HSS Hollow Structural Sections

LRFD COLUMN LOAD TABLES

HSS: TECHNICAL BROCHURE

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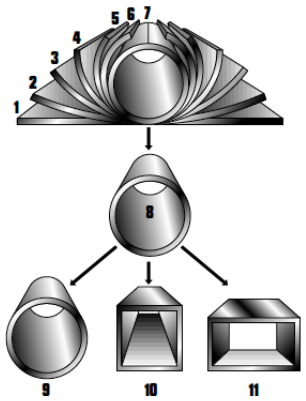
HSS Manufacturing Methods

The transformation of steel strip into hollow structural sections (HSS) is the result of a series of operations including forming, welding and sizing. Currently three methods are being used in North America for the manufacture of HSS. These methods are described below. Each method meets ASTM A-500 and CSA G-40.21 requirements for the the manufacture of HSS, and the sizes listed in this brochure may be produced to either standard.

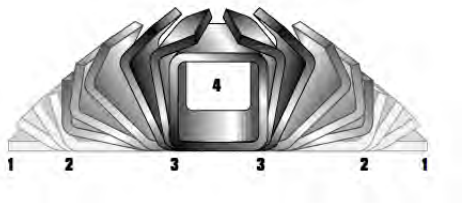
Electric Resistance Welding (ERW) Process

In the tube mill, flat steel strip (1) is formed continuously around its longitudinal axis to produce a round tube. This is done by moving the strip through a progressive set of rolls (2-6). The strip edges (7) are heated by either high frequency induction or contact welding and then forged together by weld rolls to create a continuous longitudinal weld without the addition of filler metal. The weld seam (8) is then cooled and processed through a set of sizing shaping rolls which cold-form it into a round (9), square (10) or rectangular (11) section.



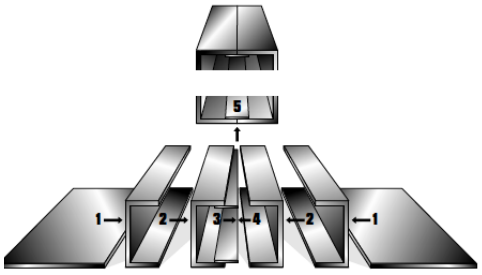
Form-Square Weld-Square (ERW) Process

In the tube mill, flat steel strip (1) is formed continuously around its longitudinal axis to produce a round tube. This is done by moving the strip through a progressive set of rolls (2-6). The strip edges (7) are heated by either high frequency induction or contact welding and then forged together by weld rolls to create a continuous longitudinal weld without the addition of filler metal. The weld seam (8) is then cooled and processed through a set of sizing shaping rolls which cold-form it into a round (9), square (10) or rectangular (11) section.



Submerged Arc Weld (SAW) Process

In the tube mill, flat steel strip (1) is formed continuously around its longitudinal axis to produce a round tube. This is done by moving the strip through a progressive set of rolls (2-6). The strip edges (7) are heated by either high frequency induction or contact welding and then forged together by weld rolls to create a continuous longitudinal weld without the addition of filler metal. The weld seam (8) is then cooled and processed through a set of sizing shaping rolls which cold-form it into a round (9), square (10) or rectangular (11) section.



Foreword

Note: The information presented in this publication has been prepared in accordance with recognized engineering principles and is for general information only. While it is believed to be accurate, this information should not be used or relied upon for any specific application without competent professional examination and verification of its accuracy, suitability, and applicability by a licensed professional engineer, designer, or architect. The publication of the material contained herein is not intended as a representation or warranty on the part of The Steel Tube Institute of North America or of any other person named herein, that this information is suitable for any general or particular use or of freedom from infringement of any patent or patents. Anyone making use of this information assumes all liability arising from such use.

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Load and Resistance Factor Design (LRFD) column load tables are presented for square, rectangular and round hollow structural sections (HSS) manufactured by the electric resistance welding (ERW) method and for square, and rectangular HSS manufactured by the submerged arc welding (SAW) method. Tables of design stresses for compression members for six minimum specified yield stress steels from Fy = 42 ksi to Fy = 70 ksi are also included.

The tabulated design strength loads and the compression member design stresses have been calculated in accordance with the AISC 2010 Specification for Structural Steel Buildings..

Revised section property data for HSS is published in "Hollow Structural Sections - Dimensions and Section Properties" available from the Steel Tube Institute of North America.

Tables for square and rectangular HSS are presented for Fy = 46 ksi and for Fy = 50 ksi. Separate tables are used for HSS sizes produced by the ERW and SAW manufacturing methods.

Tables for round HSS are presented for Fy = 42 ksi, Fy = 46 ksi and for Fy = 50 ksi. The round HSS are produced by the ERW manufacturing method.

The design strength loads have been calculated for effective lengths, KL, with respect to the least radius of gyration, r or ry, varying from 0 to 40 feet. A HSS defined as a "slender element cross section", in accordance with Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings., is identified in the tables with an asterisk (*) immediately following the design wall thickness parameter in the heading.

The tabulated values of compression member design stresses are calculated in accordance with the requirements of AISC Chapter E of the AISC 2010 "Specification" Note that these design stresses do not apply to a HSS defined as a "slender element cross section".

Refer to part 4, Design of Compression Members, of the AISC 14th Edition "Steel Construction Manual " for a discussion of the design strength of columns. The symbols in these tables follow those used in the AISC "Manual".

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Column Load Tables

Design Stress Tables

HOW TO USE COLUMN TABLE LOADS

Example 1:

Design the lightest 6-inch square ERW HSS column of Fy = 46 ksi (ASTM A500 Gr. B) to support a factored concentric load of 148 kips.

The largest effective length, KL, is 16 feet.

Enter the Fy = 46 ksi table for the 6-inch square ERW HSS.

Read across the row at KL = 16 ft. and note the following:

6 x 6 x 5/8 is good for 286 kips > 148 kips - O.K.

x 1/2 is good for 245 kips > 148 kips - O.K.

x 3/8 is good for 195 kips > 148 kips - O.K.

x 5/16 is good for 167 kips > 148 kips - O.K.

x 1/4 is good for 138 kips < 148 kips - not good

Select: 6 x 6 x 5/16 HSS (Weight = 23.3 lbs./ft.)

Example 2:

Design the lightest square ERW HSS column of Fy = 46 ksi (ASTM A500 Gr. B) to support a factored concentric load of 145 kips.

The largest effective length, KL, is 12 feet.

Enter the Fy = 46 ksi tables for square ERW HSS.

Read across the rows at KL = 12 ft. and note the following:

5 x 5 x 5/16 (19.1 lbs./ft.) is good for 148 kips > 145 kips - O.K.

5 1/2 x 5 1/2 x 1/4 (17.3 lbs./ft.) is good for 145 kips = 145 kips - O.K.

6 x 6 x 1/4 (19.0 lbs./ft.) is good for 168 kips > 145 kips - O.K.

7 x 7 x 3/16 (17.1 lbs./ft.) is good for 161 kips > 145 kips - O.K.

8 x 8 x 3/16 (19.6 lbs./ft.) is good for 179 kips > 145 kips - O.K.

Select: 7 x 7 x 3/16 HSS (Weight = 17.1 lbs./ft.)

Example 3:

Design the lightest 8-inch by 4-inch rectangular ERW HSS column of Fy = 50 ksi (ASTM A500 Gr. C) to support a factored concentric load of 170 kips.

The effective length, KL, with respect to the minor axis is 14 feet. The effective length, KL, with respect to the major axis is 26 feet.

Enter the Fy = 50 ksi table for the 8-inch x 4-inch rectangular

EWR HSS. Read across the row at KL = 14 ft. and note the following:

8 x 4 x 5/8 is good for 213 kips > 170 kips - O.K.

x 1/2 is good for 188 kips > 170 kips - O.K.

x 3/8 is good for 154 kips < 170 kips - not good

Tentatively select: 8 x 4 x 1/2

rx /ry = 1.74

Equivalent effective length for the major axis:

26 / 1.74 = 14.9

Enter the same table, read across the row at KL = 14.9 and note the following:

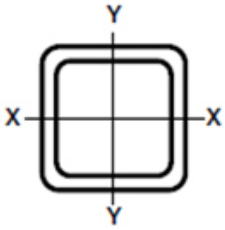
8 x 4 x 5/8 is good for 184 kips (interpolated) > 170 kips

rx /ry = 1.75 - O.K.

8 x 4 x 1/2 is good for 163 kips (interpolated) < 170 kips - not good

Select: 8 x 4 x 5/8 HSS (Weight = 42.3 lbs./ft.)

HSS/SQUARE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

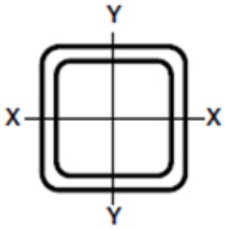


Design Axial Strength in kips (ϕ_c = 0.90)
Fy=46ksi

Nominal Size		16X16			14x14				12x12				
Wall Thickness		1/2	3/8	5/16	5/8	1/2	3/8	5/16	5/8	1/2	3/8	5/16	1/4
Weight Per Foot		103.3	78.52	65.87	110	89.68	68.31	57.36	93.34	76.07	58.1	48.86	39.43
Design Wall Thickness		0.465	0.349*	0.291*	0.581	0.465	0.349*	0.291 *	0.581	0.465	0.349	0.291*	0.233*
Effective Length KL (ft)	0	1170	782	572	1250	1020	748	551	1060	865	662	526	359
	2	1170	781	572	1253	1017	747	550	1062	864	661	525	359
	3	1169	781	572	1251	1015	747	550	1060	862	660	525	359
	4	1167	780	571	1248	1013	745	549	1056	859	658	524	358
	5	1165	779	571	1244	1010	744	548	1052	856	655	522	357
	6	1160	779	570	1240	1010	743	547	1050	852	652	521	356
	7	1160	777	569	1230	1000	741	546	1040	847	648	519	355
	8	1150	776	568	1230	998	738	545	1030	841	644	517	354
	9	1140	774	567	1220	992	736	543	1030	835	640	515	353
	10	1140	772	566	1210	986	733	541	1020	828	634	512	351
	11	1140	769	564	1210	980	729	539	1010	820	629	509	350
	12	1130	767	563	1200	972	726	537	997	812	622	505	348
	13	1120	764	561	1190	965	722	535	985	803	616	502	346
	14	1120	761	559	1180	956	718	532	973	793	609	498	344
	15	1110	758	557	1170	947	713	529	961	783	601	494	342
	16	1100	755	555	1150	938	708	526	947	773	593	489	339
	17	1090	751	553	1140	928	703	523	933	761	584	484	337
	18	1080	747	551	1130	918	697	520	918	750	576	479	334
	19	1070	743	549	1110	907	691	516	903	738	567	474	331
	20	1060	739	546	1100	896	683	513	887	725	557	468	328
	21	1050	735	543	1090	884	674	509	871	712	547	459	325
	22	1040	730	540	1070	872	665	505	854	699	537	451	321
	23	1030	725	537	1050	859	656	500	837	685	527	442	318
	24	1020	720	534	1040	846	646	496	819	671	516	434	314
	25	1010	714	531	1020	833	636	491	801	656	505	425	310
	26	994	709	528	1010	820	626	486	783	642	494	416	306
	27	981	703	524	988	806	616	481	764	627	483	406	301
	28	968	697	520	970	792	605	476	745	612	472	397	297
	29	955	691	517	953	777	594	470	726	597	460	387	292
	30	941	684	513	934	763	583	464	707	581	449	378	287
	31	927	677	509	916	748	572	458	688	566	437	368	282
	32	913	670	504	897	733	561	452	669	550	425	358	277
	33	899	663	500	878	718	550	446	649	535	413	348	272
	34	884	656	495	859	702	538	439	630	519	402	338	266
	35	870	647	491	840	687	527	432	610	503	390	329	260
	36	855	640	486	821	671	515	425	591	488	378	319	254
	37	840	631	481	801	656	503	418	572	472	366	309	248
	38	825	623	476	782	640	492	411	552	457	354	299	242
	39	809	614	470	762	625	480	403	534	442	343	290	235
	40	794	606	465	743	609	468	395	515	426	331	280	228
Area, In .^{2}		28.3	21.5	18.1	30.3	24.6	18.7	15.7	25.7	20.9	16	13.4	10.8
1, In .^{4}		1130	873	739	897	743	577	490	548	457	357	304	248
r, I n.		6.31	6.37	6.39	5.44	5.49	5.55	5.58	4.62	4.68	4.73	4.76	4.79

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.

HSS/SQUARE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

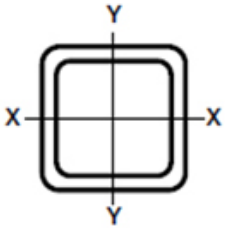


Design Axial Strength in kips (ϕ = 0.90)
Fy=46ksi

Nominal Size		10x10						9x9				
Wall Thickness		5/8	1/2	3/8	5/16	1/4	3/16	1/2	3/8	5/16	1/4	3/16
Weight Per Foot		76.3	62.5	47.9	40.4	32.6	24.7	55.7	42.8	36.1	29.2	22.2
Design Wall Thickness		0.581	0.465	0.349	0.291	0.233*	0.174*	0.465	0.349	0.291	0.233*	0.174*
Effective Length KL (ft)	0	869	712	546	460	342	206	633	489	411	330	201
	2	867	710	545	458	341	206	631	487	409	329	201
	3	864	708	543	457	341	206	629	485	408	328	200
	4	860	705	541	455	340	205	625	482	406	327	200
	5	855	701	538	452	339	205	621	479	403	325	199
	6	849	696	534	449	337	204	615	475	399	323	198
	7	841	690	530	446	336	203	609	470	395	320	197
	8	833	683	525	442	334	202	601	465	391	317	196
	9	823	676	519	437	331	201	593	458	386	312	195
	10	813	667	513	432	329	200	584	452	380	308	193
	11	802	658	506	426	326	199	574	444	374	303	192
	12	789	648	499	420	323	198	563	436	367	298	190
	13	776	638	491	414	320	196	552	428	360	292	188
	14	762	627	483	407	316	195	540	419	353	286	186
	15	748	615	474	399	313	193	527	409	345	280	184
	16	732	603	465	392	308	191	514	399	337	273	181
	17	716	590	455	384	304	189	501	389	328	267	178
	18	700	577	446	375	299	187	487	379	320	260	176
	19	682	563	435	367	295	185	472	368	311	252	173
	20	665	549	425	358	289	183	457	357	301	245	170
	21	647	535	414	349	283	180	442	345	292	237	166
	22	628	520	403	340	275	178	427	334	283	230	163
	23	610	505	392	330	268	175	412	322	273	222	159
	24	591	490	380	321	260	172	396	311	263	214	155
	25	572	474	369	311	253	169	381	299	253	206	151
	26	552	459	357	301	245	166	365	287	244	198	147
	27	533	443	345	292	237	163	350	275	234	190	142
	28	514	428	333	282	229	159	335	264	224	183	138
	29	495	412	322	272	221	156	319	252	214	175	133
	30	475	397	310	262	213	152	305	241	205	167	128
	31	456	381	298	252	205	148	290	229	195	159	122
	32	437	366	287	243	198	144	275	218	186	152	116
	33	419	351	275	233	190	140	261	208	177	145	111
	34	400	336	264	223	182	136	247	197	168	137	105
	35	382	321	252	214	175	131	233	186	159	130	100
	36	364	307	241	205	167	127	220	176	150	123	94.5
	37	347	292	231	196	160	122	209	167	142	117	90
	38	329	278	220	187	153	117	198	158	135	111	84.9
	39	313	264	209	178	146	111	188	150	128	105	81
	40	297	251	199	169	138	106	179	143	122	99.8	76.6
Area, In .^{2}		21	17.2	13.2	11.1	8.96	6.76	15.3	11.8	9.92	8.03	6.06
1, In .^{4}		304	256	202	172	141	108	183	145	124	102	78.2
r, I n.		3.8	3.86	3.92	3.94	3.97	4	3.45	3.51	3.54	3.56	3.59

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.

HSS/SQUARE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

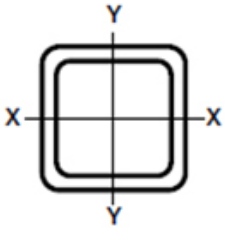


Design Axial Strength in kips (ϕ = 0.90)
Fy=46ksi

Nominal Size		8x8						7x7					
Wall Thickness		5/8	1/2	3/8	5/16	1/4	3/16	5/8	1/2	3/8	5/16	1/4	3/16
Weight Per Foot		59.3	48.9	37.7	31.8	25.8	19.6	50.8	42.1	32.6	27.6	22.4	17.1
Design Wall Thickness		0.581	0.465	0.349	0.291	0.233	0.174*	0.581	0.465	0.349	0.291	0.233	0.174*
Effective Length KL (ft)	0	679	559	431	363	294	195	580	480	371	314	255	187
	2	676	557	429	361	293	194	576	478	369	313	254	186
	3	672	554	427	359	291	194	572	474	367	311	253	185
	4	667	550	424	357	289	193	566	470	363	308	250	184
	5	661	544	420	354	287	192	559	464	359	304	247	183
	6	653	538	415	350	284	191	550	457	354	300	244	181
	7	644	531	410	346	280	190	540	448	348	295	240	179
	8	633	523	404	340	276	188	528	439	341	289	235	177
	9	622	513	397	335	272	186	515	429	333	283	230	174
	10	609	503	389	329	267	184	501	417	325	276	225	170
	11	596	492	381	322	261	182	486	405	316	268	219	166
	12	581	481	372	315	255	179	470	393	306	260	212	161
	13	565	468	363	307	249	176	453	379	296	252	206	156
	14	549	455	353	299	243	174	436	365	286	243	199	151
	15	532	441	343	290	236	170	418	350	275	234	191	146
	16	514	427	333	282	229	167	399	336	264	225	184	140
	17	496	413	322	273	222	163	381	320	252	215	176	134
	18	478	398	311	263	214	159	362	305	241	206	169	128
	19	459	383	299	254	207	155	343	290	229	196	161	123
	20	440	367	288	244	199	151	324	274	217	186	153	117
	21	421	352	276	234	191	146	305	259	206	176	145	111
	22	402	337	264	225	183	140	287	244	194	167	137	105
	23	383	321	253	215	175	134	268	229	183	157	130	99.1
	24	364	306	241	205	168	128	251	214	172	148	122	93.4
	25	345	290	229	195	160	122	233	200	161	139	115	87.8
	26	326	275	218	186	152	116	216	186	150	130	107	82.4
	27	308	260	206	176	144	111	201	173	140	121	100	77
	28	290	246	195	167	137	105	186	161	130	112	93.4	71.7
	29	273	231	184	158	129	99.3	174	150	121	105	87	66.8
	30	256	217	174	149	122	93.9	162	140	113	97.9	81.3	62.5
	31	239	204	163	140	115	89	152	131	106	92	76	58
	32	225	191	153	131	108	83.2	143	123	99.4	86	71.5	54.9
	33	211	180	144	124	101	78	134	116	94	81	67	52
	34	199	169	136	116	95.6	73.7	126	109	88.1	76.2	63.3	48.6
	35	188	160	128	110	90	70	119	103	83	72	60	46
	36	177	151	121	104	85.3	65.7	113	97.1	78.6	68	56.5	43.4
	37	168	143	115	98	81	62	107	92	74	64	53	41
	38	159	136	109	93.2	76.5	59	101	87.2	70.5	61	50.7	38.9
	39	151	129	103	89	73	56	96	83	67	58	48	37
	40	144	122	98	84.1	69.1	53.2	91.4	78.7	63.6	55.1	45.8	35.1
Area, In .^{2}		16.4	13.5	10.4	8.76	7.1	5.37	14	11.6	8.97	7.59	6.17	4.67
1, In .^{4}		146	125	100	85.6	70.7	54.4	93.4	80.5	65	56.1	46.5	36
r, I n.		2.99	3.04	3.1	3.13	3.15	3.18	2.58	2.63	2.69	2.72	2.75	2.77

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.

HSS/SQUARE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

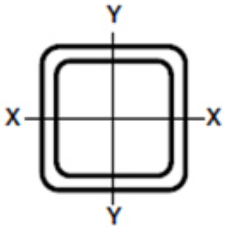


Design Axial Strength in kips (ϕ = 0.90)
Fy=46ksi

Nominal Size		6x6						
Wall Thickness		5/8	1/2	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		42.3	35.2	27.5	23.3	19	14.5	9.86
Design Wall Thickness		0.581	0.465	0.349	0.291	0.233	0.174	0.116*
Effective Length KL (ft)	0	484	403	314	266	217	165	89.6
	2	480	400	311	264	215	164	89
	3	475	396	309	262	214	162	89
	4	469	391	305	259	211	160	88
	5	460	384	300	254	208	158	88
	6	450	376	293	249	204	155	86.8
	7	438	367	286	244	199	151	85.8
	8	425	356	279	237	194	148	84.6
	9	410	344	270	230	188	143	83.3
	10	394	332	260	222	182	139	81.8
	11	378	319	250	214	175	134	80.1
	12	360	305	240	205	168	129	78.3
	13	342	290	229	196	161	123	76.2
	14	324	275	218	187	153	118	74
	15	305	260	206	177	146	112	71.6
	16	286	245	195	167	138	106	69.1
	17	267	230	183	158	130	100	66.3
	18	249	215	172	148	122	94.2	63.4
	19	231	200	160	138	115	88.4	60.2
	20	213	185	149	129	107	82.7	56.7
	21	196	171	138	120	99.4	77	52.9
	22	179	157	127	111	92.1	71.5	49.2
	23	163	144	117	102	85.1	66.2	45.6
	24	150	132	107	93.5	78.1	60.9	42
	25	138	122	98.9	86.1	72	56.1	38.7
	26	128	112	91.4	79.6	66.6	51.9	35.8
	27	119	104	84.8	73.8	61.7	48.1	33.2
	28	110	96.9	78.8	68.7	57.4	44.7	30.9
	29	103	90.4	73.5	64	53.5	41.7	28.8
	30	96	84.4	68.7	59.8	50	39	26.9
	31	90	79	64	56	47	36	25
	32	84.4	74.2	60.4	52.6	44	34.2	23.6
	33	79	70	57	49	41	32	22
	34	74.8	65.7	53.5	46.6	38.9	30.3	20.9
	35	71	62	50	44	37	29	20
	36	66.7	58.6	47.7	41.5	34.7	27.1	18.7
	37		56	45	39	33	26	18
	38			42.8	37.3	31.2	24.3	16.8
	39					30	23	16
	40							
Area, In .^{2}		11.7	9.74	7.58	6.43	5.24	3.98	2.7
1, In .^{4}		55.2	48.3	39.5	34.3	28.6	22.3	15.5
r, I n.		2.17	2.23	2.28	2.31	2.34	2.37	2.39

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.

HSS/SQUARE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

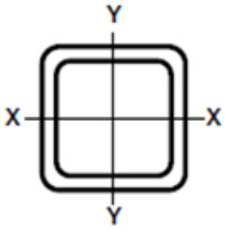


Design Axial Strength in kips (ϕ = 0.90)
Fy=50ksi

Nominal Size		16X16			14x14				12x12				
Wall Thickness		1/2	3/8	5/16	5/8	1/2	3/8	5/16	5/8	1/2	3/8	5/16	1/4
Weight Per Foot		103.3	78.52	65.87	110	89.68	68.31	57.36	93.34	76.07	58.1	48.86	39.43
Design Wall Thickness		0.465	0.349*	0.291 *	0.581	0.465	0.349*	0.291 *	0.581	0.465	0.349	0.291*	0.233*
Effective Length KL (ft)	0	1274	825	603	1364	1107	792	581	1157	941	720	556	379
	2	1272	825	603	1362	1105	791	580	1154	939	719	556	378
	3	1270	824	602	1359	1104	790	580	1151	936	717	555	378
	4	1268	823	602	1356	1101	789	579	1147	933	715	554	377
	5	1265	822	601	1351	1097	787	578	1142	929	712	552	377
	6	1261	821	600	1346	1093	785	577	1136	924	708	551	376
	7	1257	820	599	1340	1088	783	576	1129	919	704	548	374
	8	1252	818	598	1333	1083	781	574	1121	912	699	546	373
	9	1247	816	597	1325	1076	778	572	1111	905	693	543	372
	10	1240	814	596	1316	1069	774	570	1101	896	687	540	370
	11	1233	811	594	1306	1061	771	568	1089	887	680	537	368
	12	1226	808	593	1295	1053	767	566	1077	878	673	533	366
	13	1218	805	591	1284	1044	762	563	1064	867	665	529	364
	14	1209	802	589	1272	1034	758	560	1050	856	657	525	362
	15	1200	799	587	1259	1023	753	557	1035	844	648	520	359
	16	1190	795	584	1245	1012	747	554	1019	832	638	515	357
	17	1180	791	582	1230	1001	742	551	1003	819	628	510	354
	18	1169	787	580	1215	989	736	547	986	805	618	504	351
	19	1158	782	577	1199	976	729	543	968	791	608	498	347
	20	1146	778	574	1183	963	722	539	949	776	596	492	344
	21	1133	773	571	1166	949	715	535	930	761	585	485	340
	22	1121	768	568	1148	935	708	530	911	745	573	478	337
	23	1107	762	565	1130	920	700	525	891	729	561	471	333
	24	1094	756	561	1111	905	691	520	870	713	549	461	328
	25	1079	750	558	1092	890	680	515	850	696	537	451	324
	26	1065	744	554	1072	874	668	510	829	680	524	440	320
	27	1050	738	550	1052	858	656	504	807	662	511	430	315
	28	1035	731	546	1032	842	644	498	786	645	498	419	310
	29	1020	724	542	1011	825	631	492	764	628	485	408	305
	30	1004	717	537	990	808	619	485	742	610	471	397	299
	31	988	709	533	969	791	606	479	720	593	458	386	294
	32	971	702	528	947	774	593	472	698	575	445	375	288
	33	955	694	523	926	757	580	465	676	557	431	364	282
	34	938	685	518	904	739	567	458	654	540	418	352	275
	35	921	677	513	882	722	554	450	632	522	405	341	269
	36	904	668	507	860	704	540	442	610	504	391	330	262
	37	887	659	502	838	686	527	434	589	487	378	319	255
	38	869	650	496	816	668	514	426	567	470	365	308	248
	39	852	640	490	794	651	500	417	546	453	352	297	241
	40	834	630	484	772	633	487	408	525	436	339	287	233
Area, In .^{2}		28.3	21.5	18.1	30.3	24.6	18.7	15.7	25.7	20.9	16	13.4	10.8
1, In .^{4}		1130	873	739	897	743	577	490	548	457	357	304	248
r, I n.		6.31	6.37	6.39	5.44	5.49	5.55	5.58	4.62	4.68	4.73	4.76	4.79

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.

HSS/SQUARE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

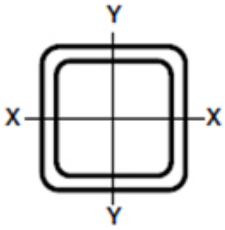


Design Axial Strength in kips (ϕ_c = 0.90)
Fy=50ksi

Nominal Size		10x10						9x9				
Wall Thickness		5/8	1/2	3/8	5/16	1/4	3/16	1/2	3/8	5/16	1/4	3/16
Weight Per Foot		76.3	62.5	47.9	40.4	32.6	24.7	55.7	42.8	36.1	29.2	22.2
Design Wall Thickness		0.581	0.465	0.349	0.291	0.233*	0.174*	0.465	0.349	0.291	0.233*	0.174*
Effective Length KL (ft)	0	945	774	594	500	361	217	689	531	446	349	212
	2	942	772	592	498	361	217	686	529	445	348	211
	3	939	769	590	496	360	216	683	527	443	347	211
	4	934	765	588	494	359	216	679	524	440	346	210
	5	928	760	584	491	358	215	673	520	437	344	210
	6	921	755	580	487	356	215	667	515	433	342	209
	7	912	748	574	483	354	214	659	509	428	340	208
	8	902	740	569	478	352	213	651	503	423	337	206
	9	891	731	562	473	350	212	641	495	417	333	205
	10	879	721	555	467	347	211	630	488	410	330	203
	11	865	711	547	460	344	209	619	479	403	326	202
	12	851	699	538	453	341	208	606	470	396	321	200
	13	835	687	529	445	337	206	593	460	387	314	197
	14	819	674	519	437	333	205	579	449	379	307	195
	15	802	660	509	429	329	203	564	438	370	300	193
	16	784	646	498	420	324	201	549	427	360	292	190
	17	765	631	487	411	319	199	533	415	350	284	187
	18	746	616	476	401	314	196	517	403	340	276	184
	19	726	600	464	391	309	194	500	390	330	268	181
	20	706	583	452	381	303	191	483	377	319	259	177
	21	685	567	439	370	297	189	466	364	308	251	173
	22	664	550	426	360	291	186	449	351	297	242	169
	23	643	533	413	349	283	183	431	338	286	233	165
	24	621	515	400	338	274	180	414	325	275	224	161
	25	599	498	387	327	266	176	396	311	264	215	157
	26	577	480	374	316	257	173	379	298	253	206	152
	27	555	462	360	305	248	169	361	285	242	197	147
	28	534	445	347	293	239	165	344	272	231	188	142
	29	512	427	334	282	230	161	327	259	220	180	136
	30	490	410	321	271	221	157	311	246	210	171	131
	31	469	392	307	260	212	153	294	234	199	163	124
	32	448	375	294	249	203	149	278	221	189	154	118
	33	427	359	282	239	195	144	262	209	179	146	112
	34	407	342	269	228	186	139	247	197	169	138	106
	35	387	326	257	218	178	134	233	186	159	130	100
	36	367	310	244	207	170	129	220	176	150	123	95
	37	348	294	232	197	162	123	209	167	142	117	90
	38	329	278	220	187	153	118	198	158	135	111	85
	39	313	264	209	178	146	112	188	150	128	105	81
	40	297	251	199	169	138	106	179	143	122	100	77
Area, In .^{2}		21	17.2	13.2	11.1	8.96	6.76	15.3	11.8	9.92	8.03	6.06
1, In .^{4}		304	256	202	172	141	108	183	145	124	102	78.2
r, I n.		3.8	3.86	3.92	3.94	3.97	4	3.45	3.51	3.54	3.56	3.59

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.

HSS/SQUARE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

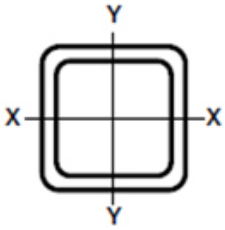


Design Axial Strength in kips (ϕ = 0.90)
Fy=50ksi

Nominal Size		8x8						7x7					
Wall Thickness		5/8	1/2	3/8	5/16	1/4	3/16	5/8	1/2	3/8	5/16	1/4	3/16
Weight Per Foot		59.3	48.9	37.7	31.8	25.8	19.6	50.8	42.1	32.6	27.6	22.4	17.1
Design Wall Thickness		0.581	0.465	0.349	0.291	0.233	0.174*	0.581	0.465	0.349	0.291	0.233	0.174*
Effective Length KL (ft)	0	738	608	468	394	320	206	630	522	404	342	278	197
	2	735	605	466	393	318	205	626	519	401	340	276	197
	3	730	601	463	390	316	205	621	515	398	337	274	196
	4	724	597	460	387	314	204	614	509	394	334	272	195
	5	717	590	455	384	311	203	606	503	389	330	268	193
	6	707	583	450	379	308	202	595	494	383	324	264	191
	7	697	575	444	374	303	200	583	484	376	319	259	189
	8	684	565	436	368	299	198	569	474	368	312	254	186
	9	671	554	428	361	293	196	554	461	359	304	248	183
	10	656	542	419	354	287	194	538	448	349	296	242	180
	11	640	529	410	346	281	191	520	434	338	288	235	176
	12	623	516	400	338	274	189	502	419	327	278	227	172
	13	605	501	389	329	267	186	482	404	316	269	219	167
	14	586	486	378	319	260	182	462	387	303	258	211	161
	15	566	470	366	310	252	179	441	371	291	248	203	154
	16	546	454	354	299	243	175	420	354	278	237	194	148
	17	525	437	341	289	235	171	399	336	265	226	186	141
	18	504	420	328	278	227	166	377	319	252	215	177	135
	19	482	403	315	267	218	162	356	301	239	204	168	128
	20	461	385	302	256	209	157	335	284	226	193	159	121
	21	439	368	289	245	200	152	314	267	212	182	150	115
	22	417	350	275	234	191	146	293	250	200	172	142	108
	23	396	333	262	223	182	139	273	233	187	161	133	102
	24	374	315	249	212	173	133	253	217	175	150	125	95
	25	353	298	236	201	165	126	234	201	163	140	116	89
	26	333	281	223	191	156	120	216	186	151	130	108	83
	27	313	265	211	180	147	113	201	173	140	121	100	77
	28	293	249	198	170	139	107	186	161	130	112	93	72
	29	274	233	186	160	131	101	174	150	121	105	87	67
	30	256	217	174	150	123	95	162	140	113	98	81	62
	31	239	204	163	140	115	89	152	131	106	92	76	58
	32	225	191	153	131	108	83	143	123	99	86	71	55
	33	211	180	144	124	101	78	134	116	94	81	67	52
	34	199	169	136	116	96	74	126	109	88	76	63	49
	35	188	160	128	110	90	70	119	103	83	72	60	46
	36	177	151	121	104	85	66	113	97	79	68	56	43
	37	168	143	115	98	81	62	107	92	74	64	53	41
	38	159	136	109	93	77	59	101	87	71	61	51	39
	39	151	129	103	89	73	56	96	83	67	58	48	37
	40	144	122	98	84	69	53	91	79	64	55	46	35
Area, In .^{2}		16.4	13.5	10.4	8.76	7.1	5.37	14	11.6	8.97	7.59	6.17	4.67
1, In .^{4}		146	125	100	85.6	70.7	54.4	93.4	80.5	65	56.1	46.5	36
r, I n.		2.99	3.04	3.1	3.13	3.15	3.18	2.58	2.63	2.69	2.72	2.75	2.77

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.

HSS/SQUARE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

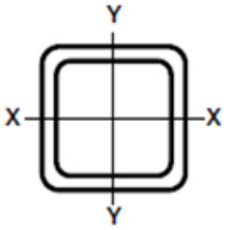


Design Axial Strength in kips (ϕ = 0.90)
Fy=50ksi

Nominal Size		6x6						
Wall Thickness		5/8	1/2	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		42.3	35.2	27.5	23.3	19	14.5	9.86
Design Wall Thickness		0.581	0.465	0.349	0.291	0.233	0.174	0.116*
Effective Length KL (ft)	0	527	438	341	289	236	179	94
	2	522	435	338	287	234	178	94
	3	516	430	335	284	232	176	94
	4	508	424	330	280	229	174	93
	5	498	416	324	275	225	171	92
	6	486	406	317	270	220	167	91
	7	472	395	309	263	215	163	90
	8	456	383	300	255	208	159	89
	9	439	369	289	247	202	154	87
	10	421	355	279	238	195	148	86
	11	402	339	267	228	187	143	84
	12	382	323	255	218	179	137	82
	13	361	306	242	207	170	130	80
	14	340	289	229	197	162	124	77
	15	318	272	216	186	153	117	75
	16	297	255	203	175	144	111	72
	17	276	238	190	164	135	104	69
	18	255	221	177	153	126	98	65
	19	235	204	164	142	118	91	62
	20	215	188	152	131	109	85	58
	21	196	172	140	121	101	78	54
	22	179	157	128	111	93	72	50
	23	163	144	117	102	85	66	46
	24	150	132	107	93	78	61	42
	25	138	122	99	86	72	56	39
	26	128	112	91	80	67	52	36
	27	119	104	85	74	62	48	33
	28	110	97	79	69	57	45	31
	29	103	90	74	64	54	42	29
	30	96	84	69	60	50	39	27
	31	90	79	64	56	47	36	25
	32	84	74	60	53	44	34	24
	33	79	70	57	49	41	32	22
	34	75	66	53	47	39	30	21
	35	71	62	50	44	37	29	20
	36	67	59	48	42	35	27	19
	37		56	45	39	33	26	18
	38			43	37	31	24	17
	39					30	23	16
	40							
Area, In .^{2}		11.7	9.74	7.58	6.43	5.24	3.98	2.7
1, In .^{4}		55.2	48.3	39.5	34.3	28.6	22.3	15.5
r, I n.		2.17	2.23	2.28	2.31	2.34	2.37	2.39

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.

HSS/SQUARE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

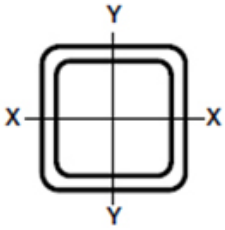


Design Axial Strength in kips (ϕ = 0.90)
Fy=46ksi

Nominal Size		5 1/2 x 5 1/2					5x5					
Wall Thickness		3/8	5/16	1/4	3/16	1/8	1/2	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		24.9	21.2	17.3	13.3	9.01	28.4	22.4	19.1	15.6	12	8.16
Design Wall Thickness		0.349	0.291	0.233	0.174	0.116*	0.465	0.349	0.291	0.233	0.174	0.116*
Effective Length KL (ft)	0	285	242	197	150	87.2	326	256	218	178	136	84.8
	2	282	240	196	149	86.9	322	253	215	176	134	84.3
	3	279	237	194	147	86.4	318	250	213	174	133	83.7
	4	275	234	191	145	85.7	311	245	209	171	130	82.8
	5	269	229	187	143	84.8	303	239	204	167	127	81.6
	6	263	224	183	139	83.7	294	232	198	162	124	80.2
	7	255	218	178	136	82.4	283	223	191	157	120	78.5
	8	247	211	172	132	80.9	271	214	183	151	116	76.6
	9	238	203	166	127	79.2	257	204	175	144	111	74.4
	10	228	195	160	122	77.3	244	194	167	137	106	71.9
	11	217	186	153	117	75.2	229	183	157	130	100	68.7
	12	206	177	145	111	72.8	214	172	148	122	94.4	64.9
	13	195	168	138	106	70.3	199	160	138	115	88.7	61.1
	14	184	158	130	100	67.5	184	149	129	107	82.8	57.2
	15	172	148	122	94.2	64.5	169	137	119	99.2	77	53.2
	16	161	139	114	88.3	60.7	154	126	110	91.5	71.2	49.4
	17	149	129	107	82.5	56.8	140	115	100	84	65.5	45.5
	18	138	120	98.9	76.7	52.9	126	104	91.3	76.7	60	41.8
	19	127	110	91.4	71	49.1	113	93.9	82.5	69.6	54.6	38.2
	20	116	101	84.1	65.5	45.4	102	84.8	74.5	62.8	49.4	34.6
	21	106	92.7	77	60.2	41.8	92.9	76.9	67.6	57	44.8	31.4
	22	96.5	84.4	70.1	54.9	38.2	84.6	70	61.5	51.9	40.8	28.6
	23	88.3	77.2	64.2	50.2	35	77.4	64.1	56.3	47.5	37.4	26.2
	24	81.1	70.9	58.9	46.1	32.1	71.1	58.9	51.7	43.6	34.3	24.1
	25	74.7	65.4	54.3	42.5	29.6	65.5	54.2	47.7	40.2	31.6	22.2
	26	69.1	60.4	50.2	39.3	27.4	60.6	50.2	44.1	37.2	29.2	20.5
	27	64.1	56	46.6	36.4	25.4	56.2	46.5	40.9	34.5	27.1	19
	28	59.6	52.1	43.3	33.9	23.6	52.2	43.2	38	32.1	25.2	17.7
	29	55.5	48.6	40.4	31.6	22	48.7	40.3	35.4	29.9	23.5	16.5
	30	51.9	45.4	37.7	29.5	20.6	45.5					
	31											
	32											
	33											
	34											
	35											
	36											
	37											
	38											
	39											
	40											
Area, In .^{2}		6.88	5.85	4.77	3.63	2.46	7.88	6.18	5.26	4.3	3.28	2.23
1, In .^{4}		29.7	25.9	21.7	17	11.8	26	21.7	19	16	12.6	8.8
r, I n.		2.08	2.11	2.13	2.16	2.19	1.82	1.87	1.9	1.93	1.96	1.99

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.

HSS/SQUARE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

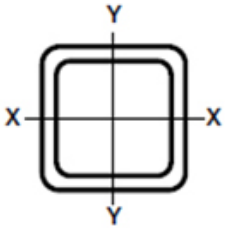


Design Axial Strength in kips (ϕ = 0.90)
Fy=46ksi

Nominal Size		4 1/2x 4 1/2						4x4					
Wall Thickness		1/2	3/8	5/16	1/4	3/16	1/8	1/2	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		25	19.8	17	13.9	10.7	7.31	21.6	17.3	14.8	12.2	9.42	6.46
Design Wall Thickness		0.465	0.349	0.291	0.233	0.174	0.116	0.465	0.349	0.291	0.233	0.174	0.116
Effective Length KL (ft)	0	288	227	194	159	121	81.8	249	198	170	140	107	73.3
	2	283	224	191	157	120	81.1	244	194	167	137	105	72.1
	3	278	220	188	154	118	80.3	239	190	163	134	103	70.8
	4	271	215	184	151	115	78.8	231	184	158	130	100	68.9
	5	262	208	178	147	112	76.7	221	177	152	126	96.6	66.5
	6	252	200	172	141	108	74.2	209	168	145	120	92.4	63.7
	7	240	191	164	136	104	71.3	196	159	137	114	87.7	60.7
	8	227	182	156	129	99.1	68.1	182	149	128	107	82.5	57.2
	9	213	171	148	122	93.9	64.6	168	138	119	99.3	77.1	53.5
	10	198	160	139	115	88.4	61	153	126	110	91.7	71.4	49.7
	11	183	149	129	107	82.7	57.2	138	115	100	84	65.6	45.8
	12	168	138	120	99.8	76.9	53.3	124	104	90.6	76.3	59.8	41.9
	13	153	126	110	92	71.1	49.4	109	92.8	81.2	68.7	54	38
	14	138	115	100	84.3	65.3	45.5	95.8	82.2	72.2	61.3	48.5	34.3
	15	124	104	91.1	76.7	59.5	41.6	83.5	72	63.5	54.3	43.1	30.6
	16	110	93.2	82.1	69.4	54	37.9	73.3	63.3	55.8	47.7	38	27.1
	17	97.8	83	73.4	62.4	48.6	34.2	65	56.1	49.4	42.3	33.6	24
	18	87.2	74	65.5	55.6	43.4	30.7	58	50	44.1	37.7	30	21.4
	19	78.3	66.4	58.8	49.9	39	27.5	52	44.9	39.6	33.8	26.9	19.2
	20	70.7	59.9	53	45.1	35.2	24.9	46.9	40.5	35.7	30.5	24.3	17.3
	21	64.1	54.4	48.1	40.9	31.9	22.5	42.6	36.7	32.4	27.7	22.1	15.7
	22	58.4	49.5	43.8	37.3	29.1	20.5	38.8	33.5	29.5	25.2	20.1	14.3
	23	53.4	45.3	40.1	34.1	26.6	18.8	35.5	30.6	27	23.1	18.4	13.1
	24	49.1	41.6	36.8	31.3	24.4	17.3		28.1	24.8	21.2	16.9	12
	25	45.2	38.4	34	28.8	22.5	15.9				19.5	15.6	11.1
	26	41.8	35.5	31.4	26.7	20.8	14.7						10.3
	27		32.9	29.1	24.7	19.3	13.6						
	28			27.1	23	18	12.7						
	29					16.7	11.8						
	30												
	31												
	32												
	33												
	34												
	35												
	36												
	37												
	38												
	39												
	40												
Area, In .^{2}		6.95	5.48	4.68	3.84	2.93	2	6.02	4.78	4.1	3.37	2.58	1.77
1, In .^{4}		18.1	15.3	13.5	11.4	9.02	6.35	11.9	10.3	9.14	7.8	6.21	4.4
r, I n.		1.61	1.67	1.7	1.73	1.75	1.78	1.41	1.47	1.49	1.52	1.55	1.58

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.

