

Notes to Designers for Prestressed Girders

CONTACT INFORMATION

Contech Engineered Solutions, LLC

20059 Simplot Blvd
Caldwell, ID 83607
208 859-2187

6087 West 5400 South
Salt Lake City, UT 84118
801 859-2187

Knife River Prestress

922 N. Carnahan Road
Spokane Valley, WA 99212
509 536-3300

Teton Prestress Concrete

5984 S Heritage Lane
Idaho Falls, ID 83402
208 552-6606

MAXIMUM GIRDER FORM LENGTH - FEET

	Teton Prestress	Knife River Prestress	Contech @ Caldwell	Contech @ Salt Lake
AASHTO Type 2,3,4		150	220	220
Bulb Tee		170	220	220
WF Girder		180	220	220
Deck Bulb Tee		170	220	220
Max Deck BulbTee top flange	7	8	8	8

BED CAPACITY

Teton Prestress in Idaho Falls

1,900 kips @ 30" cgs from bottom of girder

Maximum number of strand

AASHTO & BulbTee Girders: 42 – 0.6"Ø 60 – 0.5" Ø

WF Girders: forms not available

Knife River Prestress in Spokane

1,900 kips for AASHTO & BulbTee Girders

Maximum number of strand: 42 – 0.6"Ø 60 – 0.5" Ø

3,076 kips for WF Girders

Maximum number of strand: 70 – 0.6"Ø 98 – 0.5" Ø

Contech Engineered Solutions in Caldwell

3,500 kips @ 32" cgs from bottom of girder

Maximum number of strand

AASHTO, BulbTee, & WF Girders: 74 – 0.6"Ø (50 straight & 24 harp) 80 – 0.5" Ø

MAXIMUM NUMBER OF STRAND

The controlling values for the maximum span length curves are based on the following to allow all 3 fabricators the capability of furnishing the girders.

AASHTO & Bulb Tee Girders:	42 – 0.6”Ø	60 – 0.5” Ø
WF Girders:	56 – 0.6”Ø	80 – 0.5” Ø

LATERAL STABILITY

Lateral stability of the girder should be checked at release using the procedure in Article 5.5.4.3 of the Bridge Design Manual. The centerline of the lifting loop should be a minimum of 4’ from the end of the girder. The need for adding debonded strand in the top flange for handling should be considered.

CRANE CAPACITY

Contech Engineered Solutions in Caldwell

Straddle Cranes: 75k (maximum girder weight of 150k)
Heavy Straddle Crane and outside boom crane: 85k (maximum girder weight of 170k)
Two outside boom cranes for girder weight greater than 170k.
Outside boom cranes cost approximately \$1000/day.

Knife River Prestress in Spokane

Single Crane: 108k
Two Cranes: 200k
Girder weight more than 200k would require renting cranes at an additional cost.

Commentary

If the girder weight exceeds the crane capacity listed above, the designer should consider the extra costs for lifting and transporting the girder to determine the most economical cost. Each project should be evaluated based upon the parameters of the site to determine the best solution.

PRESTRESSED GIRDER PRELIMINARY DESIGN CURVES

GIRDER W/CAST-IN-PLACE DECK

Section Properties and maximum span length curves for the AASHTO, Bulb Tee, and WF girders are included in this Article. The maximum span length curves should only be used as an aid in preliminary design. The curves on based on the following design parameters:

- AASHTO LRFD Design Specifications using HL93 live load
- Simple Span lengths are centerline-centerline bearing
- 42'-0" out-out bridge width
- Girder spacing is for 6'-0"; 7'-3"; 9'-3"; 12'-0" (4,5,6,& 7 girders)
- 42" single slope Concrete parapet
- Slab $f'_c = 4.0$ ksi Girder $f'_c = 8.0$ ksi
- 0.6"Ø 270 ksi strand with straight & harp strand on 2" centers. Harp points at 0.4 & 0.6 points
- No permanent strand debonded. No temporary strand added for handling.
- Future wearing surface = 28 psf
- Minimum 8" nominal deck slab thickness. Structural deck thickness is 0.5" less than the nominal thickness
- The maximum number of straight strand for each girder is:

AASHTO Type 2	16 straight
AASHTO Type 3	34 straight
AASHTO Type 4	48 straight
Bulb Tee Girder	24 straight
WF Girders	44 straight
- Meets lateral stability criteria at release.

