



December 09, 2016

Craig A. Miller Sr
Webster University
470 East Lockwood Ave
St. Louis, MO 63119-3194

Via Email

Re: Paric Corporation Project No. 15051
15051-Webster University Interdisciplinary Science Building
CP-059 - Bug Screen at Fiber Cement Panels

Dear Craig A. Miller Sr:

Paric Corporation proposes to complete the following additional work for the additive sum of One Thousand Three Hundred Sixty-Three Dollars And Zero Cents \$1,363.00 .

This change will impact the scheduled completion date by 0 days.

- PCI-E-0054 (Provide Bug Screen at Fiber Cement Panels), Total \$ 1,363.00

The owner contingency will be utilized for this change proposal. This change proposal is generated per the markups on Submittal 074646-006. The bug screen is not indicated on the contract documents but can be added if this change proposal is accepted.

Proposed Change Proposal Total: \$1,363.00

If this change proposal meets with your approval, please sign and return this proposal for our records by December 16, 2016 at the latest. If accepted this scope will be incorporated into a change order.

Sincerely,

Paric Corporation

Jason Szachnieski
Project Manager

Accepted:

Date:

Craig A. Miller Sr
Webster University.

Declined:

Date:

Craig A. Miller Sr
Webster University

Paric Corporation

Page: 1 of 1
Date: 09-DEC-16
Time: 02:18 PM

PROJECT MANAGEMENT - CHANGE ITEM DETAIL REPORT

15051 - 15051-Webster University Interdisciplinary Science Building

Status: EXT EXT

CI Type	CI Number	Description	Estimated Amount	Quoted Amount	Final Amount	Due to Owner	Notes	Date Sent	Date Received	Date Closed	Budgeted Amount	Billing Amount	Owner CO
EXT	PCI-E-0054	Provide Bug Screen at Fiber Cement Panels			1,363.00	09-DEC-16					1,363.00	1,363.00	
Vendor Name													
Description													
	Kuenz Heating & Sheet Metal Co.	15051	07450.001 S	Fiber Cement Siding	1,300.00		Provide Bug Screen at Fiber Cement Panels						Provide "bug screen" per fiber cement shop drawings 074646-006 and Kuenz proposal dated 12/2/16. Add \$1,300
	PARIC	15051	23150.005 M	Contractor Default Insurance (1.25%)	16.00		Provide Bug Screen at Fiber Cement Panels						Contractor Default Insurance
	PARIC	15051	23300.001 F	Fee (2.5%)	33.00		Provide Bug Screen at Fiber Cement Panels						Contractor Fee
	PARIC	15051	23100.001 M	Risk Management (1.1%)	14.00		Provide Bug Screen at Fiber Cement Panels						Risk Management
Total For EXT			0.00	0.00	1,363.00						1,363.00	1,363.00	
Grand Total:			0.00	0.00	1,363.00						1,363.00	1,363.00	

END OF REPORT

Report Parameters

Job:	15051	Project Code:	
From Change Order:		Run Date:	09-DEC-16
To Change Order:		Run Time:	02:18 PM
Status Code:		Operator:	JAS39SZA
Report Type:	DETAIL	Posting Status:	Unposted CI
Print Notes:	Y	Report Code:	PM5000
Group By:	STATUS		

KUENZ

Heating & Sheet Metal Co.
Industrial, Institutional, Commercial and Fabrication

December 2, 2016

Paric Corporation
77 Westport Plaza, Suite 250
St. Louis, Missouri 63146

Attention: Devin Gates
Email: ddgates@paric.com

Re: Webster University Interdisciplinary Science Building
Bug Screen

Devin,

We propose to furnish and install 260 linear feet of "Bug Screen", per revised Fiber Cement shop drawings.

All of the above for the sum of ***One Thousand Three Hundred Dollars, (\$ 1,300.00).***

If we are to proceed, please issue a change order in this amount so we may order the material.

Thank you in advance for your time.

Respectfully submitted,

Chris Bradley

Chris Bradley.,
Kuenz Heating & Sheet Metal Company
CBKHSMC/jvh

This proposal is valid for 30 days and is void if not accepted within that time.

We have no duties or obligations beyond those contained in this proposal, and we are not bound by any terms or conditions not contained in this proposal, unless set forth in a subcontract agreement acceptable to us and signed by us. If we are directed to proceed with our work and no subcontract agreement is signed by us, the only terms and conditions governing our work are those contained in this proposal.

811 Westwood Industrial Park Drive St. Charles, Missouri 63304
636.936.1555 Fax 636.300.9992
e-mail: kuenz@kuenzsheetmetal.com

Confidentiality Notice:

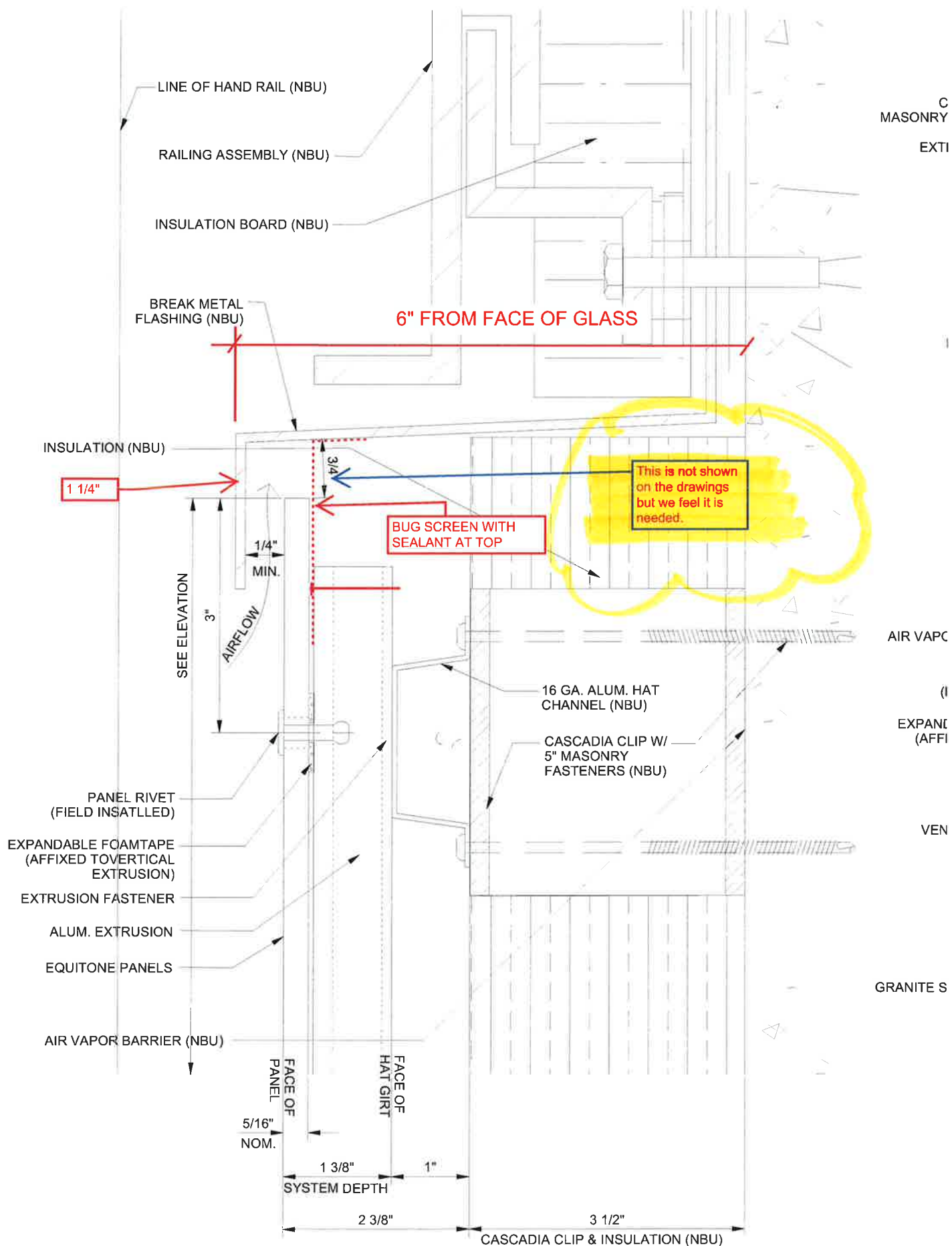
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Save a Life be a "DONOR"



SUBMITTAL IDENTIFICATION SHEET

To be completed by Contractor/CM

WEBSTER UNIVERSITY ISB

PROJECT NAME

8274 BIG BEND BLVD

ADDRESS

NUMBER

WEBSTER UNIVERSITY

OWNER

CANNON DESIGN

ARCHITECT / ENGINEER

DEVIN D GATES

SUBMITTED BY

074646-006

CONTRACTOR / CM SUBMITTAL NO.

CANNON DESIGN SUBMITTAL NO.

074646

DRAWING / DETAIL REFERENCE

SPECIFICATION SECTION / PARAGRAPH

MANUFACTURER / SUPPLIER

ITEM / PRODUCT ID

REQUIRED DATE

PRIORITY

CRITICAL

ITEM BEING SUBMITTED (check only one)

- ☒ Shop Drawings ☐ Certification / Qualifications ☐ Coordination Drawing
☐ Samples ☐ Record Documents ☐ Calculations
☐ (____ copies) ☐ Product Data ☐ Schedules
☐ LEED Submittal ☐ O&M Manuals
☐ Other _____

ITEM BEING SUBMITTED FOR (check only one)

- ☒ Action ☐ Information Only ☐ Record

REMARKS OR DEVIATIONS

CONTRACTOR / CM CERTIFICATION
(SUBMITTALS NOT CERTIFIED WILL BE RETURNED WITHOUT REVIEW)



PARIC CORPORATION
SUBMITTAL STAMP

THIS SHOP DRAWING HAS BEEN REVIEWED BY PARIC CORPORATION

Submittal review is available (request) for drawings, specifications, and details. This review is not a guarantee of compliance with contract documents.

By:
Devin D. Gates

DEVIN D GATES

REVIEWED BY

9/19/16

DATE

To be completed by Reviewer

07 4646-006

CANNON DESIGN SUBMITTAL NUMBER

9/19/16

RECEIVED DATE

- ☐ A. No Exceptions Taken
No further review of submittal is required.
☐ B. Make Corrections Noted
Incorporate corrections in work; resubmission is not required.
☒ C. Revise and Resubmit
Revise as noted, and resubmit for review.
☐ D. Rejected
Submittal is not in compliance with Contract Documents; provide new submittal.
☐ E. For Record / Information Only
Submittal was reviewed for Record / Information purposes only.
☐ F. Not Required for Review
Submittal is not required by Contract Documents and has not been reviewed.

Review is for conformance with the design concept of this project and for general compliance with contract documents. Contractor is responsible for quantities, dimensions and compliance with contract documents and for information that pertains to fabrication processes, construction techniques and coordination of this work with all trades which will be affected thereby. This review is null and void if submittal deviates from contract documents and does not indicate or note deviations.

A/E COMMENTS

☐ See attached sheet(s) for additional comments

ISSUES:

DEPTH OF SYSTEM TO BE 5 5/8" AS INDICATED THIS IS CRITICAL WHERE PANELS NEED TO BE FLUSH WITH ADJACENT CURTAINWALL AND DOOR FRAMES.

SEGEMENTED PANELS AT CURVE - CURTAINWALL AND FIBER CEMENT TO BE PER DRAWINGS AND ALIGNED WITH EACH OTHER

WE WOULD LIKE TO SEE PLANNED RIVET LAYOUT TO ASSURE NEATNESS AND ALIGNMENT OF FASTENERS.

DEMONSTRAT HOW REQUIRED OPENINGS IN PANELS WILL BE ACCOMMODATED.

