEADWALL(CH-FW-O)(DIA=18 IN)	EA	1

NO.	REVISION	BY	DATE



STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED
PROFESSIONAL ENGINEER
7/2/2021

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
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DRAINAGE PLAN AND PROFILE
SYSTEM H

SHEET 9 OF 12

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)			US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035, ETC.	109

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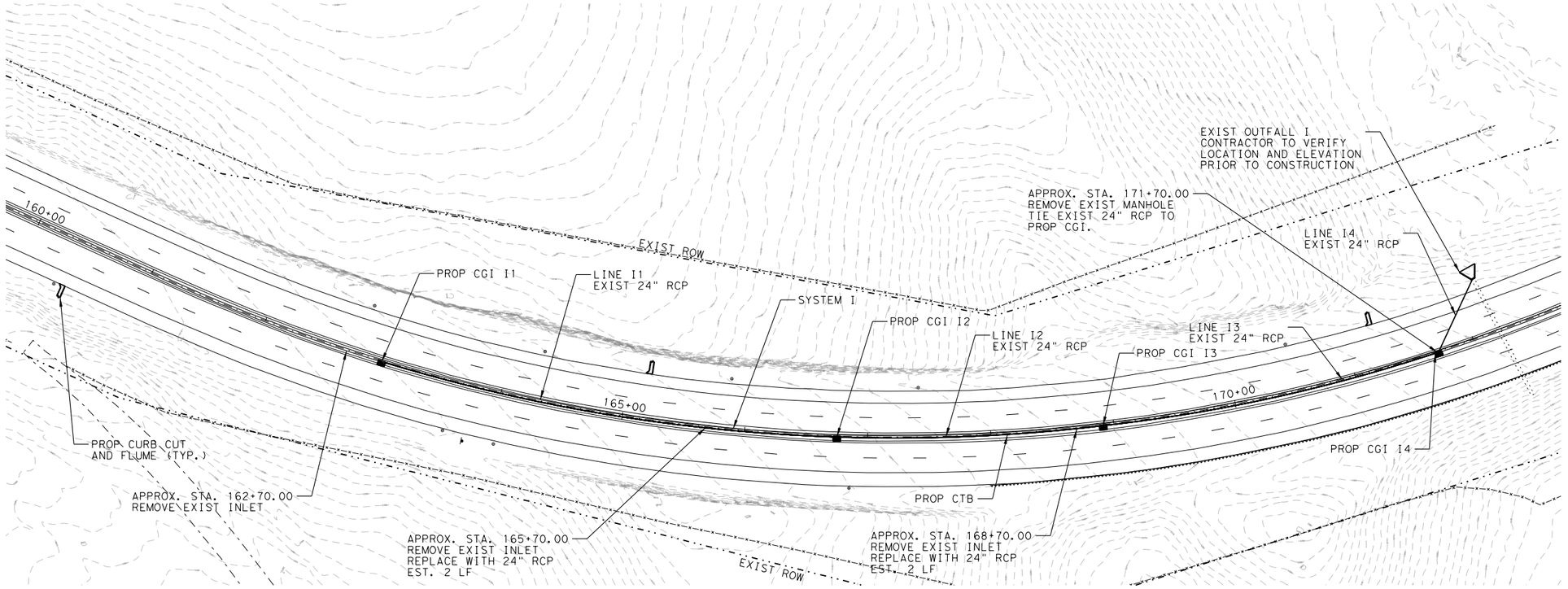

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SHEET TOTALS

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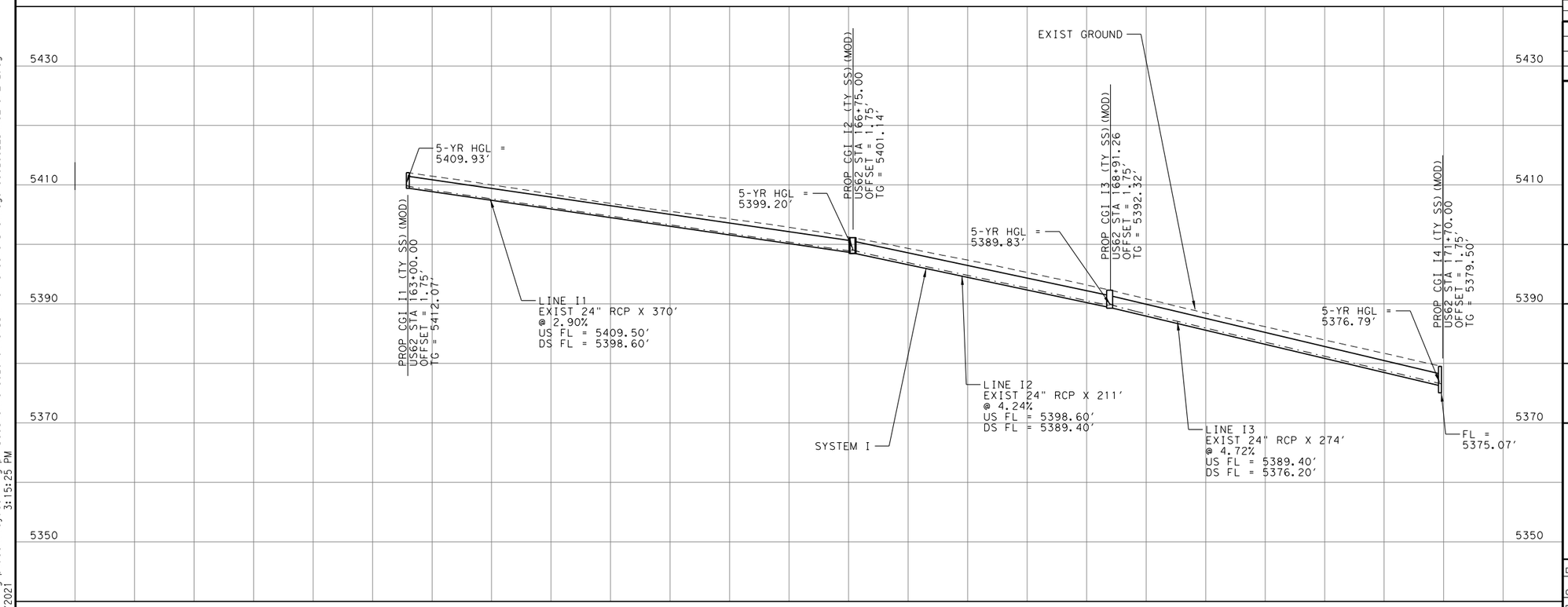
400 6001	STRUCT EXCAV	CY	12
401 6001	FLOWABLE BACKFILL	CY	5
420 6009	CL A CONC (COLLAR)	EA	7
464 6005	RC PIPE (CL III)(24 IN)	LF	28
465	INLET (COMPL)(CGI)(TY SS)(MOD)	EA	4
496 6002	REMOV STR (INLET)	EA	3
496 6003	REMOV STR (MANHOLE)	EA	1

NO.	REVISION	BY	DATE



STATE OF TEXAS
ANDRES M. CARDENAS
88453
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PROFESSIONAL ENGINEER
7/2/2021

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FIRM #587

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SYSTEM I

SHEET 10 OF 12

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)			US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	110

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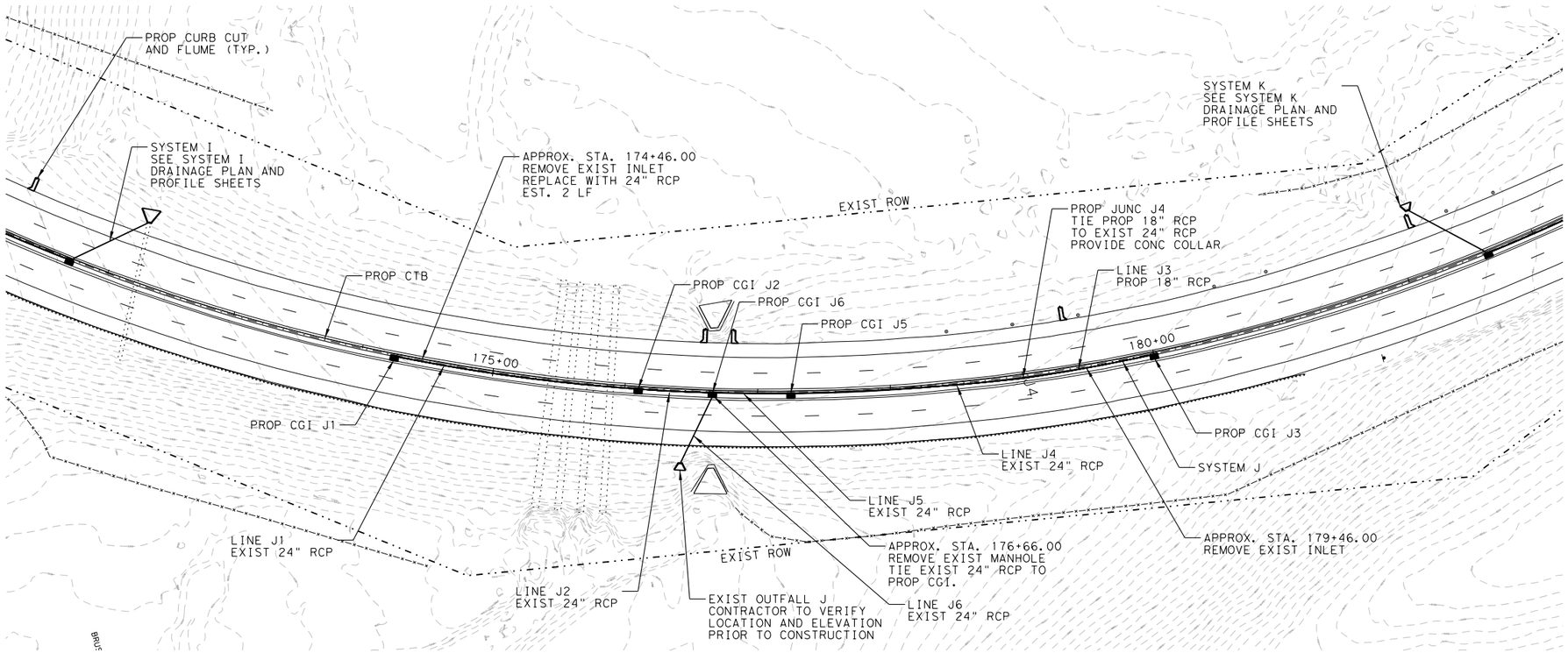

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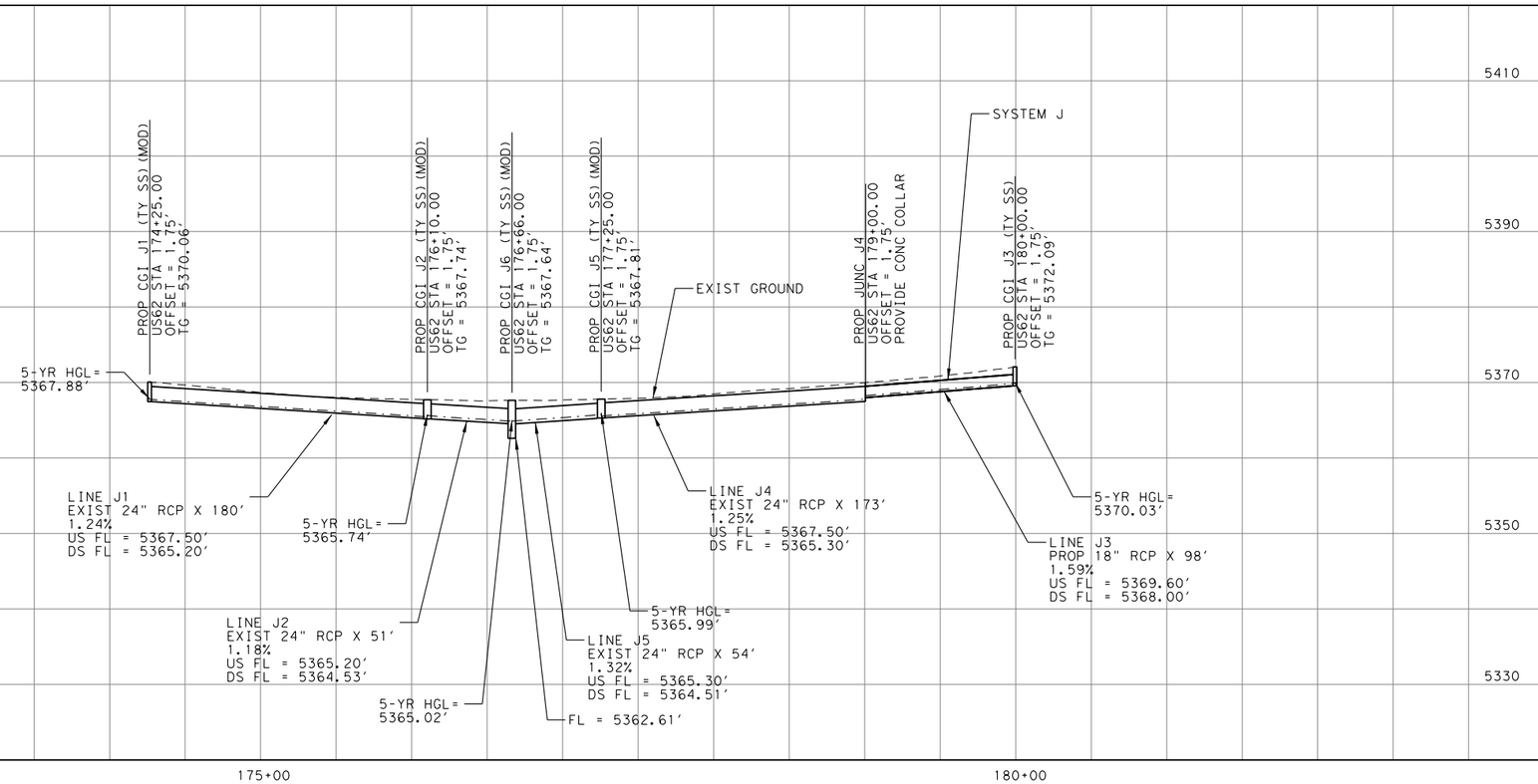
SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
400 6001	STRUCT EXCAV	CY	42
401 6001	FLOWABLE BACKFILL	CY	19
420 6009	CL A CONC (COLLAR)	EA	9
464 6003	RC PIPE (CL III)(18 IN)	LF	98
464 6005	RC PIPE (CL III)(24 IN)	LF	30
465	INLET (COMPL)(CGI)(TY SS)	EA	1
465	INLET (COMPL)(CGI)(TY SS)(MOD)	EA	4
496 6002	REMOV STR (INLET)	EA	2
496 6003	REMOV STR (MANHOLE)	EA	1

NO.	REVISION	BY	DATE



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ANDRES M. CARDENAS
88453
LICENSED PROFESSIONAL ENGINEER
7/2/2021

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

Texas Department of Transportation
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US 62/180 DRAINAGE PLAN AND PROFILE SYSTEM J

SHEET 11 OF 12

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)			US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	111

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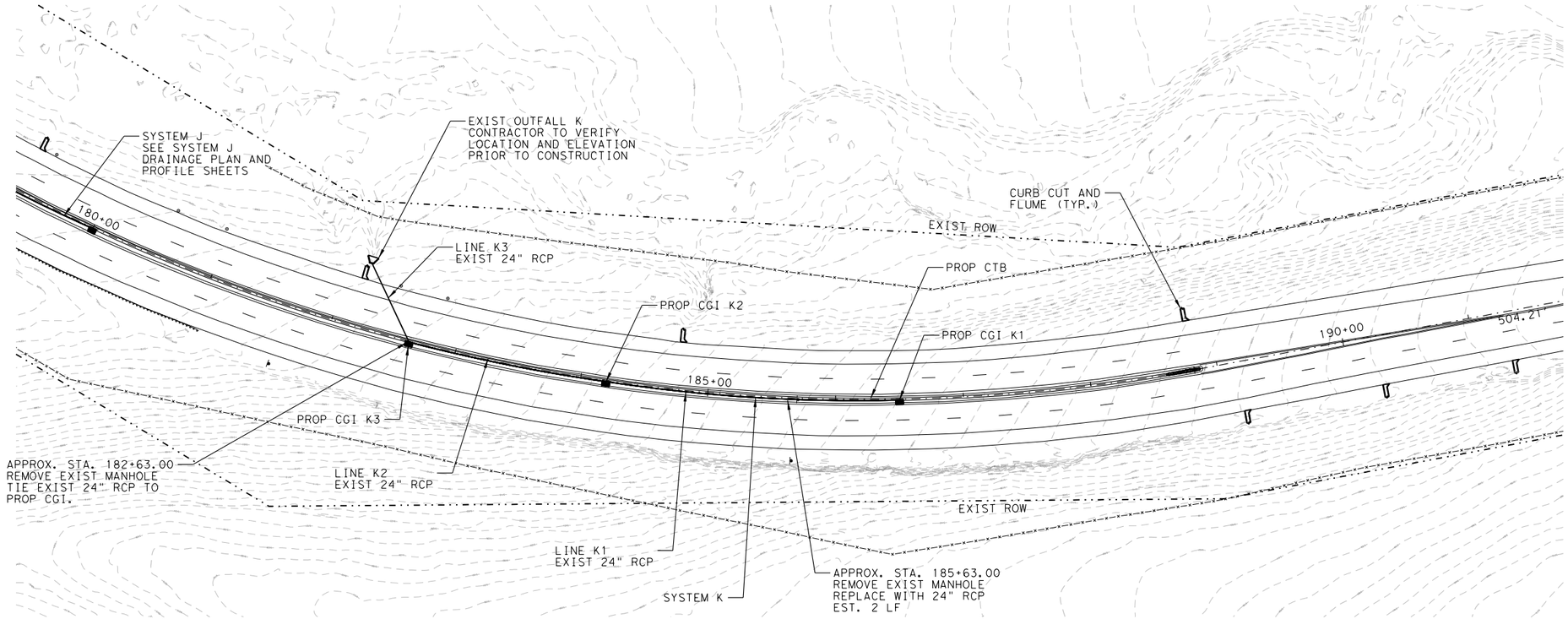

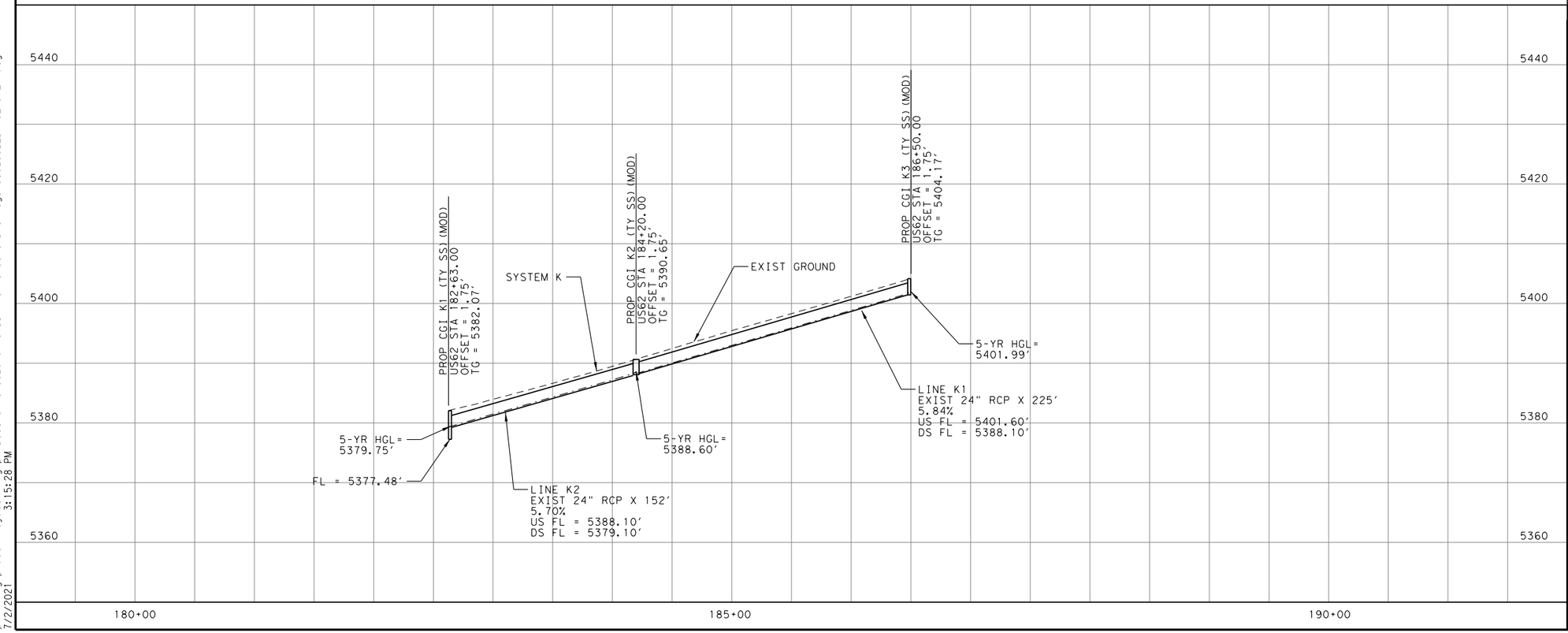

0 50 100

SCALE: 1" = 100' (H)
SCALE: 1" = 20' (V)

DRAINAGE NOTES:

1. THE CONTRACTOR SHALL REFER TO TXDOT SPECIFICATIONS, ITEM 5.6, "COOPERATING WITH UTILITIES" REGARDING REQUIREMENTS FOR COOPERATING WITH UTILITIES BEFORE, DURING AND AFTER CONSTRUCTION.
2. LIMITS OF ALL FLOWABLE FILL QUANTITIES PER DRAINAGE DETAILS SHEET.
3. ALL RCP SHALL BE CLASS III UNLESS SPECIFIED OTHERWISE.
4. A NEGATIVE (-) OFFSET INDICATES LEFT OF THE ALIGNMENT. A POSITIVE OFFSET INDICATES RIGHT OF THE ALIGNMENT.
5. CONTRACTOR TO CONFIRM CONDITION OF EXISTING RCP PIPE. ANY EXISTING RCP THAT EXHIBITS STRUCTURAL FAILURE SHALL BE REPLACED.
6. SEE DRAINAGE AREA MAPS FOR PROPOSED CURB CUT AND FLUME PLACEMENT.

SHEET TOTALS

ITEM	ITEM DESCRIPTION	UNIT	QTY
400 6001	STRUCT EXCAV	CY	8
401 6001	FLOWABLE BACKFILL	CY	3
420 6009	CL A CONC (COLLAR)	EA	5
464 6005	RC PIPE (CL III)(24 IN)	LF	18
496 6002	REMOV STR (INLET)	EA	1
496 6003	REMOV STR (MANHOLE)	EA	1

NO.	REVISION	BY	DATE

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US 62/180
DRAINAGE PLAN AND PROFILE
SYSTEM K

SHEET 12 OF 12

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)		US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No. / SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC. 112

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DRAINAGE AREA		SUBAREAS (AC)		COMPOSITE	TOTAL	ACTUAL	TOTAL	INTENSITY	DISCHARGE	INTENSITY	DISCHARGE
NO.	ACRES	UNDEVELOPED C=0.40	PAVEMENT C=0.90	C VALUE	CA	Tc (MIN)	Tc (MIN)	I(5) (IN/HR)	Q(5) (CFS)	I(100) (IN/HR)	Q(100) (CFS)
A1	0.27	0.00	0.27	0.90	0.24	1.00	10.00	5.57	1.343	8.34	2.012
A2	0.23	0.00	0.23	0.90	0.21	1.00	10.00	5.57	1.153	8.34	1.728
A3	0.11	0.00	0.11	0.90	0.10	1.00	10.00	5.57	0.537	8.34	0.804
B1	0.28	0.00	0.28	0.90	0.25	2.00	10.00	5.57	1.399	8.34	2.095
B2	0.26	0.00	0.25	0.90	0.23	2.00	10.00	5.57	1.274	8.34	1.909
B3	0.28	0.00	0.28	0.90	0.26	1.00	10.00	5.57	1.424	8.34	2.132
B4	0.26	0.00	0.26	0.90	0.23	2.00	10.00	5.57	1.297	8.34	1.943
C1	0.16	0.00	0.16	0.90	0.14	1.00	10.00	5.57	0.808	8.34	1.210
C3	0.34	0.00	0.34	0.90	0.30	1.00	10.00	5.57	1.688	8.34	2.528
C4	0.17	0.00	0.17	0.90	0.15	1.00	10.00	5.57	0.825	8.34	1.235
C5	0.22	0.00	0.22	0.90	0.19	2.00	10.00	5.57	1.077	8.34	1.612
D1	0.26	0.11	0.15	0.69	0.18	2.00	10.00	5.57	0.981	8.34	1.469
D3	0.28	0.00	0.28	0.90	0.26	1.00	10.00	5.57	1.424	8.34	2.133
E1	0.17	0.00	0.17	0.90	0.16	1.00	10.00	5.57	0.868	8.34	1.300
E2	0.36	0.00	0.36	0.90	0.33	2.00	10.00	5.57	1.830	8.34	2.740
F1	0.28	0.00	0.28	0.90	0.25	1.00	10.00	5.57	1.396	8.34	2.090
F2	0.25	0.00	0.25	0.90	0.23	1.00	10.00	5.57	1.268	8.34	1.899
F3	0.22	0.00	0.22	0.90	0.20	1.00	10.00	5.57	1.093	8.34	1.638
F4	0.28	0.00	0.28	0.90	0.25	2.00	10.00	5.57	1.419	8.34	2.125
G2	0.35	0.00	0.35	0.90	0.32	2.00	10.00	5.57	1.765	8.34	2.644
G3	0.29	0.00	0.29	0.90	0.26	1.00	10.00	5.57	1.434	8.34	2.148
G5	0.27	0.00	0.27	0.90	0.24	1.00	10.00	5.57	1.349	8.34	2.020
H1	0.19	0.00	0.19	0.90	0.17	1.00	10.00	5.57	0.972	8.34	1.456
H2	0.20	0.00	0.20	0.90	0.18	1.00	10.00	5.57	0.995	8.34	1.491
I1	0.33	0.00	0.33	0.90	0.30	2.00	10.00	5.57	1.648	8.34	2.468
I2	0.34	0.00	0.34	0.90	0.31	2.00	10.00	5.57	1.723	8.34	2.580
I3	0.19	0.00	0.19	0.90	0.17	2.00	10.00	5.57	0.947	8.34	1.419
I4	0.27	0.00	0.27	0.90	0.24	2.00	10.00	5.57	1.326	8.34	1.987
J1	0.24	0.00	0.24	0.90	0.22	1.00	10.00	5.57	1.222	8.34	1.830
J2	0.19	0.00	0.19	0.90	0.17	1.00	10.00	5.57	0.958	8.34	1.435
J3	0.26	0.00	0.26	0.90	0.23	1.00	10.00	5.57	1.308	8.34	1.959
J5	0.27	0.00	0.27	0.90	0.25	1.00	10.00	5.57	1.366	8.34	2.046
J6	0.11	0.00	0.11	0.89	0.10	2.00	10.00	5.57	0.536	8.34	0.803
K1	0.24	0.00	0.24	0.90	0.21	1.00	10.00	5.57	1.199	8.34	1.795
K2	0.20	0.00	0.20	0.90	0.18	1.00	10.00	5.57	1.028	8.34	1.539
K3	0.15	0.00	0.15	0.90	0.13	1.00	10.00	5.57	0.739	8.34	1.107
FL-1	0.62	0.00	0.62	0.90	0.56	3.00	10.00	5.57	3.098	8.34	4.640
FL-2	0.67	0.00	0.67	0.90	0.60	3.00	10.00	5.57	3.352	8.34	5.021
FL-3	0.53	0.00	0.53	0.90	0.48	2.00	10.00	5.57	2.665	8.34	3.991
FL-4	0.74	0.00	0.74	0.90	0.66	2.00	10.00	5.57	3.694	8.34	5.533
FL-5	0.42	0.00	0.42	0.90	0.38	2.00	10.00	5.57	2.112	8.34	3.164
FL-6	0.69	0.00	0.69	0.90	0.63	2.00	10.00	5.57	3.484	8.34	5.218
FL-7	0.38	0.00	0.38	0.90	0.34	2.00	10.00	5.57	1.902	8.34	2.849
FL-8	0.22	0.00	0.22	0.90	0.20	3.00	10.00	5.57	1.100	8.34	1.648
FL-9	0.23	0.00	0.23	0.90	0.20	2.00	10.00	5.57	1.130	8.34	1.693
FR-1	0.56	0.00	0.56	0.90	0.51	3.00	10.00	5.57	2.827	8.34	4.235
FR-2	0.66	0.00	0.66	0.90	0.59	3.00	10.00	5.57	3.295	8.34	4.935
FR-3	0.69	0.03	0.66	0.88	0.60	3.00	10.00	5.57	3.364	8.34	5.039
FR-4	0.77	0.00	0.77	0.90	0.70	3.00	10.00	5.57	3.873	8.34	5.801
FR-5	0.35	0.00	0.35	0.90	0.32	2.00	10.00	5.57	1.769	8.34	2.650
FR-6	0.59	0.00	0.59	0.90	0.53	2.00	10.00	5.57	2.962	8.34	4.437
FR-7	0.31	0.00	0.31	0.90	0.28	2.00	10.00	5.57	1.549	8.34	2.321
FR-8	0.83	0.00	0.83	0.90	0.75	3.00	10.00	5.57	4.159	8.34	6.229
FR-9	0.67	0.00	0.67	0.90	0.60	3.00	10.00	5.57	3.348	8.34	5.015
FL-10	0.14	0.00	0.14	0.90	0.12	2.00	10.00	5.57	0.684	8.34	1.025
FL-11	0.29	0.00	0.29	0.90	0.26	2.00	10.00	5.57	1.448	8.34	2.169
FL-12	0.50	0.00	0.50	0.90	0.45	2.00	10.00	5.57	2.496	8.34	3.738
FL-13	0.22	0.00	0.22	0.90	0.19	2.00	10.00	5.57	1.078	8.34	1.615
FL-14	0.72	0.00	0.72	0.90	0.65	2.00	10.00	5.57	3.629	8.34	5.435
FL-15	0.69	0.00	0.69	0.90	0.63	3.00	10.00	5.57	3.482	8.34	5.216
FL-16	0.65	0.00	0.65	0.90	0.59	5.00	10.00	5.57	3.265	8.34	4.890
FL-17	0.70	0.00	0.70	0.90	0.63	1.00	10.00	5.57	3.528	8.34	5.285
FL-18	0.51	0.00	0.51	0.90	0.45	3.00	10.00	5.57	2.531	8.34	3.791
FL-19	0.51	0.00	0.51	0.90	0.46	3.00	10.00	5.57	2.556	8.34	3.829
FL-20	0.50	0.00	0.50	0.90	0.45	3.00	10.00	5.57	2.520	8.34	3.774
FL-21	0.47	0.00	0.47	0.90	0.43	3.00	10.00	5.57	2.380	8.34	3.565
FL-22	0.23	0.00	0.23	0.90	0.21	3.00	10.00	5.57	1.163	8.34	1.743
FL-23	0.25	0.00	0.25	0.90	0.22	3.00	10.00	5.57	1.226	8.34	1.837
FL-24	0.23	0.00	0.23	0.90	0.20	5.00	10.00	5.57	1.135	8.34	1.701
FL-25	0.41	0.00	0.41	0.90	0.37	4.00	10.00	5.57	2.060	8.34	3.086
FL-26	0.33	0.00	0.33	0.90	0.30	4.00	10.00	5.57	1.675	8.34	2.508
FL-27	0.21	0.00	0.21	0.90	0.19	3.00	10.00	5.57	1.063	8.34	1.592
FR-10	0.25	0.00	0.25	0.90	0.22	2.00	10.00	5.57	1.248	8.34	1.870
FR-11	0.51	0.00	0.51	0.90	0.46	3.00	10.00	5.57	2.576	8.34	3.859
FR-12	0.24	0.00	0.24	0.90	0.22	2.00	10.00	5.57	1.211	8.34	1.813
FR-13	0.75	0.00	0.75	0.90	0.67	2.00	10.00	5.57	3.733	8.34	5.592
FR-14	0.60	0.00	0.60	0.90	0.54	3.00	10.00	5.57	2.990	8.34	4.478
FR-15	0.64	0.00	0.64	0.90	0.58	2.00	10.00	5.57	3.227	8.34	4.834
FR-16	0.50	0.00	0.50	0.90	0.45	2.00	10.00	5.57	2.484	8.34	3.720
FR-17	0.57	0.00	0.57	0.90	0.51	2.00	10.00	5.57	2.867	8.34	4.294

HYDROLOGIC CALCULATION NOTES:

1. HYDROLOGY CALCULATIONS PREPARED USING GEOPAK DRAINAGE AND THE RATIONAL METHOD.
2. DESIGN STORM EVENT: 5-YEAR (20%-AEP)
   CHECK STORM EVENT: 100-YEAR (1%-AEP)
   DESIGN FREQUENCY SELECTED IN COORDINATION WITH TXDOT STAFF.
3. INTENSITY COEFFICIENTS CALCULATED USING TXDOT EBDLKUP-2019-VC6.2.10.XLSM FOR CULBERSON COUNTY.
4. A MINIMUM TC OF 10 MINUTES WAS USED FOR HYDROLOGIC CALCULATIONS IN ACCORDANCE WITH THE TXDOT HYDRAULIC DESIGN MANUAL.

NO.	REVISION	BY	DATE

STATE OF TEXAS
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6/1/2021

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US 62/180
HYDRAULIC CALCULATIONS

RUNOFF COMPUTATIONS

SHEET 1 OF 10

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)	US 62/180

DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	113

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DRAINAGE AREA		SUBAREAS (AC)		COMPOSITE	TOTAL	ACTUAL	TOTAL	INTENSITY	DISCHARGE	INTENSITY	DISCHARGE
NO.	ACRES	UNDEVELOPED C=0.40	PAVEMENT C=0.90	C VALUE	CA	Tc (MIN)	Tc (MIN)	I(5) (IN/HR)	Q(5) (CFS)	I(100) (IN/HR)	Q(100) (CFS)
FR-18	0.59	0.00	0.59	0.90	0.53	2.00	10.00	5.57	2.963	8.34	4.437
FR-19	0.62	0.00	0.62	0.90	0.56	4.00	10.00	5.57	3.106	8.34	4.653
FR-20	0.54	0.00	0.54	0.90	0.49	4.00	10.00	5.57	2.724	8.34	4.080
FR-21	0.41	0.00	0.41	0.90	0.37	3.00	10.00	5.57	2.040	8.34	3.056
FR-22	0.40	0.00	0.40	0.90	0.36	2.00	10.00	5.57	2.013	8.34	3.015
FR-23	0.05	0.00	0.05	0.90	0.04	2.00	10.00	5.57	0.231	8.34	0.346
FR-24	0.07	0.00	0.07	0.90	0.07	3.00	10.00	5.57	0.370	8.34	0.554
FR-25	0.12	0.00	0.12	0.90	0.10	3.00	10.00	5.57	0.582	8.34	0.872
FR-26	0.09	0.00	0.09	0.90	0.08	3.00	10.00	5.57	0.470	8.34	0.704
FR-27	1.06	0.00	1.06	0.90	0.95	3.00	10.00	5.57	5.303	8.34	7.943

HYDROLOGIC CALCULATION NOTES:

1. HYDROLOGY CALCULATIONS PREPARED USING GEOPAK DRAINAGE AND THE RATIONAL METHOD.
2. DESIGN STORM EVENT: 5-YEAR (20%-AEP)
   CHECK STORM EVENT: 100-YEAR (1%-AEP)
   DESIGN FREQUENCY SELECTED IN COORDINATION WITH TXDOT STAFF.
3. INTENSITY COEFFICIENTS CALCULATED USING TXDOT EBDLKUP-2019-VC6.2.10.XLSM FOR CULBERSON COUNTY.
4. A MINIMUM TC OF 10 MINUTES WAS USED FOR HYDROLOGIC CALCULATIONS IN ACCORDANCE WITH THE TXDOT HYDRAULIC DESIGN MANUAL.

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HYDRAULIC CALCULATIONS

RUNOFF COMPUTATIONS

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CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	114	

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Inlets

Inlet I.D.	Inlet Type			Inlet Location				Top/Inlet	Roadway Gutter Data			Tc	5% AEP	Intercept	Q Bypass			Ponded Width				Ponded Depth	
				Cntrl Chain	Inlet Station	Offset (ft)	LT/RT	Elev (ft)	Long (%)	Trans (%)	n	(min)	Inlet Q (cfs)	Capacity (cfs)	Into (cfs)	Actual (cfs)	To Inlet I.D.	Allowed (ft)	Actual (ft)	LT (Sag) (ft)	RT (Sag) (ft)	Allowed (ft)	Actual (ft)
A1	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	55+44.00	1.75	LT	4933.70	6.50	3.10	0.015	10.00	1.4	1.07	0.05	0.33	A2	15.50	4.28			0.50	0.13
A2	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	52+52.00	1.75	LT	4914.43	6.80	2.50	0.015	10.00	1.48	1.05	0.33	0.43	A3	15.50	4.92			0.50	0.13
A3	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	49+89.00	3.50	LT	4896.98	6.07	1.80	0.015	10.00	0.97	0.67	0.43	0.29	FL-6	15.50	5.30			0.50	0.10
B1	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	67+60.00	1.75	LT	5015.17	6.20	2.40	0.015	10.00	1.67	1.13	0.27	0.53	B2	15.50	5.41			0.50	0.13
B2	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	64+50.00	1.75	LT	4994.09	7.33	4.00	0.015	10.00	2.73	1.98	1.46	0.75	B3	15.50	4.59			0.50	0.18
B3	(TY SS)(5FT)(LEFT)	Curb and Grate Inlet	On Grade	CL	61+31.21	1.75	LT	4972.90	7.10	3.20	0.015	10.00	2.17	1.97	0.75	0.20	B4	15.50	4.84			0.50	0.16
B4	(TY SS)(5FT)(LEFT)	Curb and Grate Inlet	On Grade	CL	58+40.00	1.75	LT	4953.35	6.40	3.40	0.015	10.00	1.49	1.44	0.20	0.05	A1	15.50	4.16			0.50	0.14
C1	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	83+79.00	1.75	LT	5123.57	7.20	3.30	0.015	10.00	1.21	0.97	0.41	0.24	C3	15.50	3.83			0.50	0.13
C3	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	80+24.19	1.75	LT	5099.40	6.90	3.90	0.015	10.00	1.93	1.49	0.24	0.44	C4	15.50	4.16			0.50	0.16
C4	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	78+45.00	1.75	LT	5087.63	6.86	3.40	0.015	10.00	1.27	1.02	0.44	0.25	FR-16	15.50	3.83			0.50	0.13
C5	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	74+31.00	1.75	LT	5059.26	6.57	2.50	0.015	10.00	1.08	0.81		0.27	B1	15.50	4.47			0.50	0.11
D1	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	88+92.00	1.75	LT	5157.32	6.12	3.20	0.015	10.00	2.25	1.58	1.27	0.67	D3	15.50	5.08			0.50	0.16
D3	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	85+75.00	1.75	LT	5136.01	7.26	4.70	0.015	10.00	2.1	1.69	0.67	0.41	C1	15.50	3.74			0.50	0.18
E1	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	106+50.00	1.75	LT	5208.55	6.10	3.70	0.015	10.00	1.63	1.28	0.76	0.35	E2	15.50	4.11			0.50	0.15
E2	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	102+20.00	1.75	LT	5190.55	4.90	3.40	0.015	10.00	2.18	1.57	0.35	0.61	FL-12	15.50	5.03			0.50	0.17
F1	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	116+50.00	1.75	LT	5273.31	6.90	3.20	0.015	10.00	5.51	3.12	4.12	2.39	F2	15.50	6.88			0.50	0.22
F2	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	113+75.00	1.75	LT	5254.73	6.40	2.70	0.015	10.00	3.66	2.14	2.39	1.51	F3	15.50	6.71			0.50	0.18
F3	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	111+25.00	1.75	LT	5238.26	6.40	2.70	0.015	10.00	2.61	1.66	1.51	0.94	F4	15.50	5.91			0.50	0.16
F4	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	108+35.00	1.75	LT	5219.53	6.40	3.00	0.015	10.00	2.36	1.60	0.94	0.76	E1	15.50	5.34			0.50	0.16
G2	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	134+50.00	1.75	RT	5391.10	6.50	2.50	0.015	10.00	2.31	1.47	0.54	0.83	FR-20	15.50	5.91			0.50	0.15
G3	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	138+80.00	1.75	RT	5415.86	3.20	2.60	0.015	10.00	1.79	1.25	0.36	0.54	G2	15.50	5.99			0.50	0.16
G5	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	142+20.00	1.75	RT	5426.67	3.00	2.50	0.015	10.00	1.35	0.99		0.36	G3	15.50	5.59			0.50	0.14
H1	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	147+55.00	1.75	RT	5428.56	0.90	3.20	0.015	10.00	0.97	0.84		0.13	H2	15.50	5.30			0.50	0.17
H2	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	149+76.00	1.75	RT	5426.43	0.90	3.20	0.015	10.00	1.13	0.96	0.13	0.17	FR-21	15.50	5.61			0.50	0.18
I1	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	163+00.00	1.75	RT	5412.07	2.20	4.20	0.015	10.00	2.61	1.98	0.97	0.63	I2	15.50	5.48			0.50	0.23
I2	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	166+75.00	1.75	RT	5401.14	3.70	3.80	0.015	10.00	2.35	1.74	0.63	0.61	I3	15.50	5.09			0.50	0.19
I3	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	168+91.26	1.75	RT	5392.32	4.20	4.00	0.015	10.00	1.56	1.26	0.61	0.30	I4	15.50	4.13			0.50	0.17
I4	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	171+70.00	1.75	RT	5379.50	4.90	3.50	0.015	10.00	1.63	1.26	0.30	0.37	J1	15.50	4.43			0.50	0.16
J1	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	174+25.00	1.75	RT	5370.06	2.50	3.60	0.015	10.00	1.59	1.26	0.37	0.33	J2	15.50	4.90			0.50	0.18
J2	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	176+10.00	1.75	RT	5367.74	0.90	4.10	0.015	10.00	1.29	1.12	0.33	0.17	J6	15.50	5.05			0.50	0.21
J3	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	180+00.00	1.75	RT	5372.09	2.90	3.40	0.015	10.00	1.31	1.05		0.26	J5	15.50	4.58			0.50	0.16
J5	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	177+25.00	1.75	RT	5367.81	0.90	4.10	0.015	10.00	1.95	1.62	0.58	0.33	J6	15.50	5.89			0.50	0.24
J6	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	In Sag	CL	176+66.00	1.75	RT	5367.64	n/a	4.10	0.015	10.00	1.04	10.50	0.50			15.50	4.78	4.01	4.01	0.50	0.20
K1	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	186+50.00	1.75	RT	5404.17	5.70	3.50	0.015	10.00	1.85	1.40	0.66	0.46	K2	15.50	4.52			0.50	0.16
K2	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	184+20.00	1.75	RT	5390.65	5.70	2.50	0.015	10.00	1.49	1.05	0.46	0.44	K3	15.50	5.14			0.50	0.13

HYDRAULIC CALCULATION NOTES:

1. HYDRAULIC CALCULATIONS PREPARED USING GEOPAK DRAINAGE.
2. OUTSIDE MAXIMUM ALLOWABLE PONDING WIDTH OF OUTSIDE SHOULDER AND OUTER LANE UTILIZED FOR DESIGN IN ACCORDANCE WITH TXDOT GUIDANCE.
3. INSIDE MAXIMUM ALLOWABLE PONDING WIDTH OF INSIDE SHOULDER AND INSIDE LANE UTILIZED FOR DESIGN IN ACCORDANCE WITH TXDOT GUIDANCE.

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED PROFESSIONAL ENGINEER
6/1/2021

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

Texas Department of Transportation
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US 62/180
HYDRAULIC CALCULATIONS

5-YEAR

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS	F 2021(690)			US 62/180	
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	115	

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Inlets

Inlet I.D.	Inlet Type		Inlet Location				Top/Inlet Elev (ft)	Roadway Gutter Data			Tc (min)	5% AEP Inlet Q (cfs)	Intercept Capacity (cfs)	Q Bypass			Ponded Width				Ponded Depth	
			Cntrl Chain	Inlet Station	Offset (ft)	LT/RT		Long (%)	Trans (%)	n				Into (cfs)	Actual (cfs)	To Inlet I.D.	Allowed (ft)	Actual (ft)	LT (Sag) (ft)	RT (Sag) (ft)	Allowed (ft)	Actual (ft)
K3	(TY SS)(5FT)(NONE)	Curb and Grate Inlet On Grade	CL	182+63.00	1.75	RT	5382.07	5.10	2.30	0.015	10.00	1.18	0.85	0.44	0.32	J5	15.50	5.06			0.50	0.12
FL-1	CURB CUT & FLUME (5')	Curb Inlet In Sag	CL	10+91.00	34.80	LT	4652.75	n/a	5.80	0.015	10.00	9.56	6.26	6.46		Check	21.00	11.43	1.33	7.46	0.50	0.66
FL-2	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	16+62.00	38.50	LT	4667.72	4.20	3.10	0.015	10.00	8.97	2.51	5.62	6.46	FL-1	21.00	9.32			0.50	0.29
FL-3	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	24+10.00	37.60	LT	4718.73	7.10	3.40	0.015	10.00	7.77	2.16	5.11	5.62	FL-2	21.00	7.56			0.50	0.26
FL-4	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	30+15.00	38.00	LT	4761.36	7.10	3.40	0.015	10.00	7.18	2.07	3.49	5.11	FL-3	21.00	7.34			0.50	0.25
FL-5	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	38+25.00	38.50	LT	4818.34	7.10	3.30	0.015	10.00	5.24	1.75	3.13	3.49	FL-4	21.00	6.64			0.50	0.22
FL-6	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	43+00.00	38.30	LT	4851.47	7.10	3.30	0.015	10.00	4.81	1.68	1.33	3.13	FL-5	21.00	6.43			0.50	0.21
FL-7	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	52+55.00	40.00	LT	4915.13	8.00	2.00	0.015	10.00	1.9	0.87		1.03	FL-6	21.00	6.08			0.50	0.12
FL-8	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	67+65.00	38.00	LT	5016.15	6.00	1.00	0.015	10.00	1.61	0.68	0.50	0.92	B2	21.00	9.29			0.50	0.09
FL-9	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	72+20.00	37.50	LT	5044.57	7.00	1.50	0.015	10.00	1.13	0.63		0.50	FL-8	21.00	6.14			0.50	0.09
FR-1	CURB CUT & FLUME (5')	Curb Inlet In Sag	CL	10+92.00	38.50	RT	4653.26	n/a	5.80	0.015	10.00	12	6.72	9.19		Check	21.00	13.80	8.12	1.45	0.50	0.80
FR-2	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	15+20.00	37.50	RT	4660.97	4.20	3.40	0.015	10.00	12.2	3.02	8.92	9.19	FR-1	21.00	9.88			0.50	0.34
FR-3	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	22+45.00	38.70	RT	4707.21	7.10	3.40	0.015	10.00	11.5	2.62	8.17	8.92	FR-2	21.00	8.76			0.50	0.30
FR-4	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	30+15.00	38.50	RT	4761.48	7.10	3.40	0.015	10.00	10.7	2.52	6.82	8.17	FR-3	21.00	8.52			0.50	0.29
FR-5	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	38+90.00	38.30	RT	4823.05	7.10	3.30	0.015	10.00	9.13	2.31	7.36	6.82	FR-4	21.00	8.18			0.50	0.27
FR-6	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	43+00.00	38.30	RT	4851.94	7.10	3.30	0.015	10.00	9.74	2.38	6.78	7.36	FR-5	21.00	8.38			0.50	0.28
FR-7	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	49+60.00	39.00	RT	4892.92	7.10	1.50	0.015	10.00	8.42	1.65	6.88	6.78	FR-6	21.00	12.99			0.50	0.20
FR-8	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	53+31.00	41.70	RT	4917.68	7.10	2.60	0.015	10.00	8.96	2.09	4.81	6.88	FR-7	21.00	9.43			0.50	0.25
FR-9	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	58+40.00	38.50	RT	4951.67	6.40	3.30	0.015	10.00	6.86	2.05	3.51	4.81	FR-8	21.00	7.49			0.50	0.25
FL-10	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	91+75.00	38.30	LT	5172.20	3.70	0.90	0.015	10.00	2.09	0.82	1.41	1.27	D1	21.00	11.99			0.50	0.11
FL-11	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	93+25.00	38.00	LT	5177.77	1.20	1.90	0.015	10.00	2.96	1.55	1.51	1.41	FL-10	21.00	10.57			0.50	0.20
FL-12	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	97+00.00	38.30	LT	5185.75	1.20	1.90	0.015	10.00	3.1	1.59	0.61	1.51	FL-11	21.00	10.76			0.50	0.20
FL-13	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	119+00.00	39.80	LT	5289.81	6.30	3.50	0.015	10.00	6.1	1.98	5.02	4.12	F1	21.00	6.93			0.50	0.24
FL-14	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	121+75.00	39.50	LT	5306.56	6.30	3.50	0.015	10.00	7.17	2.15	3.54	5.02	FL-13	21.00	7.36			0.50	0.26
FL-15	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	129+75.00	39.50	LT	5358.27	6.30	2.60	0.015	10.00	5.19	1.65	1.70	3.54	FL-14	21.00	7.86			0.50	0.20
FL-16	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	137+88.00	39.00	LT	5409.30	6.20	4.50	0.015	10.00	3.27	1.56		1.70	FL-15	21.00	4.70			0.50	0.21
FL-17	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	153+30.00	37.50	LT	5422.80	0.90	1.50	0.015	10.00	3.53	1.66		1.87	FL-18	21.00	13.81			0.50	0.21
FL-18	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	159+15.00	37.50	LT	5416.95	1.40	4.50	0.015	10.00	4.4	2.49	1.87	1.91	FL-19	21.00	6.95			0.50	0.31
FL-19	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	165+14.00	37.20	LT	5404.06	2.80	6.10	0.015	10.00	4.47	2.42	1.91	2.05	FL-20	21.00	5.07			0.50	0.31
FL-20	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	171+19.00	36.80	LT	5379.99	4.70	2.60	0.015	10.00	4.57	1.64	2.05	2.92	FL-21	21.00	7.91			0.50	0.21
FL-21	CURB CUT & FLUME (5')	Curb Inlet In Sag	CL	176+55.00	36.80	LT	5366.05	n/a	4.50	0.015	10.00	5.31	6.26	2.92			21.00	9.95	8.24	1.47	0.50	0.45
FL-22	CURB CUT & FLUME (5')	Curb Inlet In Sag	CL	176+85.00	36.80	LT	5366.19	n/a	5.80	0.015	10.00	1.83	6.26	0.66			21.00	3.79	0.84	4.72	0.50	0.22
FL-23	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	179+40.00	37.00	LT	5368.81	2.10	5.10	0.015	10.00	2.3	1.64	1.07	0.66	FL-22	21.00	4.67			0.50	0.24
FL-24	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	182+19.00	38.00	LT	5377.86	6.40	5.40	0.015	10.00	2.47	1.40	1.34	1.07	FL-23	21.00	3.76			0.50	0.20

HYDRAULIC CALCULATION NOTES:

1. HYDRAULIC CALCULATIONS PREPARED USING GEOPAK DRAINAGE.
2. OUTSIDE MAXIMUM ALLOWABLE PONDING WIDTH OF OUTSIDE SHOULDER AND OUTER LANE UTILIZED FOR DESIGN IN ACCORDANCE WITH TXDOT GUIDANCE.
3. INSIDE MAXIMUM ALLOWABLE PONDING WIDTH OF INSIDE SHOULDER AND INSIDE LANE UTILIZED FOR DESIGN IN ACCORDANCE WITH TXDOT GUIDANCE.

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED
PROFESSIONAL ENGINEER
6/1/2021

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

Texas Department of Transportation
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US 62/180
HYDRAULIC CALCULATIONS

5-YEAR

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:	6	TEXAS	F 2021(690)		US 62/180	
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	116

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Inlets

Inlet I.D.	Inlet Type			Inlet Location				Top/Inlet Elev (ft)	Roadway Gutter Data			Tc (min)	5% AEP Inlet Q (cfs)	Intercept Capacity (cfs)	Q Bypass			Ponded Width				Ponded Depth	
				Cntrl Chain	Inlet Station	Offset (ft)	LT/RT		Long (%)	Trans (%)	n				Into (cfs)	Actual (cfs)	To Inlet I.D.	Allowed (ft)	Actual (ft)	LT (Sag) (ft)	RT (Sag) (ft)	Allowed (ft)	Actual (ft)
FL-25	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	184+80.00	37.50	LT	5392.50	6.40	4.90	0.015	10.00	2.8	1.46	0.74	1.34	FL-24	21.00	4.18			0.50	0.20
FL-26	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	188+85.00	39.00	LT	5416.00	6.40	6.10	0.015	10.00	2.02	1.28	0.34	0.74	FL-25	21.00	3.23			0.50	0.20
FL-27	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	192+78.00	30.00	LT	5438.06	5.30	2.40	0.015	10.00	1.06	0.72		0.34	FL-26	21.00	4.71			0.50	0.11
FR-10	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	66+10.00	38.50	RT	5002.85	6.40	4.70	0.015	10.00	5.61	2.10	4.36	3.51	FR-9	21.00	5.57			0.50	0.26
FR-11	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	68+90.00	38.00	RT	5021.85	7.10	4.70	0.015	10.00	6.59	2.23	4.02	4.36	FR-10	21.00	5.80			0.50	0.27
FR-12	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	74+40.00	38.50	RT	5058.93	6.50	3.60	0.015	10.00	5.99	1.97	4.78	4.02	FR-11	21.00	6.72			0.50	0.24
FR-13	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	77+05.00	38.50	RT	5076.13	7.00	4.70	0.015	10.00	7.11	2.33	3.37	4.78	FR-12	21.00	5.98			0.50	0.28
FR-14	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	85+13.00	39.00	RT	5129.82	5.70	1.70	0.015	10.00	4.76	1.39	1.77	3.37	FR-13	21.00	10.11			0.50	0.17
FR-15	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	91+80.00	38.50	RT	5170.86	6.70	3.90	0.015	10.00	3.23	1.46		1.77	FR-14	21.00	5.04			0.50	0.20
FR-16	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	102+37.00	38.50	RT	5189.60	3.10	3.60	0.015	10.00	7.18	2.54	4.70	4.64	Check	21.00	8.27			0.50	0.30
FR-17	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	108+05.00	38.00	RT	5215.68	5.90	4.50	0.015	10.00	6.77	2.32	3.90	4.45	FR-16	21.00	6.24			0.50	0.28
FR-18	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	114+75.00	38.00	RT	5259.00	6.60	5.80	0.015	10.00	6.29	2.38	3.33	3.90	FR-17	21.00	5.07			0.50	0.29
FR-19	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	121+50.00	38.00	RT	5304.24	6.60	5.80	0.015	10.00	5.56	2.23	2.45	3.33	FR-18	21.00	4.84			0.50	0.28
FR-20	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	128+50.00	37.50	RT	5350.17	6.30	1.40	0.015	10.00	3.56	1.11	0.83	2.45	FR-19	21.00	10.05			0.50	0.14
FR-21	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	154+35.00	49.50	RT	5421.68	0.80	2.20	0.015	10.00	2.21	1.49	0.17	0.72	Check	21.00	9.33			0.50	0.20
FR-22	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	160+35.00	39.00	RT	5417.39	1.10	1.00	0.015	10.00	2.01	1.05		0.97	I1	21.00	13.89			0.50	0.14
FR-23	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	189+20.00	38.60	RT	5420.46	5.30	1.80	0.015	10.00	1.45	0.79	1.22	0.66	K1	21.00	6.33			0.50	0.11
FR-24	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	190+30.00	38.60	RT	5426.10	5.30	1.80	0.015	10.00	2.2	0.98	1.83	1.22	FR-23	21.00	7.41			0.50	0.13
FR-25	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	191+33.00	38.60	RT	5431.15	5.30	3.00	0.015	10.00	3.24	1.41	2.66	1.83	FR-24	21.00	6.22			0.50	0.19
FR-26	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	192+60.00	38.50	RT	5437.26	5.30	2.30	0.015	10.00	4.12	1.46	3.65	2.66	FR-25	21.00	8.04			0.50	0.19
FR-27	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	193+80.00	38.50	RT	5442.35	5.30	2.30	0.015	10.00	5.3	1.65		3.65	FR-26	21.00	8.83			0.50	0.20

HYDRAULIC CALCULATION NOTES:

1. HYDRAULIC CALCULATIONS PREPARED USING GEOPAK DRAINAGE.
2. OUTSIDE MAXIMUM ALLOWABLE PONDING WIDTH OF OUTSIDE SHOULDER AND OUTER LANE UTILIZED FOR DESIGN IN ACCORDANCE WITH TXDOT GUIDANCE.
3. INSIDE MAXIMUM ALLOWABLE PONDING WIDTH OF INSIDE SHOULDER AND INSIDE LANE UTILIZED FOR DESIGN IN ACCORDANCE WITH TXDOT GUIDANCE.

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED
PROFESSIONAL ENGINEER
6/1/2021

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

Texas Department of Transportation
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US 62/180
HYDRAULIC CALCULATIONS

5-YEAR

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS	F 2021(690)			US 62/180	
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	117	

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Conveyance

Link I.D.	Node I.D. US	Node I.D. DS	Invert Elev US (ft)	Invert Elev DS (ft)	Soffit Elev US (ft)	Soffit Elev DS (ft)	Link Type	No. of Barrels	Span (ft)	Rise/ Dia (ft)	Link Mtrl	Shape	Hyd Length (ft)	Slope (%)	Manning's "n"	H.G.L. US Elev (ft)	H.G.L. DS Elev (ft)	E.G.L. US Elev (ft)	E.G.L. DS Elev (ft)	Unif Depth (ft)	Unif Vel (ft/s)	Crit Depth (ft)	Crit Vel (ft/s)	Crit Slope (%)	Frictn Slope (%)	Actual Depth (ft)	Actual Vel (ft/s)	Total Q (cfs)	Link Capacity (cfs)	Junctn Loss (ft)
A1	A1	A2	4931.20	4911.90	4933.20	4913.90	Pipe	1		2	Concrete	Circular	292.06	6.61	0.012	4931.74	4912.10	4931.88	4913.13	0.20	8.10	0.40	3.00	0.39	6.61	0.20	8.10	1.34	67.77	0.14
A2	A2	A3	4911.90	4893.90	4913.90	4895.90	Pipe	1		2	Concrete	Circular	263.03	6.84	0.012	4912.50	4894.17	4912.70	4895.69	0.27	9.87	0.55	3.56	0.38	6.85	0.27	9.85	2.5	68.97	0.05
A3	A3	A_OUT	4892.54	4883.00	4894.54	4885.00	Pipe	1		2	Concrete	Circular	101.95	9.36	0.012	4893.24	4883.28	4893.46	4885.40	0.27	11.68	0.61	3.75	0.38	9.36	0.28	11.63	3.03	80.64	0.09
B1	B1	B2	5012.60	4991.60	5014.60	4993.60	Pipe	1		2	Concrete	Circular	310.03	6.77	0.012	5013.15	4991.80	5013.30	4992.88	0.20	8.26	0.41	3.04	0.39	6.77	0.20	8.26	1.4	68.61	0.14
B2	B2	B3	4991.60	4970.20	4993.60	4972.20	Pipe	1		2	Concrete	Circular	318.80	6.71	0.012	4992.23	4970.48	4992.43	4972.04	0.28	10.01	0.57	3.63	0.38	6.72	0.28	9.98	2.67	68.30	0.06
B3	B3	B4	4970.20	4950.15	4972.20	4952.15	Pipe	1		2	Concrete	Circular	291.27	6.88	0.012	4970.97	4950.49	4971.24	4952.55	0.34	11.46	0.71	4.10	0.38	6.89	0.34	11.46	4.1	69.17	0.06
B4	B4	B_OUT	4948.85	4936.00	4950.85	4938.00	Pipe	1		2	Concrete	Circular	90.86	14.14	0.012	4950.11	4936.33	4950.42	4940.31	0.33	16.02	0.82	4.45	0.39	14.14	0.33	15.93	5.39	99.14	0.45
C1	C1	C2	5121.10	5118.06	5122.60	5119.56	Pipe	1		1.5	Concrete	Circular	46.09	6.60	0.012	5121.55	5118.23	5121.67	5119.05	0.17	7.22	0.34	2.71	0.41	6.59	0.17	7.21	0.81	31.44	0.11
C2	C2	C3	5117.66	5096.20	5119.66	5098.20	Pipe	1		2	Concrete	Circular	308.48	6.96	0.012	5117.98	5096.36	5118.09	5097.15	0.16	7.07	0.31	2.60	0.40	6.96	0.16	7.07	0.81	69.53	0.01
C3	C3	C4	5096.20	5085.10	5098.20	5087.10	Pipe	1		2	Concrete	Circular	179.35	6.19	0.012	5096.82	5085.38	5097.01	5086.79	0.28	9.53	0.55	3.55	0.38	6.18	0.28	9.53	2.5	65.59	0.07
C4	C4	C5	5085.10	5056.33	5087.10	5058.33	Pipe	1		2	Concrete	Circular	413.61	6.96	0.012	5085.79	5056.64	5086.02	5058.47	0.31	10.80	0.64	3.85	0.38	6.95	0.31	10.80	3.32	69.53	0.05
C5	C5	C_OUT	5054.78	5010.00	5056.78	5012.00	Pipe	1		2	Concrete	Circular	69.84	64.12	0.012	5055.91	5010.21	5056.18	5020.43	0.21	25.60	0.74	4.19	0.38	64.11	0.21	25.47	4.4	211.10	0.39
D1	D1	D2	5154.80	5153.48	5156.80	5155.48	Pipe	1		2	Concrete	Circular	19.53	6.76	0.012	5155.26	5153.66	5155.38	5154.46	0.17	7.42	0.34	2.75	0.40	6.77	0.18	7.12	0.98	68.53	0.12
D2	D2	D3	5153.48	5132.62	5155.48	5134.62	Pipe	1		2	Concrete	Circular	297.39	7.01	0.012	5153.83	5132.79	5153.95	5133.68	0.17	7.52	0.34	2.75	0.40	7.02	0.17	7.52	0.98	69.82	0.01
D3	D3	D_OUT	5131.15	5106.00	5133.15	5108.00	Pipe	1		2	Concrete	Circular	108.90	23.09	0.012	5131.97	5106.20	5132.16	5109.70	0.20	14.94	0.54	3.52	0.38	23.10	0.20	14.90	2.4	126.69	0.28
E1	E1	E2	5204.00	5186.50	5205.50	5188.00	Pipe	1		1.5	Concrete	Circular	430.11	4.07	0.012	5204.47	5186.70	5204.59	5187.30	0.20	6.23	0.35	2.78	0.41	4.06	0.20	6.23	0.87	24.69	0.12
E2	E2	E_OUT	5186.50	5186.00	5188.00	5187.50	Pipe	1		1.5	Concrete	Circular	63.72	0.78	0.012	5187.50	5186.53	5187.73	5186.89	0.53	4.82	0.62	3.89	0.43	0.78	0.53	4.82	2.7	10.84	0.37
F1	F1	F2	5270.30	5252.20	5272.30	5254.20	Pipe	1		2	Concrete	Circular	275.11	6.58	0.012	5270.85	5252.41	5270.99	5253.46	0.21	8.18	0.41	3.03	0.39	6.58	0.21	8.18	1.4	67.62	0.14
F2	F2	F3	5252.20	5235.70	5254.20	5237.70	Pipe	1		2	Concrete	Circular	250.11	6.60	0.012	5252.83	5235.98	5253.03	5237.52	0.28	9.94	0.57	3.62	0.38	6.60	0.28	9.94	2.66	67.71	0.06
F3	F3	F4	5235.70	5216.35	5237.70	5218.35	Pipe	1		2	Concrete	Circular	290.10	6.67	0.012	5236.43	5216.68	5236.68	5218.58	0.33	11.05	0.68	3.99	0.38	6.68	0.33	11.05	3.76	68.09	0.05
F4	F4	F_OUT	5214.97	5200.00	5216.97	5202.00	Pipe	1		2	Concrete	Circular	82.62	18.12	0.012	5216.21	5200.30	5216.51	5204.93	0.30	17.27	0.80	4.39	0.39	18.12	0.30	17.17	5.18	112.22	0.44
G1	G1	G_OUT	5297.07	5290.00	5299.07	5292.00	Pipe	1		2	Concrete	Circular	107.68	6.57	0.012	5297.93	5290.37	5298.21	5292.46	0.36	11.62	0.75	4.23	0.39	6.56	0.37	11.56	4.55	67.55	0.11
G2	G2	G1	5387.90	5298.44	5389.90	5300.44	Pipe	1		2	Concrete	Circular	1367.49	6.54	0.012	5388.72	5298.80	5389.00	5300.92	0.36	11.61	0.75	4.23	0.39	6.54	0.36	11.61	4.55	67.43	0.07
G3	G3	G2	5412.70	5387.90	5414.70	5389.90	Pipe	1		2	Concrete	Circular	429.94	5.77	0.012	5413.34	5388.20	5413.55	5389.63	0.30	9.60	0.58	3.67	0.38	5.76	0.30	9.60	2.78	63.32	0.06
G4	G4	G3	5422.80	5412.70	5424.80	5414.70	Pipe	1		2	Concrete	Circular	307.07	3.29	0.012	5423.21	5412.94	5423.35	5413.57	0.24	6.34	0.40	3.01	0.39	3.28	0.24	6.34	1.35	47.81	0.01
G5	G5	G4	5424.00	5423.30	5425.50	5424.80	Pipe	1		1.5	Concrete	Circular	33.03	2.12	0.012	5424.59	5423.59	5424.75	5424.07	0.29	5.64	0.44	3.16	0.41	2.12	0.29	5.53	1.35	17.82	0.15
H1	H1	H2	5425.90	5423.80	5427.40	5425.30	Pipe	1		1.5	Concrete	Circular	221.12	0.95	0.012	5426.40	5424.10	5426.53	5424.33	0.30	3.87	0.37	2.90	0.43	0.95	0.30	3.85	0.97	11.93	0.13
H2	H2	H_OUT	5423.80	5420.00	5425.30	5421.50	Pipe	1		1.5	Concrete	Circular	62.83	6.05	0.012	5424.62	5420.27	5424.81	5421.56	0.27	9.13	0.53	3.53	0.42	6.04	0.27	9.06	1.97	30.10	0.29
I1	I1	I2	5409.50	5398.60	5411.50	5400.60	Pipe	1		2	Concrete	Circular	374.54	2.91	0.012	5410.10	5398.87	5410.26	5399.53	0.27	6.47	0.44	3.18	0.39	2.92	0.27	6.47	1.65	44.97	0.16
I2	I2	I3	5398.60	5389.40	5400.60	5391.40	Pipe	1		2	Concrete	Circular	216.39	4.25	0.012	5399.31	5389.75	5399.55	5391.05	0.35	9.14	0.64	3.87	0.38	4.26	0.35	9.12	3.37	54.36	0.07
I3	I3	I4	5389.40	5376.20	5391.40	5378.20	Pipe	1		2	Concrete	Circular	278.75	4.74	0.012	5390.18	5376.59	5390.45	5378.20	0.39	10.20	0.73	4.16	0.38	4.73	0.39	10.20	4.32	57.37	0.05
I4	I4	I_OUT	5375.07	5370.00	5377.07	5372.00	Pipe	1		2	Concrete	Circular	67.69	7.49	0.012	5376.37	5370.40	5376.68	5372.91	0.39	12.98	0.84	4.51	0.39	7.50	0.40	12.66	5.64	72.15	0.46
J1	J1	J2	5367.50	5365.20	5369.50	5367.20	Pipe	1		2	Concrete	Circular	185.16	1.24	0.012	5368.01	5365.49	5368.15	5365.79	0.29	4.39	0.38	2.93	0.40	1.25	0.29	4.39	1.22	29.38	0.13
J2	J2	J6	5365.20	5364.53	5367.20	5366.53	Pipe	1		2	Concrete	Circular	56.08	1.19	0.012	5365.76	5364.92	5365.94	5365.32	0.39	5.15	0.51	3.42	0.38	1.20	0.39	5.09	2.18	28.82	0.05
J3	J3	J4	5369.60	5368.00	5371.10	5369.50	Pipe	1		1.5	Concrete	Circular	100.12	1.60	0.012	5370.18	5368.31	5370.34	5368.71	0.31	5.07	0.43	3.15	0.42	1.60	0.31	5.06	1.31	15.47	0.15
J4	J4	J5	5367.50	5365.30	5369.50	5367.30	Pipe	1		2	Concrete	Circular	175.14	1.26	0.012	5367.91	5365.60	5368.05	5365.91	0.30	4.49	0.40	2.96	0.38	1.26	0.30	4.48	1.31	29.55	0.01
J5	J5	J6	5365.30	5364.51	5367.30	5366.51	Pipe	1		2	Concrete	Circular	59.09	1.34	0.012	5365.93	5364.93	5366.13	5365.42	0.41	5.68	0.57	3.63	0.38	1.35	0.42	5.62	2.67	30.48	0.06
J6	J6	J_OUT	5362.61	5360.00	5364.61	5362.00	Pipe	1		2	Concrete	Circular	57.54	4.54	0.012	5364.02	5360.45	5364.33	5362.10	0.43	10.72	0.82	4.45	0.39	4.53	0.45	10.28	5.39	56.15	0.59
K1	K1	K2	5401.60	5388.10	5403.60	5390.10	Pipe	1		2	Concrete	Circular	230.12	5.87	0.012	5402.11	5388.30	5402.24	5389.18	0.20	7.50	0.38	2.92	0.40	5.87	0.20	7.50	1.2	63.85	0.13
K2	K2	K3	5388.10	5379.10	5390.10	5381.10	Pipe	1		2	Concrete	Circular	157.17	5.73	0.012	5388.67	5379.37	5388.85	5380.62	0.27	8.96	0.52	3.44	0.38	5.72	0.27	8.93	2.23	63.09	0.05
K3	K3	K_OUT	5379.10	5372.00	5381.10	5374.00	Pipe	1		2	Concrete	Circular	70.11	10.13	0.012	5379.85	5372.27	5380.06	5374.47	0.27	11.93	0.60	3.74	0.38	10.13	0.27	11.86	2.97	83.89	0.14

HYDRAULIC CALCULATION NOTES:

1. HYDRAULIC CALCULATIONS PREPARED USING GEOPAK DRAINAGE.
2. OUTSIDE MAXIMUM ALLOWABLE PONDING WIDTH OF OUTSIDE SHOULDER AND OUTER LANE UTILIZED FOR DESIGN IN ACCORDANCE WITH TXDOT GUIDANCE.
3. INSIDE MAXIMUM ALLOWABLE PONDING WIDTH OF INSIDE SHOULDER AND INSIDE LANE UTILIZED FOR DESIGN IN ACCORDANCE WITH TXDOT GUIDANCE.

