Air and Water Testing
"In Plant Test"

Dawson has designed, built and successfully tested our Transcend Series "Ultra Narrow Stile" doors which are energy efficient entrances that are Thermally Broken as well as Air and Water resistant.

Attached are the Test Results from National Certified Testing Laboratories. Included in the test report are the as built drawings along with pictures of the test procedure. Also included are the Thermal reports for the double doors.

ULTRA NARROW STILE SERIES

Dawson introduces its Thermally Broken Ultra Narrow Stile Entrance, designed to meet the ever-increasing stringent energy efficiency building codes while maintaining the beautiful aesthetic appeal and construction that Dawson is known for.

- Series is offered in Balanced and Center Pivoted, Offset Pivoted "Hardware applications."
- NFRC U- value far less than the current energy requirement for thermal rated doors of .77
- Not only do these doors provide a superior thermal rating but also provides an Industry leading performance in air and water resistance.

NATIONAL CERTIFIED TESTING LABORATORIES

FIVE LEIGH DRIVE • YORK, PENNSYLVANIA 17406 • TELEPHONE (717) 846-1200
FAX (717) 767-4100
www.nctlinc.com

IN-PLANT TEST REPORT

NCTL-110-24998-1

Dawson Doors
825 Allen Street
Jamestown, NY 14701

825 Allen Street, Jamestown, NY 14701
TEST DATE
3/14/22

REPORT DATE
3/15/22
REVISION DATE
4/27/22

NATIONAL CERTIFIED TESTING LABORATORIES

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FAX (717) 767-4100
www.nctlinc.com

Report Number	NCTL-110-24998-1
Report Date	3/15/22
Revision Date	4/27/22
Report To	Dawson Doors 825 Allen Street Jamestown, NY 14701
Job Site	825 Allen Street, Jamestown, NY 14701
Test Date(s)	3/14/22
On-Site Date(s)	3/14/22
Field Test Method(s)	ASTM E283-04(12), "Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen." ASTM E331-00(16), "Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference."

TESTING PROCEDURE(S)

Note: Unless otherwise noted, all dimensions are in the order (Width x Height x Thickness) and all designations are from an interior view

All testing was conducted at Dawson Doors, 825 Allen Street, Jamestown, NY 14701. National Certified Testing Laboratories, Inc., was contracted by Dawson Doors to witness performance testing on a product mock-up for the above- referenced project. All calibration data was provided. This report includes written and photographic documentation of the testing performed and a copy of the "As-Built" product drawings.

The test specimen successfully met all criteria outlined in the testing procedure

SPECIMEN DESCRIPTION

Note: Unless otherwise noted, all dimensions are in the order (Width x Height x Thickness) and all designations are from an interior view

The test specimen was a Center Pivoted French Entry Door(s). The product employed (2) operable leaves. The unit was installed into wood and plexiglass test chamber and fastened into the test chamber and sealed with a silicone sealant. See attached "As-Built" drawings for a full description of the product.

TEST RESULTS

Note: Unless otherwise noted, all dimensions are in the order (Width x Height x Thickness) and all designations are from an interior view

Date	Test		
03/14/22	Open/ Close/ Lock Cycling		
	5 Cycles Per Vent	=	Pass/ No Damage
	Allowed	=	No Damage
03/14//22	Air Infiltration – Operable Vents 1.57 psf (25 mph)		
	Result	=	0.19 cfm/ft²
	Allowed	=	1.0 cfm/ft²
03/14//22	Static Water Penetration 1.0 psf (20.0 mph) Duration: 15 Minutes		
	Result	=	Pass/ No Leakage
	Allowed	=	No Leakage

Witness Log: (All or Partial)

Client	Company
Drew Klinedinst	NCTL
Robert Linger	Dawson Doors
Troy Barber	Dawson Doors

This test report was prepared by National Certified Testing Laboratories (NCTL), for the exclusive use of the above named client and it does not constitute certification, or approval of this product or materials. The results are for the particular specimen tested and do not imply the quality of similar or identical products manufactured or installed from specifications identical to the tested product. The results in this report are actual tested values and are applicable to the specimen tested only. The test specimen was supplied to NCTL by the above named client. NCTL is a testing lab and assumes that all information provided by the client is accurate and does not guarantee or warranty any product tested or installed.

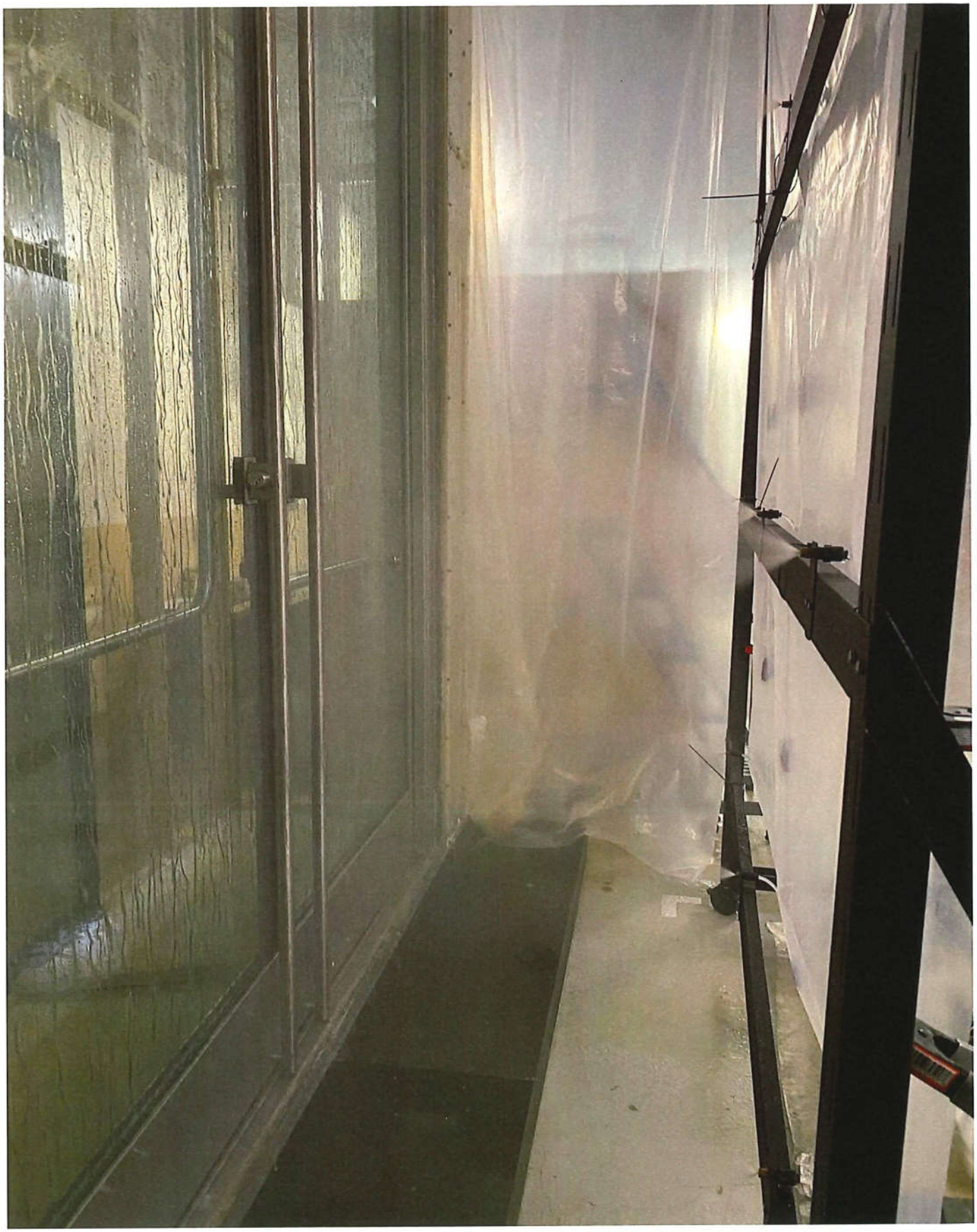
A copy of this report will be retained by NCTL for a period of four (4) years. This report does not constitute certification or approval of the product, which may only be granted by a certification program validator or recognized approval entity. All tests were conducted in full compliance with the referenced specifications and/or test methods. This report is the joint property of National Certified Testing Laboratories, Inc. and the Client to whom it is issued. Permission to reproduce this report by anyone other than National Certified Testing Laboratories, Inc. and the Client must be granted in writing by both of the above parties. This report may not be reproduced, except its entirety, without the written consent of NCTL.

