



TEST REPORT

Report No.: F9182.01-201-44

Rendered to:

MG McGRATH, INC.
Maplewood, Minnesota

PRODUCT TYPE: Aluminum Composite Panels

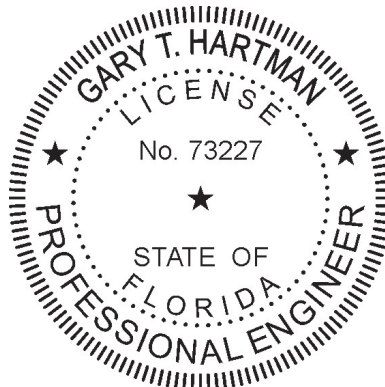
SERIES/MODEL: MG D-Set

This report contains in its entirety:

Cover Page: 1 page

Report Body: 11 pages

Drawing(s): 2 pages



Gary Hartman
Digitally Signed by: Gary Hartman

2017.11.16 17:58:12 -05'00'

Test Dates: 11/28/16

Through: 11/29/16

Report Date: 12/21/16

Report Revision Date: 11/13/17

Test Record Retention End Date: 11/29/20

1.0 Report Issued To: MG McGrath, Inc.
 1387 East Cope Avenue
 Maplewood, Minnesota 55109

2.0 Test Laboratory: Architectural Testing, Inc., an Intertek company ("Intertek-ATI")
 849 Western Avenue North
 St. Paul, Minnesota 55117
 651-636-3835

3.0 Project Summary:

3.1 Product Type: Aluminum Composite Panels

3.2 Series/Model: MG D-Set

3.3 Compliance Statement: Results obtained are tested values and were secured by using the designated test methods. The specimens tested met the performance requirements set forth in the referenced test procedures for a **±3840 Pa (±80.20 psf) Design Pressure** with missile impacts corresponding to **Missile Level D and Wind Zone 4**.

3.4 Test Dates: 11/28/16 – 11/29/16

3.5 Test Record Retention End Date: All test records for this report will be retained until November 29, 2020.

3.6 Test Location: Intertek-ATI test facility in St. Paul, Minnesota.

3.7 Test Specimen Source: The test specimens were provided by the client. Representative samples of the test specimens will be retained by Intertek-ATI for a minimum of four years from the test completion date.

3.8 Drawing Reference: The test specimen drawings have been reviewed by Intertek-ATI and are representative of the test specimens reported herein. Test specimen construction was verified by Intertek-ATI per the drawings located in Appendix A. Any deviations are documented herein or on the drawings.

3.9 List of Official Observers:

<u>Name</u>	<u>Company</u>
Katie Baldwin	MG McGrath, Inc.
Tony D. Gavin	Intertek-ATI
Steven V. Kenemer	Intertek-ATI
Karl A. Lips	Intertek-ATI
Eric J. Schoenthaler	Intertek-ATI

4.0 Test Specifications:

ASTM E330/E330M-14, *Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference*

ASTM E1886-13a, *Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials*

ASTM E1996-14a, *Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes*

5.0 Test Specimen Description:

5.1 Product Sizes:

Overall Area: 8.8 m ² (95.1 ft ²)	Width		Height	
	millimeters	inches	millimeters	inches
Overall size	2972	117	2972	117
Individual panel size (one)	2026	79-3/4	921	36-1/4
Individual panel size (one)	921	36-1/4	921	36-1/4
Individual panel sizes (two)	2026	79-3/4	991	39
Individual panel sizes (two)	921	36-1/4	991	39

5.2 Wall System: The wall system consisted 16 gauge galvanized steel horizontal hat channels mechanically fastened into the steel studs with two #12 x 3/4" tek screws at each stud location spaced 39-1/2" on center. A 16 gauge galvanized steel vertical hat channel was mechanically fastened into the horizontal hat channels with two #12 x 3/4" tek screws at each horizontal hat channel location spaced 36-3/4" from the right side of the mockup. Six composite panels that measured 4 mm (0.157") thick constructed with a 0.117" thick plastic core and 0.020" thick aluminum interior and exterior skins, adhered to the plastic core. Larger panels were reinforced with six aluminum extrusions secured with VHB tape. Smaller panels were reinforced with two aluminum extrusions secured with VHB tape. Two 90° bends were utilized on the sides of the panel with a 1" return leg. One 90° bend was utilized on the top and bottom of the panel with a 1" return leg. An aluminum extrusion (B-clip) was secured to the bottom panel return and secured with a continuous strip of 1" x 0.090" VHB tape by 3M. An aluminum extrusion (T-clip) was secured to the top panel return with a continuous strip of 1" x 0.090" VHB tape by 3M.