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED PROFESSIONAL ENGINEER
7/2/2021

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

Texas Department of Transportation
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US 62/180
HYDRAULIC CALCULATIONS

5-YEAR

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)	US 62/180

DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	118

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Inlets

Inlet I.D.	Inlet Type			Inlet Location				Top/Inlet	Roadway Gutter Data			Tc	100% AEP	Intercept	Q Bypass			Ponded Width				Ponded Depth	
				Cntrl Chain	Inlet Station	Offset (ft)	LT/RT	Elev (ft)	Long (%)	Trans (%)	n	(min)	Inlet Q (cfs)	Capacity (cfs)	Into (cfs)	Actual (cfs)	To Inlet I.D.	Allowed (ft)	Actual (ft)	LT (Sag) (ft)	RT (Sag) (ft)	Allowed (ft)	Actual (ft)
A1	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	55+44.00	1.75	LT	4933.70	6.50	3.10	0.015	10.00	2.3	1.59	0.28	0.71	A2	15.50	5.16			0.50	0.16
A2	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	52+52.00	1.75	LT	4914.43	6.80	2.50	0.015	10.00	2.44	1.54	0.71	0.90	A3	15.50	5.94			0.50	0.15
A3	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	49+89.00	3.50	LT	4896.98	6.07	1.80	0.015	10.00	1.7	1.03	0.90	0.67	FL-6	15.50	6.56			0.50	0.12
B1	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	67+60.00	1.75	LT	5015.17	6.20	2.40	0.015	10.00	2.59	1.59	0.50	1.01	B2	15.50	6.39			0.50	0.15
B2	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	64+50.00	1.75	LT	4994.09	7.33	4.00	0.015	10.00	4.63	2.98	2.72	1.65	B3	15.50	5.59			0.50	0.22
B3	(TY SS)(5FT)(LEFT)	Curb and Grate Inlet	On Grade	CL	61+31.21	1.75	LT	4972.90	7.10	3.20	0.015	10.00	3.78	3.09	1.65	0.69	B4	15.50	5.96			0.50	0.19
B4	(TY SS)(5FT)(LEFT)	Curb and Grate Inlet	On Grade	CL	58+40.00	1.75	LT	4953.35	6.40	3.40	0.015	10.00	2.63	2.35	0.69	0.28	A1	15.50	5.14			0.50	0.17
C1	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	83+79.00	1.75	LT	5123.57	7.20	3.30	0.015	10.00	2.36	1.66	1.15	0.70	C3	15.50	4.92			0.50	0.16
C3	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	80+24.19	1.75	LT	5099.40	6.90	3.90	0.015	10.00	3.23	2.23	0.70	1.00	C4	15.50	5.04			0.50	0.20
C4	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	78+45.00	1.75	LT	5087.63	6.86	3.40	0.015	10.00	2.23	1.61	1.00	0.63	FR-16	15.50	4.74			0.50	0.16
C5	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	74+31.00	1.75	LT	5059.26	6.57	2.50	0.015	10.00	1.61	1.12		0.50	B1	15.50	5.20			0.50	0.13
D1	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	88+92.00	1.75	LT	5157.32	6.12	3.20	0.015	10.00	4.51	2.67	3.04	1.83	D3	15.50	6.59			0.50	0.21
D3	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	85+75.00	1.75	LT	5136.01	7.26	4.70	0.015	10.00	3.97	2.81	1.83	1.15	C1	15.50	4.75			0.50	0.23
E1	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	106+50.00	1.75	LT	5208.55	6.10	3.70	0.015	10.00	3.24	2.21	1.94	1.04	E2	15.50	5.32			0.50	0.20
E2	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	102+20.00	1.75	LT	5190.55	4.90	3.40	0.015	10.00	3.78	2.41	1.04	1.37	FL-12	15.50	6.18			0.50	0.21
F1	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	116+50.00	1.75	LT	5273.31	6.90	3.20	0.015	10.00	9.95	4.77	7.86	5.18	F2	15.50	8.59			0.50	0.28
F2	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	113+75.00	1.75	LT	5254.73	6.40	2.70	0.015	10.00	7.08	3.46	5.18	3.62	F3	15.50	8.59			0.50	0.23
F3	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	111+25.00	1.75	LT	5238.26	6.40	2.70	0.015	10.00	5.26	2.79	3.62	2.46	F4	15.50	7.69			0.50	0.21
F4	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	108+35.00	1.75	LT	5219.53	6.40	3.00	0.015	10.00	4.59	2.64	2.46	1.94	E1	15.50	6.84			0.50	0.20
G2	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	134+50.00	1.75	RT	5391.10	6.50	2.50	0.015	10.00	3.67	2.08	1.03	1.59	FR-20	15.50	7.03			0.50	0.18
G3	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	138+80.00	1.75	RT	5415.86	3.20	2.60	0.015	10.00	2.81	1.77	0.66	1.03	G2	15.50	7.08			0.50	0.18
G5	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	142+20.00	1.75	RT	5426.67	3.00	2.50	0.015	10.00	2.02	1.36		0.66	G3	15.50	6.50			0.50	0.16
H1	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	147+55.00	1.75	RT	5428.56	0.90	3.20	0.015	10.00	1.46	1.20		0.26	H2	15.50	6.17			0.50	0.20
H2	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	149+76.00	1.75	RT	5426.43	0.90	3.20	0.015	10.00	1.75	1.40	0.26	0.35	FR-21	15.50	6.61			0.50	0.21
I1	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	163+00.00	1.75	RT	5412.07	2.20	4.20	0.015	10.00	4.2	2.91	1.73	1.29	I2	15.50	6.55			0.50	0.28
I2	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	166+75.00	1.75	RT	5401.14	3.70	3.80	0.015	10.00	3.87	2.58	1.29	1.29	I3	15.50	6.13			0.50	0.23
I3	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	168+91.26	1.75	RT	5392.32	4.20	4.00	0.015	10.00	2.71	1.98	1.29	0.74	I4	15.50	5.08			0.50	0.20
I4	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	171+70.00	1.75	RT	5379.50	4.90	3.50	0.015	10.00	2.73	1.89	0.74	0.83	J1	15.50	5.37			0.50	0.19
J1	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	174+25.00	1.75	RT	5370.06	2.50	3.60	0.015	10.00	2.66	1.92	0.83	0.75	J2	15.50	5.93			0.50	0.21
J2	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	176+10.00	1.75	RT	5367.74	0.90	4.10	0.015	10.00	2.18	1.78	0.75	0.40	J6	15.50	6.15			0.50	0.25
J3	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	180+00.00	1.75	RT	5372.09	2.90	3.40	0.015	10.00	1.96	1.46		0.50	J5	15.50	5.33			0.50	0.18
J5	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	177+25.00	1.75	RT	5367.81	0.90	4.10	0.015	10.00	3.4	2.61	1.36	0.80	J6	15.50	7.26			0.50	0.30
J6	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	In Sag	CL	176+66.00	1.75	RT	5367.64	n/a	4.10	0.015	10.00	2	10.50	1.20			15.50	7.39	5.13	5.13	0.50	0.30
K1	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	186+50.00	1.75	RT	5404.17	5.70	3.50	0.015	10.00	3.91	2.49	2.11	1.42	K2	15.50	5.98			0.50	0.21
K2	(TY SS)(5FT)(NONE)	Curb and Grate Inlet	On Grade	CL	184+20.00	1.75	RT	5390.65	5.70	2.50	0.015	10.00	2.95	1.78	1.42	1.18	K3	15.50	6.64			0.50	0.17

HYDRAULIC CALCULATION NOTES:

1. HYDRAULIC CALCULATIONS PREPARED USING GEOPAK DRAINAGE.
2. OUTSIDE MAXIMUM ALLOWABLE PONDING WIDTH OF OUTSIDE SHOULDER AND OUTER LANE UTILIZED FOR DESIGN IN ACCORDANCE WITH TXDOT GUIDANCE.
3. INSIDE MAXIMUM ALLOWABLE PONDING WIDTH OF INSIDE SHOULDER AND INSIDE LANE UTILIZED FOR DESIGN IN ACCORDANCE WITH TXDOT GUIDANCE.

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED
PROFESSIONAL ENGINEER
6/1/2021

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

Texas Department of Transportation
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US 62/180
HYDRAULIC CALCULATIONS

100-YEAR

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)		US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No. / SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035, ETC. / 119

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Inlets

Inlet I.D.	Inlet Type		Inlet Location				Top/Inlet Elev (ft)	Roadway Gutter Data			Tc (min)	100% AEP Inlet Q (cfs)	Intercept Capacity (cfs)	Q Bypass			Ponded Width				Ponded Depth	
			Cntrl Chain	Inlet Station	Offset (ft)	LT/RT		Long (%)	Trans (%)	n				Into (cfs)	Actual (cfs)	To Inlet I.D.	Allowed (ft)	Actual (ft)	LT (Sag) (ft)	RT (Sag) (ft)	Allowed (ft)	Actual (ft)
K3	(TY SS)(5FT)(NONE)	Curb and Grate Inlet On Grade	CL	182+63.00	1.75	RT	5382.07	5.10	2.30	0.015	10.00	2.28	1.42	1.18	0.86	J5	15.50	6.49			0.50	0.15
FL-1	CURB CUT & FLUME (5')	Curb Inlet In Sag	CL	10+91.00	34.80	LT	4652.75	n/a	5.80	0.015	10.00	16.9	6.72	12.26		Check	21.00	27.26	1.65	9.23	0.50	1.58
FL-2	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	16+62.00	38.50	LT	4667.72	4.20	3.10	0.015	10.00	15.5	3.28	10.51	12.26	FL-1	21.00	11.45			0.50	0.35
FL-3	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	24+10.00	37.60	LT	4718.73	7.10	3.40	0.015	10.00	13.3	2.80	9.32	10.51	FL-2	21.00	9.25			0.50	0.31
FL-4	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	30+15.00	38.00	LT	4761.36	7.10	3.40	0.015	10.00	12	2.67	6.46	9.32	FL-3	21.00	8.89			0.50	0.30
FL-5	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	38+25.00	38.50	LT	4818.34	7.10	3.30	0.015	10.00	8.71	2.25	5.55	6.46	FL-4	21.00	8.04			0.50	0.27
FL-6	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	43+00.00	38.30	LT	4851.47	7.10	3.30	0.015	10.00	7.67	2.12	2.45	5.55	FL-5	21.00	7.66			0.50	0.25
FL-7	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	52+55.00	40.00	LT	4915.13	8.00	2.00	0.015	10.00	2.85	1.07		1.78	FL-6	21.00	7.07			0.50	0.14
FL-8	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	67+65.00	38.00	LT	5016.15	6.00	1.00	0.015	10.00	2.57	0.85	0.92	1.72	B2	21.00	11.08			0.50	0.11
FL-9	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	72+20.00	37.50	LT	5044.57	7.00	1.50	0.015	10.00	1.69	0.77		0.92	FL-8	21.00	7.14			0.50	0.11
FR-1	CURB CUT & FLUME (5')	Curb Inlet In Sag	CL	10+92.00	38.50	RT	4653.26	n/a	5.80	0.015	10.00	23.1	6.72	18.88		Check	21.00	51.03	10.38	1.86	0.50	2.96
FR-2	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	15+20.00	37.50	RT	4660.97	4.20	3.40	0.015	10.00	23	4.12	18.06	18.88	FR-1	21.00	12.52			0.50	0.43
FR-3	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	22+45.00	38.70	RT	4707.21	7.10	3.40	0.015	10.00	21.6	3.54	16.57	18.06	FR-2	21.00	11.08			0.50	0.38
FR-4	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	30+15.00	38.50	RT	4761.48	7.10	3.40	0.015	10.00	20	3.41	14.17	16.57	FR-3	21.00	10.76			0.50	0.37
FR-5	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	38+90.00	38.30	RT	4823.05	7.10	3.30	0.015	10.00	17.3	3.15	14.67	14.17	FR-4	21.00	10.39			0.50	0.34
FR-6	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	43+00.00	38.30	RT	4851.94	7.10	3.30	0.015	10.00	17.9	3.19	13.42	14.67	FR-5	21.00	10.52			0.50	0.35
FR-7	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	49+60.00	39.00	RT	4892.92	7.10	1.50	0.015	10.00	15.6	2.17	13.28	13.42	FR-6	21.00	16.37			0.50	0.25
FR-8	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	53+31.00	41.70	RT	4917.68	7.10	2.60	0.015	10.00	16	2.75	9.80	13.28	FR-7	21.00	11.72			0.50	0.30
FR-9	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	58+40.00	38.50	RT	4951.67	6.40	3.30	0.015	10.00	12.6	2.76	7.54	9.80	FR-8	21.00	9.40			0.50	0.31
FL-10	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	91+75.00	38.30	LT	5172.20	3.70	0.90	0.015	10.00	4.17	1.13	3.14	3.04	D1	21.00	15.53			0.50	0.14
FL-11	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	93+25.00	38.00	LT	5177.77	1.20	1.90	0.015	10.00	5.22	2.08	3.05	3.14	FL-10	21.00	13.07			0.50	0.25
FL-12	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	97+00.00	38.30	LT	5185.75	1.20	1.90	0.015	10.00	5.11	2.05	1.37	3.05	FL-11	21.00	12.96			0.50	0.25
FL-13	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	119+00.00	39.80	LT	5289.81	6.30	3.50	0.015	10.00	10.4	2.59	8.83	7.86	F1	21.00	8.48			0.50	0.30
FL-14	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	121+75.00	39.50	LT	5306.56	6.30	3.50	0.015	10.00	11.6	2.72	6.12	8.83	FL-13	21.00	8.80			0.50	0.31
FL-15	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	129+75.00	39.50	LT	5358.27	6.30	2.60	0.015	10.00	8.17	2.05	2.95	6.12	FL-14	21.00	9.31			0.50	0.24
FL-16	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	137+88.00	39.00	LT	5409.30	6.20	4.50	0.015	10.00	4.89	1.94		2.95	FL-15	21.00	5.47			0.50	0.25
FL-17	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	153+30.00	37.50	LT	5422.80	0.90	1.50	0.015	10.00	5.29	2.03		3.25	FL-18	21.00	16.07			0.50	0.24
FL-18	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	159+15.00	37.50	LT	5416.95	1.40	4.50	0.015	10.00	7.05	3.23	3.25	3.82	FL-19	21.00	8.29			0.50	0.37
FL-19	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	165+14.00	37.20	LT	5404.06	2.80	6.10	0.015	10.00	7.65	3.25	3.82	4.39	FL-20	21.00	6.20			0.50	0.38
FL-20	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	171+19.00	36.80	LT	5379.99	4.70	2.60	0.015	10.00	8.17	2.19	4.39	5.98	FL-21	21.00	9.84			0.50	0.26
FL-21	CURB CUT & FLUME (5')	Curb Inlet In Sag	CL	176+55.00	36.80	LT	5366.05	n/a	4.50	0.015	10.00	9.55	6.26	5.98		Check	21.00	14.72	10.27	1.84	0.50	0.66
FL-22	CURB CUT & FLUME (5')	Curb Inlet In Sag	CL	176+85.00	36.80	LT	5366.19	n/a	5.80	0.015	10.00	3.67	6.26	1.93			21.00	6.04	1.10	6.13	0.50	0.35
FL-23	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	179+40.00	37.00	LT	5368.81	2.10	5.10	0.015	10.00	4.29	2.36	2.45	1.93	FL-22	21.00	5.90			0.50	0.30
FL-24	CURB CUT & FLUME (5')	Curb Inlet On Grade	CL	182+19.00	38.00	LT	5377.86	6.40	5.40	0.015	10.00	4.38	1.93	2.68	2.45	FL-23	21.00	4.66			0.50	0.25

HYDRAULIC CALCULATION NOTES:

1. HYDRAULIC CALCULATIONS PREPARED USING GEOPAK DRAINAGE.
2. OUTSIDE MAXIMUM ALLOWABLE PONDING WIDTH OF OUTSIDE SHOULDER AND OUTER LANE UTILIZED FOR DESIGN IN ACCORDANCE WITH TXDOT GUIDANCE.
3. INSIDE MAXIMUM ALLOWABLE PONDING WIDTH OF INSIDE SHOULDER AND INSIDE LANE UTILIZED FOR DESIGN IN ACCORDANCE WITH TXDOT GUIDANCE.

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED
PROFESSIONAL ENGINEER
6/1/2021

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

Texas Department of Transportation
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US 62/180
HYDRAULIC CALCULATIONS

100-YEAR

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:	6	TEXAS	F 2021(690)		US 62/180	
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	120

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Inlets

Inlet I.D.	Inlet Type			Inlet Location				Top/Inlet Elev (ft)	Roadway Gutter Data			Tc (min)	100% AEP Inlet Q (cfs)	Intercept Capacity (cfs)	Q Bypass			Ponded Width				Ponded Depth	
				Cntrl Chain	Inlet Station	Offset (ft)	LT/RT		Long (%)	Trans (%)	n				Into (cfs)	Actual (cfs)	To Inlet I.D.	Allowed (ft)	Actual (ft)	LT (Sag) (ft)	RT (Sag) (ft)	Allowed (ft)	Actual (ft)
FL-25	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	184+80.00	37.50	LT	5392.50	6.40	4.90	0.015	10.00	4.6	1.92	1.51	2.68	FL-24	21.00	5.04			0.50	0.25
FL-26	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	188+85.00	39.00	LT	5416.00	6.40	6.10	0.015	10.00	3.2	1.68	0.69	1.51	FL-25	21.00	3.83			0.50	0.23
FL-27	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	192+78.00	30.00	LT	5438.06	5.30	2.40	0.015	10.00	1.59	0.90		0.69	FL-26	21.00	5.48			0.50	0.13
FR-10	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	66+10.00	38.50	RT	5002.85	6.40	4.70	0.015	10.00	10.4	2.89	8.56	7.54	FR-9	21.00	7.03			0.50	0.33
FR-11	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	68+90.00	38.00	RT	5021.85	7.10	4.70	0.015	10.00	11.5	2.97	7.67	8.56	FR-10	21.00	7.15			0.50	0.34
FR-12	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	74+40.00	38.50	RT	5058.93	6.50	3.60	0.015	10.00	10.2	2.57	8.43	7.67	FR-11	21.00	8.22			0.50	0.30
FR-13	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	77+05.00	38.50	RT	5076.13	7.00	4.70	0.015	10.00	11.4	2.96	5.79	8.43	FR-12	21.00	7.14			0.50	0.34
FR-14	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	85+13.00	39.00	RT	5129.82	5.70	1.70	0.015	10.00	7.51	1.72	3.03	5.79	FR-13	21.00	11.99			0.50	0.20
FR-15	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	91+80.00	38.50	RT	5170.86	6.70	3.90	0.015	10.00	4.83	1.80		3.03	FR-14	21.00	5.87			0.50	0.23
FR-16	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	102+37.00	38.50	RT	5189.60	3.10	3.60	0.015	10.00	13	3.41	9.25	9.56	Check	21.00	10.32			0.50	0.37
FR-17	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	108+05.00	38.00	RT	5215.68	5.90	4.50	0.015	10.00	11.7	3.06	7.40	8.63	FR-16	21.00	7.65			0.50	0.34
FR-18	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	114+75.00	38.00	RT	5259.00	6.60	5.80	0.015	10.00	10.5	3.12	6.08	7.40	FR-17	21.00	6.14			0.50	0.36
FR-19	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	121+50.00	38.00	RT	5304.24	6.60	5.80	0.015	10.00	8.95	2.87	4.30	6.08	FR-18	21.00	5.78			0.50	0.34
FR-20	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	128+50.00	37.50	RT	5350.17	6.30	1.40	0.015	10.00	5.67	1.37	1.59	4.30	FR-19	21.00	11.96			0.50	0.17
FR-21	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	154+35.00	49.50	RT	5421.68	0.80	2.20	0.015	10.00	3.4	1.90	0.35	1.51	Check	21.00	10.96			0.50	0.24
FR-22	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	160+35.00	39.00	RT	5417.39	1.10	1.00	0.015	10.00	3.02	1.28		1.73	I1	21.00	16.16			0.50	0.16
FR-23	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	189+20.00	38.60	RT	5420.46	5.30	1.80	0.015	10.00	3.32	1.21	2.97	2.11	K1	21.00	8.64			0.50	0.16
FR-24	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	190+30.00	38.60	RT	5426.10	5.30	1.80	0.015	10.00	4.35	1.38	3.79	2.97	FR-23	21.00	9.56			0.50	0.17
FR-25	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	191+33.00	38.60	RT	5431.15	5.30	3.00	0.015	10.00	5.67	1.88	4.80	3.79	FR-24	21.00	7.67			0.50	0.23
FR-26	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	192+60.00	38.50	RT	5437.26	5.30	2.30	0.015	10.00	6.64	1.84	5.94	4.80	FR-25	21.00	9.61			0.50	0.22
FR-27	CURB CUT & FLUME (5')	Curb Inlet	On Grade	CL	193+80.00	38.50	RT	5442.35	5.30	2.30	0.015	10.00	7.94	2.01		5.94	FR-26	21.00	10.28			0.50	0.24

HYDRAULIC CALCULATION NOTES:

1. HYDRAULIC CALCULATIONS PREPARED USING GEOPAK DRAINAGE.
2. OUTSIDE MAXIMUM ALLOWABLE PONDING WIDTH OF OUTSIDE SHOULDER AND OUTER LANE UTILIZED FOR DESIGN IN ACCORDANCE WITH TXDOT GUIDANCE.
3. INSIDE MAXIMUM ALLOWABLE PONDING WIDTH OF INSIDE SHOULDER AND INSIDE LANE UTILIZED FOR DESIGN IN ACCORDANCE WITH TXDOT GUIDANCE.

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED
PROFESSIONAL ENGINEER
6/1/2021

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

Texas Department of Transportation
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US 62/180
HYDRAULIC CALCULATIONS

100-YEAR

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:	6	TEXAS	F 2021(690)		US 62/180	
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	121

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Conveyance

Link I.D.	Node I.D. US	Node I.D. DS	Invert Elev US (ft)	Invert Elev DS (ft)	Soffit Elev US (ft)	Soffit Elev DS (ft)	Link Type	No. of Barrels	Span (ft)	Rise/ Dia (ft)	Link Mtrl	Shape	Hyd Length (ft)	Slope (%)	Manning's "n"	H.G.L. US Elev (ft)	H.G.L. DS Elev (ft)	E.G.L. US Elev (ft)	E.G.L. DS Elev (ft)	Unif Depth (ft)	Unif Vel (ft/s)	Crit Depth (ft)	Crit Vel (ft/s)	Crit Slope (%)	Frictn Slope (%)	Actual Depth (ft)	Actual Vel (ft/s)	Total Q (cfs)	Link Capacity (cfs)	Junctn Loss (ft)
A1	A1	A2	4931.20	4911.90	4933.20	4913.90	Pipe	1		2	Concrete	Circular	292.06	6.61	0.012	4931.87	4912.15	4932.04	4913.45	0.25	9.14	0.49	3.35	0.38	6.61	0.25	9.14	2.01	67.77	0.17
A2	A2	A3	4911.90	4893.90	4913.90	4895.90	Pipe	1		2	Concrete	Circular	263.03	6.84	0.012	4912.65	4894.23	4912.89	4896.16	0.33	11.14	0.68	3.99	0.38	6.85	0.33	11.11	3.74	68.97	0.07
A3	A3	A_OUT	4892.54	4883.00	4894.54	4885.00	Pipe	1		2	Concrete	Circular	101.95	9.36	0.012	4893.41	4883.34	4893.68	4886.02	0.33	13.17	0.75	4.23	0.39	9.36	0.34	13.10	4.54	80.64	0.12
B1	B1	B2	5012.60	4991.60	5014.60	4993.60	Pipe	1		2	Concrete	Circular	310.03	6.77	0.012	5013.28	4991.85	5013.46	4993.20	0.25	9.33	0.50	3.38	0.38	6.77	0.25	9.33	2.1	68.61	0.18
B2	B2	B3	4991.60	4970.20	4993.60	4972.20	Pipe	1		2	Concrete	Circular	318.80	6.71	0.012	4992.38	4970.54	4992.63	4972.52	0.34	11.28	0.70	4.07	0.38	6.71	0.34	11.28	4	68.30	0.08
B3	B3	B4	4970.20	4950.15	4972.20	4952.15	Pipe	1		2	Concrete	Circular	291.27	6.88	0.012	4971.16	4950.57	4971.49	4953.17	0.42	12.91	0.88	4.63	0.40	6.89	0.42	12.91	6.14	69.17	0.08
B4	B4	B_OUT	4948.85	4936.00	4950.85	4938.00	Pipe	1		2	Concrete	Circular	90.86	14.14	0.012	4950.44	4936.40	4950.84	4941.37	0.40	18.05	1.01	5.07	0.42	14.15	0.40	17.81	8.08	99.14	0.58
C1	C1	C2	5121.10	5118.06	5122.60	5119.56	Pipe	1		1.5	Concrete	Circular	46.09	6.60	0.012	5121.66	5118.27	5121.80	5119.30	0.21	8.15	0.41	3.06	0.41	6.60	0.21	8.09	1.21	31.44	0.15
C2	C2	C3	5117.66	5096.20	5119.66	5098.20	Pipe	1		2	Concrete	Circular	308.48	6.96	0.012	5118.05	5096.39	5118.18	5097.40	0.19	7.99	0.38	2.90	0.39	6.96	0.19	7.99	1.21	69.53	0.01
C3	C3	C4	5096.20	5085.10	5098.20	5087.10	Pipe	1		2	Concrete	Circular	179.35	6.19	0.012	5096.96	5085.44	5097.21	5087.24	0.34	10.75	0.68	3.99	0.38	6.20	0.34	10.73	3.74	65.59	0.09
C4	C4	C5	5085.10	5056.33	5087.10	5058.33	Pipe	1		2	Concrete	Circular	413.61	6.96	0.012	5085.95	5056.71	5086.24	5059.02	0.38	12.18	0.79	4.34	0.39	6.95	0.38	12.18	4.97	69.53	0.06
C5	C5	C_OUT	5054.78	5010.00	5056.78	5012.00	Pipe	1		2	Concrete	Circular	69.84	64.12	0.012	5056.19	5010.25	5056.54	5023.15	0.25	28.90	0.91	4.74	0.40	64.13	0.25	28.64	6.59	211.10	0.51
D1	D1	D2	5154.80	5153.48	5156.80	5155.48	Pipe	1		2	Concrete	Circular	19.53	6.76	0.012	5155.37	5153.70	5155.51	5154.66	0.21	8.38	0.42	3.07	0.39	6.76	0.22	7.83	1.47	68.53	0.15
D2	D2	D3	5153.48	5132.62	5155.48	5134.62	Pipe	1		2	Concrete	Circular	297.39	7.01	0.012	5153.91	5132.83	5154.05	5133.95	0.21	8.49	0.42	3.07	0.39	7.01	0.21	8.49	1.47	69.82	0.01
D3	D3	D_OUT	5131.15	5106.00	5133.15	5108.00	Pipe	1		2	Concrete	Circular	108.90	23.09	0.012	5132.17	5106.24	5132.41	5110.68	0.24	16.87	0.66	3.95	0.38	23.09	0.24	16.80	3.6	126.69	0.35
E1	E1	E2	5204.00	5186.50	5205.50	5188.00	Pipe	1		1.5	Concrete	Circular	430.11	4.07	0.012	5204.58	5186.74	5204.73	5187.51	0.24	7.02	0.42	3.16	0.43	4.07	0.24	7.02	1.3	24.69	0.16
E2	E2	E_OUT	5186.50	5186.00	5188.00	5187.50	Pipe	1		1.5	Concrete	Circular	63.72	0.78	0.012	5187.75	5186.66	5188.06	5187.11	0.66	5.40	0.77	4.42	0.46	0.79	0.66	5.37	4.04	10.84	0.48
F1	F1	F2	5270.30	5252.20	5272.30	5254.20	Pipe	1		2	Concrete	Circular	275.11	6.58	0.012	5270.98	5252.45	5271.16	5253.78	0.25	9.23	0.50	3.39	0.38	6.58	0.25	9.20	2.09	67.62	0.18
F2	F2	F3	5252.20	5235.70	5254.20	5237.70	Pipe	1		2	Concrete	Circular	250.11	6.60	0.012	5252.97	5236.04	5253.23	5238.00	0.34	11.21	0.70	4.07	0.38	6.60	0.34	11.21	3.99	67.71	0.07
F3	F3	F4	5235.70	5216.35	5237.70	5218.35	Pipe	1		2	Concrete	Circular	290.10	6.67	0.012	5236.60	5216.75	5236.92	5219.17	0.40	12.45	0.84	4.51	0.39	6.68	0.40	12.42	5.63	68.09	0.07
F4	F4	F_OUT	5214.97	5200.00	5216.97	5202.00	Pipe	1		2	Concrete	Circular	82.62	18.12	0.012	5216.53	5200.37	5216.92	5206.15	0.37	19.46	0.99	5.00	0.41	18.11	0.37	19.20	7.75	112.22	0.57
G1	G1	G_OUT	5297.07	5290.00	5299.07	5292.00	Pipe	1		2	Concrete	Circular	107.68	6.57	0.012	5298.14	5290.45	5298.49	5293.08	0.44	13.09	0.93	4.79	0.40	6.56	0.45	12.98	6.81	67.55	0.14
G2	G2	G1	5387.90	5298.44	5389.90	5300.44	Pipe	1		2	Concrete	Circular	1367.49	6.54	0.012	5388.92	5298.89	5389.27	5301.55	0.45	13.08	0.93	4.79	0.40	6.55	0.45	13.08	6.81	67.43	0.09
G3	G3	G2	5412.70	5387.90	5414.70	5389.90	Pipe	1		2	Concrete	Circular	429.94	5.77	0.012	5413.50	5388.26	5413.76	5390.09	0.36	10.83	0.72	4.12	0.38	5.77	0.36	10.83	4.17	63.32	0.08
G4	G4	G3	5422.80	5412.70	5424.80	5414.70	Pipe	1		2	Concrete	Circular	307.07	3.29	0.012	5423.31	5412.99	5423.48	5413.79	0.29	7.16	0.49	3.35	0.38	3.28	0.29	7.16	2.02	47.81	0.02
G5	G5	G4	5424.00	5423.30	5425.50	5424.80	Pipe	1		1.5	Concrete	Circular	33.03	2.12	0.012	5424.74	5423.66	5424.93	5424.25	0.35	6.36	0.54	3.57	0.42	2.13	0.36	6.11	2.02	17.82	0.20
H1	H1	H2	5425.90	5423.80	5427.40	5425.30	Pipe	1		1.5	Concrete	Circular	221.12	0.95	0.012	5426.52	5424.17	5426.68	5424.46	0.37	4.34	0.45	3.23	0.41	0.95	0.37	4.34	1.46	11.93	0.16
H2	H2	H_OUT	5423.80	5420.00	5425.30	5421.50	Pipe	1		1.5	Concrete	Circular	62.83	6.05	0.012	5424.82	5420.33	5425.07	5421.94	0.33	10.28	0.65	4.00	0.44	6.05	0.33	10.14	2.95	30.10	0.37
I1	I1	I2	5409.50	5398.60	5411.50	5400.60	Pipe	1		2	Concrete	Circular	374.54	2.91	0.012	5410.24	5398.93	5410.44	5399.76	0.33	7.29	0.55	3.55	0.38	2.91	0.33	7.29	2.47	44.97	0.20
I2	I2	I3	5398.60	5389.40	5400.60	5391.40	Pipe	1		2	Concrete	Circular	216.39	4.25	0.012	5399.48	5389.83	5399.78	5391.48	0.43	10.27	0.79	4.36	0.39	4.24	0.43	10.27	5.05	54.36	0.09
I3	I3	I4	5389.40	5376.20	5391.40	5378.20	Pipe	1		2	Concrete	Circular	278.75	4.74	0.012	5390.37	5376.67	5390.71	5378.73	0.47	11.48	0.90	4.71	0.40	4.74	0.47	11.47	6.47	57.37	0.07
I4	I4	I_OUT	5375.07	5370.00	5377.07	5372.00	Pipe	1		2	Concrete	Circular	67.69	7.49	0.012	5376.70	5370.50	5377.11	5373.52	0.48	14.61	1.04	5.14	0.42	7.49	0.50	13.91	8.45	72.15	0.59
J1	J1	J2	5367.50	5365.20	5369.50	5367.20	Pipe	1		2	Concrete	Circular	185.16	1.24	0.012	5368.13	5365.55	5368.30	5365.93	0.35	4.95	0.47	3.27	0.39	1.25	0.35	4.95	1.83	29.38	0.17
J2	J2	J6	5365.20	5364.53	5367.20	5366.53	Pipe	1		2	Concrete	Circular	56.08	1.19	0.012	5365.89	5365.01	5366.12	5365.51	0.47	5.78	0.63	3.84	0.38	1.20	0.48	5.70	3.26	28.82	0.06
J3	J3	J4	5369.60	5368.00	5371.10	5369.50	Pipe	1		1.5	Concrete	Circular	100.12	1.60	0.012	5370.33	5368.37	5370.52	5368.88	0.37	5.69	0.53	3.54	0.42	1.60	0.37	5.67	1.96	15.47	0.19
J4	J4	J5	5367.50	5365.30	5369.50	5367.30	Pipe	1		2	Concrete	Circular	175.14	1.26	0.012	5368.00	5365.66	5368.18	5366.06	0.36	5.07	0.49	3.32	0.38	1.26	0.36	5.07	1.96	29.55	0.02
J5	J5	J6	5365.30	5364.51	5367.30	5366.51	Pipe	1		2	Concrete	Circular	59.09	1.34	0.012	5366.08	5365.02	5366.33	5365.64	0.51	6.38	0.70	4.07	0.38	1.34	0.51	6.26	4	30.48	0.07
J6	J6	J_OUT	5362.61	5360.00	5364.61	5362.00	Pipe	1		2	Concrete	Circular	57.54	4.54	0.012	5364.38	5360.56	5364.78	5362.54	0.53	12.05	1.01	5.06	0.42	4.54	0.56	11.28	8.07	56.15	0.76
K1	K1	K2	5401.60	5388.10	5403.60	5390.10	Pipe	1		2	Concrete	Circular	230.12	5.87	0.012	5402.23	5388.34	5402.39	5389.46	0.24	8.47	0.46	3.24	0.38	5.86	0.24	8.47	1.8	63.85	0.16
K2	K2	K3	5388.10	5379.10	5390.10	5381.10	Pipe	1		2	Concrete	Circular	157.17	5.73	0.012	5388.80	5379.42	5389.04	5381.02	0.32	10.11	0.64	3.86	0.38	5.74	0.32	10.08	3.33	63.09	0.07
K3	K3	K_OUT	5379.10	5372.00	5381.10	5374.00	Pipe	1		2	Concrete	Circular	70.11	10.13	0.012	5380.02	5372.33	5380.30	5375.08	0.32	13.44	0.74	4.20	0.38	10.12	0.33	13.24	4.44	83.89	0.18

HYDRAULIC CALCULATION NOTES:

1. HYDRAULIC CALCULATIONS PREPARED USING GEOPAK DRAINAGE.
2. OUTSIDE MAXIMUM ALLOWABLE PONDING WIDTH OF OUTSIDE SHOULDER AND OUTER LANE UTILIZED FOR DESIGN IN ACCORDANCE WITH TXDOT GUIDANCE.
3. INSIDE MAXIMUM ALLOWABLE PONDING WIDTH OF INSIDE SHOULDER AND INSIDE LANE UTILIZED FOR DESIGN IN ACCORDANCE WITH TXDOT GUIDANCE.

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED PROFESSIONAL ENGINEER
7/2/2021

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

Texas Department of Transportation
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US 62/180
HYDRAULIC CALCULATIONS

100-YEAR

SHEET 10 OF 10

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)	US 62/180

DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	122

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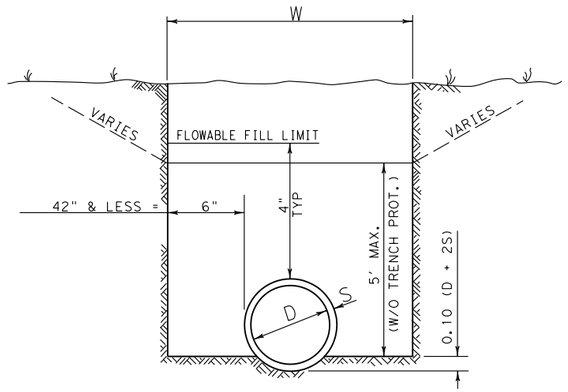


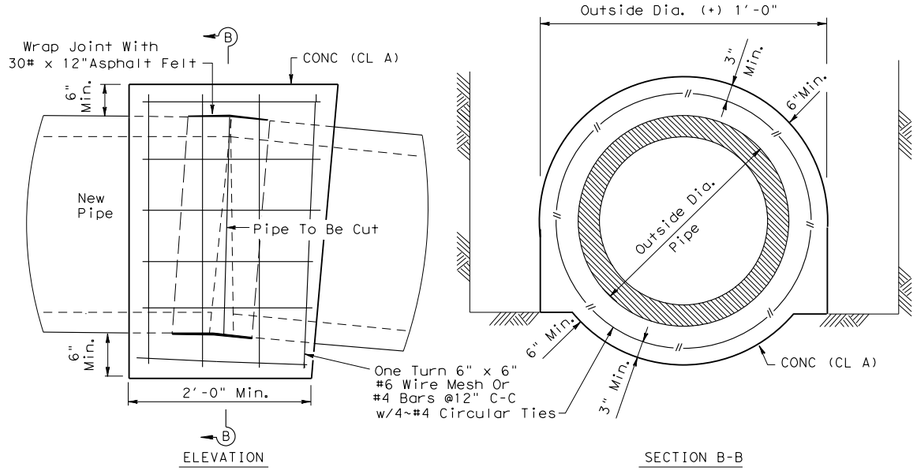
CLASS "C" BEDDING EXCEPT AS NOTED

*SEE STANDARD SPECIFICATION ITEM 400, EXCEPT WHERE NEGATIVE PROJECTION IS USED.

THE LIMITS OF FLOWABLE FILL SHALL TYPICALLY BE 4" ABOVE THE TOP OF PIPE/BOX. THE TRENCH SHALL BE UNDERCUT BY 4" AS SPECIFIED IN ITEM 400.

STRUCTURE EXCAVATION (TRENCH)

SCALE: NTS



PIPE COLLAR DETAIL - END CONNECTION

For Horizontal Or Vertical Placement

CONCRETE COLLAR DETAIL

SCALE: NTS

NOTES:
1. DETAIL TO BE USED WHEREVER PRECAST FITTINGS ARE NOT UTILIZED.
2. FOR CONNECTIONS WITH 2 PIPES OF DIFFERENT SIZES, CONTRACTOR TO MATCH SOFFITS AT CONNECTIONS.

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED PROFESSIONAL ENGINEER
6/1/2021

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

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US 62/180
DRAINAGE DETAILS

SHEET 1 OF 3

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:	6	TEXAS	F 2021(690)			US 62/180
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	123

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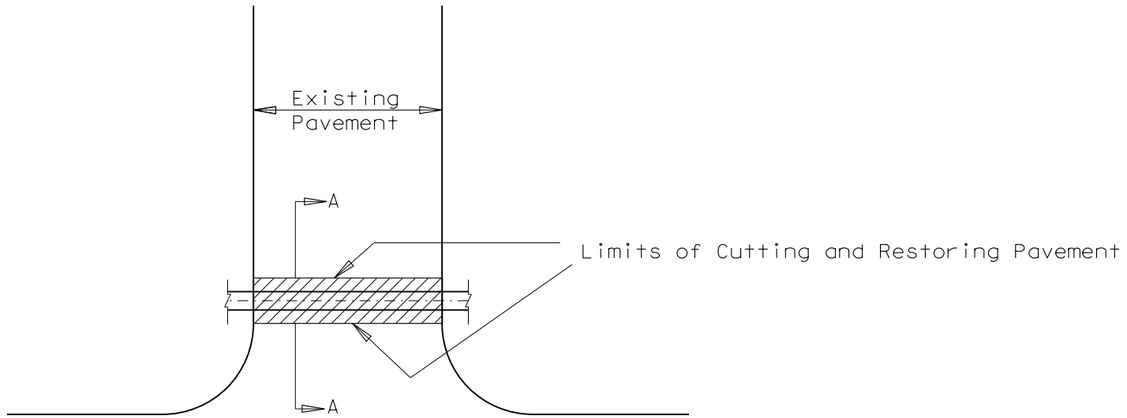
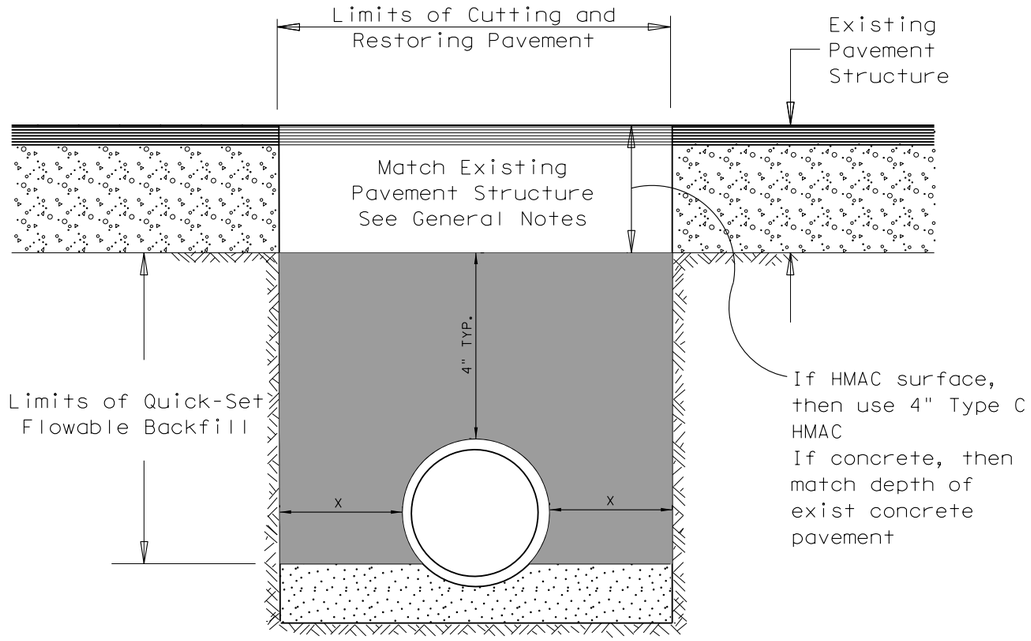


PLAN VIEW
N.T.S.

TABLE OF STANDARD EXCAVATION WIDTHS FOR RC PIPE					
PIPE		X	WIDTH OF CUTTING AND RESTORING PAVEMENT	STRUCT. EXCAV. CY. PER LF PER FT OF DEPTH	FLOWABLE FILL CY PER LF
ID	OD				
18"	22 ½"	6"	2.88′	0.108	0.136
24"	29 ½"	6"	3.46′	0.130	0.185
30"	37"	6"	4.08′	0.151	0.240
36"	44"	6"	4.67′	0.173	0.300
42"	51"	6"	5.25′	0.194	0.366

Provide width of Cutting and Restoring Pavement for installation of storm drain structures as the overall width of the structure plus:

* Flowable Fill quantity estimate based on 4" depth above top of pipe per Section A-A.



SECTION A-A
N.T.S.

GENERAL NOTES:

Consider any work performed to repair damage to the existing pavement outside the limits shown subsidiary to the pertinent Items.

Replacement material will be Flowable Backfill or an equivalent material as directed.

Payment for Cutting and Restoring Pavement as shown shall be made at the unit price bid for "Cutting and Restoring Pavement."

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED PROFESSIONAL ENGINEER
6/1/2021

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US 62/180
DRAINAGE DETAILS

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:	6	TEXAS	F 2021(690)		US 62/180	
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	124

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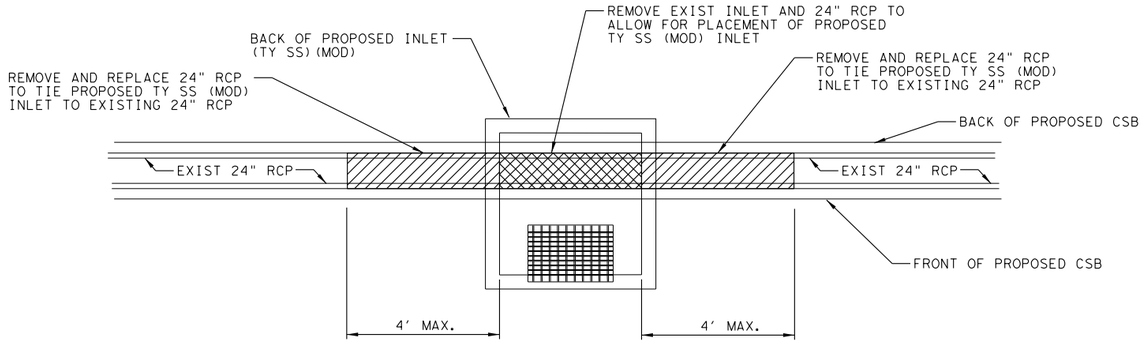
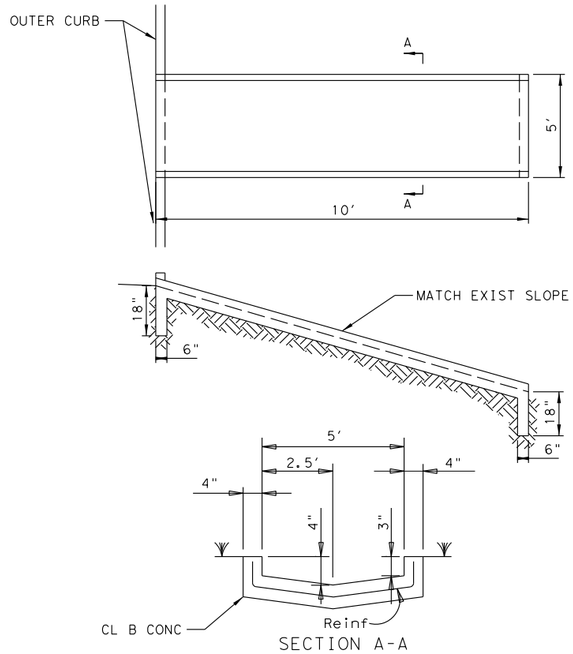


INLET (TY SS)(MOD) PLACEMENT DETAIL

N.T.S.

INLET AND PIPE REMOVAL IS CONSIDERED SUBSIDIARY TO INLET PLACEMENT AND WILL NOT BE PAID FOR SEPARATELY.



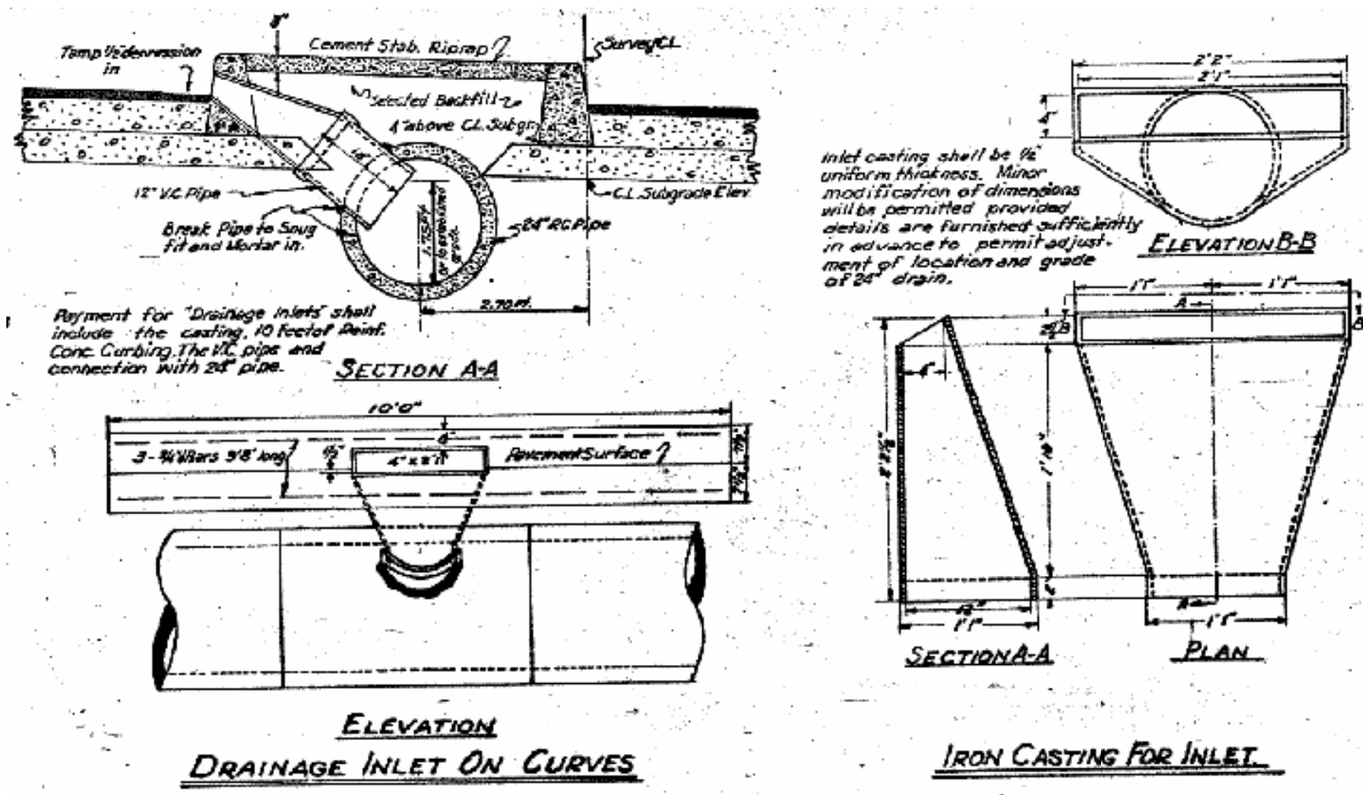
SECTION A-A

CURB CUT AND FLUME

FOR CONTRACTOR INFORMATION ONLY

PROVIDE #3 REINFORCING BARS AT 18" SPA C-C USE LAP SPLICES OF A MINIMUM 6 INCHES, MEASURED FROM THE ENDS OF REINFORCING BARS.

ESTIMATE CONC CL B QUANTITY = 1 CY



EXISTING CURB INLET DETAIL

FOR CONTRACTOR INFORMATION ONLY

PROVIDE 2 LF 24" RCP FOR EXISTING CURB INLET REMOVAL

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
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US 62/180 DRAINAGE DETAILS

SHEET 3 OF 3

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:	6	TEXAS	F 2021(690)		US 62/180	
DRAWN:	DIST.	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC.	125

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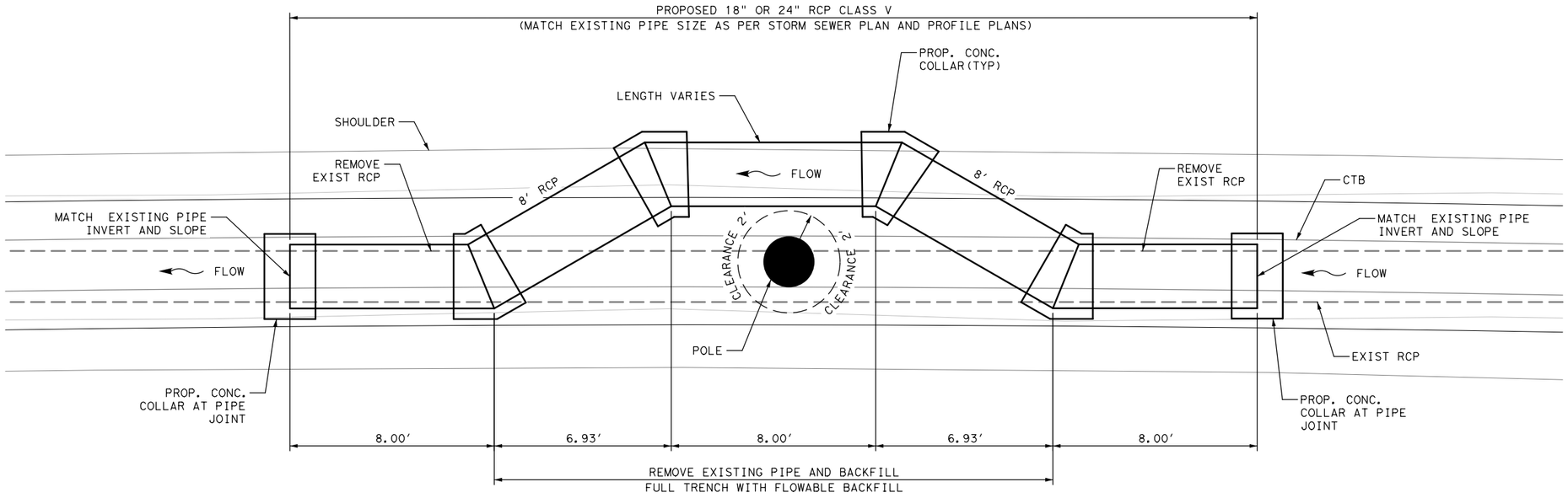
NOTES:
1. BYPASS PIPES CONSIST OF FOUR IDENTICAL 30 DEGREE ELBOWS AND EIGHT FOOT STRAIGHT PIPE RUNS.
2. THE PIPES GO AROUND POLE ON HIGH PAVEMENT SIDE.
3. UPSTREAM SEGMENT OF THE PIPES SHALL BE MUCH STEEPER THAN THE DOWNSTREAM, REFERRING TO PROFILE.
4. SHEET TABLE QUANTITIES ARE FOR AN INDIVIDUAL ILLUMINATION POLE BYPASS. NUMBER OF ILLUMINATION POLE BYPASSES ARE SHOWN ON ROADWAY SHEETS.



SHEET TOTAL			
ITEM	ITEM DESCRIPTION	UNIT	QUANTITY
400-6001	STRUCTURAL EXCAVATION	CY	30
401-6001	FLOWABLE BACKFILL	CY	18
420-6009	CLASS A CONC (COLLAR)	EA	6
464-6026	RC PIPE (CL V)(24 IN)	LF	40
496-6007	REMOVE (STR)PIPE	LF	37.9

0 2.5 5
1"=5'

NO.	REVISION	BY	DATE

SANTIAGO CASTANEDA
92904
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
5/28/2021

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US 62/180
DRAINAGE DETAILS

TYPICAL STORM SEWER ILLUMINATION POLE BYPASS

SHEET 1 OF 1

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				US 62/180	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	ELP	CULBERSON	0233	02	035,ETC	126	

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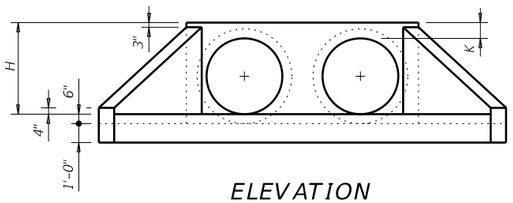
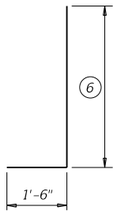
TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

Slope	Dia of Pipe (D)	Values for One Pipe						Values to be Added for Each Addt'l Pipe		
		W	X	Y	L	Reinf (Lbs)	Conc (CY) (1)	X and W	Reinf (Lbs)	Conc (CY) (1)
2:1	12"	4' – 7 ½"	2' – 6"	2' – 10"	3' – 3 ¼"	88	0.6	1' – 9"	20	0.2
	15"	5' – 5 ¾"	2' – 9 ½"	3' – 4"	3' – 10 ¼"	103	0.7	2' – 2"	24	0.3
	18"	6' – 4 ¼"	3' – 1"	3' – 10"	4' – 5"	124	0.9	2' – 8"	32	0.3
	21"	7' – 2 ¾"	3' – 4 ½"	4' – 4"	5' – 0"	143	1.1	3' – 1"	43	0.4
	24"	8' – 2 ½"	3' – 9 ½"	4' – 10"	5' – 7"	164	1.3	3' – 7"	50	0.5
	27"	9' – 1"	4' – 1"	5' – 4"	6' – 2"	179	1.5	3' – 11"	56	0.6
	30"	9' – 11 ½"	4' – 4 ½"	5' – 10"	6' – 8 ¾"	203	1.7	4' – 4"	65	0.8
	33"	10' – 10"	4' – 8"	6' – 4"	7' – 3 ¾"	224	2.0	4' – 8"	71	0.9
	36"	11' – 8 ¼"	4' – 11 ½"	6' – 10"	7' – 10 ¾"	249	2.2	5' – 1"	81	1.0
	42"	13' – 5 ¼"	5' – 6 ½"	7' – 10"	9' – 0 ½"	298	2.8	5' – 10"	97	1.3
	48"	15' – 9"	6' – 1 ½"	9' – 4"	10' – 9 ¼"	360	3.8	6' – 7"	117	1.7
	54"	17' – 5 ¾"	6' – 8 ½"	10' – 4"	11' – 11 ¼"	427	4.5	7' – 6"	151	2.1
	60"	19' – 2 ¾"	7' – 3 ½"	11' – 4"	13' – 1"	481	5.3	8' – 3"	174	2.5
	66"	20' – 11 ½"	7' – 10 ½"	12' – 4"	14' – 3"	544	6.2	8' – 9"	194	2.9
	72"	22' – 8 ½"	8' – 5 ½"	13' – 4"	15' – 4 ¾"	601	7.1	9' – 4"	213	3.3
3:1	12"	6' – 3"	2' – 6"	4' – 3"	4' – 11"	118	0.8	1' – 9"	22	0.2
	15"	7' – 5"	2' – 9 ½"	5' – 0"	5' – 9 ¼"	137	1.1	2' – 2"	28	0.3
	18"	8' – 6 ¾"	3' – 1"	5' – 9"	6' – 7 ¾"	170	1.3	2' – 8"	37	0.5
	21"	9' – 8 ¾"	3' – 4 ½"	6' – 6"	7' – 6"	195	1.6	3' – 1"	48	0.6
	24"	11' – 0"	3' – 9 ½"	7' – 3"	8' – 4 ½"	227	2.0	3' – 7"	58	0.7
	27"	12' – 2"	4' – 1"	8' – 0"	9' – 2 ¾"	251	2.3	3' – 11"	67	0.8
	30"	13' – 4"	4' – 4 ½"	8' – 9"	10' – 1 ¼"	293	2.7	4' – 4"	77	1.0
	33"	14' – 5 ¾"	4' – 8"	9' – 6"	10' – 11 ¾"	318	3.1	4' – 8"	84	1.2
	36"	15' – 7 ¾"	4' – 11 ½"	10' – 3"	11' – 10"	351	3.5	5' – 1"	96	1.4
	42"	17' – 11 ½"	5' – 6 ½"	11' – 9"	13' – 6 ¾"	432	4.5	5' – 10"	119	1.7
	48"	21' – 1 ¾"	6' – 1 ½"	14' – 0"	16' – 2"	537	6.1	6' – 7"	146	2.3
	54"	23' – 5 ½"	6' – 8 ½"	15' – 6"	17' – 10 ¾"	630	7.3	7' – 6"	186	2.9
	60"	25' – 9 ¼"	7' – 3 ½"	17' – 0"	19' – 7 ½"	719	8.7	8' – 3"	219	3.4
	66"	28' – 1"	7' – 10 ½"	18' – 6"	21' – 4 ¼"	811	10.1	8' – 9"	242	3.9
	72"	30' – 4 ¾"	8' – 5 ½"	20' – 0"	23' – 1 ¼"	924	11.7	9' – 4"	272	4.4
4:1	12"	7' – 10 ¾"	2' – 6"	5' – 8"	6' – 6 ½"	148	1.1	1' – 9"	24	0.3
	15"	9' – 4"	2' – 9 ½"	6' – 8"	7' – 8 ½"	181	1.5	2' – 2"	32	0.4
	18"	10' – 9 ½"	3' – 1"	7' – 8"	8' – 10 ¼"	221	1.9	2' – 8"	42	0.5
	21"	12' – 2 ¾"	3' – 4 ½"	8' – 8"	10' – 0"	260	2.3	3' – 1"	57	0.7
	24"	13' – 9 ½"	3' – 9 ½"	9' – 8"	11' – 2"	301	2.8	3' – 7"	67	0.9
	27"	15' – 3"	4' – 1"	10' – 8"	12' – 3 ¾"	334	3.3	3' – 11"	77	1.0
	30"	16' – 8 ¼"	4' – 4 ½"	11' – 8"	13' – 5 ¾"	385	3.8	4' – 4"	89	1.3
	33"	18' – 1 ¾"	4' – 8"	12' – 8"	14' – 7 ½"	425	4.5	4' – 8"	101	1.4
	36"	19' – 7"	4' – 11 ½"	13' – 8"	15' – 9 ¼"	472	5.1	5' – 1"	115	1.7
	42"	22' – 5 ¾"	5' – 6 ½"	15' – 8"	18' – 1"	583	6.5	5' – 10"	141	2.1
	48"	26' – 6 ¼"	6' – 1 ½"	18' – 8"	21' – 6 ¾"	730	8.9	6' – 7"	175	2.8
	54"	29' – 5"	6' – 8 ½"	20' – 8"	23' – 10 ¼"	875	10.7	7' – 6"	226	3.6
	60"	32' – 3 ¾"	7' – 3 ½"	22' – 8"	26' – 2"	996	12.7	8' – 3"	264	4.3
	66"	35' – 2 ½"	7' – 10 ½"	24' – 8"	28' – 5 ¾"	1,140	14.9	8' – 9"	300	4.9
	72"	38' – 1 ¼"	8' – 5 ½"	26' – 8"	30' – 9 ½"	1,297	17.3	9' – 4"	334	5.6
6:1	12"	11' – 2"	2' – 6"	8' – 6"	9' – 9 ¾"	224	1.9	1' – 9"	28	0.4
	15"	13' – 2 ¼"	2' – 9 ½"	10' – 0"	11' – 6 ½"	268	2.5	2' – 2"	37	0.5
	18"	15' – 2 ½"	3' – 1"	11' – 6"	13' – 3 ¼"	330	3.2	2' – 8"	50	0.7
	21"	17' – 2 ¾"	3' – 4 ½"	13' – 0"	15' – 0 ¼"	387	3.9	3' – 1"	69	0.9
	24"	19' – 4 ½"	3' – 9 ½"	14' – 6"	16' – 9"	453	4.8	3' – 7"	80	1.2
	27"	21' – 4 ¾"	4' – 1"	16' – 0"	18' – 5 ¾"	512	5.7	3' – 11"	96	1.4
	30"	23' – 5 ¼"	4' – 4 ½"	17' – 6"	20' – 2 ½"	593	6.7	4' – 4"	110	1.7
	33"	25' – 5 ½"	4' – 8"	19' – 0"	21' – 11 ¼"	675	7.8	4' – 8"	127	2.0
	36"	27' – 5 ¾"	4' – 11 ½"	20' – 6"	23' – 8"	735	9.0	5' – 1"	144	2.3
	42"	31' – 6 ¼"	5' – 6 ½"	23' – 6"	27' – 1 ½"	922	11.5	5' – 10"	179	3.0
	48"	37' – 3 ½"	6' – 1 ½"	28' – 0"	32' – 4"	1,191	15.9	6' – 7"	231	4.0
	54"	41' – 4 ¼"	6' – 8 ½"	31' – 0"	35' – 9 ½"	1,424	19.2	7' – 6"	300	5.0
	60"	45' – 4 ¾"	7' – 3 ½"	34' – 0"	39' – 3"	1,631	22.9	8' – 3"	353	6.0

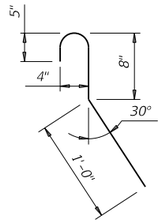


ELEVATION

(Showing dimensions.)



BARS V



BARS CL

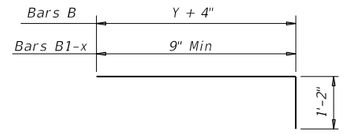
(Length = 2'-5")

TABLE OF (5) REINFORCING STEEL

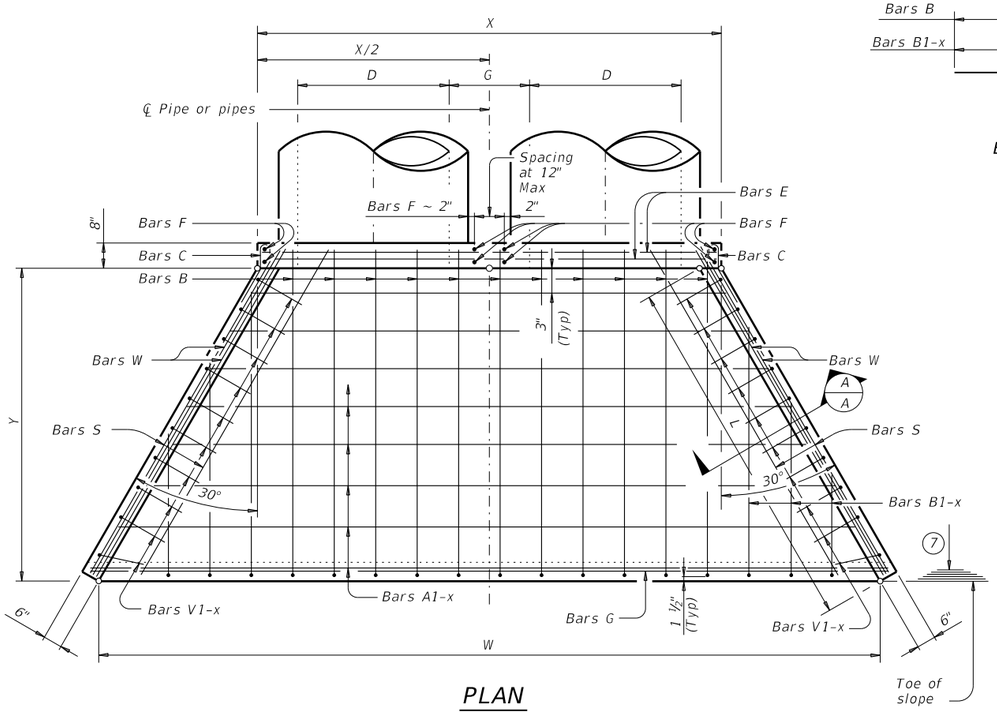
Bar	Size	Spa	No.
A	#4	1' – 0"	~
B	#3	1' – 6"	~
C	#4	1' – 0"	~
D	#3	1' – 0"	~
E	#5	~	4
F	#5	~	~
G	#3	~	2
S	#4	~	6
V	#4	1' – 0"	~
W	#5	~	4

TABLE OF CONSTANT DIMENSIONS

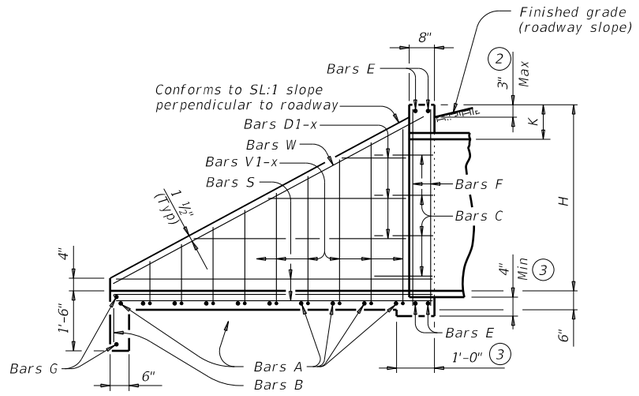
Dia of Pipe (D)	G	K (4)	H
12"	0' – 9"	1' – 0"	2' – 0"
15"	0' – 11"	1' – 0"	2' – 3"
18"	1' – 2"	1' – 0"	2' – 6"
21"	1' – 4"	1' – 0"	2' – 9"
24"	1' – 7"	1' – 0"	3' – 0"
27"	1' – 8"	1' – 0"	3' – 3"
30"	1' – 10"	1' – 0"	3' – 6"
33"	1' – 11"	1' – 0"	3' – 9"
36"	2' – 1"	1' – 0"	4' – 0"
42"	2' – 4"	1' – 0"	4' – 6"
48"	2' – 7"	1' – 3"	5' – 3"
54"	3' – 0"	1' – 3"	5' – 9"
60"	3' – 3"	1' – 3"	6' – 3"
66"	3' – 3"	1' – 3"	6' – 9"
72"	3' – 4"	1' – 3"	7' – 3"



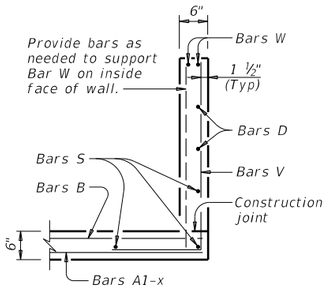
BARS B and B1-x



PLAN



TYPICAL WING ELEVATION



SECTION A-A

(1) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(2) For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(3) Provide a 1'-0" footing as shown where required to maintain 4" minimum cover for pipes.

(4) Dimensions shown are usual and maximum.

(5) Quantities shown are for one structure end only (one headwall).

(6) Min Length = $6" + 3" \times \left(\frac{12 \times H - 7}{12 \times L}\right)$

Max Length = $12 \times H - 3" \times \left(\frac{12 \times H - 7}{12 \times L}\right) - 1"$

(7) Lengths of wings based on SL:1 slope along this line.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide Class C concrete (f'c = 3,600 psi).

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Do not mount bridge rails of any type directly to these culvert headwalls.

This standard may not be used for wall heights, H, exceeding the values shown.

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing dimensions are out-to-out of bars.

