General Notes

SPECIFICATIONS: All references to the standard Specifications are to the current edition of the Kentucky Department of Highways Standard Specifications for Road and Bridge Construction, with current supplemental specifications. All references to the AASHTO Specifications are to the current edition of the AASHTO LRFD Bridge Design Specifications, with interims.

DESIGN LOADS: Beam sections are designed for H20 Live Load. The fatigue truck is also set at H20.

DESIGN LOAD DISTRIBUTION: Contrary to AASHTO LRFD Bridge Design Specifications, the design moment and shear distribution for all beams is 0.6 lanes.

FUTURE WEARING SURFACE: These beams are designed for a 15 PSF future wearing surface load.

SUBSTRUCTURE DESIGN LOADS: Unfactored design reaction forces per beam end.

DC (kips): Beam, Slab, and assumed Type III railing dead loads.
DW (kips): Future wearing surface.
LL+I (kips): LL with Dynamic load allowance.

MATERIAL DESIGN SPECIFICATIONS:

for Beam Steel	FY =	50000 PSI
for Steel Reinforcement	FY =	60000 PSI
for Class "AA" Deck Concrete	F'C =	4000 PSI

MATERIAL STEEL	A.S.T.M	AASHTO
High Strength Low Alloy Structural Steel	•A709 GR 50	•M270 GR 50

High strength bolts, nuts, and washers F3125 Grade A325 M-164 Type 1

Sheet lead and Pig lead B29-79

All steel in longitudinal rolled wide flange beams shall meet the longitudinal Charpy V-Notch toughness test for non-fracture critical components Zone 2 in accordance with the following:

M270 GR 50 (up to 2" thickness) of 15 ft-lbs at 40° F.

Sampling and testing procedures shall be in accordance with AASHTO T243 current edition, utilizing (H) frequency testing. When plate thickness exceeds 1½", frequency of testing shall be (P).

HIGH STRENGTH BOLT CONNECTIONS: Unless otherwise specified on the plans, all bolted connnections shall be ASTM F3125 Grade A325 ¾" diameter high strength bolts, nuts, and washers. Open holes shall be 13/16" diameter. Type 1 galvanized bolts shall be used as described in AASHTO M164. All high strength bolted field connections are to be installed with "direct tension indicators" (DTI's) in accordance with the Standard Specifications and ASTM F959. All DTI's shall be manufactured from a steel conforming to the chemical requirements of ASTM A325 for Type 1 galvanized steel. DTI's shall be installed under the bolt head with the bumps facing the underside of the bolt head. Put a hardened washer under the nut and tension from the nut.

BEVELED EDGES: Bevel all exposed edges ¾".

REINFORCEMENT: Dimensions shown from the face of concrete to reinforcement are clear distances. Spacing of reinforcement is from center to center of reinforcement. All steel reinforcement is to be epoxy coated in accordance with Section 811.10 of the Specifications.

CORROSION PROTECTION: These beams and all steel components are to be hot dip galvanized. If hot dip galvanizing is cost prohibitive then all steel components must be painted. Unpainted weathering steel is not recommended within 10 feet of moving water. Additionally these beams do not meet fatigue design requirements of unpainted weathering steel.

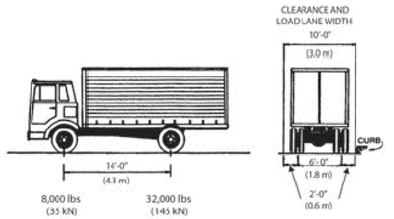
BRIDGE DECK: A galvanized steel metal grid deck may be substituted for the 8" concrete deck. This will improve the load rating, but smaller beams are not to be used.

TABLE OF BEAM SIZES AND DESIGN DATA (4 FT. MAX. BEAM SPACING)

