



MOCK-UP PERFORMANCE TEST REPORT

Product:
UCW3500

Rendered To:
FreMarq Innovations

QCT Project No.:
QCT19-5368

Test Dates:
August 12, 2019 – December 16, 2019

Report Date:
December 17, 2019

QUAST CONSULTING AND TESTING, INC.

Exterior Façade/Fenestration Consulting & Testing

1055 Indianhead Drive • P.O. Box 241 • Mosinee, WI 54455-0241 • Phone: 715-693-TEST (8378) • Fax: 715-693-0689

www.qct-usa.com

MOCK-UP PERFORMANCE REPORT

Rendered to:

FreMarq Innovations
8300 Highland Dr.
Wausau, WI 54401

Project Scope: Quast Consulting and Testing, Inc. (QCT) was contracted by FreMarq Innovations to conduct mock-up performance testing on FreMarq Innovations Unitized Curtain Wall UCW3500. Testing was conducted at Quast Consulting and Testing, Inc. laboratory, located in Mosinee, Wisconsin.

Test Procedure:

Testing was conducted in accordance with applicable AAMA and ASTM test methods.

See Exhibit A: Test Procedure (5 pg.)

Dates Tested: August 12, 2019 – December 16, 2019

Project No: QCT19-5368

Client: FreMarq Innovations

Glazing Contractor: FreMarq Innovations

Curtain Wall Fabricator: FreMarq Innovations

FreMarq Innovations Unitized Curtain Wall UCW3500



Summary of Test Results:

Test No.	Test Method	Test		Results	Notes
1	ASTM E330	Preload	+ 25 psf	PASS	
2	ASTM E283	Air Infiltration	+ 6.24 psf	PASS	
3	ASTM E331	Static Water Penetration	+ 15.0 psf	PASS	
4	AAMA 501.1	Dynamic Water Penetration	+ 15.0 psf	PASS	
5	ASTM E330	Uniform Load Deflection	+/- 50.0 psf	PASS	
6	ASTM E283	Air Infiltration	+ 6.24 psf	PASS	
7	ASTM E331	Static Water Penetration	+ 15.0 psf	PASS	
8	AAMA 501.7	Vertical Interstory Displacement	+/- 0.43"	PASS	
9	ASTM E283	Air Infiltration	+ 6.24 psf	PASS	
10	ASTM E331	Static Water Penetration	+ 15.0 psf	PASS	
11	AAMA 501.4	Horizontal Interstory Displacement	+/- 0.40"	PASS	
12	ASTM E283	Air Infiltration	+ 6.24 psf	PASS	
13	ASTM E331	Static Water Penetration	+ 15.0 psf	PASS	
14	AAMA 501.5	Thermal Cycling	0°F-180°F	PASS	
		Condensation Review	0°F	PASS	
15	ASTM E283	Air Infiltration	+ 6.24 psf	PASS	
16	ASTM E331	Static Water Penetration	+ 15.0 psf	PASS	
17	ASTM E330	Uniform Load Proof Test	+/- 75.0 psf	PASS	
18	AAMA 501.4	Horizontal Interstory Displacement	+/- 2.00"	PASS	

Description of Test Specimen:

Exterior wall mock-up made up of FreMarq Innovations unitized curtain wall UCW3500. All main framing members in the curtain wall units consisted of extruded aluminum with a fiberglass thermal break. The mock-up configuration consisted of 9 individual units configured three units wide by three units tall. The mock-up configuration included 12 fixed glass units. The overall mock-up accumulated width was approximately 15' wide by 19' tall.

The mock-up chamber was constructed inside QCT's facility and included a rough opening and 2 simulated floor slabs consisting of structural steel tubes. The rough opening head, sill, and floor slabs were utilized in the anchorage of the mock-up components.

Glazing:

All infills, 1" insulated glass units, were shop glazed from the exterior side against an interior gasket and a bead of structural silicone.

Frame Construction:

Frame members were square-cut coped and assembled using screw splines extruded into the frame profiles.

Perimeter Seals:

The mock-up contained a continuous exterior perimeter seal consisting of Dow Corning 795 silicone at the head and sill and a silicone sheet, bed into Dow Corning 795, at the jambs.

Note: See as-built drawings for further specimen description.

Drawings:

Exhibit B: Mockup as-built drawings (8 pg.)



QCT19-5368
UCW3500

December 17, 2019

Witness: The following individuals were present for all or part of the mock-up testing.

<u>Name</u>	<u>Representation</u>
Gerald Berger	FreMarq Innovations
Ken Boilesen	FreMarq Innovations
Jamie Rice-Hekendorf	FreMarq Innovations
Stephanie Lang	FreMarq Innovations
Brian Sasman	Quast Consulting and Testing
Jerry Sasman	Quast Consulting and Testing
Kelly Marlow	Quast Consulting and Testing
Eric Jehn	Quast Consulting and Testing
Taylor Duranceau	Quast Consulting and Testing
Gunner Quast	Quast Consulting and Testing

Test Results:

1. Preload (ASTM E330M-14)

Date: November 18, 2019
 Temperature: 59°F

The specimen was subjected to the following load, each for a duration of 10 seconds:

+ 25.0 psf preload

2. Air Infiltration (ASTM E283-12)

Date: November 18, 2019
 Temperature: 59°F
 Barometric Pressure: 29.70" Hg
 Test Pressure: +6.24 psf

Results: PASS

Table 1: Air leakage measurements during test 2

Component	Net Air Infiltration	Allowable
Curtain wall	0.03 CFM/ft ²	0.06 CFM/ft ²
Chamber	15.7 CFM	----
Total leakage	25.0 CFM	----

3. Static Water Penetration (ASTM E331-09)

Date: November 20, 2019
 Temperature: 59°F
 Test Pressure: 15.0 psf

Allowable: No water penetration is allowed. (See Exhibit A – Test Procedure for water leakage definition)

Results: PASS

4. Dynamic Water Penetration (AAMA 501.1-17)

Date: November 20, 2019
Temperature: 60°F
Test Pressure: 15.0 psf

Allowable: No water penetration is allowed. (*See Exhibit A, Test Procedure for water leakage definition.*)

Results: PASS

5. Uniform Load Deflection (ASTM E330/E330M-14)

Date: November 21, 2019
Temperature: 59°F

The specimen was subjected to the following loads, each for a duration of 10 seconds:

- + 25 psf preload
- + 50 psf design load
- 25 psf preload
- 50 psf design load

Deflection Performance Criteria:

At 100% design load: Net deflection perpendicular to enclosure surface for framing members shall not exceed 1/175 times distance between supports or 3/4".

Results: PASS

Table 2: Net deflection measurements during test 5

Member	Member Span (in)	Net Deflection (in)		Allowable Deflection (in)
		+50 psf	-50 psf	
Span A (Vertical stack mullion)	146	0.41	0.35	0.75
Span B (CW horizontal)	47	0.01	0.10	0.27
Span C (Horizontal stack)	47	0.02	0.00	0.27

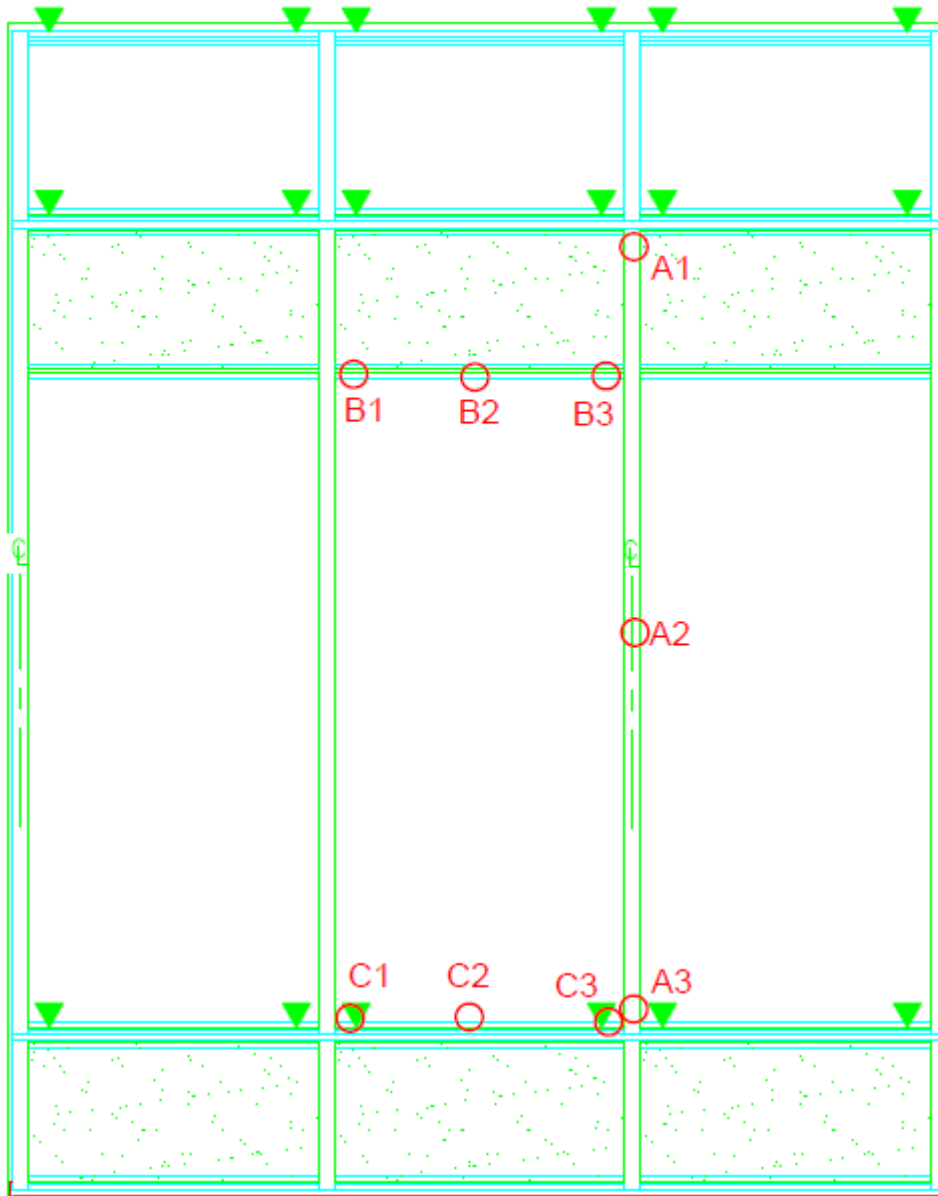


Figure 1: Deflection measurement locations during test 5.

6. Air Infiltration (ASTM E283-12)

Date: November 21, 2019
Temperature: 59°F
Barometric Pressure: 29.60" Hg
Test Pressure: +6.24 psf

Results: PASS

Gross Air Infiltration – 16.8 cfm

Note: Only the gross air infiltration was measured as the mockup was wet from previous water penetration testing. The gross air infiltration was 8.1 cfm less than the gross measurement during test 2 and less than the allowable for the entire mockup.

7. Static Water Penetration (ASTM E331-09)

Date: November 21, 2019
Temperature: 60°F
Test Pressure: 15.0 psf

Allowable: No water penetration is allowed. (*See Exhibit A – Test Procedure for water leakage definition*)

Results: PASS

8. Interstory Vertical Design Displacement (AAMA 501.7)

Date: November 21, 2019
Temperature: 59°F
Movement: ±0.43"

Result: PASS

*Note: Following the third complete vertical cycle of the movement slab it was secured in the 0.43" up position for the remainder of testing. This left the top horizontal stack "closed" and the lower horizontal stack "open".

9. Air Infiltration (ASTM E283-12)

Date: November 22, 2019
Temperature: 57°F
Barometric Pressure: 30.09" Hg
Test Pressure: +6.24 psf

Results: PASS

Gross Air Infiltration – 16.9 cfm

Note: Only the gross air infiltration was measured as the mockup was wet from previous water penetration testing. The gross air infiltration was 8.1 cfm less than the gross measurement during test 2 and less than the allowable for the entire mockup.

10. Static Water Penetration (ASTM E331-09)

Date: November 22, 2019
Temperature: 57°F
Test Pressure: 15.0 psf

Allowable: No water penetration is allowed. (*See Exhibit A – Test Procedure for water leakage definition*)

Results: PASS, water was observed near the glazing gasket at the location indicated in figure 2. The water did not penetrate beyond the innermost plane of the CW frame.