HSS/SQUARE (ERW) FOR LRFD COLUMNS
Fy = 46ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy=46ksi

Nominal Size		3-1/2 x 3-1/2					3x3				
Wall Thickness		3/8	5/16	1/4	3/16	1/8	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		14.7	12.7	10.5	8.15	5.61	12.2	10.6	8.81	6.87	4.75
Design Wall Thickness		0.349	0.291	0.233	0.174	0.116	0.349	0.291	0.233	0.174	0.116
Effective Length KL (ft)	0	169	146	120	92.7	63.8	140	122	101	78.2	53.8
	2	165	142	118	90.8	62.5	136	118	97.9	75.9	52.3
	3	160	138	115	88.4	60.9	130	113	94.1	73.2	50.5
	4	154	133	110	85.2	58.7	122	107	89.1	69.4	48.1
	5	145	126	105	81.2	56	113	98.9	83	59.8	45.1
	6	136	118	98.6	76.6	52.9	103	90.3	76.1	54.3	41.7
	7	126	110	91.7	71.5	49.5	92	81	68.7	48.6	38.1
	8	115	100	84.4	66	45.8	80.8	71.5	61.1	42.8	34.2
	9	103	90.9	76.8	60.3	42	69.8	62.1	53.4	37.1	30.3
	10	92	81.4	69.1	54.5	38.1	59.3	53	46	31.8	26.5
	11	80.9	72.1	61.5	48.7	34.1	49.4	44.5	39	26.8	22.9
	12	70.3	63	54.1	43.1	30.3	41.5	37.4	32.8	22.8	19.4
	13	60.3	54.4	47.1	37.8	26.7	35.4	31.8	27.9	19.7	16.5
	14	52	46.9	40.6	32.7	23.1	30.5	27.4	24.1	17.1	14.2
	15	45.3	40.8	35.4	28.5	20.2	26.6	23.9	21	15.1	12.4
	16	39.8	35.9	31.1	25	17.7	23.3	21	18.4	13.3	10.9
	17	35.2	31.8	27.5	22.2	15.7	20.7	18.6	16.3	11.9	9.66
	18	31.4	28.4	24.6	19.8	14		16.6	14.6	10.7	8.62
	19	28.2	25.5	22	17.7	12.6					7.73
	20	25.5	23	19.9	16	11.3					
	21	23.1	20.8	18	14.5	10.3					
	22			16.4	13.2	9.37					
	23										
	24										
	25										
	26										
	27										
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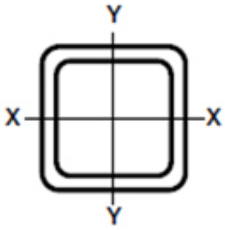
	39										
	40										
Area, In .^{2}		4.09	3.52	2.91	2.24	1.54	3.39	2.94	2.44	1.89	1.3
1, In .^{4}		6.49	5.84	5.04	4.05	2.9	3.78	3.45	3.02	2.46	1.78
r, I n.		1.26	1.29	1.32	1.35	1.37	1.03	1.08	1.11	1.14	1.17

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.

HSS/SQUARE (ERW) FOR LRFD COLUMNS
Fy = 46ksi



Design Axial Strength in kips (ϕ_c = 0.90)
Fy=46ksi

Nominal Size		2-1/2 x 2-1/2				2-1/4 x 2-1/4			2 x 2		
Wall Thickness		5/16	1/4	3/16	1/8	1/4	3/16	1/8	1/4	3/16	1/8
Weight Per Foot		8.45	7.11	5.59	3.9	6.26	4.96	3.48	5.41	4.32	3.05
Design Wall Thickness		0.291	0.233	0.174	0.116	0.233	0.174	0.116	0.233	0.174	0.116
Effective Length KL (ft)	0	97.3	81.6	63.8	44.3	72	56.7	39.6	62.5	49.3	34.8
	2	92.5	77.8	61	42.5	67.9	53.6	37.6	57.8	45.8	32.5
	3	86.9	73.4	57.7	40.3	63	50	35.2	52.4	41.9	29.9
	4	79.6	67.6	53.4	37.5	56.7	45.4	32.1	45.7	36.9	26.6
	5	71.2	60.8	48.4	34.2	49.6	40.1	28.6	38.3	31.4	22.9
	6	62	53.4	42.9	30.5	42.1	34.4	24.8	30.9	25.7	19
	7	52.7	45.9	37.1	26.6	34.7	28.7	20.9	24	20.4	15.3
	8	43.7	38.5	31.5	22.8	27.7	23.3	17.2	18.3	15.7	11.9
	9	35.2	31.5	26.1	19.1	21.9	18.5	13.8	14.5	12.4	9.42
	10	28.6	25.5	21.2	15.6	17.7	15	11.2	11.7	10	7.63
	11	23.6	21.1	17.5	12.9	14.7	12.4	9.23	9.7	8.29	6.31
	12	19.8	17.7	14.7	10.9	12.3	10.4	7.76		6.97	5.3
	13	16.9	15.1	12.6	9.25	10.5	8.87	6.61			
	14	14.6	13	10.8	7.98			5.7			
	15		11.3	9.43	6.95						
	16				6.11						
	17										
	18										
	19										
	20										
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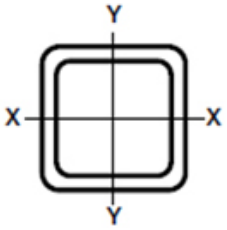
	34										
	35										
	36										
	37										
	38										
	39										
	40										
Area, In .^{2}		2.35	1.97	1.54	1.07	1.74	1.37	0.956	1.51	1.19	0.84
1, In .^{4}		1.82	1.63	1.35	0.998	1.13	0.953	0.712	0.747	0.641	0.486
r, I n.		0.88	0.908	0.937	0.965	0.806	0.835	0.863	0.704	0.733	0.761

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.

HSS/SQUARE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

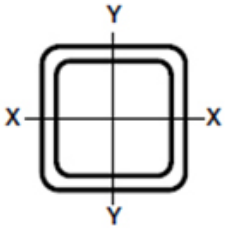


Design Axial Strength in kips (ϕ = 0.90)
Fy=50ksi

Nominal Size		5 1/2 x 5 1/2					5x5					
Wall Thickness		3/8	5/16	1/4	3/16	1/8	1/2	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		24.9	21.2	17.3	13.3	9.01	28.4	22.4	19.1	15.6	12	8.16
Design Wall Thickness		0.349	0.291	0.233	0.174	0.116*	0.465	0.349	0.291	0.233	0.174	0.116*
Effective Length KL (ft)	0	310	263	215	163	92	355	278	237	194	148	90
	2	307	261	213	162	92	350	275	234	191	146	89
	3	303	258	210	160	91	345	271	231	189	144	88
	4	298	253	207	158	90	337	265	226	185	141	87
	5	291	248	203	154	89	328	258	220	180	138	86
	6	284	242	197	151	88	316	250	213	175	134	85
	7	275	234	192	146	87	303	240	205	168	129	83
	8	265	226	185	141	85	289	229	196	161	124	81
	9	254	217	178	136	83	274	218	187	154	118	78
	10	243	208	170	130	81	258	206	177	146	112	75
	11	231	198	162	124	79	241	193	166	137	106	72
	12	218	187	154	118	76	224	180	156	129	99	68
	13	205	177	145	112	73	207	167	145	120	93	64
	14	192	166	136	105	70	190	154	134	111	86	60
	15	179	155	127	98	67	173	141	123	102	80	55
	16	166	144	118	92	63	157	129	112	94	73	51
	17	153	133	110	85	59	142	116	102	85	67	47
	18	141	122	101	79	54	126	105	92	77	61	42
	19	129	112	93	72	50	113	94	83	70	55	38
	20	117	102	85	66	46	102	85	74	63	49	35
	21	106	93	77	60	42	93	77	68	57	45	31
	22	96	84	70	55	38	85	70	62	52	41	29
	23	88	77	64	50	35	77	64	56	48	37	26
	24	81	71	59	46	32	71	59	52	44	34	24
	25	75	65	54	43	30	66	54	48	40	32	22
	26	69	60	50	39	27	61	50	44	37	29	20
	27	64	56	47	36	25	56	47	41	34	27	19
	28	60	52	43	34	24	52	43	38	32	25	18
	29	56	49	40	32	22	49	40	35	30	24	16
	30	52	45	38	30	21	45	38	33	28	22	15
	31	49	43	35	28	19		35	31	26	21	14
	32	46	40	33	26	18				25	19	14
	33	43	38	31	24	17						13
	34	40	35	29	23	16						
	35		33	28	22	15						
	36				21	14						
	37											
	38											
	39											
	40											
Area, In .^{2}		6.88	5.85	4.77	3.63	2.46	7.88	6.18	5.26	4.3	3.28	2.23
1, In .^{4}		29.7	25.9	21.7	17	11.8	26	21.7	19	16	12.6	8.8
r, I n.		2.08	2.11	2.13	2.16	2.19	1.82	1.87	1.9	1.93	1.96	1.99

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.

HSS/SQUARE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

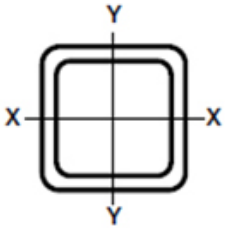


Design Axial Strength in kips (ϕ = 0.90)
Fy=50ksi

Nominal Size		4 1/2x 4 1/2						4x4					
Wall Thickness		1/2	3/8	5/16	1/4	3/16	1/8	1/2	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		25	19.8	17	13.9	10.7	7.31	21.6	17.3	14.8	12.2	9.42	6.46
Design Wall Thickness		0.465	0.349	0.291	0.233	0.174	0.116	0.465	0.349	0.291	0.233	0.174	0.116
Effective Length KL (ft)	0	313	247	211	173	132	87	271	215	185	152	116	80
	2	308	243	208	170	130	86	265	211	181	149	114	78
	3	302	238	204	167	128	85	258	206	177	146	112	77
	4	293	232	199	163	125	84	249	199	171	141	108	74
	5	283	224	192	158	121	82	237	190	164	135	104	72
	6	270	215	185	152	117	80	224	180	156	129	99	68
	7	256	205	176	145	111	76	209	169	146	121	94	65
	8	241	194	167	138	106	73	193	157	136	113	88	61
	9	225	182	157	130	100	69	176	145	126	105	81	57
	10	208	169	146	122	93	65	160	132	115	96	75	52
	11	191	156	136	113	87	60	143	119	104	87	68	48
	12	174	143	125	104	80	56	126	107	93	79	62	43
	13	157	130	114	95	74	51	111	94	83	70	55	39
	14	141	118	103	87	67	47	96	83	73	62	49	35
	15	125	105	93	78	61	43	83	72	63	54	43	31
	16	110	94	83	70	55	38	73	63	56	48	38	27
	17	98	83	73	62	49	34	65	56	49	42	34	24
	18	87	74	65	56	43	31	58	50	44	38	30	21
	19	78	66	59	50	39	28	52	45	40	34	27	19
	20	71	60	53	45	35	25	47	41	36	31	24	17
	21	64	54	48	41	32	23	43	37	32	28	22	16
	22	58	50	44	37	29	21	39	33	30	25	20	14
	23	53	45	40	34	27	19	35	31	27	23	18	13
	24	49	42	37	31	24	17		28	25	21	17	12
	25	45	38	34	29	23	16				20	16	11
	26	42	35	31	27	21	15						10
	27		33	29	25	19	14						
	28			27	23	18	13						
	29					17	12						
	30												
	31												
	32												
	33												
	34												
	35												
	36												
	37												
	38												
	39												
	40												
Area, In .^{2}		6.95	5.48	4.68	3.84	2.93	2	6.02	4.78	4.1	3.37	2.58	1.77
1, In .^{4}		18.1	15.3	13.5	11.4	9.02	6.35	11.9	10.3	9.14	7.8	6.21	4.4
r, I n.		1.61	1.67	1.7	1.73	1.75	1.78	1.41	1.47	1.49	1.52	1.55	1.58

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.

HSS/SQUARE (ERW) FOR LRFD COLUMNS
Fy = 50ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy=50ksi

Nominal Size		3-1/2 x 3-1/2					3 x 3				
Wall Thickness		3/8	5/16	1/4	3/16	1/8	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		14.7	12.7	10.5	8.15	5.61	12.2	10.6	8.81	6.87	4.75
Design Wall Thickness		0.349	0.291	0.233	0.174	0.116	0.349	0.291	0.233	0.174	0.116
Effective Length KL (ft)	0	184	158	131	101	69	153	132	110	85	59
	2	179	154	128	98	68	147	128	106	82	57
	3	173	150	124	96	66	140	122	102	79	55
	4	166	143	119	92	63	131	115	96	75	52
	5	156	135	113	87	60	121	106	89	69	48
	6	145	126	105	82	57	109	96	81	64	44
	7	133	116	97	76	53	96	85	72	57	40
	8	120	106	89	70	48	84	74	64	51	36
	9	108	95	80	63	44	71	64	55	44	31
	10	95	84	72	57	40	60	54	47	38	27
	11	82	74	63	50	35	49	44	39	32	23
	12	71	64	55	44	31	41	37	33	27	19
	13	60	54	47	38	27	35	32	28	23	17
	14	52	47	41	33	23	30	27	24	20	14
	15	45	41	35	28	20	27	24	21	17	12
	16	40	36	31	25	18	23	21	18	15	11
	17	35	32	28	22	16	21	19	16	13	10
	18	31	28	25	20	14		17	15	12	9
	19	28	25	22	18	13				11	8
	20	25	23	20	16	11					
	21	23	21	18	15	10					
	22			16	13	9					
	23										
	24										
	25										
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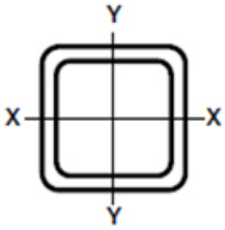
	37										
	38										
	39										
	40										
Area, In .[2]		4.09	3.52	2.91	2.24	1.54	3.39	2.94	2.44	1.89	1.3
1, In .[4]		6.49	5.84	5.04	4.05	2.9	3.78	3.45	3.02	2.46	1.78
r, I n.		1.26	1.29	1.32	1.35	1.37	1.03	1.08	1.11	1.14	1.17

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.

HSS/SQUARE (ERW) FOR LRFD COLUMNS
Fy = 50ksi



Design Axial Strength in kips (ϕ_c = 0.90)
Fy=46ksi

Nominal Size		2-1/2 x 2-1/2				2-1/4 x 2-1/4			2 x 2		
Wall Thickness		5/16	1/4	3/16	1/8	1/4	3/16	1/8	1/4	3/16	1/8
Weight Per Foot		8.45	7.11	5.59	3.9	6.26	4.96	3.48	5.41	4.32	3.05
Design Wall Thickness		0.291	0.233	0.174	0.116	0.233	0.174	0.116	0.233	0.174	0.116
Effective Length KL (ft)	0	106	89	69	48	78	62	43	68	54	38
	2	100	84	66	46	73	58	41	62	50	35
	3	94	79	62	43	68	54	38	56	45	32
	4	85	72	57	40	60	48	34	48	39	28
	5	75	64	51	36	52	42	30	40	33	24
	6	65	56	45	32	44	36	26	32	26	20
	7	54	47	39	28	35	29	22	24	20	16
	8	44	39	32	23	28	23	17	18	16	12
	9	35	31	26	19	22	19	14	14	12	9
	10	29	25	21	16	18	15	11	12	10	8
	11	24	21	18	13	15	12	9	10	8	6
	12	20	18	15	11	12	10	8		7	5
	13	17	15	13	9	10	9	7			
	14	15	13	11	8			6			
	15		11	9	7						
	16				6						
	17										
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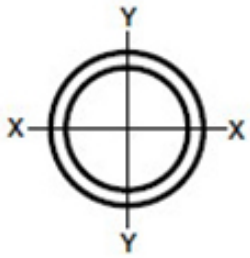
	40										
Area, In .^{2}		2.35	1.97	1.54	1.07	1.74	1.37	0.956	1.51	1.19	0.84
1, In .^{4}		1.82	1.63	1.35	0.998	1.13	0.953	0.712	0.747	0.641	0.486
r, I n.		0.88	0.908	0.937	0.965	0.806	0.835	0.863	0.704	0.733	0.761

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.

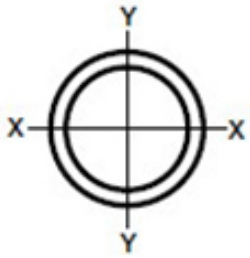
HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 42ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy=42ksi

Diameter		20		18		16				14		
Wall Thickness		0.5	0.375	0.5	0.375	0.5	0.438	0.375	0.312	0.5	0.375	0.312
Weight Per Foot		104.13	78.6	93.45	70.59	82.77	72.8	62.58	52.28	72.09	54.57	45.61
Design Wall Thickness		0.465	0.349	0.465	0.349	0.465	0.407	0.349	0.291	0.465	0.349	0.291
Effective Length KL in test	0	1080	813	968	734	858	752	650	544	749	568	472
	2	1080	812	967	733	857	752	649	543	748	566	472
	3	1080	811	966	732	856	751	648	543	745	565	471
	4	1069	810	965	731	854	749	647	542	744	563	470
	5	1069	809	962	730	851	746	646	540	741	561	468
	6	1069	808	959	727	849	744	644	539	738	559	466
	7	1069	806	957	725	846	741	641	537	735	557	464
	8	1069	804	954	723	842	738	638	535	731	554	462
	9	1059	800	950	720	838	735	635	532	725	550	458
	10	1058	798	946	717	833	731	632	529	720	546	455
	11	1054	795	941	714	828	726	628	526	715	541	451
	12	1049	792	936	709	823	721	624	522	708	537	448
	13	1044	788	931	705	816	716	619	519	701	532	444
	14	1039	784	925	701	810	710	614	515	694	526	439
	15	1033	780	919	697	804	704	609	510	686	521	434
	16	1027	775	913	691	796	698	604	506	678	515	429
	17	1021	771	905	687	788	691	598	501	669	508	424
	18	1014	766	898	681	780	684	592	496	661	502	418
	19	1008	760	890	676	772	678	586	490	651	494	413
	20	1001	755	883	669	763	669	579	485	642	487	407
	21	993	750	875	664	754	662	573	480	631	480	400
	22	985	743	866	656	744	653	565	473	622	472	394
	23	976	738	857	650	735	645	558	468	610	464	388
	24	968	732	847	644	724	636	551	462	599	455	380
	25	959	725	839	636	715	627	543	455	589	448	374
	26	951	718	828	629	704	617	535	448	577	438	366
	27	941	712	818	622	692	609	526	442	565	430	359
	28	932	704	808	614	682	598	518	434	553	421	352
	29	922	697	797	606	670	589	509	428	541	412	344
	30	912	689	787	598	659	579	501	420	529	403	337
	31	902	682	776	590	647	569	492	413	517	394	329
	32	892	673	764	581	635	558	484	406	504	384	322
	33	881	666	753	573	624	547	474	398	492	375	313
	34	869	658	741	564	611	537	466	391	480	365	306
	35	859	649	730	555	599	526	456	383	467	357	299
	36	847	641	718	546	587	516	447	375	454	347	290
	37	836	632	706	537	574	505	437	367	442	338	283
	38	825	624	695	528	561	493	428	360	429	328	274
	39	813	615	682	519	550	483	419	352	416	319	267
	40	800	607	669	510	537	472	410	344	403	309	259
Area, In .^{2}		28.5	21.5	25.6	19.4	22.7	19.9	17.2	14.4	19.8	15	12.5
1, In .^{4}		1360	1040	985	754	685	606	526	443	453	349	295
r, I n.		6.91	6.95	6.2	6.24	5.49	5.51	5.53	5.55	4.79	4.83	4.85

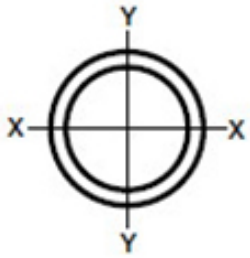
HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 42ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy=42ksi

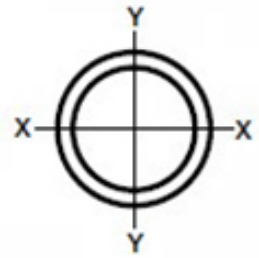
Diameter		12.75			10.75			10					
Wall Thickness		0.5	0.375	0.25	0.5	0.375	0.25	0.625	0.5	0.375	0.312	0.25	0.188
Weight Per Foot		65.42	49.56	33.38	54.74	41.59	28.04	62.58	50.73	38.55	32.28	26.03	19.7
Design Wall Thickness		0.465	0.349	0.233	0.465	0.34	0.233	0.581	0.465	0.349	0.291	0.233	0.174
Effective Length KL in test	0	677	515	346	568	419	291	650	525	400	336	270	203
	2	676	514	345	565	418	290	648	524	399	335	269	202
	3	673	512	345	563	417	289	646	522	398	334	269	201
	4	671	510	344	561	415	288	642	519	396	331	267	200
	5	669	508	342	558	413	287	637	516	393	329	266	199
	6	665	506	341	554	410	285	632	511	390	327	264	198
	7	662	503	339	548	407	282	626	506	386	324	260	196
	8	656	499	337	543	402	280	618	500	381	320	257	194
	9	651	496	334	537	398	276	610	493	377	316	254	192
	10	646	491	331	530	393	273	600	486	372	311	251	188
	11	640	486	328	523	388	269	591	479	365	306	247	185
	12	632	481	324	515	382	266	580	470	359	301	242	182
	13	625	475	321	506	376	262	569	461	353	295	238	179
	14	617	470	317	498	370	257	557	451	345	290	234	176
	15	609	464	312	488	362	252	544	442	338	284	229	173
	16	600	457	308	478	355	247	530	431	329	277	223	168
	17	591	450	304	468	347	242	517	420	322	270	218	164
	18	581	443	300	456	340	236	503	409	313	263	213	160
	19	572	435	294	446	331	231	488	397	305	256	206	156
	20	561	428	289	434	323	226	473	385	295	249	201	151
	21	551	420	284	422	314	219	458	374	287	241	195	147
	22	540	412	278	411	306	214	443	361	277	233	188	142
	23	528	403	273	398	298	208	428	348	268	226	182	138
	24	517	395	267	386	288	201	412	337	258	218	176	133
	25	505	385	262	374	278	195	396	324	249	210	169	128
	26	493	377	255	361	270	188	380	311	239	202	163	124
	27	482	367	249	348	260	183	365	299	230	194	157	119
	28	469	359	244	336	251	177	349	286	220	186	151	114
	29	456	349	237	323	242	170	334	274	212	178	145	109
	30	445	340	231	311	233	164	319	262	202	170	139	105
	31	432	330	224	299	224	158	304	250	193	163	132	101
	32	419	321	218	286	215	151	289	238	184	156	126	95
	33	407	312	212	274	206	145	274	227	175	148	121	91
	34	394	303	205	263	197	139	260	215	166	141	114	87
	35	381	293	199	250	188	133	246	203	158	133	109	83
	36	370	284	193	238	180	127	232	193	149	126	103	78
	37	357	274	186	228	172	122	220	182	141	120	97	74
	38	344	265	181	216	163	115	209	173	133	113	92	70
	39	332	256	175	205	155	110	198	164	127	108	88	67
	40	321	247	168	195	147	105	188	156	121	103	84	64
Area, In .^{2}		17.9	13.6	9.16	15	11.1	7.7	17.2	13.9	10.6	8.88	7.15	5.37
1, In .^{4}		339	262	180	199	151	106	191	159	123	105	85.3	64.8
r, I n.		4.35	4.39	4.43	3.64	3.68	3.72	3.34	3.38	3.41	3.43	3.45	3.47

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 42ksi



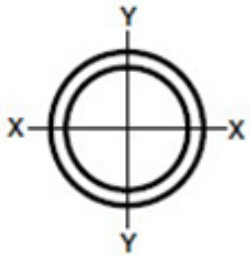
Design Axial Strength in kips (ϕ = 0.90) Fy=42ksi											
Diameter		9.625					8.625				
Wall Thickness Weight Per Foot Design Wall Thickness		0.5 48.73 0.465	0.375 37.05 0.349	0.312 31.03 0.291	0.25 25.03 0.233	0.188 18.95 0.174	0.5 43.39 0.465	0.375 33.04 0.349	0.322 28.55 0.3	0.25 22.36 0.233	0.188 16.94 0.174
Effective Length KL in test	0	506	385	323	259	196	450	343	296	232	175
	2	505	384	322	258	195	448	341	295	231	174
	3	503	382	320	257	194	446	340	294	230	173
	4	500	380	319	256	193	443	338	292	229	172
	5	496	378	316	254	192	438	335	289	227	170
	6	491	375	313	252	190	433	330	286	223	168
	7	486	371	310	250	188	427	326	283	221	166
	8	480	365	306	247	185	420	321	278	218	164
	9	473	361	302	244	183	413	316	273	214	161
	10	466	355	298	239	181	404	309	268	210	158
	11	457	349	292	236	178	396	303	263	205	155
	12	449	342	287	231	175	386	295	256	201	151
	13	439	336	281	227	170	376	288	250	196	148
	14	430	328	275	222	167	365	281	244	191	144
	15	419	321	269	217	163	355	272	236	185	140
	16	409	312	262	212	160	343	264	229	180	136
	17	397	304	255	205	156	331	254	221	174	131
	18	385	295	248	200	151	319	246	214	167	127
	19	374	287	240	195	147	307	236	205	162	122
	20	362	277	233	188	142	294	227	198	156	118
	21	349	268	226	182	138	282	218	190	149	113
	22	337	259	218	176	133	269	209	181	143	108
	23	324	250	210	169	128	257	199	174	137	104
	24	311	240	202	163	124	245	190	165	130	98
	25	300	231	194	158	119	232	180	157	124	94
	26	287	221	186	151	114	220	170	149	118	90
	27	274	212	178	145	110	208	162	142	112	85
	28	262	202	170	139	105	196	152	133	106	80
	29	250	193	163	132	101	184	144	126	100	76
	30	237	184	156	126	95	174	136	119	94	72
	31	226	175	148	120	91	162	127	111	89	68
	32	214	166	141	114	87	152	120	105	83	64
	33	202	158	133	108	83	143	112	98	78	59
	34	191	149	126	103	78	134	106	93	73	56
	35	180	141	119	97	74	127	100	88	70	53
	36	170	132	112	92	70	121	94	83	66	50
	37	161	126	107	87	66	114	89	78	62	48
	38	152	120	101	83	62	108	85	74	59	44
	39	145	113	95	78	59	103	80	71	56	42
	40	138	108	91	74	56	97	76	67	53	40
Area, In .^{2}		13.4	10.2	8.53	6.87	5.17	11.9	9.07	7.85	6.14	4.62
1, In .^{4}		141	110	93	75.9	57.7	99.5	77.8	68.1	54.1	41.3
r, I n.		3.24	3.28	3.3	3.32	3.34	2.89	2.93	2.95	2.97	2.99

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 42ksi



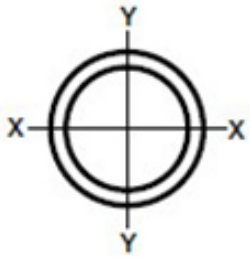
Design Axial Strength in kips (ϕ = 0.90) Fy=42ksi								
Diameter		7.625		7.5				
Wall Thickness		0.375	0.328	0.5	0.375	0.312	0.25	0.188
Weight Per Foot		29.04	25.56	37.38	28.54	23.95	19.36	14.68
Design Wall Thickness		0.349	0.305	0.465	0.349	0.291	0.233	0.174
Effective Length KL in test	0	302	265	390	296	249	201	151
	2	300	264	388	294	248	200	150
	3	298	262	384	292	246	199	149
	4	295	259	380	290	244	197	148
	5	292	256	376	286	240	195	146
	6	288	253	370	282	237	192	144
	7	283	249	363	277	233	188	142
	8	277	244	356	271	229	184	139
	9	271	238	347	265	223	180	136
	10	264	232	338	258	217	176	132
	11	257	226	327	251	212	172	129
	12	249	219	317	242	204	166	125
	13	241	212	306	235	198	160	121
	14	233	204	294	226	191	155	116
	15	223	197	283	217	183	149	112
	16	215	190	270	209	176	143	108
	17	205	181	257	199	168	137	104
	18	196	173	246	190	160	130	98
	19	186	164	233	180	152	124	94
	20	177	157	220	170	145	118	89
	21	168	148	208	161	137	111	85
	22	159	140	195	151	129	105	79
	23	149	132	183	143	122	100	75
	24	141	124	172	133	113	93	71
	25	131	116	160	125	107	87	67
	26	123	109	148	116	100	82	62
	27	114	102	138	108	92	75	58
	28	106	94	128	101	86	70	54
	29	100	88	120	93	79	66	50
	30	92	82	111	88	75	61	47
	31	87	77	104	82	70	57	43
	32	82	72	97	77	66	54	41
	33	76	68	92	72	61	51	39
	34	72	64	87	68	58	48	36
	35	68	60	82	65	55	46	34
	36	65	57	77	60	52	42	33
	37	60	54	73	57	49	40	31
	38	58	51	70	54	47	38	30
	39	55	49	66	52	44	36	28
	40	52	47	62	49	42	35	26
Area, In .^{2}		7.98	7.01	10.3	7.84	6.59	5.32	4
1, In .^{4}		52.9	47.1	63.9	50.2	42.9	35.2	26.9
r, I n.		2.58	2.59	2.49	2.53	2.55	2.57	2.59

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 42ksi



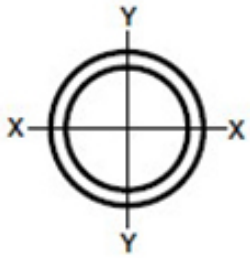
Design Axial Strength in kips (ϕ = 0.90) Fy=42ksi												
Diameter		7						6.875				
Wall Thickness Weight Per Foot Design Wall Thickness		0.5 34.71 0.465	0.375 26.53 0.349	0.312 22.29 0.291	0.25 18.02 0.233	0.188 13.68 0.174	0.125 9.18 0.116	0.5 34.04 0.465	0.375 26.03 0.349	0.312 21.87 0.291	0.25 17.69 0.233	0.188 13.43 0.174
Effective Length KL in test	0	361	275	232	187	141	95	354	271	228	184	139
	2	359	274	230	186	140	94	352	269	227	182	138
	3	356	272	229	184	139	93	348	267	224	181	137
	4	352	269	226	182	138	92	344	264	221	179	134
	5	346	265	222	180	136	91	339	259	218	177	133
	6	340	260	219	177	133	90	332	255	215	174	130
	7	334	255	215	174	131	88	325	250	210	169	128
	8	325	249	210	169	128	86	317	244	205	166	125
	9	316	242	204	165	125	84	308	236	199	161	122
	10	306	235	198	160	121	82	298	230	194	157	119
	11	295	227	192	156	118	79	287	221	186	151	114
	12	285	219	184	149	113	76	276	213	180	146	110
	13	273	211	178	144	109	74	265	204	173	140	106
	14	262	201	170	138	105	71	253	196	165	134	102
	15	250	193	163	132	101	68	240	186	158	128	97
	16	237	183	155	126	95	65	228	177	150	122	92
	17	224	174	147	120	91	61	215	167	142	115	88
	18	212	164	139	113	86	58	203	158	134	109	83
	19	199	155	131	107	82	55	191	149	126	103	78
	20	187	145	124	101	76	52	178	140	119	96	74
	21	175	136	115	94	72	49	166	130	111	91	69
	22	163	127	108	89	68	46	155	122	104	85	65
	23	151	119	101	83	64	43	143	112	96	78	60
	24	140	109	93	76	58	40	131	104	89	73	56
	25	129	101	87	71	54	37	121	96	82	68	52
	26	120	93	79	66	50	34	112	89	76	62	48
	27	110	87	74	60	47	32	104	83	70	58	44
	28	103	80	69	56	43	30	96	76	66	54	41
	29	96	75	65	53	40	28	90	71	61	50	38
	30	90	70	60	50	38	25	84	67	57	47	36
	31	84	66	56	47	35	24	78	62	53	43	34
	32	78	61	53	43	33	22	74	58	50	41	32
	33	74	58	50	40	31	21	70	55	47	39	30
	34	70	55	47	38	30	20	66	52	44	36	28
	35	66	52	44	36	28	19	61	49	42	34	26
	36	62	49	41	34	26	18	58	47	39	33	25
	37	59	47	39	33	24	17	55	43	37	31	23
	38	56	43	37	31	23	16		41	36	30	22
	39	0	41	36	30	22	15				28	21
	40	0	0	0	0	21	15					
Area, In .^{2}		9.55	7.29	6.13	4.95	3.73	2.51	9.36	7.16	6.02	4.86	3.66
1, In .^{4}		51.2	40.4	34.6	28.4	21.7	14.9	48.3	38.2	32.7	26.8	20.6
r, I n.		2.32	2.35	2.37	2.39	2.41	2.43	2.27	2.31	2.33	2.35	2.37

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 42ksi



Design Axial Strength in kips (ϕ = 0.90) Fy=42ksi									
Diameter		6.625							
Wall Thickness Weight Per Foot Design Wall Thickness		0.5 32.71 0.465	0.432 28.57 0.403	0.375 25.03 0.349	0.312 21.04 0.291	0.28 18.97 0.261	0.25 17.02 0.233	0.188 12.92 0.174	0.125 8.68 0.116
Effective Length KL in test	0	340	298	260	219	197	177	133	90
	2	338	295	258	217	196	176	132	89
	3	335	293	256	215	194	174	131	88
	4	330	289	253	213	192	173	130	87
	5	325	285	249	210	188	169	128	86
	6	318	278	244	205	185	166	126	85
	7	310	272	238	201	181	162	123	83
	8	302	265	232	196	177	159	120	80
	9	292	257	224	190	172	154	116	78
	10	283	248	217	183	165	149	112	76
	11	272	239	210	177	160	143	109	73
	12	260	229	201	169	154	138	105	71
	13	249	219	192	162	147	132	101	68
	14	236	209	183	155	140	126	95	65
	15	223	197	174	147	133	120	91	61
	16	212	186	164	140	126	113	87	58
	17	199	176	155	131	119	107	82	55
	18	186	165	145	124	112	101	77	52
	19	174	154	137	115	105	94	72	49
	20	162	143	127	108	98	89	68	46
	21	149	133	118	101	91	83	64	42
	22	139	123	109	93	85	76	58	40
	23	127	113	101	86	78	71	54	37
	24	116	104	92	79	72	65	50	34
	25	107	95	85	73	67	60	47	32
	26	100	89	78	68	61	55	42	29
	27	92	83	73	62	57	52	39	26
	28	86	76	68	58	53	48	37	25
	29	79	71	64	54	50	44	34	23
	30	74	67	59	51	47	41	32	22
	31	70	62	55	48	43	39	30	20
	32	66	58	52	44	40	37	29	19
	33	61	55	49	42	38	35	26	18
	34	58	52	46	39	36	33	25	17
	35	55	49	43	37	34	31	23	16
	36	52	47	41	35	32	29	22	15
	37			39	33	31	28	21	15
	38							20	14
	39								
	40								
Area, In .^{2}		9	7.88	6.88	5.79	5.22	4.68	3.53	2.37
1, In .^{4}		42.9	38.3	34	29.1	26.5	23.9	18.4	12.6
r, I n.		2.18	2.2	2.22	2.24	2.25	2.26	2.28	2.3

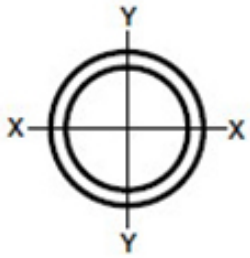
HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 42ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy=42ksi

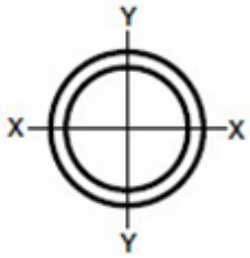
Diameter		6							5.563			
Wall Thickness		0.5	0.375	0.312	0.28	0.25	0.188	0.125	0.375	0.258	0.188	0.134
Weight Per Foot		29.37	22.53	18.95	17.11	15.35	11.67	7.84	20.78	14.62	10.79	7.77
Design Wall Thickness		0.465	0.349	0.291	0.261	0.233	0.174	0.116	0.349	0.241	0.174	0.125
Effective Length KL in test	0	306	234	197	178	160	121	80	216	152	111	80
	2	303	232	196	177	158	120	80	214	150	110	80
	3	300	230	194	175	157	118	79	212	149	109	79
	4	294	227	191	172	155	116	78	208	146	107	78
	5	289	221	187	168	151	114	77	202	143	105	76
	6	282	216	182	165	148	111	75	197	139	103	74
	7	273	211	178	160	144	109	73	191	134	100	72
	8	264	203	172	156	139	105	71	183	130	95	70
	9	254	196	165	149	134	102	69	176	124	92	67
	10	242	187	159	144	129	97	66	167	119	88	64
	11	232	179	151	138	123	93	64	158	112	84	60
	12	219	170	144	130	118	89	60	149	106	78	57
	13	208	161	137	124	111	85	57	140	100	74	54
	14	195	151	129	116	105	79	54	130	93	69	51
	15	182	143	121	110	98	75	51	121	87	65	48
	16	169	133	113	103	92	71	48	111	80	60	43
	17	157	124	106	95	87	66	44	103	74	55	40
	18	145	114	97	89	80	61	41	93	68	51	37
	19	133	106	90	82	74	56	39	85	61	47	34
	20	122	96	83	75	68	52	36	77	56	42	31
	21	110	88	76	69	62	48	33	70	51	38	29
	22	101	80	69	62	57	43	30	64	47	35	25
	23	92	73	64	57	52	40	28	58	42	32	23
	24	85	68	58	53	48	37	25	53	39	30	21
	25	78	62	53	49	44	34	23	49	36	28	20
	26	72	57	50	46	40	32	21	46	33	25	18
	27	67	53	46	41	38	29	20	42	31	23	17
	28	62	50	42	39	35	28	18	39	29	21	16
	29	58	47	40	36	33	25	17	36	26	20	15
	30	54	43	37	34	31	23	16	34	24	19	14
	31	51	40	35	32	29	22	15		23	18	13
	32	48	38	33	30	26	21	14				12
	33		36	31	28	25	19	14				
	34					24	18	13				
	35											
	36											
	37											
	38											
	39											
	40											
Area, In .^{2}		8.09	6.2	5.22	4.71	4.22	3.18	2.14	5.72	4.03	2.95	2.14
1, In .^{4}		31.2	24.8	21.3	19.4	17.6	13.5	9.28	19.5	14.3	10.7	7.9
r, I n.		1.96	2	2.02	2.03	2.04	2.06	2.08	1.85	1.88	1.91	1.92

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 42ksi



Design Axial Strength in kips (ϕ = 0.90) Fy=42ksi												
Diameter		5.5			5							
Wall Thickness Weight Per Foot Design Wall Thickness		0.5 26.7 0.465	0.375 20.53 0.349	0.258 14.44 0.241	0.5 24.03 0.465	0.375 18.52 0.349	0.312 15.62 0.291	0.258 13.07 0.241	0.25 12.68 0.233	0.188 9.66 0.174	0.125 6.51 0.116
Effective Length KL in test	0	278	214	150	250	193	163	137	132	100	68
	2	275	212	149	247	191	161	134	130	98	67
	3	271	209	147	242	187	158	132	128	97	66
	4	266	204	144	237	183	155	129	126	95	65
	5	259	200	141	230	178	150	126	122	92	62
	6	252	194	138	221	172	145	122	118	90	60
	7	244	187	132	212	164	139	116	113	86	58
	8	233	180	128	201	157	132	111	108	83	56
	9	222	173	123	190	148	126	106	103	78	53
	10	211	164	116	178	140	119	100	96	74	50
	11	199	156	110	165	130	111	93	91	69	47
	12	187	146	104	154	121	103	87	85	65	44
	13	175	137	97	141	111	95	80	78	60	41
	14	162	127	91	128	102	87	74	72	55	38
	15	149	118	85	116	93	79	67	66	51	35
	16	138	109	78	105	84	72	61	59	46	32
	17	125	100	72	93	75	65	55	54	41	29
	18	113	91	66	83	67	58	49	49	37	25
	19	103	83	59	74	60	52	44	43	34	23
	20	92	74	54	68	54	47	40	39	31	21
	21	84	68	49	61	50	42	36	35	28	19
	22	76	61	44	56	46	39	33	33	25	17
	23	70	56	41	51	41	36	30	30	23	16
	24	65	52	37	47	38	33	28	28	21	15
	25	59	48	35	43	35	30	25	25	19	14
	26	55	43	32	40	32	28	23	23	18	13
	27	51	40	30		30	25	22	21	17	12
	28	48	38	28				20	20	16	11
	29	44	35	25							
	30		33	24							
	31			22							
	32										
	33										
	34										
	35										
	36										
	37										
	38										
	39										
	40										
Area, In .^{2}		7.36	5.65	3.98	6.62	5.1	4.3	3.6	3.49	2.64	1.78
1, In .^{4}		23.5	18.8	13.8	17.2	13.9	12	10.2	9.94	7.69	5.31
r, I n.		1.79	1.83	1.86	1.61	1.65	1.67	1.68	1.69	1.71	1.73

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 42ksi



Design Axial Strength in kips (ϕ = 0.90) Fy=42ksi													
Diameter		4.5				4							
Wall Thickness Weight Per Foot Design Wall Thickness		0.337 14.98 0.315	0.237 10.79 0.221	0.188 8.66 0.174	0.125 5.84 0.116	0.313 12.33 0.291	0.25 10.01 0.233	0.237 9.52 0.221	0.226 9.11 0.211	0.22 8.88 0.205	0.188 7.65 0.174	0.125 5.17 0.116
Effective Length KL in test	0	157	112	89	60	128	105	100	95	92	79	54
	2	154	110	88	59	126	103	97	93	90	77	53
	3	151	108	86	58	123	100	94	91	88	75	52
	4	147	106	84	57	119	96	91	88	86	73	50
	5	142	102	82	55	113	92	88	84	82	70	48
	6	136	97	78	53	107	87	83	79	77	67	46
	7	128	93	74	51	100	82	77	74	72	62	42
	8	121	88	70	48	92	76	72	69	68	58	39
	9	113	82	66	44	85	70	67	64	61	53	37
	10	105	76	61	42	77	64	60	58	56	49	34
	11	96	70	56	39	69	57	55	52	51	43	31
	12	88	65	52	36	61	51	49	47	46	39	28
	13	79	58	47	33	54	44	43	41	40	35	24
	14	71	53	42	30	48	39	38	36	35	31	21
	15	64	47	38	26	41	34	33	32	31	26	19
	16	55	41	34	23	36	30	29	28	26	23	16
	17	49	37	30	21	32	26	25	24	23	21	15
	18	43	33	26	19	29	23	23	22	21	18	13
	19	39	30	24	17	25	21	20	19	19	17	12
	20	36	26	21	15	23	19	18	18	17	15	11
	21	32	24	20	14	21	17	17	16	16	14	10
	22	30	22	18	13	19	16	15	15	14	13	8
	23	26	20	16	12							
	24	24	18	15	11							
	25		17	14	10							
	26											
	27											
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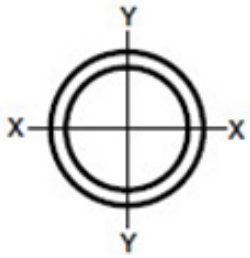
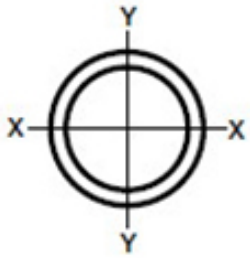
	31											
	32											
	33											
	34											
	35											
	36											
	37											
	38											
	39											
	40											
Area, In .[2]		4.14	2.97	2.36	1.6	3.39	2.76	2.62	2.51	2.44	2.09	1.42
1, In .[4]		9.12	6.82	5.54	3.84	5.87	4.91	4.7	4.52	4.41	3.83	2.67
r, I n.		1.48	1.51	1.53	1.55	1.32	1.33	1.34	1.34	1.34	1.35	1.37