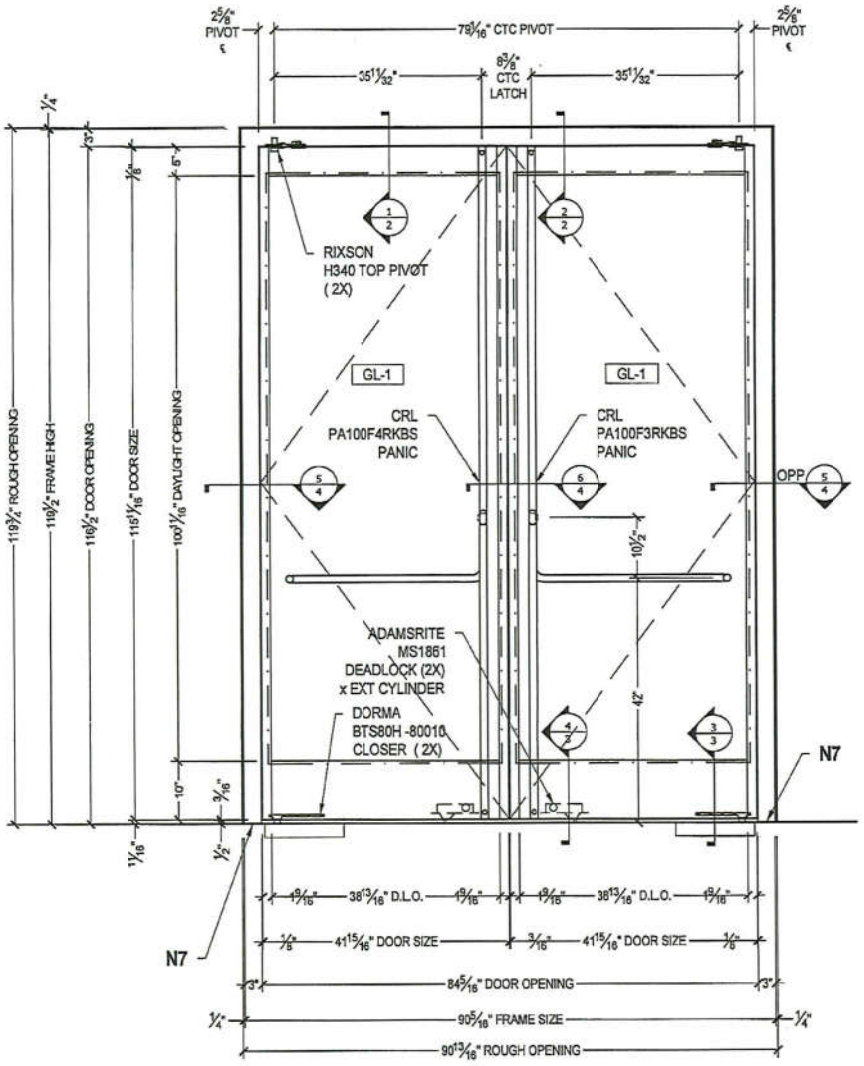
National Certified Testing Laboratories

Drew Klinedinst
Field Testing Manager

DWK/bnr
Attachments
- Appendix A - Revision Summary
- Appendix B - Photographs
- Appendix C - Drawings


PUSH





A EXTERIOR ELEVATION

Scale: 1:20

	ITEM	PART #	NOTES, PART DESCRIPTION
ASSEMBLY COMPONENTS	N1	SHEET 5	DAWSON THERMALLY BROKEN METAL FRAME ASSEMBLY
	N2		#14 x 1½" WOOD SELF TAPPING ANCHORS @ MAX 18" O.C.
	N3	SHEET 6	DAWSON THERMALLY BROKEN TOP RAIL ASSEMBLY
	N4	SHEET 6	DAWSON THERMALLY BROKEN BOTTOM RAIL ASSEMBLY
	N5	SHEET 6	DAWSON THERMALLY BROKEN VERTICAL STILE ASSEMBLY
	N6	SHEET 5	DAWSON BRAKE FORMED DOOR STOP ASSEMBLY
	N7	SHEET 5	DAWSON BRAKE FORMED 16 GA. SLOPED THRESHOLD ASSEMBLY
	N8		JAMBS SHALL HAVE END CAP AT BASE, AND SET IN BED OF SILICONE.
GLAZING	GL-1		1" INSULATED: ¼" CLEAR TEMPERED x ENERGY SELECT 40 x ½" AIR x ¼" CLEAR TEMPERED
	G2	ELA795-BL	DOW CORNING 795 SILICONE
	G3	ELA121-BL	DOW CORNING SEALANT 121
WEATHERSTRIP	W1		PERIMETER CAULKING, CLOSED CELL BACKER ROD & SILICONE SEALANT
	W2	DD-SFB105BLFS	SEALEZE XTRA SEAL STRIP BRUSH
	W3	WST5043G	½" HIGH ULTRA FAB GREY ROUND YARN
	W4	WS797	REESE 797-B ADHESIVE BACKED BULB SEAL
	W5		⅛" THICK x ¾" CLOSED CELL FOAM, CONTINUOUS
	W6		⅛" THICK x ¾" WIDE CLOSED CELL FOAM, CONTINUOUS
	W7		SET THRESHOLD ASSEMBLY IN BED OF SILICONE
HARDWARE	H1	PA100F4RKBS	CRL PANIC DEVICE X FULL HEIGHT EXTERIOR PULL
	H2	PK2BS	CRL MANUAL STRIKE
	H3	H340	RIXSON H340 TOP PIVOT
	H4	BTS80-80010	DORMA BTS-80 FLOOR CLOSER
	H5	MS1861	ADAMSRITE MS1861 BOTTOM RAIL DEADLOCK

TESTING REQUIREMENTS	
AIR INFILTRATION:	ASTM E283
LIMITED WATER:	ASTM E331 (MODIFIED PRESSURE)