Texas Department of Transportation

Bridge Division Standard

CONCRETE HEADWALLS WITH FLARED WINGS FOR 0° SKEW PIPE CULVERTS

CH-FW-0

FILE: chfw00se-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	02	035	US62/180
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		127

DATE:
FILE:

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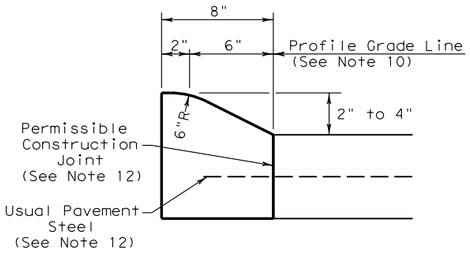
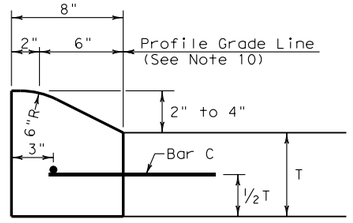
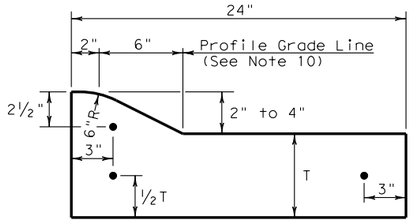
DATE:
FILE:



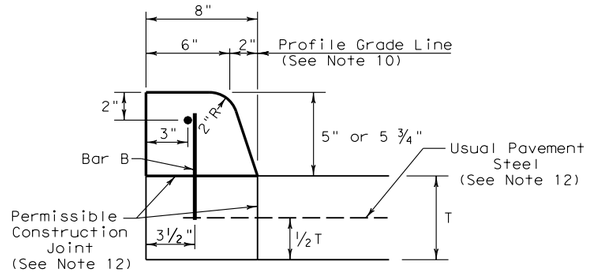
TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



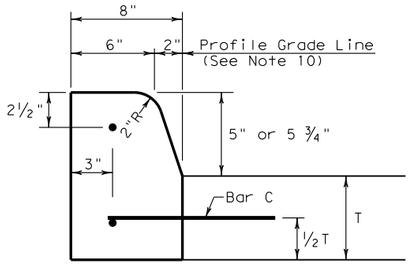
TYPE I CURB
2" - 4" HEIGHT



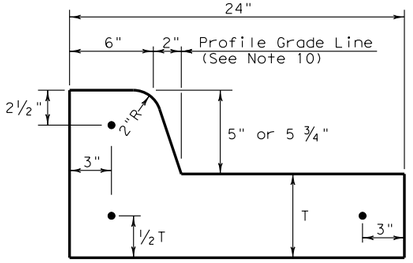
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



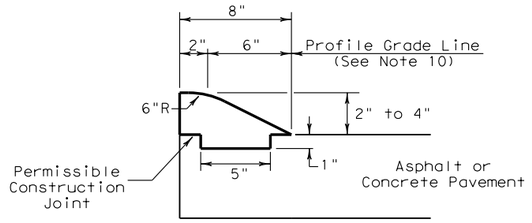
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



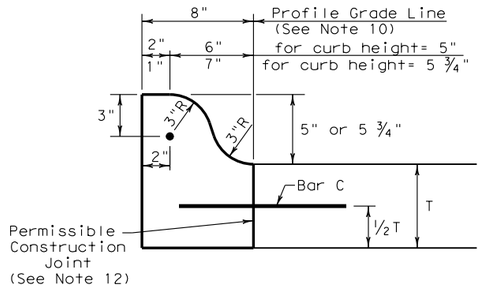
TYPE II CURB
5" - 5 ¾" HEIGHT



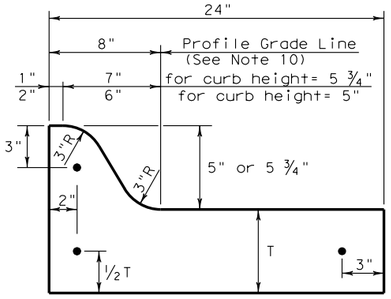
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



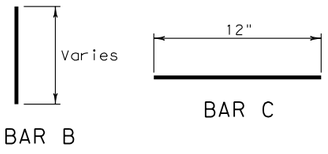
TYPE III CURB (KEYED)
2" - 4" HEIGHT



TYPE IIa CURB
5" - 5 ¾" HEIGHT

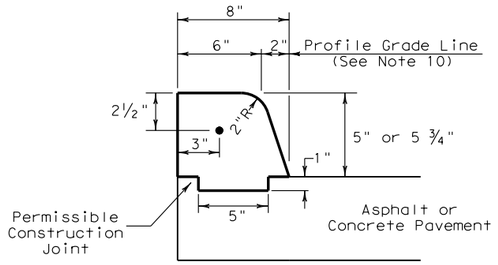


TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT

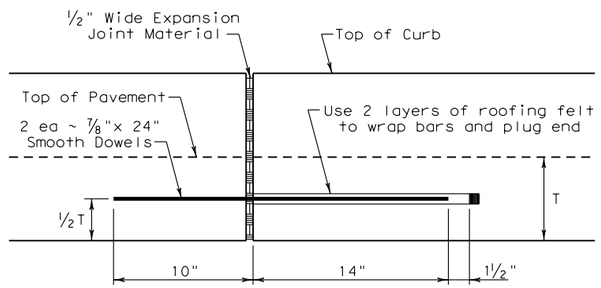


BAR B

BAR C

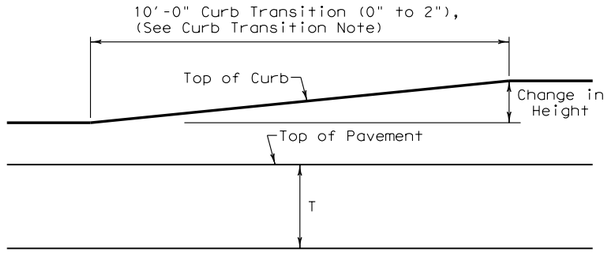


TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

Curb Transition Note:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



CURB TRANSITION
Note: To be paid for as Highest Curb

General Notes

1. All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
2. Concrete shall be Class A.
3. When reinforcing bars are used, they shall be No. 4 unless otherwise shown. The use of synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Producer List (MPL), maintained by TxDOT, Construction Division.
4. Round exposed sharp edges with a rounding tool, to a minimum radius of ¼ inch.
5. All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
6. Where concrete curb is placed on existing concrete pavement, the pavement shall be drilled and the reinforcing bars grouted in place.
7. Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
8. Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C-C.
9. Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
10. Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
11. One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
12. When vertical permissible construction joints are used, resulting in a longitudinal construction joint in the pavement, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans for longitudinal construction joints. Reinforcing steel for curb section shall then conform to that required for concrete curb.

Texas Department of Transportation

Design Division Standard

CONCRETE CURB AND CURB AND GUTTER

CCCG-12

FILE: cccg12.dgn	DN: TxDOT	CK: AM	DW: VP	CK: VP
© TxDOT: 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS UPDATED 2012 - VP	0233	02	035	US62/180
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		128

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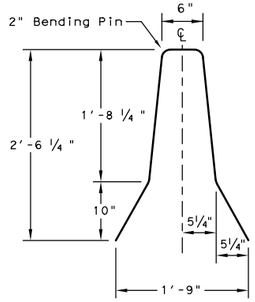
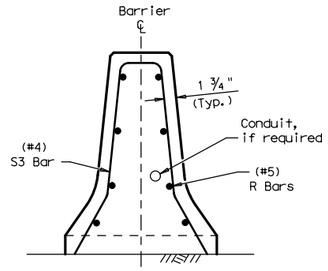
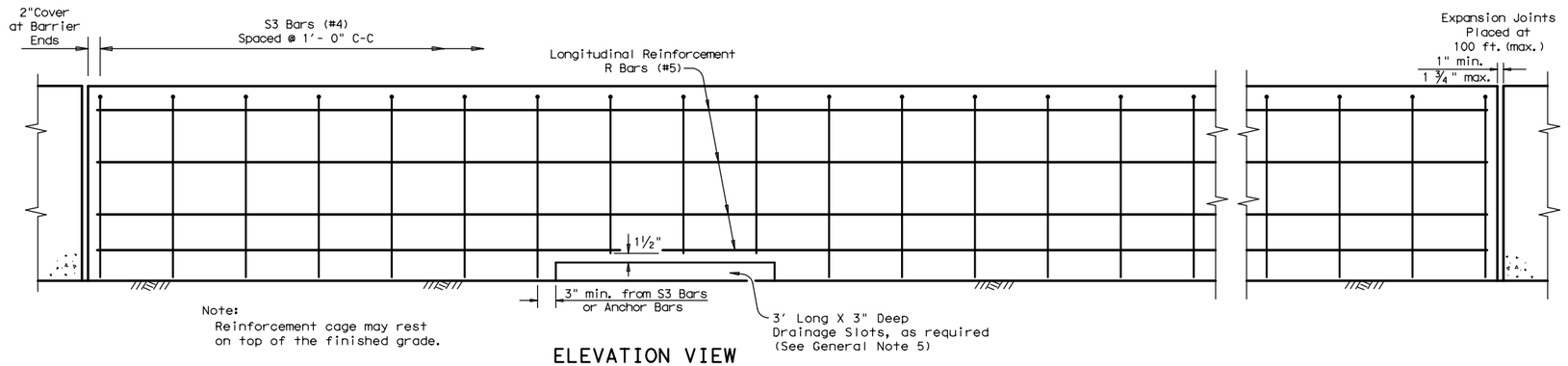
DATE:
FILE:



S3 Bar
(#4) Bar

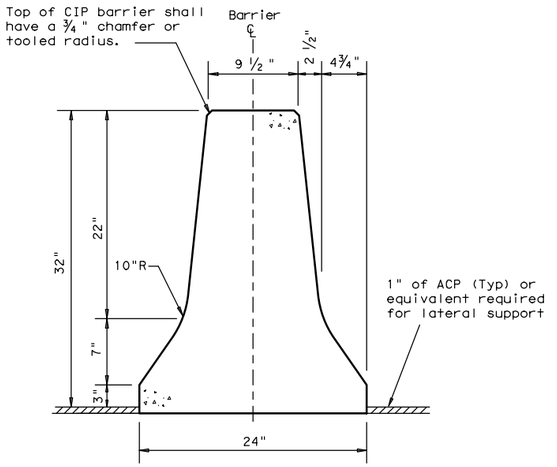


END VIEW
Cast-in-Place (CIP) Barrier
Barrier is Symmetrical About the Center Line

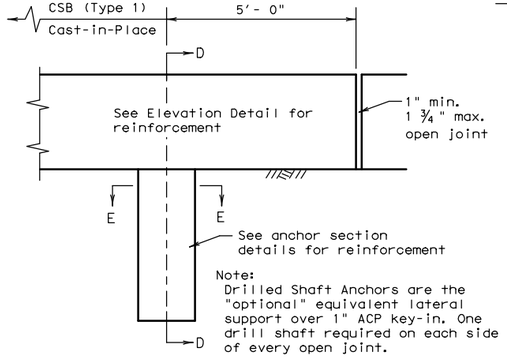


Note:
Reinforcement cage may rest on top of the finished grade.

ELEVATION VIEW
Cast-in-Place (CSB) on Flexible Pavement

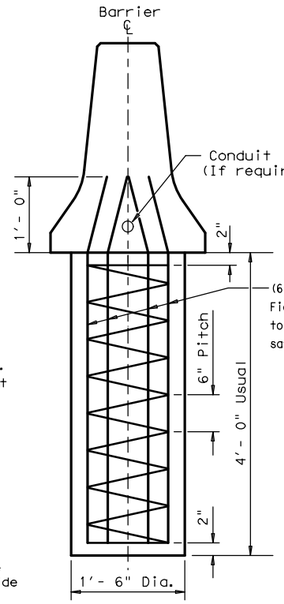


CONCRETE SAFETY BARRIER (CSB)

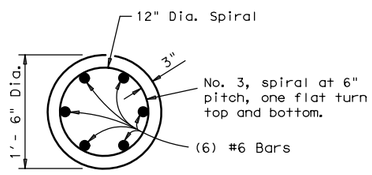


Note:
Drilled Shaft Anchors are the "optional" equivalent lateral support over 1" ACP key-in. One drill shaft required on each side of every open joint.

DRILLED SHAFT ANCHOR
LOCATION DETAIL



SECTION D-D
DRILLED SHAFT ANCHOR



SECTION E-E
DRILLED SHAFT ANCHOR
See drilled shaft anchor location detail

GENERAL NOTES

1. Concrete shall be Class C, unless otherwise specified in the plans.
2. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
3. Axis of cast-in-place barrier shall be vertical, except where roadway is superelevated, then axis is normal to roadway surface.
4. Top edges of cast-in-place barrier shall have a ¾" chamfer or tooled radius.
5. Drainage slot depths may be increased 1" to accommodate ACP. Slot locations (12'- 0", C-C Min. Spacing) are shown elsewhere, or as directed by the Engineer.
6. Cast-in-place barrier may be slip formed. Bracing may be tied or tack welded to the reinforcement cage to provide cage stability. Do not weld to anchor bars. The reinforcement cage may rest on top of the finished grade.
7. For locations where lighting is required, see the CSB(4) sheet for the proper reinforcement and anchorage.

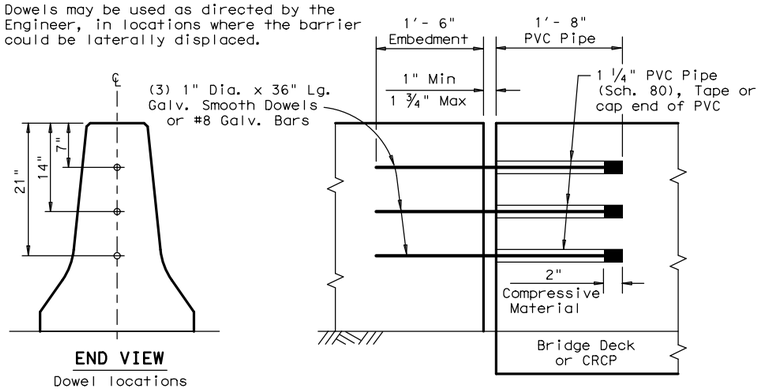
Cast-In-Place or Slip-Formed (CSB)

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

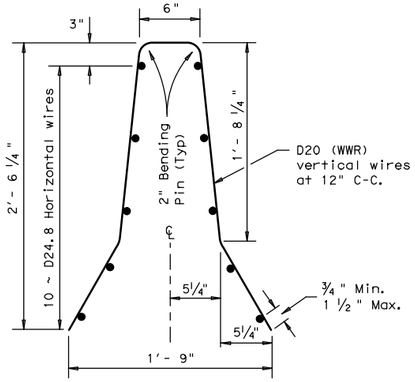
The weight of Cast-in-Place (CSB)(F-Shape) is approx. 440 lbs per ft.

EXPANSION JOINT (Dowel Location)

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



END VIEW
Dowel locations



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

(WWR) General Notes

1. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
2. The welded wire cage at the drainage slots may be cut or bent to accommodate the edge and top clearances, as directed by the Engineer.
3. The welded wire splice locations shall have a "minimum" splice lap length of 12".
4. 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".

Texas Department of Transportation

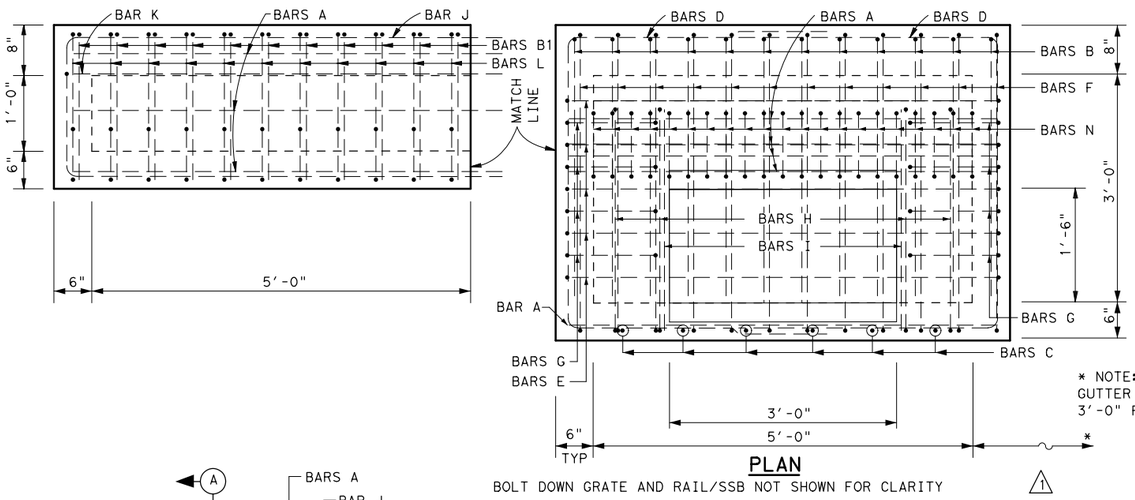
Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

CAST-IN-PLACE (TYPE 1) (FLEXIBLE PAVEMENT)

CSB(2)-13

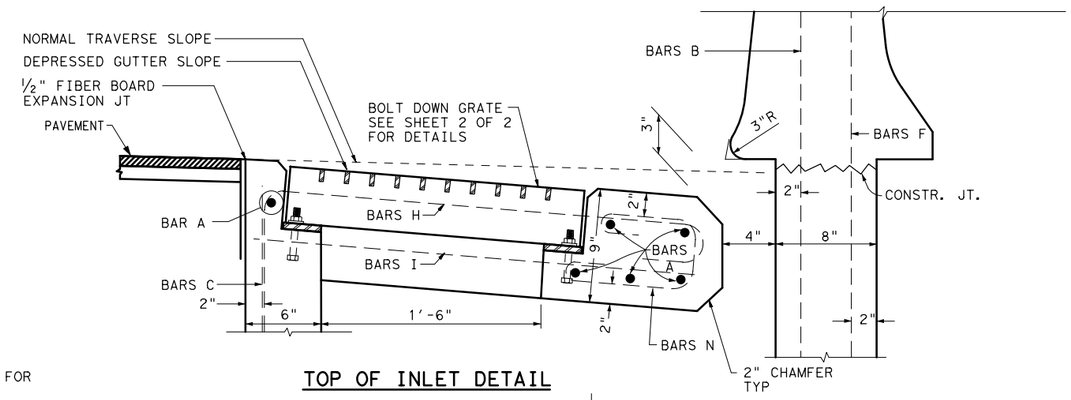
FILE: csb213.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	02	035,ETC	US 62/180
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		129



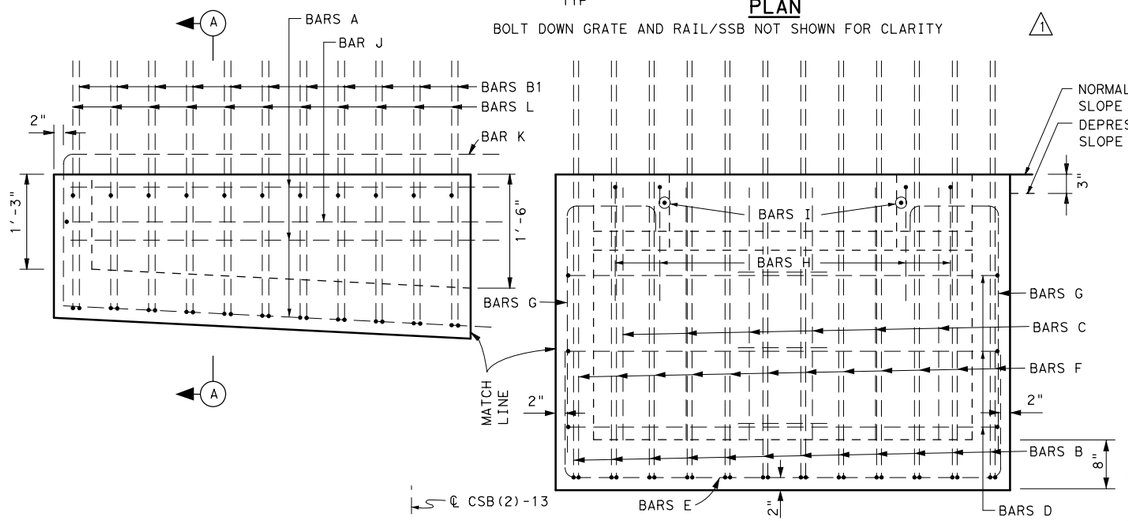
* NOTE: TRANSITION FOR GUTTER DEPRESSION= 3'-0" PER 1" DEPRESSION.

PLAN

BOLT DOWN GRATE AND RAIL/SSB NOT SHOWN FOR CLARITY

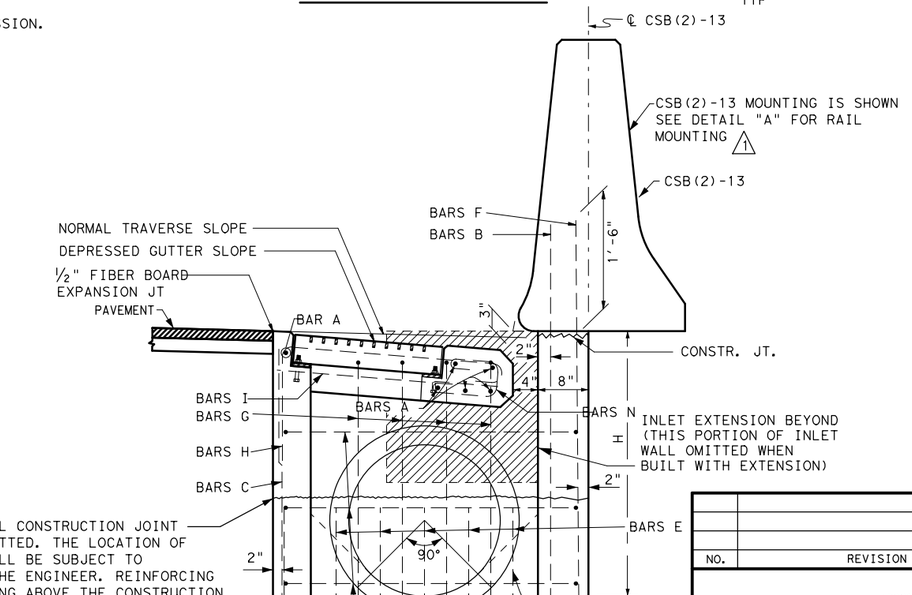


TOP OF INLET DETAIL



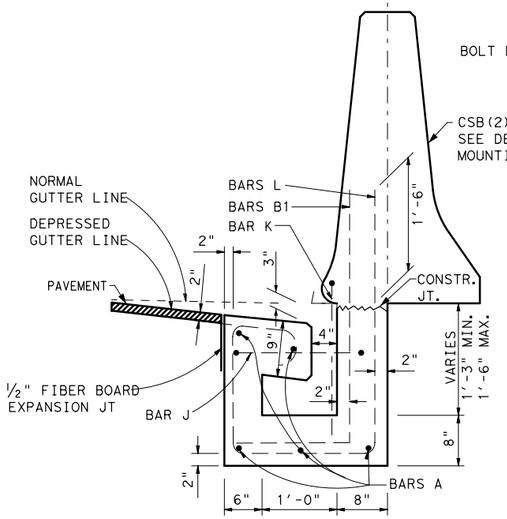
ELEVATION

BOLT DOWN GRATE AND RAIL/SSB NOT SHOWN FOR CLARITY

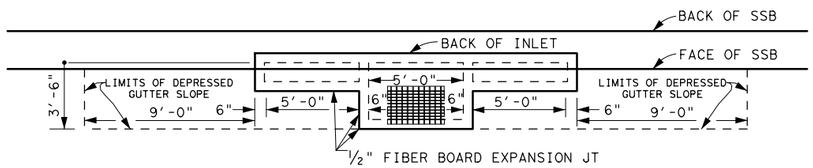


ONE HORIZONTAL CONSTRUCTION JOINT WILL BE PERMITTED. THE LOCATION OF THIS JOINT WILL BE SUBJECT TO APPROVAL BY THE ENGINEER. REINFORCING STEEL EXTENDING ABOVE THE CONSTRUCTION JOINT MAY BE BENT IN A MANNER ACCEPTABLE TO THE ENGINEER TO PROVIDE CLEARANCE FOR PAVING OPERATIONS. IN LIEU OF BENDING THE STEEL, THE CONTRACTOR MAY PROVIDE A MINIMUM 1'-0" LAP SPLICE TO THE LOWER STEEL.

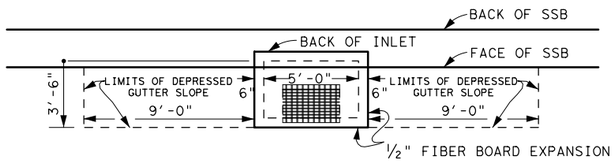
SIDE VIEW TYPE SS MOUNTING



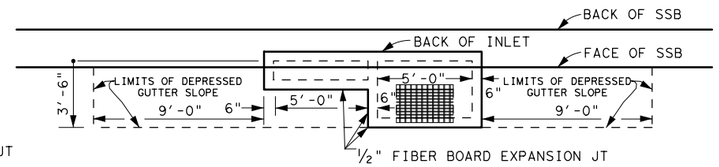
SECTION A-A



15' INLET



5' INLET



10' INLET

PLAN OF INLET AND EXTENSIONS

(TRAFFIC RAIL NOT SHOWN)

NO.	REVISION	BY	DATE

STATE OF TEXAS
ABRAHAM A ABUGATTAS
34940
LICENSED
PROFESSIONAL ENGINEER
5/28/2021

Texas Department of Transportation
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16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

US 62/180
CURB AND GRATE INLET TYPE SS DRA-001(1)-2007

SHEET 1 OF 2

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:	6	TEXAS			US 62/180	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC	130

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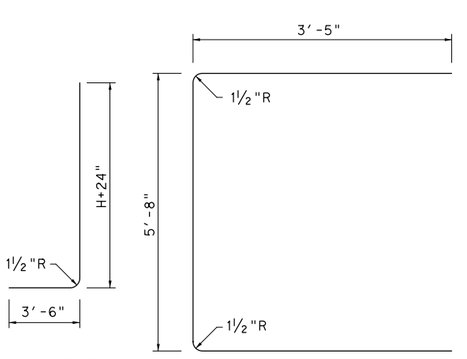
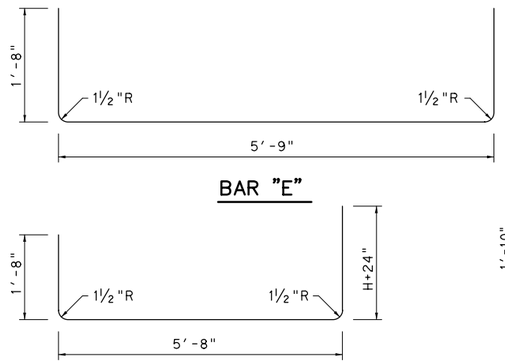
5/28/2021 3:56:32 PM

REINFORCING STEEL AND CONCRETE FOR 5' INLET

INLET SIZE		BAR "A"						BAR "B"						BAR "C"						BAR "D"						BAR "E"						BAR "F"						BAR "G"						BAR "H"						BAR "I"						BAR "N"						TOTALS	
HEIGHT FT	WIDTH FT	NO	SIZE	TY	SPACING	LENGTH	WT	NO	SIZE	TY	SPACING	LENGTH	WT	NO	SIZE	TY	SPACING	LENGTH	WT	NO	SIZE	TY	SPACING	LENGTH	WT	NO	SIZE	TY	SPACING	LENGTH	WT	NO	SIZE	TY	SPACING	LENGTH	WT	NO	SIZE	TY	SPACING	LENGTH	WT	NO	SIZE	TY	SPACING	LENGTH	WT	NO	SIZE	TY	SPACING	LENGTH	WT	NO	SIZE	TY	SPACING	LENGTH	WT	STEEL LBS	CONC CY
2.5	3'-0"	6	#6	ST	AS SHOWN	5'-9"	52	12	#5	BT	6" C-C	8'-0"	100	6	#4	ST	10" C-C	2'-10"	11	4	#4	BT	12" C-C	10'-8"	28	5	#4	BT	7" C-C	9'-1"	30	12	#5	BT	6" C-C	10'-0"	125	8	#4	BT	7" C-C	3'-10"	20	4	#4	BT	AS SHOWN	5'-0"	13	2	#4	ST	AS SHOWN	2'-11"	4	21	#4	BT	3" C-C	2'-7"	36	420	1.63
3.0	3'-0"	6	#6	ST	AS SHOWN	5'-9"	52	12	#5	BT	6" C-C	8'-6"	106	6	#4	ST	10" C-C	3'-4"	13	6	#4	BT	12" C-C	10'-8"	43	5	#4	BT	7" C-C	9'-1"	30	12	#5	BT	6" C-C	10'-6"	131	8	#4	BT	7" C-C	4'-4"	23	4	#4	BT	AS SHOWN	5'-0"	13	2	#4	ST	AS SHOWN	2'-11"	4	21	#4	BT	3" C-C	2'-7"	36	452	1.80
3.5	3'-0"	6	#6	ST	AS SHOWN	5'-9"	52	12	#5	BT	6" C-C	9'-0"	113	6	#4	ST	10" C-C	3'-10"	15	6	#4	BT	12" C-C	10'-8"	43	5	#4	BT	7" C-C	9'-1"	30	12	#5	BT	6" C-C	11'-0"	138	8	#4	BT	7" C-C	4'-10"	26	4	#4	BT	AS SHOWN	5'-0"	13	2	#4	ST	AS SHOWN	2'-11"	4	21	#4	BT	3" C-C	2'-7"	36	470	1.96
4.0	3'-0"	6	#6	ST	AS SHOWN	5'-9"	52	12	#5	BT	6" C-C	9'-6"	119	6	#4	ST	10" C-C	4'-4"	17	8	#4	BT	12" C-C	10'-8"	57	5	#4	BT	7" C-C	9'-1"	30	12	#5	BT	6" C-C	11'-6"	144	8	#4	BT	7" C-C	5'-4"	29	4	#4	BT	AS SHOWN	5'-0"	13	2	#4	ST	AS SHOWN	2'-11"	4	21	#4	BT	3" C-C	2'-7"	36	501	2.13
4.5	3'-0"	6	#6	ST	AS SHOWN	5'-9"	52	12	#5	BT	6" C-C	10-0"	125	6	#4	ST	10" C-C	4'-10"	19	8	#4	BT	12" C-C	10'-8"	57	5	#4	BT	7" C-C	9'-1"	30	12	#5	BT	6" C-C	12'-0"	150	8	#4	BT	7" C-C	5'-10"	31	4	#4	BT	AS SHOWN	5'-0"	13	2	#4	ST	AS SHOWN	2'-11"	4	21	#4	BT	3" C-C	2'-7"	36	517	2.30
5.0	3'-0"	6	#6	ST	AS SHOWN	5'-9"	52	12	#5	BT	6" C-C	10'-6"	131	6	#4	ST	10" C-C	5'-4"	21	10	#4	BT	12" C-C	10'-8"	71	5	#4	BT	7" C-C	9'-1"	30	12	#5	BT	6" C-C	12'-6"	156	8	#4	BT	7" C-C	6'-4"	34	4	#4	BT	AS SHOWN	5'-0"	13	2	#4	ST	AS SHOWN	2'-11"	4	21	#4	BT	3" C-C	2'-7"	36	548	2.47
5.5	3'-0"	6	#6	ST	AS SHOWN	5'-9"	52	12	#5	BT	6" C-C	11'-0"	138	6	#4	ST	10" C-C	5'-10"	23	10	#4	BT	12" C-C	10'-8"	71	5	#4	BT	7" C-C	9'-1"	30	12	#5	BT	6" C-C	13'-0"	163	8	#4	BT	7" C-C	6'-10"	37	4	#4	BT	AS SHOWN	5'-0"	13	2	#4	ST	AS SHOWN	2'-11"	4	21	#4	BT	3" C-C	2'-7"	36	567	2.63
6.0	3'-0"	6	#6	ST	AS SHOWN	5'-9"	52	12	#5	BT	6" C-C	11'-6"	144	6	#4	ST	10" C-C	6'-4"	25	12	#4	BT	12" C-C	10'-8"	86	5	#4	BT	7" C-C	9'-1"	30	12	#5	BT	6" C-C	13'-6"	169	8	#4	BT	7" C-C	7'-4"	39	4	#4	BT	AS SHOWN	5'-0"	13	2	#4	ST	AS SHOWN	2'-11"	4	21	#4	BT	3" C-C	2'-7"	36	598	2.80
7.0	3'-0"	6	#6	ST	AS SHOWN	5'-9"	52	12	#5	BT	6" C-C	12'-6"	156	6	#4	ST	10" C-C	7'-4"	29	14	#4	BT	12" C-C	10'-8"	100	5	#4	BT	7" C-C	9'-1"	30	12	#5	BT	6" C-C	14'-6"	181	8	#4	BT	7" C-C	8'-4"	45	4	#4	BT	AS SHOWN	5'-0"	13	2	#4	ST	AS SHOWN	2'-11"	4	21	#4	BT	3" C-C	2'-7"	36	646	3.13
8.0	3'-0"	6	#6	ST	AS SHOWN	5'-9"	52	12	#5	BT	6" C-C	13'-6"	169	6	#4	ST	10" C-C	8'-4"	33	16	#4	BT	12" C-C	10'-8"	114	5	#4	BT	7" C-C	9'-1"	30	12	#5	BT	6" C-C	15'-6"	194	8	#4	BT	7" C-C	9'-4"	50	4	#4	BT	AS SHOWN	5'-0"	13	2	#4	ST	AS SHOWN	2'-11"	4	21	#4	BT	3" C-C	2'-7"	36	695	3.47
9.0	3'-0"	6	#6	ST	AS SHOWN	5'-9"	52	12	#5	BT	6" C-C	14'-6"	181	6	#4	ST	10" C-C	9'-4"	37	18	#4	BT	12" C-C	10'-8"	128	5	#4	BT	7" C-C	9'-1"	30	12	#5	BT	6" C-C	16'-6"	206	8	#4	BT	7" C-C	10'-4"	55	4	#4	BT	AS SHOWN	5'-0"	13	2	#4	ST	AS SHOWN	2'-11"	4	21	#4	BT	3" C-C	2'-7"	36	742	3.80
10.0	3'-0"	6	#6	ST	AS SHOWN	5'-9"	52	12	#5	BT	6" C-C	15'-6"	194	6	#4	ST	10" C-C	10'-4"	41	20	#4	BT	12" C-C	10'-8"	143	5	#4	BT	7" C-C	9'-1"	30	12	#5	BT	6" C-C	17'-6"	219	8	#4	BT	7" C-C	11'-4"	61	4	#4	BT	AS SHOWN	5'-0"	13	2	#4	ST	AS SHOWN	2'-11"	4	21	#4	BT	3" C-C	2'-7"	36	793	4.14



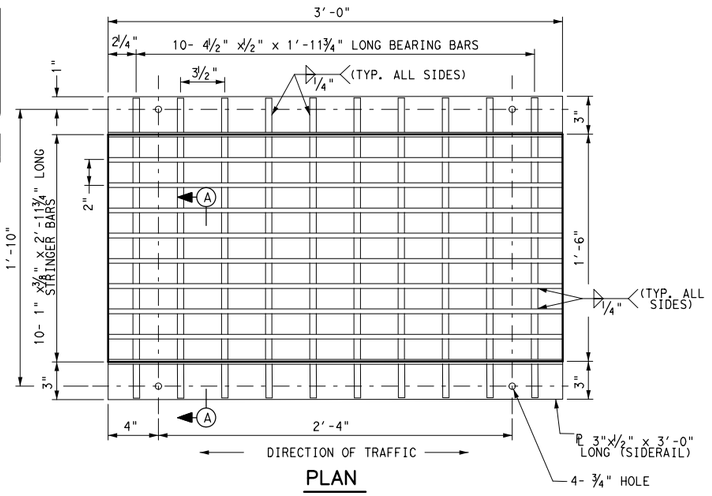
BAR "B"



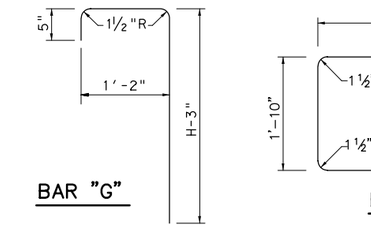
BAR "E"

BAR "D"

BAR "F"



PLAN



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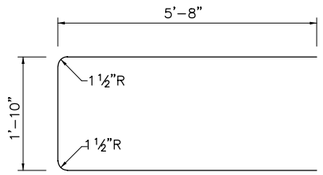

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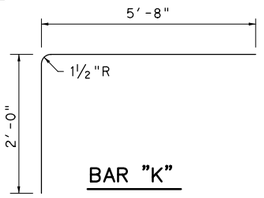

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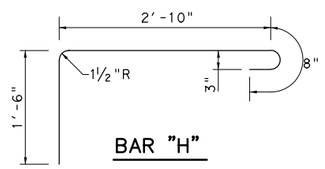

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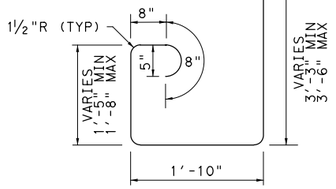

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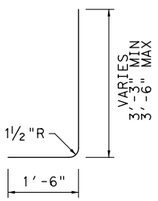

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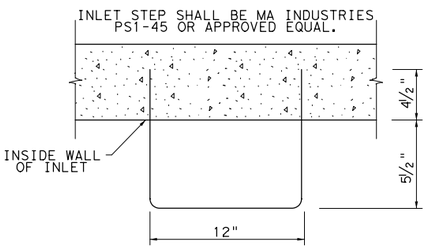
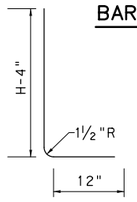


DETAIL OF INLET STEP



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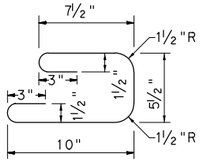
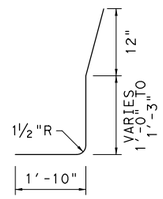
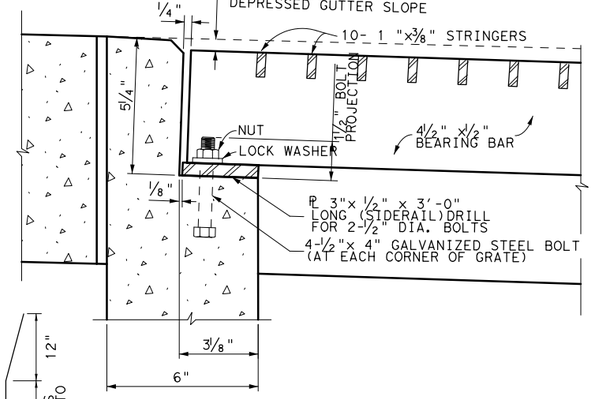


BAR "N"



BAR "B1"(#4)



SECTION A–A

BOLT DOWN GRATE DETAIL

REINFORCING STEEL AND CONCRETE FOR ONE 5' EXT.

BAR	NO	SIZE	TY	SPACING	LENGTH	WEIGHT
A	5	#6	ST	AS SHOWN	5'-9"	43
B1	11	#5	ST	6" C-C	4'-9" TO 5'-0"	56
J	1	#4	BT	AS SHOWN	13'-4"	9
K	1	#4	BT	AS SHOWN	7'-9"	5
L	11	#5	BT	6" C-C	7'-10" TO 8'-4"	91
TOTAL REINFORCING STEEL (LBS)						204
TOTAL CONCRETE (CY)						0.62

CONCRETE TO BE DEDUCTED FOR PIPES (ONE PIPE)

PIPE SIZE	CONC. C.Y.
15"	0.04
18"	0.05
21"	0.07
24"	0.09
27"	0.11
30"	0.14
36"	0.20

STRUCTURAL STEEL FOR 3' x 2' BOLT DOWN GRATE

BAR	NO	SPACING	LENGTH	WEIGHT
3"x½" SIDERAIL	2	AS SHOWN	3'-0"	31
4½"x½" BEARING BAR	10	AS SHOWN	1'-11¾"	152
1"x⅜" STRINGER BAR	10	AS SHOWN	2'-11¾"	38
TOTAL STRUCTURAL STEEL (LBS)				221

GENERAL NOTES

1. ALL CONCRETE SHALL BE CLASS "A" AND CONFORM TO ITEM 421 "HYDRAULIC CEMENT CONCRETE".
2. REINFORCING BARS SHALL BE GRADE 60 AND CONFORM TO ASTM A615. ALL REINFORCING SHALL CONFORM TO ITEM 440 "REINFORCING STEEL".
3. DIMENSIONS RELATING TO REINFORCING STEEL ARE TO THE CENTER OF THE BARS.
4. ALL EXPOSED CORNERS SHALL BE CHAMFERED ¾".
5. BAR DETAILS SHALL BE ADJUSTED AS NECESSARY TO ACCOMMODATE A HORIZONTAL CONSTRUCTION JOINT IF USED. REINFORCING STEEL QUANTITIES SHOWN DO NOT INCLUDE LAP STEEL REQUIRED FOR CONSTRUCTION JOINTS.
6. ALL STRUCTURAL STEEL SHALL CONFORM TO ASTM A 36.
7. INLET STEPS SPACED 10" C.C. AND LOCATED AS DIRECTED BY THE ENGINEER, AND SHALL BE PROVIDED AND INSTALLED IN ALL INLETS WHERE THE DEPTH EXCEEDS 5'-0".
8. TOTAL QUANTITIES SHOWN FOR CONCRETE AND REINFORCING ARE APPROXIMATE AND ARE PLACED HERE FOR INFORMATIONAL PURPOSES ONLY.
9. PAYMENT OF CURB & GRATE INLETS AND EXTENSIONS THERETO AS SHOWN ON THE PLANS WILL BE PAID FOR UNDER ITEM 465 "INLET (COMPL) (CGI) (TY SS) AND "INLET EXT (TY SS)".
10. ALL STRUCTURAL STEEL COMPONENTS EXCEPT REINFORCING SHALL BE GALVANIZED AFTER FABRICATION.

NO.	REVISION	BY	DATE

STATE OF TEXAS
ABRAHAM A ABUGATTAS
34940
LICENSED
PROFESSIONAL ENGINEER
5/28/2021

Texas Department of Transportation
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OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

US 62/180
CURB AND GRATE INLET TYPE SS
DRA-001(1)-2007

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:	6	TEXAS			US 62/180	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC	131

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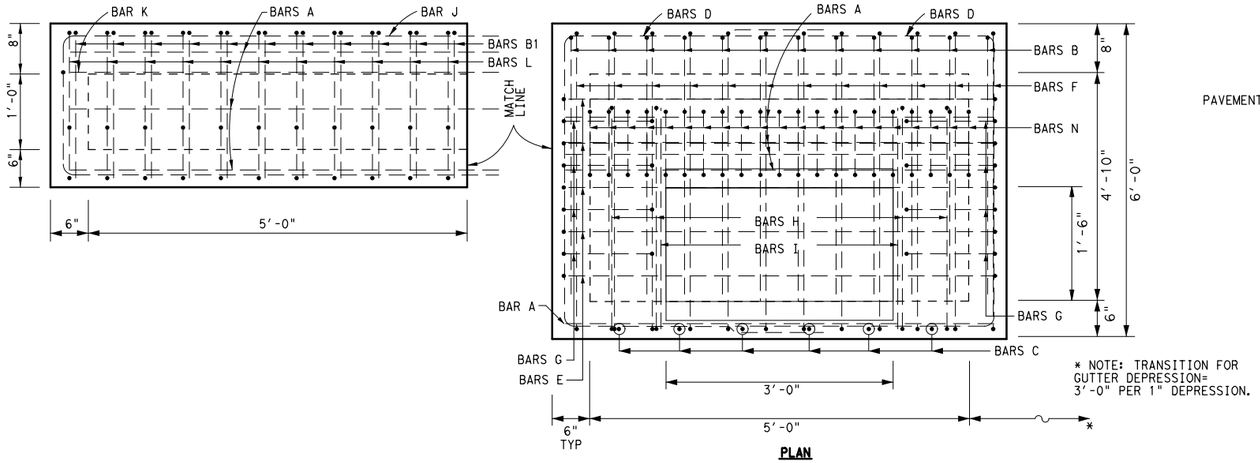
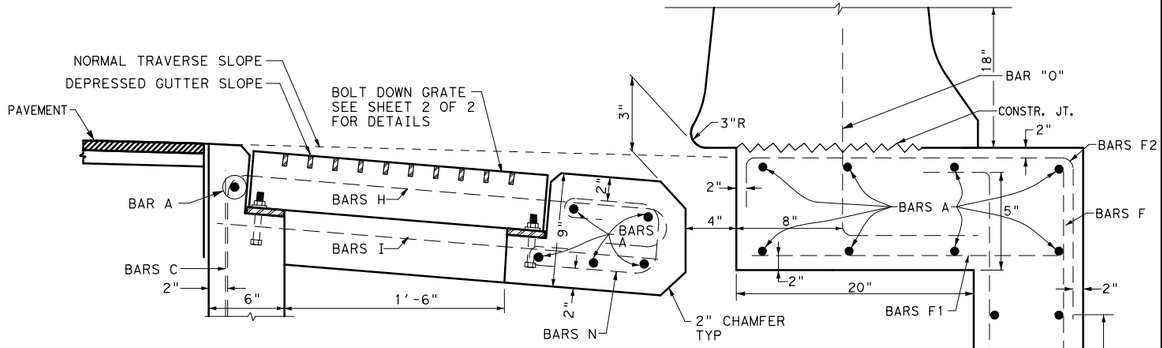


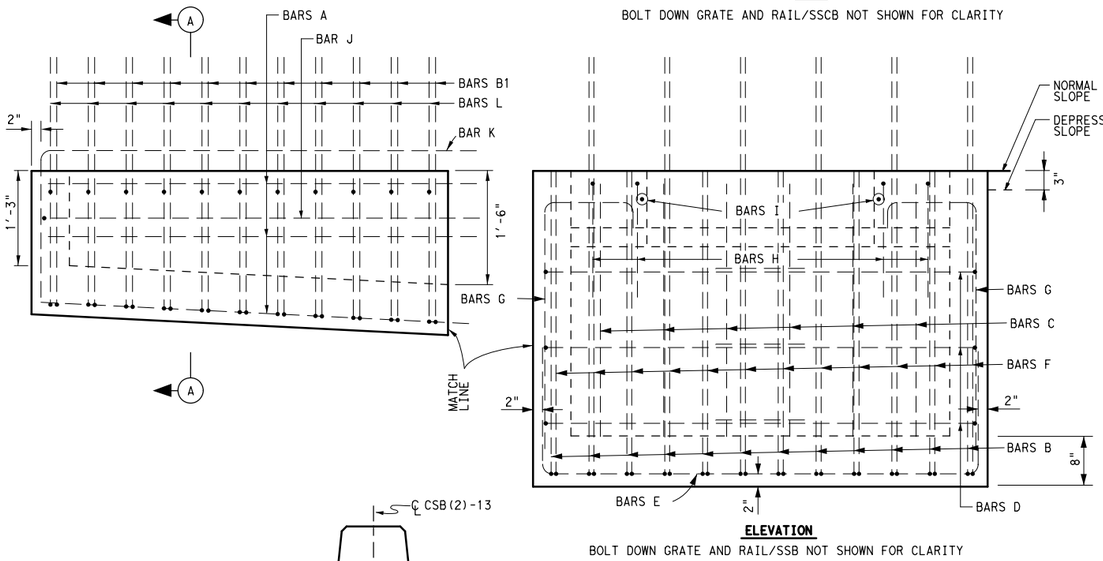
PLAN

BOLT DOWN GRATE AND RAIL/SSCB NOT SHOWN FOR CLARITY

* NOTE: TRANSITION FOR GUTTER DEPRESSION= 3'-0" PER 1" DEPRESSION.

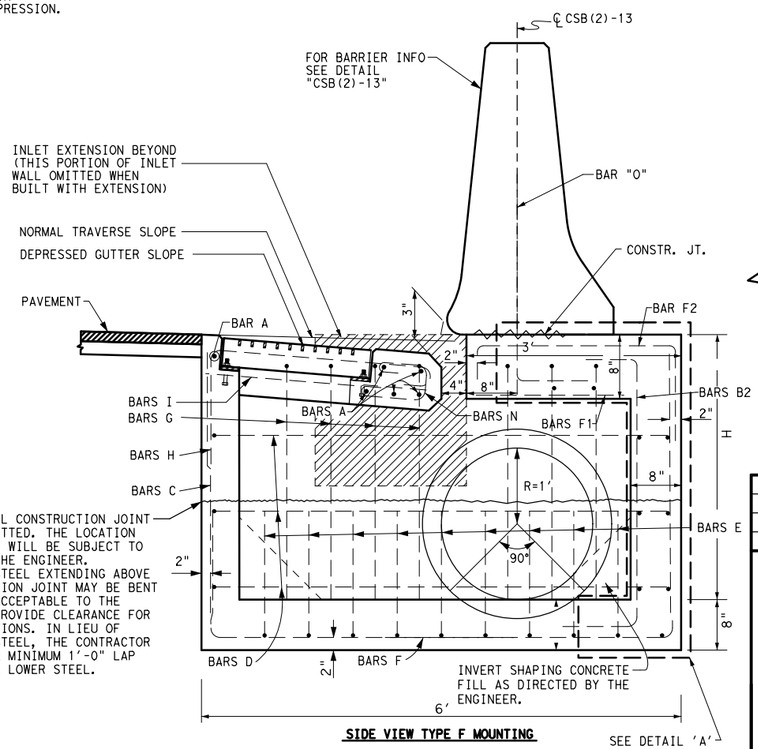


TOP OF INLET DETAIL



ELEVATION

BOLT DOWN GRATE AND RAIL/SSB NOT SHOWN FOR CLARITY



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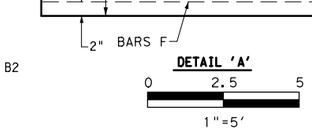
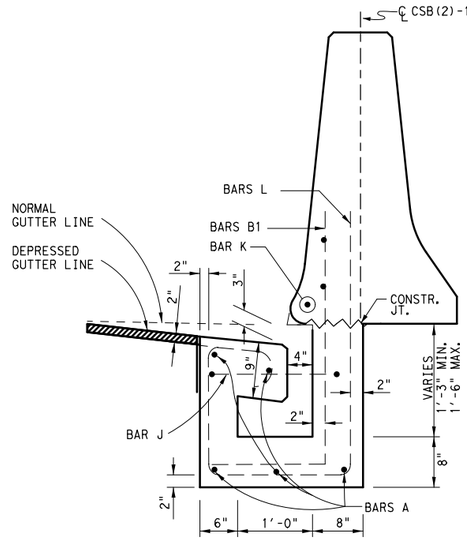


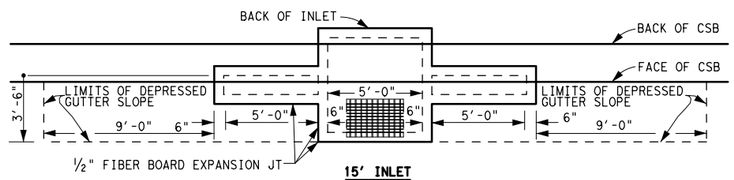
DETAIL 'A'

0 2.5 5

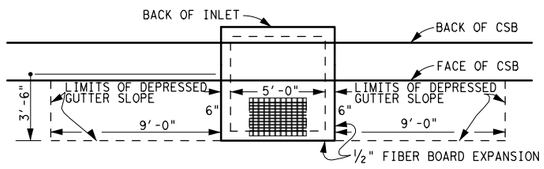
1"=5'



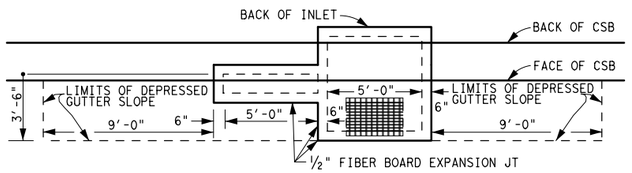
SECTION A-A



15' INLET



5' INLET



10' INLET

PLAN OF INLET AND EXTENSIONS

(TRAFFIC RAIL NOT SHOWN)

NO.	REVISION	BY	DATE

STATE OF TEXAS
ABRAHAM A ABUGATTAS
34940
LICENSED PROFESSIONAL ENGINEER
5/28/2021

Texas Department of Transportation
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HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

US 62/180
CURB AND GRATE INLET TYPE SS (MOD) DRA-001(1)-2007

SHEET 1 OF 2

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS		US 62/180

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC	132

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REINFORCING STEEL FOR 5' INLET

INLET SIZE		BAR "A"					BAR "B"					BAR "C"					BAR "D"					BAR "E"					BAR "F"					BAR "G"					BAR "H"					BAR "I"					BAR "N"				
HEIGHT FT	WIDTH FT	NO	SIZE	TY	SPACING	LENGTH	NO	SIZE	TY	SPACING	LENGTH	NO	SIZE	TY	SPACING	LENGTH	NO	SIZE	TY	SPACING	LENGTH	NO	SIZE	TY	SPACING	LENGTH	NO	SIZE	TY	SPACING	LENGTH	NO	SIZE	TY	SPACING	LENGTH	NO	SIZE	TY	SPACING	LENGTH	NO	SIZE	TY	SPACING	LENGTH	NO	SIZE	TY	SPACING	LENGTH
2.5	3'-0"	19	#6	ST	AS SHOWN	5'-9"	12	#5	BT	6" C-C	8'-0"	6	#5	BT	10" C-C	2'-10"	8	#5	BT	12" C-C	12'-6"	9	#5	BT	7" C-C	9'-1"	12	#5	BT	6" C-C	10'-0"	8	#4	BT	7" C-C	3'-10"	4	#4	BT	AS SHOWN	5'-0"	2	#4	ST	AS SHOWN	2'-11"	28	#4	BT	3" C-C	2'-7"
3.0	3'-0"	6	#6	ST	AS SHOWN	5'-9"	12	#5	BT	6" C-C	8'-6"	6	#4	BT	10" C-C	3'-4"	6	#4	BT	12" C-C	10'-8"	5	#5	BT	7" C-C	9'-1"	12	#5	BT	6" C-C	10'-6"	8	#4	BT	7" C-C	4'-4"	4	#4	BT	AS SHOWN	5'-0"	2	#4	ST	AS SHOWN	2'-11"	21	#4	BT	3" C-C	2'-7"
3.5	3'-0"	6	#6	ST	AS SHOWN	5'-9"	12	#5	BT	6" C-C	9'-0"	6	#4	BT	10" C-C	3'-10"	6	#4	BT	12" C-C	10'-8"	5	#5	BT	7" C-C	9'-1"	12	#5	BT	6" C-C	11'-0"	8	#4	BT	7" C-C	4'-10"	4	#4	BT	AS SHOWN	5'-0"	2	#4	ST	AS SHOWN	2'-11"	21	#4	BT	3" C-C	2'-7"
4.0	3'-0"	6	#6	ST	AS SHOWN	5'-9"	12	#5	BT	6" C-C	9'-6"	6	#4	BT	10" C-C	4-4"	8	#4	BT	12" C-C	10'-8"	5	#5	BT	7" C-C	9'-1"	12	#5	BT	6" C-C	11'-6"	8	#4	BT	7" C-C	5'-4"	4	#4	BT	AS SHOWN	5'-0"	2	#4	ST	AS SHOWN	2'-11"	21	#4	BT	3" C-C	2'-7"
4.5	3'-0"	6	#6	ST	AS SHOWN	5'-9"	12	#5	BT	6" C-C	10-0"	6	#4	BT	10" C-C	4'-10"	8	#4	BT	12" C-C	10'-8"	5	#5	BT	7" C-C	9'-1"	12	#5	BT	6" C-C	12'-0"	8	#4	BT	7" C-C	5'-10"	4	#4	BT	AS SHOWN	5'-0"	2	#4	ST	AS SHOWN	2'-11"	21	#4	BT	3" C-C	2'-7"
5.0	3'-0"	6	#6	ST	AS SHOWN	5'-9"	12	#5	BT	6" C-C	10'-6"	6	#4	BT	10" C-C	5'-4"	10	#4	BT	12" C-C	10'-8"	5	#5	BT	7" C-C	9'-1"	12	#5	BT	6" C-C	12'-6"	8	#4	BT	7" C-C	6'-4"	4	#4	BT	AS SHOWN	5'-0"	2	#4	ST	AS SHOWN	2'-11"	21	#4	BT	3" C-C	2'-7"
5.5	3'-0"	6	#6	ST	AS SHOWN	5'-9"	12	#5	BT	6" C-C	10'-6"	6	#4	BT	10" C-C	5'-4"	10	#4	BT	12" C-C	10'-8"	5	#5	BT	7" C-C	9'-1"	12	#5	BT	6" C-C	12'-6"	8	#4	BT	7" C-C	6'-4"	4	#4	BT	AS SHOWN	5'-0"	2	#4	ST	AS SHOWN	2'-11"	21	#4	BT	3" C-C	2'-7"
6.0	3'-0"	6	#6	ST	AS SHOWN	5'-9"	12	#5	BT	6" C-C	10'-6"	6	#4	BT	10" C-C	5'-4"	10	#4	BT	12" C-C	10'-8"	5	#5	BT	7" C-C	9'-1"	12	#5	BT	6" C-C	12'-6"	8	#4	BT	7" C-C	6'-4"	4	#4	BT	AS SHOWN	5'-0"	2	#4	ST	AS SHOWN	2'-11"	21	#4	BT	3" C-C	2'-7"

REINFORCING STEEL FOR 5' INLET

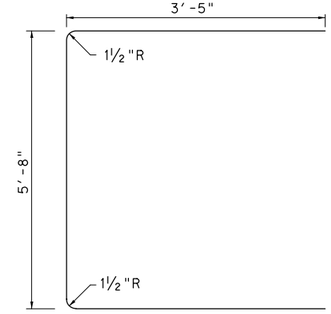
INLET SIZE		BAR "B1"					BAR "B2"					BAR "D1"					BAR "F1"					BAR "F2"					BAR "O"					BAR "L"				
HEIGHT FT	WIDTH FT	NO	SIZE	TY	SPACING	LENGTH	NO	SIZE	TY	SPACING	LENGTH	NO	SIZE	TY	SPACING	LENGTH	NO	SIZE	TY	SPACING	LENGTH	NO	SIZE	TY	SPACING	LENGTH	NO	SIZE	TY	SPACING	LENGTH	NO	SIZE	TY	SPACING	LENGTH
2.5	3'-0"	11	#5	BT	6" C-C	5'-4"	6	#4	BT	12" C-C	3'-10"	4	#4	ST	10" C-C	5'-6"	5	#5	ST	12" C-C	2'-8"	11	#5	BT	6" C-C	5'-2"	6	#6	BT	12" C-C	3'-4"	11	#4	BT	7" C-C	9'-0"
3.0	3'-0"	11	#5	BT	6" C-C	5'-4"	6	#4	BT	12" C-C	3'-10"	4	#4	ST	10" C-C	5'-6"	5	#5	ST	12" C-C	2'-8"	11	#5	BT	6" C-C	5'-2"	6	#6	BT	12" C-C	3'-4"	11	#4	BT	7" C-C	9'-0"
3.5	3'-0"	11	#5	BT	6" C-C	5'-4"	6	#4	BT	12" C-C	3'-10"	4	#4	ST	10" C-C	5'-6"	5	#5	ST	12" C-C	2'-8"	11	#5	BT	6" C-C	5'-2"	6	#6	BT	12" C-C	3'-4"	11	#4	BT	7" C-C	9'-0"
4.0	3'-0"	11	#5	BT	6" C-C	5'-4"	6	#4	BT	12" C-C	3'-10"	4	#4	ST	10" C-C	5'-6"	5	#5	ST	12" C-C	2'-8"	11	#5	BT	6" C-C	5'-2"	6	#6	BT	12" C-C	3'-4"	11	#4	BT	7" C-C	9'-0"
4.5	3'-0"	11	#5	BT	6" C-C	5'-4"	6	#4	BT	12" C-C	3'-10"	4	#4	ST	10" C-C	5'-6"	5	#5	ST	12" C-C	2'-8"	11	#5	BT	6" C-C	5'-2"	6	#6	BT	12" C-C	3'-4"	11	#4	BT	7" C-C	9'-0"
5.0	3'-0"	11	#5	BT	6" C-C	5'-4"	6	#4	BT	12" C-C	3'-10"	4	#4	ST	10" C-C	5'-6"	5	#5	ST	12" C-C	2'-8"	11	#5	BT	6" C-C	5'-2"	6	#6	BT	12" C-C	3'-4"	11	#4	BT	7" C-C	9'-0"
5.5	3'-0"	11	#5	BT	6" C-C	5'-4"	6	#4	BT	12" C-C	3'-10"	4	#4	ST	10" C-C	5'-6"	5	#5	ST	12" C-C	2'-8"	11	#5	BT	6" C-C	5'-2"	6	#6	BT	12" C-C	3'-4"	11	#4	BT	7" C-C	9'-0"
6.0	3'-0"	11	#5	BT	6" C-C	5'-4"	6	#4	BT	12" C-C	3'-10"	4	#4	ST	10" C-C	5'-6"	5	#5	ST	12" C-C	2'-8"	11	#5	BT	6" C-C	5'-2"	6	#6	BT	12" C-C	3'-4"	11	#4	BT	7" C-C	9'-0"

REINFORCING STEEL AND CONCRETE FOR ONE 5' EXT.

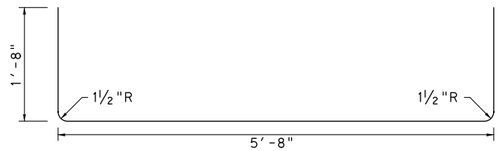
BAR	NO	SIZE	TY	SPACING	LENGTH
A	5	#6	ST	AS SHOWN	5'-9"
B1	11	#5	ST	6" C-C	4'-9" TO 5'-0"
J	1	#4	BT	AS SHOWN	13'-4"
K	1	#4	BT	AS SHOWN	7'-9"
L	11	#5	BT	6" C-C	7'-10" TO 8'-4"

STRUCTURAL STEEL FOR 3' x 2' BOLT DOWN GRATE

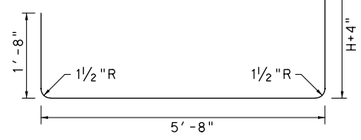
BAR	NO	SPACING	LENGTH
3"x½" SIDERAIL	2	AS SHOWN	3'-0"
4½"x½" BEARING BAR	10	AS SHOWN	1'-11¾"
1"x⅜" STRINGER BAR	10	AS SHOWN	2'-11¾"
TOTAL STRUCTURAL STEEL (LBS)			



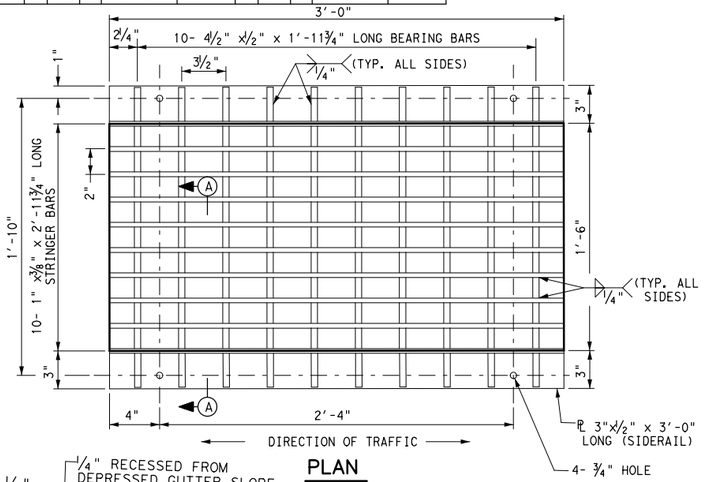
BAR "D"



BAR "E"



BAR "F"



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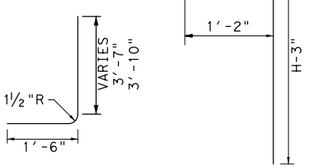
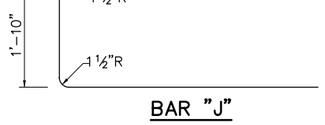


BAR "B1" BAR "G"



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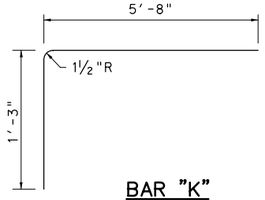

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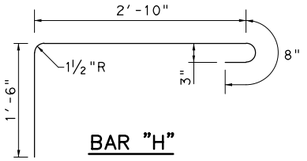

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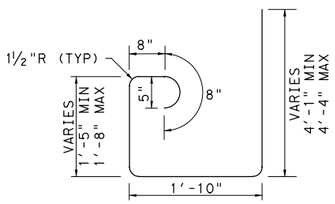

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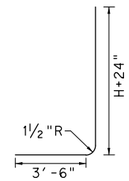

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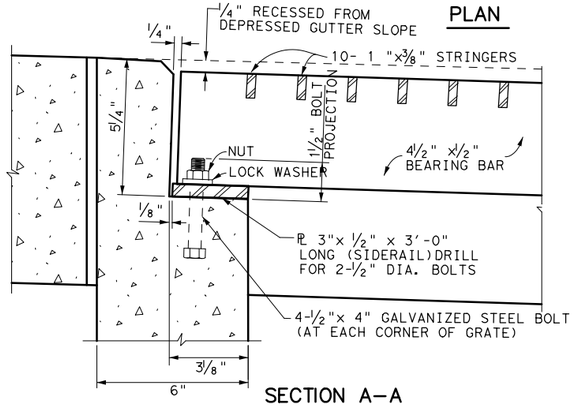
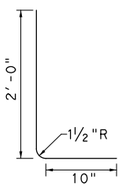
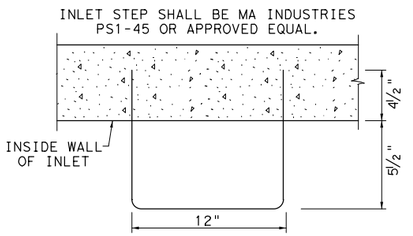


SECTION A–A

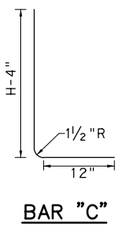
BOLT DOWN GRATE DETAIL



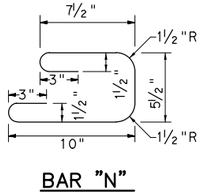
BAR "O"



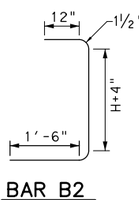
DETAIL OF INLET STEP



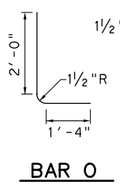
BAR "C"



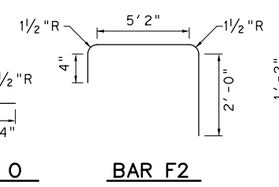
BAR "N"



BAR B2



BAR O



BAR F2

BAR "B"

GENERAL NOTES

1. ALL CONCRETE SHALL BE CLASS "A" AND CONFORM TO ITEM 421 "HYDRAULIC CEMENT CONCRETE".
2. REINFORCING BARS SHALL BE GRADE 60 AND CONFORM TO ASTM A615. ALL REINFORCING SHALL CONFORM TO ITEM 440 "REINFORCING STEEL".
3. DIMENSIONS RELATING TO REINFORCING STEEL ARE TO THE CENTER OF THE BARS.
4. ALL EXPOSED CORNERS SHALL BE CHAMFERED ¾".
5. BAR DETAILS SHALL BE ADJUSTED AS NECESSARY TO ACCOMMODATE A HORIZONTAL CONSTRUCTION JOINT IF USED. REINFORCING STEEL QUANTITIES SHOWN DO NOT INCLUDE LAP STEEL REQUIRED FOR CONSTRUCTION JOINTS.
6. ALL STRUCTURAL STEEL SHALL CONFORM TO ASTM A 36.
7. INLET STEPS SPACED 10" C.C. AND LOCATED AS DIRECTED BY THE ENGINEER, AND SHALL BE PROVIDED AND INSTALLED IN ALL INLETS WHERE THE DEPTH EXCEEDS 5'-0".
8. TOTAL QUANTITIES SHOWN FOR CONCRETE AND REINFORCING ARE APPROXIMATE AND ARE PLACED HERE FOR INFORMATIONAL PURPOSES ONLY.
9. PAYMENT OF CURB & GRATE INLETS AND EXTENSIONS THERETO AS SHOWN ON THE PLANS WILL BE PAID FOR UNDER ITEM 465 "INLET (COMPL) (CGI) (TY SS) AND "INLET EXT (TY SS)".
10. ALL STRUCTURAL STEEL COMPONENTS EXCEPT REINFORCING SHALL BE GALVANIZED AFTER FABRICATION.

NO.	REVISION	BY	DATE

STATE OF TEXAS
ABRAHAM A ABUGATTAS
34940
LICENSED PROFESSIONAL ENGINEER
5/28/2021

Texas Department of Transportation
© 2021

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

US 62/180
CURB AND GRATE INLET TYPE SS (MOD) DRA-001(1)-2007

SHEET 2 OF 2

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:	6	TEXAS				US 62/180
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	ELP	CULBERSON	0233	02	035,ETC	133

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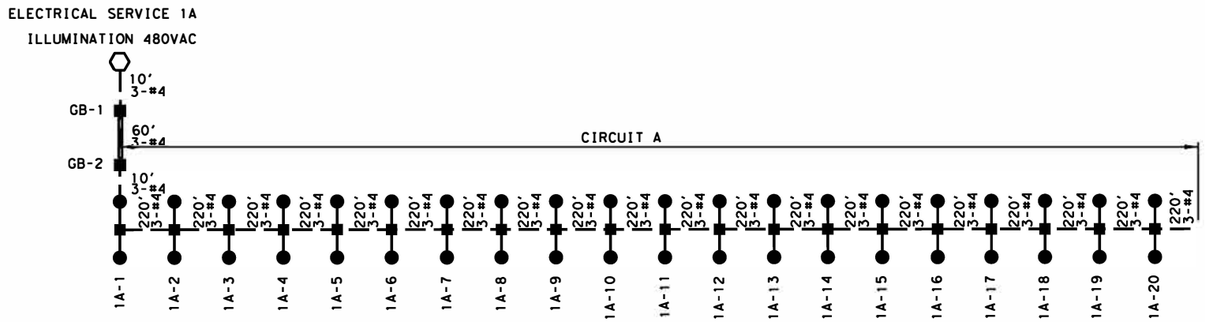

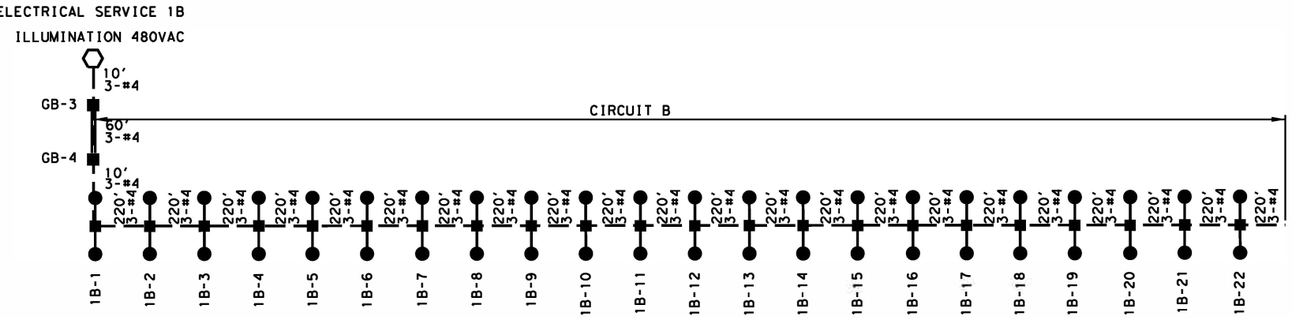

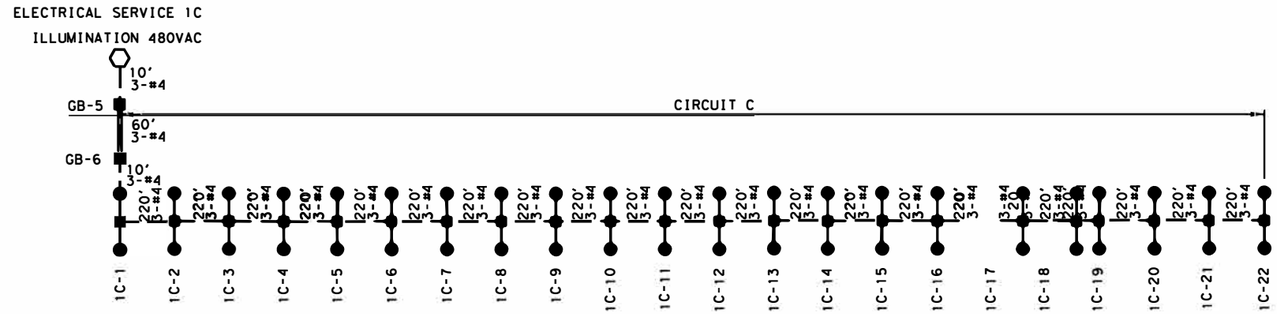

LEGEND	
	IN RD IL (TY SP)38S-8-8 (250W EQ) LED
	ELECTRICAL SERVICE
	GROUND BOX TY A
	CONDUIT AND CONDUCTOR (TRENCHED)
	CONDUIT AND CONDUCTOR (BORE)
#	RUN NUMBER
#	SERVICE NUMBER

POLE DESIGNATION

1B-2
- POLE OR LUMINAIRE NO.
- CIRCUIT NO.
- SERVICE NO.

