

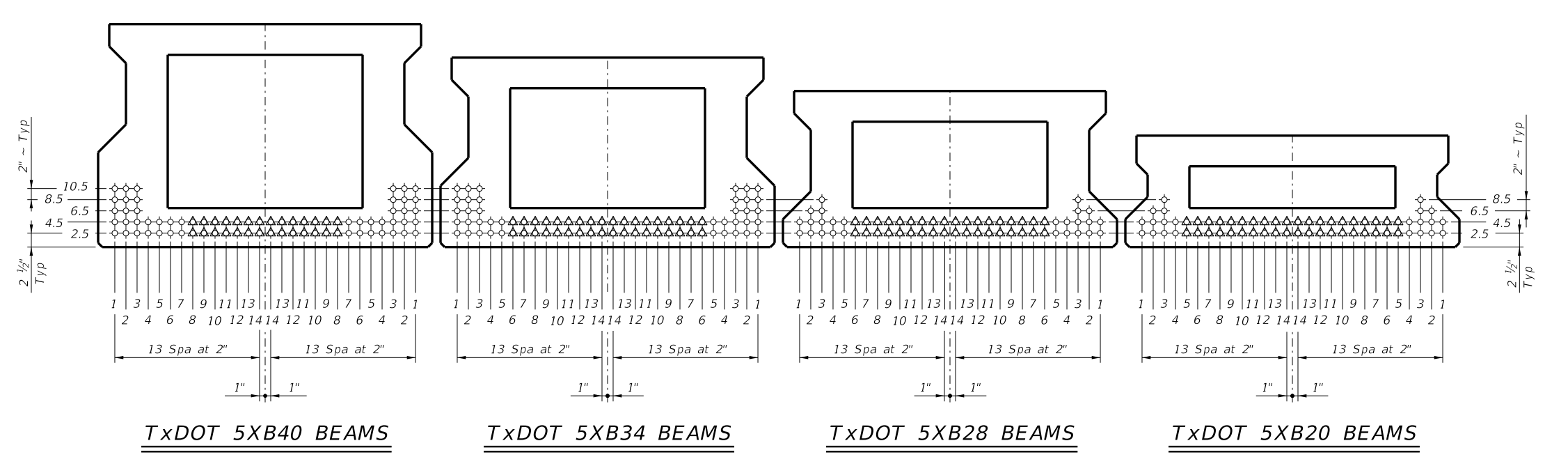
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STRUCTURE	DESIGNED BEAMS (STRAIGHT STRANDS)																			OPTIONAL DESIGN					LOAD RATING FACTORS						
	SPAN LENGTH (ft)	BEAM NO.	BEAM TYPE	PRESTRESSING STRANDS							DEBONDED STRAND PATTERN PER ROW					CONCRETE		DESIGN LOAD COMP STRESS (TOP ϵ) (SERVICE I)	DESIGN TENSILE STRESS (BOTT ϵ) (SERVICE III)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I)	LIVE LOAD DISTRIBUTION FACTOR		STRENGTH I			SERVICE III					
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH (ksi)	"e" ϵ (in)	"e" END (in)	TOT NO. DEB	DIST FROM BOTTOM (in)	NO. OF STRANDS		NUMBER OF STRANDS DEBONDED TO (ft from end)							RELEASE STRENGTH f'_{ci} (ksi)	MINIMUM 28 DAY COMP STRGTH f'_{c} (ksi)	②		Inv		Opr		Inv		
												TOTAL	DE-BONDED	3	6	9	12						15	Moment	Shear	Inv	Opr	Inv	Opr	Inv	
Type 5XB20 X-BEAMS 38' Roadway 8.5" Slab	40	ALL	5XB20		12	0.6	270	7.03	7.03	0	2.50	12	0	0	0	0	0	0	4.000	5.000	1.285	-1.634	1227	0.649	0.853	1.31	1.70	1.32			
	45	ALL	5XB20		16	0.6	270	7.03	7.03	0	2.50	16	0	0	0	0	0	0	4.000	5.000	1.628	-2.020	1468	0.630	0.847	1.50	1.94	1.32			
	50	ALL	5XB20		20	0.6	270	7.03	7.03	0	2.50	20	0	0	0	0	0	0	4.000	5.000	1.969	-2.421	1737	0.613	0.842	1.59	2.06	1.26			
	55	ALL	5XB20		24	0.6	270	7.03	7.03	4	2.50	24	4	4	0	0	0	0	4.000	5.000	2.375	-2.882	2030	0.598	0.838	1.60	2.08	1.12			
	60	ALL	5XB20		30	0.6	270	6.90	6.87	6	2.50	28	6	2	2	2	0	0	4.400	5.000	2.871	-3.426	2355	0.584	0.835	1.63	2.14	1.09			
65	ALL	5XB20		36	0.6	270	6.59	6.50	6	2.50	28	6	2	2	0	2	0	5.100	5.300	3.396	-3.998	2693	0.572	0.831	1.56	2.06	1.02				
Type 5XB28 X-BEAMS 38' Roadway 8.5" Slab	40	ALL	5XB28		12	0.6	270	10.63	10.63	0	2.50	12	0	0	0	0	0	0	4.000	5.000	0.831	-1.028	1707	0.678	0.896	1.81	2.35	2.52			
	45	ALL	5XB28		12	0.6	270	10.63	10.63	0	2.50	12	0	0	0	0	0	0	4.000	5.000	1.047	-1.266	1793	0.658	0.891	1.42	1.84	1.81			
	50	ALL	5XB28		14	0.6	270	10.63	10.63	0	2.50	14	0	0	0	0	0	0	4.000	5.000	1.292	-1.540	1919	0.640	0.887	1.38	1.79	1.53			