DECK TEE GIRDER W/PPC OVERLAY

The use of deck bulb tee girders and deck WF girders should be limited to single span bridges with a maximum 10° skew and should not be used on bridges carrying interstate traffic.

To ensure the entrained air requirement is met, limit the compressive strength to 8500 psi. Contact the fabricator to verify a mix design is available.

Section Properties and maximum span length curves for the Bulb Tee girders and WF girders with an 8" thick top flange are included in this Article.

The maximum span length curves should only be used as an aid in preliminary design. The curves on based on the following design parameters:

- AASHTO LRFD Design Specifications using HL93 live load
- Simple Span lengths are centerline-centerline bearing
- 42'-0" out-out bridge width
- Girder spacing for deck bulb tee girders is for 84", 72" & 63" top flange width. (6, 7, & 8 girders)
- Girder spacing for WF deck bulb tee girders is for 72", 63", & 56" top flange width. (7, 8, & 9 girders)
- Girder $f'_c = 8.0$ ksi
- 0.6"Ø 270 ksi strand with straight & harp strand on 2" centers. Harp points at 0.4 & 0.6 points.
- No permanent strand debonded. No temporary strand added for handling.
- 42" 3-Tube Curb Mounted Rail
- Total wearing surface = 9 psf (¾" PPC overlay)

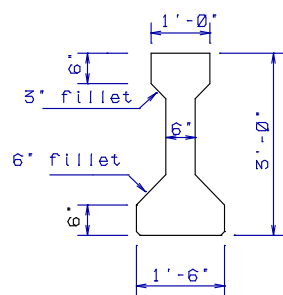
Revisions:

July 2009	Added design parameters on page 1 Added WSDOT WF girder data Added Deck Bulb Tee Girder maximum span curves
Feb 2012	Revised maximum span graphs for refined losses Changed from 7.5 ksi concrete to 10 ksi concrete
June 2013	Added Bed Capacity and Maximum Number of strand data Revised maximum span graphs for maximum number of strand
Mar 2015	Maximum span curves checked for lateral stability during handling without adding additional strand using the procedure in Article 5.5.4.3 of the Bridge Design Manual. All maximum span curves based on $F'_c=8$ ksi and 0.6"Ø strand. BT37x84 girder deleted from the standards due to lateral stability during handling BT48 Series girders deleted. The BT37 Series girders provide a narrower top flange that can better accommodate superelevation. DeckTee girders with asphalt overlay designed for a total of 0.4' asphalt to protect spray-applied membrane seal. DeckTee girders with asphalt overlay designed for a 2-tube curb mounted rail with 9½" curb height. DeckTee girder with 5" c-i-p deck preliminary design curves deleted.
Aug 2016	Changed name of Hanson Prestress to Forterra Structural Precast. Changed name of Central premix to Oldcastle Precast. Added Crane Capacity data for handling girders in the prestress yard.
Nov 2019	Harp strand at 2" centers.. 42" single slope concrete parapet used for girders with c-i-p deck. 42" 2-Tube Rail used for voided slabs and deck tee girders. AASHTO, Bulb Tee, and WF girders checked for lateral stability at release using PCI procedure. PPC overlay (9 psf) used for voided slabs and deck tee girders.
Sep 2020	Added contact information. Changed name of Oldcastle Precast to Knife River Prestress Added table for Maximum Girder Form Length Updated maximum prestress force and number of 0.6" Ø strand for Forterra's new bed in Caldwell. Revised format of maximum span graphs for Deck Bulb Tee girders & WF Bulb Tee girders.
May 2021	Corrected contact information for Teton Prestress Added "Feet" to the form length table title.
Oct 2023	Changed name of Forterra Precast to Contech Engineered Solutions. Changed format to portrait orientation. Added restrictions for use of deck tee girders and limited the compressive strength to 8500 psi to meet entrained air requirements.