ELECTRICAL SERVICE DATA SHEET

Electrical Service Description	Service #Conduit Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Lighting Contactor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
ELC SRV TY A 240/480 060 (NS)SS(E)GC(O)	2"	3/#4	N/A	2P/60	2P/ 60	N/A	A	2P/20	7	13.0
							B(Spare)	2P/20	10	
							C(Spare)	2P/20	10	
ELC SRV TY A 240/480 060 (NS)SS(E)GC(O)	2"	3/#4	N/A	2P/60	2P/ 60	N/A	A(Spare)	2P/20	10	13.3
							B	2P/20	7.7	
							C(Spare)	2P/20	10	
ELC SRV TY A 240/480 060 (NS)SS(E)GC(O)	2"	3/#4	N/A	2P/60	2P/ 60	N/A	A(Spare)	2P/20	10	13.3
							B(Spare)	2P/20	10	
							C	2P/20	7.7	

07/01/2021

US 62 MED CONCRETE TRAFFIC BARRIER
TRAFFIC

ILLUMINATION CIRCUIT DIAGRAM

SHEET 1 OF 1

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		134

DATE: 6/30/2021 8:50:39 AM
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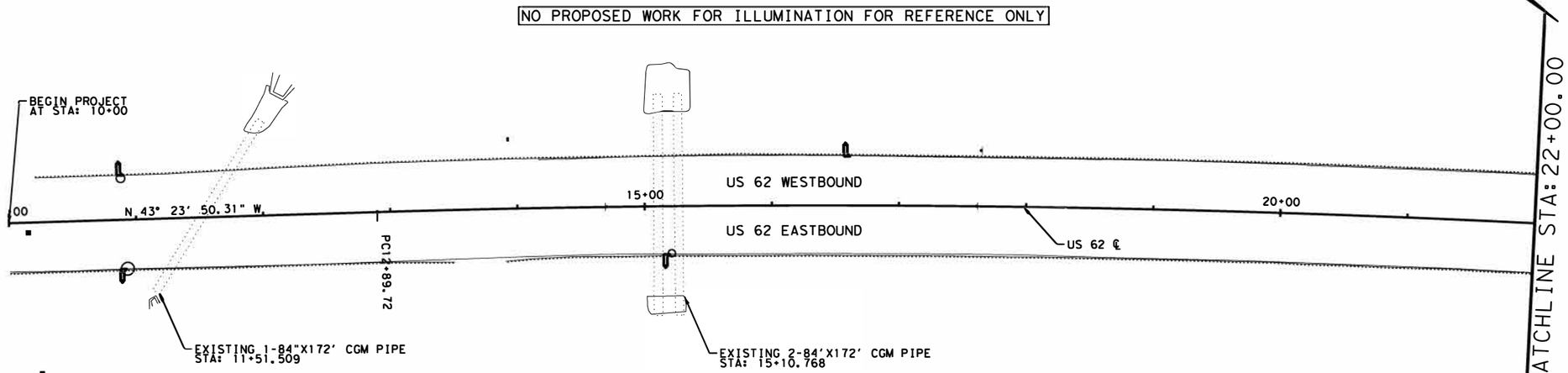
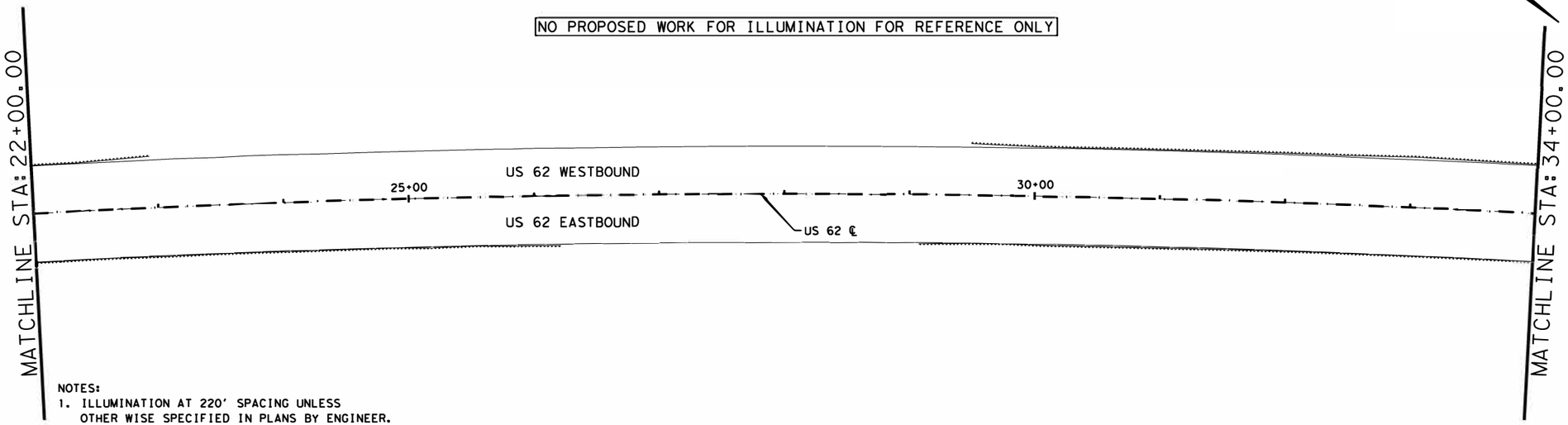


1A



NOTES:
1. ILLUMINATION AT 220' SPACING UNLESS OTHER WISE SPECIFIED IN PLANS BY ENGINEER.

2. LEDs FOR ILLUMINATION FIXTURES TO BE DARK SKY COMPLIANT AS PER ILLUMINATION ENGINEERING SOCIETY. LEDs TO BE 2700K "CCT"(CORRELATED COLOR TEMPERATURE).

3. 250WEQ LUMINAIRES TO HAVE "UO" RATING (NO UP LIGHT).

PROP. (TY SP) 38S-8-8 (250W EQ) LED	
ELECTRICAL SERVICE	
GROUND BOX TY A	
CONDUIT AND CONDUCTOR (TRENCHED)	
CONDUIT AND CONDUCTOR (BORE)	
#	RUN NUMBER
#	SERVICE NUMBER

1B-2
- POLE OR LUMINAIRE NO.
- CIRCUIT NO.
- SERVICE NO.

0' 100' 200'
SCALE: 1"=100'

STATE OF TEXAS
MARICRUZ SAENZ
108338
LICENSED
PROFESSIONAL ENGINEER
Maricruz Saenz P.E.
07/02/2021

US 62 MED CONCRETE TRAFFIC BARRIER
TRAFFIC

ILLUMINATION LAYOUT
BEGIN PROJECT TO STA. 34+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		135

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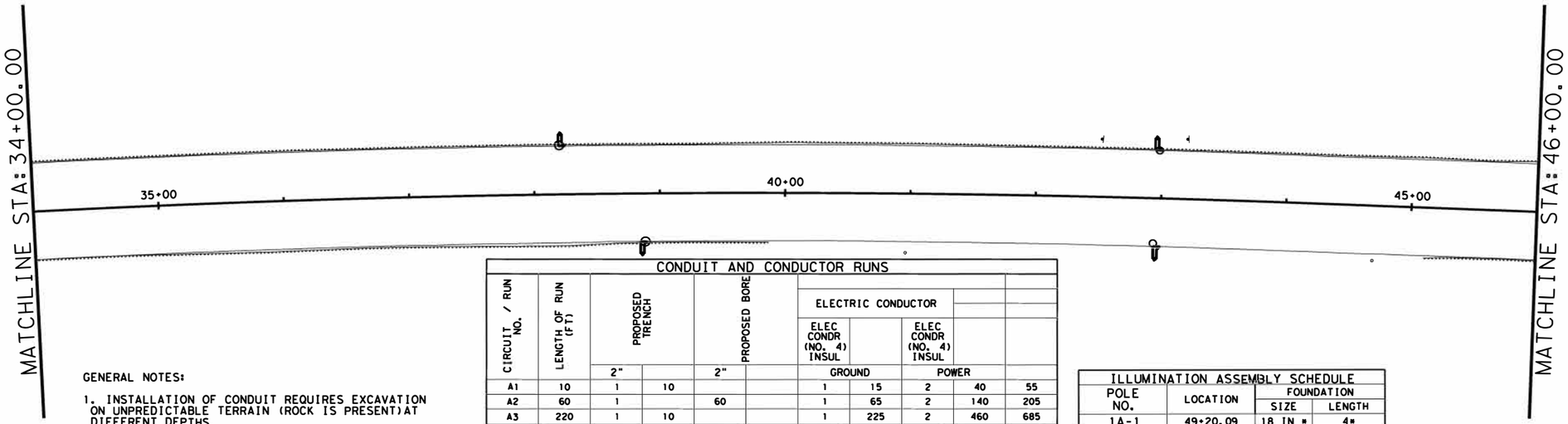


LEGEND	
⊶⊶⊶	PROP. (TY SP) 38S-8-8 (250W EQ) LED
⬡	ELECTRICAL SERVICE
■	GROUND BOX TY A
— —	CONDUIT AND CONDUCTOR (TRENCHED)
═══	CONDUIT AND CONDUCTOR (BORE)
(#)	RUN NUMBER
#	SERVICE NUMBER

POLE DESIGNATION

1B-2
- POLE OR LUMINAIRE NO.
- CIRCUIT NO.
- SERVICE NO.

GENERAL NOTES:

1. INSTALLATION OF CONDUIT REQUIRES EXCAVATION ON UNPREDICTABLE TERRAIN (ROCK IS PRESENT)AT DIFFERENT DEPTHS.

2. LOCATION ADJUSTMENTS CAN ONLY BE DETERMINED AND APPROVED BY THE ENGINEER.

3. CONTRACTOR SHALL NOTIFY TEXAS EXCAVATION SAFETY SYSTEM (TESS), 48 HOURS PRIOR TO WORKING IN OR NEAR ANY AND ALL PIPELINES AT 1-800-344-8377.

4. THE CONTRACTOR SHALL VERIFY LOCATION OF UNDERGROUND PIPELINES BY CONTACTING OWNERS OF UNDERGROUND UTILITIES OR BY EXCAVATION IN ADVANCE OF CONSTRUCTION.

5. ILLUMINATION AT 220' SPACING UNLESS OTHERWISE SPECIFIED IN PLANS BY ENGINEER.

6. LEDs FOR ILLUMINATION FIXTURES TO BE DARK SKY COMPLIANT AS PER ILLUMINATION ENGINEERING SOCIETY. LEDs TO BE 2700K "CCT"(CORRELATED COLOR TEMPERATURE).

7. 250WEQ LUMINAIRES TO HAVE "U0" RATING (NO UP LIGHT).

CONDUIT AND CONDUCTOR RUNS

CIRCUIT / RUN NO.	LENGTH OF RUN (FT)	PROPOSED TRENCH		PROPOSED BORE		ELECTRIC CONDUCTOR				
						ELEC CONDR (NO. 4) INSUL		ELEC CONDR (NO. 4) INSUL		
		2"		2"		GROUND		POWER		
A1	10	1	10			1	15	2	40	55
A2	60	1		60		1	65	2	140	205
A3	220	1	10			1	225	2	460	685
A4	10	1	10			1	15	2	40	55
A5	220	1	220			1	225	2	460	685
A6	220	1	220			1	225	2	460	685
A7	220	1	220			1	225	2	460	685
TOTAL			**690**	**60**			**995**		**2060**	**3055**

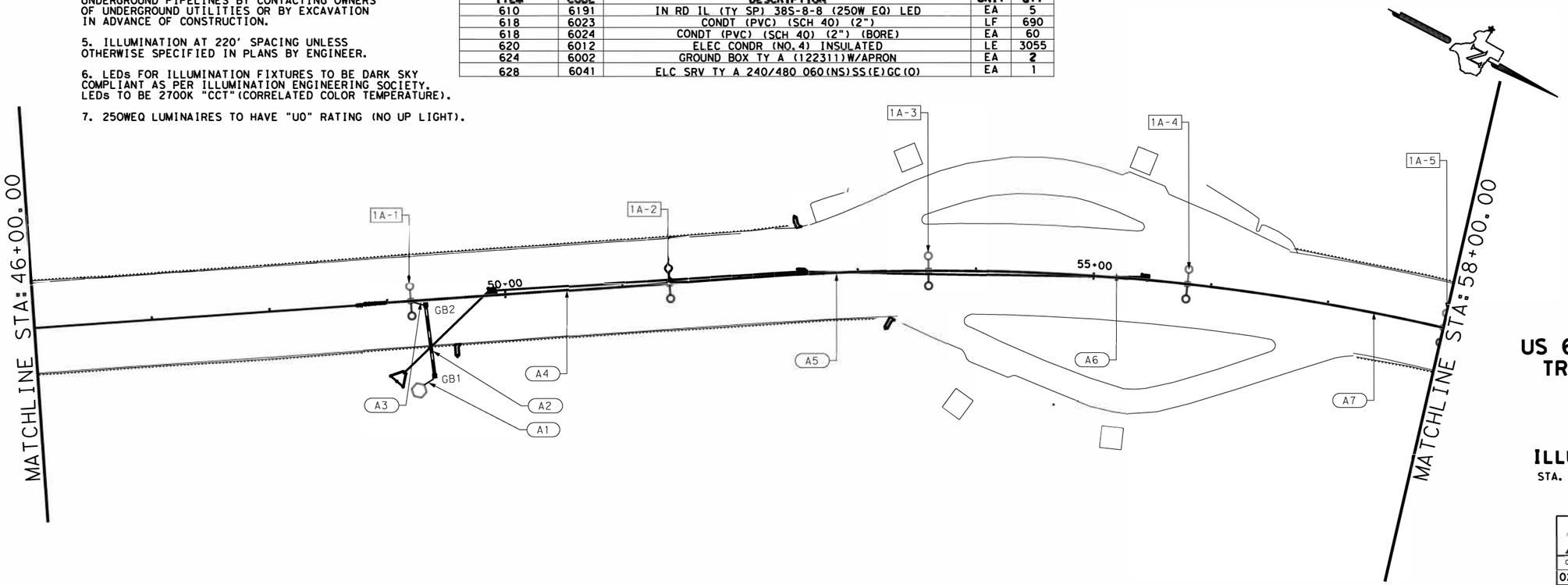
ILLUMINATION ASSEMBLY SCHEDULE

POLE NO.	LOCATION	FOUNDATION	
		SIZE	LENGTH
1A-1	49+20.09	18 IN *	4*
1A-2	51+39.94	18 IN *	4*
1A-3	53+60.00	18 IN *	4*
1A-4	55+79.94	18 IN *	4*
1A-5	57+99.94	18 IN *	4*

*SUBSIDIARY TO ITEM 514. REFER TO ROADWAY SHEETS FOR ITEM 514 QUANTITIES

ILLUMINATION ESTIMATED QUANTITIES

ITEM	CODE	DESCRIPTION	UNIT	QTY
610	6191	IN RD IL (TY SP) 38S-8-8 (250W EQ) LED	EA	5
618	6023	CONDT (PVC) (SCH 40) (2")	LF	690
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	EA	60
620	6012	ELEC CONDR (NO.4) INSULATED	LE	3055
624	6002	GROUND BOX TY A (122311)W/APRON	EA	2
628	6041	ELC SRV TY A 240/480 060(NS)SS(E)GC(O)	EA	1



STATE OF TEXAS
MARICRUZ SAENZ
108338
LICENSED
PROFESSIONAL ENGINEER

Maricruz Saenz P.E.

07/02/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC

ILLUMINATION LAYOUT

STA. 34+00.00 TO STA. 58+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		136

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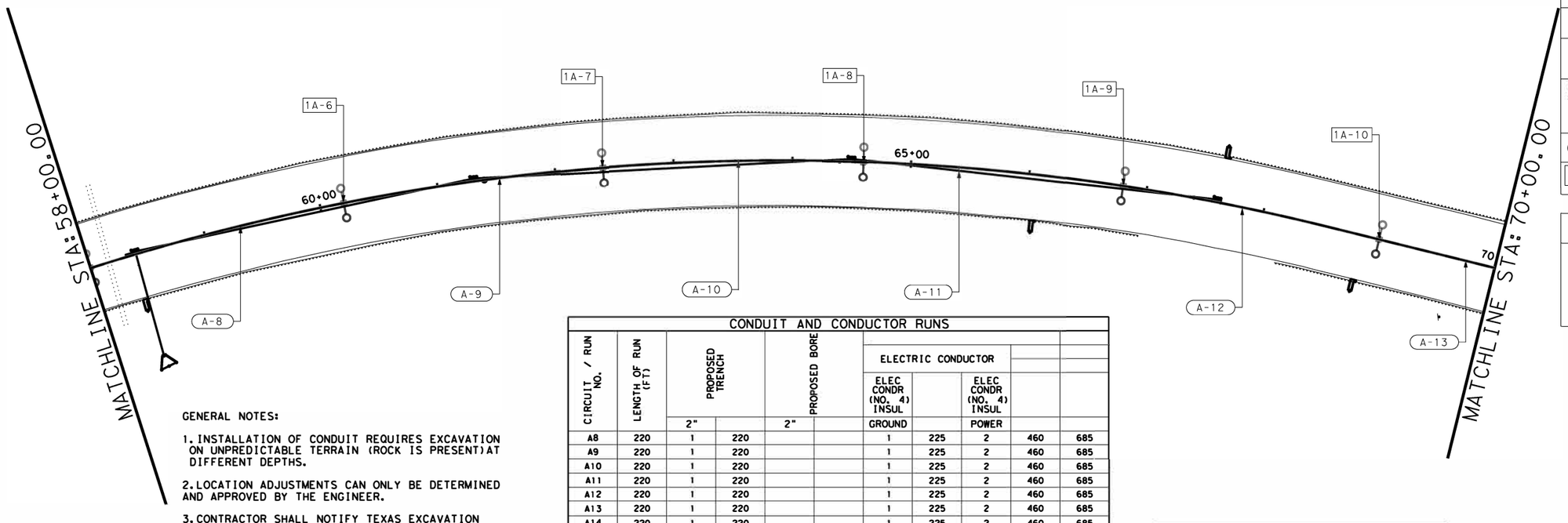


LEGEND	
	PROP. LED HMA (6 FIXT) (ASYM) (TY A)
	ELECTRICAL SERVICE
	GROUND BOX TY A
	CONDUIT AND CONDUCTOR (TRENCHED)
	CONDUIT AND CONDUCTOR (BORE)
#	RUN NUMBER
#	SERVICE NUMBER

POLE DESIGNATION

1B-2
- 1 — POLE OR LUMINAIRE NO.
- B — CIRCUIT NO.
- 2 — SERVICE NO.

GENERAL NOTES:

1. INSTALLATION OF CONDUIT REQUIRES EXCAVATION ON UNPREDICTABLE TERRAIN (ROCK IS PRESENT) AT DIFFERENT DEPTHS.

2. LOCATION ADJUSTMENTS CAN ONLY BE DETERMINED AND APPROVED BY THE ENGINEER.

3. CONTRACTOR SHALL NOTIFY TEXAS EXCAVATION SAFETY SYSTEM (TESS), 48 HOURS PRIOR TO WORKING IN OR NEAR ANY AND ALL PIPELINES AT 1-800-344-8377.

4. THE CONTRACTOR SHALL VERIFY LOCATION OF UNDERGROUND PIPELINES BY CONTACTING OWNERS OF UNDERGROUND UTILITIES OR BY EXCAVATION IN ADVANCE OF CONSTRUCTION.

5. ILLUMINATION AT 220' SPACING UNLESS OTHERWISE SPECIFIED IN PLANS BY ENGINEER.

6. LEDs FOR ILLUMINATION FIXTURES TO BE DARK SKY COMPLIANT AS PER ILLUMINATION ENGINEERING SOCIETY. LEDs TO BE 2700K "CCT" (CORRELATED COLOR TEMPERATURE).

7. 250WEQ LUMINAIRES TO HAVE "U0" RATING (NO UP LIGHT).

CONDUIT AND CONDUCTOR RUNS

CIRCUIT / RUN NO.	LENGTH OF RUN (FT)	PROPOSED TRENCH		PROPOSED BORE		ELECTRIC CONDUCTOR				
		2"		2"		ELEC CONDR (NO. 4) INSUL GROUND		ELEC CONDR (NO. 4) INSUL POWER		
A8	220	1	220			1	225	2	460	685
A9	220	1	220			1	225	2	460	685
A10	220	1	220			1	225	2	460	685
A11	220	1	220			1	225	2	460	685
A12	220	1	220			1	225	2	460	685
A13	220	1	220			1	225	2	460	685
A14	220	1	220			1	225	2	460	685
A15	220	1	220			1	225	2	460	685
A16	220	1	220			1	225	2	460	685
A18	260	1	260			1	265	2	540	805
A19	220	1	220			1	225	2	460	685
TOTAL			2460				2515		5140	7655

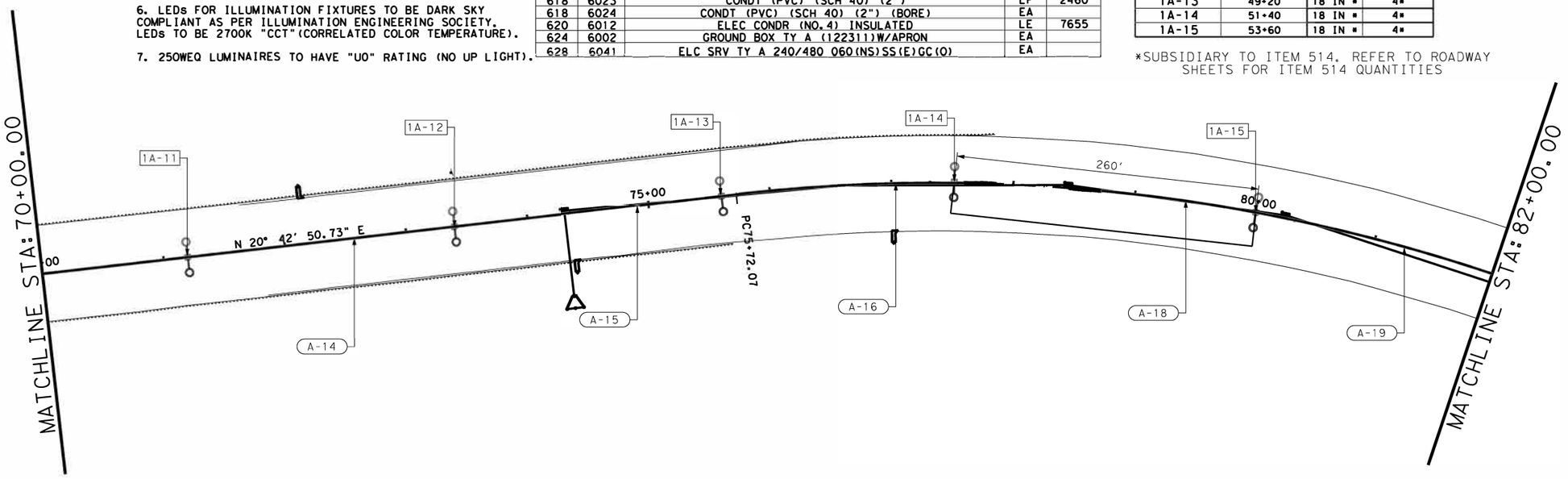
ILLUMINATION ESTIMATED QUANTITIES

ITEM	CODE	DESCRIPTION	UNIT	QTY
610	6191	IN RD IL (TY SP) 38S-8-8 (250W EQ) LED	EA	10
618	6023	CONDT (PVC) (SCH 40) (2")	LF	2460
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	EA	
620	6012	ELEC CONDR (NO.4) INSULATED	LE	7655
624	6002	GROUND BOX TY A (122311) W/APRON	EA	
628	6041	ELC SRV TY A 240/480 060(NS)SS(E)GC(O)	EA	

ILLUMINATION ASSEMBLY SCHEDULE

POLE NO.	LOCATION	FOUNDATION SIZE	FOUNDATION LENGTH
1A-6	60+20	18 IN *	4*
1A-7	62+40	18 IN *	4*
1A-8	64+60	18 IN *	4*
1A-9	66+80	18 IN *	4*
1A-10	69+00	18 IN *	4*
1A-11	71+20	18 IN *	4*
1A-12	73+40	18 IN *	4*
1A-13	49+20	18 IN *	4*
1A-14	51+40	18 IN *	4*
1A-15	53+60	18 IN *	4*

*SUBSIDIARY TO ITEM 514. REFER TO ROADWAY SHEETS FOR ITEM 514 QUANTITIES



STATE OF TEXAS
MARICRUZ SAENZ
108338
LICENSED
PROFESSIONAL ENGINEER

Maricruz Saenz P.E.

07/02/2021

US 62 MED CONCRETE TRAFFIC BARRIER
TRAFFIC

ILLUMINATION LAYOUT
STA. 58+00.00 TO STA. 82+00.00

SHEET 3 OF 8

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CONT	SECT	JOB	HIGHWAY
0233	02	035, etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		137

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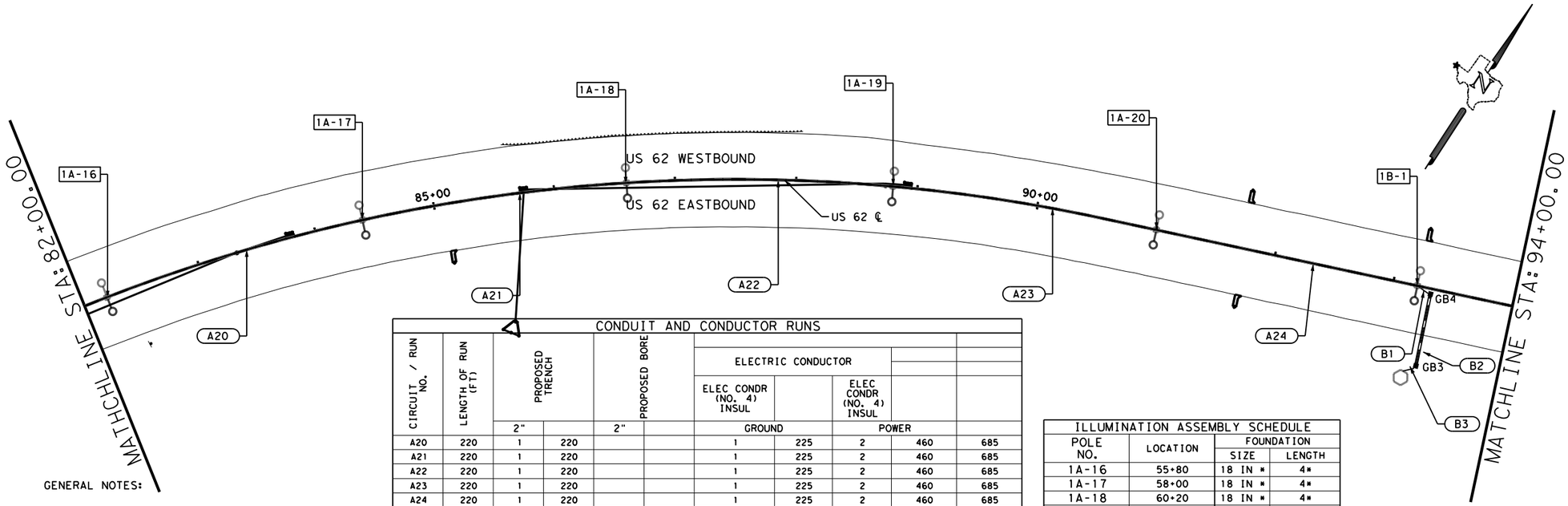


CONDUIT AND CONDUCTOR RUNS										
CIRCUIT / RUN NO.	LENGTH OF RUN (FT)	PROPOSED TRENCH		PROPOSED BORE		ELECTRIC CONDUCTOR				
						ELEC CONDR (NO. 4) INSUL		ELEC CONDR (NO. 4) INSUL		
		2"		2"		GROUND		POWER		
A20	220	1	220			1	225	2	460	685
A21	220	1	220			1	225	2	460	685
A22	220	1	220			1	225	2	460	685
A23	220	1	220			1	225	2	460	685
A24	220	1	220			1	225	2	460	685
B1	10	1	10			1	15	2	40	55
B2	60			1	60	1	65	2	140	205
B3	10	1	10			1	15	2	40	55
B4	220	1	220			1	225	2	460	685
B5	220	1	220			1	225	2	460	685
B6	220	1	220			1	225	2	460	685
B7	220	1	220			1	225	2	460	685
B8	220	1	220			1	225	2	460	685
B9	220	1	220			1	225	2	460	685
TOTAL			1780		60		1895		3900	5795

ILLUMINATION ASSEMBLY SCHEDULE			
POLE NO.	LOCATION	FOUNDATION	
		SIZE	LENGTH
1A-16	55+80	18 IN *	4*
1A-17	58+00	18 IN *	4*
1A-18	60+20	18 IN *	4*
1A-19	62+40	18 IN *	4*
1A-20	64+60	18 IN *	4*
1B-1	93+19	18 IN *	4*
1B-2	95+39	18 IN *	4*
1B-3	97+59	18 IN *	4*
1B-4	99+80	18 IN *	4*
1B-5	100+20	18 IN *	4*
1B-6	104+20	18 IN *	4*

*SUBSIDIARY TO ITEM 514. REFER TO ROADWAY SHEETS FOR ITEM 514 QUANTITIES

LEGEND	
	PROP. IN RD IL (TY SP) 38S-8-8 (250W EQ) LED
	ELECTRICAL SERVICE
	GROUND BOX TY A
	CONDUIT AND CONDUCTOR (TRENCHED)
	CONDUIT AND CONDUCTOR (BORE)
#	RUN NUMBER
#	SERVICE NUMBER

POLE DESIGNATION

1B-2
- POLE OR LUMINAIRE NO.
- CIRCUIT NO.
- SERVICE NO.

0' 100' 200'

SCALE: 1"=100'

GENERAL NOTES:

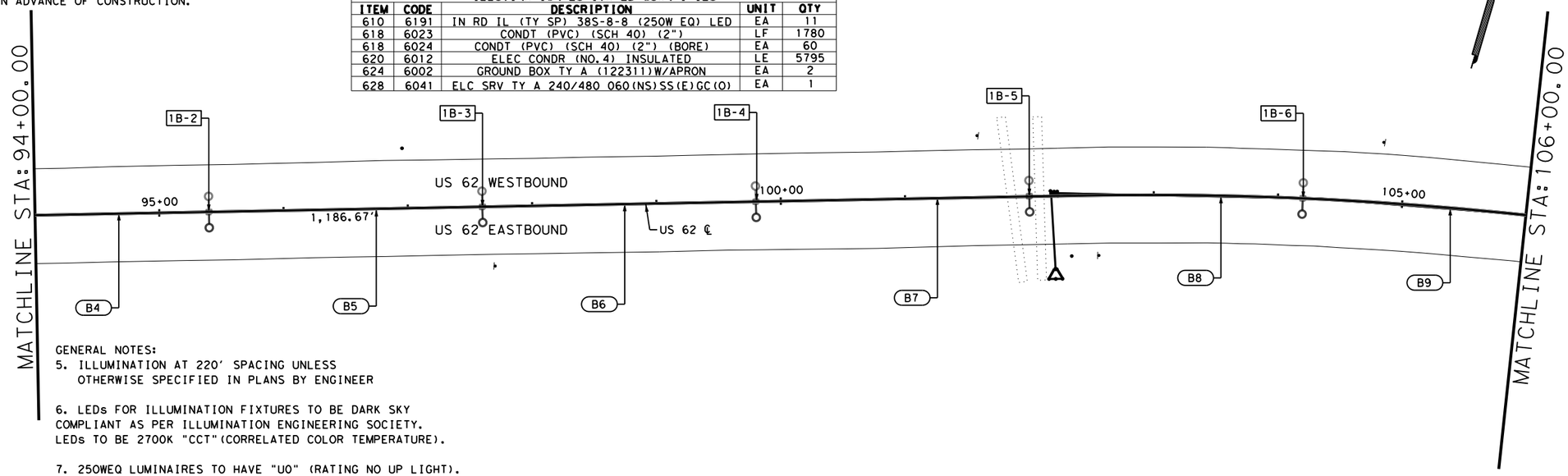
1. INSTALLATION OF CONDUIT REQUIRES EXCAVATION ON UNPREDICTABLE TERRAIN (ROCK IS PRESENT) AT DIFFERENT DEPTHS.

2. LOCATION ADJUSTMENTS CAN ONLY BE DETERMINED AND APPROVED BY THE ENGINEER.

3. CONTRACTOR SHALL NOTIFY TEXAS EXCAVATION SAFETY SYSTEM (TESS), 48 HOURS PRIOR TO WORKING IN OR NEAR ANY AND ALL PIPELINES AT 1-800-344-8377.

4. THE CONTRACTOR SHALL VERIFY LOCATION OF UNDERGROUND PIPELINES BY CONTACTING OWNERS OF UNDERGROUND UTILITIES OR BY EXCAVATION IN ADVANCE OF CONSTRUCTION.

ILLUMINATION ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QTY
610	6191	IN RD IL (TY SP) 38S-8-8 (250W EQ) LED	EA	11
618	6023	CONDT (PVC) (SCH 40) (2")	LF	1780
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	EA	60
620	6012	ELEC CONDR (NO.4) INSULATED	LE	5795
624	6002	GROUND BOX TY A (122311)W/APRON	EA	2
628	6041	ELC SRV TY A 240/480 060(NS)SS(E)GC(O)	EA	1



GENERAL NOTES:

5. ILLUMINATION AT 220' SPACING UNLESS OTHERWISE SPECIFIED IN PLANS BY ENGINEER

6. LEDs FOR ILLUMINATION FIXTURES TO BE DARK SKY COMPLIANT AS PER ILLUMINATION ENGINEERING SOCIETY. LEDs TO BE 2700K "CCT" (CORRELATED COLOR TEMPERATURE).

7. 250WEQ LUMINAIRES TO HAVE "U0" (RATING NO UP LIGHT).

STATE OF TEXAS
MARICRUZ SAENZ
108338
LICENSED
PROFESSIONAL ENGINEER

07/02/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC

ILLUMINATION LAYOUT

STA. 82+00.00 TO STA.106+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035, etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		138

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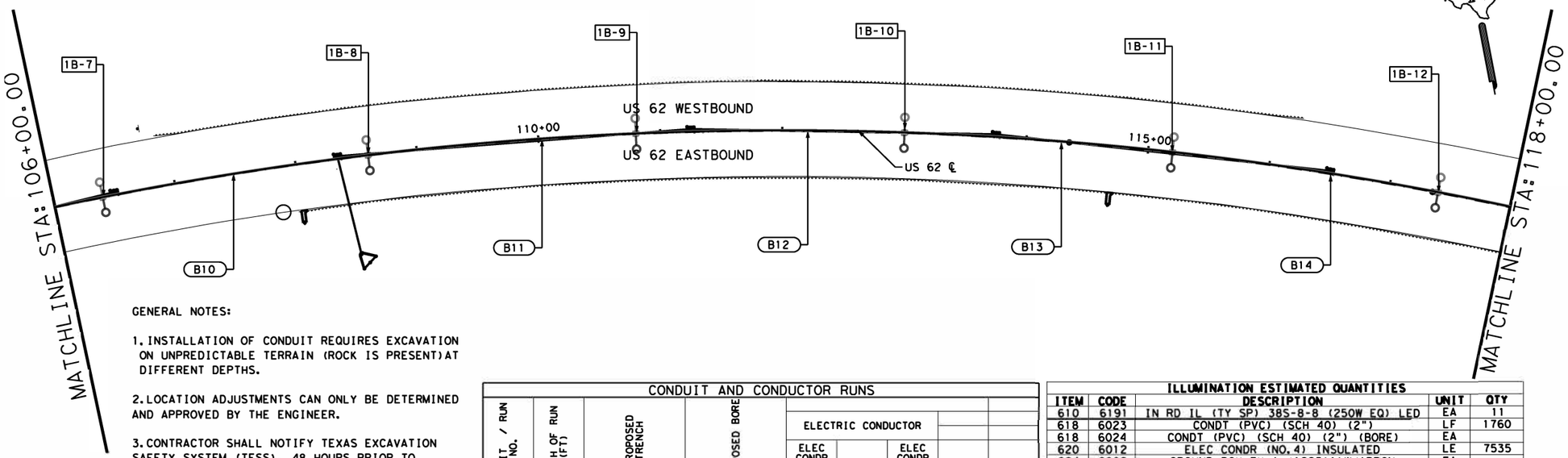


GENERAL NOTES:

1. INSTALLATION OF CONDUIT REQUIRES EXCAVATION ON UNPREDICTABLE TERRAIN (ROCK IS PRESENT) AT DIFFERENT DEPTHS.

2. LOCATION ADJUSTMENTS CAN ONLY BE DETERMINED AND APPROVED BY THE ENGINEER.

3. CONTRACTOR SHALL NOTIFY TEXAS EXCAVATION SAFETY SYSTEM (TESS), 48 HOURS PRIOR TO WORKING IN OR NEAR ANY AND ALL PIPELINES AT 1-800-344-8377.

4. THE CONTRACTOR SHALL VERIFY LOCATION OF UNDERGROUND PIPELINES BY CONTACTING OWNERS OF UNDERGROUND UTILITIES OR BY EXCAVATION IN ADVANCE OF CONSTRUCTION.

5. ILLUMINATION AT 220' SPACING UNLESS OTHERWISE SPECIFIED IN PLANS BY ENGINEER.

5. LEDs FOR ILLUMINATION FIXTURES TO BE DARK SKY COMPLIANT AS PER ILLUMINATION ENGINEERING SOCIETY. LEDs TO BE 2700K "CCT" (CORRELATED COLOR TEMPERATURE).

6. 250WEQ LUMINAIRES TO HAVE "UO" (RATING NO UP LIGHT).

CONDUIT AND CONDUCTOR RUNS

CIRCUIT / RUN NO.	LENGTH OF RUN (FT)	PROPOSED TRENCH		PROPOSED BORE		ELECTRIC CONDUCTOR				
		2"		2"		ELEC CONDR (NO. 4) INSUL		ELEC CONDR (NO. 4) INSUL		
						GROUND		POWER		
B10	220	1	220			1	225	2	460	685
B11	220	1	220			1	225	2	460	685
B12	220	1	220			1	225	2	460	685
B13	220	1	220			1	225	2	460	685
B14	220	1	220			1	225	2	460	685
B15	220	1	220			1	225	2	460	685
B16	220	1	220			1	225	2	460	685
B17	220	1	220			1	225	2	460	685
B18	220	1	220			1	225	2	460	685
B19	220	1	220			1	225	2	460	685
B20	220	1	220			1	225	2	460	685
TOTAL			1760				2475		5060	7535

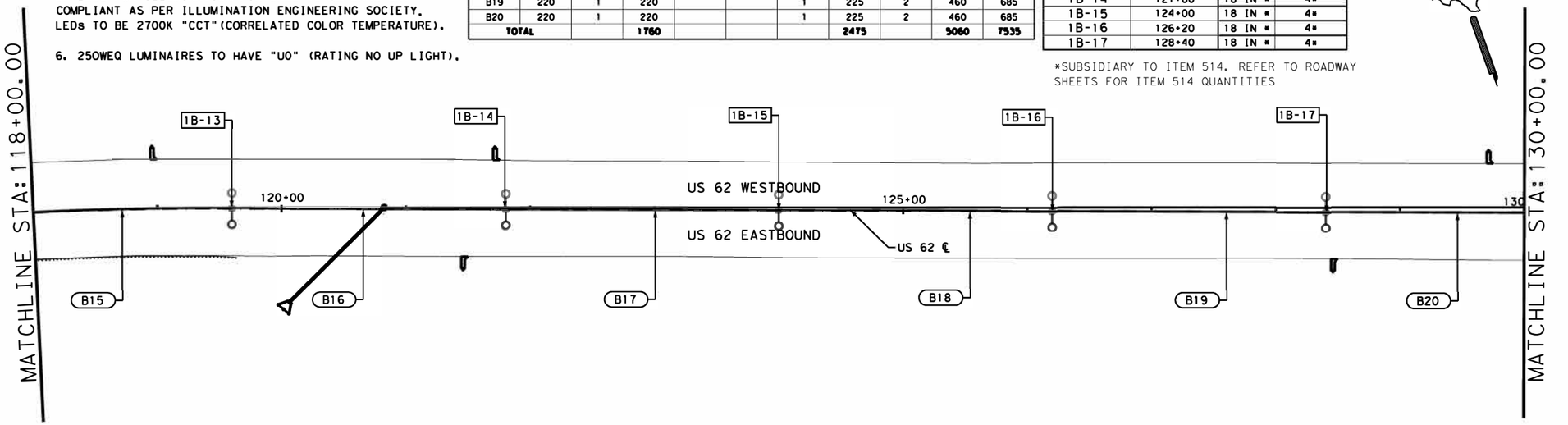
ILLUMINATION ESTIMATED QUANTITIES

ITEM	CODE	DESCRIPTION	UNIT	QTY
610	6191	IN RD IL (TY SP) 38S-8-8 (250W EQ) LED	EA	11
618	6023	CONDT (PVC) (SCH 40) (2")	LF	1760
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	EA	
620	6012	ELEC CONDR (NO. 4) INSULATED	LE	7535
624	6002	GROUND BOX TY A (122311) W/APRON	EA	
628	6041	ELC SRV TY A 240/480 060(NS) SS(E) GC(O)	EA	

ILLUMINATION ASSEMBLY SCHEDULE

POLE NO.	LOCATION	FOUNDATION	
		SIZE	LENGTH
1B-7	106+40	18 IN *	4*
1B-8	108+60	18 IN *	4*
1B-9	110+80	18 IN *	4*
1B-10	113+00	18 IN *	4*
1B-11	115+20	18 IN *	4*
1B-12	117+40	18 IN *	4*
1B-13	119+60	18 IN *	4*
1B-14	121+80	18 IN *	4*
1B-15	124+00	18 IN *	4*
1B-16	126+20	18 IN *	4*
1B-17	128+40	18 IN *	4*

*SUBSIDIARY TO ITEM 514. REFER TO ROADWAY SHEETS FOR ITEM 514 QUANTITIES



LEGEND

	PROP. IN RD IL (TY SP) 38S-8-8 (250W EQ) LED
	ELECTRICAL SERVICE
	GROUND BOX TY A
	CONDUIT AND CONDUCTOR (TRENCHED)
	CONDUIT AND CONDUCTOR (BORE)
#	RUN NUMBER
#	SERVICE NUMBER

POLE DESIGNATION

1B-2
- POLE OR LUMINAIRE NO.
- CIRCUIT NO.
- SERVICE NO.

0' 100' 200'

SCALE: 1"=100'

STATE OF TEXAS
MARICRUZ SAENZ
108338
LICENSED
PROFESSIONAL ENGINEER

Maricruz Saenz P.E.

07/02/2021

US 62 MED CONCRETE TRAFFIC BARRIER
TRAFFIC

ILLUMINATION LAYOUT
STA. 106+00.00 TO STA. 130+00.00

SHEET 5 OF 8

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CONT	SECT	JOB	HIGHWAY
0233	02	035, etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		139

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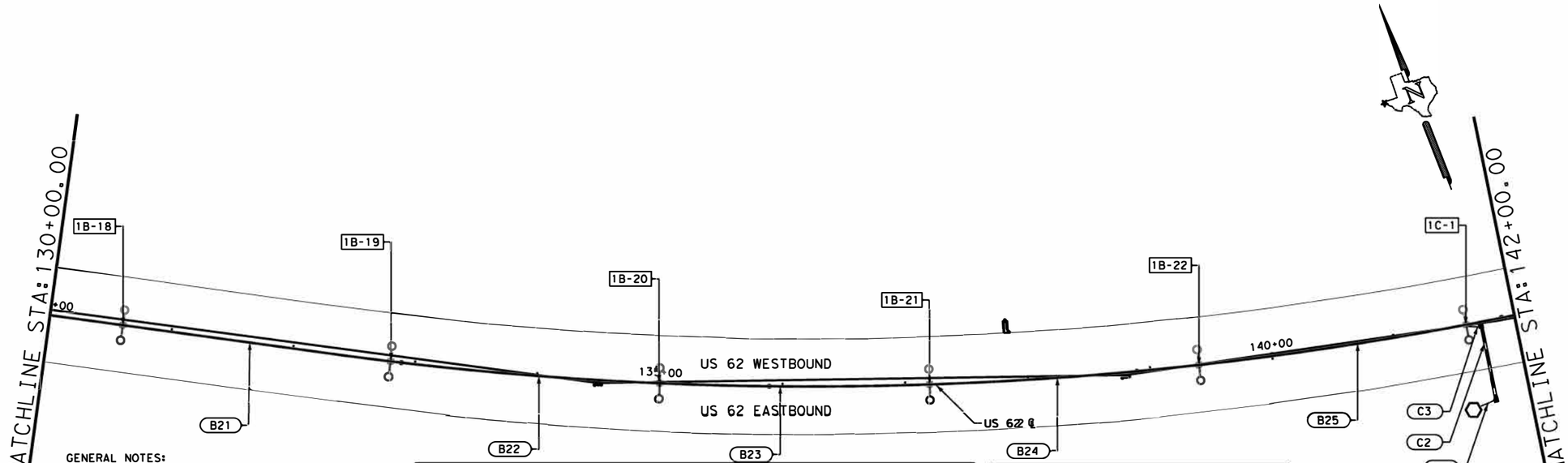


LEGEND	
	PROP. IN RD IL (TY SP) 38S-8-8 (250W EQ) LED
	ELECTRICAL SERVICE
	GROUND BOX TY A
	CONDUIT AND CONDUCTOR (TRENCHED)
	CONDUIT AND CONDUCTOR (BORE)
#	RUN NUMBER
#	SERVICE NUMBER

POLE DESIGNATION

1B-2
- POLE OR LUMINAIRE NO.
- CIRCUIT NO.
- SERVICE NO.

0' 100' 200'

SCALE: 1"=100'

GENERAL NOTES:

1. INSTALLATION OF CONDUIT REQUIRES EXCAVATION ON UNPREDICTABLE TERRAIN (ROCK IS PRESENT)AT DIFFERENT DEPTHS.

2. LOCATION ADJUSTMENTS CAN ONLY BE DETERMINED AND APPROVED BY THE ENGINEER.

3. CONTRACTOR SHALL NOTIFY TEXAS EXCAVATION SAFETY SYSTEM (TESS), 48 HOURS PRIOR TO WORKING IN OR NEAR ANY AND ALL PIPELINES AT 1-800-344-8377.

4. THE CONTRACTOR SHALL VERIFY LOCATION OF UNDERGROUND PIPELINES BY CONTACTING OWNERS OF UNDERGROUND UTILITIES OR BY EXCAVATION IN ADVANCE OF CONSTRUCTION.

CONDUIT AND CONDUCTOR RUNS

CIRCUIT / RUN NO.	LENGTH OF RUN (FT)	PROPOSED TRENCH		PROPOSED BORE		ELECTRIC CONDUCTOR				
						ELEC CONDR (NO. 4) INSUL		ELEC CONDR (NO. 4) INSUL		
		2"		2"		GROUND		POWER		
B21	220	1	220			1	225	2	460	685
B22	220	1	220			1	225	2	460	685
B23	220	1	220			1	225	2	460	685
B24	220	1	220			1	225	2	460	685
B25	220	1	220			1	225	2	460	685
C1	10	1	10			1	15	2	40	55
C2	60			1	60	1	65	2	140	205
C3	10	1	10			1	15	2	40	55
C4	220	1	220			1	225	2	460	685
C5	220	1	220			1	225	2	460	685
C6	220	1	220			1	225	2	460	685
C7	220	1	220			1	225	2	460	685
C8	220	1	220			1	225	2	460	685
C9	220	1	220			1	225	2	460	685
TOTAL			2440		60		2370		5280	7850

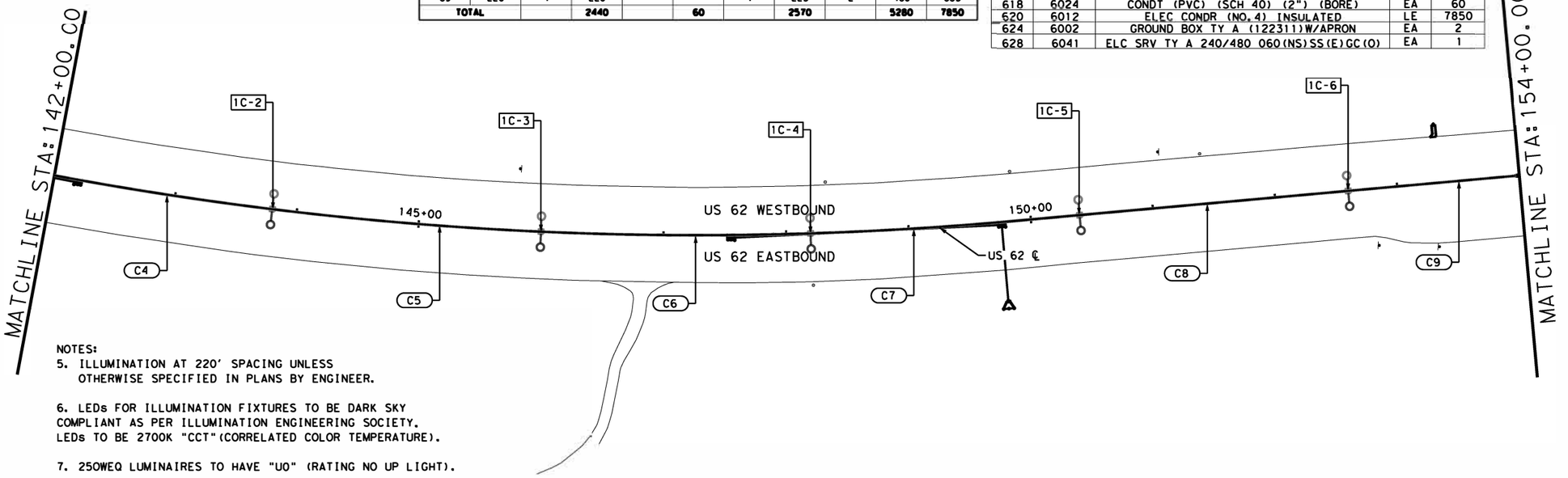
ILLUMINATION ASSEMBLY SCHEDULE

POLE NO.	LOCATION	FOUNDATION	
		SIZE	LENGTH
1B-18	130+60	18 IN *	4*
1B-19	132+80	18 IN *	4*
1B-20	108+60	18 IN *	4*
1B-21	137+20	18 IN *	4*
1B-22	139+40	18 IN *	4*
1C-1	141+60	18 IN *	4*
1C-2	143+80	18 IN *	4*
1C-3	146+00	18 IN *	4*
1C-4	148+20	18 IN *	4*
1C-5	150+40	18 IN *	4*
1C-6	152+60	18 IN *	4*

*SUBSIDIARY TO ITEM 514. REFER TO ROADWAY SHEETS FOR ITEM 514 QUANTITIES

ILLUMINATION ESTIMATED QUANTITIES

ITEM	CODE	DESCRIPTION	UNIT	QTY
610	6191	IN RD IL (TY SP) 38S-8-8 (250W EQ) LED	EA	11
618	6023	CONDT (PVC) (SCH 40) (2")	LF	2440
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	EA	60
620	6012	ELEC CONDR (NO.4) INSULATED	LE	7850
624	6002	GROUND BOX TY A (122311)W/APRON	EA	2
628	6041	ELC SRV TY A 240/480 060(NS)SS(E)GC(O)	EA	1



NOTES:

5. ILLUMINATION AT 220' SPACING UNLESS OTHERWISE SPECIFIED IN PLANS BY ENGINEER.

6. LEDs FOR ILLUMINATION FIXTURES TO BE DARK SKY COMPLIANT AS PER ILLUMINATION ENGINEERING SOCIETY. LEDs TO BE 2700K "CCT"(CORRELATED COLOR TEMPERATURE).

7. 250WEQ LUMINAIRES TO HAVE "U0" (RATING NO UP LIGHT).

STATE OF TEXAS
MARICRUZ SAENZ
108338
LICENSED
PROFESSIONAL ENGINEER

Maricruz Saenz P.E.

07/02/2021

US 62 MED CONCRETE TRAFFIC BARRIER
TRAFFIC

ILLUMINATION LAYOUT
STA. 130+00.00 TO STA. 154+00.00

SHEET 6 OF 8

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Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0233	02	035, etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		140

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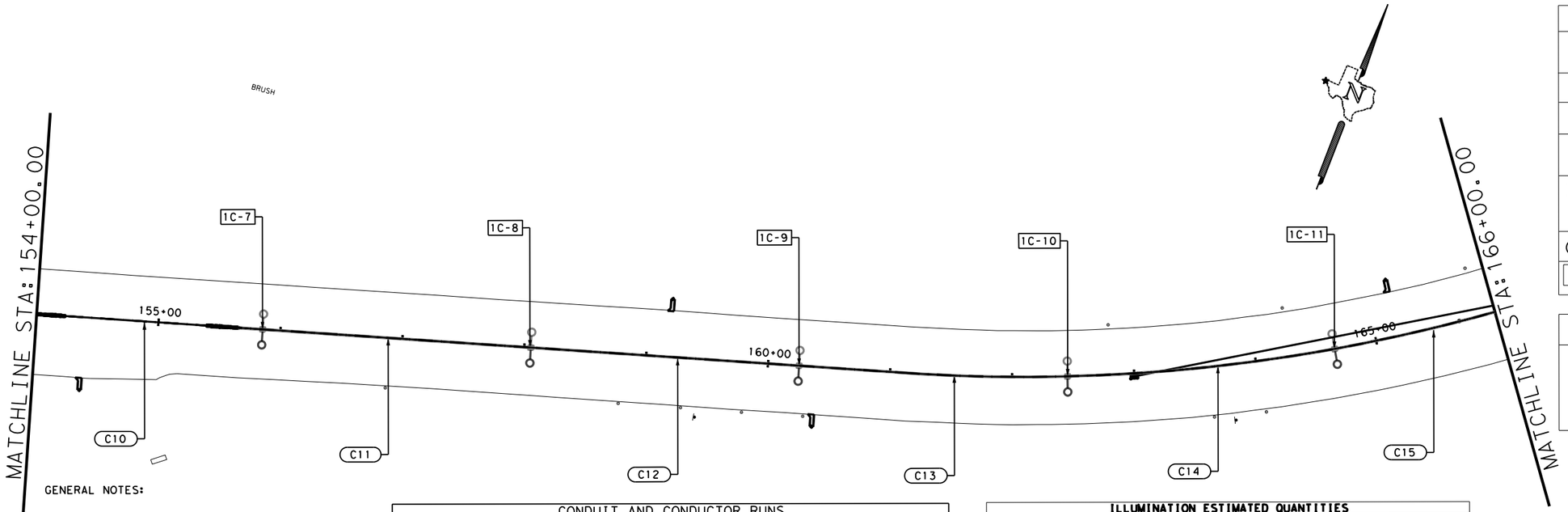


LEGEND	
	PROP. IN RD IL (TY SP) 38S-8-8 (250W EQ) LED
	ELECTRICAL SERVICE
	GROUND BOX TY A
	CONDUIT AND CONDUCTOR (TRENCHED)
	CONDUIT AND CONDUCTOR (BORE)
#	RUN NUMBER
#	SERVICE NUMBER

POLE DESIGNATION
1B-2
POLE OR LUMINAIRE NO.
CIRCUIT NO.
SERVICE NO.

GENERAL NOTES:

1. INSTALLATION OF CONDUIT REQUIRES EXCAVATION ON UNPREDICTABLE TERRAIN (ROCK IS PRESENT) AT DIFFERENT DEPTHS.

2. LOCATION ADJUSTMENTS CAN ONLY BE DETERMINED AND APPROVED BY THE ENGINEER.

3. CONTRACTOR SHALL NOTIFY TEXAS EXCAVATION SAFETY SYSTEM (TESS), 48 HOURS PRIOR TO WORKING IN OR NEAR ANY AND ALL PIPELINES AT 1-800-344-8377.

4. THE CONTRACTOR SHALL VERIFY LOCATION OF UNDERGROUND PIPELINES BY CONTACTING OWNERS OF UNDERGROUND UTILITIES OR BY EXCAVATION IN ADVANCE OF CONSTRUCTION.

CONDUIT AND CONDUCTOR RUNS

RUN NO.	LENGTH OF RUN (FT)	PROPOSED TRENCH		PROPOSED BORE		ELECTRIC CONDUCTOR				
		2"		2"		ELEC CONDR (NO. 4) INSUL GROUND		ELEC CONDR (NO. 4) INSUL POWER		
C10	220	1	220			1	225	2	460	685
C11	220	1	220			1	225	2	460	685
C12	220	1	220			1	225	4	910	1135
C13	220	1	220			1	225	2	460	685
C14	220	1	220			1	225	2	460	685
C15	220	1	220			1	225	4	910	1135
C16	220	1	220			1	225	2	460	685
C17	220	1	220			1	225	2	460	685
C18	220	1	220			1	225	4	910	1135
C19	220	1	220			1	225	2	460	685
C20	220	1	220			1	225	2	460	685
TOTAL			1980				2025		5490	7515

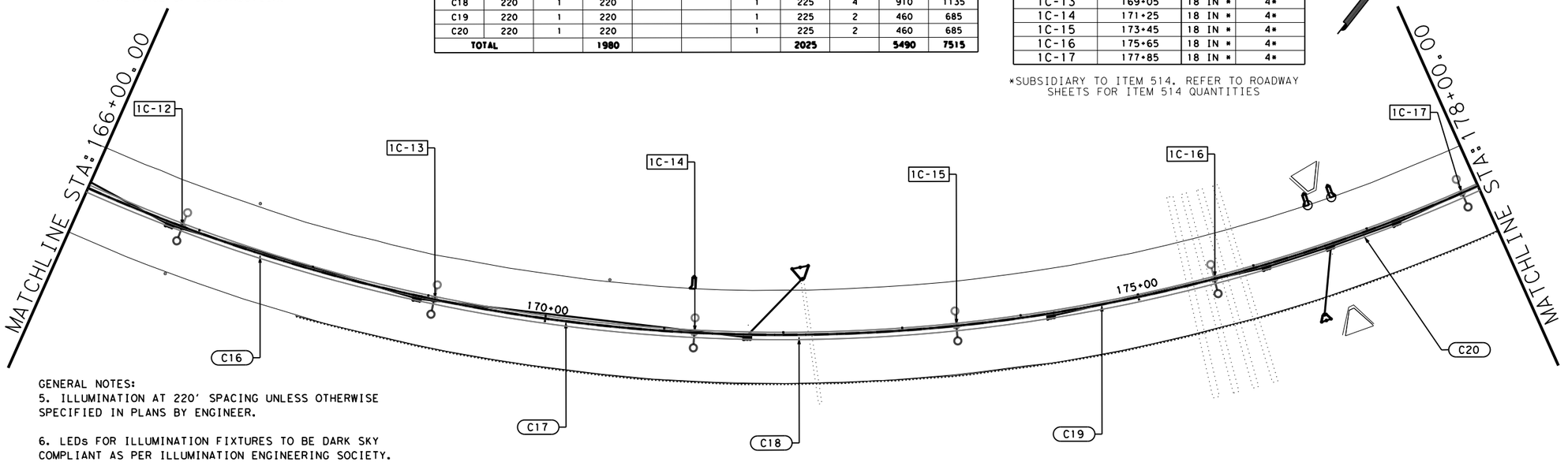
ILLUMINATION ESTIMATED QUANTITIES

ITEM	CODE	DESCRIPTION	UNIT	QTY
610	6191	IN RD IL (TY SP) 38S-8-8 (250W EQ) LED	EA	11
618	6023	CONDT (PVC) (SCH 40) (2")	LF	1980
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	EA	
620	6012	ELEC CONDR (NO. 4) INSULATED	LE	6165
624	6002	GROUND BOX TY A (122311) W/APRON	EA	
628	6041	ELC SRV TY A 240/480 060(NS)SS(E)GC(O)	EA	

ILLUMINATION ASSEMBLY SCHEDULE

POLE NO.	LOCATION	FOUNDATION SIZE	FOUNDATION LENGTH
1C-7	155+85	18 IN *	4*
1C-8	158+05	18 IN *	4*
1C-9	160+25	18 IN *	4*
1C-10	162+45	18 IN *	4*
1C-11	164+65	18 IN *	4*
1C-12	166+85	18 IN *	4*
1C-13	169+05	18 IN *	4*
1C-14	171+25	18 IN *	4*
1C-15	173+45	18 IN *	4*
1C-16	175+65	18 IN *	4*
1C-17	177+85	18 IN *	4*

*SUBSIDIARY TO ITEM 514. REFER TO ROADWAY SHEETS FOR ITEM 514 QUANTITIES



GENERAL NOTES:

5. ILLUMINATION AT 220' SPACING UNLESS OTHERWISE SPECIFIED IN PLANS BY ENGINEER.

6. LEDs FOR ILLUMINATION FIXTURES TO BE DARK SKY COMPLIANT AS PER ILLUMINATION ENGINEERING SOCIETY. LEDs TO BE 2700K "CCT" (CORRELATED COLOR TEMPERATURE).

7. 250WEQ LUMINAIRES TO HAVE "UO" (RATING NO UP LIGHT).

STATE OF TEXAS
MARICRUZ SAENZ
108338
LICENSED
PROFESSIONAL ENGINEER

Maricruz Saenz P.E.

07/02/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC

ILLUMINATION LAYOUT

STA. 154+00.00 TO STA. 178+00.00

SHEET 7 OF 08

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CONT	SECT	JOB	HIGHWAY
0233	02	035, etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		141

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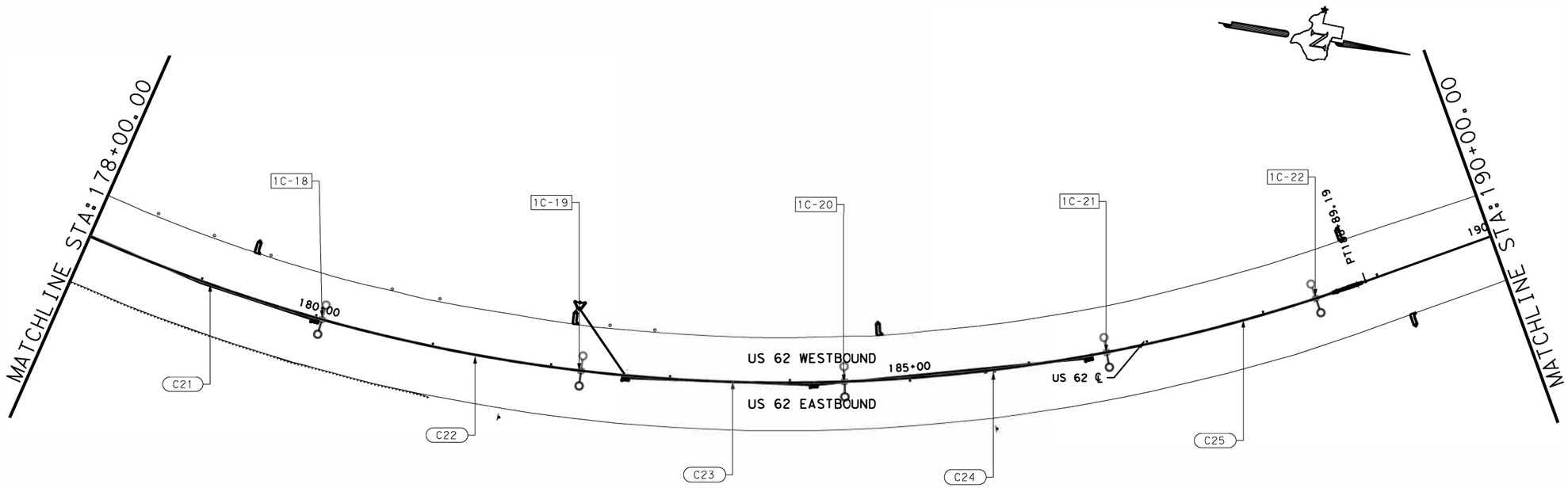


LEGEND	
	PROP. IN RD IL (TY SP) 38S-8-8 (250W EQ) LED
	ELECTRICAL SERVICE
	GROUND BOX TY A
	CONDUIT AND CONDUCTOR (TRENCHED)
	CONDUIT AND CONDUCTOR (BORE)
#	RUN NUMBER
#	SERVICE NUMBER

POLE DESIGNATION

1B-2
- POLE OR LUMINAIRE NO.
- CIRCUIT NO.
- SERVICE NO.

CONDUIT AND CONDUCTOR RUNS

RUN NO.	LENGTH OF RUN (FT)	PROPOSED TRENCH		PROPOSED BORE		ELECTRIC CONDUCTOR				
		2"		2"		ELEC CONDR (NO. 4) INSUL		ELEC CONDR (NO. 4) INSUL		
						GROUND		POWER		
C21	220	1	220			1	225	2	460	685
C22	220	1	220			1	225	2	460	685
C23	220	1	220			1	225	4	910	1135
C24	220	1	220			1	225	2	460	685
C25	220	1	220			1	225	2	460	685
TOTAL			1100				1125		2750	3875

ILLUMINATION ESTIMATED QUANTITIES

ITEM	CODE	DESCRIPTION	UNIT	QTY
610	6191	IN RD IL (TY SP) 38S-8-8 (250W EQ) LED	EA	5
618	6023	CONDT (PVC) (SCH 40) (2")	LF	1100
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	EA	
620	6012	ELEC CONDR (NO.4) INSULATED	LE	3875
624	6002	GROUND BOX TY A (122311)W/APRON	EA	
628	6041	ELC SRV TY A 240/480 060(NS)SS(E)GC(O)	EA	

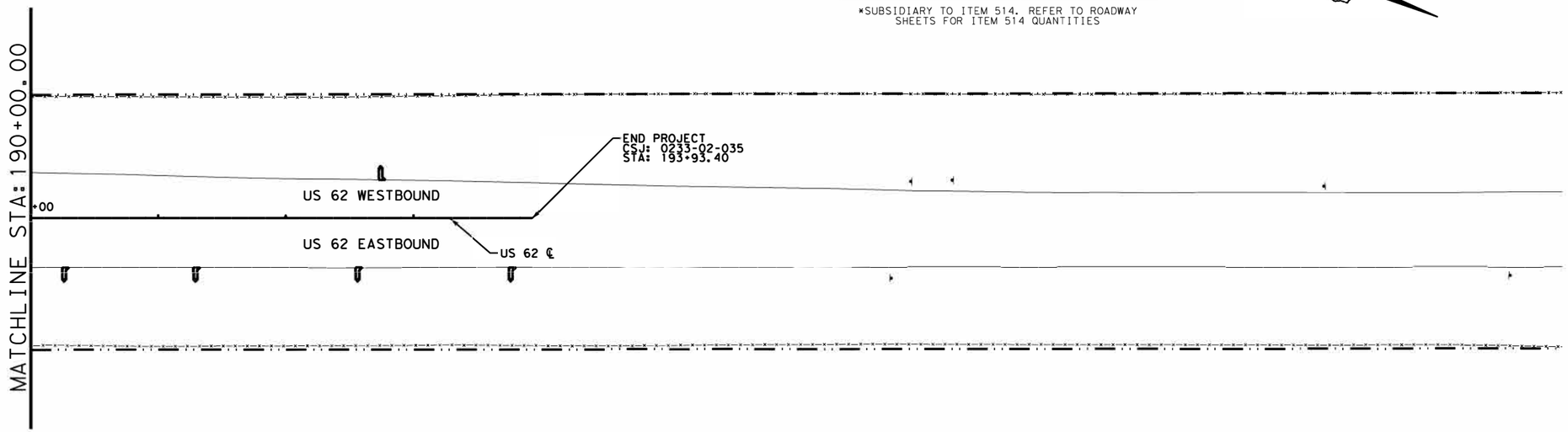
ILLUMINATION ASSEMBLY SCHEDULE

POLE NO.	LOCATION	FOUNDATION	
		SIZE	LENGTH
1C-18	180+05	18 IN *	4*
1C-19	182+25	18 IN *	4*
1C-20	184+45	18 IN *	4*
1C-21	186+65	18 IN *	4*
1C-22	188+45	18 IN *	4*

*SUBSIDIARY TO ITEM 514. REFER TO ROADWAY SHEETS FOR ITEM 514 QUANTITIES

0' 100' 200'

SCALE: 1"=100'



GENERAL NOTES:
1. ILLUMINATION AT 220' SPACING UNLESS OTHERWISE SPECIFIED IN PLANS BY ENGINEER.

2. LEDs FOR ILLUMINATION FIXTURES TO BE DARK SKY COMPLIANT AS PER ILLUMINATION ENGINEERING SOCIETY. LEDs TO BE 2700K "CCT" (CORRELATED COLOR TEMPERATURE).

3. 250WEQ LUMINAIRES TO HAVE "UO" (RATING NO UP LIGHT).

STATE OF TEXAS
MARICRUZ SAENZ
108338
LICENSED
PROFESSIONAL ENGINEER

Maricruz Saenz P.E.

07/02/2021

US 62 MED CONCRETE TRAFFIC BARRIER
TRAFFIC

ILLUMINATION LAYOUT
STA. 178+00.00 TO END PROJECT

SHEET 8 OF 08

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CONT	SECT	JOB	HIGHWAY
0233	02	035, etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		142

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GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.

2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.

3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is ½ in. or less in diameter.

4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.

5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.

6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.

2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.

3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

4. Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.

5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.

6. Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.

7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.

9. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.

10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.

2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.

3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.

4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.

5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."

6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.

7. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.

8. Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.

9. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.

10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.

11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.

12. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).

13. Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.

