ANCHOR INSTALLATION;

Generally, the anchors were tested in the formed-face of the concrete members or the face shell of the hollow concrete masonry unit, at a minimum edge and spacing distances. The Anchors were installed using either a 5/16" or 3/16" Brinker Brouwn Heavy Duty Premium Carbide Tipped Roto Hammer Bits with a Milwaukee rotary percussion hammer drill. The holes were drilled to a depth 1/8" deeper than the intended installation depth of the anchor. The initial diameter of the drill bits was 0.172" for the 5/32" bits, and 0.205" for the 3/16" bits. The former size was used for the 3/16" diameter anchors, and the latter for the 1/4" diameter anchors. The anchors were installed to the intended depth with a Dewalt cordless screw driver.

TEST RESULTS:

CORROSION TEST: Specimens representative of the 3/16" and 1/4" carbon steel screw anchors were subjected to 140 cycles of ASTM G 85 Annex 5 testing. After 140 cycles, the screws were examined and determined to exhibit rust over less than five percent of the total surface area, thus satisfying TAS 114 Appendix E, Section 2.6.1.1.

ANCHOR TESTS: Table 2 on the next page depicts the results of testing and an analysis of the results to derive an allowable load for each condition tested. Based on the results, Table 1 below depicts the allowable loads of the tested anchors. A summary of all test results, with failure modes and load-displacement curves, is provided in Appendix A to this report.

Table 1 – Screw Anchor Allowable Loads

Anchor Diameter	Anchor Material	Substrate Type	Anchor Spacing	Anchor Edge	Anchor Embed.	Allowable Load (lbf) Tension	Shear
3/16"	CS	CMU	3"	3-1/2"	1-1/4"	128	259
3/16"	CS	Concrete	2-1/4"	2-1/4"	1"	125	291
3/16"	CS	Concrete	2-1/4"	2-1/4"	1-1/4"	187	-
3/16"	CS	Concrete	2-1/4"	2-1/4"	1-1/2"	228	366
1/4"	CS	CMU	3"	3-1/2"	1-1/4"	176	322
1/4"	CS	Concrete	3"	2-1/2"	1"	170	263
1/4"	CS	Concrete	3"	2-1/2"	1-1/4"	214	-
1/4"	CS	Concrete	3"	2-1/2"	1-1/2"	317	436
1/4"	SS	CMU	3"	3-1/2"	1-1/4"	166	369
1/4"	SS	Concrete	3"	2-1/2"	1"	183	297
1/4"	SS	Concrete	3"	2-1/2"	1-1/4"	223	-
1/4"	SS	Concrete	3"	2-1/2"	1-1/2"	417	418

Table 1 – Test Summary and Analysis

Anchor Diameter (in.)	Substrate	Test Direction	Anchor Embed. (in.)	Test Ultimate Loads (lbf) 1	2	3	4	5	6	7	8	9	10	Max. Var. Tests 1 - 5 %	Mean Ultimate (lbf)	Allowable Load (lbf)
3/16 CS	Concrete	Tension	1.00	478	488	545	437	667	478	642	430	390	499	0.275	499	125
			1.25	822	823	606	952	870	701	385	734	611	818	0.256	748	187
			1.50	768	874	1307	952	837	908	1089	977	922	611	0.379	913	228
		Shear	1.00	1339	1023	1290	963	1213						0.174	1166	291
			1.50	1539	1323	1413	1575	1462						0.095	1462	366
	CMU	Tension	1.25	482	552	493	513	512						0.082	510	128
		Shear	1.25	981	1023	1174	1092	1035						0.170	1037	259
1/4 CS	Concrete	Tension	1.00	741	1003	570	754	627	614	747	642	732	409	0.357	678	170
			1.25	858	1203	788	720	852	1001	572	998	813	816	0.361	858	214
			1.50	1345	1166	1377	1130	1324						0.109	1288	317
		Shear	1.00	1049	1209	972	1078	956						0.148	1053	263
			1.50	1910	2120	1420	1543	1652	1615	1539	1740	1918	2043	0.226	1745	436
	CMU	Tension	1.25	703	633	766	628	788						0.120	704	176
		Shear	1.25	1395	1117	1234	1398	1290						0.132	1286	322

Anchor Diameter (in.)	Substrate	Test Direction	Anchor Embed. (in.)	Test Ultimate Loads (lbf) 1	2	3	4	5	6	7	8	9	10	Max. Var. Tests 1 - 5 %	Mean Ultimate (lbf)	Allowable Load (lbf)
0.25 SS	Concrete	Tension	1.00	679	862	663	728	727						0.178	732	183
			1.25	594	1194	618	1065	875	1414	1027	518	813	949	0.374	892	223
			1.50	1666	1504	1612	1736	1624						0.099	1668	417
		Shear	1.00	1237	1166	1208	961	1362						0.190	1187	297
			1.50	1678	1599	1614	1840	1638						0.099	1674	418
	CMU	Tension	1.25	756	554	363	558	464	548	781	841	819	859	0.403	665	166
		Shear	1.25	1611	1596	1302	1302	1565						0.117	1475	369

NOTES:
1. Tests apply to anchors spacing of 2-1/4" for 3/16" anchors and 3" for 1/4" anchors in concrete.
2. Tests apply to anchor edge distance of 2-1/4" for 3/16" anchors and 2-1/2" anchors in concrete.
3. Tests apply to anchor spacing of 3" in concrete masonry units.
4. Tests apply to anchor edge distance of 3-1/2" in concrete masonry units.
5. Maximum Variation denotes the load value that deviates furthest from the average of the first five tests, divided by that average.
6. If the maximum variation of the first five tests is less than 0.200, no further tests were conducted; otherwise, five additional tests were conducted.
7. The Mean Ultimate is either the average load if five tests were conducted, or the average of the remaining value from ten tests after the highest and lowest value are discarded.
8. The allowable load is the mean ultimate divided by a factor of safety of 4.0.

REMARKS:

The concrete members used for this project were disposed of shortly after each series of tests were completed. The anchor test-specimens, as well as unused anchors, are subject to disposal sixty days from the date of this report.