CHESAPEAKE BAY BRIDGE AND TUNNEL DISTRICT

TECHNICAL SPECIFICATIONS

SECTION 200 – GENERAL

200.01 Description

(a) Provide all labor, supervision, tools, equipment, materials, permits, services, and miscellaneous expenses necessary to complete the Contract as outlined in this Specification and in accordance with all other Contract Documents.

(b) Contractor shall furnish the services of all trades or unions necessary to complete all items of work as outlined in this Specification and shown on the Plans.

(c) Contractor shall be responsible to furnish all field and office engineering services required to complete this Contract. This shall also include preparation of necessary construction record documents, such as actual installed quantities for each bid item, including linear footage quantities at each repair location and other documentation as required herein these Specifications.

200.02 Standards

(a) The following industry standards and codes shall apply:

1. AASHTO - American Association of State Highway and Transportation Officials
2. EPA- Environmental Protection Agency
3. ICRI - International Concrete Repair institute
4. MUTCD – Manual on Uniform Traffic Control Devices
5. NEC - National Electrical Code [2008]
6. NFPA - National ACI - American Concrete Institute
7. AISC - American Institute of Steel Construction
8. AISI - American Iron and Steel Institute
9. ANSI - American National Standards Institute
10. ASTM - American Society for Testing and Materials
11. CRSI - Concrete Reinforcing Steel Institute
12. EPA Fire Protection Association
13. OSHA - Occupational Safety and Health Administration
14. VDOT - Virginia Department of Transportation
15. VDPOR - Virginia Department of Professional & Occupational Regulations
16. VOSH - Virginia Occupational Safety and Health Program
17. VTM - Virginia Test Methods

(b) It is the Contractor’s responsibility to thoroughly review the Contract Documents and perform all work and conform to all articles outlined therein.

(c) Drawings pertaining to other trades shall be reviewed and work shall be coordinated to prevent physical interferences.

200.03 Submittals

(a) Substitutions

1. The Contractor may recommend substitutions for certain materials after the bid has been awarded. This should not be perceived as an allowance to bid on a different system/product than what is described in the Specifications. Recommendations shall be based on one or both of the following:

    - Alternative materials to improve quality, schedule or pricing.
    - Exceptions to the specifications covering materials, manner of application, or other details.

2. Submit a written description of proposed changes or modifications to the District for review. In accordance with Special Provision SP-4 Submittals, the District requires thirty (30) days for review of proposed substitutions.

3. The information shall include catalog data sheets as a minimum and shop drawings, samples and other supportive information as necessary for the District to evaluate the proposed materials.

4. The District will review alternative material recommendations and will be the sole judge in determining whether the proposed material, accessory, or item meets the stated criteria for service and conditions imposed.

5. It is the Contractor's responsibility to notify and receive written approval from the District for substitutions that deviate from Contract Documents.

6. Do not proceed with proposed changes or modifications until authorized to do so by the District in writing. The cost of work performed on proposed changes or modifications without the District's written approval will be at the Contractor's expense, as well as any cost for correcting such unauthorized work. Repair methods employing shotcrete (wet or dry), gunnite or similar pneumatic applications of substrate repair materials will **not** be permitted.

(b) Before any material is delivered to the job site, the Contractor shall submit to the District a complete list of all materials proposed to be furnished and installed on this Project, listing manufacturers name, catalog number, cut sheets, etc.

(c) The Contractor shall submit all required shop drawings, work drawings, and all other specified documents for approval to the District in accordance with the requirements of Special Provision SP-4 Submittals.

(d) Submit signed test reports as required per Specifications.

(e) Upon completion of the Project, the Contractor shall furnish the District with two (2) complete sets of marked-up record drawings indicating locations of repairs with size of patch referenced, strand repair quantity, number of chucks, and date of completion. Drawings on which no changes have occurred shall be so marked and also submitted. Two (2) extra sets of drawings will be provided to the Contractor for this purpose.

200.04 Delivery, Storage And Handling

(a) The Contractor shall receive, unload, store, and provide necessary weather protection for all materials, equipment, and tools which he furnishes and installs. These items shall be stored in an area or in areas designated by the District.

(b) Handling of materials shall be done in accordance with the manufacturer's recommendation and in a manner which will not damage or reduce the serviceability of the material.

200.05 Disposal of Demolition Debris and Surplus Construction Materials

(a) Concrete, asphalt, miscellaneous metal and steel items and all other construction debris shall be disposed of by the Contractor off of District property at a landfill licensed to receive such materials.

(b) When removing, transporting and disposing of all demolition materials, the Contractor shall observe and comply with all applicable laws, ordinances, regulations, orders or decrees. The Contractor will not be allowed to waste any such materials or debris over the side of the bridges or trestles into the Chesapeake Bay, or other waters, nor on the stone protection around the perimeter of the islands, nor on any other areas of the District's property.

200.06 Installation

(a) Work shall be done by skilled craftsmen regularly engaged in the appropriate trade.

(b) Materials and equipment furnished shall conform to the standards specified and shall be new and free from defects. No materials and equipment, whether furnished by the Contractor or others, shall be installed or used if the items are physically damaged or functionally defective.

(c) Code requirements shall be considered a minimum standard. Where materials shown on the Drawings or indicated in the Specifications exceed code requirements, the Drawings and Specifications shall govern

SECTION 201 – Work and Materials

201.01 Description of Project:

This project consists of removal and replacement of storefronts, windows and doors at the Chesapeake Bay Bridge and Tunnel District's Administration Building and North Plaza Building as detailed below. This work is further described in the attached specifications and plans. Window replacements shall be Wojan 4600 Series, thermal broken anodized aluminum, with Solarban 60 Series on Solar Gray low E3 glass and Dow 795 Building Sealant, or approved equal.

ADMINISTRATION BUILDING	
TYPE A	Lower portion of store front to have black panel.
1 Ea.	Transom and door to match existing including push bar on door. See DWG- A-5
TYPE B	Admin. Bldg. (Addition 1988) See DWG- A-5
24 Ea.	
TYPE D	Admin. Bldg. (Addition 1988) See DWG- A-5
1 Ea.	
TYPE 1	1 Transom/ 1 Storefront/ 2 Doors. See DWG A-3
2 Ea.	
TYPE B1	Admin Bldg. (Original Const.) See DWG A-3
37 Ea.	
NORTH TOLL PLAZA	
TYPE A-1	New storefronts to match existing. See DWG- TF-4
4 Ea.	
TYPE A-2	New storefronts to match existing, entrance door is to be re-used. See DWG- TF-4
1 Ea.	
TYPE A-3	Operable portion of window to be replaced with black panel. See DWG TF-4
8 Ea.	
TYPE A-4	Operable portion of window to be replaced with fixed clear glass. See DWG TF-4
3 Ea.	
TYPE A-5	Operable portion of window to be replaced with fixed clear glass.
2 Ea.	Lower louver and screen to match existing. See DWG TF-4.

TYPE A-6	New units to match existing. See DWG- TF-4
7 Ea.	

The Contractor shall provide all labor, materials, tools, equipment and supervision necessary to perform the above described work.

201.02 Facilities & Services Provided by the District

If onsite storage of materials is needed, upon request, the District will make available to the Contractor, a site for construction staging and temporary storage of construction materials and equipment to be utilized for this Project. The Contractor will restore the site to its original condition before final acceptance of the project. The Contractor shall be responsible for any and all loading or offloading of materials at the provided location.

201.03 Materials

1. Wojan 4600 Series Thermal Anodized Aluminum Clear, or approved equal, see attached Specification sheets for Wojan 4600 Series Thermal, pages 1-7.

2. 1" Black Insulated Board shall match existing.

3. Dow 795 Building Sealant, or approved equal.

4. The windows shall be clear anodized aluminum frames with the best available hardware offered by the manufacturer.

5. The glass description : Solarban 60 Series on Solar Cool Solar Gray Low E3, or approved equal.

   a. Annealed float glass shall comply with ASTM C 1036, Type 1 ,Class 1 gray.

   b. Heat strengthened float glass shall comply with ASTM C 1048,Type 1, Class 1 gray.

   c. Tempered float glass shall comply with ASTM C1048, Type 1, Class 1 clear.

   d. Laminated glass to comply with ASTM C1172.

   e. Glass shall be annealed, heat strengthened or tempered as required by codes, or as required to meet thermal stress and wind loads of 120mph.

6. Sealed Insulating Glass:

   a. IG units consist of glass lites separated by a dehydrated airspace that is hermetically dual sealed with a primary seal of polyisobutylene or thermo plastic spacer and a secondary seal of silicone or an organic sealant depending on the application.

b. Insulating glass units are certified through the Insulating Glass Cert. Council to ASTM E2190.

7. IG Vision Performance Characteristics:

a. Exterior Lite; ¼" PPG Solarban 60 on Solar Cool Solar Gray Low-E3.

b. Interior Lite; ¼" Laminate- 1/8" clear- 0.030" clear PVB- clear.

c. ½" Cavity: ½" Air Filled

8. Performance Characteristics:

a. Thermal

1. Winter U- factor/ U- value 0.29

2. Summer U factor/ U- value 0.27

3. Solar Heat Gain Coefficient 0.17

4. Shading Coefficient 0.20

5. Light to Solar Gain 0.82

b. Optical

1. Visible Light Transmittance 11%

2. Visible Light Reflectance (outside) 11%

3. Visible Light Reflectance (inside) 14%

4. Total Solar Transmittance 8%

5. Total Solar Reflectance (outside) 14%

6. Ultraviolet Transmittance less than 2%

201.04 Construction Methods

1. Removal and replacement of storefronts, windows and doors at the Administration Building and North Plaza Building as detailed in the Specifications and Drawings. (See SP-11, Coordination of Work)

2. All buildings shall be cleaned at the end of each day and all storefronts, window and doors must be fully secured. (See SP-11, Coordination of Work)

3. All work schedules must be approved by the District Engineer.

201.05 Method of Payment

1. Mobilization shall be measured and paid for on a lump sum basis and shall be in accordance with Section 513 of the VDOT 2007 Road and Bridge Specifications.

2. All storefronts, windows and doors described in the Specifications and shown on the plans for the Administration Building shall be measured and paid for on a lump sum basis. Compensation for incidental items not specifically called for herein or on the project plans, but are necessary for the successful completion of the project in accordance with applicable codes, standards and project requirement, shall be included in the lump sum price.

3. All storefronts, windows and doors described in the Specifications and shown on the plans for the North Plaza Building shall be measured and paid for on a lump sum basis. Compensation for incidental items not specifically called for herein or on the project plans, but are necessary for the successful completion of the project in accordance with applicable codes, standards and project requirement, shall be included in the lump sum price.

Payment shall constitute full compensation for any and all labor, material and equipment costs associated with providing a fully completed, functional pay item. Compensation for incidental items not specifically called for herein or on project plans, but necessary for the successful completion of a pay item in accordance with applicable codes, standards and project requirements, shall be included in the compensation for that pay item. Work in this section that is not specifically tied to work in a subsequent section of the Request for Bid document shall be considered incidental to the overall work on the Project.

201.06 Warranty

The Contractor shall provide a warranty ensuring that all workmanship and materials will remain free of defects for a period of five (5) years from the date of Contract completion. In addition, the Contractor shall provide documentation that the windows meet or exceed 120mph structural loading. The project will not be considered final until this documentation is submitted and approved.

CHESAPEAKE BAY BRIDGE AND TUNNEL DISTRICT
32386 LANKFORD HIGHWAY
CAPE CHARLES, VIRGINIA 23310
757/331-2960 FAX 757/331-4565
WWW.CBBT.COM

January 3, 2017

Mr. Tinh Phan, CEO
PNC Corporation
14214 Washington Highway
Ashland, Virginia 23005

Dear Mr. Phan:

Subject: RMF #1114.1999, Administration Building and North Toll Plaza Building Window Replacements; Bid No. M-16-002

Please see the chart below which shows the status of your submittals:

Submittal No.	Description	Status
201.03-4	Exterior Sealant – Dow Corning 795	Approved as Noted
201.03-1	Aluminum-Framed Entrances and Storefronts	Approved as Noted
	Schedule of Values	Approved

If you have any questions, please call Shawn Spence at (757) 331-2960.

Sincerely,

Timothy R. Holloway
Director of Maintenance

/sjl

Corporate Headquarters
14214 Washington Hwy, Ashland, Virginia 23005
Phone: (804) 798-1159 Fax: (804) 798-1164

PROJECT: **Chesapeake Bay Bridge and Tunnel District**
Admin. Bldg., North & South Toll Plazas Storefront Replacement
32386 Lankford Highway
Cape Charles, VA 23310

PROJECT NO.: 1114.1999

SUBMITTAL NUMBER: 201.03-4
INFORMATIONAL SUBMITTALS: Exterior Sealant – Dow Corning 795
SECTION NUMBER: 201.03

- Product Data
- Test Reports

. APPROVED
. APPROVED AS NOTED
. NOT APPROVED
. WORK MAY PROCEED
. DO NOT PROCEED WITH WORK
6. MAKE CORRECTIONS NOTED
7. RESUBMIT
8. DO NOT RESUBMIT
9. SUBMIT FINAL CERTIFIED
10. REVIEW NOT REQUIRED BY CONTRACT DOCUMENTS

NOTE: COLOR TO BE SUBMITTED & APPROVED AT A LATER DATE.
TRH 1/2/17

ee transmittal for additional information as applicable.

ction shown above is only for conformance with the design concept f the work and with the information in the contract documents.

y approval and submission, contractor represents that he has etermined and verified materials, field measurements and onstruction criteria specified performance and design criteria nd similar data.

eviations from contract documents are not reviewed unless pecifically requested in writing by contractor. Review on esubmission will cover only designated changes on this submittal nd other changes clearly identified by contractor with encirclement.

REVIEWED BY 1/2/17 DATE

CHESAPEAKE BAY BRIDGE AND TUNNEL DISTRICT

PNC Corporation certifies that the equipment and material shown and marked in this submittal is that proposed to be incorporated into this project, is in compliance with the Contract drawings and specifications unless otherwise shown in bold face type or lettering and listed on a page or pages head "DEPARTURES FROM DRAWINGS AND SPECIFICATIONS", and can be installed in the allocated spaces.

Reviewed by Katelyn Allen
Date 12/22/16

Product Information
Silicone Sealants

DOW CORNING

Dow Corning® 795 Silicone Building Sealant

FEATURES & BENEFITS

- Suitable for most new construction and remedial sealing applications
- Versatile – high performance structural glazing and weather sealing from a single product
- Available in 16 standard colors; custom colors also available
- Excellent weatherability – virtually unaffected by sunlight, rain, snow, ozone and temperature extremes of -40°F (-40°C) to 300°F (149°C)
- Excellent unprimed adhesion to a wide variety of construction materials and building components, including anodized, alodined, most coated and many Kynar®[1]-painted aluminums[2]
- Ease of application – ready to use as supplied
- Ease of use – all-temperature gunnability, easy tooling and low-odor cure byproduct
- Meets global standards (Americas, Asia and Europe)

COMPOSITION

- One-part, neutral-cure, RTV silicone sealant

Neutral, one-part silicone sealant

APPLICATIONS

- Structural and nonstructural glazing
- Structural attachment of many panel systems
- Panel stiffener applications
- Weather sealing of most common construction materials including glass, aluminum, steel, painted metal, EIFS, granite and other stone, concrete, brick and plastics

TYPICAL PROPERTIES

Specification Writers: These values are not intended for use in preparing specifications. Please contact your local Dow Corning sales office or your Global Dow Corning Connection before writing specifications on this product.

Test	Property	Unit	Result
As Supplied			
ASTM C 679	Tack-Free Time, 50% RH	hours	3
	Curing Time at 25°C (77°F) and 50% RH	days	7–14
	Full Adhesion	days	14–21
ASTM C 639	Flow, Sag or Slump	Inches (mm)	0.1 (2.54)
	Working Time	minutes	20–30
	VOC Content	g/L	28
As Cured-After 21 days at 25°C (77°F) and 50% RH			
ASTM D 2240	Durometer Hardness, Shore A	points	35
ASTM C 794	Peel Strength	lb/in (kg/cm)	32 (5.7)
ASTM C 1135	Tension Adhesion Strength		
	At 25% extension	psi (MPa)	45 (0.310)
	At 50% extension	psi (MPa)	60 (0.414)
ASTM C 719	Joint Movement Capability	percent	± 50
ASTM C 1248	Staining (granite, marble, lime- Stone, brick and concrete)		None
As Cured-After 21 days at 25°C (77°F) and 50% RH followed by 10,000 hours in a QUV weatherometer, ASTM G 53			
ASTM C 1135	Tensile Adhesion Strength		
	At 25% extension	psi (MPa)	35 (0.241)
	At 50% extension	psi (MPa)	50 (0.345)

[1]Kynar is a trademark of Atofina Chemicals Inc
[2]Contact your local Dow Corning Sales Application Engineer for specifics

[1]Based on South Coast Air Quality Management District of California. Maximum VOC is listed both inclusive and exclusive of water and exempt compounds. For a VOC data sheet for a specific sealant color, please send your request to product.inquiry@dowcorning.com

DESCRIPTION

Dow Corning® 795 Silicone Building Sealant is a one-part, neutral-cure, architectural-grade sealant that easily extrudes in any weather and cures quickly at room temperature. This cold-applied, non-sagging silicone material cures to a medium- modulus silicone rubber upon exposure to atmospheric moisture. The cured sealant is durable and flexible enough to accommodate ±50 percent movement of original joint dimension when installed in a properly designed weather seal joint. In a properly designed structurally glazed joint, the sealant is strong enough to support glass and other panel materials under high wind load.

APPROVALS/ SPECIFICATIONS

Dow Corning 795 Silicone Building Sealant meets the requirements of:

- Federal Specification TT-S 001 543A (COM-NBS) Class A for silicone building sealants
- Federal Specification TT-S-00230C (COM-NBS) Class A for one- component building sealants
- ASTM Specification C 920 Type S, Grade NS, Class 50, Use NT, G, A and O
- ASTM Specification C 1184 for structural silicone sealants
- Canadian Specification CAN2-19.13- M82

SEALANT • WATERPROOFING & RESTORATION INSTITUTE

Issued to: Dow Corning Corp.®
Product: 795 Silicone Building Sealant

C719: Pass ✔ Ext:+50% Comp:-50%

Substrate: Glass, Aluminum, Kynar
[Glass and Aluminum Substrates were tested unprimed. Dow Corning 1200 OS Primer used on Kynar substrates]

C661: Rating 41

Validation Date: 9/11/12 - 9/10/17

No. 912-SBS917 *Copyright © 2012*

SEALANT VALIDATION
www.swrionline.org

COLORS

Dow Corning 795 Silicone Building Sealant is available in 16 colors: white, limestone, champagne, natural stone, gray, black, bronze, sandstone, adobe tan, dusty rose, rustic brick, blue spruce, anodized aluminum, and charcoal. Custom colors may be ordered to match virtually any substrate.

HOW TO USE

Please consult the *Dow Corning Americas Technical Manual*, Form No. 62-1112, for detailed information on state-of-the- art application methods and joint design. Please contact your local Dow Corning Sales Application Engineer for specific advice.

Preparation

Clean all joints, removing all foreign matter and contaminants such as grease, oil, dust, water, frost, surface dirt, old sealants or glazing compounds and protective coatings.

Application Method

Install backing material or joint filler, setting blocks, spacer shims and tapes. Mask areas adjacent to joints to ensure neat sealant lines. Primer is generally not required on non-porous surfaces, but may be necessary for optimal sealing of certain porous surfaces. A test placement is always recommended. Apply *Dow Corning* 795 Silicone Building Sealant in a continuous operation using positive pressure. (The sealant can be applied using many types of air-operated guns and most types of bulk dispensing equipment.) Before a skin forms (typically within 15 minutes), tool the sealant with light pressure to spread the sealant against the backing material and joint surfaces. Remove masking tape as soon as the bead is tooled.

HANDLING PRECAUTIONS

PRODUCT SAFETY INFORMATION REQUIRED FOR SAFE USE IS NOT INCLUDED IN THIS DOCUMENT. BEFORE HANDLING, READ PRODUCT AND SAFETY DATA SHEETS AND CONTAINER LABELS FOR SAFE USE, PHYSICAL AND HEALTH HAZARD INFORMATION. THE SAFETY DATA SHEET IS AVAILABLE ON THE DOW CORNING WEBSITE AT DOWCORNING.COM, OR FROM YOUR DOW CORNING SALES APPLICATION ENGINEER, OR DISTRIBUTOR, OR BY CALLING DOW CORNING CUSTOMER SERVICE.