BEAM SPAN	ROLLED BEAM		DEFLECTION IN INCHES		UNFACTORED BEAM END REACTION		
	BEAM MEMBER	BEAM DEPTH (IN.)	STEEL ONLY	TOTAL DL	DC (kips)	DW (kips)	LL+I (kips)
15' Max.	W16x40	16.0	0.00	0.06	5.39	0.45	25.96
	W14x43	13.7	0.01	0.07	5.42		
	W12x50	12.2	0.01	0.08	5.48		
	W10x60	10.2	0.01	0.08	5.56		
20' Max.	W18x50	18.0	0.01	0.12	7.17	0.60	27.45
	W16x57	16.4	0.01	0.12	7.25		
	W14x61	13.9	0.02	0.15	7.29		
	W12x65	12.1	0.02	0.18	7.34		
	W10x77	10.6	0.03	0.21	7.47		
25' Max.	W21x55	20.8	0.02	0.20	8.94	0.75	28.34
	W18x65	18.4	0.02	0.21	9.07		
	W16x67	16.3	0.03	0.24	9.10		
	W14x74	14.2	0.04	0.29	9.19		
	W12x79	12.4	0.05	0.35	9.26		
30' Max.	W21x73	21.2	0.04	0.30	10.93	0.90	28.94
	W18x76	18.2	0.05	0.36	10.98		
	W16x77	16.5	0.06	0.43	11.00		
	W14x90	14.0	0.07	0.49	11.20		
	W12x96	12.7	0.09	0.59	11.30		
35' Max.	W24x94	24.3	0.05	0.34	13.07	1.05	29.37
	W21x101	21.4	0.06	0.38	13.20		
	W18x97	18.6	0.08	0.52	13.13		
	W14x109	14.3	0.12	0.75	13.35		
40' Max.	W24x104	24.1	0.08	0.51	15.09	1.20	29.69
	W21x111	21.5	0.10	0.60	15.23		
	W18x130	19.3	0.12	0.66	15.63		
	W14x145	14.8	0.19	0.97	15.94		
45' Max.	W27x102	27.1	0.11	0.70	16.87	1.35	29.93
	W24x104	24.1	0.13	0.81	16.92		
	W21x122	21.7	0.15	0.87	17.34		
	W18x143	19.5	0.19	0.96	17.83		
	W14x159	15.0	0.30	1.42	18.20		
50' Max.	W30x116	30.0	0.13	0.79	19.06	1.50	30.13
	W27x129	27.6	0.15	0.83	19.40		
	W24x131	24.5	0.18	0.99	19.45		
	W21x147	22.1	0.22	1.12	19.86		
	W18x175	20.0	0.27	1.22	20.58		
55' Max.	W33x130	33.1	0.16	0.87	21.32	1.65	30.29
	W30x148	30.7	0.18	0.89	21.83		
	W27x146	27.4	0.21	1.05	21.77		
	W24x146	24.7	0.26	1.30	21.77		
	W21x166	22.5	0.31	1.42	22.34		
60' Max.	W33x152	33.5	0.21	1.04	23.90	1.80	30.43
	W30x173	30.4	0.24	1.05	24.54		
	W27x161	27.6	0.29	1.36	24.17		
	W24x176	25.2	0.35	1.53	24.63		
	W21x201	23.0	0.42	1.69	25.40		

H-20

DESIGN LOAD



These beams were sized according to H-20 truck design. This does not meet federal minimum design HL-93 nor KY minimum KYHL-93.

Use of these beams will limit the loaded size of trucks allowed to cross the bridge.

This is suitable for very low volume roads with little potential for future development. These beams can handle a loaded school bus, but are not suitable for a loaded gravel truck or concrete truck. They are not suitable for typical trucks associated with construction, agriculture, or coal.

REVISION	DATE

DATE: May 2017	CHECKED BY
DESIGNED BY: Carl Van Zee	Joseph Van Zee
DETAILED BY: Carl Van Zee	Joseph Van Zee

Commonwealth of Kentucky
DEPARTMENT OF HIGHWAYS

COUNTY

ROUTE | CROSSING

H20 Steel Beam Standards

ITEM NUMBER

PREPARED BY
Division of Structural Design

SHEET NO. S1

DRAWING NO.

General Notes

SPECIFICATIONS: All references to the standard Specifications are to the current edition of the Kentucky Department of Highways Standard Specifications for Road and Bridge Construction, with current supplemental specifications. All references to the AASHTO Specifications are to the current edition of the AASHTO LRFD Bridge Design Specifications, with interims.

DESIGN LOADS: Beam sections are designed for 1.25•HL93 (KYHL93) Live Load.

DESIGN LOAD DISTRIBUTION: Contrary to AASHTO LRFD Bridge Design Specifications, the design moment and shear distribution for all beams is 0.6 lanes.

FUTURE WEARING SURFACE: These beams are designed for a 15 PSF future wearing surface load.

SUBSTRUCTURE DESIGN LOADS: Unfactored design reaction forces per beam end.

DC (kips): Beam, Slab, and assumed Type III railing dead loads.
DW (kips): Future wearing surface.
LL+I (kips): LL with Dynamic load allowance.

MATERIAL DESIGN SPECIFICATIONS:

for Beam Steel	FY =	50000 PSI
for Steel Reinforcement	FY =	60000 PSI
for Class "AA" Deck Concrete	F'C =	4000 PSI

MATERIAL STEEL	A.S.T.M	AASHTO
High Strength Low Alloy Structural Steel	•A709 GR 50	•M270 GR 50

High strength bolts, nuts, and washers F3125 Grade A325 M-164 Type 1

Sheet lead and Pig lead B29-79

All steel in longitudinal rolled wide flange beams shall meet the longitudinal Charpy V-Notch toughness test for non-fracture critical components Zone 2 in accordance with the following:

M270 GR 50 (up to 2" thickness) of 15 ft-lbs at 40° F.

