FED. RD. DIV. NO.	PROJECT NUMBER		HIGHWAY NUMBER
6	C 917-00-51		VARIOUS
STATE	DISTRICT	COUNTY	
TEXAS	BRY	BRAZOS	
CONTROL	SECTION	JOB	SHEET NO.
0917	00	051	1

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

SEE SHEET 2
FOR INDEX OF SHEETS

PROJECT NUMBER: C 917-00-51

VARIOUS

BRAZOS COUNTY

TOTAL LENGTH OF PROJECT = 0.00 FT = 0.001 MILES

FOR THE CONSTRUCTION OF MISCELLANEOUS WORK CONSISTING OF TRAFFIC SIGNAL IMPROVEMENTS

FINAL PLANS

CONTRACTOR:

LETTING DATE:

DATE CONTRACTOR BEGAN WORK:

DATE WORK WAS COMPLETED:

DATE WORK WAS ACCEPTED:

FINAL CONTRACT COST: $

HIGHWAY	CONTROL NO.	LIMITS	STATION		REFERENCE MARKERS		TOTAL LENGTH (FT)	BRIDGE LENGTH (FT)	RDWY LENGTH (FT)
			FROM	TO	BEGIN	END			
VARIOUS	0917-00-051	VARIOUS LOCATIONS IN BRAZOS, BURLESON, FREESTONE, GRIMES, LEON, MADISON, MILAM, ROBERTSON, WALKER, AND WASHINGTON COUNTIES	N/A	N/A	N/A	N/A	N/A	0	N/A

STATE OF TEXAS
KEVIN D. TYER
87924
LICENSED
PROFESSIONAL ENGINEER

TRAF-IQ
14811 ST. MARY'S LANE, SUITE 180
HOUSTON, TEXAS 77079
832.399.1100
TEXAS PE FIRM REG # F-18726

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014, AND SPECIFICATION ITEMS LISTED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT:

REQUIRED SPECIAL LABOR PROVISIONS FOR ALL STATE CONSTRUCTION PROJECTS. (SP000---008)

NO EXCEPTIONS
NO EQUATIONS
NO RAILROAD CROSSINGS

TEXAS DEPARTMENT OF TRANSPORTATION®

SUBMITTED FOR LETTING: 6/3/2021
DocuSigned by:
59B67CE6AA5C433...
DESIGN MANAGER

RECOMMENDED FOR LETTING: 6/3/2021
DocuSigned by:
DAA3B0E...
DIRECTOR OF TRANSPORTATION PLANNING AND DEVELOPMENT

APPROVED FOR LETTING: 6/3/2021
DocuSigned by:
7A1E426988DE4A3...
DISTRICT ENGINEER

SHEET NO. DESCRIPTION

KEVIN D. TYER, P.E. — P.E.

05/27/2021
DATE

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

TRAF-IQ
14811 ST. MARY'S LANE, SUITE 180
HOUSTON, TEXAS 77079
832.399.1100
TEXAS PE FIRM REG # F-18726

NO.	DATE	REVISION	APPROV.

Texas Department of Transportation

INDEX OF SHEETS

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6	C 917-00-51		2
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS

GENERAL:

Contractor questions on this project are to be addressed to the following individuals:
Ashley Hill, P.E., A.E., Ashley.Hill@txdot.gov
Joseph Grieve, P.E., A.A.E., Joseph.Grieve@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.

Wiring coding will be done in accordance with the NEC (National Electrical Code).

Send eligible shop plan submittals with PDF attachments directly to the reviewing office.

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Highway: **Various** **Control:** **0917-00-051**
County: **Brazos**

ITEM 7 "LEGAL RELATIONS AND RESPONSIBILITIES"

State contract mowers will mow the right of way during the growing season. The Contractor will be notified by the Engineer one week in advance of the anticipated time when mowers will be in the limits of the project. Clean the right of way to such a condition that allows the mowing contractors to safely mow.

This project is on a hurricane evacuation route. Furnish at the pre-construction meeting a written plan outlining procedures to suspend work, secure the job site and safely handle traffic through and across the project in the event of a hurricane evacuation.

During the hurricane season (June 1 through November 30), do not close any travel lanes except when the Contractor can demonstrate that he can provide labor, equipment, material, work plan, and quality of work to satisfactorily return all lanes to an open, all-weather travel surface within three days of receiving written or verbal notice but no later than 3 days prior to hurricane landfall. Construction of temporary lanes to an all-weather surface will be paid in accordance with Article 9.7, "Payment for Extra Work and Force Account Method".

In addition to lane closures, cease work 3 days prior to hurricane landfall on or near the roadway that adversely impacts the flow of traffic and reduces the capacity of the highway during an evacuation. Prohibit the Contractor's, sub-contractors' or material suppliers' vehicles from entering or exiting the stream of traffic including material hauling and delivery, and mobilization or demobilization of equipment. When directed, this prohibition will include a reasonable time period for the evacuees to return to their point of origin.

In the event of the declaration of a hurricane watch, warning, other severe weather warning or national or state emergency that requires the roadways in the vicinity be used as evacuation routes, cease all work that requires the Contractor's, sub-contractors' or material suppliers' vehicles to enter the stream of traffic on these primary or secondary evacuation routes. This work includes material hauling and delivery, and mobilization or demobilization of equipment.

The following roadways are recognized evacuation routes in the Bryan District:
Primary Evacuation Routes: IH 45, US 290, SH 6, SH 36.
Secondary Evacuation Routes: US 79, US 84, SH 7, SH 30, SH 21, SH 105.
Other routes may be designated.

Roadway closures during the following key dates and/or special events are prohibited:

- Day before and day of Texas A&M home football games
- Texas A&M graduation
- Texas A&M Parents Weekend

The Engineer may decide to restrict construction operations or lane closures on these key dates and/or special events.

ITEM 8 "PROSECUTION AND PROGRESS"

By noon of each Wednesday, provide the Engineer a written outline of the daily work schedule for the following week. Include in the outline the times and places for proposed traffic control changes, lane and shoulder closures, and moving operations or other operations that affect traffic on the roadway. Unless otherwise authorized by the Engineer, prosecute the work on this project in accordance with the following sequence of work:

1) Set advance signing and barricades along US190 prior to starting the signal cabinet replacement work. For all other sites, the Contractor will keep a copy of the project with the required documentation on hand when replacing cabinet locks or installing cellular modems. As there are multiple intersection locations along this project, the Contractor may complete the work by intersection or combine work between locations. The contractor will confirm with the Bryan Area Office the planned work to ensure the appropriate inspection of barricades, work, and time charges. The use of TMAs are required when the Contractor is operating equipment within the roadway and out to the clear zone. The contractor may use law enforcement through a force account when necessary.
2) Complete work for given location. The time associated with traffic control has been set based on the Contractor only working one intersection at a time, but work may be conducted concurrently if the contractor has the time and staffing. Some work may overlap with work by other contractors, and this should be coordinated through TxDOT. Each Contractor is still responsible for his or her own traffic control based on the needs of the work.
3) The Contractor will let TxDOT know at least 5 working days prior to when the signal controller cabinet is scheduled to be replaced. The replacement will be scheduled during the off-peak period, and the day and time must be approved by the Engineer. All-way stop will be setup prior to taking the signal off-line, and the signs must be removed prior to taking the signal out of all-red flash. Law enforcement may be used.
4) The Contractor will provide on-call staff to handle trouble calls for the newly installed signal equipment within the 30-day test period.
5) Final Cleanup.

Some of these operations may be performed simultaneously.

Prepare Progress Schedule Bar Chart.

At no time is work to be conducted over an active traffic lane.

Work in the travel lanes (including lane closures) is not allowed from (6 AM) to (9 AM) and from (4 PM) to (7 PM), Monday through Friday. Work may be performed during the nighttime only with advanced approval by the Engineer.

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

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Highway: **Various** **Control:** **0917-00-051**

County: **Brazos**

Equipment and material may be pre-staged at approved locations.
The 90-day delayed start allowed after authorization under SP008-003 is to give Contractor time for material acquisition.

ITEM 502 "BARRICADES, SIGNS AND TRAFFIC HANDLING"

Where shown on applicable TCP standards, channelizing devices on the centerline are required at all times; including when a pilot vehicle is used to lead traffic. Mount a G20-4 sign at a conspicuous location on the rear of the vehicle. Traffic delays caused by one-lane, two-way traffic control, will not be allowed to exceed 5 minutes unless approved by the Engineer.

During one-way operations, station flaggers at all county roads and any other locations, such as private businesses, that may have traffic entering the work area.

Removal of ground mounted temporary signs and supports as specified on standard sheet BC(5), shall include the immediate backfilling of support holes with Type B embankment material and the compaction of the backfill material.

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

Law enforcement assistance will be required for this project and is expected to be required for major traffic control changes and lane closures. Coordinate with local law enforcement and arrange for law enforcement as directed or agreed by the Engineer. Complete the weekly tracking form provided by the department and submit invoices that agree with the tracking form for payment at the end of each month approved services were provided.

Provide construction fencing as approved at all work locations to protect pedestrian or bicycle traffic. This material and its placement will be considered subsidiary to Item 502.

ITEM 506 "TEMPORARY EROSION, SEDIMENTATION AND ENVIRONMENTAL CONTROLS"

It is not anticipated that any erosion control devices will be needed on this project. However, in the event that any devices are needed, payment for the work will be determined in accordance with Article 9.7, "Payment for Extra Work and Force Account Method".

ITEM 690 "MAINTENANCE OF TRAFFIC SIGNALS"

The Contractor shall install TRF approved TS2 traffic signal cabinet with digital electronic key access with a Siemens M60 Linux based TS2-Type 2 traffic signal controller with GPS clock, EDI Smart MMU, and Moxa SDS-3008 field hardened managed Ethernet switch.

The Contractor shall provide TxDOT a list of proposed signal related items that will be purchased prior to purchase for approval.

Cabinet Design and Configuration:

1. No self-tapping fasteners are to be used in the construction of any part of the cabinet design.
2. Provide NEMA TS 2 Size 5, Configuration 3. Refer to details provided in the plans for Size 5 cabinet dimensions and equipment configuration.
3. Existing cabinet risers are to be reused for mounting Size 5 cabinet.
4. Provide cabinet door(s) with a full-length piano hinge with stainless steel pins spot-welded at the top of the hinge. Provide door stops at the top and bottom meeting NEMA Standards Publication 2016 NEMA TS-2 Version 03.07 Clause 7.5.3. Provide three position "J" hook arm mounted door stops.
5. Provide smart lock in accordance with details above and install in place of standard No. 2 Corbin lock. Provide smart keys, charging station, vendor software, operations manual, and associated system accessories to the Department.
6. Attach aluminum lifting ears to the top of the cabinet to permit lifting the cabinet with a sling. Lifting ears with holes are provided on the cabinet so that the cabinet can be loaded and unloaded and transported in an upright position. The comers of each eye or ear shall be rounded and in the down position when shipped. These ears shall utilize only one bolt for easy reorientation with no tools needed for positioning of the ear for lifting purposes. Lifting ears may be permanently fabricated to the cabinet frame as long as they do not interfere with the construction and operation of the sunshield (if provided). Manufacturer may provide removable lifting ears that can be removed after installation. Seal any penetrations to the cabinet exterior or sunshield after removal of lifting eyes.
7. Department to provide TxDOT logo sticker for all cabinets under department control. Department to obtain TxDOT logo from TRF.
8. Powder-coat the interior of the cabinet 90% gloss smooth white.
9. Provide vertical shelf support and side unistrut "C" channels meeting the approved dimensions detailed below. Dimensions are in inches.

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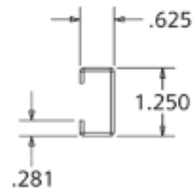
County: **Brazos**

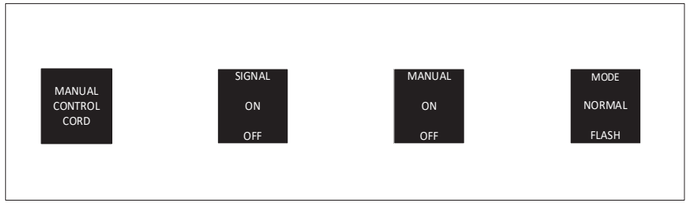


Vertical Shelf Support Unistrut "C" Channel

10. Provide cabinet shelves, perforated to encourage efficient air flow inside the cabinet but not impacting equipment placement and orientation.
11. Provide finger-safe thermostats, Bud Industries Part No. TS-15-A, or equivalent.
12. Provide a locking, auxiliary police door in the door of the cabinet to provide access to a panel containing a signal-shutdown switch, a signal-flash switch, a manual-automatic switch, and a manual-advance, push-button switch on a 6-foot, retractable cord. The police door must be gasketed to prevent entry of moisture or dust, and the lock must be provided with one brass key. All the switches within the police panel shall be a two-position toggle switch. All switches will be labeled according to their functions show in figure below.
    i. Switch Functions

1. Mode (Normal/Flash)
    a. Normal - In the normal position, the signals will operate in a normal operation.
    b. Flash - In the flash position, the signals flash switch shall cause the intersection to be placed in flashing position and the controller shall stop time. Power shall not be dropped to the CU, MMU, BIUs, and detector rack when the police panel switch is in the FLASH position.
2. Manual (On/Off)
    a. ON - When in the ON position, control of the controller unit from the police door must override any external control (external logic, etc.) in effect when the manual-automatic switch is in the on (manual) position. Each actuation of the manual-advance push-button switch must advance the controller to the next interval. Manual control must not override any calls for PE.
    b. OFF - When in the OFF position, the controller will operate in a normal operation.

3. Signal (On/Off)
    a. ON - When in the ON position, the signals shall cause all intersection displays to be turned on.
    b. OFF - When in the OFF position, the signals shall cause all intersections displays to be turned off.



Police Panel Switch Configuration

13. Provide a reusable, washable, aluminum mesh air filter.
14. Provide a door switch meeting the following requirements:
    - momentary, pin-type door switch,
    - installed in the cabinet or on the door,
    - connected to a terminal so that the equipment installed in the cabinet can confirm input is connected to logic ground when the cabinet door is open, and
    - engage cabinet light when the door is opened.
15. Provide 2 momentary, pin-type door switches for each door provided with the cabinet. Wire 1 switch to turn on the cabinet lights when the door is open, and off when the door is closed. Wire the other in parallel to a terminal block to detect a cabinet intrusion condition.
16. All connector-wiring harnesses shall terminate all wires on terminal blocks, whether the wires are utilized or not. This pertains to all devices being installed at the factory or in the field.
17. Provide AC internal cabinet wiring in accordance with the most current version of the NEC. Size conductors serving receptacles to be rated for receptacle amperage rating in accordance with the NEC.
18. Provide a finger-safe terminal block with a minimum of five compression-fitting terminals designed to accept up to a 4 AWG stranded wire for connection of the AC power lines. The block must be rated at 50 amperes. Use Ferraz Shawmut FSPDB1C or exact equivalent. The terminal block will allow additional battery backup unit (BBU) wiring without the need to use any Burndy style connectors. The wiring info below is an illustration of what shall be provided. The wiring of the terminal block shall be as follows:

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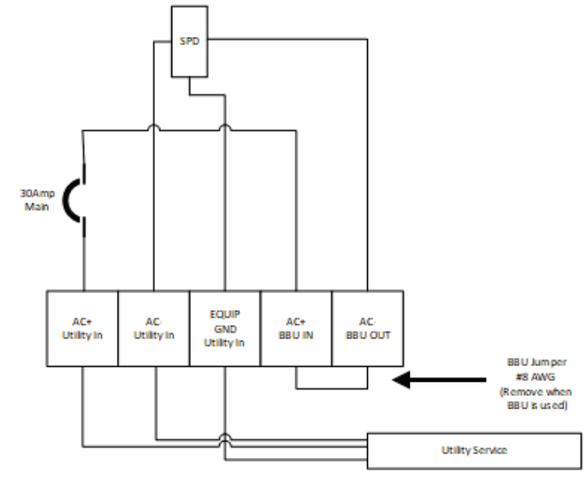
County: Brazos



Terminal Block Wiring Schematic

19. Provide all load switches having both input and output indicators. For each circuit in each load switch. The indicator light must be on when a “Low Voltage Active” input to the load switch is present. The indicator light must be on when a “High Voltage Active’ input to the load switch is present.
20. Provide five circuit breakers as follows:
    - Main breaker – Size the main circuit breaker such that the load of all branch circuits is less than the main circuit breaker ampere rating in accordance with the most current version of the NEC. This breaker must protect the signal load circuits, controller circuits, malfunction management unit (MMU), and card-rack- detector power supply
    - Accessory breaker – Minimum 15 A. Size to service LED lights, trouble light, fans, door switches, smart lock, and ground fault circuit interrupter (GFCI) receptacle in accordance with the NEC.
    - Equipment breaker – Minimum 15 A. Size to service Internet Protocol (IP) addressable power strip, electronic equipment, network or Intelligent Transportation System (ITS) equipment, and convenience duplex receptacles in accordance with the NEC.
    - Flasher breaker – Minimum 15 A. Size to service 2-circuit flasher and lighting panel.
    - Spare – Minimum 15 A. Provide one spare equipment breaker for future use.

The four minimum 15 A and main thermal-type circuit breakers must be mounted and wired in the cabinet.

The breakers must be Square “D,” QUO-150 Series or approved equivalent.

Equip the circuit breakers with solderless connectors and install on the right side wall (facing the cabinet) or lower-right side of the back panel inside the cabinet. Position the breakers so that they are easily accessible and rating markings are visible.
The above breakers are in addition to any auxiliary fuses furnished with the controller to protect component parts, such as transformers, etc.
Mount and wire a NEMA Type 5-15R GFCI type duplex receptacle to the maintenance panel on the inside of the cabinet door. This GFCI duplex receptacle is intended for maintenance personnel and is not to be used to serve equipment inside the cabinet. Permanently label GFCI duplex receptacles “Service Receptacle” .
Provide GFCI with a self-monitoring system that provides light indicators as follows:

- A green light – If the green light is on this means the outlet is working as intended, and it is providing the necessary protection.
- A red light – A red light means that there is a problem with the device. Further investigation needs to be carried out.
- No lights – If neither red nor green light is flashing, this means that no power is reaching the outlet or that the outlet may be tripped.

GFCI shall have test buttons on the face of it that perform the following:

- Test - To ensure the outlet is working properly
- Reset – To return power to the outlet after a test or trip has taken place

These ‘Test’ and ‘Reset’ buttons on the face of the GFCI shall be colored coded as the following:

- Test – Shall be ‘Red’ in color
- Reset – Shall be ‘Black’ in color

Mount and wire two additional duplex receptacles (to service network, ITS, and other electronic equipment) in the upper-left side and upper-right side of the cabinet. These receptacles are to be protected by the equipment breaker.

21. There shall be a maintenance panel on the inside of the main door containing the following:

- GFCI duplex convenience outlet
- Stop time (On/Off) Switch
- Test (Normal/Flash) Switch
- Controller (On/Off) SwitchSystem/Free Switch
- Vehicle Switch
- Ped Switch
- Preempt Test Switch

All the switches on this maintenance panel shall be a two-position toggle switch. All switches will be labeled according to their functions show in figure below.

Switch Functions:

- Stop Time (ON/OFF)
  - On - In the ON (UP) position, stop timing power shall be applied to the controller.
  - Off - In the OFF (DOWN) position shall be the normal operating position and allow auxiliary devices to apply stop timing inputs to the controller. The

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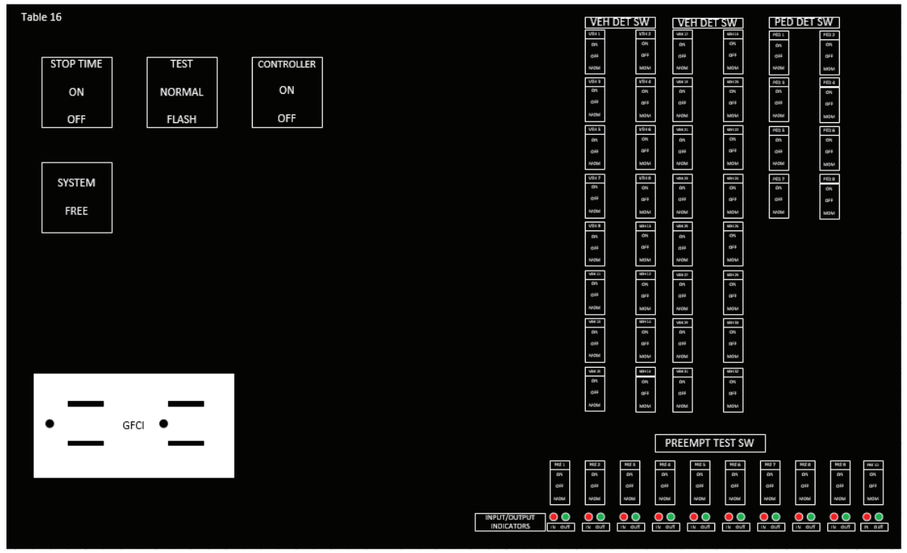
County: Brazos

conflict monitor shall be wired through the stop time switch such that when in the OFF setting and a conflict is detected, stop timing shall be applied to the controller.

- Test (NORMAL/FLASH)
  - Normal - When the switch is in the NORMAL position, the signals will operate in a normal operation.
  - Flash - When the switch is in the FLASH position, the call for flashing operation must occur. No power is to be removed to the CU, MMU or Power Supply when in this position.
- Controller (ON/OFF)
  - On - In the ON position, the signals will operate in a normal operation.
  - Off - In the OFF position, this switch shall remove power from the CU and MMU and the intersection shall be placed in flashing operation.
- System/Free (SYSTEM/FREE)
  - System - When in the ‘SYSTEM’ (UP) position, the controller unit shall be under the control of the master controller, or TBC.
  - Free - When the system switch is in the ‘FREE’ (DOWN) position, the controller unit shall operate in a non- coordinated (free) mode that releases the local controller to operate in an isolated, full-actuated manner when necessary for maintenance purposes.
- Vehicle (ON/OFF/CALL)
  - On – Normal operation
  - Off – Detector operation is off
  - Call – Momentary call of detector
- Ped (ON/OFF/CALL)
  - On – Normal operation
  - Off – Detector operation is off
  - Call – Momentary call of detector
- Preempt (CALL/OFF)
  - Call – Momentary call
  - Off – Normal operation

Switch guards or switch covers will be installed on all switches mounted to door interiors such as; the Test-normal switch and stop time switch to prevent accidental activation when the door is open. A single clear, nonconductive plastic cover to prevent accidental activation meeting the functional intent are acceptable but require approval in writing by the Engineer. If a single cover is to be used, the cover will lock in the up right (open) position when activating switches behind the cover.

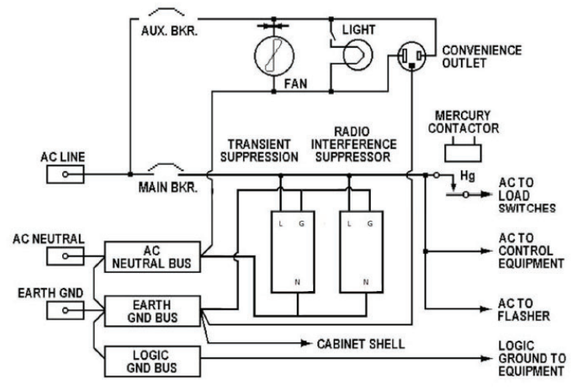


Maintenance Panel Configuration

22. Only use a 15 pin SDLC bus panel for all SDLC connections within the cabinet. Provide, one spare SDLC port on the SDLC bus and one spare SDLC cable that will be connected additional equipment to be added to the cabinet and giving access to the controller unit.
23. The cabinet must include parallel surge protection device (SPD) (Series installed SPD not permitted) on the AC service input that meets or exceeds the following requirements:
    - Install an SPD inside of the cabinet on the power distribution to the equipment. Keep leads as short as possible with all conductor bends formed to the maximum possible radius. Connect the SPD ground lead directly to the ground bus. Use of wire nuts is prohibited. Install in accordance with manufacturers recommendations.
    - Provide UL Listed Type 1 SPD labeled to UL 1449 4th edition posted at UL.com, under Certifications UL Category Code VZCA, and have a 20kA I-nominal rating. Provide SPD rated for appropriate environmental use per application
    - Do not exceed 1500V V on the Voltage Protection Rating (VPR) on any mode (L-N and N-G and L-G)
    - A minimum voltage of 150 V for the Maximum Continuous Operating Voltage (MCOV).
    - Equal or exceed 50kA kA at 8/20µs the SPD surge current rating per mode (L-N) and (N-G) and L-G.
    - Equal or exceed 50 kA at 8/20µs or the available short circuit current, whichever is higher for the SPD UL 1449 4th edition for Short Circuit Current Rating (SCCR).