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 42ksi



Design Axial Strength in kips (ϕ = 0.90) Fy=42ksi								
Diameter		3.5						
Wall Thickness Weight Per Foot Design Wall Thickness		0.313 10.65 0.291	0.3 10.25 0.28	0.25 8.68 0.233	0.216 7.58 0.201	0.203 7.15 0.189	0.188 6.65 0.174	0.125 4.51 0.116
Effective Length KL in test	0	111	107	90	78	74	69	47
	2	108	104	88	76	73	67	46
	3	104	101	85	74	70	65	44
	4	100	96	82	71	67	62	42
	5	93	90	76	67	64	58	40
	6	87	84	71	62	59	55	37
	7	79	76	66	57	54	51	34
	8	72	69	59	52	50	46	32
	9	64	61	53	47	44	41	29
	10	56	54	47	41	39	36	25
	11	49	47	41	36	34	32	22
	12	41	40	35	31	30	28	19
	13	35	34	30	26	25	23	17
	14	31	30	25	23	21	20	14
	15	26	25	22	20	19	18	13
	16	23	22	20	17	17	16	11
	17	21	20	17	16	15	14	10
	18	18	18	16	14	13	13	8
	19	17	16	14	13	12	11	7
	20							7
	21							
	22							
	23							
	24							
	25							
	26							
	27							
	28							
	29							
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							
Area, In .^{2} 1, In .^{4} r, I n.		2.93 3.81 1.14	2.83 3.7 1.14	2.39 3.21 1.16	2.08 2.84 1.17	1.97 2.7 1.17	1.82 2.52 1.18	1.23 1.77 1.2

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 42ksi



Design Axial Strength in kips (ϕ = 0.90) Fy=42ksi												
Diameter		3							2.875			
Wall Thickness Weight Per Foot Design Wall Thickness		0.25 7.34 0.233	0.216 6.42 0.201	0.203 6.06 0.189	0.188 5.65 0.174	0.152 4.62 0.142	0.134 4.1 0.125	0.125 3.84 0.116	0.25 7.01 0.233	0.203 5.79 0.189	0.188 5.4 0.174	0.125 3.67 0.116
Effective Length KL in test	0	76	67	64	58	48	42	38	73	60	56	38
	2	74	65	61	56	47	41	37	70	58	54	37
	3	71	61	58	54	44	39	36	67	55	51	35
	4	67	58	55	51	41	37	34	62	52	48	33
	5	61	53	51	47	39	35	31	57	47	44	31
	6	55	49	46	42	35	32	29	51	42	39	28
	7	49	43	41	38	32	29	25	44	37	35	24
	8	42	38	36	33	28	24	22	38	32	30	21
	9	36	33	31	29	23	21	19	33	28	25	18
	10	31	28	25	24	20	18	17	26	22	21	15
	11	25	22	21	20	17	15	14	22	19	18	13
	12	21	19	18	17	14	13	12	18	16	15	11
	13	18	16	16	15	12	11	10	16	14	13	8
	14	16	14	14	13	11	10	8	14	12	11	7
	15	14	12	12	11	10	8	7	12	10	10	6
	16	12	11	11	10	7	7	6				6
	17						6	5				
	18											
	19											
	20											
	21											
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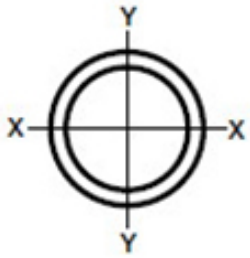
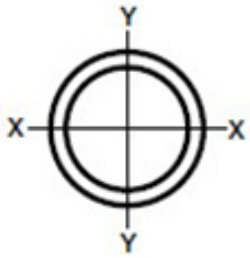
	39											
	40											
Area, In .^{2}		2.03	1.77	1.67	1.54	1.27	1.13	1.02	1.93	1.59	1.48	1.01
1, In .^{4}		1.95	1.74	1.66	1.55	1.3	1.17	1.06	1.7	1.45	1.35	0.958
r, I n.		0.982	0.992	0.996	1	1.01	1.02	1.02	0.938	0.952	0.957	0.976

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 42ksi



Design Axial Strength in kips (ϕ = 0.90) Fy=42ksi											
Diameter		2.5			2.375					1.9	1.66
Wall Thickness Weight Per Foot Design Wall Thickness		0.25 6.01 0.233	0.188 4.64 0.174	0.125 3.17 0.116	0.25 5.67 0.233	0.218 5.02 0.204	0.188 4.39 0.174	0.154 3.65 0.143	0.125 3 0.116	0.145 2.72 0.135	0.14 2.27 0.13
Effective Length KL in test	0 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40	62 59 55 51 44 38 32 26 21 17 14 12 10	48 46 42 39 35 30 25 21 17 14 12 10 8	33 32 30 26 24 21 18 15 12 10 8 6 5 5	65 60 56 50 42 36 29 22 18 15 12 10 0	57 54 50 44 38 32 25 20 16 13 11 10 0	50 47 43 38 34 28 23 18 14 12 10 8 6	41 39 36 33 29 23 19 15 12 10 8 6 5	34 32 30 26 23 20 16 13 11 8 6 5 5	29 25 23 20 16 13 10 7 5 4	23 21 18 15 11 8 6 4 3
Area, In .[2] 1, In .[4] r, I n.		1.66 1.08 0.806	1.27 0.865 0.825	0.87 0.619 0.844	1.57 0.91 0.762	1.39 0.827 0.771	1.2 0.733 0.781	1 0.627 0.791	0.82 0.527 0.8	0.75 0.293 0.626	0.62 0.184 0.543

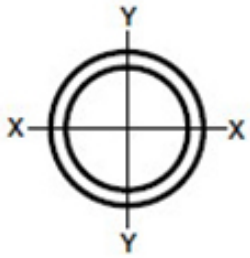
HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 46ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy=46ksi

Diameter		20		18		16				14		
Wall Thickness		0.5	0.375	0.5	0.375	0.5	0.438	0.375	0.312	0.5	0.375	0.312
Weight Per Foot		104.13	78.6	93.45	70.59	82.77	72.8	62.58	52.28	72.09	54.57	45.61
Design Wall Thickness		0.465	0.349	0.465	0.349	0.465	0.407	0.349	0.291	0.465	0.349	0.291
Effective Length KL in test	0	1175	890	1059	804	940	824	713	596	820	622	518
	2	1175	889	1059	803	938	823	712	595	818	620	517
	3	1175	888	1058	802	937	822	710	594	816	618	516
	4	1175	887	1056	800	935	820	708	593	814	617	515
	5	1175	885	1054	798	932	817	706	592	811	614	512
	6	1175	884	1050	796	929	814	704	590	808	612	510
	7	1165	881	1047	793	925	811	701	587	803	609	507
	8	1165	879	1043	791	921	807	698	584	798	605	504
	9	1165	876	1039	787	916	803	694	581	792	600	501
	10	1154	872	1033	784	910	798	690	578	786	596	497
	11	1154	868	1028	779	904	793	685	574	779	591	492
	12	1144	865	1022	775	897	787	681	570	772	584	488
	13	1144	861	1015	770	890	780	674	565	763	579	483
	14	1133	856	1009	764	882	774	669	560	755	573	478
	15	1122	851	1002	759	875	767	663	556	745	565	471
	16	1122	846	993	754	865	759	656	550	736	558	466
	17	1112	840	986	748	857	752	650	544	725	551	460
	18	1101	834	976	741	847	743	643	538	715	543	453
	19	1101	828	968	734	836	734	635	533	704	535	446
	20	1091	822	958	727	826	725	627	525	692	526	439
	21	1080	814	949	720	815	716	619	519	681	517	432
	22	1069	808	938	712	805	706	611	512	668	508	424
	23	1059	800	928	704	793	696	602	505	655	499	416
	24	1049	793	917	696	781	685	593	498	643	489	409
	25	1040	786	905	687	769	674	584	490	630	479	400
	26	1029	777	894	679	756	664	575	482	616	469	392
	27	1018	769	882	670	743	653	565	474	602	458	383
	28	1006	760	870	661	731	642	556	466	589	449	375
	29	995	752	858	651	717	630	545	457	575	438	366
	30	983	743	845	642	704	618	536	449	560	428	357
	31	971	734	832	632	690	607	525	440	546	417	348
	32	958	725	818	623	677	594	515	432	532	406	340
	33	946	716	806	613	662	582	504	424	518	395	330
	34	933	706	792	602	648	570	493	414	503	384	322
	35	920	697	778	592	634	557	483	406	489	374	312
	36	907	686	764	581	619	545	472	397	474	362	304
	37	894	677	751	572	606	533	462	388	460	352	294
	38	880	666	737	561	591	520	451	379	446	341	286
	39	866	656	722	551	576	507	439	370	431	330	276
	40	852	646	708	539	562	494	429	360	417	320	268
Area, In .^{2}		28.5	21.5	25.6	19.4	22.7	19.9	17.2	14.4	19.8	15	12.5
1, In .^{4}		1360	1040	985	754	685	606	526	443	453	349	295
r, I n.		6.91	6.95	6.2	6.24	5.49	5.51	5.53	5.55	4.79	4.83	4.85

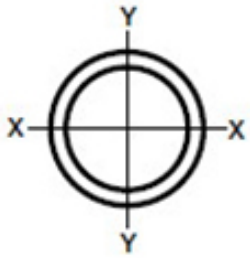
HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 46ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy=46ksi

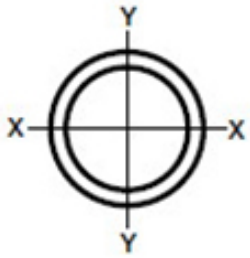
Diameter		12.75			10.75			10					
Wall Thickness		0.5	0.375	0.25	0.5	0.375	0.25	0.625	0.5	0.375	0.312	0.25	0.188
Weight Per Foot		65.42	49.56	33.38	54.74	41.59	28.04	62.58	50.73	38.55	32.28	26.03	19.7
Design Wall Thickness		0.465	0.349	0.233	0.465	0.34	0.233	0.581	0.465	0.349	0.291	0.233	0.174
Effective Length KL in test	0	741	563	379	622	460	319	713	575	438	367	296	222
	2	739	562	378	619	458	318	709	574	437	366	295	221
	3	738	560	378	617	456	317	706	571	435	365	294	220
	4	735	559	376	614	454	316	702	568	433	363	292	219
	5	732	556	375	610	451	313	697	563	430	360	290	218
	6	727	553	373	605	448	311	690	558	426	357	287	216
	7	723	550	371	599	444	308	683	552	421	353	285	214
	8	717	545	367	593	439	305	673	545	416	348	281	211
	9	710	541	364	586	434	301	664	537	410	344	277	209
	10	704	536	361	577	428	298	653	528	403	339	273	205
	11	697	529	357	569	421	293	641	519	397	332	268	201
	12	688	524	354	559	415	288	628	509	390	326	264	198
	13	680	517	348	548	408	283	615	499	381	320	258	194
	14	670	510	344	538	399	277	600	487	373	312	252	190
	15	661	503	340	527	391	272	586	475	364	305	247	185
	16	650	496	335	515	382	267	570	463	355	298	240	181
	17	640	487	329	503	374	260	554	450	345	290	234	176
	18	628	479	323	490	364	254	538	437	335	282	228	172
	19	616	470	318	476	355	248	521	424	325	273	220	166
	20	604	461	311	464	345	241	503	410	314	265	214	161
	21	591	451	305	450	336	234	486	396	304	255	206	156
	22	578	442	299	436	325	228	468	382	293	247	200	150
	23	565	432	292	421	314	220	450	367	283	238	193	145
	24	552	421	286	408	304	213	432	353	272	229	185	140
	25	538	411	278	393	294	205	414	339	260	220	178	134
	26	524	401	272	379	284	199	396	324	250	211	170	129
	27	510	391	265	364	273	192	378	310	239	202	163	124
	28	497	380	257	350	263	184	360	296	229	193	157	119
	29	482	368	250	336	252	177	343	282	218	184	149	113
	30	468	358	244	322	241	169	326	268	208	175	142	108
	31	453	347	236	307	231	163	309	255	197	166	136	103
	32	438	337	229	293	221	156	292	241	187	158	128	97
	33	425	326	221	281	211	148	276	229	177	150	122	92
	34	410	314	214	267	201	142	260	216	167	142	115	88
	35	396	304	208	254	192	136	246	203	158	133	109	83
	36	381	293	200	240	182	129	232	193	149	126	103	78
	37	367	283	193	228	173	122	220	182	141	120	97	74
	38	354	272	186	216	163	115	209	173	133	113	92	70
	39	340	263	179	205	155	110	198	164	127	108	88	67
	40	327	252	173	195	147	105	188	156	121	103	84	64
Area, In .^{2}		17.9	13.6	9.16	15	11.1	7.7	17.2	13.9	10.6	8.88	7.15	5.37
1, In .^{4}		339	262	180	199	151	106	191	159	123	105	85.3	64.8
r, I n.		4.35	4.39	4.43	3.64	3.68	3.72	3.34	3.38	3.41	3.43	3.45	3.47

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 46ksi



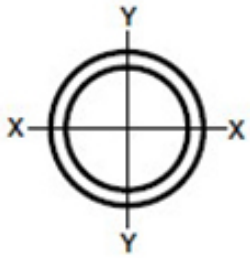
Design Axial Strength in kips (ϕ = 0.90) Fy=46ksi											
Diameter		9.625					8.625				
Wall Thickness Weight Per Foot Design Wall Thickness		0.5 48.73 0.465	0.375 37.05 0.349	0.312 31.03 0.291	0.25 25.03 0.233	0.188 18.95 0.174	0.5 43.39 0.465	0.375 33.04 0.349	0.322 28.55 0.3	0.25 22.36 0.233	0.188 16.94 0.174
Effective Length KL in test	0	555	422	354	285	214	492	376	325	254	192
	2	553	420	352	284	213	490	374	324	253	191
	3	551	419	350	283	213	487	372	322	252	190
	4	546	416	348	281	211	484	368	320	250	188
	5	542	413	345	278	210	479	365	317	248	186
	6	537	409	342	275	208	472	361	312	245	184
	7	530	404	338	272	205	466	356	308	240	181
	8	523	398	334	269	202	457	349	303	237	179
	9	515	393	328	265	199	449	343	296	233	175
	10	506	385	323	260	196	438	336	291	228	172
	11	497	379	317	256	193	428	327	284	222	167
	12	486	371	310	251	188	417	319	276	217	164
	13	474	363	304	246	185	404	310	269	211	159
	14	463	354	296	239	181	393	301	262	205	155
	15	451	345	289	233	176	379	291	253	199	150
	16	438	336	282	228	172	366	282	245	192	145
	17	425	325	273	220	166	353	271	236	185	140
	18	412	316	265	214	162	339	260	227	178	134
	19	398	305	256	208	157	324	250	217	172	129
	20	383	294	248	200	151	310	239	209	164	124
	21	370	284	238	193	146	295	229	199	157	119
	22	355	273	230	186	141	281	217	190	149	113
	23	341	263	220	179	136	267	206	180	142	108
	24	326	251	212	172	130	253	196	172	136	103
	25	311	240	202	164	124	238	185	162	128	97
	26	298	230	194	157	119	224	175	154	121	92
	27	283	219	184	150	113	212	165	144	114	87
	28	269	209	176	143	108	198	155	136	107	82
	29	255	198	167	136	103	185	145	127	101	77
	30	241	187	159	129	98	174	136	119	94	72
	31	229	178	150	122	93	162	127	111	89	68
	32	216	168	142	115	88	152	120	105	83	64
	33	202	158	133	109	83	143	112	98	78	59
	34	191	149	126	103	78	134	106	93	73	56
	35	180	141	119	97	74	127	100	88	70	53
	36	170	132	112	92	70	121	94	83	66	50
	37	161	126	107	87	66	114	89	78	62	48
	38	152	120	101	83	62	108	85	74	59	44
	39	145	113	95	78	59	103	80	71	56	42
	40	138	108	91	74	56	97	76	67	53	40
Area, In .^{2} 1, In .^{4} r, I n.		13.4 141 3.24	10.2 110 3.28	8.53 93 3.3	6.87 75.9 3.32	5.17 57.7 3.34	11.9 99.5 2.89	9.07 77.8 2.93	7.85 68.1 2.95	6.14 54.1 2.97	4.62 41.3 2.99

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 46ksi



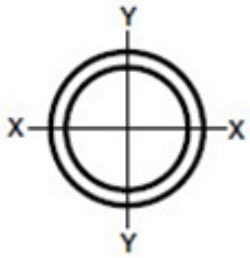
Design Axial Strength in kips (ϕ = 0.90) Fy=46ksi								
Diameter		7.625		7.5				
Wall Thickness Weight Per Foot Design Wall Thickness		0.375 29.04 0.349	0.328 25.56 0.305	0.5 37.38 0.465	0.375 28.54 0.349	0.312 23.95 0.291	0.25 19.36 0.233	0.188 14.68 0.174
Effective Length KL in test	0	330	290	427	325	273	220	165
	2	328	289	424	323	271	219	164
	3	326	287	420	320	269	217	163
	4	323	284	416	317	267	215	162
	5	319	280	410	312	263	213	160
	6	313	275	403	307	258	209	157
	7	308	270	395	302	254	205	155
	8	301	265	385	294	248	200	151
	9	293	258	376	287	241	196	147
	10	286	251	364	278	235	191	143
	11	277	244	353	270	228	184	139
	12	268	236	341	262	220	178	134
	13	258	228	327	251	212	172	130
	14	249	219	314	241	203	165	125
	15	238	210	300	231	195	159	120
	16	228	200	286	220	186	151	114
	17	217	192	271	210	178	144	109
	18	206	182	257	199	168	137	104
	19	196	173	242	188	159	130	98
	20	184	163	229	177	150	123	93
	21	174	154	214	166	142	115	88
	22	163	144	200	156	132	108	83
	23	152	136	186	146	124	102	77
	24	143	126	174	136	115	94	72
	25	133	118	160	126	108	88	67
	26	123	109	148	116	100	82	62
	27	114	102	138	108	92	75	58
	28	106	94	128	101	86	70	54
	29	100	88	120	93	79	66	50
	30	92	82	111	88	75	61	47
	31	87	77	104	82	70	57	43
	32	82	72	97	77	66	54	41
	33	76	68	92	72	61	51	39
	34	72	64	87	68	58	48	36
	35	68	60	82	65	55	46	34
	36	65	57	77	60	52	42	33
	37	60	54	73	57	49	40	31
	38	58	51	70	54	47	38	30
	39	55	49	66	52	44	36	28
	40	52	47	62	49	42	35	26
Area, In .^{2} 1, In .^{4} r, I n.		7.98 52.9 2.58	7.01 47.1 2.59	10.3 63.9 2.49	7.84 50.2 2.53	6.59 42.9 2.55	5.32 35.2 2.57	4 26.9 2.59

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 46ksi



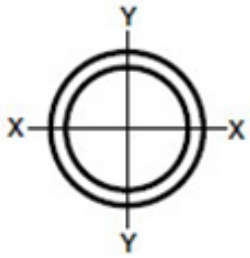
Design Axial Strength in kips (ϕ = 0.90) Fy=46ksi												
Diameter		7						6.875				
Wall Thickness Weight Per Foot Design Wall Thickness		0.5 34.71 0.465	0.375 26.53 0.349	0.312 22.29 0.291	0.25 18.02 0.233	0.188 13.68 0.174	0.125 9.18 0.116	0.5 34.04 0.465	0.375 26.03 0.349	0.312 21.87 0.291	0.25 17.69 0.233	0.188 13.43 0.174
Effective Length KL in test	0	395	302	254	205	155	104	388	296	249	201	151
	2	393	300	252	203	154	103	384	294	248	200	150
	3	389	298	250	202	152	103	381	291	246	198	149
	4	384	293	247	199	150	102	376	288	242	196	147
	5	378	289	244	197	148	100	370	284	238	193	145
	6	371	284	238	193	145	98	362	277	234	188	142
	7	362	277	233	188	142	96	354	271	229	184	140
	8	353	270	228	184	139	93	343	264	222	180	136
	9	342	262	220	179	134	91	332	256	216	175	131
	10	330	253	214	173	130	88	321	247	209	168	127
	11	318	245	206	167	126	85	309	238	201	163	123
	12	305	234	198	161	122	82	295	229	193	157	119
	13	291	224	190	154	116	78	282	218	184	149	113
	14	277	214	181	147	111	75	268	208	176	143	108
	15	264	203	173	140	106	72	254	197	167	136	103
	16	250	193	163	132	101	68	239	186	158	128	97
	17	235	182	155	126	95	65	226	176	149	121	92
	18	220	170	145	119	90	61	211	164	140	114	87
	19	206	160	137	111	85	57	197	154	131	107	82
	20	193	149	127	104	79	54	183	143	122	100	76
	21	179	140	119	97	74	51	169	133	113	93	71
	22	165	129	110	90	69	47	156	123	105	86	66
	23	152	120	102	84	64	43	143	113	97	79	60
	24	140	110	94	77	59	40	131	104	89	73	56
	25	129	101	87	71	54	37	121	96	82	68	52
	26	120	93	79	66	50	34	112	89	76	62	48
	27	110	87	74	60	47	32	104	83	70	58	44
	28	103	80	69	56	43	30	96	76	66	54	41
	29	96	75	65	53	40	28	90	71	61	50	38
	30	90	70	60	50	38	25	84	67	57	47	36
	31	84	66	56	47	35	24	78	62	53	43	34
	32	78	61	53	43	33	22	74	58	50	41	32
	33	74	58	50	40	31	21	70	55	47	39	30
	34	70	55	47	38	30	20	66	52	44	36	28
	35	66	52	44	36	28	19	61	49	42	34	26
	36	62	49	41	34	26	18	58	47	39	33	25
	37	59	47	39	33	24	17	55	43	37	31	23
	38	56	43	37	31	23	16		41	36	30	22
	39		41	36	30	22	15				28	21
	40					21	15					
Area, In .^{2}		9.55	7.29	6.13	4.95	3.73	2.51	9.36	7.16	6.02	4.86	3.66
1, In .^{4}		51.2	40.4	34.6	28.4	21.7	14.9	48.3	38.2	32.7	26.8	20.6
r, I n.		2.32	2.35	2.37	2.39	2.41	2.43	2.27	2.31	2.33	2.35	2.37

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 46ksi



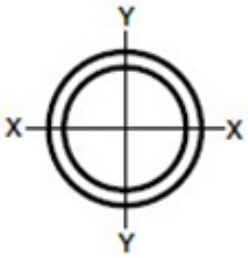
Design Axial Strength in kips (ϕ = 0.90) Fy=46ksi									
Diameter		6.625							
Wall Thickness Weight Per Foot Design Wall Thickness		0.5 32.71 0.465	0.432 28.57 0.403	0.375 25.03 0.349	0.312 21.04 0.291	0.28 18.97 0.261	0.25 17.02 0.233	0.188 12.92 0.174	0.125 8.68 0.116
Effective Length KL in test	0	373	326	285	239	216	194	146	98
	2	370	324	283	238	215	193	145	97
	3	366	321	280	235	213	191	144	96
	4	361	316	276	233	210	188	142	95
	5	354	310	271	229	206	185	140	94
	6	346	304	266	223	202	181	137	92
	7	337	295	258	218	197	177	133	90
	8	327	287	251	212	192	172	130	87
	9	316	277	242	205	185	166	126	85
	10	304	267	234	198	179	160	122	82
	11	291	256	224	190	172	154	116	78
	12	277	245	215	181	164	147	112	75
	13	264	233	204	173	157	141	107	72
	14	250	220	194	164	148	133	102	69
	15	235	208	183	156	141	126	96	65
	16	221	196	173	146	132	120	91	61
	17	206	183	161	138	124	112	86	58
	18	193	170	150	128	116	105	79	54
	19	179	159	140	120	108	97	74	51
	20	165	146	130	111	101	91	70	48
	21	151	134	120	103	93	84	65	43
	22	139	124	110	94	86	77	59	40
	23	127	113	101	86	78	71	54	37
	24	116	104	92	79	72	65	50	34
	25	107	95	85	73	67	60	47	32
	26	100	89	78	68	61	55	42	29
	27	92	83	73	62	57	52	39	26
	28	86	76	68	58	53	48	37	25
	29	79	71	64	54	50	44	34	23
	30	74	67	59	51	47	41	32	22
	31	70	62	55	48	43	39	30	20
	32	66	58	52	44	40	37	29	19
	33	61	55	49	42	38	35	26	18
	34	58	52	46	39	36	33	25	17
	35	55	49	43	37	34	31	23	16
	36	52	47	41	35	32	29	22	15
	37			39	33	31	28	21	15
	38							20	14
	39								
	40								
Area, In .^{2} 1, In .^{4} r, I n.		9 42.9 2.18	7.88 38.3 2.2	6.88 34 2.22	5.79 29.1 2.24	5.22 26.5 2.25	4.68 23.9 2.26	3.53 18.4 2.28	2.37 12.6 2.3

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 46ksi



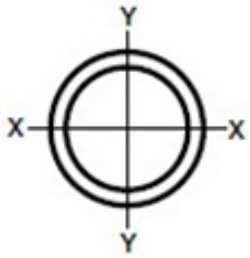
Design Axial Strength in kips (ϕ = 0.90) Fy=46ksi												
Diameter		6							5.563			
Wall Thickness Weight Per Foot Design Wall Thickness		0.5 29.37 0.465	0.375 22.53 0.349	0.312 18.95 0.291	0.28 17.11 0.261	0.25 15.35 0.233	0.188 11.67 0.174	0.125 7.84 0.116	0.375 20.78 0.349	0.258 14.62 0.241	0.188 10.79 0.174	0.134 7.77 0.125
Effective Length KL in test	0	335	256	216	195	175	131	89	237	167	122	89
	2	331	254	214	193	173	130	88	234	165	121	88
	3	327	251	212	191	172	129	87	231	163	120	87
	4	322	247	208	187	168	127	86	227	160	118	85
	5	314	241	203	184	165	124	84	220	156	114	83
	6	306	235	198	179	161	122	82	214	151	111	80
	7	296	228	193	174	156	118	79	206	146	107	78
	8	285	220	185	167	150	113	77	198	140	103	75
	9	273	211	178	161	145	109	74	188	133	98	72
	10	260	201	170	155	139	105	71	179	127	93	68
	11	247	192	162	147	132	100	68	168	120	89	65
	12	233	181	154	139	125	95	65	158	112	84	60
	13	219	170	145	131	118	90	60	147	105	78	57
	14	204	160	136	123	111	84	57	136	97	73	53
	15	190	149	127	115	104	78	54	125	90	67	49
	16	176	138	118	107	96	73	50	114	83	61	46
	17	162	127	109	98	89	68	47	105	75	57	41
	18	148	118	101	91	83	62	43	94	69	52	38
	19	134	107	92	84	75	58	39	85	61	47	34
	20	122	97	84	76	69	53	36	77	56	42	31
	21	110	88	76	69	62	48	33	70	51	38	29
	22	101	80	69	62	57	43	30	64	47	35	25
	23	92	73	64	57	52	40	28	58	42	32	23
	24	85	68	58	53	48	37	25	53	39	30	21
	25	78	62	53	49	44	34	23	49	36	28	20
	26	72	57	50	46	40	32	21	46	33	25	18
	27	67	53	46	41	38	29	20	42	31	23	17
	28	62	50	42	39	35	28	18	39	29	21	16
	29	58	47	40	36	33	25	17	36	26	20	15
	30	54	43	37	34	31	23	16	34	24	19	14
	31	51	40	35	32	29	22	15		23	18	13
	32	48	38	33	30	26	21	14				12
	33		36	31	28	25	19	14				
	34					24	18	13				
	35											
	36											
	37											
	38											
	39											
	40											
Area, In .[2]		8.09	6.2	5.22	4.71	4.22	3.18	2.14	5.72	4.03	2.95	2.14
1, In .[4]		31.2	24.8	21.3	19.4	17.6	13.5	9.28	19.5	14.3	10.7	7.9
r, I n.		1.96	2	2.02	2.03	2.04	2.06	2.08	1.85	1.88	1.91	1.92

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 46ksi



Design Axial Strength in kips (ϕ = 0.90) Fy=46ksi											
Diameter		5.5			5						
Wall Thickness Weight Per Foot Design Wall Thickness		0.5 26.7 0.465	0.375 20.53 0.349	0.258 14.44 0.241	0.5 24.03 0.465	0.375 18.52 0.349	0.312 15.62 0.291	0.258 13.07 0.241	0.25 12.68 0.233	0.188 9.66 0.174	
Effective Length KL in test	0 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40	305 301 296 290 283 273 263 251 238 226 212 197 183 168 155 141 127 114 103 92 84 76 70 65 59 55 51 48 44	234 231 228 223 218 211 203 195 185 175 165 155 143 132 122 111 102 92 83 74 68 61 56 52 48 43 40 38 35 33	165 163 161 158 154 149 144 138 131 125 118 110 103 95 88 80 73 67 60 54 49 44 41 37 35 32 30 28 25 24 22	274 270 265 258 250 239 229 216 202 188 175 160 146 131 119 105 93 83 74 68 61 56 51 47 43 40	211 209 204 199 193 185 178 168 158 148 138 126 115 105 95 85 75 67 60 54 50 46 41 38 35 32 30	178 176 173 168 163 157 150 143 134 126 116 108 98 90 82 73 65 58 52 47 42 39 36 33 30 28 25	149 147 144 141 137 131 126 120 113 106 98 91 84 76 69 61 55 49 44 40 36 33 30 28 25 23 22 20	144 143 140 137 132 128 123 116 110 103 96 89 82 74 68 60 54 49 43 39 35 33 30 28 25 23 21 20	109 108 106 104 101 97 93 89 84 78 73 68 62 57 52 47 42 37 34 31 28 25 23 21 19 18 17 16	
Area, In .[2] 1, In .[4] r, I n.		7.36 23.5 1.79	5.65 18.8 1.83	3.98 13.8 1.86	6.62 17.2 1.61	5.1 13.9 1.65	4.3 12 1.67	3.6 10.2 1.68	3.49 9.94 1.69	2.64 7.69 1.71	1.78 5.31 1.73

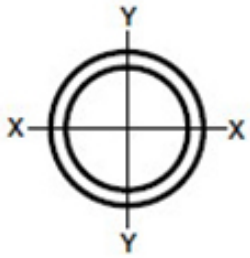
HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 46ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy=46ksi

Diameter		4.5					4						
Wall Thickness Weight Per Foot Design Wall Thickness		0.125 6.51 0.116	0.337 14.98 0.315	0.237 10.79 0.221	0.188 8.66 0.174	0.125 5.84 0.116	0.313 12.33 0.291	0.25 10.01 0.233	0.237 9.52 0.221	0.226 9.11 0.211	0.22 8.88 0.205	0.188 7.65 0.174	0.125 5.17 0.116
Effective Length KL in test	0	74	172	123	97	67	141	114	108	104	101	87	59
	2	73	168	121	96	66	138	112	106	102	98	85	57
	3	72	165	119	94	64	133	109	104	98	96	83	56
	4	70	160	114	91	62	128	105	100	95	93	79	54
	5	68	154	110	88	60	122	100	95	91	88	76	52
	6	66	146	106	85	57	115	94	89	86	84	71	49
	7	62	138	100	79	54	107	88	84	79	77	67	46
	8	60	129	93	75	51	98	80	77	73	72	61	42
	9	57	120	87	70	48	89	73	70	67	66	56	39
	10	53	110	80	65	44	80	66	64	60	59	51	35
	11	50	101	73	59	40	72	59	56	54	53	46	32
	12	47	91	67	54	37	64	52	50	48	47	40	28
	13	42	82	60	49	34	55	46	43	41	40	35	24
	14	39	72	54	43	30	48	39	38	36	35	31	21
	15	36	64	48	38	26	41	34	33	32	31	26	19
	16	32	55	41	34	23	36	30	29	28	26	23	16
	17	29	49	37	30	21	32	26	25	24	23	21	15
	18	25	43	33	26	19	29	23	23	22	21	18	13
	19	23	39	30	24	17	25	21	20	19	19	17	12
	20	21	36	26	21	15	23	19	18	18	17	15	11
	21	19	32	24	20	14	21	17	17	16	16	14	10
	22	17	30	22	18	13	19	16	15	15	14	13	8
	23	16	26	20	16	12							
	24	15	24	18	15	11							
	25	14		17	14	10							
	26	13											
	27	12											
	28	11											
	29												
	30												
	31												
	32												
	33												
	34												
	35												
	36												
	37												
	38												
	39												
	40												
Area, In .^{2}		4.14	2.97	2.36	1.6		3.39	2.76	2.62	2.51	2.44	2.09	1.42
1, In .^{4}		9.12	6.82	5.54	3.84		5.87	4.91	4.7	4.52	4.41	3.83	2.67
r, I n.		1.48	1.51	1.53	1.55		1.32	1.33	1.34	1.34	1.34	1.35	1.37

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 46ksi



Design Axial Strength in kips (ϕ = 0.90) Fy=46ksi								
Diameter		3.5						
Wall Thickness Weight Per Foot Design Wall Thickness		0.313 10.65 0.291	0.3 10.25 0.28	0.25 8.68 0.233	0.216 7.58 0.201	0.203 7.15 0.189	0.188 6.65 0.174	0.125 4.51 0.116
Effective Length KL in test	0	122	118	98	86	82	75	51
	2	118	113	96	84	79	73	50
	3	113	109	93	80	76	71	48
	4	108	104	88	77	73	68	46
	5	101	97	83	72	69	64	43
	6	93	90	76	67	64	58	40
	7	85	82	70	60	57	54	37
	8	75	73	62	55	52	49	33
	9	67	65	55	49	46	43	30
	10	57	56	48	42	40	37	26
	11	49	48	41	37	35	33	22
	12	41	40	35	31	30	28	19
	13	35	34	30	26	25	23	17
	14	31	30	25	23	21	20	14
	15	26	25	22	20	19	18	13
	16	23	22	20	17	17	16	11
	17	21	20	17	16	15	14	10
	18	18	18	16	14	13	13	8
	19	17	16	14	13	12	11	7
	20							7
	21							
	22							
	23							
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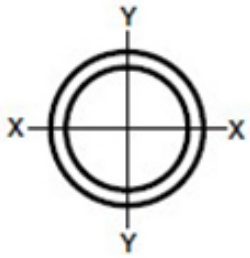
	34							
	35							
	36							
	37							
	38							
	39							
	40							
Area, In .^{2} 1, In .^{4} r, I n.		2.93 3.81 1.14	2.83 3.7 1.14	2.39 3.21 1.16	2.08 2.84 1.17	1.97 2.7 1.17	1.82 2.52 1.18	1.23 1.77 1.2

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 46ksi



Design Axial Strength in kips (ϕ = 0.90) Fy=46ksi												
Diameter		3							2.875			
Wall Thickness Weight Per Foot Design Wall Thickness		0.25 7.34 0.233	0.216 6.42 0.201	0.203 6.06 0.189	0.188 5.65 0.174	0.152 4.62 0.142	0.134 4.1 0.125	0.125 3.84 0.116	0.25 7.01 0.233	0.203 5.79 0.189	0.188 5.4 0.174	0.125 3.67 0.116
Effective Length KL in test	0	84	73	69	64	53	47	42	79	66	61	41
	2	80	71	67	61	51	46	40	76	64	58	40
	3	77	67	64	58	49	43	39	72	59	56	38
	4	72	62	59	55	46	40	36	67	55	52	36
	5	66	57	54	50	41	37	34	60	51	47	33
	6	58	52	49	44	37	34	31	54	44	42	29
	7	52	46	42	39	33	30	26	47	39	36	25
	8	44	39	37	34	29	25	23	39	33	31	22
	9	37	33	32	29	24	22	20	33	28	26	18
	10	31	28	26	24	20	18	17	26	22	21	15
	11	25	22	21	20	17	15	14	22	19	18	13
	12	21	19	18	17	14	13	12	18	16	15	11
	13	18	16	16	15	12	11	10	16	14	13	8
	14	16	14	14	13	11	10	8	14	12	11	7
	15	14	12	12	11	10	8	7	12	10	10	6
	16	12	11	11	10	7	7	6				6
	17					6	5					
	18											
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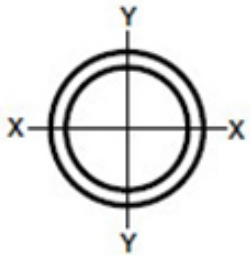
	39											
	40											
Area, In .[2]		2.03	1.77	1.67	1.54	1.27	1.13	1.02	1.93	1.59	1.48	1.01
1, In .[4]		1.95	1.74	1.66	1.55	1.3	1.17	1.06	1.7	1.45	1.35	0.958
r, I n.		0.982	0.992	0.996	1	1.01	1.02	1.02	0.938	0.952	0.957	0.976

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 46ksi



Design Axial Strength in kips (ϕ = 0.90) Fy=46ksi											
Diameter		2.5			2.375					1.9	1.66
Wall Thickness Weight Per Foot Design Wall Thickness		0.25 6.01 0.233	0.188 4.64 0.174	0.125 3.17 0.116	0.25 5.67 0.233	0.218 5.02 0.204	0.188 4.39 0.174	0.154 3.65 0.143	0.125 3 0.116	0.145 2.72 0.135	0.14 2.27 0.13
Effective Length KL in test	0	69	53	36	65	57	50	41	34	31	25
	2	65	50	34	60	54	47	39	32	29	22
	3	60	47	32	56	50	43	36	30	24	19
	4	54	42	29	50	44	38	33	26	21	15
	5	48	37	25	42	38	34	29	23	17	12
	6	40	32	22	36	32	28	23	20	13	8
	7	33	26	18	29	25	23	19	16	10	6
	8	26	21	15	22	20	18	15	13	7	4
	9	21	17	12	18	16	14	12	11	5	3
	10	17	14	10	15	13	12	10	8	4	0
	11	14	12	8	12	11	10	8	6	0	0
	12	12	10	6	10	10	8	6	5	0	0
	13	10	8	5	0	0	6	5	5	0	0
	14										
	15										
	16										
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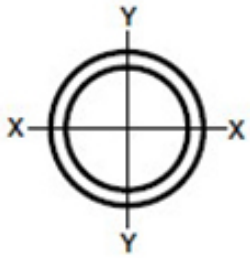
	35										
	36										
	37										
	38										
	39										
	40										
Area, In .[2] 1, In .[4] r, I n.		1.66 1.08 0.806	1.27 0.865 0.825	0.87 0.619 0.844	1.57 0.91 0.762	1.39 0.827 0.771	1.2 0.733 0.781	1 0.627 0.791	0.82 0.527 0.8	0.75 0.293 0.626	0.62 0.184 0.543

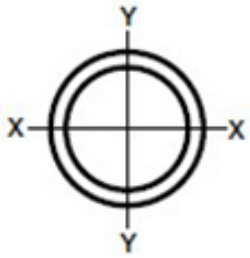
HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 50ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy=50ksi

Diameter		20		18		16				14		
Wall Thickness		0.5	0.375	0.5	0.375	0.5	0.438	0.375	0.312	0.5	0.375	0.312
Weight Per Foot		104.13	78.6	93.45	70.59	82.77	72.8	62.58	52.28	72.09	54.57	45.61
Design Wall Thickness		0.465	0.349	0.465	0.349	0.465	0.407	0.349	0.291	0.465	0.349	0.291
Effective Length KL in test	0	1281	968	1154	874	1022	896	774	648	892	676	562
	2	1281	967	1154	872	1020	895	773	647	889	673	561
	3	1281	966	1154	870	1019	893	772	646	887	672	560
	4	1281	965	1144	869	1015	890	770	645	884	670	558
	5	1271	962	1144	867	1012	887	768	643	881	667	556
	6	1271	960	1144	865	1009	884	764	641	877	664	554
	7	1271	957	1133	862	1004	880	761	637	871	661	551
	8	1260	954	1133	858	998	876	757	634	865	655	546
	9	1260	951	1122	854	993	870	753	630	859	651	542
	10	1249	947	1122	850	987	865	748	626	851	645	538
	11	1249	942	1112	845	979	859	742	622	843	640	533
	12	1239	938	1112	840	971	852	737	617	834	632	527
	13	1239	933	1101	834	962	845	731	612	825	626	522
	14	1228	928	1091	828	954	836	723	606	814	618	516
	15	1218	921	1080	822	944	828	717	600	804	610	508
	16	1207	915	1069	814	934	820	708	594	792	601	502
	17	1207	908	1069	808	923	810	701	587	780	593	494
	18	1196	901	1055	799	913	800	692	580	768	583	487
	19	1186	895	1044	792	900	790	684	573	755	574	479
	20	1175	886	1032	784	888	779	674	565	741	563	470
	21	1165	879	1021	775	876	769	665	557	727	553	462
	22	1154	870	1009	766	863	757	655	550	714	542	453
	23	1144	862	996	757	849	745	645	541	699	532	444
	24	1133	853	984	748	835	734	635	533	684	521	435
	25	1122	844	971	737	822	721	624	523	669	509	426
	26	1101	835	957	727	807	708	613	515	653	498	416
	27	1091	825	943	717	792	696	602	505	637	486	406
	28	1080	815	930	706	777	682	591	496	622	474	396
	29	1069	806	915	696	761	669	579	486	606	462	386
	30	1051	795	900	684	745	655	568	476	590	450	376
	31	1038	785	885	673	731	642	556	467	573	437	366
	32	1023	774	870	662	715	628	544	456	557	426	356
	33	1009	763	854	650	698	614	532	447	541	413	345
	34	994	752	840	638	682	599	520	436	524	400	336
	35	979	741	824	627	666	586	507	427	508	389	325
	36	964	730	808	615	649	572	496	416	491	376	314
	37	949	718	792	602	633	557	483	406	475	364	305
	38	933	706	776	591	617	543	471	396	460	352	294
	39	917	695	759	578	600	528	458	385	444	340	285
	40	901	683	743	566	584	515	446	375	428	328	275
Area, In .^{2}		28.5	21.5	25.6	19.4	22.7	19.9	17.2	14.4	19.8	15	12.5
1, In .^{4}		1360	1040	985	754	685	606	526	443	453	349	295
r, I n.		6.91	6.95	6.2	6.24	5.49	5.51	5.53	5.55	4.79	4.83	4.85

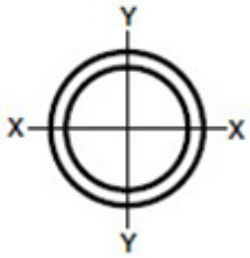
HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 50ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy=50ksi