LYNN GROSSMAN

Kathy Williams

10/21/16

REVIEWED BY

DATE

WEBSTER UNIVERSITY INTERDISCIPLINARY SCIENCE BUILDING WEBSTER GROVES, MISSOURI

ARCHITECT

Cannon Design
Saint Louis, Missouri

CUSTOMER/INSTALLER

Kuentz Heating and Sheet Metal Company
Saint Louis, Missouri

EQUITONE U110-1.00 SYSTEM

SUPPLIED EXTRUSIONS

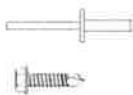


(SEE DETAIL DRAWINGS FOR ACTUAL SIZE)

SUPPLIED HARDWARE

PANEL RIVET
(SUPPLIED COLOR MATCHED)

EXTRUSION FASTENER
1/8" x 1/2" 1" RWH WITH 3/8" HEX HEAD,
#3 DRILL POINT, CLIMASEAL ACR COATED



USE CENTERING TOOL TO DRILL THRU PRE-DRILLED
PANEL HOLES INTO ALUMINUM SUBFRAMING

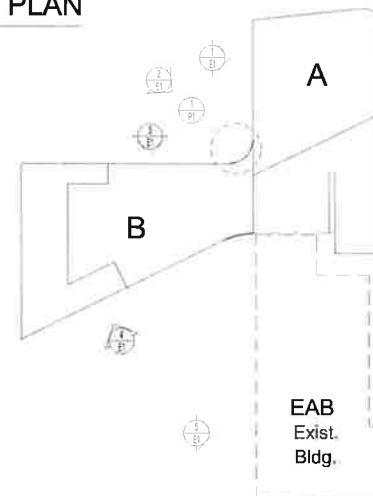
DRAWING INDEX

T1	TITLE SHEET - EQUITONE
P1	PARTIAL PLAN AT CURVED WALL
E1	ELEVATIONS
D1	FULL SIZE DETAILS
D2	FULL SIZE DETAILS
D3	FULL SIZE DETAILS
D4	FULL SIZE DETAILS
D5	FULL SIZE DETAILS

APPROVAL STAMP

KEY PLAN

NTS



ARCHITECT/CUSTOMER NOTE

UNIVERSE CORPORATION HAS PREPARED THIS SET OF SUBMISSION DRAWINGS IN ACCORDANCE WITH CRITERIA ESTABLISHED BY OTHERS. THE CONTRACTOR SHALL BE RESPONSIBLE TO VERIFY THE INFORMATION CONTAINED HEREIN, INCLUDING ALL DIMENSIONS.

UNIVERSE CORPORATION REQUIRES A "WRITTEN RELEASE TO PROCEED WITH FABRICATION", PRIOR TO MANUFACTURING PANEL MATERIAL.

UNIVERSE CORPORATION WILL FABRICATE ALL OF ITS MATERIALS FROM THIS APPROVAL SET. IF FIELD VERIFICATION OF DIMENSIONS IS REQUIRED, THE CUSTOMER SHALL BE RESPONSIBLE TO SUPPLY THESE DIMENSIONS TO UNIVERSE CORPORATION PRIOR TO PANEL MANUFACTURING/ENGINEERING.

DISCREPANCIES FOUND DURING FIELD VERIFICATION OF DIMENSIONS SHALL BE CORRECTED BY THE CUSTOMER AND NOT BY UNIVERSE CORPORATION.

GENERAL NOTES

1. MATERIAL TO BE 8mm EQUITONE
2. COLOR/FINISH: N374 (natural)
3. ALL DIMENSIONS TO BE VERIFIED
4. "NBU" INDICATES MATERIAL NOT SUPPLIED BY UNIVERSE CORP
5. ALL FRAMING TO BE MINIMUM 0-90 16-GA. STEEL OR 3/4" TREATED PLYWOOD. (NOT SUPPLIED BY UNIVERSE CORP.)
6. FLUID APPLIED: AIR AND MOISTURE BARRIER (N B U).
7. INSULATION OF ANY TYPE (N B U)
8. THESE SHOP DRAWINGS PREPARED USING ARCHITECTURAL DRAWINGS DATED 01.15.2016

SPECIAL NOTES

1. EDGES WILL BE LIGHTLY SANDED TO REMOVE ANY SHARPNESS CREATED WITH THE FABRICATION PROCESS. IF REQUIRED, LURO WILL BE APPLIED TO EDGES AFTER FABRICATION.
2. ONCE UNIVERSE HAS RECEIVED COLOR AND SHOP DRAWING SUBMITTAL APPROVALS, THERE IS AN 12-14 WEEK LEAD TIME FOR THE PROCUREMENT OF THE EQUITONE MATERIAL. (THIS TIME DOES NOT INCLUDE ENGINEERING AND FABRICATION)
3. IN ACCORDANCE WITH EQUITONE DESIGN CRITERIA, PROPER VENTILATION AND FREE AIR MOVEMENT WITHIN THE AIRSPACE BEHIND THE EQUITONE PANELS MUST BE MAINTAINED. VENT OPENINGS AND JOINT SPACINGS AS DETAILED IN THESE SHOP DRAWINGS MUST REMAIN UNOBSTRUCTED. FAILURE TO MAINTAIN THIS VENTILATION AND AIRSPACE REQUIREMENTS WILL GREATLY AFFECT THE PERFORMANCE OF THESE PANELS. POSSIBLE LEADING TO PANEL SYSTEM ISSUES.

PANEL INSTALLER NOTES

- A. TOP OF PANELS DESIGNATED WITH AN "H" ON BACK OF PANELS FOR "HEAD"
- B. UNLESS NOTED OTHERWISE, A U7000 SYSTEM REQUIRES AN INSTALL SEQUENCE OF BOTTOM TO TOP
- C. CUT-OUTS OR PENETRATIONS IN EQUITONE PANELS DUE TO LIGHT FIXTURES, SCUPPERS, ETC TO BE FIELD CUT BY PANEL INSTALLER TO INSURE PROPER FIT. (N B U)

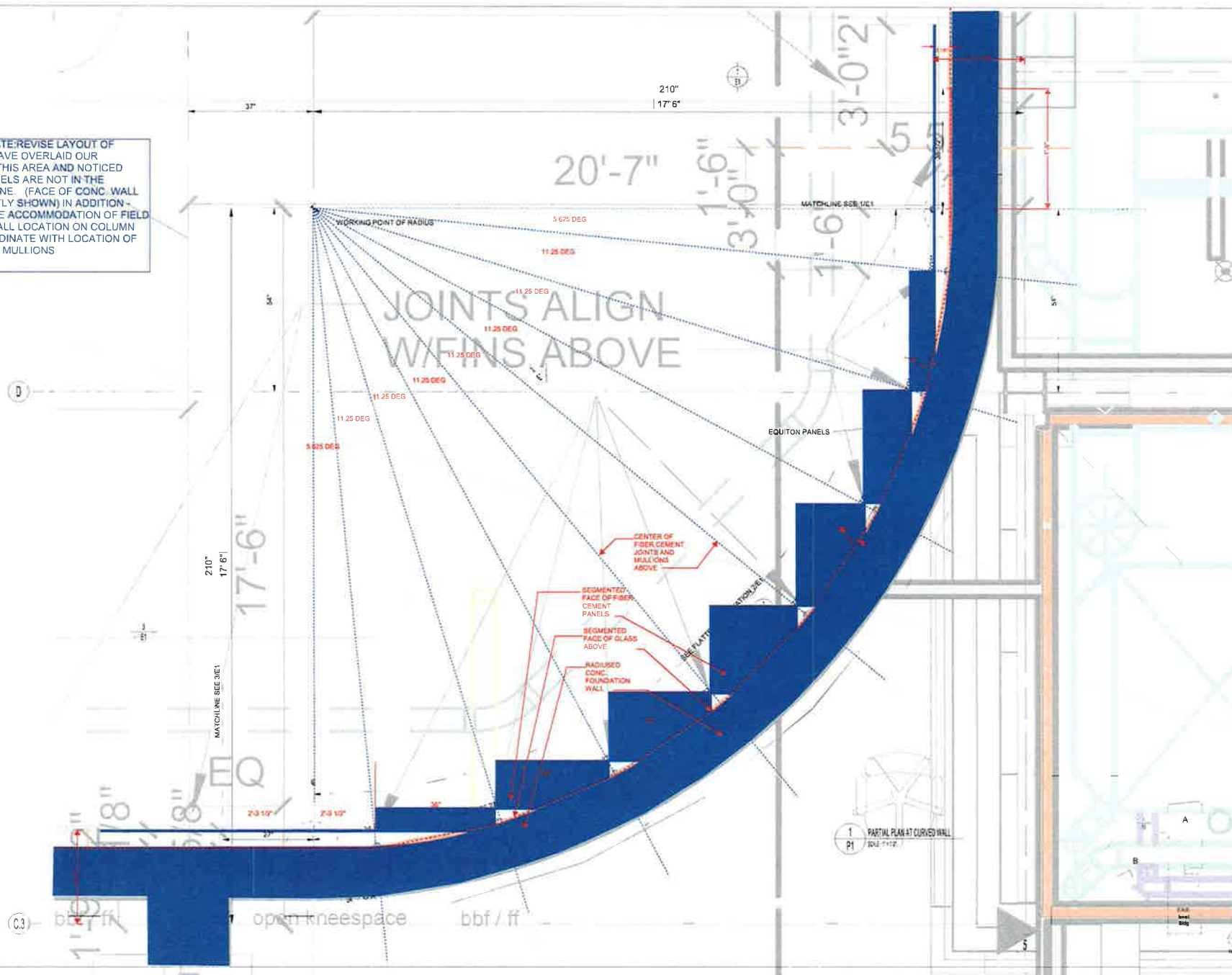
Kuentz Heating and Sheet Metal Company
St. Charles, MO 63304

Webster University Interdisciplinary Science Bldg - EQUITONE
Webster Groves MO
TITLESHEET

UNIVERSE CORPORATION
3115 S. GILBERT ST.
ST. LOUIS, MO 63104-2718
TEL: 314.351.2200
FAX: 314.351.2201
WWW.UNIVERSECORP.COM

PROJECT NUMBER
2016-06-0556
SHEET NUMBER
T1

CM COORDINATE/REVISE LAYOUT OF CURVE: WE HAVE OVERLAID OUR DRAWING OF THIS AREA AND NOTICED THAT THE PANELS ARE NOT IN THE CORRECT PLANE. (FACE OF CONC. WALL NOT CORRECTLY SHOWN) IN ADDITION - DEMONSTRATE ACCOMMODATION OF FIELD CONCRETE WALL LOCATION ON COLUMN LINE C,3 COORDINATE WITH LOCATION OF CURTAINWALL MULLIONS



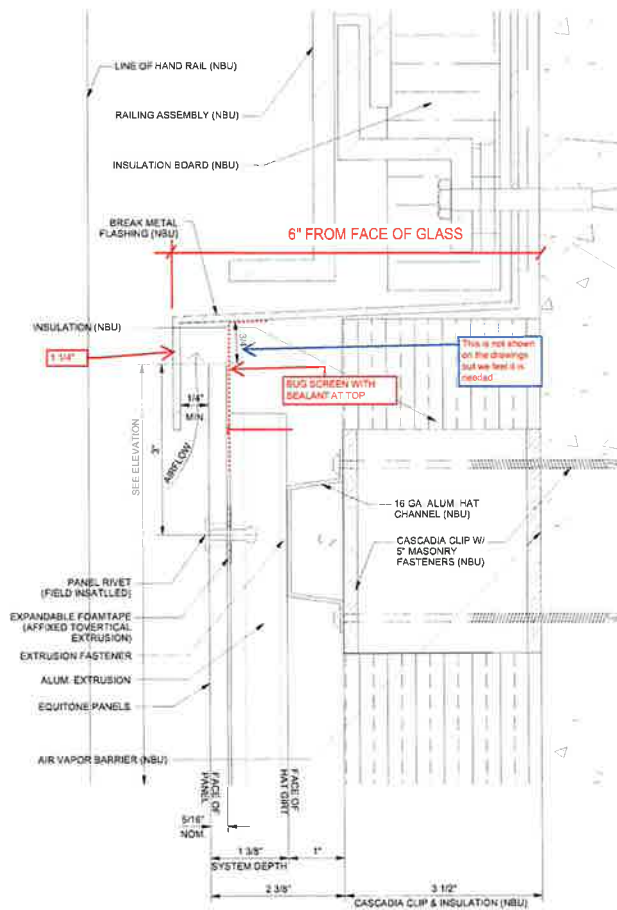
Kuenz Heating and Steel Metal Company
St. Charles, MO 63304