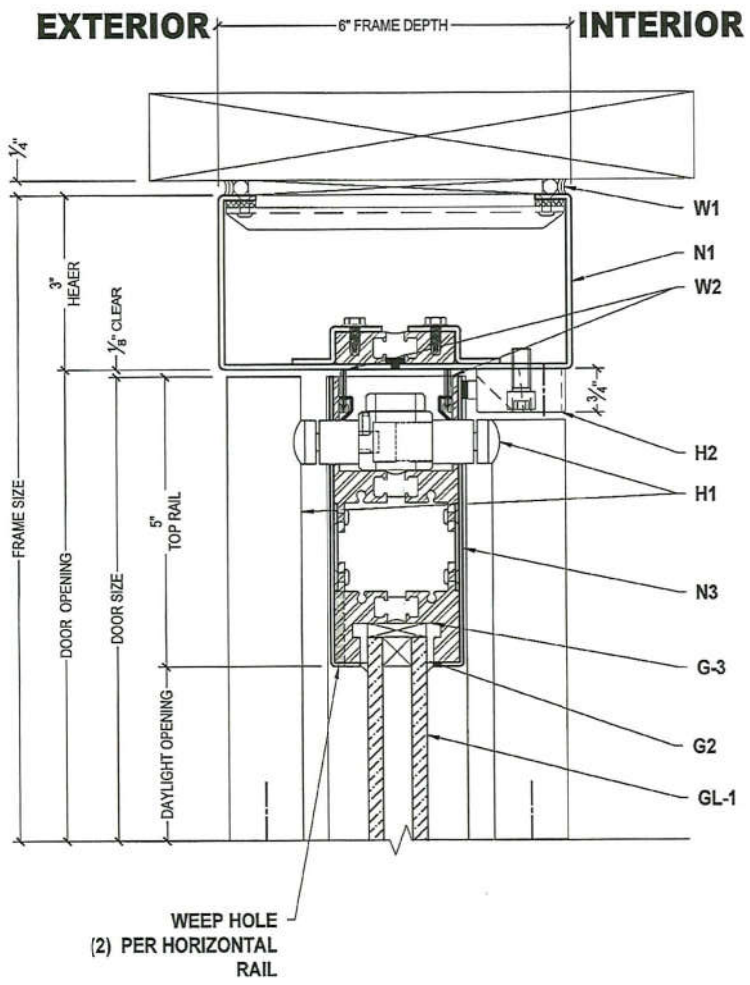
REVISIONS

DAWSON
825 Allen Street, Jamestown, N.Y. 14701
PH: (716) 664-3811
www.dawsonmetal.com

PROJECT
CENTER PIVOTED
DT-010 SERIES
AIR AND WATER TEST

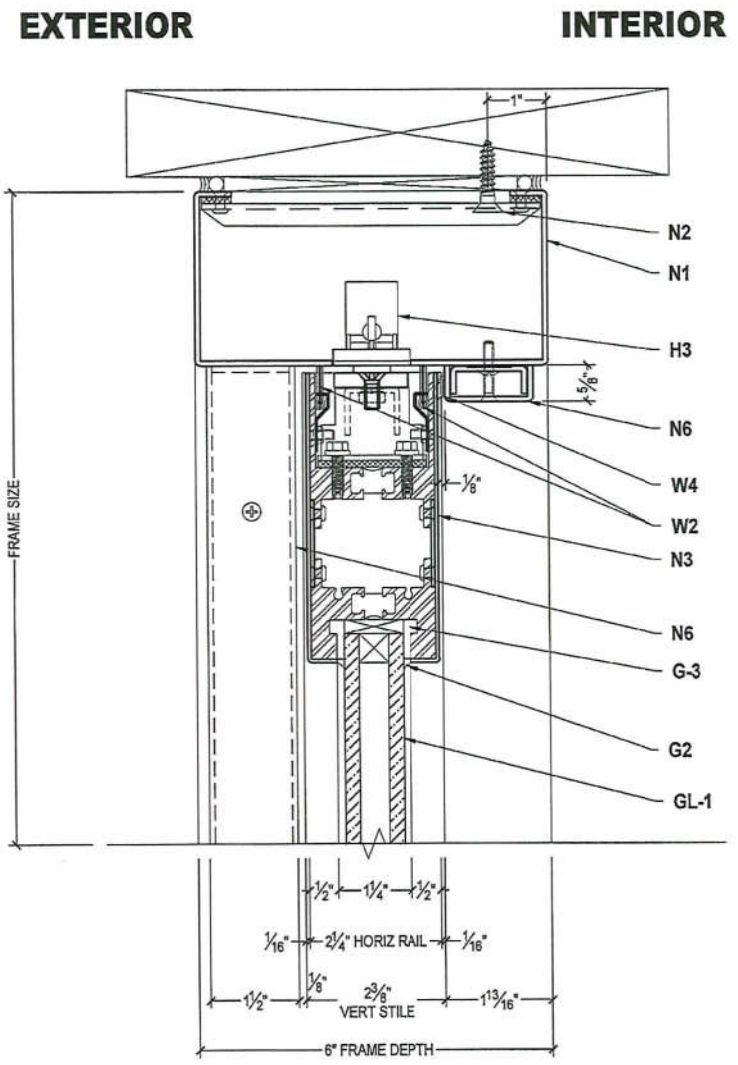
CONTRACTOR

Drawn By: T.B.
Date: 03-11-22
SHEET NO. 1 OF 6



1 TOP RAIL - @ LOCK

Scale: 1:2



2 TOP RAIL @ PIVOT

Scale: 1:2

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PROJECT
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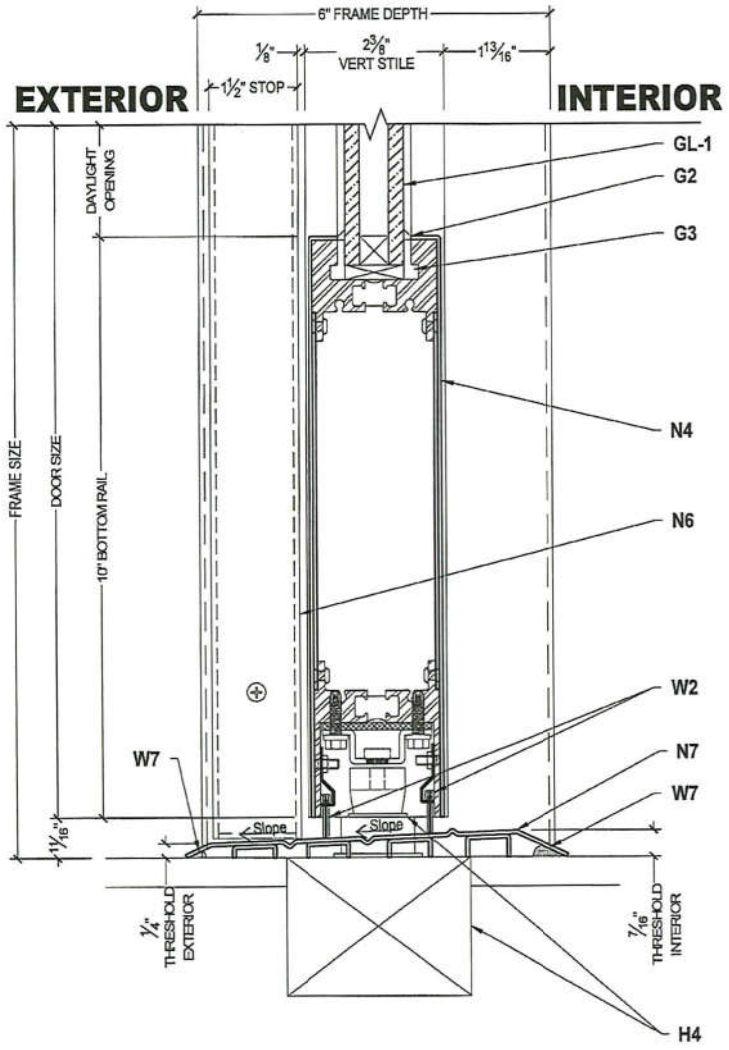
NARROW STILE DOUBLE DOOR
AIR AND WATER TESTING