	55	ALL	5XB28		16	0.6	270	10.63	10.63	0	2.50	16	0	0	0	0	0	0	4.000	5.000	1.561	-1.835	2150	0.624	0.883	1.33	1.72	1.28			
	60	ALL	5XB28		18	0.6	270	10.63	10.63	0	2.50	18	0	0	0	0	0	0	4.000	5.000	1.855	-2.153	2481	0.610	0.880	1.27	1.65	1.05			
	65	ALL	5XB28		22	0.6	270	10.63	10.63	0	2.50	22	0	0	0	0	0	0	4.000	5.000	2.149	-2.473	2814	0.598	0.877	1.39	1.83	1.07			
	70	ALL	5XB28		26	0.6	270	10.63	10.63	2	2.50	26	2	2	0	0	0	0	4.000	5.000	2.460	-2.807	3156	0.586	0.875	1.50	1.94	1.04			
	75	ALL	5XB28		32	0.6	270	10.38	10.32	6	2.50	28	6	2	2	2	0	2	0	4.000	5.000	2.844	-3.208	3549	0.576	0.873	1.65	2.13	1.06		
	80	ALL	5XB28		38	0.6	270	10.10	9.96	8	2.50	28	8	2	2	2	0	2	4.500	5.000	3.215	-3.599	3935	0.567	0.871	1.53	2.06	1.10			
	85	ALL	5XB28		44	0.6	270	9.90	9.74	8	2.50	28	8	2	2	0	2	2	5.200	5.800	3.647	-4.044	4360	0.558	0.869	1.51	2.03	1.14			
Type 5XB34 X-BEAMS 38' Roadway 8.5" Slab	40	ALL	5XB34		12	0.6	270	13.11	13.11	0	2.50	12	0	0	0	0	0	0	4.000	5.000	0.662	-0.776	1779	0.695	0.923	2.15	2.78	3.40			
	45	ALL	5XB34		12	0.6	270	13.11	13.11	0	2.50	12	0	0	0	0	0	0	4.000	5.000	0.855	-0.963	2130	0.674	0.919	1.71	2.21	2.51			
	50	ALL	5XB34		14	0.6	270	13.11	13.11	0	2.50	14	0	0	0	0	0	0	4.000	5.000	1.053	-1.171	2486	0.655	0.915	1.68	2.17	2.20			
	55	ALL	5XB34		14	0.6	270	13.11	13.11	0	2.50	14	0	0	0	0	0	0	4.000	5.000	1.271	-1.396	2427	0.639	0.911	1.33	1.73	1.58			
	60	ALL	5XB34		14	0.6	270	13.11	13.11	0	2.50	14	0	0	0	0	0	0	4.000	5.000	1.508	-1.638	2592	0.625	0.908	1.05	1.36	1.05			
	65	ALL	5XB34		18	0.6	270	13.11	13.11	0	2.50	18	0	0	0	0	0	0	4.000	5.000	1.764	-1.897	2957	0.612	0.906	1.28	1.65	1.16			
	70	ALL	5XB34		22	0.6	270	13.11	13.11	0	2.50	22	0	0	0	0	0	0	4.000	5.000	2.019	-2.156	3323	0.601	0.904	1.45	1.88	1.22			
	75	ALL	5XB34		26	0.6	270	13.11	13.11	2	2.50	26	2	2	0	0	0	0	4.000	5.000	2.311	-2.446	3720	0.590	0.902	1.57	2.04	1.19			
	80	ALL	5XB34		30	0.6	270	12.97	12.95	4	2.50	28	4	2	2	0	0	0	4.000	5.000	2.596	-2.731	4116	0.581	0.901	1.64	2.12	1.16			
	85	ALL	5XB34		34	0.6	270	12.75	12.68	6	2.50	28	6	2	2	2	0	0	4.000	5.000	2.940	-3.068	4562	0.572	0.899	1.65	2.14	1.05			
