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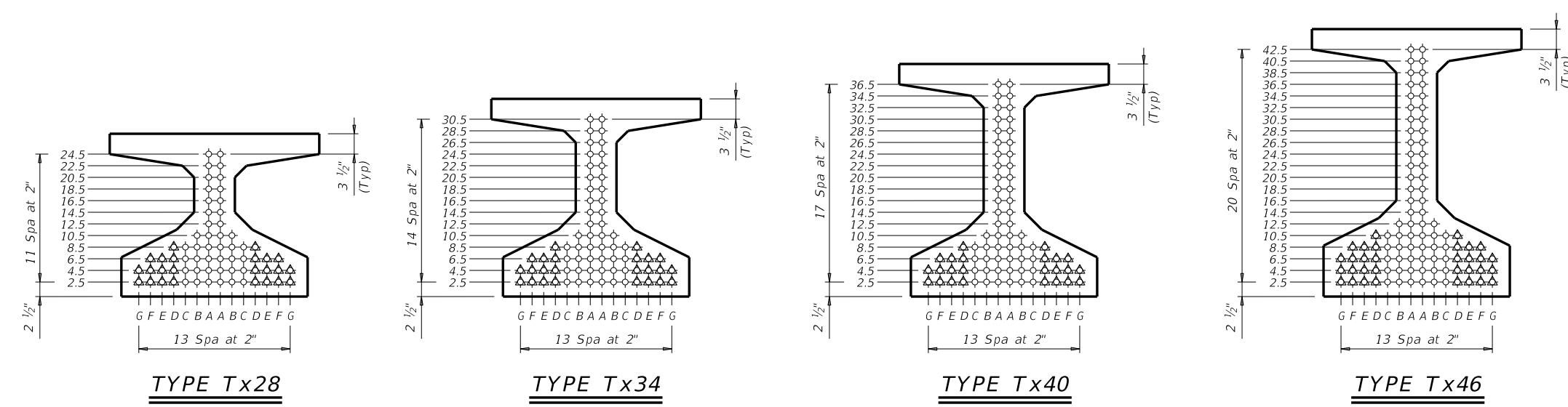
STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN	CONCRETE		OPTIONAL DESIGN				LOAD RATING FACTORS				
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS					NO.		T _O END (in)	RELEASE STRGTH (1) f' _{ci} (ksi)	MINIMUM 28 DAY COMP STRGTH f' _c (ksi)	DESIGN LOAD COMP STRESS (TOP ϵ) (SERVICE I) f _{ct} (ksi)	DESIGN LOAD TENSILE STRESS (BOT ϵ) (SERVICE III) f _{cb} (ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR (2)		STRENGTH I		SERVICE III
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH f _{pu} (ksi)	"e" $\bar{\epsilon}$ (in)									"e" END (in)	Moment	Shear	Inv	Opr
Type Tx28 Girders 40' Roadway 8.5" Slab	40	ALL	Tx28		12	0.6	270	10.48	10.48	2	10.5	4.700	5.000	1.171	-1.656	1590	0.830	1.040	1.54	2.00	1.85
	45	ALL	Tx28		14	0.6	270	10.48	9.34			4.000	5.200	1.483	-2.021	1684	0.800	1.050	1.53	1.98	1.63
	50	ALL	Tx28		16	0.6	270	10.23	9.23	4	8.5	4.000	5.600	1.807	-2.427	1973	0.780	1.050	1.44	1.87	1.38
	55	ALL	Tx28		18	0.6	270	10.04	7.81	4	14.5	4.000	6.200	2.190	-2.882	2297	0.760	1.060	1.37	1.77	1.15
	60	ALL	Tx28		22	0.6	270	9.75	6.48	4	22.5	4.400	6.800	2.597	-3.355	2625	0.740	1.060	1.35	1.90	1.13
65	ALL	Tx28		26	0.6	270	9.56	6.48	4	24.5	5.200	7.200	3.049	-3.865	2965	0.720	1.070	1.20	1.77	1.09	
Type Tx34 Girders 40' Roadway 8.5" Slab	40	ALL	Tx34		12	0.6	270	13.01	13.01			4.000	5.000	0.920	-1.270	1937	0.860	1.020	1.82	2.36	2.43
	45	ALL	Tx34		14	0.6	270	13.01	12.15	2	8.5	4.000	5.000	1.161	-1.547	2121	0.830	1.030	1.81	2.35	2.20
	50	ALL	Tx34		14	0.6	270	13.01	12.44	2	6.5	4.000	5.000	1.425	-1.865	2073	0.810	1.030	1.46	1.89	1.64
	55	ALL	Tx34		16	0.6	270	12.76	11.76	4	8.5	4.000	5.000	1.724	-2.213	2383	0.790	1.040	1.42	1.84	1.41
	60	ALL	Tx34		16	0.6	270	12.76	11.76	4	8.5	4.500	5.800	2.033	-2.567	2721	0.770	1.040	1.38	1.79	1.24
	65	ALL	Tx34		20	0.6	270	12.41	9.61	4	18.5	4.000	5.800	2.373	-2.945	3069	0.750	1.050	1.17	1.74	1.08
	70	ALL	Tx34		24	0.6	270	12.18	8.18	4	28.5	4.400	6.200	2.747	-3.350	3430	0.730	1.050	1.45	1.90	1.09
	75	ALL	Tx34		28	0.6	270	12.01	8.58	4	28.5	5.200	6.500	3.138	-3.781	3824	0.720	1.050	1.49	1.99	1.11
80	ALL	Tx34		32	0.6	270	11.64	8.26	6	24.5	5.800	7.000	3.567	-4.245	4236	0.710	1.060	1.22	1.79	1.05	
Type Tx40 Girders 40' Roadway 8.5" Slab	40	ALL	Tx40		12	0.6	270	15.60	15.60			4.000	5.000	0.757	-1.027	1998	0.890	1.010	2.08	2.70	2.97
