

Ad Hoc Testing Plan

Title: Utility shelving pull-out testing

Purpose of Test:

Test utility shelving precast anchor material for shear strength and pull-out strength utilizing a 1/2in lag screw.

Testing Plan:

Fastener shear test (Vertical Position):

1. Cut material into linear foot lengths.
2. Cast material into concrete. Cast compression cylinders to verify compression strength same day of testing. Allow to cure per SME recommendations.
3. Attach racking using a single specified fastener (Self tapped) with impact drill.
4. Position pull-gauge as seen in Figure 1.
5. Attach the force gauge to the racking.
6. Apply force until the fastener is pulled from the material or material fails. Document with photos, peak force measurement, and observations.
7. Complete concrete cylinder compression test same day and record data.
8. Repeat for a total of 3 attempts.

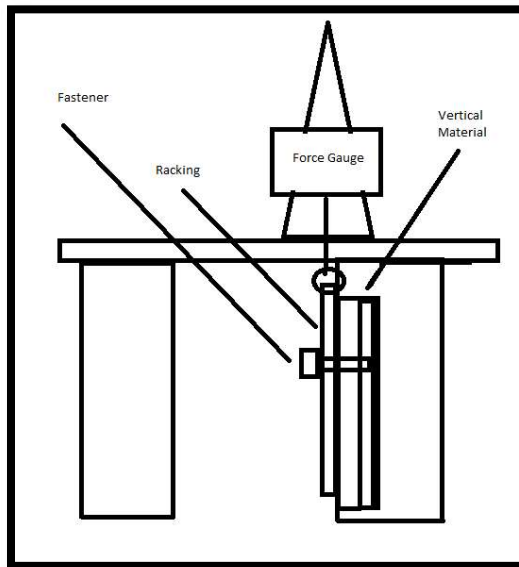
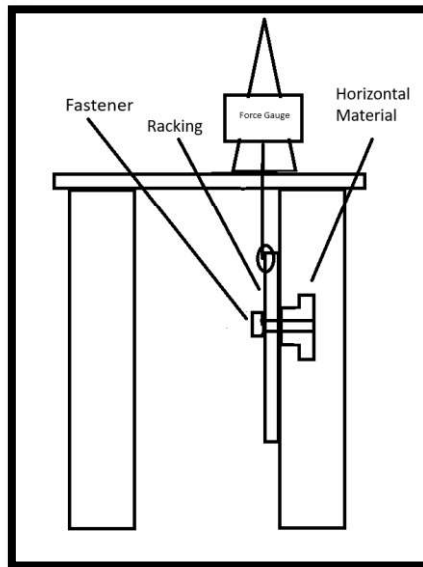
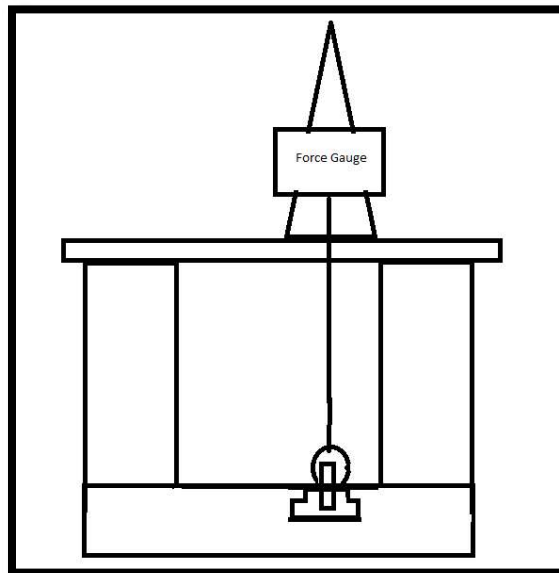
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2. Cast material into concrete. Cast compression cylinders to verify compression strength same day of testing. Allow to cure per SME recommendations.
3. Attach racking using a single specified fastener (Self tapped) with impact drill.
4. Position pull-gauge as seen in Figure 2.
5. Attach the force gauge to the racking.
6. Apply force until the fastener is pulled from the material or material fails. Document with photos, peak force measurement, and observations.
7. Complete concrete cylinder compression test same day and record data.
8. Repeat for a total of 3 attempts.

Fastener Tension Testing:

1. Cut material into linear foot lengths.
2. Cast material into concrete. Cast compression cylinders to verify compression strength same day of testing. Allow to cure per SME recommendations.
3. Attach racking using a single specified fastener (Self tapped) with impact drill.
4. Position pull-gauge as seen in Figure 3.
5. Attach the force gauge to the racking.

