

TEST REPORT

Report No.: D0162.02-201-44

Rendered to:

TFC – A DIVISION OF CENTURION INDUSTRIES, INC.
Garrett, Indiana

PRODUCT TYPE: Pressure Equalized Rainscreen
SERIES/MODEL: 4 mm Composite Panel System

AAMA 509-09, *Voluntary Test and Classification Method for Drained and Back
Ventilated Rain Screen Wall Cladding Systems.*

Classification: V1/W1

Reference must be made to Report No. D0162.02-201-44, dated 08/29/13 for complete test specimen description and detailed test results.

1.0 Report Issued To: TFC – A Division of Centurion Industries, Inc.
1107 North Taylor Road
Garrett, Indiana 46738

2.0 Test Laboratory: Architectural Testing, Inc.
849 Western Ave. North
St. Paul, Minnesota 55117
651-636-3835

3.0 Project Summary:

3.1 Product Type: Pressure Equalized Rainscreen

3.2 Series/Model: 4 mm Composite Panel System

3.3 Compliance Statement: Results obtained are tested values and were secured by using the designated test methods. Test specimen description and results are reported herein.

3.4 Test Dates: 08/14/2013 - 08/16/2013

3.5 Test Record Retention End Date: All test records for this report will be retained until August 29, 2017.

3.6 Test Location: Architectural Testing, Inc. test facility in St. Paul, Minnesota.

3.7 Test Sample Source: The test specimen was provided by the client. Representative samples of the test specimen will be retained by Architectural Testing for a minimum of four years from the test completion date.

3.8 Drawing Reference: The test specimen drawings have been reviewed by Architectural Testing and are representative of the test specimen reported herein. Test specimen construction was verified by Architectural Testing 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>
Karl Lips-Eakins	Architectural Testing, Inc.

4.0 Test Methods:

AAMA 509-09, *Voluntary Test and Classification Method for Drained and Back Ventilated Rain Screen Wall Cladding Systems.*

ASTM E 283-04, *Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.* Testing was conducted at 75 Pa (1.57 psf) positive static air pressure difference.

Air Flow Analysis: Testing was conducted at 75 Pa (1.57 psf) positive static air pressure difference to verify "defective" air-water barrier. Testing was conducted at 26 Pa (0.55 psf) positive static air pressure difference to establish the air flow capabilities of the exterior cladding system. Each condition; head, jamb, sill, intermediate vertical and intermediate horizontal were tested by taking the air flow readings of each element to better understand the system's ability to allow for ventilation and the potential for drying.

ASTM E 331-00, *Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform Static Air Pressure Difference.* Testing was conducted at both 300 Pa (6.24 psf) and 575 Pa (12.0 psf) positive static air pressure difference for a 15 minute duration. Water was applied to the mock-up at a minimum rate of 5 gal/hr/ft².

AAMA 501.1-05, *Standard Test Method for Water Penetration of Windows, Curtain Walls, and Doors Using Dynamic Pressure.* Testing was conducted with a dynamic pressure equivalent of both 300 Pa (6.24 psf) and 575 Pa (12.0 psf) for a 15 minute duration. Water was applied to the mock-up at a minimum rate of 5 gal/hr/ft².

5.0 Test Specimen Description:

5.1 Product Sizes:

Overall Area: 6.1 m ² (66.2 ft ²)	Width		Height	
	millimeters	inches	millimeters	inches
Overall size	2470	97-1/4	2489	98
Panel size (x4)	1225	48-1/4	1212	47-3/4

5.0 Test Specimen Description: (Continued)

5.2 Joint Sizes:

Joint Location	Width		Height	
	millimeters	inches	millimeters	inches
Head joint	2470	97-1/4	3	1/8
Sill joint	2470	97-1/4	19	3/4
Horizontal joint	2470	97-1/4	13	1/2
Vertical joint	2489	98	16	5/8

5.3 Rain Screen Panel Construction: The wall system consisted of four composite panels that measured 4 mm (0.158") thick. The panels were constructed with a 0.118" thick plastic core and 0.020" thick aluminum interior and exterior skins, adhered to the plastic core. One 90° bend was utilized on all four sides of the panel with a 3/4" return leg. An aluminum extrusion was secured to the interior perimeter of the panel and secured with #6 x 1" screws. Extrusion corners were mitered and joined with a 4" x 4" piece of composite material. Horizontal joints, in the mid-field of the wall system, utilized a bent aluminum flashing to divert water towards the panel. The panels had 1/8" dia. weep holes along the bottom return leg spaced 6" from corners and mid-span.

3" long "F" shaped aluminum extrusions were utilized to secure the panels to the base wall, 2 per side, by fitting into the panel edge and screwed onto studs/sheathing with a #12 x 2" hex head screw. The perimeter of the wall system utilized an "L" shaped aluminum flashing. The intermediate joints of the wall panel system utilized an aluminum composite filler strip that slid into the panel backer extrusion.

5.4 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 stud wall was covered with 1/8" thick clear lexan, sealed and secured to the exterior of the wall to simulate an air/water barrier. A formed aluminum gutter was installed at the base of the acrylic sheet for the purpose of collecting, draining, and measuring the water that contacted the air/water barrier. The wall panel system was installed onto the clear polycarbonate in a manner consistent with normal construction procedures for the system.

6.0 Test Procedure:

Prior to installation of the test specimen, a chamber tare reading was taken to establish the air flow through the buck/chamber arrangement. The clear polycarbonate was calibrated to a pre-determined air leakage rate by drilling 1/8" diameter holes on the backside in a uniform pattern, making sure to create an even pressure drop and leakage rate across the wall and in each quadrant. The test specimen was installed and an air infiltration reading was taken, subtracting the initial tare and air leakage established through the defect holes to obtain a net air infiltration reading through the cladding assembly.

Upon completion of the initial air measurements through the specimen, the system was prepared to determine air flow through the cladding elements. Each joint (head, jambs, sill, intermediate horizontal(s), and intermediate vertical) was temporarily sealed using foam blocks and tape as required. A tare reading was performed and each joint was subsequently tested to determine the air flow through each of the various joinery elements.

After air flow testing, water penetration testing was initiated. For the water penetration test, the tape was removed from all but the jamb joinery. This process provides for the determination of water penetration through the designed rain screen cladding elements; less the jamb conditions; which were intentionally omitted from the test results as they are considered non-standard conditions. For the purpose of this test, water penetration is considered to be any water that makes contact with the AWB and is either collected in the gutter at the sill, or penetrates the purposely designed defects that were drilled in the AWB. The water was collected, measured by weight, and then converted to a unit of volume in order to draw comparisons between the various pressure levels tested.

After the completion of the water testing protocol, the specimen was allowed to sit for several hours at test lab interior ambient conditions. The specimen was later evaluated to determine the amount of residual water that may have remained on the AWB and/or back of the specimen. The purpose of this was to achieve an understanding of the drying capability of the system.

7.0 Test Results: The temperature during testing was 26°C (78°F). The results are tabulated as follows:

Air Leakage (Infiltration per ASTM E 283) (Initial Tare)

Pressure	Results	Allowed	Note
75 Pa (1.57 psf)	1.1 L/s (2.23 cfm)	Report Only	1
	0.15 L/s/m ² (0.03 cfm/ft ²)		

Air Leakage (Infiltration per ASTM E 283) (with Defects)

Pressure	Results	Allowed	Note
75 Pa (1.57 psf)	3.5 L/s (7.39 cfm)	Report Only	1
	0.60 L/s/m ² (0.12 cfm/ft ²)		1, 2

Air Leakage (Infiltration per ASTM E 283) (Total with Cladding)

Pressure	Results	Allowed	Note
75 Pa (1.57 psf)	3.5 L/s (7.39 cfm)	Report Only	1
	0.60 L/s/m ² (0.12 cfm/ft ²)		1, 3

Note #1: The calibrated air leakage was achieved by drilling twelve 1/8" diameter holes through the polycarbonate. These holes represent purposely designed defects in the AWB.

Note #2: Result includes initial wall tare and defects which resulted in a leakage of 0.6 L/s/m² (0.12 csm/ft²).

Note #3: Result includes initial tare, 0.6 L/s/m² (0.12 cfm/ft²) of purposely imposed defects and added leakage from wall system installation.

8.0 Test Results For System Classification: The data compiled during testing for classification purposes is recorded in Tables #1 and #2.

Air Leakage (Infiltration per ASTM E 283) (Air Flow Across Cladding)

Pressure	Results	Allowed
26 Pa (0.55 psf)	See Table 1	Report Only

TABLE #1

Test Results - Air Flow Measurement Across The Cladding Elements

Data	Head	Sill	Horizontal	Vertical	Sum L/s (cfm) ⁽³⁾	L/s/m ² (cfm/ft ²) ⁽⁴⁾
L/s (cfm) ⁽¹⁾	7.52 (15.93)	0.99 (2.09)	1.57 (3.33)	2.10 (4.44)	12.18 (25.79)	1.95 (0.39)
L/s/m (cfm/ft) ⁽²⁾	10.84 (1.97)	1.43 (0.26)	2.26 (0.41)	3.03 (0.55)	Not Required	Not Required

⁽¹⁾Data for each element (1) head/sill/horizontal(s)/vertical(s) and expressed as L/s (cfm).

⁽²⁾L/s (cfm) per lineal ft. of each element - head/sill/horizontal(s)/vertical(s) and expressed as L/s/m (cfm/ft).

⁽³⁾The sum the total L/s (cfm) from all of the elements.

⁽⁴⁾The sum total of (3) divided by the square footage and expressed as L/s/m² (cfm/ft²). Used for classification purposes to determine the V-axis (See Charts).

Ventilation Classification: V1

8.0 Test Results For System Classification: (Continued)

Static Water Penetration (per ASTM E 331)

Pressure	Results	Allowed
300 Pa (6.24 psf)	See Table 2	Report Only
575 Pa (12.0 psf)		

Dynamic Water Penetration (per AAMA 501.1)

Pressure	Results	Allowed
300 Pa (6.24 psf)	See Table 2	Report Only
575 Pa (12.0 psf)		

TABLE #2							
Test Results - Water Collected Off/Through the AWB							
Data	300 Pa (6.24 psf) static	577 Pa (12 psf) static	300 Pa (6.24 psf) dynamic	577 Pa (12 psf) dynamic	TTL ml (oz.) ⁽³⁾	Sum ml/m ² (oz/ft ²) ⁽⁴⁾	Avg. ml/m ² (oz/ft ²) ⁽⁵⁾
Liquid ml (oz) ⁽¹⁾	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	3.9 (0.13)	3.9 (0.13)	Not Required	Not Required
ml/m ² (oz/ft ²) ⁽²⁾	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	<0.01 (<0.01)	Not Required	<0.01 (<0.01)	<0.01 (<0.01)
⁽¹⁾ Results of each water test, expressed as liquid ml (oz).							
⁽²⁾ Results of each individual test is divided by the square footage of the specimen and expressed as ml/m ² (oz/ft ²).							
⁽³⁾ Sum the results of the four water tests from ⁽¹⁾ and express as total ml (oz).							
⁽⁴⁾ The sum per m ² (ft ²) of specimen area.							
⁽⁵⁾ The average ml/m ² (oz/ft ²) for all four tests. Used for classification purposes to determine the W-axis (See Charts).							

Note: Water contacted the Lexan after splashing off of the intermediate horizontal members.

Water Penetration Classification: W1

9.0 Test Results: Optional Performance

Uniform Load Deflection (per ASTM E 330)

Pressure	Results	Allowed	Note
taken on panel edge +2880 Pa (+60.0 psf) -2880 Pa (-60.0 psf)	3.8 mm (0.15") 0.3 mm (0.01")	Report Only	4, 5

Uniform Load Structural (per ASTM E 330)

Pressure	Results	Allowed	Note
taken on panel edge +2880 Pa (+60.0 psf) -2880 Pa (-60.0 psf)	<0.3 mm (<0.01") <0.3 mm (<0.01")	Report Only	4, 5

Air Leakage (Infiltration per ASTM E 283) (Total with Cladding)

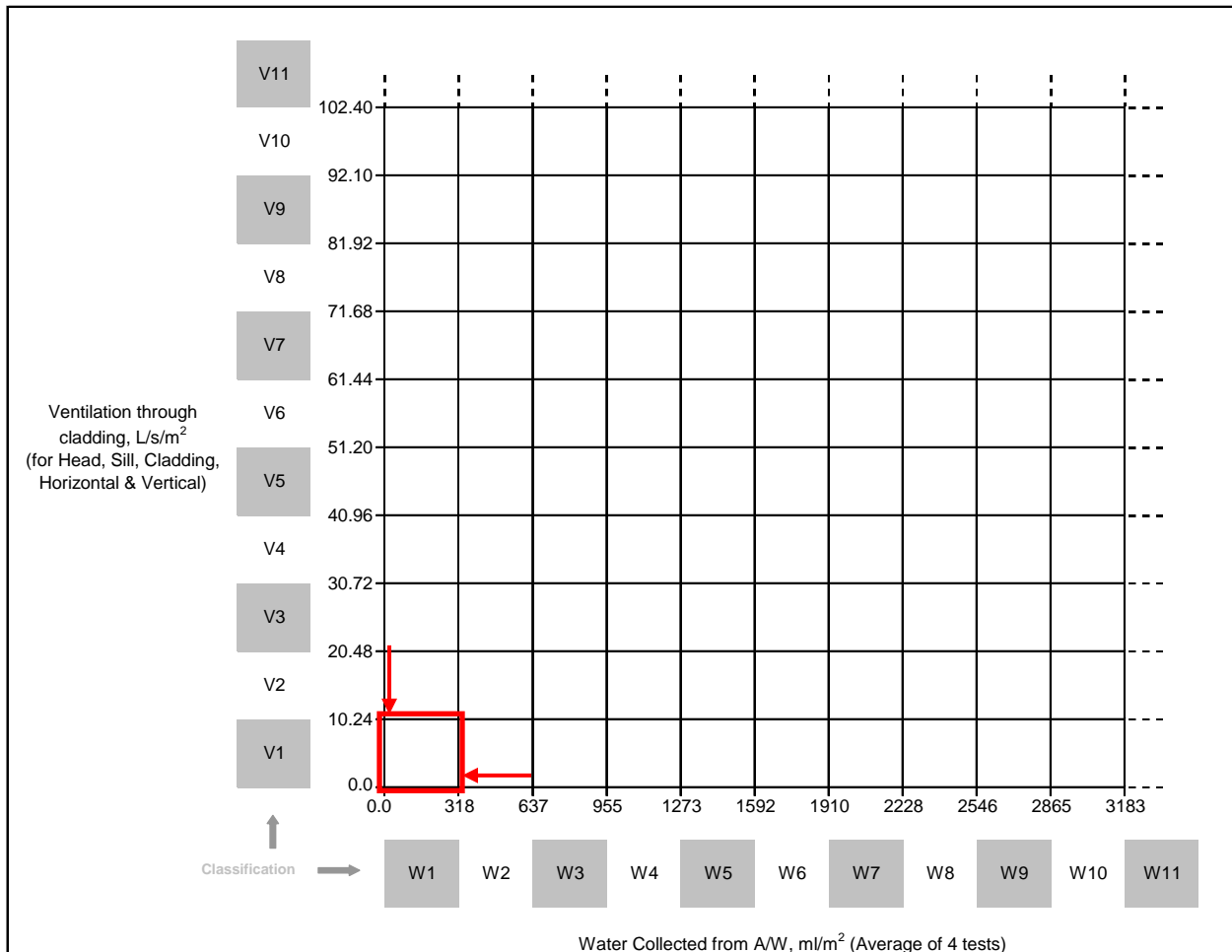
Pressure	Results	Allowed	Note
75 Pa (1.57 psf)	3.5 L/s (7.39 cfm)	Report Only	1
	0.60 L/s/m ² (0.12 cfm/ft ²)		1, 3

Note #4: Loads were held for 10 seconds.

Note #5: Tape and film were not used to seal against air leakage during structural testing.

10.0 Classification Rating: Based on the results of the air flow across the cladding (Table 1) and the water collected through the AWB (Table 2) the system tested achieved a V1/W1 Classification. Chart 1 shown below is used to plot the results of the test.

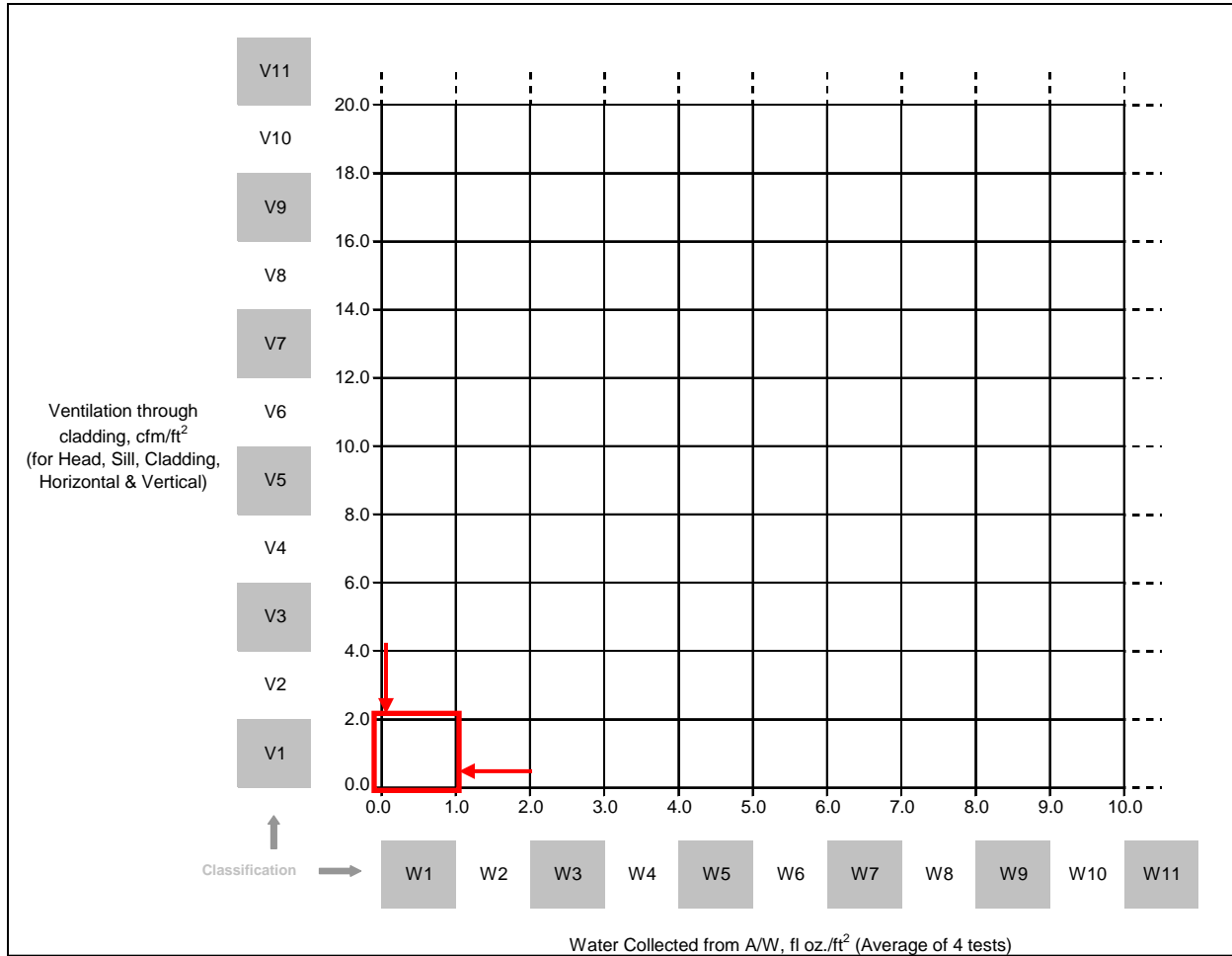
CHART 1: System Classification Chart: (SI Units)



Note: Upon examination of the specimen several hours after testing, the specimen was found to have allowed for drying and did not trap water.

10.2 Classification Rating: (Continued)

CHART 1: System Classification Chart: (IP Units)



Note: Upon examination of the specimen several hours after testing, the specimen was found to have allowed for drying and did not trap water.

General Note: This report is not intended as a comprehensive evaluation of the system regarding performance and application to specific buildings. All testing was performed in accordance with the referenced standards.

The service life of this report will expire on the stated Test Record Retention End Date, at which time such materials as drawings, data sheets, samples of test specimens, copies of this report, and any other pertinent project documentation, shall be discarded without notice.

If test specimen contains glazing, no conclusions of any kind regarding the adequacy or inadequacy of the glass in any glazed test specimen can be made. 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 specimen tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, Inc.

Karl A. Lips-Eakins
Senior Technician

Daniel A. Johnson
Director, Regional Operations

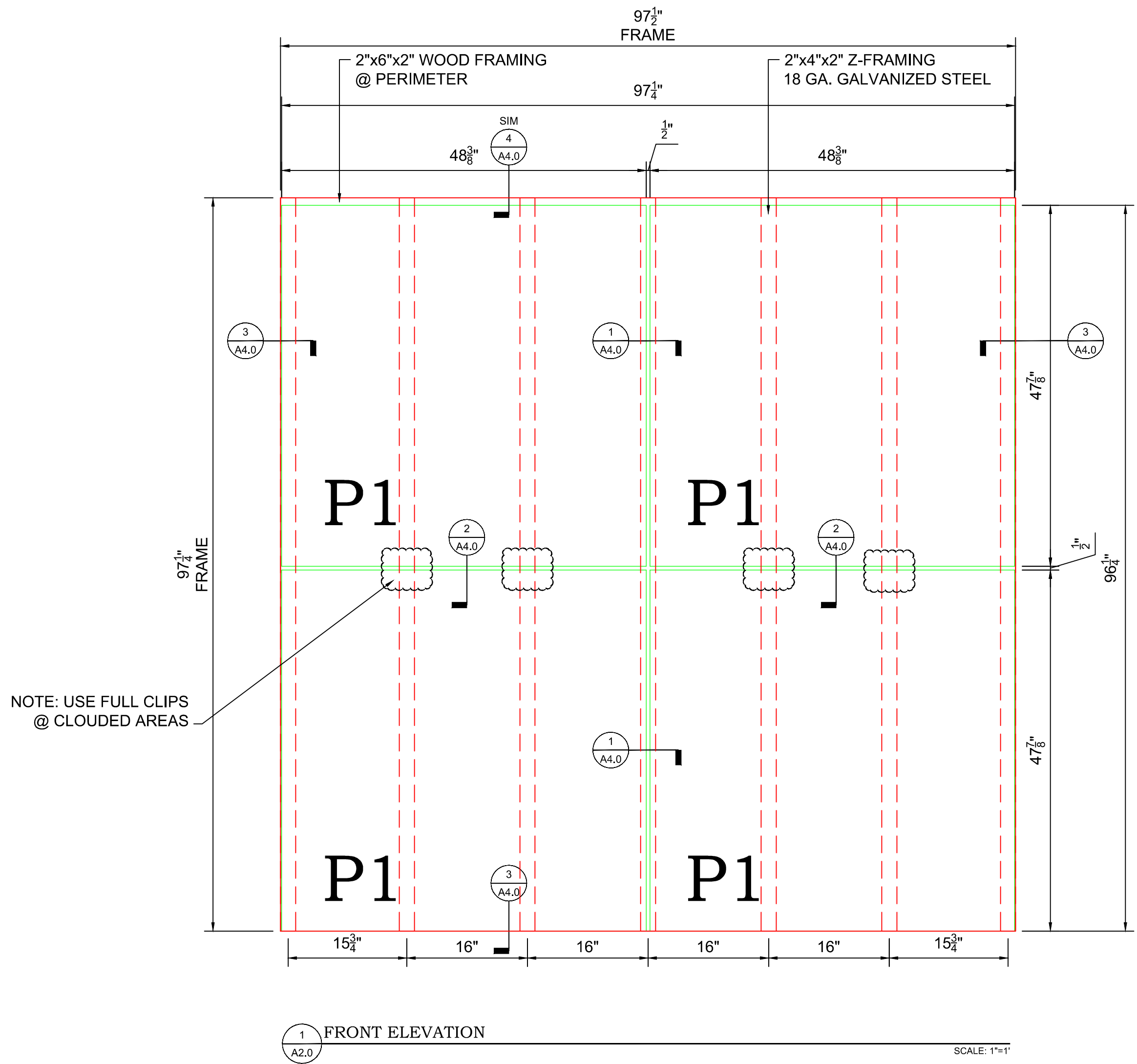
KLE/jb

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

Appendix A

Drawings

APPROVED FOR FABRICATION & CONSTRUCTION
 THIS DESIGN IS BASED ON APPROVAL DRAWINGS AND T.F.C.'S PROJECT SCOPE OF WORK.
 DTLR: _____ DATE: _____
 P. M.: _____ DATE: _____



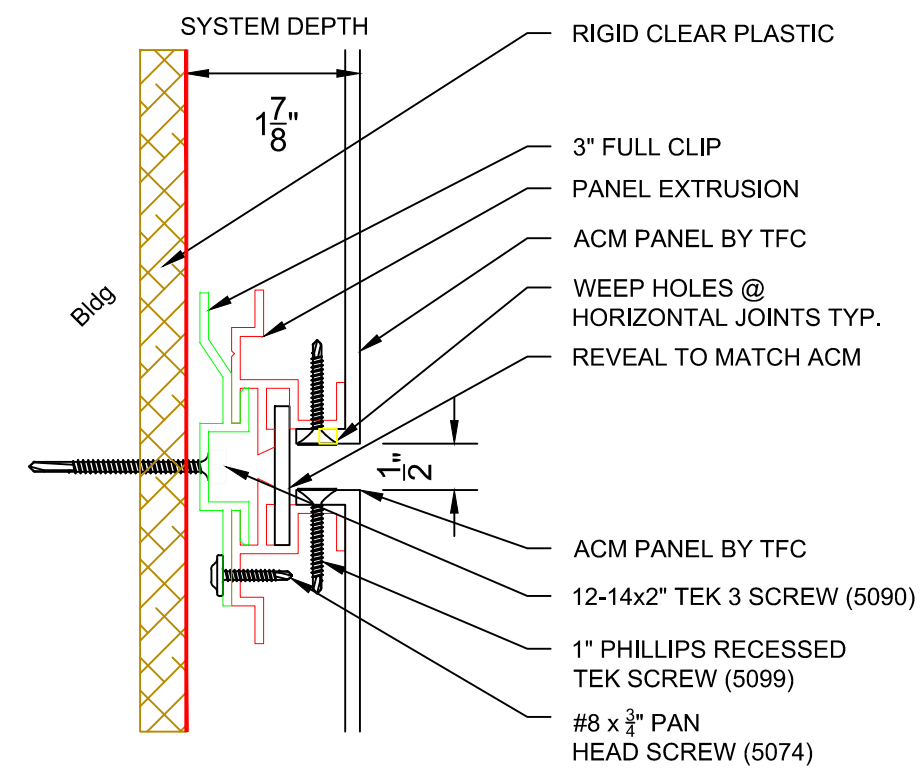
REV. #	DESCRIPTION	DATE	DTL.	REV. #	DESCRIPTION	DATE	DTL.
*	FAB AND CONSTRUCTION	7-24-13	DF				

509 TEST PANEL'S WALL

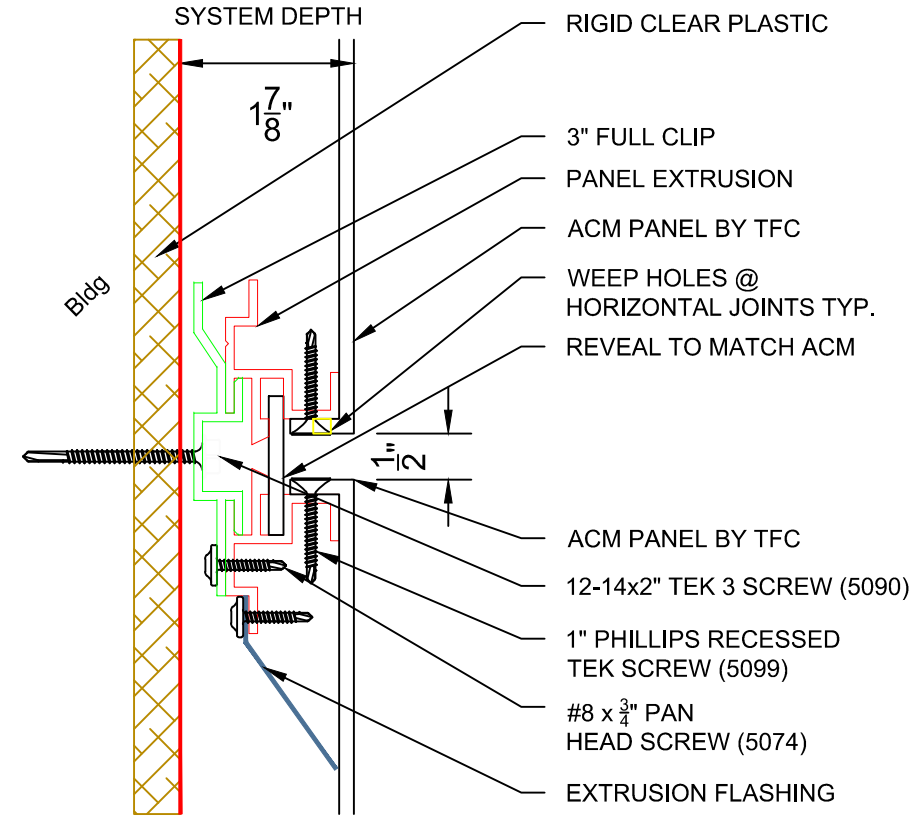
ELEVATION
 JOB#: 509 TEST PANELS
 DATE: 7-24-13
 SCALE: 1" = 1'
 DRAWN BY: DF

A2.0

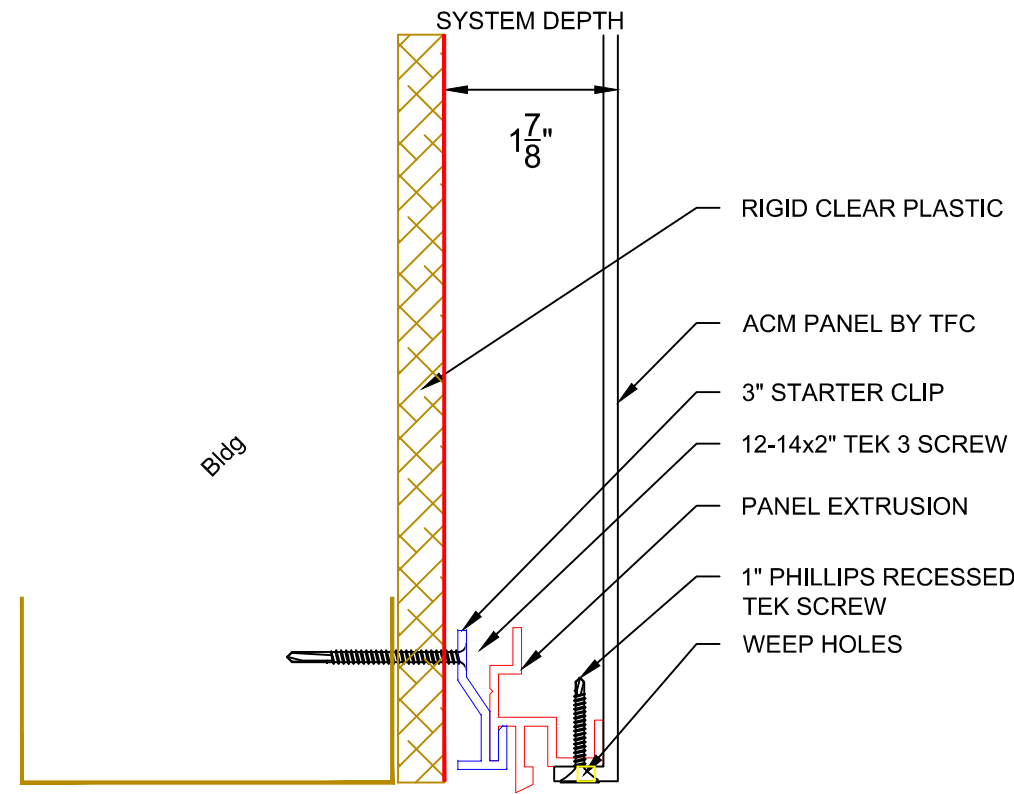
APPROVED FOR FABRICATION & CONSTRUCTION
THIS DESIGN IS BASED ON APPROVAL DRAWINGS AND T.F.C.'S PROJECT SCOPE OF WORK.
 DTLR: _____ DATE: _____
 P. M.: _____ DATE: _____



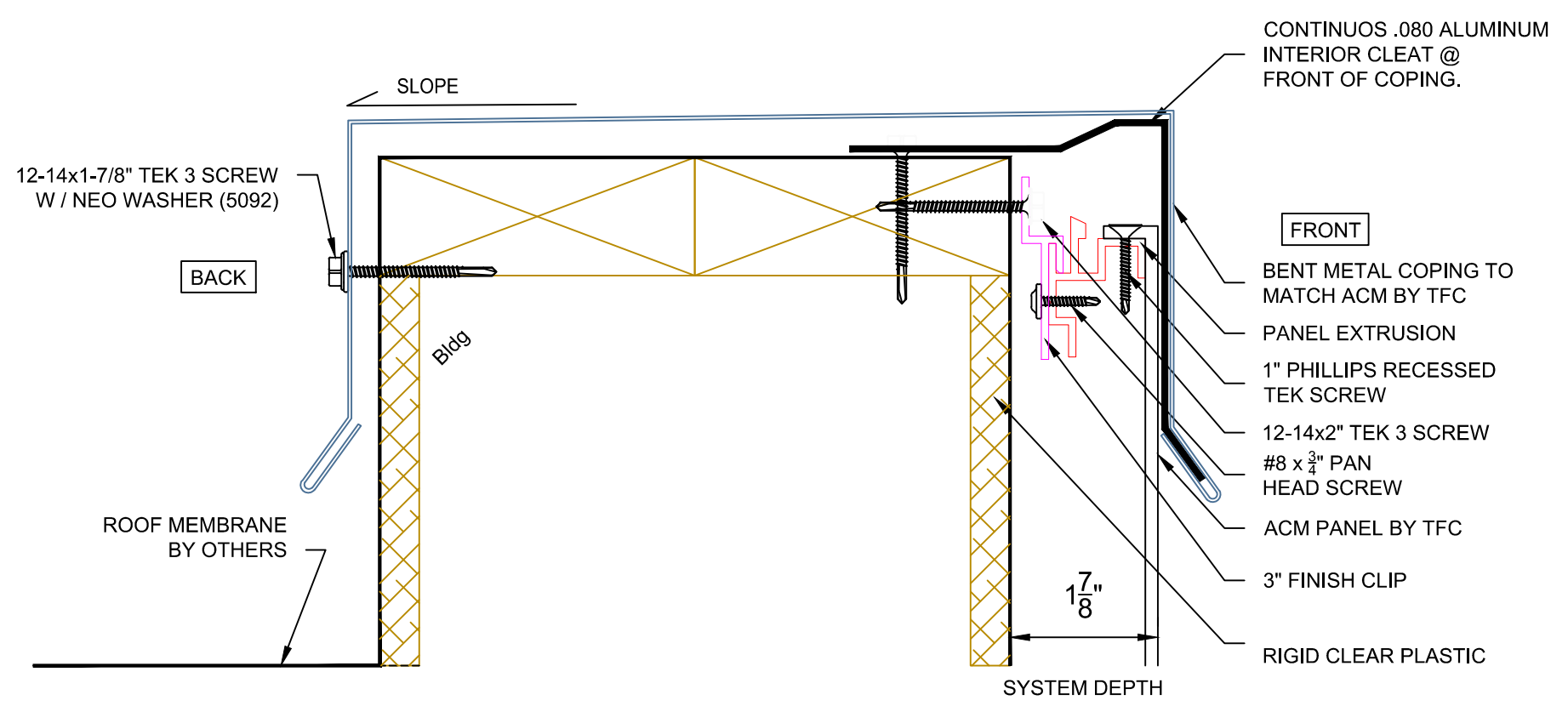
1 TYPICAL DETAIL @ JOINT/VERTICAL
 A4.0 SCALE: 6"=1'-0"



2 TYPICAL DETAIL @ JOINT/ HORIZONTAL
 A4.0 SCALE: 6"=1'-0"



3 DETAIL @ BASE / END DETAIL
 A4.0 SCALE: 6"=1'-0"



4 DETAIL @ BENT METAL COPING
 A4.0 SCALE: 6"=1'-0"

REV. #	DESCRIPTION	DATE	DTL.	REV. #	DESCRIPTION	DATE	DTL.
1	FAB AND CONSTRUCTION	7-24-13	DF				

509 TEST PANEL'S WALL

DETAILS
 JOB#: 509 TEST PANELS
 DATE: 7-24-13
 SCALE: 6" = 1'
 DRAWN BY: DF

A4.0