	45	ALL	Tx40		14	0.6	270	15.60	15.60			4.700	5.000	0.953	-1.249	2363	0.860	1.010	2.08	2.69	2.72
	50	ALL	Tx40		14	0.6	270	15.60	15.60			4.500	5.000	1.175	-1.505	2555	0.830	1.020	1.70	2.21	2.12
	55	ALL	Tx40		16	0.6	270	15.35	14.35	4	8.5	4.000	5.000	1.408	-1.776	2685	0.810	1.020	1.66	2.15	1.89
	60	ALL	Tx40		16	0.6	270	15.35	14.35	4	8.5	4.000	5.000	1.672	-2.070	2798	0.790	1.030	1.39	1.81	1.46
	65	ALL	Tx40		18	0.6	270	15.16	13.82	4	10.5	4.000	5.000	1.942	-2.368	3153	0.770	1.030	1.38	1.79	1.31
	70	ALL	Tx40		20	0.6	270	15.00	13.40	4	12.5	4.000	5.000	2.249	-2.705	3554	0.760	1.030	1.35	1.75	1.14
	75	ALL	Tx40		24	0.6	270	14.77	9.77	4	34.5	4.100	5.600	2.574	-3.046	3937	0.740	1.040	1.12	1.73	1.02
	80	ALL	Tx40		26	0.6	270	14.68	9.76	4	36.5	4.400	5.800	2.900	-3.399	4348	0.730	1.040	1.20	1.88	1.05
	85	ALL	Tx40		30	0.6	270	14.40	10.00	6	28.5	5.100	6.100	3.268	-3.787	4786	0.720	1.040	1.26	1.99	1.04
90	ALL	Tx40		34	0.6	270	14.07	9.48	6	32.5	5.600	6.300	3.628	-4.168	5218	0.710	1.040	1.52	1.85	1.16	
Type Tx46 Girders 40' Roadway 8.5" Slab	40	ALL	Tx46		12	0.6	270	17.60	17.60			4.000	5.000	0.663	-0.816	2075	0.920	0.990	2.31	3.00	3.55
	45	ALL	Tx46		12	0.6	270	17.60	17.60			4.000	5.000	0.832	-0.994	2458	0.890	1.000	1.92	2.49	2.84
	50	ALL	Tx46		14	0.6	270	17.60	17.60			4.200	5.000	1.026	-1.204	2931	0.870	1.000	1.88	2.44	2.56
	55	ALL	Tx46		16	0.6	270	17.35	16.35	4	8.5	4.000	5.000	1.236	-1.421	3272	0.840	1.010	1.86	2.41	2.33
	60	ALL	Tx46		16	0.6	270	17.35	16.35	4	8.5	4.000	5.000	1.466	-1.657	3218	0.820	1.010	1.56	2.03	1.85
	65	ALL	Tx46		16	0.6	270	17.35	16.35	4	8.5	4.500	5.500	1.702	-1.897	3301	0.800	1.010	1.56	2.02	1.69
	70	ALL	Tx46		18	0.6	270	17.16	15.83	4	10.5	4.000	5.000	1.969	-2.168	3722	0.790	1.020	1.32	1.71	1.31
	75	ALL	Tx46		20	0.6	270	17.00	15.40	4	12.5	4.000	5.000	2.251	-2.442	4127	0.770	1.020	1.06	1.46	1.00
	80	ALL	Tx46		22	0.6	270	16.88	15.06	4	14.5	4.000	5.000	2.537	-2.727	4561	0.760	1.020	1.19	1.69	1.05
	85	ALL	Tx46		26	0.6	270	16.68	12.07	4	34.5	4.000	5.300	2.856	-3.039	5023	0.750	1.020	1.31	1.86	1.07
	90	ALL	Tx46		30	0.6	270	16.40	9.20	6	42.5	4.100	5.500	3.190	-3.351	5458	0.730	1.030	1.38	2.02	1.06
	95	ALL	Tx46		34	0.6	270	16.07	9.72	6	42.5	4.700	5.700	3.520	-3.670	5924	0.720	1.030	1.47	2.12	1.09
100	ALL	Tx46		38	0.6	270	15.81	10.45	6	40.5	5.400	6.100	3.862	-4.000	6400	0.710	1.030	1.48	2.19	1.10	
105	ALL	Tx46		42	0.6	270	15.60	10.46	6	42.5	5.900	6.800	4.249	-4.363	6911	0.700	1.030	1.50	1.75	1.08	

