

# DESIGN NOTES

1. DESIGN SPECIFICATIONS: "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES" ADOPTED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, 1996, INCLUDING THE 1997 THROUGH 2001 INTERIM SPECIFICATIONS AND THE ODOT BRIDGE DESIGN MANUAL.

## 2. DESIGN DATA:

- LIVE LOADING - HS25 AND THE ALTERNATE MILITARY LOADING
- DEAD LOADS - ASPHALT OVERLAY - 3 1/2" THICK (AVG.)  
RAILING WEIGHT - 90 PLF PER RAIL (TST-1-99)  
FWS - 60 PSF
- DEAD LOAD - DIAPHRAGM WEIGHT IS BASED ON 3'-0" LONG DIAPHRAGMS.
- CONCRETE - MIN. COMPRESSIVE STRENGTH AT 28 DAYS  $f'_c = 7000$  P.S.I.  
MIN. COMPRESSIVE STRENGTH AT TIME OF INITIAL PRESTRESS  $f'_c = 5000$  P.S.I.
- REINFORCING STEEL - GRADE 60  
MINIMUM YIELD STRENGTH 60,000 P.S.I.
- PRESTRESSING STEEL - ASTM A416  
1/2" DIAMETER  
 $A_s = 0.167$  SQ. IN.  
 $f_s = 270,000$  P.S.I.  
 $E_s = 28,500$  K.S.I.  
 $R_H = 70\%$   
INITIAL STRESS  $0.75 f_s = 202,500$  P.S.I.  
INITIAL TENSION LOAD = 33,818 LBS/STRAND

3. PRESTRESS LOSSES HAVE BEEN COMPUTED IN ACCORDANCE WITH AASHTO ARTICLE 9.16.2. TOTAL LOSSES DETERMINED BY THIS METHOD MAY BE EXPRESSED AS  $\Delta f_s = 11,175 + (25,650/E_c) + (11.4) f_{cir} - 6.65 f_{eds}$

## 4. INTERMEDIATE DIAPHRAGMS:

- SPAN  $\leq 50$  FT. USE ONE DIAPHRAGM
- 50 FT.  $<$  SPAN  $\leq 75$  FT. USE TWO DIAPHRAGMS
- SPAN  $> 75$  FT. USE THREE DIAPHRAGMS

5. CAMBER DATA GIVEN IS THE CALCULATED CAMBER AT TIME OF PAVING (1.88 - 1.85C), WHERE B = CAMBER DUE TO PRESTRESSING AT RELEASE AND C = DEFLECTION DUE TO WEIGHT OF BEAM INCLUDING DIAPHRAGMS. D = CALCULATED DEFLECTION AT MIDSPAN DUE TO A 3 1/2" THICK ASPHALT WEARING SURFACE AND TWO (2) BRIDGE RAILS WEIGHING 90LB/FT. PER RAIL. THE VALUE SHOWN IS THE MAXIMUM INITIAL SUPERIMPOSED DEAD LOAD DEFLECTION FOR GROUP E ROADWAY WIDTHS.