6. Apply force until the fastener is pulled from the material or material fails. Document with photos, peak force measurement, and observations.
7. Complete concrete cylinder compression test same day and record data.
8. Repeat for a total of 3 attempts.

Figure 1:**Figure 2:****Figure 3:**

Force required for shear test with approved fasteners is > 600 lbs of pressure.

Results Summary:

Observations:

Fastener was self-tapped and did not show signs of bulging, splintering, splitting, etc when directly screw into the material. Based on this observation, any lag screw up to this size should be acceptable to self-tap into the material.

Results (Shear Testing in Vertical Position):

Testing utilized a single fastener securing the provided bracket. The bracket was pulled laterally parallel to the material ensuring low friction and direct shear testing with the provided bracket.

15/16in Material: Shear tests showed a failure of the material @ an average 1115.7 lbs of pressure (minimum of 928 lbs) over 3 tests. See Attached Images.

1 1/2in Material: Shear tests showed a failure of the material @ an average of 1596.3 lbs of pressure (minimum of 1530 lbs) over 3 tests. See Attached Images.

Results (Shear Testing in Horizontal Position):

Testing utilized a single fastener securing the provided bracket. The bracket was pulled laterally parallel to the material ensuring low friction and direct shear testing with the provided bracket.

15/16in Material: Shear tests showed a failure of the material @ an average 1048 lbs of pressure (minimum of 993 lbs) over 3 tests. See Attached Images.

1 1/2in Material: Shear tests showed a failure of the material @ an average of 1985.7 lbs of pressure (minimum of 1894 lbs) over 3 tests. See Attached Images.

Results (Tension Testing):

15/16in Material: Failed at an average of 1093.5 lbs of pressure (minimum of 978 lbs) over 3 tests. See Attached Images.

1 1/2in Material: Failed at an average of 1503 lbs of pressure (minimum of 1330 lbs) over 3 tests. See Attached Images.

Compression Testing

Date:	Cyl Diameter (in):	Cylinder Length (in):	L/D Ratio:	Day	Max Load (ftlbs)	L/D Correction Factor	PSI	Predicted Max Strength (PSI)
9/11/2023	3	6	2.000	14	35750	1	5057.6	6023.5
9/11/2023	3	6	2.000	14	28875	1	4085.0	4865.1

15/16" Material

Rep:	Pull Strength (Lbs):	Lag Screw:	Orientation:	Test:	Notes:
4-1	1075	(1/2inx1.5in)	Vertical	Shear	fail/screw stripped out
4-2	928	(1/2inx1.5in)	Vertical	Shear	fail/screw stripped out
4-3	1344	(1/2inx1.5in)	Vertical	Shear	fail/screw stripped out
Average:	1115.7				
5-1	1053	(1/2inx1.5in)	Horizontal	Shear	fail/screw stripped out
5-2	1098	(1/2inx1.5in)	Horizontal	Shear	fail/screw stripped out
5-3	993	(1/2inx1.5in)	Horizontal	Shear	fail/screw stripped out
Average:	1048				
6-1	1217	(1/2inx1.5in)	NA	Tension	fail/screw stripped out
6-2	989	(1/2inx1.5in)	NA	Tension	fail/screw stripped out
6-3	1190	(1/2inx1.5in)	NA	Tension	fail/screw stripped out
6-4	978	(1/2inx1.5in)	NA	Tension	fail/screw stripped out
Average:	1093.5				

1 1/2" Material

Rep:	Pull Strength (Lbs):	Lag Screw:	Orientation:	Test:	Notes:
7-1	1530	22361 (1/2in - 6x2in)	Vertical	Shear	fail/screw stripped out
7-2	1572.9	22361 (1/2in - 6x2in)	Vertical	Shear	fail/screw stripped out
7-3	1686	22361 (1/2in - 6x2in)	Vertical	Shear	fail/screw stripped out
Average:	1596.3				
8-1	2065	22361 (1/2in - 6x2in)	Horizontal	Shear	fail/screw stripped out
8-2	1998	22361 (1/2in - 6x2in)	Horizontal	Shear	fail/screw stripped out
8-3	1894	22361 (1/2in - 6x2in)	Horizontal	Shear	fail/screw stripped out
Average:	1985.666667				
9-1	1330	22361 (1/2in - 6x2in)	NA	Tension	fail/screw stripped out
9-2	1608	22361 (1/2in - 6x2in)	NA	Tension	fail/screw stripped out
9-3	1572	22361 (1/2in - 6x2in)	NA	Tension	fail/screw stripped out
Average:	1503.333333				

Apparatus Setup and Attachment images:









Failure Modes:





