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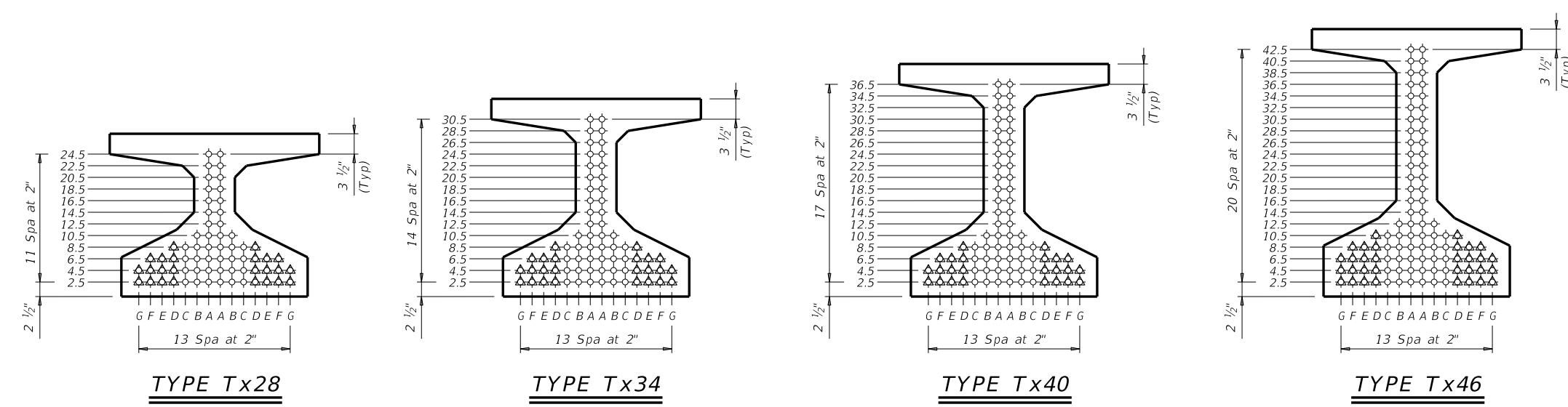
STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN					LOAD RATING FACTORS		
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS					NO.					TO END (in)	RELEASE STRGTH (ksi)	MINIMUM 28 DAY COMP STRGTH (ksi)	DESIGN LOAD COMP STRESS (TOP ϵ) (SERVICE I) $f_{ct}(ksi)$	DESIGN LOAD TENSILE STRESS (BOT ϵ) (SERVICE III) $f_{cb}(ksi)$	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR	
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH f_{pu} (ksi)	"e" ϵ (in)		"e" END (in)	Moment	Shear	Inv							Opr	Inv
Type Tx28 Girders 24' Roadway 8.5" Slab	40	ALL	Tx28		10	0.6	270	10.48	10.48	2	8.5	4.000	5.000	1.055	-1.423	1382	0.670	0.850	1.56	2.02	1.98
	45	ALL	Tx28		12	0.6	270	10.48	10.48			4.500	5.000	1.332	-1.744	1525	0.650	0.850	1.58	2.05	1.79
	50	ALL	Tx28		12	0.6	270	10.48	10.48			4.200	5.000	1.645	-2.113	1657	0.630	0.860	1.25	1.62	1.25
	55	ALL	Tx28		14	0.6	270	10.48	9.62			4.000	5.000	1.969	-2.490	1919	0.610	0.860	1.27	1.64	1.11
	60	ALL	Tx28		18	0.6	270	10.04	7.81			4.000	5.600	2.320	-2.901	2206	0.600	0.870	1.43	1.86	1.14
	65	ALL	Tx28		22	0.6	270	9.75	6.12			4.300	5.900	2.716	-3.337	2486	0.580	0.870	1.55	2.00	1.14
	70	ALL	Tx28		26	0.6	270	9.56	6.48			5.200	6.300	3.131	-3.802	2793	0.570	0.870	1.26	1.89	1.01
	75	ALL	Tx28		28	0.6	270	9.48	6.62	5.600	7.800	3.572	-4.291	3110	0.560	0.880	1.38	1.81	1.08		
Type Tx34 Girders 24' Roadway 8.5" Slab	40	ALL	Tx34		10	0.6	270	13.01	13.01	2	6.5	4.000	5.000	0.835	-1.089	1605	0.690	0.830	1.85	2.40	2.60
	45	ALL	Tx34		10	0.6	270	13.01	13.01			4.500	5.500	1.050	-1.332	1750	0.670	0.840	1.90	2.46	2.42
	50	ALL	Tx34		12	0.6	270	13.01	13.01			4.000	5.000	1.294	-1.612	1868	0.650	0.840	1.53	1.98	1.81
