CITY OF LUCAS, TEXAS

CONSTRUCTION PLANS FOR:

SOUTH ORCHARD ROAD CHANNEL AND CULVERT **IMPROVEMENTS**

BID #RFP-028-23

CITY COUNCIL

JIM OLK, MAYOR KATHLEEN PEELE, MAYOR PRO-TEM TIM JOHNSON TIM BANEY DAVID KERR PHILIP LAWRENCE DEBBIE FISHER

CITY MANAGER JONI CLARKE

DIRECTOR OF PUBLIC WORKS SCOTT HOLDEN, P.E.



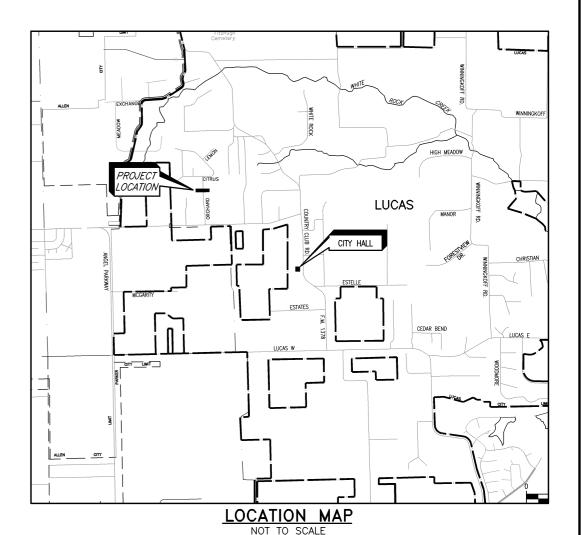
PREPARED BY

BIRKHOFF, HENDRICKS & CARTER, L.L.P.

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September, 2022

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GENERAL NOTES:

- 1. THE LOCATION OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE MANNER ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR HIS REPRESENTATIVE (ENGINEER). THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK AND SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGE WHICH MIGHT OCCUR DUE TO THE CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE ANY AND ALL INNERGROUND UTILITIES.
- THE NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, 4TH EDITION, OCTOBER 2004, ARE HEREAFTER, COLLECTIVELY REFERRED TO AS "THE STANDARD SPECIFICATIONS".
- IN THE EVENT AN ITEM IS NOT COVERED WITHIN THESE PLANS AND SPECIFICATIONS, THE NORTH CENTRAL TEXAS COUNCIL
 OF GOVERNMENTS (NCTCOG) STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION SHALL APPLY.
- 4. THE CONTRACTOR SHALL CONTACT THE ENGINEER SHOULD ANY DISCREPANCIES BE FOUND IN THE CONSTRUCTION PLANS AND/OR THE SPECIAL PROVISIONS. THE CONTRACTOR WILL NOT BE COMPENSATED FOR ANY WORK NOT AUTHORIZED BY THE
- 5. (NOTE REMOVED).
- 6. THE CONTRACTOR SHALL NOT PLACE FILL OR WASTE MATERIAL ON ANY PRIVATE PROPERTY WITHOUT A WRITTEN AGREEMENT WITH THE PROPERTY OWNER AND APPROVAL BY CITY. A COPY OF THIS AGREEMENT SHALL BE PROVIDED TO THE CITY.
- TRENCH SAFETY DESIGN SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR SHALL SUBMIT A TRENCH SAFETY DESIGN PLAN, SEALED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF TEXAS, FOR REVIEW PRIOR TO THE STATE OF CONSTRUCTION.
- 8. THE CONTRACTOR SHALL PROTECT THE EXISTING TREES, BUSHES, LANDSCAPING PLANTS, SPRINKLERS, AND LAWNS UNLESS SHOWN OTHERWISE ON THE CONSTRUCTION DRAWINGS. ANY DAMAGE TO THE EXISTING TREES, BUSHES, LANDSCAPING PLANTS, SPRINKLERS, AND LAWNS CAUSED BY THE CONSTRUCTION SHALL BE REPLACED TO THE SATISFACTION OF THE PROPERTY OWNER AND THE CITY AT THE CONTRACTOR'S SOLE EXPENSE.
- 9. THE CONTRACTOR SHALL PROTECT ALL UNDERGROUND IRRIGATION SYSTEMS. ADJUSTMENT OR RELOCATION OF IRRIGATION SYSTEM SHALL BE INSTALLED BY AN IRRIGATOR LICENSED IN THE STATE OF TEXAS AND, IF REQUIRED, SHALL BE INCIDENTAL TO RIGHT OF MAY PREPARATION
- 10. THE CONTRACTOR SHALL RESTORE ALL AREAS DISTURBED BY THE CONSTRUCTION TO THE ORIGINAL CONDITION OR BETTER. RESTORED AREAS INCLUDE BUT NOT LIMITED TO TRENCH BACKFILL, SIDE SLOPES, FENCES, IRRIGATION SYSTEMS, DRIVEWAYS, PRIVATE YARDS, SIGNS AND ROADWAYS. DISTURBED ROADWAY CLEAR ZONES SHALL BE HYDRO MULCHED, WATERED & ESTABLISHED. DISTURBED CHANNEL SIDE SLOPES SHALL BE RESTORED WITH SOLID BLOCK SOD, WATERED, FERTILIZED & ESTABLISHED. THE ESTABLISHMENT OF GRASS IN DISTURBED AREAS SHALL BE DETERMINED BY THE CITY.
- 11. TEMPORARY FENCING SHALL BE PLACED PRIOR TO ANY FENCE REMOVAL FOR CONSTRUCTION. TEMPORARY FENCING SHALL MATCH THE EXISTING FENCE. PAYMENT FOR TEMPORARY FENCE SHALL BE SUBSIDIARY TO THE REMOVAL AND REPLACEMENT OF THE FENCE.
- 12. NO SEPARATE PAY IS PROVIDED FOR THE TREE REMOVAL. TREE REMOVAL SHALL BE CONSIDERED SUBSIDIARY TO APPROPRIATE ITEMS IN THE BID SCHEDULE.

PAVING NOTES

- 1. THE CONTRACTOR SHALL KEEP STREETS ADJACENT TO THE PROJECT FREE OF MUD AND DEBRIS FROM THE CONSTRUCTION.
- 2. CONCRETE FOR ALL STREETS SHALL BE IN ACCORDANCE WITH NCTCOG CLASS "P1" CONCRETE (4,000 P.S.I. COMPRESSIVE @ 28 DAYS MINIMUM 6 SACK MIX).
- 3. THE CONTRACTOR SHALL PROVIDE ACCESS TO PRIVATE PROPERTY AT ALL TIMES. DRIVEWAYS WILL BE REPLACED AS DIRECTED BY THE ENGINEER. TEMPORARY DRIVEWAYS SHALL BE CONSTRUCTED IMMEDIATELY AFTER THE CONTRACTOR HAS DISTURBED OR ALTERED THE ADJACENT PROPERTY OWNERS ACCESS TO HIS PROPERTY.
- 4. DRIVEWAY LOCATIONS IF ANY SHOWN ARE SUBJECT TO CHANGE TO SUIT ACTUAL FIELD CONDITIONS AT THE TIME OF CONSTRUCTION AND MAY BE SHIFTED AS DIRECTED BY THE ENGINEER.
- 5. DRIVEWAYS CONSTRUCTED OFF RIGHT-OF-WAY SHALL MATCH THE EXISTING DRIVE CONSTRUCTION MATERIALS, OR AS DIRECTED BY THE ENGINEER, WHERE APPLIES.
- 5. WHEN EXCAVATION IS REQUIRED NEXT TO A PAVEMENT LANE CARRYING TRAFFIC AND WIDENING IS NOT COMPLETED WITHIN FORTY EIGHT (48) HOURS, SUFFICIENT BACKFILL SHALL BE PLACED AGAINST THE EDGE OF PAVEMENT TO PROVIDE A USUAL 3-1 SLOPE
- 7. WHERE THE CONTRACTOR DESIRES TO MOVE ANY EQUIPMENT NOT LICENSED FOR OPERATION ON PUBLIC ROADWAYS ON OR ACROSS PAVEMENT, HE SHALL PROTECT THE PAVEMENT FROM DAMAGE. ANY DAMAGE TO PAVEMENT SHALL BE REPLACED AT THE CONTRACTOR'S SOLE EXPENSE.
- 8. THE CONTRACTOR SHALL NOT COMMENCE WORK ON THE ROADWAY BEFORE 7:00 AM AND SHALL ARRANGE HIS WORK SO THAT NO MACHINERY OR EQUIPMENT SHALL BE CLOSER THAN 30 FEET TO THE TRAVELED ROADWAY AFTER SUNSET EXCEPT AS APPROVED BY THE ENGINEER. UNLESS OTHERWISE APPROVED BY THE CITY, WORKING HOURS SHALL BE 7AM-6PM MON.—FRI. AND 8AM-5PM ON SATURDAYS. NO WORK SHALL BE DONE ON CITY HOLIDAYS OR SUNDAYS WITHOUT WRITTEN PERMISSION FROM THE CITY.
- 9. WHERE PROPOSED REINFORCED CONCRETE PAVEMENT CONNECT TO EXISTING REINFORCED CONCRETE PAVEMENT, THE CONTRACTOR SHALL MATCH AT SAME TOP CONCRETE ELEVATION WITH A SMOOTH TRANSITION INCLUDING AT CONCRETE CURB CONNECTIONS. SEE LONGITUDINAL BUTT JOINT DETAIL FOR TYPICAL CONNECTION.
- 10. THIS PROJECT WILL NOT BE CONSIDERED COMPLETE UNTIL THE ENGINEER DETERMINES THAT ALL CURBS, PAVEMENT AND SIDEWALKS HAVE BEEN SWEPT CLEAN OF ALL DIRT AND DEBRIS.

PAVEMENT MARKINGS AND SIGNS

- ALL PAVEMENT MARKINGS, SIGN MATERIALS AND CONSTRUCTION SHALL CONFORM TO THE LATEST ADDITIONS OF THE STANDARD HIGHWAY DEPARTMENT SIGN DESIGN FOR TEXAS, THE TEXAS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD) UNLESS NOTED OTHERWISE.
- 2. SIGN LOCATIONS SHOWN ON THE PLANS ARE DIAGRAMMATIC.
- 3. PAYMENT FOR EACH SIGN SHALL INCLUDE MOUNTING HARDWARE, THE SIGN POLE AND GROUND MOUNTING SYSTEM. ALL GROUND MOUNTED SIGNS SHALL BE GALVANIZED 12—GAUGE YIELDING BREAKAWAY GROUND MOUNTED SIGN SYSTEMS. THE SYSTEM SHALL CONSIST OF THE FOLLOWING THREE ELEMENTS:
 - a) 12-FOOT LONG 2-INCH SQUARE POLES WITH HOLES
 - b) 30-INCH LONG 2.25-INCH SQUARE BASE
 - c) 18-INCH LONG 2.5-INCH SQUARE SLEEVE
- 4. SIGNS SHALL BE PLACED IN CONFORMANCE WITH THE LATEST EDITION OF TMUTCD.
- REFLECTORIZED PAVEMENT MARKINGS SHALL BE THERMOPLASTIC, PER TXDOT STANDARD SPECIFICATIONS, ITEM 666. PAVEMENT MARKERS SHALL COMPLY WITH TXDOT STANDARD SPECIFICATIONS, ITEM 672.
- 6. ANY SIGNS TEMPORARILY REMOVED BY THE CONTRACTOR SHALL BE REPLACED. PAYMENT FOR THE REPLACEMENT OF SIGNS NOT CALLED OUT IN THE CONSTRUCTION PLANS AND INCLUDED IN THE BID SCHEDULE SHALL BE SUBSIDIARY TO THE PROJECT.

TRAFFIC CONTROL

- THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE TRAFFIC CONTROL DURING THE PROJECT. ALL TRAFFIC CONTROL WORK SHALL BE IN ACCORDANCE WITH THE LATEST VERSION OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD).
- 2. ALL TRAFFIC CONTROL PLANS MUST BE SUBMITTED BY THE CONTRACTOR FOR REVIEW A MINIMUM OF SEVEN WORKING DAYS PRIOR TO ANTICIPATED LANE CLOSURES. THE TRAFFIC CONTROL PLAN MUST BE APPROVED BY THE CITY PRIOR TO BEGINNING CONSTRUCTION ACTIVITY. TRAFFIC CONTROL PLANS MAY BE REQUIRED ON OTHER ROADWAYS AS DETERMINED BY THE CITY OR THE ENGINEER. ALL TRAFFIC CONTROL PLANS MUST BE PREPARED BY AN INDIVIDUAL CERTIFIED IN THEIR PREPARATION IN THE STATE OF TEXAS.
- BARRICADES AND SIGNS SHALL BE PLACED IN SUCH A MANNER AS NOT TO INTERFERE WITH SIGHT DISTANCE OF DRIVERS ENTERING THE ROADWAY OR SIDE STREETS.
- ALL TEMPORARY TRAFFIC CONTROL DEVICES SHALL BE REMOVED AS SOON AS PRACTICAL OR MOVED AS APPROPRIATE WHEN THEY ARE NO LONGER NEEDED.

UTILITY NOTES

- 1. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROTECT ALL EXISTING PUBLIC AND PRIVATE UTILITIES THROUGHOUT THE CONSTRUCTION ON THIS PROJECT. THE CONTRACTOR SHALL CONTACT THE APPROPRIATE UTILITY COMPANY FOR LINE RESPONSIBILITY AND IS LIABLE TO THESE COMPANIES FOR ANY DAMAGE CAUSED TO THEIR FACILITIES.
- THE CONTRACTOR SHALL TAKE EXTREME CARE WHEN EXCAVATING IN THE VICINITY OF UTILITIES. THE
 CONTRACTOR MAY BE REQUIRED TO PROBE OR EXPOSE THESE FACILITIES. THE CONTRACTOR WILL BE
 RESPONSIBLE FOR DAMAGE TO THESE UTILITIES CAUSED BY THE CONTRACTOR.
- 3. ERECTION OF POLES AND STRUCTURES LOCATED NEAR ANY OVERHEAD OR UNDERGROUND UTILITIES SHALL BE ACCOMPLISHED USING ESTABLISHED INDUSTRY SAFETY AND UTILITY SAFETY PRACTICES.
- 4. THE CONTRACTOR SHALL COORDINATE WITH ELECTRIC AND UNDERGROUND UTILITIES AND COMPLY WITH ALL REGULATIONS TO ALLOW CONSTRUCTION.

