Applied Testing & Geosciences, LLC
When Quality Counts

3/2/2021

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CANADA

ER-454 ASD to LRFD Conversion

Dear Swen,

The following presents a summary of the existing ER-454 allowable load tables converted to LRFD capacities per the methodology outlined in AC233 and the NDS-2018 Appendix N.

Steel Values

Steel values (see Table 1) were converted to LRFD values per the methodology outlined in AC233 3.2.1. This method calculates LRFD values from the original test data with a Resistance Factor of 0.5.

Reference Connection Values

Reference connection values (See Withdrawal-Table 2, Lateral Shear- Table 3, and Pullout – Table 4) were converted to LRFD values per the methodology outlined in NDS Appendix N.3 which allows for direct conversion from ASD reference values to LRFD reference values. This methodology determines the LRFD Reference value by multiplying the ASD reference value by a Format Conversion Factor, a LRFD Resistance Factor and a LRFD Time Effect Factor. (See Example below.)

NDS N.3 LRFD Conversion Factors

Time effect factor	λ	0.8	per NDS Table N3 and ASTM D5457 6.7.3
Resistance Factor	Φ	0.65	per NDS Table N2
Format conversion Factor	KF	3.323077	Per NDS Table N1 (matches KF calculated in ASTM D5457 eq 4)

ASD to LRFD Conversion Example (NDS N.3)

Reference Design Value	ASD Resistance	75	per ESR-454 Tables 2 for 9x2-3/4 screw in SG=0.36
Time effect factor	λ	0.8	per NDS Table N3 and ASTM D5457 6.7.3
Resistance Factor	Φ	0.65	per NDS Table N2
Format conversion Factor	KF	3.323077	Per NDS Table N1 (matches KF calculated in ASTM D5457 eq 4)
converted	LRFD Resistance	249	per NDS N.3
adjusted	LRFD' Resistance	129.6	per NDS N.3 and AWC LRFD Manual M11.5

The following tables provide the corresponding LRFD versions of ER-454 Tables 1, 2, 3 and 4

Table 1 (LRFD Conversion)

Screw ID	Specified	Allowable Steel Strength (lbs)	
	Bending Yield (psi)	Tensile (lbs)	Shear (lbs)
9 x 2-3/4 9 x 3-1/8	215000	885	506
10 x 2-1/2 10 x 4-1/2	220000	1207	604
12 x 3-1/2 12 x 6	235000	1668	906
10 x 3-1/8	225000	1152	620
5/16 x 2-1/2 5/16 x 3-1/8 5/16 x 4	220000	1912	1086
3/8 x 6 3/8 x 7	215000	2506	1420

Table 2 (LRFD Conversion)

Reference Withdrawal Design Values (lbs/in)					
Screw ID	SG=0.36	SG=0.42	SG=0.50	SG=0.55	LVL Equiv SG=0.50
9 x 2-3/4	130	166	216	247	263
9 x 3-1/8	131	156	188	209	242
10 x 2-1/2	128	161	202	230	275
10 x 4-1/2	188	216	254	278	280
12 x 3-1/2 12 x 6	168	206	263	295	297
10 x 3-1/8	156	169	188	200	256
5/16 x 2-1/2	194	240	301	339	280
5/16 x 3-1/8	204	237	278	306	287
5/16 x 4	216	259	318	354	323
3/8 x 6	197	245	311	351	342
3/8 x 7	183	261	363	427	372

Table 3 (LRFD Conversion)

Reference Lateral Shear Design Values (lbs)					
Screw ID	**SG=0.36**	**SG=0.42**	**SG=0.50**	**SG=0.55**	**LVL Equiv SG=0.50**
9 x 2-3/4	156	188	232	259	232
9 x 3-1/8	145	187	242	278	271
10 x 2-1/2	138	171	216	247	216
10 x 4-1/2	173	211	261	292	299
12 x 6	263	349	501	594	465
10 x 3-1/8	183	251	342	397	318
5/16 x 2-1/2	183	240	320	363	320
5/16 x 3-1/8	211	278	385	446	385
5/16 x 4	340	366	403	425	416
3/8 x 6	366	453	626	734	501
3/8 x 7	508	589	700	769	610

Table 4 (LRFD Conversion)

Reference Pull-through Design Values (lbs)					
Screw ID	**SG=0.36**	**SG=0.42**	**SG=0.50**	**SG=0.55**	**LVL Equiv SG=0.50**
9 x 2-3/4 9 x 3-1/8	107	119	135	145	290
10 x 2-1/2 10 x 4-1/2	130	149	175	190	353
12 x 3-1/2 12 x 6	124	161	209	238	460
10 x 3-1/8	292	404	555	648	669
5/16 x 2-1/2 5/16 x 3-1/8 5/16 x 4	505	508	639	688	855
3/8 x 6 3/8 x 7	537	613	714	778	937

Sincerely,
For Applied Testing

Thomas Smith

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