14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

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REVISIONS		0233	02	035,etc	US 62
		DIST	COUNTY		SHEET NO.
		ELP	CULBERSON		143

71A

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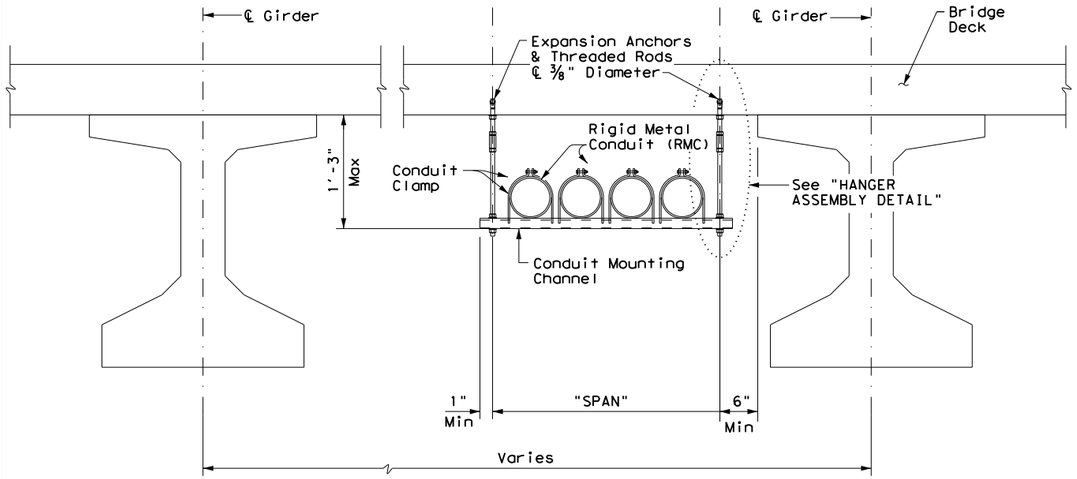
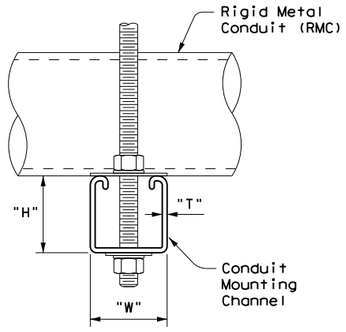
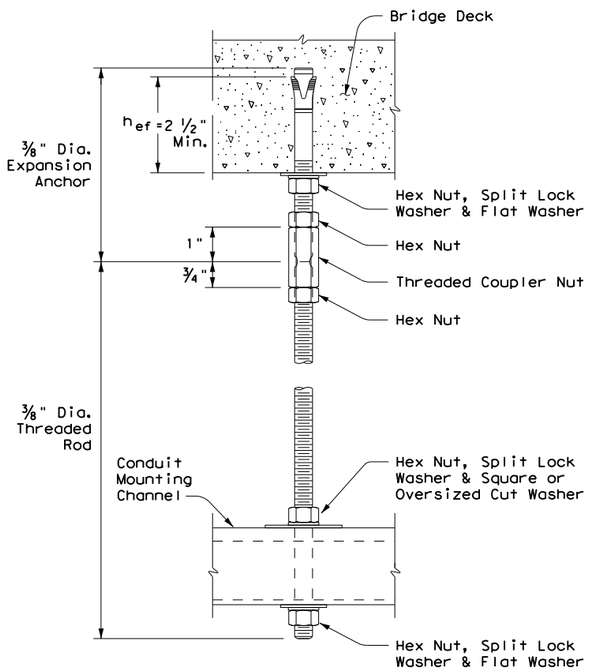


CONDUIT HANGING DETAIL

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

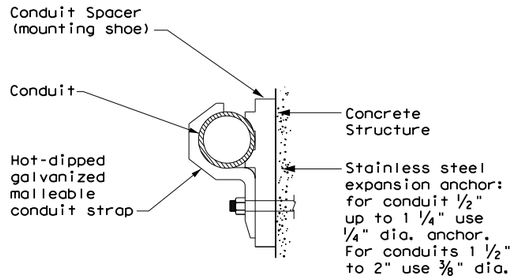
Channels with round or short slotted hole patterns are allowed, if the load carrying capacity is not reduced by more than 15%.

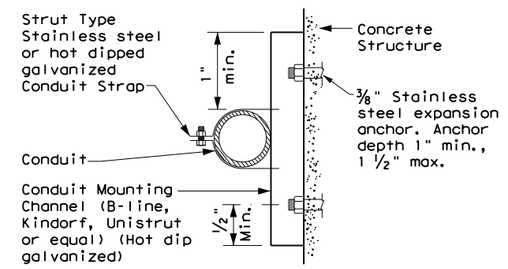




HANGER ASSEMBLY DETAIL

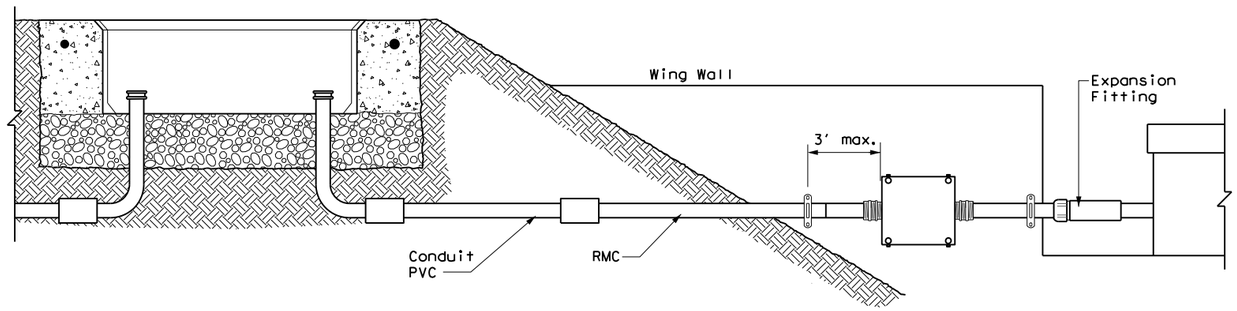
ELECTRIC CONDUIT TO BRIDGE DECK ATTACHMENT





CONDUIT MOUNTING OPTIONS

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



TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL

EXPANSION ANCHOR NOTES FOR BRIDGE DECK ATTACHMENT

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

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUIT SUPPORTS

ED(2)-14

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ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

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

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

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

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

B. CONSTRUCTION METHODS

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

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

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

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

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

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

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

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

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

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

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

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

C. TEMPORARY WIRING

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

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

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

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

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

GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

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

B. CONSTRUCTION METHODS

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

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

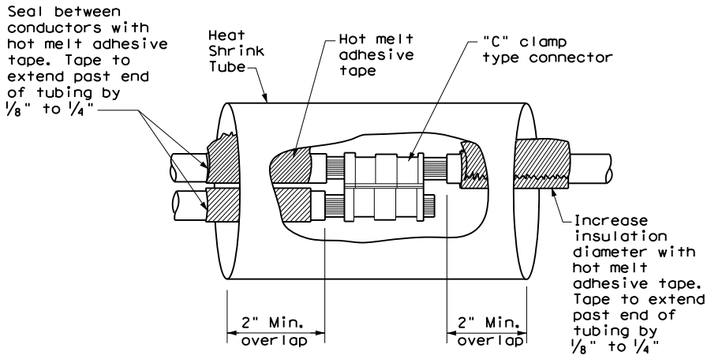
3. Install ground rods so the imprinted part number is at the upper end of the rod.

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

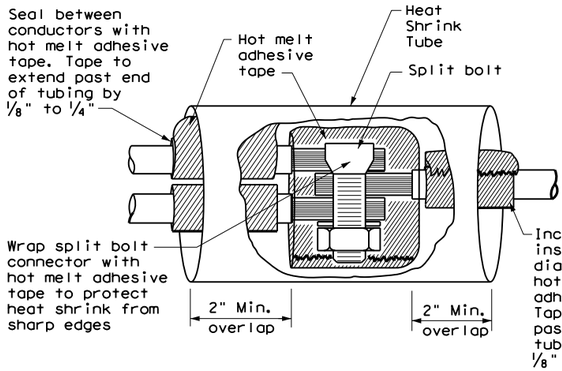
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.

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

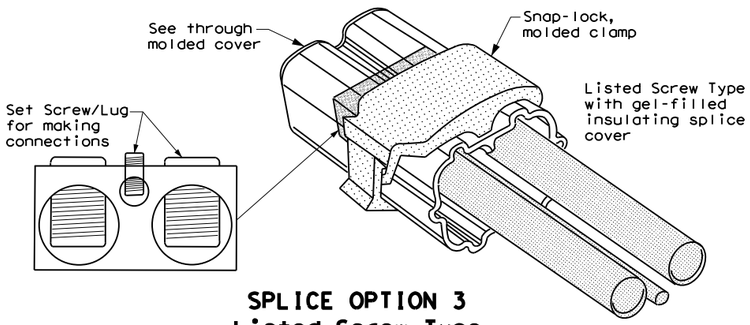
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

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Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUCTORS

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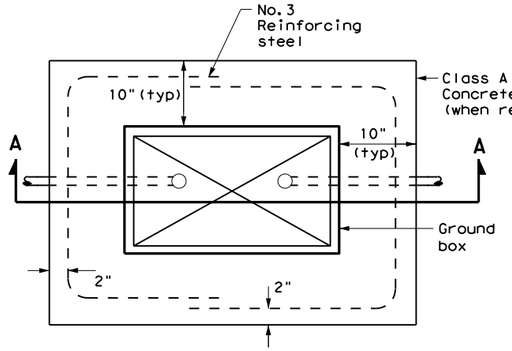
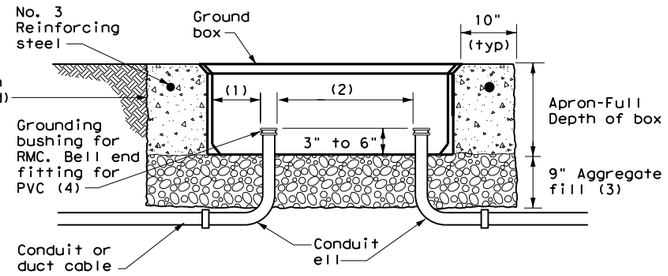


PLAN VIEW



SECTION A - A

APRON FOR GROUND BOX

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

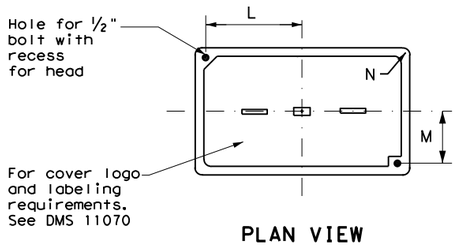
(2) Maintain sufficient space between conduits to allow for proper installation of bushing.

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

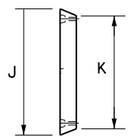
(4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

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

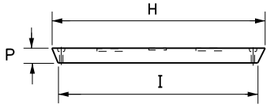
GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



PLAN VIEW



END



SIDE

GROUND BOX COVER

GROUND BOXES

A. MATERIALS

1. Provide polymer concrete ground boxes measuring 16x30x24 in. (WxLxD) or smaller in accordance with Departmental Material Specification (DMS) 11070 "Ground Boxes" and Item 624 "Ground Boxes."

2. Provide Type A, B, C, D, and E ground boxes as shown in the plans, and as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 624.

3. Ensure ground box cover is correctly labeled in accordance with DMS 11070.

4. Provide larger ground boxes in accordance with Item 624 and as shown in the plans.

B. CONSTRUCTION METHODS

1. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure aggregate bed is in place and at least 9 inches deep, prior to setting the ground box. Install ground box on top of aggregate.

2. Cast ground box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Ground box aprons, including concrete and reinforcing steel, are subsidiary to ground boxes when called for by descriptive code.

3. Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.

4. Install all conduits and ells in a neat and workmanlike manner. Uniformly space conduits so grounding bushings and bell end fittings can easily be installed.

5. Temporarily seal all conduits in the ground box until conductors are installed.

6. Permanently seal conduits immediately after the completion of conductor installation and pull tests. Permanently seal the ends of all conduits with duct seal, expandable foam, or other method as approved. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a sealant.

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

8. When a type B or D ground box is stacked to meet volume requirements, it is allowable to cut an appropriately sized hole for conduit entry in the side wall at least 18 inches below grade.

9. If an existing ground box in the contract has a metal cover, bond the cover to the equipment grounding conductor with a 3 ft. long stranded bonding jumper the same size as the grounding conductor. The bonding jumper is subsidiary to various bid items. Verify existing ground boxes with metal covers are shown on the plans, with notes fully describing the work required.

10. If other ground boxes with metal covers are within the project limits but are not part of the contract, the Engineer may direct the Contractor to bond the metal covers, identifying the specific boxes in writing. This work will be paid for separately.

11. Bond metal ground box covers to the grounding conductor with a tank ground type lug.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS GROUND BOXES

ED(4)-14

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ELECTRICAL SERVICES NOTES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SERVICE ASSEMBLY ENCLOSURE

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

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

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

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

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

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

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

PHOTOELECTRIC CONTROL

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

*ELECTRICAL SERVICE DATA

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

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

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

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE

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

Schematic Type

Service Voltage V / V

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

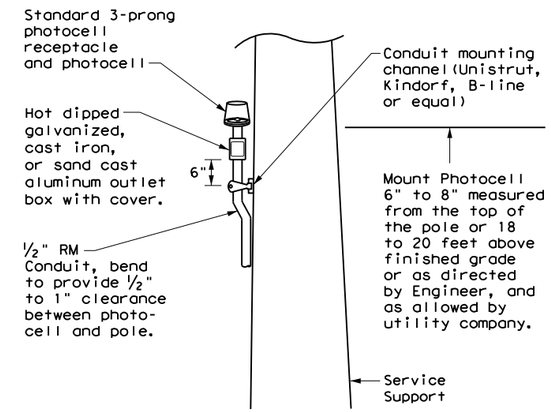
(SS)= Safety Switch Ahead of Meter-Check with Utility
(NS)= No safety Switch Ahead of Meter-Check with Utility

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

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

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

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



TOP MOUNTED PHOTOCELL

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

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Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

ED(5)-14

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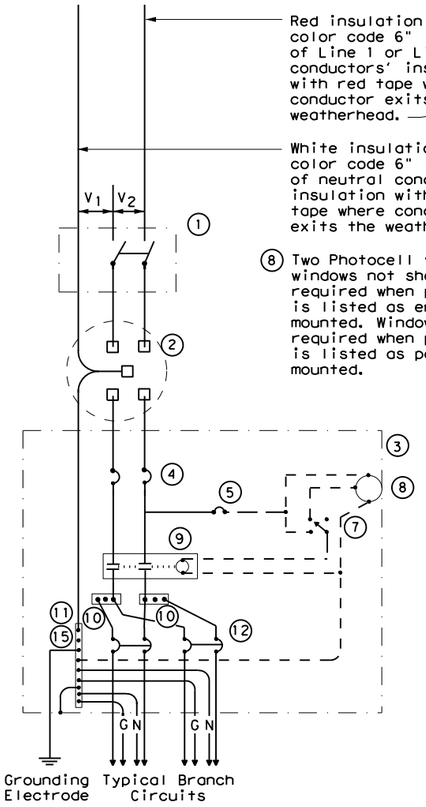
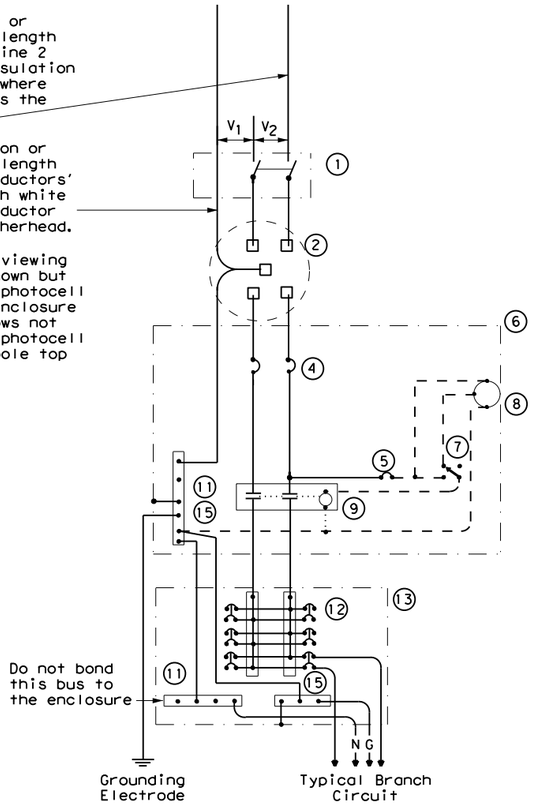


SCHEMATIC TYPE A
THREE WIRE



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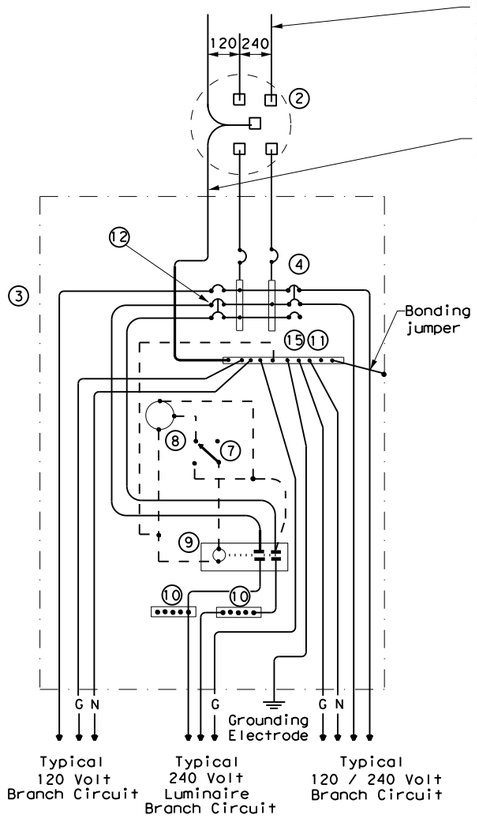
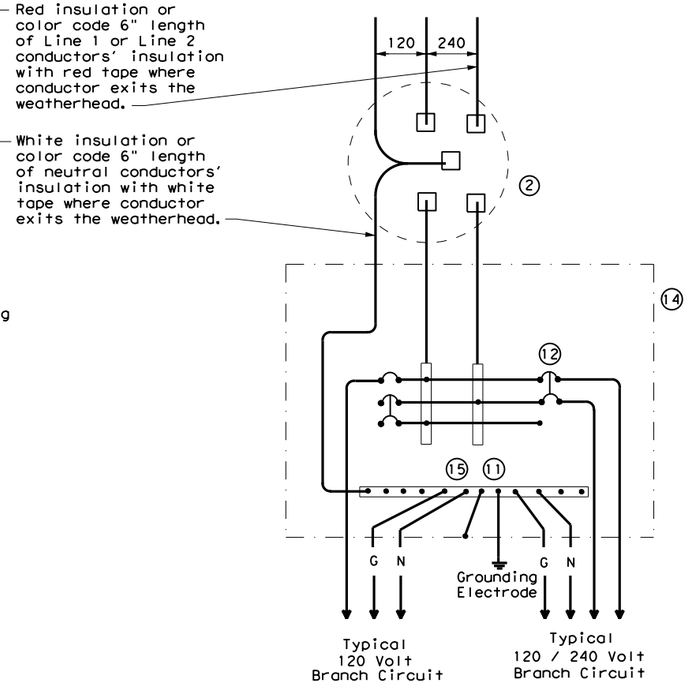
THREE WIRE



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



SCHEMATIC TYPE T
120/240 VOLTS - THREE WIRE

Galvanized steel-"Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

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

SCHEMATIC LEGEND	
1	Safety Switch (when required)
2	Meter (when required-verify with electric utility provider)
3	Service Assembly Enclosure
4	Main Disconnect Breaker (See Electrical Service Data)
5	Circuit Breaker, 15 Amp (Control Circuit)
6	Auxiliary Enclosure
7	Control Station ("H-O-A" Switch)
8	Photo Electric Control (enclosure-mounted shown)
9	Lighting Contactor
10	Power Distribution Terminal Blocks
11	Neutral Bus
12	Branch Circuit Breaker (See Electrical Service Data)
13	Separate Circuit Breaker Panelboard
14	Load Center
15	Ground Bus

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES

ED(6)-14

FILE: ed6-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS)11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 ½ in. or 1 ⅝ in. wide by 1 in. up to 3 ¾ in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.

2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.

3. Provide and install galvanized ¾ in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized ¾ in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 ¼ in. to 3 ½ in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.

4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.

5. Furnish and install rigid metallic ells in all steel pole and steel frame foundations for all conduits entering the service from underground.

6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.

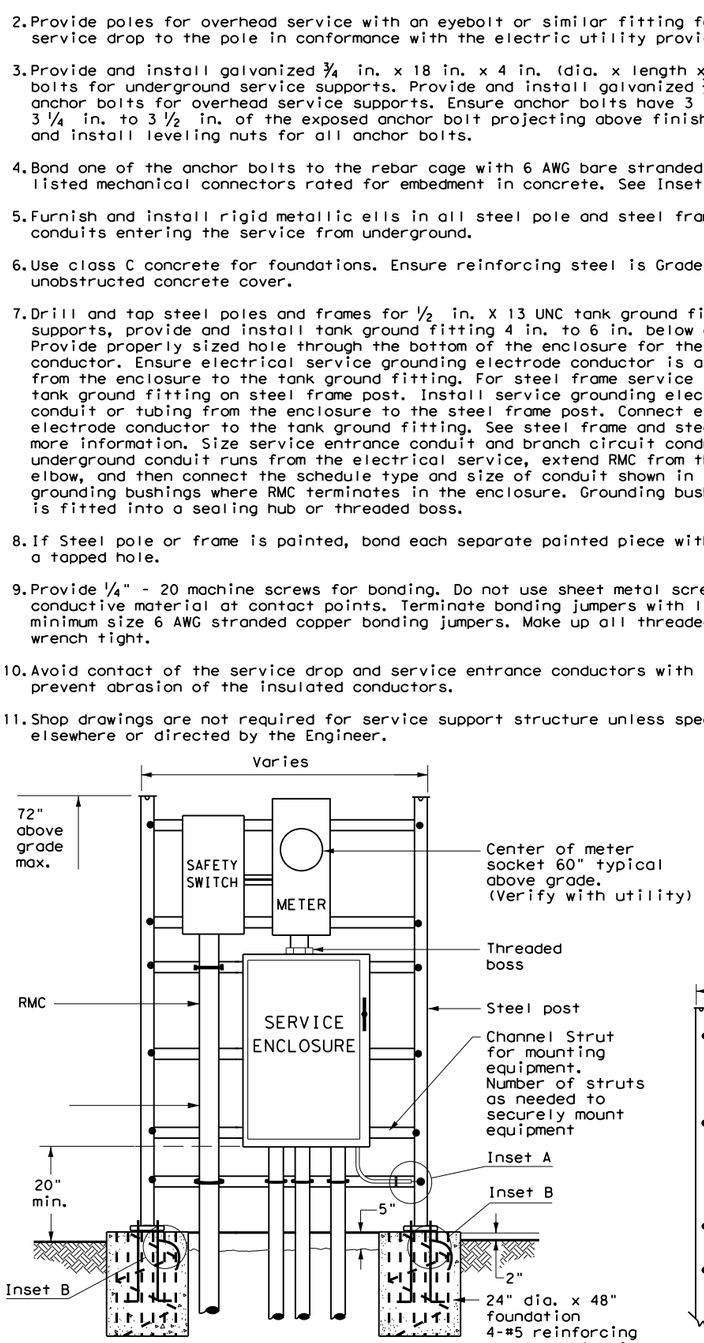
7. Drill and tap steel poles and frames for ½ in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.

8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.

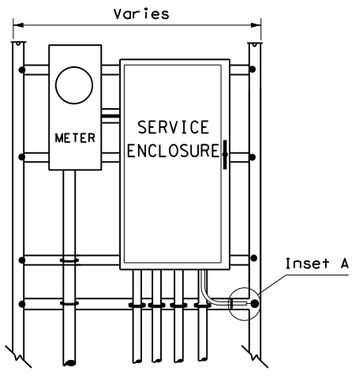
9. Provide ¼" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.

10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.

11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.

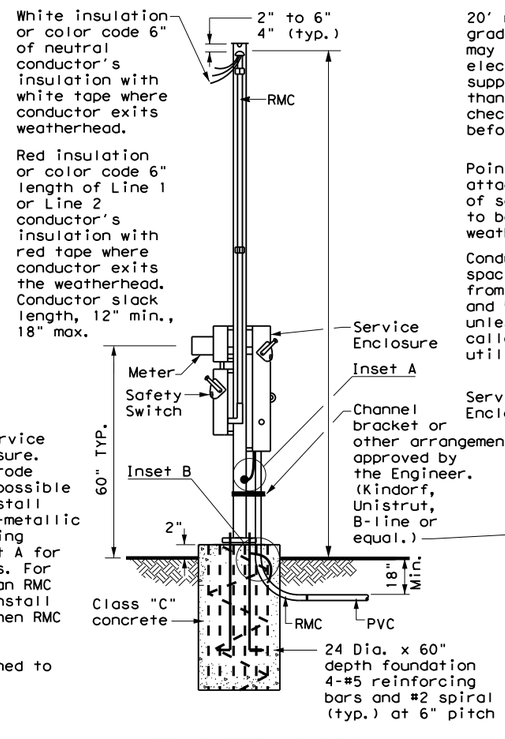


WITH SAFETY SWITCH
FRONT VIEW

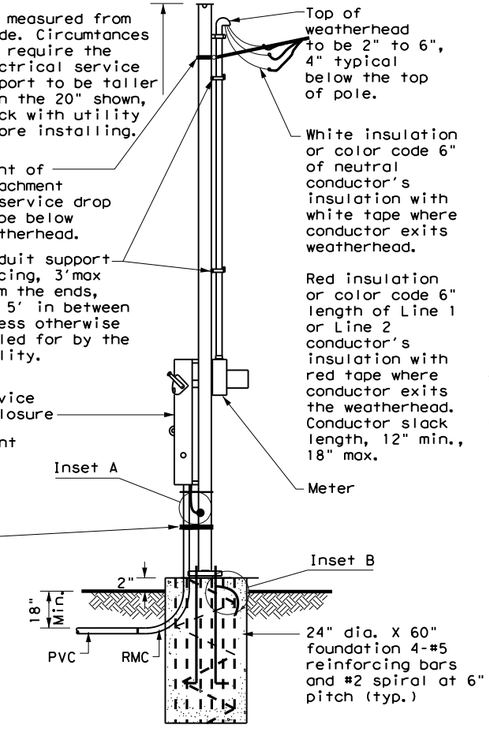


WITHOUT SAFETY SWITCH

SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE



WITH SAFETY SWITCH



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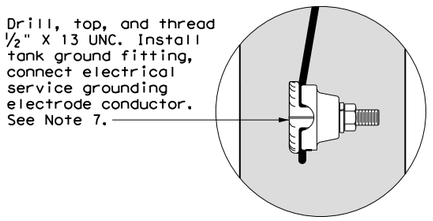
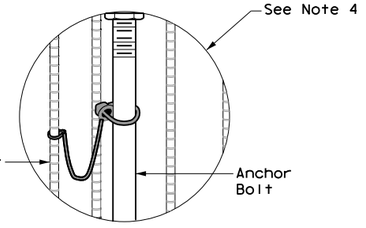
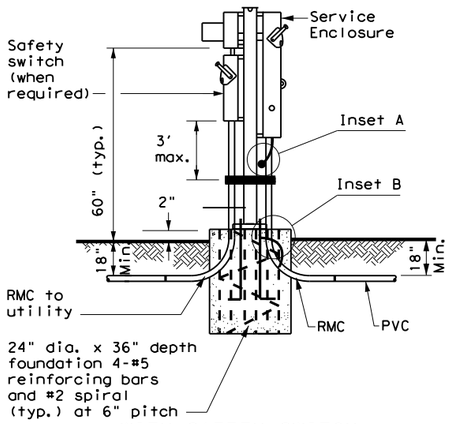
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE



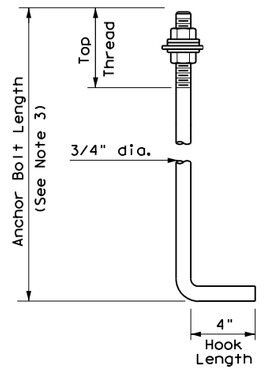
FRONT VIEW
INSET A



INSET B

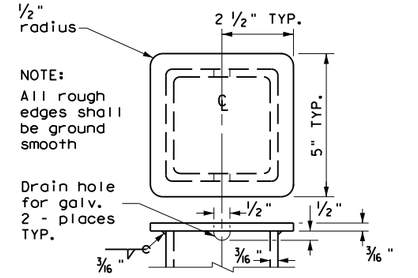


WITH SAFETY SWITCH

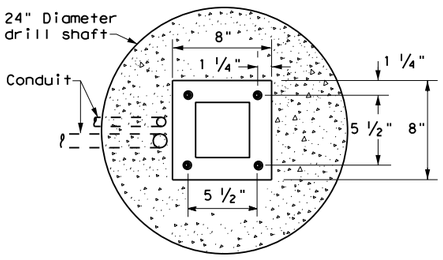


HOOKED ANCHOR DETAIL

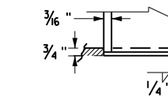
SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE



POLE TOP PLATE

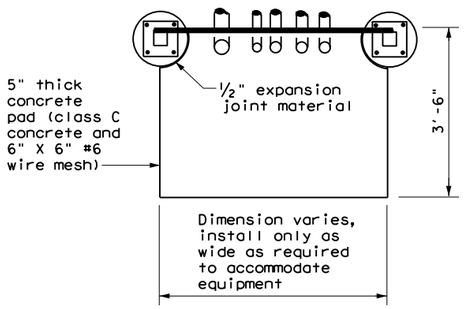


BASE PLATE DETAIL



BOTTOM OF POLE

SERVICE SUPPORT TYPE SF & SP



TOP VIEW

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

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

ED(7)-14

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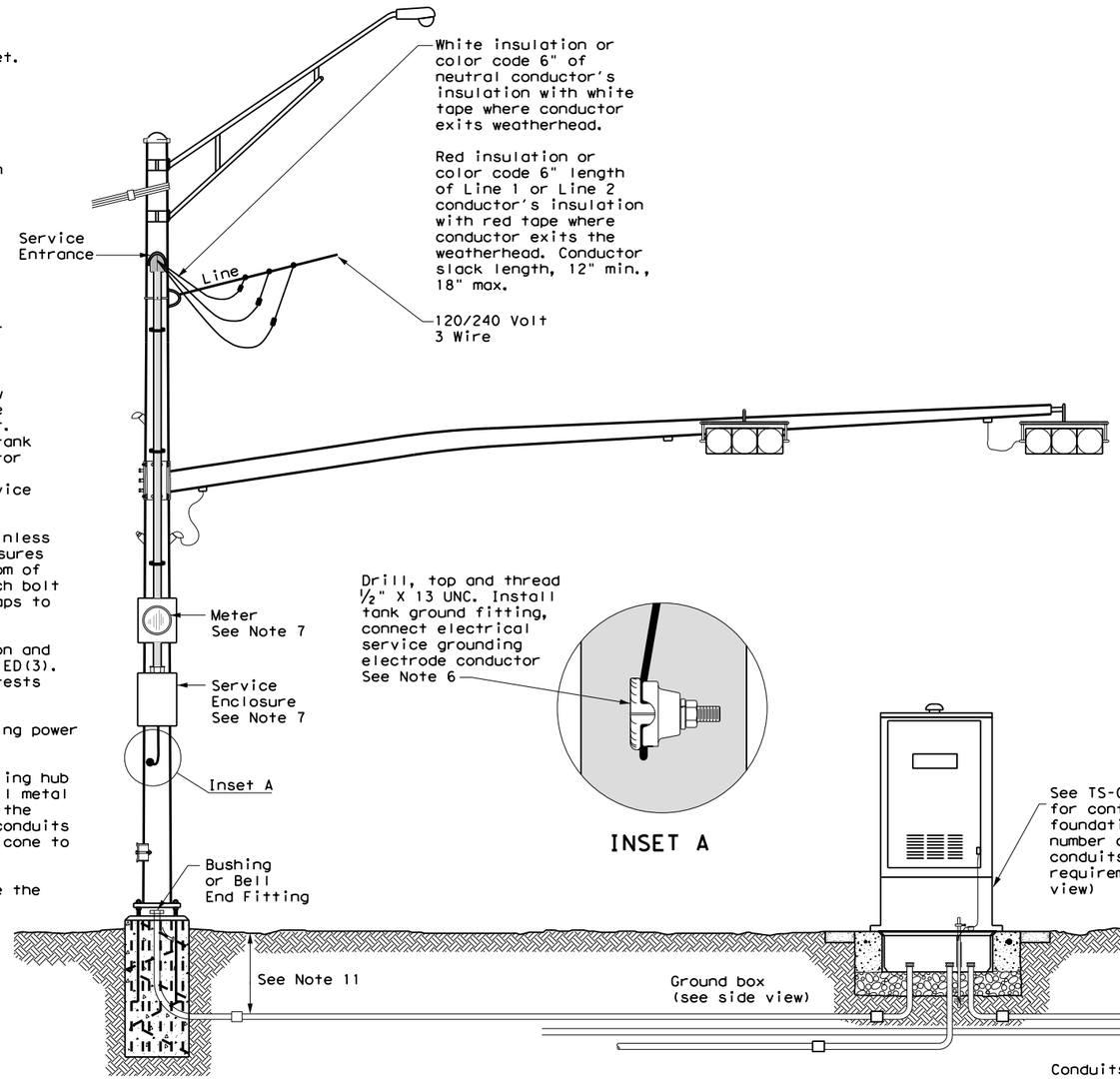
TRAFFIC SIGNAL NOTES

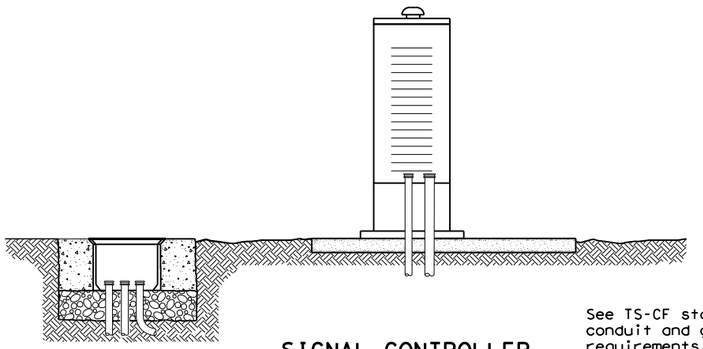
1. Do not pass luminaire conductors through the signal controller cabinet.
2. Include an equipment grounding conductor in all conduits throughout the electrical system. Bond all exposed metal parts to the grounding conductor.
3. Provide roadway luminaires, when required, in accordance with the material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



SIGNAL POLE WITH SERVICE

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

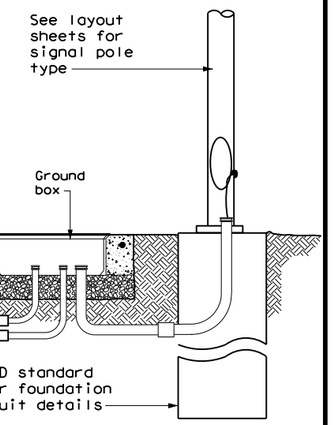
INSET A



SIGNAL CONTROLLER SIDE VIEW

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

SIGNAL CONTROLLER FRONT VIEW



SIGNAL POLE

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS TYPICAL TRAFFIC SIGNAL SYSTEM DETAILS

ED(8)-14

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PEDESTAL SERVICE NOTES

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

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

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

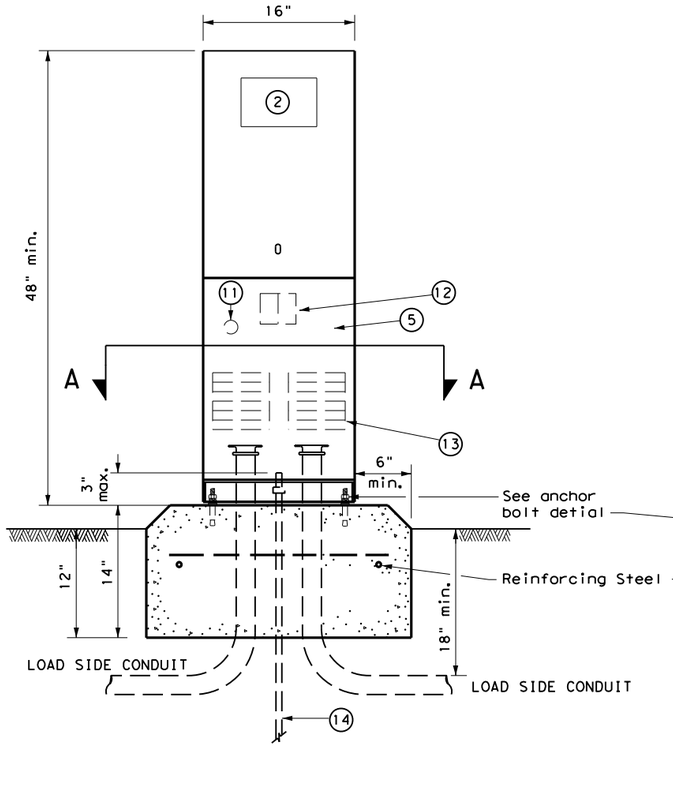
4. Provide #4 reinforcing steel for foundations in accordance with Item 440, "Reinforcement for Concrete."

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

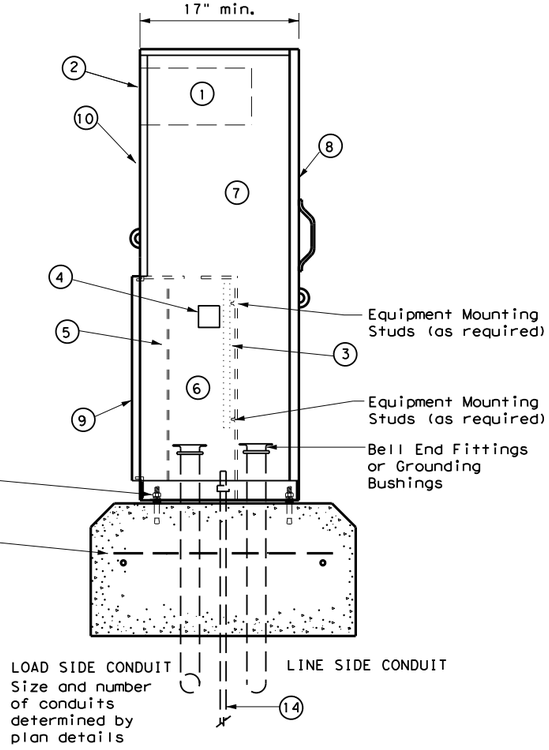
6. Finish top of concrete foundation in a neat and workmanlike manner. If leveling washers are used, ensure no more than ⅛ in. gap at any corner. Do not exceed a maximum dip or rise in the foundation of ⅛ in. per foot. When properly installed, ensure the top of the service enclosure is level front to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

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

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

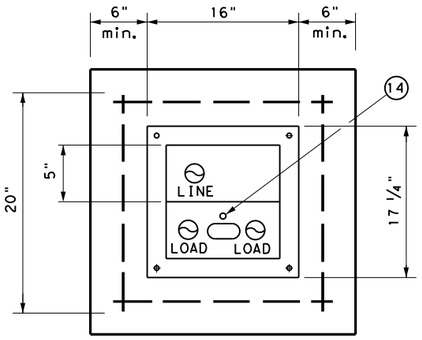


FRONT VIEW

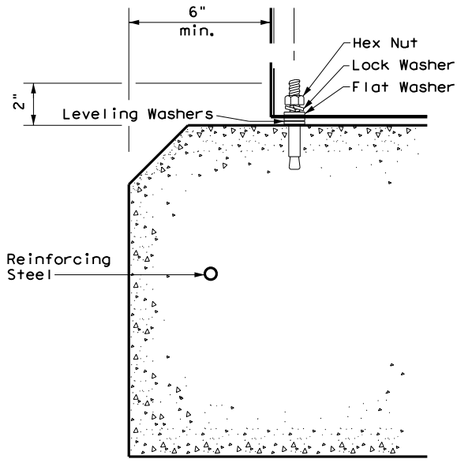


SIDE VIEW

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



SECTION A-A



ANCHOR BOLT DETAIL

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

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
ELECTRICAL SERVICE SUPPORT
PEDESTAL SERVICE TYPE PS

ED(9)-14

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		ELP	CULBERSON		145A1		

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TIMBER POLE (TP) SERVICE SUPPORT NOTES

1. Ensure electrical service support is a class 5 treated timber pole as per Item 627 "Treated Timber Poles." Embed timber pole to depth required in Item 627.
2. Conduit and electrical conductors attached to the electrical service pole and underground within 12 in. of service pole are not paid for directly but are subsidiary to the electrial service.
3. Install pole-top mounted photocell (T) on north side of pole, or in service enclosure (E) as required. See Electrical Service Data chart in plan set.
4. Gain pole as required to provide flat surface for each channel. Gain timber pole to 5/8 in. max. depth and 1 7/8 in. max. height. Gain pole in a neat and workmanlike manner.
5. Mount meter and service equipment on stainless steel or galvanized channel (Unistrut, Kindorf, or equal). Provide channel sized 1 in. to 3 3/4 in. maximum depth, and 1½ in. to 1⅝ in. maximum width. File smooth the cut ends of galvanized channel and paint with zinc rich paint before installing on pole. Secure each channel section to timber pole with two galvanized or SS lag bolts, ¼ in. minimum diameter by 1½ in. minimum length. Use a galvanized or SS flat washer on each lag bolt. Do not stack channel.
6. When excess length must be trimmed from poles, trim from the top end only.

(1) Class 5 pole, height as required

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

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

(4) Safety switch (when required)

(5) Meter (when required)

(6) Service enclosure

(7) 6 AWG bare grounding electrode conductor in ½ in. PVC to ground rod - extend ½ in. PVC 6 in. underground.

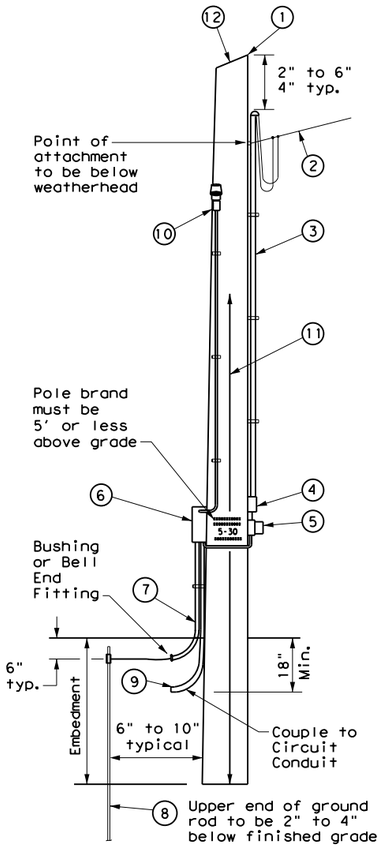
(8) ⅝ in. x 8 ft. Copper clad ground rod - drive ground rod to a depth of 2 in. to 4 in. below grade.

(9) RMC same size as branch circuit conduit.

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

(11) When required by the serving utility provide bare 6 AWG copper conductor. Run wire from pole top to butt wrap or copper butt plate. Protect conductor with non-conductive material to a height of 8 ft. above finished grade.

(12) When required by utility, cut top of pole at an angle to enhance rain run off.

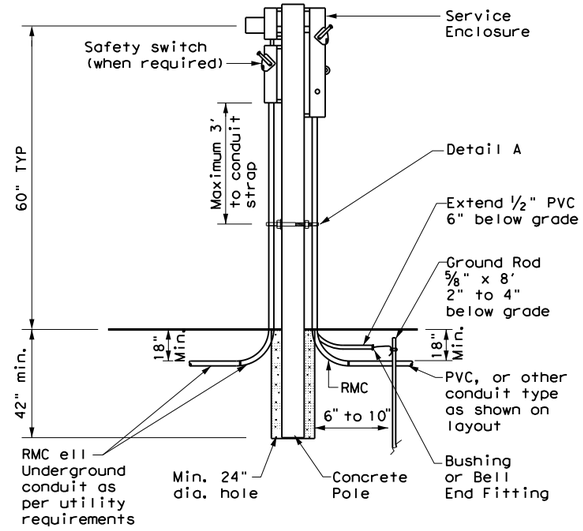


SERVICE SUPPORT TYPE TP (O)

GRANITE CONCRETE (GC) & OTHER CONCRETE (OC) NOTES

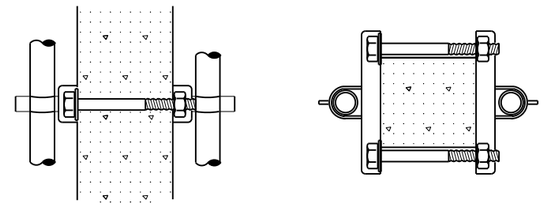
Ensure electrical service support structures bid as type Granite Concrete (GC) or Other Concrete (OC) meet the following requirements.

1. Provide GC and OC poles that meet the requirements of DMS 11080 "Electrical Services."
2. Provide prestressed concrete poles suitable for direct embedment into the ground without special foundations.
3. Verify poles are marked as required on DMS 11080. Location of marking should be approximately 4' above final grade. Use the two-point pickup locations when handling pole in horizontal position, and one-point pickup location for use in raising the pole to a vertical position. These marks are small but conspicuous.
4. Embed poles 42 in. or 10% of the length plus 2 ft., whichever is greater.
5. Ensure all installation details of services are in accordance with utility company specifications.
6. Install a one point rack or eye bolt bracket 6 inches to 12 inches below the weatherhead as an overhead service drop anchoring point for the electric utility.
7. Furnish and install galvanized or stainless steel channel strut 1 ½ in. or 1 ⅝ in. wide by 1 in. up to 3 ¾ in. deep (Unistrut, Kindorf, B-line or equal). Attach channel strut with stainless steel concrete anchors (max. 1" depth), square U-bolts or back to back channel strut with long bolts, or other secure mounting as approved by the Engineer. Ensure bolts are galvanized in accordance with ASTM A153. Do not stack channel struts.
8. Backfill the holes thoroughly by tamping in 6 in. lifts. After tamping to grade, place additional backfill material in a 6 inch high cone around the pole to allow for settling. Use material equal in composition and density to the surrounding area. Backfilling will not be paid for directly but is subsidiary to various bid items.



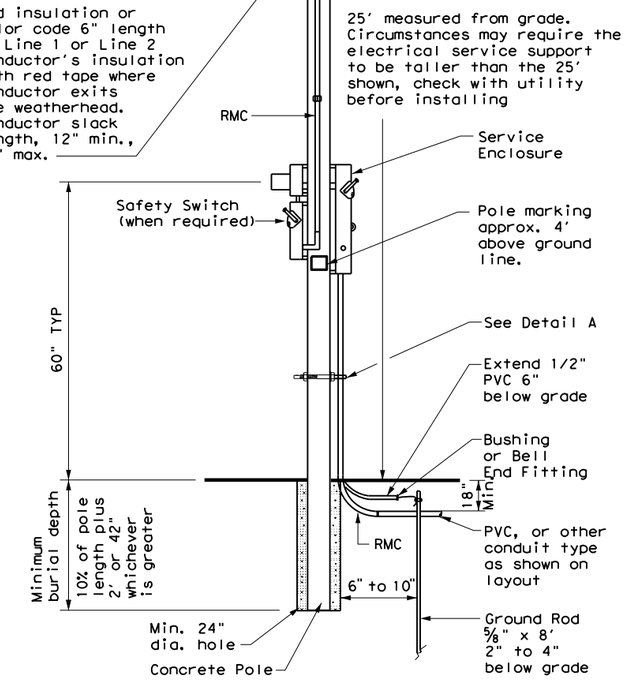
CONCRETE SERVICE SUPPORT

Underground (U)



DETAIL A

See Note 7. Before installing channel that has been cut, file sharp edges and paint with zinc-rich paint. Ensure there is no paint splatter on the pole.



CONCRETE SERVICE SUPPORT

Overhead (O)

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES GC, OC, & TP

ED(10)-14

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DUCT CABLE & HDPE CONDUIT NOTES

1. Provide duct cable in accordance with Departmental Material Specification (DMS) 11060 "Duct Cable" and Item 622 "Duct Cable." Provide duct cable as listed on the Material Producer List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 622.

2. Provide High-Density Polyethylene (HDPE) conduit in accordance with DMS 11060 and Item 618, "Conduit." Provide HDPE as listed on the MPL on the Department web site under "Roadway Illumination and Electrical Supplies," Item 618.

3. Supply duct cable with a minimum 2 in. diameter, unless otherwise shown in the plans. Provide duct cable and HDPE conduit as shown by descriptive code or on the plans. Bend duct cable and HDPE conduit as recommended by the manufacturer, with a minimum bending radius of 26 in. for 2 in. duct. Follow manufacturers' recommendations when handling duct cable and HDPE conduit reels and during installation of duct cable and HDPE conduit.

4. Do not splice conductors within duct cable or HDPE conduit. Couple duct cable and HDPE entering a ground box or foundation to a PVC elbow. When galvanized steel RMC elbows are called for in the plans and any portion of the RMC elbow is buried less than 18" from possible contact, ground the RMC elbow.

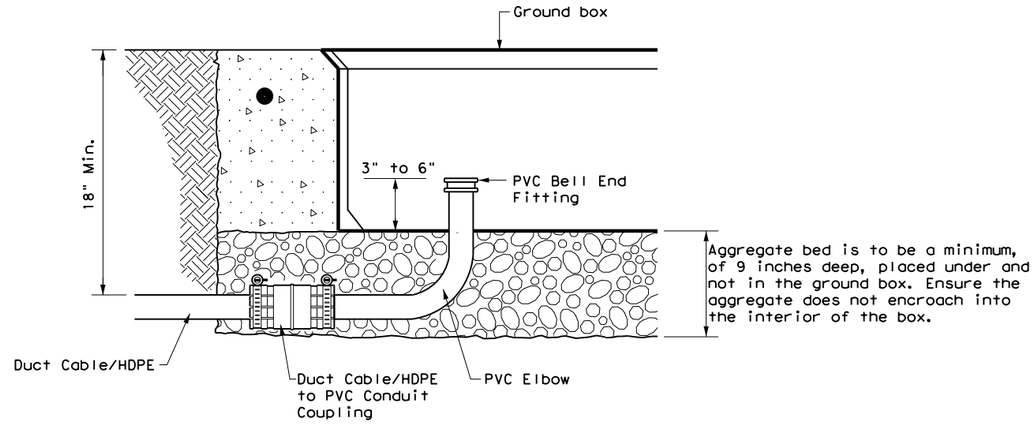
5. Furnish and install duct cable with factory installed conductors, sized as shown in the plans and as required by the National Electrical Code (NEC). The NEC contains specific requirements for duct cable in Article, "Nonmetallic Underground Conduit with Conductors: Type NUCC."

6. When conduit casing is called for in the plans, extend duct cable or HDPE conduit through the conduit casing in one continuous length without connection to the casing.

7. Seal the ends of duct cable or HDPE conduit with duct seal, expandable foam, or other approved method after completing the pull tests required by Item 622.

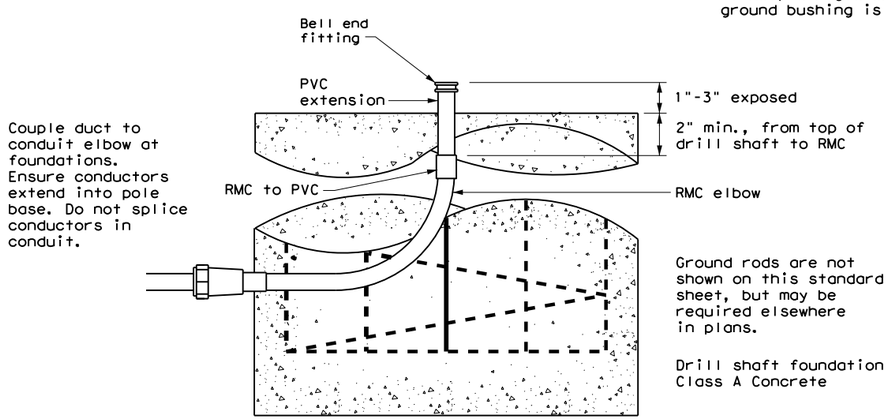
8. Provide minimum cover of 24 in. under roadways, 18 in. in other locations, or as shown on the plans.

9. Furnish and install listed fittings to couple duct cable or HDPE conduit to other types of conduit. Duct cable and HDPE conduit may be field-threaded and spliced with PVC or RMC threaded couplings; connected with listed tie-wrap fittings; connected using listed coupling made of HDPE with stainless steel external banding clamps and locking rings; connected with approved electrofusion conduit couplings; or connected using an approved chemical fusion method using an epoxy or adhesive specifically designed for HDPE couplings and connectors all installed in accordance with their manufacturer's instructions. Do not use PVC glue on HDPE. Do not use water pipe fittings, or connect conduit with heat shrink tubing.

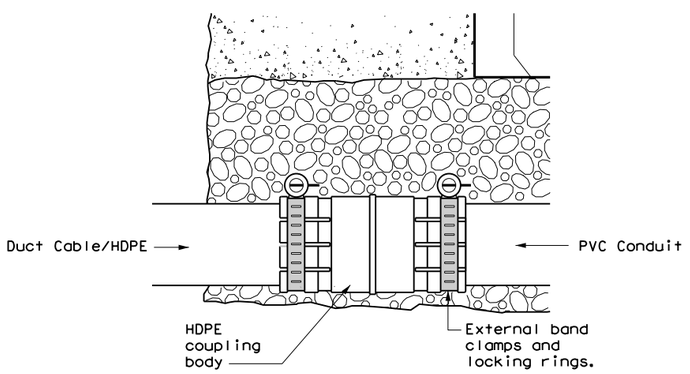


DUCT CABLE/HDPE AT GROUND BOX

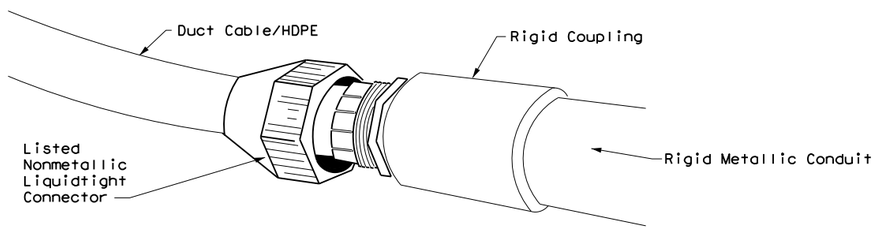
When the upper end of an RMC Ell does not enter the ground box, it may be extended with a SCH-40 PVC conduit nipple and bell end, provided there is a minimum of 18" of cover over all parts of the elbow. If not, a rigid extension and ground bushing is required.



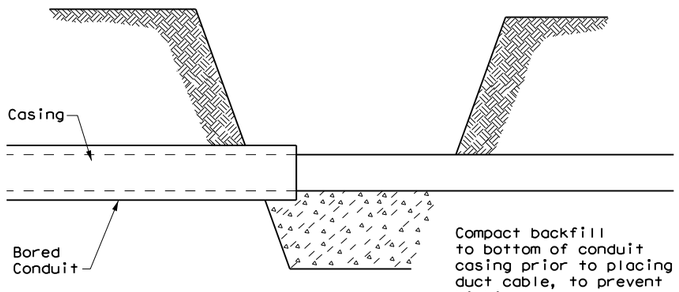
DUCT CABLE / HDPE AT FOUNDATION



DUCT CABLE/HDPE TO PVC



DUCT CABLE/HDPE TO RMC



BORE PIT DETAIL

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
DUCT CABLE/ HDPE CONDUIT

ED(11)-14

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BATTERY BOX GROUND BOXES NOTES

A. MATERIALS

1. Provide polymer concrete or fiberglass reinforced plastic (FRP) battery box ground box and cover in accordance with Departmental Material Specification (DMS) 11071 "Battery Box Ground Boxes." Battery box will accommodate up to 4 batteries, each measuring 8 in. x 13.5 in. x 10 in. (W x L x D). Label battery box ground box cover in accordance with DMS 11071.

2. Supply a marine grade batteries with covers. Secure the marine grade batteries with covers to the stainless steel rack in the bottom of the ground box with tie down straps.

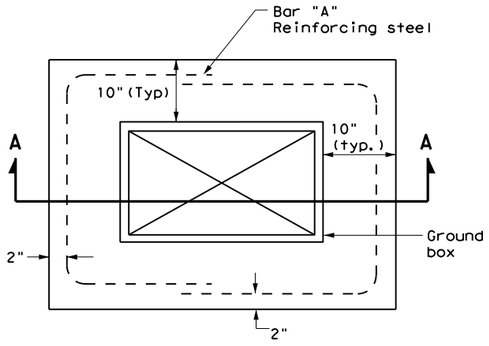
B. CONSTRUCTION METHODS

1. Ensure conduit entry will not interfere with placement of the batteries in the battery box ground box.

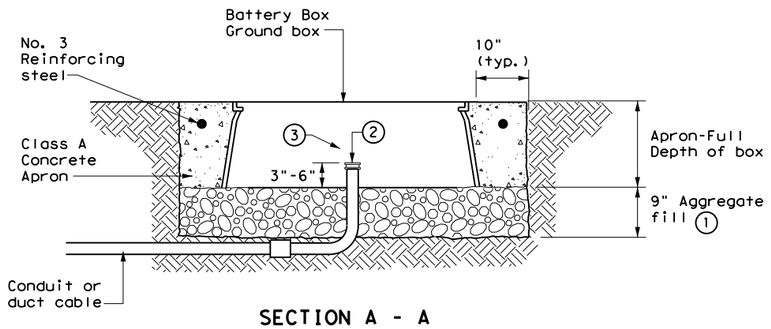
2. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting battery box ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure the aggregate bed is in place and is a minimum of 9 in. deep prior to setting the box. Install battery box ground box on top of aggregate.

3. Cast battery box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Battery box ground box aprons, including concrete and reinforcing steel, are subsidiary to battery box ground boxes when called for by descriptive code.

4. Bolt covers down when not working in battery box ground boxes. Keep bolt holes in the box clear of dirt.



PLAN VIEW



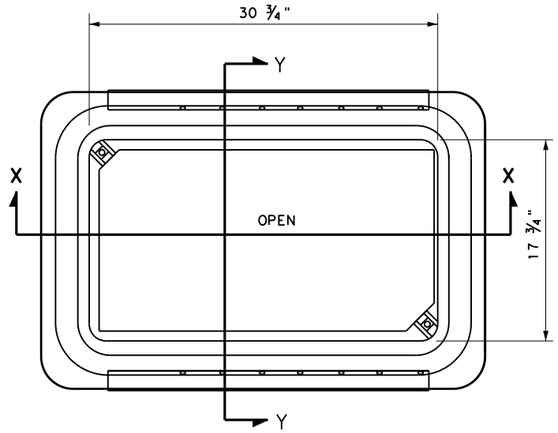
SECTION A - A

APRON FOR BATTERY BOX GROUND BOXES

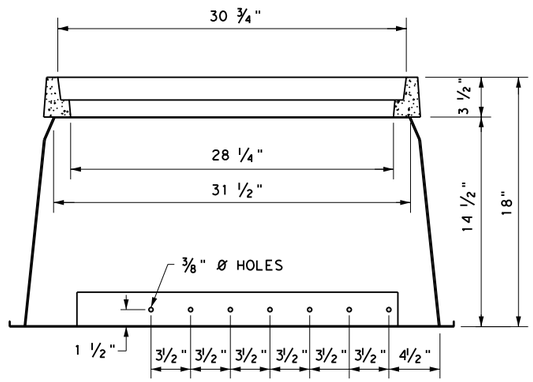
(1) Place aggregate under the box and not in the box. Aggregate should not encroach on the interior volume of the box.

(2) Install bushing or bell end fitting on the upper end of all ells.

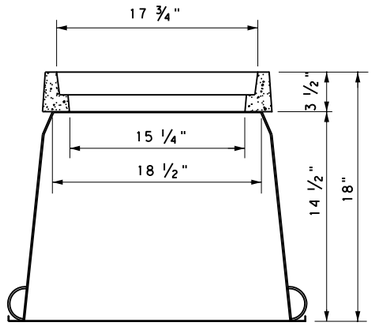
(3) Install all conduits in a neat and workmanlike manner.



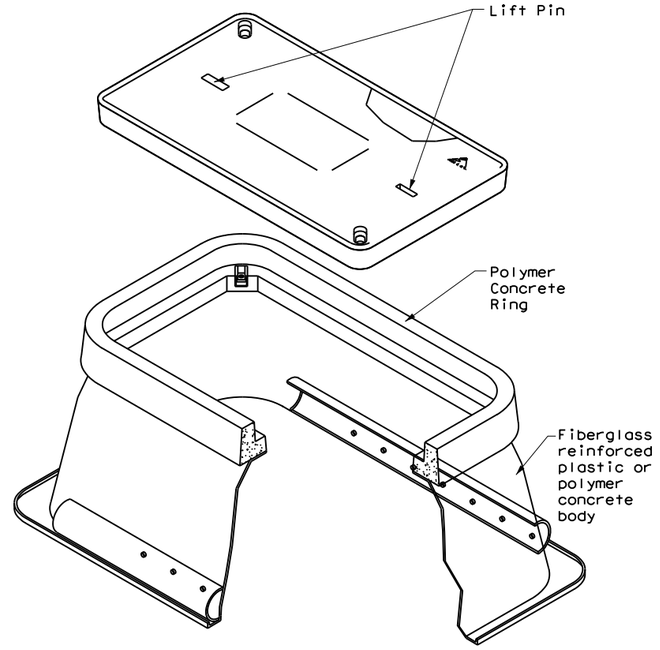
BATTERY BOX TOP VIEW



SECTION X-X



SECTION Y-Y



Texas Department of Transportation | Traffic Operations Division Standard

ELECTRICAL DETAILS
BATTERY BOX
GROUND BOXES

ED(12)-14

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	ELP	CULBERSON		154

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ROADWAY ILLUMINATION ASSEMBLY NOTES

1. Details apply to roadway lighting installations bid or referenced under Item 610, "Roadway Illumination Assemblies." Provide, furnish, and install all other materials not shown on the plans which may be necessary for complete and proper construction. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the State such warranties or guarantees.

2. The locations of poles and fixtures may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.

3. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC),TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA),and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association, Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection.

4. Provide Roadway Illumination Light Fixtures as per TxDOT Departmental Material Specification (DMS) 11010, Item 610, and as shown on the Material Producers List (MPL) for Roadway Illumination and Electrical Supplies.

5. Fabricate steel roadway illumination poles in accordance with Roadway Illumination Poles (RIP) standards and Item 610. Poles fabricated according to RIP standards do not require shop drawing submittals.

   a. Alternate designs to RIP standards or the use of aluminum to fabricate poles will require the submission of shop drawings electronically. For instructions on submitting shop drawings electronically see "Guide to Electronic Shop Drawing Submittal" on the TxDOT web site.

   b. Limitations on use of the RIP standard: The RIP standard details were developed for installations in locations where the 3-second gust basic maximum wind speed is 110 mph, and where the elevation of the base of the pole is less than (i.e. not more than) 25′ above the elevation of the surrounding terrain, in accordance with the "AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals," 6th Edition (2013) of the AASHTO Design Specifications. For poles to be installed in regions where the maximum basic wind speed exceeds 110 mph or to be mounted more than 25′ above the surrounding terrain, provide poles meeting the following requirements:

      i. Submittals. Following the electronic shop drawing submittal process (see Guide to Electronic Shop Drawing Submittal on the TxDOT web site), submit to the Engineer for approval fabrication drawings and calculations for the poles, sealed by a Texas licensed professional engineer (P.E.).

      ii. Luminaire Structural Support Requirements. Provide light poles, arms, and anchor bolt assemblies with a 25 year design life to safely resist dead loads, ice loads and the required basic wind speeds at the location of installation in accordance with the 6th edition (2013) of the AASHTO Design Specifications. For transformer base poles, include transformer base and connecting hardware in calculations and shop drawing submittals. Structurally test all transformer bases to resist the theoretical plastic moment capacity of the pole. Submit certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished with the shop drawings. Show breakaway base model number, manufacturer's name, and logo on shop drawings. Include on manufacturer's shop drawings the ASTM designations for all materials to be used.

6. For both transformer and shoe-base type illumination poles, provide and install double-pole breakaway fuse holders as specified by DMS-11040. Breakaway fuse holders are listed on the MPL for Roadway Illumination and Electrical Supplies under Items 610 & 620. Provide 10 amp time delay fuses for breakaway connectors in light poles, or inside the light fixture for underpass luminaires. In each pole, connect luminaires to the breakaway connector with continuous stranded 12 AWG copper conductors as listed on the MPL. Bond all equipment grounding conductors together and to the ground lug in the transformer base or hand hole.

7. Tighten anchor bolts for shoe base, concrete traffic barrier base, and bridge mount roadway illumination poles, in accordance with Item 449.

8. Install T-Base with following procedure:

   a. Anchor Bolt Tightening.

      i. Coat the threads of the anchor bolts with electrically conductive lubricant.

      ii. Place the T-base over the anchor bolts. Foundation must be level and flat. The maximum permissible gap under any one corner of the t-base is 1/8" before nuts are tightened.

      iii. Coat the bearing surfaces of the nuts and washers with electrically conductive lubricant. Install (1) 1/2" hold down washer, (1) lock washer, and (1) nut on each anchor bolt. Turn the nuts onto the bolts so that each is hand-tight against the washer.

      iv. Using a torque wrench, tighten each nut to 150 ft-lb. Uniform contact is required between the foundation and the T-base in the corner regions of the T-base, and all corner gaps must be closed after applying torque. If a gap still exists after torquing to 150 ft-lbs, continue torquing each bolt incrementally until gap is closed or maximum allowable torque of 250 ft. pound is reached, whichever comes first. If 250 ft-lbs is not enough to close the gap the foundation must be leveled. Gaps along the straight sides of the T-bases and the foundation are permissible. Ensure that no high point of contact occurs between the straight sides of the T-base and the foundation.

      v. Check top of T-base for level. If not level then foundation must be leveled.

   b. Top Bolt Procedure

      i. Erect pole over T-base with crane. Coat bolts, nuts, washers, and lock washers with electrically conductive lubricant.

      ii. Install bolts and 1/2" connecting washers from the inside of the T-base, thread up through the pole base. Install flat washers, lock washers and nuts snug tight according to Item 447, "Structural Bolting."

      iii. Tighten each nut to 150 ft-lb. using a torque wrench.

   c. Level and Plumb

      i. Ensure pole is plumb and mast arm is perpendicular to the roadway according to plans to within 5 degrees.

9. Construct luminaire pole foundations in accordance with Item 416, "Drilled Shaft Foundations," and TxDOT standard sheet RID(2).

10. Provide and install underpass luminaires in accordance with Item 610, DMS-11010, and TxDOT standard sheet RID(3). Typical luminaire size for underpass luminaires is 150W HPS or 150W EQ LED.

11. Mount luminaires on arms level as shown by the luminaire level indicator.

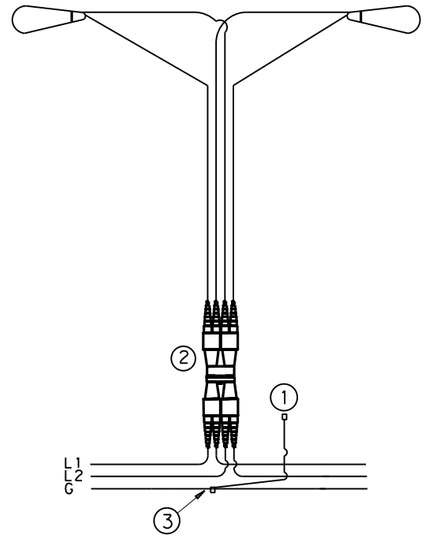
12. Orient luminaires perpendicular to the roadway intended to be lit unless otherwise shown on the plans.

Wiring Diagram Notes:

(1) Use 1/2 in.-13 UNC threaded, copper or tin-plated copper, pole bonding connector, sized appropriately for conductors, bonded to T-base, or use ground lug in handhole as available.

(2) Use pre-qualified two-pole breakaway connectors for all luminaire pole installations. For luminaires fed by a circuit with a neutral conductor, use double pole breakaway connectors with the neutral side unfused and marked white.

(3) Split Bolt or other connector.



L1,L2 = Hot Conductors
G = Grounding Conductor

TYPICAL WIRING DIAGRAM

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

Decorative LED Lighting Notes:

1. LED Drivers in Remote Outdoor enclosures (for drivers that do not include an enclosure as part of a factory assembly):

   a. Provide NEMA 3R outdoor enclosure or as approved.

   b. Install enclosure at least 12" above ground or other horizontal surface. Mount vertically or on ceiling, and avoid direct sun where possible.

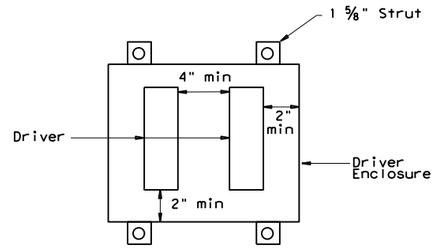
   c. Install drivers with at least 2 inches of space from enclosure walls.

   d. For multiple drivers in an enclosure, provide at least 4 inches side to side and 1 inch end to end from other drivers or electronic equipment

   e. For drivers mounted on back wall of enclosure, mount enclosure on 1 5/8" strut or other standoff to dissipate heat, or mount driver to side of the enclosure or to the metal cover.

   f. Provide remote drivers with a maximum of 100 watts

   g. Provide drivers with documentation of 100,000 hr lifetime at Tcase of 65C or higher.



Driver Spacing In Remote Enclosure

Texas Department of Transportation — Traffic Safety Division Standard

ROADWAY ILLUMINATION DETAILS

RID(1)-20

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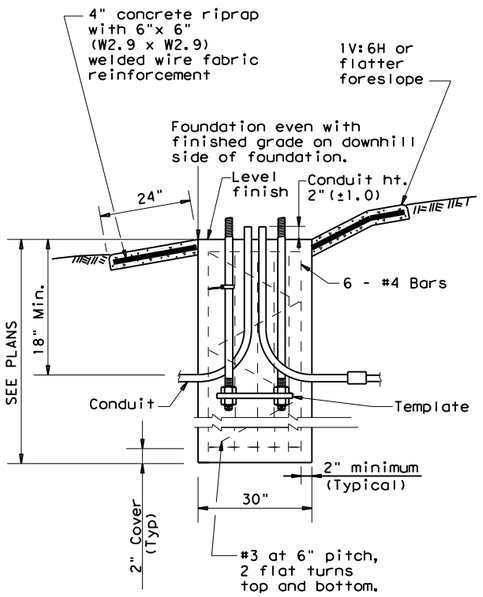
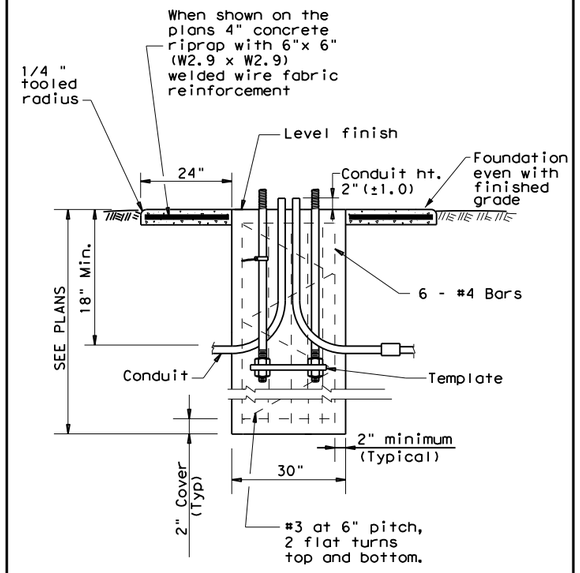


SECTION A-A
SHOWING SLOPED GRADE



SECTION A-A
SHOWING CONSTANT GRADE

TABLE 1

ANCHOR BOLTS

POLE MOUNTING HEIGHT	BOLT CIRCLE		ANCHOR BOLT SIZE
	Shoe Base	T-Base	
<40 ft.	13 in.	14 in.	1in. x 30in.
40-50 ft.	15 in.	17 ¼in.	1 ¼in. x 30in.