Sampling and testing procedures shall be in accordance with AASHTO T243 current edition, utilizing (H) frequency testing. When plate thickness exceeds 1½", frequency of testing shall be (P).

HIGH STRENGTH BOLT CONNECTIONS: Unless otherwise specified on the plans, all bolted connnections shall be ASTM F3125 Grade A325 ¾" diameter high strength bolts, nuts, and washers. Open holes shall be 13/16" diameter. Type 1 galvanized bolts shall be used as described in AASHTO M164. All high strength bolted field connections are to be installed with "direct tension indicators" (DTI's) in accordance with the Standard Specifications and ASTM F959. All DTI's shall be manufactured from a steel conforming to the chemical requirements of ASTM A325 for Type 1 galvanized steel. DTI's shall be installed under the bolt head with the bumps facing the underside of the bolt head. Put a hardened washer under the nut and tension from the nut.

BEVELED EDGES: Bevel all exposed edges ¾".

REINFORCEMENT: Dimensions shown from the face of concrete to reinforcement are clear distances. Spacing of reinforcement is from center to center of reinforcement. All steel reinforcement is to be epoxy coated in accordance with Section 811.10 of the Specifications.

CORROSION PROTECTION: These beams and all steel components are to be hot dip galvanized. If hot dip galvanizing is cost prohibitive then all steel components must be painted. Unpainted weathering steel is not recommended within 10 feet of moving water. Additionally these beams do not meet fatigue design requirements of unpainted weathering steel.

BRIDGE DECK: A galvanized steel metal grid deck may be substituted for the 8" concrete deck. This will improve the load rating, but smaller beams are not to be used.

TABLE OF BEAM SIZES AND DESIGN DATA (4 FT. MAX. BEAM SPACING)

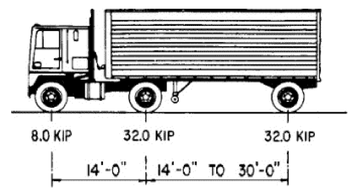
BEAM SPAN	ROLLED BEAM		DEFLECTION IN INCHES		UNFACTORED BEAM END REACTION		
	BEAM MEMBER	BEAM DEPTH (IN.)	STEEL ONLY	TOTAL DL	DC (kips)	DW (kips)	LL+I (kips)
15' Max.	W18x50	18.0	0.00	0.03	5.54	0.45	46.82
	W16x50	16.3	0.00	0.03	5.54		
	W14x53	13.9	0.01	0.06	5.56		
	W12x58	12.2	0.01	0.06	5.60		
	W10x77	10.6	0.01	0.07	5.76		
20' Max.	W18x65	18.2	0.00	0.08	7.41	0.60	49.69
	W16x67	16.3	0.00	0.09	7.44		
	W14x74	14.2	0.00	0.11	7.51		
	W12x79	12.4	0.00	0.13	7.56		
	W10x100	11.1	0.00	0.14	7.79		
25' Max.	W24x76	23.9	0.02	0.11	9.29	0.75	51.96
	W21x93	21.6	0.02	0.11	9.52		
	W18x76	18.2	0.02	0.18	9.29		
	W16x89	16.8	0.03	0.18	9.47		
	W14x99	14.2	0.03	0.21	9.59		
30' Max.	W24x103	24.5	0.03	0.16	11.49	0.90	56.68
	W21x101	21.4	0.03	0.20	11.46		
	W18x97	18.6	0.04	0.28	11.39		
	W14x145	14.8	0.06	0.31	12.16		
35' Max.	W27x129	27.6	0.04	0.20	13.79	1.05	61.07
	W24x117	24.3	0.05	0.26	13.57		
	W21x122	21.7	0.06	0.32	13.67		
	W18x143	19.5	0.07	0.35	14.05		
	W14x176	15.2	0.10	0.47	18.33		
40' Max.	W30x148	30.7	0.05	0.25	16.09	1.20	64.66
	W27x146	27.4	0.06	0.30	16.06		
	W24x146	24.7	0.07	0.36	16.06		
	W21x147	22.1	0.09	0.46	16.07		
	W18x192	20.4	0.11	0.45	17.01		
45' Max.	W33x130	33.1	0.07	0.39	17.63	1.35	67.72
	W30x132	30.3	0.08	0.45	17.68		
	W27x129	27.6	0.10	0.54	17.59		
	W24x146	24.7	0.11	0.58	18.00		
	W21x166	22.5	0.14	0.63	18.46		
50' Max.	W36x150	35.9	0.10	0.45	20.05	1.50	70.41
	W33x152	33.5	0.10	0.50	20.1		
	W30x148	30.7	0.12	0.60	19.98		
	W27x146	27.4	0.14	0.71	19.95		
	W24x162	25.0	0.17	0.80	20.35		
55' Max.	W36x160	36.0	0.13	0.62	22.27	1.65	72.83
	W33x169	33.8	0.14	0.65	22.51		
	W30x173	30.4	0.17	0.74	22.66		
	W27x178	27.8	0.20	0.87	22.80		
	W24x192	25.5	0.24	0.99	23.17		
60' Max.	W36x194	36.5	0.18	0.73	25.3	1.80	75.05
	W33x201	33.7	0.19	0.77	25.52		
	W30x173	30.4	0.24	1.05	24.66		
	W27x194	28.1	0.28	1.13	25.31		

