Standards Committee
Meeting Agenda
Wednesday, November 16, 2022, at 1:00pm
Meeting Location: 1334 Smith Street, Charleston, WV in Lower-Level Conference

Also meeting virtually via Google Meet. E-mail distribution includes instruction.

Call to Order

Roll Call of Attendees

Approval of Minutes of 9-7-2022 Meeting

Unfinished Business – Standards discussed at last Committee meeting.

TITLE	Champion
None	

New Business

TITLE	Champion
1st time to Committee. Eight proposed drawings and revisions to WVDOH Standard Details Book – Volume 3. These drawings are for steel superstructures and would be new 3300 Section. The following sheets are included: a) *Sheet # 3300GN1 – Steel Standard Beam Notes 1 of 2* b) *Sheet # 3300GN2 - Steel Standard Beam Notes 2 of 2* c) *Sheet # 3320SB1 – Composite Steel Beam Sheet 1 of 6* d) *Sheet # 3320SB2 – Composite Steel Beam Sheet 2 of 6* e) *Sheet # 3320SB3 – Composite Steel Beam Sheet 3 of 6* f) *Sheet # 3320SB4 – Composite Steel Beam Sheet 4 of 6* g) *Sheet # 3320SB5 – Composite Steel Beam Sheet 5 of 6* h) *Sheet # 3320SB6 – Composite Steel Beam Sheet 9 of 6*	B. Neeley
1st time to Committee. *Structure Directive (SD) 2048 – Adjacent Box Beams*. The SD updates the Standard Bridge Plans references and approval requirements. It is redline copy, showing the proposed changes.	B. Neeley
1st time to Committee. *Structure Directive (SD) 2150 – Load Rating of New Bridge Design*. The SD is an update the load rating requirments; to follow more closely with AASHTO Manual for Bride Evaluation. It is redline copy, showing the proposed changes. A clean version of the SD is included, too.	Craig Iser

1st time to Committee. *Sign Fabrication Detail, R40-1- Your Highway Taxes at Work (Fed / State)* Revision to the Funding Source sign fabrication. a) Detail D40-1. The proposed sign fabrication detail is new addition to the D-Series, its size is 96" x 42", and on green background with white letters. b) Existing R20-1 sign fabrication detail will be removed.	Edward Payne

Next Meeting Date: Wednesday, January 4, 2023.
Deadline for submissions: December 9, 2022.

Adjournment

Note: 2023 Standards Committee meeting schedule: 1/4, 3/1, 5/3, 7/5, 9/6, 11/1

Standards Committee
Meeting Minutes
September 7, 2022

Call to Order: The meeting was called to called to order by Acting Chair Steve Boggs shortly after 9:00 AM.

Attendees: See Attendee List for a list of attendees.

Minutes: Minutes of the 5-4-2022 Meeting were reviewed and approved without objection.

Unfinished Business: Items which were discussed at prior meeting are listed below:

I. None.

New Business: Items discussed for the first time at committee meeting are listed below:

II. *Design Directive (DD) 102 – Shop Drawing and Catalog Sheets*. The revision updates the references and adds instruction for Alternative Project Delivery. There was a brief explanation and discussion; Engineering Division has created task force to review and consider further updates to the DD.

Next Meeting: The next meeting is on Wednesday, November 16 7, 2022. Deadline for submissions October 21, 2022.

Adjournment: The meeting was adjourned.

Manuals Committee
Meeting Minutes
September 7, 2022

Call to Order: The meeting was called to called to order by Acting Chair Steve Boggs shortly after conclusion of Standards Committee meeting.

Attendees: See Attendee List for a list of attendees.

Unfinished Business: Items which were discussed at prior meeting are listed below:

I. **2022 Alternative Project Delivery (APD) Manual.** The APD manual describes method of procurement, evaluation, and award process. It guides WVDOH personnel and construction delivery staff through an APD project. Roles and responsibilities for all involved in APD are defined. There was a brief explanation, no discussion.

Alternative Project Delivery Manual was approved at the meeting. Vote 5-0.

New Business: Items discussed for the first time at committee meeting are listed below:

II. None.

Next Meeting: The next meeting is on Wednesday, November 16 7, 2022. Deadline for submissions October 21, 2022.

Adjournment: The meeting was adjourned.

April Specification Committee Meeting
Wednesday, September 7, 2022
Attendee List

Virtual Meeting Attendees

1.	Bodnar, David	WVDOH – Engineering Division
2.	Boyd, Jason	Baker
3.	Brayack, Daniel	WVDOH – MCS&T Division
4.	Brown, Phil	WVDOH – MCS&T Division
5.	Elkins, Jerry	HNTB
6.	Epperly, Rebecca	WVDOH – Technical Support Division
7.	Farley, Paul	WVDOH – MCS&T Division
8.	Gillispie, Adam	WVDOH – MCS&T Division
9.	Hanson, Calvin	WVDOH – MCS&T Division
10.	Lough, Eric	WVDOH – Operations Division
11.	Mance, Mike	WVDOH – MCS&T Division
12.	McNutt, Don	American Concrete Pipe Association
13.	Moran, Tim	WVDOH – Operations Division
14.	Stanevich, Ron	WVDOH – MCS&T Division
15.	Thapa, Suman	WVDOH – MCS&T Division
16.	Thaxton, Andrew	WVDOH – MCS&T Division
17.	Trent, Kimberly	WVDOH – Operations Division

In Person Meeting Attendees

1.	Adkins, Janie	WVDOH – Technical Support Division
2.	Boggs, Steve	WVDOH – Technical Support Division
3.	Crane, John	Contractors Association of West Virginia
4.	Scites, RJ	WVDOH – Engineering Division
5.	Smith, Shawn A	WVDOH – Contract Administration Division
6.	Whitmore, Ted	WVDOH – Traffic Engineering

TOTAL ATTENDEES: 23

SPECIFICATIONS

ALL BEAMS HEREIN HAVE BEEN EVALUATED IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS, GUIDES, AND REFERENCES:

1) AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION.

2) AASHTO MANUAL FOR BRIDGE EVALUATION (MBE), 3RD EDITION.

3) AASHTO/NSBA GUIDELINES TO DESIGN FOR CONSTRUCTION AND FABRICATION G12.1-2020.

4) AASHTO/NSBA GUIDELINES FOR STEEL GIRDER BRIDGE ANALYSIS G13.1-2019

5) WEST VIRGINIA BRIDGE DESIGN MANUAL, 2004 EDITION INCLUDING ALL INTERIMS UP TO 2018.

6) WEST VIRGINIA STANDARD SPECIFICATIONS FOR ROADS AND BRIDGES, 2017 INCLUDING ALL INTERIMS UP TO 2022.

DESIGN NOTES

ALL BEAMS ARE EVALUATED USING THE LOAD AND RESISTANCE FACTOR DESIGN (LRFD) METHOD. THE FOLLOWING DESIGN ASSUMPTIONS ARE USED IN DEVELOPMENT OF DATA SHEETS HEREIN. SUPERSTRUCTURES WHICH DO NOT CONFORM TO ALL ASSUMPTIONS MAY NECESSITATE MODIFICATIONS.

1. PERMANENT DEADLOADS:

SELF WEIGHT OF STEEL BEAM.

LOAD ALLOWANCE FOR DIAPHRAGMS OR CROSS-FRAMES AND OTHER MISCELLANEOUS ATTACHMENT'S SELF WEIGHT APPLIED AS A LINEAR LOAD OF 25 PLF ON EACH BEAM.

SELF WEIGHT OF AN 8-INCH REINFORCED CONCRETE DECK APPLIED BASED ON TRIBUTARY WIDTH PERPENDICULAR TO THE BEAM AS SPECIFIED IN AASHTO LRFD SECTION 4.6.2.6.

SELF WEIGHT OF A 2-INCH CONCRETE SACRIFICIAL HAUNCH.

SELF WEIGHT OF LOCAL OVERHANG CONCRETE THICKENING APPLIED TO FASCIA BEAM.

STAY-IN-PLACE (SIP) FORMWORK UNIT WEIGHT OF 15 PSF APPLIED BETWEEN TIPS OF THE TOP BEAM FLANGE.

SELF WEIGHT OF TWO (2) TYPE F BARRIERS (305 PLF EACH) DISTRIBUTED EVENLY BETWEEN ALL BEAMS FOR COMPOSITE SUPERSTRUCTURES.

FUTURE WEARING SURFACE OF 25 PSF OF ROADWAY WIDTH EVENLY DISTRIBUTED BETWEEN ALL BEAMS FOR COMPOSITE SUPERSTRUCTURES.

2. DESIGN LIVE LOAD:

HL-93 LIVE LOAD AND IMPACT APPLIED IN ACCORDANCE WITH THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR ALL LIMIT STATES. LIVE LOAD DISTRIBUTION FACTORS INCLUDE CORRECTION FACTORS WITHIN LRFD SECTION 4.6.2.2.

FATIGUE DESIGN TRUCK AND IMPACT IN ACCORDANCE WITH AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR ALL FATIGUE LIMIT STATES.

3. SERVICABILITY:

LIVE LOAD DEFLECTION LIMITED OF L/800 AS CALCULATED WITHIN AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

DESIGN NOTES (CONT.)

4. LOAD RATING:

ALL BEAMS PROVIDED HEREIN ARE LOAD RATED IN ACCORDANCE WITH SECTION 3.15 OF THE WEST VIRGINIA BRIDGE DESIGN MANUAL TO ACHIEVE EQUAL OR GREATER LOAD CARRYING CAPACITIES THAN NOTED IN THE TABLE SHOWN. A LEGAL LOAD FACTOR OF 1.45, CORRESPONDING TO UNKNOWN ADTT, IS USED. SEE OTHER LITERATURE FOR TRUCK AXLE CONFIGURATIONS.

TARGET LOAD RATINGS (TONS)

CLASSIFICATION	TRUCK	TONS
STANDARD	TYPE 3	41
	SU4	49
	SU5	51
	SU6	51
	SU7	51
	TYPE 3S2	55
EMERGENCY	EV2	36
	EV3	54
CRTS	SU-40	53
	SU-45	60
	3S-55	73
	3S-60	79
PERMIT	WP47	59

5. CONSTRUCTION LOADS:

FASCIA BEAMS HAVE BEEN EVALUATED FOR LOAD EFFECTS FROM OVERHANG BRACKETS DURING DECK PLACEMENT. THE BEAMS HAVE BEEN SIZED TO WITHSTAND LOAD EFFECTS WITH LATERAL BRACES SPACED AT 50% OF THE FINAL DIAPHRAGM OR CROSS-FRAME SPACING. A DEAD LOAD FACTOR OF 1.30 AND LIVE LOAD FACTOR OF 1.75 IS USED. THE FOLLOWING ASSUMPTIONS HAVE BEEN MADE:

THE SELF WEIGHT OF THE STEEL BEAM, LOAD ALLOWANCE FOR DIAPHRAGMS OR CROSS-FRAMES, SELF WEIGHT OF ALL CONCRETE, AND SELF WEIGHT OF STAY-IN-PLACE (SIP) FORMWORK IS APPLIED.

A UNIFORM DEADLOAD OF 10 PSF APPLIED THE FULL OVERHANG WIDTH FOR TIMBER FORMWORK SELF WEIGHT.

AN EIGHT WHEEL FINISHING MACHINE WITH A MAXIMUM WHEEL LOAD OF 1,300 LB FOR A TOTAL MACHINE LOAD OF 10,500 LBS ORIENTED PARALLEL TO THE SKEW IS APPLIED. THE MINIMUM OUT-TO-OUT WHEEL SPACING AT EACH END IS 103 INCHES. THE FINISHING MACHINE WHEELS ARE POSITIONED AT THE OVERHANG EDGE.

A MAXIMUM OVERHANG FALSEWORK BRACKET SPACING OF 48 INCHES AND A MAXIMUM DISTANCE FROM THE CENTERLINE OF THE FASCIA BEAM TO THE FACE OF THE SAFETY HANDRAIL OF 65 INCHES.

A UNIFORM LIVE LOAD OF 25 PSF BETWEEN THE EDGE OF THE OVERHANG AND SAFETY HANDRAIL APPLIED CONCURRENTLY WITH A LINEAR LOAD OF 75 PLF ALONG THE SAFETY RAIL.

CONSTRUCTION LOADS FROM OVERHANG FORMWORK ARE NOT EVALUATED FOR BEAMS WITH WEB DEPTHS LESS THAN 18 INCHES. UNCONVENTIONAL OVERHANG FORMWORK MAY BE NECESSARY. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE DESIGN OF THE FALSEWORK SUPPORT SYSTEM, BEAM DESIGN FOR CONSTRUCTION LOADING, TEMPORARY BRACING, AND DEVELOPMENT OF DETAILS NECESSARY FOR CONSTRUCTION.

DESIGN NOTES (CONT.)

6. UNIT WEIGHTS:

THE UNIT WEIGHT OF ALL MATERIAL MATCHES THE RECOMMENDATIONS OF AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS CHAPTER 3.

7. SECTION PROPERTIES:

THE SECTION PROPERTIES ARE DEVELOPED BY OMITTING THE TOP ¼" OF DECK (WEARING SURFACE) AND SACRIFICIAL HAUNCHES. LONGITUDINAL DECK REINFORCING STEEL IS NOT CONSIDERED. THE COMPOSITE SECTION PROPERTIES ARE DEVELOPED USING A CONCRETE MODULUS OF 3986 KSI CORRESPONDING TO AN "N" VALUE OF 7.27.

8. DESIGN REQUIREMENTS:

THE BEAMS AND THEIR CONNECTION PLATES HAVE BEEN DESIGNED FOR INFINITE FATIGUE LIFE.

THE MINIMUM PLATE THICKNESSES FOR BEAMS MEET THE MOST CONSERVATIVE RECOMMENDATIONS WITHIN THE NOTED SPECIFICATIONS, GUIDES, AND REFERENCES. THE MAXIMUM PLATE THICKNESS IS LIMITED TO 2".

9. DESIGN LIMITATIONS:

BEAMS AND DECK SHALL BE ORIENTED PARALLEL (NON-CURVED). BEAMS SHALL BE PARALLEL TO PROFILE OR MEET THE REQUIREMENTS OF LRFD SECTION 4.6.1.2.4b. BEST ENGINEERING JUDGEMENT SHALL BE USED FOR SUPERSTRUCTURES WITH CURVED PROFILES AT THE ENDS OF THE BRIDGE WHICH DO NOT MEET THESE REQUIREMENTS.

SUPPORTS SHALL BE ORIENTED PARALLEL WITH A SKEW ANGLE NOT EXCEEDING 30 DEGREES.

CONSTANT DECK THICKNESS SHALL BE USED EXCEPT AT HAUNCHES AND OTHER LOCAL THICKENING. CONCRETE DECK SHALL MEET AASHTO AND WVDOH REQUIREMENTS FOR EMPIRICAL DECK DESIGN.

ALL BEAMS WITHIN THE TYPICAL SECTION SHALL USE THE SAME BEAM CROSS SECTION, SPLICE LOCATION, AND SHEAR STUD ARRANGEMENT AS APPLICABLE.

THE SUPERSTRUCTURE SHALL NOT HAVE A PREDICTED ADT GREATER THAN 50,000, DETOUR LENGTH GREATER THAN 50 MILES, OR MEET ANY OTHER CRITERIA WHICH MAY RESULT IN LOAD MODIFIER FACTORS GREATER THAN 1.00.

THE SUPERSTRUCTURE CROSS SECTION SHALL CONSIST OF A MINIMUM OF FOUR (4) BEAM LINES. ROADWAY WIDTHS BETWEEN 20-FT AND 24-FT HAVE BEEN DESIGNED FOR TWO (2) TRAFFIC LANES AS SPECIFIED WITHIN AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 3.6.1.1.1.

NOT TO SCALE

MATERIALS AND FABRICATION

1. SUPERSTRUCTURE CONCRETE:

DECK CONCRETE SHALL MEET ALL REQUIREMENTS WITHIN THE STANDARD SPECIFICATIONS FOR CLASS H OR CLASS K CONCRETE AS APPLICABLE. A 28-DAY CONCRETE STRENGTH OF 4,000 PSI SHALL BE ATTAINED.

A WATER REDUCING, RETARDING ADMIXTURE IN ACCORDANCE WITH SECTION 707.2 OF THE STANDARD SPECIFICATIONS SHALL BE USED ON ALL SUPERSTRUCTURE CONCRETE. INCLUDE THE COST OF THE ADMIXTURE IN THE UNIT PRICE FOR CLASS H OR CLASS K CONCRETE. RETARDER WILL NOT BE REQUIRED BELOW 50°F, BUT WATER REDUCING ADMIXTURE SHALL BE USED. THE CONTRACTOR'S ATTENTION IS CALLED TO THE TEST REQUIREMENTS FOR THE SET-RETARDING ADMIXTURE.

SURFACES THAT RECEIVE A CONCRETE PROTECTIVE COATING SHALL MEET ALL REQUIREMENTS WITHIN THE STANDARD SPECIFICATIONS.

2. MILD REINFORCING STEEL:

REINFORCING STEEL SHALL MEET THE REQUIREMENTS OF AASHTO M31 GRADE 60. REINFORCEMENT WITH EQUAL OR GREATER STRENGTH MAY BE SUBSTITUTED AT THE ENGINEER'S DISCRETION. DO NOT WELD REINFORCING BARS DURING FABRICATION.

3. STRUCTURAL STEEL:

ALL STRUCTURAL STEEL SHALL CONFORM TO AASHTO M270 GRADES 50, 50W, OR 50CR. ZONE 2 CHARPY V-NOTCH IMPACT TESTING SHALL APPLY IN TENSION ZONES.

BOLTED CONNECTIONS ARE DESIGNED AS SLIP-CRITICAL JOINTS WITH ALL FAYING SURFACES HAVING A CLASS B SLIP COEFFICIENT. FABRICATOR SHALL VERIFY THIS SLIP COEFFICIENT CAN BE ATTAINED.

4. IDENTIFICATION MARKING:

ALL STEEL MILL AND FABRICATOR IDENTIFICATION MARKINGS FOR STEEL PLATES, SHAPES, AND FABRICATED MEMBERS SHALL BE BY METAL TAGS, SOAPSTONE, OR SOME OTHER READILY REMOVABLE MATERIAL OR SHALL BE MARKED IN AN AREA OF THE COMPLETED MEMBER WHICH WILL BE ENCASED OR COVERED WITH CONCRETE. MARKING METHODS AND LOCATIONS ARE SUBJECT TO APPROVAL OF THE ENGINEER. DO NOT USE PAINT OR WAX-BASED CRAYONS FOR MARKING.

5. STEEL STORAGE:

STORE MEMBERS IN THE FABRICATION SHOP IN SUCH A MANNER AS TO BE KEPT FREE AND CLEAN OF ALL FOREIGN SUBSTANCES SUCH AS GREASE, OIL, CHALK AND CRAYON MARKS, PAINT, AND DIRT. ALL STORAGE SHALL BE ABOVE GROUND AND SLOPED TO ALLOW FREE DRAINAGE OF MELTED SNOW, RAINWATER AND DEW. IF STORED FOR PERIODS LONGER THAN THREE (3) MONTHS, THE MEMBERS MUST BE PLACED ON METAL SUPPORTS. FOR PERIODS OF STORAGE LESS THAN THREE (3) MONTHS, MEMBERS MAY BE PLACED ON CLEAN, UNTREATED WOOD TIMBERS. STORE PLATE GIRDERS WITH THE WEB IN THE UPRIGHT POSITION. THE MEMBERS MAY BE STACKED PROVIDED METAL OR WOOD SUPPORTS, AS NOTED ABOVE, SEPARATE INDIVIDUAL MEMBERS. UNDER NO CIRCUMSTANCES SHALL MEMBERS BE NESTED TOGETHER OR BUNDLED. DO NOT ALLOW TREATED LUMBER OR TREATED TIMBER TO CONTACT STEEL MEMBERS.