	90	ALL	5XB34		40	0.6	270	12.51	12.36	8	2.50	28	8	2	2	0	2	2	4.100	5.000	3.295	-3.413	5017	0.563	0.898	1.57	2.09	1.06			
	95	ALL	5XB34		46	0.6	270	12.32	12.11	10	2.50	28	10	2	2	2	2	2	4.700	5.600	3.671	-3.779	5497	0.556	0.897	1.53	2.05	1.13			
	100	ALL	5XB34		50	0.6	270	12.23	11.95	12	2.50	28	12	2	4	2	2	2	5.100	6.200	4.058	-4.153	5983	0.548	0.896	1.49	2.00	1.06			
Type 5XB40 X-BEAMS 38' Roadway 8.5" Slab	40	ALL	5XB40		12	0.6	270	15.70	15.70	0	2.50	12	0	0	0	0	0	0	4.000	5.000	0.562	-0.629	1846	0.709	0.947	2.48	3.22	4.22			
	45	ALL	5XB40		12	0.6	270	15.70	15.70	0	2.50	12	0	0	0	0	0	0	4.000	5.000	0.726	-0.781	2214	0.688	0.943	1.99	2.57	3.18			
	50	ALL	5XB40		14	0.6	270	15.70	15.70	0	2.50	14	0	0	0	0	0	0	4.000	5.000	0.893	-0.950	2649	0.669	0.939	1.96	2.54	2.84			
	55	ALL	5XB40		14	0.6	270	15.70	15.70	0	2.50	14	0	0	0	0	0	0	4.000	5.000	1.076	-1.133	3002	0.653	0.936	1.57	2.04	2.13			
	60	ALL	5XB40		16	0.6	270	15.70	15.70	0	2.50	16	0	0	0	0	0	0	4.000	5.000	1.276	-1.330	3191	0.638	0.934	1.56	2.02	1.89			
	65	ALL	5XB40		16	0.6	270	15.70	15.70	0	2.50	16	0	0	0	0	0	0	4.000	5.000	1.491	-1.540	3124	0.625	0.932	1.26	1.63	1.36			
	70	ALL	5XB40		18	0.6	270	15.70	15.70	0	2.50	18	0	0	0	0	0	0	4.000	5.000	1.722	-1.764	3482	0.613	0.930	1.25	1.62	1.18			
	75	ALL	5XB40		22	0.6	270	15.70	15.70	0	2.50	22	0	0	0	0	0	0	4.000	5.000	1.970	-2.003	3902	0.602	0.928	1.44	1.87	1.25			
	80	ALL	5XB40		24	0.6	270	15.70	15.70	2	2.50	24	2	2	0	0	0	0	4.000	5.000	2.233	-2.255	4341	0.592	0.927	1.39	1.81	1.03			
	85	ALL	5XB40		28	0.6	270	15.70	15.70	4	2.50	28	4	2	2	0	0	0	4.000	5.000	2.513	-2.521	4800	0.583	0.926	1.52	1.97	1.04			
	90	ALL	5XB40		34	0.6	270	15.35	15.24	8	2.50	28	8	4	4	0	0	0	4.000	5.000	2.757	-2.759	5222	0.575	0.925	1.76	2.28	1.20			
95	ALL	5XB40		38	0.6	270	15.18	14.99	10	2.50	28	10	2	6	2	0	0	4.000	5.000	3.052	-3.039	5700	0.567	0.925	1.71	2.27	1.13				
100	ALL	5XB40		44	0.6	270	14.98	14.70	12	2.50	28	12	2	4	2	2	2	4.100	5.000	3.379	-3.347	6219	0.560	0.924	1.60	2.13	1.15				
105	ALL	5XB40		48	0.6	270	14.87	14.53	14	2.50	28	14	2	6	2	2	2	4.500	5.500	3.717	-3.664	6749	0.553	0.924	1.56	2.08	1.11				

