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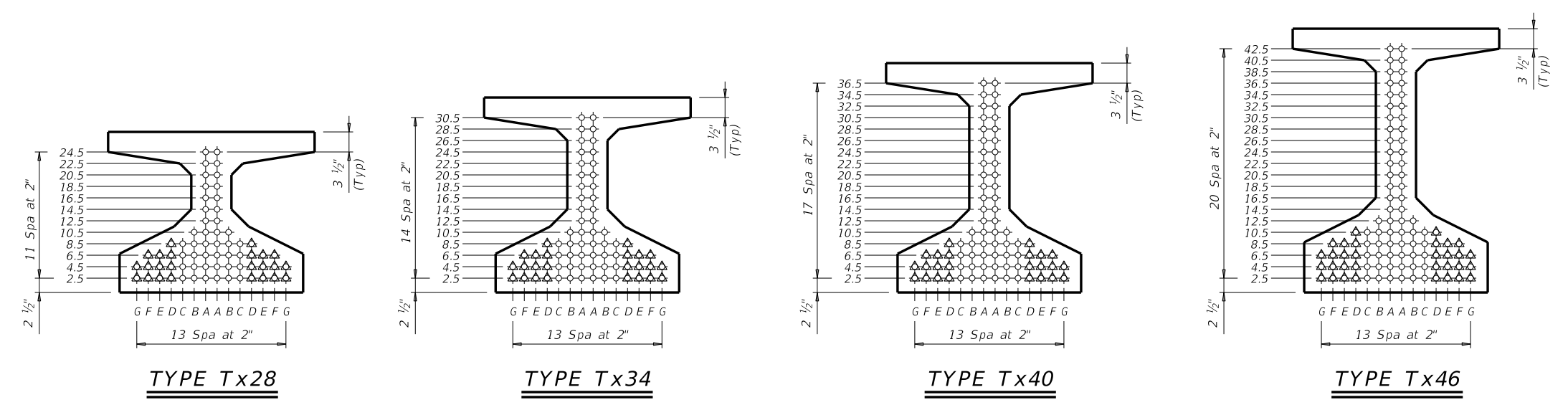
STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN				LOAD RATING FACTORS			
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS					f _{pu} (ksi)			"e" (in)	"e" END (in)	① f' _{ci} (ksi)	MINIMUM 28 DAY COMP STRGTH f' _c (ksi)	DESIGN LOAD COMP STRESS (TOP ϵ) (SERVICE 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
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH	"e" (in)		Moment	Shear								Inv	Opr	Inv
Type Tx28 Girders 28' Roadway 8.5' Slab	40	ALL	Tx28		12	0.6	270	10.48	10.48			4.700	5.000	1.152	-1.588	1581	0.760	0.960	1.68	2.18	2.02
	45	ALL	Tx28		12	0.6	270	10.48	10.48			4.800	5.800	1.458	-1.949	1578	0.740	0.970	1.58	2.05	1.76
	50	ALL	Tx28		14	0.6	270	10.48	9.62	2	8.5	4.000	5.200	1.787	-2.340	1855	0.710	0.970	1.34	1.73	1.26
	55	ALL	Tx28		18	0.6	270	10.04	7.81	4	14.5	4.000	6.000	2.167	-2.793	2180	0.700	0.980	1.26	1.64	1.04
	60	ALL	Tx28		22	0.6	270	9.75	6.48	4	22.5	4.400	6.500	2.557	-3.243	2487	0.680	0.980	1.33	1.82	1.04
	65	ALL	Tx28		24	0.6	270	9.65	7.65	4	16.5	5.200	6.600	2.999	-3.736	2808	0.660	0.980	1.23	1.91	1.04
70	ALL	Tx28		28	0.6	270	9.48	6.91	4	22.5	5.700	7.400	3.448	-4.249	3154	0.650	0.990	1.35	1.74	1.11	
Type Tx34 Girders 28' Roadway 8.5' Slab	40	ALL	Tx34		12	0.6	270	13.01	13.01			4.000	5.000	0.884	-1.199	1806	0.790	0.940	1.99	2.58	2.67
	45	ALL	Tx34		12	0.6	270	13.01	13.01			4.000	5.000	1.113	-1.460	1921	0.760	0.950	1.64	2.13	2.07
	50	ALL	Tx34		14	0.6	270	13.01	13.01			5.100	6.000	1.375	-1.769	2187	0.740	0.950	1.61	2.08	1.83
	55	ALL	Tx34		14	0.6	270	13.01	13.01			5.000	6.000	1.662	-2.098	2224	0.720	0.960	1.31	1.70	1.35