	55	ALL	Tx34		12	0.6	270	13.01	13.01			4.000	5.000	1.553	-1.904	1981	0.630	0.840	1.24	1.61	1.33
	60	ALL	Tx34		14	0.6	270	13.01	12.44			4.000	5.000	1.845	-2.231	2287	0.620	0.850	1.27	1.64	1.22
	65	ALL	Tx34		16	0.6	270	12.76	11.76			4.000	5.000	2.161	-2.579	2605	0.610	0.850	1.25	1.62	1.06
	70	ALL	Tx34		20	0.6	270	12.41	9.61			4.000	5.100	2.461	-2.902	2888	0.590	0.850	1.46	1.89	1.13
	75	ALL	Tx34		24	0.6	270	12.18	7.84			4.300	5.400	2.818	-3.283	3223	0.580	0.860	1.57	2.04	1.15
	80	ALL	Tx34		26	0.6	270	12.09	8.09	4.700	5.700	3.168	-3.660	3554	0.570	0.860	1.39	1.96	1.04		
	85	ALL	Tx34		30	0.6	270	11.81	7.81	5.400	6.100	3.567	-4.078	3909	0.560	0.860	1.46	2.00	1.04		
Type Tx40 Girders 24' Roadway 8.5" Slab	40	ALL	Tx40		10	0.6	270	15.60	15.60	4	6.5	4.000	5.000	0.697	-0.889	1671	0.720	0.820	2.10	2.73	3.15
	45	ALL	Tx40		10	0.6	270	15.60	15.60			4.000	5.000	0.873	-1.080	1972	0.690	0.820	1.74	2.26	2.50
	50	ALL	Tx40		12	0.6	270	15.60	15.60			4.000	5.000	1.065	-1.299	2276	0.670	0.830	1.78	2.31	2.33
	55	ALL	Tx40		12	0.6	270	15.60	15.60			4.000	5.000	1.283	-1.538	2237	0.650	0.830	1.46	1.90	1.80
	60	ALL	Tx40		14	0.6	270	15.60	15.60			4.200	5.000	1.522	-1.801	2434	0.640	0.830	1.49	1.93	1.66
	65	ALL	Tx40		14	0.6	270	15.60	15.60			4.000	5.000	1.780	-2.081	2688	0.630	0.840	1.24	1.60	1.25
	70	ALL	Tx40		16	0.6	270	15.35	14.85			4.000	5.000	2.035	-2.349	2989	0.610	0.840	1.28	1.65	1.17
	75	ALL	Tx40		18	0.6	270	15.16	14.27			4.000	5.000	2.328	-2.657	3337	0.600	0.840	1.28	1.66	1.05
	80	ALL	Tx40		22	0.6	270	14.87	11.24			4.000	5.000	2.616	-2.961	3681	0.590	0.850	1.47	1.90	1.11
	85	ALL	Tx40		26	0.6	270	14.68	9.76			4.400	5.100	2.930	-3.287	4041	0.580	0.850	1.60	2.08	1.22
	90	ALL	Tx40		28	0.6	270	14.60	10.03			4.800	5.500	3.259	-3.626	4410	0.570	0.850	1.55	2.01	1.07