Diameter		12.75			10.75			10					
Wall Thickness		0.5	0.375	0.25	0.5	0.375	0.25	0.625	0.5	0.375	0.312	0.25	0.188
Weight Per Foot		65.42	49.56	33.38	54.74	41.59	28.04	62.58	50.73	38.55	32.28	26.03	19.7
Design Wall Thickness		0.465	0.349	0.233	0.465	0.34	0.233	0.581	0.465	0.349	0.291	0.233	0.174
Effective Length KL in test	0	806	612	412	676	500	346	774	626	478	399	322	241
	2	804	611	411	672	498	345	771	624	475	398	321	240
	3	802	609	410	670	496	344	768	620	473	396	319	239
	4	798	607	409	666	493	342	762	616	470	394	318	238
	5	794	604	407	662	490	340	756	611	466	391	314	236
	6	790	600	404	656	486	337	749	605	462	386	311	234
	7	784	596	401	649	481	334	739	598	456	382	308	232
	8	777	591	398	642	475	330	728	590	450	377	304	229
	9	770	586	395	633	469	326	717	580	444	372	300	226
	10	762	579	391	624	462	321	704	571	436	365	294	221
	11	753	573	386	613	454	316	690	559	428	359	289	217
	12	743	565	381	602	447	310	676	547	418	352	284	213
	13	733	558	377	590	438	305	660	536	410	343	277	209
	14	722	550	371	578	429	299	644	522	399	336	271	203
	15	710	541	365	564	419	292	626	508	389	327	264	198
	16	699	533	359	551	410	285	608	494	378	318	256	193
	17	686	523	353	537	399	278	589	480	367	308	249	187
	18	672	512	346	522	389	271	570	464	356	299	241	182
	19	659	503	340	507	377	264	551	449	344	289	234	176
	20	645	492	332	491	366	255	530	433	332	280	226	170
	21	630	481	325	475	355	248	510	416	320	269	218	164
	22	615	470	318	460	343	239	490	400	308	259	210	158
	23	600	458	310	444	331	232	470	384	295	249	201	152
	24	584	447	303	427	319	223	449	367	283	238	194	146
	25	569	435	294	411	307	215	429	352	271	229	185	140
	26	553	424	287	395	295	208	409	336	258	218	177	133
	27	537	411	278	378	284	199	389	320	247	209	168	128
	28	521	399	271	362	271	191	370	304	235	198	161	122
	29	504	386	263	346	259	183	350	288	222	188	152	115
	30	488	374	254	330	248	175	331	273	211	179	145	110
	31	472	362	246	314	236	167	312	258	200	169	138	104
	32	455	349	238	300	226	159	294	244	188	160	130	98
	33	439	338	230	284	214	151	276	229	178	150	123	93
	34	424	325	221	269	203	144	260	216	167	142	115	88
	35	408	313	214	254	193	137	246	203	158	133	109	83
	36	392	302	205	240	182	129	232	193	149	126	103	78
	37	376	290	198	228	173	122	220	182	141	120	97	74
	38	361	278	190	216	163	115	209	173	133	113	92	70
	39	345	267	182	205	155	110	198	164	127	108	88	67
	40	330	255	175	195	147	105	188	156	121	103	84	64
Area, In .^{2}		17.9	13.6	9.16	15	11.1	7.7	17.2	13.9	10.6	8.88	7.15	5.37
1, In .^{4}		339	262	180	199	151	106	191	159	123	105	85.3	64.8
r, I n.		4.35	4.39	4.43	3.64	3.68	3.72	3.34	3.38	3.41	3.43	3.45	3.47

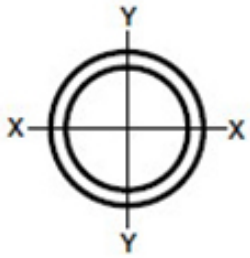
HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 50ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy=50ksi

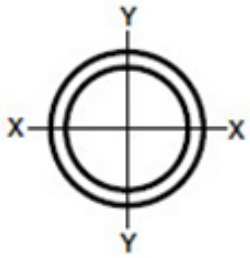
Diameter		9.625					8.625				
Wall Thickness		0.5	0.375	0.312	0.25	0.188	0.5	0.375	0.322	0.25	0.188
Weight Per Foot		48.73	37.05	31.03	25.03	18.95	43.39	33.04	28.55	22.36	16.94
Design Wall Thickness		0.465	0.349	0.291	0.233	0.174	0.465	0.349	0.3	0.233	0.174
Effective Length KL in test	0	604	460	384	309	233	536	408	354	276	208
	2	600	457	382	308	232	533	407	352	275	206
	3	597	455	380	306	231	529	403	349	273	205
	4	593	452	378	305	229	525	400	346	271	204
	5	588	448	375	302	228	519	396	343	268	202
	6	581	443	371	299	224	511	391	338	265	199
	7	574	437	366	295	222	503	384	332	260	196
	8	565	431	361	291	219	494	377	327	256	193
	9	556	424	355	286	216	484	370	320	251	188
	10	545	416	348	281	212	472	361	313	246	185
	11	534	408	342	275	208	460	352	305	239	180
	12	522	399	334	269	203	447	342	296	233	176
	13	509	389	326	263	198	433	331	288	226	170
	14	496	379	318	256	194	418	321	278	219	165
	15	481	368	309	250	188	403	310	269	211	160
	16	467	357	300	242	183	388	299	259	203	154
	17	451	346	290	235	177	372	286	249	196	148
	18	435	335	281	227	172	356	274	238	187	142
	19	420	322	271	219	165	340	263	229	180	136
	20	403	310	260	211	160	323	250	218	172	130
	21	388	299	251	203	154	307	237	208	163	124
	22	371	286	240	195	147	291	226	197	155	118
	23	355	273	230	186	141	275	213	186	147	111
	24	339	262	220	178	136	259	201	176	139	106
	25	322	249	210	170	129	244	190	166	131	100
	26	306	237	200	162	123	229	178	156	123	94
	27	290	224	190	155	116	214	167	146	115	88
	28	274	213	180	146	111	199	156	137	108	83
	29	259	201	170	139	105	185	145	127	101	77
	30	245	191	161	131	100	174	136	119	94	72
	31	230	179	151	124	94	162	127	111	89	68
	32	216	168	142	116	88	152	120	105	83	64
	33	202	158	133	109	83	143	112	98	78	59
	34	191	149	126	103	78	134	106	93	73	56
	35	180	141	119	97	74	127	100	88	70	53
	36	170	132	112	92	70	121	94	83	66	50
	37	161	126	107	87	66	114	89	78	62	48
	38	152	120	101	83	62	108	85	74	59	44
	39	145	113	95	78	59	103	80	71	56	42
	40	138	108	91	74	56	97	76	67	53	40
Area, In .^{2}		13.4	10.2	8.53	6.87	5.17	11.9	9.07	7.85	6.14	4.62
1, In .^{4}		141	110	93	75.9	57.7	99.5	77.8	68.1	54.1	41.3
r, I n.		3.24	3.28	3.3	3.32	3.34	2.89	2.93	2.95	2.97	2.99

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 50ksi



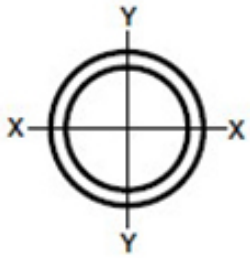
Design Axial Strength in kips (ϕ = 0.90) Fy=50ksi								
Diameter		7.625		7.5				
Wall Thickness		0.375	0.328	0.5	0.375	0.312	0.25	0.188
Weight Per Foot		29.04	25.56	37.38	28.54	23.95	19.36	14.68
Design Wall Thickness		0.349	0.305	0.465	0.349	0.291	0.233	0.174
Effective Length KL in test	0	359	316	464	353	296	239	180
	2	357	313	461	350	294	238	179
	3	354	311	456	347	292	236	178
	4	350	308	451	344	289	233	176
	5	345	303	445	339	285	230	173
	6	339	299	436	332	280	226	170
	7	332	292	427	325	274	221	166
	8	324	285	416	318	268	216	163
	9	316	277	403	309	260	211	159
	10	307	270	391	300	252	204	154
	11	296	260	377	289	244	197	149
	12	286	252	363	278	235	191	144
	13	275	242	348	267	226	183	138
	14	264	232	332	255	216	175	132
	15	252	221	317	244	206	167	126
	16	239	211	300	232	196	159	121
	17	228	200	284	219	185	151	114
	18	215	190	268	208	176	143	108
	19	203	179	251	195	165	134	102
	20	191	168	235	183	156	127	96
	21	179	158	219	170	145	119	90
	22	167	147	203	159	136	111	85
	23	156	138	188	148	126	103	78
	24	144	128	174	137	116	95	73
	25	133	118	160	126	108	88	68
	26	123	109	148	116	100	82	62
	27	114	102	138	108	92	75	58
	28	106	94	128	101	86	70	54
	29	100	88	120	93	79	66	50
	30	92	82	111	88	75	61	47
	31	87	77	104	82	70	57	43
	32	82	72	97	77	66	54	41
	33	76	68	92	72	61	51	39
	34	72	64	87	68	58	48	36
	35	68	60	82	65	55	46	34
	36	65	57	77	60	52	42	33
	37	60	54	73	57	49	40	31
	38	58	51	70	54	47	38	30
	39	55	49	66	52	44	36	28
	40	52	47	62	49	42	35	26
Area, In .^{2}		7.98	7.01	10.3	7.84	6.59	5.32	4
1, In .^{4}		52.9	47.1	63.9	50.2	42.9	35.2	26.9
r, I n.		2.58	2.59	2.49	2.53	2.55	2.57	2.59

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 50ksi



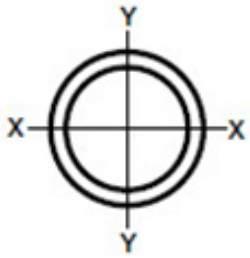
Design Axial Strength in kips (ϕ = 0.90) Fy=50ksi												
Diameter		7						6.875				
Wall Thickness Weight Per Foot Design Wall Thickness		0.5 34.71 0.465	0.375 26.53 0.349	0.312 22.29 0.291	0.25 18.02 0.233	0.188 13.68 0.174	0.125 9.18 0.116	0.5 34.04 0.465	0.375 26.03 0.349	0.312 21.87 0.291	0.25 17.69 0.233	0.188 13.43 0.174
Effective Length KL in test	0	430	328	276	222	168	113	421	322	271	219	165
	2	427	325	274	221	166	112	418	320	269	217	163
	3	422	323	271	219	165	111	414	317	266	215	162
	4	416	319	268	216	163	110	408	312	263	212	160
	5	410	312	264	213	161	108	400	307	258	209	157
	6	400	306	258	209	158	106	392	300	253	204	154
	7	391	299	252	203	154	104	381	292	247	199	150
	8	379	290	245	198	149	101	370	284	239	194	146
	9	366	281	237	192	145	97	357	274	232	187	142
	10	354	271	229	185	140	94	343	265	223	181	137
	11	339	260	220	178	134	91	329	254	214	174	131
	12	324	249	211	170	129	88	313	242	205	166	126
	13	309	237	201	163	124	84	299	231	195	159	120
	14	293	226	191	156	118	79	283	219	185	150	114
	15	276	214	181	147	111	75	266	206	175	143	108
	16	260	201	170	139	106	72	250	195	165	134	102
	17	245	190	161	130	100	68	233	182	155	126	95
	18	228	177	150	123	93	64	217	170	144	118	90
	19	212	165	140	114	87	59	201	158	134	110	84
	20	197	154	130	107	82	55	186	146	125	102	77
	21	181	142	121	98	75	52	172	134	115	94	72
	22	166	130	111	91	70	48	157	124	106	87	67
	23	152	120	102	84	65	44	143	113	97	79	61
	24	140	110	94	77	59	40	131	104	89	73	56
	25	129	101	87	71	54	37	121	96	82	68	52
	26	120	93	79	66	50	34	112	89	76	62	48
	27	110	87	74	60	47	32	104	83	70	58	44
	28	103	80	69	56	43	30	96	76	66	54	41
	29	96	75	65	53	40	28	90	71	61	50	38
	30	90	70	60	50	38	25	84	67	57	47	36
	31	84	66	56	47	35	24	78	62	53	43	34
	32	78	61	53	43	33	22	74	58	50	41	32
	33	74	58	50	40	31	21	70	55	47	39	30
	34	70	55	47	38	30	20	66	52	44	36	28
	35	66	52	44	36	28	19	61	49	42	34	26
	36	62	49	41	34	26	18	58	47	39	33	25
	37	59	47	39	33	24	17	55	43	37	31	23
	38	56	43	37	31	23	16	0	41	36	30	22
	39	0	41	36	30	22	15	0			28	21
	40	0	0	0	0	21	15					
Area, In .^{2}		9.55	7.29	6.13	4.95	3.73	2.51	9.36	7.16	6.02	4.86	3.66
1, In .^{4}		51.2	40.4	34.6	28.4	21.7	14.9	48.3	38.2	32.7	26.8	20.6
r, I n.		2.32	2.35	2.37	2.39	2.41	2.43	2.27	2.31	2.33	2.35	2.37

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 50ksi



Design Axial Strength in kips (ϕ = 0.90) Fy=50ksi									
Diameter		6.625							
Wall Thickness		0.5	0.432	0.375	0.312	0.28	0.25	0.188	0.125
Weight Per Foot		32.71	28.57	25.03	21.04	18.97	17.02	12.92	8.68
Design Wall Thickness		0.465	0.403	0.349	0.291	0.261	0.233	0.174	0.116
Effective Length KL in test	0	406	355	309	260	235	211	159	107
	2	401	352	307	258	233	209	158	106
	3	397	347	304	255	231	206	156	105
	4	391	342	300	252	228	203	154	104
	5	383	336	293	247	223	200	151	102
	6	374	328	287	241	218	196	147	100
	7	363	319	278	235	212	191	144	96
	8	352	308	270	228	205	184	140	94
	9	339	298	260	220	198	178	134	91
	10	324	285	250	211	191	172	130	88
	11	310	272	239	202	182	164	124	84
	12	294	259	228	193	174	157	119	80
	13	278	246	216	183	165	148	113	76
	14	263	232	203	173	157	141	107	72
	15	246	217	192	162	147	132	101	68
	16	230	203	179	152	138	124	94	65
	17	214	190	167	142	129	116	89	60
	18	198	176	155	132	120	108	83	56
	19	182	162	143	122	111	101	76	52
	20	167	148	131	112	103	92	71	48
	21	152	136	121	104	94	85	65	44
	22	139	124	110	94	86	77	59	40
	23	127	113	101	86	78	71	54	37
	24	116	104	92	79	72	65	50	34
	25	107	95	85	73	67	60	47	32
	26	100	89	78	68	61	55	42	29
	27	92	83	73	62	57	52	39	26
	28	86	76	68	58	53	48	37	25
	29	79	71	64	54	50	44	34	23
	30	74	67	59	51	47	41	32	22
	31	70	62	55	48	43	39	30	20
	32	66	58	52	44	40	37	29	19
	33	61	55	49	42	38	35	26	18
	34	58	52	46	39	36	33	25	17
	35	55	49	43	37	34	31	23	16
	36	52	47	41	35	32	29	22	15
	37			39	33	31	28	21	15
	38							20	14
	39								
	40								
Area, In .^{2}		9	7.88	6.88	5.79	5.22	4.68	3.53	2.37
1, In .^{4}		42.9	38.3	34	29.1	26.5	23.9	18.4	12.6
r, I n.		2.18	2.2	2.22	2.24	2.25	2.26	2.28	2.3

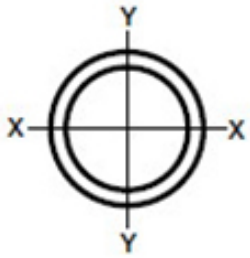
HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 50ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy=50ksi

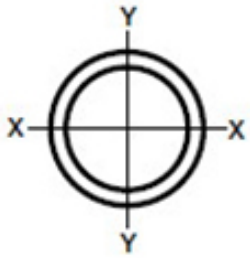
Diameter		6							5.563			
Wall Thickness		0.5	0.375	0.312	0.28	0.25	0.188	0.125	0.375	0.258	0.188	0.134
Weight Per Foot		29.37	22.53	18.95	17.11	15.35	11.67	7.84	20.78	14.62	10.79	7.77
Design Wall Thickness		0.465	0.349	0.291	0.261	0.233	0.174	0.116	0.349	0.241	0.174	0.125
Effective Length KL in test	0	364	280	235	212	190	143	96	257	181	132	96
	2	360	276	233	210	188	142	95	254	179	131	95
	3	355	272	230	208	185	140	94	250	177	129	94
	4	348	268	226	203	182	138	92	245	173	127	92
	5	340	262	220	199	178	134	91	238	168	124	90
	6	330	254	214	194	174	131	88	231	163	120	87
	7	319	246	208	187	167	127	86	221	157	115	84
	8	306	236	199	180	162	122	83	212	150	110	80
	9	291	226	191	173	155	118	79	200	143	105	76
	10	276	215	181	164	147	111	75	190	134	100	72
	11	262	203	172	156	140	106	72	178	126	93	68
	12	246	191	162	147	132	101	68	165	119	88	64
	13	229	179	151	138	124	94	64	154	110	82	59
	14	213	166	142	128	115	88	59	141	102	75	55
	15	197	155	131	120	108	82	56	129	93	69	51
	16	180	142	122	110	100	76	52	118	85	64	47
	17	165	130	111	102	91	70	48	106	76	57	42
	18	149	119	102	92	84	64	43	95	69	52	38
	19	136	108	92	85	76	58	40	85	61	47	34
	20	122	97	84	76	69	53	36	77	56	42	31
	21	110	88	76	69	62	48	33	70	51	38	29
	22	101	80	69	62	57	43	30	64	47	35	25
	23	92	73	64	57	52	40	28	58	42	32	23
	24	85	68	58	53	48	37	25	53	39	30	21
	25	78	62	53	49	44	34	23	49	36	28	20
	26	72	57	50	46	40	32	21	46	33	25	18
	27	67	53	46	41	38	29	20	42	31	23	17
	28	62	50	42	39	35	28	18	39	29	21	16
	29	58	47	40	36	33	25	17	36	26	20	15
	30	54	43	37	34	31	23	16	34	24	19	14
	31	51	40	35	32	29	22	15		23	18	13
	32	48	38	33	30	26	21	14				12
	33		36	31	28	25	19	14				
	34					24	18	13				
	35											
	36											
	37											
	38											
	39											
	40											
Area, In .^{2}		8.09	6.2	5.22	4.71	4.22	3.18	2.14	5.72	4.03	2.95	2.14
1, In .^{4}		31.2	24.8	21.3	19.4	17.6	13.5	9.28	19.5	14.3	10.7	7.9
r, I n.		1.96	2	2.02	2.03	2.04	2.06	2.08	1.85	1.88	1.91	1.92

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 50ksi



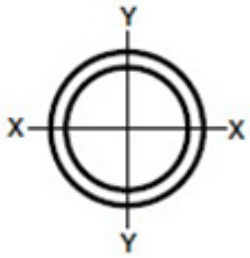
Design Axial Strength in kips (ϕ = 0.90) Fy=50ksi											
Diameter		5.5			5						
Wall Thickness Weight Per Foot Design Wall Thickness		0.5 26.7 0.465	0.375 20.53 0.349	0.258 14.44 0.241	0.5 24.03 0.465	0.375 18.52 0.349	0.312 15.62 0.291	0.258 13.07 0.241	0.25 12.68 0.233	0.188 9.66 0.174
Effective Length KL in test	0	331	254	179	298	230	194	162	157	119
	2	327	251	177	293	226	191	160	155	118
	3	322	247	175	287	221	187	157	151	115
	4	314	241	170	280	216	182	152	148	112
	5	305	235	166	269	209	176	147	143	109
	6	294	227	161	257	200	169	142	138	105
	7	282	218	155	245	190	161	134	131	100
	8	268	208	147	230	179	152	128	124	94
	9	254	197	140	214	167	143	120	116	89
	10	238	185	132	198	156	132	111	109	83
	11	222	174	124	182	144	123	103	101	77
	12	206	162	115	166	131	112	94	92	71
	13	191	149	107	150	120	103	86	85	65
	14	174	138	98	134	108	92	78	76	58
	15	158	125	90	120	96	83	70	69	53
	16	143	113	83	105	85	73	62	61	48
	17	128	103	74	93	75	65	55	54	42
	18	114	92	67	83	67	58	49	49	37
	19	103	83	60	74	60	52	44	43	34
	20	92	74	54	68	54	47	40	39	31
	21	84	68	49	61	50	42	36	35	28
	22	76	61	44	56	46	39	33	33	25
	23	70	56	41	51	41	36	30	30	23
	24	65	52	37	47	38	33	28	28	21
	25	59	48	35	43	35	30	25	25	19
	26	55	43	32	40	32	28	23	23	18
	27	51	40	30		30	25	22	21	17
	28	48	38	28				20	20	16
	29	44	35	25						
	30		33	24						
	31			22						
	32									
	33									
	34									
	35									
	36									
	37									
	38									
	39									
	40									
Area, In .[2]		7.36	5.65	3.98	6.62	5.1	4.3	3.6	3.49	2.64
1, In .[4]		23.5	18.8	13.8	17.2	13.9	12	10.2	9.94	7.69
r, I n.		1.79	1.83	1.86	1.61	1.65	1.67	1.68	1.69	1.71

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 50ksi



Design Axial Strength in kips (ϕ = 0.90) Fy=50ksi														
Diameter		4.5					4							
Wall Thickness Weight Per Foot Design Wall Thickness		0.125 6.51 0.116	0.337 14.98 0.315	0.237 10.79 0.221	0.188 8.66 0.174	0.125 5.84 0.116	0.313 12.33 0.291	0.25 10.01 0.233	0.237 9.52 0.221	0.226 9.11 0.211	0.22 8.88 0.205	0.188 7.65 0.174	0.125 5.17 0.116
Effective Length KL in test	0	80	186	133	106	72	152	124	118	113	110	94	64
	2	79	183	131	105	71	149	122	115	110	107	92	62
	3	77	179	128	102	69	144	118	112	107	104	89	60
	4	76	173	124	98	67	139	113	107	103	100	86	58
	5	73	165	119	95	65	131	107	102	97	95	82	55
	6	71	157	113	90	61	123	101	95	91	89	76	52
	7	68	147	107	85	58	113	93	89	85	83	71	49
	8	64	137	100	79	54	104	85	82	77	75	65	44
	9	60	126	92	74	51	93	76	73	70	68	59	40
	10	56	115	85	68	47	84	69	66	62	61	53	36
	11	52	104	76	61	42	73	60	58	55	54	47	33
	12	49	93	69	55	38	64	53	51	49	48	41	29
	13	44	83	61	50	34	55	46	43	42	40	35	24
	14	40	73	54	44	31	48	39	38	36	35	31	21
	15	36	64	48	38	26	41	34	33	32	31	26	19
	16	33	55	41	34	23	36	30	29	28	26	23	16
	17	29	49	37	30	21	32	26	25	24	23	21	15
	18	25	43	33	26	19	29	23	23	22	21	18	13
	19	23	39	30	24	17	25	21	20	19	19	17	12
	20	21	36	26	21	15	23	19	18	18	17	15	11
	21	19	32	24	20	14	21	17	17	16	16	14	10
	22	17	30	22	18	13	19	16	15	15	14	13	8
	23	16	26	20	16	12							
	24	15	24	18	15	11							
	25	14		17	14	10							
	26	13											
	27	12											
	28	11											
	29												
	30												
	31												
	32												
	33												
	34												
	35												
	36												
	37												
	38												
	39												
	40												
Area, In .^{2}		1.78	4.14	2.97	2.36	1.6	3.39	2.76	2.62	2.51	2.44	2.09	1.42
1, In .^{4}		5.31	9.12	6.82	5.54	3.84	5.87	4.91	4.7	4.52	4.41	3.83	2.67
r, I n.		1.73	1.48	1.51	1.53	1.55	1.32	1.33	1.34	1.34	1.34	1.35	1.37

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 50ksi



Design Axial Strength in kips (ϕ = 0.90) Fy=50ksi								
Diameter		3.5						
Wall Thickness Weight Per Foot Design Wall Thickness		0.313 10.65 0.291	0.3 10.25 0.28	0.25 8.68 0.233	0.216 7.58 0.201	0.203 7.15 0.189	0.188 6.65 0.174	0.125 4.51 0.116
Effective Length KL in test	0	132	127	108	93	89	82	55
	2	128	123	104	91	86	79	54
	3	123	119	101	87	83	76	52
	4	115	112	95	83	78	73	50
	5	108	104	89	77	73	68	47
	6	98	95	82	71	67	62	42
	7	89	86	73	65	60	56	39
	8	78	76	66	57	54	51	35
	9	69	66	57	50	48	44	31
	10	58	56	49	43	41	38	26
	11	50	48	41	37	35	33	23
	12	41	40	35	31	30	28	19
	13	35	34	30	26	25	23	17
	14	31	30	25	23	21	20	14
	15	26	25	22	20	19	18	13
	16	23	22	20	17	17	16	11
	17	21	20	17	16	15	14	10
	18	18	18	16	14	13	13	8
	19	17	16	14	13	12	11	7
	20							7
	21							
	22							
	23							
	24							
	25							
	26							
	27							
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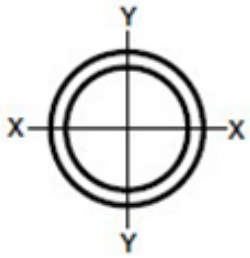
	29							
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							
Area, In .^{2} 1, In .^{4} r, I n.		2.93 3.81 1.14	2.83 3.7 1.14	2.39 3.21 1.16	2.08 2.84 1.17	1.97 2.7 1.17	1.82 2.52 1.18	1.23 1.77 1.2

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 50ksi



Design Axial Strength in kips (ϕ = 0.90) Fy=50ksi												
Diameter		3							2.875			
Wall Thickness Weight Per Foot Design Wall Thickness		0.25 7.34 0.233	0.216 6.42 0.201	0.203 6.06 0.189	0.188 5.65 0.174	0.152 4.62 0.142	0.134 4.1 0.125	0.125 3.84 0.116	0.25 7.01 0.233	0.203 5.79 0.189	0.188 5.4 0.174	0.125 3.67 0.116
Effective Length KL in test	0	91	79	75	69	57	51	46	87	72	67	46
	2	88	76	72	67	55	49	44	83	69	64	43
	3	83	72	69	64	52	47	42	78	65	60	41
	4	76	67	64	58	49	43	39	72	59	55	38
	5	70	61	57	53	44	39	36	65	54	50	35
	6	61	54	51	48	39	35	32	56	47	44	31
	7	54	48	44	41	35	31	28	49	40	38	26
	8	46	40	38	35	30	26	24	40	34	32	22
	9	38	34	32	30	24	22	20	33	28	26	19
	10	31	28	26	24	20	18	17	26	22	21	15
	11	25	22	21	20	17	15	14	22	19	18	13
	12	21	19	18	17	14	13	12	18	16	15	11
	13	18	16	16	15	12	11	10	16	14	13	8
	14	16	14	14	13	11	10	8	14	12	11	7
	15	14	12	12	11	10	8	7	12	10	10	6
	16	12	11	11	10	7	7	6				6
	17						6	5				
	18											
	19											
	20											
	21											
	22											
	23											
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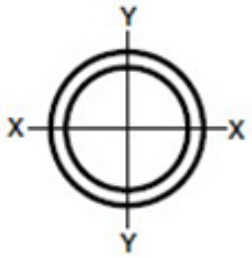
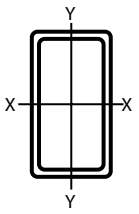
	30											
	31											
	32											
	33											
	34											
	35											
	36											
	37											
	38											
	39											
	40											
Area, In .[2]		2.03	1.77	1.67	1.54	1.27	1.13	1.02	1.93	1.59	1.48	1.01
1, In .[4]		1.95	1.74	1.66	1.55	1.3	1.17	1.06	1.7	1.45	1.35	0.958
r, I n.		0.982	0.992	0.996	1	1.01	1.02	1.02	0.938	0.952	0.957	0.976

HSS/ROUND (ERW) FOR LRFD COLUMNS
Fy = 50ksi



Design Axial Strength in kips (ϕ = 0.90) Fy50ksi											
Diameter		2.5			2.375					1.9	1.66
Wall Thickness Weight Per Foot Design Wall Thickness		0.25 6.01 0.233	0.188 4.64 0.174	0.125 3.17 0.116	0.25 5.67 0.233	0.218 5.02 0.204	0.188 4.39 0.174	0.154 3.65 0.143	0.125 3 0.116	0.145 2.72 0.135	0.14 2.27 0.13
Effective Length KL in test	0 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40	75 70 65 57 50 41 34 26 21 17 14 12 10	57 54 50 44 39 33 26 21 17 14 12 10 8	39 37 34 31 28 23 19 15 12 10 8 6 5 5	71 66 60 53 44 37 29 22 18 15 12 10	62 58 53 47 40 33 26 20 16 13 11 10	54 51 47 41 35 29 23 18 14 12 10 8 6	46 42 39 34 30 24 20 15 12 10 8 6 5	37 35 32 29 24 20 17 13 11 8 6 5 5	34 31 26 22 17 13 10 7 5 4	28 24 20 16 12 8 6 4 3
Area, In .[2] 1, In .[4] r, I n.		1.66 1.08 0.806	1.27 0.865 0.825	0.87 0.619 0.844	1.57 0.91 0.762	1.39 0.827 0.771	1.2 0.733 0.781	1 0.627 0.791	0.82 0.527 0.8	0.75 0.293 0.626	0.62 0.184 0.543

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

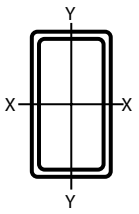


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		20x12				20x8				20x4		
Wall Thickness		5/8	1/2	3/8	5/16	5/8	1/2	3/8	5/16	1/2	3/8	5/16
Weight Per Foot		127	103	78.5	65.9	110.36	89.68	68.31	57.36	76.07	58.10	48.86
Design Wall Thickness		0.581	0.465*	0.349*	0.291 *	0.581	0.465*	0.349*	0.291*	0.465*	0.349*	0.291*
Effective Length KL in test	0	1450	1111	743	563	1254	959	627	478	806	515	383
	2	1447	1111	742	563	1250	957	626	477	799	512	381
	3	1444	1110	742	562	1245	954	624	476	790	507	378
	4	1440	1107	740	561	1237	950	622	475	777	501	374
	5	1435	1104	739	560	1227	945	619	473	760	493	369
	6	1430	1100	737	560	1216	938	616	470	740	483	362
	7	1420	1100	734	558	1202	931	612	468	716	471	355
	8	1410	1090	731	557	1187	922	607	465	688	458	346
	9	1400	1090	728	555	1169	913	602	461	655	443	337
	10	1390	1080	725	553	1150	902	596	457	614	426	326
	11	1380	1070	721	551	1129	890	590	453	571	407	314
	12	1370	1070	717	549	1107	877	583	448	528	387	301
	13	1350	1060	712	546	1083	863	575	443	484	365	287
	14	1340	1050	707	543	1058	847	567	437	442	341	271
	15	1320	1040	702	540	1032	831	558	431	400	315	255
	16	1310	1030	696	537	1004	814	549	425	359	289	237
	17	1290	1020	690	534	976	796	539	418	320	260	219
	18	1270	1010	684	530	947	775	529	411	286	232	199
	19	1250	997	677	526	917	751	518	404	256	208	178
	20	1240	985	670	522	886	727	507	396	231	188	161
	21	1220	972	663	518	855	702	495	388	210	170	146
	22	1190	959	656	513	824	677	482	379	191	155	133
	23	1170	945	648	509	792	652	469	370	175	142	122
	24	1150	931	639	504	761	627	456	361	161	130	112
	25	1130	916	631	497	729	601	442	352	148	120	103
	26	1110	901	622	491	697	576	428	342	137	111	95
	27	1080	882	613	485	666	551	413	332	127	103	88
	28	1060	864	604	478	635	526	398	322	118	96	82
	29	1040	845	594	471	604	501	383	311			77
	30	1010	826	584	464	574	477	367	300			
	31	988	806	574	457	545	453	351	289			
	32	963	787	563	449	516	430	334	277			
	33	939	767	553	442	487	407	317	266			
	34	914	747	542	434	459	384	300	254			
	35	889	727	531	426	433	362	283	242			
	36	864	708	519	418	409	342	268	229			
	37	840	688	508	409	387	324	254	217			
	38	815	668	496	401	367	307	240	205			
	39	790	648	484	392	349	292	228	195			
	40	766	629	472	384	331	277	217	185			
Area, In 2		35	28.3	21.5	18.1	30.3	24.6	18.7	15.7	20.9	16.0	13.4
lx (in4)		1880	1550	1200	1010	1440	1190	926	786	838	657	560
ly (in4)		851	705	547	464	338	283	222	189	59	48	41
rx/ry		1.49	1.48	1.48	1.48	2.06	2.05	2.04	2.04	3.77	3.71	3.69
ry (in)		4.93	4.99	5.04	5.07	3.34	3.39	3.44	3.47	1.68	1.73	1.75

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

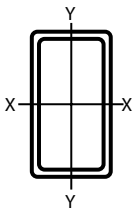


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		18x6					16x12			
Wall Thickness		5/8	1/2	3/8	5/16	1/4	5/8	1/2	3/8	5/16
Weight Per Foot		93.34	76.07	58.10	48.86	39.43	110	89.7	68.3	57.4
Design Wall Thickness		0.581	0.465*	0.349*	0.291*	0.233*	0.581	0.465	0.349*	0.291*
Effective Length KL in test	0	1064	858	563	425	302	1250	1020	720	547
	2	1057	854	561	424	301	1250	1017	719	547
	3	1049	850	559	422	300	1250	1015	718	546
	4	1038	843	555	420	299	1246	1012	717	545
	5	1023	833	550	417	297	1241	1008	715	544
	6	1005	819	545	413	295	1240	1000	712	543
	7	985	803	538	409	292	1230	998	710	541
	8	962	785	531	404	289	1220	992	706	540
	9	937	765	522	398	285	1210	985	703	537
	10	909	744	512	392	281	1200	978	699	535
	11	879	720	502	385	277	1190	969	694	533
	12	848	696	490	377	272	1180	960	689	530
	13	815	670	478	369	267	1170	950	684	527
	14	781	643	465	360	262	1160	940	678	524
	15	747	616	450	351	256	1140	929	672	520
	16	711	587	435	341	250	1130	917	665	516
	17	675	559	420	330	243	1110	905	658	512
	18	639	530	403	319	236	1090	892	651	508
	19	603	501	385	307	229	1080	878	644	504
	20	567	472	367	295	222	1060	864	635	499
	21	531	444	348	282	214	1040	850	627	494
	22	496	416	328	269	205	1020	835	618	489
	23	462	389	307	255	197	1000	820	609	482
	24	429	362	286	241	188	985	804	600	475
	25	397	336	267	227	179	965	788	590	468
	26	367	310	247	212	169	944	772	580	461
	27	340	288	229	196	160	923	755	570	454
	28	316	268	213	183	149	902	738	559	446
	29	295	250	199	170	139	881	721	548	438
	30	276	233	186	159	130	859	704	537	430
	31	258	218	174	149	122	837	687	525	422
	32	242	205	163	140	114	816	669	513	414
	33	228	193	153	132	108	794	652	500	405
	34	215	182	145	124	101	772	634	487	396
	35	202	171	136	117	96	750	616	473	387
	36	191	162	129	110	90	727	599	460	378
	37	181	153	122	105	86	705	581	447	369
	38	172	145	116	99	81	684	563	433	360
	39	163	138	110	94	77	662	546	420	350
	40	155	131	104	90	73	640	528	407	341
Area, In 2		25.7	20.9	16.0	13.4	10.8	30.3	24.6	18.7	15.7
lx (in4)		923	770	602	513	419	1090	904	702	595
ly (in4)		158	134	106	91	75	700	581	452	384
rx/ry		2.42	2.40	2.38	2.37	2.37	1.25	1.25	1.25	1.24
ry (in)		2.48	2.53	2.58	2.61	2.63	4.8	4.86	4.91	4.94

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

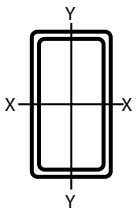


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		16x8				16x4			14x10				
Wall Thickness		5/8	1/2	3/8	5/16	1/2	3/8	5/16	5/8	1/2	3/8	5/16	1/4
Weight Per Foot		93.3	76.1	58.1	48.9	62.46	47.90	40.35	93.3	76.1	58.1	48.9	39.4
Design Wall Thickness		0.581	0.465	0.349*	0.291*	0.465	0.349*	0.291*	0.581	0.465	0.349*	0.291*	0.233*
Effective Length KL in test	0	1060	865	609	466	712	492	371	1060	865	649	505	356
	2	1060	862	607	465	702	488	368	1060	863	648	504	356
	3	1055	858	605	464	690	483	365	1058	861	647	503	356
	4	1049	853	602	462	673	475	360	1054	857	644	502	355
	5	1040	846	599	460	651	466	354	1048	853	642	500	354
	6	1030	838	595	457	626	454	346	1040	847	639	497	353
	7	1020	829	590	454	598	440	337	1030	840	635	495	351
	8	1000	818	585	450	567	425	327	1020	833	630	492	350
	9	989	806	579	446	534	407	316	1010	825	625	488	348
	10	972	792	572	441	499	388	303	1000	815	620	484	346
	11	954	778	564	436	463	366	289	988	805	613	480	344
	12	934	762	556	430	427	339	274	974	794	607	475	342
	13	913	746	547	424	390	312	257	960	783	599	470	339
	14	891	728	537	418	355	285	239	944	770	591	464	336
	15	868	710	527	411	320	259	221	927	757	581	459	333
	16	844	691	516	403	286	234	201	910	743	571	452	330
	17	819	671	505	395	254	210	180	892	729	560	446	326
	18	793	651	493	387	227	187	161	873	714	549	439	323
	19	767	630	480	378	204	168	144	853	698	537	431	319
	20	741	609	467	369	184	151	130	833	682	525	424	315
	21	714	587	453	360	167	137	118	812	666	513	416	310
	22	686	565	438	350	152	125	108	791	649	500	408	306
	23	659	544	422	340	139	114	99	770	632	488	399	301
	24	631	522	405	329	128	105	90	748	615	475	390	295
	25	604	500	389	319	118	97	83	726	597	461	381	289
	26	577	478	372	307	109	90	77	704	579	448	372	282
	27	550	456	356	296	101	83	71	681	561	434	362	276
	28	523	434	339	284		77	66	659	543	421	353	269
	29	497	413	323	273				636	525	407	343	263
	30	471	392	307	260				614	507	393	332	256
	31	446	372	292	248				591	489	380	321	249
	32	421	352	277	235				569	471	366	309	242
	33	396	332	262	223				547	453	353	298	234
	34	373	313	247	210				525	436	339	287	227
	35	352	295	233	198				503	418	326	276	219
	36	333	279	220	188				482	401	313	265	212
	37	315	264	208	178				461	384	300	254	204
	38	299	250	197	168				440	367	287	243	196
	39	283	238	187	160				420	351	275	233	189
	40	269	226	178	152				399	334	262	223	181
Area, In 2		25.7	20.9	16	13.4	17.2	13.2	11.1	25.7	20.9	16	13.4	10.8
lx (in4)		815	679	531	451	455	360	308	687	573	447	380	310
ly (in4)		274	230	181	155	47	38	33	407	341	267	227	186
rx/ry		1.72	1.72	1.71	1.71	3.12	3.06	3.05	1.30	1.29	1.29	1.29	1.29
ry (in)		3.27	3.32	3.37	3.40	1.65	1.71	1.73	3.98	4.04	4.09	4.12	4.14

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

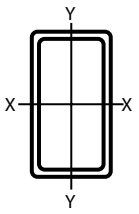


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		14x6					
Wall Thickness		5/8	1/2	3/8	5/16	1/4	3/16
Weight Per Foot		76.33	62.46	47.90	40.35	32.63	24.73
Design Wall Thickness		0.581	0.465	0.349*	0.291*	0.233*	0.174*
Effective Length KL in test	0	869	712	533	410	295	192
	2	864	708	531	408	294	191
	3	857	702	528	406	293	190
	4	847	694	524	403	291	189
	5	834	685	518	399	288	188
	6	820	673	511	395	286	187
	7	802	659	504	390	282	185
	8	783	644	495	384	278	183
	9	761	627	483	377	274	180
	10	738	608	470	369	269	178
	11	713	589	455	361	264	175
	12	686	568	439	352	259	172
	13	659	546	423	342	252	168
	14	630	523	406	331	246	165
	15	601	500	389	320	239	161
	16	571	476	371	308	231	157
	17	541	452	353	296	224	152
	18	511	427	335	283	215	148
	19	481	403	316	268	207	143
	20	451	379	298	253	198	138
	21	422	356	280	238	189	133
	22	393	332	263	223	179	128
	23	365	310	245	209	169	122
	24	338	287	229	195	159	116
	25	311	266	212	181	149	111
	26	288	246	196	168	138	105
	27	267	228	182	155	128	99
	28	248	212	169	144	119	92
	29	231	197	158	135	111	86
	30	216	184	147	126	104	80
	31	202	173	138	118	97	75
	32	190	162	129	111	91	71
	33	179	152	122	104	86	66
	34	168	144	115	98	81	62
	35	159	135	108	92	76	59
	36	150	128	102	87	72	56
	37	142	121	97	83	68	53
	38	135	115	92	78	65	50
	39	128	109	87	74	62	47
	40	122	104	83	71	58	45
Area, In 2		21.0	17.2	13.2	11.1	9.0	6.8
Ix (in4)		478	402	317	271	222	170
Iy (in4)		124	105	84	72	60	46
rx/ry		1.96	1.95	1.94	1.94	1.93	1.92
ry (in)		2.43	2.48	2.53	2.55	2.58	2.61

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

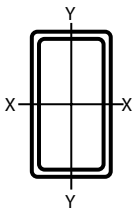


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		14x4					
Wall Thickness		5/8	1/2	3/8	5/16	1/4	3/16
Weight Per Foot		67.82	55.66	42.79	36.10	29.23	22.18
Design Wall Thickness		0.581	0.465	0.349*	0.291*	0.233*	0.174*
Effective Length KL in test	0	774	633	475	361	256	163
	2	762	624	471	358	255	162
	3	748	613	465	354	252	161
	4	728	598	457	349	249	159
	5	703	579	446	342	245	157
	6	674	556	432	334	240	154
	7	642	531	414	324	234	151
	8	606	503	393	313	228	148
	9	568	473	371	301	220	144
	10	528	442	348	287	212	140
	11	487	410	324	272	202	135
	12	446	377	300	255	193	130
	13	405	345	275	236	182	124
	14	365	313	251	216	170	118
	15	327	282	228	197	158	112
	16	290	252	205	178	145	105
	17	257	223	183	159	132	98
	18	229	199	163	142	118	90
	19	205	179	146	128	106	83
	20	185	161	132	115	95	74
	21	168	146	120	104	86	68
	22	153	133	109	95	79	62
	23	140	122	100	87	72	56
	24	129	112	92	80	66	52
	25	119	103	85	74	61	48
	26	110	96	78	68	56	44
	27		89	73	63	52	41
	28			67	59	49	38
	29					45	35
	30						
	31						
	32						
	33						
	34						
	35						
	36						
	37						
	38						
	39						
	40						
Area, In 2		18.7	15.3	11.8	9.9	8.0	6.1
lx (in4)		373	317	252	216	178	137
ly (in4)		47	41	34	29	24	19
rx/ry		2.81	2.77	2.74	2.72	2.71	2.68
ry (in)		1.59	1.64	1.69	1.72	1.74	1.77