5.0 Test Specimen Description: (Continued)

5.2 Wall System: (Continued):

An aluminum extrusion (J clip) was secured to the bottom hat channel with #12 x 3/4" screws. Bottom panels were set into the J-clip and secured through the top T-clip with #12 x 3/4" screws. This pattern continued until the paneling was completed. An aluminum extrusion (W-clip) was secured vertically to the horizontal hat channels with two #12 x 3/4" screws and an aluminum composite filler strip that slid into the W-clip behind the panels.

5.3 Test Wall Construction: The test wall was constructed of 16 gauge, 6" galvanized steel studs. The steel studs were spaced 16" on center inside a 2x10 wood buck. The wall panel system was installed directly onto the studs in a manner consistent with normal construction procedures for the system. The exterior of the test unit was sealed to the wood buck with silicone.

5.4 Installation: Installation of the tested product was performed by the client. The panels were installed in a left to right order. The panel wall assembly sides and top were covered with corner trim.

6.0 Test Results: The temperature during testing was 20°C (68°F). The results are tabulated as follows:

Title of Test	Results	Note
Uniform Load Deflection, per ASTM E330 Deflections taken at midspan of middle left panel +3840 Pa (+80.20 psf) -3840 Pa (-80.20 psf)	26.4 mm (1.04") 6.10 mm (0.24")	1, 2
Uniform Load Structural, per ASTM E330 Permanent sets taken at midspan of middle left panel +5760 Pa (+120.30 psf) -5760 Pa (-120.30 psf)	1.5 mm (0.06") <0.3 mm (<0.01")	1, 2

Note 1: Loads were held for 10 seconds.

Note 2: Tape and film were used to seal against air leakage during structural testing. In our opinion, the tape and film did not influence the results of the test.

6.0 Test Results: (Continued)

ASTM E1886, Large Missile Impact

Conditioning Temperature: 20°C (68°F)

Missile Weight: 4128 g (9.1 lbs)

Missile Length: 2502 mm (98-1/2")

Muzzle Distance from Test Specimen: 5.2 m (17' 0")

Test Unit #1: Orientation within $\pm 5^\circ$ of horizontal

Impact #1: Missile Velocity: 15.4 m/s (50.4 fps)	
Impact Area:	Center of middle right panel
Observations:	Missile hit target area; dented panel, no penetration
Results:	Pass

Impact #2: Missile Velocity: 15.3 m/s (50.1 fps)	
Impact Area:	Lower left corner of middle right panel
Observations:	Missile hit target area; dented panel, tear in panel. No penetration with 76 mm (3") sphere
Results:	Pass

Impact #3: Missile Velocity: 15.4 m/s (50.5 fps)	
Impact Area:	Lower right corner of middle left panel
Observations:	Missile hit target area; dented panel, tear in panel. No penetration with 76 mm (3") sphere
Results:	Pass

Impact #4: Missile Velocity: 15.4 m/s (50.4 fps)	
Impact Area:	Vertical centerline, 1295 mm (51") from left edge of middle left panel
Observations:	Missile hit target area; dented panel, no penetration
Results:	Pass

Impact #5: Missile Velocity: 15.4 m/s (50.5 fps)	
Impact Area:	Centerline of the seam between the lower left panel and the middle left panel
Observations:	Missile hit target area; dented panel, no penetration
Results:	Pass

6.0 Test Results: (Continued)

ASTM E1886, Large Missile Impact

Conditioning Temperature: 20°C (68°F)