	60	ALL	Tx34		16	0.6	270	12.76	11.76	4	8.5	4.000	5.000	1.957	-2.432	2537	0.700	0.960	1.30	1.69	1.19
	65	ALL	Tx34		20	0.6	270	12.41	9.61	4	18.5	4.000	5.500	2.285	-2.804	2886	0.690	0.960	1.16	1.64	1.02
	70	ALL	Tx34		22	0.6	270	12.28	8.65	4	24.5	4.200	5.800	2.636	-3.195	3247	0.680	0.970	1.40	1.82	1.03
	75	ALL	Tx34		26	0.6	270	12.09	8.40	4	28.5	4.800	6.100	3.004	-3.588	3587	0.660	0.970	1.52	1.97	1.08
80	ALL	Tx34		30	0.6	270	11.81	7.81	6	26.5	5.300	6.500	3.398	-4.016	3966	0.650	0.970	1.32	2.03	1.06	
85	ALL	Tx34		34	0.6	270	11.48	7.25	6	30.5	5.800	7.100	3.830	-4.476	4364	0.640	0.980	1.33	1.79	1.03	
Type Tx40 Girders 28' Roadway 8.5' Slab	40	ALL	Tx40		10	0.6	270	15.60	15.60			4.000	5.000	0.735	-0.976	1872	0.820	0.930	1.82	2.36	2.73
	45	ALL	Tx40		12	0.6	270	15.60	15.60			4.000	5.000	0.917	-1.181	2207	0.790	0.930	1.88	2.44	2.58
	50	ALL	Tx40		14	0.6	270	15.60	15.60			4.500	5.500	1.130	-1.430	2590	0.770	0.940	1.85	2.40	2.31
	55	ALL	Tx40		14	0.6	270	15.60	15.60			4.300	5.300	1.364	-1.695	2518	0.750	0.940	1.53	1.98	1.79
	60	ALL	Tx40		16	0.6	270	15.35	14.35	4	8.5	4.000	5.000	1.604	-1.964	2637	0.730	0.950	1.52	1.97	1.63
	65	ALL	Tx40		16	0.6	270	15.35	14.35	4	8.5	4.000	5.000	1.876	-2.258	2970	0.710	0.950	1.29	1.67	1.25
	70	ALL	Tx40		18	0.6	270	15.16	14.27	4	8.5	4.000	5.000	2.170	-2.579	3347	0.700	0.950	1.27	1.65	1.10
	75	ALL	Tx40		22	0.6	270	14.87	11.24	4	24.5	4.000	5.300	2.461	-2.887	3694	0.680	0.950	1.16	1.66	1.00
	80	ALL	Tx40		24	0.6	270	14.77	10.77	4	28.5	4.300	5.500	2.793	-3.239	4093	0.670	0.960	1.25	1.84	1.03
	85	ALL	Tx40		28	0.6	270	14.60	10.03	4	36.5	4.800	5.700	3.120	-3.588	4489	0.660	0.960	1.36	1.99	1.08