Webster University Interdisciplinary Science Bldg-EQUITONE
Webster Groves, MO

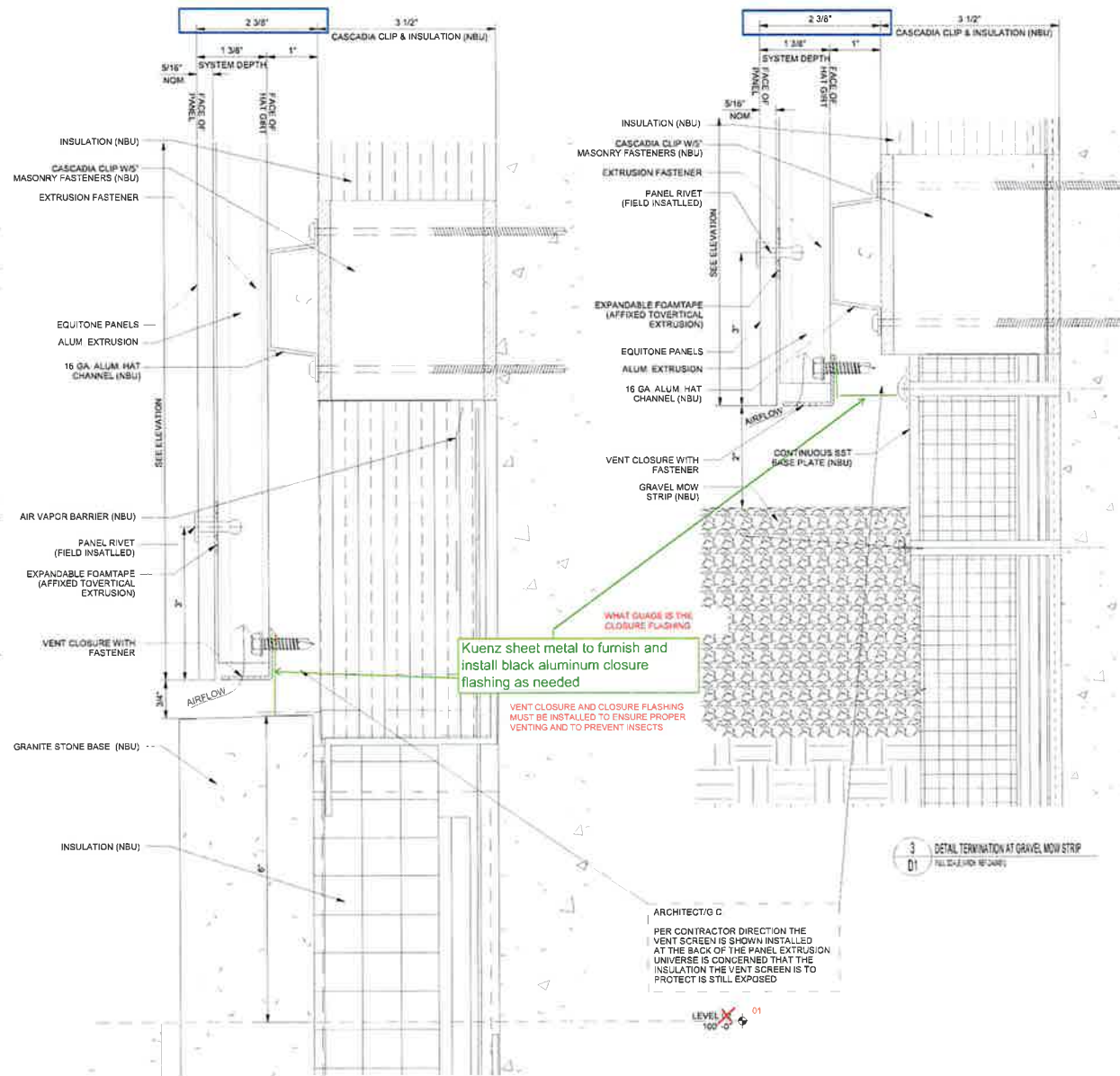
UNIVERSE CORPORATION
333 FORASTER RD
ST. LOUIS, MO 63044-3710
PHONE: (314) 982-2512
FAX: (314) 439-2801
WWW.UNIVERSECORP.COM

PROJECT NUMBER	2016-06-055
SHEET NUMBER	D1

kuenz sheet metal to furnish and
install cascadia clips and hat channels



1 DETAIL AT WALKING SURFACE - NORTH ATRIUM
1/8\"/>



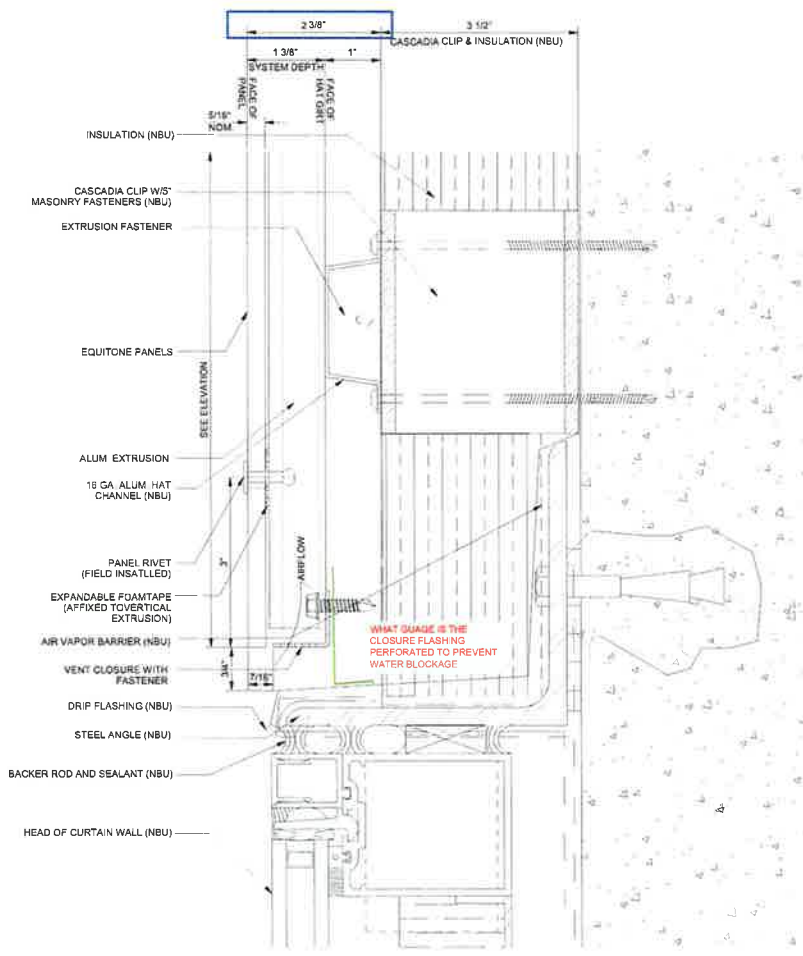
2 DETAIL TERMINATION AT CONC. PAVERS
1/8\"/>

Kuenz Heating and Steel Metal Company
St. Charles, MO 63304

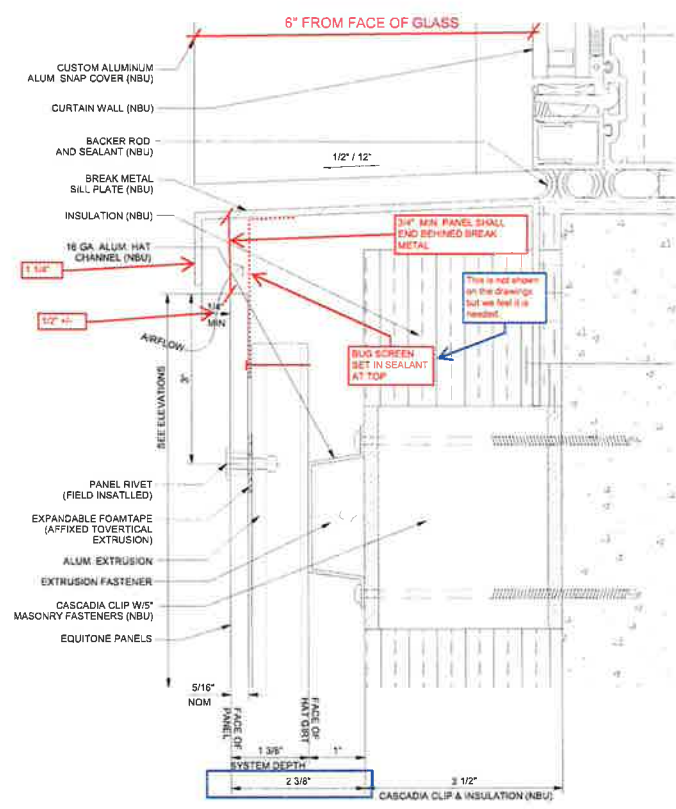
Webster University Interdisciplinary Science Bldg - EQUITONE
Webster Groves MO

UNIVERSE CORPORATION
3333 CORNELIUS RD
ST. LOUIS, MO 63114
PH: (314) 861-1555
WWW.UNIVERSECORP.COM

PROJECT NUMBER
2016-06-0556
SHEET NUMBER
01



1
D2
DETAIL AT HEAD OF SPANDREL GLAZING
FULL SCALE (FROM REF. DRAWING)



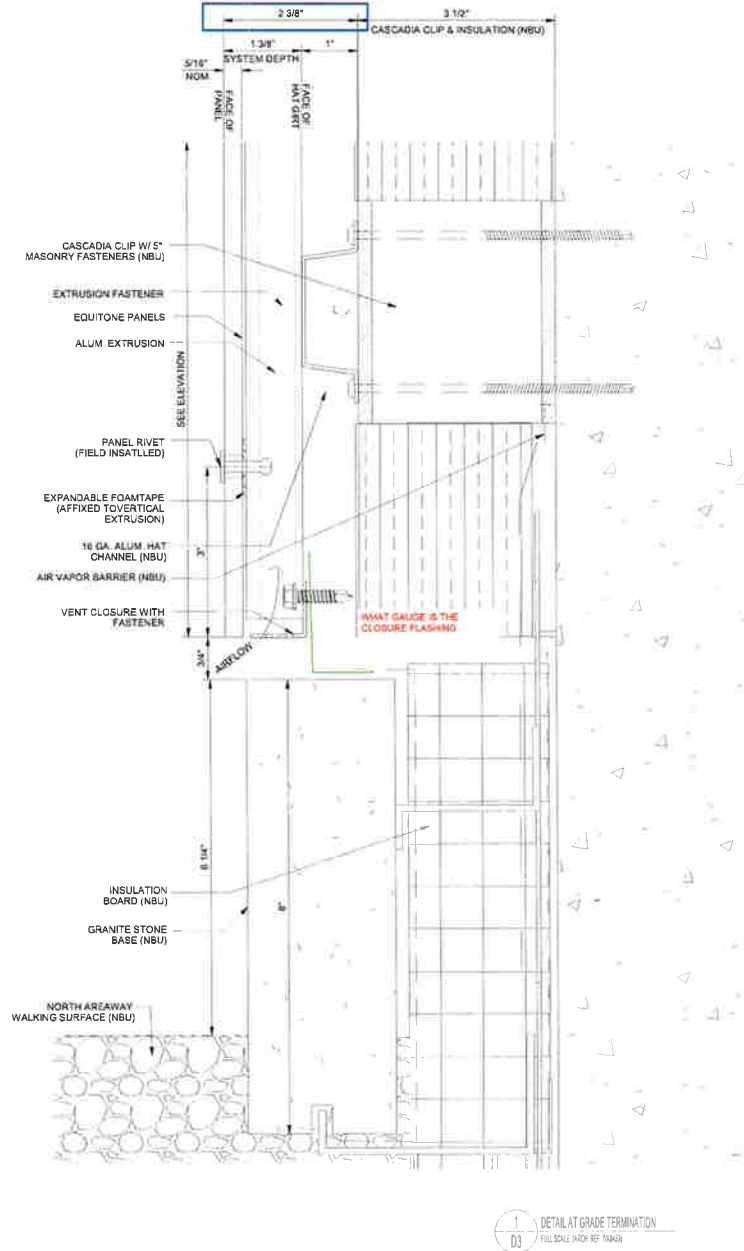
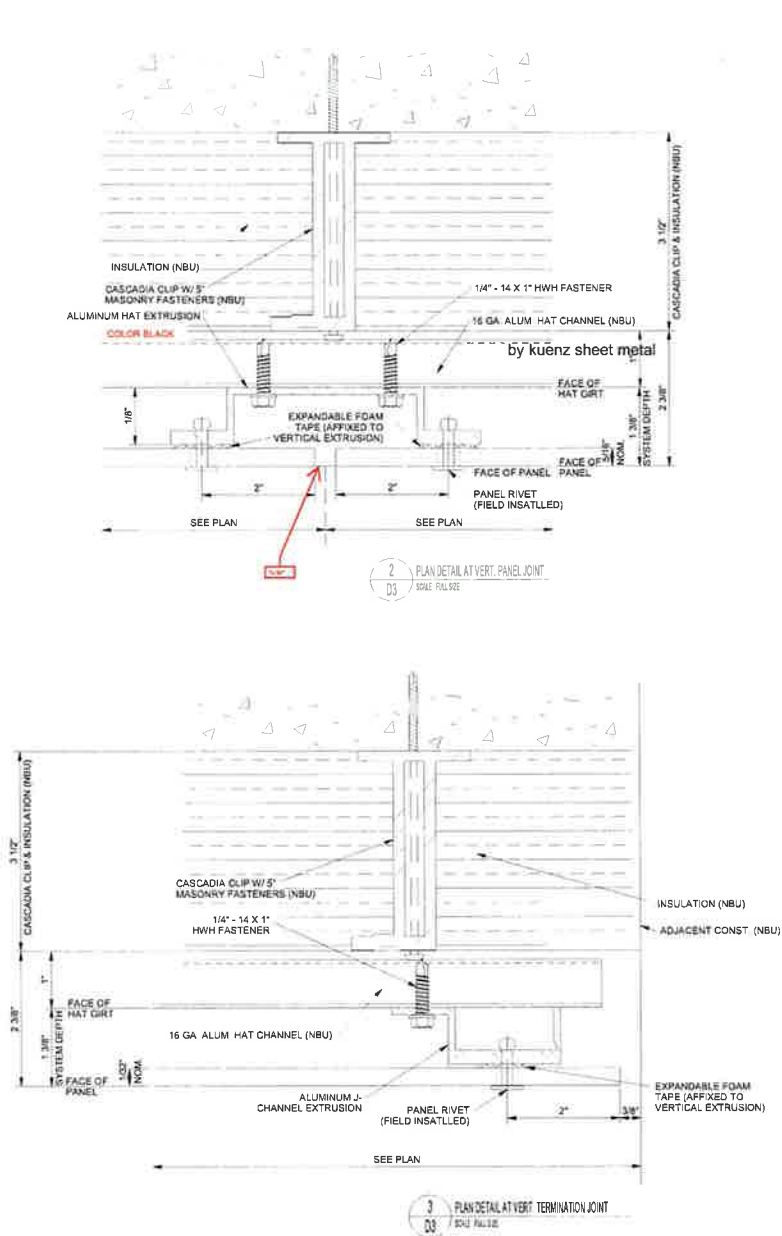
2
D2
DETAIL AT CURTAIN WALL SILL
FULL SCALE (FROM REF. DRAWING)

DESIGNED BY: Kuenz Heating and Sheet Metal Company
ST. CHARLES, MO 63304

DESIGNED BY: Webster University Interdisciplinary Science Bldg. - EQUITONE
WEBSTER GROVES, MO

UNIVERSE CORPORATION
3123 COLASIE RD
ST. LOUIS, MO 63114
PHONE: (314) 441-3114
FAX: (314) 441-3115
WWW: WWW.UNIVERSECORP.COM

PRODUCT NUMBER: 2016-06-0556
SHEET NUMBER: D2



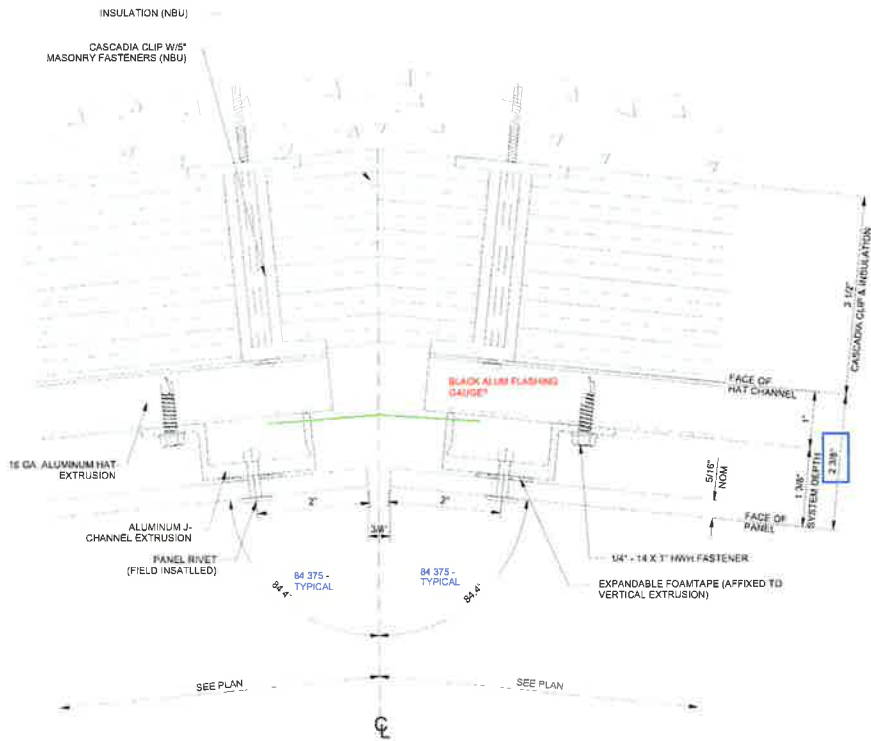
UNIVERSITY OF MISSOURI
Kuenz Heating and Sheet Metal Company
St. Charles, MO 63304

UNIVERSITY OF MISSOURI
Webster University Interdisciplinary Science Bldg - EQUITONE
Webster Groves MO
64080-0000

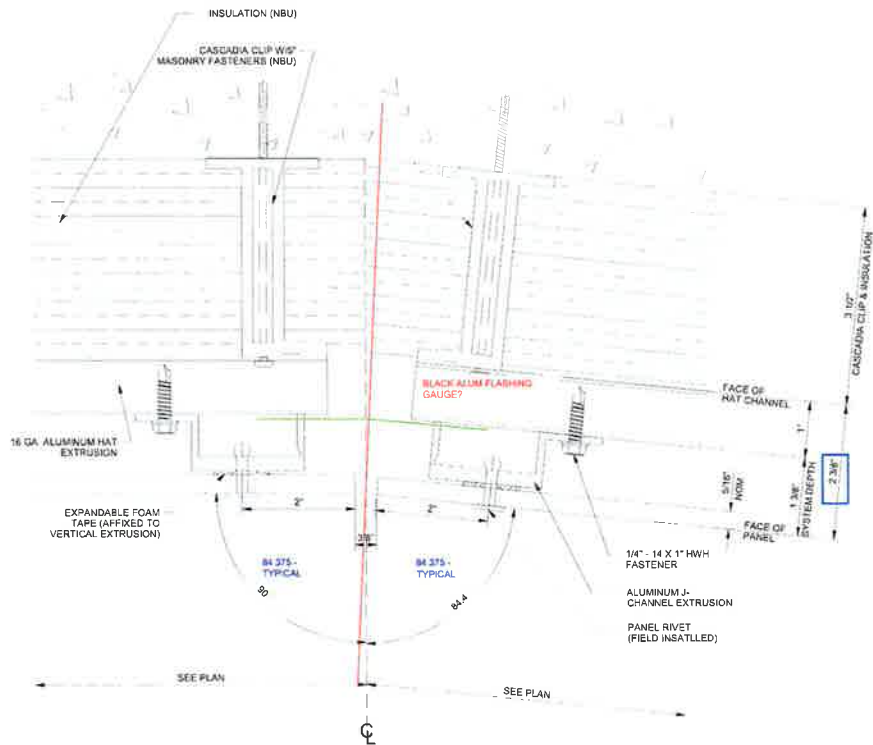
UNIVERSITY OF MISSOURI
3333 FORESTER RD
PHILADELPHIA, MO 64114
PHONE: (816) 868-2550
WWW.UMSHEETMETAL.COM

PROJECT NUMBER
2016-06-0556
SHEET NUMBER
D3

CM COORDINATE CONCRETE WALL IS RADIUS NOT SEGMENTED DEPTH OF SYSTEM VARIES - DESIGN DEPTH WILL OCCUR AT CENTER OF PANELS AND WILL BE LESS AT ENDS

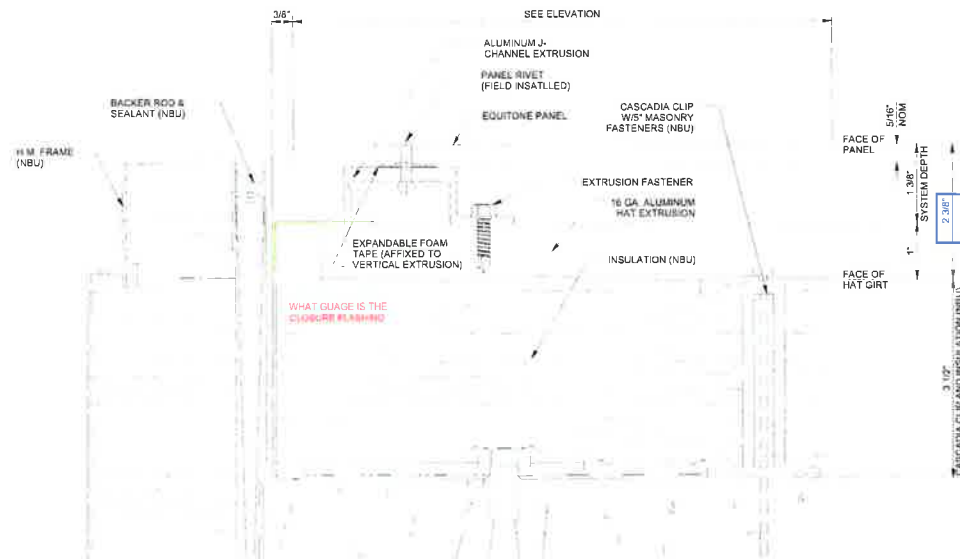


1 VERTICAL JOINT DETAIL
D4 FULL SCALE

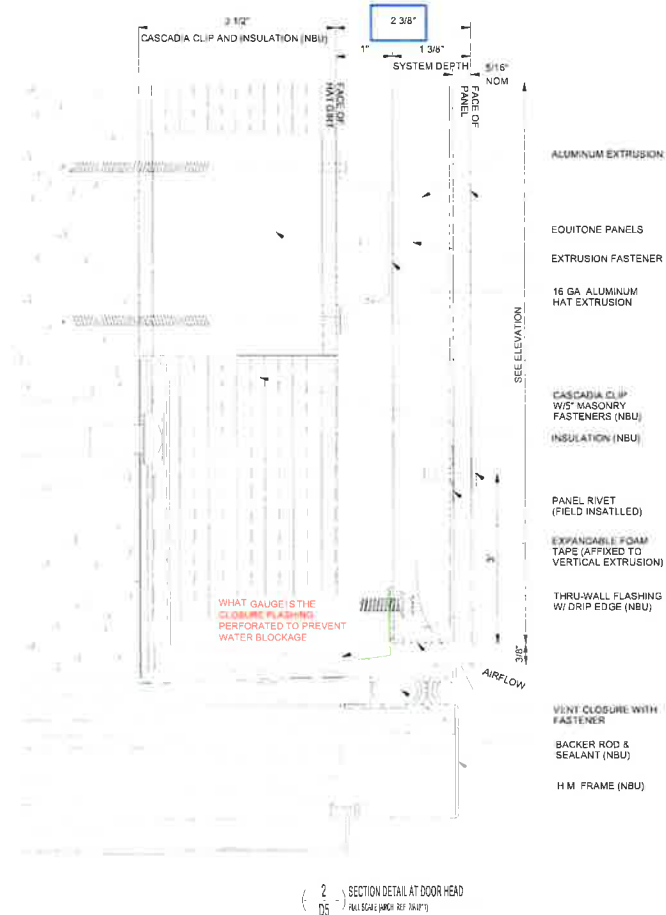


(2) VERTICAL JOINT DETAIL
D4 } FULL SCALE

PLAN DETAIL AT CURTAINWALL JAMB 1
FULL SCALE (W/CH REF DIMS) DS



PLAN DETAIL AT DOOR JAMB 3
FULL SCALE (W/CH REF DIMS) DS



FIBER CEMENT PANELS TO BE FLUSH
WITH ADJACENT CONSTRUCTION
ADJUST DEPTH

UNIVERSE CORPORATION
3333 S. GARDEN RD.
WEBSTER GROVES, MO 63116
PH: 636-863-8300 FAX: 636-863-8301
WWW.UNIVERSECORP.COM

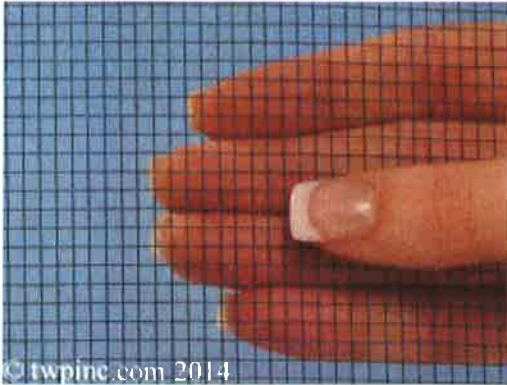
UNIVERSE CORPORATION
Webster University Interdisciplinary Science Bldg-EQUITONE
Webster Groves MO
63116
PH: 636-863-8300 FAX: 636-863-8301
WWW.UNIVERSECORP.COM

UNIVERSE CORPORATION
3333 S. GARDEN RD.
WEBSTER GROVES, MO 63116
PH: 636-863-8300 FAX: 636-863-8301
WWW.UNIVERSECORP.COM

PROJECT NUMBER
2016-06-0556
SHEET NUMBER
DS

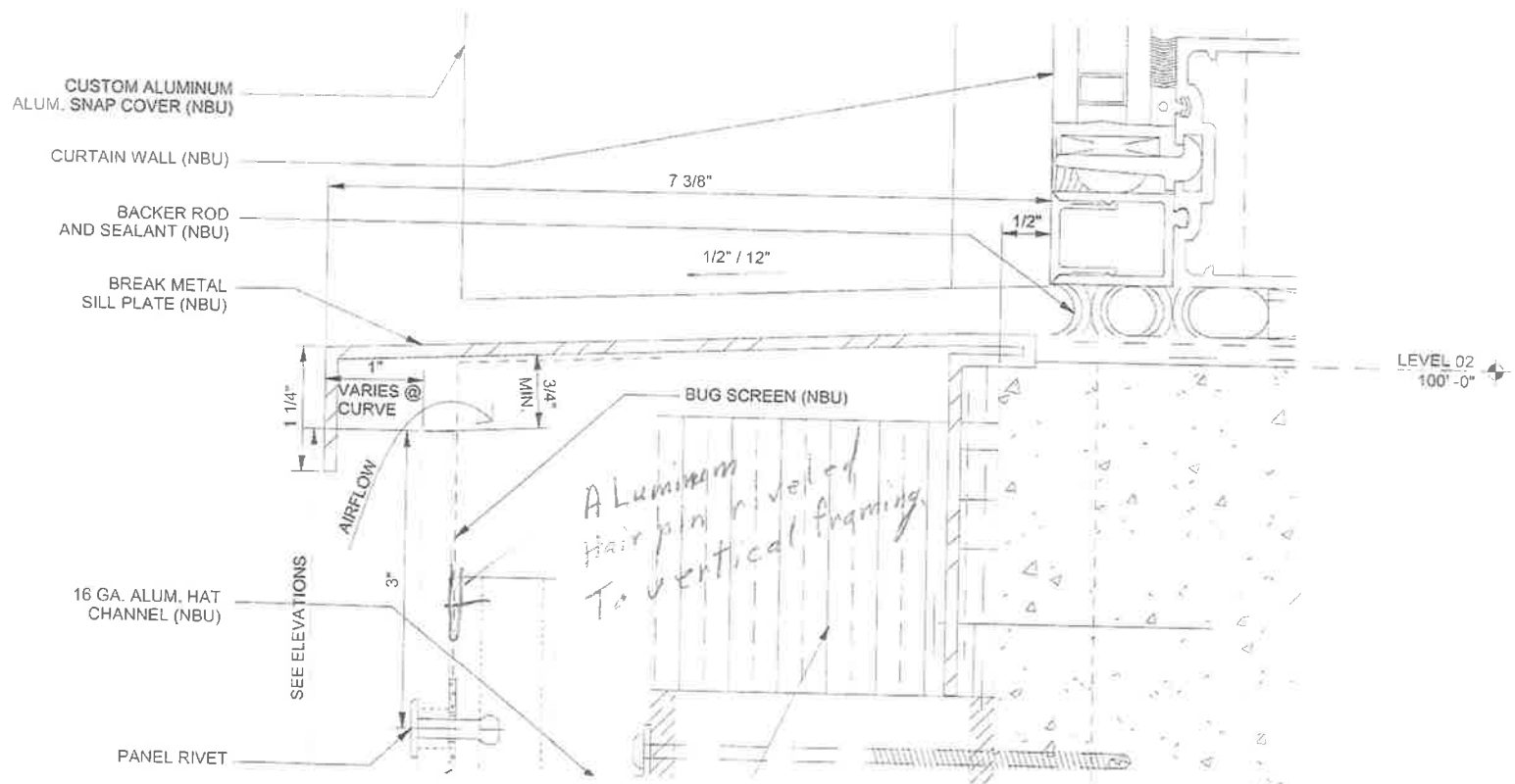


8 Mesh Epoxy Coated Aluminum 0.010" Wire Dia 36" Wide



Name	8 Mesh Epoxy Coated Aluminum 0.010" Wire Dia 36" Wide
Part Number	008X008A0100W36EPOXY
Material	Epoxy Aluminum

Mesh	8 x 8 per inch (per 2.54 cm)	Wire Diameter	0.0100 inches 0.2540 mm
Opening Size	0.1150 inches 2.92 mm	Opening Area Percentage	85%
Overall Thickness	0.02 inches 0.508 mm	Weight	0.03 lb/sq foot 0.15 kg/sq meter
Full Roll Length	100 feet / 30.49 meters	Standard Widths	36 inches
Weave Type	PSW	Surface Finish Coating	Black Epoxy Coated
Purchasing UOM	Square Foot, Full Roll	Link to Product Page	Click here
Typical Uses	Bee and wasp control. Foundation Vents, Soffit Screens		
Comments	Cuts with sturdy shears. Meets ASTM E2016-11		



Szachnieski, Jason

From: Szachnieski, Jason
Sent: Thursday, January 12, 2017 8:49 AM
To: 'Patel, Kelvin'; Craig Miller, Sr. (craigmiller29@webster.edu)
Cc: Gates, Devin; Ray, Steve; Grossman, Lynn
Subject: RE: Webster ISB bug screen
Attachments: VHB Tapes TDS 11-2015 MARKED UP.PDF

Kelvin & Craig,

The top of the screen can be taped at no additional cost per Kuenz. See attached proposed tape. Please let me know if you need anything further to approve CP-059.

Thanks,
Jason

JASON SZACHNIESKI, PE, LEED® AP

SENIOR PROJECT MANAGER

Direct: 636-561-9608

Main: 636-561-9500

77 Westport Plaza, Suite 250
St. Louis, MO 63146

PARIC.COM



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From: Patel, Kelvin [mailto:kpatel@CANNONDESIGN.COM]
Sent: Thursday, December 22, 2016 10:02 AM
To: Craig Miller, Sr. (craigmiller29@webster.edu); Szachnieski, Jason
Cc: Gates, Devin; Ray, Steve; Grossman, Lynn
Subject: FW: Webster ISB bug screen

Craig & Jason,

See below comment from KWA regarding bug screen attachment.

Thanks,

Kelvin Patel, CDT, LEED AP BD+C

Associate

CANNONDESIGN

T 314.425.8756

From: Scott Klingsick [<mailto:scott@kwastl.com>]

Sent: Thursday, December 22, 2016 7:35 AM

To: Patel, Kelvin <kpatel@CANNONDESIGN.COM>; Kathy Williams <kathy@kwastl.com>

Cc: Grossman, Lynn <lgrossman@CANNONDESIGN.COM>

Subject: RE: Webster ISB bug screen

Kelvin,

We have reviewed the attached information and the only comment we have is that we would like the top of the bug screen to be attached with tape or similar to ensure that the screen will not sag.

Scott Klingsick, LEED Green Associate

Project Manager

9721 Litzsinger Rd.

St. Louis, MO 63124

(p) 314.962.2560 (f) 314.962.4057

scott@kwastl.com



KWA Architects

You have requested Kathy Williams and Associates, LLC dba KWA to supply electronic media containing plans for use by your company. Due to the potential that the information set forth on the electronic media can be modified, unintentionally or otherwise, the use of such electronic media will be at your company's sole risk and without any liability, risk or exposure to KWA LLC (Kathy Williams & Associates). You will not be automatically updated on revisions and/or modifications to the attached. **CONFIDENTIAL** The information, data and drawings embodied in this document are strictly confidential and are supplied with the understanding that they will not be disclosed to third parties without the prior written consent of the Owner.

From: Patel, Kelvin [<mailto:kpatel@CANNONDESIGN.COM>]

Sent: Wednesday, December 21, 2016 10:26 AM

To: Kathy Williams; Scott Klingsick

Cc: Grossman, Lynn

Subject: FW: Webster ISB bug screen

Kathy / Scott,

Below and attached is the bug screen information for fiber cement panels along with its CP.

I assume the cavity referred below is acceptable.

Let me know your comments.

Thanks,

Kelvin Patel, CDT, LEED AP BD+C

Associate

CANNONDESIGN

T 314.425.8756

From: Szachnieski, Jason [<mailto:JRSzachnieski@paric.com>]

Sent: Wednesday, December 21, 2016 8:42 AM

To: Patel, Kelvin <kpatel@CANNONDESIGN.COM>; Craig A. Miller, Sr. <craigmiller29@webster.edu>

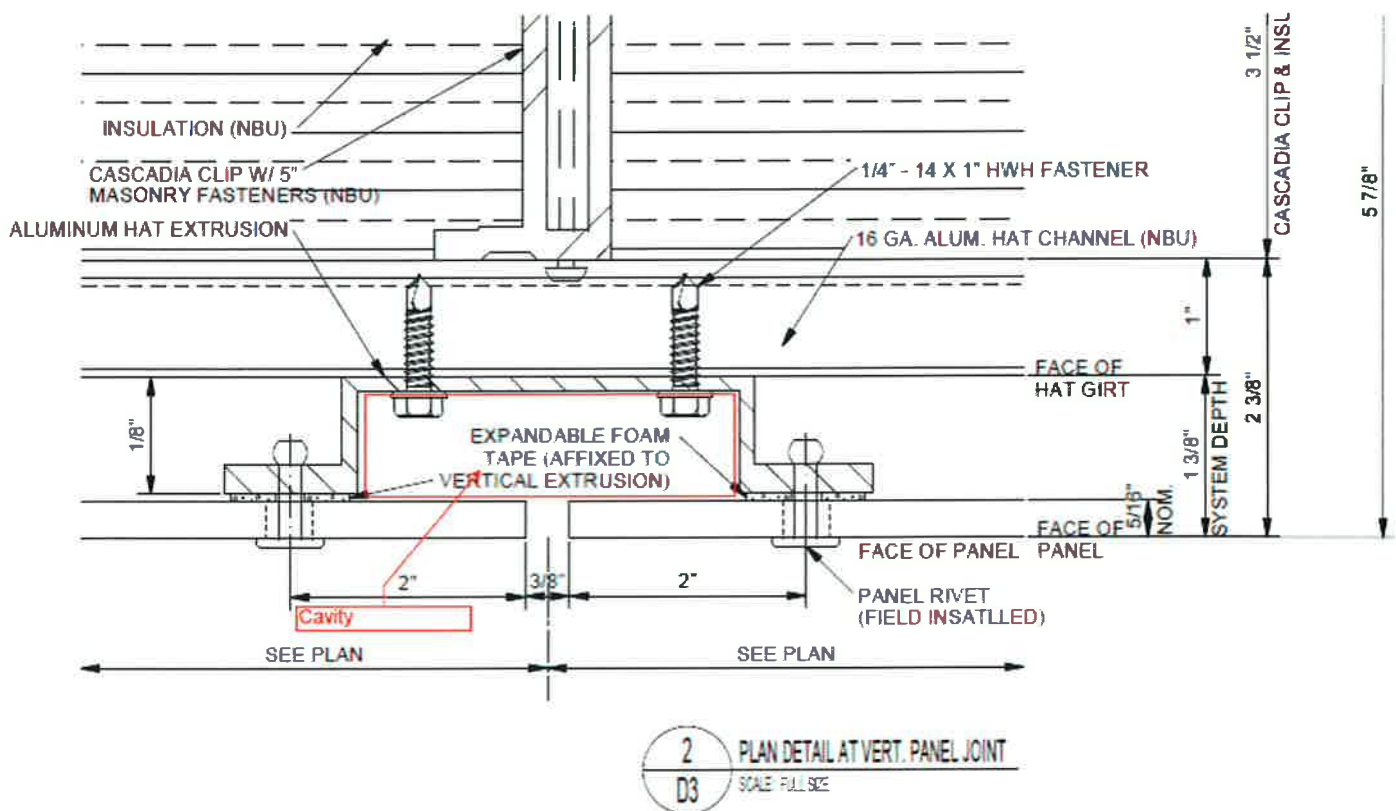
Cc: Gates, Devin <ddgates@paric.com>; Ray, Steve <sray@paric.com>

Subject: FW: Webster ISB bug screen

Kelvin and Craig,

Attached is the product data and proposed installation detail for the bug screen with CP-59. The screen is stiff enough that Kuenz and bend it at 90 degrees and fasten it to the vertical framing prior to the installation of the panels. Please note even with this screen you will still have cavities within the system (see detail below). Let me know if you need any further information to reach a decision on this CP.

Thanks,
Jason



JASON SZACHNIESKI, PE, LEED® AP

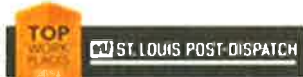
SENIOR PROJECT MANAGER

Direct: 636-561-9608

Main: 636-561-9500

77 Westport Plaza, Suite 250
St. Louis, MO 63146

PARIC.COM



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From: Chris Bradley [<mailto:chris@kuenzsheetmetal.com>]

Sent: Tuesday, December 20, 2016 11:39 AM

To: Szachnieski, Jason

Cc: Gates, Devin

Subject: RE: Webster ISB bug screen

Jason

See attached

This is what I had in mind

Still wondering about all the 3/8" gaps between the panels

The price I sent was for the screen shown at the top of the panels under the flashing

From: Szachnieski, Jason [<mailto:JRSzachnieski@paric.com>]

Sent: Tuesday, December 20, 2016 9:49 AM

To: Chris Bradley

Cc: Gates, Devin

Subject: FW: Webster ISB bug screen

Morning Chris,

Can you share the product data with us for what you would use for this bug screen? Also, how would it be attached (adhesive?) and how long should Webster expect the adhesive to last?

Thanks,

Jason

JASON SZACHNIESKI, PE, LEED® AP

SENIOR PROJECT MANAGER

Direct: 636-561-9608

Main: 636-561-9500

77 Westport Plaza, Suite 250
St. Louis, MO 63146

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3M[™]

VHB[™] Tapes

Technical Data

November 2015

Product Description:

3M[™] VHB[™] Tapes provide the convenience and simplicity of a tape fastener and are ideal for use in many interior and exterior bonding applications. In many situations, they can replace rivets, spot welds, liquid adhesives and other permanent fasteners.

These 3M[™] VHB[™] Tapes are made with acrylic foam which is viscoelastic in nature. This gives the foam energy absorbing and stress relaxing properties which provides these tapes with their unique characteristics. The acrylic chemistry provides outstanding durability performance.

These tapes utilize a variety of specific foam, adhesive, color and release liner types to provide each product/family with specific features. These features can include adhesion to specific or a broad range of materials, conformability, high tensile strength, high shear and peel adhesion, resistance to plasticizer migration, and UL746C recognition. All 3M[™] VHB[™] Tapes have excellent durability and excellent solvent and moisture resistance.

The tapes included in this data page represent products most commonly used by customers. Please refer to "3M[™] VHB[™] Tape Specialty Tapes" technical data sheet for additional 3M[™] VHB[™] Tapes that may be required in special circumstances.

3M[™] VHB[™] Tape Products

4941 Family

This family utilizes multi-purpose acrylic adhesive on both sides of a conformable adhesive foam core. The adhesive provides excellent adhesion to a broad range of high and medium surface energy substrates including metals, glass, and a wide variety of plastics, as well as plasticized vinyl. The conformable adhesive foam core provides good contact, even with mismatched substrates. The combination of foam strength, conformability, and adhesion makes this family one of the most capable all-around 3M[™] VHB[™] tapes.

Tape Number	Color	Thickness in (mm)
4919F	Black	0.025 (0.6)
4926	Gray	0.015 (0.4)
4936(F)	Gray	0.025 (0.6)
4941(F)	Gray	0.045 (1.1)
4947F	Black	0.045 (1.1)
4956(F)	Gray	0.062 (1.6)
4979F	Black	0.062 (1.6)
4991	Gray	0.090 (2.3)
4991B	Black	0.090 (2.3)

5952 Family

This family utilizes modified acrylic adhesive on both sides of a very conformable adhesive foam core, providing adhesion the broadest range of substrates, including most powder coated paints.

Tape Number	Color	Thickness in (mm)
5906	Black	0.006 (0.15)
5907	Black	0.008 (0.20)
5908	Black	0.010 (0.25)
5909	Black	0.012 (0.30)
5915(P)	Black	0.016 (0.4)
5915WF	White	0.016 (0.4)
5925(P)	Black	0.025 (0.6)
5925WF	White	0.025 (0.6)
5930(P)	Black	0.032 (0.8)
5930WF	White	0.032 (0.8)
5952(P)	Black	0.045 (1.1)
5952WF	White	0.045 (1.1)
5958FR	Black	0.040 (1.0)
5962(P)	Black	0.062 (1.6)
5962WF	Black	0.062 (1.6)

RP Family

This family utilizes multi-purpose acrylic adhesive on both sides of a conformable adhesive foam core. The adhesive provides good adhesion to a broad range of high and medium surface energy substrates including metals, glass, and a wide variety of plastics. The conformable adhesive foam core provides good contact, even with mismatched substrates

Tape Number	Color	Thickness in (mm)
RP16(F)	Gray	0.016 (0.4)
RP25(F)	Gray	0.025 (0.6)
RP32(F)	Gray	0.032 (0.8)
RP45(F)	Gray	0.045 (1.1)
RP62(F)	Gray	0.062 (1.6)

(P) or (F) after the product number designates that both a paper and film liner product version are available. [e.g. 4941 (paper liner) and 4941F (film liner), 5915 (film liner) and 5915P (paper liner)]. See page 2 for specific details.

Typical Physical Properties

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

3M™ VHB™ Tapes				Adhesive and Foam			Release Liner		
Family	Number	Color	Tape Thickness Inches (mm) Tolerance	Adhesive Type	Foam Type	Density lb/ft ³ (kg/m ³)	Type	Thickness Inches (mm)	Color
4941	4919F	Black	0.025 (0.6) ± 15%	Multi-Purp	Conform	45 (720)	PE Film	0.005 (0.13)	Red (printed)
	4926	Gray	0.015 (0.4) ± 15%	Multi-Purp	Conform	45 (720)	Dk Paper	0.003 (0.08)	White (printed)
	4936	Gray	0.025 (0.6) ± 15%	Multi-Purp	Conform	45 (720)	Dk Paper	0.003 (0.08)	White (printed)
	4936F	Gray	0.025 (0.6) ± 15%	Multi-Purp	Conform	45 (720)	PE Film	0.005 (0.13)	Red (printed)
	4941	Gray	0.045 (1.1) ± 10%	Multi-Purp	Conform	45 (720)	Dk Paper	0.003 (0.08)	White (printed)
	4941F	Gray	0.045 (1.1) ± 10%	Multi-Purp	Conform	45 (720)	PE Film	0.005 (0.13)	Red
	4947F	Black	0.045 (1.1) ± 10%	Multi-Purp	Conform	45 (720)	PE Film	0.005 (0.13)	Red (printed)
	4956	Gray	0.062 (1.6) ± 10%	Multi-Purp	Conform	45 (720)	Dk Paper	0.003 (0.08)	White (printed)
	4956F	Gray	0.062 (1.6) ± 10%	Multi-Purp	Conform	45 (720)	PE Film	0.005 (0.13)	Red (printed)
	4979F	Black	0.062 (1.6) ± 10%	Multi-Purp	Conform	45 (720)	PE Film	0.005 (0.13)	Red (printed)
	4991	Gray	0.090 (2.3) ± 10%	Multi-Purp	Conform	45 (720)	PE Film	0.005 (0.13)	Red (printed)
	4991B	Black	0.090 (2.3) ± 10%	Multi-Purp	Conform	45 (720)	PE Film	0.005 (0.13)	Red (printed)
5952	5906	Black	0.006 (0.15) ± 15%	Modified	Very Conf	45 (720)	PET	0.003 (0.08)	Clear
	5907	Black	0.008 (0.20) ± 15%	Modified	Very Conf	45 (720)	PET	0.003 (0.08)	Clear
	5908	Black	0.010 (0.25) ± 15%	Modified	Very Conf	45 (720)	PET	0.003 (0.08)	Clear
	5909	Black	0.012 (0.30) ± 15%	Modified	Very Conf	45 (720)	PET	0.003 (0.08)	Clear
	5915	Black	0.016 (0.4) ± 15%	Modified	Very Conf	43 (690)	PE Film	0.005 (0.13)	Red (printed)
	5915P	Black	0.016 (0.4) ± 15%	Modified	Very Conf	43 (690)	PCK Paper	0.004 (0.10)	White (printed)
	5915WF	White	0.016 (0.4) ± 15%	Modified	Very Conf	43 (690)	PE Film	0.005 (0.13)	Red (printed)
	5925	Black	0.025 (0.6) ± 15%	Modified	Very Conf	37 (590)	PE Film	0.005 (0.13)	Red (printed)
	5925P	Black	0.025 (0.6) ± 15%	Modified	Very Conf	37 (590)	PCK Paper	0.004 (0.10)	White (printed)
	5925WF	White	0.025 (0.6) ± 15%	Modified	Very Conf	37 (590)	PE Film	0.005 (0.13)	Red (printed)
	5930	Black	0.032 (0.8) ± 15%	Modified	Very Conf	37 (590)	PE Film	0.005 (0.13)	Red (printed)
	5930P	Black	0.032 (0.8) ± 15%	Modified	Very Conf	37 (590)	PCK Paper	0.004 (0.10)	White (printed)
	5930WF	White	0.032 (0.8) ± 15%	Modified	Very Conf	37 (590)	PE Film	0.005 (0.13)	Red (printed)
	5952	Black	0.045 (1.1) ± 10%	Modified	Very Conf	37 (590)	PE Film	0.005 (0.13)	Red (printed)
	5952P	Black	0.045 (1.1) ± 10%	Modified	Very Conf	37 (590)	PCK Paper	0.004 (0.10)	White (printed)
	5952WF	White	0.045 (1.1) ± 10%	Modified	Very Conf	37 (590)	PCK Paper	0.004 (0.10)	White (printed)
	5958FR	Black	0.040 (1.0) ± 10%	Modified	Very Conf	50 (800)	PE Film	0.005 (0.13)	Red (printed)
	5962	Black	0.062 (1.6) ± 10%	Modified	Very Conf	37 (590)	PE Film	0.005 (0.13)	Red (printed)
	5962P	Black	0.062 (1.6) ± 10%	Modified	Very Conf	37 (590)	PCK Paper	0.004 (0.10)	White (printed)
	5962WF	Black	0.062 (1.6) ± 10%	Modified	Very Conf	37 (590)	PE Film	0.005 (0.13)	Red (printed)
RP	RP16	Gray	0.016 (0.4) ± 15%	Multi-Purp	Conform	45 (720)	Dk Paper	0.003 (0.08)	White (printed)
	RP16F	Gray	0.016 (0.4) ± 15%	Multi-Purp	Conform	45 (720)	PE Film	0.005 (0.13)	Red (printed)
	RP25	Gray	0.025 (0.6) ± 15%	Multi-Purp	Conform	45 (720)	Dk Paper	0.003 (0.08)	White (printed)
	RP25F	Gray	0.025 (0.6) ± 15%	Multi-Purp	Conform	45 (720)	PE Film	0.005 (0.13)	Red (printed)
	RP32	Gray	0.032 (0.8) ± 15%	Multi-Purp	Conform	45 (720)	Dk Paper	0.003 (0.08)	White (printed)
	RP32F	Gray	0.032 (0.8) ± 15%	Multi-Purp	Conform	45 (720)	PE Film	0.005 (0.13)	Red (printed)
	RP45	Gray	0.045 (1.1) ± 10%	Multi-Purp	Conform	45 (720)	Dk Paper	0.003 (0.08)	White (printed)
	RP45F	Gray	0.045 (1.1) ± 10%	Multi-Purp	Conform	45 (720)	PE Film	0.005 (0.13)	Red (printed)
	RP62	Gray	0.062 (1.6) ± 10%	Multi-Purp	Conform	45 (720)	Dk Paper	0.003 (0.08)	White (printed)
	RP62F	Gray	0.062 (1.6) ± 10%	Multi-Purp	Conform	45 (720)	PE Film	0.005 (0.13)	Red (printed)

Available Sizes

Tape Thickness inches (mm)	Standard Length yards (meters)	Minimum Width inches (mm)	Maximum Width inches (mm)	Maximum Roll Length		
				Width 1/4" up to 3/8" (6.4mm up to 9.5mm) yards (meters)	Width >3/8" up to 1/2" (>9.5mm up to 12.7mm) yards (meters)	Width 1/2" and wider (12.7mm and wider) yards (meters)
< 0.015 (0.4)	72 (65.8)	0.5 (13)	46 (1168)	N/A N/A	N/A N/A	See Note Below
0.015/0.016 (0.4)	72 (65.8)	0.25 (6)	48* (1219)	144 (131.7)	175 (160.0)	360 (329.2)
0.025 (0.6)	72 (65.8)	0.25 (6)	48* (1219)	72 (65.8)	108 (98.8)	175 (160.0)
0.032 (0.8)	72 (65.8)	0.25 (6)	48 (1219)	72 (65.8)	108 (98.8)	175 (160.0)
0.040 (1.0)	36 (32.9)	0.25 (6)	48 (1219)	72 (65.8)	108 (98.8)	144 (131.7)
0.045 (1.1)	36 (32.9)	0.25 (6)	48 (1219)	72 (65.8)	108 (98.8)	144 (131.7)
0.062 (1.6)	36 (32.9)	0.25 (6)	46 (1168)	72 (65.8)	72 (65.8)	108 (98.8)
0.090 (2.3)	36 (32.9)	0.25 (6)	46 (1168)	36 (32.9)	36 (32.9)	72 (65.8)

*Exception – 5915 (P) max. width 46 inches (1168 mm); 5925 (P) max. width 47 inches (1194 mm).