Missile Weight: 4128 g (9.1 lbs)

Missile Length: 2502 mm (98-1/2")

Muzzle Distance from Test Specimen: 5.2 m (17' 0")

Test Unit #2: Orientation within $\pm 5^\circ$ of horizontal

Impact #1: Missile Velocity: 15.5 m/s (51.0 fps)	
Impact Area:	Upper left corner of middle right panel
Observations:	Missile hit target area; dented panel, no penetration
Results:	Pass

Impact #2: Missile Velocity: 15.3 m/s (50.3 fps)	
Impact Area:	Center of middle right panel
Observations:	Missile hit target area; dented panel, no penetration
Results:	Pass

Impact #3: Missile Velocity: 15.3 m/s (50.3 fps)	
Impact Area:	Vertical centerline, 1295 mm (51") from left edge of middle left panel
Observations:	Missile hit target area; dented panel, no penetration
Results:	Pass

Impact #4: Missile Velocity: 15.4 m/s (50.6 fps)	
Impact Area:	Upper right corner of middle left panel
Observations:	Missile hit target area; dented panel, no penetration
Results:	Pass

Impact #5: Missile Velocity: 15.4 m/s (50.5 fps)	
Impact Area:	Centerline of the seam between the upper left panel and the middle left panel
Observations:	Missile hit target area; dented panel, no penetration
Results:	Pass

6.0 Test Results: (Continued)

ASTM E1886, Large Missile Impact

Conditioning Temperature: 20°C (68°F)

Missile Weight: 4128 g (9.1 lbs)

Missile Length: 2502 mm (98-1/2")

Muzzle Distance from Test Specimen: 5.2 m (17' 0")

Test Unit #3: Orientation within $\pm 5^\circ$ of horizontal

Impact #1: Missile Velocity: 15.3 m/s (50.2 fps)	
Impact Area:	Upper right corner of middle right panel
Observations:	Missile hit target area; dented panel, no penetration
Results:	Pass

Impact #2: Missile Velocity: 15.4 m/s (50.6 fps)	
Impact Area:	Center of middle right panel
Observations:	Missile hit target area; dented panel, no penetration
Results:	Pass

Impact #3: Missile Velocity: 15.1 m/s (49.6 fps)	
Impact Area:	Vertical centerline, 1295 mm (51") from left edge of middle left panel
Observations:	Missile hit target area; dented panel, no penetration
Results:	Pass

Impact #4: Missile Velocity: 15.4 m/s (50.4 fps)	
Impact Area:	Lower left corner of middle left panel
Observations:	Missile hit target area; dented panel, no penetration
Results:	Pass

Impact #5: Missile Velocity: 15.3 m/s (50.1 fps)	
Impact Area:	Centerline of the seam between the lower left panel and the middle left panel
Observations:	Missile hit target area; dented panel, no penetration
Results:	Pass

6.0 Test Results: (Continued)

ASTM E1886, Air Pressure Cycling

Test Unit #1

Design Pressure: ± 3840 Pa (± 80.20 psf)

POSITIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Observations
770 to 1920 (16.0 to 40.0)	3500	2.37	No penetrations
0 to 2300 (0 to 48.0)	300	3.25	No penetrations
1920 to 3070 (40.0 to 64.0)	600	2.06	No penetrations
1150 to 3840 (24.0 to 80.0)	100	3.45	No penetrations

NEGATIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Observations
1150 to 3840 (24.0 to 80.0)	50	3.07	No penetrations
1920 to 3070 (40.0 to 64.0)	1050	1.87	No penetrations
0 to 2300 (0 to 48.0)	50	3.04	No penetrations
770 to 1920 (16.0 to 40.0)	3350	2.19	No penetrations

Result: Pass

6.0 Test Results: (Continued)

ASTM E1886, Air Pressure Cycling

Test Unit #2

Design Pressure: ± 3840 Pa (± 80.20 psf)

POSITIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Observations
770 to 1920 (16.0 to 40.0)	3500	2.50	No penetrations
0 to 2300 (0 to 48.0)	300	3.10	No penetrations
1920 to 3070 (40.0 to 64.0)	600	1.30	No penetrations
1150 to 3840 (24.0 to 80.0)	100	2.30	No penetrations

NEGATIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Observations
1150 to 3840 (24.0 to 80.0)	50	2.60	No penetrations
1920 to 3070 (40.0 to 64.0)	1050	3.30	No penetrations
0 to 2300 (0 to 48.0)	50	3.40	No penetrations
770 to 1920 (16.0 to 40.0)	3350	2.90	No penetrations

Result: Pass

Note: Test Specimens #2 and #3 were cycled in a common chamber.