90	ALL	Tx40		32	0.6	270	14.23	8.98	6	34.5	5.200	5.800	3.489	-3.972	4911	0.650	0.960	1.41	2.06	1.04	
95	ALL	Tx40		36	0.6	270	13.93	8.93	6	36.5	5.800	6.500	3.863	-4.359	5336	0.640	0.970	1.46	1.80	1.05	
Type Tx46 Girders 28' Roadway 8.5' Slab	40	ALL	Tx46		10	0.6	270	17.60	17.60			4.000	5.000	0.646	-0.778	1949	0.850	0.920	2.03	2.63	3.27
	45	ALL	Tx46		12	0.6	270	17.60	17.60			4.000	5.000	0.809	-0.947	2308	0.820	0.920	2.09	2.71	3.09
	50	ALL	Tx46		12	0.6	270	17.60	17.60			4.000	5.000	0.994	-1.141	2728	0.790	0.920	1.71	2.22	2.43
	55	ALL	Tx46		14	0.6	270	17.60	17.60			4.000	5.000	1.190	-1.346	3018	0.770	0.930	1.73	2.24	2.25
	60	ALL	Tx46		14	0.6	270	17.60	17.60			4.500	5.500	1.412	-1.577	3048	0.760	0.930	1.70	2.20	2.16
	65	ALL	Tx46		16	0.6	270	17.35	16.35	4	8.5	4.000	5.000	1.649	-1.814	3161	0.740	0.930	1.44	1.87	1.61
	70	ALL	Tx46		16	0.6	270	17.35	16.85	4	6.5	4.000	5.000	1.903	-2.063	3487	0.720	0.940	1.23	1.59	1.24
	75	ALL	Tx46		18	0.6	270	17.16	15.83	4	10.5	4.000	5.000	2.162	-2.322	3884	0.710	0.940	1.24	1.61	1.14
	80	ALL	Tx46		22	0.6	270	16.88	15.06	4	14.5	4.000	5.000	2.452	-2.607	4306	0.700	0.940	1.21	1.61	1.01
	85	ALL	Tx46		24	0.6	270	16.77	14.10	4	20.5	4.000	5.000	2.738	-2.889	4726	0.690	0.940	1.38	1.82	1.07
	90	ALL	Tx46		28	0.6	270	16.60	11.46	4	40.5	4.200	5.200	3.061	-3.199	5174	0.680	0.950	1.47	1.99	1.09
	95	ALL	Tx46		32	0.6	270	16.23	9.85	6	40.5	4.500	5.400	3.387	-3.512	5624	0.670	0.950	1.55	2.11	1.10
100	ALL	Tx46		36	0.6	270	15.94	10.27	6	40.5	5.100	5.800	3.728	-3.837	6086	0.660	0.950	1.55	2.17	1.10	
105	ALL	Tx46		40	0.6	270	15.70	10.30	6	42.5	5.600	6.400	4.099	-4.186	6571	0.650	0.950	1.44	1.87	1.01	

