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Structural Testing Laboratory

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TEST REPORT

FOR

PABCO® Gypsum

8000 East Lake Meade Boulevard
Las Vegas, NV 89124

Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels ASTM C1629/C1629M – 15

Soft Body Impact Test

Test Report No: SB-1701

Assignment No: J-161

Subject Material: 5/8" QuietRock®530 and 5/8" QuietRock® ES Type X Gypsum Panels

Test Date: March 30, 2017

Report Date: April 11, 2017

Prepared by: _____

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Revision Summary

DATE	SUMMARY
April 11, 2017	Original issue date. Original NGCTS report SB-1701.

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Introduction

The subject of this test report is the structural integrity investigation of two different gypsum panel products. The investigation consisted of a series of soft body impact load tests conducted on test specimens containing either 5/8" QuietRock®530 Type X gypsum panels or 5/8" QuietRock® ES Type X gypsum panels, manufactured by the client, PABCO® Gypsum. This report presents the results of that investigation and contains a description of the material evaluated and the procedures used.

The purpose of the tests was to determine the Soft Body Impact Classification Level of the gypsum panel products, as measured by the test method described in ASTM C1629 / C1629M – 15 Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels. Testing was conducted in accordance with "the test method described in ASTM C1629 / C1629M" – ASTM E695 Standard Method of Measuring Relative Resistance of Wall, Floor and Roof Construction to Impact Loading.

All tests were conducted on March 30, 2017 at the Structural Testing Laboratory of NGC Testing Services™ (NGCTS). Testing was conducted by the technical staff of NGCTS and was witnessed by representatives of PABCO® Gypsum (Rick Ladwig and Sunder Ram).

Test Specimens

Construction of all soft body impact test specimen assemblies, as detailed below, was performed on-site by NGCTS personnel on March 28, 2017. The gypsum panel products used in the construction of the test specimens were manufactured and provided by PABCO® Gypsum. All other materials used in the construction of the test specimen assemblies were provided by NGCTS.

Materials

The materials used in the construction of the test specimen assemblies are described below.

Nominal 2x4 Wood Framing – The wood framing consisted of nominal 2 by 4 in., SPF No. 2 grade wood studs that were supplied in 10 ft. lengths. NGCTS personnel cut the wood framing to desired lengths.

5/8" QuietRock® 530 Type X Gypsum Panel – The nominally 5/8 in. thick gypsum panels, identified as "QuietRock 530 TYPE-X", were manufactured on 01/11/2017 by PABCO® Gypsum. The gypsum panels were supplied in 4 ft. widths and 8 ft. lengths.

5/8" QuietRock® ES Type X Gypsum Panels – The nominally 5/8 in. thick gypsum panels, identified as "QuietRock ES", were manufactured on 03/30/2015 by PABCO® Gypsum. The gypsum panels were supplied in 4 ft. widths and 8 ft. lengths.

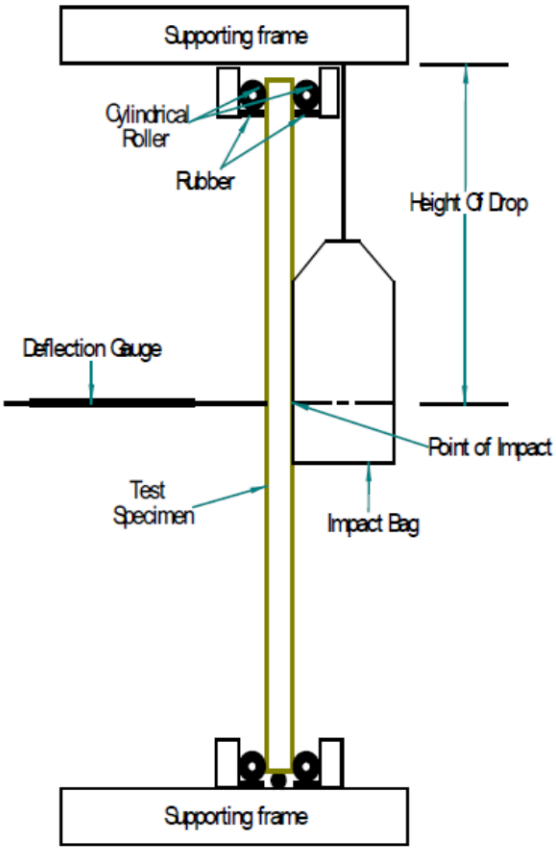
Fasteners – 3-1/2 in., smooth shank, 16d nails and #6 x 1-1/4 in. Type W bugle head drywall screws.