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

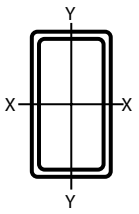


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		12x10				12x8					
Wall Thickness		1/2	3/8	5/16	1/4	5/8	1/2	3/8	5/16	1/4	3/16
Weight Per Foot		69.3	53	44.6	36	76.3	62.5	47.9	40.4	32.6	24.7
Design Wall Thickness		0.465	0.349	0.291*	0.233*	0.581	0.465	0.349	0.291*	0.233*	0.174*
Effective Length KL in test	0	787	604	491	351	869	712	546	445	327	204
	2	785	603	490	351	866	709	545	444	326	204
	3	782	601	489	350	862	706	542	442	325	203
	4	779	599	487	350	856	701	539	440	324	203
	5	775	595	485	349	849	696	534	437	322	202
	6	770	591	482	347	840	688	529	434	320	201
	7	763	587	479	346	829	680	523	430	317	200
	8	756	582	476	344	817	671	516	425	314	199
	9	749	576	472	342	804	660	508	420	311	197
	10	739	569	468	340	789	648	499	415	307	196
	11	730	562	463	337	773	636	490	408	303	194
	12	720	554	458	335	756	622	480	401	298	192
	13	708	546	452	332	738	607	469	394	294	190
	14	697	537	446	329	719	592	458	386	288	188
	15	685	528	440	325	699	576	446	376	283	186
	16	671	518	433	322	678	560	433	365	277	183
	17	658	508	425	318	657	543	421	355	271	180
	18	644	498	417	314	635	525	407	344	265	177
	19	629	486	408	309	613	507	394	333	258	174
	20	614	475	398	305	590	489	380	321	251	171
	21	599	464	389	300	567	470	367	310	244	167
	22	583	451	379	294	544	452	352	298	236	164
	23	568	439	369	288	520	433	338	286	228	160
	24	551	427	359	282	497	414	324	274	220	156
	25	535	415	349	275	474	396	310	263	212	151
	26	518	402	338	268	451	377	296	251	204	146
	27	502	390	328	261	429	359	282	239	195	141
	28	485	377	317	254	406	341	269	228	186	136
	29	468	364	307	247	385	323	255	217	177	130
	30	451	352	296	240	363	306	242	205	168	125
	31	434	339	286	232	342	289	229	194	159	120
	32	418	326	275	224	321	272	216	184	151	114
	33	401	314	265	217	302	255	203	173	142	109
	34	385	302	254	208	285	241	192	163	134	103
	35	369	289	244	200	269	227	181	154	126	97
	36	354	277	234	192	254	215	171	145	120	91.8
	37	338	265	224	184	240	203	162	138	113	87
	38	322	253	214	176	228	193	153	131	107	82.4
	39	307	242	205	168	216	183	146	124	102	78
	40	292	230	195	161	206	174	138	118	96.8	74.4
Area, In 2		19	14.6	12.2	9.9	9.9	21	13.2	11.1	8.96	6.76
lx (in4)		395	310	264	216	216	397	262	224	184	140
ly (in4)		298	234	200	164	164	210	140	120	98.8	75.7
rx/ry		1.15	1.15	1.15	1.15	1.37	1.37	1.37	1.37	1.36	1.36
ry (in)		3.96	4.01	4.04	4.07	3.16	3.21	3.27	3.29	3.32	3.35

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

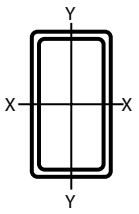


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		12x6						12x4					
Wall Thickness		5/8	1/2	3/8	5/16	1/4	3/16	5/8	1/2	3/8	5/16	1/4	3/16
Weight Per Foot		67.8	56.7	42.8	36.1	29.2	22.2	59.32	48.85	37.69	31.84	25.82	19.63
Design Wall Thickness		0.581	0.465	0.349	0.291*	0.233*	0.174*	0.581	0.465	0.349	0.291*	0.233*	0.174*
Effective Length KL in test	0	774	633	489	396	288	189	679	559	431	348	250	160
	2	769	629	485	394	287	188	668	551	425	345	248	159
	3	762	624	482	392	286	187	655	541	417	341	245	158
	4	753	617	476	389	284	186	638	527	407	335	242	156
	5	742	608	470	385	281	185	615	510	395	327	237	154
	6	728	597	462	380	278	183	589	489	380	318	232	151
	7	712	585	453	374	274	181	560	466	363	307	225	147
	8	695	571	442	367	270	179	528	441	345	293	218	143
	9	675	555	430	360	265	176	494	414	325	276	209	139
	10	653	538	418	352	260	173	458	386	304	259	200	134
	11	631	520	404	341	254	170	422	358	283	242	190	129
	12	606	501	390	330	248	166	386	328	261	224	179	123
	13	581	481	375	317	241	162	349	300	239	206	167	117
	14	555	460	360	305	234	158	314	271	218	188	155	110
	15	529	439	344	291	226	154	280	244	197	171	141	103
	16	502	418	327	278	218	150	248	217	177	154	127	96
	17	474	396	311	264	209	145	219	192	157	137	114	88
	18	447	374	294	251	200	140	196	172	140	123	102	80
	19	420	352	278	237	191	134	176	154	126	110	91	71
	20	393	330	262	223	182	129	159	139	114	99	82	65
	21	366	309	245	210	171	123	144	126	103	90	75	59
	22	341	288	229	196	161	118	131	115	94	82	68	53
	23	316	268	214	183	150	112	120	105	86	75	62	49
	24	291	248	199	171	140	105	110	96	79	69	57	45
	25	268	229	184	158	130	99.2	101	89	73	64	53	41
	26	248	211	170	146	120	92.8	94	82	67	59	49	38
	27	230	196	157	136	111	86.1		76	62	54	45	35
	28	241	182	146	126	104	80.1				51	42	33
	29	199	170	136	118	96.6	74.7						31
	30	186	159	128	110	90.3	69.8						
	31	174	149	119	103	85	65						
	32	164	140	112	96.5	79.4	61.3						
	33	154	131	105	91	75	58						
	34	145	124	99.3	85.5	70.3	54.3						
	35	137	117	94	81	66	51						
	36	129	110	88.6	76.3	62.7	48.5						
	37	122	104	84	72	59	46						
	38	116	99	79	68	56	43						
	39	110	94	75	65	53	41						
	40		89.3	71.7	61.8	50.8	39.2						
Area, In 2		18.7	15.3	11.8	9.92	8.03	6.06	16.4	13.5	10.4	8.8	7.1	5.4
lx (in4)		321	271	215	184	151	116	245	210	168	144	119	92
ly (in4)		107	91.1	72.9	62.8	51.9	40	40	35	29	25	21	16
rx/ry		1.73	1.73	1.72	1.71	1.71	1.70	2.46	2.44	2.41	2.39	2.38	2.36
ry (in)		2.39	2.44	2.49	2.52	2.54	2.57	1.57	1.62	1.67	1.70	1.72	1.75

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

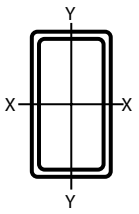


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		12x3 1/2		12x3			12x2	
Wall Thickness		3/8	5/16	5/16	1/4	3/16	1/4	3/16
Weight Per Foot		36.41	30.78	29.72	24.12	18.35	22.42	17.08
Design Wall Thickness		0.349	0.291*	0.291*	0.233*	0.174*	0.233*	0.174*
Effective Length KL in test	0	414	336	324	231	146	211	131
	2	407	332	318	227	144	205	128
	3	397	326	311	223	142	197	124
	4	385	319	302	218	139	185	119
	5	370	309	290	211	136	171	112
	6	352	298	272	202	132	153	104
	7	331	282	252	192	126	131	94
	8	310	264	230	180	120	107	82
	9	287	245	208	167	114	85	69
	10	263	225	186	152	107	69	56
	11	239	205	164	136	98	57	46
	12	215	185	142	119	90	48	39
	13	192	166	122	102	80	41	33
	14	170	147	105	88	70	35	28
	15	149	129	92	77	61		
	16	131	114	81	68	54		
	17	116	101	72	60	47		
	18	103	90	64	53	42		
	19	93	81	57	48	38		
	20	84	73	52	43	34		
	21	76	66	47	39	31		
	22	69	60			28		
	23	63	55					
	24	58	50					
	25							
	26							
	27							
	28							
	29							
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							
Area, In 2		10.0	8.5	8.2	6.6	5.0	6.2	4.7
lx (in4)		156	134	124	103	80	87	67
ly (in4)		21	19	13	11	9	4	4
rx/ry		2.70	2.69	3.07	3.05	3.02	4.44	4.36
ry (in)		1.46	1.48	1.27	1.29	1.32	0.85	0.87

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings. Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

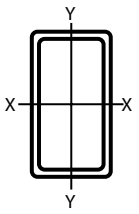


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		10x8						10x6					
Wall Thickness		5/8	1/2	3/8	5/16	1/4	3/16	5/8	1/2	3/8	5/16	1/4	3/16
Weight Per Foot		67.8	56.7	42.8	36.1	29.2	22.2	59.3	48.9	37.7	31.8	25.8	19.6
Design Wall Thickness		0.581	0.465	0.349	0.291	0.233*	0.174*	0.581	0.465	0.349	0.291	0.233*	0.174*
Effective Length KL in test	0	774	633	489	411	318	200	679	559	431	363	279	185
	2	771	631	487	409	317	200	674	555	428	360	278	185
	3	767	628	484	407	316	199	668	550	424	358	276	184
	4	762	624	481	405	314	199	660	544	419	354	274	182
	5	755	618	477	401	312	198	650	536	413	349	271	181
	6	746	611	472	397	310	197	637	526	406	343	268	179
	7	737	604	466	392	307	196	623	514	398	336	263	176
	8	726	595	460	387	303	194	606	501	388	328	259	174
	9	713	585	452	381	300	193	588	487	377	319	253	171
	10	699	574	444	374	295	191	569	472	366	309	247	167
	11	685	562	435	367	291	189	548	455	354	299	241	164
	12	669	550	426	359	286	187	526	438	341	289	234	160
	13	652	537	416	351	280	185	504	420	327	277	226	155
	14	635	522	405	342	275	182	480	401	313	266	216	151
	15	616	508	394	333	269	179	456	382	299	254	207	146
	16	597	493	383	323	262	176	432	362	284	242	197	141
	17	577	477	371	314	255	173	407	342	269	229	187	135
	18	557	461	359	303	247	170	383	323	254	217	177	130
	19	537	444	346	293	239	166	359	303	239	204	167	124
	20	516	428	334	283	230	162	335	284	225	192	157	118
	21	495	411	321	272	222	158	311	265	210	180	148	112
	22	474	394	308	261	213	154	288	246	196	168	138	105
	23	453	377	295	251	205	149	266	228	182	157	129	98.9
	24	432	360	282	240	196	144	245	210	169	145	120	92.3
	25	411	343	269	229	187	139	225	194	155	134	110	85.6
	26	390	326	257	218	179	134	208	179	144	124	102	79.1
	27	370	309	244	208	170	128	193	166	133	115	94.7	73.4
	28	349	293	232	197	162	123	180	154	124	107	88.1	68.2
	29	330	277	219	187	154	117	168	144	116	99.7	82.1	63.6
	30	311	262	207	177	146	111	157	134	108	93.2	76.7	59.4
	31	291	246	196	167	138	106	147	126	101	87	72	56
	32	274	231	184	158	130	99.8	138	118	94.9	81.9	67.4	52.2
	33	257	217	173	148	122	94	129	111	89	77	63	49
	34	242	205	163	140	115	88.5	122	105	84	72.5	59.7	46.3
	35	229	193	154	132	109	83	115	99	79	68	56	44
	36	216	183	145	125	103	78.9	109	93.3	75	64.7	53.3	41.3
	37	205	173	138	118	97	75	103	88	71	61	50	39
	38	194	164	130	112	92.1	70.8	97.6	83.8	67.3	58.1	47.8	37
	39	184	156	124	106	87	67	93	80	64	55	45	35
	40	175	148	118	101	83.2	63.9			60.7	52.4	43.2	33.4
Area, In 2		18.7	15.3	11.8	9.92	8.03	6.06	16.4	13.5	10.4	8.76	7.1	5.37
Ix (in4)		253	214	169	145	119	91.4	201	171	137	118	96.9	74.6
Iy (in4)		178	151	120	103	84.7	65.1	89.4	76.8	61.8	53.3	44.1	34.1
rx/ry		1.19	1.19	1.19	1.19	1.18	1.18	1.50	1.49	1.49	1.48	1.48	1.48
ry (in)		3.09	3.14	3.19	3.22	3.25	3.28	2.34	2.39	2.44	2.47	2.49	2.52

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

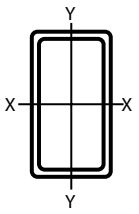


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		10x5				10x4						10x3 1/2
Wall Thickness		3/8	5/16	1/4	3/16	5/8	1/2	3/8	5/16	1/4	3/16	3/8
Weight Per Foot		35.13	29.72	24.12	18.35	50.81	42.05	32.58	27.59	22.42	17.08	31.31
Design Wall Thickness		0.349	0.291	0.233*	0.174*	0.581	0.465	0.349	0.291	0.233*	0.174*	0.349
Effective Length KL in test	0	400	338	260	171	580	480	371	314	241	156	357
	2	397	335	258	170	570	473	366	310	239	155	350
	3	392	331	256	169	559	464	360	305	236	154	342
	4	386	326	253	167	543	452	351	297	232	152	331
	5	378	320	249	165	523	436	339	288	226	149	318
	6	368	312	245	163	500	418	326	277	220	145	302
	7	358	303	240	160	474	398	311	265	213	141	284
	8	345	293	233	156	446	376	295	252	205	137	265
	9	332	282	227	153	416	352	277	237	195	132	244
	10	318	270	219	148	385	327	259	222	183	126	224
	11	303	257	210	144	354	302	240	206	170	120	203
	12	287	244	200	139	322	277	221	191	158	114	182
	13	271	231	189	134	291	251	202	175	145	107	162
	14	255	217	178	128	260	227	183	159	132	99	143
	15	238	203	167	122	231	203	165	144	120	92	125
	16	222	190	156	116	203	180	148	129	108	83	110
	17	206	176	145	109	180	159	131	115	97	75	97
	18	190	163	135	103	161	142	117	102	86	67	87
	19	174	150	124	96	144	127	105	92	77	60	78
	20	159	137	114	88	130	115	95	83	70	54	70
	21	145	125	104	81	118	104	86	75	63	49	64
	22	132	113	95	74	108	95	78	69	58	45	58
	23	121	104	87	68	98	87	72	63	53	41	53
	24	111	95	80	62	90	80	66	58	49	38	49
	25	102	88	73	57	83	74	61	53	45	35	
	26	94	81	68	53		68	56	49	41	32	
	27	87	75	63	49			52	46	38	30	
	28	81	70	59	46					36	28	
	29	76	65	55	42							
	30	71	61	51	40							
	31	66	57	48	37							
	32	62	54	45	35							
	33	59	50	42	33							
	34	55	48	40	31							
	35			37	29							
	36											
	37											
	38											
	39											
	40											
Area, In 2		9.7	8.2	6.6	5.0	14.0	11.6	9.0	7.6	6.2	4.7	8.6
lx (in4)		120	104	86	66	149	129	104	90	75	58	96
ly (in4)		41	35	29	23	34	30	24	21	18	14	18
rx/ry		1.72	1.72	1.71	1.70	2.12	2.10	2.08	2.06	2.05	2.05	2.32
ry (in)		2.05	2.07	2.10	2.13	1.54	1.59	1.64	1.67	1.70	1.72	1.44

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		10x3					10x2			
Wall Thickness		3/8	5/16	1/4	3/16	1/8	3/8	5/16	1/4	3/16
Weight Per Foot		30.03	25.46	20.72	15.80	10.71	27.48	23.34	19.02	14.53
Design Wall Thickness		0.349	0.291	0.233*	0.174*	0.116*	0.349	0.291	0.233*	0.174*
Effective Length KL in test	0	342	290	221	142	76	314	266	202	128
	2	334	283	218	140	75	295	251	195	124
	3	323	274	213	138	74	273	233	186	120
	4	309	263	207	135	73	244	210	173	114
	5	291	249	199	130	71	212	184	154	106
	6	271	232	189	125	69	179	157	132	96
	7	249	214	177	119	67	146	130	110	85
	8	226	195	162	113	64	115	104	90	72
	9	202	176	146	105	61	91	82	71	58
	10	179	156	131	97	58	74	67	58	47
	11	156	137	115	88	54	61	55	48	39
	12	134	119	101	78	50	51	46	40	32
	13	114	102	87	68	46	44	39	34	28
	14	99	88	75	58	41				24
	15	86	76	65	51	36				
	16	75	67	57	45	32				
	17	67	59	51	40	28				
	18	60	53	45	35	25				
	19	53	48	41	32	23				
	20	48	43	37	29	20				
	21			33	26	18				
	22					17				
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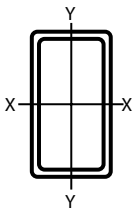
	32									
	33									
	34									
	35									
	36									
	37									
	38									
	39									
	40									
Area, In 2		8.3	7.0	5.7	4.3	2.9	7.6	6.4	5.2	4.0
lx (in4)		88	76	64	49	34	72	63	53	41
ly (in4)		12	11	9	7	5	5	4	4	3
rx/ry		2.67	2.64	2.61	2.60	2.57	3.91	3.84	3.78	3.72
ry (in)		1.22	1.25	1.28	1.30	1.33	0.79	0.81	0.84	0.86

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

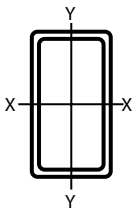


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		9x7						9x5					
Wall Thickness		5/8	1/2	3/8	5/16	1/4	3/16	5/8	1/2	3/8	5/16	1/4	3/16
Weight Per Foot		59.32	48.85	37.69	31.84	25.82	19.63	50.81	42.05	32.58	27.59	22.42	17.08
Design Wall Thickness		0.581	0.465	0.349	0.291	0.233*	0.174*	0.581	0.465	0.349	0.291	0.233*	0.174*
Effective Length KL in test	0	679	559	431	363	292	194	580	480	371	314	254	168
	2	675	556	428	361	291	193	574	475	368	311	252	167
	3	671	552	426	359	290	193	566	470	364	308	250	166
	4	664	547	422	356	288	192	556	461	358	303	246	164
	5	656	541	417	352	285	191	543	451	350	297	242	162
	6	647	533	412	347	282	189	527	439	341	289	236	159
	7	636	524	405	342	277	187	510	425	331	281	229	156
	8	623	514	397	335	272	185	490	409	319	271	221	153
	9	609	503	389	328	267	183	468	392	307	261	213	149
	10	593	491	380	321	261	181	446	374	294	250	204	144
	11	577	478	370	313	254	178	422	355	279	238	195	139
	12	559	464	359	304	247	174	397	335	265	225	185	134
	13	541	449	348	295	240	170	372	315	250	213	175	128
	14	521	433	337	285	232	166	346	294	234	200	165	122
	15	501	417	325	275	224	162	321	274	219	187	154	116
	16	481	401	312	265	216	157	296	253	203	174	144	109
	17	460	384	300	254	208	152	271	233	188	161	134	102
	18	439	367	287	244	199	147	247	214	173	149	124	95
	19	417	350	274	233	191	142	224	195	159	137	114	87
	20	396	332	261	222	182	136	202	177	145	125	104	80
	21	375	315	248	211	173	131	184	160	131	113	95	73
	22	353	298	235	200	164	125	167	146	120	103	87	67
	23	333	281	222	190	156	119	153	134	110	95	79	61
	24	312	264	209	179	147	113	141	123	101	87	73	56
	25	292	248	197	168	139	107	130	113	93	80	67	52
	26	273	232	185	158	131	100	120	104	86	74	62	48
	27	253	217	173	148	122	94	111	97	80	69	57	44
	28	236	201	161	138	115	88	103	90	74	64	53	41
	29	220	188	150	129	107	83	96	84	69	60	50	38
	30	205	175	140	121	100	77	90	78	64	56	47	36
	31	192	164	131	113	93	72	84	73	60	52	44	34
	32	180	154	123	106	88	68	79	69	57	49	41	32
	33	170	145	116	100	82	64	74	65	53	46	38	30
	34	160	137	109	94	78	60				43	36	28
	35	151	129	103	89	73	57						26
	36	143	122	97	84	69	54						
	37	135	115	92	79	66	51						
	38	128	109	87	75	62	48						
	39	121	104	83	71	59	46						
	40	115	99	79	68	56	43						
Area, In 2		16.4	13.5	10.4	8.8	7.1	5.4	14.0	11.6	9.0	7.6	6.2	4.7
lx (in4)		174	149	119	102	84	65	133	115	93	80	66	51
ly (in4)		117	100	80	69	57	44	52	45	37	32	27	21
rx/ry		1.22	1.22	1.22	1.21	1.21	1.21	1.60	1.59	1.58	1.58	1.57	1.58
ry (in)		2.68	2.73	2.78	2.81	2.84	2.87	1.92	1.97	2.03	2.05	2.08	2.10

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

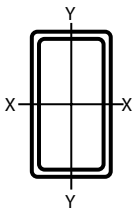


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		9x3					8x6					
Wall Thickness		1/2	3/8	5/16	1/4	3/16	5/8	1/2	3/8	5/16	1/4	3/16
Weight Per Foot		35.24	27.48	23.34	19.02	14.53	50.81	42.05	32.58	27.59	22.42	17.08
Design Wall Thickness		0.465	0.349	0.291	0.233*	0.174*	0.581	0.465	0.349	0.291	0.233	0.174*
Effective Length KL in test	0	403	314	266	215	140	580	480	371	314	255	180
	2	392	306	260	212	138	575	477	369	312	254	179
	3	378	296	252	206	135	570	473	366	310	252	178
	4	360	282	241	197	132	562	467	361	306	249	176
	5	338	266	227	187	127	553	459	356	301	245	174
	6	313	247	212	175	122	542	450	349	296	241	172
	7	285	227	196	162	115	529	440	342	289	236	169
	8	256	205	178	148	108	514	428	333	282	230	166
	9	227	184	160	133	100	498	415	323	274	224	162
	10	199	162	142	119	91	480	401	313	266	217	159
	11	171	141	124	105	81	462	386	302	256	209	154
	12	145	121	107	91	71	442	371	290	247	202	150
	13	124	103	92	78	61	422	354	278	236	194	145
	14	107	89	79	68	53	401	337	266	226	185	140
	15	93	77	69	59	46	380	320	253	215	177	134
	16	82	68	61	52	41	358	303	240	204	168	128
	17	72	60	54	46	36	337	285	227	193	159	122
	18	65	54	48	41	32	315	268	213	182	150	115
	19	58	48	43	37	29	294	251	200	171	141	108
	20		44	39	33	26	273	234	187	160	133	102
	21				30	24	253	217	175	150	124	95
	22						233	201	162	139	115	89
	23						214	185	150	129	107	83
	24						196	170	138	119	99	77
	25						181	157	128	110	91	71
	26						167	145	118	101	85	66
	27						155	134	109	94	78	61
	28						144	125	102	87	73	57
	29						135	116	95	82	68	53
	30						126	109	89	76	64	49
	31						118	102	83	71	59	46
	32						111	96	78	67	56	43
	33						104	90	73	63	52	41
	34						98	85	69	59	49	38
	35						92	80	65	56	47	36
	36						87	76	62	53	44	34
	37						83	72	58	50	42	32
	38							68	55	47	40	31
	39								52	45	38	29
	40									43	36	28
Area, In 2		9.7	7.6	6.4	5.2	4.0	14.0	11.6	9.0	7.6	6.2	4.7
lx (in4)		81	66	58	48	38	114	98	79	68	57	44
ly (in4)		13	11	10	8	7	72	63	51	44	36	28
rx/ry		2.46	2.45	2.42	2.39	2.38	1.26	1.25	1.25	1.25	1.25	1.24
ry (in)		1.17	1.21	1.24	1.27	1.29	2.27	2.32	2.38	2.40	2.43	2.46

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

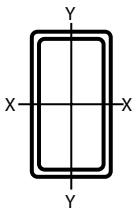


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		8x4						
Wall Thickness		5/8	1/2	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		42.30	35.24	27.48	23.34	19.02	14.53	9.86
Design Wall Thickness		0.581	0.465	0.349	0.291	0.233	0.174*	0.116*
Effective Length KL in test	0	484	403	314	266	217	151	84
	2	476	397	309	262	214	150	84
	3	466	389	303	258	210	148	83
	4	453	378	296	251	205	145	82
	5	436	365	286	243	199	142	80
	6	416	349	274	233	191	138	78
	7	393	332	261	223	183	134	76
	8	369	313	247	211	173	128	74
	9	343	292	232	198	163	123	72
	10	317	271	216	185	153	116	69
	11	290	249	200	171	142	109	66
	12	263	227	183	157	131	101	62
	13	236	206	167	144	120	93	59
	14	211	185	151	130	109	85	55
	15	186	165	135	117	98	77	51
	16	163	145	120	105	88	69	47
	17	145	129	107	93	78	62	43
	18	129	115	95	83	70	55	38
	19	116	103	85	74	63	49	34
	20	105	93	77	67	57	45	31
	21	95	84	70	61	51	40	28
	22	86	77	64	55	47	37	26
	23	79	70	58	51	43	34	23
	24	73	65	54	47	39	31	22
	25	67	59	49	43	36	29	20
	26		55	46	40	34	26	18
	27				37	31	24	17
	28						23	16
	29							
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							
Area, In 2		11.7	9.7	7.6	6.4	5.2	4.0	2.7
lx (in4)		82	72	59	51	43	33	23
ly (in4)		27	24	20	17	14	11	8
rx/ry		1.75	1.74	1.73	1.73	1.72	1.70	1.71
ry (in)		1.511.56	1.61	1.63	1.66	1.69	1.71	

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

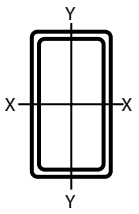


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		8x3					
Wall Thickness		1/2	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		31.84	24.93	21.21	17.32	13.25	9.01
Design Wall Thickness		0.465	0.349	0.291	0.233	0.174*	0.116*
Effective Length KL in test	0	365	285	242	197	137	74
	2	354	277	236	193	134	73
	3	341	268	229	187	132	72
	4	324	256	219	179	128	71
	5	304	241	206	169	123	69
	6	280	224	192	158	117	66
	7	255	205	177	146	110	63
	8	228	185	161	133	103	60
	9	202	165	144	120	93	57
	10	175	145	128	106	83	53
	11	150	126	112	93	73	48
	12	127	108	96	81	64	44
	13	108	92	82	69	55	39
	14	93	79	71	60	48	34
	15	81	69	62	52	41	29
	16	71	61	54	46	36	26
	17	63	54	48	40	32	23
	18	56	48	43	36	29	20
	19	51	43	38	32	26	18
	20		39	35	29	23	17
	21					21	15
	22						
	23						
	24						
	25						
	26						
	27						
	28						
	29						
	30						
	31						
	32						
	33						
	34						
	35						
	36						
	37						
	38						
	39						
	40						
Area, In 2		8.81	6.88	5.85	4.77	3.63	2.46
lx (in4)		58.5	48.5	42.4	35.5	27.8	19.3
ly (in4)		11.7	9.94	8.81	7.49	5.94	4.2
rx/ry		2.24	2.21	2.19	2.18	2.16	2.14
ry (in)		1.15	1.20	1.23	1.25	1.28	1.31

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings. Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

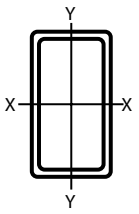


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		8x2					7x5						
Wall Thickness		3/8	5/16	1/4	3/16	1/8	5/8	1/2	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		22.37	19.08	15.62	11.97	8.16	42.3	35.24	27.48	23.34	19.02	14.53	9.86
Design Wall Thickness		0.349	0.291	0.233	0.174*	0.116*	0.581	0.465	0.349	0.291	0.233	0.174*	0.116*
Effective Length KL in test	0	256	218	178	122	65	484	403	314	266	217	161	89
	2	240	205	168	118	63	479	399	311	264	215	160	89
	3	221	190	157	113	61	472	394	307	260	212	159	88
	4	198	171	142	105	58	463	386	302	256	209	157	87
	5	171	149	125	96	55	452	377	295	250	204	154	86
	6	144	127	107	84	51	438	366	287	244	199	151	85
	7	117	104	89	71	46	422	354	278	236	193	147	84
	8	91	83	72	58	40	405	340	267	228	186	142	82
	9	72	66	57	46	33	386	325	256	218	179	137	81
	10	59	53	46	37	27	366	309	244	208	171	131	79
	11	48	44	38	31	22	345	292	232	198	163	125	76
	12	41	37	32	26	19	324	275	219	187	154	118	74
	13		31	27	22	16	302	257	206	176	145	112	71
	14				19	14	280	240	192	165	136	105	67
	15						258	222	179	154	127	98	64
	16						237	204	166	142	118	91	60
	17						216	187	153	131	109	85	57
	18						196	171	140	121	101	78	53
	19						176	154	127	110	92	72	49
	20						159	139	115	100	84	66	45
	21						144	126	105	91	76	60	41
	22						131	115	95	83	69	54	38
	23						120	105	87	76	63	50	34
	24						110	97	80	69	58	46	32
	25						102	89	74	64	54	42	29
	26						94	82	68	59	50	39	27
	27						87	76	63	55	46	36	25
	28						81	71	59	51	43	33	23
	29						76	66	55	48	40	31	22
	30						71	62	51	44	37	29	20
	31						66	58	48	42	35	27	19
	32								45	39	33	26	18
	33									37	31	24	17
	34											23	16
	35												
	36												
	37												
	38												
	39												
	40												
Area, In 2		6.18	5.26	4.3	3.3	2.2	11.7	9.74	7.58	6.43	5.24	4.0	2.7
lx (in4)		38.2	33.7	28.5	22	16	69.3	60.6	49.5	43	35.8	28	19
ly (in4)		3.72	3.38	2.94	2	2	40.5	35.6	29.2	25.5	21.3	17	12
rx/ry		3.20	3.15	3.11	3.06	3.01	1.31	1.31	1.30	1.30	1.30	1.29	1.29
ry (in)		0.78	0.80	0.83	0.85	0.88	1.86	1.91	1.97	1.99	2.02	2.05	2.07

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

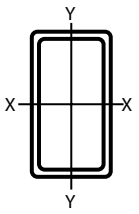


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		7x4						7x3					
Wall Thickness		1/2	3/8	5/16	1/4	3/16	1/8	1/2	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		31.84	24.93	21.21	17.32	13.25	9.01	28.43	22.37	19.08	15.62	11.97	8.16
Design Wall Thickness		0.465	0.349	0.291	0.233	0.174*	0.116*	0.465	0.349	0.291	0.233	0.174*	0.116*
Effective Length KL in test	0	365	285	242	197	147	83	326	256	218	178	132	73
	2	359	280	239	195	145	82	317	249	212	174	130	72
	3	351	275	234	191	143	81	305	241	205	168	127	71
	4	341	268	228	186	140	80	290	229	196	161	123	69
	5	329	258	221	180	137	78	271	216	185	152	117	67
	6	314	248	212	173	132	76	249	200	172	142	109	64
	7	298	236	202	166	127	74	226	183	157	131	101	61
	8	280	222	191	157	120	7 2	202	165	143	119	92	58
	9	261	208	179	148	113	69	178	147	127	107	83	54
	10	241	193	167	138	106	66	155	129	112	95	74	49
	11	221	178	154	128	98	62	132	112	98	83	65	45
	12	201	163	141	118	91	59	112	95	84	72	56	40
	13	181	148	129	107	83	55	95	81	71	61	48	34
	14	162	133	116	97	75	51	82	70	62	53	42	30
	15	144	119	104	88	68	47	71	61	54	46	36	26
	16	126	105	93	79	61	43	63	54	47	41	32	23
	17	112	93	82	70	54	38	56	48	42	36	28	20
	18	100	83	73	62	48	34	50	42	37	32	25	18
	19	90	75	66	56	43	31	45	38	33	29	23	16
	20	81	67	59	50	39	28			30	26	20	15
	21	73	61	54	46	36	25					19	13
	22	67	56	49	42	32	23						
	23	61	51	45	38	30	21						
	24	56	47	41	35	27	19						
	25	52	43	38	32	25	18						
	26		40	35	30	23	16						
	27				28	22	15						
	28						14						
	29												
	30												
	31												
	32												
	33												
	34												
	35												
	36												
	37												
	38												
	39												
	40												
Area, In 2		8.81	6.88	5.85	4.77	3.6	2.5	7.9	6.2	5.3	4.3	3.3	2.2
Ix (in4)		50.6	41.8	36.4	30.5	24	17	41	34	30	25	20	14
Iy (in4)		20.7	17.3	15.2	12.8	10	7	10	9	8	7	5	4
rx/ry		1.57	1.56	1.55	1.54	1.54	1.53	1.99	1.97	1.97	1.95	1.94	1.93
ry (in)		1.53	1.58	1.61	1.64	1.66	1.69	1.14	1.19	1.21	1.24	1.26	1.29

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings. Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi

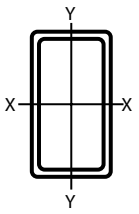


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		6x5				6x4					
Wall Thickness		3/8	5/16	1/4	3/16	1/2	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		24.93	21.21	17.32	13.25	28.43	22.37	19.08	15.62	11.97	8.16
Design Wall Thickness		0.349	0.291	0.233	0.174	0.465	0.349	0.291	0.233	0.174	0.116*
Effective Length KL in test	0	285	242	197	150	326	256	218	178	136	81
	2	282	240	196	149	321	252	214	175	134	80
	3	278	237	193	147	314	247	210	172	131	79
	4	273	233	190	145	305	240	205	168	128	78
	5	267	227	186	142	293	231	198	162	124	76
	6	259	221	181	138	279	221	189	156	119	74
	7	250	214	175	134	264	210	180	148	114	72
	8	241	206	169	129	248	198	170	140	108	69
	9	230	197	162	124	230	185	159	132	101	66
	10	219	188	154	118	212	171	148	123	94	62
	11	207	178	146	112	194	157	136	113	87	59
	12	195	168	138	106	176	143	125	104	80	55
	13	183	157	130	100	158	129	113	95	73	51
	14	170	147	122	94	140	116	102	86	66	46
	15	158	137	113	88	124	103	91	77	60	42
	16	145	126	105	81	109	91	80	68	53	38
	17	133	116	97	75	96	81	71	61	47	33
	18	122	106	89	69	86	72	64	54	42	30
	19	110	97	81	63	77	65	57	48	38	27
	20	99	87	73	58	70	58	52	44	34	24
	21	90	79	67	52	63	53	47	40	31	22
	22	82	72	61	48	57	48	43	36	28	20
	23	75	66	55	43	53	44	39	33	26	18
	24	69	61	51	40	48	40	36	30	24	17
	25	64	56	47	37	45	37	33	28	22	15
	26	59	52	43	34			30	26	20	14
	27	55	48	40	32					19	13
	28	51	45	37	29						
	29	47	41	35	27						
	30	44	39	33	26						
	31	41	36	31	24						
	32	39	34	29	22						
	33			27	21						
	34										
	35										
	36										
	37										
	38										
	39										
	40										
Area, In 2		6.885.85	4.77	3.63		7.88	6.18	5.26	4.3	3.28	2.23
lx (in4)		33.929.6	24.7	19.3		33.9	28.3	24.8	20.9	16.4	11.4
ly (in4)		25.522.3	18.7	14.6		17.7	14.9	13.1	11.1	8.76	6.15
rx/ry		1.161.15	1.15	1.15		1.39	1.38	1.37	1.37	1.37	1.36
ry (in)		1.921.95	1.98	2.01		1.50	1.55	1.58	1.61	1.63	1.66

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		6x3						6x2				
Wall Thickness		1/2	3/8	5/16	1/4	3/16	1/8	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		25.03	19.82	16.96	13.91	10.7	7.31	17.27	14.83	12.21	9.42	6.46
Design Wall Thickness		0.465	0.349	0.291	0.233	0.174	0.116*	0.349	0.291	0.233	0.174	0.116*
Effective Length KL in test	0	288	227	194	159	121	72	198	170	140	107	62
	2	279	221	189	155	118	71	185	159	132	101	60
	3	268	213	182	150	115	69	170	147	122	94	58
	4	254	203	174	143	110	67	151	132	110	86	54
	5	237	190	163	135	104	65	130	115	96	76	50
	6	218	176	151	126	97	62	108	96	82	65	45
	7	197	160	139	116	90	58	87	79	68	54	39
	8	176	144	125	105	82	54	68	62	54	44	32
	9	154	128	111	94	73	50	53	49	43	35	25
	10	133	112	98	83	65	45	43	40	35	28	21
	11	113	96	85	72	57	40	36	33	29	23	17
	12	95	82	72	62	50	35	30	28	24	20	14
	13	81	70	62	53	42	30		23	21	17	12
	14	70	60	53	46	37	26					11
	15	61	52	46	40	32	22					
	16	53	46	41	35	28	20					
	17	47	41	36	31	25	18					
	18	42	36	32	28	22	16					
	19		33	29	25	20	14					
	20				22	18	13					
	21						11					
	22											
	23											
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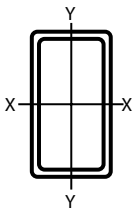
	36											
	37											
	38											
	39											
	40											
Area, In 2		6.95	5.48	4.68	3.84	2.93	2	4.78	4.1	3.37	2.58	1.77
lx (in4)		26.8	22.7	20.1	17	13.4	9.43	17.1	15.3	13.1	10.5	7.42
ly (in4)		8.65	7.47	6.66	5.7	4.55	3.23	2.75	2.52	2.21	1.8	1.31
rx/ry		1.76	1.74	1.74	1.72	1.71	1.71	2.49	2.46	2.43	2.40	2.38
ry (in)		1.12	1.17	1.19	1.22	1.25	1.27	0.76	0.79	0.81	0.84	0.86

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		5x4					5x3					
Wall Thickness		1/2	3/8	5/16	1/4	3/16	1/2	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		25.03	19.82	16.96	13.91	10.7	21.63	17.27	14.83	12.21	9.42	6.46
Design Wall Thickness		0.465	0.349	0.291	0.233	0.174	0.465	0.349	0.291	0.233	0.174	0.116*
Effective Length KL in test	0	288	227	194	159	121	249	198	170	140	107	70
	2	283	223	191	156	119	241	192	165	136	104	68
	3	276	218	187	153	117	232	185	159	131	101	67
	4	268	212	181	149	114	219	176	152	125	96	64
	5	257	204	175	144	110	203	164	142	118	91	62
	6	244	195	167	138	106	186	151	132	109	85	58
	7	230	185	159	131	101	167	137	120	100	78	54
	8	215	173	149	124	95	148	123	108	90	70	49
	9	199	162	139	116	89	129	108	96	80	63	44
	10	183	149	129	107	83	110	94	84	70	56	39
	11	166	137	118	99	77	93	80	72	61	49	35
	12	150	124	108	90	70	78	68	61	52	42	30
	13	133	112	97	82	64	66	58	52	44	36	26
	14	118	100	87	74	58	57	50	45	38	31	22
	15	103	88	77	66	52	50	43	39	33	27	19
	16	91	78	68	58	46	44	38	34	29	24	17
	17	80	69	60	51	41	39	34	30	26	21	15
	18	72	61	54	46	36	35	30	27	23	19	13
	19	64	55	48	41	33		27	24	21	17	12
	20	58	50	44	37	29					15	11
	21	53	45	39	34	27						
	22	48	41	36	31	24						
	23	44	38	33	28	22						
	24	40	34	30	26	20						
	25		32	28	24	19						
	26				22	17						
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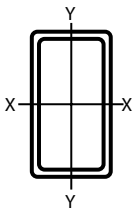
Area, In 2		6.95	5.48	4.68	3.84	2.93	6.02	4.78	4.1	3.37	2.58	1.77
lx (in4)		21.2	17.9	15.8	13.4	10.6	16.4	14.1	12.6	10.7	8.53	6.03
ly (in4)		14.8	12.6	11.1	9.46	7.48	7.14	6.23	5.59	4.81	3.85	2.75
rx/ry		1.20	1.19	1.19	1.19	1.19	1.51	1.51	1.50	1.50	1.49	1.48
ry (in)		1.46	1.52	1.54	1.57	1.60	1.09	1.14	1.17	1.19	1.22	1.25

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings. Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		5x2 1/2			5x2				
Wall Thickness		1/4	3/16	1/8	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		11.36	8.78	6.03	14.72	12.7	10.51	8.15	5.61
Design Wall Thickness		0.233	0.174	0.116*	0.349	0.291	0.233	0.174	0.116*
Effective Length KL in test	0	130	100	65	169	146	120	93	60
	2	125	96	63	158	137	113	88	58
	3	119	92	61	145	126	105	82	55
	4	111	86	58	128	112	94	74	51
	5	102	79	54	110	97	82	65	46
	6	92	71	50	91	81	70	55	39
	7	81	63	44	72	66	57	46	33
	8	70	55	39	56	51	45	37	27
	9	59	47	34	44	41	36	29	21
	10	49	39	28	36	33	29	24	17
	11	41	33	24	30	27	24	20	14
	12	34	27	20	25	23	20	17	12
	13	29	23	17			17	14	10
	14	25	20	15					9
	15	22	17	13					
	16	19	15	11					
	17		14	10					
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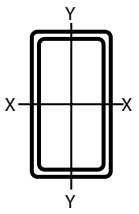
Area, In 2		3.14	2.41	1.65	4.09	3.52	2.91	2.24	1.54
lx (in4)		9.4	7.51	5.34	10.3	9.34	8.08	6.5	4.65
ly (in4)		3.13	2.53	1.82	2.27	2.09	1.84	1.51	1.1
rx/ry		1.73	1.74	1.71	2.13	2.11	2.10	2.07	2.05
ry (in)		1.00	1.02	1.05	0.75	0.77	0.80	0.82	0.85

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings. Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		4x3					4x2 1/2		
Wall Thickness		3/8	5/16	1/4	3/16	1/8	5/16	1/4	3/16
Weight Per Foot		14.72	12.7	10.51	8.15	5.61	11.64	9.66	7.51
Design Wall Thickness		0.349	0.291	0.233	0.174	0.116	0.291	0.233	0.174
Effective Length KL in test	0	169	146	120	93	64	134	111	85
	2	164	141	117	90	62	128	106	82
	3	158	136	113	87	60	121	101	78
	4	149	129	107	83	57	112	94	73
	5	139	121	101	78	54	102	86	67
	6	128	111	93	72	50	91	76	60
	7	115	100	85	66	46	79	67	53
	8	102	90	76	60	42	67	57	46
	9	90	79	67	53	37	56	48	39
	10	77	68	59	47	33	45	40	32
	11	65	58	50	41	29	38	33	27
	12	55	49	43	35	25	32	28	22
	13	47	42	36	29	21	27	23	19
	14	40	36	31	25	18	23	20	16
	15	35	31	27	22	16	20	18	14
	16	31	28	24	19	14		15	13
	17	27	24	21	17	12			
	18	24	22	19	15	11			
	19			17	14	10			
	20					9			
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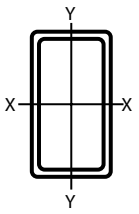
Area, In 2		4.09	3.52	2.91	2.24	1.54	3.23	2.67	2.06
lx (in4)		7.92	7.13	6.15	4.93	3.52	6.13	5.32	4.3
ly (in4)		5	4.52	3.91	3.16	2.27	2.89	2.53	2.06
rx/ry		1.25	1.26	1.25	1.25	1.26	1.46	1.45	1.44
ry (in)		1.11	1.13	1.16	1.19	1.21	0.95	0.97	1.00

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings. Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi



Design Axial Strength in kips (ϕ = 0.90) Fy46ksi											
Nominal Size		4x2					3 1/2 x 2 1/2				
Wall Thickness		3/8	5/16	1/4	3/16	1/8	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		12.17	10.58	8.81	6.87	4.75	12.17	10.58	8.81	6.87	4.75
Design Wall Thickness		0.349	0.291	0.233	0.174	0.116	0.349	0.291	0.233	0.174	0.116
Effective Length KL in test	0	140	122	101	78	54	169	146	120	93	64
	2	130	114	95	74	51	165	142	118	91	62
	3	119	104	87	68	47	160	138	115	88	61
	4	105	93	78	62	43	154	133	110	85	59
	5	89	79	68	54	38	145	126	105	81	56
	6	73	66	57	46	32	136	118	99	77	53
	7	57	53	46	38	27	126	110	92	71	50
	8	44	41	36	30	22	115	100	84	66	46
	9	35	32	29	24	17	103	91	77	60	42
	10	28	26	23	19	14	92	81	69	55	38
	11	23	22	19	16	12	81	72	61	49	34
	12	20	18	16	13	10	70	63	54	43	30
	13				11	8	60	54	47	38	27
	14						52	47	41	33	23
	15						45	41	35	28	20
	16						40	36	31	25	18
	17						35	32	28	22	16
	18						31	28	25	20	14
	19						28	25	22	18	13
	20						25	23	20	16	11
	21						23	21	18	15	10
	22								16	13	9
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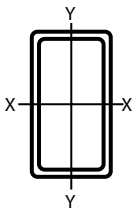
Area, In 2		3.39	2.94	2.44	1.89	1.3	3.39	2.94	2.44	1.89	1.3
Ix (in4)		5.59	5.12	4.49	3.66	2.65	4.74	4.34	3.79	3.09	2.23
Iy (in4)		1.79	1.66	1.48	1.22	0.898	2.75	2.53	2.23	1.82	1.33
rx/ry		1.77	1.75	1.75	1.73	1.72	1.00	1.00	1.00	1.00	1.00
ry (in)		0.73	0.75	0.78	0.80	0.83	1.26	1.29	1.32	1.35	1.37