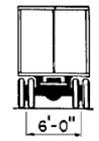
KY-HL93 (1.25XHL93)

DESIGN LOAD

From AASHTO design code -> Vehicular Live Loading designated HL-93 shall consist of design truck or design tandem plus design lane load.

DESIGN TRUCK





DESIGN TANDEM

Shall consist of a pair of 25,000 pound axles spaced at 4'-0" apart. Transverse wheel spacing is 6'-0".

DESIGN LANE LOAD

The design lane load shall consist of a load of 640 pound/ foot uniformly distributed in the longitudinal direction. Transversely the load is to be uniformly distributed over a 10'-0" width.

The current KY design standard for state roads is to increase the federal minimum (HL-93) by 25% (KY-HL93).

REVISION	DATE

DATE: May 2017	CHECKED BY
DESIGNED BY: Carl Van Zee	Joseph Van Zee
DETAILED BY: Carl Van Zee	Joseph Van Zee

Commonwealth of Kentucky
DEPARTMENT OF HIGHWAYS

COUNTY

ROUTE | CROSSING

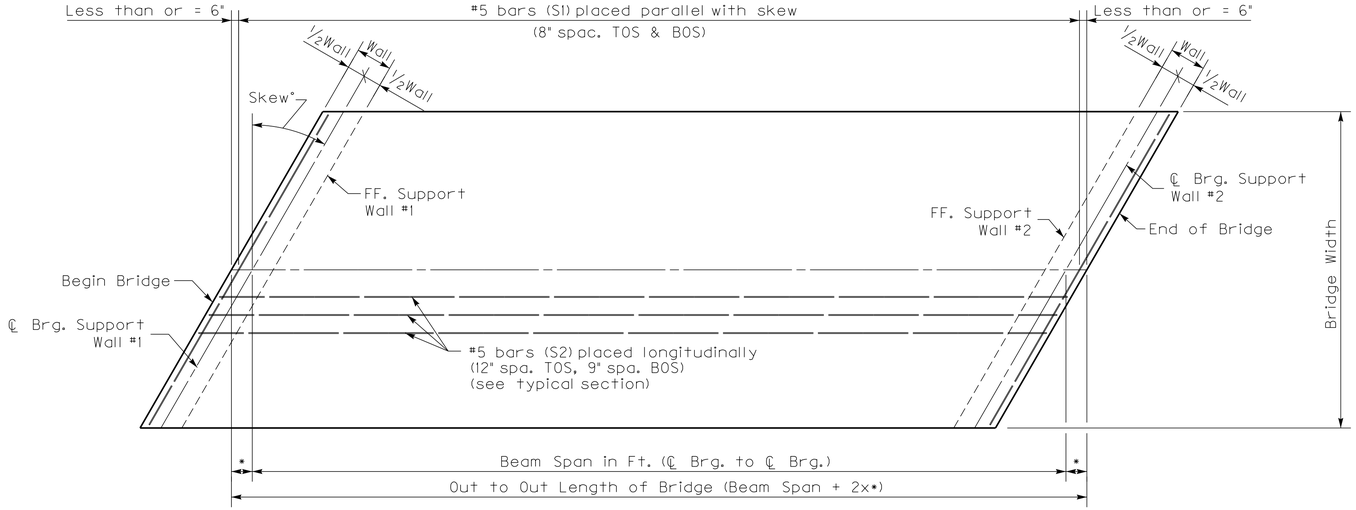
KYHL-93 Steel Beam Standards

ITEM NUMBER

PREPARED BY
Division of Structural Design

SHEET NO. S2

DRAWING NO.