    - SPD provided with Metal Oxide Varistors (MOV) shall include thermal disconnect for each MOV for safety purposes
    - Gas tube and spark gap SPD are not be permitted alone on any current carrying phase. Ensure each MOV's operational status can be monitored via visual indicator, including N-G mode when applicable.
    - Provide SPD with one set of Normally Open (NO), Normally Closed (NC) Form C contacts for remote monitoring, and replaceable modules.
    - SPD shall not allow any leakage current to ground
    - An EMI/RFI filter, independent from the SPD shall be provided and installed on the load side of the signal circuit breaker and shall be protected by the surge protector. This filter shall be rated for the maximum load of the cabinet and shall provide a minimum attenuation of 50 decibels over the frequency range of 200 kHz to 75 MHz. This Filter shall be UL 1283 Certified, under Certifications UL Category Code FOKY.

The figure below presents a typical cabinet power distribution schematic with parallel SPD protection.



Typical Power Distribution with Parallel SPD

24. The cabinet must include a low-voltage power, control, and data surge protection devices that meets or exceeds the following requirements:
    - Install a specialized SPD on all conductive circuits including, but not limited to, data communication cables, coaxial video cables, and low-voltage power cables. Ensure that these devices comply with the functional requirements shown in the table below for all available modes (i.e., power L-N, N-G; data and signal center pin-to-shield, L-L, L-G, and shield-G where appropriate).
    - These specialized SPD must have an operating voltage matching the characteristics of the circuit. Ensure that these specialized SPD are UL 1449 4th edition, VZCA for low voltage power and control, UL497B, QVGQ for Dataline surge protection, or UL 497E, QVLA, for Coaxial surge protection, as applicable.

- Provide the SPD with 3 stages of surge suppression in a Pi (π) configuration. The first stage (primary side) consists of parallel-connected Gas Discharge Tubes (GDTs). The second stage consists of a series connected resistor or inductor. The third stage (secondary side) consists of parallel-connected transorbs or silicone avalanche diodes (SADs).
- Ground the SPD to the DIN rail and a wire terminal connection point. (Grounding solely through the DIN rail connection is not adequate and does not meet the performance or intent of this specification.)
- Install coaxial SPDs in a manner that prevents ground loops and resulting signal deterioration. This is usually caused where the cable has different references to ground at either end and connecting SPDs at both ends that have only Pin to Shield protection completes a ground loop circuit through the Shield. Provide independent shield protection not connected to ground.

SPD Minimum Requirements

Circuit Description	Maximum Continuous Operating Voltage (MCOV)	Frequency/ Bandwidth/ Data Rate	Surge Capacity	Maximum Let-Through Voltage
Power – UL 1449 Category code VZCA				
12 VDC	15-20 V	N/A	5 kA per mode (8x20 µs)	<150 Vpk
24 VAC	30-55 V	N/A	5 kA per mode (8x20 µs)	<175 Vpk
48 VDC	60-85 V	N/A	5 kA per mode (8x20 µs)	<200 Vpk
12 VDC	15-20 V	N/A	5 kA per mode (8x20 µs)	<150 Vpk
Coaxial Lead-in Conductors – UL 497E category code QVLA				
Coaxial Lead-in Conductors	4-8 V	Up to 4GHz	10 kA per mode (8x20 µs)	<100 Vpk

Circuit Description	Maximum Continuous Operating Voltage (MCOV)	Frequency/ Bandwidth/ Data Rate	Surge Capacity	Maximum Let-Through Voltage
Data Line Communications- UL 497B category code QVGQ				
RS422/RS485	8-15 V	Up to 10 Mbps	10 kA per mode (8x20 µs)	<30 Vpk
T1	13-30V	Up to 10 Mbps	10 kA per mode (8x20 µs)	<30 Vpk
Ethernet Data	7-12V	Up to 1000 Mbps	2kAper mode (10x1000 µs)	<30 Vpk
Serial Communication	6-15V	Up to 40Mbps	400A 8x20 µs	Serial Communication

25. Provide low-wattage quick-connect LED lighting for interior lighting in the cabinet. Provide cool white (6000K) color LED light fixture with a minimum 190 lumens. The lighting must illuminate the back and side panels so all stenciled lettering are readable in the cabinet. A toggle switch will be provided allowing the user to manually turn off LED lighting. In addition to the toggle switch, the LED lighting shall turn on when the cabinet door is opened, and turn off when the cabinet door is closed. A MOV or other such transient suppression device shall be placed across the AC power input to the LED power supply lighting.

Install three LED lights with switches with equivalent light quality in the cabinet. One light is to be located at the top of the cabinet, one light is to be located to illuminate the pull out drawer, and one light is to be located on one side wall of the cabinet to illuminate the load switch bay. Enable lights to turn on when the cabinet door is opened and turn off when the cabinet door is closed. Power the lights with quick-connect wiring.

26. Provide low-amperage quick-connect fans.
27. All back panels within the cabinet shall be matte black anodized aluminum, silkscreen printed in white lettering for identifying all inputs/outputs-termination points. The silk screen shall meet all temperature requirements in section 2 of the NEMA Standards Publication 2016 NEMA TS-2 Version 03.07, or latest version to prevent fading, peeling, etc.
28. Provide copper ground buses for both the power-supply neutral (common) and chassis ground. Each bus bar must provide a minimum of ten unused terminals with eight 32 × 5/16-in. or larger screws. Provide two neutral and ground bus bars, left and right of the lower part of the. Also, provide three neutral bus bars located that the bottom of the main load switch panel directly below the field output terminals. All neutral buses shall be bonded, and all ground buses shall be bonded. Space neutrals buses out equally across the field output terminals.

29. Provide power supplies with a separate front panel indicator LED for each of the four (4) outputs. Front panel banana jack test points for 24VDC and logic ground shall also be provided. The cabinet power supply shall be shelf mounted. It shall not be attached to the back panel or shelf.
30. Provide bus interface units (BIUs) meeting all NEMA TS2 Section 8 requirements. Provide BIUs with three (3) separate front panel indicator light emitting diodes (LEDs) for power, transmit, and valid data.
31. Provide flash transfer relays meeting NEMA TS2 Section 6 requirements.
32. Provide shielded Category 6 Ethernet communication cables in accordance with Item 6004, "Networking Intelligent Transportation System (ITS) Communication Cable." Each cable to measure 8 linear feet and be bundled and stored in the controller cabinet pull out drawer during delivery and for Contractor use. Provide Ethernet communication cables following the color scheme and assignment information as follows:
    - White - Ethernet Switch (1' Patch Cord)
    - Blue – Traffic Signal Controller
    - Green – Malfunction Monitor Unit (MMU)
    - Red – Battery Backup Unit (BBU)
    - Yellow - APS (Accessible Pedestrian System)
    - Black – Detection (i.e. radar, video, etc)
    - Purple - PTZ Camera
    - Orange - Other
    - Grey - Other
    - Pink - Broadband Radio

Contractor shall procure and install retrofit cabinet lock at each identified traffic control cabinet per manufacturer installation procedure. Payment for the items identified below shall be subsidiary to Item 680.

Create a log containing electronic lock serial numbers and physical intersection cross streets where each lock was installed. Provide to the Department district office 114 Bluetooth capable electronic keys, with remote charging cable. Each key shall support recharging of the key battery with a simple mini-USB cable.

Provide to the Department district office the programming communicator hardware and software suitable for programming all electronic keys. The applicable programming software will be downloaded and installed on to the programming unit. Contractor to program a minimum of 10 keys in the presence of Department district personnel using user-privilege data provided by the Department district. Provide suitable training to Department district staff on use and operation of programming unit, remote key privileges configuration, and electronic key use. Provide training or instruction to the Department district personnel on required software to be installed on the user's mobile device(s) to support remote key credential update.

Sheet: 3H
Highway: Various Control: 0917-00-051
County: Brazos

There is one approved electronic lock system for use on this project: Cyberlock. The procurement shall be consistent with the following part numbers, or approved equivalent:

Cyberlock System Part Numbers

- Field cabinet lock – part number CL-TC2L (reference quantity sheet for number of units). Each of these locks are left-hand open doors.
- Field cabinet keys – part number CK-BLUE3 (quantity identified above)
- District programming unit – part number CKS-020 (quantity 1)

ITEM 6185 "TRUCK MOUNTED ATTENUATOR (TMA) AND TRAILER ATTENUATOR (TA)"

In addition to the shadow vehicles with truck mounted attenuator (TMA) that are specified as being required on the traffic control plan for this project,

provide one (1) shadow vehicle with TMA for WZ(BTS-1)-13 as detailed on "NEAR SIDE LANE CLOSURE" of this standard sheet,

Therefore, one (1) 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.

Ten (10) TMA days are provided in the project estimate for stationary operations.

ITEM 6430 "CELLULAR ROUTER"

Contractor shall transport, install, and test Department district-furnished cellular router with power supply and power cable assembly. Provide a minimum of 30 days' notice to the Department district for pick-up of the routers. Install cellular router in equipment cabinets in accordance with details shown in the plans or as directed. Provide all materials not supplied by the Department district necessary for the cellular router installation. Router shall be powered by hardwiring to power panel on right side of signal cabinet. Before fabrication, submit for approval five prints of the working drawings for attachment of the cellular routers. Show the details of any additional brackets, connections, and methods of attachment.

Testing of the cellular router is for the purpose of relieving the Contractor of maintenance of the system. The Contractor will be relieved of the responsibility for maintenance of the cellular router in accordance with Item 7 after all testing is successfully completed.

After all cellular routers have been installed, the Department district will conduct approved continuity, stand alone, and cellular router tests on the installed field equipment with central, remote, and laptop equipment. A final acceptance test will be conducted to demonstrate all

control, monitor, and communication requirements for 90 days. The Engineer will furnish a letter acknowledging the final acceptance testing commencement date stating the first day of the final acceptance test. The completion of the final acceptance test occurs when system downtime due to mechanical, electrical, or other malfunctions to equipment furnished or installed does not exceed 72 hrs. and any individual points of failure identified during the test period have operated free of defects. Assume responsibility only for test failures directly related to the work in accordance with this Item.

At intersections where cellular router is installed, provide four ethernet cables to connect cellular router ethernet ports to the controller, MMU, and two other equipment located within the cabinet. Each cable length shall be 5 ft long minimum, and all extra length shall be neatly coiled and tie-wrapped. Ethernet cables shall be factory terminated and are not to be cut or terminated by Contractor.

Provide Category 6 Ethernet communication cables in accordance with Item 6004, “Networking Intelligent Transportation System (ITS) Communication Cable.” Provide Ethernet communication cables following the color scheme and assignment information as follows:

- Blue – Traffic Signal Controller
- Green – Malfunction Monitor Unit (MMU)
- Red – Battery Backup Unit (BBU), if present
- Yellow – APS (Accessible Pedestrian System), if present
- Black – Detection (i.e. radar, video, etc), if present

The cellular router has a total of 4 ethernet ports. The Contractor shall coordinate with the Department district which equipment shall be connected to the router, up to the maximum of 4.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0917-00-051 **DISTRICT** Bryan **COUNTY** Brazos
HIGHWAY Various

		CONTROL SECTION JOB		**0917-00-051**		TOTAL EST.	TOTAL FINAL
		PROJECT ID		**A00134475**			
		COUNTY		**Brazos**			
		HIGHWAY		**Various**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	3.000		3.000	
	690-6042	REPLACE OF CONTROL CABINET(POLE MNT)	EA	6.000		6.000	
	690-6142	REPLACE CABINET LOCK	EA	114.000		114.000	
	6185-6002	TMA (STATIONARY)	DAY	10.000		10.000	
	6430-6001	INSTALL CELLULAR ROUTER	EA	10.000		10.000	
	18	EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	
		LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	

SCHEDULE OF MATERIALS

LOCATION	690 6042 REPLACE OF CONTROL CABINET (POLE MNT) *	690 6142 ELECTRONIC LOCK (FURNISH & INSTALL)	6430 6001 INSTALL CELLULAR ROUTER**
	EA	EA	EA
BRAZOS COUNTY			
US 190/SH 6 (N EARL RUDDER FWY) AT FM 2818		1	
US 190/SH 6 (N EARL RUDDER FWY) AT FM 974 (WILKES ST/TABOR RD)		1	
US 190 W/SH 6 (N EARL RUDDER FWY) AT US 190 E/SH 21		1	
SH 6 (N EARL RUDDER FWY) AT M L KING JR ST/OLD RELIANCE RD		1	
SH 6 (N EARL RUDDER FWY) AT FM 158 (E WILLIAM J BRYAN PKWY/BOONVILLE RD)		1	
SH 6 (N EARL RUDDER FWY) AT BRIARCREST DR		1	
SH 6 (EARL RUDDER FWY S) AT FM 60 (UNIVERSITY DR E)		1	
SH 6 (EARL RUDDER FWY S) AT SH 30 (HARVEY RD)		1	
SH 6 (EARL RUDDER FWY S) AT SOUTHWEST PKWY/RAINTREE DR		1	
SH 6 (EARL RUDDER FWY S) AT ROCK PRAIRIE RD		1	
SH 6 (EARL RUDDER FWY S) AT WILLIAM D. FITCH PKWY		1	
SH 30 AT WILLIAM D. FITCH PKWY		1	
US 190/SH 21 AT FM 2776 (ANDERT RD)		1	
SUBTOTAL	**0**	**13**	**0**
BURLESON COUNTY			
SH 21 (PRESIDENTIAL CORRIDOR E) AT CR 300		1	
SH 21 (PRESIDENTIAL CORRIDOR E) AT SH 36 (N GREEN ST)		1	
SH 21 (PRESIDENTIAL CORRIDOR E) AT N MAIN ST		1	
SH 21 (PRESIDENTIAL CORRIDOR W) AT FM 975 (N BANK ST)		1	
SH 21 (PRESIDENTIAL CORRIDOR W) AT FM 2000/CR 307		1	
SH 36 (S GREEN ST) AT LP 83 (E BUCK ST)		1	
SH 36 (AVE B) AT FM 1361 (8TH ST)		1	
SUBTOTAL	**0**	**7**	**0**
FREESTONE COUNTY			
US 84 (TEAGUE ST) AT IH 45 SERVICE RD		1	
US 84 (W COMMERCE ST) AT SH 75		1	
US 84 (COMMERCE ST) AT S MOUNT ST		1	
US 84 (E COMMERCE ST) AT OAK ST		1	
US 84 AT FM 553		1	
FM 27 AT IH 45 SERVICE RD		1	
SUBTOTAL	**0**	**6**	**0**
GRIMES COUNTY			
SH 6/SH 105 E AT SH 90/SH 150 W (E WASHINGTON AVE)		1	
SH 6/SH 105 W AT SPUR 515/SH 105 E		1	
SH 105 (E WASHINGTON AVE) AT BROSIG AVE		1	
SH 105 AT FM 1774		1	
SH 105 (WASHINGTON AVE) AT SH 6 (LA SALLE ST)		1	
SH 105 (WASHINGTON AVE) AT FM 379 (5TH ST)		1	
SUBTOTAL	**0**	**6**	**0**
LEON COUNTY			
US 79 (N MAIN ST/W COMMERCE ST) AT IH 45		1	
US 79 (COMMERCE ST) AT SH 75 N		1	
US 79 (E COMMERCE ST) AT CENTER ST		1	
SUBTOTAL	**0**	**3**	**0**

*THIS BID ITEM INCLUDES THE COST OF REPLACING THE EXISTING TRAFFIC SIGNAL CABINET WITH A NEW TS2 TYPE 2 POLE MOUNTED CABINET WITH CONTROLLER AND AN ETHERNET COMPATIBLE MMU.

**TXDOT TO PROVIDE CELLULAR ROUTER.

STATE OF TEXAS
KEVIN D. TYER
87924
LICENSED PROFESSIONAL ENGINEER

05/27/2021

TRAF-IQ
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TEXAS PE FIRM REG # F-18726

NO.	DATE	REVISION	APPROV.

Texas Department of Transportation

SCHEDULE OF MATERIALS

SHEET 1 OF 4

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		5
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS

SCHEDULE OF MATERIALS (CONT.)

LOCATION	690 6042 REPLACE OF CONTROL CABINET (POLE MNT) * EA	690 6142 ELECTRONIC LOCK (FURNISH & INSTALL) EA	6430 6001 INSTALL CELLULAR ROUTER** EA
MADISON COUNTY			
SH 21 (E MAIN ST) AT IH 45 SERVICE RD		1	
US 190/SH 21 (E MAIN ST) AT SH 75 N (S MAY ST)		1	
US 190/SH 21 (E MAIN ST) AT SPUR 174 (S MADISON ST)		1	
SH 75 N (N MAY ST) AT E COLLARD ST		1	
SUBTOTAL	**0**	**4**	**0**
MILAM COUNTY			
US 79/US 190/SH 36 N (AVENUE C) AT SH 36 S		1	
US 79 N/US 190 E/SH 36 S (AVENUE C) AT US 190 W/SH 36 S		1	
US 79 (CAMERON AVE) AT FM 487 (ACKERMAN ST)		1	
US 79 (CAMERON AVE) AT FM 908 (MAIN ST)		1	
US 79 (CAMERON AVE) AT FM 487 (WILCOX ST)		1	
US 79 (CAMERON AVE) AT CHILDRESS DR		1	
US 79 (CAMERON AVE) AT MEADOWS DR		1	
US 79 AT FM 486 (MAIN ST)		1	
US 190/SH 36/US 77 N AT US 77 S		1	
US 190/SH 36/US 77 (E 4TH ST) AT N FANNIN AVE		1	
US 190/SH 36/US 77 S (W 4TH ST) AT US 77 N (N TRAVIS AVE)		1	
US 77 (N TRAVIS AVE) AT 22ND ST		1	
SUBTOTAL	**0**	**12**	**0**
ROBERTSON COUNTY			
US 79 N /US 190 E/SH 6 (S MARKET ST) AT US 79 S/US 190 W (W BROWN ST)		1	
US 79 N/SH 6 (S MARKET ST) AT W 5TH ST		1	
US 79 S/US 190 W (W BROWN ST) AT S ALAMO ST		1	
US 79 S/US 190 W (W BROWN ST) AT HACKBERRY ST		1	
US 79 AT FM 46 (BREMOND ST)		1	
US 79/SH 6 (MARKET ST) AT FM 485		1	
SH 6 (MAIN ST) AT BURNETT ST		1	
SUBTOTAL	**0**	**7**	**0**

*THIS BID ITEM INCLUDES THE COST OF REPLACING THE EXISTING TRAFFIC SIGNAL CABINET WITH A NEW TS2 TYPE 2 POLE MOUNTED CABINET WITH CONTROLLER AND AN ETHERNET COMPATIBLE MMU.

**TXDOT TO PROVIDE CELLULAR ROUTER.

STATE OF TEXAS
KEVIN D. TYER
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LICENSED PROFESSIONAL ENGINEER

05/27/2021

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NO.	DATE	REVISION	APPROV.

Texas Department of Transportation

SCHEDULE OF MATERIALS

SHEET 2 OF 4

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		6
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS

SCHEDULE OF MATERIALS (CONT.)

LOCATION	690 6042 REPLACE OF CONTROL CABINET (POLE MNT) *	690 6142 ELECTRONIC LOCK (FURNISH & INSTALL)	6430 6001 INSTALL CELLULAR ROUTER**
	EA	EA	EA
WALKER COUNTY			
SH 75 N AT W IH 45 SERVICE RD		1	
SH 75 N AT 10TH ST/PINE SHADOWS DR		1	
SH 75 N AT FM 2821		1	
SH 75 N (SAM HOUSTON AVE) AT 13TH ST		1	
SH 75 N (SAM HOUSTON AVE) AT 16TH ST/BEARKAT BLVD		1	
SH 75 N (SAM HOUSTON AVE) AT 17TH ST		1	
SH 75 N (SAM HOUSTON AVE) AT 19TH ST		1	
SH 75 N (SAM HOUSTON AVE) AT 20TH ST/BOWERS BLVD		1	
SH 75 N (SAM HOUSTON AVE) AT AVENUE J/LAKE RD		1	
SH 75 N (SAM HOUSTON AVE) AT AVENUE I		1	
SH 75 N (SAM HOUSTON AVE) AT FM 1374 (MONTGOMERY RD)		1	
SH 75 N (SAM HOUSTON AVE) AT SYCAMORE AVE		1	
SH 75 N (SAM HOUSTON AVE) AT BOETTCHER DR		1	
SH 75/SH 150 W/FM 1375 W AT FM 1375 E (LONGSTREET RD/GIBBS ST)		1	
SH 30 AT VETERAN MEMORIAL PKWY		1	1
SH 30 AT BRAZOS DR/FINANCIAL PLAZA		1	1
US 190 E/SH 30 (11TH ST) AT IH 45 SERVICE RD/US 190 W		1	1
US 190/SH 30 (11TH ST) AT NORMAL PARK DR		1	1
US 190 /SH 30/SH 75 (11TH ST) AT SH 75 N	1	1	1
US 190 /SH 30/SH 75 (11TH ST) AT AVENUE O	1	1	1
US 190/SH 30 (11TH ST) AT FM 247 (AVENUE M)	1	1	1
US 190/SH 30/SH 75 N (11TH ST) AT SH 75 S (SAM HOUSTON AVE)	1	1	1
US 190/SH 30 (11TH ST) AT UNIVERSITY AVE	1	1	1
US 190/SH 30 (11TH ST) AT AVENUE I		1	
US 190/SH 30 (11TH ST) AT M. L. KING JR. BLVD	1	1	1
US 190/SH 30 W (11TH ST/PHELPS DR) AT SH 30 E (SYCAMORE AVE)		1	
FM 2821 AT HOLLY SPRINGS DR		1	
FM 2821 AT FM 247		1	
SH 19 AT FM 2821		1	
SH 19 AT FM 980		1	
SH 19 AT OLD COLONY RD		1	
IH 45 W SERVICE RD/SH 75 AT FM 1791		1	
IH 45 SERVICE RD AT FM 1374 (MONTGOMERY RD)		1	
FM 2821 AT M. L. KING JR. BLVD		1	
SUBTOTAL	**6**	**34**	**10**

*THIS BID ITEM INCLUDES THE COST OF REPLACING THE EXISTING TRAFFIC SIGNAL CABINET WITH A NEW TS2 TYPE 2 POLE MOUNTED CABINET WITH CONTROLLER AND AN ETHERNET COMPATIBLE MMU.

**TXDOT TO PROVIDE CELLULAR ROUTER.

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Texas Department of Transportation

SCHEDULE OF MATERIALS

SHEET 3 OF 4

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		7
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS

SCHEDULE OF MATERIALS (CONT.)

LOCATION	690 6042 REPLACE OF CONTROL CABINET (POLE MNT) * EA	690 6142 ELECTRONIC LOCK (FURNISH & INSTALL) EA	6430 6001 INSTALL CELLULAR ROUTER** EA
WASHINGTON COUNTY			
BU 36 (N PARK ST) AT A H EHRIG DR		1	
BU 36 (N PARK ST) AT FM 577 (BLUE BELL RD)		1	
BU 36 (N PARK ST) AT MARTIN LUTHER KING JR PKWY/ACADEMY ST		1	
BU 36 (S AUSTIN ST) AT BU 290 E (W ALAMO ST)		1	
BU 36 (S DAY ST) AT W STONE ST		1	
US 290/SH 36 N AT BU 36/SH 36 S (S DAY ST)		1	
SH 36 AT BU 36 (N PARK ST)		1	
SH 36 AT FM 109		1	
SH 36 AT FM 577 (W BLUE BELL RD)		1	
SH 105 AT FM 577 (BLUE BELL RD)		1	
FM 577 (BLUE BELL RD) AT E ALAMO ST/CHAPPELL HILL RD		1	
FM 577 (S BLUE BELL RD) AT E TOM GREEN ST		1	
FM 577 (S BLUE BELL RD) AT E STONE ST		1	
BU 290 (W MAIN ST) AT MARTIN LUTHER KING JR PKWY/BLINN BLVD		1	
BU 290 (S MARKET ST) AT SH 105 (E ALAMO ST)		1	
BU 290 (S MARKET ST) AT E TOM GREEN ST		1	
BU 290 (S MARKET ST) AT CHAPPEL HILL ST		1	
BU 290 (S MARKET ST) AT E STONE ST		1	
US 290 AT BU 290		1	
US 290 AT FM 577		1	
US 290 AT WESTWOOD LN		1	
US 290 AT FM 1155 (MAIN ST)		1	
SUBTOTAL	**0**	**22**	**0**
TOTAL	**6**	**114**	**10**

*THIS BID ITEM INCLUDES THE COST OF REPLACING THE EXISTING TRAFFIC SIGNAL CABINET WITH A NEW TS2 TYPE 2 POLE MOUNTED CABINET WITH CONTROLLER AND AN ETHERNET COMPATIBLE MMU.