Note: 5952 family tapes thinner than 0.015 in (0.4 mm) have max. length 360 yd (329.2 m) for widths 1 in (25 mm) to 8 in (203 mm) and 180 yd (164.6 m) for all other widths.

Slitting Tolerance

Standard slitting tolerance $\pm 1/32$ inch (± 0.031 inch, ± 0.79 mm).

Precision slitting with slitting tolerance of $\pm 1/64$ inch (± 0.016 in., ± 0.41 mm) is available on select products with minimum order of full web increments.

Core Size

All products are provided on a 3 inch ID Core (76.2 mm)

Converted Parts

In addition to standard and custom roll sizes available from 3M through the distribution network, 3M™ VHB™ Tapes are also available in limitless shapes and sizes through the 3M Converter network. For additional information, contact 3M Converter Markets at 1-800-223-7427 or on the web at www.3M.com/converter.

Shelf Life

All 3M™ VHB™ Tapes have a shelf life of 24 months from date of shipment when stored at 40°F to 100°F (4°C to 38°C) and 0-95% relative humidity. The optimum storage conditions are 72°F (22°C) and 50% relative humidity.

Performance of tapes is not projected to change even after shelf life expires; however, 3M does suggest that 3M™ VHB™ Tapes are used prior to the shelf life date whenever possible.

The manufacturing date is available on all 3M™ VHB™ Tape cores as the lot number. The lot number, typically a 4 digit code, is a Julian date (Y D D D). The first digit refers to the year of manufacture, the last 3 digits refer to the days after January 1. Example: A lot number of 9266 would translate to a date of manufacture of Sept. 22 (266th day of year) in 2009. On most products this is found as the 4 digits after the "9" following the product number. For tapes printed continuously around the core (e.g. 3M™ VHB™ Tape 5952 family) the lot number typically will be the string of 4 digits preceding the product number.

Special Cases:

Plasticized Vinyl – Plasticizers compounded in soft vinyl can migrate into adhesives and significantly change their performance characteristics. 3M™ VHB™ Tapes 4941 family has very good plasticizer resistance and adhesion to many vinyl formulations. Because of the wide variation in vinyl formulations, however, evaluation by the user must be conducted with the specific vinyl used to ensure that performance will be satisfactory over time. Problems related to plasticizer migration can often be predicted by accelerated aging of assembled parts at 150°F (66°C) for one week).

Typical Performance Characteristics

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

3M™ VHB™ Tapes				Dynamic Adhesion Performance		
Family	Product Number	Color	Thickness Inches	90° Peel Adhesion lb/in N/cm	Normal Tensile lb/in² kPa	Dynamic Overlap Shear lb/in² kPa
4941	4919F	Black	0.025	17 (30)	90 (620)	80 (550)
	4926	Gray	0.015	14 (25)	95 (660)	90 (620)
	4936(F)	Gray	0.025	17 (30)	90 (620)	80 (550)
	4941(F)	Gray	0.045	22 (39)	85 (590)	70 (480)
	4947F	Black	0.045	22 (39)	85 (590)	70 (480)
	4956(F)	Gray	0.062	22 (39)	80 (550)	70 (480)
	4979F	Black	0.062	22 (39)	80 (550)	70 (480)
	4991	Gray	0.090	22 (39)	70 (480)	65 (450)
	4991B	Black	0.090	22 (39)	70 (480)	65 (450)
5952	5906	Black	0.006	9 (16)	100 (690)	100 (690)
	5907	Black	0.008	10 (18)	100 (690)	100 (690)
	5908	Black	0.010	12 (21)	100 (690)	100 (690)
	5909	Black	0.012	12 (21)	100 (690)	100 (690)
	5915(P)	Black	0.016	14 (25)	90 (620)	90 (620)
	5915WF	White	0.016	14 (25)	90 (620)	90 (620)
	5925(P)	Black	0.025	17 (30)	90 (620)	90 (620)
	5925WF	White	0.025	17 (30)	90 (620)	90 (620)
	5930(P)	White	0.032	19 (33)	90 (620)	85 (590)
	5930WF	Black	0.032	19 (33)	90 (620)	85 (590)
	5952(P)	Black	0.045	22 (39)	90 (620)	80 (550)
	5952WF	White	0.045	22 (39)	90 (620)	80 (550)
	5958FR	Black	0.040	20 (35)	100 (690)	100 (690)
	5962(P)	Black	0.062	22 (39)	90 (620)	80 (550)
	5962WF	White	0.062	22 (39)	90 (620)	80 (550)
RP	RP16(F)	Gray	0.016	12 (21)	95 (660)	90 (620)
	RP25(F)	Gray	0.025	17 (30)	90 (620)	80 (550)
	RP32(F)	Gray	0.032	18 (32)	85 (590)	75 (520)
	RP45(F)	Gray	0.045	20 (35)	85 (590)	70 (480)
	RP62(F)	Gray	0.062	20 (35)	80 (550)	70 (480)



90° Peel Adhesion - Based on ASTM D3330 - To stainless steel, room temperature, jaw speed 12 in/min (304.8 mm/min). Average force to remove is measured. 72 hour dwell.



Normal Tensile (T-Block Tensile) - ASTM D-897 - To aluminum, room temperature, 1 in² (6.45 cm²), jaw speed 2 in/min (50.8 mm/min) Peak force to separate is measured. 72 hour dwell.



Dynamic Overlap Shear - ASTM D-1002 - To stainless steel, room temperature, 1 in² (6.45 cm²), jaw speed 0.5 in/min (12.7 mm/min) Peak force to separate is measured. 72 hour dwell.

3M™ VHB™ Tapes

Typical Performance Characteristics

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

3M™ VHB™ Tapes				Static Shear				Temperature Tolerance	
Family	Product Number	Color	Thickness Inches	72°F (22°C)	150°F (66°C)	200°F (93°C)	250°F (121°C)	Short Term (Minutes, Hours) °F (°C)	Long Term (Days, Weeks) °F (°C)
4941	4919F	Black	0.025	1000	500	500		300 (149)	200 (93)
	4926	Gray	0.015	1000	500	500		300 (149)	200 (93)
	4936(F)	Gray	0.025	1000	500	500		300 (149)	200 (93)
	4941(F)	Gray	0.045	1000	500	500		300 (149)	200 (93)
	4947F	Black	0.045	1000	500	500		300 (149)	200 (93)
	4956(F)	Gray	0.062	1000	500	500		300 (149)	200 (93)
	4979F	Black	0.062	1000	500	500		300 (149)	200 (93)
	4991	Gray	0.090	1000	500	500		250 (121)	200 (93)
	4991B	Black	0.090	1000	500	500		250 (121)	200 (93)
5952	5906	Black	0.006	1000	500	500	250	300 (149)	250 (121)
	5907	Black	0.008	1000	500	500	250	300 (149)	250 (121)
	5908	Black	0.010	1000	500	500	250	300 (149)	250 (121)
	5909	Black	0.012	1000	500	500	250	300 (149)	250 (121)
	5915(P)	Black	0.016	1000	500	500	250	300 (149)	250 (121)
	5915WF	White	0.016	1000	500	500	250	300 (149)	250 (121)
	5925(P)	Black	0.025	1000	500	500	250	300 (149)	250 (121)
	5925WF	Black	0.032	1000	500	500	250	300 (149)	250 (121)
	5930(P)	Black	0.032	1000	500	500	250	300 (149)	250 (121)
	5930WF	White	0.032	1000	500	500	250	300 (149)	250 (121)
	5952(P)	Black	0.045	1000	500	500	250	300 (149)	250 (121)
	5952WF	White	0.045	1000	500	500	250	300 (149)	250 (121)
	5958FR	Black	0.040	1000	350	250		300 (149)	200 (93)
	5962(P)	Black	0.062	1000	500	500	250	300 (149)	250 (121)
	5962WF	White	0.062	1000	500	500	250	300 (149)	250 (121)
RP	RP16(F)	Gray	0.016	1000	500	500		250 (121)	200 (93)
	RP25(F)	Gray	0.025	1000	500	500		250 (121)	200 (93)
	RP32(F)	Gray	0.032	1000	500	500		250 (121)	200 (93)
	RP45(F)	Gray	0.045	1000	500	500		250 (121)	200 (93)
	RP62(F)	Gray	0.062	1000	500	500		250 (121)	200 (93)



Static Shear - ASTM D3654 - To stainless steel, tested at various temperatures and gram loadings. 0.5 in² (3.23 cm²). Will hold listed weight for 10,000 minutes (approximately 7 days). Conversion: 1500 g/0.5 in² equals 6.6 lb/in²; 500 g/0.5 in² = 2.2 lb/in².

Short Term Temperature Tolerance - No change in room temperature dynamic shear properties following 4 hours conditioning at indicated temperature with 100 g/static load. (Represents minutes, hours in a process type temperature exposure).

Long Term Temperature Tolerance - Maximum temperature where tape supports at least 250 g load per 0.5 in² in static shear for 10,000 minutes. (Represents continuous exposure for days or weeks).

Additional Typical Performance Characteristics

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

	3M™ VHB™ Tape 4941 5952		Units	Test Standard
Dielectric Constant	2.29 1.99	2.14 1.95	at 1 kHz at 1MHz	ASTM D150 ASTM D150
Dissipation Factor	0.0245 0.0374	0.0065 0.0506	at 1 kHz at 1MHz	ASTM D150 ASTM D150
Dielectric Breakdown Strength	14 (360)	18 (455)	V/μm (V/mil)	ASTM D140
Thermal Conductivity (k value)	0.08 (0.5)	0.05 (0.4)	W/mK (BTU•in/hr•ft²•°F)	
Volume Resistivity	2.1 x 10 ¹⁴	2.5 x 10 ¹⁴	Ω-cm	ASTM D257
Surface Resistivity	2.7 x 10 ¹⁴	>10 ¹⁶	Ω/sq	ASTM D257
Water Vapor Transmission Rate	25.6	37.1	g/m²•day	ASTM F1249 at 38°C/100% RH
Thermal Properties of Modeling				
Thermal Coefficient of Expansion	180 (100)		10 ⁻⁶ m/m/°C (10 ⁻⁶ in/in/°F)	
Shear Modulus (at 25°C, 1 Hz)	3 x 10 ⁵		Pa	

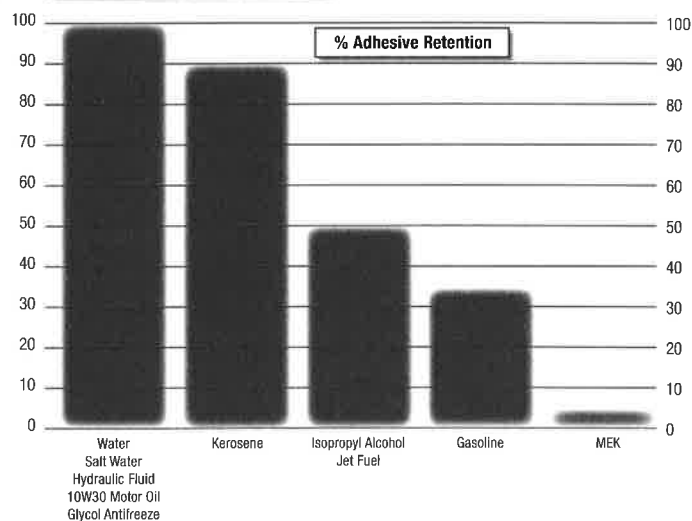
3M™ VHB™ Tapes UL746C Listings - File MH 17478

Category Q0QW2 Component - Polymeric Adhesive Systems, Electrical Equipment

3M™ VHB™ Tapes/ Product Families	Substrates	Temperature Rating Minimum Maximum	
4919F, 4926, 4936, 4936F, 4941, 4941F, 4947F, 4956, 4956F, 4979F	Ceramic	-35°C	110°C
	Aluminum, Galvanized Steel, Stainless Steel, Enameled Steel, Nickel Coated ABS, Glass (with or without Silane Coating) PVC, Glass/Epoxy, PBT, Polycarbonate, Acrylic/Polyurethane Paint, Polyester Paint	-35°C	90°C
4991	ABS	-35°C	75°C
	Polycarbonate, Aluminum, Acrylic/Polyurethane Paint, Polyester Paint	-35°C	90°C
5915, 5915P, 5915WF 5925, 5925P, 5925WF, 5930, 5930P, 5930WF, 5952, 5952P, 5952WF, 5962, 5962P, 5962WF	Polycarbonate, Primer 94 Coated Polycarbonate, Aluminum, Acrylic/Polyurethane Paint, Galvanized Steel, Polyester Paint, Epoxy Paint, Silane Coated Glass, Uncoated Glass, Stainless Steel, Enameled Steel, Glass Epoxy, Polybutylene Terephthalate, Nylon, Polyphenylene Ether (PPE), Acrylic	-35°C	90°C
5952, 5952P, 5952WF	Rigid PVC, ABS	-35°C	75°C
	Cellulose Acetate Butyrate	-35°C	90°C
RP16	Aluminum, Silane Coated Glass	-35°C	90°C
	PVC, ABS	-35°C	75°C
RP16, RP25, RP32, RP45, RP62	Galvanized Steel, Enameled Steel, Nylon, Polycarbonate, Glass Epoxy, Phenolic, PPE/PS Blend, PBT, Epoxy Paint, Polyester Paint, Adhesion Promoter 111 Coated Epoxy Paint, Promoter 111 Coated Polyester Paint, Acrylic Urethane Paint, Epoxy/Polyester Paint	-35°C	90°C
RP62	Stainless Steel, Glass, Acrylic	-35°C	90°C
	PVC, ABS	-35°C	75°C

A current list can be found at www.ul.com (select certifications, search file MH17478)

Solvent and Fuel Resistance



Test Method

- Tape between stainless steel and aluminum foil
- 72 hours dwell at room temperature
- Solvent immersion for 72 hours
- Test within 45 minutes after removing from solvent
- 90° peel angle
- 12 in/min rate of peel
- Peel adhesion compared to control

Note: Continuous submersion in chemical solutions is not recommended. The above information is presented to show that occasional chemical contact should not be detrimental to tape performance in most applications in ordinary use.

Burn Characteristics 3M™ VHB™ Tape 5958FR

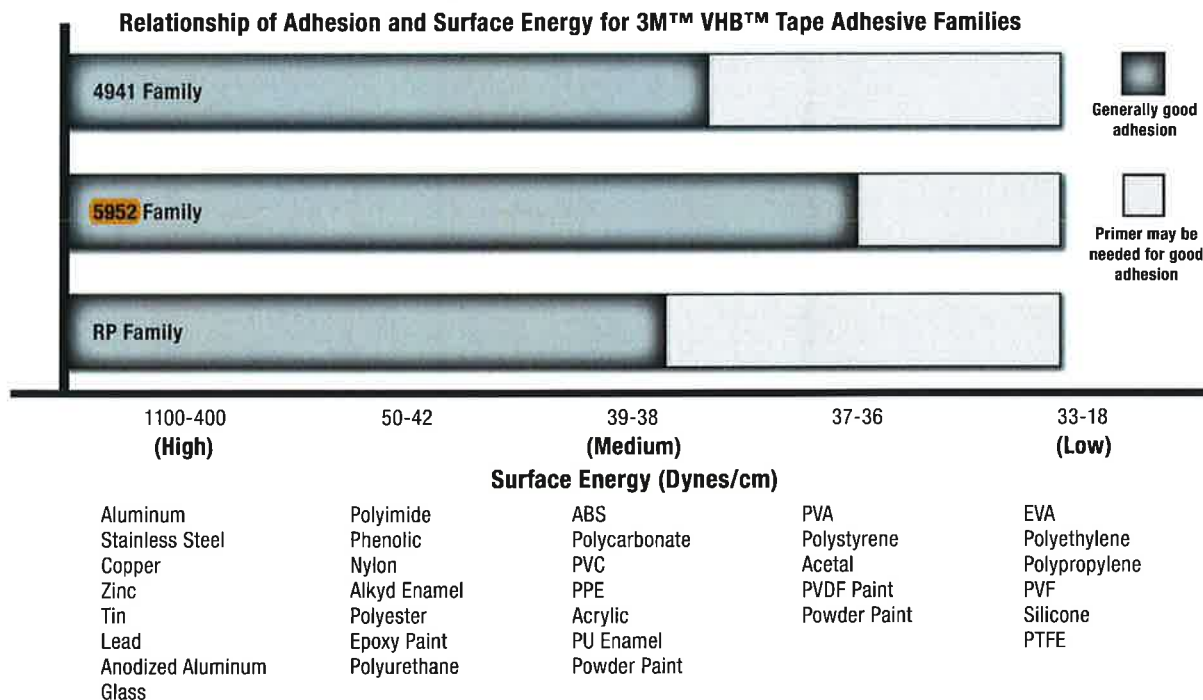
- Meets FAR 25.853 (a) 12 second vertical burn, Appendix F, Part I (a)(ii)
- Meets NBS Smoking Density (ASTM F814/E662)
- Meets Toxicity (Dräger Tube ABD0031, AITM 3.0005)

Design and Tape Selection Considerations

- **Choose the right tape for the substrate:** Adhesives must flow onto the substrate surfaces in order to achieve intimate contact area and allow the molecular force of attraction to develop. The degree of flow of the adhesive on the substrate is largely determined by the surface energy of the substrate.



This illustration demonstrates the effect of surface energy on adhesive interfacial contact. High surface energy materials draw the adhesive closer for high bond strength.



NOTES: There are a wide variety of formulations, surfaces finishes and surface treatments available on substrate materials which can affect adhesion. This chart is intended to provide only a rough estimate of the adhesion levels which can be expected on some common materials relative to a reference surface such as aluminum.

Foam type can affect and/or limit maximum adhesive strength.

- **Use the right tape thickness:** The necessary thickness of tape depends on the rigidity of substrates and their flatness irregularity. While the 3M™ VHB™ Tapes will conform to a certain amount of irregularity, they will not flow to fill gaps between the materials. For bonding rigid materials with normal flatness, consider use of tapes with thickness of 45 mils (1.1 mm) or greater. As the substrate flexibility increases thinner tapes can be considered.
- **Use the right amount of tape:** Because 3M™ VHB™ Tapes are viscoelastic by nature their strength and stiffness is a function of the rate at which they are stressed. They behave stronger with relatively faster rate of stress load (dynamic stresses) and will tend to show creep behavior with stress load acting over a long period of time (static stresses). As a general rule, for **static loads**, approximately four square inches of tape should be used for each pound (57 cm² of tape per kg) of weight to be supported in order to prevent excessive creep. For **dynamic loads**, the dynamic performance characteristics provided on page 4 should be useful, factoring in the appropriate safety factors.
- **Allow for thermal expansion/contraction:** 3M™ VHB™ Tapes can perform well in applications where two bonded surfaces may expand and contract differentially. Assuming good adhesion to the substrates, the tapes can typically tolerate differential movement in the shear plane up to 3 times their thickness.
- **Bond Flexibility:** While an advantage for many applications where allowing differential movement is a benefit, the tape bonds are typically more flexible than alternative bonding methods. Suitable design modifications or periodic use of rigid fasteners or adhesives may be needed if additional stiffness is required.
- **Severe Cold Temperature:** Applications which require performance at severe cold temperatures must be thoroughly evaluated by the user if the intended use will subject the tape product to high impact stresses. A technical bulletin "3M™ VHB™ Tape Cold Temperature Performance" (70-0707-3991-0) is available for additional information.

Application Techniques

- **Clean:** Most substrates are best prepared by cleaning with a 50:50 mixture of isopropyl alcohol (IPA*) and water prior to applying 3M™ VHB™ Tapes.

Exceptions to the general procedure that may require additional surface preparation include:

- **Heavy Oils:** A degreaser or solvent-based cleaner may be required to remove heavy oil or grease from a surface and should be followed by cleaning with IPA/water.
- **Abrasion:** Abrading a surface, followed by cleaning with IPA/water, can remove heavy dirt or oxidation and can increase surface area to improve adhesion.
- **Adhesion Promoters:** Priming a surface can significantly improve initial and ultimate adhesion to many materials such as plastics and paints.
- **Porous surfaces:** Most porous and fibred materials such as wood, particleboard, concrete, etc. need to be sealed to provide a unified surface.
- **Unique Materials:** Special surface preparation may be needed for glass and glass-like materials, copper and copper containing metals, and plastics or rubber that contain components that migrate (e.g. plasticizers).

Refer to 3M Technical Bulletin "Surface Preparation for 3M™ VHB™ Tape Applications" for additional details and suggestions. (70-0704-8701-5)

***Note:** These cleaner solutions contain greater than 250 g/l of volatile organic compounds (VOC). Please consult your local Air Quality Regulations to be sure the cleaner is compliant. When using solvents, be sure to follow the manufacturer's precautions and directions for use when handling such materials.

- **Pressure:** Bond strength is dependent upon the amount of adhesive-to-surface contact developed. Firm application pressure develops better adhesive contact and helps improve bond strength. Typically, good surface contact can be attained by applying enough pressure to insure that the tape experiences approximately 15 psi (100 kPa) pressure. Either roller or platen pressure can be used. Note that rigid surfaces may require 2 or 3 times that much pressure to make the tape experience 15 psi.

- **Temperature:** Ideal application temperature range is 70°F to 100°F (21°C to 38°C). Pressure sensitive adhesives use viscous flow to achieve substrate contact area. Minimum suggested application temperatures:

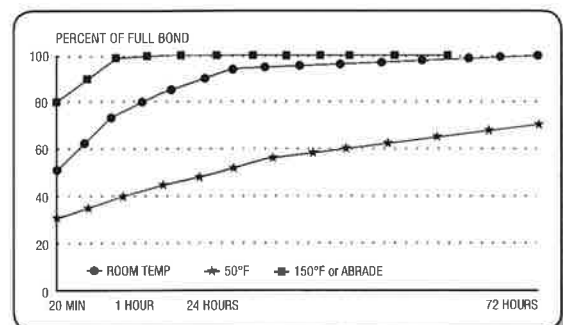
- 50°F (10°C): 3M™ VHB™ Tapes 5952 and RP families.
- 60°F (15°C): 3M™ VHB™ Tape 4941 family.

Note: Initial tape application to surfaces at temperatures below these suggested minimums is not recommended because the adhesive becomes too firm to adhere readily. However, once properly applied, low temperature holding is generally satisfactory.

To obtain good performance with all 3M™ VHB™ Tapes, it is important to ensure that the surfaces are dry and free of condensed moisture.

- **Time:** After application, the bond strength will increase as the adhesive flows onto the surface (also referred to as "wet out"). At room temperature approximately 50% of ultimate bond strength will be achieved after 20 minutes, 90% after 24 hours and 100% after 72 hours. This flow is faster at higher temperatures and slower at lower temperatures. Ultimate bond strength can be achieved more quickly (and in some cases bond strength can be increased) by exposure of the bond to elevated temperatures (e.g. 150°F [66°C] for 1 hour). This can provide better adhesive wetout onto the substrates. Abrasion of the surfaces or the use of primers/ adhesion promoters can also have the effect of increasing bond strength and achieving ultimate bond strength more quickly.

Bond Typical Build vs. Time



Technical Information

The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.

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Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application.

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If the 3M™ VHB™ Tape is proved to be defective within the warranty period stated above, THE EXCLUSIVE REMEDY, AT 3M'S OPTION, SHALL BE TO REFUND THE PURCHASE PRICE OF OR TO REPAIR OR REPLACE THE DEFECTIVE 3M™ VHB™ TAPE. 3M shall not otherwise be liable for loss or damages, whether direct, indirect, special, incidental, or consequential, regardless of the legal theory asserted, including negligence, warranty, or strict liability.

ISO 9001

This Industrial Adhesives and Tapes Division product was manufactured under a 3M quality system registered to ISO 9001 standards.

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