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		3x2 1/2				3x2				3x1 1/2		
Wall Thickness		5/16	1/4	3/16	1/8	5/16	1/4	3/16	1/8	1/4	3/16	1/8
Weight Per Foot		9.51	7.96	6.23	4.33	8.45	7.11	5.59	3.9	6.26	4.96	3.48
Design Wall Thickness		0.291	0.233	0.174	0.116	0.291	0.233	0.174	0.116	0.233	0.174	0.116
Effective Length KL in test	0	109	91	71	49	97	82	64	44	72	57	40
	2	104	88	68	47	90	76	60	42	64	51	36
	3	98	83	64	45	82	70	55	39	54	44	31
	4	91	77	60	42	72	62	49	35	44	36	26
	5	81	69	55	38	61	53	43	30	33	28	21
	6	72	61	49	35	50	44	36	26	24	20	16
	7	61	53	42	30	39	35	29	21	17	15	11
	8	52	45	36	26	30	27	23	17	13	11	9
	9	42	37	30	22	24	22	18	13	11	9	7
	10	34	30	25	18	19	17	15	11			6
	11	28	25	21	15	16	14	12	9			
	12	24	21	17	13	13	12	10	8			
	13	20	18	15	11				6			
	14	17	15	13	9							
	15	15	13	11	8							
	16			10	7							
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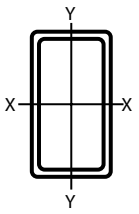
Area, In 2		2.64	2.21	1.71	1.19	2.35	1.97	1.54	1.07	1.74	1.37	0.96
lx (in4)		2.91	2.57	2.11	1.54	2.38	2.12	1.76	1.3	1.68	1.42	1.06
ly (in4)		2.17	1.93	1.59	1.16	1.23	1.11	0.931	0.692	0.541	0.466	0.355
rx/ry		1.16	1.16	1.15	1.15	1.39	1.38	1.38	1.37	1.76	1.75	1.72
ry (in)		0.91	0.94	0.96	0.99	0.73	0.75	0.78	0.80	0.56	0.58	0.61

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 46ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		3x1		2 1/2x1 1/2			2x1 1/2		2x1	
Wall Thickness		3/16	1/8	1/4	3/16	1/8	3/16	1/8	3/16	1/8
Weight Per Foot		6.32	3.05	5.41	4.32	3.05	3.68	2.63	3.04	2.2
Design Wall Thickness		0.174	0.116	0.233	0.174	0.116	0.174	0.116	0.174	0.116
Effective Length KL in test	0	49	35	63	49	35	42	30	35	25
	2	38	27	55	44	31	37	27	26	20
	3	27	20	47	38	27	32	23	18	14
	4	17	14	37	31	23	25	19	11	9
	5	11	9	28	24	18	19	15	7	6
	6	7	6	20	17	13	14	11	5	4
	7			14	12	10	10	8		
	8			11	10	7	8	6		
	9			9	8	6	6	5		
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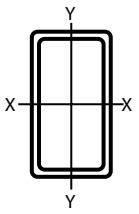
Area, In 2		1.19	0.84	1.51	1.19	0.84	1.02	0.72	0.84	0.61
Ix (in4)		1.07	0.817	1.03	0.881	0.668	0.494	0.383	0.349	0.28
Iy (in4)		0.172	0.138	0.447	0.389	0.299	0.312	0.244	0.112	0.092
rx/ry		0.38	0.41	0.36	0.38	0.40	0.37	0.39	0.37	0.39
ry (in)		1.00	1.00	1.50	1.50	1.50	1.50	1.50	1.00	1.00

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

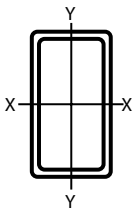


Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		20x12				20x8				20x4		
Wall Thickness		5/8	1/2	3/8	5/16	5/8	1/2	3/8	5/16	1/2	3/8	5/16
Weight Per Foot		127	103	78.5	65.9	110.36	89.68	68.31	57.36	76.07	58.10	48.86
Design Wall Thickness		0.581	0.465*	0.349*	0.291 *	0.581	0.465*	0.349*	0.291*	0.465*	0.349*	0.291*
Effective Length KL in test	0	1575	1189	794	594	1364	1022	668	509	856	546	405
	2	1572	1187	793	593	1358	1020	666	508	848	542	403
	3	1569	1186	792	593	1352	1016	664	507	837	537	400
	4	1564	1183	790	592	1343	1012	662	505	823	530	395
	5	1558	1180	788	591	1332	1006	659	503	804	521	389
	6	1551	1176	786	590	1318	999	655	500	781	510	382
	7	1542	1171	783	588	1302	990	650	497	755	497	374
	8	1532	1165	780	586	1284	981	645	494	724	482	364
	9	1521	1159	777	584	1263	969	639	490	689	465	354
	10	1508	1152	773	582	1241	957	633	485	648	446	341
	11	1495	1144	768	580	1216	944	625	480	599	425	328
	12	1480	1136	763	577	1190	929	617	475	550	402	313
	13	1464	1127	758	575	1162	913	609	469	501	377	298
	14	1447	1117	752	572	1133	896	600	463	453	351	280
	15	1429	1106	746	568	1103	878	590	456	406	322	262
	16	1410	1095	740	565	1071	858	579	449	361	292	242
	17	1390	1083	733	561	1038	838	568	441	320	260	221
	18	1369	1071	726	557	1004	816	557	433	286	232	199
	19	1347	1058	719	553	970	793	544	425	256	208	178
	20	1324	1044	711	548	935	767	531	416	231	188	161
	21	1301	1029	702	544	899	739	518	407	210	170	146
	22	1277	1014	694	539	864	711	504	397	191	155	133
	23	1252	999	685	533	828	682	489	387	175	142	122
	24	1227	983	676	528	792	653	474	377	161	130	112
	25	1201	966	666	522	756	624	459	366	148	120	103
	26	1175	949	656	516	720	596	443	355	137	111	95
	27	1148	931	646	510	685	568	426	344	127	103	88
	28	1121	912	635	504	651	540	409	332	118	96	82
	29	1094	892	624	496	616	512	392	320			77
	30	1066	870	613	488	583	485	374	308			
	31	1039	848	601	479	550	459	356	295			
	32	1011	826	590	471	518	433	338	283			
	33	983	804	578	462	487	407	319	269			
	34	955	781	565	454	459	384	300	257			
	35	926	759	553	445	433	362	283	242			
	36	898	736	540	435	409	342	268	229			
	37	870	714	527	426	387	324	254	217			
	38	843	692	514	416	367	307	240	205			
	39	815	669	500	407	349	292	228	195			
	40	788	647	487	397	331	277	217	185			
Area, In 2		35	28.3	21.5	18.1	30.3	24.6	18.7	15.7	20.9	16.0	13.4
lx (in4)		1880	1550	1200	1010	1440	1190	926	786	838	657	560
ly (in4)		851	705	547	464	338	283	222	189	59	48	41
rx/ry		1.49	1.48	1.48	1.48	2.06	2.05	2.04	2.04	3.77	3.71	3.69
ry (in)		4.93	4.99	5.04	5.07	3.34	3.39	3.44	3.47	1.68	1.73	1.75

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

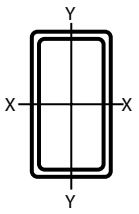


Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		18x6					16x12			
Wall Thickness		5/8	1/2	3/8	5/16	1/4	5/8	1/2	3/8	5/16
Weight Per Foot		93.34	76.07	58.10	48.86	39.43	110	89.7	68.3	57.4
Design Wall Thickness		0.581	0.465*	0.349*	0.291*	0.233*	0.581	0.465	0.349*	0.291*
Effective Length KL in test	0	1157	915	599	452	321	1364	1107	770	577
	2	1149	910	597	451	320	1361	1105	769	577
	3	1139	905	594	449	319	1358	1103	768	576
	4	1125	897	590	446	317	1354	1099	766	575
	5	1108	887	584	443	315	1348	1095	764	574
	6	1087	875	578	438	313	1341	1089	761	573
	7	1063	861	571	433	310	1333	1083	758	571
	8	1036	844	562	428	306	1324	1076	755	569
	9	1007	823	552	421	302	1314	1068	750	567
	10	975	798	542	414	298	1303	1059	746	564
	11	940	771	530	406	293	1290	1049	740	561
	12	904	742	517	398	288	1277	1038	735	558
	13	866	712	503	389	282	1262	1027	729	555
	14	827	681	488	379	276	1247	1014	722	552
	15	787	650	472	368	269	1230	1001	715	548
	16	746	617	455	357	262	1213	988	708	544
	17	705	585	437	345	255	1195	973	700	539
	18	664	552	418	332	247	1176	958	692	534
	19	623	519	399	319	239	1156	942	683	530
	20	583	487	378	305	230	1136	926	674	524
	21	544	455	357	291	221	1115	909	664	519
	22	505	424	335	276	212	1093	892	654	513
	23	468	394	312	261	203	1071	874	644	507
	24	431	364	289	245	193	1048	856	633	500
	25	397	336	267	229	182	1025	838	622	494
	26	367	310	247	212	172	1001	819	611	486
	27	340	288	229	196	161	977	800	599	478
	28	316	268	213	183	149	953	780	587	469
	29	295	250	199	170	139	928	761	575	460
	30	276	233	186	159	130	904	741	562	451
	31	258	218	174	149	122	879	721	549	442
	32	242	205	163	140	114	854	701	536	432
	33	228	193	153	132	108	829	681	523	423
	34	215	182	145	124	101	804	661	508	413
	35	202	171	136	117	96	779	641	493	403
	36	191	162	129	110	90	754	621	478	392
	37	181	153	122	105	86	729	601	463	382
	38	172	145	116	99	81	705	582	448	372
	39	163	138	110	94	77	680	562	433	361
	40	155	131	104	90	73	656	542	418	350
Area, In 2		25.7	20.9	16.0	13.4	10.8	30.3	24.6	18.7	15.7
Ix (in4)		923	770	602	513	419	1090	904	702	595
Iy (in4)		158	134	106	91	75	700	581	452	384
rx/ry		2.42	2.40	2.38	2.37	2.37	1.25	1.25	1.25	1.24
ry (in)		2.48	2.53	2.58	2.61	2.63	4.8	4.86	4.91	4.94

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

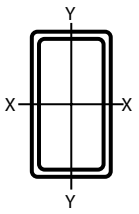


Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		16x8				16x4			14x10				
Wall Thickness		5/8	1/2	3/8	5/16	1/2	3/8	5/16	5/8	1/2	3/8	5/16	1/4
Weight Per Foot		93.3	76.1	58.1	48.9	62.46	47.90	40.35	93.3	76.1	58.1	48.9	39.4
Design Wall Thickness		0.581	0.465	0.349*	0.291*	0.465	0.349*	0.291*	0.581	0.465	0.349*	0.291*	0.233*
Effective Length KL in test	0	1157	941	649	497	774	523	394	1157	941	695	540	376
	2	1152	937	647	496	762	518	391	1153	938	694	539	375
	3	1146	932	645	495	748	512	387	1150	935	692	538	375
	4	1138	926	642	493	728	504	381	1144	931	690	536	374
	5	1128	918	638	490	703	493	374	1137	925	686	534	373
	6	1116	909	634	487	673	480	366	1129	919	683	531	372
	7	1102	897	628	483	640	465	356	1119	911	678	528	370
	8	1086	885	622	479	604	447	345	1108	902	673	525	369
	9	1068	870	615	474	566	427	332	1096	893	667	521	367
	10	1048	855	607	469	526	405	317	1082	882	661	516	365
	11	1027	838	599	463	485	381	302	1067	870	654	511	362
	12	1004	820	589	456	443	354	284	1051	857	646	506	359
	13	979	800	579	450	403	323	266	1034	843	638	500	357
	14	954	780	568	442	363	293	246	1015	829	629	494	353
	15	927	759	557	434	324	264	225	996	813	620	487	350
	16	899	736	545	426	287	236	203	976	797	610	480	347
	17	870	714	532	417	254	210	180	954	781	599	472	343
	18	841	690	518	407	227	187	161	932	763	587	465	339
	19	811	666	504	398	204	168	144	910	745	574	456	334
	20	780	642	489	387	184	151	130	886	727	560	448	330
	21	749	617	474	377	167	137	118	863	708	545	439	325
	22	718	592	458	366	152	125	108	838	688	531	429	320
	23	687	567	441	354	139	114	99	814	669	516	420	314
	24	656	543	422	342	128	105	90	789	649	501	410	309
	25	625	518	403	330	118	97	83	763	628	486	399	303
	26	594	493	385	318	109	90	77	738	608	470	389	296
	27	564	469	366	305	101	83	71	712	588	455	378	289
	28	534	445	348	292		77	66	687	567	440	367	281
	29	505	421	330	279				661	547	424	356	274
	30	477	398	313	265				636	526	409	344	266
	31	449	376	295	251				611	506	393	332	258
	32	421	353	278	237				586	486	378	319	250
	33	396	332	262	223				561	466	363	307	242
	34	373	313	247	210				536	446	348	294	233
	35	352	295	233	198				512	427	333	282	225
	36	333	279	220	188				489	408	318	270	216
	37	315	264	208	178				466	389	304	258	208
	38	299	250	197	168				442	371	290	246	199
	39	283	238	187	160				420	352	276	235	191
	40	269	226	178	152				399	334	262	223	182
Area, In 2		25.7	20.9	16	13.4	17.2	13.2	11.1	25.7	20.9	16	13.4	10.8
lx (in4)		815	679	531	451	455	360	308	687	573	447	380	310
ly (in4)		274	230	181	155	47	38	33	407	341	267	227	186
rx/ry		1.72	1.72	1.71	1.71	3.12	3.06	3.05	1.30	1.29	1.29	1.29	1.29
ry (in)		3.27	3.32	3.37	3.40	1.65	1.71	1.73	3.98	4.04	4.09	4.12	4.14

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

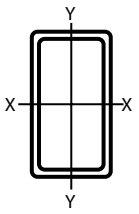


Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		14x6						14x4					
Wall Thickness		5/8	1/2	3/8	5/16	1/4	3/16	5/8	1/2	3/8	5/16	1/4	3/16
Weight Per Foot		76.33	62.46	47.90	40.35	32.63	24.73	67.82	55.66	42.79	36.10	29.23	22.18
Design Wall Thickness		0.581	0.465	0.349*	0.291*	0.233*	0.174*	0.581	0.465	0.349*	0.291*	0.233*	0.174*
Effective Length KL in test	0	945	774	569	437	314	204	842	689	506	384	272	173
	2	938	769	566	435	313	204	828	678	501	380	270	172
	3	930	762	563	432	311	203	811	665	494	376	268	170
	4	918	753	558	429	309	202	787	647	485	370	264	169
	5	904	742	552	425	307	200	758	624	473	362	259	166
	6	886	728	544	420	304	198	724	598	459	353	254	163
	7	866	712	535	414	300	196	686	568	442	342	247	160
	8	843	694	525	407	295	194	645	536	419	330	240	156
	9	818	674	514	399	291	191	601	501	394	316	231	152
	10	791	652	501	390	285	188	555	465	367	300	222	147
	11	762	629	487	381	279	185	508	429	340	283	212	141
	12	731	605	469	371	273	181	462	392	312	265	200	136
	13	699	580	450	360	266	178	416	355	285	245	188	129
	14	666	553	430	348	259	174	372	320	258	222	175	123
	15	633	527	410	335	251	169	330	285	232	200	162	115
	16	599	499	390	322	242	164	290	252	207	179	147	108
	17	564	472	369	308	234	160	257	223	183	159	132	100
	18	530	444	349	294	224	154	229	199	163	142	118	92
	19	496	417	328	278	215	149	205	179	146	128	106	83
	20	463	390	308	261	205	144	185	161	132	115	95	74
	21	430	364	288	245	194	138	168	146	120	104	86	68
	22	399	338	268	228	184	132	153	133	109	95	79	62
	23	368	313	249	212	173	126	140	122	100	87	72	56
	24	338	288	230	197	161	119	129	112	92	80	66	52
	25	311	266	212	181	150	113	119	103	85	74	61	48
	26	288	246	196	168	138	106	110	96	78	68	56	44
	27	267	228	182	155	128	99		89	73	63	52	41
	28	248	212	169	144	119	92			67	59	49	38
	29	231	197	158	135	111	86					45	35
	30	216	184	147	126	104	80						
	31	202	173	138	118	97	75						
	32	190	162	129	111	91	71						
	33	179	152	122	104	86	66						
	34	168	144	115	98	81	62						
	35	159	135	108	92	76	59						
	36	150	128	102	87	72	56						
	37	142	121	97	83	68	53						
	38	135	115	92	78	65	50						
	39	128	109	87	74	62	47						
	40	122	104	83	71	58	45						
Area, In 2		21.0	17.2	13.2	11.1	9.0	6.8	18.7	15.3	11.8	9.9	8.0	6.1
lx (in4)		478	402	317	271	222	170	373	317	252	216	178	137
ly (in4)		124	105	84	72	60	46	47	41	34	29	24	19
rx/ry		1.96	1.95	1.94	1.94	1.93	1.92	2.81	2.77	2.74	2.72	2.71	2.68
ry (in)		2.43	2.48	2.53	2.55	2.58	2.61	1.59	1.64	1.69	1.72	1.74	1.77

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

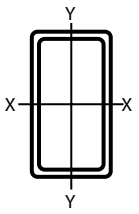


Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		12x10				12x8					
Wall Thickness		1/2	3/8	5/16	1/4	5/8	1/2	3/8	5/16	1/4	3/16
Weight Per Foot		69.3	53	44.6	36	76.3	62.5	47.9	40.4	32.6	24.7
Design Wall Thickness		0.465	0.349	0.291*	0.233*	0.581	0.465	0.349	0.291*	0.233*	0.174*
Effective Length KL in test	0	855	657	526	371	945	774	594	476	350	215
	2	853	655	525	370	941	771	592	475	349	215
	3	850	653	523	370	936	767	589	473	347	214
	4	846	650	521	369	929	761	585	470	346	214
	5	841	646	519	368	920	754	580	467	344	213
	6	835	642	516	366	910	746	573	463	341	212
	7	827	636	513	365	897	736	566	459	338	211
	8	819	630	509	363	883	725	558	454	335	209
	9	810	623	504	361	868	713	548	448	331	208
	10	799	615	499	358	850	699	538	441	327	206
	11	788	607	494	355	832	684	527	434	322	204
	12	776	598	488	353	812	668	515	426	317	202
	13	763	588	481	349	791	651	503	418	312	200
	14	750	578	475	346	769	634	490	409	306	197
	15	735	567	467	342	745	615	476	399	299	195
	16	720	556	459	338	721	596	462	389	293	192
	17	704	544	451	334	697	576	447	377	286	189
	18	688	531	443	329	672	556	432	364	279	186
	19	671	519	434	324	646	535	416	352	271	182
	20	654	506	424	319	620	514	401	338	263	178
	21	636	492	413	314	594	493	385	325	255	175
	22	618	479	402	308	567	472	369	312	246	170
	23	599	465	390	302	541	451	353	299	238	166
	24	581	451	379	296	515	430	337	285	229	162
	25	562	436	367	288	489	409	321	272	219	157
	26	543	422	355	281	463	388	305	259	210	151
	27	524	408	343	273	438	367	290	246	201	145
	28	505	393	331	265	413	347	274	233	191	140
	29	486	379	319	257	389	328	260	220	181	134
	30	467	364	307	248	366	309	245	208	171	128
	31	448	350	295	240	342	289	231	196	161	122
	32	430	336	284	231	321	272	216	184	151	116
	33	412	322	272	222	302	255	203	173	142	109
	34	393	308	260	214	285	241	192	163	134	103
	35	376	295	249	205	269	227	181	154	126	97
	36	358	281	238	195	254	215	171	145	120	92
	37	341	268	227	187	240	203	162	138	113	87
	38	324	255	216	178	228	193	153	131	107	82
	39	307	242	205	169	216	183	146	124	102	78
	40	292	230	195	161	206	174	138	118	97	74
Area, In 2		19	14.6	12.2	9.9	9.9	21	13.2	11.1	8.96	6.76
lx (in4)		395	310	264	216	216	397	262	224	184	140
ly (in4)		298	234	200	164	164	210	140	120	98.8	75.7
rx/ry		1.15	1.15	1.15	1.15	1.37	1.37	1.37	1.37	1.36	1.36
ry (in)		3.96	4.01	4.04	4.07	3.16	3.21	3.27	3.29	3.32	3.35

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

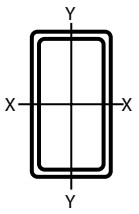


Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		12x6						12x4					
Wall Thickness		5/8	1/2	3/8	5/16	1/4	3/16	5/8	1/2	3/8	5/16	1/4	3/16
Weight Per Foot		67.8	56.7	42.8	36.1	29.2	22.2	59.32	48.85	37.69	31.84	25.82	19.63
Design Wall Thickness		0.581	0.465	0.349	0.291*	0.233*	0.174*	0.581	0.465	0.349	0.291*	0.233*	0.174*
Effective Length KL in test	0	842	689	531	423	308	201	738	608	468	371	266	170
	2	835	684	527	421	306	201	725	598	461	367	264	169
	3	828	678	523	418	305	200	710	586	452	362	261	168
	4	817	669	517	415	302	199	689	570	441	356	257	166
	5	804	659	509	410	299	197	663	550	426	347	251	163
	6	787	646	500	404	296	195	633	526	409	337	245	160
	7	769	631	489	398	292	193	599	499	389	325	238	156
	8	748	615	476	390	287	190	561	470	368	311	229	151
	9	725	597	463	382	281	187	522	439	345	293	220	146
	10	700	577	448	372	275	183	481	407	321	274	209	141
	11	673	556	432	362	269	180	440	374	296	254	198	135
	12	645	534	416	351	262	176	399	341	272	233	186	128
	13	616	511	399	337	254	171	359	308	247	213	173	121
	14	586	487	381	323	246	167	319	277	223	193	159	114
	15	556	462	362	307	237	162	282	246	200	174	143	106
	16	525	438	344	292	228	157	248	217	178	155	128	98
	17	494	413	325	276	218	151	219	192	157	137	114	89
	18	463	388	306	261	208	146	196	172	140	123	102	80
	19	433	364	288	245	198	140	176	154	126	110	91	71
	20	403	339	269	230	187	134	159	139	114	99	82	65
	21	373	316	251	215	176	127	144	126	103	90	75	59
	22	345	293	233	200	164	121	131	115	94	82	68	53
	23	317	270	216	186	152	114	120	105	86	75	62	49
	24	291	248	199	172	141	107	110	96	79	69	57	45
	25	268	229	184	158	130	100	101	89	73	64	53	41
	26	248	211	170	146	120	93	94	82	67	59	49	38
	27	230	196	157	136	111	86		76	62	54	45	35
	28	214	182	146	126	104	80				51	42	33
	29	199	170	136	118	97	75						31
	30	186	159	128	110	90	70						
	31	174	149	119	103	85	65						
	32	164	140	112	97	79	61						
	33	154	131	105	91	75	58						
	34	145	124	99	85	70	54						
	35	137	117	94	81	66	51						
	36	129	110	89	76	63	48						
	37	122	104	84	72	59	46						
	38	116	99	79	68	56	43						
	39	110	94	75	65	53	41						
	40		89	72	62	51	39						
Area, In 2		18.7	15.3	11.8	9.92	8.03	6.06	16.4	13.5	10.4	8.8	7.1	5.4
Ix (in4)		321	271	215	184	151	116	245	210	168	144	119	92
Iy (in4)		107	91.1	72.9	62.8	51.9	40	40	35	29	25	21	16
rx/ry		1.73	1.73	1.72	1.71	1.71	1.70	2.46	2.44	2.41	2.39	2.38	2.36
ry (in)		2.39	2.44	2.49	2.52	2.54	2.57	1.57	1.62	1.67	1.70	1.72	1.75

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

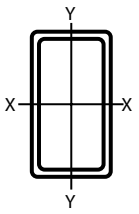


Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		12x3 1/2		12x3			12x2	
Wall Thickness		3/8	5/16	5/16	1/4	3/16	1/4	3/16
Weight Per Foot		36.41	30.78	29.72	24.12	18.35	22.42	17.08
Design Wall Thickness		0.349	0.291*	0.291*	0.233*	0.174*	0.233*	0.174*
Effective Length KL in test	0	450	357	344	245	155	224	139
	2	441	353	338	241	153	217	136
	3	430	347	330	237	151	208	131
	4	416	338	320	230	147	195	125
	5	398	328	306	222	143	178	118
	6	377	315	290	212	139	158	108
	7	353	300	267	201	133	135	97
	8	328	280	242	188	126	108	84
	9	302	258	217	173	119	85	69
	10	275	235	191	157	111	69	56
	11	248	213	167	139	101	57	46
	12	221	191	144	120	92	48	39
	13	195	169	122	102	81	41	33
	14	171	148	105	88	70	35	28
	15	149	129	92	77	61		
	16	131	114	81	68	54		
	17	116	101	72	60	47		
	18	103	90	64	53	42		
	19	93	81	57	48	38		
	20	84	73	52	43	34		
	21	76	66	47	39	31		
	22	69	60			28		
	23	63	55					
	24	58	50					
	25							
	26							
	27							
	28							
	29							
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							
Area, In 2		10.0	8.5	8.2	6.6	5.0	6.2	4.7
lx (in4)		156	134	124	103	80	87	67
ly (in4)		21	19	13	11	9	4	4
rx/ry		2.70	2.69	3.07	3.05	3.02	4.44	4.36
ry (in)		1.46	1.48	1.27	1.29	1.32	0.85	0.87

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings. Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

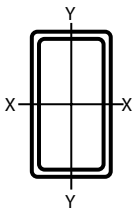


Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		10x8						10x6					
Wall Thickness		5/8	1/2	3/8	5/16	1/4	3/16	5/8	1/2	3/8	5/16	1/4	3/16
Weight Per Foot		67.8	56.7	42.8	36.1	29.2	22.2	59.3	48.9	37.7	31.8	25.8	19.6
Design Wall Thickness		0.581	0.465	0.349	0.291	0.233*	0.174*	0.581	0.465	0.349	0.291	0.233*	0.174*
Effective Length KL in test	0	842	689	531	446	340	211	738	608	468	394	299	198
	2	838	686	529	445	339	211	732	603	465	391	297	197
	3	833	682	526	442	338	210	725	598	461	388	295	196
	4	827	677	522	439	336	210	716	590	455	383	293	195
	5	819	670	517	435	334	209	703	580	448	378	289	193
	6	809	663	512	430	331	208	689	568	439	370	285	190
	7	797	653	505	425	328	206	672	555	429	362	280	188
	8	784	643	497	418	324	205	653	540	418	353	275	185
	9	770	631	488	411	320	203	632	523	406	343	269	181
	10	754	619	479	403	315	201	609	505	392	332	262	177
	11	736	605	469	395	309	199	585	486	378	320	255	173
	12	718	590	457	386	304	196	560	466	363	307	247	169
	13	698	575	446	376	298	194	533	445	347	294	238	164
	14	678	558	434	366	291	191	506	423	331	281	229	158
	15	657	541	421	355	284	188	479	401	314	267	218	153
	16	635	524	407	344	277	185	451	379	298	253	207	147
	17	612	506	394	333	269	181	423	357	281	239	196	141
	18	589	487	380	321	261	178	396	334	264	225	184	135
	19	565	468	365	309	252	174	369	312	247	211	173	128
	20	541	449	351	297	243	169	342	291	231	198	162	121
	21	517	430	336	285	233	165	316	269	215	184	151	115
	22	493	411	322	273	223	160	291	249	199	171	140	107
	23	470	391	307	261	213	155	266	229	184	158	130	100
	24	446	372	293	249	204	150	245	210	169	146	120	93
	25	422	353	278	237	194	144	225	194	155	134	110	86
	26	399	334	264	225	184	138	208	179	144	124	102	79
	27	377	316	250	213	175	132	193	166	133	115	95	73
	28	354	298	236	201	165	125	180	154	124	107	88	68
	29	333	280	222	190	156	119	168	144	116	100	82	64
	30	311	263	209	179	147	113	157	134	108	93	77	59
	31	291	246	196	168	138	106	147	126	101	87	72	56
	32	274	231	184	158	130	100	138	118	95	82	67	52
	33	257	217	173	148	122	94	129	111	89	77	63	49
	34	242	205	163	140	115	88	122	105	84	73	60	46
	35	229	193	154	132	109	83	115	99	79	68	56	44
	36	216	183	145	125	103	79	109	93	75	65	53	41
	37	205	173	138	118	97	75	103	88	71	61	50	39
	38	194	164	130	112	92	71	98	84	67	58	48	37
	39	184	156	124	106	87	67	93	80	64	55	45	35
	40	175	148	118	101	83	64			61	52	43	33
Area, In 2		18.7	15.3	11.8	9.92	8.03	6.06	16.4	13.5	10.4	8.76	7.1	5.37
lx (in4)		253	214	169	145	119	91.4	201	171	137	118	96.9	74.6
ly (in4)		178	151	120	103	84.7	65.1	89.4	76.8	61.8	53.3	44.1	34.1
rx/ry		1.19	1.19	1.19	1.19	1.18	1.18	1.50	1.49	1.49	1.48	1.48	1.48
ry (in)		3.09	3.14	3.19	3.22	3.25	3.28	2.34	2.39	2.44	2.47	2.49	2.52

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

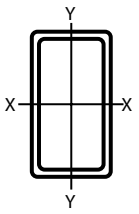


Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		10x5				10x4						10x3 1/2
Wall Thickness		3/8	5/16	1/4	3/16	5/8	1/2	3/8	5/16	1/4	3/16	3/8
Weight Per Foot		35.13	29.72	24.12	18.35	50.81	42.05	32.58	27.59	22.42	17.08	31.31
Design Wall Thickness		0.349	0.291	0.233*	0.174*	0.581	0.465	0.349	0.291	0.233*	0.174*	0.349
Effective Length KL in test	0	435	368	277	182	630	522	404	342	257	167	388
	2	431	364	276	181	619	513	397	336	254	165	380
	3	425	360	273	180	605	503	390	330	251	163	371
	4	418	353	270	178	587	488	379	322	246	161	358
	5	409	346	266	176	564	470	366	311	240	158	342
	6	398	337	260	173	537	449	351	298	233	154	323
	7	385	326	254	170	507	426	333	284	225	150	302
	8	371	314	247	166	474	400	314	268	216	145	280
	9	355	301	240	161	440	373	294	252	205	139	257
	10	339	288	231	157	404	344	273	234	193	133	233
	11	321	273	222	152	368	315	251	216	179	126	210
	12	303	258	212	146	332	287	230	198	164	118	187
	13	285	243	199	140	298	258	208	180	150	111	164
	14	266	227	187	134	264	231	187	163	136	102	143
	15	248	212	174	127	232	205	167	146	122	93	125
	16	229	196	162	120	203	180	148	130	109	84	110
	17	211	181	150	113	180	159	131	115	97	75	97
	18	193	166	138	105	161	142	117	102	86	67	87
	19	176	151	126	97	144	127	105	92	77	60	78
	20	159	137	115	89	130	115	95	83	70	54	70
	21	145	125	104	81	118	104	86	75	63	49	64
	22	132	113	95	74	108	95	78	69	58	45	58
	23	121	104	87	68	98	87	72	63	53	41	53
	24	111	95	80	62	90	80	66	58	49	38	49
	25	102	88	73	57	83	74	61	53	45	35	
	26	94	81	68	53		68	56	49	41	32	
	27	87	75	63	49			52	46	38	30	
	28	81	70	59	46					36	28	
	29	76	65	55	42							
	30	71	61	51	40							
	31	66	57	48	37							
	32	62	54	45	35							
	33	59	50	42	33							
	34	55	48	40	31							
	35			37	29							
	36											
	37											
	38											
	39											
	40											
Area, In 2		9.7	8.2	6.6	5.0	14.0	11.6	9.0	7.6	6.2	4.7	8.6
lx (in4)		120	104	86	66	149	129	104	90	75	58	96
ly (in4)		41	35	29	23	34	30	24	21	18	14	18
rx/ry		1.72	1.72	1.71	1.70	2.12	2.10	2.08	2.06	2.05	2.05	2.32
ry (in)		2.05	2.07	2.10	2.13	1.54	1.59	1.64	1.67	1.70	1.72	1.44

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

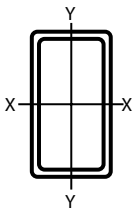


Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		10x3					10x2			
Wall Thickness		3/8	5/16	1/4	3/16	1/8	3/8	5/16	1/4	3/16
Weight Per Foot		30.03	25.46	20.72	15.80	10.71	27.48	23.34	19.02	14.53
Design Wall Thickness		0.349	0.291	0.233*	0.174*	0.116*	0.349	0.291	0.233*	0.174*
Effective Length KL in test	0	372	315	236	151	81	341	289	215	136
	2	362	307	231	149	80	319	271	207	132
	3	349	297	226	146	79	293	251	196	127
	4	332	283	219	142	77	260	224	182	120
	5	312	267	210	138	76	223	194	162	111
	6	288	248	199	132	73	185	163	137	100
	7	263	227	186	125	71	148	132	113	87
	8	237	205	170	118	67	115	104	90	72
	9	210	183	152	109	64	91	82	71	58
	10	183	161	135	100	60	74	67	58	47
	11	158	140	118	90	56	61	55	48	39
	12	134	119	102	79	51	51	46	40	32
	13	114	102	87	68	47	44	39	34	28
	14	99	88	75	58	41				24
	15	86	76	65	51	36				
	16	75	67	57	45	32				
	17	67	59	51	40	28				
	18	60	53	45	35	25				
	19	53	48	41	32	23				
	20	48	43	37	29	20				
	21			33	26	18				
	22					17				
	23									
	24									
	25									
	26									
	27									
	28									
	29									
	30									
	31									
	32									
	33									
	34									
	35									
	36									
	37									
	38									
	39									
	40									
Area, In 2		8.3	7.0	5.7	4.3	2.9	7.6	6.4	5.2	4.0
lx (in4)		88	76	64	49	34	72	63	53	41
ly (in4)		12	11	9	7	5	5	4	4	3
rx/ry		2.67	2.64	2.61	2.60	2.57	3.91	3.84	3.78	3.72
ry (in)		1.22	1.25	1.28	1.30	1.33	0.79	0.81	0.84	0.86

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

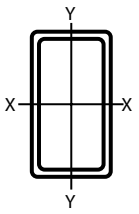


Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		9x7						9x5					
Wall Thickness		5/8	1/2	3/8	5/16	1/4	3/16	5/8	1/2	3/8	5/16	1/4	3/16
Weight Per Foot		59.32	48.85	37.69	31.84	25.82	19.63	50.81	42.05	32.58	27.59	22.42	17.08
Design Wall Thickness		0.581	0.465	0.349	0.291	0.233*	0.174*	0.581	0.465	0.349	0.291	0.233*	0.174*
Effective Length KL in test	0	738	608	468	394	313	205	630	522	404	342	271	180
	2	734	604	465	392	312	204	623	516	400	338	269	179
	3	728	600	462	389	310	203	614	509	394	334	267	177
	4	721	594	458	386	308	202	602	500	387	328	263	175
	5	711	586	452	381	305	201	587	488	379	321	259	173
	6	700	577	446	376	302	200	568	473	368	312	253	170
	7	687	567	438	369	297	198	548	457	356	302	246	166
	8	672	555	429	362	293	195	525	439	343	291	238	162
	9	655	542	419	354	287	193	500	419	328	279	228	157
	10	637	527	408	345	280	190	473	398	313	266	218	152
	11	618	512	397	335	273	187	446	376	296	252	207	146
	12	598	496	385	325	265	184	418	353	279	238	196	140
	13	576	478	372	315	256	180	389	330	262	224	184	134
	14	554	461	358	304	247	175	360	307	245	209	172	127
	15	531	442	344	292	238	170	331	284	227	194	161	120
	16	507	423	330	280	229	165	303	261	210	180	149	113
	17	483	404	316	268	219	160	276	238	193	166	137	105
	18	459	384	301	256	209	154	250	217	176	152	126	97
	19	435	365	286	244	199	148	224	196	160	138	115	89
	20	411	345	271	231	190	142	202	177	145	125	105	81
	21	387	326	257	219	180	135	184	160	131	113	95	73
	22	363	307	242	207	170	129	167	146	120	103	87	67
	23	340	288	228	195	160	122	153	134	110	95	79	61
	24	317	269	214	183	151	116	141	123	101	87	73	56
	25	295	251	200	171	141	109	130	113	93	80	67	52
	26	273	234	186	160	132	102	120	104	86	74	62	48
	27	253	217	173	149	123	95	111	97	80	69	57	44
	28	236	201	161	138	115	89	103	90	74	64	53	41
	29	220	188	150	129	107	83	96	84	69	60	50	38
	30	205	175	140	121	100	77	90	78	64	56	47	36
	31	192	164	131	113	93	72	84	73	60	52	44	34
	32	180	154	123	106	88	68	79	69	57	49	41	32
	33	170	145	116	100	82	64			53	46	38	30
	34	160	137	109	94	78	60				43	36	28
	35	151	129	103	89	73	57						26
	36	143	122	97	84	69	54						
	37	135	115	92	79	66	51						
	38	128	109	87	75	62	48						
	39	121	104	83	71	59	46						
	40	115	99	79	68	56	43						
Area, In 2		16.4	13.5	10.4	8.8	7.1	5.4	14.0	11.6	9.0	7.6	6.2	4.7
Ix (in4)		174	149	119	102	84	65	133	115	93	80	66	51
Iy (in4)		117	100	80	69	57	44	52	45	37	32	27	21
rx/ry		1.22	1.22	1.22	1.21	1.21	1.21	1.60	1.59	1.58	1.58	1.57	1.58
ry (in)		2.68	2.73	2.78	2.81	2.84	2.87	1.92	1.97	2.03	2.05	2.08	2.10

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

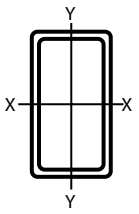


Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		9x3					8x6					
Wall Thickness		1/2	3/8	5/16	1/4	3/16	5/8	1/2	3/8	5/16	1/4	3/16
Weight Per Foot		35.24	27.48	23.34	19.02	14.53	50.81	42.05	32.58	27.59	22.42	17.08
Design Wall Thickness		0.465	0.349	0.291	0.233*	0.174*	0.581	0.465	0.349	0.291	0.233	0.174*
Effective Length KL in test	0	438	341	289	230	149	630	522	404	342	278	192
	2	425	331	282	225	146	625	518	401	339	276	191
	3	409	320	272	220	144	619	513	397	336	273	190
	4	388	304	259	212	140	610	506	392	332	270	188
	5	362	285	244	200	134	599	497	385	326	266	186
	6	332	263	226	186	128	585	487	378	320	260	183
	7	301	240	207	171	121	570	474	369	312	254	180
	8	268	215	187	155	113	553	461	358	304	248	177
	9	235	191	166	139	104	534	446	347	295	240	173
	10	203	166	146	123	94	514	429	335	284	232	168
	11	173	143	126	107	83	492	412	322	274	224	163
	12	145	121	108	92	72	469	394	309	263	215	158
	13	124	103	92	78	61	446	375	295	251	205	153
	14	107	89	79	68	53	422	356	280	239	196	147
	15	93	77	69	59	46	398	336	266	226	186	140
	16	82	68	61	52	41	373	316	251	214	176	134
	17	72	60	54	46	36	349	297	236	201	166	127
	18	65	54	48	41	32	325	277	221	189	156	120
	19	58	48	43	37	29	301	258	206	177	146	112
	20		44	39	33	26	278	239	192	164	136	105
	21				30	24	256	220	178	153	126	98
	22						234	203	164	141	117	91
	23						214	185	151	130	108	84
	24						196	170	138	119	99	77
	25						181	157	128	110	91	71
	26						167	145	118	101	85	66
	27						155	134	109	94	78	61
	28						144	125	102	87	73	57
	29						135	116	95	82	68	53
	30						126	109	89	76	64	49
	31						118	102	83	71	59	46
	32						111	96	78	67	56	43
	33						104	90	73	63	52	41
	34						98	85	69	59	49	38
	35						92	80	65	56	47	36
	36						87	76	62	53	44	34
	37						83	72	58	50	42	32
	38							68	55	47	40	31
	39								52	45	38	29
	40									43	36	28
Area, In 2		9.7	7.6	6.4	5.2	4.0	14.0	11.6	9.0	7.6	6.2	4.7
lx (in4)		81	66	58	48	38	114	98	79	68	57	44
ly (in4)		13	11	10	8	7	72	63	51	44	36	28
rx/ry		2.46	2.45	2.42	2.39	2.38	1.26	1.25	1.25	1.25	1.25	1.24
ry (in)		1.17	1.21	1.24	1.27	1.29	2.27	2.32	2.38	2.40	2.43	2.46

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

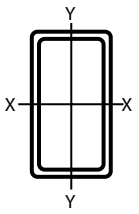


Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		8x4						
Wall Thickness		5/8	1/2	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		42.30	35.24	27.48	23.34	19.02	14.53	9.86
Design Wall Thickness		0.581	0.465	0.349	0.291	0.233	0.174*	0.116*
Effective Length KL in test	0	527	438	341	289	236	161	90
	2	517	431	336	285	232	160	89
	3	505	422	329	279	228	157	88
	4	489	409	320	272	222	155	87
	5	469	393	308	262	214	151	85
	6	446	375	295	251	205	147	83
	7	420	355	280	238	196	141	81
	8	392	332	263	225	185	135	78
	9	362	309	245	210	173	129	75
	10	332	284	227	195	161	122	72
	11	301	260	209	179	149	114	69
	12	271	235	190	164	136	105	65
	13	241	211	172	148	124	96	61
	14	213	188	154	133	112	87	57
	15	186	165	137	119	100	78	52
	16	163	145	120	105	88	70	48
	17	145	129	107	93	78	62	43
	18	129	115	95	83	70	55	38
	19	116	103	85	74	63	49	34
	20	105	93	77	67	57	45	31
	21	95	84	70	61	51	40	28
	22	86	77	64	55	47	37	26
	23	79	70	58	51	43	34	23
	24	73	65	54	47	39	31	22
	25	67	59	49	43	36	29	20
	26		55	46	40	34	26	18
	27				37	31	24	17
	28						23	16
	29							
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							
Area, In 2		11.7	9.7	7.6	6.4	5.2	4.0	2.7
lx (in4)		82	72	59	51	43	33	23
ly (in4)		27	24	20	17	14	11	8
rx/ry		1.75	1.74	1.73	1.73	1.72	1.70	1.71
ry (in)		1.51	1.56	1.61	1.63	1.66	1.69	1.71