TABLE 2

RECOMMENDED FOUNDATION LENGTHS
(See note 1)

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

TABLE 3

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

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

GENERAL NOTES:

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

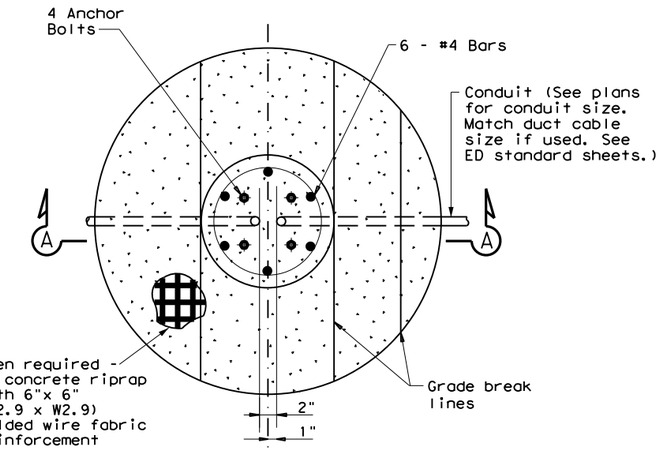
TABLE 4

BREAKAWAY POLE PLACEMENT (See note 6)

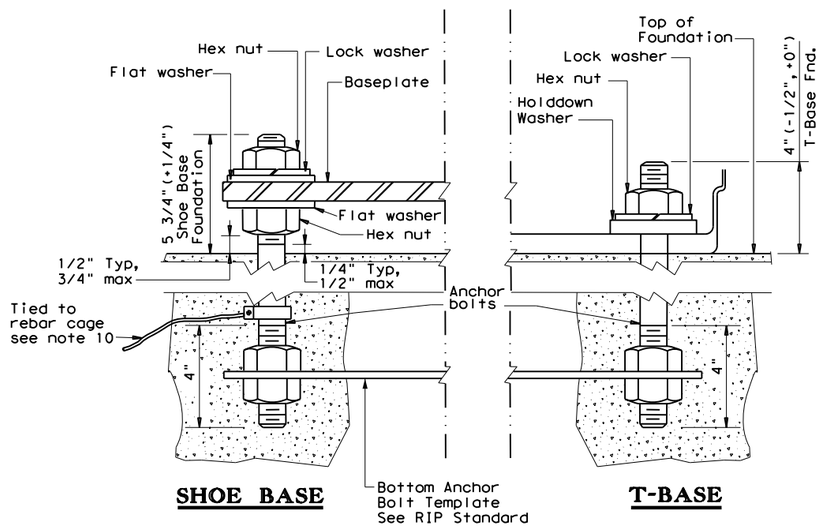
ROADWAY FUNCTIONAL CLASSIFICATION	** POLE OFFSET (DISTANCE TO FACE OF TRANSFORMER BASE)
Freeway Mainlanes (roadway with full control of access)	15 ft. (minimum and typical) from lane edge
All curbed, 45 mph or less design speed	2.5 ft. minimum (15 ft. desirable) from curb face
All others	10 ft. minimum*(15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

* or as close to ROW line as is practical

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



FOUNDATION DETAIL



ANCHOR BOLT DETAIL

Texas Department of Transportation — Traffic Safety Division Standard

ROADWAY ILLUMINATION DETAILS
(RDWY ILLUM FOUNDATIONS)
RID(2)-20

FILE: rid2-20.dgn	DN:	CK:	DW:	CK:
© TxDOT January 2007	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	02	035,etc	US 62
1-11	DIST	COUNTY		SHEET NO.
7-17	ELP	CULBERSON		156
12-20				

72B

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DATE: 6/2/2021 8:30:42 PM
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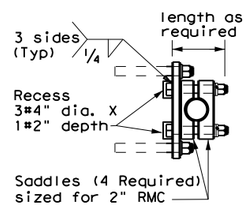
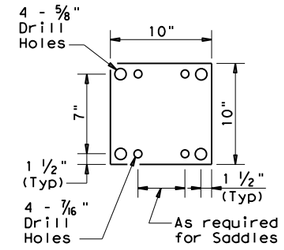
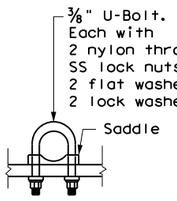


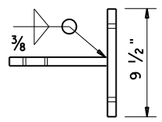
SECTION A-A



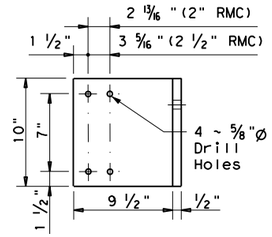
MOUNTING PLATE
(ASTM A-36 or better)



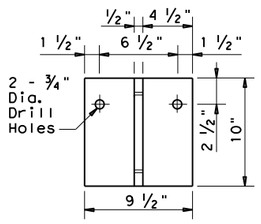
CLAMP DETAIL
(2 Req'd)



PLAN VIEW

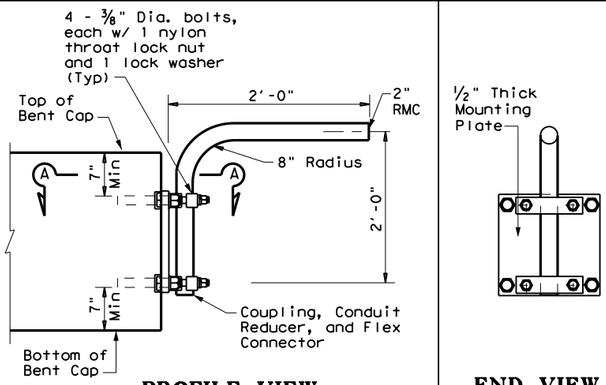


FRONT



SIDE

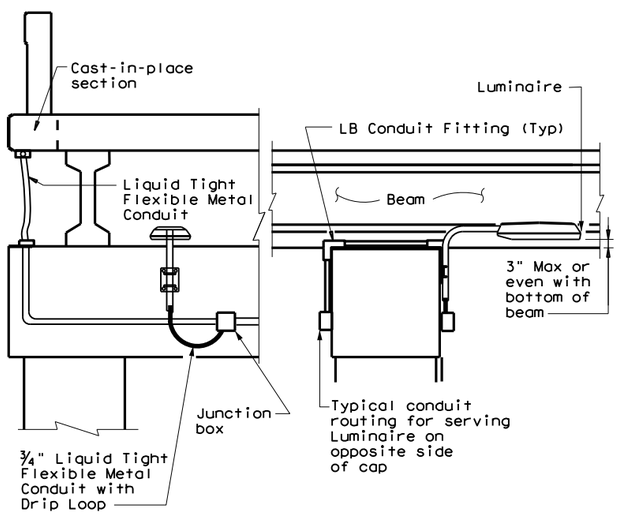
BRACKET DETAIL
Make from 1/2" plate (ASTM A-36 or better)



PROFILE VIEW
Or as Required
(See Note A.3)

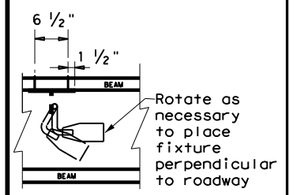
END VIEW

UNDERPASS LIGHTING ARM



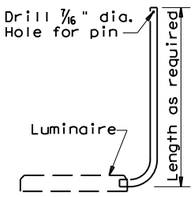
IN RD IL AM (U/P)(TY 1)
If bridge has pre-cast panels under deck, run circuit under deck edge.

UNDERPASS LIGHTING TYPE 1

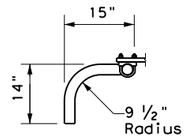


PLAN VIEW

FIXTURE ORIENTATION

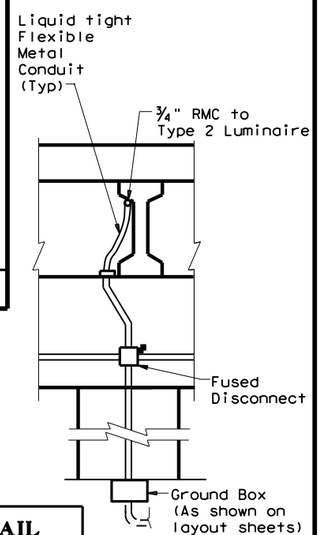


SIDE



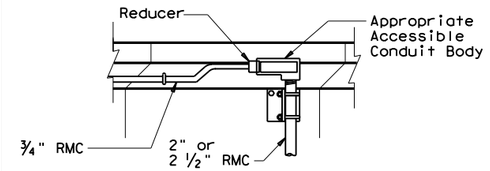
PLAN VIEW

ARM DETAIL

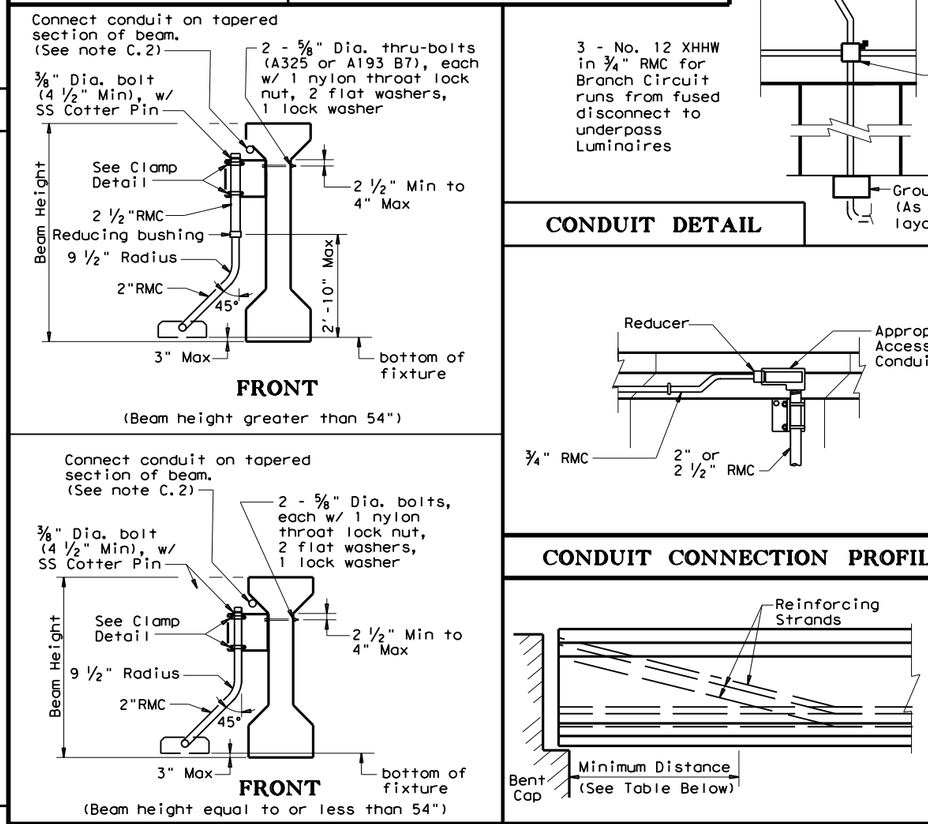


3 - No. 12 XHHW in 3/4" RMC for Branch Circuit runs from fused disconnect to underpass Luminaires

CONDUIT DETAIL



CONDUIT CONNECTION PROFILE



FRONT
(Beam height greater than 54")

FRONT
(Beam height equal to or less than 54")

IN RD IL AM (U/P)(TY 2)

LOCATION OF UNDERPASS LIGHT MOUNTING BRACKET

TABLE 5
LOCATION OF UNDERPASS LIGHT MOUNTING BRACKET TABLE

SPAN LENGTH	MINIMUM DISTANCE
≤ 50'	10'-0"
50' - 70'	15'-0"
70' - 90'	20'-0"
> 90'	25'-0"

UNDERPASS LIGHTING TYPE 2

GENERAL NOTES:

A. ALL 150 watt HPS and 150 watt equivalent LED Luminaires

1. Luminaire locations, conduit and conductor sizes and routing are typical and diagrammatic only. See project layout sheets for specific details.
2. Conduit will be paid for under Item 618, "Conduit" and conductors will be paid for under Item 620, "Electrical Conductors," unless otherwise shown on the plans.
3. Adjust conduit in saddles to place fixture height and orientation as required. See fixture orientation detail and plans. Where practicable, place luminaires so the bottom of luminaire is above the bottom of the beam, maximum of 3 in. (See detail UNDERPASS LIGHTING ARM TYPE 2)
4. Except as noted, galvanize all structural steel and exposed bolts, nuts, and washers in accordance with Item 445 "Galvanizing".
5. Fabrication of brackets and support arms will not be paid for directly but is subsidiary to Item 610, "Roadway Illumination Assemblies."
6. Install a heavy duty NEMA 3R fused disconnect or breaker enclosure rated at 30 amps and 480 volts to switch underpass luminaires as shown on plans, with at least one per bridge circuit. Install 20 amp time-delay fuses or inverse-time circuit breakers. Mount disconnect or breaker enclosure 10 ft.(min) above grade on columns or bent caps as approved by the Department. Modify disconnect to allow padlocking in the "ON" and "OFF" positions. Padlocks and disconnect switches or circuit breakers for underpass fixtures will not be paid for directly but are subsidiary to the various bid items of the contract.
7. Conduit on columns, caps, and slab is shown surface mounted. For new columns and caps, embed PVC conduit in concrete. Bond and ground metal junction boxes and conduit.

B. TYPE 1

1. Provide 2 in. rigid metal conduit (2.375" O.D., 0.146" wall) for Type 1 arm shaft.
2. Use 3/8 in. stainless steel bolt or stud non-epoxy type expansion anchors for concrete for Type 1 mounting. Except as noted, provide an allowable 2650 lbs minimum pull-out force (after consideration of adjustment factors for edge distance and bolt spacing) for each anchor. Install each anchor to the embedment depth recommended by the manufacturer.
3. Attach conduit to plate with 4 saddles, four - 3/8 in. diameter bolts, nylon throat lock nuts, and lock washers.

C. TYPE 2

1. Provide 2 in. rigid metal conduit (2.375" O.D., 0.146" wall) or provide a combination of 2 1/2 in. (2.875" O.D., 0.193" wall) and 2 in. (2.375" O.D., 0.146" wall) rigid metal conduits with a reducing bushing as beam height stipulated for Type 2 arm shaft. Field cutting and threading will be permitted. Paint cut and threaded areas with zinc rich paint after conduit is connected to adjacent fitting.
2. Connecting conduit may be strapped to tapered section only of precast beams as shown. Anchor as approved by the Engineer. Maximum anchor depth is 1 in.
3. Indiscriminate drilling into precast concrete beams may result in reduced beam strength. Use drilling location and method as directed by the Engineer. See Location of Underpass Lighting Mounting Bracket detail. The locations shown in the table are such that reinforcing strands will not be damaged.

Texas Department of Transportation
Traffic Safety Division Standard

ROADWAY ILLUMINATION DETAILS
(UNDERPASS LIGHT FIXTURES)
RID(3)-20

FILE: rid3-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	02	035,etc	US 62
2-14	DIST	COUNTY		SHEET NO.
7-17	ELP	CULBERSON		157
12-20				

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SHIPPING PARTS LIST - POLES AND LUMINAIRE ARMS

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

OTHER Designation Pole	A1	A2	Luminaire	Quantity

GENERAL NOTES:

1. All work, materials and services not shown on the plans which may be necessary for complete and proper construction shall be performed, furnished and installed by the Contractor. Faulty fabrication or poor workmanship in any material, equipment or installation will be considered justification for rejection. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the Department such warranties or guarantees.

2. The location of poles and fixtures are diagrammatic only and may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.

3. Standard Steel Pole Designs. Steel poles fabricated in accordance with the details and dimensions shown herein, shall be considered standard designs. Submission of shop drawings and design calculations for standard designs is not required.

4. Optional Steel Pole Designs. Multi-sided steel poles may be allowed as optional designs, if steel poles are permitted or required, pending approval by the Department as outlined below.

   a. Shop Drawings. Optional designs require submission of shop drawings and design calculations bearing the seal of an engineer licensed in the State of Texas, in accordance with Item 441, "Steel Structures." The Department may elect to pre-approve some shop drawings for optionally designed poles. Submission of shop drawings and design calculations is not required for structures fabricated in accordance with the details of shop drawings on the pre-approved list maintained by the TxDOT Traffic Operations Division. Any deviation from the pre-approved shop drawings will require submission of shop drawings of the complete assembly and design calculations as described above.
   b. Structural Support Design for Luminaires. Lighting support structures shall be designed for a 25 year design life in accordance with the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto. All poles shall be designed for 110 mph 3-second gust wind speeds. The Gust Factor, G, and Wind Importance Factor, Ir, shall be applied as per the AASHTO Specifications assuming a 25-year design life. The design wind pressure for hurricane wind velocities greater than 100 mph shall not be less than the design wind pressure using 100 mph with the non-hurricane Wind Importance Factor, Ir, value. For transformer base poles, fabricator shall include transformer base and connecting hardware in design calculations and shop drawing submittals. All transformer bases shall have been structurally tested to resist the theoretical plastic moment capacity of the pole. Certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished shall be submitted with the shop drawings. Shop drawings shall show breakaway base model number, and manufacturer's name and logo. Manufacturer's shop drawings shall include the ASTM designations for all materials to be used.
   c. Mast Arm Attachments. All poles and attachments shall be structurally designed to support two 12-foot mast arms and luminaires. Poles shall be supplied with mast arm combinations as shown in the plans. All mast arms shall be designed for a 60-pound luminaire having an effective projected area of 1.6 square feet.
   d. Anchor Bolt Assembly. Anchor bolt assemblies for optionally designed poles shall be the same as those shown herein.

5. Aluminum Pole Designs. Aluminum pole designs may be allowed, if aluminum poles are permitted or required, pending approval by the Department as outlined below.

   a. Meet all of the requirements stated above for optional steel pole designs and the following:
      1. Aluminum poles shall be fabricated in accordance with "Structural Welding Code-Aluminum" AWS D1.2.
      2. Aluminum pole designs shall use the same anchor bolt assembly and be subject to the same geometric restraints and other requirements for steel poles specified herein.
      3. Aluminum poles shall be equipped with vibration mitigation devices, as approved by the engineer.
      4. Pole components shall be constructed using the following material:
         Shaft: ASTM B221 or B241 Alloy 6063-T6, ASTM B209 Alloy 5086-H34, ASTM B221 Alloy 6005-T5.
         Base Flange: ASTM B26 Alloy 356.0-T6 or ASTM B108 Alloy 356.0-T6 (Yield strength test required).
         Mast Arm Fitting: ASTM B209 Alloy 6061-T6 or ASTM B221 Alloy 6005-T5.
         Mast Arms: ASTM B241 Alloy 6061-T6 or Alloy 6063-T6.
         Pole Cap: ASTM B209 Alloy 5086-H32 or ASTM B108 or B26 Alloy 356.0-T6.
         Bolts: Stainless Steel AISI 300 series. Bolts threading into aluminum threads shall be treated with anti-seize compound, Never-Seez Compound, Permatex 133K or equal.

6. Special Designs. Poles with architectural treatments shall meet the requirements shown elsewhere in the plans.

7. Luminaire Mounting Height. Actual luminaire mounting height shall be the nominal mounting height given on RIP(2) for all pole-arm combinations except for poles with 4 ft. luminaire arms, which shall be 3'-0" lower than the nominal height, unless otherwise shown or directed.

EXPLANATION OF ROADWAY ILLUMINATION ASSEMBLY DESIGNATIONS

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

- SA: Pole and mast arm may be steel or aluminum.
- ST: Pole and mast arm must be steel.
- AL: Pole and mast arm must be aluminum.
- SP: Special (ovalized) steel or aluminum pole for installing on CSB or SSCB. See standard sheet CSB (4), or SSCB (4).

Two numerical digits denote nominal mounting height in feet.

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

First number denotes length of mast arm in feet.

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

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

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

SHEET 1 OF 4

Texas Department of Transportation | Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(1)-19

FILE: rip-19.dgn	DN:	CK:	DW:	CK:
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REVISIONS 7-17 12-19	0233	02	035,etc	US 62
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		158

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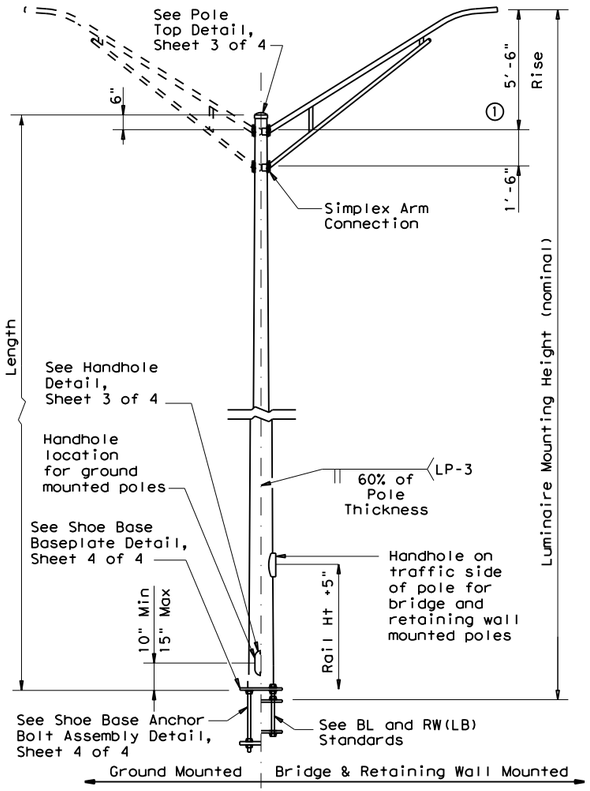
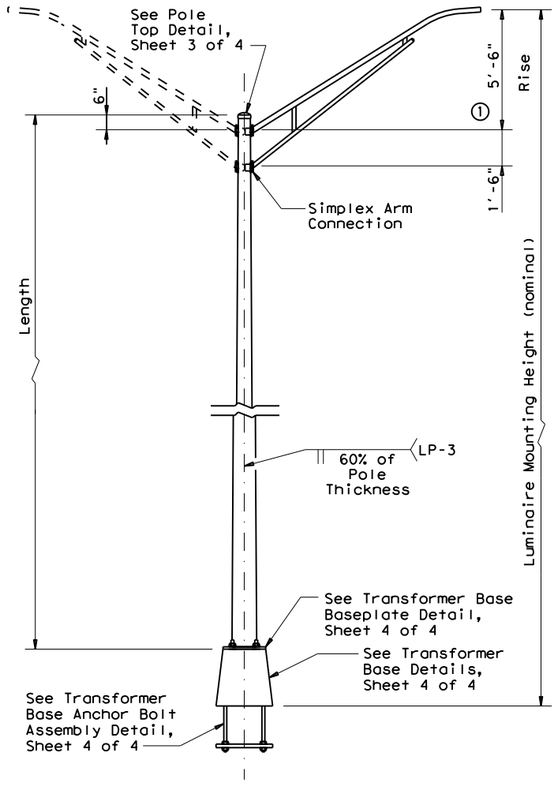


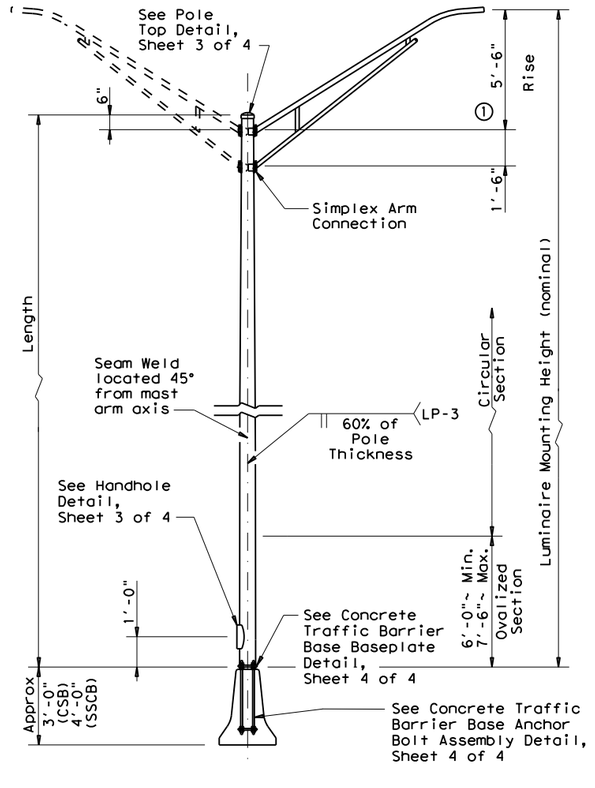
SHOE BASE POLE

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



TRANSFORMER BASE POLE

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



CONCRETE TRAFFIC BARRIER BASE POLE

CONCRETE TRAFFIC BARRIER BASE POLE (CSB/SSCB)						
Luminaire Mounting Height (Nominal) (ft)	Base ② Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)	
					About ℄ of Rail	Perp. to Rail
28.00	9.00	5.78	23.00	0.1196	10.3	13.2
38.00	9.00	4.38	33.00	0.1196	16.6	20.8
48.00	10.50	4.48	43.00	0.1345	25.1	30.5

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

NOTES:

① 2'-6" rise for 4 ft. luminaire arms.

② Before ovalized as shown on Concrete Traffic Barrier Base Baseplate details, Sheet 4 of 4.

③ A1011 SS Gr 50 may be used instead of HSLAS, provided the material meets the elongation requirements for HSLAS.

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

GENERAL NOTES:

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

Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(2)-19

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7-17	DIST	COUNTY		SHEET NO.
12-19	ELP	CULBERSON		159

73B

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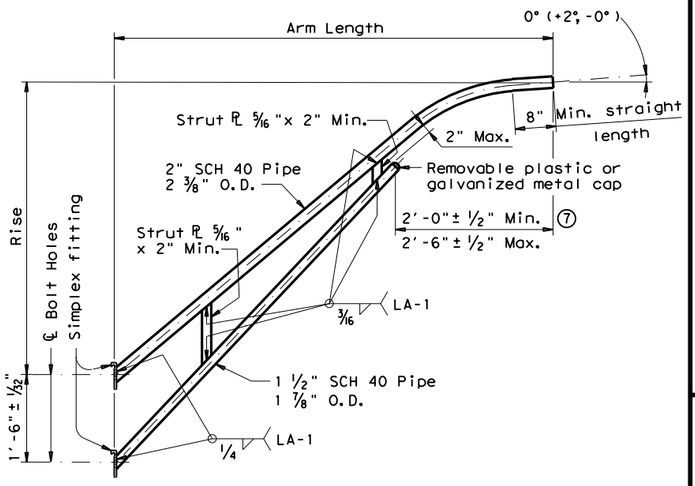
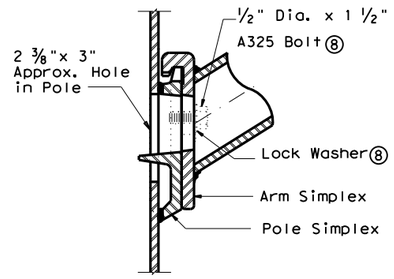


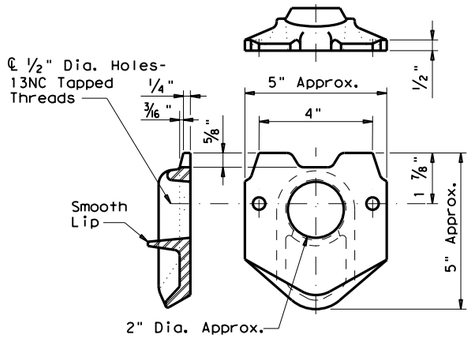
LUMINAIRE ARM

LUMINAIRE ARM DIMENSIONS		
Nominal Arm Length	Arm Length	Rise
4'-0"	3'-6"	2'-6"
6'-0"	5'-6"	5'-6"
8'-0"	7'-6"	5'-6"
10'-0"	9'-6"	5'-6"
12'-0"	11'-6"	5'-6"

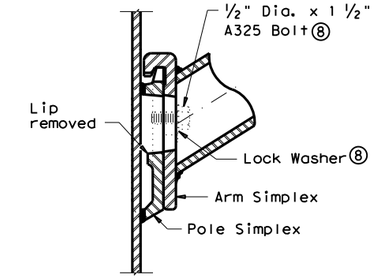
ARM ASSEMBLY FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Arm Length	±1"
Arm Rise	±1"
Deviation from flat	1/8" in 12"
Spacing between holes	±1/32"



UPPER SIMPLEX FITTING
(Gusset not shown for clarity)

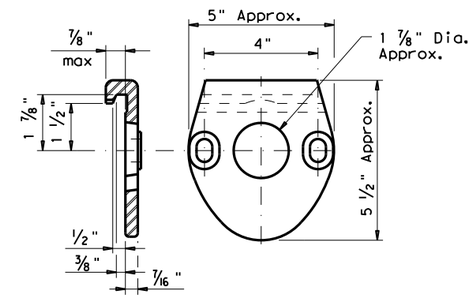


POLE SIMPLEX DETAIL ⑨



LOWER SIMPLEX FITTING
(Gusset not shown for clarity)

SECTION B-B



ARM SIMPLEX DETAIL ⑨

NOTES:

④ Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.

⑤ A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.

⑥ A572, A1008 HSLAS-F, and A1011 HSLAS-F materials may have higher yield strengths but shall not have less elongation than the grade indicated.

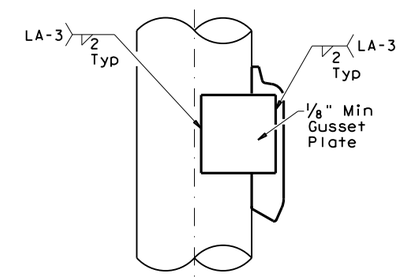
⑦ Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.

⑧ Each pole simplex fitting shall be supplied with 2 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans.

⑨ Proposed deviations in arm simplex dimensions or materials must be submitted to the Department for approval.

⑩ A welded handhole frame is permissible. Maximum of two (2) CJP weld splices is allowed.

MATERIALS	
Pole or Arm Simplex	ASTM A27 Gr 65-35 or Gr 70-36, A148 Gr 80-50, A576 Gr 1021 ⑤, or A36 (Arm only)
Arm Pipes	ASTM A53 Gr A or B, A500 Gr B, A501, A 1008 HSLAS-F Gr 50 ⑥, or A1011 HSLAS-F Gr 50 ⑥
Arm Struts and Gusset Plates ④	ASTM A36, A572 Gr 50 ⑥, or A588
Misc.	ASTM designations as noted



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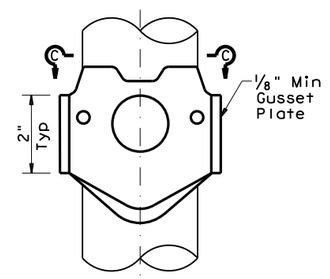

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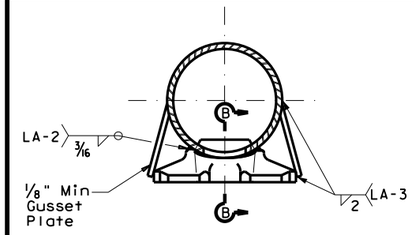
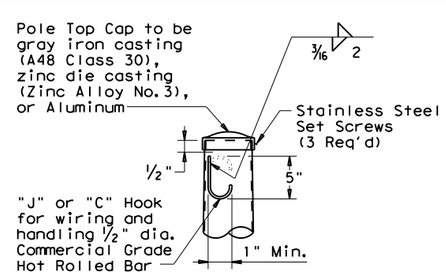
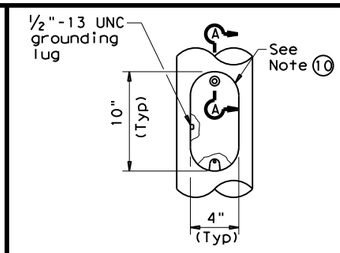


SECTION C-C

SIMPLEX ATTACHMENT DETAIL



POLE TOP



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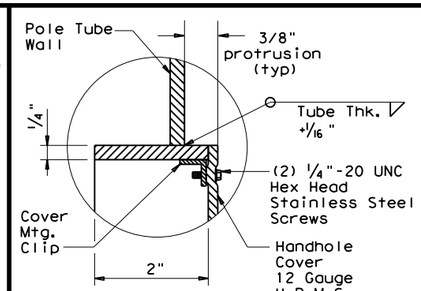

SECTION A-A

HANDHOLE

Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(3)-19

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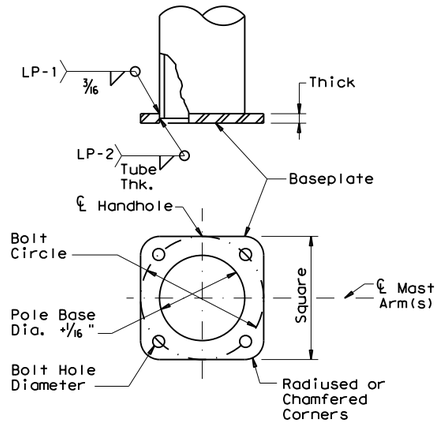
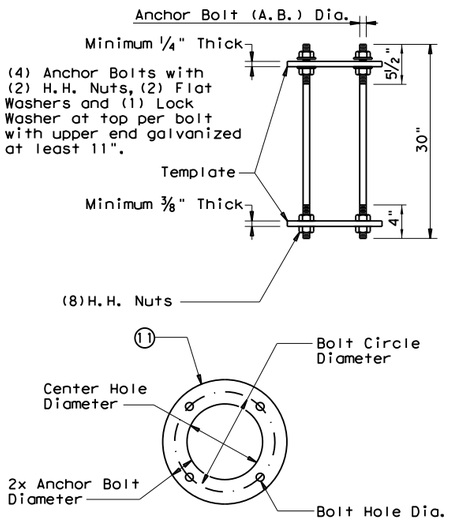


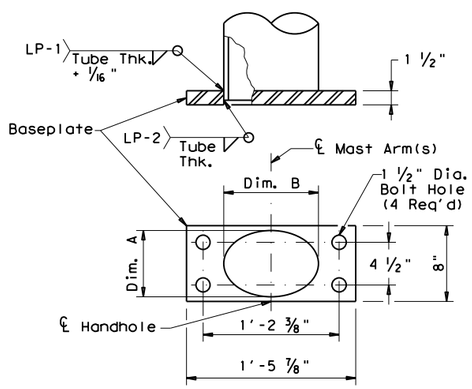
SHOE BASE BASEPLATE

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



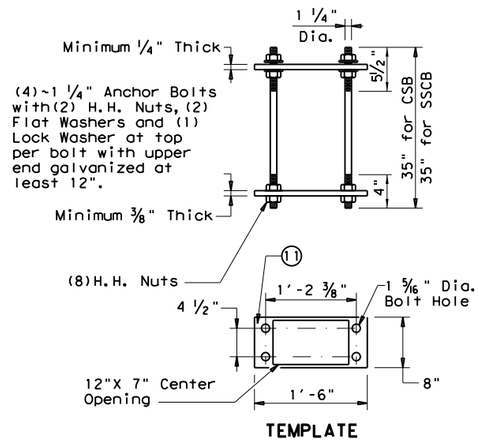
SHOE BASE ANCHOR BOLT ASSEMBLY

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



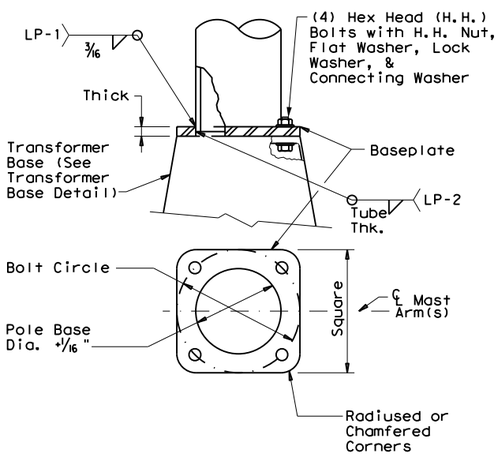
CONCRETE TRAFFIC BARRIER BASE BASEPLATE

CONCRETE TRAFFIC BARRIER BASE BASEPLATE TABLE			
MOUNTING HEIGHTS (nominal)	POLE DIA.(12)	DIM. A	DIM. B
28' - 38'	9"	7" ± 1/4"	10" ± 1/4"
48'	10 1/2"	7" ± 1/4"	13" ± 1/4"



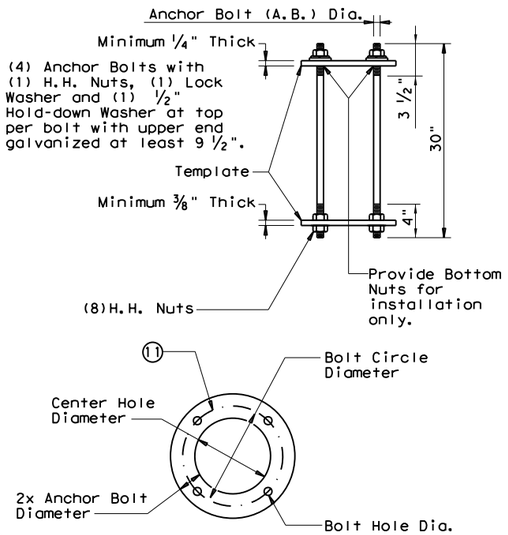
CONCRETE TRAFFIC BARRIER BASE ANCHOR BOLT ASSEMBLY

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



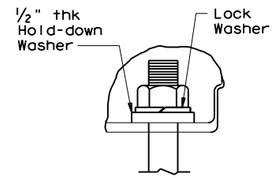
TRANSFORMER BASE BASEPLATE

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

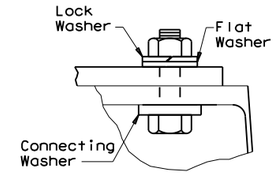


TRANSFORMER BASE ANCHOR BOLT ASSEMBLY

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



DETAIL A



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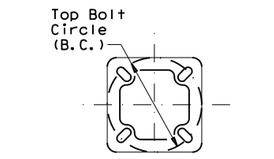
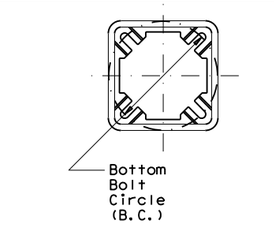
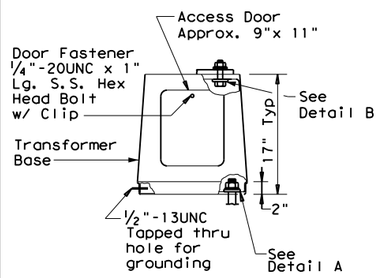


TOP PLAN



BOTTOM PLAN



ELEVATION

TRANSFORMER BASE DETAILS

GENERAL NOTES:

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

NOTES:

(11) Anchor Bolt Templates do not need to be galvanized.

(12) Pole diameter before ovalized.

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

Texas Department of Transportation — Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(4)-19

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	DIST	COUNTY		SHEET NO.
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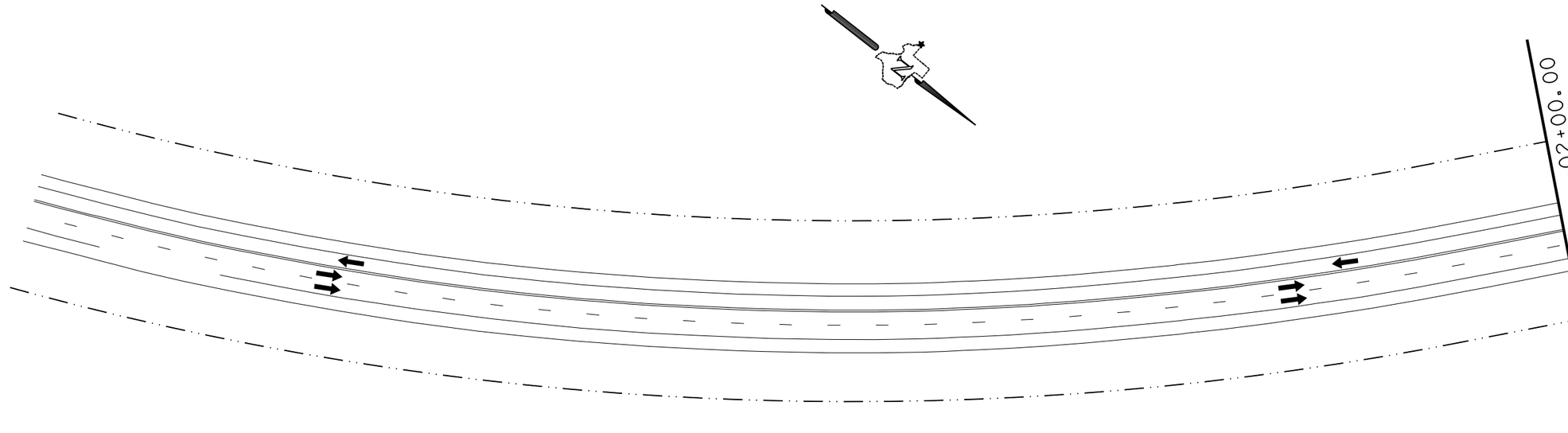


LEGEND

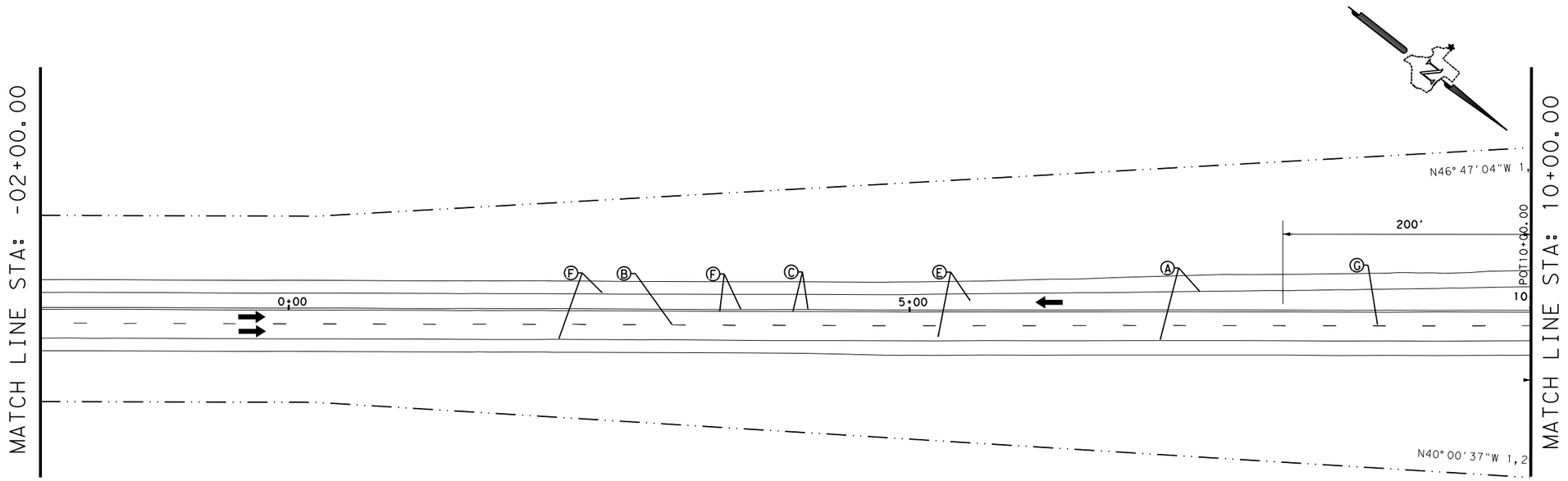
- (A) 4" SLD (W)
- (B) 6" BRK (W)
- (C) 4" SLD (Y)
- (D) REFL PAV MRKR TY II-C-R
- (E) 4" ELIMINATE
- (F) 4" PAV SURF PREP
- (G) 6" PAV SURF PREP

0′ 100′ 200′

SCALE: 1"=100′

*NOTE:
REFER TO PM STANDARDS FOR FURTHER PAVEMENT MARKING INFORMATION.

PAVEMENT MARKING QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
666	6287	REF PROF PAV MRK TY I(Y)4"(SLD)(090MIL)	LF	1,400
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	2,200
666	6306	RE PM W/RET REQ TY I (W)6"(BRK)(100MIL)	LF	400
672	6010	REFL PAV MRKR TY II-C-R	EA	0
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	4,000
678	6001	PAV SURF PREP FOR MRK (4")	LF	3,600
678	6002	PAV SURF PREP FOR MRK (6")	LF	400



STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED
PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC

PAVEMENT MARKING LAYOUT

BEGIN PROJECT TO STA. 10+00.00

SHEET 1 OF 9

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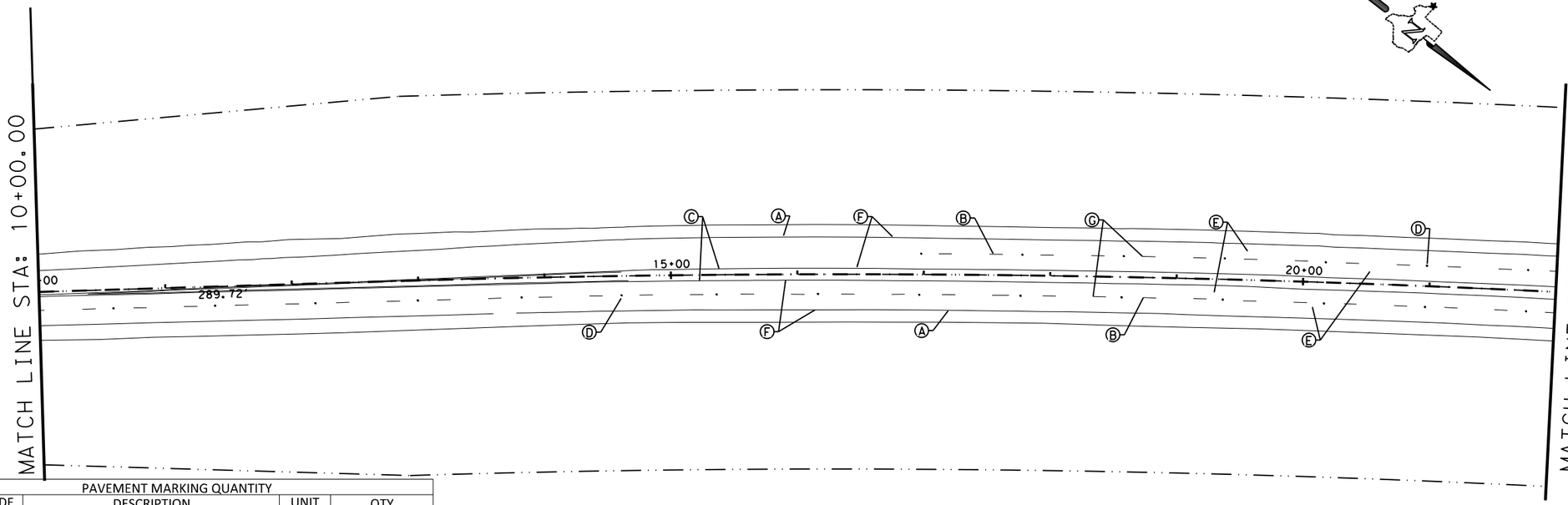


LEGEND

- (A) 4" SLD (W)
- (B) 6" BRK (W)
- (C) 4" SLD (Y)
- (D) REFL PAV MRKR TY II-C-R
- (E) 4" ELIMINATE
- (F) 4" PAV SURF PREP
- (G) 6" PAV SURF PREP

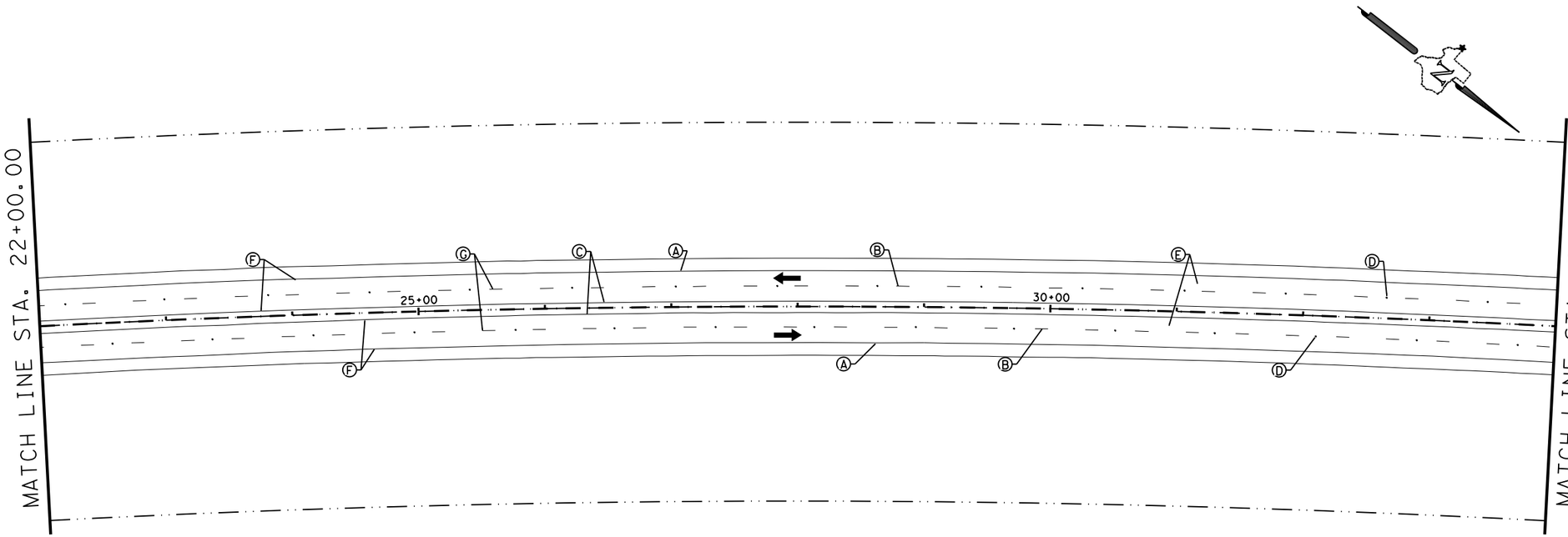
0' 100' 200'

SCALE: 1"=100'

PAVEMENT MARKING QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
666	6287	REF PROF PAV MRK TY I(Y)4"(SLD)(090MIL)	LF	4,800
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	4,800
666	6306	RE PM W/RET REQ TY I (W)6"(BRK)(100MIL)	LF	1,075
672	6010	REFL PAV MRKR TY II-C-R	EA	54
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	10,675
678	6001	PAV SURF PREP FOR MRK (4")	LF	9,600
678	6002	PAV SURF PREP FOR MRK (6")	LF	1,075

*GENERAL NOTES:

1. REFER TO PM STANDARDS FOR FURTHER PAVEMENT MARKING INFORMATION.
2. FOLLOW TCP PHASING FOR PAVEMENT MARKING INSTALLATION.



STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC

PAVEMENT MARKING LAYOUT

STA. 10+00.00 TO STA. 34+00.00

SHEET 2 OF 9

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		163

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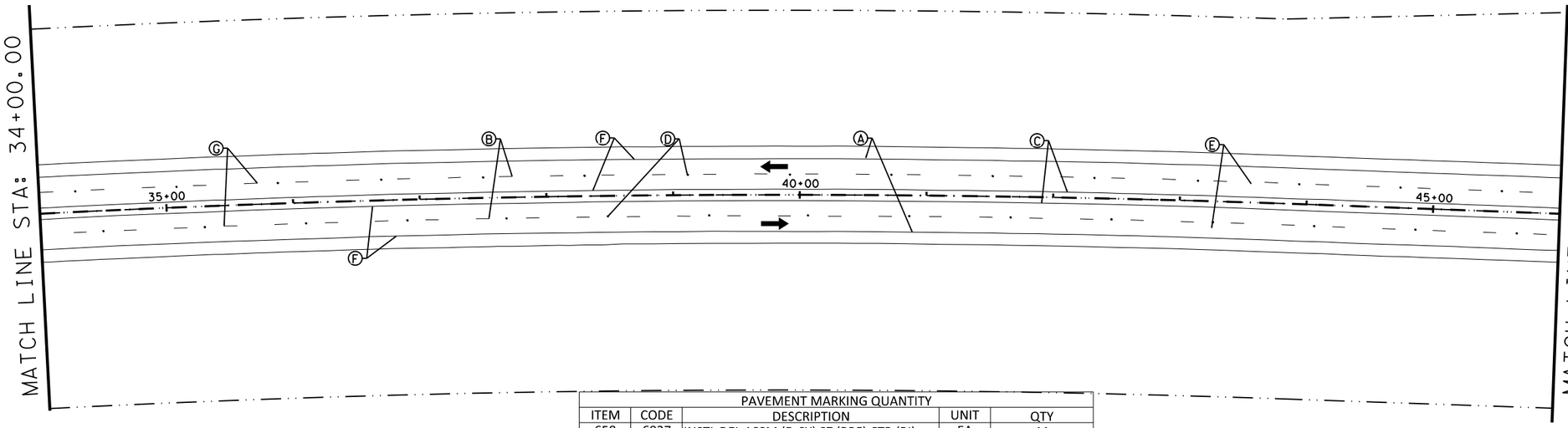


LEGEND

- (A) 4" SLD (W)
- (B) 6" BRK (W)
- (C) 4" SLD (Y)
- (D) REFL PAV MRKR TY II-C-R
- (E) 4" ELIMINATE
- (F) 4" PAV SURF PREP
- (G) 6" PAV SURF PREP
- (H) BRF CTB (Y)BI

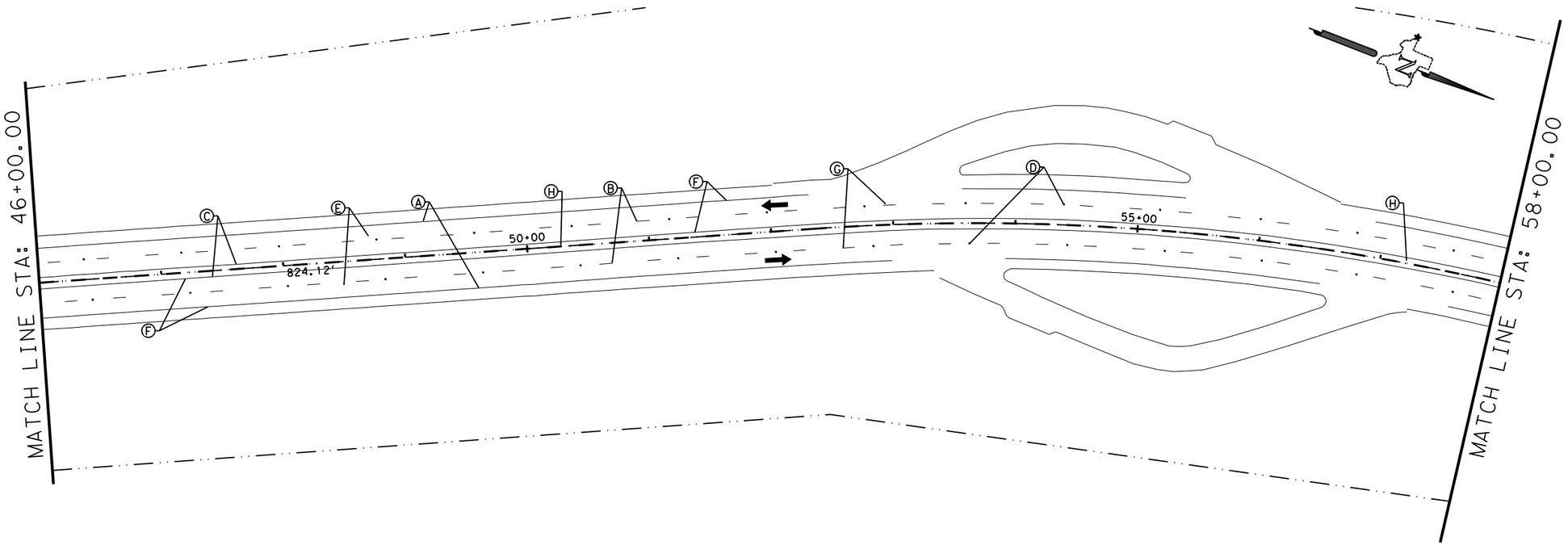
0′ 100′ 200′

SCALE: 1"=100′

PAVEMENT MARKING QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
658	6027	INSTL DEL ASSM (D-SY) SZ (BRF) CTB (BI)	EA	11
666	6287	REF PROF PAV MRK TY I(Y)4"(SLD)(090MIL)	LF	4,800
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	4,613
666	6306	RE PM W/RET REQ TY I (W)6"(BRK)(100MIL)	LF	1,080
672	6010	REFL PAV MRKR TY II-C-R	EA	60
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	10,316
678	6001	PAV SURF PREP FOR MRK (4")	LF	9,116
678	6002	PAV SURF PREP FOR MRK (6")	LF	1,200

*GENERAL NOTES:

1. REFER TO PM STANDARDS FOR FURTHER PAVEMENT MARKING INFORMATION.
2. FOLLOW TCP PHASING FOR PAVEMENT MARKING INSTALLATION.
3. REFER TO CTB REFLECTOR STANDARDS FOR CTB REFLECTOR INSTALLATION.



STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED
PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC

PAVEMENT MARKING LAYOUT

STA. 34+00.00 TO STA. 58+00.00

SHEET 3 OF 9

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CONT	SECT	JOB	HIGHWAY
0233	02	035, etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		164

DATE: 6/2/2021 8:31:30 PM
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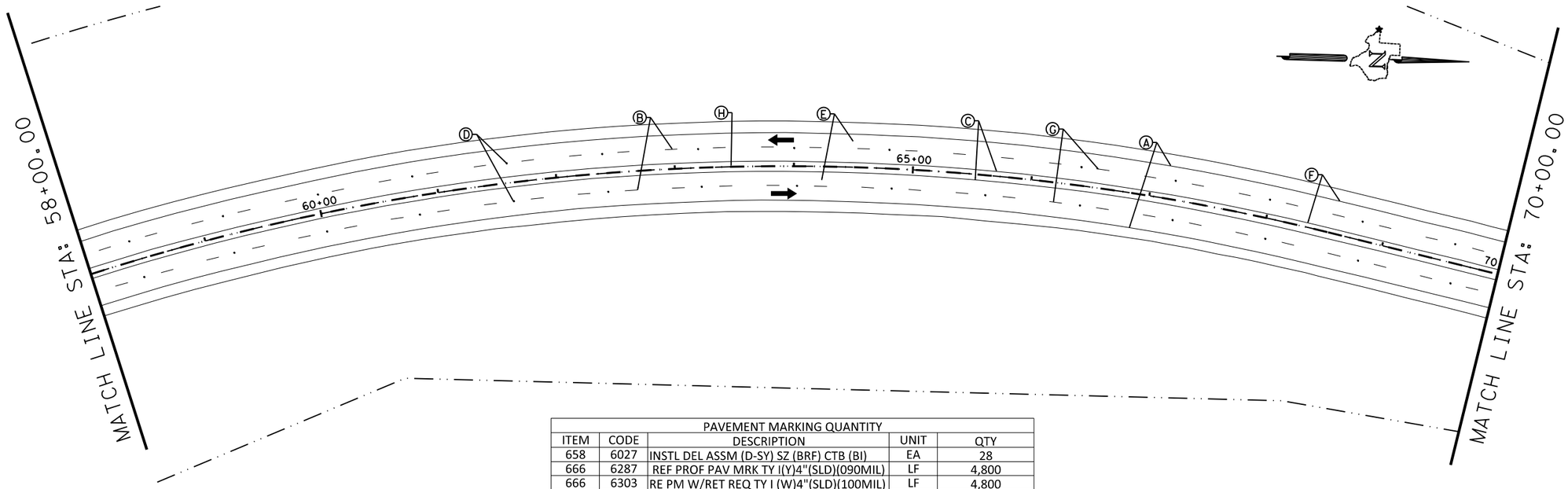


LEGEND

- (A) 4" SLD (W)
- (B) 6" BRK (W)
- (C) 4" SLD (Y)
- (D) REFL PAV MRKR TY II-C-R
- (E) 4" ELIMINATE
- (F) 4" PAV SURF PREP
- (G) 6" PAV SURF PREP
- (H) BRF CTB (Y)BI

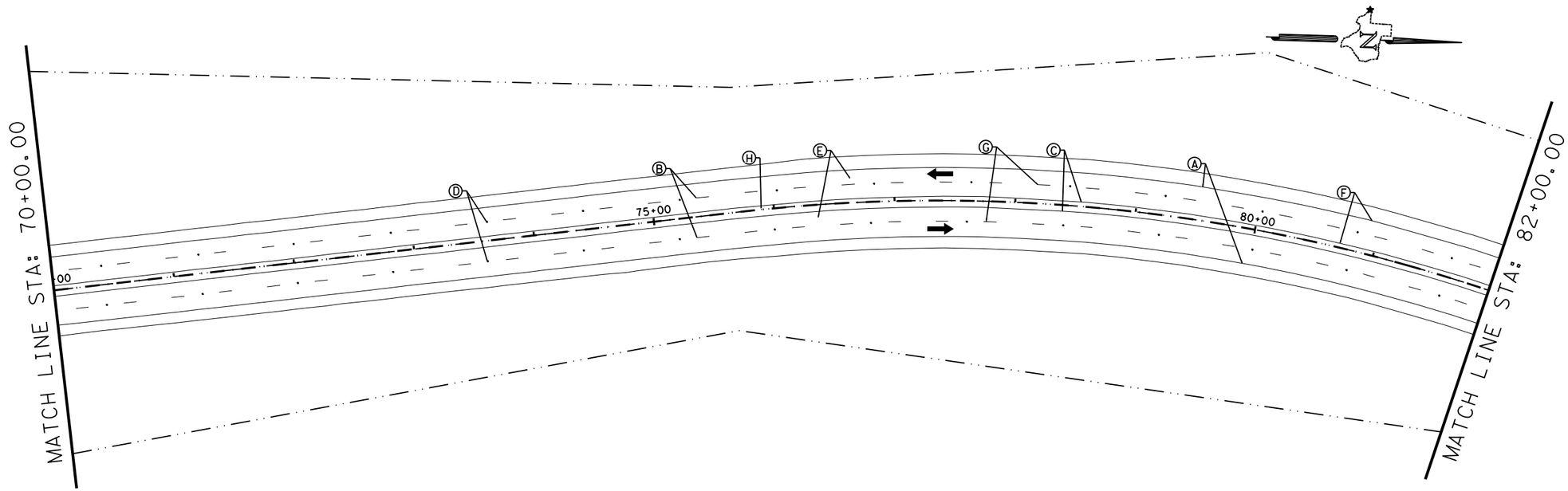
0' 100' 200'

SCALE: 1"=100'

PAVEMENT MARKING QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
658	6027	INSTL DEL ASSM (D-SY) SZ (BRF) CTB (BI)	EA	28
666	6287	REF PROF PAV MRK TY I(Y)4"(SLD)(090MIL)	LF	4,800
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	4,800
666	6306	RE PM W/RET REQ TY I (W)6"(BRK)(100MIL)	LF	1,200
672	6010	REFL PAV MRKR TY II-C-R	EA	60
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	10,800
678	6001	PAV SURF PREP FOR MRK (4")	LF	9,600
678	6002	PAV SURF PREP FOR MRK (6")	LF	1,200

*GENERAL NOTES:

1. REFER TO PM STANDARDS FOR FURTHER PAVEMENT MARKING INFORMATION.
2. FOLLOW TCP PHASING FOR PAVEMENT MARKING INSTALLATION.
3. REFER TO CTB REFLECTOR STANDARDS FOR CTB REFLECTOR INSTALLATION.



STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC

PAVEMENT MARKING LAYOUT

STA. 58+00.00 TO STA. 82+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035, etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		165

DATE: 6/2/2021 8:31:38 PM
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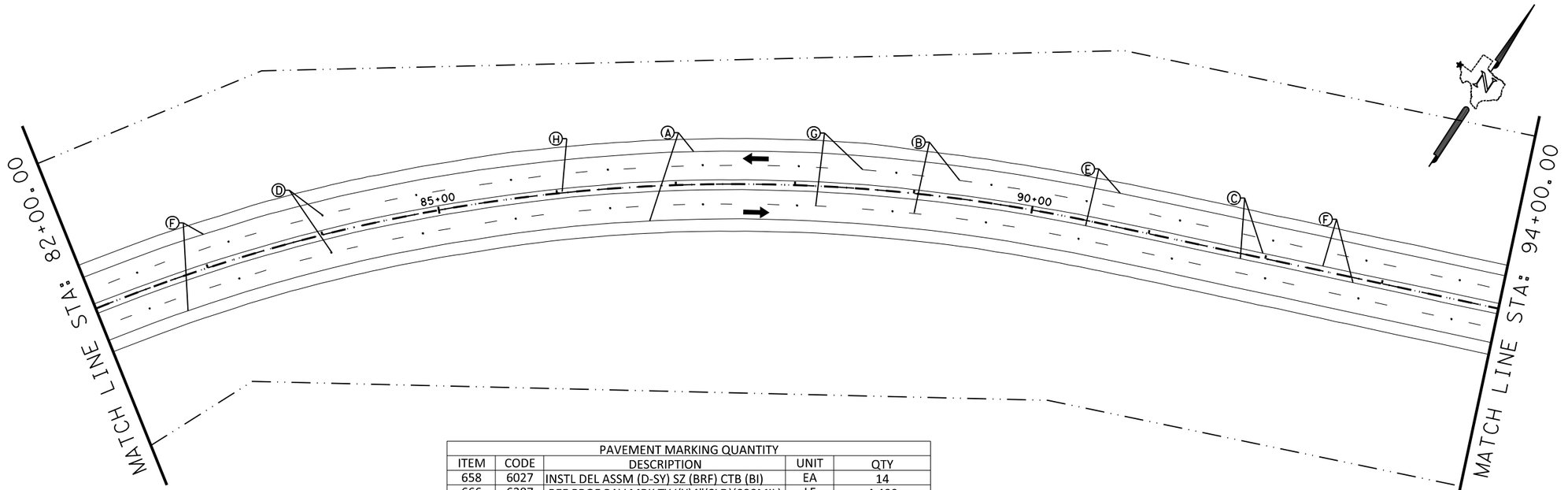


PAVEMENT MARKING QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
658	6027	INSTL DEL ASSM (D-SY) SZ (BRF) CTB (BI)	EA	14
666	6287	REF PROF PAV MRK TY I(Y)4"(SLD)(090MIL)	LF	4,400
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	4,800
666	6306	RE PM W/RET REQ TY I (W)6"(BRK)(100MIL)	LF	1,200
672	6010	REFL PAV MRKR TY II-C-R	EA	60
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	10,400
678	6001	PAV SURF PREP FOR MRK (4")	LF	9,200
678	6002	PAV SURF PREP FOR MRK (6")	LF	1,200

LEGEND

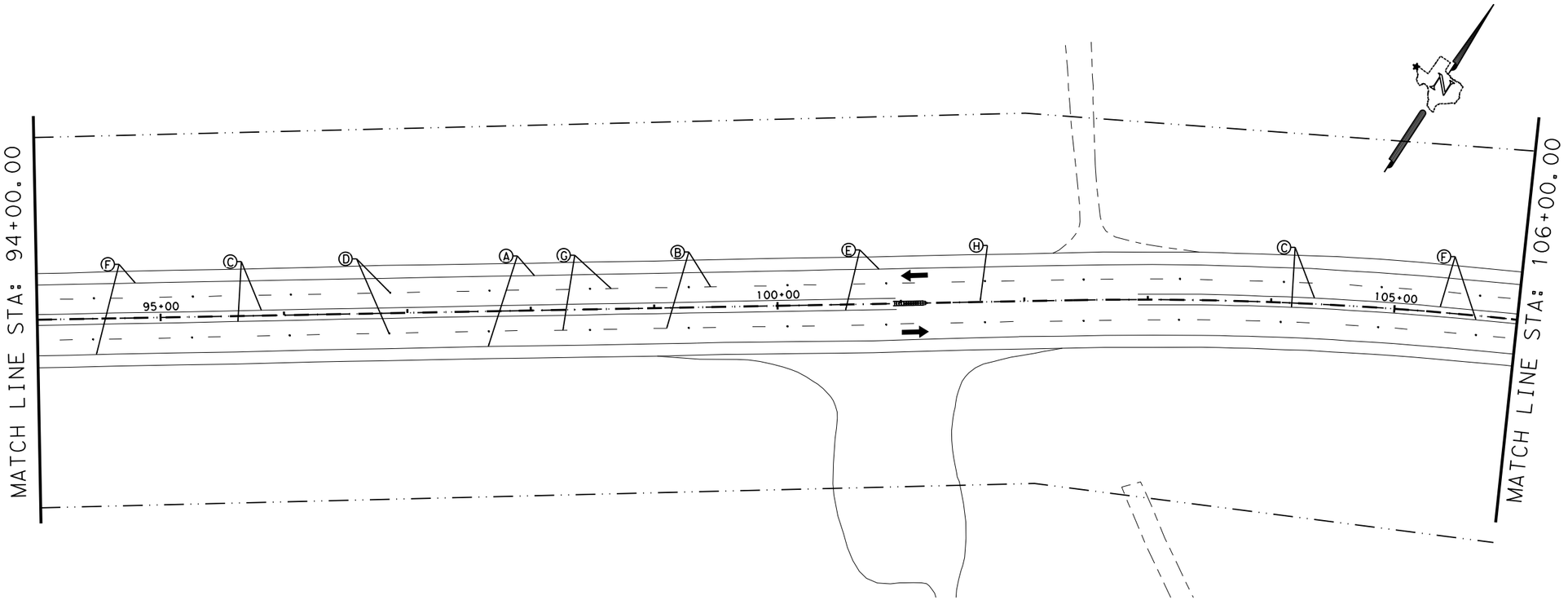
- (A) 4" SLD (W)
- (B) 6" BRK (W)
- (C) 4" SLD (Y)
- (D) REFL PAV MRKR TY II-C-R
- (E) 4" ELIMINATE
- (F) 4" PAV SURF PREP
- (G) 6" PAV SURF PREP
- (H) BRF CTB (Y)BI

0′ 100′ 200′

SCALE: 1"=100′

*GENERAL NOTES:

1. REFER TO PM STANDARDS FOR FURTHER PAVEMENT MARKING INFORMATION.
2. FOLLOW TCP PHASING FOR PAVEMENT MARKING INSTALLATION.
3. REFER TO CTB REFLECTOR STANDARDS FOR CTB REFLECTOR INSTALLATION.



STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC

PAVEMENT MARKING LAYOUT

STA. 82+00.00 TO STA. 106+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		166

DATE: 6/2/2021 8:31:45 PM
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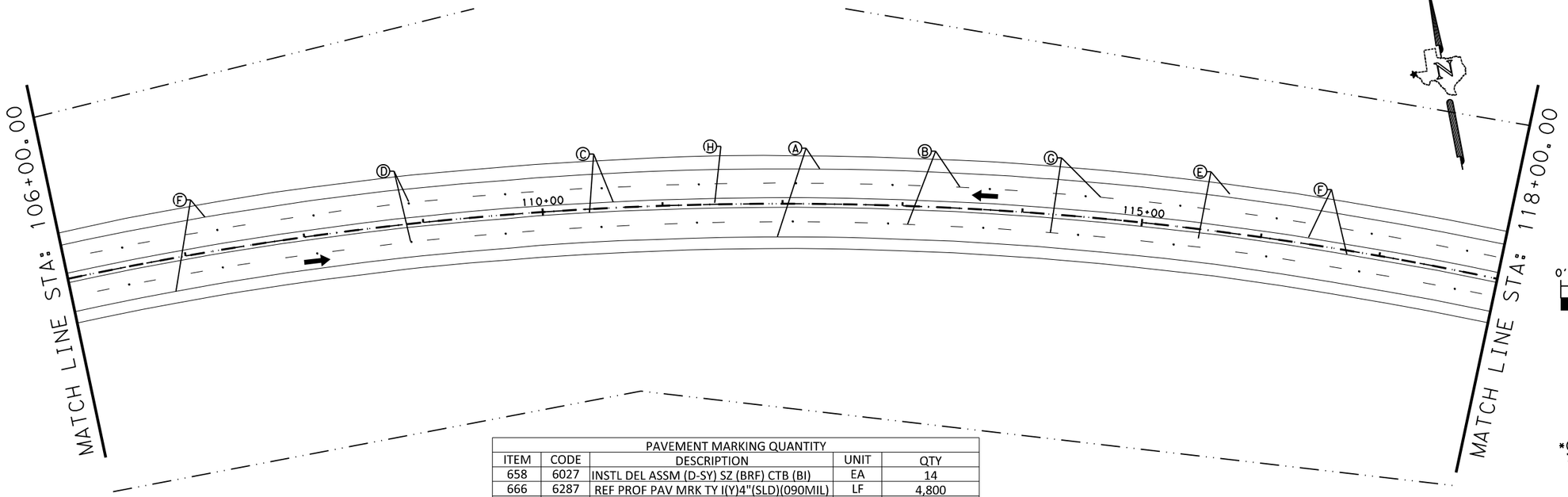


LEGEND

- Ⓐ 4" SLD (W)
- Ⓑ 6" BRK (W)
- Ⓒ 4" SLD (Y)
- Ⓓ REFL PAV MRKR TY II-C-R
- Ⓔ 4" ELIMINATE
- Ⓕ 4" PAV SURF PREP
- Ⓖ 6" PAV SURF PREP
- Ⓗ BRF CTB (Y)BI

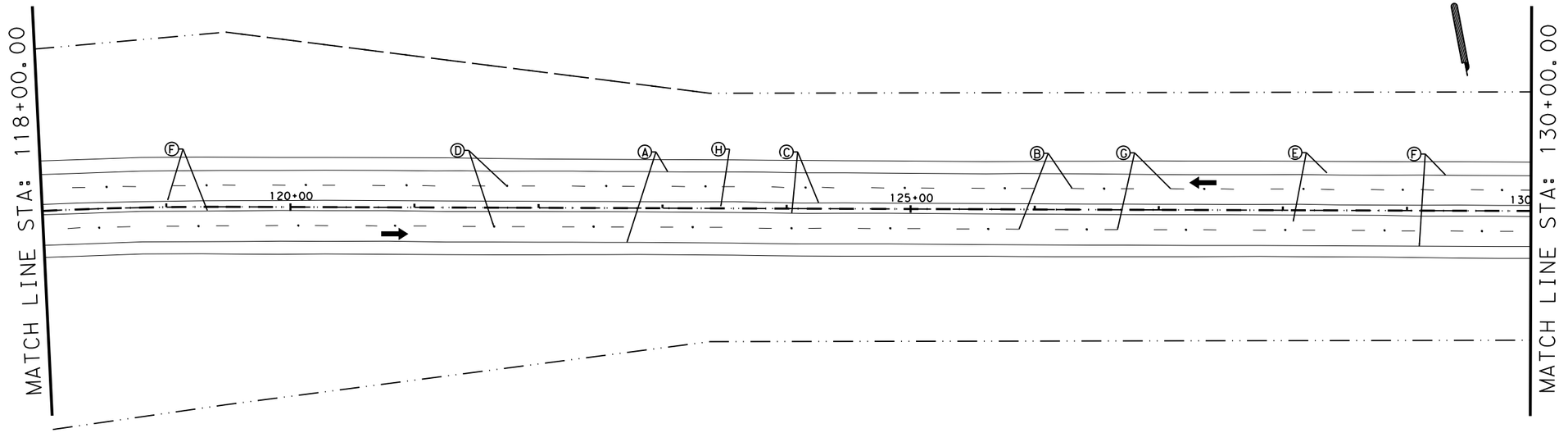
0′ 100′ 200′

SCALE: 1"=100′

PAVEMENT MARKING QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
658	6027	INSTL DEL ASSM (D-SY) SZ (BRF) CTB (BI)	EA	14
666	6287	REF PROF PAV MRK TY I(Y)4"(SLD)(090MIL)	LF	4,800
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	4,800
666	6306	RE PM W/RET REQ TY I (W)6"(BRK)(100MIL)	LF	1,200
672	6010	REFL PAV MRKR TY II-C-R	EA	60
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	10,800
678	6001	PAV SURF PREP FOR MRK (4")	LF	9,600
678	6002	PAV SURF PREP FOR MRK (6")	LF	1,200

*GENERAL NOTES:

1. REFER TO PM STANDARDS FOR FURTHER PAVEMENT MARKING INFORMATION.
2. FOLLOW TCP PHASING FOR PAVEMENT MARKING INSTALLATION.
3. REFER TO CTB REFLECTOR STANDARDS FOR CTB REFLECTOR INSTALLATION.



STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC

PAVEMENT MARKING LAYOUT

STA. 106+00.00 TO STA. 130+00.00

SHEET 6 OF 9

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CONT	SECT	JOB	HIGHWAY
0233	02	035, etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		167

DATE: 6/2/2021 8:31:54 PM
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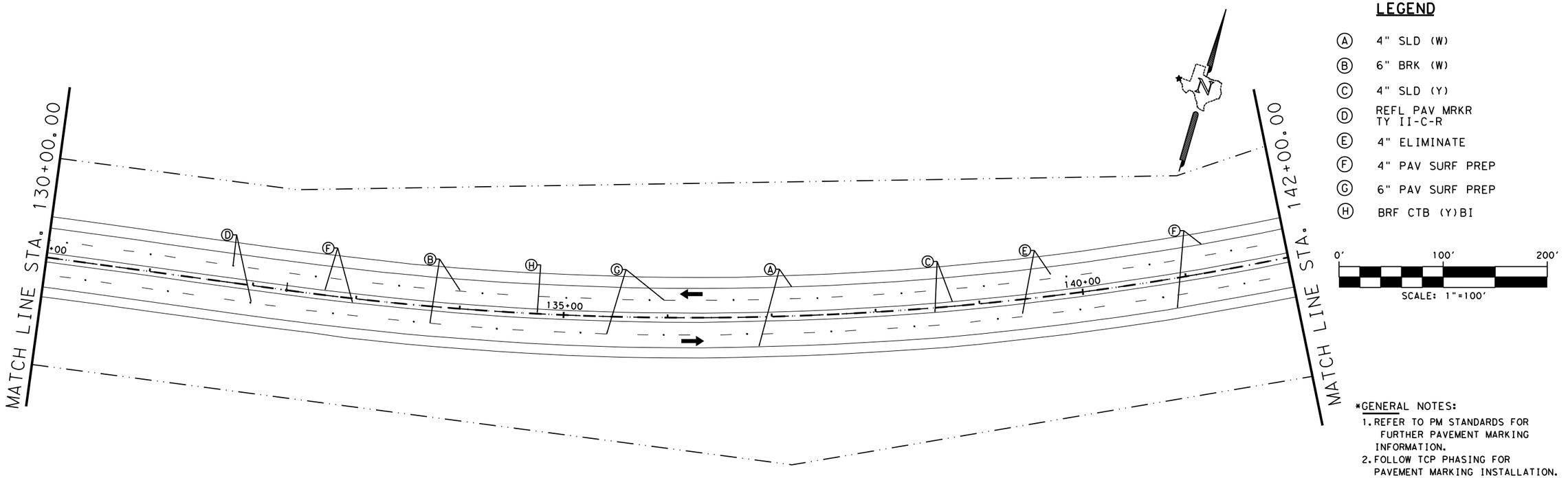
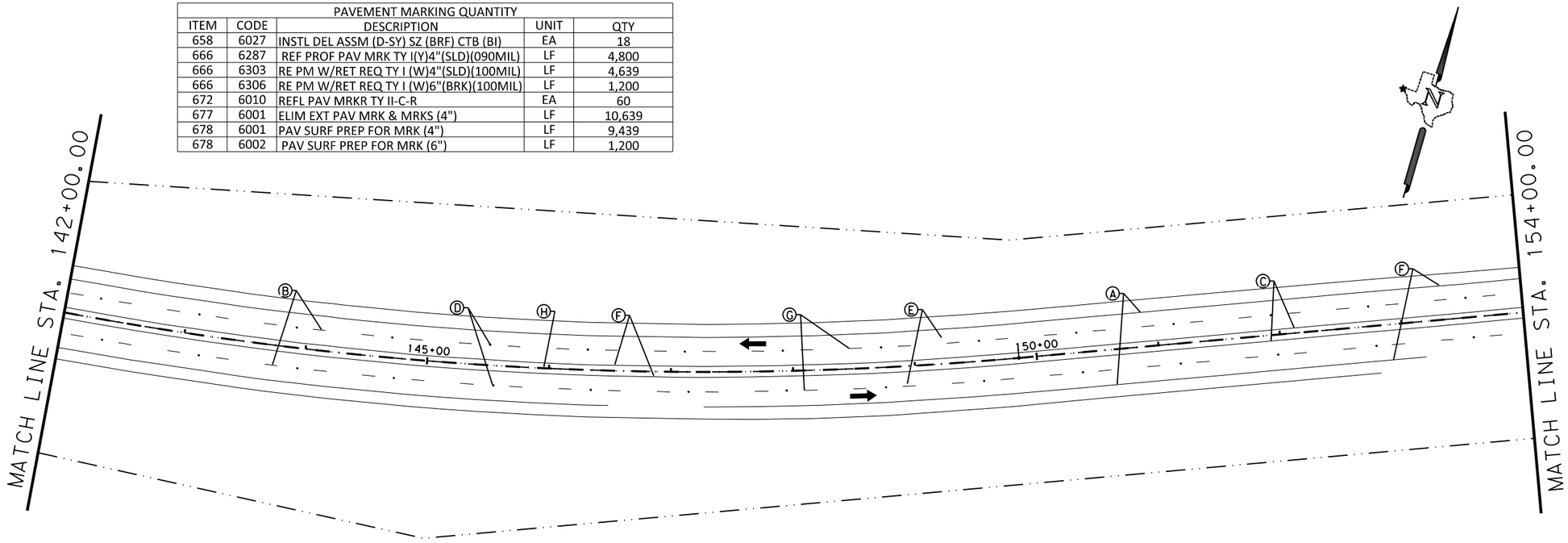


*GENERAL NOTES:

1. REFER TO PM STANDARDS FOR FURTHER PAVEMENT MARKING INFORMATION.
2. FOLLOW TCP PHASING FOR PAVEMENT MARKING INSTALLATION.
3. REFER TO CTB REFLECTOR STANDARDS FOR CTB REFLECTOR INSTALLATION.

PAVEMENT MARKING QUANTITY

ITEM	CODE	DESCRIPTION	UNIT	QTY
658	6027	INSTL DEL ASSM (D-SY) SZ (BRF) CTB (BI)	EA	18
666	6287	REF PROF PAV MRK TY I(Y)4"(SLD)(090MIL)	LF	4,800
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	4,639
666	6306	RE PM W/RET REQ TY I (W)6"(BRK)(100MIL)	LF	1,200
672	6010	REFL PAV MRKR TY II-C-R	EA	60
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	10,639
678	6001	PAV SURF PREP FOR MRK (4")	LF	9,439
678	6002	PAV SURF PREP FOR MRK (6")	LF	1,200



STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC

PAVEMENT MARKING LAYOUT

STA. 130+00.00 TO STA. 154+00.00

SHEET 7 OF 9

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CONT	SECT	JOB	HIGHWAY
0233	02	035, etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		168

DATE: 6/2/2021 8:32:01 PM
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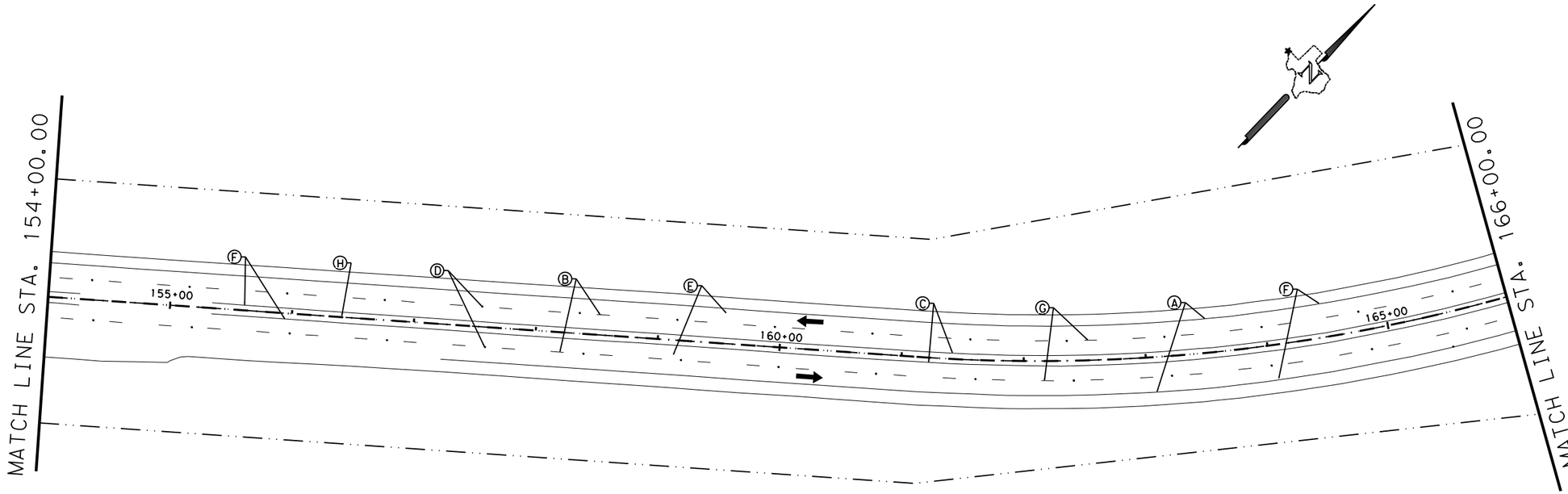


LEGEND

- (A) 4" SLD (W)
- (B) 6" BRK (W)
- (C) 4" SLD (Y)
- (D) REFL PAV MRKR TY II-C-R
- (E) 4" ELIMINATE
- (F) 4" PAV SURF PREP
- (G) 6" PAV SURF PREP
- (H) BRF CTB (Y)BI

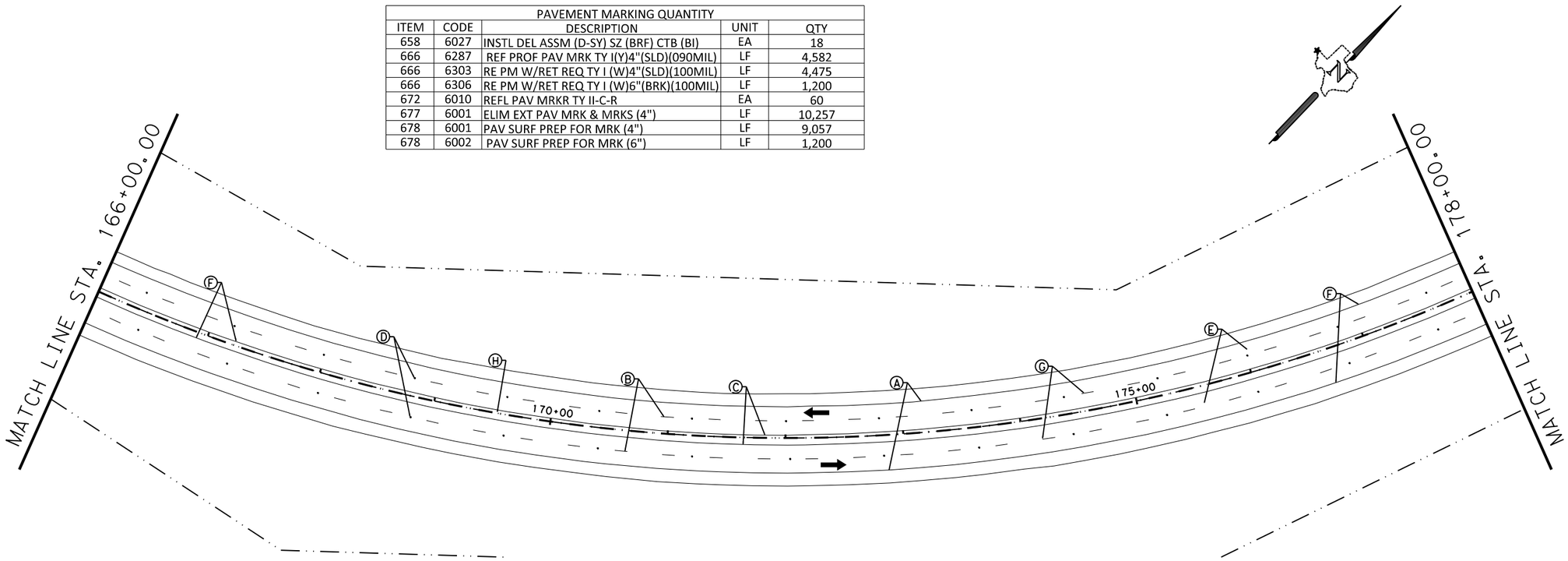
0' 100' 200'

SCALE: 1"=100'

*GENERAL NOTES:

1. REFER TO PM STANDARDS FOR FURTHER PAVEMENT MARKING INFORMATION.
2. FOLLOW TCP PHASING FOR PAVEMENT MARKING INSTALLATION.
3. REFER TO CTB REFLECTOR STANDARDS FOR CTB REFLECTOR INSTALLATION.

PAVEMENT MARKING QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
658	6027	INSTL DEL ASSM (D-SY) SZ (BRF) CTB (BI)	EA	18
666	6287	REF PROF PAV MRK TY I(Y)4"(SLD)(090MIL)	LF	4,582
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	4,475
666	6306	RE PM W/RET REQ TY I (W)6"(BRK)(100MIL)	LF	1,200
672	6010	REFL PAV MRKR TY II-C-R	EA	60
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	10,257
678	6001	PAV SURF PREP FOR MRK (4")	LF	9,057
678	6002	PAV SURF PREP FOR MRK (6")	LF	1,200



STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED
PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC

PAVEMENT MARKING LAYOUT

STA. 154+00.00 TO STA. 178+00.00

SHEET 8 OF 9

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CONT	SECT	JOB	HIGHWAY
0233	02	035, etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		169

DATE: 6/2/2021 8:32:08 PM
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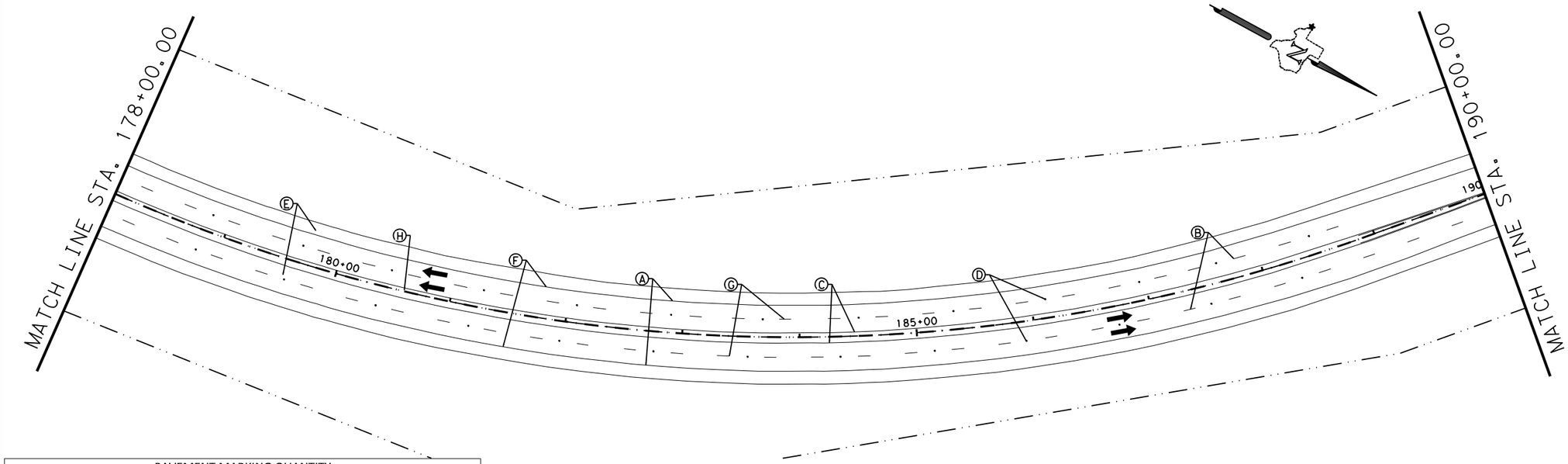


LEGEND

- (A) 4" SLD (W)
- (B) 6" BRK (W)
- (C) 4" SLD (Y)
- (D) REFL PAV MRKR TY II-C-R
- (E) 4" ELIMINATE
- (F) 4" PAV SURF PREP
- (G) 6" PAV SURF PREP
- (H) BRF CTB (Y)BI

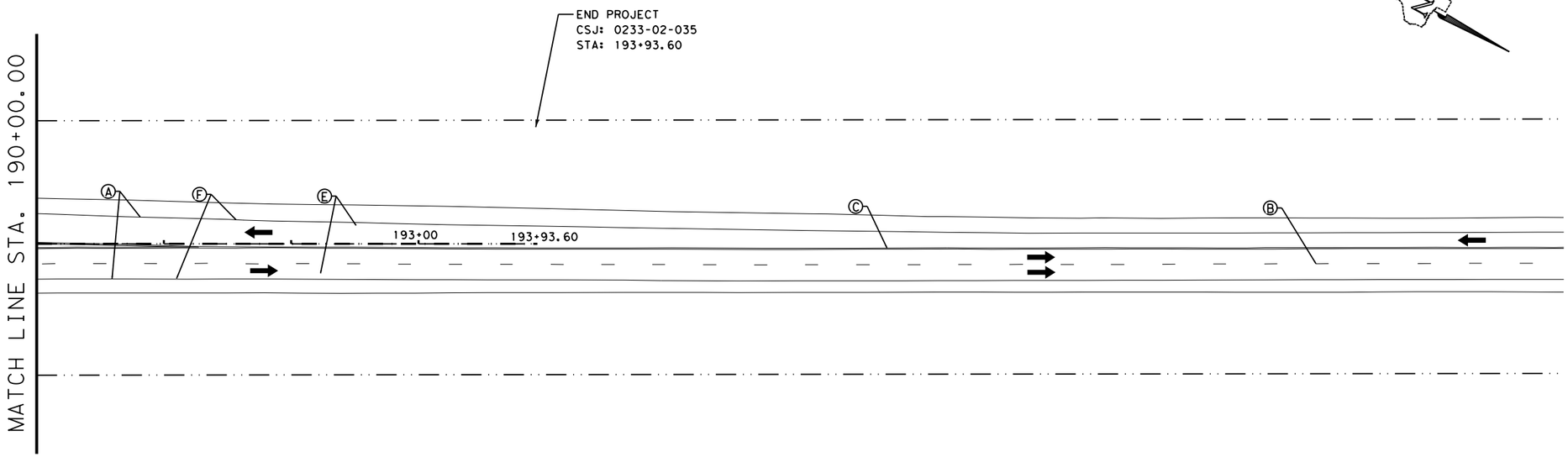
0′ 100′ 200′

SCALE: 1"=100′

PAVEMENT MARKING QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
658	6027	INSTL DEL ASSM (D-SY) SZ (BRF) CTB (BI)	EA	9
666	6287	REF PROF PAV MRK TY I(Y)4"(SLD)(090MIL)	LF	5,287
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	4,016
666	6306	RE PM W/RET REQ TY I (W)6"(BRK)(100MIL)	LF	870
672	6010	REFL PAV MRKR TY II-C-R	EA	27
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	10,168
678	6001	PAV SURF PREP FOR MRK (4")	LF	9,298
678	6002	PAV SURF PREP FOR MRK (6")	LF	870

*GENERAL NOTES:

1. REFER TO PM STANDARDS FOR FURTHER PAVEMENT MARKING INFORMATION.
2. FOLLOW TCP PHASING FOR PAVEMENT MARKING INSTALLATION.
3. REFER TO CTB REFLECTOR STANDARDS FOR CTB REFLECTOR INSTALLATION.



STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED
PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER

TRAFFIC

PAVEMENT MARKING LAYOUT

STA. 178+00.00 TO STA. 193+93.40

SHEET 9 OF 9

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CONT	SECT	JOB	HIGHWAY
0233	02	035, etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		170

DATE: 6/2/2021 8:32:16 PM
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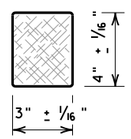
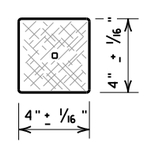
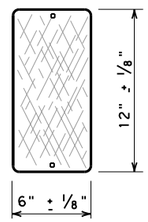
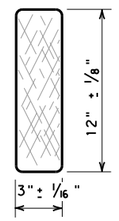
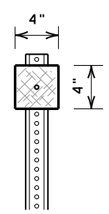
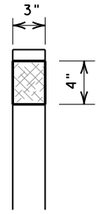
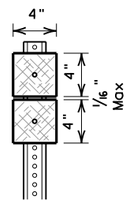
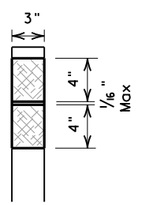
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS

	SINGLE		DOUBLE	
DEVICE				
	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
S = Single
D = Double

COLOR OF REFLECTORS
W = White
Y = Yellow
R = Red

REFLECTOR UNIT SIZE
1 or 2

TYPE OF POST OR DELINEATOR
WC = Wing Channel Post
YFLX = Yellow Flexible Post
WFLX = White Flexible Post
BRF = Barrier Reflector

TYPE OF MOUNT
GND = Embedded (drivable or set in concrete)
CTB = Concrete Barrier Mount
GF1 or GF2 = Guard Fence Attachment
SRF = Surface Mount

DIRECTION
If Required
BI = Bi-Directional
BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
1, 2, 3, or 4

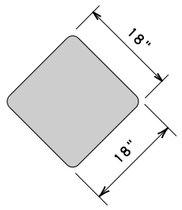
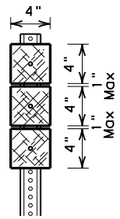
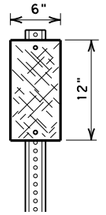
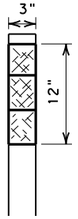
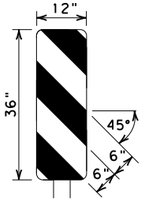
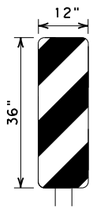
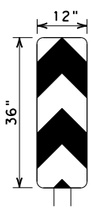
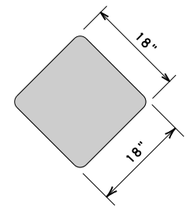
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

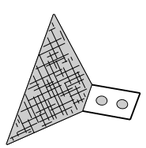
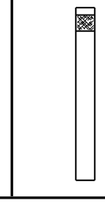
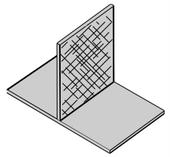
TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

OBJECT MARKERS

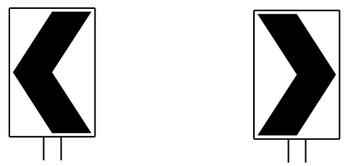
	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
NOTE	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

CHEVRONS

DEVICE



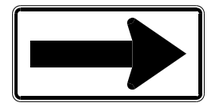
W1-8

SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

NOTE
1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

ONE DIRECTION LARGE ARROW

DEVICE



W1-6

SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

DEPARTMENTAL MATERIAL SPECIFICATIONS

FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	02	035,etc	US 62
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	ELP	CULBERSON		171

20A

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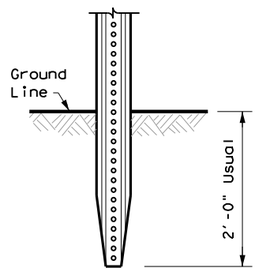
DATE: 6/2/2021 8:32:39 PM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT5\Documents\24 - ELP\Design Projects\025392045\4 Attachments for Sign Group\Final Sign Standard Attachments 20B.dgn

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

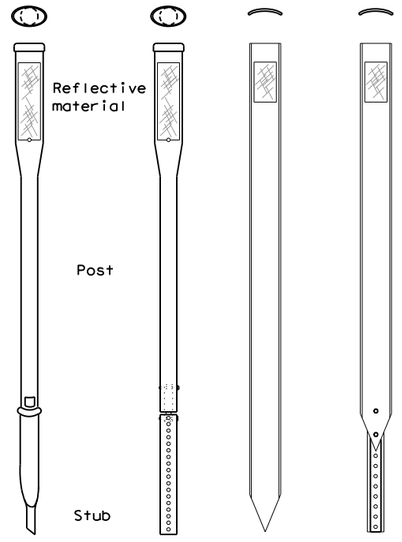


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

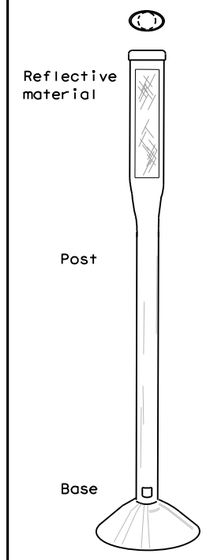
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



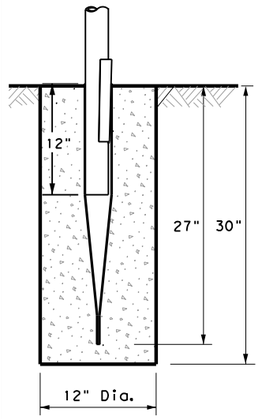
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

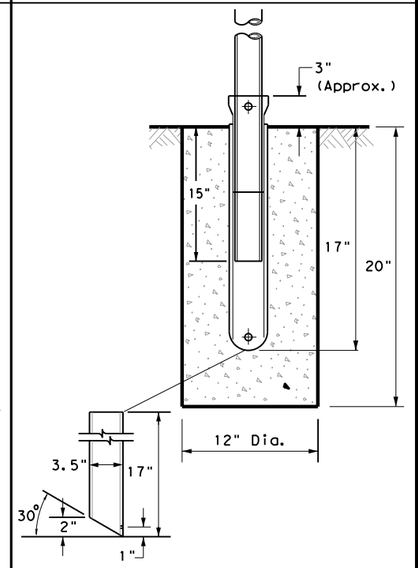
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

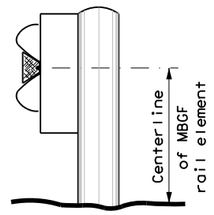
NOTE

1. Install per manufacturer's recommendations.

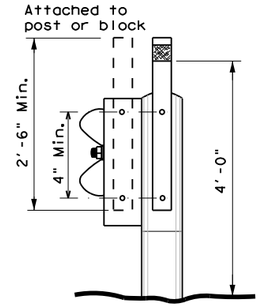
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

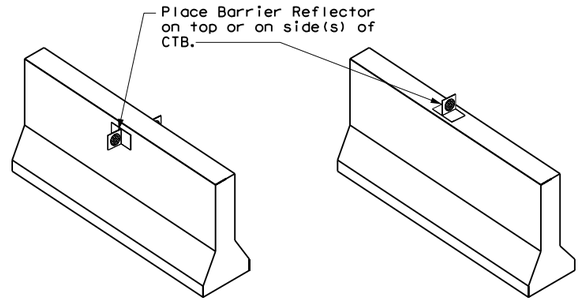
GF1



GF2



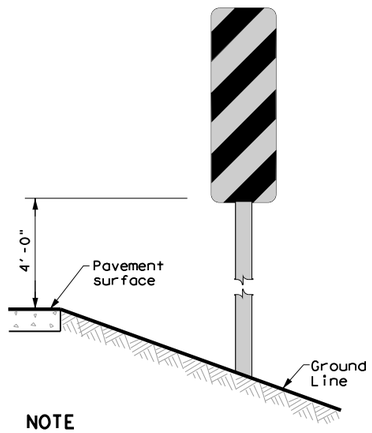
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

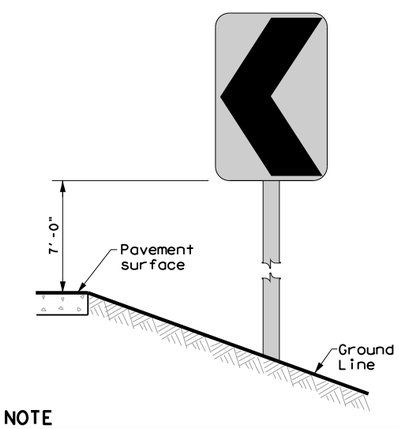
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

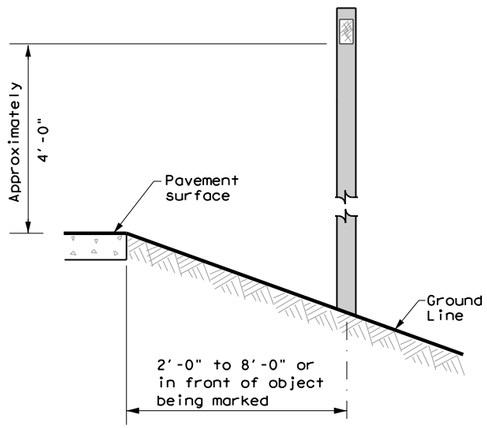
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	02	035,etc	US 62
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	ELP	CULBERSON		172

20B

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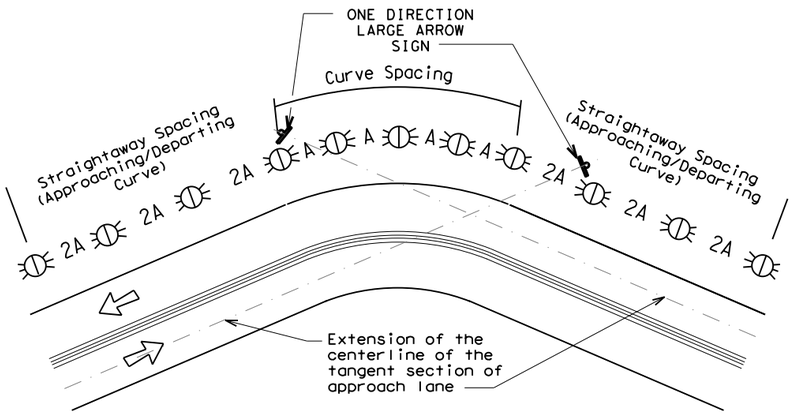
MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

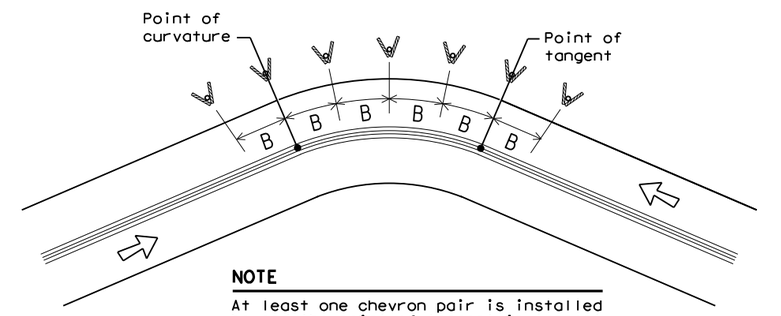
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	——
2	2865	160	320	——
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100'max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100'max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND

	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	02	035,etc	US 62
3-15 8-15 8-15 7-20	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		173

20C

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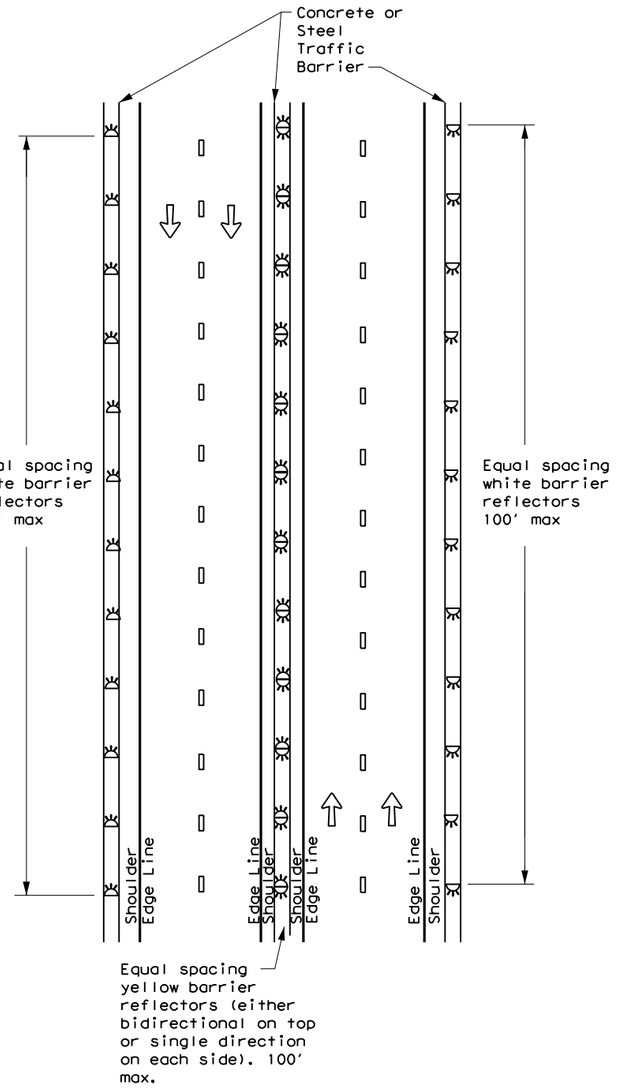
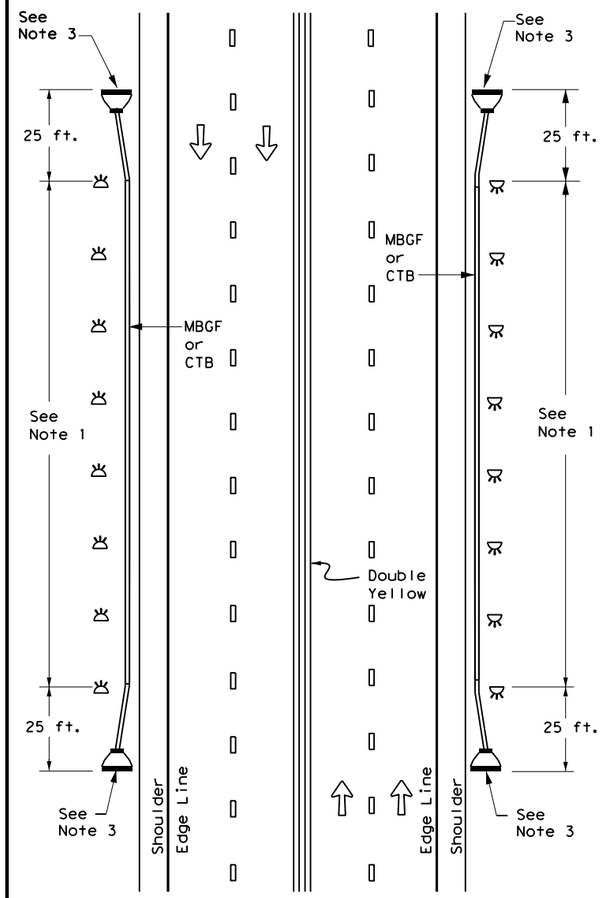
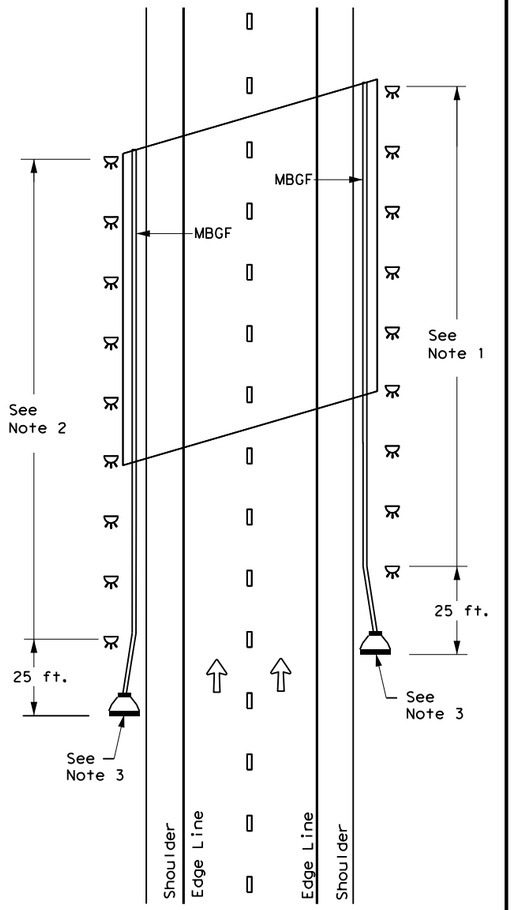
CONTINUOUS CONCRETE OR STEEL BARRIER



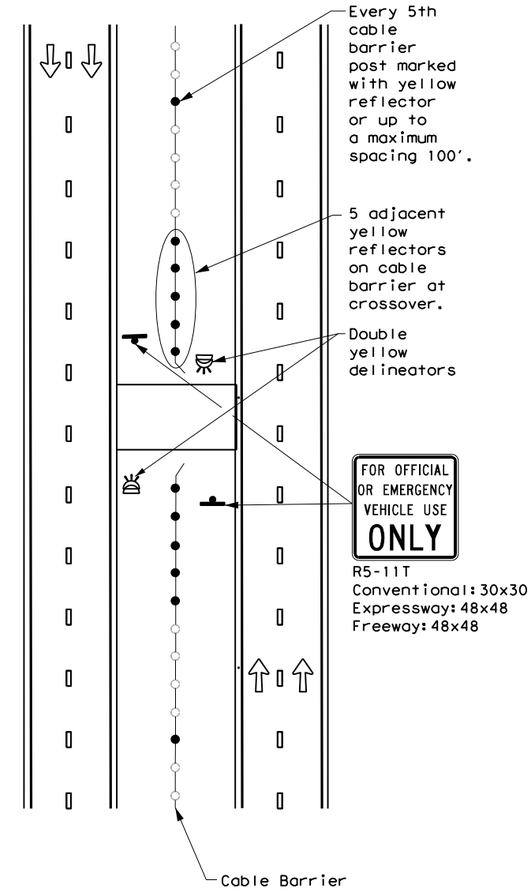
MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



EMERGENCY CROSSOVER



NOTES

1. Equal spacing (100' max), but not less than 3 single directional white barrier reflectors or delineators. On Continuos Barrier, equal spacing (100' max.)
2. Equal spacing (100' max), but not less than 3 single directional yellow barrier reflectors or delineators.
3. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3)in front of the terminal end.

LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(6)-20

FILE: dom6-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	02	035,etc	US 62
7-20	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		174

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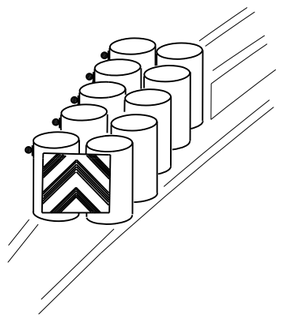
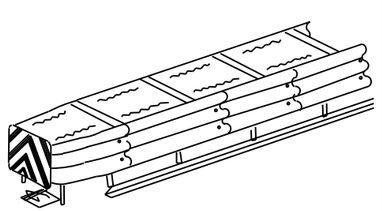
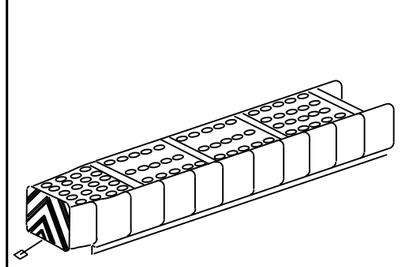
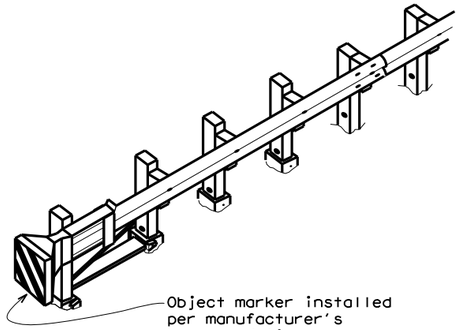
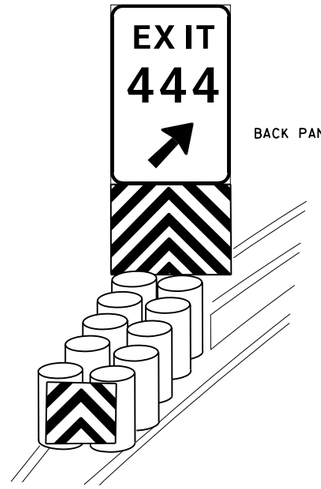
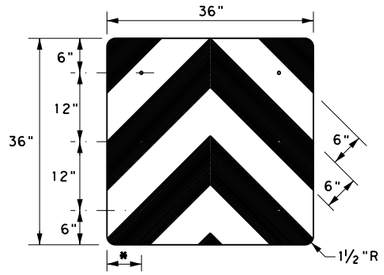


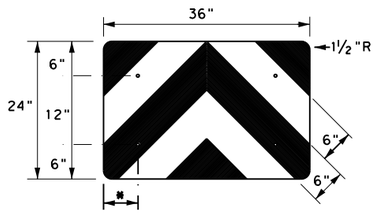




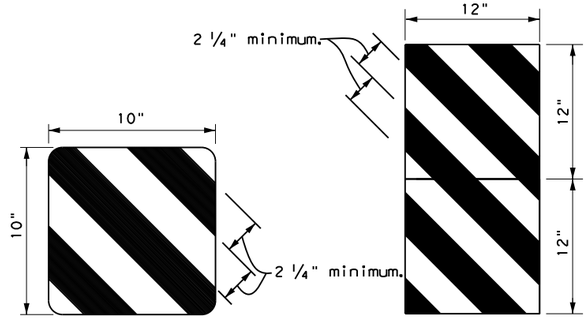




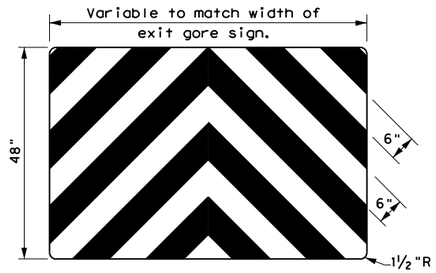


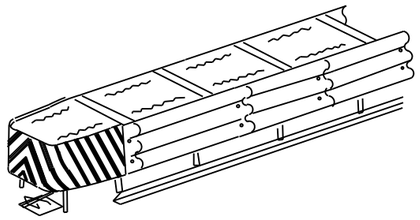


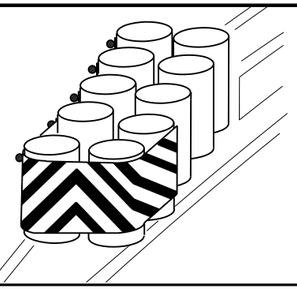
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

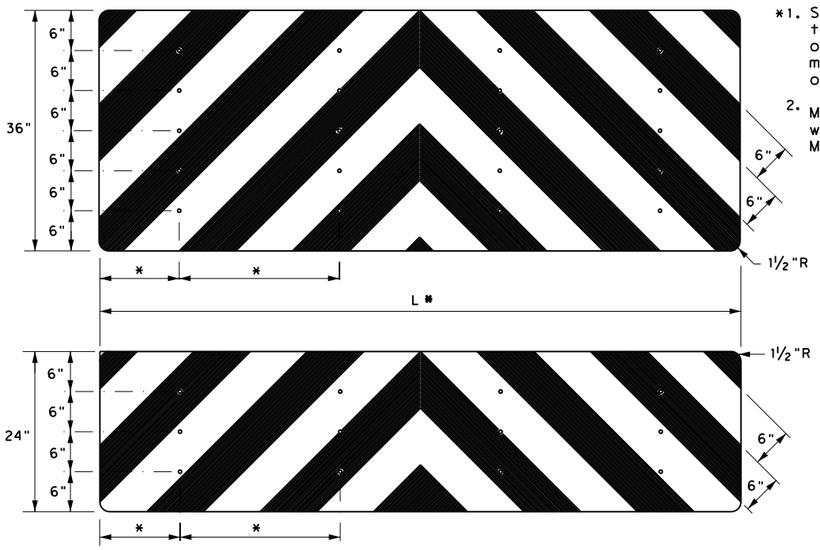


OBJECT MARKERS SMALLER THAN 3 FT^2









NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
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4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	ELP	CULBERSON		175
4-98 7-20				

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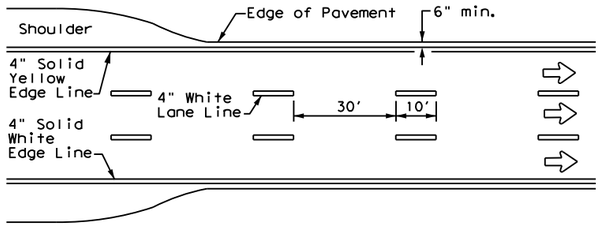
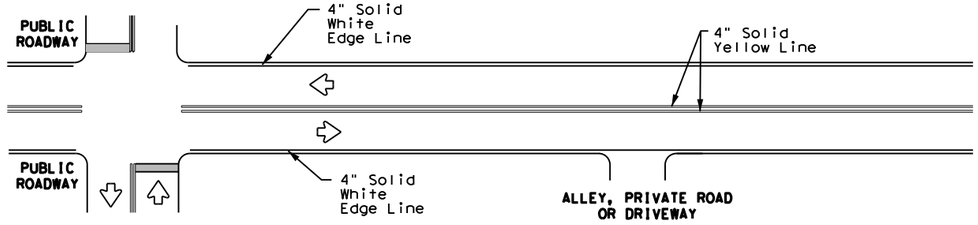
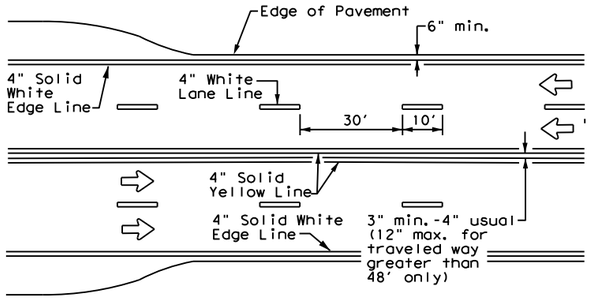


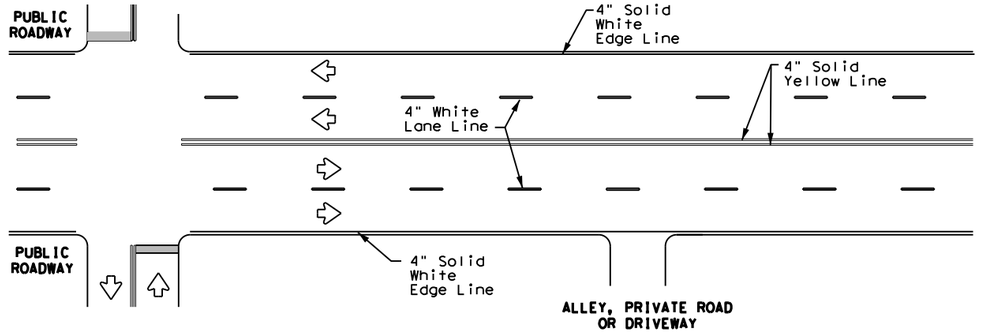
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



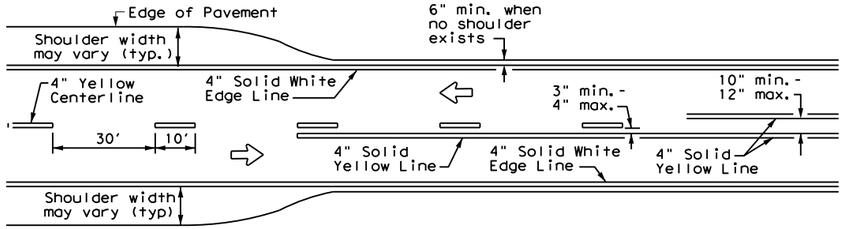
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



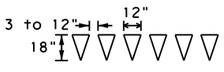
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



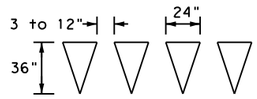
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

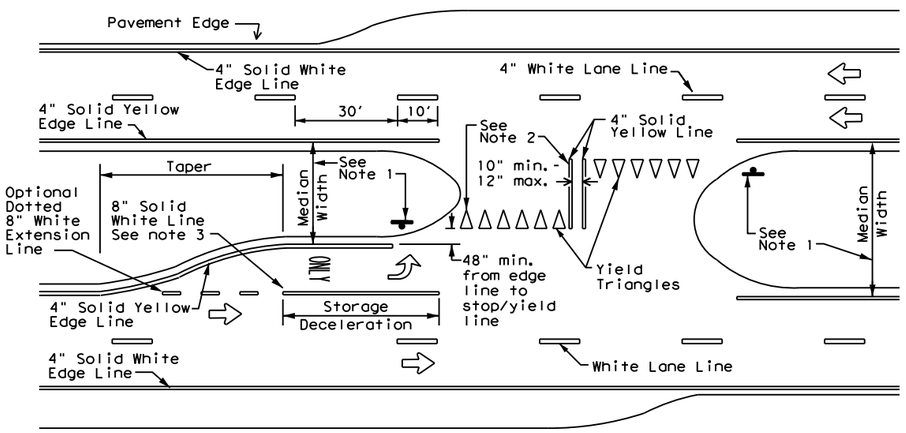


For posted speed on road being marked equal to or less than 40 MPH.



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

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

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

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

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

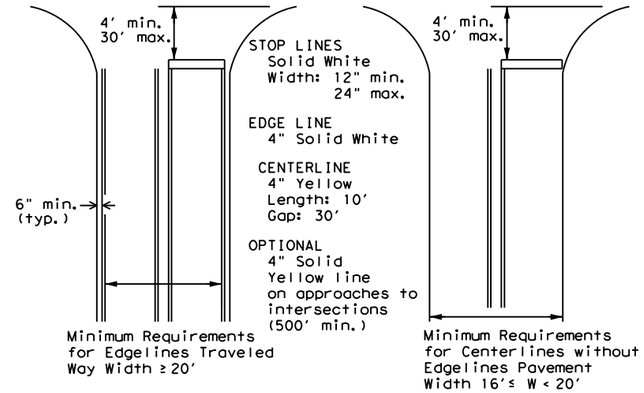
GENERAL NOTES

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

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

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

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



GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
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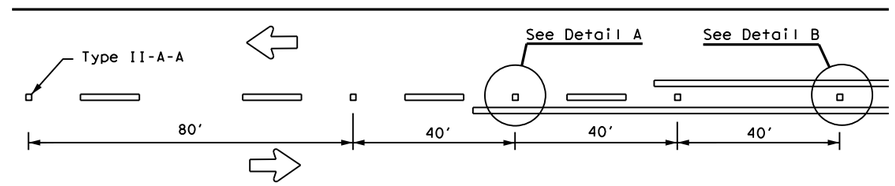
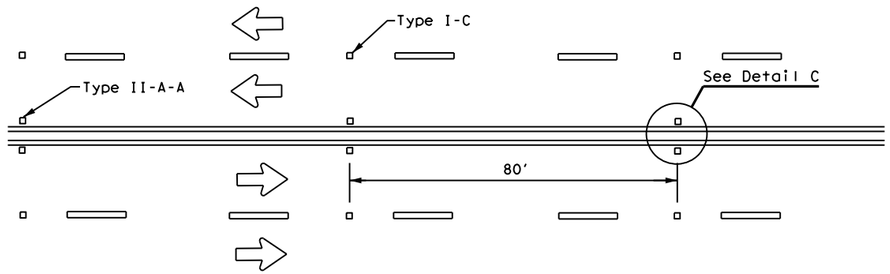
REVISIONS 8-95 3-03	0233	02	035,etc	US 62
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	ELP	CULBERSON		176

22A

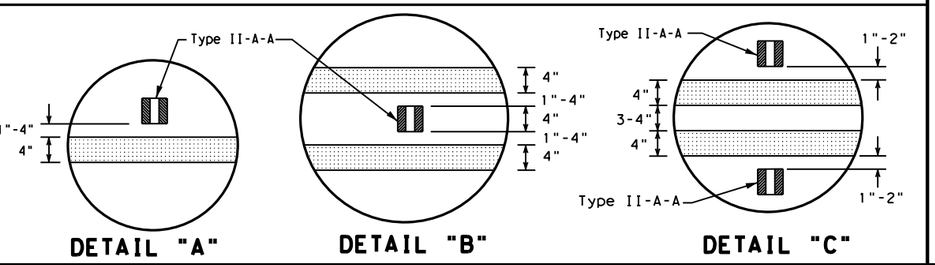
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



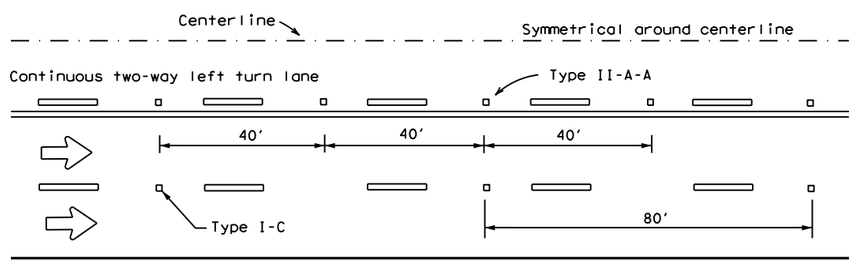
CENTERLINE FOR ALL TWO LANE ROADWAYS



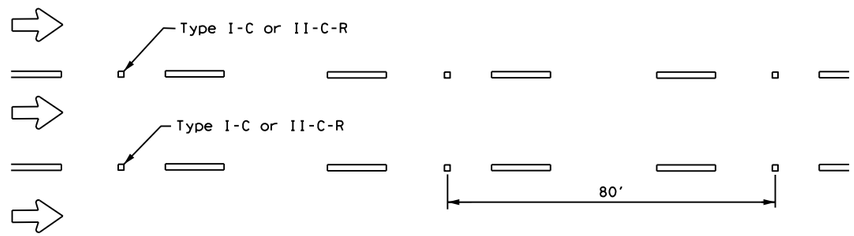
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" **DETAIL "B"** **DETAIL "C"**

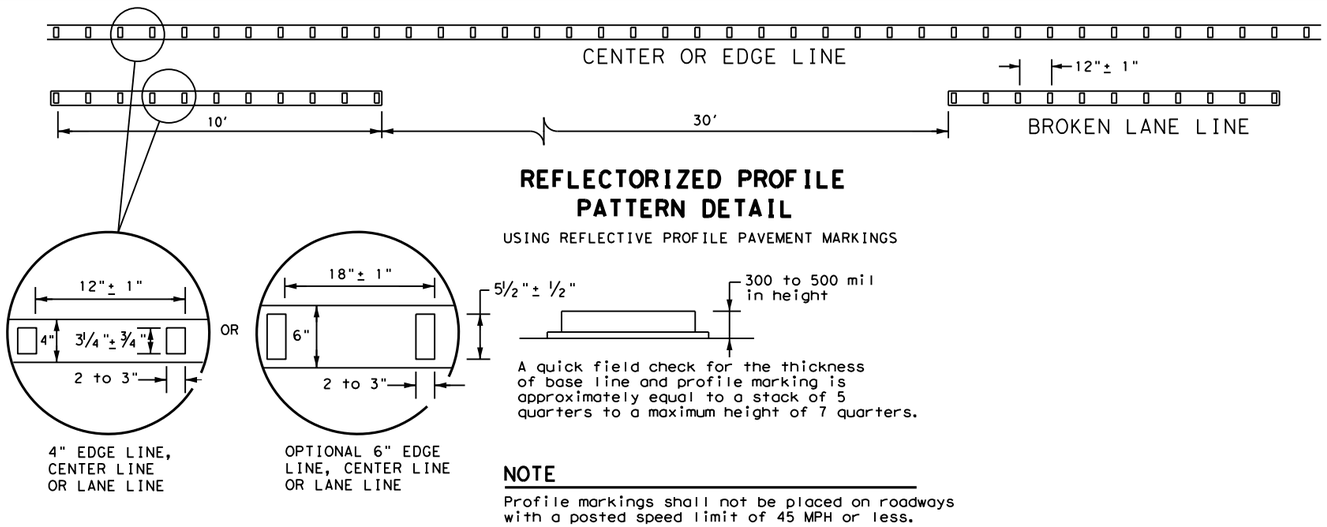


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



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

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



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

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

4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

NOTE

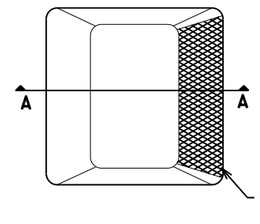
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

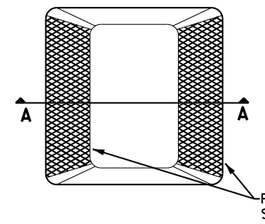
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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

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



Type I (Top View)



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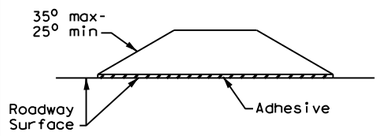

SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-20

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10 5-00 2-12 8-00 6-20	0233	02	035,etc	US 62
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		177

22B

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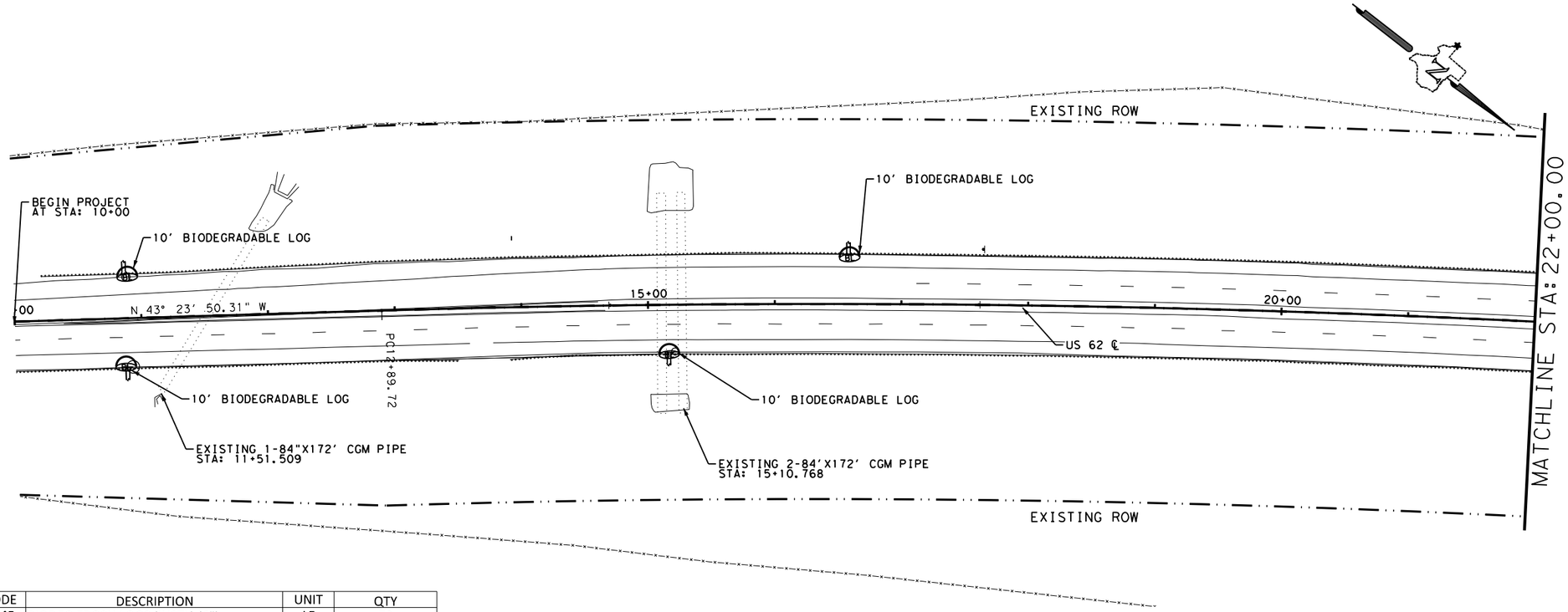


LEGEND

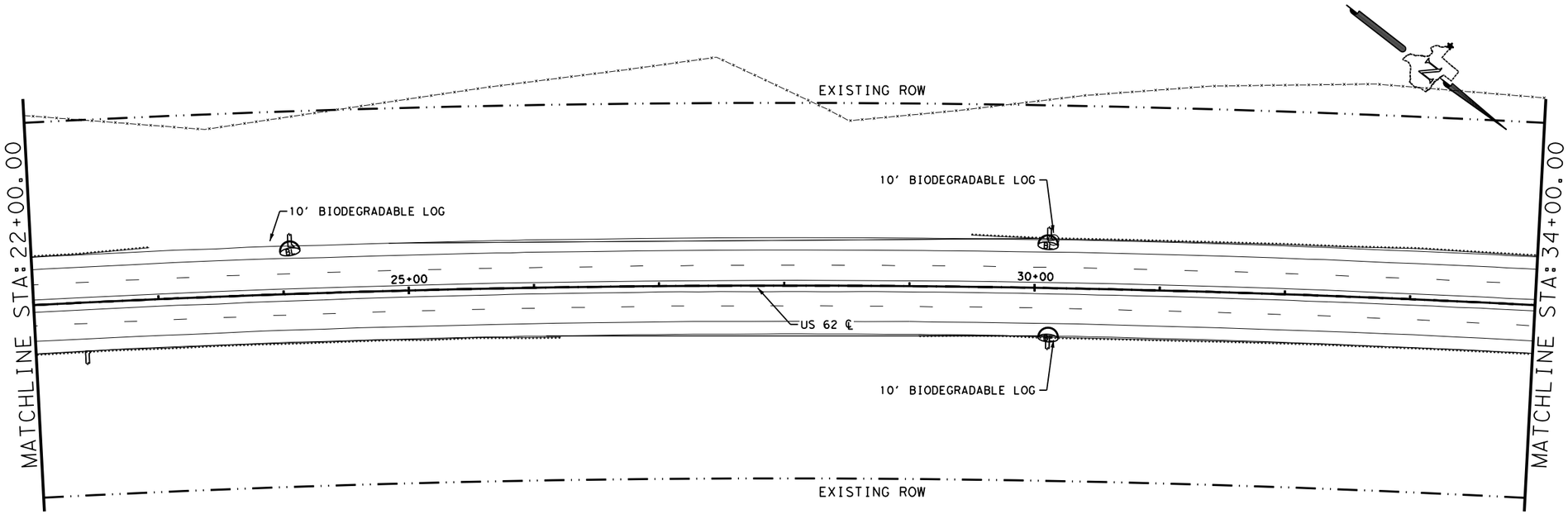
- SCF — SEDIMENT CONTROL FENCE
- BL — BIODEGRADABLE LOG
- RFD — ROCK FILTER DAM
- DIRECTION OF FLOW

NOTE:
1. PLACE 10' OF BIODEGRADABLE LOG AT EACH FLUME AND INLET.

