

# MIDDLE CREEK BRIDGE

## COUNTY ROAD 410

### BLANCO COUNTY, TEXAS

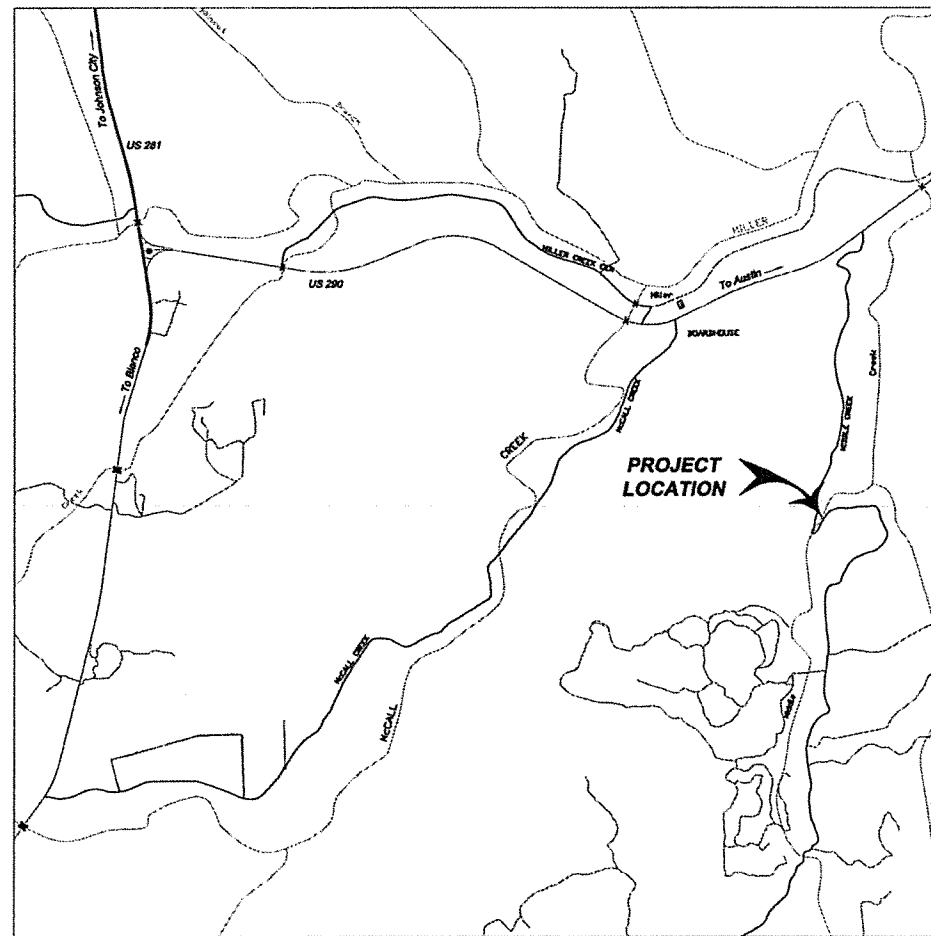
CONTRACTOR: \_\_\_\_\_  
 DATE WORK BEGAN: \_\_\_\_\_  
 DATE WORK COMPLETED: \_\_\_\_\_  
 FINAL COST: \_\_\_\_\_  
 LIST OF APPROVED REVISIONS:

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	GENERAL NOTES
3	SEQUENCE OF WORK
4	TYPICAL SECTIONS
5	TRAFFIC CONTROL PLAN (TCP)
6	PLAN AND PROFILE
7	SWPPP (SW3P)
8	EROSION CONTROL PLAN
9	HYDRAULIC DATA SHEET
10	BRIDGE LAYOUT
11	BRIDGE CORE LOGS
12	ESTIMATED QUANTITIES AND BEARING SEAT ELEVATIONS
13-14	ABUTMENT DETAILS
15	AJ*
16	CSAB*
17-18	FD*
19-22	PCP*
23	PCP-FAB*
24-25	PMDF*
26-28	T223*
29-30	IGD*
31-33	IGEB*
34	IGMS*
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36	IGTS*
37-38	MEBR(C)*
39	IGSD-24*
40-41	SIG-24-15*
42	MBGF-11
43	MBGF(TL2)-11
44	BED-14
45	SGT(8)31-11
46	EROSION CONTROL DETAILS
47	TCP(1-2)-12
48	TCP(2-7)-12
49-60	BC(1)-13 - BC(12)-13
61	D & OM(1)-10
62	D & OM(3)-04
63	SET TYPE II

#### CONSTRUCTION OF BRIDGE AND APPROACHES

CONTRACTOR PERFORMS BRIDGE ITEMS ONLY

BLANCO COUNTY PERFORMS APPROACHES CONSTRUCTION



LOCATION MAP

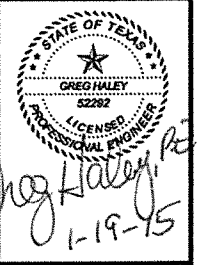
#### BLANCO COUNTY COMMISSIONERS COURT

Honorable Brett Bray, Judge  
 John F. Wood, Commissioner, Precinct 1  
 James Sultemeier, Commissioner, Precinct 2  
 Chris Liesmann, Commissioner, Precinct 3  
 Paul Granberg, Commissioner, Precinct 4

**K.C. ENGINEERING, INC.**  
 CONSULTING ENGINEERS  
 705 HWY. 281 NORTH, PLAZA I, SUITE 103  
 MARBLE FALLS, TEXAS 76654  
 OFFICE: 830-693-5635 FAX: 830-693-9664  
 Email: info@kceengineering.com  
 REGISTRATION # F-000977



TITLE SHEET  
 MIDDLE CREEK BRIDGE  
 COUNTY ROAD 410  
 BLANCO COUNTY TEXAS



Job No.	Scale (Hor.)	AS NOTED	AS NOTED
14-104			
Date: 1/12/14	Checked By: MS	Drawn By: MS	Remarks
Rev. No.	Date	Remarks	
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ENGINEER IN CHARGE:

*Greg Haley, P.E.* 1-19-15  
 Greg Haley, P.E. Date

SHEET  
 01

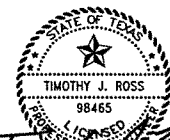
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These drawings are for illustration purposes only and not to be scaled for any purposes. K.C. Engineering, Inc. and the Engineer shall not be responsible for anything obtained by scaling these drawings.

**SPECIFICATION NOTE:**

These plans are governed by the specifications entitled K.C. Engineering, Inc. Standard Specifications (3rd Edition) dated May 2010. All references to the term "Specifications" in the plans shall refer to those defined above, unless specifically noted otherwise.

\* THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE HAVE BEEN ISSUED BY ME ARE APPLICABLE TO THIS PROJECT.



*Timothy J. Ross*  
 1/19/15

**GENERAL NOTES:**

- ALL IMPROVEMENTS SHALL BE MADE IN ACCORDANCE WITH THESE APPROVED PLANS. ANY ADDITIONAL IMPROVEMENTS WILL REQUIRE PLAN REVISIONS AND APPROVAL OF BLANCO COUNTY.
- CONTRACTORS SHALL CALL THE TEXAS ONE CALL SYSTEM AND BLANCO COUNTY FOR UTILITY LOCATIONS PRIOR TO ANY WORK IN CURRENT OR PREVIOUS CITY EASEMENTS OR COUNTY ROAD RIGHT-OF-WAY AT 1-800-DIG-TESS.
- THE CONTRACTOR SHALL NOTIFY BLANCO COUNTY AT LEAST FORTY-EIGHT (48) HOURS PRIOR TO ANY INSTALLATION OF A DRAINAGE FACILITY WITHIN A DRAINAGE EASEMENT OR COUNTY RIGHT-OF-WAY.
- ALL CONSTRUCTION OPERATIONS SHALL BE ACCOMPLISHED IN ACCORDANCE WITH APPLICABLE REGULATIONS OF THE U.S. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION. COPIES OF THE OSHA STANDARDS MAY BE PURCHASED FROM THE U.S. GOVERNMENT PRINTING OFFICE. INFORMATION AND RELATED REFERENCE MATERIALS MAY BE PURCHASED FROM OSHA, 903 SAN JACINTO, RM. 319, AUSTIN, TEXAS 78701.
- THE CONTRACTOR SHALL COMPLY WITH THE REQUIREMENTS OF BLANCO COUNTY.
- THE CONTRACTOR SHALL NOT DISPOSE OF SURPLUS EXCAVATED MATERIAL FROM THE SITE WITHOUT THE APPROVAL OF THE ENGINEER AND BLANCO COUNTY. APPROVAL SHALL INCLUDE THE DISPOSAL SITE.
- CONTRACTOR IS RESPONSIBLE FOR DEMOLITION OF ANY FACILITY ON SITE AND UTILITY RELOCATION WORK.
- ALL AREAS DISTURBED BY CONSTRUCTION SHALL BE RESTORED AND GRADED TO DRAIN. SLOPES SHALL BE STABILIZED TO PREVENT EROSION. ALL SITE STABILIZATION SHALL BE PERFORMED PER THE PROJECT SPECIFICATIONS AS OUTLINED ON THE TITLE SHEET.
- UPON APPROVAL OF THE ENGINEER, ALL DEBRIS AND EXCESS MATERIAL SHALL BE REMOVED FROM THE SITE IN A MANNER NOT TO DAMAGE THE SITE.
- THE INFORMATION CONTAINED ON THESE DRAWINGS IN REGARDS TO EXISTING UTILITIES, TOPOGRAPHY, CONTOURS, OR SUBSURFACE CONDITIONS IS FURNISHED SOLELY AS THE INFORMATION AVAILABLE AT THIS TIME. ITS ACCURACY IS NOT GUARANTEED AND ITS USE IN NO WAY RELIEVES THE CONTRACTOR OF ANY RESPONSIBILITY FOR LOSSES DUE TO ANY INACCURACIES.
- THE CONTRACTOR SHALL NOTIFY BLANCO COUNTY BEFORE BEGINNING ANY UTILITY CONSTRUCTION IN PUBLIC R.O.W. OR PUBLIC EASEMENT. NO PIPE SHALL BE LAID UNTIL THE ASSIGNED INSPECTOR HAS MET WITH THE CONTRACTOR OR HIS REPRESENTATIVE AT THE PROJECT SITE.
- THE CONTRACTOR SHALL CONTACT ALL UTILITY COMPANIES FOR EXISTING UTILITY LOCATIONS PRIOR TO CONSTRUCTION.
- THE CONTRACTOR WILL BE RESPONSIBLE FOR OBTAINING WORK ORDERS FOR PROPOSED PUBLIC IMPROVEMENTS FROM BLANCO COUNTY, IF REQUIRED, PRIOR TO STARTING CONSTRUCTION.
- THE CONTRACTOR WILL BE RESPONSIBLE FOR OBTAINING "LETTERS OF ACCEPTANCE" FROM BLANCO COUNTY FOR COMPLETED PUBLIC IMPROVEMENTS. THE LETTER OF ACCEPTANCE SHALL BE PROVIDED TO OWNER AND ENGINEER PRIOR TO REQUESTING FINAL PAYMENT.
- ALL CONTRACTORS AND SUBCONTRACTORS SHALL BE REQUIRED TO HAVE COMPLETE PLANS AND SPECIFICATIONS AT ALL TIMES.
- ALL WORK PERFORMED IN CONJUNCTION WITH THIS PROJECT SHALL COMPLY WITH THE PROJECT SPECIFICATIONS AS OUTLINED ON THE TITLE SHEET.
- THE CONTRACTOR SHALL SUBMIT ELECTRONIC RECORD DRAWINGS (PDF FORMAT) TO BLANCO COUNTY WITHIN 30 DAYS OF PROJECT COMPLETION. RECORD DRAWINGS SHALL REFLECT ANY CHANGES OR COMPLETED CONSTRUCTION THAT DIFFERS FROM APPROVED DRAWINGS.

**TRENCH EXCAVATION SAFETY PROTECTION:**

CONTRACTOR AND/OR CONTRACTOR'S INDEPENDENTLY RETAINED EMPLOYEE OR STRUCTURAL DESIGN/GEOTECHNICAL/SAFETY/EQUIPMENT CONSULTANT, IF ANY, SHALL REVIEW THESE PLANS AND ANY AVAILABLE GEOTECHNICAL INFORMATION AND THE ANTICIPATED INSTALLATION SITES WITHIN THE PROJECT WORK AREA IN ORDER TO IMPLEMENT CONTRACTOR'S TRENCH EXCAVATION SAFETY PROTECTION SYSTEMS, PROGRAMS AND/OR PROCEDURES FOR THE PROJECT DESCRIBED IN THE CONTRACT DOCUMENTS. THE CONTRACTOR'S IMPLEMENTATION OF THESE SYSTEMS, PROGRAMS AND/OR PROCEDURES SHALL PROVIDE FOR ADEQUATE TRENCH EXCAVATION SAFETY PROTECTION THAT COMPLY WITH AS A MINIMUM, OSHA STANDARDS FOR TRENCH EXCAVATIONS. SPECIFICALLY, CONTRACTOR AND/OR CONTRACTOR'S INDEPENDENTLY RETAINED EMPLOYEE OR SAFETY CONSULTANT SHALL IMPLEMENT A TRENCH SAFETY PROGRAM IN ACCORDANCE WITH OSHA STANDARDS GOVERNING THE PRESENCE AND ACTIVITIES OF INDIVIDUALS WORKING IN AND AROUND TRENCH EXCAVATION.

**NOTES:**

- ALL MATERIALS AND CONSTRUCTION PROCEDURES WITHIN THE SCOPE OF THIS PROJECT SHALL CONFORM TO THE PROJECT SPECIFICATIONS, BLANCO COUNTY, AND ALL REGULATIONS, AS WELL AS OTHER SAFETY CODES AND INSPECTION PROVISIONS APPLICABLE TO THE PROJECT AND REQUIREMENTS.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ACQUIRING ALL PERMITS, TESTS, APPROVALS, AND ACCEPTANCES REQUIRED TO COMPLETE THE CONSTRUCTION OF THIS PROJECT.
- ALL ITEMS NOT SPECIFICALLY CALLED FOR ON THE PLANS, OR IN THE SPECIFICATIONS, BUT NECESSARY TO REASONABLY CONSTRUCT THE FACILITY OR IMPROVEMENT, SHALL BE CONSIDERED INCIDENTAL TO THE OVERALL PROJECT AND NO SEPARATE PAY ITEMS WILL BE MADE FOR THESE ITEMS.
- THE CONTRACTOR SHALL EXCAVATE AROUND ANY EXISTING UTILITIES WHICH INTERSECT THE PROPOSED ALIGNMENT AND NOTIFY THE OWNER'S REPRESENTATIVE OF POTENTIAL CONFLICTS, PRIOR TO ANY CONSTRUCTION IN THE AREA.
- THE LOCATIONS AND DEPTHS OF EXISTING UTILITIES SHOWN ON THESE PLANS ARE APPROXIMATE ONLY. ACTUAL LOCATIONS AND DEPTHS OF UTILITIES MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. ANY DAMAGE TO EXISTING UTILITIES SHALL BE REPAIRED BY THE CONTRACTOR AT HIS EXPENSE.
- ALL UTILITY CONNECTIONS TO FACILITIES SHALL BE COORDINATED WITH BLANCO COUNTY AND ENGINEER.
- PROPOSED IMPROVEMENTS SHALL BE CONSTRUCTED TO THE ELEVATIONS AND GRADES INDICATED HEREIN.
- REFER TO PROJECT SPECIFICATIONS FOR ADDITIONAL SPECIFICATIONS AND CONTRACT INFORMATION.

THE LOCATION OF EXISTING UNDERGROUND AND OVERHEAD UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR THE ENGINEER. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL OVERHEAD AND UNDERGROUND UTILITIES.

THE EXISTING CONDITIONS SHOWN IN THESE PLANS, INCLUDING BOUNDARY, BUILDINGS, TREES, AND TOPOGRAPHY ARE BASED ON SURVEY INFORMATION PROVIDED BY:

BAKER SURVEYING  
2250 N US HWY 281  
BLANCO, TEXAS 78606  
(830) 388-2250

CONTRACTOR TO VERIFY EXISTING CONDITIONS PRIOR TO CONSTRUCTION AND NOTIFY KC ENGINEERING, INC. AT (830) 693-5635, CONCERNING ANY DISCREPANCIES.

**LEGEND**

- GAS VALVE
- AIR CONDITIONER
- ELECTRIC METER
- TRANSFORMER PAD
- CABLE PEDESTAL
- FIRE HYDRANT
- DOWN GUY
- YARD LIGHT
- LIGHT POLE
- UTILITY POLE
- STORM MANHOLE
- SANITARY SEWER MANHOLE
- SEWER VALVE
- CLEANOUT
- SIGN
- TELEPHONE RISER
- TREE
- WATER WELL UNLESS OTHERWISE NOTED
- WATER METER
- WATER VALVE
- COMBINATION AIR/VACUUM VALVE
- IRRIGATION CONTROL VALVE
- UTILITY VAULT UNKNOWN
- MAILBOX
- TEMPORARY BENCHMARK
- UNDERGROUND FIBER OPTIC
- EXISTING SANITARY SEWER
- OVERHEAD UTILITY
- UNDERGROUND TELEPHONE
- UNDERGROUND ELECTRIC
- EXISTING WATER
- WIRE FENCE
- WOOD FENCE
- CHAINLINK FENCE
- PROPOSED WATER
- PROPOSED FORCE MAIN
- PROPOSED SILT FENCE
- PROPOSED LIMITS OF CONSTRUCTION
- EXISTING CONTOURS
- PROPOSED CONTOURS
- PROPERTY LINES

**UTILITY COMPANIES:**

VERIZON (TELEPHONE)  
CONTACT: APRIL GORDON  
PHONE: (512) 756-1684

PEDERNALES ELECTRIC CO-OP  
CONTACT: GEOFFREY BLAIR  
PHONE: (830) 693-5525

BLANCO COUNTY  
PRECINCT 4  
CONTACT: PAUL GRANBERG  
PHONE: (830) 833-1077

**K.C. ENGINEERING, INC.**  
CONSULTING ENGINEERS  
705 HWY. 281 NORTH, PLAZA 1, SUITE 103  
MARBLE FALLS, TEXAS 78654  
OFFICE: 830-693-5635 FAX: 830-693-9664  
Email: info@kcengineering.com  
REGISTRATION # F-000977



**GENERAL NOTES**  
MIDDLE CREEK BRIDGE  
COUNTY ROAD 410  
BLANCO COUNTY, TEXAS



*Greg Haley PE*  
1-19-15

File: K:\14-104 Middle Creek Bridge Design\PLAN SHEETS\GEN NOTES.dwg	AS NOTED
Job No. 14-104	AS NOTED
Scale (Hoc.):	Scale (Vert.):
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Rev. No. 1	Drawn By: MS
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## SEQUENCE OF WORK

### PHASE 1 – ROW CLEARING, EXCAVATION AND EMBANKMENT

1. PRIOR TO CONTRACT EXECUTION, BLANCO COUNTY SHALL CLEAR THE ROW
2. PRIOR TO CONTRACT EXECUTION, BLANCO COUNTY SHALL PLACE EROSION CONTROL MEASURES
3. PRIOR TO CONTRACT EXECUTION, BLANCO COUNTY SHALL CONSTRUCT THE APPROACHES
4. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THESE CONSTRUCTION PLANS AND SPECIFICATIONS

### PHASE 2 – BRIDGE CONSTRUCTION

1. ADJUST EROSION CONTROL MEASURES AS NECESSARY
2. PLACE ALL TRAFFIC CONTROL DEVICES IN ACCORDANCE WITH THESE PLANS AND SPECIFICATIONS
3. CONTRACTOR SHALL PERFORM EXCAVATION/EMBANKMENT AROUND THE ABUTMENTS NECESSARY FOR THEIR CONSTRUCTION (DRILLED SHAFTS, CAPS, BACKWALL, ETC.) AND THAT REQUIRED FOR ACCESS FOR THE CONSTRUCTION OF ABUTMENTS, DRILLED SHAFTS AND BEAMS
4. CONSTRUCT DRILLED SHAFTS
5. CONSTRUCT ABUTMENT CAPS, BACKWALLS AND WINGWALLS
6. CONSTRUCT BACKWALL TO CONSTRUCTION JOINT
7. PLACE PRESTRESSED CONCRETE BEAMS
8. BRACE PRESTRESSED CONCRETE BEAMS AS DETAILED IN THESE PLANS
9. PROFILE PRESTRESSED CONCRETE BEAMS AT THE ENDS, MID-POINTS, AND QUARTER-POINTS AND SUBMIT TO BLANCO COUNTY
10. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THESE CONSTRUCTION PLANS AND SPECIFICATIONS

### PHASE 3 – EXCAVATION AND EMBANKMENT

1. ADJUST EROSION CONTROL MEASURES AS NECESSARY
2. CONTRACTOR SHALL PROVIDE 2 WEEKS IN HIS SCHEDULE FOR BLANCO COUNTY TO COMPLETE EMBANKMENT
3. BLANCO COUNTY SHALL CONSTRUCT THE REMAINDER OF THE EXCAVATION AND EMBANKMENT TO GRADE
3. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THESE CONSTRUCTION PLANS AND SPECIFICATIONS

### PHASE 4 – BRIDGE CONSTRUCTION

1. ADJUST EROSION CONTROL MEASURES AS NECESSARY
2. PLACE BRIDGE DECK FORMS AND OVERHANG FORMS
3. SET GRADES BASED UPON PROFILE INFORMATION SUBMITTED PREVIOUSLY (IN LIEU OF GRADES FROM BLANCO COUNTY, SET BRIDGE GRADES BASED UPON DEFLECTION DIAGRAM IN THESE PLANS)
4. CONSTRUCT BACKWALLS TO GRADE
5. PLACE DECK AND TYNE ACCORDING TO THE SPECIFICATIONS
6. PROVIDE CURING ACCORDING TO THE SPECIFICATIONS
7. CONTRACTOR SHALL PROVIDE AN INDEPENDENT TESTING LAB TO TEST ALL CONCRETE FOR COMPLIANCE WITH THESE PLANS AND SPECIFICATIONS – SUBMIT TEST RESULTS TO BLANCO COUNTY
8. PLACE BRIDGE RAIL
9. CONCRETE SURFACES TO RECEIVE AN ORDINARY FINISH
10. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THESE CONSTRUCTION PLANS AND SPECIFICATIONS

### PHASE 5 – FLEX BASE AND PAVING

1. ADJUST EROSION CONTROL MEASURES AS NECESSARY
2. BLANCO COUNTY SHALL PLACE FLEXIBLE BASE
3. BLANCO COUNTY SHALL PERFORM PAVING
4. BLANCO COUNTY PERFORMS PERMANENT VEGETATION ESTABLISHMENT
5. BLANCO COUNTY REMOVES TEMPORARY EROSION CONTROL MEASURES UPON 70% ESTABLISHMENT OF VEGETATIVE COVER
6. CONTRACTOR PERFORMS FINAL PUNCH LIST ITEMS
4. CONTRACTOR PERFORMS FINAL CLEAN-UP FOR BRIDGE WORK
5. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THESE CONSTRUCTION PLANS.

IT IS THE CONTRACTOR'S RESPONSIBILITY TO FOLLOW THE SEQUENCE OF WORK NOTED HEREIN

THE CONTRACTOR MAY SUBMIT AN ALTERNATE SEQUENCE AND TRAFFIC CONTROL PLAN (TCP) SUBJECT TO THE APPROVAL OF BLANCO COUNTY PRIOR TO USING ANY ALTERNATE SEQUENCING PLAN

PROVIDE SAFE AND CONVENIENT ACCESS TO ABUTTING PROPERTY, COUNTY ROAD, AND PRIVATE ROAD

CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE ROADWAY SURFACE FOR ANY DAMAGES CREATED

Date: Jan 18, 2015, 7:21pm User ID: Greg  
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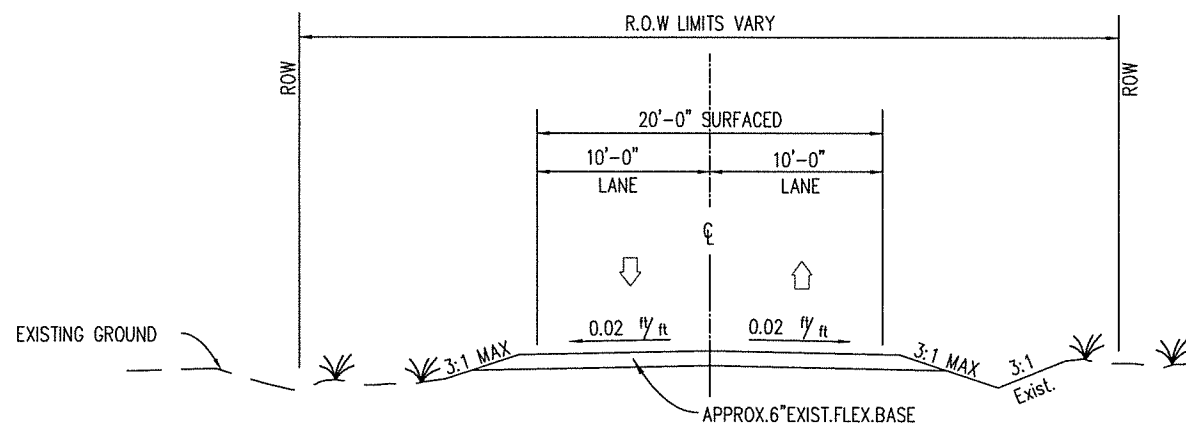
**K.C. ENGINEERING, INC.**  
CONSULTING ENGINEERS  
705 HWY. 281 NORTH, PLAZA I, SUITE 103  
MARBLE FALLS, TEXAS 78654  
OFFICE: 830-693-5635 FAX: 830-693-9664  
Email: info@kceengineering.com  
REGISTRATION # F-000977



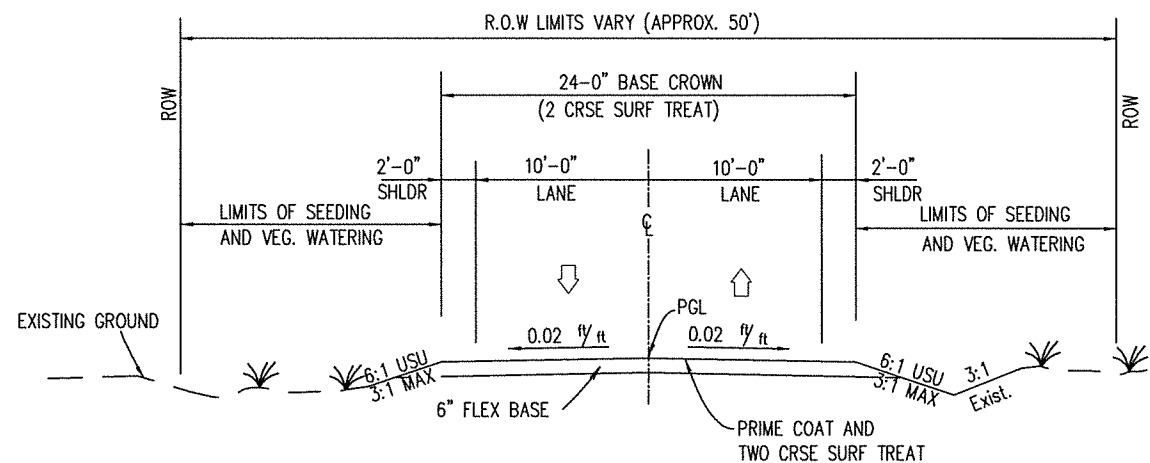
SEQUENCE OF WORK  
MIDDLE CREEK BRIDGE  
COUNTY ROAD 410  
BLANCO COUNTY, TEXAS

STATE OF TEXAS  
GREG HALEY  
52292  
REGISTERED PROFESSIONAL ENGINEER  
*Greg Haley PE*  
1-19-15

Job No. 14-104	Scale (Hor.): N/A	Scale (Vert.): N/A	Checked By: GK	Drawn By: GK
Date: 11/09/14	Date: Date	Date: Date	Date: Date	Date: Date
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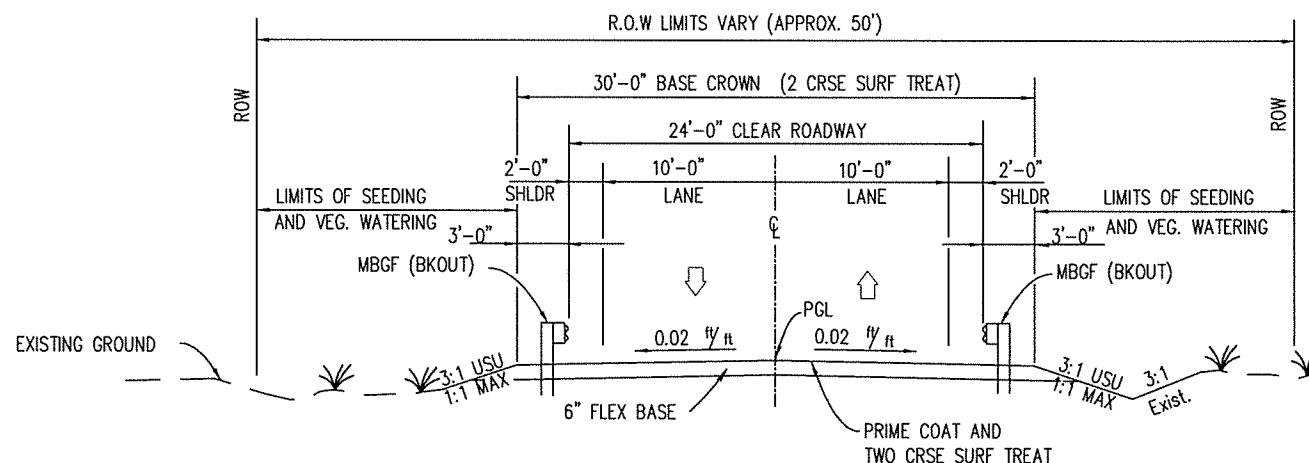


EXISTING ROADWAY SECTION



PROPOSED ROADWAY SECTION

STA. 1+00.00 TO STA. 1+73.00  
 STA. 4+23.67 TO STA. 4+50.00



PROPOSED ROADWAY SECTION

STA. 1+73.00 TO STA. 2+71.17  
 STA. 3+26.17 TO STA. 4+23.67

NOTES:

- FLEX BASE SHALL BE: ITEM 247 FLEX BASE (COMPL IN PLAC) (TY A GR 6 CL 5)
- PRIME COAT SHALL BE: ITEM 310 ASPH MATL (MC-30 OR SS-1)
- SURF TREAT SHALL BE: ITEM 316 ASPH (AC-10) (LATEX ADDITIVE)
- AND: ITEM 316 AGGR (TY B, GR 3 & 4)

Date: Jan 16, 2015, 7:22pm User ID: Greg  
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**K.C. ENGINEERING, INC.**  
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**CR 410  
 MIDDLE CREEK BRIDGE  
 TYPICAL SECTIONS  
 BLANCO COUNTY, TEXAS**



*Greg Haley PE*  
 1-19-15

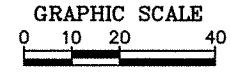
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OBEY  
WARNING  
SIGNS  
STATE LAW

END  
WORK ZONE

CONSTRUCTION OF APPROACHES  
TO BE PERFORMED BY  
BLANCO COUNTY

CONTRACTOR PERFORMS  
BRIDGE CONSTRUCTION ONLY



NOTES:

SIGN LOCATIONS SHOWN HEREON ARE FOR  
ILLUSTRATION PURPOSES ONLY. USE THE  
STANDARD DETAILS HEREIN TO DETERMINE  
APPROPRIATE SIGN LOCATIONS.

ALL TRAFFIC CONTROL SHALL COMPLY WITH  
THE APPLICABLE STANDARD DETAILS CONTAINED  
HEREIN.

ROAD  
WORK  
AHEAD

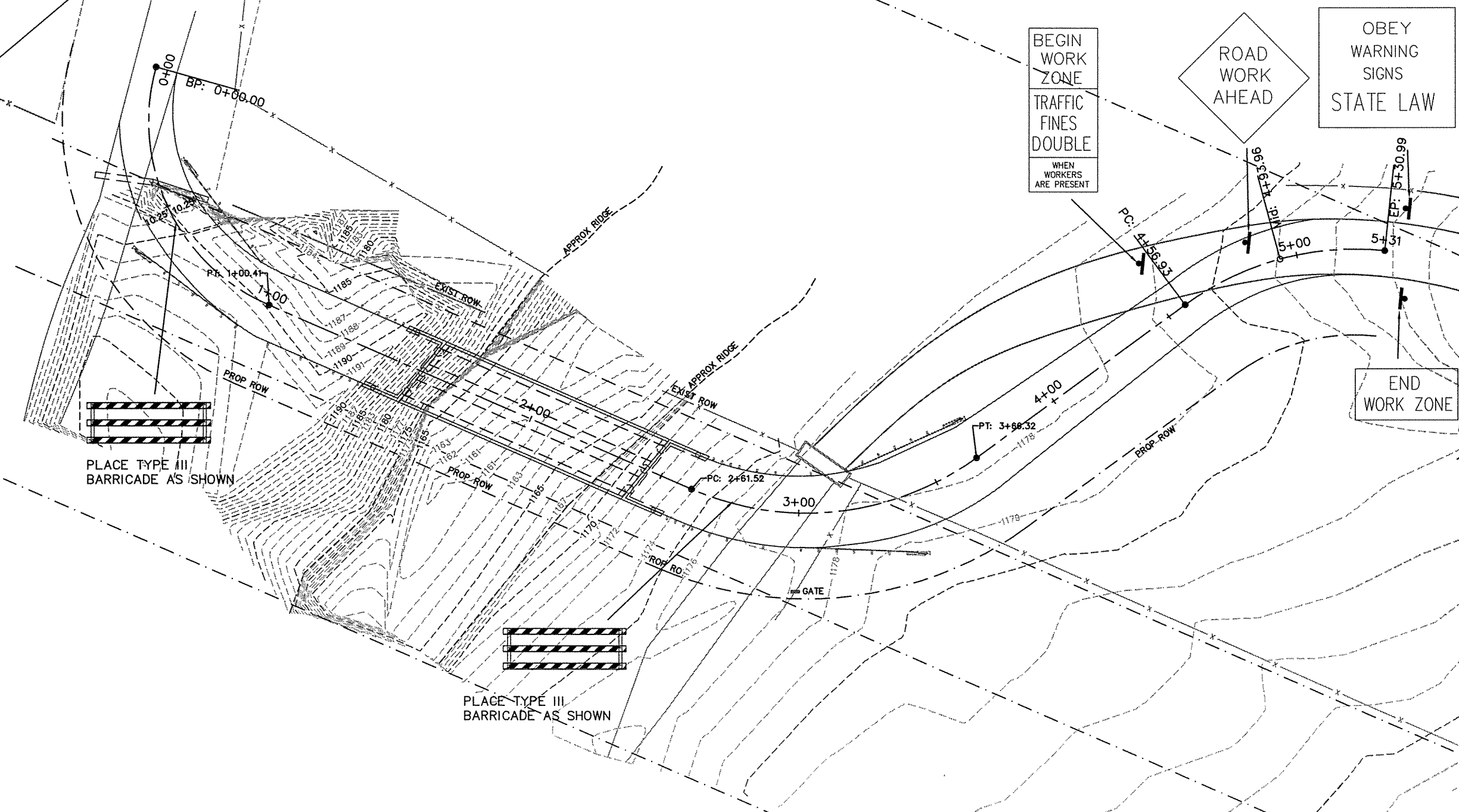
BEGIN  
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WORKERS  
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FINES  
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WORKERS  
ARE PRESENT

ROAD  
WORK  
AHEAD

OBEY  
WARNING  
SIGNS  
STATE LAW

END  
WORK ZONE



PLACE TYPE III  
BARRICADE AS SHOWN

PLACE TYPE III  
BARRICADE AS SHOWN

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TRAFFIC CONTROL PLAN  
CR 4410  
MIDDLE CREEK BRIDGE  
BLANCO COUNTY, TEXAS

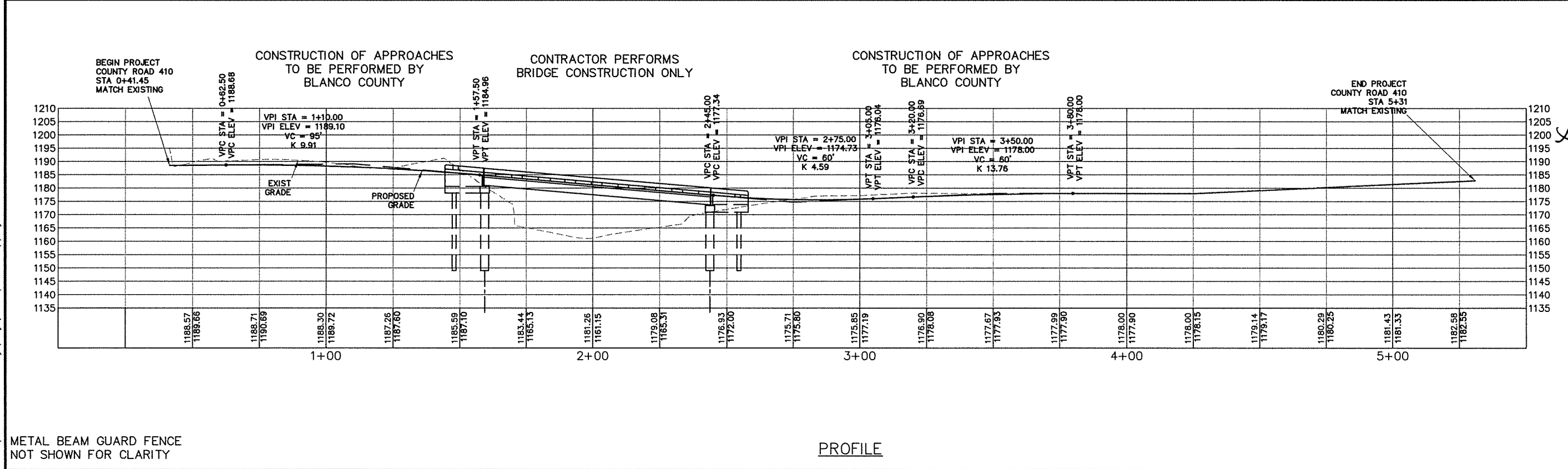
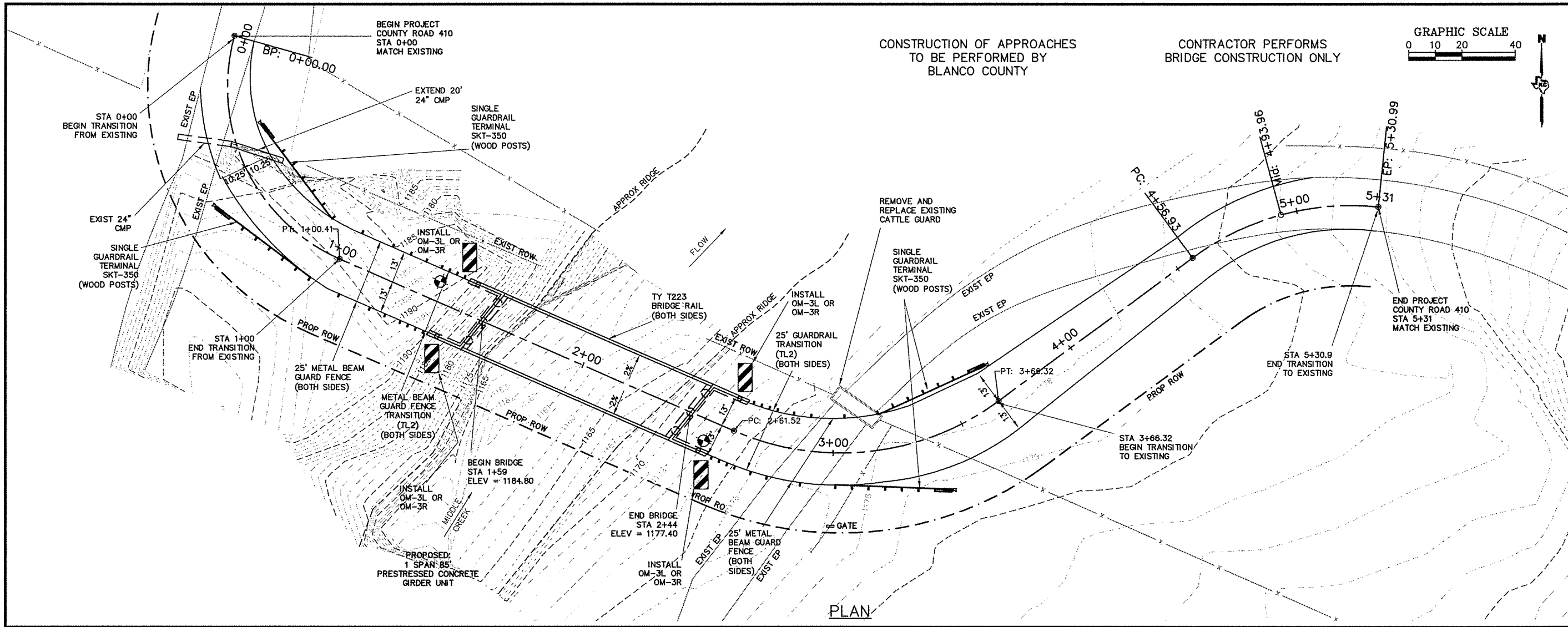


*Greg Haley*  
1-19-15

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Scale (Vert.)	AS NOTED
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Date	Remarks
Rev. No.	Date
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SHEET  
05

Date: Jan 18, 2015, 7:24pm User ID: Greg  
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**K.C. ENGINEERING, INC.**  
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**PLAN AND PROFILE**  
**MIDDLE CREEK BRIDGE**  
**CR 410**  
**BLANCO COUNTY, TEXAS**

1-19-15

Job No.	Scale (Hor.)	AS NOTED
14-104	AS NOTED	AS NOTED
Date: 12/26/14	Checked By: GK	Drawn By: GK
Rev. No.	Date	Remarks
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Date: Jan 18, 2015, 6:11pm User ID: Greg  
 File: K:\14-104 Middle Creek Bridge\Design\Civil\_3D\VP 14-104-(2).dwg

A. GENERAL SITE DATA

1. PROJECT LIMITS:

COUNTY ROAD 410 AT MIDDLE CREEK

PROJECT COORDINATES:

BEGIN PROJECT: LAT 30.181219' LONG -98.319021'  
 END PROJECT: LAT 30.181046' LONG -98.317428'

2. PROJECT SITE MAPS

- PROJECT LOCATION MAP: TITLE SHEET
- SLOPES ANTICIPATED AFTER MAJOR GRADINGS OR AREAS OF SOIL DISTURBANCE: EXISTING AND PROPOSED TYPICAL SECTIONS
- LOCATION OF EROSION AND SEDIMENT CONTROLS:

3. PROJECT DESCRIPTION: CONSTRUCT BRIDGE AND APPROACHES

4. MAJOR SOIL DISTURBING ACTIVITIES: APPROACHES GRADING

5. EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER  
 ROCK OUTCROPPINGS WITH SPARSE GRASS COVER  
 EXISTING COVER ~ 30%

6. TOTAL PROJECT AREA: 2.0 ACRES

7. TOTAL AREA TO BE DISTURBED: 2.0 ACRES

8. WEIGHTED RUNOFF COEFFICIENT  
 BEFORE CONSTRUCTION: 0.46  
 AFTER CONSTRUCTION: 0.47

9. NAME OF RECEIVING WATERS: MIDDLE CREEK TO MILLER CREEK TO PEDERNALES RIVER TO THE COLORADO RIVER BASIN AND LAKE TRAVIS

10. PROJECT SW3P FILE: FOR PROJECTS DISTURBING ONE ACRE OR MORE, MAINTAIN AN SW3P FILE WITH ALL PERTINENT ENVIRONMENTAL DOCUMENTS, CORRESPONDENCE, ETC. AT THE PROJECT. IF NO FIELD OFFICE IS AVAILABLE THEN THE SW3P FILE SHALL BE KEPT READILY ACCESSIBLE.

B. EROSION AND SEDIMENT CONTROLS

1. SOIL STABILIZATION PRACTICES:

- TEMPORARY SEEDING
- PERMANENT PLANTING, SODDING, OR SEEDING
- MULCHING
- SOIL RETENTION BLANKET
- BUFFER ZONES
- PRESERVATION OF NATURAL RESOURCES

OTHER: N/A

2. STRUCTURAL PRACTICES

- SILT FENCES
- HAY BALES
- ROCK FILTER DAMS
- DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
- DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
- DIVERSION DIKE AND SWALE COMBINATIONS
- PIPE SLOPE DRAINS
- PAVED FLUMES
- ROCK BEDDING AT CONSTRUCTION EXIT
- TIMBER MATTING AT CONSTRUCTION EXIT
- CHANNEL LINERS
- SEDIMENT TRAPS
- SEDIMENT BASINS
- STORM INLET SEDIMENT TRAP
- STONE OUTLET STRUCTURES
- CURBS AND GUTTERS
- STORM SEWERS
- VELOCITY CONTROL DEVICES

OTHER: N/A

3. STORM WATER MANAGEMENT:

STORM WATER DRAINAGE WILL BE PROVIDED BY N/A  
 THIS SYSTEM WILL CARRY DRAINAGE WITHIN THE RIGHT-OF-WAY TO NATURAL DRAINAGE FEATURES THAT FLOW TO RECEIVING WATERS LISTED TO THE LEFT.

4. STORM WATER MANAGEMENT ACTIVITIES: (SEQUENCE OF CONSTRUCTION):

SEE THE SEQUENCE OF WORK ELSEWHERE IN THE PLANS.

5. NON-STORM WATER DISCHARGES:

FILTER NON-STORM WATER DISCHARGES, OR HOLD RETENTION BASINS, BEFORE BEING ALLOWED TO MIX WITH STORM WATER. THESE DISCHARGES CONSIST OF NON-POLLUTED GROUNDWATER, SPRING WATER, FOUNDATION AND/OR FOOTING DRAIN WATER; AND WATER USED FOR DUST CONTROL, PAVEMENT WASHING AND VEHICLE WASHWATER CONTAINING NO DETERGENTS.

C. OTHER REQUIREMENTS AND PRACTICES

1. MAINTENANCE:

MAINTENANCE WILL BE PERFORMED AS INDICATED ON FIELD INSPECTIONS AND MAINTENANCE REPORT.

2. INSPECTION:

INSPECTION WILL BE PERFORMED AS INDICATED ON FIELD INSPECTION AND MAINTENANCE REPORT.

3. WASTE MATERIALS:

ALL WASTE MATERIALS WILL BE COLLECTED, STORED AND DISPOSED OF IN A LEGAL AND PROPER MANNER. NO CONSTRUCTION WASTE MATERIAL WILL BE BURIED ON-SITE.

4. HAZARDOUS WASTE (INCLUDING SPILL REPORTING):

AT A MINIMUM, ANY PRODUCTS IN THE FOLLOWING CATEGORIES ARE CONSIDERED TO BE HAZARDOUS. PAINTS, ACIDS FOR CLEANING MASONRY SURFACES, CLEANING SOLVENTS, ASPHALT PRODUCTS, CHEMICAL ADDITIVES FOR SOIL STABILIZATION, OR CONCRETE CURING COMPOUNDS AND ADDITIVES. IN THE EVENT A SPILL, WHICH MAY BE HAZARDOUS, THE SPILL COORDINATOR MUST BE CONTACTED IMMEDIATELY.

5. SANITARY WASTE:

ALL SANITARY WASTE WILL BE COLLECTED FROM PORTABLE UNITS AS NECESSARY OR AS REQUIRED BY LOCAL REGULATION BY A LICENSED SANITARY WASTE MANAGEMENT CONTRACTOR.

OFFSITE VEHICLE TRACKING:

- HAUL ROADS DAMPENED FOR DUST CONTROL
- LOADED HAUL TRUCKS TO BE COVERED WITH TARPULIN
- EXCESS DIRT ON ROAD REMOVED DAILY
- STABILIZED CONSTRUCTION ENTRANCE

OTHER: N/A

REMARKS: DISPOSAL AREAS, STOCKPILES AND HAUL ROADS SHALL BE CONSTRUCTED IN A MANNER THAT WILL MINIMIZE AND CONTROL SEDIMENT FROM ENTERING RECEIVING WATERS. DISPOSAL AREAS SHALL NOT BE LOCATED IN ANY WATERBODY OR STREAMBED.

CONSTRUCTION STAGING AREAS AND VEHICLE MAINTENANCE AREAS SHALL BE CONSTRUCTED TO MINIMIZE THE RUNOFF OF POLLUTANTS.

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

**K.C. ENGINEERING, INC.**  
 CONSULTING ENGINEERS  
 705 HWY. 281 NORTH, PLAZA I, SUITE 103  
 MARBLE FALLS, TEXAS 78654  
 OFFICE: 830-693-5635 FAX: 830-693-9664  
 Email: info@kceengineering.com  
 REGISTRATION # F-000977



SWPPP  
 MIDDLE CREEK BRIDGE  
 COUNTY ROAD 410  
 BLANCO COUNTY, TEXAS

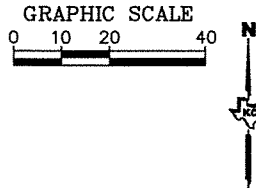


*Greg Hale PE*  
 1-19-15

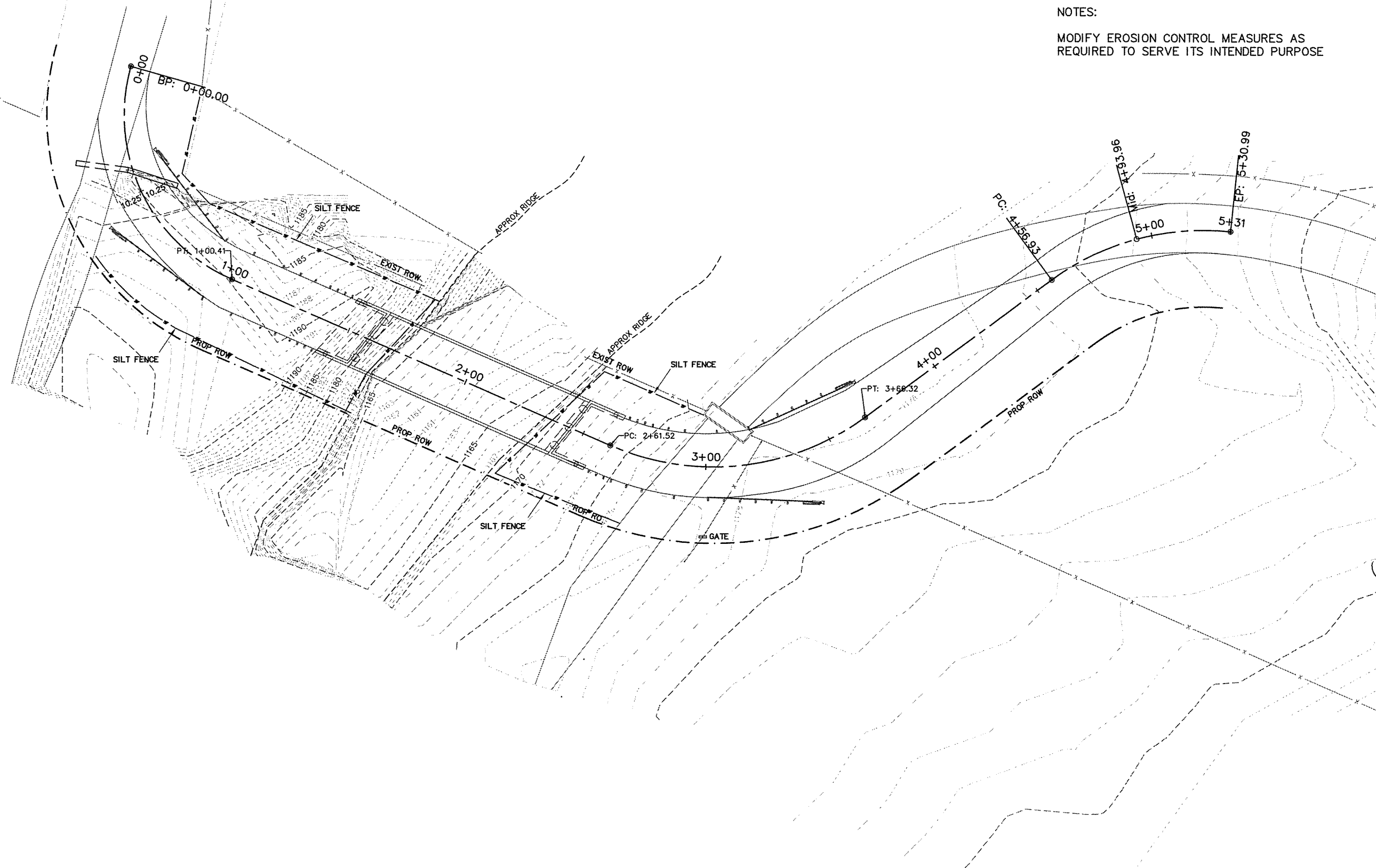
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Date: 1/19/14	Checked By:	Date:	Rev. No. 1	Remarks
			2	
			3	
			4	

CONSTRUCTION OF APPROACHES  
TO BE PERFORMED BY  
BLANCO COUNTY

CONTRACTOR PERFORMS  
BRIDGE CONSTRUCTION ONLY



NOTES:  
MODIFY EROSION CONTROL MEASURES AS  
REQUIRED TO SERVE ITS INTENDED PURPOSE



**K.C. ENGINEERING, INC.**  
CONSULTING ENGINEERS  
705 HWY. 281 NORTH, PLAZA I, SUITE 103  
MARBLE FALLS, TEXAS 78654  
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Email: info@kceengineering.com  
REGISTRATION # F-000977



EROSION CONTROL PLAN  
MIDDLE CREEK BRIDGE  
CR 410  
BLANCO COUNTY, TEXAS



*Greg Haley PE*  
1-19-15

File: K114-104 DESIGN\CIVIL 3DIMP 14-104-GK-2.DWG	Scale (Hor.): AS NOTED	AS NOTED
Job No: 14-104	Scale (Vert.): AS NOTED	AS NOTED
Date: 11/09/14	Checked By: GK	Drawn By: GK
Rev. No.	Date	Remarks
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SHEET  
08

Date: Jan 16, 2015, 7:25pm User ID: Greg  
File: K:\14-104 Middle Creek Bridge\Design\Civil 3D\MP 14-104-(2).dwg





**HYDRAULIC DATA SHEET**  
**MIDDLE CREEK BRIDGE**  
**COUNTY ROAD 410**  
**BLANCO COUNTY, TEXAS**



*Greg Haley*  
 1-19-15

File No.	14-104	Scale (Hor.)	AS NOTED
Job No.	14-104	Scale (Ver.)	AS NOTED
Date:	12/31/14	Checked By:	000
Rev. No.	1	Drawn By:	GK
	2	Date	
	3	Remarks	
	4		

**Hydrologic Computations**

Hydrologic Method: HEC-HMS (NRCS Runoff Curve Method)  
 Drainage Area: 3,657 Ac = 5.5731 Sq. Miles Design Frequency: 2 Yrs.

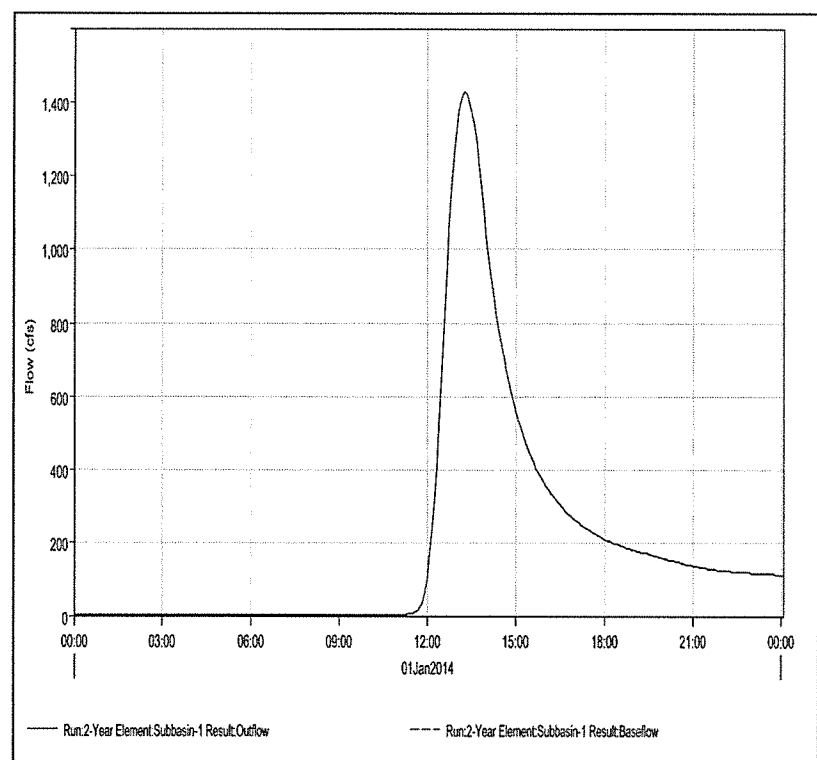
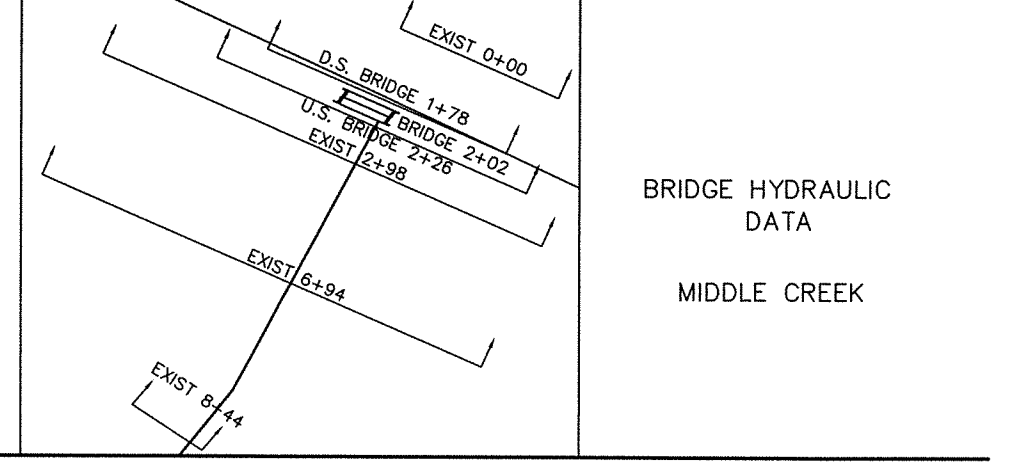
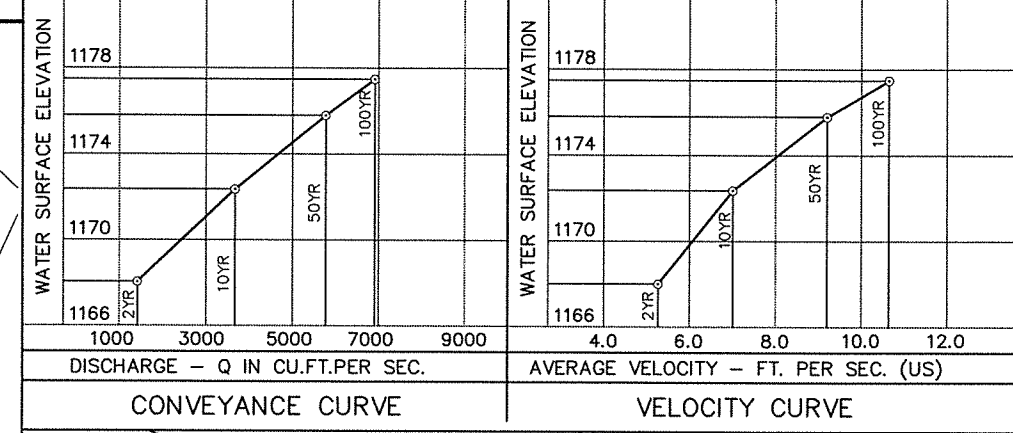
Summary of Soil Conditions and Land Use:  
 Predominant Soil Classification: Bracket-Real Association, Hilly  
 Mostly Rural. Curve Number = 70 (estimated from soils maps)  
 USACE HEC-HMS was used to calculate discharges.  
 USACE HEC-RAS was used to analyze the channel and structure.

Summary of Input Parameters:  
 Lag Time: 1.25 hours (75.2 minutes)  
 Time of Concentration: 2.09 hours (125 minutes)  
 Precipitation Depth: 2 YR: 4.0", 5 YR: 5.4", 10 YR: 6.5", 25 YR: 7.6" 50 YR: 8.6", 100 YR 9.7"

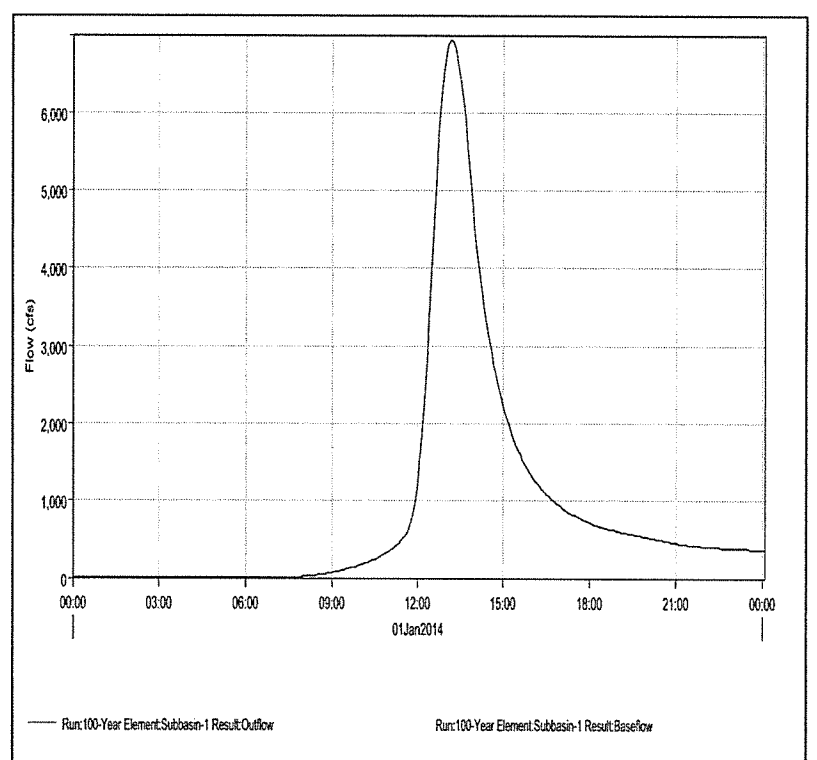
Middle Creek is not a FEMA studied waterway.