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		8x3						8x2				
Wall Thickness		1/2	3/8	5/16	1/4	3/16	1/8	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		31.84	24.93	21.21	17.32	13.25	9.01	22.37	19.08	15.62	11.97	8.16
Design Wall Thickness		0.465	0.349	0.291	0.233	0.174*	0.116*	0.349	0.291	0.233	0.174*	0.116*
Effective Length KL in test	0	396	309	264	215	145	79	278	237	194	130	69
	2	384	301	256	209	143	78	259	221	182	125	67
	3	370	290	248	202	140	77	237	204	168	119	65
	4	349	275	235	193	136	75	211	182	151	111	62
	5	325	258	221	181	130	73	180	157	131	100	58
	6	298	238	205	168	123	70	148	131	111	88	53
	7	268	216	187	155	116	67	119	106	91	73	47
	8	238	194	168	140	107	63	91	83	72	58	41
	9	208	172	149	124	97	59	72	66	57	46	33
	10	179	149	131	109	86	55	58	53	47	37	27
	11	151	128	113	95	75	50	49	43	38	31	22
	12	127	108	96	82	65	45	40	37	32	26	19
	13	108	92	83	69	55	39		31	27	22	16
	14	93	79	71	59	48	34				19	14
	15	82	69	61	52	41	29					
	16	71	60	54	46	36	26					
	17	64	54	48	40	32	23					
	18	56	48	42	36	29	20					
	19	51	43	38	33	26	18					
	20		39	35	30	23	17					
	21					21	15					
	22											
	23											
	24											
	25											
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	29											
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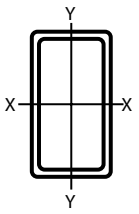
	31											
	32											
	33											
	34											
	35											
	36											
	37											
	38											
	39											
	40											
Area, In 2		8.81	6.88	5.85	4.77	3.63	2.46	6.18	5.26	4.3	3.28	2.23
Ix (in4)		58.5	48.5	42.4	35.5	27.8	19.3	38.2	33.7	28.5	22.4	15.7
Iy (in4)		11.7	9.94	8.81	7.49	5.94	4.2	3.72	3.38	2.94	2.39	1.72
rx/ry		2.24	2.21	2.19	2.18	2.16	2.14	3.20	3.15	3.11	3.06	3.01
ry (in)		1.15	1.20	1.23	1.25	1.28	1.31	0.78	0.80	0.83	0.85	0.88

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

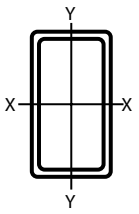


Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		7x5						
Wall Thickness		5/8	1/2	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		42.3	35.24	27.48	23.34	19.02	14.53	9.86
Design Wall Thickness		0.581	0.465	0.349	0.291	0.233	0.174*	0.116*
Effective Length KL in test	0	526	438	341	289	236	173	94
	2	520	433	338	286	233	171	93
	3	512	427	332	283	231	170	93
	4	502	418	326	277	227	167	92
	5	488	408	319	271	221	164	91
	6	472	395	309	263	215	161	90
	7	453	380	299	254	208	156	88
	8	433	364	286	245	200	152	86
	9	412	347	273	233	192	146	84
	10	389	328	259	221	182	139	82
	11	364	309	245	210	173	132	80
	12	340	289	230	197	163	125	77
	13	314	269	215	184	152	117	74
	14	290	249	199	172	142	110	70
	15	266	229	184	159	132	102	66
	16	241	210	169	146	122	94	62
	17	218	191	155	134	112	87	58
	18	196	172	141	122	103	80	54
	19	176	155	127	111	93	72	50
	20	159	140	114	100	84	66	45
	21	144	126	104	91	76	60	41
	22	131	115	94	83	69	54	38
	23	120	106	87	75	64	50	34
	24	110	96	79	70	58	46	32
	25	102	89	73	64	54	42	29
	26	94	83	68	59	50	39	27
	27	87	76	62	55	46	36	25
	28	80	71	58	51	42	33	23
	29	75	67	54	48	40	31	22
	30	71	61	51	44	37	29	20
	31	66	58	48	41	35	27	19
	32	0	0	44	39	33	26	18
	33	0	0	0	37	31	24	17
	34	0	0	0	0	0	23	16
	35							
	36							
	37							
	38							
	39							
	40							
Area, In 2		11.7	9.74	7.58	6.43	5.24	3.98	2.7
lx (in4)		69.3	60.6	49.5	43	35.8	27.9	19.3
ly (in4)		40.5	35.6	29.2	25.5	21.3	16.6	11.6
rx/ry		1.31	1.31	1.30	1.30	1.30	1.29	1.29
ry (in)		1.86	1.91	1.97	1.99	2.02	2.05	2.07

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings. Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

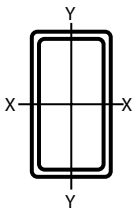


Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		7x4						7x3					
Wall Thickness		1/2	3/8	5/16	1/4	3/16	1/8	1/2	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		31.84	24.93	21.21	17.32	13.25	9.01	28.43	22.37	19.08	15.62	11.97	8.16
Design Wall Thickness		0.465	0.349	0.291	0.233	0.174*	0.116*	0.465	0.349	0.291	0.233	0.174*	0.116*
Effective Length KL in test	0	396	309	264	215	157	88	355	278	237	194	141	78
	2	390	305	259	212	155	88	343	270	230	188	138	77
	3	381	299	254	208	153	86	329	260	222	182	135	75
	4	368	289	247	201	150	85	311	247	211	174	130	73
	5	355	278	238	195	146	83	289	231	198	163	124	71
	6	337	266	228	186	141	81	265	213	183	151	116	68
	7	318	252	216	177	135	79	238	193	166	139	107	64
	8	298	236	203	167	128	76	211	173	149	125	97	60
	9	275	220	190	157	120	73	184	152	132	111	86	56
	10	253	203	176	145	111	69	158	132	115	97	76	51
	11	230	186	161	133	103	65	132	113	100	85	66	46
	12	208	168	147	122	94	61	111	95	84	72	57	40
	13	185	151	132	111	86	57	95	82	72	61	48	34
	14	164	136	119	100	77	52	82	70	61	53	42	30
	15	144	120	106	89	69	48	71	61	54	47	36	26
	16	126	105	93	78	61	43	62	54	48	40	32	23
	17	112	93	83	70	54	38	56	48	41	36	28	20
	18	100	84	73	62	48	34	50	42	37	32	25	18
	19	90	74	66	56	43	31	44	38	33	29	23	16
	20	80	68	59	51	39	28			31	25	20	15
	21	73	61	54	46	36	25					19	13
	22	67	56	49	41	32	23						
	23	61	51	44	38	30	21						
	24	56	47	41	35	27	19						
	25	52	43	38	32	25	18						
	26		40	35	30	23	16						
	27				28	22	15						
	28						14						
	29												
	30												
	31												
	32												
	33												
	34												
	35												
	36												
	37												
	38												
	39												
	40												
Area, In 2		8.81	6.88	5.85	4.77	3.63	2.46	7.88	6.18	5.26	4.3	3.28	2.23
lx (in4)		50.6	41.8	36.4	30.5	23.8	16.6	40.7	34	29.9	25.2	19.8	13.8
ly (in4)		20.7	17.3	15.2	12.8	10	7.03	10.2	8.7	7.74	6.59	5.24	3.71
rx/ry		1.57	1.56	1.55	1.54	1.54	1.53	1.99	1.97	1.97	1.95	1.94	1.93
ry (in)		1.53	1.58	1.61	1.64	1.66	1.69	1.14	1.19	1.21	1.24	1.26	1.29

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi

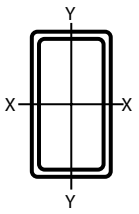


Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		6x5				6x4					
Wall Thickness		3/8	5/16	1/4	3/16	1/2	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		24.93	21.21	17.32	13.25	28.43	22.37	19.08	15.62	11.97	8.16
Design Wall Thickness		0.349	0.291	0.233	0.174	0.465	0.349	0.291	0.233	0.174	0.116*
Effective Length KL in test	0	309	264	215	163	355	278	237	194	147	87
	2	306	260	213	162	348	273	233	191	145	86
	3	302	257	210	160	340	267	228	186	143	85
	4	295	252	205	157	329	259	221	181	139	83
	5	288	246	201	154	316	249	213	175	133	81
	6	280	238	195	148	300	237	203	167	128	79
	7	269	230	188	144	282	224	193	159	122	76
	8	258	220	181	139	263	210	181	149	114	73
	9	246	211	173	132	242	195	168	140	107	69
	10	233	199	164	126	222	179	156	129	100	65
	11	219	188	155	120	201	164	142	119	91	61
	12	205	177	146	112	181	148	129	108	84	57
	13	191	165	137	105	161	132	116	97	75	52
	14	177	152	127	98	142	118	104	87	68	47
	15	163	141	118	91	124	104	91	77	60	42
	16	149	129	108	84	109	91	80	69	53	38
	17	136	119	98	77	96	80	71	60	48	33
	18	123	107	90	70	86	72	64	54	42	30
	19	110	96	82	64	77	65	57	49	38	27
	20	100	87	73	57	70	58	52	43	34	24
	21	90	79	67	52	64	53	47	39	31	22
	22	83	72	60	48	57	48	42	36	29	20
	23	75	66	55	43	53	44	39	33	25	18
	24	69	60	51	40	49	40	36	31	23	17
	25	64	56	47	37	44	37	33	28	22	15
	26	59	52	43	34			31	25	20	14
	27	55	48	40	32					19	13
	28	51	44	37	30						
	29	48	41	35	28						
	30	44	39	33	25						
	31	41	36	31	24						
	32	39	34	29	22						
	33			26	21						
	34										
	35										
	36										
	37										
	38										
	39										
	40										
Area, In 2		6.88	5.85	4.77	3.63	7.88	6.18	5.26	4.3	3.28	2.23
Ix (in4)		33.9	29.6	24.7	19.3	33.9	28.3	24.8	20.9	16.4	11.4
Iy (in4)		25.5	22.3	18.7	14.6	17.7	14.9	13.1	11.1	8.76	6.15
rx/ry		1.16	1.15	1.15	1.15	1.39	1.38	1.37	1.37	1.37	1.36
ry (in)		1.92	1.95	1.98	2.01	1.50	1.55	1.58	1.61	1.63	1.66

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		6x3						6x2				
Wall Thickness		1/2	3/8	5/16	1/4	3/16	1/8	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		25.03	19.82	16.96	13.91	10.7	7.31	17.27	14.83	12.21	9.42	6.46
Design Wall Thickness		0.465	0.349	0.291	0.233	0.174	0.116*	0.349	0.291	0.233	0.174	0.116*
Effective Length KL in test	0	312	247	211	173	132	76	215	184	151	116	66
	2	303	239	204	168	128	75	200	173	142	109	64
	3	290	230	197	162	124	74	182	158	131	102	61
	4	273	218	187	155	119	71	161	140	118	91	57
	5	253	203	175	145	111	68	137	121	102	79	52
	6	231	187	161	134	104	65	111	100	85	68	46
	7	208	169	146	122	95	61	88	79	69	55	40
	8	183	150	131	110	86	57	68	61	54	44	32
	9	159	132	115	97	76	52	53	49	42	35	25
	10	136	114	101	85	67	47	43	39	35	29	21
	11	113	97	86	73	58	41	36	33	29	23	17
	12	95	82	72	62	50	35	30	28	24	20	14
	13	80	70	61	53	42	30		23	20	17	12
	14	70	60	53	46	37	26					11
	15	60	52	47	40	32	22					
	16	53	46	40	35	28	20					
	17	48	40	36	31	24	18					
	18	42	36	32	28	22	16					
	19		33	29	24	20	14					
	20				22	18	13					
	21						11					
	22											
	23											
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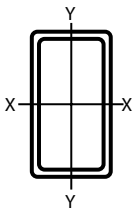
	31											
	32											
	33											
	34											
	35											
	36											
	37											
	38											
	39											
	40											
Area, In 2		6.95	5.48	4.68	3.84	2.93	2	4.78	4.1	3.37	2.58	1.77
Ix (in4)		26.8	22.7	20.1	17	13.4	9.43	17.1	15.3	13.1	10.5	7.42
Iy (in4)		8.65	7.47	6.66	5.7	4.55	3.23	2.75	2.52	2.21	1.8	1.31
rx/ry		1.76	1.74	1.74	1.72	1.71	1.71	2.49	2.46	2.43	2.40	2.38
ry (in)		1.12	1.17	1.19	1.22	1.25	1.27	0.76	0.79	0.81	0.84	0.86

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		5x4					5x3					
Wall Thickness		1/2	3/8	5/16	1/4	3/16	1/2	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		25.03	19.82	16.96	13.91	10.7	21.63	17.27	14.83	12.21	9.42	6.46
Design Wall Thickness		0.465	0.349	0.291	0.233	0.174	0.465	0.349	0.291	0.233	0.174	0.116*
Effective Length KL in test	0	312	247	211	173	132	271	215	184	151	116	74
	2	307	242	206	169	129	262	209	179	147	113	73
	3	300	237	202	166	127	250	200	173	142	109	71
	4	289	230	196	161	124	235	188	163	134	104	68
	5	276	220	188	156	119	217	176	152	126	97	65
	6	262	210	180	148	113	197	161	140	116	90	61
	7	246	197	169	140	108	176	145	127	105	83	57
	8	228	184	159	131	102	154	128	113	94	74	52
	9	210	170	147	122	94	132	111	98	83	66	46
	10	191	157	136	112	88	111	95	86	72	57	41
	11	172	142	123	103	80	93	80	73	61	50	35
	12	154	128	111	93	73	78	68	61	52	42	30
	13	136	114	100	84	66	67	57	52	44	36	26
	14	119	101	88	75	59	57	50	44	38	31	22
	15	104	88	77	66	52	50	43	39	33	26	19
	16	91	77	68	58	46	43	38	34	30	23	17
	17	80	69	60	52	40	39	34	31	25	21	15
	18	72	61	54	46	36	35	30	28	23	19	13
	19	65	55	49	41	33		26	24	21	17	12
	20	58	50	43	37	30				0	15	11
	21	53	46	39	34	26						
	22	48	41	36	31	24						
	23	43	37	33	29	22						
	24	40	35	31	25	20						
	25		32	28	23	19						
	26				22	17						
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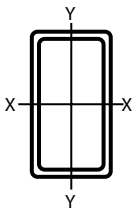
Area, In 2		6.95	5.48	4.68	3.84	2.93	6.02	4.78	4.1	3.37	2.58	1.77
lx (in4)		21.2	17.9	15.8	13.4	10.6	16.4	14.1	12.6	10.7	8.53	6.03
ly (in4)		14.8	12.6	11.1	9.46	7.48	7.14	6.23	5.59	4.81	3.85	2.75
rx/ry		1.20	1.19	1.19	1.19	1.19	1.51	1.51	1.50	1.50	1.49	1.48
ry (in)		1.46	1.52	1.54	1.57	1.60	1.09	1.14	1.17	1.19	1.22	1.25

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		5x2 1/2			5x2				
Wall Thickness		1/4	3/16	1/8	3/8	5/16	1/4	3/16	1/8
Weight Per Foot		11.36	8.78	6.03	14.72	12.7	10.51	8.15	5.61
Design Wall Thickness		0.233	0.174	0.116*	0.349	0.291	0.233	0.174	0.116*
Effective Length KL in test	0	141	108	69	184	159	131	101	64
	2	136	104	67	170	147	123	94	61
	3	128	100	65	156	136	112	88	58
	4	120	92	61	136	120	101	78	54
	5	108	85	57	114	102	87	68	48
	6	96	75	53	93	84	72	57	41
	7	84	66	47	73	67	58	47	34
	8	72	57	40	56	51	46	37	27
	9	60	48	34	44	40	36	30	21
	10	49	39	29	36	33	29	23	17
	11	40	33	24	30	28	24	20	14
	12	34	28	20	24	23	20	17	12
	13	29	23	17			17	14	10
	14	25	20	15					9
	15	22	18	13					
	16	19	16	11					
	17		14	10					
	18								
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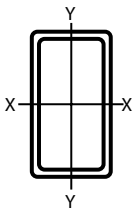
	40								
Area, In 2		3.14	2.41	1.65	4.09	3.52	2.91	2.24	1.54
lx (in4)		9.4	7.51	5.34	10.3	9.34	8.08	6.5	4.65
ly (in4)		3.13	2.53	1.82	2.27	2.09	1.84	1.51	1.1
rx/ry		1.73	1.74	1.71	2.13	2.11	2.10	2.07	2.05
ry (in)		1.00	1.02	1.05	0.75	0.77	0.80	0.82	0.85

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		4x3					4x2 1/2		
Wall Thickness		3/8	5/16	1/4	3/16	1/8	5/16	1/4	3/16
Weight Per Foot		14.72	12.7	10.51	8.15	5.61	11.64	9.66	7.51
Design Wall Thickness		0.349	0.291	0.233	0.174	0.116	0.291	0.233	0.174
Effective Length KL in test	0	184	159	131	101	69	145	120	93
	2	178	154	127	97	68	139	115	89
	3	170	147	122	94	65	130	109	85
	4	161	139	115	90	61	121	101	78
	5	148	129	108	84	58	108	91	71
	6	136	118	98	77	54	95	80	64
	7	121	106	89	70	49	82	70	55
	8	107	93	79	62	43	69	59	48
	9	92	82	70	55	39	56	49	39
	10	78	70	60	48	34	46	39	32
	11	66	58	51	41	29	37	33	26
	12	55	49	42	35	24	32	28	22
	13	47	41	36	30	21	26	23	19
	14	40	36	32	25	18	23	20	17
	15	35	32	28	22	16	20	18	15
	16	31	28	24	19	14		16	13
	17	28	24	21	17	13			
	18	24	22	19	16	11			
	19			17	14	10			
	20					8			
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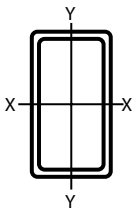
Area, In 2		4.09	3.52	2.91	2.24	1.54	3.23	2.67	2.06
lx (in4)		7.92	7.13	6.15	4.93	3.52	6.13	5.32	4.3
ly (in4)		5	4.52	3.91	3.16	2.27	2.89	2.53	2.06
rx/ry		1.25	1.26	1.25	1.25	1.26	1.46	1.45	1.44
ry (in)		1.11	1.13	1.16	1.19	1.21	0.95	0.97	1.00

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

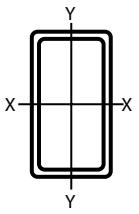
HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi



Design Axial Strength in kips (ϕ = 0.90) Fy50ksi												
Nominal Size		4x2					3 1/2x2 1/2					
Wall Thickness Weight Per Foot Design Wall Thickness		3/8 12.17 0.349	5/16 10.58 0.291	1/4 8.81 0.233	3/16 6.87 0.174	1/8 4.75 0.116	3/8 12.17 0.349	5/16 10.58 0.291	1/4 8.81 0.233	3/16 6.87 0.174	1/8 4.75 0.116	
Effective Length KL in test	0 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40	152 141 127 111 93 74 57 43 35 29 23 19	132 123 112 98 83 68 53 40 32 26 21 18	110 103 94 84 71 58 47 36 29 23 19 16	85 79 73 66 56 48 38 30 23 19 16 14 12	58 55 51 46 40 34 28 22 17 14 12 10 8	152 145 136 124 110 95 80 67 53 43 36 30 25 22 19	132 126 119 109 97 86 73 60 49 40 33 28 23 20 18	110 105 98 91 83 72 62 53 43 35 29 24 21 18 16	85 82 77 71 65 57 50 42 35 29 23 20 17 15 13 12	58 56 53 50 46 40 35 31 25 21 17 15 13 11 10 8	
Area, In 2 lx (in4) ly (in4) rx/ry ry (in)		3.39 5.59 1.79 1.77 0.73	2.94 5.12 1.66 1.75 0.75	2.44 4.49 1.48 1.75 0.78	1.89 3.66 1.22 1.73 0.80	1.3 2.65 0.898 1.72 0.83	3.39 4.74 2.75 1.00 1.26	2.94 4.34 2.53 1.00 1.29	2.44 3.79 2.23 1.00 1.32	1.89 3.09 1.82 1.00 1.35	1.3 2.23 1.33 1.00 1.37	2.64 2.91 2.17 1.16 0.91	2.21 2.57 1.93 1.16 0.94

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi



Design Axial Strength in kips (ϕ = 0.90) Fy50ksi														
Nominal Size		3x2 1/2					3 1/2x2 1/2							
Wall Thickness		5/16		1/4	3/16	1/8								
Weight Per Foot		9.51		7.96	6.23	4.33								
Design Wall Thickness		0.291		0.233	0.174	0.116								
Effective Length KL in test	0	119		100	77	54								
	2	113		95	73	51								
	3	106		89	70	49								
	4	96		82	65	46								
	5	86		74	58	41								
	6	75		65	51	36								
	7	64		55	44	32								
	8	52		46	37	26								
	9	42		37	31	22								
	10	34		31	24	18								
	11	29		25	20	15								
	12	23		21	17	13								
	13	20		18	15	11								
	14	17		16	13	10								
	15	15		14	11	8								
	16				10	7								
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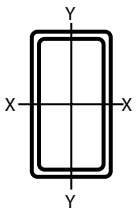
Area, In 2		3.39	2.94	2.44	1.89	1.3	3.39	2.94	2.44	1.89	1.3	2.64	2.21	
lx (in4)		5.59	5.12	4.49	3.66	2.65	4.74	4.34	3.79	3.09	2.23	2.91	2.57	
ly (in4)		1.79	1.66	1.48	1.22	0.898	2.75	2.53	2.23	1.82	1.33	2.17	1.93	
rx/ry		1.77	1.75	1.75	1.73	1.72	1.00	1.00	1.00	1.00	1.00	1.16	1.16	
ry (in)		0.73	0.75	0.78	0.80	0.83	1.26	1.29	1.32	1.35	1.37	0.91	0.94	

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size				3x2				3x1 1/2			3x1	
Wall Thickness				5/16	1/4	3/16	1/8	1/4	3/16	1/8	3/16	1/8
Weight Per Foot				8.45	7.11	5.59	3.9	6.26	4.96	3.48	6.32	3.05
Design Wall Thickness				0.291	0.233	0.174	0.116	0.233	0.174	0.116	0.174	0.116
Effective Length KL in test	0			106	89	69	48	78	61	43	54	38
	2			97	83	65	46	69	54	38	40	30
	3			88	75	59	41	58	47	34	28	21
	4			76	66	53	37	46	38	28	17	14
	5			64	55	44	32	34	29	21	11	8
	6			51	46	37	26	23	20	16	7	6
	7			39	35	30	21	17	15	12		
	8			31	28	23	17	14	12	8		
	9			24	21	18	14	11	10	7		
	10			19	17	15	11			5		
	11			16	15	12	8					
	12			14	12	11	7					
	13						6					
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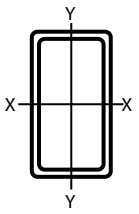
Area, In 2			1.71	1.19	2.35	1.97	1.54	1.07	1.74	1.37	0.96	1.19	0.84
Ix (in4)			2.11	1.54	2.38	2.12	1.76	1.3	1.68	1.42	1.06	1.07	0.817
Iy (in4)			1.59	1.16	1.23	1.11	0.931	0.692	0.541	0.466	0.355	0.172	0.138
rx/ry			1.15	1.15	1.39	1.38	1.38	1.37	1.76	1.75	1.72	0.38	0.41
ry (in)			0.96	0.99	0.73	0.75	0.78	0.80	0.56	0.58	0.61	1.00	1.00

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (ERW) FOR LRFD COLUMNS
Fy = 50ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		2 1/2x1 1/2			2x1 1/2		2x1	
Wall Thickness		1/4	3/16	1/8	3/16	1/8	3/16	1/8
Weight Per Foot		5.41	4.32	3.05	3.68	2.63	3.04	2.2
Design Wall Thickness		0.233	0.174	0.116	0.174	0.116	0.174	0.116
Effective Length KL in test	0	68	54	38	46	33	38	28
	2	59	47	34	40	29	28	21
	3	50	40	29	34	24	18	15
	4	38	32	23	26	20	11	10
	5	28	24	18	19	15	7	5
	6	19	17	13	14	11	5	4
	7	15	13	10	10	7		
	8	11	10	7	7	6		
	9	8	7	5	6	4		
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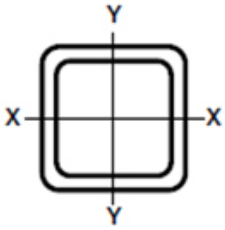
	40							
Area, In 2		1.51	1.19	0.84	1.02	0.72	0.84	0.61
lx (in4)		1.03	0.881	0.668	0.494	0.383	0.349	0.28
ly (in4)		0.447	0.389	0.299	0.312	0.244	0.112	0.092
rx/ry		0.36	0.38	0.40	0.37	0.39	0.37	0.39
ry (in)		1.50	1.50	1.50	1.50	1.50	1.00	1.00

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/SQUARE (SAW) FOR LRFD COLUMNS
Fy = 46ksi

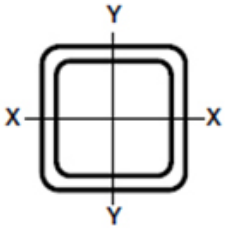


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		32x32			30x30			28x28			26x26		
Wall Thickness		5/8	1/2	3/8	5/8	1/2	3/8	5/8	1/2	3/8	5/8	1/2	3/8
Weight Per Foot		259.83	210.72	159.37	242.82	197.11	149.16	225.80	183.50	138.95	208.79	169.89	128.74
Design Wall Thickness		0.625*	0.5*	0.375*	0.625*	0.5*	0.375*	0.625*	0.5*	0.375*	0.625*	0.5*	0.375*
Effective Length KL in KL (ft)	0	2546	1721	1013	2502	1699	1004	2452	1674	993	2393	1644	981
	2	2546	1721	1013	2502	1699	1004	2451	1674	993	2392	1644	981
	3	2545	1721	1013	2501	1699	1004	2451	1673	993	2391	1644	981
	4	2545	1720	1012	2501	1698	1003	2450	1673	993	2390	1643	981
	5	2544	1720	1012	2500	1698	1003	2449	1672	993	2389	1643	981
	6	2543	1719	1012	2499	1697	1003	2448	1672	992	2388	1642	980
	7	2542	1719	1012	2498	1697	1003	2446	1671	992	2386	1641	980
	8	2541	1718	1012	2496	1696	1002	2444	1670	992	2384	1640	979
	9	2540	1718	1011	2495	1695	1002	2443	1669	991	2381	1638	979
	10	2538	1717	1011	2493	1694	1002	2440	1668	991	2379	1637	978
	11	2537	1716	1011	2491	1693	1001	2438	1667	990	2376	1636	977
	12	2535	1715	1010	2489	1692	1001	2435	1665	990	2373	1634	977
	13	2533	1714	1010	2487	1691	1000	2433	1664	989	2369	1632	976
	14	2531	1713	1009	2484	1689	1000	2430	1662	988	2366	1630	975
	15	2529	1712	1009	2481	1688	999	2426	1660	987	2362	1628	974
	16	2526	1710	1008	2478	1686	998	2423	1658	987	2357	1626	973
	17	2524	1709	1008	2475	1685	998	2419	1656	986	2353	1623	972
	18	2521	1708	1007	2472	1683	997	2415	1654	985	2348	1620	971
	19	2518	1706	1006	2469	1681	996	2411	1652	984	2343	1618	970
	20	2515	1704	1006	2465	1679	995	2407	1650	983	2337	1615	968
	21	2512	1703	1005	2461	1677	994	2402	1647	982	2332	1612	967
	22	2509	1701	1004	2457	1675	993	2397	1645	981	2326	1609	965
	23	2505	1699	1003	2453	1673	992	2392	1642	979	2319	1605	964
	24	2501	1697	1003	2449	1670	991	2387	1639	978	2313	1602	962
	25	2498	1695	1002	2444	1668	990	2381	1636	977	2306	1598	961
	26	2494	1693	1001	2439	1665	989	2375	1633	975	2299	1594	959
	27	2489	1691	1000	2434	1663	988	2369	1630	974	2292	1590	957
	28	2485	1689	999	2429	1660	987	2363	1627	973	2284	1586	956
	29	2481	1686	998	2424	1657	986	2357	1623	971	2276	1582	954
	30	2476	1684	997	2418	1654	984	2350	1619	969	2268	1578	952
	31	2471	1681	996	2413	1651	983	2343	1616	968	2259	1573	950
	32	2466	1679	995	2407	1648	982	2336	1612	966	2251	1568	948
	33	2461	1676	993	2400	1645	980	2328	1608	964	2242	1563	945
	34	2456	1673	992	2394	1642	979	2321	1604	963	2232	1558	943
	35	2451	1670	991	2388	1638	977	2313	1600	961	2223	1553	941
	36	2445	1667	990	2381	1635	976	2305	1595	959	2213	1548	939
	37	2439	1664	988	2374	1631	974	2296	1591	957	2202	1542	936
	38	2433	1661	987	2367	1627	973	2288	1586	955	2192	1537	934
	39	2427	1658	986	2360	1623	971	2279	1582	953	2181	1531	931
	40	2421	1655	984	2352	1619	969	2270	1577	951	2170	1525	928
Area, in^2		76.4	61.9	46.8	71.4	57.9	43.8	66.4	53.9	40.8	61.4	49.9	37.8
I, in^4		12300	10100	7750	10100	8320	6370	8140	6730	5150	6460	5350	4110
r, in		12.7	12.8	12.9	11.9	12	12.1	11.1	11.2	11.2	10.3	10.4	10.4

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/SQUARE (SAW) FOR LRFD COLUMNS
Fy = 46ksi

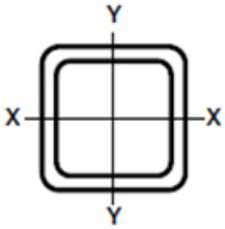


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		24x24			22x22			20x20			18x18		
Wall Thickness		5/8	1/2	3/8	5/8	1/2	3/8	5/8	1/2	3/8	5/8	1/2	3/8
Weight Per Foot		191.78	156.28	118.53	174.76	142.67	108.32	157.75	129.06	98.12	140.73	115.45	87.91
Design Wall Thickness		0.625*	0.5*	0.375*	0.625	0.5*	0.375*	0.625	0.5*	0.375*	0.625	0.5	0.375*
Effective Length KL in KL (ft)	0	2323	1610	967	2128	1569	950	1921	1518	930	1714	1403	905
	2	2322	1610	967	2127	1568	950	1920	1518	930	1713	1402	904
	3	2321	1609	967	2125	1568	950	1918	1517	929	1711	1401	904
	4	2320	1608	967	2124	1567	950	1916	1516	929	1709	1399	903
	5	2319	1608	966	2121	1566	949	1913	1515	928	1705	1397	902
	6	2317	1607	966	2118	1564	949	1910	1513	928	1702	1394	901
	7	2314	1605	965	2114	1563	948	1906	1511	927	1697	1390	900
	8	2312	1604	965	2110	1561	947	1902	1508	926	1692	1386	899
	9	2309	1602	964	2106	1559	946	1896	1506	924	1687	1382	897
	10	2306	1601	963	2100	1557	945	1891	1503	923	1680	1377	895
	11	2302	1599	962	2095	1554	944	1884	1500	922	1673	1371	893
	12	2298	1596	961	2088	1551	943	1878	1496	920	1666	1365	891
	13	2292	1594	960	2082	1548	941	1870	1492	918	1657	1358	889
	14	2286	1592	959	2074	1545	940	1862	1488	916	1649	1351	886
	15	2279	1589	958	2066	1542	939	1854	1483	914	1639	1344	884
	16	2271	1586	957	2058	1538	937	1844	1479	912	1629	1336	881
	17	2263	1583	955	2049	1534	935	1835	1473	910	1619	1327	878
	18	2254	1580	954	2040	1530	933	1825	1468	908	1607	1318	874
	19	2245	1576	952	2030	1525	931	1814	1462	905	1596	1309	871
	20	2236	1572	951	2020	1521	929	1803	1456	902	1583	1299	867
	21	2226	1569	949	2009	1516	927	1791	1450	899	1570	1289	863
	22	2215	1564	947	1998	1511	925	1779	1443	896	1557	1278	859
	23	2204	1560	945	1986	1505	922	1766	1436	893	1543	1267	855
	24	2193	1556	943	1974	1500	920	1753	1428	890	1529	1256	851
	25	2182	1551	941	1961	1494	917	1739	1421	886	1514	1244	846
	26	2170	1546	939	1948	1488	914	1725	1413	883	1499	1232	841
	27	2157	1541	937	1935	1481	912	1711	1401	879	1483	1219	836
	28	2144	1536	935	1921	1474	909	1696	1389	875	1467	1206	831
	29	2131	1531	932	1907	1468	906	1681	1377	871	1451	1193	825
	30	2117	1525	930	1892	1460	902	1665	1365	867	1434	1179	820
	31	2103	1519	927	1877	1453	899	1649	1352	863	1417	1166	814
	32	2089	1513	925	1862	1445	896	1633	1338	858	1399	1151	808
	33	2074	1507	922	1846	1437	892	1616	1325	854	1381	1137	801
	34	2059	1501	919	1830	1429	889	1599	1311	849	1363	1122	795
	35	2044	1494	916	1814	1421	885	1581	1297	844	1344	1108	788
	36	2028	1487	913	1797	1412	881	1564	1283	839	1326	1093	781
	37	2012	1480	910	1780	1403	877	1546	1269	833	1307	1077	774
	38	1996	1473	907	1763	1394	873	1527	1254	828	1287	1062	767
	39	1979	1466	904	1745	1385	869	1509	1239	823	1268	1046	759
	40	1962	1458	900	1727	1375	864	1490	1224	817	1248	1030	752
Area, in^2		56.4	45.9	34.8	51.4	41.9	31.8	46.4	37.9	28.8	41.4	33.9	25.8
I, in^4		5030	4170	3210	3820	3190	2460	2830	2370	1830	2020	1700	1320
r, in		9.44	9.53	9.6	8.62	8.72	8.78	7.81	7.9	7.97	6.99	7.08	7.15

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/SQUARE (SAW) FOR LRFD COLUMNS
Fy = 50ksi

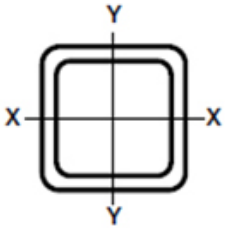


Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		32x32			30x30			28x28			26x26		
Wall Thickness		5/8	1/2	3/8	5/8	1/2	3/8	5/8	1/2	3/8	5/8	1/2	3/8
Weight Per Foot		259.83	210.72	159.37	242.82	197.11	149.16	225.80	183.50	138.95	208.79	169.89	128.74
Design Wall Thickness		0.625*	0.5*	0.375*	0.625*	0.5*	0.375*	0.625*	0.5*	0.375*	0.625*	0.5*	0.375*
Effective Length KL in KL (ft)	0	2683	1809	1062	2639	1787	1053	2588	1762	1043	2529	1733	1031
	2	2683	1809	1062	2639	1787	1053	2588	1762	1043	2529	1732	1031
	3	2682	1809	1062	2638	1787	1053	2587	1761	1043	2528	1732	1031
	4	2682	1808	1062	2637	1786	1053	2586	1761	1042	2527	1731	1030
	5	2681	1808	1062	2636	1786	1053	2585	1760	1042	2526	1731	1030
	6	2680	1807	1062	2635	1785	1052	2584	1760	1042	2524	1730	1030
	7	2679	1807	1061	2634	1785	1052	2582	1759	1041	2522	1729	1029
	8	2677	1806	1061	2632	1784	1052	2580	1758	1041	2520	1727	1029
	9	2676	1805	1061	2631	1783	1051	2578	1757	1041	2517	1726	1028
	10	2674	1805	1060	2629	1782	1051	2576	1755	1040	2514	1725	1027
	11	2673	1804	1060	2627	1781	1050	2573	1754	1039	2511	1723	1027
	12	2671	1803	1059	2624	1779	1050	2570	1752	1039	2507	1721	1026
	13	2668	1801	1059	2622	1778	1049	2567	1751	1038	2504	1719	1025
	14	2666	1800	1058	2619	1777	1049	2564	1749	1037	2499	1717	1024
	15	2664	1799	1058	2616	1775	1048	2560	1747	1036	2495	1714	1023
	16	2661	1798	1057	2613	1773	1047	2557	1745	1035	2490	1712	1022
	17	2658	1796	1057	2609	1772	1047	2552	1743	1035	2485	1709	1021
	18	2655	1794	1056	2606	1770	1046	2548	1741	1034	2480	1706	1019
	19	2652	1793	1055	2602	1768	1045	2543	1738	1032	2474	1703	1018
	20	2649	1791	1055	2598	1765	1044	2539	1736	1031	2468	1700	1017
	21	2645	1789	1054	2594	1763	1043	2534	1733	1030	2462	1697	1015
	22	2641	1787	1053	2589	1761	1042	2528	1730	1029	2455	1693	1013
	23	2638	1785	1052	2585	1758	1041	2523	1727	1028	2449	1690	1012
	24	2634	1783	1051	2580	1756	1040	2517	1724	1026	2441	1686	1010
	25	2629	1781	1050	2575	1753	1039	2511	1721	1025	2434	1682	1008
	26	2625	1778	1049	2570	1750	1037	2504	1717	1023	2426	1677	1007
	27	2620	1776	1048	2564	1747	1036	2498	1714	1022	2418	1673	1005
	28	2616	1774	1047	2558	1744	1035	2491	1710	1020	2409	1669	1003
	29	2611	1771	1046	2552	1741	1034	2483	1706	1018	2401	1664	1001
	30	2606	1768	1045	2546	1738	1032	2476	1702	1017	2392	1659	998
	31	2600	1766	1044	2540	1735	1031	2468	1698	1015	2382	1654	996
	32	2595	1763	1042	2534	1731	1029	2460	1694	1013	2372	1649	994
	33	2589	1760	1041	2527	1728	1028	2452	1690	1011	2362	1643	992
	34	2584	1757	1040	2520	1724	1026	2444	1685	1009	2352	1638	989
	35	2578	1753	1038	2513	1720	1024	2435	1680	1007	2341	1632	987
	36	2571	1750	1037	2505	1716	1023	2426	1676	1005	2330	1626	984
	37	2565	1747	1036	2498	1712	1021	2417	1671	1003	2319	1620	981
	38	2559	1743	1034	2490	1708	1019	2408	1666	1001	2307	1614	978
	39	2552	1740	1033	2482	1704	1017	2398	1661	998	2295	1607	976
	40	2545	1736	1031	2474	1699	1016	2388	1655	996	2283	1601	973
Area, in^2		76.4	61.9	46.8	71.4	57.9	43.8	66.4	53.9	40.8	61.4	49.9	37.8
I, in^4		12300	10100	7750	10100	8320	6370	8140	6730	5150	6460	5350	4110
r, in		12.70	12.80	12.90	11.90	12.00	12.10	11.10	11.20	11.20	10.30	10.40	10.40

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/SQUARE (SAW) FOR LRFD COLUMNS
Fy = 50ksi

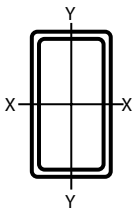


Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		24x24			22x22			20x20			18x18		
Wall Thickness		5/8	1/2	3/8	5/8	1/2	3/8	5/8	1/2	3/8	5/8	1/2	3/8
Weight Per Foot		191.78	156.28	118.53	174.76	142.67	108.32	157.75	129.06	98.12	140.73	115.45	87.91
Design Wall Thickness		0.625*	0.5*	0.375*	0.625	0.5*	0.375*	0.625	0.5*	0.375*	0.625	0.5	0.375*
Effective Length KL in KL (ft)	0	2460	1698	1017	2313	1657	1000	2088	1607	980	1863	1526	954
	2	2459	1698	1017	2312	1656	1000	2087	1606	979	1861	1524	954
	3	2458	1697	1016	2310	1656	999	2085	1605	979	1859	1523	953
	4	2457	1696	1016	2308	1655	999	2082	1604	978	1857	1520	953
	5	2455	1696	1016	2305	1654	999	2079	1602	978	1853	1518	952
	6	2453	1694	1015	2301	1652	998	2075	1600	977	1849	1514	951
	7	2450	1693	1015	2297	1650	997	2070	1598	976	1843	1510	949
	8	2447	1692	1014	2292	1648	996	2065	1596	975	1837	1505	948
	9	2444	1690	1013	2287	1646	995	2059	1593	973	1831	1500	946
	10	2440	1688	1012	2280	1644	994	2052	1589	972	1823	1494	944
	11	2436	1686	1011	2274	1641	993	2045	1586	970	1815	1487	942
	12	2432	1683	1010	2266	1638	992	2037	1582	969	1806	1480	940
	13	2427	1681	1009	2258	1635	990	2028	1578	967	1796	1472	937
	14	2422	1678	1008	2250	1631	989	2019	1573	965	1786	1464	934
	15	2416	1675	1007	2240	1627	987	2008	1568	962	1775	1455	931
	16	2410	1672	1005	2231	1623	985	1998	1563	960	1763	1446	928
	17	2404	1668	1004	2220	1619	983	1986	1557	957	1751	1436	924
	18	2397	1665	1002	2209	1614	981	1974	1551	955	1737	1425	921
	19	2390	1661	1000	2198	1609	979	1962	1544	952	1724	1414	917
	20	2383	1657	999	2186	1604	977	1949	1538	949	1709	1403	913
	21	2375	1652	997	2173	1599	974	1935	1531	946	1694	1391	909
	22	2367	1648	995	2160	1593	972	1921	1523	942	1678	1378	904
	23	2358	1643	993	2146	1587	969	1906	1515	939	1662	1365	899
	24	2349	1638	991	2132	1581	966	1890	1507	935	1646	1352	895
	25	2339	1633	988	2117	1574	963	1874	1499	932	1628	1338	889
	26	2329	1628	986	2102	1567	960	1858	1490	928	1610	1324	884
	27	2319	1622	984	2086	1560	957	1841	1480	923	1592	1309	878
	28	2309	1617	981	2070	1553	954	1824	1471	919	1573	1294	873
	29	2297	1611	979	2053	1545	951	1806	1461	915	1554	1278	867
	30	2282	1605	976	2036	1537	947	1788	1451	910	1535	1263	860
	31	2266	1598	973	2019	1529	944	1769	1440	905	1515	1247	854
	32	2249	1592	970	2001	1521	940	1750	1429	900	1494	1230	847
	33	2232	1585	967	1982	1512	936	1730	1417	895	1473	1214	840
	34	2214	1578	964	1964	1503	932	1710	1403	890	1452	1197	833
	35	2196	1570	961	1944	1494	928	1690	1387	885	1431	1179	826
	36	2178	1563	958	1925	1484	924	1669	1371	879	1409	1162	818
	37	2159	1555	954	1905	1474	919	1649	1354	873	1387	1144	810
	38	2140	1547	951	1885	1464	915	1627	1337	867	1365	1126	802
	39	2121	1539	947	1865	1454	910	1606	1320	861	1342	1108	794
	40	2101	1531	943	1844	1443	905	1584	1302	855	1320	1090	785
Area, in^2		56.4	45.9	34.8	51.4	41.9	31.8	46.4	37.9	28.8	41.4	33.9	25.8
I, in^4		5030	4170	3210	3820	3190	2460	2830	2370	1830	2020	1700	1320
r, in		9.44	9.53	9.60	8.62	8.72	8.78	7.81	7.90	7.97	6.99	7.08	7.15

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds. Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (SAW) FOR LRFD COLUMNS
Fy = 46ksi