	95	ALL	Tx40		32	0.6	270	14.23	8.60	5.100	5.800	3.620	-3.991	4799	0.560	0.850	1.62	2.10	1.06		
	100	ALL	Tx40		36	0.6	270	13.93	8.93	5.800	6.600	4.006	-4.393	5245	0.560	0.850	1.47	1.94	1.06		
Type Tx46 Girders 24' Roadway 8.5" Slab	40	ALL	Tx46		10	0.6	270	17.60	17.60	4	6.5	4.000	5.000	0.613	-0.708	1732	0.740	0.810	2.35	3.05	3.78
	45	ALL	Tx46		10	0.6	270	17.60	17.60			4.000	5.000	0.768	-0.865	2066	0.720	0.810	1.93	2.50	3.01
	50	ALL	Tx46		12	0.6	270	17.60	17.60			4.000	5.000	0.937	-1.042	2452	0.700	0.820	1.97	2.55	2.81
	55	ALL	Tx46		12	0.6	270	17.60	17.60			4.000	5.000	1.127	-1.235	2726	0.680	0.820	1.63	2.11	2.22
	60	ALL	Tx46		14	0.6	270	17.60	17.60			4.000	5.000	1.332	-1.438	2951	0.660	0.820	1.68	2.18	2.10
	65	ALL	Tx46		14	0.6	270	17.60	17.60			4.000	5.000	1.557	-1.662	2905	0.650	0.820	1.41	1.82	1.64
	70	ALL	Tx46		14	0.6	270	17.60	17.60			4.000	5.000	1.798	-1.898	3157	0.640	0.830	1.18	1.52	1.25
	75	ALL	Tx46		16	0.6	270	17.35	16.85			4.000	5.000	2.050	-2.137	3495	0.620	0.830	1.23	1.59	1.17
	80	ALL	Tx46		18	0.6	270	17.16	16.27			4.000	5.000	2.304	-2.384	3859	0.610	0.830	1.25	1.63	1.09
	85	ALL	Tx46		22	0.6	270	16.88	15.06			4.000	5.000	2.591	-2.656	4249	0.600	0.830	1.46	1.89	1.30
	90	ALL	Tx46		24	0.6	270	16.77	14.10			4.000	5.000	2.870	-2.923	4631	0.590	0.840	1.45	1.88	1.06
	95	ALL	Tx46		28	0.6	270	16.60	11.46			4.200	5.000	3.192	-3.234	5087	0.590	0.840	1.57	2.03	1.08
	100	ALL	Tx46		32	0.6	270	16.23	9.48			4.400	5.000	3.524	-3.542	5513	0.580	0.840	1.65	2.14	1.07
	105	ALL	Tx46		36	0.6	270	15.94	9.94			5.000	5.800	3.856	-3.851	5937	0.570	0.840	1.72	2.23	1.17
110	ALL	Tx46		38	0.6	270	15.81	10.45	5.400	6.300	4.200	-4.169	6370	0.560	0.840	1.67	2.16	1.04			
115	ALL	Tx46		42	0.6	270	15.60	10.75	6.000	7.000	4.584	-4.532	6886	0.560	0.840	1.46	1.96	1.05			