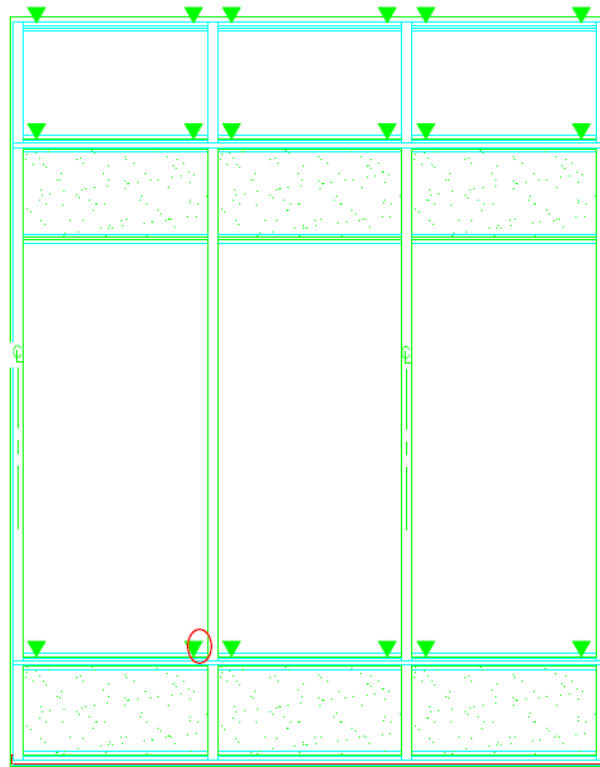


Figure 2: Location of water observed during test 10



Photo 1: Water observed during test 10

11. Interstory Horizontal Design Displacement (AAMA 501.4)

Date: November 22, 2019
Temperature: 58°F
Movement: ±0.40"

Result: PASS

12. Air Infiltration (ASTM E283-12)

Date: November 22, 2019
Temperature: 58°F
Barometric Pressure: 30.11" Hg
Test Pressure: +6.24 psf

Results: PASS

Gross Air Infiltration – 16.9 cfm

Note: Only the gross air infiltration was measured as the mockup was wet from previous water penetration testing. The gross air infiltration was 8.1 cfm less than the gross measurement during test 2 and less than the allowable for the entire mockup.

13. Static Water Penetration (ASTM E331-09)

Date: November 22, 2019
Temperature: 59°F
Test Pressure: 15.0 psf

Allowable: No water penetration is allowed. (*See Exhibit A – Test Procedure for water leakage definition*)

Results: PASS, water was observed in the same location as in test 10.

14. **Thermal Cycling (AAMA 501.5-07):** *“Test Method for Thermal Cycling of Exterior Walls”* The mock-up was enclosed from the exterior with an insulated thermal chamber. Exterior surface temperature was cycled between 0°F and 180°F for 3 complete cycles. During each of the cold cycles, the interior ambient conditions were maintained at 72°F.

Dates: 12/2/2019 – 12/4/2019

Results: PASS. No physical damage or deterioration was visibly evident at the conclusion of the thermal cycling test.

Condensation Evaluation:

During the Thermal Cycling test, the interior side of the mock-up was instrumented with thermocouples to measure interior surface temperatures. Upon thermal stabilization of the 0°F cold cycle, interior surface temperatures were measured and compared to the design dew point temperature. 72°F interior ambient air temperature at 30% RH yields a dew point temperature of 38.9°F.

Results: PASS

Interior surface temperatures were measured as indicated on the following page.

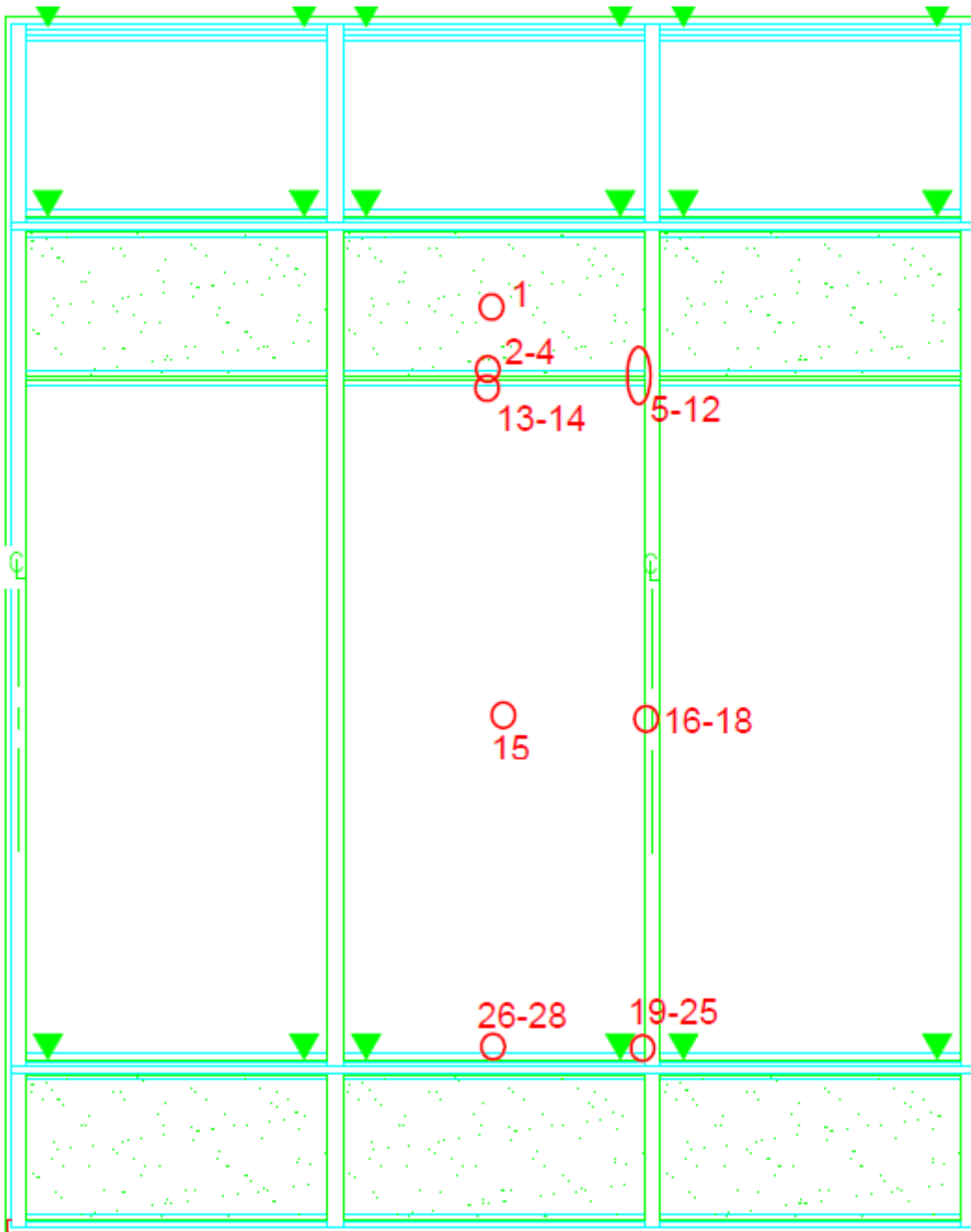


Figure 3: Interior Temperature Measurement Locations

Results are derived from the average temperature measurements recorded from 10:45 – 10:55 am on 12/3/2019

Table 3: Interior surface temperatures recorded during the condensation review.

Thermocouple No.	Description	Temperature °F
	Interior Air	69.7
	Exterior Air	-0.9
1	Center of Spandrel Glass	56.8
2	Edge of Spandrel Glass	46.6
3	Horizontal	58.1
4	Horizontal	59.8
5	Corner of Spandrel Glass	44.5
6	Vertical Mullion	59.0
7	Horizontal	58.4
8	Horizontal	59.7
9	Vertical Mullion	59.9
10	Vertical Mullion	59.1
11	Horizontal	59.3
12	Corner of Vision Glass	50.8
13	Edge of Vision Glass	56.2
14	Horizontal	60.1
15	Center of Vision Glass	59.3
16	Vertical Mullion	61.6
17	Edge of Vision Glass	53.5
18	Vertical Mullion	62.4
19	Corner of Vision Glass	42.9
20	Vertical Mullion	56.2
21	Horizontal	65.3
22	Vertical Mullion	57.7
23	Horizontal	58.4
24	Horizontal	58.4
25	Chicken Head	57.2
26	Horizontal	55.4
27	Edge of Vision Glass	44.9
28	Horizontal	58.6

**Note: Measured interior relative humidity at the time of recorded temperature data was 30%. No visible condensation was observed at the time of temperature recording.*

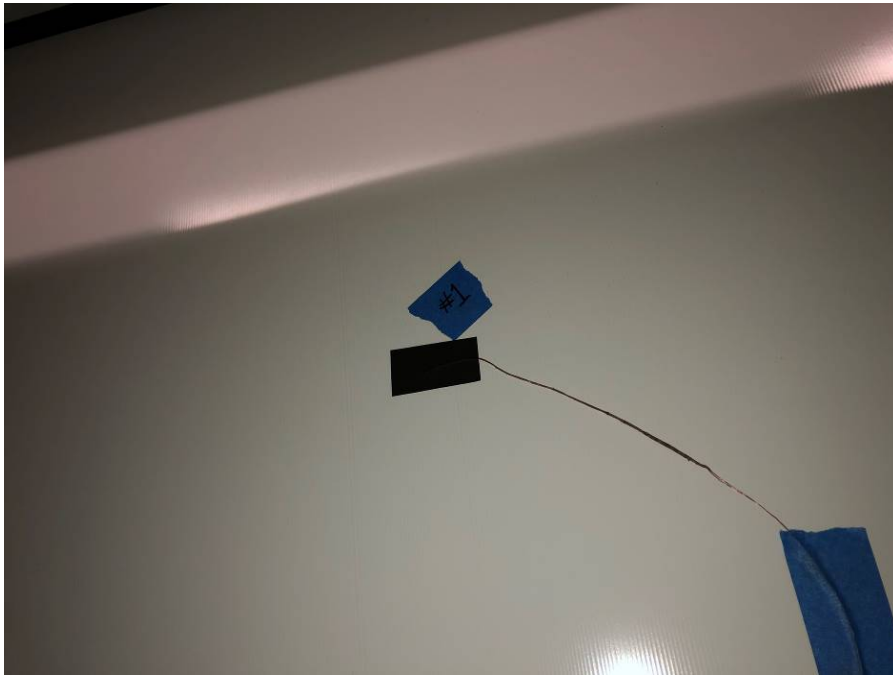


Photo 2: Thermocouple 1

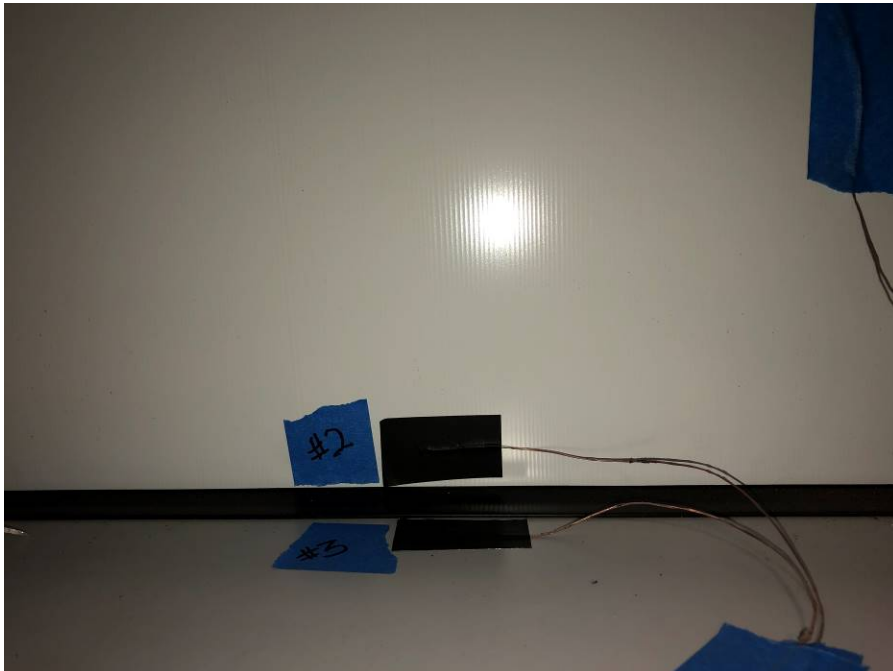


Photo 3: Thermocouple 2-3

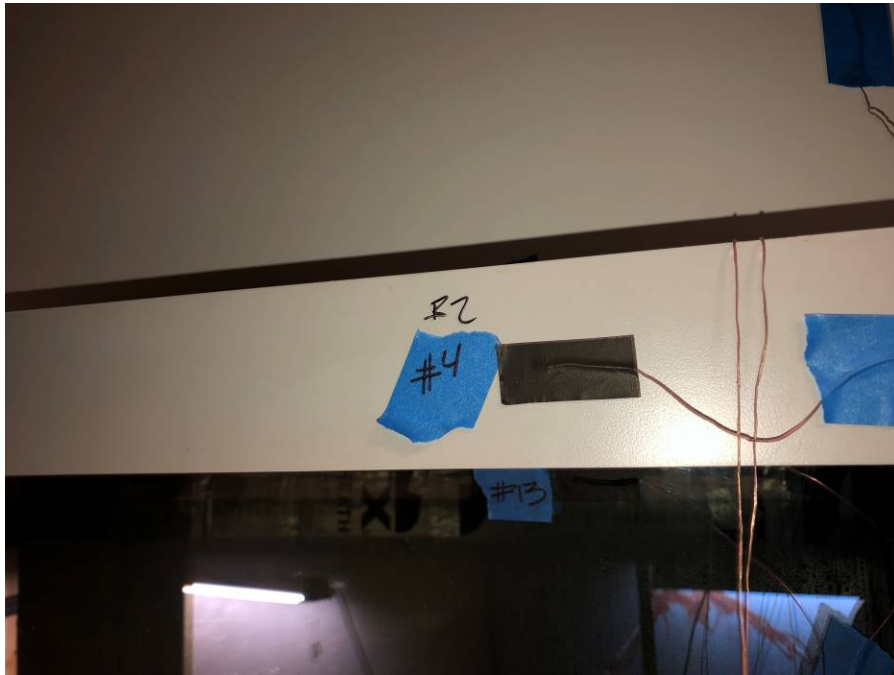


Photo 4: Thermocouple 4

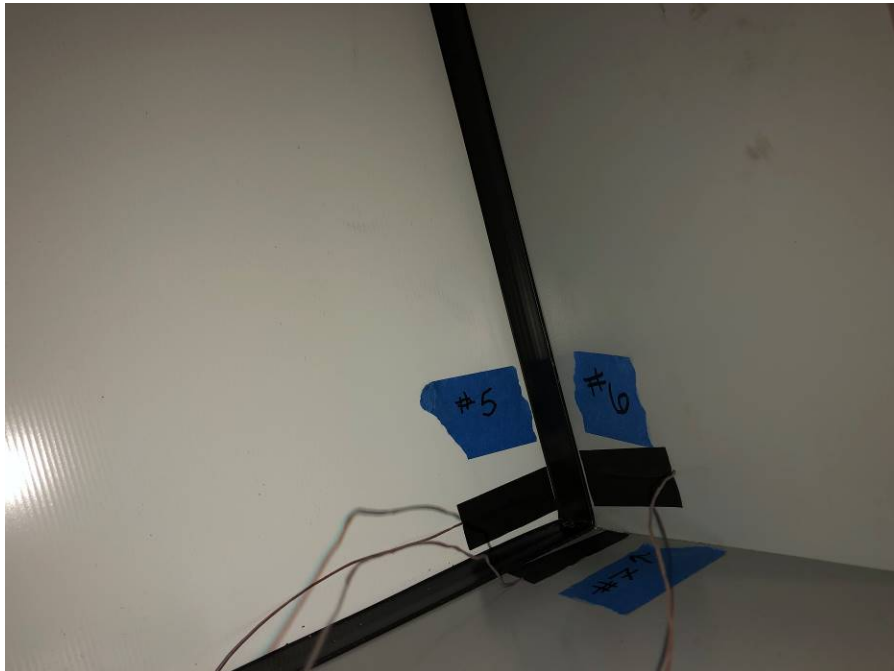


Photo 5: Thermocouple 5-7

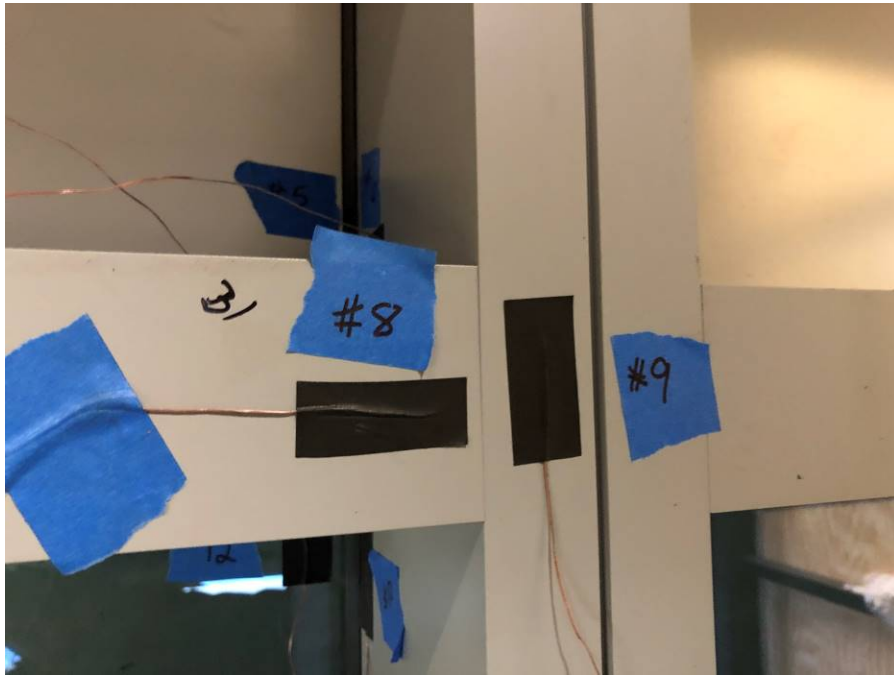


Photo 6: Thermocouple 8-9



Photo 7: Thermocouple 10-12

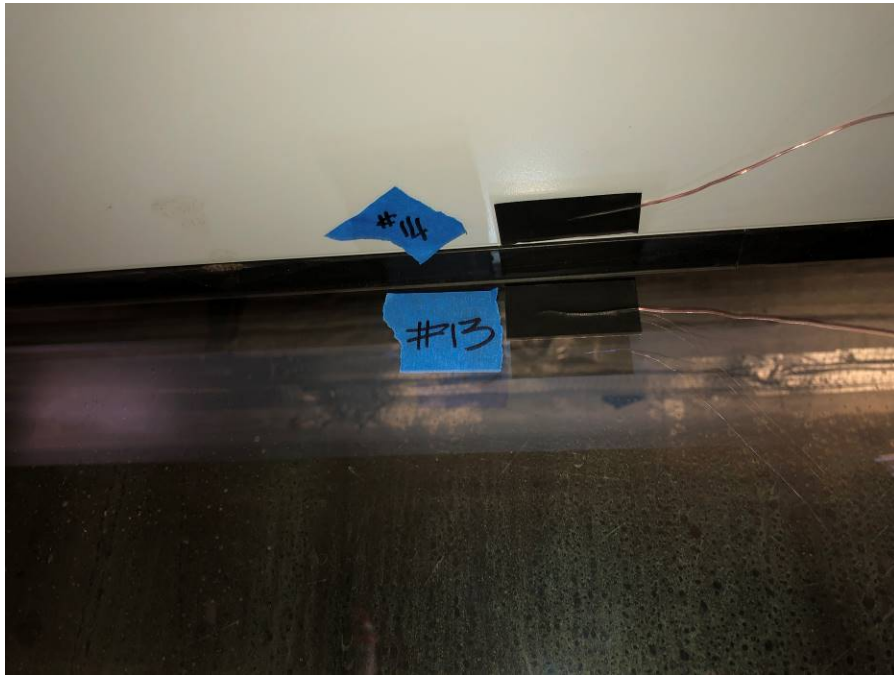


Photo 8: Thermocouple 13-14



Photo 9: Thermocouple 15



Photo 10: Thermocouple 16-18

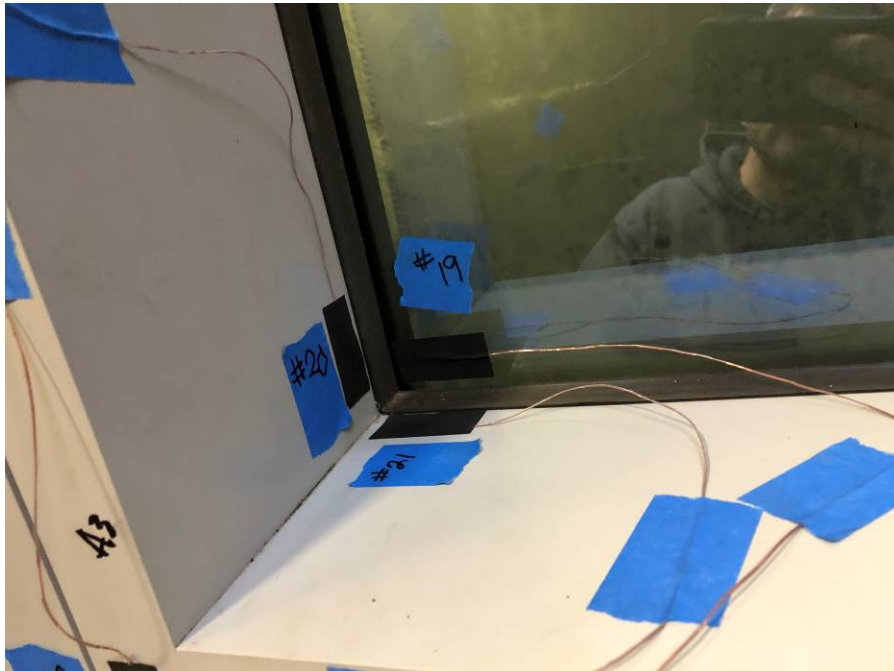


Photo 11: Thermocouple 19-21

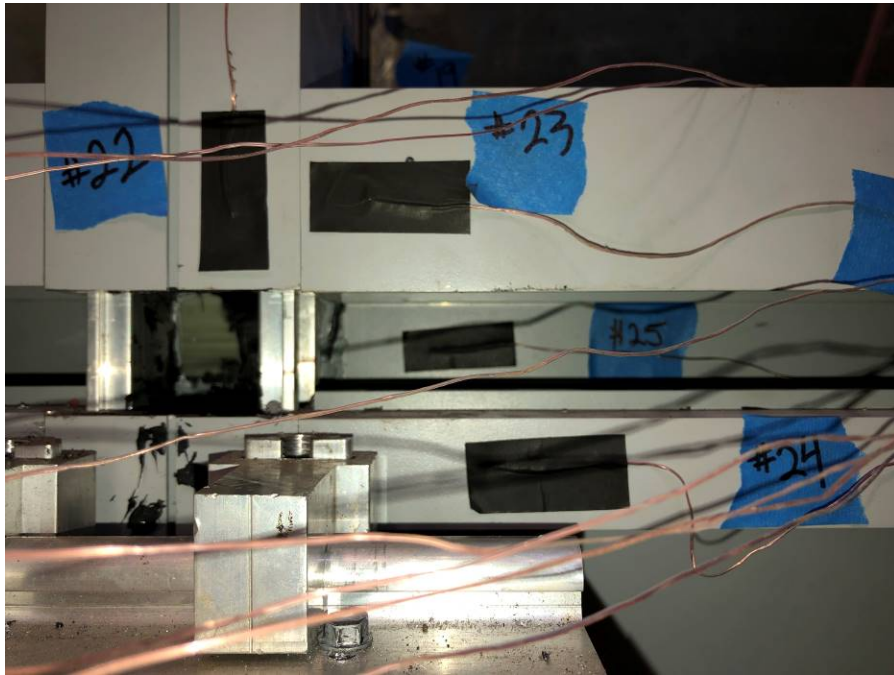


Photo 12: Thermocouple 22-25

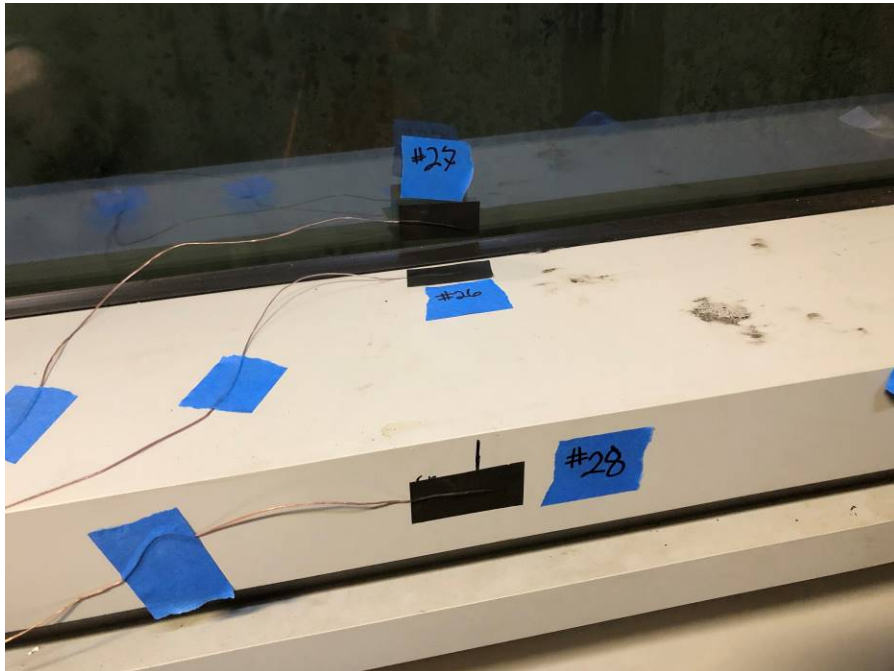


Photo 13: Thermocouple 26-28

15. Air Infiltration (ASTM E283-12)

Date: December 11, 2019
 Temperature: 60°F
 Barometric Pressure: 30.05" Hg
 Test Pressure: +6.24 psf

Results: PASS

Table 4: Air infiltration measurements during test 15

Component	Net Air Infiltration	Allowable
Curtain wall	0.01 CFM/ft ²	0.06 CFM/ft ²
Chamber	22.80 CFM	----
Total leakage	26.70 CFM	----

16. Static Water Penetration (ASTM E331-09)

Date: December 16, 2019
 Temperature: 59°F
 Test Pressure: 15.0 psf

Allowable: No water penetration is allowed. *(See Exhibit A – Test Procedure for water leakage definition)*

Results: PASS

17. Uniform Load Proof Test (ASTM E330/E330M-14)

Date: December 16, 2019
 Temperature: 58°F

The specimen was subjected to the following loads, each for a duration of 10 seconds:

- + 37.5 psf preload
- + 75.0 psf design load
- 37.5 psf preload
- 75.0 psf design load

Performance Criteria:

Permanent set shall not exceed 0.2% of span.

Results: PASS

Permanent set measurement locations same as Deflection measurement locations noted in Test #5, Figure 1.

Table 5: Net permanent set measurements after proof loads

Member	Member Span (in)	Net Permanent Set (in)		Allowable Permanent Set (in)
		+75.0 psf	-75.0 psf	
Span A (Vertical stack mullion)	146	0.01	0.01	0.29
Span B (CW horizontal)	47	0.00	0.00	0.09
Span C (Horizontal stack)	47	0.01	0.01	0.09

18. Interstory Horizontal Inelastic Displacement (AAMA 501.4)

Date: December 16, 2019
 Temperature: 58°F
 Movement: ±2.00"

Result: PASS



QCT19-5368
UCW3500

December 17, 2019

Summary

This performance test report is prepared for the convenience of our customer and endeavors to provide accurate and timely test results. It contains a summary of observations made by a qualified representative of Quast Consulting and Testing, Inc. This report is intended to help in your Quality Assurance Program, but it does not represent a continuous nor exhaustive evaluation. A copy of this report and all associated documentation will be retained by QCT for a period of ten years. This report is the exclusive property of the client so named herein and is applicable only to the specimen tested. This report is not complete without all attachments and may not be reproduced except in full without written approval of Quast Consulting and Testing, Inc.

Attachments:

Exhibit A: Test Procedure (5 pg.)

Exhibit B: Mockup as-built drawings (8 pg.)

QUAST CONSULTING and TESTING, INC.

QUAST CONSULTING and TESTING, INC.

Eric Jehn
Author

Brian M. Sasman, P.E.
Reviewer

QCT19-5368.01



QCT19-5368
UCW3500

December 17, 2019

Revision Log

Revision #	Date	Description
0	1/6/2020	Original report issued to FreMarq Innovations

QCT19-5368
UCW3500



December 17, 2019

Exhibit A

Test Procedure

1055 Indianhead Drive
P.O. Box 241
Mosinee, WI 54455-0241
Phone: 715-693-TEST (8378)
Fax: 715-693-0689
www.qct-usa.com



August 28, 2019
December 16, 2019 (REV 1)

MOCK-UP TEST PROCEDURE
The Heights Merrimack

The following tests and performance criteria are a synopsis of the laboratory mockup testing procedure proposed for The Heights Merrimack project.

Tests performed on the curtain wall mockup for The Heights Merrimack shall be in substantial accordance with the test procedures described in referenced AAMA and ASTM standards.

Mock-up installation and testing is subject to observation by the Contractor, Architect and Consultants.

Static air pressure differential must be applied to the chamber for the purpose of chamber calibration and de-bugging prior to the start of formal testing. This process may also serve as an initial qualitative analysis of the mock-up air infiltration rate. All information critical to the mock-up system will be documented.

Undocumented tests are not permitted.

Formal reporting cannot be completed until QCT is provided a final set of mockup as-built prints.

1. Preload to +25 psf held for ten (10) seconds.
2. **Static Air Infiltration:** ASTM E283-12 “*Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen*” Testing to be conducted at pressure differential of 6.24 psf.

Component	Maximum Allowable Air Infiltration
Fixed Wall	0.06 cfm/ft ²

3. **Static Water Penetration:** ASTM E331-09 “*Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Pressure Difference*” Testing shall be conducted at a positive static pressure differential of 15.0 psf. Water will be applied to the exterior face of the specimen for the duration of fifteen (15) minutes at a minimum rate of five (5) gallons per square foot per hour. No water penetration is allowed.
4. **Dynamic Water Penetration:** AAMA 501.1-05 “*Standard Test Method for Water Penetration of Windows, Curtain Walls, and Doors Using Dynamic Pressure*” Testing shall be conducted at 15 psf with a minimum water application rate of 5 gallons per square foot per hour. No water penetration is allowed.
5. **Uniform Load Deflection Test:** ASTM E330-10 “*Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference*” Deflections will be measured with dial indicators. Loads will be applied as follows:

+ 25 psf positive design load preload	(10 sec)
+50 psf positive design load	(10 sec)
- 25 psf negative design load preload	(10 sec)
- 50 psf negative design load	(10 sec)

Performance criteria:

At 100% design load: Deflection normal to wall plane shall be limited to 1/175 or 3/4” max.

6. **Repeat Static Air Infiltration:** ASTM E283-12 “Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen” Testing to be conducted at positive pressure 6.24 psf.

note: In the event that the mock-up specimen is wet from previous water penetration tests, the gross air infiltration rate will be compared to that of test #2. If a change in measurements prompts concern, the mock-up will be dried and a full air infiltration measurement will be performed.

7. **Repeat Static Water Penetration:** ASTM E331-09 “Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Pressure Difference” Testing shall be conducted at a positive static pressure differential of 15.0 psf. No water penetration is allowed.

8. **Interstory Vertical Design Displacement:** AAMA 501.7 Three complete cycles performed in each direction. Vertical movement (± 0.43 ”) shall be displaced up, back to zero, displaced down and back to zero making up one complete cycle.

**At completion of the final vertical movement cycle the movement slab shall be left in the maximum open position. The slab will remain at this position for the remainder of the test procedure.*

There shall be no failure or gross permanent distortion of anchors, frame, glass or panels. Structural silicone shall not experience adhesive or cohesive failure along any glass, frame or panel edge. Glazing gaskets may not disengage and weather seals may not fail.

9. **Repeat Static Air Infiltration:** ASTM E283-12 “Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen” Testing to be conducted at positive pressure 6.24 psf.

note: In the event that the mock-up specimen is wet from previous water penetration tests, the gross air infiltration rate will be compared to that of test #2. If a change in measurements prompts concern, the mock-up will be dried and a full air infiltration measurement will be performed.

10. **Repeat Static Water Penetration:** ASTM E331-09 “Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Pressure Difference” Testing shall be conducted at a positive static pressure differential of 15.0 psf. No water penetration is allowed.

11. **Interstory Horizontal Design Displacement: AAMA 501.4** Three complete cycles performed in each direction. Horizontal movement (± 0.40 ") shall be displaced left, back to zero, displaced right and back to zero making up one complete cycle.

There shall be no failure or gross permanent distortion of anchors, frame, glass or panels. Structural silicone shall not experience adhesive or cohesive failure along any glass, frame or panel edge. Glazing gaskets may not disengage and weather seals may not fail.

12. **Repeat Static Air Infiltration: ASTM E283-12** "*Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen*" Testing to be conducted at positive pressure 6.24 psf.

note: In the event that the mock-up specimen is wet from previous water penetration tests, the gross air infiltration rate will be compared to that of test #2. If a change in measurements prompts concern, the mock-up will be dried and a full air infiltration measurement will be performed.

13. **Repeat Static Water Penetration: ASTM E331-09** "*Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Pressure Difference*" Testing shall be conducted at a positive static pressure differential of 15.0 psf. No water penetration is allowed.

14. **Thermal Cycling: AAMA 501.5-07** "*Test Method for Thermal Cycling of Exterior Walls*" The mock-up will be enclosed from the exterior with an insulated thermal chamber. Exterior ambient temperatures will be cycled between 0°F and 180°F for 3 complete cycles. The interior ambient air temperature will be maintained at 72°F.

Condensation Risk Evaluation: During the cold segment of the Thermal Cycling test, the mock-up will be evaluated for condensation potential. The exterior ambient air temperature will be reduced to and maintained at 0°F while maintaining 72°F on the interior side of the mock-up. Provisions for producing environmental conditions will follow the general guidelines set forth in AAMA 501.5-07 "*Test Method for Thermal Cycling of Exterior Walls*". Air movement will be provided to prevent vertical temperature stratification, however interior and exterior convective coefficients will not be quantified. Thermocouples will be placed on the interior surface of the mock-up members to monitor and record temperatures. Upon thermal stabilization of the system, interior surface temperatures will be recorded and compared to the design dew point temperature. The design dew point temperature representing 72°F and 30% relative humidity is 38.9°F. Compliance will be determined by thermocouple measurements on the interior surface of the specimen. Any interior surface temperature falling below the dew point temperature shall be considered non-compliant to performance requirements. Measures will be taken by the laboratory to minimize actual interior relative humidity so to prevent condensation formation on interior surfaces.

15. **Repeat Static Air Infiltration:** **ASTM E283-12** “*Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen*” Testing to be conducted at positive pressure 6.24 psf. A new chamber calibration will be performed at this time.

16. **Repeat Static Water Penetration:** **ASTM E331-09** “*Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Pressure Difference*” Testing shall be conducted at a positive static pressure differential of 15.0 psf. No water penetration is allowed.

17. **Uniform Load Proof Test:** **ASTM E330-10** “*Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference*” Permanent sets will be measured where necessary with dial indicators. Loads will be applied for a duration of ten (10) seconds in the following sequence:

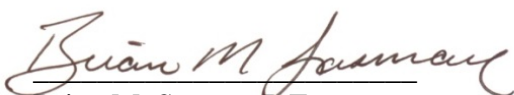
+ 37.5 psf positive proof load preload	(10 sec)
+ 75.0 psf positive proof load	(10 sec)
- 37.5 psf negative proof load preload	(10 sec)
- 75.0 psf negative proof load	(10 sec)

No glass breakage or permanent damage to fasteners, anchors and hardware components is to occur and permanent deformation to wall framing members is not to exceed 0.2% of their clear spans.

18. **Interstory Horizontal Inelastic Displacement:** **AAMA 501.4** Six complete cycles performed in each direction. Horizontal movement “parallel” to the plane of the wall (2.00”) shall be displaced to the left, back to zero, displaced to the right and back to zero making up one complete cycle.

Testing will be conducted, documented and formal report generated by Quast Consulting and Testing, Inc. All changes as a result of the testing will be documented in a final set of as-built drawings. This shall conclude the performance testing of the above mentioned mockup.

Respectfully Submitted



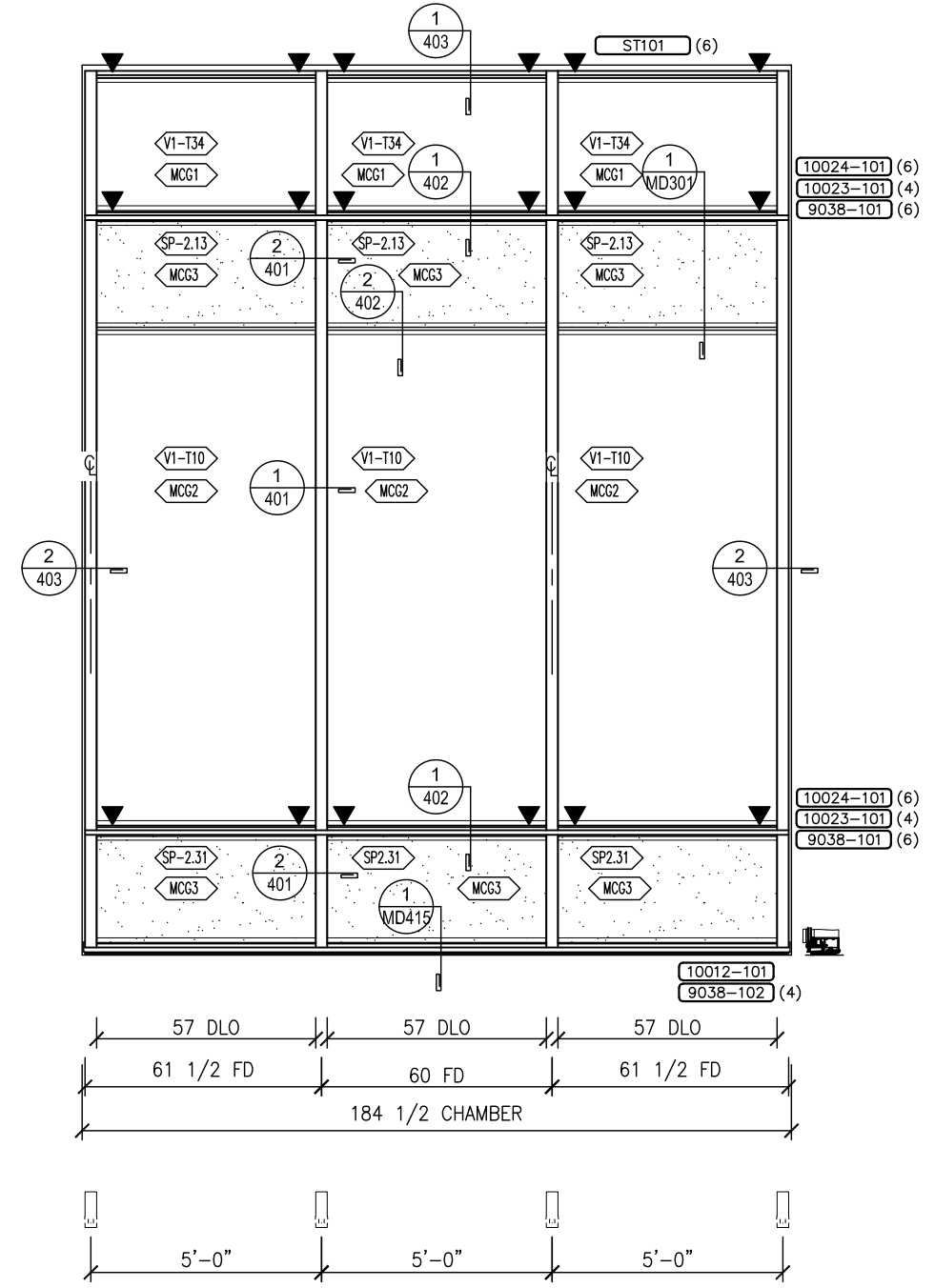
Brian M. Sasman P.E.
Quast Consulting and Testing, Inc.

Exhibit B

Mockup as Built Drawings

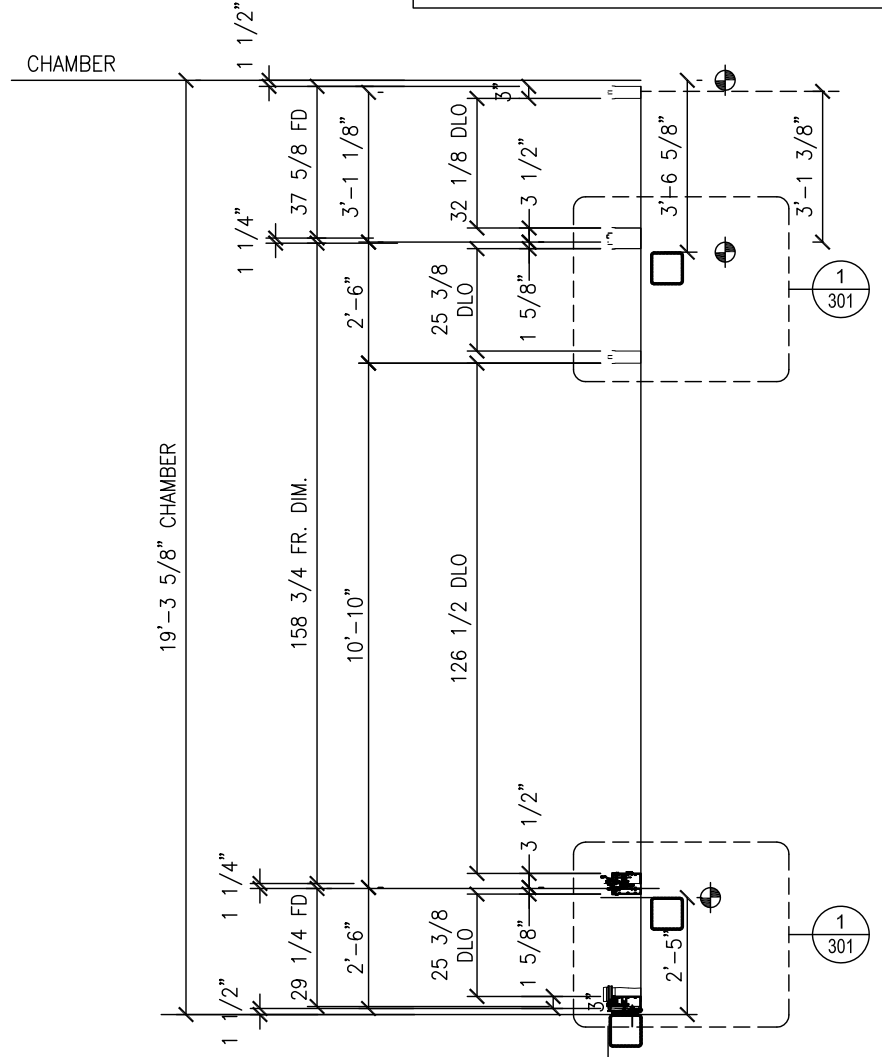
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- MU4 QTY REQ'D: 1 MU5 QTY REQ'D: 1 MU6 QTY REQ'D: 1
- MU1 QTY REQ'D: 1 MU2 QTY REQ'D: 1 MU3 QTY REQ'D: 1

1 ENLARGED ELEVATION
2 | A-202 WEST

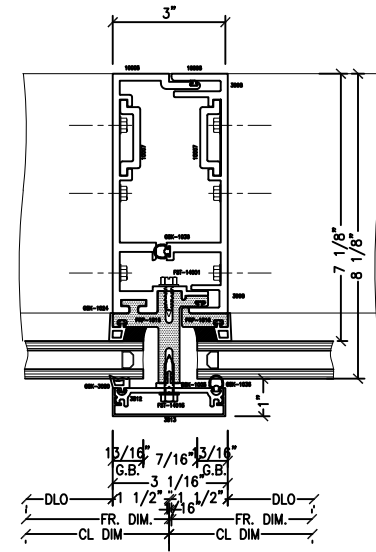
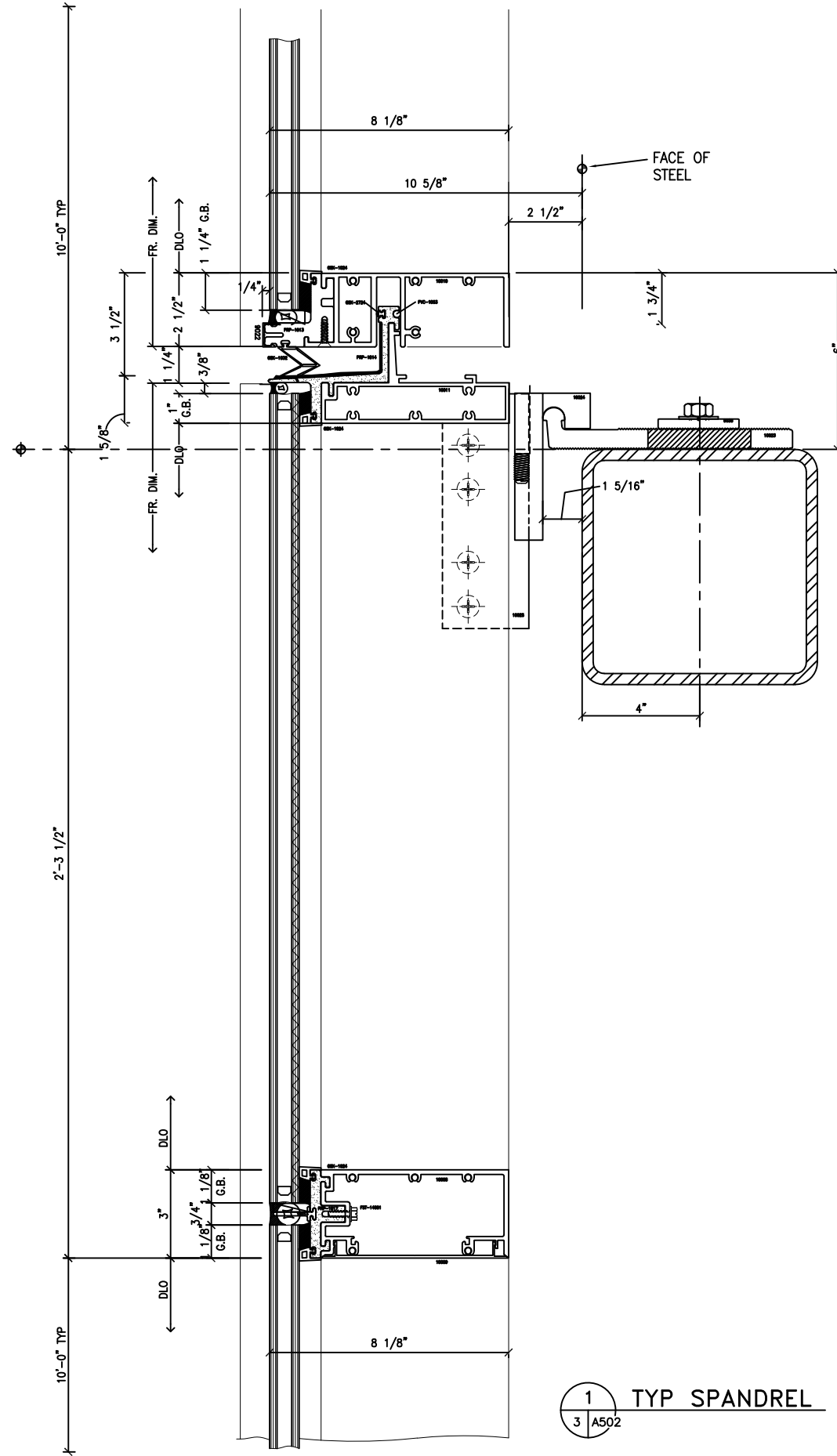


2 ENLARGED PLAN
1 | A-104 LEVEL 4

	V	1" INSULATED VISION
	SP	1" INSULATED SPANDREL

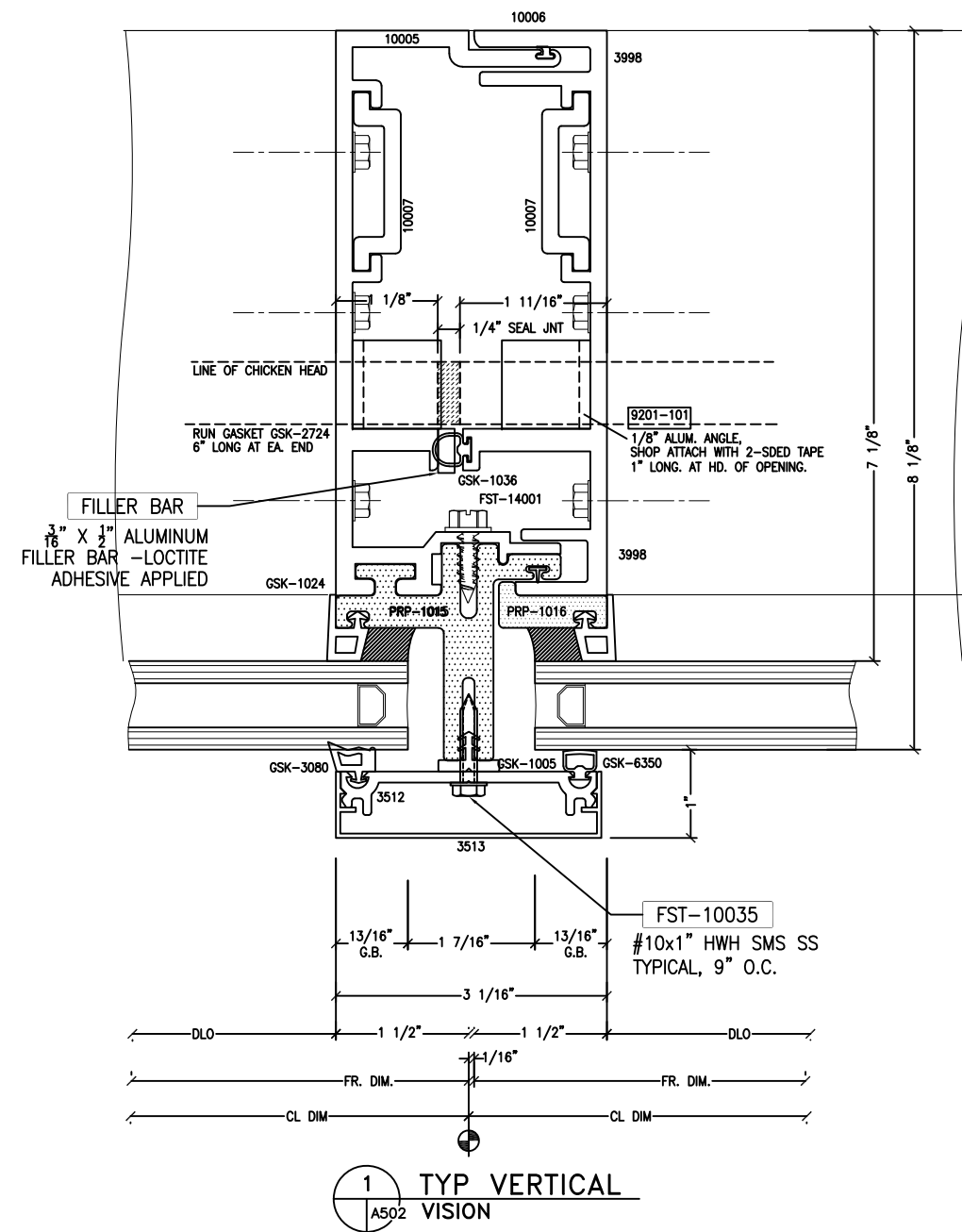
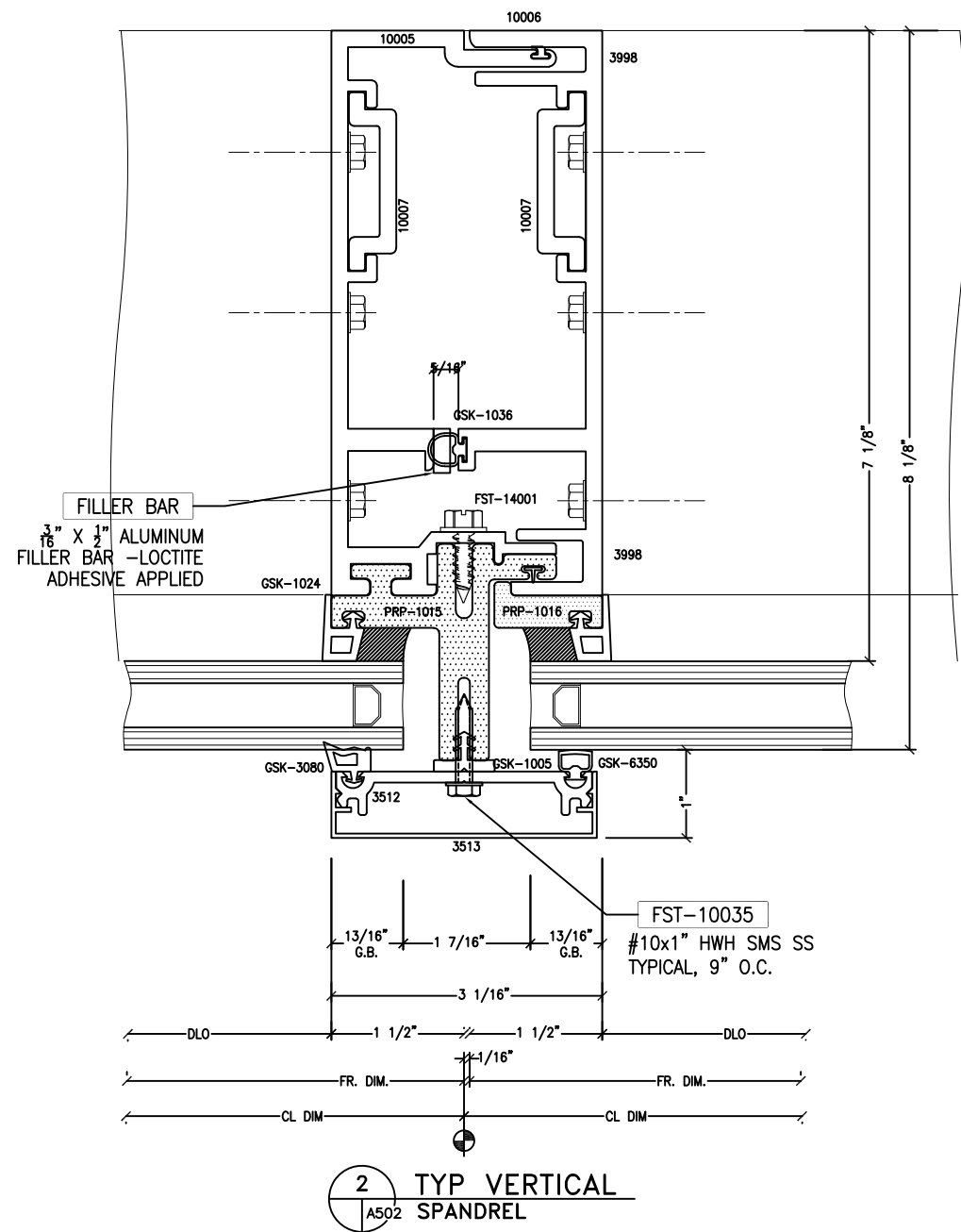


3 SECTION
1 | A-311



1 TYP SPANDREL
3 A502

Fromoq Innovations, Inc		<small>PHONE (719) 843-0043</small>	
<small>8300 Highland Drive WAUSAU, WI 54981</small>		PROJECT NAME: Merrimack Street Mixed use	
<small>General Notes: 1. Contractor to verify all dimensions in the field. All framing will be manufactured to the dimensions indicated unless otherwise noted. 2. Contact to review all conditions for compliance to contract documents and if required provide correct details on drawings and specifications. 3. Drawings marked "approved" or "approved as noted" shall be interpreted as an accurate condition of job requirements and such approval shall author release to fabrication. 4. Fromoq shall not be responsible for any errors and/or work that occurs from the use of these drawings by other trades.</small>		LOCATION: Lawrence MA.	
		ARCHITECT: SGA Boston MA.	
		CUSTOMER: REPRESENTATIVE:	
CUST. ORDER NO.		REV. NO. DATE	
SHEET NAME SPANDREL SECTION			
SCALE FULL		DATE 10/24/18	
DRAWN BY TT		SHEET NO.	
35 of 41		MD301	



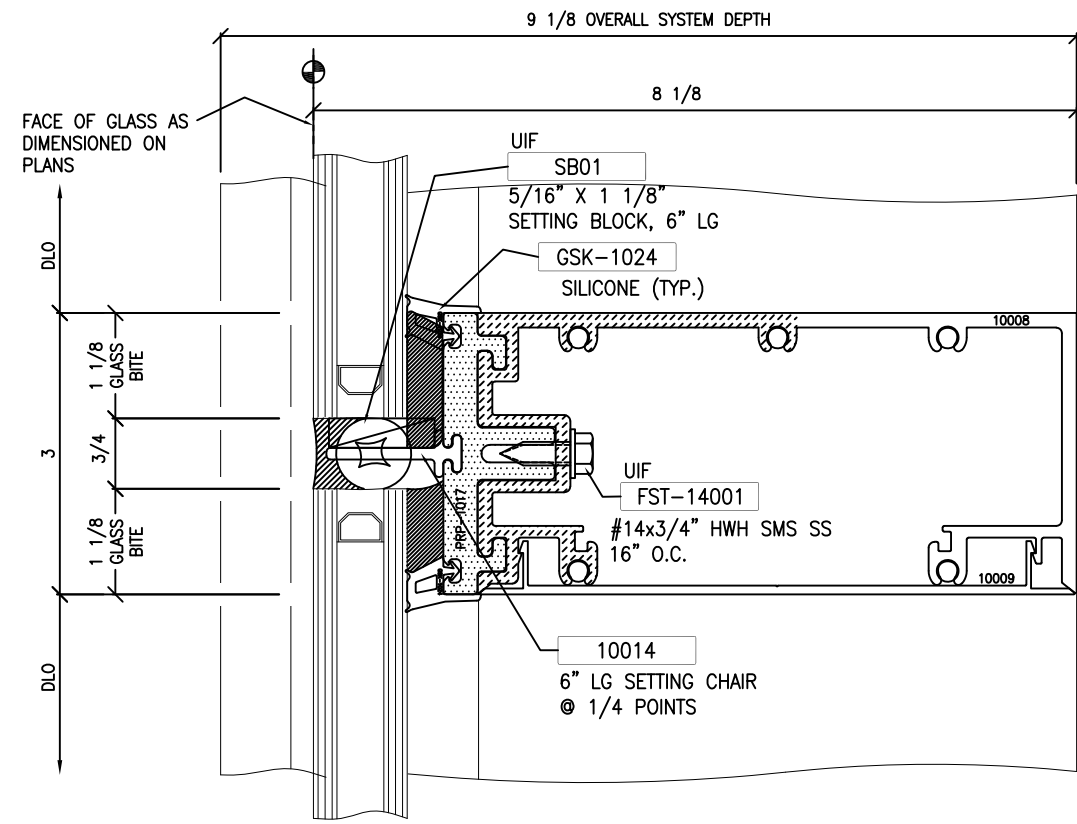
PROJECT NAME: Merrimack Street Mixed use		ARCHITECT: SGA Boston MA.	
LOCATION: Lawrence MA.		CUSTOMER:	
REV. NO.	DATE	REV. NO.	DATE
1	11-30-18	2	10/21/19
DRAWN SUBMITTAL/REVISION DESCRIPTIONS		DRAWN SUBMITTAL/REVISION DESCRIPTIONS	
ADDED FILLER BAR @ PRIMARY SEAL GSKT		ADDED FILLER BAR @ PRIMARY SEAL GSKT	
2nd SUBMITTAL		2nd SUBMITTAL	
AUG		AUG	

PHONE (718) 843-0842	
FromMarq Innovations, Inc.	
8300 Highland Drive	
WAUSAU, WI 54981	

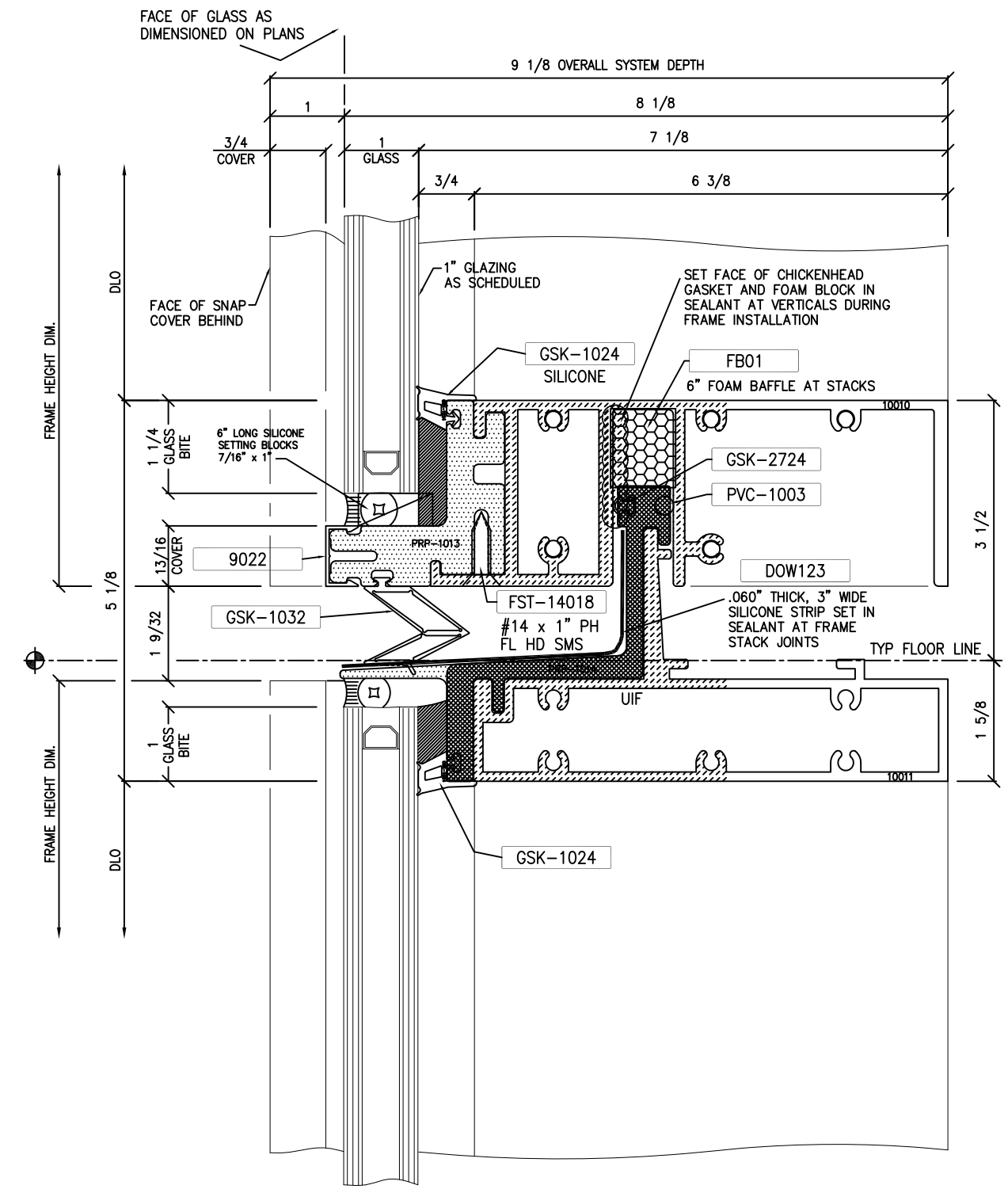
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JOB NO.	CUST. ORDER NO.
SHEET NAME	SPANDEL SECTION
SCALE FULL	DATE 10/24/18
DRAWN BY TT	SHEET NO.

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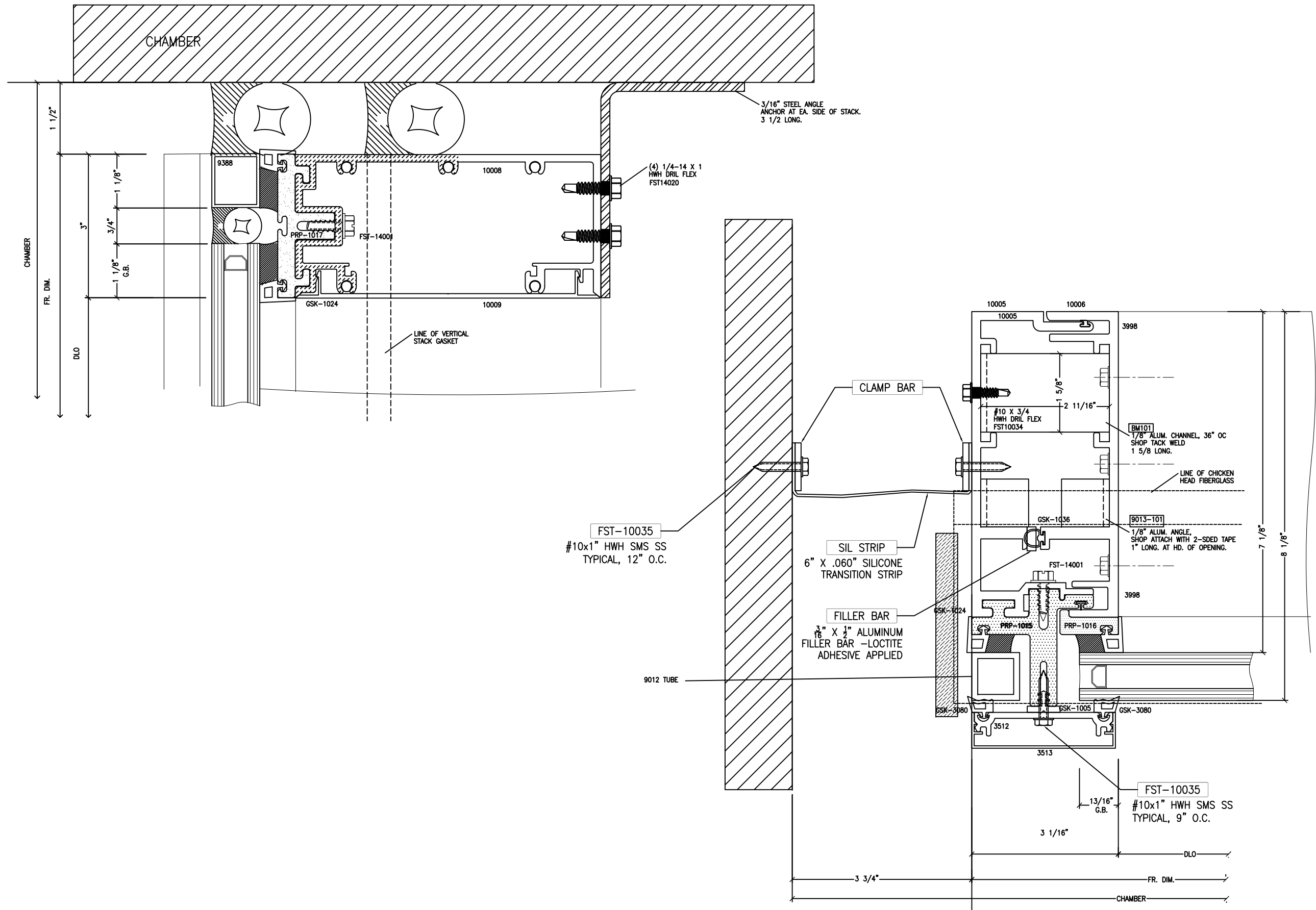


2 TYP INTERMEDIATE
A502



1 TYP STACK
A502

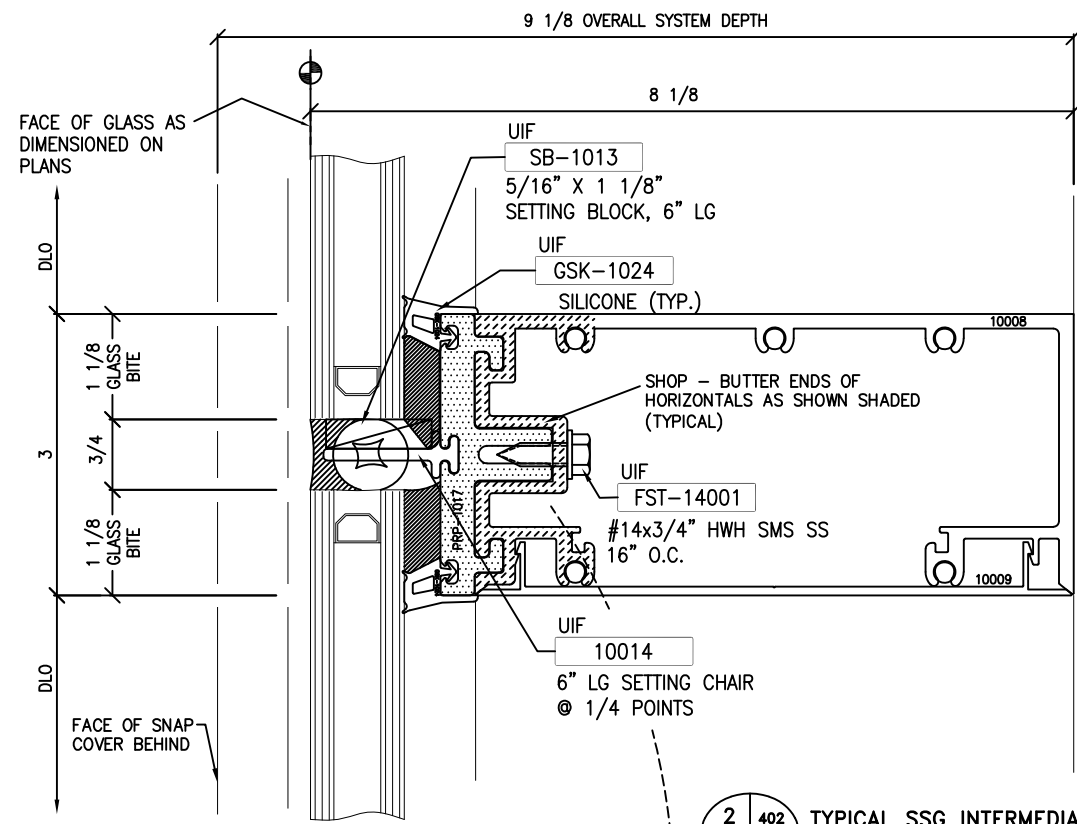
PROJECT NAME: Merrimack Street Mixed use		ARCHITECT: SGA Boston MA.		CUSTOMER: Boston MA.		REPRESENTATIVE:	
LOCATION: Lawrence MA.		PHONE (718) 843-0848		WAUSAU, WI 54981		General Notes: 1. Contractor to verify all dimensions in the field. All framing will be manufactured to the dimensions indicated unless otherwise noted. 2. Contractor to review all conditions for compliance to contract documents and if required provide correct details. 3. Drawings marked "approved" or approved as noted shall be interpreted as an accurate condition of job requirements and such approval shall not be construed as an approval of fabrication. 4. Framing shall not be responsible for any errors and/or work that occurs from the use of these drawings by other trades.	
JOB NO.		CUST. ORDER NO.		SHEET NAME SPANDREL SECTION		SCALE FULL DATE 10/24/18	
DRAWN BY TT		SHEET NO.		DATE 11-30-18		REV. NO. DATE	
DRAWN SUBMITTAL/REVISION DESCRIPTIONS		DRAWN SUBMITTAL/REVISION DESCRIPTIONS		DATE		DATE	



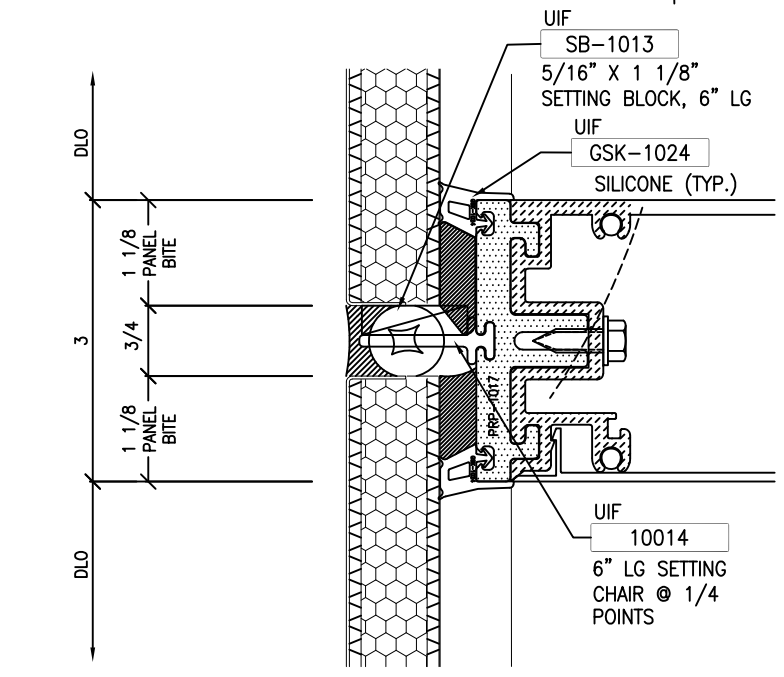
2 TYP STACK/JAMB
A502

PROJECT NAME: Merrimack Street Mixed use LOCATION: Lawrence MA.		ARCHITECT: SGA Boston MA.		CUSTOMER: Boston MA.		REPRESENTATIVE:	
PHONE (718) 843-0848		10/21/19		11-30-18		DATE	
8300 Highland Drive WAUSAU, WI 54981		KXB		A/JG		DRAWN SUBMITTAL/REVISION DESCRIPTIONS	
JOB NO.		CUST. ORDER NO.		SHEET NAME SPANDREL SECTION		SCALE FULL DATE 10/24/18	
DRAWN BY TT		SHEET NO.		88 of 41		MD403	

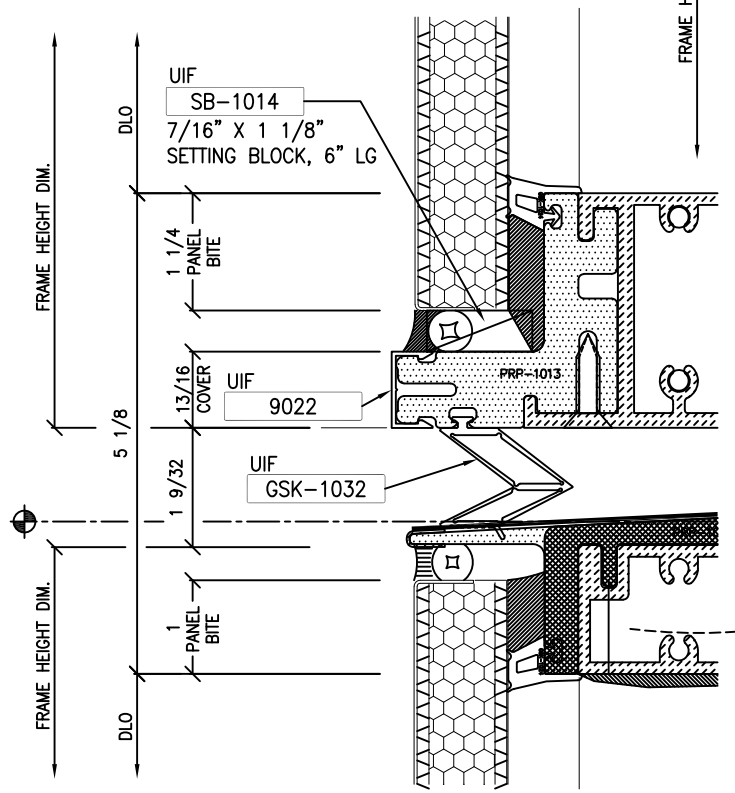
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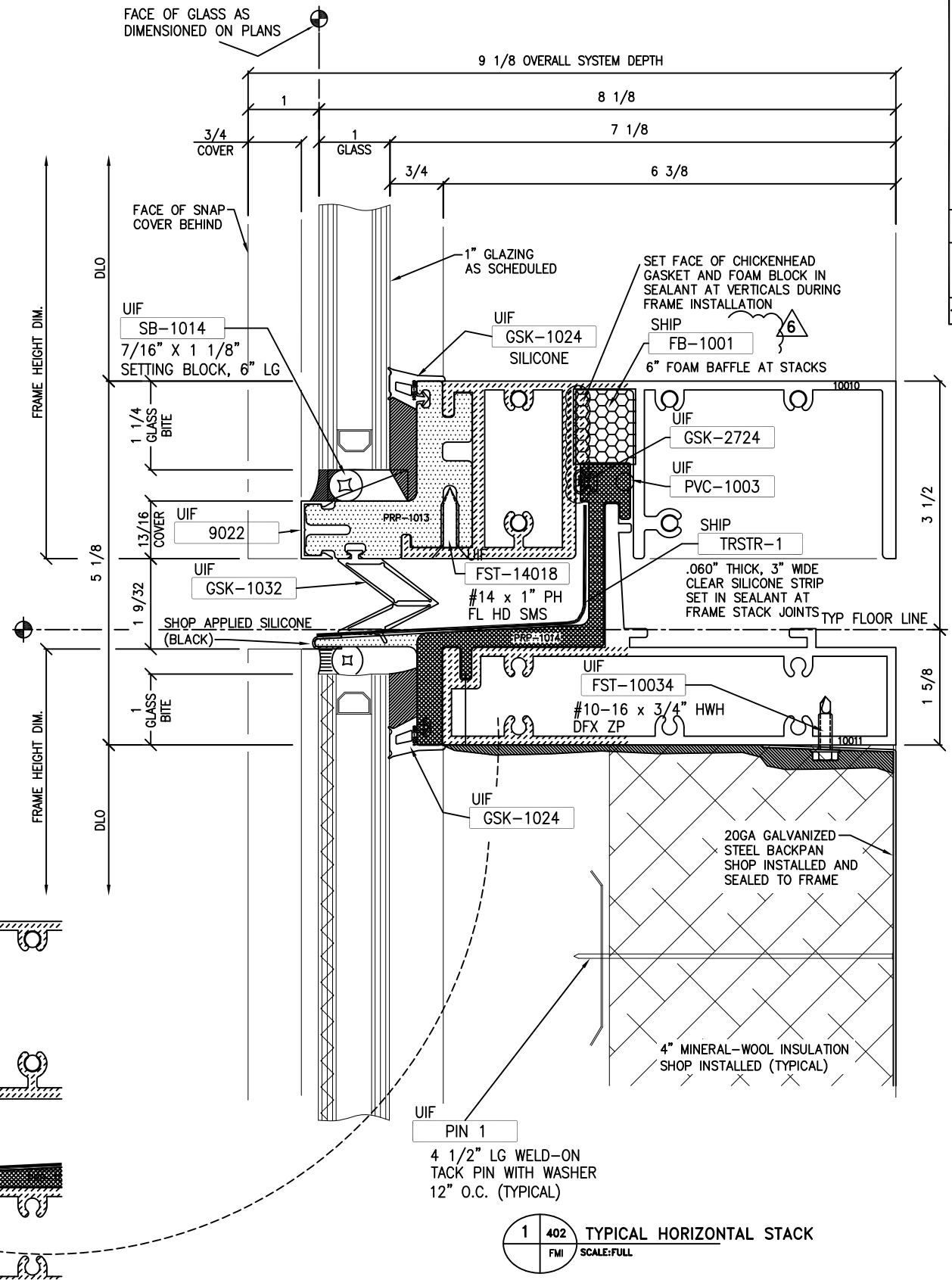
2 402 TYPICAL SSG INTERMEDIATE
FMI SCALE: FULL



B INTERMEDIATE AT 1" THICK THERMOLITE PANEL



A STACK AT 1" THICK THERMOLITE PANEL



1 402 TYPICAL HORIZONTAL STACK
FMI SCALE: FULL

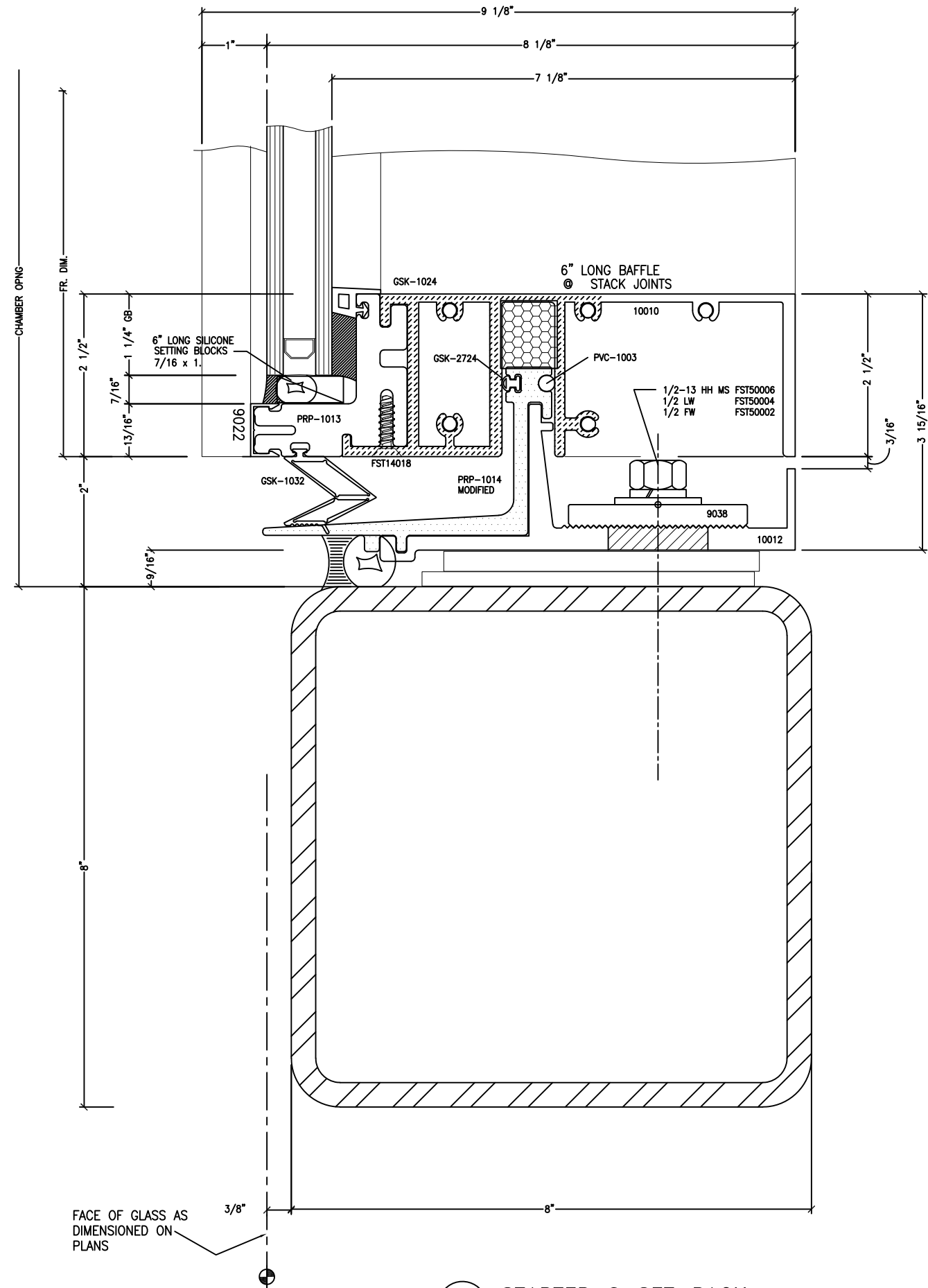
REV. NO.	DATE	DESCRIPTION
1	11-30-18	2nd SUBMITTAL
2	2-12-19	GENERAL REVISIONS
3	2-21-19	FOR PRODUCTION
4	3-18-19	GENERAL REVISIONS
5	04/09/19	FINAL FMI REVISIONS FOR PRODUCTION

PROJECT NAME: THE HEIGHTS AT HAVERHILL
 LOCATION: HAVERHILL, MASSACHUSETTS
 ARCHITECT: SGA
 CUSTOMER: ALLSTATE GLAZING, LTD.
 REPRESENTATIVE:

From Marq Innovations, Inc.
 8300 Highland Drive
 WAUSAU, WI 54981
 PHONE (715) 843-0848

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JOB NO.	CUST. ORDER NO.
SHEET NAME DETAIL SHEET	
SCALE FULL	DATE 10/24/18
DRAWN BY TT	SHEET NO. 402



FACE OF GLASS AS DIMENSIONED ON PLANS

1 STARTER © SET-BACK
2 A503

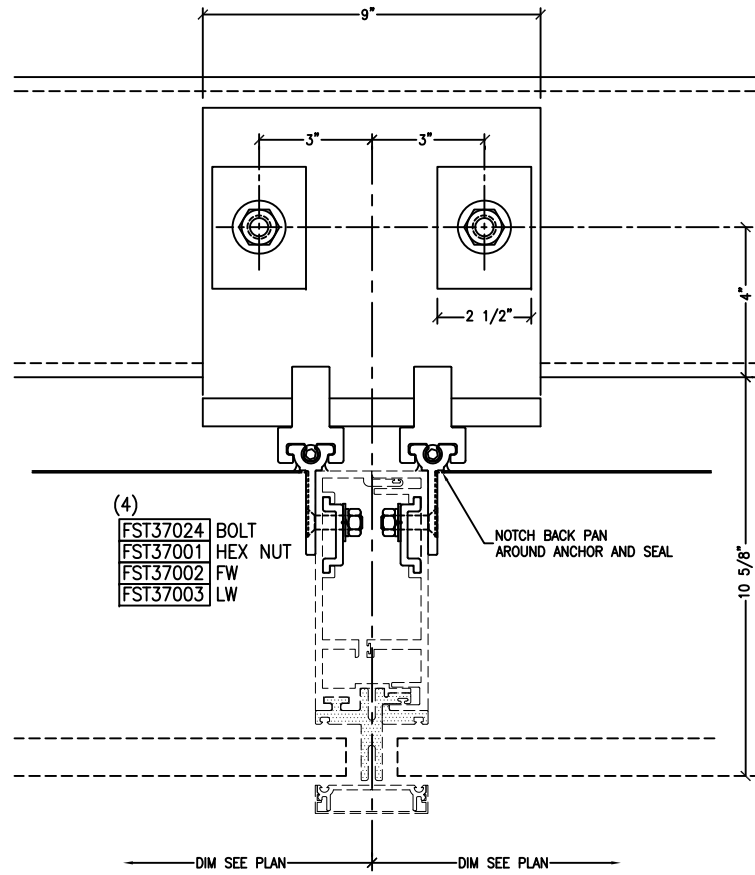
FromMarq Innovations, Inc
 8300 Highland Drive
 WAUSAU, WI 54981
 PHONE (715) 843-0843

General Notes:
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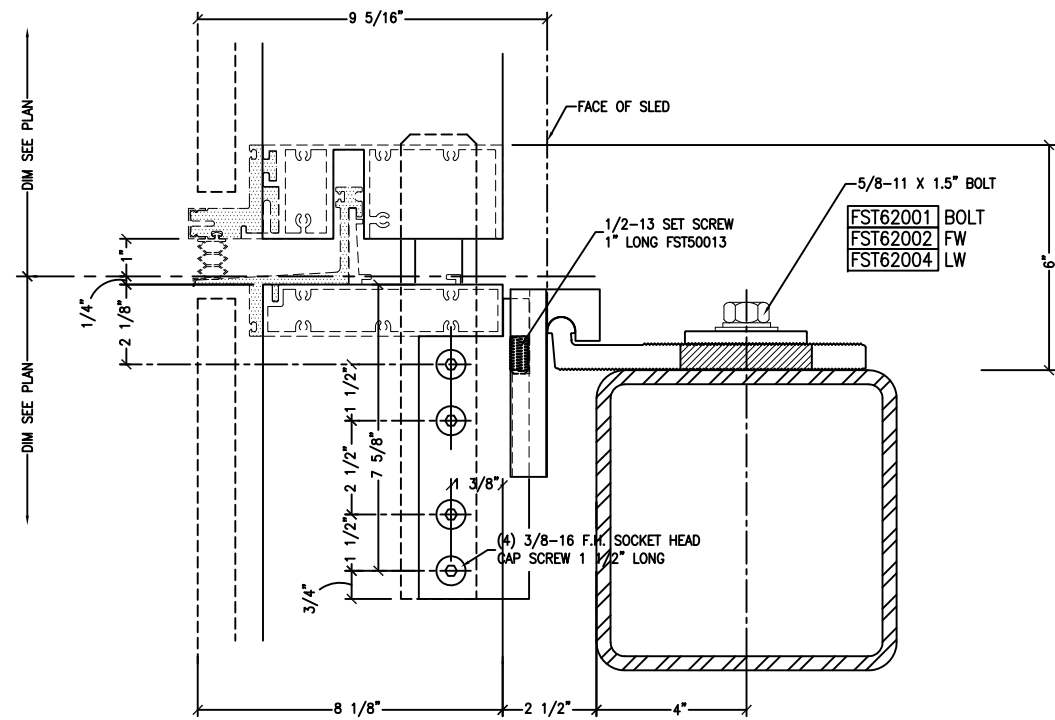
JOB NO.	
CUST. ORDER NO.	
SHEET NAME SPANDREL SECTION	
SCALE FULL	DATE 10/24/18
DRAWN BY TT	SHEET NO.
10 of 41	MD415

PROJECT NAME: Merrimack Street Mixed use
 LOCATION: Lawrence MA.
 ARCHITECT: SGA Boston MA.
 CUSTOMER:
 REPRESENTATIVE:

REV. NO.	DATE	DRAWN SUBMITTAL/REVISION DESCRIPTIONS



1
X XX
TYPICAL ANCHOR PLAN



A
TYPICAL ANCHOR SECTION

REV. NO.	DATE	DRAWN	SUBMITAL/REVISION	DESCRIPTIONS

PROJECT NAME: Merrimack Street Mixed use	ARCHITECT: SGA Boston MA.
LOCATION: Lawrence MA.	CUSTOMER: REPRESENTATIVE:

Fromarq Innovations, Inc
8300 Highland Drive
WAUSAU, WI 54981
PHONE (718) 843-0843

General Notes:
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JOB NO.	CUST. ORDER NO.
SHEET NAME ANCHOR DETAILS	
SCALE FULL	DATE 10/24/18
DRAWN BY TT	SHEET NO.