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

DESIGN NOTES:
 Designed according to AASHTO LRFD Bridge Design Specifications. Load rated using Load and Resistance Factor Rating according to AASHTO Manual for Bridge Evaluation.
 Optional designs for girders 120 feet or longer must have a calculated residual camber equal to or greater than that of the designed girder.
 Prestress losses for the designed girders have been calculated for a relative humidity of 60 percent. Optional designs must likewise conform.

FABRICATION NOTES:
 Provide Class H concrete.
 Provide Grade 60 reinforcing steel bars.
 Use low relaxation strands, each pretensioned to 75 percent of f_{pu}.
 Strand debonding must comply with Item 424.4.2.2.4. Full-length debonded strands are only permitted in positions marked Δ. Double wrap full-length debonded strands in outer most position of each row.
 When shown on this sheet, the Fabricator has the option of furnishing either the designed girder or an approved optional design. All optional design submittals must be signed, sealed and dated by a Professional Engineer registered in the State of Texas.
 Seal cracks in girder ends exceeding 0.005" in width as directed by the Engineer. The fabricator is permitted to decrease the spacing of Bars R and S by providing additional bars to help limit crack width provided the decreased spacing results in no less than 1" clear between bars. The fabricator must take an approved corrective action if cracks greater than 0.005" form on a repetitive basis.

DEPRESSED STRAND DESIGNS:
 Locate strands for the designed girder 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., beginning each row in the "A" position and working outward until the required number of strands is reached. All strands in the "A" position must be depressed, maintaining the 2" spacing so that, at the girder ends, the upper two strands are in the position shown in the table.



HL93 LOADING SHEET 1 OF 2

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER STANDARD DESIGNS

40' ROADWAY

IGSD-40

FILE: IG-IGSD40-21.dgn	DN: EFC	CK: AJF	DW: EFC	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS				
10-19: Redesigned girders.				
1-21: Added load rating.				
DIST	COUNTY			SHEET NO.