STORM WATER POLLUTION PREVENTION NOTES

- 1. PRIOR TO COMMENCING ANY CONSTRUCTION ACTIVITIES, THE CONTRACTOR SHALL PROVIDE A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) TO THE CITY.
- THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR IMPLEMENTING ALL THE VARIOUS STORM WATER POLLUTION PREVENTION MEASURES AND SHALL BE REQUIRED TO COMPLY WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL EROSION, CONSERVATION, AND SANITATION ORDINANCES.
- 3. IF THESE STORM WATER POLLUTION PREVENTION SYSTEMS, AS APPROVED, CANNOT CONTROL EROSION, THE SWPPP WILL BE REQUIRED TO BE REVISED AND/OR ADDITIONAL EROSION CONTROL DEVICES WILL BE REQUIRED ON SITE AT NO ADDITIONAL COST TO THE CITY.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR PAYMENT OF ALL ASSOCIATED FEES, INCLUDING BUT NOT LIMITED TO THE N.O.I. (NOTICE OF INTENT) APPLICATION FEE AND WATER QUALITY FEE.
- 5. PERIMETER CONTROLS SUCH AS SILT CONTROL FENCE OR HAY BALES SHALL BE INSTALLED AT ALL DOWN SLOPE BOUNDARIES AND AS REQUIRED WHERE PAVEMENT REMOVAL, UTILITY CONSTRUCTION, GRADING, OR OTHER CONSTRUCTION ACTIVITIES ARE TO BE PREFORMED. THE CONTRACTOR SHALL TAKE SUCH MEASURES AT ALL TIMES TO MINIMIZE SITE TRACKING OR TRANSPORT OF SEDIMENT AND DEBRIS OFF—SITE.
- 6. DAMAGES TO ADJACENT PROPERTY OR TO RECEIVING WATERS CAUSED BY IMPROPERLY INSTALLED OR POORLY MAINTAINED EROSION CONTROL MEASURES SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
- 7. THE CONTRACTOR SHALL REMOVE AND PROPERLY DISPOSE OF SILT AND SEDIMENT FROM EROSION CONTROL DEVICES WHEN THE EFFECTIVENESS OF THESE MEASURES IS REDUCED, OR AS DIRECTED BY THE ENGINEER.
- 8. THE CONTRACTOR SHALL PROVIDE ADEQUATE PROTECTION FOR THE EXISTING AND PROPOSED STORM DRAINAGE INLETS AND PREVENT THE ENTRY OF ANY SEDIMENT OR OTHER MATERIALS INTO THE DRAINAGE SYSTEM.
- THE CONTRACTOR SHALL NOT ALLOW ANY CONSTRUCTION DEBRIS OUTSIDE THE PROJECT BOUNDARIES. ANY
 DEBRIS (MUD, GRAVEL, ORGANIC MATERIAL, ETC.) THAT FALLS ONTO ADJACENT PROPERTY OR EXISTING
 PAVEMENT SHALL BE REMOVED IMMEDIATELY.
- 10. THE CONTRACTOR SHALL REMOVE ALL TEMPORARY EROSION CONTROL DEVICES UPON COMPLETION OF CONSTRUCTION ACTIVITIES.
- 11. INSPECTION INTERVAL REQUIREMENTS TO BE SENT TO CITY.

DRAINAGE NOTES

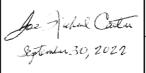
- ALL DRAINAGE PIPES SHALL INTERSECT STRUCTURES AT THE CENTERLINE OF THE STRUCTURE INSIDE WALL FACE, UNLESS NOTED OTHERWISE.
- 2. ALL R.C.P. AND R.C.B. BEND AND INTERSECTIONS SHALL BE CONSTRUCTED UTILIZING PRECAST 45' OR 60' BENDS, WYES, UNLESS NOTED OTHERWISE AND SHALL BE SUBSIDIARY TO R.C.P. OR R.C.B. INSTALLATION.
- 3. ALL STORM SEWER SHALL BE ASTM C-76, CLASS III REINFORCED CONCRETE PIPE, UNLESS NOTED OTHERWISE.
- 4. ALL STORM SEWER INLETS. MANHOLES & EMBEDMENT SHALL BE AS PER THE DETAILS
- ALL EXCESS EXCAVATION SHALL BE PROPERLY DISPOSED OF OFFSITE OF THE PROJECT IN A LOCATION APPROVED BY THE CITY. (NO SEPARATE PAY ITEM)

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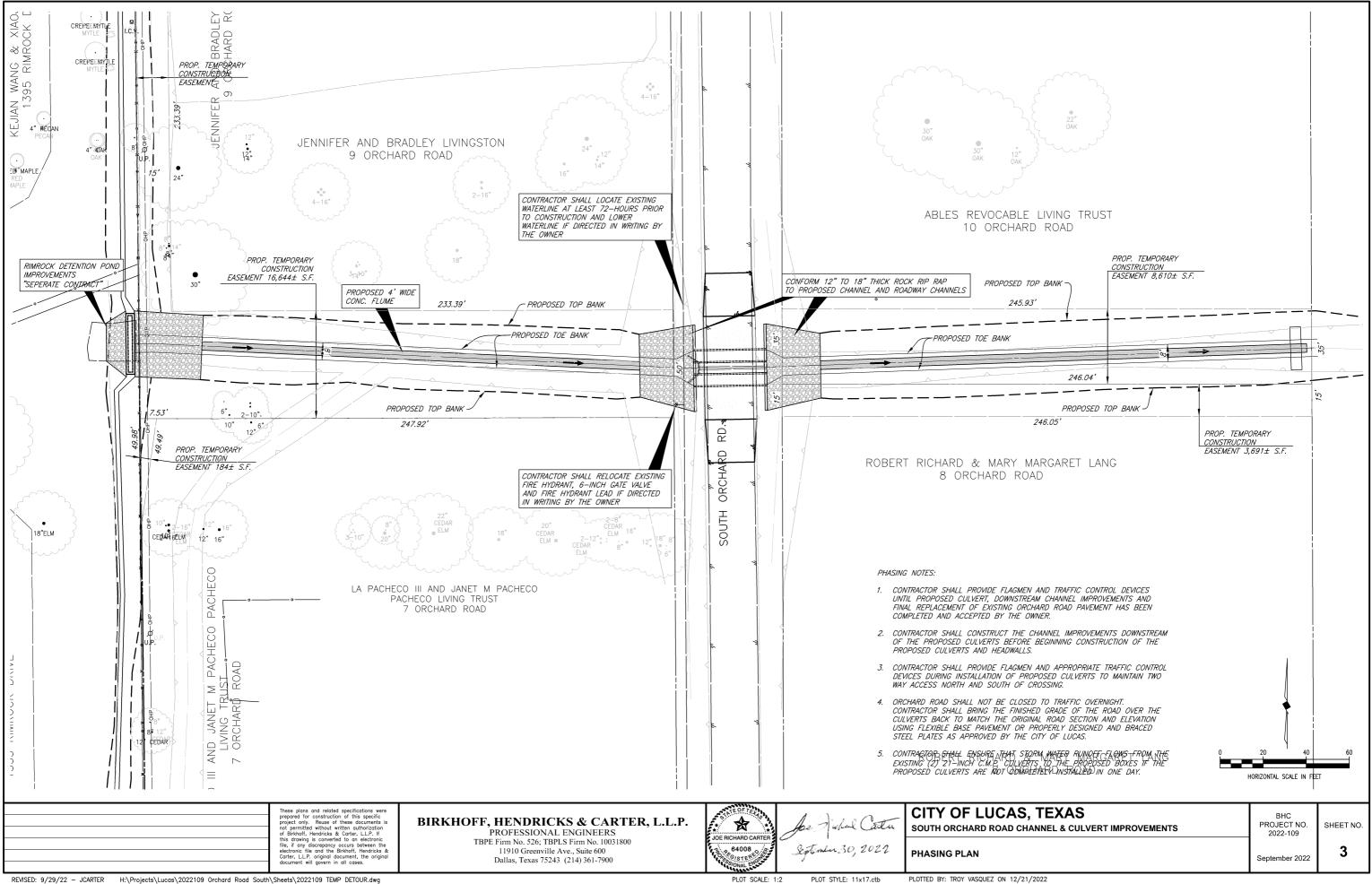
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SOUTH ORCHARD ROAD CHANNEL & CULVERT IMPROVEMENTS

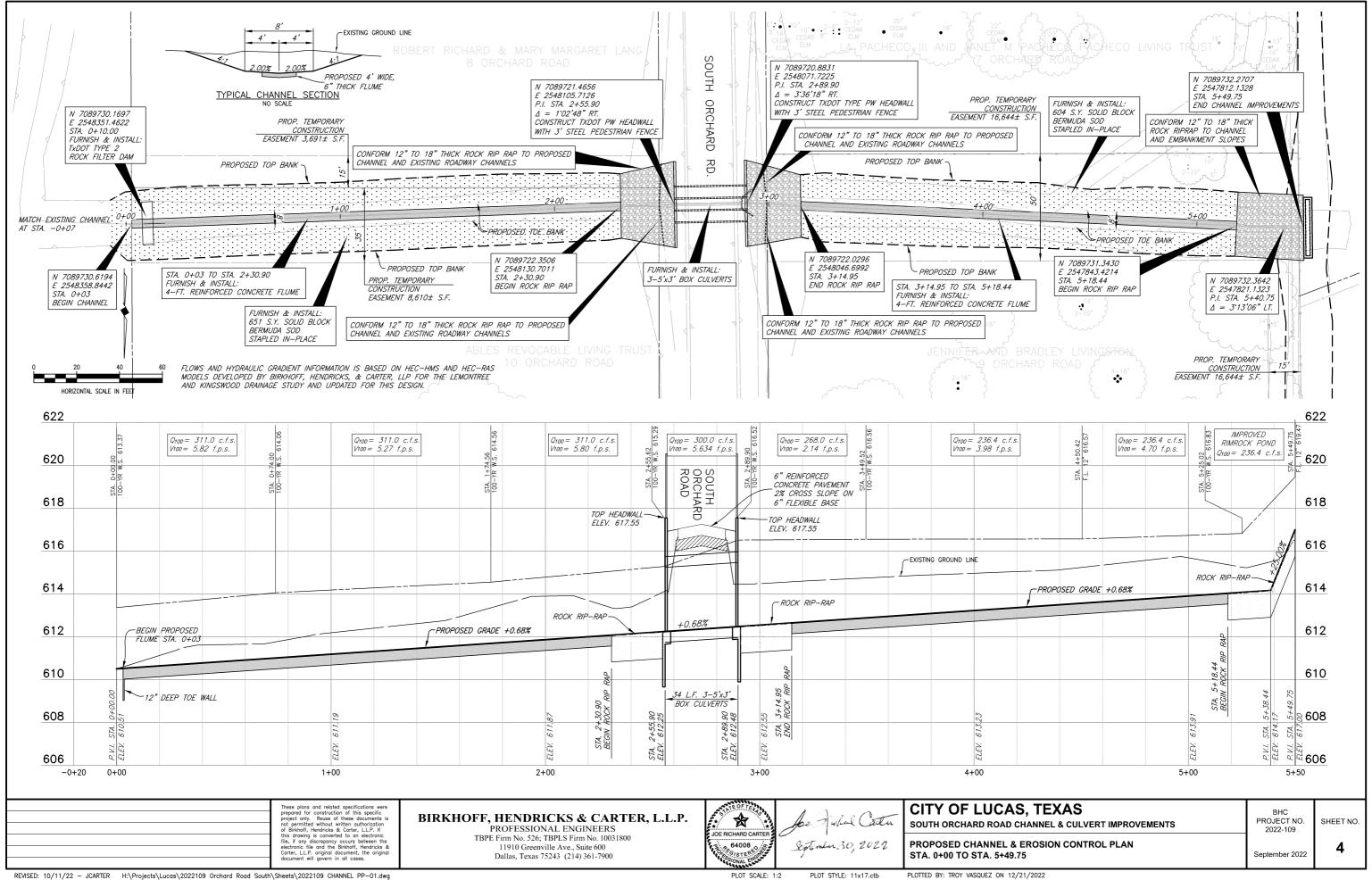
GENERAL NOTES

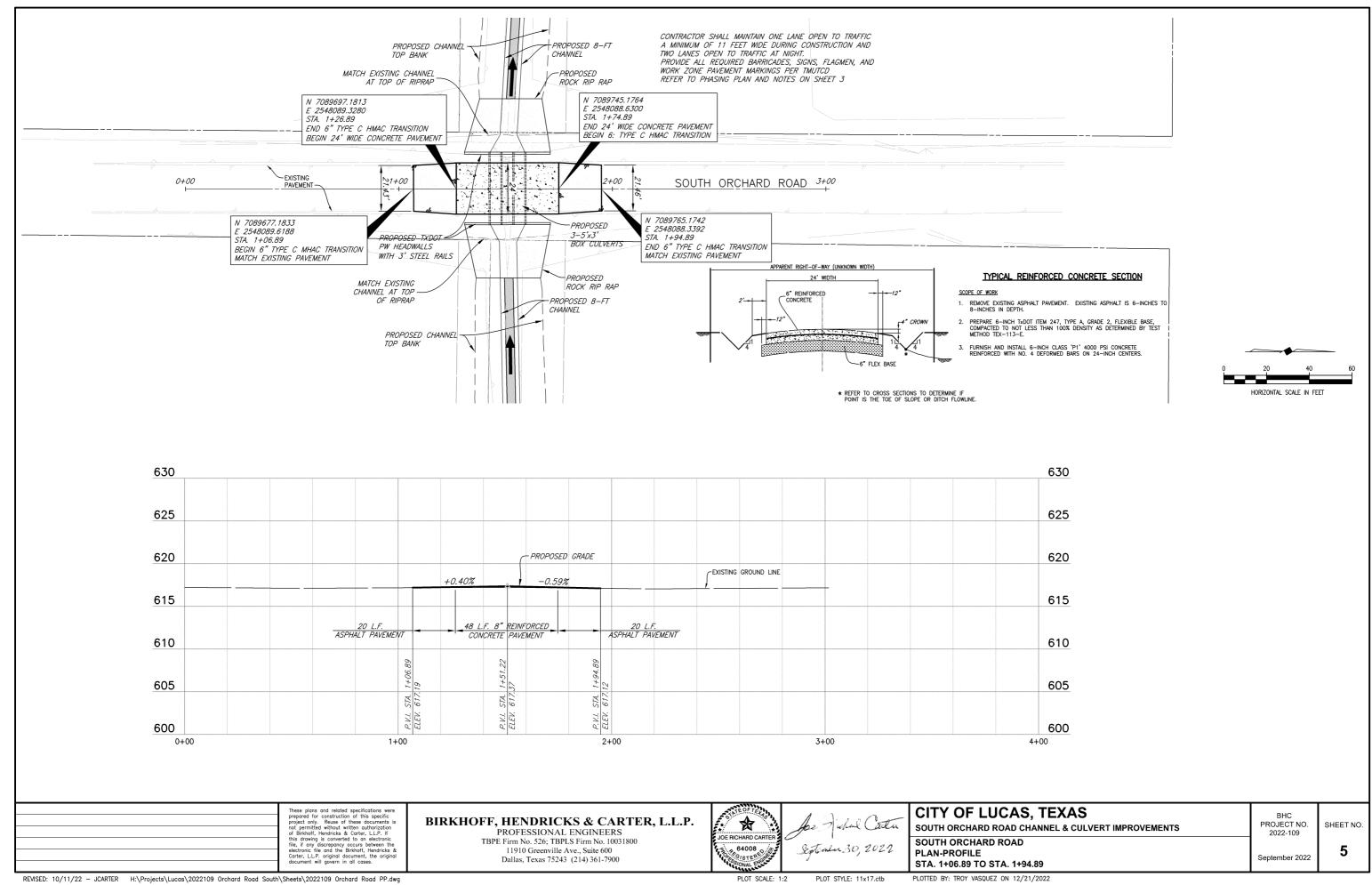
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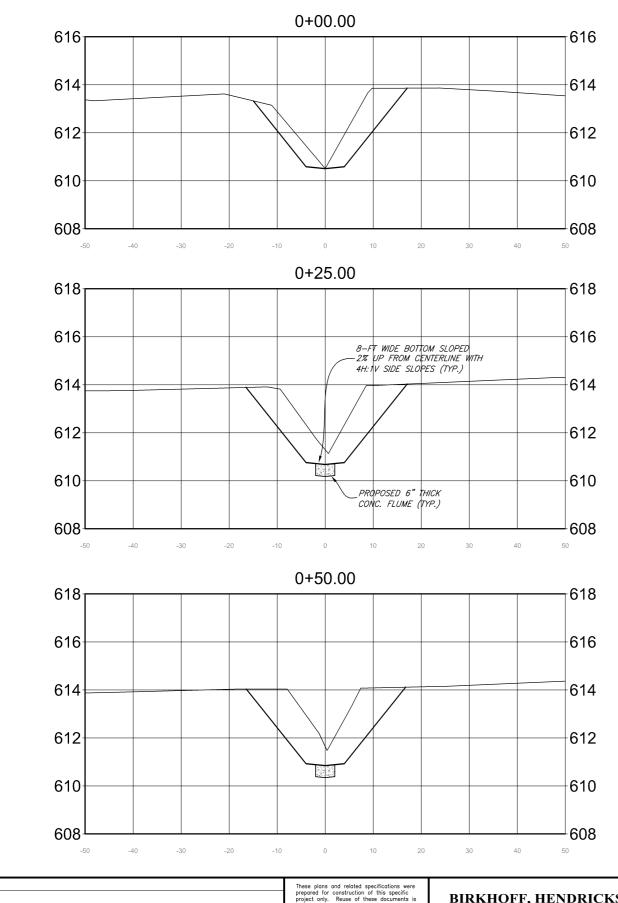
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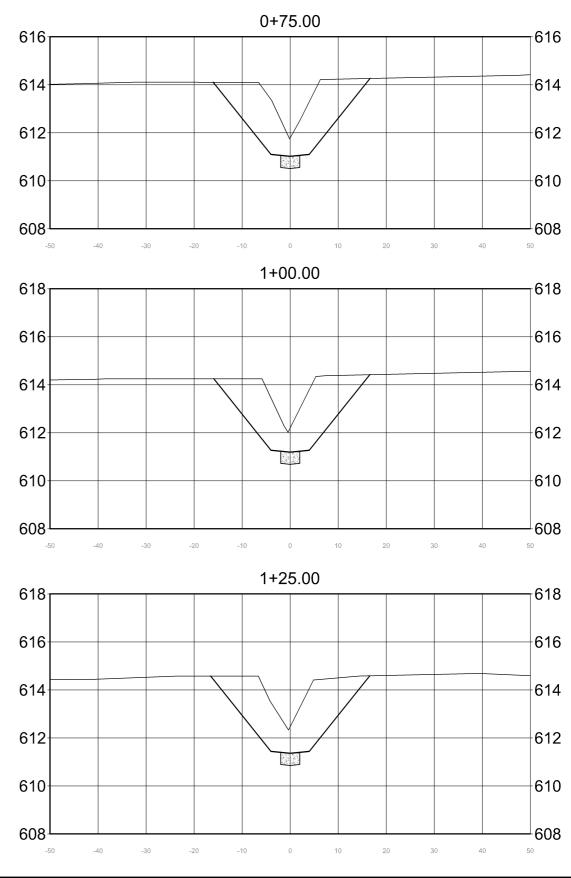
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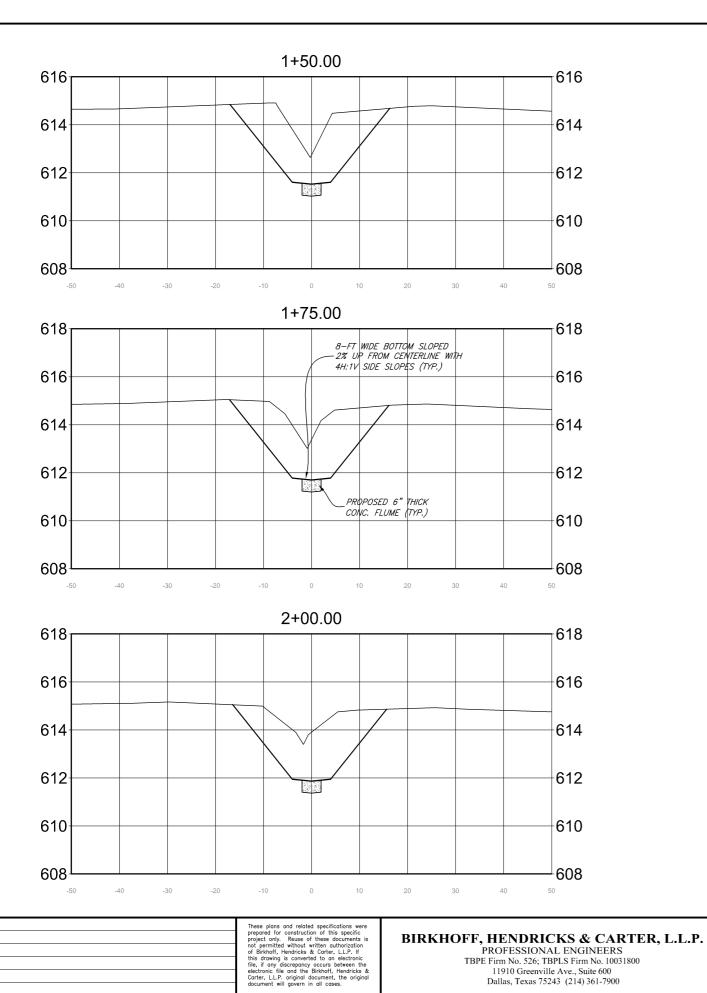
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SOUTH ORCHARD ROAD CHANNEL & CULVERT IMPROVEMENTS

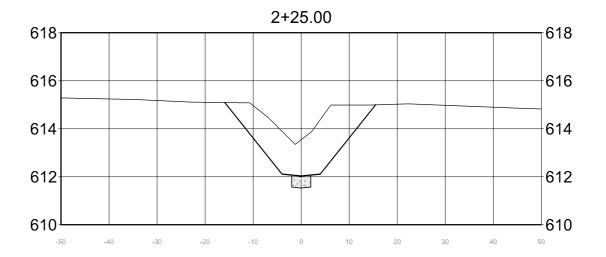
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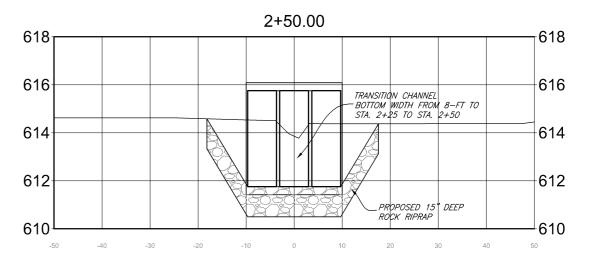
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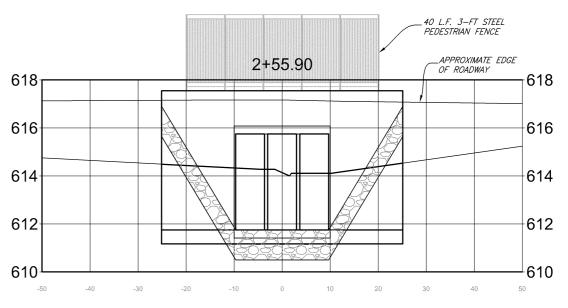
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CROSS SECTIONS









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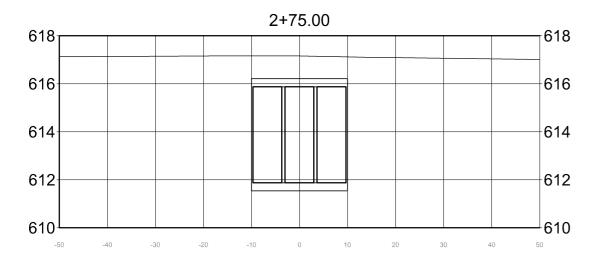
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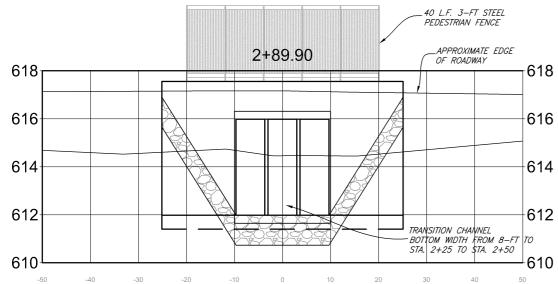
CITY OF LUCAS, TEXAS SOUTH ORCHARD ROAD CHANNEL & CULVERT IMPROVEMENTS **CROSS SECTIONS**

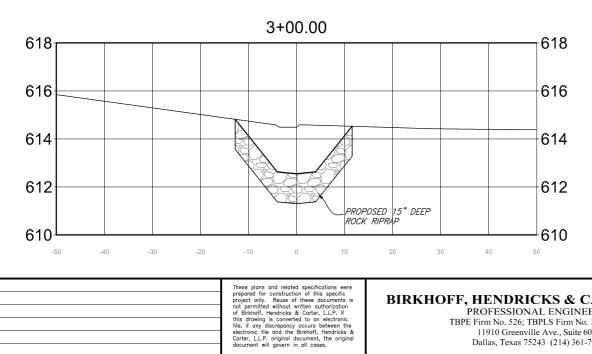
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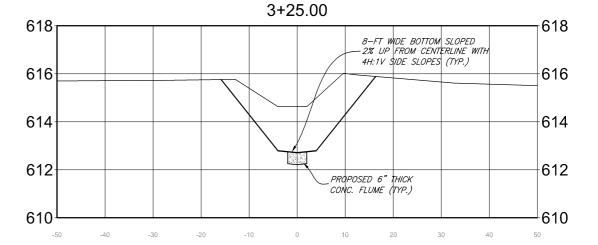
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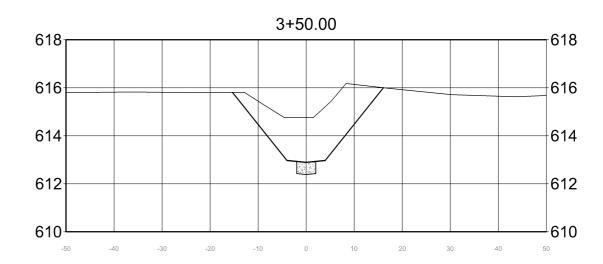
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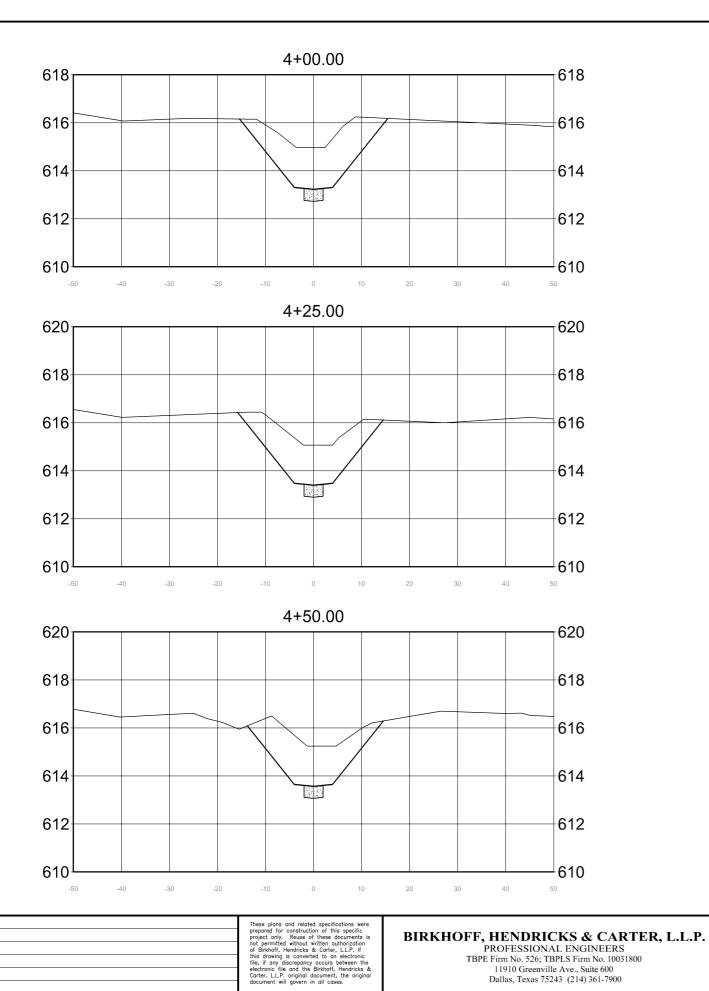
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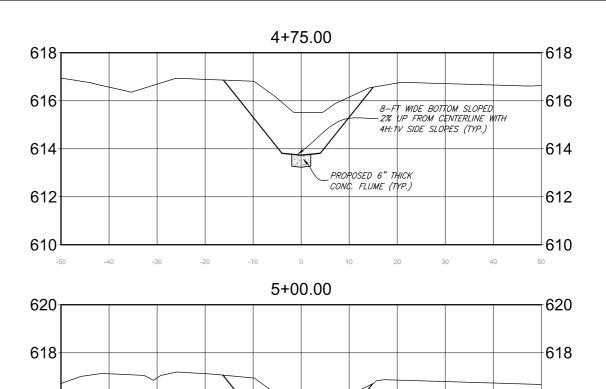
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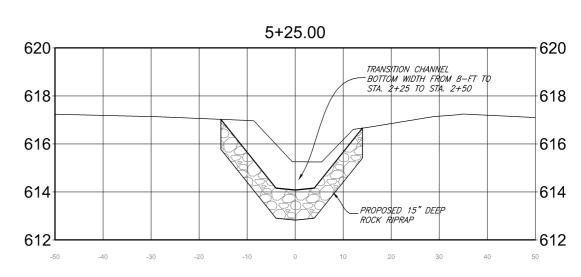
CITY OF LUCAS, TEXAS SOUTH ORCHARD ROAD CHANNEL & CULVERT IMPROVEMENTS **CROSS SECTIONS**

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CROSS SECTIONS

CITY OF LUCAS, TEXAS SOUTH ORCHARD ROAD CHANNEL & CULVERT IMPROVEMENTS

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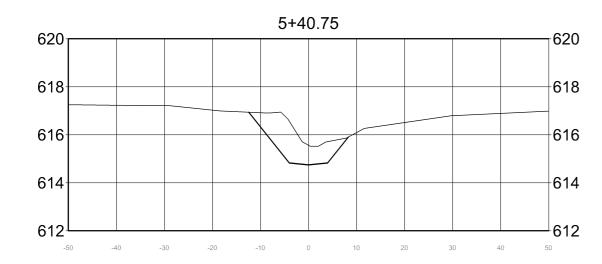
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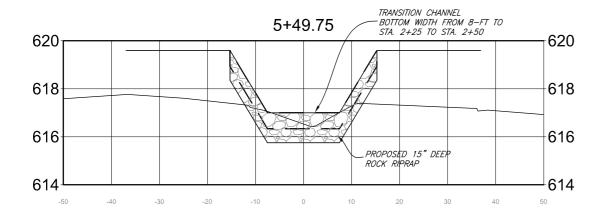
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CITY OF LUCAS, TEXAS
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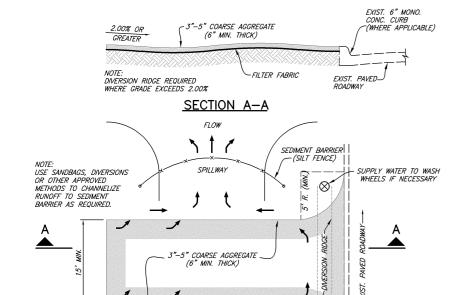
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CROSS SECTIONS



PLAN
CONSTRUCTION EXIT ROAD
FOR EROSION CONTROL

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NO SCALE

FILTER FABRIC MIN. HEIGHT 24" ABOVE EXISTING GROUND LEVEL COMPACTED EARTH OR ROCK BACKFILL FLOW FABRIC TOE—IN STEEL OR WOOD POST FILTER FABRIC HOG WIRE WITH MAX. 6"x6" OPENINGS, IF REQUIRED TRENCH 6" DEEP AND 6" WIDE COMPACTED EARTH OR ROCK BACKFILL EXTENSION OF FABRIC INTO TRENCH

ISOMETRIC VIEW

SILT FENCE DETAIL

6" MIN. EACH SIDE 8' MAX. SILT FENCE 6" MIN. TOP OF STONE. EACH SIDE OF SILT FENCE FLOW

STONE OVERFLOW STRUCTURE

LOCATION AS CALLED FOR IN PLANS EROSION CONTROL

SECTION VIEW

NOTES:

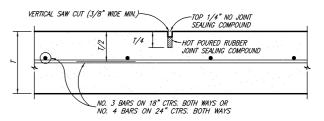
1) THE CONTRACTOR SHALL INSPECT SILT FENCE WEEKLY
AND AFTER MAJOR RAIN EVENTS TO ENSURE THAT THE
DEVICE IS FUNCTIONING PROPERLY AND MAINTAIN IN
ACCORDANCE WITH NCTCOG.

2) THE CONTRACTOR SHALL REMOVE SEDIMENT FROM BEHIND FENCE WHEN THE DEPTH OF SEDIMENT HAS BUILT UP TO ONE—THIRD THE HEIGHT OF THE FENCE ABOVE GRADE.

3) THE CONTRACTOR SHALL INSPECT THE BASE OF THE FENCE TO ENSURE THAT NO GAPS HAVE DEVELOPED AND RE-TRENCH AS NECESSARY.

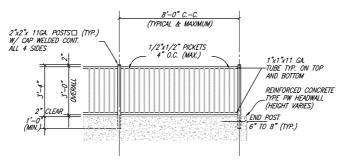
4) THE CONTRACTOR SHALL INSPECT FENCE POSTS TO ENSURE THAT THEY ARE PROPERLY SUPPORTING THE FENCE: IF NECESSARY, THE CONTRACTOR SHALL RESET AND ADD POSTS

5) IF FILTER FABRIC IS RIPPED, DAMAGED OR DETERIORATED, THE CONTRACTOR SHALL REPLACE IT IN ACCORDANCE WITH THE ORIGINAL SPECIFICATIONS AND DETAILS. (MAINTENANCE OF THE SILT FENCE SHALL BE AT THE CONTRACTORS OWN EXPENSE)



TRANSVERSE JOINTS SPACED 15 FT. C.-C. (MAX.) LONGITUDINAL JOINTS SPACED 20 FT. C.-C. (MAX.)

SAWED DUMMY JOINT

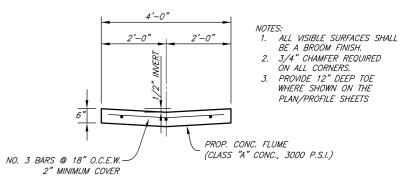


STEEL PEDESTRIAN RAIL

NOT TO SCALE

DAILING NOTES

- RAIL SHALL BE MADE OF STEEL AND BE PAINTED WITH TWO COATS OF BLACK PAINT.
- SHOP DRAWINGS FOR ALL RAILING SHALL BE SUBMITTED FOR APPROVAL PRIOR TO FABRICATION.
- 3" SQUARE OR ROUND STEEL INSERT MAY BE USED TO MOUNT PEDESTRIAN RAIL. ALL VOIDS SHALL BE FILLED WITH HIGH STRENGTH NON-SHRINK GROUT.



REINFORCED CONCRETE FLUME WITHOUT CURBS

NOT TO SCALE

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CITY OF LUCAS, TEXAS

CONSTRUCTION DETAILS

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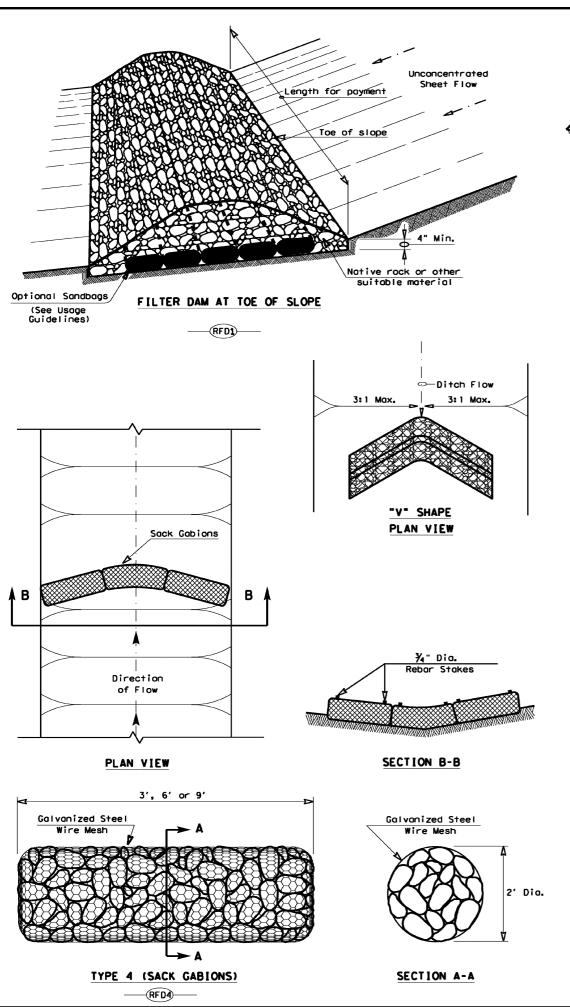
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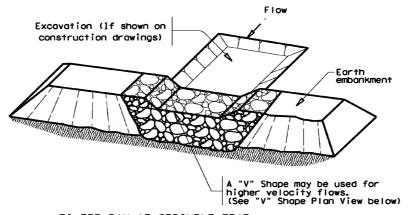
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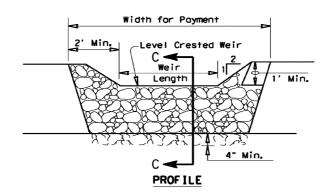
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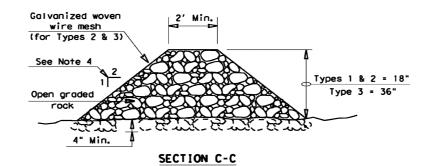




FILTER DAM AT SEDIMENT TRAP







ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT² of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

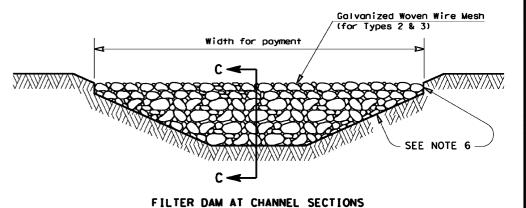
Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.



GENERAL NOTES

- 1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
- Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation
- 3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
- Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
- Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
- 6. Filter dams should be embedded a minimum of 4" into existing ground.
- The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
- 8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
- 9. Sack Gabions should be staked down with $\frac{y}{4}$ " dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 1/2" x 3 1/4"
- 10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
- 11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam Type 2 Rock Filter Dam Type 3 Rock Filter Dam RFD4 Type 4 Rock Filter Dom



TEMPORARY EROSION. SEDIMENT AND WATER POLLUTION CONTROL MEASURES ROCK FILTER DAMS

EC(2) - 16

DN:TXDOT CK: KM DW: VP DN/CK: LS ILE: ec216 TxDOT: JULY 2016 DIST COUNTY SHEET NO. 12

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).
- The development and design of the Traffic Control Plan (TCP) is the responsibility of the Engineer.
- The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.
- 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.
- 3. 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

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

THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT http://www.txdot.gov

COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)

DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)

MATERIAL PRODUCER LIST (MPL)

ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"

STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)

TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD)

TRAFFIC ENGINEERING STANDARD SHEETS

SHEET 1 OF 12

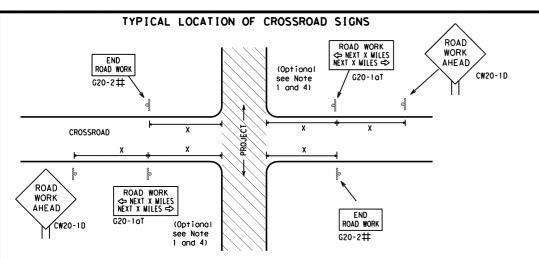


Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

5-10	5-21						13
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- ## May be mounted on back of "ROAD WORK AHEAD" (CW20-1D) sign with approval of Engineer.
- 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
- 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 X X G20-9TP ZONE ★ ★R20-5T FINES Doubi F X X R20-5aTP ROAD WORK <> NEXT X MILES END * * G20-26T WORK ZONE G20-1bTI \Diamond 1000'-1500' - Hwy INTERSECTED 1 Block - City 1000' -1500' - Hwy 1 Block - City ROADWAY \Rightarrow ROAD WORK G20-1bTR NEXT X MILES => Limit WORK ZONE G20-2bT X X WORK ZONE * * G20-9TP TRAFFI G20-6T * * R20-5T FINES DOUBL F ★ ★ R20-5aTP ROAD WORK G20-2

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

SPACING

	3126				
Sign Number or Series	Conventional Road	Expressway/ Freeway			
CW20 ⁴ CW21 CW22 CW23 CW25	48" × 48"	48" × 48"			
CW1, CW2, CW7, CW8, CW9, CW11,	36" × 36"	48" × 48"			
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" × 48"	48" × 48"			

- Sign△ Posted Speed Spacing " X " Feet MPH Apprx. 30 120 35 160 40 240 45 320 50 400 55 5002 60 600² 65 700² 70 800² 75 900 80 1000²
- * 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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS SPEED ZONE STAY ALERT R4-1 (os PASS LIMIT OBEY TRAFF (★ ★ R20-5T FINES WARNING * * G20-51 SIGNS CW20-1D appropriate ROAD WORK R20-5aTP STATE LAW TALK OR TEXT LATER CW13-1P R2-1* * ROAD X X G20-61 CW20-1D CW1-4R G20-10T + + R20-3T * * WORK AHEAD XXAHEAD Type 3 Barricade or (W13-1P CW20-1D channelizing devices \Diamond \Diamond \Diamond \Diamond \Rightarrow ➾ Beginning of -NO-PASSING END G20-2bT * * \Rightarrow WORK Space \Rightarrow SPEED LIMIT line should CSJ Limit $\otimes | \times \times$ FND coordinate ROAD WORK When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional with sign G20-2 X X location NOTES

"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

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

WORK ZONE STAY ALERT SPEED OBEY ROAD WORK TRAFFI * *G20-5T ROAD WARNING LIMIT ROAD ROAD X XR20-5T FINES WORK CLOSED DOUBL F STATE LAW AHEAD TALK OR TEXT LATER X R20-5aTP Type 3 Barricade or X XG20-6T CW13-1P XX R20-31 G20-10T R2-1 CW20-1D CONTRACTOR channelizing CW20-1E devices CSJ Limi \Rightarrow Channelizing Devices SPEED R2-1 $\Diamond\Diamond$ END LIMIT ROAD WORK WORK ZONE G20-2bT * * G20-2 * *

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.
- imes imes 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
Ι	Type 3 Barricade
0	Channelizing Devices
+	Sign
x	See Typical Construction Warning Sign Size and Spacing chart or the TMUTCD for sign spacing requirements.

SHEET 2 OF 12

Safety Division Texas Department of Transportation

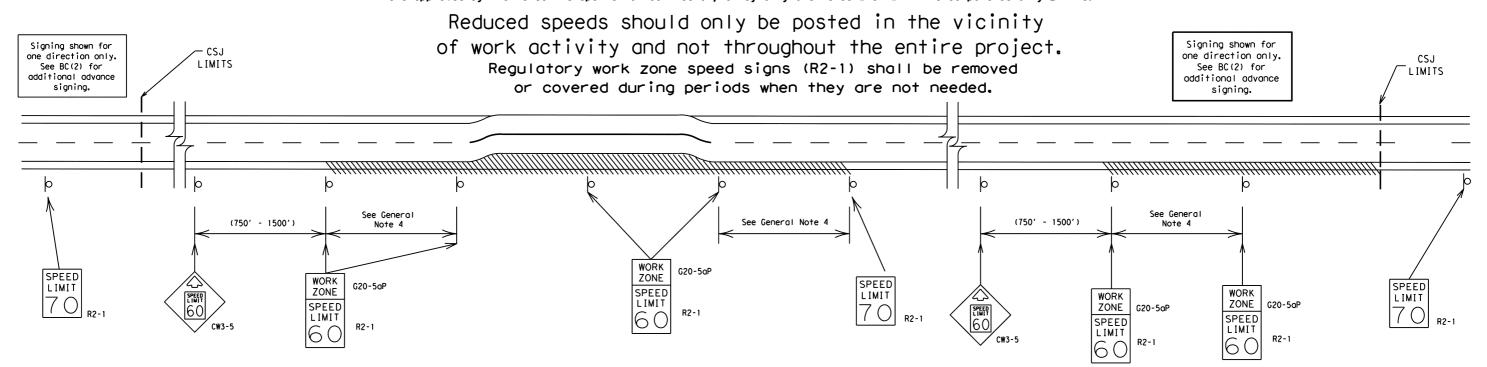
BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

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© TxD0T	November 2002	CONT	SECT	JOB		HIGHWAY		
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7-13	5-21						14	

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.



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.

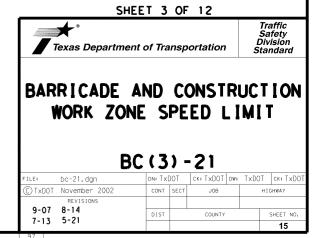
SHORT TERM WORK ZONE SPEED LIMITS

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)).

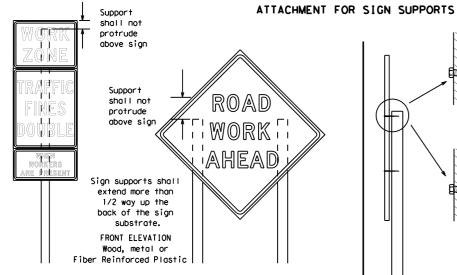
GENERAL NOTES

- Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
- Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
- Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
- 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)).
- 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).
- 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.
- 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.

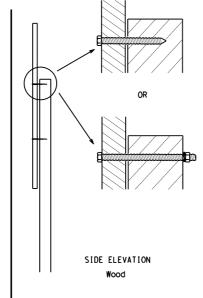


ATE: ILE: * When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

* * 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.



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.

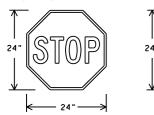


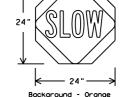
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or monufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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.





Background - Red Legend & Border - White Background - Orange Legend & Border - Black

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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

- Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
- Wooden sign posts shall be painted white.
- Barricades shall NOT be used as sign supports.
- 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.
- The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.

 The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD) for small roadside
- signs. Supports for temporary large roadside signs shall meet the requirements detailed on the Temporary Large Roadside Signs (TLRS) standard sheets. The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
- The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
- Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
 - The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.

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

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

SIGN MOUNTING HEIGHT

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

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.
- "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.

- When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
- Long-term stationary or intermediate stationary signs installed on square metal tubing may be turned away from traffic 90 degrees when the sign message is not applicable. This technique may not be used for signs installed in the median of divided highways or near any intersections where the sign may be seen from approaching traffic.
- 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.
- When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night, without damaging the sign sheeting.
- Burlap shall NOT be used to cover signs. Duct tape or other adhesive material shall NOT be affixed to a sign face.
- 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 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
- Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.

 Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
- Sandbaas shall be made of a durable material that tears upon vehicular mpact. Rubber (such as tire inner tubes) shall NOT be used
- Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list. Sandbags shall only be placed along or laid over the base supports of the
- traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
- Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

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

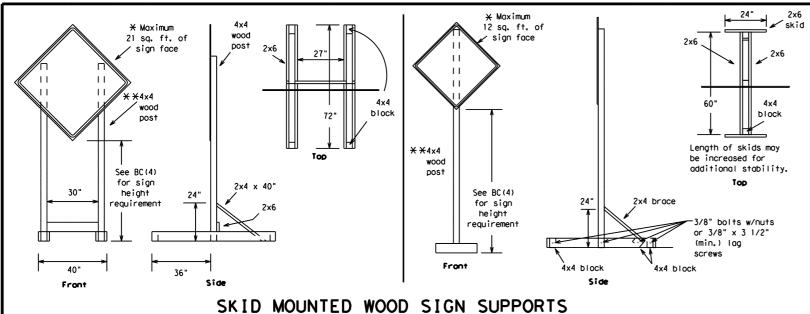
SHEET 4 OF 12



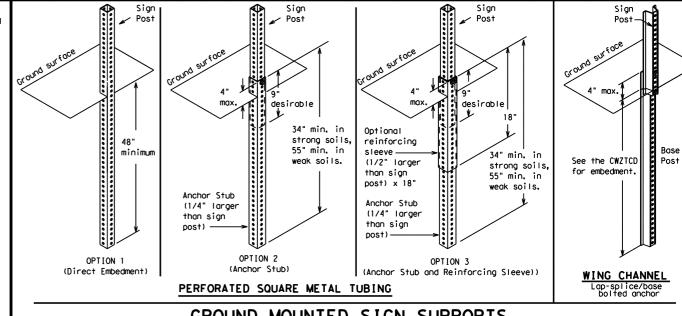
BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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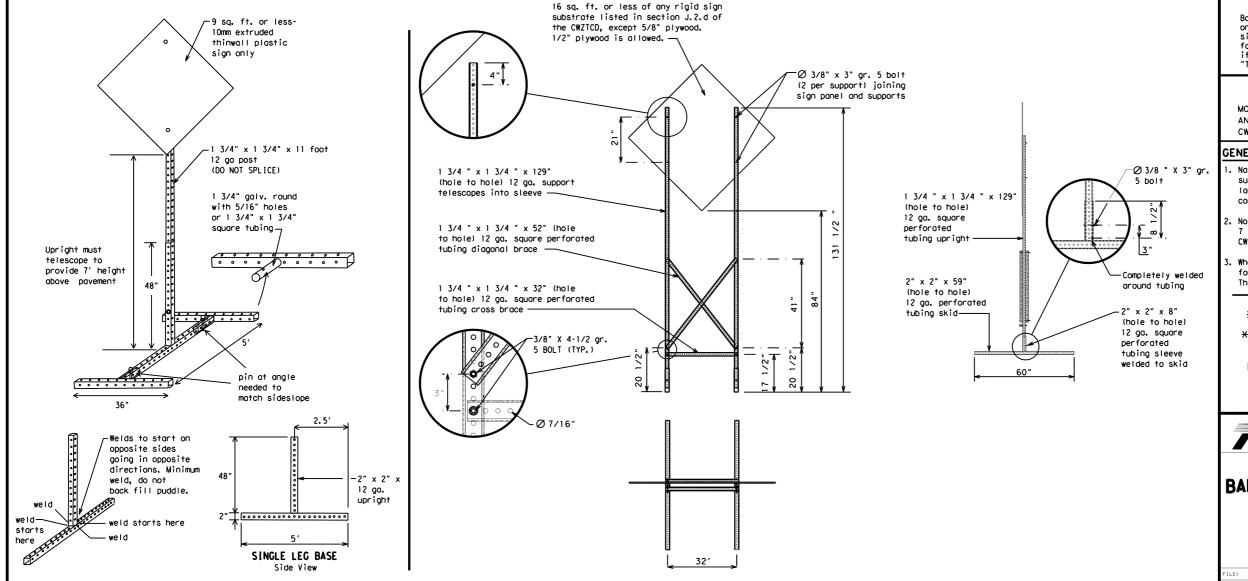


* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS



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.



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 They may be set in concrete or in sturdy soils if approved by the Engineer. (See web address for "Traffic Engineering Standard Sheets" on BC(1)).

OTHER DESIGNS

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

GENERAL NOTES

- Nails may be used in the assembly of wooden sign supports, but 3/8" bolts with nuts or 3/8" x 3 1/2" lag screws must be used on every joint for final connection.
- No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the
- 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.
- $\hfill \square$ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

SHEET 5 OF 12



BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

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SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

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

- The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
- Messages on PCMS should contain no more than 8 words (about four to eight characters per word), not including simple words such as "TO,"
- 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
- Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED," Do not use the term "RAMP,"
- Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
- When in use, the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
- The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight. Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.
- The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
- Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
- 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. 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	WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD	Major	MAJ
Alternate	ALT	Miles	MI
Avenue	AVE	Miles Per Hour	MPH
Best Route	BEST RTE	Minor	MNR
Boulevard	BLVD	Monday	MON
Bridge	BRDG	Normal	NORM
Cannot	CANT	North	N
Center	CTR	Northbound	(route) N
Construction Ahead	CONST AHD	Parking	PKING
CROSSING	XING	Road	RD
Detour Route	DETOUR RTE	Right Lane	RT LN
Do Not	DONT	Saturday	SAT
East	F	Service Road	SERV RD
Eastbound	(route) E	Shoulder	SHLDR
Emergency	EMER	Slippery	SL IP
Emergency Vehicle		South	S
Entrance, Enter	ENT	Southbound	(route) S
Express Lane	EXP LN	Speed	SPD
Expressway	EXPWY	Street	ST
XXXX Feet	XXXX FT	Sunday	SUN
Fog Ahead	FOG AHD	Telephone	PHONE
	FRWY, FWY	Temporary	TEMP
Freeway Freeway Blocked	FWY BLKD	Thursday	THURS
Friday	FRI	To Downtown	TO DWNTN
Hazardous Driving		Traffic	TRAF
Hazardous Material		Travelers	TRVLRS
High-Occupancy	HOV	Tuesday	TUES
Vehicle	HUV	Time Minutes	TIME MIN
Highway	H₩Y	Upper Level	UPR LEVEL
Hour (s)	HR. HRS	Vehicles (s)	VEH, VEHS
Information	INFO	Warning	WARN
It Is	ITS	Wednesday	WED
Junction	JCT	Weight Limit	WT LIMIT
Left	LFT	West	W
	LFT LN	Westbound	(route) W
Left Lane Lane Closed	LN CLOSED	Wet Pavement	WET PVMT
		Will Not	WONT
Lower Level	LWR LEVEL		

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

/Lane/Ramp	Closure	List	Other	Cond

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

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

SIGNAL

XXXX FT

Phase 2: Possible Component Lists

A	Action to Take/Effect on Travel List				Location List		Warning List		* * Advance Notice List
	MERGE RIGHT		FORM X LINES RIGHT		AT FM XXXX		SPEED LIMIT XX MPH		TUE-FRI XX AM- X PM
	DETOUR NEXT X EXITS		USE XXXXX RD EXIT		BEFORE RAILROAD CROSSING		MAXIMUM SPEED XX MPH		APR XX- XX X PM-X AM
	USE EXIT XXX		USE EXIT I-XX NORTH		NEXT X MILES		MINIMUM SPEED XX MPH		BEGINS MONDAY
	STAY ON US XXX SOUTH		USE I-XX E TO I-XX N		PAST US XXX EXIT		ADVISORY SPEED XX MPH		BEGINS MAY XX
	TRUCKS USE US XXX N		WATCH FOR TRUCKS		XXXXXXX TO XXXXXXX		RIGHT LANE EXIT		MAY X-X XX PM - XX AM
	WATCH FOR TRUCKS		EXPECT DELAYS		US XXX TO FM XXXX		USE CAUTION		NEXT FRI-SUN
	EXPECT DELAYS		PREPARE TO STOP				DRIVE SAFELY		XX AM TO XX PM
	REDUCE SPEED XXX FT		END SHOULDER USE				DRIVE WITH CARE		NEXT TUE AUG XX
	USE OTHER ROUTES		WATCH FOR WORKERS						TONIGHT XX PM- XX AM
2.	STAY IN LANE	×			*	* See A	pplication Guide	elines 1	Note 6.

APPLICATION GUIDELINES

CLOSED

TUE - FRI

- 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/Ramo 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
- 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.
- 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.

SHIFT

FULL MATRIX PCMS SIGNS

same size arrow.

DRIVEWAY

CLOSED

XXXXXXXX BLVD

CLOSED

- 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

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Traffic

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE

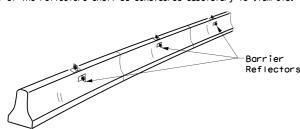
Texas Department of Transportation

BC(6)-21

MESSAGE SIGN (PCMS)

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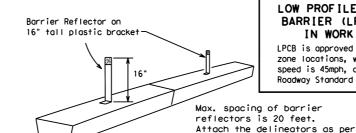
- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- 2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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



LOW PROFILE CONCRETE BARRIER (LPCB)

LOW PROFILE CONCRETE

BARRIER (LPCB) USED

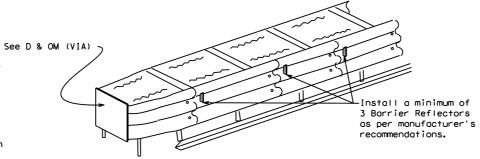
IN WORK ZONES

LPCB is approved for use in work

zone locations, where the posted

speed is 45mph, or less. See Roadway Standard Sheet LPCB.

manufacturer's recommendations.



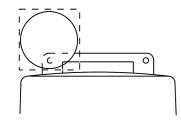
DELINEATION OF END TREATMENTS

END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet the apppropriate crashworthy standards as defined in the Manual for Assessing Safety Hardware (MASH). Refer to the CW7TCD 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_{FI} or C_{FI} 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

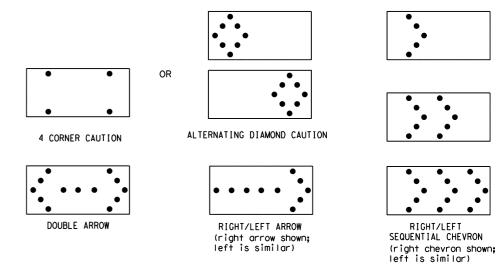
- 1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- 2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- 3. A series of sequential flashing warning lights placed 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.
- Round reflectors shall be fully reflectorized, including the area where attached to the drum.
- Square substrates must have a minimum of 30 square inches of reflectorized sheeting. They do not have to be reflectorized where it attaches to the drum.
- 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.

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



- The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
- The straight line caution display is NOT ALLOWED.
- The Flashing Arrow Board shall be capable of minimum 50 percent dimming from rated lamp voltage. The flashing rate of the lamps shall not be less than 25 nor more than 40 flashes per minute.
- Minimum lamp "on time" shall be approximately 50 percent for the flashing arrow and equal intervals of 25 percent for each sequential phase of the flashing chevron.
- 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.

	R	EQUIREMENTS			
TYPE	MINIMUM SIZE	MINIMUM NUMBER OF PANEL LAMPS	MINIMUM VISIBILITY DISTANCE		
В	30 × 60	13	3/4 mile		
С	48 × 96	15	1 mile		

ATTENTION
Flashing Arrow Boards shall be equipped with
automatic dimming devices.

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

FLASHING ARROW BOARDS

SHEET 7 OF 12

TRUCK-MOUNTED ATTENUATORS

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



Traffic Safety

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

BC(7)-21

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GENERAL NOTES

- For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
- 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" (CWTTCN).
- Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
- The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

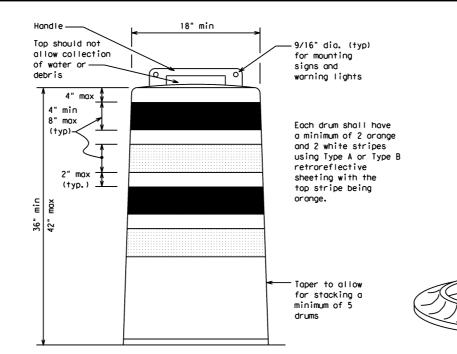
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- 2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
- 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.
- 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.

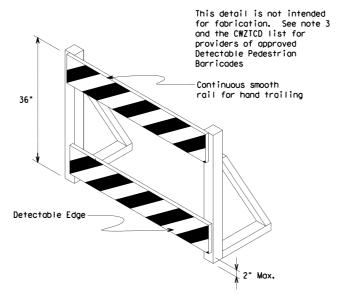
RETROREFLECTIVE SHEETING

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

BALLAST

- 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.
- Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral crumb rubber base or a solid rubber base.
- Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
- The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
- . When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
- 6. Ballast shall not be placed on top of drums.
- 7. Adhesives may be used to secure base of drums to pavement.





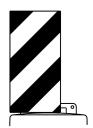
DETECTABLE PEDESTRIAN BARRICADES

- When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility. Refer to WZ(BTS-2) for Pedestrian Control requirements for Sidewalk Diversions, Sidewalk Detours and Crosswalk Closures.
- Where pedestrians with visual disabilities normally use the closed sidewalk, a Detectable Pedestrian Barricade shall be placed across the full width of the closed sidewalk instead of a Type 3 Barricade.
- Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, same 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.
- 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 Troffic Lane Divider, Driveway sign D70a, Keep Right R4 series or other signs as approved by Engineer

See Ballast



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

- Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
- 2. Chevrons and other work zone signs with an orange background shall be manufactured with Type $B_{\rm FL}$ or Type $C_{\rm FL}$ Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
- Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type A or Type B. Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
- 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.
- Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
- Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
- 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.
- R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

SHEET 8 OF 12

Texas Department of Transportation

BARRICADE AND CONSTRUCTION
CHANNELIZING DEVICES

Traffic

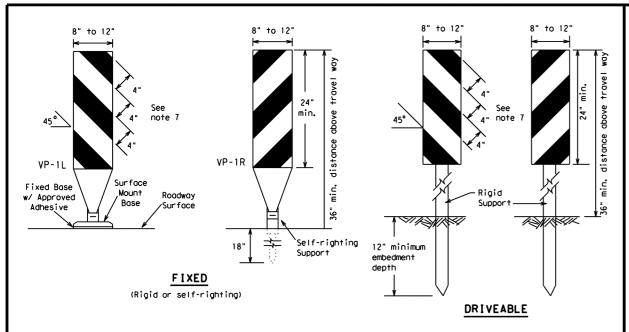
BC(8)-21

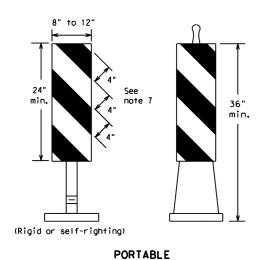
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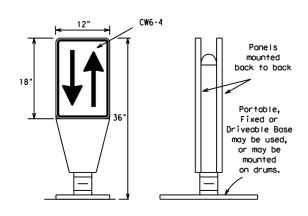
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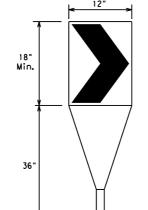
- Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
- 2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation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

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 movemen caused by a vehicle impact or wind gust.
- The OTLD may be used in combination with 42" cones or VPs.
- Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
- 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)



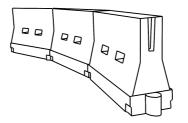
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

- The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
- Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
- 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.
- 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.
- For Long Term Stationary use on tapers or transitions on freeways and divided highways, self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.

CHEVRONS

GENERAL NOTES

- Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
- 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.
- 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 powement surfaces, including powement surface discoloration or surface integrity. Driveable bases shall not be permitted on final powement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.



LONGITUDINAL CHANNELIZING DEVICES (LCD)

- LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
- 2. LCDs may be used instead of a line of cones or drums.
- LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- 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

- Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the
 work space per the appropriate Manual for Assessing Safety Hardware (MASH) crashworthiness requirements based on
 roadway speed and barrier application.
- Water ballosted 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.
- When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

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

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

Posted Speed	Formula	Desirable Taper Lengths ***			Spacing of Channelizing Devices		
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
30	2	150′	1651	180'	30'	60′	
35	$L = \frac{WS^2}{60}$	2051	225′	245′	35′	70′	
40	- 60	265′	295′	3201	40′	80'	
45		450′	495′	540'	45′	90′	
50		500'	550′	6001	50′	100′	
55	L=WS	550′	6051	6601	55′	110'	
60	- "3	600'	660′	720′	60`	120'	
65		650′	715′	780′	65′	130′	
70		700′	770′	840′	70′	140′	
75		750′	8251	900'	75′	150′	
80		800'	880'	960′	80′	160′	

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12



Traffic Safety Division Standard

Suggested Maximum

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (9) -21

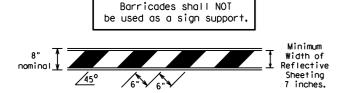
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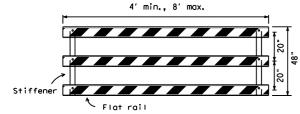
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TYPE 3 BARRICADES

- 1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type 3 Barricades and a list of all materials used in the construction of Type 3 Barricades.
- 2. Type 3 Barricades shall be used at each end of construction projects closed to all traffic.
- 3. Barricades extending across a roadway should have stripes that slope downward in the direction toward which traffic must turn in detouring. When both right and left turns are provided, the chevron striping may slope downward in both directions from the center of the barricade. Where no turns are provided at a closed road, striping should slope downward in both directions toward the center of roadway.
- 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.
- 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.
- 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. Sandbaas 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.

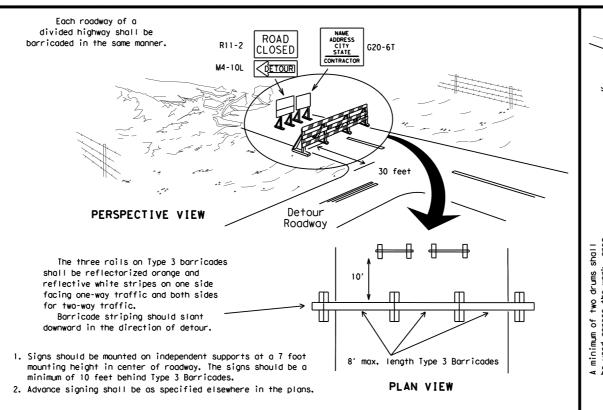


TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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



TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION

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 Typical shoulder width is less than 4 feet.

Plastic Drum

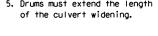
PERSPECTIVE VIEW

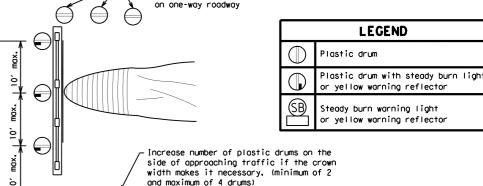
These drums

are not required

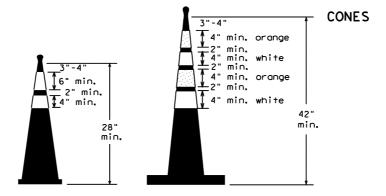
than 12 feet, steady-burn lights may be omitted if drums are used. 5. Drums must extend the length of the culvert widening.

4. When the shoulder width is greater



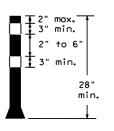


CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



6" min. 4" min. min.

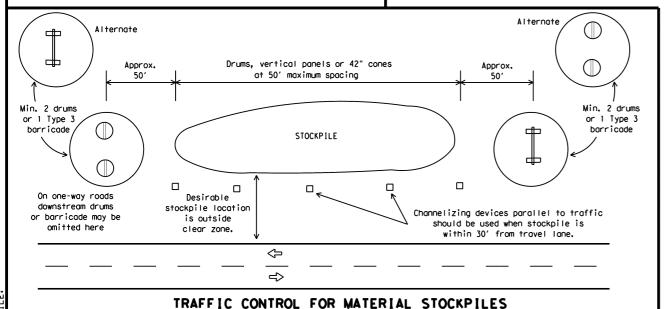
PLAN VIEW



Two-Piece cones

One-Piece cones

Tubular Marker



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.

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

42" 2-piece cones shall have a minimum weight of

- 3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to gid 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.

SHEET 10 OF 12



BARRICADE AND CONSTRUCTION CHANNEL IZING 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
- 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
- 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
- 2. All raised payement 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 payement markings (foil back) shall meet the requirements of DMS-8240.

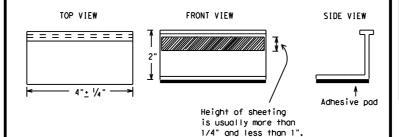
MAINTAINING WORK ZONE PAVEMENT MARKINGS

- 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. Payement 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 payement 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
 - 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 SPECIFICATIO	NS
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 payement markings can be found at the Material Producer List web address shown on BC(1).

SHEET 11 OF 12



Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

	DIST			COUNTY			SHEET NO	٥.
1998	CONT	SECT		JOB		HIO	SHWAY	
	DN:	TxDOT	-	ck: TxDOT	DW:	TxDOT	ck: Txl	TOC
	1998	1998 CONT	1998 CONT SECT	1998 CONT SECT	1998 CONT SECT JOB	1998 CONT SECT JOB	1998 CONT SECT JOB HIG	1998 CONT SECT JOB HIGHWAY

PAVEMENT MARKING PATTERNS 10 to 12" Type II-A-A Ta 6000000/p00000 00000 `Yellow <> REFLECTORIZED PAVEMENT MARKINGS - PATTERN A RAISED PAVEMENT MARKERS - PATTERN A Type II-A-A $\langle \rangle$ □ و م/ه □ ه ه ه ا ➾ Type Y 4 +0 8" Type II-A-Abuttons-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 Type I-C Type W buttons-~~~ Type I-C or II-C-R Type I-A Type Y buttons ₹> Type I-A~ Type Y buttons-Yellow └Type I-C or II-C-R Type W buttons-REFLECTORIZED PAVEMENT MARKINGS RAISED PAVEMENT MARKERS -Type I-C Prefabricated markings may be substituted for reflectorized pavement markings. EDGE & LANE LINES FOR DIVIDED HIGHWAY Type I-C Type W buttons-0000 _oood 0000 -Type II-A-A Type Y buttons <> 00000 0000 <> <> ∽Type I-C Type W buttons-RAISED PAVEMENT MARKERS REFLECTORIZED PAVEMENT MARKINGS Prefabricated markings may be substituted for reflectorized pavement markings. LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS Type W buttons Type I-C-0000 0000 $\langle \rangle$ 000000 \$ 00000 Type II-A-A Type Y buttons-<> ♦ 00000 0000 $\langle \rangle$ Type W buttons~ -Type I-C REFLECTORIZED PAVEMENT MARKINGS RAISED PAVEMENT MARKERS Prefabricated markings may be substituted for reflectorized pavement markings. TWO-WAY LEFT TURN LANE

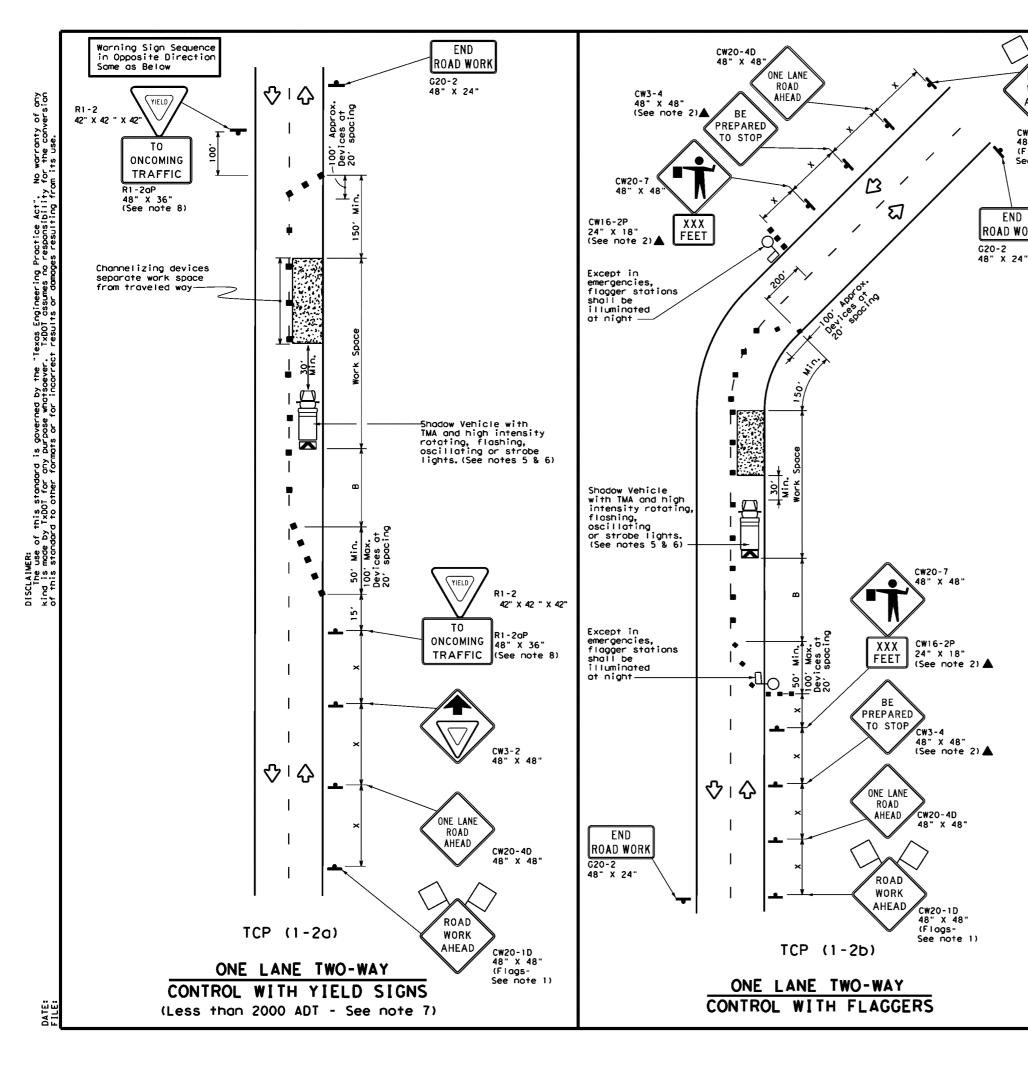
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS Type Y buttons DOUBLE PAVEMENT □ 0 NO-PASSING REFLECTORIZED LINE MARKINGS Type I-C , I-A or II-A-A Type W or Y buttons EDGE LINE RAISED SOL I D PAVEMENT ò 0 0 MARKERS OR SINGLE LINES 60" REFLECTORIZED NO-PASSING LINE PAVEMENT White or Yellow Type I-C Type W buttons WIDE RAISED PAVEMENT LINE REFLECTORIZED (FOR LEFT TURN CHANNELIZING LINE OR CHANNELIZING LINE USED TO MARKINGS DISCOURAGE LANE CHANGING.) White 30"+/-3" >| |< 30"± 3" Type I-C or II-A-A-RAISED 0 Q 0 9 0 **CENTER** PAVEMENT MARKERS LType W or Y buttons LINE OR LANE REFLECTORIZED LINE MARKINGS White or Yellow Type I-C or II-A-A **BROKEN** (when required) LINES RAISED ‡8 1-2' **AUXILIARY** MARKERS Type I-C or II-C-R OR LANEDROP REFLECTORIZED LINE REMOVABLE MARKINGS 5′ <u>+</u> 6" | - - - WITH RAISED PAVEMENT MARKERS If raised payement markers are used Raised Pavement Markers 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 20' ± 1' removal of raised pavement markers Centerline only - not to be used on edge lines and tape. SHEET 12 OF 12 Traffic Safety Division Standard Texas Department of Transportation BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS 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." BC(12)-21 DN: TXDOT CK: TXDOT DW: TXDOT CK: TXDO bc-21.dgn ◯TxDOT February 1998

1-97 9-07 5-21

2-98 7-13 11-02 8-14 SHEET NO

24

DATE:



	LEGE	ND	
~~~	Type 3 Barricade	• •	Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
<b></b>	Trailer Mounted Flashing Arrow Board	(X	Portable Changeable Message Sign (PCMS)
4	Sign	♡	Traffic Flow
$\triangle$	Flog	Ф	Flagger

Speed	Formula	D	Minimum esirob er Len **	le	Spaci: Channe		Minimum Sign Spacing "X"	Suggested Longitudinal Buffer Space	Stopping Sight Distance
*		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	Distance	-B-	
30	2	150'	165'	1801	30'	60,	120'	90,	2001
35	L = WS ²	2051	225'	2451	35′	70′	160'	120′	250'
40	8	2651	2951	320'	40′	80'	240'	155′	3051
45		450'	4951	540'	45′	90'	320'	1951	360'
50		5001	550′	6001	50′	100'	4001	240'	425'
55	L=WS	550'	6051	660'	55′	110'	500′	2951	495'
60	L-#3	600'	660'	720'	60′	120'	600'	3501	570′
65		6501	715′	780′	65′	130'	700′	410′	645'
70		7001	770'	8401	70′	140'	8001	475'	730′
75		750′	8251	900'	75′	150'	900'	540'	820'

* Conventional Roads Only

** Taper lengths have been rounded off.

L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

		TYPICAL L	JSAGE	
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	1			

#### GENERAL NOTES

ROAD

WORK

AHEAD

CW20-1D

(Flags-

END

ROAD WORK

See note 1)

- 1. Flags attached to signs where shown are REQUIRED.
- 2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine
- maintenance work, when approved by the Engineer.

  3. The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign, but proper sign spacing shall be maintained.
- 4. Sign spacing may be increased or an additional CW20-1D "ROAD WORK AHEAD" sign may be used if advance warning ahead of the flagger or R1-2 "YIELD" sign is less than 1500 feet. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet
- in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
- 6. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.

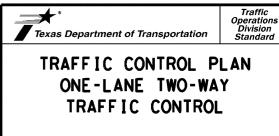
#### TCP (1-2a)

- 7. R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work spaces should be no longer than one half city block. In rural areas on roadways with less than 2000 ADT, work
- spaces should be no longer than 400 feet.

  8. R1-2 "YIELD" sign with R1-2aP "TO ONCOMING TRAFFIC" plaque shall be placed on a support at a 7 foot minimum mounting height.

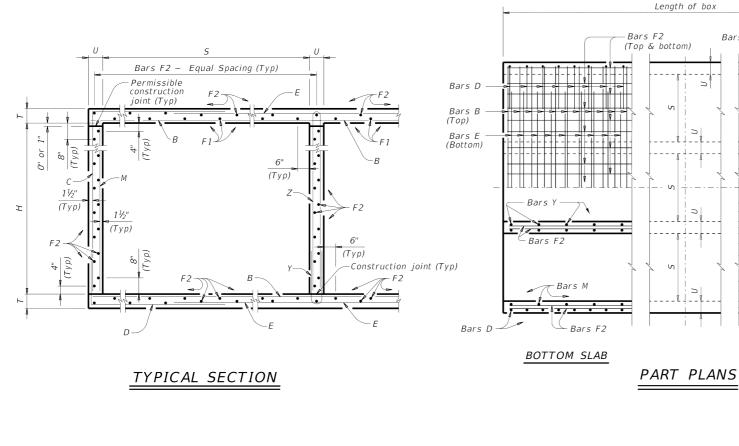
#### TCP (1-2b)

- 9. Flaggers should use two-way radios or other methods of communication to control traffic. 10. Length of work space should be based on the ability of flaggers to communicate.
- 1. If the work space is located near a horizontal or vertical curve, the buffer distances
- should be increased in order to maintain adequate stopping sight distance to the flagger and a queue of stopped vehicles (see table above).
- 2. Channelizing devices on the center-line may be omitted when a pilot car is leading traffic and approved by the Engineer.
- 3. Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situations.

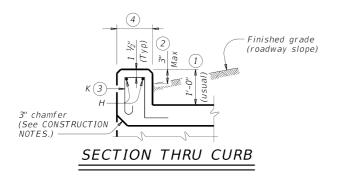


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2-94 2-12	DIST		COUNTY		SHEET NO.
1-97 2-18					25

TCP(1-2)-18



5'-0" 5'-6 1/2" 3'-8 1/2"



BAR	TABLE O	
Н	"X"	"γ"
2'-0"	2'-6 1/2"	3'-8 1/2"
3'-0"	3'-6 ½"	3'-8 1/2"
4'-0"	4'-6 1/2"	3'-8 1/2"
5'-0"	5'-6 1/5"	3'-8 1/3"

Bars F2-

Bars Z

1 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

For vehicle safety, the following requirements must be met:
• For structures without bridge rail, construct curbs no more than 3" above

- Bars H

Bars F

-Bars B

(Bottom)

Bars C

-Bars F1 (Bottom)

TOP SLAB

• For structures with bridge rail, construct curbs flush with finished grade.

Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

4 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi.

Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR Required WWR =  $(0.44 \text{ sq. in. per } 0.5 \text{ ft.}) \times (60 \text{ ksi} / 70 \text{ ksi}) = 0.755 \text{ sq. in. per ft.}$  If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) =  $4.86^{\circ}$  Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

#### CONSTRUCTION NOTES:

Do not use permanent forms.

Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If
this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed, and Bars Y and Z may be reversed.

#### MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide galvanized reinforcing steel if required elsewhere in the plans.

Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:

culverts with overlay,
culverts with 1-to-2 course surface treatment, or

• culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
• Uncoated or galvanized ~ #4 = 1'-8" Min

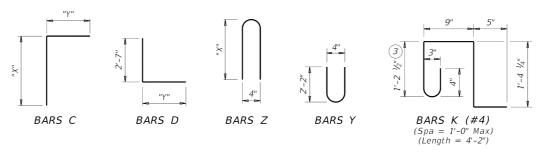
• Uncoated or galvanized ~ #5 = 2'-1" Min • Uncoated or galvanized ~ #6 = 2'-6" Min

#### GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.

See the Multiple Box Culverts Cast-In-Place Miscellaneous Detail (MC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

Cover dimensions are clear dimensions, unless noted otherwise.



HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

MULTIPLE BOX CULVERTS CAST-IN-PLACE 5'-0" SPAN 0' TO 20' FILL

MC-5-20

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E SPANS	DIMENCIONS														QUANTITIES																											
ER OF		Bars B Bars C & D						Bars E					Bars F1 ~ #4		#4	Bars F2 ~ #4		Bars M ~ #4			Bars Y & Z ~ #4				Bars H 4 ~ #4 Bars K			Per of I	Foot Barrel	Curb	Tota	I										
NUMBER		S	Н	Т	U	No. Size	Spa	Length	Wt	No	Size Spa			Bars Length		No.	Size	Lengt	h W	t No	Spa	Length	Wt	No.	eds Length	Wt	No.	Length	Wt	No.	Bar		Bar: Length	_	Length	Wt	No. Wt	Conc (CY)	Renf (Lb)	Conc Rei (CY) (Lt	nf Conc R	Renf 'Lb)
2	5	i' - 0''	2' - 0"	8"	7"	108 #5	9"	11' - 6"	1,295	108	8 #5 9"	6' - 3''	704	6' - 4"	713	108	#5 9	)" 8' - 8	" 97	76 8	18'	39' - 9"	212	38	18" 39' - 9"	1,009	108 9'	2' - 0"	144	54 9'	4' - 7"	165	5' - 3''	189	11' - 6"	31	26 72	0.710	135.2	0.9 103	3 29.3 5	,510
3	5	i' - 0"	2' - 0"	8"	7"	108 #5	9"	17' - 1"	1,924	108	8 #5 9"	6' - 3"	704	6' - 4''	713	108	#5 9	)" 14' - 3	" 1,60	5 12	18'	39' - 9"	319	54	18" 39' - 9"	1,434	108 9'	2' - 0"	144	108 9	4' - 7"	331	5' - 3"	379	17' - 1"	46	38 106	1.029	188.8	1.3 152	2 42.4 7	,705
4	5	i' - 0"	2' - 0"	8"	7"	108 #5	9"	22' - 8"	2,553	108	8 #5 9"	6' - 3"	704	6' - 4''	713	108	#5 9	9" 19' - 1	0" 2,23	34 16	18'	39' - 9"	425	70	18" 39' - 9"	1,859	108 9'	2' - 0"	144	162 9	4' - 7"	496	5' - 3"	568	22' - 8"	61	48 134	1.348	242.4	1.7 195	5 55.6 9	,891
5	5	i' - 0''	2' - 0"	8"	7"	108 #5	9"	28' - 3"	3,182	108	8 #5 9"	6' - 3"	704	6' - 4''	713	108	#5 9	0" 25' - 5	" 2,86	53 20	18	39' - 9"	531	86	18" 39' - 9"	2,284	108 9'	2' - 0"	144	216 9"	4' - 7"	661	5' - 3"	758	28' - 3"	75	60 167	1.667	296.0	2.1 242	68.8 12	,082
6 Vers	5	i' - 0''	2' - 0"	8"	7"	108 #5	9"	33' - 10''	3,811	108	8 #5 9"	6' - 3"	704	6' - 4"	713	108	#5 9	9" 31' - 0	" 3,49	92 24	18	39' - 9"	637	102	18" 39' - 9"	2,708	108 9'	2' - 0"	144	270 9"	4' - 7"	827	5' - 3"	947	33' - 10	" 90	70 195	1.986	349.6	2.5 285	82.0 14	,268
0 2	5	i' - O''	3' - 0"	8"	7"	108 #6	9"	11' - 6"	1,865	108	8 #5 9"	7' - 3"	817	6' - 4''	713	108	#5 9	9" 8' - 8	" 97	76 8	18	39' - 9"	212	44	18" 39' - 9"	1,168	108 9'	3' - 0"	216	54 9'	4' - 7"	165	7' - 3"	262	11' - 6"	31	26 72	0.775	159.9	0.9 103	31.9 6	,497
Se.	5	i' - 0''	3' - 0"	8"	7"	108 #6	9"	17' - 1"	2,771	108	8 #5 9"	7' - 3"	817	6' - 4"	713	108	#5 9	)" 14' - 3	" 1,60	5 12	18'	39' - 9"	319	62	18" 39' - 9"	1,646	108 9'	3' - 0"	216	108 9	4' - 7"	331	7' - 3"	523	17' - 1"	46	38 106	1.115	223.5	1.3 152	2 45.9 9	,093
tor ts u	5	i' - 0"	3' - 0"	8"	7"	108 #6	9"	22' - 8"	3,677	108	8 #5 9"	7' - 3"	817	6' - 4''	713	108	#5 9	9" 19' - 1	0" 2,23	34 16	18'	39' - 9"	425	80	18" 39' - 9"	2,124	108 9'	3' - 0"	216	162 9	4' - 7"	496	7' - 3"	785	22' - 8"	61	48 134	1.456	287.2	1.7 195	5 59.9 11	,682
£ 5	5	i' - 0"	3' - 0"	8"	7"	108 #6	9"	28' - 3"	4,583	108	8 #5 9"	7' - 3"	817	6' - 4''	713	108	#5 9	)" 25' - 5	" 2,86	53 20	18	39' - 9"	531	98	18" 39' - 9"	2,602	108 9'	3' - 0"	216	216 9'	4' - 7"	661	7' - 3"	1,046	28' - 3"	75	60 167	1.796	350.8	2.1 242	73.9 14	,274
free 6	5	i' - 0''	3' - 0"	8"	7"	108 #6	9"	33' - 10''	5,488	108	8 #5 9"	7' - 3"	817	6' - 4"	713	108	#5 9	9" 31' - 0	" 3,49	92 24	18'	39' - 9"	637	116	18" 39' - 9"	3,080	108 9'	3' - 0"	216	270 9'	4' - 7"	827	7' - 3"	1,308	33' - 10	90	70 195	2.137	414.5	2.5 285	88.0 16	,863
ting 2	5'	i' - 0"	4' - 0"	8"	7"	108 #6	9"	11' - 6"	1,865	108	8 #5 9"	8' - 3"	929	6' - 4"	713	108	#5 9	9" 8' - 8	" 97	76 8	18'	39' - 9"	212	44	18"   39' - 9"	1,168	108 9'	4' - 0"	289	54 9	4' - 7"	165	9' - 3"	334	11' - 6"	31	26 72	0.840	166.3	0.9 103	34.5 6	,754
res esu	5	i' - 0"	4' - 0"	8"	7"	108 #6	9"	17' - 1"	2,771	108	8 #5 9"	8' - 3"	929	6' - 4"	713	108	#5 9	)" 14' - 3	" 1,60	5 12	18'	39' - 9"	319	62	18" 39' - 9"	1,646	108 9'	4' - 0''	289	108 9"	4' - 7"	331	9' - 3"	667	17' - 1"	46	38 106	1.202	231.8	1.3 152	9 49.4 9	,422
ou 3	5	i' - 0"	4' - 0"	8"	7"	108 #6	9"	22' - 8''	3,677	108	8 #5 9"	8' - 3"	929	6' - 4''	713	108	#5 9	)'' 19' - 1	0" 2,23	34   16	18'	39' - 9''	425	80	18''   39' - 9''	2,124	108 9'	4' - 0''	289	162 9'	4' - 7"	496	9' - 3"	1,001	22' - 8"	61	48 134	1.564	297.2	1.7 195	64.3 12	,083
5 mag	5	i' - 0"	4' - 0"	8"	7"	108 #6	9"	28' - 3"	4,583	108	8 #5 9"	8' - 3"	929	6' - 4''	713	108	#5 9	9"   25' - 5	" 2,86	53 20	18	39' - 9"	531	98	18''   39' - 9''	2,602	108 9	4' - 0''	289	216 9'	4' - 7"	661	9' - 3''	1,335	28' - 3"	75	60 167	1.926	362.7	2.1 242	? 79.1 14.	,748
6 gar	5	i' - O''	4' - 0"	8"	7"	108 #6	9"	33' - 10''	5,488	108	8 #5 9"	8' - 3"	929	6' - 4''	713	108	#5 9	9" 31' - 0	" 3,49	92 24	18	39' - 9"	637	116	18"   39' - 9"	3,080	108 9'	4' - 0''	289	270 9'	4' - 7"	827	9' - 3''	1,668	33' - 10	90	70 195	2.288	428.1	2.5 285	94.0 17	,408
2 2	5	i' - 0"	5' - 0"	8"	7"	108 #6	9"	11' - 6"	1,865	108	8 #5 9"	9' - 3"	1,042	6' - 4''	713	108	#5 9	0" 8' - 8	" 97	76 8	18'	39' - 9"	212	50	18"   39' - 9"	1,328	108 9'	5' - 0"	361	54 9'	4' - 7''	165	11' - 3"	406	11' - 6"	31	26 72	0.904	176.7	0.9 103	37.0 7	,171
Sult;	5	i' - 0"	5' - 0"	8"	7"	108 #6	9"	17' - 1''	2,771	108	8 #5 9"	9' - 3"	1,042	6' - 4''	713	108	#5 9	)" 14' - 3	" 1,60	05 12	18	39' - 9"	319	70	18'' 39' - 9''	1,859	108 9'	5' - 0"	361	108 9"	4' - 7''	331	11' - 3"	812	17' - 1"	46	38 106	1.288	245.3	1.3 152	2 52.8 9	,965
. ë 4	5	5' - 0"	5' - 0"	8"	7"	108 #6	9"	22' - 8"	3,677	108	8 #5 9"	9' - 3"	1,042	6' - 4''	713	108	#5 9	9" 19' - 1	0" 2,23	34   16	18'	39' - 9"	425	90	18"   39' - 9"	2,390	108 9'	5' - 0"	361	162 9	4' - 7''	496	11' - 3"	1,217	22' - 8"	61	48 134	1.672	313.9	1.7 195	68.6 12	,750
5 Ject	5	i' - 0"	5' - 0"	8"	7"	108 #6	9"	28' - 3"	4,583	108	8 #5 9"	9' - 3"	1,042	6' - 4''	713	108	#5 9	)" 25' - 5	" 2,86	3 20	18'	39' - 9"	531	110	18"   39' - 9"	2,921	108 9'	5' - 0"	361	216 9'	4' - 7"	661	11' - 3"	1,623	28' - 3"	75	60 167	2.056	382.5	2.1 242	84.3 15	,540
6 satsi	5	i' - 0"	5' - 0"	8"	7"	108 #6	9"	33' - 10''	5,488	108	8 #5 9"	9' - 3"	1,042	6' - 4''	713	108	#5 9	0" 31' - 0	" 3,49	92   24	18	39' - 9''	637	130	18"   39' - 9"	3,452	108 9	5' - 0"	361	270 9"	4' - 7"	827	11' - 3"	2,029	33' - 10	90	70 195	2.439	451.0	2.5 285	5 100.1 18	,326

HL93 LOADING SHEET 2 OF 2

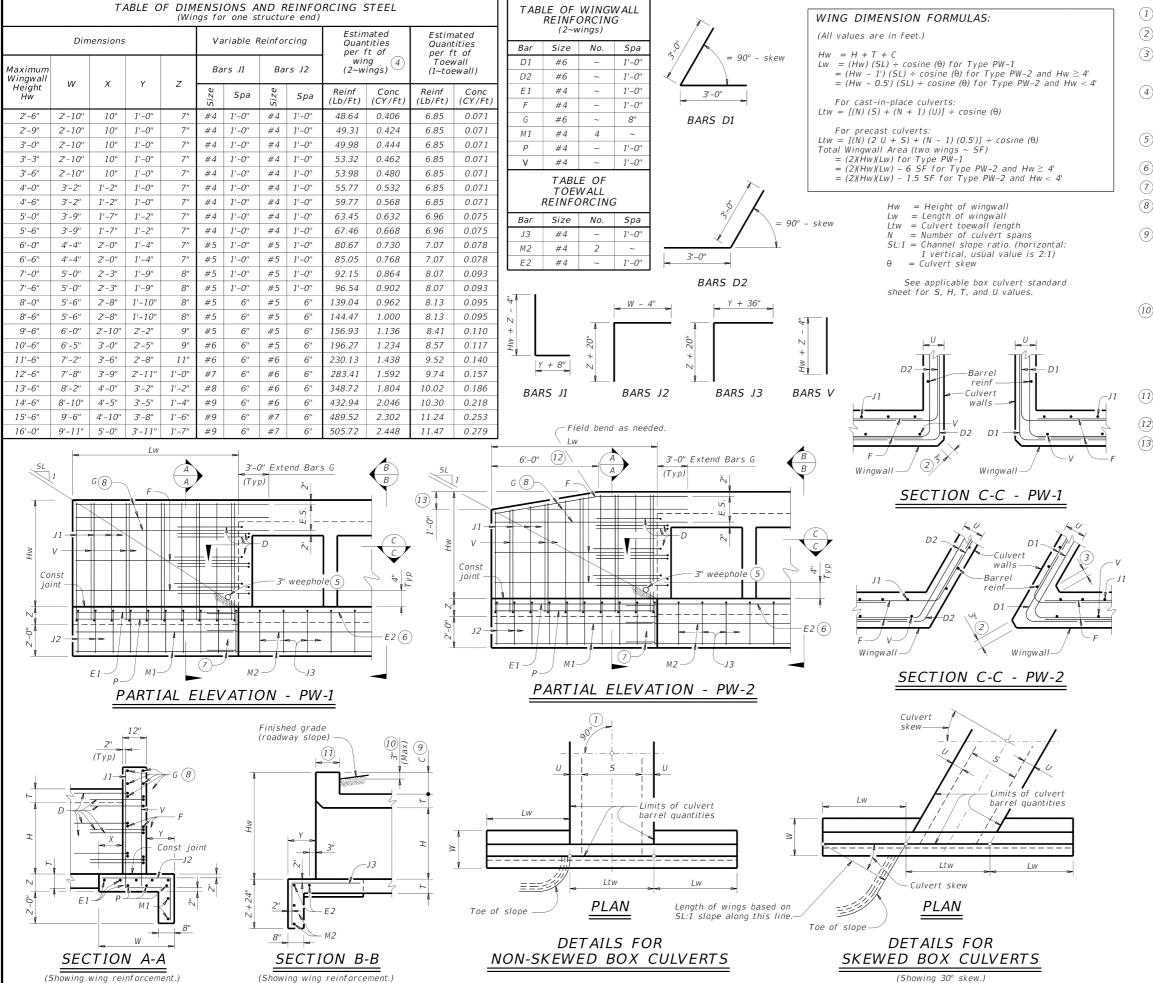
Texas Department of Transportation

Division Standard

MULTIPLE BOX CULVERTS
CAST-IN-PLACE
5'-0" SPAN
0' TO 20' FILL

MC-5-20

							27
	REVISIONS	DIST		COUNT	Υ		SHEET NO.
C)T x DOT I	February 2020	CONT	SECT	CT JOB		ніс	HWAY
LE: mc520	Oste-20.dgn	DN: TBE		ск: ВМР	DW: T)	CD0T	ck: TxD0T



1)  $Skew = 0^{\circ}$ 

2) At discharge end, chamfer may be ¾" minimum

(3) For 15° skew ~ 1" For 30° skew ~ 2 For  $45^{\circ}$  skew  $\sim 3''$ 

4 Quantities shown are for two Type PW-1 wings. Adjust concrete volume for Type PW-2 wings. To determine estimated quantities for two wings, multiply the tabulated values by Lw. Quantities shown do not include

(5) Provide weepholes for Hw = 5'-0" and greater. Fill around weepholes

(6) Extend Bars E2 1'-6" minimum into the wingwall footing.

Department 1'-6" minimum with Bars M2.

8 Place Bars G as shown, equally spaced at 8" maximum. Provide at least two pairs of Bars G per wing.

(9) O" Min to 5'-O" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

- (10) For vehicle safety, the following requirements must be met:
   For structures without bridge rail, construct curbs no more than 3" above finished grade.
  - For structures with bridge rail, construct curbs flush with finished grade.

Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

- 1) 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elswhere in the plans.
- (12) 3'-0" for Hw < 4'.
- (13) 6" for Hw < 4'.

#### DESIGNER NOTES:

Type PW-1 can be used for all applications and must be used if railing is to be mounted to the wingwall. Type PW-2 can only be used for applications without a railing mounted to the wingwall.

#### MATERIAL NOTES:

Provide Class C concrete (f'c=3,600 psi). Provide Grade 60 reinforcing steel. Provide galvanized reinforing steel if required elsewhere in the plans.

#### GENERAL NOTES:

Designed in accordance with AASHTO LRED Bridge Design Specifications.

Depth of toewalls for wingwalls and culverts may be reduced or eliminated when founded on solid rock, when directed by the Engineer.

See Box Culvert Supplement (BCS) standard sheet for wingwall type and additional dimensions and information. Quantities for concrete and reinforcing steel

resulting from the formulas given on this sheet are for the Contractor's information only.

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing dimensions are out-to-out of bars.



Bridge Division

CONCRETE WINGWALLS WITH PARALLEL WINGS FOR **BOX CULVERTS** TYPES PW-1 AND PW-2

PW

	pwstde01-20.dgn	DN: GAF	-	CK: CAT	DW:	TxD0T		ck: TxDOT
xD0T	February 2020	CONT	SECT	JOB			HWAY	
	REVISIONS							
		DIST		COUNTY				SHEET NO.
								28