USABLE LIFE AND STORAGE

When stored at or below 27°C (80°F), *Dow Corning* 795 Silicone Building Sealant has a shelf life of 12 months from the date of manufacture. Refer to product packaging for "Use By Date."

PACKAGING INFORMATION

Dow Corning 795 Silicone Building Sealant is supplied in 10.3-fl oz (305-mL) disposable plastic cartridges that fit ordinary caulking guns, 20-fl oz (590- mL) sausages and 2- and 4.5-gal (7.5- and 1 7-L) bulk containers.

LIMITATIONS

Dow Corning 795 Silicone Building Sealant should not be used:

- In structural applications without prior review and approval by your local Dow Corning Sales Application Engineer
- In below-grade applications
- When surface temperatures exceed 50°C (122°F) during installation
- On surfaces that are continuously immersed in water
- On building materials that bleed oils, plasticizers or solvents that may affect adhesion

2016, July 1
Form No. 61-885Q-01

- On frost-laden or wet surfaces
- In totally confined joints (the sealant requires atmospheric moisture for cure)
- If the sealant is intended to be painted (paints do not typically adhere to most silicone sealants)
- To surfaces in direct contact with food or other food-grade applications

This product is neither tested nor represented as suitable for medical or pharmaceutical uses.

HEALTH AND ENVIRONMENTAL INFORMATION

To support customers in their product safety needs, Dow Corning has an extensive Product Stewardship organization and a team of Product Safety and Regulatory Compliance (PS&RC) specialists available in each area.

For further information, please see our website, dowcorning.com or consult your local Dow Corning representative.

LIMITED WARRANTY INFORMATION – PLEASE READ CAREFULLY

The information contained herein is offered in good faith and is believed to be accurate. However, because conditions and methods of use of our products are beyond our control, this information should not be used in substitution for customer's tests to ensure that our products are safe, effective, and fully satisfactory for the intended end use. Suggestions of use shall not be taken as inducements to infringe any patent.

Dow Corning's sole warranty is that our products will meet the sales specifications in effect at the time of shipment.

Your exclusive remedy for breach of such warranty is limited to refund of purchase price or replacement of any product shown to be other than as warranted.

TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, DOW CORNING SPECIFICALLY DISCLAIMS ANY OTHER EXPRESS OR IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY.

DOW CORNING DISCLAIMS LIABILITY FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

We help you invent the future.™

dowcorning.com

2016, July 1
Form No 61-885Q-01

74 Kent Street
Brooklyn, New York 11222-1517

Phone (718) 383-5080
Fax (718) 383-7445
E-mail: dllabs@aol.com

Accredited by National Voluntary Laboratory Accreditation Program - Lab Code 100252
ISO / IEC 17025 and relevant requirements of ISO 9002

May 29, 2009

Dow Corning Corporation
2200 W. Salzburg Road
DC-4 Sealants Test Lab 3A4
Auburn, MI 48611

Att: **Ms. Kelly Allore**

DL-15761 AR
Via FAX (989) 496-4374

OBJECTIVE

To test a sealant for conformance to the requirements outlined in ASTM C 1184-05, "Standard Specification for Structural Silicone Sealants", Type S, Use G.

PRODUCT TESTED

***Dow Corning*® 795 Silicone Building Sealant, Black**, Lot: 5134463

TEST PROCEDURES

The sealant was tested in accordance with the procedures outlined in Paragraphs 8. Test Methods and 9. Shelf Life.

TEST RESULTS

The test results can be found in the Appendix.

CONCLUSION

The submitted sample of ***Dow Corning*® *795* Silicone Building Sealant** conforms to the requirements outlined in ASTM C 1184, Table 1 – Requirements for Physical, Mechanical and Performance Qualities of a Sealant.

DL Labs, Inc.

Mario Lazaro, Jr.
Assistant Technical Director

APPENDIX

TEST RESULTS

Dow Corning® 795 Silicone Building Sealant, Black
ASTM C 1184 - Table I Requirements for Physical, Mechanical and Performance Qualities of a Sealant

Par.	ASTM	Test	Requirement	Result
8.1	C 639	Rheological Properties		
		Vertical	3/16" max. flow	
		122°F		No flow
		40°F		No flow
		Horizontal	No deformation	
		122°F		No deformation
		40°F		No deformation
8.2	C 603	Extrusion Rate	10 seconds max.	2-seconds
8.3	C 661	Hardness – Shore A-2	Between 20 and 60	35
8.4	C 792	Effect of Heat Aging @ 88°C		
		Weight Loss	10% max.	0.4% wt. loss
		Cracking	None	No cracking
		Chalking	None	No chalking
8.5	C 679	Tack-Free Time	3 hours max.	115-minutes
8.6	C 1135	Tensile Adhesion	50 psi min.	
		Standard Conditions		85 psi
		88° C (190° F)		65 psi
		-29° C (-20° F)		100 psi
		Water Immersion		85 psi
		5,000 hrs. Weathering		110 psi
9.1		Shelf Life	6-months min.	6-months

Corporate Headquarters
14214 Washington Hwy, Ashland, Virginia 23005
Phone: (804) 798-1159 Fax: (804) 798-1164

PROJECT: **Chesapeake Bay Bridge and Tunnel District**
Admin. Bldg., North & South Toll Plazas Storefront Replacement
32386 Lankford Highway
Cape Charles, VA 23310

PROJECT NO.: 1114.1999

SUBMITTAL NUMBER: 201.03-1
INFORMATIONAL SUBMITTALS: Aluminum-Framed Entrances and Storefronts
SECTION NUMBER: 201.03

- Product Data
- Product Test Reports

1. APPROVED
2. APPROVED AS NOTED
3. NOT APPROVED
4. WORK MAY PROCEED
5. DO NOT PROCEED WITH WORK
6. MAKE CORRECTIONS NOTED
7. RESUBMIT
8. DO NOT RESUBMIT
9. SUBMIT FINAL CERTIFIED
10. REVIEW NOT REQUIRED BY CONTRACT DOCUMENTS

See transmittal for additional information as applicable.

Action shown above is only for conformance with the design concept of the work and with the information in the contract documents.

By approving this submission Contractor represents that he has determined and verified materials, field measurements and construction criteria specified performance and design criteria and similar data.

Deviations from contract documents are not reviewed unless specifically requested in writing by contractor. Review on resubmission will cover only designated changes on this submittal and other changes clearly identified by contractor with encirclement.

TWS 1/2/17
REVIEWED BY DATE

CHESAPEAKE BAY BRIDGE AND TUNNEL DISTRICT

NOTE: COLOR TO BE SUBMITTED AND APPROVED AT A LATER DATE. DEPTH OF 45 TU WAS POTENTIAL ISSUE AT PLAZA. MAKE SURE THIS IS RESOLVED BEFORE ORDERING
TCH 1/2/17

PNC Corporation certifies that the equipment and material shown and marked in this submittal is that proposed to be incorporated into this project, is in compliance with the Contract drawings and specifications unless otherwise shown in bold face type or lettering and listed on a page or pages head "DEPARTURES FROM DRAWINGS AND SPECIFICATIONS", and can be installed in the allocated spaces.

Reviewed by Kallen Katelyn Allen
Date 12/22/16

> YES 45 TU

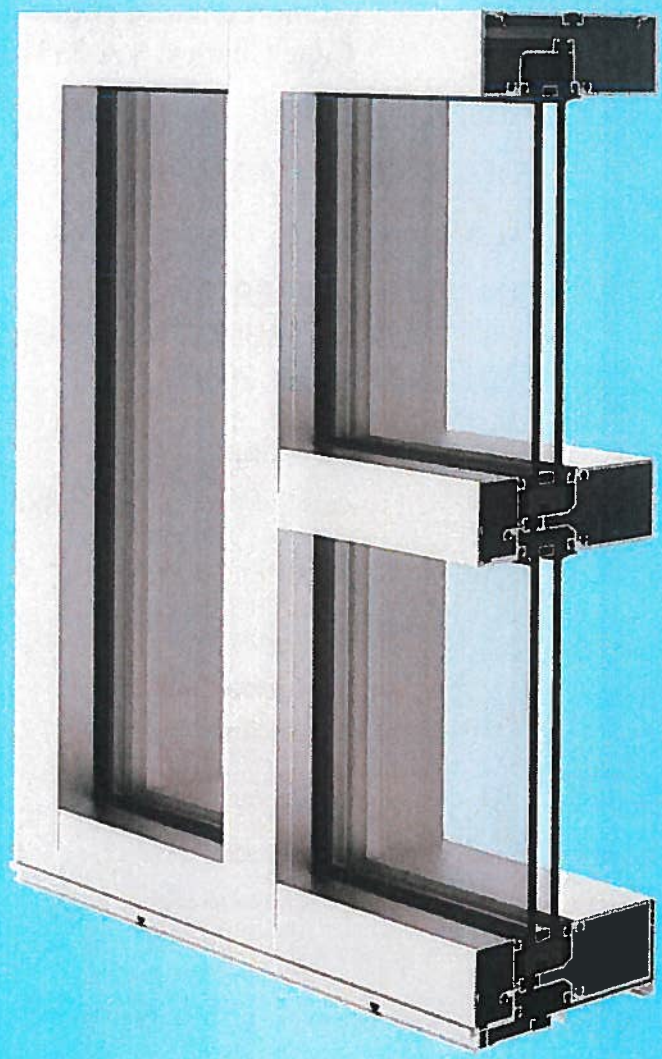
Thermally Broken Center Set Storefront System

SYSTEM DESCRIPTION:

YES 45 TU is a thermally broken, center set, flush glazed storefront system for insulating glass. The system is thermally broken by means of a poured and debridged pocket that employs a patented process, ThermaBond Plus®, to greatly improve adhesion of the polyurethane to the extruded aluminum. Combining science and technology, ThermaBond Plus resolves the problem of adhesion and the resultant dry shrinkage associated with typical poured and debridged systems.

OPTIONS & FEATURES:

- 2" Face by 4-1/2" Overall Depth
- Outside or Inside Glazed
- Accepts 1" Insulating Glass
- High Performance Sill Flashing
  - No Blind Seals
  - Tall back leg for enhanced water resistance
  - Patented 3 point attachment of end dam
- Patented Screw Spline or Shear Block Assembly
- ThermaBond Plus Thermal Break
- Model 20D/35D/50D Single Doors up to 4'-0" x 8'-0"
- Model 20D/35D/50D Pairs up to 8'-0" x 8'-0"



> YES 45 TU

Thermally Broken Center Set Storefront System

1.01 SUMMARY

A. Section Includes: Aluminum Storefront Systems.
   1. YKK AP Series YES 45 TU Center Set Aluminum Storefront System.
B. Related Sections:
   1. Glass and Glazing: Refer to Division 8 Glass and Glazing Section for glass and glazing requirements

1.02 SYSTEM DESCRIPTION

A. Performance Requirements: Provide aluminum storefront systems that comply with performance requirements indicated, as demonstrated by testing manufacturer's assemblies in accordance with test method indicated.
   1. Air Infiltration: Completed storefront systems shall have 0.06 CFM/FT² (1.10 m³/h·m²) maximum allowable infiltration when tested in accordance with ASTM E 283 at differential static pressure of 6.24 PSF (299 Pa).
   2. Water Infiltration: No uncontrolled water when tested in accordance with ASTM E 331 at test pressure differential of: 10 PSF (479 Pa) (or when required, field tested in accordance with AAMA 503). Fastener Heads must be seated and sealed against Sill Flashing on any fasteners that penetrate through the Sill Flashing.
   3. Wind Loads: Completed storefront system shall withstand wind pressure loads normal to wall plane indicated:
      a. Exterior Walls:
         1) Positive Pressure:
         2) Negative Pressure:
      b. Interior Walls (Pressure Acting in Either Direction):
   4. Deflection: Maximum allowable deflection in any member when tested in accordance with ASTM E 330 with allowable stress in accordance with AA Specifications for Aluminum Structures.
      a. Without Horizontals: L/175 maximum.
      b. With Horizontals: L/175 or L/240 + 1/4" (6.4mm) for spans greater than 13'-6" (4.1m) but less than 40'-0" (12.2m).
   5. Thermal Movement: Provide for thermal movement caused by 180 degrees F. (82.2 degrees C.) surface temperature, without causing buckling stresses on glass, joint seal failure, undue stress on structural elements, damaging loads on fasteners, reduction of performance, or detrimental effects.
   6. Thermal Performance: When tested in accordance with AAMA 507, AAMA 1503 and NFRC 100:
      a. Condensation Resistance Factor (CRFf): A minimum of 60.
      b. Thermal Transmittance U Value: 0.45 BTU/HR/FT²/°F or less.

Note: Thermal Performance for the glazed system as a whole will be affected by the characteristics of the glass specified and percentage of vision area.

   7. Acoustical Performance: Acoustical Performance: When tested in accordance with AAMA 1801:
      a. Sound Transmission Class (STC) shall not be less than 35 laminated.
      b. Outdoor–Indoor Transmission Class (OITC) shall not be less than 29 laminated.

2.01 MANUFACTURERS

A. Acceptable Manufacturers: YKK AP America, Inc.
   1. Storefront System: YKK AP YES 45 TU Storefront System.
B. Storefront Framing System:
   1. Description: Center set, exterior flush glazed; jambs and vertical mullions continuous; head, sill, intermediate horizontal attached by screw spline joinery or shear block attachment.
   2. Components: Manufacturer's standard extruded aluminum mullions, 90 degree corner posts, entrance door framing, and indicated shapes.
   3. Thermal Barrier: Provide continuous thermal barrier by means of a poured and debridged pocket consisting of a two-part, chemically cured high density polyurethane which is bonded to the aluminum by YKK AP ThermaBond Plus®. Systems employing non structural thermal barriers are not acceptable.

2.02 MATERIALS

A. Extrusions: ASTM B 221 (ASTM B 221M), 6063-T5 Aluminum Alloy.

2.03 ACCESSORIES

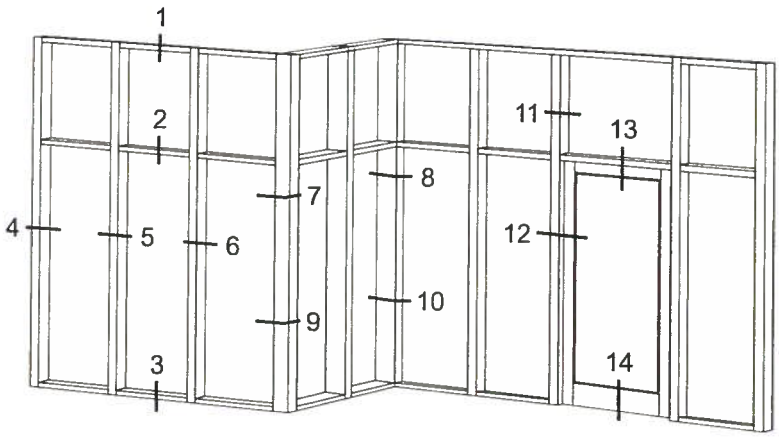
A. Manufacturer's Standard Accessories:
   1. Fasteners: Zinc plated steel concealed fasteners: Hardened aluminum alloys or AISI 300 series stainless steel exposed fasteners.
   2. Glazing: Setting blocks, edge blocks, and spacers in accordance with ASTM C 864, shore durometer hardness as recommended by manufacturer; glazing gaskets in accordance with ASTM C 864.
   3. 0.050 Aluminum Sill Flashing End Dams must have 3 point attachment.

2.06 FINISHES

A. Anodic Coating: Electrolytic color coating followed by an organic seal applied in accordance with the requirements of AAMA 612.
B. High Performance Organic Coating Finish: Factory applied two-coat 70% Kynar resin by Arkema or 70% Hylar resin by Solvay Solexis, fluoropolymer based coating system, Polyvinylidene Fluoride (PVF-2), applied in accordance with YKK AP procedures and meeting AAMA 2605 specifications.

For additional information on architectural aluminum products offered by YKK AP America Inc. visit our web site at www.ykkap.com.

YES 45 TU HORIZONTAL MEMBERS FOR OUTSIDE GLAZING



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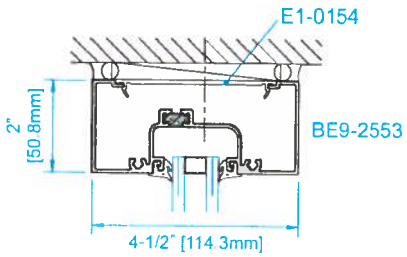
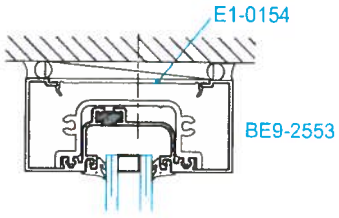


SECTION 1
HEAD



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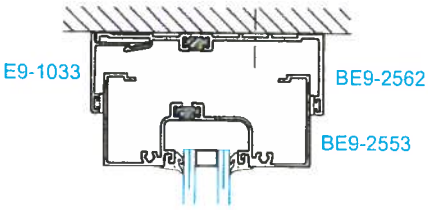
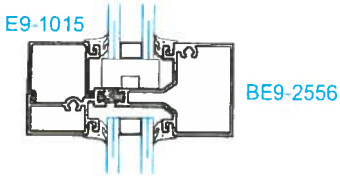
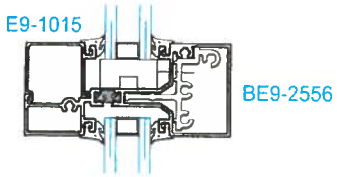


SECTION 1B
HEAD RECEPTOR



SECTION 2
HORIZONTAL



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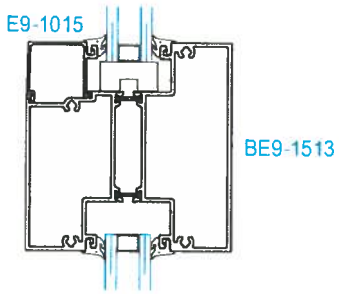
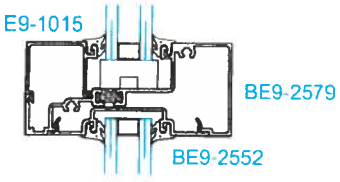


SECTION 2D
4-1/2" HORIZONTAL



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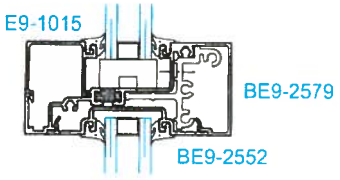
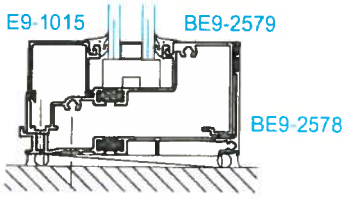
TWO PIECE HORIZONTAL



SECTION 2C
TWO PIECE HORIZONTAL



SECTION 3
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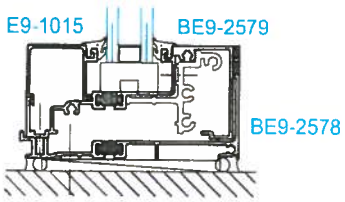

SECTION 3A
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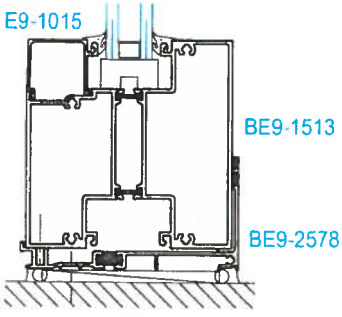
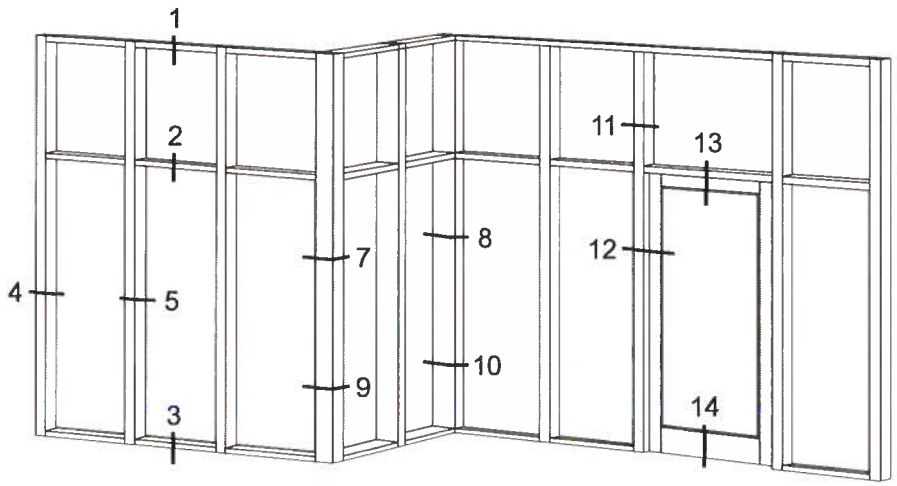
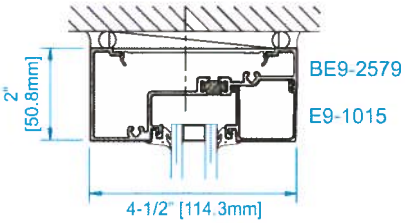


SECTION 3B
4-1/2" SILL

YES 45 TU HORIZONTAL MEMBERS FOR INSIDE GLAZING

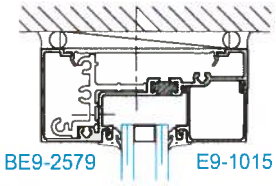


SCREW SPLINE

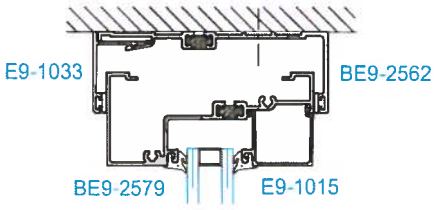


SECTION 1
HEAD

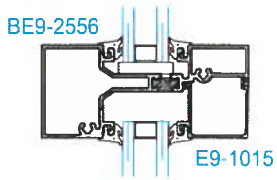
SHEAR BLOCK



SECTION 1A
HEAD



SECTION 1B
HEAD RECEPTOR



SECTION 2
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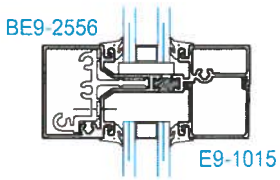
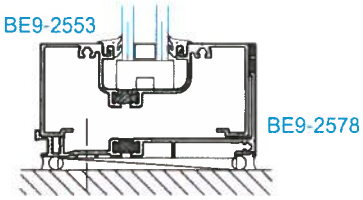


SECTION 2A
HORIZONTAL



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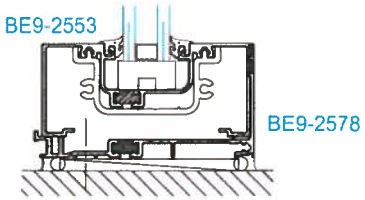
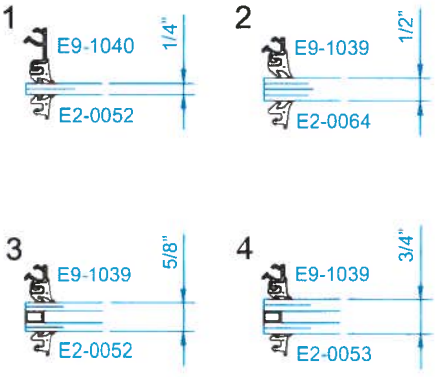


*SECTION 3A
SILL

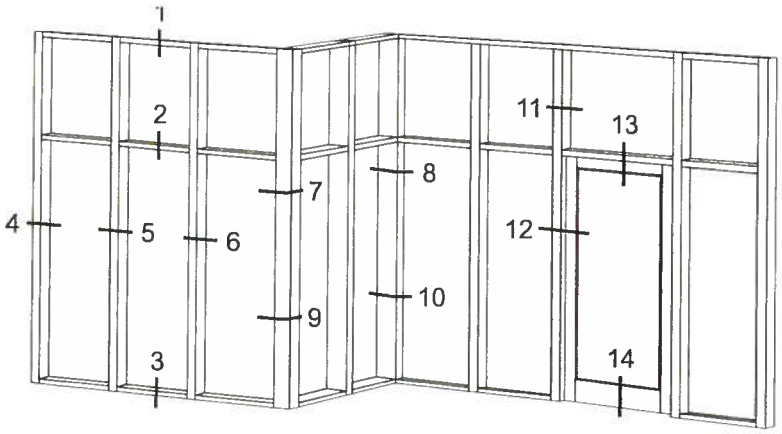
GLAZING OPTIONS



SCALE: 1/4 SIZE
0 3 6

*For applications for loads over 500 lbs., See Details 3 & 3A on Page 127.

YES 45 TU VERTICAL & CORNER MEMBERS



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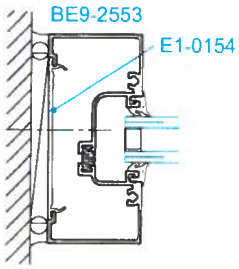
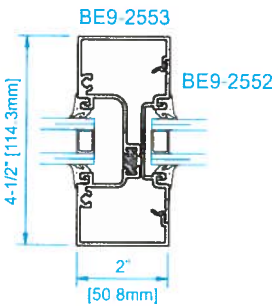
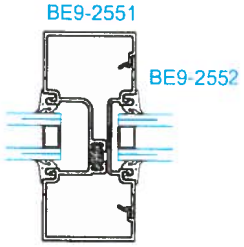


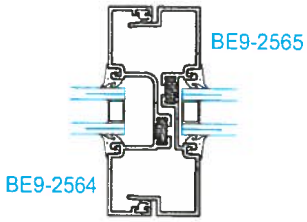
SECTION 4
JAMB



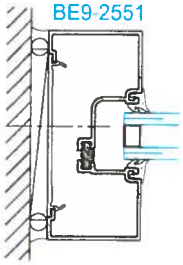
SECTION 5
MULLION



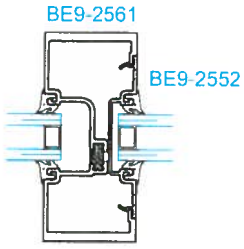
SECTION 5A
MULLION



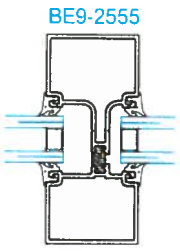
SECTION 6
EXPANSION
MULLION



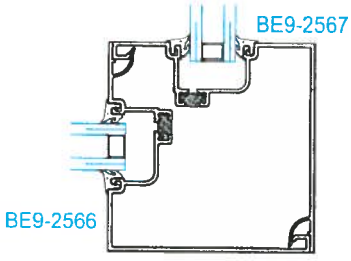
SECTION 4A
JAMB



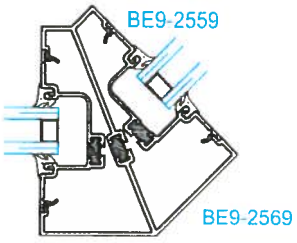
SECTION 5B
HEAVY DUTY
MULLION



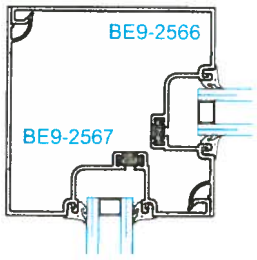
SECTION 5C
TUBULAR
MULLION



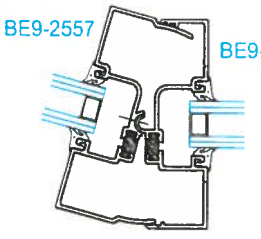
SECTION 7
90° OUTSIDE CORNER



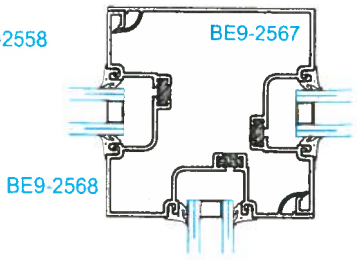
SECTION 7A
135° OUTSIDE CORNER



SECTION 8
90° INSIDE CORNER

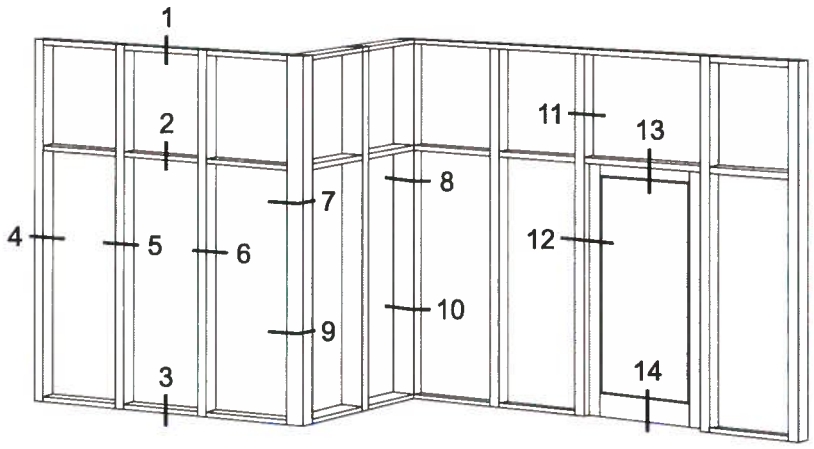


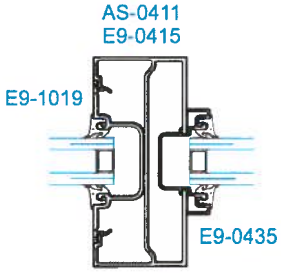
SECTION 9
0°-15° HINGED
MULLION



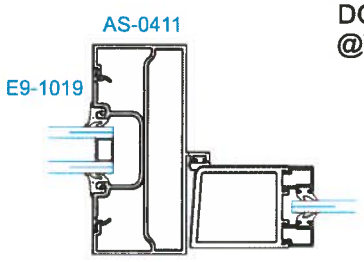
SECTION 10
THREE WAY
90° CORNER

YES 45 TU DOOR FRAMING MEMBERS

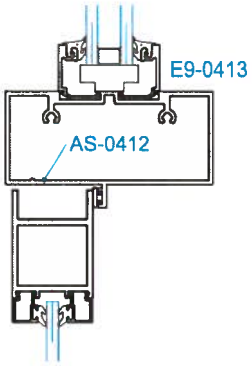




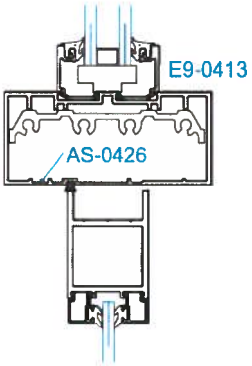
SECTION 11
DOOR JAMB
@TRANSOM



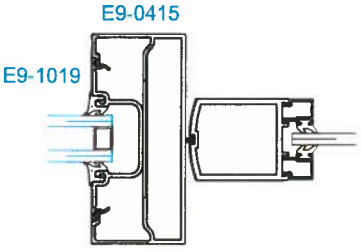
SECTION 12
SINGLE ACTING
DOOR JAMB



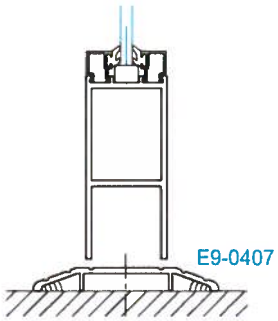
SECTION 13
SINGLE ACTING
TRANSOM BAR



SECTION 13A
DOUBLE ACTING
TRANSOM BAR



SECTION 12A
DOUBLE ACTING
DOOR JAMB



SECTION 14
BOTTOM RAIL

SCALE: 1/4 SIZE
0 3 6

FLORIDA | GEORGIA | TEXAS
BRANCH OFFICE
1701 Westfork Drive, Suite 106
Lithia Springs, GA 301224
770.941.6916
HTLTEST.COM

YKK AP America, Inc

YES-45TU Store Front Window System
Test Report #: G231-0404-08-3

1.0 MANUFACTURER'S IDENTIFICATION

1.1	Name of Applicant:	YKK AP America, Inc. 7680 The Bluffs, Suite 100 Austell, GA 30168 Voice: 678-838-6000 Fax: 678-838-6056
1.2	Contact Person:	Don Pangburn

2.0 LABORATORY IDENTIFICATION

2.1	HTL Lab Certifications:	Miami-Dade County (04-0806.02); Florida Building Code; (TST3892); IAS (TL-338)

3.0 SCOPE OF WORK

3.1 Introduction

YKK AP America, Inc. retained HTL, LLC to conduct compliance testing for their YES-45TU store front window system.

3.2 Report Information

Table 3.1 provides the test dates for each mock-up and specimen number.

Table 3.1: Specimen Test Dates

Mock-Up	Specimen #	Test Date
YES-45TU	3	4/17-18/08

4.0 PRODUCT IDENTIFICATION

4.1	Product Type:	Store Front
4.2	Model Designation:	YES-45TU
4.3	Performance Class:	+/- 25 psf
4.4	Overall Size:	152" (w) x 108" (h)
4.5	Drawing:	This test report is incomplete if not accompanied by YKK AP America, Inc drawing labeled "YES-45TU"bearing the ink stamp of Hurricane Test Laboratory, LLC. ***See attached drawings for description of specimen as tested.***
4.6	Sample Source:	Sample provided by YKK AP America, Inc.

ENGINEER OF RECORD

Vinu J. Abraham, P.E.
FL Reg. #53820
7/29/2008

FLORIDA | GEORGIA | TEXAS
BRANCH OFFICE
1701 Westfork Drive, Suite 106
Lithia Springs, GA 301224
770.941.6916
HTLTEST.COM

5.0 TEST RESULTS

5.1 Table 5.1 provides the test results for Specimen # 3:

Table 5.1: Test Results

Test Method	Test Conditions	Measured	Allowed
Air Infiltration Test (ASTM E283)	1.57 psf	<0.01 cfm/ft^2	N/A
	6.24 psf	<0.01 cfm/ft^2	0.060 cfm/ft^2
Water Infiltration Test (ASTM E331)	12 psf	PASSED per ASTM E331 (no water found inside of the unit)	
Uniform Static Load Test (ASTM E330)	+ 25 psf	**Deflection**	
		Vertical Mullion	
		0.46 in.	0.60 in.
		Intermediate Horizontal	
		0.04 in.	0.27 in.
	- 25 psf	**Deflection**	
		Vertical Mullion	
		0.45 in.	0.60 in.
		Intermediate Horizontal	
		0.05 in.	0.27 in.
Water Infiltration Test (ASTM E331)	12 psf	PASSED per ASTM E331 (no water found inside of the unit)	
Uniform Load Structural Test (ASTM E330)	+ 37.5 psf	**Permanent Set**	
		Vertical Mullion	
		0.00 in.	0.43 in.
		Intermediate Horizontal	
		0.00 in.	0.20 in.
	- 37.5 psf	**Permanent Set**	
		Vertical Mullion	
		0.00 in.	0.43 in.
		Intermediate Horizontal	
		0.01 in.	0.20 in.

ENGINEER OF RECORD

7/29/2008

6.0 CERTIFICATION AND DISCLAIMER STATEMENT

All tests performed on this test specimen were conducted in accordance with the specifications of the applicable codes, standards and test methods listed below by HTL, LLC. HTL, LLC does not have, nor does it intend to acquire or will it acquire, a financial interest in any company manufacturing or distributing products tested at HTL. HTL is not owned, operated or controlled by any company manufacturing or distributing products it tests. This report is only intended for the use of the entity named in Section 1.0 of this report. Detailed assembly drawings showing wall thickness of all members, corner construction and hardware applications are on file and have been compared to the test specimen submitted. A copy of this test report along with representative sections of the test specimen will be retained at HTL for a period of three (3) years. All results obtained apply only to the specimen tested and they do indicate compliance with the performance requirements of the test methods and specifications listed in the following section.

7.0 APPLICABLE CODES, STANDARDS, AND TEST METHODS

ASTM E283-04 – Standard Test Method for Determining Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

ASTM E330-02 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

ASTM E331-00 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

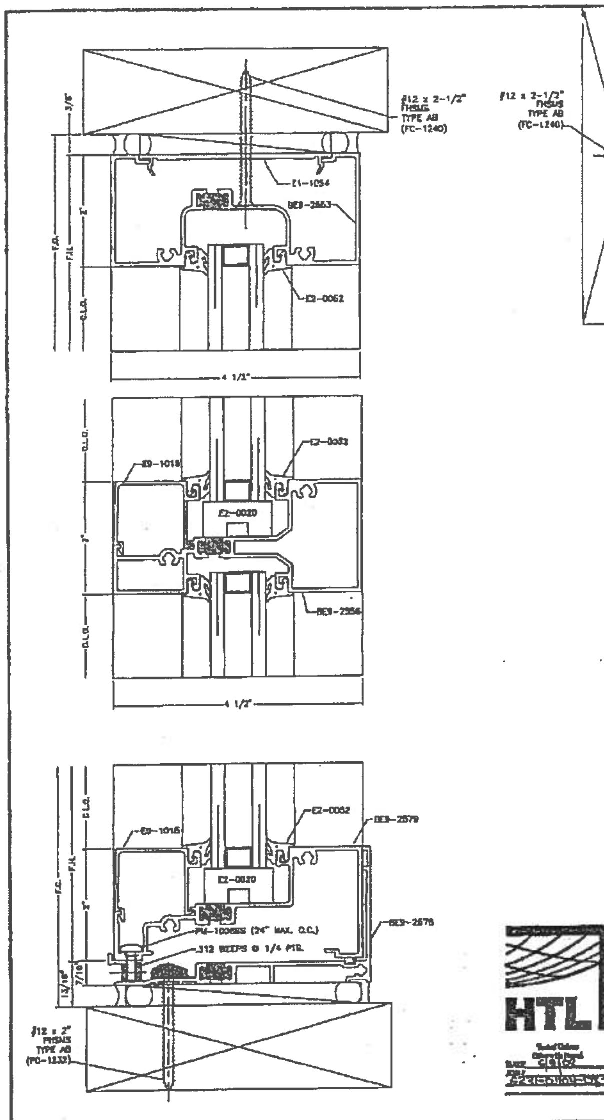
AAMA 501 – Method of Testing for Exterior Walls

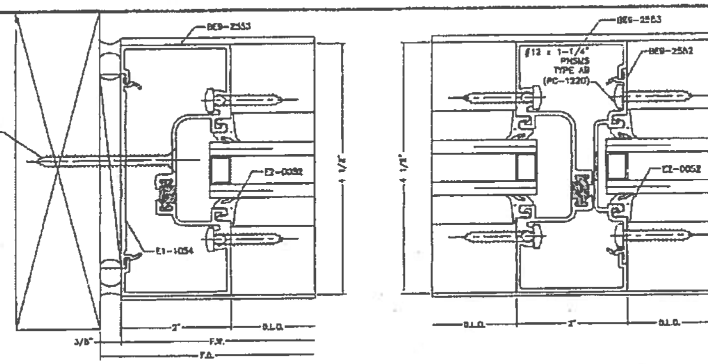
8.0 WITNESSES (ALL OR PARTIAL)

Vinu J. Abraham, P.E.	CEO	HTL, LLC
Jose Colon, E.I.	Operations Manager	HTL, LLC
Ian McKenzie	Laboratory Foreman	HTL, LLC
Andrew Bush	Engineering Assistant	HTL, LLC
Don Pangburn	Product Designer	YKK AP America, Inc.

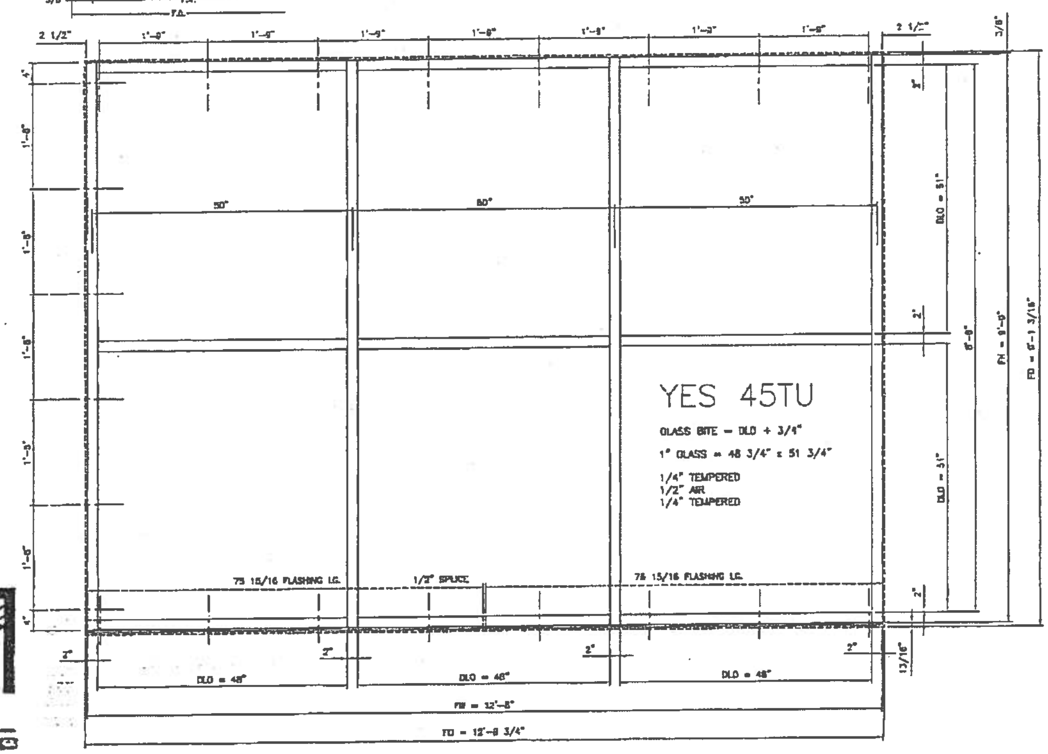
ENGINEER OF RECORD

7/29/2008





ASTM E283	Air	6.24psf
ASTM E331	Water	12.0psf
ASTM E330	Design	25.0psf
ASTM E330	Unif.Load	37.5psf



YKK AP

YKK AP America Inc.

YES 45TU AWB TESTING

DESCRIPTION	YES 45TU
SCALE: As Noted	ISSUE DATE: 12/21/07
DRAWN BY: O.D.	SHEET NO. 01
CHECKED BY: DP	

Architectural Testing

NFRC U-FACTOR, SHGC, VT, & CONDENSATION RESISTANCE COMPUTER SIMULATION REPORT

Rendered to:
YKK AP AMERICA

SERIES/MODEL:
YES 45 TU Storefront

Report Number:	**B6796.02-116-45**
Report Date:	**02/29/12**
Expiration Date:	**02/24/16**

130 Derry Court
York, PA 17406-8405
phone: 717-764-7700
fax: 717-764-4129
www.archtest.com

Architectural Testing

NFRC U-FACTOR, SHGC, VT, & CONDENSATION RESISTANCE
COMPUTER SIMULATION REPORT

Rendered to:
YKK AP AMERICA
332 Firetower Road
Dublin, Georgia 31021

Report Number:	B6796.02-116-45
Simulation Date:	02/24/12
Report Date:	02/29/12
Expiration Date:	02/24/16

Project Summary:
Architectural Testing, Inc. was contracted to perform U-Factor, Solar Heat Gain Coefficient, Visible Transmittance, and Condensation Resistance* computer simulations in accordance with the National Fenestration Rating Council (NFRC). The products were evaluated in full compliance with NFRC requirements to the standards listed below.

**NFRC's Condensation Resistance rating is NOT equivalent to a Condensation Resistance Factor (CRF) determined in accordance with AAMA 1503.*

Standards:

NFRC 100-2010:	*Procedure for Determining Fenestration Product U-Factors*
NFRC 200-2010:	*Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence*
NFRC 500-2010:	*Procedure for Determining Fenestration Product Condensation Resistance Values*

Software:

Frame and Edge Modeling:	THERM 6.3.19
Center-of-Glass Modeling:	WINDOW 6.3.9
Total Product Calculations:	WINDOW 6.3.9
Spectral Data Library:	19.0

Simulations Specimen Description:

Series/Model:	YES 45 TU Storefront
Type:	Glazed Wall System , Window Wall
Frame Material:	AP Aluminum w/ Thermal Breaks - Partial
Sash Material:	NA Not Applicable
Standard Size:	2000mm x 2000mm

130 Derry Court
York, PA 17406-8405
phone: 717-764-7700
fax: 717-764-4129
www.archtest.com

Modeling Assumptions/Technical Interpretations:

1) To prevent air infiltration, tape was applied to all interior sash crack locations.
2) This product is available in either a painted or anodized finish. These two finish types were grouped for simulation purposes in accordance with NFRC 100-2010, Section 5.9.5.2.A.iii.2 and Table 5-5. The painted finish was simulated since it is the worst case (highest emissivity).
3) The center-line modeling approach was conducted using the vertical intermediate for the jambs. This procedure in the NFRC Simulation Manual Section 8.10.

Specialty Products Table:

The specialty products method allow the manufacturer to determine the overall product SHGC and VT for any glazing option. The center of glass SHGC and/or VT must be determined using WINDOW 6.3.9. The method gives overall product SHGC and VT indexed on center of glass properties. All values used in the calculations are truncated to six decimal place precision.

	No Dividers	Dividers < 1	Dividers > 1
SHGC0	0.010245	0.013651	0.016844
SHGC1	0.893713	0.792952	0.698509
VT0	0.000000	0.000000	0.000000
VT1	0.883468	0.779300	0.681664

SHGC = SHGC0 + SHGCc (SHGC1 - SHGC0)

VT = VT0 + VTc (VT1 - VT0)

Validation Matrix:

The following products are part of a validation matrix. Only one is required for validation testing.

Product Line	*Report Number*
None	-

Spacer Option Description

	Sealant		
Spacer Type	*Primary*	*Secondary*	*Code*
Aluminum Spacer	Butyl Rubber	Butyl Rubber	A1-D

Grid Option Description

Grid Size	*Grid Type*	*Grid Pattern*
None	-	-

Reinforcement Option Description

Location	*Material*
None	-

Gas Filling Technique Description

Fill Type	*Method*
84.48% Xenon	Dual Probe w/ Concentration Sensor
76.09% Argon	Single Probe Timed
85.82% Argon	Single Probe Timed
83.03% Argon	Single Probe Timed
88.65% Argon	Single Probe Timed
87.42% Argon	Single Probe Timed
64.98% Argon	Single Probe Timed
74.70% Argon	Single Probe Timed
60.79% Argon	Single Probe Timed
62.42% Argon	Single Probe Timed
86.02% Argon	Single Probe Timed
81.67% Xenon	Single Probe Timed
94.6% Xenon	Evacuated Chamber

Edge-of-Glass Construction

Interior Condition	EPDM Gasket Against Glass
Exterior Condition	EPDM Gasket Against Glass

Weatherstripping

Type	*Quantity*	*Location*
None	-	-

Frame/Sash Materials Finish

Interior	Painted Aluminum
Exterior	Painted Aluminum

NFRC 100/200/500 Summary Sheet
YES 45 TU Storefront

ID	Pane Thickness 1	Gap Width 1	Pane Thickness 2	Gap Width 2	Pane Thickness 3	Gap Width 3	Pane Thickness 4	Gap Fill	Low-e (Surface#)	Tint	Spacer	Grid Type
	U-Factor			Solar Heat Gain Coefficient (SHGC) Grids (None / <1 / >=1)					Visible Transmittance (VT) Grids (None / <1 / >=1)		Condensation Resistance	
1	COG=0.4400											
	0.222	0.500	0.225					XEN84.48		CL	A1-D	N
	U-Factor 0.55			SHGC (N) 0.61					VT (N) 0.65		CR 32	
2	COG=0.4200											
	0.222	0.500	0.225					ARG76.09	0.652(#2)	GY	A1-D	N
	U-Factor 0.53			SHGC (N) 0.24					VT (N) 0.21		CR 32	
3	COG=0.4000											
	0.220	0.500	0.225					ARG85.82	0.566(#2)	GY	A1-D	N
	U-Factor 0.51			SHGC (N) 0.24					VT (N) 0.18		CR 32	
4	COG=0.3800											
	0.226	0.500	0.225					ARG83.03	0.471(#2)	AZ	A1-D	N
	U-Factor 0.50			SHGC (N) 0.17					VT (N) 0.14		CR 32	
5	COG=0.3600											
	0.220	0.500	0.225					ARG88.65	0.395(#2)	GY	A1-D	N
	U-Factor 0.48			SHGC (N) 0.13					VT (N) 0.06		CR 33	
6	COG=0.3400											
	0.232	0.500	0.225					ARG87.42	0.318(#2)	CL	A1-D	N
	U-Factor 0.47			SHGC (N) 0.42					VT (N) 0.50		CR 33	
7	COG=0.3200											
	0.223	0.500	0.225					ARG64.98	0.215(#2)	CL	A1-D	N
	U-Factor 0.45			SHGC (N) 0.56					VT (N) 0.65		CR 33	
8	COG=0.3000											
	0.233	0.500	0.225					ARG74.7	0.166(#2)	CL	A1-D	N
	U-Factor 0.43			SHGC (N) 0.40					VT (N) 0.47		CR 33	
9	COG=0.2800											
	0.223	0.500	0.225					ARG60.79	0.087(#2)	CL	A1-D	N
	U-Factor 0.42			SHGC (N) 0.49					VT (N) 0.67		CR 33	
10	COG=0.2600											
	0.223	0.500	0.225					ARG62.42	0.035(#2)	CL	A1-D	N
	U-Factor 0.40			SHGC (N) 0.35					VT (N) 0.62		CR 33	

NFRC 100/200/500 Summary Sheet
YES 45 TU Storefront

ID	Pane Thickness 1	Gap Width 1	Pane Thickness 2	Gap Width 2	Pane Thickness 3	Gap Width 3	Pane Thickness 4	Gap Fill	Low-e (Surface#)	Tint	Spacer	Grid Type
	U-Factor			Solar Heat Gain Coefficient (SHGC) Grids (None / <1 / >=1)					Visible Transmittance (VT) Grids (None / <1 / >=1)		Condensation Resistance	
11	COG=0.2400											
	0.223	0.500	0.223					ARG86.02	0.035(#2) / 0.035(#3)	CL	A1-D	N
	U-Factor 0.39			SHGC (N) 0.32					VT (N) 0.55		CR 33	
12	COG=0.2200											
	0.223	0.500	0.223					XEN81.67	0.018(#2) / 0.018(#3)	CL	A1-D	N
	U-Factor 0.37			SHGC (N) 0.24					VT (N) 0.46		CR 33	
13	COG=0.2000											
	0.223	0.500	0.223					XEN94.6	0.018(#2) / 0.018(#3)	CL	A1-D	N
	U-Factor 0.35			SHGC (N) 0.23					VT (N) 0.46		CR 33	

The Condensation Resistance results obtained from this procedure are for controlled laboratory conditions and do not include the effects of air movement through the specimen, solar radiation, and the thermal bridging that may occur due to the specific design and construction of the fenestration system opening.

Ratings values included in this report are for submittals to an NFRC-licensed IA and are not meant to be used directly for labeling purposes. Only those values identified on a valid Certification Authorization Report (CAR) by an NFRC accredited Inspection Agency (IA) are to be used for labeling purposes. The ratings values were rounded in accordance to NFRC 601, NFRC Unit and Measurement Policy.

Architectural Testing, Inc. is an NFRC accredited simulation laboratory and all simulations were conducted in full compliance with NFRC approved procedures and specifications. The NFRC procedure requires that the computational results be verified through actual test results.

Detailed drawings, simulation data files, a copy of this report, or other pertinent project documentation will be retained by Architectural Testing, Inc. for a period of four years from the original test date. At the end of this retention period, such materials shall be discarded without notice and the service life of this report will expire. Results obtained are simulated values and were secured by using the designated test methods. 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 product simulated. This report may not be reproduced, except in full, without the written approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, INC.:

SIMULATED BY:

Kristen L. Livelsberger

Digitally Signed by: Kristen L Livelsberger

Kristen L. Livelsberger
Senior Simulation Technician
NFRC Certified Simulator

REVIEWED BY:

Michael J. Thoman

Digitally Signed by: Michael J Thoman

Michael J. Thoman
Director - Simulations and Thermal Testing
Simulator-In-Responsible-Charge

KLL:kll
B6796.02-116-45

Attachments (pages): This report is complete only when all attachments listed are included.
Appendix A: Drawings and Bills of Material (10)

Revision Log

Rev. #	Date	Page(s)	Revision(s)
.02R0	02/29/12	All	Original Report Issued

All drawings and Bills of Material used to simulate this product are enclosed in this Appendix

Appendix A

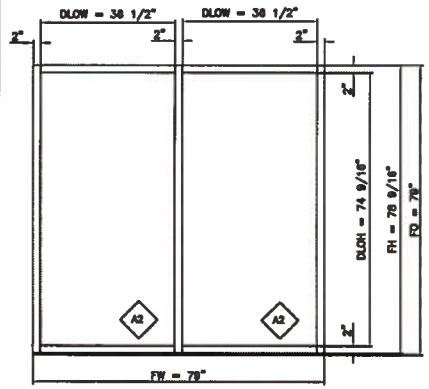
B6796.02-116-45

Architectural Testing

Report #: B6796-116-45
Date: 02/17/12
Verified by:

YES 45 TU

THERMAL TESTING PROGRAM
NFRC 100, 102, 200, 500
AAMA 507, 1503

TEST SPECIMEN #	YES45TU-07
ELEVATION	
PERFORMANCE TEST	THERMAL
GLAZING	EXT: GLAZING GASKET
	INT: GLAZING GASKET
TESTS TO BE PERFORMED	NFRC 100, 102, 200, 500 AAMA 507, 1503

GLASS FORMULAS:

GW=(DLOW + 7/8") X GH=(DLOH + 7/8")

GLASS FOR THERMAL TEST:

A2 1" INSULATED GLASS LOW-E, VIRACON
1/4"VE1-2M Lo-EHS (#2)x1/2" ALUM.SPACER (12.5mm),AIR FILLED
x 1/4" Cir. HS.

SIZE: YES45FI-02: 37 3/8" x 75 7/16"

LEGEND:

DLOH = DLO HEIGHT OF STOREFRONT
DLOW = DLO WIDTH OF STOREFRONT

SHEET	DESCRIPTION
7	NOTES, TEST ELEVATIONS
8	DETAILED CROSS SECTIONS
9	BILL OF MATERIALS AND COMPONENTS

YKK AP

YKK AP AMERICA INC.
HEADQUARTERS:
DUBLIN PLANT:

DESCRIPTION: NOTES - ELEVATIONS
THERMAL
AAMA and NFRC TESTING PROGRAM

SYSTEM: YES 45 TU
STOREFRONT SYSTEM

YES45TU-07

ANODIZED

SCALE: NTS
GLAZING: AS SHOWN

DRAWN BY: RMK
APPROVED BY: BCM
SHEET NO.: 7

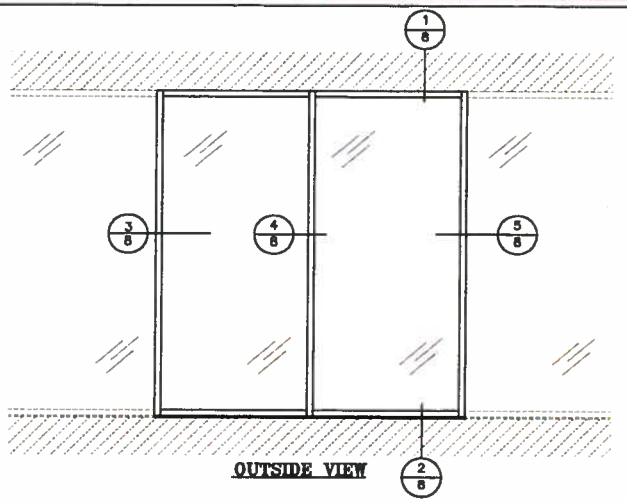
DATE: 01/18/12

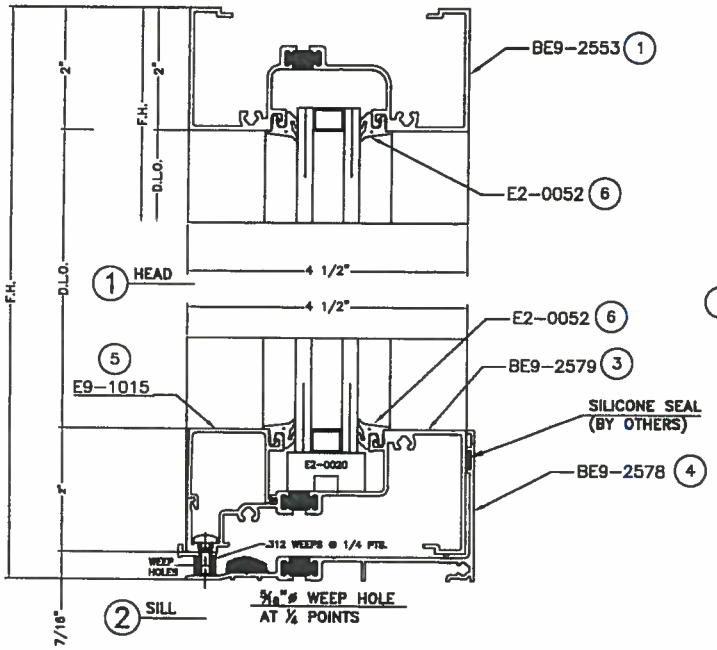
Architectural Testing

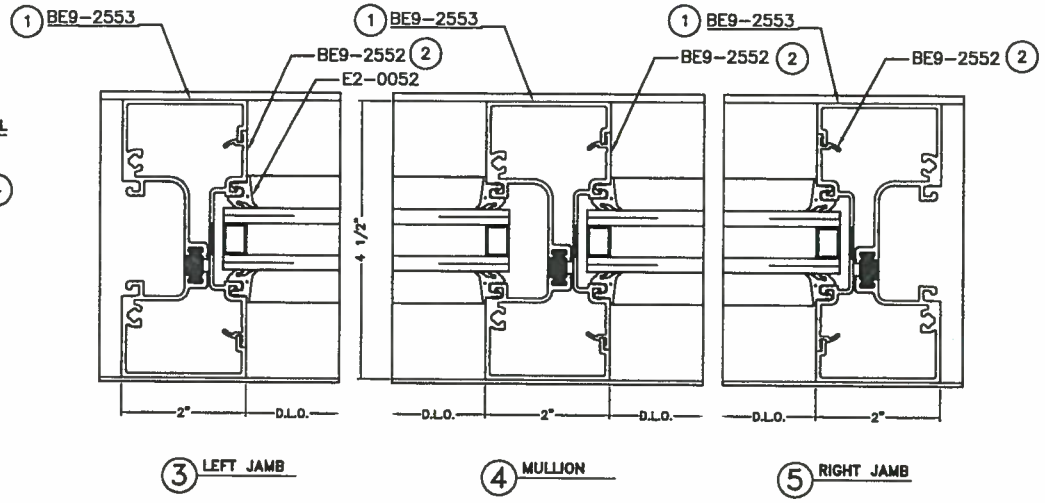
Report #: B6796-116-45
Date: 02/17/12
Verified by:

YES 45 TU

THERMAL TESTING PROGRAM
NFRC 100, 102, 200, 500
AAMA 507, 1503







LEGEND:

1/2 — DETAIL NUMBER / SHEET NUMBER

NOTES:

1. SEE SHEET #9 FOR ITEM NUMBER DESCRIPTION

YKK AP

YKK AP AMERICA INC.
HEADQUARTERS:
DUBLIN PLANT:

DESCRIPTION: CROSS SECTIONS THERMAL TESTING PROGRAM

SYSTEM: YES 45 TU STOREFRONT SYSTEM

YES45TU-08

ANODIZED

FULL | AS SHOWN

RMK

SCM

01/18/12

8

Architectural Testing

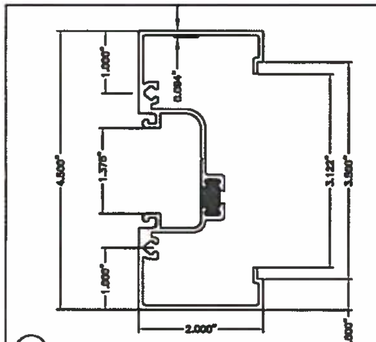
Report #: B6796-116-45

Date: 02/17/12

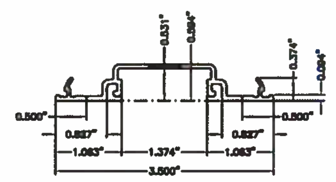
Verified by: [signature]

YES 45 TU

AAMA 501 TESTING PROGRAM
PERFORMANCE CLASS: DP 25PSF



1 BE9-2553



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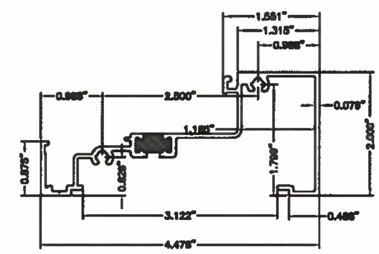
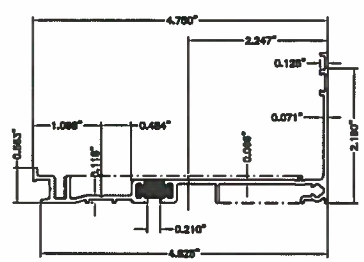


3 BE9-2579



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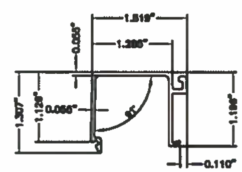


5 E9-1015

YES 45 TU BILL OF MATERIAL

ITEM #	PART #	DESCRIPTION	MATERIAL	MANUFACTURER
1	BE9-2553	HEAD	6063-T5	YKK AP
2	BE9-2552	SNAP IN FILLER	6063-T5	YKK AP
3	BE9-2579	SILL	6063-T5	YKK AP
4	BE9-2578	SILL FLASHING	6063-T5	YKK AP
5	E9-1015	GLASS STOP	6063-T5	YKK AP
6	E2-0052	PUSH IN GASKET 3/16" FC	EPDM	TREMCO OR EQ.
7	E2-0047	WATER DEFLECTOR	SANOPRENE RIDGID	TREMCO OR EQ.
8	E1-0199	END DAM	3003-H14	YKK AP
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				

NOTES:

1. SEE SHEET #8 FOR ITEM NUMBER LOCATION

YKK AP

YKK AP AMERICA INC.
HEADQUARTERS:
DUBLIN PLANT:

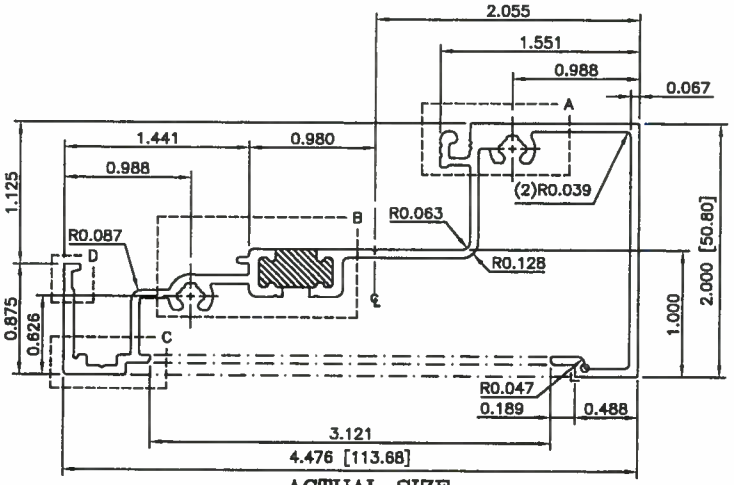
DESCRIPTION: B.O.M. and COMPONENTS
AAMA 501 TESTING PROGRAM

SYSTEM: YES 45 TU
STOREFRONT SYSTEM

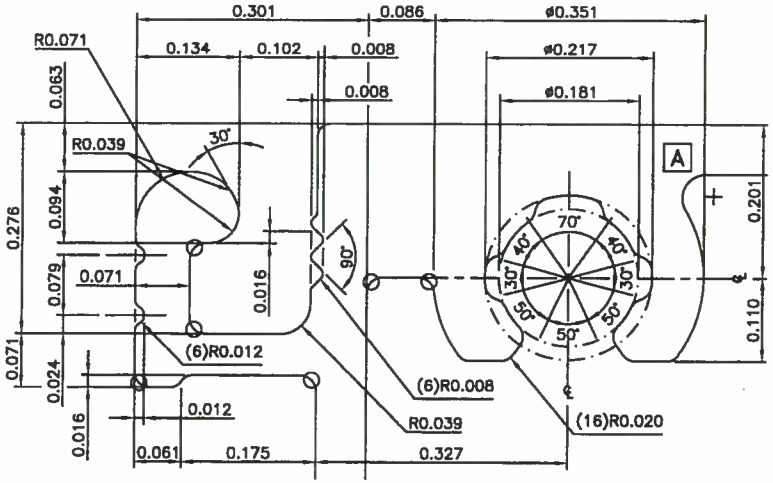
DRAWING NUMBER: YES45TU-09
FINISH: ANODIZED
SCALE: FULL
GLAZING: AS SHOWN
DRAWN BY: RMK
APPROVED BY: BCM
SHEET NO.: 9
DATE: 01/18/12

Architectural Testing

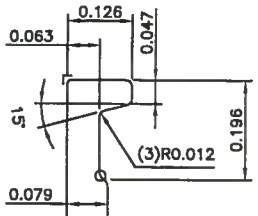
Report #: B6796-116-45
Date: 02/17/12
Verified by:



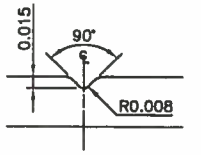
ACTUAL SIZE



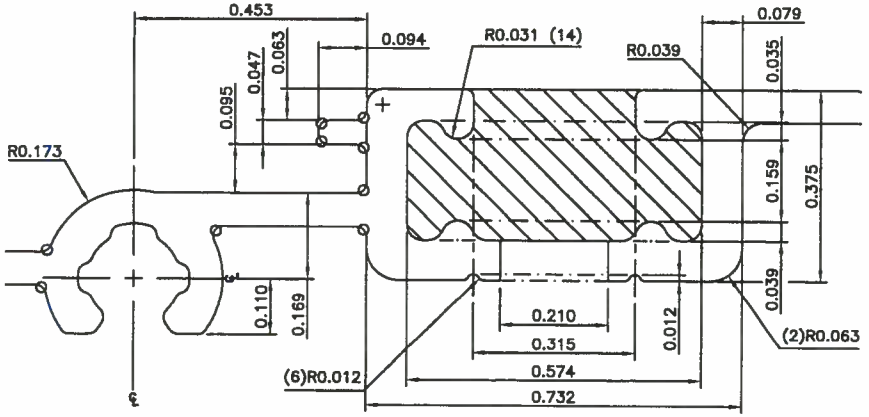
DETAIL A
6X SCALE



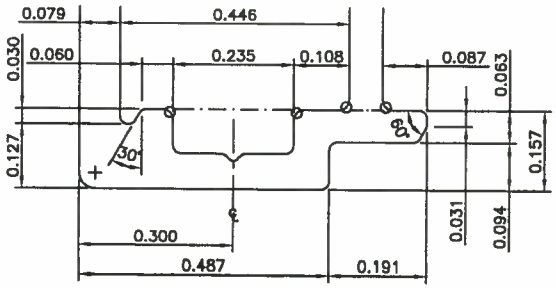
DETAIL D
4X SCALE



GROOVE DETAIL
6X SCALE



DETAIL B
4X SCALE

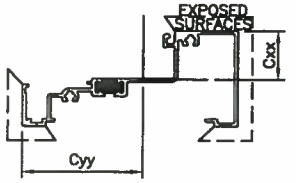


DETAIL C
4X SCALE

POLYURETHANE = 0.072 LB/FT [0.107 Kg/m]

E.C.	REV.	DRAWN BY	DESCRIPTION	DATE
	A	D.O.	0.031 RADIUS WAS 0.020	06/09/08
	B	D.O.	CHANGED SHAPE/REDRAWN	08/29/08

DRAWING NUMBER BE9-2579 B



GENERAL NOTES

1) 0.065"[1.65mm] TYP. WALL THICKNESS UNLESS OTHERWISE SPECIFIED.
2) MATES WITH
3) 0.016" TYP. RAD. UNLESS OTHERWISE SPECIFIED.
4) CROSS (+) INDICATES 0.031" RAD.
5) CIRCLE (O) INDICATES 0.020" RAD.
6) SYMBOL (⌜) INDICATES MINIMUM RAD. OF 0.008".

MOMENT OF INERTIA (In⁴)	Ixx	0.341 [14.19cm⁴]
	Iyy	1.928 [80.23cm⁴]
SECTION MODULUS (In³)	Sxx	0.333 [5.46cm³]
	Syy	0.770 [12.62cm³]
CENTER OF GRAVITY (In)	Cxx	1.022 [2.60cm]
	Cyy	2.504 [6.36cm]
AREA (In²)		0.840 [5.42cm²]
WT./FT.		0.988 [1.470Kg/m]
CIR. SIZE (In)		4.887 [12.41cm]
OS. PMTR. (In)		[cm]
T. PMTR. (In)		[cm]
PTD. PMTR. (In)		5.127 [13.02cm]

STANDARD A.A. TOLERANCES TO APPLY UNLESS OTHERWISE SPECIFIED

ALLOY AND TEMPER: 6063-T5

FINISH: PAINTED OR ANODIZED

DESCRIPTION: SILL

SYSTEM: YES 45TU

SCALE: AS NOTED

DRAWING NUMBER BE9-2579 B

YKK ap

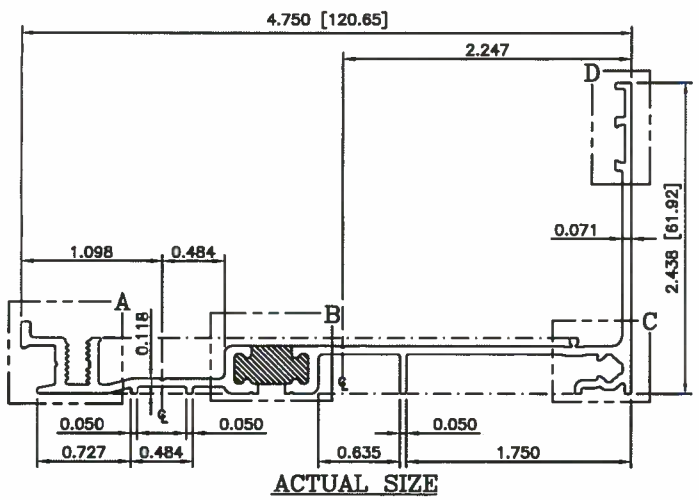
DRAWN BY: D.O.

DATE: 11/02/07

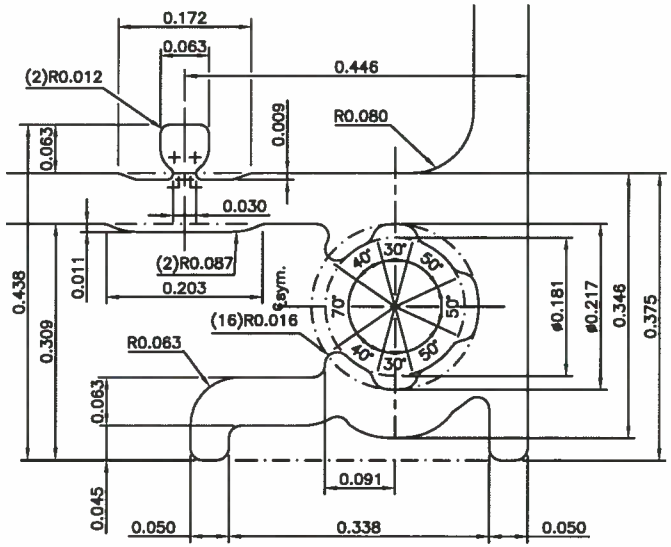
APPROVED BY: D.P.

Architectural Testing

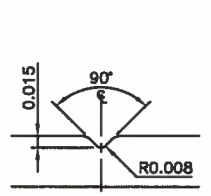
Report #: B6796-116-45
Date: 02/17/12
Verified by: Kristen K. Landsteiner



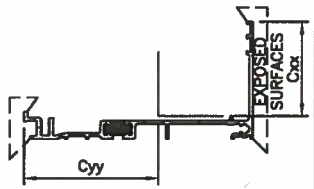
ACTUAL SIZE

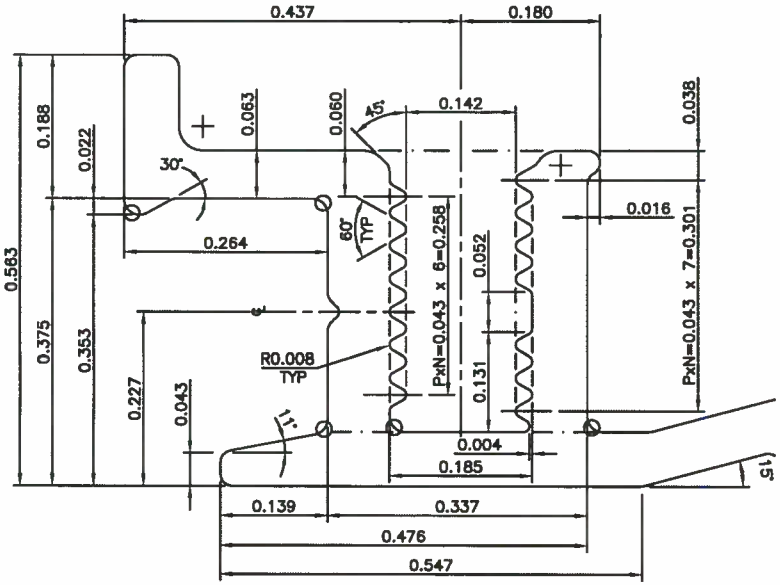


DETAIL C
6X SCALE

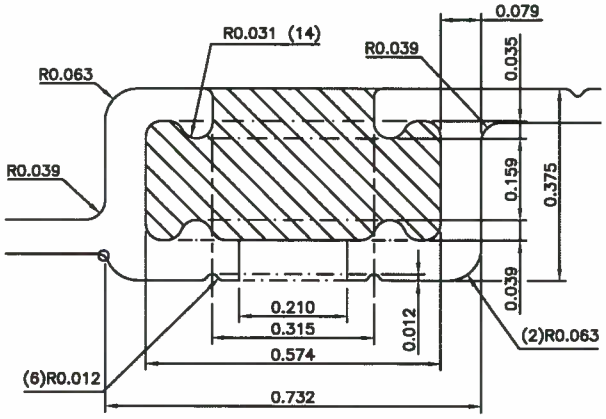


GROOVE DETAIL
6X SCALE

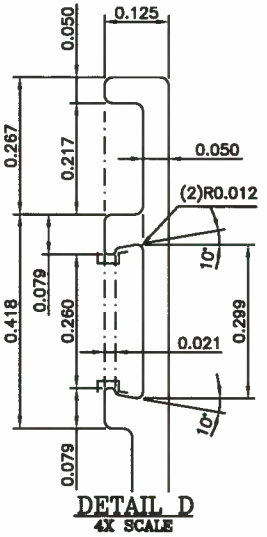




DETAIL A
6X SCALE



DETAIL B
4X SCALE



DETAIL D
4X SCALE

POLYURETHANE = 0.072 LB/FT [0.107 Kg/m]

E.C.	REV.	DRAWN BY	DESCRIPTION	DATE
			WAS EXPERIMENTAL DIE BE9-1085	
	A	D.O.	CHANGED SHAPE/REDRAWN	08/29/08

GENERAL NOTES

1) 0.066"[1.68mm] TYP. WALL THICKNESS UNLESS OTHERWISE SPECIFIED.
2) MATES WITH
3) 0.016" TYP. RAD. UNLESS OTHERWISE SPECIFIED.
4) CROSS (+) INDICATES 0.031" RAD.
5) CIRCLE (O) INDICATES 0.020" RAD.
6) SYMBOL (⌐) INDICATES MINIMUM RAD. OF 0.008".

MOMENT OF INERTIA (In^4)	I_{xx}	0.222 [9.22cm^4]
	I_{yy}	1.918 [79.82cm^4]
SECTION MODULUS (In^3)	S_{xx}	0.113 [1.85cm^3]
	S_{yy}	0.688 [11.27cm^3]
CENTER OF GRAVITY (In)	C_{xx}	1.964 [4.99cm]
	C_{yy}	2.789 [7.08cm]
AREA (In^2)		0.682 [4.40cm^2]
WT./FT.		0.803 [1.194kg/m]
CIR. SIZE (In)		5.217 [13.25cm]
OS. PMTR. (In)		[cm]
T. PMTR. (In)		[cm]
PTD. PMTR. (In)		3.556 [9.03cm]

STANDARD A.A. TOLERANCES TO APPLY UNLESS OTHERWISE SPECIFIED

ALLOY AND TEMPER: 6063-T5

FINISH: PAINTED OR ANODIZED

DESCRIPTION: SILL FLASHING

SYSTEM: YES 45TU

SCALE: AS NOTED

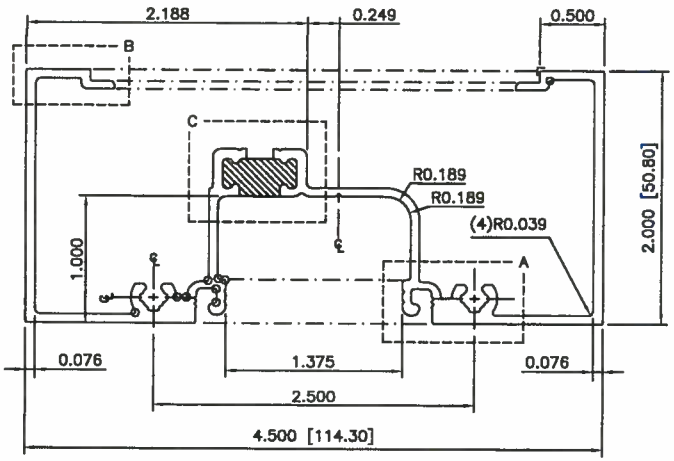
DRAWING NUMBER: BE9-2578 A

YKK ap

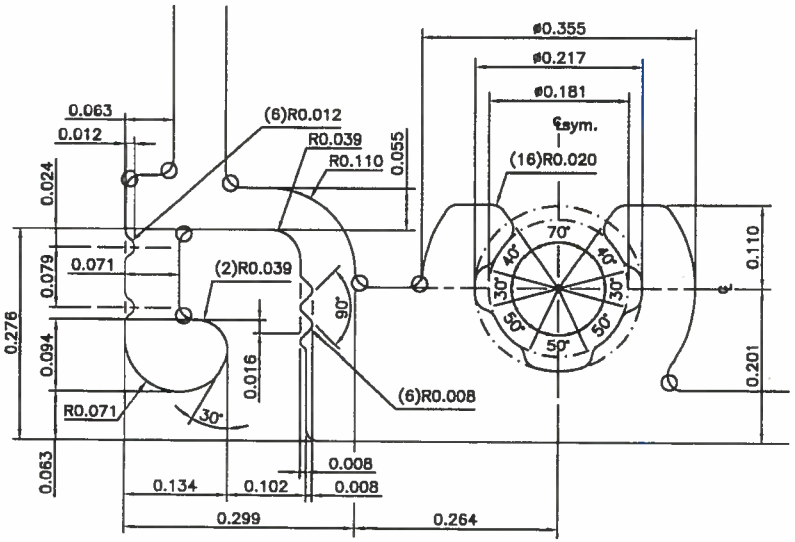
DRAWN BY: D.O.
DATE: 04/28/08
APPROVED BY: D.P.