Plan: 220141227a Middle Creek One RS: 202 Profile: 2-Tr	Plan: 220141227a Middle Creek One RS: 202 Profile: 100-Yr
E.G. US (ft)	1178.18
W.S. US (ft)	1178.50
Q Total (cfs)	6927.00
Q Bridge (cfs)	6927.99
Q Weir (cfs)	0.00
Wear Sta LR (ft)	1170.12
Wear Sta RR (ft)	1170.79
Wear Submrg	0.35
Wear Max Depth (ft)	0.50
Min El Weir Flow (ft)	1177.06
Min El Pst (ft)	1176.10
Delta EG (ft)	0.72
Delta WG (ft)	1.07
BR Open Area (sq ft)	664.31
BR Open Vel (ft/s)	10.65
Coef of Q	0.77
Br Sel Method	Energy only

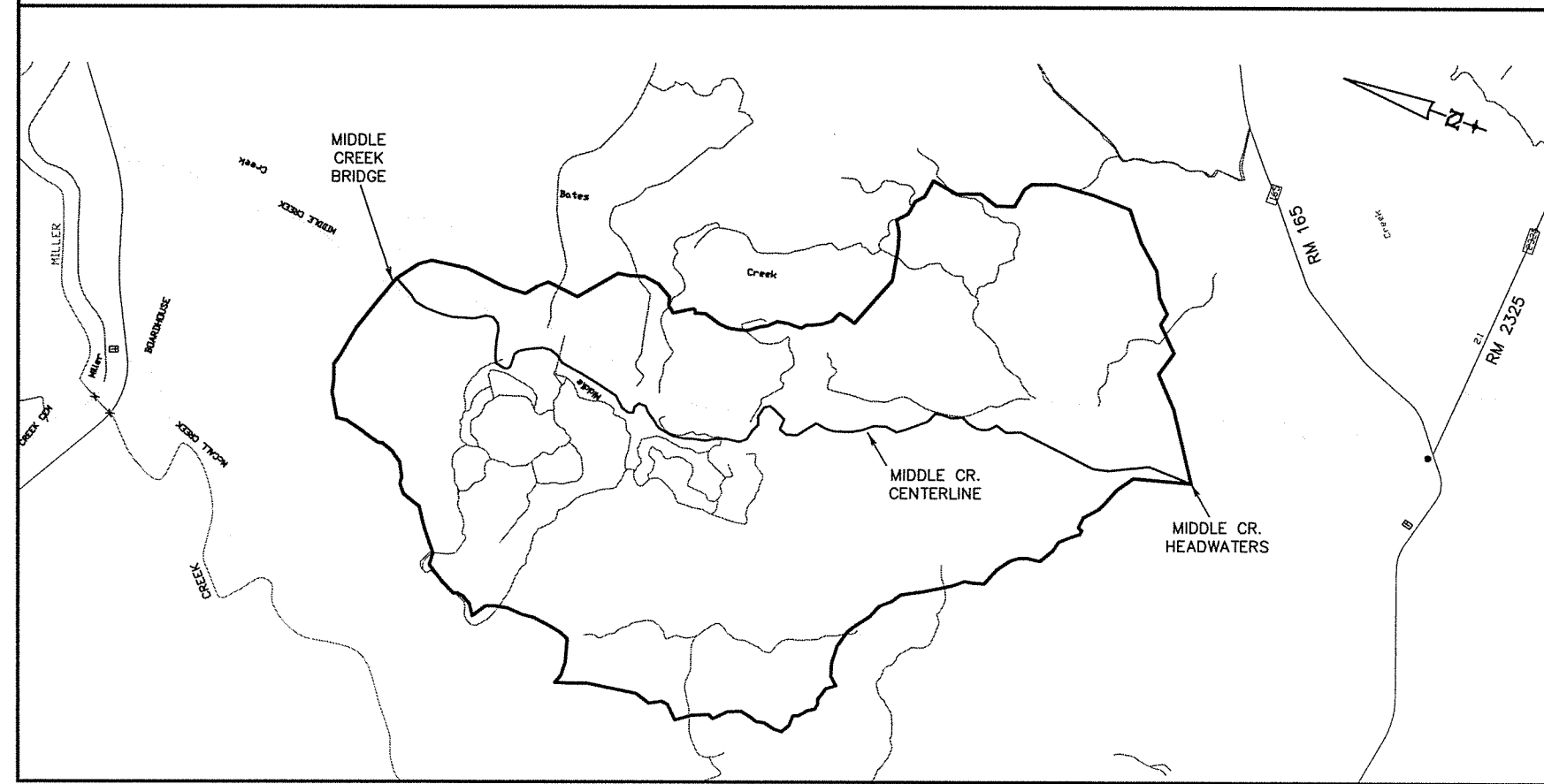
Interval	2-Yr.	5-Yr.	10-Yr.	25-Yr.	50-Yr.	100-Yr.
Q (cfs)	1426	1564	3673	4760	5782	6927



2-YEAR HYDROGRAPH

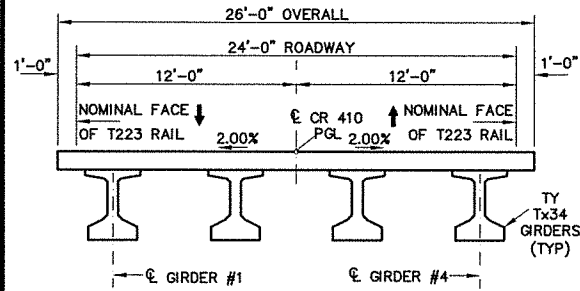


100-YEAR HYDROGRAPH



LOCATION & DRAINAGE AREA

Date: Jan 18, 2015, 7:24am User: JD\_Crog  
 File: K:\14-104 Middle Creek Bridge Design\Civil 3D\MP 14-104-(2).dwg



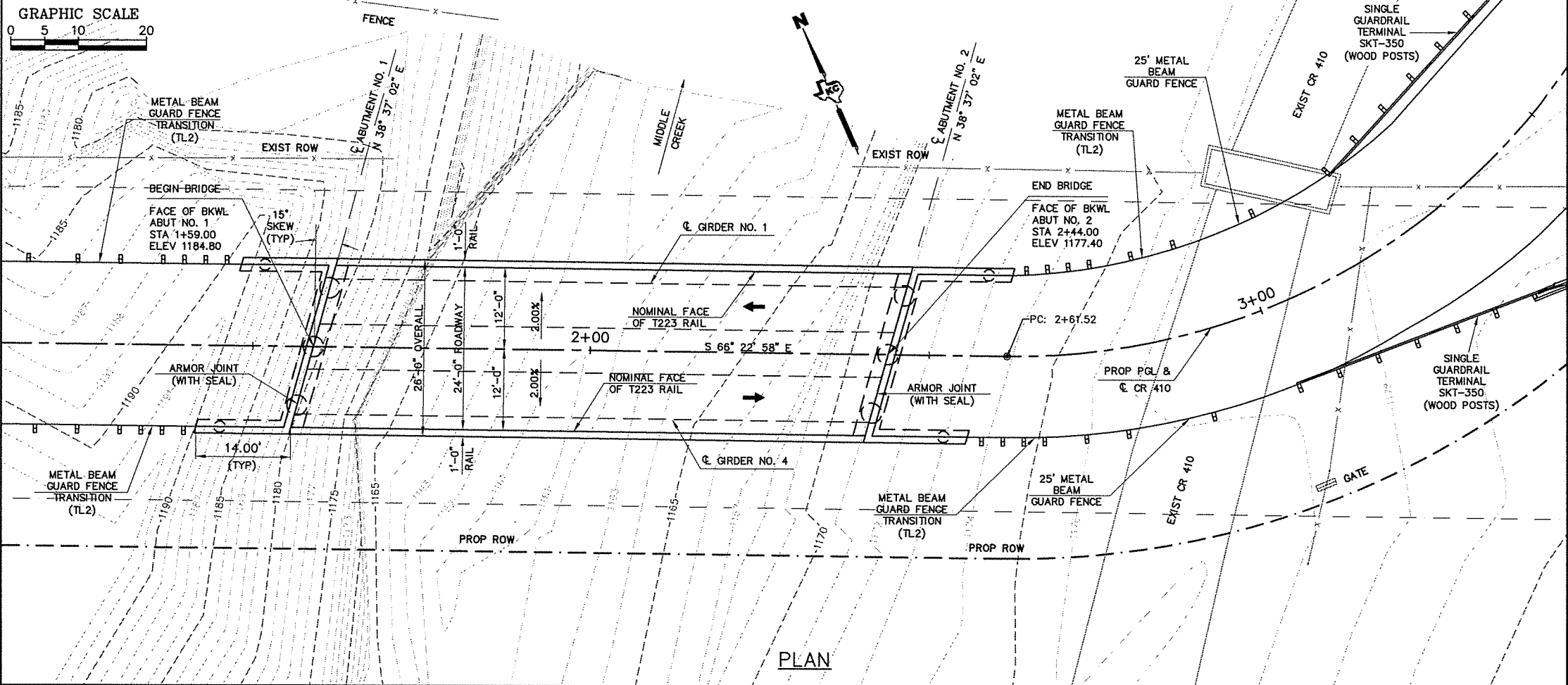
TYPICAL SECTION  
(NTS)

- DESIGNED IN ACCORDANCE WITH AASHTO LRFD SPECIFICATIONS, 6TH EDITION.
- HORIZONTAL DIMENSIONS ARE SHOWN. LENGTHS MUST BE CORRECTED FOR GRADE OR CROSS SLOPE WHERE APPROPRIATE.
- "D" DENOTES DOWELS IN OUTSIDE BEAMS.
- CONTRACTOR SHALL VERIFY LOCATIONS OF ALL UTILITIES PRIOR TO CONSTRUCTION.
- SEE "BRIDGE CORE LOGS" SHEET FOR GEOTECHNICAL INFORMATION

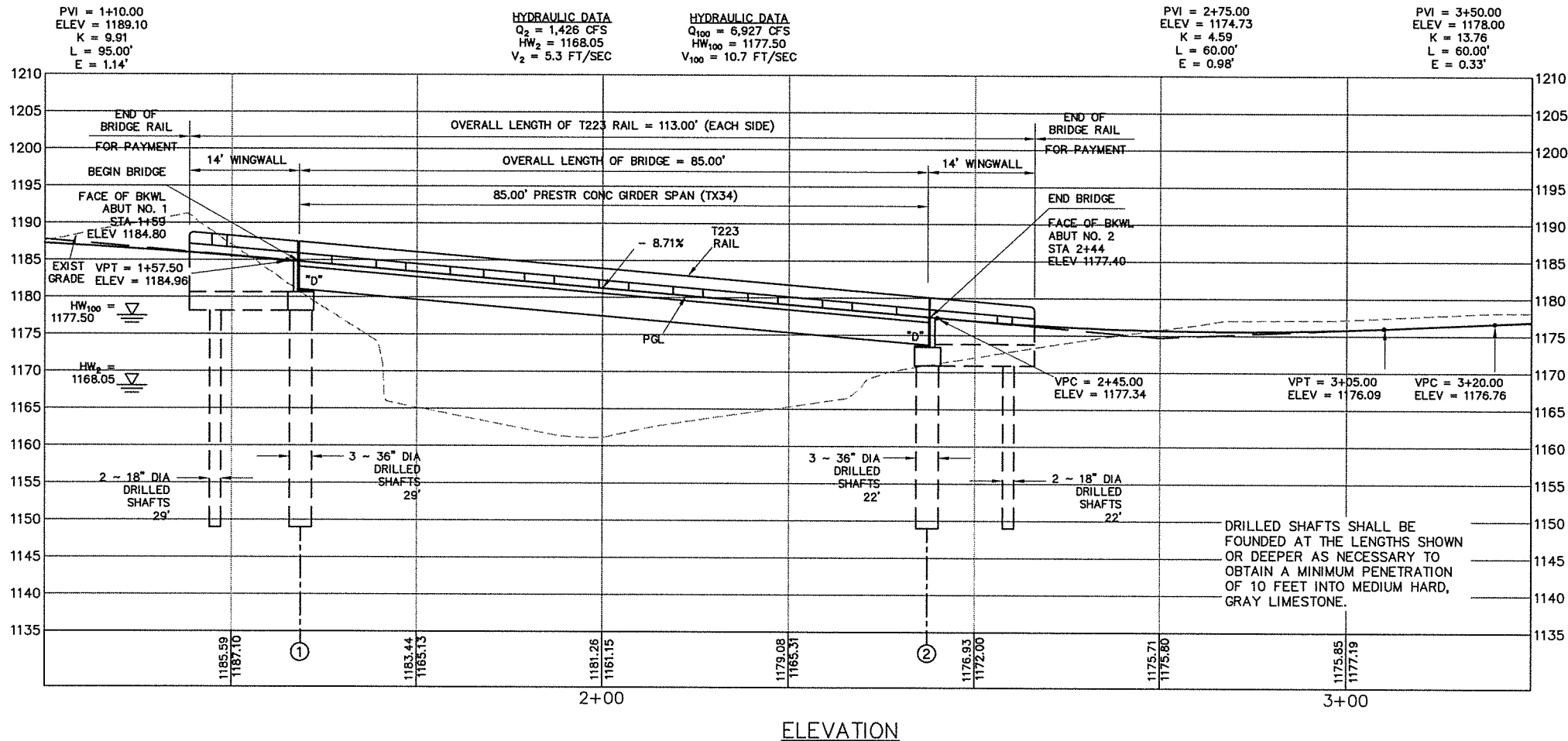
CONSTRUCTION OF APPROACHES  
TO BE PERFORMED BY  
BLANCO COUNTY

CONTRACTOR PERFORMS  
BRIDGE CONSTRUCTION ONLY

HL-93 LOADING  
FUNCTIONAL CLASSIFICATION: N/A  
2014 ADT - < 400 VPD  
DESIGN SPEED - MEET OR IMPROVE WHAT IS TYPICAL  
ON THE REMAINDER OF THE ROADWAY  
NBI - N/A (NEW STRUCTURE) ASSIGNED AT A LATER  
DATE



PLAN



ELEVATION

**K.C. ENGINEERING, INC.**  
CONSULTING ENGINEERS  
705 HWY. 281 NORTH, PLAZA I, SUITE 103  
MARBLE FALLS, TEXAS 78654  
OFFICE: 830-693-5635 FAX: 830-693-9664  
Email: info@kceengineering.com  
REGISTRATION # F-000977

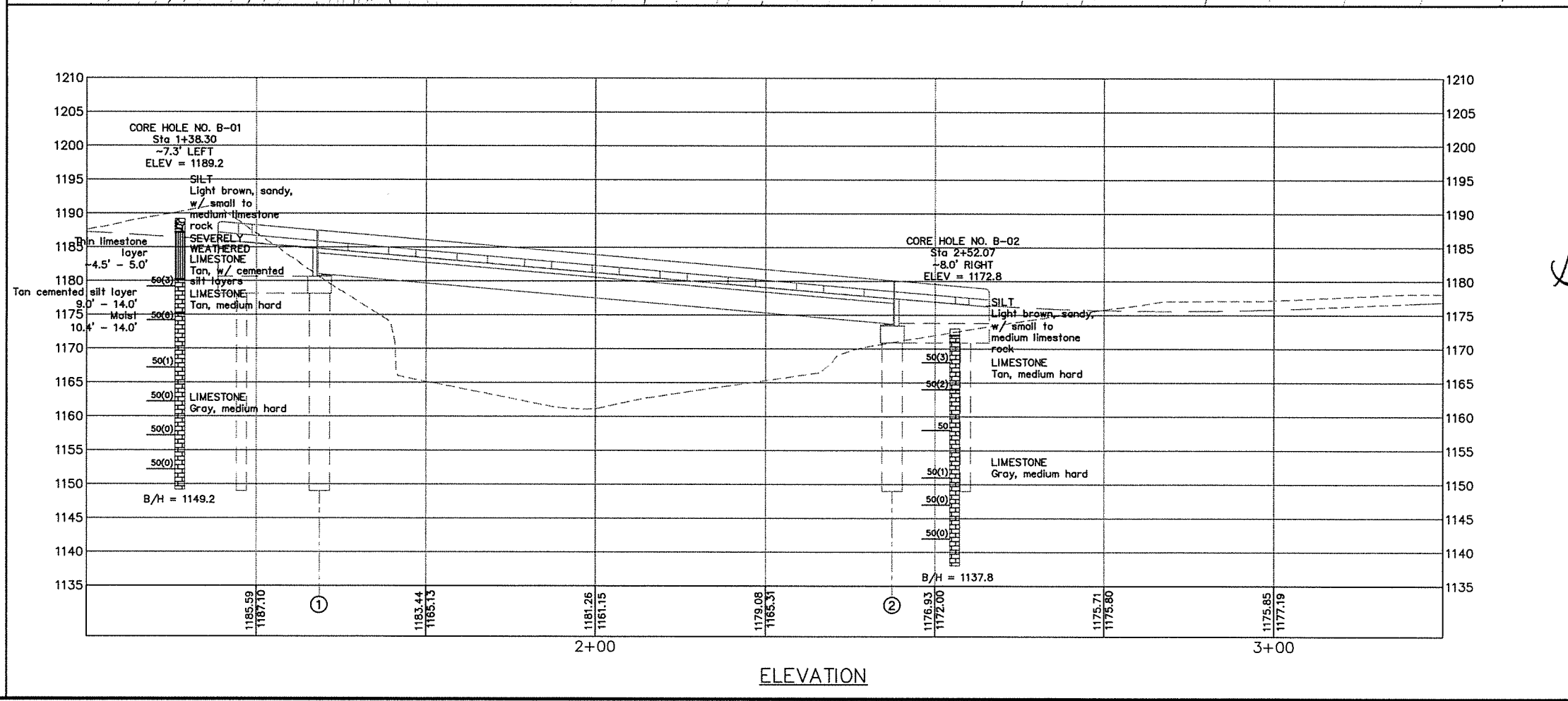
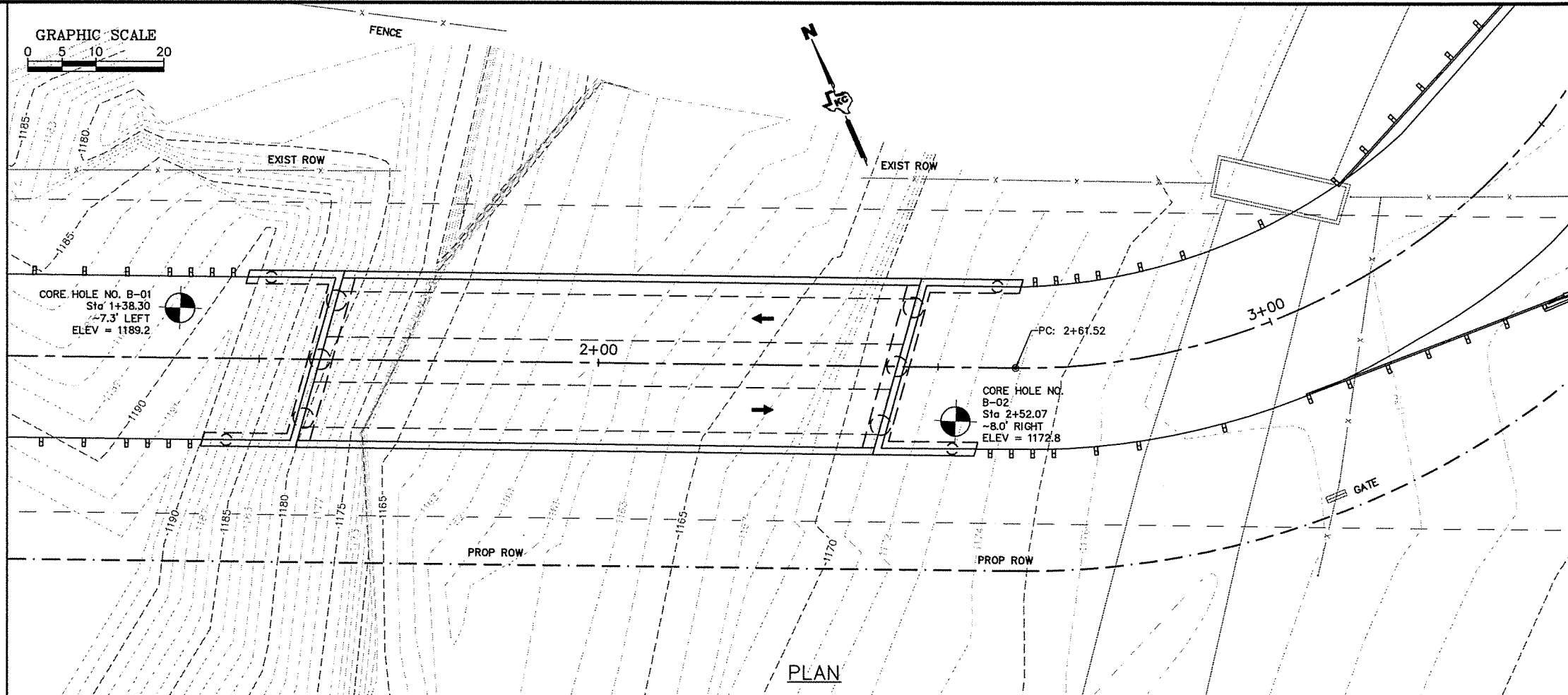


BRIDGE LAYOUT  
COUNTY ROAD 410  
MIDDLE CREEK BRIDGE  
BLANCO COUNTY, TEXAS



*Greg Haley, PE*  
1-19-15

Rev. No.	Date	Checked By	Drawn By	Remarks
1	12/31/14		GK	
2				
3				
4				



GEOTECHNICAL INFORMATION PROVIDED BY STEVE B. JOHNSON, P.E., OF HOLT ENGINEERING, INC.

Date: Jan 18, 2015, 8:09pm User: ID: Greg  
File: K:\14-104 Middle Creek Bridge Design\Civil\_3D\WP\_14-104-(2).dwg

**K.C. ENGINEERING, INC.**  
CONSULTING ENGINEERS  
705 HWY. 281 NORTH, PLAZA I, SUITE 103  
MARBLE FALLS, TEXAS 78654  
OFFICE: 830-683-5635 FAX: 830-683-9664  
Email: info@kceengineering.com  
REGISTRATION # F-000977



BRIDGE CORE LOGS  
COUNTY ROAD 410  
MIDDLE CREEK BRIDGE  
BLANCO COUNTY, TEXAS



*Greg Haley, P.E.*  
1-19-15

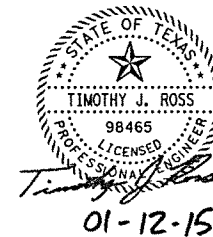
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Job No: 14-104	Date: 12/28/14	Rev. No. 1	Rev. No. 2	Rev. No. 3
				4

DRAWING DATE: 1/12/2015 FILENAME: P:\CURRENT\14\016\DWG\SH1\14016\*BQ01.dgn

SUMMARY OF ESTIMATED QUANTITIES								
BID ITEM	400 2005	416 2001	416 2004	420 2003	422 2001	425 2065	450 2161	454 2005
BRIDGE ELEMENT	CEM STABIL BKFL	DRILL SHAFT (18"DIA)	DRILL SHAFT (36"DIA)	CL C CONC (ABUT)	REINF CONC SLAB	PRESTR CONC GIRDER (TX34)	RAIL (TY T223)	ARMOR JOINT (WITH SEAL)
	CY	LF	LF	CY	SF	LF	LF	LF
2 - ABUTMENTS	86	102	153	43.2			56.0	46
1 - 85.00' PRESTRESSED CONCRETE I-GIRDER SPAN (TX34)					2,210	337.93	170.0	
<b>TOTALS</b>	<b>86</b>	<b>102</b>	<b>153</b>	<b>43.2</b>	<b>2,210</b>	<b>337.93</b>	<b>226.0</b>	<b>46</b>

**BEARING SEAT ELEVATIONS**

BENT 1 (FWD)	BEAM 1 1180.247	BEAM 2 1180.535	BEAM 3 1180.691	BEAM 4 1180.713
BENT 2 (BK)	BEAM 1 1173.024	BEAM 2 1173.313	BEAM 3 1173.469	BEAM 4 1173.490



**HL-93 LOADING**

Rev. No.	C.O. No.	Description	Date	By



P.E. Structural Consultants, Inc.  
www.PEStructural.com  
TBPE Firm No. F-1475

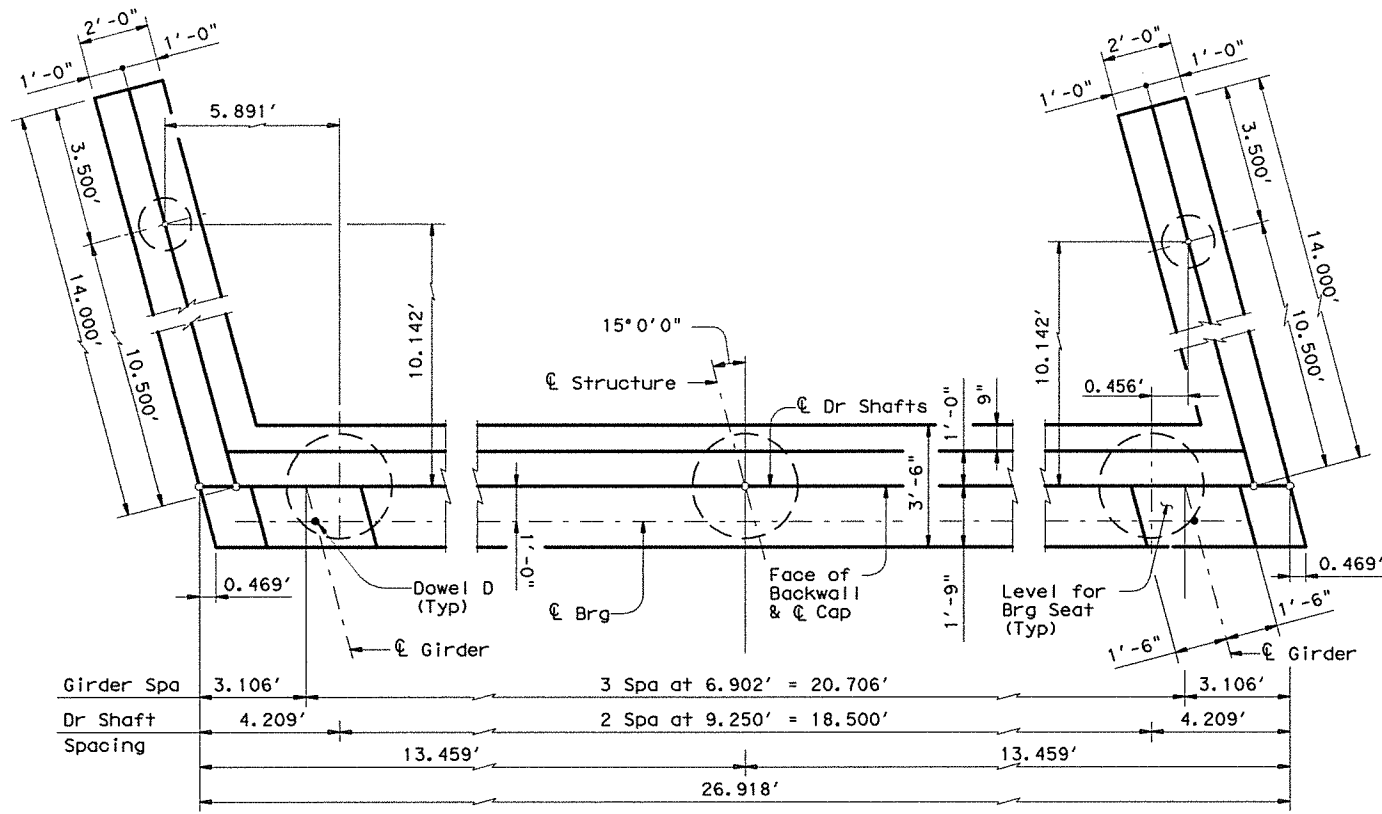
**CR 410 MIDDLE CREEK BRIDGE**

**ESTIMATED QUANTITIES & BEARING SEAT ELEVATIONS**

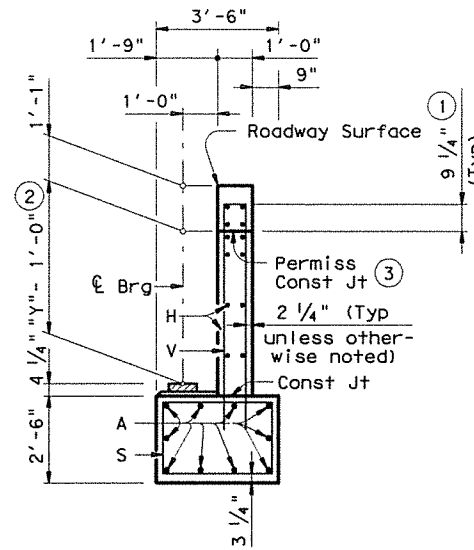
NO SCALE		SHEET 1 OF 1		
DESIGN:	DRAWN:	CHECKED:	HIGHWAY NO.	SHEET NO.
RJW	TLS	TJR	CR 410	12

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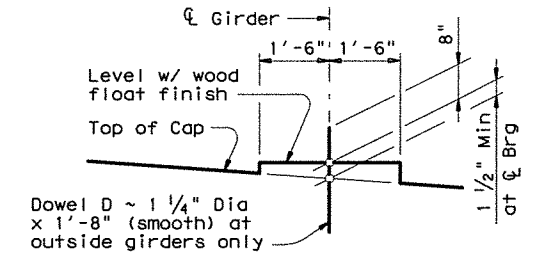
DRAWING DATE: 1/12/2015



**PLAN**



**SECTION A-A**



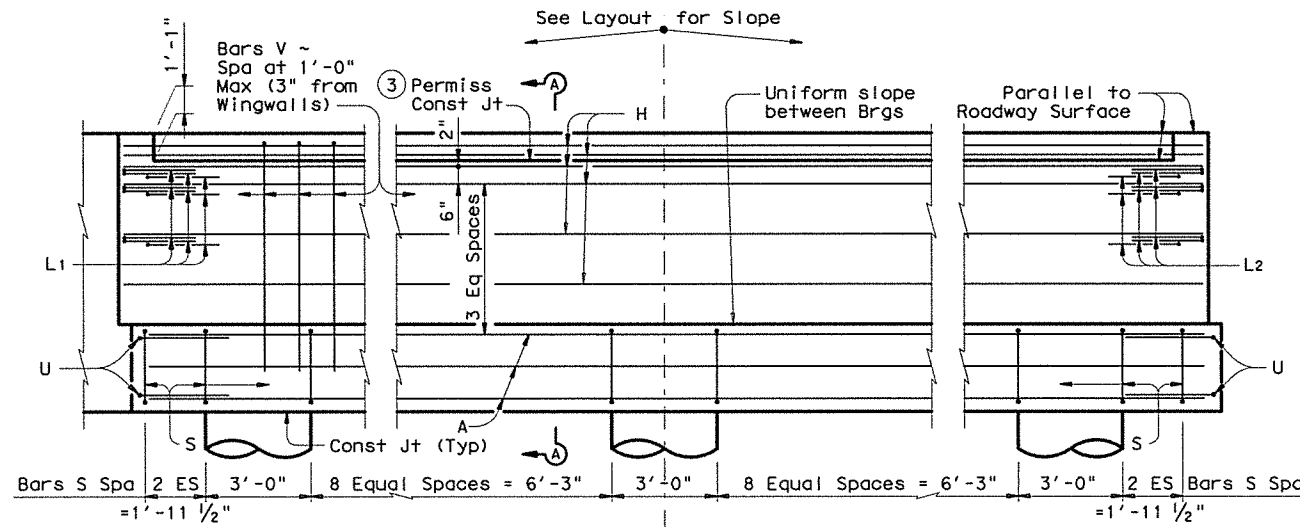
**BEARING SEAT DETAIL**

(Bearing surface must be clean and free of all loose material before placing bearing pad.)

- ① Increase as required to maintain 3 3/4" from Finished Grade.
- ② See Span details for "Y" value.
- ③ At contractor's option, backwall may be cast in one lift to roadway surface.

**GENERAL NOTES:**

Designed according to AASHTO LRFD Specifications.  
 Concrete strength  $f'c = 3,600$  psi.  
 All cap and wall reinforcing must be Grade 60.  
 See Bridge Layout for foundation type, size and length.  
 See Foundation Detail Standard Sheet, FD, for all foundation details and notes.  
 See applicable rail details for rail anchorage in wingwalls.  
 These abutment details may be used with Standard SIG-24-15 only.  
 Calculated Foundation Loads ~  
 Cap Drilled Shafts = 97 Tons/Shaft  
 Wingwall Drilled Shafts = 10 Tons/shaft



**ELEVATION**

**HL-93 LOADING**

Rev. No.	C.O. No.	Description	Date	By

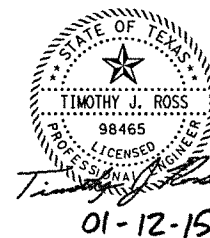
**PESC** P.E. Structural Consultants, Inc.  
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 TBPE Firm No. F-1475

**CR 410 MIDDLE CREEK BRIDGE**

**ABUTMENT  
 DETAILS**

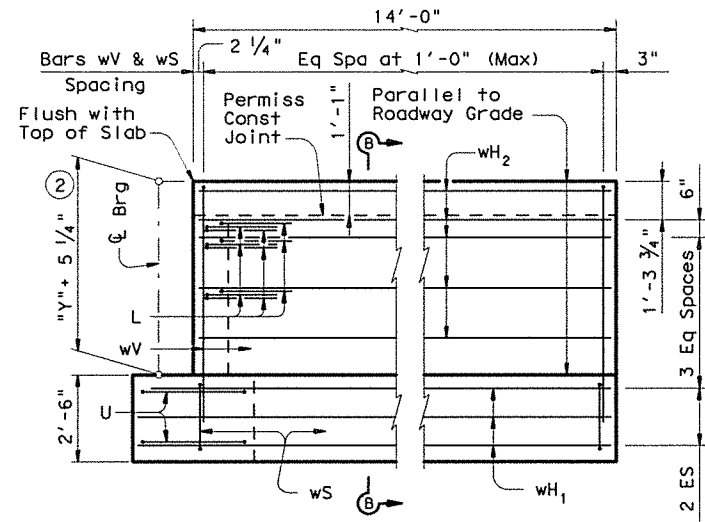
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RJK	TLS	TJR	CR 410	13

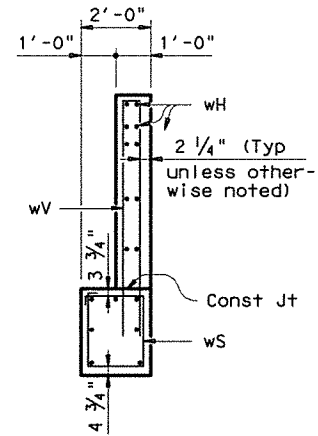


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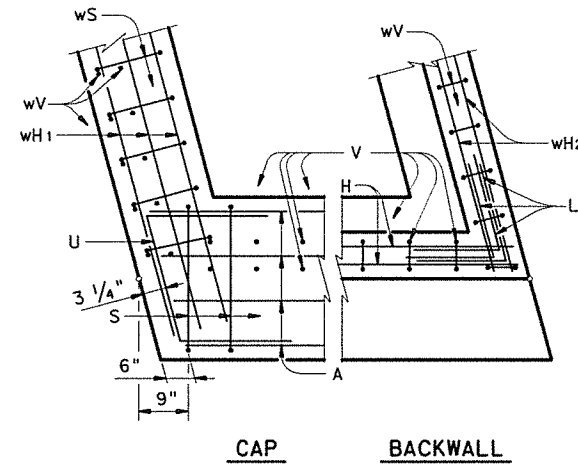
DRAWING DATE: 1/12/2015



**WINGWALL ELEVATION**



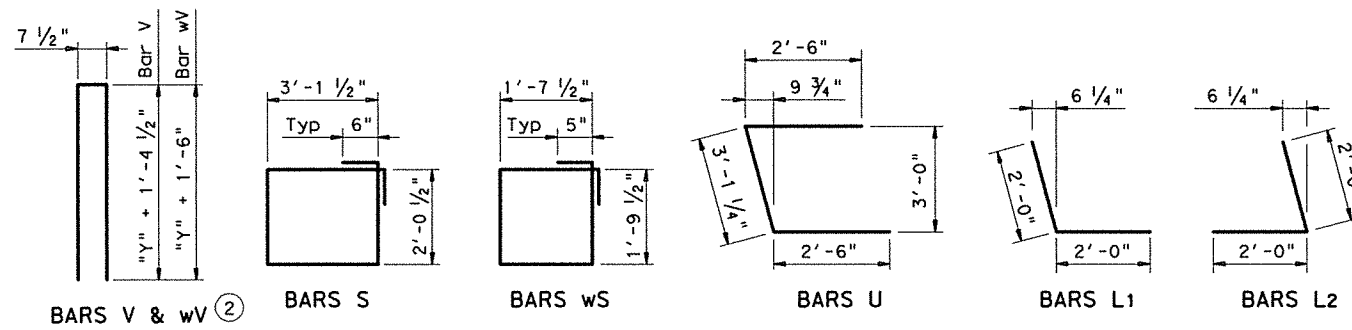
**SECTION B-B**



**CORNER DETAILS**

TABLE OF ESTIMATED QUANTITIES <sup>④</sup>				
Bar	No.	Size	Length	Weight
A	10	#11	25'-11"	1,377
D	2	1 1/4"D	1'-8"	14
H	12	#6	26'-7"	479
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	24	#5	11'-4"	284
U	4	#6	8'-1"	49
V	26	#5	10'-11"	296
wH1	14	#6	15'-5"	324
wH2	20	#6	13'-8"	411
wS	30	#4	7'-8"	154
wV	30	#5	11'-2"	349
Reinforcing Steel			Lb	3,845
Class "C" Concrete			CY	21.6

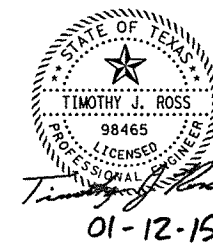
<sup>④</sup> Quantities shown are for one Abutment only.



<sup>②</sup> See Span details for "Y" value.

**HL-93 LOADING**

Rev. No.	C.O. No.	Description	Date	By



01-12-15

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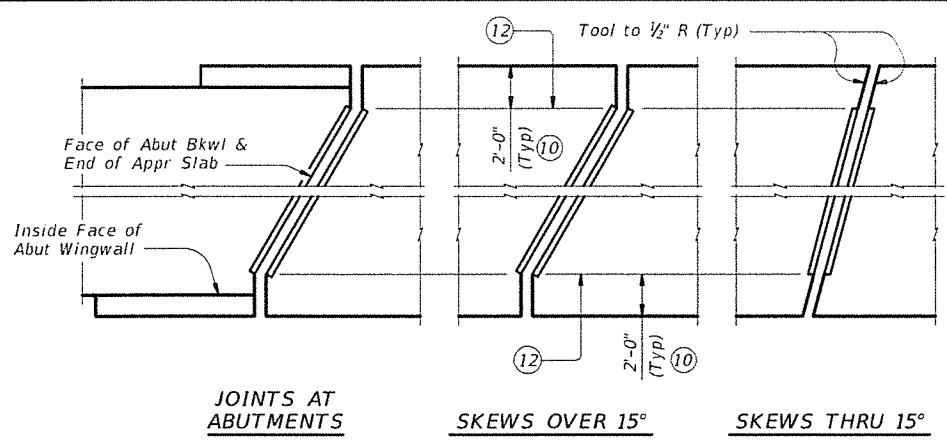
**CR 410 MIDDLE CREEK BRIDGE**

**ABUTMENT DETAILS**

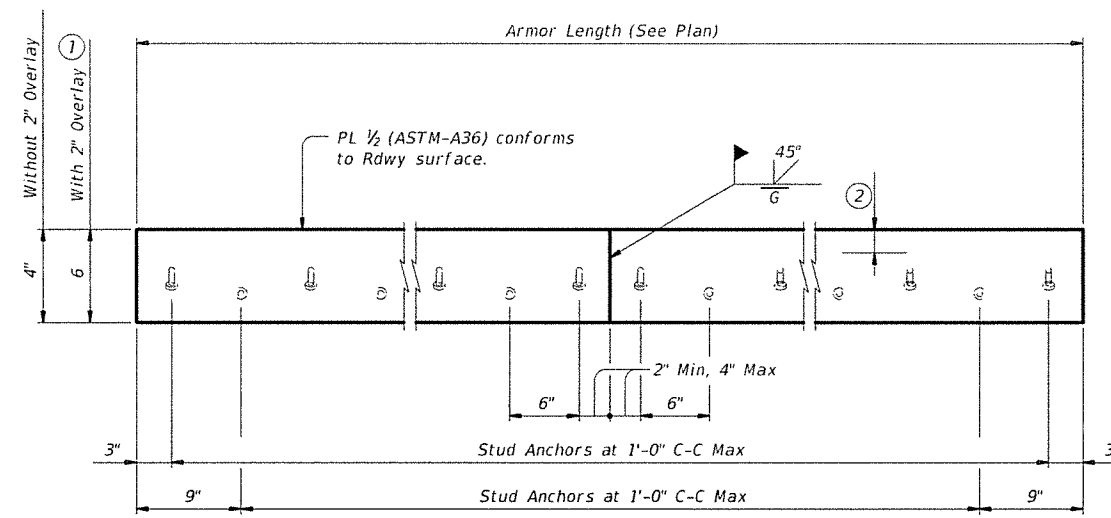
SHEET 2 OF 2

DESIGN:	DRAWN:	CHECKED:	HIGHWAY NO.	SHEET NO.
RJW	TLS	TJR	CR 410	14

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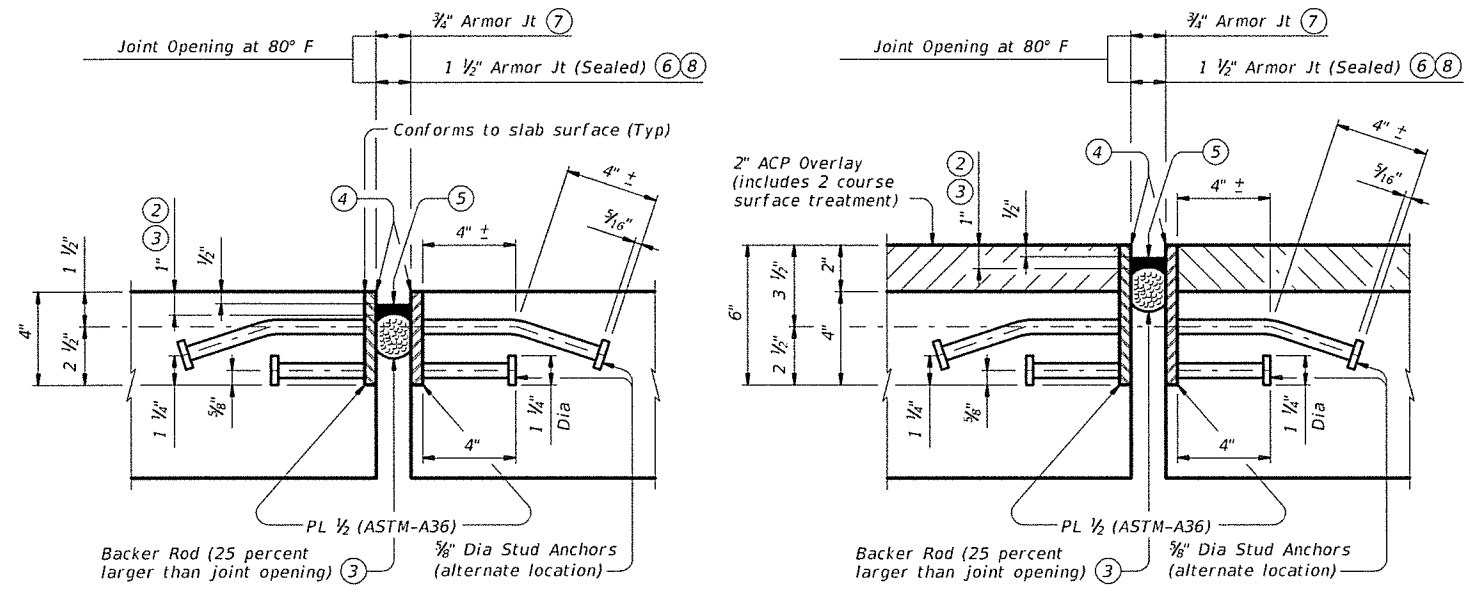


**JOINTS AT ABUTMENTS**      **SKEWS OVER 15°**      **SKEWS THRU 15°**  
**PLANS OF ARMOR PLATES**



**ELEVATION OF BASIC ARMOR PLATE**

- ① Adjust 6" plate height for overlay thicknesses other than the 2" shown. Adjust values by 1.70 Lbs for each 1/2" variation in thickness.
- ② Do not paint top 1 1/2" of plate if using sealed armor joint.
- ③ Set top of backer rod 1" below top of armor plate. Backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.
- ④ Blast clean entire contact area between sealant and plate (SSPC-SP10) before installing sealant. Light brush blast and thoroughly clean all dust and debris from concrete surfaces in contact with joint sealant before application of Silicone Seal.
- ⑤ Use Class 7 joint sealant that conforms to DMS-6310.
- ⑥ Place sealant while ambient temperature is between 55°F and 80°F and is rising.
- ⑦ Armor Joint does not include joint sealant or backer rod.
- ⑧ Armor Joint (Sealed) includes Class 7 joint sealant and backer rod.
- ⑨ Form vertical leg of seal as per the Manufacturer's recommendations. Use Class 4 joint sealant if Class 7 cannot be installed correctly. Install according to Manufacturer's recommendations.
- ⑩ Unless shown otherwise, terminate armor plate at slab break point if break is more than 2'-0" from slab edge.
- ⑪ See "Plans of Armor Plates".
- ⑫ At Fabricator's option, armor plate may extend up to 6" beyond this point for skews through 15°.
- ⑬ Align shipping angle perpendicular to joint.



**SHOWN WITHOUT 2" OVERLAY AT JOINT LOCATION**      **SHOWN WITH 2" OVERLAY AT JOINT LOCATION ①**  
**ARMOR JOINT SECTIONS**

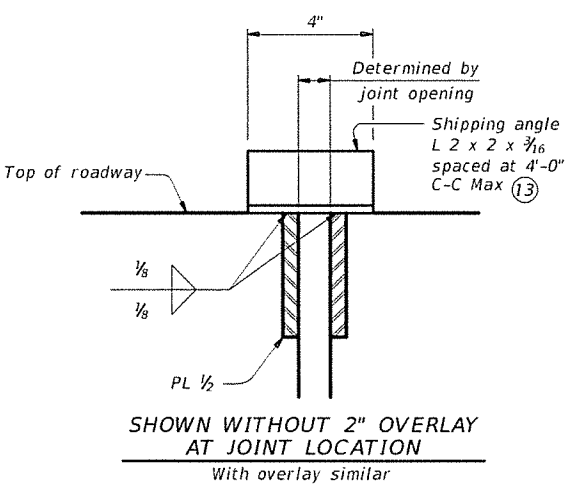
Showing Armor Joint (Sealed)

**FABRICATION NOTES:**  
 Match mark corresponding plate sections and secure together for shipment with shipping angle. Do not use erection bolts.  
 Ship armor joints in convenient lengths of 10'-0" Min and 24'-0" Max unless necessary for stage construction or widenings. One shop splice is permitted in each shipping length provided no piece is less than 2'-0" long and sufficient studs are added to limit the stud to shop splice distance to 2" Min and 4" Max.  
 Weld studs in accordance with AWS D1.1.  
 Use groove welds for all shop and field butt splices. Grind smooth areas in contact with seal. Make all necessary field splice joint preparations in the shop.  
 Paint portions of plate not in contact with concrete with the primer specified for System II paint.  
 Shop drawings for the fabrication of Armor Joints will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

**CONSTRUCTION NOTES:**  
 Secure armor joints in position and place to proper grade and alignment by welding braces to adjacent reinforcing steel, to prestressed beam stirrups, or to anchors cast in concrete diaphragms. Include cost of temporary bracing in the price bid for Armor Joint.  
 Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint.

**GENERAL NOTES:**  
 Provide Armor Joints at locations shown on the plans. Provide the seal when "Armor Joint (Sealed)" is noted on the plans.  
 These joint details accommodate a joint movement range of 1 3/8" ( 3/4" opening movement and 5/8" closure movement).  
 Payment for Armor Joint, with or without Seal, is based on length of Armor Plate.

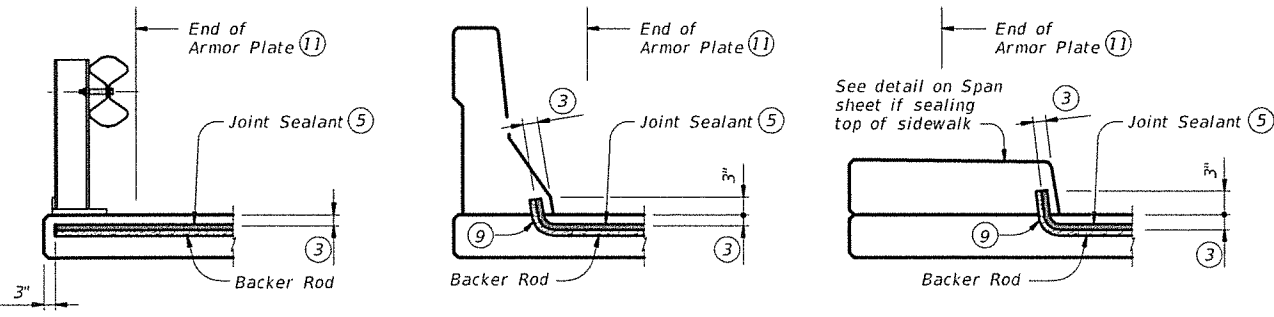
WEIGHTS P.L.F. FOR ONE ARMOR JOINT (2 PLATES)	
WITHOUT OVERLAY	16.10 Lb
WITH 2" OVERLAY ①	22.90 Lb



**SHOWN WITHOUT 2" OVERLAY AT JOINT LOCATION**  
 With overlay similar

**SHIPPING ANGLE**

An alternate method of securing joint sections may be used if approved by the Bridge Division.  
 Erection bolts are not allowed.



**AT STEEL POST BRIDGE RAIL**      **AT CONCRETE BRIDGE RAIL**      **AT SIDEWALK**

**JOINT SEALANT TERMINATION DETAILS**

Armor Joint (Sealed) only. Armor Plate is not shown for clarity.

Texas Department of Transportation  
 Bridge Division Standard

## ARMOR JOINT DETAILS

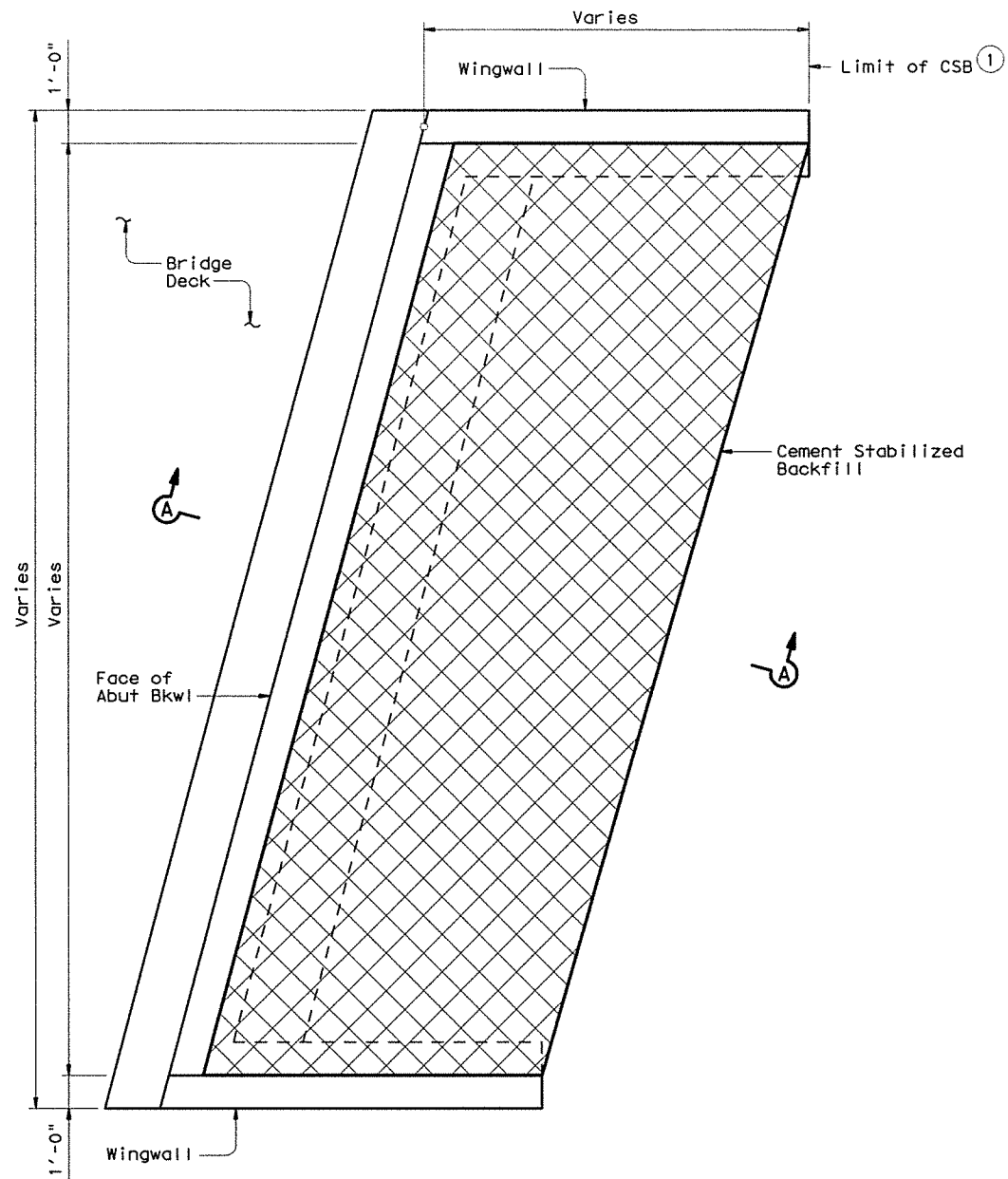
AJ

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©TxDOT April 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR 410
12/10: Changed plate size.	RIST	COUNTY	SHEET NO	
7/13: Removed erection bolts, removed joint height, add shipping angle	BLANCO		15	

DATE: FILE:

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PATH:	
LEVELS DISPLAYED	
1	

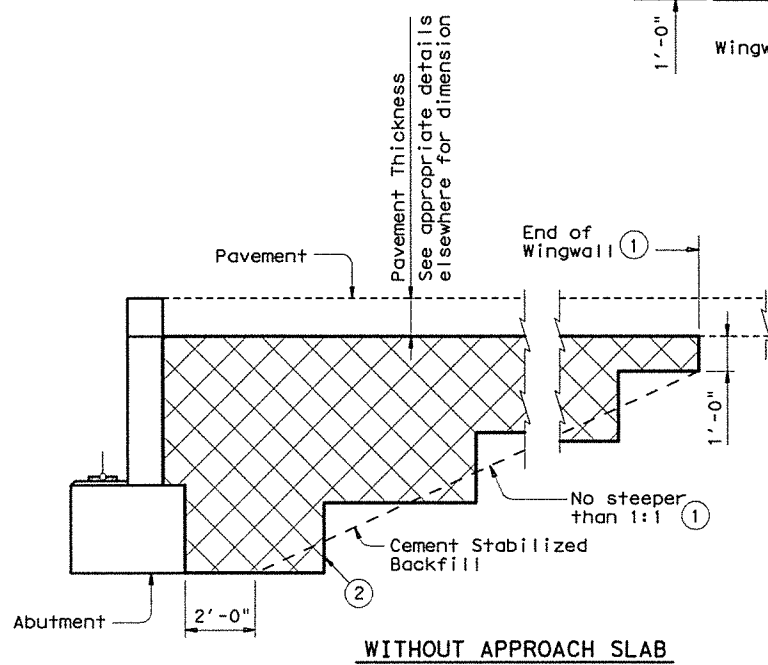


**PLAN**  
Showing Skew

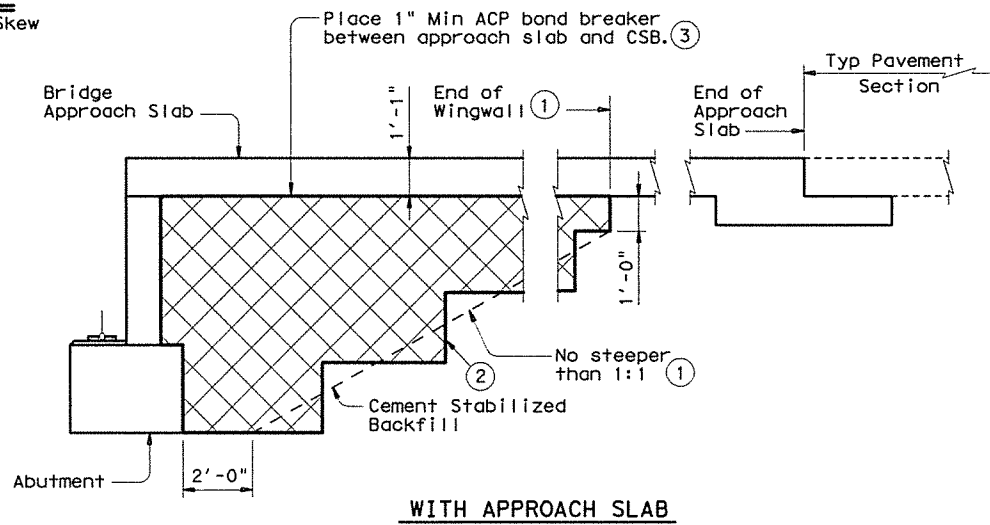
- ① Usual limit of Cement Stabilized Backfill is at end of wingwall. However, extend limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.
- ② Bench backfill as shown with 12" (approximate) bench depths.
- ③ Other materials can be used as a bond breaker if permitted by the Engineer. 2 layers of 30 Lb roofing felt or 2 layers of heavy mil polyethylene sheeting are examples.

**GENERAL NOTES:**

Provide Cement Stabilized Backfill meeting the requirements of Item 400, "Excavation and Backfill for Structures", to the limits shown at bridge abutments.  
 Details are drawn showing left forward skew. See Bridge Layout for actual skew direction.  
 These details do not apply when MSE or Concrete Block retaining walls are used in lieu of wingwalls.



**WITHOUT APPROACH SLAB**



**WITH APPROACH SLAB**

**SECTION A-A**

Texas Department of Transportation  
Bridge Division

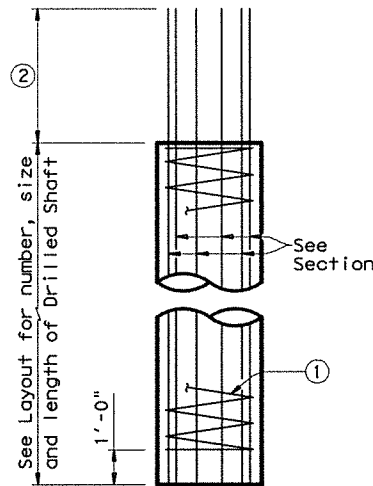
**CEMENT STABILIZED  
ABUTMENT BACKFILL  
BRIDGE ABUTMENT**

**CSAB**

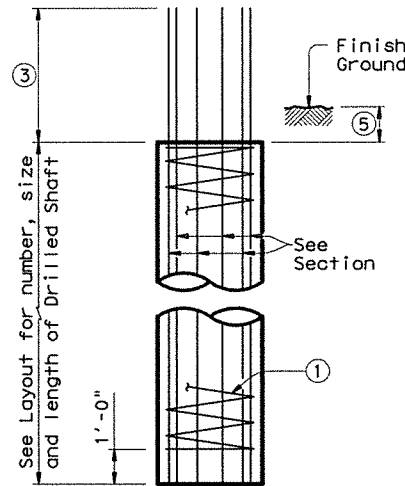
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© TxDOT April 2006	DISTRICT	FEDERAL AID PROJECT	SHEET	
REVISIONS			16	
08-2007: Added Note 3.	COUNTY	CONTROL SECT	JOB	HIGHWAY
	BLANCO			CR 410



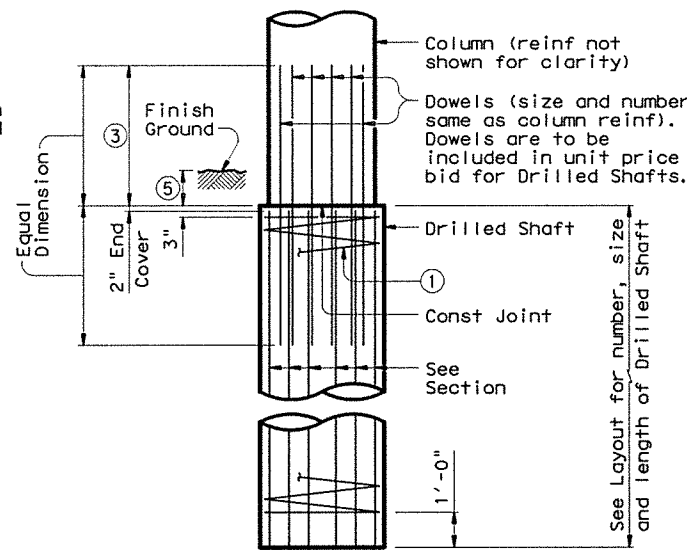
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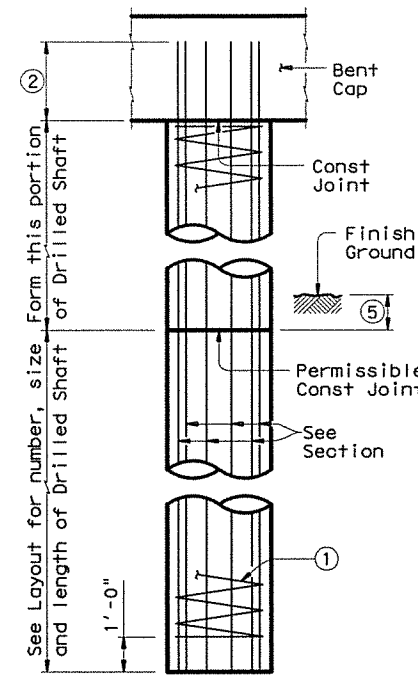
ABUTMENTS, WINGWALLS AND MULTI-DRILLED SHAFT FOOTINGS



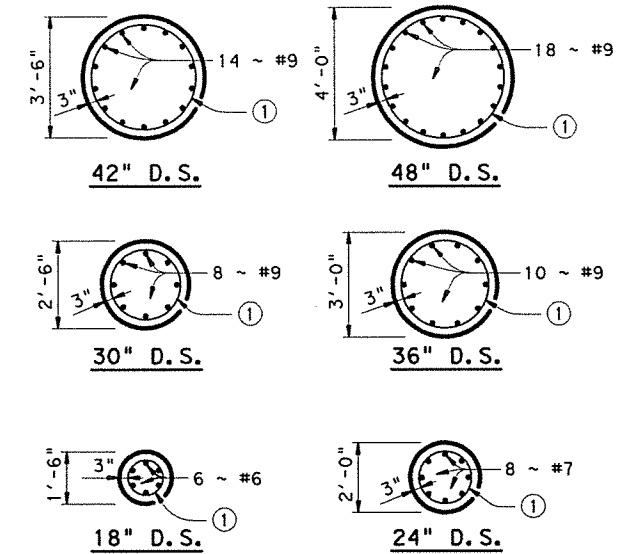
INTERIOR BENTS DRILLED SHAFT DIA EQUAL TO COLUMN DIA



INTERIOR BENTS DRILLED SHAFT DIA GREATER THAN COLUMN DIA



OPTIONAL INTERIOR BENT DRILLED SHAFT DETAIL



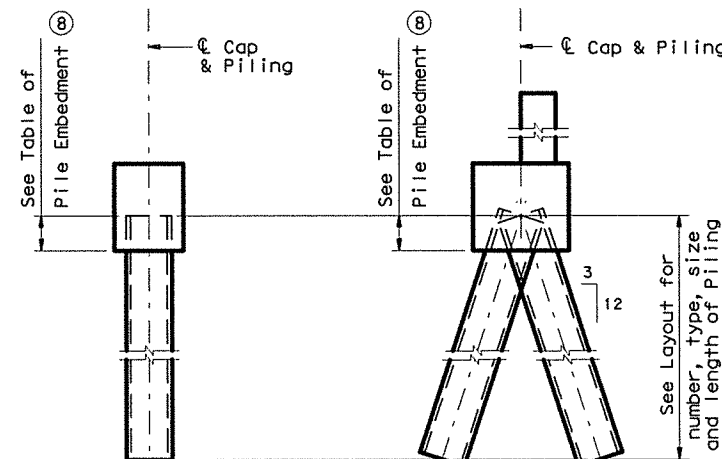
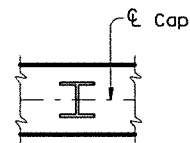
DRILLED SHAFT SECTIONS

**DRILLED SHAFT DETAILS**

TABLE OF PILE EMBEDMENT		
Pile Type		Embedment Depth
Concrete	Steel	Ft
16" Sq	HP14x73	1'-0"
18" Sq	HP14x117 (6)	1'-0"
20" Sq	HP18x135	1'-6"
24" Sq	(7)	1'-6"

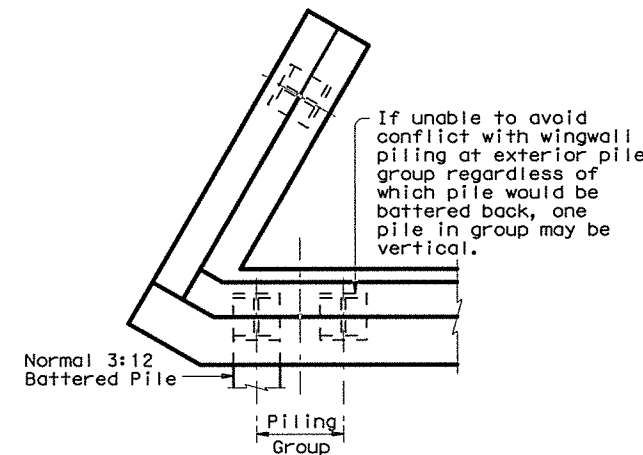
See standard CP for additional details on concrete pile embedment.