CONTRACTOR

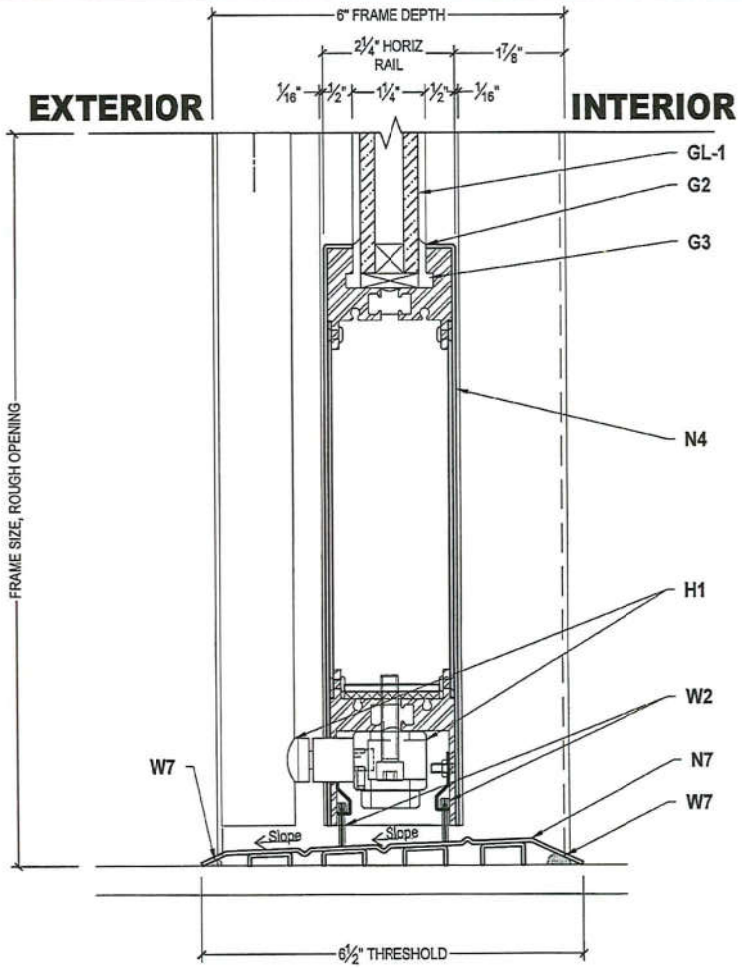
Drawn By: T.B.
Date: 03-11-22

SHEET NO.
2 OF 6



3 BOTTOM RAIL @ CLOSER

Scale: 1:2



4 BOTTOM RAIL @ CRL

Scale: 1:2

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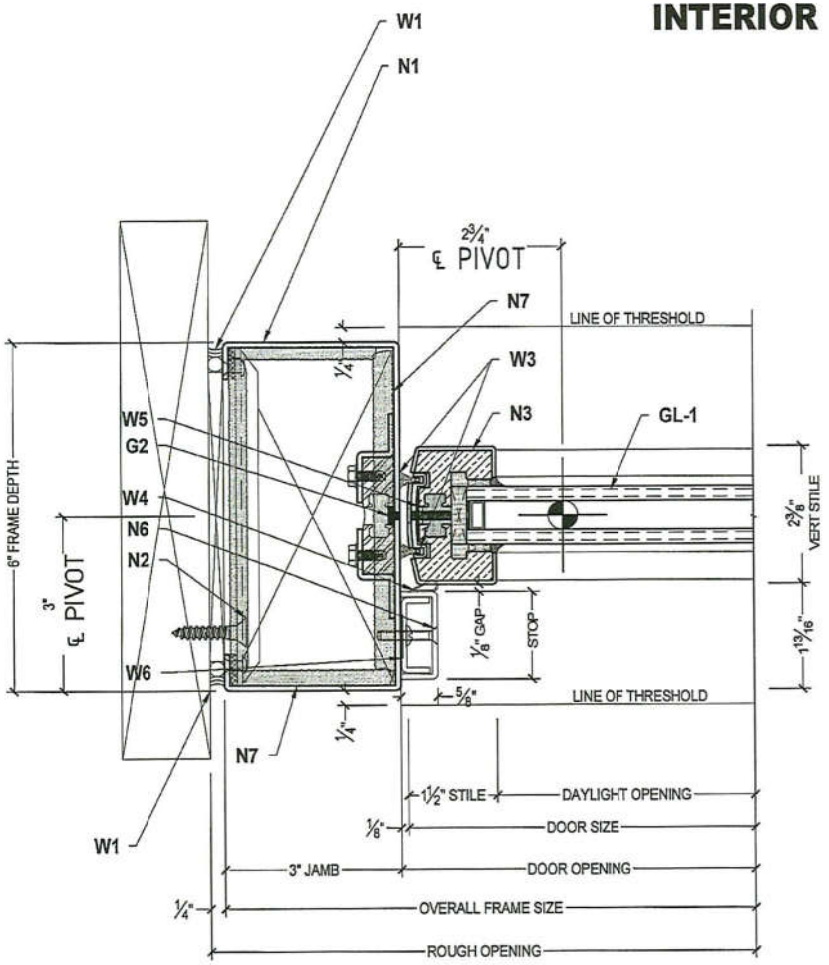
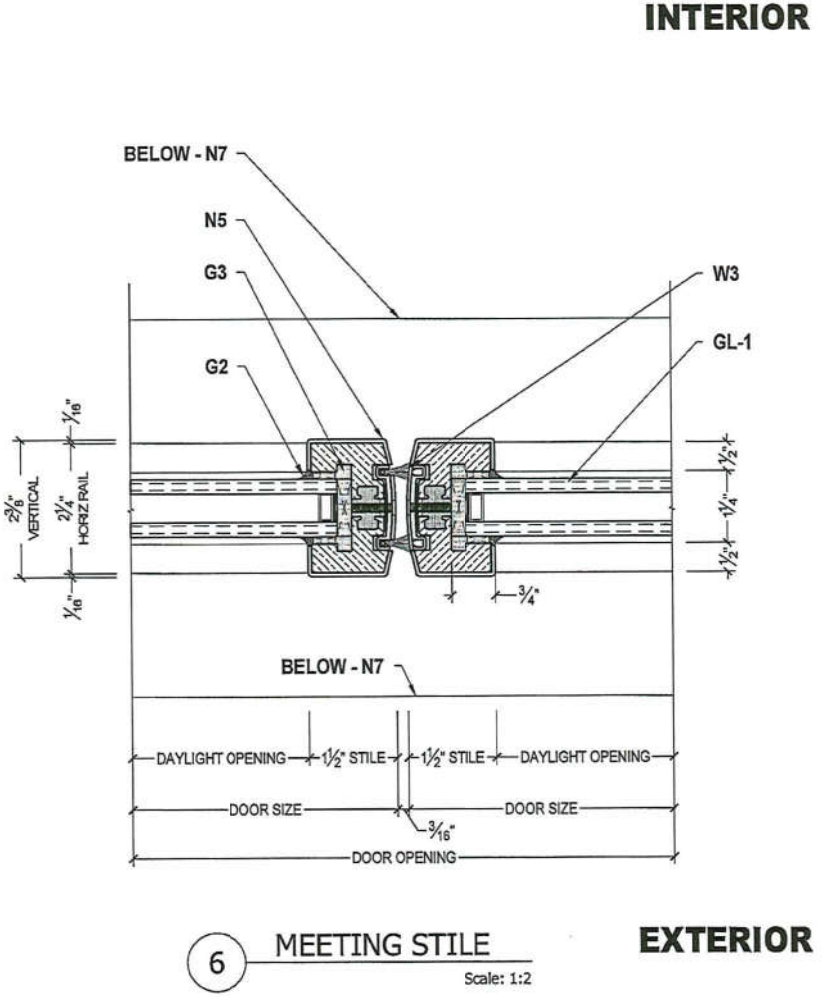
NARROW STILE DOUBLE DOOR
AIR AND WATER TESTING