6.0 Test Results: (Continued)

ASTM E1886, Air Pressure Cycling

Test Unit #3

Design Pressure: ± 3840 Pa (± 80.20 psf)

POSITIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Observations
770 to 1920 (16.0 to 40.0)	3500	2.50	No penetrations
0 to 2300 (0 to 48.0)	300	3.10	No penetrations
1920 to 3070 (40.0 to 64.0)	600	1.30	No penetrations
1150 to 3840 (24.0 to 80.0)	100	2.30	No penetrations

NEGATIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Observations
1150 to 3840 (24.0 to 80.0)	50	2.60	No penetrations
1920 to 3070 (40.0 to 64.0)	1050	3.30	No penetrations
0 to 2300 (0 to 48.0)	50	3.40	No penetrations
770 to 1920 (16.0 to 40.0)	3350	2.90	No penetrations

Result: Pass

Note: Test Specimens #2 and #3 were cycled in a common chamber.

General Note: Upon completion of testing, the specimens met the requirements of Section 7 of ASTM E1996.

7.0 Test Equipment:

Cannon: Constructed from steel piping utilizing compressed air to propel the missile

Missile: 2x4 Southern Pine

Timing Device: Electronic Beam Type

Cycling Mechanism: Computer controlled centrifugal blower with electronic pressure measuring device

Deflection Measuring Device: Linear transducers

Tape and film were used to seal against air leakage during structural testing. In our opinion, the tape and film did not influence the results of the test.

Intertek-ATI will service this report for the entire test record retention period. Test records such as detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation, will be retained by Intertek-ATI for the entire test record retention period.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimens tested. This report may not be reproduced, except in full, without the written approval of Intertek-ATI.

For ARCHITECTURAL TESTING, INC.:



Digitally Signed by: Eric Schoenthaler

Eric J. Schoenthaler
Project Manager

EJS/wmr



Digitally Signed by: Gary Hartman

Gary T. Hartman, P.E.
Laboratory Support Engineer

Attachments (pages): This report is complete only when all attachments listed are included.
Appendix A: Drawings (2)

Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
0	12/21/16	N/A	Original report issue.
1	07/27/17	Cover, 11	Included PE seal and signature.
2	11/13/17	Appendix-A	Revised drawing to show proper anchor spacing.

Appendix A

Drawings

PANEL MOCKUPS

METAL PANEL

SHOP DRAWINGS

ABBREVIATIONS	
ALUM.	ALUMINUM
AMG	AMG ARCHITECTURAL GLASS AND GLAZING
APPROX.	APPROXIMATELY
ARCH.	ARCHITECT
B.M.	BRAKE METAL
C.L. OR C	CENTERLINE
CONT.	CONTINUOUS
DIA.	DIAMETER
D.L.	DEAD LOAD
D.L.O.	DAYLIGHT OPENING
D.O.	DOOR OPENING
F.S.	FRAME SIZE
F.V.	FIELD VERIFY
G.S.	GLASS SIZE
GYP.	GYPSUM BOARD
HORIZ.	HORIZONTAL
I.D.	INSIDE DIAMETER
MAX.	MAXIMUM
MGM	M.G. McGRATH, INC.
MIN.	MINIMUM
N.B. AMG	NOT BY AMG
N.I.C.	NOT IN CONTRACT
N.T.S.	NOT TO SCALE
O.A.	OVERALL
O.C.	ON CENTER
O.D.	OUTSIDE DIAMETER
O.H.	OPPOSITE HAND
OPP.	OPPOSITE
PERF.	PERFORATED / PERFORATION
P.S.	PANEL SIZE
PTD.	PAINTED
REF.	REFERENCE
REQ'D	REQUIRED
R.O.	ROUGH OPENING
SIM.	SIMILAR
S.J.	SPLICE JOINT
S.P.	SPLICE PLATE
T.B.D.	TO BE DETERMINED
T.O.	TOP OF
T.O.P.	TOP OF PANEL
TYP.	TYPICAL
U.N.O.	UNLESS NOTED OTHERWISE
V.B.A.	VERIFY BY ARCHITECT
VERT.	VERTICAL
V.I.F.	VERIFY IN FIELD
W.P.	WORK POINT

PROJECT NOTES

THESE DRAWINGS HAVE BEEN PREPARED PER THE ARCHITECTURAL PLANS AND SPECIFICATIONS
M. G. McGRATH, INC. ASSUMES NO RESPONSIBILITY FOR ERRORS RESULTING FROM THE USE OF
HARD COPY DOCUMENTS AND NOTED DIMENSIONS TAKE PRECEDENCE OVER ELECTRONIC DOCUMENTS.

- M. G. McGRATH, INC. IS NOT RESPONSIBLE FOR DIMENSIONS DETERMINED BY SCALING THESE DRAWINGS.
HARD COPY DOCUMENTS AND NOTED DIMENSIONS TAKE PRECEDENCE OVER ELECTRONIC DOCUMENTS.

- REQUEST IS HEREBY MADE FOR ANY DEVIATIONS TO THE PLANS AND SPECIFICATIONS AS HEREIN
SHOWN. APPROVAL BY THE ARCHITECT SHALL CONSTITUTE ACCEPTANCE OF ANY DEVIATIONS SHOWN.

- PRECAUTIONS MUST BE MADE FOR MATERIAL FINISHES, TO PREVENT STAINING AND / OR SCRATCHES
WHICH DAMAGE THE FINISH, RESULTING FROM BUT NO LIMITED TO: WET CARDBOARD, ALKALIS AND SAND
FROM CONCRETE, STUCCO FINISH, PLASTER OR WELDING PRODUCTS. SUCH AN OCCURRENCE SHALL NOT
BE THE RESPONSIBILITY OF M. G. McGRATH, INC.

- M. G. McGRATH, INC. HAS NO RESPONSIBILITY FOR LATENT DEFECTS OF OTHERS.

NOTE:
M.G. McGRATH TO FIELD VERIFY
ALL DIMENSIONS & CONDITIONS



Test sample complies with these details.
Deviations are noted.

Report# F9182
Date 6-1-17 Tech W

MGM D-SET PANEL	
- MATERIAL SUPPLIER - M.G. McGRATH, INC. - MATERIAL MANUFACTURER - M.G. McGRATH, INC. - MATERIAL INSTALLER - M.G. McGRATH, INC. - MATERIAL TYPE - 4mm COMPOSITE MATERIAL D-SET - AVB TYPE - GRACE PERM-A-BARRIER - FURRING - 16 GA. $\frac{7}{8}$ HAT CHANNEL - SUBFRAMING - 16 GA. 2"X6" COLD FORM STUDS FRAMING	
MGM FLUSH SEAM PANEL	
- MATERIAL SUPPLIER - M.G. McGRATH, INC. - MATERIAL MANUFACTURER - M.G. McGRATH, INC. - MATERIAL INSTALLER - M.G. McGRATH, INC. - MATERIAL TYPE - 22 GA. MGM F-SEAM - AVB TYPE - GRACE PERM-A-BARRIER - FURRING - 16 GA. $\frac{7}{8}$ HAT CHANNEL - SUBFRAMING - 16 GA. 2"X6" COLD FORM STUDS FRAMING	
MGM HOOK SEAM PANEL	
- MATERIAL SUPPLIER - M.G. McGRATH, INC. - MATERIAL MANUFACTURER - M.G. McGRATH, INC. - MATERIAL INSTALLER - M.G. McGRATH, INC. - MATERIAL TYPE - 22 GA. MGM H-SEAM - AVB TYPE - GRACE PERM-A-BARRIER - FURRING - 16 GA. $\frac{7}{8}$ HAT CHANNEL - SUBFRAMING - 16 GA. 2"X6" COLD STUDS FORM FRAMING	

M. G. McGrath, Inc.
1387 East Cope Avenue
Maplewood, MN 55109
(651)704-0300
Fax(651)704-9989


MGM McGrath
ARCHITECTURAL SURFACES

GENERAL NOTES

DO NOT SCALE DRAWINGS. FIELDED DIMENSIONS ARE TO BE FOLLOWED.
FIELD TEST DRAWINGS IN CONNECTION WITH GENERAL ARCHITECTURAL
PLANS, STRUCTURAL PLANS, AND OTHER RELATED DRAWINGS.
THESE DOCUMENTS CONTAIN INFORMATION OF
M. G. McGRATH, INC. WHICH IS PROPRIETARY AND SHALL
NOT BE USED FOR ANY OTHER PURPOSE.

REVISIONS			
NO.	DATE	REVISED	DATE

PROJECT INFORMATION:

PROJECT TITLE:

SECTION #:

ARCHITECT:

GENERAL CONTRACTOR:

ENGINEERING CONSULTANT:

PROJECT MANAGER:

PROJECT ESTIMATOR:

PROJECT SUPERINTENDENT:

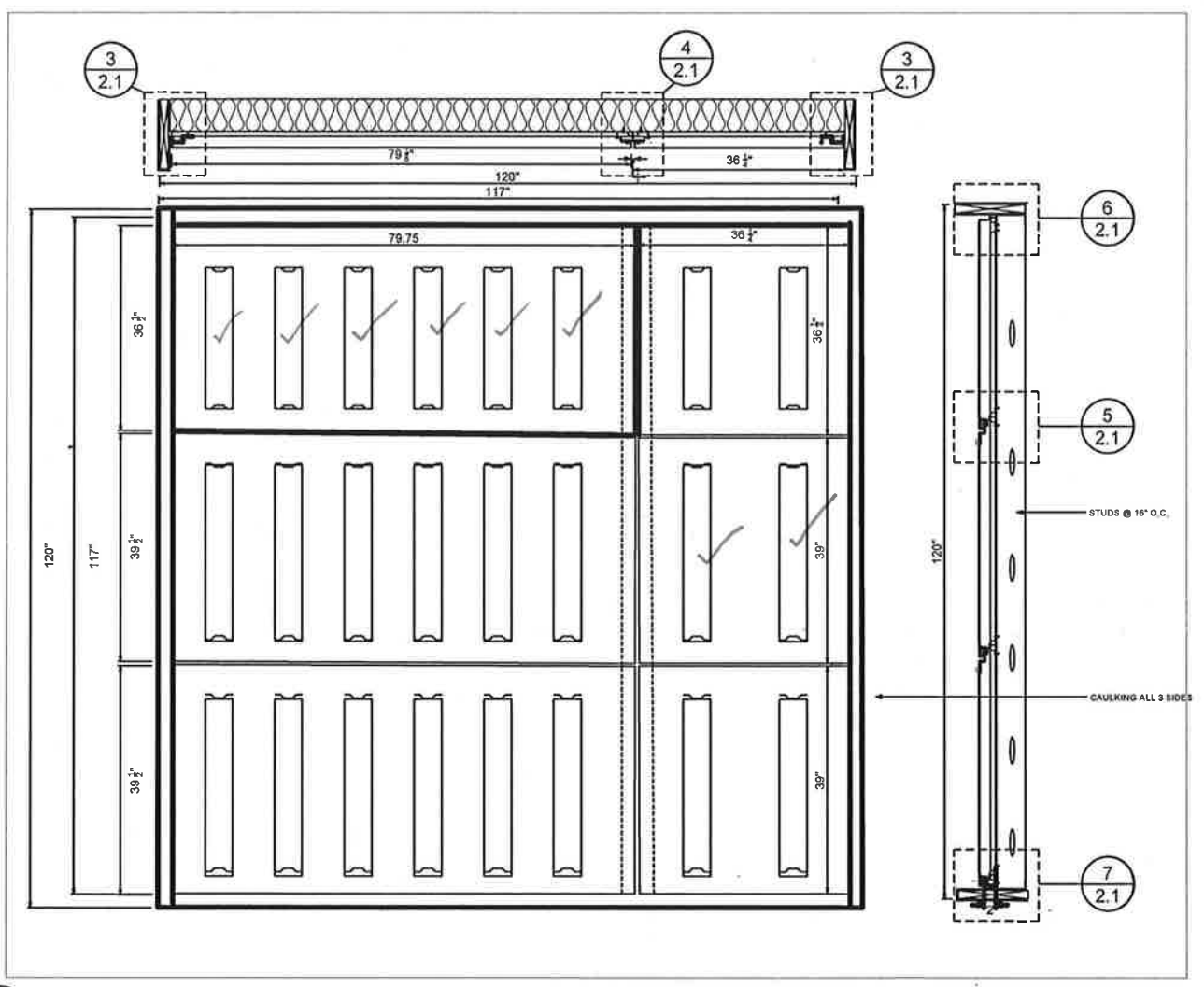
DRAWING INFORMATION:

DRAWING TITLE:

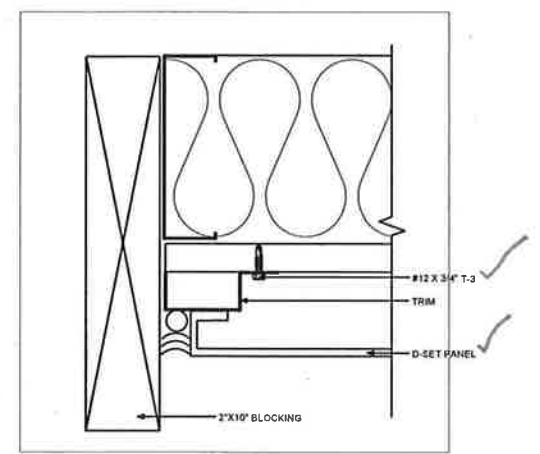
PANEL SYSTEMS

SUBMITTAL DATE:	05/22/17 11:44am
DRAWN BY:	MB
PROJECT NUMBER:	SHEET NUMBER

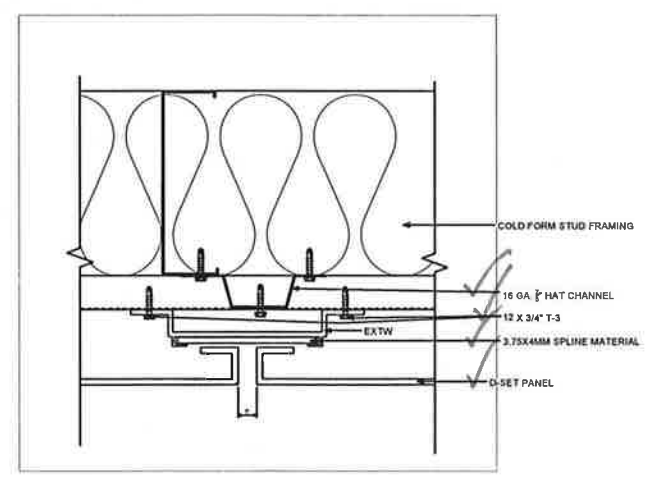
1.1



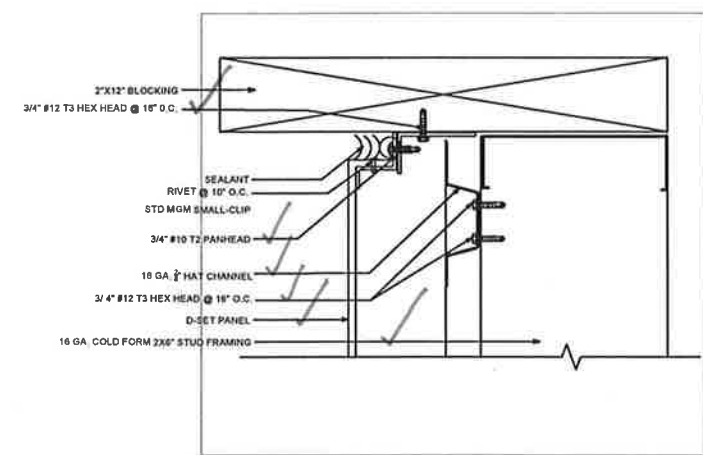
1 D-SET ELEVATION
1" = 1'-0"



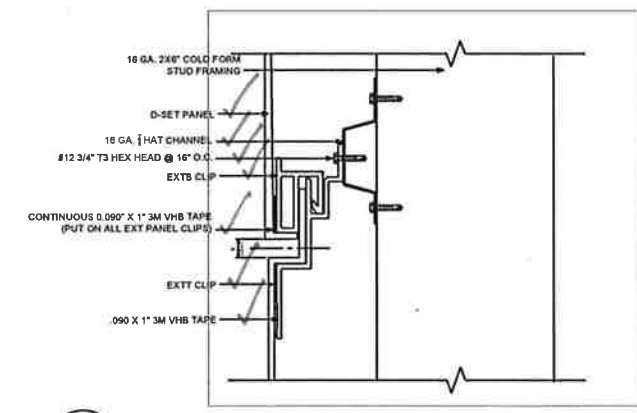
3 D-SET PLAN EDGE DETAIL
6" = 1'-0"



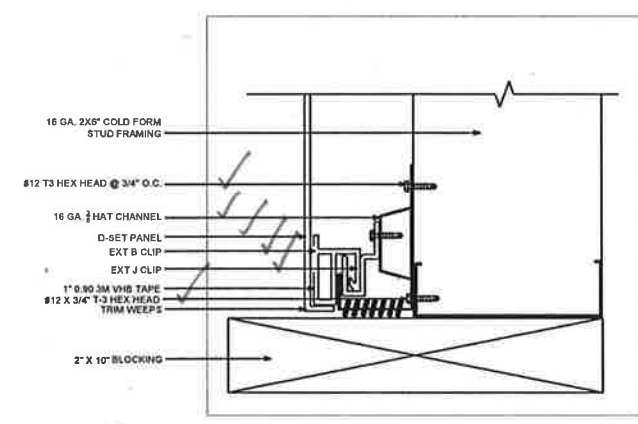
4 D-SET PLAN JOINT
6" = 1'-0"



6 D-SET SECTION TOP
6" = 1'-0"



5 D-SET SECTION JOINT
6" = 1'-0"



7 D-SET SECTION SILL
6" = 1'-0"

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# F9182

Date 11-13-17 Tech 1D

M. G. McGrath, Inc.
1387 East Cope Avenue
Maplewood, MN 55109
(651)704-0300
Fax(651)704-9989

GENERAL NOTES

DO NOT SCALE DRAWINGS. DIMENSIONS ARE TO BE FOLLOWED.
UNLESS OTHERWISE NOTED, ALL DIMENSIONS ARE TO FACE UNLESS NOTED OTHERWISE.
ALL DIMENSIONS ARE TO FACE UNLESS NOTED OTHERWISE.
ALL DIMENSIONS ARE TO FACE UNLESS NOTED OTHERWISE.

REVISIONS

NO.	DATE	REVISION	BY	CHKD
1	10/4/17	fastener spacing	JD	

PROJECT INFORMATION:

PROJECT TITLE:

SECTION #:

ARCHITECT:

GENERAL CONTRACTOR:

ENGINEERING CONSULTANT:

PROJECT MANAGER:

PROJECT ESTIMATOR:

PROJECT SUPERINTENDENT:

DRAWING INFORMATION:

DRAWING TITLE:

PANEL SYSTEMS

DATE: 10/05/17	SCALE: 10:5
DESIGNED BY: JMB	APPROVED BY:
PROJECT NUMBER:	SHEET NUMBER: 2.1