**TXDOT TO PROVIDE CELLULAR ROUTER.

STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER

05/27/2021

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Texas Department of Transportation

SCHEDULE OF MATERIALS

SHEET 4 OF 4

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		8
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS

DATE:
FILE:

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

Texas Department of Transportation

Traffic Safety Division Standard

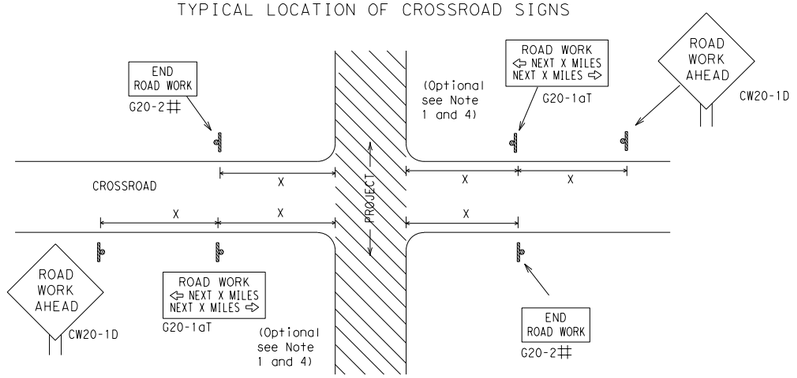
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0917	00	051	VARIOUS
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	BRY	BRAZOS		9
5-10 5-21				

DATE:
FILE:

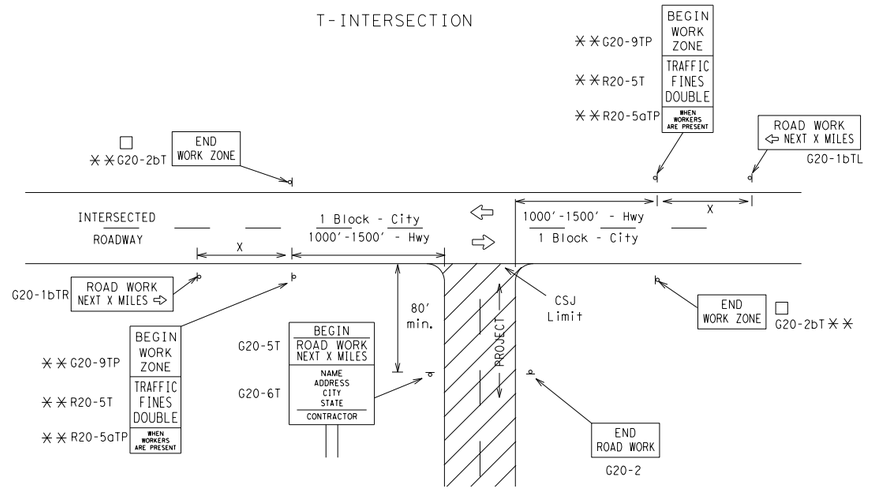
TYPICAL LOCATION OF CROSSROAD SIGNS



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]

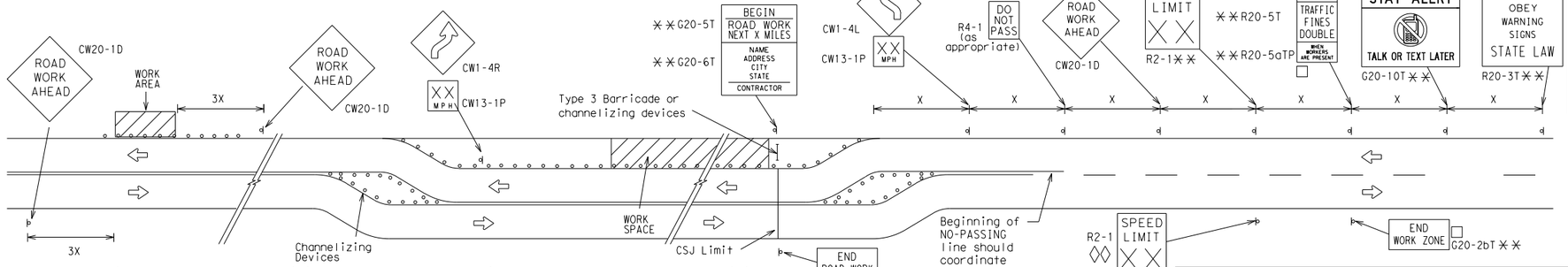
✳ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ 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.

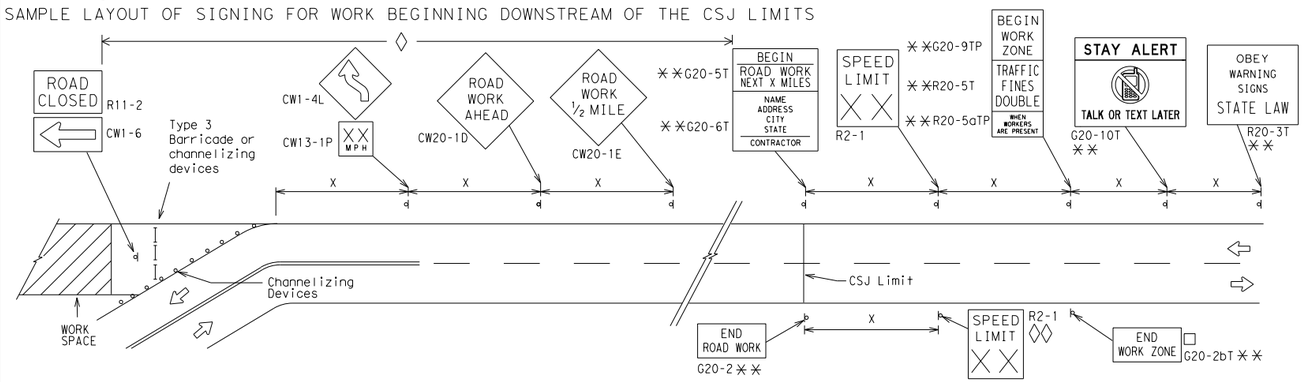
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

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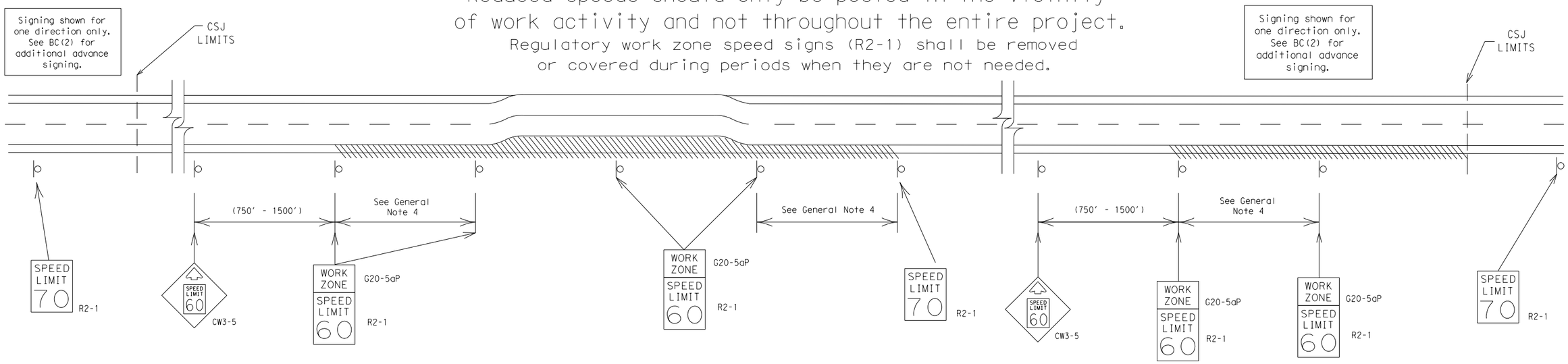
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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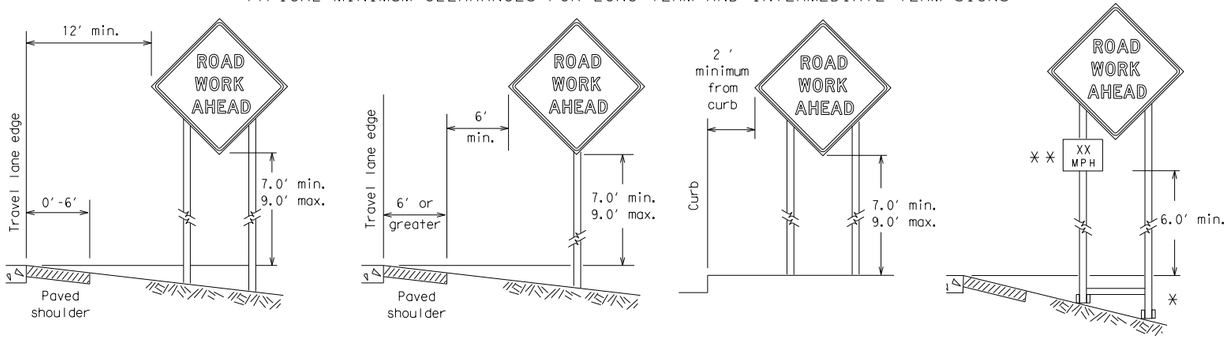
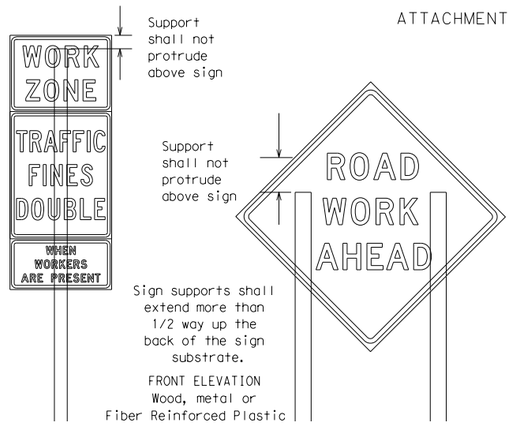
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



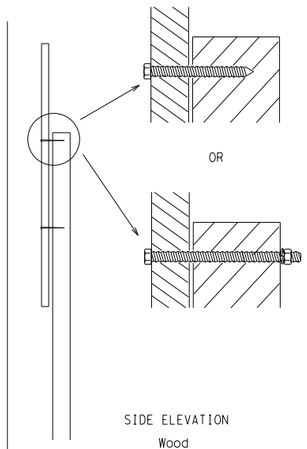
⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS



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

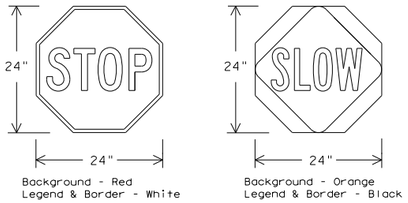


Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

STOP/SLOW PADDLES

1. STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24".
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.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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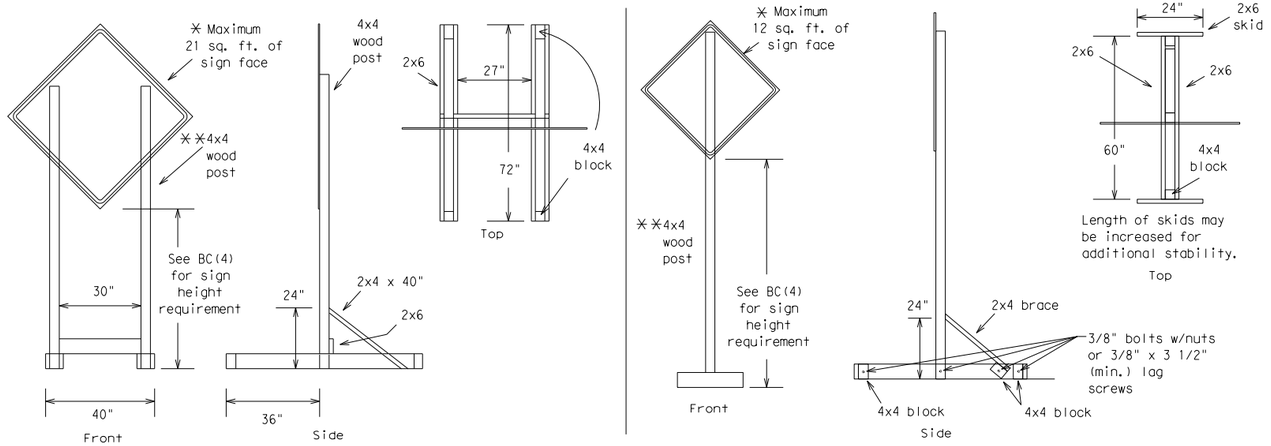
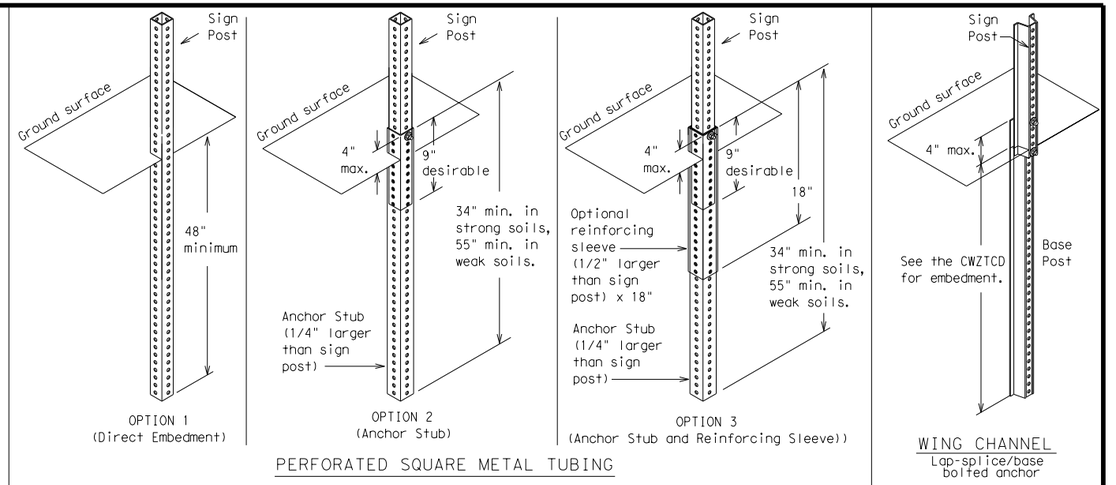


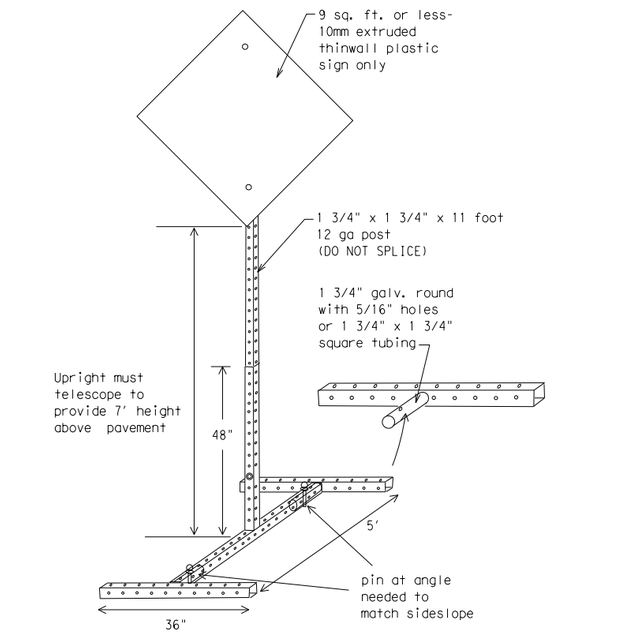
SKID MOUNTED WOOD SIGN SUPPORTS

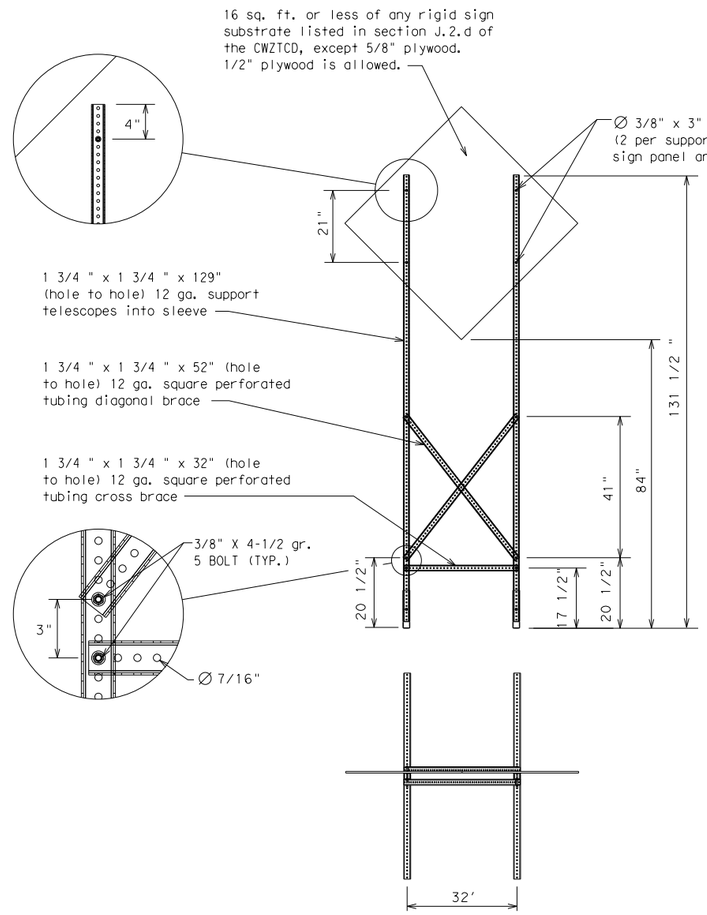
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

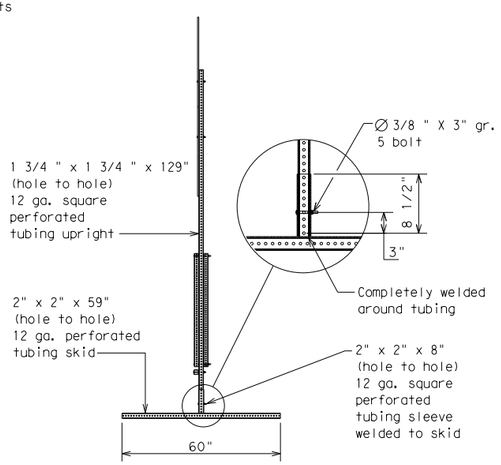


GROUND MOUNTED SIGN SUPPORTS

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.

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

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

Other Condition List

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

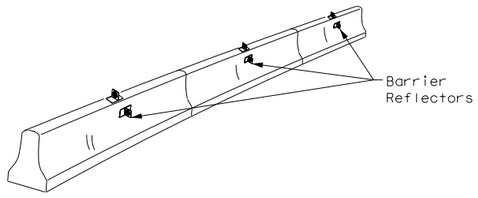
BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0917	00	051	VARIOUS
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BRY	BRAZOS		14

100

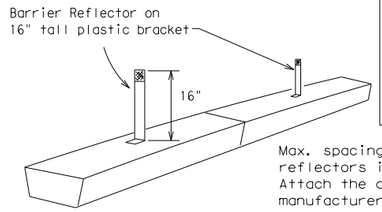
DATE:
FILE:

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.

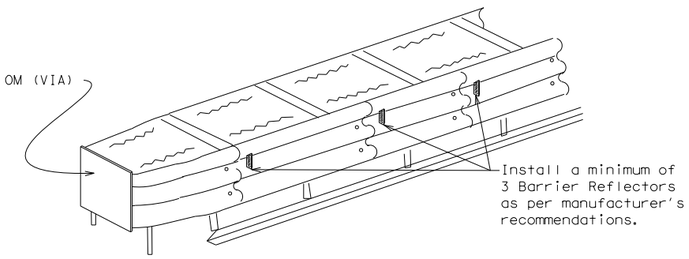


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB)

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.

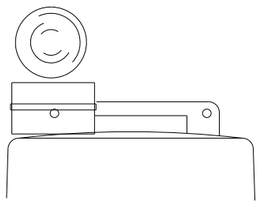


DELINEATION OF END TREATMENTS

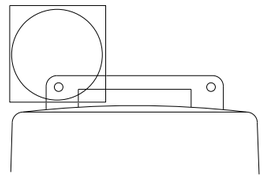
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

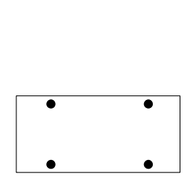
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

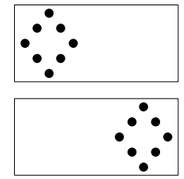
Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

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:

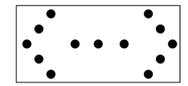


4 CORNER CAUTION

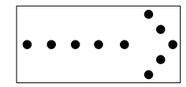
OR



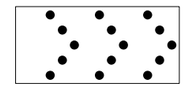
ALTERNATING DIAMOND CAUTION



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

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

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0917	00	051	VARIOUS
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BRY	BRAZOS		15

DATE:
FILE:

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:

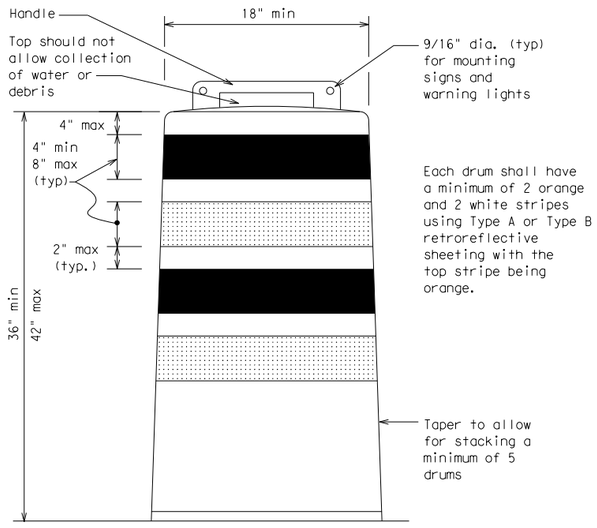
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

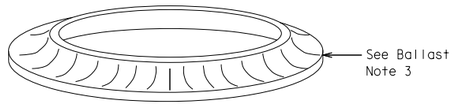
RETROREFLECTIVE SHEETING

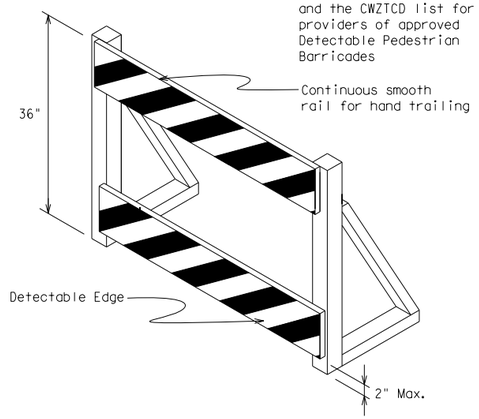
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

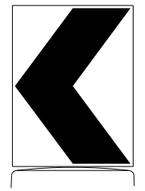




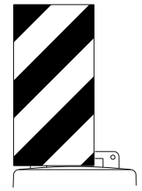


DETECTABLE PEDESTRIAN BARRICADES

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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Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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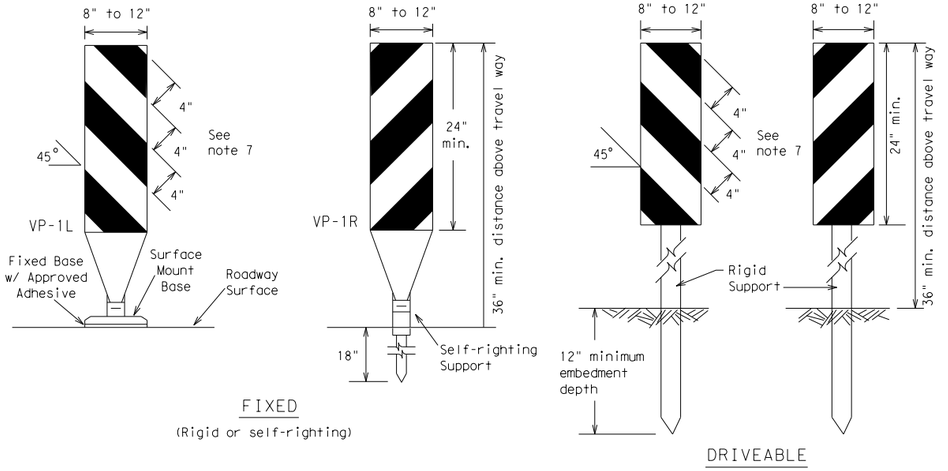
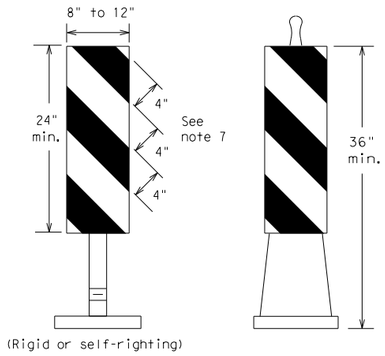


FIXED

(Rigid or self-righting)

DRIVEABLE

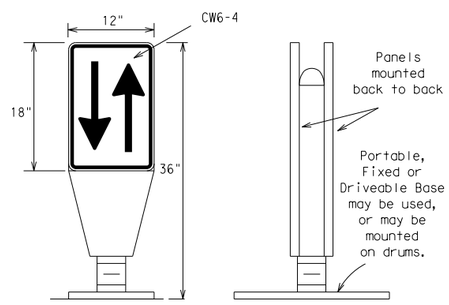


(Rigid or self-righting)

PORTABLE

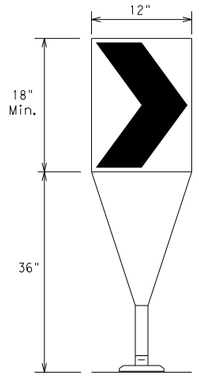
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual 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.