CONTRACTOR

Drawn By: T.B.	Date: 03-11-22
SHEET NO. 3 OF 6	



5 PIVOT STILE
Scale: 1:2



6 MEETING STILE
Scale: 1:2

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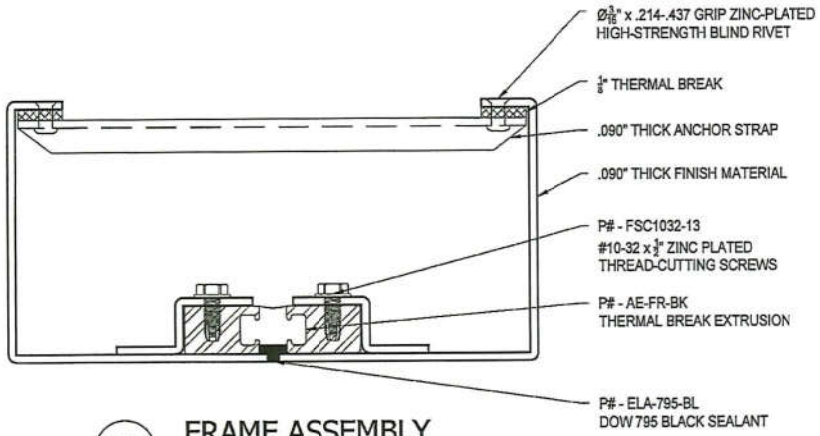
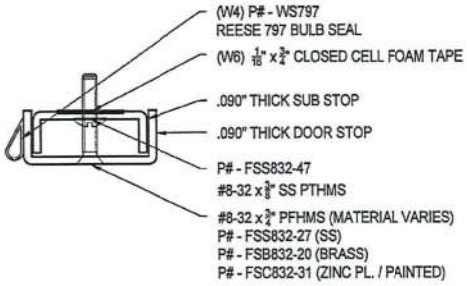
Drawn By: T.B.
Date: 03-11-22
SHEET NO. 4 OF 6



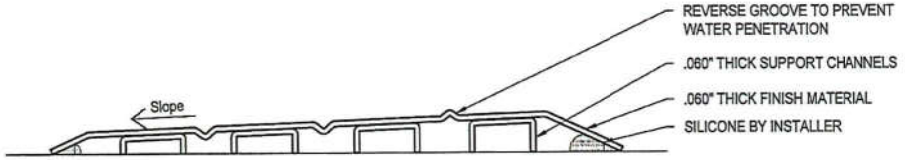
N1 FRAME ASSEMBLY

Scale: 3/4 : 1



N6 DOOR STOP ASSEMBLY

Scale: 3/4 : 1



N7 THRESHOLD ASSEMBLY

Scale: 3/4 : 1

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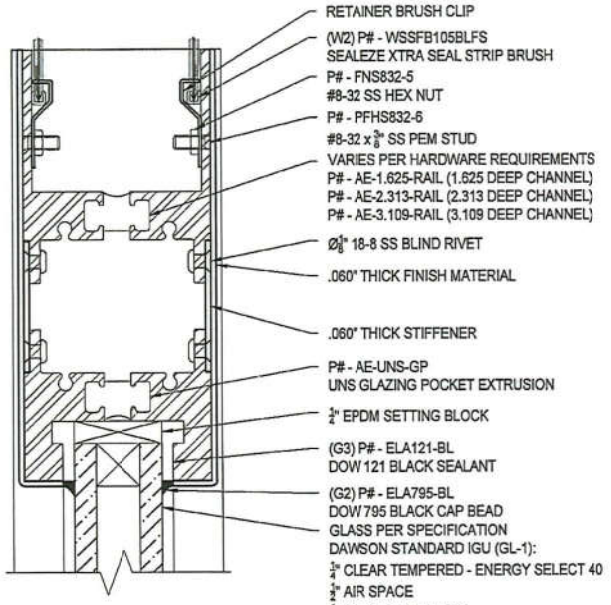
CONTRACTOR