Architectural Testing

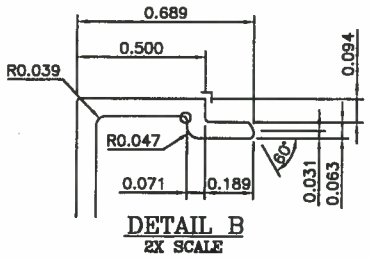
Report #: B6796-116-45
Date: 02/17/12
Verified by:



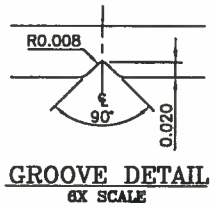
ACTUAL SIZE



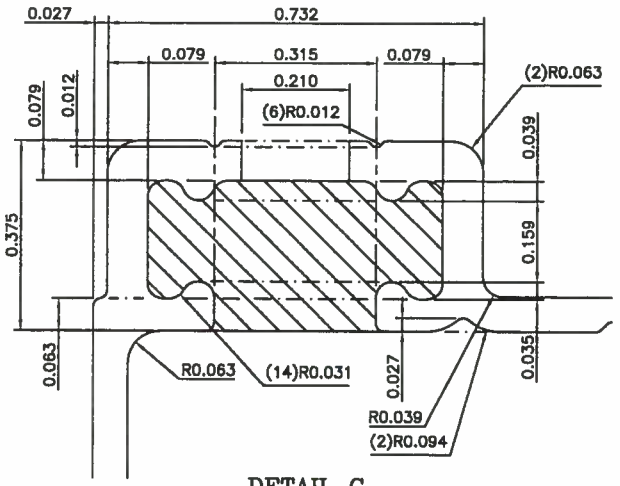
DETAIL A
6X SCALE



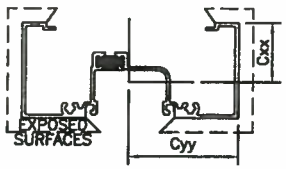
DETAIL B
2X SCALE



GROOVE DETAIL
6X SCALE



DETAIL C
4X SCALE



DRAWING NUMBER BE9-2553 A

GENERAL NOTES

1) 0.068"[1.73mm] TYP. WALL THICKNESS UNLESS OTHERWISE SPECIFIED.
2) MATES WITH
3) 0.016" TYP. RAD. UNLESS OTHERWISE SPECIFIED.
4) CROSS (+) INDICATES 0.031" RAD.
5) CIRCLE (O) INDICATES 0.020" RAD.
6) SYMBOL (⌜) INDICATES MINIMUM RAD. OF 0.008".

MOMENT OF INERTIA (in^4)	I_{xx}	0.443 [18.44cm^4]
	I_{yy}	2.582 [107.47cm^4]
SECTION MODULUS (in^3)	S_{xx}	0.355 [5.82cm^3]
	S_{yy}	1.132 [18.55cm^3]
CENTER OF GRAVITY (in)	C_{xx}	1.248 [3.17cm]
	C_{yy}	2.281 [5.79cm]
AREA (in^2)		1.040 [6.71cm^2]
WT./FT.		1.223 [1.820kg/m]
CIR. SIZE (in)		4.914 [12.48cm]
OS. PMTR. (in)		[cm]
T. PMTR. (in)		[cm]
PTD. PMTR. (in)		7.614 [19.34cm]

STANDARD A.A. TOLERANCES TO APPLY UNLESS OTHERWISE SPECIFIED

ALLOY AND TEMPER: 6063-T5

FINISH: PAINTED OR ANODIZED

DESCRIPTION: HEAD

SYSTEM: YES 45TU

SCALE: AS NOTED

DRAWING NUMBER BE9-2553 A

POLYURETHANE 0.072 LB/FT [0.107 Kg/m]

E.C.	REV.	DRAWN BY	DESCRIPTION	DATE
	A	D.O.	CHANGED SHAPE/REDRAWN	08/29/08

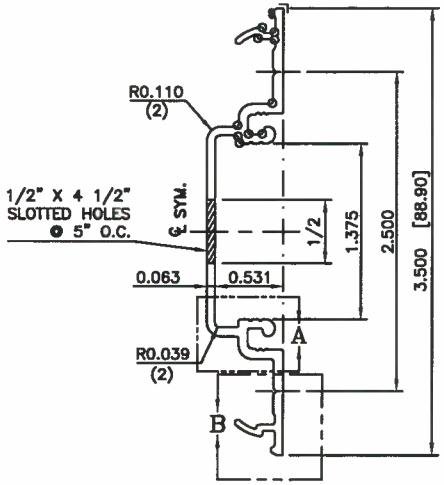
YKK ap

DRAWN BY: RTB
DATE: 6/2/00
APPROVED BY: A. OI

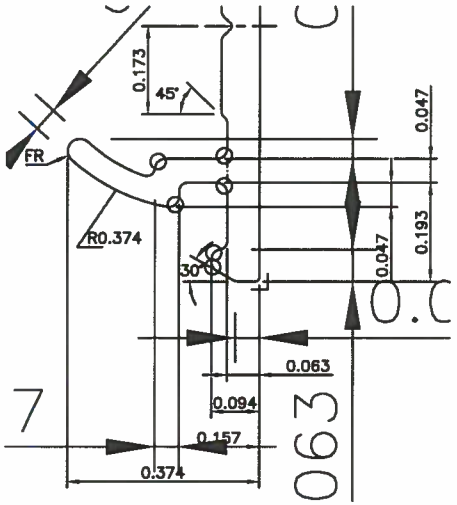
Architectural Testing

Report #: B6796-116-45
Date: 02/17/12
Verified by: Kristen R. Bardsley

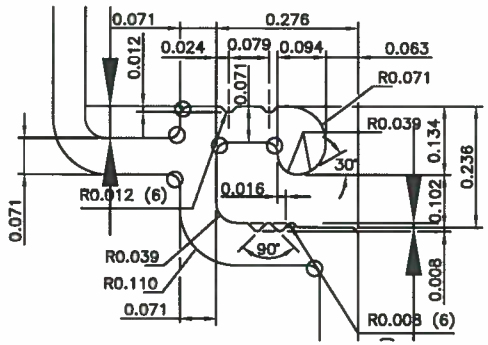
DRAWING NUMBER BE9-2552



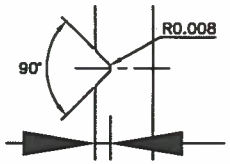
ACTUAL SIZE



DETAIL B
4X SCALE



DETAIL A
4X SCALE

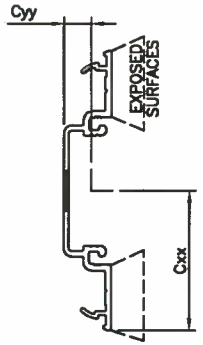


GROOVE DETAIL
4X SCALE

NOTE: MADE FROM EXTRUSION E9-2552.

* DENOTES ACTUAL DIMENSION

E.C.	REV.	DRAWN BY	DESCRIPTION	DATE



GENERAL NOTES

1) 0.075"[1.91mm] TYP. WALL THICKNESS UNLESS OTHERWISE SPECIFIED.
2) MATES WITH
3) 0.016" TYP. RAD. UNLESS OTHERWISE SPECIFIED.
4) CROSS (+) INDICATES 0.031" RAD.
5) CIRCLE (O) INDICATES 0.020" RAD.
6) SYMBOL (⌒) INDICATES MINIMUM RAD. OF 0.008".

MOMENT OF INERTIA (in^4)	I_{xx}	0.415[17.26cm^4]
	I_{yy}	0.017[0.72cm^4]
SECTION MODULUS (in^3)	S_{xx}	0.236[3.87cm^3]
	S_{yy}	0.052[0.86cm^3]
CENTER OF GRAVITY (in)	C_{xx}	1.756[4.46 cm]
	C_{yy}	0.329[0.84 cm]
AREA (in^2)		0.388[2.50cm^2]
WT./FT.		0.456[0.679kg/m]
CIR. SIZE * (in)		3.501[8.89cm]
OS. PMTR. (in)		11.568[29.38 cm]
T. PMTR. (in)		11.568[29.38 cm]
PTD. PMTR. * (in)		1.642[4.17cm]

STANDARD A.A. TOLERANCES TO APPLY UNLESS OTHERWISE SPECIFIED

ALLOY AND TEMPER: 6063-T5

FINISH: PAINTED OR ANODIZED

DESCRIPTION: SNAP IN FILLER

SYSTEM: YES 45-TU

SCALE: AS NOTED

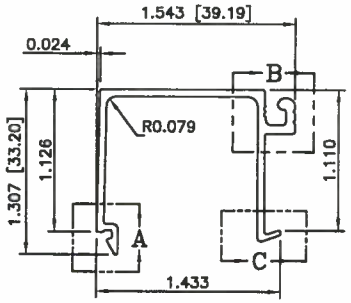
DRAWING NUMBER BE9-2552

YKK AP America

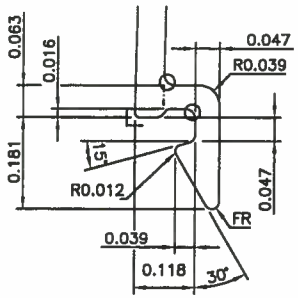
DRAWN BY: DHM
DATE: 10/17/00
APPROVED BY: A. Oi

Architectural Testing

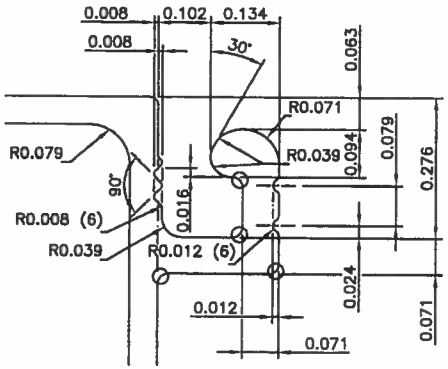
Report #: B6796-116-45
Date: 02/17/12
Verified by: Kristen K. Breidsinger



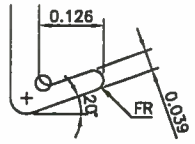
ACTUAL SIZE



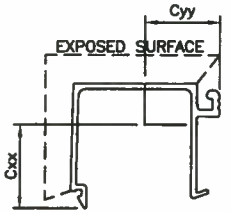
DETAIL A
4X SCALE



DETAIL B
4X SCALE



DETAIL C
4X SCALE



DRAWING NUMBER E9-1015

GENERAL NOTES

1) 0.055"[1.40mm] TYP. WALL THICKNESS UNLESS OTHERWISE SPECIFIED.
2) MATES WITH E9-1014, E9-1016.
3) 0.016" TYP. RAD. UNLESS OTHERWISE SPECIFIED.
4) CROSS (+) INDICATES 0.031" RAD.
5) CIRCLE (O) INDICATES 0.020" RAD.
6) SYMBOL (r) INDICATES MINIMUM RAD. OF 0.008".

MOMENT OF INERTIA (in^4)	I_{xx}	0.041 [1.71cm^4]
	I_{yy}	0.084 [3.50cm^4]
SECTION MODULUS (in^3)	S_{xx}	0.047 [0.77cm^3]
	S_{yy}	0.108 [1.77cm^3]
CENTER OF GRAVITY (in)	C_{xx}	0.875 [2.22cm]
	C_{yy}	0.777 [1.97cm]
AREA (in^2)		0.251 [1.62cm^2]
WT./FT.		0.295 [0.439kg/m]
CIR. SIZE (in)		2.000 [5.08cm]
OS. PMTR. (in)		8.739 [22.20cm]
T. PMTR. (in)		8.739 [22.20cm]
PTD. PMTR. (in)		3.000 [7.62cm]

STANDARD A.A. TOLERANCES TO APPLY UNLESS OTHERWISE SPECIFIED

ALLOY AND TEMPER: 6063-T5

FINISH: PAINTED OR ANODIZED

DESCRIPTION: GLASS STOP (1" GL.)

SYSTEM: YES 45F-I

SCALE: AS NOTED

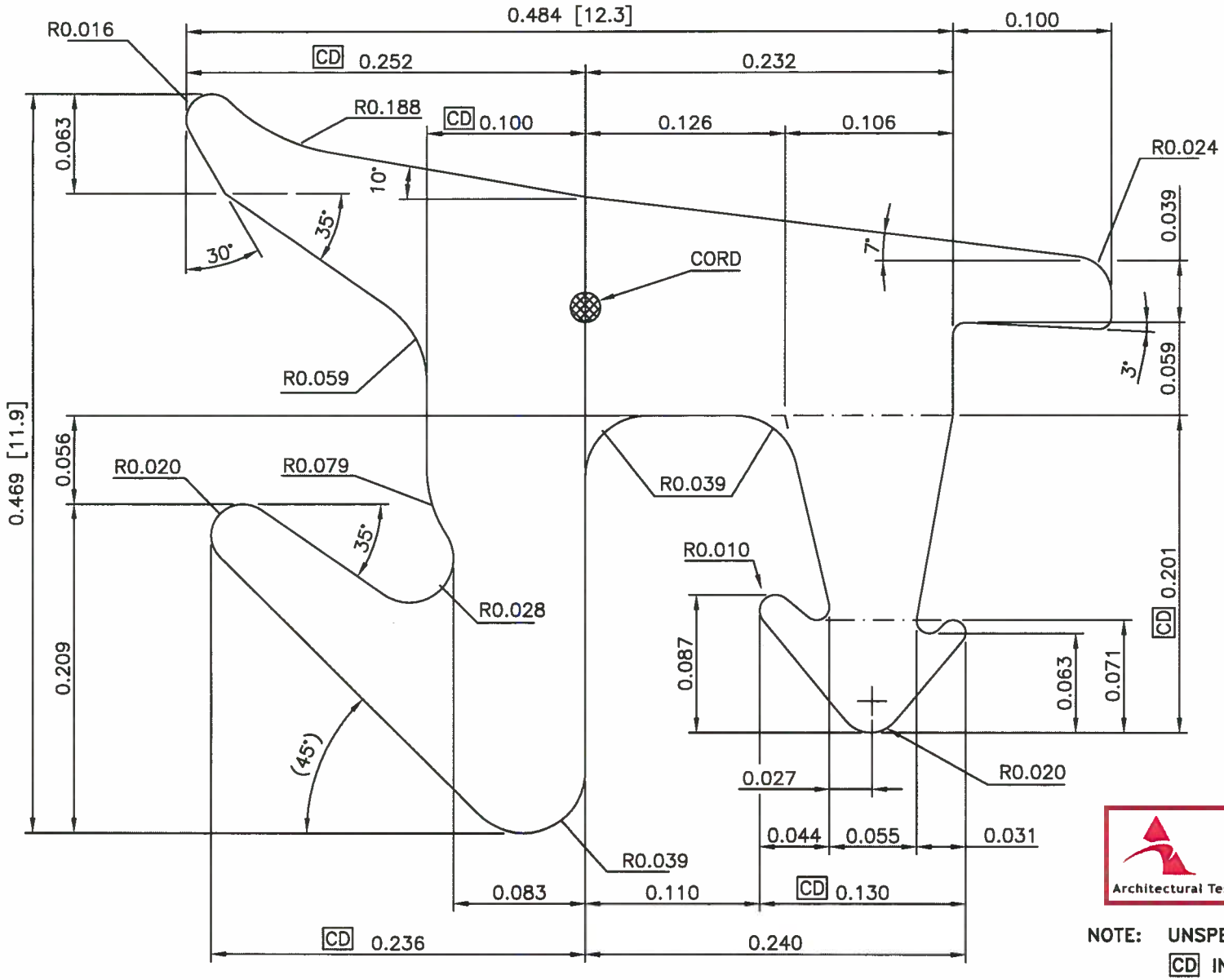
E.C.	REV.	DRAWN BY	DESCRIPTION	DATE
		DHM	REDRAWN	12/6/99

DRAWING NUMBER E9-1015

YKK AP America

DRAWN BY: SENNA
DATE: 5/25/63
APPROVED BY: M.I.

E2-0052 | B



ACTUAL SIZE

Architectural Testing
Report #: B6796-116-45
Date: 02/17/12
Verified by:

NOTE: UNSPECIFIED RADIUS = 0.008" [0.20]
CD INDICATES RMA CLASS-1

REV.	DESCRIPTION	BY	DATE
A	REVISED DART DESIGN	RBE	06/13/96
B	REVISED DESIGN (REDRAWN)	A.OI	11/13/98

MATERIAL	EPDM DUROMETER: 70±5
TOLERANCE	RMA CLASS-2
SYSTEM(S)	YES 40,45, & 45T
FINISH	SILICONE COATED COLOR: BLACK
DESCRIPTION	GLAZING GASKET (3/16" F.C.)

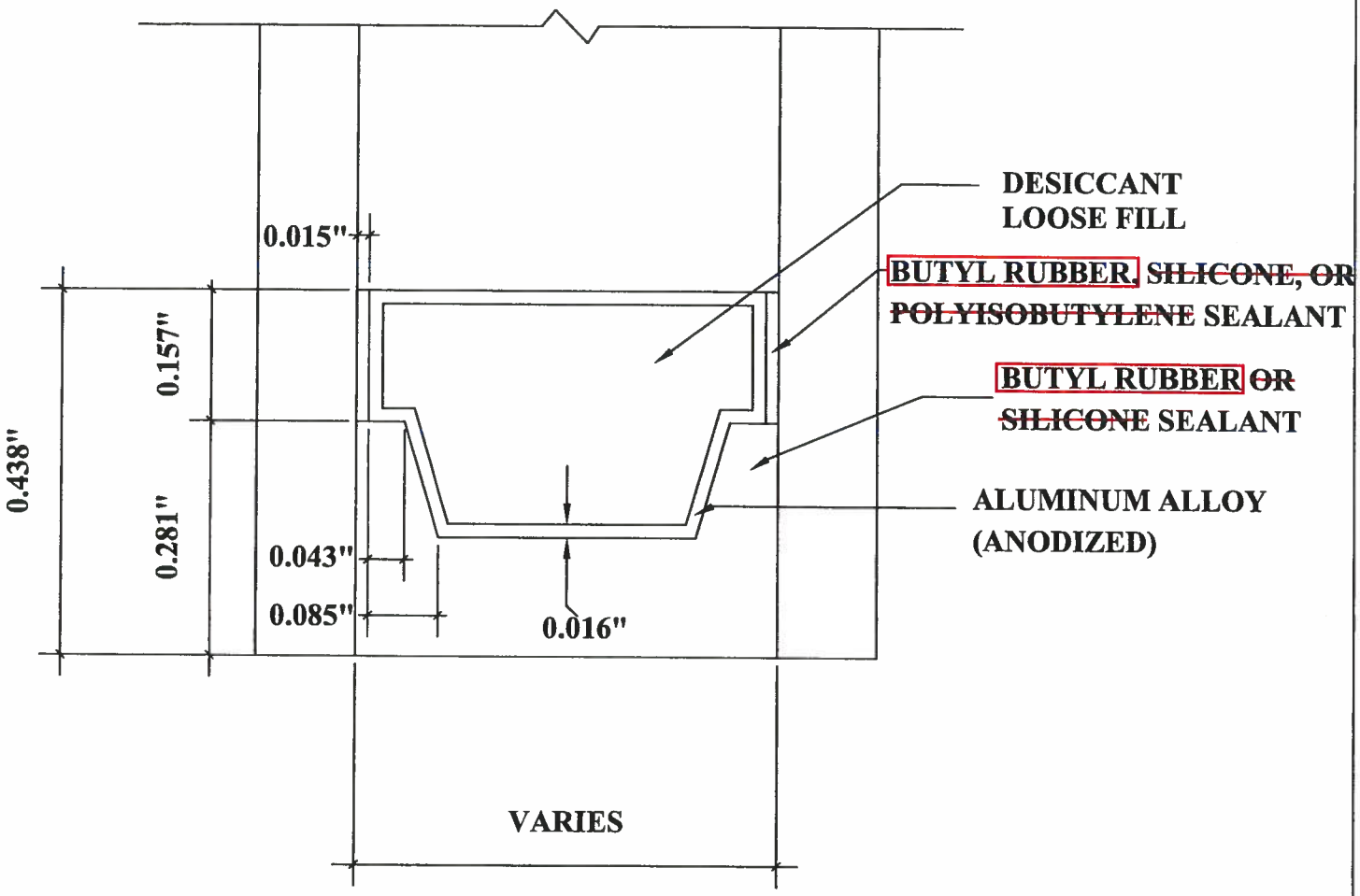
SCALE	DRAWN BY	DATE	APPROVED BY
10/1, 1/1	J.A.I.	11/28/94	M.I.