**ORIENTATION OF STEEL H-PILING**



VERTICAL PILE BATTERED PILE

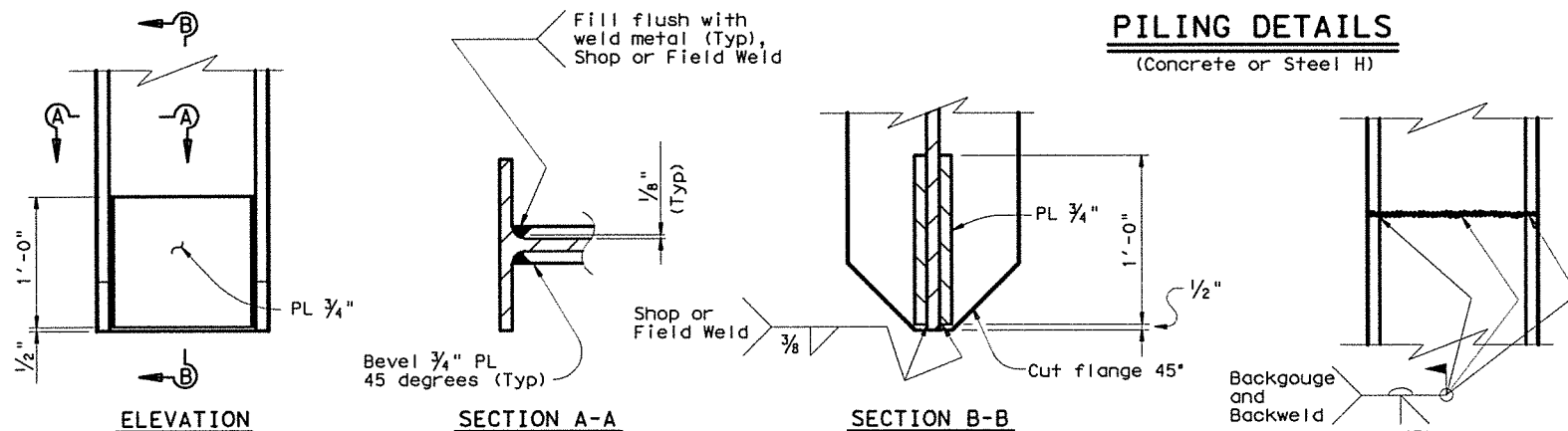
**PILING DETAILS**  
(Concrete or Steel H)



**DETAIL "A"**

(Showing Plan View of a 30° Skewed Abutment)

- ① #3 Spiral at 6" pitch (One flat turn top & bottom).
- ② Min extension into supported element:  
#6 Bars = 1'-0"  
#7 Bars = 1'-5"  
#9 Bars = 2'-3"
- ③ Min lap with Column reinf:  
#7 Bars = 2'-4"  
#9 Bars = 3'-10"
- ④ Drilled Shafts may extend to the bottom of bent caps for "H" heights of 6 ft and less (as shown on the Bridge Layout), if approved by the Engineer. This option can only be used when the Drilled Shaft diameter equals the Column diameter. Obtain approval of the forming method above the ground line prior to construction. No adjustments in payment will be made if this option is used.
- ⑤ 6" Min at Grade Crossing, 1'-0" Min in Channel.
- ⑥ Or HP16x101.
- ⑦ Where no steel HP section is shown, a suitable HP equivalent to the square concrete pile has not been evaluated.
- ⑧ Or as shown on plans.



**STEEL H-PILE TIP REINFORCEMENT**

See Item 407 "Steel Piling" to determine when tip reinforcement is required and for options to the details shown.

**STEEL H-PILE SPLICE DETAIL**

Use when required.

**COMMON FOUNDATION DETAILS**

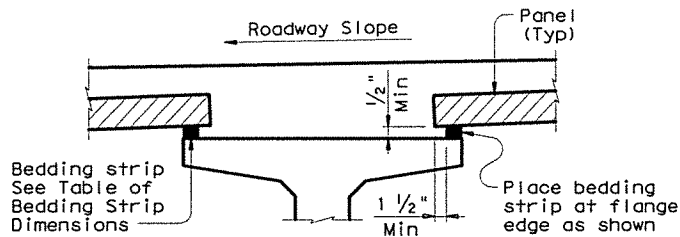
FD

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REVISIONS		COUNTY	CONTROL SECT	JOB HIGHWAY
01-2012: Notes; Embedment; Steel H-Piles		BLANCO		CR 410



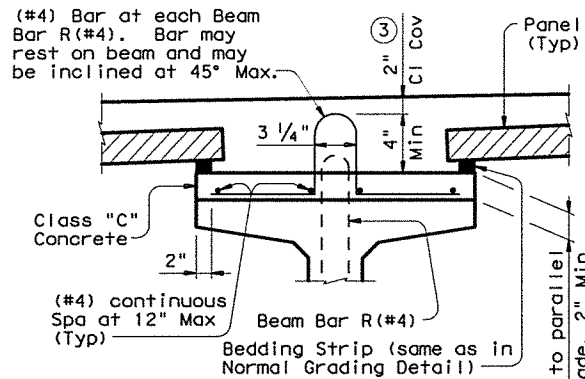
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LEVELS DISPLAYED: 1



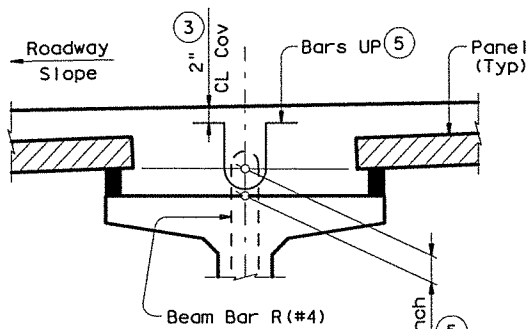
**NORMAL GRADING DETAIL ①**

Showing Prestressed Concrete I-Girders. (Other Beam Types Similar)



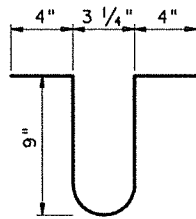
**SPECIAL GRADING DETAIL FOR CONCRETE BEAMS**

Showing Prestressed Concrete I-Girders. (Other Beam Types Similar)

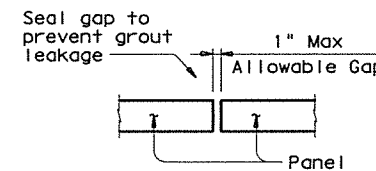


**HAUNCH REINFORCING DETAIL**

Showing Prestressed Concrete I-Girders. (Other Beam Types Similar)

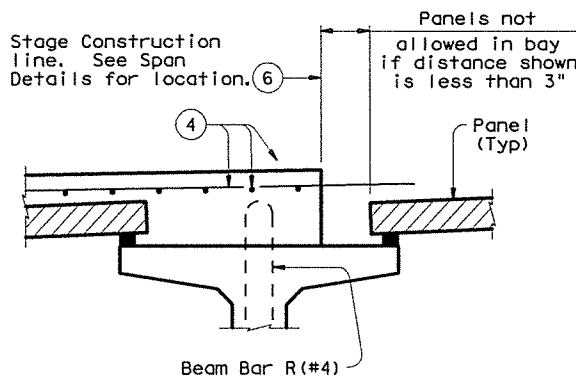


BARS UP (#4) ⑤

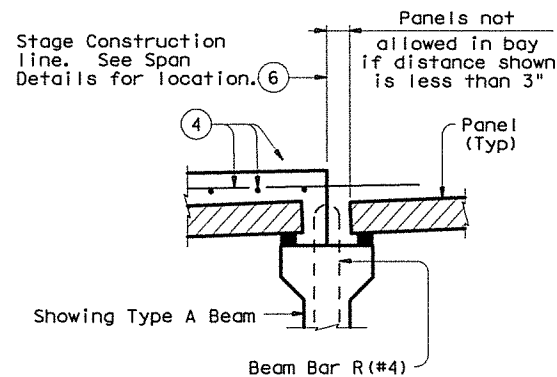


**TYPICAL SECTION AT PANEL JOINT**

(Panel reinforcing not shown for clarity.) The gap cannot be considered as a panel fabrication tolerance.



PRESTR CONC I-GIRDERS



PRESTR CONC I-BEAMS

**STAGE CONSTRUCTION LIMITATIONS**

(Other Beam Types Similar)

WIDTH	HEIGHT ②	
	Min	Max
1" (Min)	1/2"	2"
1 1/4"	1/2"	2 1/2"
1 1/2"	1/2"	3"
1 3/4"	1/2"	3 1/2"
2" (Max)	1/2"	4"

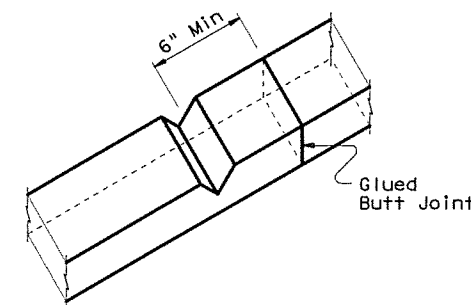
- ① To reduce the quantity of cast-in-place concrete, bedding strip thickness may be increased in 1/4" increments. Bedding strips must be comprised of one layer. Bond bedding strips to the beams with an adhesive compatible with bedding strips. Bedding strips over 2.5" high may need to be bonded to panels. The same thickness strip must be used under any one panel edge and the maximum change in thickness between adjacent panels is 1/4". Alternatively, bedding strips may be cut to grade. Panels may be supported by an alternate method, using a commercial product, if approved by the Engineer of Bridge Design, Bridge Division.
- ② Height must not exceed twice the width.
- ③ Clear cover shall be as indicated unless otherwise shown on Span Details.
- ④ See Span Details for top slab reinforcement and clear cover. Longitudinal top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- ⑤ Space Bars UP (#4) with Beam Bars R (#4) in all areas where measured haunch exceeds 3" or 3 1/2" with Prestressed Concrete I-Girders. Epoxy coating for Bars UP is not required.
- ⑥ Construction Joints cannot be located on top of a panel.
- ⑦ Butt adjacent bedding strips together with adhesive. Cut v-notches, approx 1/4" deep, in the top of the bedding strips at 8' o.c..

**CONSTRUCTION NOTES:**

Erected panels must bear uniformly on bedding strips of extruded polystyrene placed along top flange edges. If additional blocking is needed, special grading details for supporting the panels and extra reinforcing between beam and slab will be considered subsidiary to deck construction. Bars U, shown on PCP-FAB, may be bent over or cut off if necessary. Care must be taken to ensure proper cleaning of construction debris and consolidation of concrete mortar under the edges of the panels. Bedding strips must be placed at beam flange edges so that adequate space is provided for the mortar to flow a minimum of 1 1/2" under the panels as the slab concrete is placed. To allow the proper amount of mortar to flow between beam and panel, the minimum vertical opening must be at least 1/2". Roadway cross-slope reduces the opening available for entry of the mortar. Bedding strips varying in thickness across the beam are therefore required. All reinforcing steel in the cast-in-place slab must be Grade 60. See Table of Reinforcing Steel for size and spacing of reinforcement. If the top and bottom layer of reinforcing steel is shown on the Span Details to be epoxy coated, then the D, E, P, & Z bars must be epoxy coated. For clear span between U-beams less than or equal to 18", see Permissible Slab Forming Detail on Miscellaneous Slab Detail sheets, UBMS. Bar Laps, where required, must be as follows:  
 Uncoated ~ #4 = 1'-5"  
 ~ #5 = 1'-9"  
 Epoxy Coated ~ #4 = 2'-1"  
 ~ #5 = 2'-7"

**GENERAL NOTES:**

Designed according to AASHTO LRFD Specifications. Panel placement may follow either Option 1 or Option 2 except Option 1 must be used where the slab is continuous over inverted-T bents or if the skew exceeds 45 degrees. Use of Prestressed Concrete Panels is not permitted for horizontally curved steel plate or tub girders. See Span Details for other possible restrictions on their use. These details are to be used in conjunction with the Span Details, PCP-FAB and other applicable Standard sheets. Any additional reinforcement or concrete required on this standard is to be considered subsidiary to the bid item "Reinforced Concrete Slab".



**BEDDING STRIP DETAIL ⑦**

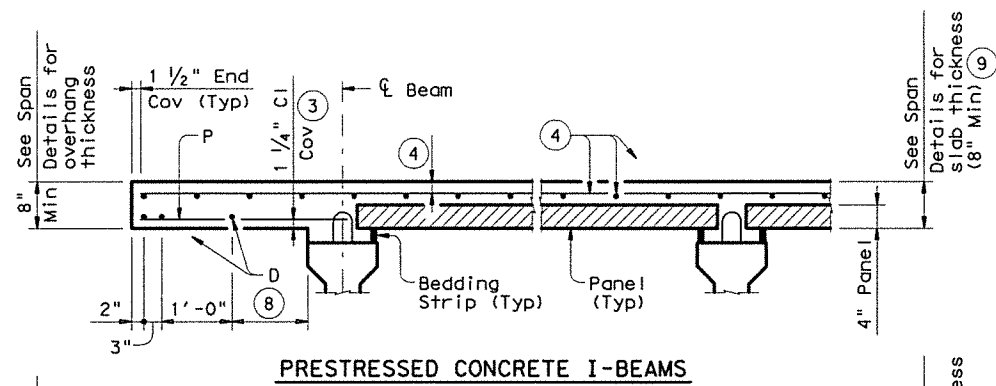
**PRESTRESSED CONCRETE PANELS  
 OPTIONAL DECK DETAILS**

**PCP**

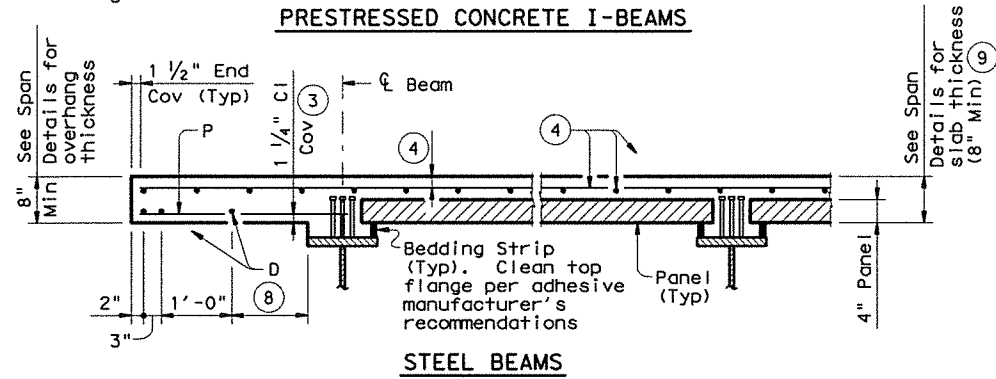
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REVISIONS				
08-07: Added I-Girders & added note to wall splice detail.	COUNTY	CONTROL	SECT	JOB
10-10: Added Option 2 & referenced PCP-FAB.	BLANCO			CR 410

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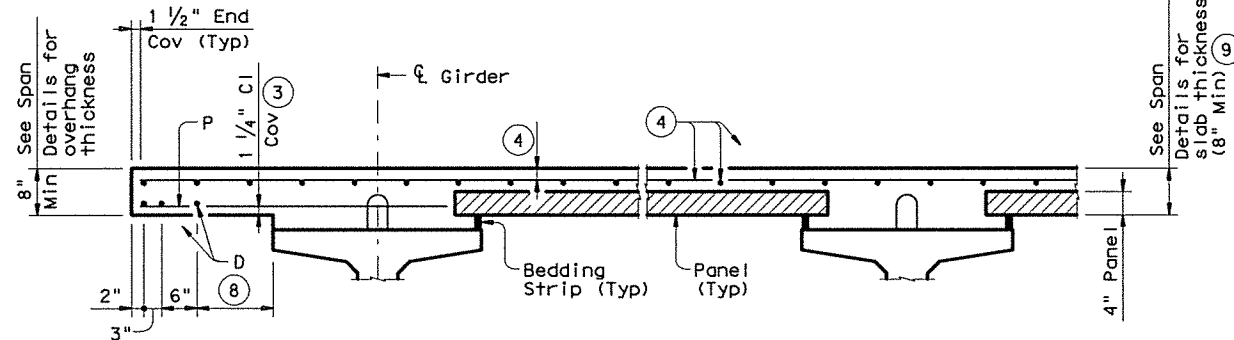
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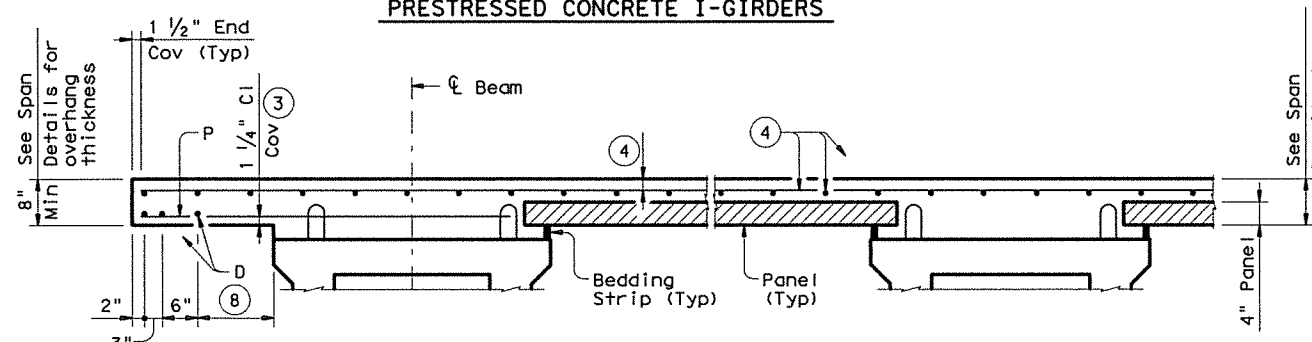
**PRESTRESSED CONCRETE I-BEAMS**



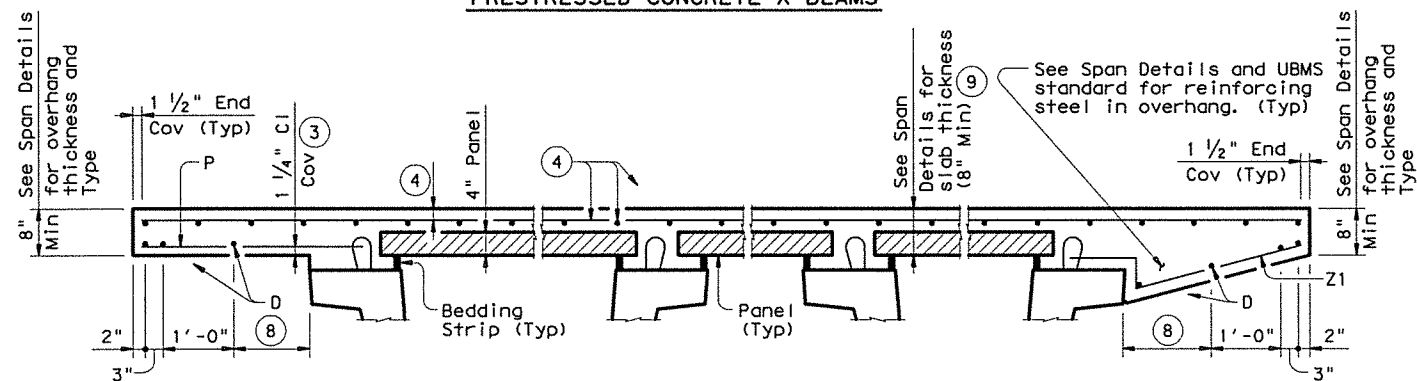
**STEEL BEAMS**



**PRESTRESSED CONCRETE I-GIRDERS**

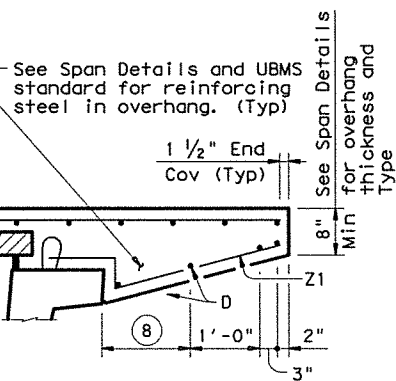


**PRESTRESSED CONCRETE X-BEAMS**



**NORMAL OVERHANG WITH PRESTR CONC U-BEAMS**

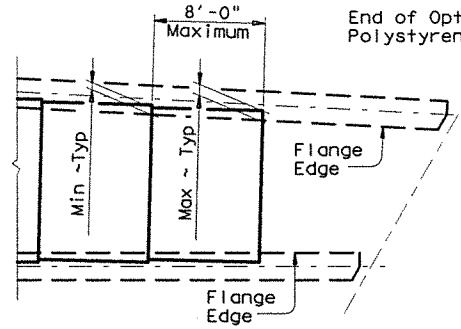
**TYPICAL PART TRANSVERSE SECTIONS**



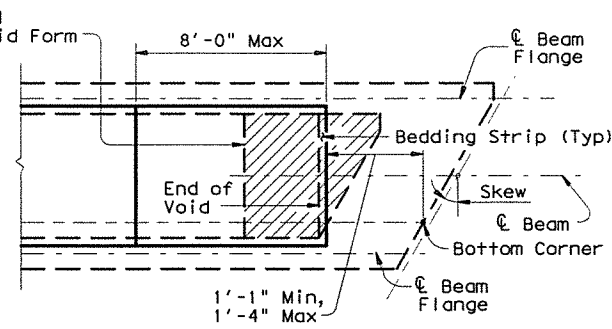
**SLOPED OVERHANG WITH PRESTR CONC U-BEAMS**

**AT FLARED BEAMS OR GIRDERS**

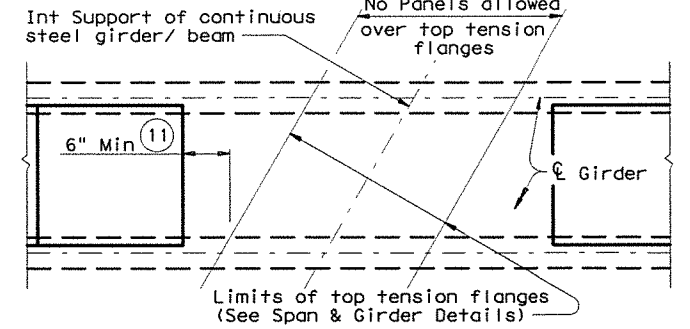
See PCP-FAB standard for Min and Max dimensions based on Bm/Girder type.



**OVER CONC U-BEAMS**

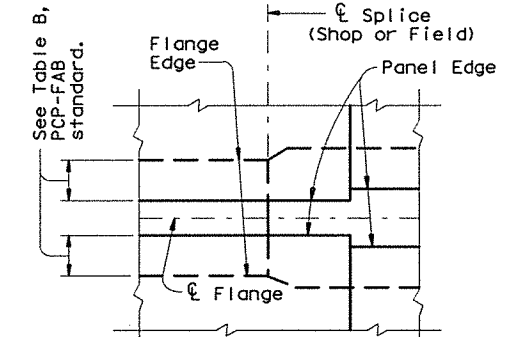


**PART PLANS OF PANEL PLACEMENT**



**AT INT SUPPORTS OF CONTINUOUS STEEL GIRDERS**

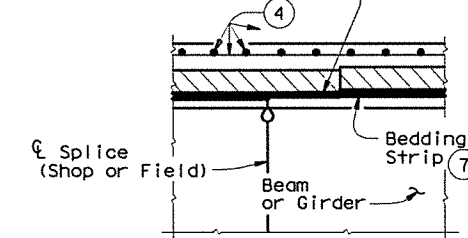
- ③ Clear cover shall be as indicated unless otherwise shown on Span Details.
- ④ See Span Details for top slab reinforcement and clear cover. Longitudinal top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- ⑦ Butt adjacent bedding strips together with adhesive. Cut v-notches, approx 1/4" deep, in the top of the bedding strips at 8' o.c..
- ⑧ Equally space additional bar if more than 1'-3" Max.
- ⑨ The actual thickness constructed may exceed the slab thickness shown on the Span Details but the extra thickness shall be no more than 2" (1" for Prestressed Concrete U-Beams and Steel Beams). Bearing Seat Elevations or finished grade may be adjusted.
- ⑩ Field adjust Bars Z1(#4) to match actual slope of slab overhangs. Width of slab overhang will vary along span with curved slab edges. Adjust Bar Z1(#4) dimensions to maintain proper cover. Bars Z2(#4) are located at Inv-T stems only.
- ⑪ Location of concrete placement sequence boundaries and bolted field splices should be considered by the contractor in determining panel limits.



**PLAN AT SPLICE**

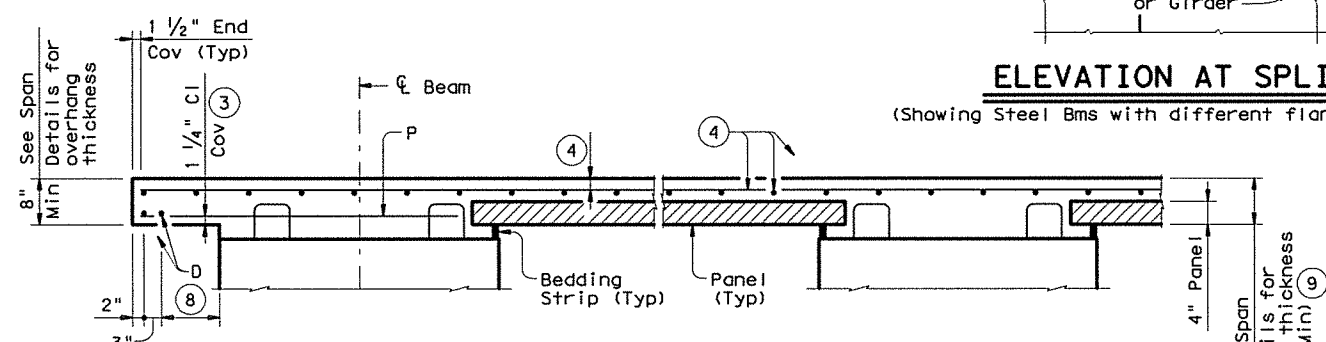
(Showing Steel Bms with flange width transition)

Cut bedding strip to adjust for difference in flange thickness.



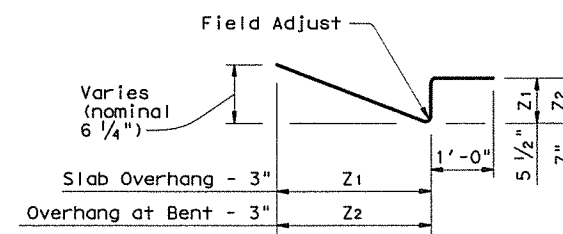
**ELEVATION AT SPLICE**

(Showing Steel Bms with different flange thickness)



**PRESTRESSED CONCRETE SPREAD SLAB BEAMS**

Bars P over exterior beams are still required when no overhang is used. In this case, only one Bar D, 2" from slab edge, is required.



**BARS Z (#4) ⑩**

HL93 LOADING

SHEET 2 OF 4

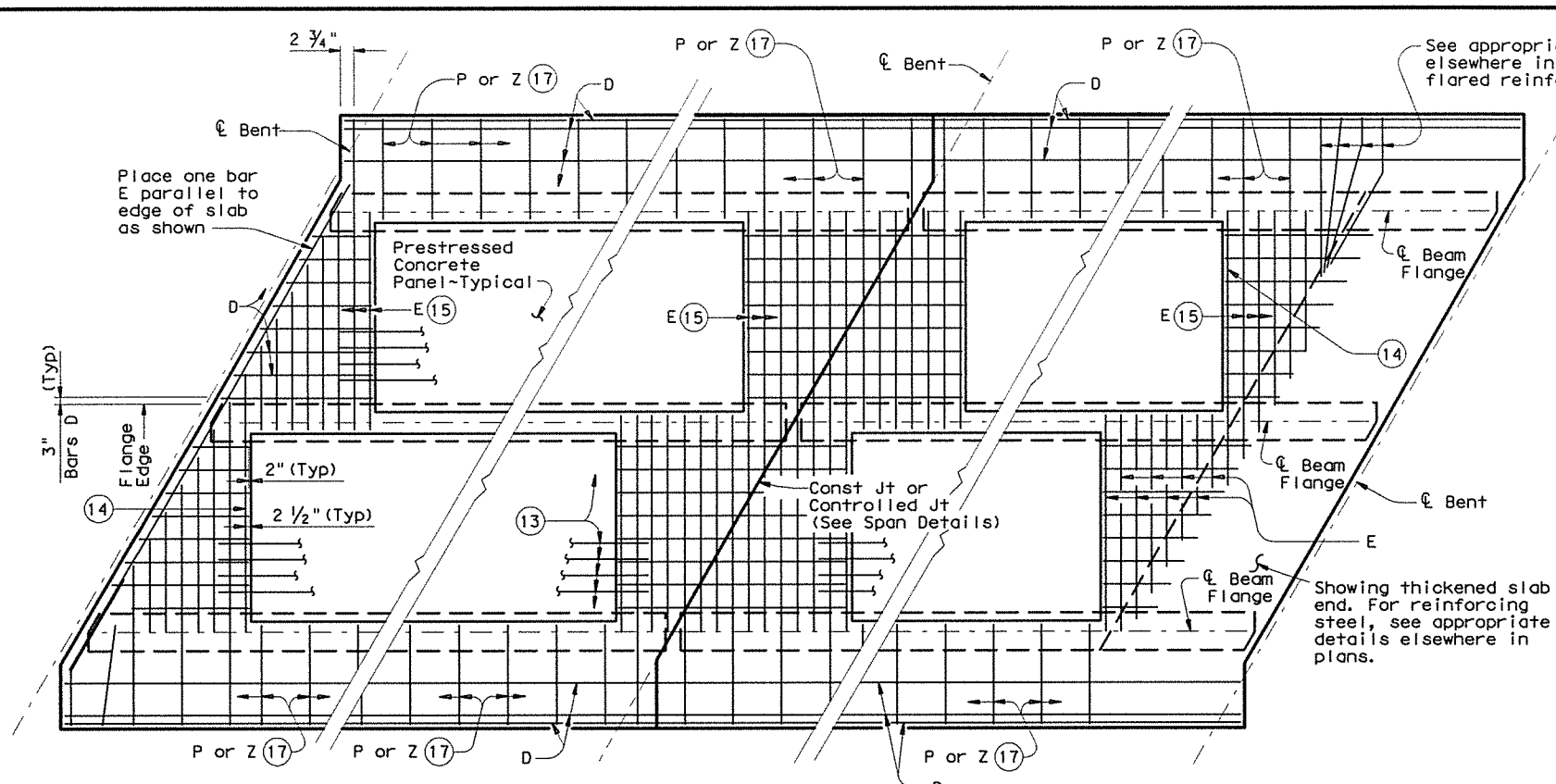
Texas Department of Transportation  
Bridge Division

**PRESTRESSED CONCRETE PANELS  
OPTIONAL DECK DETAILS**

PCP

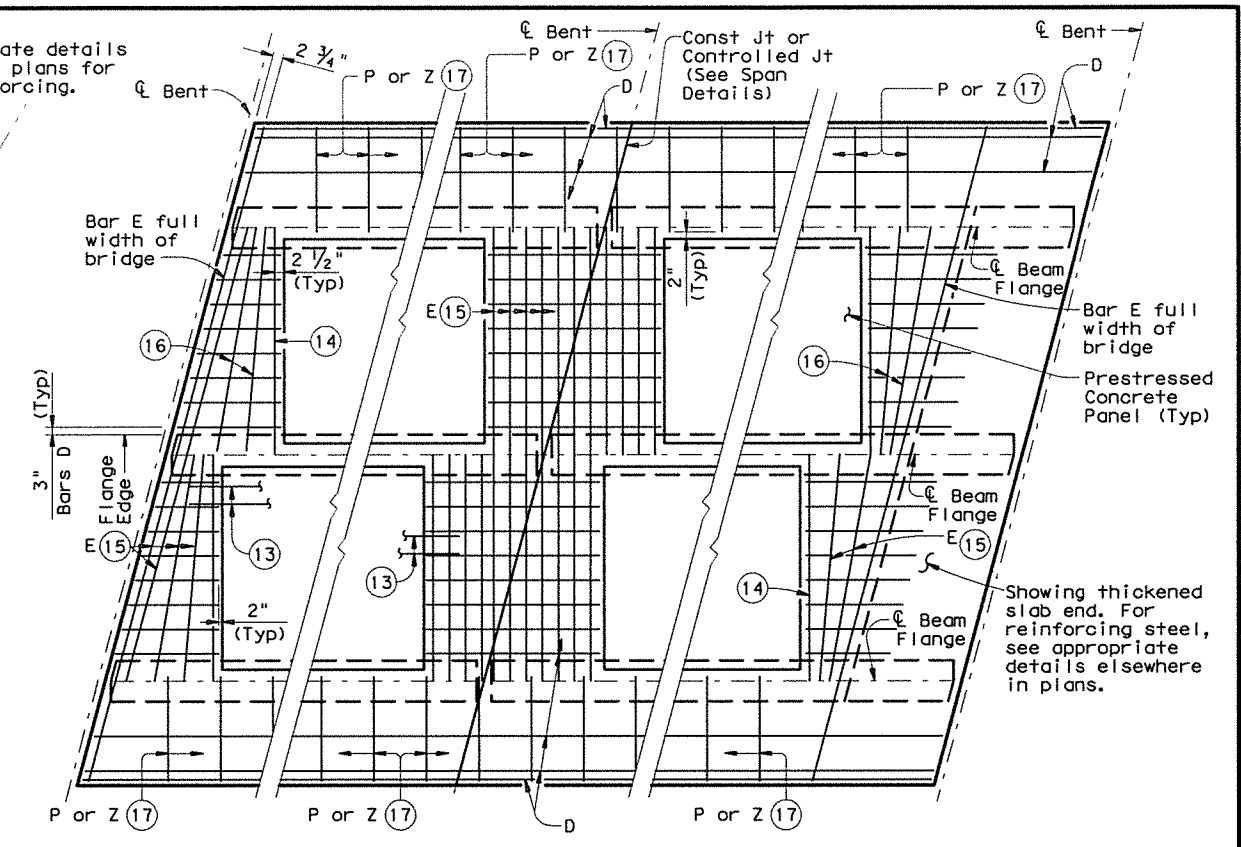
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REVISIONS	COUNTY	CONTROL	SECT	JOB
08-07: Added I-Girders & added note to WR splice detail.	BLANCO			HIGHWAY
10-10: Added Option 2 & referenced PCP-FAB.				CR 410

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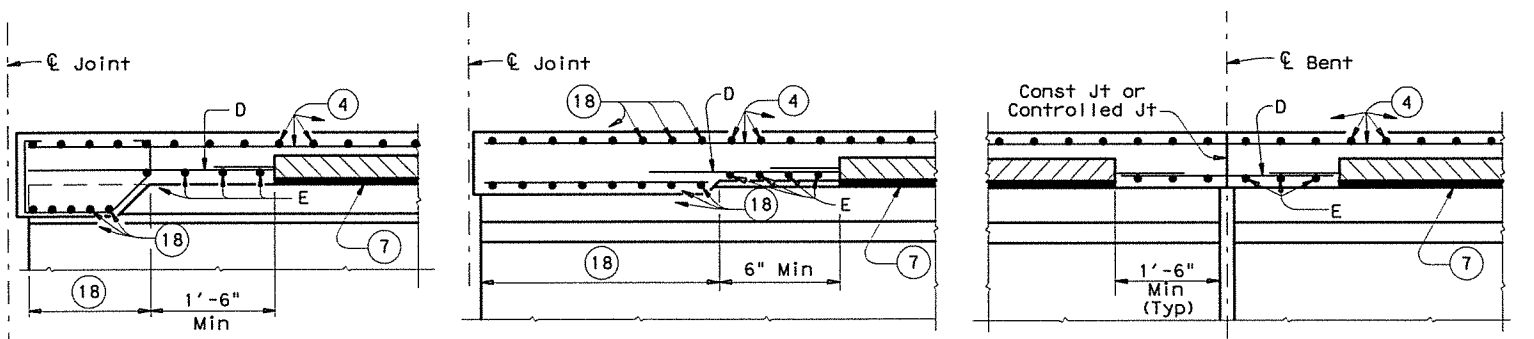
AT ALL SPAN ENDS UNLESS NOTED OTHERWISE      AT INTERIOR BENTS      AT THICKENED END SLABS

**OPTION 1 ~ PLAN OF SLABS WITH NORMAL REINFORCEMENT**

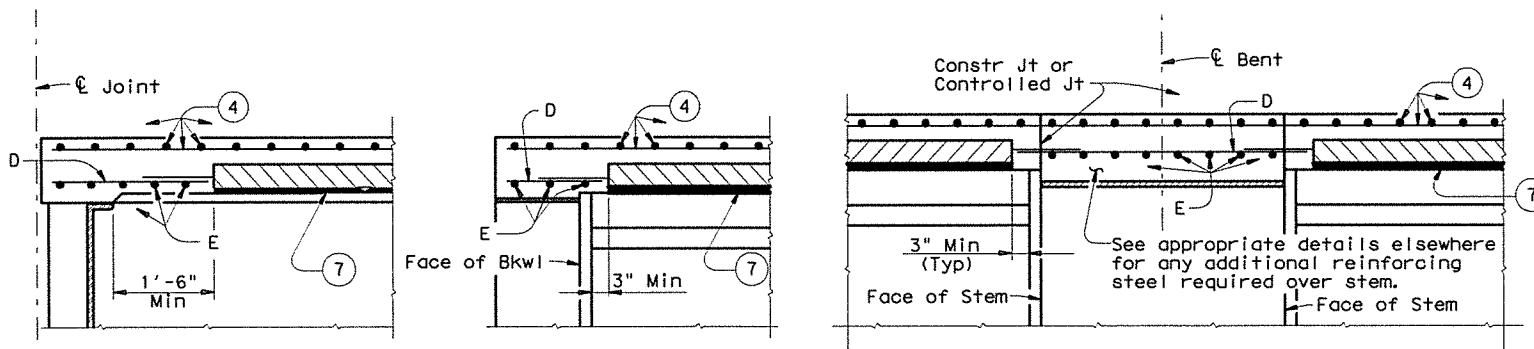


AT ALL SPAN ENDS UNLESS NOTED OTHERWISE      AT INTERIOR BENTS      AT THICKENED END SLABS

**OPTION 1 ~ PLAN OF SLABS WITH SKEWED REINFORCEMENT**



AT THICKENED SLAB ENDS FOR PRESTR CONC U-BMS      AT THICKENED SLAB ENDS FOR PRESTR CONC I-BMS AND STEEL BMS      AT SLAB CONTINUOUS OVER CONVENTIONAL INTERIOR BENTS FOR ALL SIMPLE SPAN BMS



AT CONVENTIONAL END DIAPHRAGMS FOR STEEL BMS      AT SLAB OVER ABUTMENT BACKWALL FOR ALL BMS      AT SLAB CONTINUOUS OVER INVERTED-T BENTS FOR ALL BMS

**OPTION 1 ~ ELEVATIONS AT BEAM ENDS**

- ④ See Span Details for top slab reinforcement and clear cover. Longitudinal top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- ⑦ Butt adjacent bedding strips together with adhesive. Cut v-notches, approx 1/4" deep, in the top of the bedding strips at 8' o.c..
- ⑫ Max Spacing as listed unless otherwise shown.
- ⑬ At connection with cast-in-place slab, extend longitudinal panel reinforcement. See PCP-FAB for details.
- ⑭ Maintain one Bar E(#5) parallel to panel ends (Typ).
- ⑮ Bars E(#5) not continuous over beam flanges must overlap beam flange 6" Min.
- ⑯ Add flared Bars E(#5) (Min Spa = 2", Max Spa = 10") as required at panel ends.
- ⑰ Where possible, Bars E(#5) may be extended into overhangs to replace Bars P(#4). Bars Z(#4) are required for sloped overhangs with U-Beams.
- ⑱ See appropriate thickened slab end details for reinforcing and limits of thickened slab end.

BAR	SIZE	Max Spa (in.)
D	#5	9
E	#5	6
P	#4	18
UP	#4	~
Z	#4	18

**PRESTRESSED CONCRETE PANELS  
OPTIONAL DECK DETAILS**

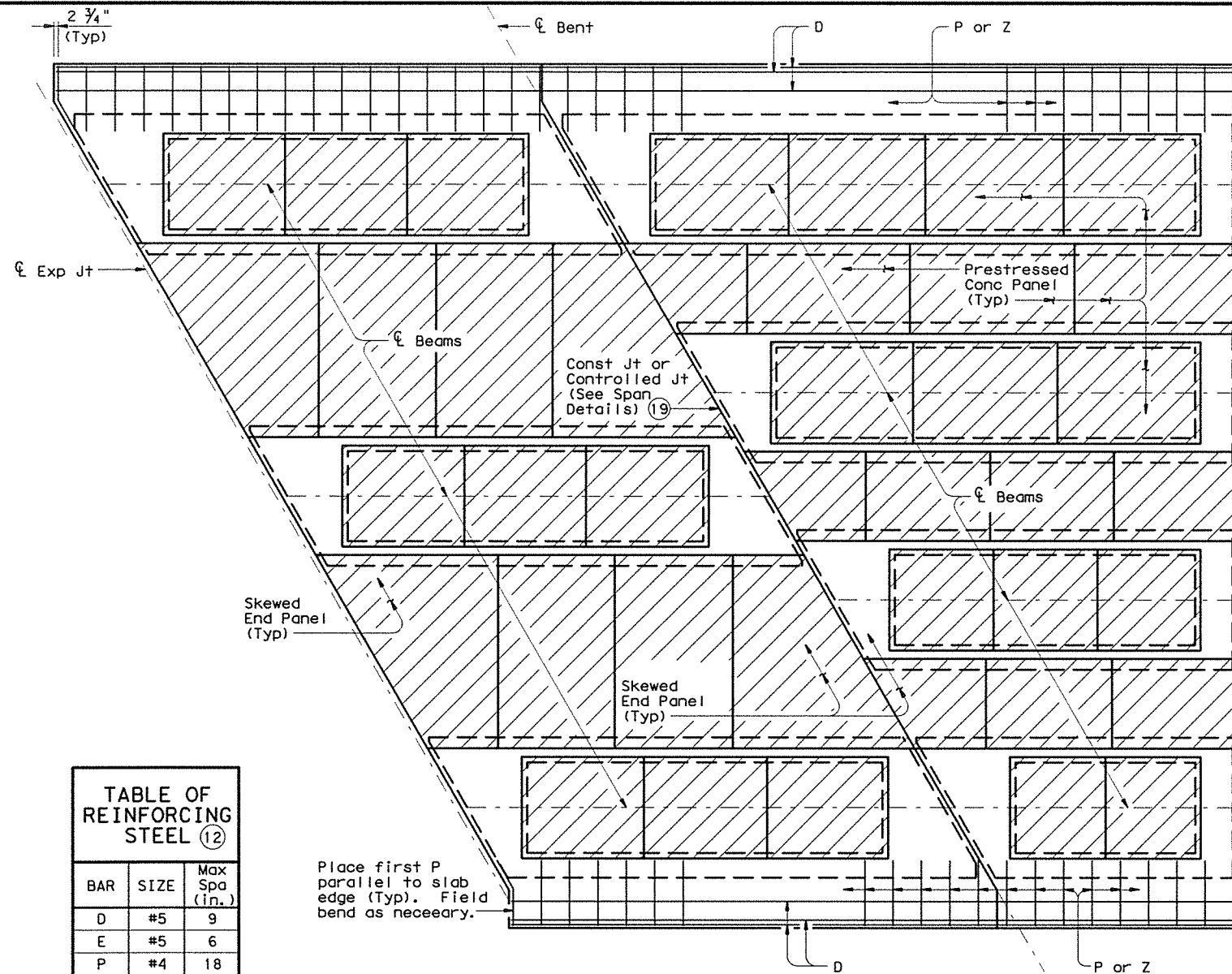
**PCP**

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REVISIONS				
08-07: Added I-Girders & added note to W&B splice detail.				21
10-10: Added Option 2 & referenced PCP-FAB.	COUNTY	CONTROL SECT	JOB	HIGHWAY
	BLANCO			CR 410

LEVELS DISPLAYED

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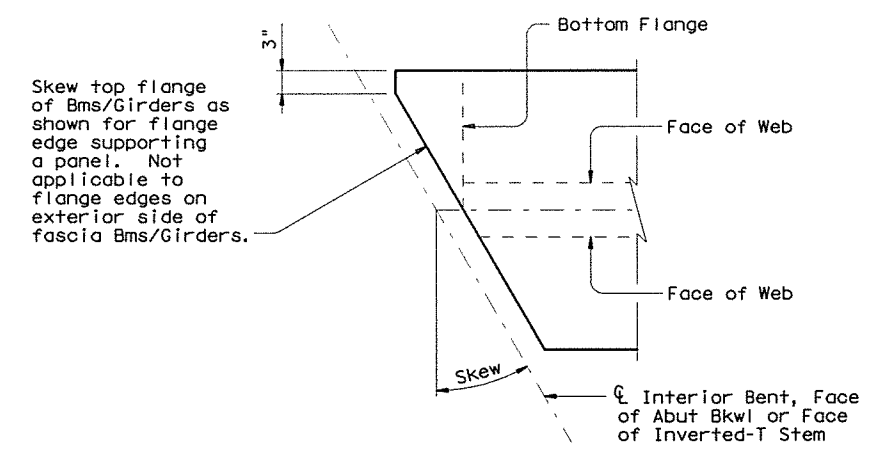
LEVELS DISPLAYED											
PATH:											



BAR	SIZE	Max Spa (in.)
D	#5	9
E	#5	6
P	#4	18
UP	#4	-
Z	#4	18

Place first P parallel to slab edge (Typ). Field bend as necessary.

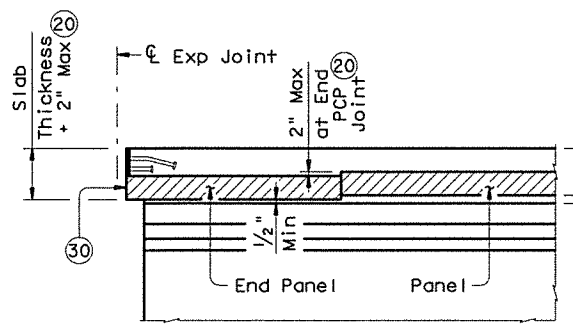
**OPTION 2 ~ PLAN OF SLAB**  
(Showing U-Beams; other beams similar)



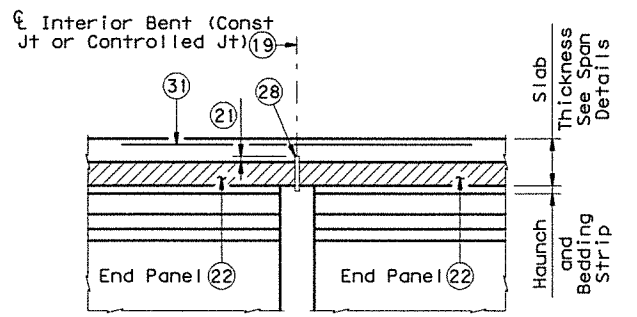
**OPTION 2 ~ SHOWING MODIFICATION TO BEAM/GIRDER TOP FLANGE FOR SKEWS OVER 5°**  
Showing I-Bm/I-Girder, U-Bms and Steel Bms similar.

- ④ See Span Details for top slab reinforcement and clear cover. Longitudinal top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- ⑫ Max Spacing as listed unless otherwise shown.
- ⑰ Top Plastic Joint Former at Controlled Joints (Stress Cap, Zip Strip, Stress Lock, etc.) is not required with these Details.
- ⑳ End panel may be set up to 2" lower to accommodate expansion joint hardware, provided bedding strip is not less than 1/2" thick.
- ㉑ 0" Min, 3/4" Max, support as necessary.
- ㉒ Place panel within 1/2" of 3/4" thick board.
- ㉓ 3/4" thick board, leave in place. Place straight, within 1/4" of Centerline of Bent, across bridge width and end board at exterior flange edge of fascia beams/girders. Do not extend into overhang.
- ㉔ Permanent galvanized steel sheet form. Removable formwork is acceptable.
- ㉕ Place end panel within 1/2" of expansion joint opening. End panel cannot encroach on required expansion joint opening.
- ㉖ Additional (#4) bar 5'-0" in length must be placed under slab bars A and between every slab bars T. Center (#4) bar on Joint.

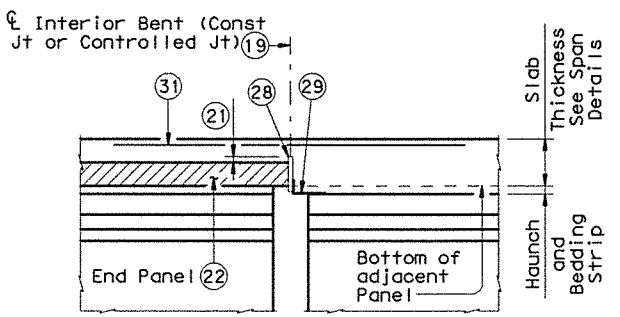
**SPECIAL OPTION 2 CONSTRUCTION NOTES:**  
Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended. Saw cutting panels to fit is acceptable when approved by the Engineer. Minimum distance from a saw cut edge to a panel strand is 1 1/2". Do not extend the longitudinal panel reinforcement into the cast-in-place slab.  
Top flanges of beams and girders on skewed bridges must be modified as shown on this drawing. The Contractor is responsible for coordinating this modification with the beam fabricator prior to submitting shop drawings for approval.  
Bending of anchor studs of expansion joints shown on standards AJ, SEJ-A and SEJ-S(0) is permissible if necessary to clear top of end panels. The Contractor is responsible for coordinating modifications with the joint fabricator. Submit shop drawings for approval when modifications to expansion joint hardware are made. These details are not applicable for bridges with expansion joints as shown on standard SEJ-P.  
Bedding strips under skewed end panels must conform to the requirements of Item 425 except their minimum compressive strength must be 60 psi.



**JOINTS (BETWEEN BEAMS/GIRDERS)**  
For SEJ-A, SEJ-S(0), AJ and Type A Expansion Joints only.

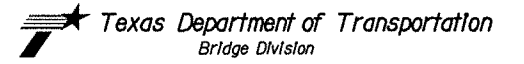


**CONVENTIONAL INTERIOR BENT**  
Panel against Panel between Bms/Girders.



**CONVENTIONAL INTERIOR BENT**  
Panel against Bm/Girder End in Adjacent Span.

**OPTION 2 ~ ELEVATIONS AT BEAM ENDS**



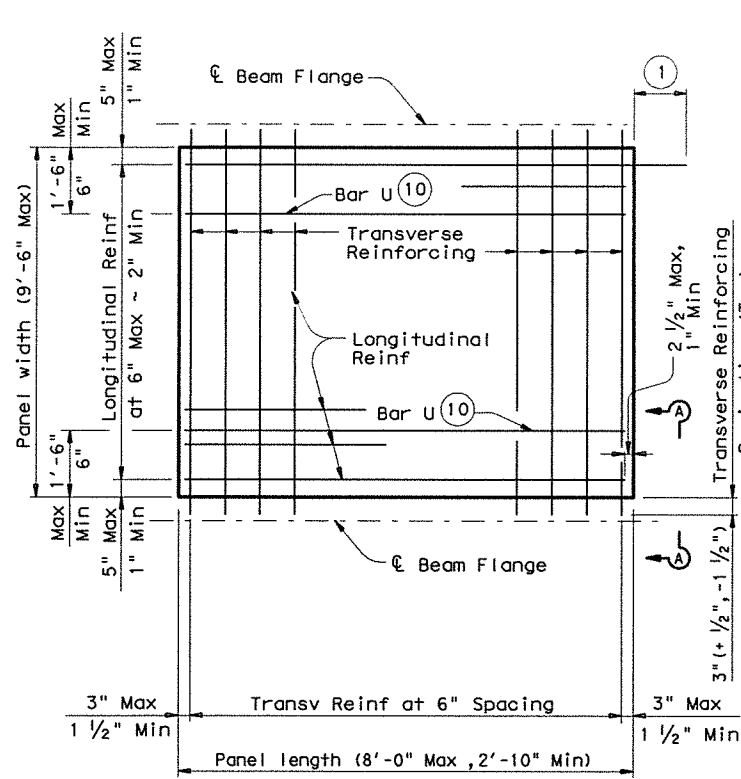
**PRESTRESSED CONCRETE PANELS**  
**OPTIONAL DECK DETAILS**

**PCP**

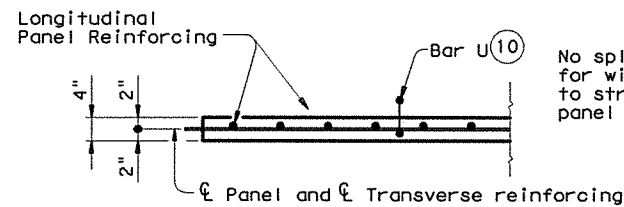
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© TxDOT April 2006	DISTRICT	FEDERAL AID PROJECT	SHEET	
REVISIONS		COUNTY	CONTROL	SECT
08-07: Added I-Girders & added note to W&R splice detail.		BLANCO		JOB
10-10: Added Option 2 referenced PCP-FAB.				HIGHWAY
				CR 410

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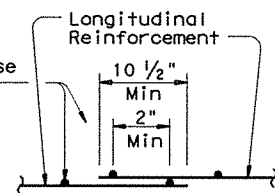
**TYPICAL NON-SKEWED PANEL PLAN**



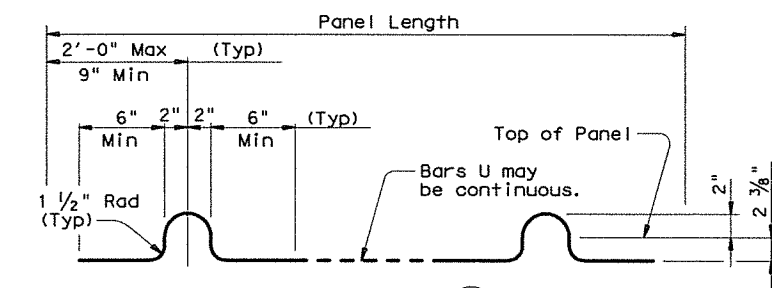
**SECTION A-A**

(Not Showing supplemental #4 bars for Skewed End Panels.)

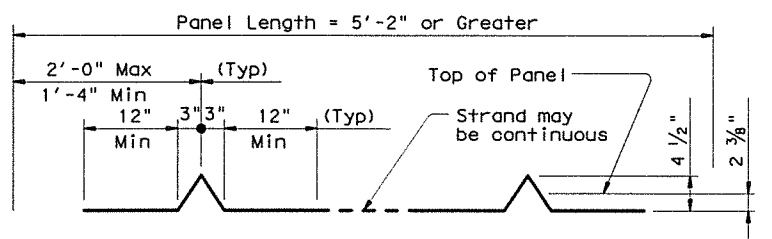
No splice required for wires parallel to strands (transverse panel reinforcing)



**WELDED WIRE REINFORCEMENT (WWR) SPLICE DETAIL**

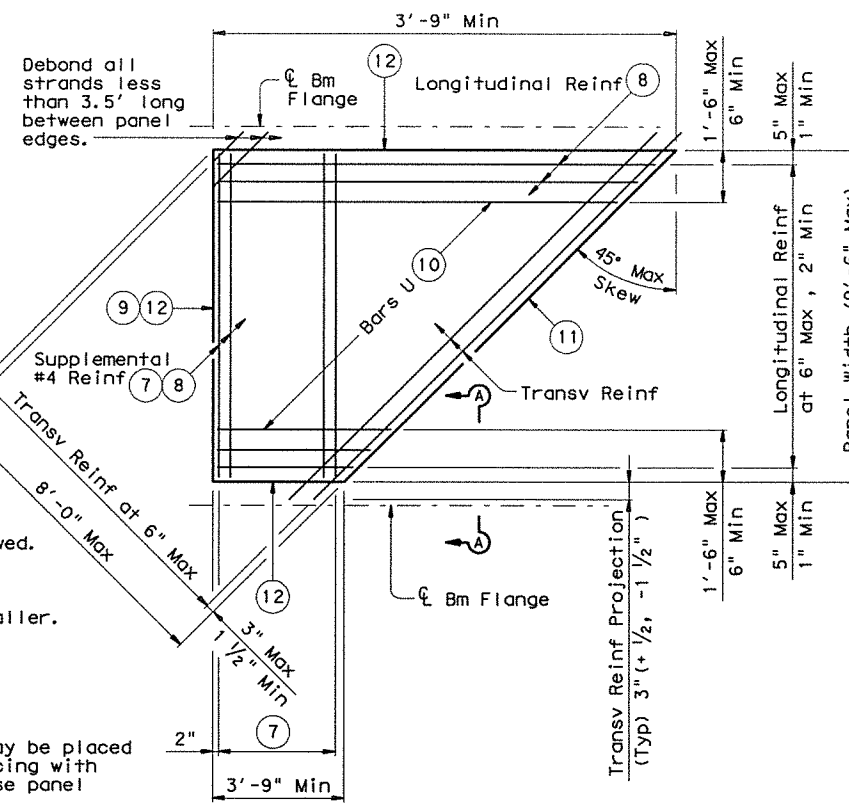


**BARS U (#3)**



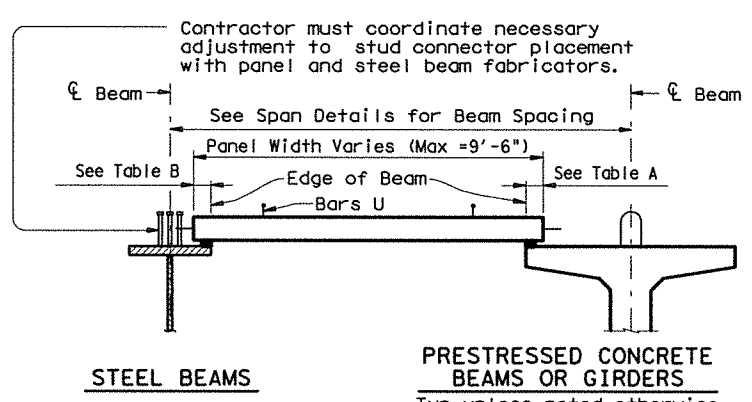
**OPTIONAL STRAND FOR BARS U**

- 1 At connection with cast-in-place slab, extend longitudinal panel reinforcement 1'-0" (+2", -0") past panel end. Alternatively, provide (#3) x 2'-0" dowels at 6" Max Spacing and extend dowels 1'-0" past panel end.
- 2 Four loops required per panel.
- 3 Four loops required per panel. 3/8" or 1/2" strands may be used.
- 4 Normal dimensions must be used on spans with parallel beams. Maximum and Minimum dimensions apply only to spans with flared beams.
- 5 See Normal Grading Detail on PCP standard for lap requirements and bedding strip dimensions. Some laps shown in tables cannot utilize all bedding strip widths.
- 6 One Splice allowed per panel. No more than two sheets of WWR are allowed.
- 7 Provide (#4) bars under transverse reinforcing, 10 Spaces at 4" = 3'-4". Omit for 5 degree (1:12) skew and smaller.
- 8 End Cover 2 1/2" Max, 1" Min.
- 9 Recess strands on indicated panel edge in accordance with Item 424.
- 10 At the fabricator's option, Bars U may be placed parallel to transverse panel reinforcing with horizontal legs in plane of transverse panel reinforcing.
- 11 Use length of indicated panel edge as panel width for purpose of determining type of transverse reinforcing.
- 12 Timber form work permissible this edge.



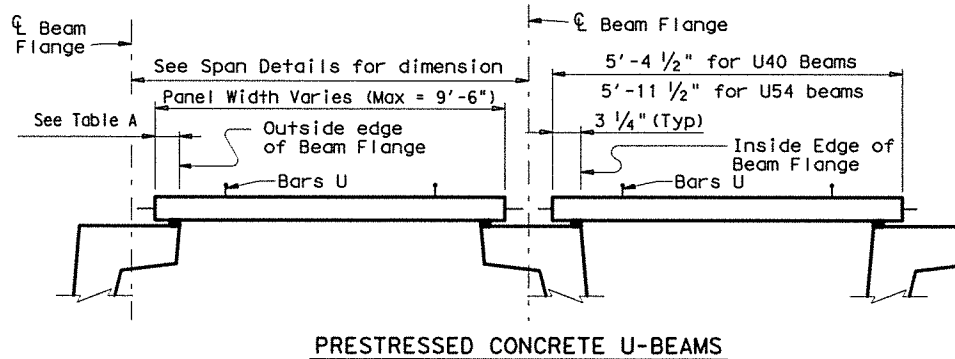
**TYPICAL SKEWED END PANEL PLAN**

(Only to be used with details shown elsewhere in the plans.)



**STEEL BEAMS**

**PRESTRESSED CONCRETE BEAMS OR GIRDERS**  
Typ unless noted otherwise



**PRESTRESSED CONCRETE U-BEAMS**

**TYPICAL SECTIONS FOR DETERMINING PANEL WIDTH**

Beam Type	Normal (In.)	Min (In.)	Max (In.)
A	3	2 1/2	3 1/2
B	3	2 1/2	3 1/2
C	4	3	4 1/2
IV	6	4	7 1/2
VI	6 1/2	4 1/2	8 1/2
U40	5 1/2	5 1/2	7
U54	5 1/2	5 1/2	7
Tx28-70	6	4	7 1/2
XB20	4	3	4 1/2
XB28	4	3	4 1/2
XB34	4	3	4 1/2
XB40	4	3	4 1/2
XSB12	4	3	4 1/2
XSB15	4	3	4 1/2

Top Flange Width	Normal (In.)	Min (In.)	Max (In.)
11" to 12"	2 3/4	2 1/2	2 3/4
Over 12" to 15"	3 1/4	3	3 1/4
Over 15" to 18"	4	3	4 3/4
Over 18"	5	3 1/2	6 1/4

**GENERAL NOTES:**

All concrete for panels is to be Class H. Use Class H (HPC) concrete for panels if required elsewhere in plans. Release strength f'ci=4000 psi. Minimum 28 day strength f'c=5000 psi.

Remove laitance from top panel surface. Finish top of panel to a roughness between a No.6 and No.9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).

Shop drawings for the fabrication of panels will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

A panel layout which identifies location of each panel must be developed by the fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.

**TRANSVERSE PANEL REINFORCEMENT:**

For panel widths over 5', use 3/8" or 1/2" Dia (270K) prestressing strands with a tension of 16.1 kips per strand. For panel widths over 3'-6" up to and including 5', use 3/8" or 1/2" Dia (270K) prestressing strands with a tension of 16.1 kip per strand. Optionally, #4 Grade 60 reinforcing bars may be used in lieu of prestressed strands.

For panel widths up to 3'-6", use #4 Grade 60 reinforcing bars (prestressed strands are not allowed). Place transverse panel reinforcement at panel centroid and space at 6" Max.