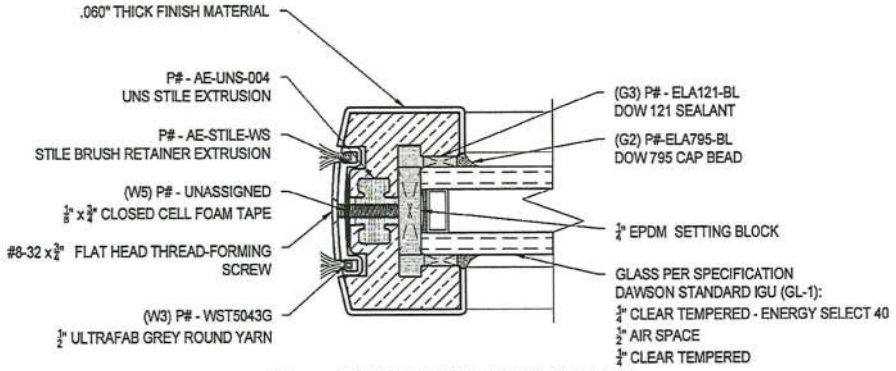
Drawn By: T.B.
Date: 03-11-22

SHEET NO.
5 OF 6



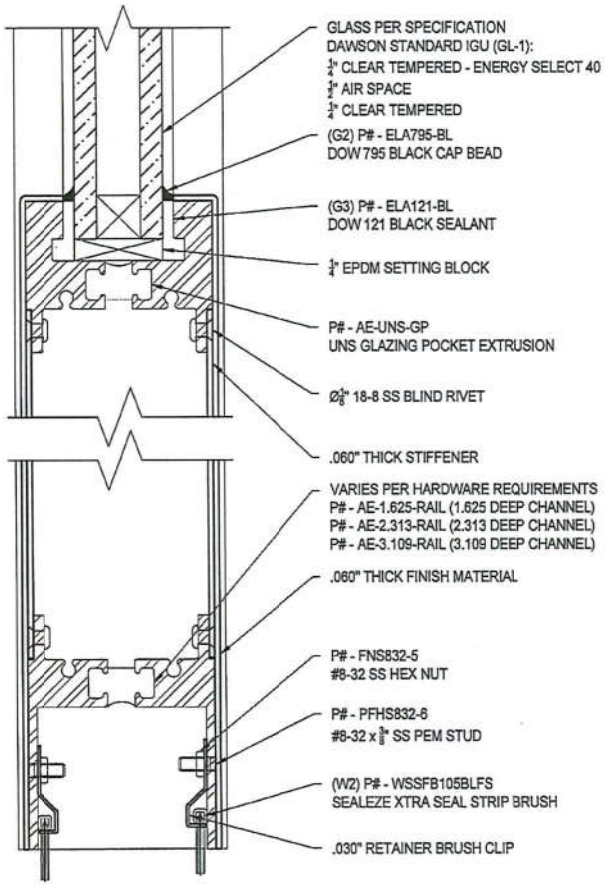
N3 TOP RAIL ASSEMBLY

Scale: 3/4 : 1



N5 UNS STILE ASSEMBLY

Scale: 3/4 : 1



N4 BOTTOM RAIL ASSEMBLY

Scale: 3/4 : 1

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CONTRACTOR

Drawn By: T.B.
Date: 03-11-22

SHEET NO.
6 OF 6

DAWSON

ARCHITECTURAL ENTRANCES METAL FABRICATION FINISHING SERVICES

Dawson Thermally Broken Ultra-Narrow Stile Center Pivoted Door System

Thermal Analysis Process Documentation

U-Value Calculation Using Lawrence Berkeley National Laboratories

THERM Software & NFRC Procedure 100

Prepared by: RLL

On April 27, 2022

Dawson Metal Company

825 Allen St.

Jamestown, NY 14701

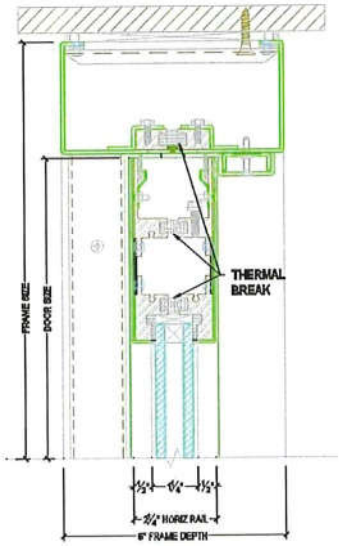
Table of Contents

Initial Statements

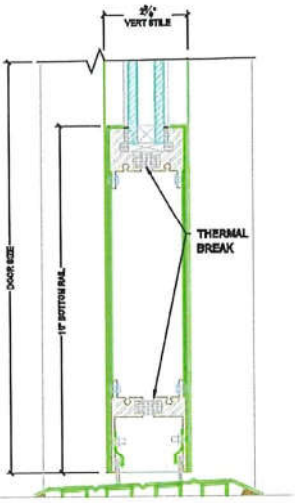
This document details the approach and methods used by Dawson in order to compute, calculate, determine and otherwise evaluate the U-Value (aka. U-Factor) for a U.N.S. Center Pivoted Double Door Entrance. The door blanks are sized according to NFRC Procedure 100 as 37.75 inches wide and 82.375 inches tall.

The following details are provided to show thermal performance of the door:

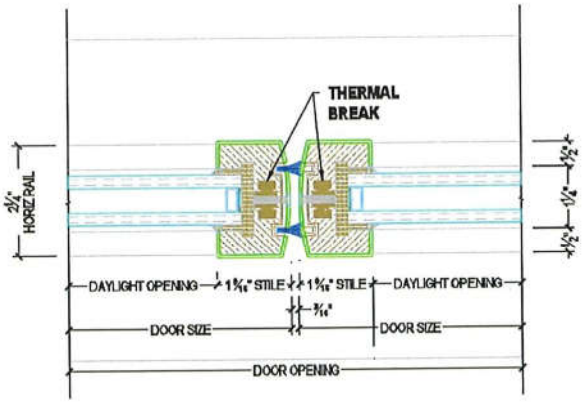
Typical Header Detail



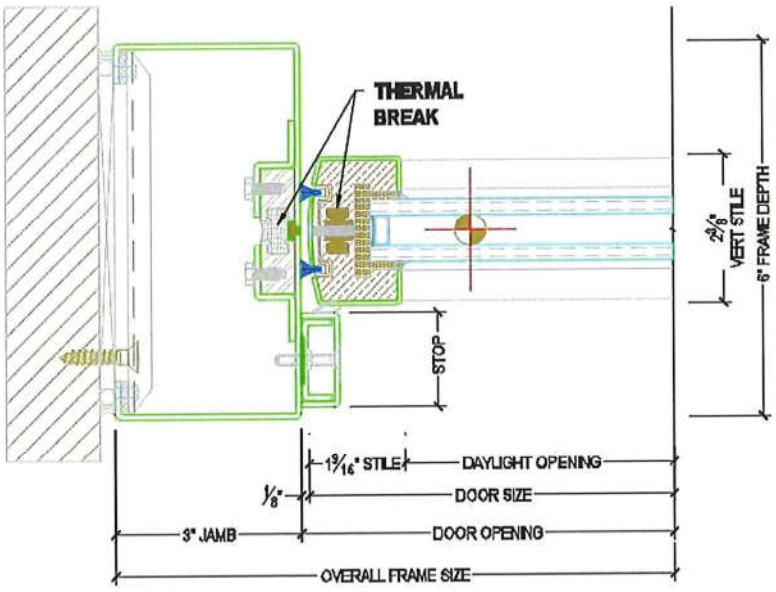
Typical Sill Detail



Typical Meeting Stile



Typical Pivot Jamb Details



Thermophysical properties of all materials used in the simulations were obtained from the NFRC 101-2006 Material Database. No material data from outside sources were required for these simulations.

These calculations are provided by Dawson and are for informational purposes only. These calculations have not been certified by the NFRC. This report shall not be reproduced in any format other than this which has been provided by Dawson Metal Company (DMC) in its entirety without the consent of DMC.

Methodology

This analysis was performed in accordance with NFRC (National Fenestration Rating Council) Procedure 100 for determining the thermal transmittance of fenestration products, using approved software developed by the Lawrence Berkeley National Laboratories (LBNL). The software package used to conduct this analysis was LBNL THERM 7.8 (THERM). This piece of software is a Finite Element Analysis modeling tool that utilizes meshing matrices to break down complex geometry into small, simple elements. THERM uses an algorithm known as the Quadtree Method for Mesh Generation, which breaks each component into quadrants, and then those quadrants into further and further quadrants until the geometry is broken into "sufficiently small and sufficiently simple" elements. The mesh generation will achieve the goal of small and simple according to ISO 15099 which states: "The error between the theoretical U-Value and the computed U-Value is less than 1%." Additional tools used to compute the U-Value are detailed throughout this report.

The NFRC Procedure 100 manual outlines the use of two-dimensional heat transfer analysis of the various profiles that make up the fenestration product. In order to accurately predict the heat transfer through the product, the geometry must be captured and analyzed. THERM is the 2-D heat transfer software used to conduct this analysis. THERM applies steady state thermal conditions to the boundaries of the fenestration product model. Conduction, convection and radiation are all included in this thermal analysis and the application of appropriate boundary conditions to accurate product geometry (internal and external) provides THERM with the inputs needed to calculate the relevant mode of heat transfer through the fenestration product.

The output from THERM is a U-Value for the individual components of the fenestration product, for a pair of Dawson Ultra-Narrow stile Center Pivoted Doors, those components are the Frame and the Glazing which are composed of sub components. The individual frame components include the Pivot Stiles along with the Pivot Jambs, Bottom Rail, Threshold, the Top Rail, and the Header. These components were combined according to Figures 1 and 2 where the header part of the frame is combined with the top rail of the door, the pivot jambs of the frame is combined with the pivot stile of the door, etc. This decision was made to ensure that the gap between the door and the frame, as well as the weather stripping that was designed to seal that gap, is all being accounted for in the analysis. The NFRC Procedure 100 states: "The use of a spreadsheet, in accordance with ISO150999 Section 4.1.4, is required to compute the total U-Value of the door using an area-weighted-average method of calculation." According to this method, the U-Values for the components of the door are multiplied by the respective component areas and then divided by the total area of the door. The weighted U-Values are then added and the resulting total is the overall U-Value for the door system.