YKK ap America

DRAWING NUMBER	REV.
E2-0052	B

Architectural Testing

Report #: B6796-116-45
Date: 02/17/12
Verified by:



DETAIL FOR THERMAL MODELING OF
ALUMINUM SPACER (A1-D)

Architectural Testing

AAMA 1801 SOUND TRANSMISSION LOSS TEST REPORT

Rendered to:

YKK AP AMERICA

SERIES/MODEL: YES 45TU

TYPE: Curtain Wall System

Summary of Test Results				
ATI Data File No.	**Glazing (Nominal Dimensions)**	**Air Infiltration**	**STC**	**OITC**
76094.01	1" IG (1/4" annealed exterior, 1/2" air space, 1/4" annealed interior)	<0.01 cfm/ft^2	32	26

Reference should be made to ATI Report No. 76094.01-113-11 for complete test specimen description. The complete test results are listed in Appendix B.

130 Derry Court
York, PA 17406-8405
phone: 717-764-7700
fax: 717-764-4129
www.archtest.com

Architectural Testing

ACOUSTICAL PERFORMANCE TEST REPORT

Rendered to:

YKK AP AMERICA
332 Firetower Road
Dublin, Georgia 31021

Report No: 76094.01-113-11
Test Date: 09/04/07
Report Date: 10/16/07
Expiration Date: 09/04/11

Test Sample Identification:

Series/Model: YES 45TU

Type: Curtain Wall System

Overall Size: 79" by 78-3/4"

Glazing (Nominal Dimensions): 1" IG (1/4" Annealed Exterior, 1/2" Air Space, 1/4" Annealed Interior)

Project Scope: Architectural Testing, Inc. (ATI) was contracted by YKK AP America to conduct air leakage and sound transmission loss tests on a Series/Model YES 45TU, curtain wall system. A summary of the results is listed in the Test Results section and the complete test data is included as Appendix B of this report. The sample was provided by the client.

130 Derry Court
York, PA 17406-8405
phone: 717-764-7700
fax: 717-764-4129
www.archtest.com

Test Methods: The acoustical test was conducted in accordance with the following:

AAMA 1801-07, *Acoustical Rating of Windows, Doors, and Glazed Wall Sections.*

ASTM E 1425-91 (Re-approved 1999), *Standard Practice for Determining the Acoustical Performance of Exterior Windows and Doors.*

ASTM E 90-04, *Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.*

ASTM E 413-04, *Classification for Rating Sound Insulation.*

ASTM E 1332-90 (Re-approved 2003), *Standard Classification for Determination of Outdoor-Indoor Transmission Class.*

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.*

ASTM E 2235-04, *Standard Test Method for Determination of Decay Rates for Use in Sound Insulation Test Methods.*

Test Equipment: The equipment used to conduct this test meets the requirements of ASTM E 90. The microphones were calibrated before conducting the sound transmission loss test. The test equipment and test chamber descriptions are listed in Appendix A.

Sample Installation:

Sound transmission loss tests were initially performed on a filler wall that was designed to test 40" by 86" and 80" by 86" specimens. The filler wall achieved an STC rating of 63.

The 80" by 84" plug was removed from the filler wall assembly. A wood frame was used to reduce the size of the opening to 79-1/4" by 79-1/4". The curtain wall system was placed on a foam isolation pad in the test opening. Duct seal was used to seal the perimeter of the test specimen to the test opening on both sides. The interior side of the curtain wall frame, when installed, was approximately 1/4" from being flush with the receiving room side of the filler wall. A stethoscope was used to check for any abnormal air leaks around the test specimen prior to testing.

Test Procedure:

Air Leakage Test - A negative pressure of 6.24 psf was applied inside the chamber that was placed around the interior side of the curtain wall system. The total air leakage and extraneous air leakage measurements were used to calculate the specimen air leakage. Barometric pressure corrections were applied to the air leakage calculations.

Sound Transmission Loss Test - The sound transmission loss test consisted of the following measurements: one background noise sound pressure level and five sound absorption measurements were conducted at each of the five microphone positions. Two sound pressure level measurements were made simultaneously in both rooms at each of the five microphone positions. The air temperature and relative humidity conditions were monitored and recorded during the background, absorption, source, and receive room measurements.

Sample Descriptions:

Frame Construction:

		Frame
Size		79" by 78-3/4"
Thickness		4-1/2"
Corners		Butted
	Fasteners	Screws
	Seal Method	Sealant
Material		Thermally broken aluminum
	Thermal Break Material	Urethane
	Reinforcement	N/A
Daylight Opening Size (X2)		36-3/8" by 74-3/8"

Sample Descriptions: (Continued)

Glazing:

Measured Overall Insulation Glass Unit Thickness	0.960"
Spacer Type	Aluminum

	Exterior Sheet	Gap	Interior Sheet
Measured Thickness	0.223"	0.514"	0.223"
Muntin Pattern	N/A	N/A	N/A
Material	Annealed	Air*	Annealed
Laminate Material	N/A	N/A	N/A

Glazing Method	Pocket glazed
Glazing Material	Flexible wedge gasket
Glazing Bead Material	Aluminum

Components:

TYPE	QUANTITY	LOCATION
Weatherstrip		
No weatherstrip		
Hardware		
Thermally broken aluminum receptor plate (Urethane)	1	Sill
Drainage		
No drainage		

- *- Stated per Client/Manufacturer, N/A-Non Applicable*

Comments: The weight of the test sample was 278 lbs. The design drawings (included in Appendix C) supplied by the client, accurately describe the Series/Model YES 45TU, curtain wall system. The dimensions on the drawings that are circled and/or checked were verified against the test specimen. The curtain wall system was disassembled, and the components will be retained by ATI for four years.

Test Results: The STC (Sound Transmission Class) rating was calculated in accordance with ASTM E 413. The OITC (Outdoor-Indoor Transmission Class) was calculated in accordance with ASTM E 1332. A summary of the sound transmission loss test results on the Series/Model YES 45TU, curtain wall system is listed below.

Summary of Test Results				
ATI Data File No.	**Glazing (Nominal Dimensions)**	**Air Infiltration**	**STC**	**OITC**
76094.01	1" IG (1/4" annealed exterior, 1/2" air space, 1/4" annealed interior)	<0.01 cfm/ft^2	32	26

The complete test results are listed in Appendix B. Flanking limit tests and reference specimen tests are available upon request.

Detailed drawings, data sheets, representative samples of test specimens, a copy of this report, or other pertinent project documentation will be retained by Architectural Testing, Inc. for a period of four years from the original test date. At the end of this retention period, such materials shall be discarded without notice and the service life of this report will expire. Results obtained are tested values and were secured by using the designated test methods. 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(s) tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, INC:

Brandon C Ward
Digitally Signed by: Brandon C. Ward

Brandon C. Ward
Technician - Acoustical Testing

Todd D Kister
Digitally Signed by: Todd D. Kister

Todd D. Kister
Laboratory Supervisor - Acoustical Testing

BCW:crc

Attachments (pages): This report is complete only when all attachments listed are included.
- Appendix-A: Equipment description (1)
- Appendix-B: Complete test results (3)
- Appendix-C: Drawings (1)

NVLAP LAB CODE 200361

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Revision Log

Rev. #	Date	Page(s)	Revision(s)
0	10/16/07	N/A	Original test report

Appendix A

Instrumentation:

Instrument	Manufacturer	Model	Description	ATI Number
Analyzer	Agilent Technologies	35670A	Dynamic signal analyzer	Y002929
Receive Room Microphone	G.R.A.S.	40AR	1/2", pressure type, condenser microphone	Y003246
Source Room Microphone	G.R.A.S.	40AR	1/2", pressure type, condenser microphone	Y003245
Receive Room Preamp	G.R.A.S.	26AK	1/2" preamplifier	Y003249
Source Room Preamp	G.R.A.S.	26AK	1/2" preamplifier	Y003248
Microphone Calibrator	Bruel & Kjaer	4228	Pistonphone calibrator	Y002816
Noise Source	Delta Electronics	SNG-1	Two, non-coherelated "Pink" noise signals	Y002181
Equalizer	Rane	RPE228	Programmable EQ	Y002180
Power Amplifiers	Renkus-Heinz	P2000	2 - Amplifiers	Y002179 Y001779
Receive Room Loudspeakers	Renkus-Heinz	Trap Jr/9"	2 - Loudspeakers	Y001784 Y001785
Source Room Loudspeakers	Renkus-Heinz	Trap Jr/9"	2 - Loudspeakers	Y002649 Y002650

Test Chamber:

	Volume	Description
Receiving Room	8291.3 ft^3 (234 m^3)	Rotating vane and stationary diffusers. Temperature and humidity controlled. Isolation pads under the floor.
Source Room	7296.3 ft^3 (206.6 m^3)	Stationary diffusers only. Temperature and humidity controlled.

	Maximum Size	Description
TL Test Opening	14 ft wide by 10 ft high	Vibration break between source and receive rooms.

Appendix B

Complete Test Results

SOUND TRANSMISSION LOSS

ASTM E90

Architectural Testing

ATI No.	76094.01	Date	09/04/07
Client	YKK AP America		
Specimen	Series/Model YES 45TU curtain wall system with 1" IG (1/4" annealed, 1/2" air space, 1/4" annealed)		
Specimen Area	43.20 Sq Ft		
Filler Area	96.80 Sq Ft		
Operator	Brandon C. Ward		

	Bkgrd	Absorp	Source	Receive	Filler	Specimen
Temp F	72.7	74.0	72.8	73.3	73.8	73.2
RH %	38.9	37.1	39.0	38.2	62.0	38.3

Freq (Hz)	Bkgrd SPL (dB)	Absorp (Sabines /Sq Ft)	Source SPL (dB)	Receive SPL (dB)	Filler TL (dB)	Specimen TL (dB)	95% Conf Limit	No. of Defici-encies	Trans Coef Diff
80	44.4	54.3	84.5	63.7	31.9	20	2.92	0	8.6
100	39.5	56.1	86.8	61.7	35.8	25	4.04	0	8.3
125	39.3	56.9	92.8	65.1	43.1	27	3.33	0	13.1
160	43.4	53.2	94.7	68.6	46.3	25	0.92	0	17.5
200	44.5	56.7	99.2	82.4	51.3	16	1.66	6	32.2
250	39.7	57.3	100.4	78.3	51.5	21	2.06	4	27.2
315	37.5	63.4	98.3	74.0	56.6	23	1.26	5	30.5
400	35.8	62.6	98.3	67.6	60.0	29	1.24	2	27.5
500	33.7	57.8	100.0	67.7	59.0	31	0.45	1	24.4
630	29.3	57.9	102.2	67.8	63.1	33	0.47	0	26.5
800	28.2	59.6	101.7	65.1	65.0	35	0.34	0	26.3
1000	26.9	62.4	101.5	63.0	66.7	37	0.48	0	26.3
1250	27.0	68.7	105.3	64.8	73.8	38	0.40	0	31.9
1600	22.1	71.9	111.3	72.0	75.9	37	0.47	0	35.4
2000	15.8	80.0	107.1	74.4	75.7	30	0.36	6	42.2
2500	8.2	92.6	105.6	71.4	75.4	31	0.30	5	41.0
3150	7.8	113.5	106.4	68.3	76.9	34	0.26	2	39.5
4000	6.9	138.3	105.0	62.2	78.6	38	0.48	0	37.4
5000	7.2	186.8	103.2	53.2	80.5	44	0.47	0	33.4

STC Rating = **32** *(Sound Transmission Class)*
Deficiencies = **31** *(Number of deficiencies versus contour curve)*
OITC Rating = **26** *(Outdoor/Indoor Transmission Class)*

Note: *The acoustical chambers are qualified for measurements down to 80 hertz. Data reported below 80 hertz is for reference only.*

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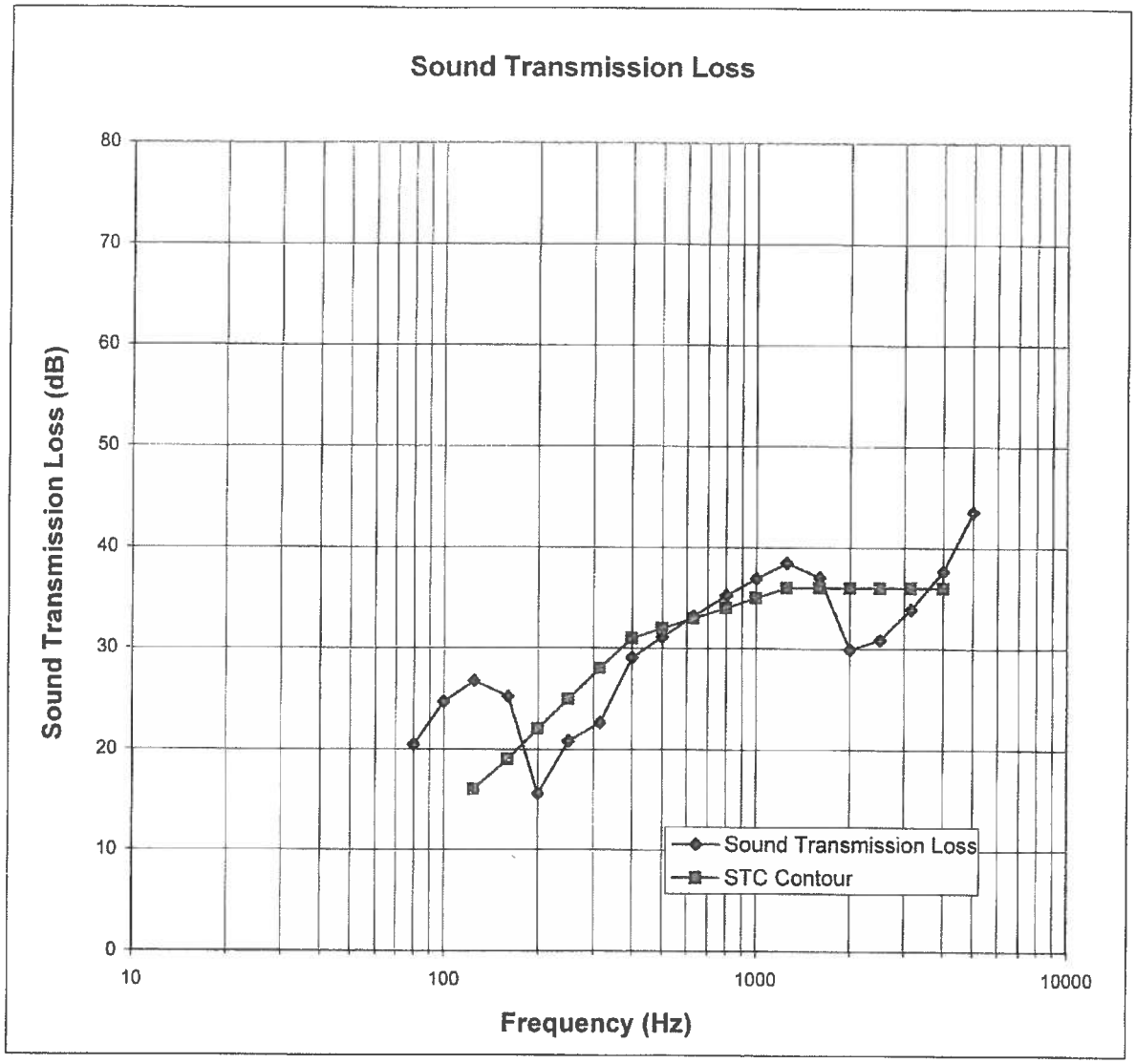
Architectural Testing

ATI No.	76094.01	**Date**	09/04/07
Client	YKK AP America		
Specimen	Series/Model YES 45TU curtain wall system with 1" IG (1/4" annealed, 1/2" air space, 1/4" annealed)		
Specimen Area	43.20 Sq Ft		
Filler Area	96.80 Sq Ft		
Operator	Brandon C. Ward		



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AAMA 1801 Data Sheet

ATI Job Number :	76094.01
Client Name :	YKK AP America
Test Date :	9/3/2007
Tests Performed by:	BCW
Specimen Type :	Curtain wall mock up
Series/Model Number :	YES 45TU
Sample Size :	79" by 78-3/4"

Architectural Testing

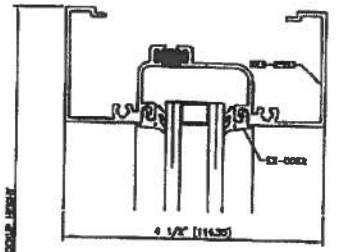
Air Leakage per ASTM test method ASTM E283

Total Air flow (ft^3/min) :	32.0		
Extraneous Leakage (ft3/min) :	32		
Temperature (^{o}F) at Specimen:	72		
Barometric Pressure at Specimen (in mbar):	1011	(Inches of Hg) :	29.85
Specimen Area in square feet :	43.20		
Density of air at reference standard conditions (lb/ft^3)	0.075		

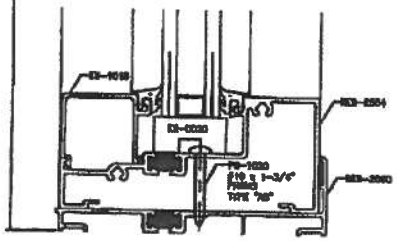
Total air flow w/ air density correction (ft3/min)	Extraneous leakage with air density correction (ft3/min)	Air leakage through the specimen with air density correction (ft3/min)	Rate of air leakage per unit area (ft3/min)/sq.ft.
31.874	31.874	0.000	<0.01

Appendix C

Design Drawings



DETAIL 1



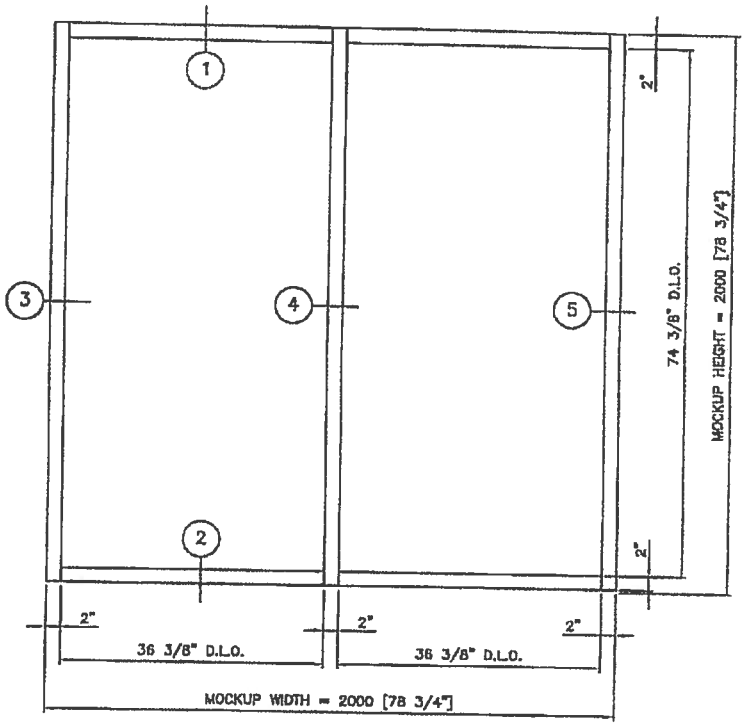
DETAIL 2

Architectural Testing

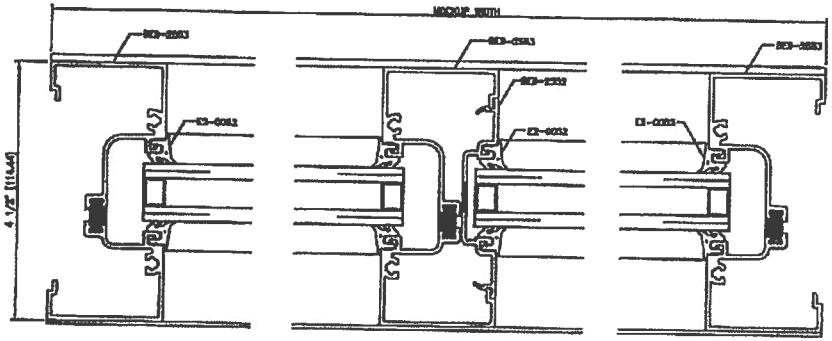
Test sample complies with these details.
Deviations are noted.