6. SHOP DRAWING APPROVAL

SHOP DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER. SHOP DRAWING REVIEW AND APPROVAL SHALL BE IN ACCORDANCE WITH DD-102.

ERECTION AND STORAGE

1. SUPERSTRUCTURE CONCRETE:

THE DECK PLACEMENT SEQUENCE SHALL BE SHOWN WITHIN THE CONTRACT PLANS. THE DECK CONCRETE MUST ATTAIN A MINIMUM STRENGTH OF 3,000 PSI BEFORE SUBSEQUENT DECK PLACEMENTS ARE MADE.

NO CONSTRUCTION EQUIPMENT OR LOADS NOT REQUIRED TO COMPLETE THE DECK SLAB, PARAPETS, OR OTHER APPURTENANCES SHALL BE ALLOWED ON THE BRIDGE DECK. NO CONSTRUCTION EQUIPMENT WITH AN AXLE LOAD GREATER THAN 20,000 LBS SHALL BE PERMITTED ON THE BRIDGE DECK. CONTRACTOR SHALL PROVIDE THE AXLE WEIGHTS OF ALL CONSTRUCTION EQUIPMENT USED ON THE DECK.

THE CONTRACTOR IS RESPONSIBLE AND ASSUMES ALL RESPONSIBILITY FOR THE FALSEWORK SUPPORT SYSTEM. THE CONTRACTOR SHALL SUBMIT THE FORMING PLAN AND SUPPORTING CALCULATIONS TO THE ENGINEER PRIOR TO ERECTION. FORMING DESIGN SHALL BE PREPARED AND SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF WEST VIRGINIA, WHO SHALL ALSO VERIFY THAT THE DESIGN IS UTILIZED IN THE FIELD.

2. MILD REINFORCING STEEL:

THE CONTRACTOR SHALL FIELD REPAIR ALL DAMAGED OR CUT EPOXY COATED REINFORCING STEEL WITH AN APPROVED EPOXY REPAIR MATERIAL. DO NOT WELD REINFORCEMENT BARS DURING CONSTRUCTION.

3. STRUCTURAL STEEL:

DO NOT WELD ANY PART OF THE SUPERSTRUCTURE WITHOUT PRIOR WRITTEN APPROVAL FROM THE ENGINEER, UNLESS SHOWN ON THE CONTRACT PLANS. NO WELDING OF THE STAY-IN-PLACE FORMS OR OTHER CONNECTION WILL BE PERMITTED.

4. STEEL STORAGE:

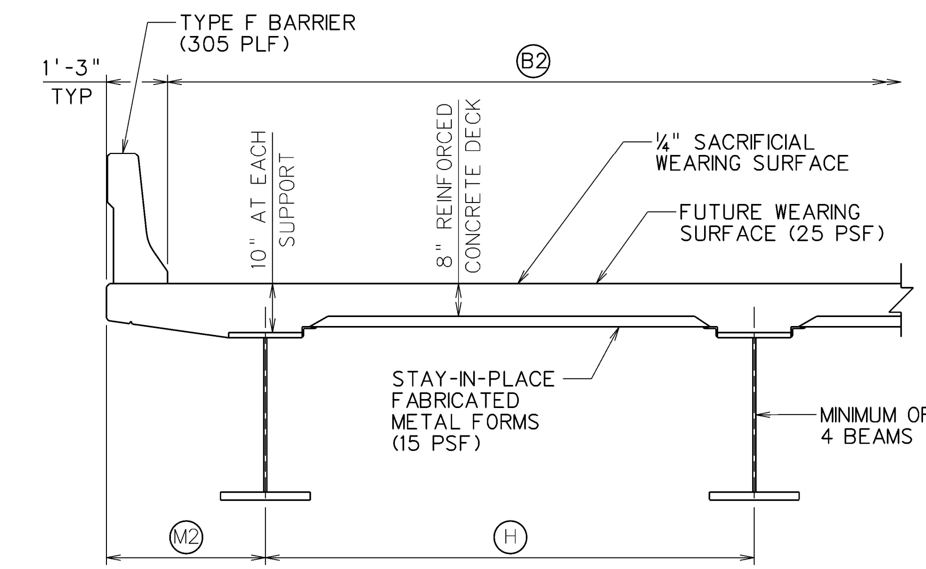
THE SAME REQUIREMENTS FOR SHOP STORAGE SHALL APPLY IN THE FIELD.

5. HANDLING:

STEEL MEMBERS MUST NOT BE GOUGED, SCRATCHED, DENTED, OR ALLOWED TO RUB AGAINST OTHER MEMBERS THAT WOULD RESULT IN DAMAGE TO THE BLAST CLEANED PROFILE. MEMBERS SHALL BE HANDLED USING SOFTENERS AND SLINGS INSTEAD OF CHOKERS AND CHAINS.

CONTROL DIMENSION NOTES

THE CONTROL DIMENSIONS AND LIMITS TABLE PROVIDE MINIMUM AND MAXIMUM VALUES FOR EACH DIMENSION USED WITHIN DEVELOPMENT OF THESE STANDARDS. DEVIATIONS FROM THESE DIMENSIONS MAY NECESSITATE MODIFICATION TO THE BEAM SIZES. DETAILED DIMENSIONS SHOULD BE DEFINED USING STANDARD DETAIL SHEETS.



PARTIAL TYPICAL SECTION

CONTROL DIMENSIONS AND LIMITS TABLE

CODE	DESCRIPTION	MINIMUM	MAXIMUM	TARGET
B2	ROADWAY WIDTH	15'-0"		SEE DD-601
C	SPAN LENGTH	30'-0"	140'-0"	
H	GIRDER SPACING	6'-0"	11'-0"	SEE NOTE A
M2	OVERHANG	2'-0"	0.33 x H	

NOTE A - VARY BEAM SPACING TO DETERMINE SOLUTION THAT MINIMIZES TOTAL STEEL WEIGHT

NOT TO SCALE

NO.	REVISION	DATE	BY

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DESIGNED	DATE	CHECKED	DATE
DRAWN	DATE	REVIEWED	DATE

STANDARD STEEL GIRDER DESIGN DATA SHEETS
STANDARD STEEL BEAM NOTES
SHEET 2 OF 2
SHEET NUMBER 3300GN2

PRINT DATE
19-SEP-2022 09:22

19-SEP-2022 09:22

COMPOSITE PLATE GIRDERS (6 FT GIRDER SPACING, 0 DEGREE SKEW)

SPAN LENGTH	DIAPHRAGM SPACING	PLATE GIRDER SIZE			SHEAR CONNECTOR MAX SPACING		TABLE NOTES
		TOP FLANGE PLATE	WEB PLATE	BOT FLANGE PLATE	(D)	(E)	
60	20.00	12 x 0.750	28 x 0.5000	12 x 1.000	18 @ 6	9	D
65	21.67	12 x 0.875	30 x 0.5000	12 x 1.000	20 @ 6	9	D
70	23.33	14 x 0.750	32 x 0.5000	14 x 1.000	14 @ 6	9	D
75	25	14 x 0.875	34 x 0.5000	14 x 1.125	40 @ 9	12	B,D
80	20.00	12 x 0.875	34 x 0.5000	14 x 1.250	8 @ 6	9	F
85	21.25	14 x 0.750	34 x 0.5000	16 x 1.250	10 @ 6	9	D
90	22.50	16 x 0.750	34 x 0.5000	16 x 1.375	10 @ 6	9	D
95	23.75	16 x 0.750	36 x 0.5000	16 x 1.375	52 @ 9	12	B,D
100	25.00	16 x 0.875	36 x 0.5000	16 x 1.625	60 @ 9	12	D
105	21.00	16 x 0.875	36 x 0.5000	18 x 1.500	-	9	D
110	22.00	16 x 1.000	36 x 0.5000	18 x 1.625	-	9	D
115	23.00	18 x 1.000	48 x 0.5000	20 x 1.125	8 @ 9	12	F
120	24.00	18 x 1.000	50 x 0.5000	18 x 1.250	-	12	E
125	25.00	18 x 1.000	50 x 0.5000	18 x 1.375	-	12	E
130	26.00	20 x 1.000	52 x 0.5000	20 x 1.250	40 @ 12	15	E
135	27.00	20 x 1.000	54 x 0.5000	20 x 1.250	34 @ 12	15	E
140	28.00	20 x 1.000	56 x 0.5000	20 x 1.250	28 @ 12	15	E

COMPOSITE PLATE GIRDERS (6 FT GIRDER SPACING, 30 DEGREE SKEW)

SPAN LENGTH	DIAPHRAGM SPACING	PLATE GIRDER SIZE			SHEAR CONNECTOR MAX SPACING		TABLE NOTES
		TOP FLANGE PLATE	WEB PLATE	BOT FLANGE PLATE	(D)	(E)	
60	20.00	12 x 0.750	28 x 0.5000	12 x 0.875	48 @ 6	9	D
65	21.67	14 x 0.750	28 x 0.5000	16 x 0.875	48 @ 6	9	D
70	23.33	14 x 0.750	32 x 0.5000	16 x 0.875	36 @ 6	9	D
75	25.00	16 x 0.750	32 x 0.5000	16 x 1.000	40 @ 6	9	D
80	20.00	12 x 0.875	34 x 0.5000	12 x 1.375	32 @ 6	9	D
85	21.25	14 x 0.750	36 x 0.5000	16 x 1.125	26 @ 6	9	D
90	22.50	16 x 0.750	36 x 0.5000	16 x 1.250	28 @ 6	9	D
95	23.75	16 x 0.750	36 x 0.5000	16 x 1.375	30 @ 6	9	D
100	25.00	16 x 0.875	36 x 0.5000	16 x 1.500	30 @ 6	9	D
105	21.00	16 x 0.875	36 x 0.5000	18 x 1.500	34 @ 6	9	B,D
110	22.00	18 x 1.000	44 x 0.5000	18 x 1.250	52 @ 9	12	F
115	23.00	18 x 1.000	48 x 0.5000	20 x 1.125	32 @ 9	12	F
120	24.00	18 x 1.000	50 x 0.5000	20 x 1.125	24 @ 9	12	E
125	25.00	18 x 1.000	52 x 0.5000	20 x 1.125	18 @ 9	12	E
130	26.00	20 x 1.000	52 x 0.5000	20 x 1.250	18 @ 9	12	E
135	27.00	20 x 1.000	54 x 0.5000	20 x 1.250	10 @ 9	12	E
140	28.00	20 x 1.000	56 x 0.5000	20 x 1.250	-	12	E

TABLE NOTES:

A. SKEW INDEX EXCEEDS 0.30 ASSUMING 30° MAX SKEW

B. CONTRACTIBILITY OF THE EXTERIOR BEAM CONTROLS OVER ALL STRENGTH LIMIT STATES. A MORE THOROUGH EVALUATION MAY REDUCE BEAM SIZES.

C. LIVE LOAD DEFLECTION REQUIREMENTS CONTROL OVER ALL STRENGTH LIMIT STATES. A MORE THOROUGH EVALUATION MAY REDUCE BEAM SIZES.

D. DIAPHRAGMS ARE RECOMMENDED.

E. X SHAPED CROSSFRAMES ARE RECOMMENDED.

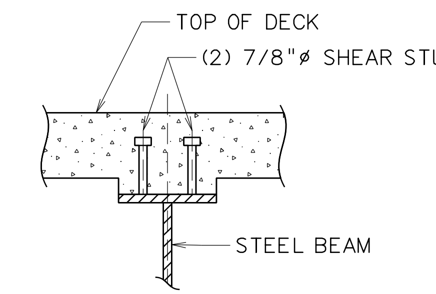
F. K SHAPED CROSSFRAMES ARE RECOMMENDED.

COMPOSITE ROLLED BEAMS (6 FT GIRDER SPACING, 0 DEGREE SKEW)

SPAN LENGTH	DIAPHRAGM SPACING	STANDARD DESIGN				OPTIONAL DESIGN			
		ROLLED SECTION	SHEAR CONNECTOR SPACING (D)	SHEAR CONNECTOR SPACING (E)	TABLE NOTES	ROLLED SECTION	SHEAR CONNECTOR SPACING (D)	SHEAR CONNECTOR SPACING (E)	TABLE NOTES
30	15.00	W14X74	-	6	D				
35	17.50	W18X86	-	6	D				
40	20.00	W30X90	-	9	D				
45	22.50	W30X99	-	9	B,D				
50	25.00	W30X116	10 @ 6	9	B,D				
55	18.33	W30X116	12 @ 6	9	D				
60	20.00	W33X118	12 @ 6	9	D				
65	21.67	W33X130	14 @ 6	9	D				
70	23.33	W36X150	38 @ 9	12	D	W40X149	34 @ 9	12	B,F
75	25.00	W36X160	40 @ 9	12	B,D				
80	20.00	W36X182	44 @ 9	12	D	W40X167	44 @ 9	12	F
85	21.25	W36X194	46 @ 9	12	D				
90	22.50	W33X221	18 @ 6	9	D	W40X199	42 @ 9	12	F
95	23.75	W36X231	52 @ 9	12	D	W40X215	38 @ 9	12	F
100	25.00	W36X247	54 @ 9	12	D	W44X230	28 @ 9	12	F
105	21.00	W36X262	64 @ 9	12	D	W44X230	28 @ 9	12	F
110	22.00	W36X282	66 @ 9	12	D	W44X262	30 @ 9	12	F

COMPOSITE ROLLED BEAMS (6 FT GIRDER SPACING, 30 DEGREE SKEW)

SPAN LENGTH	DIAPHRAGM SPACING	STANDARD DESIGN				OPTIONAL DESIGN			
		ROLLED SECTION	SHEAR CONNECTOR SPACING (D)	SHEAR CONNECTOR SPACING (E)	TABLE NOTES	ROLLED SECTION	SHEAR CONNECTOR SPACING (D)	SHEAR CONNECTOR SPACING (E)	TABLE NOTES
30	15.00	W30X90	12 @ 6	9	A,D				
35	17.50	W30X90	22 @ 6	9	D				
40	20.00	W30X90	24 @ 6	9	D				
45	22.50	W30X108	28 @ 6	9	B,D				
50	25.00	W33X118	20 @ 6	9	B,D				
55	18.33	W33X118	34 @ 6	9	D				
60	20.00	W33X118	36 @ 6	9	D				
65	21.67	W36X135	40 @ 6	9	D				
70	23.33	W36X150	42 @ 6	9	B,D				
75	25.00	W30X173	60 @ 6	9	D				
80	20.00	W36X182	48 @ 6	9	D				
85	21.25	W36X194	52 @ 6	9	D				
90	22.50	W33X221	54 @ 6	9	D	W40X199	36 @ 6	9	F
95	23.75	W36X231	38 @ 6	9	D	W40X215	38 @ 6	9	F
100	25.00	W36X231	60 @ 6	9	D	W44X230	20 @ 6	9	F
105	21.00	W36X262	42 @ 6	9	D	W44X230	22 @ 6	9	F
110	22.00	W36X262	66 @ 6	9	D	W40X249	44 @ 6	9	F



SHEAR STUD DETAIL

NOTES:

1. THE ENGINEER SHOULD NOTE THAT DATA WITHIN THE TABLES ARE BASED ON THE DESIGN METHODS NOTED ON STANDARD SHEETS 3300GN1 AND 3300GN2. DEVIATIONS FROM THE CRITERIA USED MAY NECESSITATE MODIFICATION TO THE BEAM SIZES.

2. THE ENGINEER, FABRICATOR, AND ERECTOR SHALL BE AWARE THAT THE BEAM ENDS MAY TWIST OR WARP DURING ERECTION. THE CONTRACTOR IS REQUIRED TO MAKE ANY CORRECTIONS BEFORE THE BEAMS ARE SECURED IN PLACE.

3. THE ENGINEER MAY USE PLATE SIZES OR ROLLED BEAMS LARGER THAN THOSE NOTED WITHIN THE TABLE GIVEN THE MOMENT OF INERTIA AND SECTION MODULUS IN BOTH AXIS ARE GREATER OR EQUAL TO THOSE SPECIFIED FOR BOTH THE NON-COMPOSITE AND COMPOSITE CASES AS APPLICABLE.

4. THE ENGINEER MAY SUBSTITUTE THREE (3) SHEAR STUDS PER ROW GIVEN THE TOTAL NUMBER OF SHEAR STUDS PER FOOT REMAINS EQUAL OR GREATER AND ALL MINIMUM SPACING'S NOTED WITHIN AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS ARE MET WITHOUT FURTHER EVALUATION.

5. THE ENGINEER SHOULD VERIFY AVAILABILITY OF ROLLED BEAMS LARGER THAN W36. INFREQUENT ROLL SCHEDULES MAY DELAY FABRICATION AND CONSTRUCTION.

6. ROLLED BEAMS SHALL NOT BE CAMBERED FOR LESS THAN ¾". NATURAL MILL CAMBER SHOULD BE PLACED TO MINIMIZE HAUNCH THICKNESS FROM UNCAMBERED BEAMS.

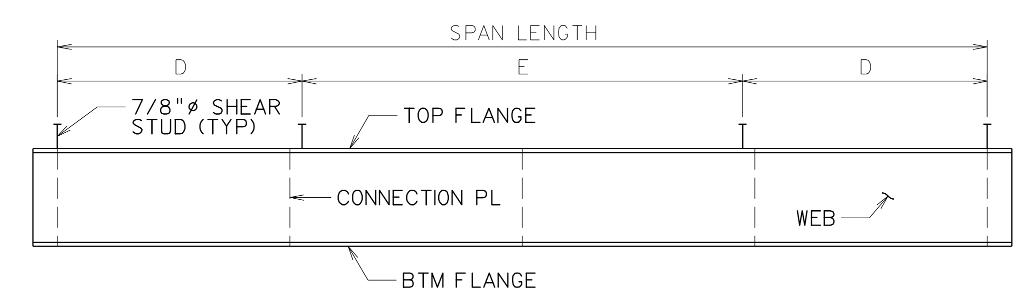
7. THE ENGINEER SHOULD VERIFY WITH LOCAL FABRICATORS IF THEY ARE CAPABLE OF CAMBERING ROLLED BEAMS LARGER THAN W27 WITHOUT THE USE OF HEAD. A PLATE GIRDER SOLUTION MAY WARRANT CONSIDERATION IF LOCAL FABRICATOR DOES NOT HAVE THIS CAPABILITY.

NOTES (CONT.):

8. THE ENGINEER SHOULD CONSIDER TRANSPORTATION FOR LONG BEAMS. THE DESIGN AND DETAILING OF OPTIONAL FIELD SPLICES MAY BE PRUDENT IF TRANSPORTATION IS IN QUESTION.

9. THE ENGINEER MAY SUBSTITUTE A DECK SYSTEM WHICH IS LIGHTER THAN ASSUMED HEREIN WITHOUT FURTHER EVALUATION.

10. THE ENGINEER MAY UTILIZE DATA WITHIN THE TABLES FOR BEAM SPACINGS NOT SHOWN WITHOUT FURTHER EVALUATION GIVEN THE LARGER BEAM FOR ADJACENT SPACINGS IS SELECTED.