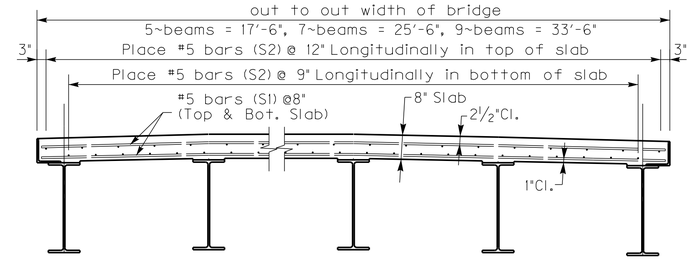


PLAN OF SLAB

Note: All reinforcing steel shall be epoxy coated.

#5 Skewed Transverse Bar (S1) Length
- 0° Skew -> Bridge Width - 4"
- 15° Skew -> ((Bridge Width - 4") x 1.035)
- 30° Skew -> ((Bridge Width - 4") x 1.155) - 3/8"
- 45° Skew -> ((Bridge Width - 4") x 1.414) - 5/8"

* 0° skew, ½Wall
15° skew, ½Wall x 1.035
30° skew, ½Wall x 1.155
45° skew, ½Wall x 1.414

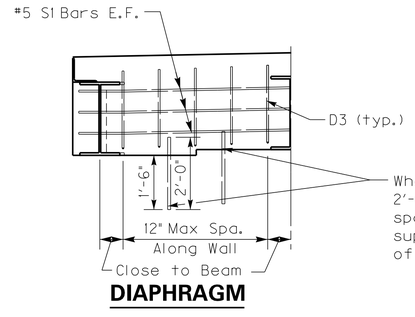


TYPICAL SECTION

Note: It is recommended a crash tested barrier be attached to the Superstructure to contain all vehicles within the roadway. Recommended barriers include the Type T631 guardrail, Type 3, or 32" Vertical Face railing.

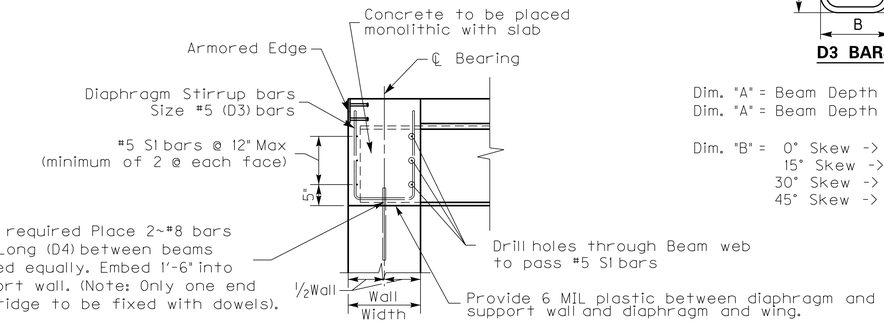
Notes: 1.) Diaphragm stirrups are to project into the slab regardless of slab forming method.

2.) Place stirrup bars parallel to face of beams.



DIAPHRAGM

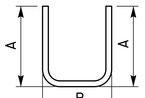
When required Place 2~#8 bars 2'-0" Long (D4) between beams spaced equally. Embed 1'-6" into support wall. (Note: Only one end of bridge to be fixed with dowels).



DIAPHRAGM X-SECTION

(Perpendicular to Diaphragm)

Note: End Diaphragms are required on both Grid Deck and Slabs.



D3 BARS

Dim. "A" = Beam Depth + 4" for Slab
Dim. "A" = Beam Depth - 4" for Grid Deck.

Dim. "B" = 0° Skew -> (Wall Width - 4")
15° Skew -> (Wall Width - 4") x 1.035
30° Skew -> (Wall Width - 4") x 1.155
45° Skew -> (Wall Width - 4") x 1.414

REVISION	DATE
DATE: May 2017	CHECKED BY
DESIGNED BY: Carl Van Zee	Joseph Van Zee
DETAILED BY: Carl Van Zee	Joseph Van Zee