Construction

A total of three (3) nominal 4 ft. by 8 ft. test specimens were constructed by the technical staff of NGCTS. The framing for the test specimens consisted of nominal 2 by 4 in. wood studs and plates. The wood studs, spaced 16 in. on center, were placed between single top and bottom plates. At each stud and plate intersection, two 3-1/2 in., 16d nails were driven through the plates and into the ends of the studs. Two (2) of the test specimens had a single layer of the 5/8" QuietRock® 530 Type X panels directly applied, vertically, to the wood stud framing members. The third test specimen had a single layer of the 5/8" QuietRock® ES Type X panels directly applied, vertically, to the wood stud framing members. All of the gypsum panels were attached to the wood framing using 1-1/4 in. Type W bugle head drywall screws, spaced 12 in. on center in the field and perimeter.

Test Apparatus

The test apparatus utilized for testing was in compliance with ASTM E695 – 03 (2015) e1 Section 7 Apparatus for Wall Systems, Specimens Vertical and Figure 3. The apparatus consisted of a rigid supporting frame, support channels, cylindrical and supporting rollers, impact bag, moveable frame and various measuring devices. A general sketch of the test apparatus supporting frame and setup is provided below.



Impact Load Test Frame

The impact instrument, a steel shot-filled leather bag, was made in accordance to sections 6.2.1 – 6.2.6 of ASTM E695 – 03 (2015) e1. The steel shot, 2mm in diameter, was added to the impact instrument to achieve the desired weight for testing, and two layers of 3 in. thick foam rubber were placed on top of the shot, inside the leather bag, to prevent spillage during testing. The leather bag was housed in a moveable wooden frame for adjusting the impact height of the bag. The leather bag was supported via a 1/4 in. cable and allowed to act as a pendulum. A set of hinged doors hold the bag in place until a “trip chain” was pulled, opening the doors and allowing the bag to free-fall through an angular distance until the test specimen was impacted.

Test Procedure

Testing was conducted in accordance with the procedure outlined in Section 9 of ASTM E 695 – 03 (2015) e1, with modifications as described below.

The specimen was mounted vertically and positioned on a cylindrical roller to prevent transverse restraint. Supporting rollers at the top and bottom of the rigid supporting frame contacted the vertical surface of the frame and specimen with each roller resting horizontally on sponge rubber 16 ± 3 mm (5/8 ± 1/8 in.) thick to prevent longitudinal restraint.

The impact bag was supported in the moveable frame and raised to the initial drop height. All height measurements were measured, using a metal tape measure, from the point of impact of the center of gravity of the bag as it strikes the specimen to this same point when the bag is in the raised position. The bag was released by smoothly and swiftly opening the hinged doors of the moveable frame, causing the bag to swing as a true pendulum, thus eliminating wobbling.

As agreed upon by the client and NGCTS, each specimen was repeatedly impacted at a single point of impact in one cavity with the drop height being increased by 6 or 12 in. with each successive drop until structural failure, as defined per Section 3.2.2 of ASTM C1629 / C1629M – 15, was achieved. Following each impact any surface damage and/or deformation were recorded and the level of the impact energy applied was calculated. The residual deflection was measured from the face side of the specimen, using a solid straight edge and a digital micrometer.

Following structural failure in the initial cavity, the above procedure was repeated on an adjacent cavity, beginning with the drop height that caused structural failure in the initial cavity.

The level of energy required to cause the single impact penetration or excessive deformation was calculated to determine the soft body impact resistance. Tests were made on three specimens – two containing 5/8" QuietRock® 530 Type X gypsum panels, and one containing 5/8" QuietRock® ES Type X gypsum panels.

Performance Requirements

Abuse resistant panels are classified into one of three levels of abuse resistance based on minimum performance when tested in accordance with the test method that evaluates soft body impact (ASTM E695). Minimum requirements for each level are shown in the table below from ASTM C1629 / C1629M – 15.

Performance Requirements
Soft Body Impact Test

Classification Level	Soft Body Minimum ft-lbf [J]
1	90 [122]
2	195 [265]
3	300 [408]

Test Results and Conclusions

QuietRock®530

Soft body impact tests on the test specimen assemblies were conducted in accordance with the applicable test standard, on March 30, 2017. The resulting test data is provided in Appendix A of this report.

The test specimen assemblies were impacted as required by the soft body impact test method. Structural failure, as determined by section 3.2.2 of ASTM C1629 / C1629M – 15, was determined to occur at impact energy greater than 300 ft-lb. Based on the data obtained, the gypsum panel product met the minimum impact energy level of 300 ft-lb related to Classification Level 3.

The 5/8" QuietRock®530 Type X gypsum panel test assemblies, constructed, installed and tested as described in this test report, met the minimum performance requirements for Soft Body Impact Classification Level 3 per ASTM C1629 / C1629M – 15.

QuietRock® ES

Soft body impact tests on the test specimen assemblies were conducted in accordance with the applicable test standard, on March 30, 2017. The resulting test data is provided in Appendix A of this report.

