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Important Notice

In August 1, 2013, PABCO® Gypsum, a division of PABCO® building products, LLC acquired the QuietRock® business and operations from Serious Energy, Inc. Serious Energy, Inc. corporate structure and legal name changed through the years from Quiet Solution, Inc. to Serious Materials, Inc to Serious Energy, Inc. The acquisition of the QuietRock® business by PABCO® Gypsum includes the products, technical data, test reports and other intellectual property. For the avoidance of confusion, references to "Quiet Solution", "Serious Materials", or "Serious Energy" used within test reports, in general, should be understood as references to PABCO® Gypsum as of August 1, 2013.

PFS Test Report

PFS TEST REPORT #05-74
IMPACT LOAD TESTS
FOR
QUIET SOLUTION, LLC
SUNNYVALE, CALIFORNIA

BY:

PFS CORPORATION
2402 DANIELS STREET
MADISON, WISCONSIN

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PFS TEST REPORT #05-74
IMPACT LOAD TESTS
FOR
QUIET SOLUTION, LLC
SUNNYVALE, CALIFORNIA

GENERAL

The PFS Corporation, Madison, Wisconsin, performed client requested testing services for Quiet Solution, LLC, Sunnyvale, California. The testing was performed in accordance with procedures and methods referenced in ASTM E695-03, *"Standard Test Method of Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading"* and with client provided directions. The test materials were received in good order at the PFS Laboratory on December 13, 2005. Testing was performed from December 21-22, 2005.

MATERIALS

The tests were performed on four client constructed and submitted 4-by-8-ft. panels. Each panel specimen was constructed of dimensional 2-by-4 lumber with four single studs spaced 16-in. on-center. A single 4-by-8 panel of QR-530 laminated drywall was screw fastened to one side of the wood frame. The fastening schedule for the drywall laminate was 3-in. on-center around the perimeter and 4-in. on-center in the field.

TEST METHOD

All specimens were tested in a vertical position. Samples were securely mounted to a frame using the specified piping and sponge rubber recommended by ASTM E695-03. The impactor was a leather bag constructed according to the specifications listed in ASTM E695-03. The bag was filled with lead shot to a total weight of 60.0 lbs. A rope was strung through a movable frame and tied to the bag, such that the bag could swing freely as a pendulum to impact the panel at the bottom of its swing (*Photo 1*). The frame could be raised or lowered to facilitate different heights of drop, and moved left or right to adjust the horizontal point of impact on the specimen. Hinged doors were affixed to the frame and latched shut. Release of the latch smoothly and swiftly allowed the bag to swing as a true pendulum (i.e. without wobble).

TEST METHOD (cont.)

The bag was raised and dropped in vertical increments of 6 inches, where the height of drop is defined as the vertical difference in the bag's center of mass at the point of impact on the panel and the bag's center of mass while at rest in the movable frame before drop. The maximum drop possible using this method occurs when the movable frame holding the bag is raised to a horizontal position, that is, when the angle between the face of the specimen and the frame is 90°.

Impacts were applied to four different locations: (1) on the face between the studs, in the center of the panel, (2) on the back between the studs, in the center of the panel, (3) on the face at one stud, left of center, and (4) on the back at one stud, left of center.

Instantaneous deflection and set were recorded in the center of the panel, directly opposite the point of impact for test locations (1) and (2). For test locations (3) and (4), an additional deflection gauge was installed on the stud, opposite the point of impact for locations (3) and (4). A new panel specimen was mounted in the fixture for each test.

TEST RESULTS

The client defined any of three occurrences as constituting failure of the panel:

1. The first visible indication of surface damage (Surface failure).
2. The first permanent set of L/240 at impact location (Deformation failure).
3. Penetration of impactor through product (Structural failure).

In all cases, the first of these possible occurrences (surface failure) was the first failure type observed in the panels. Failure was generally subjective, as it was defined as "any damage that would constitute need of repair." Technical failure for each test panel position is listed below, along with a description of the observed damage constituting failure.

Test #	Impact Location	Drop Height that Caused Failure	Failure Description (*Photo #*)
1	On panel face, between studs	36 in.	Slight indentation of panel at point of impact. (*2*)
2	On panel back, between studs	66 in.	First sign of drywall cracking on panel face (which was opposite the point of impact). (*3*)
3	On panel face, on stud	84 in.	"Kinking" of drywall on panel face. (*4*)
4	On panel back, on stud	78 in.	First sign of drywall cracking along the stud on the panel face (opposite point of impact). (*5*)

Testing was carried out through the maximum possible drop, despite the fact that all panels had technically failed via occurrence 1 prior to reaching that point. Drops in excess of the failure heights listed above only amplified the severity of surface failure. Occurrences 2 (deformation failure) and 3 (structural failure) were never observed during testing, even after the maximum drop height of 102 inches. Detailed test results can be found in Tables 1 - 4. Data collected after technical failures are highlighted in light gray.