Simulation Conditions & Assumptions

The steady state thermal conditions applied to the outermost surfaces of the models in the simulations performed by Dawson were obtained from ISO 150999 Section 8.2 as well as NFRC Procedure 100 and are listed as:

Exterior Conditions:

T_{out} = exterior ambient temperature of -18° C (-0.4° F)

V = wind speed of 5.5 m/s (12.3 mph)

Interior Conditions:

T_{in} = interior ambient temperature of 21.0° C (69.8° F)

Materials Used:

Door Pans – Muntz Metal

Door Structure – Aluminum

Thermal Break – Urethane

Glazing – Double Low-e Air Fill Construction

Thermal Bridging

In order to ensure simulation accuracy, areas of the door where thermal bridging occurs were taken into consideration. The method for analyzing elements that bridge the thermal break is outlined in the NFRC THERM 7/ WINDOW 7 Simulation Manual under ***Section 8.8 Non-Continuous Thermal Bridge Elements***. This section of the NFRC documentation identifies elements such as bolts, partially de-bridged, and thermally slotted cross sections. Dawson, following this manual used the K-Effective method of analysis which is a small weighted average formula that takes the thermal heat transfer coefficients for the relevant modes of heat transfer and averages them according to their area weights along the section of the door that contains those elements. A sample equation of how the K-Effective values are determined is included below in Equation 1.

$$K_{eff} = (F_b * K_b) + (F_n * K_n)$$

Where:

K_{eff} = Weight Averaged Thermal Conductivity

F_b = Fraction of area which is thermally bridged

K_b = Thermal conductivity coefficient of bridging material

F_n = Fraction of area which is not thermally bridged

K_n = Thermal conductivity coefficient of non-bridging material

Equations

$$U_f = \frac{\sum[(U_H A_H), (U_S A_S), (U_P A_P), (U_M A_M), (U_{EGT} A_{EGT}), (U_{EGB} A_{EGB}), (U_{EGP} A_{EGP}), (U_{EGM} A_{EGM})]}{A_f}$$

Equation 1: Weighted Average Calculation for Frame Components U-Value in a Dawson Stile & Rail Center Pivoted Door

Where:

$A_f = \sum(A_H, A_S, A_P, A_M, A_{EGT}, A_{EGB}, A_{EGP}, A_{EGM})$

U_f	= U-Frame		
U_H	= U-Header	A_H	= Area of Header
U_S	= U-Stile	A_S	= Area of Stile
U_P	= U-Pivot Jamb	A_P	= Area of Pivot Stile
U_M	= U-Meeting Stile	A_M	= Area of Meeting Stile
U_{EGT}	= U-Edge of Glass Top	A_{EGT}	= Area of Edge of Glass Top
U_{EGB}	= U-Edge of Glass Bottom	A_{EGB}	= Area of Edge of Glass Bottom
U_{EGP}	= U-Edge of Glass Pivot Stile	A_{EGP}	= Area of Edge of Glass Pivot Stile
U_{EGM}	= U-Edge of Glass Meeting Stile	A_{EGM}	= Area of Edge of Glass Meeting Stile

$$U_G = \frac{U_{cg} A_{cg}}{A_{cg}}$$

Equation 2: Weighted Average Calculation for Center of Glazing U-Value in a Dawson Stile & Rail Center Pivoted Door

Where:

U_G	= U-Glass		
U_{cg}	= U-Center of Glazing	A_{cg}	= Area Center of Glazing

The Total U-Value for the entrance system was calculated using the area weighted average formula found in Equation 3. The U-Values for the U_f and U_g are weighted averages that were pulled from Equations 1 and 2. The total area is simply the area of the entire entrance system, frame and doors combined. As stated in the Methodology section of the report, frame and the door stiles and rails have been combined to include the gap around the door and the weather stripping that seals that gap. In this way, a more comprehensive analysis of the door system is accomplished, not excluding major areas of thermal energy transfer.

$$U_t = \frac{[\sum(U_f A_f) + \sum(U_g A_g)]}{A_T}$$

Equation 3: *Weighted Average Calculation for Total U-Value Dawson Stile & Rail Center Pivoted Door*

Where:

U_T	= Total product U-factor	A_T	= Total fenestration area
U_f	= Frame U-factor	A_f	= Frame Area
U_g	= Center-of-glazing U-factor	A_g	= Center-of-glazing Area

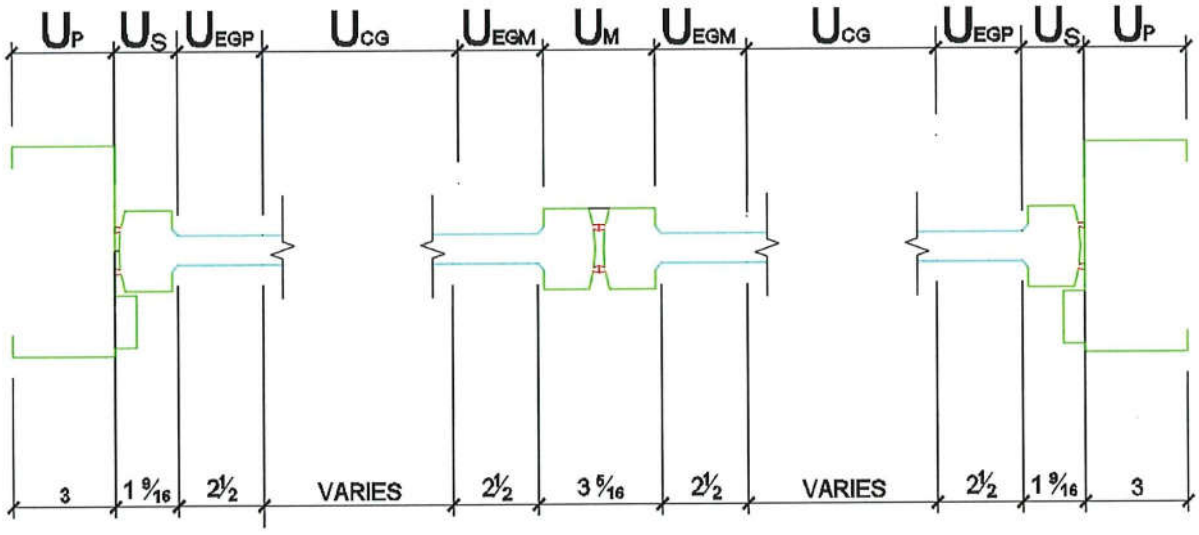


Figure 1: Component Section View Taken Along a Horizontal Section Line

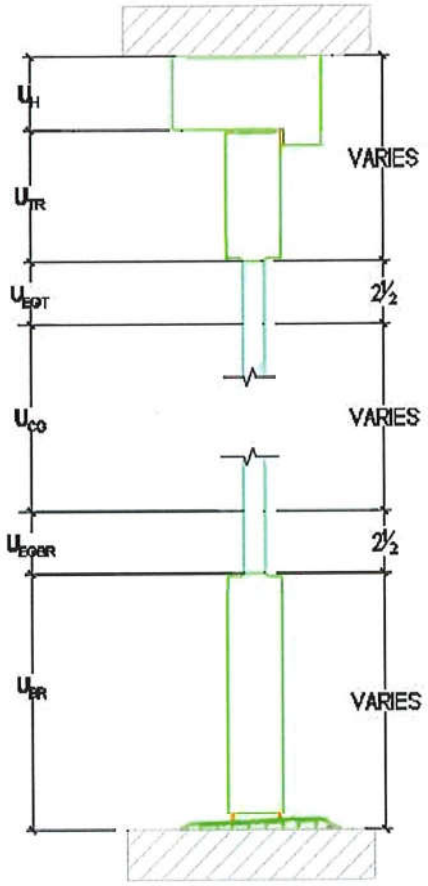


Figure 2: Component Section View Taken Along a Vertical Section Line

Calculation Results

The result shown below was calculated in a spreadsheet which allows Dawson engineers to input sizes and component u-values generated using THERM 7.8 program for all of the individual contributing components. This method provides Dawson engineers the ability to compute the Total Fenestration Product U-Value for any door, glass or hardware configuration. The "TOTAL SYSTEM U-VALUE" which is highlighted in green cell represents the result for a standard NFRC size door (82 3/8" x 37 3/4"), an increase in door size will result in the reduction in the overall U-value. (See figure 9).