ITEM	CODE	DESCRIPTION	UNIT	QTY
506	6045	BIODEG EROSN LOGS (INSTL) (6")	LF	70
506	6043	BIODEG EROSN LOGS (REMOVE)	LF	70

0' 100' 200'

SCALE: 1"=100'



STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED
PROFESSIONAL ENGINEER

06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER
ENVIRONMENTAL

SWP3 LAYOUT
BEGIN PROJECT TO STA. 34+00.00

SHEET 1 OF 8

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		178

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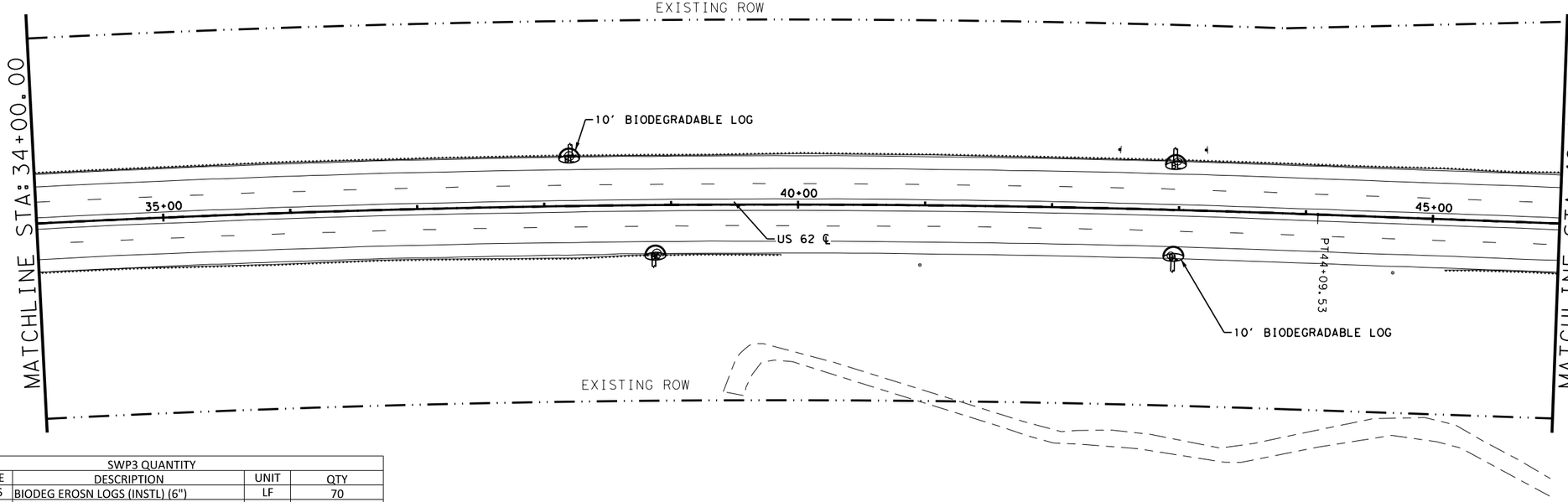


SWP3 QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
506	6045	BIODEG EROSN LOGS (INSTL) (6")	LF	70
506	6043	BIODEG EROSN LOGS (REMOVE)	LF	70
506	6001	ROCK FILTER DAMS (INSTALL) (TY 1)	LF	20
506	6011	ROCK FILTER DAM (REMOVE)	LF	20

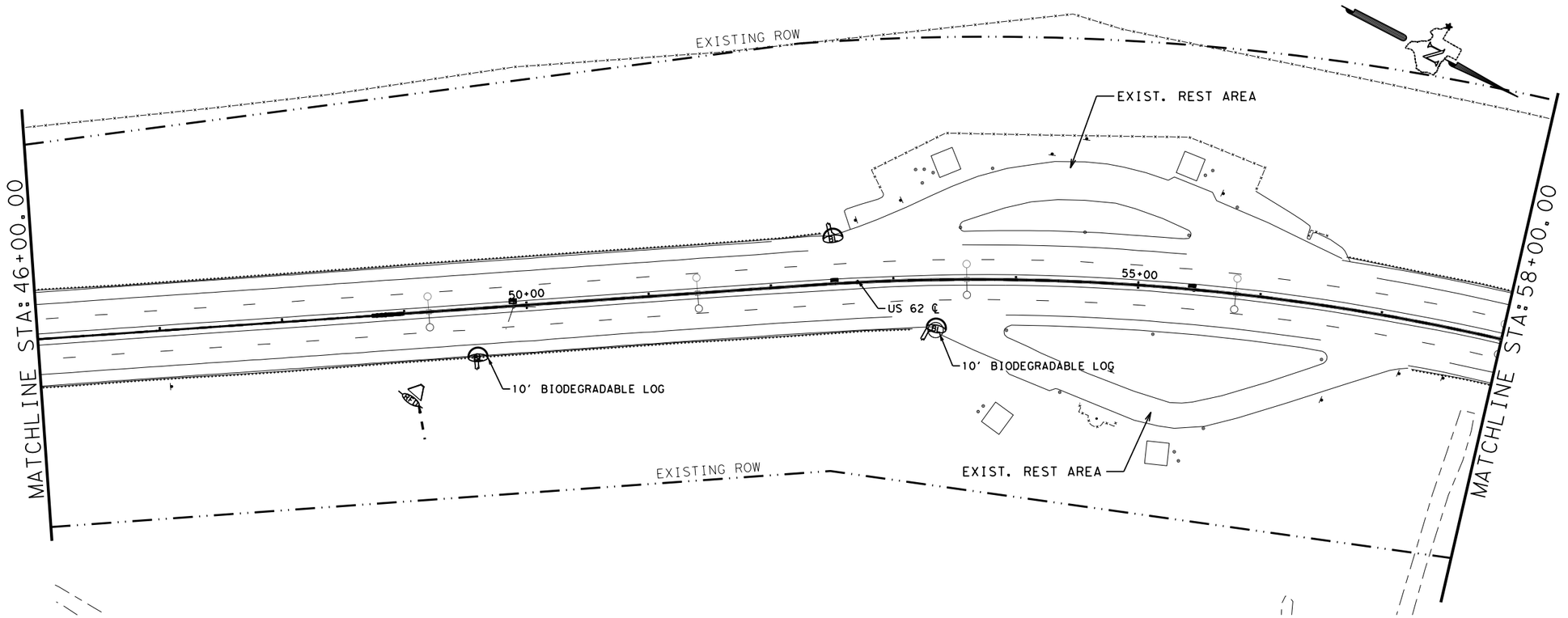
LEGEND

- SCF — SEDIMENT CONTROL FENCE
- BL — BIODEGRADABLE LOG
- RFD — ROCK FILTER DAM
- DIRECTION OF FLOW

NOTE:
1. PLACE 10' OF BIODEGRADABLE LOG AT EACH FLUME AND INLET.

0' 100' 200'

SCALE: 1"=100'



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ENVIRONMENTAL

SWP3 LAYOUT
STA. 34+00.00 TO STA. 58+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035	US0062
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		179

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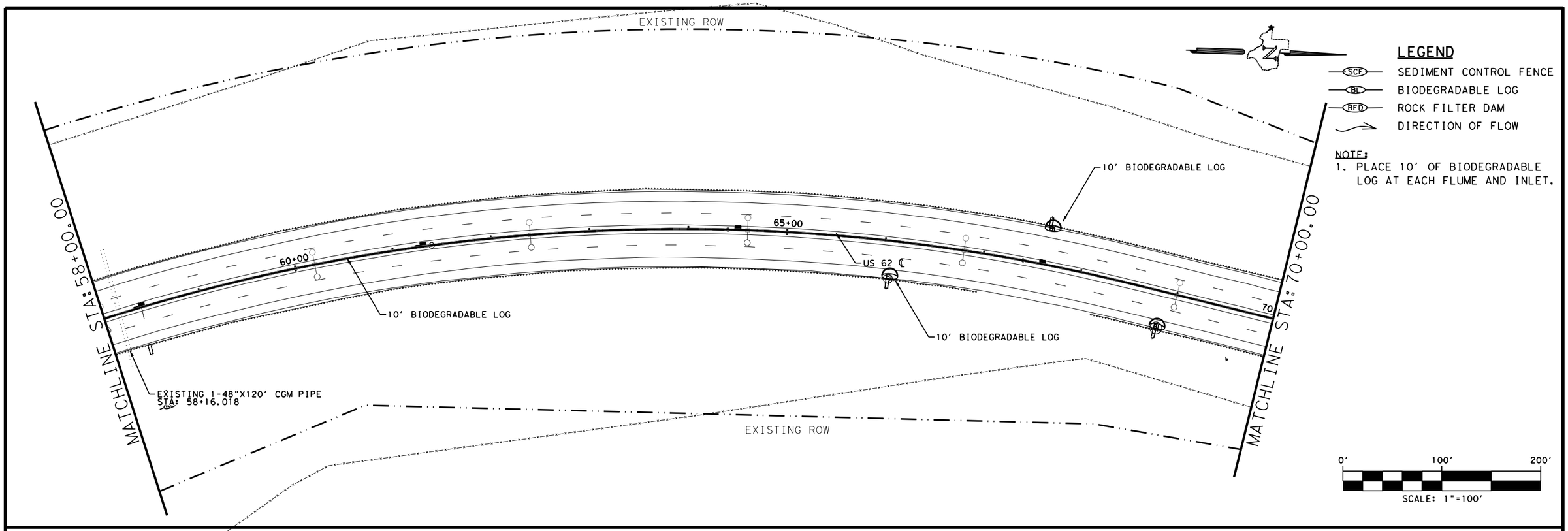

SWP3 QUANTITY				
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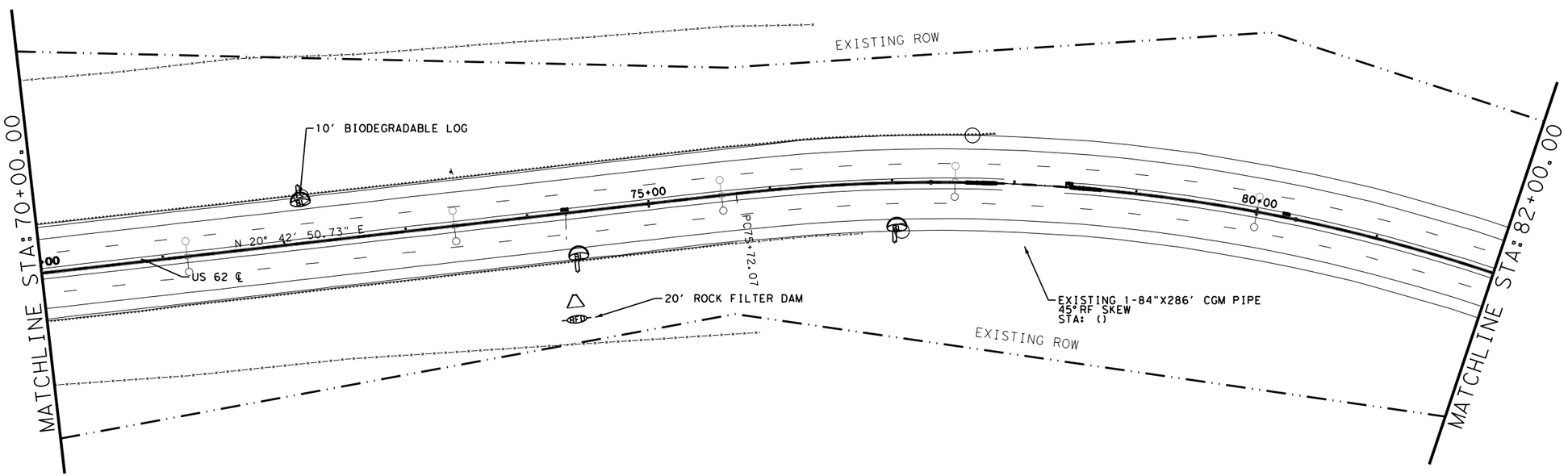
506	6043	BIODEG EROSN LOGS (REMOVE)	LF	60
506	6001	ROCK FILTER DAMS (INSTALL) (TY 1)	LF	20
506	6011	ROCK FILTER DAM (REMOVE)	LF	20



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US 62 MED CONCRETE TRAFFIC BARRIER
ENVIRONMENTAL

SWP3 LAYOUT
STA. 58+00.00 TO STA. 82+00.00

SHEET 3 OF 8

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CONT	SECT	JOB	HIGHWAY
0233	02	035	US0062
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		14810

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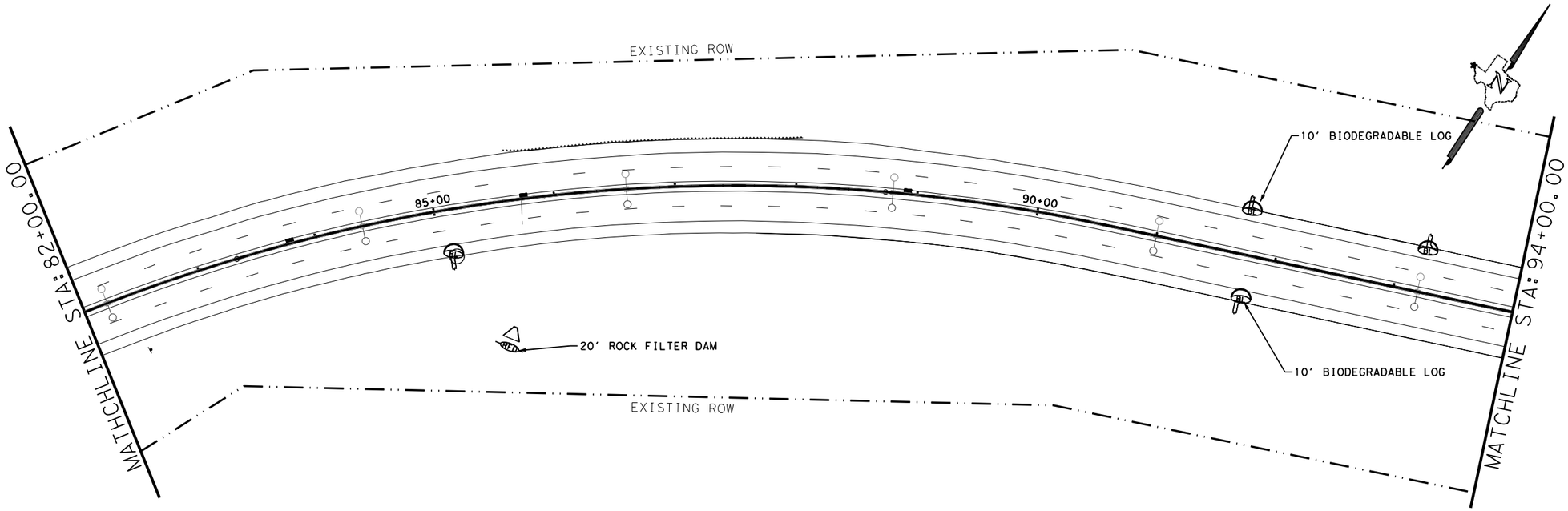


LEGEND

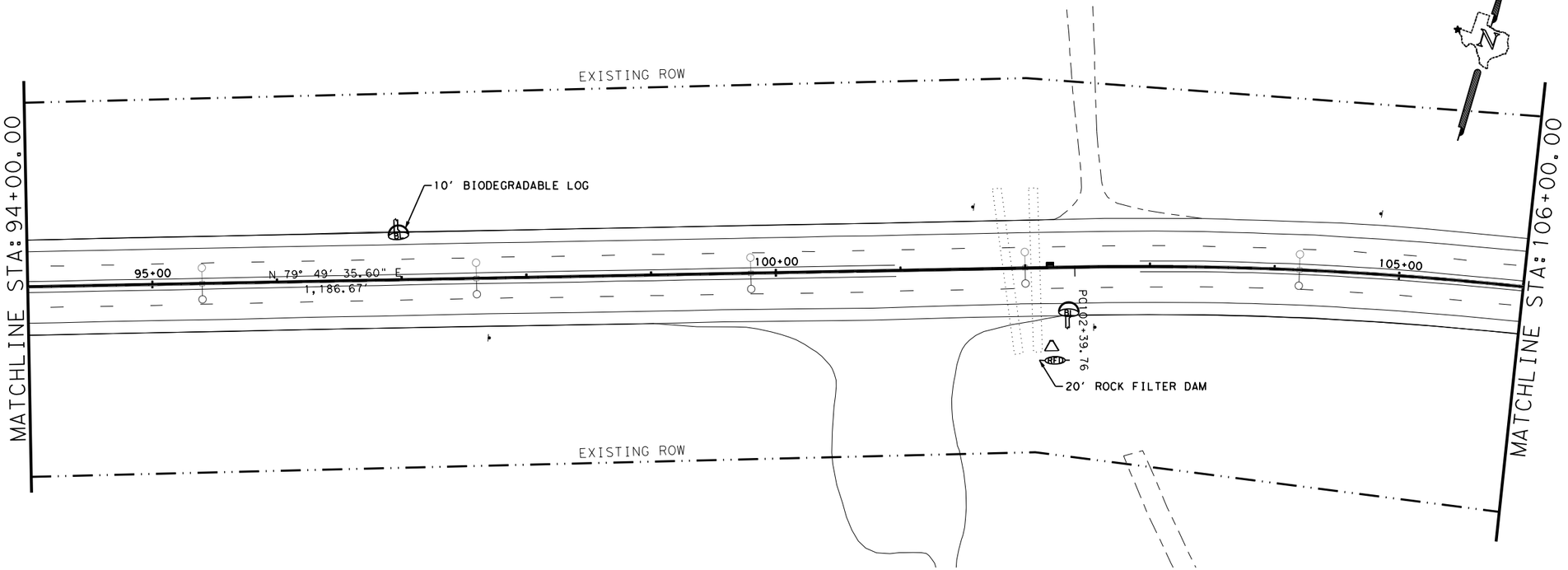
- SCF — SEDIMENT CONTROL FENCE
- BL — BIODEGRADABLE LOG
- RFD — ROCK FILTER DAM
- DIRECTION OF FLOW

NOTE:
1. PLACE 10' OF BIODEGRADABLE LOG AT EACH FLUME AND INLET.

SWP3 QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
506	6045	BIODEG EROSN LOGS (INSTL) (6")	LF	70
506	6043	BIODEG EROSN LOGS (REMOVE)	LF	70
506	6001	ROCK FILTER DAMS (INSTALL) (TY 1)	LF	40
506	6011	ROCK FILTER DAM (REMOVE)	LF	40

0' 100' 200'

SCALE: 1"=100'



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06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER
ENVIRONMENTAL

SWP3 LAYOUT
STA. 82+00.00 TO STA.106+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		181

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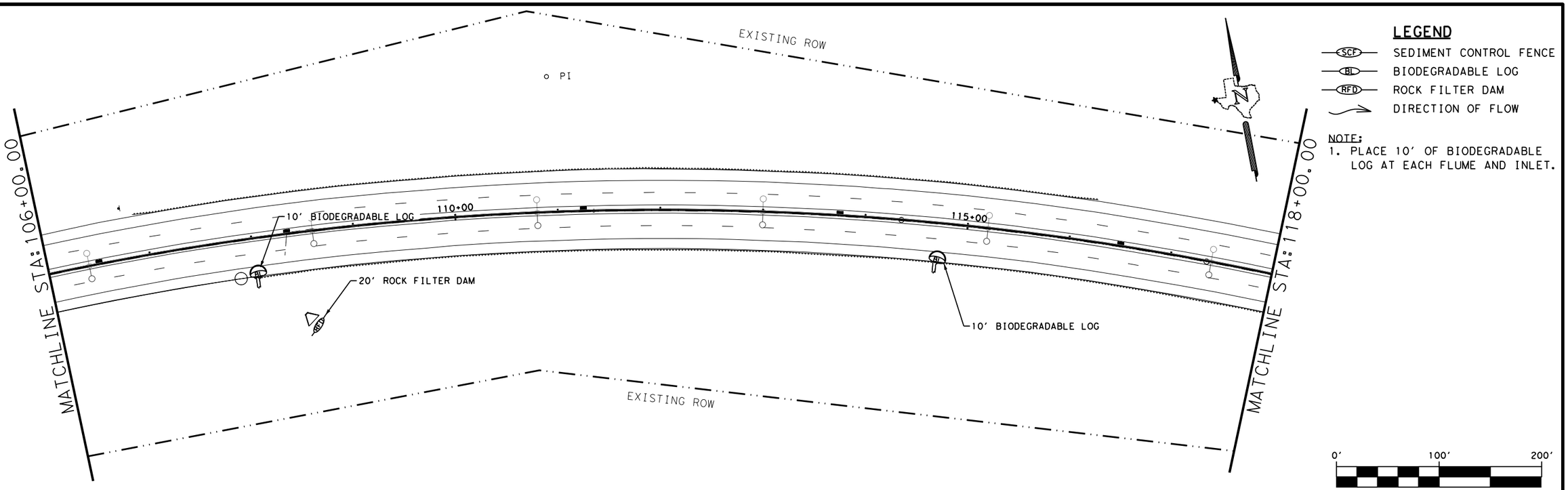

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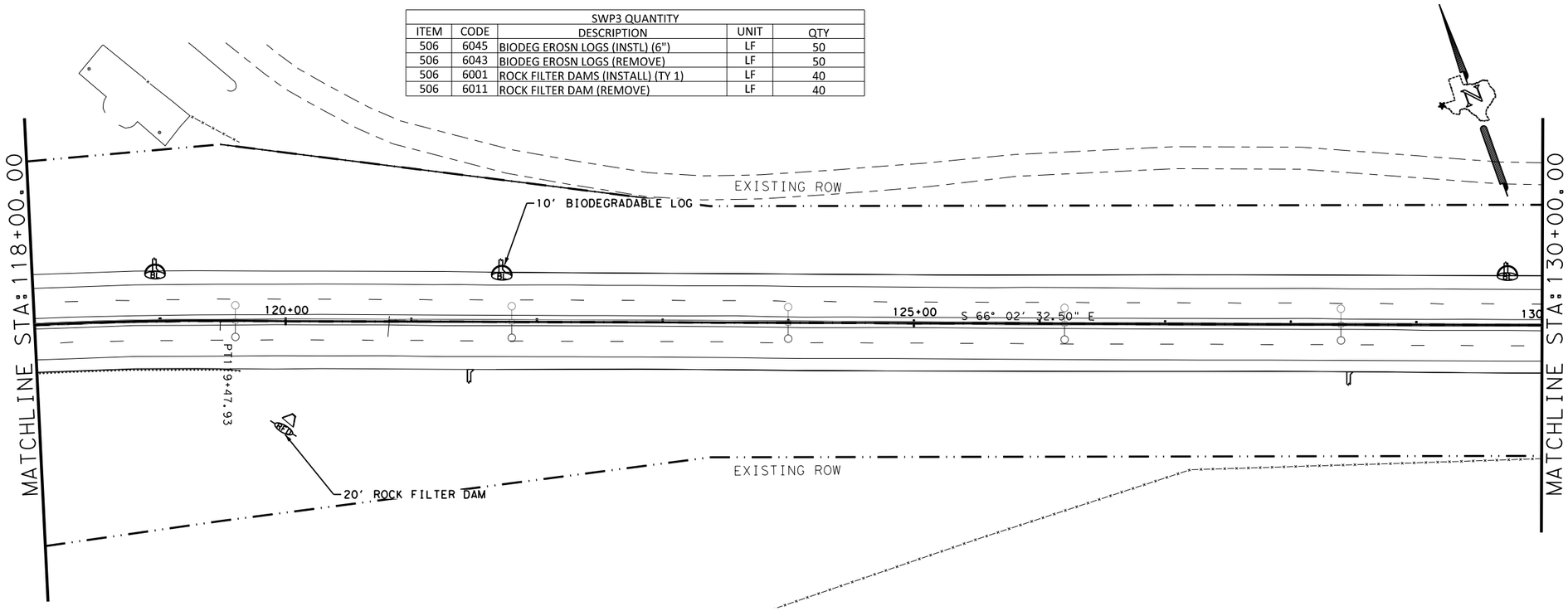
506	6043	BIODEG EROSN LOGS (REMOVE)	LF	50
506	6001	ROCK FILTER DAMS (INSTALL) (TY 1)	LF	40
506	6011	ROCK FILTER DAM (REMOVE)	LF	40



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US 62 MED CONCRETE TRAFFIC BARRIER
ENVIRONMENTAL

SWP3 LAYOUT
STA. 106+00.00 TO STA. 130+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		182

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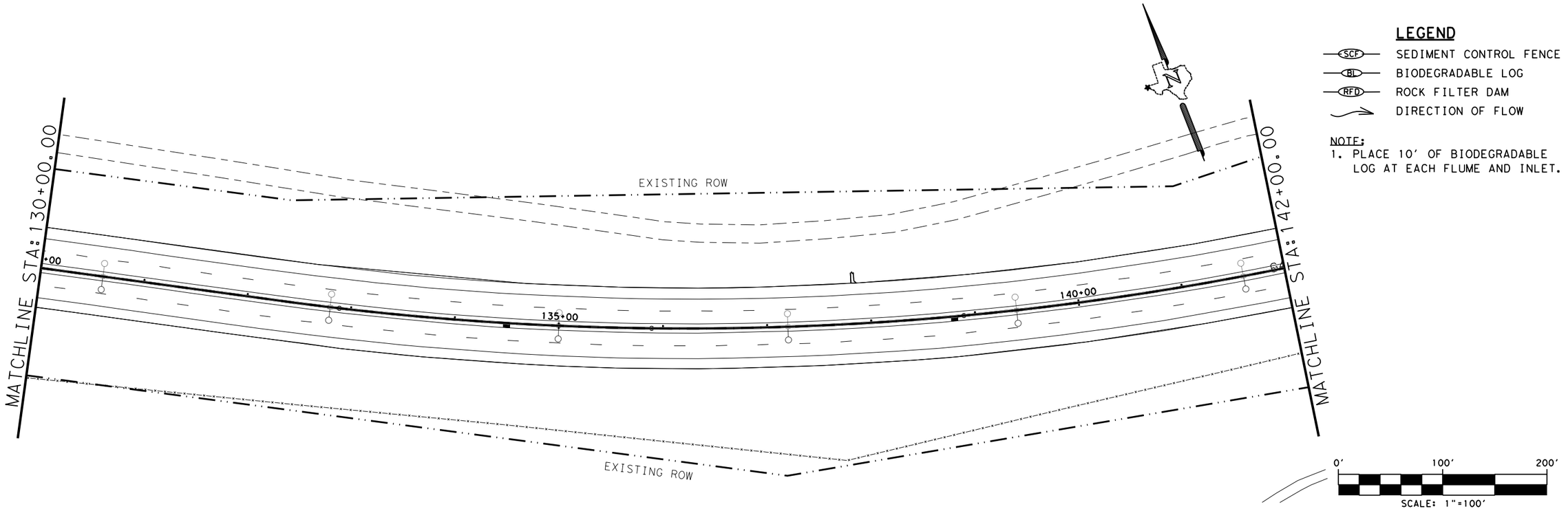
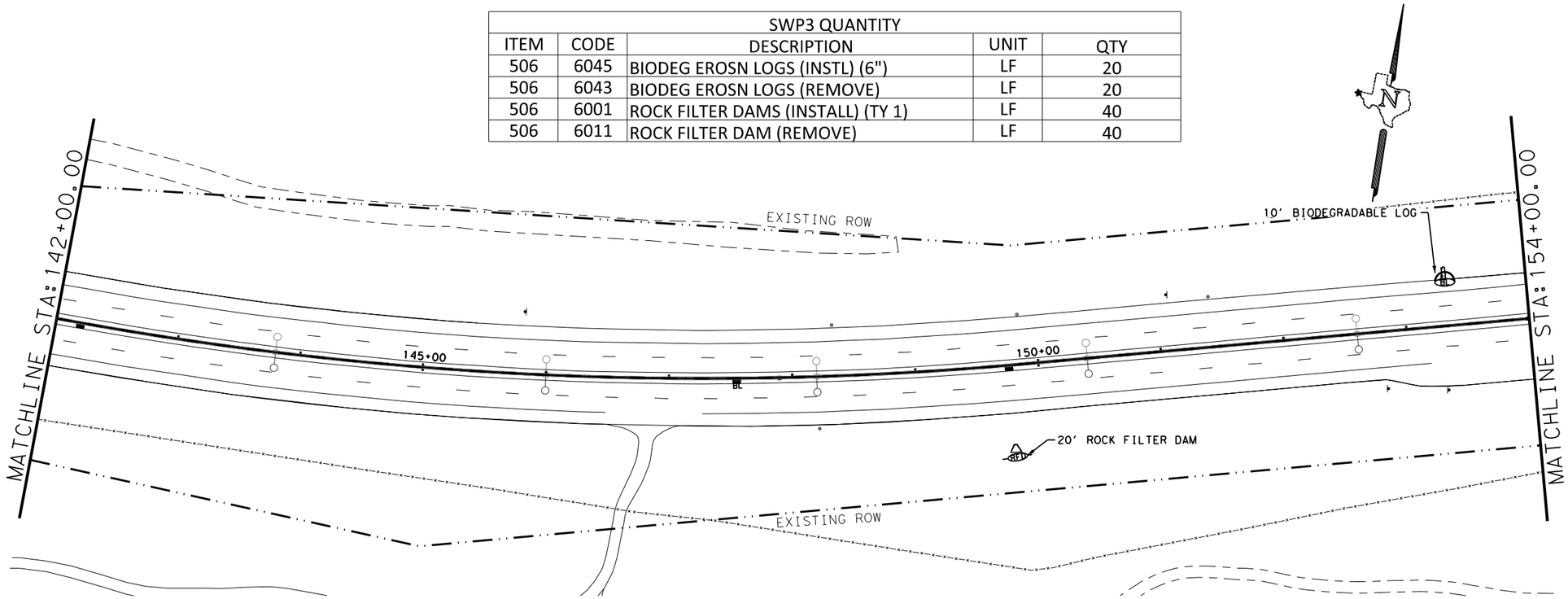


SWP3 QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
506	6045	BIODEG EROSN LOGS (INSTL) (6")	LF	20
506	6043	BIODEG EROSN LOGS (REMOVE)	LF	20
506	6001	ROCK FILTER DAMS (INSTALL) (TY 1)	LF	40
506	6011	ROCK FILTER DAM (REMOVE)	LF	40



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US 62 MED CONCRETE TRAFFIC BARRIER
ENVIRONMENTAL

SWP3 LAYOUT
STA. 130+00.00 TO STA. 154+00.00

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		183

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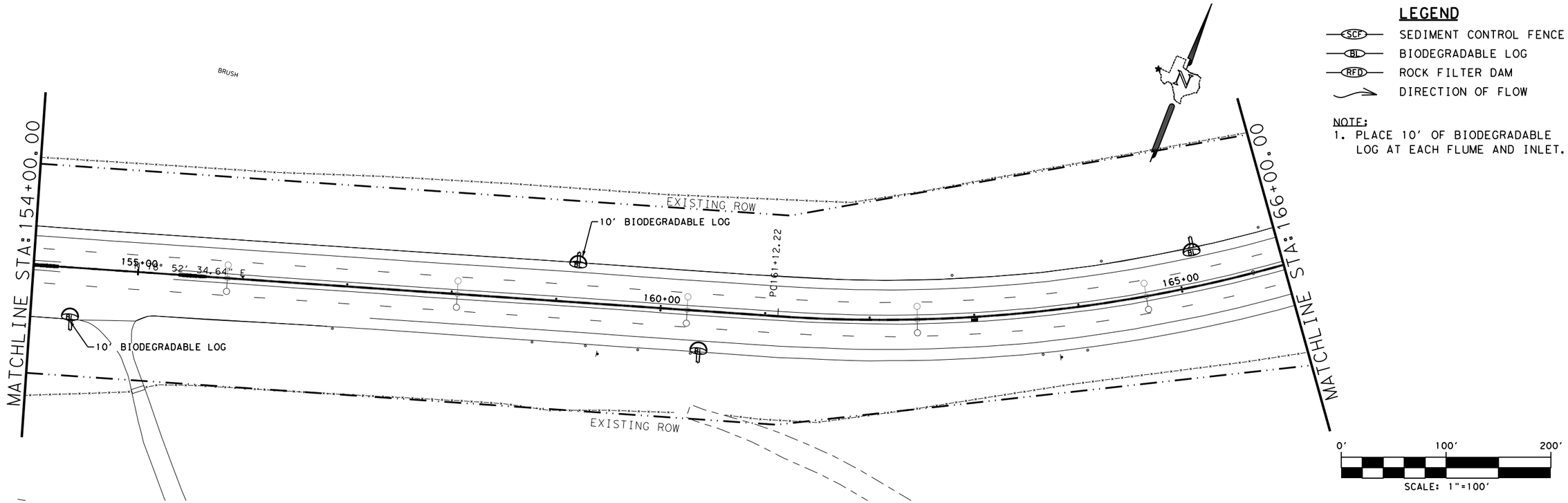
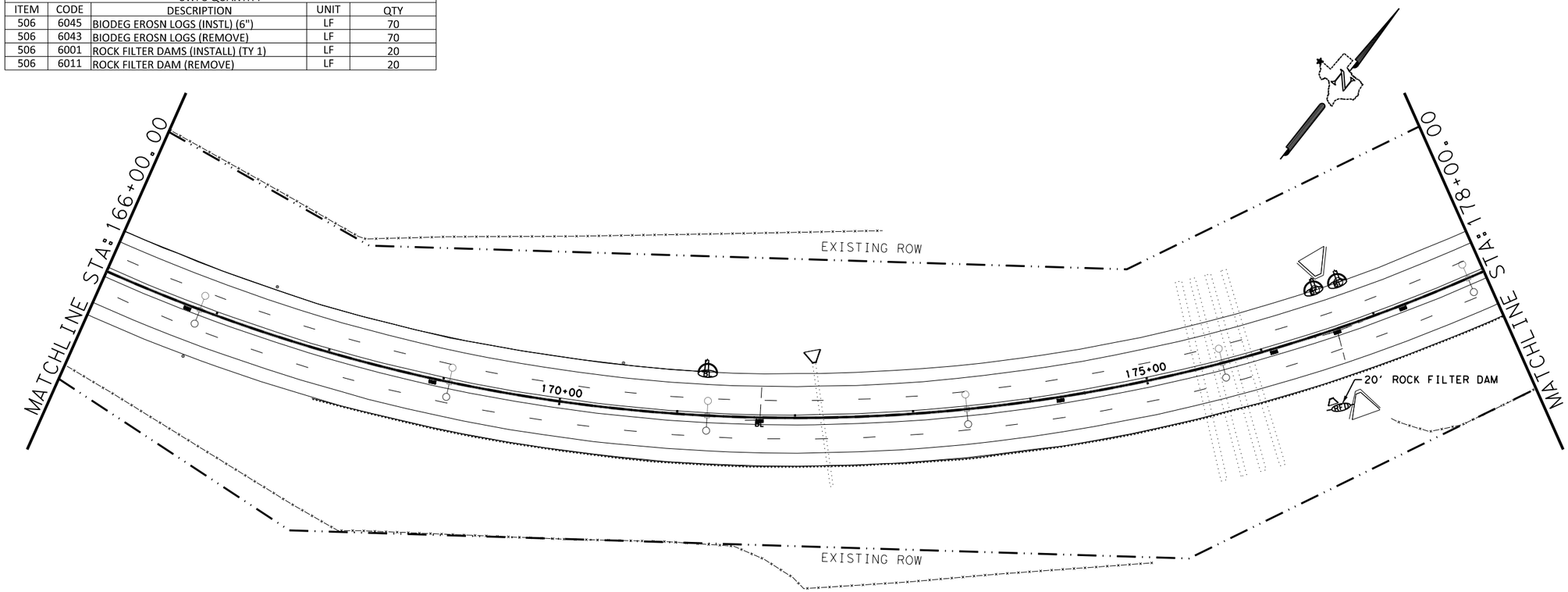


SWP3 QUANTITY				
ITEM	CODE	DESCRIPTION	UNIT	QTY
506	6045	BIODEG EROSN LOGS (INSTL) (6")	LF	70
506	6043	BIODEG EROSN LOGS (REMOVE)	LF	70
506	6001	ROCK FILTER DAMS (INSTALL) (TY 1)	LF	20
506	6011	ROCK FILTER DAM (REMOVE)	LF	20



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ENVIRONMENTAL

SWP3 LAYOUT
STA. 154+00.00 TO STA. 178+00.00

SHEET 7 OF 8

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CONT	SECT	JOB	HIGHWAY
0233	02	035,etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		184

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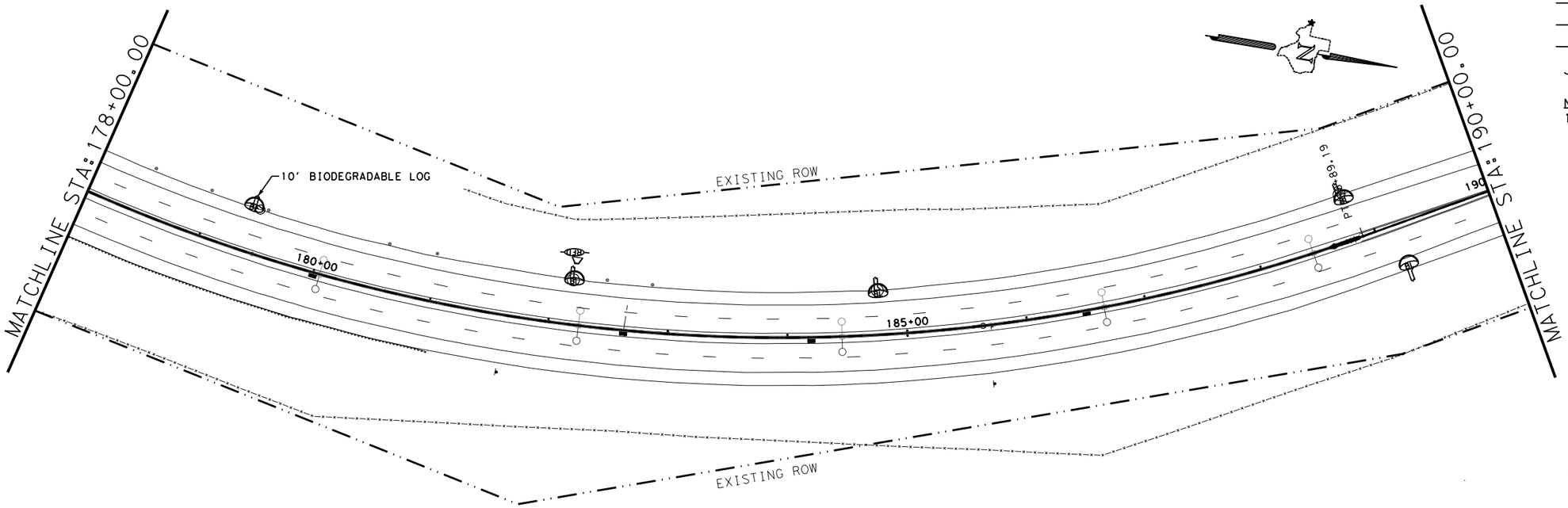

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ITEM	CODE	DESCRIPTION	UNIT	QTY
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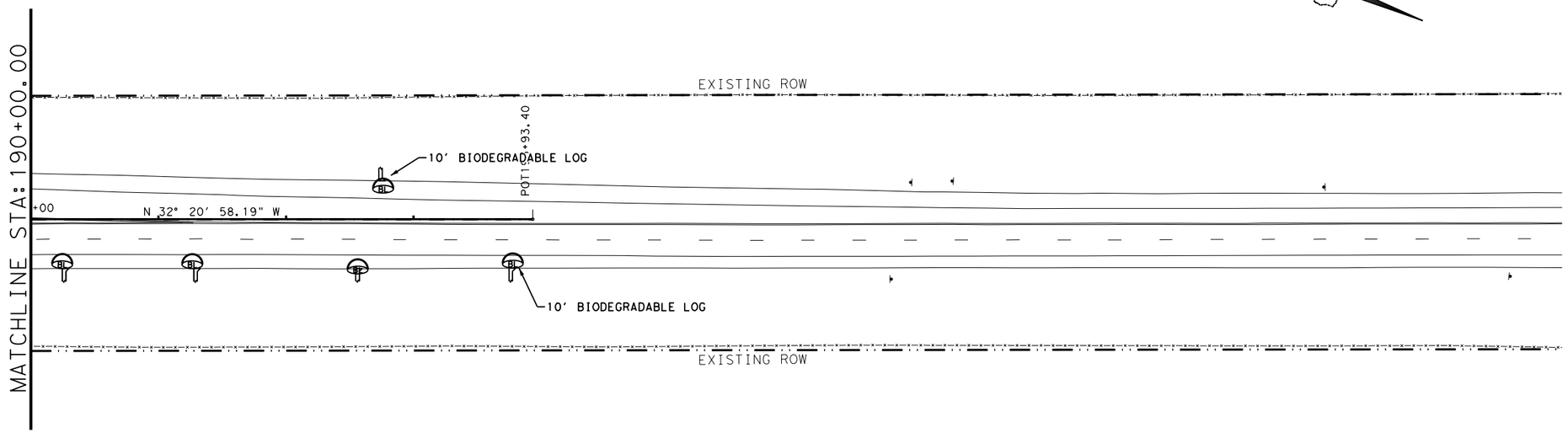
506	6043	BIODEG EROSN LOGS (REMOVE)	LF	90
506	6001	ROCK FILTER DAMS (INSTALL) (TY 1)	LF	20
506	6011	ROCK FILTER DAM (REMOVE)	LF	20



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06/03/2021

US 62 MED CONCRETE TRAFFIC BARRIER
ENVIRONMENTAL

SWP3 LAYOUT
STA. 178+00.00 TO END PROJECT

SHEET 8 OF 8

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CONT	SECT	JOB	HIGHWAY
0233	02	035, etc	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		185

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STORM WATER POLLUTION PREVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with TPDES General Permit TXR150000. The operator, The Texas Department of Transportation ensures that: Project specifications provide that adequate BMPs have been developed for this project. The contractor shall be the party responsible for implementing the BMPs described herein. The contractor shall implement changes approved by the Project Engineer to the SWP3 within the times specified in the SWP3 or the TPDES General Permit. Operators affected by modifications to specifications will be notified in a timely manner.

1. SITE OR PROJECT DESCRIPTION:

NATURE OF THE CONSTRUCTION ACTIVITY: SEE TITLE SHEET

POTENTIAL POLLUTANTS AND SOURCES:

Sediment laden storm water	*Storm water conveyance over disturbed areas*
Fuels, oils, and lubricants	*Construction vehicles and storage areas*
Construction debris and waste	*Various construction activities*
Sanitary waste	*Restroom facilities*
Trash	*Construction site and Receptacles*

SEQUENCE OF ACTIVITIES THAT WILL DISTURB SOILS:

1.
2.
3.
4.
5.
6.
7.
8.

AREAS:

TOTAL AREA OF PROJECT: 3.2 ACRES

TOTAL AREA OF SOIL DISTURBANCE: 0.0198347 ACRES

TOTAL AREA OFF-SITE:

WEIGHTED RUNOFF COEFFICIENT (BEFORE AND AFTER CONSTRUCTION):

DATA DESCRIBING THE SOIL: *Soil consists mainly of sand with sparse vegetaion throughtout.*

GENERAL LOCATION MAP: SEE TITLE SHEET

DETAILED SITE MAP: SEE EROSION CONTROL PLAN LAYOUT SHEET.

THE LOCATION AND DESCRIPTION OF CONCRETE AND ASPHALT PLANTS:
Supporting Concrete Plant Facilities shall be located off site.

Supporting Asphalt Plant Facilities shall be located off site.

NAME OF RECEIVING WATERS:

A COPY OF TPDES CGP TXR150000 IS INCLUDED IN THE SWP3 FILE.

REMARKS:

401 WATER QUALITY CERTIFICATION: YES____ NO__X__

2. BEST MANAGEMENT PRACTICES (BMPs):

EROSION AND SEDIMENT CONTROLS: Erosion and sediment controls have been designed to retain sediment on-site. Controls shall be utilized to reduce off site transport of suspended sediments and pollutants if it is necessary to pump water from the site. Control measures shall be installed per specifications or as directed. Sediment must be removed from controls per the plan requirements or manufacturers recommendations, but no later than the time that design capacity has been reduced by 50%. If sediment escapes the site, accumulations will be removed to minimize further negative effects. Controls will be developed to limit the off site transportation of litter, construction debris, and construction materials.

INTERIM(INT), PERMANENT(PER), AND 401 CERTIFICATION BMP'S:

EROSION CONTROLS:	401	INT	PER
☐ *Compaction & Tracking of slopes*	__	__	__
☐ *Diversion Dike*	__	__	__
☐ *Preserve Existing Vegetation*	__	__	__
☐ *Soil Stabilization*	__	__	__
☐ *Permanent Vegetation*	__	__	__
☐ *No Erosion Controls are Required.*			

SEDIMENT CONTROLS:	401	INT	PER
☐ *Silt Fence*	__	__	__
☒ *Rock Berm*	__	X	__
☐ *Buffer Zones*	__	__	__
☒ *Erosion Control Logs*	__	X	__
☐ *Ditch Block*	__	__	__
☐ *No Sediment Controls are Required.*			

POST CONSTRUCTION TSS CONTROL (401 CERTIFICATION ONLY):

- ☐ *Vegetation Lined Drainage Ditch*
- ☐ *Retention/Irrigation*
- ☐ *Erosion Control Compost*
- ☐ *Grassy Swales*
- ☐ *Vegetative Filter Strips*
- ☒ *No Post Construction TSS Control Required.*

SEQUENCE OR SCHEDULE OF IMPLEMENTATION:

1. *Install Storm Water Pollution Prevention Measures as indicated on SWP3 Sheets.*
2. *Inspect Storm Water Pollution Prevention Measures periodically and after rainfall events.*
3. *Repair/Replace Storm Water Pollution Prevention Measures as per the direction of the Engineer.*
4. *Upon project completion, remove Storm Water Pollution Prevention Measures.*
5.
6.
7.

The El Paso District of the Texas Department of Transportation uses Site-Manager, a computer based construction record-keeping system. Documentation describing major grading activities, temporary or permanent cessation of construction, and stabilization measures is a part of this system and is incorporated by reference into this SWPPP.

Stabilization measures must be initiated within 14 days when practicable in portions of the site where construction has temporarily or permanently ceased, if earth disturbing activities will not be resumed within 21 days.

3. STRUCTURAL CONTROL PRACTICES:

Structural control practices for this project are listed elsewhere herein.

4. PERMANENT STORM WATER CONTROLS:

Structural control practices installed during construction will be maintained and inspected after construction has ceased on the site and until final stabilization is attained. Unless specified in the plans, after project acceptance TxDOT will assume maintenance responsibilities for the controls and measures. Other permanent controls include existing and proposed; riprap at culvert inlets and outlets, diversion dikes, swales, retaining walls, and other similar devices.

5. OTHER CONTROLS:

OFF-SITE VEHICLE TRACKING OF SEDIMENTS AND THE GENERATION OF DUST: The off site vehicle tracking of sediments shall be minimized by removal of excess dirt from the road and at entrances to the work site. The generation of dust will be minimized as directed by the Project Engineer by dampening haul roads and covering haul trucks with a tarpaulin.

CONSTRUCTION AND WASTE MATERIALS: The contractor will maintain a clean, orderly construction site. Construction waste including trash, rubble, scrap and vegetation shall be disposed of in lidded dumpsters or in a manner approved by the Project Engineer. Disposal methods must meet Federal, State, and Local waste management guidelines. No construction waste will be buried or burned on site. Spoils disposal, material storage, and materials resulting from the destruction of existing roads and structures shall be stored in areas designated by the Project Engineer and protected from run-off. All waterways shall be cleared of temporary embankment, temporary bridges, matting, false work, piling, debris, or other obstructions placed during construction operations, that are not part of the finished work, as soon as practicable. All excess soil generated by the construction will be collected and disposed of by the contractor. Disposal areas, stockpiles, and haul roads shall be constructed in a manner that will minimize and control the amount of sediment that may enter receiving waters. Disposal areas shall not be located in any wetland, water body, or stream bed.

POLLUTANT SOURCES FROM AREAS OTHER THAN CONSTRUCTION: Staging areas and vehicle maintenance areas shall be located and constructed in a manner to minimize the runoff of pollutants. If potential pollutant sources are identified after the start of construction, controls and measures shall be implemented as directed by the Project Engineer.

5. OTHER CONTROLS (CONT):

DEDICATED ASPHALT PLANTS: Asphalt or asphaltic material for this project will be produced off site. If the project requires a dedicated asphalt plant and the plant within 1 mile of the project limits it will be considered an off site PSL. Consideration shall be given to on site plant and storage facilities and measures implemented as directed by the Project Engineer.

DEDICATED CONCRETE PLANTS: Cement or Concrete material for this project will be produced off site. If the project requires a dedicated concrete plant and the plant is within 1 mile of the project limits it will be considered an off site PSL. Consideration shall be given to on site plant and storage facilities and measures implemented as directed by the Project Engineer. Concrete trucks shall be wasted or washed out in locations designated by the Project Engineer. The locations shall be protected by a berm sufficient to contain all waste and wash water. Wash water shall not be allowed to enter any storm drainage system or waterway. The residual material and contaminated soil shall be collected and disposed of in accordance with Federal, State, and Local guidelines. Staging areas and vehicle maintenance areas shall be located and constructed in a manner to minimize the runoff of pollutants.

HAZARDOUS MATERIALS AND SPILL REPORTING: The contractor shall take appropriate measures to prevent, minimize, and control the spillage or leakage of hazardous materials and any associated wastes on site and in maintenance and staging areas. hazardous materials shall include but are not limited to paints, acids, solvents, asphalt products, chemical additives, curing compounds, oils, fuels, and lubricants. Hazardous materials shall not be stored, accumulated, or transported in open containers subject to precipitation or spillage, but shall be stored, accumulated, or transported in closed containers of the type recommended by the manufacturer. In the event of a spill the Project Engineer should be contacted immediately. All spills shall be immediately cleaned and any contaminated soil removed and disposed of in accordance with Local, State, and Federal laws. Fuel tanks shall be protected by a secondary containment, such as a lined berm, capable of containing 1.5 times the capacity of the tank, or as approved by the Project Engineer.

OFF SITE PSLs: All off site project specific locations including dedicated asphalt plants, concrete plants, or utility installations, required by the contractor, are the contractor's responsibility. The contractor shall secure all permits required by local, state, or federal laws for off site PSLs. The contractor shall provide diagrams and areas of disturbance for all PSL's within 1 mile of the project.

SANITARY FACILITIES: All sanitary or septic wastes that are generated onsite shall be treated and disposed of in accordance with state and local regulations. Raw sewage or septage shall not be discharged or buried on site. Precaution shall be taken to prevent illicit discharges to storm water. Licensed waste management contractors shall be required to dispose of sanitary waste. Porta johns will be required for the construction site or as directed by the Project Engineer.

VELOCITY DISSIPATION DEVICES: Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel as shown in the plans or as directed by the Project Engineer to provide a non-erosive flow velocity from the structure to a watercourse so that the natural physical and biological characteristics and functions are maintained and protected.

6. APPROVED STATE AND LOCAL PLANS:

This SWP3 is consistent with requirements specified in applicable sediment and erosion site plans or site permits, or storm water management site plans or permits approved by federal, state, or local officials.

7. MAINTENANCE:

Control measures shall be properly installed according to specifications. If inspections or other information indicates a control has been installed, used, or is performing inadequately, the contractor must replace or modify the control as soon as practicable after discovery. Control measures shall be maintained in effective operating condition. If inspections determine that BMPs are not operating effectively maintenance will be performed as necessary to continue the effectiveness of the controls. Maintenance must be accomplished as soon as practicable. Controls adjacent to creeks, culverts, bridges, and water crossings shall have priority. Controls that have been disabled, run over, removed, or otherwise rendered ineffective must be corrected immediately upon discovery.

8. INSPECTION OF CONTROLS:

A TxDOT inspector will inspect disturbed areas of the site that have not been finally stabilized, areas used for storage of materials that are exposed to precipitation, and structural controls for evidence of, or the potential for, pollutants entering the drainage system. Sediment and erosion controls measures identified in the SWP3 will be inspected to ensure that they are operating correctly. Locations where vehicles enter or exit the site will be inspected for evidence of off-site vehicle tracking. Inspections will be conducted every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater. The SWP3 will be modified based on the result of these inspections. Revisions will be completed within 7 Calendar days following the inspection. Revised implementation schedules will be described in the SWP3 and implemented as soon as practicable. Rain gages will be maintained on site for the duration of the project. Reports summarizing the scope of the inspections are included in the SWP3 file.

9. NON-STORM WATER COMPONENTS:

The contractor shall be required to implement appropriate pollution prevention controls and measures for all eligible non-storm water components of the discharge as approved and directed by the Project Engineer.

STATE OF TEXAS
LEVI L. PAVIA
127908
LICENSED PROFESSIONAL ENGINEER

06/03/2021 REV: 07-14

TxDOT STORM WATER POLLUTION PREVENTION PLAN (SWP3)

©2021
Texas Department of Transportation
SHEET OF

CONT	SECT	JOB	HIGHWAY
0233	02	035	US 62
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		186

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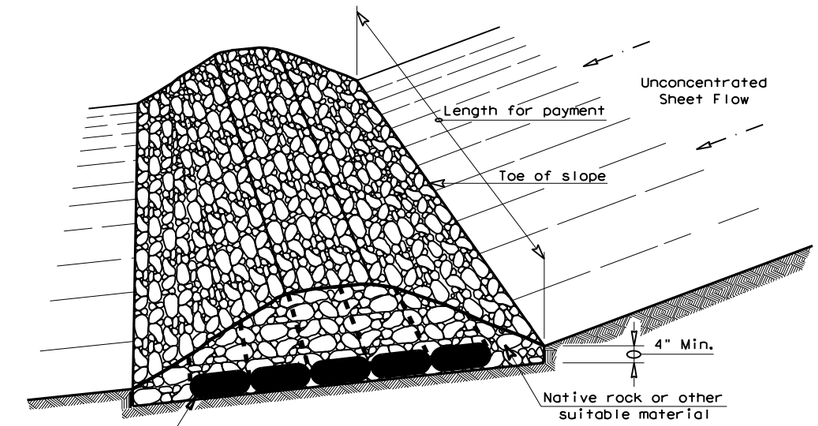
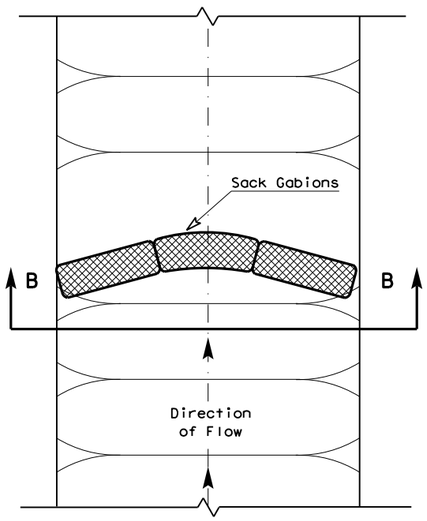
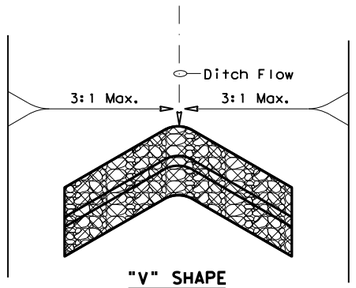


FILTER DAM AT TOE OF SLOPE

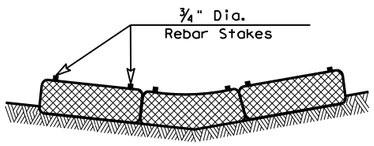
RFD1



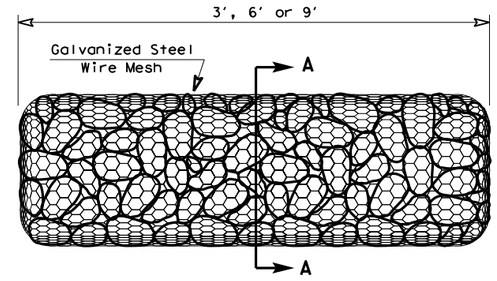
PLAN VIEW



"V" SHAPE
PLAN VIEW

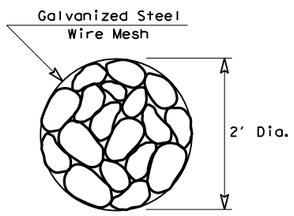


SECTION B-B

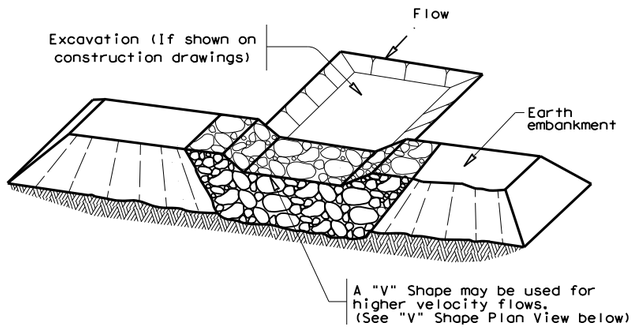


TYPE 4 (SACK GABIONS)

RFD4

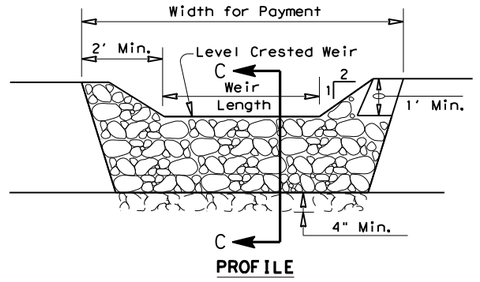


SECTION A-A



FILTER DAM AT SEDIMENT TRAP

RFD1 — OR — RFD2



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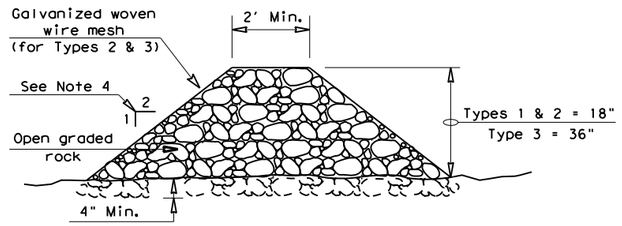
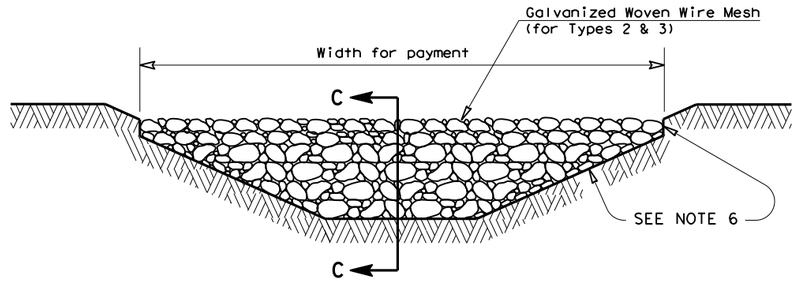


SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 — OR — RFD2 — OR — RFD3

GENERAL NOTES

1. 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.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. 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.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

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/FT^2 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 (approximently 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.

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

Texas Department of Transportation — 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	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	02	035,etc	US 62
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		187

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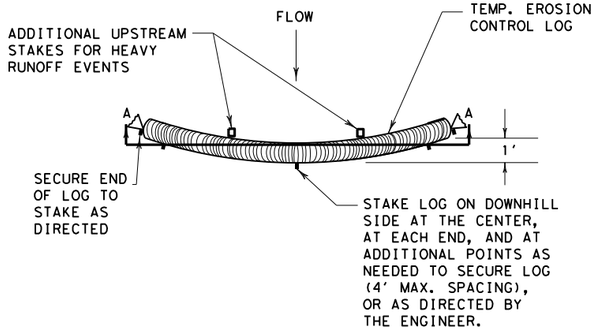
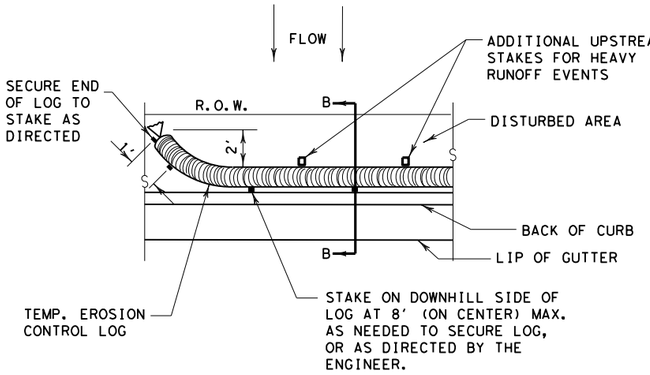


PLAN VIEW



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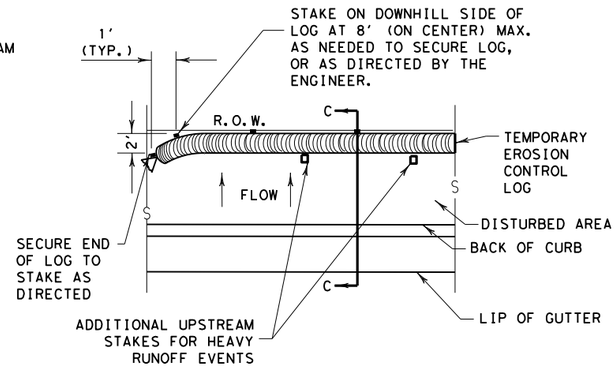

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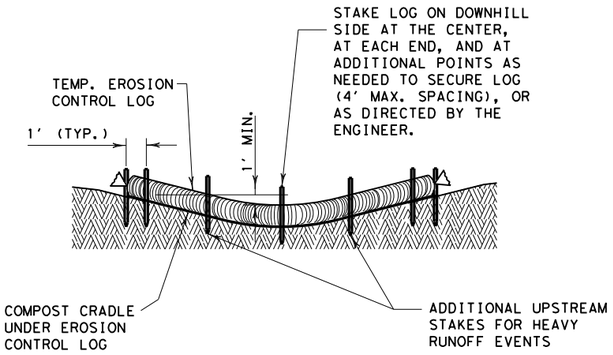
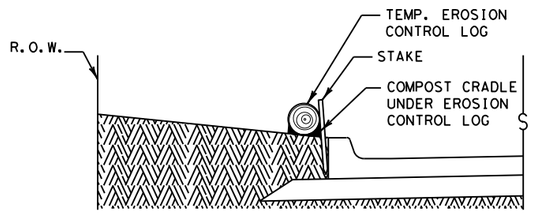


SECTION A-A

EROSION CONTROL LOG DAM

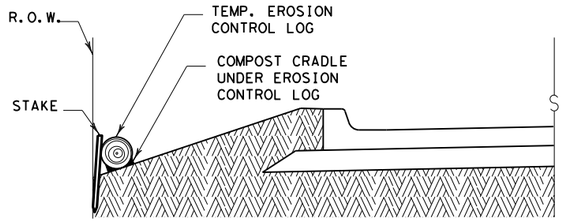
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

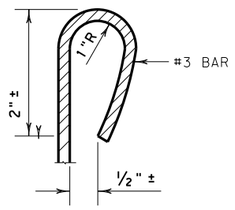
CL-BOC



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



REBAR STAKE DETAIL

LEGEND

- CL-D — EROSION CONTROL LOG DAM
- CL-BOC — EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW — EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST — EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL — EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- CL-CI — EROSION CONTROL LOG AT CURB INLET
- CL-GI — EROSION CONTROL LOG AT CURB & GRATE INLET

GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

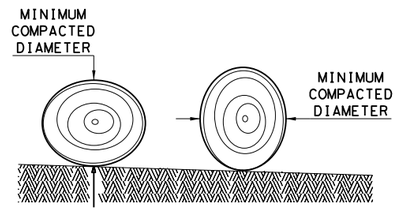
Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

SHEET 1 OF 3

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
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	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		188

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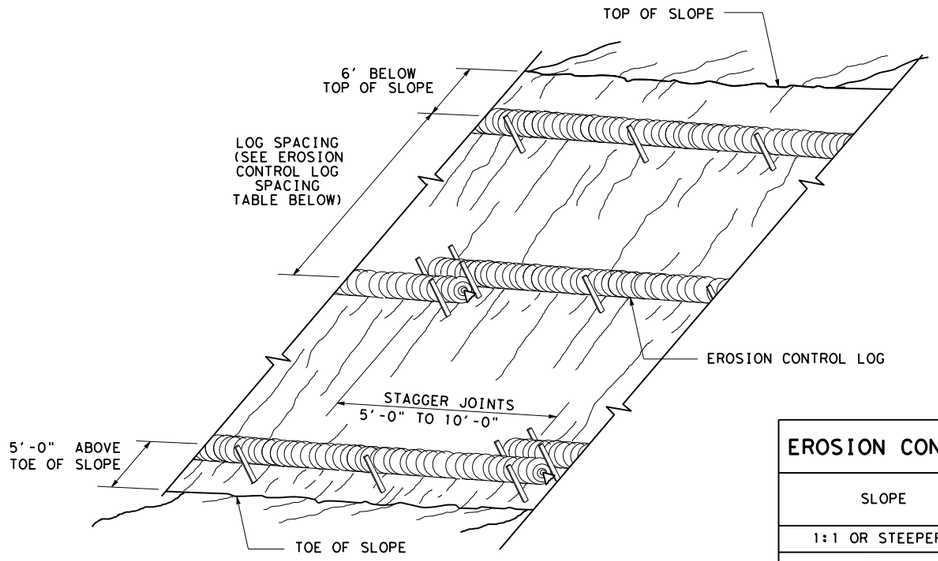
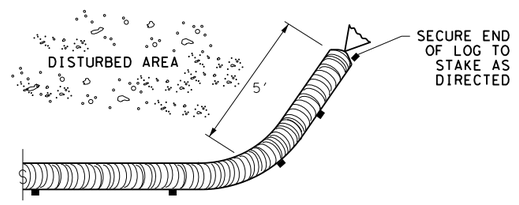


EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

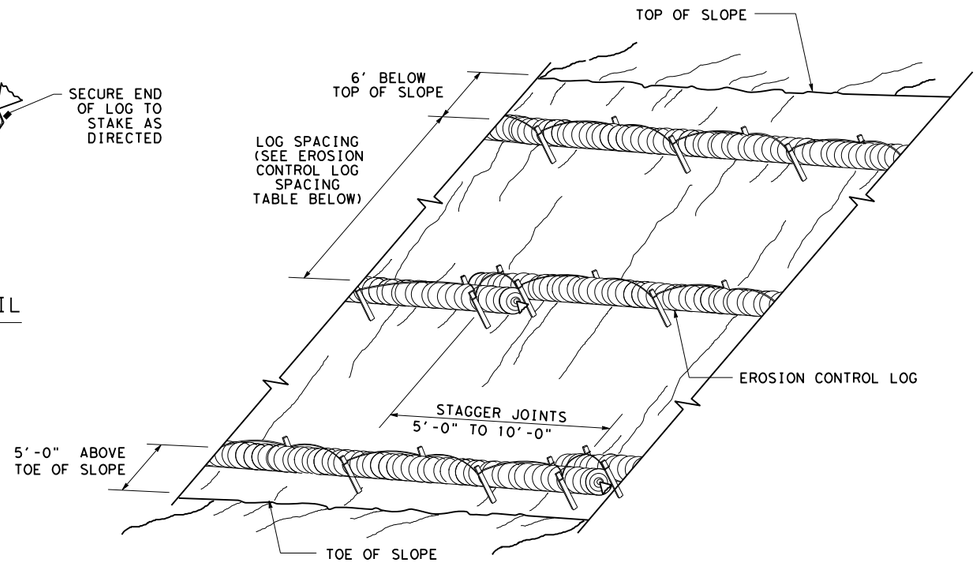
CL-SST



END SECTION RAP DETAIL

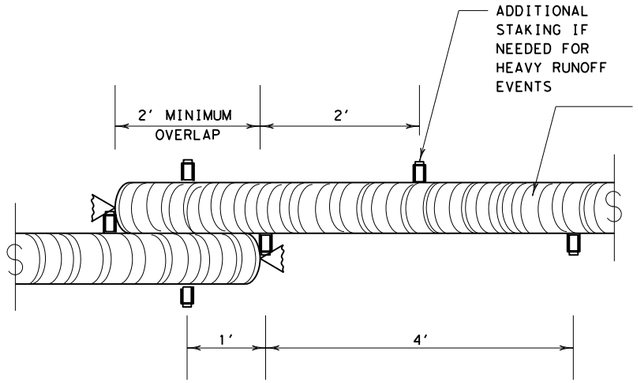
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

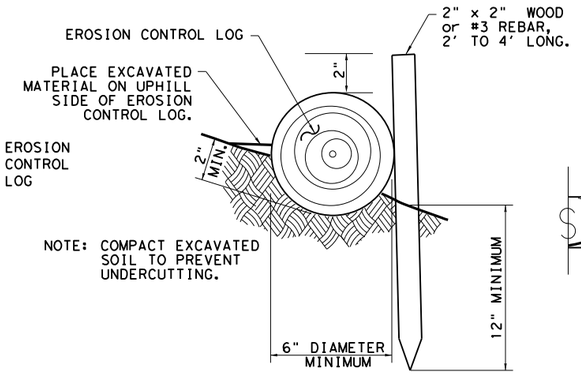
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

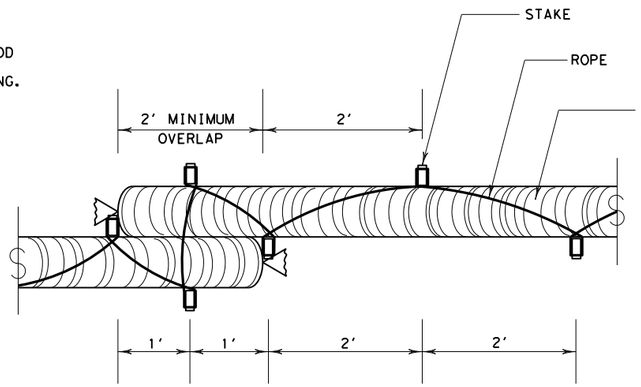


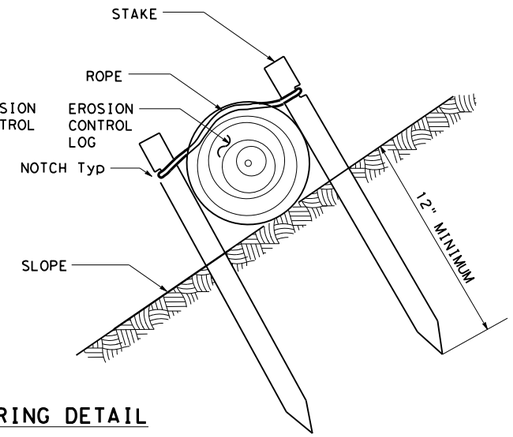


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

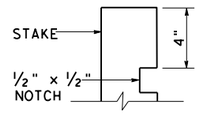
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
EROSION CONTROL LOG
EC(9)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
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	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		189

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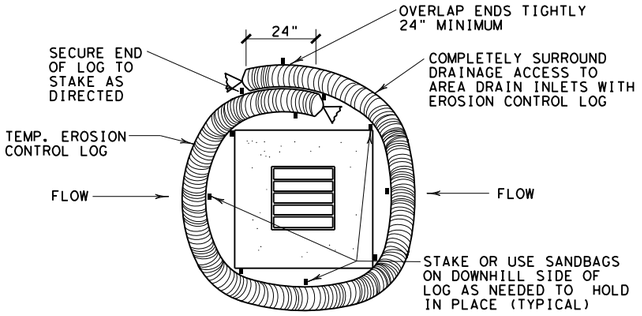
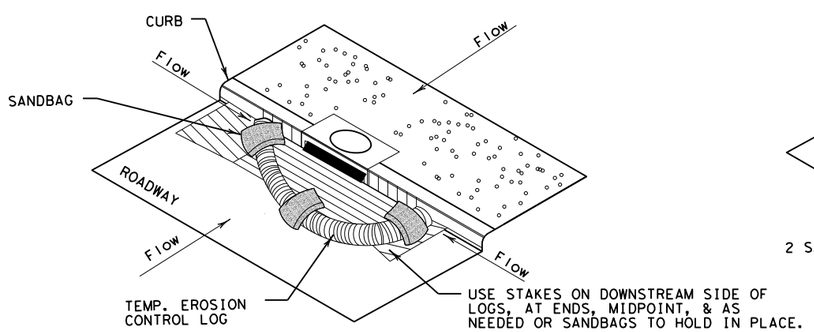


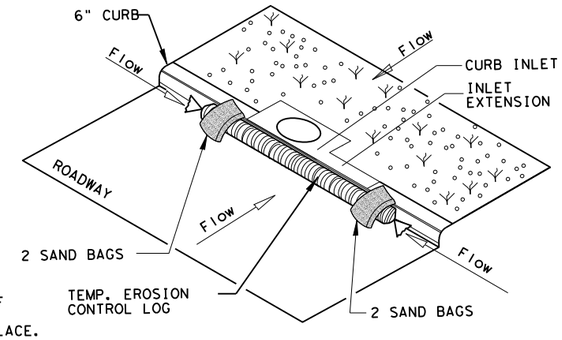
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

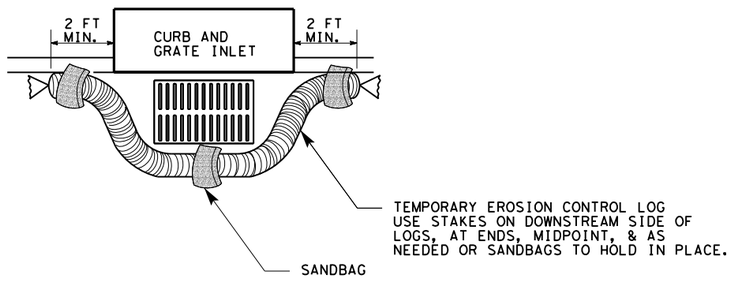
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

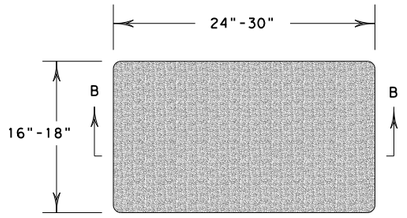
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

SECTION B-B



SANDBAG DETAIL

SHEET 3 OF 3

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT		CK: KM	DW: LS/PT		CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0233	02	035,etc		US 62	
	DIST	COUNTY				SHEET NO.
	ELP	CULBERSON				190