REPORT STATEMENTS

This report may not be reproduced, except in full, without the written approval of the PFS Corporation.

This test report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

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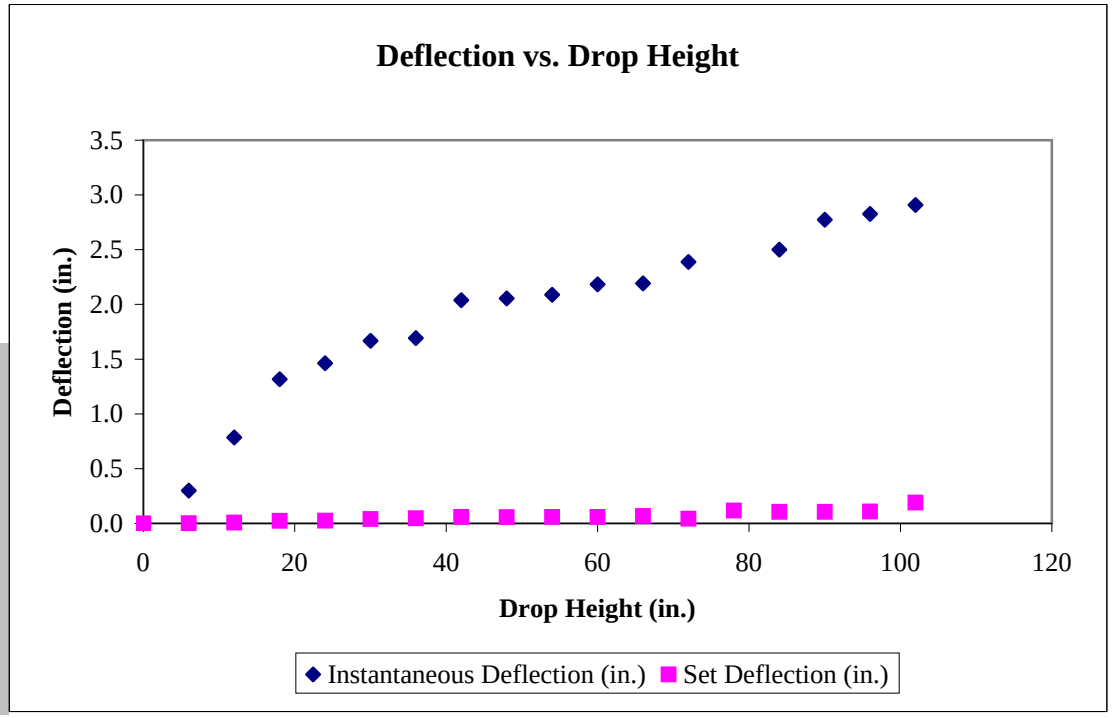
QUIET SOLUTION, LLC

E 695-03 Impact Loading Test

Test 1: Impact on Panel Face, Between Studs
Impactor Weight: 60.0 lbs

Height of Drop (in.)	Instantaneous Deflection (in.)	Set Deflection (in.)
0	0.000	0.000
6	0.300	0.002
12	0.785	0.008
18	1.317	0.023
24	1.463	0.025
30	1.667	0.039
36	1.692	0.047
42	2.039	0.058
48	2.055	0.057
54	2.088	0.059
60	2.184	0.059
66	2.192	0.067
72	2.388	0.042
78	Gauge Failed	0.117
84	2.500	0.105
90	2.774	0.105
96	2.826	0.108
102	2.908	0.190



Observations: Gauges recorded deflection on the back of the panel at the point of impact. After 24 in. drop, very thin cracking of the back panel. Cracks elongate with increasing height of drop. After 36 in. drop, very slight indentation on front face of panel. A 102 in. drop is the maximum achievable drop using this method. After 102 in. drop, there was a small wrinkle on the front face of the panel near the edge. Total depression at impact point was 0.257 in.

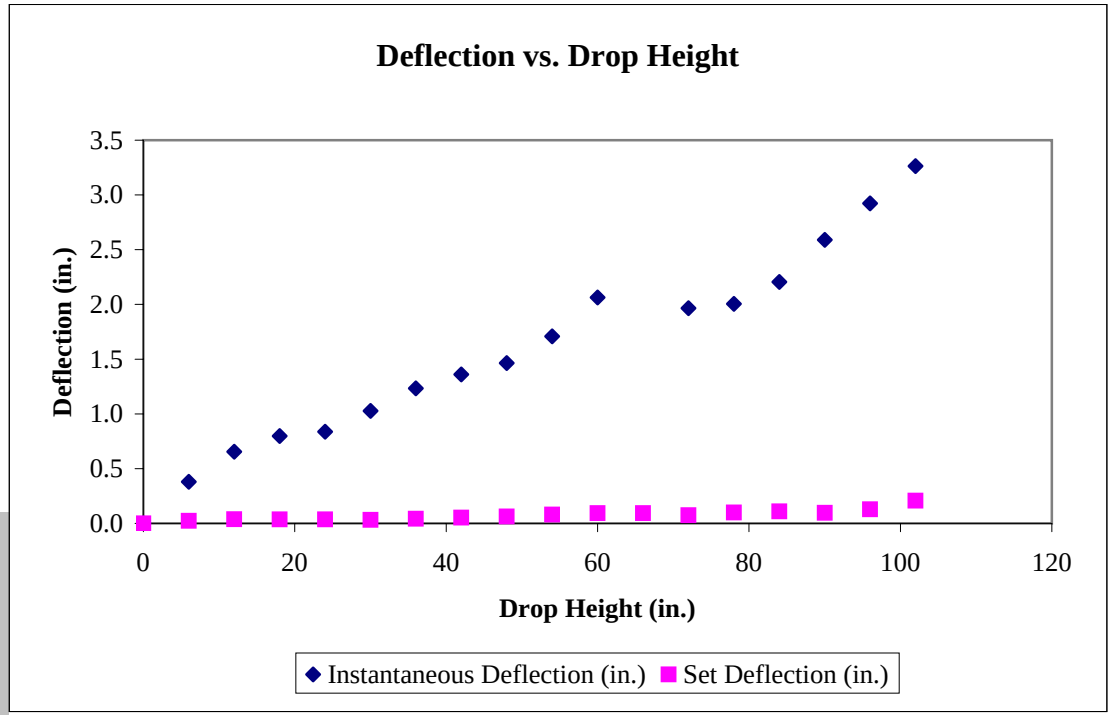
Table 1

QUIET SOLUTION, LLC

E 695-03 Impact Loading Test

Test 2: Impact on Panel Back, Between Studs
Impactor Weight: 60.0 lbs

Height of Drop (in.)	Instantaneous Deflection (in.)	Set Deflection (in.)
0	0.000	0.000
6	0.380	0.023
12	0.654	0.038
18	0.798	0.037
24	0.838	0.037
30	1.027	0.032
36	1.234	0.042
42	1.360	0.053
48	1.464	0.063
54	1.708	0.080
60	2.064	0.093
66	Gauge Failed	0.094
72	1.966	0.075
78	2.005	0.100
84	2.205	0.110
90	2.589	0.097
96	2.923	0.128
102	3.263	0.207



Observations: Gauges recorded deflection on the back of the panel at the point of impact. First sign of cracking on the face after 66 in. drop. Only a slight depression at point of impact at conclusion of the test. Many fewer cracks in drywall than in Test 1.

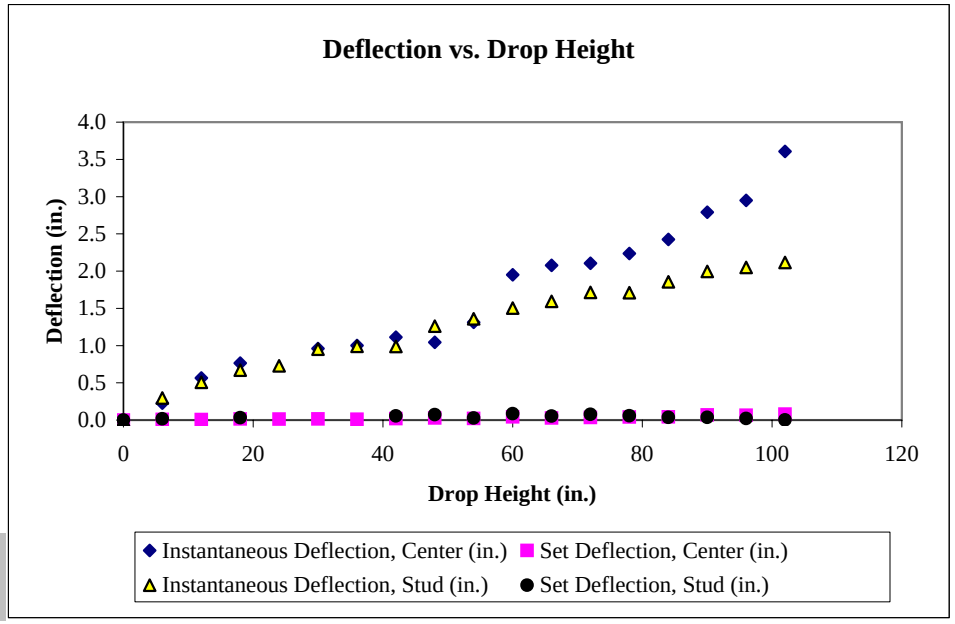
Table 2

QUIET SOLUTION, LLC

E 695-03 Impact Loading Test

Test 3: Impact on Panel Face, Off-center, on Stud
Impactor Weight: 60.0 lbs

Height of Drop (in.)	Instantaneous Deflection, Center (in.)	Set Deflection, Center (in.)	Instantaneous Deflection, Stud (in.)	Set Deflection, Stud (in.)
0	0.000	0.000	0.000	0.000
6	0.227	0.008	0.296	0.018
12	0.564	0.006	0.508	-0.004
18	0.764	0.015	0.671	0.033
24	Gauge Failed	0.012	0.728	-0.020
30	0.960	0.015	0.951	-0.026
36	1.001	0.011	0.990	Gauge Failed
42	1.113	0.020	0.989	0.055
48	1.043	0.028	1.260	0.074
54	1.313	0.021	1.359	0.029
60	1.951	0.042	1.504	0.087
66	2.078	0.029	1.593	0.053
72	2.105	0.034	1.714	0.077
78	2.236	0.041	1.709	0.057
84	2.425	0.042	1.856	0.036
90	2.790	0.069	1.995	0.037
96	2.950	0.065	2.049	0.022
102	3.607	0.079	2.115	0.003



Observations: Two sets of deflection gauges were used, one set on the stud opposite impact, and one set on the center of the panel, as in the previous tests. After 84 in. drop, there was a wrinkle on the face of the drywall near the edge, similar to Test 1. There was also a crack at the top of the stud on the edge of the panel. The wrinkle elongated with increasing drop height, to a final length of ~10 in. Slight cracking in the drywall on the back of the panel.

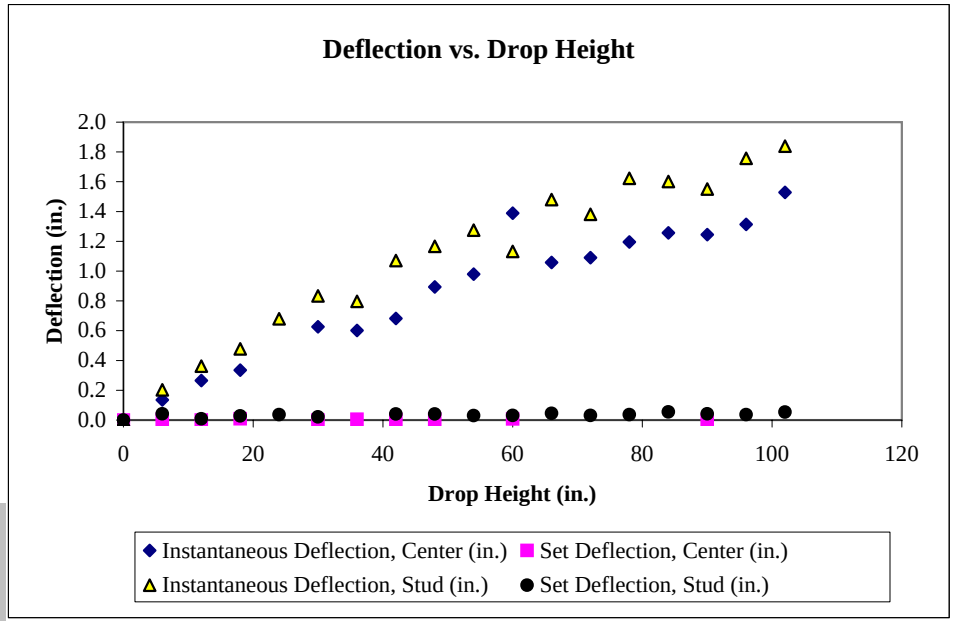
Table 3

QUIET SOLUTION, LLC

E 695-03 Impact Loading Test

Test 4: Impact on Panel Back, Off-center, on Stud
Impactor Weight: 60.0 lbs

Height of Drop (in.)	Instantaneous Deflection, Center (in.)	Set Deflection, Center (in.)	Instantaneous Deflection, Stud (in.)	Set Deflection, Stud (in.)
0	0.000	0.000	0.000	0.000
6	0.135	0.004	0.203	0.042
12	0.265	0.000	0.362	0.009
18	0.335	0.009	0.478	0.028
24	0.464	-0.026	0.680	0.037
30	0.626	0.000	0.834	0.022
36	0.602	0.005	0.797	0.024
42	0.682	0.003	1.071	0.041
48	0.894	0.005	1.167	0.041
54	0.980	-0.011	1.275	0.030
60	1.389	0.008	1.132	0.031
66	1.058	-0.012	1.480	0.045
72	1.090	-0.004	1.381	0.031
78	1.196	-0.015	1.623	0.037
84	1.257	-0.007	1.601	0.055
90	1.245	0.000	1.551	0.042
96	1.314	-0.009	1.757	0.037
102	1.528	-0.003	1.839	0.054



Observations: Two sets of deflection gauges were used, one set on the stud opposite impact, and one set on the center of the panel, as in the previous tests. After 78 in. drop, the drywall was beginning to crack on the face side. After 84 in. drop, there was cracking on the face side along the screw heads.

Table 4

Photo 1: General test set-up for specimen vertical impact testing. As shown, bag is set to impact on panel face between studs.

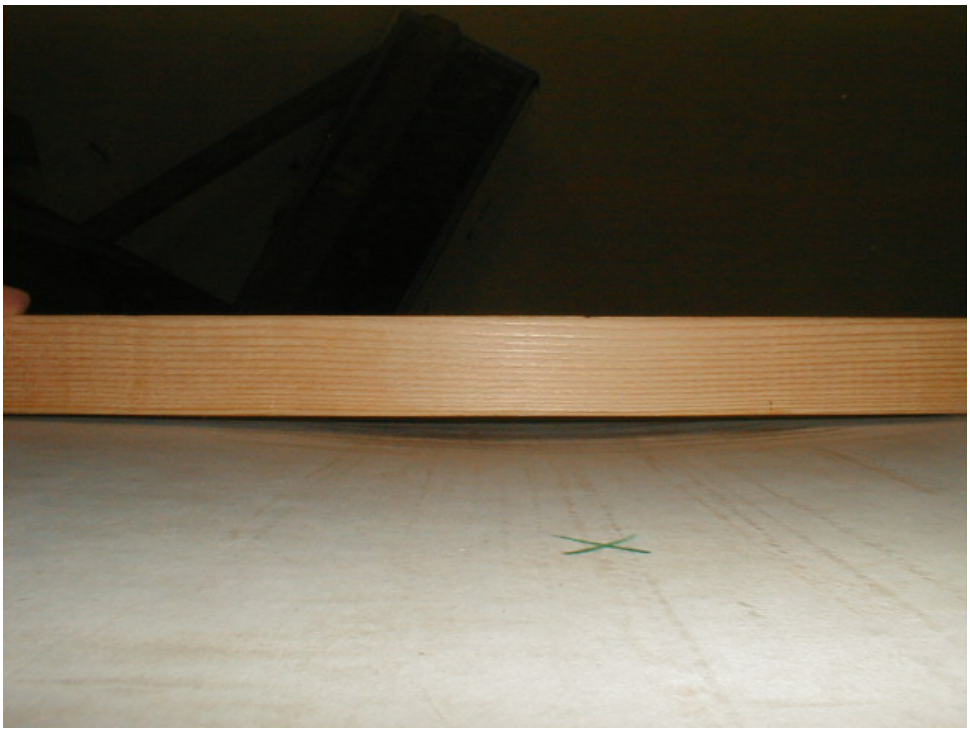


Photo 2: Indentation of panel at point of impact for the first test. The wooden slat being held across the panel is 1.5 inches tall.

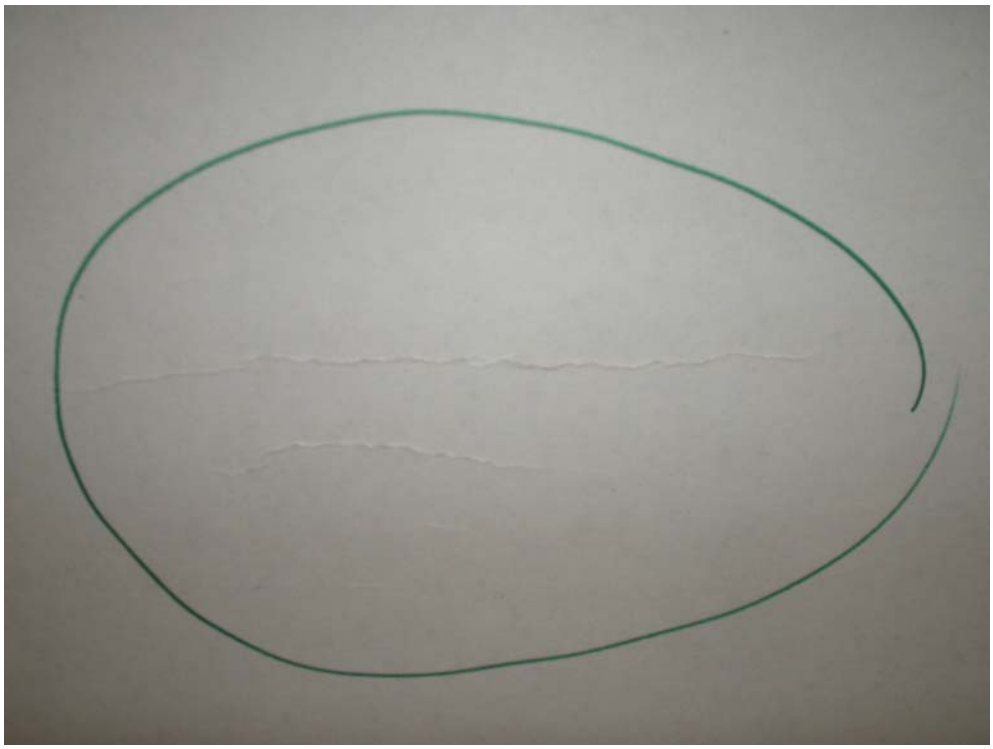


Photo 3: Cracking on the face of the panel after impact on the back during test two.

Photo 4: "Kinking" of the panel face during test three.

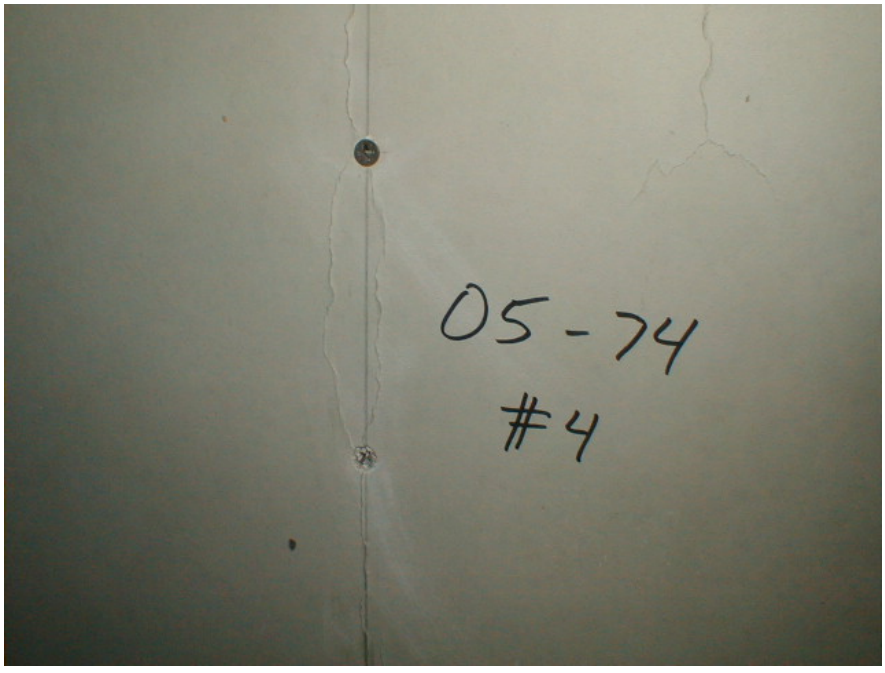


Photo 5: Cracking of the panel face along the stud line during test four.