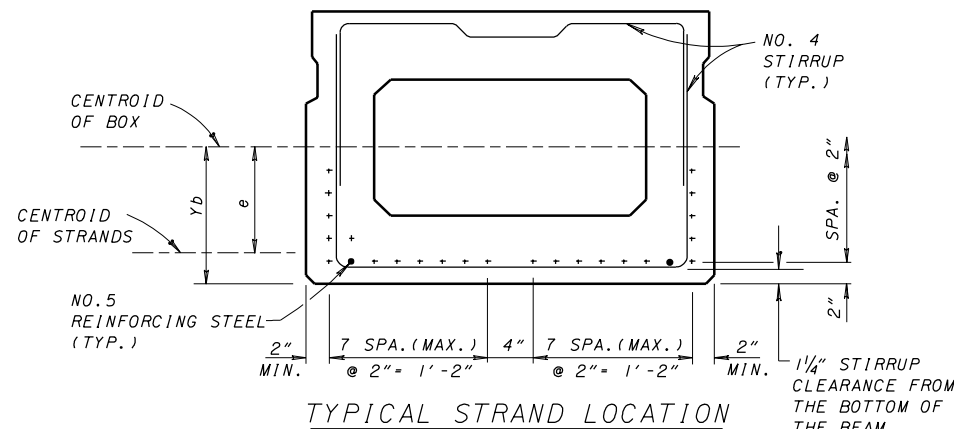
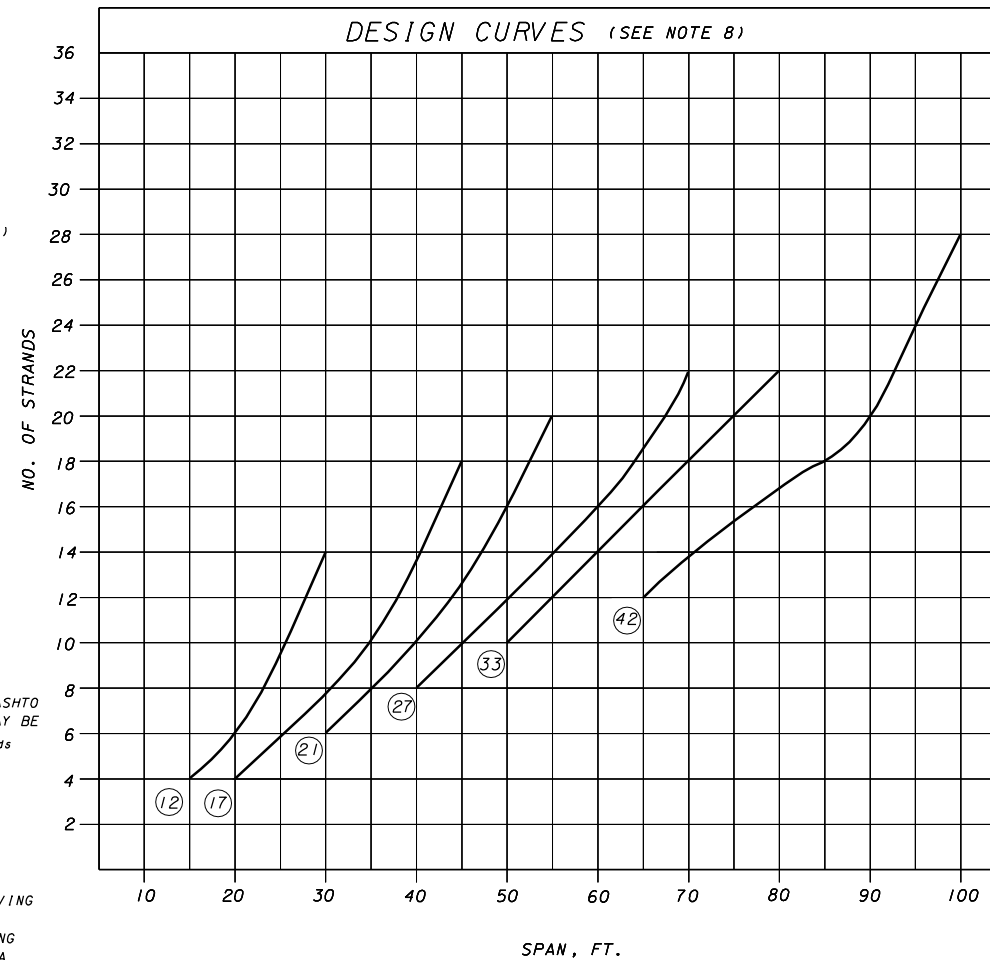
6. THIS DRAWING PROVIDES INFORMATION FOR THE DESIGNER AND IS NOT INTENDED FOR USE AS A STANDARD DRAWING. REFERENCE SHALL BE MADE TO STANDARD DRAWING PSBD-1-93 FOR DETAILS OF BEAMS.

7. ROADWAY WIDTH: THE BEAMS ON THIS SHEET ARE DESIGNED FOR THE FOLLOWING ROADWAY WIDTHS, MEASURED BETWEEN FACE OF BRIDGE RAILS:

GROUP E  
54 FT.  $<$  WIDTH  $\leq 63$  FT.