① Based on the following allowable stresses (ksi):
 Compression = 0.65 f'_{ci}
 Tension = 0.24 $\sqrt{f'_{ci}}$
 Optional designs must likewise conform.
 ② Portion of full HL93.

DESIGN NOTES:
 Designed in accordance with AASHTO LRFD Bridge Design Specifications.
 Load rated using Load and Resistance Factor Rating according to AASHTO Manual for Bridge Evaluation.
 Prestress losses for the designed beams have been calculated for a relative humidity of 60 percent. Optional designs must likewise conform.
 Beam designs are applicable for 8 1/2" concrete slabs without overlay and 0 through 30 degree skews.

FABRICATION NOTES:
 Provide Class H concrete.
 Provide Grade 60 reinforcing steel bars.
 Use low relaxation strands, each pretensioned to 75 percent of fpu.
 When shown on this sheet, the Fabricator has the option of furnishing either the designed beam or an approved optional beam design. All optional design submittals and shop drawings must be signed, sealed and dated by a Professional Engineer registered in the State of Texas.
 Locate strands for the designed beam as low as possible on the 2" grid system unless a non-standard strand pattern is indicated. Fill row "2.5", then row "4.5", then row "6.5", etc. Place strands within a row as follows:
 1) Locate a strand in each "1" position.
 2) Place strand symmetrically about vertical centerline of box.
 3) Space strands as equally as possible across the entire width.
 Strand debonding must comply with Item 424.4.2.2.4. Do not debond strands in position "1". Distribute debonded strands equally about the vertical centerline. Decrease debonded lengths working inward, with debonding staggered in each row.
 Full-length debonded strands are only permitted in positions marked Δ . Double wrap full-length debonded strands.



HL93 LOADING

		Bridge Division Standard	
PRESTRESSED CONCRETE X-BEAM STANDARD DESIGNS			
38' ROADWAY			
XBSD-38			
FILE: XB-XBSD38-22.dgn	DN: TAR	CK: EFC	DW: JER
©TxDOT August 2022	CONT	SECT	JOB
REVISIONS		HIGHWAY	
DIST	COUNTY	SHEET NO.	

DATE: FILE: