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GSD International, L.P.
5602 Armour Drive
Houston, TX
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Attention: Mr. Matthew Wells

Dear Sir:

SUBJECT: TESTING OF SCAFFOLD CLAMPS

Acuren Group Inc. received several right angle and swivel scaffold clamps from GSD International, L.P. for testing. Each right angle clamp was stamped with YF-G-08L-01 and EN 74-1-B while the swivel clamps were stamped with YF-G-09B-02 and EN 74-1-A. Acuren was requested to perform distortion and slip testing on the clamps in accordance with CSA S269.2 "Access Scaffolding for Construction Purposes". Results from the tests are as follows.

Distortion tests were performed according to Section 11.3.3.2 of CSA S269.2 and the test arrangements were set up as per the force diagrams in CSA S269.2 Figures 3 and 5. A photograph of a typical test assembly for the right angle clamps is shown in Figure 1. During right angle distortion test, compressive forces were applied to the horizontal reference tubing while the vertical bar was pressed against the bottom cross-head. A steel abutment was utilized on the vertical reference bar to support the coupler during the distortion test. The first right angle clamp slip test was performed with galvanized steel reference tubing, but significant distortion of the tubing occurred before any significant distortion of the clamp, therefore the subsequent tests were conducted using a steel reference bar. The first set of 4 right angle clamp distortion tests resulted in individual result variations greater than 15% from the calculated average, so another set of 4 tests was completed to satisfy the CSA specification. In general, the pins at the collars of the clamps showed the greatest amount of distortion (Figure 2). The maximum loads obtained prior to significant distortion of the right angle clamps are contained in Table 1. For swivel clamp distortion tests, compressive forces were applied to the central clamp while the outer two clamps held the diagonal bar in place. The outer two clamps were fixed around welds on their respective vertical bars in order to keep the outer clamps stationary with respect to the test fixture. Figure 3



ISO 9001:2000

displays a typical test assembly for swivel clamps. Similar to the right angle clamps, the variation in some of the swivel clamp distortion loads were greater than 15% from the average, therefore another set of tests was conducted and the average of all 8 tests was utilized. The greatest amount of distortion on the swivel clamps was apparent at the two halves of the swivel joints; Figure 4 outlines where the distortion was evident. The maximum loads obtained prior to significant distortion of the swivel clamps are contained in Table 2. In accordance with CSA S269.2, a reduction factor of 2.5 was applied to the average of all 8 distortion loads for each type of clamp to calculate the design capacities.

Slip tests were also performed in accordance with Section 11.3.3.2 of CSA S269.2. Each slip test was set up in according to the force diagrams in CSA S269.2 Figures 4 and 6. Test assemblies were similar to those shown in Figures 1 and 2. The right angle slipping test is similar to the distortion test except that slipping of the clamp along the vertical tube prior to distortion of the assembly is observed during the slip test. The swivel clamp slip test is also similar to the distortion test; however during the slip test, compressive forces are applied to the top of the central vertical tube rather than to the central clamp, which allows the potential for the vertical tube to slip within the central clamp. Maximum loads obtained prior to observable slipping are shown in Tables 3 and 4. In accordance with CSA S269.2, a reduction factor of 2.5 was applied to the average slip loads to calculate the design capacities.

TABLE 1 RIGHT ANGLE CLAMP DISTORTION TEST RESULTS

Clamp ID	Maximum Load (lb)	Maximum Load (kN)	Deviation from Average	Observations
RA1	7280	32	20%	Distortion of clamp
RA2	12130	54	34%	Distortion of clamp
RA3	10970	49	21%	Distortion of clamp
RA4	8200	36	10%	Distortion of clamp
RD5	8790	39	3%	Distortion of clamp
RD6	7610	34	16%	Distortion of clamp
RD7	9200	41	2%	Distortion of clamp
RD8	8310	37	8%	Distortion of clamp
Average Distortion Load	9061 lb	40 kN		
Design Capacity	3624 lb	16 kN		



TABLE 2 SWIVEL CLAMP DISTORTION TEST RESULTS

Clamp ID	Maximum Load (lb)	Maximum Load (kN)	Deviation from Average	Observations
SS1	3520	16	42%	Distortion of clamp
SS2	6100	27	1%	Distortion of clamp
SS3	5790	26	4%	Distortion of clamp
SS4	6920	31	15%	Distortion of clamp
SD5	5500	24	9%	Distortion of clamp
SD6	6560	29	9%	Distortion of clamp
SD7	6130	27	2%	Distortion of clamp
SD8	7700	34	28%	Distortion of clamp
Average Distortion Load	6028 lb	27 kN		
Design Capacity	2411 lb	11 kN		

TABLE 3 RIGHT ANGLE CLAMP SLIP TEST RESULTS

Clamp ID	Maximum Load (lb)	Maximum Load (kN)	Observations
RA1	6030	27	Clamp slipped
RA2	6000	27	No observed slip, clamp started to deform
RA3	7290	32	Clamp slipped
RA4	6830	30	No observed slip, clamp started to deform
Average Slip Load	6538 lb	29 kN	
Maximum Deviation from Average	12%		
Design Capacity	2615 lb	12 kN	



TABLE 4 SWIVEL CLAMP SLIP TEST RESULTS

Clamp ID	Maximum Load (lb)	Maximum Load (kN)	Observations
SS1	2150	10	Clamp slipped
SS2	2440	11	Clamp slipped
SS3	1950	9	Clamp slipped
SS4	2430	11	Clamp slipped
Average Slip Load	2243 lb	10 kN	
Maximum Deviation from Average	13%		
Design Capacity	897 lb	4 kN	



FIGURE 1 RIGHT ANGLE CLAMP TEST ARRANGEMENT