BEAM ELEVATION

NOT TO SCALE

PRINT DATE 19-SEP-2022 09:45

19-SEP-2022 09:45

NO.	REVISION	DATE	BY

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DESIGNED	DATE	CHECKED	DATE
DRAWN	DATE	REVIEWED	DATE

STANDARD BRIDGE PLANS
COMPOSITE STEEL BEAM
SHEET 1 OF 6
SHEET NUMBER 3320SB1

COMPOSITE PLATE GIRDERS (7' GIRDER SPACING, 0 DEGREE SKEW)							
SPAN LENGTH	DIAPHRAGM SPACING	PLATE GIRDER SIZE			SHEAR CONNECTOR MAX. SPACING		TABLE NOTES
		TOP FLANGE PLATE	WEB PLATE	BOT FLANGE PLATE	(D)	(E)	
60	20.00	12 x 0.875	28 x 0.5000	12 x 1.000	24 @ 6	9	D
65	21.67	14 x 0.750	28 x 0.5000	14 x 1.125	34 @ 6	9	D
70	23.33	16 x 0.750	32 x 0.5000	16 x 1.000	22 @ 6	9	D
75	25.00	16 x 0.750	32 x 0.5000	16 x 1.125	24 @ 6	9	D
80	20.00	14 x 0.750	34 x 0.5000	14 x 1.250	16 @ 6	9	D
85	21.25	16 x 0.750	34 x 0.5000	16 x 1.375	18 @ 6	9	D
90	22.50	16 x 0.750	36 x 0.5000	16 x 1.375	18 @ 6	9	D
95	23.75	16 x 0.875	36 x 0.5000	16 x 1.500	-	9	D
100	25.00	18 x 1.000	40 x 0.5000	18 x 1.250	48 @ 9	12	D
105	21.00	18 x 1.000	44 x 0.5000	18 x 1.250	28 @ 9	12	F
110	22.00	18 x 1.000	46 x 0.5000	18 x 1.250	30 @ 9	12	F
115	23.00	18 x 1.000	48 x 0.5000	18 x 1.375	24 @ 9	12	F
120	24.00	18 x 1.000	48 x 0.5000	18 x 1.375	16 @ 9	12	F
125	25.00	18 x 1.000	50 x 0.5000	18 x 1.375	18 @ 9	12	F
130	26.00	20 x 1.000	52 x 0.5000	20 x 1.375	-	12	F
135	27.00	20 x 1.000	54 x 0.5000	20 x 1.375	-	12	F
140	28.00	20 x 1.000	56 x 0.5625	20 x 1.250	-	12	F

COMPOSITE PLATE GIRDERS (7' GIRDER SPACING, 30 DEGREE SKEW)							
SPAN LENGTH	DIAPHRAGM SPACING	PLATE GIRDER SIZE			SHEAR CONNECTOR MAX. SPACING		TABLE NOTES
		TOP FLANGE PLATE	WEB PLATE	BOT FLANGE PLATE	(D)	(E)	
60	20.00	14 x 0.750	28 x 0.5000	14 x 1.125	-	6	B,D
65	21.67	16 x 0.750	30 x 0.5000	16 x 0.875	66 @ 6	9	D
70	23.33	16 x 0.750	32 x 0.5000	16 x 0.875	56 @ 6	9	D
75	25.00	16 x 0.750	34 x 0.5000	16 x 1.000	40 @ 6	9	D
80	20.00	14 x 0.750	36 x 0.5000	14 x 1.125	48 @ 6	9	D
85	21.25	16 x 0.750	36 x 0.5000	16 x 1.125	52 @ 6	9	D
90	22.50	16 x 0.750	36 x 0.5000	16 x 1.375	46 @ 6	9	D
95	23.75	16 x 0.875	36 x 0.5000	16 x 1.500	48 @ 6	9	D
100	25.00	16 x 1.000	36 x 0.5000	18 x 1.375	50 @ 6	9	D
105	21.00	16 x 1.000	36 x 0.5000	18 x 1.500	64 @ 6	9	D
110	22.00	18 x 1.000	44 x 0.5000	18 x 1.375	2 @ 6	9	F
115	23.00	18 x 1.000	48 x 0.5000	18 x 1.250	24 @ 6	9	F
120	24.00	18 x 1.000	50 x 0.5000	18 x 1.250	24 @ 6	9	F
125	25.00	18 x 1.000	52 x 0.5000	18 x 1.250	26 @ 6	9	F
130	26.00	20 x 1.000	52 x 0.5000	20 x 1.250	36 @ 9	12	F
135	27.00	20 x 1.000	52 x 0.5000	20 x 1.375	36 @ 9	12	F
140	28.00	20 x 1.000	52 x 0.5000	20 x 1.375	28 @ 6	9	F

TABLE NOTES:

A. SKEW INDEX EXCEEDS 0.30 ASSUMING 30° MAX SKEW

B. CONTRACTIBILITY OF THE EXTERIOR BEAM CONTROLS OVER ALL STRENGTH LIMIT STATES. A MORE THOROUGH EVALUATION MAY REDUCE BEAM SIZES.

C. LIVE LOAD DEFLECTION REQUIREMENTS CONTROL OVER ALL STRENGTH LIMIT STATES. A MORE THOROUGH EVALUATION MAY REDUCE BEAM SIZES.

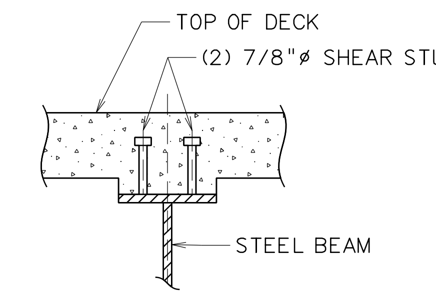
D. DIAPHRAGMS ARE RECOMMENDED.

E. X SHAPED CROSSFRAMES ARE RECOMMENDED.

F. K SHAPED CROSSFRAMES ARE RECOMMENDED.

COMPOSITE ROLLED BEAMS (7 FT GIRDER SPACING, 0 DEGREE SKEW)									
SPAN LENGTH	DIAPHRAGM SPACING	STANDARD DESIGN				OPTIONAL DESIGN			
		ROLLED SECTION	SHEAR CONNECTOR SPACING (D)	SHEAR CONNECTOR SPACING (E)	TABLE NOTES	ROLLED SECTION	SHEAR CONNECTOR SPACING (D)	SHEAR CONNECTOR SPACING (E)	TABLE NOTES
30	15.00	W18X76	-	6	D				
35	17.50	W30X90	-	9	D				
40	20.00	W30X90	-	9	B,D				
45	22.50	W24X104	36 @ 6	9	D				
50	25.00	W24X117	30 @ 6	9	D				
55	18.33	W33X118	12 @ 6	9	D				
60	20.00	W33X130	24 @ 6	9	D				
65	21.67	W36X135	14 @ 6	9	B,D				
70	23.33	W36X160	14 @ 6	9	D				
75	25.00	W36X182	16 @ 6	9	B,D				
80	20.00	W36X194	16 @ 6	9	D	W40X183	8 @ 6	9	F
85	21.25	W36X210	18 @ 6	9	D	W40X199	10 @ 6	9	F
90	22.50	W36X231	18 @ 6	9	D	W40X215	54 @ 9	12	F
95	23.75	W36X247	20 @ 6	9	D	W44X230	38 @ 9	12	F
100	25.00	W36X262	20 @ 6	9	D	W44X230	48 @ 9	12	F
105	21.00	W36X282	22 @ 6	9	C,D	W44X262	42 @ 9	12	F
110	22.00	W36X330	-	9	C,D	W44X262	52 @ 9	12	F

COMPOSITE ROLLED BEAMS (7 FT GIRDER SPACING, 30 DEGREE SKEW)									
SPAN LENGTH	DIAPHRAGM SPACING	STANDARD DESIGN				OPTIONAL DESIGN			
		ROLLED SECTION	SHEAR CONNECTOR SPACING (D)	SHEAR CONNECTOR SPACING (E)	TABLE NOTES	ROLLED SECTION	SHEAR CONNECTOR SPACING (D)	SHEAR CONNECTOR SPACING (E)	TABLE NOTES
30	15.00	W30X90	30 @ 6	9	A,D				
35	17.50	W30X90	-	6	A,D				
40	20.00	W30X90	-	6	A,B,D				
45	22.50	W30X116	-	6	B,D				
50	25.00	W33X130	30 @ 6	9	B,D				
55	18.33	W33X130	34 @ 6	9	D				
60	20.00	W33X130	48 @ 6	9	D				
65	21.67	W36X150	40 @ 6	9	D				
70	23.33	W36X170	42 @ 6	9	B,D	W40X167	42 @ 6	9	B,F
75	25.00	W36X194	60 @ 6	9	B,D				
80	20.00	W36X194	64 @ 6	9	D				
85	21.25	W36X210	68 @ 6	9	D	W40X199	52 @ 6	9	F
90	22.50	W36X231	72 @ 6	9	D	W40X215	54 @ 6	9	F
95	23.75	W36X231	76 @ 6	9	D	W40X215	58 @ 6	9	F
100	25.00	W36X247	80 @ 6	9	D	W44X230	40 @ 6	9	F
105	21.00	W36X282	64 @ 6	9	C,D	W44X262	22 @ 6	9	F
110	22.00	W36X330	66 @ 6	9	C,D	W44X262	44 @ 6	9	F



SHEAR STUD DETAIL

NOTES:

1. THE ENGINEER SHOULD NOTE THAT DATA WITHIN THE TABLES ARE BASED ON THE DESIGN METHODS NOTED ON STANDARD SHEETS 3300GN1 AND 3300GN2. DEVIATIONS FROM THE CRITERIA USED MAY NECESSITATE MODIFICATION TO THE BEAM SIZES.

2. THE ENGINEER, FABRICATOR, AND ERECTOR SHALL BE AWARE THAT THE BEAM ENDS MAY TWIST OR WARP DURING ERECTION. THE CONTRACTOR IS REQUIRED TO MAKE ANY CORRECTIONS BEFORE THE BEAMS ARE SECURED IN PLACE.

3. THE ENGINEER MAY USE PLATE SIZES OR ROLLED BEAMS LARGER THAN THOSE NOTED WITHIN THE TABLE GIVEN THE MOMENT OF INERTIA AND SECTION MODULUS IN BOTH AXIS ARE GREATER OR EQUAL TO THOSE SPECIFIED FOR BOTH THE NON-COMPOSITE AND COMPOSITE CASES AS APPLICABLE.

4. THE ENGINEER MAY SUBSTITUTE THREE (3) SHEAR STUDS PER ROW GIVEN THE TOTAL NUMBER OF SHEAR STUDS PER FOOT REMAINS EQUAL OR GREATER AND ALL MINIMUM SPACING'S NOTED WITHIN AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS ARE MET WITHOUT FURTHER EVALUATION.

5. THE ENGINEER SHOULD VERIFY AVAILABILITY OF ROLLED BEAMS LARGER THAN W36. INFREQUENT ROLL SCHEDULES MAY DELAY FABRICATION AND CONSTRUCTION.

6. ROLLED BEAMS SHALL NOT BE CAMBERED FOR LESS THAN ¾". NATURAL MILL CAMBER SHOULD BE PLACED TO MINIMIZE HAUNCH THICKNESS FROM UNCAMBERED BEAMS.

7. THE ENGINEER SHOULD VERIFY WITH LOCAL FABRICATORS IF THEY ARE CAPABLE OF CAMBERING ROLLED BEAMS LARGER THAN W27 WITHOUT THE USE OF HEAD. A PLATE GIRDER SOLUTION MAY WARRANT CONSIDERATION IF LOCAL FABRICATOR DOES NOT HAVE THIS CAPABILITY.

NOTES (CONT.):

8. THE ENGINEER SHOULD CONSIDER TRANSPORTATION FOR LONG BEAMS. THE DESIGN AND DETAILING OF OPTIONAL FIELD SPLICES MAY BE PRUDENT IF TRANSPORTATION IS IN QUESTION.

9. THE ENGINEER MAY SUBSTITUTE A DECK SYSTEM WHICH IS LIGHTER THAN ASSUMED HEREIN WITHOUT FURTHER EVALUATION.

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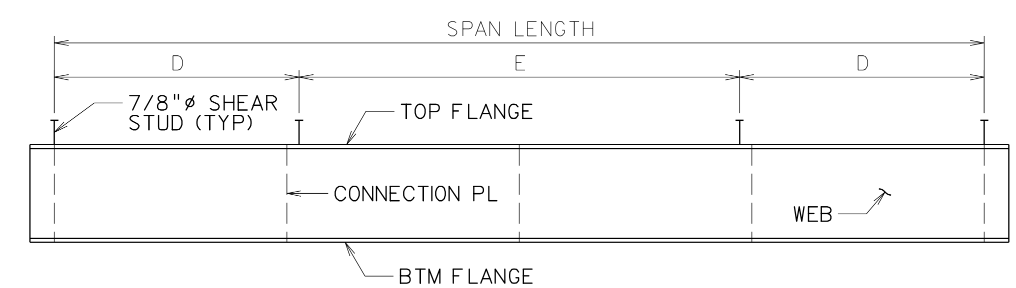


BEAM ELEVATION

NOT TO SCALE

NO.	REVISION	DATE	BY

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DESIGNED | DATE | CHECKED | DATE
DRAWN | DATE | REVIEWED | DATE

STANDARD BRIDGE PLANS
COMPOSITE STEEL BEAM
SHEET 2 OF 6
SHEET NUMBER 3320SB2

PRINT DATE 19-SEP-2022 09:49
19-SEP-2022 09:49

COMPOSITE PLATE GIRDERS (8' GIRDER SPACING, 0 DEGREE SKEW)

SPAN LENGTH	DIAPHRAGM SPACING	PLATE GIRDER SIZE: TOP FLANGE PLATE	PLATE GIRDER SIZE: WEB PLATE	PLATE GIRDER SIZE: BOT FLANGE PLATE	SHEAR CONNECTOR MAX SPACING (D)	SHEAR CONNECTOR MAX SPACING (E)	TABLE NOTES
60	20.00	14 x 0.750	26 x 0.5000	14 x 1.000	48 @ 6	9	D
65	21.67	16 x 0.750	30 x 0.5000	16 x 0.875	40 @ 6	9	D
70	23.33	16 x 0.750	32 x 0.5000	16 x 1.000	28 @ 6	9	D
75	25.00	16 x 0.750	34 x 0.5000	16 x 1.125	24 @ 6	9	D
80	20.00	14 x 0.750	36 x 0.5000	16 x 1.125	32 @ 6	9	B,D
85	21.25	16 x 0.750	36 x 0.5000	16 x 1.250	34 @ 6	9	D
90	22.50	16 x 0.875	36 x 0.5000	18 x 1.250	18 @ 6	9	D
95	23.75	16 x 1.000	36 x 0.5000	18 x 1.375	20 @ 6	9	D
100	25.00	18 x 1.000	42 x 0.5000	18 x 1.250	54 @ 9	12	F
105	21.00	18 x 1.000	42 x 0.5000	18 x 1.375	56 @ 9	12	F
110	22.00	18 x 1.000	44 x 0.5000	20 x 1.250	60 @ 9	12	F
115	23.00	18 x 1.000	48 x 0.5000	18 x 1.375	32 @ 9	12	F
120	24.00	18 x 1.000	50 x 0.5000	18 x 1.375	32 @ 9	12	F
125	25.00	18 x 1.000	52 x 0.5000	18 x 1.375	34 @ 9	12	F
130	26.00	20 x 1.000	52 x 0.5000	20 x 1.375	18 @ 9	12	F
135	27.00	20 x 1.000	52 x 0.5000	20 x 1.500	18 @ 9	12	F
140	28.00	20 x 1.000	58 x 0.5625	20 x 1.250	-	12	F

COMPOSITE PLATE GIRDERS (8' GIRDER SPACING, 30 DEGREE SKEW)

SPAN LENGTH	DIAPHRAGM SPACING	PLATE GIRDER SIZE: TOP FLANGE PLATE	PLATE GIRDER SIZE: WEB PLATE	PLATE GIRDER SIZE: BOT FLANGE PLATE	SHEAR CONNECTOR MAX SPACING (D)	SHEAR CONNECTOR MAX SPACING (E)	TABLE NOTES
60	20.00	12 x 1.125	26 x 0.5000	18 x 1.875	-	6	B,D
65	21.67	14 x 1.125	28 x 0.5000	18 x 1.750	66 @ 6	9	B,D
70	23.33	14 x 1.125	30 x 0.5000	18 x 1.750	56 @ 6	9	B.D
75	25.00	16 x 1.125	30 x 0.5000	18 x 1.625	76 @ 6	9	B,D
80	20.00	16 x 1.125	30 x 0.5000	18 x 1.625	-	6	D
85	21.25	14 x 1.000	34 x 0.5000	18 x 1.750	68 @ 6	9	B,D
90	22.50	16 x 0.875	34 x 0.5000	18 x 1.750	72 @ 6	9	B,D
95	23.75	20 x 1.000	40 x 0.5000	20 x 1.125	58 @ 6	9	D
100	25.00	18 x 1.000	40 x 0.5000	18 x 1.250	40 @ 6	9	F
105	21.00	18 x 1.000	42 x 0.5000	18 x 1.375	42 @ 6	9	F
110	22.00	18 x 1.000	44 x 0.5000	18 x 1.375	44 @ 6	9	F
115	23.00	18 x 1.000	46 x 0.5000	18 x 1.375	24 @ 6	9	F
120	24.00	18 x 1.000	48 x 0.5000	18 x 1.375	24 @ 6	9	F
125	25.00	18 x 1.000	50 x 0.5000	18 x 1.500	26 @ 6	9	F
130	26.00	20 x 1.000	50 x 0.5000	20 x 1.375	26 @ 6	9	F
135	27.00	20 x 1.000	54 x 0.5625	20 x 1.250	28 @ 6	9	F
140	28.00	20 x 1.000	58 x 0.5625	20 x 1.250	28 @ 6	9	F

TABLE NOTES:

A. SKEW INDEX EXCEEDS 0.30 ASSUMING 30° MAX SKEW

B. CONTRACTIBILITY OF THE EXTERIOR BEAM CONTROLS OVER ALL STRENGTH LIMIT STATES. A MORE THOROUGH EVALUATION MAY REDUCE BEAM SIZES.

C. LIVE LOAD DEFLECTION REQUIREMENTS CONTROL OVER ALL STRENGTH LIMIT STATES. A MORE THOROUGH EVALUATION MAY REDUCE BEAM SIZES.

D. DIAPHRAGMS ARE RECOMMENDED.

E. X SHAPED CROSSFRAMES ARE RECOMMENDED.

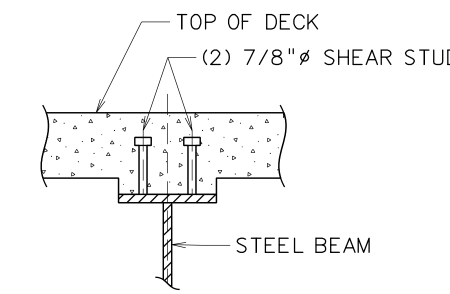
F. K SHAPED CROSSFRAMES ARE RECOMMENDED.

COMPOSITE ROLLED BEAMS (8 FT GIRDER SPACING, 0 DEGREE SKEW)

SPAN LENGTH	DIAPHRAGM SPACING	STANDARD DESIGN: ROLLED SECTION	STANDARD DESIGN: SHEAR CONNECTOR SPACING (D)	STANDARD DESIGN: SHEAR CONNECTOR SPACING (E)	STANDARD DESIGN: TABLE NOTES	OPTIONAL DESIGN: ROLLED SECTION	OPTIONAL DESIGN: SHEAR CONNECTOR SPACING (D)	OPTIONAL DESIGN: SHEAR CONNECTOR SPACING (E)	OPTIONAL DESIGN: TABLE NOTES
30	15.00	W18X76	-	6	D				
35	17.50	W30X90	-	9	D				
40	20.00	W21X101	-	6	D				
45	22.50	W24X117	-	6	D				
50	25.00	W33X130	10 @ 6	9	B,D				
55	18.33	W33X130	22 @ 6	9	D				
60	20.00	W33X130	24 @ 6	9	B,D				
65	21.67	W36X150	26 @ 6	9	B,D				
70	23.33	W36X170	28 @ 6	9	B,D	W40X167	14 @ 6	9	B,F
75	25.00	W30X191	60 @ 6	9	D				
80	20.00	W36X194	32 @ 6	9	D				
85	21.25	W33X221	52 @ 6	9	D	W40X215	18 @ 6	9	F
90	22.50	W36X231	36 @ 6	9	D	W40X215	18 @ 6	9	F
95	23.75	W36X262	38 @ 6	9	D	W44X230	-	9	F
100	25.00	W36X282	40 @ 6	9	D	W44X262	-	9	F
105	21.00	W36X302	42 @ 6	9	D	W44X262	-	9	F
110	22.00	W36X330	22 @ 6	9	C,D	W44X290	-	9	F

COMPOSITE ROLLED BEAMS (8 FT GIRDER SPACING, 30 DEGREE SKEW)

SPAN LENGTH	DIAPHRAGM SPACING	STANDARD DESIGN: ROLLED SECTION	STANDARD DESIGN: SHEAR CONNECTOR SPACING (D)	STANDARD DESIGN: SHEAR CONNECTOR SPACING (E)	STANDARD DESIGN: TABLE NOTES	OPTIONAL DESIGN: ROLLED SECTION	OPTIONAL DESIGN: SHEAR CONNECTOR SPACING (D)	OPTIONAL DESIGN: SHEAR CONNECTOR SPACING (E)	OPTIONAL DESIGN: TABLE NOTES
30	15.00	W30X90	-	6	A,D				
35	17.50	W30X90	-	6	A,B,D				
40	20.00	W30X108	-	6	A,B,D				
45	22.50	W33X118	-	6	A,B,D				
50	25.00	W36X135	30 @ 6	9	B,D				
55	18.33	W36X135	44 @ 6	9	D				
60	20.00	W36X135	48 @ 6	9	B,D				
65	21.67	W36X150	66 @ 6	9	B,D				
70	23.33	W36X182	56 @ 6	9	B,D				
75	25.00	W33X221	76 @ 6	9	D	W40X199	46 @ 6	9	F
80	20.00	W36X231	64 @ 6	9	D	W40X199	64 @ 6	9	F
85	21.25	W36X231	68 @ 6	9	D	W40X199	68 @ 6	9	F
90	22.50	W36X231	-	6	D	W40X215	72 @ 6	9	F
95	23.75	W36X247	-	6	D	W44X230	58 @ 6	9	F
100	25.00	W36X262	-	6	D	W40X249	80 @ 6	9	F
105	21.00	W36X282	-	6	D	W44X262	64 @ 6	9	F
110	22.00	W36X302	-	6	D	W44X290	66 @ 6	9	F



SHEAR STUD DETAIL

NOTES:

1. THE ENGINEER SHOULD NOTE THAT DATA WITHIN THE TABLES ARE BASED ON THE DESIGN METHODS NOTED ON STANDARD SHEETS 3300GN1 AND 3300GN2. DEVIATIONS FROM THE CRITERIA USED MAY NECESSITATE MODIFICATION TO THE BEAM SIZES.

2. THE ENGINEER, FABRICATOR, AND ERECTOR SHALL BE AWARE THAT THE BEAM ENDS MAY TWIST OR WARP DURING ERECTION. THE CONTRACTOR IS REQUIRED TO MAKE ANY CORRECTIONS BEFORE THE BEAMS ARE SECURED IN PLACE.

3. THE ENGINEER MAY USE PLATE SIZES OR ROLLED BEAMS LARGER THAN THOSE NOTED WITHIN THE TABLE GIVEN THE MOMENT OF INERTIA AND SECTION MODULUS IN BOTH AXIS ARE GREATER OR EQUAL TO THOSE SPECIFIED FOR BOTH THE NON-COMPOSITE AND COMPOSITE CASES AS APPLICABLE.

4. THE ENGINEER MAY SUBSTITUTE THREE (3) SHEAR STUDS PER ROW GIVEN THE TOTAL NUMBER OF SHEAR STUDS PER FOOT REMAINS EQUAL OR GREATER AND ALL MINIMUM SPACING'S NOTED WITHIN AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS ARE MET WITHOUT FURTHER EVALUATION.

5. THE ENGINEER SHOULD VERIFY AVAILABILITY OF ROLLED BEAMS LARGER THAN W36. INFREQUENT ROLL SCHEDULES MAY DELAY FABRICATION AND CONSTRUCTION.

6. ROLLED BEAMS SHALL NOT BE CAMBERED FOR LESS THAN ¾". NATURAL MILL CAMBER SHOULD BE PLACED TO MINIMIZE HAUNCH THICKNESS FROM UNCAMBERED BEAMS.

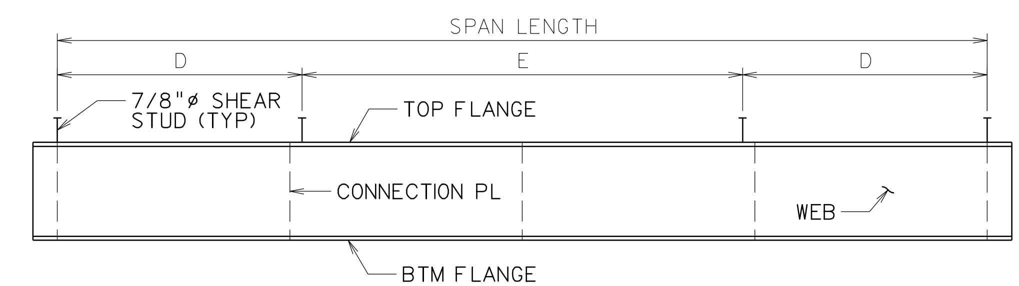
7. THE ENGINEER SHOULD VERIFY WITH LOCAL FABRICATORS IF THEY ARE CAPABLE OF CAMBERING ROLLED BEAMS LARGER THAN W27 WITHOUT THE USE OF HEAD. A PLATE GIRDER SOLUTION MAY WARRANT CONSIDERATION IF LOCAL FABRICATOR DOES NOT HAVE THIS CAPABILITY.

NOTES (CONT.):

8. THE ENGINEER SHOULD CONSIDER TRANSPORTATION FOR LONG BEAMS. THE DESIGN AND DETAILING OF OPTIONAL FIELD SPLICES MAY BE PRUDENT IF TRANSPORTATION IS IN QUESTION.

9. THE ENGINEER MAY SUBSTITUTE A DECK SYSTEM WHICH IS LIGHTER THAN ASSUMED HEREIN WITHOUT FURTHER EVALUATION.

10. THE ENGINEER MAY UTILIZE DATA WITHIN THE TABLES FOR BEAM SPACINGS NOT SHOWN WITHOUT FURTHER EVALUATION GIVEN THE LARGER BEAM FOR ADJACENT SPACINGS IS SELECTED.



BEAM ELEVATION

NOT TO SCALE

NO.	REVISION	DATE	BY

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DESIGNED	DATE	CHECKED	DATE
DRAWN	DATE	REVIEWED	DATE

STANDARD BRIDGE PLANS
COMPOSITE STEEL BEAM
SHEET 3 OF 6
SHEET NUMBER 3320SB3

PRINT DATE 19-SEP-2022 09:54

19-SEP-2022 09:54

COMPOSITE PLATE GIRDERS (9' GIRDER SPACING, 0 DEGREE SKEW)

SPAN LENGTH	DIAPHRAGM SPACING	PLATE GIRDER SIZE: TOP FLANGE PLATE	PLATE GIRDER SIZE: WEB PLATE	PLATE GIRDER SIZE: BOT FLANGE PLATE	SHEAR CONNECTOR MAX SPACING (D)	SHEAR CONNECTOR MAX SPACING (E)	TABLE NOTES
60	20.00	14 x 0.750	28 x 0.5000	14 x 1.125	-	6	B,D
65	21.67	14 x 0.875	30 x 0.5000	16 x 1.000	52 @ 6	9	D
70	23.33	16 x 0.750	32 x 0.5000	16 x 1.125	56 @ 6	9	B,D
75	25.00	16 x 0.875	32 x 0.5000	16 x 1.375	60 @ 6	9	B,D
80	20.00	14 x 1.000	34 x 0.5000	16 x 1.375	64 @ 6	9	D
85	21.25	16 x 0.875	34 x 0.5000	18 x 1.375	68 @ 6	9	D
90	22.50	16 x 1.000	36 x 0.5000	18 x 1.500	54 @ 6	9	D
95	23.75	18 x 1.000	40 x 0.5000	20 x 1.250	38 @ 6	9	F
100	25.00	18 x 1.000	40 x 0.5000	20 x 1.375	20 @ 6	9	F
105	21.00	18 x 1.000	44 x 0.5000	18 x 1.500	22 @ 6	9	F
110	22.00	18 x 1.000	46 x 0.5000	20 x 1.375	-	9	F
115	23.00	18 x 1.000	46 x 0.5000	18 x 1.625	-	9	F
120	24.00	18 x 1.000	48 x 0.5000	20 x 1.500	-	9	F
125	25.00	18 x 1.000	50 x 0.5625	18 x 1.625	-	9	F
130	26.00	20 x 1.000	52 x 0.5625	20 x 1.500	-	9	F
135	27.00	20 x 1.000	54 x 0.5625	20 x 1.500	54 @ 9	12	F
140	28.00	20 x 1.000	58 x 0.5625	20 x 1.500	38 @ 9	12	F

COMPOSITE PLATE GIRDERS (9' GIRDER SPACING, 30 DEGREE SKEW)

SPAN LENGTH	DIAPHRAGM SPACING	PLATE GIRDER SIZE: TOP FLANGE PLATE	PLATE GIRDER SIZE: WEB PLATE	PLATE GIRDER SIZE: BOT FLANGE PLATE	SHEAR CONNECTOR MAX SPACING (D)	SHEAR CONNECTOR MAX SPACING (E)	TABLE NOTES
60	20.00	16 x 1.000	32 x 0.5000	18 x 1.375	-	6	D
65	21.67	18 x 1.000	32 x 0.5000	18 x 1.625	66 @ 6	9	D
70	23.33	18 x 1.125	32 x 0.5000	18 x 1.875	70 @ 6	9	D
75	25.00	16 x 1.125	34 x 0.5000	18 x 1.625	76 @ 6	9	B,D
80	20.00	14 x 1.125	34 x 0.5000	18 x 2.000	-	6	B,D
85	21.25	14 x 1.125	36 x 0.5000	18 x 2.000	86 @ 6	9	B,D
90	22.50	16 x 1.125	36 x 0.5000	18 x 1.875	-	6	B,D
95	23.75	16 x 1.125	36 x 0.5000	18 x 1.875	-	6	B,D
100	25.00	18 x 1.000	40 x 0.5625	18 x 1.625	50 @ 6	9	F
105	21.00	18 x 1.000	40 x 0.5625	18 x 1.625	-	6	F
110	22.00	18 x 1.000	44 x 0.5625	18 x 1.500	88 @ 6	9	F
115	23.00	18 x 1.000	44 x 0.5000	20 x 1.500	-	6	F
120	24.00	18 x 1.000	48 x 0.5000	18 x 1.625	72 @ 6	9	F
125	25.00	18 x 1.000	52 x 0.5625	18 x 1.500	50 @ 6	9	F
130	26.00	20 x 1.000	54 x 0.5625	20 x 1.375	26 @ 6	9	F
135	27.00	20 x 1.000	56 x 0.5625	20 x 1.375	28 @ 6	9	F
140	28.00	20 x 1.000	58 x 0.5625	20 x 1.500	28 @ 6	9	B,F

TABLE NOTES:

A. SKEW INDEX EXCEEDS 0.30 ASSUMING 30° MAX SKEW

B. CONTRACTIBILITY OF THE EXTERIOR BEAM CONTROLS OVER ALL STRENGTH LIMIT STATES. A MORE THOROUGH EVALUATION MAY REDUCE BEAM SIZES.

C. LIVE LOAD DEFLECTION REQUIREMENTS CONTROL OVER ALL STRENGTH LIMIT STATES. A MORE THOROUGH EVALUATION MAY REDUCE BEAM SIZES.

D. DIAPHRAGMS ARE RECOMMENDED.

E. X SHAPED CROSSFRAMES ARE RECOMMENDED.

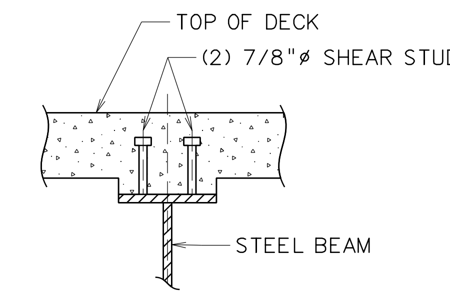
F. K SHAPED CROSSFRAMES ARE RECOMMENDED.

COMPOSITE ROLLED BEAMS (9 FT GIRDER SPACING, 0 DEGREE SKEW)

SPAN LENGTH	DIAPHRAGM SPACING	STANDARD DESIGN: ROLLED SECTION	STANDARD: SHEAR CONNECTOR SPACING (D)	STANDARD: SHEAR CONNECTOR SPACING (E)	STANDARD: TABLE NOTES	OPTIONAL DESIGN: ROLLED SECTION	OPTIONAL: SHEAR CONNECTOR SPACING (D)	OPTIONAL: SHEAR CONNECTOR SPACING (E)	OPTIONAL: TABLE NOTES
30	15.00	W30X90	30 @ 6	9	D				
35	17.50	W30X90	-	6	B,D				
40	20.00	W24X104	-	6	D				
45	22.50	W33X130	18 @ 6	9	B,D				
50	25.00	W27X146	-	6	D				
55	18.33	W27X146	-	6	D				
60	20.00	W36X150	36 @ 6	9	D				
65	21.67	W36X160	40 @ 6	9	D				
70	23.33	W36X182	56 @ 6	9	B,D				
75	25.00	W33X201	60 @ 6	9	D	W40X199	46 @ 6	9	F
80	20.00	W36X231	64 @ 6	9	D	W40X211	48 @ 6	9	F
85	21.25	W36X247	68 @ 6	9	D	W44X230	34 @ 6	9	F
90	22.50	W36X262	72 @ 6	9	D	W44X230	36 @ 6	9	F
95	23.75	W36X282	76 @ 6	9	D	W44X262	38 @ 6	9	F
100	25.00	W36X302	80 @ 6	9	D	W44X290	40 @ 6	9	F
105	21.00	W36X330	84 @ 6	9	D	W44X290	42 @ 6	9	F
110	22.00	W36X361	78 @ 6	9	D	W44X335	44 @ 6	9	F

COMPOSITE ROLLED BEAMS (9 FT GIRDER SPACING, 30 DEGREE SKEW)

SPAN LENGTH	DIAPHRAGM SPACING	STANDARD DESIGN: ROLLED SECTION	STANDARD: SHEAR CONNECTOR SPACING (D)	STANDARD: SHEAR CONNECTOR SPACING (E)	STANDARD: TABLE NOTES	OPTIONAL DESIGN: ROLLED SECTION	OPTIONAL: SHEAR CONNECTOR SPACING (D)	OPTIONAL: SHEAR CONNECTOR SPACING (E)	OPTIONAL: TABLE NOTES
30	15.00	W30X90	-	6	A,D				
35	17.50	W30X90	-	6	A,B,D				
40	20.00	W33X118	-	6	A,B,D				
45	22.50	W33X130	-	6	A,B,D				
50	25.00	W36X150	-	6	A,B,D				
55	18.33	W36X170	-	6	D	W40X167	44 @ 6	9	F
60	20.00	W36X210	-	6	D	W40X167	-	6	F
65	21.67	W36X231	66 @ 6	9	D	W40X183	66 @ 6	9	B,F
70	23.33	W36X262	70 @ 6	9	D	W40X199	70 @ 6	9	F
75	25.00	W36X282	76 @ 6	9	D	W40X215	76 @ 6	9	F
80	20.00	W36X302	-	6	D	W44X230	64 @ 6	9	F
85	21.25	W36X330	-	6	D	W44X230	68 @ 6	9	F
90	22.50	W36X361	-	6	D	W44X230	-	6	F
95	23.75	W36X361	-	6	D	W44X262	-	6	F
100	25.00	W36X395	-	6	D	W44X262	-	6	F
105	21.00	W36X395	-	6	D	W44X290	-	6	F
110	22.00	W36X395	-	6	D	W40X324	-	6	F



SHEAR STUD DETAIL

NOTES:

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4. THE ENGINEER MAY SUBSTITUTE THREE (3) SHEAR STUDS PER ROW GIVEN THE TOTAL NUMBER OF SHEAR STUDS PER FOOT REMAINS EQUAL OR GREATER AND ALL MINIMUM SPACING'S NOTED WITHIN AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS ARE MET WITHOUT FURTHER EVALUATION.

5. THE ENGINEER SHOULD VERIFY AVAILABILITY OF ROLLED BEAMS LARGER THAN W36. INFREQUENT ROLL SCHEDULES MAY DELAY FABRICATION AND CONSTRUCTION.

6. ROLLED BEAMS SHALL NOT BE CAMBERED FOR LESS THAN ¾". NATURAL MILL CAMBER SHOULD BE PLACED TO MINIMIZE HAUNCH THICKNESS FROM UNCAMBERED BEAMS.

7. THE ENGINEER SHOULD VERIFY WITH LOCAL FABRICATORS IF THEY ARE CAPABLE OF CAMBERING ROLLED BEAMS LARGER THAN W27 WITHOUT THE USE OF HEAD. A PLATE GIRDER SOLUTION MAY WARRANT CONSIDERATION IF LOCAL FABRICATOR DOES NOT HAVE THIS CAPABILITY.

NOTES (CONT.):

8. THE ENGINEER SHOULD CONSIDER TRANSPORTATION FOR LONG BEAMS. THE DESIGN AND DETAILING OF OPTIONAL FIELD SPLICES MAY BE PRUDENT IF TRANSPORTATION IS IN QUESTION.

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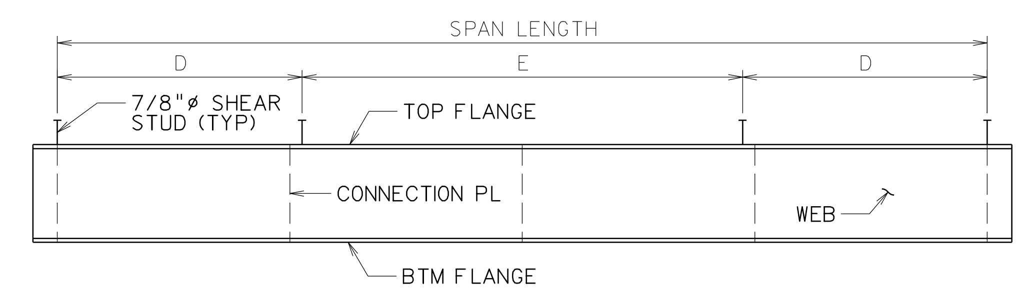


BEAM ELEVATION

NOT TO SCALE

PRINT DATE 19-SEP-2022 09:57

NO.	REVISION	DATE	BY

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DESIGNED	DATE	CHECKED	DATE
DRAWN	DATE	REVIEWED	DATE

STANDARD BRIDGE PLANS
COMPOSITE STEEL BEAM
SHEET 4 OF 6
SHEET NUMBER 3320SB4

19-SEP-2022 09:57

COMPOSITE PLATE GIRDERS (10' GIRDER SPACING, 0 DEGREE SKEW)

SPAN LENGTH	DIAPHRAGM SPACING	PLATE GIRDER SIZE			SHEAR CONNECTOR MAX SPACING		TABLE NOTES
		TOP FLANGE PLATE	WEB PLATE	BOT FLANGE PLATE	(D)	(E)	
60	20.00	14 x 1.125	26 x 0.5000	18 x 1.750	-	6	B,D
65	21.67	14 x 1.125	28 x 0.5000	18 x 1.750	-	6	B,D
70	23.33	14 x 1.125	30 x 0.5000	18 x 1.750	70 @ 6	9	B,D
75	25.00	16 x 1.125	30 x 0.5000	18 x 1.625	-	6	B,D
80	20.00	16 x 1.125	30 x 0.5000	18 x 1.625	-	6	D
85	21.25	14 x 1.125	36 x 0.5000	18 x 1.625	68 @ 6	9	B,D
90	22.50	16 x 1.000	36 x 0.5000	18 x 1.625	90 @ 6	9	B,D
95	23.75	18 x 1.000	38 x 0.5000	20 x 1.500	76 @ 6	9	F
100	25.00	18 x 1.000	42 x 0.5000	18 x 1.625	40 @ 6	9	F
105	21.00	18 x 1.000	42 x 0.5000	20 x 1.625	64 @ 6	9	F
110	22.00	18 x 1.000	46 x 0.5000	18 x 1.750	44 @ 6	9	F
115	23.00	18 x 1.000	48 x 0.5000	18 x 1.750	46 @ 6	9	F
120	24.00	18 x 1.000	50 x 0.5625	18 x 1.750	24 @ 6	9	F
125	25.00	18 x 1.125	52 x 0.5625	18 x 1.750	26 @ 6	9	F
130	26.00	20 x 1.000	54 x 0.5625	20 x 1.625	-	9	F
135	27.00	20 x 1.000	56 x 0.5625	20 x 1.625	-	9	F
140	28.00	20 x 1.125	56 x 0.5625	20 x 1.750	-	9	B,F

COMPOSITE PLATE GIRDERS (10' GIRDER SPACING, 30 DEGREE SKEW)

SPAN LENGTH	DIAPHRAGM SPACING	PLATE GIRDER SIZE			SHEAR CONNECTOR MAX SPACING		TABLE NOTES
		TOP FLANGE PLATE	WEB PLATE	BOT FLANGE PLATE	(D)	(E)	
60	20.00	16 x 1.375	34 x 0.5000	18 x 1.750	-	6	D
65	21.67	14 x 1.375	36 x 0.5000	18 x 1.625	66 @ 6	9	D
70	23.33	14 x 1.125	38 x 0.5000	16 x 1.750	70 @ 6	9	F
75	25.00	14 x 1.250	38 x 0.5000	18 x 1.750	76 @ 6	9	B,F
80	20.00	16 x 1.375	38 x 0.5000	18 x 1.875	-	6	B,F
85	21.25	16 x 1.375	38 x 0.5000	20 x 1.875	-	6	F
90	22.50	18 x 1.500	38 x 0.5000	20 x 1.875	-	6	F
95	23.75	18 x 1.500	40 x 0.6250	18 x 1.750	-	6	F
100	25.00	18 x 1.000	42 x 0.5000	18 x 1.750	70 @ 6	9	B,F
105	21.00	20 x 1.125	42 x 0.5000	20 x 2.000	-	6	F
110	22.00	20 x 1.125	42 x 0.5000	20 x 2.000	-	6	F
115	23.00	20 x 1.125	42 x 0.5000	20 x 2.000	-	6	F
120	24.00	20 x 1.125	42 x 0.5000	20 x 2.000	-	6	B,F
125	25.00	20 x 1.000	50 x 0.6250	20 x 1.625	-	6	F
130	26.00	20 x 1.000	54 x 0.6250	20 x 1.500	78 @ 6	9	F
135	27.00	20 x 1.125	54 x 0.5625	20 x 1.625	82 @ 6	9	F
140	28.00	20 x 1.125	58 x 0.5625	20 x 1.625	56 @ 6	9	F

TABLE NOTES:

A. SKEW INDEX EXCEEDS 0.30 ASSUMING 30° MAX SKEW

B. CONTRACTIBILITY OF THE EXTERIOR BEAM CONTROLS OVER ALL STRENGTH LIMIT STATES. A MORE THOROUGH EVALUATION MAY REDUCE BEAM SIZES.

C. LIVE LOAD DEFLECTION REQUIREMENTS CONTROL OVER ALL STRENGTH LIMIT STATES. A MORE THOROUGH EVALUATION MAY REDUCE BEAM SIZES.

D. DIAPHRAGMS ARE RECOMMENDED.

E. X SHAPED CROSSFRAMES ARE RECOMMENDED.

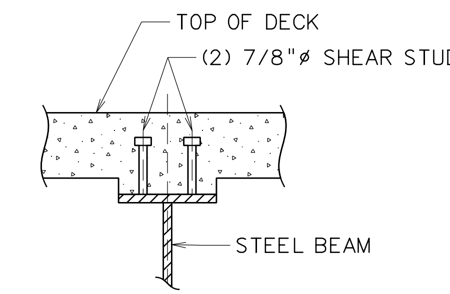
F. K SHAPED CROSSFRAMES ARE RECOMMENDED.

COMPOSITE ROLLED BEAMS (10 FT GIRDER SPACING, 0 DEGREE SKEW)

SPAN LENGTH	DIAPHRAGM SPACING	STANDARD DESIGN				OPTIONAL DESIGN			
		ROLLED SECTION	SHEAR CONNECTOR SPACING (D)	SHEAR CONNECTOR SPACING (E)	TABLE NOTES	ROLLED SECTION	SHEAR CONNECTOR SPACING (D)	SHEAR CONNECTOR SPACING (E)	TABLE NOTES
30	15.00	W30X90	-	6	D				
35	17.50	W24X104	-	6	D				
40	20.00	W33X118	-	6	B,D				
45	22.50	W36X135	28 @ 6	9	B,D				
50	25.00	W36X160	30 @ 6	9	B,D				
55	18.33	W36X160	44 @ 6	9	D				
60	20.00	W36X160	60 @ 6	9	D				
65	21.67	W36X170	-	6	B,D				
70	23.33	W33X201	-	6	D	W40X199	56 @ 6	9	F
75	25.00	W33X221	-	6	D	W40X199	60 @ 6	9	F
80	20.00	W36X247	80 @ 6	9	D	W44X230	48 @ 6	9	F
85	21.25	W36X262	-	6	D	W40X249	68 @ 6	9	F
90	22.50	W36X282	-	6	D	W44X262	64 @ 6	9	F
95	23.75	W36X302	-	6	D	W44X290	40 @ 6	9	F
100	25.00	W36X330	-	6	D	W40X324	-	6	F
105	21.00	W36X361	-	6	D	W44X335	74 @ 6	9	F
110	22.00	W36X395	-	6	D	W40X362	-	6	F

COMPOSITE ROLLED BEAMS (10 FT GIRDER SPACING, 30 DEGREE SKEW)

SPAN LENGTH	DIAPHRAGM SPACING	STANDARD DESIGN				OPTIONAL DESIGN			
		ROLLED SECTION	SHEAR CONNECTOR SPACING (D)	SHEAR CONNECTOR SPACING (E)	TABLE NOTES	ROLLED SECTION	SHEAR CONNECTOR SPACING (D)	SHEAR CONNECTOR SPACING (E)	TABLE NOTES
30	15.00	W33X118	-	6	A,D				
35	17.50	W33X118	-	6	A,D				
40	20.00	W36X135	-	6	A,B,D				
45	22.50	W36X170	-	6	A,B,D	W40X149	-	6	A,B,F
50	25.00	W36X231	-	6	A,D	W40X183	-	6	A,B,F
55	18.33	W36X282	-	6	A,D	W40X211	-	6	A,F
60	20.00	W36X330	60 @ 6	9	D	W44X230	48 @ 6	9	F
65	21.67	W36X361	66 @ 6	9	D	W44X230	52 @ 6	9	F
70	23.33	W36X395	70 @ 6	9	D	W44X230	70 @ 6	9	F
75	25.00	W36X441	76 @ 6	9	D	W44X262	76 @ 6	9	F
80	20.00	W36X487	80 @ 6	9	D	W44X290	80 @ 6	9	F
85	21.25	W36X487	-	6	D	W44X290	-	6	F
90	22.50	W36X487	-	6	D	W44X335	-	6	F
95	23.75	W36X529	-	6	D	W44X335	-	6	F
100	25.00	W36X529	-	6	D	W40X503	-	6	F



SHEAR STUD DETAIL

NOTES:

1. THE ENGINEER SHOULD NOTE THAT DATA WITHIN THE TABLES ARE BASED ON THE DESIGN METHODS NOTED ON STANDARD SHEETS 3300GN1 AND 3300GN2. DEVIATIONS FROM THE CRITERIA USED MAY NECESSITATE MODIFICATION TO THE BEAM SIZES.

2. THE ENGINEER, FABRICATOR, AND ERECTOR SHALL BE AWARE THAT THE BEAM ENDS MAY TWIST OR WARP DURING ERECTION. THE CONTRACTOR IS REQUIRED TO MAKE ANY CORRECTIONS BEFORE THE BEAMS ARE SECURED IN PLACE.

3. THE ENGINEER MAY USE PLATE SIZES OR ROLLED BEAMS LARGER THAN THOSE NOTED WITHIN THE TABLE GIVEN THE MOMENT OF INERTIA AND SECTION MODULUS IN BOTH AXIS ARE GREATER OR EQUAL TO THOSE SPECIFIED FOR BOTH THE NON-COMPOSITE AND COMPOSITE CASES AS APPLICABLE.

4. THE ENGINEER MAY SUBSTITUTE THREE (3) SHEAR STUDS PER ROW GIVEN THE TOTAL NUMBER OF SHEAR STUDS PER FOOT REMAINS EQUAL OR GREATER AND ALL MINIMUM SPACING'S NOTED WITHIN AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS ARE MET WITHOUT FURTHER EVALUATION.

5. THE ENGINEER SHOULD VERIFY AVAILABILITY OF ROLLED BEAMS LARGER THAN W36. INFREQUENT ROLL SCHEDULES MAY DELAY FABRICATION AND CONSTRUCTION.

6. ROLLED BEAMS SHALL NOT BE CAMBERED FOR LESS THAN ¾". NATURAL MILL CAMBER SHOULD BE PLACED TO MINIMIZE HAUNCH THICKNESS FROM UNCAMBERED BEAMS.

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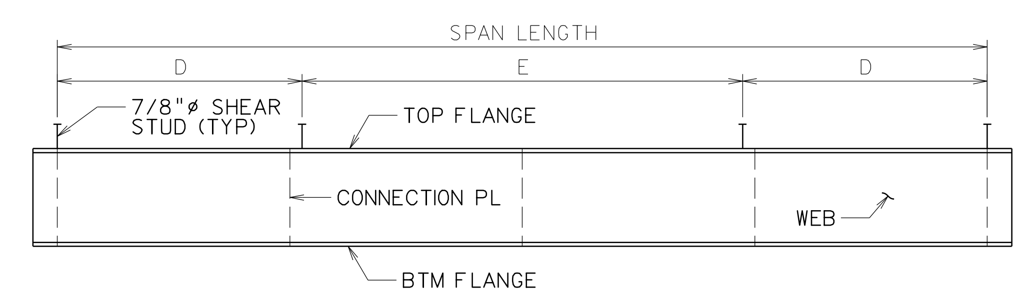
NOTES (CONT.):

8. THE ENGINEER SHOULD CONSIDER TRANSPORTATION FOR LONG BEAMS. THE DESIGN AND DETAILING OF OPTIONAL FIELD SPLICES MAY BE PRUDENT IF TRANSPORTATION IS IN QUESTION.

9. THE ENGINEER MAY SUBSTITUTE A DECK SYSTEM WHICH IS LIGHTER THAN ASSUMED HEREIN WITHOUT FURTHER EVALUATION.

10. THE ENGINEER MAY UTILIZE DATA WITHIN THE TABLES FOR BEAM SPACINGS NOT SHOWN WITHOUT FURTHER EVALUATION GIVEN THE LARGER BEAM FOR ADJACENT SPACINGS IS SELECTED.



BEAM ELEVATION

NOT TO SCALE

PRINT DATE 19-SEP-2022 10:04

NO.	REVISION	DATE	BY

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DESIGNED	DATE	CHECKED	DATE
DRAWN	DATE	REVIEWED	DATE

STANDARD BRIDGE PLANS
COMPOSITE STEEL BEAM
SHEET 5 OF 6
SHEET NUMBER 3320SB5

19-SEP-2022 10:04

DRAFT

COMPOSITE PLATE GIRDERS (11' GIRDER SPACING, 0 DEGREE SKEW)

SPAN LENGTH	DIAPHRAGM SPACING	PLATE GIRDER SIZE: TOP FLANGE PLATE	PLATE GIRDER SIZE: WEB PLATE	PLATE GIRDER SIZE: BOT FLANGE PLATE	SHEAR CONNECTOR MAX SPACING (D)	SHEAR CONNECTOR MAX SPACING (E)	TABLE NOTES
60	20.00	18 x 1.625	28 x 0.5000	20 x 2.000	-	6	D
65	21.67	18 x 1.625	28 x 0.5000	20 x 2.000	-	6	D
70	23.33	18 x 1.250	30 x 0.5000	18 x 2.000	-	6	D
75	25.00	16 x 1.125	32 x 0.5000	18 x 1.750	-	6	B,D
80	20.00	14 x 1.125	34 x 0.5000	18 x 1.875	-	6	B,D
85	21.25	16 x 1.125	34 x 0.5000	18 x 1.750	-	6	D
90	22.50	18 x 1.000	38 x 0.5000	20 x 1.500	-	6	F
95	23.75	18 x 1.000	40 x 0.5000	18 x 1.750	-	6	F
100	20.00	18 x 1.000	42 x 0.5000	20 x 1.625	70 @ 6	9	B,F
105	21.00	18 x 1.000	44 x 0.5000	18 x 1.875	84 @ 6	9	F
110	22.00	18 x 1.000	46 x 0.5000	18 x 1.875	66 @ 6	9	F
115	23.00	18 x 1.125	48 x 0.5625	18 x 1.875	70 @ 6	9	F
120	24.00	20 x 1.000	50 x 0.5625	20 x 1.750	48 @ 6	9	F
125	25.00	20 x 1.000	52 x 0.5625	20 x 1.750	50 @ 6	9	F
130	26.00	20 x 1.125	52 x 0.5625	20 x 1.875	52 @ 6	9	F
135	27.00	20 x 1.125	56 x 0.5625	20 x 1.875	28 @ 6	9	B,F
140	28.00	20 x 1.250	56 x 0.5625	20 x 1.875	28 @ 6	9	F

COMPOSITE PLATE GIRDERS (11' GIRDER SPACING, 30 DEGREE SKEW)

SPAN LENGTH	DIAPHRAGM SPACING	PLATE GIRDER SIZE: TOP FLANGE PLATE	PLATE GIRDER SIZE: WEB PLATE	PLATE GIRDER SIZE: BOT FLANGE PLATE	SHEAR CONNECTOR MAX SPACING (D)	SHEAR CONNECTOR MAX SPACING (E)	TABLE NOTES
60	20.00	18 x 1.750	36 x 0.5000	18 x 1.875	-	6	A,D
65	21.67	14 x 1.625	38 x 0.5000	18 x 2.000	66 @ 6	6	F
70	23.33	18 x 1.750	38 x 0.5000	18 x 2.000	70 @ 6	6	F
75	25.00	14 x 1.750	40 x 0.5000	18 x 2.000	76 @ 6	6	F
80	20.00	16 x 1.750	40 x 0.5000	20 x 2.000	-	6	F
85	21.25	18 x 1.875	40 x 0.5000	20 x 2.000	-	6	F
90	22.50	16 x 1.750	42 x 0.5000	18 x 2.000	-	6	F
95	23.75	16 x 1.750	42 x 0.5000	20 x 2.000	-	6	F
100	25.00	18 x 1.750	42 x 0.5000	20 x 2.000	70 @ 6	9	F
105	21.00	20 x 1.250	44 x 0.6250	20 x 2.000	-	9	F
110	22.00	18 x 1.625	46 x 0.5625	20 x 1.875	-	9	F
115	23.00	18 x 1.625	46 x 0.5625	20 x 1.875	-	9	F
120	24.00	18 x 1.625	46 x 0.5625	20 x 1.875	-	9	F
125	25.00	18 x 1.375	50 x 0.5625	20 x 2.000	-	9	B,F
130	26.00	20 x 1.125	54 x 0.5625	20 x 2.000	-	9	F
135	27.00	20 x 1.250	54 x 0.5625	20 x 1.875	-	9	F
140	28.00	20 x 1.250	58 x 0.6250	20 x 1.750	84 @ 6	9	F

TABLE NOTES:

A. SKEW INDEX EXCEEDS 0.30 ASSUMING 30° MAX SKEW

B. CONTRACTIBILITY OF THE EXTERIOR BEAM CONTROLS OVER ALL STRENGTH LIMIT STATES. A MORE THOROUGH EVALUATION MAY REDUCE BEAM SIZES.

C. LIVE LOAD DEFLECTION REQUIREMENTS CONTROL OVER ALL STRENGTH LIMIT STATES. A MORE THOROUGH EVALUATION MAY REDUCE BEAM SIZES.

D. DIAPHRAGMS ARE RECOMMENDED.

E. X SHAPED CROSSFRAMES ARE RECOMMENDED.

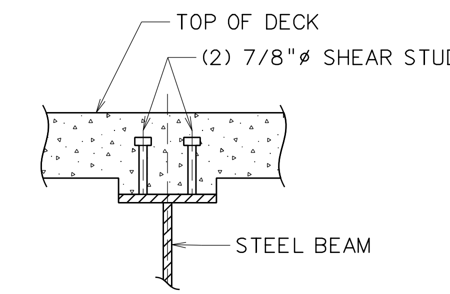
F. K SHAPED CROSSFRAMES ARE RECOMMENDED.

COMPOSITE ROLLED BEAMS (11 FT GIRDER SPACING, 0 DEGREE SKEW)

SPAN LENGTH	DIAPHRAGM SPACING	STANDARD DESIGN: ROLLED SECTION	STANDARD DESIGN: SHEAR CONNECTOR SPACING (D)	STANDARD DESIGN: SHEAR CONNECTOR SPACING (E)	STANDARD DESIGN: TABLE NOTES	OPTIONAL DESIGN: ROLLED SECTION	OPTIONAL DESIGN: SHEAR CONNECTOR SPACING (D)	OPTIONAL DESIGN: SHEAR CONNECTOR SPACING (E)	OPTIONAL DESIGN: TABLE NOTES
30	15.00	W30X90	-	6	B,D				
35	17.50	W30X116	-	6	B,D				
40	20.00	W33X130	-	6	B,D				
45	22.50	W36X150	-	6	B,D				
50	25.00	W36X170	-	6	B,D				
55	18.33	W36X170	-	6	D				
60	20.00	W36X170	-	6	D				
65	21.67	W36X210	-	6	D	W40X183	-	6	B,F
70	23.33	W36X231	-	6	D	W40X199	-	6	F
75	25.00	W36X247	-	6	D	W40X215	-	6	F
80	20.00	W36X262	-	6	D	W44X230	72 @ 6	9	F
85	21.25	W36X282	-	6	D	W44X262	68 @ 6	9	F
90	22.50	W36X302	-	6	D	W44X290	82 @ 6	9	F
95	23.75	W36X330	-	6	D	W40X324	-	6	F
100	25.00	W36X361	-	6	D	W44X335	-	6	F
105	21.00	W36X395	-	6	D	W40X362	-	6	F
110	22.00	W36X441	-	6	D	W40X397	-	6	F

COMPOSITE ROLLED BEAMS (11 FT GIRDER SPACING, 30 DEGREE SKEW)

SPAN LENGTH	DIAPHRAGM SPACING	STANDARD DESIGN: ROLLED SECTION	STANDARD DESIGN: SHEAR CONNECTOR SPACING (D)	STANDARD DESIGN: SHEAR CONNECTOR SPACING (E)	STANDARD DESIGN: TABLE NOTES	OPTIONAL DESIGN: ROLLED SECTION	OPTIONAL DESIGN: SHEAR CONNECTOR SPACING (D)	OPTIONAL DESIGN: SHEAR CONNECTOR SPACING (E)	OPTIONAL DESIGN: TABLE NOTES
30	15.00	W36X135	-	6	A,D				
35	17.50	W36X135	-	6	A,B,D				
40	20.00	W36X182	-	6	A,D	W40X149	-	6	A,B,F
45	22.50	W36X231	-	6	A,D	W40X183	-	6	A,B,F
50	25.00	W36X330	-	6	A,D	W44X230	-	6	A,F
55	18.33	W36X395	-	6	A,D	W44X230	-	6	A,F
60	20.00	W36X441	-	6	A,D	W44X262	-	6	A,F
65	21.67	W36X487	66 @ 6	9	D	W44X290	66 @ 6	9	F
70	23.33	W36X529	70 @ 6	9	D	W44X335	70 @ 6	9	F
75	25.00	W36X652	60 @ 6	9	D	W40X503	76 @ 6	9	F
80	20.00	W36X652	64 @ 6	9	D	W40X503	-	6	F
85	21.25	W36X652	-	6	D	W40X593	86 @ 6	9	F
90	22.50	W36X652	-	6	D	W40X593	-	6	F



SHEAR STUD DETAIL

NOTES:

1. THE ENGINEER SHOULD NOTE THAT DATA WITHIN THE TABLES ARE BASED ON THE DESIGN METHODS NOTED ON STANDARD SHEETS 3300GN1 AND 3300GN2. DEVIATIONS FROM THE CRITERIA USED MAY NECESSITATE MODIFICATION TO THE BEAM SIZES.

2. THE ENGINEER, FABRICATOR, AND ERECTOR SHALL BE AWARE THAT THE BEAM ENDS MAY TWIST OR WARP DURING ERECTION. THE CONTRACTOR IS REQUIRED TO MAKE ANY CORRECTIONS BEFORE THE BEAMS ARE SECURED IN PLACE.

3. THE ENGINEER MAY USE PLATE SIZES OR ROLLED BEAMS LARGER THAN THOSE NOTED WITHIN THE TABLE GIVEN THE MOMENT OF INERTIA AND SECTION MODULUS IN BOTH AXIS ARE GREATER OR EQUAL TO THOSE SPECIFIED FOR BOTH THE NON-COMPOSITE AND COMPOSITE CASES AS APPLICABLE.

4. THE ENGINEER MAY SUBSTITUTE THREE (3) SHEAR STUDS PER ROW GIVEN THE TOTAL NUMBER OF SHEAR STUDS PER FOOT REMAINS EQUAL OR GREATER AND ALL MINIMUM SPACING'S NOTED WITHIN AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS ARE MET WITHOUT FURTHER EVALUATION.

5. THE ENGINEER SHOULD VERIFY AVAILABILITY OF ROLLED BEAMS LARGER THAN W36. INFREQUENT ROLL SCHEDULES MAY DELAY FABRICATION AND CONSTRUCTION.

6. ROLLED BEAMS SHALL NOT BE CAMBERED FOR LESS THAN ¾". NATURAL MILL CAMBER SHOULD BE PLACED TO MINIMIZE HAUNCH THICKNESS FROM UNCAMBERED BEAMS.

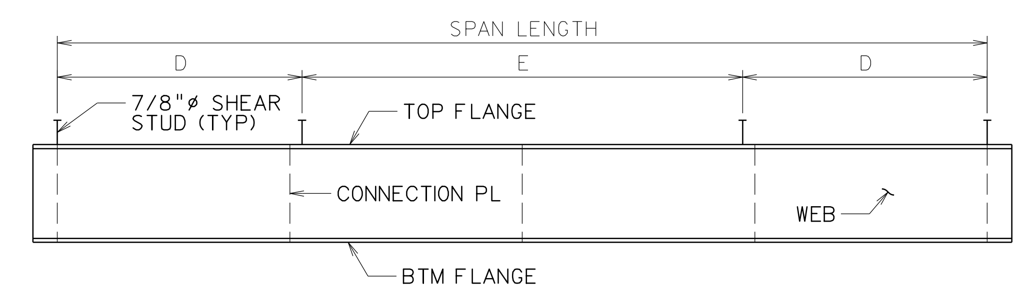
7. THE ENGINEER SHOULD VERIFY WITH LOCAL FABRICATORS IF THEY ARE CAPABLE OF CAMBERING ROLLED BEAMS LARGER THAN W27 WITHOUT THE USE OF HEAD. A PLATE GIRDER SOLUTION MAY WARRANT CONSIDERATION IF LOCAL FABRICATOR DOES NOT HAVE THIS CAPABILITY.

NOTES (CONT.):

8. THE ENGINEER SHOULD CONSIDER TRANSPORTATION FOR LONG BEAMS. THE DESIGN AND DETAILING OF OPTIONAL FIELD SPLICES MAY BE PRUDENT IF TRANSPORTATION IS IN QUESTION.

9. THE ENGINEER MAY SUBSTITUTE A DECK SYSTEM WHICH IS LIGHTER THAN ASSUMED HEREIN WITHOUT FURTHER EVALUATION.

10. THE ENGINEER MAY UTILIZE DATA WITHIN THE TABLES FOR BEAM SPACINGS NOT SHOWN WITHOUT FURTHER EVALUATION GIVEN THE LARGER BEAM FOR ADJACENT SPACINGS IS SELECTED.



BEAM ELEVATION

NOT TO SCALE

PRINT DATE 19-SEP-2022 10:03

19-SEP-2022 10:03

NO.	REVISION	DATE	BY

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DESIGNED ____ DATE ____ CHECKED ____ DATE ____
DRAWN ____ DATE ____ REVIEWED ____ DATE ____

STANDARD BRIDGE PLANS
COMPOSITE STEEL BEAM
SHEET 6 OF 6
SHEET NUMBER 3320SB6

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

STRUCTURE DIRECTIVE 2048
ADJACENT BOX BEAMS
August 8, 2022
Supersedes May 4, 2022
~~*First Edition*~~

Prestressed box beam designs for spans ranging from twenty (20) feet to one hundred (100) feet are included in the Standard Details Book Volume 3 – Standard Bridge Plans by the WVDOH. Design and Assembly Details and Design Tables are included for box beams ranging in size from seventeen (17) inches to forty-two (42) inches in height. Also included in the Standard Bridge Plans are Design and Assembly Details (~~BR-B100 thru BR-B104~~ 3000 Series) that show the various details and notes that are to be included in the construction plans. The Standard Bridge Plans also include design tables for twelve (12) inch plank beams for spans ranging from ten (10) feet to twenty-two (22) feet. As of this printing, the box beams and plank beams in the Standard Bridge Plans have been designed using the AASHTO LRFD 1998 Edition and are to be used only with the permission of the Bridge Project Manager.

Adjacent box beams are to be placed so that a ¾ inch gap is obtained between the beams to allow for the placement of a full depth shear key. The procedures for detailing and placement of the shear key are located on Standard Sheet ~~BR-B103~~ 3000MB2 of the Standard Bridge Plans. If these standard plans are not used, these details shall be included in the contract plans.

In addition to the full depth shear key, adjacent box beams are to be transversely post tensioned using 1 inch diameter, 150 KSI thread bars conforming to AASHTO M 275, Type II. For skewed and non-skewed bridges, the full-length (transverse direction) thread bars shall be post-tensioned to a force of 80 KIPS. Thread bars that do not penetrate the full width of the structure shall be stressed to 40 KIPS.

When adjacent box beams are used that do not meet the standard drawings, a full design of the superstructure must be completed. If this design is performed, and the standard sheets are altered, the Designer must ensure that the words "Standard" ~~and "Approval Signature"~~ are removed from the sheets.

2048.1-ALTERATION OF STANDARD SHEETS

The WVDOH has coordinated the development of these standards with the various suppliers of precast box beams. ~~A commitment has been made that there will be no alteration to the standard sheets when they are incorporated into plans for specific bridges. The WVDOH has also implemented a statewide purchasing contract that will be utilized for the purchase of beams and slabs for bridges that will be constructed by state forces. This contract will be in effect for one year or longer and the contract prices are based on supplying beams and slabs per the design and details contained in the standard plans.~~

When standard plan sheets are incorporated into a set of plans for a specific bridge, no alterations of these sheets are to be made. If changes are ~~absolutely~~ necessary ~~in order~~ to adapt the plans to some unusual situation, then approval to alter the plan sheets must be obtained from the ~~State Bridge Engineer~~Bridge Project Manager. Exception to this is permitted where the design must be modified in accordance with SD 2048.~~3~~2, Odd Length Beams, to accommodate odd span lengths not listed on the standard plan sheets.

2048.2-ODD LENGTH BEAMS

The standard plans contain design and manufacturing details for specific span lengths. If the span lengths are between those listed on the standard plans, it cannot be assumed that the design and manufacturing data for the closest shorter or longer listed span length will be acceptable, particularly if a concrete barrier is being utilized. In this situation, the data for the next highest listed beam length shall be chosen. The initial tension at the beam end may be greater than the allowable, which may require additional debonding of strands to alleviate the overstressing.

It will be necessary to ~~check the~~perform a design for span lengths other than those shown on the standard plan design data chart. It is requested that Engineering Division ~~check~~ review designs prepared by consulting engineering firms or by district offices prior to extensive plan development.~~ It is also requested that district offices include span length information in TS&L submittals so that the design can be checked as part of the TS&L approval. If changes are required from the standard design data and strand pattern, the Engineering Division will provide the necessary data. For projects designed by district offices, the Engineering Division will provide the data with the approved TS&L. The Designer should then add the revised data to the design data table of the particular beam sheet. Existing data should not be erased, but new data should be entered into a blank column in the table. If a revised strand pattern is required, the necessary revisions are to be made to the "Typical Beam Reinforcing Section".~~

2048.3-ADDITIONAL DESIGN INFORMATION

Omission of a wearing surface or ~~A bituminous~~ an asphalt concrete wearing surface is appropriate on bridges with a low ADT (average daily traffic) that are not on part of the Coal Resource Transportation System (CRTS). On higher ADT bridges, a concrete deck, reinforced with a single mat of reinforcing steel, should be ~~incorporated into the design~~considered. Horizontal shear bars shall be provided between the interface of the box beam and the concrete deck. The top surface of the beams shall have a roughened surface when a composite deck is used.

~~Adjacent box or plank beam bridges without composite decks will generally not be approved for situations where extremely high heavy truck traffic or heavy load service is anticipated. This commonly occurs on haul roads, due to the failure of longitudinal shear keys on bridges built in accordance with the WVDOH Standard Plans. This matter should be addressed during the early planning and TS&L stages of plan development.~~

The use of backwalls is encouraged on all new designs of adjacent precast/prestressed box beam bridges. When backwalls are used, expansion joint details shall be used as shown in Standard ~~Plan~~ Sheet ~~BR-B100~~ 3000MB3. If a composite ~~desk~~ deck with backwall is used, see Figure 2048.A.

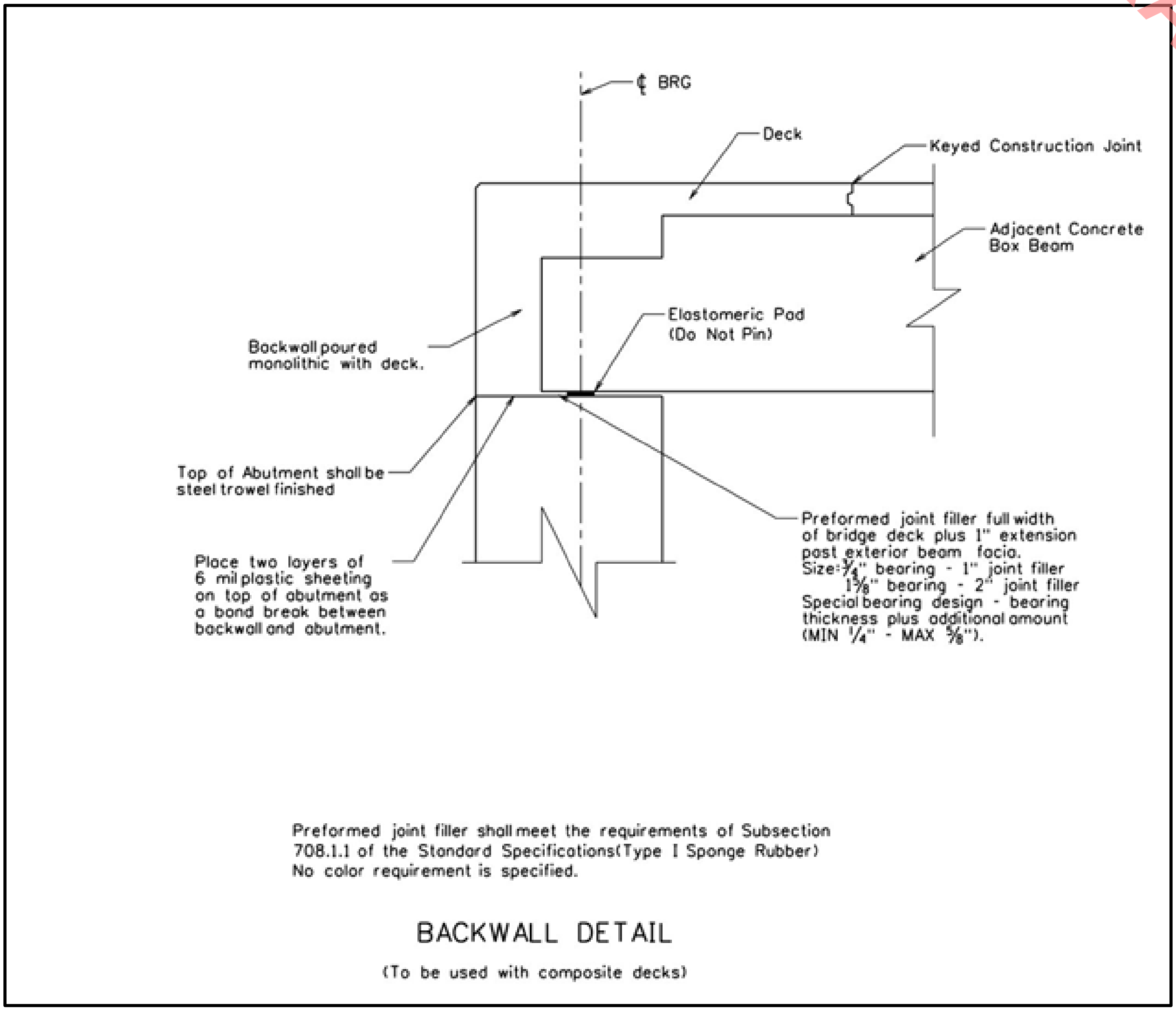


Figure 2048.A

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

STRUCTURE DIRECTIVE 2150
LOAD RATING OF NEW BRIDGE DESIGN
September 7, 2022
Supersedes May 4, 2022

Load and Resistance Factor Rating (LRFR) is consistent with the AASHTO LRFD Bridge Design Specifications (AASHTO LRFD BDS) in using a reliability-based limit states philosophy and extends the provisions of these specifications ~~LRFD Specifications~~ to the areas of inspection, load rating, posting and permit rules, fatigue evaluation, and load testing of existing bridges. The LRFR methodology has been developed to provide uniform reliability in bridge load ratings.

2150.1-LOAD RATING OF NEW AND REPLACEMENT BRIDGES

Load rating analysis shall be performed for all new or replacement bridges, including value engineering or value engineering change proposals submitted by the contractor, using the LRFR method found in the current edition of the AASHTO Manual for Bridge Evaluation (MBE). ~~This document provides guidance to load rating engineers for performing and submitting load rating calculations and serves as a supplement to the MBE to describe WVDOT specific load rating requirements.~~ All applicable limit states per MBE Table 6A.4.2.2-1 will be satisfied, including those listed as optional checks.

Each bridge shall be load rated at inventory and operating levels for AASHTO's HL93 loading as presented in the MBE ~~Governing Specifications~~ on all routes. In addition, a legal load evaluation~~n analysis~~ shall be completed for each West Virginia legal load~~s~~ on all routes. Bridges on a Coal Resource Transportation System (CRTS) route shall be load rated for four additional trucks (WV-SU40, WV-SU45, WV-3S55, and WV-3S60) during the legal load evaluation. The axle configurations and loads for the~~:~~ WV Legal Trucks are shown in Figure 2150.A, CRTS Trucks and Emergency Vehicle~~s~~ Live Loads are shown in Figure 2150.B, and Wood "Pup" Truck Live Loads are shown in Figure 2150.C.

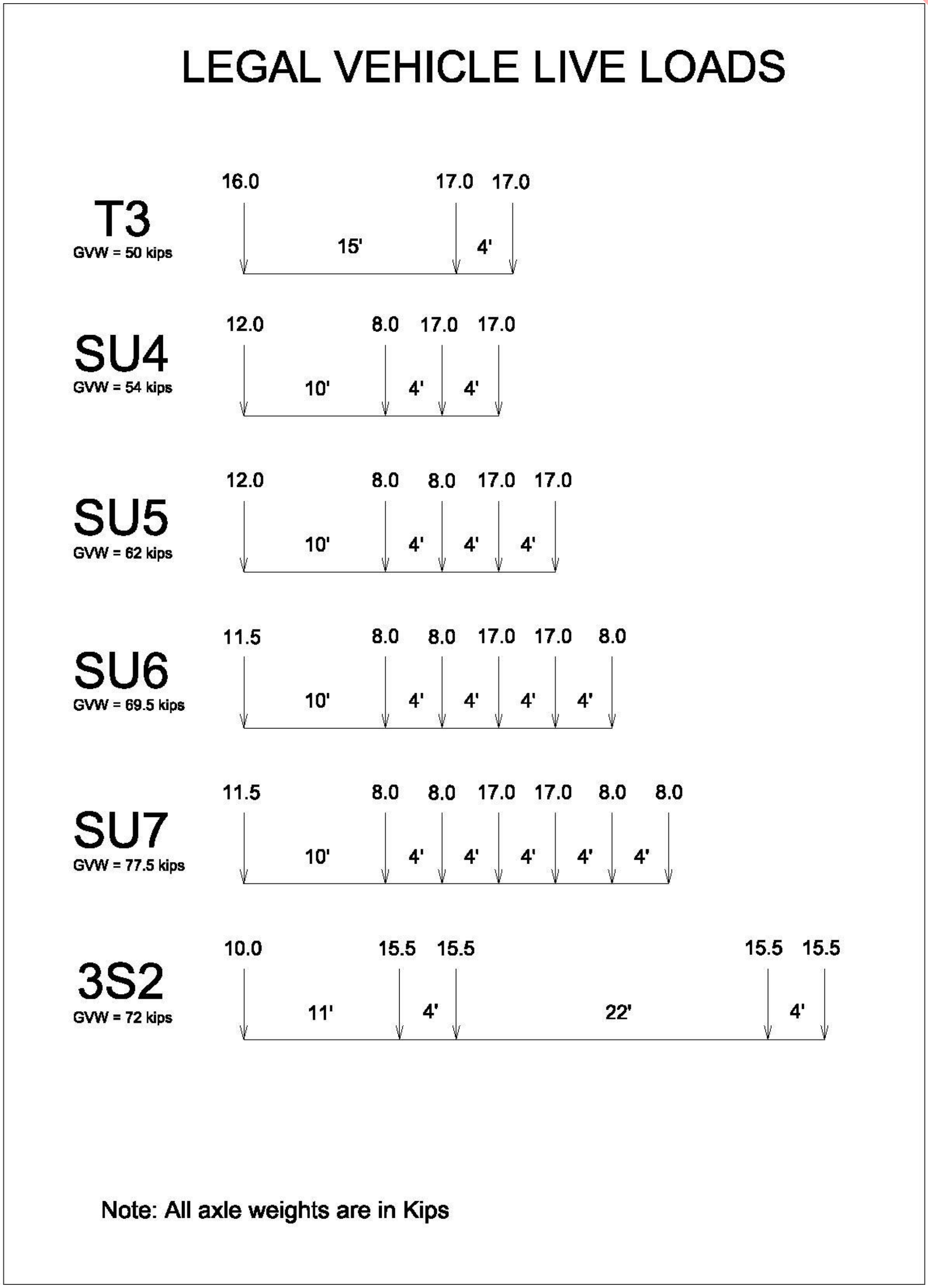


Figure 2150.A

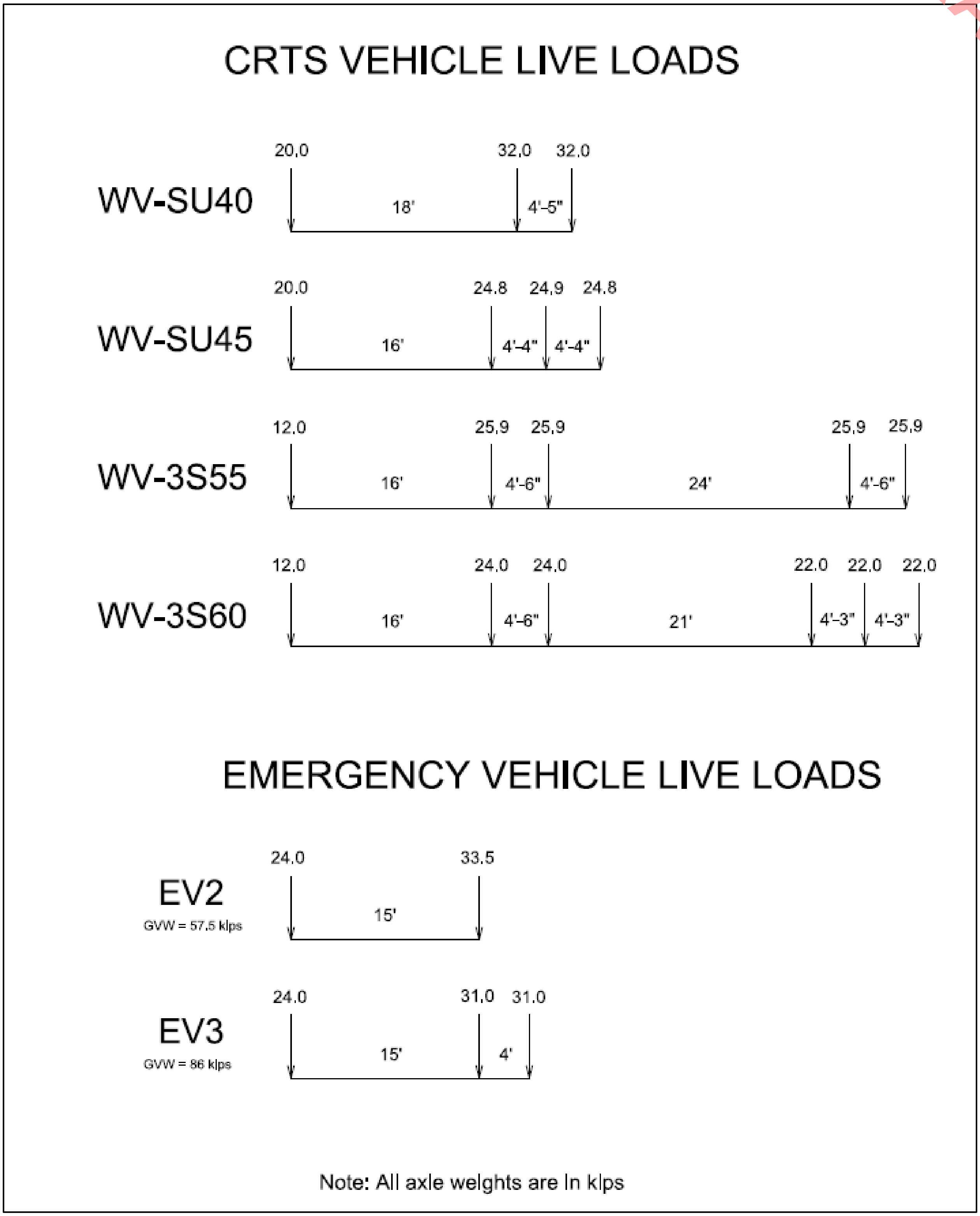


Figure 2150.B

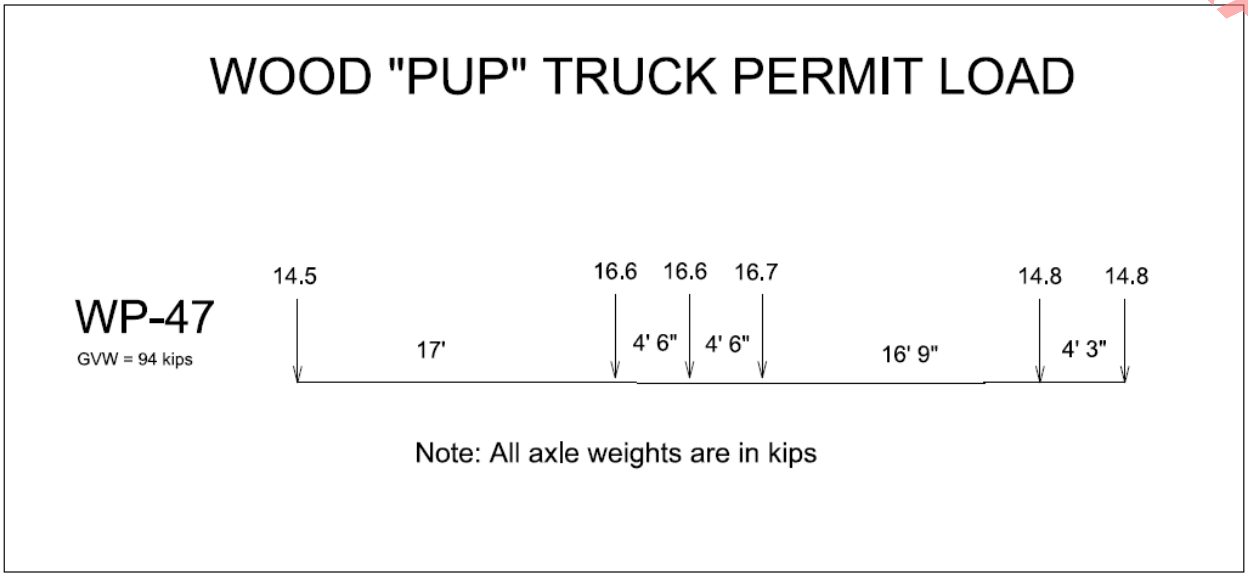


Figure 2150.C

The bridge load rating analysis using the LRFR method shall be performed concurrent with the beam/girder final design to assure proper design and adequate rating. The target~~ inventory~~ ratings for new or replacement bridge designs are shown in Table 2150.~~-~~D.

Table 2150.D -Target Ratings

Design-Inventory (Factor)	Legal (Tons)													
	Standard							CRTS*				Emergency		Permit**
HL93	Type 3	SU4	SU5	SU6	SU7	Type 3S2	Lane***	SU-40	SU-45	3S-55	3S-60	EV2	EV3	WP47
1.00	41	49	51	51	51	55	50	53	60	73	79	36	54	59

* Required for CRTS (Coal Resource Transportation System) routes only, considered as legal load evaluation ~~Legal~~

** Although WP47 is a permitted truck, it shall be load rated as a legal load configuration

*** Not required for single spans less than and equal to 200 feet

~~**Table 20150. D** -Target Inventory Ratings~~

The designer will perform the load rating and submit all required information, as detailed in this article, to the bridge project manager. A request for an independent load rating check shall be submitted to the Evaluation Section of Operations Division (OM) by the bridge project manager during the load rating submission. The request shall contain the following information:

A. Load rating sheets containing tabulated section properties, live load distribution factors (and conversion factors, if needed), dead load moments and shears, and live load moments and shears at critical locations in each span and at all supports.

B. Controlling rating factors (design) and tonnages (legal loads) for all required configurations, as shown in Table 2150.D.
C. A full set of current bridge design plans.
D. The CP/RW date of the project.

If requested, the designer shall also be required to submit to OM, through the bridge project manager, original rating computations included with the design calculations and shall clearly identify or include the following information:
A. Design specifications.
B. Design live load.
C. Member capacities.
D. Method of analysis – line girder, grid, or finite element.
E. Method used for calculation of live load distribution factors.
F. Live load distribution factors.
G. Table of applicable load factors.
H. Controlling limit states.
I. Design, legal, and permit ratings for all required loadings for consultant designed bridges if required by project scope.
J. Relevant computer input and output information for consultant designed bridges if required by project scope.

Upon submission, OM or the District Office will perform an independent load rating of the bridge. If the independent load rating check performed by the WVDOH indicates a rating less than any of the target values (shown above in Table 2150.D), the bridge project manager in coordination with the Evaluation Section of Operations Division shall be contacted immediately to determine what actions are to be taken before proceeding further with the final design and Ifdetailing. the rating of bridges designed using the LRFD Specifications is less than the target value, and the design is found to be adequate, the Bridge Project Manager in coordination with the evaluation section shall be contacted immediately to determine what actions are to be taken before proceeding further with the final design and detailing.

The designer shall state in the plans when redistribution of negative moments is utilized for use in the permit rating of the bridge. See AASHTO LRFD BDS 4.6.4.

A request for an independent load rating check shall be submitted to Operations Division by the Bridge Project Manager during the load rating submission. The request shall contain the following information:

A. Load rating sheets containing tabulated section properties, live load distribution factors, dead load moments and shears, and live load moments and shears at critical locations in each span and at all supports.

B. Superstructure framing plan, typical cross section, girder elevation, and bridge general notes sheets, and any of sheets which contain core information needed to complete an independent check.

C. The PS&E CP/RW date of the project.

If requested, the Designer shall also be required to submit to OM original rating computations included with the design calculations and shall clearly identify or include the following information:

A. Design specifications.

B. Design live load.

C. Member capacities.

D. Method of analysis – line girder, grid, or finite element.

E. Method used for calculation of live load distribution factors.

F. Live load distribution factors.

G. Table of applicable load factors.

H. Controlling limit states.

I. Inventory and Operating Ratings for all required loadings for consultant designed bridges if required by project scope.

J. Relevant computer input and output information for consultant designed bridges if required by project scope.

2150.1 RATING COMPUTATIONS

The load rating shall be computed using the following general rating equation (see MBE 6A.4.2.1):

$$RF = \frac{C - (\gamma DC)(DC) - (\gamma DW)(DW) \pm (\gamma p)(P)}{(\gamma LL)(LL + IM)}$$

RF	=	Rating Factor C=Capacity
C	=	Capacity
DC	=	Dead load effect due to structural components and attachments
DW	=	Dead load effects due to wearing surface and utilities
P	=	Permanent loads other than dead loads (secondary prestressing effects, etc.)
LL	=	Live load effect of the Rating Vehicle
IM	=	Dynamic load allowance
γDC	=	LRFD load factor for structural components and attachments
γ DW	=	LRFD load factor for wearing surfaces and utilities
γ p	=	LRFD load factor for permanent loads other than dead loads=1.0
γ LL	=	Evaluation live load factor for the Rating Vehicle

Load factors shall be determined from MBE Table 6A.4.2.2-1

2150.1.1 For Strength Limit States:

$$C = \varphi c\ \varphi s\ \varphi\ Rn$$

Where the following lower limit shall apply:

$\varphi c\ \varphi s \geq 0.85$

2150.1.2 For All Non-Strength Limit States:

$$C = f_R$$

φc	=	Condition Factor
φs	=	System Factor
φ	=	AASHTO LRFD Resistance Factor
Rn	=	Nominal member resistance (as built or as inspected)
f_R	=	Allowable stress specified in the LRFD code

2150.2 LRFR LIMIT STATES FOR EVALUATION:

All LRFR Limit States shall follow MBE and Table 6A4.2.2-1.

Strength limit state is used for checking the ultimate capacity of structural members and is the primary limit state utilized for determining posting needs. Service and fatigue limit states are utilized to limit stresses, deformations, and cracking under regular service conditions. In LRFR, Service and Fatigue limit state checks are optional in the sense that a posting or permit decision does not have to be dictated by the result. These serviceability checks provide valuable information for the engineer to use in the decision process. LRFR limit states for evaluation are shown in Table 2150.C below. Evaluation at the strength limit state is the only required check during the LRFR analysis on all new or replacement bridges. Evaluation at the service and fatigue limit states will not be required unless specified as part of the initial scope of work.

Bridge Type	**Limit State**	**Design**	**Legal**
		HL93	H, Type3, WV SU4, HS, 3S2, CRTS, Lane Load Models
Steel	Strength I	x	x
	Strength II		
	Service II	xx	xx
Reinforced Concrete	Strength I	x	x
	Strength II		
	Service I		
Prestressed Concrete (non-segmental)	Strength I	x	x
	Strength II		
	Service III	xx	
Timber	Strength I	x	x
	Strength II		

x Required evaluation on all new or replacement bridges

xx Optional evaluation required only if specified during initial scope of work meeting

Table 2150.C

For non-segmental prestressed concrete bridges, LRFR provides a limit state check for cracking of concrete (SERVICE III) by limiting concrete tensile stresses under service loads. Service III need not be checked for design load Operating Ratings as it is a design level check.

~~Service I and Service III limit states are mandatory for load rating of segmental concrete box girder bridges. See MBE 6A.5.14.~~

~~A new SERVICE I load combination for reinforced concrete components and prestressed concrete components has been introduced in LRFR to check for possible inelastic deformations in the reinforcing steel during heavy permit load crossings. See MBE 6A.5.4.2.2.2. This check shall be applied to permit load checks and sets a limiting criterion of 0.9Fy in the extreme tension reinforcement. Limiting steel stress to 0.9Fy is intended to ensure that there is elastic behavior and that cracks that develop during the passage of overweight vehicles will close once the vehicle is removed. It also ensures that there is reserve ductility in the member.~~

~~Steel structures shall satisfy the overload permanent deflection check under the SERVICE II load combination for design load and legal load ratings. Maximum steel stress is limited to 95% and 80% of the yield stress for composite and non-composite compact girders respectively. See MBE 6A.6.4.2.2. Service II checks for permit loads are recommended but optional. During an overweight permit review the actual truck weight is available, so a 1.0 live load factor is specified.~~

~~A tabulation of rating examples are included in Appendix A of the MBE.~~

2150.2-LOAD RATING OF NEW OR REPLACEMENT FRAMES, ARCHES, THREE SIDED STRUCTURES AND CULVERTS

The load rating analysis shall be performed by the designer in accordance with the governing specifications and the MBE using the live load models presented in this document.

If it is determined ~~that~~ the depth of fill is such that live load effects can be neglected (per AASHTO MBE), ~~then~~ the structure would have an infinite safe load capacity for ~~HL93, WV Legal Loads, and CRTS Trucks~~live loads as long as the structure has residual capacity remaining after dead load effects have been considered.

A 3D Finite Element Analysis shall be performed for any structure ~~that is~~ constructed on a longitudinal slope to determine the out of plane load effects on the structure in the final condition.

Calculations shall be submitted to the bridge project manager for approval prior to fabrication of any primary structural elements.

~~**2150.4 LOAD RATING OF GUSSET PLATES**~~

~~Load rating of gusset plates will be performed in accordance with *FHWA Gusset Guidance - Load Rating Guidance and Examples for Bolted and Riveted Gusset Plates in Truss Bridges*, FHWA-IF-09-014, February 2009 current edition of BDM and WVDOH Bridge Load and Rating Manual (BLRM).~~

~~A. When load rating gusset plates with unknown material properties, member strength should be obtained from the current version of the MBE.~~

~~B. When checking the Limiting Slenderness Ratio (see FHWA Gusset Guidance 3.5) the unsupported edges of gusset plates should be evaluated in accordance based the following guidelines:~~

~~Compression Edges~~

$$l/t \leq 1.648\sqrt{E/F_y}$$

~~Tension Edges~~ $l/t \leq 2.06\sqrt{E/F_y}$

All gusset plates rated using LFR will have the optional 0.9 reduction factor applied to the ratings as specified in the FHWA Gusset Guidance. This reduction factor is used to give the same reliability as the values obtained by LRFR ratings that uses the system factor to account for the non-redundant members.

2150.3-LOAD RATING OF REHABILITATED OR WIDENED STRUCTURES

Load rating of structures using combination specifications within the superstructure (e.g. a superstructure designed by LRFD for the new widened superstructure elements and the original superstructure elements designed by Load Factor Design) shall not be permitted.

Load rating of structures partially reconstructed resulting in the use of combination of specifications between substructure and superstructure elements (e.g. a reconstructed superstructure designed by LRFD supported by the original substructure designed by Allowable Stress Design, Load Factor Design, or unknown specifications) is permitted. The method of analysis for a reconstructed superstructure shall be LRFR.Load rating of structures using combination specifications within the superstructure (e.g. a superstructure designed by LRFD for the new widened superstructure elements and the original superstructure elements designed by Load Factor Design) shall not be permitted.

Load rating of structures partially reconstructed resulting in the use of combination specifications between substructure and superstructure elements (e.g. a reconstructed superstructure designed by LRFD supported by the original substructure designed by Allowable Stress Design, Load Factor Design, or unknown specifications) is permitted. The method of analysis for a reconstructed superstructure shall be Load and Resistance Factor Rating.