VERTICAL PANELS (VPs)



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

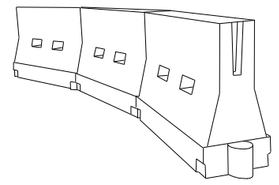
OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



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

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

CHEVRONS



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

GENERAL NOTES

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

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Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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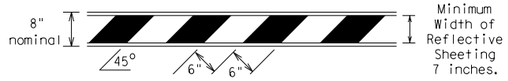
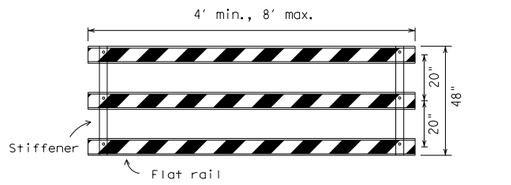
TYPE 3 BARRICADES

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.



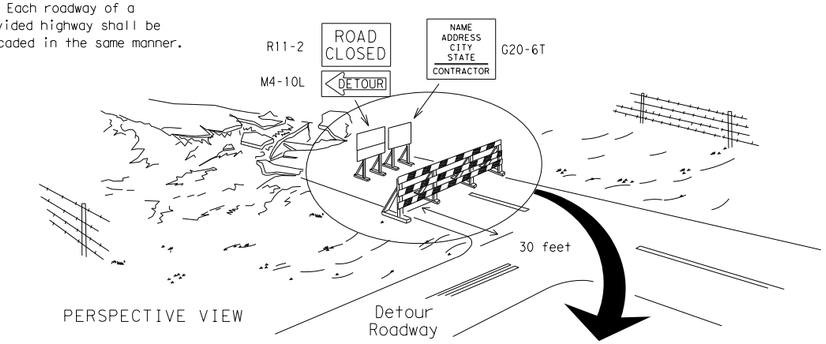
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

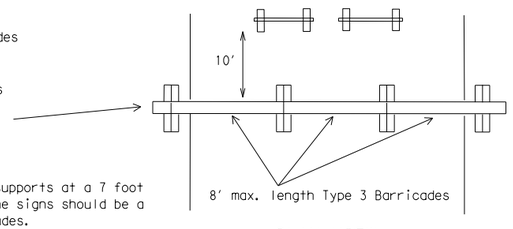
Each roadway of a divided highway shall be barricaded in the same manner.



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.

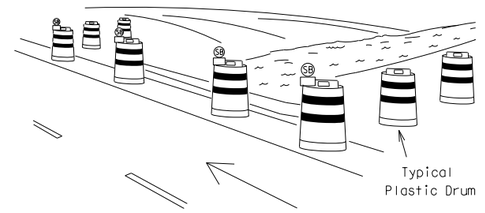
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

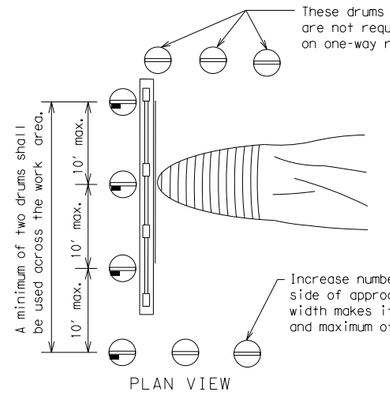
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

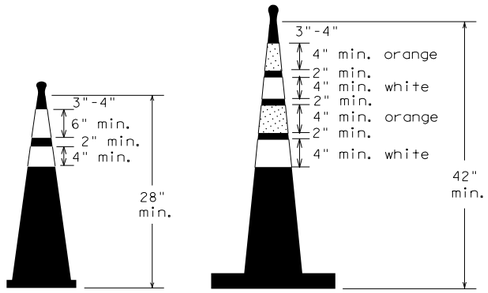
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder 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.



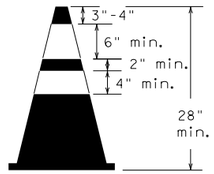
PLAN VIEW

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

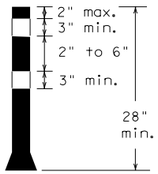
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

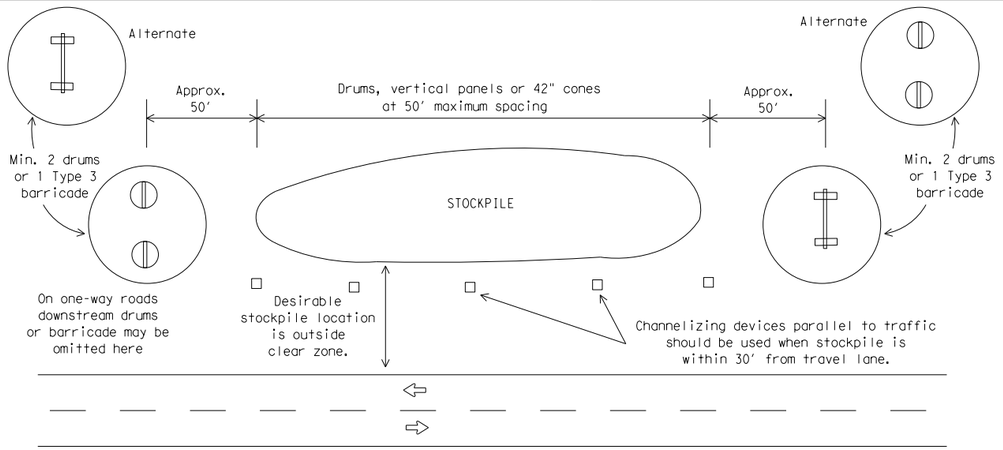


Tubular Marker

28" Cones shall have a minimum weight of 9 1/2 lbs.

42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

DATE:
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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.

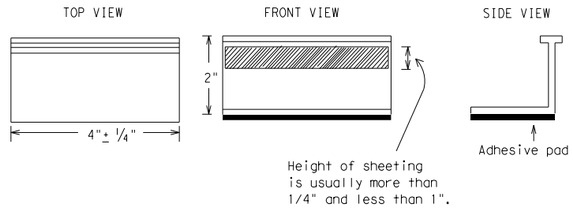
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

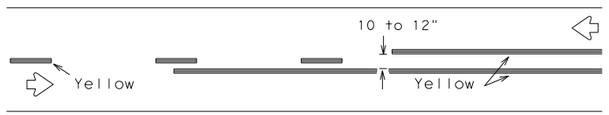
BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

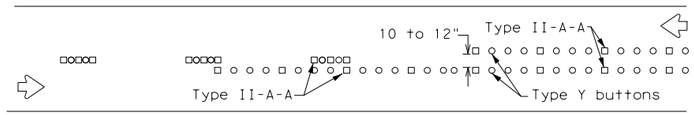
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0917	00	051	VARIOUS
2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	BRY	BRAZOS		19
11-02 8-14				

DATE:
FILE:

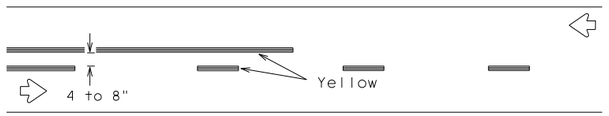
PAVEMENT MARKING PATTERNS



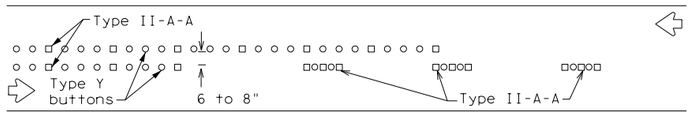
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



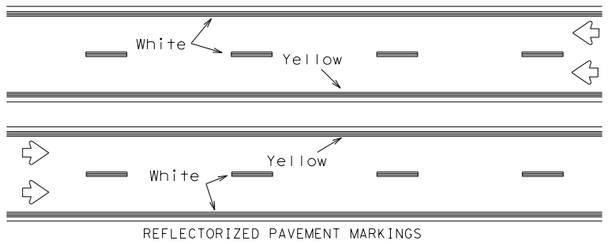
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



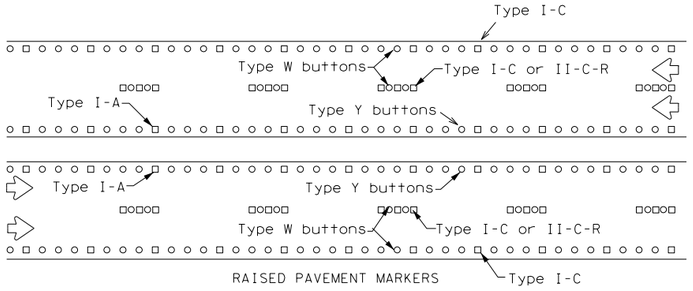
RAISED PAVEMENT MARKERS - PATTERN B

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



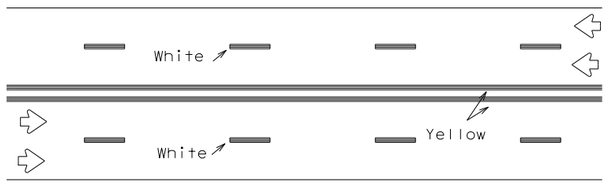
REFLECTORIZED PAVEMENT MARKINGS



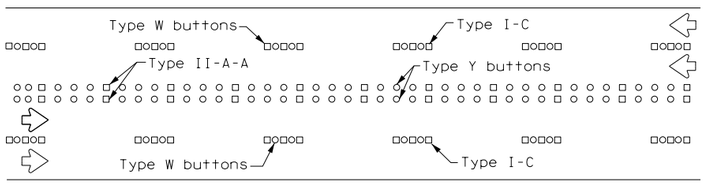
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



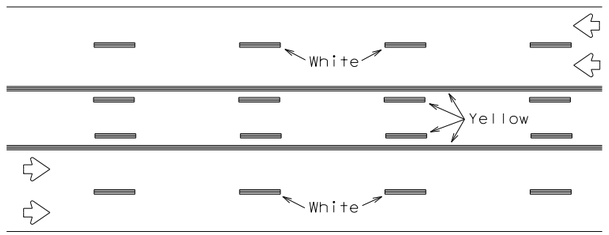
REFLECTORIZED PAVEMENT MARKINGS



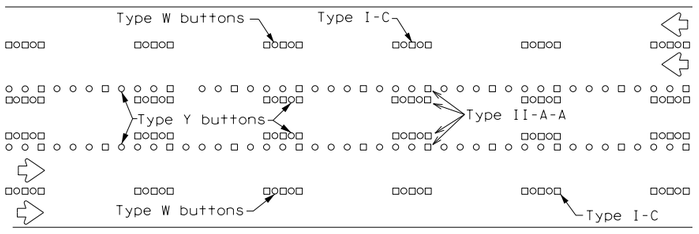
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

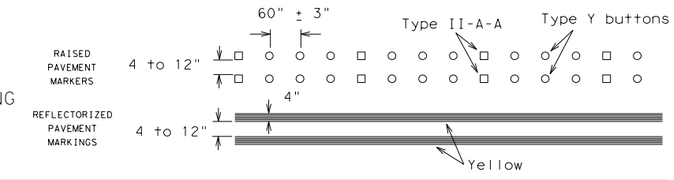
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

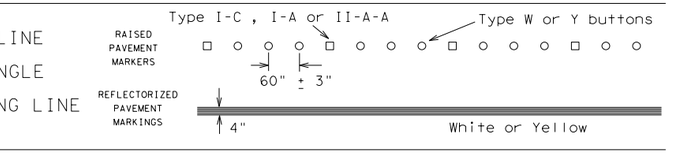
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

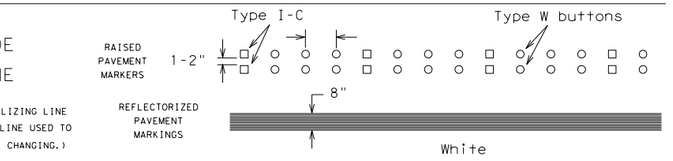


EDGE LINE OR SINGLE NO-PASSING LINE



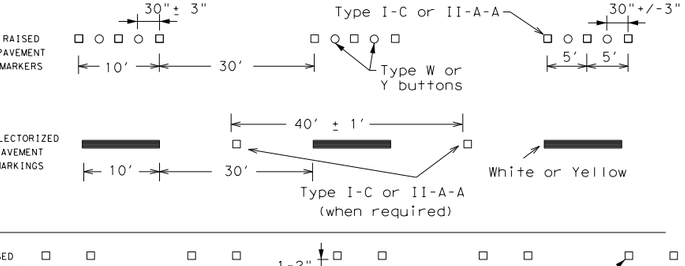
WIDE LINE

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

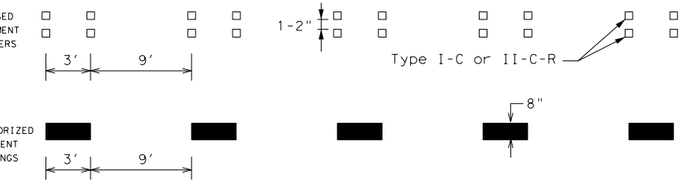


BROKEN LINES

CENTER LINE OR LANE LINE

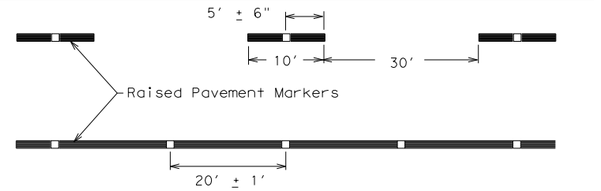


AUXILIARY OR LANEDROP LINE



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
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2-98 7-13	BRY	BRAZOS		20
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DATE:
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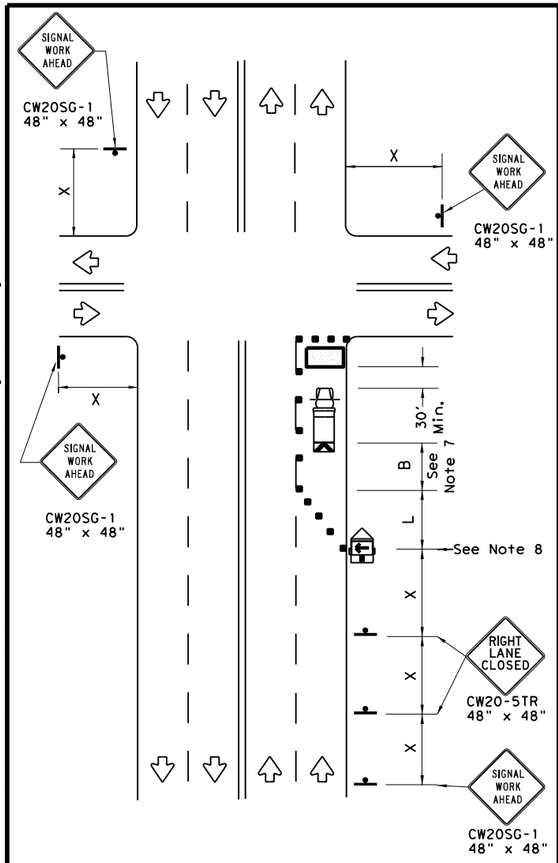
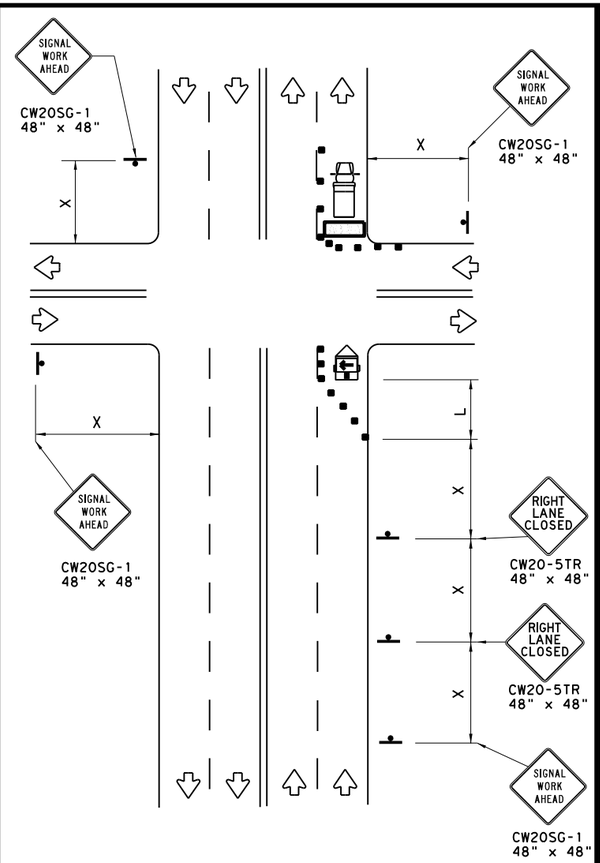


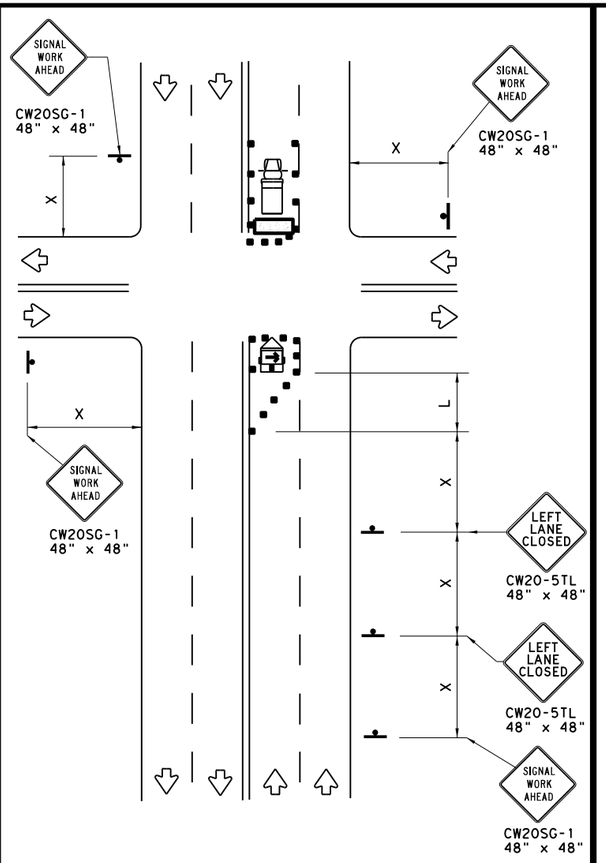
NEAR SIDE LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



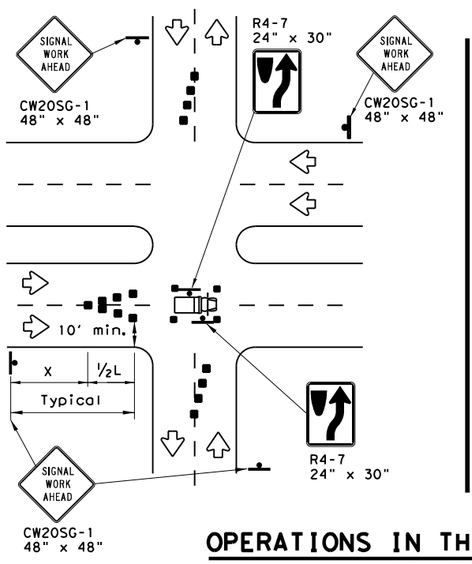
FAR SIDE RIGHT LANE CLOSURE

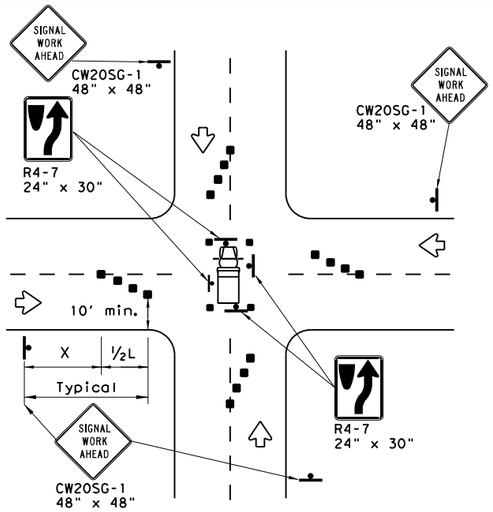
SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE LEFT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY





OPERATIONS IN THE INTERSECTION

SHORT DURATION

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)

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ(BTS-1)-13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
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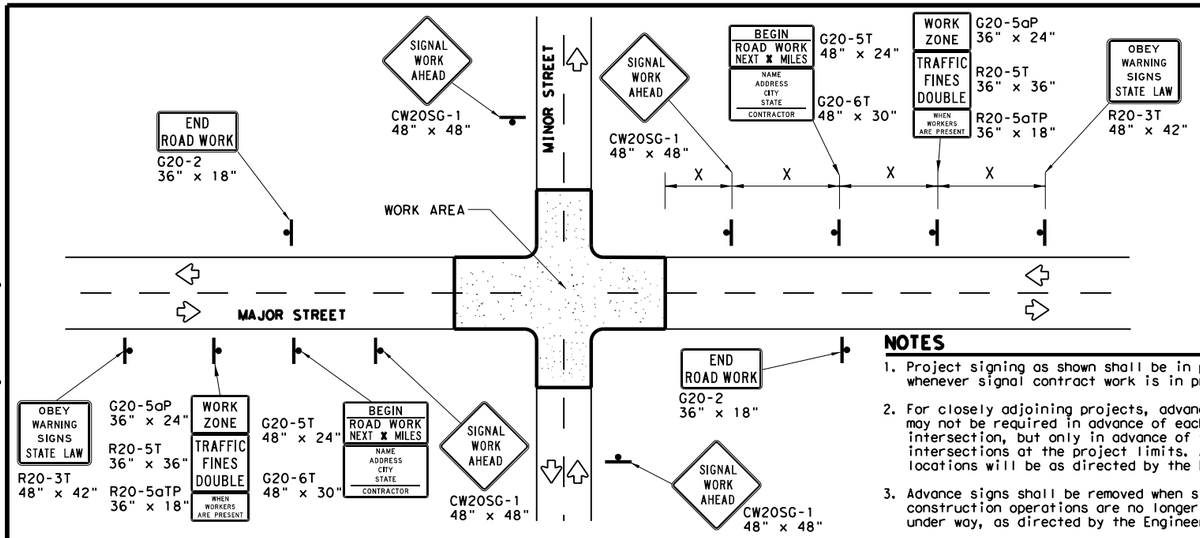
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03	BRY	BRAZOS		21



TYPICAL ADVANCE SIGNAL PROJECT SIGNING

FOR LONG TERM and INTERMEDIATE-TERM STATIONARY WORK OPERATIONS

NOTES

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

DURATION OF WORK

1. Work zone durations are defined in Part 6, Section 6G.02 of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

SIGN MOUNTING HEIGHT

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

REMOVING OR COVERING

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

REFLECTIVE SHEETING

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

SIGN SUPPORT WEIGHTS

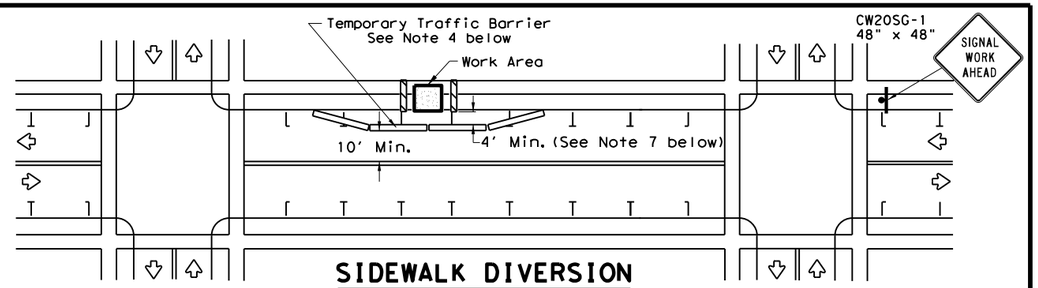
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support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

LEGEND	
	Sign
	Channelizing Devices
	Type 3 Barricade

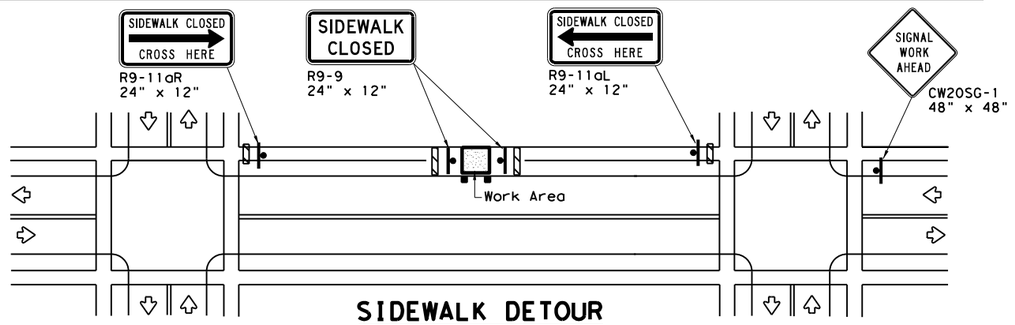
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

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

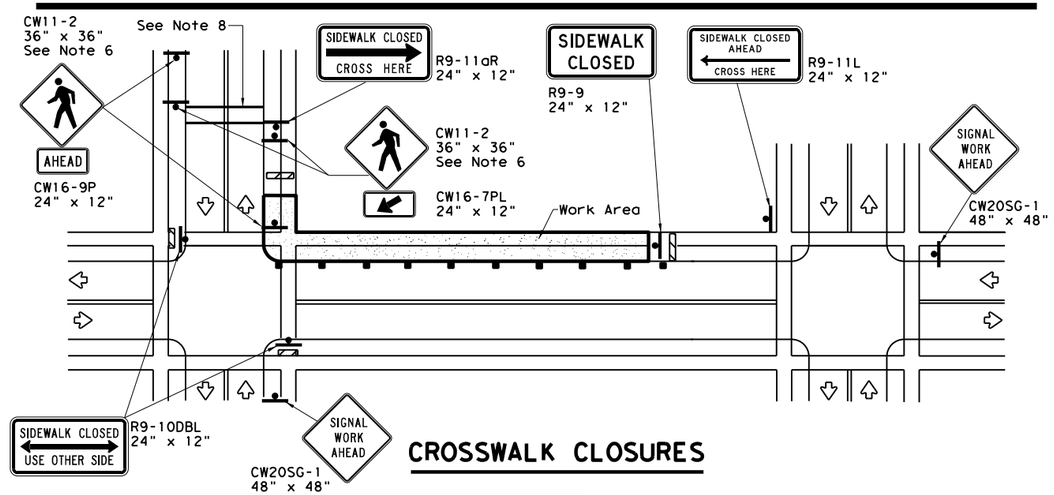
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



SIDEWALK DIVERSION



SIDEWALK DETOUR



CROSSWALK CLOSURES

PEDESTRIAN CONTROL

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ(BTS-2)-13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
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2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03	BRY	BRAZOS		22

DATE:
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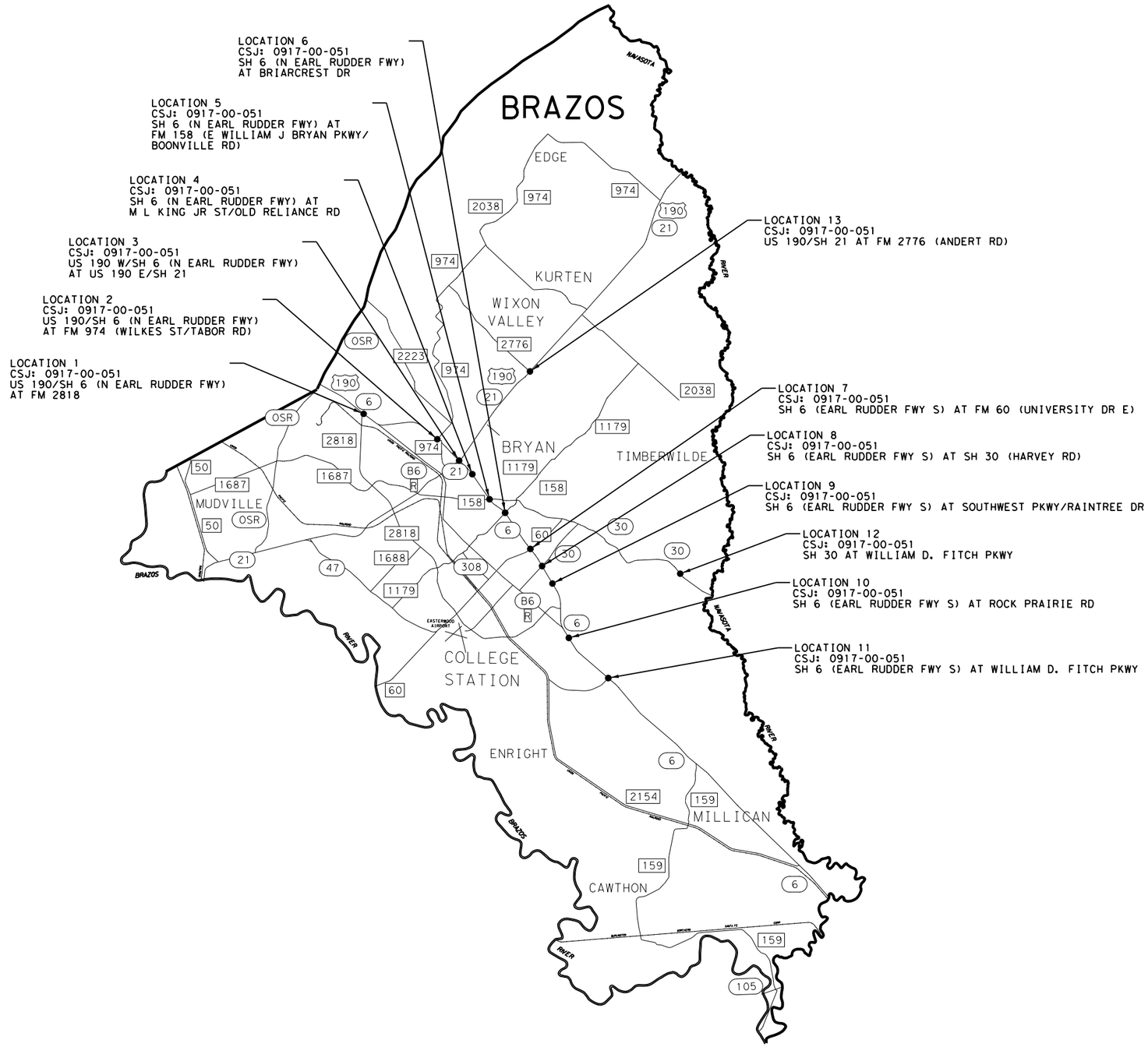

LOCATION 6
CSJ: 0917-00-051
SH 6 (N EARL RUDDER FWY)
AT BRIARCREST DR

LOCATION 5
CSJ: 0917-00-051
SH 6 (N EARL RUDDER FWY) AT
FM 158 (E WILLIAM J BRYAN PKWY/
BOONVILLE RD)

LOCATION 4
CSJ: 0917-00-051
SH 6 (N EARL RUDDER FWY) AT
M L KING JR ST/OLD RELIANCE RD

LOCATION 3
CSJ: 0917-00-051
US 190 W/SH 6 (N EARL RUDDER FWY)
AT US 190 E/SH 21

LOCATION 2
CSJ: 0917-00-051
US 190/SH 6 (N EARL RUDDER FWY)
AT FM 974 (WILKES ST/TABOR RD)

LOCATION 1
CSJ: 0917-00-051
US 190/SH 6 (N EARL RUDDER FWY)
AT FM 2818

LOCATION 13
CSJ: 0917-00-051
US 190/SH 21 AT FM 2776 (ANDERT RD)

LOCATION 7
CSJ: 0917-00-051
SH 6 (EARL RUDDER FWY S) AT FM 60 (UNIVERSITY DR E)

LOCATION 8
CSJ: 0917-00-051
SH 6 (EARL RUDDER FWY S) AT SH 30 (HARVEY RD)

LOCATION 9
CSJ: 0917-00-051
SH 6 (EARL RUDDER FWY S) AT SOUTHWEST PKWY/RAINTREE DR

LOCATION 12
CSJ: 0917-00-051
SH 30 AT WILLIAM D. FITCH PKWY

LOCATION 10
CSJ: 0917-00-051
SH 6 (EARL RUDDER FWY S) AT ROCK PRAIRIE RD

LOCATION 11
CSJ: 0917-00-051
SH 6 (EARL RUDDER FWY S) AT WILLIAM D. FITCH PKWY

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SCALE IN MILES

STATE OF TEXAS
KEVIN D. TYER
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HOUSTON, TEXAS 77079
832.399.1100
TEXAS PE FIRM REG # F-18726

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Texas Department of Transportation

BRAZOS COUNTY LOCATION MAP

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		23
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS

SCOPE OF WORK

LOCATION NUMBER	COUNTY	CITY	HIGHWAY	CROSS STREET	LATITUDE	LONGITUDE	FURNISH & INSTALL ELECTRONIC LOCK
1	BRAZOS	BRYAN	US 190/SH 6 (N EARL RUDDER FWY)	FM 2818	30.7276	-96.425	1
2	BRAZOS	BRYAN	US 190/SH 6 (N EARL RUDDER FWY)	FM 974 (WILKES ST/TABOR RD)	30.710112	-96.373723	1
3	BRAZOS	BRYAN	US 190 W/SH 6 (N EARL RUDDER FWY)	US 190 E/SH 21	30.696219	-96.359779	1
4	BRAZOS	BRYAN	SH 6 (N EARL RUDDER FWY)	M L KING JR ST/OLD RELIANCE RD	30.687752	-96.350315	1
5	BRAZOS	BRYAN	SH 6 (N EARL RUDDER FWY)	FM 158 (E WILLIAM J BRYAN PKWY/BOONVILLE RD)	30.672245	-96.339414	1
6	BRAZOS	BRYAN	SH 6 (N EARL RUDDER FWY)	BRIARCREST DR	30.662522	-96.328654	1
7	BRAZOS	COLLEGE STATION	SH 6 (EARL RUDDER FWY S)	FM 60 (UNIVERSITY DR E)	30.639957	-96.311514	1
8	BRAZOS	COLLEGE STATION	SH 6 (EARL RUDDER FWY S)	SH 30 (HARVEY RD)	30.629342	-96.303096	1
9	BRAZOS	COLLEGE STATION	SH 6 (EARL RUDDER FWY S)	SOUTHWEST PKWY/RAINTREE DR	30.618507	-96.296187	1
10	BRAZOS	COLLEGE STATION	SH 6 (EARL RUDDER FWY S)	ROCK PRAIRIE RD	30.584305	-96.285403	1
11	BRAZOS	COLLEGE STATION	SH 6 (EARL RUDDER FWY S)	WILLIAM D. FITCH PKWY	30.559364	-96.257556	1
12	BRAZOS	COLLEGE STATION	SH 30	WILLIAM D. FITCH PKWY	30.622008	-96.203621	1
13	BRAZOS	WIXON VALLEY	US 190/SH 21	FM 2776 (ANDERT RD)	30.749959	-96.306481	1
						TOTAL	13

NOTES:

1. CONTRACTOR TO FURNISH AND INSTALL SIGNAL EQUIPMENT AT LOCATIONS AS INDICATED IN THE TABLE. ELECTRONIC LOCKS SHALL BE THE CYBERLOCK TRAFFIC CABINET LOCK SYSTEM. SEE GENERAL NOTES FOR PART NUMBERS.

2. LATITUDE AND LONGITUDE REPRESENT APPROXIMATE LOCATION OF TRAFFIC SIGNAL CABINET. CONTRACTOR TO CONFIRM LOCATION OF CABINET IN THE FIELD.

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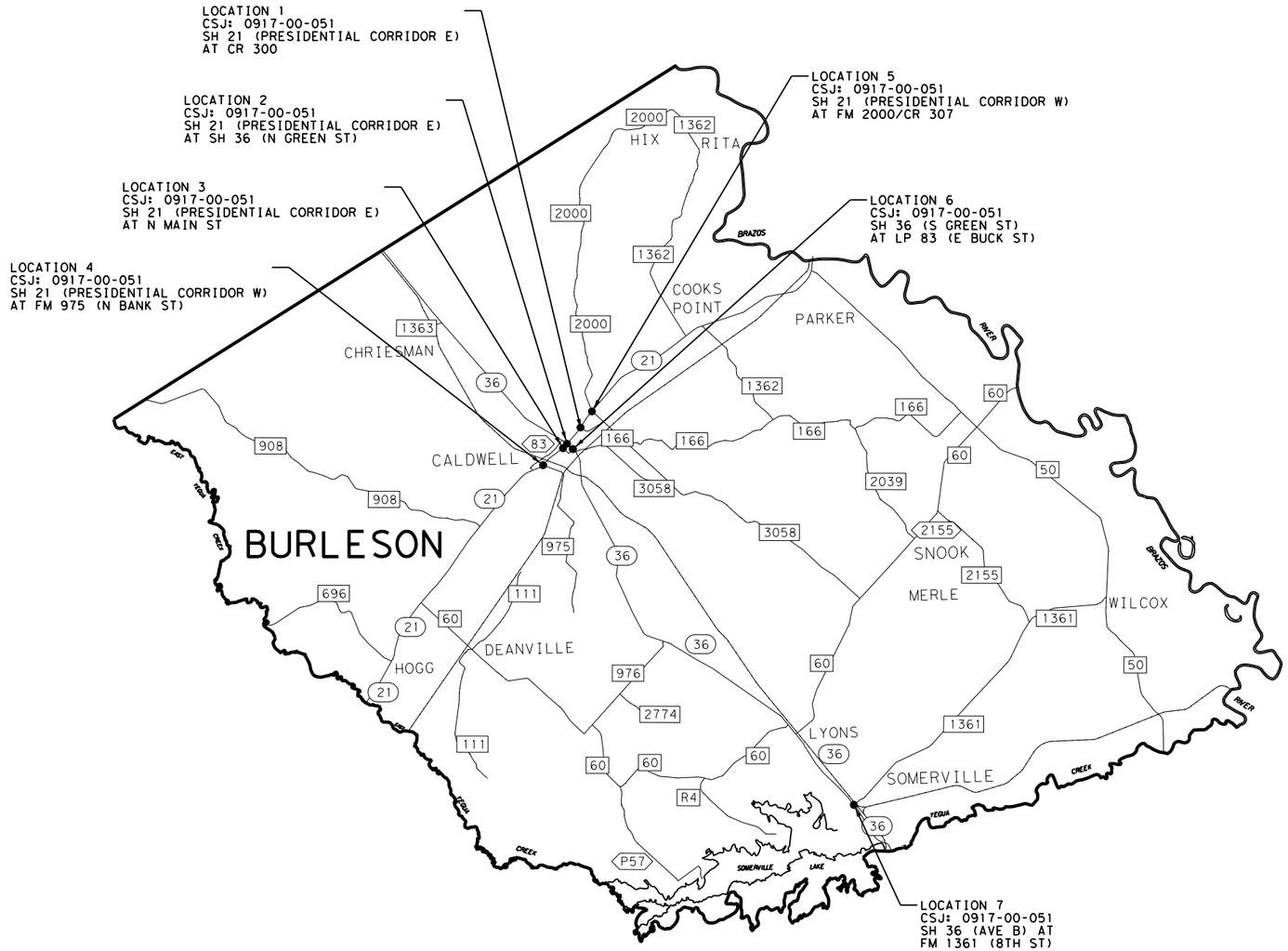
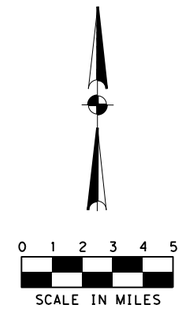
BRAZOS COUNTY DETAILS

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		24
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS





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BURLESON COUNTY LOCATION MAP

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		25
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS

SCOPE OF WORK

LOCATION NUMBER	COUNTY	CITY	HIGHWAY	CROSS STREET	LATITUDE	LONGITUDE	FURNISH & INSTALL ELECTRONIC LOCK
1	BURLESON	CALDWELL	SH 21 (PRESIDENTIAL CORRIDOR E)	CR 300	30.545566	-96.685063	1
2	BURLESON	CALDWELL	SH 21 (PRESIDENTIAL CORRIDOR E)	SH 36 (N GREEN ST)	30.537079	-96.693628	1
3	BURLESON	CALDWELL	SH 21 (PRESIDENTIAL CORRIDOR E)	N MAIN ST	30.534763	-96.695786	1
4	BURLESON	CALDWELL	SH 21 (PRESIDENTIAL CORRIDOR W)	FM 975 (N BANK ST)	30.526444	-96.707858	1
5	BURLESON	CALDWELL	SH 21 (PRESIDENTIAL CORRIDOR W)	FM 2000/CR 307	30.553422	-96.677278	1
6	BURLESON	CALDWELL	SH 36 (S GREEN ST)	LP 83 (E BUCK ST)	30.534136	-96.689985	1
7	BURLESON	SOMERVILLE	SH 36 (AVE B)	FM 1361 (8TH ST)	30.346166	-96.528733	1
						TOTAL	7

NOTES:

1. CONTRACTOR TO FURNISH AND INSTALL SIGNAL EQUIPMENT AT LOCATIONS AS INDICATED IN THE TABLE. ELECTRONIC LOCKS SHALL BE THE CYBERLOCK TRAFFIC CABINET LOCK SYSTEM. SEE GENERAL NOTES FOR PART NUMBERS.

2. LATITUDE AND LONGITUDE REPRESENT APPROXIMATE LOCATION OF TRAFFIC SIGNAL CABINET. CONTRACTOR TO CONFIRM LOCATION OF CABINET IN THE FIELD.

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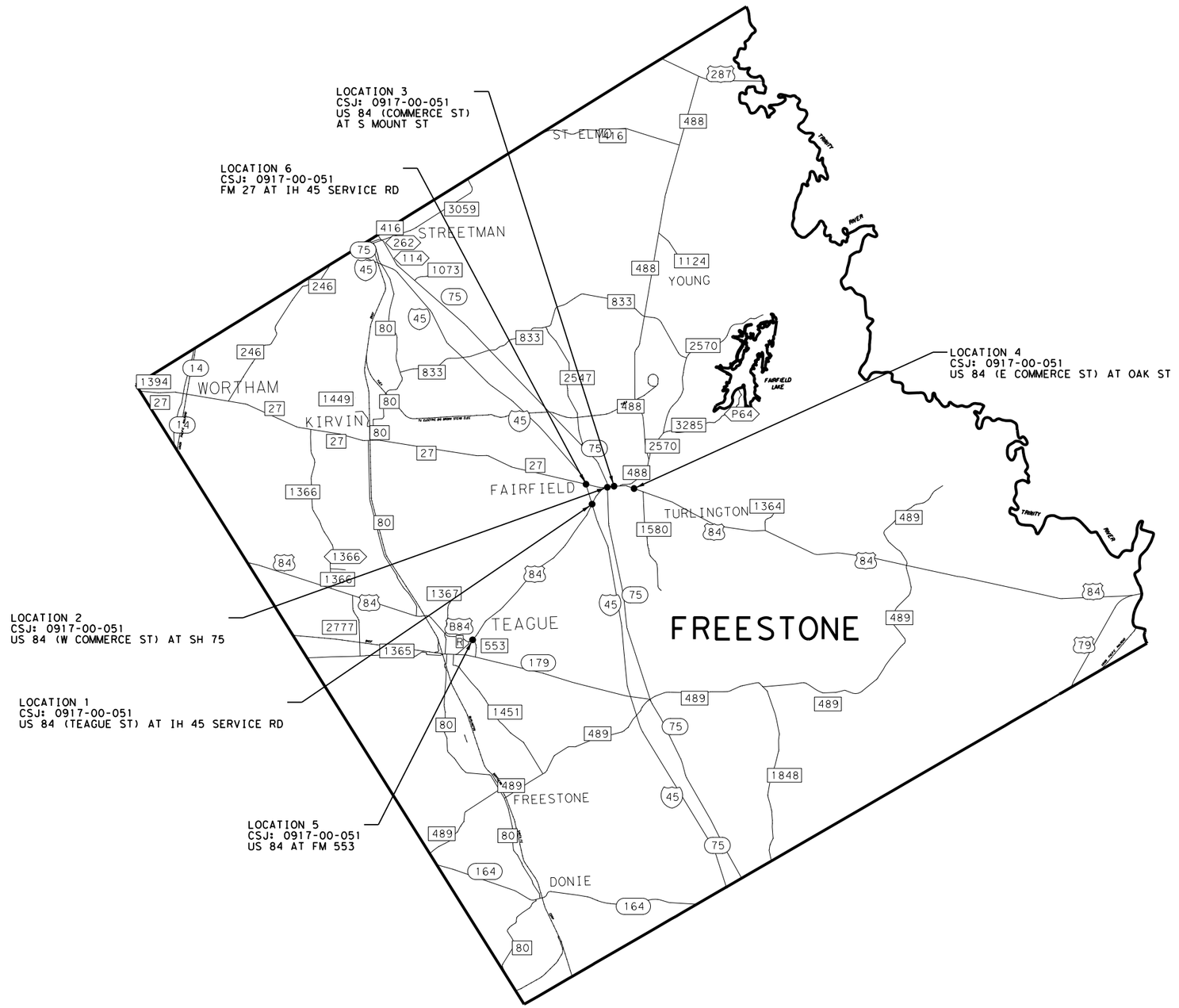
BURLESON COUNTY DETAILS

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		26
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS



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SCALE IN MILES

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FREESTONE COUNTY LOCATION MAP

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		27
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS

SCOPE OF WORK

LOCATION NUMBER	COUNTY	CITY	HIGHWAY	CROSS STREET	LATITUDE	LONGITUDE	FURNISH & INSTALL ELECTRONIC LOCK
1	FREESTONE	FAIRFIELD	US 84 (TEAGUE ST)	IH 45 SERVICE RD	31.713104	-96.177746	1
2	FREESTONE	FAIRFIELD	US 84 (W COMMERCE ST)	SH 75	31.724496	-96.165554	1
3	FREESTONE	FAIRFIELD	US 84 (COMMERCE ST)	S MOUNT ST	31.725069	-96.160695	1
4	FREESTONE	FAIRFIELD	US 84 (E COMMERCE ST)	OAK ST	31.723137	-96.14631	1
5	FREESTONE	TEAGUE	US 84	FM 553	31.635385	-96.26356	1
6	FREESTONE	FAIRFIELD	FM 27	IH 45 SERVICE RD	31.727466	-96.181916	1
						TOTAL	6

NOTES:

1. CONTRACTOR TO FURNISH AND INSTALL SIGNAL EQUIPMENT AT LOCATIONS AS INDICATED IN THE TABLE. ELECTRONIC LOCKS SHALL BE THE CYBERLOCK TRAFFIC CABINET LOCK SYSTEM. SEE GENERAL NOTES FOR PART NUMBERS.

2. LATITUDE AND LONGITUDE REPRESENT APPROXIMATE LOCATION OF TRAFFIC SIGNAL CABINET. CONTRACTOR TO CONFIRM LOCATION OF CABINET IN THE FIELD.