**LONGITUDINAL PANEL REINFORCEMENT:**

Any of the following options may be used for longitudinal panel reinforcement:

1. (#3) Grade 60 reinforcing steel at 6" Max Spacing. No splices allowed.
2. 3/8" Dia prestressing strands at 4 1/2" Max Spacing (unstressed). No splices allowed.
3. 1/2" Dia prestressing strands at 6" Max Spacing (unstressed). No splices allowed.
4. Deformed Welded Wire Reinforcement (WWR) (ASTM A497) providing 0.22 sq in per foot of panel width. Wires larger than D11 not permitted. Provide transverse wires to ensure proper handling of reinforcing. One splice per panel is allowed. See WWR Splice Detail.

No combination of longitudinal reinforcement options in a panel is allowed. Place longitudinal panel reinforcement above or below transverse panel reinforcement. Must be placed above transverse panel reinforcement for skewed end panels with supplemental #4 reinforcement.

HL93 LOADING

Texas Department of Transportation  
Bridge Division

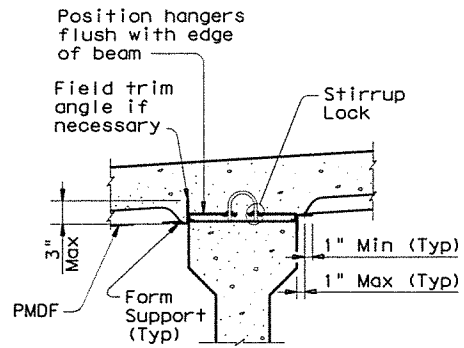
**PRESTRESSED CONCRETE PANEL FABRICATION DETAILS**

PCP-FAB

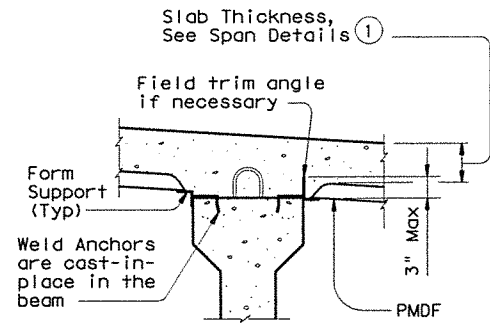
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October 2010	DISTRICT	FEDERAL AID PROJECT	SHEET	
REVISIONS	COUNTY	CONTROL SECT	JOB	HIGHWAY
	BLANCO			CR 410

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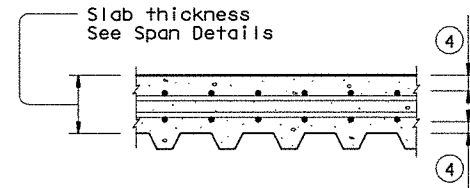
PA TH: LEVELS DISPLAYED



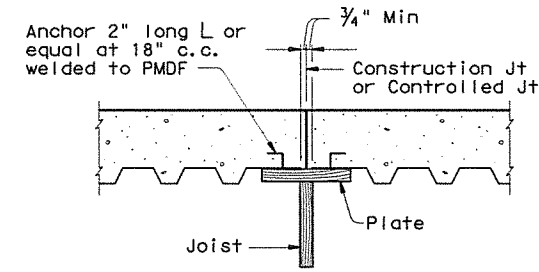
**PRESTR CONC I-BEAMS AND I-GIRDERS WITH STIRRUP LOCKS**



**PRESTR CONC I-BEAMS AND I-GIRDERS WITH WELD ANCHORS**

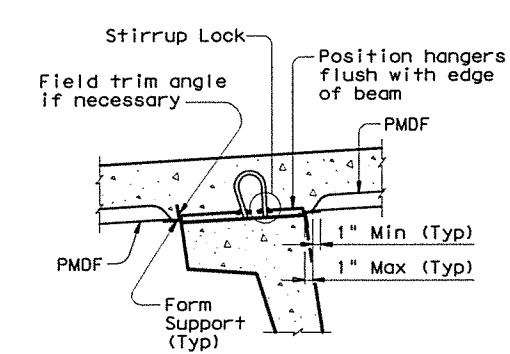


**TYP LONGITUDINAL SLAB SECTION**

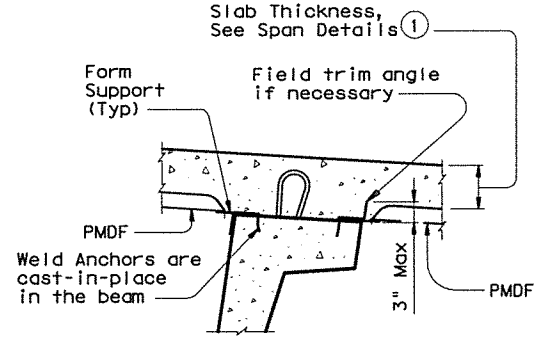


Note: In spans where PMDF forms are used, timber forms must be used at construction joints. Adequate provision must be made to support edge of metal form and to provide anchorage of metal form to slab concrete where joined to wood forms.

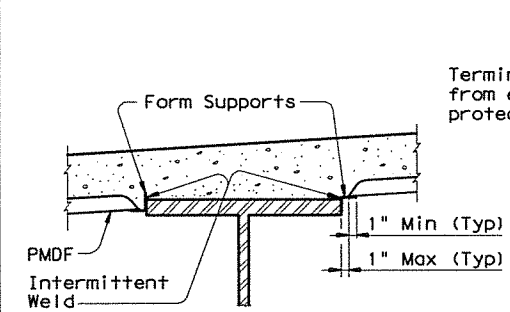
**SECTION THRU CONSTRUCTION JOINT**



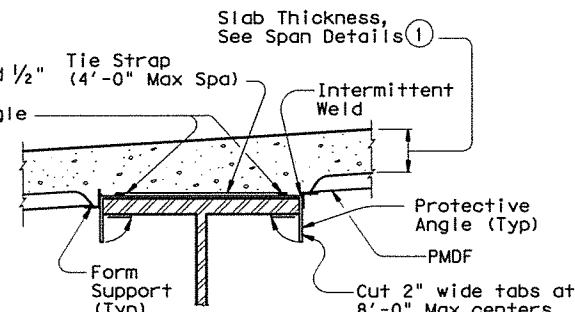
**U-BEAMS WITH STIRRUP LOCKS**



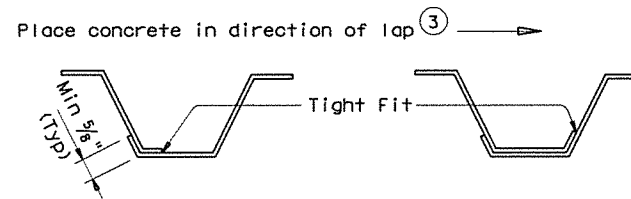
**U-BEAMS WITH WELD ANCHORS**



**STEEL BEAMS AT COMPRESSION FLANGES**



**STEEL BEAMS AT TENSION FLANGES ②**



**SIDE LAP DETAILS**

- ① Slab thickness minus  $\frac{5}{8}$ " if corrugations match reinforcing bars.
- ② Welding of form supports to tension flanges will not be permitted. Other methods of providing wind hold down resistance for PMDF in tension flange zones will be considered. At least one layer of sheet metal must be provided between the flange and the weld joint.
- ③ The direction of concrete placement will be such that the upper layer of the form overlap is loaded first.
- ④ See Span details for cover requirements.

**GENERAL NOTES:**

Steel for Permanent Metal Deck Forms (PMDF) and support angles shall conform to ASTM A653, Structural Steel (SS), with coating designation G165. Steel must have a minimum yield strength of 33 ksi. Minimum thickness of PMDF is 20 gage and that of support angles and protective angles is 12 gage. Submit two copies of forming plans for PMDF to the Engineer. These plans must show all essential details of proposed form sheets, closures, fasteners, supports, connectors, special conditions and size and location of welds. These plans must clearly show areas of tension flanges for steel beams and provisions for protecting the tension flanges from welding notch effects by inclusion of separating sheet metal or other positive method. These plans must be designed, signed, and sealed by a licensed professional engineer. Department approval of these plans is not required, but the Department reserves the right to require modifications to the plans. The Contractor is responsible for the adequacy of these plans. The details and notes shown on this standard are to be used as a guide in preparation of the forming plans. All material, labor, tools and incidentals necessary to form a bridge deck with Permanent Metal Deck Forms is considered subsidiary to Item 422, "Reinforced Concrete Slab".

**DESIGN NOTES:**

As a minimum, PMDF and support angles must be designed for the dead load of the form, reinforcement and concrete plus 50 psf for construction loads. Flexural stresses due to these design loads must not exceed 75 percent of the yield strength of the steel. Allowable stress for weld metal must be 12,400 psi. Maximum deflection under the weight of forms, reinforcement and concrete or 120 psf, whichever is greater, shall not exceed the following:

1/180 of the form design span, but not more than 0.50", for design spans of 10' or less.

1/240 of the form design span, but not more than 0.75", for design spans greater than 10'.

The form design span must not be less than the clear distance between beam flanges, measured parallel to the form flutes, minus 2".

**CONSTRUCTION NOTES:**

Form sheets must not be permitted to rest directly on the top of beam flanges. Form sheets must be securely fastened to form supports and must have a minimum bearing length of one inch at each end. Form supports must be placed in direct contact with beam flanges.

All attachments must be made by permissible welds, screws, bolts, clips or other means shown on the the forming plans. All sheet metal assembly screws must be installed with torque-limiting devices to prevent stripping. Only welds or bolts must be used to support vertical loads.

Welding and welds must be in accordance with the provisions of Item 448, "Structural Field Welding", pertaining to fillet welds. All welds must be made by a qualified welder in accordance with Item 448.

All permanently exposed form metal, where the galvanized coating has been damaged, must be thoroughly cleaned and repaired in accordance with Item 445, "Galvanizing". Minor heat discoloration in areas of welds need not be touched up.

Flutes must line up uniformly across the entire width of the structure where main reinforcing steel is located in the flute.

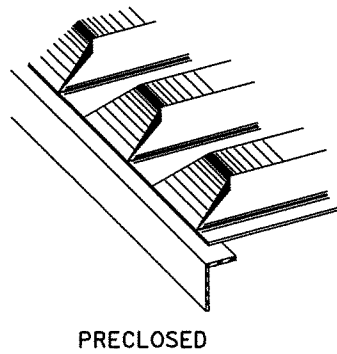
Construction joints will not be permitted unless shown on the plans. The location of and forming details for any construction joint used must be shown on the forming plans. Forms below a construction joint must be removed after curing of the slab.

A sequence for uniform vibration of concrete must be approved by the Engineer prior to concrete placement. Attention must be given to prevent damage to the forms, yet provide proper vibration to prevent voids or honeycomb in the flutes and at headers and/or construction joints.

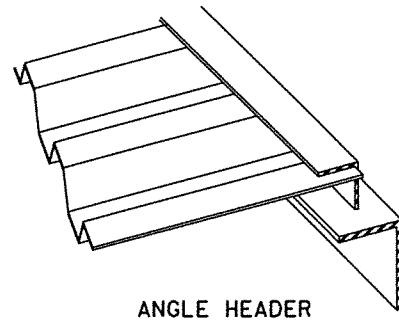
**PERMANENT METAL DECK FORMS**

**PMDF**

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© TxDOT April 2006	DISTRICT	FEDERAL AID PROJECT	SHEET	
REVISIONS				24
08-2007: Added I-Girders.	COUNTY	CONTROL	SECT	JOB
	BLANCO			CR 410



**PRECLOSED**



**ANGLE HEADER**

NOTE: This type is to be used for skewed ends only.

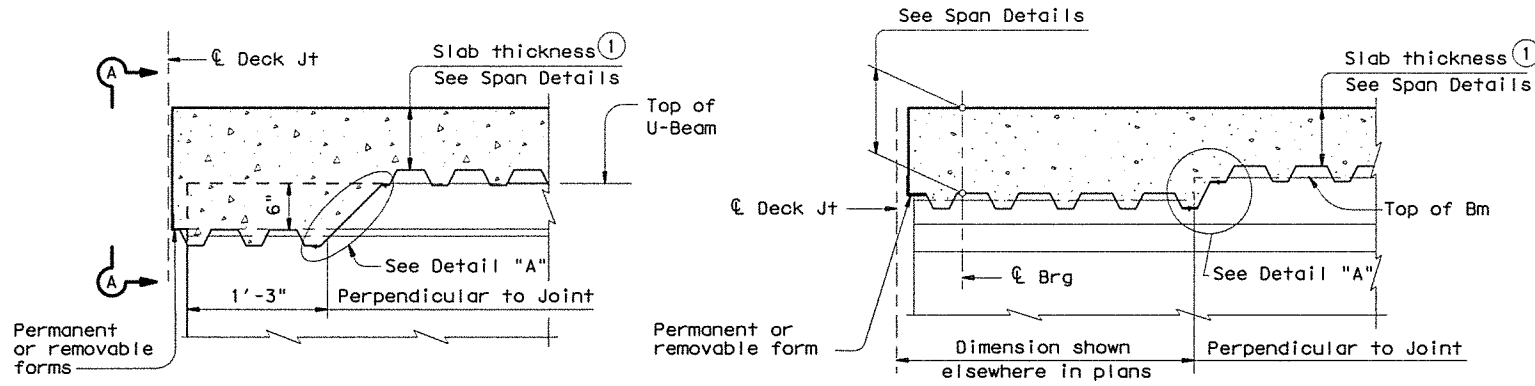
**TYPES OF END CLOSURES**



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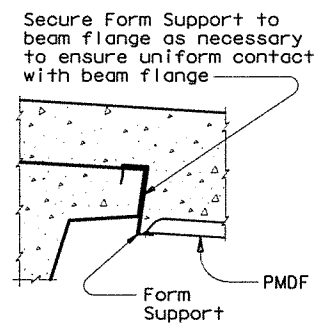
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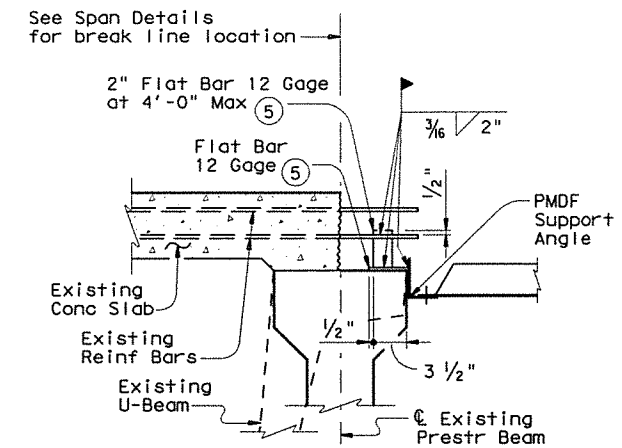
**AT THICKENED SLAB END FOR U-BEAMS**

**AT THICKENED SLAB END FOR PRESTRESSED I-BEAMS, I-GIRDERS AND STEEL BEAMS**

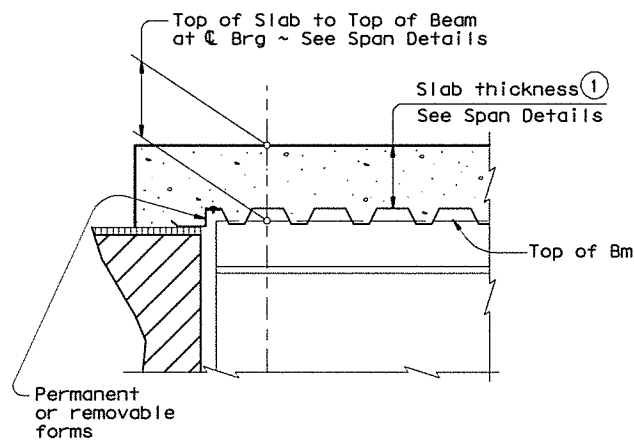
Showing I-Beam block-out. No block-out for I-Girders or Steel Beams.



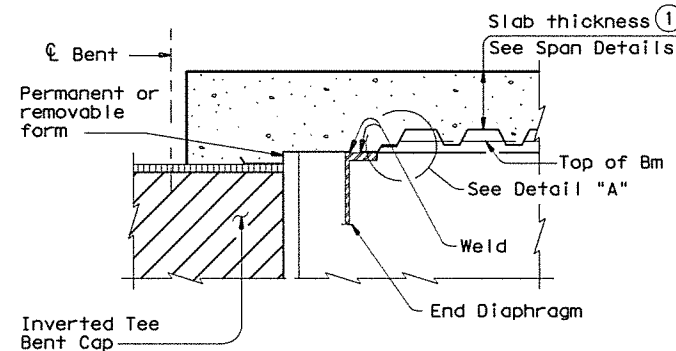
**SECTION A-A**



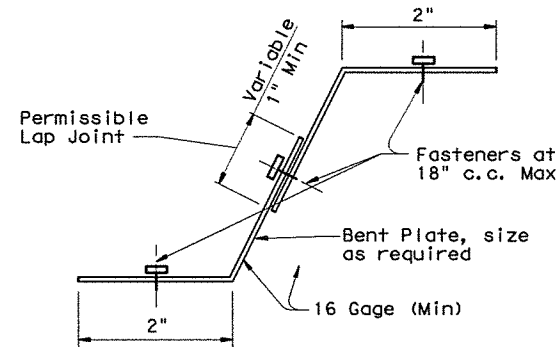
**SHOWING PRESTRESSED CONCRETE I-BEAMS, I-GIRDERS AND U-BEAMS**



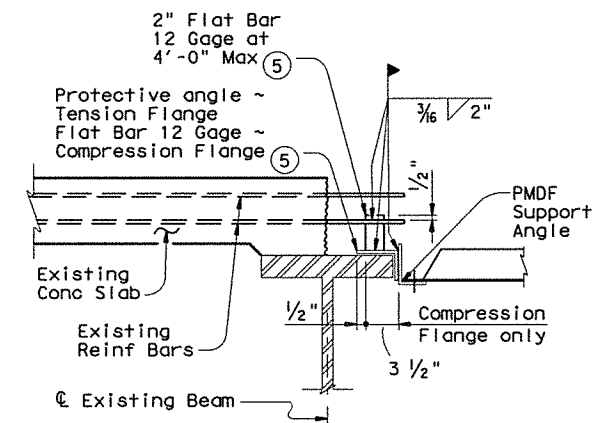
**AT SLAB OVER ABUT BKWL OR INV TEE STEM FOR CONC BEAMS WITHOUT THICKENED SLAB END**



**AT SLAB OVER INV TEE STEM FOR STEEL BEAMS WITHOUT THICKENED SLAB END**

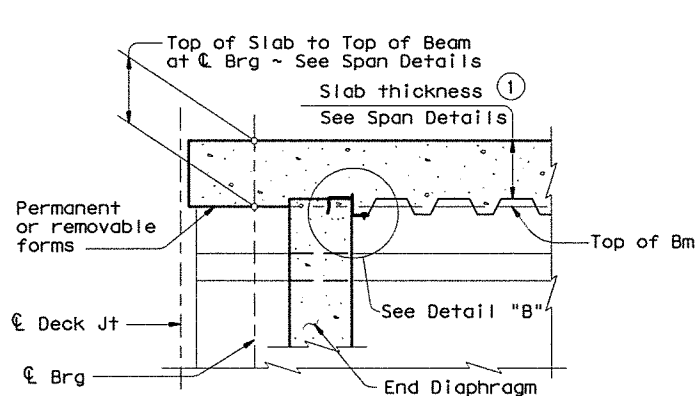


**DETAIL "A"**

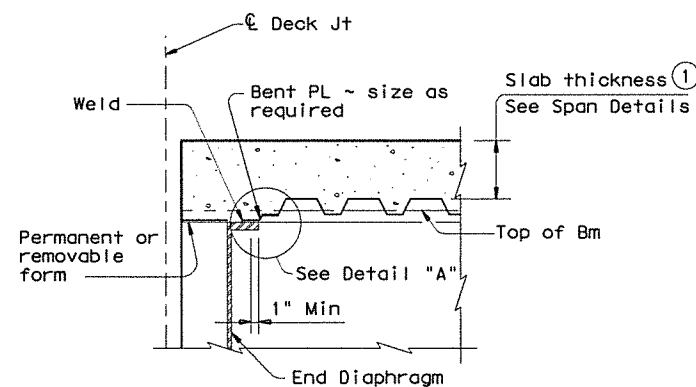


**SHOWING STEEL BEAMS**

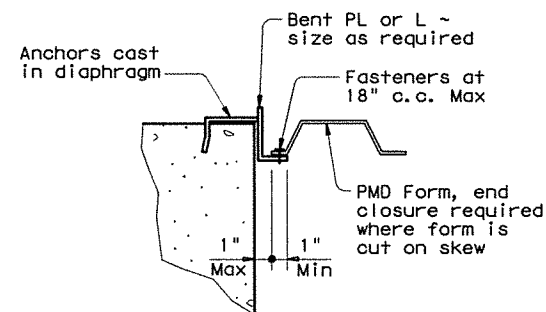
**WIDENING DETAILS**



**AT CONC END DIAPHRAGM FOR PRESTRESSED I-BEAMS AND STEEL BEAMS**



**AT END DIAPHRAGM FOR STEEL BEAMS WITHOUT THICKENED SLAB END**



**DETAIL "B"**

- ① Slab thickness minus 3/16" if corrugations match reinforcing bars
- ⑤ Minimum yield stress of 12 Gage bars shall be 40 ksi

**DETAILS AT ENDS OF BEAMS**

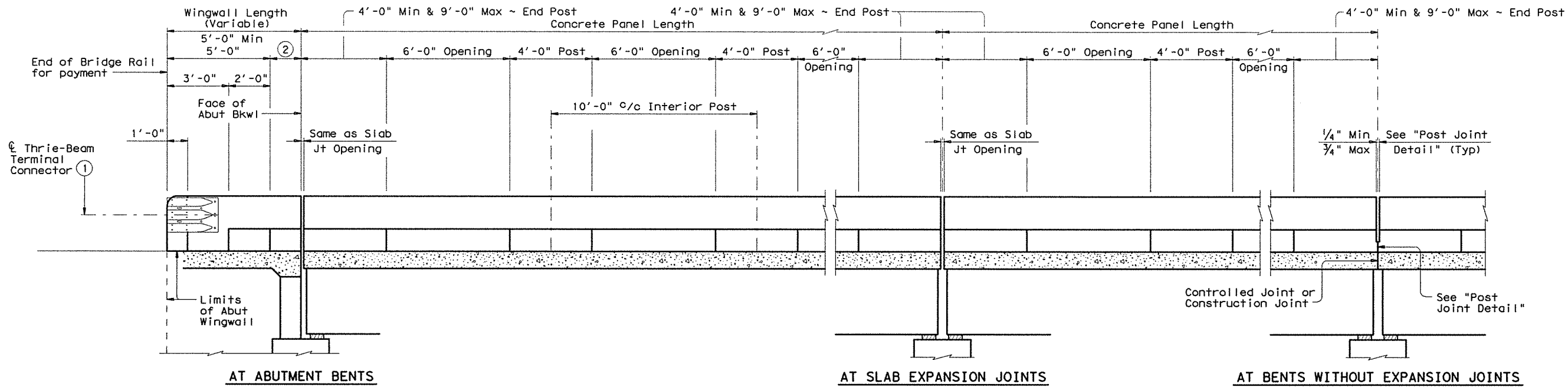
**PERMANENT METAL DECK FORMS**

**PMDF**

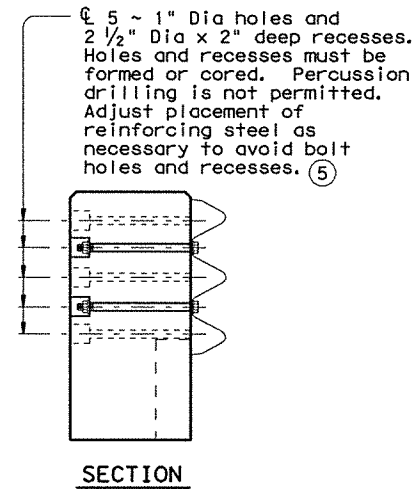
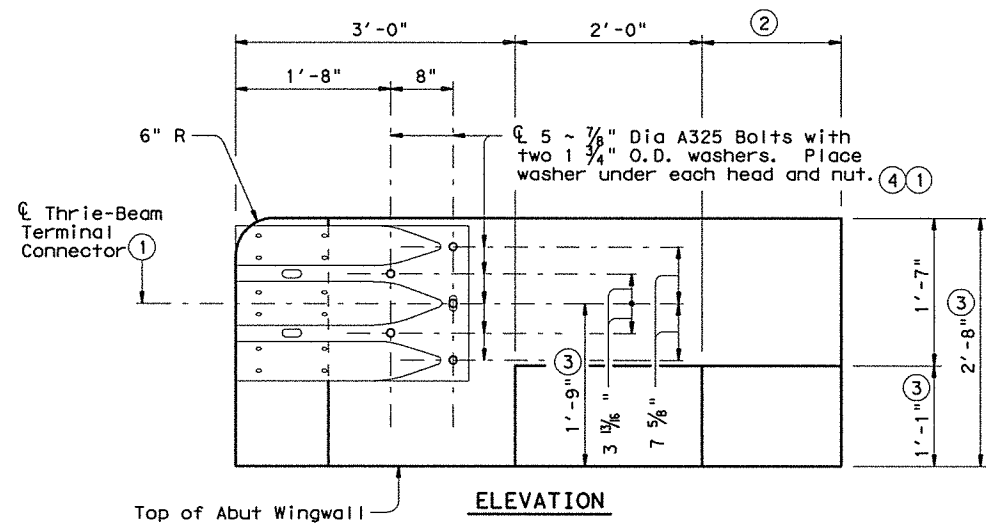
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© TxDOT April 2006	DISTRICT	FEDERAL AID PROJECT	SHEET	
REVISIONS				25
08-2007: Added I-Girders.	COUNTY	CONTROL SECT	JOB	HIGHWAY
	BLANCO			CR 410

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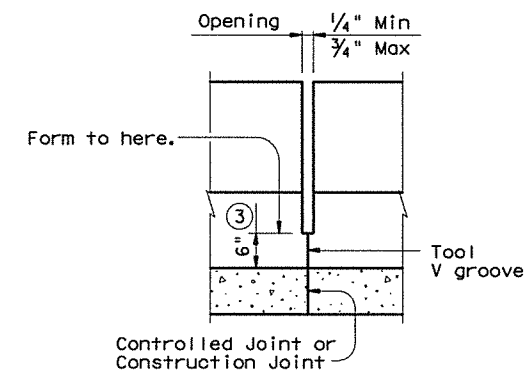
LEVELS DISPLAYED  
 1. PATH:



**ROADWAY ELEVATION OF RAIL**



**TERMINAL CONNECTION DETAILS**



**POST JOINT DETAIL**

Provide at all interior bents without slab expansion joints.

- ① Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Metal Beam Guard Fence Transitions must be attached to the bridge rail and extended along the embankment unless otherwise shown in the plans.
- ② Wingwall Length minus 5'-0" (Varies)
- ③ Increase 2" for structures with overlay.
- ④ Bolts must be sufficient length to extend 1/2" to 3/4" beyond nut.
- ⑤ Bolt recesses are only required when pedestrian sidewalks are adjacent to back of rail.

SHEET 1 OF 3

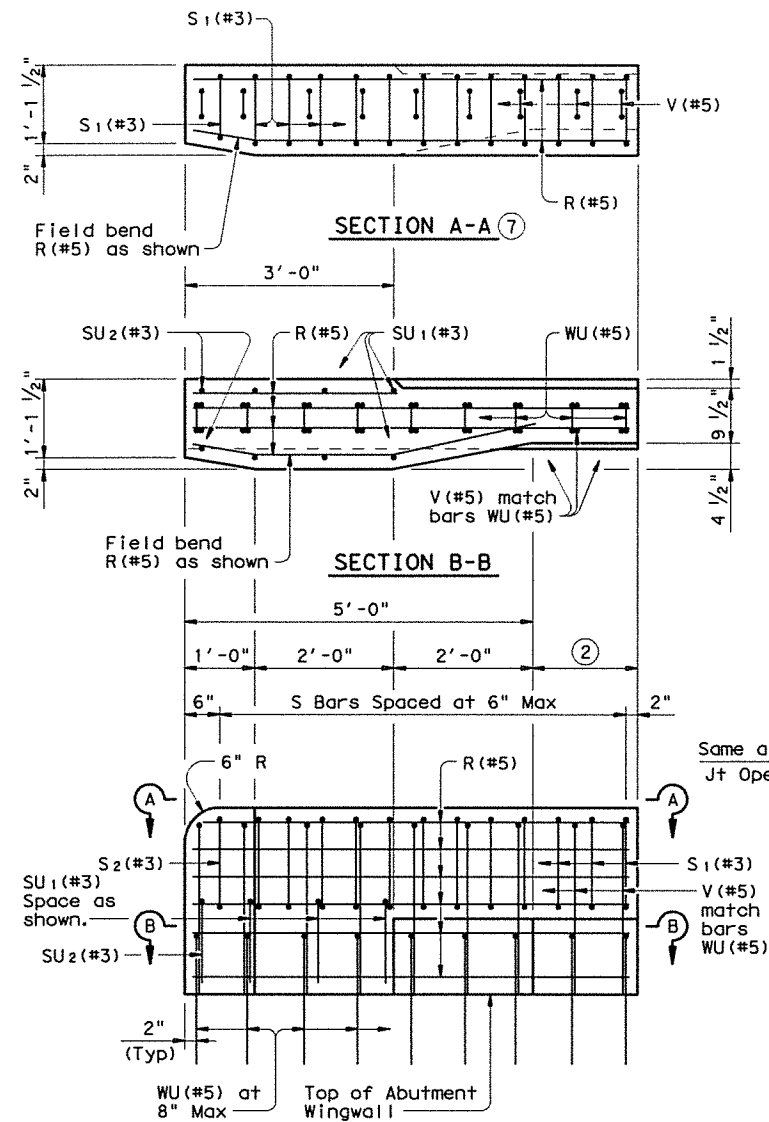
Texas Department of Transportation  
 Bridge Division

**TRAFFIC RAIL**

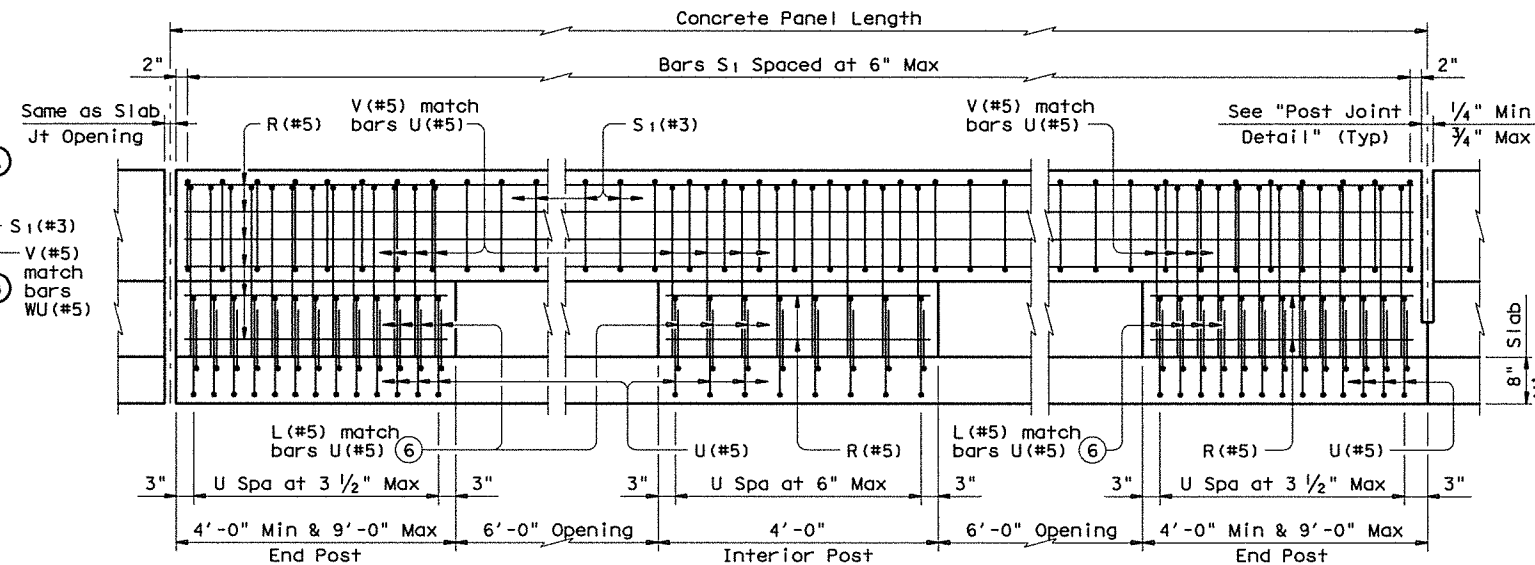
**TYPE T223**

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REVISIONS				
05-11: Post Joint Note.	COUNTY	CONTROL	SECT	JOB
07-12: Guardrail Transition.	BLANCO			CR 410

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AT ABUT WINGWALL



AT SLAB EXPANSION JOINTS AT 4' INTERIOR POST AT BENTS WITHOUT EXPANSION JOINTS

**ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT**

- ② Wingwall Length minus 5'-0" (Varies)
- ⑥ Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.
- ⑦ Bars SU1(#3), SU2(#3) and WU(#5) not shown for clarity.

LEVELS DISPLAYED

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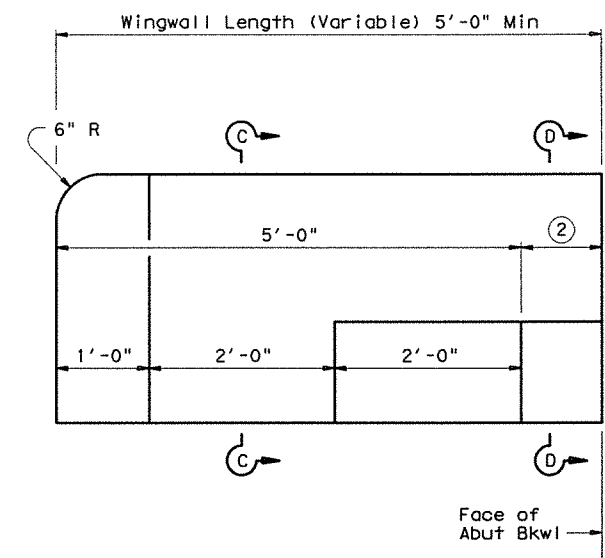
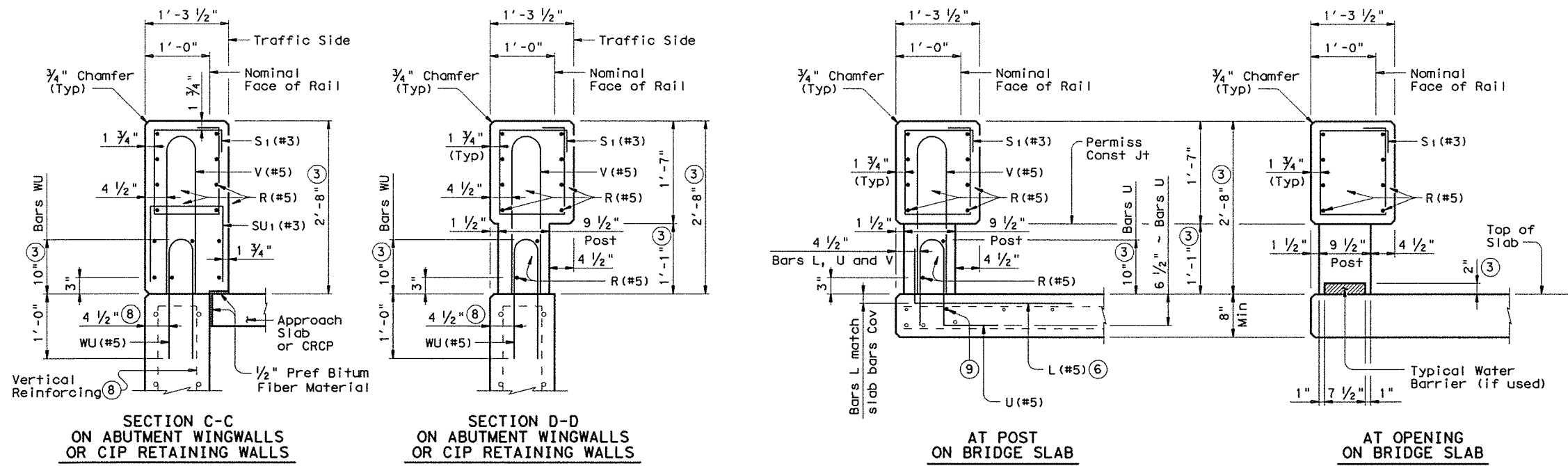
**TRAFFIC RAIL**

**TYPE T223**

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REVISIONS			27	
05-11: Post Joint Note, 07-12: Guardrail Transition.				
COUNTY	CONTROL	SECT	JOB	HIGHWAY
BLANCO				CR 410

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LEVELS DISPLAYED	PATH:
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**ELEVATION AT ABUTMENT WINGWALL**

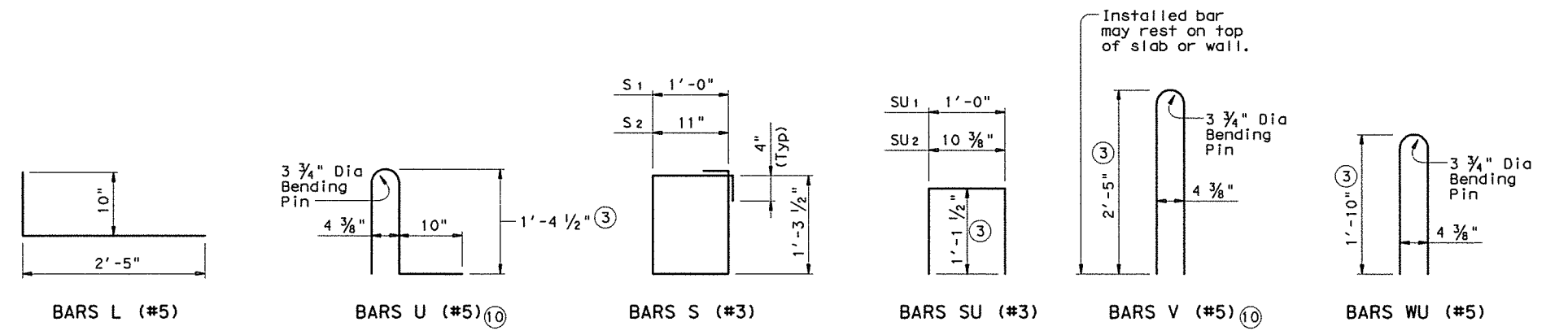
**SECTIONS THRU RAIL**

- ② Wingwall Length minus 5'-0" (Varies)
- ③ Increase 2" for structures with overlay.
- ⑥ Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.
- ⑧ When vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls on traffic side of wall, move the horizontal wingwall/retaining wall reinforcing to the inside of Bars WU where bars conflict.
- ⑨ Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.
- ⑩ At the Contractor's option, Bars V may be replaced by extending Bars U to 2'-5" above the roadway surface without overlay.

**CONSTRUCTION NOTES:**  
 Face of rail and parapet must be vertical transversely unless otherwise shown in the plans or approved by the Engineer.  
 Water barriers must be provided at openings draining onto undercrossing roadways and sidewalks. They may be cast-in-place or precast in convenient lengths and bonded to the bridge deck with an approved epoxy cement.

**MATERIAL NOTES:**  
 All steel components except reinforcing must be galvanized unless otherwise shown on plans.  
 Use Class "C" concrete. Use Class "C" (HPC) if required elsewhere. Chamfer all exposed corners.  
 All reinforcing must be Grade 60.  
 Epoxy coat all rail reinforcement if slab bars are epoxy coated.

**GENERAL NOTES:**  
 This rail has been evaluated and accepted to be of equal strength to railings with like geometry, which have been crash tested to meet NCHRP Report 350 TL-4 criteria. This rail can be used for design speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for design speeds of 45 mph and less.  
 This railing cannot be used on bridges with expansion joints providing more than 5" movement.  
 Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.  
 Shop drawings will not be required for this rail.  
 Average weight of railing with no overlay is 358 plf.



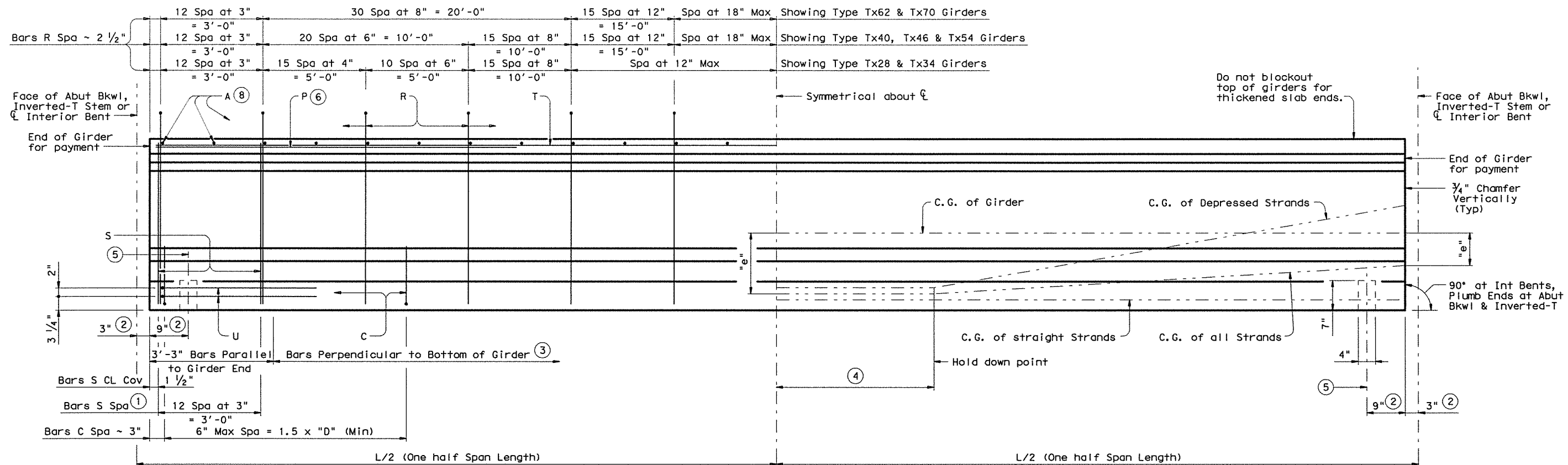
Texas Department of Transportation  
 Bridge Division

**TRAFFIC RAIL**

**TYPE T223**

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REVISIONS		28		
05-11: Post Joint Note.	COUNTY	CONTROL SECT	JOB	HIGHWAY
07-12: Guardrail Transition.	BLANCO			CR 410

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- ① Bundle with Bars R.
- ② Measured along C.L. of Girder at Interior Bents; perpendicular to Abutment Bkwl or Inverted-T Stem.
- ③ The average of the top and bottom spacing of Bars R cannot exceed the required spacing.

### GIRDER ELEVATION

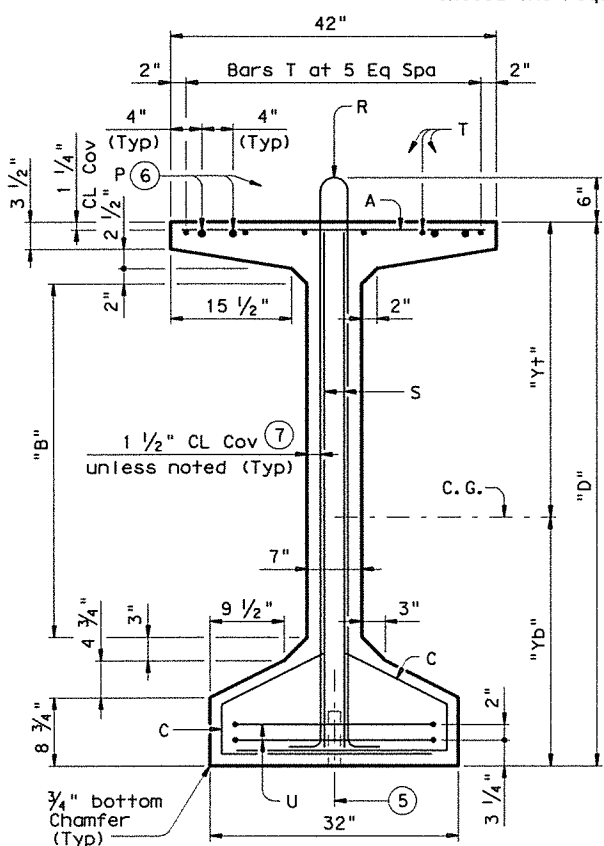
- ④ L/20, but not less than 5'-0" (-0,+2').
- ⑤ 4" x 1 1/2" Vertical Slotted Hole at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details. Anchorage holes may be tapered (4 3/4" x 1 5/8") at base. If holes are formed with sheet metal, forms may be left in place.
- ⑥ Bars P (#6 x 15'-0") are only required when "e" at girder ends exceeds 0.25 x "D". At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.
- ⑦ 1 3/8" Clear Cover to Bars S.
- ⑧ Space Bars A at 6" Max for girders requiring overhang bracket hangers. Space at 12" Max for all other girders. Tie to Bars R as necessary. See standard IGMS for "Deck Forming Notes".

GIRDER DIMENSIONS AND SECTION PROPERTIES								
Girder Type	"D" (in.)	"B" (in.)	"Yt" (in.)	"Yb" (in.)	Area (in. <sup>2</sup> )	"Ix" (in. <sup>4</sup> )	"Iy" (in. <sup>4</sup> )	Weight (plf)
Tx28	28	6	15.02	12.98	585	52,772	40,559	610
Tx34	34	12	18.49	15.51	627	88,355	40,731	653
Tx40	40	18	21.90	18.10	669	134,990	40,902	697
Tx46	46	22	25.90	20.10	761	198,089	46,478	793
Tx54	54	30	30.49	23.51	817	299,740	46,707	851
Tx62	62	37 1/2"	33.72	28.28	910	463,072	57,351	948
Tx70	70	45 1/2"	38.09	31.91	966	628,747	57,579	1,006

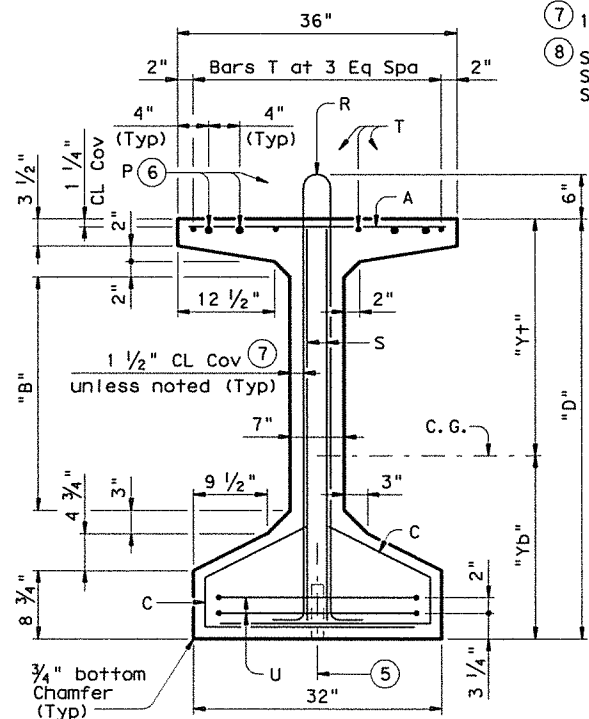
#### GENERAL NOTES:

Designed in accordance with AASHTO LRFD Specifications. All concrete must be Class H. Provide Class H(HPC) if shown elsewhere in plans. All reinforcing bars must be Grade 60. An equal area of deformed Welded Wire Reinforcement (WWR) (ASTM A497) may be substituted for Bars A, C, R or T unless otherwise noted. It is permissible for bars or strands to come in contact with materials used in forming anchor holes.

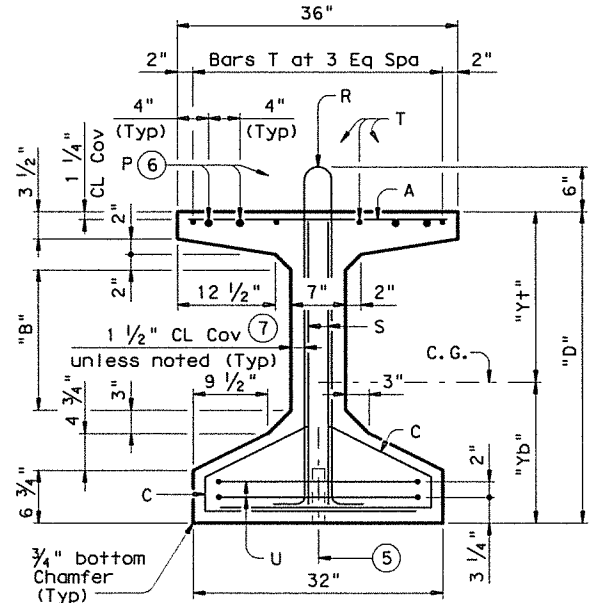
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**TYPE Tx62 & Tx70**



**TYPE Tx46 & Tx54**



**TYPE Tx28, Tx34 & Tx40**



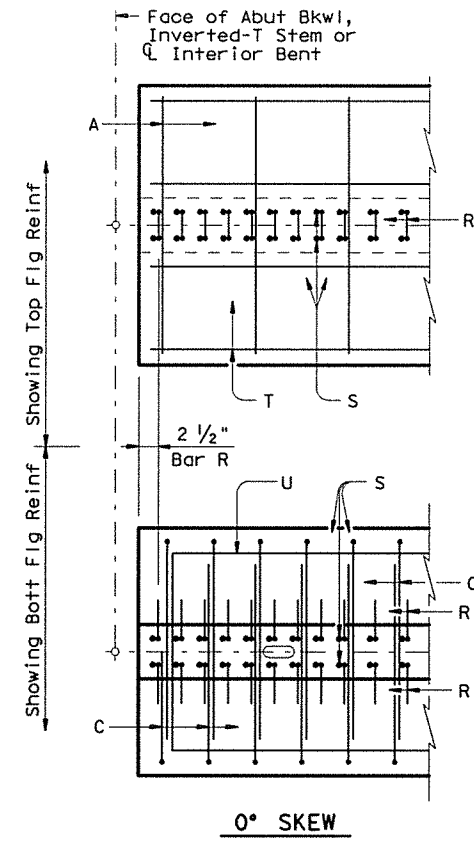
## PRESTRESSED CONCRETE I-GIRDER DETAILS

### IGD

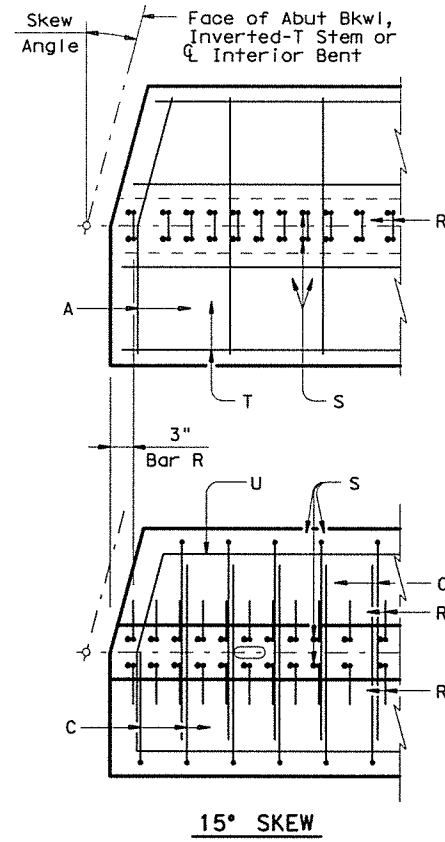
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REVISIONS		COUNTY	CONTROL	SECT
02/09 General Notes.		BLANCO		
12/10 Optional Top Flange Reinforcing.				
			JOB	HIGHWAY
				CR 410

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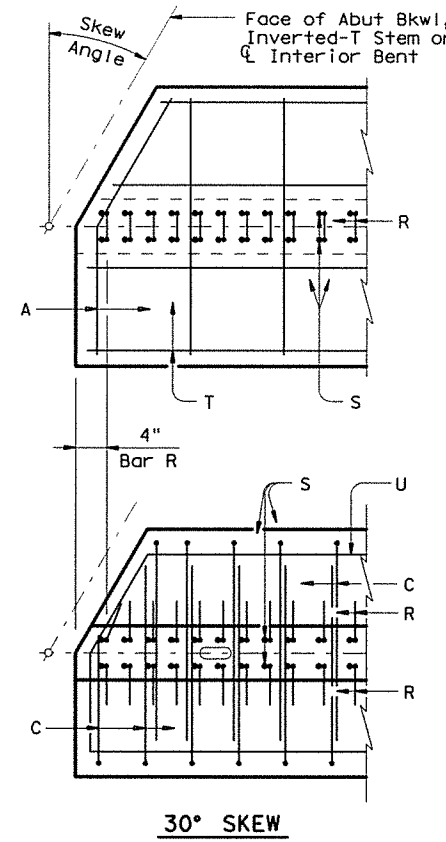
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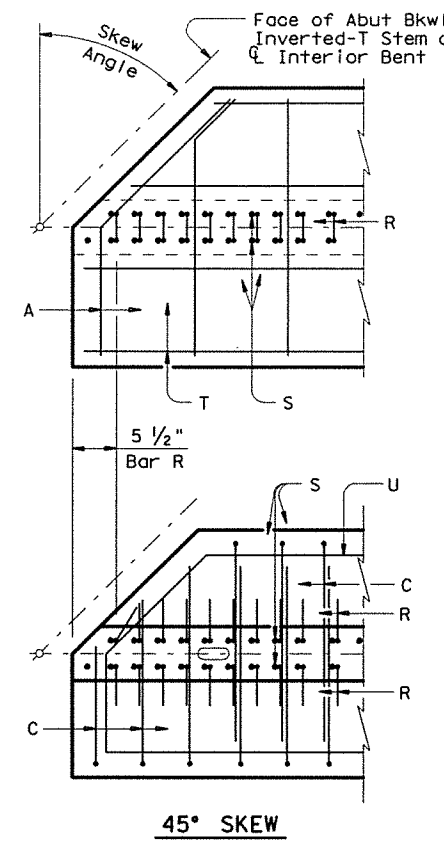
0° SKEW



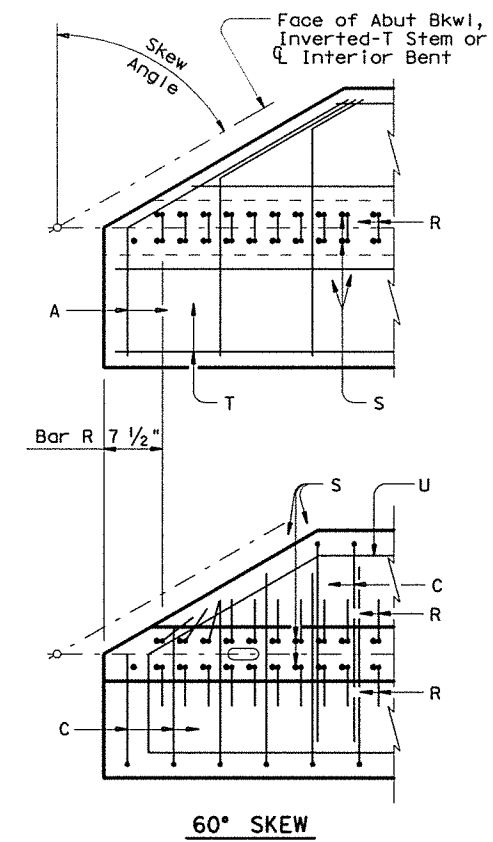
15° SKEW



30° SKEW



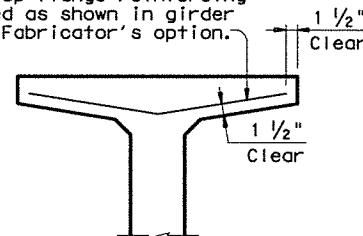
45° SKEW



60° SKEW

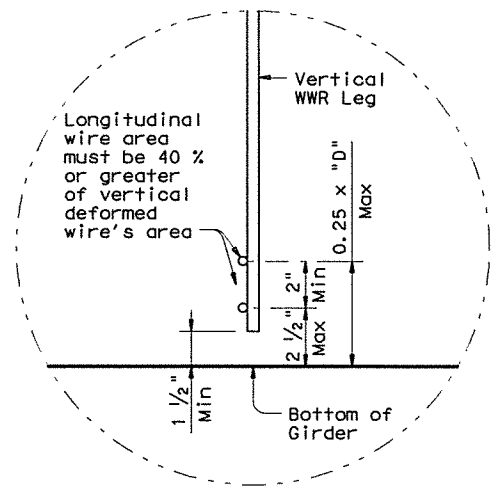
**PLAN OF GIRDER ENDS** ⑨

To control top flange cracking that may occur during form removal, additional top flange reinforcing may be placed as shown in girder ends at the Fabricator's option.

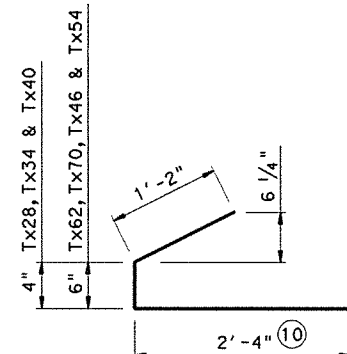


**OPTIONAL TOP FLANGE REINFORCING DETAIL**

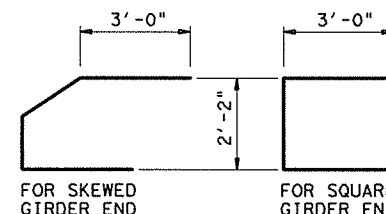
- ⑨ Reinforcing patterns shown are provided as guides to determine reinforcement placement in skewed ends. Place Bars S as close to girder end as cover requirements permit, which may prevent them to be bundled with Bars R.
- ⑩ Bars may be cut or bent at skewed end as required.
- ⑪ Increase as necessary for bars at skewed end.
- ⑫ No portion of bar less than 10 ft.
- ⑬ For Welded Wire Reinforcement (WWR) option, area of Bars R may be reduced in proportion to the increase in reinforcement yield strength over 60 ksi. Yield strength of WWR is limited to 75 ksi.



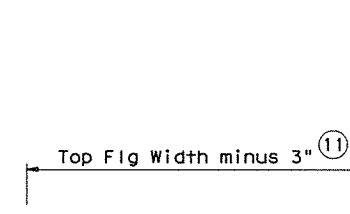
**OPTIONAL WELDED WIRE REINFORCEMENT (WWR) DETAIL**



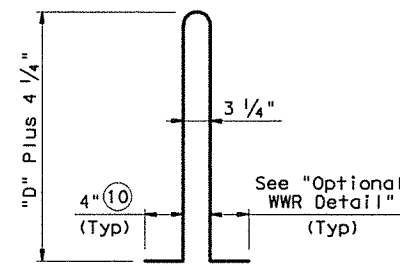
BARS C (#4)



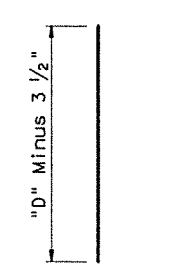
BARS U (#5)



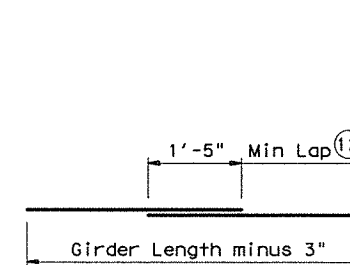
BARS A (#3)



BARS R (#4) ⑬



BARS S (#6)



BARS T (#4)

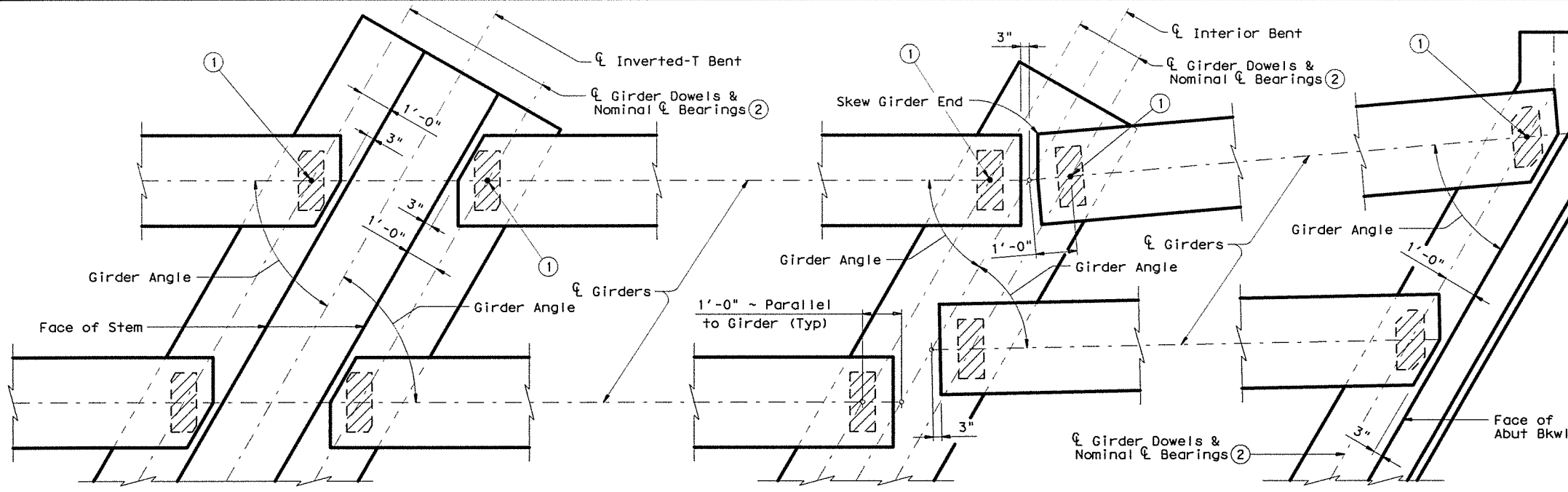
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REVISIONS				
02/09 General Notes				30
12/10 Optional Top Flange Reinforcing	COUNTY	CONTROL	SECT	JOB HIGHWAY
	BLANCO			CR 410

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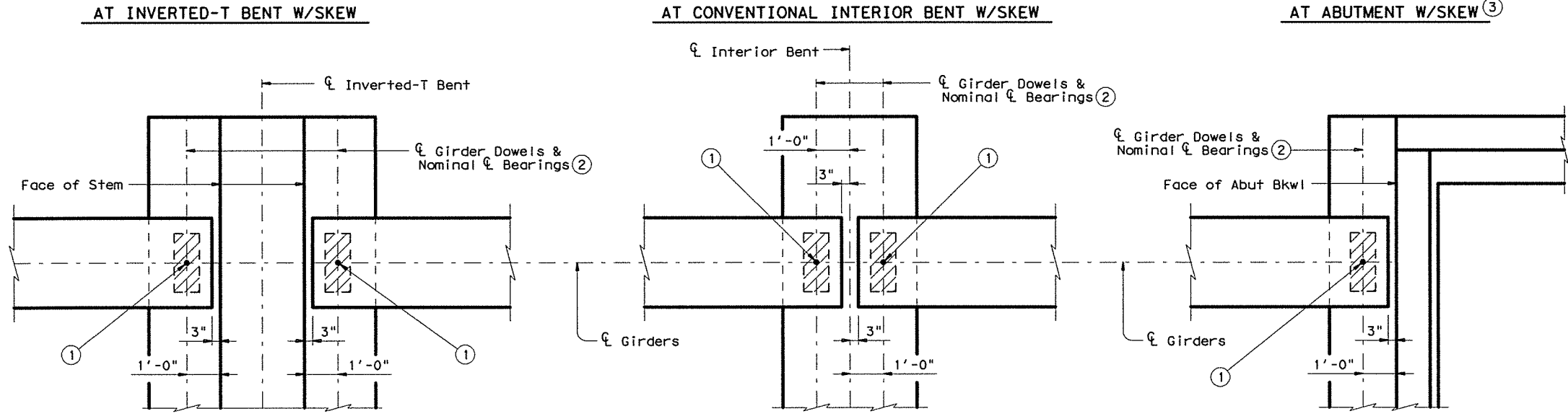
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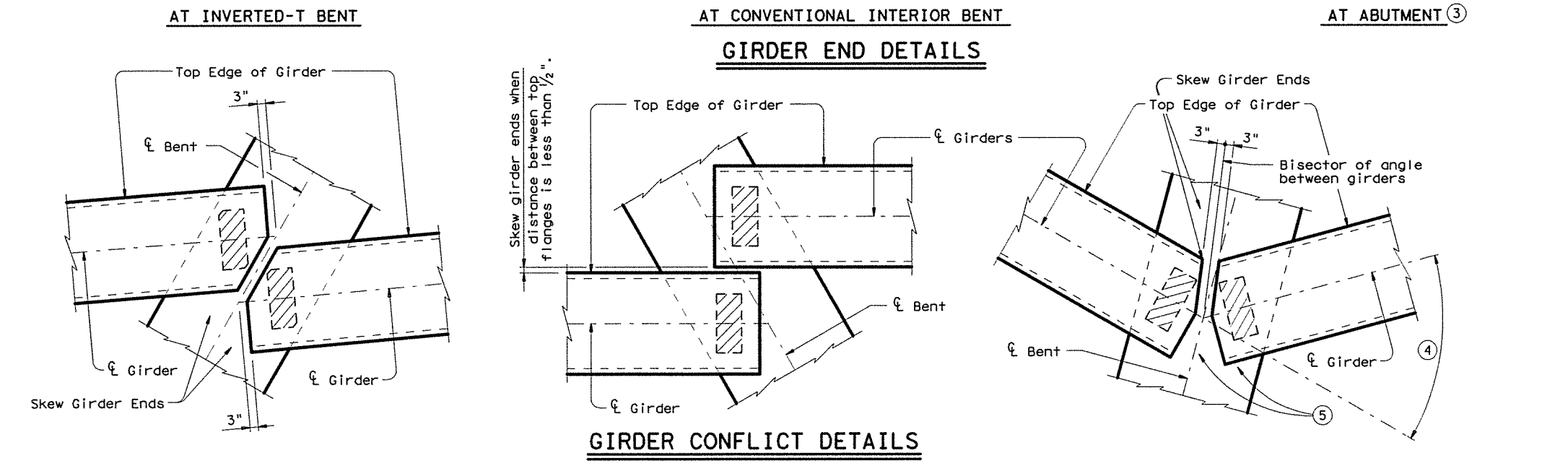
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- ① Dowel at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details.
- ② For purposes of computing Bearing Seat Elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.
- ③ For Transition Bents with backwall, girder and elastomeric bearings must receive the same treatment as shown for Abutments.
- ④ When angle exceeds 0°, one or both girders ends must be skewed to maintain the clearance between girder ends as shown in view.
- ⑤ See Elastomeric Bearing Data Table for Bearing size. Girder end skew angles in Table not applicable for this situation. Table reflects girder conflicts of this type on radial bents only.