- 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 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

Texas Department of Transportation
 Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER STANDARD DESIGNS
 24' ROADWAY

IGSD-24

FILE: IG-IGSD24-21.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.

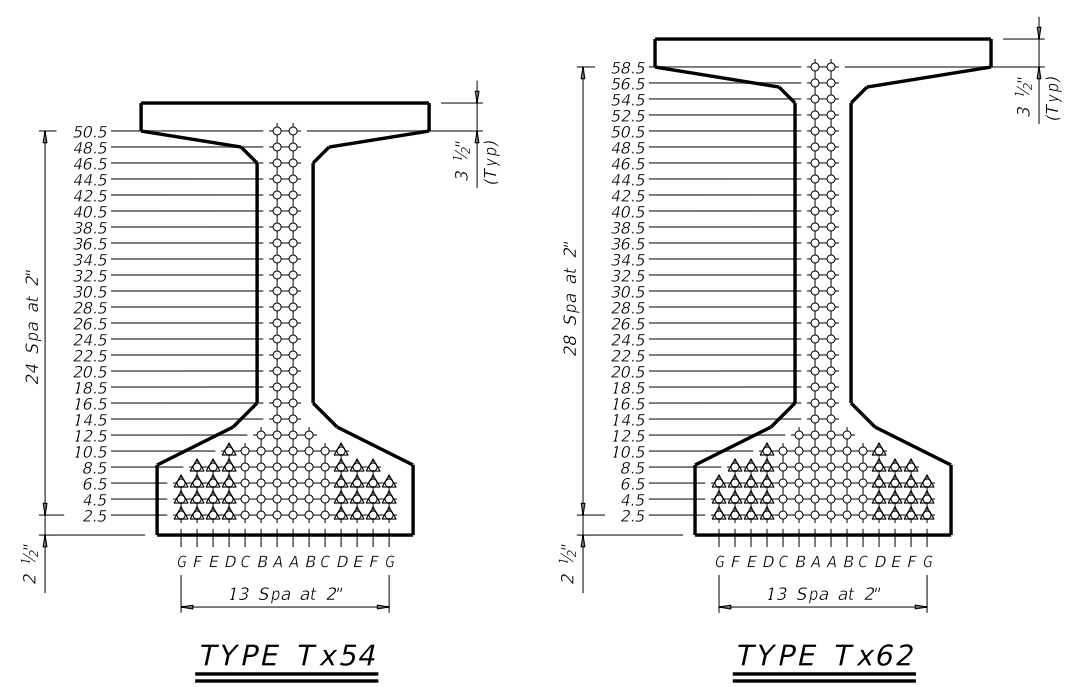
DATE: FILE:

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DATE:
FILE:

STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN					LOAD RATING FACTORS			NON-STANDARD STRAND PATTERNS	
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS					RELEASE STRGTH ① f'ci (ksi)			MINIMUM 28 DAY COMP STRGTH f'c (ksi)	DESIGN LOAD COMP STRESS (TOP ̵) (SERVICE I) Fct(ksi)	DESIGN LOAD TENSILE STRESS (BOT ̵) (SERVICE III) Fcb(ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR ②		STRENGTH I		SERVICE III	PATTERN	STRAND ARRANGEMENT AT ̵ OF GIRDER	
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" ̵ (in)								"e" END (in)	Moment	Shear	Inv	Opr			Inv
Type Tx54 Girders 24' Roadway 8.5" Slab	40	ALL	Tx54		8	0.6	270	21.01	21.01			4.000	5.000	0.511	-0.578	1798	0.770	0.800	2.05	2.66	3.76		
	45	ALL	Tx54		10	0.6	270	21.01	21.01			4.000	5.000	0.636	-0.703	2126	0.740	0.800	2.24	2.90	3.69		
	50	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	0.781	-0.850	2533	0.720	0.810	1.81	2.35	2.91		
	55	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	0.938	-1.007	2951	0.700	0.810	1.90	2.46	2.79		
	60	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	1.108	-1.173	3271	0.680	0.810	1.60	2.07	2.25		
	65	ALL	Tx54		14	0.6	270	21.01	21.01			4.000	5.000	1.285	-1.348	3547	0.670	0.810	1.66	2.16	2.16		
	70	ALL	Tx54		14	0.6	270	21.01	21.01			4.000	5.000	1.482	-1.540	3502	0.660	0.820	1.41	1.82	1.73		
	75	ALL	Tx54		16	0.6	270	20.76	20.26	4	6.5	4.000	5.000	1.689	-1.733	3745	0.640	0.820	1.47	1.91	1.66		
	80	ALL	Tx54		16	0.6	270	20.76	20.76	4	8.5	4.000	5.000	1.912	-1.944	4001	0.630	0.820	1.26	1.63	1.30		
	85	ALL	Tx54		18	0.6	270	20.56	19.67	4	10.5	4.000	5.000	2.148	-2.166	4406	0.620	0.820	1.07	1.39	1.00		
	90	ALL	Tx54		20	0.6	270	20.41	19.21	4	14.5	4.000	5.000	2.379	-2.384	4806	0.610	0.820	1.33	1.73	1.16		
	95	ALL	Tx54		22	0.6	270	20.28	18.46	4	18.5	4.000	5.000	2.639	-2.624	5234	0.600	0.820	1.35	1.75	1.07		
	100	ALL	Tx54		26	0.6	270	20.08	16.39	4	28.5	4.000	5.000	2.896	-2.871	5699	0.600	0.830	1.52	1.97	1.14		
	105	ALL	Tx54		30	0.6	270	19.81	12.21	6	44.5	4.000	5.000	3.180	-3.130	6153	0.590	0.830	1.51	1.96	1.02		
	110	ALL	Tx54		32	0.6	270	19.63	11.38	6	50.5	4.100	5.000	3.477	-3.400	6619	0.580	0.830	1.63	2.12	1.03		
115	ALL	Tx54		36	0.6	270	19.34	12.01	6	50.5	4.700	5.500	3.786	-3.679	7096	0.570	0.830	1.60	2.07	1.00			
120	ALL	Tx54		38	0.6	270	19.22	13.22	6	44.5	5.200	6.100	4.116	-3.985	7646	0.570	0.830	1.65	2.14	1.01			
125	ALL	Tx54		42	0.6	270	19.01	12.72	6	50.5	5.600	6.600	4.415	-4.257	8113	0.560	0.830	1.71	2.24	1.09			
Type Tx62 Girders 24' Roadway 8.5" Slab	60	ALL	Tx62		12	0.6	270	25.78	25.78			4.000	5.000	0.878	-0.986	3525	0.700	0.800	1.81	2.35	2.73		
	65	ALL	Tx62		12	0.6	270	25.78	25.78			4.000	5.000	1.016	-1.133	3847	0.690	0.800	1.89	2.45	2.64		
	70	ALL	Tx62		14	0.6	270	25.78	25.78			4.000	5.000	1.171	-1.293	4173	0.680	0.810	1.61	2.08	2.16		
	75	ALL	Tx62		14	0.6	270	25.78	25.78			4.000	5.000	1.332	-1.455	4132	0.660	0.810	1.68	2.18	2.10		
	80	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	1.506	-1.633	4429	0.650	0.810	1.45	1.88	1.72		
	85	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	1.691	-1.819	4610	0.640	0.810	1.24	1.61	1.37		
	90	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	1.885	-2.013	5051	0.630	0.810	1.29	1.68	1.31		
	95	ALL	Tx62		20	0.6	270	25.18	24.78	4	6.5	4.000	5.000	2.081	-2.209	5493	0.620	0.820	1.11	1.44	1.02		
	100	ALL	Tx62		22	0.6	270	25.05	23.96	4	10.5	4.000	5.000	2.295	-2.420	5959	0.610	0.820	1.16	1.50	1.01		
	105	ALL	Tx62		24	0.6	270	24.94	23.28	4	14.5	4.000	5.000	2.514	-2.642	6475	0.610	0.820	1.37	1.78	1.10		
	110	ALL	Tx62		26	0.6	270	24.85	22.70	4	18.5	4.000	5.000	2.723	-2.850	6936	0.600	0.820	1.39	1.80	1.03		
	115	ALL	Tx62		30	0.6	270	24.58	17.78	6	40.5	4.000	5.000	2.963	-3.083	7440	0.590	0.820	1.56	2.02	1.09		
	120	ALL	Tx62		34	0.6	270	24.25	15.07	6	58.5	4.200	5.000	3.213	-3.325	7957	0.580	0.820	1.55	2.01	1.00		
	125	ALL	Tx62		36	0.6	270	24.11	17.11	6	48.5	4.700	5.600	3.480	-3.591	8551	0.580	0.820	1.64	2.13	1.04		
	130	ALL	Tx62		40	0.6	270	23.88	16.68	6	54.5	5.100	6.100	3.733	-3.836	9072	0.570	0.820	1.52	2.09	1.02		
135	ALL	Tx62		42	0.6	270	23.78	16.35	6	58.5	5.300	6.300	4.002	-4.104	9676	0.570	0.830	1.61	2.18	1.05			

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
 24' ROADWAY

IGSD-24

FILE: IG-IGSD24-21.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.	