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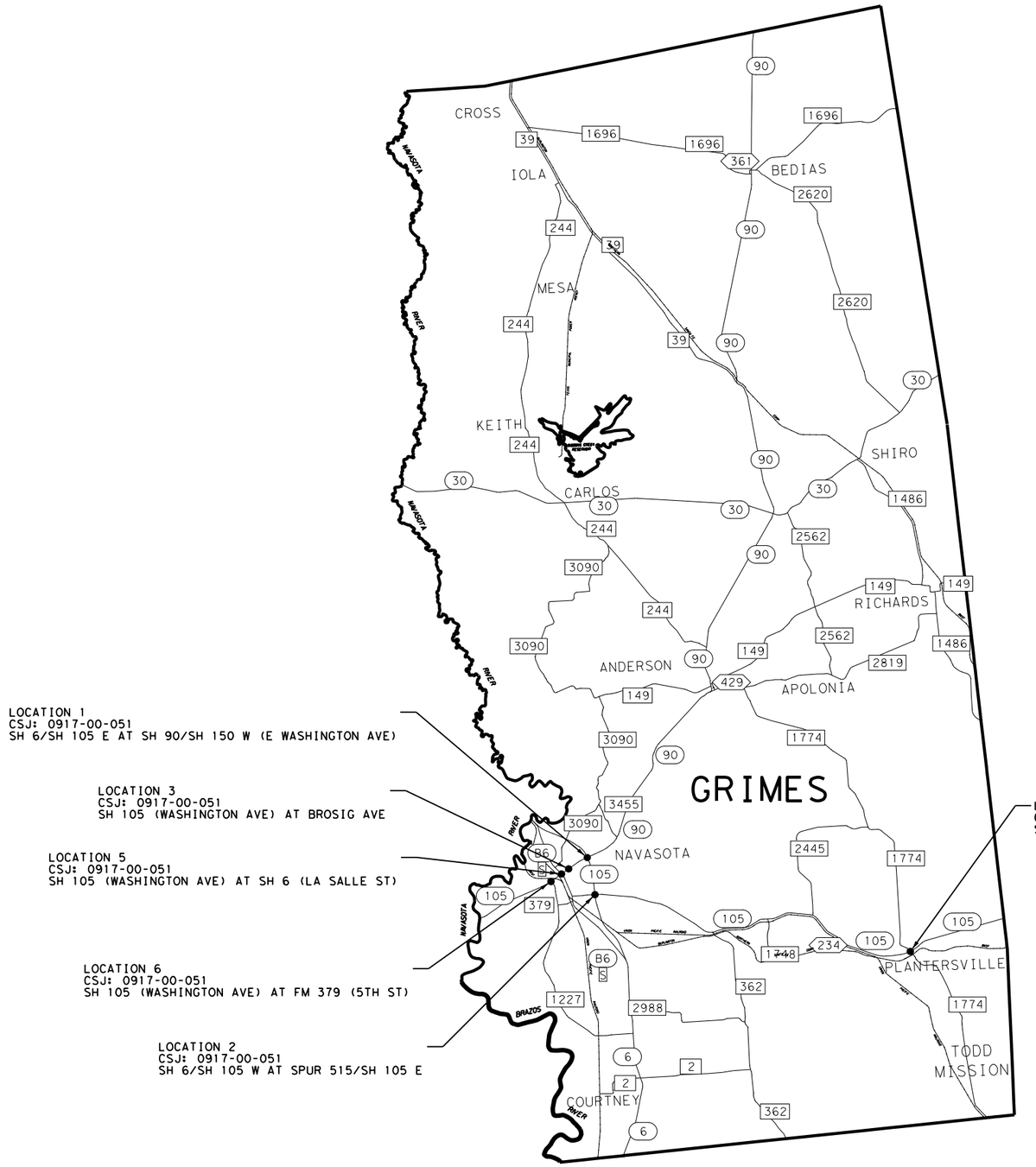
FREESTONE COUNTY DETAILS

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		28
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS



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SCALE IN MILES

STATE OF TEXAS
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GRIMES COUNTY LOCATION MAP

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		29
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS

SCOPE OF WORK

LOCATION NUMBER	COUNTY	CITY	HIGHWAY	CROSS STREET	LATITUDE	LONGITUDE	FURNISH & INSTALL ELECTRONIC LOCK
1	GRIMES	NAVASOTA	SH 6/SH 105 E	SH 90/SH 150 W (E WASHINGTON AVE)	30.396856	-96.071239	1
2	GRIMES	NAVASOTA	SH 6/SH 105 W	SPUR 515/SH 105 E	30.376138	-96.067201	1
3	GRIMES	NAVASOTA	SH 105 (E WASHINGTON AVE)	BROSIG AVE	30.391356	-96.083476	1
4	GRIMES	PLANTERSVILLE	SH 105	FM 1774	30.338324	-95.866317	1
5	GRIMES	NAVASOTA	SH 105 (WASHINGTON AVE)	SH 6 (LA SALLE ST)	30.388603	-96.088249	1
6	GRIMES	NAVASOTA	SH 105 (WASHINGTON AVE)	FM 379 (5TH ST)	30.38445	-96.095268	1
						TOTAL	6

NOTES:

1. CONTRACTOR TO FURNISH AND INSTALL SIGNAL EQUIPMENT AT LOCATIONS AS INDICATED IN THE TABLE. ELECTRONIC LOCKS SHALL BE THE CYBERLOCK TRAFFIC CABINET LOCK SYSTEM. SEE GENERAL NOTES FOR PART NUMBERS.

2. LATITUDE AND LONGITUDE REPRESENT APPROXIMATE LOCATION OF TRAFFIC SIGNAL CABINET. CONTRACTOR TO CONFIRM LOCATION OF CABINET IN THE FIELD.

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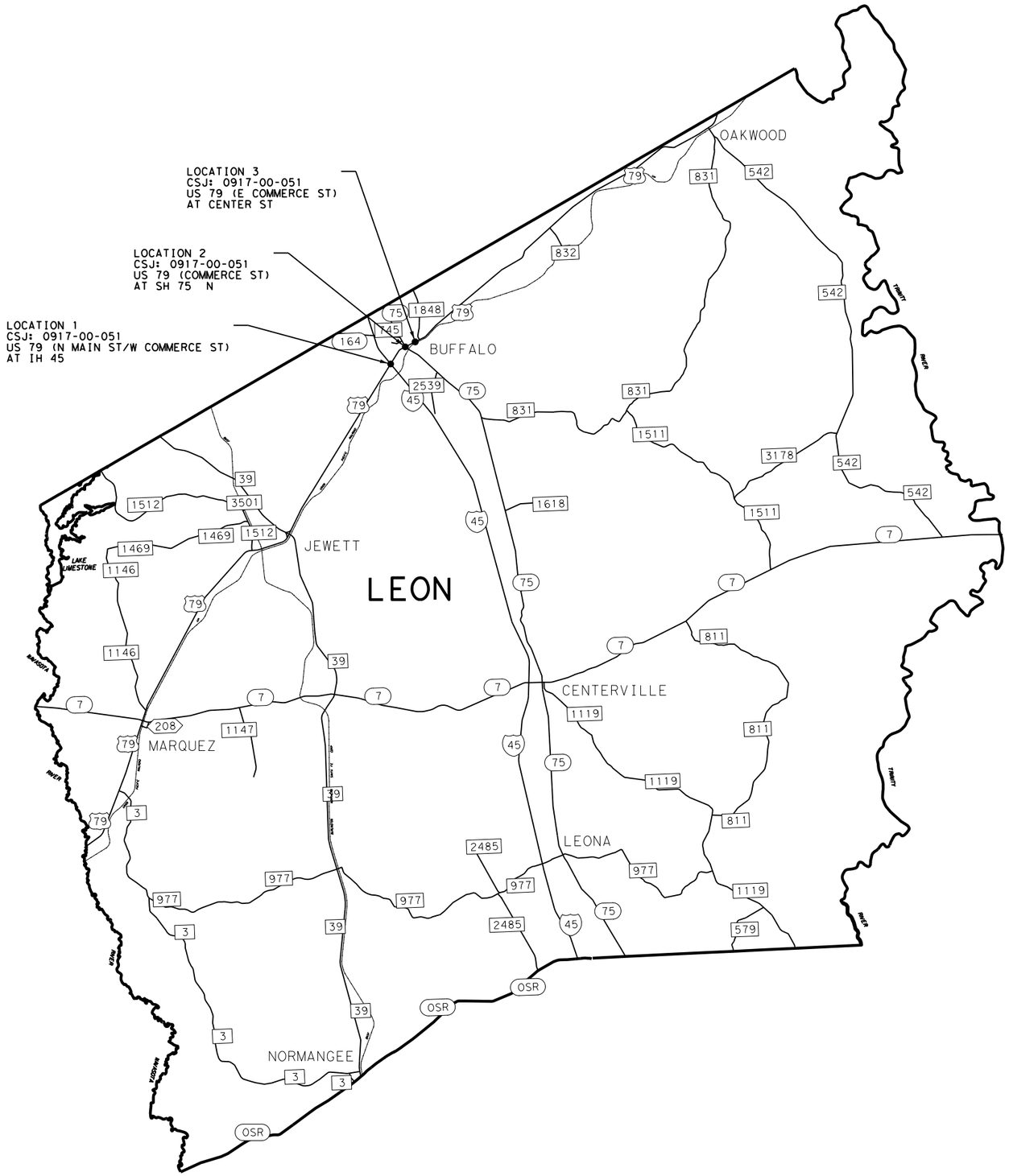
GRIMES COUNTY DETAILS

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		30
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS



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SCALE IN MILES

STATE OF TEXAS
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87924
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Texas Department of Transportation

LEON COUNTY LOCATION MAP

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		31
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS

SCOPE OF WORK

LOCATION NUMBER	COUNTY	CITY	HIGHWAY	CROSS STREET	LATITUDE	LONGITUDE	FURNISH & INSTALL ELECTRONIC LOCK
1	LEON	BUFFALO	US 79 (N MAIN ST/W COMMERCE ST)	IH 45	31.45016	-96.077071	1
2	LEON	BUFFALO	US 79 (COMMERCE ST)	SH 75 N	31.461173	-96.065264	1
3	LEON	BUFFALO	US 79 (E COMMERCE ST)	CENTER ST	31.463873	-96.058354	1
						TOTAL	3

NOTES:

1. CONTRACTOR TO FURNISH AND INSTALL SIGNAL EQUIPMENT AT LOCATIONS AS INDICATED IN THE TABLE. ELECTRONIC LOCKS SHALL BE THE CYBERLOCK TRAFFIC CABINET LOCK SYSTEM. SEE GENERAL NOTES FOR PART NUMBERS.

2. LATITUDE AND LONGITUDE REPRESENT APPROXIMATE LOCATION OF TRAFFIC SIGNAL CABINET. CONTRACTOR TO CONFIRM LOCATION OF CABINET IN THE FIELD.

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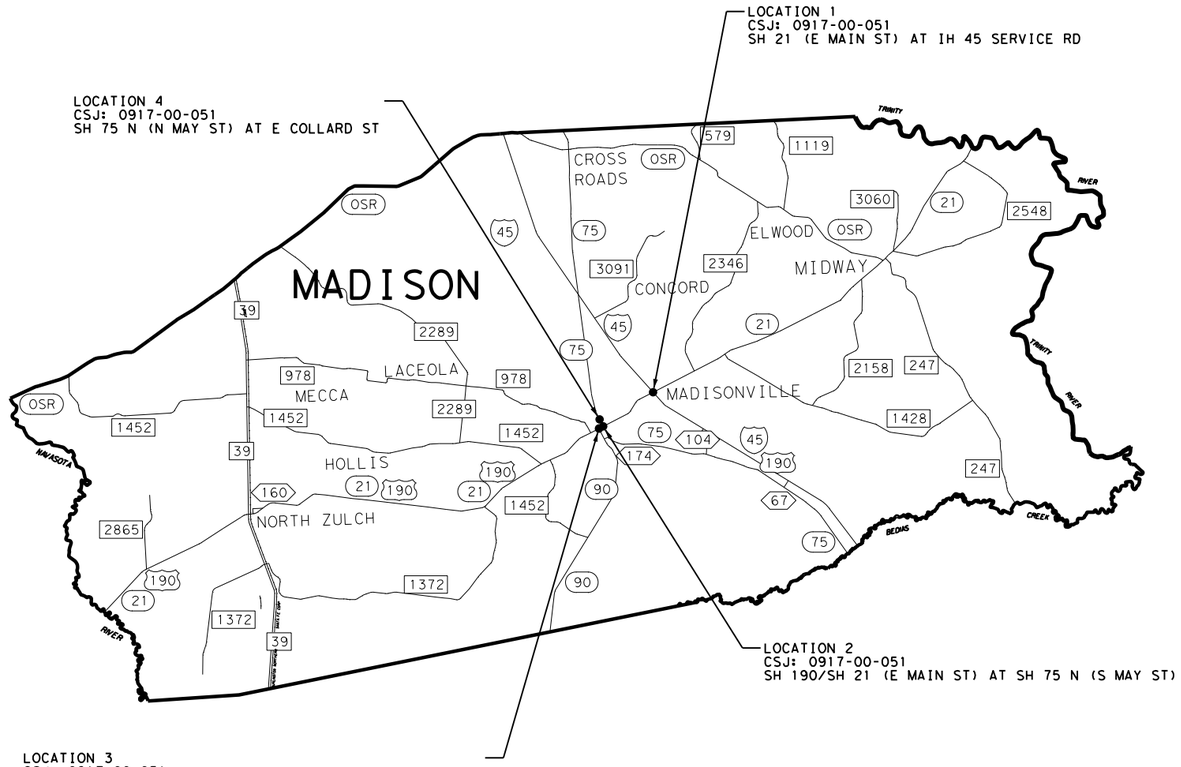
LEON COUNTY DETAILS

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		32
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS



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SCALE IN MILES

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MADISON COUNTY LOCATION MAP

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		33
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS

SCOPE OF WORK

LOCATION NUMBER	COUNTY	CITY	HIGHWAY	CROSS STREET	LATITUDE	LONGITUDE	FURNISH & INSTALL ELECTRONIC LOCK
1	MADISON	MADISONVILLE	SH 21 (E MAIN ST)	IH 45 SERVICE RD	30.964951	-95.883931	1
2	MADISON	MADISONVILLE	US 190/SH 21 (E MAIN ST)	SH 75 N (S MAY ST)	30.950252	-95.911401	1
3	MADISON	MADISONVILLE	US 190/SH 21 (E MAIN ST)	SPUR 174 (S MADISON ST)	30.949205	-95.913895	1
4	MADISON	MADISONVILLE	SH 75 N (N MAY ST)	E COLLARD ST	30.953657	-95.913276	1
						TOTAL	4

NOTES:

1. CONTRACTOR TO FURNISH AND INSTALL SIGNAL EQUIPMENT AT LOCATIONS AS INDICATED IN THE TABLE. ELECTRONIC LOCKS SHALL BE THE CYBERLOCK TRAFFIC CABINET LOCK SYSTEM. SEE GENERAL NOTES FOR PART NUMBERS.

2. LATITUDE AND LONGITUDE REPRESENT APPROXIMATE LOCATION OF TRAFFIC SIGNAL CABINET. CONTRACTOR TO CONFIRM LOCATION OF CABINET IN THE FIELD.

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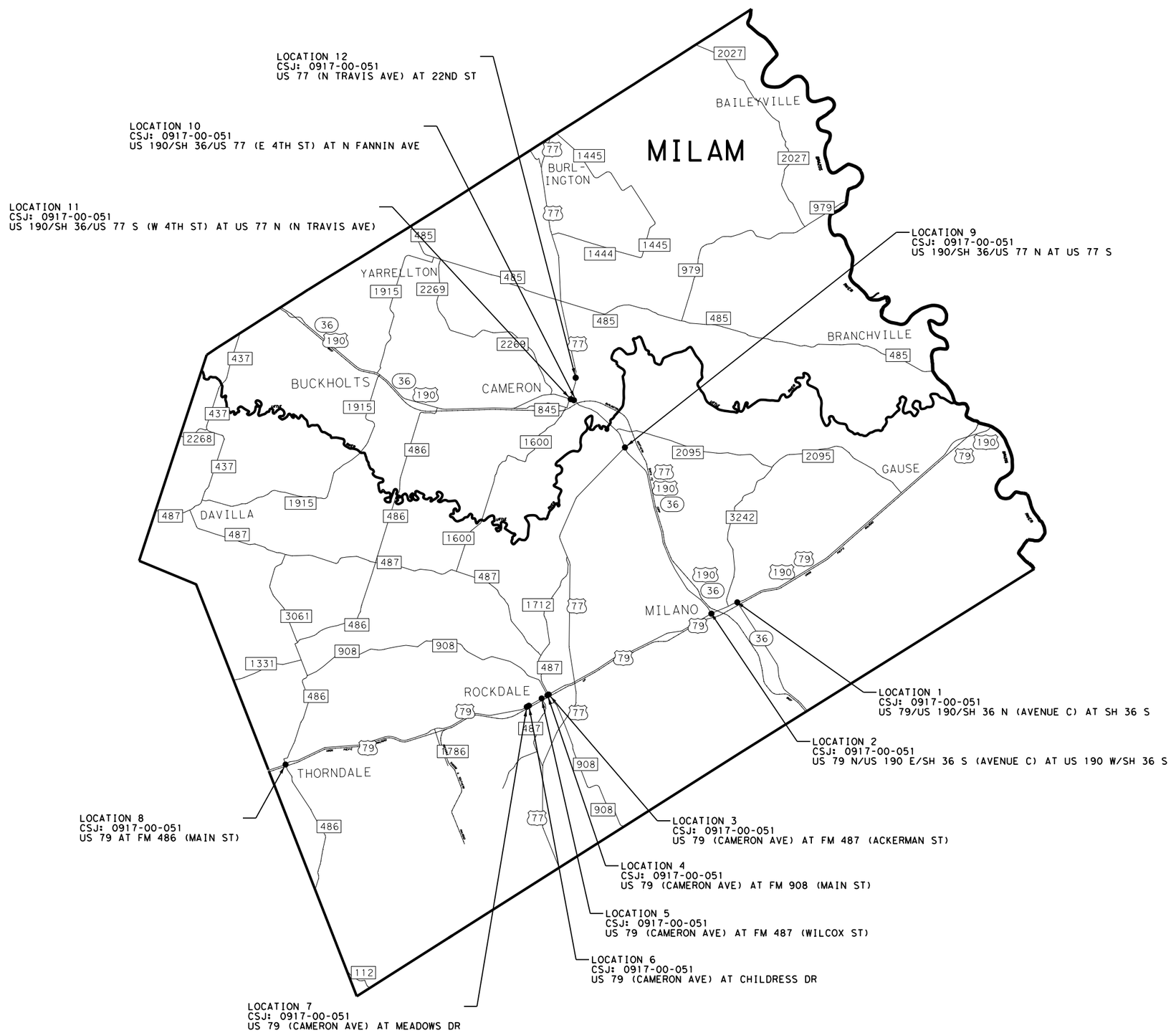
MADISON COUNTY DETAILS

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		34
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS



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SCALE IN MILES

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MILAM COUNTY LOCATION MAP

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		35
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS

SCOPE OF WORK

LOCATION NUMBER	COUNTY	CITY	HIGHWAY	CROSS STREET	LATITUDE	LONGITUDE	FURNISH & INSTALL ELECTRONIC LOCK
1	MILAM	MILANO	US 79/US 190/SH 36 N (AVENUE C)	SH 36 S	30.714017	-96.852364	1
2	MILAM	MILANO	US 79 N/US 190 E/SH 36 S (AVENUE C)	US 190 W/SH 36 S	30.706986	-96.872558	1
3	MILAM	ROCKDALE	US 79 (CAMERON AVE)	FM 487 (ACKERMAN ST)	30.656025	-97.000195	1
4	MILAM	ROCKDALE	US 79 (CAMERON AVE)	FM 908 (MAIN ST)	30.655698	-97.001575	1
5	MILAM	ROCKDALE	US 79 (CAMERON AVE)	FM 487 (WILCOX ST)	30.653564	-97.006119	1
6	MILAM	ROCKDALE	US 79 (CAMERON AVE)	CHILDRESS DR	30.648911	-97.016314	1
7	MILAM	ROCKDALE	US 79 (CAMERON AVE)	MEADOWS DR	30.647907	-97.017759	1
8	MILAM	THORNDALE	US 79	FM 486 (MAIN ST)	30.613554	-97.205811	1
9	MILAM	CAMERON	US 190/SH 36/US 77 N	US 77 S	30.819786	-96.935745	1
10	MILAM	CAMERON	US 190/SH 36/US 77 (E 4TH ST)	N FANNIN AVE	30.852418	-96.974727	1
11	MILAM	CAMERON	US 190/SH 36/US 77 S (W 4TH ST)	US 77 N (N TRAVIS AVE)	30.853142	-96.977243	1
12	MILAM	CAMERON	US 77 (N TRAVIS AVE)	22ND ST	30.867708	-96.972981	1
						TOTAL	12

NOTES:

1. CONTRACTOR TO FURNISH AND INSTALL SIGNAL EQUIPMENT AT LOCATIONS AS INDICATED IN THE TABLE. ELECTRONIC LOCKS SHALL BE THE CYBERLOCK TRAFFIC CABINET LOCK SYSTEM. SEE GENERAL NOTES FOR PART NUMBERS.

2. LATITUDE AND LONGITUDE REPRESENT APPROXIMATE LOCATION OF TRAFFIC SIGNAL CABINET. CONTRACTOR TO CONFIRM LOCATION OF CABINET IN THE FIELD.

05/27/2021

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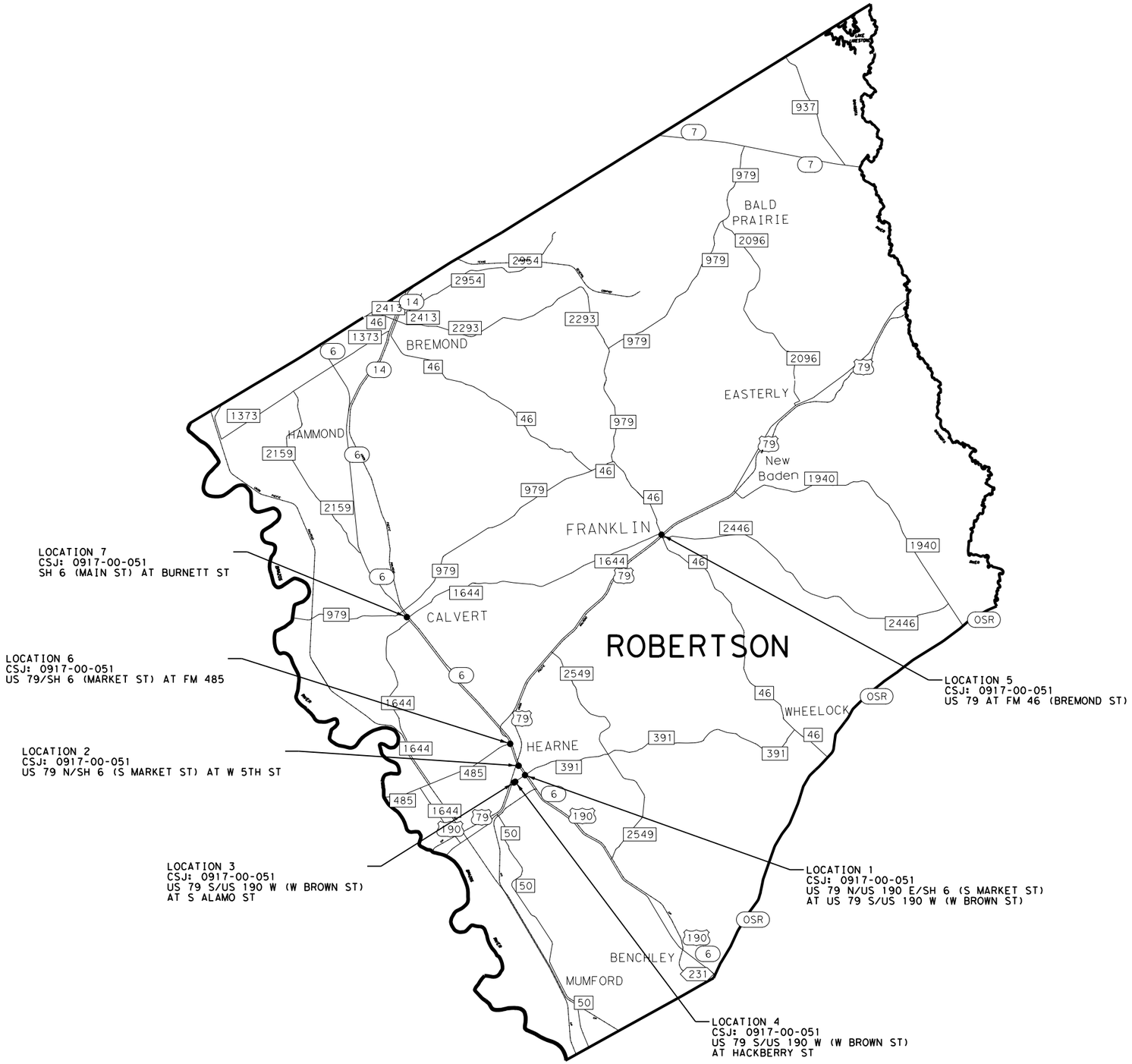
MILAM COUNTY DETAILS

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		36
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS



0 1 2 3 4 5
SCALE IN MILES

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Texas Department of Transportation

ROBERTSON COUNTY
LOCATION MAP

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		37
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS

SCOPE OF WORK

LOCATION NUMBER	COUNTY	CITY	HIGHWAY	CROSS STREET	LATITUDE	LONGITUDE	FURNISH & INSTALL ELECTRONIC LOCK
1	ROBERTSON	HEARNE	US 79 N /US 190 E/SH 6 (S MARKET ST)	US 79 S/US 190 W (W BROWN ST)	30.876347	-96.591309	1
2	ROBERTSON	HEARNE	US 79 N/SH 6 (S MARKET ST)	W 5TH ST	30.882467	-96.596074	1
3	ROBERTSON	HEARNE	US 79 S/US 190 W (W BROWN ST)	S ALAMO ST	30.871865	-96.599599	1
4	ROBERTSON	HEARNE	US 79 S/US 190 W (W BROWN ST)	HACKBERRY ST	30.872399	-96.598622	1
5	ROBERTSON	FRANKLIN	US 79	FM 46 (BREMOND ST)	31.025903	-96.485658	1
6	ROBERTSON	HEARNE	US 79/SH 6 (MARKET ST)	FM 485	30.896464	-96.601717	1
7	ROBERTSON	CALVERT	SH 6 (MAIN ST)	BURNETT ST	30.978684	-96.674569	1
						TOTAL	7

NOTES:

1. CONTRACTOR TO FURNISH AND INSTALL SIGNAL EQUIPMENT AT LOCATIONS AS INDICATED IN THE TABLE. ELECTRONIC LOCKS SHALL BE THE CYBERLOCK TRAFFIC CABINET LOCK SYSTEM. SEE GENERAL NOTES FOR PART NUMBERS.