**GENERAL NOTES:**  
 These details accommodate skew angles up to 60°. Shop drawings for approval are required. A bearing layout which identifies location and orientation of all bearings must be developed by the bearing fabricator. Permanently mark each bearing in accordance with the bearing layout. A copy of the bearing layout is to be provided to the Engineer. Cost of furnishing and installing elastomeric bearings, including beveled and embedded steel plates, must be included in unit price bid for "Prestressed Concrete Girders".



HL93 LOADING SHEET 1 OF 3

Texas Department of Transportation  
 Bridge Division

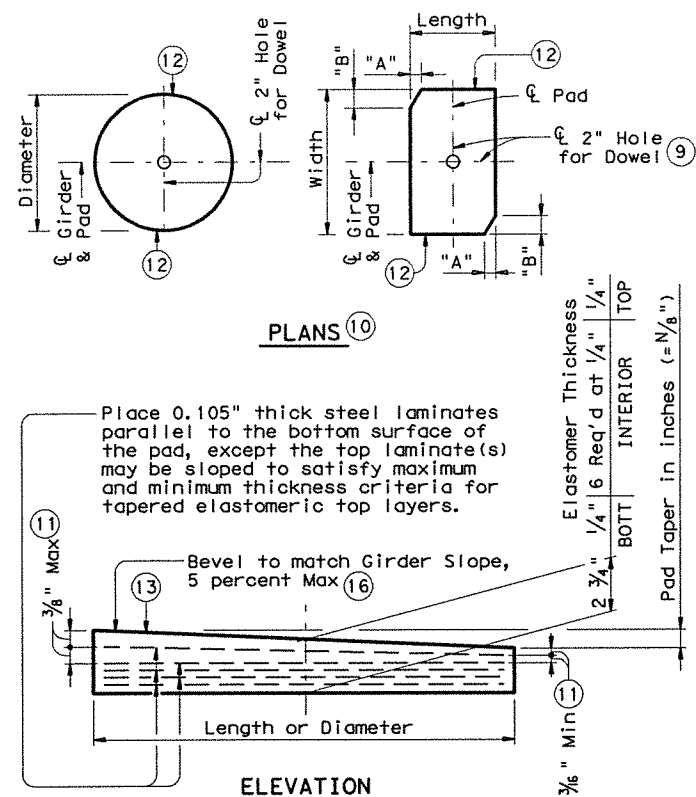
**ELASTOMERIC BEARING AND GIRDER END DETAILS**  
 PRESTR CONCRETE I-GIRDERS

**IGEB**

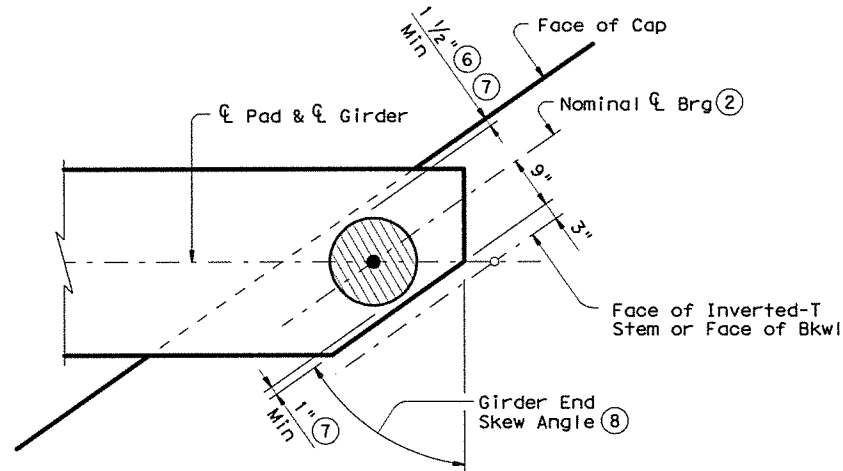
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REVISIONS			31	
12/10: Added Sale Plate Details.	COUNTY	CONTROL SECT	JOB	HIGHWAY
	BLANCO			CR 410

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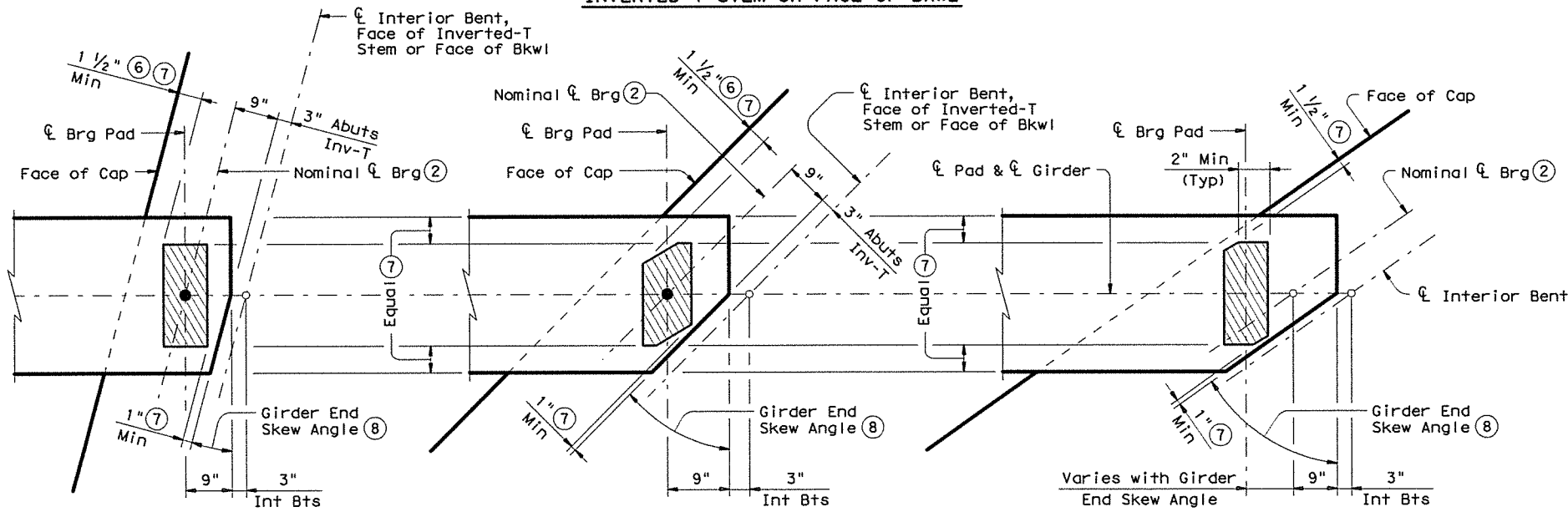
LEVELS DISPLAYED  
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**LAMINATED ELASTOMERIC BEARING DETAILS**



**ROUND BEARINGS FOR SKEWED GIRDER ENDS AT FACE OF INVERTED-T STEM OR FACE OF BKWL**



**SKEWED GIRDER ENDS AT INT BENTS, FACE OF INVERTED-T STEM OR FACE OF BKWL**

**SKEWED GIRDER ENDS AT CONVENTIONAL INTERIOR BENTS**  
(No Girder Dowels)

**ELASTOMERIC BEARING PLACEMENT DIAGRAMS**

**TABLE OF MINIMUM SUBSTRUCTURE DIMENSIONS**

Girder Type	Abutments	Int Bents	Inv-T Bents
	Face of Bkwl to Face of Cap	Overall Cap Width	Corbel Width
Tx28 thru Tx54	1'-9"	3'-6"	1'-10 1/2"
Tx62 & Tx70	2'-0"	4'-0"	2'-1 1/2"

**ELASTOMERIC BEARING DATA TABLE**

Bent Type	Girder Type	Bearing Type	Girder End Skew Angle Range	Pad Size Lgth x Wdth	Pad Clip Dimensions		
					"A"	"B"	
ABUTMENTS, INVERTED-T AND TRANSITION BENTS WITH BACKWALLS	Tx28, Tx34, Tx40, Tx46 & Tx54	G-1-"N"	0° thru 21°	8" x 21"	---	---	
		G-2-"N"	21° thru 30°	8" x 21"	1 1/2"	2 1/2"	
		G-3-"N"	30° thru 45°	9" x 21"	4 1/2"	4 1/2"	
		G-4-"N"	45° thru 60°	15" Dia	---	---	
	Tx62 & Tx70	G-5-"N"	0° thru 21°	9" x 21"	---	---	
		G-6-"N"	21° thru 30°	9" x 21"	1 1/2"	2 1/2"	
		G-7-"N"	30° thru 45°	10" x 21"	4 1/2"	4 1/2"	
		G-8-"N"	45° thru 60°	10" x 21"	7 1/4"	4 1/4"	
CONVENTIONAL INTERIOR BENTS	Tx28, Tx34, Tx40, Tx46 & Tx54	---	---	---	---	---	
		G-1-"N"	0° thru 60°	8" x 21"	---	---	
CONVENTIONAL INTERIOR BENTS WITH SKEWED GIRDER ENDS (GIRDER CONFLICTS)	Tx28, Tx34, Tx40, Tx46 & Tx54	G-1-"N"	0° thru 18°	8" x 21"	---	---	
		G-2-"N"	18° thru 30°	8" x 21"	1 1/2"	2 1/2"	
		G-9-"N"	30° thru 45°	8" x 21"	3"	3"	
		G-10-"N"	45° thru 60°	9" x 21"	6"	3 1/2"	
		Tx62 & Tx70	G-5-"N"	0° thru 18°	9" x 21"	---	---
			G-11-"N"	18° thru 30°	9" x 21"	---	---
		G-12-"N"	30° thru 45°	9" x 21"	1 1/2"	1 1/2"	
			45° thru 60°	9" x 21"	3"	1 3/4"	

- ② For purposes of computing Bearing Seat Elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.
- ③ 3" for Inverted-T.
- ⑦ Factors controlling laminated bearing placement if no dowel is present. Place Centerline Pad as near Nominal Centerline Brg as possible between limits shown.
- ⑧ Girder end skew angle is equal to 90° minus the girder angle except at some conflicting girders.
- ⑨ Provide 2" Dia Hole only at locations required. See substructure details for location.
- ⑩ See Elastomeric Bearing Data Table for dimensions.
- ⑪ Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.
- ⑫ Locate Permanent Mark here.
- ⑬ BEARING TYPE must be indicated on all pads. For tapered pads, BEARING TYPE must be located on the high side. The Fabricator must include the value of "N" (amount of taper in 1/8" increments) in this mark.  
 Examples: N=0, (for 0" taper)  
 N=1, (for 1/8" taper)  
 N=2, (for 1/4" taper)  
 (etc.)  
 Fabricated pad top surface slope must not vary from plan girder slope by more than (0.0625 / (Length or Dia)) IN/IN.
- ⑭ The use of Polyisoprene (natural rubber), for the manufacture of bearing pads, is not permitted.
- ⑮ Substructure dimensions must satisfy the minimums provided to accommodate the elastomeric bearings shown on this standard.
- ⑯ See sheet 3 of 3 for beveled plate use when slopes exceed 5 percent.
- ⑰ If girder end is skewed for a girder conflict at an interior bent and a beveled sole plate is required, use bearing type for abutments at this location. Location of bearing centerline is to be set as for abutments in this case.

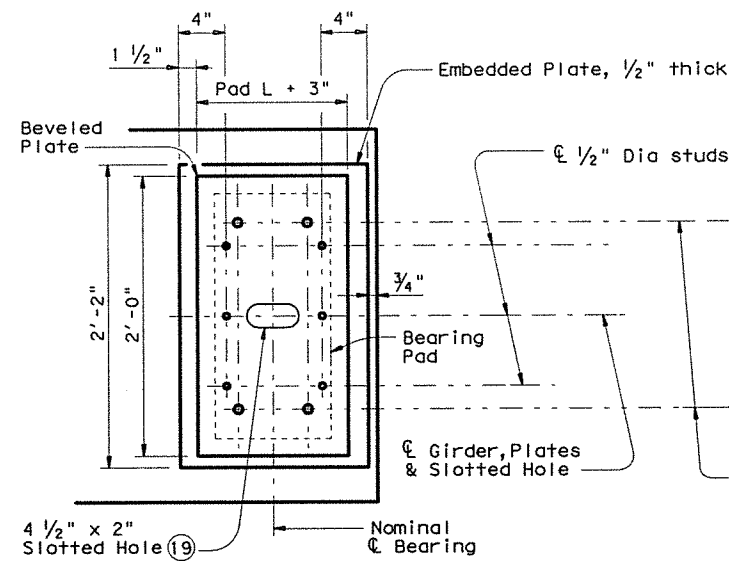
**ELASTOMERIC BEARING AND GIRDER END DETAILS PRESTR CONCRETE I-GIRDERS**

**IGEB**

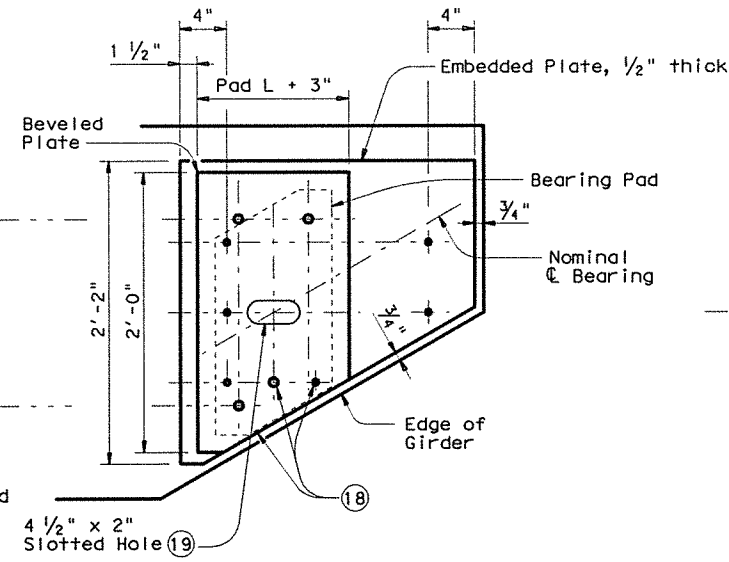
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REVISIONS				
12/10: Added Sole Plate Details.	COUNTY	CONTROL SECT	JOB	HIGHWAY
	BLANCO			CR 410



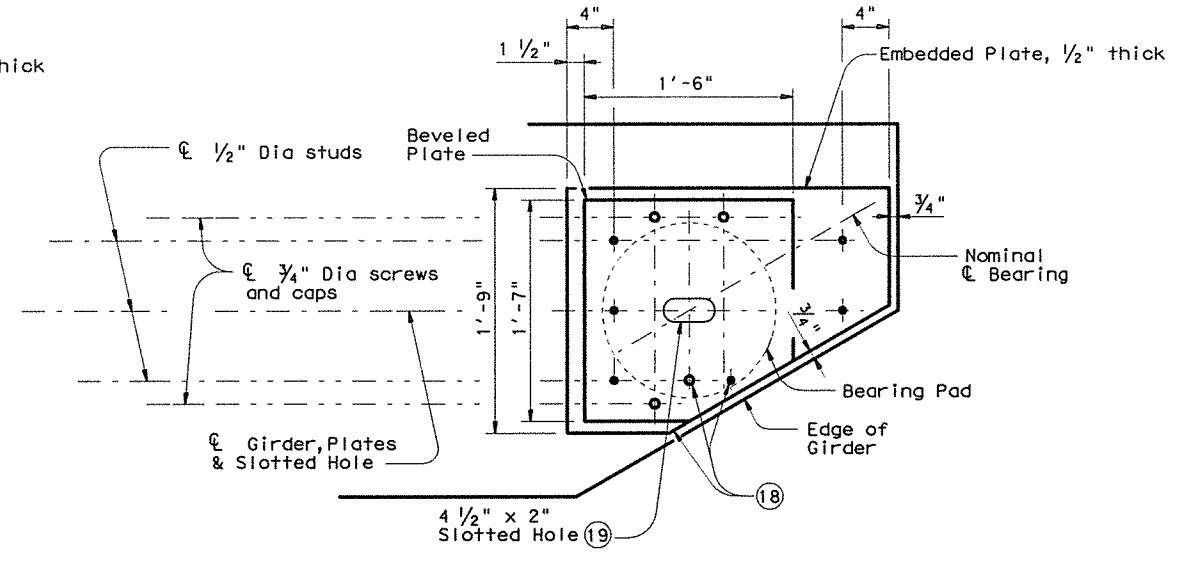
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**NORMAL GIRDER END**  
RECTANGULAR BEARING PAD

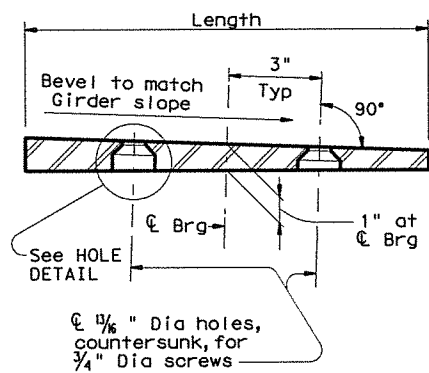


**SKewed GIRDER END**  
CLIPPED RECTANGULAR BEARING PAD

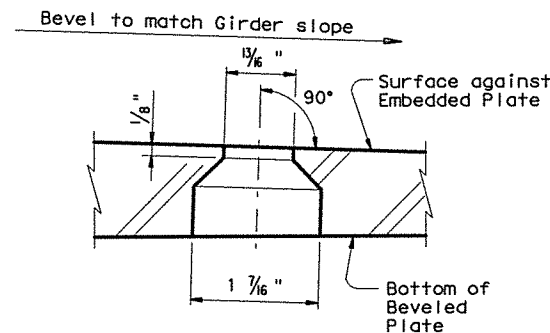


**SKewed GIRDER END**  
15" DIA BEARING PAD

**PLAN VIEW OF SOLE PLATE DETAILS**

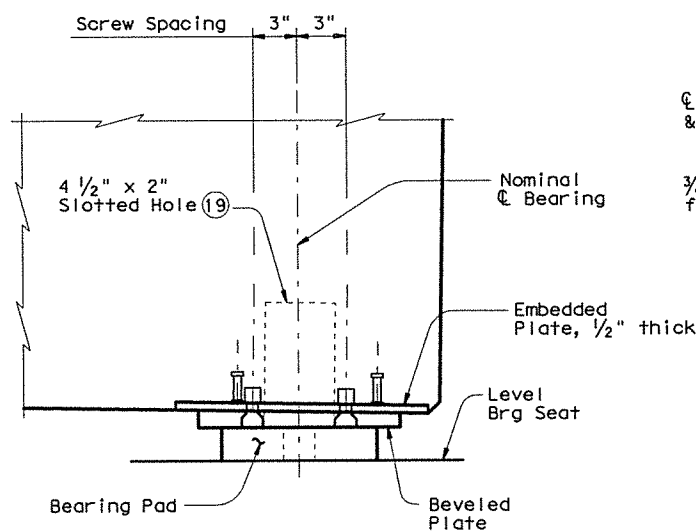


**SECTION THRU BEVELED PLATE**

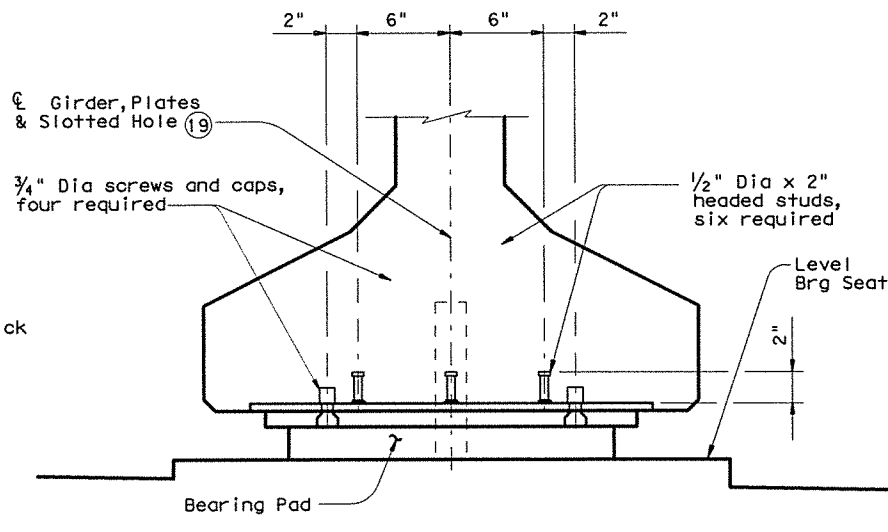


**HOLE DETAIL**

- ⑱ Cut Beveled and Embedded Plates to match girder end skew. Adjust location of screw and stud as shown when necessary.
- ⑲ Slotted hole is required at doweled girder end locations.



**SIDE ELEVATION**



**END ELEVATION**

**GIRDER DETAILS**

**SOLE PLATE NOTES:**

Provide constant thickness elastomeric bearings with beveled and embedded steel sole plates in accordance with these details when the girder slope exceeds 5 percent or if otherwise required in the plans. Provide for all girders in the span.

On the shop drawings, dimension sole plates to the nearest 1/16" based on required thickness at centerline of bearing and slope of girder. Thickness tolerance variation from the approved shop drawings is 1/16" +/-, except variation from a plane parallel to the theoretical top surface can not exceed 1/16" total. Bearing surface tolerances listed in Item 424 apply to embedded and beveled plates.

Steel plate must conform to ASTM A 36, A 572 Gr 50, or A 709 Gr 36 or Gr 50. Hot dip galvanize both the embedded plate and beveled sole plate after fabrication. Seal weld caps to embedded plate before galvanizing.

When determining if relocation of screw holes and studs are necessary for skewed girder ends, minimum clearance from screw or stud centerline to plate edge is 1.25".

Tap threads in the embedded plate only. Drill and tap prior to galvanizing.

3/4" Dia screws must be electroplated, socket flat head countersunk cap screws conforming to ASTM F 835. Electroplating must conform to ASTM B 633, SC 2, Type I. Provide screws long enough to maintain a 3/4" minimum embedment into the embedded plate and galvanized cap. Provide galvanized steel caps (16 ga Min) with a nominal 1" inside diameter and deep enough to accommodate the screws, but not less than 1/2" deep or deeper than 1".

Install beveled sole plates prior to shipping girders. Installed screw heads must not protrude below the bottom of the beveled plate.

**ELASTOMERIC BEARING  
AND GIRDER END DETAILS  
PRESTR CONCRETE I-GIRDERS**

**IGEB**

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REVISIONS				
12/10: Added Sole Plate Details.	COUNTY	CONTROL SECT	JOB	HIGHWAY
	BLANCO			CR 410

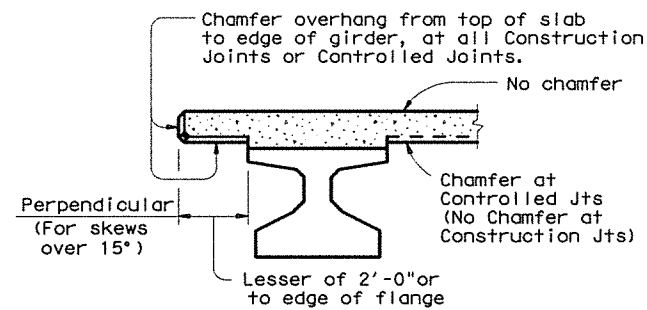
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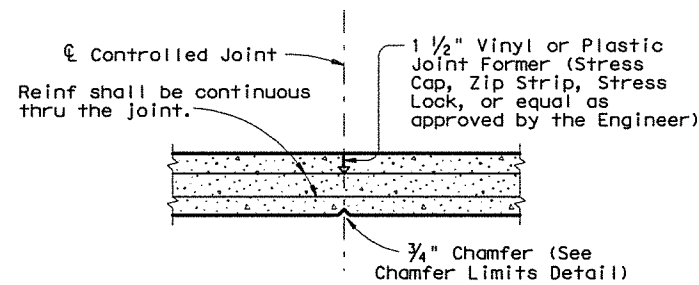
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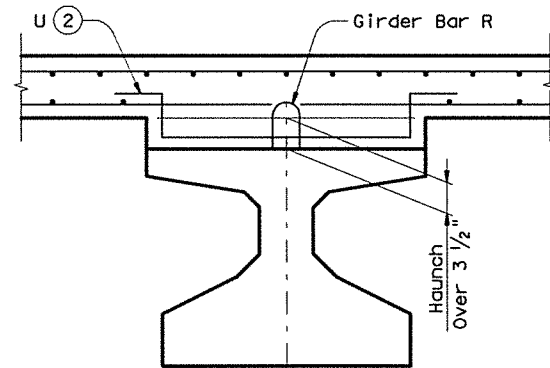


**CHAMFER LIMITS DETAIL ①**

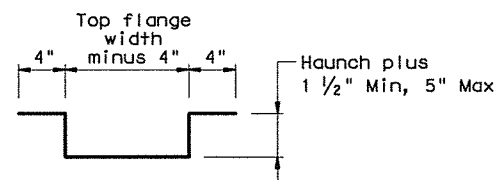


**CONTROLLED JOINT DETAIL**

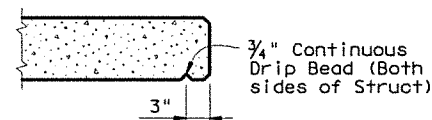
(Saw-cutting will not be allowed)



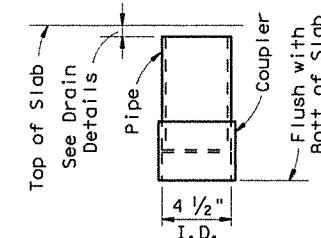
**HAUNCH REINFORCING DETAIL**



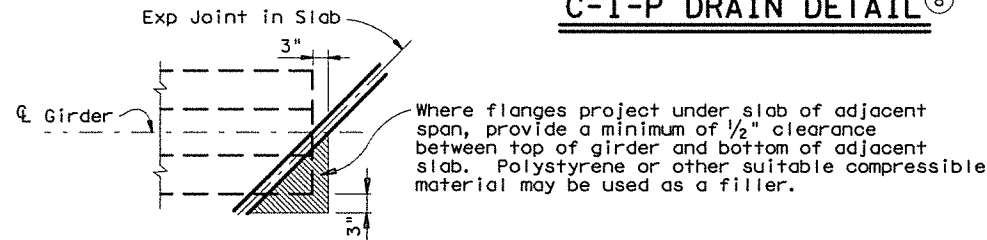
**BARS U (#4)**



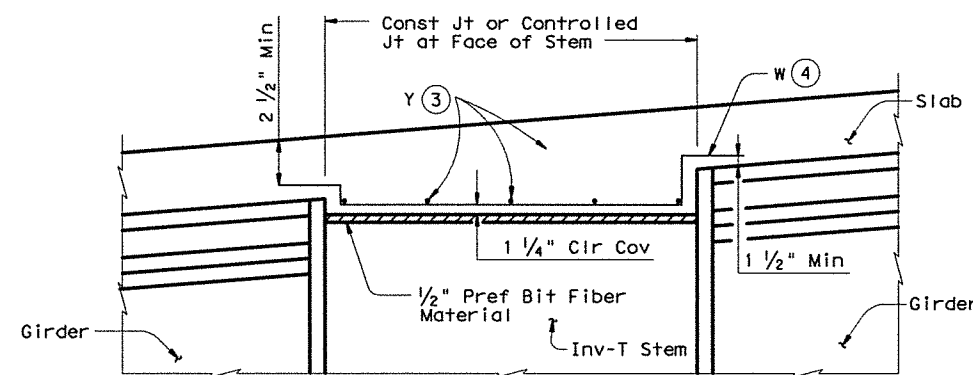
**DRIP BEAD DETAIL**



**C-I-P DRAIN DETAIL ⑧**

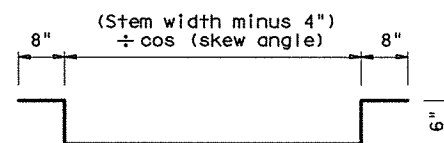


**TREATMENT AT GIRDER END FOR SKEWED SPANS**

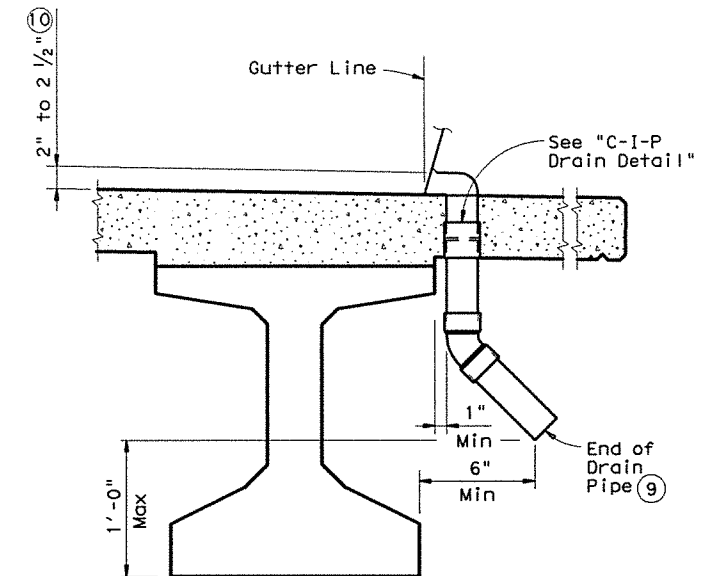


**REINFORCEMENT OVER INV-T BENTS**

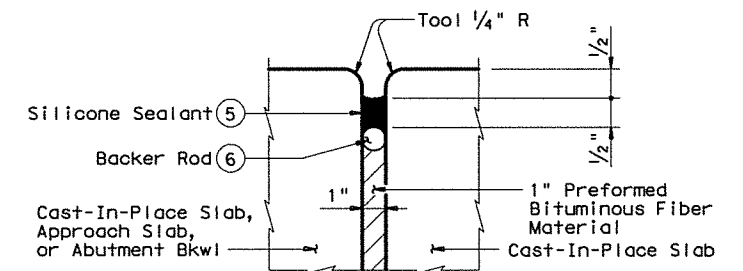
Slab reinforcement not shown for clarity.



**BARS W (#4)**



**DRAIN DETAIL ⑪**



**TYPE A JOINT DETAIL ⑦**

**GENERAL NOTES:**

Designed in accordance with AASHTO LRFD Specifications.  
 All items (reinforcing steel, drains, joint formers, etc.) shown on this sheet shall be considered subsidiary to other bid items.

**DECK FORMWORK NOTES:**

Overhang bracket hangers are limited to a safe working load of 3,600 lbs, applied to and along the axis of a coil rod at 45 degrees from vertical, regardless of higher loads permitted by hanger manufacturers. Do not place a hanger less than 12" from girder end. Space hangers accordingly.

- ① See Span details for type of joint and joint locations.
- ② Space Bars U with Girder Bars R in all areas where measured haunch exceeds 3 1/2".
- ③ Space Bars Y (#4) at 12" Max. Use 2" end cover. Number of Bars Y must satisfy spacing limit. Place parallel to bent.
- ④ Space Bars W at 12" Max (3" from end of cap). Tilt if necessary to maintain cover requirements. Place parallel to longitudinal slab reinforcement.
- ⑤ Class 7 silicone sealant that conforms to DMS-6310. Install when ambient temperature is between 55°F and 85°F and rising. Engineer to determine allowable hours for sealant application.
- ⑥ 1 1/4" backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.

- ⑦ The maximum distance between Type A expansion joints is 100'. See Bridge Layout for location of joints. Type A joints will not be paid for directly, but shall be considered subsidiary to Item 420, "Concrete Structures".
- ⑧ Roughen outside of PVC with coarse rasp or equal to ensure bond with cast-in-place concrete.
- ⑨ No water shall be discharged onto girders.
- ⑩ Drain Entrance formed in Rail or Sidewalk.
- ⑪ All drain pipe and fittings to be 4" diameter (Sch 40) PVC. See Item 481 "PVC Pipe for Drains" for pipe, connections and solvent welding. Bend reinforcing steel to clear PVC 1". Drain length and location shall be as directed by the Engineer. No drains shall be permitted over roadways or railways, or within 10'-0" of Bent Caps. Degrease outside of exposed PVC, apply acrylic water base primer, then coat with same surface finishing material as used for outside girder face. Variations of the above designs, as required for the type of rail used and its location on the structure, shall be installed with the approval and direction of the Engineer.

Texas Department of Transportation  
 Bridge Division

**MISCELLANEOUS  
 SLAB DETAILS  
 PRESTR CONCRETE I-GIRDERS**

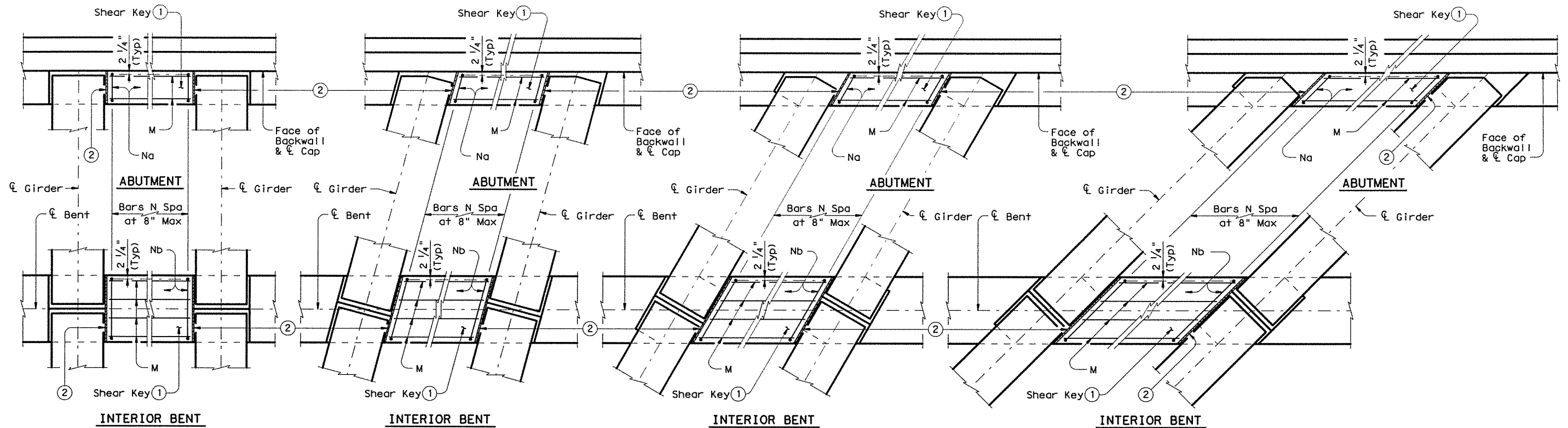
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REVISIONS			34	
02/09 Deck Formwork Notes	COUNTY	CONTROL SECT	JOB	HIGHWAY
	BLANCO			CR 410

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**PARTIAL PLANS WITH NO SKEW**

**PARTIAL PLANS WITH 15° SKEW**

**PARTIAL PLANS WITH 30° SKEW**

**PARTIAL PLANS WITH 45° SKEW**

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

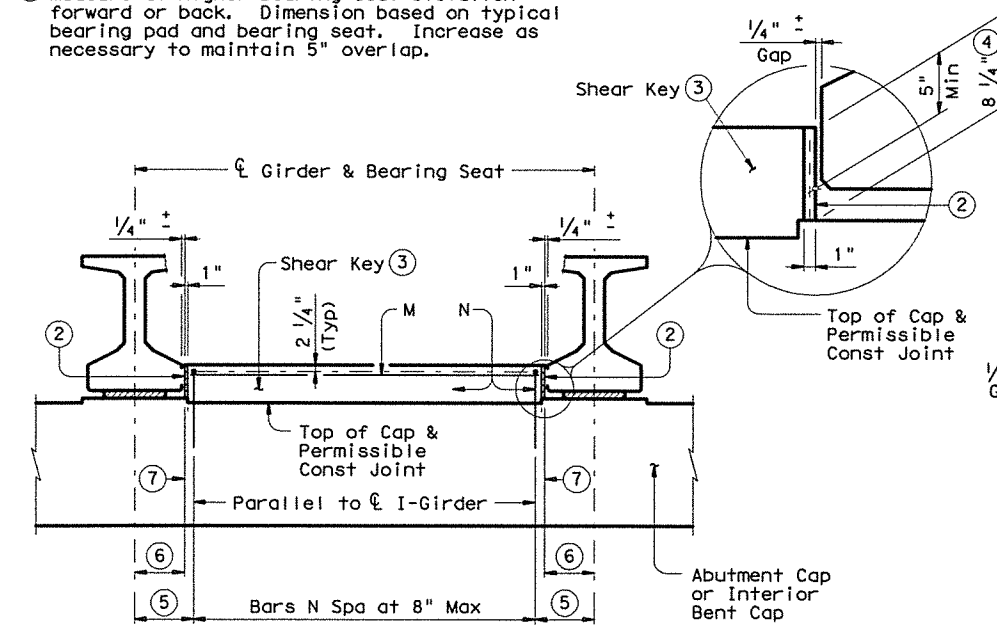
Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

- ① Place shear keys on the upstream side of structure between outside girder and next adjacent girder, unless shown otherwise on plans.
- ② UHMW Polyethylene Wear Pad. (Typ)
- ③ Leave a 1/4" gap plus or minus between girder and face of wear pad. Cast wear pad with shear key, smooth side facing girder. Care must be taken to keep concrete from flowing under girder. Slope top of shear keys in accordance with Item 420.4, "Treatment and Finishing of Horizontal Surfaces."
- ④ Measure at higher bearing seat elevation forward or back. Dimension based on typical bearing pad and bearing seat. Increase as necessary to maintain 5" overlap.

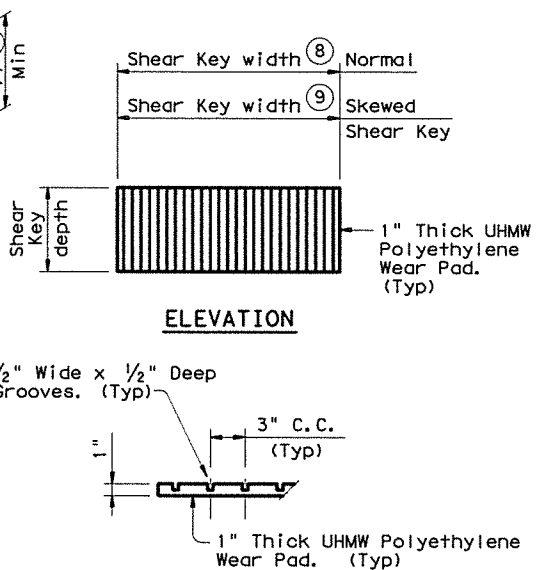
- ⑤ With No Skew =  $1'-8\frac{1}{4}"$ , measured along  $\ell$  Cap. With Skew =  $1'-8\frac{1}{4}" \div \cos \text{Skew}$ , measured along  $\ell$  Cap.
- ⑥ With No Skew =  $1'-4\frac{1}{4}"$ , measured along  $\ell$  Cap. With Skew =  $1'-4\frac{1}{4}" \div \cos \text{Skew}$ , measured along  $\ell$  Cap.
- ⑦ Face of UHMW Polyethylene Wear Pad. Smooth side of polyethylene wear pad facing girder.

- ⑧ Abutments =  $\frac{1}{2}$  Cap width. Interior Bents = Cap width.
- ⑨ Abutments =  $\frac{1}{2}$  Cap width  $\div \cos \text{Skew}$ . Interior Bents = Cap width  $\div \cos \text{Skew}$ .



**PARTIAL ELEVATION OF ABUTMENT OR INTERIOR BENT CAP**

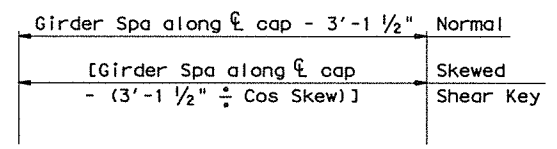
Showing shear key with girder Type Tx46. Other I-Girder types similar.



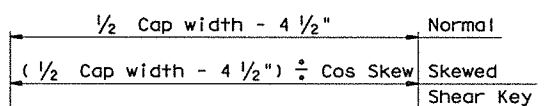
**ELEVATION**

**PART SECTION**

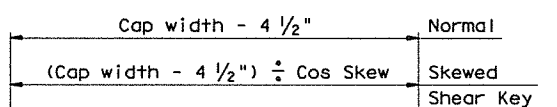
**ULTRA HIGH MOLECULAR WEIGHT (UHMW) POLYETHYLENE WEAR PAD DETAILS**



**BARS M (#5)**



**BARS Na (#5) (For Abutments)**



**BARS Nb (#5) (For Interior Bents)**

**CONSTRUCTION NOTES:**  
 Use Class "C" concrete. Use Class "C" (HPC) if shown elsewhere on the plans.  
 Provide concrete with strength  $f'c = 3,600$  psi.  
 Provide Grade 60 reinforcing steel.  
 Provide epoxy coated reinforcing steel for shear key if Abutment or Interior Bent reinforcing steel is epoxy coated.  
 Provide Ultra High Molecular Weight Polyethylene wear pads in accordance with ASTM D6712.

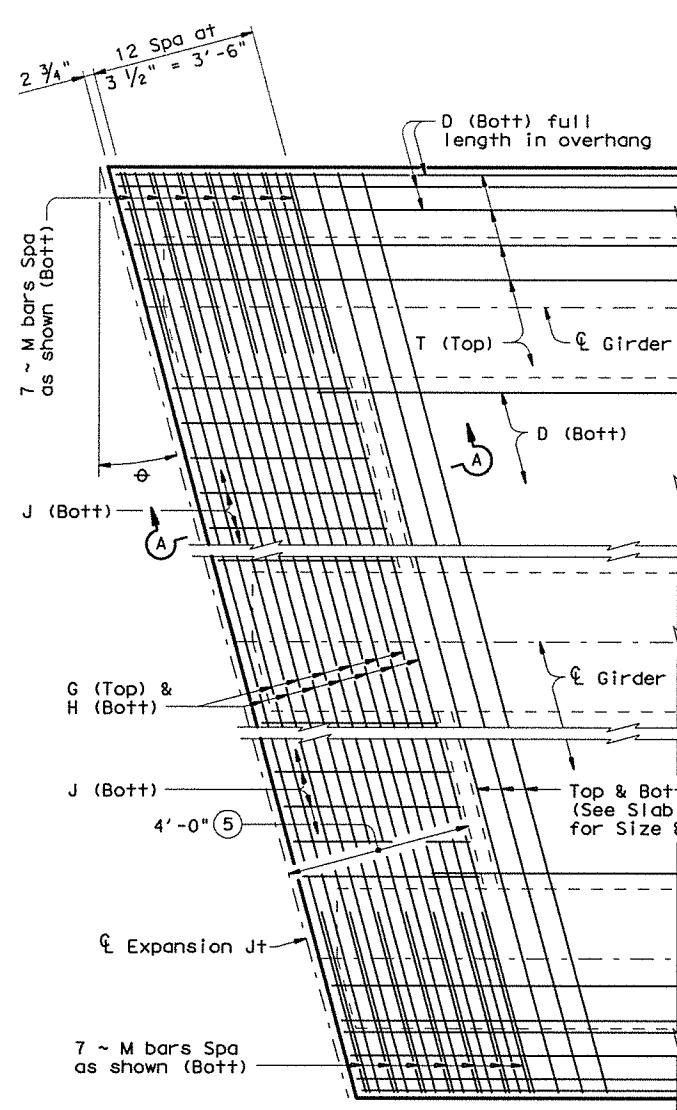
**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Specifications.  
 Details showing skew are drawn showing right forward skew. See Bridge Layout for actual skew direction.  
 These details are limited to bridges skewed 45 degrees and less. This standard is only applicable for I-Girders.  
 Modify details for bearing conditions, and girder spacing not shown on this standard. Details do not account for sole plate or pedestal bearing seat.  
 Include shear key concrete in Abutment or Bent concrete for payment.  
 UHMW polyethylene wear pads are subsidiary to Class "C" concrete.

Texas Department of Transportation  
 Bridge Division  
**SHEAR KEY DETAILS**  
**PRESTR CONCRETE I-GIRDERS**  
  
**IGSK**

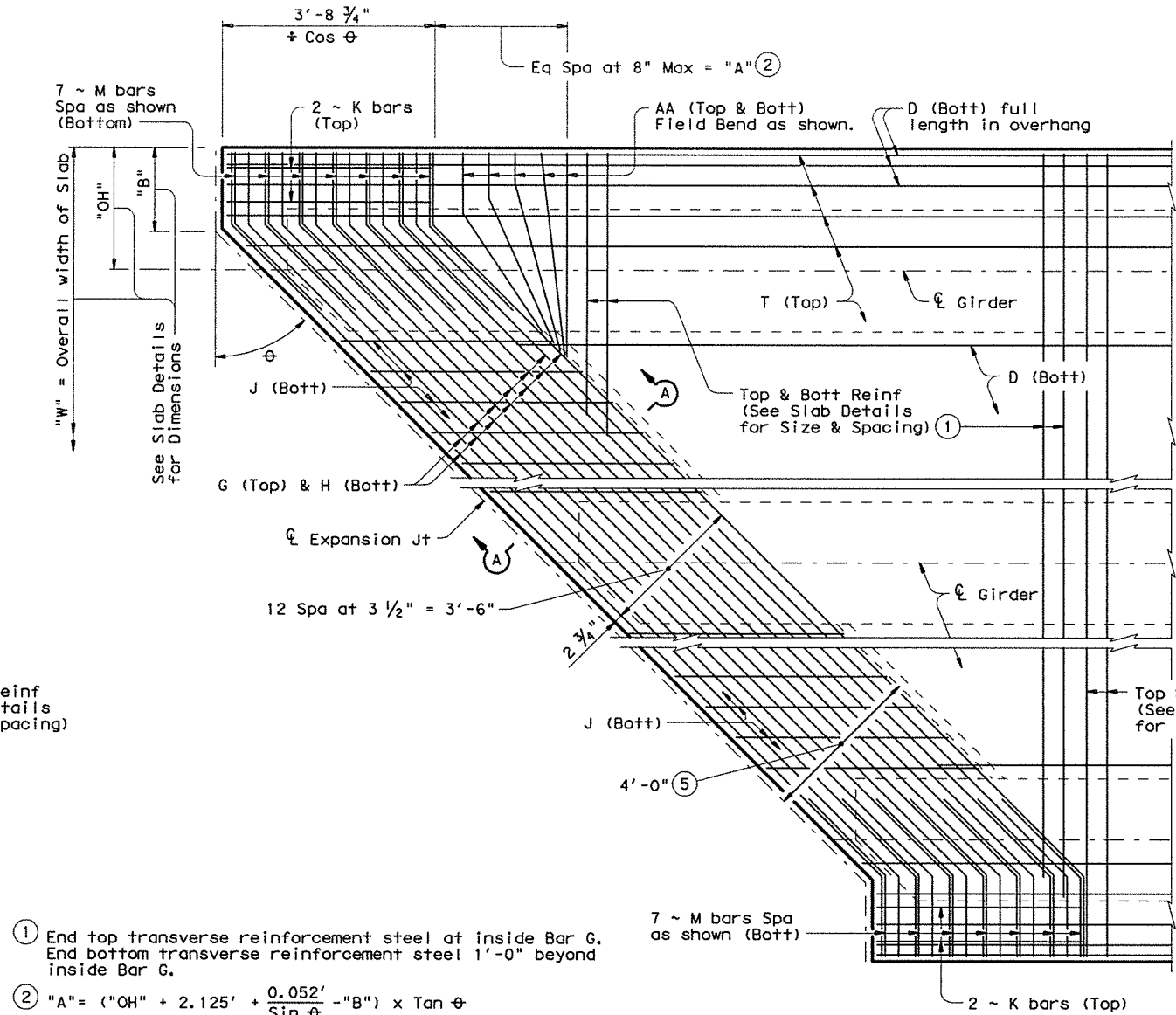
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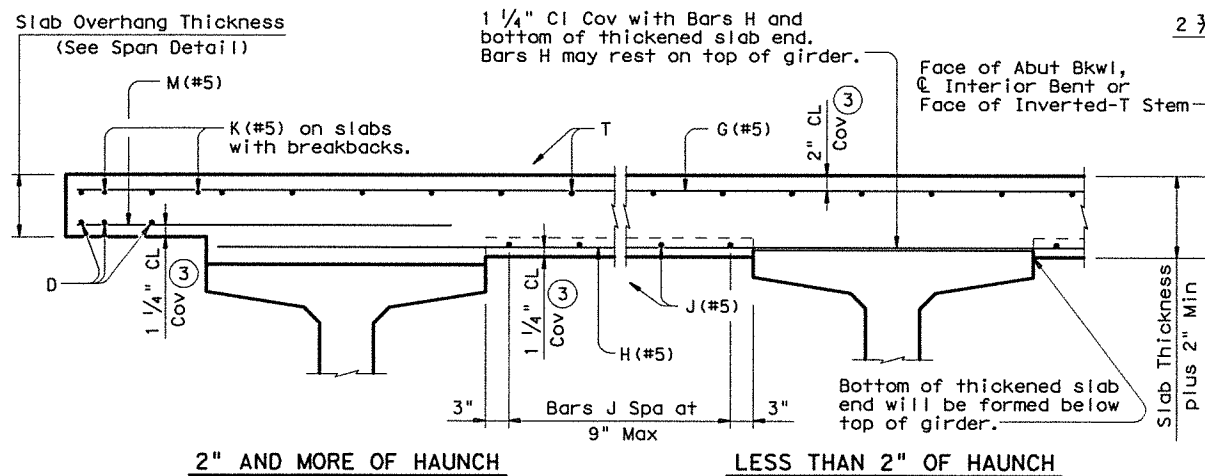


**PARTIAL PLAN FOR SLABS WITHOUT BREAKBACK**

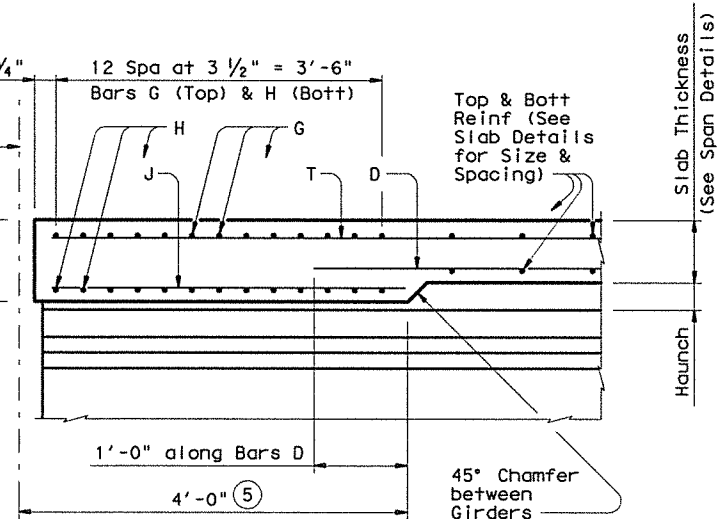


**PARTIAL PLAN FOR SLABS WITH BREAKBACK**

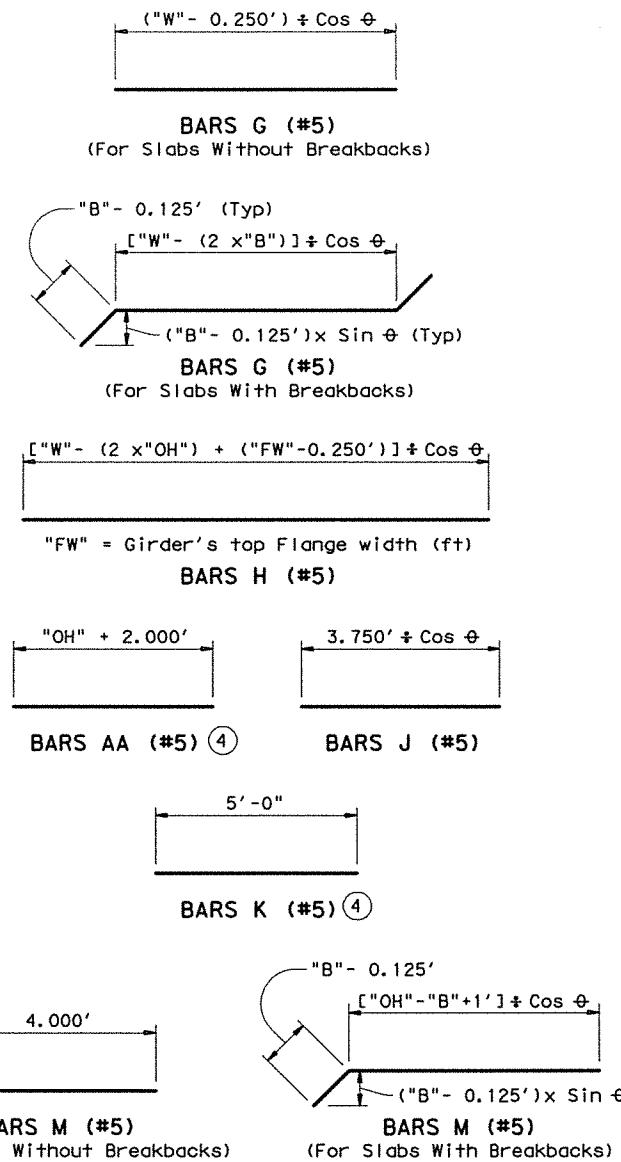
- ① End top transverse reinforcement steel at inside Bar G. End bottom transverse reinforcement steel 1'-0" beyond inside Bar G.
- ②  $A = ("OH" + 2.125' + \frac{0.052'}{\sin \theta} - "B") \times \tan \theta$
- ③ Clear Cover will be as shown unless otherwise shown on Span Details.
- ④ Only required on slabs with breakbacks.
- ⑤ Thickened Slab End dimensioned perpendicular to Face of Bkwl, Centerline Interior Bent or Face of Inverted-T Stem.



**TYPICAL TRANSVERSE SECTION**  
 (Showing Prestressed Conc I-Girders at G Brg)



**SECTION A-A**  
 (Showing with 2" and more of Haunch)



**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Specifications.  
 These details are restricted to Prestressed Concrete I-Girder Spans.  
 These details are to be used in conjunction with the Span Details and Standard PCP (if prestressed concrete panels are used).  
 All reinforcing bars must be Grade 60 steel.  
 If slab reinforcing steel is shown on the Slab Details to be epoxy coated, then Bars AA, G, K, H, J and M must be epoxy coated. Bar laps, where required, will be as follows:  
 Uncoated ~ #4 = 1'-5"  
 ~ #5 = 1'-9"  
 Epoxy Coated ~ #4 = 2'-1"  
 ~ #5 = 2'-7"

HL93 LOADING

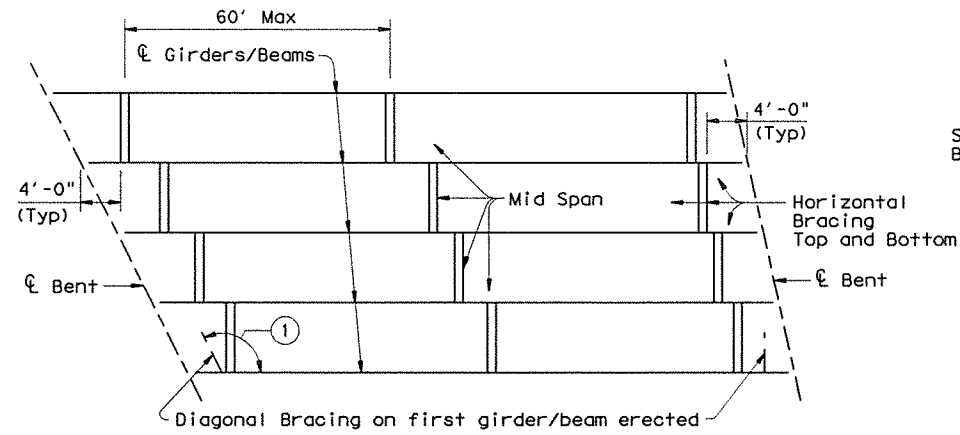
Texas Department of Transportation  
 Bridge Division

**THICKENED SLAB END DETAILS**  
**PRESTRESSED CONCRETE I-GIRDER SPANS**

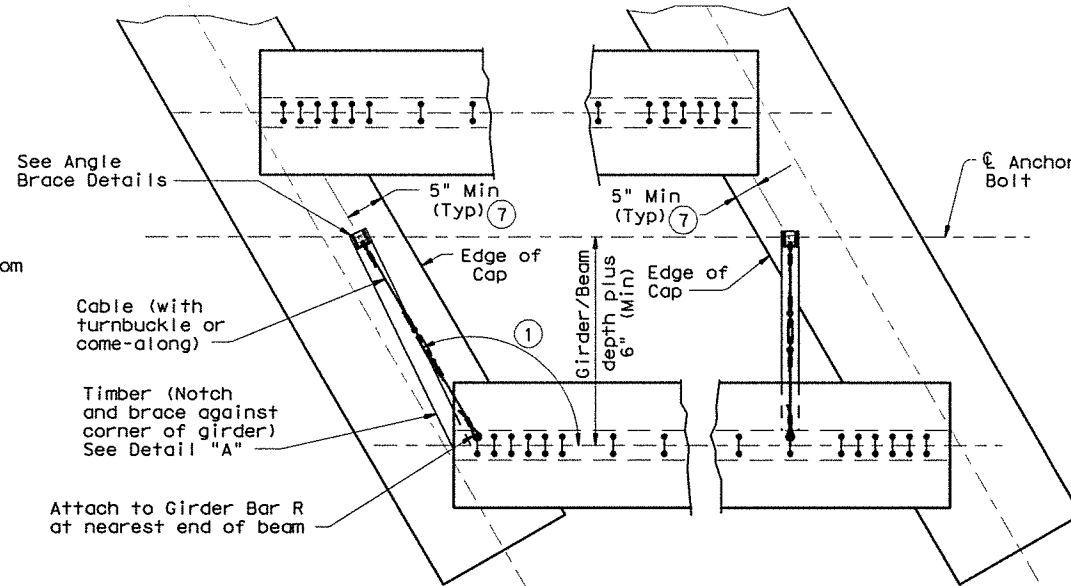
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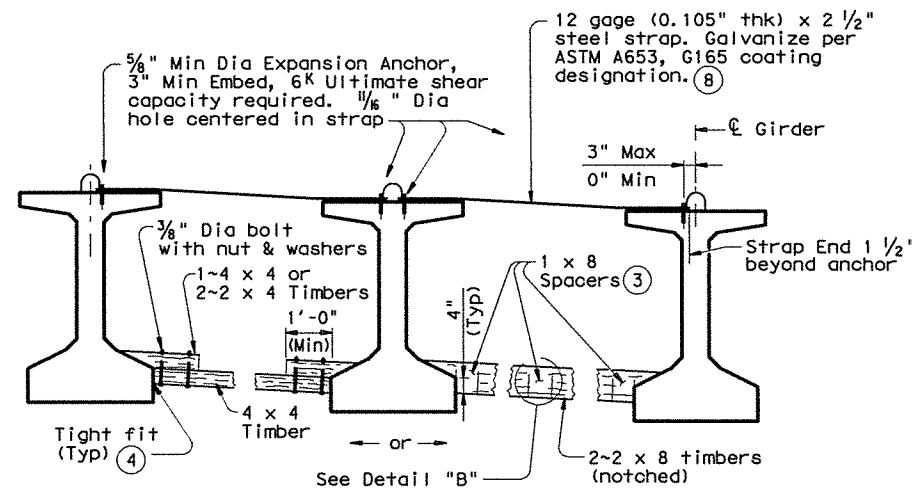
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**ERECTION BRACING**

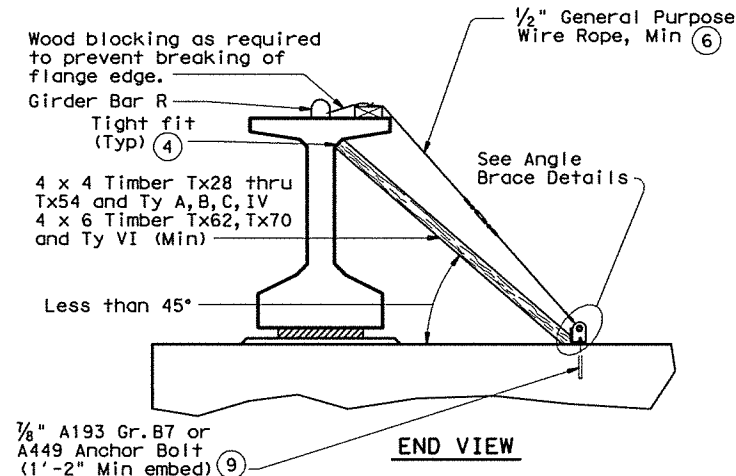


**PLAN**



**FOR ERECTION BRACING, OPTION 1**

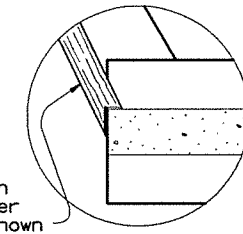
(This option is not allowed when slab is formed with PMDF or plywood.)