DATE: FILE:

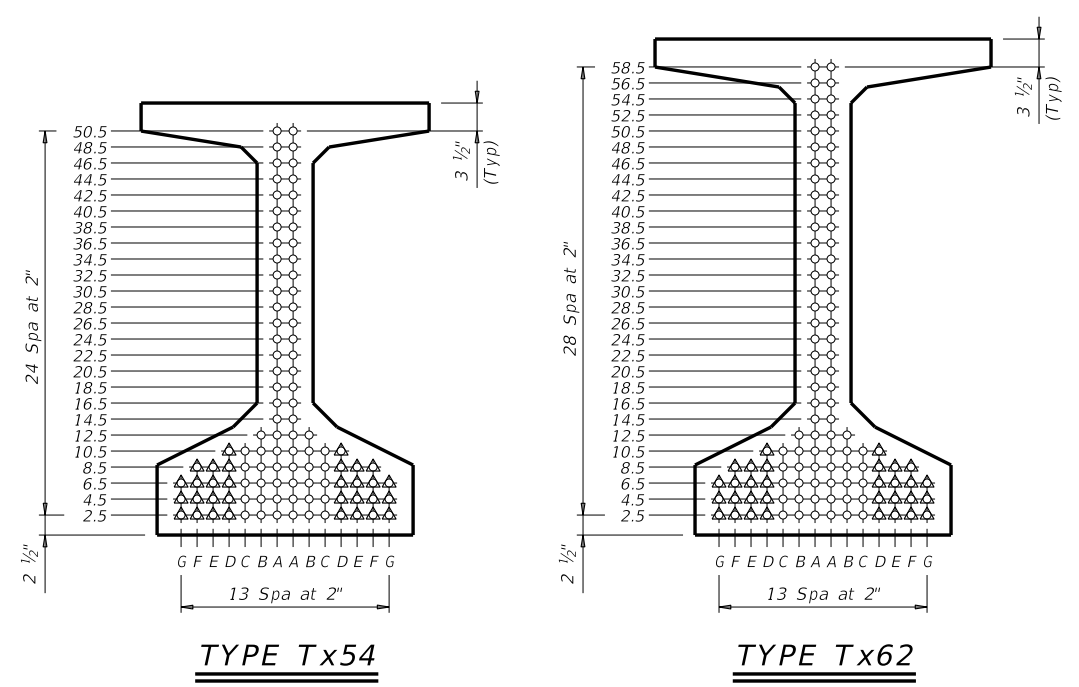
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DATE: FILE:

STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN					LOAD RATING FACTORS		
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS					NO.			TO END (in)	RELEASE STRGTH (1) f'ci (ksi)	MINIMUM 28 DAY COMP STRGTH f'c (ksi)	DESIGN LOAD COMP STRESS (TOP ε) (SERVICE I) fct(ksi)	DESIGN LOAD TENSILE STRESS (BOTτ ε) (SERVICE III) fcb(ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR (2)		STRENGTH I SERVICE III	
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" ε (in)		"e" END (in)	Moment							Shear	Inv	Opr	Inv
Type Tx54 Girders 40' Roadway 8.5" Slab	40	ALL	Tx54		10	0.6	270	21.01	21.01			4.000	5.000	0.554	-0.670	2161	0.960	0.980	2.11	2.74	3.61
	45	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	0.688	-0.808	2537	0.920	0.990	2.21	2.86	3.46
	50	ALL	Tx54		14	0.6	270	21.01	21.01			4.000	5.000	0.847	-0.978	3027	0.900	0.990	2.17	2.81	3.14
	55	ALL	Tx54		14	0.6	270	21.01	21.01			4.000	5.000	1.018	-1.154	3506	0.870	0.990	1.82	2.36	2.56
	60	ALL	Tx54		16	0.6	270	20.76	20.26	4	6.5	4.000	5.000	1.206	-1.346	3925	0.850	1.000	1.82	2.36	2.36
	65	ALL	Tx54		16	0.6	270	20.76	20.26	4	6.5	4.000	5.000	1.408	-1.548	3872	0.830	1.000	1.55	2.01	1.92
	70	ALL	Tx54		18	0.6	270	20.56	19.23	4	10.5	4.000	5.000	1.614	-1.751	4103	0.810	1.000	1.57	2.04	1.79
	75	ALL	Tx54		18	0.6	270	20.56	19.67	4	8.5	4.000	5.000	1.847	-1.981	4272	0.800	1.000	1.34	1.74	1.43
	80	ALL	Tx54		20	0.6	270	20.41	18.81	4	12.5	4.000	5.000	2.091	-2.214	4703	0.780	1.010	1.36	1.76	1.32
	85	ALL	Tx54		20	0.6	270	20.41	18.81	4	12.5	4.000	5.000	2.353	-2.466	5180	0.770	1.010	1.17	1.52	1.02
	90	ALL	Tx54		24	0.6	270	20.17	17.84	4	18.5	4.000	5.000	2.612	-2.717	5655	0.760	1.010	1.35	1.76	1.09
	95	ALL	Tx54		28	0.6	270	20.01	14.29	4	44.5	4.000	5.000	2.902	-2.991	6161	0.750	1.010	1.50	1.94	1.11
	100	ALL	Tx54		32	0.6	270	19.63	11.38	6	50.5	4.100	5.000	3.184	-3.260	6658	0.740	1.020	1.55	2.08	1.12
	105	ALL	Tx54		34	0.6	270	19.48	13.48	6	40.5	4.700	5.400	3.500	-3.555	7191	0.730	1.020	1.46	2.03	1.01
110	ALL	Tx54		38	0.6	270	19.22	12.27	6	50.5	5.000	5.700	3.831	-3.862	7738	0.720	1.020	1.53	2.13	1.05	
115	ALL	Tx54		42	0.6	270	19.01	12.72	6	50.5	5.600	6.400	4.147	-4.157	8268	0.710	1.020	1.39	1.87	1.08	
120	ALL	Tx54		46	0.6	270	18.66	11.36	8	50.5	5.800	6.800	4.504	-4.484	8840	0.700	1.020	1.34	1.76	1.03	
Type Tx62 Girders 40' Roadway 8.5" Slab	60	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	0.948	-1.129	4196	0.880	0.990	2.04	2.65	2.83
	65	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	1.106	-1.298	4607	0.860	0.990	1.75	2.27	2.35
	70	ALL	Tx62		18	0.6	270	25.33	25.33			4.000	5.000	1.274	-1.476	4887	0.840	0.990	1.77	2.29	2.21
	75	ALL	Tx62		18	0.6	270	25.33	25.33			4.000	5.000	1.443	-1.653	4843	0.820	0.990	1.55	2.00	1.85
	80	ALL	Tx62		20	0.6	270	25.18	24.38	4	8.5	4.000	5.000	1.634	-1.854	5110	0.810	1.000	1.55	2.01	1.72
	85	ALL	Tx62		20	0.6	270	25.18	24.38	4	8.5	4.000	5.000	1.834	-2.057	5382	0.790	1.000	1.36	1.77	1.41
	90	ALL	Tx62		22	0.6	270	25.05	23.60	4	12.5	4.000	5.000	2.048	-2.277	5897	0.780	1.000	1.37	1.78	1.31
	95	ALL	Tx62		24	0.6	270	24.94	23.94	4	10.5	4.900	5.000	2.273	-2.506	6428	0.770	1.000	1.19	1.55	1.03
	100	ALL	Tx62		28	0.6	270	24.78	22.49	4	20.5	4.500	5.100	2.491	-2.730	6948	0.760	1.000	1.38	1.78	1.12
	105	ALL	Tx62		32	0.6	270	24.40	15.40	6	54.5	4.000	5.000	2.736	-2.977	7508	0.750	1.010	1.20	1.77	1.01
	110	ALL	Tx62		34	0.6	270	24.25	15.42	6	56.5	4.200	5.000	2.970	-3.214	8051	0.740	1.010	1.65	2.18	1.31
	115	ALL	Tx62		36	0.6	270	24.11	15.78	6	56.5	4.500	5.200	3.236	-3.479	8638	0.730	1.010	1.58	2.12	1.22
	120	ALL	Tx62		38	0.6	270	23.99	17.67	6	46.5	5.000	5.900	3.513	-3.752	9241	0.720	1.010	1.55	2.07	1.12
	125	ALL	Tx62		42	0.6	270	23.78	16.35	6	58.5	5.300	6.200	3.770	-4.009	9815	0.710	1.010	1.58	2.13	1.35
130	ALL	Tx62		46	0.6	270	23.43	15.78	8	52.5	5.700	6.600	4.073	-4.315	10512	0.710	1.010	1.51	1.88	1.21	

NON-STANDARD STRAND PATTERNS	
PATTERN	STRAND ARRANGEMENT AT ε OF GIRDER

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



HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER STANDARD DESIGNS
40' ROADWAY

IGSD-40

FILE: IG-IGSD40-21.dgn	DN: EFC	CK: AJF	DW: EFC	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS				
10-19: Redesigned girders.				
1-21: Added load rating.				
DIST	COUNTY			SHEET NO.