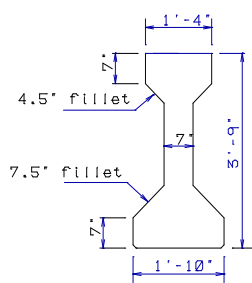
AASHTO GIRDER SECTION PROPERTIES

DEPTH	AREA	CENTER OF GRAVITY		MOMENT OF INERTIA	SECTION MODULUS		WEIGHT
		TOP	BOTTOM		TOP	BOTTOM	LB/FT
36"	368.44	20.147	15.853	50,842	2524	3207	384
45"	558.94	24.706	20.294	125,165	5066	6168	582
54"	788.44	29.249	24.751	260,403	8903	10,521	821

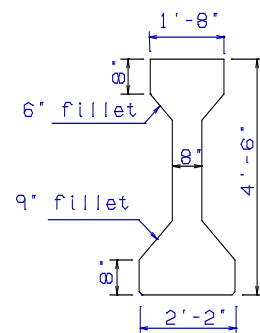
ALL UNITS IN INCHES EXCEPT WEIGHT



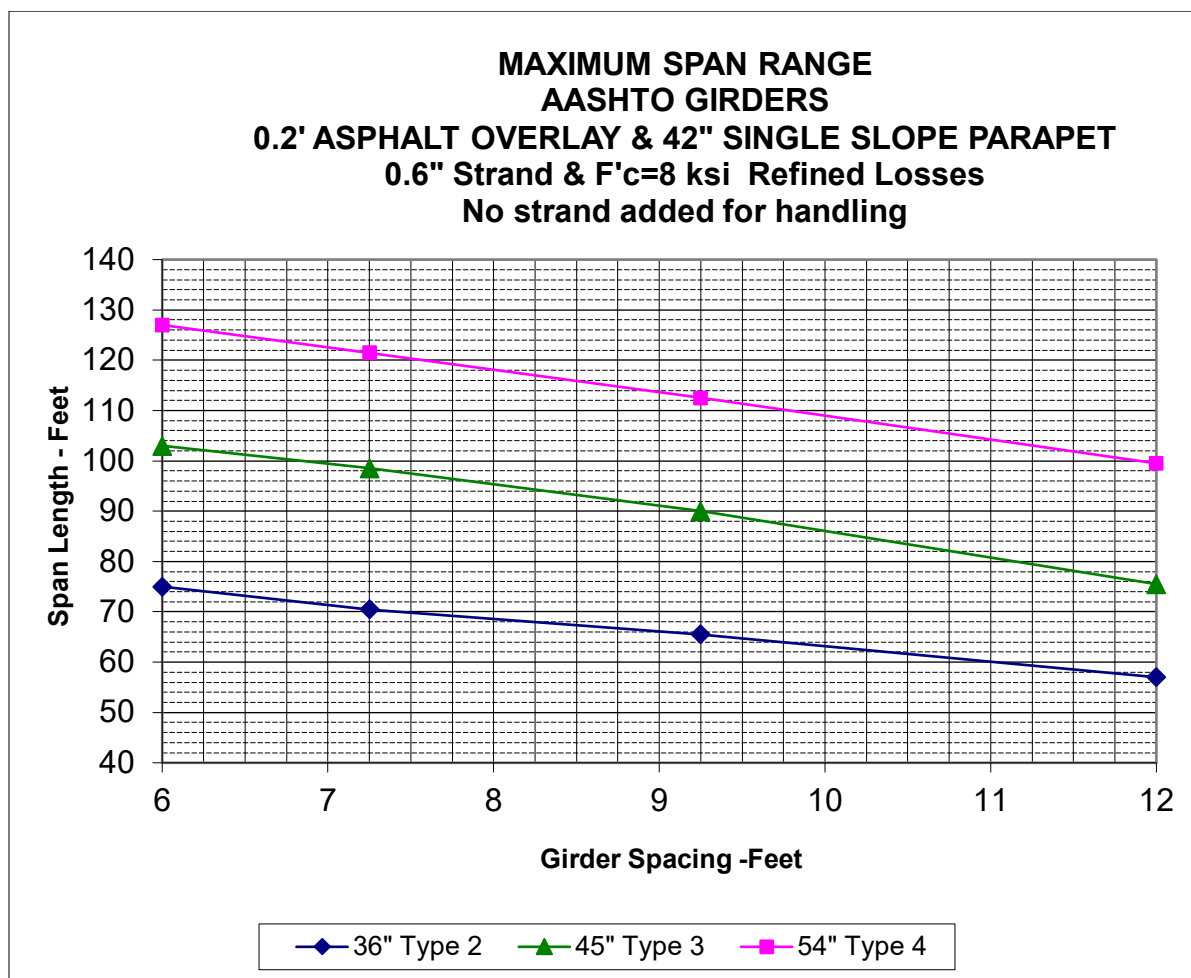
TYPE 2 GIRDER



TYPE 3 GIRDER



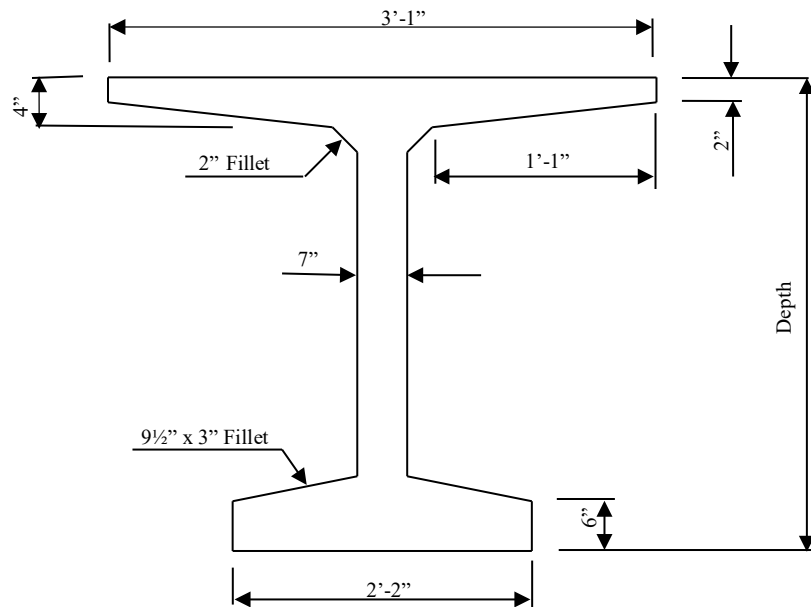
TYPE 4 GIRDER

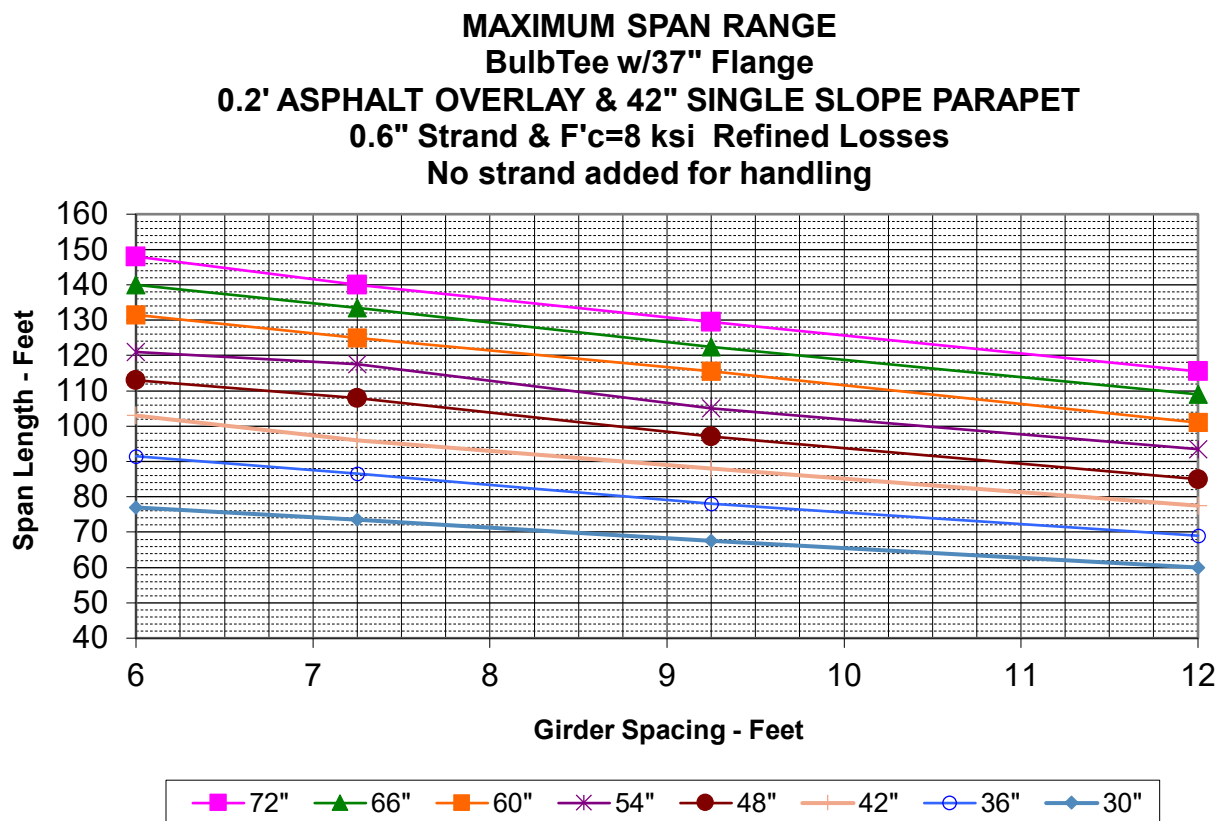


37" TOP FLANGE BULB TEE GIRDER SECTION PROPERTIES

DEPTH	AREA	CENTER OF GRAVITY		MOMENT OF INERTIA	SECTION MODULUS		WEIGHT LB/FT
		TOP	BOTTOM		TOP	BOTTOM	
30"	449.9375	15.644	14.356	51,361	3,283	3,578	469
36"	491.9375	18.857	17.143	82,126	4,355	4,791	512
42"	533.9375	22.036	19.964	121,708	5,523	6,096	556
48"	575.9375	25.190	22.810	170,872	6,783	7,491	600
54"	617.9375	28.322	25.678	230,379	8,134	8,972	644
60"	659.9375	31.438	28.562	300,990	9,574	10,538	687
66"	701.9375	34.539	31.461	383,465	11,102	12,189	731
72"	743.9375	37.630	34.370	478,562	12,718	13,924	775