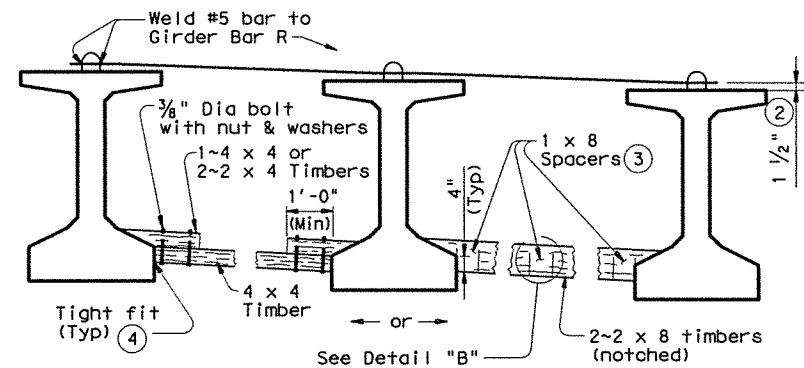
**END VIEW**

**DIAGONAL BRACING DETAILS**

(To be used on both ends of the first girder/beam erected in the span in each phase.)

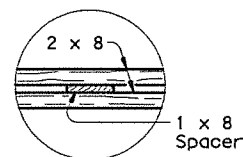


**DETAIL "A"**



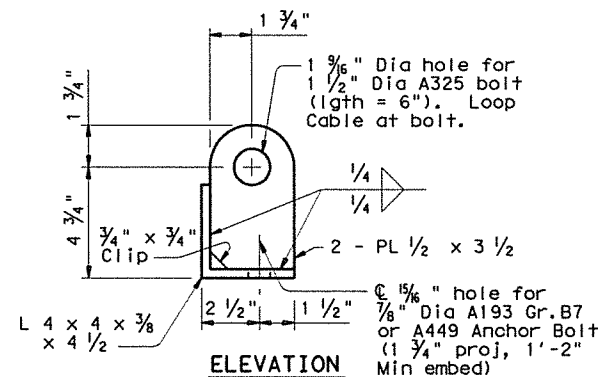
**FOR ERECTION BRACING, OPTION 2**

**HORIZONTAL BRACING DETAILS**

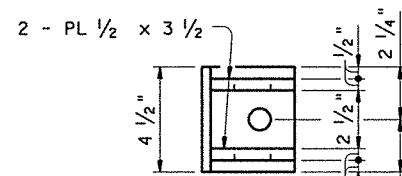


**PLAN**

**DETAIL "B"**



**ELEVATION**



**PLAN**

**ANGLE BRACE DETAILS**

**HAULING & ERECTION:**

The Contractor's attention is directed to the possible lateral instability of prestressed concrete girders and beams over 130' long, especially during hauling and erection. The use of the following methods to improve stability is encouraged: Locate lifting devices at the maximum practical distance from girder ends; use external lateral stiffening devices during hauling and erection; lift with vertical lines using two machines; and take care in handling to minimize inertial and impact forces.

**ERECTION BRACING:**

Erection bracing details shown are considered the minimum for fulfilling the bracing requirements of Item 425.

Required erection bracing must be placed immediately after erection of each girder and remain in place until additional bracing as required for slab placement is in place. This standard is needed in all cases to meet requirements for Slab Placement Bracing.

**PHASED CONSTRUCTION:**

Place erection and slab placement bracing for all girders in a phase as shown in these details. For phases after first, also place erection and slab placement bracing between outer girder of completed phase and adjacent girder of current phase. When the phase construction joint is between girders, top bracing can be omitted.

- ① If angle shown exceeds 120 degrees, move diagonal brace to other side of girder/beam and place square to girder/beam. This may prevent exterior girder from being erected first.
- ② Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to Girder Bars R (See Sheet 2 of 2).
- ③ Clear distance between spacers must not exceed 3'. Nail together with 16d nails.
- ④ Use wedges as necessary to obtain tight fit. Nail wedges to timbers.
- ⑤ Pressure treated landscape timbers can not be used.
- ⑥ All hardware used with cable must be able to develop a minimum 25 kips breaking strength. Use thimbles at all loops in cable. Install cable clamps with saddles bearing against the live end and U-bolts bearing against the dead end.
- ⑦ It is acceptable to tie anchor bolts to cap reinforcement.
- ⑧ Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.
- ⑨ Anchor bolt may be drilled and epoxied in place. Provide 25k minimum pullout. Core drill hole.

SHEET 1 OF 2

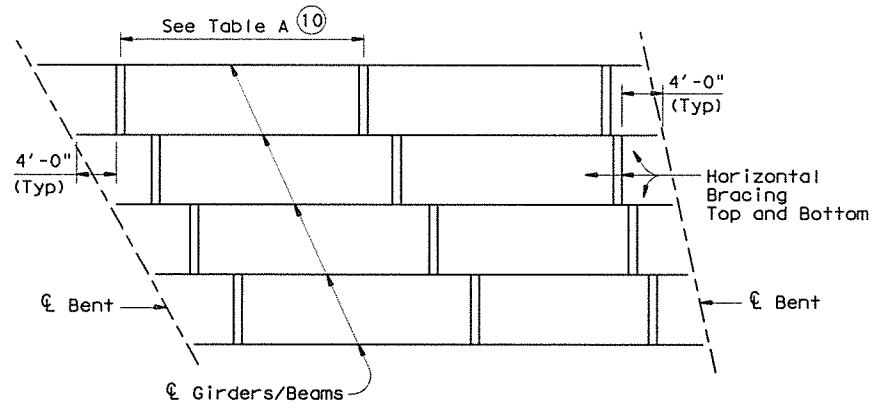
		<b>Bridge Division Standard</b>	
<b>MINIMUM ERECTION AND BRACING REQUIREMENTS PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS</b>			
<b>MEBR (C)</b>			
FILE# mebcstel.dgn	DN: TxDOT	CR: TxDOT	DW: TxDOT
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			HIGHWAY
			CR 410
DIST		COUNTY	SHEET NO.
		BLANCO	37

Revision  
5/13: Removed Cross Bracing Detail, Added Bracing Option, Revised Bracing Spacing, Added Phased Constr. Notes.

06-2007: Revised "Cross Bracing Detail", Hauling, Erection Note and added I-Girders.

DATE:  
FILE:

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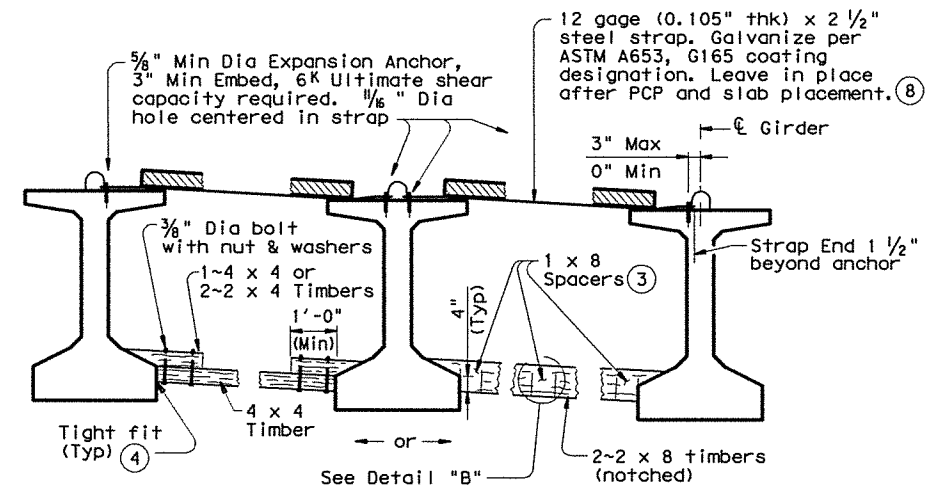


**SLAB PLACEMENT BRACING**

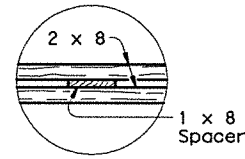
TABLE A		
OPTION 1-RIGID BRACING (STEEL STRAP)		
Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	1/4 points	1/4 points
Tx34	1/4 points	1/4 points
Tx40	1/4 points	1/8 points
Tx46	1/4 points	1/8 points
Tx54	1/4 points	1/8 points
Tx62	1/4 points	1/8 points
Tx70	1/4 points	1/8 points
A	1/8 points	1/8 points
B	1/8 points	1/8 points
C	1/8 points	1/8 points
IV	1/4 points	1/8 points
VI	1/4 points	1/8 points

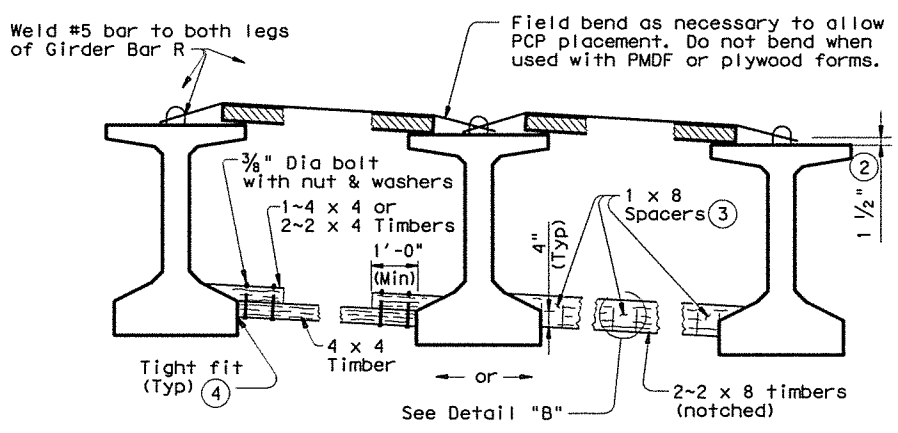
OPTION 2-FLEXIBLE BRACING (NO. 5 OVER PCP)		
Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	1/4 points	1/8 points
Tx34	1/4 points	1/8 points
Tx40	1/4 points	1/8 points
Tx46	1/4 points	1/8 points
Tx54	1/4 points	1/8 points
Tx62	1/4 points	1/8 points
Tx70	1/4 points	1/8 points
A	2.0 ft	1.5 ft
B	3.0 ft	2.0 ft
C	4.5 ft	2.0 ft
IV	1/4 points	4.0 ft
VI	1/4 points	4.0 ft



**FOR SLAB PLACEMENT BRACING, OPTION 1 - RIGID**  
(Showing slab formed with PCP. This option is not allowed when slab is formed with PMDF or plywood.)



**PLAN**  
**DETAIL "B"**



**FOR SLAB PLACEMENT BRACING, OPTION 2 - FLEXIBLE**  
(Showing slab formed with PCP.)

**HORIZONTAL BRACING DETAILS (5)**

- (2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to Girder Bars R.
- (3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.
- (4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.
- (5) Pressure treated landscape timbers can not be used.
- (8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.
- (10) Bracing spacing (1/4 and 1/8 points) measured between first and last typical brace location.
- (11) Measure slab overhang from centerline of girder or beam. When overhang varies in span, determine bracing spacing based on largest overhang.

**SLAB PLACEMENT BRACING:**

The details for slab placement bracing are considered minimum for fulfilling the requirements of Specification Items 422 and 425. Required slab placement bracing must remain in place until slab concrete has attained a compressive strength of 3000 psi.

**GENERAL NOTES:**

Bracing details for spans longer than 150' are not provided. The Contractor must submit proposed bracing details for such conditions to the Engineer for approval prior to erection. Systems equal to or better than those shown may be used provided details of such systems are submitted to and approved by the Engineer prior to erection. Use of these systems or details does not relieve the Contractor of the responsibility for the adequacy of the bracing and the safety of the structure. Removal of bracing for short periods of time to align girders and beams is permissible. All turn-buckles, come-alongs, anchors and other connections must be capable of developing the full strength of the cable shown. Furnish anchor bolts and nuts in accordance with Item 449, "Anchor Bolts".

SHEET 2 OF 2

		Bridge Division Standard	
<b>MINIMUM ERECTION AND BRACING REQUIREMENTS PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS</b>			
<b>MEBR (C)</b>			
FILE: mebcstel.dgn	DW: TxDOT	CR: TxDOT	DW: TxDOT
© TxDOT January 2005		CONT	SECT
		JOB	HIGHWAY
		DIST	COUNTY
		CR 410	
		BLANCO	
		SHEET NO. 38	

Revision 5/13: Removed Cross Bracing Detail, Added Bracing Option, Revised Bracing Spacing, Added Phased Constr. Notes.

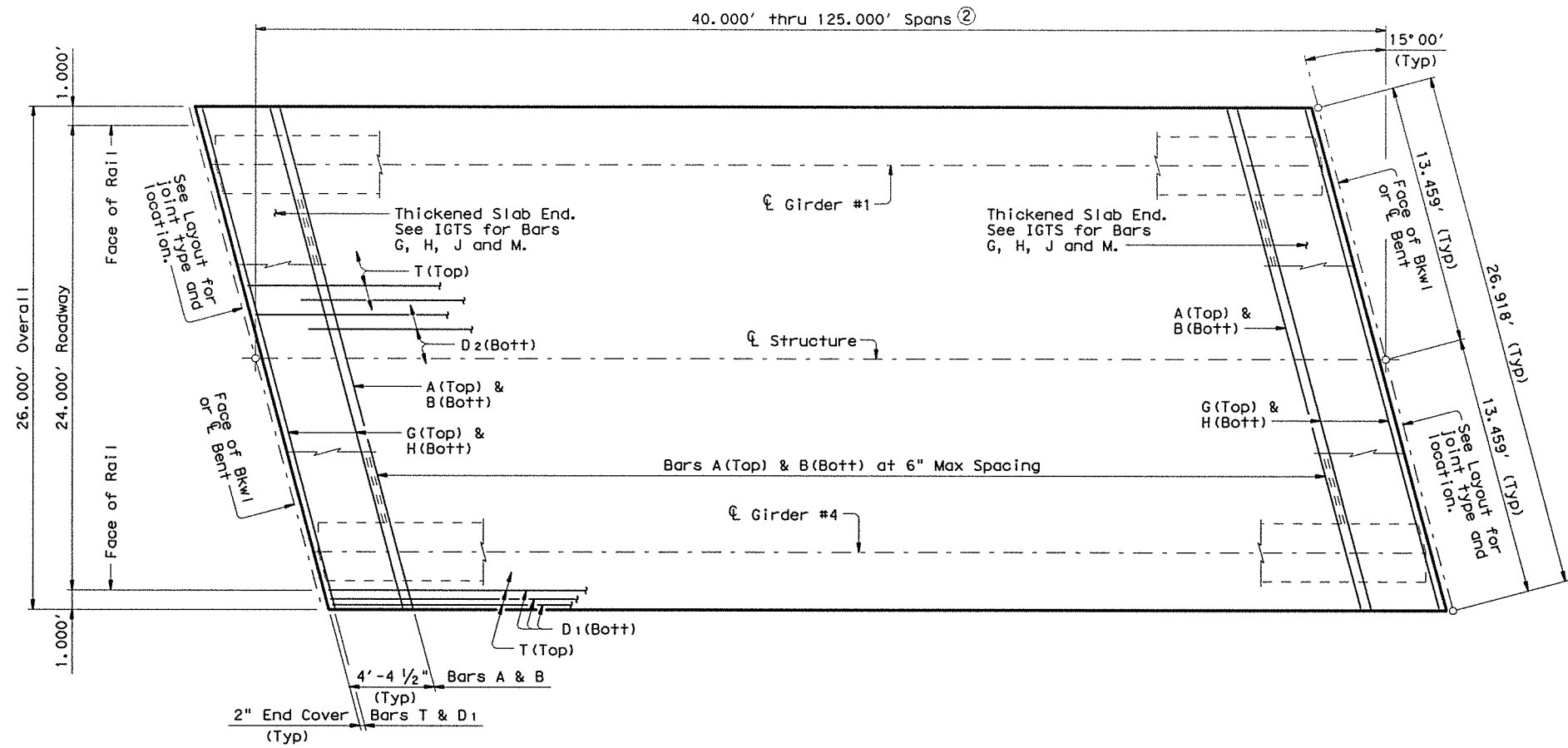
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DISCLAIMER:  
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or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

LEVELS DISPLAYED

1									
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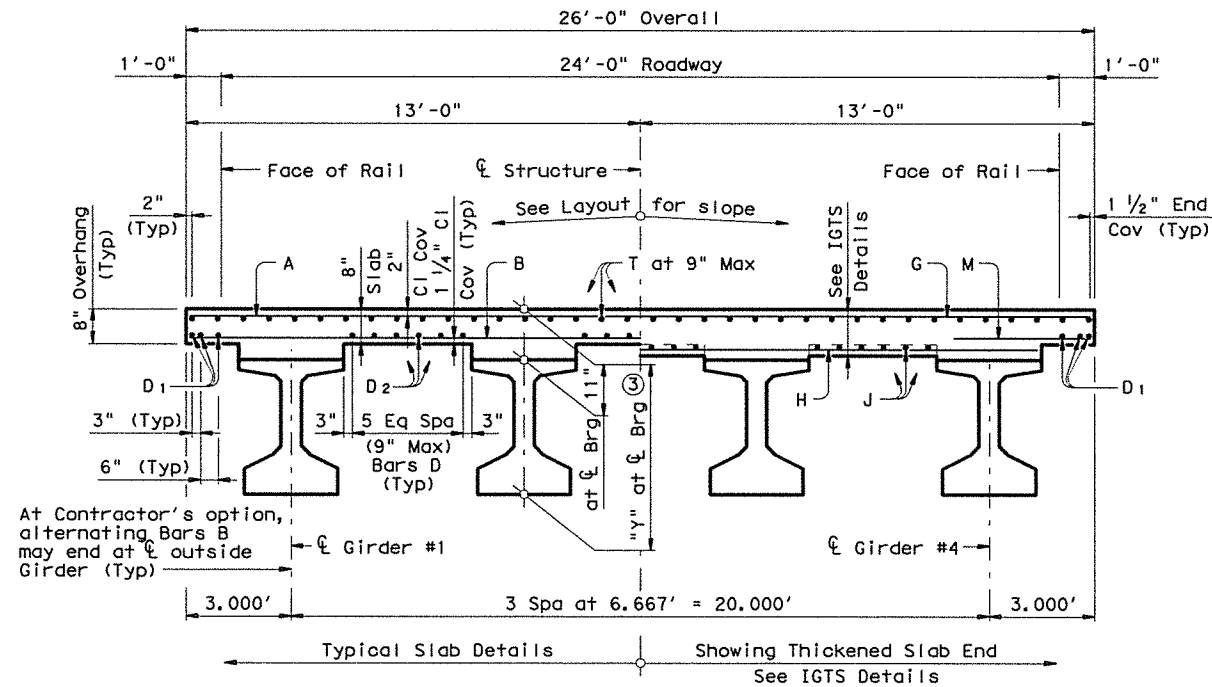


**PLAN**<sup>①</sup>

**BAR TABLE**

BAR	SIZE
A	#5
B	#5
D	#5
G	#5
H	#5
J	#5
M	#5
T	#4

- ① If multi-span units (with slab continuous over interior bents) are indicated on the Bridge Layout, see Standard IGCS for adjustment to slab reinforcement and quantities.
- ② Span Lengths for Prestressed Concrete I-Girder Type:  
 Type Tx28 for Spans Lengths 40,000' thru 75,000'.  
 Type Tx34 for Spans Lengths 40,000' thru 85,000'.  
 Type Tx40 for Spans Lengths 40,000' thru 100,000'.  
 Type Tx46 for Spans Lengths 40,000' thru 115,000'.  
 Type Tx54 for Spans Lengths 40,000' thru 125,000'.
- ③ "Y" value shown is based on theoretical beam camber, dead load deflection from an 8" cast-in-place concrete slab and a constant roadway grade. The contractor will adjust this value as necessary for any roadway vertical curve.



**TYPICAL TRANSVERSE SECTION**  
(Showing Girder Type Tx46)

**TABLE OF SECTION DEPTHS**

GIRDER TYPE	"Y" AT $\bar{C}$ BRG <sup>③</sup>
	Ft/In
Tx28	3'-3"
Tx34	3'-9"
Tx40	4'-3"
Tx46	4'-9"
Tx54	5'-5"

HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation  
Bridge Division

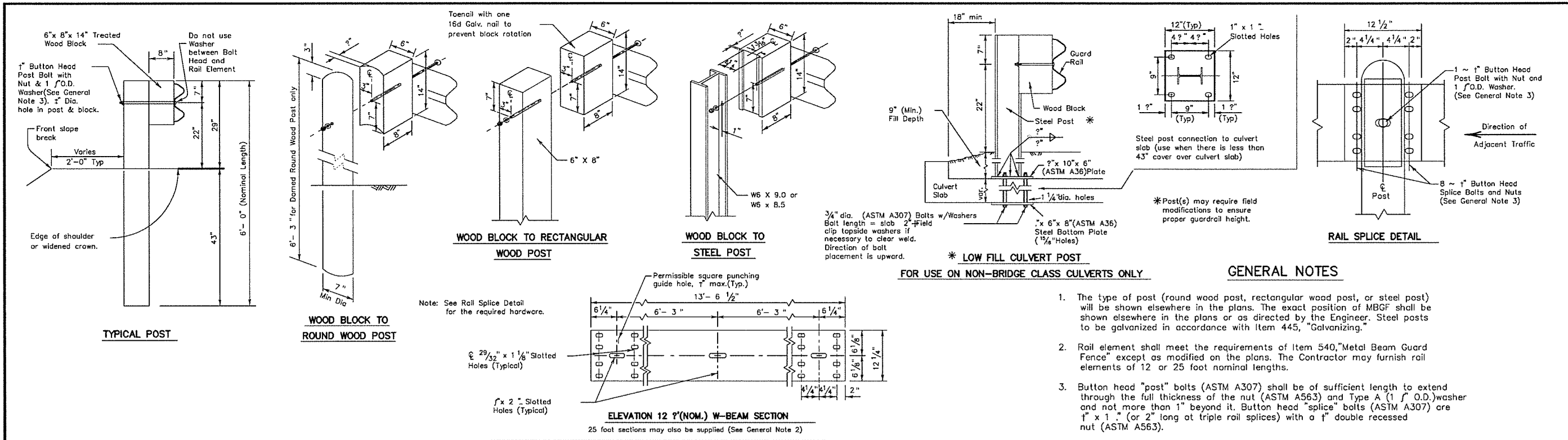
**PRESTRESSED CONCRETE  
I-GIRDER SPANS  
(TYPE Tx28 THRU Tx54)  
24' ROADWAY 15° SKEW**

**SIG-24-15**

FILE: sig02ste.dgn	DW: JMH	CK: NRR	DW: JTR	CK: JMH
© TxDOT June 2007	DISTRICT	FEDERAL AID PROJECT	SHEET	
REVISIONS			40	
COUNTY	CONTROL	SECT	JOB	HIGHWAY
BLANCO				CR 410



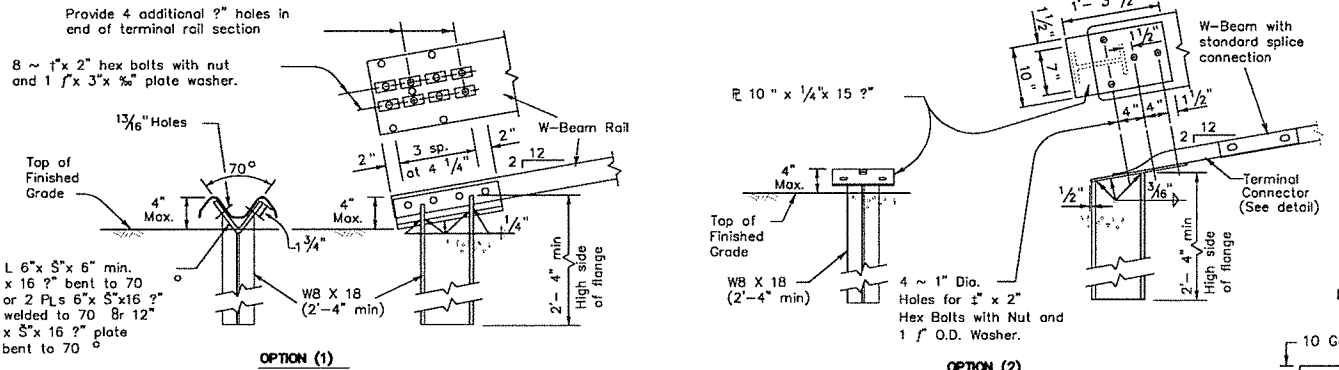
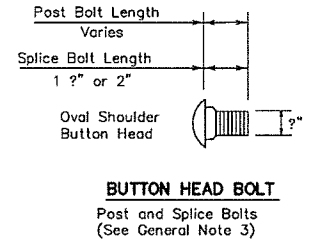
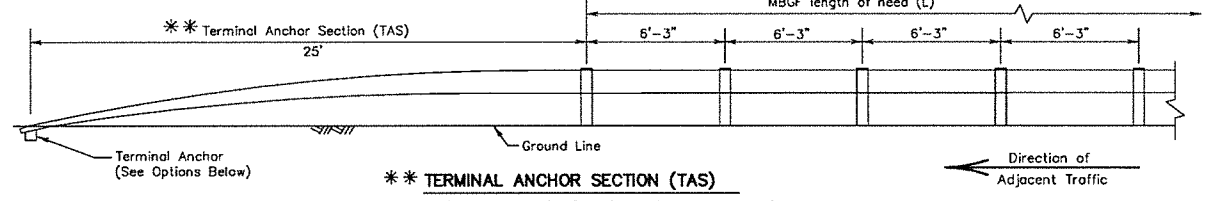




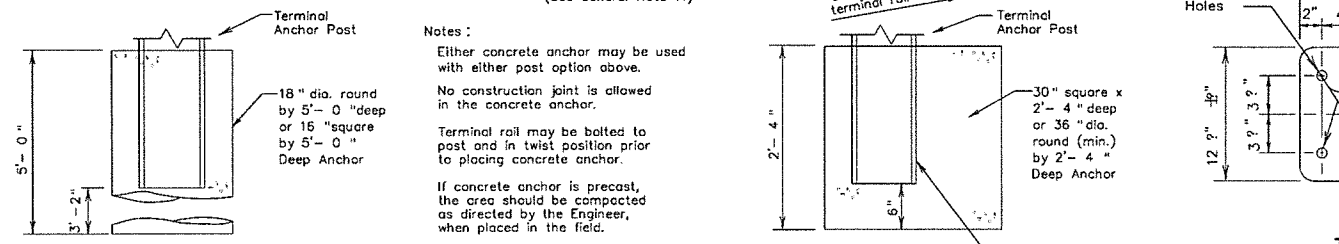
**\* LOW FILL CULVERT POST FOR USE ON NON-BRIDGE CLASS CULVERTS ONLY**

**GENERAL NOTES**

- The type of post (round wood post, rectangular wood post, or steel post) will be shown elsewhere in the plans. The exact position of MBEF shall be shown elsewhere in the plans or as directed by the Engineer. Steel posts to be galvanized in accordance with Item 445, "Galvanizing."
- Rail element shall meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified on the plans. The Contractor may furnish rail elements of 12 or 25 foot nominal lengths.
- Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and Type A (1" O.D.) washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 1" x 1" (or 2" long at triple rail splices) with a 1" double recessed nut (ASTM A563).
- Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item.
- Crown shall be widened to accommodate the Metal Beam Guard Fence.
- The lateral approach to the guard fence, shall have a slope rate of not more than 1V:10H.
- Unless otherwise shown in the plans, guard fence placed in the vicinity of curbs shall be positioned so that the face of curb is located directly below or behind the face of the block. Rail placed over curbs shall be installed so that the post bolt is located approximately 21 inches above the gutter pan or roadway surface.
- If solid rock is encountered within 0 to 18" of the finished grade, drill a 22" dia. hole, 24" into the rock, or drill two 12" dia. front to back overlapping holes, 24" into the rock. If solid rock is encountered below 18", drill a 12" dia. hole, 12" into the rock or to the standard embedment depth, whichever is less. Any excess post length, after meeting these depths, may be field cut to ensure proper guardrail mounting height. Backfill with a cohesionless material.
- Posts shall not be set in concrete, of any depth.
- Special fabrication will be required at installations having a curvature of less than 150 ft. radius.
- The terminal anchor section (TAS) post shall be set in Class A concrete (unless otherwise shown in the plans) in accordance with Item 421, "Hydraulic Cement Concrete." Concrete shall be subsidiary to the bid item requiring construction of the terminal anchor section (TAS). Terminal anchor post to be galvanized in accordance with Item 445, "Galvanizing."
- Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or blocks of similar dimensions. The Construction Division, TxDOT maintains a Material Producer List (MPL) for producers of materials conforming to DMS-7210. Only producers on the MPL can furnish composite material posts and/or blocks.



**TERMINAL ANCHOR POST OPTIONS**  
(See General Note 11)



Note: Terminal Connector to be used with terminal anchor post options 2.

**TERMINAL CONNECTOR**

For connection hardware to concrete rails, see the MBEF transition standards.

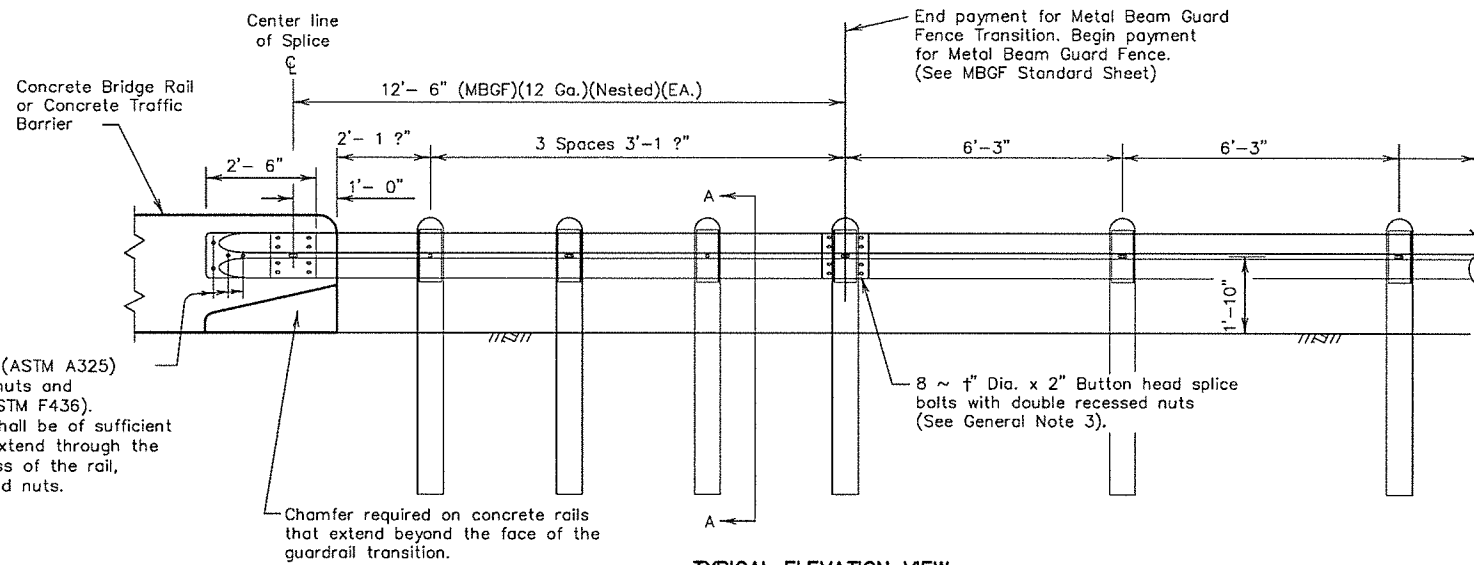
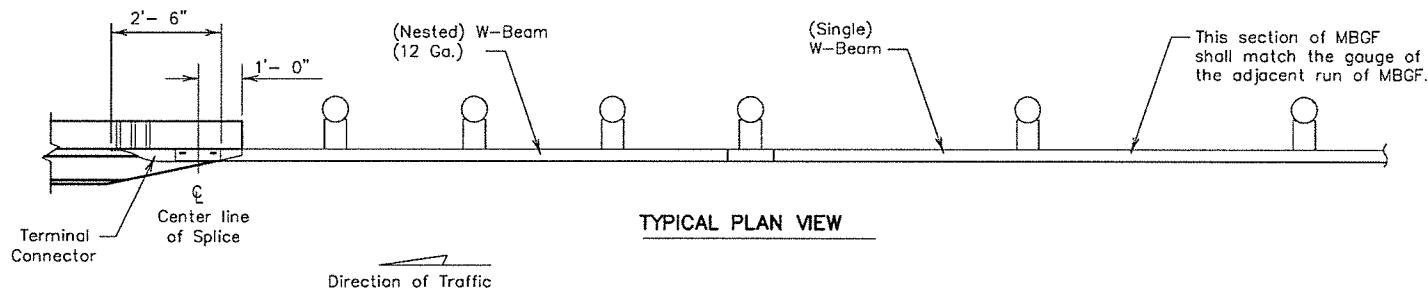
Texas Department of Transportation  
 Design Division Standard

**METAL BEAM GUARD FENCE**

**MBGF-11**

NO.	DESCRIPTION	DATE	BY	CHKD	APP

FILE: K:\14-104 Middle Creek Bridge Design\PLAN SHEETS\RAIL STANDARDS.dwg  
 Job No: 14-104  
 Scale (Plan): NTS  
 Scale (Vert.): AS NOTED  
 Date: 06/02/14  
 Checked By: GK  
 Rev. No.: 1  
 Date: 1-19-15  
 Remarks:

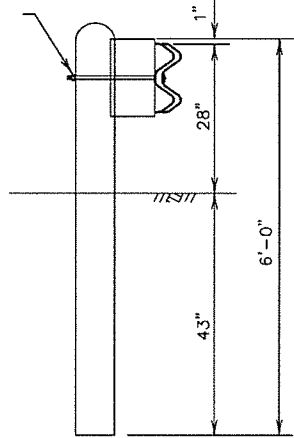


4 ~ 1/4" Dia. (ASTM A325) hex bolts, nuts and washers (ASTM F436). hex bolts shall be of sufficient length to extend through the full thickness of the rail, washers, and nuts.

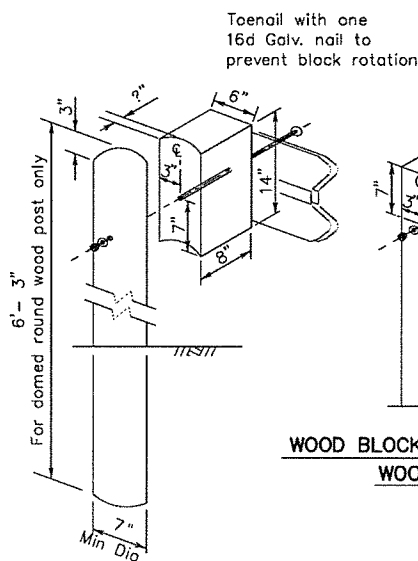
Chamfer required on concrete rails that extend beyond the face of the guardrail transition.

8 ~ 1" Dia. x 2" Button head splice bolts with double recessed nuts (See General Note 3).

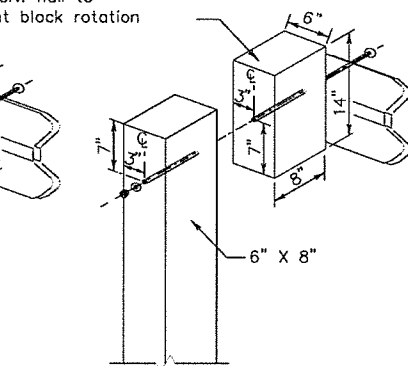
1" Button head post bolt with nut & washer (See General Note 3).



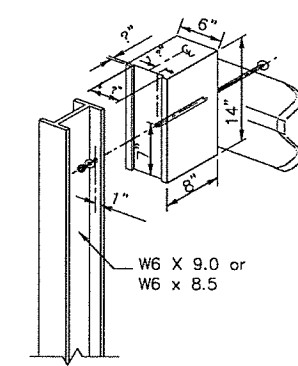
SECTION A-A



WOOD BLOCK TO ROUND WOOD POST



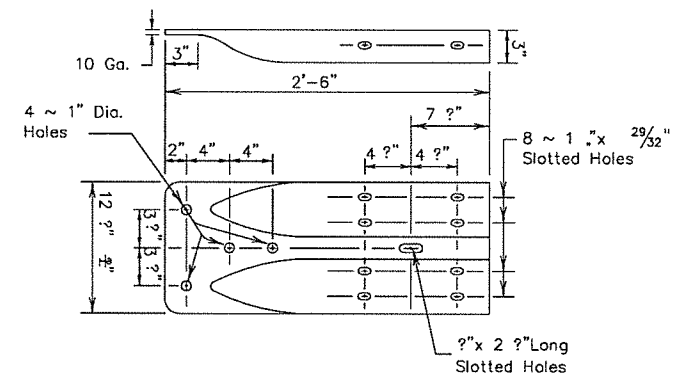
WOOD BLOCK TO RECTANGULAR WOOD POST



WOOD BLOCK TO STEEL POST

**GENERAL NOTES**

- The type of post (round wood post, rectangular wood post, or steel post) will be shown elsewhere in the plans. The exact position of transitions shall be shown elsewhere in the plans or as directed by the Engineer.
- Rail element shall meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified on the plans.
- Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut and Type A 1" O.D. washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 1" x 2" (at triple rail splices) with 1" double recessed nuts (ASTM A563).
- Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item requiring construction of the transition.
- Crown will be widened to accommodate transitions.
- If solid rock is encountered. See the MBGF standard sheet for the proper installation guidance.
- Posts shall not be set in concrete.
- Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or blocks of similar dimensions. The Construction Division, TxDOT, maintains a Material Producer List (MPL) for producers of materials conforming to DMS-7210. Only producers on the MPL can furnish composite material posts and/or blocks.
- Refer to MBGF standard sheet for additional details.



**TERMINAL CONNECTOR**

FOR USE WITH MBGF CONNECTIONS TO CONCRETE BRIDGE RAILS AND TRAFFIC BARRIERS

Texas Department of Transportation  
Design Division Standard

**METAL BEAM GUARD FENCE TRANSITION (TL2)**  
(Low Speed Transition)  
MBGF(TL2)-11

Job No. 14-104	Scale (Hor.): AS NOTED	Drawn By: GK
Date: 08/02/14	Checked By:	Remarks
Rev. No. 1	Date	Remarks
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3		
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File: K:\14-104 Middle Creek Bridge\Design\PLAN SHEET\RAIL STANDARDS.dwg

**K.C. ENGINEERING, INC.**  
CONSULTING ENGINEERS  
705 HWY. 281 NORTH, PLAZA I, SUITE 103  
MARBLE FALLS, TEXAS 78654  
OFFICE: 830-693-5635 FAX: 830-693-9664  
Email: info@kcengineering.com  
REGISTRATION # F-000977

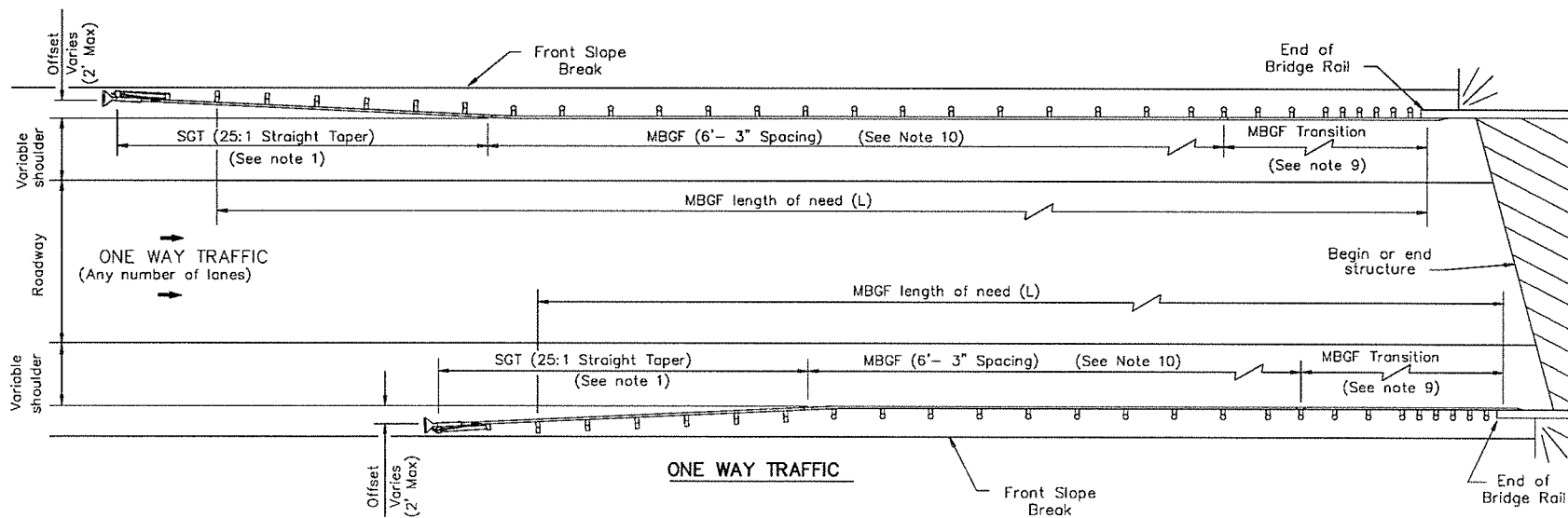
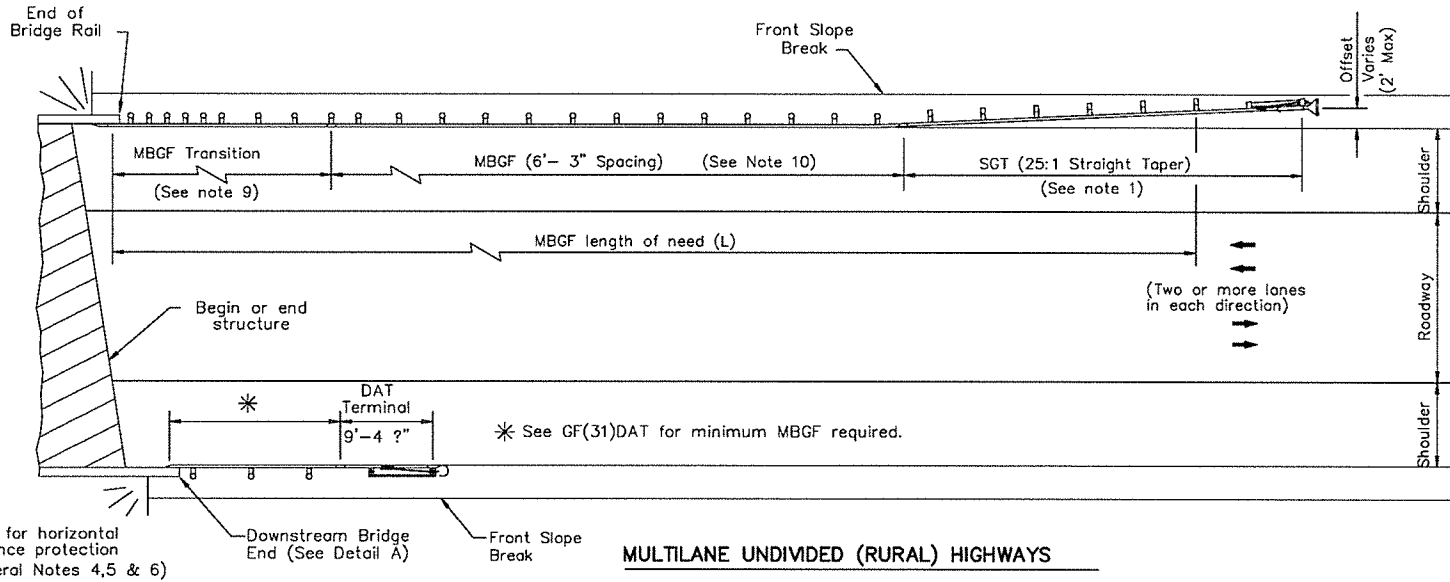
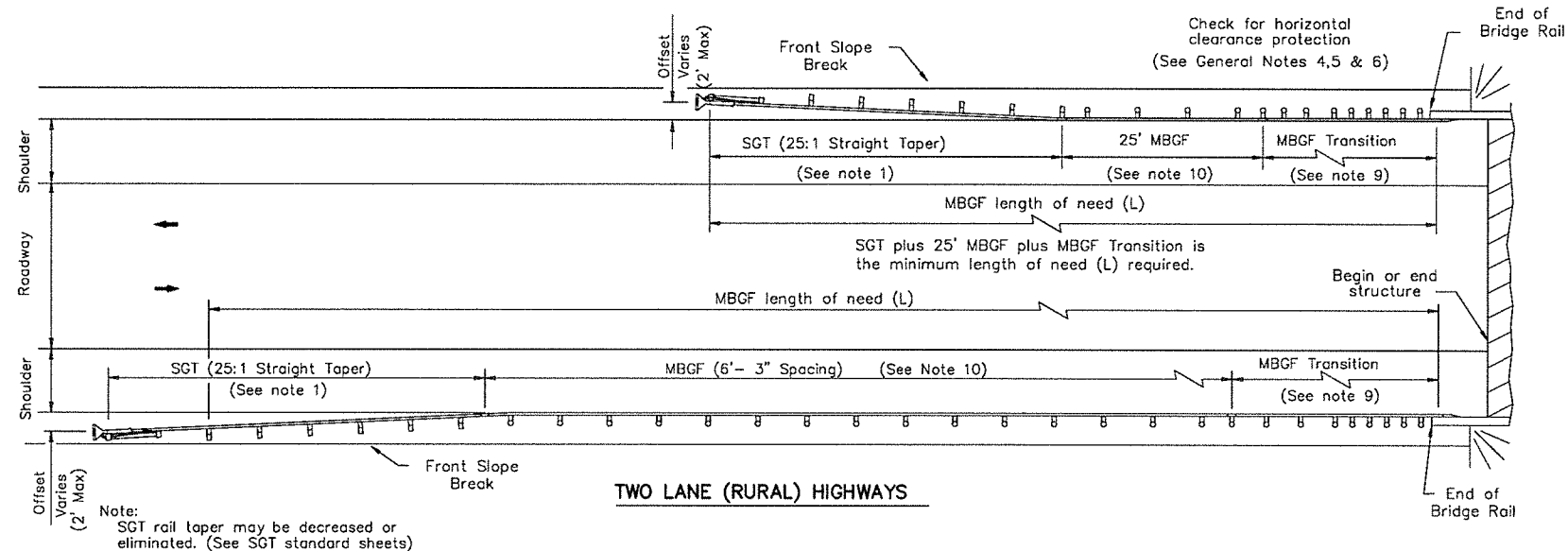


**MBGF(TL2)-11**  
**MIDDLE CREEK BRIDGE**  
**COUNTY ROAD 410**  
**BLANCO COUNTY TEXAS**



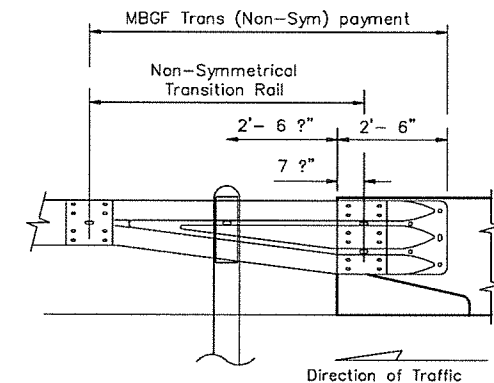
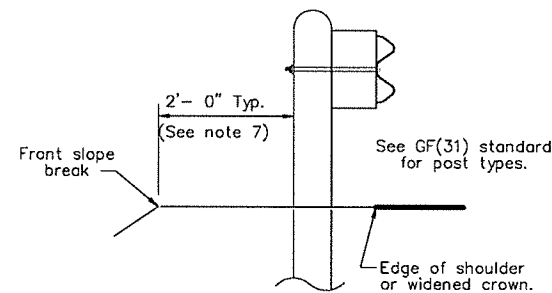
*Greg Haley*  
1-19-19

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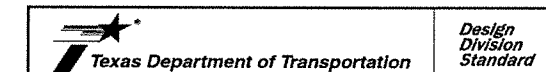


**GENERAL NOTES**

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



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



**BRIDGE END DETAILS  
 (METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)**

**BED-14**

Job No. 14-104	Scale (Hor.): NTS	Scale (Ver.): AS NOTED
Date: 08/02/14	Checked By: GK	Drawn By: GK
Rev. No. 1	Date	Remarks
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3		
4		

**K.C. ENGINEERING, INC.**  
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 705 HWY. 281 NORTH, PLAZA I, SUITE 103  
 MARBLE FALLS, TEXAS 78654  
 OFFICE: 830-693-5635 FAX: 830-693-9664  
 Email: info@kcengineering.com  
 REGISTRATION # F-000977



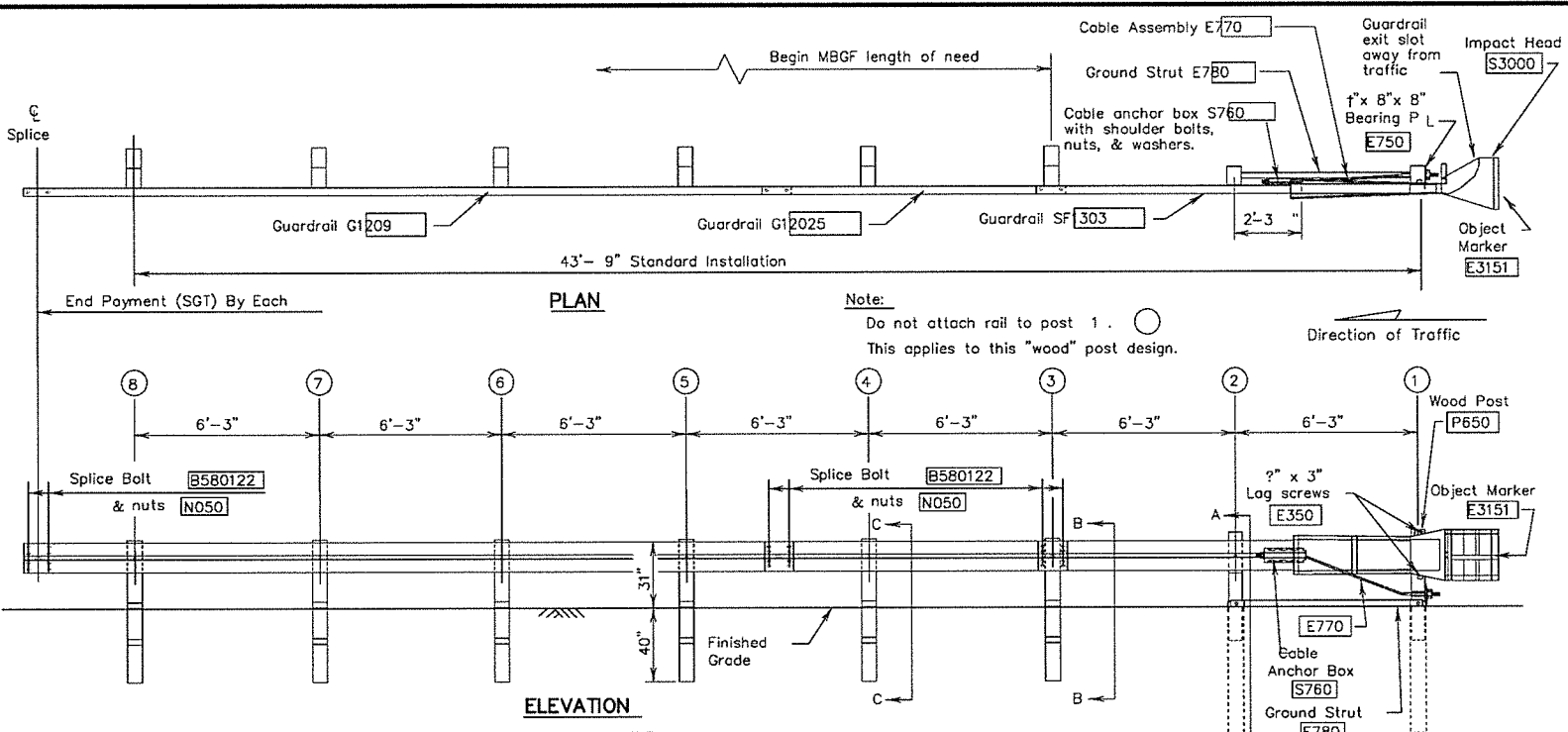
**BED-14  
 MIDDLE CREEK BRIDGE  
 COUNTY ROAD 410  
 BLANCO COUNTY TEXAS**



*Greg Haley PE*  
 1-19-15

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Job No. 14-104
Date: 08/02/14
Rev. No. 1
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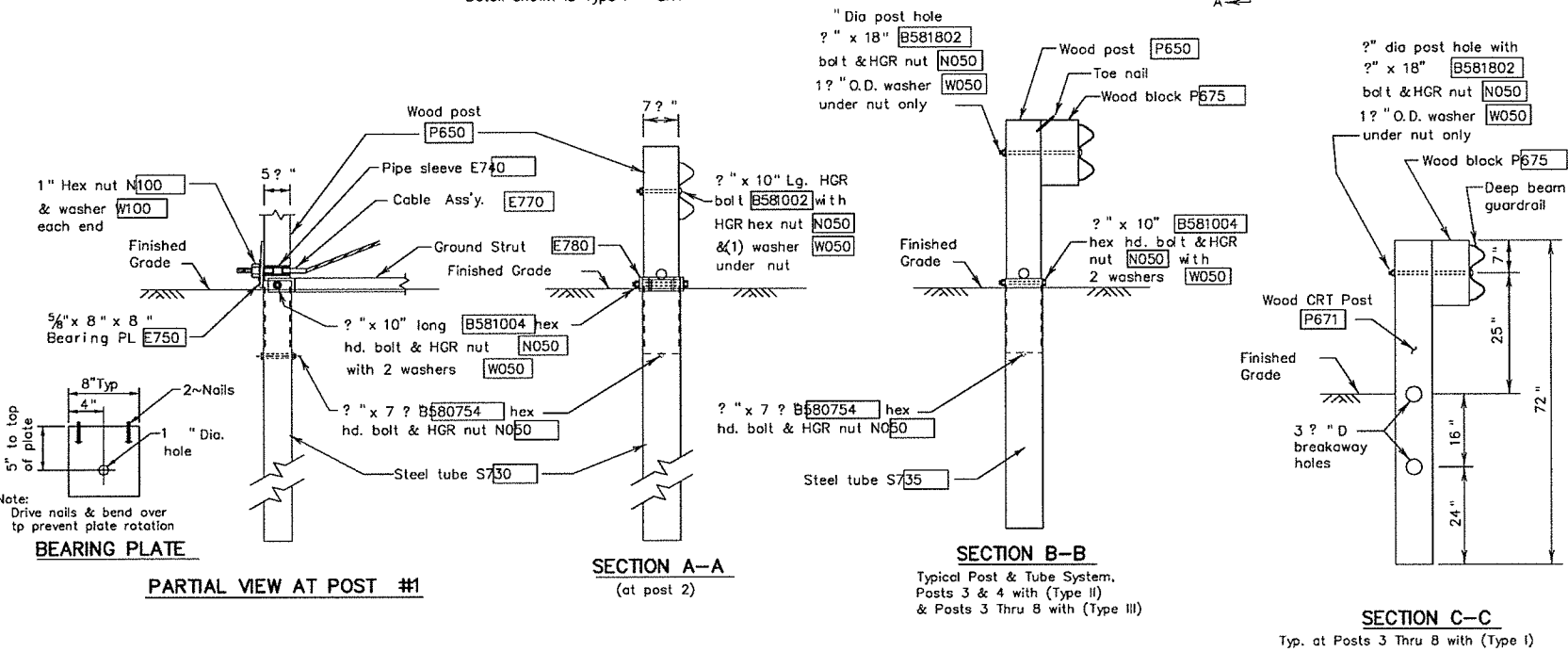
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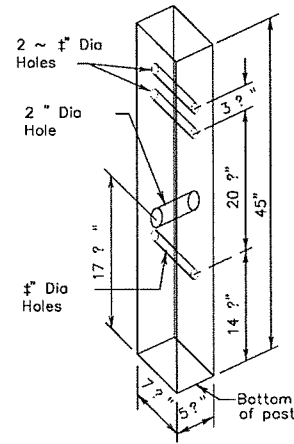
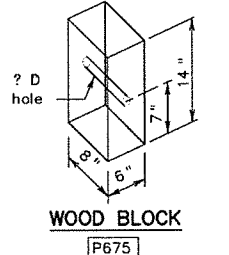
**GENERAL NOTES**

- For additional information contact: Interstate Steel Inc., (432) 263-3725.
- The Type of SGT unit will be specified elsewhere in the plans. Numbers in circles indicate post position. The Type of SGT unit chosen is a maintenance consideration and does not affect the systems performance.
 

Post & Tube Options		Post Only	
Type I Posts	1 thru 2	Posts 3 thru 8	○
Type II Posts	1 thru 4	Posts 5 thru 8	○
Type III Posts	1 thru 8		○
- SGT's placed within the "minimum" 150 ft. radius, shall be installed straight. Standard rail elements may be installed within the radius, without special fabrication.
- All bolts, nuts cable assemblies, cable anchors, steel tubes & bearing plates shall be galvanized.
- A flare rate of 25:1 may be used to prevent the terminal head from encroaching on the shoulder. The flare may be decreased or eliminated for specific installations, if directed by the Engineer.
- The steel tubes shall not protrude more than 4 inches above ground. Site grading may be necessary to meet this requirement.
- The steel tubes may be driven with an approved driving head. They shall not be driven with the wood post in the tube. If the steel tubes are placed in drilled holes, the backfill material must be satisfactorily compacted to prevent tube settlement.
- If solid rock is encountered. See the Manufacturer's installation manual for the proper installation guidance.
- The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
- The wood blocks shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks. The bearing plate on the front post shall also be "toe nailed" to prevent rotation.
- For curb installations, the soil tubes and posts shall be installed at the proper ground elevation behind the curb. The posts will then require field drilling new holes to accommodate the rail to post connection bolt to maintain the proper height of the rail above the gutter pan. The excess post length above the rail will be removed as directed by the Engineer.
- An object marker shall be installed on the front of the impact head as detailed on D&OM(VA).
- A special site evaluation should be considered, prior to using this end treatment where there is less than 25 feet between the outlet side of the end treatment and any adjacent driving lane.



Code #	POST & TUBE OPTIONS			DESCRIPTION
	Type I Qty.	Type II Qty.	Type III Qty.	
S1303	1	1	1	Guardrail (12 Ga.) 12'- 6" SKT Panel
G12025	1	1	1	Guardrail (12 Ga.) 9'- 4"
G1209	1	1	1	Guardrail (12 Ga.) 25'- 0"
S730	2	2	2	Steel Tube - 6" x 8" x 72" x ?"
S735	0	2	6	Steel Tube - 6" x 8" x 54" x ?"
P650	2	4	8	Wood Post - 5" x 7" x 45"
P671	6	4	0	Wood CRT Posts - 6" x 8" x 72"
P675	6	6	6	Wood Block - 6" x 8" x 14"
E740	1	1	1	Pipe Sleeve - 2 Std. Pipe x 5" ?"
E750	1	1	1	Bearing Plate - 8" x 8" x 5/8"
S760	1	1	1	Cable Anchor Box
E770	1	1	1	Cable Assembly
E780	1	1	1	Ground Strut
S3000	1	1	1	Impact Head
B580754	2	4	8	? x 7" Hex Hd. Bolt
B581004	2	4	8	? x 10" Hex Hd. Bolt (Top of Tubes)
W050	11	15	21	? Washers
B581002	1	1	1	? x 10" HGR Post Bolt (Post 2)
B580122	24	24	24	? x 1" HGR Splice Bolt
B581802	6	6	6	? x 18" HGR Post Bolt (Posts 3 thru 8)
N050	33	37	45	? RGR Nut (16-Spl, 7-Posts, 2-Strut)
E350	2	2	2	? x 3" Lag Screw
N100	2	2	2	1" Hex Nut (Anchor Cable)
W100	2	2	2	1" Washer (Anchor Cable)
SB58A	8	8	8	Cable Anchor Box Shoulder Bolts
N055A	8	8	8	? A325 Structural Nut
W050A	16	16	16	? A325 Structural Washer
E3151	1	1	1	Object Marker - (18" x 18")

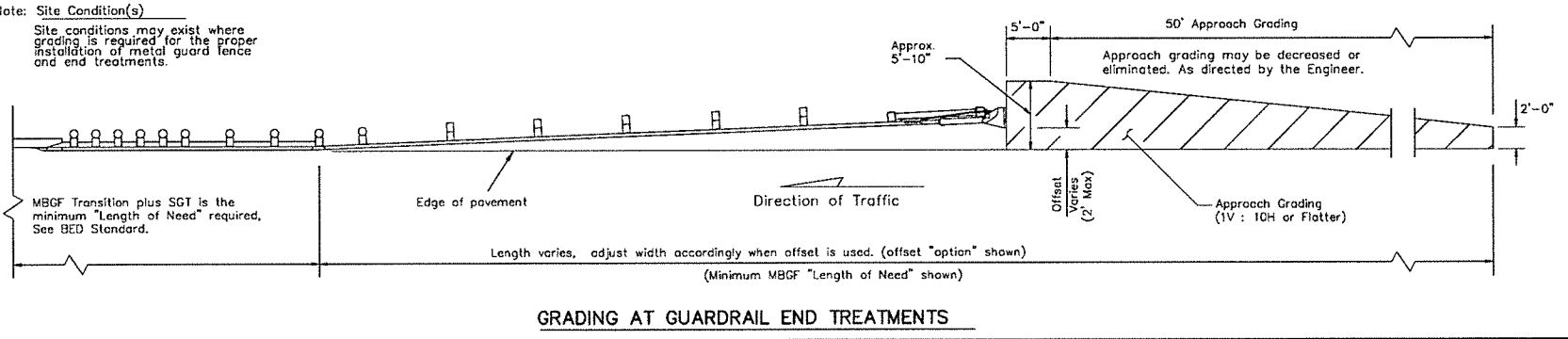


All measurements should be taken from bottom of posts.