Commonwealth of Kentucky
DEPARTMENT OF HIGHWAYS

COUNTY

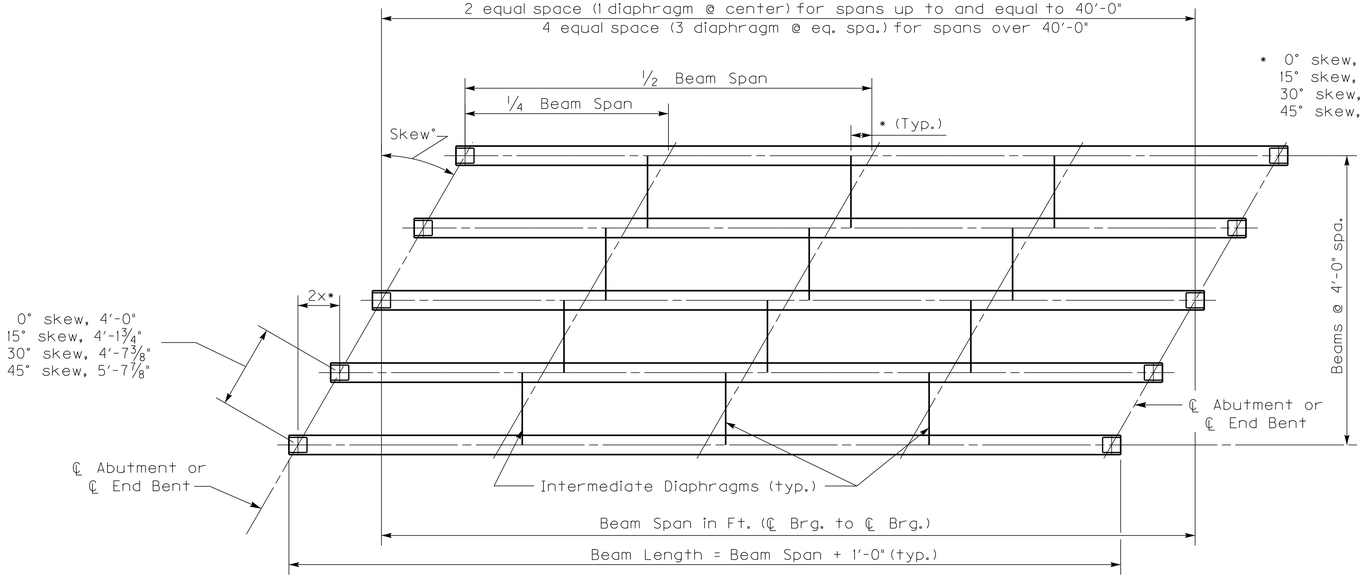
ROUTE | CROSSING

Slab and End Diaphragm Details

ITEM NUMBER

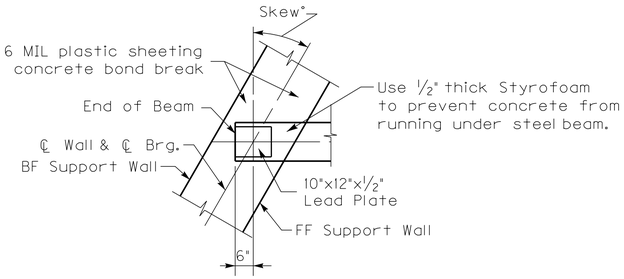
PREPARED BY
Division of Structural Design

SHEET NO. S3
DRAWING NO.



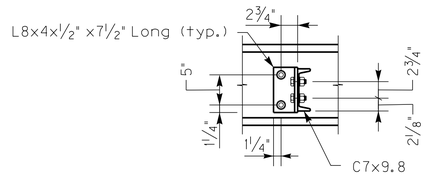
FRAMING PLAN

Note: Place girders with any mill or shop camber bowed up in the middle. Heat cambering is not required.

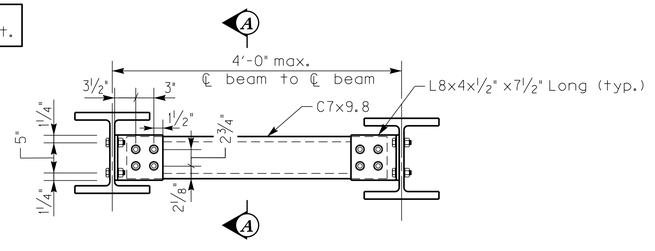


END OF BEAM DETAIL @ SUPPORTS

Note: Use 3/4"Ø Bolts with 13/16 "Ø Holes Throughout.

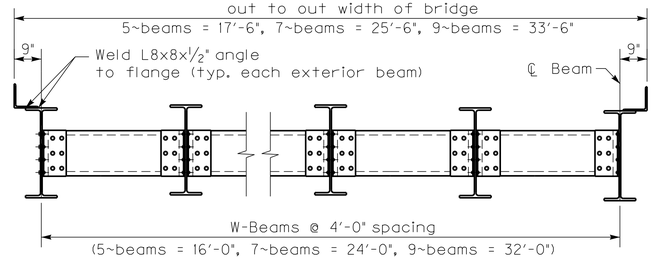


SECTION A–A



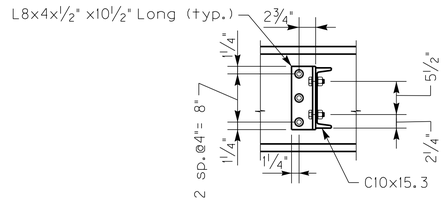
INTERMEDIATE DIAPHRAGM

(for up to 14" beam depth)