ALL UNITS IN INCHES EXCEPT WEIGHT

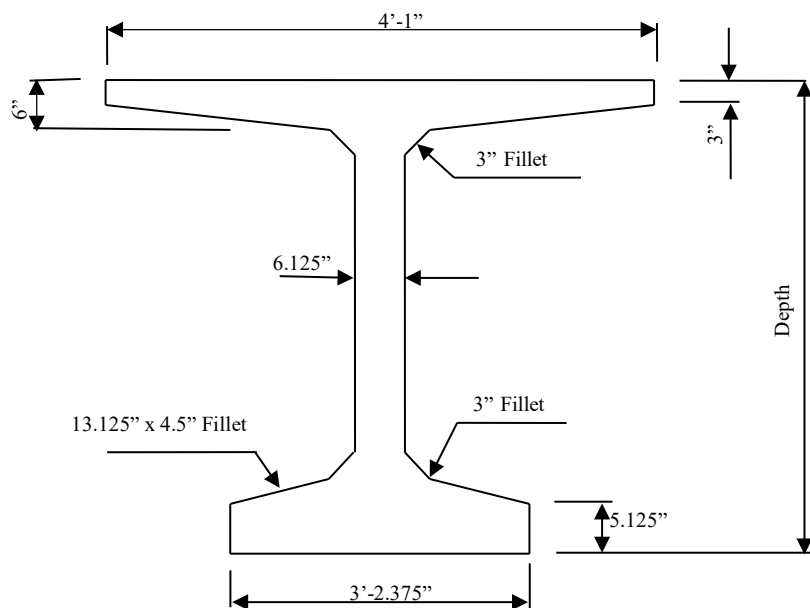


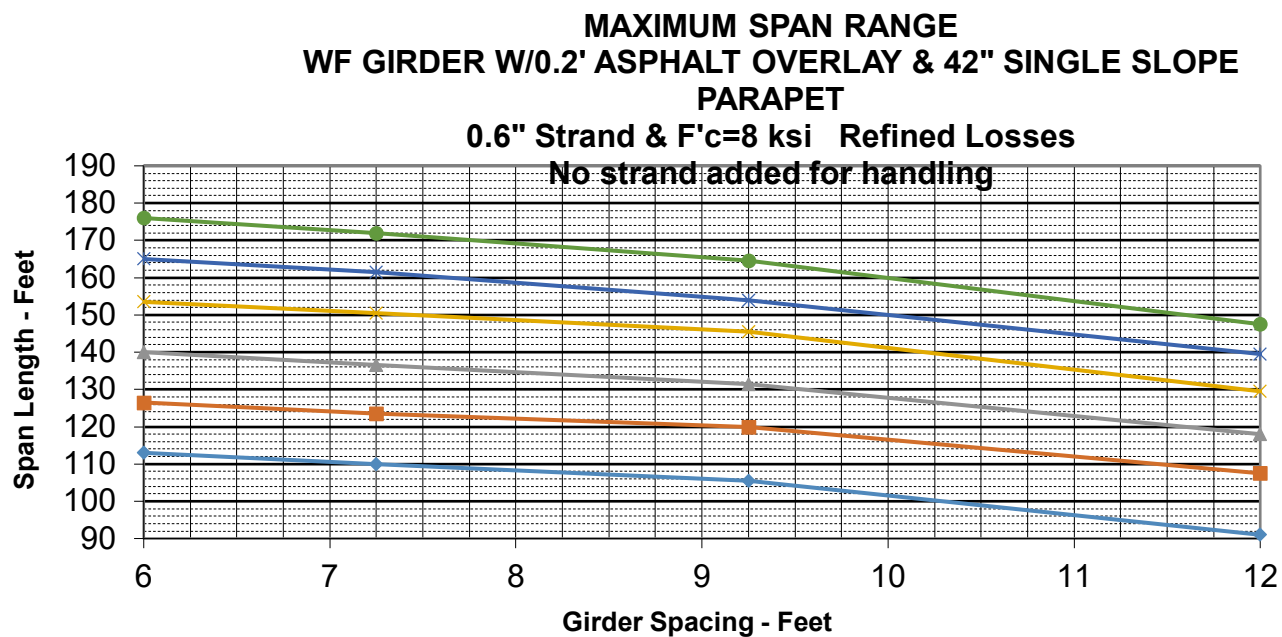


WF GIRDER SECTION PROPERTIES

CENTER OF GRAVITY					SECTION MODULUS		WEIGHT LB/FT
DEPTH	AREA	TOP	BOTTOM	MOMENT OF INERTIA	TOP	BOTTOM	
42"	727.531	21.640	20.360	183,642	8,486	9,020	758
50"	776.531	25.849	24.151	282,559	10,931	11,700	809
58"	825.531	30.033	27.967	406,266	13,527	14,527	860
66"	874.531	34.196	31.804	556,339	16,269	17,493	911
74"	923.531	38.343	35.657	734,356	19,152	20,595	962
82.625"	976.359	42.796	39.829	959,393	22,418	24,088	1017