**UNIVERSAL WOOD POST**

**POST & TUBE OPTIONS**

- |               |          |   |
|---------------|----------|---|
| Type I post   | 1 thru 2 | ○ |
| Type II post  | 1 thru 4 | ○ |
| Type III post | 1 thru 8 | ○ |



Texas Department of Transportation  
 Design Division Standard

**SINGLE GUARDRAIL TERMINAL (SKT-31) (WOOD POST) SGT(8)31-11**

Scale (Hor.): AS NOTED  
 Scale (Ver.): AS NOTED  
 Date: 06/22/14  
 Checked By: GK  
 Drawn By: GK

Job No: 14-104  
 Date: 06/22/14  
 Rev. No: 2

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 REGISTRATION # F-000977

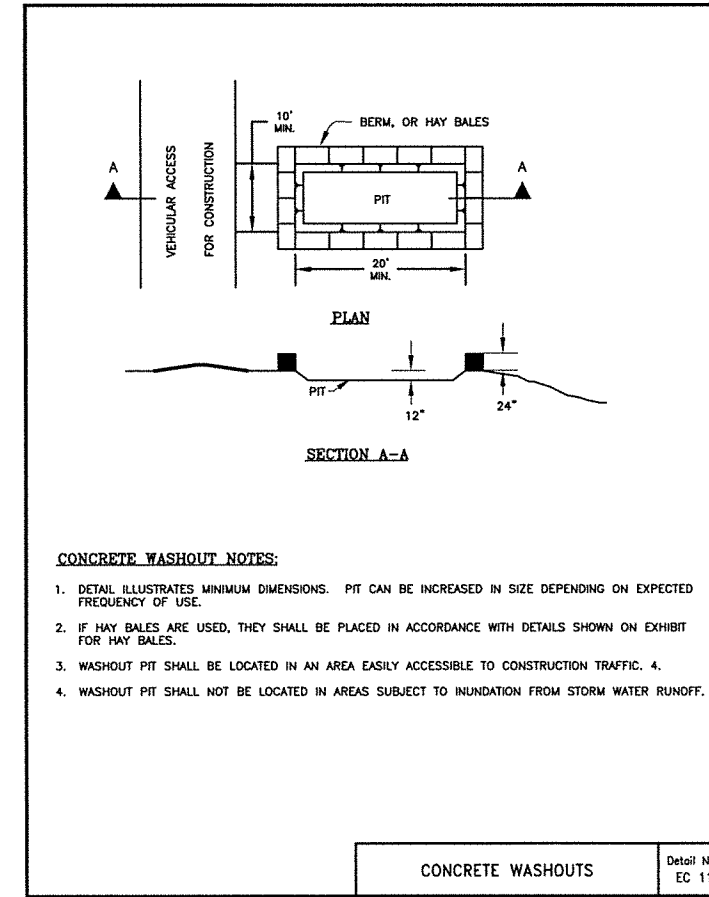
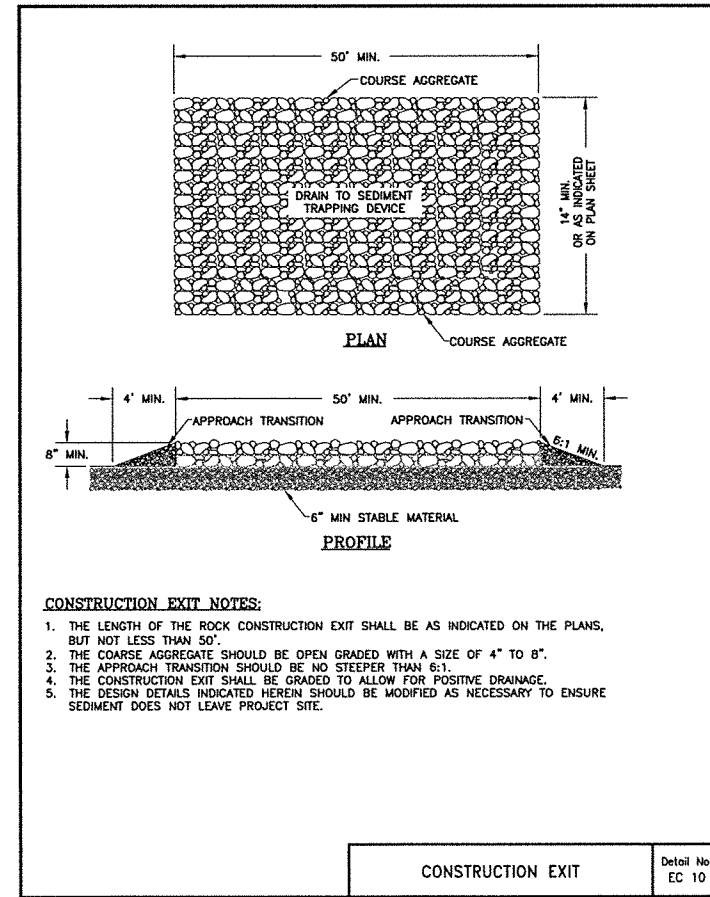
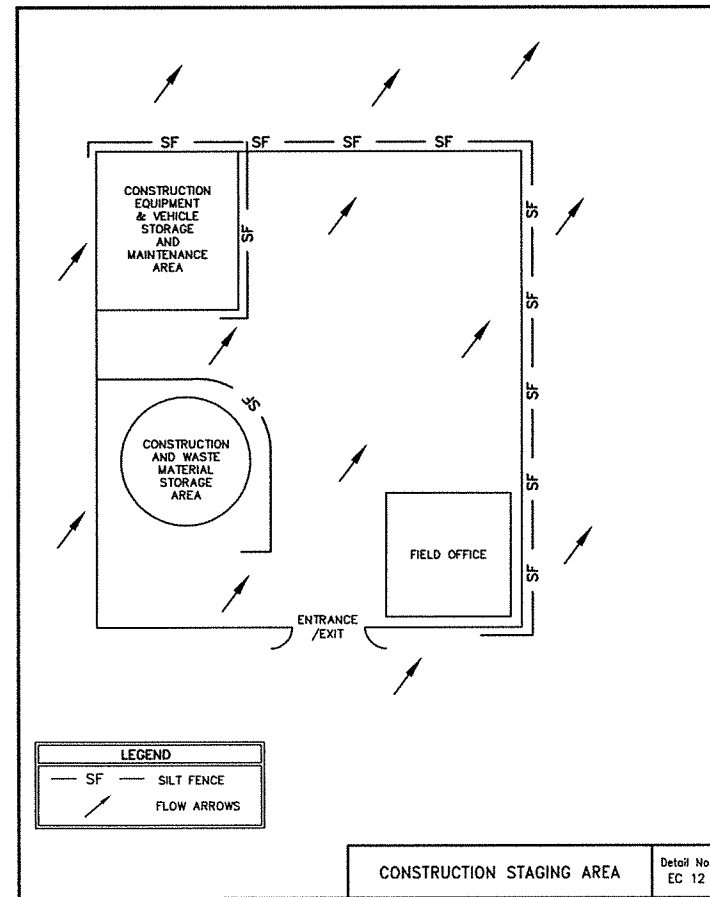
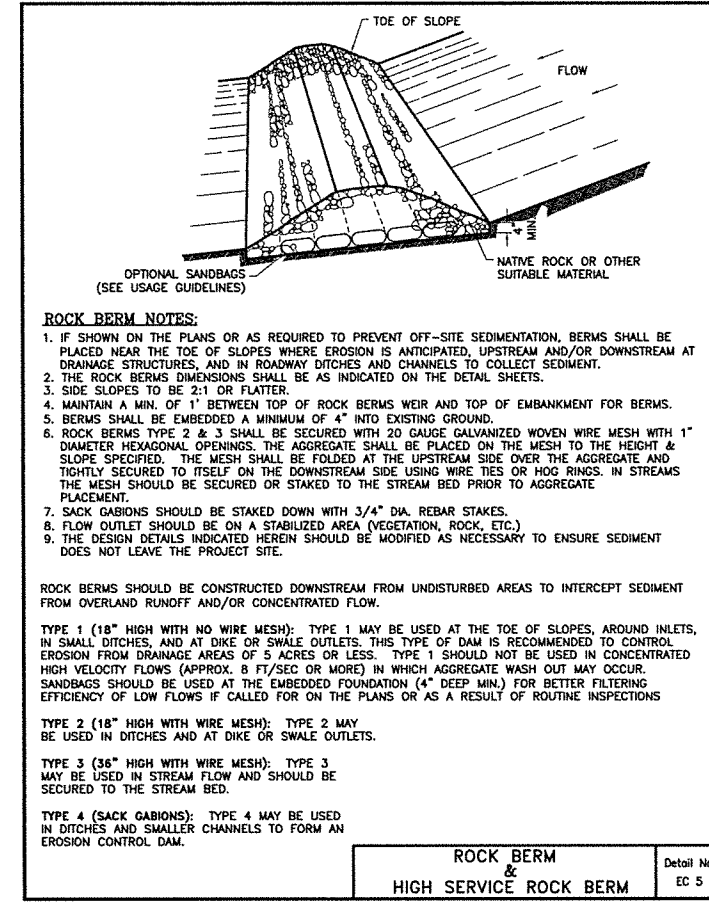
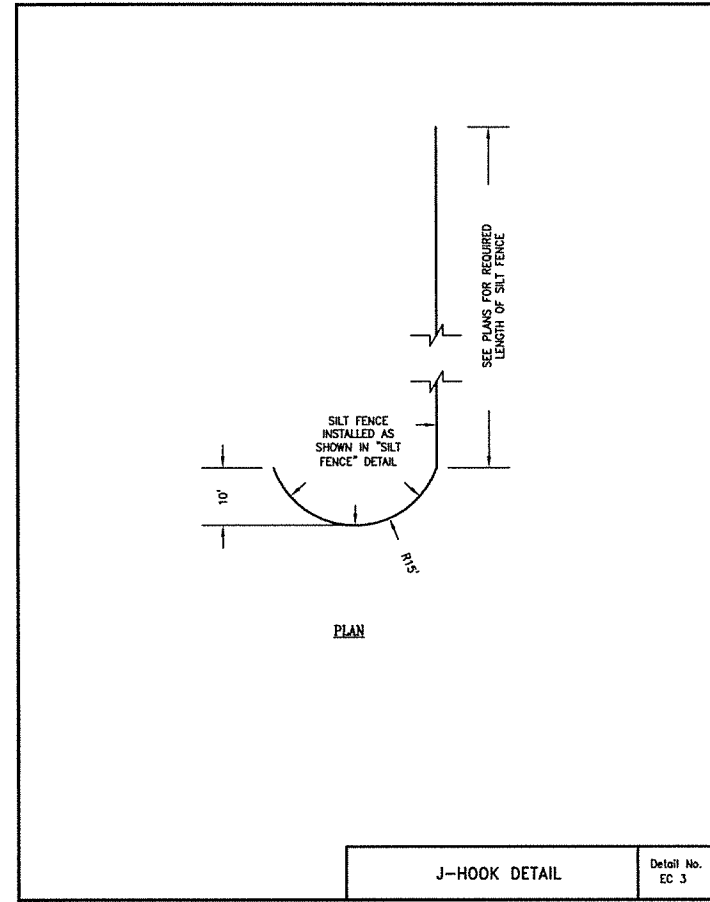
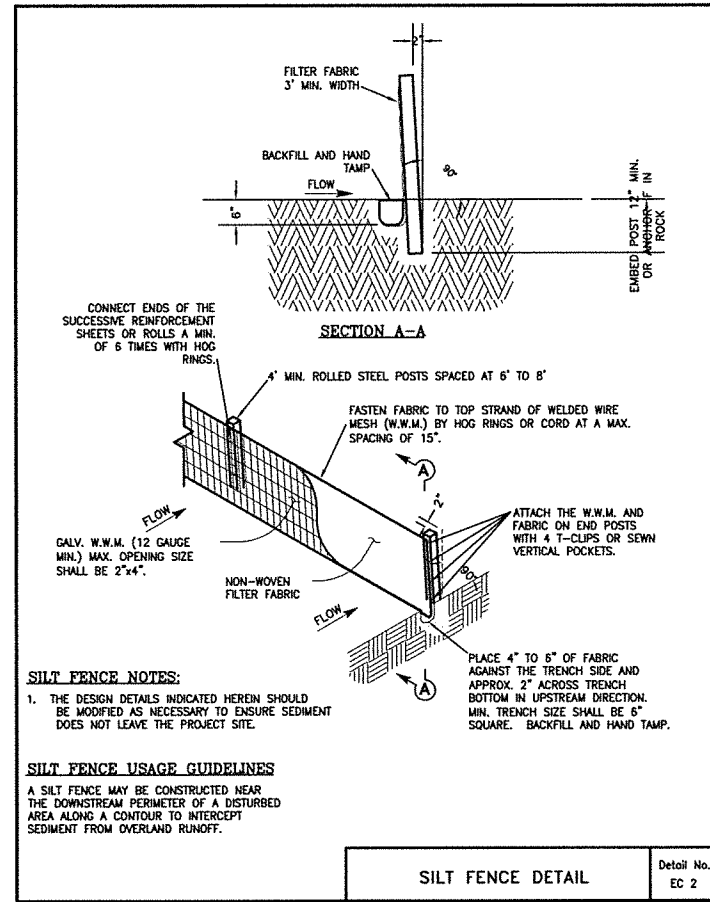
**SGT(8)31-11**  
 MIDDLE CREEK BRIDGE  
 COUNTY ROAD 410  
 BLANCO COUNTY TEXAS

STATE OF TEXAS  
 GREG WALLEY  
 52292  
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1-19-15

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**SHEET 45**



Date: Jan 18, 2015, 11:44pm User ID: Greg  
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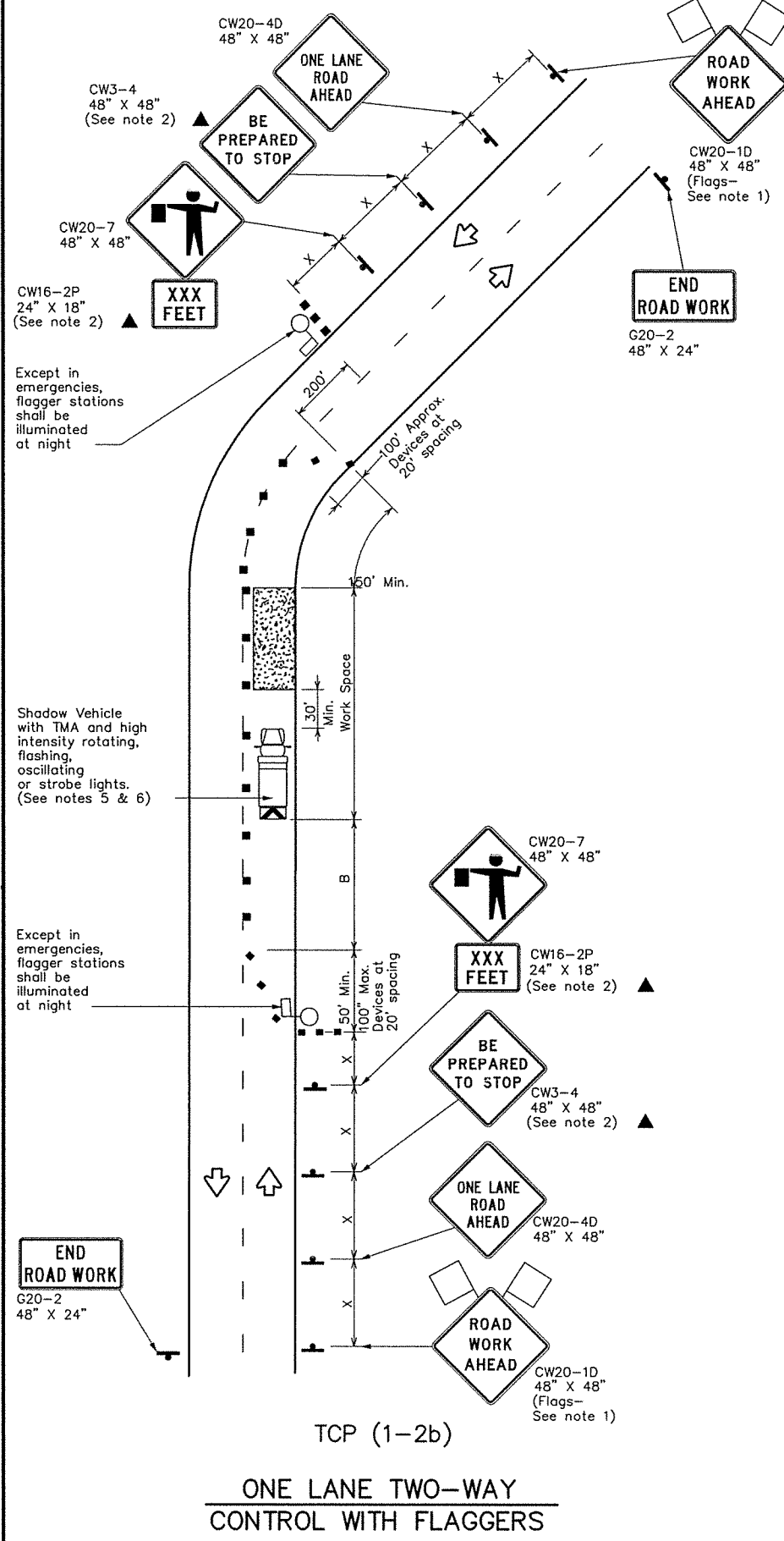
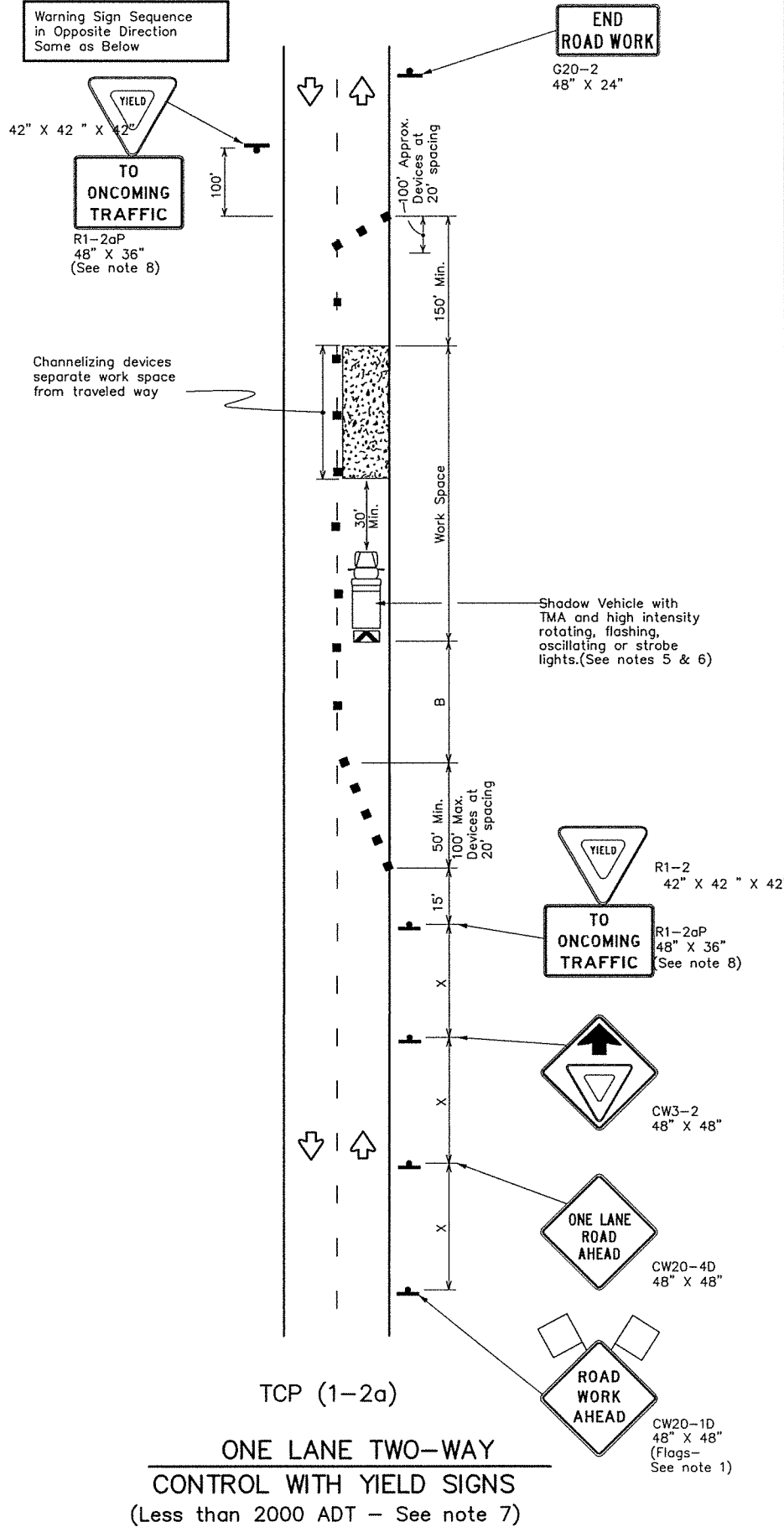


**EROSION CONTROL STANDARDS**  
**MIDDLE CREEK BRIDGE**  
**COUNTY ROAD 410**  
**BLANCO COUNTY, TEXAS**

STATE OF TEXAS  
2. MARTIN STAR  
102414  
LICENSED PROFESSIONAL ENGINEER  
1-19-15

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Date: 06/02/14	Checked By:	Remarks
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**LEGEND**

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

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

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

**TYPICAL USAGE**

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

**GENERAL NOTES**

- Flags attached to signs where shown are REQUIRED.
  - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
  - The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign, but proper sign spacing shall be maintained.
  - Sign spacing may be increased or an additional CW20-1D "ROAD WORK AHEAD" sign may be used if advance warning ahead of the flagger or R1-2 "YIELD" sign is less than 1500 feet.
  - A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
  - Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
- TCP (1-2a)**
- R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work spaces should be no longer than one half city block. In rural areas on roadways with less than 2000 ADT, work spaces should be no longer than 400 feet.
  - R1-2 "YIELD" sign with R1-2aP "TO ONCOMING TRAFFIC" plaque shall be placed on a support at a 7 foot minimum mounting height.
- TCP (1-2b)**
- Flaggers should use two-way radios or other methods of communication to control traffic.
  - Length of work space should be based on the ability of flaggers to communicate.
  - If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain adequate stopping sight distance to the flagger and a queue of stopped vehicles (see table above).
  - Channelizing devices on the center-line may be omitted when a pilot car is leading traffic and approved by the Engineer.
  - Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situations.

For construction or maintenance contract work, specific project requirements for shadow vehicles can be found in the project GENERAL NOTES for Item 502, Barricades, Signs and Traffic Handling.

Texas Department of Transportation  
 Traffic Operations Division

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

TCP(1-2)-12

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REVISIONS	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
4-90 2-12	CONT	SECT	JOB	HIGHWAY
14-104	DIST		COUNTY	SHEET NO.

Job No: 14-104  
 Scale (Hor.): N/A  
 Scale (Vert.): N/A  
 Date: 08/02/14  
 Checked By: GK  
 Drawn By: GK

Rev. No.	Date	Remarks
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**TCP(1-2)-12**  
**MIDDLE CREEK BRIDGE**  
**COUNTY ROAD 410**  
**BLANCO COUNTY, TEXAS**

STATE OF TEXAS  
 GREG HALEY  
 REGISTERED PROFESSIONAL ENGINEER  
 52292

1-19-15

**SHEET**  
**47**

Traffic Control Devices shown for one direction

New pavement surface should extend to this point. (See note 2)

CW1-6  
48" X 24"  
(See note 2) ▲

OM-3  
Object Markers

4" Solid White Edgeline

Type II-A-A  
Raised Pavement Markers on 40' C-C.

4" Double Yellow Line

New pavement surface should extend to this point. (See note 5)

END ROAD WORK G20-2  
48" X 24"

CW1-6  
48" X 24"  
(See note 2) ▲

Warning Reflectors may be added on top of channelizing devices for additional conspicuity at night. Warning Reflectors, chevrons or steady-burn warning lights may be added if drums or longitudinal channelizing devices are used. (Both directions)

Barricades may be offset to permit workers and equipment to enter and exit work space.

CW1-4R  
48" X 48"  
XX MPH  
CW13-1P  
24" X 24"

ROAD CLOSED R11-2  
48" X 30"  
CW1-6  
48" X 24"

CW1-4L  
48" X 48"  
XX MPH  
CW13-1P  
24" X 24"  
(See note 2) ▲

ROAD WORK XXX FT CW20-1A,B or C  
48" X 48"

ROAD WORK AHEAD CW20-1D  
48" X 48"  
(Flags-  
See note 1)

TCP (2-7a)

ROADWAY DIVERSION

Traffic Control Devices shown for one direction

END ROAD WORK G20-2  
48" X 24"

PASS WITH CARE If applicable  
R4-2  
24" X 30"

CTB with safety end treatment, or other barrier system as detailed elsewhere in the plans.

4" Solid White Edgeline

4" Double Yellow Line  
Type II-A-A  
Raised Pavement Markers on 40' C-C.

NARROW BRIDGE CW5-2  
48" X 48"  
(See note 6)

DO NOT PASS R4-1  
24" X 30"

ROAD WORK AHEAD CW20-1D  
48" X 48"  
(Flags-  
See note 1)

TCP (2-7b)

BRIDGE WIDENING

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Raised Pavement Markers Ty II-AA
	Sign		Traffic Flow
	Flag		Flagger

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

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

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

GENERAL NOTES

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

TCP (2-7a)

- Raised pavement markers shall be placed 40 feet c-c on centerline throughout project.
- Roadway diversion design requirements should be based on posted speed limit or prevailing speed.
- New pavement surface should be extended across existing roadway edge to a point where existing pavement markings left in place during project do not conflict with construction area pavement marking.

TCP (2-7b)

- The CW5-2 "Narrow Bridge" sign may be omitted if lane and shoulder widths are maintained.

For construction or maintenance contract work, specific project requirements for shadow vehicles can be found in the project GENERAL NOTES for Item 502, Barricades, Signs and Traffic Handling.

Texas Department of Transportation  
 Traffic Operations Division

TRAFFIC CONTROL PLAN  
 DIVERSIONS AND  
 NARROW BRIDGES

TCP(2-7)-12

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8-95	2-12	CONT	SECT	JOB
1-97		DIST	COUNTY	SHEET NO.
4-98				
3-03				

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TCP(2-7)-12  
 MIDDLE CREEK BRIDGE  
 COUNTY ROAD 410  
 BLANCO COUNTY, TEXAS



Greg Haley PE  
 1-19-15

Job No.	Scale (Hor.):	N/A	Scale (Vert.):	N/A	Drawn By:	GK
Date:	08/02/14	Checked By:		Remarks:		
Rev. No.	1	Date				
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**BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:**

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

**WORKER SAFETY APPAREL NOTES:**

- Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear high-visibility safety apparel meeting the requirements of ISEA "American National Standard for High-Visibility Apparel" 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.

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

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

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

COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)
TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD)
TRAFFIC ENGINEERING STANDARD SHEETS

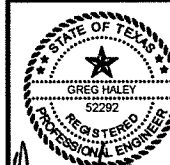
SHEET 1 OF 12

<b>BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS</b>			
<b>BC(1)-13</b>			
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4-03 5-10	DIST	COUNTY	SHEET NO.
9-07 7-13			

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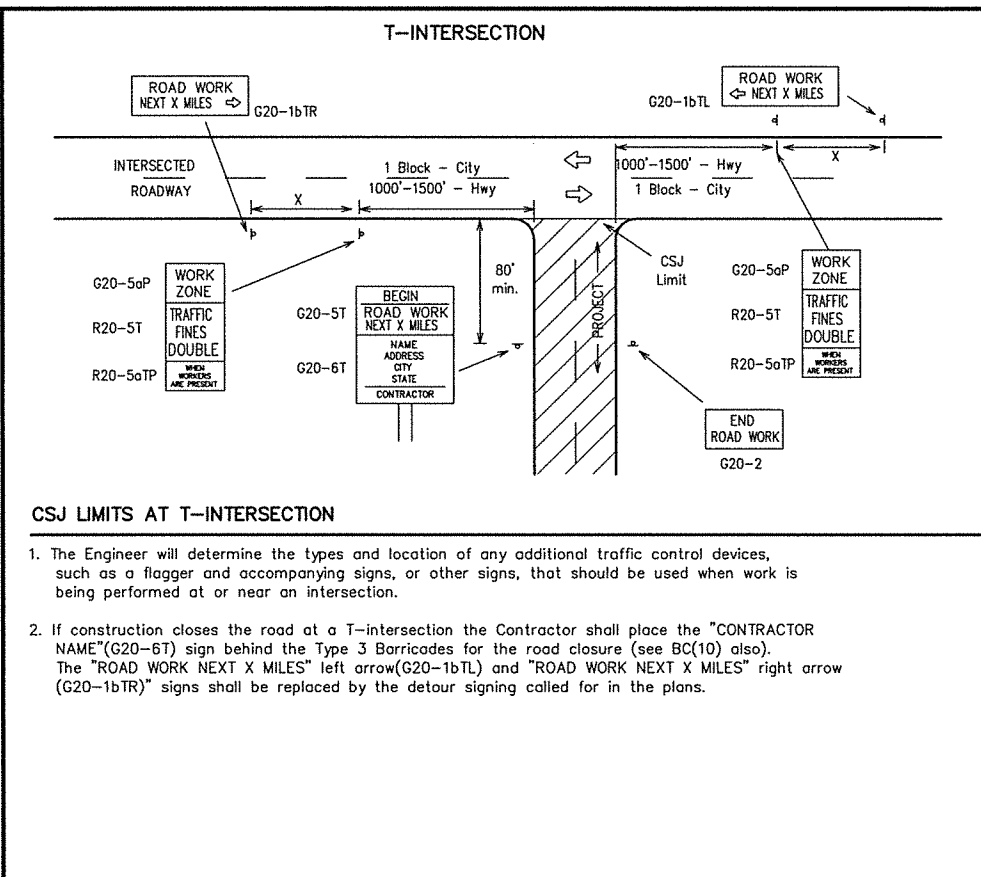
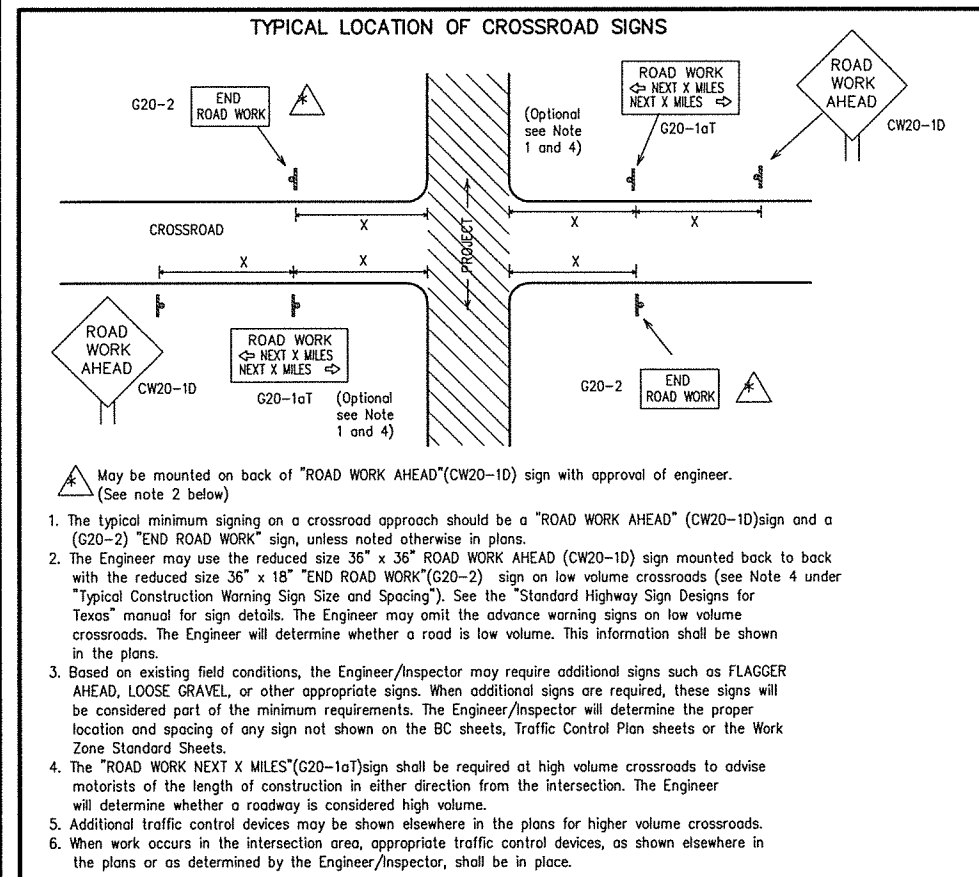
BARRICADE STANDARDS  
MIDDLE CREEK BRIDGE  
COUNTY ROAD 410  
BLANCO COUNTY, TEXAS



*Greg Hale*  
1-19-15

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Date: 06/02	Remarks	
Rev. No.	Date	Remarks
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Date: Jan 18, 2015, 11:48pm User ID: Greg  
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### TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING 1.5.6

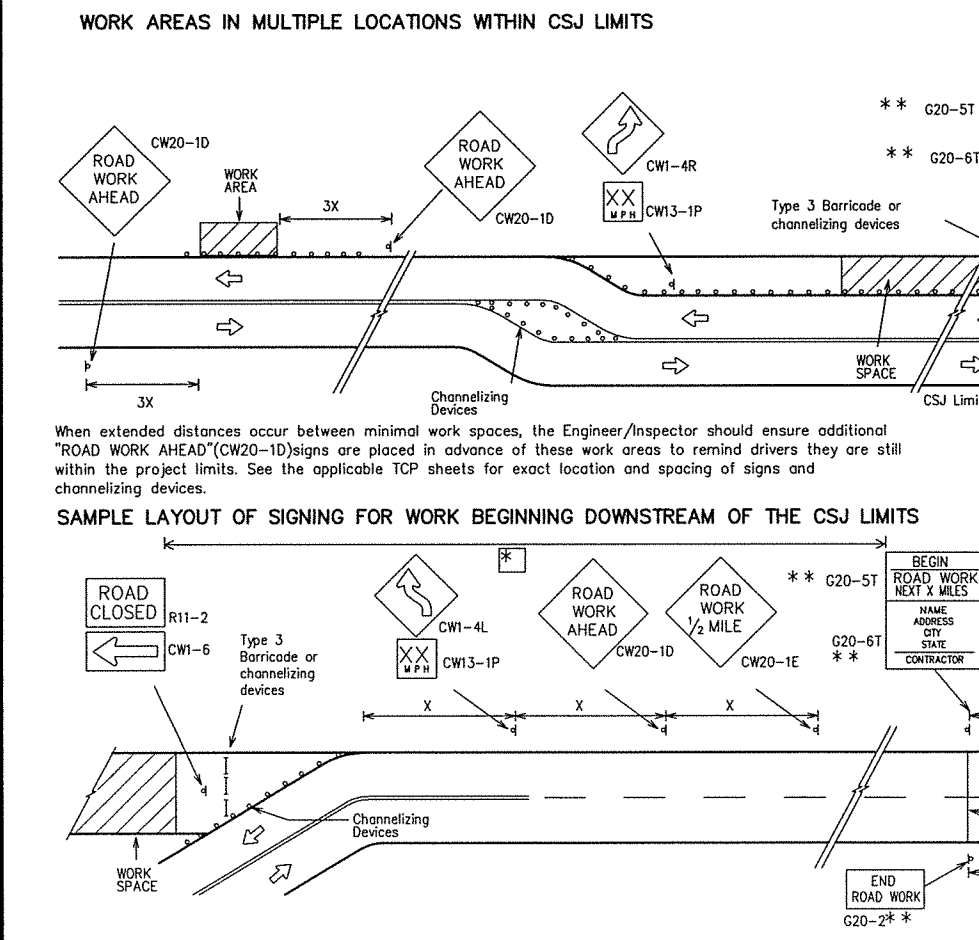
Sign Number or Series	SIZE		SPACING	
	Conventional Road	Expressway/ Freeway	Posted Speed	Sign Spacing "X" Δ
CW20 <sup>4</sup> CW21 CW22 CW23 CW25	48" x 48"	48" x 48"	MPH	Feet (Apprx.)
			30	120
			35	160
			40	240
			45	320
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"	50	400
			55	500 <sup>2</sup>
			60	600 <sup>2</sup>
			65	700 <sup>2</sup>
			70	800 <sup>2</sup>
			75	900 <sup>2</sup>
			80	1000 <sup>2</sup>
			*	* <sup>3</sup>

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

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

### GENERAL NOTES

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



### LEGEND

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

### NOTES

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

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

\*\* Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.

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

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

### LEGEND

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

SHEET 2 OF 12

Texas Department of Transportation  
 Traffic Operations Division Standard

## BARRICADE AND CONSTRUCTION PROJECT LIMIT

### BC(2)-13

FILE: _bc-13.dgn	DN: _TxDOT_	CK: TxDOT_	DR: TxDOT_	DC: TxDOT_
©TxDOT November_2002_	CONT	SECT	JOB	HIGHWAY
9-07				
7-13				

9-07  
7-13

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**BARRICADE STANDARDS**  
**MIDDLE CREEK BRIDGE**  
**COUNTY ROAD 410**  
**BLANCO COUNTY, TEXAS**

STATE OF TEXAS  
 GREG HALEY  
 52292  
 REGISTERED PROFESSIONAL ENGINEER

Sheeply  
 7-19-15

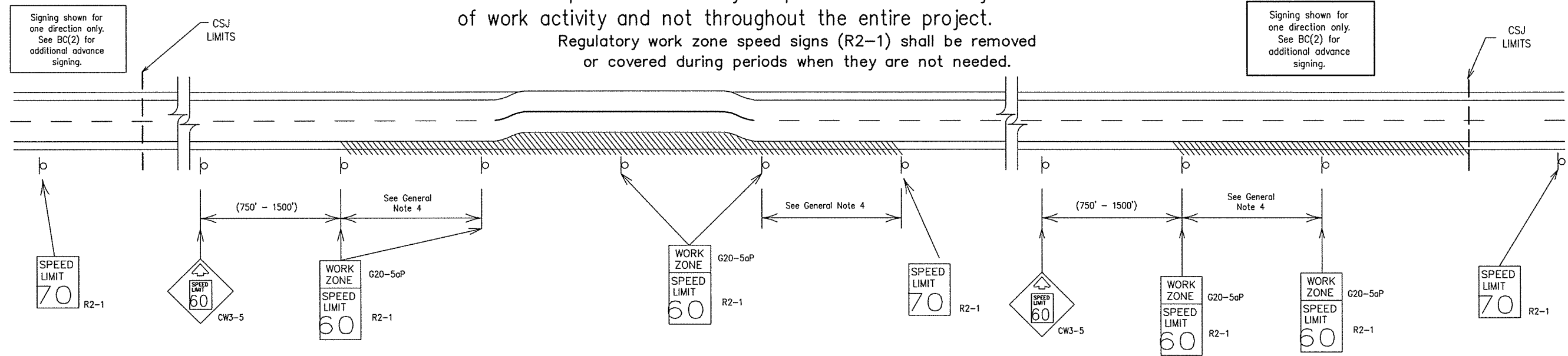
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 Date: 06/02/14  
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SHEET 50

# TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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



## GUIDANCE FOR USE:

### LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

- rough road or damaged pavement surface
- substantial alteration of roadway geometrics (diversions)
- construction detours
- grade
- width
- other conditions readily apparent to the driver

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

### SHORT TERM WORK ZONE SPEED LIMITS

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

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

## GENERAL NOTES

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

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

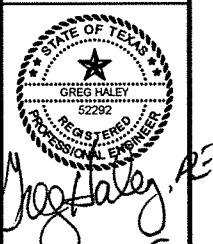
SHEET 3 OF 12

<b>BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT</b>			
<b>BC(3)-13</b>			
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BARRICADE STANDARDS  
MIDDLE CREEK BRIDGE  
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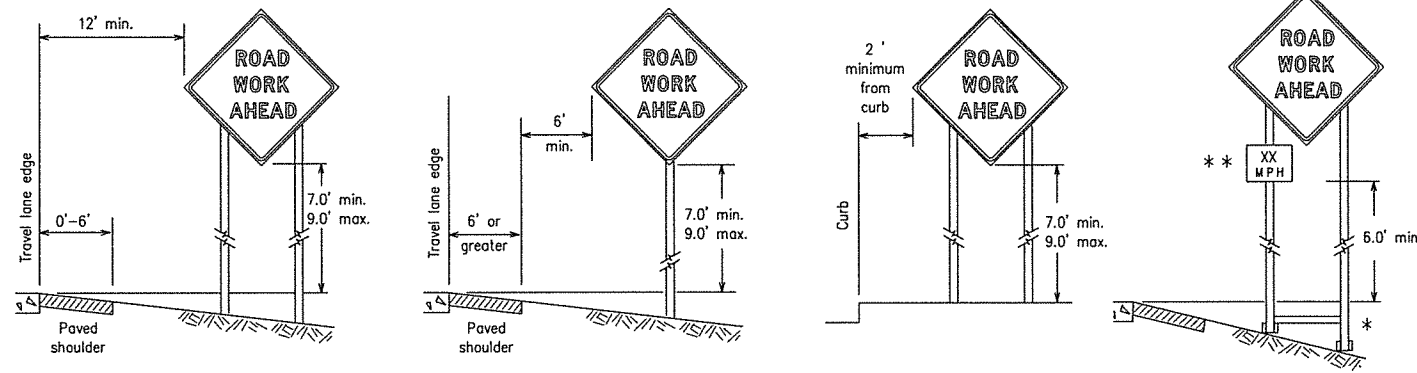


*Greg Haley, P.E.*  
1-19-15

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TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



\* When placing skid supports on uneven 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.

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

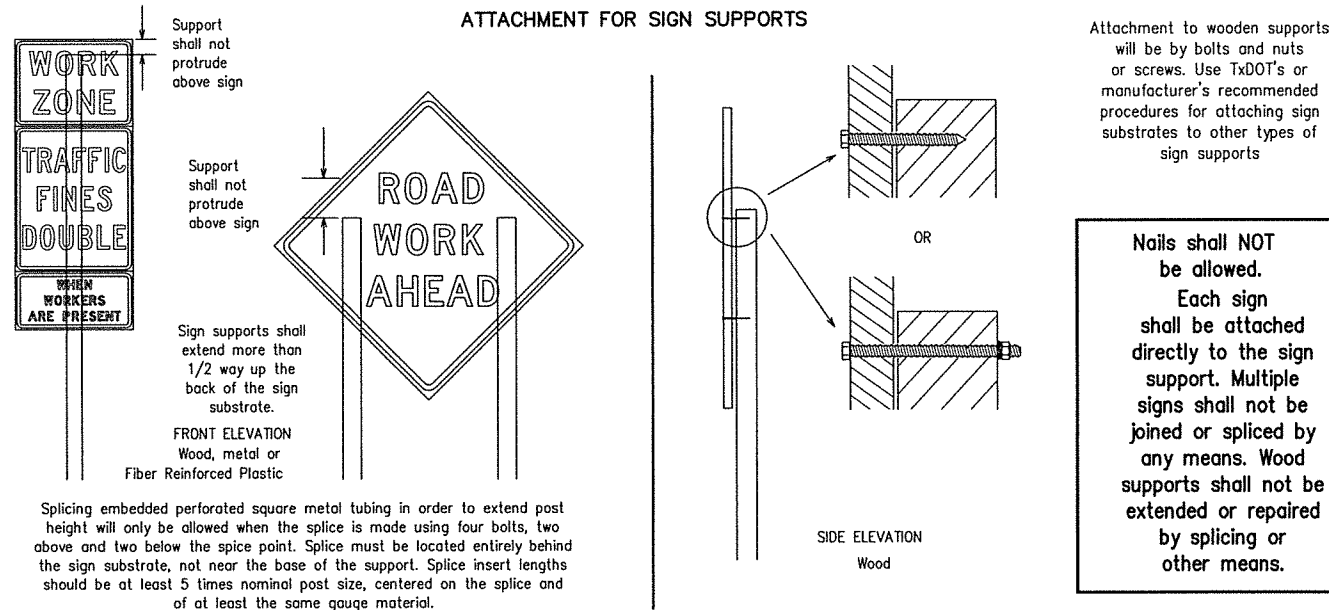
SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

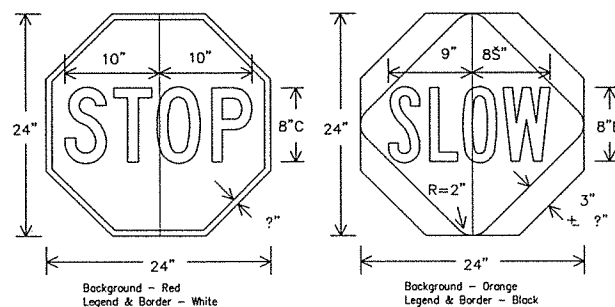
- Flags may be used to draw attention to warning signs. When used the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

ATTACHMENT FOR SIGN SUPPORTS



STOP/SLOW PADDLES

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



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, 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.
- 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 sheets or the CWZTCD. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
- Any sign or traffic control device that is struck or damaged by the Contractor or his/her construction equipment shall be replaced as soon as possible by the Contractor to ensure proper guidance for the motorists. This will be subsidiary to Item 502.

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BARRICADE STANDARDS  
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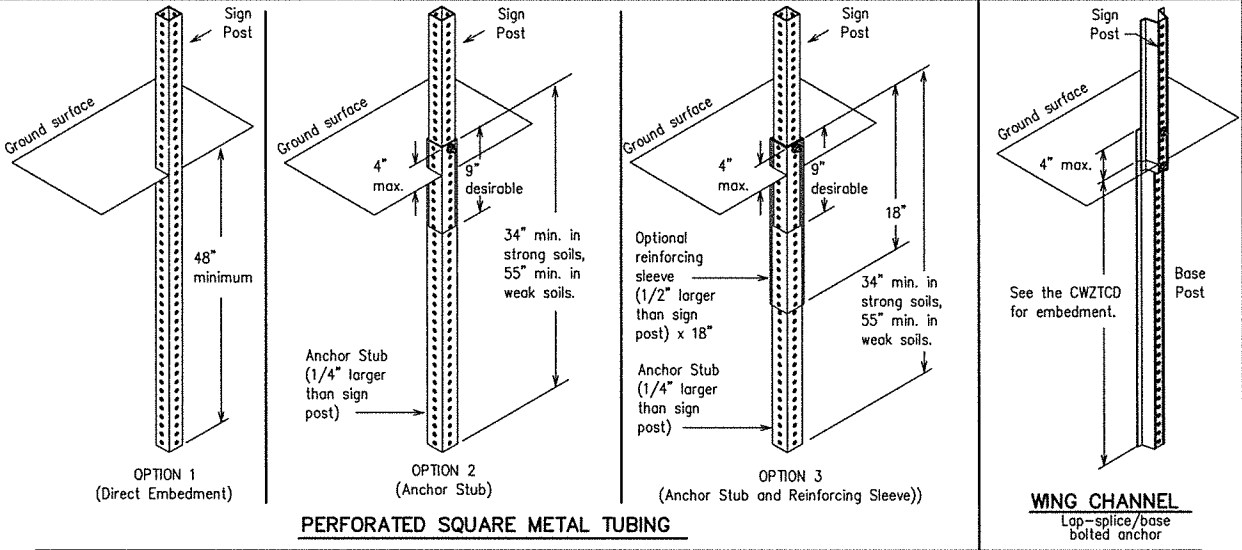
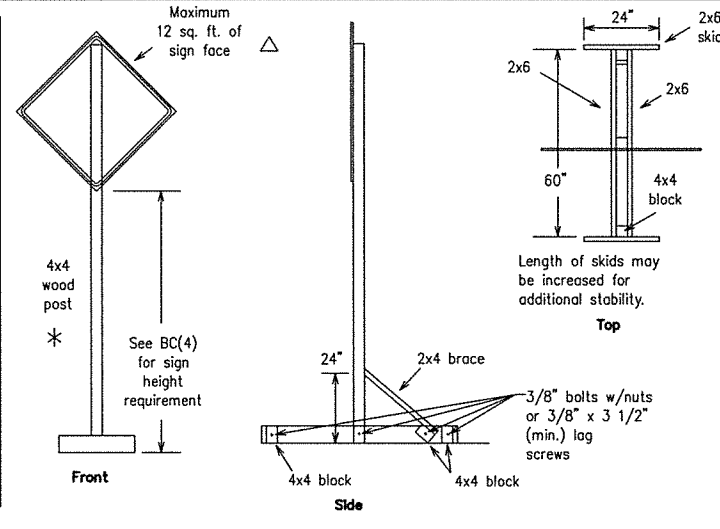
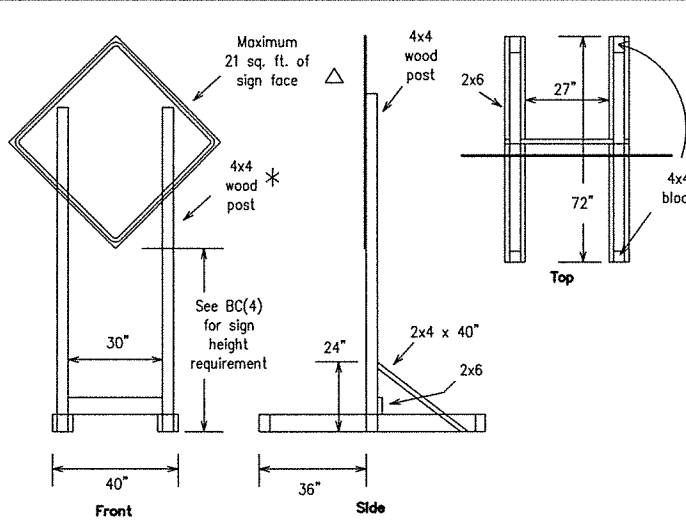


*Gregory R. [Signature]*  
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SHEET 4 OF 12

Texas Department of Transportation		Traffic Operations Division Standard	
<b>BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES</b>			
<b>BC(4)-13</b>			
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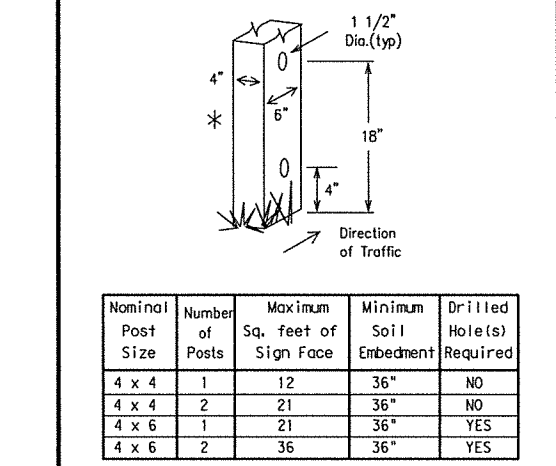
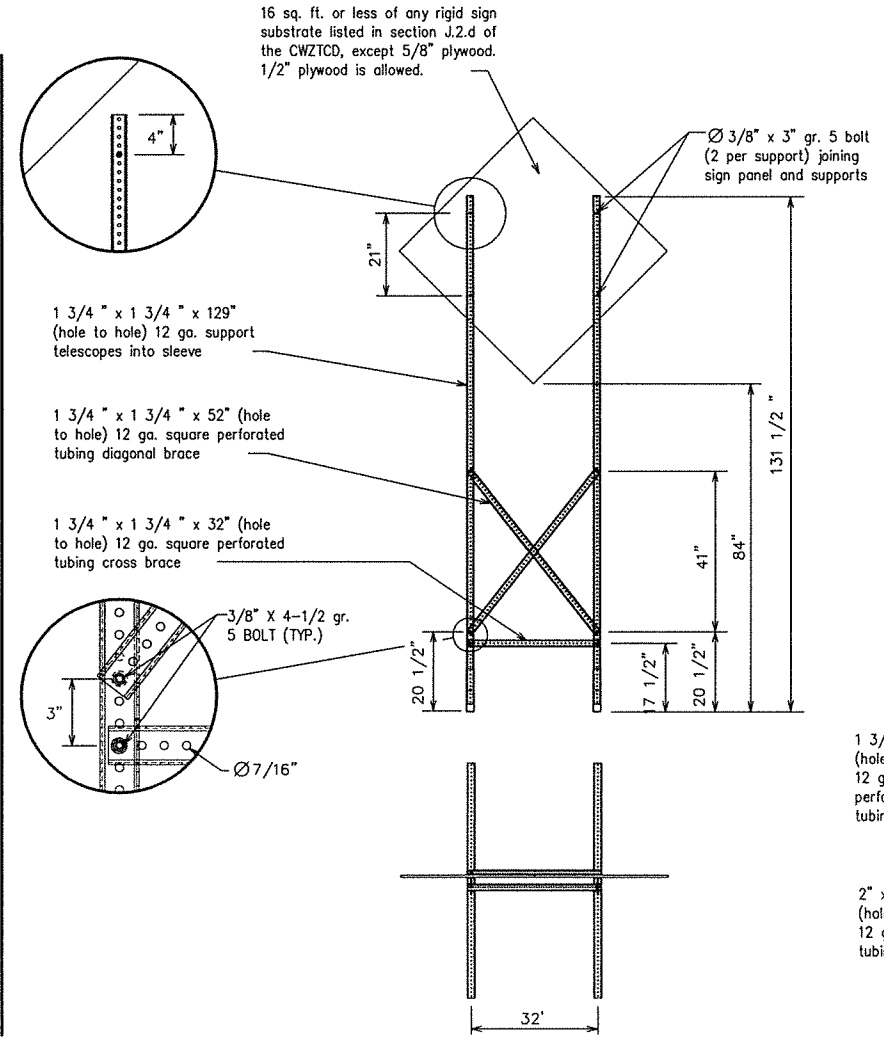
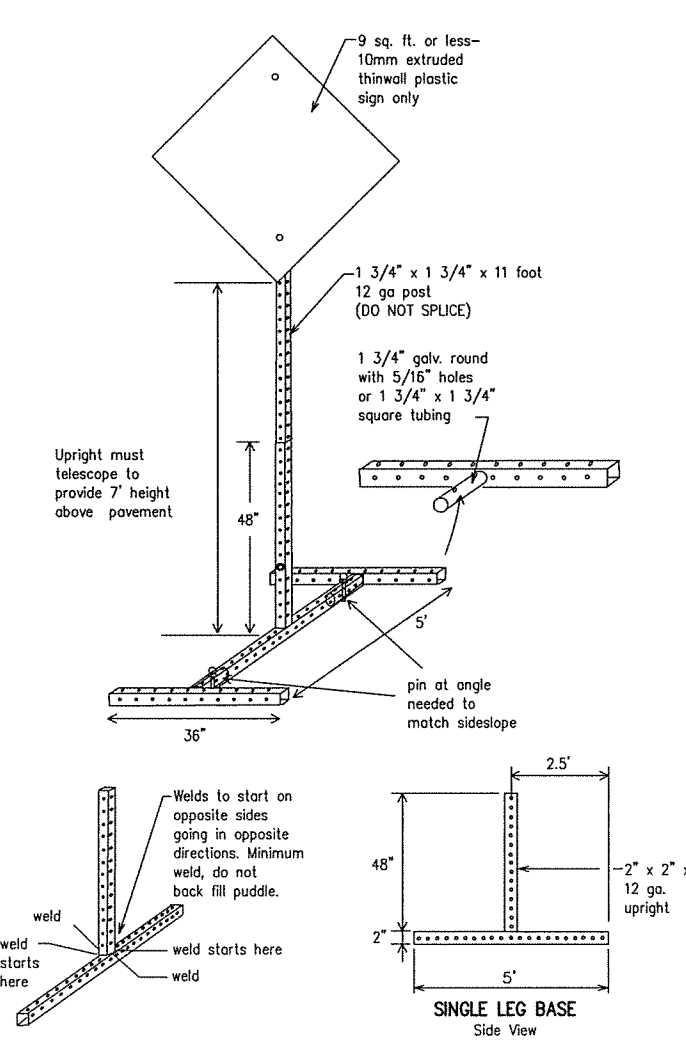
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Rev. No. 1  
Date [Date]  
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**SKID MOUNTED WOOD SIGN SUPPORTS**  
LONG/INTERMEDIATE TERM STATIONARY – PORTABLE SKID MOUNTED SIGN SUPPORTS

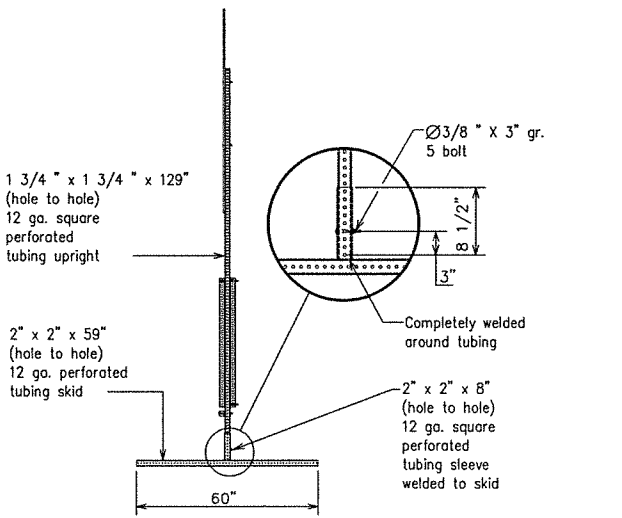
**GROUND MOUNTED SIGN SUPPORTS**

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



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

**WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS**



**SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS**

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

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

**GENERAL NOTES**

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

See BC(4) for definition of "Work Duration."  
\* Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.  
△ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

SHEET 5 OF 12

Texas Department of Transportation  
Traffic Operations Division Standard

**BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT**

**BC(5)-13**

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STATE OF TEXAS  
GREG HALEY  
52282  
REGISTERED PROFESSIONAL ENGINEER

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**SHEET**  
53

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

## RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

### PORTABLE CHANGEABLE MESSAGE SIGNS

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

### Phase 1: Condition Lists

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

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

### Phase 2: Possible Component Lists

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

\*\* See Application Guidelines Note 6.

### APPLICATION GUIDELINES

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

### WORDING ALTERNATIVES

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

WORD OR PHRASE	ABBREVIATION	WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD	Major	MAJ
Alternate	ALT	Miles	MI
Avenue	AVE	Miles Per Hour	MPH
Best Route	BEST RTE	Minor	MNR
Boulevard	BLVD	Monday	MON
Bridge	BRDG	Normal	NORM
Canot	CANT	North	N
Center	CTR	Northbound (route) N	
Construction Ahead	CONST AHD	Parking	PKING
CROSSING	XING	Road	RD
Detour Route	DETOUR RTE	Right Lane	RT LN
Do Not	DONT	Saturday	SAT
East	E	Service Road	SERV RD
Eastbound (route) E		Shoulder	SHLDR
Emergency	EMER	Slippery	SLIP
Emergency Vehicle	EMER VEH	South	S
Entrance, Enter	ENT	Southbound (route) S	
Express Lane	EXP LN	Speed	SPD
Expressway	EXPWY	Street	ST
XXXX Feet	XXXX FT	Sunday	SUN
Fog Ahead	FOG AHD	Telephone	PHONE
Freeway	FRWY, FWY	Temporary	TEMP
Freeway Blocked	FWY BLKD	Thursday	THURS
Friday	FRI	To Downtown	TO DWN TN
Hazardous Driving	HAZ DRIVING	Traffic	TRAF
Hazardous Material	HAZMAT	Travelers	TRV LRS
High-Occupancy	HOV	Tuesday	TUES
Vehicle	VEH	Time Minutes	TIME MIN
Highway	HWY	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
Left Lane	LFT LN	Westbound (route) W	
Lane Closed	LN CLOSED	Wet Pavement	WET PVMT
Lower Level	LWR LEVEL	Will Not	WONT
Maintenance	MAINT		

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

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

### FULL MATRIX PCMS SIGNS

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

SHEET 6 OF 12

		<b>Traffic Operations Division Standard</b>
<b>BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)</b>		
<b>BC(6)-13</b>		
FILE: bc-13.dgn	DN: TXDOT	CK: TXDOT
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9-07	DIST	COUNTY
7-13		SHEET NO.

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**BARRICADE STANDARDS**  
**MIDDLE CREEK BRIDGE**  
**COUNTY ROAD 410**  
**BLANCO COUNTY, TEXAS**

STATE OF TEXAS  
GREG HALEY  
52292  
REGISTERED PROFESSIONAL ENGINEER

*Greg Haley PE*  
1-19-15

File: K:\14-104 Middle Creek Road\Design\PLAN SHEETS\BC-13.dwg

Job No. 14-104

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Scale (Vert.): N/A

Date: 06/20/14

Checked By: 008

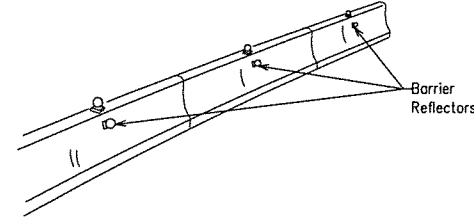
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Rev. No. 1

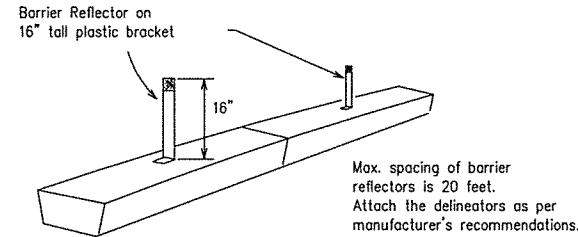
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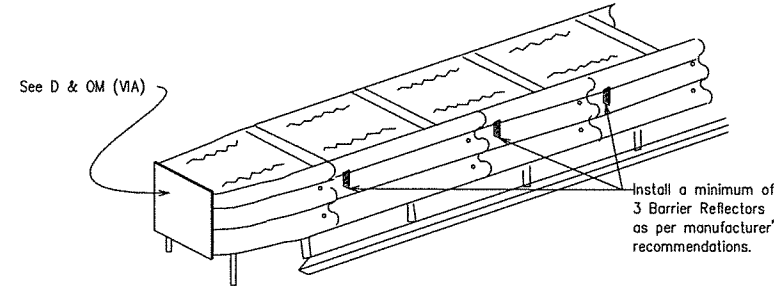
- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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



**CONCRETE TRAFFIC BARRIER (CTB)**



**LOW PROFILE CONCRETE BARRIER (LPCB)**



**DELINEATION OF END TREATMENTS**

**END TREATMENTS FOR CTB'S USED IN WORK ZONES**

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

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

**BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS**

**WARNING LIGHTS**

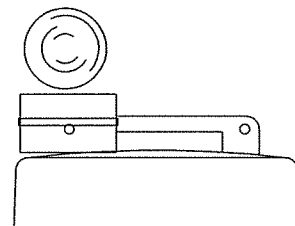
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A—Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet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

**WARNING LIGHTS MOUNTED ON PLASTIC DRUMS**

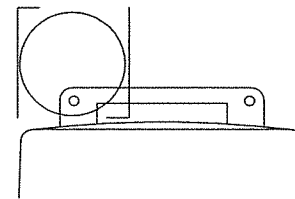
- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing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

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

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



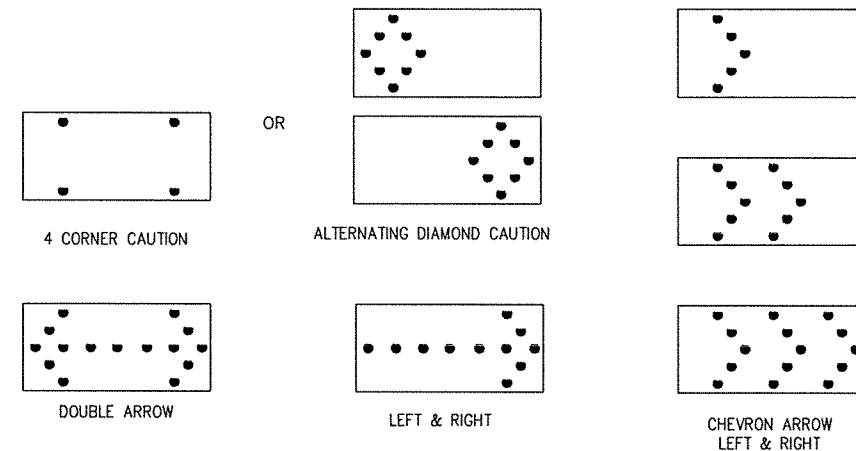
Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



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

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

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



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

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

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

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

**FLASHING ARROW BOARDS**

SHEET 7 OF 12

**TRUCK-MOUNTED ATTENUATORS**

- Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the National Cooperative Highway Research Report No. 350 (NCHRP 350) or the Manual for Assessing Safety Hardware (MASH).
- Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
- Refer to the CWZTCD for a list of approved TMAs.
- TMAs are required on freeways unless otherwise noted in the plans.
- A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
- The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.