- 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

Texas Department of Transportation
 Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER STANDARD DESIGNS
 28' ROADWAY

IGSD-28

FILE: IG-IGSD28-21.dgn	DN: EFC	CK: AJF	DW: EFC	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS				
10-19: Redesign girders.				
1-21: Added load rating.				
DIST	COUNTY			SHEET NO.

DATE: FILE:

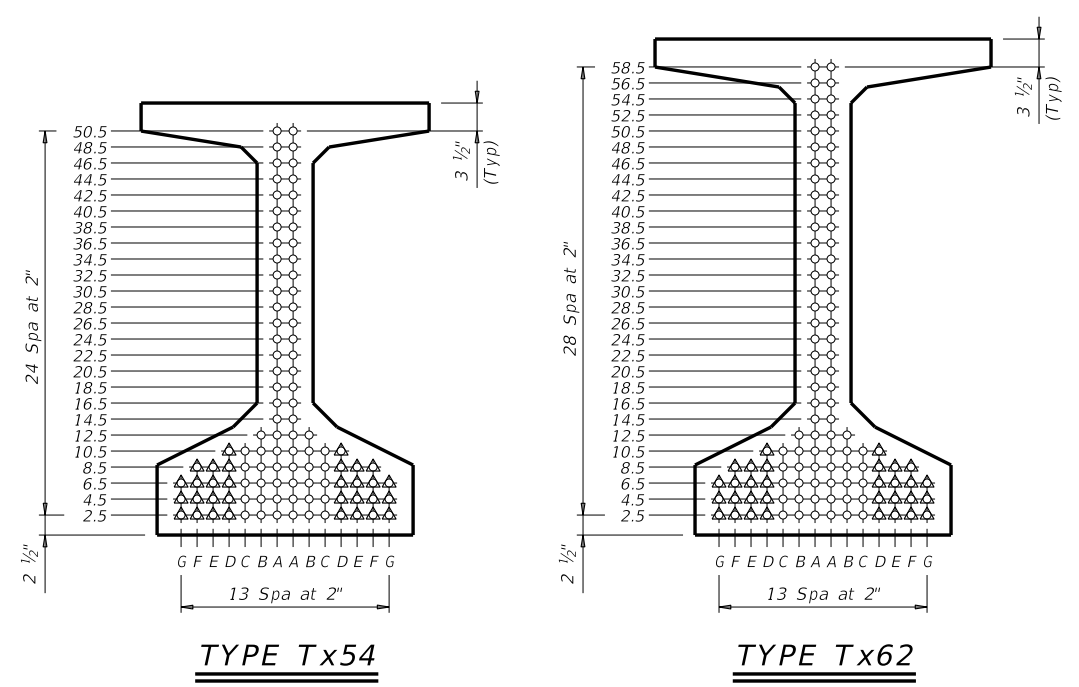
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DATE: FILE:

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 (BOT ϵ) (SERVICE III) fcb(ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR (2)	
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" $\bar{\epsilon}$ (in)		"e" END (in)	Moment	Shear	Inv							Opr	Inv
Type Tx54 Girders 28' Roadway 8.5" Slab	40	ALL	Tx54		10	0.6	270	21.01	21.01			4.000	5.000	0.536	-0.634	2015	0.880	0.910	2.32	3.00	3.94
	45	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	0.670	-0.771	2387	0.850	0.910	2.39	3.10	3.74
	50	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	0.822	-0.929	2824	0.820	0.910	1.97	2.56	3.00
	55	ALL	Tx54		14	0.6	270	21.01	21.01			4.000	5.000	0.983	-1.096	3285	0.800	0.920	2.00	2.59	2.80
	60	ALL	Tx54		14	0.6	270	21.01	21.01			4.000	5.000	1.163	-1.277	3619	0.780	0.920	1.69	2.18	2.27
	65	ALL	Tx54		16	0.6	270	20.76	20.26	4	6.5	4.000	5.000	1.356	-1.468	3862	0.760	0.920	1.71	2.22	2.13
	70	ALL	Tx54		16	0.6	270	20.76	20.26	4	6.5	4.000	5.000	1.567	-1.677	3811	0.750	0.920	1.45	1.88	1.71
	75	ALL	Tx54		18	0.6	270	20.56	19.67	4	8.5	4.000	5.000	1.782	-1.884	4043	0.730	0.930	1.49	1.93	1.61
	80	ALL	Tx54		18	0.6	270	20.56	19.67	4	8.5	4.000	5.000	2.026	-2.119	4448	0.720	0.930	1.27	1.65	1.26
	85	ALL	Tx54		20	0.6	270	20.41	18.81	4	12.5	4.000	5.000	2.263	-2.349	4883	0.710	0.930	1.29	1.67	1.17
	90	ALL	Tx54		22	0.6	270	20.28	18.46	4	14.5	4.000	5.000	2.528	-2.601	5348	0.700	0.930	1.30	1.68	1.07
	95	ALL	Tx54		26	0.6	270	20.08	16.39	4	28.5	4.000	5.000	2.786	-2.848	5805	0.690	0.930	1.47	1.91	1.13
	100	ALL	Tx54		30	0.6	270	19.81	12.21	6	44.5	4.000	5.000	3.077	-3.120	6296	0.680	0.940	1.43	1.88	1.01
	105	ALL	Tx54		32	0.6	270	19.63	12.51	6	44.5	4.300	5.000	3.381	-3.403	6800	0.670	0.940	1.55	2.03	1.00
	110	ALL	Tx54		36	0.6	270	19.34	12.01	6	50.5	4.700	5.400	3.686	-3.686	7303	0.660	0.940	1.64	2.16	1.06
115	ALL	Tx54		40	0.6	270	19.11	12.51	6	50.5	5.300	6.100	4.016	-3.989	7832	0.650	0.940	1.30	2.00	1.01	
120	ALL	Tx54		44	0.6	270	18.83	11.55	8	48.5	5.600	6.500	4.352	-4.308	8420	0.650	0.940	1.46	1.88	1.07	
125	ALL	Tx54	*	48	0.6	270	18.42	10.09	10	50.5	5.800	7.200	4.709	-4.633	8977	0.640	0.940	1.46	1.97	1.01	
Type Tx62 Girders 28' Roadway 8.5" Slab	60	ALL	Tx62		14	0.6	270	25.78	25.78			4.000	5.000	0.916	-1.069	3911	0.800	0.910	1.91	2.48	2.76
	65	ALL	Tx62		14	0.6	270	25.78	25.78			4.000	5.000	1.069	-1.235	4248	0.790	0.910	1.92	2.49	2.58
	70	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	1.231	-1.403	4544	0.770	0.910	1.66	2.15	2.15
	75	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	1.395	-1.579	4502	0.760	0.920	1.68	2.18	2.03
	80	ALL	Tx62		18	0.6	270	25.33	25.33			4.000	5.000	1.576	-1.763	4785	0.740	0.920	1.47	1.91	1.69
	85	ALL	Tx62		18	0.6	270	25.33	25.33			4.000	5.000	1.771	-1.964	5084	0.730	0.920	1.27	1.65	1.35
	90	ALL	Tx62		18	0.6	270	25.33	25.33			4.000	5.000	1.976	-2.174	5571	0.720	0.920	1.30	1.68	1.27
	95	ALL	Tx62		22	0.6	270	25.05	23.96	4	10.5	4.000	5.000	2.192	-2.393	6073	0.710	0.920	1.12	1.45	1.00
	100	ALL	Tx62		24	0.6	270	24.94	23.28	4	14.5	4.000	5.000	2.400	-2.605	6563	0.700	0.920	1.33	1.73	1.11
	105	ALL	Tx62		28	0.6	270	24.78	20.21	4	36.5	4.000	5.000	2.636	-2.841	7092	0.690	0.930	1.25	1.73	1.02
	110	ALL	Tx62		30	0.6	270	24.58	17.78	6	40.5	4.000	5.000	2.858	-3.067	7602	0.680	0.930	1.65	2.14	1.19
	115	ALL	Tx62		34	0.6	270	24.25	15.42	6	56.5	4.200	5.000	3.113	-3.319	8156	0.670	0.930	1.62	2.10	1.09
	120	ALL	Tx62		36	0.6	270	24.11	17.11	6	48.5	4.700	5.500	3.378	-3.579	8725	0.660	0.930	1.59	2.06	1.05
	125	ALL	Tx62		40	0.6	270	23.88	16.68	6	54.5	5.100	6.000	3.629	-3.839	9330	0.660	0.930	1.67	2.31	1.20
	130	ALL	Tx62		44	0.6	270	23.60	14.87	8	56.5	5.300	6.200	3.913	-4.116	9926	0.650	0.930	1.60	2.15	1.18
135	ALL	Tx62		48	0.6	270	23.28	14.94	8	58.5	5.800	6.700	4.206	-4.402	10535	0.640	0.940	1.55	1.93	1.08	

NON-STANDARD STRAND PATTERNS	
PATTERN	STRAND ARRANGEMENT AT $\bar{\epsilon}$ OF GIRDER
*	2.5(14),4.5(14),6.5(14),8.5(4),10.5(2)

- (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.



HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER STANDARD DESIGNS
28' ROADWAY

IGSD-28

FILE: IG-IGSD28-21.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.