The test specimen assemblies were impacted as required by the soft body impact test method. Structural failure, as determined by section 3.2.2 of ASTM C1629 / C1629M – 15, was determined to occur at impact energy greater than 90 ft-lb, but less than 135 ft-lb. Based on the data obtained, the gypsum panel product met the minimum impact energy level of 90 ft-lb related to Classification Level 1.

The 5/8" QuietRock® ES Type X gypsum panel test assemblies, constructed, installed and tested as described in this test report, met the minimum performance requirements for Soft Body Impact Classification Level 1 per ASTM C1629 / C1629M – 15.

APPENDIX A

Test Data Sheets

STRUCTURAL TESTING DATA

SOFT BODY IMPACT TEST
ASTM E695

TEST DATE	03/30/17	ASSIGNMENT NO.	J-161	TEST NO.	SB-1701-1
ENGINEER	-	TECHNICIAN(S)	SMA / RHB	TEMPERATURE	66 °F
CLIENT	PABCO Gypsum			HUMIDITY	49%

TEST ASSEMBLY DESCRIPTION	Single Layer of 5/8" QuietRock 530 Type X Gypsum Board
	Nominal 2x4 Wood Strud Framing, Spaced 16" OC

CONSTRUCTION DATE	03/28/17
SPECIMEN NO.	1
WEIGHT OF IMPACT BAG (lb)	90

BAG DROP HEIGHT (ft)	IMPACT ENERGY (ft-lb)	SPECIMEN DAMAGE / COMMENTS
(left cavity)		
1.0	90	No visible damage to board (front or back); Residual deflection = 0.059"
2.0	180	No visible damage to board (front or back); Residual deflection = 0.136"
3.0	270	Paper creased on front of board; Residual deflection = 0.199"
4.0	360	Board core cracked at stud line (Failure)
(right cavity)		
4.0	360	Paper creased near stud line; residual deflection = 0.106"

Failure Impact Energy, ft-lb	**> 360**

Notes: Failure impact energy was determined to be greater than 360 ft-lb. Data obtained indicates that this panel product meets/exceeds Soft Body Impact Classification Level 3 (impact energy ≥ 300 ft-lb).

STRUCTURAL TESTING DATA

SOFT BODY IMPACT TEST
ASTM E695

TEST DATE	03/30/17	ASSIGNMENT NO.	J-161	TEST NO.	SB-1701-2
ENGINEER	-	TECHNICIAN(S)	SMA / RHB	TEMPERATURE	66 °F
CLIENT	PABCO Gypsum			HUMIDITY	49%

TEST ASSEMBLY DESCRIPTION	Single Layer of 5/8" QuietRock 530 Type X Gypsum Board
	Nominal 2x4 Wood Strud Framing, Spaced 16" OC

CONSTRUCTION DATE	03/28/17
SPECIMEN NO.	2
WEIGHT OF IMPACT BAG (lb)	90

BAG DROP HEIGHT (ft)	IMPACT ENERGY (ft-lb)	SPECIMEN DAMAGE / COMMENTS
(left cavity)		
4.0	360	Board cracked / broke on backside (Failure); Residual deflection = 0.308"
(right cavity)		
3.3	300	Minor paper damage after impact; Residual deflection = 0.133"

Failure Impact Energy, ft-lb	**> 300**

Notes: Failure impact energy was determined to be greater than 300 ft-lb. Data obtained indicates that this panel product meets Soft Body Impact Classification Level 3 (impact energy ≥ 300 ft-lb).

STRUCTURAL TESTING DATA

SOFT BODY IMPACT TEST
ASTM E695

TEST DATE	03/30/17	ASSIGNMENT NO.	J-161	TEST NO.	SB-1701-3
ENGINEER	-	TECHNICIAN(S)	SMA / RHB	TEMPERATURE	67 °F
CLIENT	PABCO Gypsum			HUMIDITY	50%

TEST ASSEMBLY DESCRIPTION	Single Layer of 5/8" QuietRock ES Type X Gypsum Board Nominal 2x4 Wood Strud Framing, Spaced 16" OC
CONSTRUCTION DATE	03/28/17
SPECIMEN NO.	1
WEIGHT OF IMPACT BAG (lb)	90

BAG DROP HEIGHT (ft)	IMPACT ENERGY (ft-lb)	SPECIMEN DAMAGE / COMMENTS
(right cavity)		
1.0	90	Paper torn on front side; Residual deflection = 0.089"
1.5	135	Board core cracked at back side of panel (Failure)
(center cavity)		
1.5	135	Board core cracked at back side of panel (Failure)

Failure Impact Energy, ft-lb	**> 90**

Notes: Failure impact energy was determined to be greater than 90 ft-lb. Data obtained indicates that this panel product meets Soft Body Impact Classification Level 1 (impact energy ≥ 90 ft-lb).