Report# 16094.01-113-11

Date 10-15-07 Tech BCW



ELEVATION: 3/4" = 1'



DETAIL 3

DETAIL 4

DETAIL 5

ALL DETAILS: HALF SCALE

TEST MOCKUP FOR AAMA 1503-98
GLASS SIZE: (2) 37 1/4" X 75 1/4"
GLASS TYPE: 1" (1/4"clr ann, 1/2" air, 1/4" clr ann)
Ti-AC40 3rd Surface

YKK AP AMERICA INC.

DESCRIPTION: THERMAL ELEVATION/DETAILS

SYSTEM: YES 45TU

GLASS OUTSIDE

DRAWN: D.D.

DATE: 04/22/07

SHEET: 1

CERTIFICATE of COMPLIANCE

OVERALL RATING	
U-Factor: (Btu/h•ft²•°F)	
SHGC:	

Directions: Fill out form completely. Determine the Overall Rating for this project by using the C.O.G. U-Factor and C.O.G. SHGC from Table 1 and looking up the overall rating from Table 2. Indicate the Overall Rating in the space above. Linear interpolation is permitted.

Certificate Authorization

Name: Company:

Signature: Date:

CERTIFIES THAT THE MATERIALS LISTED ON THIS CERTIFICATE WERE INSTALLED ON THE PROJECT IDENTIFIED BELOW.

PROJECT INFORMATION:

Street Address:

City: State: Zip:

GLAZING CONTRACTOR / INSTALLER: Contact Person:

Street Address: Phone Number:

City: State: Zip:

TABLE 1 – GLAZING

GLAZING MATERIAL SUPPLIER: Contact Person:

Street Address: Phone Number:

City: State: Zip:

Glass and Spacer Type:

Center-of-glass (C.O.G.) U-factor: Btu/h•ft²•°F Center-of-glass (C.O.G.) SHGC:

TABLE 2 – FRAMING

FRAMING MATERIAL SUPPLIER: YKK AP America Inc.

Street Address: 270 Riverside Pkwy, Suite A

City: Austell

Contact Person: David Warden

Phone Number: 800-955-9551

State: GA Zip: 30168

Product Line: **YES 45 TU**

U-factor Matrix (Btu/h•ft²•°F)		SHGC Matrix	
C.O.G. U-factor	OVERALL U-factor	C.O.G. SHGC	OVERALL SHGC
0.48	0.58	0.75	0.67
0.46	0.56	0.70	0.63
0.44	0.55	0.65	0.58
0.42	0.53	0.60	0.54
0.40	0.51	0.55	0.50
0.38	0.50	0.50	0.45
0.36	0.48	0.45	0.41
0.34	0.47	0.40	0.36
0.32	0.45	0.35	0.32
0.30	0.43	0.30	0.28
0.28	0.42	0.25	0.23
0.26	0.40	0.20	0.19
0.24	0.39	0.15	0.14
0.22	0.37	0.10	0.10
0.20	0.35	0.05	0.05

The overall ratings for U-factor and SHGC are based on a size of 2000 mm x 2000 mm (78 3/4 in x 78 3/4 in) as required in NFRC 100.

Overall U-factors and Solar Heat Gain Coefficients (SHGC) listed in the matrix were determined in accordance with NFRC 100 and NFRC 200 respectively by a NFRC accredited laboratory.

ACCREDITED LABORATORY: Architectural Testing

Reference Test Report #: B6796.01-116-45

CONTINUATION SHEET				AIA DOCUMENT G703					PAGE 2 OF 2	
AIA Document G702, APPLICATION AND CERTIFICATE FOR PAYMENT, containing						APPLICATION NUMBER:			000(16-09)	
Contractor's signed Certificate is attached.						APPLICATION DATE:			29-Dec-16	
In tabulations below, amounts are stated to the nearest tenth of a cent.						PERIOD TO:				
Use Column 1 on Contracts where variable retainage for line items may apply.						PROJECT NO.:			RMF 1114.1999	

A		B	C	D	E	F	G		H	I
ITEM NO.		DESCRIPTION OF WORK ***Job Title*** ***Job Location***	SCHEDULED VALUE	WORK COMPLETED FROM PREVIOUS APPLICATION (D + E)	WORK COMPLETED THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN)	TOTAL COMPLETED AND STORED TO DATE	% (G / C)	BALANCE TO FINISH (C - G)	RETAINAGE
1		Bonds	$4,500.00				0.00	0%	$4,500.00	$0.00
2		Shop Drawings/Submittals	$4,500.00				0.00	0%	$4,500.00	$0.00
3		General Conditions	$6,500.00				0.00	0%	$6,500.00	$0.00
4		Storefront Materiials:								
		a. Storefront frame, entrances and vents	$114,048.99				0.00	0%	$114,048.99	$0.00
		b. Insulated Glass and Panels	$35,000.00				0.00	0%	$35,000.00	$0.00
		c. Louvers	$1,200.00				0.00	0%	$1,200.00	$0.00
5		Storefront Installation								
		a. Storefront frame, entrances and vents	$36,800.00				0.00	0%	$36,800.00	$0.00
		b. Insulated Glass and Panels	$4,560.00				0.00	0%	$4,560.00	$0.00
		c. Louvers	$300.00				0.00	0%	$300.00	$0.00
		d. Exterior and Interior sealants	$6,000.00				0.00	0%	$6,000.00	$0.00
6		Punchlist	$3,500.00				0.00	0%	$3,500.00	$0.00
7		Change Order #1	$49,628.78				0.00	0%	$49,628.78	$0.00
		Totals	**266,537.77**	**0.00**	**0.00**	**0.00**	**0.00**		**266,537.77**	**0.00**

1. APPROVED
2. ~~APPROVED AS NOTED~~
3. NOT APPROVED
4. WORK MAY PROCEED
5. DO NOT PROCEED WITH WORK
6. MAKE CORRECTIONS NOTED
7. RESUBMIT
8. DO NOT RESUBMIT
9. SUBMIT FINAL CERTIFIED
10. REVIEW NOT REQUIRED BY CONTRACT DOCUMENTS

See transmittal for additional information as applicable.

Action shown above is only for conformance with the design concept of the work and with the information in the contract documents.

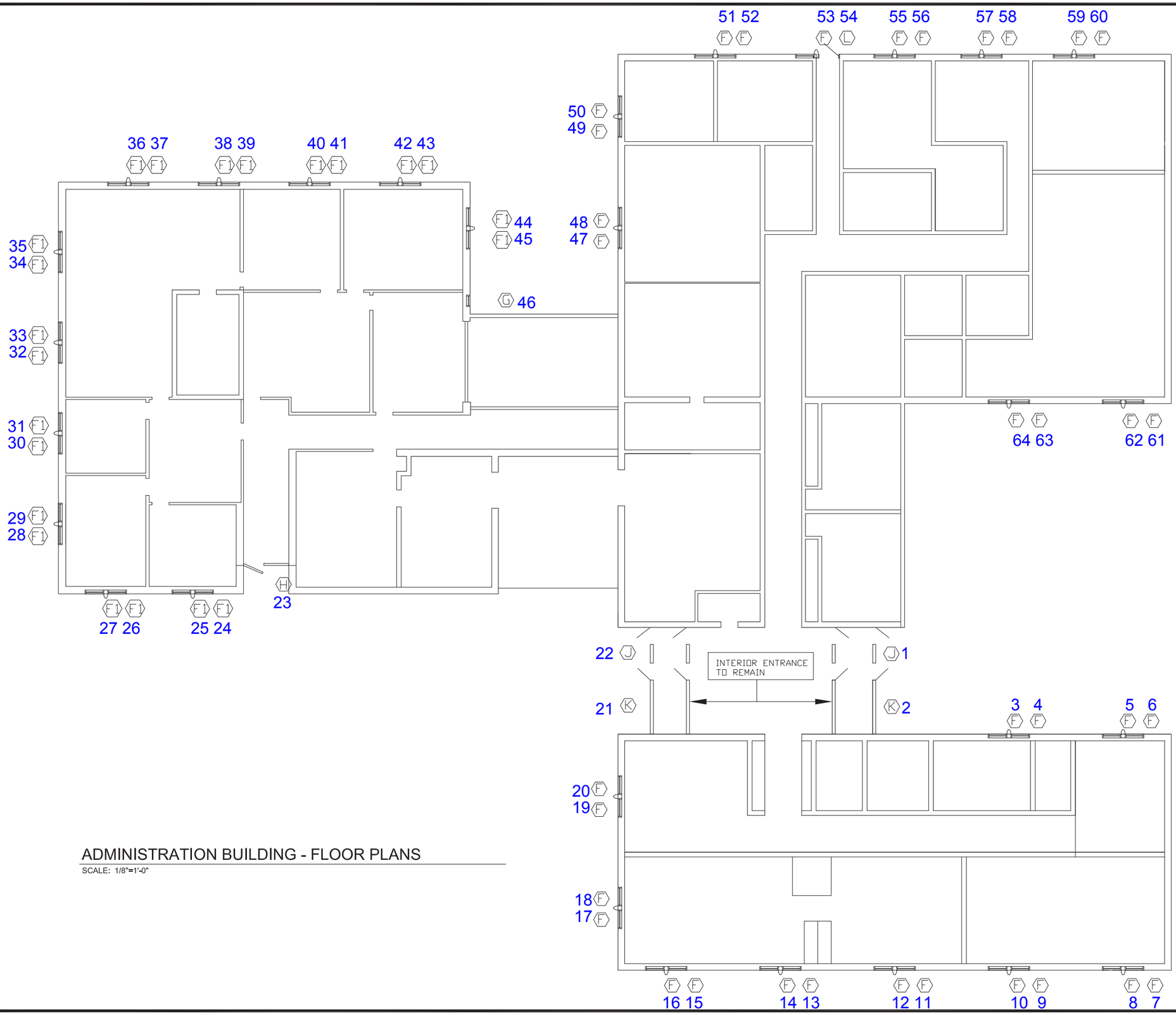
By approval and submission, contractor represents that he has determined and verified materials, field measurements and construction criteria specified performance and design criteria and similar data.

Deviations from contract documents are not reviewed unless specifically requested in writing by contractor. Review on resubmission will cover only designated changes on this submittal and other changes clearly identified by contractor with encirclement.

REVIEWED BY

DATE 1/3/17

CHESAPEAKE BAY BRIDGE AND TUNNEL DISTRICT



ADMINISTRATION BUILDING - FLOOR PLANS

SCALE: 1/8"=1'-0"

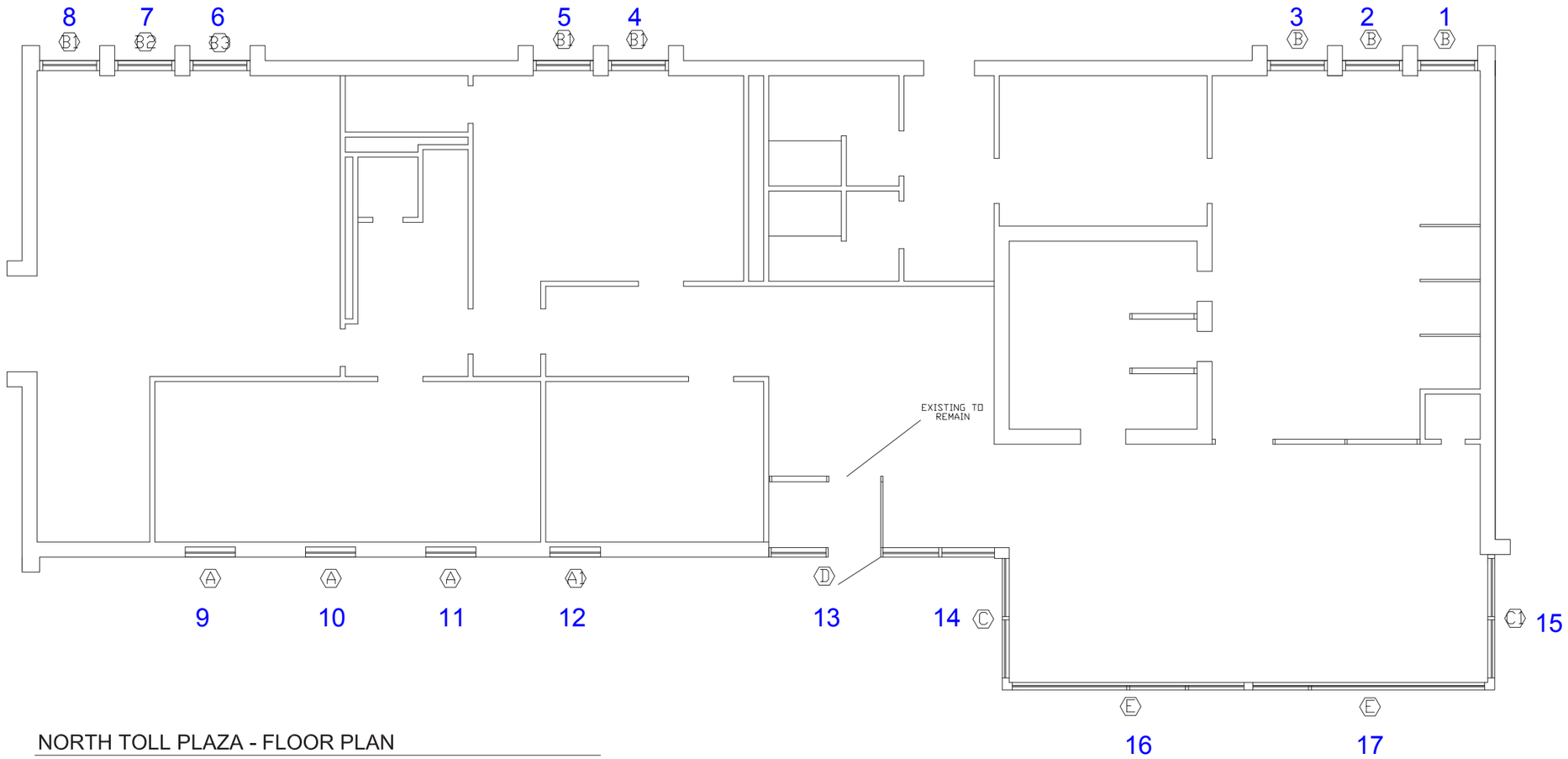
PNC Corporation
14214 Washington Hwy.
Ashland, Virginia 23005
Office: (804) 798-1159
Fax : (804) 798-1164

CHESAPEAKE BAY BRIDGE & TUNNEL DISTRICT
ADMINISTRATION BUILDING, NORTH & SOUTH PLAZA - WINDOW REPLACEMENT
CHESAPEAKE, VIRGINIA

Administration Building - Floor Plan

DATE: 2/10/17
PROJECT NO.: 1114.1999
DRAWN BY: PTT
REVIEWED BY: PTT
REVISED:
SCALE: AS NOTED
FILE NO.:

SHEET NO.
A2.0



NORTH TOLL PLAZA - FLOOR PLAN

SCALE: 1/4"=1'-0"

PNC Corporation

14214 Washington Hwy.
Ashland, Virginia 23005
Office: (804) 798-1159
Fax : (804) 798-1164

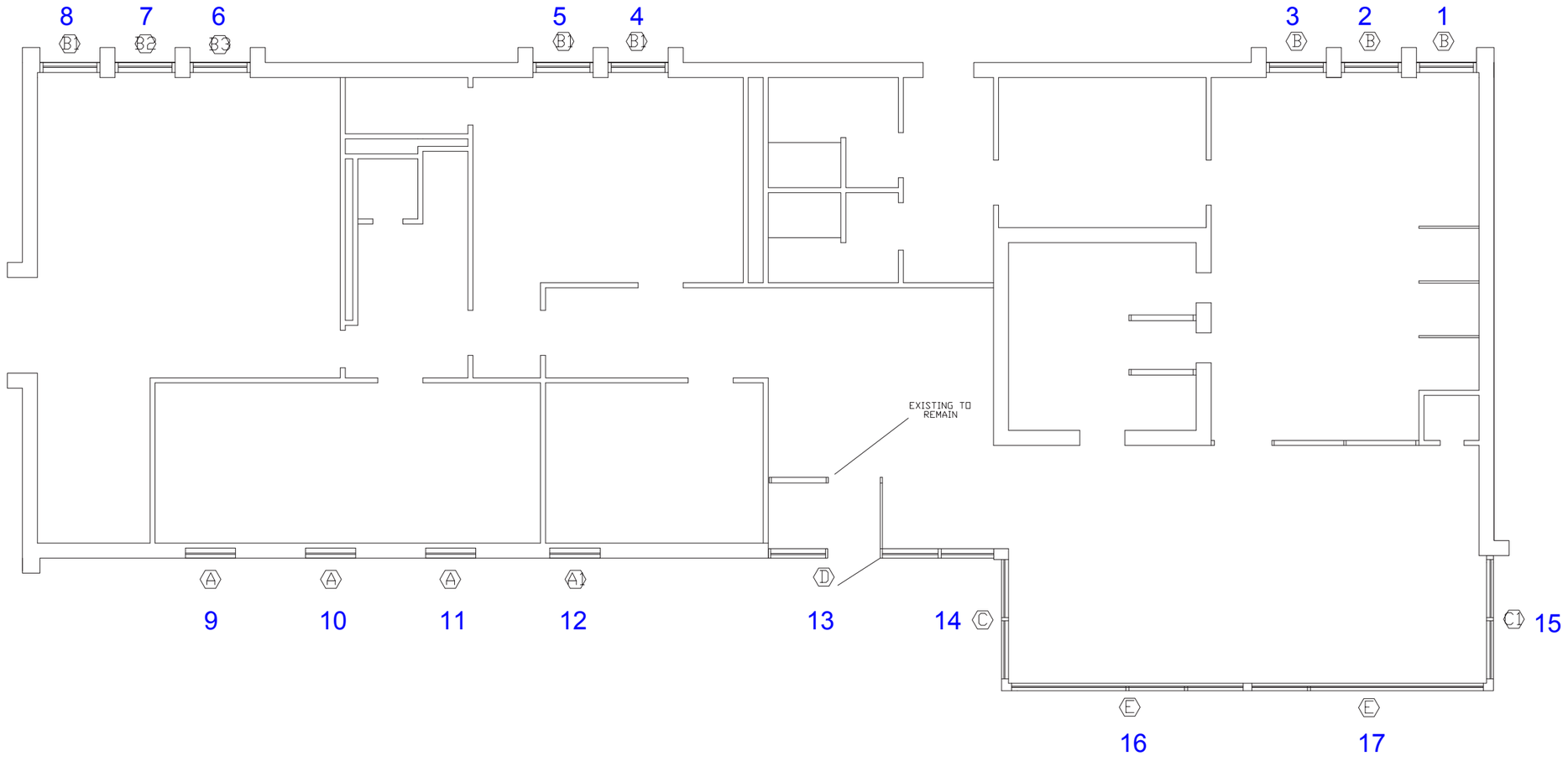
CHESAPEAKE BAY BRIDGE & TUNNEL DISTRICT
ADMINISTRATION BUILDING, NORTH & SOUTH PLAZA - WINDOW REPLACEMENT
CHESAPEAKE, VIRGINIA

North Toll Plaza - Floor Plan

DATE: 2/10/17
PROJECT NO.: 1114.1999
DRAWN BY: PTT
REVIEWED BY: PTT
REVISED:
SCALE: AS NOTED
FILE NO.:

SHEET NO.

A2.1



SOUTH TOLL PLAZA - FLOOR PLANS

SCALE: 1/4"=1'-0"

PNC Corporation

14214 Washington Hwy.
Ashland, Virginia 23005
Office: (804) 798-1159
Fax : (804) 798-1164

CHESAPEAKE BAY BRIDGE & TUNNEL DISTRICT
ADMINISTRATION BUILDING, NORTH & SOUTH PLAZA - WINDOW REPLACEMENT
CHESAPEAKE, VIRGINIA

South Toll Plaza - Floor Plan

DATE: 2/10/17
PROJECT NO.: 1114.1999
DRAWN BY: PTT
REVIEWED BY: PTT
REVISED:
SCALE: AS NOTED
FILE NO.:

SHEET NO.

A2.2