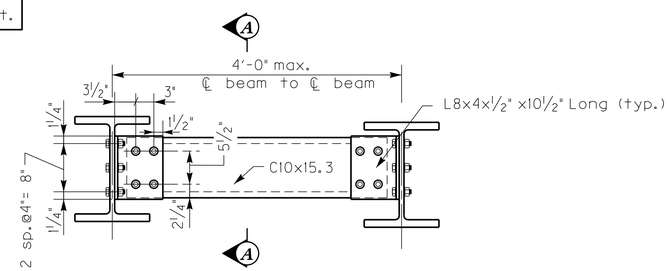


FRAMING TYPICAL

Note: Use 3/4"Ø Bolts with 13/16 "Ø Holes Throughout.



SECTION A–A



INTERMEDIATE DIAPHRAGM

(for up to 20" beam depth)

REVISION	DATE
DATE: May 2017	CHECKED BY
DESIGNED BY: Carl Van Zee	Joseph Van Zee
DETAILED BY: Carl Van Zee	Joseph Van Zee

Commonwealth of Kentucky
DEPARTMENT OF HIGHWAYS

COUNTY

ROUTE | CROSSING

Rolled Steel Diaphragm Details

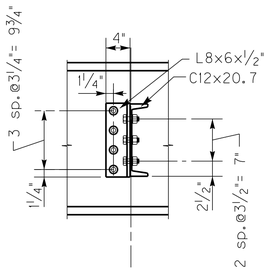
ITEM NUMBER

PREPARED BY
Division of Structural Design

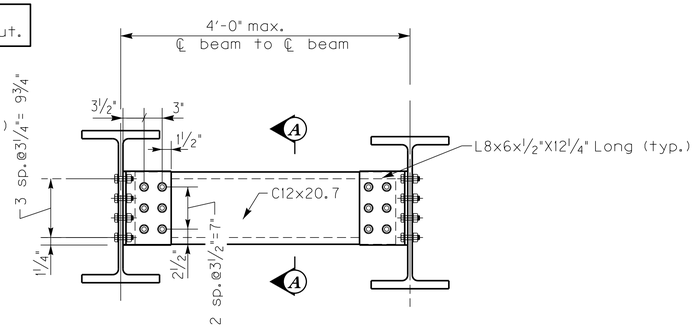
SHEET NO. S4

DRAWING NO.

Note: Use $\frac{3}{4}$"Ø Bolts with $\frac{13}{16}$"Ø Holes Throughout.

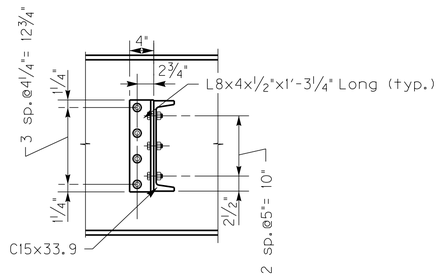


SECTION A–A

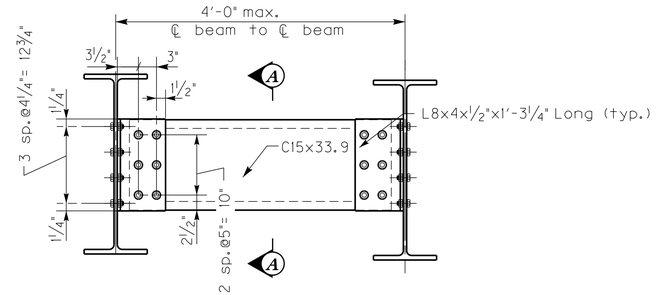


INTERMEDIATE DIAPHRAGM
(for up to 24" beam depth)

Note: Use $\frac{3}{4}$"Ø Bolts with $\frac{13}{16}$"Ø Holes Throughout.

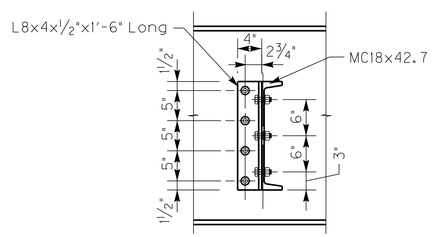


SECTION A–A

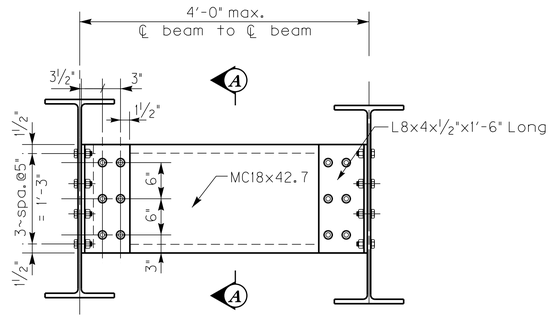


INTERMEDIATE DIAPHRAGM
(for up to 30" beam depth)

Note: Use $\frac{3}{4}$"Ø Bolts with $\frac{13}{16}$"Ø Holes Throughout.