8. INTERPOLATION: THE DESIGN CURVES SHALL BE USED TO DETERMINE THE NUMBER OF STRANDS REQUIRED FOR BEAM SPANS NOT SPECIFICALLY LISTED IN THE DESIGN DATA TABLE. HOWEVER, THE NUMBER OF STRANDS USED SHALL ALWAYS BE ROUNDED UP TO THE NEAREST EVEN NUMBER. THE REMAINING DESIGN DATA MAY BE OBTAINED FROM THE TABLE BY USING STRAIGHT LINE INTERPOLATION BETWEEN GIVEN VALUES. DO NOT EXTRAPOLATE BEYOND THE CURVES OR GIVEN DATA.

9. NARROW ROADWAY: THESE DESIGNS SHALL NOT BE USED FOR ROADWAY WIDTHS LESS THAN 24 FT. SPECIAL DESIGN IS REQUIRED FOR ROADWAY WIDTHS LESS THAN 24 FT.



STRANDS SHALL BE PLACED PER BDM 302.5.1.2.b AND SHALL BE DISTRIBUTED SYMMETRICALLY OVER THE BEAM WIDTH. STRAND PATTERN AND THE DEBONDED LENGTHS SHALL BE SYMMETRICAL ABOUT VERTICAL  $\phi$  OF BEAM. DEBONDED STRANDS SHALL BE IN BOTTOM LAYER. LENGTH OF STRANDS TO BE DEBONDED IS MEASURED FROM ENDS OF BEAM. TWO BOTTOM REINFORCING BARS SHALL BE LOCATED AT THE CORNER OF THE STIRRUPS. A LAP OF 3'-3" FOR #5 BARS AND 4'-0" FOR #6 BARS SHOULD BE PROVIDED WITHIN THE OUTER QUARTER OF THE SPAN, IF NEEDED.