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

**BC(7)-13**

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9-07	DIST	COUNTY	SHEET NO.	
7-13				

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**BARRICADE STANDARDS**  
**MIDDLE CREEK BRIDGE**  
**COUNTY ROAD 410**  
**BLANCO COUNTY, TEXAS**



*Greg Haley*  
1-19-15

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Date: 06/02/14	Date	Remarks
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**GENERAL NOTES**

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

**GENERAL DESIGN REQUIREMENTS**

Pre-qualified plastic drums shall meet the following requirements:

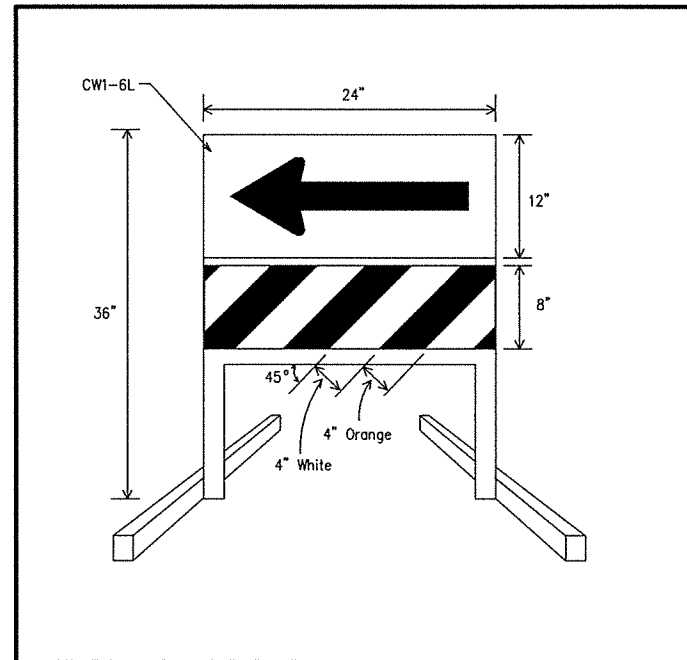
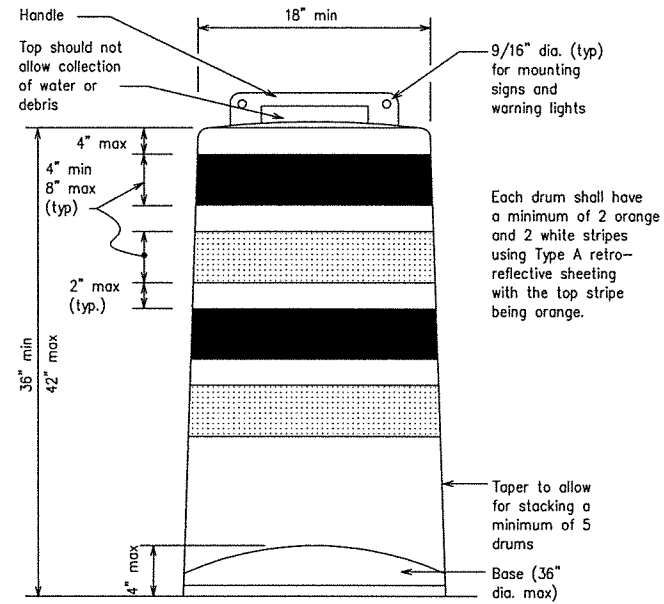
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

**RETROREFLECTIVE SHEETING**

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

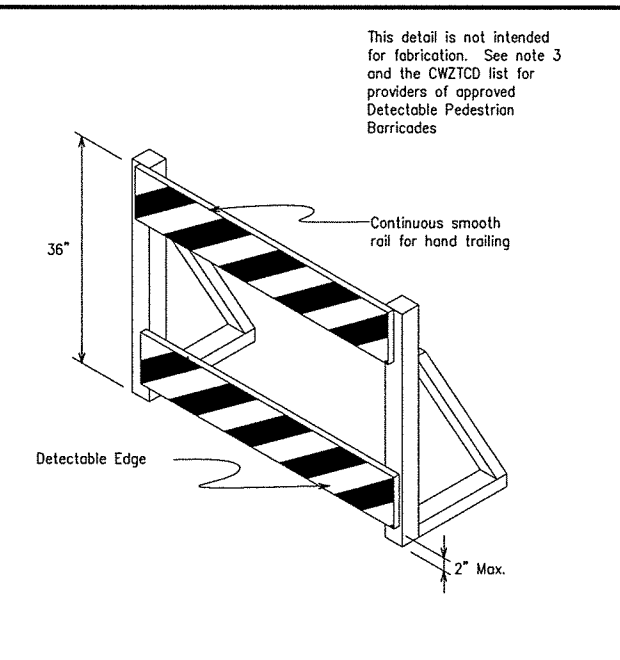
**BALLAST**

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



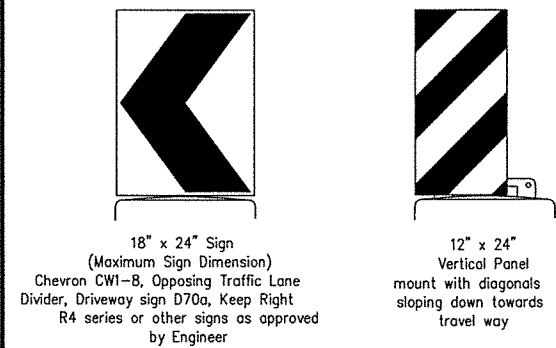
**DIRECTION INDICATOR BARRICADE**

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



**DETECTABLE PEDESTRIAN BARRICADES**

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



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

**SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS**

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

SHEET 8 OF 12

		<b>Traffic Operations Division Standard</b>	
<h2>BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES</h2>			
<h3>BC(8)-13</h3>			
FILE: bc-13.dgn	DN: TXDOT	CK: TXDOT	DR: TXDOT
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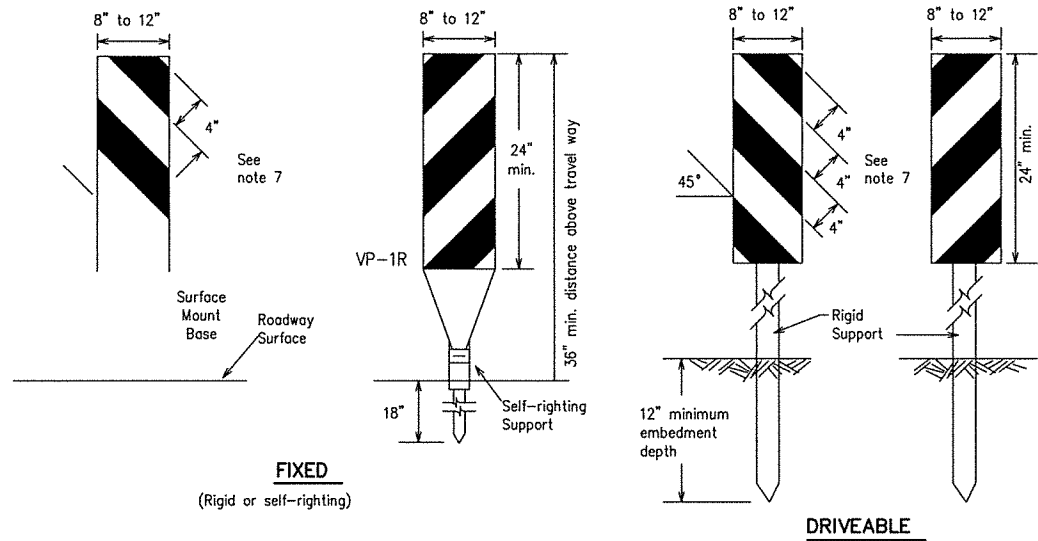
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SHEET 8 OF 12

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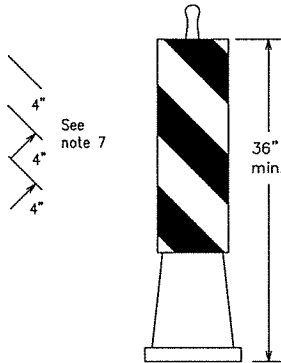
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(Rigid or self-righting)

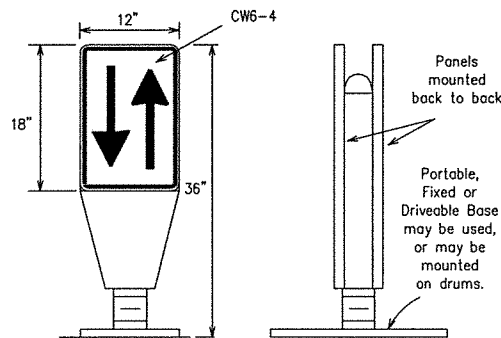
**DRIVEABLE**

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



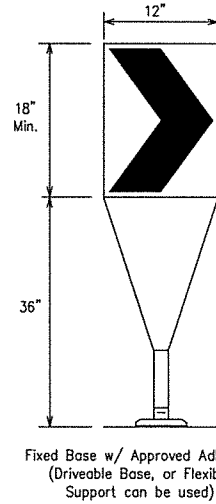
**PORTABLE**

**VERTICAL PANELS (VPs)**



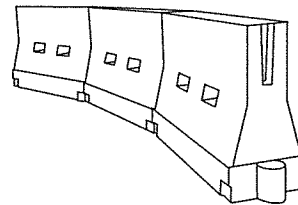
**OPPOSING TRAFFIC LANE DIVIDERS (OTLD)**

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



**CHEVRONS**

- The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
- Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
- Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
- To be effective, the chevron should be visible for at least 500 feet.
- Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B or Type C 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.



**LONGITUDINAL CHANNELIZING DEVICES (LCD)**

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

**WATER BALLASTED SYSTEMS USED AS BARRIERS**

- Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate NCHRP 350 crashworthiness requirements based on roadway speed and barrier application.
- Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
- Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
- When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

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

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

**GENERAL NOTES**

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

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

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

**SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS**

SHEET 9 OF 12

Texas Department of Transportation  
 Traffic Operations Division Standard

**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC(9)-13**

FILE: \_bc-13.dgn\_    PK: \_TxDOT\_    CK: TxDOT    DW: \_TxDOT\_    CR: TxDOT  
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9-07  
7-13

Job No. 14-104  
Date: 08/02/14  
Checked By: 000  
Rev. No. 1

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Scale (Ver.): N/A  
Drawn By:  
Date: 08/02/14  
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Remarks

1  
2  
3  
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 REGISTRATION # F-009877

**BARRICADE STANDARDS**  
**MIDDLE CREEK BRIDGE**  
**COUNTY ROAD 410**  
**BLANCO COUNTY, TEXAS**

STATE OF TEXAS  
 GREG HALEY  
 52292  
 PROFESSIONAL ENGINEER

1-19-15

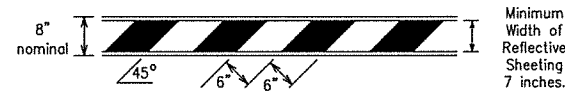
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 Date: 08/02/14  
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 Rev. No. 1

SHEET 57

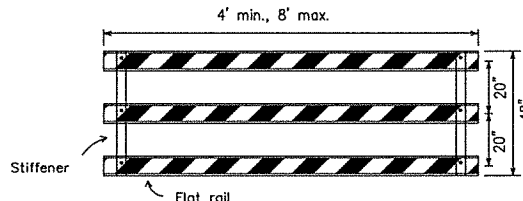
**TYPE 3 BARRICADES**

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

Barricades shall NOT be used as a sign support.

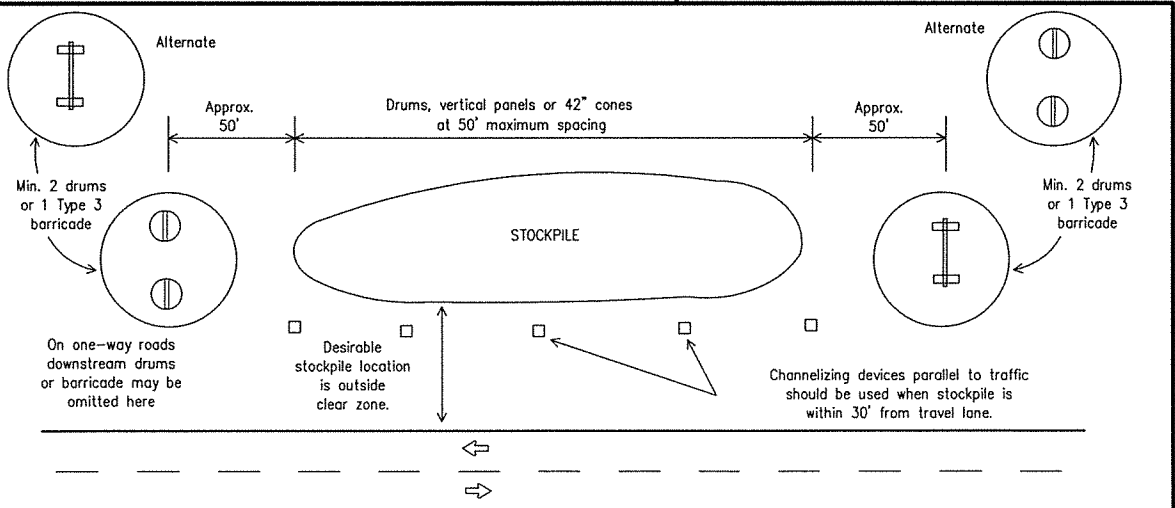


**TYPICAL STRIPING DETAIL FOR BARRICADE RAIL**

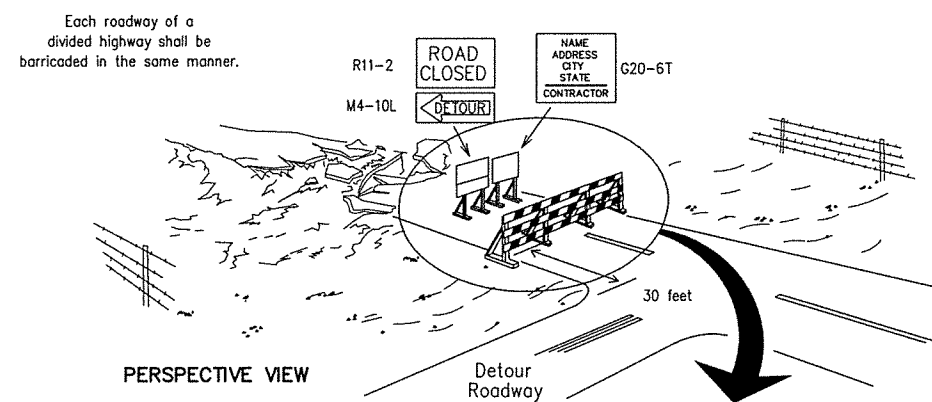


Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

**TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES**

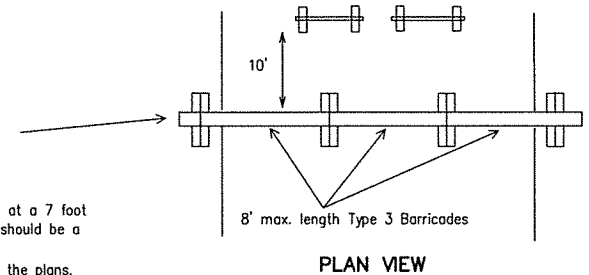


**TRAFFIC CONTROL FOR MATERIAL STOCKPILES**



PERSPECTIVE VIEW

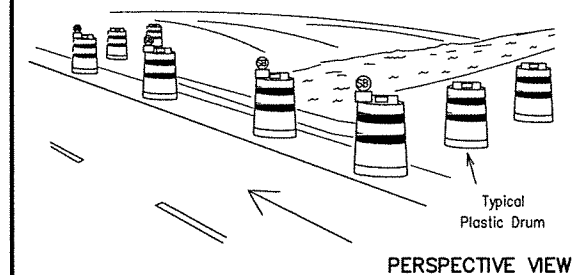
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



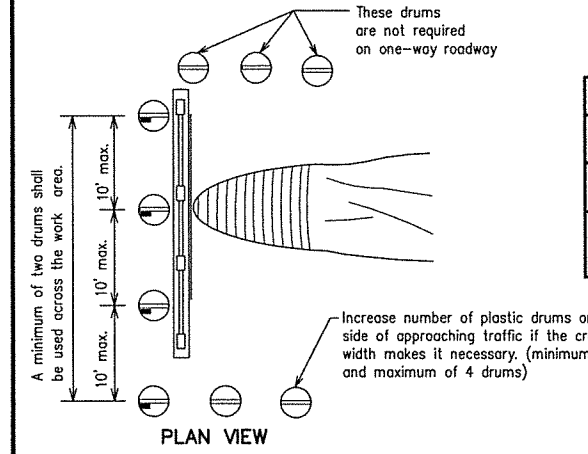
PLAN VIEW

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

**TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION**



PERSPECTIVE VIEW

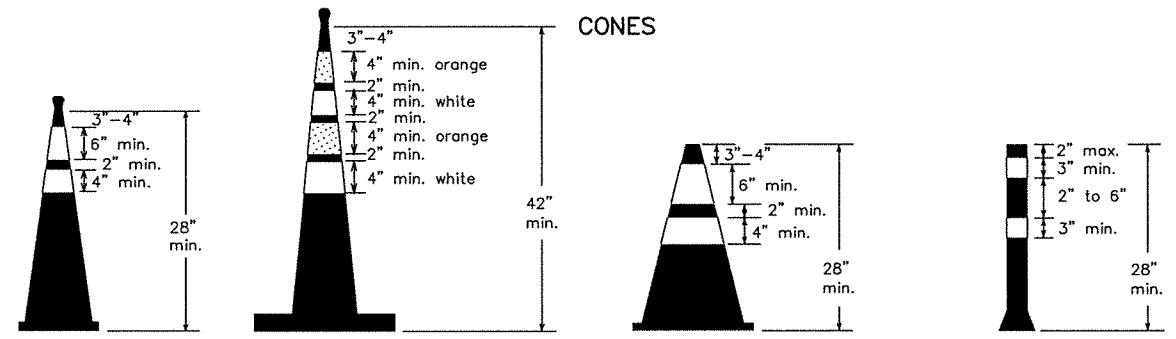


PLAN VIEW

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

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

**CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS**



**CONES**

Two-Piece cones

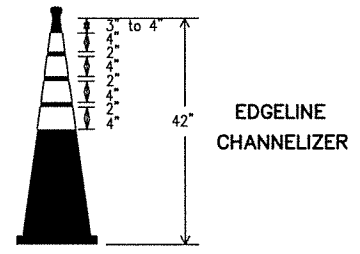
One-Piece cones

Tubular Marker

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

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

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



EDGE LINE CHANNELIZER

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

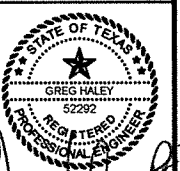
**SHEET 10 OF 12**

Texas Department of Transportation		Traffic Operations Division Standard	
<b>BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES</b>			
<b>BC(10)-13</b>			
FILE: bc-13.dgn	DN: TxDOT	CK: TxDOT	EW: TxDOT
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9-07	DIST	COUNTY	SHEET NO.
7-13			

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REGISTRATION # F-000977



BARRICADE STANDARDS  
MIDDLE CREEK BRIDGE  
COUNTY ROAD 410  
BLANCO COUNTY, TEXAS



*Greg Haley*  
1-19-15

Date: Jan 18, 2015, 11:51pm User ID: Greg  
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Rev. No. 2  
Rev. No. 3  
Rev. No. 4

## WORK ZONE PAVEMENT MARKINGS

### GENERAL

1. The Contractor shall be responsible for maintaining work zone and existing pavement markings, in accordance with the standard specifications and special provisions, on all roadways open to traffic within the CSJ limits unless otherwise stated in the plans.
2. Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
3. Additional supplemental pavement marking details may be found in the plans or specifications.
4. Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
5. When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard Plan Sheet WZ(STPM).
6. When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs at the beginning of sections where passing.
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 pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and Departmental Material Specification DMS-4200 or DMS-4300.

### PREFABRICATED PAVEMENT MARKINGS

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

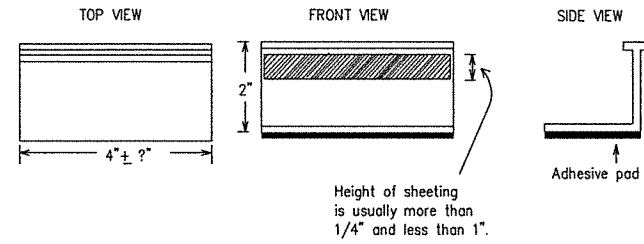
### MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

### REMOVAL OF PAVEMENT MARKINGS

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

### Temporary Flexible-Reflective Roadway Marker Tabs



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

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

### RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

SHEET 11 OF 12

<b>Texas Department of Transportation</b>		<i>Traffic Operations Division Standard</i>
<b>BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS</b>		
<b>BC(11)-13</b>		
FILE: _bc-13.dgn	DN: TxDOT	OK: TxDOT
© TxDOT February, 1998	CONT	SECT
2-98 11-02 7-13	DIST	COUNTY
1-02 9-07		SHEET NO.

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 REGISTRATION # F-000977



BARRICADE STANDARDS  
 MIDDLE CREEK BRIDGE  
 COUNTY ROAD 410  
 BLANCO COUNTY, TEXAS

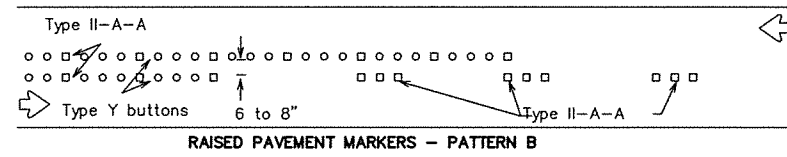
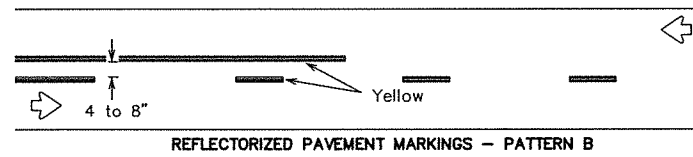
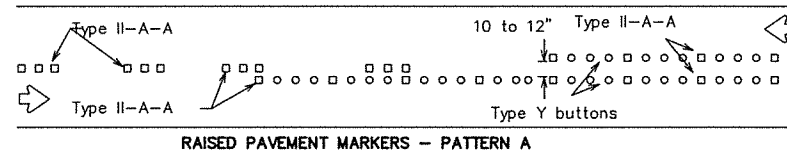
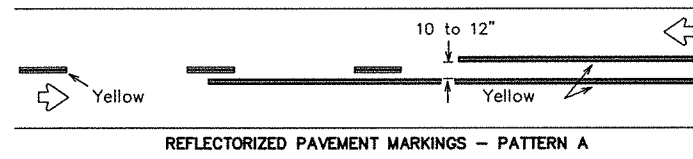
STATE OF TEXAS  
 GREG HALLEY  
 52292  
 REGISTERED PROFESSIONAL ENGINEER

*Greg Haley PE*  
1-19-15

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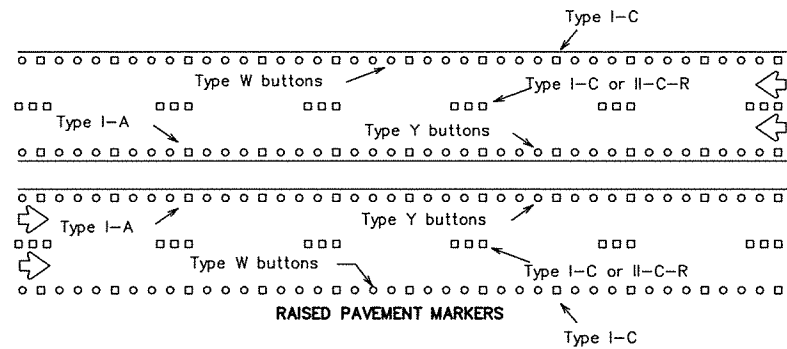
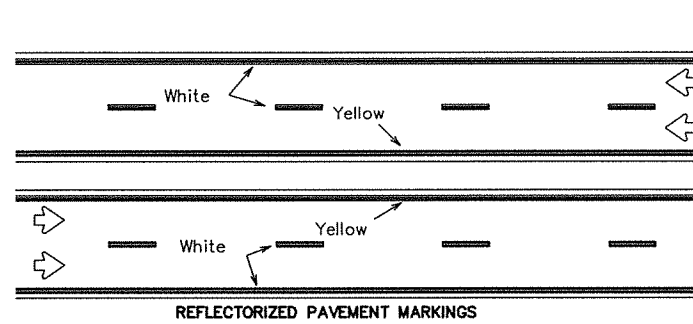
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### PAVEMENT MARKING PATTERNS



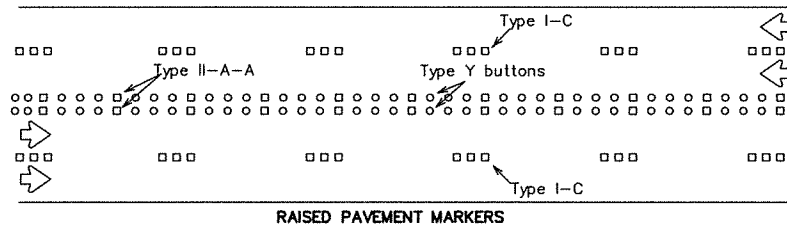
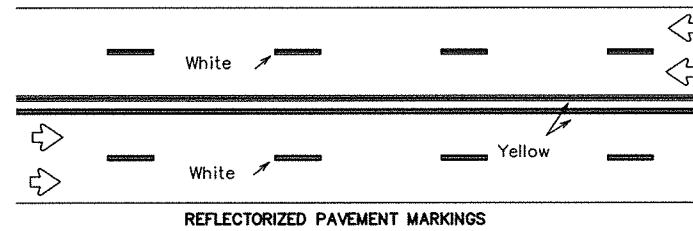
Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer. Prefabricated markings may be substituted for reflectorized pavement markings.

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



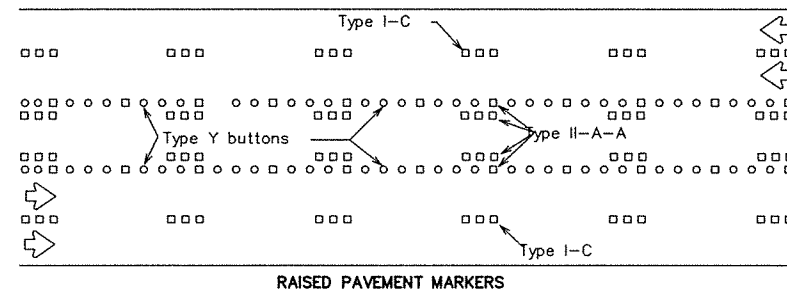
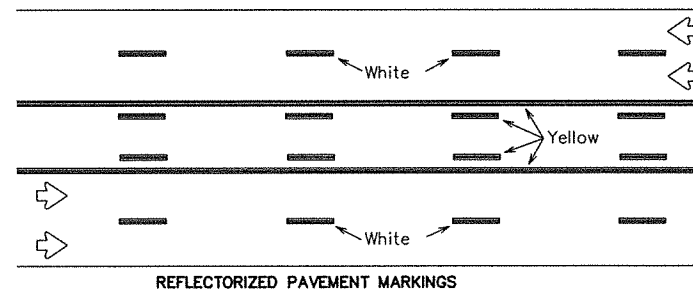
Prefabricated markings may be substituted for reflectorized pavement markings.

### EDGE & LANE LINES FOR DIVIDED HIGHWAY



Prefabricated markings may be substituted for reflectorized pavement markings.

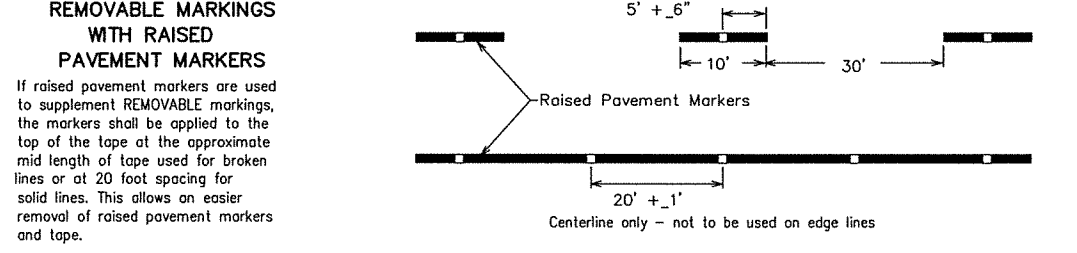
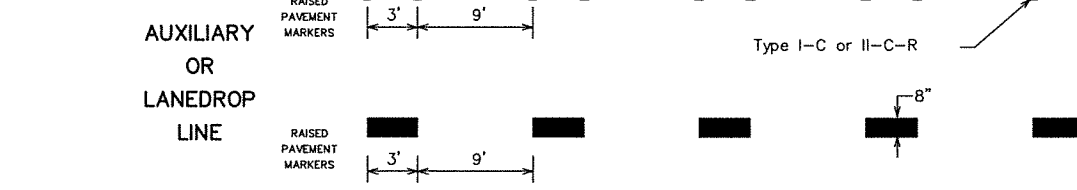
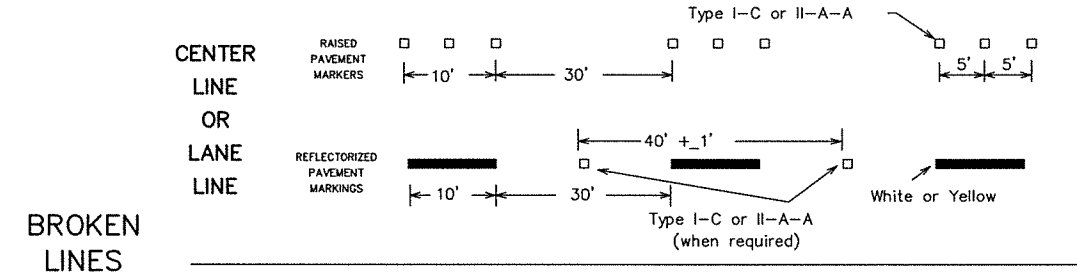
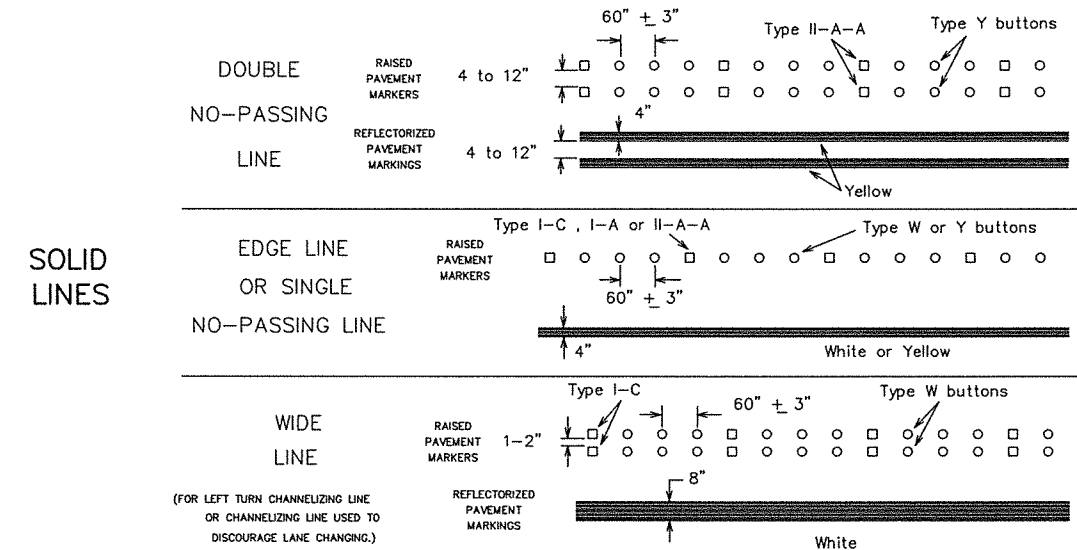
### LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



Prefabricated markings may be substituted for reflectorized pavement markings.

### TWO-WAY LEFT TURN LANE

### STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



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."

SHEET 12 OF 12

Texas Department of Transportation  
 Traffic Operations Division Standard

## BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

### BC(12)-13

FILE: _bc-13.dgn	DN: _TXDOT_	OK: TXDOT	DR: _TXDOT_	OK: TXDOT
©TXDOT February 1998	CONT	SECT	JOB	HIGHWAY
1-97 11-02 7-13	DIST	COUNTY	SHEET NO.	
2-98 9-07				

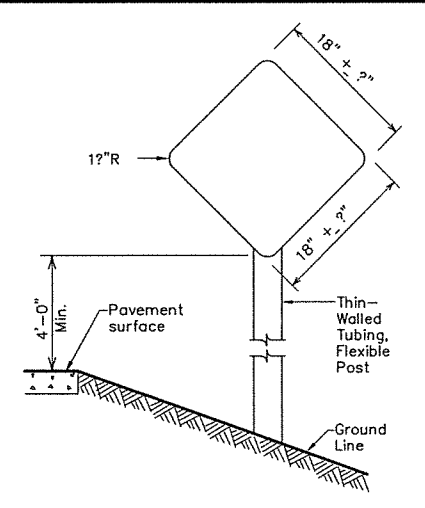
**K.C. ENGINEERING, INC.**  
 CONSULTING ENGINEERS  
 705 HWY. 281 NORTH, PLAZA I, SUITE 103  
 MARBLE FALLS, TEXAS 78854  
 OFFICE: 830-683-5635 FAX: 830-683-9664  
 Email: info@kceengineering.com  
 REGISTRATION # F-000977

BARRICADE STANDARDS  
 MIDDLE CREEK BRIDGE  
 COUNTY ROAD 410  
 BLANCO COUNTY, TEXAS

Greg Haley  
 1-19-15

File: K:\14-104 Middle Creek Bridge Design\PLAN SHEETS\BC-13.dwg  
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 Drawn By: [Blank]  
 Rev. No. 1  
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SHEET 60

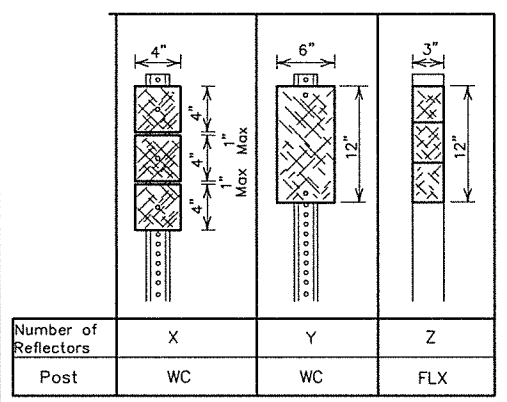


**TYPE 1**  
18" x 18"  
Yellow  
Type E Sheeting

**TYPE 4**  
18" x 18"  
Red  
Type D Sheeting

Use Sign blank 0.080" thick sheet aluminum conforming to ASTM B-209 Alloy 6061-T6. Use reflective sheeting in accordance with DMS 8300.

TYPES 1 and 4



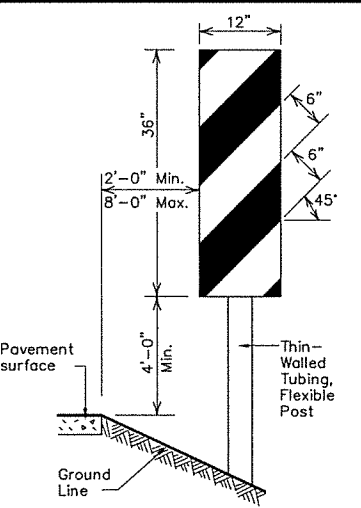
**TYPE 2**

Number of Reflectors	X	Y	Z
Post	WC	WC	FLX

- NOTES**
- All type 2 object markers are yellow
  - WC-wing channel post, 1.12 lbs/ft steel per ASTM A 1011 SS Gr 50, or ASTM A499
  - FLX-flexible post (embedded and surface mount)

Typically used on bridge rail approach ends, some bridge abutments and at bridge rail exits on two-lane, two-way roadways

**OBJECT MARKERS**

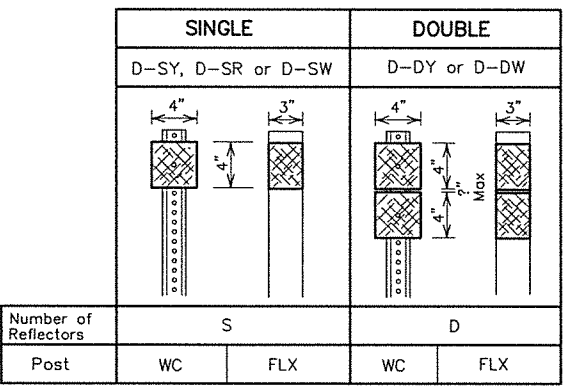


**OM-3 Directions**

- L - Placed on Left Side  
R - Placed on Right Side  
C - Placed on Center

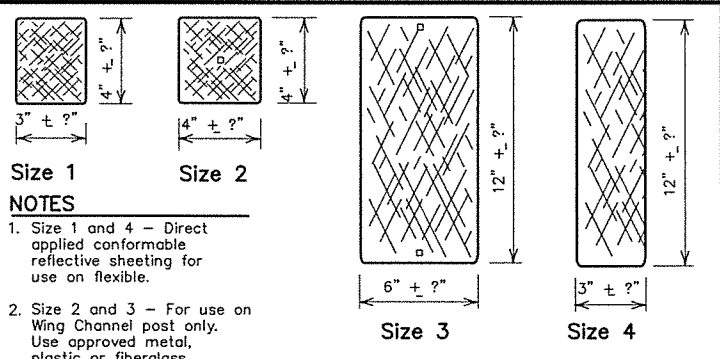
Use Sign blank .080" thick sheet aluminum conforming to ASTM B-209 Alloy 6061-T6. Use reflective sheeting in accordance with DMS 8300, Type E. Use at bridges with no approach rails.

TYPE 3



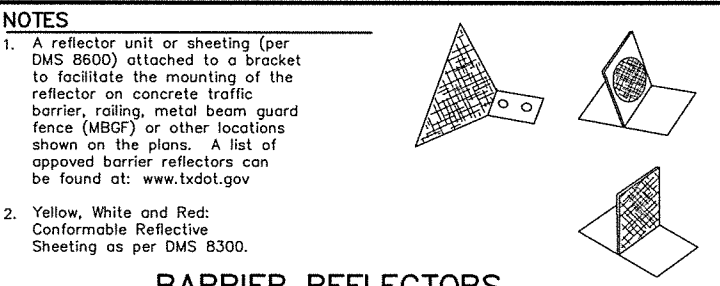
**DELINEATORS**

- NOTES**
- Reflector Units: W-White, R-Red, Y-Yellow
  - Length of post may vary to meet field conditions.
  - WC-wing channel post, 1.12 lbs/ft Steel per ASTM A 1011 SS Gr 50, or ASTM A499
  - FLX-flexible post (embedded and surface mount)



**REFLECTOR UNIT SIZES**

- NOTES**
- Size 1 and 4 - Direct applied conformable reflective sheeting for use on flexible.
  - Size 2 and 3 - For use on Wing Channel post only. Use approved metal, plastic or fiberglass backplate with 17/64" square mounting holes.
  - Yellow, White & Red: Conformable Reflective Sheeting as per DMS 8300.



**BARRIER REFLECTORS**

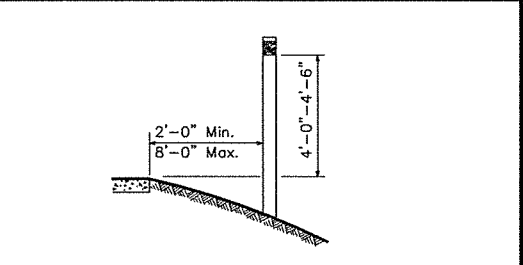
**D & OM DESCRIPTIVE CODES**

NSTL DEL ASSM (D-XX)SZ X,(XXX)XXX(X)

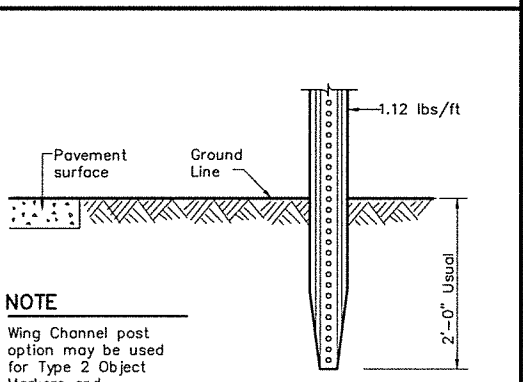
- NUMBER OF REFLECTORS**  
S = Single  
D = Double
- COLOR OF REFLECTORS**  
W = White  
Y = Yellow  
R = Red
- REFLECTOR UNIT SIZE**  
1 or 2
- TYPE OF POST OR DELINEATOR**  
WC = Wing Channel Post  
FLX = Flexible Post  
TYC = Barrier Reflector
- TYPE OF MOUNT**  
GND = Embedded (drivable or set in concrete)  
CTB = Concrete Barrier Mount  
GF1 or GF2 = Guard Fence Attachment  
SRF = Surface Mount
- DIRECTION**  
If Required  
BI = Bi-Directional  
BR = Bi-Directional with red on back

NSTL OM ASSM (OM-XX) (XXX)XXX(X)

- TYPE OF OBJECT MARKER**  
1, 2, 3, or 4
- NUMBER OF REFLECTORS OR DIRECTION**  
X = 3-Size 2 reflector units (Type 2 only)  
Y = 1-Size 3 reflector unit (Type 2 only)  
Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only)  
L = Left Side (Type 3 Object Marker only)  
R = Right Side (Type 3 Object Marker only)  
C = Center (Type 3 Object Marker only)
- TYPE OF POST**  
WC = Wing Channel Post  
FLX = Flexible Post  
TWT = Thin Walled Tubing
- TYPE OF MOUNT**  
GND = Embedded (drivable or set in concrete)  
SRF = Surface Mount
- DIRECTION**  
If Required  
BI = Bi-Directional

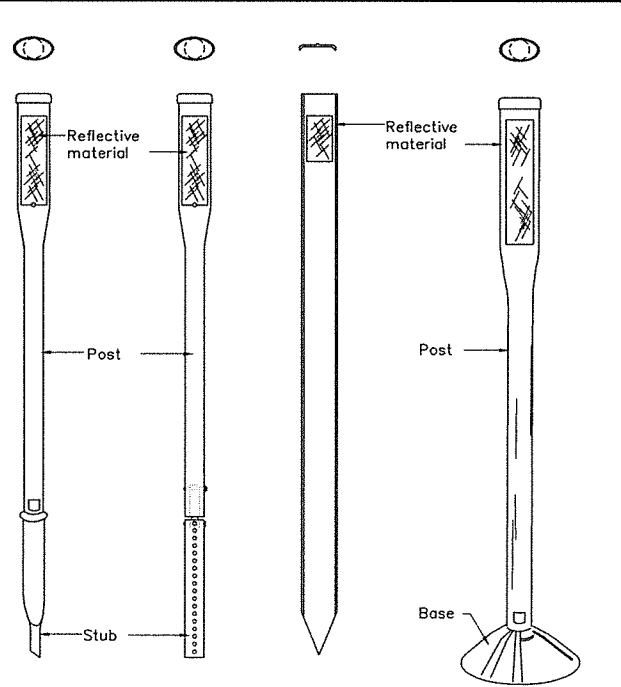


**TYPICAL INSTALLATION**



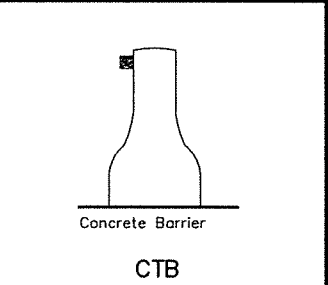
**NOTE**  
Wing Channel post option may be used for Type 2 Object Markers and delineators only.

**WING CHANNEL**

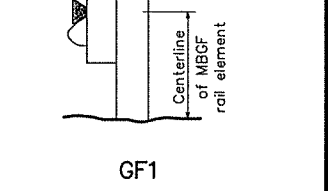


**FLEXIBLE POSTS**

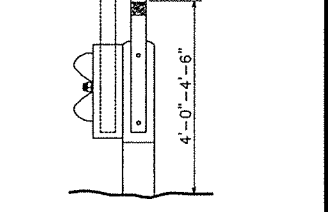
- NOTES**
- See Material Producer List for approved devices.
  - Install to manufacturer's recommendations.



**CTB**



**GF1**



**GF2**

**BARRIER REFLECTORS**

**GENERAL NOTES**

- Place delineators on a section of roadway the same distance from the edge of pavement.
- Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
- When object markers are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of 4'-0"-4'-6". If this is the case, place the object markers as close to the desired height as possible.
- Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.

**DEPARTMENTAL MATERIAL SPECIFICATIONS**

FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS AND OBJECT MARKERS	DMS-8600

Texas Department of Transportation  
Traffic Operations Division

**DELINEATOR & OBJECT MARKER INSTALLATION AND MATERIAL DESCRIPTION D & OM(1)-10**

©TxDOT August 2004	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
10-09	CONT	SECT	JOB	HIGHWAY
4-10	DIST	COUNTY	SHEET NO.	

**K.C. ENGINEERING, INC.**  
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OFFICE: 830-693-5635 FAX: 830-693-9664  
Email: info@kceengineering.com  
REGISTRATION # F-000977



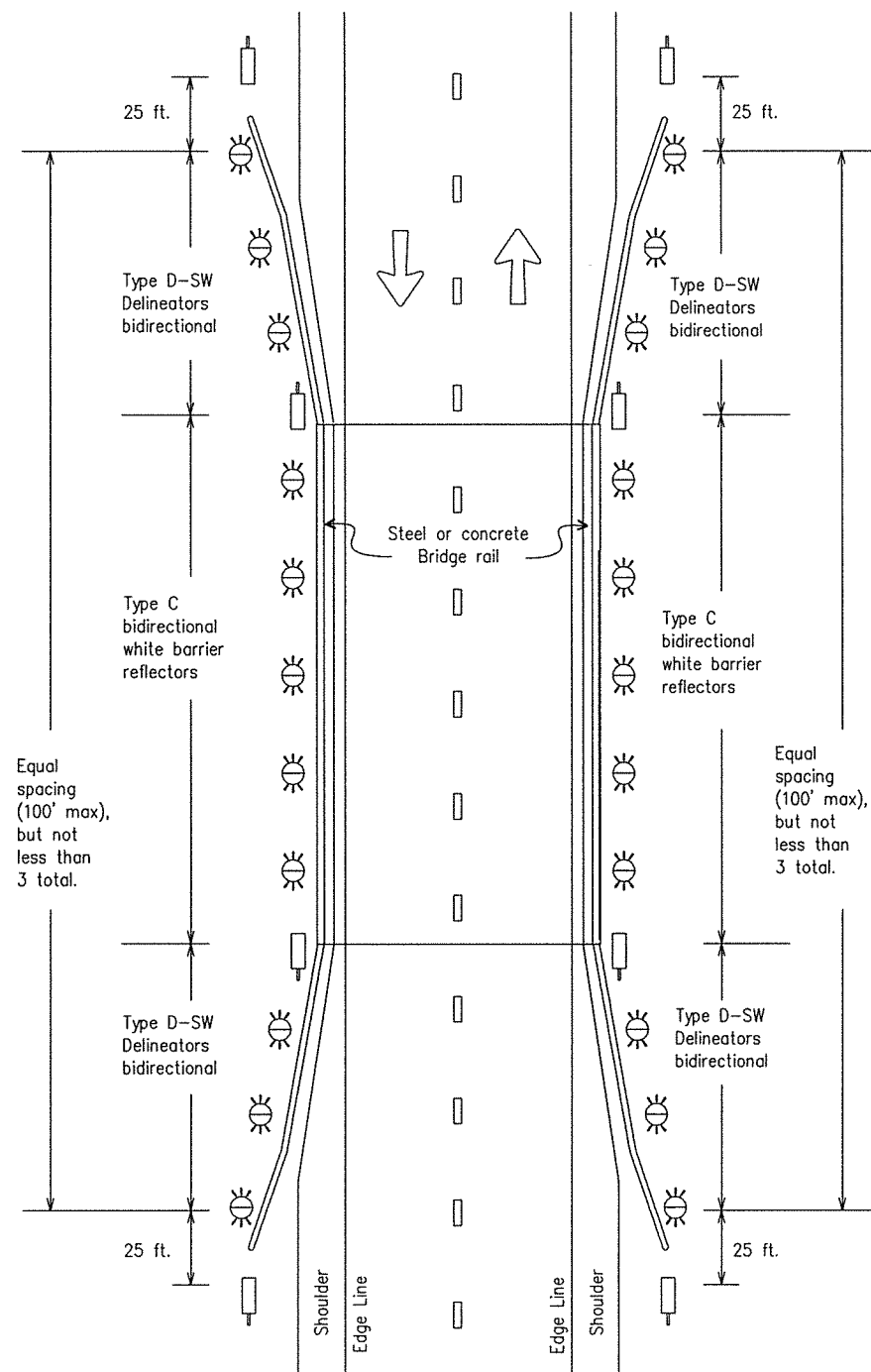
**OBJECT MARKER DETAILS**  
MIDDLE CREEK BRIDGE  
COUNTY ROAD 410  
BLANCO COUNTY, TEXAS

Scale (Hor.): N/A  
Scale (Vert.): N/A  
Checked By: N/A  
Drawn By: GK  
Date: 08/02/14  
Rev. No. 1  
Remarks

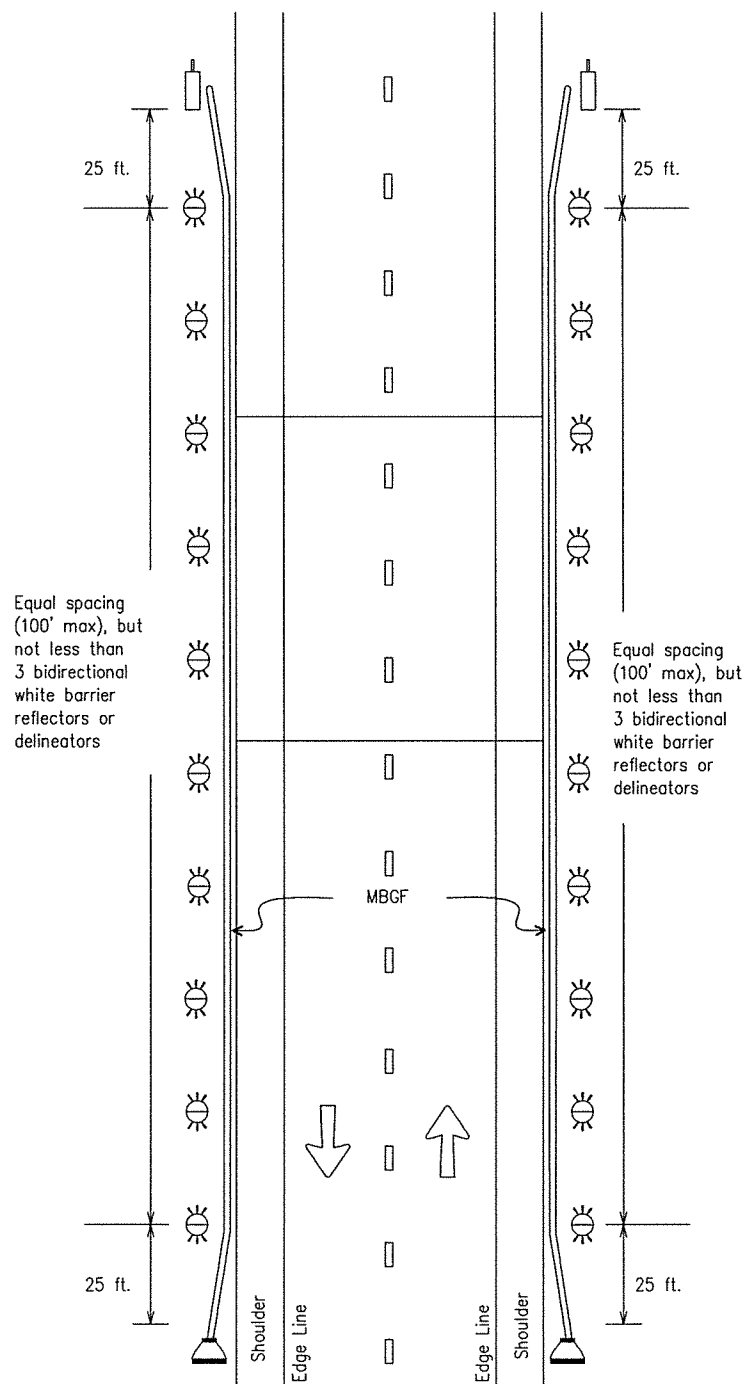
Job No.	14-104
Date	08/02/14
Rev. No.	1
Rev. No.	2
Rev. No.	3
Rev. No.	4

Date: Jan 19, 2015, 7:21am User ID: Greg  
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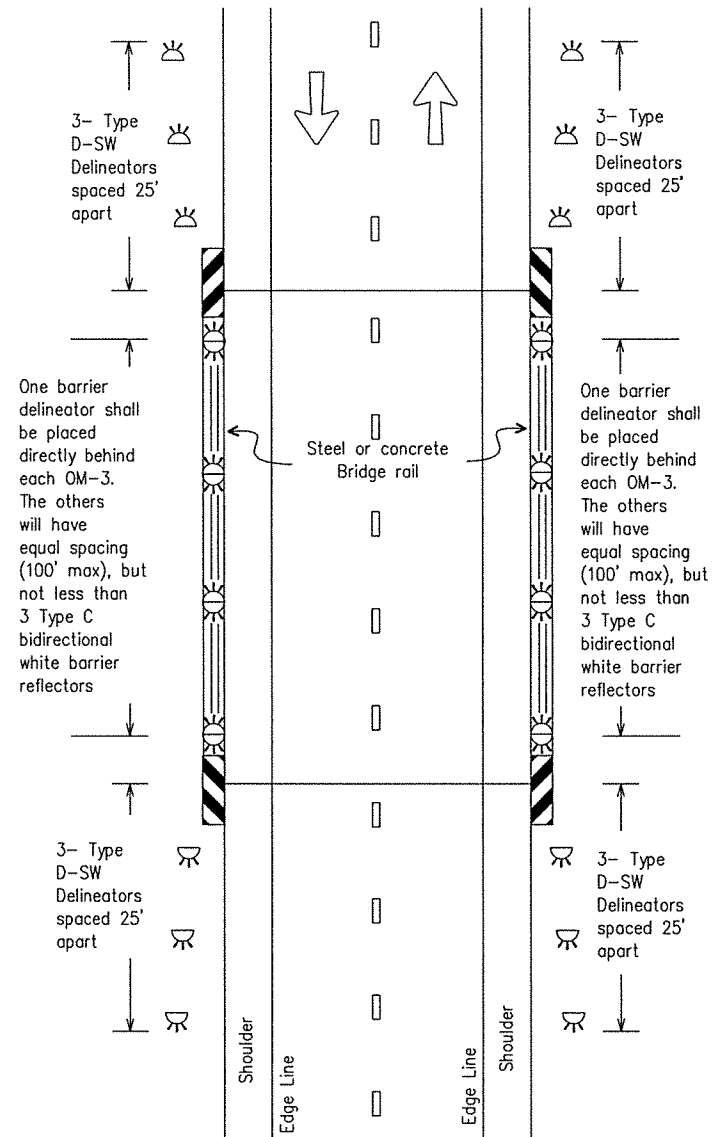
Two-way, Two lane Roadway  
with Reduced Width Approach Rail



Two-way, Two lane Roadway  
with Metal Beam Guard Fence (MBGF)



Two-way, Two lane Roadway  
Bridge with No Approach Rail



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End

Terminal Ends include OB-3F.  
There is no need to install an  
OM-2 in front of terminal.

Texas Department of Transportation  
Traffic Operations Division

**DELINEATOR & OBJECT MARKER PLACEMENT DETAILS**  
D & OM(3)-04

© TxDOT August 2004

DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
CONT	SECT	JOB	HIGHWAY
DIST	COUNTY	SHEET NO.	

Date: Jan 19, 2015, 7:21am User ID: Greg  
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MARBLE FALLS, TEXAS 78654  
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REGISTRATION # F-000977

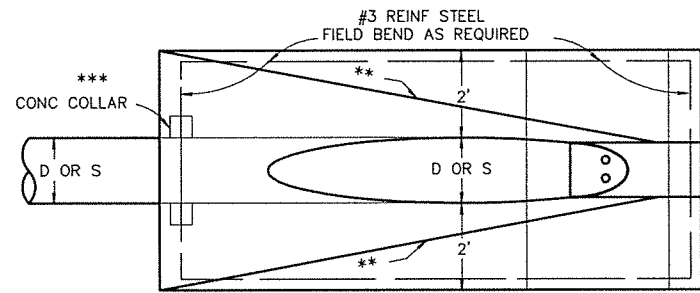


OBJECT MARKER DETAILS  
MIDDLE CREEK BRIDGE  
COUNTY ROAD 410  
BLANCO COUNTY, TEXAS

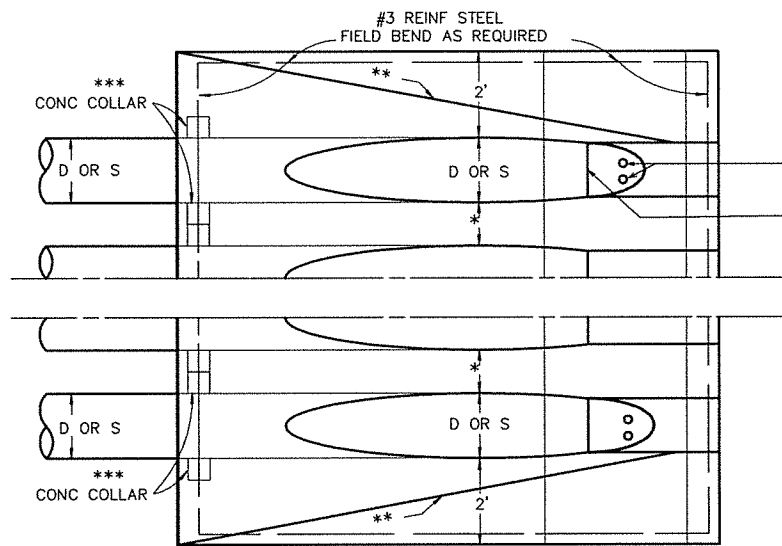


*Greg Staley*  
1-19-15

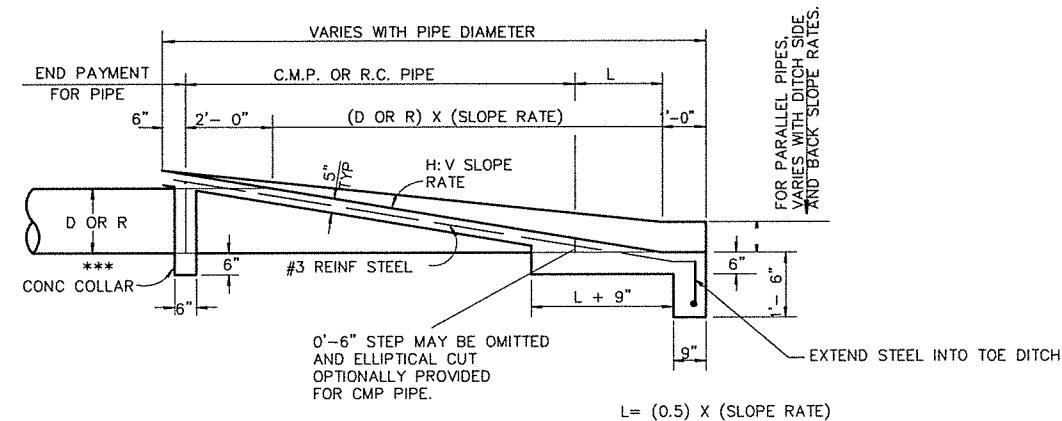
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Rev. No.	Date	Remarks
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3		
4		



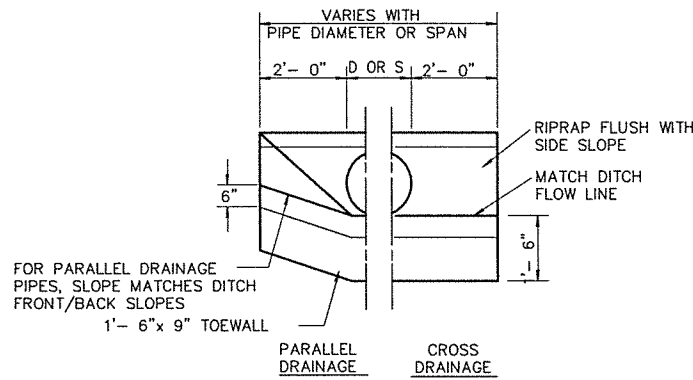
SINGLE PIPE PLAN



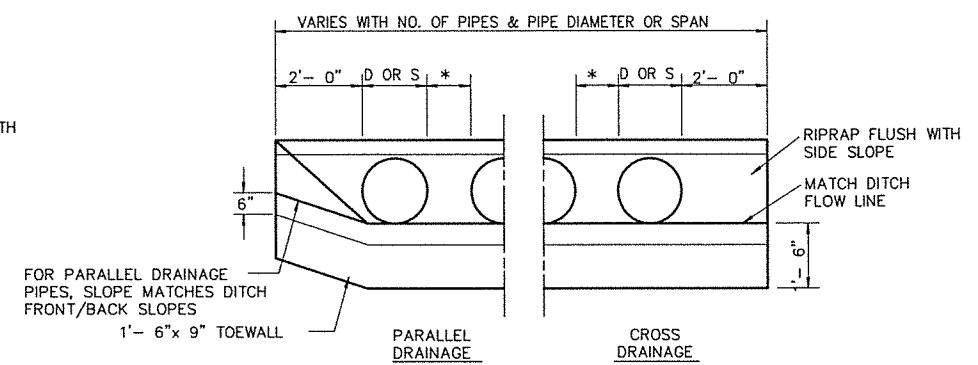
MULTIPLE PIPES PLAN



SIDE ELEVATION



SINGLE PIPE END ELEVATION



MULTIPLE PIPES END ELEVATION

2" x 6" GALVANIZED BOLT FOR ANCHORAGE OF CMP LIP (TYP.)  
 IF SQUARE CUT IS USED, PLACE BOLTS NO CLOSER THAN 3" TO LIP OF PIPE (TYP.)

\* CLEAR DISTANCE VARIES WITH PIPE DIAMETER.  
 \*\* BREAK IN SLOPE APPLIES ONLY TO PARALLEL DRAINAGE  
 \*\*\* WHEN NECESSARY

D = DIAMETER OF CIRCULAR PIPE  
 S = SPAN OF ARCH/ELLIPTICAL PIPE  
 R = RISE OF ARCH/ELLIPTICAL PIPE

GENERAL NOTES:

USE CLASS "C" FOR ALL RIPRAP CONCRETE. REINFORCE WITH WWF 6X6-W2.9XW2.9 AND #3 REINFORCING STEEL AS SHOWN.

SLOPE RATE SHALL BE 6:1 OR FLATTER FOR PARALLEL DRAINAGE INSTALLATIONS; SLOPE RATE MATCHES ADJACENT SIDE SLOPE RATE FOR CROSS DRAINAGE INSTALLATIONS.

CONSIDER RIPRAP CONCRETE CL "C", REINFORCING STEEL, CORRUGATED METAL PIPE OR REINFORCED CONCRETE PIPE SUBSIDIARY TO PERTINENT ITEM.

PARALLEL DRAINAGE PIPES FOR DRIVEWAYS, SIDE ROADS, ETC.

MINIMUM DIAMETER OR SPANS REQUIRING SAFETY PIPE RUNNERS AS DETAILED ON SETP-PD:

PIPE	SINGLE	DOUBLE	TRIPLE OR MORE
CIRCULAR	36"	30"	ALL
ARCH/ELLIP	DES 4	DES 3	ALL

CROSS DRAINAGE PIPES

MINIMUM DIAMETER OR SPANS REQUIRING SAFETY PIPE RUNNERS AS DETAILED ON SETP-CD:

CIRC. PIPE DIA. OR ARCH/ELLIPTICAL PIPE DESIGN SIZE	SKEW	SINGLE PIPE	MULTIPLE PIPE	TRIPLE OR MORE
NORMAL		42" OR DESIGN 5	36" OR DESIGN 4	ALL
15°		36" OR DESIGN 4	36" OR DESIGN 4	ALL
30°		30" OR DESIGN 3	30" OR DESIGN 3	ALL
45°		30" OR DESIGN 3	24" OR DESIGN 2	ALL

Texas Department of Transportation  
 Austin District Design

### SAFETY END TREATMENT TYPE II

Austin District Standard

©1xDOT	2003	DIST	FED REC	STATE PROJECT	SHEET
REVISIONS					
14-104	3/03_District_Update	6			
DATE	08/20/14	CHECKED BY	DATE		
1		1			
2		2			
3		3			
4		4			

**K.C. ENGINEERING, INC.**  
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 Email: info@kceengineering.com  
 REGISTRATION # F-0009177



SET TYPE II  
 MIDDLE CREEK BRIDGE  
 COUNTY ROAD 410  
 BLANCO COUNTY, TEXAS

01-19-15

Order: Jan 19, 2015, 7:24am User: ID: Ceng  
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