2. LATITUDE AND LONGITUDE REPRESENT APPROXIMATE LOCATION OF TRAFFIC SIGNAL CABINET. CONTRACTOR TO CONFIRM LOCATION OF CABINET IN THE FIELD.

05/27/2021

TRAF-IQ
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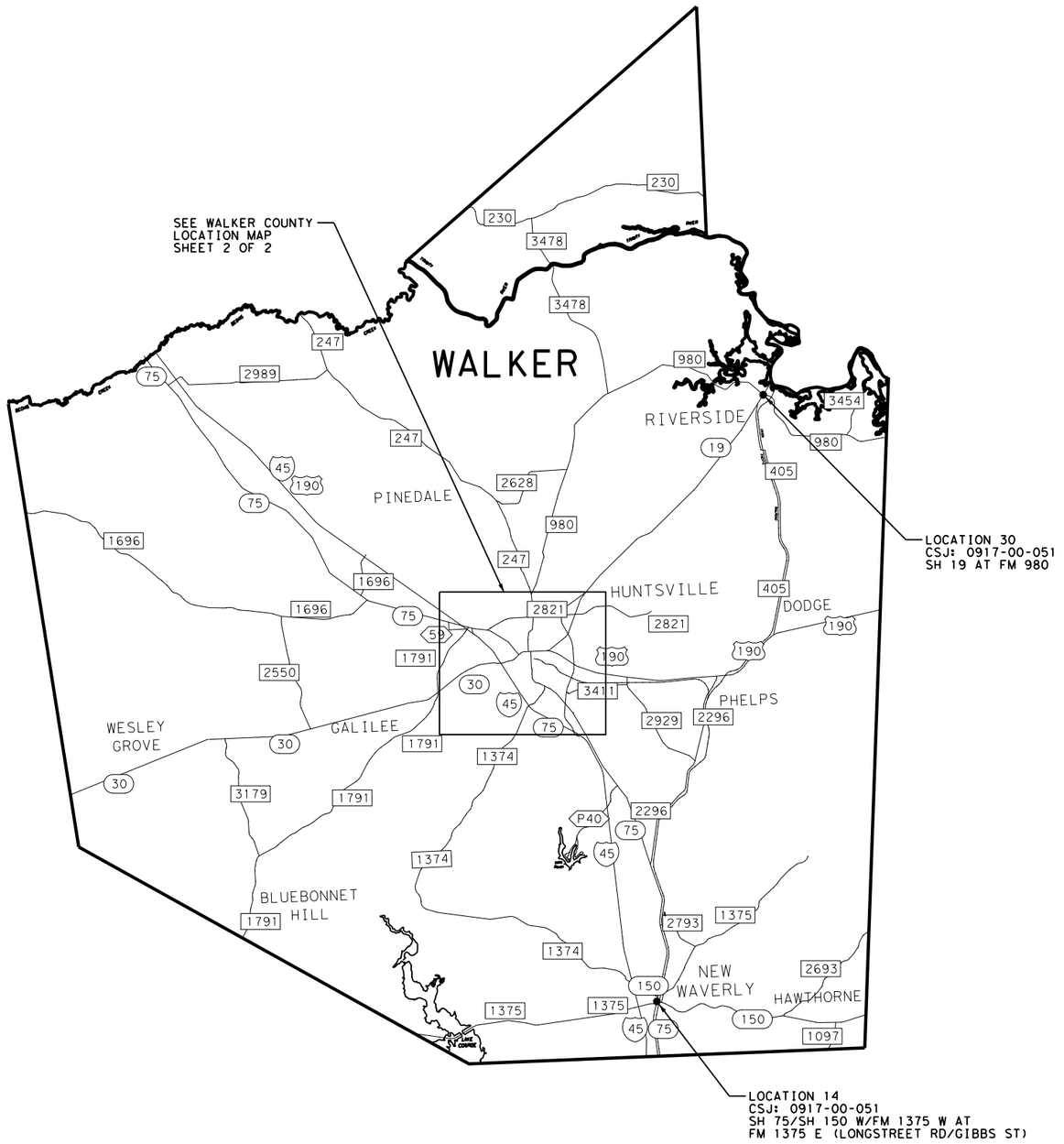
HOUSTON, TEXAS 77079
832.399.1100
TEXAS PE FIRM REG # F-18726

NO.	DATE	REVISION	APPROV.

Texas Department of Transportation

ROBERTSON COUNTY DETAILS

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		38
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS



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SCALE IN MILES

STATE OF TEXAS
KEVIN D. TYER
87924
LICENSED
PROFESSIONAL ENGINEER

05/27/2021

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HOUSTON, TEXAS 77079
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TEXAS PE FIRM REG # F-18726

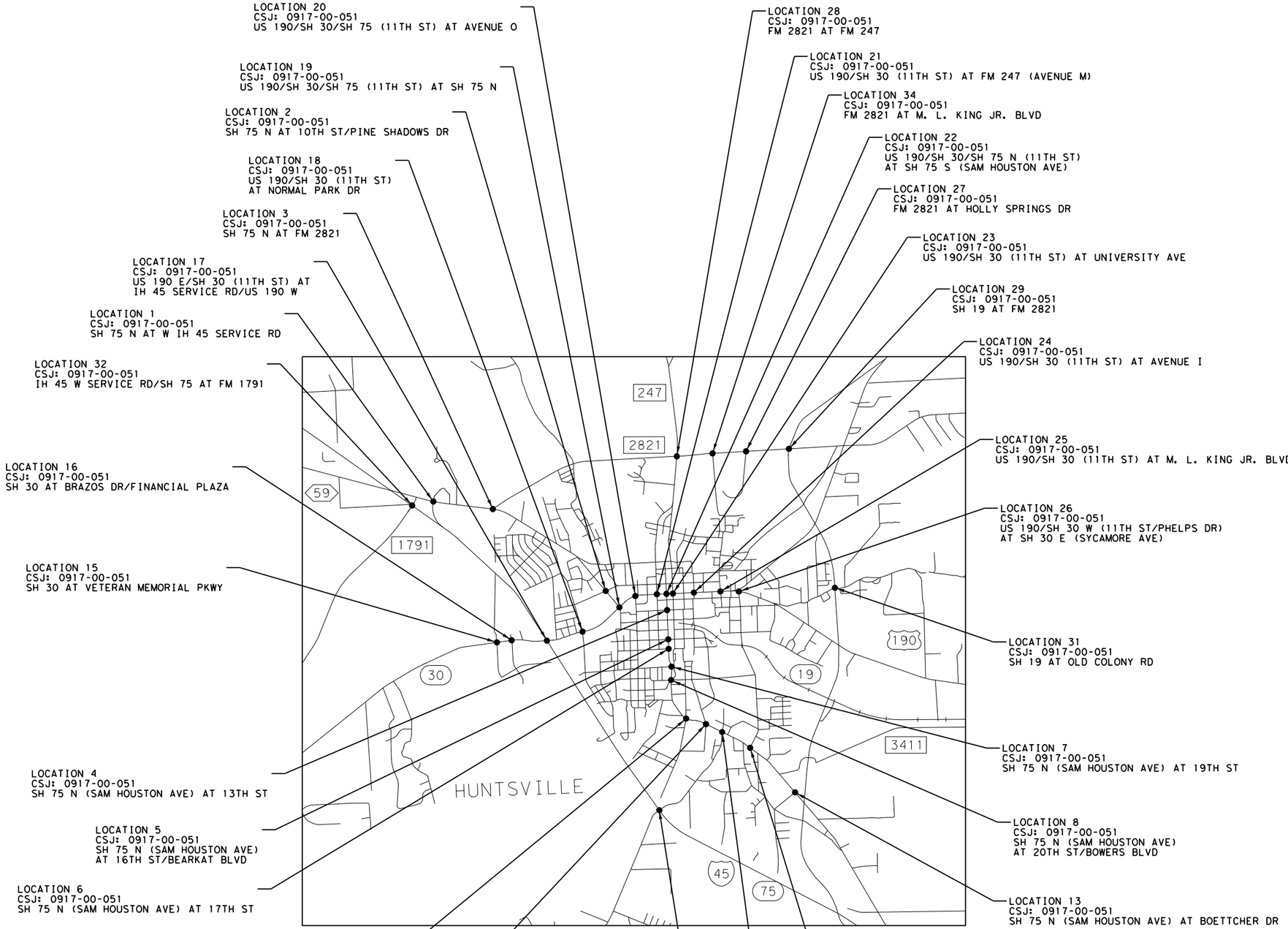
NO.	DATE	REVISION	APPROV.

Texas Department of Transportation

WALKER COUNTY LOCATION MAP

SHEET 1 OF 2

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		39
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS



LOCATION 20
CSJ: 0917-00-051
US 190/SH 30/SH 75 (11TH ST) AT AVENUE O

LOCATION 19
CSJ: 0917-00-051
US 190/SH 30/SH 75 (11TH ST) AT SH 75 N

LOCATION 2
CSJ: 0917-00-051
SH 75 N AT 10TH ST/PINE SHADOWS DR

LOCATION 18
CSJ: 0917-00-051
US 190/SH 30 (11TH ST)
AT NORMAL PARK DR

LOCATION 3
CSJ: 0917-00-051
SH 75 N AT FM 2821

LOCATION 17
CSJ: 0917-00-051
US 190 E/SH 30 (11TH ST) AT
IH 45 SERVICE RD/US 190 W

LOCATION 1
CSJ: 0917-00-051
SH 75 N AT W IH 45 SERVICE RD

LOCATION 32
CSJ: 0917-00-051
IH 45 W SERVICE RD/SH 75 AT FM 1791

LOCATION 16
CSJ: 0917-00-051
SH 30 AT BRAZOS DR/FINANCIAL PLAZA

LOCATION 15
CSJ: 0917-00-051
SH 30 AT VETERAN MEMORIAL PKWY

LOCATION 4
CSJ: 0917-00-051
SH 75 N (SAM HOUSTON AVE) AT 13TH ST

LOCATION 5
CSJ: 0917-00-051
SH 75 N (SAM HOUSTON AVE)
AT 16TH ST/BEARKAT BLVD

LOCATION 6
CSJ: 0917-00-051
SH 75 N (SAM HOUSTON AVE) AT 17TH ST

LOCATION 9
CSJ: 0917-00-051
SH 75 N (SAM HOUSTON AVE)
AT AVENUE J/LAKE RD

LOCATION 10
CSJ: 0917-00-051
SH 75 N (SAM HOUSTON AVE) AT AVENUE I

LOCATION 28
CSJ: 0917-00-051
FM 2821 AT FM 247

LOCATION 21
CSJ: 0917-00-051
US 190/SH 30 (11TH ST) AT FM 247 (AVENUE M)

LOCATION 34
CSJ: 0917-00-051
FM 2821 AT M. L. KING JR. BLVD

LOCATION 22
CSJ: 0917-00-051
US 190/SH 30/SH 75 N (11TH ST)
AT SH 75 S (SAM HOUSTON AVE)

LOCATION 27
CSJ: 0917-00-051
FM 2821 AT HOLLY SPRINGS DR

LOCATION 23
CSJ: 0917-00-051
US 190/SH 30 (11TH ST) AT UNIVERSITY AVE

LOCATION 29
CSJ: 0917-00-051
SH 19 AT FM 2821

LOCATION 24
CSJ: 0917-00-051
US 190/SH 30 (11TH ST) AT AVENUE I

LOCATION 25
CSJ: 0917-00-051
US 190/SH 30 (11TH ST) AT M. L. KING JR. BLVD

LOCATION 26
CSJ: 0917-00-051
US 190/SH 30 W (11TH ST/PHELPS DR)
AT SH 30 E (SYCAMORE AVE)

LOCATION 31
CSJ: 0917-00-051
SH 19 AT OLD COLONY RD

LOCATION 7
CSJ: 0917-00-051
SH 75 N (SAM HOUSTON AVE) AT 19TH ST

LOCATION 8
CSJ: 0917-00-051
SH 75 N (SAM HOUSTON AVE)
AT 20TH ST/BOWERS BLVD

LOCATION 13
CSJ: 0917-00-051
SH 75 N (SAM HOUSTON AVE) AT BOETTCHER DR

LOCATION 12
CSJ: 0917-00-051
SH 75 N (SAM HOUSTON AVE) AT SYCAMORE AVE

LOCATION 11
CSJ: 0917-00-051
SH 75 N (SAM HOUSTON AVE)
AT FM 1374 (MONTGOMERY RD)

LOCATION 33
CSJ: 0917-00-051
IH 45 SERVICE RD AT FM 1374 (MONTGOMERY RD)

0 1
SCALE IN MILES

STATE OF TEXAS
KEVIN D. TYER
87924
LICENSED
PROFESSIONAL ENGINEER
05/27/2021

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HOUSTON, TEXAS 77079
832.399.1100
TEXAS PE FIRM REG # F-18726

NO.	DATE	REVISION	APPROV.

Texas Department of Transportation

WALKER COUNTY
LOCATION MAP

SHEET 2 OF 2

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		40
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS

SCOPE OF WORK

LOCATION NUMBER	COUNTY	CITY	HIGHWAY	CROSS STREET	LATITUDE	LONGITUDE	FURNISH & INSTALL ELECTRONIC LOCK	INSTALL CELLULAR ROUTER	FURNISH & INSTALL CABINET
1	WALKER	HUNTSVILLE	SH 75 N	W IH 45 SERVICE RD	30.736855	-95.585919	1		
2	WALKER	HUNTSVILLE	SH 75 N	10TH ST/PINE SHADOWS DR	30.724482	-95.560884	1		
3	WALKER	HUNTSVILLE	SH 75 N	FM 2821	30.735816	-95.577795	1		
4	WALKER	HUNTSVILLE	SH 75 N (SAM HOUSTON AVE)	13TH ST	30.721736	-95.551577	1		
5	WALKER	HUNTSVILLE	SH 75 N (SAM HOUSTON AVE)	16TH ST/BEARKAT BLVD	30.717841	-95.551564	1		
6	WALKER	HUNTSVILLE	SH 75 N (SAM HOUSTON AVE)	17TH ST	30.716354	-95.551517	1		
7	WALKER	HUNTSVILLE	SH 75 N (SAM HOUSTON AVE)	19TH ST	30.714124	-95.551193	1		
8	WALKER	HUNTSVILLE	SH 75 N (SAM HOUSTON AVE)	20TH ST/BOWERS BLVD	30.712359	-95.55136	1		
9	WALKER	HUNTSVILLE	SH 75 N (SAM HOUSTON AVE)	AVENUE J/LAKE RD	30.707244	-95.549272	1		
10	WALKER	HUNTSVILLE	SH 75 N (SAM HOUSTON AVE)	AVENUE I	30.706672	-95.546341	1		
11	WALKER	HUNTSVILLE	SH 75 N (SAM HOUSTON AVE)	FM 1374 (MONTGOMERY RD)	30.705461	-95.54368	1		
12	WALKER	HUNTSVILLE	SH 75 N (SAM HOUSTON AVE)	SYCAMORE AVE	30.703292	-95.539716	1		
13	WALKER	HUNTSVILLE	SH 75 N (SAM HOUSTON AVE)	BOETTCHER DR	30.697266	-95.533523	1		
14	WALKER	NEW WAVERLY	SH 75/SH 150 W/FM 1375 W	FM 1375 E (LONGSTREET RD/GIBBS ST)	30.537559	-95.483687	1		
15	WALKER	HUNTSVILLE	SH 30	VETERAN MEMORIAL PKWY	30.718524	-95.577121	1	1	
16	WALKER	HUNTSVILLE	SH 30	BRAZOS DR/FINANCIAL PLAZA	30.7186	-95.575238	1	1	
17	WALKER	HUNTSVILLE	US 190 E/SH 30 (11TH ST)	IH 45 SERVICE RD/US 190 W	30.718442	-95.56923	1	1	
18	WALKER	HUNTSVILLE	US 190/SH 30 (11TH ST)	NORMAL PARK DR	30.719142	-95.564513	1	1	
19	WALKER	HUNTSVILLE	US 190 /SH 30/SH 75 (11TH ST)	SH 75 N	30.722187	-95.558654	1	1	1
20	WALKER	HUNTSVILLE	US 190 /SH 30/SH 75 (11TH ST)	AVENUE O	30.723737	-95.55638	1	1	1
21	WALKER	HUNTSVILLE	US 190/SH 30 (11TH ST)	FM 247 (AVENUE M)	30.7239	-95.552842	1	1	1
22	WALKER	HUNTSVILLE	US 190/SH 30/SH 75 N (11TH ST)	SH 75 S (SAM HOUSTON AVE)	30.723876	-95.551587	1	1	1
23	WALKER	HUNTSVILLE	US 190/SH 30 (11TH ST)	UNIVERSITY AVE	30.72386	-95.550594	1	1	1
24	WALKER	HUNTSVILLE	US 190/SH 30 (11TH ST)	AVENUE I	30.723723	-95.547225	1		
25	WALKER	HUNTSVILLE	US 190/SH 30 (11TH ST)	M. L. KING JR. BLVD	30.723962	-95.543379	1	1	1
26	WALKER	HUNTSVILLE	US 190/SH 30 W (11TH ST/PHELPS DR)	SH 30 E (SYCAMORE AVE)	30.723636	-95.540582	1		
27	WALKER	HUNTSVILLE	FM 2821	HOLLY SPRINGS DR	30.742303	-95.537722	1		
28	WALKER	HUNTSVILLE	FM 2821	FM 247	30.74174	-95.549188	1		
29	WALKER	HUNTSVILLE	SH 19	FM 2821	30.742284	-95.531819	1		
30	WALKER	RIVERSIDE	SH 19	FM 980	30.852875	-95.403271	1		
31	WALKER	HUNTSVILLE	SH 19	OLD COLONY RD	30.723704	-95.525891	1		
32	WALKER	HUNTSVILLE	IH 45 W SERVICE RD/SH 75	FM 1791	30.736268	-95.59026	1		
33	WALKER	HUNTSVILLE	IH 45 SERVICE RD	FM 1374 (MONTGOMERY RD)	30.695172	-95.554596	1		
34	WALKER	HUNTSVILLE	FM 2821	M. L. KING JR. BLVD	30.742142	-95.544282	1		
						TOTAL	34	10	6

NOTES:

1. CONTRACTOR TO FURNISH AND INSTALL SIGNAL EQUIPMENT AT LOCATIONS AS INDICATED IN THE TABLE. CONTRACTOR TO PROVIDE ELECTRONIC LOCKS, SMART MMUS, CONTROLLERS, AND CABINETS. CELLULAR ROUTERS WILL BE PROVIDED BY THE DISTRICT AND INSTALLED BY THE CONTRACTOR. ELECTRONIC LOCKS SHALL BE THE CYBERLOCK TRAFFIC CABINET LOCK SYSTEM. SEE GENERAL NOTES FOR PART NUMBERS.

2. LATITUDE AND LONGITUDE REPRESENT APPROXIMATE LOCATION OF TRAFFIC SIGNAL CABINET. CONTRACTOR TO CONFIRM LOCATION OF CABINET IN THE FIELD.

3. CONTRACTOR SHALL MAINTAIN THE EXISTING SIGNAL INSTALLATION AND OPERATIONS AT THE INTERSECTION UNTIL THE PROPOSED SIGNAL EQUIPMENT IS OPERATIONAL.

4. CONTRACTOR SHALL TRANSPORT, INSTALL, AND TEST DISTRICT-FURNISHED CELLULAR ROUTER. ROUTER SHALL BE POWERED BY HARDWIRING TO POWER PANEL ON RIGHT SIDE OF SIGNAL CABINET. AFTER ALL CELLULAR ROUTERS HAVE BEEN INSTALLED, THE DEPARTMENT WILL CONDUCT TESTS ON THE FIELD EQUIPMENT TO DETERMINE ACCEPTANCE. THE CELLULAR ROUTERS WILL BE CONFIGURED BY OTHERS, HOWEVER THE CONTRACTOR SHALL BE ON SITE AS NECESSARY FOR FINAL ROUTER ACCEPTANCE. SEE GENERAL NOTES FOR ADDITIONAL INFORMATION.

5. REPLACE EXISTING POLE MOUNTED SIGNAL CABINET WITH PROPOSED TS2 TYPE 2 POLE MOUNTED TRAFFIC SIGNAL CABINETS ON EXISTING POLES UTILIZING EXISTING INTERSECTION WIRING AND CABLE TERMINATIONS.

6. CONTRACTOR SHALL REMOVE AND SALVAGE ALL EXISTING TRAFFIC SIGNAL EQUIPMENT AFTER PROPOSED SIGNAL EQUIPMENT IS OPERATIONAL. DELIVER SALVAGED EQUIPMENT TO TXDOT SIGNAL SHOP. CONTACT JERRY HERNANDEZ AT 979-218-9090.

7. CONTRACTOR SHALL FURNISH AND INSTALL 4 FACTORY TERMINATED ETHERNET CABLES (5 FOOT LONG MINIMUM) AT EACH INTERSECTION. SUBSIDIARY TO ITEM 6430. ETHERNET CABLES ARE NOT TO BE CUT OR TERMINATED BY CONTRACTOR. SEE GENERAL NOTES FOR ADDITIONAL INFORMATION.

05/27/2021

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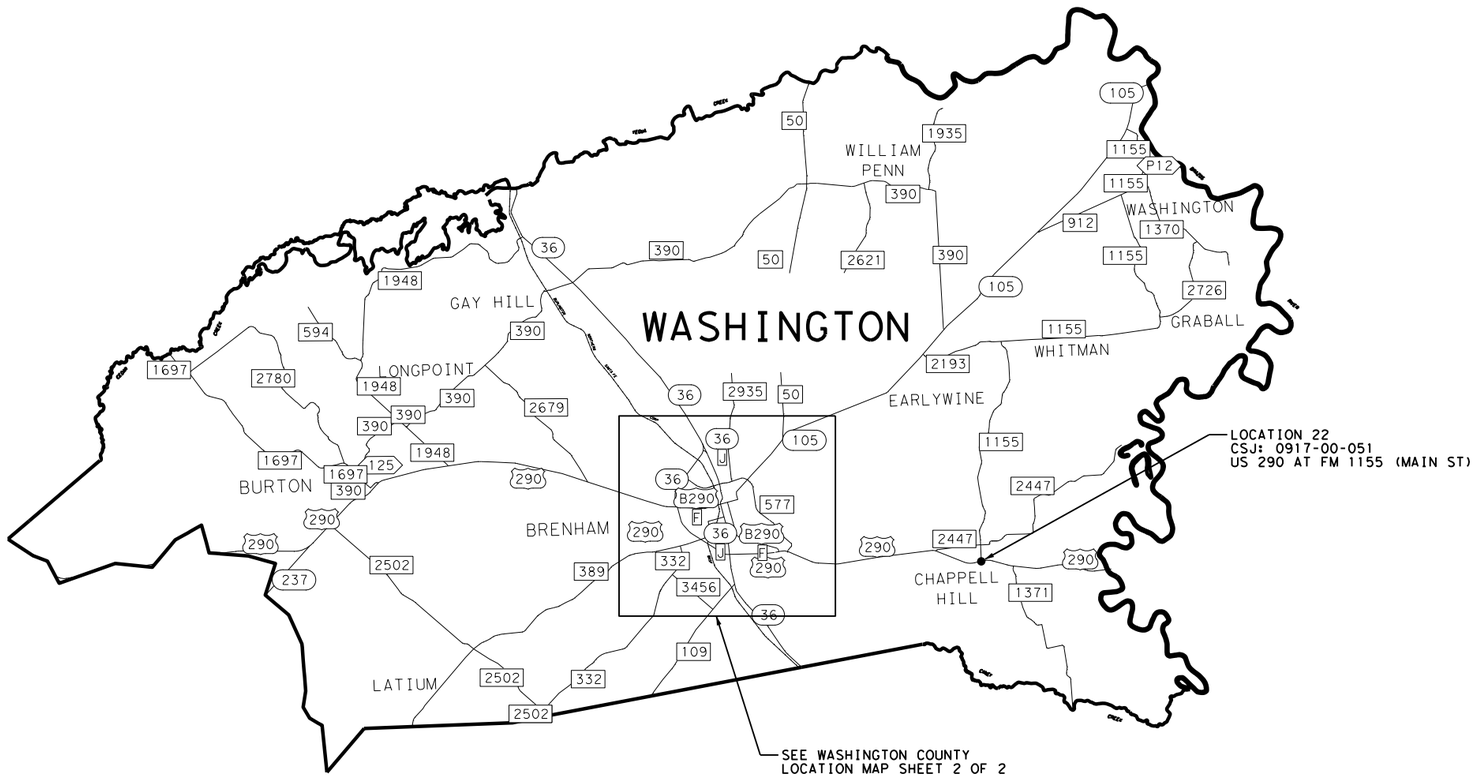
TEXAS PE FIRM REG # F-18726

NO.	DATE	REVISION	APPROV.