2150.46-CONVERSION FACTORS FOR REFINED ANALYSIS

When structures are designed using refined analyses, conversion factors shall be developed. The refined analyses methods include line girder analyses based on refined live load conversion factors, grid analyses and finite element analyses. The conversion factors indicate the relationship of live load design moments and shears obtained from the refined analysis to the live load moments and shears obtained from a standard line girder analysis with a live load distribution factor of 1.0 for a single lane (a single lane equals two wheels). The conversion factors for both the maximum and minimum moments and shears are developed separately for each live load under consideration. For example, the Type-3 legal load configuration for a continuous span steel I-girder bridge would have conversion factors provided for maximum and minimum moment effects, as well as maximum and minimum shear effects.

Do not use AASHTO distribution factors for the line girder analysis.

The conversion factors for refined analyses shall be computed using the following equation:

$$CF = \frac{Moment\ or\ Shear\ (refined\ analysis)}{Moment\ or\ shear\ (line\ girder\ analysis)}$$

Subsequent analyses of the structure may be completed using a standard line girder analysis with a live load distribution factor 1.0 for a single lane (a single lane equals two wheels). Do not use AASHTO distribution factors for the line girder analysis. For additional loadings, or re-evaluation of the design vehicle, the live load moments and shears obtained from the standard line girder analysis shall be multiplied by the conversion factors obtained from refined analysis at appropriate girder location under investigation. For example, for Girder 3 at mid-span of span 2, the equivalent refined moment for a particular live load can be calculated as follows:

Girder 3, Location: Span 2.5

CF = 1.026 (listed in the table on the original plans)

M(line girder) = 3175.8 K-FT (live load moment from line girder analysis for the live load)

M(refined) = 3175.8 K-FT (1.026)
= 3258.4 K-FT (equivalent refined live load moment for the live load) ~~When structures are designed using refined analyses, conversion factors shall be developed. The refined analyses methods include line girder analyses based on refined live load distribution factors, grid analyses and finite element analyses. The conversion factors indicate the relationship of live load design moments and shears obtained from the refined analysis to the live load moments and shears obtained from a standard line girder analysis with a live load distribution factor of 1.0 for a single lane (a single lane equals two wheels). Do not use AASHTO distribution factors for the line girder analysis.~~

~~The conversion factors for refined analyses shall be computed using the following equation:~~

$$CF = \frac{\text{Moment (refined analysis)}}{\text{Moment (line girder analysis)}}$$

~~Use of conversion factors~~

~~Subsequent analyses of the structure may be completed using a standard line girder analysis with a live load distribution factor 1.0 for a single lane (a single lane equals two wheels). Do not use AASHTO distribution factors for the line girder analysis. For additional loadings, or re-evaluation of the design vehicle, the live load moments and shears obtained from the standard line girder analysis shall be multiplied by the conversion factors obtained from refined analysis at appropriate girder location under investigation. For example, for a presumed Girder 3 at mid-span of span 2, the equivalent refined moment can be calculated as follows:~~

~~Girder 3, Location: Span 2.5~~

~~CF = 1.026 (presumably listed in the table on the original plans)~~

~~$M_{(LG)}$ = 3175.8 K-FT (live load moment from line girder analysis)~~

		3175.8 K-FT
		(1.026)
$M_{(refined}$	=	3258.4 K-FT (equivalent refined live load moment)

2150.5-LOAD RATING PLAN SHEETS

The required information for the plan sheet submittal is located in SD 3042.10.18. Example : plan sheets are also available for reference on the WVDOH website.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

STRUCTURE DIRECTIVE 2150
LOAD RATING OF NEW BRIDGE DESIGN
September 7, 2022
Supersedes May 4, 2022

Load and Resistance Factor Rating (LRFR) is consistent with the AASHTO LRFD Bridge Design Specifications (AASHTO LRFD BDS) in using a reliability-based limit states philosophy and extends the provisions of these specifications to the areas of inspection, load rating, posting and permit rules, fatigue evaluation, and load testing of existing bridges. The LRFR methodology has been developed to provide uniform reliability in bridge load ratings.

2150.1-LOAD RATING OF NEW AND REPLACEMENT BRIDGES

Load rating analysis shall be performed for all new or replacement bridges, including value engineering or value engineering change proposals submitted by the contractor, using the LRFR method found in the current edition of the AASHTO Manual for Bridge Evaluation (MBE). All applicable limit states per MBE Table 6A.4.2.2-1 will be satisfied, including those listed as optional checks.

Each bridge shall be load rated at inventory and operating levels for AASHTO's HL93 loading as presented in the MBE on all routes. In addition, a legal load evaluation shall be completed for each West Virginia legal load on all routes. Bridges on a Coal Resource Transportation System (CRTS) route shall be load rated for four additional trucks (WV-SU40, WV-SU45, WV-3S55, and WV-3S60) during the legal load evaluation. The axle configurations and loads for the WV Legal Trucks are shown in Figure 2150.A, CRTS Trucks and Emergency Vehicle Live Loads are shown in Figure 2150.B, and Wood "Pup" Truck Live Loads are shown in Figure 2150.C.

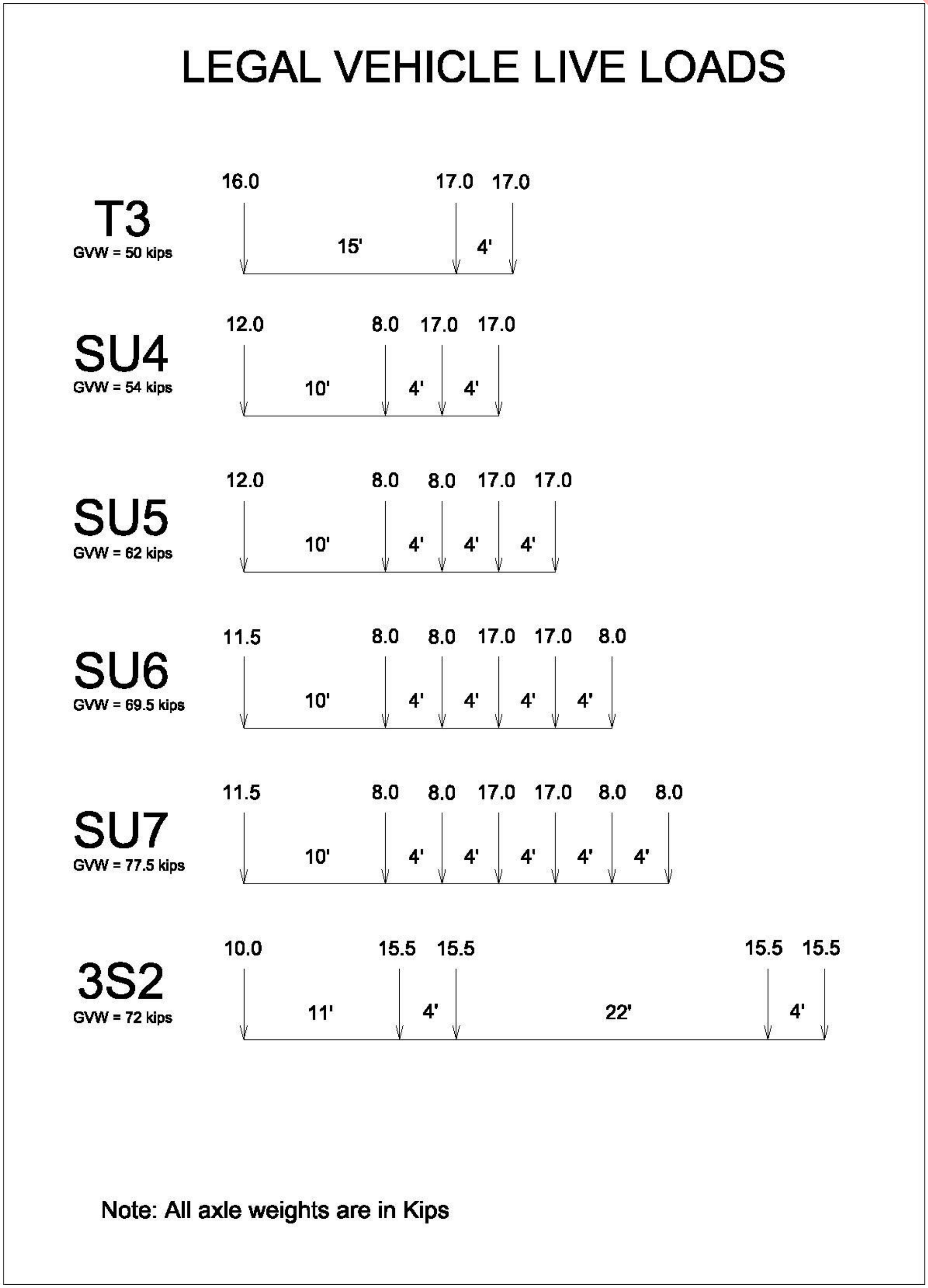


Figure 2150.A

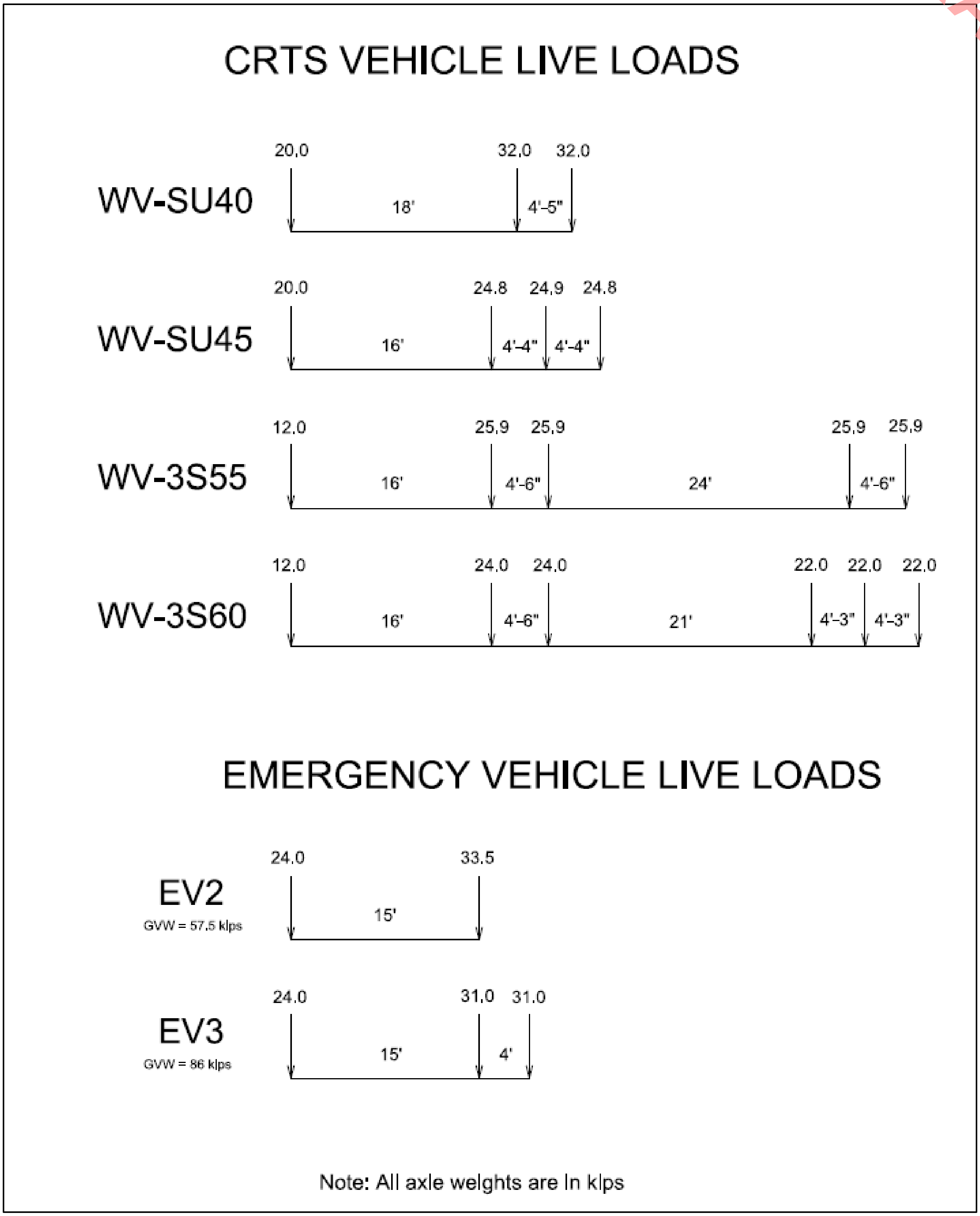


Figure 2150.B

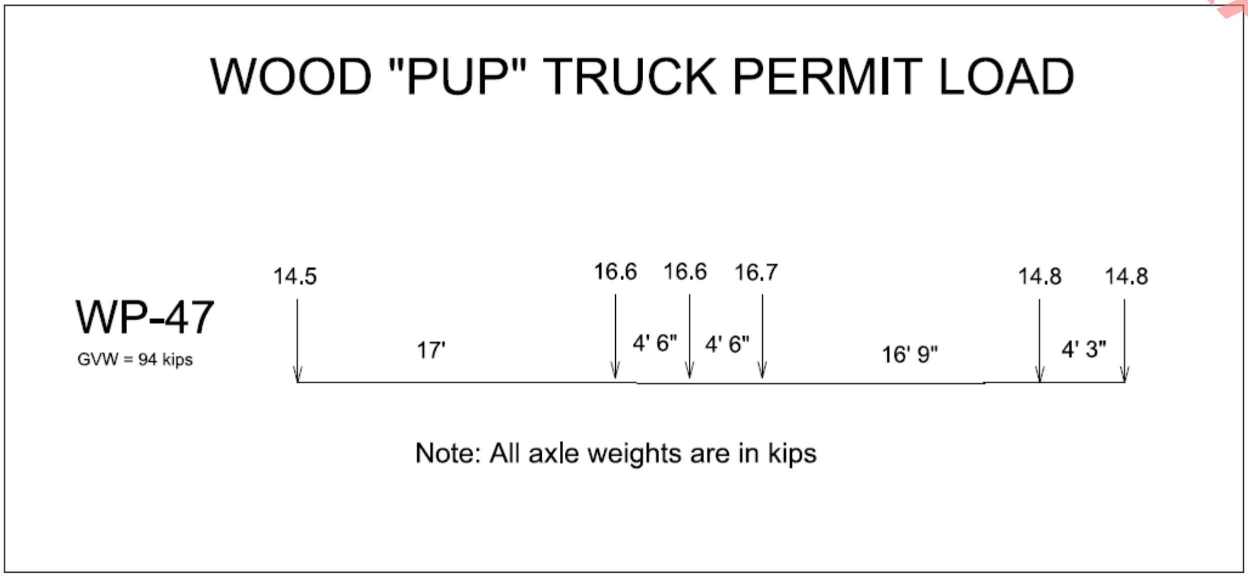


Figure 2150.C

The bridge load rating analysis using the LRFR method shall be performed concurrent with the beam/girder final design to assure proper design and adequate rating. The target ratings for new or replacement bridge designs are shown in Table 2150.D.

Table 2150.D -Target Ratings

Design-Inventory (Factor)	Legal (Tons)													
	Standard							CRTS*				Emergency		Permit**
HL93	Type 3	SU4	SU5	SU6	SU7	Type 3S2	Lane***	SU-40	SU-45	3S-55	3S-60	EV2	EV3	WP47
1.00	41	49	51	51	51	55	50	53	60	73	79	36	54	59

* Required for CRTS (Coal Resource Transportation System) routes only, considered as legal load evaluation
** Although WP47 is a permitted truck, it shall be load rated as a legal load configuration
*** Not required for single spans less than and equal to 200 feet

The designer will perform the load rating and submit all required information, as detailed in this article, to the bridge project manager. A request for an independent load rating check shall be submitted to the Evaluation Section of Operations Division (OM) by the bridge project manager during the load rating submission. The request shall contain the following information:

A. Load rating sheets containing tabulated section properties, live load distribution factors (and conversion factors, if needed), dead load moments and shears, and live load moments and shears at critical locations in each span and at all supports.
B. Controlling rating factors (design) and tonnages (legal loads) for all required configurations, as shown in Table 2150.D.
C. A full set of current bridge design plans.

D. The CP/RW date of the project.

If requested, the designer shall also be required to submit to OM, through the bridge project manager, original rating computations included with the design calculations and shall clearly identify or include the following information:

A. Design specifications.
B. Design live load.
C. Member capacities.
D. Method of analysis – line girder, grid, or finite element.
E. Method used for calculation of live load distribution factors.
F. Live load distribution factors.
G. Table of applicable load factors.
H. Controlling limit states.
I. Design, legal, and permit ratings for all required loadings for consultant designed bridges if required by project scope.
J. Relevant computer input and output information for consultant designed bridges if required by project scope.

Upon submission, OM or the District Office will perform an independent load rating of the bridge. If the independent load rating check performed by the WVDOH indicates a rating less than any of the target values (shown above in Table 2150.D), the bridge project manager in coordination with the Evaluation Section of Operations Division shall be contacted immediately to determine what actions are to be taken before proceeding further with the final design and detailing.

The designer shall state in the plans when redistribution of negative moments is utilized for use in the permit rating of the bridge. See AASHTO LRFD BDS 4.6.4.

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2150.5-LOAD RATING PLAN SHEETS

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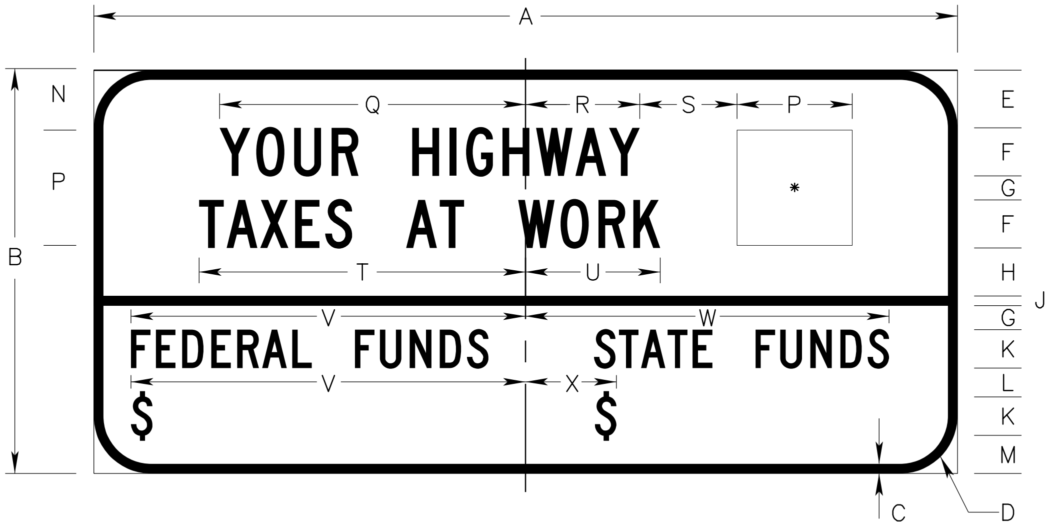

COLORS
LEGEND – WHITE (REF)
BACKGROUND – GREEN (REF)

DIMENSIONS (INCHES)

A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R
90	42	1	6	6	5C	2½	5	1	4C	3	4	6¼	12	31⅞	11⅞

S	T	U	V	W	X
10⅛	34	14	41⅛	37⅞	9 7/16

* – SHIELD SUBJECT TO CHANGE BASED ON ROUTE

D40–1 CODE	
90"x42"	

D40–1