SECTION A–A



INTERMEDIATE DIAPHRAGM
(for up to 36" beam depth)

REVISION	DATE
DATE: May 2017	CHECKED BY
DESIGNED BY: Carl Van Zee	Joseph Van Zee
DETAILED BY: Carl Van Zee	Joseph Van Zee

Commonwealth of Kentucky
DEPARTMENT OF HIGHWAYS

COUNTY

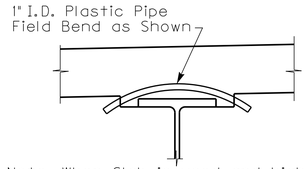
ROUTE | CROSSING

Rolled Steel Diaphragm Details

ITEM NUMBER

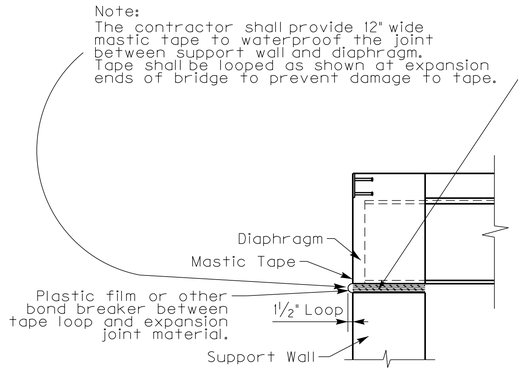
PREPARED BY
Division of Structural Design

SHEET NO. S5
DRAWING NO.

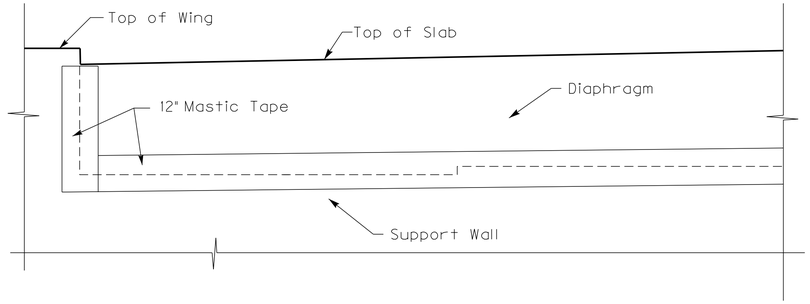


Note: When Slab is used and high water expected over bottom of beam elevation, place 1" plastic pipe above beams 4'-0" from each end. Work and material is incidental to superstructure concrete.

AIR VENT DETAIL



DIAPHRAGM X-SECTION



DIAPHRAGM ELEVATION

GENERAL NOTES

MASTIC TAPE: Mastic Tape used to seal joints is to meet the requirements of ASTM C-877 Type I, II, or III. The joint is to be covered with 12-inch wide mastic tape. Prior to application, the joint surface shall be clean and free of dirt, debris, or deleterious material. Primer, if required by the tape mfgr., shall be applied for a minimum width of nine inches on each side of the joint.

Mastic Tape shall be either:

EZ-WRAP RUBBER by PRESS-SEAL GASKET CORPORATION,
SEAL WRAP by MAR MAC MANUFACTURING CO. INC. ,
CADILLOC by the UP RUBBER CO. INC.
or approved equal.

Mastic Tape shall cover the joint continuously unless otherwise shown in the plans. Mastic Tape shall be spliced by lapping a minimum of six inches and in accordance with the mfgrs. recommendations with the overlap running downhill.

The cost of labor, materials, and incidental items for furnishing and installing Mastic Tape shall be considered incidental to the unit price bid for Concrete Class 'AA' and no separate measurement or payment shall be made.

MASTIC TAPE APPLICATION

REVISION	DATE

DATE: May 2017	CHECKED BY
DESIGNED BY: Carl Van Zee	Joseph Van Zee
DETAILED BY: Carl Van Zee	Joseph Van Zee

Commonwealth of Kentucky
DEPARTMENT OF HIGHWAYS

COUNTY

ROUTE | CROSSING

Air Vent and Mastic Tape Details

ITEM NUMBER

PREPARED BY
Division of Structural Design

SHEET NO. S6

DRAWING NO.