Texas Department of Transportation

WALKER COUNTY DETAILS

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		41
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS



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SCALE IN MILES

STATE OF TEXAS
KEVIN D. TYER
87924
LICENSED
PROFESSIONAL ENGINEER

05/27/2021

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TEXAS PE FIRM REG # F-18726

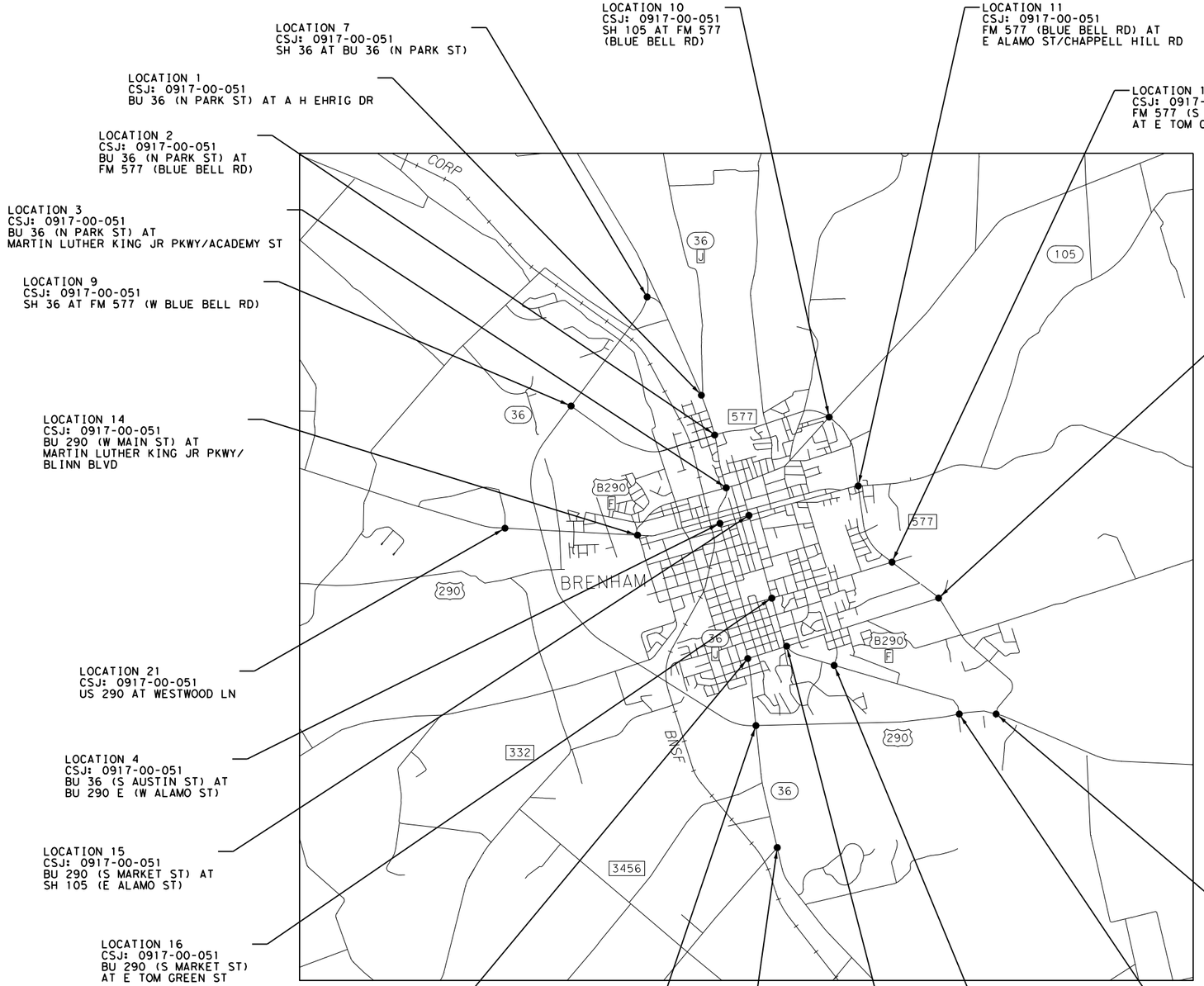
NO.	DATE	REVISION	APPROV.

Texas Department of Transportation

WASHINGTON COUNTY LOCATION MAP

SHEET 1 OF 2

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		42
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS



LOCATION 1
CSJ: 0917-00-051
BU 36 (N PARK ST) AT A H EHRIG DR

LOCATION 2
CSJ: 0917-00-051
BU 36 (N PARK ST) AT
FM 577 (BLUE BELL RD)

LOCATION 3
CSJ: 0917-00-051
BU 36 (N PARK ST) AT
MARTIN LUTHER KING JR PKWY/ACADEMY ST

LOCATION 4
CSJ: 0917-00-051
BU 36 (S AUSTIN ST) AT
BU 290 E (W ALAMO ST)

LOCATION 5
CSJ: 0917-00-051
BU 36 (S DAY ST) AT W STONE ST

LOCATION 6
CSJ: 0917-00-051
US 290/SH 36 N AT
BU 36/SH 36 S (S DAY ST)

LOCATION 7
CSJ: 0917-00-051
SH 36 AT BU 36 (N PARK ST)

LOCATION 8
CSJ: 0917-00-051
SH 36 AT FM 109

LOCATION 9
CSJ: 0917-00-051
SH 36 AT FM 577 (W BLUE BELL RD)

LOCATION 10
CSJ: 0917-00-051
SH 105 AT FM 577
(BLUE BELL RD)

LOCATION 11
CSJ: 0917-00-051
FM 577 (BLUE BELL RD) AT
E ALAMO ST/CHAPPELL HILL RD

LOCATION 12
CSJ: 0917-00-051
FM 577 (S BLUE BELL RD)
AT E TOM GREEN ST

LOCATION 13
CSJ: 0917-00-051
FM 577 (S BLUE BELL RD)
AT E STONE ST

LOCATION 14
CSJ: 0917-00-051
BU 290 (W MAIN ST) AT
MARTIN LUTHER KING JR PKWY/
BLINN BLVD

LOCATION 15
CSJ: 0917-00-051
BU 290 (S MARKET ST) AT
SH 105 (E ALAMO ST)

LOCATION 16
CSJ: 0917-00-051
BU 290 (S MARKET ST)
AT E TOM GREEN ST

LOCATION 17
CSJ: 0917-00-051
BU 290 (S MARKET ST)
AT CHAPPEL HILL ST

LOCATION 18
CSJ: 0917-00-051
BU 290 (S MARKET ST)
AT E STONE ST

LOCATION 19
CSJ: 0917-00-051
US 290 AT BU 290

LOCATION 20
CSJ: 0917-00-051
US 290 AT FM 577

LOCATION 21
CSJ: 0917-00-051
US 290 AT WESTWOOD LN

0 1
SCALE IN MILES

STATE OF TEXAS
KEVIN D. TYER
87924
LICENSED
PROFESSIONAL ENGINEER

05/27/2021

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HOUSTON, TEXAS 77079
832.399.1100
TEXAS PE FIRM REG # F-18726

NO.	DATE	REVISION	APPROV.

Texas Department of Transportation

WASHINGTON COUNTY
LOCATION MAP

SHEET 2 OF 2

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		43
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS

SCOPE OF WORK

LOCATION NUMBER	COUNTY	CITY	HIGHWAY	CROSS STREET	LATITUDE	LONGITUDE	FURNISH & INSTALL ELECTRONIC LOCK
1	WASHINGTON	BRENHAM	BU 36 (N PARK ST)	A H EHRIG DR	30.181375	-96.401873	1
2	WASHINGTON	BRENHAM	BU 36 (N PARK ST)	FM 577 (BLUE BELL RD)	30.176757	-96.400289	1
3	WASHINGTON	BRENHAM	BU 36 (N PARK ST)	MARTIN LUTHER KING JR PKWY/ACADEMY ST	30.17046	-96.398965	1
4	WASHINGTON	BRENHAM	BU 36 (S AUSTIN ST)	BU 290 E (W ALAMO ST)	30.166341	-96.400107	1
5	WASHINGTON	BRENHAM	BU 36 (S DAY ST)	W STONE ST	30.150499	-96.396941	1
6	WASHINGTON	BRENHAM	US 290/SH 36 N	BU 36/SH 36 S (S DAY ST)	30.141869	-96.396272	1
7	WASHINGTON	BRENHAM	SH 36	BU 36 (N PARK ST)	30.193294	-96.408896	1
8	WASHINGTON	BRENHAM	SH 36	FM 109	30.128275	-96.393491	1
9	WASHINGTON	BRENHAM	SH 36	FM 577 (W BLUE BELL RD)	30.180467	-96.418958	1
10	WASHINGTON	BRENHAM	SH 105	FM 577 (BLUE BELL RD)	30.178195	-96.384633	1
11	WASHINGTON	BRENHAM	FM 577 (BLUE BELL RD)	E ALAMO ST/CHAPPELL HILL RD	30.170198	-96.381488	1
12	WASHINGTON	BRENHAM	FM 577 (S BLUE BELL RD)	E TOM GREEN ST	30.161093	-96.377549	1
13	WASHINGTON	BRENHAM	FM 577 (S BLUE BELL RD)	E STONE ST	30.156843	-96.37113	1
14	WASHINGTON	BRENHAM	BU 290 (W MAIN ST)	MARTIN LUTHER KING JR PKWY/BLINN BLVD	30.16505	-96.410698	1
15	WASHINGTON	BRENHAM	BU 290 (S MARKET ST)	SH 105 (E ALAMO ST)	30.167173	-96.396261	1
16	WASHINGTON	BRENHAM	BU 290 (S MARKET ST)	E TOM GREEN ST	30.157441	-96.393549	1
17	WASHINGTON	BRENHAM	BU 290 (S MARKET ST)	CHAPPEL HILL ST	30.149124	-96.385257	1
18	WASHINGTON	BRENHAM	BU 290 (S MARKET ST)	E STONE ST	30.151883	-96.391389	1
19	WASHINGTON	BRENHAM	US 290	BU 290	30.142859	-96.369325	1
20	WASHINGTON	BRENHAM	US 290	FM 577	30.143456	-96.363101	1
21	WASHINGTON	BRENHAM	US 290	WESTWOOD LN	30.166321	-96.428903	1
22	WASHINGTON	CHAPPELL HILL	US 290	FM 1155 (MAIN ST)	30.135587	-96.256831	1
						TOTAL	22

NOTES:

1. CONTRACTOR TO FURNISH AND INSTALL SIGNAL EQUIPMENT AT LOCATIONS AS INDICATED IN THE TABLE. ELECTRONIC LOCKS SHALL BE THE CYBERLOCK TRAFFIC CABINET LOCK SYSTEM. SEE GENERAL NOTES FOR PART NUMBERS.

2. LATITUDE AND LONGITUDE REPRESENT APPROXIMATE LOCATION OF TRAFFIC SIGNAL CABINET. CONTRACTOR TO CONFIRM LOCATION OF CABINET IN THE FIELD.

05/27/2021

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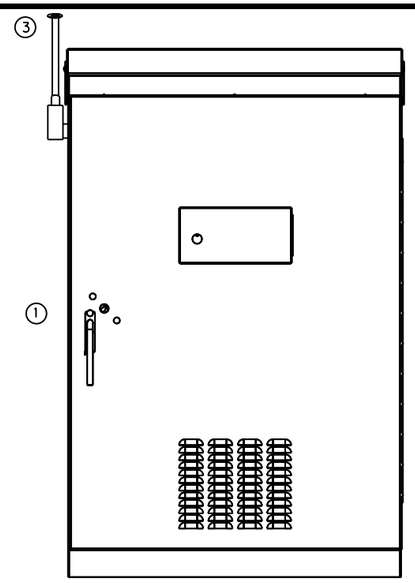
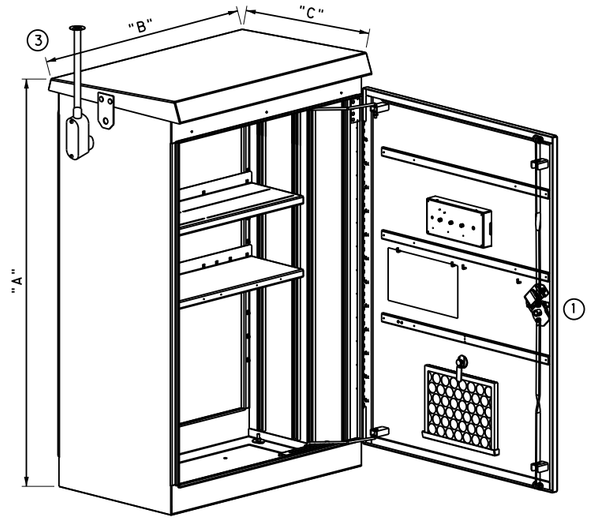
Texas Department of Transportation

WASHINGTON COUNTY DETAILS

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 917-00-51		44
STATE	DIST.	COUNTY	
TEXAS	BRY	BRAZOS	
CONT.	SECT.	JOB	HIGHWAY NO.
0917	00	051	VARIOUS



FRONT ELEVATION



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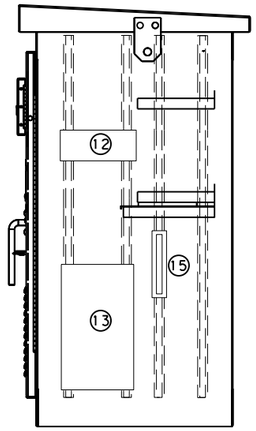
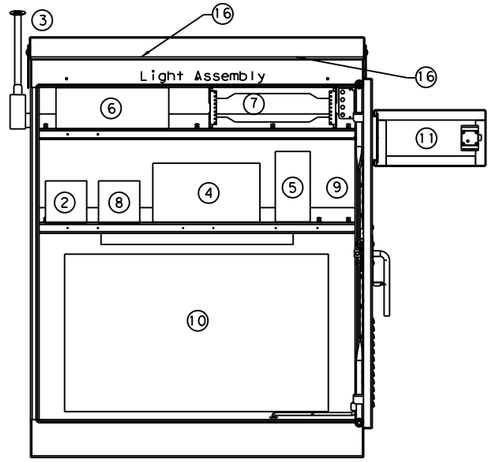
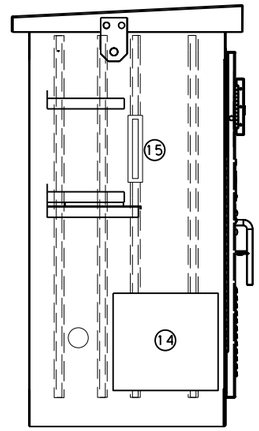


INSIDE LEFT WALL



INSIDE FRONT



INSIDE RIGHT WALL

CABINET EQUIPMENT CONFIGURATION

GENERAL NOTES:

1. External cabinet features and door configuration shown is diagrammatic in nature and intended to represent a typical pole mounted cabinet setup.
2. Layout of hardware equipment and configuration shown is diagrammatic in nature and intended to represent a preferred pole mounted cabinet setup. Hardware needed for each cabinet varies and not all cabinet equipment may be shown. The contractor will be responsible for configuring cabinets with all appropriate traffic signal hardware in accordance with the plans and specifications. The contractor may alter the cabinet configuration shown to maximize space and ensure easy access for maintenance.
3. All dimensions are approximate and represent minimum dimensions.
4. Remove No. 2 lock and install smart lock per manufacturer instructions.
5. The contractor will be responsible for ensuring connectivity of cellular router. Install cellular router and antenna per manufacturer instructions.
6. Install signal controller and MMU per manufacturer instructions.
7. Contractor shall submit shop drawings showing equipment placement and configuration.
8. Size 5 Configuration 3 as denoted in TxDOT DMS 11170.

REFERENCE KEY NOTES:

1. Smart Lock
2. Cellular Router
3. Cellular Router Antenna
4. Traffic Signal Controller
5. Malfunction Management Unit (MMU)
6. Detection Card Equipment
7. 4RU (Size 5/6) or 7RU (Size 7) EIA 19" Rack
8. Power Supply
9. Ethernet Switch
10. Load Switch Bay and Back Panel
11. Police Panel
12. Preemption Panel (when required)
13. Loop Detector Panel
14. Power Distribution Panel
15. Light Assembly (Side Wall Mount)
16. Fan Assembly (Min. 2)

Cabinet Size	Cabinet Dimensions		
	"A"	"B"	"C"
	IN	IN	IN
Size 5	48	30	16

05/27/2021

TRAF·IQ
14811 ST. MARY'S LANE, SUITE 180
HOUSTON, TEXAS 77079
832.399.1100
TEXAS PE FIRM REG # F-18726

TRAFFIC SIGNAL CABINET INSTALLATION DETAILS

SIZE 5 CONFIGURATION 3

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
JC	6	C 917-00-51		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JC	TEXAS	BRY	BRAZOS	45
CHECK	CONTROL	SECTION	JOB	
AC	0917	00	051	
CHECK				
KT				

DATE:
FILE:

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

FILE:	ed1-14.dgn	DN:	CK:	DW:	CK:
© TxDOT	October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS		0917	00	051	VARIOUS
		DIST	COUNTY		SHEET NO.
		BRY	BRAZOS		46

71A

DATE:
FILE:

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.

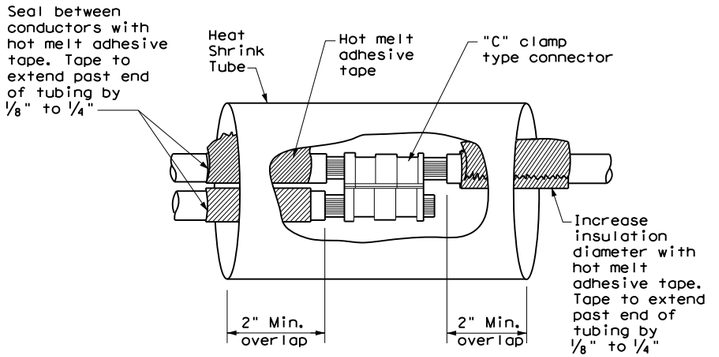
3. Install ground rods so the imprinted part number is at the upper end of the rod.

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

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUCTORS

ED(3)-14

FILE: ed3-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0917	00	051	VARIOUS
	DIST	COUNTY		SHEET NO.
	BRY	BRAZOS		47

71C

During the planning phase of project development the following environmental permits, issues and commitments have been developed during coordination with resource agencies, local governmental entities and the general public. Any change orders and/or deviations from the final design must be reported to the Engineer prior to the commencement of construction activities. As additional environmental clearances may be required.

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.

☐ Required Action ☒ No Action Required

Refer to 2014 TxDOT Standard Specification Items:
7.7.2 Texas Pollutant Discharge Elimination System (TPDES) Permits and Storm Water Pollution Prevention PLans (SWP3)
506 Temporary Erosion, Sedimentation and Environmental Controls
734 Litter Removal
735 Debris Removal
738 Cleaning and Sweeping Highways

II. WORK IN OR NEAR STREAMS, WATER BODIES 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#

Information regarding the USACE Nationwide Permit Program can be found at:
http://www.swf.usace.army.mil/Missions/Regulatory/Permitting/GeneralPermits.aspx

Refer to 2014 TxDOT Standard Specification Items:
7.7.3 Work in Waters of the United States
7.7.6 Project Specific Locations
496 Removing Structures
506 Temporary Erosion, Sedimentation and Environmental Controls
506.4.3.4 Restricted Activities and Required Precautions

III. CULTURAL RESOURCES

Refer to 2014 TxDOT Standard Specification Item 7.7.1 Cultural Resources, in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) immediately cease work in the vicinity and contact the Engineer.

☐ Required Action ☒ No Action Required

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.

☐ Required Action ☒ No Action Required

Refer to 2014 TxDOT Standard Specification Items:
160 Topsoil
161 Compost
162 Sodding for Erosion Control
164 Seeding for Erosion Control
166 Fertilizer
168 Vegetative Watering
169 Soil Retention Blankets
170 Irrigation System
180 Wildflower Seeding
192 Landscape Planting
193 Landscape Establishment
506 Temporary Erosion, Sedimentation, and Environmental Controls
730 Roadside Mowing
751 Landscape Maintenance
752 Tree and Brush Removal

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

☒ Required Action ☐ No Action Required

Action No.

1. Do not kill snakes or other animals!

2. Do not destroy nests on structures within the project limits.

   Temporarily prevent the building of nests on any structures that require work within the project limits during the construction timeframe.

   This can be accomplished by application of bird repellant gel, netting, or removal by hand every 3-4 days.

   The nesting/breeding season for migratory birds is March 1 - September 1.

Under the Migratory Bird Treaty Act (MBTA), it is unlawful by any means or manner, to pursue, hunt, take, capture, [or] kill any migratory birds except as permitted by regulation (16 U.S.C. 703-704). Neither the statute nor its implementing regulations (Title 50, Code of Federal Regulations, Parts 10, 13, 21) exempt unintentional take of migratory birds. The unauthorized take (e.g. killing, capturing, or collecting) of migratory birds is a strict liability criminal offense that does not require knowledge or specific intent on the part of the offender. Even when engaged in an otherwise lawful activity for which the intent is not the killing of migratory birds, a violation may be committed.

3. If caves or sinkholes are discovered, cease work in the immediate area to verify the presence or absence of wildlife.

The Bryan District Environmental Section can be contacted at (979) 778-9766 to assist with the removal of wildlife that will not leave on their own with gentle persuasion.

Refer to 2014 TxDOT Standard Specification Item:
7.7.6 Project Specific Locations

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

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

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

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 notifiy 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 discoverd on site. Hazardous Materials or Contamination Issues Specific to this Project:

☒ Required Action ☐ No Action Required

Action No.

1. The Clean Water Act, in part, requires that any spill of oil that could enter a waterway, as defined by the Act, and that violates applicable water quality standards or causes a film or sheen on water require reporting to the TCEQ and local authorities.
   Contact the Bryan District Environmental Section at 979-778-9766.

   If potentially hazardous material and/or contaminated media (i.e. soil, groudwater, surface water, sediment, building materials) are unexpectedly encountered during construction, immediately cease work in the vicinity and contact the Engineer.

   Refer to 2014 TxDOT Standard Specification Items:
   6.10 Hazardous Materials
   7.12 Responsibility for Hazardous Materials

VII. OTHER ENVIRONMENTAL ISSUES

☐ Required Action ☒ No Action Required

Refer to 2014 TxDOT Standard Specification Items:
7.7.6 Project Specific Locations
751 Landscape Maintenance

Contacts:

Mr. John D. Moravec
Environmental Coordinator
Texas Department of Transportation
Bryan District
2591 N. Earl Rudder Freeway
Bryan, TX 77803
Phone: (979) 778-9766
Fax: (979) 778-9702
e-mail: John.Moravec@txdot.gov

PRINT DATE	REVISION DATE
$DATE$	

Texas Department of Transportation
Bryan District

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC)

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6	C 917-00-51	VARIOUS
STATE	DISTRICT	COUNTY
TEXAS	BRY	BRAZOS
CONTROL	SECTION	JOB / SHEET NO.
0917	00	051 / 48

FILENAME: $FILES
REV DATE:
CSJ: 0917-00-047