ALL UNITS IN INCHES EXCEPT WEIGHT



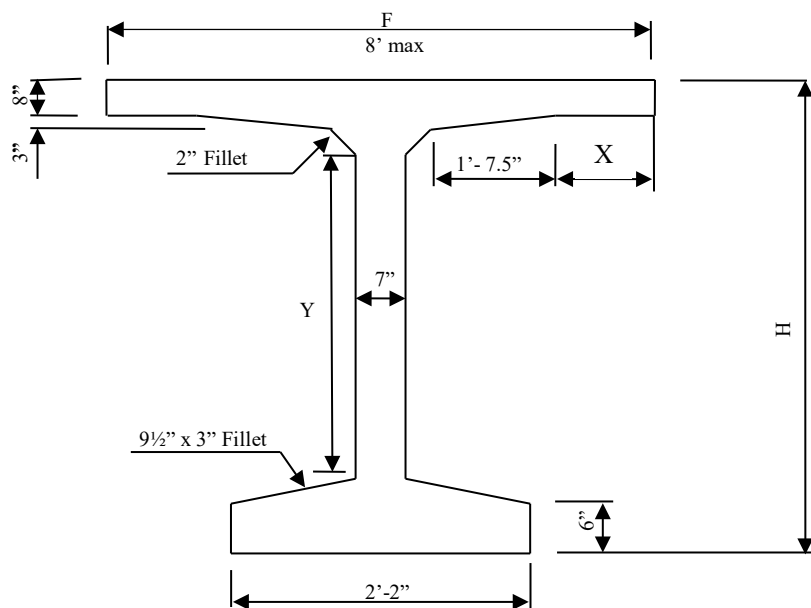


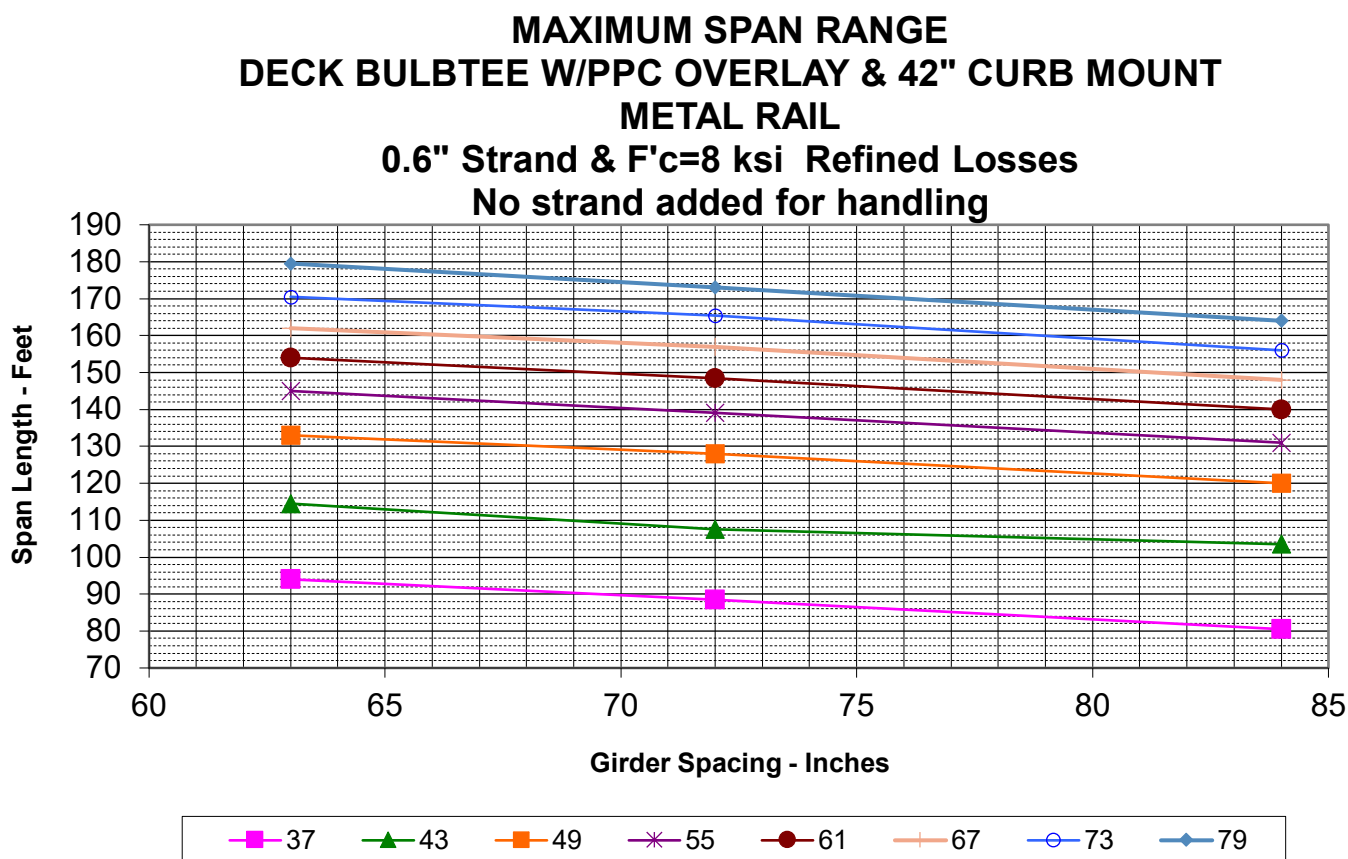
WF42G WF50G WF58G WF66G WF74G WF83G

DECK BULB TEE GIRDER W/PPC OVERLAY

BASE GIRDER	H	Y= (H-22)
30" BT	37	15
36" BT	43	21
42" BT	49	27
48" BT	55	33
54" BT	61	39
60" BT	67	45
66" BT	73	51
72" BT	79	57

$$X = (F-50)/2$$





WF DECK TEE GIRDER W/PPC OVERLAY

BASE GIRDER	H	Y = (H-26.625)
42" WF	47	20.375
50" WF	55	28.375
58" WF	63	36.375
66" WF	71	44.375
74" WF	79	52.375
83" WF	87.625	61

$$X = (F-49)/2$$