## GROUP E DESIGN DATA (SEE NOTE 7)

BOX	SPAN c/c BRG. FT.	MID-SPAN e in.	NO. OF STRANDS	STRAND LOCATION FROM BOTTOM OF BOX								NUMBER AND LENGTH OF STRANDS DEBONDED		TENSILE BARS AT BOTTOM		TENSILE BARS AT TOP				CAMBER/DEFLECTION DATA IN. (SEE NOTE 5)						
												NO.	SIZE	FULL LENGTH		ADDITIONAL BARS EACH END		B	C	1.88-1.85C	D					
				2"	4"	6"	8"	10"	12"	14"	1'-6"			2'-6"	3'-6"	4'-6"	NO.					SIZE	NO.	SIZE	LENGTH	
B12-36	15	3.96	4	4											2	5	4	5	-	-	-	0.094	0.023	0.127	0.006	
	20	3.96	6	6											2	5	4	5	-	-	-	0.250	0.072	0.317	0.020	
	25	3.56	10	8	2										2	5	4	5	-	-	-	0.581	0.176	0.720	0.048	
	30	3.39	14	10	4									2	2	5	4	5	-	-	-	1.098	0.366	1.299	0.099	
B17-36	20	6.42	4	4												4	5	4	5	-	-	-	0.101	0.029	0.128	0.007
	25	6.42	6	6												2	5	4	5	-	-	-	0.236	0.070	0.295	0.018
	30	6.42	8	8												2	5	4	5	-	-	-	0.450	0.144	0.544	0.037
	35	6.42	10	10												2	5	4	5	-	-	-	0.761	0.264	0.881	0.068
	40	6.13	14	12	2											2	5	4	5	-	-	-	1.312	0.449	1.531	0.115
45	5.98	18	14	4										2	2	5	4	5	-	-	-	2.041	0.716	2.349	0.185	
B21-36	30	8.39	6	6												2	5	4	5	-	-	-	0.248	0.091	0.278	0.020
	35	8.39	8	8												2	5	4	5	-	-	-	0.448	0.168	0.496	0.038
	40	8.39	10	10												2	5	4	5	-	-	-	0.727	0.285	0.781	0.064
	45	8.10	14	12	2											2	5	4	5	2	5	4'-0"	1.227	0.454	1.369	0.103
	50	7.89	16	12	4											2	5	4	5	2	5	4'-0"	1.680	0.688	1.751	0.157
55	7.59	20	14	4	2									2	2	5	4	5	2	5	4'-0"	2.412	1.032	2.432	0.229	
B27-36	40	11.36	8	8												2	5	4	5	-	-	-	0.408	0.167	0.425	0.033
	45	11.36	10	10												2	5	4	5	2	5	3'-9"	0.641	0.267	0.660	0.053
	50	11.36	12	12												2	5	4	5	2	5	5'-0"	0.944	0.403	0.954	0.080
	55	11.36	14	14												2	5	4	5	4	5	6'-0"	1.325	0.610	1.257	0.117
	60	11.11	16	14	2											2	5	4	5	4	5	6'-0"	1.755	0.857	1.574	0.166
	65	10.56	20	14	4	2									2	2	5	4	5	2	5	5'-6"	2.420	1.173	2.186	0.229
	70	10.09	22	14	4	2	2								2	2	5	4	5	2	5	4'-3"	2.948	1.569	2.404	0.308
B33-36	50	14.28	10	10												2	5	4	5	2	5	4'-6"	0.592	0.267	0.572	0.048
	55	14.28	12	12												2	5	4	5	2	5	5'-9"	0.855	0.406	0.788	0.070
	60	14.28	14	14												2	5	4	5	4	5	7'-0"	1.181	0.571	1.069	0.099
	65	14.03	16	14	2											2	5	4	5	4	5	7'-3"	1.549	0.780	1.345	0.136
	70	13.84	18	14	4										2	2	5	4	5	4	5	7'-3"	1.985	1.043	1.643	0.183
	75	13.48	20	14	4	2									2	2	5	4	5	4	5	7'-0"	2.460	1.366	1.901	0.241
	80	13.01	22	14	4	2	2								2	2	5	4	5	4	5	6'-3"	2.966	1.853	1.911	0.312
B42-36	65	18.72	12	12												2	5	4	5	4	5	6'-9"	0.849	0.493	0.616	0.073
	70	18.72	14	14												2	5	4	5	4	5	8'-0"	1.143	0.658	0.840	0.098
	75	18.47	16	14	2											2	5	4	5	6	5	8'-6"	1.474	0.861	1.060	0.130
	80	17.83	18	12	4	2										2	5	4	5	6	5	8'-3"	1.817	1.149	1.145	0.168
	85	18.28	18	14	4											2	5	4	5	6	5	8'-9"	2.107	1.454	1.103	0.214
	90	17.92	20	14	4	2									2	2	5	4	5	6	5	8'-6"	2.566	1.815	1.261	0.269
	95	16.89	24	14	4	2	2	2	2						2	2	5	4	5	4	5	7'-3"	3.209	2.240	1.632	0.333
100	15.58	28	14	4	2	2	2	2	2	2				2	2	5	4	5	4	5	6'-6"	3.810	2.735	1.798	0.409	

▲ - LENGTH MEASURED FROM ENDS OF BEAM

## SECTION PROPERTIES

BOX	A IN. <sup>2</sup>	I IN. <sup>4</sup>	Yb IN.	S <sub>t</sub> IN. <sup>3</sup>	S <sub>b</sub> IN. <sup>3</sup>
B12 - 36	423.8	5122	5.96	848	859
B17 - 36	426.3	13840	8.42	1613	1644
B21 - 36	479.8	24893	10.39	2346	2396
B27 - 36	539.8	48647	13.36	3567	3641
B33 - 36	594.5	82048	16.28	4907	5040
B42 - 36	684.5	152479	20.72	7165	7359

REVISIONS	STATE OF OHIO DEPARTMENT OF TRANSPORTATION OFFICE OF STRUCTURAL ENGINEERING	5/6
	ORIGINAL DESIGN PREPARED BY: URS CORPORATION - OHIO	
<b>DESIGN DATA FOR PRESTRESSED CONCRETE BRIDGE GROUP E ROADWAY WIDTH NON-COMPOSITE 36" ADJACENT BOX BEAMS WITH STRAIGHT STRANDS</b>		
DESIGNED MDP	DRAWN SFW	CHECKED MAC
REVIEWED RSC	DATE 12/20/02	