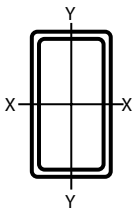


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		32x24			30x24			28x24			26x24		
Wall Thickness		5/8	1/2	3/8	5/8	1/2	3/8	5/8	1/2	3/8	5/8	1/2	3/8
Weight Per Foot		225.80	183.50	138.95	217.30	176.70	133.84	217.30	176.70	133.84	200.28	163.08	123.64
Design Wall Thickness		0.625*	0.5*	0.375*	0.625*	0.5*	0.375*	0.625*	0.5*	0.375*	0.625*	0.5*	0.375*
Effective Length KL in KL (ft)	0	2435	1665	990	2413	1654	985	2387	1642	980	2358	1627	974
	2	2434	1665	990	2412	1654	985	2387	1642	980	2357	1627	974
	3	2433	1665	990	2411	1654	985	2386	1641	980	2356	1626	974
	4	2432	1664	989	2410	1653	985	2385	1641	980	2355	1626	974
	5	2431	1663	989	2409	1652	985	2383	1640	979	2354	1625	973
	6	2429	1663	989	2407	1652	984	2382	1639	979	2352	1624	973
	7	2428	1662	988	2405	1651	984	2380	1638	978	2350	1623	972
	8	2425	1661	988	2403	1649	983	2377	1636	978	2347	1622	972
	9	2423	1659	987	2401	1648	983	2375	1635	977	2344	1620	971
	10	2420	1658	987	2398	1646	982	2372	1633	977	2341	1618	970
	11	2417	1656	986	2395	1645	981	2368	1632	976	2338	1616	970
	12	2414	1654	985	2391	1643	980	2365	1630	975	2334	1614	969
	13	2410	1652	984	2387	1641	980	2361	1628	974	2330	1612	968
	14	2406	1650	983	2383	1639	979	2356	1625	973	2324	1610	967
	15	2401	1648	982	2377	1636	978	2350	1623	972	2318	1607	966
	16	2396	1646	981	2372	1634	977	2344	1620	971	2312	1604	964
	17	2390	1643	980	2366	1631	975	2338	1617	970	2306	1602	963
	18	2384	1641	979	2359	1628	974	2331	1614	968	2299	1598	962
	19	2377	1638	978	2353	1625	973	2324	1611	967	2291	1595	960
	20	2371	1635	977	2346	1622	971	2317	1608	966	2283	1592	959
	21	2364	1632	975	2338	1619	970	2309	1605	964	2275	1588	957
	22	2356	1628	974	2330	1616	968	2301	1601	962	2267	1584	955
	23	2348	1625	972	2322	1612	967	2292	1597	961	2258	1580	954
	24	2340	1621	971	2314	1608	965	2284	1593	959	2249	1576	952
	25	2332	1617	969	2305	1604	964	2274	1589	957	2239	1572	950
	26	2323	1613	967	2296	1600	962	2265	1585	955	2229	1567	948
	27	2314	1609	966	2286	1596	960	2255	1580	953	2219	1562	946
	28	2305	1605	964	2276	1591	958	2245	1575	951	2208	1557	944
	29	2295	1601	962	2266	1587	956	2234	1571	949	2197	1552	941
	30	2285	1596	960	2256	1582	954	2223	1565	947	2185	1547	939
	31	2274	1591	958	2245	1577	952	2212	1560	945	2173	1541	937
	32	2264	1586	956	2234	1572	949	2200	1555	942	2161	1536	934
	33	2253	1581	953	2222	1566	947	2188	1549	940	2149	1530	932
	34	2241	1576	951	2211	1561	945	2176	1544	937	2136	1524	929
	35	2230	1571	949	2198	1555	942	2163	1538	935	2123	1518	926
	36	2218	1565	946	2186	1549	940	2150	1531	932	2109	1511	923
	37	2206	1559	944	2173	1543	937	2137	1525	929	2095	1504	920
	38	2193	1553	941	2160	1537	934	2124	1519	926	2081	1498	917
	39	2180	1547	939	2147	1531	932	2110	1512	923	2067	1491	914
	40	2167	1541	936	2133	1524	929	2095	1505	920	2052	1483	911
Area, in^2		66.4	53.9	40.8	63.9	51.9	39.3	61.4	49.9	37.8	58.9	47.9	36.3
Ix, in^4		9880	8160	6250	8480	7010	5380	7210	5970	4580	6060	5020	3860
Iy, in^4		6390	5280	4050	6050	5000	3840	5710	4730	3630	5370	4450	3420
Ratio, r_x/r_y		1.24	1.24	1.24	1.18	1.18	1.18	1.12	1.12	1.12	1.06	1.06	1.06
r_y, in		9.81	9.89	9.96	9.73	9.82	9.88	9.65	9.73	9.79	9.55	9.64	9.7

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (SAW) FOR LRFD COLUMNS
Fy = 46ksi

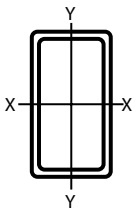


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		24x22			22x20			20x18			20x16		
Wall Thickness		5/8	1/2	3/8	5/8	1/2	3/8	5/8	1/2	3/8	5/8	1/2	3/8
Weight Per Foot		183.27	149.47	113.43	166.25	135.86	103.22	149.24	122.25	93.01	140.73	115.45	87.91
Design Wall Thickness		0.625*	0.5*	0.375*	0.625	0.5*	0.375*	0.625	0.5*	0.375*	0.625	0.5*	0.375*
Effective Length KL in KL (ft)	0	2225	1589	959	2024	1544	940	1817	1461	917	1714	1378	901
	2	2225	1589	959	2023	1543	940	1816	1460	917	1712	1377	901
	3	2223	1588	958	2022	1542	940	1814	1459	917	1710	1376	900
	4	2222	1587	958	2019	1541	939	1812	1457	916	1707	1374	900
	5	2220	1586	958	2017	1540	939	1809	1455	915	1704	1372	899
	6	2217	1585	957	2013	1538	938	1805	1453	914	1699	1369	897
	7	2214	1584	956	2009	1536	937	1800	1450	913	1694	1365	896
	8	2210	1582	956	2005	1534	936	1795	1447	912	1688	1362	894
	9	2206	1580	955	1999	1532	935	1789	1443	910	1681	1357	892
	10	2202	1578	954	1993	1529	934	1783	1439	909	1674	1352	890
	11	2197	1576	953	1987	1526	932	1776	1434	907	1665	1347	888
	12	2191	1573	952	1980	1522	931	1768	1429	905	1656	1341	885
	13	2184	1570	950	1972	1519	929	1759	1423	903	1646	1335	882
	14	2177	1567	949	1964	1515	927	1750	1417	900	1636	1328	879
	15	2169	1564	948	1955	1511	926	1741	1411	898	1624	1320	876
	16	2160	1560	946	1946	1506	924	1730	1404	895	1612	1313	873
	17	2151	1557	944	1936	1501	921	1719	1397	892	1600	1304	869
	18	2141	1553	943	1925	1496	919	1708	1389	889	1586	1296	865
	19	2131	1548	941	1914	1490	917	1696	1381	886	1572	1286	861
	20	2121	1544	939	1903	1485	914	1683	1373	882	1558	1277	856
	21	2110	1539	937	1891	1479	911	1670	1364	879	1543	1266	852
	22	2098	1534	935	1878	1472	909	1656	1354	875	1527	1254	847
	23	2086	1529	932	1865	1466	906	1642	1345	871	1511	1241	842
	24	2074	1524	930	1852	1459	903	1627	1334	867	1494	1228	836
	25	2061	1518	928	1838	1451	899	1612	1322	862	1476	1214	831
	26	2048	1513	925	1823	1444	896	1596	1309	858	1459	1200	825
	27	2034	1507	922	1808	1436	892	1580	1296	853	1440	1185	819
	28	2020	1500	920	1793	1426	889	1563	1283	848	1421	1170	812
	29	2005	1494	917	1777	1416	885	1546	1270	843	1402	1155	806
	30	1990	1487	914	1761	1405	881	1529	1256	838	1383	1139	799
	31	1975	1480	911	1745	1395	877	1511	1241	832	1363	1123	792
	32	1959	1473	907	1728	1384	873	1493	1227	827	1342	1107	785
	33	1943	1465	904	1710	1372	869	1474	1212	821	1322	1090	777
	34	1927	1458	901	1693	1361	864	1455	1197	815	1301	1073	769
	35	1910	1450	897	1675	1349	859	1436	1181	809	1279	1056	760
	36	1893	1441	894	1656	1337	855	1417	1166	802	1258	1039	750
	37	1875	1433	890	1638	1324	850	1397	1150	796	1236	1021	741
	38	1857	1424	886	1619	1312	845	1377	1134	789	1214	1004	731
	39	1839	1415	882	1600	1299	839	1357	1118	782	1192	986	720
	40	1821	1406	878	1580	1285	834	1336	1101	775	1170	968	710
Area, in^2		53.9	43.9	33.3	48.9	39.9	30.3	43.9	35.9	27.3	41.4	33.9	25.8
Ix, in^4		4680	3900	3000	3530	2950	2280	2590	2180	1690	2360	1990	1540
Iy, in^4		4110	3420	2630	3060	2560	1970	2210	1850	1440	1680	1410	1100
Ratio, r_x/r_y		1.07	1.07	1.07	1.07	1.07	1.08	1.08	1.09	1.08	1.19	1.19	1.18
r_y, in		8.73	8.82	8.89	7.91	8	8.07	7.1	7.19	7.25	6.37	6.46	6.52

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (SAW) FOR LRFD COLUMNS
Fy = 46ksi

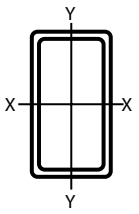


Design Axial Strength in kips (ϕ = 0.90)
Fy46ksi

Nominal Size		20x12	18x12			16x12	14x12	
Wall Thickness		5/8	5/8	1/2	3/8	5/8	1/2	3/8
Weight Per Foot		123.72	115.21	95.03	72.59	106.71	81.42	62.39
Design Wall Thickness		0.625	0.625	0.5	0.375*	0.625	0.5	0.375
Effective Length KL in KL (ft)	0	1507	1403	1155	800	1300	989	758
	2	1505	1401	1153	799	1298	988	756
	3	1501	1398	1151	798	1295	986	755
	4	1497	1394	1148	796	1291	983	753
	5	1492	1389	1143	794	1286	979	750
	6	1485	1382	1138	792	1280	974	746
	7	1477	1375	1132	789	1273	969	742
	8	1468	1366	1125	786	1264	962	738
	9	1458	1357	1118	782	1255	955	732
	10	1447	1346	1109	777	1245	948	726
	11	1434	1334	1100	773	1234	939	720
	12	1421	1321	1090	767	1221	930	713
	13	1406	1308	1079	762	1208	920	706
	14	1391	1293	1067	756	1194	909	698
	15	1375	1277	1054	749	1179	898	689
	16	1357	1261	1041	743	1164	886	680
	17	1339	1244	1027	735	1147	873	671
	18	1320	1225	1013	728	1130	860	661
	19	1300	1207	998	719	1112	846	651
	20	1280	1187	982	711	1093	832	640
	21	1259	1167	966	702	1074	817	629
	22	1237	1146	949	693	1054	802	618
	23	1214	1125	932	683	1034	787	607
	24	1191	1103	915	673	1013	771	595
	25	1167	1080	897	663	992	755	583
	26	1143	1058	878	652	970	738	570
	27	1119	1034	860	641	948	722	558
	28	1094	1011	841	630	926	705	545
	29	1069	987	822	618	903	687	532
	30	1043	963	802	606	880	670	519
	31	1018	939	783	594	857	653	506
	32	992	914	763	582	834	635	493
	33	966	890	743	569	811	617	479
	34	940	865	723	556	788	600	466
	35	914	840	703	543	765	582	453
	36	888	816	683	528	742	565	439
	37	862	791	663	513	719	547	426
	38	836	767	644	498	696	530	413
	39	810	742	624	483	673	512	400
	40	784	718	604	468	650	495	387
Area, in^2		36.4	33.9	27.9	21.3	31.4	23.9	18.3
Ix, in^4		1890	1450	1240	971	1090	678	534
Iy, in^4		864	783	668	524	702	536	422
Ratio, r_x/r_y		1.48	1.36	1.36	1.36	1.25	1.12	1.12
r_y, in		4.87	4.81	4.89	4.95	4.73	4.73	4.8

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (SAW) FOR LRFD COLUMNS
Fy = 50ksi

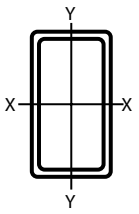


Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		32x24			30x24			28x24			26x24		
Wall Thickness		5/8	1/2	3/8	5/8	1/2	3/8	5/8	1/2	3/8	5/8	1/2	3/8
Weight Per Foot		225.80	183.50	138.95	217.30	176.70	133.84	208.79	169.89	128.74	200.28	163.08	123.64
Design Wall Thickness		0.625*	0.5*	0.375*	0.625*	0.5*	0.375*	0.625*	0.5*	0.375*	0.625*	0.5*	0.375*
Effective Length KL in KL (ft)	0	2571	1754	1040	2549	1743	1035	2524	1730	1030	2494	1715	1024
	2	2571	1753	1039	2549	1742	1035	2523	1730	1030	2494	1715	1024
	3	2570	1753	1039	2548	1742	1035	2522	1729	1029	2493	1715	1023
	4	2569	1752	1039	2547	1741	1034	2521	1729	1029	2492	1714	1023
	5	2567	1752	1039	2545	1740	1034	2520	1728	1029	2490	1713	1023
	6	2566	1751	1038	2543	1739	1034	2518	1727	1028	2488	1712	1022
	7	2564	1749	1038	2541	1738	1033	2516	1726	1028	2486	1711	1022
	8	2561	1748	1037	2539	1737	1033	2513	1724	1027	2483	1709	1021
	9	2558	1747	1037	2536	1736	1032	2510	1723	1027	2480	1707	1020
	10	2555	1745	1036	2533	1734	1031	2507	1721	1026	2476	1706	1020
	11	2552	1743	1035	2529	1732	1030	2503	1719	1025	2472	1704	1019
	12	2549	1741	1034	2526	1730	1029	2499	1717	1024	2468	1701	1018
	13	2545	1739	1033	2521	1728	1029	2495	1714	1023	2464	1699	1017
	14	2540	1737	1032	2517	1725	1028	2490	1712	1022	2459	1696	1015
	15	2536	1735	1031	2512	1723	1026	2485	1709	1021	2453	1693	1014
	16	2531	1732	1030	2507	1720	1025	2480	1706	1019	2448	1690	1013
	17	2526	1729	1029	2501	1717	1024	2474	1703	1018	2442	1687	1011
	18	2520	1726	1028	2496	1714	1023	2468	1700	1017	2435	1684	1010
	19	2514	1723	1026	2490	1711	1021	2461	1697	1015	2429	1680	1008
	20	2508	1720	1025	2483	1707	1020	2455	1693	1014	2421	1676	1007
	21	2501	1716	1023	2476	1704	1018	2447	1689	1012	2414	1672	1005
	22	2495	1713	1022	2469	1700	1016	2440	1685	1010	2406	1668	1003
	23	2487	1709	1020	2462	1696	1015	2432	1681	1008	2398	1664	1001
	24	2480	1705	1018	2454	1692	1013	2424	1676	1006	2389	1659	999
	25	2472	1701	1017	2446	1687	1011	2415	1672	1004	2380	1654	997
	26	2464	1696	1015	2437	1683	1009	2406	1667	1002	2371	1649	995
	27	2456	1692	1013	2428	1678	1007	2397	1662	1000	2361	1644	993
	28	2447	1687	1011	2419	1673	1005	2388	1657	998	2351	1638	990
	29	2438	1682	1009	2409	1668	1003	2378	1652	996	2341	1633	988
	30	2428	1677	1006	2400	1663	1000	2367	1646	993	2329	1627	985
	31	2419	1672	1004	2389	1657	998	2356	1640	991	2316	1621	982
	32	2408	1667	1002	2377	1652	995	2342	1634	988	2302	1615	980
	33	2396	1661	999	2364	1646	993	2329	1628	985	2288	1608	977
	34	2383	1655	997	2351	1640	990	2315	1622	983	2273	1601	974
	35	2370	1649	994	2337	1633	987	2300	1615	980	2258	1595	971
	36	2356	1643	992	2323	1627	985	2286	1608	977	2242	1587	968
	37	2342	1637	989	2308	1620	982	2270	1601	974	2227	1580	965
	38	2328	1630	986	2293	1614	979	2255	1594	971	2210	1573	961
	39	2313	1624	983	2278	1607	976	2239	1587	967	2194	1565	958
	40	2299	1617	980	2263	1599	973	2223	1579	964	2177	1557	955
Area, in^2		66.4	53.9	40.8	63.9	51.9	39.3	61.4	49.9	37.8	58.9	47.9	36.3
Ix, in^4		9880	8160	6250	8480	7010	5380	7210	5970	4580	6060	5020	3860
Iy, in^4		6390	5280	4050	6050	5000	3840	5710	4730	3630	5370	4450	3420
Ratio, r_x/r_y		1.24	1.24	1.24	1.18	1.18	1.18	1.12	1.12	1.12	1.06	1.06	1.06
r_y, in		9.81	9.89	9.96	9.73	9.82	9.88	9.65	9.73	9.79	9.55	9.64	9.70

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (SAW) FOR LRFD COLUMNS
Fy = 50ksi

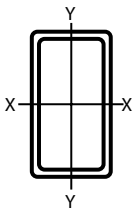


Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		24x22			22x20			20x18			20x16		
Wall Thickness		5/8	1/2	3/8	5/8	1/2	3/8	5/8	1/2	3/8	5/8	1/2	3/8
Weight Per Foot		183.27	149.47	113.43	166.25	135.86	103.22	149.24	122.25	93.01	140.73	115.45	87.91
Design Wall Thickness		0.625*	0.5*	0.375*	0.625	0.5*	0.375*	0.625	0.5*	0.375*	0.625	0.5*	0.375*
Effective Length KL in KL (ft)	0	2386	1677	1008	2201	1632	990	1976	1566	967	1863	1476	951
	2	2385	1677	1008	2199	1631	989	1974	1565	967	1861	1475	950
	3	2384	1676	1008	2197	1630	989	1972	1564	966	1859	1473	950
	4	2382	1675	1008	2195	1629	989	1969	1562	965	1855	1471	949
	5	2380	1674	1007	2191	1628	988	1965	1560	965	1851	1469	948
	6	2377	1673	1006	2187	1626	987	1961	1557	964	1846	1465	947
	7	2373	1671	1006	2182	1624	986	1955	1553	962	1839	1462	945
	8	2369	1670	1005	2177	1621	985	1949	1550	961	1832	1457	943
	9	2364	1667	1004	2171	1619	984	1942	1545	959	1824	1452	941
	10	2359	1665	1003	2164	1616	983	1935	1540	957	1815	1447	939
	11	2354	1662	1002	2156	1612	981	1926	1535	955	1805	1440	936
	12	2347	1660	1001	2148	1608	979	1917	1529	953	1795	1434	933
	13	2341	1656	999	2139	1604	978	1907	1523	951	1783	1426	930
	14	2334	1653	998	2129	1600	976	1896	1516	948	1771	1419	927
	15	2326	1649	996	2119	1595	974	1885	1509	945	1757	1410	923
	16	2318	1646	994	2108	1590	971	1873	1501	942	1743	1401	919
	17	2309	1641	993	2096	1585	969	1860	1493	939	1728	1392	915
	18	2299	1637	991	2084	1579	967	1846	1484	936	1713	1382	911
	19	2290	1632	989	2071	1573	964	1832	1475	932	1696	1371	906
	20	2279	1628	986	2057	1567	961	1817	1465	928	1679	1360	901
	21	2268	1622	984	2043	1560	958	1802	1455	924	1662	1348	896
	22	2257	1617	982	2028	1553	955	1786	1444	920	1643	1336	891
	23	2245	1611	979	2013	1546	952	1769	1433	916	1624	1324	885
	24	2233	1605	977	1997	1538	948	1752	1422	911	1604	1311	879
	25	2220	1599	974	1981	1530	945	1734	1410	906	1584	1297	873
	26	2207	1593	971	1964	1522	941	1715	1397	901	1563	1283	866
	27	2193	1586	968	1946	1513	937	1696	1385	896	1542	1268	860
	28	2177	1579	965	1929	1504	933	1677	1372	891	1520	1252	853
	29	2159	1572	962	1910	1495	929	1657	1358	885	1498	1234	846
	30	2142	1565	959	1891	1485	925	1637	1344	879	1475	1216	838
	31	2124	1557	955	1872	1475	920	1616	1328	873	1452	1197	830
	32	2106	1549	952	1852	1464	916	1595	1311	867	1428	1178	822
	33	2087	1541	948	1832	1454	911	1574	1294	861	1404	1159	814
	34	2067	1532	945	1811	1442	906	1552	1277	854	1380	1140	805
	35	2048	1523	941	1791	1430	901	1530	1259	847	1356	1120	796
	36	2028	1514	937	1769	1416	896	1507	1241	840	1331	1100	787
	37	2008	1505	933	1748	1402	890	1484	1222	833	1306	1080	777
	38	1987	1495	928	1726	1387	885	1461	1204	825	1281	1060	768
	39	1966	1485	924	1704	1372	879	1438	1185	817	1255	1039	756
	40	1944	1475	919	1681	1357	873	1414	1166	809	1230	1019	744
Area, in^2		53.9	43.9	33.3	48.9	39.9	30.3	43.9	35.9	27.3	41.4	33.9	25.8
Ix, in^4		4680	3900	3000	3530	2950	2280	2590	2180	1690	2360	1990	1540
Iy, in^4		4110	3420	2630	3060	2560	1970	2210	1850	1440	1680	1410	1100
Ratio, r_x/r_y		1.07	1.07	1.07	1.07	1.07	1.08	1.08	1.09	1.08	1.19	1.19	1.18
r_y, in		8.73	8.82	8.89	7.91	8.00	8.07	7.10	7.19	7.25	6.37	6.46	6.52

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

HSS/RECTANGLE (SAW) FOR LRFD COLUMNS
Fy = 50ksi



Design Axial Strength in kips (ϕ = 0.90)
Fy50ksi

Nominal Size		20x12	18x12			16x12	14x12	
Wall Thickness		5/8	5/8	1/2	3/8	5/8	1/2	3/8
Weight Per Foot		123.72	115.21	95.03	72.59	106.71	81.42	62.39
Design Wall Thickness		0.625	0.625	0.5	0.375*	0.625	0.5	0.375
Effective Length KL in KL (ft)	0	1638	1526	1256	855	1413	1076	818
	2	1635	1523	1253	854	1410	1073	817
	3	1631	1519	1251	853	1407	1071	815
	4	1626	1514	1247	851	1402	1067	813
	5	1620	1508	1242	849	1396	1063	810
	6	1612	1501	1236	846	1389	1057	807
	7	1603	1492	1229	842	1381	1051	803
	8	1592	1482	1221	839	1371	1044	799
	9	1580	1470	1212	834	1360	1035	793
	10	1567	1458	1201	829	1348	1026	787
	11	1552	1444	1190	824	1335	1016	779
	12	1537	1429	1178	818	1320	1005	771
	13	1520	1413	1165	812	1305	993	762
	14	1501	1395	1152	805	1288	981	753
	15	1482	1377	1137	797	1271	967	743
	16	1462	1358	1122	790	1253	953	733
	17	1441	1338	1105	781	1233	939	722
	18	1419	1316	1089	772	1213	923	710
	19	1395	1294	1071	763	1192	907	698
	20	1371	1272	1053	754	1171	891	686
	21	1347	1248	1034	744	1148	874	673
	22	1321	1224	1015	733	1125	856	660
	23	1295	1199	995	722	1102	838	647
	24	1268	1174	974	711	1078	820	633
	25	1241	1148	953	699	1053	801	619
	26	1213	1122	932	687	1028	782	605
	27	1185	1095	911	675	1003	763	590
	28	1157	1068	889	662	977	744	576
	29	1128	1040	867	649	951	724	561
	30	1098	1013	845	635	925	704	546
	31	1069	985	822	621	899	684	531
	32	1040	957	800	607	873	664	516
	33	1010	929	777	593	846	644	501
	34	980	901	755	578	820	624	486
	35	951	874	732	563	794	604	470
	36	921	846	710	548	768	584	455
	37	892	818	687	532	742	565	441
	38	863	791	665	515	716	545	426
	39	834	763	643	499	691	526	411
	40	805	737	621	482	665	507	396
Area, in^2		36.4	33.9	27.9	21.3	31.4	23.9	18.3
Ix, in^4		1890	1450	1240	971	1090	678	534
Iy, in^4		864	783	668	524	702	536	422
Ratio, r_x/r_y		1.48	1.36	1.36	1.36	1.25	1.12	1.12
r_y, in		4.87	4.81	4.89	4.95	4.73	4.73	4.80

*Slender Element cross section. Width-Thickness and/or Depth-Thickness ratio λr, exceeds Table B4.1 of the AISC 2010 Specification for Structural Steel Buildings.
Double horizontal line indicates Kl/r limit of 200.

LFRD COLUMNS - 42 STRESS

Design Stress, ϕc x Fcr
Fy=42
Minimum specified yield stress steel, ϕc = 0.90

Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)
1	37.80	41	34.09	81	25.26	121	15.38	161	8.71
2	37.79	42	33.91	82	25.01	122	15.15	162	8.61
3	37.78	43	33.74	83	24.76	123	14.93	163	8.50
4	37.76	44	33.56	84	24.51	124	14.70	164	8.40
5	37.75	45	33.37	85	24.26	125	14.46	165	8.30
6	37.72	46	33.19	86	24.00	126	14.23	166	8.20
7	37.68	47	33.00	87	23.75	127	14.01	167	8.10
8	37.65	48	32.81	88	23.50	128	13.79	168	8.00
9	37.61	49	32.62	89	23.24	129	13.57	169	7.91
10	37.57	50	32.42	90	22.99	130	13.36	170	7.81
11	37.52	51	32.22	91	22.73	131	13.16	171	7.73
12	37.47	52	32.02	92	22.48	132	12.97	172	7.63
13	37.41	53	31.81	93	22.22	133	12.77	173	7.55
14	37.34	54	31.61	94	21.97	134	12.58	174	7.46
15	37.28	55	31.39	95	21.72	135	12.40	175	7.38
16	37.21	56	31.18	96	21.46	136	12.22	176	7.30
17	37.13	57	30.96	97	21.21	137	12.04	177	7.21
18	37.06	58	30.75	98	20.95	138	11.86	178	7.13
19	36.97	59	30.53	99	20.70	139	11.69	179	7.05
20	36.88	60	30.30	100	20.46	140	11.53	180	6.98
21	36.79	61	30.08	101	20.20	141	11.36	181	6.89
22	36.69	62	29.85	102	19.95	142	11.20	182	6.82
23	36.59	63	29.63	103	19.70	143	11.04	183	6.74
24	36.49	64	29.39	104	19.45	144	10.90	184	6.67
25	36.38	65	29.16	105	19.21	145	10.75	185	6.60
26	36.26	66	28.93	106	18.95	146	10.60	186	6.53
27	36.15	67	28.69	107	18.71	147	10.45	187	6.46
28	36.02	68	28.45	108	18.47	148	10.31	188	6.40
29	35.89	69	28.22	109	18.22	149	10.18	189	6.32
30	35.77	70	27.97	110	17.98	150	10.04	190	6.26
31	35.63	71	27.73	111	17.74	151	9.91	191	6.19
32	35.49	72	27.50	112	17.49	152	9.77	192	6.13
33	35.35	73	27.24	113	17.26	153	9.65	193	6.07
34	35.21	74	27.00	114	17.02	154	9.53	194	6.00
35	35.06	75	26.76	115	16.78	155	9.40	195	5.94
36	34.91	76	26.51	116	16.54	156	9.29	196	5.88
37	34.75	77	26.26	117	16.31	157	9.17	197	5.82
38	34.59	78	26.02	118	16.07	158	9.05	198	5.76
39	34.43	79	25.76	119	15.84	159	8.94	199	5.71
40	34.26	80	25.52	120	15.61	160	8.82	200	5.64

Tabulated design comprehensive stress does not apply to slender sections. When element width-to-thickness ration exceeds λr, refer to AISC Chapter E7 of the AISC 2010 Specification for Structural Steel Buildings.

LFRD COLUMNS - 46 STRESS

Design Stress, ϕc x Fcr
Fy=46
Minimum specified yield stress steel, ϕc = 0.90

Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)
1	41.40	41	36.97	81	26.63	121	15.43	161	8.71
2	41.39	42	36.77	82	26.33	122	15.17	162	8.61
3	41.38	43	36.56	83	26.05	123	14.93	163	8.50
4	41.36	44	36.35	84	25.75	124	14.70	164	8.40
5	41.33	45	36.13	85	25.46	125	14.46	165	8.30
6	41.30	46	35.90	86	25.17	126	14.23	166	8.20
7	41.26	47	35.68	87	24.88	127	14.01	167	8.10
8	41.22	48	35.46	88	24.59	128	13.79	168	8.00
9	41.18	49	35.23	89	24.30	129	13.57	169	7.91
10	41.12	50	34.99	90	24.00	130	13.36	170	7.81
11	41.06	51	34.75	91	23.72	131	13.16	171	7.73
12	41.00	52	34.52	92	23.43	132	12.97	172	7.63
13	40.93	53	34.27	93	23.14	133	12.77	173	7.55
14	40.86	54	34.03	94	22.85	134	12.58	174	7.46
15	40.78	55	33.78	95	22.56	135	12.40	175	7.38
16	40.69	56	33.52	96	22.27	136	12.22	176	7.30
17	40.61	57	33.27	97	21.98	137	12.04	177	7.21
18	40.51	58	33.01	98	21.70	138	11.86	178	7.13
19	40.40	59	32.76	99	21.41	139	11.69	179	7.05
20	40.30	60	32.50	100	21.12	140	11.53	180	6.98
21	40.19	61	32.23	101	20.85	141	11.36	181	6.89
22	40.08	62	31.97	102	20.56	142	11.20	182	6.82
23	39.95	63	31.70	103	20.28	143	11.04	183	6.74
24	39.82	64	31.43	104	20.00	144	10.90	184	6.67
25	39.70	65	31.16	105	19.72	145	10.75	185	6.60
26	39.56	66	30.89	106	19.44	146	10.60	186	6.53
27	39.42	67	30.61	107	19.16	147	10.45	187	6.46
28	39.27	68	30.34	108	18.89	148	10.31	188	6.40
29	39.12	69	30.05	109	18.61	149	10.18	189	6.32
30	38.96	70	29.77	110	18.35	150	10.04	190	6.26
31	38.81	71	29.50	111	18.07	151	9.91	191	6.19
32	38.65	72	29.21	112	17.81	152	9.77	192	6.13
33	38.48	73	28.93	113	17.53	153	9.65	193	6.07
34	38.30	74	28.64	114	17.27	154	9.53	194	6.00
35	38.13	75	28.36	115	17.00	155	9.40	195	5.94
36	37.95	76	28.07	116	16.75	156	9.29	196	5.88
37	37.76	77	27.78	117	16.49	157	9.17	197	5.82
38	37.57	78	27.50	118	16.22	158	9.05	198	5.76
39	37.38	79	27.21	119	15.96	159	8.94	199	5.71
40	37.18	80	26.92	120	15.69	160	8.82	200	5.64

Tabulated design comprehensive stress does not apply to slender sections. When element width-to-thickness ration exceeds λr, refer to AISC Chapter E7 of the AISC 2010 Specification for Structural Steel Buildings.

LFRD COLUMNS - 50 STRESS

Design Stress, ϕc x Fcr
Fy=50
Minimum specified yield stress steel, ϕc = 0.90

Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)
1	45.00	41	39.79	81	27.86	121	15.43	161	8.71
2	44.99	42	39.56	82	27.52	122	15.17	162	8.61
3	44.97	43	39.31	83	27.19	123	14.93	163	8.50
4	44.95	44	39.06	84	26.86	124	14.70	164	8.40
5	44.92	45	38.81	85	26.53	125	14.46	165	8.30
6	44.88	46	38.55	86	26.21	126	14.23	166	8.20
7	44.84	47	38.29	87	25.88	127	14.01	167	8.10
8	44.79	48	38.02	88	25.55	128	13.79	168	8.00
9	44.74	49	37.76	89	25.22	129	13.57	169	7.91
10	44.67	50	37.48	90	24.89	130	13.36	170	7.81
11	44.61	51	37.21	91	24.56	131	13.16	171	7.73
12	44.52	52	36.93	92	24.24	132	12.97	172	7.63
13	44.45	53	36.65	93	23.91	133	12.77	173	7.55
14	44.36	54	36.36	94	23.58	134	12.58	174	7.46
15	44.27	55	36.07	95	23.26	135	12.40	175	7.38
16	44.16	56	35.78	96	22.93	136	12.22	176	7.30
17	44.06	57	35.48	97	22.62	137	12.04	177	7.21
18	43.95	58	35.18	98	22.30	138	11.86	178	7.13
19	43.82	59	34.89	99	21.98	139	11.69	179	7.05
20	43.71	60	34.58	100	21.66	140	11.53	180	6.98
21	43.57	61	34.28	101	21.35	141	11.36	181	6.89
22	43.43	62	33.98	102	21.03	142	11.20	182	6.82
23	43.30	63	33.66	103	20.72	143	11.04	183	6.74
24	43.15	64	33.35	104	20.40	144	10.90	184	6.67
25	42.99	65	33.05	105	20.10	145	10.75	185	6.60
26	42.83	66	32.73	106	19.79	146	10.60	186	6.53
27	42.66	67	32.41	107	19.48	147	10.45	187	6.46
28	42.49	68	32.09	108	19.18	148	10.31	188	6.40
29	42.32	69	31.78	109	18.88	149	10.18	189	6.32
30	42.13	70	31.45	110	18.58	150	10.04	190	6.26
31	41.95	71	31.13	111	18.28	151	9.91	191	6.19
32	41.75	72	30.80	112	17.98	152	9.77	192	6.13
33	41.56	73	30.48	113	17.69	153	9.65	193	6.07
34	41.36	74	30.16	114	17.39	154	9.53	194	6.00
35	41.15	75	29.83	115	17.08	155	9.40	195	5.94
36	40.93	76	29.50	116	16.79	156	9.29	196	5.88
37	40.71	77	29.17	117	16.51	157	9.17	197	5.82
38	40.49	78	28.84	118	16.22	158	9.05	198	5.76
39	40.27	79	28.51	119	15.96	159	8.94	199	5.71
40	40.03	80	28.19	120	15.69	160	8.82	200	5.64

Tabulated design comprehensive stress does not apply to slender sections. When element width-to-thickness ration exceeds λr, refer to AISC Chapter E7 of the AISC 2010 Specification for Structural Steel Buildings.

LFRD COLUMNS - 60 STRESS

Design Stress, ϕc x Fcr
Fy=60
Minimum specified yield stress steel, ϕc = 0.90

Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)
1	54.00	41	46.60	81	30.37	121	15.43	161	8.71
2	53.98	42	46.26	82	29.93	122	15.17	162	8.61
3	53.96	43	45.91	83	29.51	123	14.93	163	8.50
4	53.93	44	45.56	84	29.08	124	14.70	164	8.40
5	53.88	45	45.21	85	28.65	125	14.46	165	8.30
6	53.83	46	44.85	86	28.22	126	14.23	166	8.20
7	53.77	47	44.48	87	27.79	127	14.01	167	8.10
8	53.69	48	44.12	88	27.37	128	13.79	168	8.00
9	53.62	49	43.74	89	26.95	129	13.57	169	7.91
10	53.52	50	43.36	90	26.53	130	13.36	170	7.81
11	53.43	51	42.98	91	26.11	131	13.16	171	7.73
12	53.32	52	42.60	92	25.70	132	12.97	172	7.63
13	53.21	53	42.20	93	25.28	133	12.77	173	7.55
14	53.08	54	41.81	94	24.87	134	12.58	174	7.46
15	52.94	55	41.41	95	24.46	135	12.40	175	7.38
16	52.80	56	41.01	96	24.06	136	12.22	176	7.30
17	52.64	57	40.61	97	23.65	137	12.04	177	7.21
18	52.49	58	40.20	98	23.25	138	11.86	178	7.13
19	52.32	59	39.79	99	22.85	139	11.69	179	7.05
20	52.14	60	39.38	100	22.46	140	11.53	180	6.98
21	51.95	61	38.95	101	22.07	141	11.36	181	6.89
22	51.76	62	38.54	102	21.67	142	11.20	182	6.82
23	51.55	63	38.12	103	21.29	143	11.04	183	6.74
24	51.34	64	37.69	104	20.89	144	10.90	184	6.67
25	51.12	65	37.27	105	20.49	145	10.75	185	6.60
26	50.89	66	36.85	106	20.11	146	10.60	186	6.53
27	50.65	67	36.42	107	19.74	147	10.45	187	6.46
28	50.41	68	35.99	108	19.37	148	10.31	188	6.40
29	50.16	69	35.57	109	19.02	149	10.18	189	6.32
30	49.90	70	35.13	110	18.67	150	10.04	190	6.26
31	49.64	71	34.70	111	18.34	151	9.91	191	6.19
32	49.36	72	34.26	112	18.01	152	9.77	192	6.13
33	49.08	73	33.83	113	17.69	153	9.65	193	6.07
34	48.79	74	33.40	114	17.39	154	9.53	194	6.00
35	48.49	75	32.96	115	17.08	155	9.40	195	5.94
36	48.20	76	32.53	116	16.79	156	9.29	196	5.88
37	47.89	77	32.09	117	16.51	157	9.17	197	5.82
38	47.57	78	31.66	118	16.22	158	9.05	198	5.76
39	47.26	79	31.24	119	15.96	159	8.94	199	5.71
40	46.93	80	30.80	120	15.69	160	8.82	200	5.64

Tabulated design comprehensive stress does not apply to slender sections. When element width-to-thickness ration exceeds λr, refer to AISC Chapter E7 of the AISC 2010 Specification for Structural Steel Buildings.

LFRD COLUMNS - 65 STRESS

Design Stress, ϕc x Fcr
Fy=65
Minimum specified yield stress steel, ϕc = 0.90

Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)
1	58.49	41	49.86	81	31.35	121	15.43	161	8.71
2	58.48	42	49.47	82	30.88	122	15.17	162	8.61
3	58.45	43	49.08	83	30.39	123	14.93	163	8.50
4	58.42	44	48.66	84	29.91	124	14.70	164	8.40
5	58.36	45	48.26	85	29.44	125	14.46	165	8.30
6	58.30	46	47.84	86	28.96	126	14.23	166	8.20
7	58.22	47	47.42	87	28.49	127	14.01	167	8.10
8	58.14	48	46.99	88	28.02	128	13.79	168	8.00
9	58.06	49	46.57	89	27.55	129	13.57	169	7.91
10	57.95	50	46.12	90	27.08	130	13.36	170	7.81
11	57.83	51	45.69	91	26.63	131	13.16	171	7.73
12	57.71	52	45.24	92	26.16	132	12.97	172	7.63
13	57.57	53	44.79	93	25.71	133	12.77	173	7.55
14	57.42	54	44.34	94	25.25	134	12.58	174	7.46
15	57.26	55	43.88	95	24.81	135	12.40	175	7.38
16	57.09	56	43.42	96	24.36	136	12.22	176	7.30
17	56.91	57	42.96	97	23.92	137	12.04	177	7.21
18	56.72	58	42.49	98	23.48	138	11.86	178	7.13
19	56.53	59	42.02	99	23.04	139	11.69	179	7.05
20	56.32	60	41.55	100	22.60	140	11.53	180	6.98
21	56.10	61	41.07	101	22.15	141	11.36	181	6.89
22	55.87	62	40.60	102	21.72	142	11.20	182	6.82
23	55.63	63	40.12	103	21.29	143	11.04	183	6.74
24	55.39	64	39.63	104	20.89	144	10.90	184	6.67
25	55.12	65	39.16	105	20.49	145	10.75	185	6.60
26	54.86	66	38.67	106	20.11	146	10.60	186	6.53
27	54.58	67	38.18	107	19.74	147	10.45	187	6.46
28	54.30	68	37.69	108	19.37	148	10.31	188	6.40
29	54.01	69	37.21	109	19.02	149	10.18	189	6.32
30	53.70	70	36.72	110	18.67	150	10.04	190	6.26
31	53.40	71	36.23	111	18.34	151	9.91	191	6.19
32	53.08	72	35.74	112	18.01	152	9.77	192	6.13
33	52.75	73	35.25	113	17.69	153	9.65	193	6.07
34	52.41	74	34.76	114	17.39	154	9.53	194	6.00
35	52.07	75	34.27	115	17.08	155	9.40	195	5.94
36	51.72	76	33.79	116	16.79	156	9.29	196	5.88
37	51.36	77	33.30	117	16.51	157	9.17	197	5.82
38	50.99	78	32.81	118	16.22	158	9.05	198	5.76
39	50.62	79	32.33	119	15.96	159	8.94	199	5.71
40	50.25	80	31.84	120	15.69	160	8.82	200	5.64

Tabulated design comprehensive stress does not apply to slender sections. When element width-to-thickness ration exceeds λr, refer to AISC Chapter E7 of the AISC 2010 Specification for Structural Steel Buildings.

LFRD COLUMNS - 70 STRESS

Design Stress, ϕc x Fcr
Fy=70
Minimum specified yield stress steel, ϕc = 0.90

Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)	Kl/r	ϕc Fcr (ksi)
1	62.99	41	53.04	81	32.19	121	15.43	161	8.71
2	62.98	42	52.59	82	31.65	122	15.17	162	8.61
3	62.95	43	52.14	83	31.12	123	14.93	163	8.50
4	62.89	44	51.67	84	30.60	124	14.70	164	8.40
5	62.84	45	51.20	85	30.07	125	14.46	165	8.30
6	62.77	46	50.73	86	29.55	126	14.23	166	8.20
7	62.68	47	50.25	87	29.03	127	14.01	167	8.10
8	62.59	48	49.76	88	28.51	128	13.79	168	8.00
9	62.48	49	49.27	89	28.01	129	13.57	169	7.91
10	62.35	50	48.78	90	27.50	130	13.36	170	7.81
11	62.23	51	48.27	91	26.99	131	13.16	171	7.73
12	62.08	52	47.76	92	26.49	132	12.97	172	7.63
13	61.92	53	47.26	93	25.99	133	12.77	173	7.55
14	61.75	54	46.75	94	25.50	134	12.58	174	7.46
15	61.57	55	46.23	95	25.01	135	12.40	175	7.38
16	61.37	56	45.70	96	24.51	136	12.22	176	7.30
17	61.17	57	45.18	97	24.01	137	12.04	177	7.21
18	60.95	58	44.65	98	23.53	138	11.86	178	7.13
19	60.71	59	44.11	99	23.05	139	11.69	179	7.05
20	60.47	60	43.58	100	22.60	140	11.53	180	6.98
21	60.22	61	43.04	101	22.15	141	11.36	181	6.89
22	59.95	62	42.50	102	21.72	142	11.20	182	6.82
23	59.68	63	41.96	103	21.29	143	11.04	183	6.74
24	59.39	64	41.42	104	20.89	144	10.90	184	6.67
25	59.09	65	40.88	105	20.49	145	10.75	185	6.60
26	58.79	66	40.33	106	20.11	146	10.60	186	6.53
27	58.47	67	39.79	107	19.74	147	10.45	187	6.46
28	58.14	68	39.24	108	19.37	148	10.31	188	6.40
29	57.80	69	38.70	109	19.02	149	10.18	189	6.32
30	57.45	70	38.15	110	18.67	150	10.04	190	6.26
31	57.10	71	37.61	111	18.34	151	9.91	191	6.19
32	56.73	72	37.06	112	18.01	152	9.77	192	6.13
33	56.35	73	36.51	113	17.69	153	9.65	193	6.07
34	55.97	74	35.97	114	17.39	154	9.53	194	6.00
35	55.58	75	35.42	115	17.08	155	9.40	195	5.94
36	55.18	76	34.88	116	16.79	156	9.29	196	5.88
37	54.76	77	34.34	117	16.51	157	9.17	197	5.82
38	54.34	78	33.80	118	16.22	158	9.05	198	5.76
39	53.92	79	33.26	119	15.96	159	8.94	199	5.71
40	53.48	80	32.72	120	15.69	160	8.82	200	5.64

Tabulated design comprehensive stress does not apply to slender sections. When element width-to-thickness ration exceeds λr, refer to AISC Chapter E7 of the AISC 2010 Specification for Structural Steel Buildings.