ENTRANCE SIZES	
FRAME HEIGHT	86.25
FRAME WIDTH	81.9375
THRESHOLD	0.5
HEADER	3
RIGHT JAMB	3
LEFT JAMB	3
TOP RAIL	4.75
BOTTOM RAIL	10
PIVOT STILE	1.56
MEETING STILE	1.56
DOOR HEIGHT	85.38
DOOR WIDTH	37.75

GLASS MAKEUP	1/4 IN CLEAR TEMPERED WITH ENERGY SELECT 40 1/2 IN AIR 1/4 IN CLEAR TEMPERED
MATERIAL	6063 ALUMINUM EXTRUSIONS WITH URETHANE THERMAL BREAK CLAD WITH MUNTZ METAL
HARDWARE DESCRIPTION	RIXSON H28 FLOOR CLOSER, RIXSON H345 TOP PIVOT

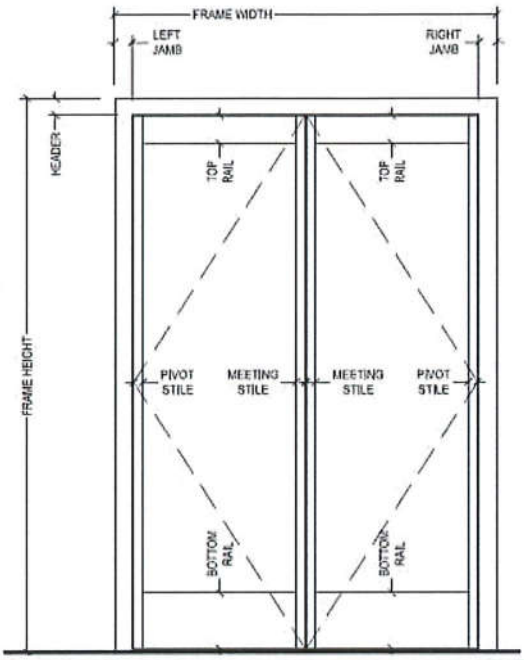
U-VALUE	0.47

THIS U-VALUE REPORT HAS BEEN PREPARED BY Robert Linger ON 04/27/22 FOR

NFRC STANDARD

REFERENCE ELEVATION TO THE RIGHT TO CLARIFY ENTRANCE SIZES

TESTING CRITERIA
U-VALUE ESTIMATION CALCULATED FOLLOWING NFRC PROCEDURE 100 USING LBNL THERM 7.7 IN ACCORDANCE WITH ISO 15099 SECTION 4.1.4



ENTRANCE SIZE REFERENCE

THERM Component Thermal Gradients

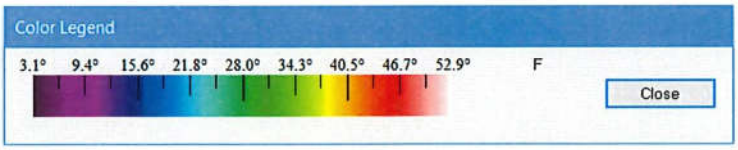


Figure 4: This temperature gradient applies to the following thermal images. For visual comparison, all thermal gradients were kept on one scale.

Figure 3: Excel Spreadsheet that brings in component sizes and performs the weighted average calculation described in Equations 1,2, and 3.

The screenshots shown in Figures 5,6,7, and 8, which were taken from THERM, are assuming the steady state thermal conditions as discussed in the "Simulation Conditions and Assumptions" section of this report. The door was modeled as Muntz metal for this simulation, thus ensuring a worst-case scenario for materials offered, and a conservative heat transfer value.

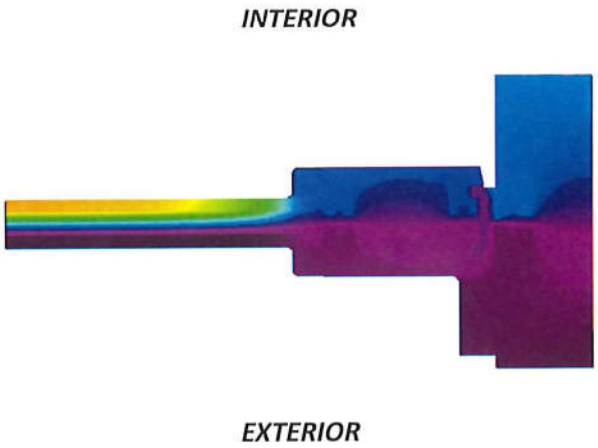


Figure 5: Pivot stile with pivot jamb and appropriate weather stripping and edge of glass thermal profiles

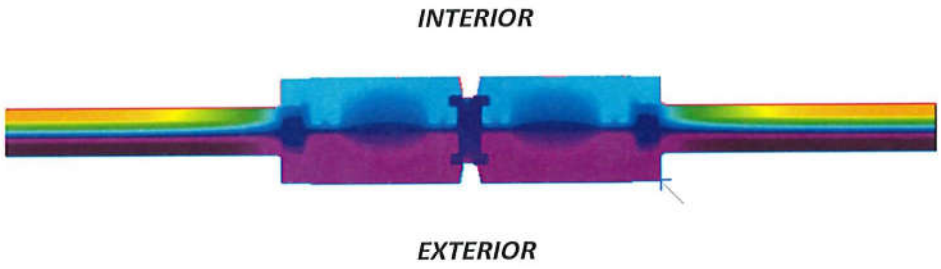


Figure 6: Meeting stiles with appropriate weather stripping and edge of glass thermal profile

EXTERIOR ***INTERIOR***

Figure 7: Top rail and header with door stop and weather stripping and edge of glass thermal profiles

EXTERIOR ***INTERIOR***

Figure 8: Bottom rail, threshold, weather stripping, and edge of glass thermal profile.

FRAME HEIGHTS	FRAME WIDTHS					
	70	72	74	76	78	80
83	0.48	0.48	0.48	0.47	0.47	0.47
85	0.48	0.48	0.47	0.47	0.47	0.47
87	0.48	0.47	0.47	0.47	0.47	0.46
89	0.48	0.47	0.47	0.47	0.47	0.46
91	0.48	0.47	0.47	0.47	0.46	0.46
93	0.47	0.47	0.47	0.47	0.46	0.46
95	0.47	0.47	0.47	0.46	0.46	0.46
97	0.47	0.47	0.47	0.46	0.46	0.46
99	0.47	0.47	0.46	0.46	0.46	0.46
101	0.47	0.47	0.46	0.46	0.46	0.46
103	0.47	0.46	0.46	0.46	0.46	0.45
105	0.47	0.46	0.46	0.46	0.46	0.45
107	0.47	0.46	0.46	0.46	0.45	0.45
109	0.46	0.46	0.46	0.46	0.45	0.45
111	0.46	0.46	0.46	0.46	0.45	0.45
113	0.46	0.46	0.46	0.45	0.45	0.45
115	0.46	0.46	0.46	0.45	0.45	0.45
117	0.46	0.46	0.46	0.45	0.45	0.45
119	0.46	0.46	0.45	0.45	0.45	0.45

Figure 9: *GRADIENT CHART FOR APROXIMATE U-VALUES OF VARIOUS SIZE DOORS & FRAMES.*